206-97042A
Feb. 2008

INSTRUCTION MANUAL
Operation Guide
UV-1800
SHIMADZU
SPECTROPHOTOMETER

Read the instruction manual thoroughly before you use the product. Keep this instruction manual for future reference.

SHIMADZU CORPORATION
KYOTO JAPAN

ANALYTICAL & MEASURING INSTRUMENTS DIVISION

This page is intentionally left blank.

Introduction

Read this manual thoroughly before using the instrument.

Thank you for purchasing this instrument. This manual describes installation, operation, hardware validation, cautions for use, and details on accessories and options. Read the manual thoroughly before using the instrument. Use the instrument in accordance with the manual's instructions. Keep this manual for future reference.

IMPORTANT

- If the user or usage location changes, be sure this Instruction Manual is always kept together with the product.
- If this documentation or the warning labels on the instrument become lost or damaged, promptly obtain replacements from your Shimadzu representative.
- To ensure safe operation, read the Safety Instructions before using the instrument.
- To ensure safe operation, contact your Shimadzu representative if product installation, adjustment, or re-installation (after the product is moved) is required.

COPYRIGHT

- Information in this publication is subject to change without notice and does not represent a commitment on the part of the vendor.
- Any errors or omissions which may have occurred in this publication despite the utmost care taken in its production will be corrected as soon as possible, but not necessarily immediately upon detection.
- All rights are reserved, including those to reproduce this publication or parts thereof in any form without permission in writing from Shimadzu Corporation.
- Microsoft and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries. Other company names and product names mentioned in this manual are trademarks or registered trademarks of their respective companies. TM and ® marks are omitted in this manual.

© 2007-2008 Shimadzu Corporation. All rights reserved.

Safety Instructions

- To ensure safe operation of the instrument, read these Safety Instructions carefully before use.
- Observe all of the WARNINGS and CAUTIONS described in this section. They are extremely important for safety.

In this manual, warnings and cautions are indicated using the following conventions:

WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or possibly death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury or equipment damage.
NOTE	Emphasizes additional information that is provided to ensure the proper use of this product.

The symbol used in this manual is as follows:

	Indication of location for related information in the instruction manuals

Installation Site Precautions

WARNING

When using flammable and toxic samples, be sure to install ventilation equipment at an installation site.

CAUTION

- The weight of this instrument is 15 kg. During installation, consider the entire weight combined with other instruments.

  The lab table on which this instrument is installed should be strong enough to support the total weight of this instrument. It should be level stable, and have depth of at least 600 mm.
  Otherwise, the instrument could tip over or fall off the table.

- Avoid installation sites that are exposed to corrosive gases or excessive dust.

  These adverse conditions may be detrimental to maintaining instrument performance and may shorten its service life.

Installation Precautions

To ensure safe operation, contact your Shimadzu representative for installation, adjustment, or re-installation after moving the instrument to a different site.

WARNING

- Take measures to prevent the instrument from falling in the event of earthquake or other disaster.

  Strong vibrations could cause the instrument to fall over, resulting in injury.

- The power supply voltages and power consumptions of this instrument are listed below. The power supply voltage of the instrument is indicated on the label on the side of the instrument. Connect the instrument only to a power supply of the voltage indicated; otherwise, fire or electric shock could result. Check that the power supply voltage is stable and that its current capacity is sufficient to operate all the components of the system. If not, the instrument will not operate at its rated performance.

Power Supply Voltage (Indicated on the instrument)	Power Consumption	Frequency
AC100 V-120 V and AC220 V-240 V (100-120 V and 220-240 V ~)	140 VA	50-60 Hz

- Ground the instrument

  Grounding is necessary to prevent electric shock in the event of an accident or electrical discharge, and important for ensuring stable operation.

- Do not place heavy objects on the power cord, and keep any hot items away.

  The cord could be damaged, resulting in fire, electrical shock or malfunction. If the cord becomes damaged, contact your Shimadzu representative immediately.

- Do not modify the cord in any way. Do not bend it excessively or pull on it.

  The cord could be damaged, resulting in fire, electrical shock or malfunction. If the cord becomes damaged, contact your Shimadzu representative immediately.

Operation Precautions

WARNING

- Always wear protective gloves when handling any toxic or biologically infectious samples.
- Do not use flammable sprays (hair sprays, insecticide sprays, etc.) near the instrument.

  They could ignite and cause a fire.

CAUTION

- Do not use mobile phones near the instrument.

  They could damage data.

Precautions for Instrument Inspection, Maintenance, Adjustment and Care.

WARNING

- Unplug the instrument before inspection, maintenance, or parts replacement.

  Otherwise, electrical shock or short-circuit accidents could occur.

- Never remove the main cover.

  This may cause injury or malfunction of the instrument.
  The main cover does not need to be removed for routine maintenance, inspection and adjustment.
  Have your Shimadzu representative perform any repairs requiring removal of the main cover.

- If the power cord plug gets dusty, remove the plug from the power outlet and wipe away the dust with a dry cloth.

  If dust is allowed to accumulate, fire could result.

- Replacement parts must be of the specifications given in "1.1 UV-1800 Configuration" and "6.2 Maintenance Parts" in the System User's Guide.

  Use of any other parts may result in instrument damage and malfunction.

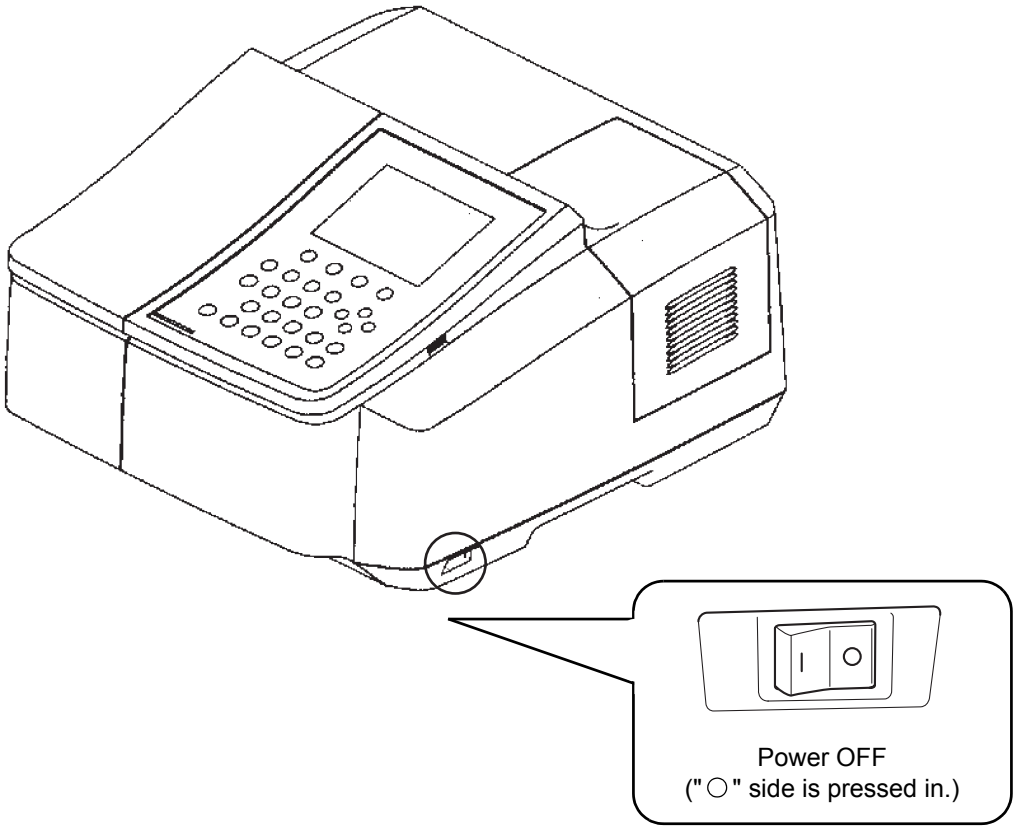
- If any water gets onto the instrument, wipe it away immediately to prevent rust. Never use alcohol or thinner solvents for cleaning the instrument.

  They could cause discoloration.

- Dispose waste liquid properly and in accordance with the instructions of your administrative department.

Emergency Operation

In an emergency situation, press the "○" side of the power switch located on the right side bottom of the UV-1800 to turn OFF the instrument.



Operation at Power Outage

In case of electrical failure, perform the following operations:

1. Press the "○" side of the power switch located on the right side bottom of the UV-1800 to turn OFF the instrument.
2. After the power comes back on, start up the UV-1800 normally by following "Installation Precautions" and "Operation Precautions".

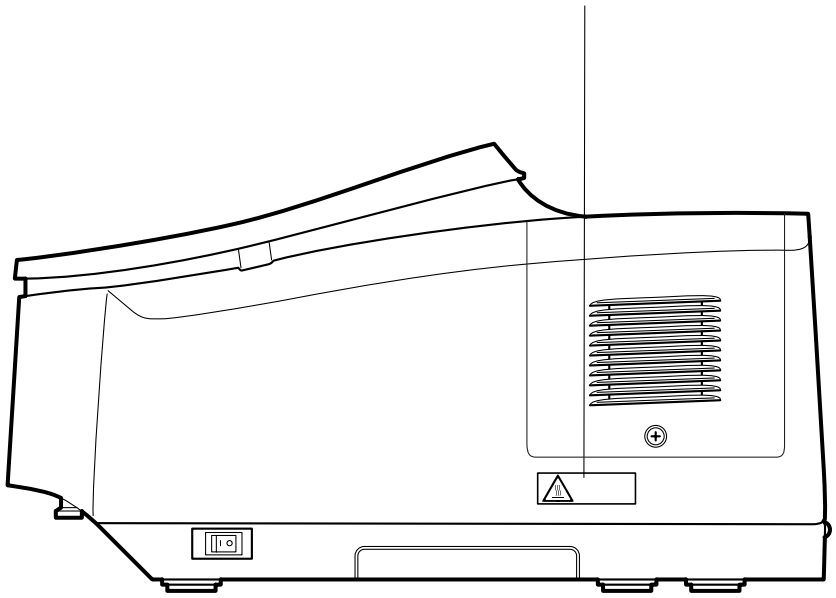
Warning Labels

For safety operation, warning labels are affixed where special attention is required.
Should any of these labels peel off or be damaged, obtain replacements from Shimadzu Corporation.

(Right side)

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.



Product Warranty

Our company provides a warranty on this product, as stated below.

Details

1. Warranty Period: Please consult your Shimadzu representative for information about the extent of the warranty.

2. Warranty Description: If failure occurs for reasons attributable to our company during the warranty period, our company will provide repairs or the replacement of parts without charge (including USB dongles). However, we may not be able to provide identical products in the case of products such as PCs, and their peripherals and parts, which have a short lifespan in the market.

3. Warranty Exceptions: The failures caused by the following events are excluded from the warranty, even if they occur during the warranty period.

1) The product is handled in an improper way.
2) Repairs or modifications are performed by companies or people other than our company and our designated companies.
3) This product was used in combination with hardware or software other than those designated by our company.
4) Device failures and damage to data and software, including the basic software, that are caused by computer viruses.
5) Device failures and damage to data and software, including the basic software, that are caused by power failures, including power outages and sudden drops of voltage.
6) Device failures and damage to data and software, including the basic software, that are caused by powering off the device without the proper shutdown procedure.
7) Failures caused by reasons other than the device itself.
8) Failures caused by use in harsh environments, such as in high temperature or humidity, corrosive gas, or vibration.
9) Failures caused by fires and earthquakes or any other act of providence, contamination by radio active substances and hazardous substances, or any other force majeure event including wars, riots, and crimes.
10) Problems occur because the device is transferred or transported after installation.
11) Expendable items and parts
    Note: Recording media such as floppy disks and CD-ROMs are considered expendables.

* If there is a document such as a warranty attached to the product, or there is a separate contract agreed upon that includes warranty conditions, the rules stated in those documents shall be followed.
Warranty periods for products with special specifications and systems are provided separately.

After-Sales Service and Replacement Parts Availability

After-Sales Service

If any problem occurs with this instrument, inspect it and take appropriate corrective action as described in the Section "Troubleshooting". If the problem persists, or symptoms not covered in the Troubleshooting section occur, contact your Shimadzu representative.

Replacement Parts Availability

Replacement parts for this instrument will be available for a period of seven (7) years after the discontinuation of the product. Thereafter, such parts may cease to available. Note, however, that the availability of parts not manufactured by Shimadzu shall be determined by the relevant manufacturers.

Disposal Precautions

■ Disposal of UV-1800

When disposing of the UV-1800, contact your Shimadzu representative.
Otherwise, be sure to dispose of the product separately from general garbage, in compliance with the applicable laws or regulations in the country or region where it is used.

■ When disposing of deuterium (D2) lamp

If the deuterium (D2) lamp should be broken or its life is finished, dispose of the lamp separately from general garbage. When disposing of the deuterium (D2) lamp supplied from Shimadzu Corporation, select a method which will not adversely influence the environment or human body, or ask a special disposal dealer for advice or assistance.
The materials of deuterium (D2) lamp are as follows.

- Metals (Tungsten)
- Quartz glass
- Ceramic
- Plastic

Action for Environment (WEEE)

To all users of Shimadzu equipment in the European Union:

WEEE Mark

Equipment marked with this symbol indicates that it was sold on or after 13th August 2005, which means it should not be disposed of with general household waste. Note that our equipment is for industrial/professional use only.

Contact Shimadzu service representative when the equipment has reached the end of its life. They will advise you regarding the equipment take-back.

With your co-operation we are aiming to reduce contamination from waste electronic and electrical equipment and preserve natural resource through reuse and recycling.
Do not hesitate to ask Shimadzu service representative, if you require further information.

Regulatory Information

For Europe:
The product complies with the requirements of the EMC Directive 2004/108/EC and Low Voltage Directive 2006/95/EC.

Product Name:	UV-Visible Spectrophotometer
Model Name:	UV-1800
Manufacturer:	SHIMADZU CORPORATION ANALYTICAL & MEASURING INSTRUMENTS DIVISION
Address:	1, NISHINOKYO-KUWABARACHO, NAKAGYO-KU, KYOTO, 604-8511, JAPAN
Authorized Representative in EU:	Shimadzu Europa GmbH
Address:	Albert-Hahn-Strasse 6-10, 47269 Duisburg, F.R. Germany

CONTENTS

Chapter 5 Photometric 8λ (Multi-Wavelength)

Chapter 6 Spectrum

Chapter 7 Quantitation

Chapter 8 Kinetics

Chapter 9 Kinetics Rate

Chapter 10 Time Scan

Chapter 11 Multi-component Quantitation

Chapter 12 Bio-method

Chapter 13 Data Processing

Chapter 14 Utilities

Chapter 15 Maintenance

Chapter 16 Instrument Validation

Chapter 17 PC Control

Chapter 18 Sample Module Control (Multi-cell, Sipper Operation)

Appendix A UVProbe Basic Operation

Index

Chapter 1 Before Operating...

CONTENTS

1.1 Application of Power

1.1.1 Operation Precautions

■ Precautions Before Operation

CAUTION

- Before turning ON the power switch, check to be sure that nothing is placed in the sample compartment and cell holder.

  If the power is turned ON when a sample cell is mounted to the UV-1800, the light source energy check and wavelength check may be judged as "NG" since the light beam is obstructed.
  When this occurs, first turn OFF the power switch, remove the cell, and then turn ON the power switch again.

- If "Sipper 160" (special accessory) is mounted, turn ON the power switch with the flow cell filled with distilled water.

  If the sample remains halfway within the cell, the light source energy check and wavelength check may be judged as "NG" since the beam is refracted or scattered on the remaining sample. If this occurs, turn OFF the power switch and turn it ON again while pressing down the sipper 160 suction lever. After the pump of the sipper 160 starts rotating, suction the distilled water from the sample suction port. When the distilled water starts being drained, release the lever and finish the suction operation.

■ Precautions During Operation

CAUTION

- Keep the sample compartment cover closed during measurement or 100 %T (0 Abs) correction.

  Any outside light detected on the spectrometer may interfere with accurate measurement and correction.

NOTE

100 %T (0 Abs) correction is the function to correct the current photometric value to 100 %T for transmittance measurement, and 0 Abs for absorbance measurement. Performing this correction only for the specified wavelength is called "Auto-zero", and performing within the specified wavelength range is "Baseline correction".

1.1.2 Turning ON Power and Initialization

When the instrument power is turned ON, the UV-1800 starts executing various checks and initializations.
For details on this procedure, refer to the System User's Guide, "2.5 Turning ON the Power and Initialization".

1.2 Screen Display and Keypad

CAUTION

DO NOT press the keys on the operation keypad using a sharp-tipped instrument such as ballpoint pen.
The film on the keys may be torn off or the keys may be damaged.

Fig. 1.1 illustrates the relation between the screen of the UV-1800 and the keypad. 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 or display mode, etc., you must press the (ENTER) key to set that value.

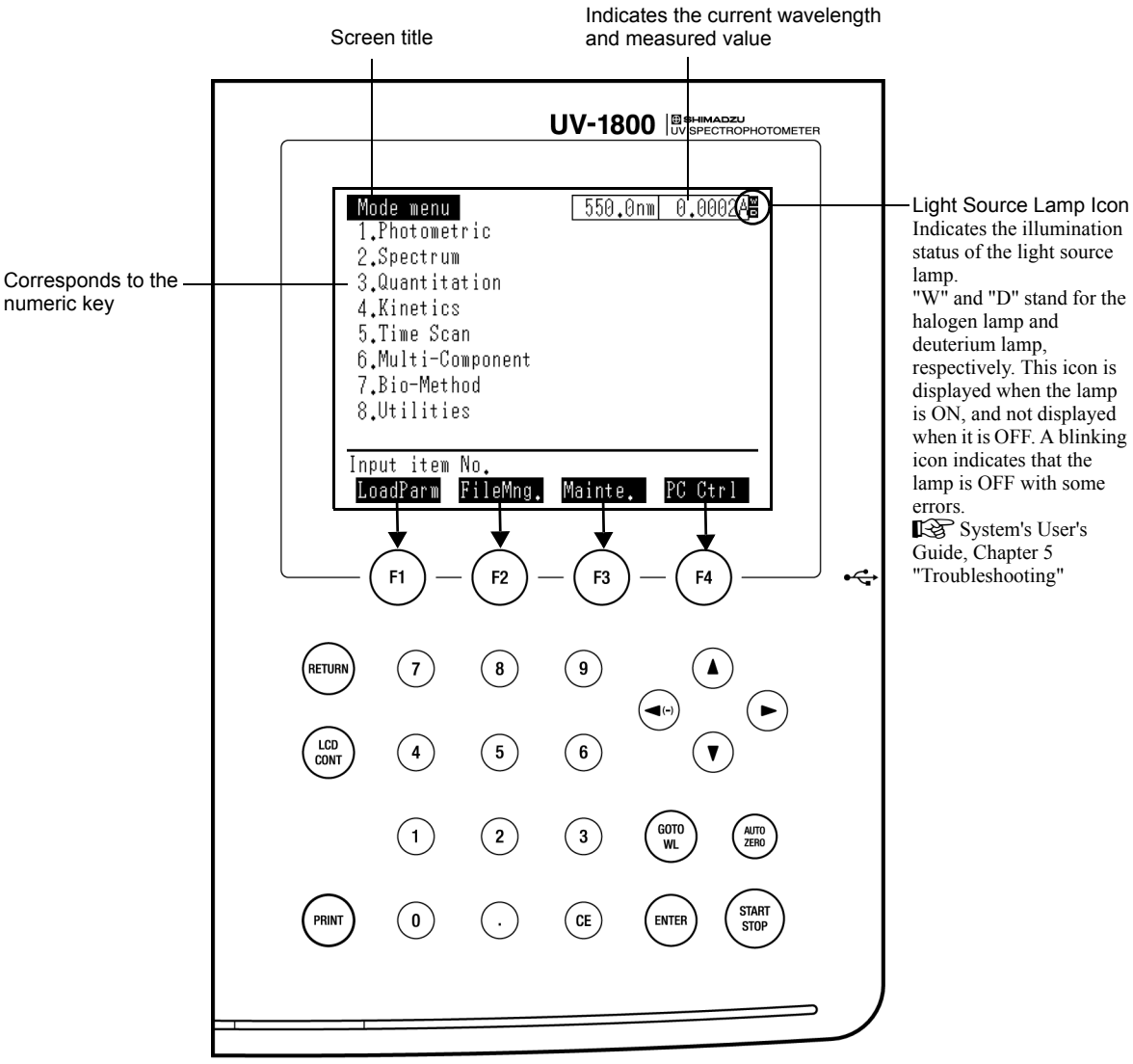


Fig. 1.1 Screen display and keypad

The basic function of each key is described below. Some keys may be assigned to special functions depending on the screen.

Key	Description
START/STOP	This is the key for starting and stopping measurement once parameter setting has been completed.
AUTO ZERO	When you press this key, the absorbance (transmittance) at the current wavelength will automatically be set to 0 Abs (100 %T).
GOTO WL	This is the key that is used to change the current wavelength.
ENTER	When you enter a value, press this key after the value to set the entering value.
◄(–) ► ▲ ▼	Use these keys to move the cursor in the LCD screen upward/ downward, or left/right. The left cursor key can also be used to enter a negative (–) value when entering numeric values.
F1 F2 F3 F4	These are the keys corresponding to the functions that are displayed at the bottom of the LCD screen.
RETURN	Use this key to display to the previous screen.
LCD CONT	Use this key to adjust the screen contrast. Using cursor keys (▲ ▼) while holding down this key changes the contrast.
PRINT	Use this key to output a hard copy of the monitor screen.
. 0 ~ 9	Use these keys to enter numeric values.
CE	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.

1.3 Login Screen (Only When Security Function is On)

The UV-1800 has a security function that allows limiting function availability according to user level. (☞ "15.2.2 Setting Security Functions")

3 types of users can be specified for the UV-1800: Administrator, Developer, and Operator. If the security function is ON, you need to login to the UV-1800 as one of those users.

The Login screen (Fig. 1.2) appears when the power is turned ON and the following initialization is complete, or when the current user is logged out (Note).

NOTE

Press the RETURN key on the [Mode menu] screen (☞ "2.1 Mode Menu Screen") to log out from the current user.

In the initial state of the screen, the last logged-in user is displayed. If you enter a correct password the display will switch to the [Mode menu] screen.

Set or change the password for each user in the Security Settings screen (☞ "15.2.2 Setting Security Functions"). No password has been assigned to any user in the initial settings.

NOTE

- Be extremely careful not to lose your password.
  Note especially that if the password for Administrator is lost, the status cannot be recovered even by attempting to set a new password, since the security function settings become defunct.
  In such cases, the service personnel must work at your installation site for function recovery. Contact your Shimadzu representative.

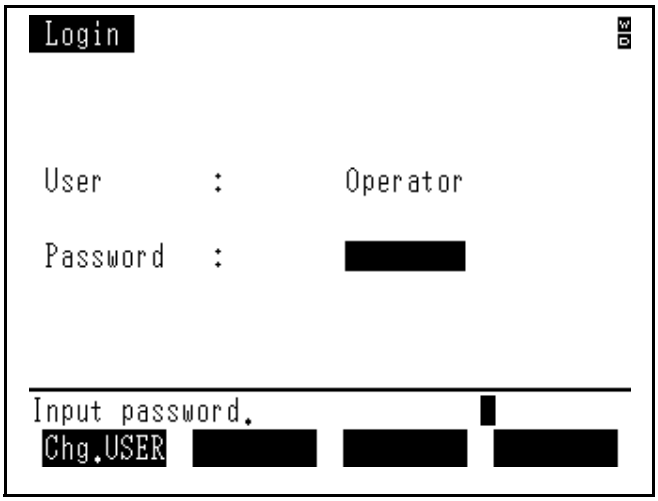
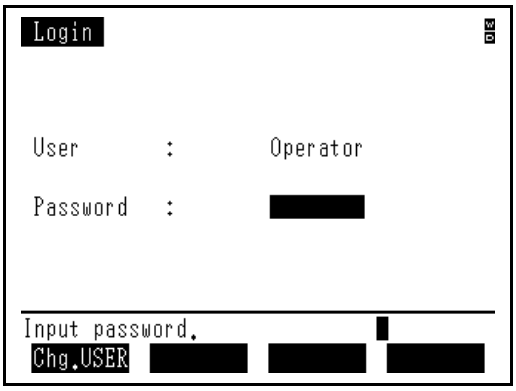


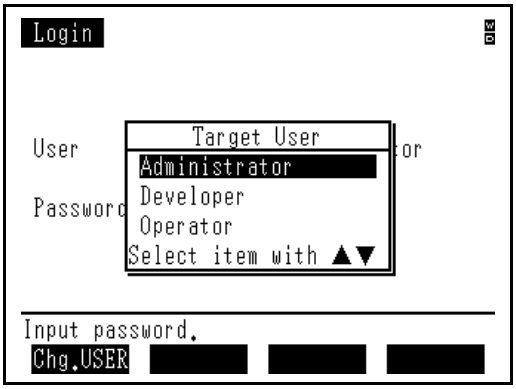
Fig. 1.2 [Login] Screen

1.3.1 User Selection and Password

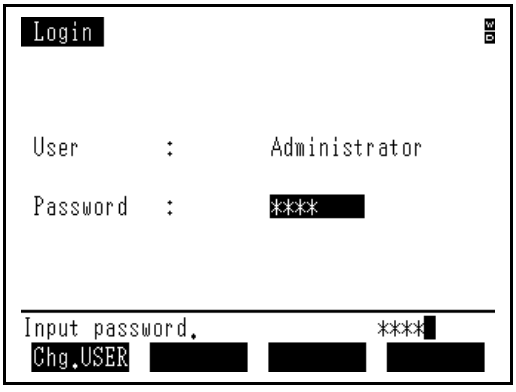
1 Press (F1) [Chg.USER] key in the [Login] screen.



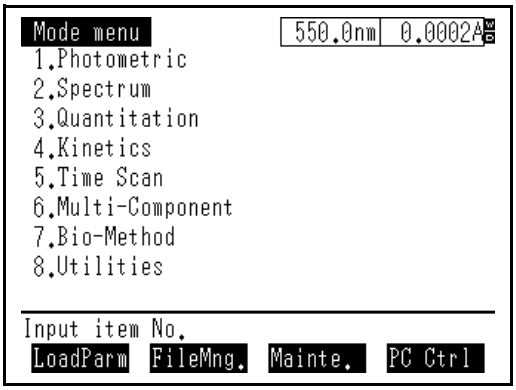
2 The [Target User] Selection screen is displayed. Use the (▲) (▼) keys to select a user. (Here, [Administrator] is selected.)
Press the (ENTER) key to confirm the selection.



3 Enter the password for the selected user. For example, to enter a password "1234", press the (1), (2), (3), (4) keys in order. After the entry, press the (ENTER) key to confirm the password.



4 The [Mode menu] screen is displayed.



NOTE
Available functions vary according to the rights assigned to each user.

1.4 Using the USB Memory Device

NOTE
For details on the procedure for using the USB memory device, refer to the instruction manual of the USB memory device.

You can connect a commercially available USB memory device (a flash memory that supports USB 1.1) to the UV-1800. The USB connector for connecting the USB memory is located on the side of the operation keypad (☞ System User's Guide, "1.2.3 UV-1800 Main Body, Right Side View").

NOTE
The USB memory can also be connected to the USB connector located on the left side of the instrument (☞ System User's Guide, "1.2.2 UV-1800 Main Body, Left Side View"). However, the UV-1800 can simultaneously recognize only a USB memory device.

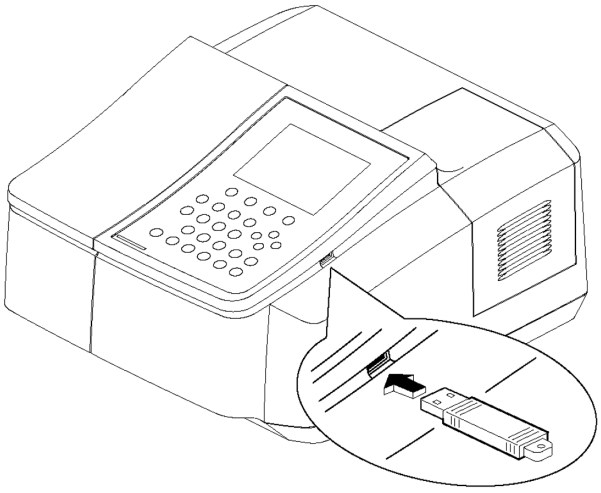


Fig. 1.3 Connecting the USB memory device

Using the USB memory device, the following operations become available:

- Storing measurement parameters and data acquired during measurements:
  You can store these data in your PC hard disk via the USB memory device.
  For the procedure for saving measurement parameters and acquired data, refer to "3.1 Save Files".

- Reading measurement data on a commercially available PC software:
  The UV-1800 can convert the measurement data to the CSV format, which can be read on any software supporting the format.
  For the procedure for converting/saving measurement data in the CSV format, refer to "2.4 File Management".

- Reading measurement data on the UVProbe software
  The data files obtained/saved in the UV-1800 can be read on the PC control/analysis software UVProbe (Standard accessory).
  For details on the type of data files that can be read on the UVProbe, refer to "3.4 Read Files (on UVProbe)".

NOTE
Data files once saved in the UVProbe software cannot be read on the UV-1800.

■ Precautions for connecting the USB memory

When you connect the USB memory device, the "USB memory icon" is displayed on the right bottom of the screen.

The USB memory can be connected or removed regardless of the power ON/OFF status of the UV-1800. However, if the USB memory is unplugged during the data transfer, the data within the memory device may be corrupted. DO NOT remove the USB memory device while the message indicating that the UV-1800 is currently accessing the memory device is displayed.

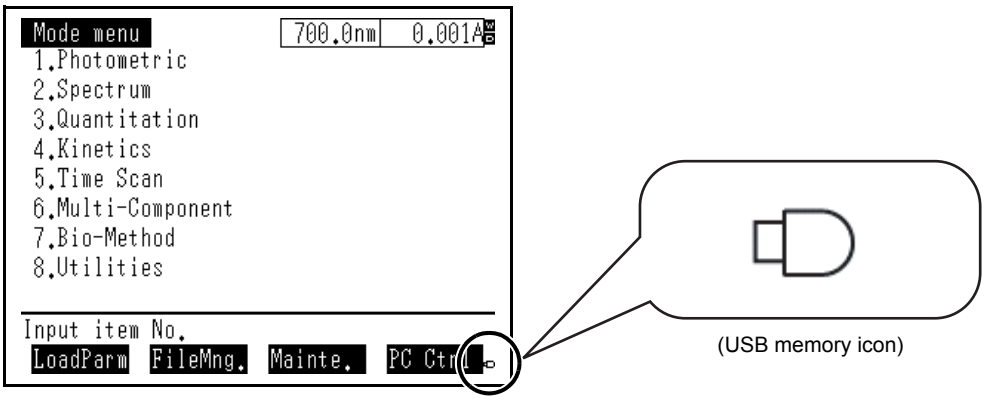


Fig. 1.4

1.5 Handling Internal Data

When performing measurement, the UV-1800 usually obtains data values containing more decimal places than are displayed on the screen.

For curve data, the UV-1800 saves obtained values as they are. For table data, the UV-1800 rounds obtained photometric values as given below before calculating concentrations, etc, displaying and saving the results.

- Abs (Absorbance): Rounded to four decimal places (i.e. the fifth decimal place is rounded off).
- %T (Transmittance): Rounded to two decimal places (i.e. the third decimal place is rounded off).

NOTE

The number of digits of the data displayed on the screen is in accordance with the set value of [Decimal Display] in the Utilities Menu screen.

☞ "14.1 Utilities Menu Screen"

This page is intentionally left blank.

Chapter 2 Mode Selection

The [Mode menu] screen which is displayed after initialization is completed, and the operations which are shared by the various modes are explained in this chapter.

CONTENTS

2.1 Mode Menu Screen

The screen to select a measurement mode to be carried out (the [Mode menu] screen : Fig. 2.1) is displayed.

NOTE

If the security function ("15.2.2 Setting Security Functions") is ON, the login screen is displayed. For the login procedure, refer to "1.3 Login Screen (Only When Security Function is On)".

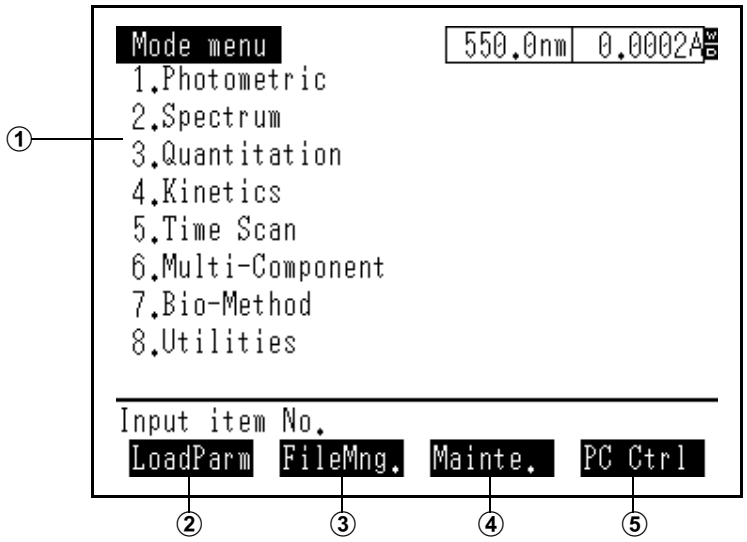


Fig. 2.1 [Mode menu] screen

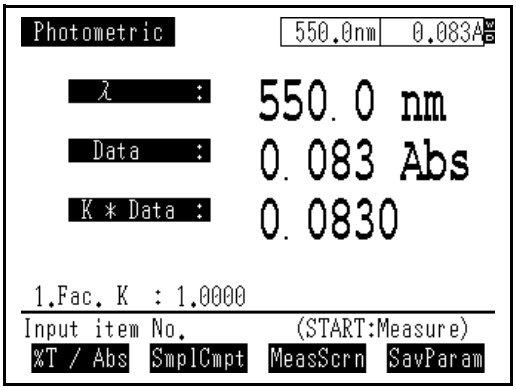
No.	Key Operation	Display	Description
①	1	[Photometric]	Displays the screen for selecting the Photometric mode measurement method. • One-wavelength measurement ☞ Chapter 4 "Photometric (One-Wavelength)" • Multi-wavelength measurement ☞ Chapter 5 "Photometric 8λ (Multi-Wavelength)"
	2	[Spectrum]	Displays the Measurement Parameter Configuration screen for Spectrum mode. ☞ Chapter 6 "Spectrum"
	3	[Quantitation]	Displays the Measurement Parameter Configuration screen for Quantitation mode. ☞ Chapter 7 "Quantitation"
	4	[Kinetics]	Displays the screen for selecting the Kinetics mode measurement method. • Kinetics Measurement ☞ Chapter 8 "Kinetics" • Rate Measurement ☞ Chapter 9 "Kinetics Rate"
	5	[Time Scan]	Displays the Measurement Parameter Configuration screen for Time Scan mode. ☞ Chapter 10 "Time Scan"
	6	[Multi-Component]	Displays the Measurement Parameter Configuration screen for Multi-component Quantitation mode. ☞ Chapter 11 "Multi-component Quantitation"
	7	[Bio-Method]	Displays the screen for selecting the Bio-method mode measurement method. ☞ Chapter 12 "Bio-method"
	8	[Utilities]	Displays the screen for performing the instrument utility settings. ☞ Chapter 14 "Utilities"
②	F1	[LoadParm]	Calls the conditions stored in the built-in memory or USB memory. ☞ "2.3 Load Parameters"
③	F2	[FileMng.]	Used to perform various operations (file loading, CSV conversion, etc.) on stored files in the built-in memory or USB memory. ☞ "2.4 File Management"

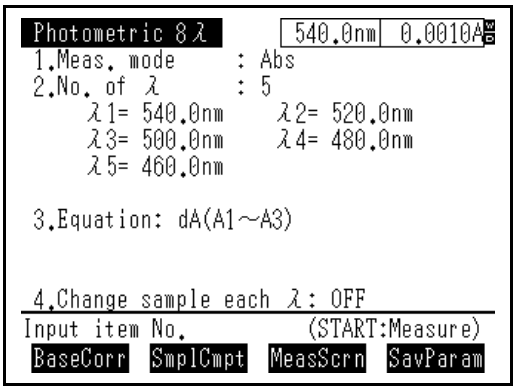
No.	Key Operation	Display	Description
④	F3	[Mainte.]	Displays the screen for performing inspection and maintenance of the UV-1800 (e.g. instrument validation and usage time check for the light source lamp), as well as security function settings. ☞ Chapter 15 "Maintenance"
⑤	F4	[PC Ctrl]	Allows controlling the UV-1800 via an external computer. ☞ Chapter 17 "PC Control"
–	RETURN	–	Logs out the current user when the security function (☞ "15.2.2 Setting Security Functions") is ON.

2.2 Overview of Various Modes

You can move from the [Mode menu] screen to one of the 8 measurement modes and 2 functions described below. For details on each mode, refer to the listed reference.

■ [Photometric] mode





Measures absorbance or % transmittance of a sample at arbitrary wavelengths.
The following 2 measurement methods are available.

* One-wavelength measurement

  ☞ Chapter 4 "Photometric (One-Wavelength)"

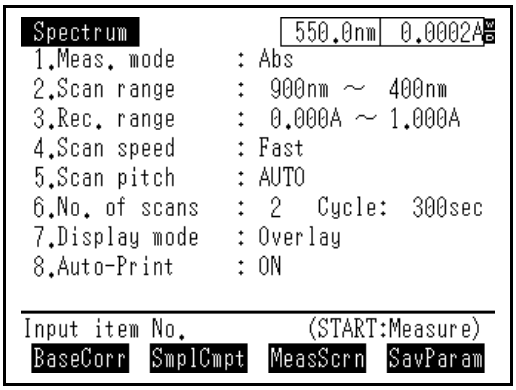
* Multi-wavelength measurement

  ☞ Chapter 5 "Photometric 8λ (Multi-Wavelength)"

In multi-wavelength measurement, it is possible to select one of the following five equations based on the data obtained at up to four wavelengths and then output the calculation results:

- A1-A2
- A1/A2
- dA(A1 to A3)
- (K1A1 + K2A2 + K3A3 + K4A4)x K5
- K5x(K1A1 + K2A2)/(K3A3 + K4A4)

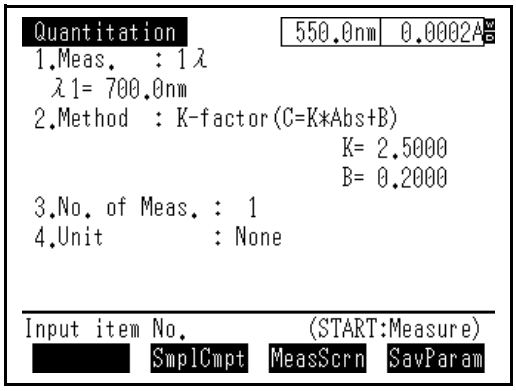
■ [Spectrum] mode



Scans a wavelength range to measure the absorbance and % transmittance of a sample as a function of wavelength.
Single beam energy measurement can also be performed.
Data processing such as peak detection, smoothing, and mathematical calculation may be applied to the measured spectrum.

☞ Chapter 6 "Spectrum"

■ [Quantitation] mode



Creates a calibration curve from a standard sample and quantitates an unknown sample.
The following 4 measurement methods are available.

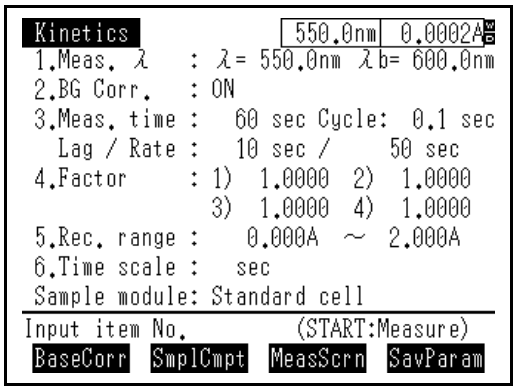
* 1-wavelength measurement
* 2-wavelength measurement
* 3-wavelength measurement
* Derivative quantitation

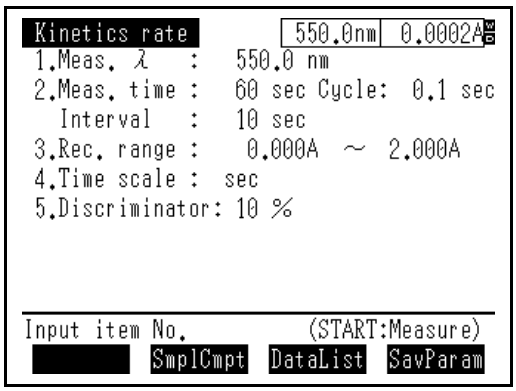
In addition, the following 3 methods are available for calibration curve generation.

* K-factor
* Single point calibration curve
* Multi-point calibration curve

☞ Chapter 7 "Quantitation"

■ [Kinetics] mode





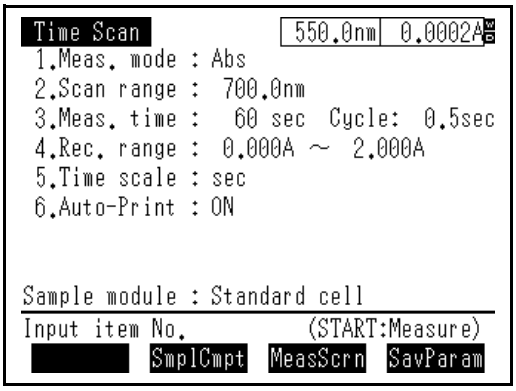
Calculates enzyme activity from the time dependent change in absorbance.
Up to 16 samples can be measured at once using a multi-cell holder (optional).

The following 2 measurement methods are available.

* Kinetics measurement
* Rate measurement

☞ Chapter 8 "Kinetics"
☞ Chapter 9 "Kinetics Rate"

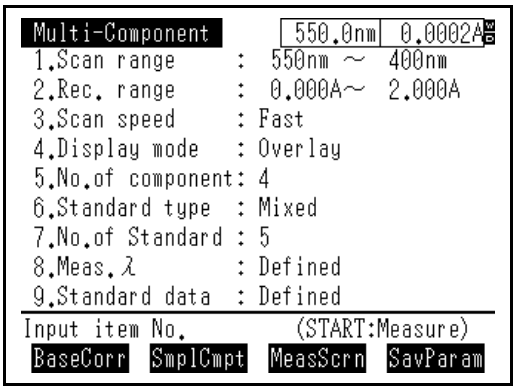
■ [Time Scan] mode



This function is used to measure the change in the rate of absorbance, transmittance, or energy in the fixed wavelength. Up to 16 samples can be measured using the multi-cell holder (option).
Data processing such as mathematical calculation may be applied to the measurement data.

☞ Chapter 10 "Time Scan"

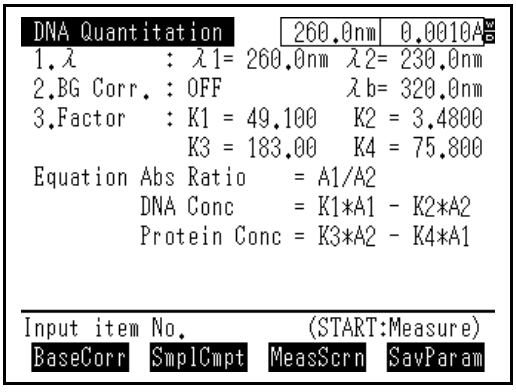
■ [Multi-component] mode

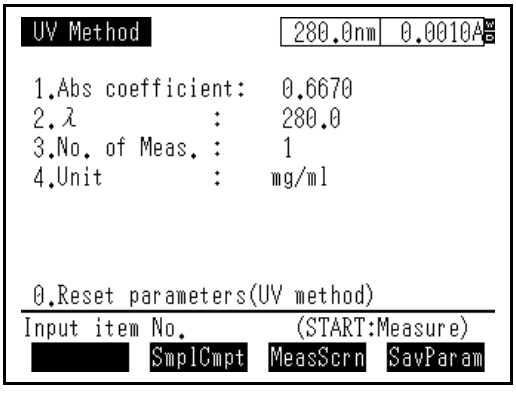


Enables samples with up to 8 constituent components to be measured and quantitated.

☞ Chapter 11 "Multi-component Quantitation"

■ [Bio-method] mode





In the Bio-method Mode, the following 2 measurement methods are available.

* DNA quantitation
* Protein measurement

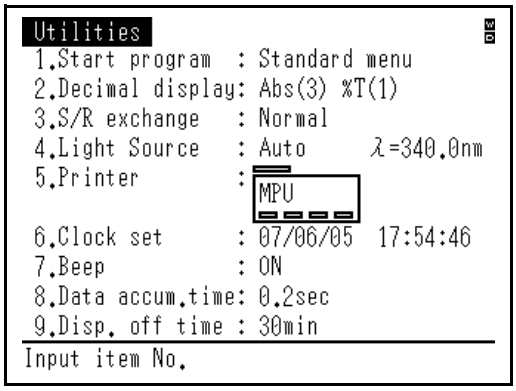
The [DNA Quantitation] obtains the DNA and protein concentrations based on the measured absorbances.

The [Protein measurement] performs protein quantitation. The following 5 methods are available.

- Lowry method
- BCA method
- CBB method
- Biuret method
- UV absorption method

☞ Chapter 12 "Bio-method"

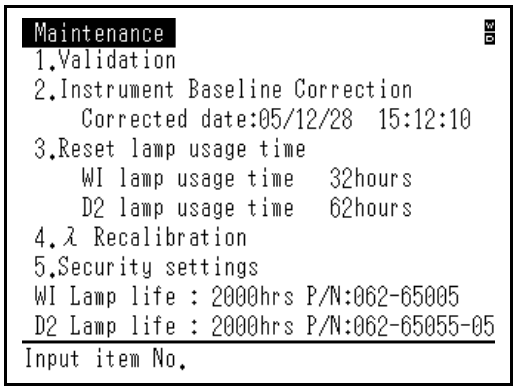
■ [Utilities] mode



This is the mode for setting and changing the basic operating parameters of the instrument.

☞ Chapter 14 "Utilities"

■ [Maintenance]



This mode provides the following functions for maintenance purposes.

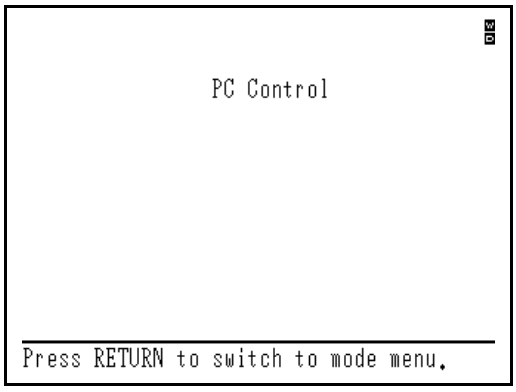
<Instrument performance/status check>
- Instrument Validation function
- Lamp illumination time management

<Instrument calibration/correction>
- Baseline correction
- Wavelength recalibration

<User authority management>
- Security settings

☞ Chapter 15 "Maintenance"

■ [PC control]



This mode allows the UV-1800 to be controlled by an external computer.
Also select this mode when using the UVProbe software attached to this instrument.

☞ Chapter 17 "PC Control"

2.3 Load Parameters

You can load the measurement parameters stored in the built-in memory or USB memory device. (For details on saving parameters, refer to 3.1 Save Files.)

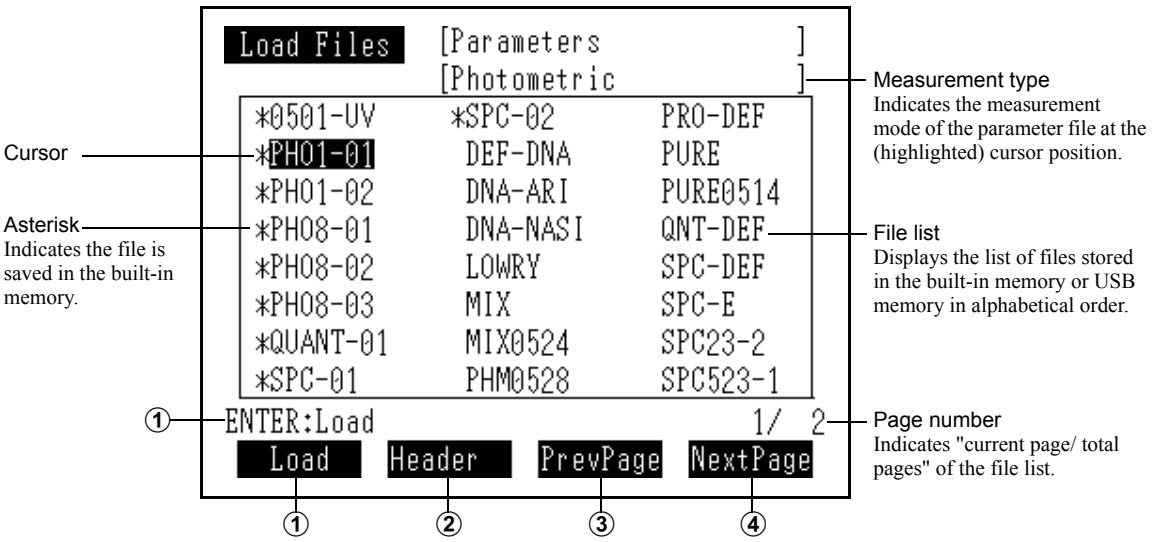


Fig. 2.2 [Load Files] screen

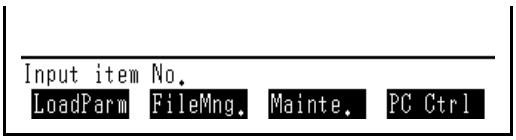
No.	Key Operation	Display	Description
①	F1 or ENTER	[Load]	Loads the file at the current cursor position (highlighted).
②	F2	[Header]	Displays the contents of the file at the current cursor position (highlighted). Press the RETURN key to return to the [Load files] screen (Fig. 2.2). Header [Parameters] *PH01-01 [Photometric] Date: 2007/04/24 10:02:52 Meas. mode: %T λ /nm : 550.0 K Factor : 0.9999 Header sample
③	F3	[PrevPage]	Displays the previous page of the file list.
④	F4	[NextPage]	Displays the next page of the file list.
–	▲ ▼ ◄(-) ►	–	Moves a cursor in the file list.

NOTE

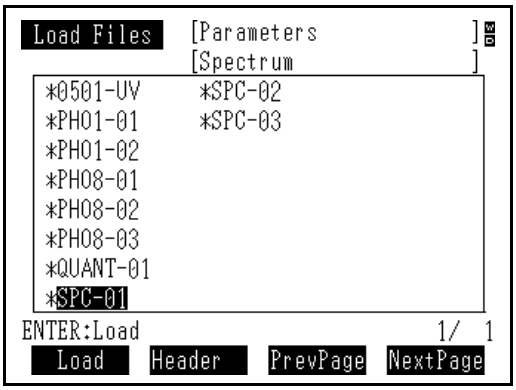
When using a USB memory device, the file list can only display 2000 files. If more than 2000 files exist in the USB memory, a notification message appears and only 2000 files are displayed. Files are displayed in an alphabetized order.

■ "Load Parameters" Procedure

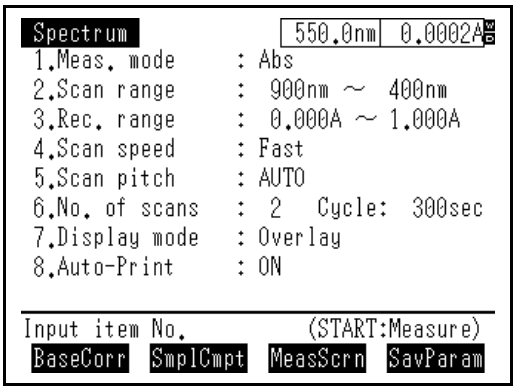
1 Press (F1) [LoadParm] key in the [Mode menu] screen.



2 The [Load files] screen is displayed.
By pressing the (▲) (▼) (◄) (►) keys, move the cursor to the desired parameter file.
Press the (ENTER) key, or the [Load] (F1) key.



3 The Parameter Configuration screen for the selected measurement mode appears, and the parameter settings in the selected file will be loaded on the screen.



2.4 File Management

The UV-1800 creates the following 3 types of measurement files.

1. Parameter file
2. Curve data file
3. Table data file

When you select F2 [FileMng.] key and narrow down the files to be operated, the File Management will appear, where you can perform file operations on these 3 types of files, such as copying, deleting, saving in CSV format (☞ "2.4.3 Saving in CSV Format"), and displaying the file contents.

NOTE

When using a USB memory device, only 2000 files are displayed in the file list for each measurement file type listed above. Files are displayed in an alphabetized order.

2.4.1 Narrowing Down Files

To display the [File Manager] screen, you need to first narrow down the file selection with regard to memory storage type, file type, and method type.

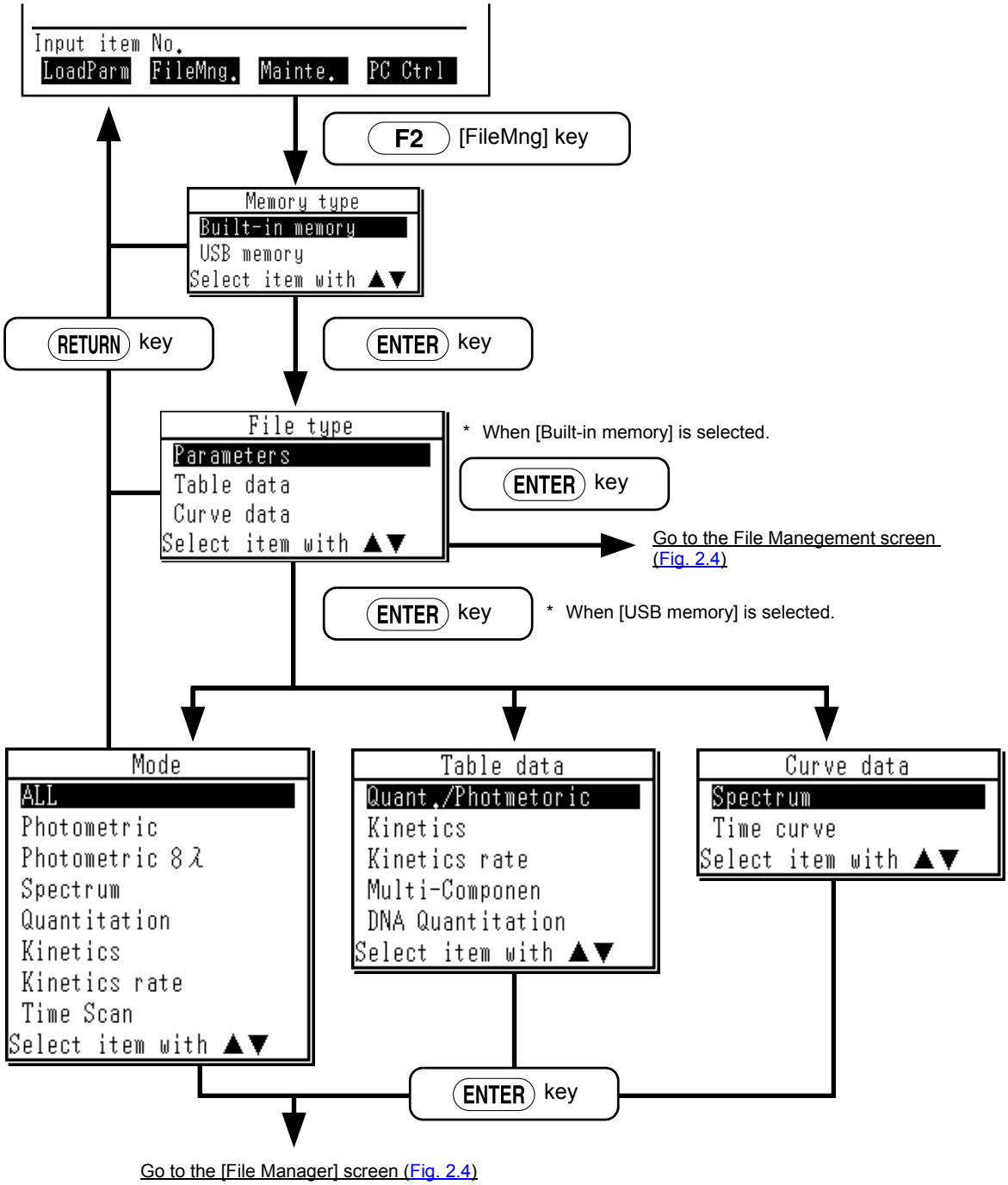


Fig. 2.3 Operational/Screen flow to [File Manager] screen

2.4.2 File Manager Screen

In the file list, only the files that have been narrowed down in the previous section 2.4.1 are displayed.

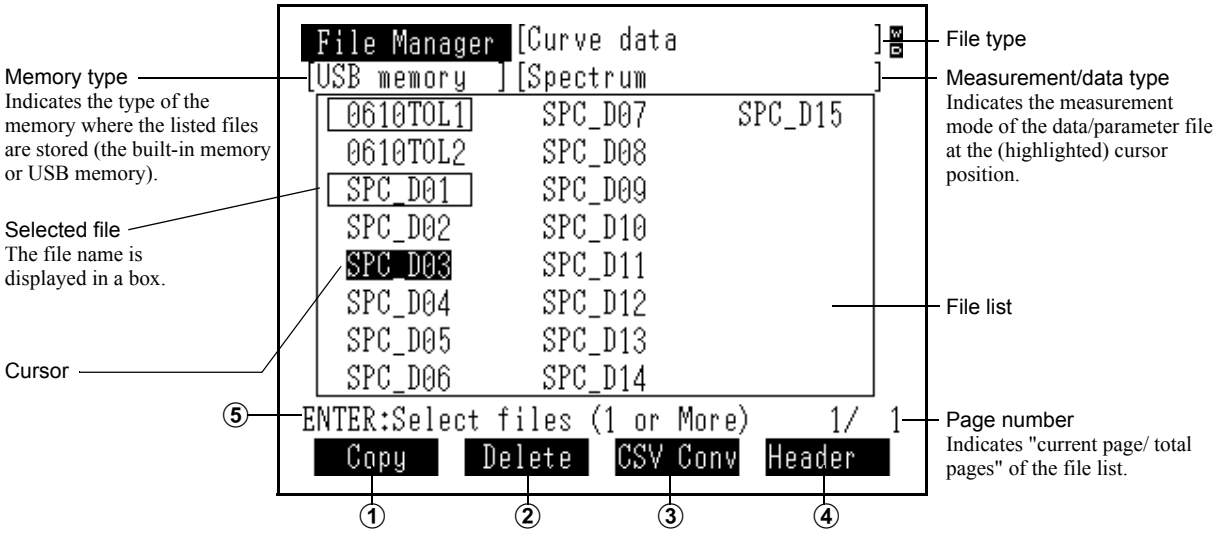
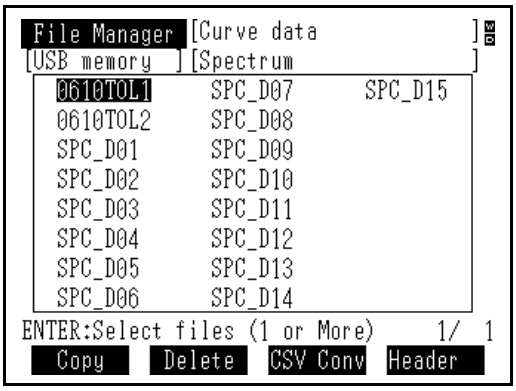


Fig. 2.4 [File Manager] screen

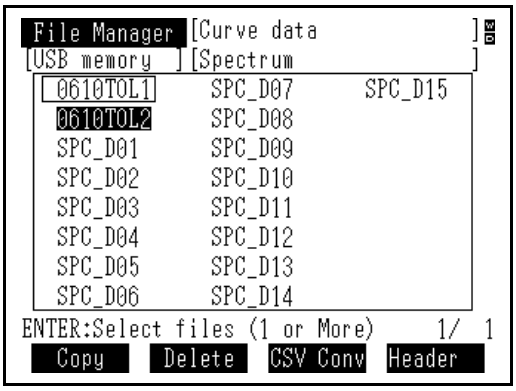
No.	Key Operation	Display	Description
①	F1	[Copy]	Saves the selected file under the same name to a separate memory.
②	F2	[Delete]	Deletes the selected file from the memory storage.
③	F3	[CSV Conv]	Converts the selected file to CSV format and saves it to the USB memory. ☞ "2.4.3 Saving in CSV Format" **NOTE** The parameter files cannot be converted to CSV file format.
④	F4	[Header]	Displays the contents of the file at the current cursor position (highlighted). Press the RETURN key to return to the [File Manager] screen (Fig. 2.4). Header [Curve data] SPC_D06 [Spectrum] Date: 2007/03/28 10:01:35 Meas. mode: %T Scan range /nm: 700.0 - 300.0 Scan pitch /nm: 0.2 Scan speed : Fast Header sample
⑤	ENTER	–	Selects a file or cancels the selected file.
–	▲ ▼ ◄(-) ►	–	Moves a cursor in the file list.

■ "File Selection" Procedure

1 By pressing the ▲ ▼ ◄(-) ► keys, move the cursor (highlighted) and highlight the desired file.
Press the ENTER key to confirm the file selection.



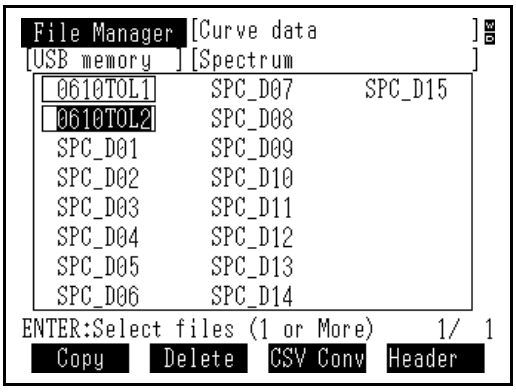
2 In the list, the name of the file selected and confirmed in procedure 1 is displayed in a box.
Repeat procedure 1 if you wish to select multiple files at one time.



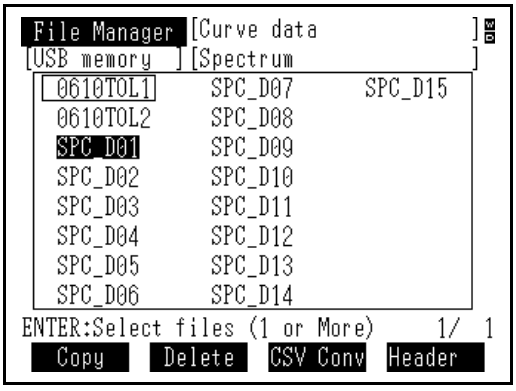
NOTE
A maximum of 32 files can be processed in one operation simultaneously.

■ Canceling of "File Selection" Procedure

1 Using the ▲ ▼ ◄(-) ► keys, move the cursor (highlighted) and highlight an already-selected file that is displayed in a box.



2 Press the ENTER key to cancel the already-made selection. (The box will disappear.)



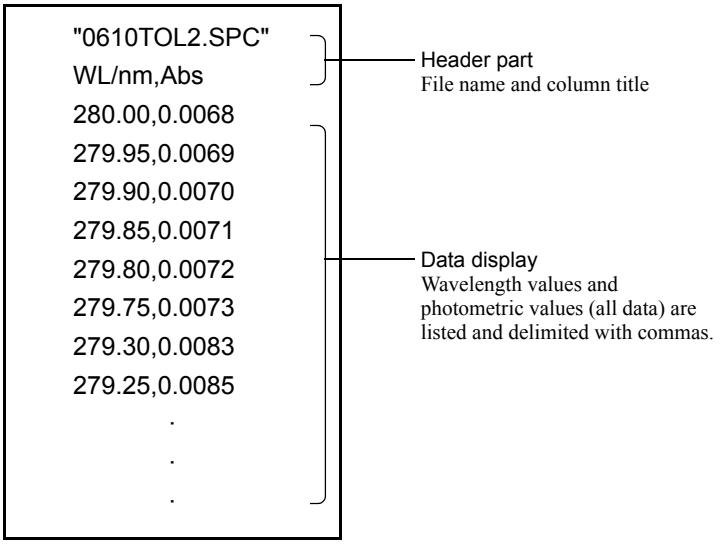
2.4.3 Saving in CSV Format

This function is used for converting the curve data or table data acquired in the UV-1800 to the text data in CSV (Comma Separated Values) format, and saving this data.
The converted data are saved as the decimal place values specified in [2. Decimal Display] in the Utilities Menu screen.
You can use the converted data on any commercially available software that supports the CSV format.

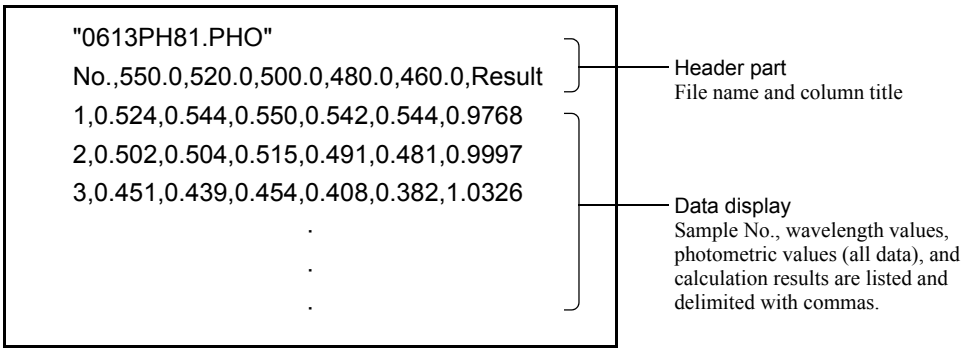
NOTE
The parameter files cannot be converted to the CSV format.

The data file newly created in CSV format is saved under the same name as that of the original file. Note that data files in CSV format can only be saved in the USB memory device.
The data files converted to the CSV format are saved in the folder location described below within the USB memory. If the folder does not exist, the UV-1800 automatically creates it when saving the data files.

File Type	Folder Configuration
Curve data file converted to the CSV format (*.csv)	\UV1800\CData
Table data file converted to the CSV format (*.csv)	\UV1800\TData



(Conversion example of spectrum curve data)



(Conversion example of photometric 8λ table data)

Chapter 3 Shared Operations

This chapter describes the operations common to several modes of the UV-1800. The operations which are specific to each mode will be described in the chapter explaining the mode.

CONTENTS

3.1 Save Files

The files created in each mode of UV-1800 are saved by the following key operations.
For details on the save file screen and the operation procedure, refer to "3.1.1 Save Single File".
Meanwhile, for saving multiple files simultaneously, refer to "3.1.2 Save Multiple Files".

Table 3.1 List of the UV-1800 file type

File Type	Operation Screen	Display	Key Operation	Number of storable files (Built-in Memory)
Parameters file*1)	Measurement Parameter Configuration Screen	[SavParam]	F4	24 files
Curve data file	Measurement Screen	[SavCurve]	F4	8 files
Table data file	Measurement Screen	[SaveData]	F4	8 files

*1) Note that the measurement parameters for optional accessories (multi-cell holder, sipper, etc.) connected to the sample compartment are not saved.

When the USB memory is connected, files of each type are saved in the folder under the location described below. If the destination folder does not exist, the UV-1800 creates it automatically when saving the files.

File Type	Folder Configuration
Parameters file	\UV1800\Method
Curve data file	\UV1800\CData
Table data file	\UV1800\TData

NOTE
The maximum number of the files that can be saved in USB memory depends on the memory storage size. However, only 2000 files can be displayed in the file list for each measurement file type listed above. Files are displayed in an alphabetized order.

When browsing the files in USB memory on the computer, they will have the file extensions described in the following.

Table 3.2 List of the UV-1800 measurement data files

File / Measurement Type	Parameters File	Table Data File	Curve Data File
Photometric	*.mp0	*.pho	
Photometric 8λ	*.mp1	*.pho	
Spectrum	*.ms0		*.spc
Quantitation	*.mq0	*.pho	
Kinetics	*.mk0	*.kin	*.tmc
Kinetics Rate	*.mk1	*.rat	*.tmc
Time scan	*.mt0		*.tmc
Multi-component	*.mm0	*.mcq	*.spc
Bio-method (DNA Quantitation)	*.md0	*.dna	
Bio-method (Lowry)	*.mq1	*.pho	
Bio-method (BCA)	*.mq2	*.pho	
Bio-method (CBB)	*.mq3	*.pho	
Bio-method (Biuret)	*.mq4	*.pho	
Bio-method (UV method)	*.mq5	*.pho	

* The files framed with " [ ] " can be read on the UVProbe software (standard accessory).

3.1.1 Save Single File

When you select [SavParam], [SavCurve], or [SaveData] in each measurement mode, the [Save files] screen (Fig. 3.1) is displayed.

The file list of the [Save files] screen displays the files that have been saved to the built-in memory or USB memory in the current measurement mode. The name of the file stored in the built-in memory is marked with an asterisk to differentiate the file location.

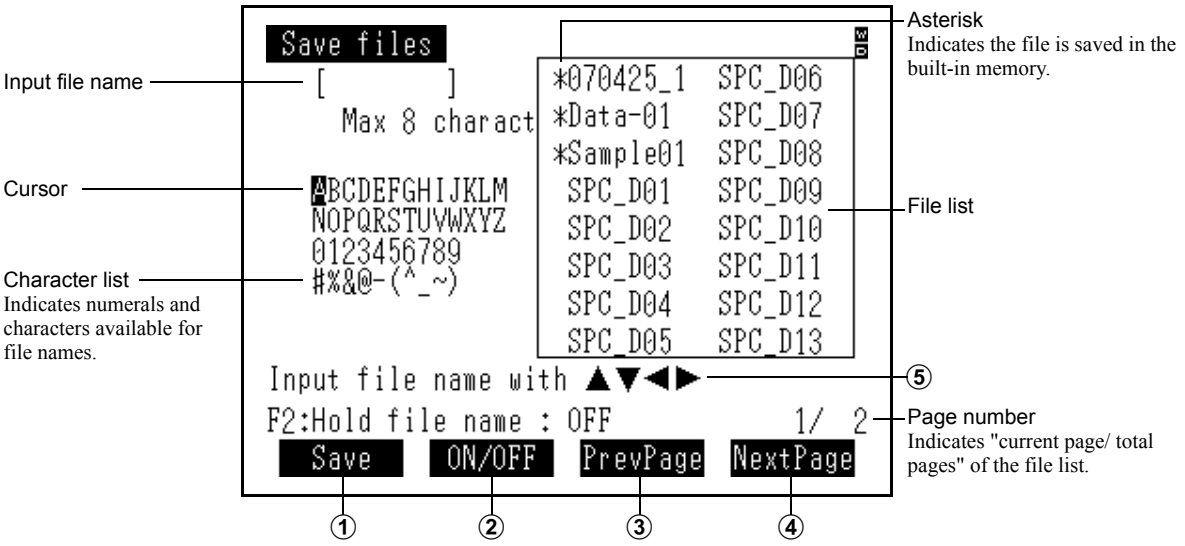
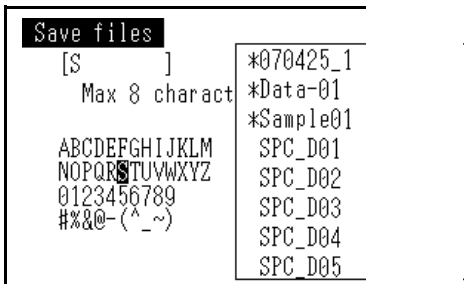


Fig. 3.1 [Save files] screen (For single file)

No.	Key Operation	Display	Description
①	F1	[Save]	Saves a file under the input file name.
②	F2	[ON/OFF]	Toggles ON/OFF of the filename memory function. ON: The [Save files] screen opens with the last-entered filename displayed in the Input file name column. OFF: The [Save files] screen opens with blank in the Input file name column.
③	F3	[PrevPage]	Displays the file list on the previous page.
④	F4	[NextPage]	Displays the file list on the next page.
⑤	▲ ▼ ◀(-) ▶	–	Moves a cursor in the character list.
–	ENTER	–	Inputs the character at the current cursor position.
–	CE	–	Deletes the last letter in the input file name field.
–	. 0 ~ 9	–	Inputs numbers for a part of the file name.

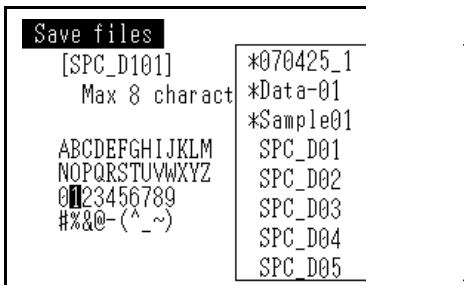
■ "Save files" Procedure

1 Use the ▲ ▼ ◄(-) ► keys to move the cursor to the desired character on the character list.
Press the ENTER key to enter the character in the input file name column.



2 Repeat the procedure 1 until you finish entering the desired filename. A maximum of 8 characters can be entered.

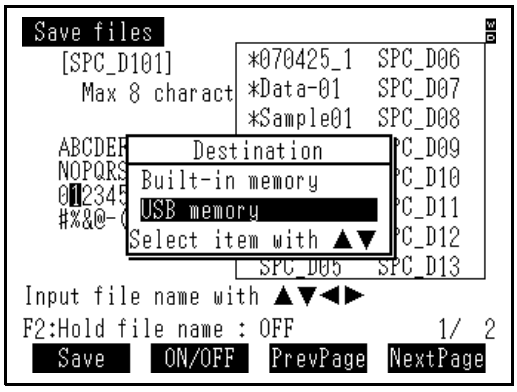
> **NOTE**
> For saving multiple files, a maximum of 6 files can be entered.



Press [Save] F1 key.

3 Use the ▲ ▼ keys to move the cursor to the desired destination memory.
Press the ENTER key to save the file.

> **NOTE**
> If the save is not allowed due to a lack of free space on the built-in memory, you can move to the screen for deleting unnecessary files in the built-in memory. (☞ "3.1.3 Delete Files in Built-in Memory")



3.1.2 Save Multiple Files

When the following measurements are performed, multiple curve data are obtained at one measurement. Therefore, all data files are saved simultaneously.

- Repeated measurement in the Spectrum mode*
- Measurement using multiple cells in the Kinetics/Time Scan mode

* Only when executing the auto-file function with a USB memory device connected. (☞ "6.2.2 Auto-file Function")

A maximum of 6 characters can be used as a filename since cell numbers or measurement numbers are automatically attached to the filename.

Example) When entering the filename "KIN" for a measurement with 3 cells

File Name	Description
KIN01	Time course data at cell position 1
KIN02	Time course data at cell position 2
KIN03	Time course data at cell position 3

The file list on the [Save files] screen displays only the data files that have been saved to the built-in memory or USB memory in the currently selected measurement mode. The name of the file stored in the built-in memory is marked with an asterisk to differentiate the file location.

Except for the difference of maximum input characters, the function and operation procedure are identical to those for saving a single file (See 3.1.1).

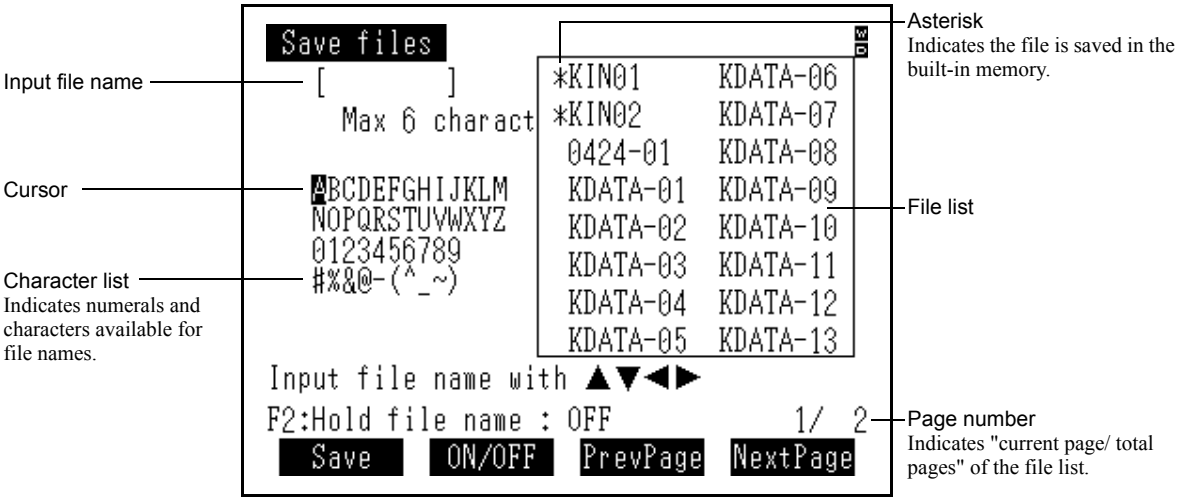


Fig. 3.2 [Save files] screen (For multiple files)

3.1.3 Delete Files in Built-in Memory

When saving files to the built-in memory when enough space does not exist in the memory, a message (Fig. 3.4) appears asking you whether to delete unnecessary files.

When the deletion is selected, the [Delete files] screen (Fig. 3.3) appears.

For the maximum number of files that can be saved in built-in memory, refer to section 3.1, "Table 3.1 List of the UV-1800 file type".

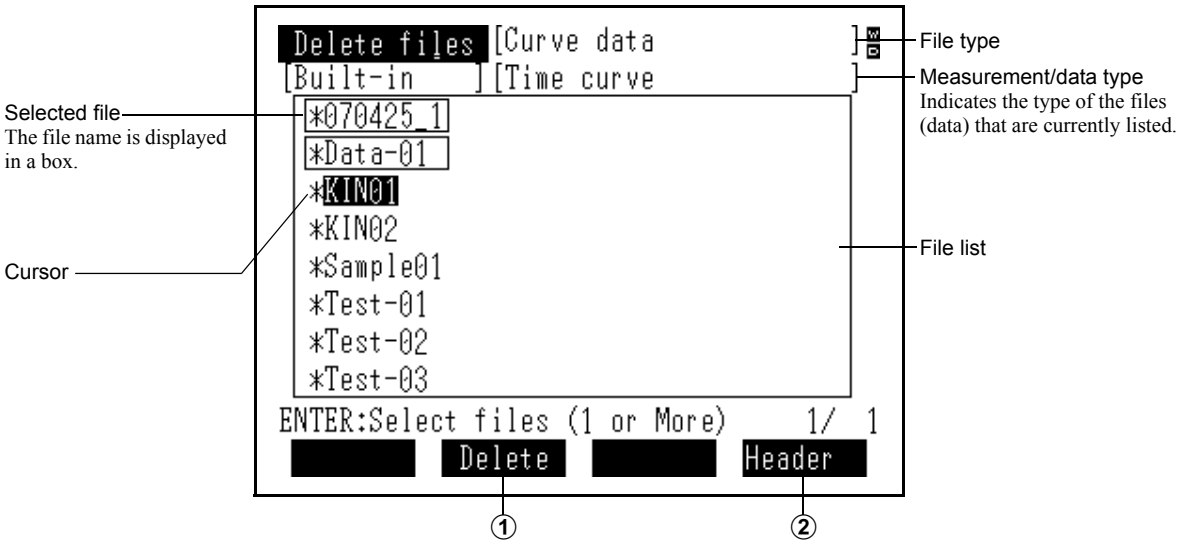


Fig. 3.3 [Delete files] screen in Built-in Memory

No.	Key Operation	Display	Description
①	F2	[Delete]	Calls the selected file.
②	F4	[Header]	Displays the contents of the file at the current cursor position (highlighted). Press the RETURN key to return to the [Delete files] screen (Fig. 3.3). Header sample
–	▲ ▼ ◄(-) ►	–	Moves a cursor in the file list.
–	ENTER	–	Selects a file or cancels the selected file.

■ "Delete files" Procedure

1 Use the ◄(-) ► keys to move the cursor to [Yes], and press the ENTER key.

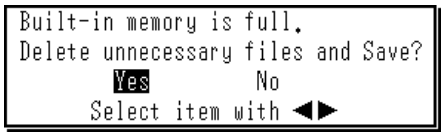


Fig. 3.4

2 The [Delete files] screen is displayed.
Using the ▲ ▼ keys, move the cursor to the data file you wish to delete.
Press the ENTER key to confirm the selection.

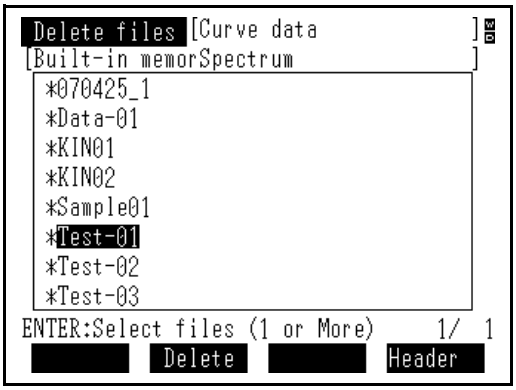


Fig. 3.5

3 The name of the file selected and confirmed in procedure 2 is displayed in a box.
Repeat procedure 2 when you wish to delete multiple files.

> **NOTE**
> A maximum of 32 files can be processed in one operation simultaneously.

After having marked all data files to be deleted, press the F2 [Delete] key.

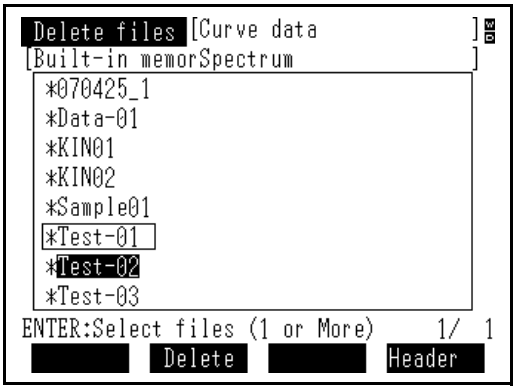


Fig. 3.6

4 A confirmation message for the deletion appears.
Use the ◄(-) ► keys to move the cursor to [Yes], and press the ENTER key.

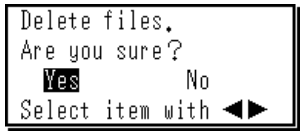


Fig. 3.7

5 The selected files are deleted, and you will return to the [Delete files] screen (Fig. 3.5). Then, press the RETURN key to save the new file and return to the previous screen.

3.2 Load Files

The files created and saved in each measurement mode of the UV-1800 can be loaded by the following key operations.

File Type	Operation Screen	Key Operation	Reference
Parameters file	[Mode menu] screen	F1 [LoadPam]	Section 2.1
Curve data file	Measurement screen (Spectrum (Fig. 6.3) Time scan (Fig. 10.4) Kinetics (Fig. 8.8) Kinetics rate (Fig. 9.7))	F3 [LoadCurv]	
	Curve Display screen (Multi-component (Fig. 11.19))	F3 [LoadCurv]	
Table data file	Data Display screen (Photometric (Fig. 4.7) Photometric 8λ (Fig. 5.9) Quantitation (Fig. 7.15) Kinetics (Fig. 8.14) Kinetics rate (Fig. 9.14) Multi-component (Fig. 11.17) DNA Quantitation (Fig. 12.7) Lowry method (Fig. 7.15) BCA method (Fig. 7.15) CBB method (Fig. 7.15) Biuret method (Fig. 7.15) UV method (Fig. 12.15))	F4 [LoadData]	

NOTE

When using a USB memory device, only 2000 files can be displayed in the file list for each measurement file type listed above. Files are displayed in an alphabetized order.

3.2.1 Load Single File

When loading the parameter files and table data files, the screen for loading a single file is displayed. For details on loading the parameter files, refer to "2.3 Load Parameters".

The file list of the [Load files] screen displays only the files that have been saved to the built-in memory or USB memory in the current measurement mode. The name of the file stored in the built-in memory is marked with an asterisk to differentiate the file location.

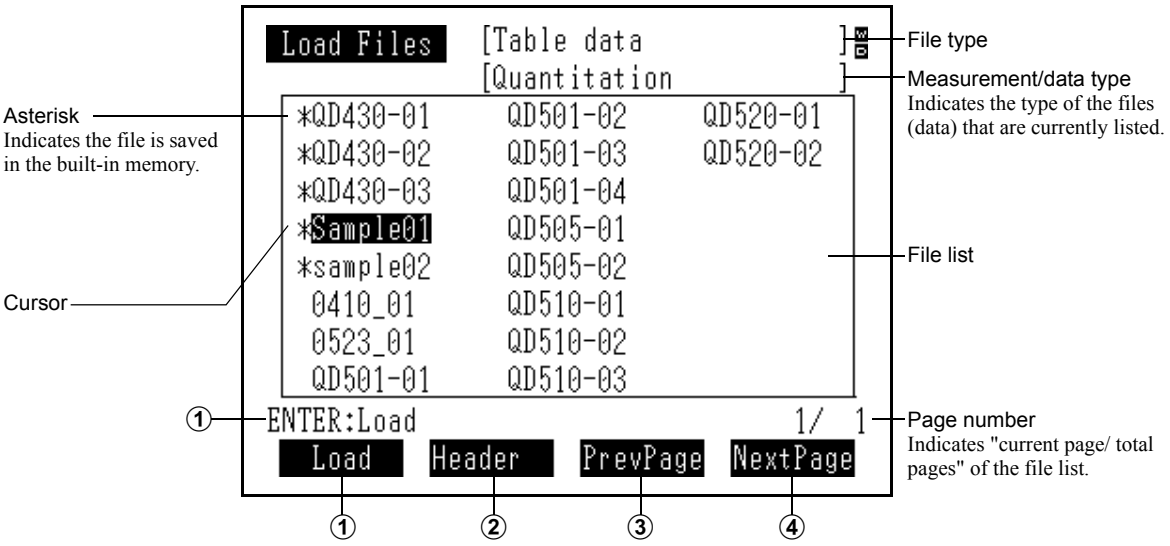


Fig. 3.8 [Load files] screen

No.	Key Operation	Display	Description
①	F1 or ENTER	[Load]	Loads the file at the current cursor position (highlighted).
②	F2	[Header]	Displays the contents of the file at the current cursor position (highlighted). Press the RETURN key to return to the [Load Files] screen (Fig. 3.8). Header [Table data] *Sample01 [Quantitation] Date: 2007/05/25 18:58:36 Meas. mode: Abs λ /nm : λ1: 700.0 λ2: 600.0 Calibration curve : K Factor Unit: g/l Header sample
③	F3	[PrevPage]	Displays the file list on the previous page.
④	F4	[NextPage]	Displays the file list on the next page.
–	▲ ▼ ◄ ►	–	Moves a cursor in the file list.

■ "Load files" Procedure

1 Press (F4) [LoadData] key in the Data Display screen.

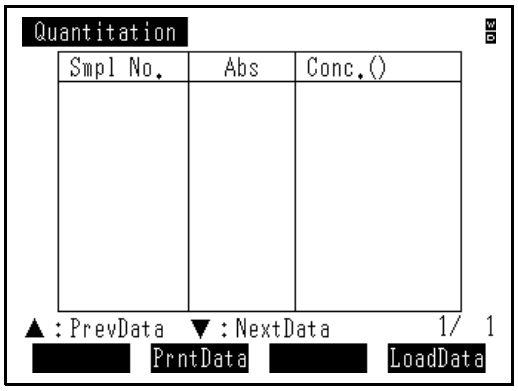


Fig. 3.9

2 The [Load files] screen is displayed.
Using the (▲) (▼) (◄) (►) keys, move the cursor to the desired table data file.
Press (ENTER) or (F1) [Load] key.

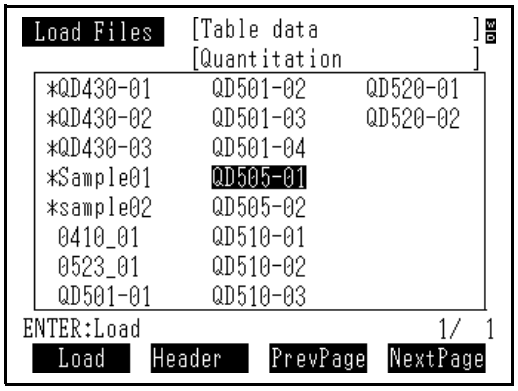


Fig. 3.10

3 The selected table data file is loaded.

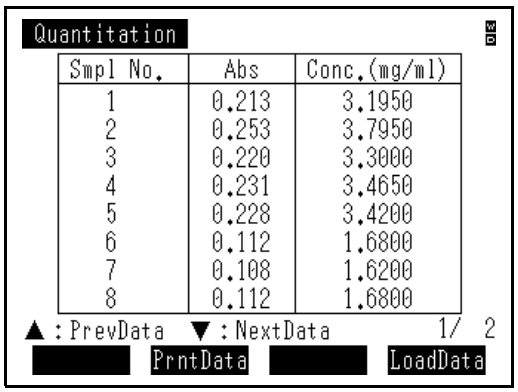


Fig. 3.11

3.2.2 Load Multiple Files

When loading the curve data files, the screen for loading multiple files is displayed.

A maximum of 32 files can be loaded simultaneously.

> **NOTE**
> Even though multiple files are loaded, all files are read-only (only displayed) except the latest-loaded file.

The file list on the [Load files] screen displays only the data files that have been saved to the built-in memory or USB memory in the currently selected measurement mode. The name of the file stored in the built-in memory is marked with an asterisk to differentiate the file location.

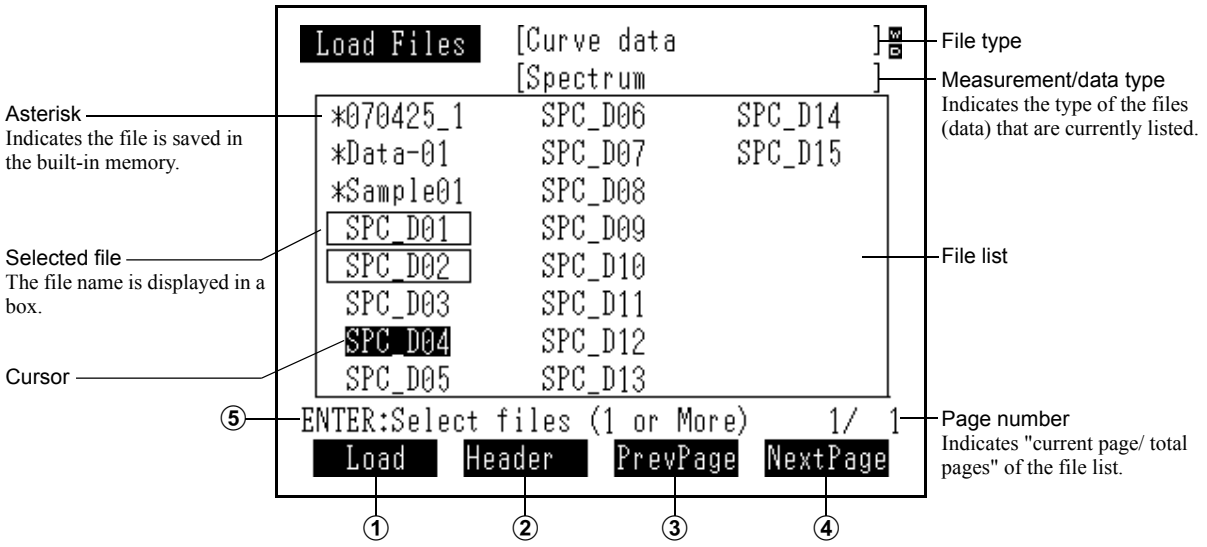


Fig. 3.12 [Load Files] screen

No.	Key Operation	Display	Description
①	F1	[Load]	Calls the selected file.
②	F2	[Header]	Displays the contents of the file at the current cursor position (highlighted). Press the RETURN key to return to the [Load Files] screen (Fig. 3.12). Header SPC_D04 [Curve data [Spectrum Date: 2007/03/28 10:01:35 Meas. mode: %T Scan range /nm: 700.0 - 300.0 Scan pitch /nm: 0.2 Scan speed : Fast Header sample
③	F3	[PrevPage]	Displays the file list on the previous page.
④	F4	[NextPage]	Displays the file list on the next page.
⑤	ENTER	–	Selects a file or cancels the selected file.
–	▲ ▼ ◄ ►	–	Moves a cursor in the file list.

■ Load (multiple) files Procedure

1 Press (F3) [LoadCurv] key in the [Mode menu] screen.

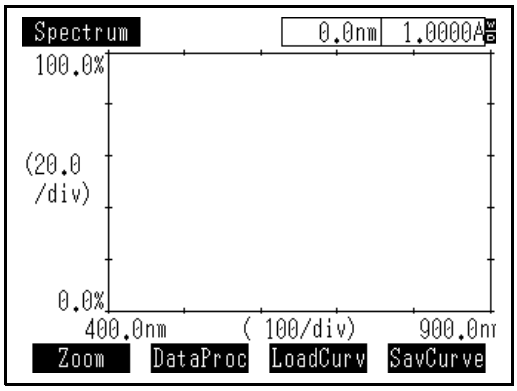


Fig. 3.13

2 The [Load files] screen is displayed.
By pressing the (▲) (▼) (◄) (►) keys, move the cursor to the desired curve data file.
Press (ENTER) key to select the file.

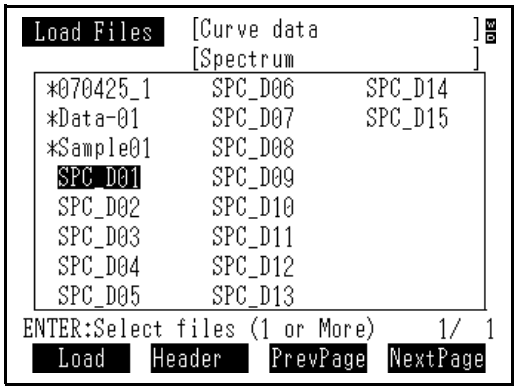


Fig. 3.14

3 The name of the file selected and confirmed in procedure 2 is displayed in a box.
Repeat procedure 2 if you wish to load multiple files.

> **NOTE**
> A maximum of 32 files can be processed in one operation simultaneously.

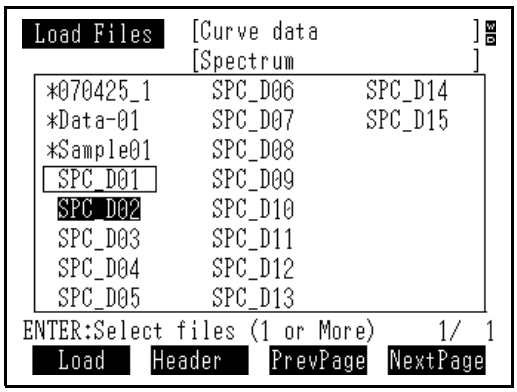


Fig. 3.15

4 After selecting the file, press (F1) [Load] key.

5 The selected curve data files are loaded.

NOTE
The data processing can be applied only to the latest-loaded file.

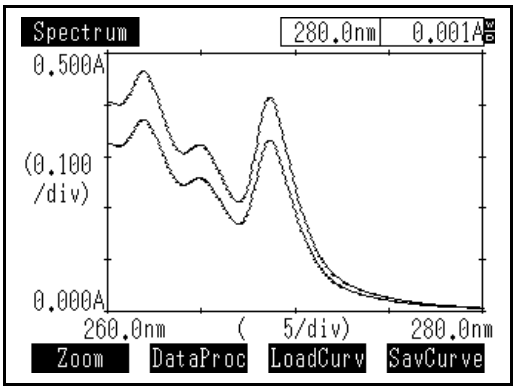


Fig. 3.16

3.3 Printout

The UV-1800 can provide the following printout forms. For the detailed printout methods and printout formats (layout sample), refer to the chapter for each measurement mode.

- Hard copy of screen
  Press the PRINT key to print a hard copy of the screen.
- Print using function keys
  When a function key has a [PrntData] 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. (See "4.3.2 Data Printout".)
- Data Print for each Measurement
  In modes (such as Photometric mode) in which the measurement results are obtained as numeric values, if a hard copy printer is connected to the UV-1800 (and communication is established), the measurement results will be printed on the printer for every measurement.
- Print waveform
  The waveforms and parameters in a curve data file are printed.
- Print waveform data
  Execute [DataPrnt] on the Data Processing screen to print out all numeric value data within the selected curve data file. (See "13.7 Print Processing".)

3.3.1 Available Printer

Besides the exclusive screen copy printer, the following commercially available printers which support the following control codes are available for the UV-1800.

EPSON: ESC/P-9, ESC/P-24, and ESC/P Raster

HP: PCL

	Hard copy of screen	Print using function keys	Data Print for each Measurement	Print waveform	Print waveform data
Printer for screen copy	○ Yes	○ Yes	○ Yes	○ Yes	○ Yes
Commercially available printer	○ Yes	○ Yes	× No	○ Yes	○ Yes

CAUTION

When using the ESC/P Raster printer, DO NOT unplug the USB cable before the printer head returns to its home position. If you do, the printer will fall into an abnormal status in which no printing commands are accepted.
To plug the USB printer cable to another port or computer after (or while) using with the UV-1800, be sure to turn OFF the printer power beforehand.

3.4 Read Files (on UVProbe)

Using a USB memory device, the measurement data (with the extensions of [*.spc], [*.pho], and [*.tmc]) obtained/saved in the UV-1800 can be read on the PC control/analysis software UVProbe (standard accessory). (☞ See Table 3.1)

NOTE

- For the UVProve installation procedure, refer to the UVProbe Tutorial (instruction manual).
- The data files once saved on the UVProbe software cannot be read on the UV-1800.
- The UV-1800 data files can be read on the UVProbe software Ver. 2.30, or later versions.

The UVProbe software consists of 3 measurement modules: Spectrum, Photometric, and Kinetics.
Select a module on which to read the data according to the type of the measurement data (differentiated with extensions).

Waveform data files with extension [*.spc] → Spectrum module
Data files with extension [*.pho] → Photometric module
Curve data files with extension [*.tmc] → Kinetics module

You can select the measurement module from the [Window] menu on the UVProbe.

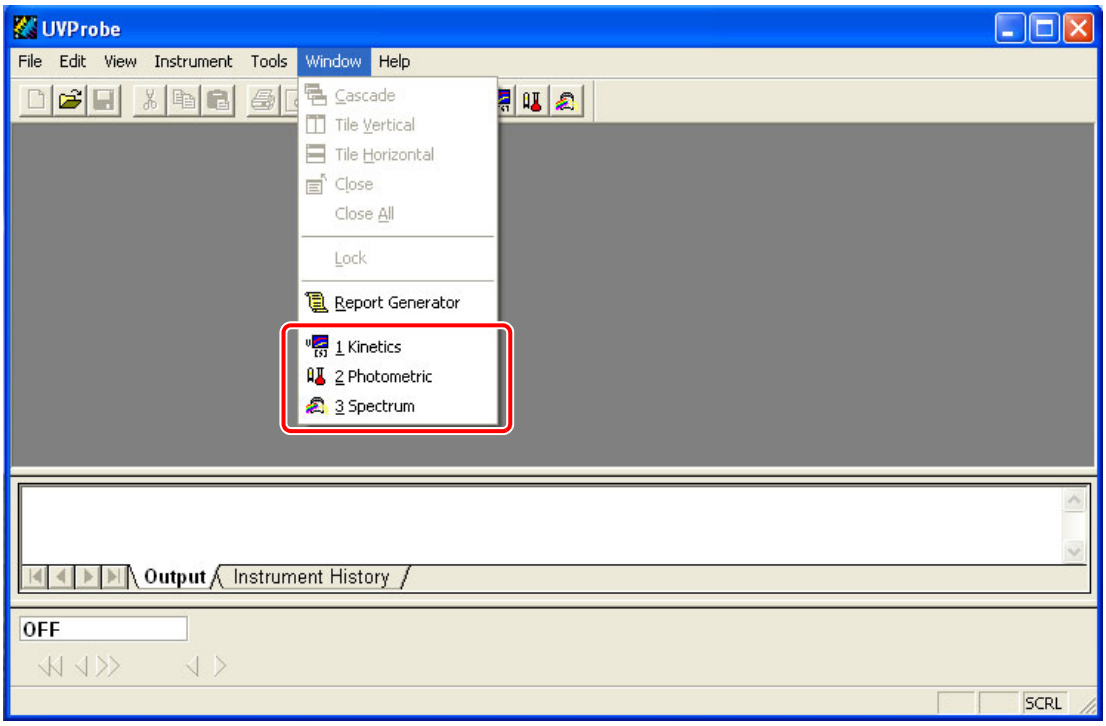


Fig. 3.17

For the UVProbe overview and the basic operation including startup, refer to "Appendix A UVProbe Basic Operation".

3.4.1 Precautions When Reading Files

■ Preparation

It is required to install an instrument driver after installing the UVProbe software to the computer. Follow the procedure described in "17.2.1 UVProbe Installation and Instrument Addition".

NOTE

The UV-1800 data files can be read on the UVProbe software Ver. 2.30, or later versions.

■ When loading PHO files (with extension [*.pho])

(1) Changed Sample No.

Since the UVProbe cannot use the same sample No. within the data, the numbers from 001 to 400 are attached to the sample No. when loading data files.

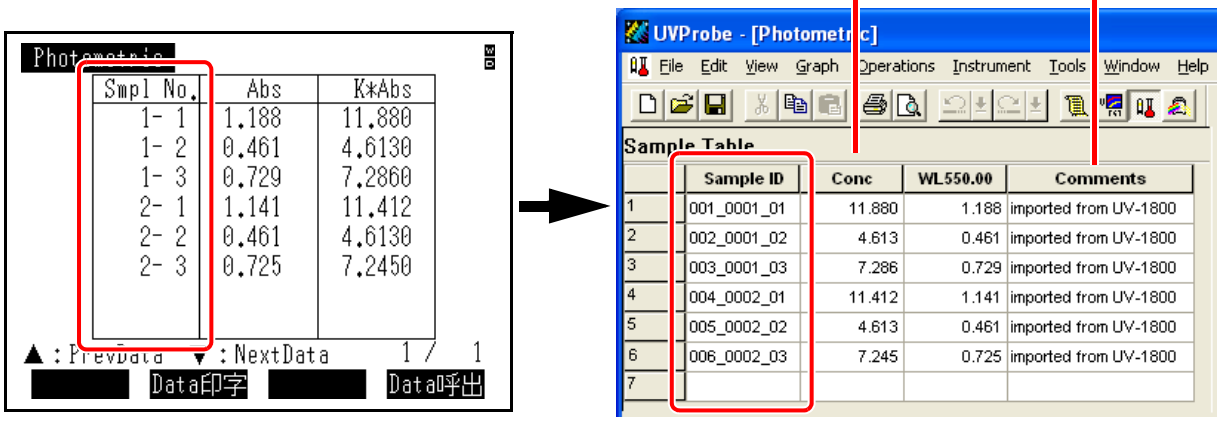
Example) Sample No. (UV-1800) → Sample ID (UVProbe)

1-3 → 003_0001_03

Ascending numbers assigned from the first row

Since the files of photometric (one-wavelength) measurement are loaded as quantitation files using K-factor method, the "K*Abs" values are displayed in "Conc." column.

"Imported from UV-1800" is automatically entered in the comment column. (The comment can be edited.)



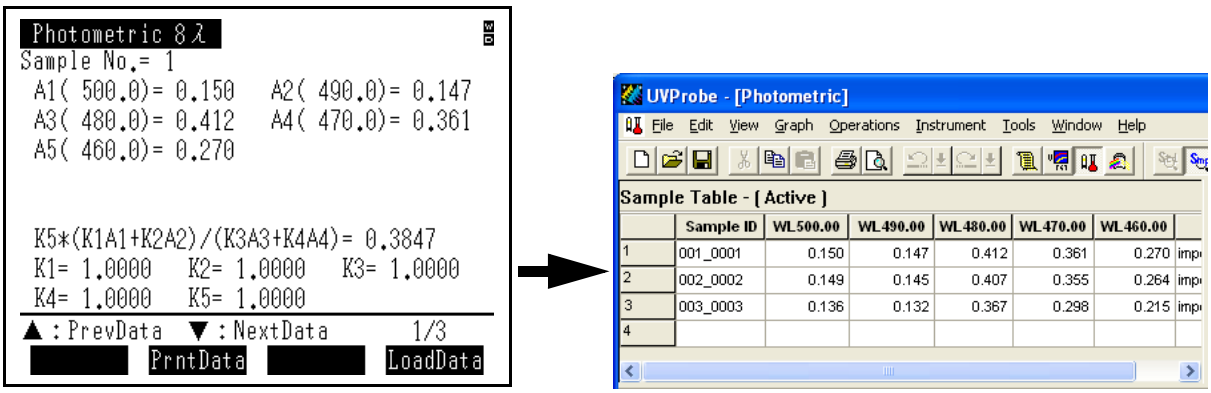
(UV-1800) (UVProbe)

(2) Difference of results in multi-wavelength calculation and quantitation

When loading PHO files, the UVProbe loads only measurement data within the files and performs data calculation separately on the software. Errors may therefore occasionally be found in multi-wavelength calculation results (2 wavelength difference/ratio, and 3 wavelength calculations) as well as in quantitation results, due to differences in data accuracy and rounding methods.

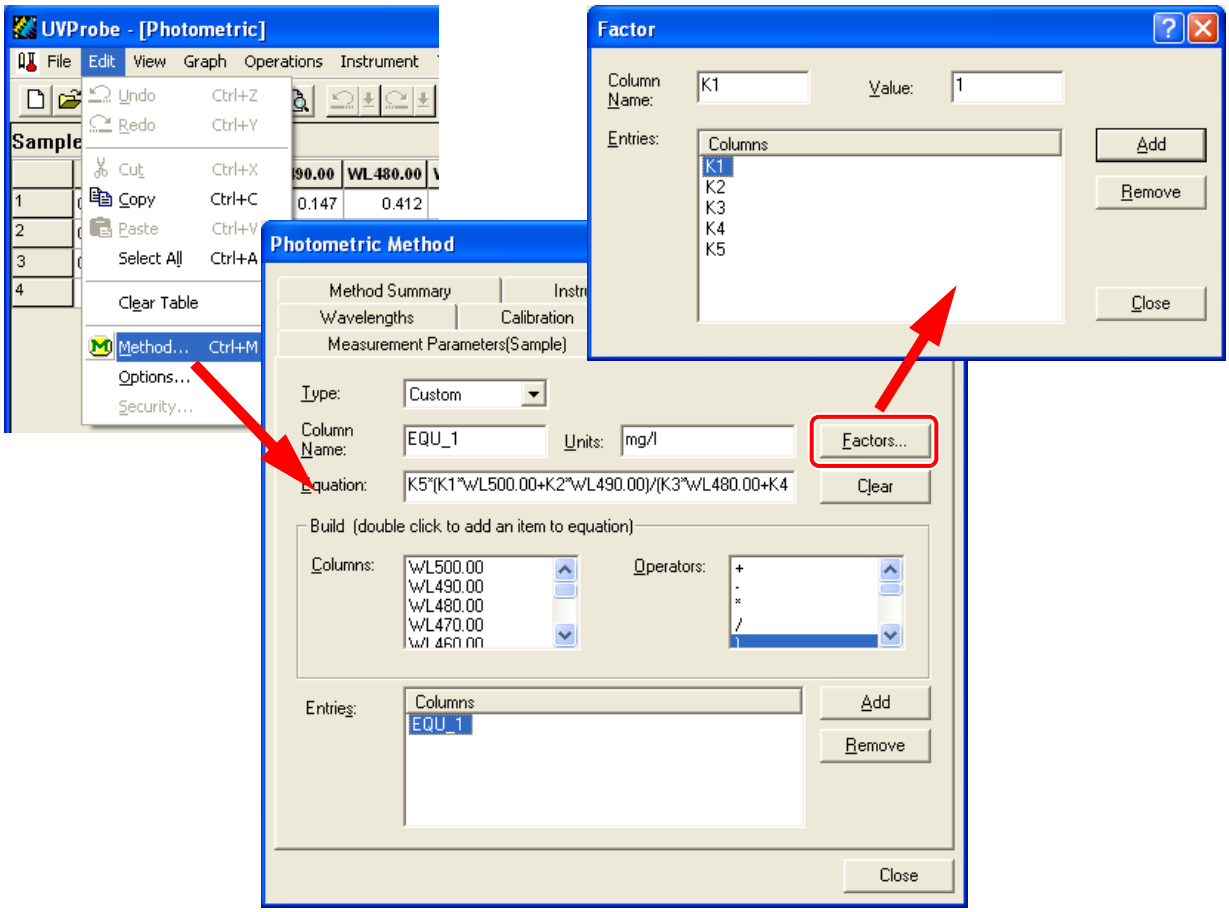
(3) Loading Photometric 8λ data

When loading the data obtained in the photometric (multi-wavelength) measurement, the UVProbe loads only the results of 2 wavelength difference/ratio, and 3 wavelength calculations.



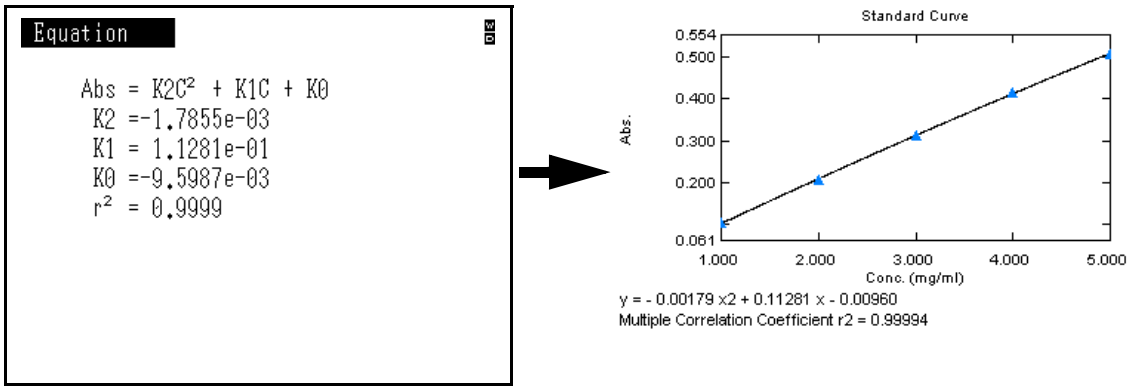
(UV-1800) (UVProbe)

* If you need the results of the same calculation formulas as those used in the original file, create and register appropriate formulas using the calculation function on the measurement method after the data file is loaded.



(4) Correlation coefficient of calibration curve

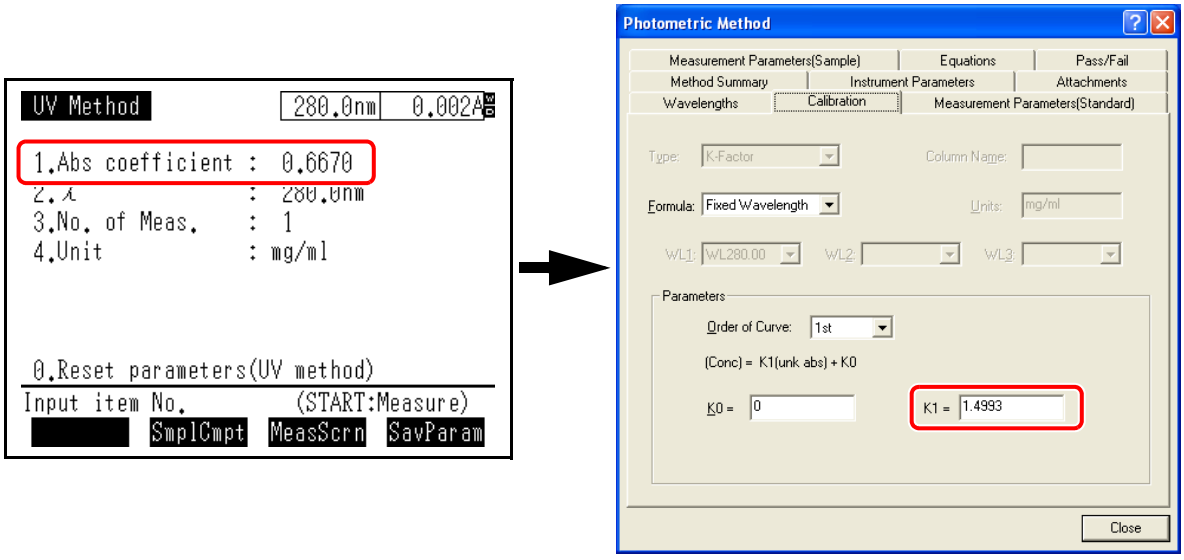
The value "correlation coefficient: r2" used in the UV-1800 applies to a linear, quadratic, and cubic calibration curve. However, the value used in the UVProbe software only applies to a linear calibration curve. The correlation coefficient value that applies to a quadratic and cubic calibration curve is called the "Multiple Correlation Coefficient: r2" in the UVProbe software.



(UV-1800) (UVProbe)

(5) Abs. coefficient in the UV absorption method

The "Abs. coefficient" in the UV absorption method is set as the factor K1 (1/Abs. coefficient) for the K-factor method.



(UV-1800) (UVProbe)

■ File Saving Format

When the UV-1800 data file is loaded and saved on the UVProbe software, it is converted to a file format available only for the UVProbe software. The extensions of some types of files may be changed during the saving process.

Measurement Type	File Type	File Extension	
		Original File (UV-1800)	After Conversion with UVProbe
Photometric	Table data file	*.pho	*.unk
Photometric 8λ	Table data file	*.pho	*.unk
Spectrum	Curve data file	*.spc	*.spc
Quantitation	Table data file	*.pho (Single point calibration curve method)	*.pho
		*.pho (Multi-point calibration curve method)	*.pho
		*.pho (K-factor method)	*.unk
Kinetics	Curve data file	*.tmc	*.kin
Kinetics Rate	Curve data file	*.tmc	*.kin
Multi-component	Curve data file	*.spc	*.spc
Lowry method	Table data file	*.pho	*.pho
BCA method	Table data file	*.pho	*.pho
CBB method	Table data file	*.pho	*.pho
Biuret method	Table data file	*.pho	*.pho
UV method	Table data file	*.pho	*.unk

3.4.2 Loading and Saving Procedure

The following are the procedures for loading and saving UV-1800 data files on the UVProbe software, using a spectrum data file as an example:

■ Loading a data file

1 Click [Spectrum] from the [Window] menu.

2 Click [Open] from the [File] menu.

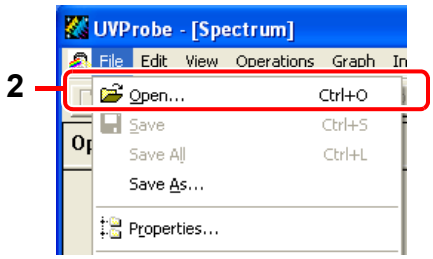


Fig. 3.18

3 The [Open Spectrum File] is displayed. Select (click) the desired file, and click the [Open] button.

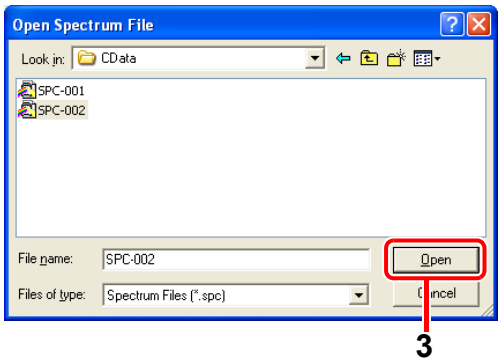


Fig. 3.19

4 The spectrum data file obtained in the UV-1800 is automatically converted to the UVProbe format, and the message that the file name is changed is displayed.

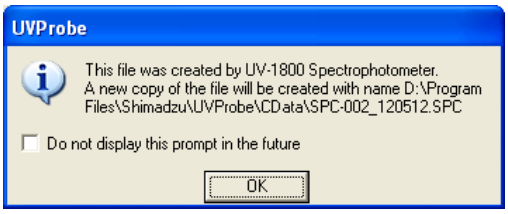


Fig. 3.20

> **NOTE**
> During the automatic file conversion, a new file name (the original file name with the time of loading the file) is assigned to the converted file.
> Example) If the file "SPC-002.spc" is loaded at 17:31:44, the following file name is assigned:
> New file name: SPC-002_173144.spc

5 Click [OK] to close the message. The spectrum data is loaded to the UVProbe software.

> **NOTE**
> When the converted file is loaded on the UVProbe software, it is not yet saved to the storage disk. To save the converted file to the disk, execute the command [Save as] from the [File] menu.

■ Saving the data file

1 Click [Save as] from the [File] menu.

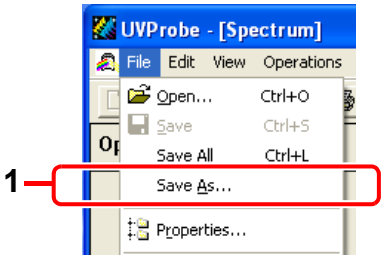


Fig. 3.21

2 Click the [Select] button in the [Save Spectum File] window.

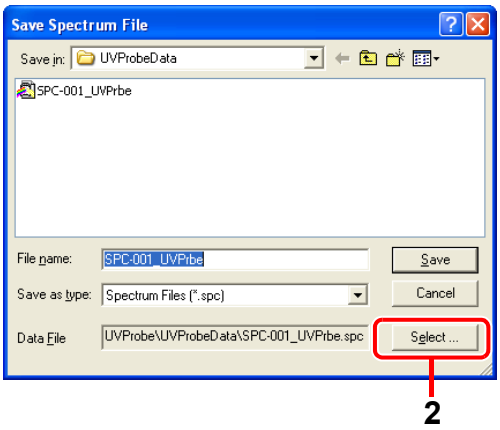
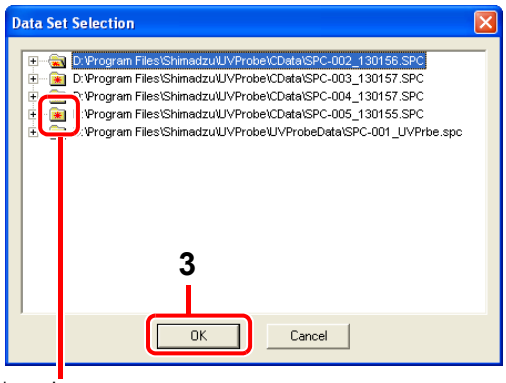


Fig. 3.22

3 The [Data Set Selection] window lists the data files currently loaded on the UVProbe software. Select (click) the files to be saved, and click the [OK] button.



* mark
Indicates that the file has not been saved to the storage disk. This is also indicated of those files changed in the data processing, etc. after being loaded, but not yet saved.

Fig. 3.23

4 Verify that the selected file is displayed in the [Data File] column in the [Save Spectrum File] window.

5 Enter the name of the file to be saved.

6 Click the [Save] button.

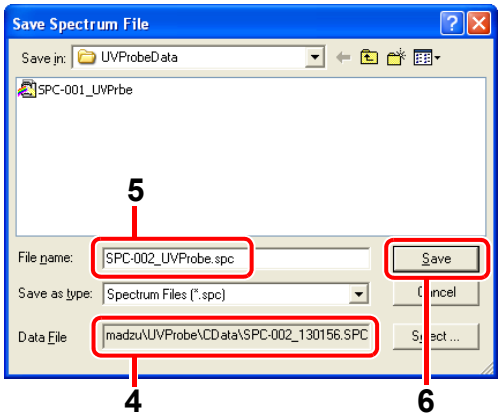


Fig. 3.24

NOTE

The data files automatically converted and saved on the UVProbe software cannot be read on the UV-1800.

This page is intentionally left blank.

Chapter 4 Photometric (One-Wavelength)

The photometric measurement is used to measure absorbance (Abs) or transmittance (%T) at an arbitrary (one-)wavelength.
To repeat the measurement, the measurement results may be displayed as a list. A single list allows including a maximum of 400 measurement results, which may be stored as a single file in the memory of the main unit.
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.

CONTENTS

4.1 Measurement Parameter Configuration Screen

When you select [1. Photometric] (press the F1 key) in the [Mode menu] screen (Fig. 2.1), the Method Selection screen (Fig. 4.1) will be displayed.

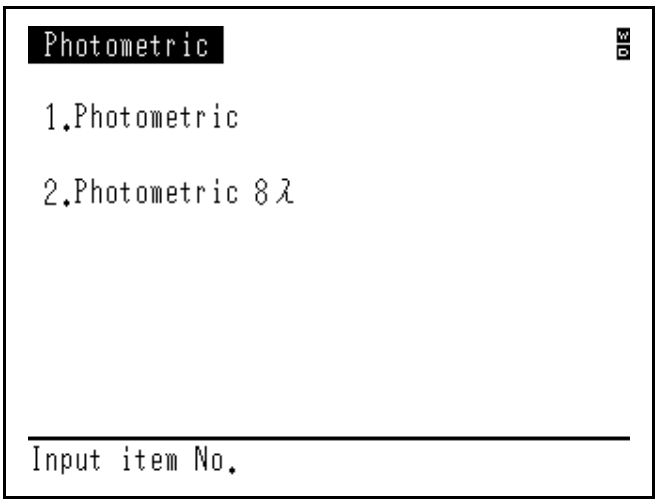


Fig. 4.1 Method Selection screen

When you select [1. Photometric] (press the F1 key) in the Method Selection screen, the Measurement Parameter Configuration screen for the one-wavelength measurement (Fig. 4.2) will be displayed.

To set the measurement wavelength, use the GOTO WL key.

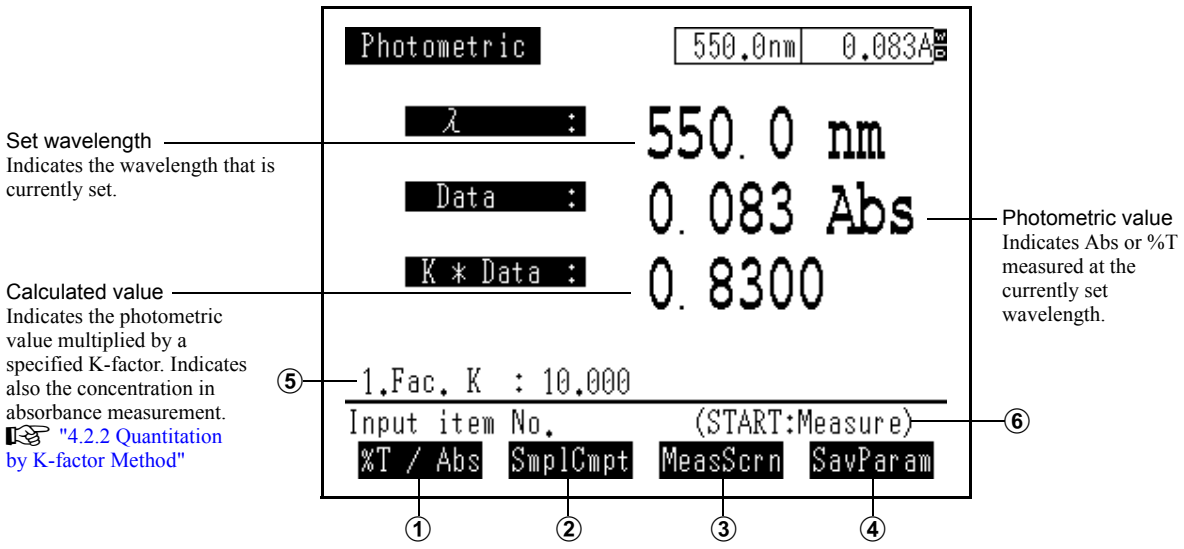


Fig. 4.2 Measurement Parameter Configuration screen

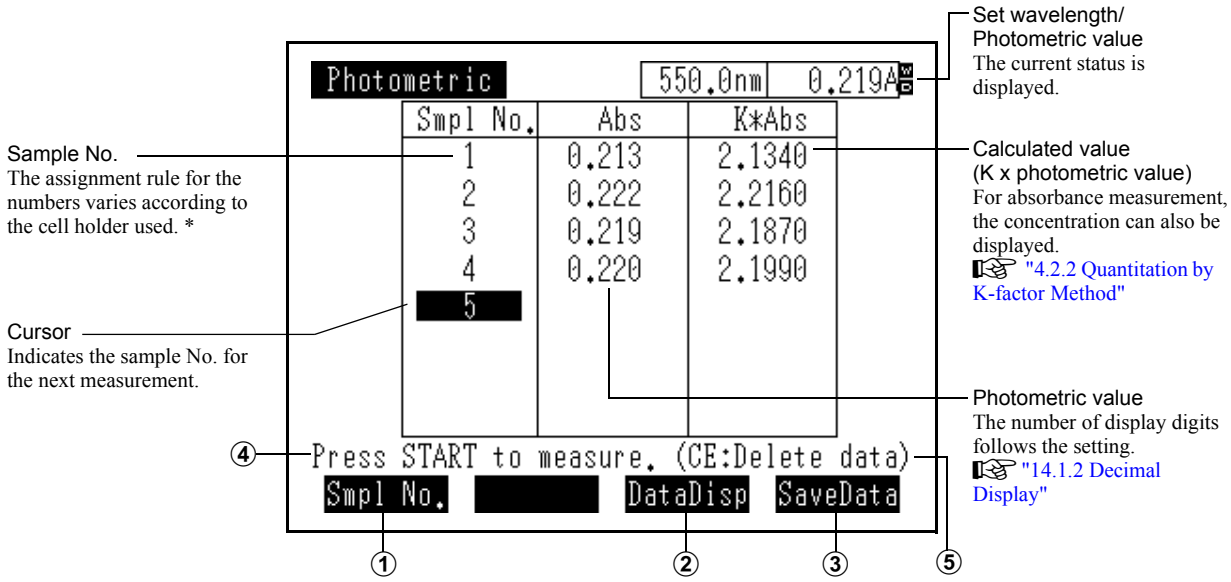
No.	Key Operation	Display	Description
①	F1	[%T/Abs]	Toggles between %T (transmittance) and Abs (absorbance).
②	F2	[SmplCmpt]	Used to set the sample module. The setting items include the sample module type, the number of cells, and the operating conditions for the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
③	F3	[MeasScrn]	Changes over to the Measurement screen. (Fig. 4.3)
④	F4	[SavParam]	Stores the current measurement conditions in the built-in memory or USB memory device. ☞ "3.1 Save Files"
⑤	1	–	Specifies the factor to be multiplied to photometric values.
⑥	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen (Fig. 4.3)
–	GOTO WL	–	Specifies the wavelengths for measurement. The setting range is from 190 nm to 1100 nm in units of 0.1 nm.
–	RETURN	–	Returns to the [Mode menu] screen. (Fig. 2.1)

If blank correction is required, set the blank sample prior to the measurement and then press the AUTO ZERO key. The measured value will be set to 0 Abs (100 %).

4.2 Measurement

4.2.1 Measurement Screen

In the Measurement Parameter Configuration screen (Fig. 4.2), press the F3 [MeasScrn] key or the START/STOP key. The Measurement screen will appear.
(If the START/STOP key is pressed, the first measurement run will be carried out with the Measurement screen displayed.)



* When using a single cell or when No. of drive cells is 1, the sample numbers are assigned in sequence, starting from 1. When using multiple cells by attaching a multi-cell or micro multi-cell, a dash (-) and the cell number are attached to the sample number.

Single cells: [Sample No.]
Multiple cells: [Sample No.] - [Cell No.]

Fig. 4.3 Photometric Measurement screen
(for one-wavelength measurement)

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Used to change the sample number for the next measurement. The sample number can be selected from 0 to 9999.
②	F3	[DataDisp]	Displays a data table. ☞ "4.3 Data Display"
③	F4	[SaveData]	Saves the measurement results as a table data file to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
④	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen (Fig. 4.3). **NOTE** A maximum of 400 measurements can be entered in a single table data file.
⑤	CE	–	Deletes all the data displayed on the screen.
–	GOTO WL	–	Specifies the wavelengths used for the measurement. The setting range is from 190 nm to 1100 nm in units of 0.1 nm.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 4.2).

4.2.2 Quantitation by K-factor Method

This is a simple quantitation method (K-factor method) used when the absorbance and concentration are directly proportional (Concentration = K × Absorbance), and a conversion factor K is given.
The following is a measurement procedure.

1 Press F1 [1. Fac. K] key in the Measurement Parameter Configuration screen (Fig. 4.2).

2 The input column for [1. Fac. K] is highlighted (Fig. 4.4). Enter a factor with numeric keys.

NOTE
You cannot recalculate measured results by changing the K-factor after the measurement is completed.

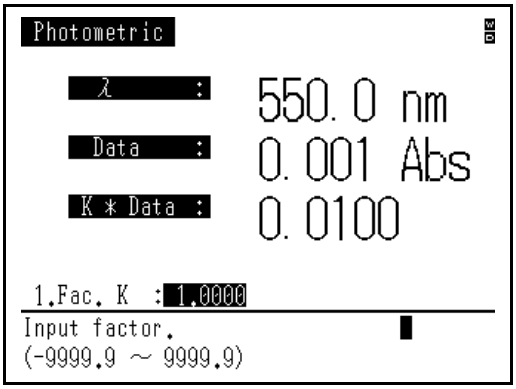


Fig. 4.4 Factor Input screen

3 Press the ENTER key to confirm the input value and move back to the Measurement Parameter Confirmation screen (Fig. 4.2).
The factor entered in procedure 2 is displayed in the [1. Fac. K] column.

4 Press the AUTO ZERO key while nothing or a blank sample is placed in the sample compartment.

5 Place the unknown sample in the sample compartment, and press the START/STOP key to execute the measurement.

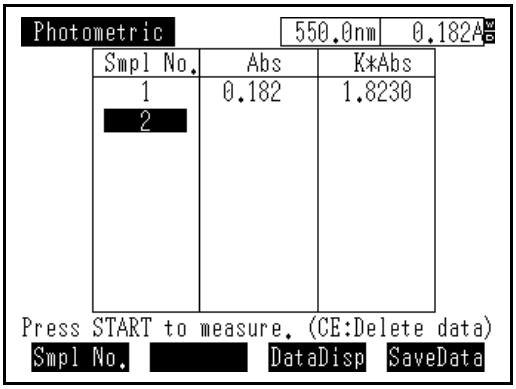


Fig. 4.5 Measurement screen

6 The Measurement screen appears (Fig. 4.5), and absorbance values (Abs) and quantitation results (K*Abs) are displayed.

4.2.3 Data Print for Each Measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed on the printer for every measurement.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

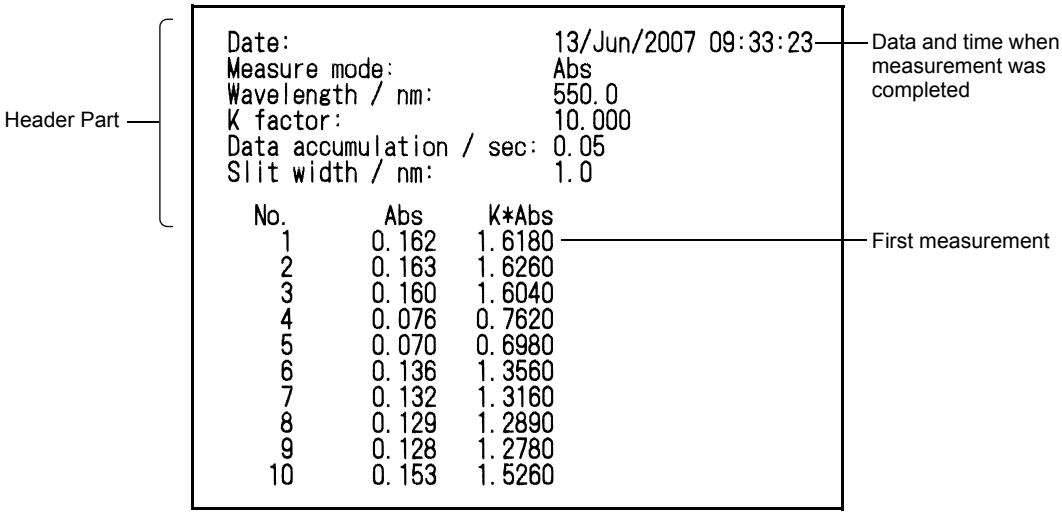


Fig. 4.6 Sample printout

4.3 Data Display

4.3.1 Data Display Screen

As the measurement is repeated on the Measurement screen, the data will be scrolled with only the latest seven measurement results displayed on the screen. The Data Display screen is used to list the measurement results including those which have disappeared from the screen. It also allows for the printing out of the data table or loading data.

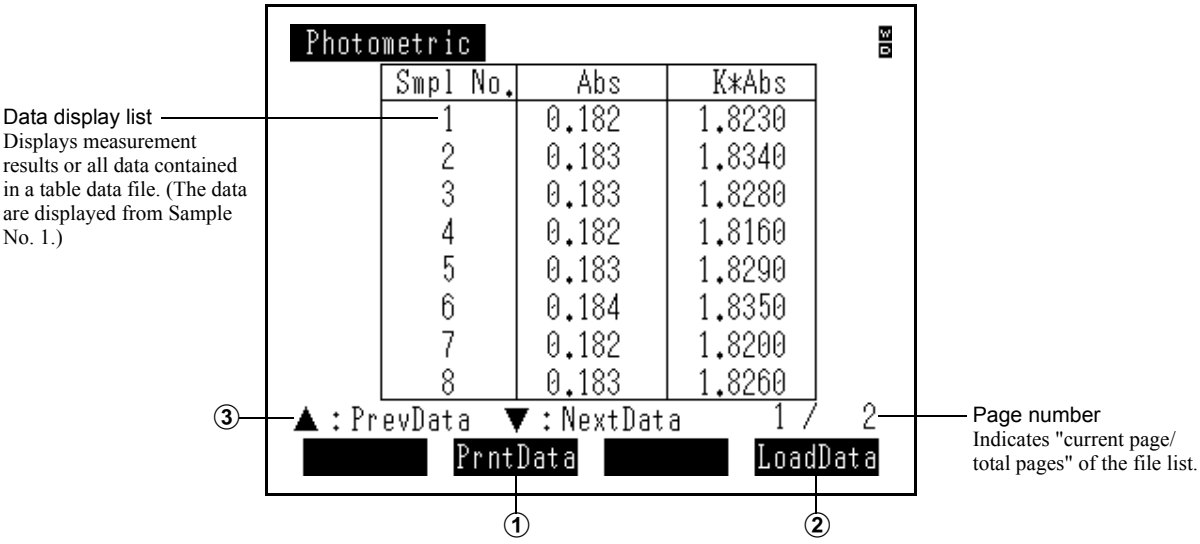


Fig. 4.7 Data Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all data displayed in the list. ☞ "4.3.2 Data Printout"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the data table to review the hidden measurement data. Each pressing of the key scrolls the table by 8 data lines.
–	RETURN	–	Returns to the Measurement screen (Fig. 4.3).

4.3.2 Data Printout

The entire data can be printed out as a numeric data table on the printer (optional).

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

NOTE

Pressing the PRINT key on the keyboard in the Measurement screen (Fig. 4.3) or Data Display screen (Fig. 4.7) will produce a hard copy of the displayed screen.

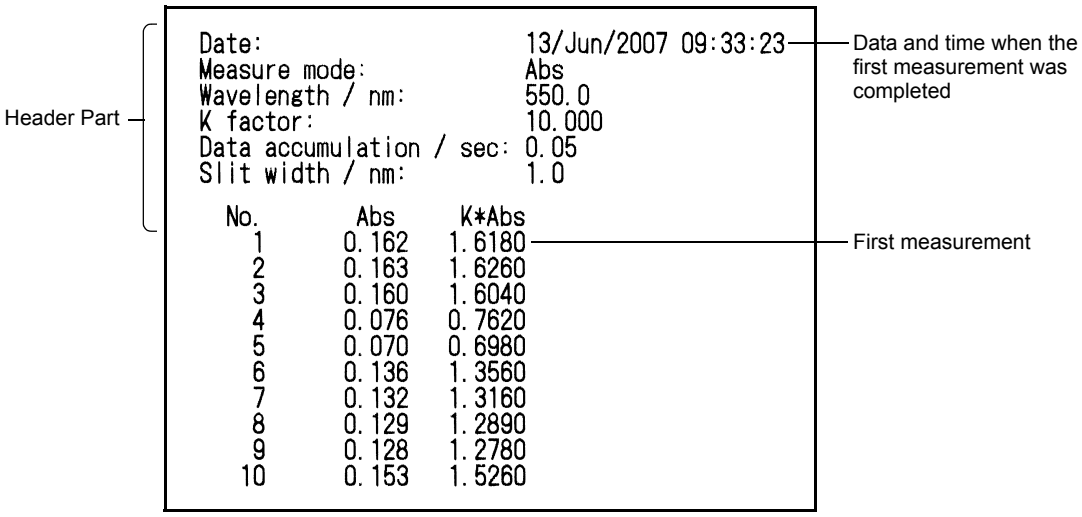


Fig. 4.8 Sample printout

This page is intentionally left blank.

Chapter 5 Photometric 8λ (Multi-Wavelength)

CONTENTS

5.1 Photometric 8λ

The [Photometric 8λ] (multi-wavelength measurement) allows you to specify a maximum of 8 arbitrary wavelengths and then measure the absorbance or transmittance at those wavelengths. It is also possible to select one of the following 5 equations based on the data obtained at up to 4 wavelengths and then output the calculation results.

- Two-wavelength calculation
  The ratio and difference between the photometric values at two wavelengths are calculated. This process is applicable for eliminating the effect of any interfering component (difference), scattering due to turbidity, and floating of the baseline due to the production of small bubbles, and also for evaluating the purity (ratio) (☞ "7.5.1 Two-wavelength Quantitation").

- Three-wavelength calculation
  This process is performed as follows (☞ "7.5.2 Three-wavelength Quantitation"):
  A2 – Ad (where Ad = (λ1 – λ2) × A3 + (λ2 – λ3) × A1)/(λ1 – λ3)
  where λ1~λ3 are measurement wavelengths (arbitrary numbers are to be entered) and A1~A3 are absorbance (or transmittance) values at the measurement wavelengths.
  The three-wavelength calculation is also applicable for eliminating the effect of any interfering component, and floating of the baseline that has slanted due to turbidity or any other reason.

- Equation calculation with four-wavelength data
  This process is performed as follows:
  ((K1 × A1 + K2 × A2 + K3 × A3 + K4 × A4) × K5); or
  (K5 × (K1 × A1 + K2 × A2)/(K3 × A3 + K4 × A4))
  where K1~K5 are coefficients (arbitrary numbers are to be entered) and A1~A4 are absorbance (or transmittance) values at measurement wavelengths λ1~ λ4.
  For the calculation of this equation, the measurement wavelengths and coefficients are specified freely. In addition, A1~A4 can be measured while selecting different samples. This provides high versatility.

NOTE
The measurement data at each wavelength is rounded to four decimal places.

5.2 Measurement Parameter Configuration Screen

When you select [1. Photometric] (press the 1 key) in the [Mode menu] screen (Fig. 2.1), the Method Selection screen (Fig. 5.1) will be displayed.

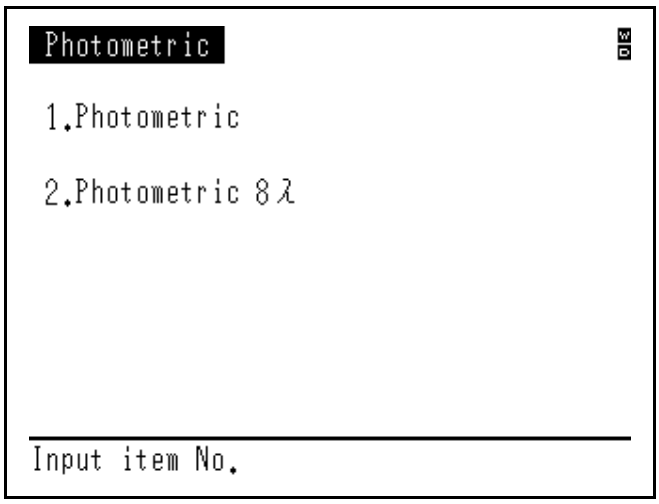


Fig. 5.1 Method Selection screen

When you select [2. Photometric 8λ] (press the 2 key) in the Method Selection screen, the Measurement Parameter Configuration screen for photometric 8λ (multi-wavelength measurement) (Fig. 5.2) will be displayed.

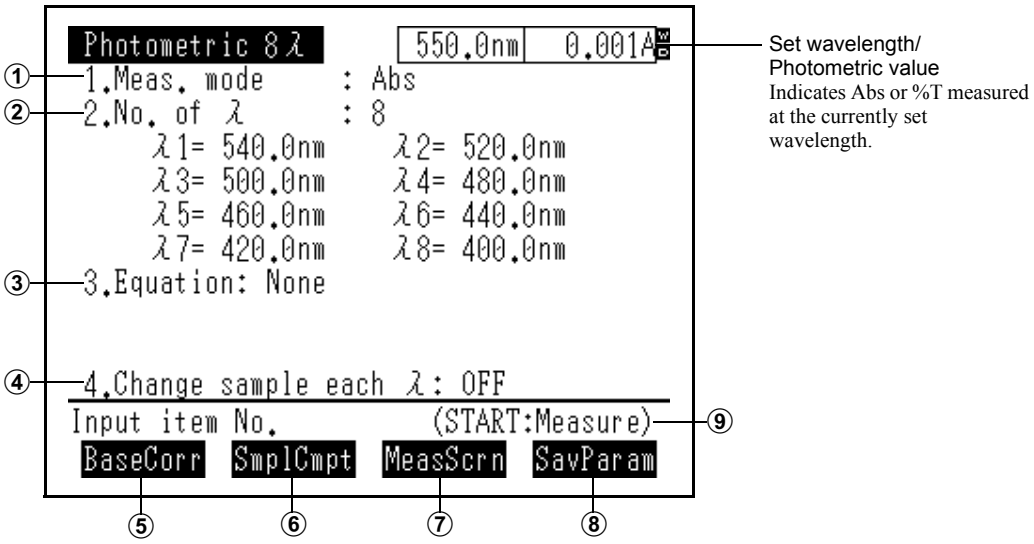
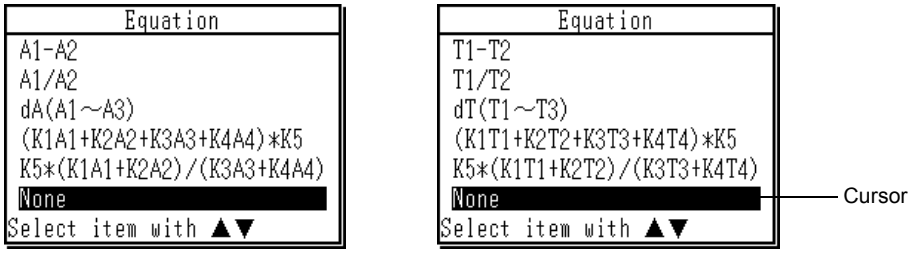


Fig. 5.2 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[Meas. mode]	Selects the photometric mode. Pressing the key toggles the mode between Abs (absorbance) and %T (transmittance).
②	2	[No. of λ]	Specifies the number of wavelengths and each wavelength values. The specifiable number of wavelengths for one measurement is from 1 to 8, with an input range is of 190.0 nm to 1100.0 nm. (The same wavelength values are not acceptable.) The measurement will be carried out in the order of λ1, λ2,…λn. When all the data have been entered, the UV-1800 automatically goes to λ1.
③	3	[Equation]	Selects an equation used for the arithmetic operation. ☞ "5.2.1 Equation"
④	4	[Change sample each λ]	Specify whether or not to change the sample whenever the measurement is performed at each wavelength. ☞ "5.2.2 Changing Sample"
⑤	F1	[BaseCorr]	Allows setting the blank sample prior to the measurement of an unknown sample and then correcting the baseline under the specified conditions.
⑥	F2	[SmplCmpt]	Used to set the sample module. The setting items include the sample module type and the operating conditions of the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
⑦	F3	[MeasScrn]	Switches to the Measurement screen.
⑧	F4	[SavParam]	Used to save the current measurement conditions to the memory. ☞ "3.1 Save Files"
⑨	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen (Fig. 5.7).
–	RETURN	–	Returns to the [Mode menu] screen (Fig. 2.1).

5.2.1 Equation

When you select [Equation] from the Measurement Parameter Configuration screen, the Equation Selection screen appears (Fig. 5.3). If you select the desired equation from the list, the measured data will be operated upon with the selected equation after the measurement, and the calculation result will be displayed with photometric values. Select [None] if no arithmetic operation is required.



(Photometric mode: Transmittance) (Photometric mode: Absorbance)

Fig. 5.3 Equation Selection Screen

Key Operation	Description
▲ ▼	Moves the cursor position.
ENTER	Confirms the equation or process at the cursor position.
RETURN	Returns to the Parameter Configuration screen.

* When "dA(A1~A3) (dA(T1~T3))" is selected, the following calculation is performed.

Absorbance: $A2-\frac{(\lambda1-\lambda2)\times A3+(\lambda2-\lambda3)\times A1}{\lambda1-\lambda3}$

Transmittance: $T2-\frac{(\lambda1-\lambda2)\times T3+(\lambda2-\lambda3)\times T1}{\lambda1-\lambda3}$

* The symbols in the equations stand for the following:

An (n=1~4): Absorbance at measurement wavelength λn (n=1 to 4)

Tn (n=1~4): Transmittance at measurement wavelength λn (n=1 to 4)

Kn (n=1~4): Factor that is specifiable between -9999.9 and 9999.9. The Factor Input screen (Fig. 5.4) is displayed when an equation has been selected. After entering a factor with numeric keys and confirming with the ENTER key, the screen will prompt you for the next factor entry.

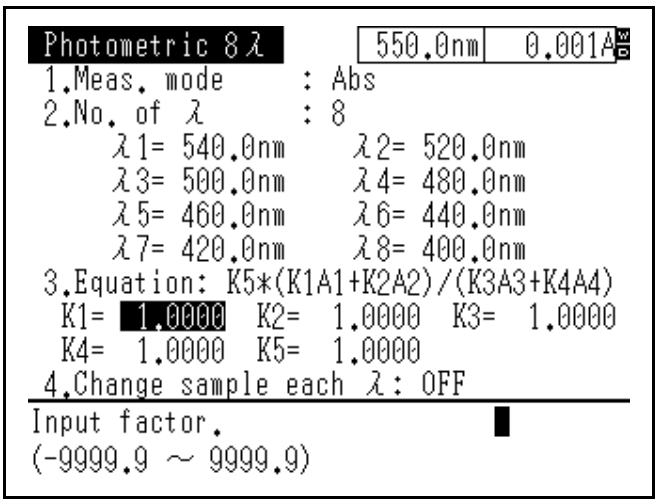


Fig. 5.4 Factor Input Screen

NOTE

If the number of measurement wavelengths does not meet the number of wavelengths in the equation for the multi-wavelength measurement, the measurement cannot be carried out.

5.2.2 Changing Sample

You can specify whether or not to change sample for each wavelength by selecting the [Change sample each λ] on the Parameter Configuration screen.

The available options are described below:

[OFF]

The sample is not changed at each wavelength. The same sample is measured at all the wavelengths specified in "Number of measurement wavelengths". If the sample module selected in "Sample control" is Multi-cell, the sample in each cell is measured at all the wavelengths by automatically changing the sample to the specified number of cells.
Shown below as an example is the measurement flow chart of the case in which "6-cell" is selected, the number of measurement wavelengths is set to 3, and the number of cells used is set to 3:

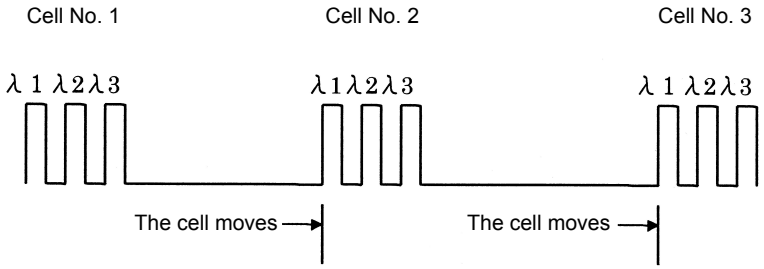


Fig. 5.5 Measuring operation

[Single cell]

This mode is used to change the sample at each measurement wavelength. Change the sample after the measurement at one wavelength, press the (START/STOP) key according to the message displayed on the screen, and then proceed to the next measurement.

NOTE

The (START/STOP) key cannot be used to abort the measurement; instead the (RETURN) key must be used for this purpose.

[Multi-cell]
After the measurement at one wavelength, the multi-cell holder is automatically moved to change the sample. The maximum number of selectable cells is eight. The number of cells used is automatically set to the number of measurement wavelengths. The sample module must be set to Multi-cell. This mode is not available for the sipper unit.
Shown below as an example is the measurement flow chart of the case in which 6-cell is selected and the number of measurement wavelengths is set to 3:

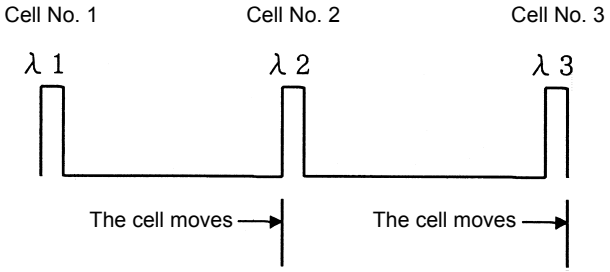


Fig. 5.6 Measuring operation

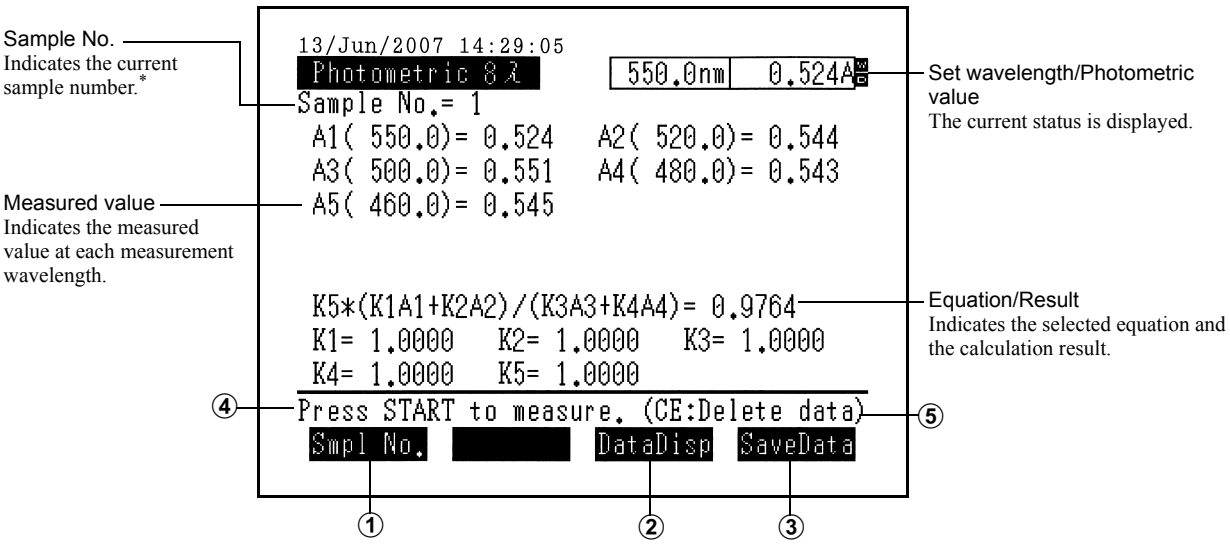
NOTE

1. If [Multi-cell] is selected, the sipper unit cannot be used.
2. To abort the measurement, press the (START/STOP) key. In this case, the measurement will be resumed starting at measurement wavelength λ1 when the (START/STOP) key is pressed again.

5.3.1 Measurement Screen

Pressing the [MeasScrn] F3 key or the START/STOP key in the Measurement Parameter Configuration screen (Fig. 5.2), the Measurement screen appears as shown in Fig. 5.7. (When the START/STOP key is pressed the first measurement will be performed.) If the specified number of wavelengths does not meet the required number for the calculation, the measurement cannot be carried out.

To abort the measurement, press the START/STOP key. The aborting operation occurs after the wavelength has been changed. In this case, the result is not displayed and no data is printed out.



* When using a single cell or when No. of drive cells is 1, the sample numbers are assigned in sequence, starting from 1. When using multiple cells by attaching a multi-cell or micro multi-cell, a dash (-) and the cell number are attached to the sample number.

Single cells: [Sample No.]
Multiple cells: [Sample No.] - [Cell No.]

Fig. 5.7 Photometric Multi-wavelength Measurement Screen

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Used to change the sample number for the next measurement. The sample number can be selected from 0 to 9999.
②	F3	[DataDisp]	Function for displaying a data table. ☞ "5.4 Data Display"
③	F4	[SaveData]	Saves the measurement results as a table data file to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
④	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen (Fig. 5.7). **NOTE** A maximum of 200 measurements can be performed as a single table data file.
⑤	CE	–	Deletes all measured data or data in the loaded data file.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 5.2).

5.3.2 Data Print for Each Measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed on the printer for every measurement.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

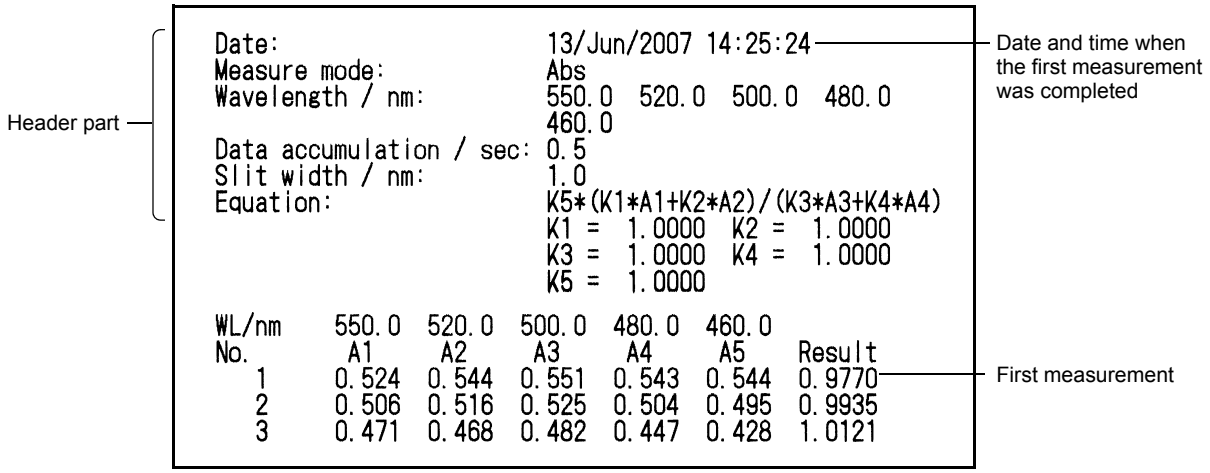


Fig. 5.8 Example of data printout for each measurement

NOTE

A hard copy printer can print data and calculation results for up to only seven lines. Therefore, measured data and calculation results are printed in one line for each measurement wavelength in the following measurement conditions:

```
Date:                    2007/07/14 13:57:31
Measure mode:            Abs
Wavelength / nm:         540.0  520.0  500.0  480.0
                         460.0  440.0  420.0  400.0
Data accumulation / sec: 0.5
Slit width / nm:         1.0
Equation:                K5*(K1*A1+K2*A2)/(K3*A3+K4*A4)
                         K1 =  1.0000  K2 =  1.0000
                         K3 =  1.0000  K4 =  1.0000
                         K5 =  1.0000

 No.      1
 A1( 540.0 ) =  0.199
 A2( 520.0 ) =  0.309
 A3( 500.0 ) =  0.146
 A4( 480.0 ) =  0.406
 A5( 460.0 ) =  0.262
 A6( 440.0 ) =  0.384
 A7( 420.0 ) =  0.084
 A8( 400.0 ) =  0.085
 Result      =  0.9190
```

5.4 Data Display

5.4.1 Data Display Screen

This screen allows you to review all measured data or data contained in a loaded file.

It is also possible to print all data on the screen, or load another data file from the memory storage.

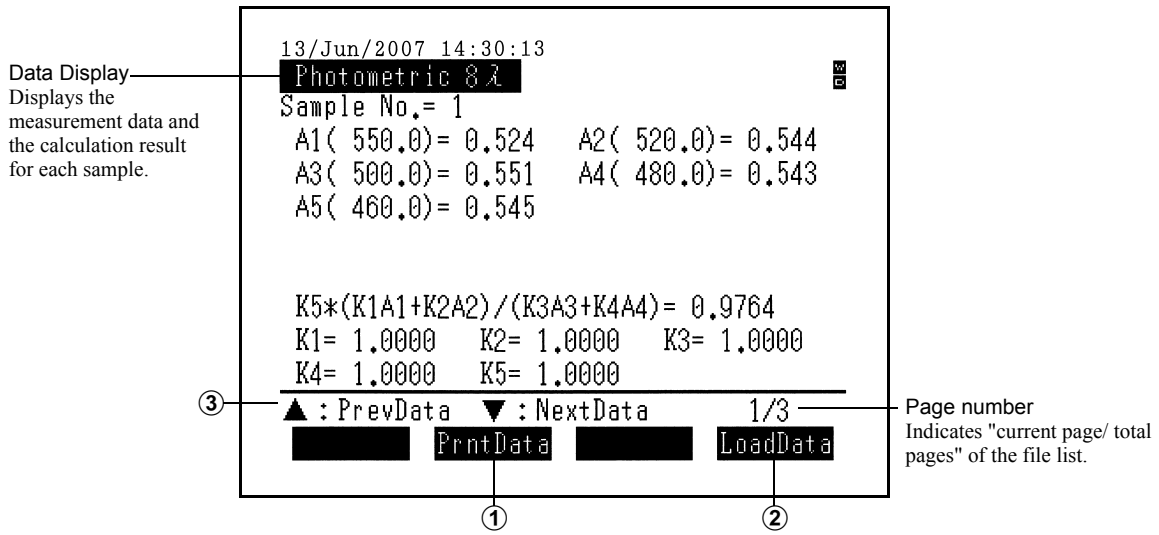


Fig. 5.9 Data Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all data displayed in the list. ☞ "5.4.2 Data Printout"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Switches the data list displayed on the screen. Each pressing of the key switches to the previous or next sample data.
–	RETURN	–	Returns to the Measurement screen (Fig. 5.7).

5.4.2 Data Printout

The entire data can be printed out as a numeric data table on the printer (optional). In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

> **NOTE**
> Pressing the (PRINT) key on the keypad will produce only a hard copy of the screen.

The printout form varies according to the connected printer for output.

■ Output to a hard-copy printer

The data is printed in the same form as when printing for each measurement.
(See Fig. 5.8 for a printout example.)

■ Output to a commercially available printer

The measurement data and the calculation result are printed in a row for each sample.

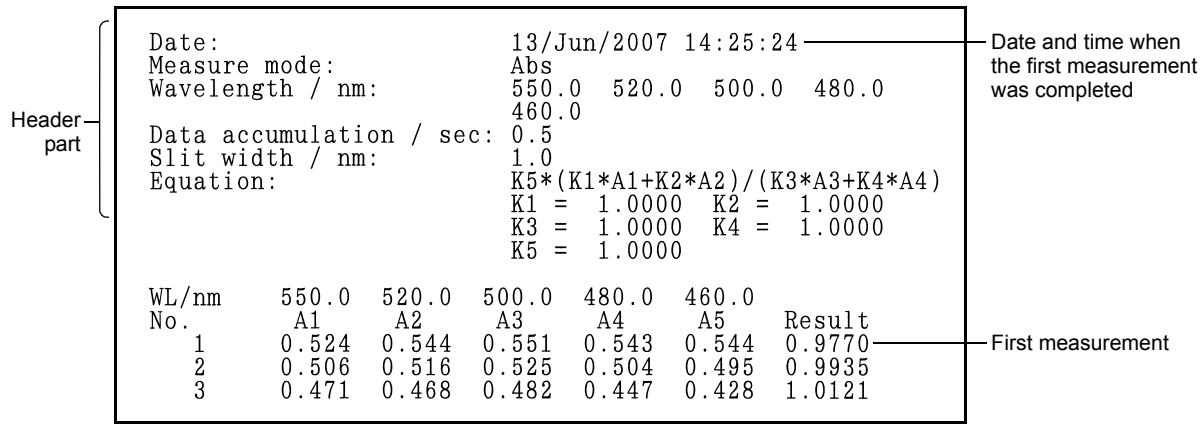


Fig. 5.10 Example of Data Printout

This page is intentionally left blank.

Chapter 6 Spectrum

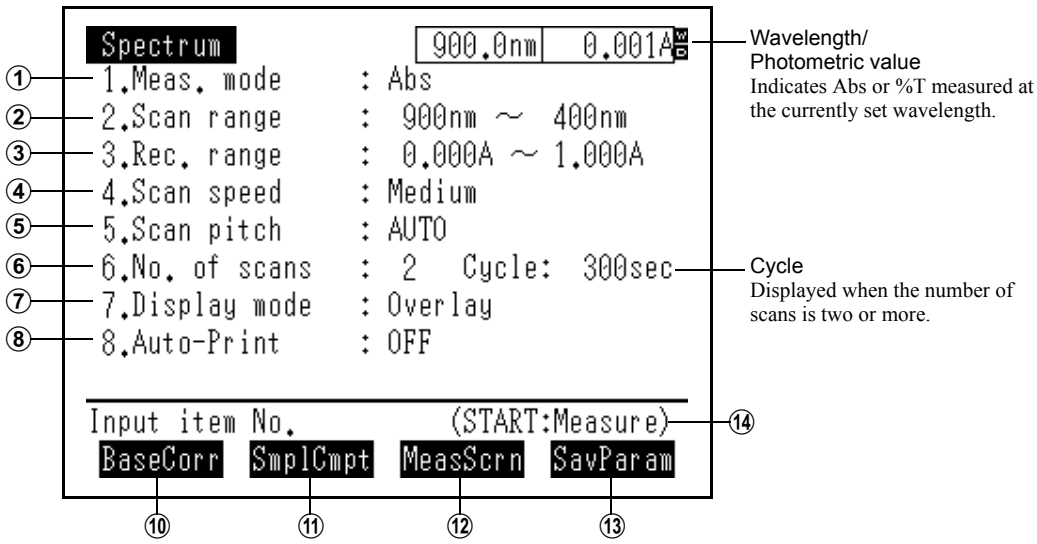
The spectrum mode is used to measure spectra. Measure the absorbance and transmittance spectra of the sample by performing the wavelength scan. This mode also allows you to measure the energy of a light source using its single beam.
The measured spectra may be stored as a single file in the memory of the main unit. Data processing such as peak detection, smoothing, and mathematical calculation may also be applied to those spectra.

CONTENTS

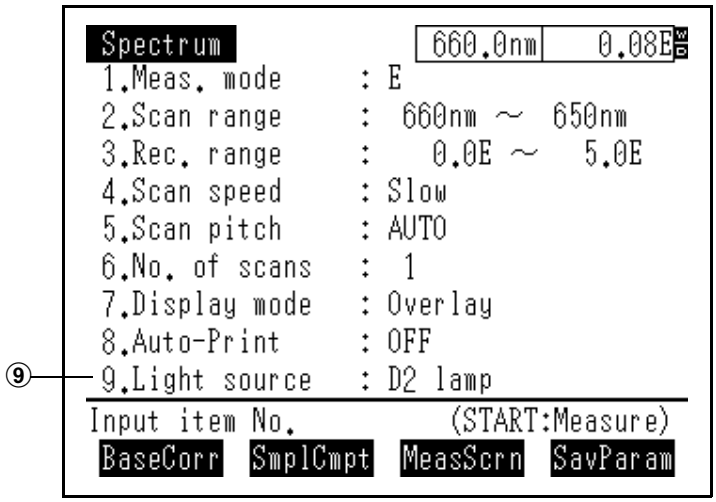
6.1 Measurement Parameter Configuration Screen

When you select [2.Spectrum] (press the 2 key) in the [Mode menu] screen (Fig. 2.1), the Measurement Parameter Configuration screen (Fig. 6.1) will be displayed.

The measurement parameter configuration screens differ slightly for the Abs (absorbance) and %T (transmittance) measurement modes, and for the E (energy) measurement mode (Fig. 6.1).



(Abs and %T modes)



(E mode)

Fig. 6.1 Measurement Parameter Configuration screen

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>①</td><td>1</td><td>[Meas. Mode]</td><td>Selects the measurement mode.
You can select one of the following measurement modes: %T (transmittance), Abs (absorbance), or E (energy). Upon selection, the [Rec. range] value is also changed to the corresponding range.</td></tr>
<tr><td>②</td><td>2</td><td>[Scan range]</td><td>Sets the range of the wavelength scans. Enter the scan starting and ending wavelength, in that order.
■Range<table><tr><td>Wavelength range</td><td>190 nm to 1100 nm</td></tr></table>The starting wavelength must be longer than the ending wavelength. The minimum scan range is determined by the scan pitch setting.

(Scan start wavelength) ≥ (Scan end wavelength) + (Scan pitch)

NOTE
If the measurement points led by the calculation with the specified scan range and scan pitch exceed 2001, the scan pitch is changed to the minimum value that creates less than 2001 points, after the execution confirmation message is displayed.</td></tr>
<tr><td>③</td><td>3</td><td>[Rec. range]</td><td>The recording range is used to input the upper limit/ lower limit of Y-axis when displaying the Reaction Curve on the screen.
■Input range<table><tr><td>Abs</td><td>-4.000 to 4.000</td></tr><tr><td>%T and E</td><td>-400.0 to 400.0</td></tr></table></td></tr>
<tr><td>④</td><td>4</td><td>[Scan speed]</td><td>To specify a wavelength scanning rate, select one from the four options, i.e. Fast, Medium, Slow, and Very slow.
■Accumulation time<table><tr><td>Fast</td><td>0.05 sec</td></tr><tr><td>Medium</td><td>0.2 sec</td></tr><tr><td>Slow</td><td>0.5 sec</td></tr><tr><td>Very slow</td><td>2.0 sec</td></tr></table></td></tr>
</table>

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>⑤</td><td>5</td><td>[Scan pitch]</td><td>Selects the pitch (interval) at which to obtain data during wavelength scan.
■Selection item
<table>
<tr><td>AUTO</td><td>The scan pitch is automatically set according to the scan range.</td></tr>
<tr><td>0.05</td><td>Measured every 0.05 nm.</td></tr>
<tr><td>0.1</td><td>Measured every 0.1 nm.</td></tr>
<tr><td>0.2</td><td>Measured every 0.2 nm.</td></tr>
<tr><td>0.5</td><td>Measured every 0.5 nm.</td></tr>
<tr><td>1.0</td><td>Measured every 1.0 nm.</td></tr>
<tr><td>2.0</td><td>Measured every 2.0 nm.</td></tr>
</table>
If [AUTO] is selected, the scan pitch is determined by the selected scan range so that the number of measurement points becomes maximum and still does not exceed 2001 (the minimum value out of 0.05/0.1/0.2/0.5/1.0/2.0 that meets [Wavelength range/Scan pitch < 2001])</td></tr>
</table>

No.	Key Operation	Display	Description
⑥	6	[No. of scans]	Set the number of times a scan will be repeated. To save all curve data obtained in a repeated measurement, connect a USB memory device and use the auto-file function (☞ "6.2.2 Auto-file Function"). **NOTE** When a repeated measurement is performed without connecting the USB memory device, only the latest acquired data can be saved or printed after the measurement. ■Range Range of repetition times: 1 to 99 times • If this is set to 2 or more times, the interval setting will be displayed with the scanning repetitions on the same display line. (See Fig. 6.1.) • If this is set to 2 or more times, a multi cell measurement using multi-cell holder cannot be performed. • When you press START/STOP key once, measurement will be repeated only the set number of times. ■Scanning interval This is a time period from a scan start to the next scan start. • The scanning interval includes the time required for scanning. If the scanning interval is set to a value longer than the time required for scanning, the UV-1800 will wait for the time equivalent to the difference between the two and then start scanning. During this waiting period, the next scanning count and the remaining waiting time are displayed. • If the time required for scanning is actually longer than the scanning interval, the scan will be continuously carried out without any waiting time. In this case, the set value for the scanning interval will be changed to the actually required time.

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>⑦</td><td>7</td><td>[Display mode]</td><td>Selects how to display the spectra.
Each time this key is pressed, the parameter toggles between Sequential and Overlay.
■Display method<table><tr><td>Sequential</td><td>The screen is renewed for each scan and only the spectrum from that measurement is displayed.</td></tr><tr><td>Overlay</td><td>The screen is not updated with each scanning result. The spectrum display for each scan is left as it is so that multiple spectra are overlaid in the display.</td></tr></table></td></tr>
<tr><td>⑧</td><td>8</td><td>[Auto-Print]</td><td>Switches ON/OFF of the auto-print function.
Each pressing of this key toggles between ON and OFF.
■Description<table><tr><td>ON</td><td>A screen hard copy and measurement parameters are automatically printed after the measurement.
For details on the printout form, refer to "6.4.2 Waveform Format", Fig. 6.9 Example of waveform printout (with hard copy printer).</td></tr><tr><td>OFF</td><td>The automatic printout is not performed.</td></tr></table>• For multi-cell measurements and repeated measurements without using the auto-file function, only the latest-acquired data can be saved or printed after the measurement. Therefore, if you wish to obtain the printouts of these measurement results, connect the printer (Communication: ON) and set the auto-print function to [ON] beforehand.</td></tr>
</table>

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>⑨</td><td>9</td><td>[Light source]</td><td>Selects the light source for the measurement. (E (energy) mode only)
Select a light source for the energy measurement. The selected light source will be used regardless of the parameter setting for the light source.
■Light source types<table><tr><td>WI lamp</td><td>Selects the tungsten iodine lamp (halogen lamp).</td></tr><tr><td>D2 lamp</td><td>Selects the deuterium lamp.</td></tr><tr><td>OFF</td><td>Turns OFF both the WI and D2 lamps. The light source mirror turns to the third light source.</td></tr></table>* This function is used to introduce the external light source into the spectrometer when measuring the energy change of light sources other than those equipped with the standard UV-1800.</td></tr>
<tr><td>⑩</td><td>F1</td><td>[BaseCorr]</td><td>Allows you to set a blank sample prior to the measurement of an unknown sample and correct the baseline.</td></tr>
<tr><td>⑪</td><td>F2</td><td>[SmplCmpt]</td><td>Set the sample module. The setting items include the sample module type and the operating conditions of the sipper.
☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"</td></tr>
<tr><td>⑫</td><td>F3</td><td>[MeasScrn]</td><td>Switches to the Measurement screen.</td></tr>
<tr><td>⑬</td><td>F4</td><td>[SavParam]</td><td>Saves current measurement parameters to the built-in memory or USB memory device.
☞ "3.1 Save Files"</td></tr>
<tr><td>⑭</td><td>START/STOP</td><td>–</td><td>Starts the measurement under the set parameters and displays the Measurement screen (Fig. 6.3).</td></tr>
<tr><td>–</td><td>RETURN</td><td>–</td><td>Returns to the [Mode menu] screen (Fig. 2.1).</td></tr>
</table>

6.2 Measurement

6.2.1 Measurement Screen

When you press the START/STOP key in the Measurement Parameter Configuration screen (Fig. 6.1) or Curve Display screen (Fig. 6.3), measurement starts and a spectral waveform is plotted in real time (Fig. 6.2).

After the measurement has been finished (stopped), the Curve Display screen will be displayed as shown in Fig. 6.3.

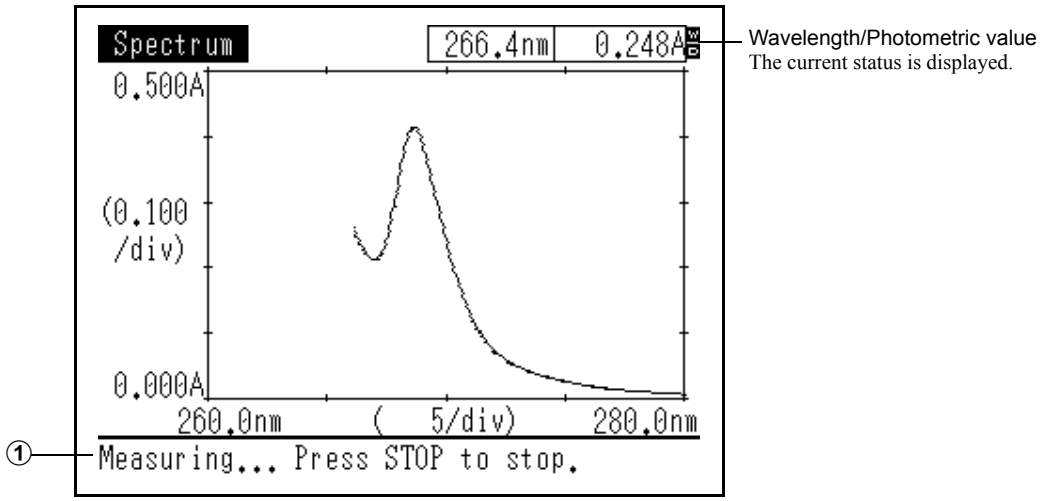


Fig. 6.2 Screen during measurement

No.	Key Operation	Display	Description
①	START/STOP	–	Terminates the current measurement and moves to the Curve Display screen (Fig. 6.3).

NOTE

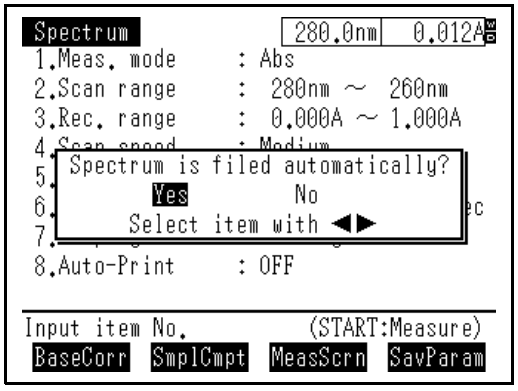
When [7. Display mode] is set to "Overlay" in the Measurement Parameter Configuration screen (Fig. 6.1), all spectra are overlaid on the screen graph. However, only the spectrum data obtained in the latest measurement can be saved, processed, and printed.

6.2.2 Auto-file Function

When using a USB memory device, you can save all curve data acquired in a repeated measurement.

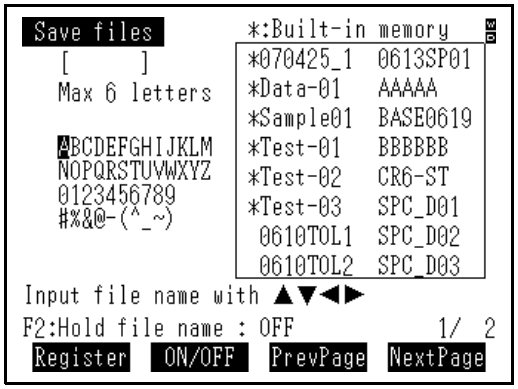
* The repeated measurement refers to a measurement of which the "No. of scans" parameter is set to more than [2] in the Measurement Parameter Configuration screen.

1 If you set a parameter for repeated measurements and press the (START/STOP) key, the confirmation screen appears asking you whether or not to execute the auto-file function.

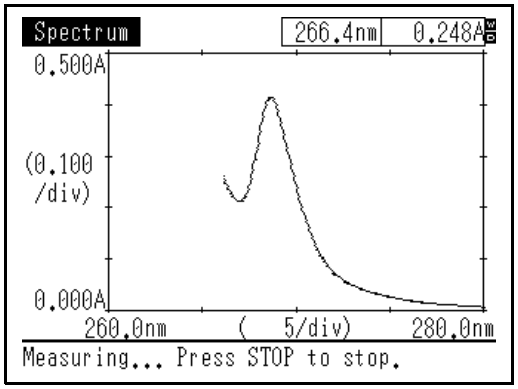


2 Use (◄) (►) keys to select [Yes] and press the (ENTER) key.

3 The screen for saving multiple files appears. Enter the file name and press the (F1) [Register] key. (☞ "3.1.2 Save Multiple Files")



4 A repeated measurement is started.
Upon completion of the measurement, the multiple spectrum data obtained are saved to the USB memory. The file name specified in procedure 3 is assigned to those data with sequential numbers from "01" attached.



6.3 Displaying Spectrum

6.3.1 Curve Display Screen

When you complete/terminate measurement, or press the F3 [MeasScrn] key in the Measurement Parameter Configuration screen, the Curve Display screen (Fig. 6.3) appears.
In this screen, you can display, save, and print the waveform within measured or loaded spectrum data.

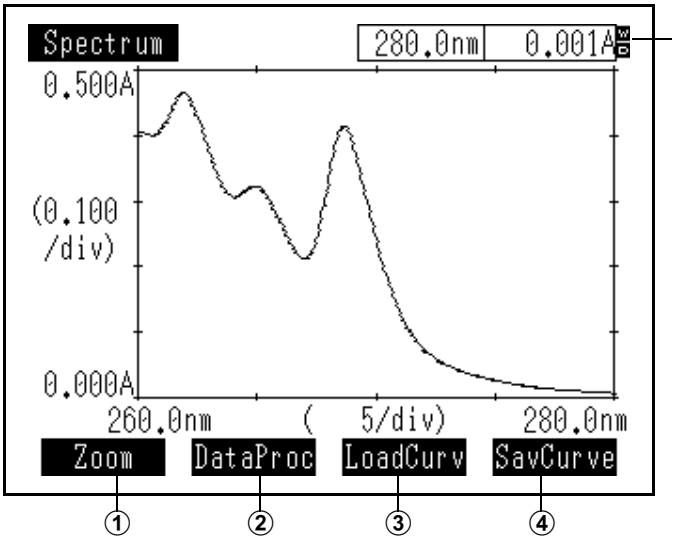


Fig. 6.3 Curve Display Screen

NOTE

Acquired curve data is not yet saved when the measurement has completed. The curve data will be lost if (1) the next sample measurement is started, (2) another curve data file is loaded, or (3) the measurement parameters are changed.
To save the acquired spectrum data, press the F4 key.

No.	Key Operation	Display	Description
①	F1	[Zoom]	Changes the vertical or horizontal axis range. ☞ "6.3.3 Zoom Screen"
②	F2	[DataProc]	Performs the following data processings on displayed spectra. • Mathematical calculation, derivative processing, peak detection, Area calculation, point pick and printout. ☞ Chapter 13 "Data Processing"
③	F3	[LoadCurv]	Loads the spectrum data files that are stored in the memory storage. ☞ "3.2.2 Load Multiple Files"

No.	Key Operation	Display	Description
④	F4	[SavCurve]	Saves the acquired spectrum data to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
⑤	START/STOP	–	The measurement is started under the set parameters and the spectrum is displayed. If pressed during measurement, the measurement is terminated.
⑥	PRINT	–	Prints a hard copy of the screen or the spectrum data. ☞ "6.4 Print Out"
⑦	RETURN	–	Returns to the Parameter Configuration screen (Fig. 6.1).
⑧	◄(-) ►	–	Displays the reading cursor on the graph to read the wavelength and data values at any arbitrary cursor position. ☞ "6.3.2 Reading with Cursor"

6.3.2 Reading with Cursor

If the ◄ or ► key is pressed in the Curve Display screen (Fig. 6.3), the reading cursor appears.

Using this reading cursor, you can read the wavelength and data values at any arbitrary cursor position.

Furthermore, for listing or printing the data values at multiple wavelengths, refer to the description on the point pick function (☞ "13.6 Point Pick"). For printing all data as numeric values, refer to the description on the print processing function (☞ "13.7 Print Processing").

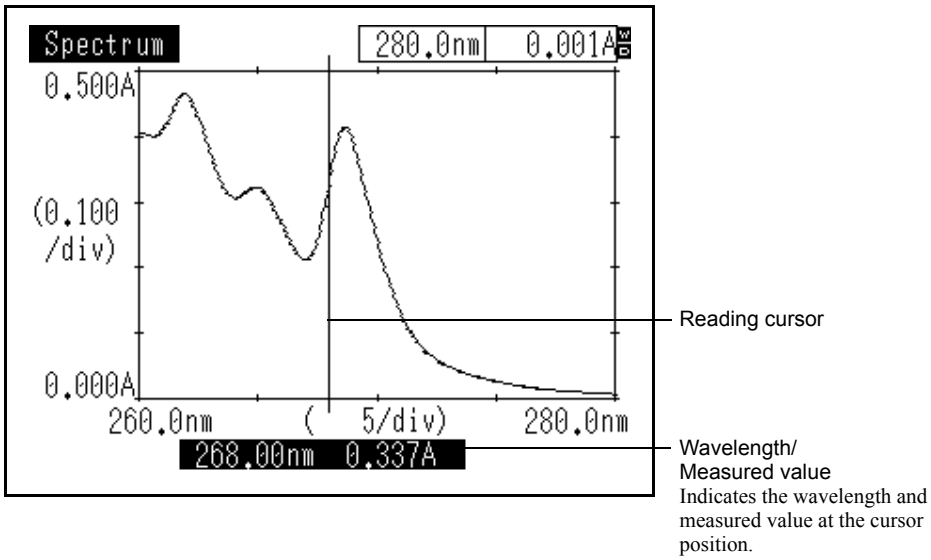


Fig. 6.4 Reading with Cursor screen

Key Operation	Description
◄ ►	Moves the cursor on the graph and displays the wavelength and photometric values at the current cursor position. Holding down the key will move the cursor faster.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than above	The reading cursor disappears, and you will return to the Curve Display screen (Fig. 6.3).

NOTE

When multiple spectra are overlaid on the graph, the cursor reads the wavelength and photometric values of the latest measured or loaded spectrum data.

6.3.3 Zoom Screen

When you press the F1 [Zoom] key in the Curve Display screen (Fig. 6.3), the Zoom screen (Fig. 6.5) will be displayed.

The displayed spectrum can be enlarged or reduced by changing the vertical or horizontal axis of the spectrum (only enlarged by changing the horizontal axis).

NOTE

1. If the curve data is overwritten on the screen using the curve call function, the enlargement or reduction is applied to the last loaded data.
2. If the measurement result is overwritten, the enlargement or reduction is applied to the last measurement data.

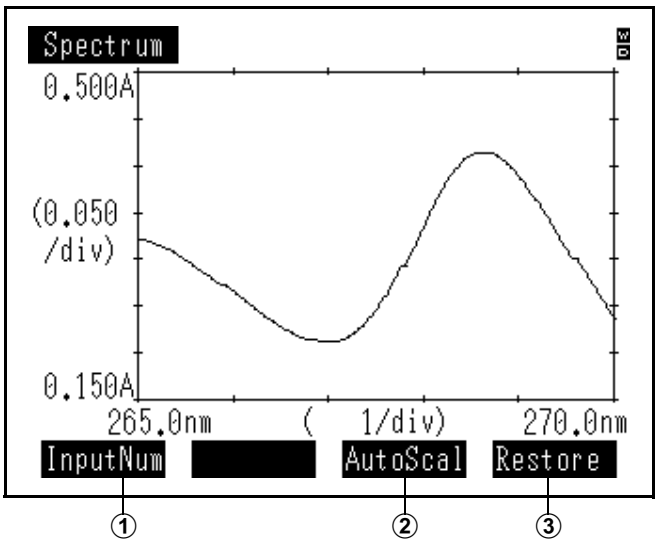
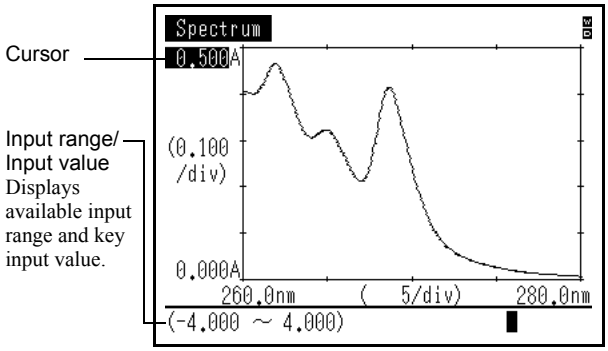


Fig. 6.5 Zoom screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis range. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing of ENTER key moves the cursor to [vertical axis upper limit] → [vertical axis lower limit] → [horizontal axis lower limit] → [horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 6.6).  Fig. 6.6 Zoom screen **NOTE** Data exist only at each scan pitch. Therefore, when values other than the integral multiple of the scan pitch are entered as horizontal axis values, the entered values are automatically replaced with the wavelength values nearest to the existing data values.
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed spectrum automatically.
③	F4	[Restore]	Restores the display range to the original state.
–	PRINT	–	Prints the curve data with the zoom operation applied. ☞ "6.4 Print Out"
–	◄(-) ►	–	Displays the cursor on the spectrum graph to activate the cursor reading function. ☞ "6.3.2 Reading with Cursor"
–	RETURN	–	Returns to the Measurement screen (Fig. 6.3).

6.4 Print Out

The graph of the spectrum data can be printed out in "Print waveform ([Draw curve])" or "Hard copy of screen ([Screen copy])". For printing all data as numeric values, refer to the description on the print processing function (☞ "13.7 Print Processing").

6.4.1 Print Mode

If you press the PRINT key in the Curve Display screen (Fig. 6.3), the screen will appear for selecting a print mode from above.

Move the cursor to the desired mode with the ▲ ▼ keys, and confirm the selection with the ENTER key.

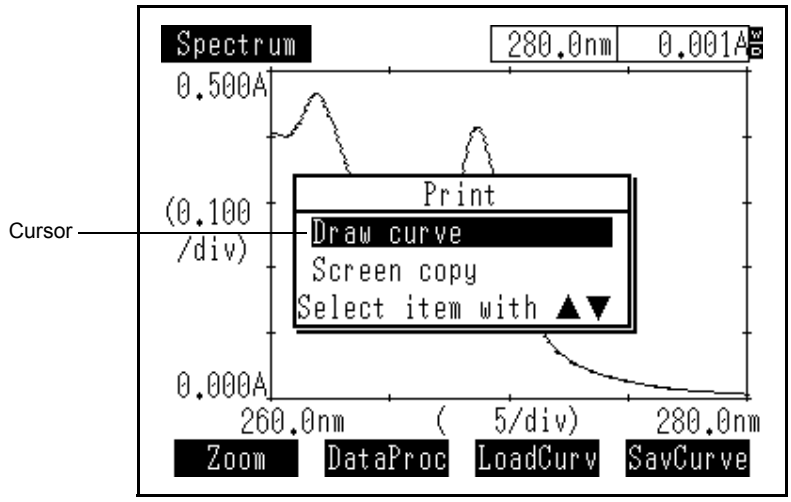


Fig. 6.7 Print form selection screen

■ Print waveform ([Draw curve])

The graph and measurement parameters of a spectrum data are printed out. If a commercially available printer is selected, the screen for selecting a grid type for the graph output is displayed. Move the cursor to the desired grid type with the ▲ ▼ keys, and confirm the selection with the ENTER key.

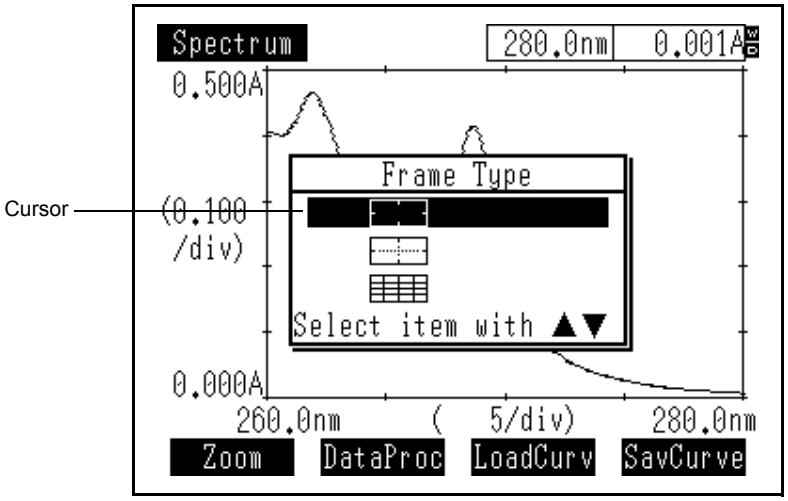


Fig. 6.8 Grid Type Selection screen

When the grid type is confirmed, the spectrum and parameters in measured or loaded curve data are printed out. The print form varies according to the connected printer for output. ☞ "6.4.2 Waveform Format"

> **NOTE**
> Even though multiple spectra are overlaid on the screen, only the latest measured or loaded curve data can be printed out.

■ Hard copy of screen ([Screen copy])

The current screen (spectrum display screen) image when the PRINT key is pressed will be printed in the same size.

6.4.2 Waveform Format

First, the print format for the "Print waveform" varies according to the connected printer for output.

The following shows examples of printouts using different types of printers.

■ Output to a hard-copy printer

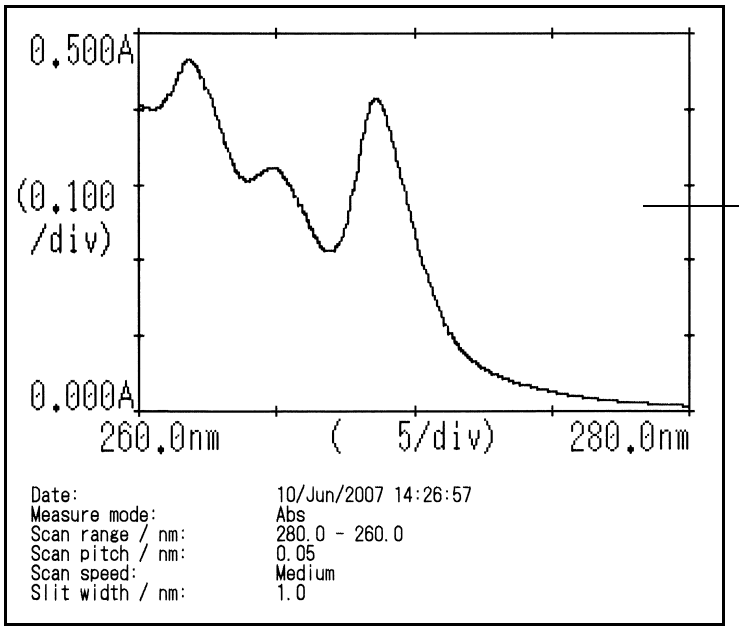


Fig. 6.9 Example of waveform printout (with hard copy printer)

■ Output to a commercially available printer

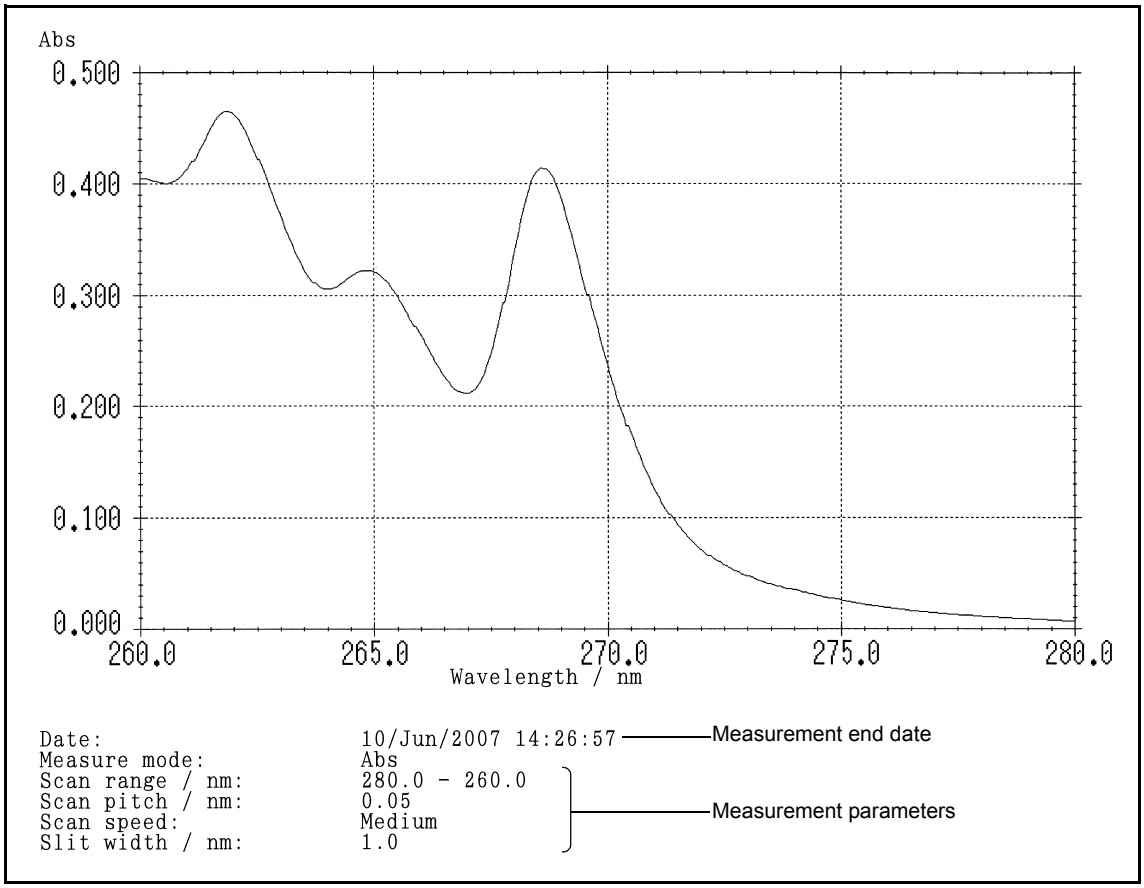


Fig. 6.10 Example of waveform printout (with commercially available printer)

Chapter 7 Quantitation

The quantitation mode is used to quantify an unknown sample by creating a calibration curve from the standard sample. The following four types of measurement methods are available according to the number of wavelengths used:

- One-wavelength method: The sample is quantified using its absorbance at a single wavelength. The operation procedures in this chapter mainly describe this method.
- Two-wavelength method: The absorbance at a wavelength other than the quantitation wavelength is used to eliminate the interfering components and contaminants (☞ "7.5.1 Two-wavelength Quantitation").
- Three-wavelength method: The absorbance of two wavelengths is used to eliminate the interfering components (☞ "7.5.2 Three-wavelength Quantitation").
- Derivative quantitation: The derivative value (1st through 4th orders) for the spectrum at the quantitation wavelength is used (☞ "7.6 Derivative Quantitation Method").

The calibration curve is created using one of the following three methods:

- K factor method: In the equation, "concentration = K x absorbance + B", K and B are predetermined.
- Single-point calibration curve method: One standard sample is measured to create the calibration curve.
- Multi-point calibration curve method: Multiple standard samples (10 maximum) are measured to create the calibration curve.

If the measurement is repeated, the measurement results may be displayed as a list. A single list can include a maximum of 200 measurement results. This data may be stored as a single file in the memory of the main unit.

CONTENTS

7.1 Measurement Parameter Configuration Screen

When you select [3. Quantitation] (press the 3 key) in the [Mode menu] screen (Fig. 2.1), the Measurement Parameter Configuration screen in Fig. 7.1 will be displayed.

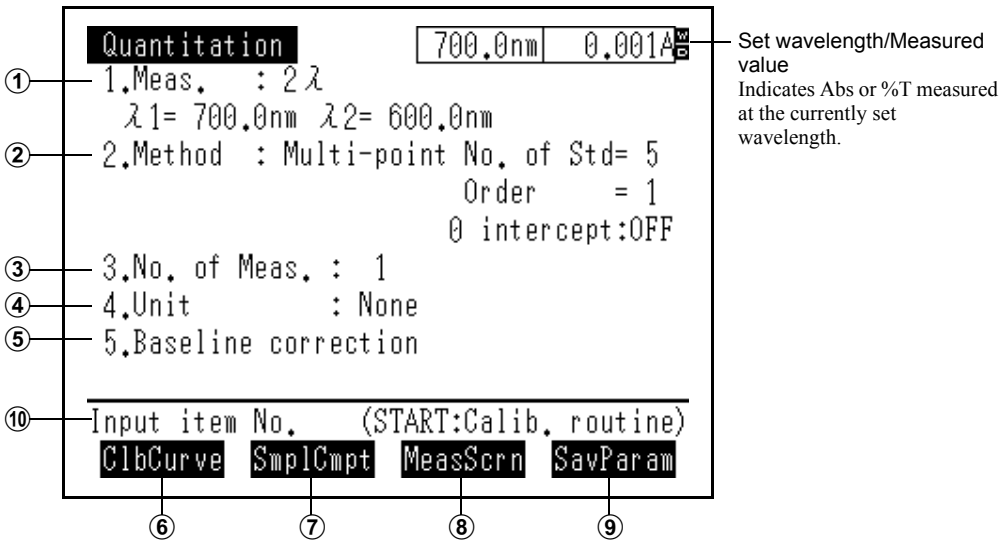


Fig. 7.1 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[Meas.]	Selects the measurement method used for quantitation. ☞ "7.1.1 Select Measurement Method"
②	2	[Method]	Selects the calibration method used for quantitation. ☞ "7.1.2 Select Calibration Method"

No.	Key Operation	Display	Description
③	3	[No. of Meas.]	Specifies how many times the same sample is to be measured. Input range of repetition count: 1 to 10 times ■When the repetition count is set to more than 1 • Standard sample: The measurement is repeatedly performed and the mean value for absorbance is used. ☞ "7.2.2 Entering Absorbance" • Unknown sample: The measurement is repeatedly performed and both the measured values and mean value are displayed. ☞ "7.3.1 Measurement Screen" To abort the repeating measurement, press the RETURN key. In this case, the mean value will not be calculated. **NOTE** The repeating measurement while using a multi-cell or similar holder (optional) with the multiple cells cannot be carried out.
④	4	[Unit]	Specifies the concentration unit for the Quantitation result by selecting one of the following units: None, %, ppm, ppb, g/l, mg/ml, ng/ml, M/L and µg/ml. You can also register the desired unit other than those listed above. ☞ "7.1.3 Select Concentration Unit"
⑤	5	[Baseline correction]	The baseline is corrected in the wavelength range specified in the measurement wavelengths. To perform the quantitation by the two-wavelength, three-wavelength, or derivative quantitation method, set the blank sample on the cell prior to the measurement, and then correct the baseline. To abort the correction, press the START/STOP key.
⑥	F1	[ClbCurve]	Switches to the Calibration Curve screen. ☞ "7.2.4 Displaying a Calibration Curve" If a calibration has not been created, switches to the screen for creating the calibration curve (Concentration Table screen). ☞ "7.2 Creating a Calibration Curve"

No.	Key Operation	Display	Description
⑦	F2	[SmplCmpt]	Sets the parameters for the sample module. The setting items include the sample module type, the number of cells, and the operating conditions of the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
⑧	F3	[MeasScrn]	Switches to the Measurement screen.
⑨	F4	[SavParam]	Save measurement parameters, including the calibration curve equation, to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
⑩	START/STOP	–	If a calibration curve used for quantitation exists or if K-factor method is to be applied, the measurement is started under the set parameters and the Measurement screen is displayed. ☞ "7.3 Measuring Unknown Sample (Quantitation)" If a calibration has not been created, switches to the screen for creating the calibration curve (Concentration Table screen). ☞ "7.2 Creating a Calibration Curve"
–	RETURN	–	Returns to the [Mode menu] screen (Fig. 2.1).

If it is required to perform a blank correction, place a blank sample and press the AUTO ZERO key before measurement.

The obtained photometric value will be set to 0 Abs (100 %).

NOTE

Changing any parameter (including unit) in the Measurement Parameter Configuration screen after creating a calibration curve will result in the deletion of the calibration curve data.

7.1.1 Select Measurement Method

When [Meas.] is selected in the Measurement Parameter Configuration screen, the Measurement Method screen (Fig. 7.2) is displayed.

Select the measurement method from the following four types and then enter the measurement wavelength as instruction on the screen.

Move the cursor to the desired measurement method with the ▲ ▼ keys, and confirm it with the ENTER key.

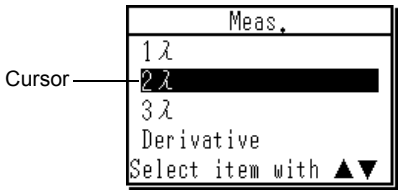


Fig. 7.2 Measurement Method screen

[1λ] (One-wavelength method)

Enter measurement wavelength λ1.

[2λ] (Two-wavelength method)

Enter measurement wavelengths λ1 and λ2. λ1 is the quantitation wavelength and λ2 the wavelength at which to eliminate the interfering components. (☞ "7.5.1 Two-wavelength Quantitation")

[3λ] (Three-wavelength method)

Enter measurement wavelengths λ1, λ2 and λ3. λ1 is the quantitation wavelength, and λ2 and λ3 the wavelengths at which to eliminate the interfering components. The entered wavelength values are automatically arranged as λ1, λ2, and λ3 in this order starting with the longer wavelength side. (☞ "7.5.2 Three-wavelength Quantitation")

[Derivative] (Derivative quantitation method)

Enter the measurement wavelength λ1 and the order of the derivatives.
(☞ "7.6 Derivative Quantitation Method")

7.1.2 Select Calibration Method

When [Method] is selected in the Measurement Parameter Configuration screen, the Calibration Method screen (Fig. 7.3) is displayed.
Select one of the three quantitation methods, namely [K-facter (C=K*Abs + B)], [1 point calib.], and [Multi-point calib.], and then set the parameters according to the instructions given on the screen.
Move the cursor to the desired calibration method with the ▲ ▼ keys, and confirm it with the ENTER key.

When the single-point calibration curve or the multi-point calibration curve is selected, measure the standard sample for creating the calibration curve before measuring an unknown sample.

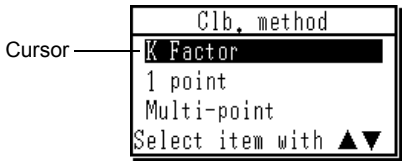


Fig. 7.3 Calibration Method screen

- [K Factor]
  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 K-factor method is selected in the Calibration Method screen, the screen for specifying a factor is displayed. Input the factor with numeric keys, and press the ENTER key. The factor at the cursor position is confirmed. After the confirmation of K value, the cursor moves to the B value column. After the B value has been confirmed by the same procedure, the UV-1800 returns to the Measurement Parameter Configuration screen (Fig. 7.1).
  Input range for K and B: –9999.9 to 9999.9
  The number of significant figures is 5 (0.0001 is acceptable).

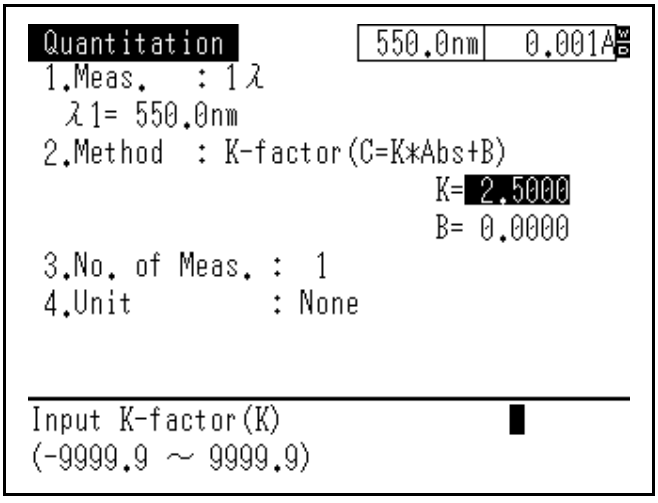


Fig. 7.4 Setup screen for calibration curve (K factor method)

- [1 point] (Single point calibration curve method)
  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. The created calibration curve can be reviewed by pressing the F1 key on the Parameter Configuration screen (Fig. 7.1).

- [Multi-point] (Multi-point calibration curve method)
  Set the parameters for creating the calibration curve from multiple standard samples of known concentrations. A linear, quadratic, or cubic equation can be used as the calibration curve equation. Enter the number of standard samples, the order of the calibration curve equation, and the zero intercept conditions according to the messages appearing on the screen.
  The required number of standard sample is equal to or larger than the order of the calibration curve equation when "0 Intercept" is set to YES, or equal to or larger than the order of the calibration curve equation plus 1 when "0 Intercept" is set to NO.
  Number of standard samples: 1 to 10
  Order: 1 to 3
  Zero intercept: YES/NO
  The cursor on the screen indicates the item currently specified. Confirming the selection with the ENTER key moves the cursor to the next item.
  After all the parameters are specified, the UV-1800 returns to the Measurement Parameter Configuration screen.

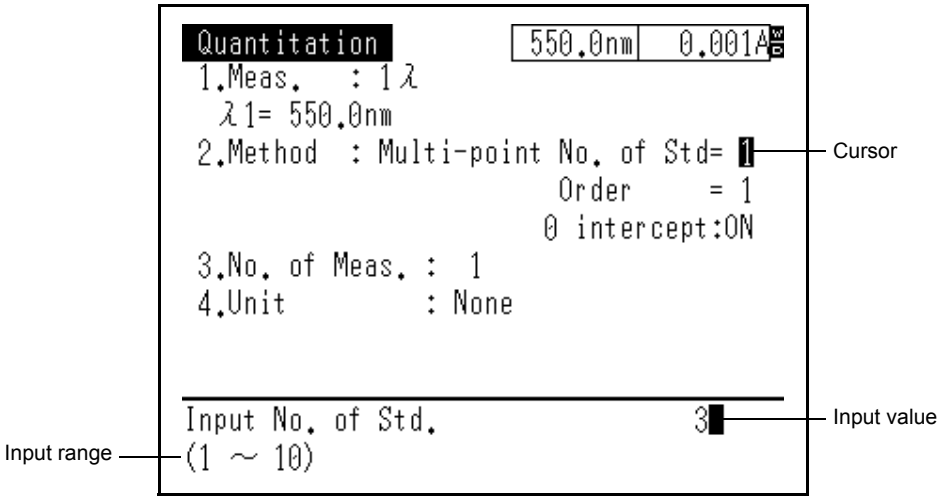


Fig. 7.5 Setup screen for calibration curve (multi-point calibration curve method)

7.1.3 Select Concentration Unit

When [Unit] is selected on the Measurement Parameter Configuration screen, the Concentration Unit screen (Fig. 7.6) is displayed.

Move the cursor to the desired concentration unit using the ▲ ▼ keys, and confirm it with the ENTER key.

To use a unit other than those displayed on the list, select [Unit Regist.] on the screen.

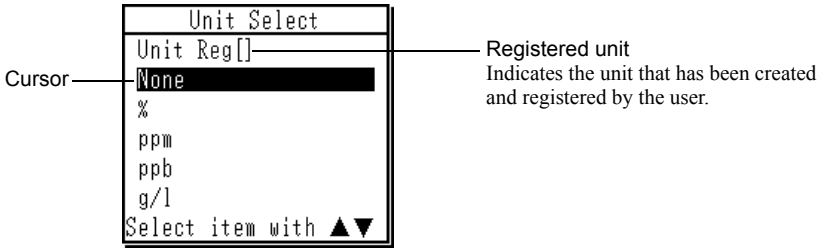


Fig. 7.6 Concentration Unit screen

If [Unit Regist.] is selected, the Unit Registration screen appears (Fig. 7.7).

Using the ▲ ▼ ◄(-) ► keys, move the cursor to desired characters on the list, and confirm it with the ENTER key.

> **NOTE**
> A maximum of 6 characters can be entered as a registered unit.

Press the F1 [Register] key to register the unit you have entered. The unit will be displayed in the Concentration Unit screen.

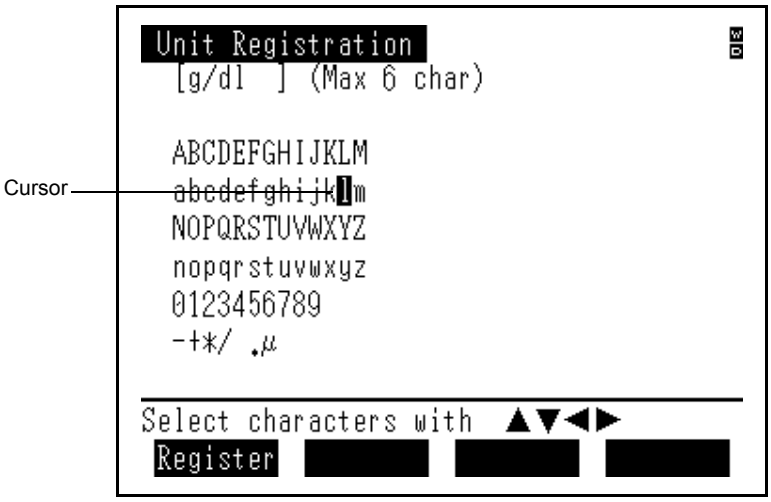


Fig. 7.7 Unit Registration screen

7.1.4 Save Calibration Curve

A calibration curve can be saved to memory at the same time that the other measurement parameters are saved using the [Sav Param] function in the Parameter Configuration screen.

(See "3.1 Save Files".)

A saved calibration curve can be recalled at the same time as the other measurement parameters using [Params] in the [Mode menu] screen.

(See "2.3 Load Parameters".)

7.2 Creating a Calibration Curve

If the single point or multi-point calibration curve is selected for the calibration curve method among the measurement parameters, the calibration curve must be created before an unknown sample is measured. The calibration curve equation may be stored as a parameters file like other parameters. It is therefore possible to call it using the parameter call function (F1 key) via the [Mode menu] screen.

When the START/STOP key is pressed with the Parameter Configuration screen displayed, the screen for entering concentration of standard sample (concentration table) appears.

7.2.1 Entering Concentrations

Key in the concentration of standard samples (STD). Their concentrations can be entered at random regardless of which one is larger or smaller.

When the concentrations of all the standard samples are entered, the screen for entering absorbance appears.

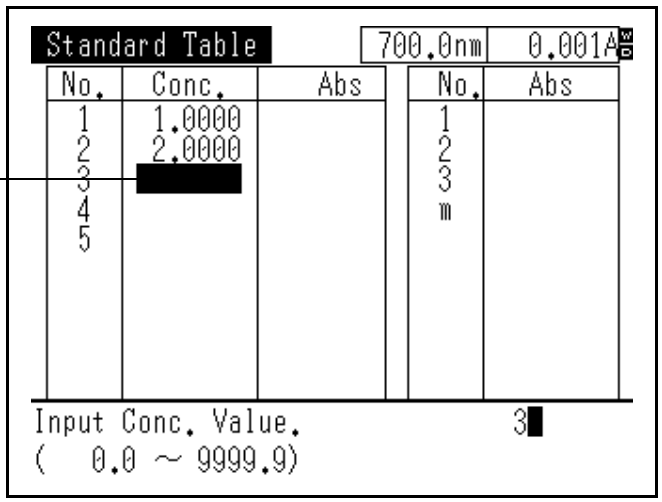
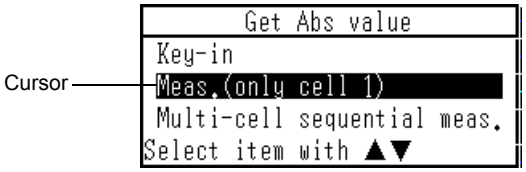


Fig. 7.8 Concentration Table (entering concentrations)

7.2.2 Entering Absorbance

Specify the absorbance (Abs) of each standard sample (STD) by selecting one of the following three methods.

When the concentrations are entered, the screen for selecting a method to input absorbance appears. To select the input method, use the ▲ ▼ keys to move the cursor to the desired input method, and confirm your selection with the ENTER key.



NOTE

- For the single point curve calibration curve method, select either [Keying-in] or [Measurement input (cell 1 only)].
- If the repetition count is set to more than one (1), you cannot select [Multi-cell sequential measurement input].

■ Keying-in ([Key-in])

Enter a value for Abs.

■ Measurement input (cell 1 only) ([Meas. (only cell)])

Set the standard samples on the multi-cell holder (optional) in the order of having entered their concentrations starting with cell 1, and then press the START/STOP key.

If the repetition count is set to more than one, the measurement will be performed repeatedly and the mean value for absorbance will be used.

Fig. 7.9 shows the Standard Sample Measurement screen.

The table on the left side screen displays the concentration and absorbance of each standard sample. When measurements are repeated, the measured values are displayed in the table on the right side screen. After the repeated measurements are completed, the mean value of the results is displayed on the left side table as the standard sample absorbance.

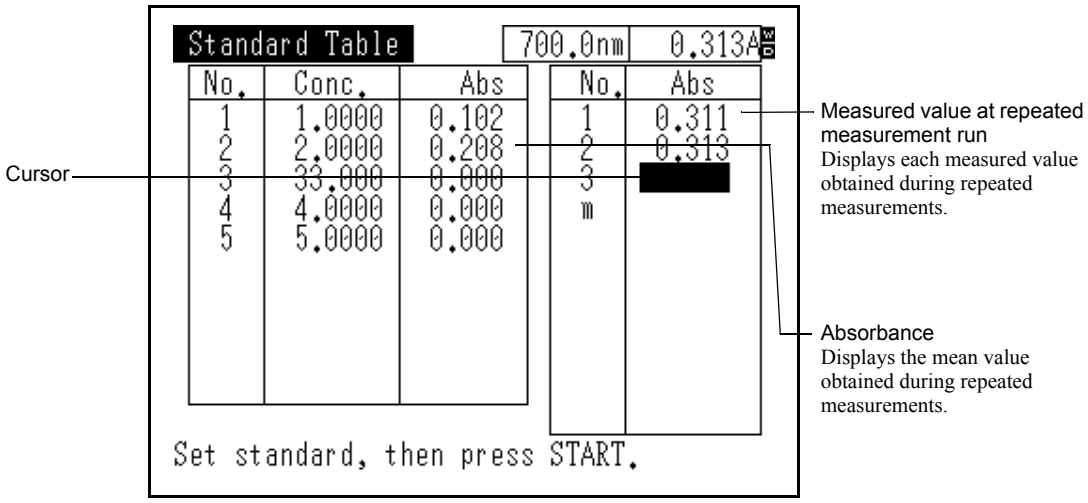


Fig. 7.9 Standard Sample Measurement screen (multi-point calibration method)

7

■ Multi-cell sequential measurement input (Displayed only when the Multi-point calibration curve method is selected)

Each cell will be automatically selected to carry out the measurement.

Even though using a multi-cell holder that can hold more than 10 cells, no more than 10 standard samples can be measured. Additionally, if for example 7 standard samples are to be measured with a 6-cell holder, the measurement will be interrupted when the 6th measurement has completed, and the UV-1800 will return to the standby screen for the next measurement.

7.2.3 Concentration Table

After the input of absorbance has been completed, the Concentration/Abs Data screen (Fig. 7.10) appears. This screen allows you to review the calibration curve by pressing the F1 key.

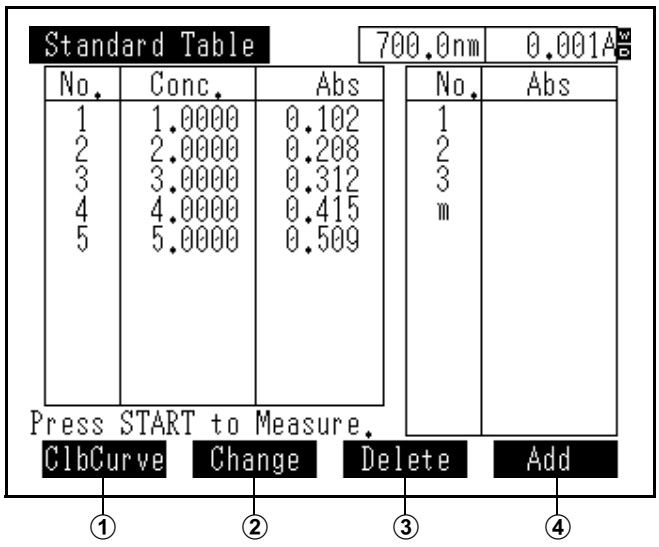


Fig. 7.10 Concentration/Abs Data screen (concentration table)

No.	Key Operation	Display	Description
①	F1	[ClbCurve]	Switches to the Calibration Curve screen. ☞ "7.2.4 Displaying a Calibration Curve"
②	F2	[Change]	Allows changing the concentration and absorbance of the specified standard sample number.
③	F3	[Delete]	Deletes the data on the specified standard sample number.
④	F4	[Add]	Allows adding each concentration and absorbance of the standard sample.
–	START/STOP	–	Switches to the Measurement screen and starts measurement of unknown sample. ☞ "7.3 Measuring Unknown Sample (Quantitation)"
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 7.1).

7.2.4 Displaying a Calibration Curve

The calibration curve can be reviewed on the Concentration Table screen (Fig. 7.10) or the Measurement Parameter Configuration screen (Fig. 7.1).

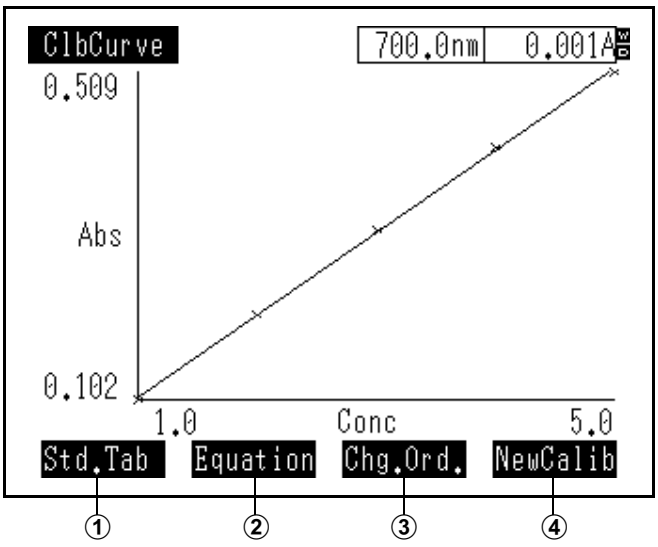


Fig. 7.11 Calibration Curve screen

No.	Key Operation	Display	Description
①	F1	[Std.Tab]	Displays the list of concentration and absorbance of each standard sample. ☞ "7.2.3 Concentration Table"

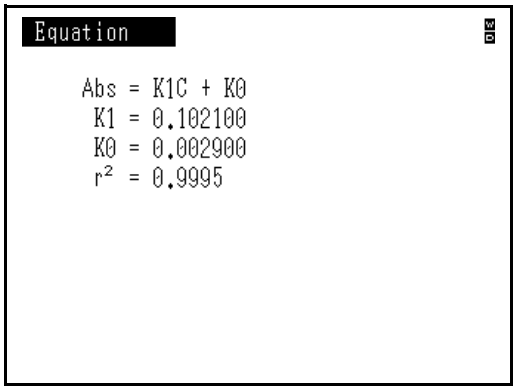
<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>②</td><td>F2</td><td>[Equation]</td><td>Displays the calibration curve equation.
 

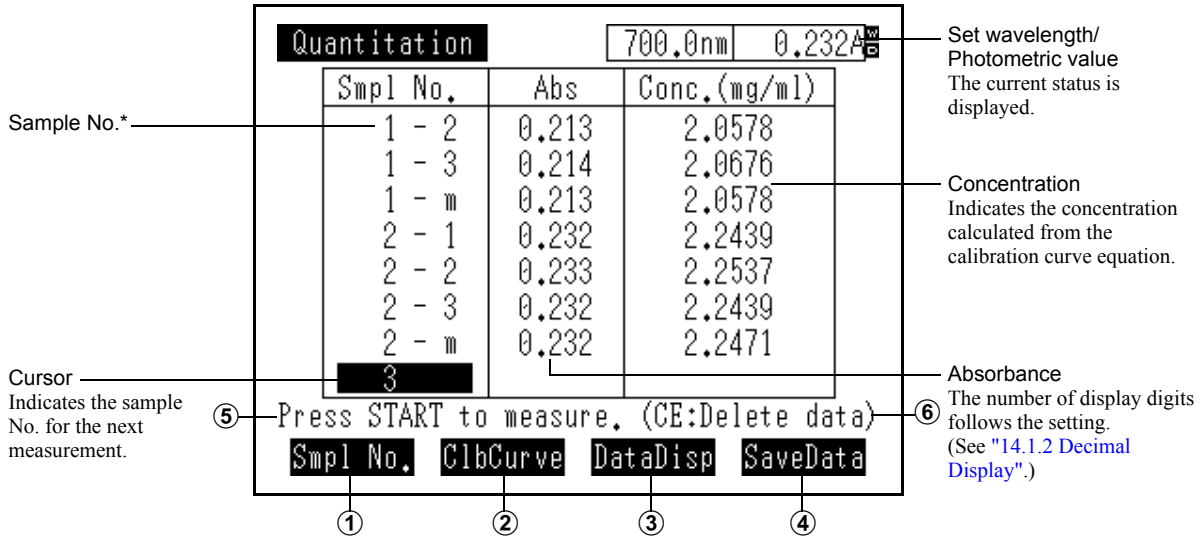
Fig. 7.12 Calibration Curve screen
The correlation coefficient r2 is obtained using the following equation (only when there is no zero intercept):
$r^2 = \frac{\{\Sigma(Ai - Am)(Ci - Cm)\}^2}{\{\Sigma(Ai - Am)^2\}\{\Sigma(Ci - Cm)^2\}}$
where
Ai: Absorbance of standard sample
Ci: Concentration of standard sample
Am: Mean value of Ai
Cm: Mean value of Ci

NOTE
For the quadratic or cubic equation, the value of $K3Ci^3 + K2Ci^2 + K1Ci + K0$ is used for the value Ai.</td></tr>
<tr><td>③</td><td>F3</td><td>[Chg.Ord.]</td><td>Allows changing the order of the calibration curve.</td></tr>
<tr><td>④</td><td>F4</td><td>[NewCalib]</td><td>Creates a calibration curve. The concentration and absorbance values of all the standard samples are deleted and then the screen for entering concentration appears.
☞ "7.2.1 Entering Concentrations"</td></tr>
<tr><td>–</td><td>START/STOP</td><td>–</td><td>Switches to the Measurement screen and starts measurement of unknown sample.
☞ "7.3 Measuring Unknown Sample (Quantitation)"</td></tr>
<tr><td>–</td><td>RETURN</td><td>–</td><td>Returns to the Measurement Parameter Configuration screen (Fig. 7.1).</td></tr>
</table>

7.3 Measuring Unknown Sample (Quantitation)

7.3.1 Measurement Screen

After the calibration curve has been created successfully, an unknown sample can be measured. Press the F3 [DataDisp] key or the START/STOP key while the Measurement Parameter Configuration screen (Fig. 7.1) is displayed. The Measurement screen will appear (Fig. 7.13). If the START/STOP key is pressed, the first measurement run will be carried out.



* The display format of sample No. varies according to the set measurement parameters.

■ When measuring a single cell or using the Multi-cell (optional) with the parameter of "Drive cell No." set to "1".
The sample numbers are assigned from 1 sequentially.

■ When measuring multiple cells by attaching the Multi-cell (optional), etc.
A hyphen (-) and cell No. are attached to the sample No.
Example) The first measurement at cell position "3" => Sample No.: 1-3

■ When measurements are repeated
A hyphen (-) and repetition count or "m" signifying a mean value are attached to the sample No.
Example) The second measurement of the first sample => Sample No.: 1-2 (1-m for the mean value)

Fig. 7.13 Measurement screen for unknown sample

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Changes the next measured sample number by entering a number in a range between 0 and 9999.
②	F2	[ClbCurve]	Displays the calibration curve. ☞ "7.2.4 Displaying a Calibration Curve"
③	F3	[DataDisp]	Displays the list of measurement data or allows printing it out again. ☞ "7.4 List Display"
④	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"

No.	Key Operation	Display	Description
⑤	START/STOP	–	Starts the measurement under the set parameters. **NOTE** A maximum of 200 measurements can be entered in a single table data file.
⑥	CE	–	Delete all the data displayed on the screen.
–	RETURN	–	Returns to the Measurement Parameters Configuration screen (Fig. 7.1).

NOTE
Repeated measurement using a multi-cell or similar holder (optional) with the multiple cells cannot be carried out.

7.3.2 Data Print for Each Measurement

If a hard copy printer is connected to the UV-1800 (and communication is established), the measurement results will be printed on the printer every time measurement has finished.
In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

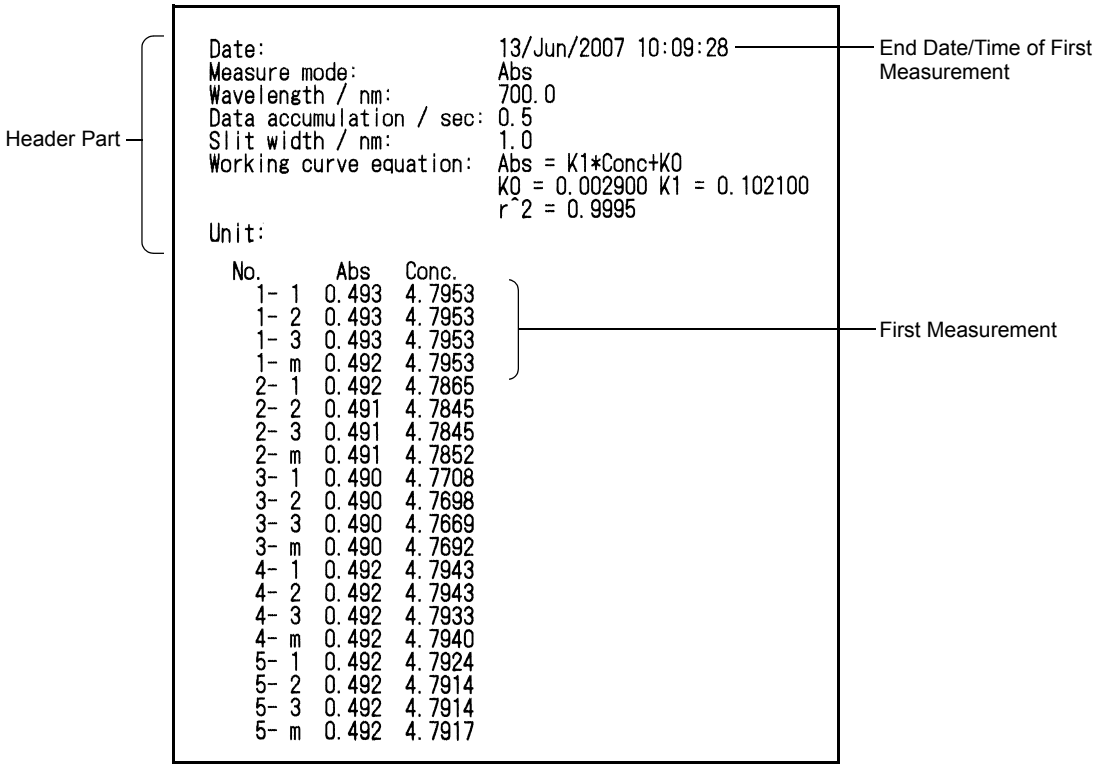
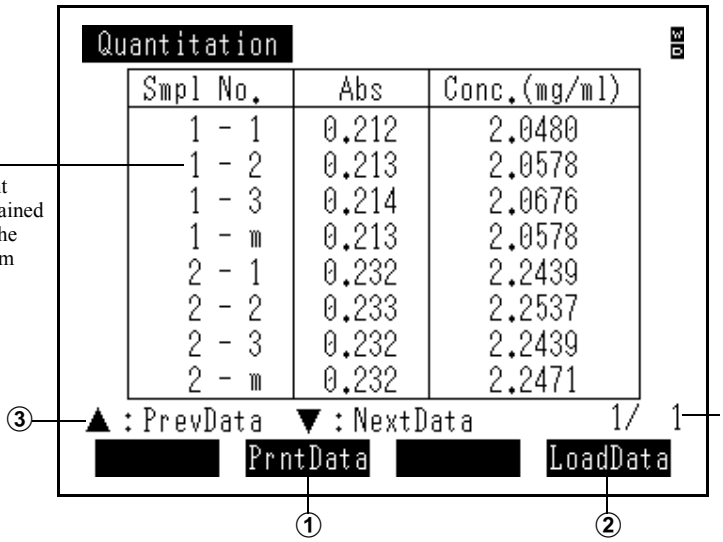


Fig. 7.14 Example of data printout for each measurement

7.4 List Display

7.4.1 List Display Screen

As the measurement is repeated, the Measurement screen will be scrolled while displaying only the latest eight measurement results. The list display function is used to display the list of the measurement data.



Data display list
Displays measurement results or all data contained in a table data file. (The data are displayed from Sample No. 1.)

Page number
Indicates "current page/ total pages" of the file list.

Fig. 7.15 List Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all data displayed in the list. ☞ "7.4.2 Data Printout"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the data table to review hidden measurement data. Each pressing of the key scrolls the table by 8 data lines.
–	RETURN	–	Returns to the Measurement screen (Fig. 7.13).

7.4.2 Data Printout

The entire data can be printed out as a numeric data table on the printer (optional). In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

NOTE
Pressing the (PRINT) key on the keypad will produce only a hard copy of the screen.

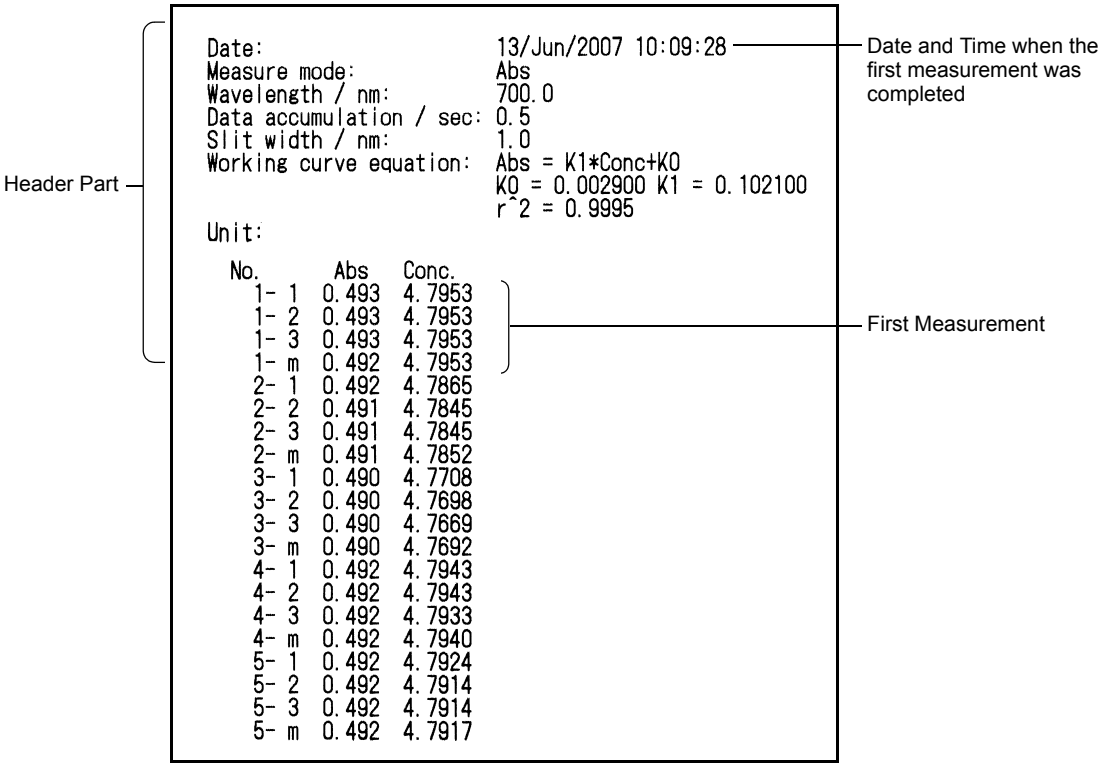


Fig. 7.16 Example of data printout for each measurement

7.5 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 to correct "floating" of the baseline due to bubbles when such conditions exist.

7.5.1 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.

Assume that the absorbance of the measured sample is A_1 and A_2 at wavelengths λ_1 and λ_2, that the absorbance of the target component B is B_1 and B_2, and that the absorbance of interfering component C is C_1 and C_2 ($A_1 = B_1 + C_1$, $A_2 = B_2 + C_2$).

When wavelengths λ_1 and λ_2 are selected so that C_1 is equal to C_2, the following equation holds:

$$A_1 - A_2 = B_1 - B_2$$

Thus, the information on the target component remains. Normally, the absorbance wavelength for the target component is set for λ_1.

An example of two-wavelength measurement is shown in Fig. 7.17.

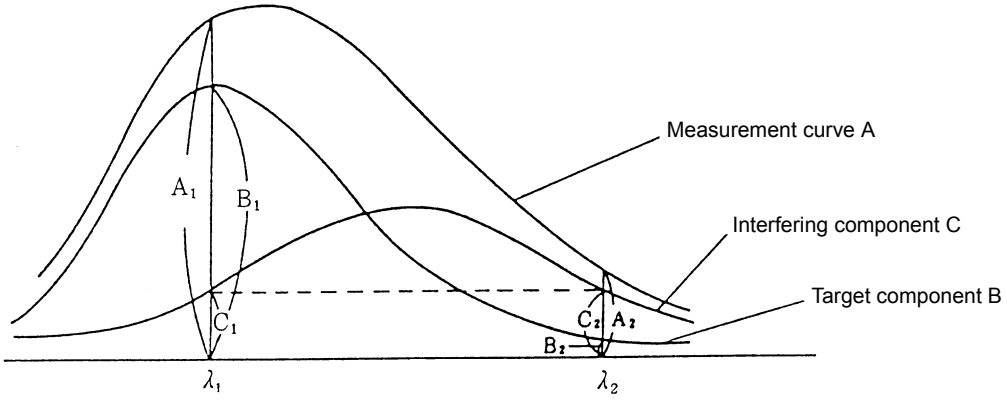


Fig. 7.17 Schematic diagram of two-wavelength quantitation

Quantitation measurement is then performed according to these parameters.

7.5.2 Three-wavelength Quantitation

Three-wavelength quantitation also eliminates the effects of interfering components, and is also useful in eliminating "floating" of sloped baselines due to dust, etc.

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

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

Where A_1, A_2, and A_3 stand for the absorbance of the sample at wavelengths λ_1, λ_2, and λ_3. (See Fig. 7.18)

The elimination of the effects of an interfering component will be explained below using Fig. 7.18.

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.

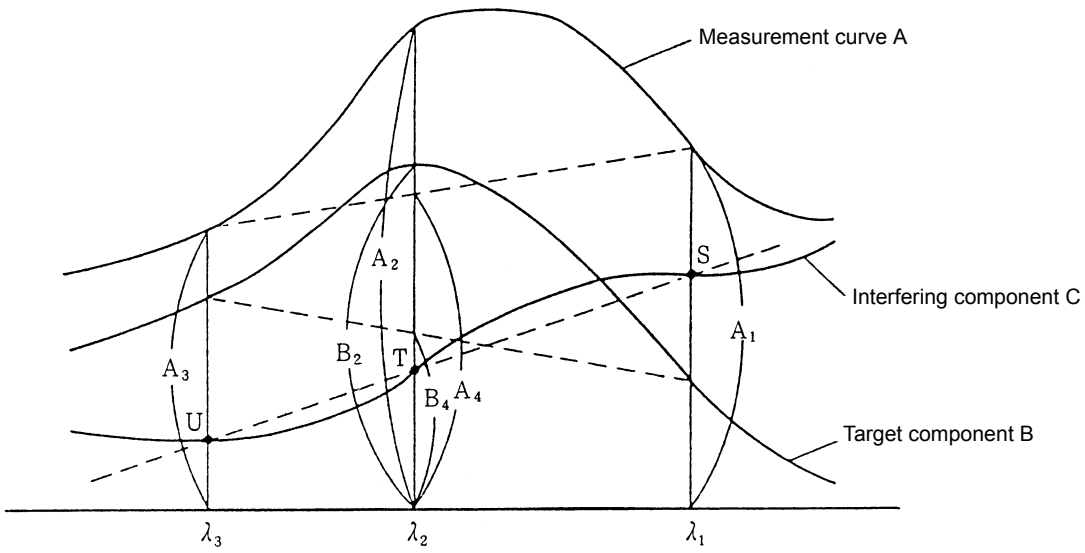


Fig. 7.18 Schematic diagram of three-wavelength quantitation

7.6 Derivative Quantitation Method

This method of quantitation uses the derivative value at a set wavelength(s). Derivative quantitation has the following advantages.

- Absorption bands can be recognized when there are two or more absorption bands overlapping at the same wavelength or at slightly different wavelengths.
- Weak absorption bands which are hidden in portions where the absorbance increases sharply relative to wavelength.
- The single greatest point of absorption can be recognized in broad absorption spectra.
- Since a straight line correlation can be drawn between the derivative value and the concentration, quantitative analysis becomes simpler in the presence of a background.

The 2nd derivative spectrum in a case where two absorption bands overlap at different wavelengths is shown in Fig. 7.19. (a) is the normal spectrum, where the absorption band B cannot be discerned in the spectrum A + B in which the absorption bands A and B are overlapped. The 2nd order derivative of this is shown in (b), where the spectrum A + B is obtained by the combination of the derivatives of absorption bands A and B. Thus, the absorption band B, which was hidden in the larger absorption band A, can clearly be discerned in the 2nd derivative.

Refer to "13.3 Derivative Operations" for details on derivative calculations.

Derivative in the quantitation mode is calculated from 17 points of data before and after the center of the set wavelength. The derivative wavelength difference $\Delta\lambda$ is constant at 0.8 nm. In addition, the order of derivative can be set from 1st through 4th.

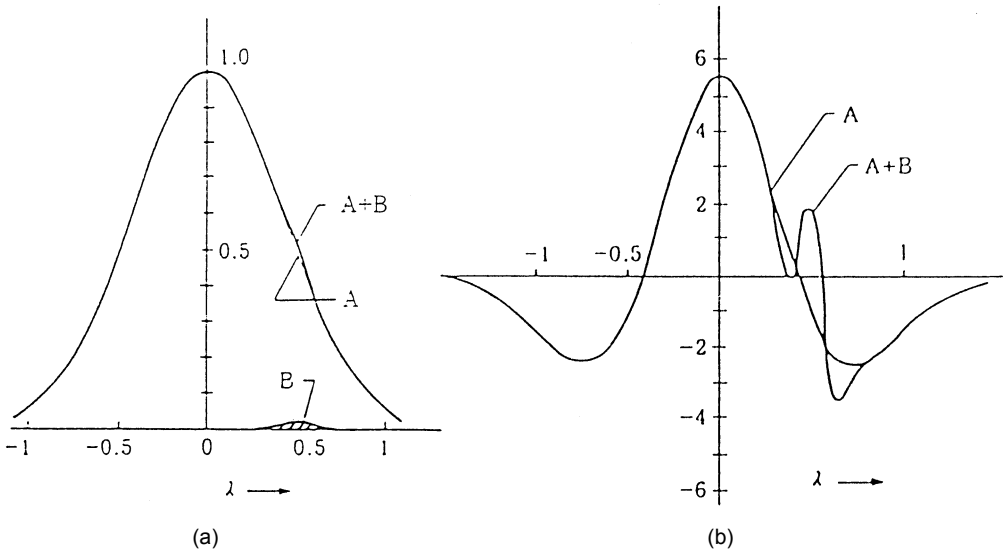


Fig. 7.19 2nd derivative spectrum with two absorption bands - Overlapping at different wavelengths -

Chapter 8 Kinetics

The Kinetics mode allows you to measure the changes in the absorbance (Abs), which occur over time from the enzyme reaction, and to obtain the activity value of the enzyme from that measurement result.

CONTENTS

8.1 Operation

When you select [4. Kinetics] (press the 4 key) in the [Mode menu] screen (Fig. 2.1), the Method Selection screen (Fig. 8.1) will be displayed.

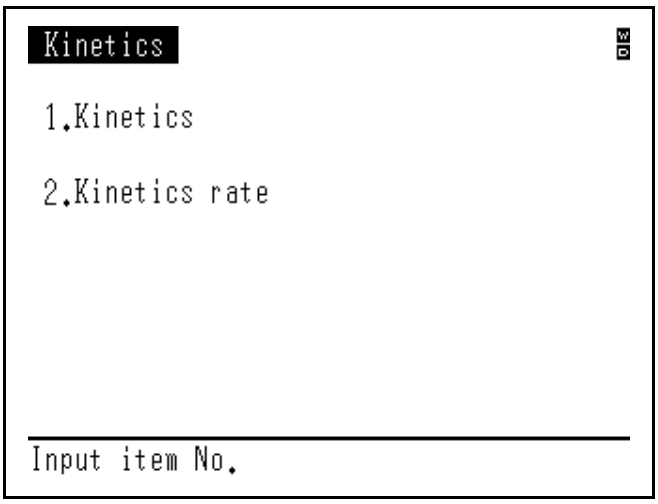


Fig. 8.1 Method Selection screen

When you select [1. Kinetics] (press the 1 key) in the Method Selection screen, the Measurement Parameter Configuration screen for kinetics measurement (Fig. 8.4) will be displayed.

In the kinetics measurement, it is possible to display the change (Reaction speed) at the rate of absorbance on the screen and to obtain the change in absorbance quantity of an interval set by the lag time and rate time by calculating its change in quantity per minute. To eliminate the effect of the background, the measurement is performed at two wavelengths (for measurement and background correction), and the reaction speed can be obtained by similarly calculating from the time course change in the difference of the two measured absorbances.
Fig. 8.2 shows the relation between the change in the rate of absorbance and the lag time and rate time. Linear regression of the sampling data between the rate time is carried out by the method of least squares to obtain the rate of change (Δ Abs/min).
Activity values are obtained by multiplying the range of change by four factor values.

(Activity value) = (Factor 1) × (Factor 2) × (Factor 3) × (Factor 4) × (Rate of change)

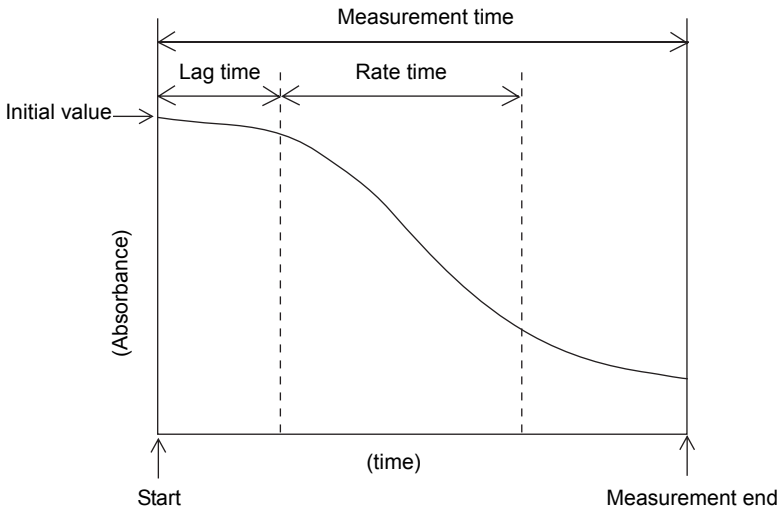
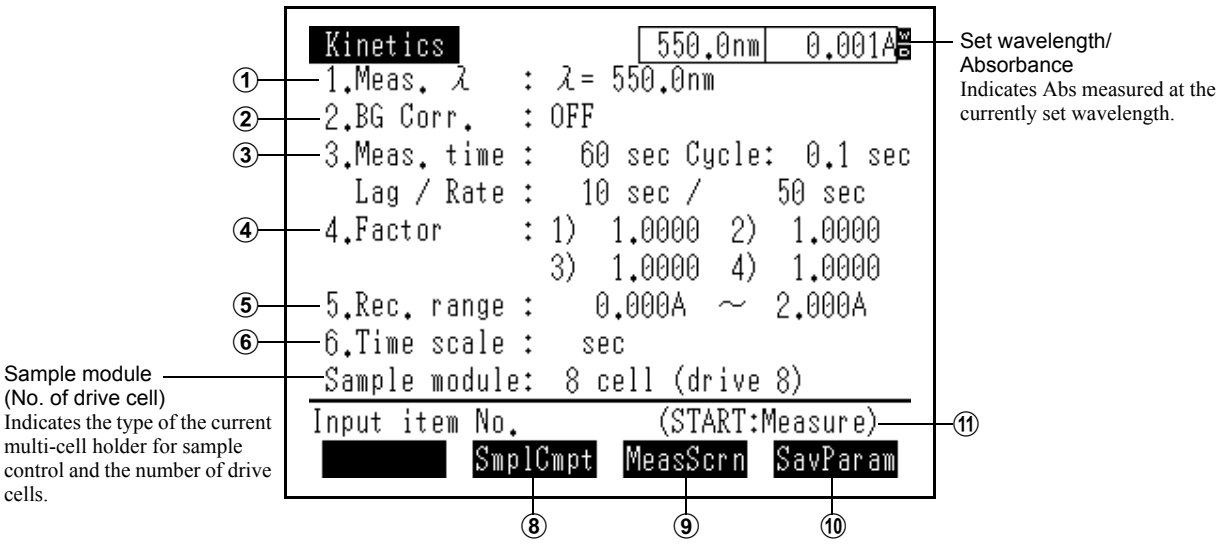


Fig. 8.2 Lag time and rate time

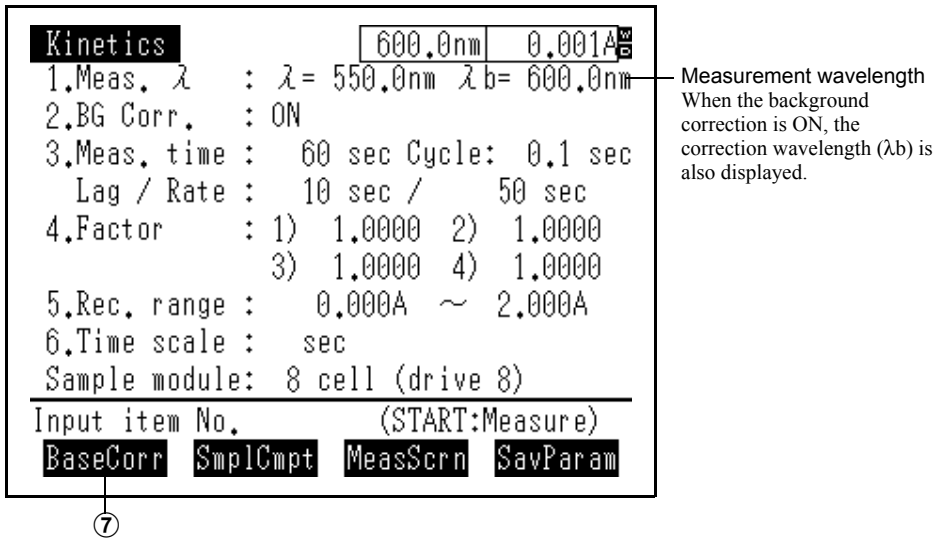
8.2 Measurement Parameter Configuration Screen

Fig. 8.3 shows the Measurement Parameter Configuration screen for Kinetics measurement.

Set the parameters by pressing the numeric keys corresponding to the item numbers on the screen.



(BG correction: OFF)



(BG correction: ON)

Fig. 8.3 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[Meas. λ]	Specifies the measurement wavelength (λ) and the wavelength for background measurement (λb: only when the background correction is ON).
②	2	[BG Corr.]	Indicates whether or not to perform the background correction. Each pressing of the key toggles the background correction ON/OFF.

No.	Key Operation	Display	Description
③	3	[Meas. time] [Cycle] [Lag/Rate]	Specifies Measurement time, Cycle, and Lag/Rate time (start and end times of activity value calculation) in order. Confirm each of the values using the ENTER key. ☞ "8.2.1 Setting Measurement Time, Cycle (Measurement Cycle), and Lag/Rate"
④	4	[Factor]	Used to input a coefficient for the equation that connects the rate of change of absorbance in terms of the activity value. It is possible to specify each of the four factors in the equation below. The input range is from -9999.9 to 9999.9. The number of significant figures is 5. (0.0001 is acceptable.) (Activity value) = (Factor 1) × (Factor 2) × (Factor 3) × (Factor 4) × (Reaction speed)
⑤	5	[Rec. range]	The recording range is used to input the upper limit/ lower limit of the Y-axis when displaying the Reaction Curve on the screen. Input range is from -4.000A to 4.000A.
⑥	6	[Time scale]	The time scale (unit) can be toggled between minutes and seconds. When the key is pressed the unit of time is changed from [min] to [sec] and vice versa.
⑦	F1	[BaseCorr]	Performs the baseline correction involving the wavelength specified in [1. Meas. λ]. (Displayed only when BG correction is ON.)
⑧	F2	[SmplCmpt]	Sets the sample module. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
⑨	F3	[MeasScrn]	Measurement results are displayed in tabular format.
⑩	F4	[SavParam]	Saves the current measurement parameters. ☞ "3.1 Save Files"
⑪	START/STOP	–	Switches to the Reaction Curve Display screen and starts the measurement.
–	RETURN	–	Returns to the Kinetics Method Selection screen (Fig. 8.1).

8.2.1 Setting Measurement Time, Cycle (Measurement Cycle), and Lag/Rate

When [3] (Meas. Time, Cycle, and Lag/Rate) is selected in the Measurement Parameter Configuration screen, the following values should be entered:

■ Measurement time

To set the measurement time, enter the total time to obtain actual absorbance data values. The input range is from 1 to 9999 seconds (minutes).

However, when the background correction is ON or when performing a multi cell measurement with multi-cell holder, the lower limit of the range is determined by the difference of set wavelengths or the number of drive cells.

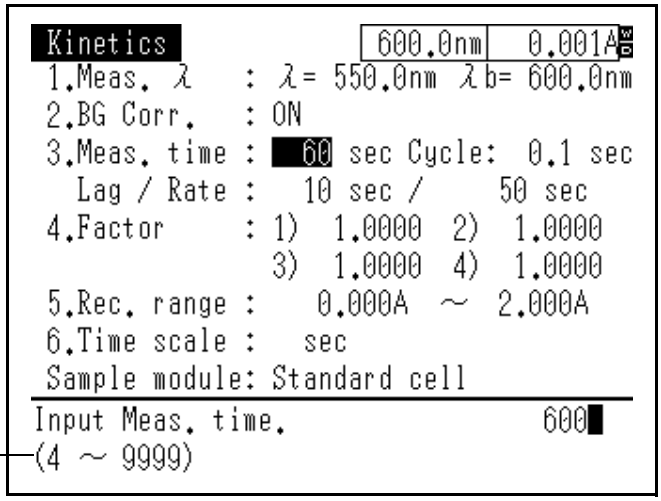


Fig. 8.4 Measurement Parameter Configuration screen

■ Cycle (measurement cycle)

Specify the interval (measurement cycle) to acquire measurement data.

Move the cursor on the selection screen with the ▲ ▼ keys, and confirm the selection with the ENTER key.

Up to 2001 data points can be obtained in this measurement method. You cannot select measurement cycle values that create data points exceeding the limit.

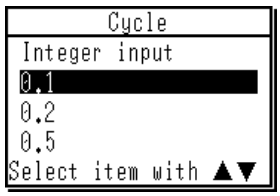


Fig. 8.5 [Cycle] screen

The unit of the measurement cycle follows the setting specified in the [6. Time scale] in the Measurement Parameter Configuration screen.

If [Integer] is selected, the cycle input range is as given in the following:

When "Measurement time" < 2001 sec. (min.): Integers from 1 to 1000

When "Measurement time" ≧ 2001 sec. (min.): Integers from (Measurement time/2000) to 1000

As in the setting of measurement time, however, when the background correction is ON or when performing a multi cell measurement with multi-cell holder, the lower limit of the range is determined by the difference of set wavelengths or the number of drive cells.

■ Lag/Rate

For Lag (lag time), define the time period which is not counted for activity value calculation. Specify the time from the measurement start.

For Rate (rate time), define the time period which is counted for activity value calculation. Specify the time from the lag time end (See Fig. 8.2).

The input range for the lag time is from [0 to (Measurement time - Cycle)] (in units of 1). The range for the rate time is from [Cycle to (Measurement time - Lag time)] (in units of 1).

8.3 Measurement

When the kinetics measurement is started, the reaction curve starts being plotted on the screen in real time (Fig. 8.6).

After the measurement, measurement results are displayed in the data table (☞ "8.5 Data List") the screen will be changed to one showing the reaction curve (Fig. 8.7).

The dotted line as shown in Fig. 8.6 indicates the calculation interval of the activity value (the end of lag time and the end of rate time).

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed on the printer for every measurement.

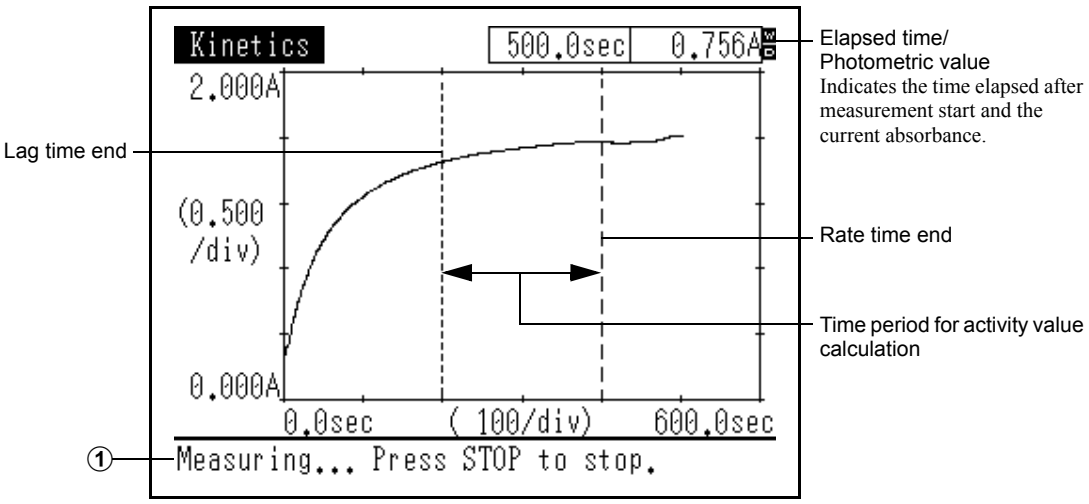


Fig. 8.6 Kinetics Measurement screen

No.	Key Operation	Description
①	START/STOP	Terminates measurement and displays the Data List Display screen (Fig. 8.13). After the measurement results has been registered and displayed, the Reaction Curve Display screen (Fig. 8.7) is displayed. In the case of multi-cell measurement, the measurement will be terminated after the last cell measurement has completed. All data measured before the termination can be considered to be valid.

8.4 Displaying a Reaction Curve

8.4.1 Curve Display Screen

When you complete/terminate measurement, or press the F2 (Curve) key in the Data List screen (Fig. 8.13), the Curve Display screen appears (Fig. 8.7).

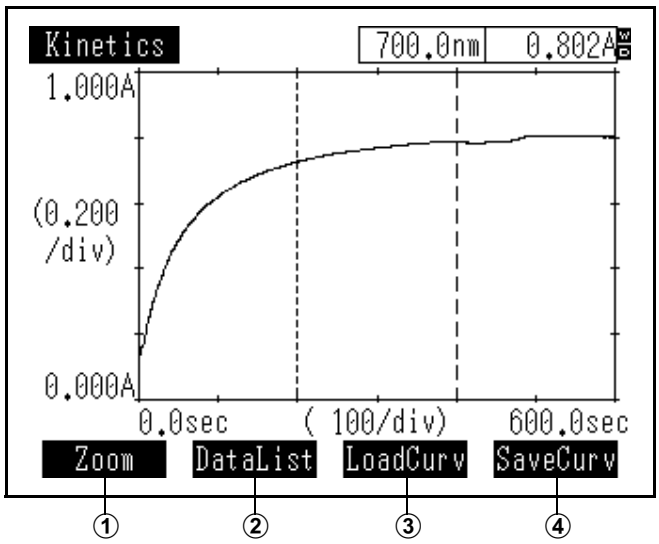


Fig. 8.7 Curve Display screen

NOTE

The acquired curve data is not yet saved when the measurement has completed. The curve data will be lost, if (1) the next sample measurement is started, (2) another curve data file is loaded, or (3) the measurement and calculation parameters are changed. To save the acquired curve data, press the F4 key.

No.	Key Operation	Display	Description
①	F1	[Zoom]	Changing the range of Y-axis and X-axis of displayed reaction curve enables zooming of the reaction curve. ☞ "8.4.3 Zoom Screen"
②	F2	[DataList]	Pressing this function key changes the screen to one showing the data table. Measurement results (sample number, initial value (Abs), Δa/min, activity value) will be displayed in tabular format. ☞ "8.5 Data List"

No.	Key Operation	Display	Description
③	F3	[LoadCurv]	Loads a curve data file that is stored in the memory storage. However, you can load only curve data obtained under the same parameters (measurement wavelengths, BG correction, and measurement time) as those currently set. ☞ "3.2 Load Files" The activity value is calculated by the calculation parameters set on the Parameters Setting screen with respect to the recalled waveform data, and the results will be displayed.
④	F4	[SaveCurv]	Saves the acquired reaction curve data to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
–	START/STOP	–	Starts the measurement under the set parameters.
–	PRINT	–	Prints a hard copy of the screen or the time course data. ☞ "8.4.4 Print Mode" ☞ "8.6.1 Waveform Format"
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 8.4).
–	◄(-) ►	–	Displays the reading cursor on the graph to read the data values at any arbitrary sampling point. ☞ "8.4.2 Reading with Cursor"

8.4.2 Reading with Cursor

If the ◄(-) or ► key is pressed in the Curve Display screen (Fig. 8.7), the reading cursor appears. Using this reading cursor, you can read the data values at any arbitrary sampling point.

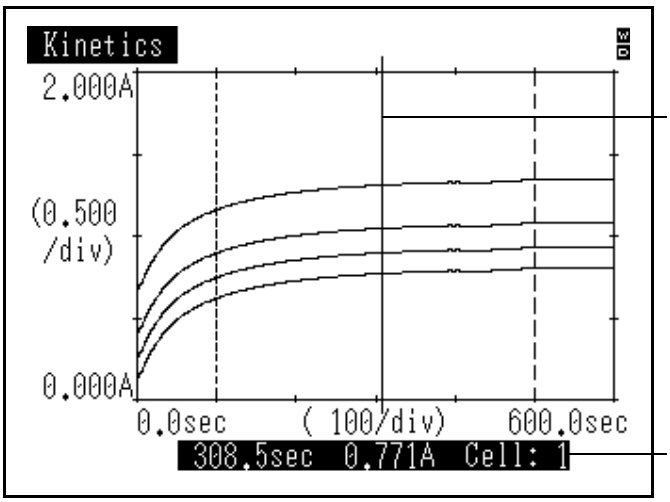


Fig. 8.8 Reading with Cursor screen

Key Operation	Description
◄(-) ►	Moves the cursor on the reaction curve graph and displays the time and Abs at the cursor position. Holding down the ◄(-) ► key will move the cursor faster.
▲ ▼	Selects a reaction curve to be read with the cursor. When performing a multi cell measurement with multi-cell holder, multiple reaction curves will be displayed on the graph. Therefore, to review a particular reaction curve, you need to switch the cell No. and select the target curve by pressing the ▲ ▼ keys.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than the above	The reading cursor disappears, and the UV-1800 returns to the Reaction Curve Display screen (Fig. 8.8).

8.4.3 Zoom Screen

When you press the F1 [zoom] key in the Curve Display screen (Fig. 8.7), the Zoom screen (Fig. 8.9) will be displayed. The displayed reaction curve can be enlarged or reduced by changing the vertical or horizontal axis of the graph (only enlarged by changing the horizontal axis).

NOTE

If the curve data is over-written on the screen using the curve call function, the enlargement or reduction is applied to the last loaded data.

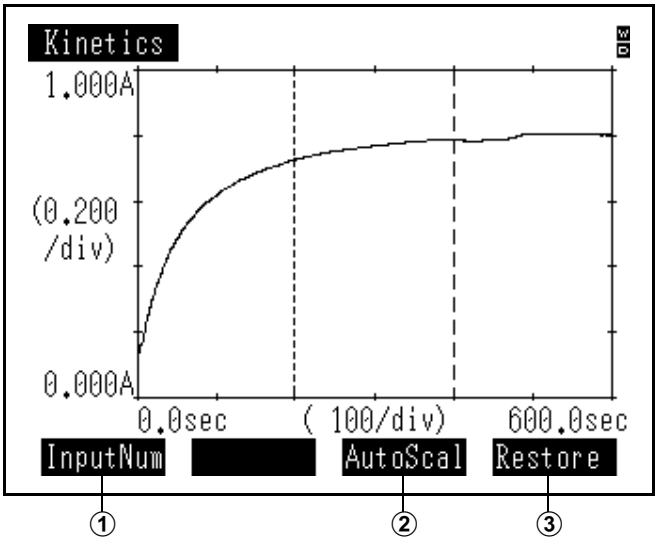
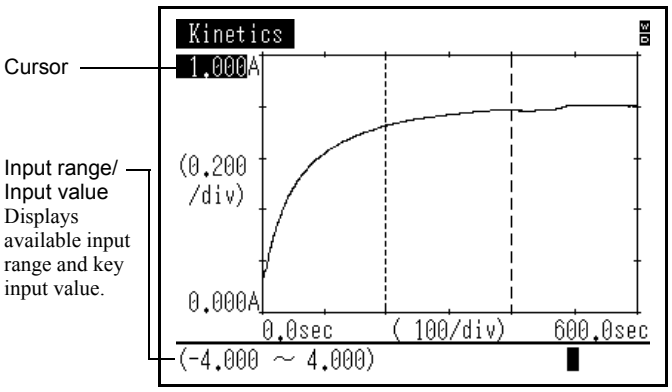


Fig. 8.9 Zoom screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis range. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing of the ENTER key moves the cursor to [vertical axis upper limit] → [vertical axis lower limit] → [horizontal axis lower limit] → [horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 8.9).  Fig. 8.10 Zoom Screen (during setting) **NOTE** Data exist only at each measurement cycle. Therefore, when values other than the integral multiple of the cycle are entered as horizontal axis values, the entered values are automatically replaced with the time values nearest to the existing data values.
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed reaction curve automatically.
③	F4	[Restore]	Restores the display range to the original state.
④	PRINT	–	Prints the curve data with the zoom operation applied. ☞ "8.6 Print (Output) Format"
⑤	◄(-) ►	–	Displays the cursor on the reaction curve graph to activate the cursor reading function. ☞ "8.4.2 Reading with Cursor"
⑥	RETURN	–	Returns to the Reaction Curve Display screen (Fig. 8.7).

8.4.4 Print Mode

When you press the PRINT key in the Curve Display screen (Fig. 8.7), the screen appears for selecting a print mode from "Print waveform ([Draw curve])" and "Hard copy of screen ([Screen copy])".

Move the cursor to the desired print mode with the ▲ ▼ keys, and confirm the selection with the ENTER key.

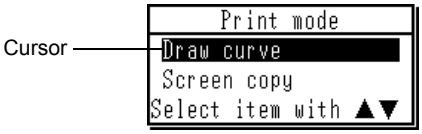


Fig. 8.11 [Print mode] screen

■ Print waveform ([Draw curve])

Waveforms and measurement parameters of a curve data are printed. ☞ "8.6.1 Waveform Format"

For a commercially available printer, the screen for selecting a grid type for graph output is displayed.

Move the cursor to the desired grid type with the ▲ ▼ keys, and confirm the selection with the ENTER key.

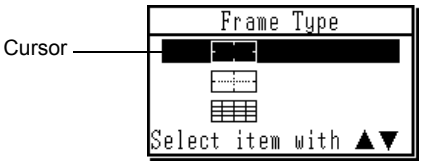


Fig. 8.12 [Frame Type] Selection screen

When the grid type is confirmed, the measured or loaded reaction curve and the parameters are printed out.

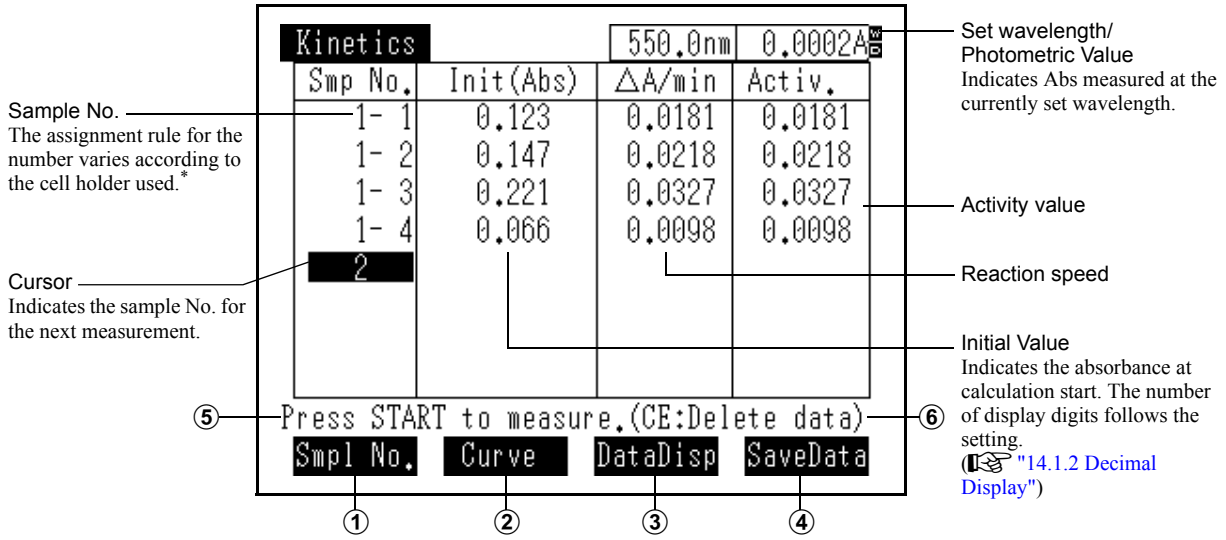
■ Hard copy of screen ([Screen copy])

The current screen image when the PRINT key is pressed will be printed in the same size.

8.5 Data List

8.5.1 Data List Screen

As shown in Fig. 8.13, measurement results (Smpl No., Abs (init.), Δ A/min, Activ) will be displayed in the tabular format. Measurement results for each measurement will be added below. The maximum number of data of measurement results is 200. To display or print out these measurement results, press the F3 [DataDisp] key to bring up the screen of data display for further processing.



* When using a single cell or when No. of drive cells is 1, the sample numbers are assigned in sequence, starting from 1.
When using multiple cells by attaching a multi-cell or micro multi-cell, a dash (-) and the cell number are attached to the sample number.
Single cells: [Sample No.]
Multiple cells: [Sample No.] - [Cell No.]

Fig. 8.13 Data List Display screen

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Used to change the sample number for the next measurement. The sample number can be selected from 0 to 9999.
②	F2	[Curve]	Switches to the Reaction Curve Display screen. ☞ "8.4.1 Curve Display Screen"
③	F3	[DataDisp]	Displays and prints all measured data, or loads a table data file stored in the memory storage. ☞ "8.5.2 List Display"
④	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"
⑤	START/STOP	–	Starts the measurement under the set parameters. **NOTE** A maximum of 200 measurements can be entered in a single table data file.
⑥	CE	–	Deletes all the data displayed on the screen.
⑦	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 8.3).

8.5.2 List Display

In the screen of the data list, the results of only the 8 immediately previous measurements will be displayed. In this case, it is possible to display all of the measurement results. It is also possible to output a batch of all measurement results on a printer.

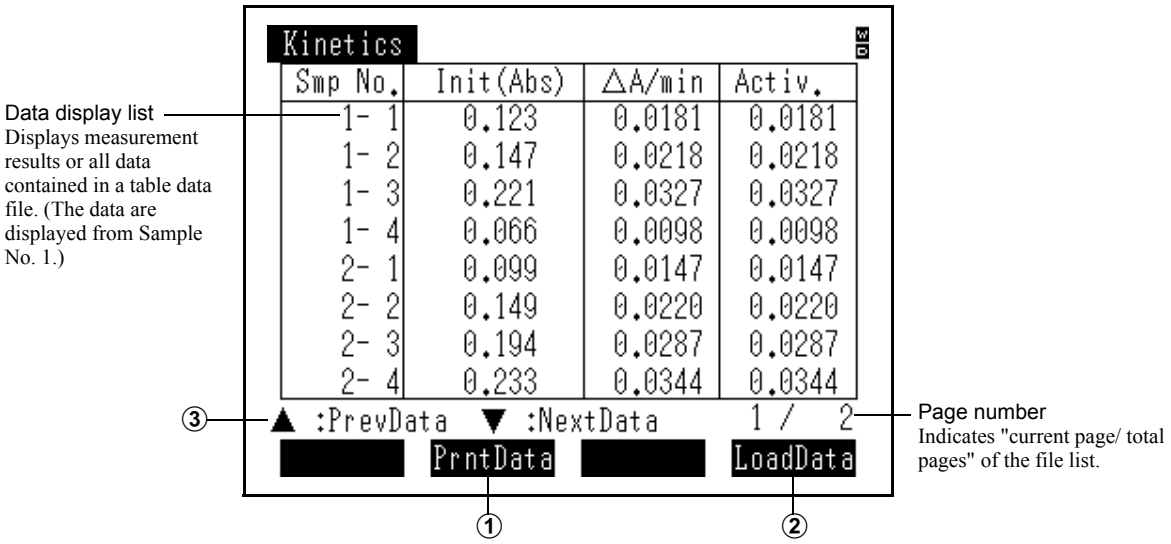


Fig. 8.14 List Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all listed data or reaction curve data that is displayed on the screen. ☞ "8.5.3 Data Print Format"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.1 Save Files"
③	▲ ▼	–	Allows scrolling the data table to review the hidden measurement data. Each pressing the key scrolls the table in units by 8 data lines.
–	RETURN	–	Returns to the List Display screen (Fig. 8.13).

8.5.3 Data Print Format

When you press the F2 [PrntData] key in the List Display screen, the screen for selecting a print format appears. Move the cursor to the desired format with the ▲ ▼ keys, and confirm the selection with the ENTER key.

The print process will be started when the print format is confirmed.

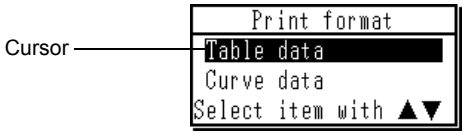


Fig. 8.15 [Print format] Selection screen

Print Format	Description
[Table data]	Prints all numeric data shown on the data table and the measurement parameters. ☞ "8.6.2 Table Data Format"
[Curve data]	Prints time and absorbance at each cycle on reaction curve, and also the measurement parameters. ☞ "8.6.3 Curve Data Format"

8.6.1 Waveform Format

When you press the PRINT key in the Curve Display screen (Fig. 8.7), the screen appears for selecting a print mode (Fig. 8.11).

If you select [Draw curve] as a print mode, waveforms and measurement parameters of a curve data are printed.

In the header part, the date and time of the end of the curve data measurement as well as measurement parameters are printed.

The print format for "Print waveform" varies according to the connected printer for output.

The following shows examples of printouts using different types of printers.

■ Output to a hard-copy printer

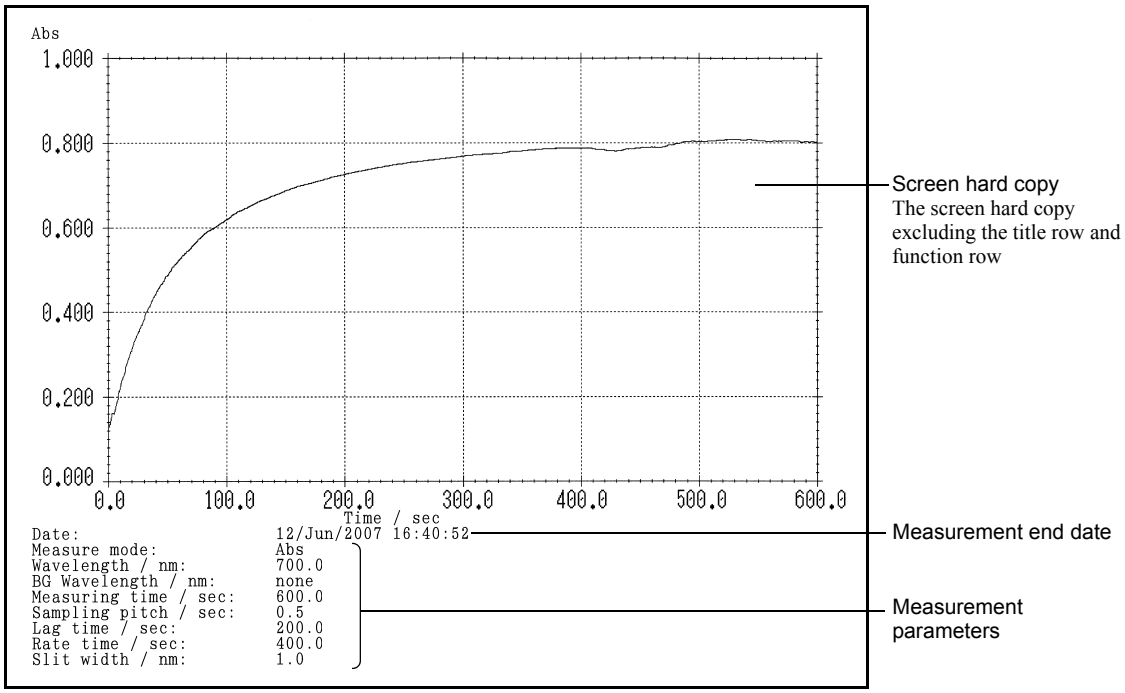


Fig. 8.16 Example of waveform printout (with hard copy printer)

■ Output to a commercially available printer

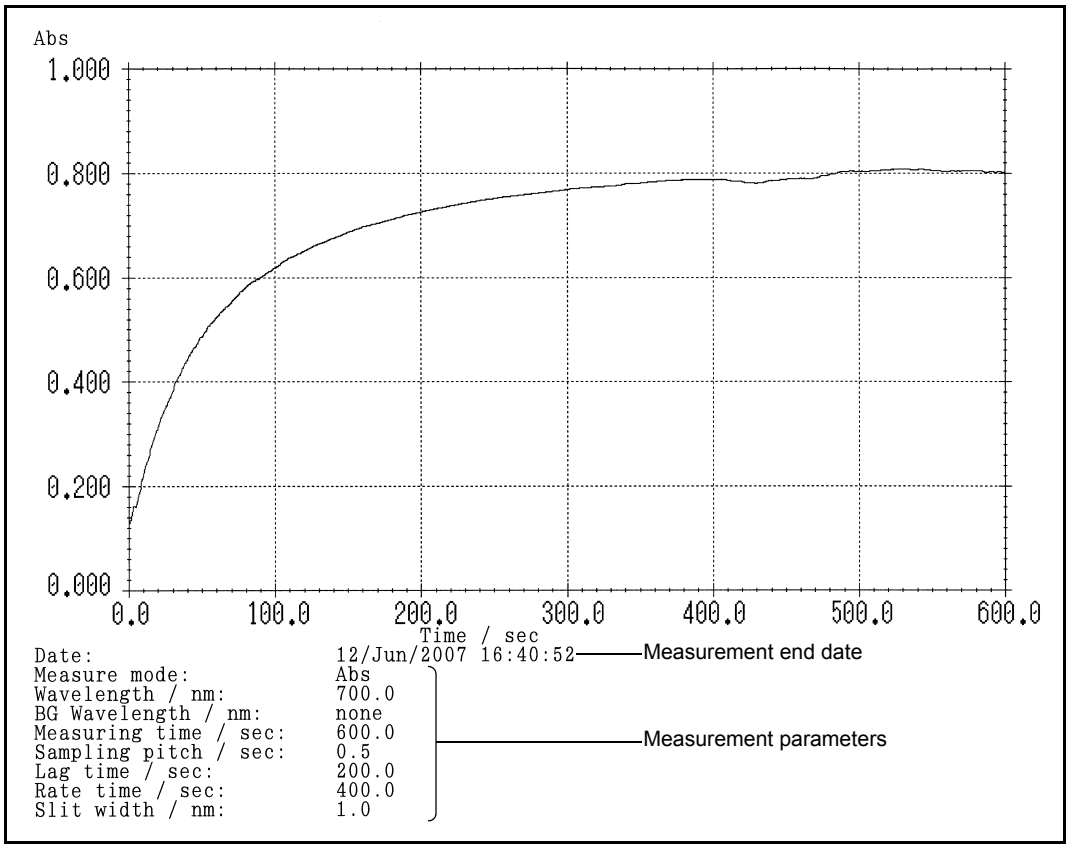


Fig. 8.17 Example of waveform printout (with commercially available printer)

8.6.2 Table Data Format

In kinetics measurement, the result can be printed after each measurement, or the entire result can be printed at once. Both print modes use the same print format.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

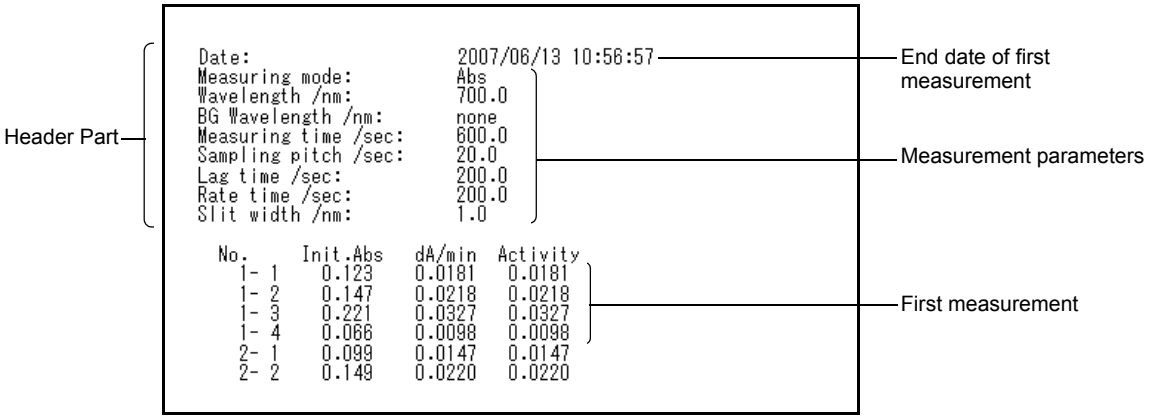


Fig. 8.18 Example of table data printout

■ Printout for each measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed out on the printer for each measurement (rate interval).

■ Print all at once

When you press the F2 [PrntData] key in the List Display screen (Fig. 8.14), the screen for selecting a print format appears. If [Table data] is selected, all measurement results up to that point, or all the data within the currently-loaded table data file will be printed.

8.6.3 Curve Data Format

When you press the F2 [PrntData] key in the List Display screen (Fig. 8.15), the screen for selecting a print format appears. If [Curve data] is selected, the curve data (time and absorbance at each measurement cycle) within the latest measured or loaded reaction curve will be printed.
In the header part, the date and time of the end of the curve data measurement as well as measurement parameters are printed.

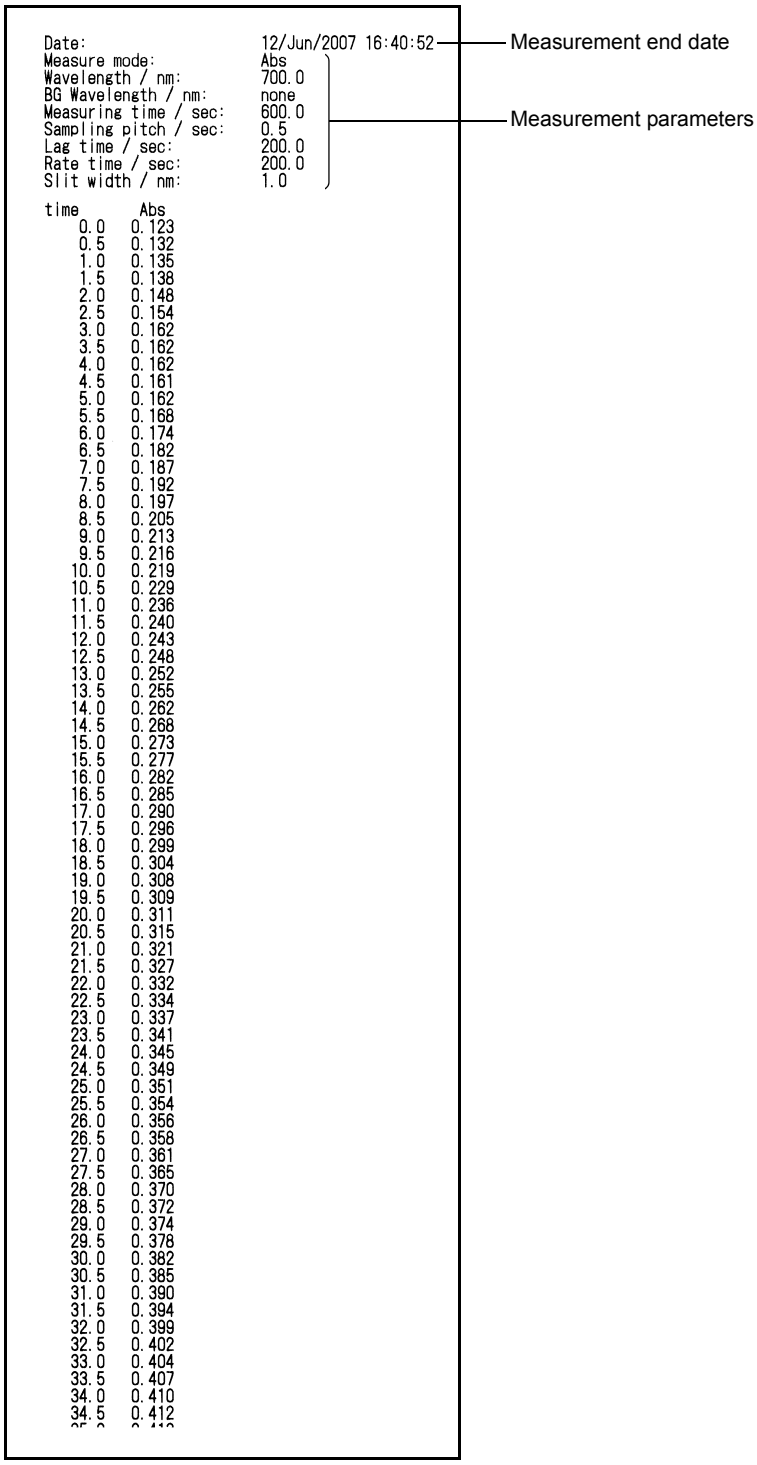


Fig. 8.19 Example of curve data printout

Chapter 9 Kinetics Rate

CONTENTS

9.1 Operation

When you select [4. Kinetics] (press the 4 key) in the [Mode menu] screen (Fig. 2.1), the Method Selection screen (Fig. 9.1) will be displayed.

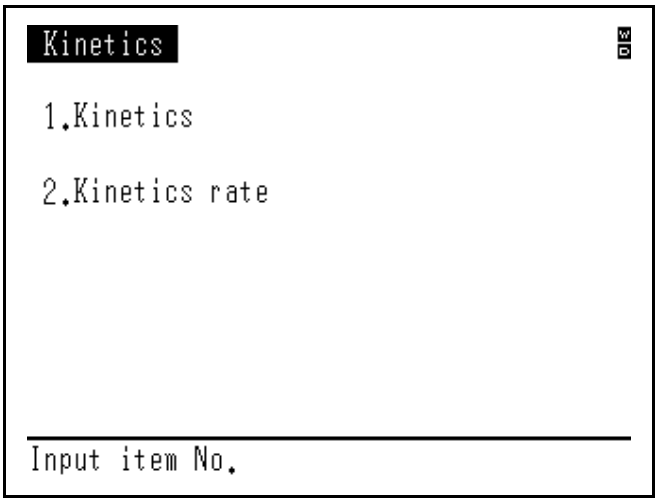


Fig. 9.1 Method Selection screen

When you select [2. Rate] (press the 2 key) in the Method Selection screen, the Measurement Parameter Configuration screen for rate measurement (Fig. 9.2) will be displayed.

The kinetics rate measurement mode is used to measure the change in the rate of absorbance for one wavelength and obtain the change in quantity of absorbance per rate interval.
A discriminant is used to determine whether the absorbance is being changed linearly and to display the linearity (L) or the non-linearity (N). The discriminant is as follows. Linearity (L) is determined by whether the ratio of the rate of change of absorbance during one cycle and the rate of change of one cycle before are within the proportion (%) set in the criteria.

(Discriminant)
|{(change in quantity of absorbance at the last rate interval)-(change in quantity of absorbance at the rate interval)}/ (change in quantity of absorbance at the last rate interval)| × 100<(criteria)

9.2 Measurement Parameter Configuration Screen

Fig. 9.2 shows the Measurement Parameter Configuration screen.

Set the parameters by pressing the numeric keys corresponding to the item numbers on the screen.

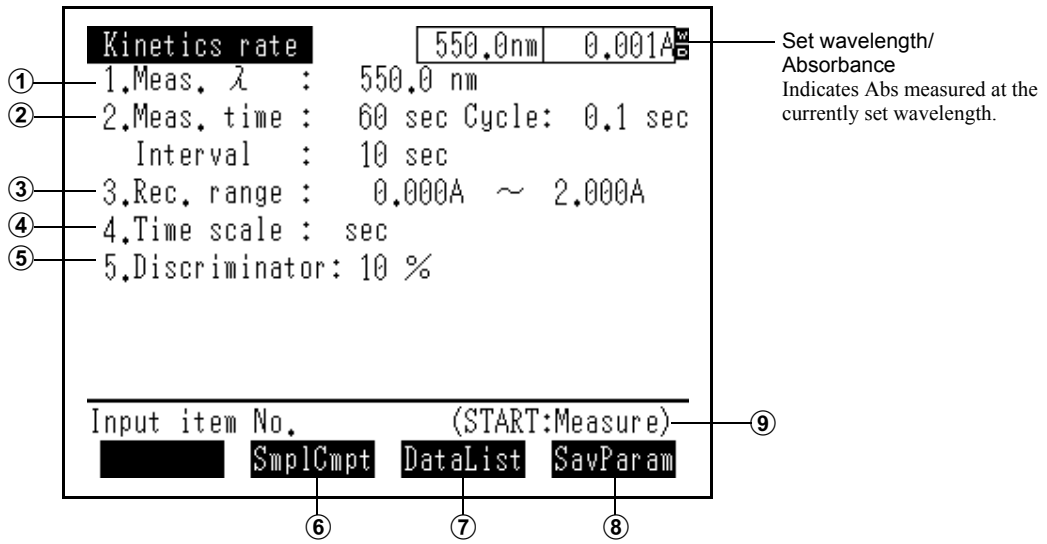


Fig. 9.2 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[Meas. λ]	Specifies the measurement wavelength. The input range is from 190.0 nm to 1100.0 nm.
②	2	[Meas. time] [Cycle] [Interval]	Specifies Measurement time, Cycle, and Rate interval in order. Confirm each of the values with the ENTER key. ☞ "9.2.1 Setting Measurement Time, Cycle, and Interval"
③	3	[Rec. range]	The recording range is used to input the upper limit/lower limit of the Y-axis when displaying the Reaction Curve on the screen. Input range is from -4.000 A to 4.000 A.
④	4	[Time scale]	The time scale (unit) can be toggled between minutes and seconds. When the key is pressed the unit of time is changed from [min] to [sec] and vice versa.

No.	Key Operation	Display	Description
⑤	5	[Discriminator]	A discriminant is used to determine whether the absorbance is being changed linearly and to display the linearity (L) or the non-linearity (N). ■Discriminant |{(change in quantity of absorbance at the last rate interval)-(change in quantity of absorbance at the rate interval)} / (change in quantity of absorbance at the last rate interval)|×100 <(Criteria) ☞ "9.1 Operation"
⑥	F2	[SmplCmpt]	Sets the sample module. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)" **NOTE** Multi-cell measurement with a multi-cell holder is not available in the Rate measurement.
⑦	F3	[DataList]	Measurement results are displayed in tabular format.
⑧	F4	[SavParam]	Saves the current measurement parameters. ☞ "3.1 Save Files"
⑨	START/STOP	–	Switches to the Data List Display screen and starts the measurement.
–	RETURN	–	Returns to the Kinetics Method selection screen (Fig. 9.1).

9.2.1 Setting Measurement Time, Cycle, and Interval

■ Measurement time

To set the measurement time, enter the total time to obtain actual absorbance data values. The input range is from 1 to 9999 seconds (minutes).

■ Cycle (measurement cycle)

Specify the interval (measurement cycle) to acquire measurement data.

Move the cursor on the selection screen with the ▲ ▼ keys, and confirm the selection with the ENTER key.

Up to 2001 data points can be obtained in this measurement method. You cannot select measurement cycle values that create data points exceeding the limit.

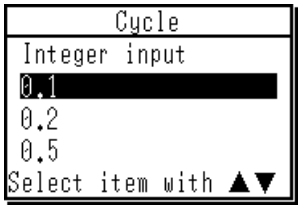


Fig. 9.3 [Cycle] screen

The unit of the measurement cycle follows the setting specified in [4. Time scale] on the Measurement Parameter Configuration screen.

If [Integer input] is selected, the cycle input range is as given in the following:

When "Measurement time" < 2001 sec. (min.):Integers from 1 to 1000
When "Measurement time" ≧ 2001 sec. (min.):Integers from (Measurement time/2000) to 1000

■ Interval (rate interval)

In the rate measurement, the reaction speed (Abs/min) at each of the specified rate interval is obtained.

Move the cursor on the selection screen with the ▲ ▼ keys, and confirm the selection with the ENTER key.

Up to 401 measurement points can be obtained in the rate measurement. You cannot select rate interval values that create measurement points exceeding the limit.

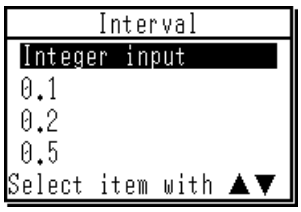


Fig. 9.4 [Interval] screen

If [Integer input] is selected, the input range is from [1 to (Measurement time)] (integral multiple of measurement cycle).

The rate interval unit follows the setting specified in [4. Time scale] on the Measurement Parameter Configuration screen. If an [Integer input] is selected, the input range is integers from "(Measurement time/400) to Measurement time" (integral multiples of measurement cycle).

9.3 Measurement

The screen displayed during measurement varies according to the screen from which the measurement is started. If a hard copy printer is connected to the UV-1800, the measurement result will be printed for each rate interval, regardless of the displayed screen. (See "9.6.2 Table Data Format".)

9.3.1 Data Display during Measurement

When measurement is initiated from the Measurement Parameter Configuration screen (Fig. 9.2) or the Data List screen (Fig. 9.13) by pressing the START/STOP key, the measurement result starts being displayed in the Data List for each rate interval. For details on the displayed item results, refer to "9.5 Data List".

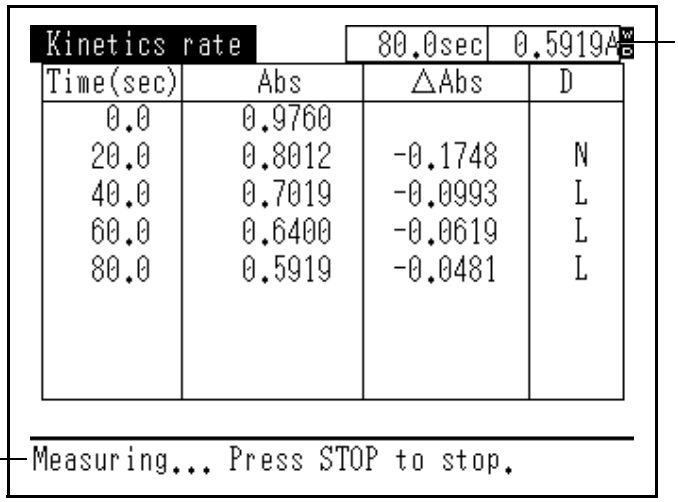


Fig. 9.5 Screen during measurement (data display)

No.	Key Operation	Display	Description
①	START/STOP	–	Terminates the measurement and moves to the Data List Display screen (Fig. 9.14).

9.3.2 Curve Display Screen during Measurement

When the measurement is started from the Reaction Curve Display screen (Fig. 9.5) by pressing the START/STOP key, the reaction curve starts being plotted on the screen in real time.

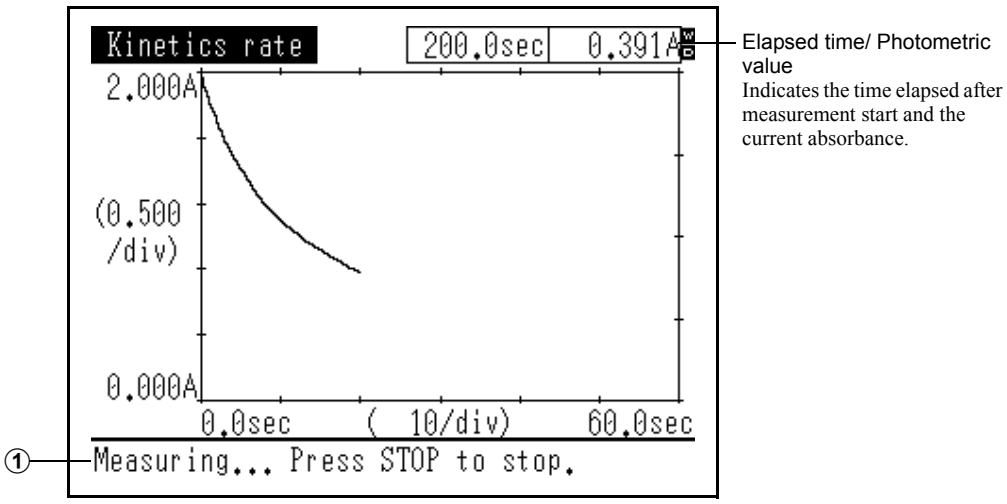


Fig. 9.6 Screen during measurement (curve display)

No.	Key Operation	Display	Description
①	START/STOP	–	Terminates the measurement and displays the Data List Display screen (Fig. 9.13). After the measurement results have been registered and displayed, the UV-1800 switches to the Reaction Curve Display screen (Fig. 9.7).

9.4 Displaying a Reaction Curve

9.4.1 Curve Display Screen

When you complete/terminate measurement, or press the F2 [Curve] key in the Data List screen (Fig. 9.13), the Curve Display screen appears (Fig. 9.7).

In this screen, you can display, save, or print the reaction curve within measured or loaded spectrum data.

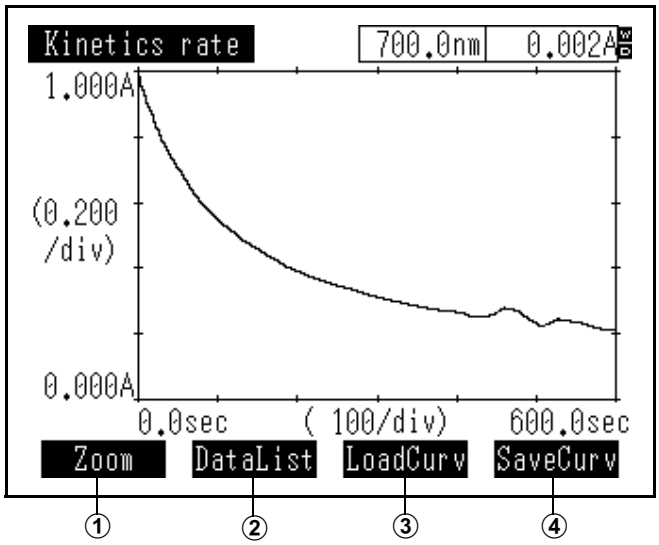


Fig. 9.7 Reaction Curve Display screen

NOTE

The acquired curve data is not yet saved when the measurement has completed. The curve data will be lost, if (1) the next sample measurement is started, (2) another curve data file is loaded, or (3) the screen is switched (to the Parameter Configuration screen). To save the acquired curve data, press the F4 key.

No.	Key Operation	Display	Description
①	F1	[Zoom]	Changing the range of Y-axis and X-axis of displayed reaction curve enables zooming of the reaction curve. ☞ "9.4.3 Zoom Screen"
②	F2	[DataList]	Switches to the data table screen. Measurement results (Time (sec), Abs, ΔAbs, Discriminant result) will be displayed in tabular format. ☞ "9.5 Data List"
③	F3	[LoadCurv]	Loads a curve data file that is stored in the memory storage. ☞ "3.2 Load Files"

No.	Key Operation	Display	Description
④	F4	[SaveCurv]	Saves the acquired reaction curve data to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
–	PRINT	–	Prints a hard copy of the screen or the reaction curve data. ☞ "9.4.4 Print Mode" ☞ "9.6 Print (Output) Format"
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 9.2).
–	◄ ►	–	Displays the reading cursor on the graph to read the data values at any arbitrary sampling point. ☞ "9.4.2 Reading with Cursor"

9.4.2 Reading with Cursor

If the ◄(-) or ► key is pressed in the Curve Display screen, the reading cursor appears. Using this reading cursor, you can read the data values at any arbitrary sampling point.

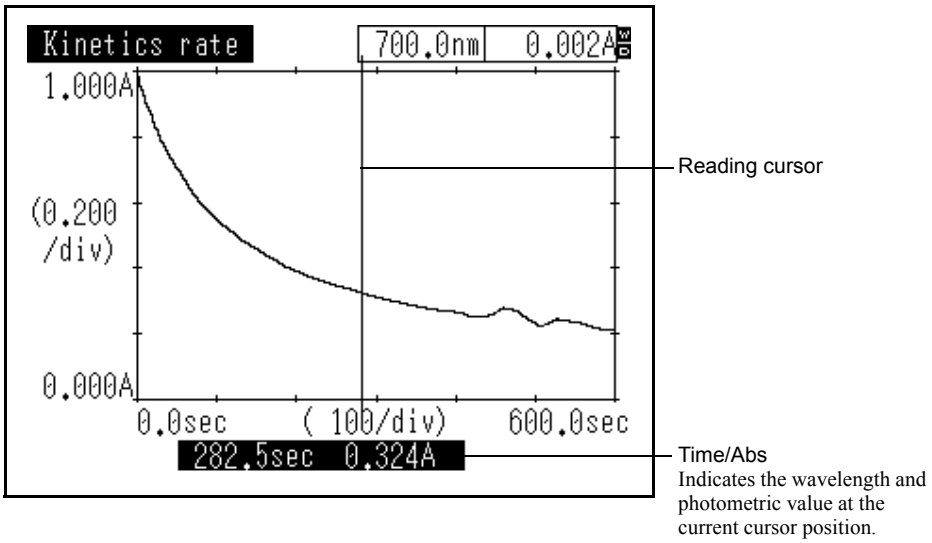


Fig. 9.8 Reading with Cursor screen

Key Operation	Description
◄(-) ►	Moves the cursor on the reaction curve graph and displays the time and Abs at the cursor position. Holding down the ◄(-) ► key will move the cursor faster.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than the above	The reading cursor disappears, and the UV-1800 returns to the Reaction Curve Display screen (Fig. 9.7).

9.4.3 Zoom Screen

When you press the F1 [Zoom] key in the Curve Display screen (Fig. 9.7), the Zoom screen (Fig. 9.9) will be displayed. The displayed reaction curve can be enlarged or reduced by changing the vertical or horizontal axis of the graph (only enlarged by changing the horizontal axis).

NOTE

If the curve data is overwritten on the screen using the curve call function, the enlargement or reduction is applied to the last loaded data.

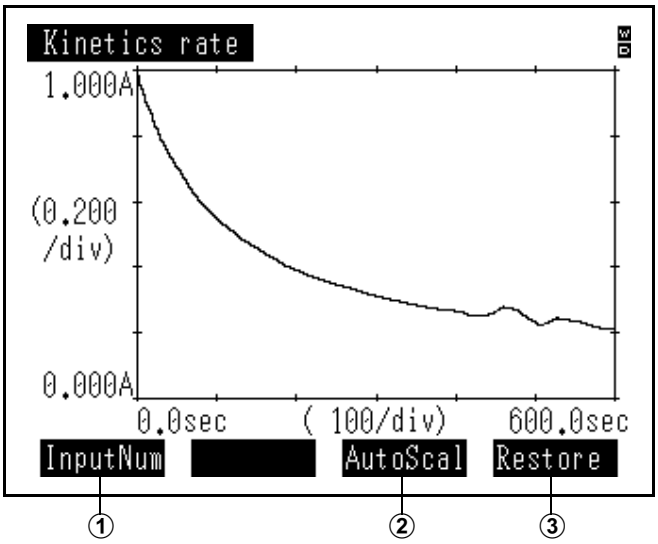
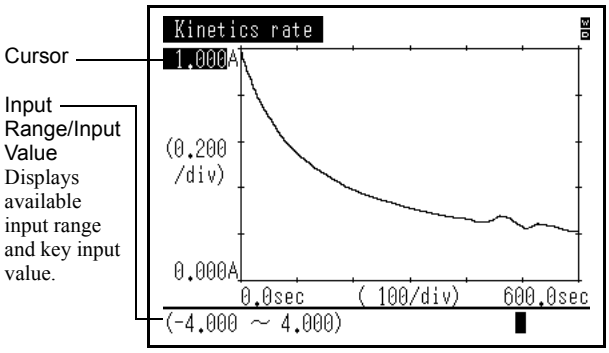


Fig. 9.9 Zoom screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis range. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing of the ENTER key moves the cursor to [vertical axis upper limit] → [vertical axis lower limit] → [horizontal axis lower limit] → [horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 9.9).  Fig. 9.10 Zoom Screen **NOTE** Data exist only at each measurement cycle. Therefore, when values other than the integral multiple of the cycle are entered as horizontal axis values, the entered values are automatically replaced with the time values nearest to the existing data values.
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed reaction curve automatically.
③	F4	[Restore]	Restores the display range to the original state.
–	START/STOP	–	Starts the measurement under the set parameters and returns to the Measurement screen (Fig. 9.5).
–	PRINT	–	Prints the curve data with the zoom operation applied. ☞ "9.6 Print (Output) Format"
–	◄(-) ►	–	Displays the cursor on the reaction curve graph to activate the cursor reading function. ☞ "9.4.2 Reading with Cursor"
–	RETURN	–	Returns to the Reaction Curve Display screen (Fig. 9.7).

9.4.4 Print Mode

When you press the PRINT key in the Reaction Curve Display screen (Fig. 9.7), the screen appears for selecting a print mode from "Print waveform ([Draw curve])" and "Hard copy of screen ([Screen copy])" (Fig. 9.11).

Move the cursor to the desired print mode with the ▲ ▼ keys, and confirm the selection with the ENTER key.

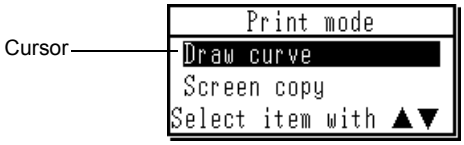


Fig. 9.11 [Print mode] screen

■ Print waveform ([Draw curve])

Waveform and measurement parameters of a curve data are printed. ☞ "9.6.1 Waveform Format"

For a commercially available printer, the screen for selecting a grid type for graph output is (Fig. 9.12) displayed. Move the cursor to the desired grid type with the ▲ ▼ keys, and confirm the selection with the ENTER key.

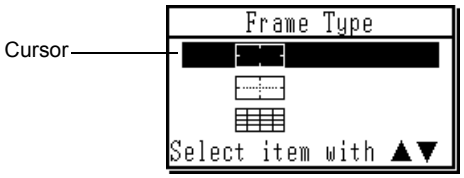


Fig. 9.12 [Frame Type] Selection screen

■ Hard copy of screen ([Screen copy])

The current screen image when the PRINT key is pressed will be printed in the same size.

9.5 Data List

9.5.1 Data List Display Screen

As shown in Fig. 9.13, measurement results (Time (sec), Abs, Δ A/min and D) will be displayed in tabular format. Measurement results for each measurement will be added below. To display or print out these measurement results, press the F3 [DataDisp] key to bring up the data display screen for further processing.

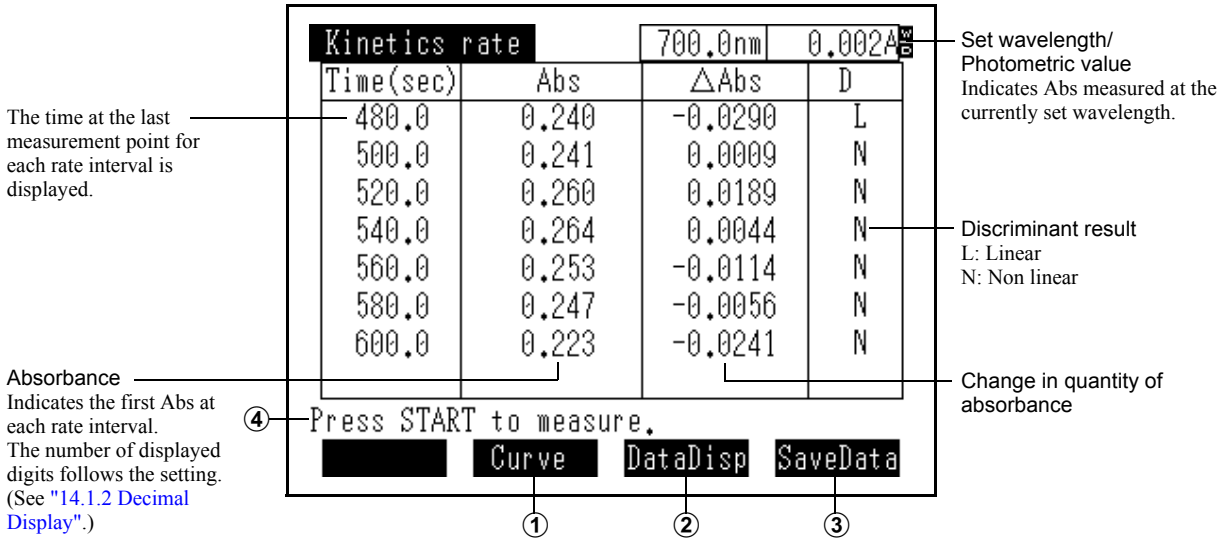


Fig. 9.13 Data List screen

No.	Key Operation	Display	Description
①	F2	[Curve]	Switches to the Reaction Curve Display screen (Fig. 9.7). ☞ "9.4.1 Curve Display Screen"
②	F3	[DataDisp]	Displays and prints all measured data, or loads a table data file stored in the memory storage. ☞ "9.5.2 List Display"
③	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"
④	START/STOP	–	Starts the measurement under the set parameters.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 9.2).

9.5.2 List Display

In the screen of the data list, the results of only the 8 immediately previous measurements will be displayed. In this screen, it is possible to display all of the measurement results. It is also possible to output a batch of all measurement results on a printer.

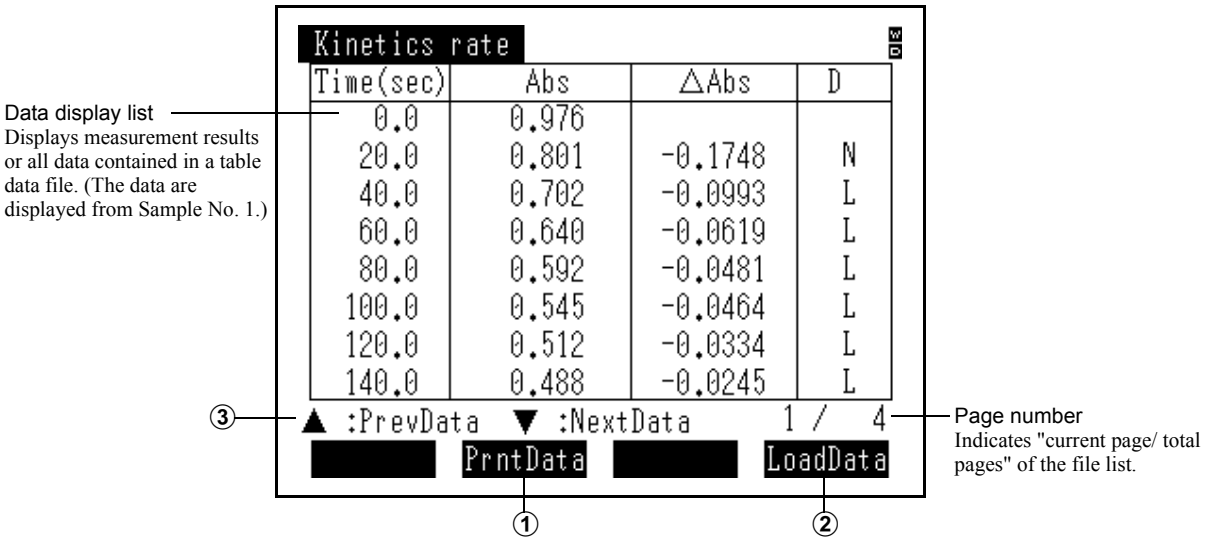


Fig. 9.14 List Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Print all listed data or reaction curve data that is displayed on the screen. ☞ "9.5.3 Data Print Format"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the data table to review the hidden measurement data. Each pressing of the key scrolls the table by 8 data lines.
④	RETURN	–	Returns to the Data List screen (Fig. 9.13).

9.5.3 Data Print Format

When you press the F2 [PrntData] key in the List Display screen, the screen for selecting a print format appears. Move the cursor to the desired format with the ▲ ▼ keys, and confirm the selection with the ENTER key.
The print process will be started when the print format is confirmed.

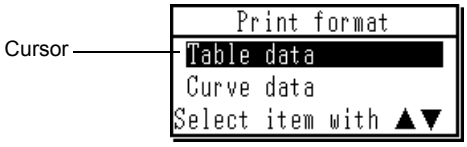


Fig. 9.15 [Print format] Selection screen

Display	Description
[Table data]	Prints all numeric data shown on the data table and the measurement parameters. ☞ "9.6.2 Table Data Format"
[Curve data]	Prints the time and measured absorbance for each cycle together with the measurement parameters. ☞ "9.6.3 Curve Data Format"

9.6 Print (Output) Format

9.6.1 Waveform Format

When you press the (PRINT) key in the Curve Display screen (Fig. 9.7), the screen appears for selecting a print mode (Fig. 9.11). If you select [Draw curve] as a print mode, waveforms and measurement parameters of a curve data are printed.

In the header part, the date and time of the end of the curve data measurement as well as measurement parameters are printed.

The print format for "Print waveform" varies according to the connected printer for output.

The following shows examples of printouts using different types of printers.

■ Output to a hard-copy printer

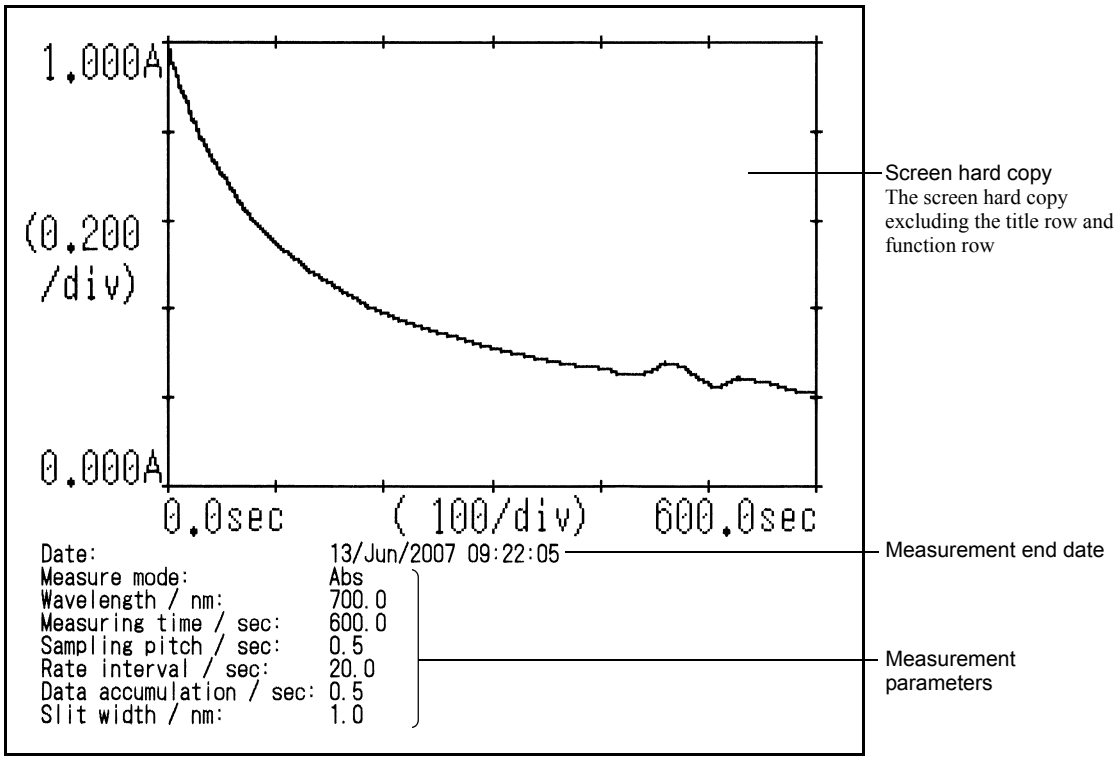


Fig. 9.16 Example of waveform printout (with hard copy printer)

■ Output to a commercially available printer

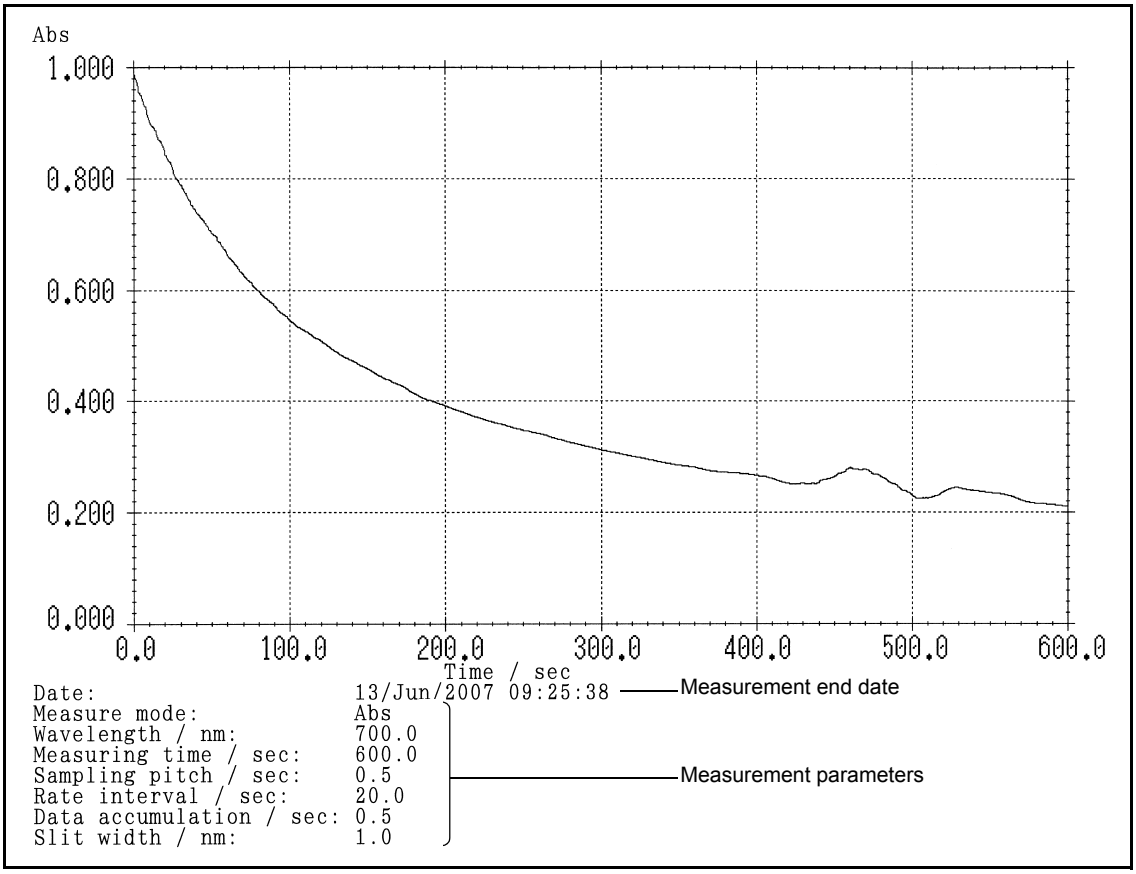
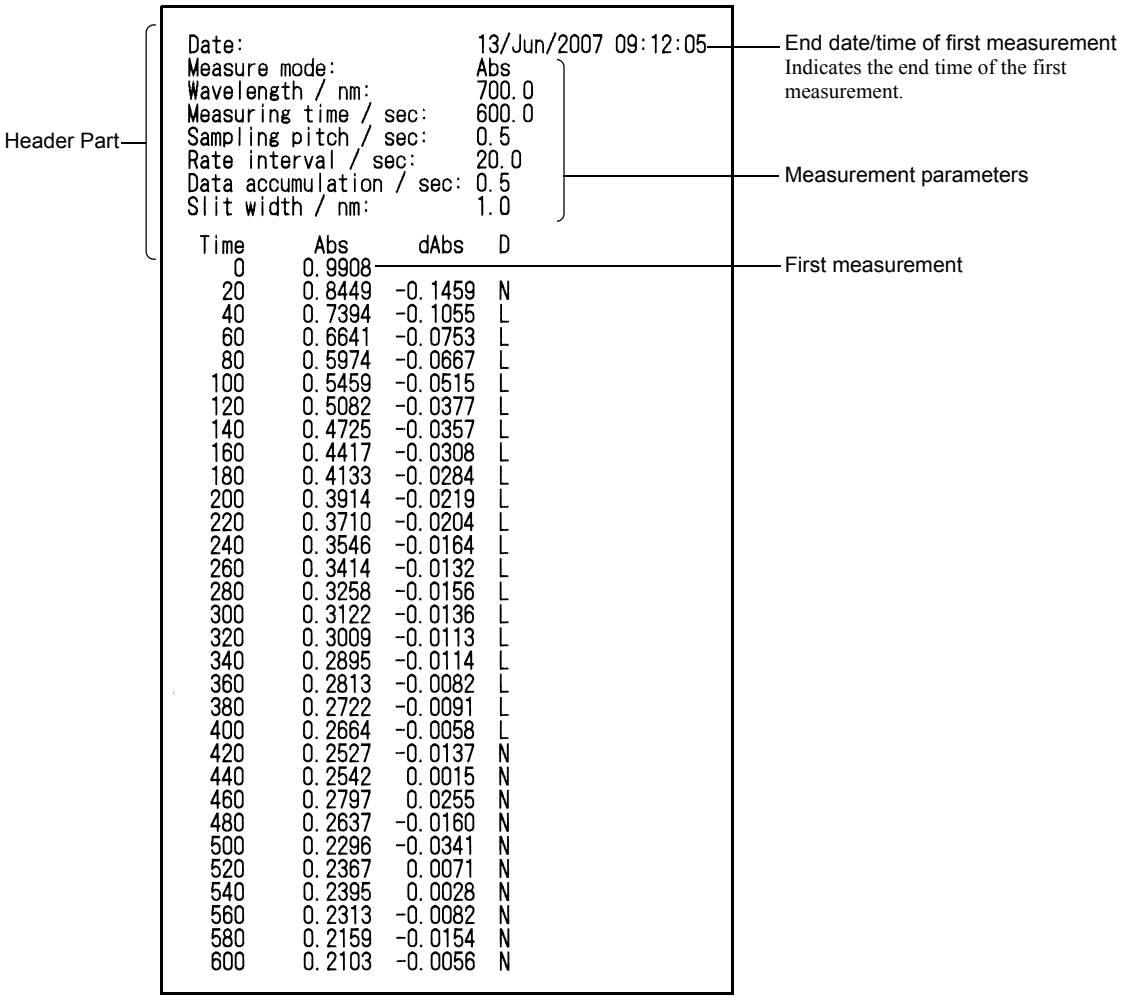


Fig. 9.17 Example of waveform printout (with commercially available printer)

9.6.2 Table Data Format

In rate measurement, the result can be printed for each rate interval, or the entire results can be printed all at once. Both print modes use the same print format.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.




```
Date:                        13/Jun/2007 09:12:05
Measure mode:                Abs
Wavelength / nm:             700.0
Measuring time / sec:        600.0
Sampling pitch / sec:        0.5
Rate interval / sec:         20.0
Data accumulation / sec:     0.5
Slit width / nm:             1.0

 Time      Abs      dAbs    D
    0    0.9908
   20    0.8449   -0.1459  N
   40    0.7394   -0.1055  L
   60    0.6641   -0.0753  L
   80    0.5974   -0.0667  L
  100    0.5459   -0.0515  L
  120    0.5082   -0.0377  L
  140    0.4725   -0.0357  L
  160    0.4417   -0.0308  L
  180    0.4133   -0.0284  L
  200    0.3914   -0.0219  L
  220    0.3710   -0.0204  L
  240    0.3546   -0.0164  L
  260    0.3414   -0.0132  L
  280    0.3258   -0.0156  L
  300    0.3122   -0.0136  L
  320    0.3009   -0.0113  L
  340    0.2895   -0.0114  L
  360    0.2813   -0.0082  L
  380    0.2722   -0.0091  L
  400    0.2664   -0.0058  L
  420    0.2527   -0.0137  N
  440    0.2542    0.0015  N
  460    0.2797    0.0255  N
  480    0.2637   -0.0160  N
  500    0.2296   -0.0341  N
  520    0.2367    0.0071  N
  540    0.2395    0.0028  N
  560    0.2313   -0.0082  N
  580    0.2159   -0.0154  N
  600    0.2103   -0.0056  N
```

Fig. 9.18 Example of table data printout

■ Printout for each measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed out on the printer for every measurement (rate interval).

■ Print all at once

When you press the **F2** [PrntData] key in the List Display screen (Fig. 9.14), the screen for selecting a print format appears. If [Table data] is selected, all measurement results up to that point, or all the data within the currently-loaded table data file will be printed.

9.6.3 Curve Data Format

When you press the F2 [PrntData] key in the List Display screen (Fig. 9.14), the screen for selecting a print format appears. If [Curve data] is selected, the curve data (time and absorbance at each measurement cycle) within the latest measured or loaded reaction curve will be printed.
In the header part, the date and time of the end of the curve data measurement as well as measurement parameters are printed.

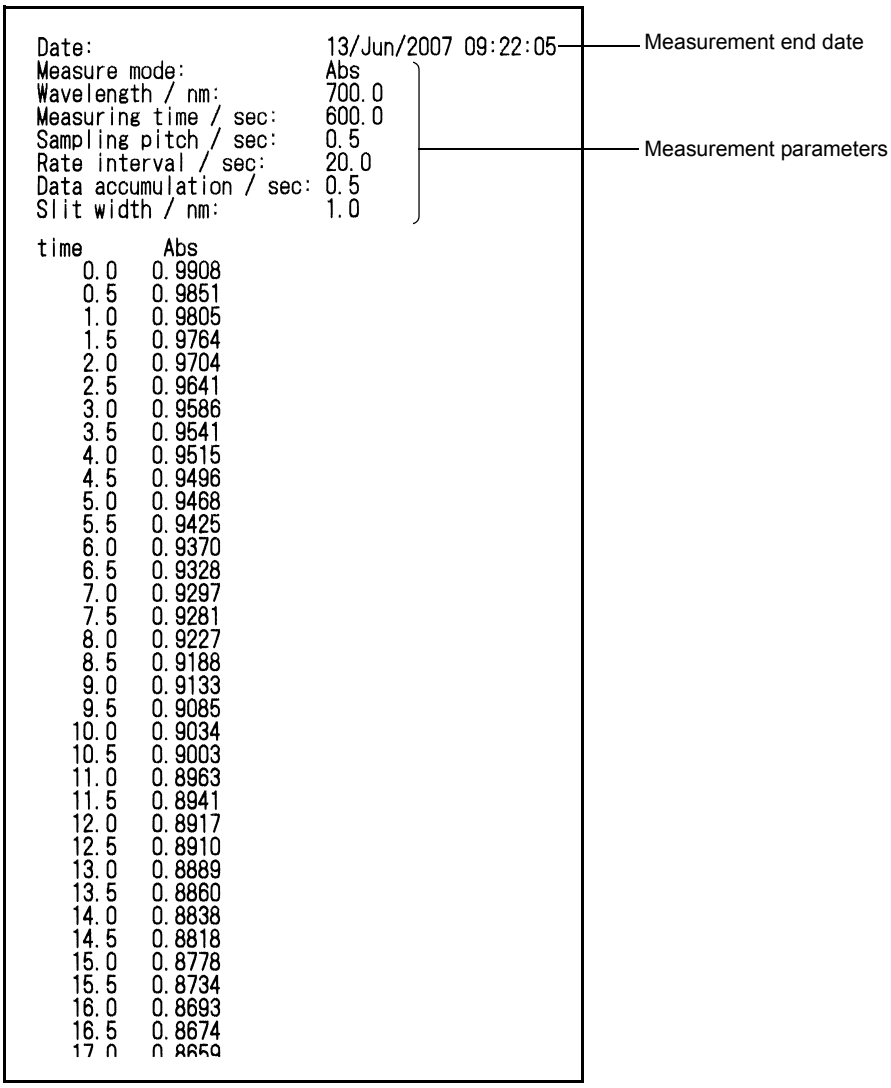


Fig. 9.19 Example of curve data printout

This page is intentionally left blank.

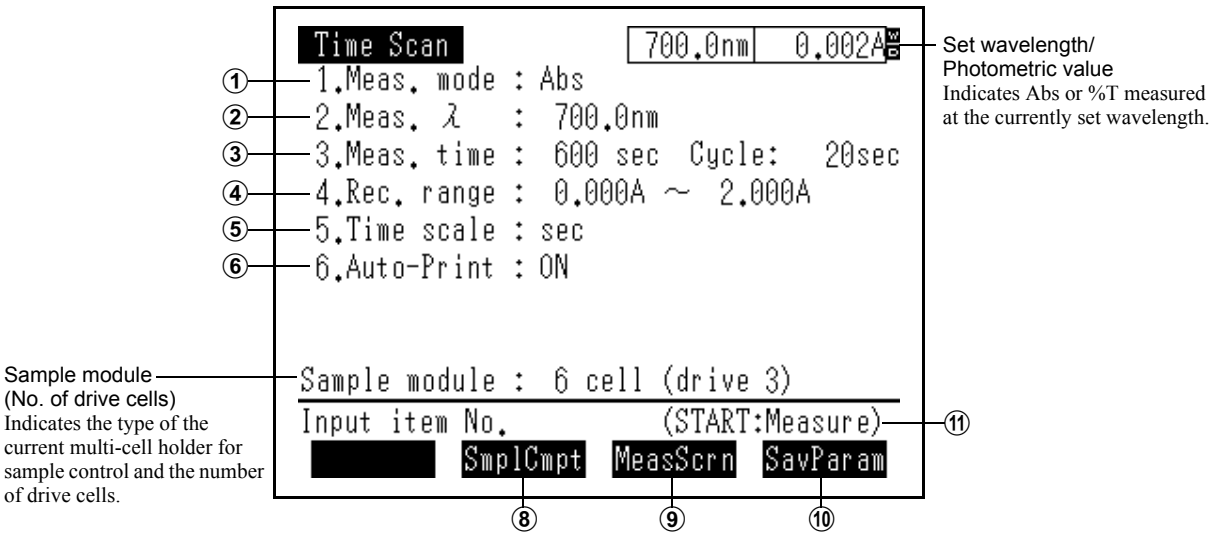
Chapter 10 Time Scan

The time scan mode is used to measure the change in the rate of absorbance (Abs), transmittance (%T), or energy (E) in the specified arbitrary wavelength.

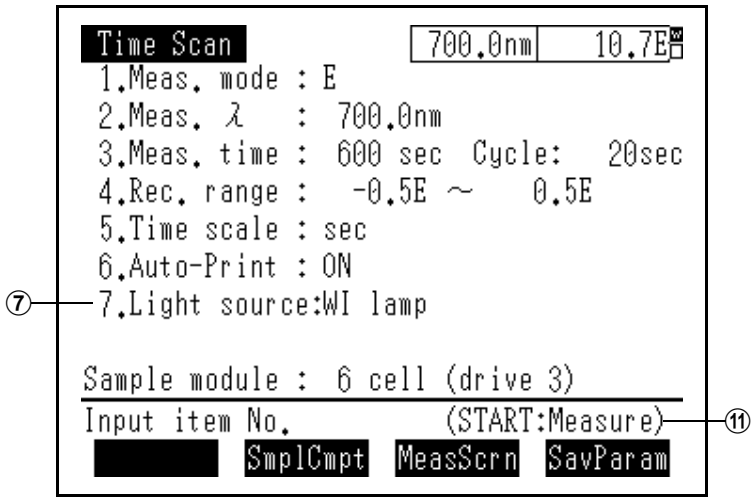
CONTENTS

10.1 Measurement Parameter Configuration Screen

When [5. Time scan] is selected in the [Mode menu] screen (Fig. 2.1), the Measurement Parameter Configuration screen related to the time scan mode is displayed.



(Abs and %T modes)



(E mode)

Fig. 10.1 Measurement Parameter Configuration screen (E mode)

No.	Key Operation	Display	Description
①	1	[Meas. mode]	Selects the measurement mode. You can select one of the following measurement modes: %T (transmittance), Abs (absorbance), or E (energy). Upon selection, the [Rec. range] value is also changed to the corresponding range.
②	2	[Meas. λ]	Specifies the measurement wavelength. The input range is from 190.0 nm to 1100.0 nm.

No.	Key Operation	Display	Description
③	3	[Meas. time] [Cycle]	Specifies Measurement time and Cycle in order. Confirm each of the values with the ENTER key. ☞ "10.1.1 Setting Measurement Time and Cycle"
④	4	[Rec. range]	The recording range is used to input the upper limit/ lower limit of Y-axis when displaying the Reaction Curve on the screen. Input range is from - 4.000 A to 4.000 A.
⑤	5	[Time scale]	The time scale (unit) can be toggled between minutes and seconds. When the key is pressed, the unit of time is changed from [min] to [sec] and vice versa.
⑥	6	[Auto-Print]	Switches ON/OFF of the auto-print function. Each pressing of this key toggles between [ON] and [OFF]. ON: A screen hard copy and measurement parameters are automatically printed after the measurement. For details on the printout form, refer to "10.4.2 Waveform Format", Fig. 6.8 Example of waveform printout (with hard copy printer). OFF: The automatic printout is not performed.

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>⑦</td><td>7</td><td>[Light source]</td><td>Selects the light source for the measurement. (E (energy) mode only)
The selected light source will be used regardless of the parameter setting for the light source.
■Light source types
<table>
<tr><td>WI lamp</td><td>Selects the tungsten iodine lamp (halogen lamp).</td></tr>
<tr><td>D2 lamp</td><td>Selects the deuterium lamp.</td></tr>
<tr><td>OFF</td><td>Turns OFF both the WI and D2 lamps. The light source mirror turns to the third light source*.</td></tr>
</table>
* This function is used to introduce the external light source into the spectrometer when measuring the energy change of light sources other than those equipped with the standard UV-1800.</td></tr>
<tr><td>⑧</td><td>F2</td><td>[SmplCmpt]</td><td>Sets the sample module. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"</td></tr>
<tr><td>⑨</td><td>F3</td><td>[MeasScrn]</td><td>Switches to the Measurement screen.</td></tr>
<tr><td>⑩</td><td>F4</td><td>[SavParam]</td><td>Enables current measurement parameters to be saved.
☞ "3.1 Save Files"</td></tr>
<tr><td>⑪</td><td>START/STOP</td><td>–</td><td>Starts the measurement under the set parameters and displays the Measurement screen (Fig. 10.3).</td></tr>
<tr><td>⑫</td><td>RETURN</td><td>–</td><td>Returns to the [Mode menu] screen (Fig. 2.1).</td></tr>
</table>

10.1.1 Setting Measurement Time and Cycle

■ Measurement time

To set the measurement time, enter the total time to obtain actual absorbance data values. The input range is from 1 to 9999 seconds (minutes).

However, when performing multi-cell measurement with multi-cell holder, the lower limit of the range is determined by the number of drive cells.

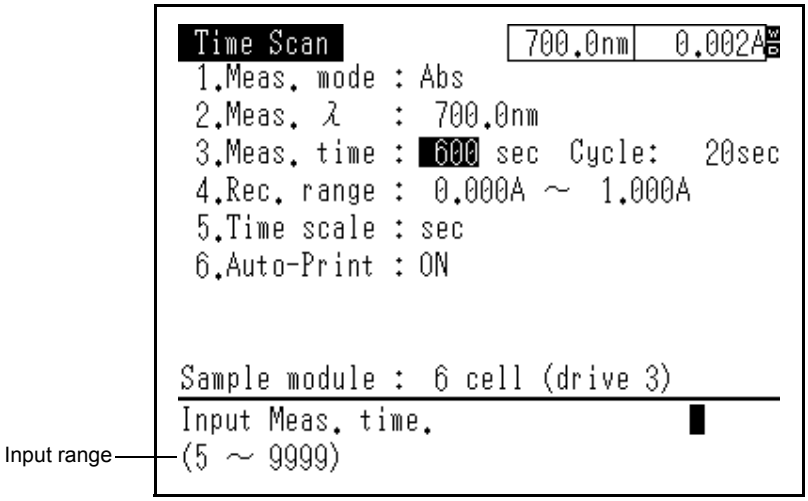


Fig. 10.2 Measurement Parameters Configuration screen

■ Cycle (measurement cycle)

Specify the interval (measurement cycle) to acquire measurement data.

The unit of the measurement cycle follows the setting specified in [5. Time scale] in the Measurement Parameter Configuration screen.

If [Integer input] is selected, the cycle input range is as given in the following:

When "Measurement time" < 2001 sec. (min.): Integers from 1 to 1000

When "Measurement time" ≧ 2001 sec. (min.): Integers from (Measurement time/2000) to 1000

10.2 Measurement

When the measurement is started from the Measurement Parameter Configuration screen (Fig. 10.1) or Curve Display screen (Fig. 10.4) by pressing the START/STOP key, the time course change in the absorbance (transmittance, or energy) starts being plotted on the screen in real time (Fig. 10.3). After the measurement, the Curve Display screen (Fig. 10.4) will be displayed.

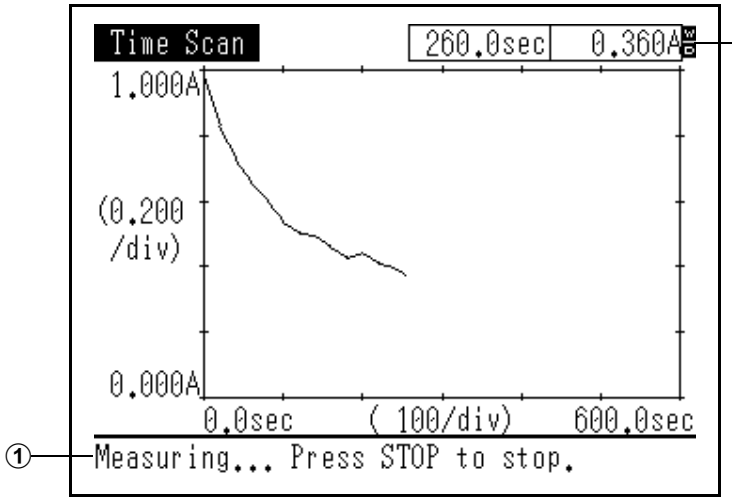


Fig. 10.3 Time Scan Measurement screen during measurement

No.	Key Operation	Description
①	START/STOP	Terminates the measurement and switches to the Curve Display screen (Fig. 10.4).

10.3 Displaying Time Course Curve

10.3.1 Curve Display Screen

When you complete/terminate measurement, or press the F3 [MeasScrn] key in the Measurement Parameter Configuration screen (Fig. 10.1), the Curve Display screen (Fig. 10.4) appears.

In this screen, you can display, save, and print the waveform within measured or loaded spectrum data.

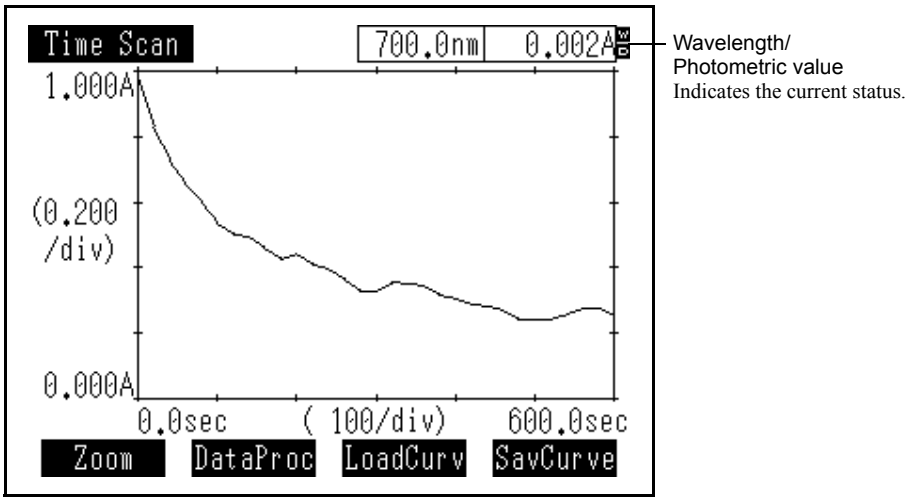
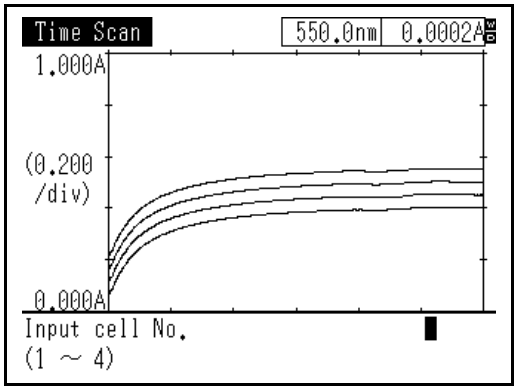


Fig. 10.4 Curve Display screen

NOTE

The acquired time course data is not yet saved when the measurement has completed. The time course data will be lost if (1) the next sample measurement is started, (2) another time course data file is loaded, or (3) the measurement parameters are changed. To save the acquired time course curve data, press the F4 key.

No.	Key Operation	Display	Description
①	F1	[Zoom]	Changing the range of Y-axis and X-axis of displayed time course curve enables zooming of the time course curve. ☞ "10.3.3 Zoom Screen"
②	F2	[DataProc]	Performs the data processing on measured or loaded time course data. In the Data Processing screen, the following processing options are available: Mathematical calculation, derivative processing, peak detection, area calculation, point pickup and printout. ☞ Chapter 13 "Data Processing" This data processing can only be performed on a single reaction curve. Therefore, for a multiple cell measurement with multi-cell holder, the Curve Data Selection screen appears for selecting a target curve (cell No.). Enter the cell No. for the target curve (Input range: 1 to the number of drive cells), and confirm with the ENTER key.  Fig. 10.5 Curve Data Selection screen
③	F3	[LoadCurv]	Loads a time course data file that is stored in the built-in memory storage or USB memory device. ☞ "3.2 Load Files"
④	F4	[SavCurve]	Saves the acquired reaction curve data to the memory storage. ☞ "3.1 Save Files"
–	PRINT	–	Prints a hard copy of the screen or the time course data. ☞ "10.4 Print Format"

No.	Key Operation	Display	Description
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 10.1).
–	◄(-) ►	–	Displays the reading cursor on the graph to read the data values at any arbitrary sampling point. ☞ "10.3.2 Reading with Cursor"

10.3.2 Reading with Cursor

If the ◄(-) or ► key is pressed in the Curve Display screen (Fig. 10.4), the reading cursor appears. Using this reading cursor, you can read the data values at any arbitrary sampling point. Furthermore, for listing or printing data values at multiple sampling points, refer to the description on the point pick function (☞ "13.6 Point Pick"). For printing all data in numeric values, refer to the description on the print processing function (☞ "13.7 Print Processing").

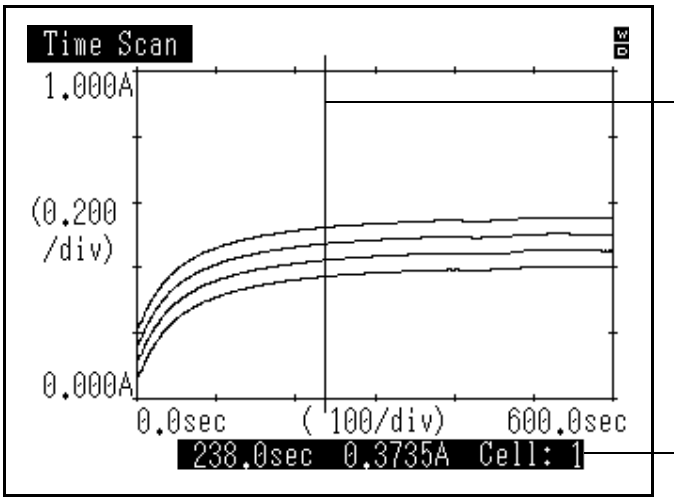


Fig. 10.6 Reading with Cursor screen

Key Operation	Description
◄(-) ►	Moves the cursor on the time course curve graph and displays the time and Abs at the cursor position. Holding down the ◄(-) ► key will move the cursor faster.
▲ ▼	Selects a time course data to be read with the cursor. When performing multi cell measurement with multi-cell holder, multiple reaction curves will be displayed on the graph. Therefore, to review a particular reaction curve, you need to switch the cell No. and select the target time course data by pressing the ▲ ▼ keys.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than the above	The reading cursor disappears, and the UV-1800 returns to the Reaction Curve Display screen (Fig. 10.4).

10.3.3 Zoom Screen

When you press the F1 [Zoom] key in the Curve Display screen (Fig. 10.4), the Zoom screen (Fig. 10.7) will be displayed. The displayed time course curve can be enlarged or reduced by changing the vertical or horizontal axis of the graph (only enlarged by changing the horizontal axis).

NOTE

If the curve data is overwritten on the screen using the curve call function, the enlargement or reduction is applied to the last loaded data.

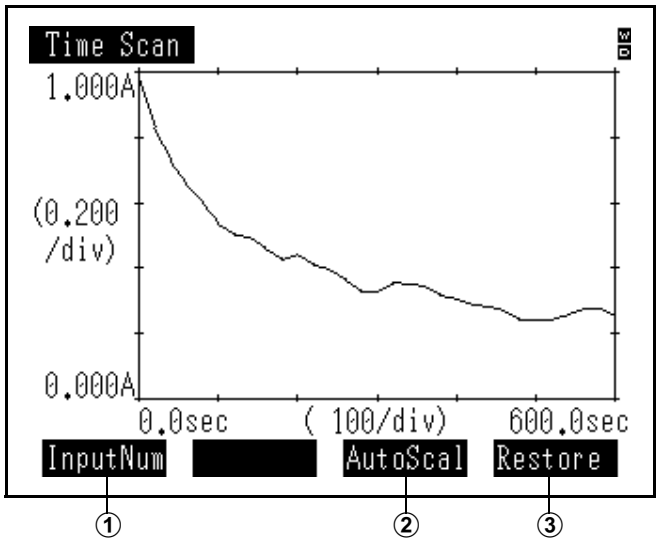
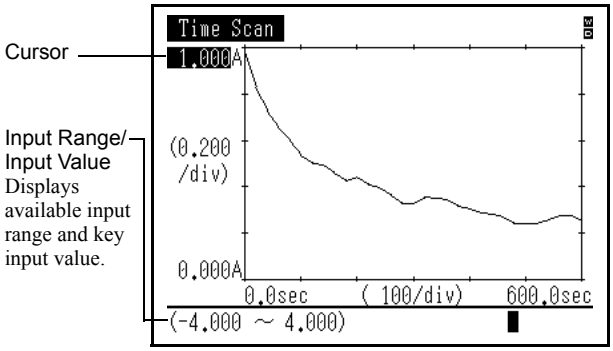


Fig. 10.7 Zoom Screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis value. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing, the ENTER key moves the cursor to [vertical axis upper limit] → [vertical axis lower limit] → [horizontal axis lower limit] → [horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 10.7).  Fig. 10.8 Zoom Screen **NOTE** Data exist only at each measurement cycle. Therefore, when values other than the integral multiple of the cycle are entered as horizontal axis values, the entered values are automatically replaced with the time values nearest to the existing data values.
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed reaction curve automatically.
③	F4	[Restore]	Restores the display range to the original state.
–	PRINT	–	Prints the curve data with the zoom operation applied. ☞ "10.4 Print Format"
–	◄(-) ►	–	Displays the cursor on the reaction curve graph to activate the cursor reading function. ☞ "10.3.2 Reading with Cursor"
–	RETURN	–	Returns to the Reaction Curve Display screen (Fig. 10.4).

10.4 Print Format

The graph of a time course data can be printed out in "Print waveform ([Draw curve])" or "Hard copy of screen ([Screen copy])".

If you wish to output all the data in numeric values, see "13.7 Print Processing".

10.4.1 Print Mode

When you press the PRINT key in the Reaction Curve Display screen (Fig. 10.5), the screen appears for a print mode from "Print waveform ([Draw curve])" or "Hard copy of screen ([Screen copy])".

Move the cursor to the desired mode with the ▲ ▼ keys, and confirm the selection with the ENTER key.

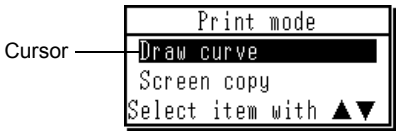


Fig. 10.9 [Print mode] screen

■ Print waveform ([Draw curve])

Waveforms and measurement parameters in a time course data are printed.

(☞ "10.4.2 Waveform Format")

For a commercially available printer, the screen for selecting a grid type for graph output is displayed.

Move the cursor to the desired grid type with the ▲ ▼ keys, and confirm the selection with the ENTER key.

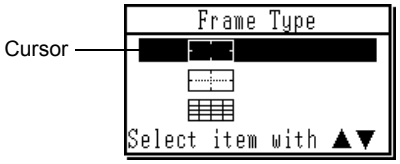


Fig. 10.10 [Frame Type] Selection screen

When the grid type is confirmed, the measured or loaded reaction curve and the parameters are printed out.

■ Hard copy of screen ([Screen copy])

The current screen image when the PRINT key is pressed will be printed in the same size.

10.4.2 Waveform Format

The print format for "Print waveform" varies according to the connected printer for output.

The following shows examples of printouts using different types of printers.

■ Output to a hard-copy printer

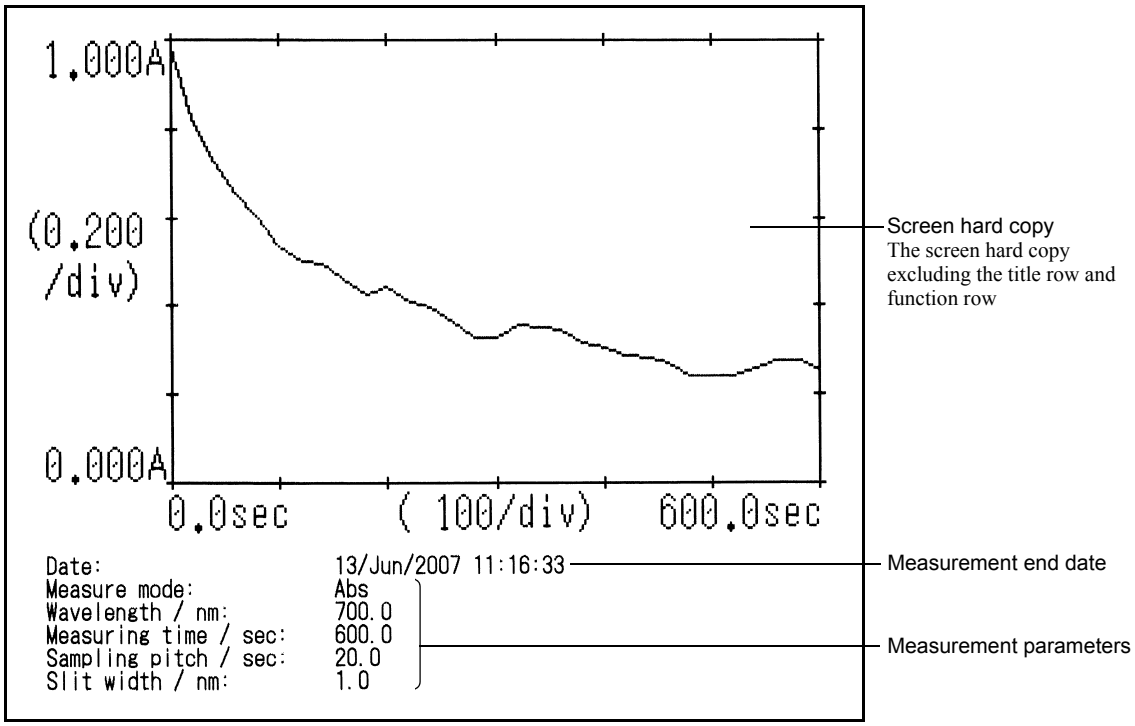


Fig. 10.11 Example of waveform printout (with hard copy printer)

■ Output to a commercially available printer

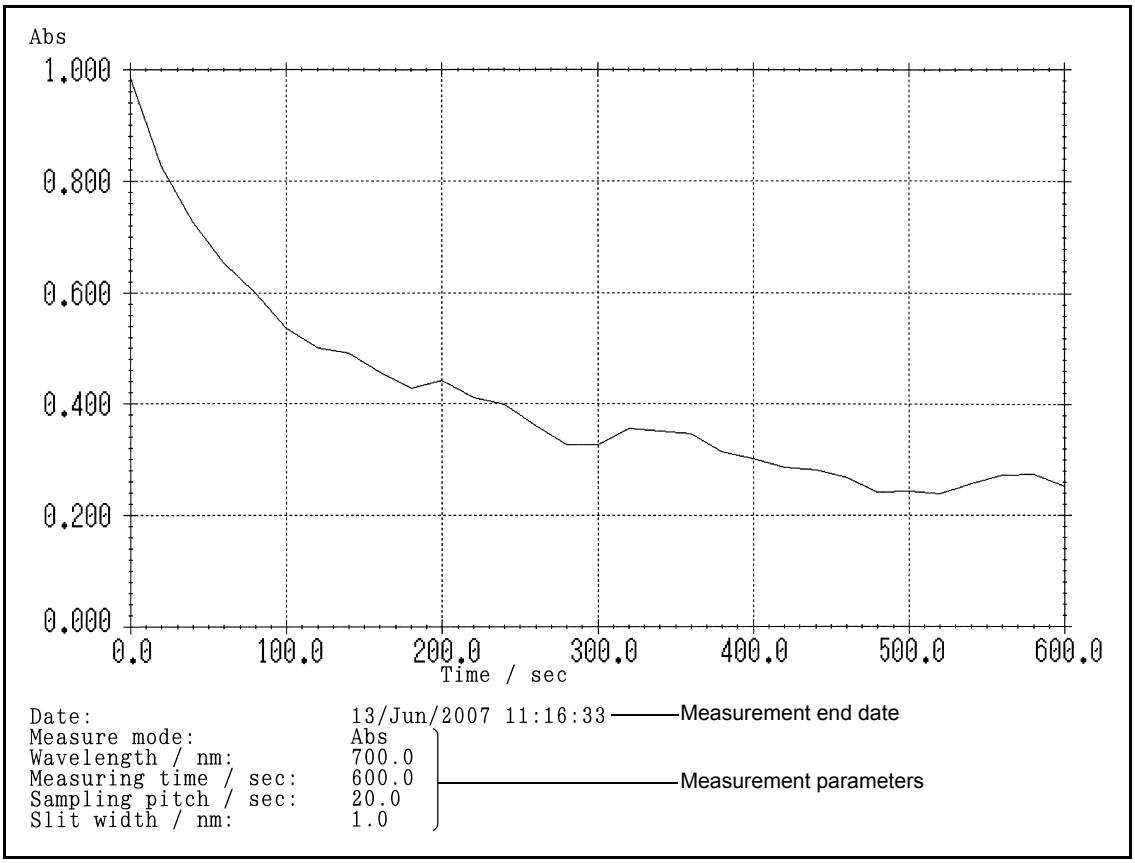


Fig. 10.12 Example of waveform printout (with commercially available printer)

This page is intentionally left blank.

Chapter 11 Multi-component Quantitation

CONTENTS

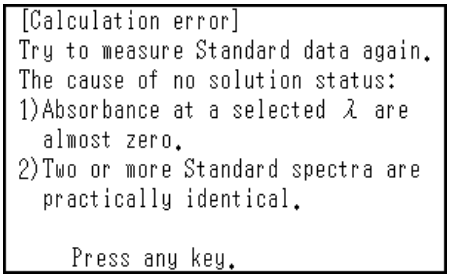
11.1 Multi-component Quantitation

The multi-component quantitation mode is the mode in which the concentration of each constituent component is determined by using the absorption spectrum of the mixed sample with pure standards or standards made up of multiple constituent components.

1) Mixed samples with up to 8 constituent components can be quantitated.
2) In addition to using pure samples of each constituent component as the standard samples, a mixed sample in which the concentration of each constituent component is known may also be used.
   The effects of interference among the various constituent components can be minimized by using a mixed sample as the standard sample.
3) Parameter files for this mode store measurement parameters and standard sample data, making their file size relatively large. Therefore they can only be saved by using a USB memory device. In addition, a spectrum saved in memory can be loaded and used as the standard sample (☞ "11.3 Standard Sample Data") or unknown sample data (☞ "11.4 Measurement of Unknown Sample"). However, unlike other parameter files, these can only be saved one at a time.
4) The measurement wavelengths can be set at uniform intervals or randomly set.

NOTE

1) If Multi-component quantitation calculation cannot be performed, e.g. due to an unsuitable standard sample, the error message "Multi-component calculation error" will be displayed on the screen.



2) If a sample whose absorbance is virtually zero, or a sample with a closely similar absorption spectrum shape is used as the standard sample, isolation quantitation calculations may not be properly be performed or accurate values may not be found.
3) If a mixed sample with 4 or more constituent components is used as the standard sample, it is highly probable that isolation quantitation calculations will not be properly performed.

11.2 Measurement Parameter Configuration Screen

When you select [6. Multi-Component] in the [Mode menu] screen (Fig. 2.1), the Measurement Parameter Configuration screen is displayed (Fig. 11.1). Set the parameters by pressing the numeric keys corresponding to the item numbers on the screen.

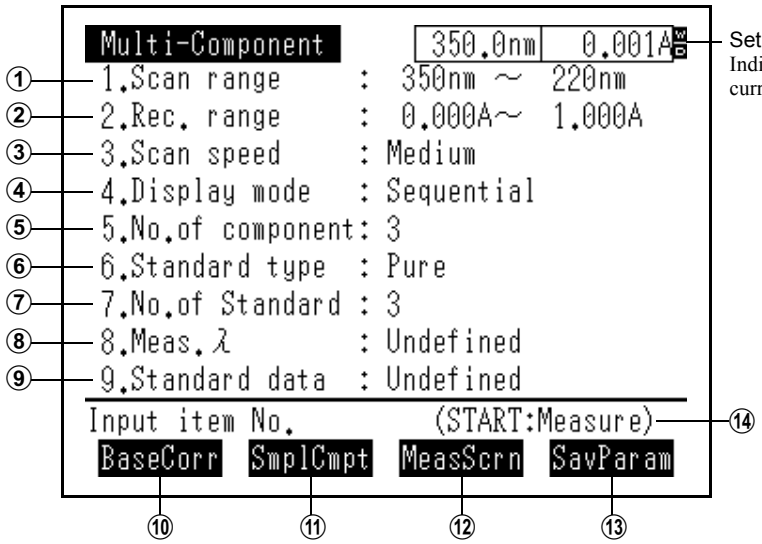
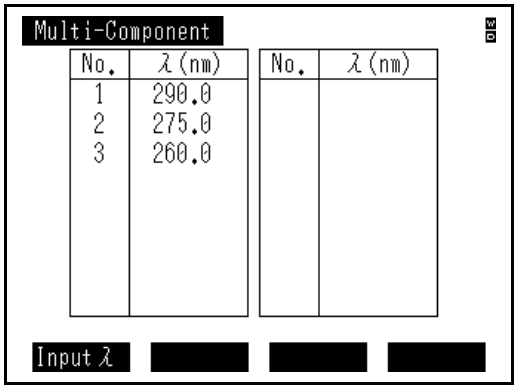


Fig. 11.1 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[Scan range]	Enter the wavelength range over which the absorbance will be measured. The input range is from 190 nm to 1100 nm (in units of 1 nm). The scan pitch will be automatically determined by the scan range specified here. Table 11.1 The relation between scan range and scan pitch Scan Range (nm) (Start wavelength-End wavelength) / Scan Pitch 910 nm ≥ (Scan range) / 1.0 nm ≥ 500 nm 500 nm > (Scan range) / 0.5 nm ≥ 200 nm 200 nm > (Scan range) / 0.2 nm ≥ 100 nm 100 nm > (Scan range) / 0.1 nm
②	2	[Rec. range]	Enter the range for the vertical axis (-4.000 to 4.000) when displaying the absorption spectrum on screen for a standard sample measurement or unknown sample measurement.

No.	Key Operation	Display	Description
③	3	[Scan speed]	Set the wavelength scanning speed from among 4 levels (Fast, Medium, Slow, Very Slow).
④	4	[Display mode]	Select whether to overlay absorption spectra for standards or unknown samples, or rewrite the spectrum for each measurement. Each pressing of the key toggles between [Overlay] and [Rewrite].
⑤	5	[No. of component]	Enter the number of components that comprise the mixed sample. The entry range is from 2 to 8 components. The number of constituent components is related to both [6. Standard type] and [7. No. of Standard]. If it becomes necessary to change the No. of standards because there has been a change in the No. of components, you will be instructed on screen to "Change param". In addition, if [6. Standard type] is set to "Pure", [7. No. of Standard] will automatically be overwritten with the same number as the No. of components.
⑥	6	[Standard type]	Select whether the standard sample is a pure sample made from a single component or a mixed sample of known concentrations of more than one component. Move the cursor with ▲ ▼ keys and confirm the selection with the ENTER key.  Fig. 11.2 [Standard type] Selection screen
⑤	7	[No. of Standard]	Enter the number of standard samples. For a pure sample, the number will be automatically entered with the same number as the No. of components. For a mixed sample, the input range is from (No. of components + 1) to 16.

No.	Key Operation	Display	Description
⑧	8	[Meas. λ]	Select the wavelength for measurement of standards and unknowns. The concentration of the sample will be calculated from the absorbance at specified measurement wavelengths in the spectrum. Select [8. Meas. λ] to review the currently set wavelength.  Fig. 11.3 Set Wavelength Review screen To modify wavelength values, press the F1 [Input λ] key while this screen is displayed. ☞ "11.2.1 Input Measurement Wavelength" Press the RETURN key to return to the Measurement Parameter Configuration screen.
⑨	9	[Standard data]	Enter the standard sample concentrations to measure the standard sample absorbance spectra. ☞ "11.3 Standard Sample Data"
⑩	F1	[BaseCorr]	Used to correct the baseline under the specified conditions.
⑪	F2	[SmplCompt]	Used to set the sample module. The setting items include the sample module type and the operating conditions of the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)" **NOTE** Multi-cell measurement with multi-cell holder is not available in the Multi-component Quantitation Mode.
⑫	F3	[MeasScrn]	Switches to the Component Concentration screen (Fig. 11.15).

No.	Key Operation	Display	Description
⑬	F4	[SavParam]	Saves the current set parameters as a parameter file. ☞ "3.1 Save Files" **NOTE** The parameter file for the Multi-component Quantitation Mode cannot be saved to the built-in memory since the file size is too large. Please use a USB memory device when saving the parameter file.
⑭	START/STOP	–	Switches to the Measurement screen and starts the measurement.
–	RETURN	–	Returns to the [Mode menu] screen (Fig. 2.1).

11.2.1 Input Measurement Wavelength

You can enter wavelengths by setting an equal interval using the starting wavelength (long wavelength) as a standard or by numerically entering any desired wavelength values.

When the F1 [Input λ] key is pressed on the Set Wavelength Review screen (Fig. 11.3), the screen for selecting the input method is displayed (Fig. 11.4).

Move the cursor with the ▲ ▼ keys and confirm the selection with the ENTER key.

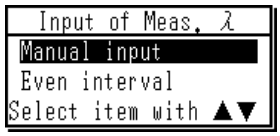


Fig. 11.4 [Input of Meas. λ] screen

■ Manual Input (Entering Wavelength Values Arbitrarily)

When you select [Manual input] in Fig. 11.4, Fig. 11.5 will be displayed.

1 Refer to the input range displayed at the screen bottom and enter the desired number of wavelengths with numeric keys. (The entered value will be displayed at the cursor position.)

> **NOTE**
> When using pure standards, skip to the next procedure, which is the setting on the Desired Wavelength Input screen.

Press the ENTER key to confirm the input number of wavelengths.

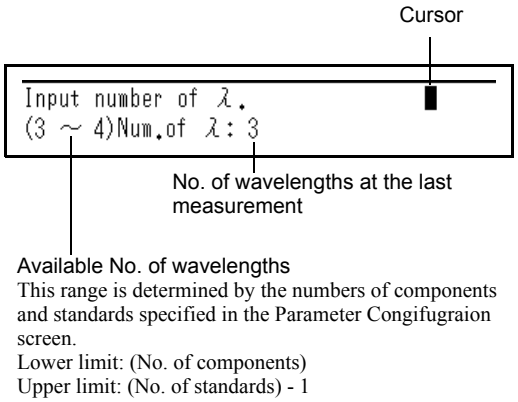


Fig. 11.5 Input of Number of Meas. λ screen

2 The Desired Wavelength Input screen is displayed. Enter desired wavelength values with numeric keys. (The entered value will be displayed at the cursor position.)

> **NOTE**
> You cannot enter two or more of the same wavelength, or wavelengths that are not integral multiples of the scan pitch.

Press the ENTER key to confirm the input number of wavelengths.

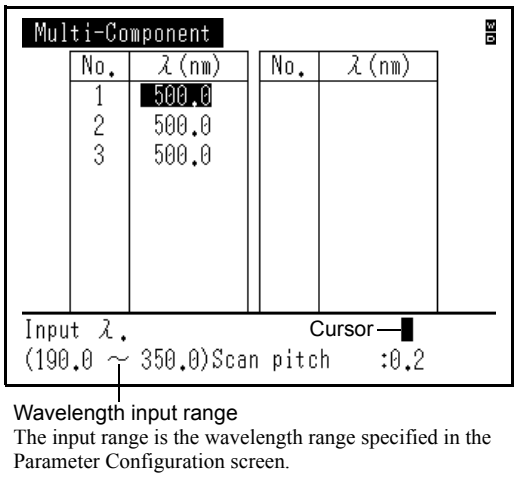


Fig. 11.6 Input Range of Meas. λ screen

3 Repeat procedure 2 until you finish entering all wavelength values for the specified number of points. The display will return to the Parameter Configuration screen (Fig. 11.1). ("Defined" will be displayed in [8. Meas. λ].)

■ Even Interval (Acquiring Data at Even Intervals)

The screen for specifying a measurement wavelength interval is displayed.

1 Enter the desired wavelength interval with numeric keys. The value will be displayed at the cursor position at the bottom of the screen. The minimum input unit for the interval is 1 nm.

* The wavelength intervals are determined by measurement wavelength range, No. of components, and No. of standards.
- **For pure sample (the minimum unit of 1 nm)**
  Lower limit: Wavelength range/No. of components + 1 nm
  Upper limit: Wavelength range/(No. of components - 1) nm

Example)
Wavelength range: 700 nm to 400 nm, No. of components: 5 →
The specifiable minimum value: 61 nm, and the maximum value: 75 nm.

- **For mixed sample (the minimum unit of 1 nm)**
  Lower limit: Wavelength range/(No. of standards- 1) + 1 nm
  Upper limit: Wavelength range/(No. of components- 1) nm

Example)
Wavelength range: 700 nm to 400 nm, No. of components: 5 →
The specifiable minimum value: 34 nm, and the maximum value: 75 nm.

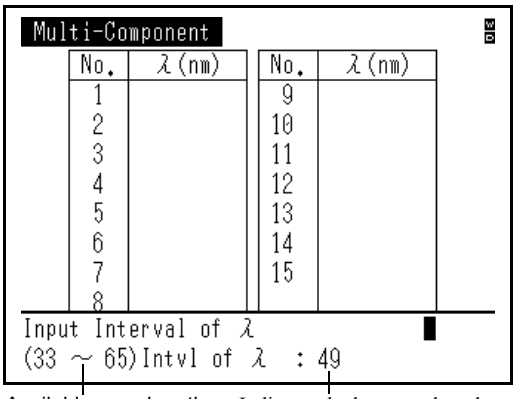


Fig. 11.7 Wavelength Interval Input screen

2 Press the ENTER key and the measurement wavelengths will be automatically set in even intervals starting from the start wavelength (the longest wavelength in the scan range). Approximately 2 seconds after the wavelengths are listed, the display returns to the Parameter Configuration screen (Fig. 11.1). ("Defined" will be displayed in [8. Meas. λ].)

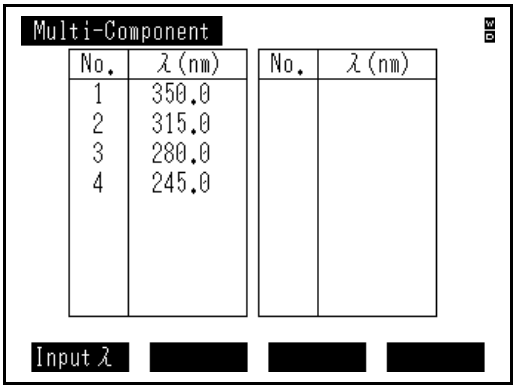


Fig. 11.8 Example of wavelength definition

11.3 Standard Sample Data

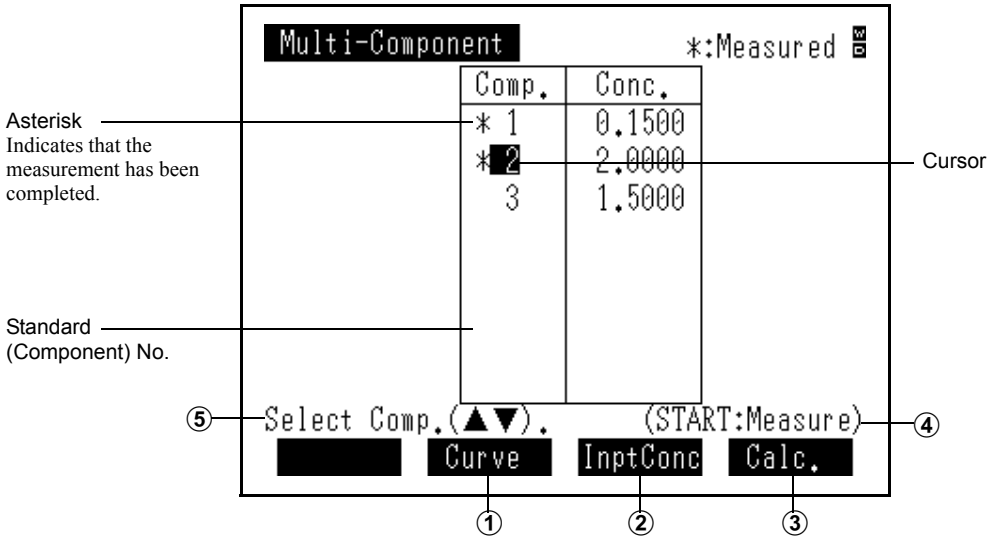
When you select [9. Standard data] in the Parameter Configuration screen (Fig. 11.1), a standard sample concentration input screen will be displayed.

In this screen, you will enter standard sample concentrations, and load the absorbances at specified wavelengths (Fig. 11.1 [8. Meas. λ]).

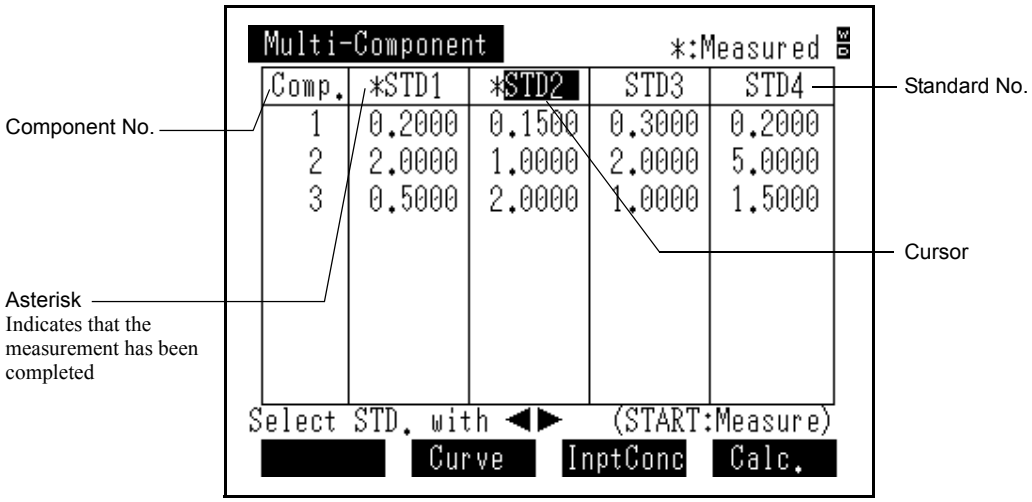
You can load the standard sample absorbances from actually measured data or existing spectrum data files.

In either case, however, parameters [1.] through [8.] must be set in the Parameter Configuration screen beforehand.

The Concentration Input screen differs depending on whether the standard sample is pure or mixed.



(Pure sample)



(Mixed sample)

Fig. 11.9 Standard Sample Data Input screen

No.	Key Operation	Display	Description
①	F2	[Curve]	Switches to the Spectrum Display screen where you can confirm the spectral waveform. ☞ "11.6 Spectrum Display screen" Additionally, by using the [LoadCurv] function from the Spectrum Display screen, you can specify spectrum data files stored in the built-in memory or USB memory as standard sample data. ☞ "11.3.3 Loading from Spectrum (Curve) Data File" **NOTE** You can load only spectrum data under parameters identical to the current parameter settings (Scan range, Measurement mode, and Scan pitch).
②	F3	[InptConc]	Switches to the Concentration Input screen. ☞ "11.3.1 Entering Concentration"
③	F4	[Calc.]	Calculates the parameters for quantitation after all the standard data are entered and measured. Upon completion of calculation, a message is displayed. After that, the Measurement (Fig. 11.1) Parameter Configuration screen will be displayed.
④	START/STOP	–	Switches to the Measurement screen and starts standard sample measurement.
⑤	▲ ▼ ◄(-) ►	–	Moves the cursor on the component (standard sample) column.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 11.1).

11.3.1 Entering Concentration

The procedure for entering standard sample concentrations is as follows:

1 In the Standard Sample Data Input screen (Fig. 11.9), move the cursor by pressing the ▲ ▼ keys (◄ ► keys for mixed sample) to the position of the component (standard sample) whose concentration is to be entered. Then, press the F3 [InptConc] key.

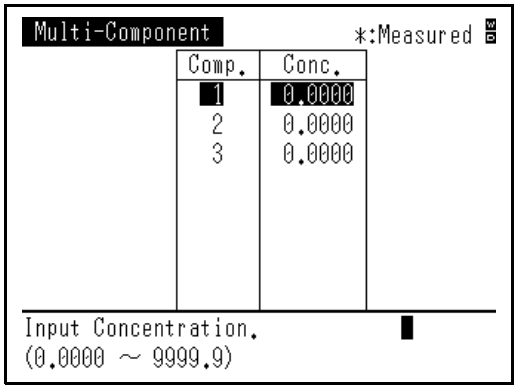
2 The concentration column of the standard sample selected in procedure 1 will be highlighted (Fig. 11.10). Input the concentration using the numeric keys.

3 Press the ENTER key to reflect the input concentration on the concentration table. The concentration column for the next component will then be highlighted.

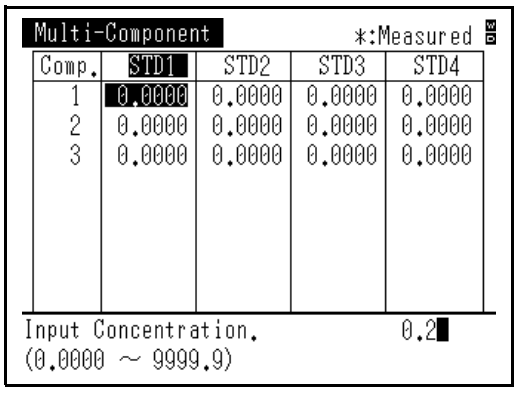
NOTE

If the ENTER key is pressed without inputting any concentration value, no change is made to the existing concentration, and the concentration column for the next component is highlighted.
After the concentration of Component 3 is confirmed, the cursor returns to Component 1 in the case of example in Fig. 11.10.

4 After all concentrations are confirmed, press the RETURN key to return to the Standard Sample Data Input screen (Fig. 11.9).



(Pure sample)



(Mixed sample)

Fig. 11.10 Concentration Input screen

11.3.2 Loading Absorbance

Next, measure the standard sample at the wavelength range specified in the Measurement Parameter Configuration screen (Fig. 11.1).
To perform baseline correction, press the F1 [BaseCorr] key in the Measurement Parameter Configuration screen (Fig. 11.1).
The following is the procedure for loading absorbance:

1 In the Standard Sample Data Input screen (Fig. 11.9), move the cursor by pressing the ▲ ▼ keys (◄ ► keys for mixed sample) to the position of the component (standard sample) to be measured.

2 Place the standard sample in the sample compartment, and press the START/STOP key. The Measurement screen (Fig. 11.11) appears and the measurement begins.

NOTE
If the START/STOP key is pressed during measurement, the measurement is terminated and the currently obtained data is discarded.

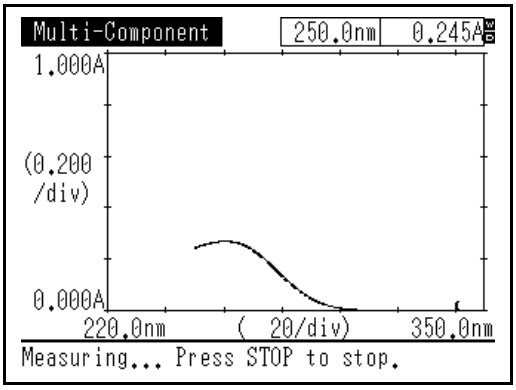
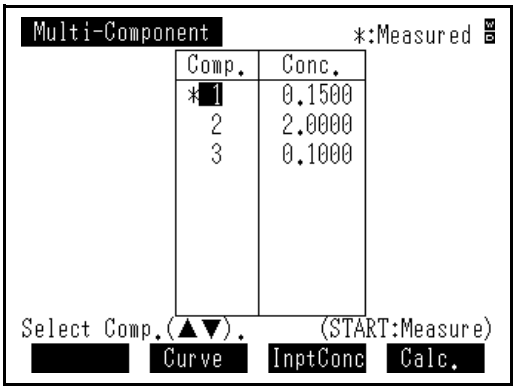


Fig. 11.11 Screen during measurement

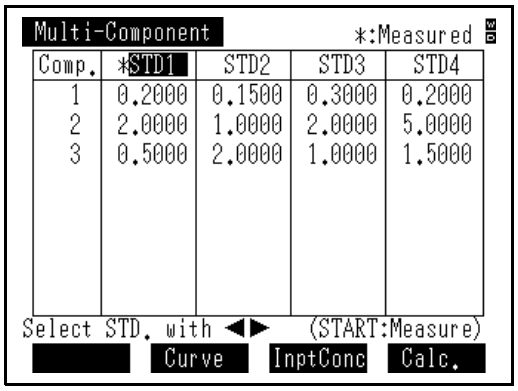
3 After the measurement is completed, the absorbance at the specified wavelength (Fig. 11.1 [8. Meas. λ]) is automatically loaded and the Data Input screen appears.
The component (standard sample) already measured is marked with "*".

NOTE
When the next measurement is started, the previously measured spectrum data (curve data) is discarded. If you wish to save the curve data, press the F2 key to perform the saving operation.
☞ "11.6 Spectrum Display screen"



(Pure sample)

4 Repeat procedures 1 and 2 for each standard sample, and after all measurements are completed, press the F4 [Calc.] key.
Upon completion of calculation, a message is displayed.
Press the RETURN key to return to the Measurement Parameter Configuration screen.



(Mixed sample)

Fig. 11.12 Standard Sample Data Input screen

5 The Measurement Parameter Configuration screen (Fig. 11.1) appears, and the [9. Standard data] column is indicated with "Defined".

11.3.3 Loading from Spectrum (Curve) Data File

Instead of performing actual measurement, you can load the absorbance at the specified wavelength (Fig. 11.1 [8. Meas. λ]) from the standard sample spectrum data (curve data) stored in the built-in memory or USB memory.

NOTE
You can load only spectrum data (curve data) acquired under the same parameter values (scan range, photometric mode, and scan pitch) as those currently set.

The following is the procedure for the operation:

1 In the Standard Sample Data Input screen (Fig. 11.9), move the cursor by pressing the ▲ ▼ keys to the position of the component (standard sample) to which the data is to be loaded.
Press the **F2** [Curve] key.

2 The Spectrum Display screen appears. Press the **F3** [LoadCurv] key to load the desired curve data.
☞ "3.2 Load Files"

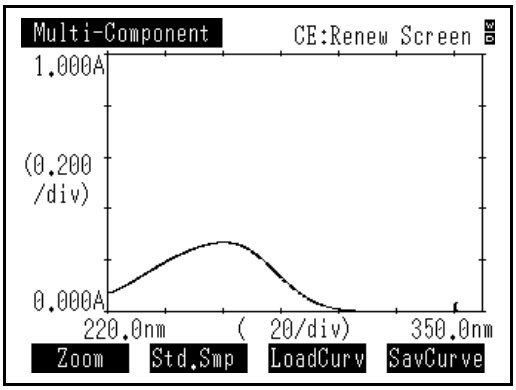
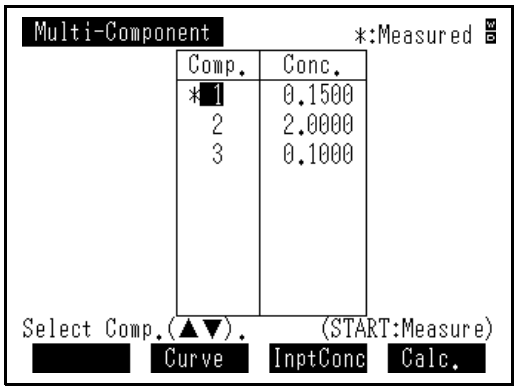


Fig. 11.13 Screen during measurement

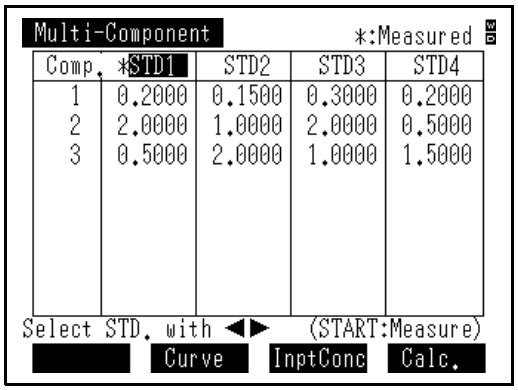
3 When the curve data is loaded, the data (absorbance at the wavelength specified in Fig. 11.1 [8. Meas. λ]) is automatically imported. Then the Standard Sample Data Input screen appears with the data reflected in the list.
The component (standard sample) to which the data has been loaded is indicated with "*".

4 Repeat procedures 1 and 2 for each standard sample, and after all measurements are completed, press the F4 [Calc.] key.

Upon completion of calculation, a message is displayed.
Press the RETURN key to return to the Measurement Parameter Configuration screen.



(Pure sample)



(Mixed sample)

Fig. 11.14 Standard Sample Data Input screen

5 The Measurement Parameter Configuration screen (Fig. 11.1) appears, and the [9. Standard data] column is indicated with "Defined".

11.4 Measurement of Unknown Sample

11.4.1 Measurement Screen

After you finish setting quantitation parameters, press the F3 [MeasDisp] key to switch the Measurement Parameter Configuration screen (Fig. 11.1) into the Component Concentration screen (Fig. 11.13).

Set an unknown sample and press START/STOP key. Then the Spectrum Display screen comes up and the measurement begins. After setting quantitation parameters are completed, you can start the measurement by hitting START/STOP key in the Measurement Parameter Configuration screen (Fig. 11.1).

When the measurement is over, the display turns to the Component Concentration screen (Fig. 11.15), and the concentration of each component in the unknown sample. If an optional screen copy printer is connected to the UV-1800, the result output will be printed when each of the sample measurements is complete (☞ "11.4.2 Data Print for Each Measurement").

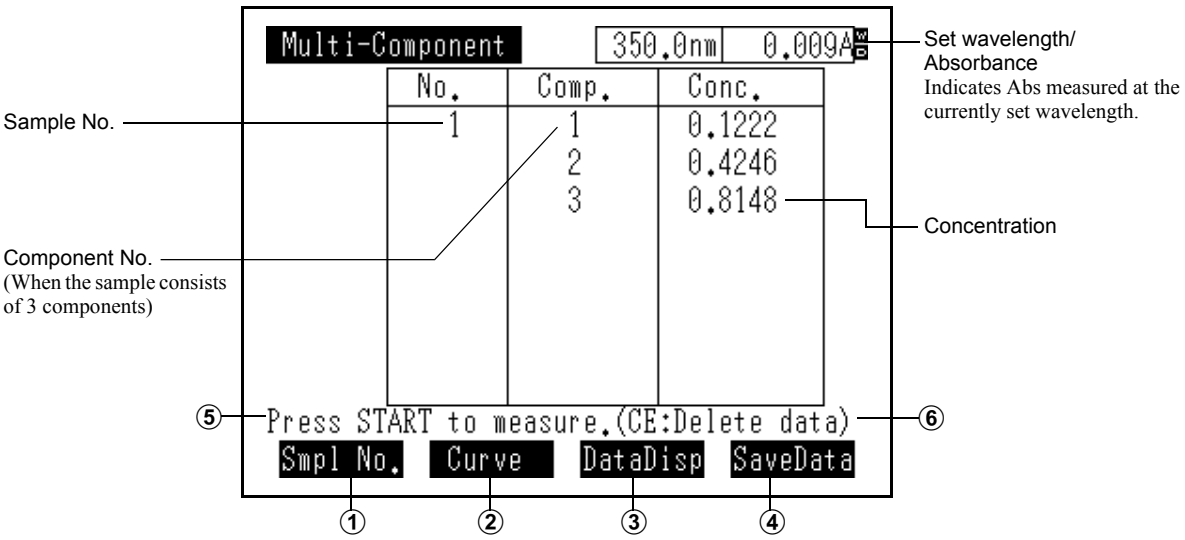


Fig. 11.15 Component Concentration screen

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Used to change the sample number for the next measurement. The sample number can be selected from 0 to 9999.

No.	Key Operation	Display	Description
②	F2	[Curve]	Switches to the Spectrum Display screen on which you can confirm and save the spectral waveform of the unknown sample. ☞ "11.6 Spectrum Display screen" Additionally, by loading spectrum data files stored in the built-in memory or USB memory in the Spectrum Display screen, the concentration for each component is calculated and displayed in the Component Concentration screen, just as if using actually measured data. **NOTE** You can load only the spectrum data under identical parameters to the current parameter settings (Scan range, Measurement mode, and Scan pitch).
③	F3	[DataDisp]	Displays the data list of measurement data (Fig. 11.17). ☞ "11.5.1 Data Display Screen"
④	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"
⑤	START/STOP	–	Starts the measurement of unknown sample. **NOTE** A maximum of 200 measurements can be performed as a single table data file.
⑥	CE	–	Deletes all the data displayed on the screen.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 11.1).

11.4.2 Data Print for Each Measurement

If a hard copy printer is connected to the UV-1800, the measurement results will be printed on the printer for every measurement.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

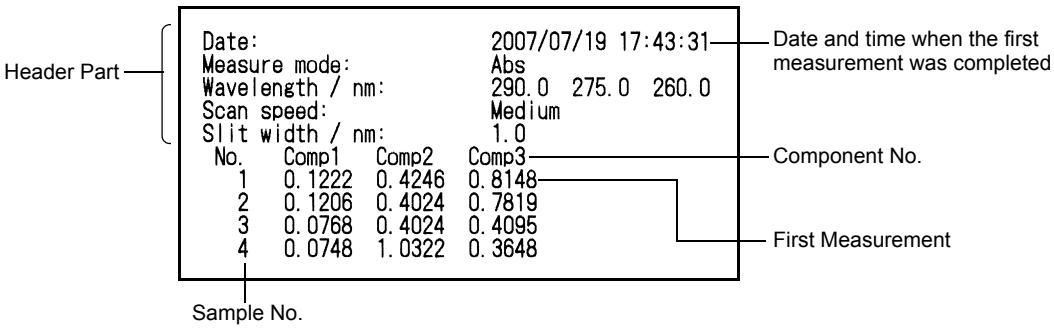


Fig. 11.16 Example of data printout for each measurement

11.5 Data Display

11.5.1 Data Display Screen

When you press the F3 [DataDisp] key in the Component Concentration screen (Fig. 11.15), the Data Display screen (Fig. 11.17) will be displayed.

In this screen, you can browse through all quantitation results obtained up to that point.

Additionally, you can load the data from the built-in memory or USB memory, and print the quantitation results all at once.

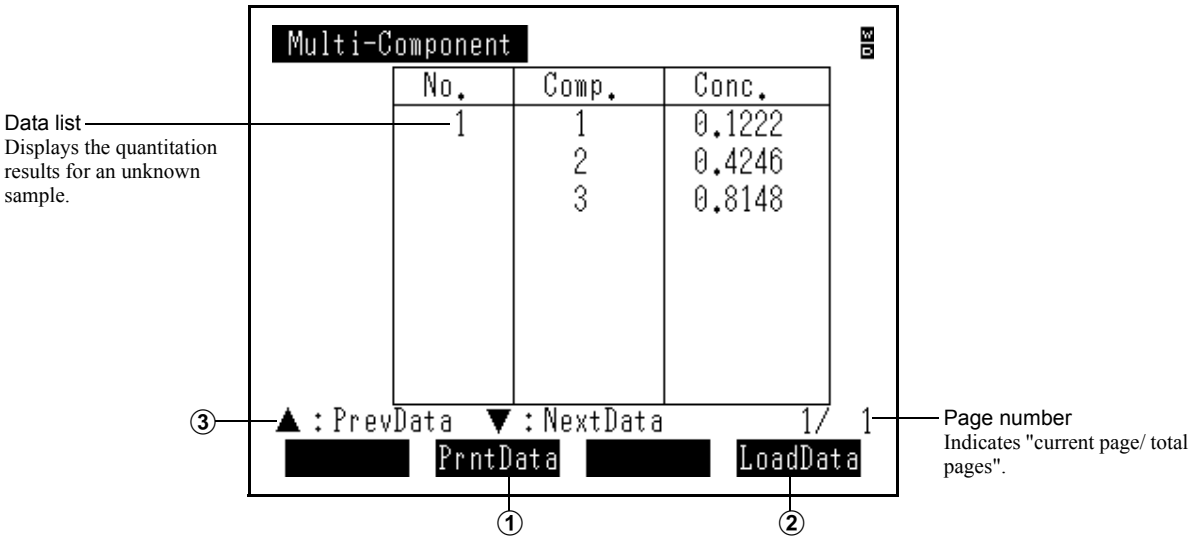


Fig. 11.17 Data Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all data displayed in the list. ☞ "11.5.2 Data Printout"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the data table for each sample.
–	RETURN	–	Returns to the Component Concentration screen (Fig. 11.15).

11.5.2 Data Printout

The entire data can be printed out as a numeric data table on the printer (optional).

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

NOTE

Pressing the (PRINT) key on the keypad will produce only a hard copy of the screen.

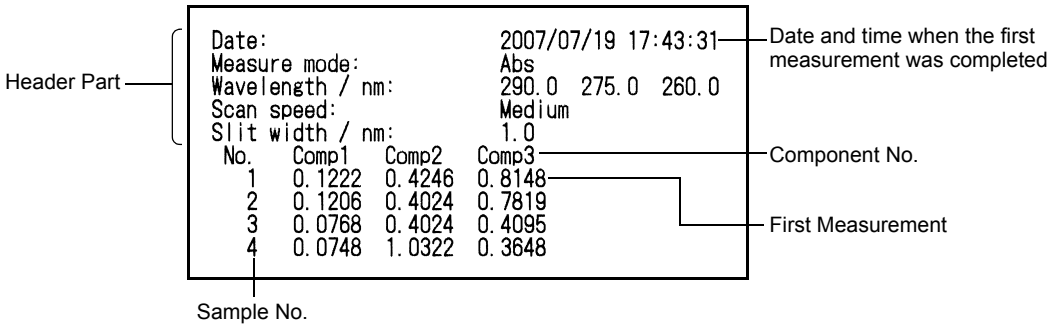


Fig. 11.18 Example of data printout for each measurement

11.6 Spectrum Display screen

When you press the F2 [Curve] key on the Standard Sample Data Input screen (Fig. 11.9) or the Component Concentration screen, the Spectrum Display screen (Fig. 11.19) will be displayed.

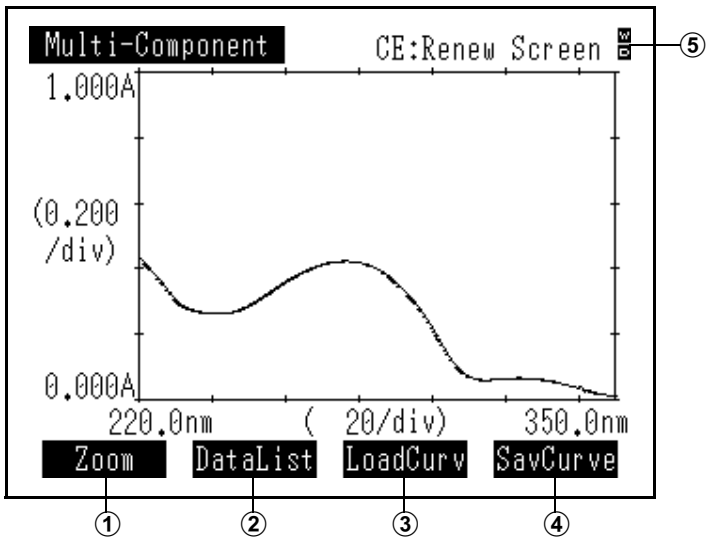


Fig. 11.19 Spectrum Display screen

No.	Key Operation	Display	Description
①	F1	[Zoom]	Allows changing the ranges of the vertical and horizontal axes. ☞ "11.6.2 Zoom Screen"
②	F2	[DataList]	Returns to the screen on which the current spectrum was called up (Standard Sample Data Input screen (Fig. 11.9) or Component Concentration screen (Fig. 11.15)).
③	F3	[LoadCurv]	Loads a curve data file stored in the memory storage. ☞ "3.2 Load Files" The loaded spectrum data can be used as standard or unknown sample data for isolation quantitation calculation.
④	F4	[SavCurve]	Saves measured spectrum data to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
⑤	CE	[Review Screen]	Deletes the spectral waveform displayed on the screen.
–	PRINT	–	Prints a hard copy of the screen currently displayed.

No.	Key Operation	Display	Description
–	◄ ►	–	Displays the cursor on the graph and enables the cursor reading of the data.
–	RETURN	–	Returns to the screen on which the current spectrum was called up (Standard Sample Data Input screen (Fig. 11.9) or Component Concentration screen (Fig. 11.15)).

11.6.1 Reading with Cursor

When you press the ◄ or ► key in the Spectrum Display screen (Fig. 11.19), the Reading with Cursor screen (Fig. 11.20) will be displayed.

In the Reading with Cursor screen (Fig. 11.20) the spectrum data at given measurement wavelength can be read with the cursor.

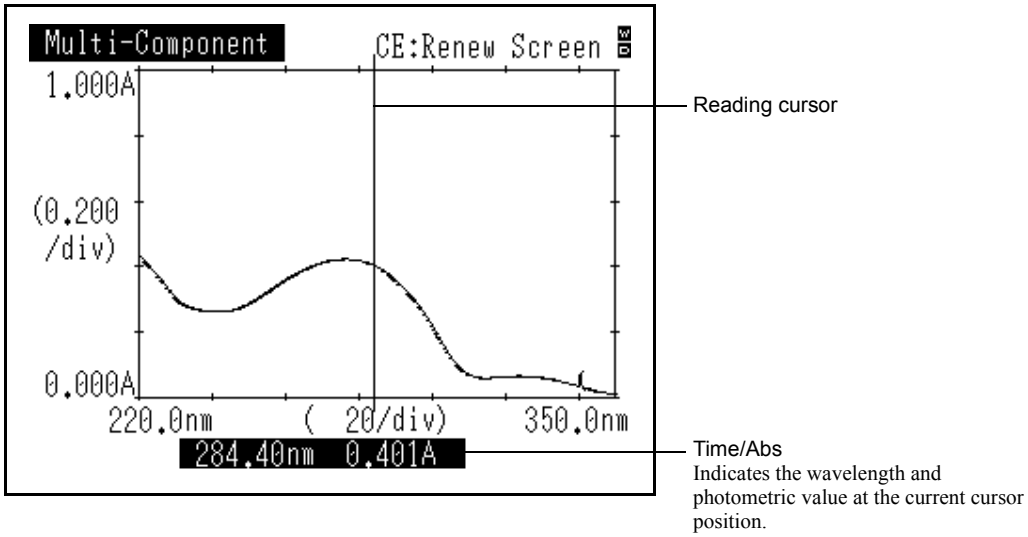


Fig. 11.20 Reading with Cursor screen

Key Operation	Description
◄ ►	Moves the cursor on the spectrum graph and displays the time and Abs at the cursor position. Holding down the ◄ ► key will move the cursor faster.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than the above	The reading cursor disappears and the UV-1800 returns to the Spectrum Display screen (Fig. 11.19).

11.6.2 Zoom Screen

When you press the F1 [Zoom] key in the Spectrum Display screen (Fig. 11.19), the Zoom screen (Fig. 11.21) will be displayed.

The displayed spectrum graph can be enlarged or reduced by changing the vertical or horizontal axis of the spectrum (only enlarged by changing the horizontal axis).

NOTE

1. If the curve data is overwritten on the screen using the curve call function, the enlargement or reduction is applied to the last loaded data.
2. If the measurement result is overwritten, the enlargement or reduction is applied to the last measurement data.

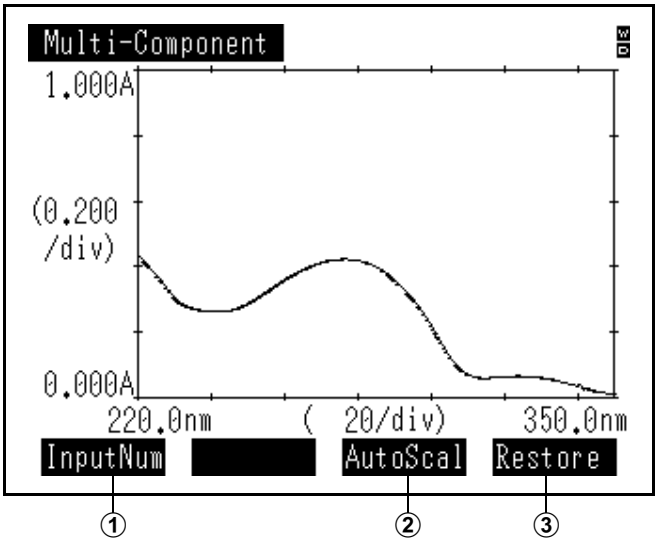
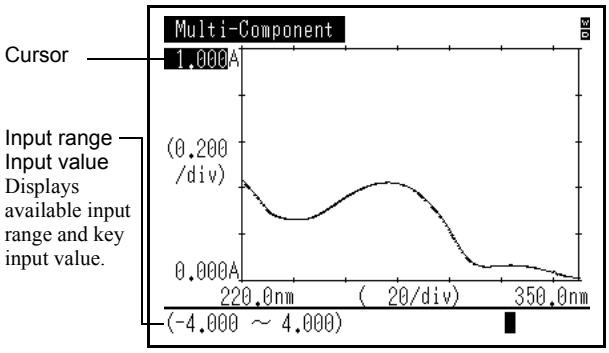


Fig. 11.21 Zoom Screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis range. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing of the ENTER key moves the cursor to [vertical axis upper limit]→[vertical axis lower limit]→[horizontal axis lower limit]→[horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 11.22).  Fig. 11.22 Zoom Screen
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed spectrum automatically.
③	F4	[Restore]	Restores the display range to the original state.
–	PRINT	–	Produces a hard copy of the screen with the zoom operation applied.
–	◄(-) ►	–	Displays the cursor on the spectrum graph to activate the cursor reading function. ☞ "11.6.1 Reading with Cursor"
–	RETURN	–	Returns to the Spectrum Display screen (Fig. 11.19).

This page is intentionally left blank.

Chapter 12 Bio-method

The Bio-method mode allows you to obtain the DNA and protein concentrations with various quantitation methods.

CONTENTS

12.1 Bio-method Selection

When you select [7.Bio-Method] in the [Mode menu] screen (Fig. 2.1), the screen for selecting a quantitation method appears (Fig. 12.1). Select the item number for a desired method with numeric keys while the selection screen (Fig. 12.1) is displayed.

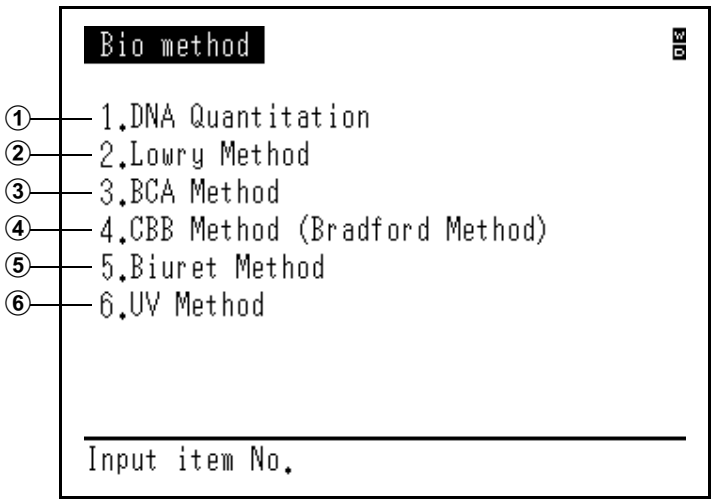


Fig. 12.1 Bio-Method Selection screen

No.	Key Operation	Display	Description
①	1	[DNA Quantitation]	[DNA Quantitation] performs measurement at specified two to three fixed wavelengths and obtains the concentration of DNA and proteins, and absorbance ratio, based on the measured absorbances. You can choose any wavelength for measurements, including the most commonly used wavelengths (260 nm/ 230 nm or 260 nm/ 280 nm). You can add measurements at a wavelength of 320 nm for back ground correction. You can also set the desired parameters for calculating the DNA and protein concentrations in samples. ☞ "12.2 DNA Quantitation"
②	2	[Lowry Method]	This method offers excellent sensitivity and reproducibility. Based on reactions to tyrosine and tryptophan, this method utilizes different absorbance values depending on the type of protein measured, even if the amount of protein is the same. ☞ "12.3 Lowry Method, BCA Method, CBB Method, and Biuret Method"

No.	Key Operation	Display	Description
③	3	[BCA Method]	This method measures the absorbance at a wavelength of 562 nm using a reagent called Bicinchoninic Acid. You must take into consideration that the absorbance is known to increase with time when this method is used. ☞ "12.3 Lowry Method, BCA Method, CBB Method, and Biuret Method"
④	4	[CBB Method (Bradford Method)]	This method measures the absorbance at a wavelength of 595 nm using a reagent called Coomassie Brilliant Blue G-250. ☞ "12.3 Lowry Method, BCA Method, CBB Method, and Biuret Method"
⑤	5	[Biuret Method]	This method is based on the unique peptide linkage of protein as well as the Biuret reaction which involves the formation of a colored compound with copper reagent. This method offers a fast and easy determination of protein concentration. The drawback is its low sensitivity. In this method, absorbance is normally measured at a wavelength of 540 to 560 nm. ☞ "12.3 Lowry Method, BCA Method, CBB Method, and Biuret Method"
⑥	6	[UV Method]	This method determines protein concentration directly from absorbance value and absorptivity in the ultraviolet region, without using any color reagent. This method normally measures absorbance at a wavelength of 280 nm. ☞ "12.4 UV Absorption Method"

For details on the quantitation methods described above, refer to the following references.

1. Warberg, O., and Christian, W. (1942) *Biochem.*Z.310, 384-421.
2. Vernon F. Kalb, Jr., and Robert W. Bernlohr (1977) *Anal. Biochem.* 82, 362-371.
3. Gornall, A.G., Bradawill, C. J. & David, M.M. (1949) *J. Biol. Chem.* 177, 751-766.
4. Lowry, O. H., Rosebrough, N. J., Farr, A. I. & Randall, R. J. (1951) *J. Biol. Chem.* 193, 265-275.
5. Bradford, M. M. (1976) *Anal. Biochem.* 72, 248-254.
6. Smith, P. K., Krohn, R. I., Hermanson, G. T., Mallia, A. K., Gartner, F. H., Provenzano, M. D., Fujimoto, E. K., Goeke, N. M., Olson, B. J. & Klenk, D. C. (1985) *Anal. Biochem.* 150, 76-85.

12.2 DNA Quantitation

12.2.1 Measurement Parameter Configuration Screen

When you select [1. DNA Quantitation] in the Bio-Method Selection screen (Fig. 12.1), the Measurement Parameter Configuration screen (Fig. 12.2) is displayed as follows.
In the DNA quantitation, the following equations are used to calculate DNA and protein concentrations:

Absorbance ratio = A1/A2
DNA = K1 × A1 - K2 × A2 [µg/ml]
Protein = K3 × A2 - K4 × A 1[µg/ml]
(Equation 12.1)

K1 to K4: Factors
A1: Absorbance at wavelength λ1 (Subtract absorbance at wavelength λb when performing BG correction.)
A2: Absorbance at wavelength λ2 (Subtract absorbance at wavelength λb when performing BG correction.)
The factors used in equation 12.1 and wavelength values for measuring absorbance can be set in the Measurement Parameter Configuration screen (Fig. 12.2).

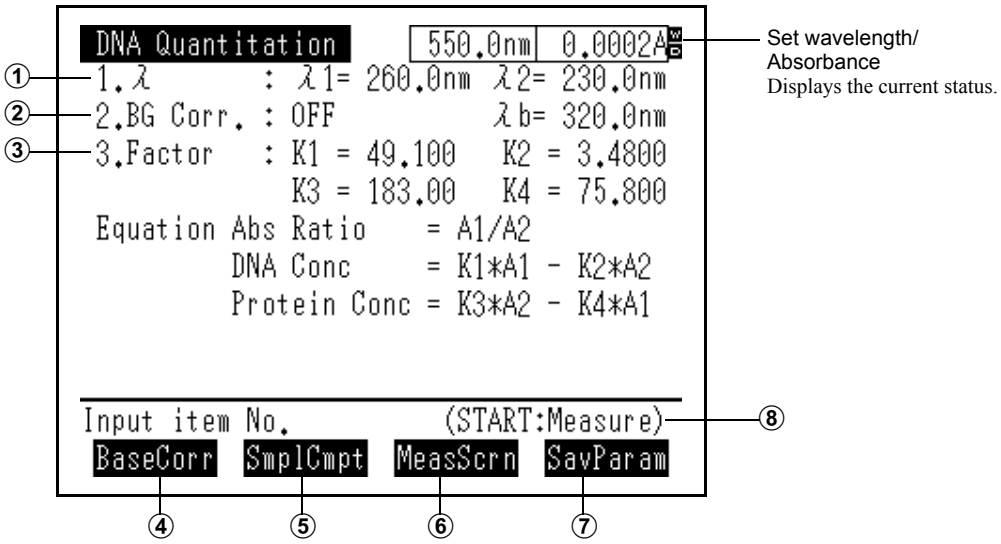


Fig. 12.2 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	1	[λ]	Sets the desired wavelength. ☞ "12.2.2 λ (Wavelength)"
②	2	[BG Corr.]	Indicates whether or not to perform the background correction. Background correction is performed by subtracting absorbance λb from absorbances λ1 and λ2 set in [1. λ]. Each pressing of the key toggles between ON/OFF of the background correction. Specify the wavelength (λb) for background correction in the item [1. λ].

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>③</td><td>3</td><td>[Factor]</td><td>
Specifies the equation factors:

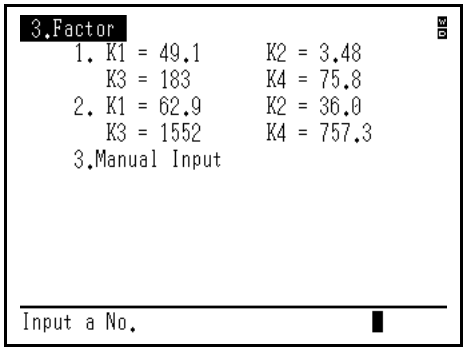
For [3. Manual Input], the input range is from - 9999.9 to 9999.9. The minimum input unit is 0.0001 (the number of significant figures is 5).


Fig. 12.3 Factor Selection screen

The equations used for calculating DNA and protein concentrations (Equation 12.1) are formulated to eliminate mutual interference, which means that the equation factors will be automatically determined once two measurement wavelengths (λ1, λ2) are defined.
Table 12.1 Measurement wavelength and factor in the concentration equation (optical pass length: 10 mm)
<table>
<tr><th></th><th>K1</th><th>K2</th><th>K3</th><th>K4</th></tr>
<tr><td>λ1: 260.0 nm
λ2: 230.0 nm</td><td>49.1</td><td>3.48</td><td>183</td><td>75.8</td></tr>
<tr><td>λ1: 260.0 nm
λ2: 280.0 nm</td><td>62.9</td><td>36.0</td><td>1552</td><td>757.3</td></tr>
</table>
Therefore, if you select wavelengths in [λ] of the Measurement Parameter Configuration screen (Fig. 12.2), the factors are automatically set.
However, the wavelength-factor relationship described in Table 12.1 applies only when using the cell with optical path length of 10 mm. Therefore, when using a different cell, it is required to select the 3 [Manual Input] key to input corrected factors.
For manual input, the input range is from "- 9999.9 to 9999.9" and the lowest digit is "0.0001" (5 significant figures).
Example) When optical path length l = 5 mm,
10/ l = 2
Thus, the corrected factors (Kn') can be obtained as follows:
K1' = K1 × 2, K2' = K2 × 2, K3' = K3 × 2, K4' = K4 × 2
</td></tr>
</table>

No.	Key Operation	Display	Description
④	F1	[BaseCorr]	Select this to a baseline correction over the range covering all selected wavelengths, using a blank sample.
⑤	F2	[SmplCmpt]	Sets the parameters for the sample module. The setting items inlluce the sample module, type, the number of cells, and the operating conditions of the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
⑥	F3	[MeasScrn]	Switches to the Measurement screen.
⑦	F4	[SavParam]	Saves measurement parameters, including the calibration curve equation to the built-in memory storage or USB memory device. ☞ "3.1 Save Files"
⑧	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen (Fig. 12.6). ☞ "12.2.3 Measurement"
⑨	RETURN	–	Returns to the Bio-method Selection screen (Fig. 12.1).

12.2.2 λ (Wavelength)

When you select [λ] in the Measurement Parameter Configuration screen, the λ (Wavelength) Selection screen is displayed (Fig. 12.4).

Select the measurement wavelengths at which to measure A1 and A2 used in Equation 12.1. You can select one of the most frequently used combinations of wavelengths, or input arbitrary wavelengths manually.

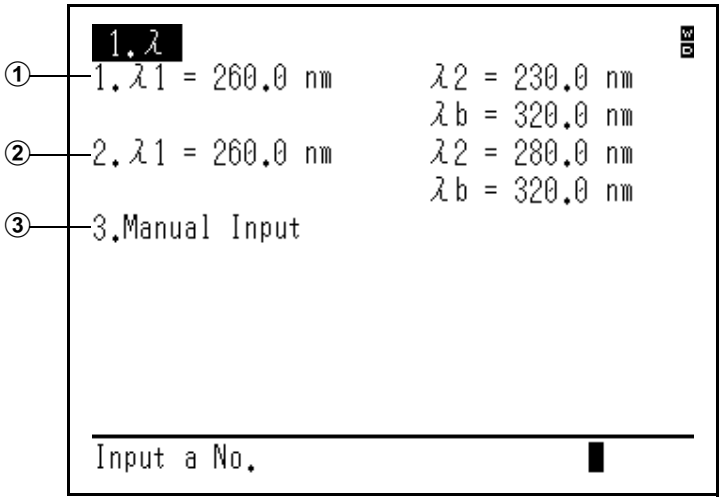
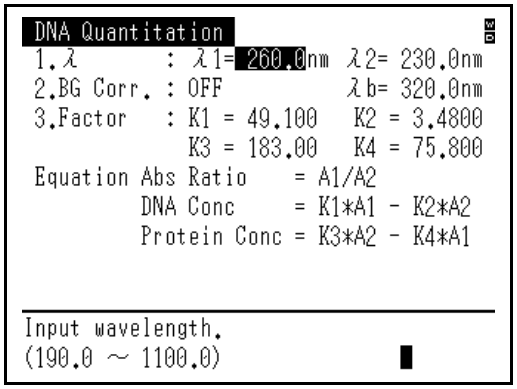


Fig. 12.4 λ (Wavelength) Selection screen

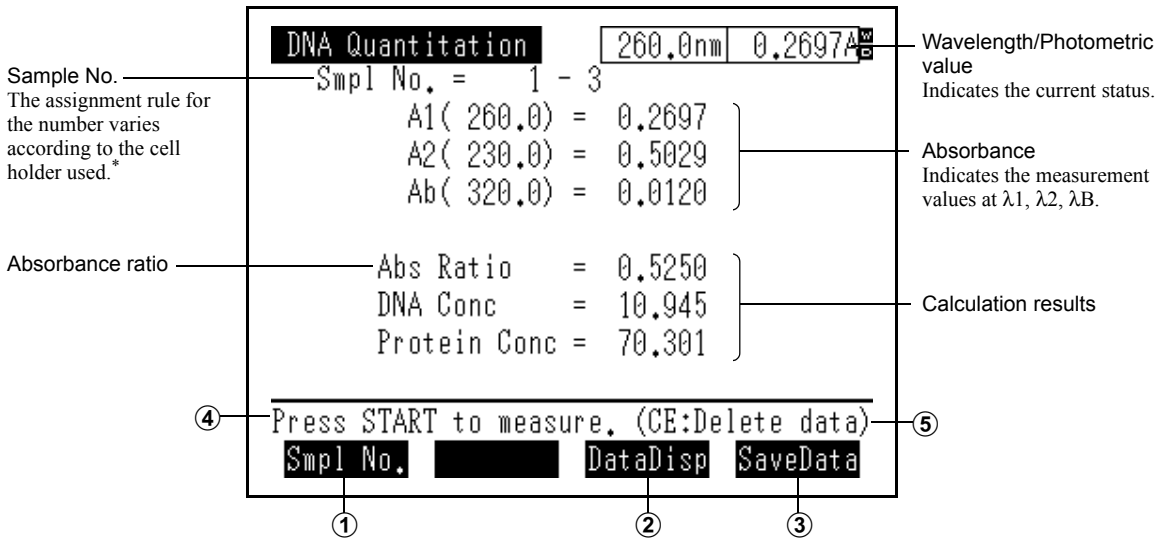
No.	Key Operation	Display	Description
①	1	[λ1=260.0 nm λ2=230.0 nm] [λb=320.0 nm]	Specifies the wavelengths (shown in the left) displayed in the Selection screen (Fig. 12.4) as measurement wavelengths. **NOTE** If the wavelength combination described above is selected, the factors suitable for the wavelengths are automatically set. ☞ "12.2.1 Measurement Parameter Configuration Screen" [3. Factor]
②	2	[λ1=260.0 nm λ2=280.0 nm] [λb=320.0 nm]	Specifies the wavelengths (shown in the left) displayed in the Selection screen (Fig. 12.4) as measurement wavelengths. **NOTE** If the wavelength combination described above is selected, the factors suitable for the wavelengths are automatically set. ☞ "12.2.1 Measurement Parameter Configuration Screen" [3. Factor]
③	3	[Manual Input]	Allows you to manually input measurement wavelengths (λ1, λ2, λb) using the numeric keys. The input range is from 190.0 nm to 1100.0 nm (in units of 0.1 nm).  Fig. 12.5 Measurement Wavelength Manual Input Screen

12.2.3 Measurement

After selecting all the parameters in the Measurement Parameter Configuration screen (Fig. 12.2), press (START/STOP) to start measurement. After the measurement, the Measurement screen (Fig. 12.6) displays the sample No., absorbance values A1, A2, and Ab, absorbance ratio A1/A2 and DNA and protein concentrations.

If overflow occurs because A1 is divided by A2=0, "####" will appear on the screen.

If a hard copy printer is connected to the UV-1800, the measurement results will be printed on the printer for every sample measurement. ☞ "12.2.5 Printout (Output)"



* The display format of sample No. varies according to the set measurement parameters.

■ When measuring a single cell or using the Multi-cell (optional) with the parameter of "Drive cell No." set to "1".
The sample numbers are assigned from 1 sequentially.

■ When measuring multiple cells by attaching the Multi-cell (optional), etc.
A hyphen (-) and cell No. are attached to the sample No.
Example) The first measurement at the cell position "3" => Sample No.: 1-3

Fig. 12.6 Measurement screen

No.	Key Operation	Display	Description
①	F1	[Smpl No.]	Changes the next measured sample number by entering a number in a range between 0 and 9999.
②	F3	[DataDisp]	Displays the list of measurement data. ☞ "12.2.4 List Display"
③	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"
④	START/STOP	–	Starts the measurement under the set parameters. **NOTE** A maximum of 100 measurements can be entered in a single table data file.
⑤	CE	–	Deletes all the data displayed on the screen.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 12.2).

12.2.4 List Display

Fig. 12.7 shows the Data Display screen, where all measurement results are displayed. In addition, you can output those results to the printer all at once, or load the data file stored in the built-in memory or USB memory.

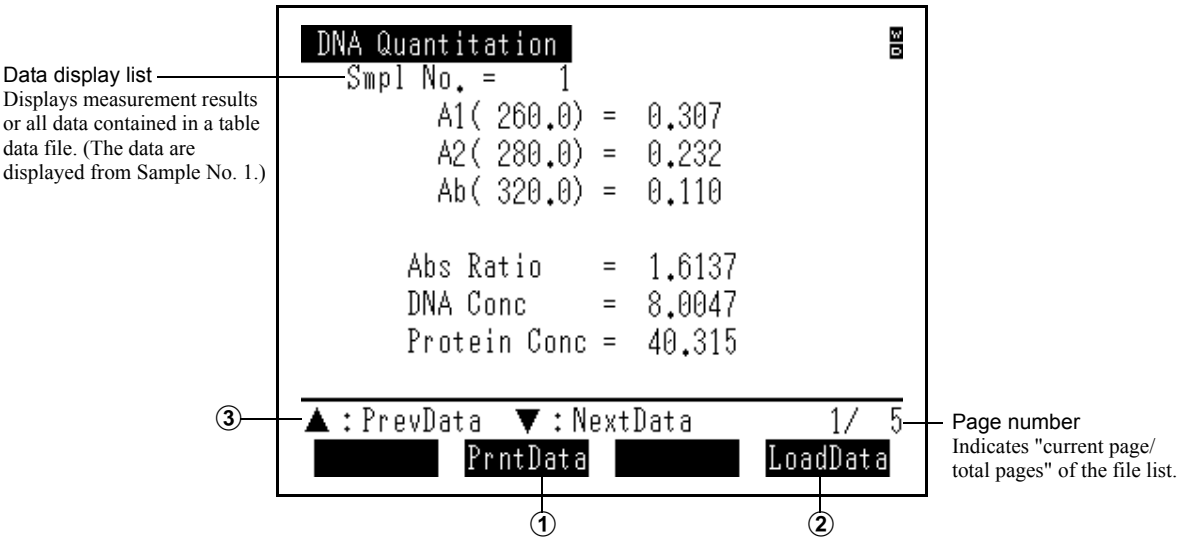


Fig. 12.7 List Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Prints all data listed on the screen. ☞ "12.2.5 Printout (Output)"
②	F4	[LoadData]	Loads the table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the screen. Each pressing of the key scrolls the screen by 1 sample data set.
–	RETURN	–	Returns to the Measurement screen (Fig. 12.6).

12.2.5 Printout (Output)

Fig. 12.8 shows an example of data printout.

In DNA quantitation, the result can be printed for each measurement, or the entire results can be printed all at once. Both print modes use the same print format.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

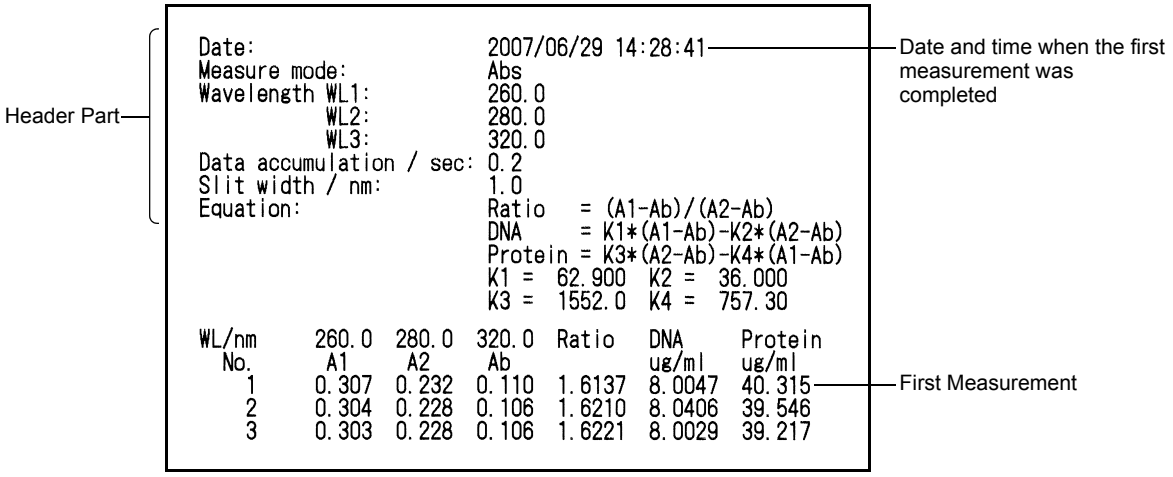


Fig. 12.8 Example of data printout for each measurement

■ Printout for each measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed out on the printer for every measurement of the sample.

■ Print all at once

When you select the F2 [PrntData] key in the List Display screen (Fig. 12.7), all measurement results up to that point, or all the data within the currently loaded table data file will be printed.

NOTE

Pressing the PRINT key in the Measurement screen (Fig. 12.6) or the List Display screen (Fig. 12.7) will produce only a hard copy of the displayed screen.

12.3 Lowry Method, BCA Method, CBB Method, and Biuret Method

12.3.1 Measurement Parameter Configuration Screen

When you select [Lowry Method], [BCA Method], [CBB Method], or [Biuret Method] in the Bio-Method Selection screen (Fig. 12.1), the Measurement Parameter Configuration screen is displayed as follows.

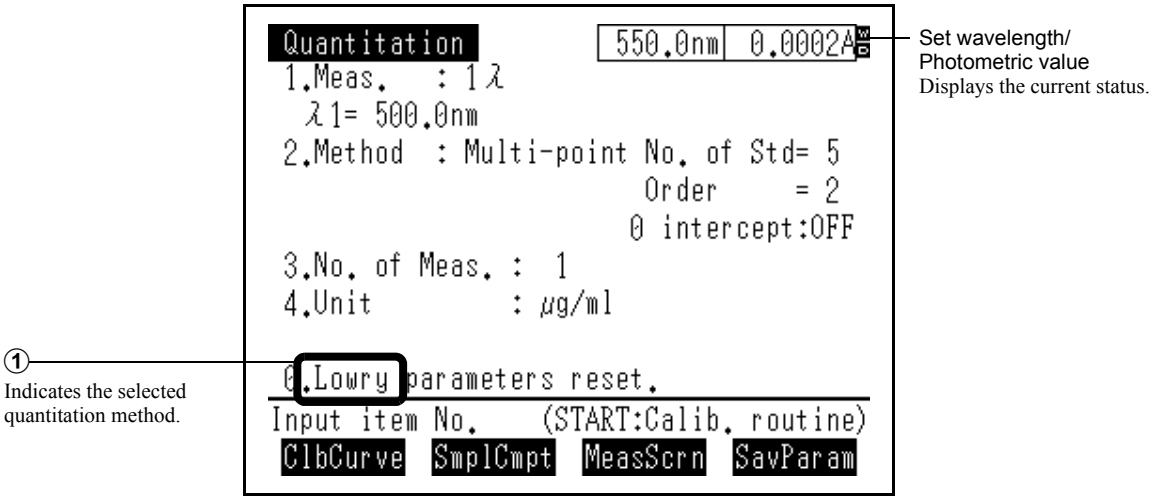


Fig. 12.9 Measurement Parameter Configuration screen (when Lowry method is selected)

Except for [0. Reset parameters (defined value)], the items displayed on the screen are identical to those for the Quantitation Mode. Since all measurement function, etc., are also the same, refer to Chapter 7 "Quantitation" for details on the functions and operation procedures.
This section only describes the parameter configuration functions.

No.	Key Operation	Display	Description
①	0	[Reset parameters (Lowry)]	Resets the measurement parameters to the pre-defined values. ☞ "12.3.2 Measurement Parameters (Defined Values)"

12.3.2 Measurement Parameters (Defined Values)

Table below shows the pre-defined values for each quantitation method. These defined parameters facilitate the subsequent procedures and can also be arbitrarily modified after the setting.

Table 12.2 Measurement Parameters (Defined Values) for Different Bio-Method

Quantitation method	Lowry method	BCA method	CBB method	Biuret method
Measurement method	1λ quantitation	1λ quantitation	1λ quantitation	1λ quantitation
Measurement wavelength (λ1)	500.0 nm	562.0 nm	595.0 nm	540.0 nm
Calibration curve method	Multi-point calibration curve method	Multi-point calibration curve method	Multi-point calibration curve method	Multi-point calibration curve method
No. of standards	5	5	5	5
Order of multi-point calibration curve method	Quadratic	Quadratic	Quadratic	Linear
Zero intercept	No	No	No	No
No. of repetitions	1	1	1	1
Unit	μg/ml	μg/ml	μg/ml	mg/ml

12.4 UV Absorption Method

12.4.1 Measurement Parameter Configuration Screen

When you select [6. UV Method] in the Bio-Method Selection screen (Fig. 12.1), the Measurement Parameter Configuration screen will be displayed as follows.

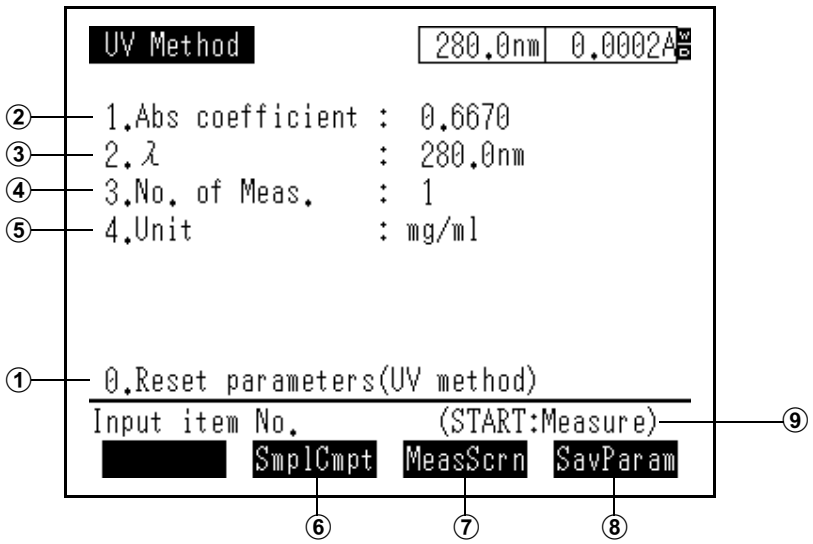


Fig. 12.10 Measurement Parameter Configuration screen

No.	Key Operation	Display	Description
①	0	[Reset parameters (UV method)]	Resets the changed measurement parameters to the pre-defined values. ■Defines values Quantitation method / Defined values: Absorbance coefficient: 0.6670 Measurement wavelength: 280.0 nm No. of repetitions: 1 Unit: mg/ml
②	1	[Abs coefficent]	Enter the desired absorptivity for the protein to be measured. The input range is from 0.0001 to 99.999 (The number of significant figures is 5). The concentration can be calculated by (absorbance/ absorptivity). The frequently used absorptivity BSA (bull serum albumin) has been selected as the default setting.
③	2	[λ]	Select the desired wavelength as which to perform quantitative analysis. Normally, set it to 280 nm. The input range is from 190.0 nm to 1100.0 nm (in units of 0.1 nm).

No.	Key Operation	Display	Description
④	3	[No. of Meas.]	Specifies how many times the same sample is to be measured. Input range of repetition count: 1 to 10 ■When the repetition count is set to more than 1 • Standard sample: The measurement is repeatedly performed and the mean value for absorbance is used. • Unknown sample: The measurement is repeatedly performed and both the measured values and mean value are displayed. To abort the repeating measurement, press the RETURN key. In this case, the mean value will not be calculated. **NOTE** If a multi-cell or similar holder is used with the number of cells set to more than one, the repeating measurement function takes priority. The interlocked measurement of multiple cells cannot be carried out.
⑤	4	[Unit]	Specifies the concentration unit for the Quantitation result by selecting one of the following units: None, %, ppm, ppb, g/l, mg/ml, ng/ml, M/L and µg/ml You can also register the desired unit other than those listed above. ☞ "12.4.2 Select Concentration Unit"
⑥	F2	[SmplCmpt]	Sets the parameters for the sample module. The setting items include the sample module type, the number of cells, and the operating conditions of the sipper. ☞ Chapter 18 "Sample Module Control (Multi-cell, Sipper Operation)"
⑦	F3	[MeasScrn]	Switches to the Measurement screen.
⑧	F4	[SavParam]	Saves measurement parameters, including the calibration curve equation. ☞ "3.1 Save Files"
⑨	START/STOP	–	Starts the measurement under the set parameters and displays the Measurement screen. ☞ "12.4.3 Measurement"
–	RETURN	–	Returns to the Bio-method Selection screen.

12.4.2 Select Concentration Unit

When you press the 4 [Unit] key in the Measurement Parameter Configuration screen (Fig. 12.10), the Concentration Unit screen (Fig. 12.11) is displayed.

Move the cursor to a desired concentration unit using the ▲ ▼ keys, and confirm it with the ENTER key.

To use a unit other than those displayed on the list, select [Unit Regist.] on the screen.

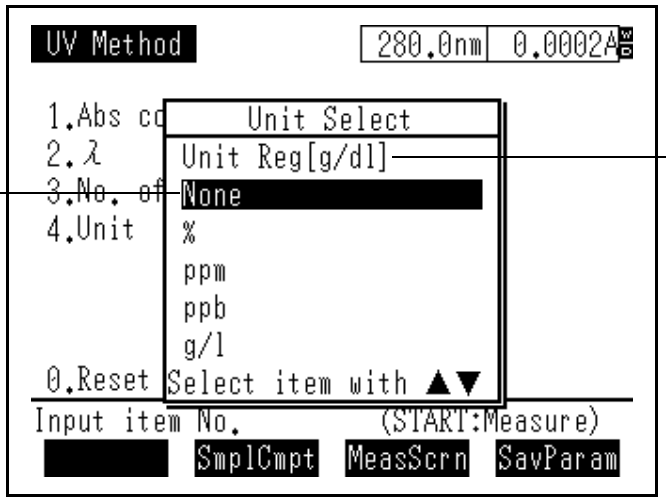


Fig. 12.11 Concentration Unit screen

If [Unit Regist.] is selected, the [Unit Registration] screen appears (Fig. 12.12).

Using the ▲ ▼ ◄(-) ► keys, move the cursor to desired characters on the list, and cofirm with the ENTER key.

Press the F1 [Register] key to register the unit you have entered. The unit will be displayed in the Measurement Parameter Configuration screen (Fig. 12.10).

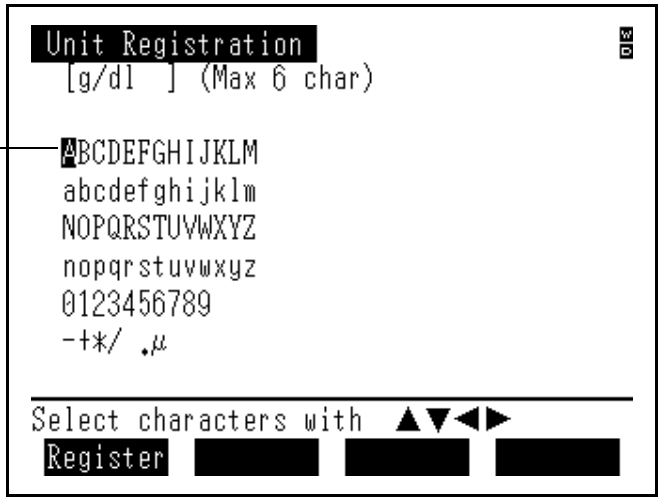
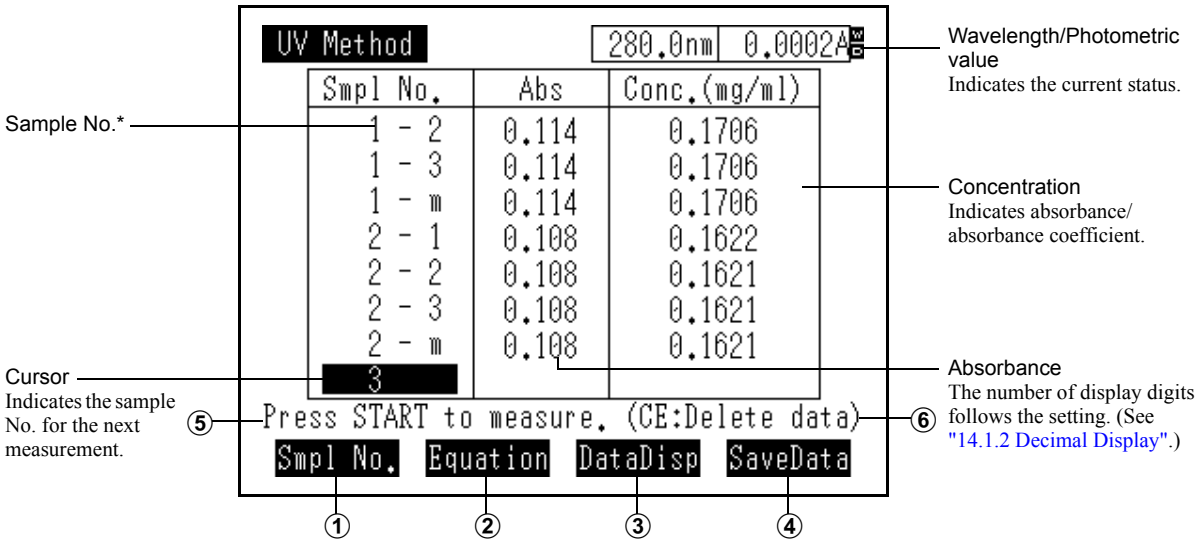


Fig. 12.12 [Unit Registration] screen

12.4.3 Measurement

Press the F3 [DataDisp] key or the START/STOP key while the Measurement Parameter Configuration screen (Fig. 12.10) is displayed. The Measurement screen will appear (Fig. 12.13). If the START/STOP key is pressed, the first measurement run will be carried out.

It a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed on the printer for every measurement of the sample.



* The display format of sample No. varies according to the set measurement parameters.

■ When measuring a single cell or using the Multi-cell (optional) with the parameter of "Drive cell No." set to "1".
The sample numbers are assigned from 1 sequentially.

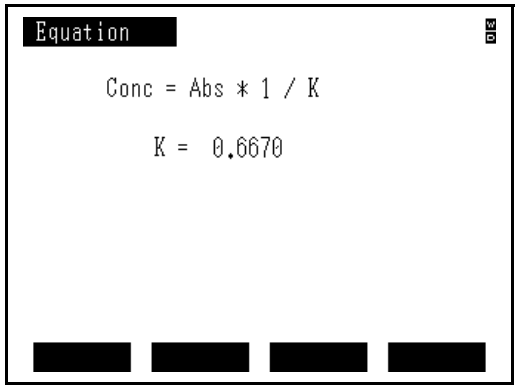
■ When measuring multiple cells by attaching the Multi-cell (optional), etc.
A hyphen (-) and cell No. are attached to the sample No.
Example) The first measurement at the cell position "3" => Sample No.: 1-3

■ When measurements are repeated
A hyphen (-) and repetition count or "m" signifying a mean value are attached to the sample No.
Example) The second measurement of the first sample => Sample No.: 1-2 (1-m for the mean value)

Fig. 12.13 Measurement screen

NOTE

The repeating measurement while using a multi-cell or similar holder (optional) with the multiple cells cannot be carried out.

No.	Key Operation	Display	Description
①	1	[Smpl No.]	Changes the next measured sample number by entering a number in range between 0 and 9999.
②	F2	[Equation]	Displays the equation for concentration calculation.  Fig. 12.14 Concentration equation display
③	F3	[DataDisp]	Displays the list of measurement data. ☞ "12.4.4 List Display"
④	F4	[SaveData]	Saves the measurement results as a table data file to the memory storage. ☞ "3.1 Save Files"
⑤	START/STOP	–	Starts the measurement under the set parameters. Note: A maximum of 200 measurements can be entered in a single table data file.
⑥	CE	–	Deletes all the data displayed on the screen.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 12.9).

12.4.4 List Display

When you press the F3 [DataDisp] key in the Measurement screen (Fig. 12.13), a list of measurement results is displayed (Fig. 12.15).

As the measurement is repeated on the Measurement screen (Fig. 12.13), the data will be scrolled with only the latest eight measurement results displayed on the screen. The List Display is the function that can display the list of all measurement results.

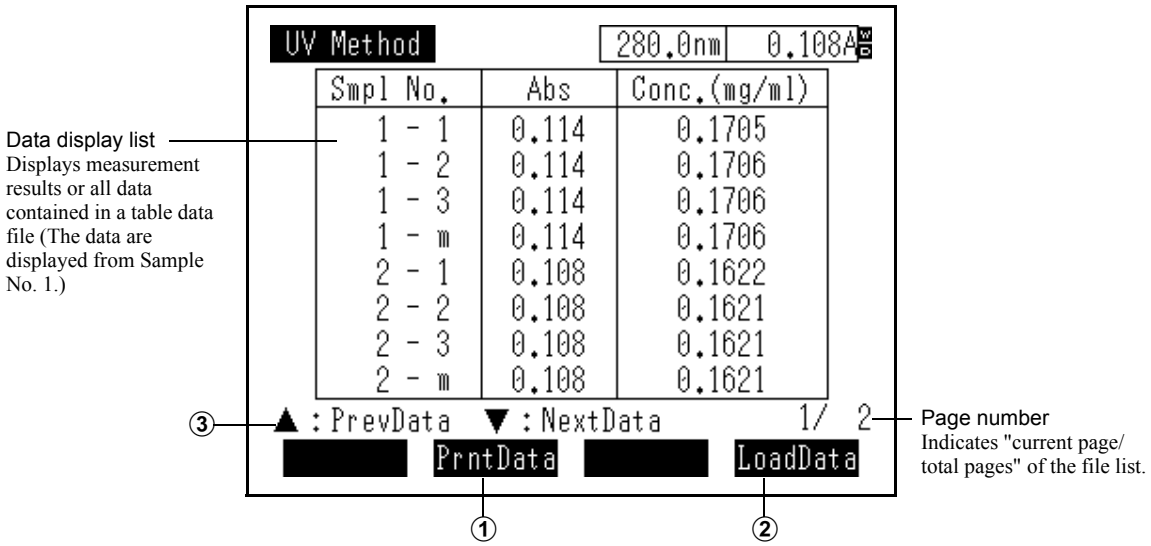


Fig. 12.15 List Display screen

No.	Key Operation	Display	Description
①	F2	[PrntData]	Print all data listed on the screen. ☞ "12.4.5 Printout (Output)"
②	F4	[LoadData]	Loads a table data file stored in the memory storage. ☞ "3.2.1 Load Single File"
③	▲ ▼	–	Allows scrolling the data table to review the hidden measurement data. Each pressing of the key scrolls the table by 8 data lines.
–	RETURN	–	Returns to the Measurement screen (Fig. 12.13).

12.4.5 Printout (Output)

Fig. 12.16 shows an example of data printout.

In UV absorption method, the result can be printed for each measurement, or the entire results can be printed all at once. Both print modes use the same print format.

In the header part, the date and time of the end of the first measurement as well as the measurement parameters are printed.

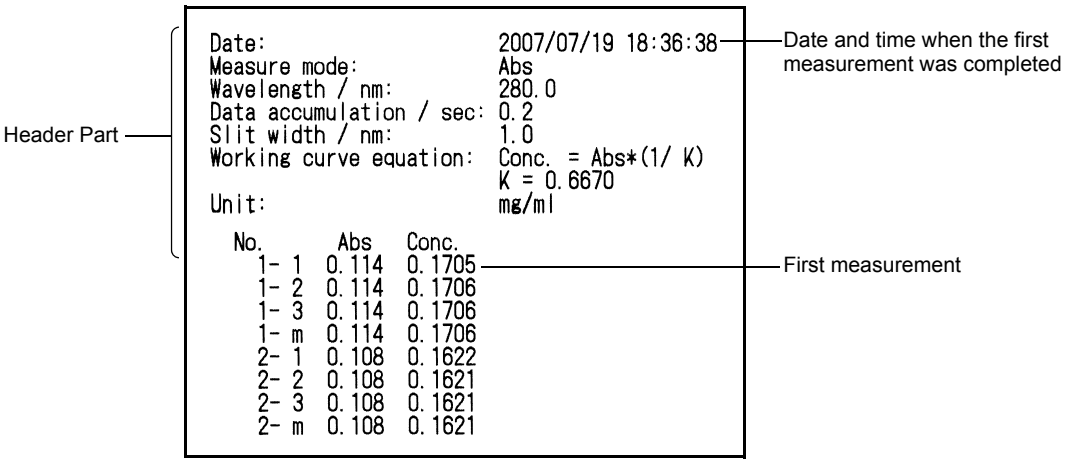


Fig. 12.16 Example of data printout for each measurement

■ Printout for each measurement

If a hard copy printer (optional) is connected to the UV-1800, the measurement results will be printed out on the printer for every measurement of the sample.

■ Print all at once

When you select the **F2** [PrntData] key in the List Display screen (Fig. 12.15), all measurement results up to that point, or all the data within the currently loaded table data file will be printed.

> **NOTE**
> Pressing the **PRINT** key in the Measurement screen (Fig. 12.6) or the List Display screen (Fig. 12.7) will produce only a hard copy of the displayed screen.

Chapter 13 Data Processing

The data processing function can be used from the Spectrum mode or the Time Scan mode. This function allows you to apply the following processing options to the measured waveform data:

- Mathematical calculation
- Derivative processing (including smoothing)
- Peak detection
- Area calculation
- Point pickup
- Printout

CONTENTS

13.1 Processing Options Screen

Upon pressing the F2 [DataProc] key on the Measurement screen (Spectrum mode) or on the Curve Display screen (Time Scan mode), the Processing Options screen appears.
The last measured data is displayed and can be processed. To process the data that is already stored in the built-in memory of the main unit or the USB memory, call the corresponding file using the Call Curve function.
(Multiple waveforms cannot be displayed simultaneously on the Data Processing screen.)

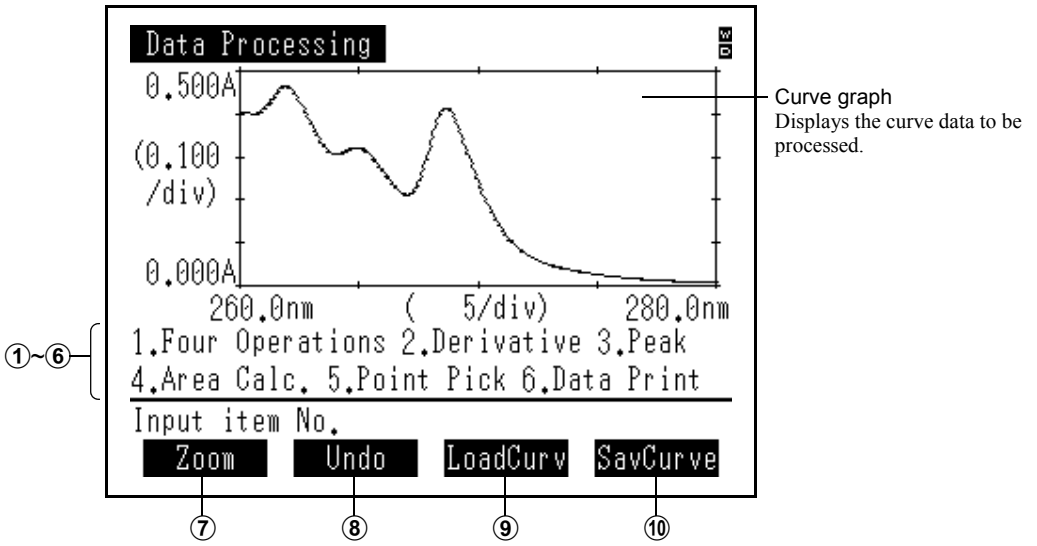


Fig. 13.1 Processing Options screen

No.	Key Operation	Display	Description
①	1	[Four Operations]	Allows performing arithmetic operations between curve data and values and operation between curve data. However, no data can be calculated if unit inconsistencies exist between the vertical and horizontal axes. ☞ "13.2 Arithmetic Operations"
②	2	[Derivative]	Applies the 1st to 4th order differential operation or smoothing to the curve data. ☞ "13.3 Derivative Operations"
③	3	[Peak]	Detects the peaks or valleys of the curve data and then displays them as a list of values on the vertical and horizontal axes. Up to 20 peaks or valleys can be detected. ☞ "13.4 Peak Detection"
④	4	[Area Calc.]	Calculates the area enclosed by the curve data and the horizontal axis. ☞ "13.5 Area Calculation"

No.	Key Operation	Display	Description
⑤	5	[Point pick]	Displays, as a list, values on the vertical axis against the horizontal axis at arbitrary or constant intervals of the curve data. Up to 20 points can be displayed. ☞ "13.6 Point Pick"
⑥	6	[Data Print]	Prints the measurement parameters and the data at each sampling point on the curve data. ☞ "13.7 Print Processing"
⑦	F1	[Zoom]	Changing the range of Y-axis and X-axis of displayed curve chart enables enlarging/reducing of the chart. ☞ "13.1.2 Enlarging/Reducing"
⑧	F2	[Undo]	Undoes the last data processing. You can undo only the last operation. This item is only displayed when the undo operation is possible.
⑨	F3	[LoadCurv]	Loads curve data files stored in the memory storage. ☞ "3.2 Load Files"
⑩	F4	[SavCurve]	Saves processed curve data to the memory storage. ☞ "3.1 Save Files"
–	RETURN	–	Returns to the screen on which this function was celled up.
–	◄(-) ►	–	Displays the cursor on the graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"

13.1.1 Reading with Cursor

When you press the ◄(-) or ► key in the Processing Options screen (Fig. 13.1) or in the Operation Result screen displaying the curve data graph, the Reading with Cursor screen (Fig. 13.2) will be displayed.

In the Reading with Cursor screen (Fig. 13.2), the curve data at a given measurement time can be read with the cursor.

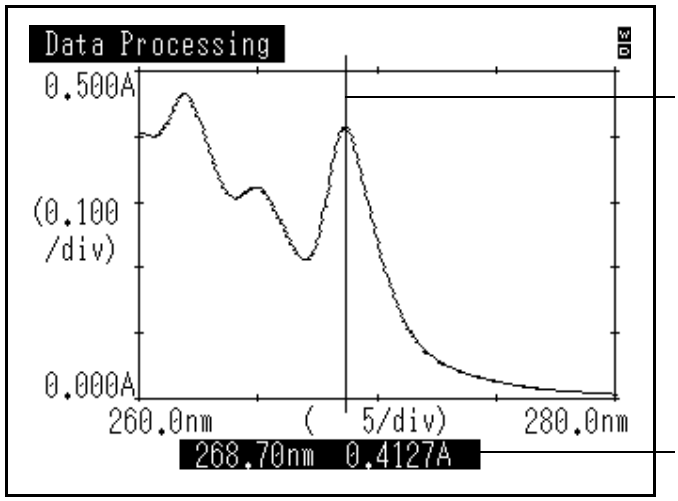


Fig. 13.2 Reading with Cursor screen

Key Operation	Description
◄(-) ►	Moves the cursor on the curve graph and displays the horizontal and vertical values. Holding down the ◄(-) ► key will move the cursor faster.
PRINT	Prints a hard copy of the screen currently displayed.
Any keys other than the above	The reading cursor disappears, and the UV-1800 returns to the Processing Options screen (Fig. 13.1).

13.1.2 Enlarging/Reducing

When you press the F1 [Zoom] key on the Processing Options screen (Fig. 13.1), the Zoom screen is displayed.

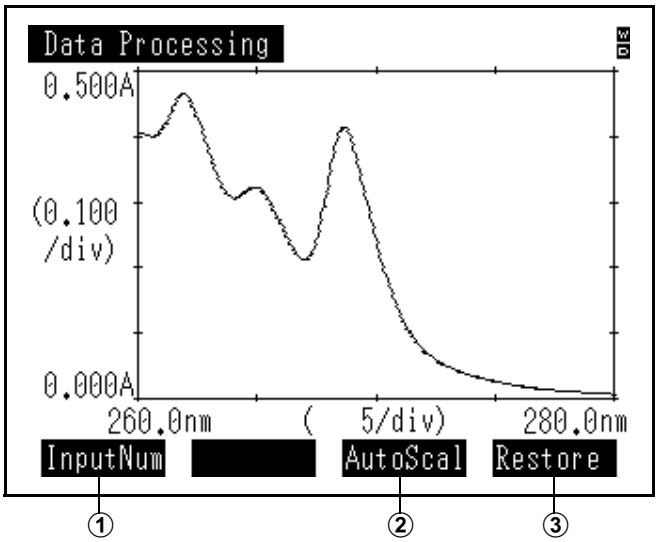
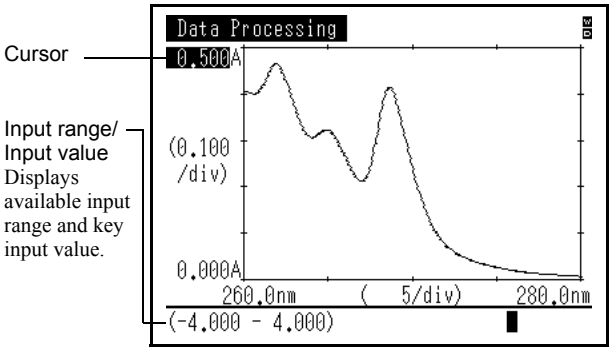


Fig. 13.3 Zoom screen

No.	Key Operation	Display	Description
①	F1	[InputNum]	Enlarges or reduces the graph by directly specifying the vertical or horizontal axis range. Specify the range value at the cursor position with numeric keys, and confirm it with the ENTER key. Each pressing of the ENTER key moves the cursor to [vertical axis upper limit] → [vertical axis lower limit] → [horizontal axis lower limit] → [horizontal axis upper limit], and finally returns to the Zoom screen (Fig. 13.4).  Fig. 13.4 Zoom screen **NOTE** Data exist only at each sampling interval. Therefore, when values other than the integral multiple of the sampling interval are entered as horizontal axis values, the entered values are automatically replaced with the wavelength (time) values nearest to the existing data values.
②	F3	[AutoScal]	Adjusts the vertical axis range according to the displayed curve automatically.
③	F4	[Restore]	Restores the display range to the original state.
–	PRINT	–	Produces a screen hard copy with the zoom operation applied.
–	◄(-) ►	–	Displays the cursor on the graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"
–	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).

13.1.3 Example of Data Printout

The printout examples of arithmetic operations (☞ "13.2 Arithmetic Operations"), derivative operations (☞ "13.3 Derivative Operations"), and area calculations (☞ "13.5 Area Calculation") are given below.

When you press the F2 [DataPrnt] key in the Operation Result screen of each operation, the screen hard copy of the processed result and measurement parameters of the original data are printed.

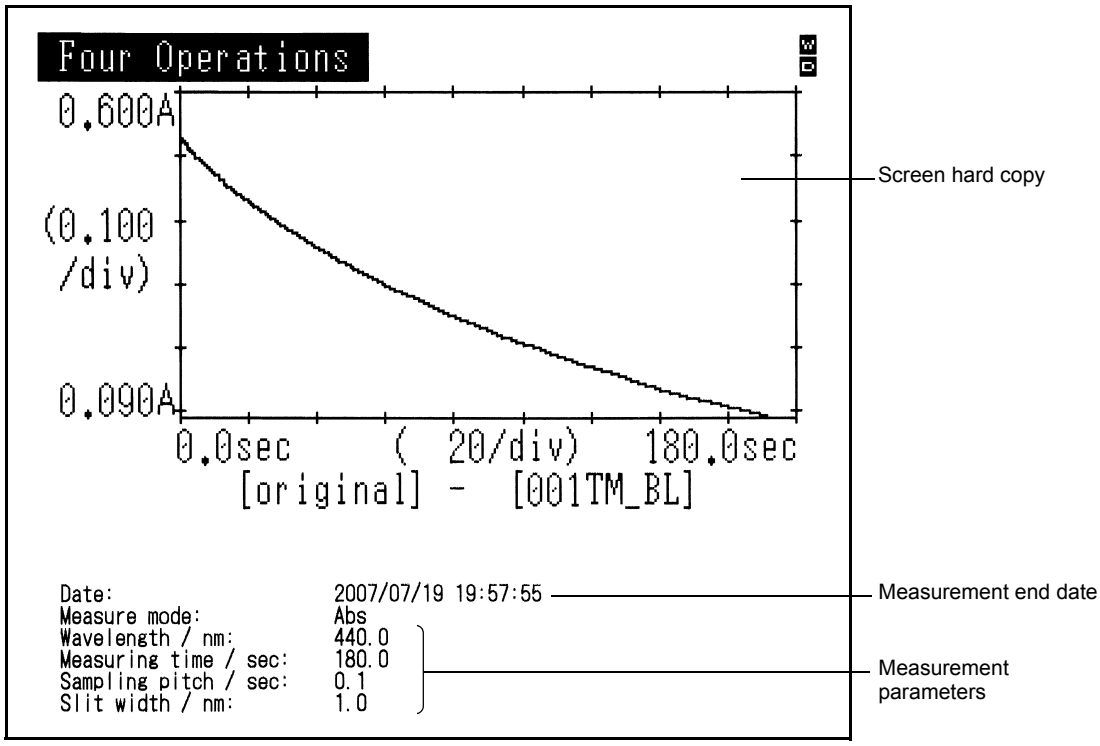


Fig. 13.5 Example of data printout (arithmetic operation)

13.2 Arithmetic Operations

This option allows you to perform arithmetic operations between the curve data and values or operations between the curve data displayed on the Processing Options screen.

13.2.1 Selecting Data

1 Press the (1) [Four Operations] key on the Processing Options screen (Fig. 13.1) to display the Operator Selection screen (Fig. 13.6).
Move the cursor to the desired operator with the (▲) (▼) keys, and confirm with the (ENTER) key.

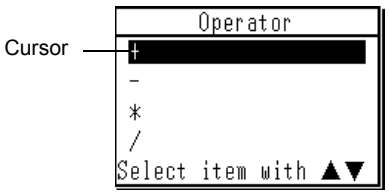


Fig. 13.6 [Operator] Selection screen

2 The screen appears for selecting the data to be operated (Fig. 13.7). Select [Curve data file] when operating a curve data that is stored in the memory, or select [Factor] when performing the four operations with factor.
Move the cursor with the (▲) (▼) keys, and confirm the selection with the (ENTER) key.

Fig. 13.7 Data Selection screen

13.2.2 Arithmetic Operations with Factor

This option allows you to perform the arithmetic operations (+, –, ×, and ÷) between the curve data and values that have been displayed (called) on the Processing Options screen.

1 When you select [Factor] as operation target, the Factor Input screen (Fig. 13.8) is displayed.

2 Enter a numeric value (factor) with numeric keys with the input range of - 9999.9 to 9999.9 (the number of significant figures: 5, the minimum input unit: 0.0001.)

3 After having entered the factor, press the (ENTER) key to perform the arithmetic operation.
Press the (RETURN) key to return to the Processing Options screen (Fig. 13.1).

4 When the operation has completed, the Operation Result screen (Fig. 13.13) will display the processed curve data.

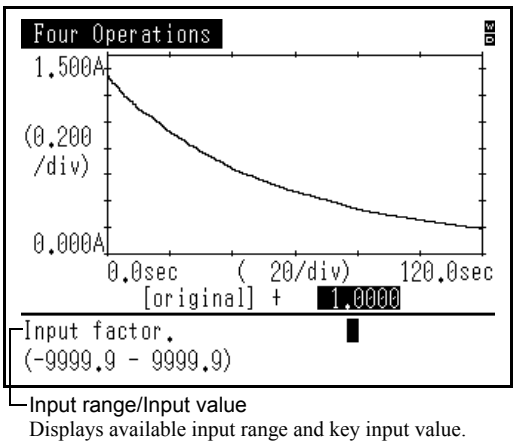


Fig. 13.8 Factor Input screen

13.2.3 Arithmetic Operations with Curve Data

You can load the curve data stored in the built-in instrument memory or in USB memory as an operation target, and perform arithmetic operations.
However, no arithmetic operations can be performed on data containing unit inconsistencies between the vertical axis (Abs, %T, and E) and the horizontal axis (nm, sec, and min).

1 When you select "Curve data file" as operation target, the Load Files screen (Fig. 13.9) is displayed.
Use the ▼ ▲ ◄(-) ► keys to move the cursor to the desired curve data, and press the ENTER key to load the file.
Press the RETURN key to return to the Processing Options screen (Fig. 13.1).
(For details on the Load Files screen functions and operation procedure, refer to "3.2 Load Files" in this manual.)

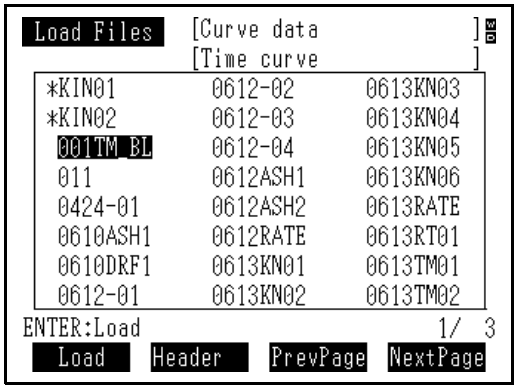


Fig. 13.9 Load Files screen

2 When the file is loaded, the waveform stored in the curve data and the file name are displayed.
Press the START/STOP key to perform the arithmetic operation. The Operation Result screen (Fig. 13.13) is displayed.
Press the CE key to return to the Load Files screen (Fig. 13.9).

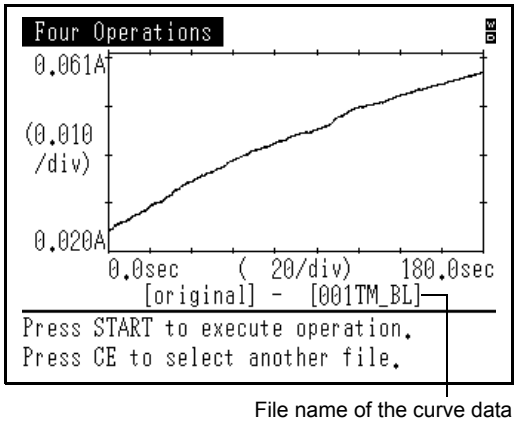


Fig. 13.10 Data Review screen

3 When the operation has completed, the Operation Result screen (Fig. 13.13) will display the processed curve data.

NOTE

When performing an arithmetic operation between two curve data sets with different horizontal axis ranges and sampling intervals, the operation will be performed as follows:

■ When the horizontal axis range is different

The arithmetic operation will be performed on the overlapping part of the two data ranges.

Example)

- Original data (wavelength range: 400 nm to 600 nm)
- Operation target data (wavelength range: 420 nm to 620 nm)

In the case above, the following data is generated:

- Operation result data (wavelength range: 420 nm to 600 nm)

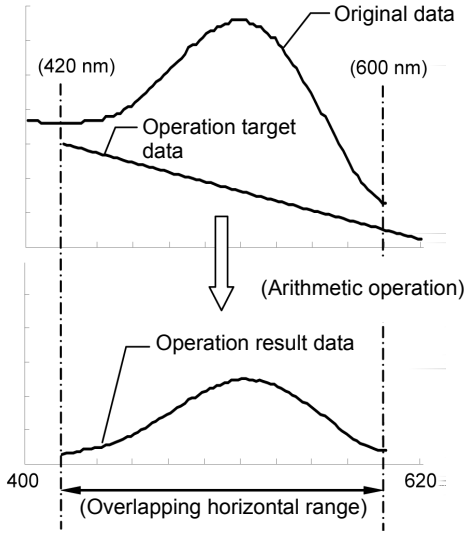


Fig. 13.11 Operation of data with different horizontal ranges

■ When the sampling interval is different

The arithmetic operation is performed by interpolating the operation target data in compliance with the sampling interval (wavelength) of the original data, as shown in the right figure.

Example)

- Original data (sampling interval: 0.2 nm)
- Operation target data (sampling interval: 0.5 nm)

In the case above, the following data is generated:

- Operation result data (sampling interval: 0.2 nm)

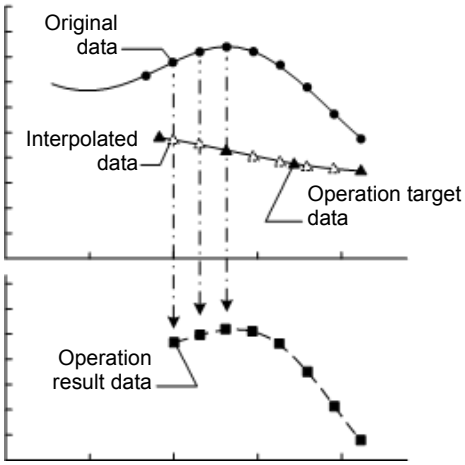
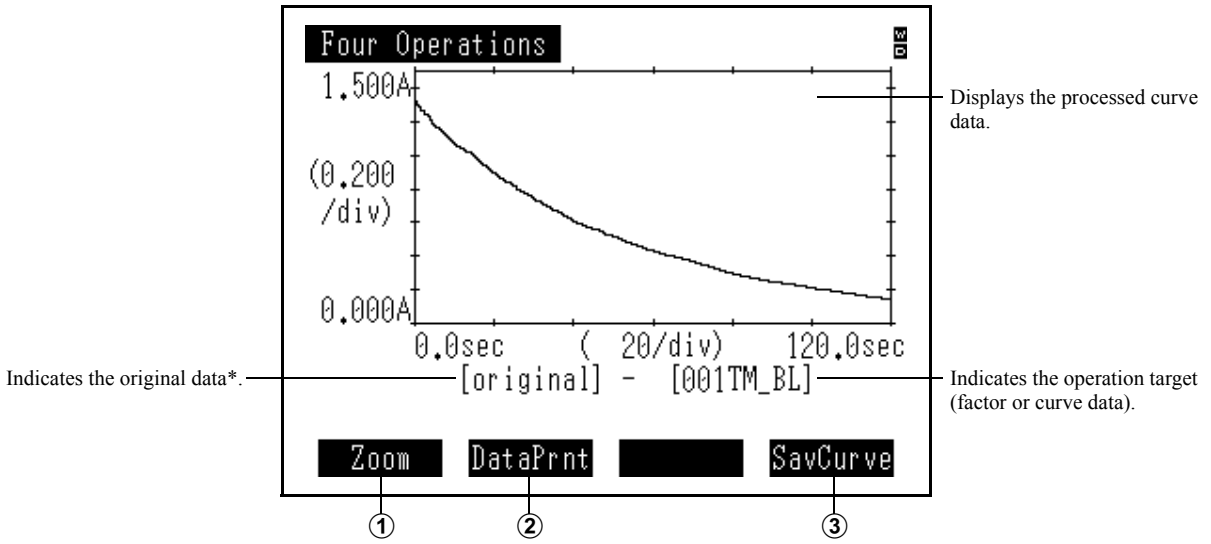


Fig. 13.12 Operation of data with different sampling intervals

13.2.4 Operation Result Screen

When the arithmetic operation is completed on the Data Review screen, the Operation Result screen (Fig. 13.13) displays the processed curve data.



* This screen displays the processed curve data.
[Original]: Curve data measured or loaded before calling the Processing Options screen (Fig. 13.1)
[Modified]: Curve data that has already been processed
[(File name)]: Curve data loaded in the Processing Options screen (Fig. 13.1).

Fig. 13.13 Operation Result screen

No.	Key Operation	Display	Description
①	F1	[Zoom]	Enlarges or reduces the processed waveform on the screen. ☞ "13.1.2 Enlarging/Reducing"
②	F2	[DataPrnt]	Prints a screen hard copy and the measurement parameters. ☞ "13.1.3 Example of Data Printout"
③	F4	[SavCurve]	Saves the processed curve data to the memory storage. ☞ "3.1 Save Files"
④	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).
⑤	◄(-) ►	–	Displays the cursor on the curve graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"

13.3 Derivative Operations

For the curve data, 1st to 4th order derivative processing or smoothing can be performed. For this derivative processing, the convolution method digital derivative operation using 17 data pieces consisting of former and latter data (Savitzky-Golay method)* has been adopted.

* A. Savitzky, M.J.E Golay, "Smoothing and Differentiation of Data by Simplified Least Squares Procedures", Analytical Chemistry, vol. 36, no. 8, pp. 1627-1639, 1964.

To perform derivative processing, the order of derivative and derivative wavelength (time) difference must be determined.

The derivative wavelength (time) difference is defined by the sampling interval of operated curve data and the coefficient Δλ(N) (ΔT(N)) specified to perform the operation.

[Derivative wavelength (time) difference] = ([Sampling interval] × [Coefficient] × 16) ÷ 2

This coefficient defines the interval of data points on the waveform used for the operation. When the coefficients are defined as "1" and "2", one sampling interval and two sampling intervals are the respective intervals of the data points picked up for the operation.

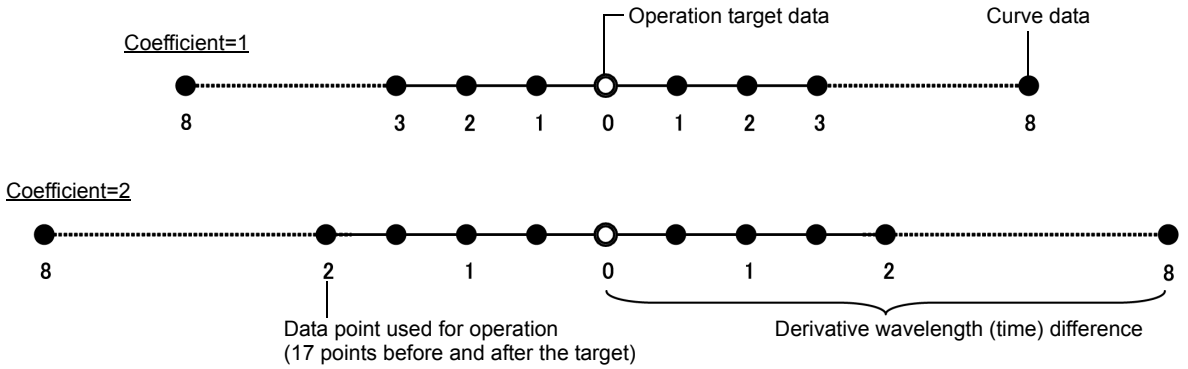


Fig. 13.14 Derivative wavelength (time) difference and coefficient Δλ(N) (ΔT(N))

The greater the coefficient, the greater the derivative wavelength (time) difference, and the less the noise. However, specifying a coefficient larger than appropriate deteriorates the resolution of the derivative spectrum (☞ Fig. 13.13). Determine the coefficient value considering the two elements of noise and resolution.

13.3.1 Derivative Processing

1 Press 2 key [Derivative] on the Processing Options screen to display the Order Input screen (Fig. 13.15).

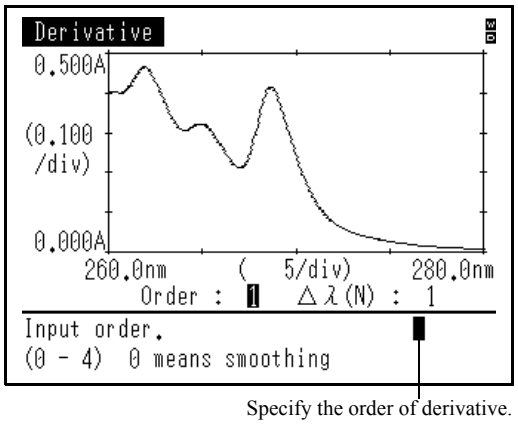


Fig. 13.15 Order Input screen

2 Enter the order of derivative with numeric keys and confirm it with the ENTER key.
For the order of derivative, select from 0 through 4.
When 0 is specified, smoothing is performed.

3 Enter the coefficient Δλ (N) or (ΔT (N)) and confirm it with the ENTER key.
For the coefficient, select from 1 through 9.

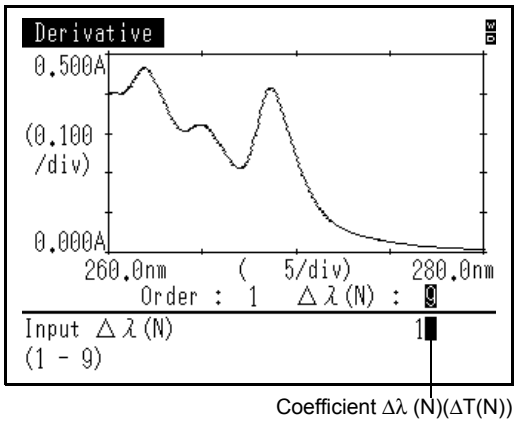


Fig. 13.16 Coefficient (Δλ(N) or ΔT(N)) Input screen

13.3.2 Operation Result Screen

When the coefficient Δλ(T)(ΔT(N)) is entered, the differentiation is performed and then the result is displayed. Fig. 13.17 shows the result obtained by processing the data in Fig. 13.16 with the order of 1 and the coefficient of 1 (Δλ = 0.8). The processing result can be saved and the waveform can be enlarged/reduced.

When the RETURN key is pressed, the Processing Options screen appears, but the curve data for the calculation result is displayed on that screen. To re-display the data before it has been processed, press the [Restore] F3 key.

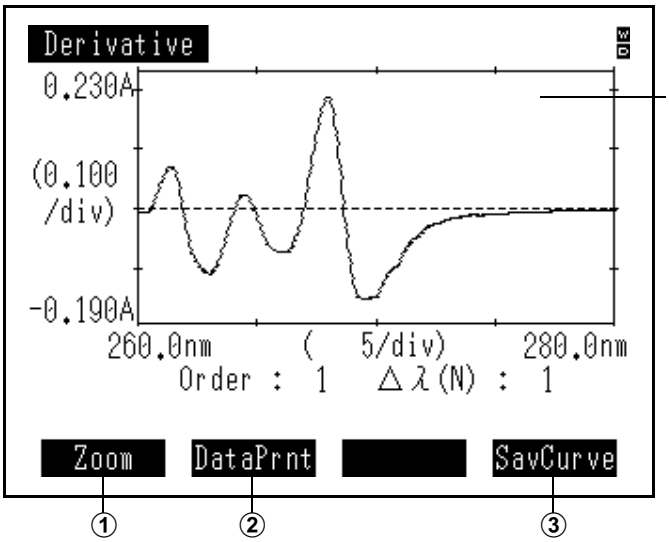
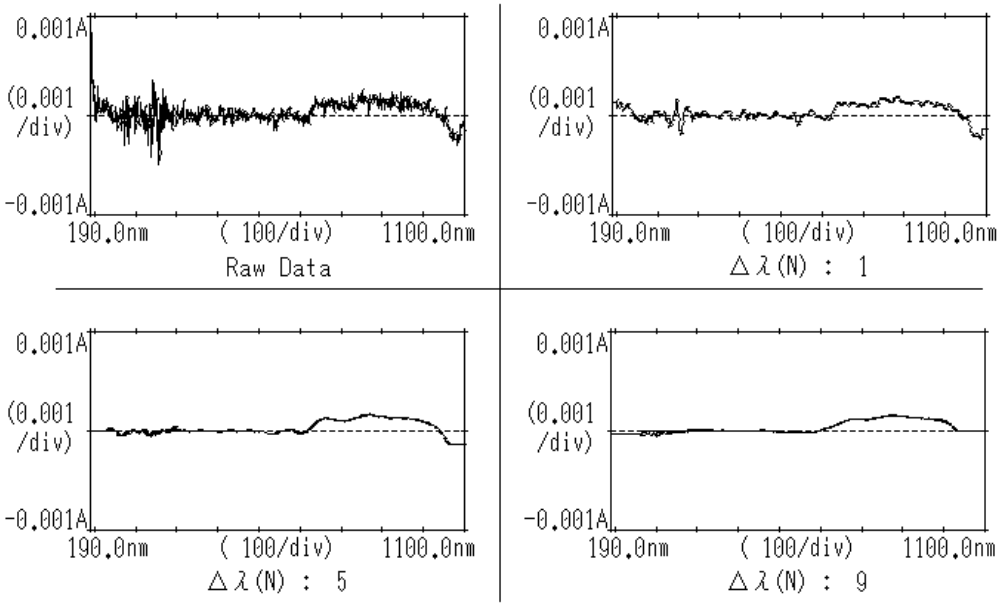


Fig. 13.17 Operation Result screen

No.	Key Operation	Display	Description
①	F1	[Zoom]	Enlarges or reduces the processed waveform on the screen. ☞ "13.1.2 Enlarging/Reducing"
②	F2	[DataPrnt]	Prints a screen hard copy and the measurement parameters. ☞ "13.1.3 Example of Data Printout"
③	F4	[SavCurve]	Saves the processed curve data to the memory storage. ☞ "3.1 Save Files"
–	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).
–	◄ ►	–	Displays the cursor on the curve graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"

■ Example of smoothing processing



■ Example of 1st order derivative

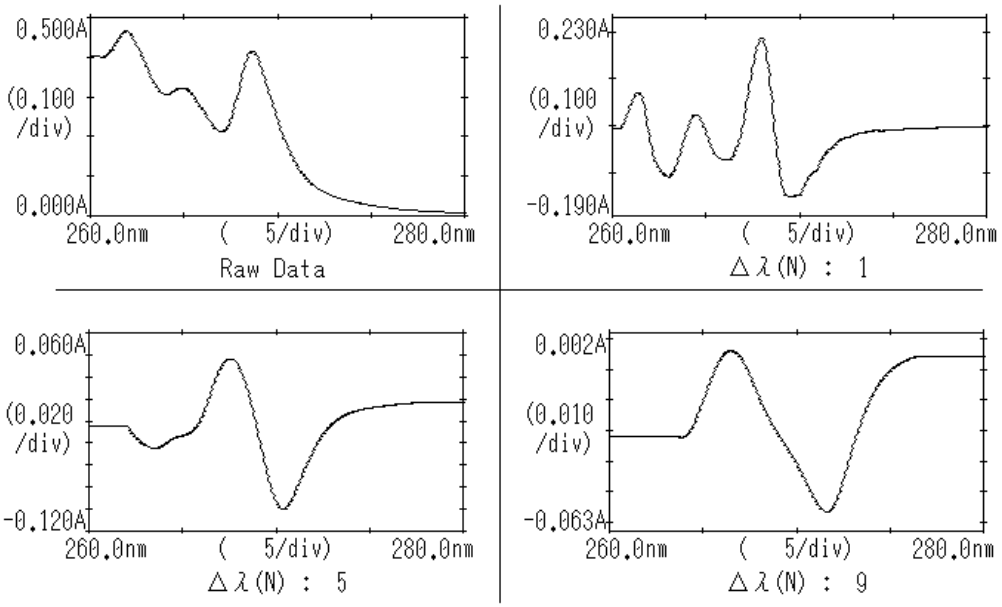


Fig. 13.18 Changes in derivative spectrum depending on derivative wavelength difference

NOTE

In order to calculate the derivative values for each data set, 17 data points consisting of former and latter data are required (Fig. 13.13). Therefore, when calculating the data set around both ends of the curve data, the edging data is repeatedly used for the calculation, since no other data is available.

Example)
When performing derivative processing on the following spectrum data, it is assumed for the calculation that all data sets at wavelengths shorter than 400 nm are 0.1 Abs, and those at wavelengths longer than 500 nm are 0.2 Abs.

Wavelength range: 400 nm to 500 nm
Data at both ends: Absorbance at 400 nm=0.1 Abs, Absorbance at 500 nm=0.2 nm

13.4 Peak Detection

This function detects peaks and valleys on the curve data according to the algorithm described below, and displays the values in the table.

■ Peak detection algorithm

For spectra, peaks are searched from the longer wavelength side (right side). For time course curves, peaks are searched from the side of time "zero" (left side).

A maximum of 20 peaks are detected by repeating the following procedures (1) to (3):

(1) The program searches a section consisting of six continuously increasing data points (Section A) and a section consisting of six continuously decreasing data points (Section B), appearing after Section A.

(2) The maximum data point detected between Sections A and B is defined as a peak.

(3) Once the peak is detected, the program starts searching the next section consisting of six continuously increasing data points (Section C).

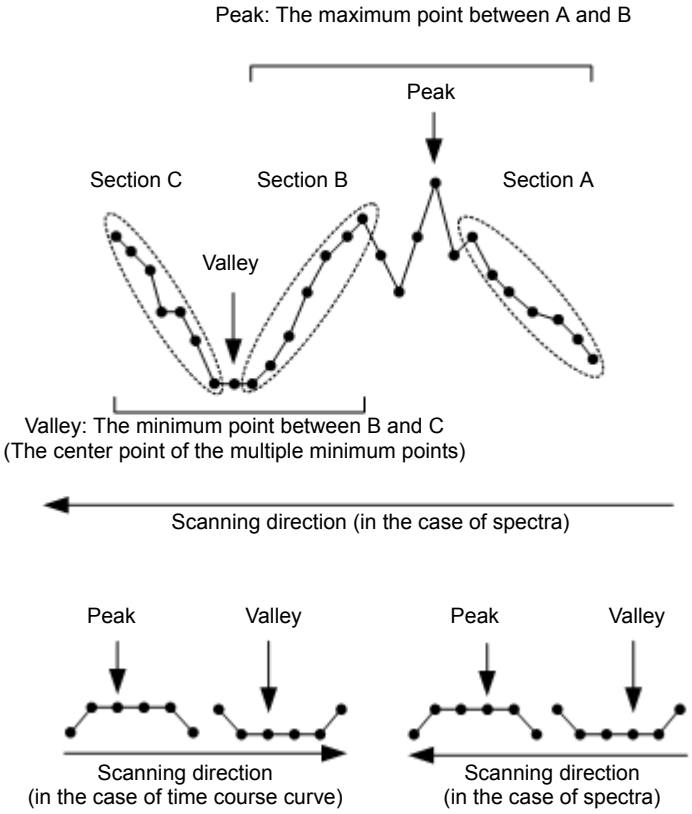
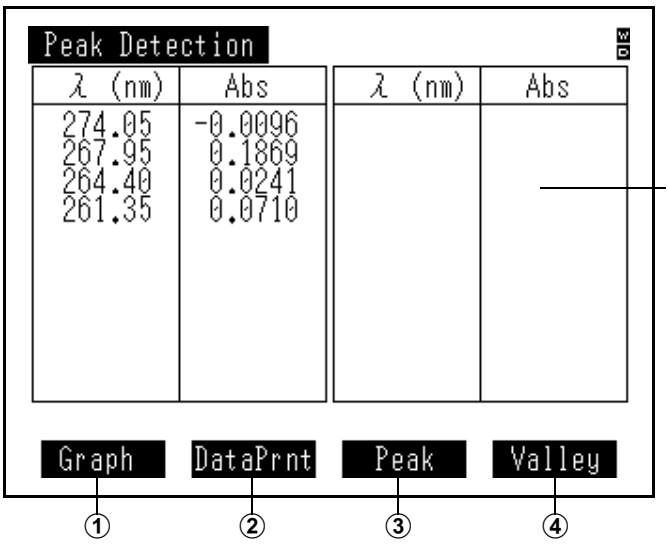


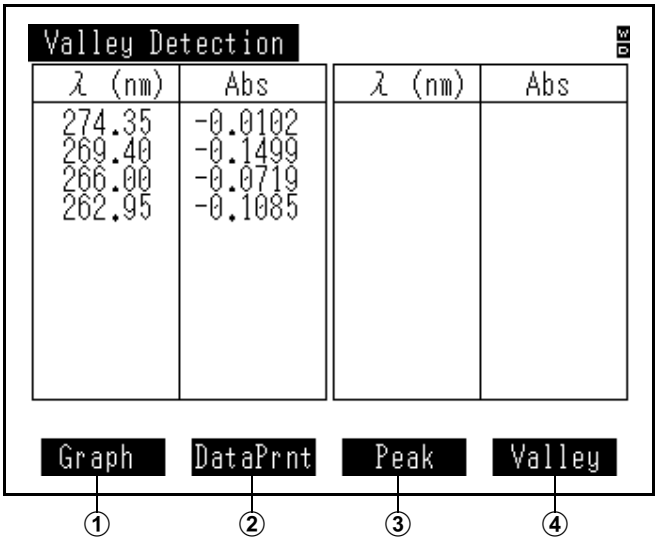
Fig. 13.19 Peak detection algorithm

When the 3 [Peak] key the pressed in the Processing Options screen (Fig. 13.1), the peaks and valleys in the curve data are detected and the Peak Detection screen (Fig. 13.19) is displayed. Up to 20 peaks or valleys can be detected.

When you select the F1 [Graph] key, the curve data with the marks indicating peaks or valleys will be displayed.

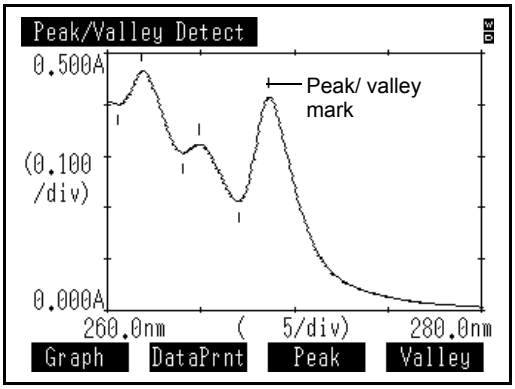


(Peak table)



(Valley table)

Fig. 13.20 Peak (Valley) Detection screen

No.	Key Operation	Display	Description
①	F1	[Graph]	Displays the curve data with the mark indicating peaks or valleys.  Fig. 13.21 Peak Detection screen (graph)
②	F2	[DataPrnt]	Prints a screen hard copy, measurement parameters, and peak (valley) detection results. ☞ "Fig. 13.22 Example of data printout (peak detection)"
③	F3	[Peak]	Displays the Peak Detection screen (Fig. 13.20 (peak table)).
④	F4	[Valley]	Displays the Valley Detection screen (Fig. 13.20 (valley table))
–	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).
–	◄ ►	–	Displays the cursor on the curve graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"

■ Data Printout Example

If you press the F2 [DataPrnt] on the Peak Detection screen, the screen hard copy will be printed (Fig. 13.22).

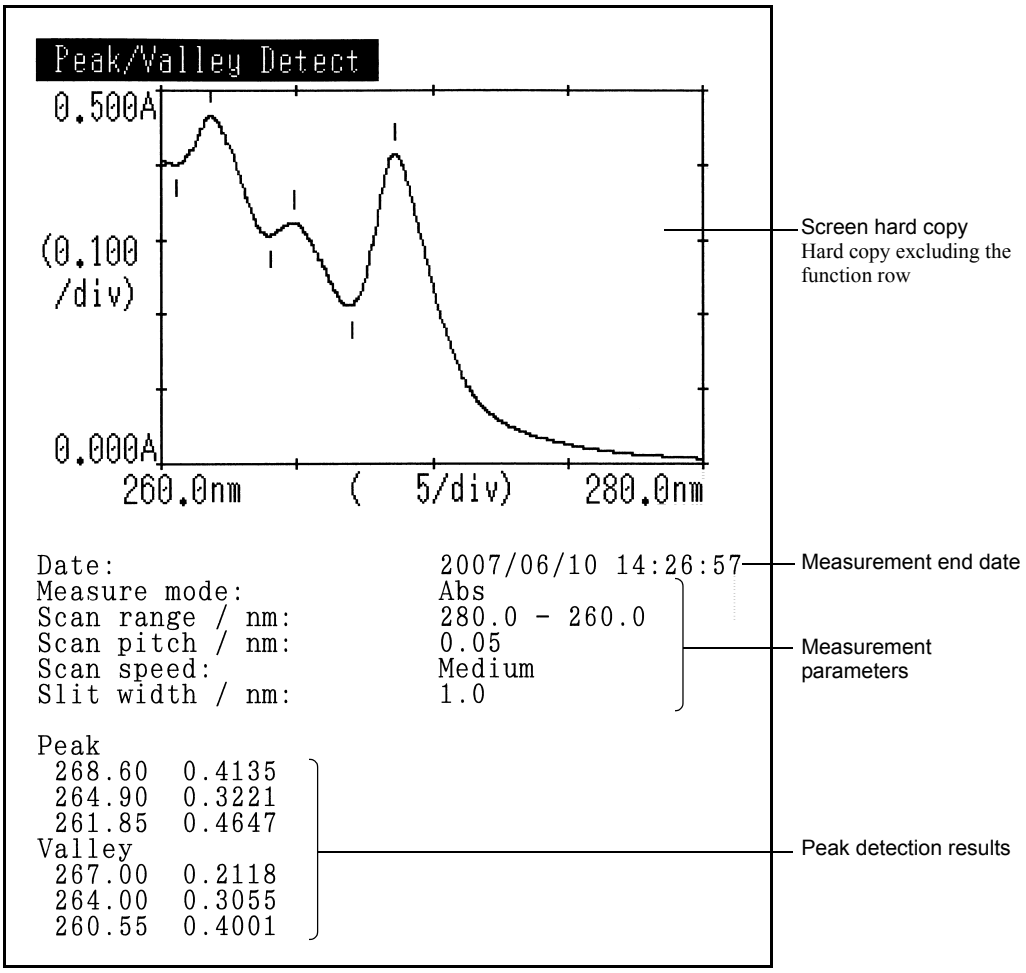


Fig. 13.22 Example of data printout (peak detection)

13.5 Area Calculation

This function calculates the area of the portion surrounded by the curve data and the specified vertical axis.

The calculation results are expressed as the values α, ß, and α + ß (Fig. 13.26). However, the calculation method varies according to the data type of the vertical axis (photometric value).

■ When the type of photometric value is absorbance (Abs) or energy (E)

α = the area of the portion bounded by the curve data and a straight line connecting the starting and ending points on the data

The sign of α for the area protruding upwards is (+), and (-) for that protruding downwards.

ß = the area of the portion bounded by a straight line connecting the starting and ending points on the curve data and the horizontal axis

The sign of ß is always (+).

Example)

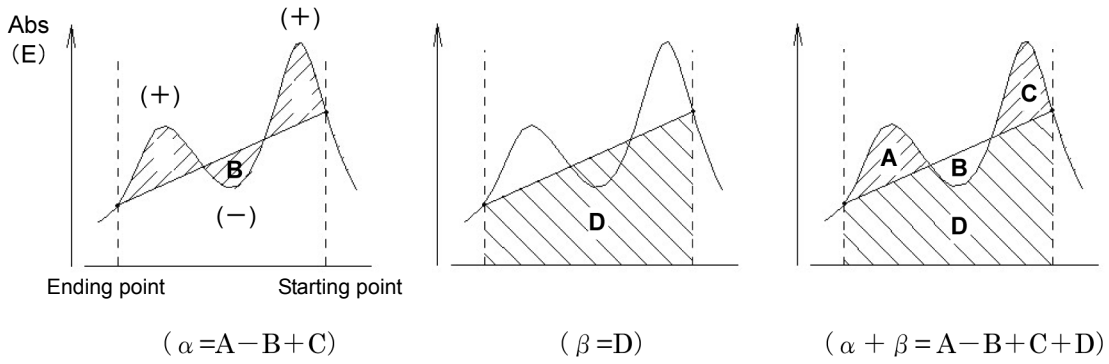


Fig. 13.23 Example of area calculation (Abs, E)

■ When the type of photometric value is transmittance (%T)

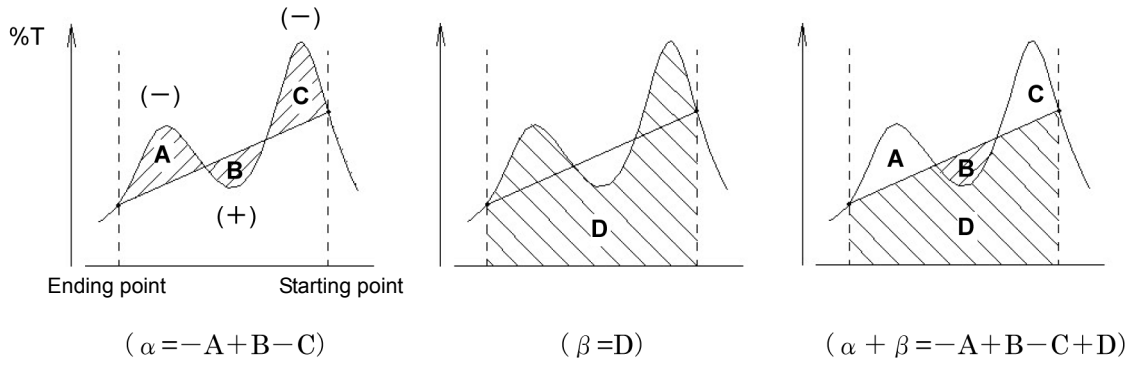
α = the area of the portion bounded by a straight line connecting the starting and ending points on the curve data and the horizontal axis

The sign of α for the area protruding upwards is (-), and (+) for that protruding downwards.

ß = the area of the portion bounded by the curve data and horizontal axis (the starting and ending points)

The sign of ß is always (+).

Example)



$(\alpha = -A + B - C)$ $(\beta = D)$ $(\alpha + \beta = -A + B - C + D)$

Fig. 13.24 Example of area calculation (%T)

13.5.1 Area Calculation Processing

Press the 4 [Area Calc.] key on the Processing Options screen (Fig. 13.1) to display the Range Setting screen (Fig. 13.25).

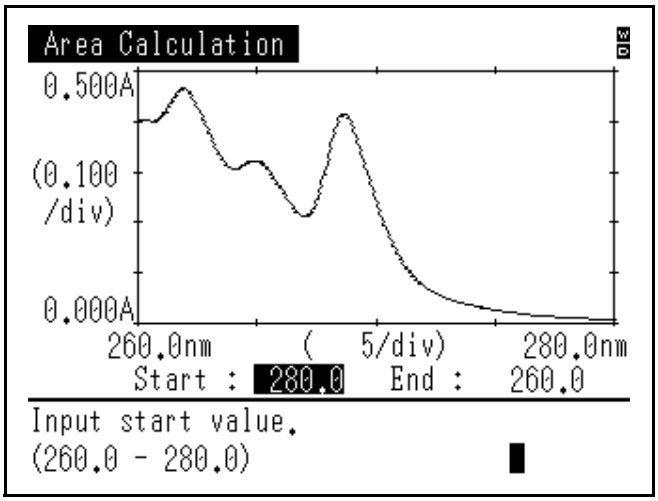


Fig. 13.25 Range Setting screen

Using the numeric keys, type in the starting and ending points of the horizontal axis (wavelength or time) for the area calculation, and confirm with the ENTER key.
Alternatively, you can specify the starting and ending points using the reading cursor function. To do so, perform the following procedure:

NOTE
When the cursor is dipslayed on the screen, data input with numeric keys will not be accepted. To make the entry with numeric keys available, press the RETURN key while the cursor is displayed on the screen.

1 Press the ◄(-) ► keys on the Range Setting screen (Fig. 13.25) to display cursor on the curve graph.
Press the ◄(-) ► keys to move the cursor to the desired starting point, and confirm it with the ENTER key.

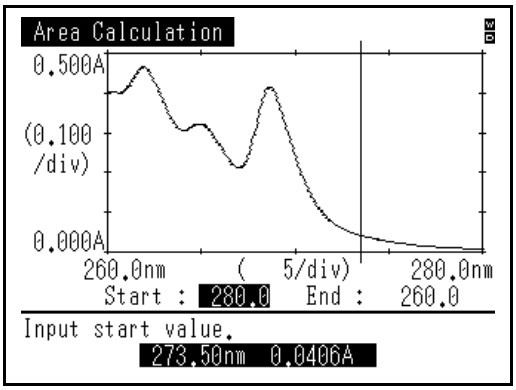


Fig. 13.26 Input screen for starting point

NOTE
Holding down the ◄(-) ► keys moves the cursor faster.

2 Next, the Entry screen for the ending point appears. Similarly as in procedure 1, enter the ending point by pressing the ◄(-) ► keys to move the cursor to the desired ending point, and confirm it with the ENTER key.
If you confirm the positions of the starting and ending points, the Operation Result screen (Fig. 13.28) will be displayed.

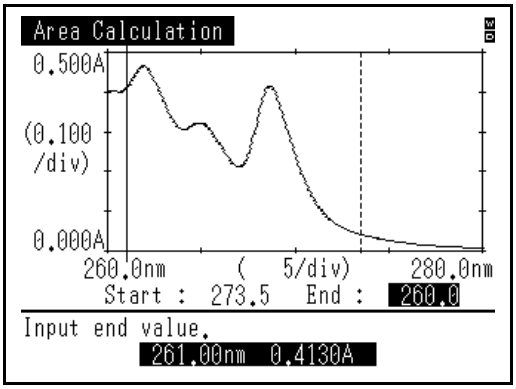


Fig. 13.27 Input screen for ending point

13.5.2 Operation Result Screen

The Operation Result screen (Fig. 13.28) displays curve graph, calculation range, and calculation result.

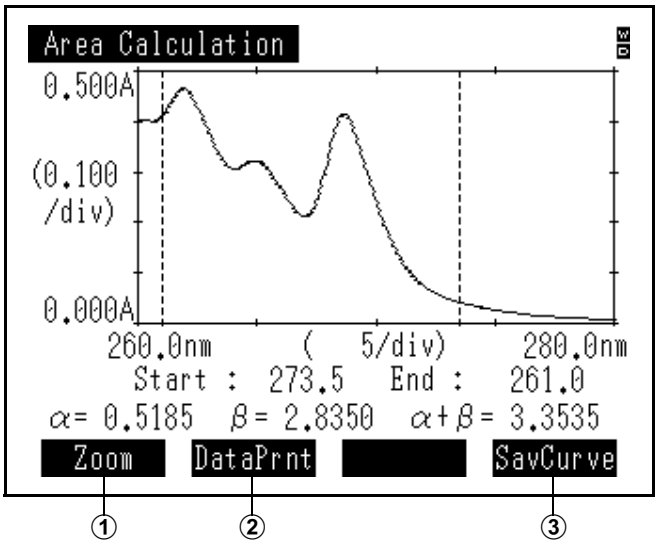


Fig. 13.28 Operation Result screen

No.	Key Operation	Display	Description
①	F1	[Zoom]	Enlarges or reduces the processed waveform on the screen. ☞ "13.1.2 Enlarging/Reducing"
②	F2	[DataPrnt]	Prints the screen hard copy and the measurement parameters. ☞ "13.1.3 Example of Data Printout"
③	F4	[SavCurve]	Saves the curve data to the memory storage. ☞ "3.1 Save Files"
–	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).
–	◄(-) ►	–	Displays the cursor on the curve graph to activate the cursor reading function. ☞ "13.1.1 Reading with Cursor"

13.6 Point Pick

This function is used to pick up the photometric values at specified wavelengths (time) on the curve displayed on the Processing Options screen (Fig. 13.1), and display them as a numeric data list.

1 Press [5] [Point Pick] key on the Processing Options screen (Fig. 13.1) to display the screen for selecting a data pick-up method (Fig. 13.29). (Press the [RETURN] key to return to the Operator Selection screen.)

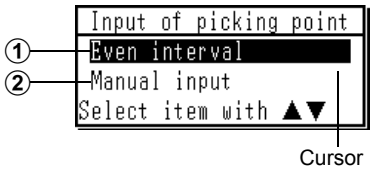


Fig. 13.29 Pick-up Method screen

■ Data pick-up method

No.	Method	Description
①	Even interval	Displays a list of ordinate data for up to 20 points at a specified interval from a specified abscissa (wavelength, time). ☞ "13.6.1 Point Pick at Even Intervals"
②	Manual input	Displays the data at arbitrary wavelengths (or time). ☞ "13.6.2 Point Pick with Manual Input"

2 Move the cursor to a desired method with the [▲] [▼] keys, and confirm it with the [ENTER] key.

13.6.1 Point Pick at Even Intervals

The screen (Fig. 13.30) appears for specifying a horizontal value (wavelength, time) from which the data pick-up is started and also the data interval. Enter the start wavelength (time) and interval with numeric keys, and confirm each of the values with the [ENTER] key. A list of the picked up data will be displayed on the screen (Fig. 13.33).

☞ "13.6.3 List Display Screen"

Press the [RETURN] key to return to the Processing Options screen (Fig. 13.1).

-Input range of starting abscissa

When horizontal axis is wavelength - Upper limit: Scan start wavelength
Lower limit: Scan end wavelength

When horizontal axis is time - Lower limit: 0
Upper limit: Data end time

-Input range of interval: Scan pitch (interval) to 1000

NOTE
Data exist only at each scan pitch (cycle). Enter the integral multiple of the scan pitch (cycle) for the starting wavelength (time) and interval.

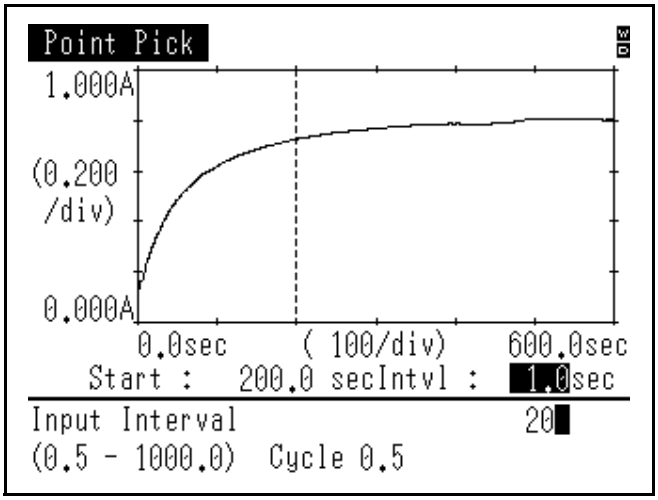


Fig. 13.30 Wavelength (time) Input screen (even interval)

13.6.2 Point Pick with Manual Input

First, the screen appears for specifying the number of data to be picked up (Fig. 13.31).
Enter the desired number of the data points with numeric keys (input range of 1 to 20), and confirm with the ENTER key. The screen appears for entering each wavelength value at which the point pick is performed (Fig. 13.32).

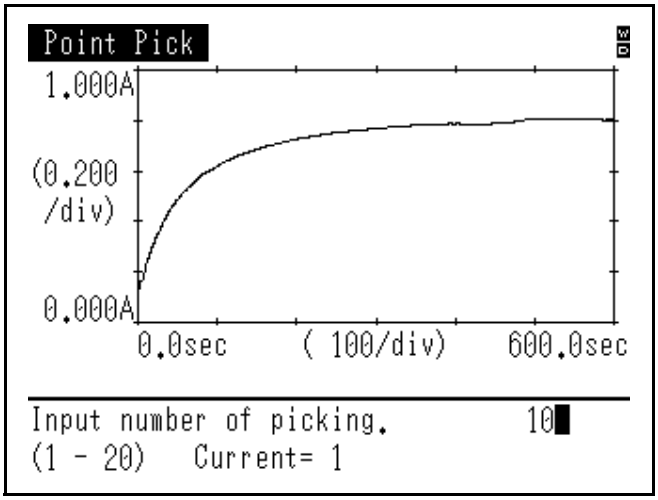


Fig. 13.31 Data Point Input screen

In the Wavelength (time) Input screen, you can enter wavelengths (time) for each specified data point. The data list column initially displays the same number of wavelengths (time) used for the last point-pick operation as the number of the data points specified. (If the last-picked points are fewer than the number of specified points, the columns for the differences are displayed as "---".)

Enter the wavelength (time) to perform point pick with numeric keys, and confirm with the ENTER key. The entered value will be highlighted on the data list.

After all wavelengths for the specified number of points are confirmed, the List Display screen is displayed. ☞ "13.6.3 List Display Screen"

Press the RETURN key to return to the Processing Options screen (Fig. 13.1).

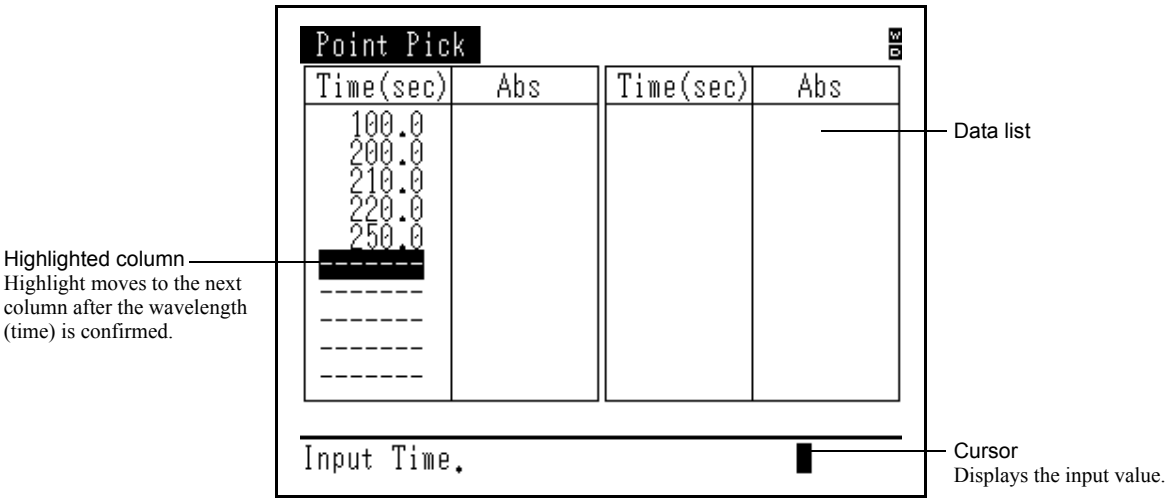


Fig. 13.32 Wavelength (time) Input screen

13.6.3 List Display Screen

This screen displays up to 20 data points that have been picked up.

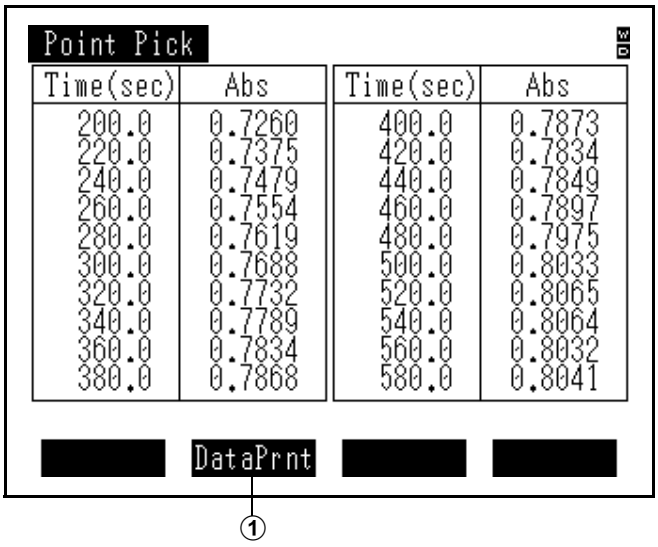


Fig. 13.33 List Display screen (Start time 200 sec, Interval 20 sec)

No.	Key Operation	Display	Description
①	F2	[DataPrnt]	Prints a screen hard copy, measurement parameters, and point pick results. For the point pick at even intervals, all data points picked within the horizontal range of curve data are printed out, though only 20 data points are displayed in the List Display screen. ☞ "Fig. 13.34 Example of data printout"
–	RETURN	–	Returns to the Processing Options screen (Fig. 13.1).

■ Data Printout Example

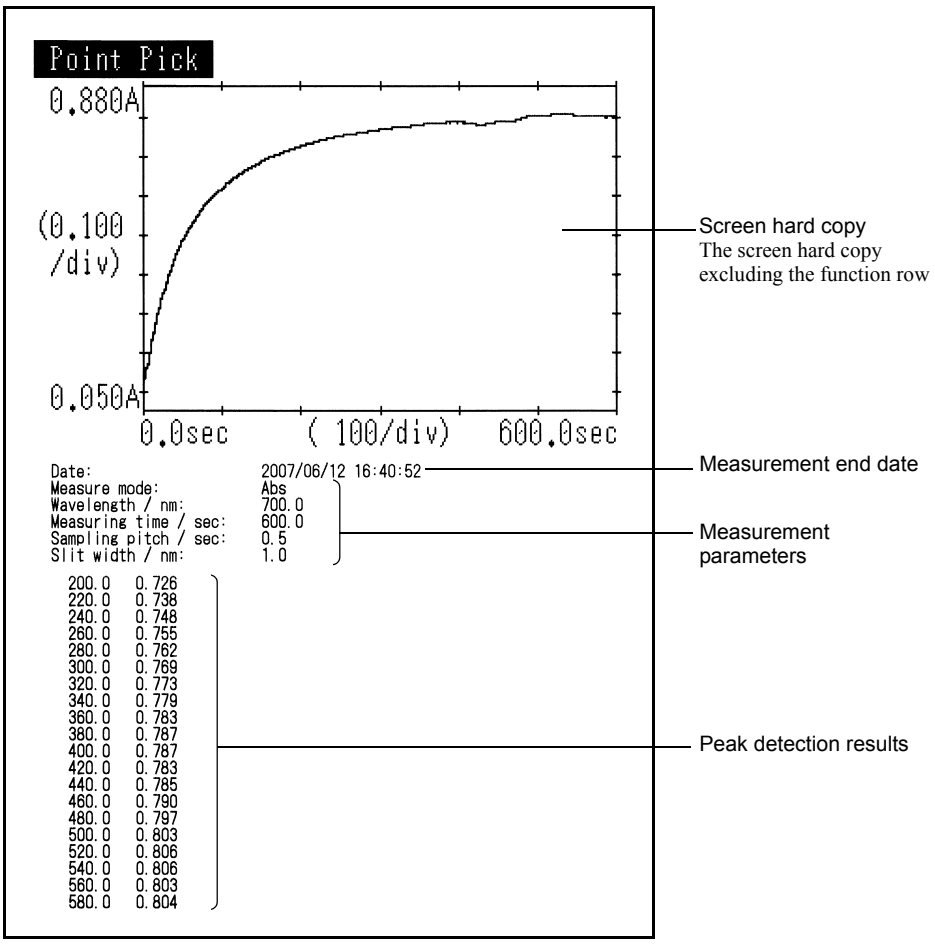


Fig. 13.34 Example of data printout

13.7 Print Processing

This processing is used to output the data value at each sampling point on the curve displayed on the Processing Options screen (Fig. 13.1).

Once the print process has started, it cannot be cancelled. If you must abort printing nonetheless, simply unplug the USB cable for the printer from the UV-1800.

NOTE

The number of display digits of the output data is determined by the setting in [2. Decimal display] of [8. Utilities] on the [Mode menu] screen (Fig. 2.1).

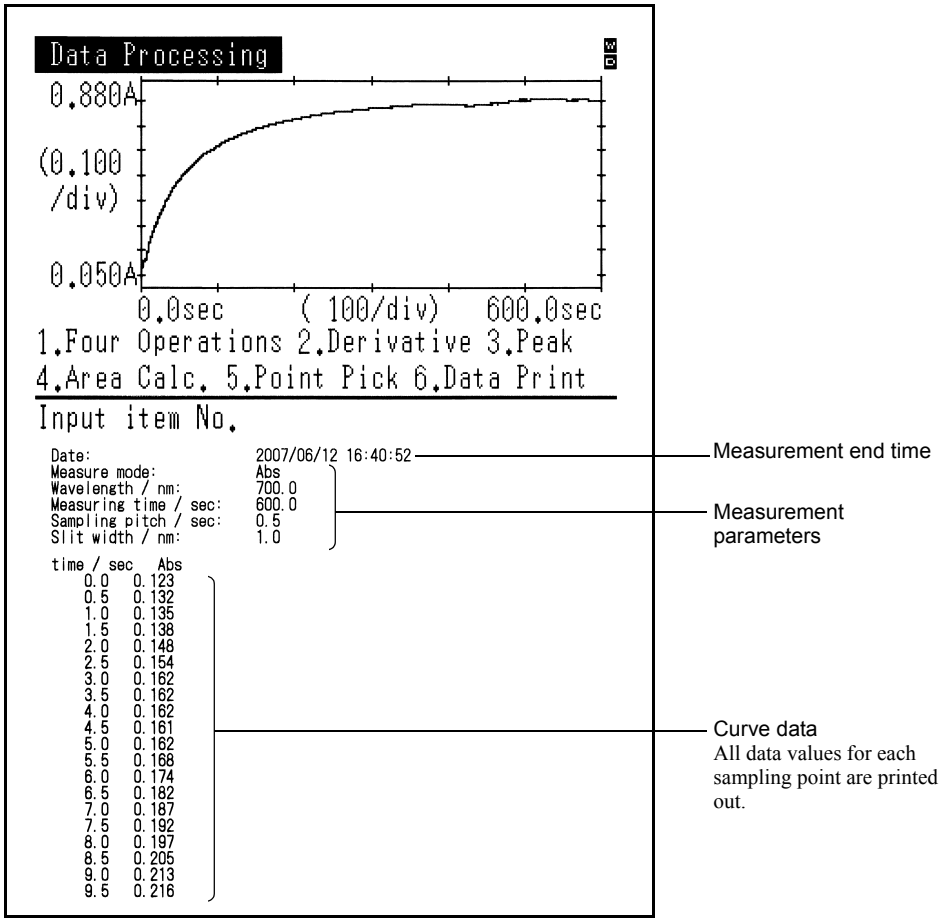


Fig. 13.35 Printout example of data processing

This page is intentionally left blank.

Chapter 14 Utilities

This is the mode for setting the instrument's operating parameters, such as the light source switching wavelength, printer setup, or number of data columns displayed.
The parameters which can be set in this mode are parameters shared with other modes.
These will also be stored internally, even if the power is turned OFF.

CONTENTS

14.1 Utilities Menu Screen

When you select [9. Utilities] in the [Mode menu] screen (Fig. 2.1), the Utilities menu shown in Fig. 14.1 will be displayed.

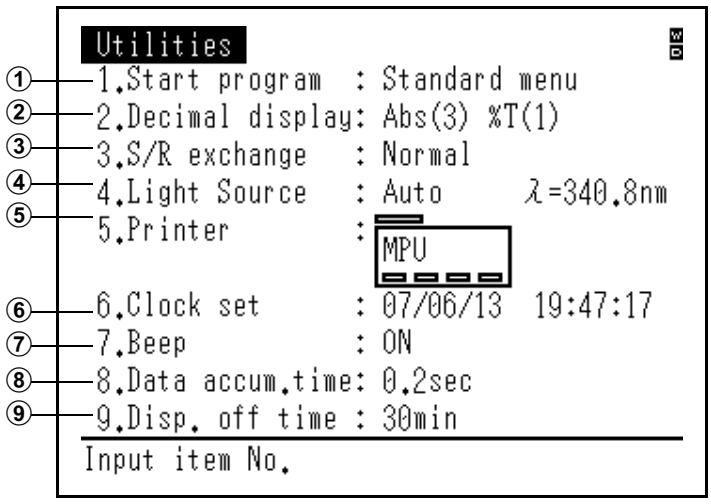


Fig. 14.1 Utilities Menu screen

No.	Key Operation	Display	Description
①	1	[Start program]	Sets the mode in which the instrument will enter standby when the power is turned ON. ☞ "14.1.1 Start Program"
②	2	[Decimal display]	Sets the number of decimals of data to be displayed. ☞ "14.1.2 Decimal Display"
③	3	[S/R exchange]	Exchange the light flux on the sample side and reference (subject) side. Each pressing of the key toggles between "Normal" and "Inverse". Normal: The front of the sample compartment will be the sample light flux, and the back will be the reference light flux. Inverse: The front of the sample compartment will be the reference light flux, and the back will be the sample light flux. "Inverse" is used when custom-made accessories are installed. "Normal" is normally used.
④	4	[Light Source]	Sets the light source switching. ☞ "14.1.3 Light Source Selection"

No.	Key Operation	Display	Description
⑤	5	[Printer]	Sets the printer to be used and the format of a hard copy. ☞ "14.1.4 Printer Setting"
⑥	6	[Clock set]	Sets the current time and the date print format. Use numeric keys to set the clock time. The clock is the 24-hour type and is set either in the order (Year/Month/Date Hour: Minute: Second) or (Date/Month/Year Hour: Minute: Second). The former is displayed in numeric forms, but the latter in English in order to display Month. Ex.) 10/Dec/07 12:34:56 Since it has a battery back-up, it is not necessary to set the clock every time you turn ON the power.
⑦	7	[Beep]	Sets the buzzer sound to turn ON/OFF. Each pressing of the key toggles between [ON] and [OFF].
⑧	8	[Data accum. time]	Designates the accumulation time to read data in the Photometric (one- and multi-wavelength), Quantitation, and Bio-method modes. ☞ "14.1.5 Setting Data Accumulation Time"
⑨	9	[Disp. off time]	The LCD backlight is automatically turned OFF when measurement is not performed. The following four time periods are available for OFF timer setting: 10 min, 30 min, 60 min, ∞. When nothing is executed during the set time, the LCD is turned OFF. Press any one of the keys to reactivate the display. ☞ "14.1.6 Turning OFF LCD Backlight Automatically"

14.1.1 Start Program

When you select 1 [Start program] key in the Utilities Menu screen (Fig. 14.1), the screen below is displayed.

Move the cursor to the desired start program with the ▲ ▼ key, and confirm with the ENTER key.

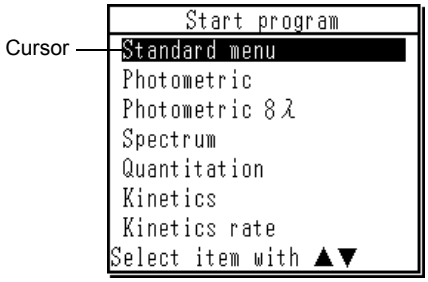


Fig. 14.2 Start Program Selection screen

The selectable start programs are as shown in the following table.

Start Program	Description
Standard menu	This mode has been set as a factory default.
Photometric	The instrument will stand by at the Measurement Parameter Configuration screen of the selected mode (or measurement method).
Photometric 8λ	
Spectrum	
Quantitation	
Kinetics	
Kinetics rate	
Time course	
Multi-component quantitation	
Bio-method (DNA Quantitation)	
Lowry method	
BCA method	
CBB method	
Biuret method	
UV Absorption method	
Stored parameter files	The selected parameter file stored in the built-in memory or USB memory device is loaded and the instrument will start up in the Measurement mode for the file contents. To save measurement parameters, perform [SavParam] in each measurement mode.

NOTE
To show the hidden items, scroll the screen display.

14.1.2 Decimal Display

You can switch the number of digits in the photometric data display between "Abs (3) %T (1)" and "Abs (4) %T (2)".
The value at the minimum digit is rounded off when displayed or printed out.

"Abs (3) %T (1)":
•Abs (Absorbance):Rounded to three decimal places (i.e. the fourth decimal place is rounded off).
•%T (Transmittance):Rounded to one decimal place (i.e. the second decimal place is rounded off).
•E (Energy):Rounded to one decimal place (i.e. the second decimal place is rounded off).

"Abs (4) %T (2)":
•Abs (Absorbance):Rounded to four decimal place (i.e. the fifth decimal place is rounded off).
•%T (Transmittance):Rounded to two decimal places (i.e. the third decimal place is rounded off).
•E (Energy):Rounded to two decimal places (i.e. the third decimal place is rounded off).

NOTE
Photometric data is saved in CSV format as the decimal place values set here.

NOTE
Except for some measurement modes (☞ "1.5 Handling Internal Data"), internal floating-point data (before being rounded off) is used for various operations based on measurement values. The displayed data has been rounded off. Therefore, the value manually calculated from the photometric data is different from the one resulting from the operation; the fewer the number of significant digits, the larger the difference.

14.1.3 Light Source Selection

The UV-1800 uses a deuterium lamp (D_2 lamp) in the ultra-violet region and a tungsten iodine lamp (WI lamp) in the visible/near-infrared region.
Select whether to automatically switch between the two light sources according to measurement wavelengths, or to fix them regardless of the wavelengths.

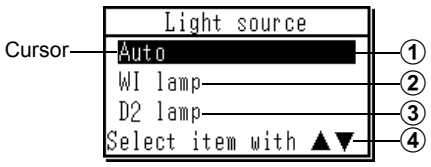


Fig. 14.3 Light Source Switching Selection screen

No.	Key Operation	Display	Description
①	–	[Auto]	Enter the wavelength for light source switching with numeric keys. The input range is from 295.0 to 364.0 nm (in units of 0.1 nm). The factory default is 340.8 nm.
②	–	[WI lamp]	Regardless of the setting of the measurement wavelength, the WI lamp is always the light source.
③	–	[D2 lamp]	Regardless of the setting of the measurement wavelength, the D2 lamp is always the light source.
④	▲ ▼	–	To select the light switch setting, move the cursor to a desired setting with ▲ ▼ keys, and confirm with the ENTER key.

14.1.4 Printer Setting

When you select 5 [Printer] key in the Utilities Menu screen (Fig. 14.1), the screen below is displayed.

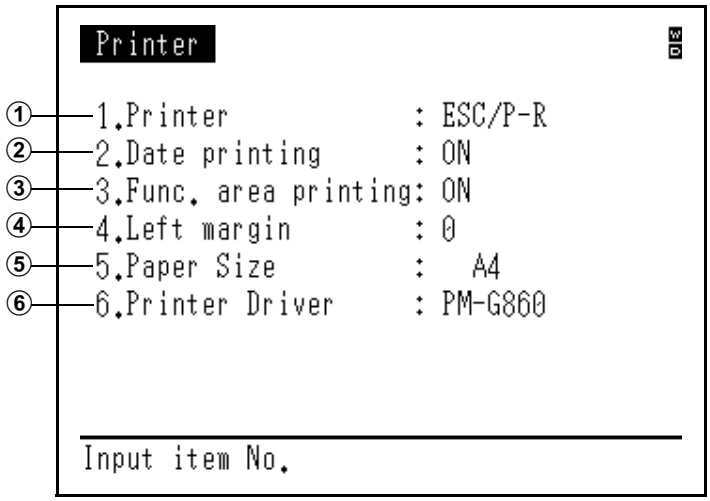


Fig. 14.4 Printer Setting Selection screen (When "ESC/P-R" is selected)

No.	Key Operation	Display	Description
①	1	[Printer]	Goes to the Printer Selection screen. ☞ "■ Printer Selection" in this section
②	2	[Date printing]	Specifies whether the date should be printed on the hard copy output or not. Each pressing of the key toggles the display between [ON] and [OFF].
③	3	[Function area printing]	Specifies whether the function key should be printed on the hard copy output or not. Each pressing of the key toggles the display between [ON] and [OFF].
④	4	[Left margin]	Sets the left margin of the page (not available in MPU). The setting range is from 0 to 9.
⑤	5	[Paper Size]	Sets the paper size (not available in MPU). Each pressing of the key toggles the display between [A4] and [Letter].
⑥	6	[Printer Driver]	Changes the printer to be used. (Displayed only when "ESC/P-R" is selected.) ☞ "14.2 Changing Printer Driver (only when ESC/P-R is selected)" The model name of the currently available printer is displayed on the screen.

■ Printer Selection

Printer type	Description
MPU	Select this when using the screen copy printer MPU (option).
ESC/P-24	Select this when using a printer that supports the ESC/P control code for EPSON 24-pin printers. This is also applied for laser printers.
ESC/P-9	Select this when using a printer that supports the ESC/P control code for EPSON 9-pin printers.
ESC/P-R	Select this when using a printer that supports the ESC/Raster control code for EPSON. Note that driver software must be changed according to the printer used. Be sure to preselect a driver specific to the printer. ☞ "14.2 Changing Printer Driver (only when ESC/P-R is selected)"
PCL	Select this when using a printer that supports the PCL control code for HP.

CAUTION

When using the ESC/P Raster printer, DO NOT unplug the USB cable before the printer head returns to its home position. If you do, the printer will fall into an abnormal status in which no printing commands are accepted.
To plug the USB printer cable to another port or computer after (or while) using with the UV-1800, be sure to turn OFF the printer power beforehand.

As long as a printer other than MPU is selected, [4. Left margin] and [5. Paper Size] can be specified. To select a printer, move the cursor to the desired printer type with ▲ ▼ keys, and confirm with the ENTER key.

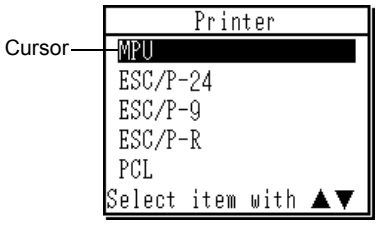


Fig. 14.5 Printer Selection screen

14.1.5 Setting Data Accumulation Time

For Photometric (one- and multi-wavelength) mode, Quantitation mode and Bio-method mode, you can select the data accumulation time for acquiring data.

Four options are available: 0.05, 0.2, 0.5 and 2.0 sec. (Default value: 0.2 sec.)

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

The number of outputs per second is almost the reciprocal of the accumulation time.

To select the accumulation time, move the cursor to the desired setting with ▲ ▼ keys, and confirm with the ENTER key.

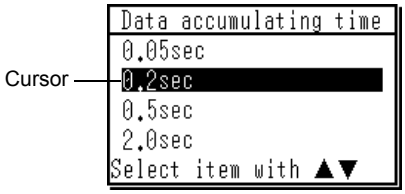


Fig. 14.6 [Data accumulating time] Selection screen

14.1.6 Turning OFF LCD Backlight Automatically

To select "display OFF time", move the cursor to the desired setting with ▲ ▼ keys, and confirm with the ENTER key.

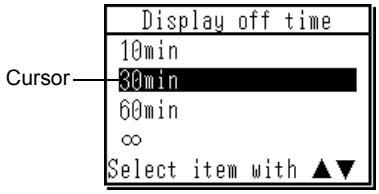


Fig. 14.7 [Display off time] Selection screen

NOTE

For spectrum measurements, the accumulation time is determined depending on "Scan speed" specified as measurement parameters (☞ "6.1 Measurement Parameter Configuration Screen").

14.2 Changing Printer Driver (only when ESC/P-R is selected)

When using a printer that supports the ESC/P Raster control code ("ESC/P-R"), the driver software specific to the printer must be installed on UV-1800 to ensure proper printing operation. Therefore, when a model name different from that of the currently connected printer is displayed on [6. Printer Driver] in the Printer Setting Selection screen (Fig. 14.4) be sure to change the printer driver using the following procedure.

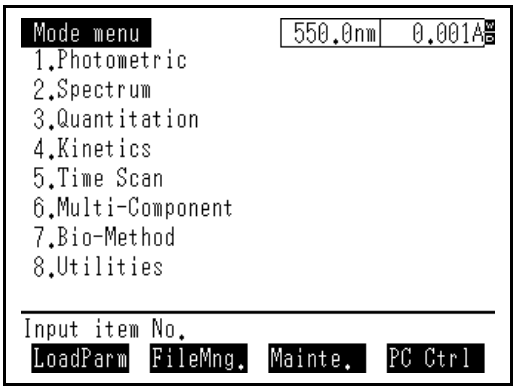
To learn about ESC/P-R printers compatible with UV-1800, and how to obtain drivers specific to the printers, contact your Shimadzu Representative where you purchased the product.

14.2.1 Preparing USB Memory Stick

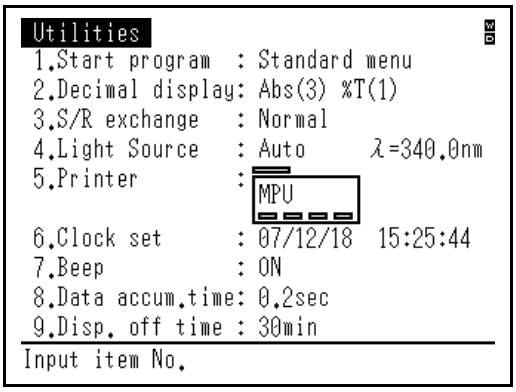
1) Prepare a USB memory stick, and create the following folders under the root directory.
   "\UV1800\DevInfo"
2) Save the printer driver file (esc_p_r.drv) you have previously downloaded to the created folder (\DevInfo).
   "\UV1800\DevInfo\ esc_p_r.drv"

14.2.2 Printer Driver Changing Procedure

1 Select [8. Utilities] in the [Mode menu] screen. (Press the **8** key.)

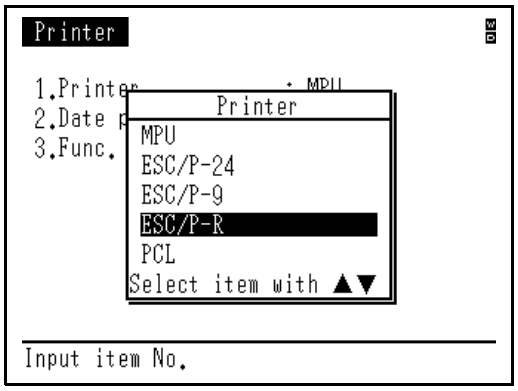


2 Select [5. Printer] in the Utilities Menu screen. (Press the **5** key.)

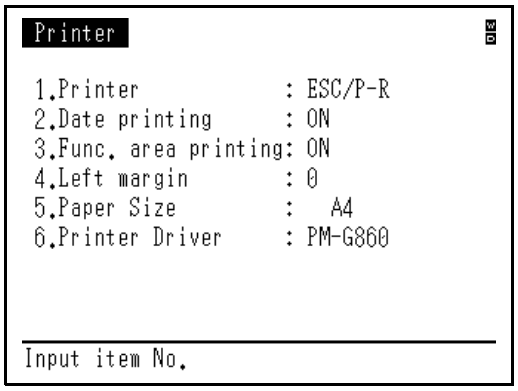


3 Select [1. Printer] in the Printer Setting Selection screen. (Press the 1 key.)

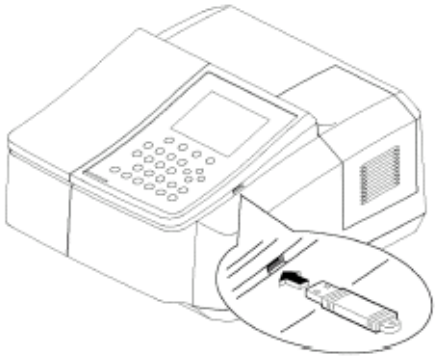
4 The Printer Selection screen will be displayed. Use the ▲ ▼ keys to move the cursor to "ESC/P-R", and confirm the selection with the ENTER key.



5 The model name of the currently available printer will be displayed on [6. Printer Driver] in the Printer Setting Selection screen.

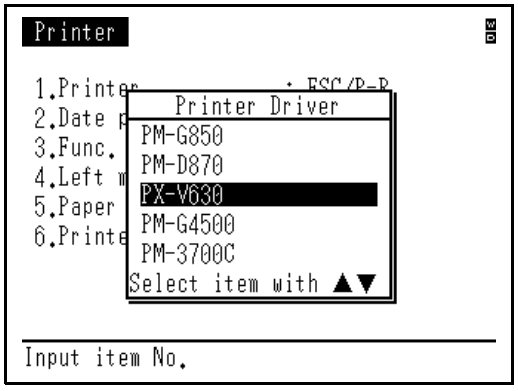


6 Plug the USB memory stick that stores the printer driver file into the UV-1800.



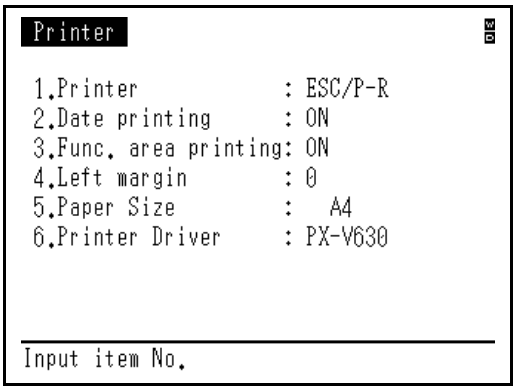
7 Select [6. Printer Driver] in the Printer Setting Selection screen. (Press the 6 key.)

8 The Printer Driver Selection screen will be displayed. Use the ▲ ▼ keys to move the cursor to the model name of the printer to be used. Confirm the selection with the ENTER key.



9 Verify that the printer model name you have just selected is displayed on [6. Printer Driver] in the Printer Setting Selection screen. Then remove the USB memory stick.

10 Press the (RETURN) key to return to the Utilities Menu screen.



Chapter 15 Maintenance

The UV-1800 provides a validation function used to validate its performance, and a maintenance function used to manage the time periods of lamp illumination and the dates of instrument baseline correction.

CONTENTS

15.1 Maintenance Screen

When the F3 [Mainte.] key is pressed on the [Mode menu] screen (Fig. 2.1) used to select each measurement mode, the [Maintenance] screen appears.

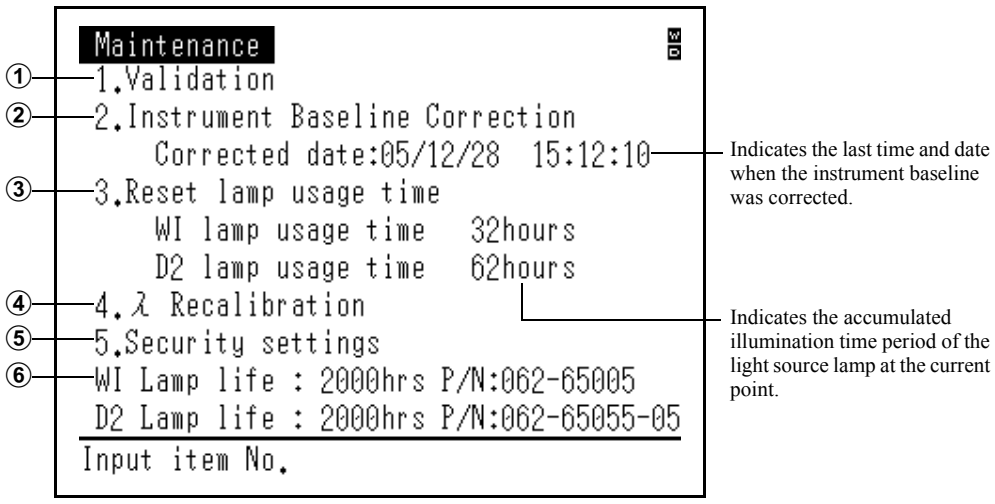


Fig. 15.1 [Maintenance] screen

No.	Key Operation	Display	Description
①	1	[Validation]	Changes over to the mode used to validate the performance of the spectrophotometer. The validation function is used to periodically validate the performance of the UV-1800 and record the result. ☞ "16 Instrument Validation"

No.	Key Operation	Display	Description
②	2	[Instrument Baseline Correction]	Performs the instrument baseline correction. Approximately 17 minutes is required to complete the correction, and other operations are not available during that period. Perform the instrument baseline correction in the following cases: • When installing or moving the UV-1800 • When steps or shock noises are observed on spectra even if the baseline has been corrected. **NOTE** DO NOT open the sample compartment cover during instrument baseline correction. ■Instrument baseline correction The UV-1800 has the following two types of baseline correction: ①Instrument Baseline Correction This corrects the optical balance of the spectrometer itself. The baseline is corrected with a shorter interval within the entire wavelength range (190 nm - 1100 nm), and the correction data is stored. **NOTE** If the instrument baseline correction is interrupted, the stored data is not overwritten. ②Baseline Correction This corrects the baseline within the specified wavelength range to 100 %T (0 Abs). This correction is completed quickly since it is executed within a relatively wide interval. The UV-1800 uses the correction data obtained from (1) when performing (2). Therefore, the steps and shock noises can be removed in a short time. Usually they can be removed only when corrections are performed with the same interval as that used when the measurement data is obtained.

No.	Key Operation	Display	Description
③	3	[Reset lamp usage time]	Use this function during the light source lamp replacement (☞ UV-1800 System User's Guide, "3.6 Replacing the Light Source") to reset the lamp illumination time currently recorded/displayed. Move the cursor to the target lamp with the ▲ ▼ key, and press the ENTER key to reset the illumination time period.  Fig. 15.2 [Reset lamp usage time] screen
④	4	[λ Recalibration]	Aligns the wavelength origin (wavelength recalibration) by referencing the emission line of the D2 lamp (656.1 nm). Perform the wavelength recalibration in the following cases: • To learn the original wavelength accuracy of the UV-1800 after long elapsed power use, to check instrument functions, etc. • In the case of significant environment temperature change after the power is turned ON. **NOTE** • Use the standard sample compartment, and verify that nothing is placed in the cell holder. • DO NOT open the sample compartment cover during the calibration. ■Wavelength recalibration The wavelength recalibration is also performed during the initialization process at the instrument startup. Normally, the wavelength origin does not fluctuate, but it may occasionally shift due to the influence of environment temperature fluctuations. Though the shift can be corrected by restarting the UV-1800, this function can correct the shift when the instrument and light source lamp are at stable temperature.

No.	Key Operation	Display	Description
⑤	5	[Security settings]	Displays the setting screen for security functions, where you can switch ON/OFF each security function, change passwords, and perform other security operations. **NOTE** When the security function is enabled (ON), the setting screen is displayed only when you have logged in as Administrator. ☞ "15.2 Security Functions"
–	–	[WI Lamp life] [D2 Lamp life]	Displays the part number and product life of the light source lamp for replacement.
–	RETURN	–	Returns to the [Mode menu] screen (Fig. 2.1).

15.2 Security Functions

15.2.1 Security Function Operations

The UV-1800 has a security function that allows restricting function availability according to user level. When the security functions are enabled, you need to log in to the UV-1800 as one of the following users before using the instrument: Administrator, Developer, or Operator. (☞ "1.3 Login Screen (Only when security function is on)")

If available functions are specified for each user beforehand, you can control function availability according to user level.

The following is the procedure for setting the security functions:

1 Set the security parameters (☞ "15.2.3 Authority Setting for Security Parameters").

In the Security Settings screen (Fig. 15.6), specify which user can use what functions to control the data and instrument. Table 15.1 shows the security parameters (functions) that can be assigned to users and the default authority setting for each user.

The default (factory) authority setting assumes user levels defined as follows:

[Administrator]

The administrative manager of the UV-1800, who can use all functions of the instrument

[Developer]

The inspection manager, who can used all functions except those for instrument management (other than the instrument validation function)

[Operator]

The operator of the UV-1800, who can perform measurements using parameter files created/saved by the inspection manager, and save the measured data

2 Set the password for each user (☞ "15.2.4 Changing Password").

Set the password for each user in the Password Change screen (Fig. 15.9).

3 Enable the security functions (☞ "15.2.2 Setting Security Functions").

Turn ON the security functions in the [Security settings] screen (Fig. 15.4).

4 Return to the [Mode menu] screen (Fig. 2.1) and press the RETURN key.

The current user (Administrator) is logged off, and the Login screen appears (Fig. 15.3), where you can log in to the UV-1800 as the desired user (☞ "1.3 Login Screen (Only When Security Function is On)")

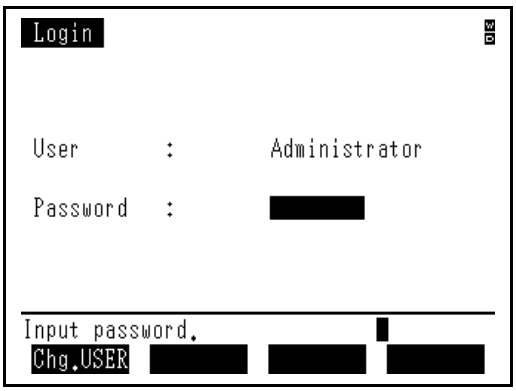


Fig. 15.3 [Login] screen

Table 15.1 Security Parameters (Authority) and Default Values

No.	Parameters (Authority)	Description	Defualt Values*1		
			A	D	O
(Security Parameters 1)					
①	Change parameters	The right to change parameters in the Measurement Parameter Configuration screen for each measurement mode	√	√	
②	Change Calibration Curve	Quantitation mode, Bio-method mode • The right to change, add, and delete the standard sample data in Concentration Table screen • The right to change the order of calibration curve and to create a new calibration curve in the Calibration Curve screen	√	√	
③	Load Parameter Files	The right to load parameter files for each measurement mode in the [Mode menu] screen (Fig. 2.1)	√	√	√
④	Save Parameter Files	The right to save the currently set parameters as a separate file in the Measurement Parameter Configuration screen for each measurement mode	√	√	
⑤	Change Utilities	The right to change parameters in the Utilities Menu screen (Fig. 14.1)	√	√	
⑥	Change Validation Settings	The right to change parameters of each item to be validated for the instrument validation function	√	√	
⑦	Load Data Files	• The right to load stored table data files in the (Result) List Display screen • The right to load curve data files in the Measurement screen or Curve Display screen	√	√	√
⑧	Save Data Files	The right to save measurement results as data files in the Measurement screen or Curve Display screen	√	√	√
⑨	Data Processings	The right to perform the data processing (☞ Chapter 13) from the Measurement screen of the Spectrum mode or the Time Scan mode	√	√	
(Security Parameters 2)					
①	Instrument Baseline Correction	The right to perform the instrument baseline correction in the [Maintenance] screen (Fig. 15.1)	√		
②	Reset Lamp Illumination Time	The right to reset the lamp illumination time in the [Maintenance] screen (Fig. 15.1)	√		

No.	Parameters (Authority)	Description	Defualt Values*1		
			A	D	O
③	PC Control Mode	• The right to switch to the external control mode (☞ Chapter 17) from the [Mode menu] screen (Fig. 2.1) • The right to return to the [Mode menu] screen from the external control mode *2	√		
④	Copy Files	The right to copy the files stored in the built-in memory or USB memory in the [File Manager] screen (☞ "2.4.2 File Manager Screen")	√	√	
⑤	Delete Files	• The right to delete the files stored in the built-in memory or USB memory in the [File Manager] screen (☞ "2.4.2 File Manager Screen") • The right to overwrite and save data files in each measurement mode. • The right to delete the built-in memory files from the screen displayed when insufficient storage space prevents saving (☞ "3.1.3 Delete Files in Built-in Memory").	√	√	
⑥	Convert to CSV	The right to convert files in the built-in memory or USB memory to data files in CSV format in the [File Manager] screen (☞ "2.4.2 File Manager Screen")	√	√	

*1 The Column sub-captions of "A", "D", and "O" stand for Administrator, Developer, and Operator, respectively. The tick mark (√) means that corresponding user(s) can use the particular function.

*2 Use this function to protect the status where the UVProbe software (standard accessory) controls the instrument history (☞ "A.1.2 Common Screen Frame").

15.2.2 Setting Security Functions

When you press the 5 [Security settings] key on the [Maintenance] screen (Fig. 15.1), the following screen appears.

NOTE

Be extremely careful not to lose your password.
Note especially that if the password for Administrator is lost, the status cannot be recovered even by attempting to set a new password, since the security function settings become defunct.
In such cases, the service personnel must work at your installation site for function recovery.
Contact your Shimadzu representative.

Only the Administrator can change the security function settings.
Therefore, if the 5 [Security settings] key is pressed in the [Maintenance] screen, the UV-1800 will prompt you to enter the Administrator's password.

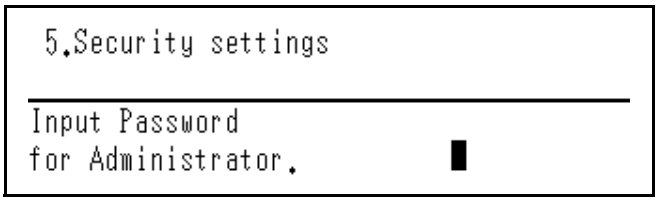


Fig. 15.4 Password-prompting message ([Maintenance] screen)

When you enter the Administrator's password and press the ENTER key, the [Security settings] screen (Fig. 15.5) appears.

NOTE

If you have never set a password (☞ "15.2.4 Changing Password"), just press the ENTER key without entering anything. No password has been set to the UV-1800 in its initial setting.

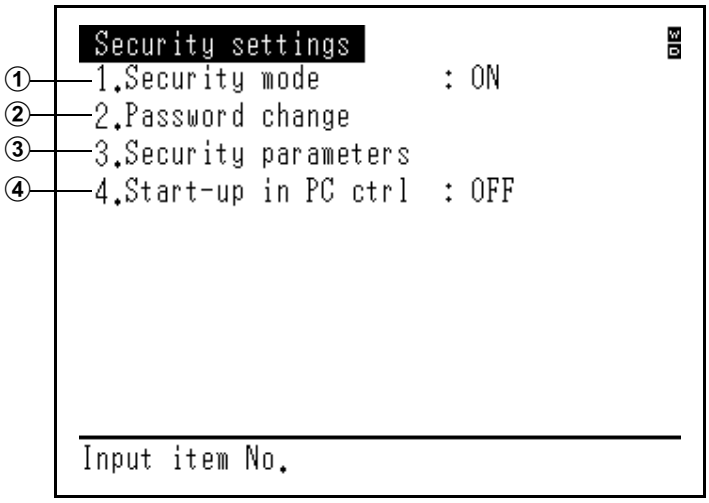


Fig. 15.5 [Security settings] screen

No.	Key Operation	Display	Description
①	1	[Security mode]	Switches the ON/OFF of the security functions. Each pressing of the key toggles the display between [ON] and [OFF].
②	2	[Password change]	When the security function is ON, specifies the password for logging in. ☞ "15.2.4 Changing Password"
③	3	[Security parameters]	When the security function is ON, specifies the functions user authority available to user. ☞ "15.2.3 Authority Setting for Security Parameters"
④	4	[Start-up in PC ctrl]	Used to set up the UV-1800 to automatically start up in the PC Control mode (Refer to Chapter 17) after the initialization. Each pressing of the key toggles the display between [ON] and [OFF] of this function.
–	RETURN	–	Returns to the [Maintenance] screen (Fig. 15.1).

15.2.3 Authority Setting for Security Parameters

If you press the 3 [Security parameters] key on the Security Setting screen (Fig. 15.5), the Security Parameters screen is displayed.

The Security Parameters screen displays the various functions in which user availability can be set, and identifies the users who can access those functions. "A", "D", and "O" stand for Administrator, Developer, and Operator, respectively.
To switch the screens for "Security parameters 1" and "Security parameters 2", use the ▲ ▼ keys.

For detailed explanation of each parameter, refer to Table 15.1.

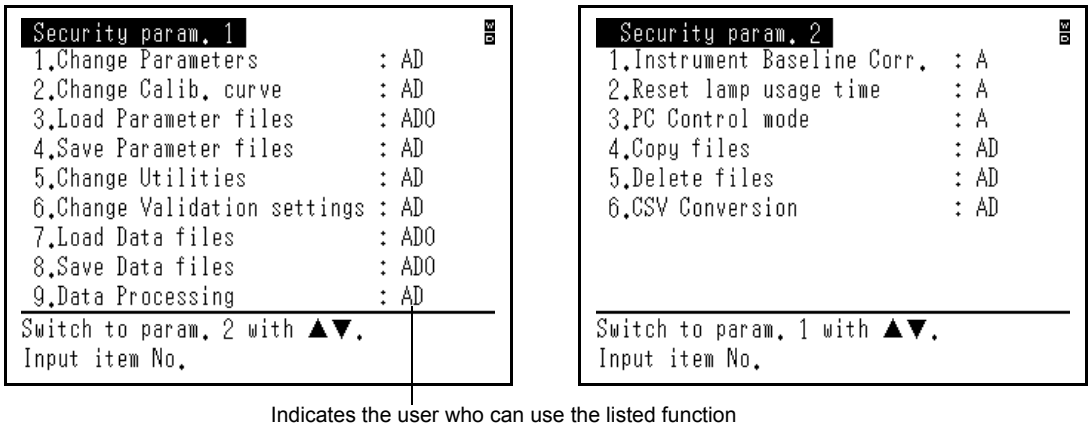


Fig. 15.6 Security Parameters screens

The following is the procedure for indicating which users can use a given security parameter. Here, the procedure is explained using an example where you indicate the user who can change [5. Change Utilities] in Security Parameters 1 as "only Administrator".

1 Press the (5) key when Security Parameters 1 is displayed.
The User Selection screen is displayed (Fig. 15.7).

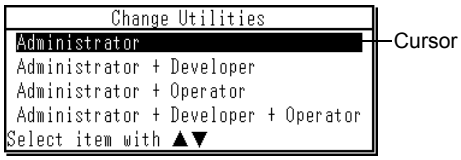


Fig. 15.7 User Selection screen

2 Using the (▲) (▼) keys, move the cursor to the position of "Administrator".
When confirming the setting by pressing the (ENTER) key, you will return to the Security Parameters screen (Fig. 15.8).
The user who can control the [5. Change Utilities] parameter is indicated with "A" on the screen.

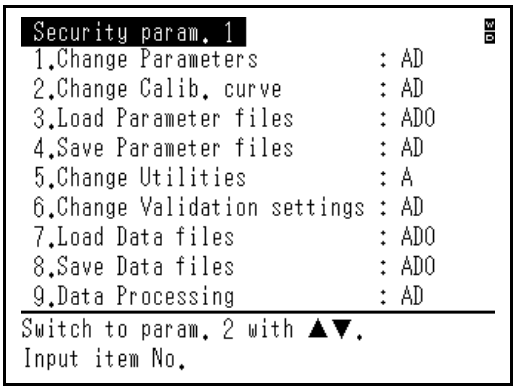


Fig. 15.8 Security Parameters screen (Security Parameters 1)

15.2.4 Changing Password

If you select the 2 [Password change] key on the [Security settings] screen (Fig. 15.5), the [Target User] screen will appear.

Select the user whose password is to be changed. To select the user, move the cursor to the target user, and confirm with the ENTER key.

Fig. 15.9 [Target User] screen

Next, change the password in the screen subsequently displayed.

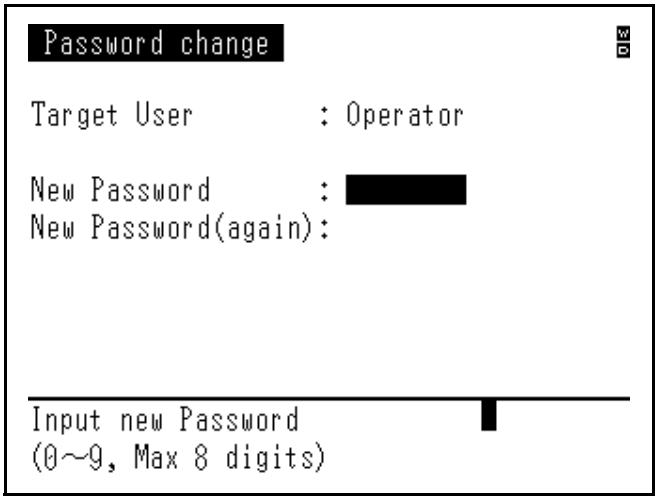


Fig. 15.10 [Password change] screen

Enter the password with numeric keys. The available numerals are 0 to 9, and up to 8 digits can be entered.

NOTE

Be extremely careful not to lose your password.
Note especially that if the password for Administrator is lost, the status cannot be recovered even by attempting to set a new password, since the security function settings become defunct.
In such cases, the service personnel must work at your installation site for function recovery.
Contact your Shimadzu representative.

This page is intentionally left blank.

Chapter 16 Instrument Validation

CONTENTS

16.1 Parameter Configuration Screen for Instrument Validation

When you press the F3 [Maintenance] key in the [Mode menu] screen (Fig. 2.1), the [Maintenance] screen (Fig. 16.1) will be displayed (☞ Chapter 15).

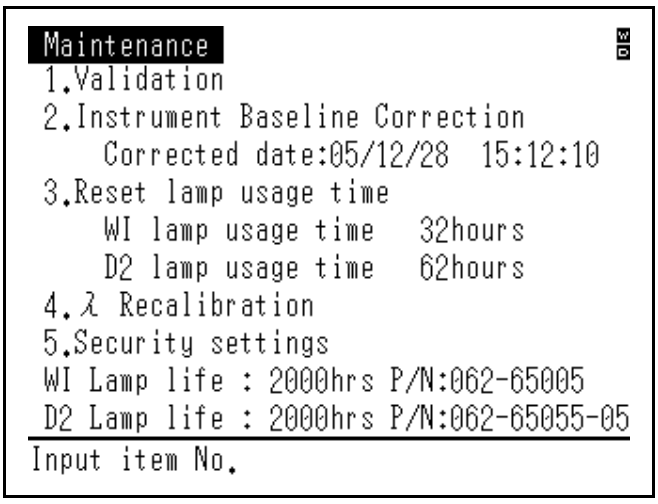


Fig. 16.1 [Maintenance] screen

When you select [1. Validation] (press the 1 key) in the [Maintenance] screen (Fig. 16.1), the Parameter Configuration screen for Instrument Validation (Fig. 16.2) will be displayed.

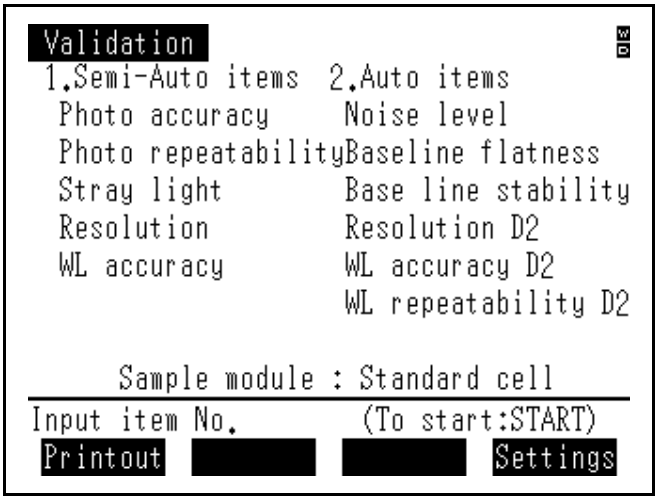


Fig. 16.2 Parameter Configuration screen for Instrument Validation

In this screen, complete the validation setting, select validation items, and execute the validations. Then you can check instrument function (i.e., the validation process of measurement, evaluation, and result printout).

For details on the validation functions in the Parameter Configuration screen, see "16.3 Parameter Configuration Screen".

16.2 Overview of Validation Items

This section describes the items that UV-1800 allows you to validate with its validation functions.

16.2.1 Semi-Auto Items

The semi-auto items are validation items that require validation products such as optical filters. Therefore, when performing validation using the standard sample compartment, the operator must perform the key operation and insert/remove the validation products as instructed by the messages displayed at screen bottom. However, when using optional multiple cell holders such as Multi-cell and CPS-240, the validation process can be performed automatically for each validation item. For details, refer to "16.5 Semi-Auto Validation Item Details".

Table 16.1 List of Semi-Auto Validation Items

Items	Description
Photometric Accuracy (☞ 16.5.1)	The optical filter for transmittance calibration*1 is measured (absorbance or transmittance), and then the deviation of the measured values from the standard values for calibration (standard values) indicated on the filter is used for the evaluation. For this validation, up to 4 types of filters can be simultaneously used. To produce a more accurate validation, it is recommended to perform the validation at or near the reagent (filter) temperature specified in the certificate of the calibration filter. Moreover, when defining the criteria, add the calibration filter accuracy described in the certificate.
Photometric Repeatability (☞ 16.5.2)	The optical filter for transmittance calibration*1 is used to measure the photometric value (absorbance or transmittance) at an arbitrarily specified wavelength three times. The mean value is obtained, and then the deviation of the measured values from that mean value is used to evaluate the results. For this validation, up to 4 types of filters can be simultaneously used.
Stray Light (☞ 16.5.3)	Stray light is represented by the ratio of the sum of light intensity at wavelengths other than the specified one to the intensity of light coming from the monochromator at the specified wavelength. It is possible to evaluate the stray light value at the following wavelengths. • 200 nm - A solution of potassium chloride (12 g/l) is used. • 220 nm - A solution of sodium iodine (10 g/l) is used. • 340 nm/370 nm - A solution of sodium nitrite (50 g/l) is used. The UV-1800 System User's Guide, "6.3.7 Calibration Curve Curvature" explains absorbance errors due to stray light. Refer to the section when defining the criteria.

16.2 Overview of Validation Items

Items	Description
Resolution (☞ 16.5.4)	The absorbance spectrum of a toluene solution in hexane (0.02 %V/V) is measured. The absorbance ratio between the maximum (peak) value near 269 nm and the minimum (valley) value near 266 nm is obtained, and this value is evaluated. This validation conforms to the verification method of resolution specified in the European Pharmacopoeia.
Wavelength Accuracy (☞ 16.5.5)	The filter for wavelength calibration*1 is measured, and then the deviation from the reference wavelength indicated on the filter is used to evaluate the validation result. When defining the criteria, add the calibration filter accuracy (inaccuracy) described in the certificate.

*1 The National Institute of Standard and Technology (NIST), the Japan Quality Assurance Organization (JQA), and other organizations evaluate and supply glass-optical filters and solution filters for calibrators of spectrometer transmittance (absorbance) and wavelength indication values. Various types of the filter are available depending on the wavelength and the type of vertical axis ranges to be calibrated.

The following table shows a list of validation product names used for the semi-auto validation.

Validation item	No.	Product name	Source or Shimadzu P/N
Photometric Accuracy / Photometric Repeatability	①	Optical filter for transmittance calibration*1	Procure from the NIST or the Japan Quality Assurance Organization (JQA).
Wavelength Accuracy	②	Filter for wavelength calibration*1	Procure from the NIST or the Japan Quality Assurance Organization (JQA).
Resolution	③	Validation reagent for resolution specified in the European Pharmacopoeia*2 (0.02 per cent V/V solution of toluene R in hexane R)	Procure from a reagent dealer.
Stray Light	④	Sodium iodine solution (10 g/l)	Procure from a reagent dealer.
	⑤	Sodium nitrite solution (50 g/l)	Procure from a reagent dealer.
	⑥	Potassium chloride solution (12 g/l)	Procure from a reagent dealer.
	⑦	10 mm cubic cell made of quartz	P/N 200-34442
	⑧	Shutter block	P/N 202-30338

*1 Use the filter calibrated at 1 nm band path (spectrum band width).
*2 Hexane solution is required for the blank.

NOTE

Since the cells ⑦ are used for ④, ⑤, and ⑥, as many are required as the number of reagents to be measured.

16.2.2 Auto Items

The auto items are validation items that do not require validation products, which can be measured and evaluated, and their results printed out automatically.
Table 16.2 shows a list of auto validation items.

Table 16.2 List of Auto Validation Items

Items	Description
Noise Level (☞ 16.6.1)	The time changes around the absorbance of 0 Abs at the specified wavelength are measured for 1 minute, and the deflection of the absorbance at that time is defined as noise level (P-P). The RMS value* is obtained from the measurement for 1 minute, and then both of these values are evaluated.
Baseline Stability (☞ 16.6.3)	The time changes around absorbance of 0 Abs are measured and then the measured change per hour is defined as baseline stability. The value for baseline stability is evaluated. This validation result is greatly influenced by the environment temperature fluctuation. It is recommended to perform the test when the power has been turned ON for more than 1 hour (i.e., when the instrument temperature is stable) in a place where the fluctuation of environment temperature falls within 2 °C/H.
Baseline Flatness (☞ 16.6.2)	The baseline is corrected without a sample. Immediately after the correction, the wavelengths are scanned. The curvature of the spectrum obtained at that time is defined as baseline flatness, and this value is evaluated. It is recommended to perform the test when the power has been turned ON for more than 1 hour (i.e., when the instrument temperature is stable).
Resolution D2 (☞ 16.6.4)	The emission lines radiated from the deuterium (D2) lamp used as the light source for the UV-1800 are measured. The half-value width (spectrum bandwidth) of the obtained spectral waveform for the emission lines is defined as the resolution, and this value is evaluated.
Wavelength Accuracy D2 (Emission lines) (☞ 16.6.5)	Emission line radiated from the deuterium (D2) lamp used as the light source for the UV-1800 is measured, and then the deviation from the emission line wavelength is used to evaluate the validation result.
Wavelength Repeatability D2 (☞ 16.6.6)	Emission line radiated from the deuterium (D2) lamp used as the light source for the UV-1800 is measured three times. The mean value is obtained, and then the deviation of the measured values from that mean value is used to evaluate the results.

* The RMS value is obtained using the following equation:

$$\text{RMS value} = \sqrt{\frac{\sum (Ai - Am)^2}{N}}$$

Ai : Absorbance
Am : Mean value of absorbance
N : Number of data

16.3 Parameter Configuration Screen

When [1. Validation] is selected in the [Maintenance] screen (Fig. 16.1), the Parameter Configuration screen for instrument validation (Fig. 16.3) will appear.

In this screen, you can perform general settings for the validation (☞ "16.3.3 Validation Options"), select validation items (☞ "16.3.1 Selecting a Validation Item and Changing the Parameters"), and start the validation (☞ "16.4 Executing Validation").

The parameters set in this screen are saved to the UV-1800 when the validation is executed.

This means that the parameters of the previous validation are always stored in the instrument.

NOTE

If you return to the [Mode menu] screen (Fig. 2.1) after changing parameters without executing the validation, the changed parameters will not be saved to the UV-1800, and the parameters of the previous validation remain unchanged.

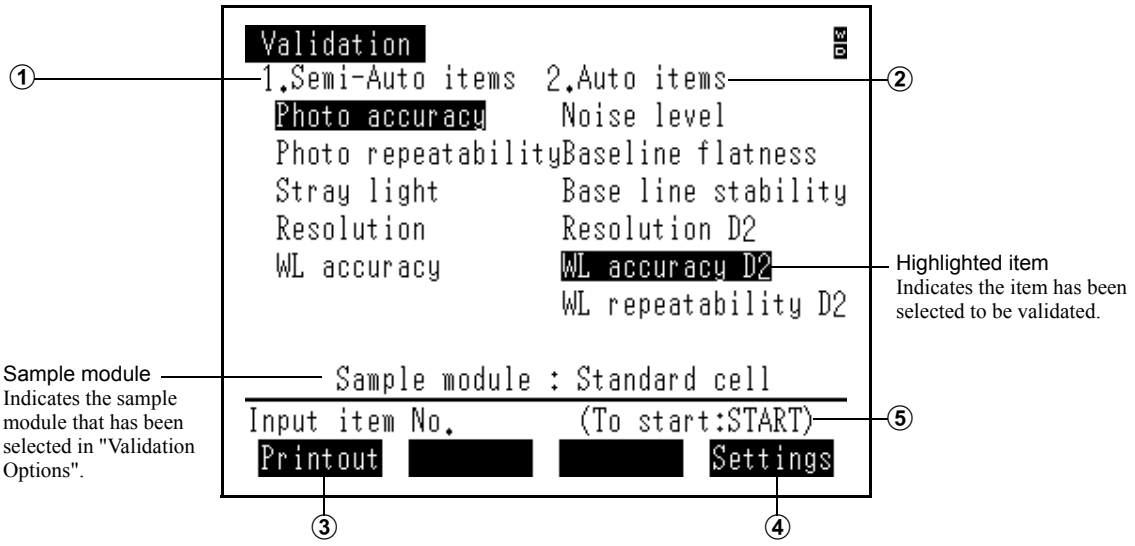


Fig. 16.3 Parameter Configuration screen for instrument validation

No.	Key Operation	Display	Description
①	1	[Semi-Auto items]	Switches to the Semi-Auto Items Selection screen. ☞ "16.3.1 Selecting a Validation Item and Changing the Parameters"
②	2	[Auto items]	Switches to the Auto Items Selection screen. ☞ "16.3.1 Selecting a Validation Item and Changing the Parameters"
③	F1	[Printout]	Prints the list of the validation results at the last time. ☞ "16.3.2 Printing Results"
④	F4	[Settings]	Performs the following settings: • Auto print: ON/OFF • Using Multicell (6-position Micro Multi-cell, CPS-240): Yes/ No • Print init. Status: ON/OFF ☞ "16.3.3 Validation Options"
⑤	START/STOP	–	Starts the validation for the selected items (of which names are highlighted).

16.3.1 Selecting a Validation Item and Changing the Parameters

Press 1 or 2 key on the Main screen of the instrument validation (Fig. 16.3). The Validation Options screen for the semi-automatic or full-automatic validation will appear.

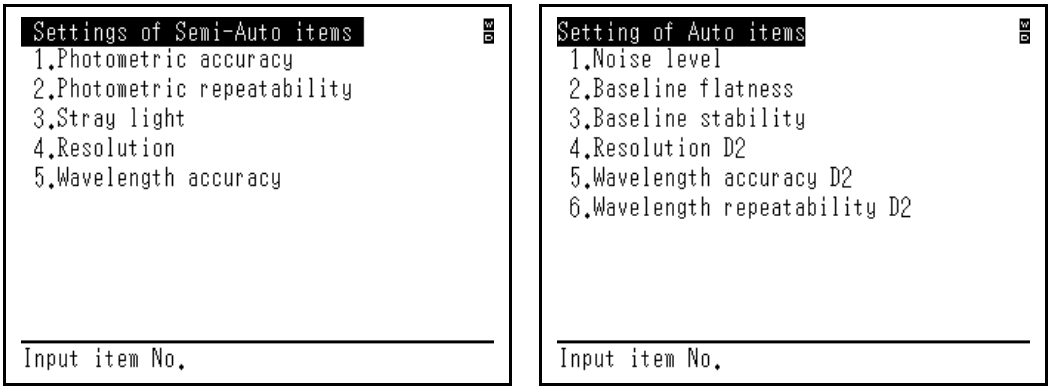
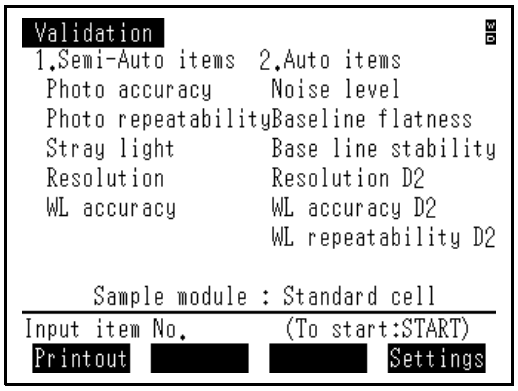


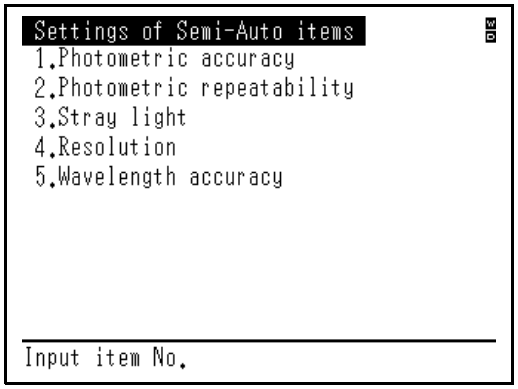
Fig. 16.4 Validation Options screen

An example of selecting validation items and setting validation parameters is given below.
The following example describes the steps for selecting the validation items of "Photometric Accuracy" and "Wavelength Accuracy D2".

1 Press the 1 [Semi-Auto items] key on the Parameter Configuration screen for instrument validation.

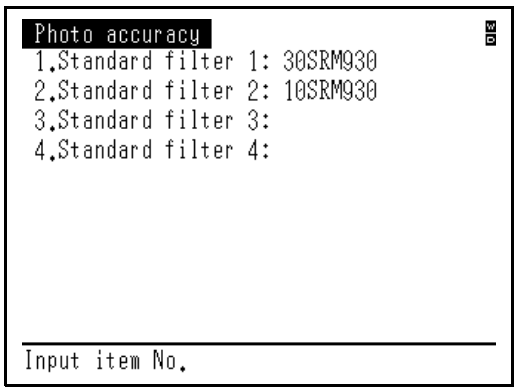


2 Press the 1 [1. Photometric accuracy] key on the [Settings of Semi-Auto items] screen.



3 Using numeric keys, enter the item number of the filter to be validated on the filter selection screen for photometric accuracy.

Since the validation using "Standard filter 2" is performed in this example, press the 2 key.

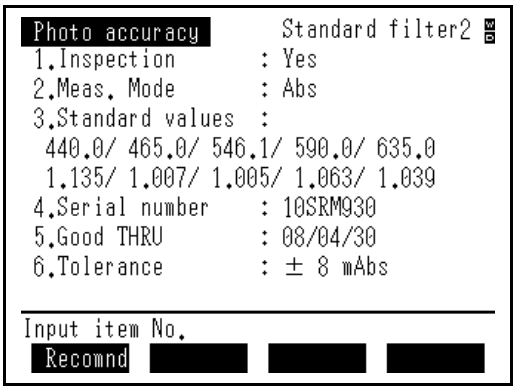


NOTE
If the serial numbers have been input in the Parameter Setting screen for standard filters, the numbers are displayed in the Filter Selection screen.
☞ "16.5.1 Photometric Accuracy"

4 Press the 1 key to change [1. Inspection] from [No] to [Yes] in the Parameter Setting screen for "Photometeric accuracy"/ "Standard fileter 2".

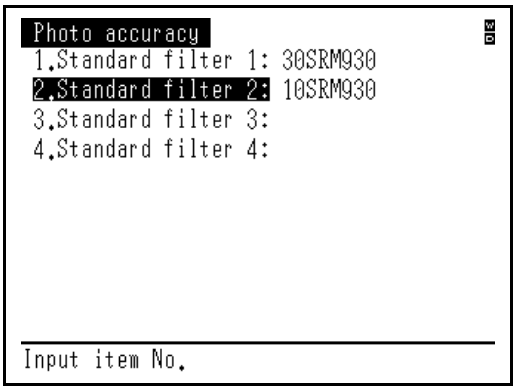
Set the other parameters at your option. (For details of the setting methods, see "16.5.1 Photometric Accuracy".)

Press the RETURN key after completing the setting.



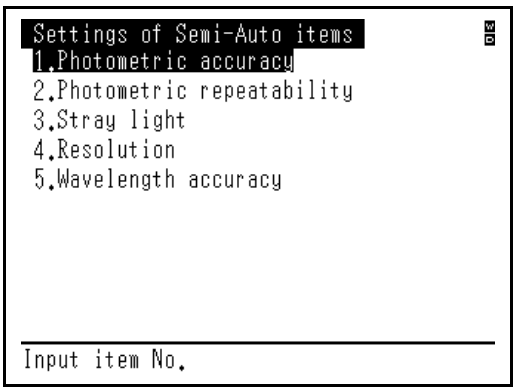
5 Verify that "Standard filter 2" is highlighted in the Filter Selection screen, and press the RETURN key.

> **NOTE**
> The items to be validated are highlighted.



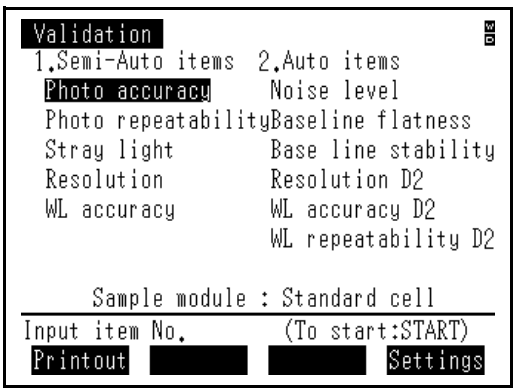
6 Verify that [1. Photometric accuracy] is highlighted in the [Settings of Semi-Auto items] screen, and press the RETURN key.

> **NOTE**
> The semi-auto items to be validated are highlighted.

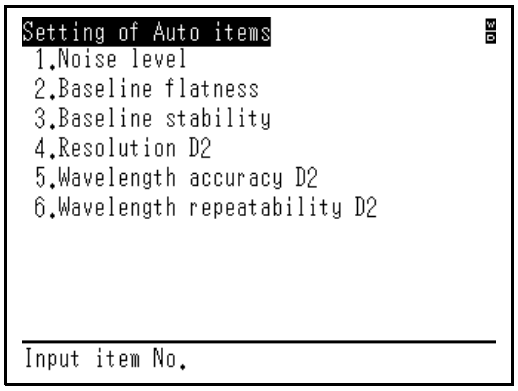


7 Press the 2 [2. Auto items] key on the Parameter Configuration screen for instrument validation.

> **NOTE**
> The items to be validated are highlighted.



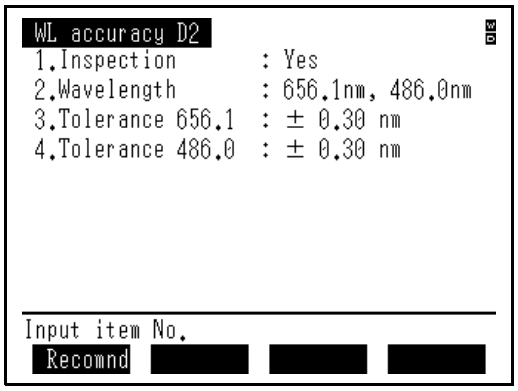
8 Press 5 [5. Wavelength accuracy D2] key on the [Setting of Auto items] screen.



9 Press the 1 key to change [1. inspection] from [No] to [Yes] in the Parameter Setting screen for "WL accuracy D2".

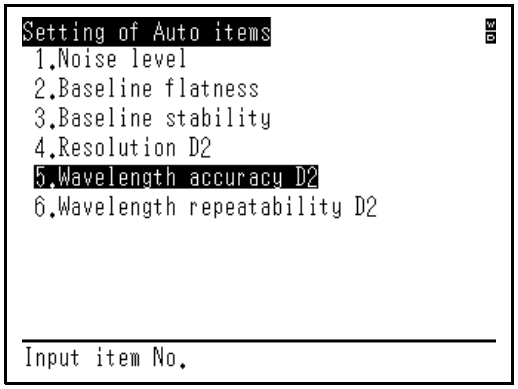
Specify arbitrary values for measurement wavelength and tolerance. For details on the setting procedure, refer to "16.6.5 Wavelength Accuracy D2".

Press the RETURN key after completing the setting.



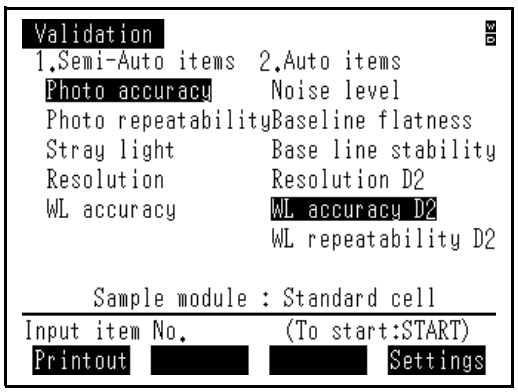
10 Verify that [5. Wavelength Accuracy D2] is highlighted in the [Setting of Auto-items] screen, and press the RETURN key.

NOTE
The auto items to be validated are highlighted.



11 Press the RETURN key to go back to the Parameter Configuration screen.

NOTE
The items to be validated are highlighted.



16.3.2 Printing Results

When you press F1 key in the Parameter Configuration screen for Instrument Validation (Fig. 16.3), all the recorded validation results are printed out. (Note that the results for items that have not been validated are not printed out.)

While the "Auto print" command (☞ "16.3.3 Validation Options") prints screen hard copies such as spectral waveforms and time course curves, the "PrintOut" command prints only the validation results. For details on the contents of each validation item, refer to the printout example of each validation item described in "16.5 Semi-Auto Validation Item Details" and "16.6 Auto Validation Item Details".

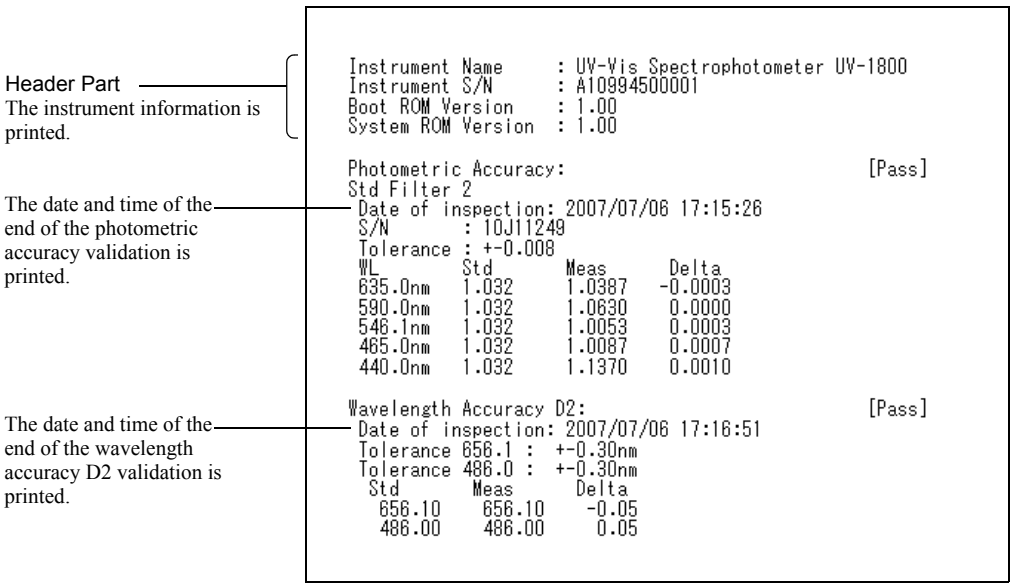


Fig. 16.5 Example of Printing Results

When performing the instrument validation, the UV-1800 stores only the latest result for each validation item. Therefore, upon the completion of the validation of a new item, the previously obtained result is overwritten by the new one. The date of inspection is stored and printed for each validation item.

NOTE

If a commercially available printer is selected as used, the left margin can be set in a range between 0 and 9. In this case, the printout format is the same as that of a screen hardcopy printer. To select a printer and then set it up, select [8. Utilities]/[5. Printer] in the Mode screen. (See "14.1.4 Printer Setting".)

16.3.3 Validation Options

When the F4 key is pressed on the Parameter Configuration screen for instrument validation (Fig. 16.3), the Validation Settings screen appears.

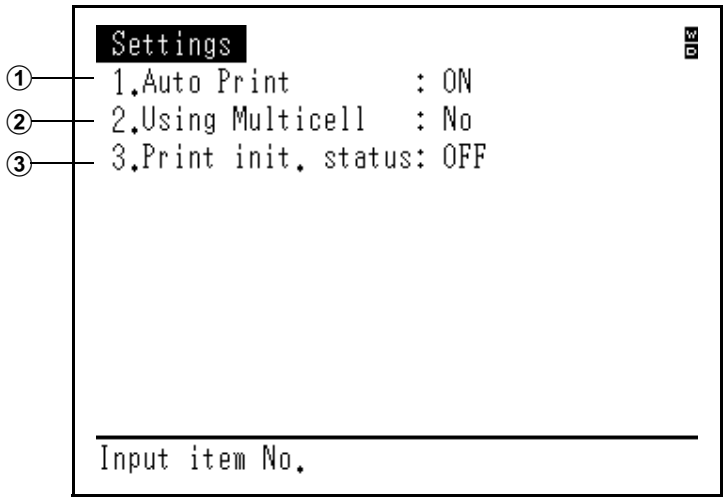
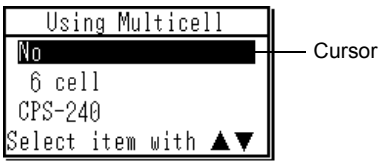
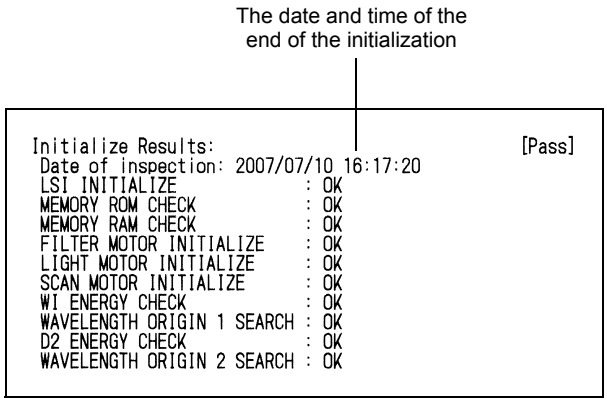


Fig. 16.6 Validation Settings screen

No.	Key Operation	Display	Description
①	1	[Auto print]	Select whether or not to perform Auto print after each validation. Each pressing of the key toggles between [ON] and [OFF]. If Auto print is set to [ON], the result is printed whenever each validation option is completed. If a spectrum or time course is measured during the validation, the corresponding graph is also printed out (as a hard copy of the screen). For the print format, see the sections of each validation option that describe changing the parameter. **NOTE** 1)The printout format does not depend upon the printer. Therefore, the result is printed out in the same format on both a screen hardcopy printer and a commercially available printer. 2) When a screen hardcopy printer is used with Auto print set to [ON], the validation result cannot be printed out if the printer is set to "OFF LINE".

No.	Key Operation	Display	Description
②	2	[Using Multicell]	Select whether or not to use the optional multicell (6-cell) or CPS-240 for validation. Using the ▲ ▼ keys, move the cursor to the desired sample module, and confirm with the ENTER key.  Fig. 16.7 Sample Module Selection screen When executing semi-automatic validation items using the multicell (6-cell) or CPS-240, the validation can be implemented by automatically switching filters and reagents to be used. For the instruction of how to use these options and the operation details, refer to the instruction on each validation item (16.5).
③	3	[Print init. status]	Allows you to select whether or not to print the results of initialization and various self-diagnosis checks performed when the power is turned ON. Each pressing of the key toggles between ON and OFF. If [Print init. status] is set to [ON], the selected initialization items and the results are recorded and printed out.  (Printout format of the initialization result record)
–	RETURN	–	Returns to the Parameter Configuration screen (Fig. 16.3).

16.4 Executing Validation

When you press the START/STOP key in the Parameter Configuration screen (Fig. 16.3), the validation for highlighted items is started.

First, the UV-1800 checks the expiration date of the validation products used.

If any one of the validation products registered to the executed semi-auto item has expired, the entire validation process is terminated and you will return to the Parameter Configuration screen (☞ "16.4.1 Monitoring Validity of Validation Products").

The validations are executed from semi-auto items to auto-items.

Since the semi-automatic validation is carried out interactively, the operator must type in data and add/remove validation products in accordance with the messages displayed on the screen.

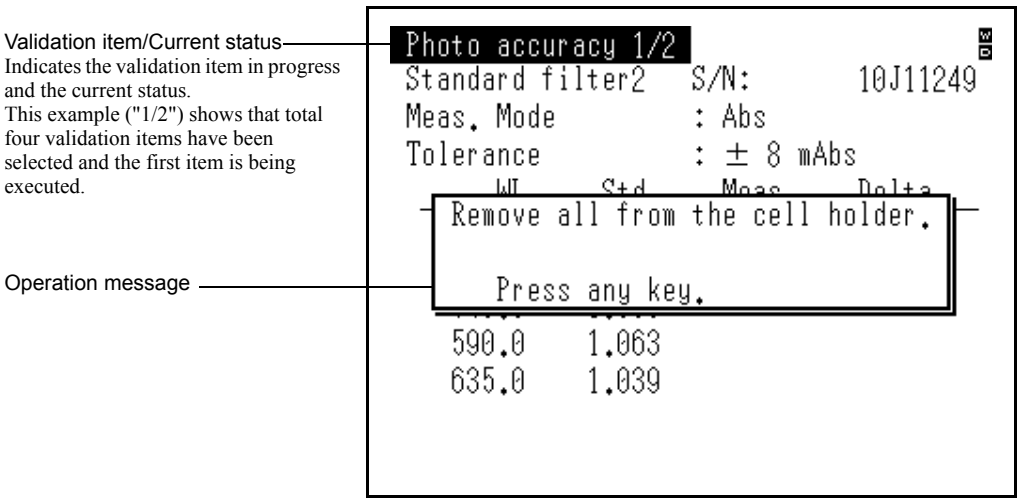


Fig. 16.8 Validation Execution screen (Photometric accuracy)

The validation results will be displayed and saved for each validation item upon completion of the validation.

When the auto print function is enabled (☞ "16.3.3 Validation Options"), the results will be automatically printed. For printout examples, refer to "16.5 Semi-Auto Validation Item Details" and "16.6 Auto Validation Item Details".

The key functions during validation are given in the following:

Key Operation	Description
RETURN	Terminates the current validation item, and returns to the Parameter Configuration screen (Fig. 16.2). (No more validation is executed.)
START/STOP	Terminates the current validation item, and proceeds to the next validation item.
Any keys other than the above	Allows you to proceed to the next operation when an operation message is displayed.

NOTE

Although the current validation (item) is terminated, the results of the validation items completed up to that point are saved to the UV-1800. Therefore, those results can be printed out (☞ "16.3.2 Printing Results").

For examples of screen displays during validation, refer to "16.4.2 Example of Executing Validation".

16.4.1 Monitoring Validity of Validation Products

For the semi-auto validation items, the performance assurance period for validation products, and validities of standard values and calibration values can be entered in the Validation Parameter Setting screen. (☞ "16.5 Semi-Auto Validation Item Details")

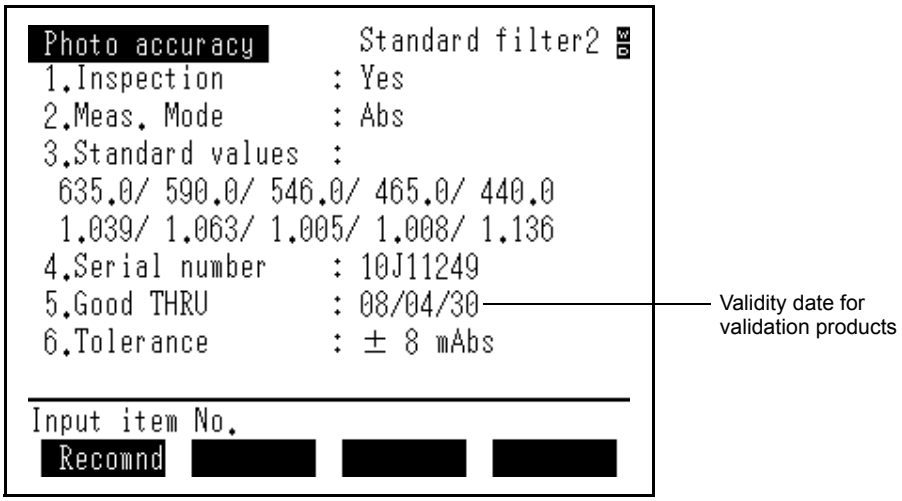
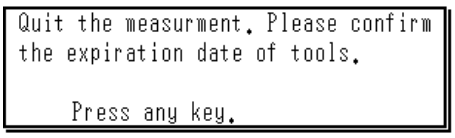


Fig. 16.9 Validation Parameter Setting screen (Photometric accuracy)

When starting the validation process using the instrument validation function, first the UV-1800 checks the expiration date of the validation products.

If any one of the validation products for the scheduled validation items is expired, the entire validation is aborted.

(The following message appears, and by pressing any key you will return to the Parameter Configuration screen for the instrument validation (Fig. 16.3)).



In such a case, verify the validation product expiration date in the Parameter Configuration screen for the item in question, and change any discrepancies to the correct product information.

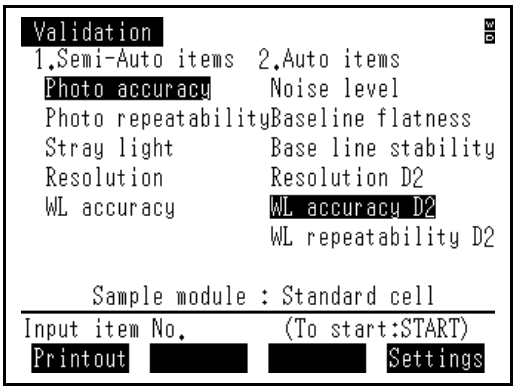
16.4.2 Example of Executing Validation

An example of executing the validation is given below.

The following example describes the steps for executing the validation items of "Photometric accuracy" and "Wavelength accuracy D2".

Note that the validation parameters in the example below are those specified in "16.3.1 Selecting a Validation Item and Changing the Parameters".

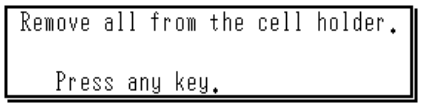
1 Verify that the title of the validation item to be executed is highlighted in the Parameter Cofiguration screen for instrument validation.
(This example shows that "Photometric accuracy" and "Wavelength accuracy D2" will be executed.)



2 Press the START/STOP key to start the validation.

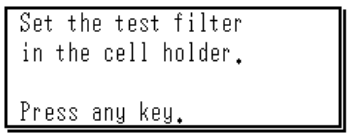
(The validation of the photometric accuracy is started.)

3 Verify that nothing is placed in the sample compartment as instructed in the message, and press the START/STOP key to start baseline correction.

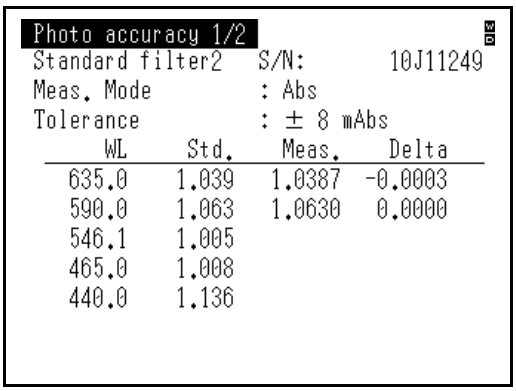


(The baseline correction is performed.)

4 When the baseline correction is completed, the next message appears. Insert the standard filter to follow the message, and press the ENTER key.



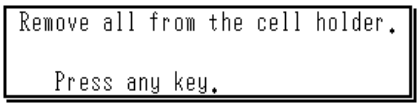
5 The photometric values at the specified wavelengths are measured sequentially, and the evaluation results are displayed simultaneously based on the deviation from the standard value.



NOTE

When "Auto print" is set to "ON" (☞ "16.3.3 Validation Options"), the validation results are automatically printed (☞ Fig. 16.9).

6 When the measurements and evaluations are completed for all wavelengths, the message in the figure at right appears.
Remove the standard filter, verify that nothing is placed in the sample compartment as instructed in the message, and close the sample comartment cover.

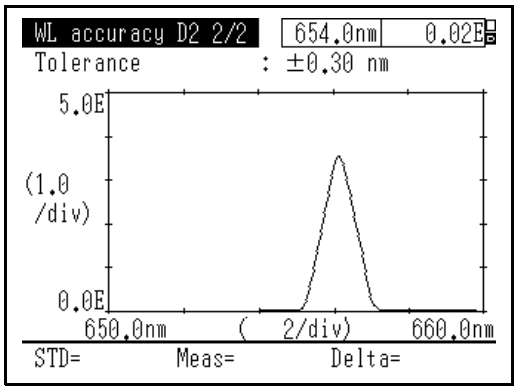


Press the ENTER key to proceed to the next validation item.

(The validation of the wavelength accuracy D2 is started.)

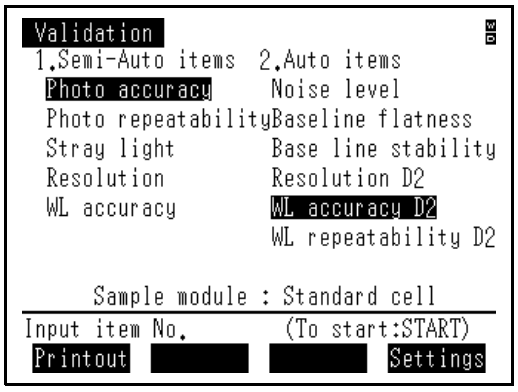
7 The Validation screen for [Wavelength accuracy D2] is displayed, and the waveform is plotted in real time.

When both 486.0 nm and 656.1 nm are selected for measurement wavelengths, first the emission line of 656.1 nm is measured, and the result is displayed at the bottom of the screen. Then, the Measurement screen for the emission line 486.0 nm immediately appears, and the measurement is started.



NOTE
When "Auto print" is set to "ON" (☞ "16.3.3 Validation Options"), the validation results are automatically printed (☞ Fig. 16.10).

8 When all scheduled validation items are completed, you will return to the Parameter Configuration screen for the instrument validation.



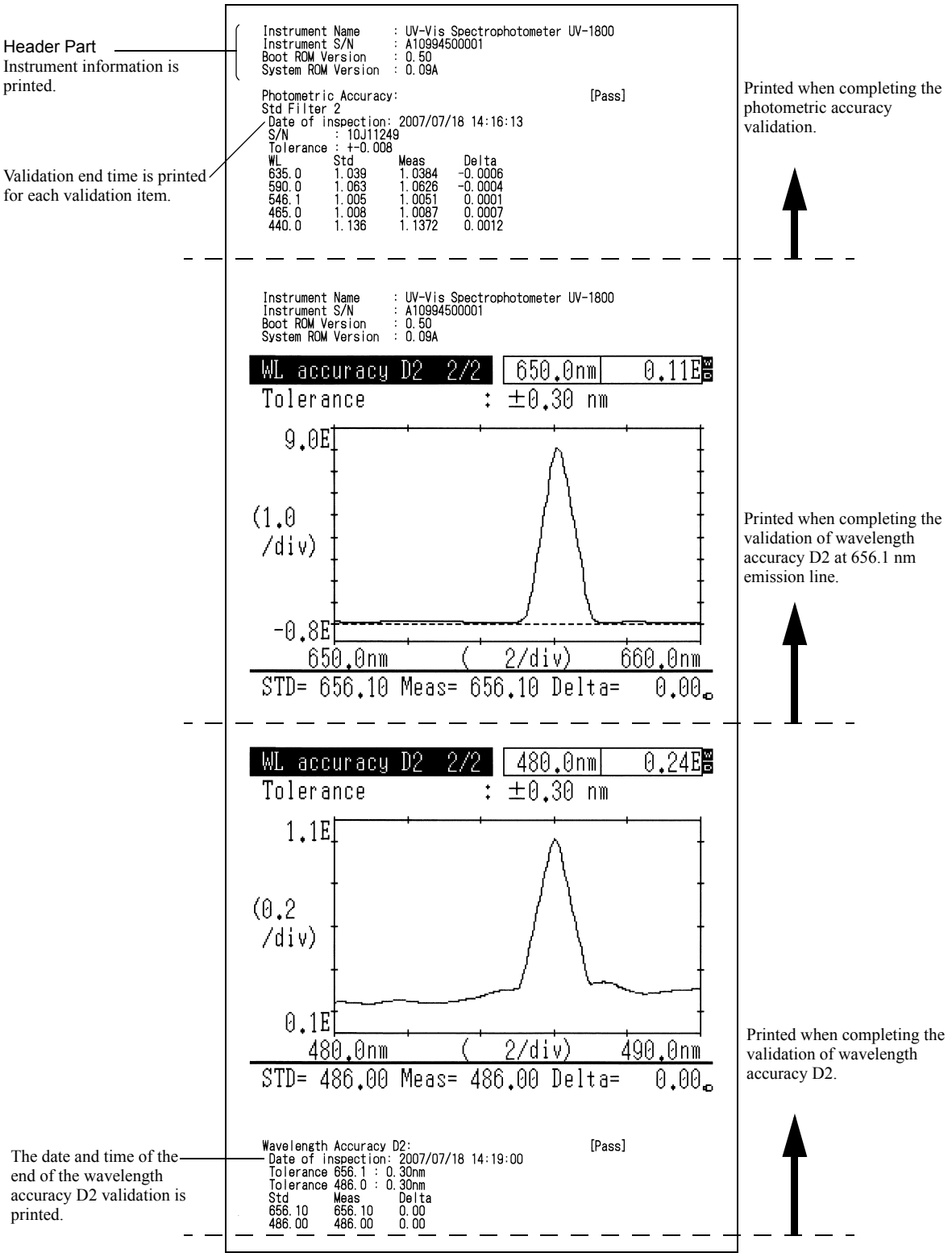


Fig. 16.10 Example of Auto print

16.5 Semi-Auto Validation Item Details

16.5.1 Photometric Accuracy

In the validation of the photometric accuracy, the optical filter for transmittance calibration is measured (absorbance or transmittance), and then the deviation of the measured values from the standard values for calibration (standard values) indicated on the filter is used for the evaluation.

For the validation, the calibrated four types of filters are available.

If you enter the item number of each filter on the Standard Filter Selection screen (Fig. 16.11) with numeric keys, the screen appears for setting the validation parameters for the filter (Fig. 16.12). Press the RETURN key to return to the Validation Options screen for the semi-auto items (Fig. 16.4).

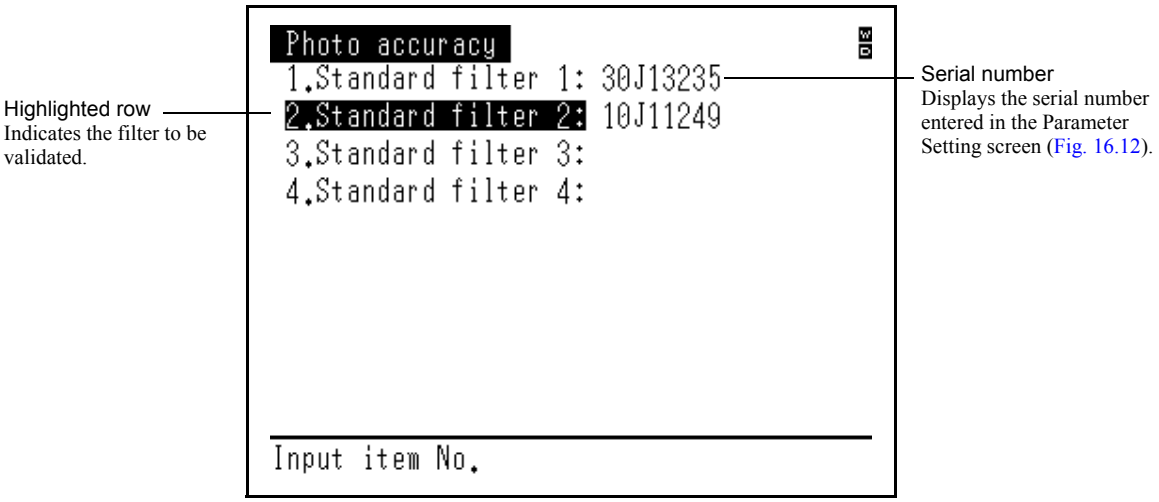


Fig. 16.11 Standard Filter Selection screen

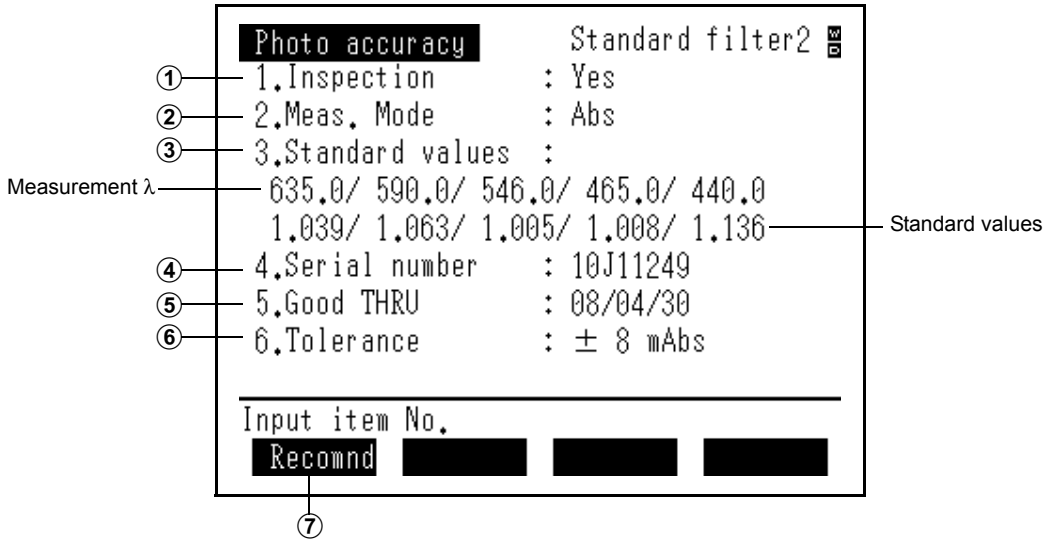
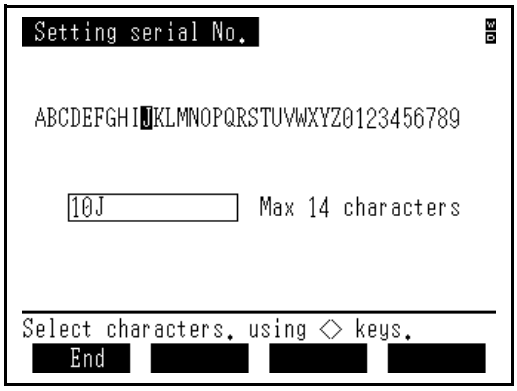


Fig. 16.12 Parameter Setting screen for photometric accuracy (standard filter 2)

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>①</td><td>1</td><td>[Inspection]</td><td>Select [Yes] or [No] to specify whether the photometric accuracy is validated or not.
Each pressing of the key toggles between [Yes] and [No].</td></tr>
<tr><td>②</td><td>2</td><td>[Meas. Mode]</td><td>Select the unit of photometric values. Each pressing of the key toggles between [Abs (Absorbance)] and [%T (Transmittance)]. By this operation, the filter standard value and tolerance are also switched to those specified for the selected photometric mode.
NOTE
The standard value and tolerance for the filter in the absorbance/ transmittance mode are separately stored. Therefore, if the measurement mode is changed to Transmittance when the standard value and tolerance were entered in the Absorbance mode, the values entered in the Absorbance mode will not be converted into the ones in the Transmittance mode.</td></tr>
<tr><td>③</td><td>3</td><td>[Standard values]</td><td>Enter the measurement wavelengths and standard values for the filter.
<table><tr><td>Measurement λ</td><td>Specify the wavelengths at which to measure the photometric values. The wavelength entered here is the wavelength tolerance for the optical filters used for the validation. For the photometric accuracy validation, five different wavelengths can be specified.</td></tr><tr><td>Standard value</td><td>Enter the standard values corresponding to the measurement specified in the item above. The unit of standard values changes according to the unit specified in [2. Meas. Mode] on the screen shown in Fig. 16.12. The input range of standard values is between 0.000 and 4.000 Abs and between 0.00 and 99.99 %.</td></tr></table></td></tr>
</table>

No.	Key Operation	Display	Description
④	4	[Serial number]	Enter the serial number of the filter. The number entered here will be saved as a validation parameter for the photometric accuracy and printed out together with the validation result.  Fig. 16.13 [Setting serial No.] screen Press the ◄(-) ► keys to move the cursor to the desired character in the list. Then, press the ENTER key to enter the selected character in the input filename column. After you finish entering the serial number by repeating the same procedure, press the F1 [End] key to return to the Parameter Setting screen (Fig. 16.12). **NOTE** If you press the F1 [End] key without entering any serial number, no serial number will be set.
⑤	5	[Good THRU]	Enter the validity for the standard value of the filter. The date entered here is saved as a validation parameter and used to automatically check to see whether the validation expires or not when the validation is performed. If a filter with expired validity is used, the validation cannot be performed. (☞ "16.4.1 Monitoring Validity of Validation Products") **NOTE** The format for displaying the date is the same as specified in [8. Utilities]/[6. Clock set] on the Mode screen.

No.	Key Operation	Display	Description
⑥	6	[Tolerance]	Enter the tolerance (range) used to evaluate the validation result. The unit of the tolerance changes according to the unit specified in [2. Meas. Mode] in Fig. 16.12. The tolerance input range is between 1 and 99 mAbs for absorbance (Abs) and between 0 and 99 % for transmittance. The tolerance for transmittance is set as a relative value. Therefore, if, for example, the tolerance is set to ± 2 % of the standard value 23.92 (%T), the allowance range will be "23.92 ± 0.48 (23.44 - 24.40) %T" obtained by [23.92 × (2/100) ≒ 0.48]. **NOTE** To define tolerances, the calibration accuracy of the standard filter must be considered. For example, if the filter accuracy (relative accuracy to transmittance) is ± 1 %, the value converted to absorbance will be approx. "± 0.0043 Abs". Therefore, when checking whether the instrument photometric accuracy falls within ± 0.004 Abs by using a 10 % transmittance filter, define the tolerance as "within ±0.008 Abs (the fourth decimal place is rounded off)".
⑦	F1	[Recomnd]	Resets the tolerance for photometric accuracy to the recommended value (default value). The recommended value is "within ± 8 mAbs" for absorbance (Abs) or "within ± 2 %" for transmittance (%T). **NOTE** The values above are the tolerances for the periodic inspection performed by Shimadzu.
–	RETURN	–	Returns to the Standard Filter Selection screen (Fig. 16.11).

■ Filter arrangement when using the multicell (6-cell) or CPS-240

When using the optional cell holder such as multicell (6-cell) or CPS-240, set the standard filters as shown in Fig. 16.14.

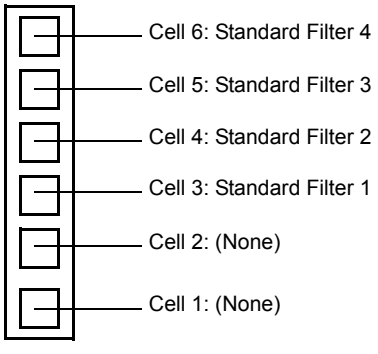
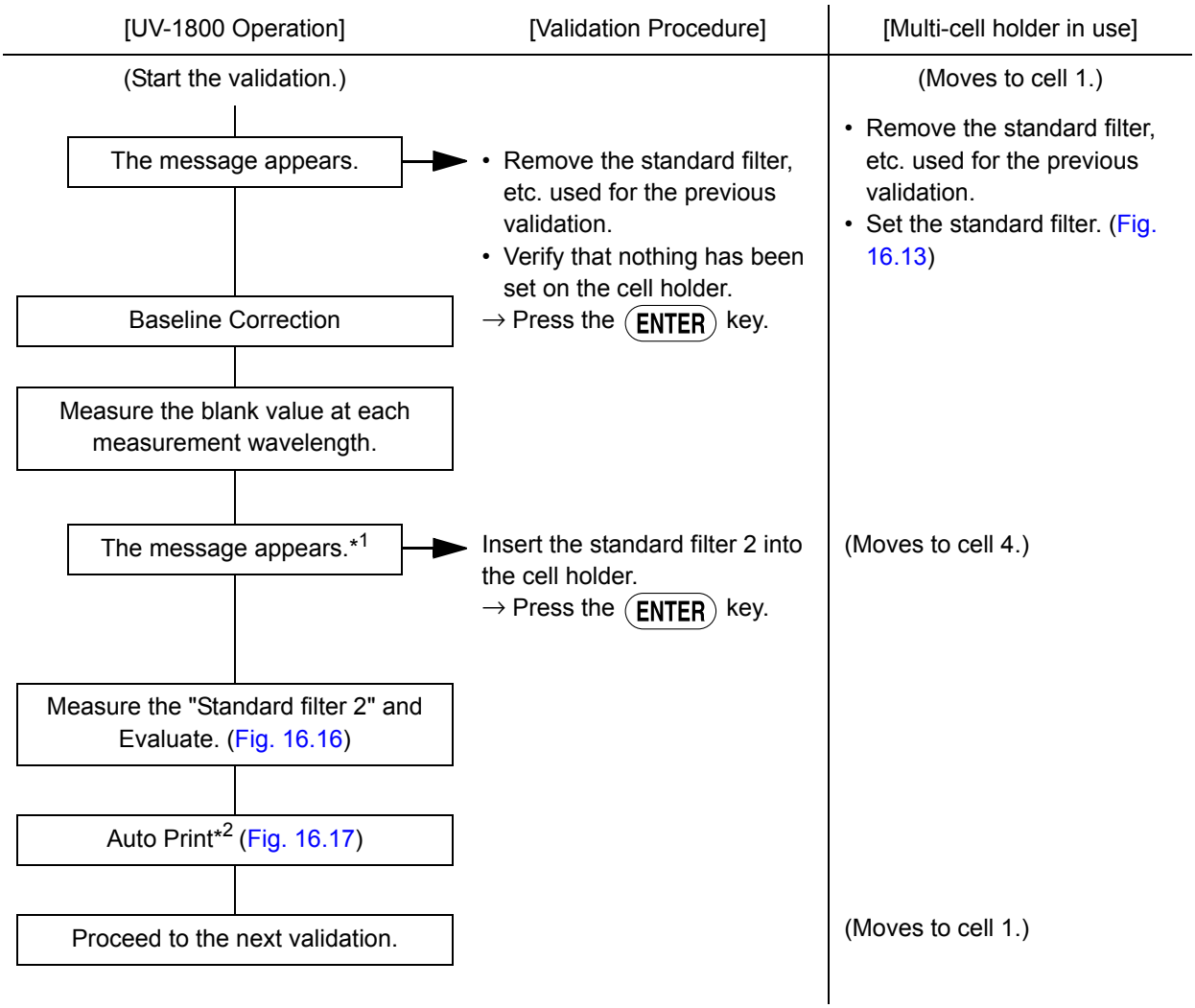


Fig. 16.14 Set positions for standard filter

■ Validation flow

After the validation is started, carry out the validation process as instructed by messages displayed at the bottom of the screen.

The validation flow of the photometric accuracy using standard filter 1 is shown below. If multiple standard filters are to be used for the validation, the following procedure is performed for each filter.



*1 Not displayed when using the Multi-cell.

*2 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.15 Validation flow of photometric accuracy

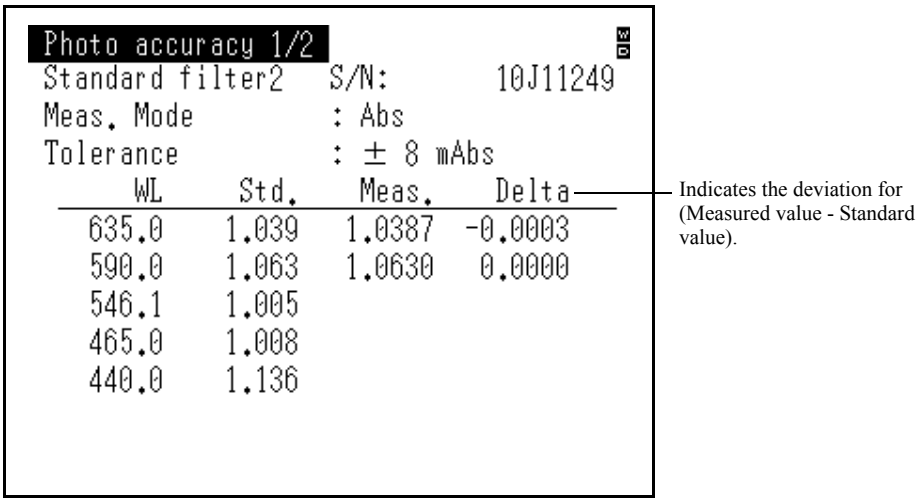


Fig. 16.16 Validation Results screen for photometric accuracy (in progress)

The format of the validation result that is printed out after the validation is shown below:

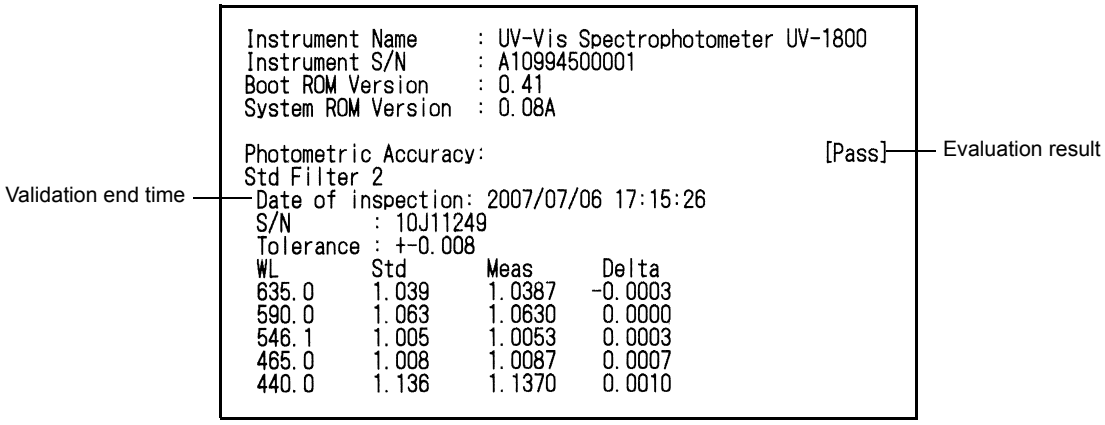


Fig. 16.17 Auto print format for photometric accuracy

The evaluation result is printed out next to the title of the validation item. If the deviations at all validation wavelengths for the filter are within tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.5.2 Photometric Repeatability

In the validation of photometric repeatability, the optical filter for transmittance calibration is used to measure the photometric value (absorbance or transmittance) at an arbitrarily specified wavelength three times. The mean value is obtained, and then the deviation of the measured values from that mean value is used to evaluate the results.

For this validation, the calibrated four types of filters are available.

If you enter the item number of each filter on the Standard Filter Selection screen (Fig. 16.18) with numeric keys, the screen appears for setting the validation parameters for the filter (Fig. 16.19). Press the RETURN key to return to the Validation Options screen for the semi-auto items (Fig. 16.4).

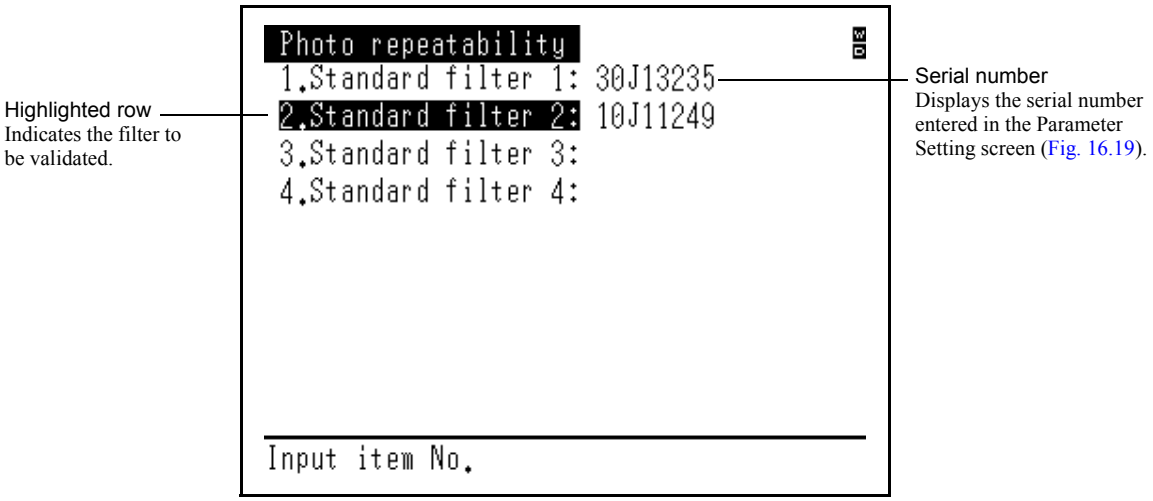


Fig. 16.18 Standard Filter Selection screen

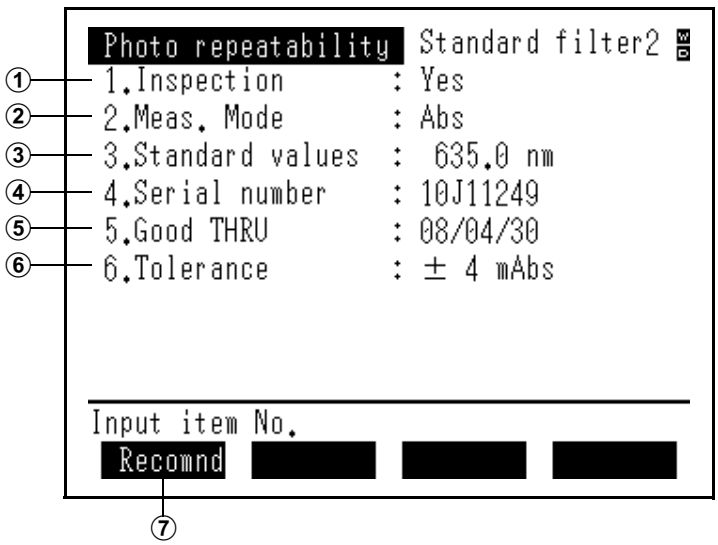
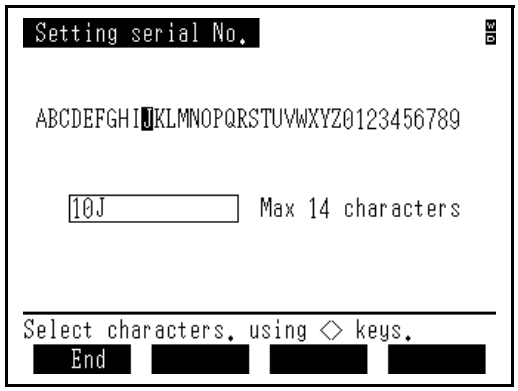


Fig. 16.19 Parameter Setting screen for photometric repeatability (standard filter 2)

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the validation is performed or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Meas. Mode]	Select the unit of photometric values. Each pressing of the key toggles between [Abs (Absorbance)] and [%T (Transmittance)]. By this operation, the tolerance is also switched to that specified for the selected photometric mode. **NOTE** The tolerance in the absorbance/transmittance mode is independently stored. Therefore, for example, if the measurement mode is changed to Transmittance when the standard value and tolerance were entered in the Absorbance mode, the values entered in the Absorbance mode will not be converted into the ones in the Transmittance mode.
③	3	[Wavelength]	Enter a wavelength at which to measure the photometric value.
④	4	[Serial number]	Enter the serial number of the filter. The number entered here will be saved as a validation parameter for the photometric repeatability and printed out together with the validation result.  Fig. 16.20 [Setting serial No.] screen Press the ◄ ► keys to move the cursor to the desired character in the list. Then, press the ENTER key to enter the selected character in the input filename column. After you finish entering the serial number by repeating the same procedure, press the F1 [End] key to return to the Parameter Setting screen (Fig. 16.19). **NOTE** If you press the F1 [End] key without entering any serial number, no serial number will be set.

No.	Key Operation	Display	Description
⑤	5	[Good THRU]	Enter the validity for the standard value of the filter. The date entered here is saved as a validation parameter and used to automatically check to see whether the validation expires or not when the validation is performed. If a filter with expired validity is used, the validation cannot be performed. (☞ "16.4.1 Monitoring Validity of Validation Products") **NOTE** The format for displaying the date is the same as specified in [8. Utilities]/[6. Clock set] on the Mode screen (Fig. 2.1).
⑥	6	[Tolerance]	Enter the tolerance (range) used to evaluate the validation result. The unit of the tolerance changes according to the unit specified in [2. Meas. Mode] in Fig. 16.19. The tolerance input range is between 1 and 99 mAbs for absorbance (Abs) and between 0 and 99 % for transmittance.
⑦	F1	[Recomnd]	Resets the tolerance for photometric accuracy to the recommended value (default value). The recommended value is "within ± 4 mAbs" for absorbance (Abs) or "within ± 1 %T" for tolerance (%T). **NOTE** The values above are the tolerances for the periodic inspection (repeatability near 1 Abs) performed by Shimadzu.
–	RETURN	–	Returns to the Standard Filter Selection screen (Fig. 16.18).

■ Filter arrangement when using the multicell (6-cell) or CPS-240

When using the optional cell holder such as multicell (6-cell) or CPS-240, set the standard filters as shown in Fig. 16.21.

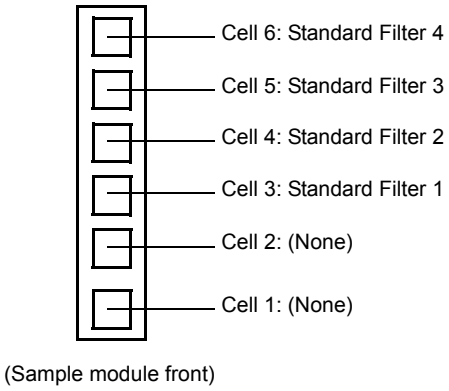


Fig. 16.21 Set positions for standard filters

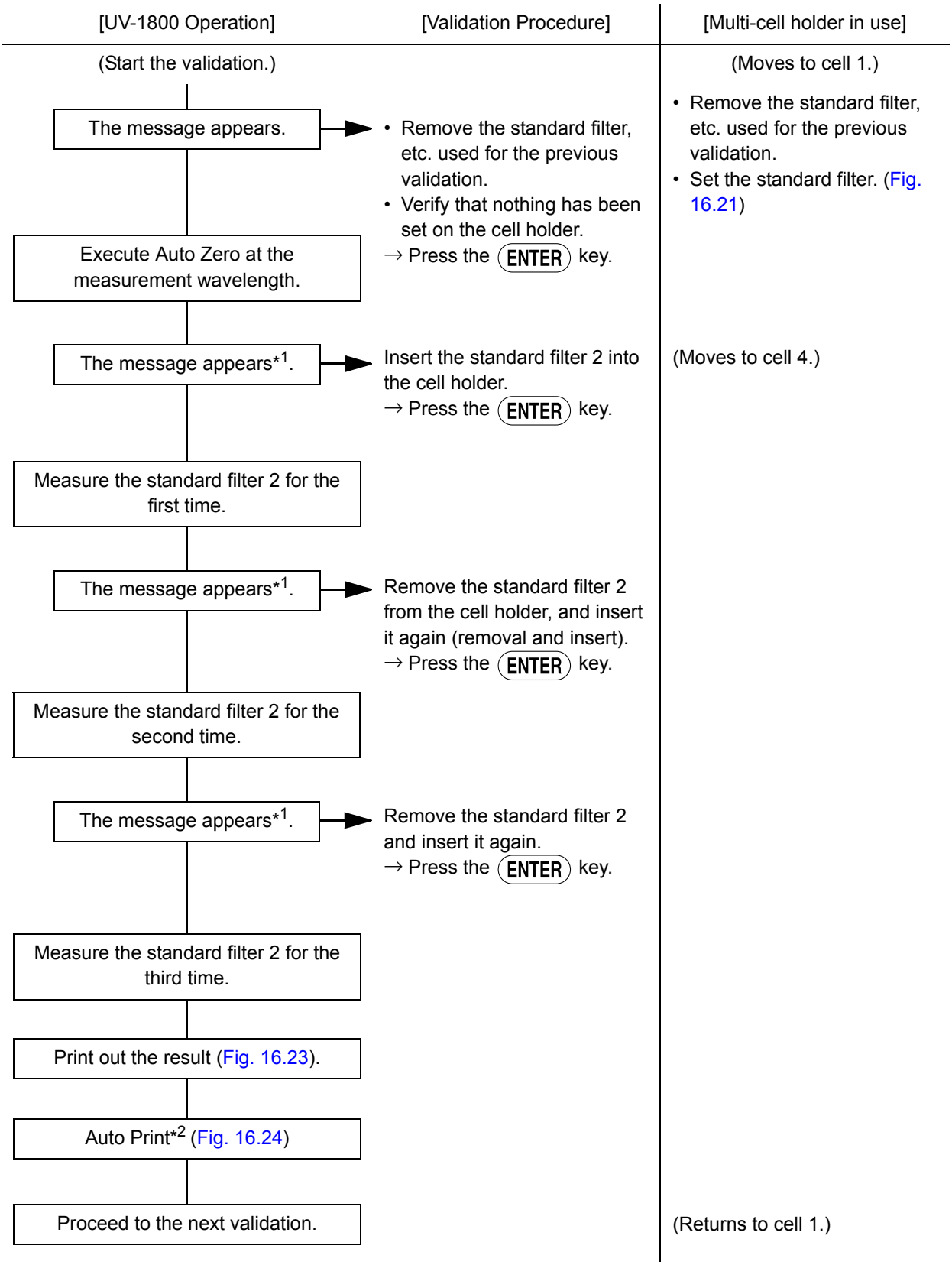
■ Validation flow

After the validation is started, carry out the validation process as instructed by messages displayed at the bottom of the screen.

The validation flow of the photometric repeatability using standard filter 1 is shown below. If multiple standard filters are to be used for the validation, the following procedure is performed for each filter.

NOTE

When using the Multi-cell, standard filters cannot be removed nor inserted.



*1 Not displayed when using the Multi-cell.
*2 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.22 Validation flow of photometric repeatability

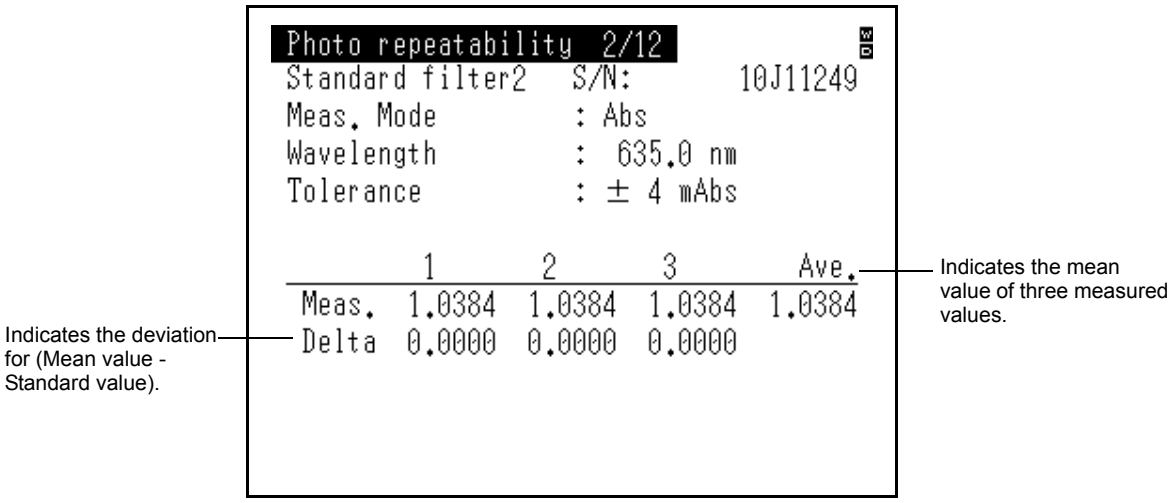


Fig. 16.23 Validation Execution screen for photometric repeatability

The format of the validation result that is printed out after the validation is shown below:

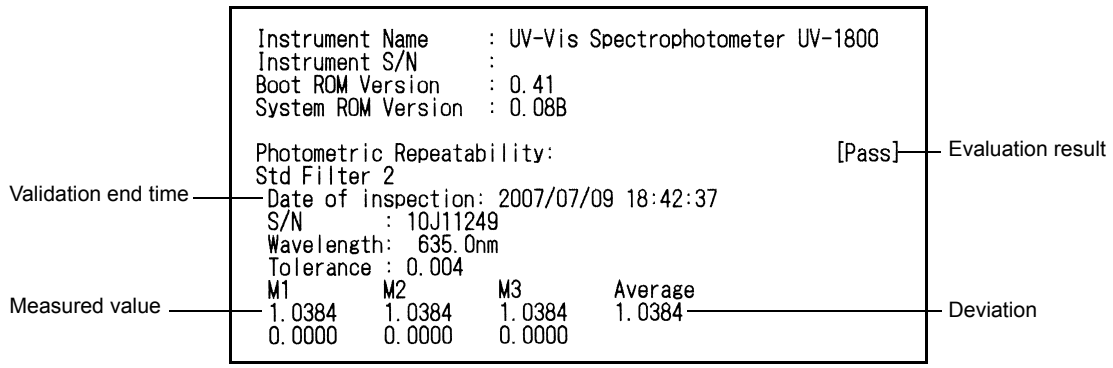


Fig. 16.24 Auto print format for photometric repeatability

The evaluation result is printed out next to the title of the validation item. If the deviations between all measured values at the validation wavelength and the mean value are within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.5.3 Stray Light

Stray light is represented by the ratio of the sum of light intensity at wavelengths other than the specified one to the intensity of light coming from the spectroscope at the specified wavelength.
In this validation, the transmittance measured at a specific wavelength using an arbitrary test filter is defined as stray light, and this value is evaluated. Up to four validation wavelengths can be used for validation.
If you enter the item number of each filter on the Test Filter Selection screen (Fig. 16.25) with numeric keys, the screen appears for setting the validation parameters for the filter (Fig. 16.26). Press the RETURN key to return to the Validation Options screen for the semi-auto items (Fig. 16.4).

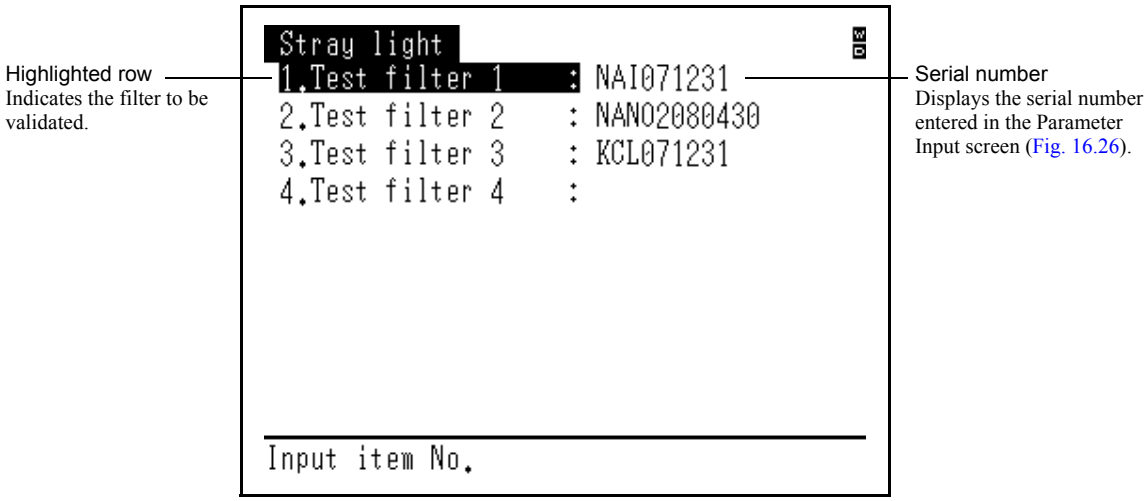


Fig. 16.25 Test Filter Selection Screen

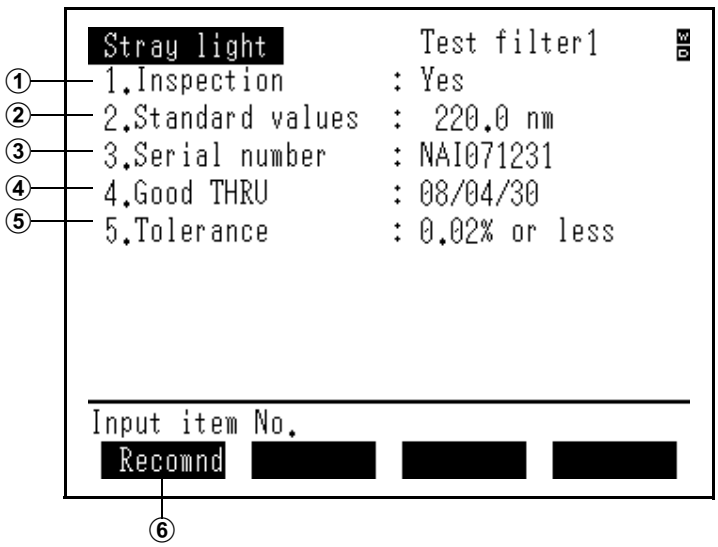
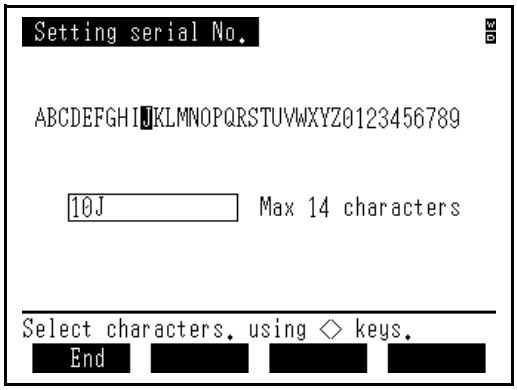


Fig. 16.26 Parameter Setting screen for stray light (test filter 2)

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether stray light is validated or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Wavelength]	Enter a wavelength at which to measure the stray light.
③	3	[Serial number]	Enter the serial number of the filter. The number entered here will be saved as a validation parameter for the stray light and printed out together with the validation result.  Fig. 16.27 [Setting serial No.] screen Press the ◄ ► keys to move the cursor to the desired character in the list. Then, press the ENTER key to enter the selected character in the input filename column. After you finish entering the serial number by repeating the same procedure, press the F1 [End] key to return to the Parameter Setting screen (Fig. 16.26). **NOTE** If you press the F1 [End] key without entering any serial number, no serial number will be set.
④	4	[Good THRU]	Enter the validity for the test filter. The date entered here is saved as a validation parameter and used to automatically check to see whether the validation expires or not when the validation is performed. If a filter with expired validity is used, the validation cannot be performed. (☞ "16.4.1 Monitoring Validity of Validation Products") **NOTE** The format for displaying the date is the same as specified in [8. Utilities]/[6. Clock set] on the Mode screen.
⑤	5	[Tolerance]	Enter the tolerance (range) used to evaluate the validation result. The tolerance input range is between 0.00 and 1.00 %.

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>⑥</td><td>F1</td><td>[Recomnd]</td><td>This allows you to set the recommended values (default values) when placing the following solution filters as test filters 1 to 4. The recommended values for each validation are shown below.
<table>
<tr><th></th><th>Test Filter 1</th><th>Test Filter 2</th><th>Test Filter 3</th><th>Test Filter 4</th></tr>
<tr><td>Corresponding filter</td><td>Sodium iodine solution (10 g/l)</td><td>Sodium nitrite solution (50 g/l)</td><td>Potas-sium chloride solution (12 g/l)</td><td>–</td></tr>
<tr><td>Measurement λ</td><td>220 nm</td><td>340 nm</td><td>198 nm</td><td>–</td></tr>
<tr><td>Tolerance (recommended value)</td><td>0.05 % Max.</td><td>0.05 % Max.</td><td>1 % Max.</td><td>0.05 % Max.</td></tr>
</table>
NOTE
The values above are the tolerances for the periodic inspection performed by Shimadzu.</td></tr>
<tr><td>–</td><td>RETURN</td><td>–</td><td>Returns to the Test Filter Selection screen (Fig. 16.25).</td></tr>
</table>

■ Filter arrangement when using the multicell (6-cell) or CPS-240

When using the optional cell holder such as multicell (6-cell) or CPS-240, set the test filters as shown in Fig. 16.23.

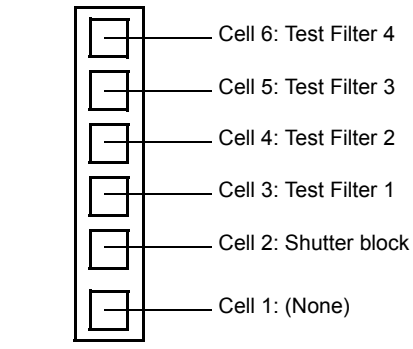
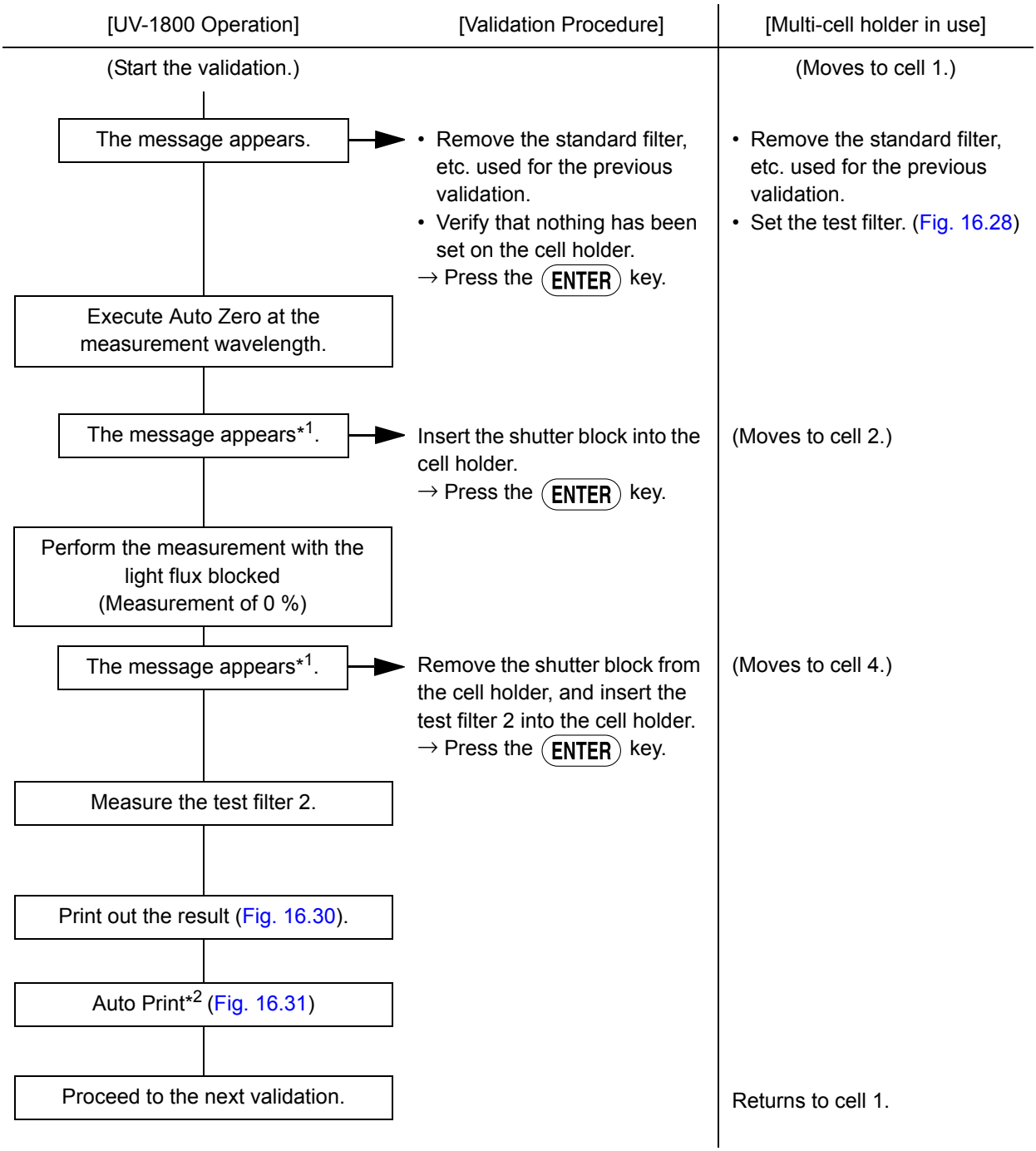


Fig. 16.28 Set positions for test filters

■ Validation flow

After the validation is started, carry out the validation process as instructed by messages displayed at the bottom of the screen.

The validation flow of the stray light using test filter 1 is shown below. If multiple test filters are to be used for the validation, the following procedure is performed for each filter.



*1 Not displayed when using the Multi-cell.

*2 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.29 Validation flow of stray light

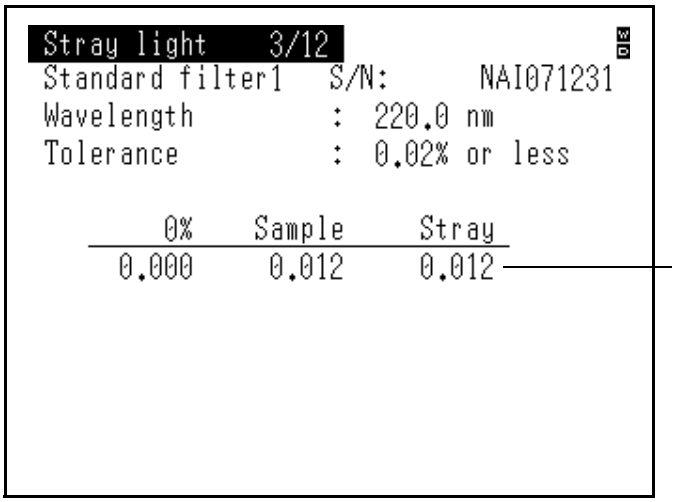


Fig. 16.30 Validation Results screen for stray light

The format of the validation result that is printed out after the validation is shown below:

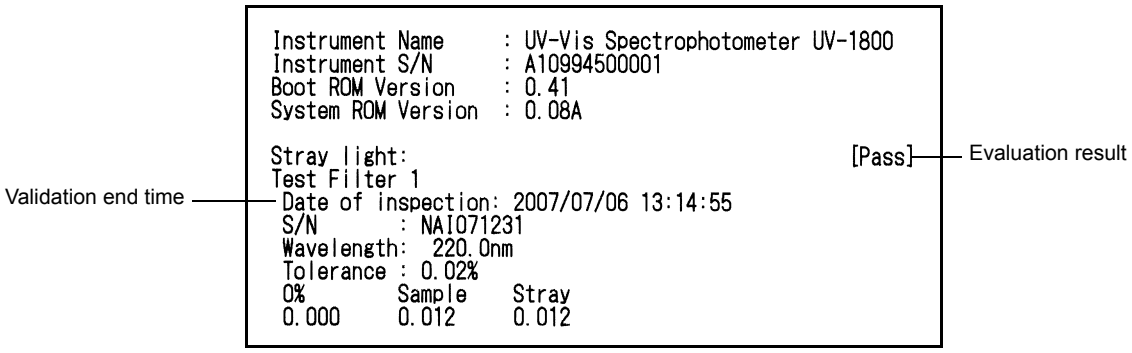


Fig. 16.31 Auto print format for stray light

The evaluation result is printed out next to the title of the validation item. If the stray light values of all tested "test filters" are within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

NOTE

The header is added to the above format when the result is actually printed out. (For further details of the header, see 16.4.2.)

16.5.4 Resolution

For the validation of resolution, the absorbance spectrum of a toluene solution in hexane (0.02 %V/V) is measured. The absorbance ratio between the maximum (peak) value near 269 nm and the minimum (valley) value near 266 nm is obtained, and this value is evaluated.

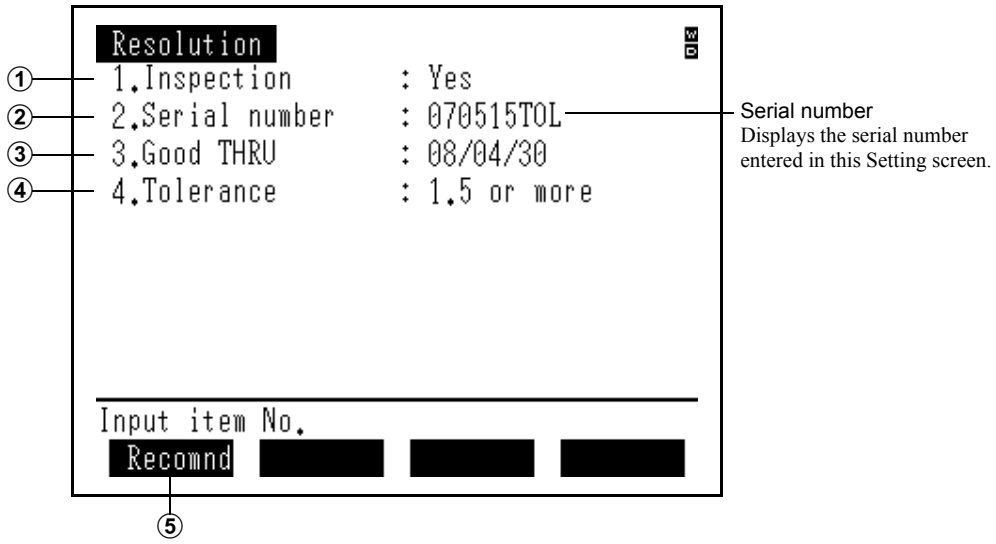
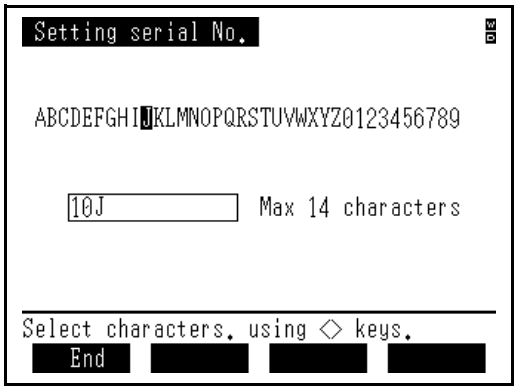


Fig. 16.32 Parameter Setting screen for resolution

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the validation is performed or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Serial number]	Enter the serial number of the solution. The number entered here will be saved as a validation parameter for the resolution and printed out together with the validation result.  Fig. 16.33 [Setting serial No.] screen Press the ◄ ► keys to move the cursor to the desired character in the list. Then, press the ENTER key to enter the selected character in the input filename column. After you finish entering the serial number by repeating the same procedure, press the F1 [End] key to return to the Parameter Setting screen (Fig. 16.32). **NOTE** If you press the F1 [End] key without entering any serial number, no serial number will be set.
③	3	[Good THRU]	Enter the validity for the solution. The date entered here is saved as a validation parameter and used to automatically check to see whether the validation expires or not when the validation is performed. If a solution with expired validity is used, the validation cannot be performed. (☞ "16.4.1 Monitoring Validity of Validation Products") **NOTE** The format for displaying the date is the same as specified in [8. Utilities]/[6. Clock set] on the Mode screen.
④	4	[Tolerance]	Enter the tolerance used to evaluate the measurement result of resolution in a range between 1.0 and 2.0.

No.	Key Operation	Display	Description
⑤	F1	[Recomnd]	Resets the tolerance for resolution to the recommended value (default value). The recommended value is more than 1.5. **NOTE** Shimadzu recommends the value above for the inspection tolerance.
–	RETURN	–	Returns to the [Settings of Semi-Auto items] screen (Fig. 16.4).

■ Solution arrangement when using the multicell (6-cell) or CPS-240

When using the optional cell holder such as multicell (6-cell) or CPS-240, set the solution as shown in Fig. 16.34.

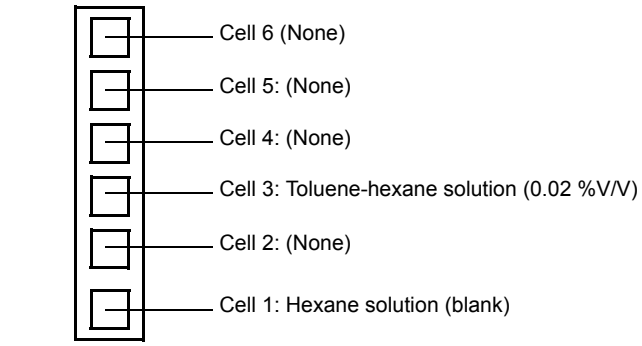
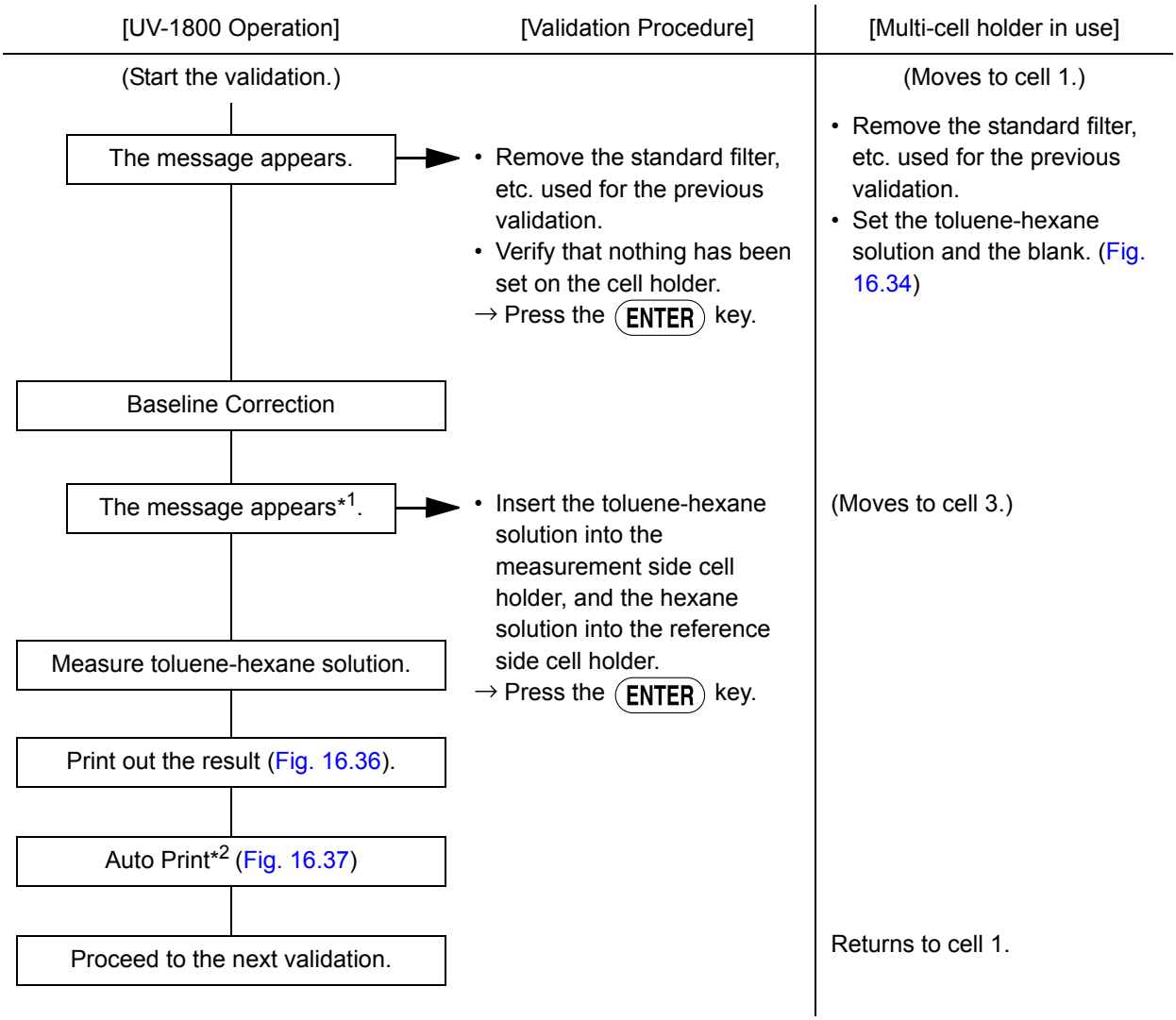


Fig. 16.34 Set position for toluene-hexane solution

■ Validation flow

After the validation is started, carry out the validation process as instructed by messages displayed at the bottom of the screen.



*1 Not displayed when using the Multi-cell.
*2 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.35 Validation flow of resolution

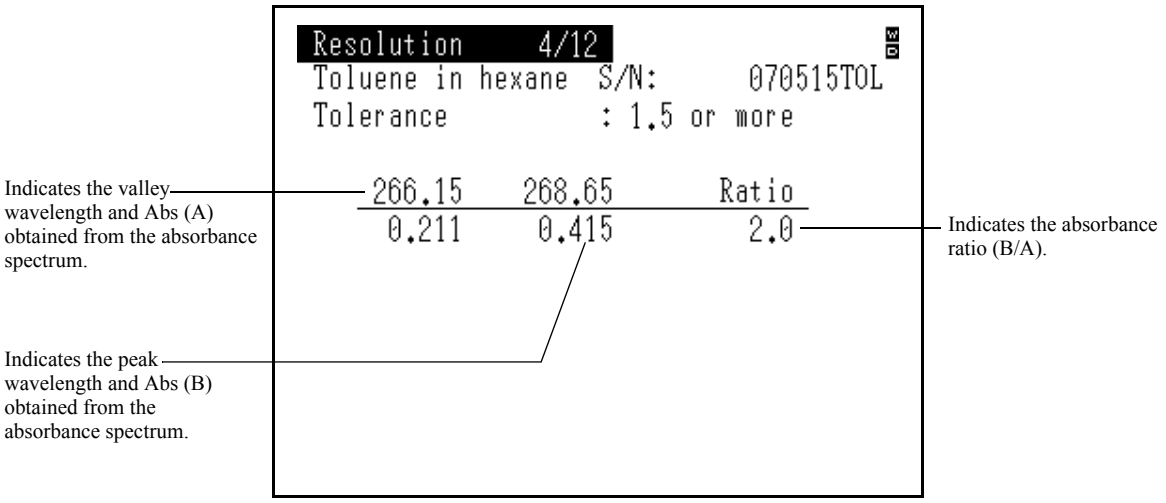


Fig. 16.36 Validation Results screen for resolution

The format of the validation result that is printed out after the validation is shown below.

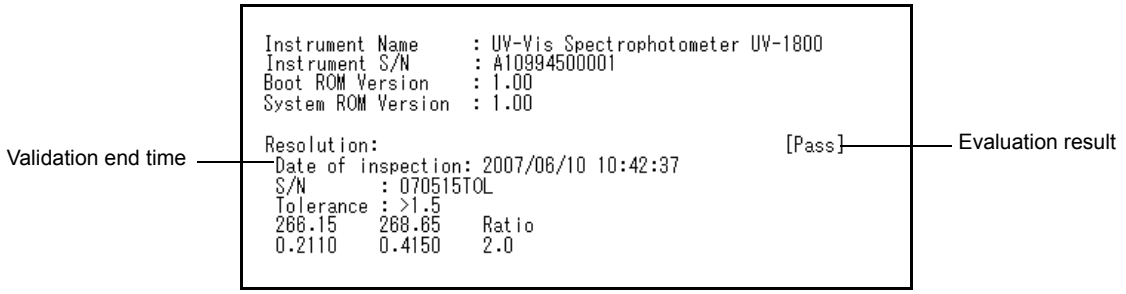


Fig. 16.37 Auto print format for resolution

The evaluation result is printed out next to the title of the validation item.

If the absorbance ratio obtained from the measurements is within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.5.5 WL Accuracy

In the validation of wavelength accuracy, the optical filter for wavelength calibration is measured, and then the deviation from the absorption peak wavelength (for calibrated filter) or the reference wavelength indicated on the filter is used to evaluate the validation result.

Up to two types of calibrated filters can be used for the validation.

If you enter the item number of each filter on the Standard Filter Selection screen (Fig. 16.38) with numeric keys, the screen appears for setting the validation parameters for the filter (Fig. 16.39). Press the RETURN key to return to the Validation Options screen for the semi-auto items (Fig. 16.4).

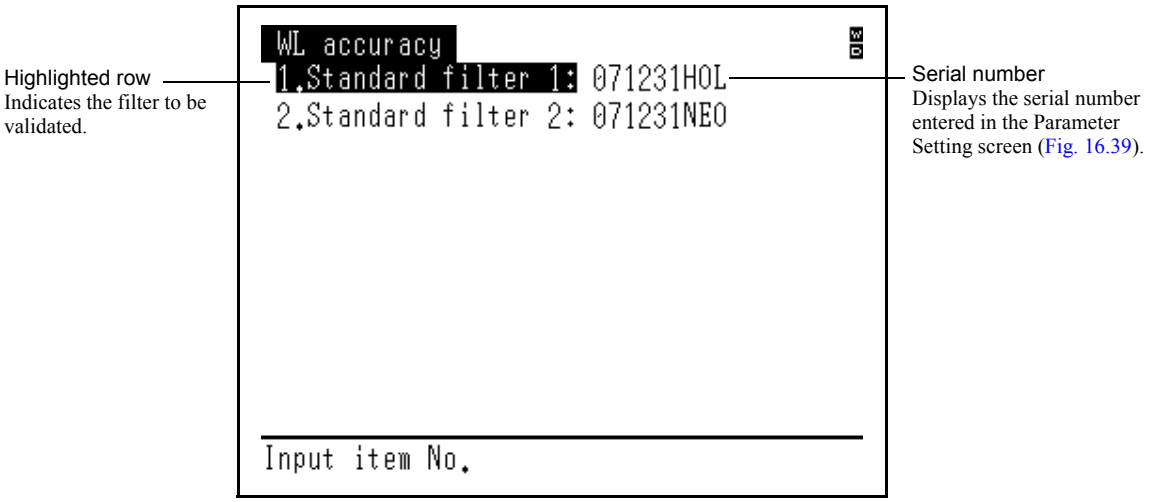


Fig. 16.38 Standard Filter Selection screen

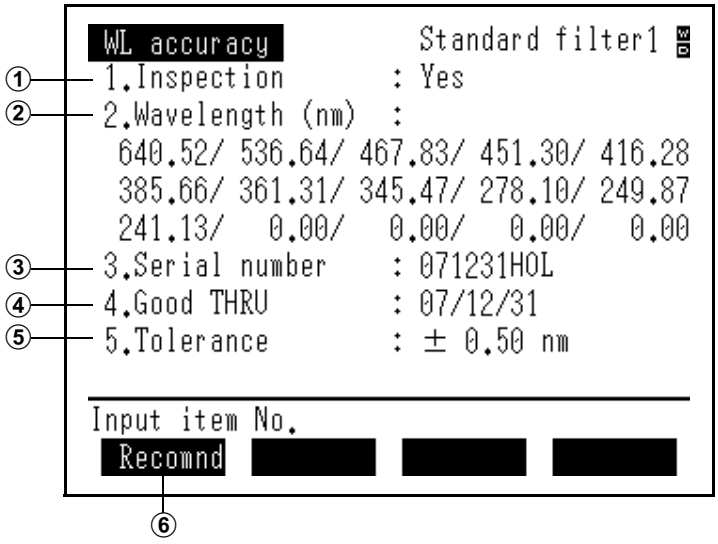
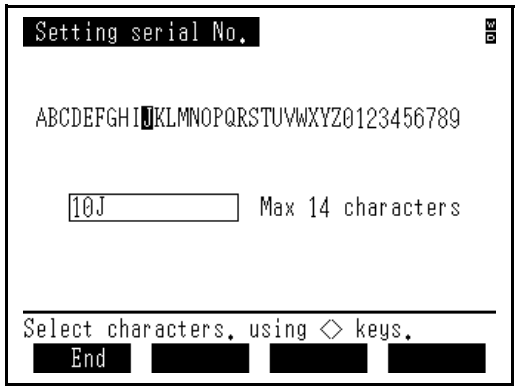


Fig. 16.39 Parameter Setting screen for wavelength accuracy (standard filter 1)

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the wavelength accuracy is validated or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Wavelength]	Enter the calibrated absorption peak wavelength. A maximum of 15 wavelengths may be entered as validation wavelengths. For example, if you want to validate 12 wavelengths, enter 0 when inputting the 13th wavelength, and then press the ENTER key. All of the 13th and subsequent wavelengths will be displayed (set) as 0.0, and only the entered 12 wavelengths will be used for the validation.
③	3	[Serial number]	Enter the serial number of the filter. The number entered here will be saved as a validation parameter for the photometric accuracy and printed out together with the validation result.  Fig. 16.40 [Setting serial No.] screen Press the ◄ ► keys to move the cursor to the desired character in the list. Then, press the ENTER key to enter the selected character in the input filename column. After you finish entering the serial number by repeating the same procedure, press the F4 [End] key to return to the Parameter Setting screen (Fig. 16.39). **NOTE** If you press the F1 [End] key without entering any serial number, no serial number will be set.
④	4	[Good THRU]	Enter the validity for the standard value of the filter. The date entered here is saved as a validation parameter and used to automatically check to see whether the validation expires or not when the validation is performed. If a filter with expired validity is used, the validation cannot be performed. (☞ "16.4.1 Monitoring Validity of Validation Products") **NOTE** The format for displaying the date is the same as specified in [8. Utilities]/[6. Clock set] on the Mode screen (Fig. 2.1).

No.	Key Operation	Display	Description
⑤	5	[Tolerance]	Enter the tolerance used to evaluate the validation result of wavelength accuracy in a range between 0.1 and 9.9. **NOTE** To define tolerances, the calibration accuracy (i.e., inaccuracy) of the standard filter must be considered. For example, when filter accuracy is ± 0.3 nm and when checking whether the instrument wavelength accuracy falls within ± 0.3 nm, define the tolerance as "within ± 0.6 nm". Note that tolerances cannot be defined for each reference wavelength. When using a different accuracy filter for each reference wavelength, add the largest accuracy value among the reference wavelengths to be inspected.
⑥	F1	[Recomnd]	Resets the tolerance for wavelength accuracy to the recommended value (default value). The recommended value is within ± 0.5 nm. **NOTE** The value above is the tolerance for the shipping inspection performed by Shimadzu.
–	RETURN	–	Returns to the Standard Filter Selection screen (Fig. 16.38).

■ Filter arrangement when using the multicell (6-cell) or CPS-240

When using the optional cell holder such as multicell (6-cell) or CPS-240, set the standard filters as shown in Fig. 16.41.

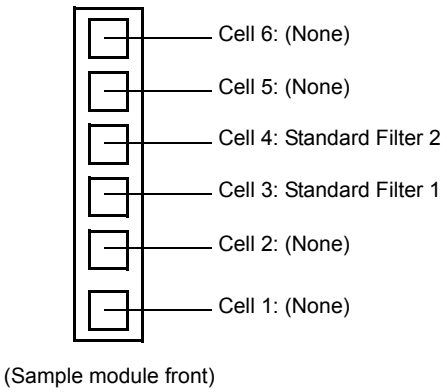
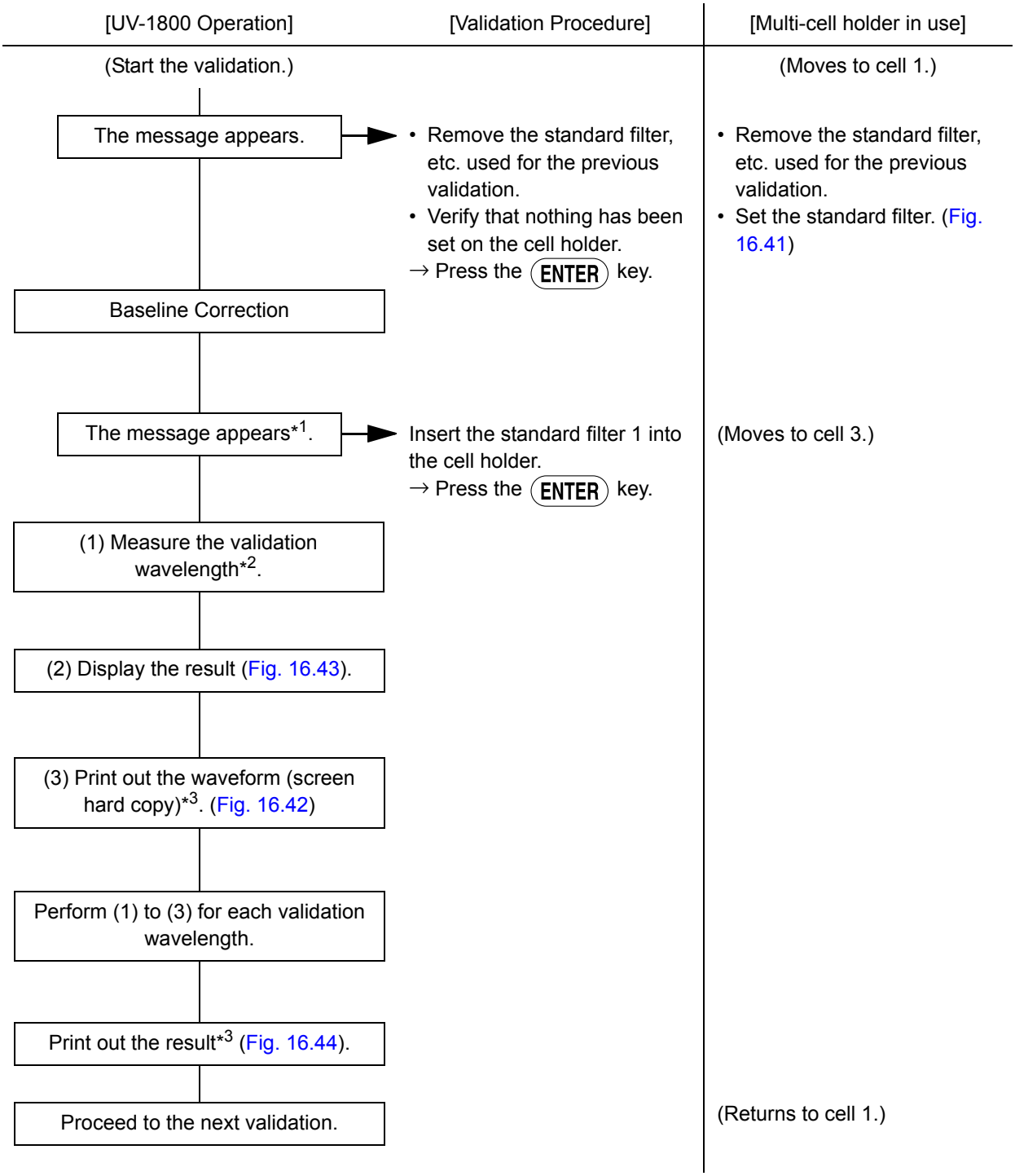


Fig. 16.41 Set positions for standard filters

■ Validation flow

After the validation is started, carry out the validation process as instructed by messages displayed at the bottom of the screen.

The validation flow of the wavelength accuracy using standard filter 1 is shown below. If multiple standard filters are to be used for the validation, the following procedure is performed for each filter.



*1 Not displayed when using the Multi-cell.
*2 Spectrum measurement is performed within the range of 10 nm of the specified validation wavelength.
*3 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.42 Validation flow of wavelength accuracy

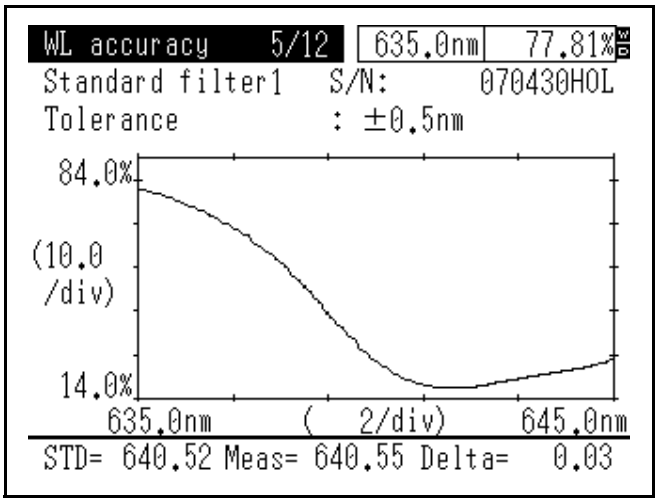


Fig. 16.43 Validation Results screen for wavelength accuracy

The format of the validation result that is printed out after the validation is shown below:

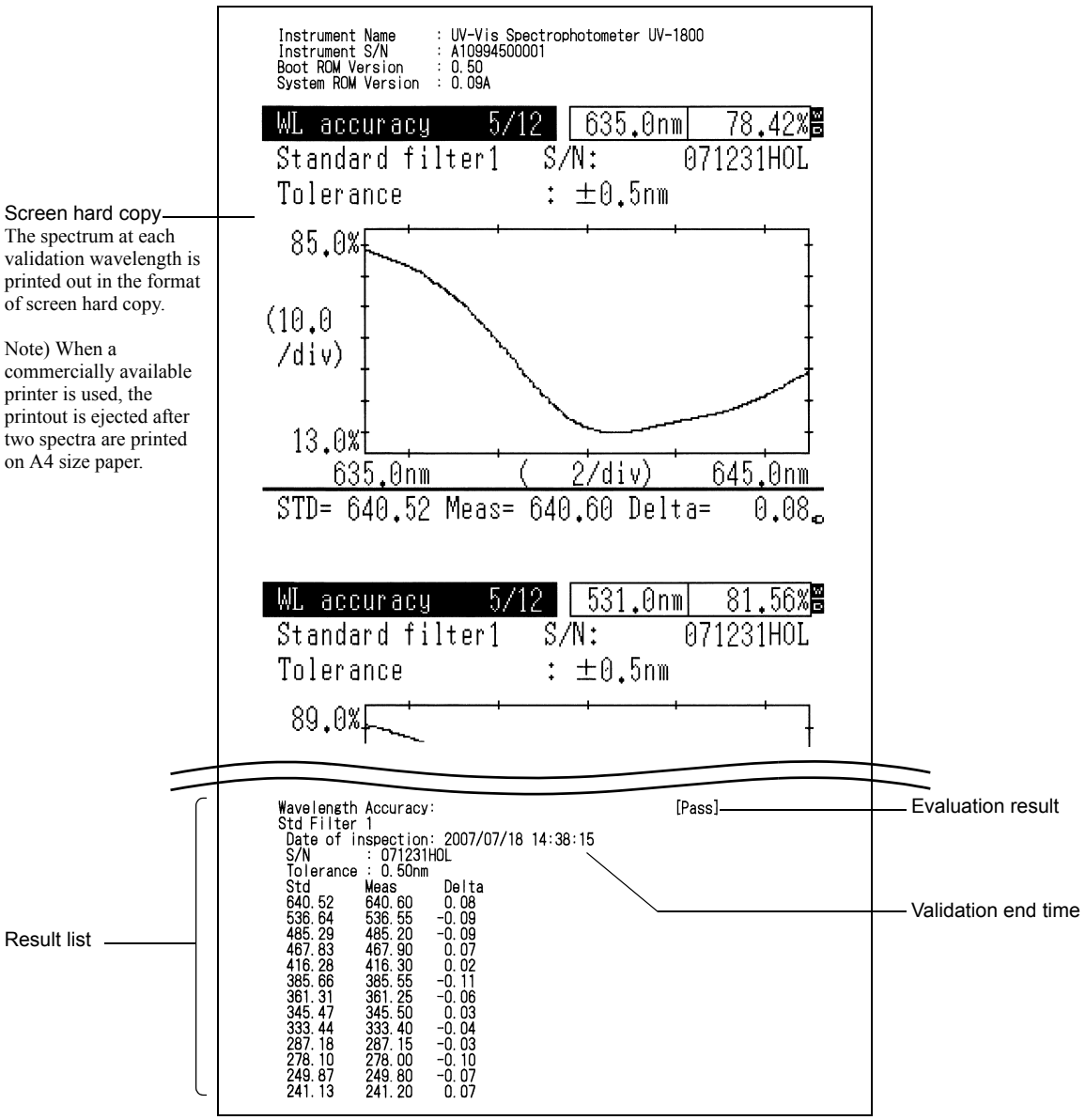


Fig. 16.44 Auto print format for wavelength accuracy

The evaluation result is printed out next to the title of the validation item. If the deviations at all the validation wavelengths are within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6 Auto Validation Item Details

16.6.1 Noise Level

In the validation of noise level, the time changes around the absorbance of 0 Abs at the wavelength specified for each model are measured for 1 minute, and the deflection of the absorbance at that time is defined as noise level (P-P). The RMS value is obtained from the measurement for 1 minute and then both of these values are evaluated.

For this validation, the noise level of up to four wavelengths can be validated.

If you enter the item number of validation wavelength on the Validation Wavelength Selection screen (Fig. 16.45) with numeric keys, the screen appears for setting the parameters for the validation at the wavelength (Fig. 16.46). Press the RETURN key to return to the Validation Options screen for the auto-validation items (Fig. 16.4).

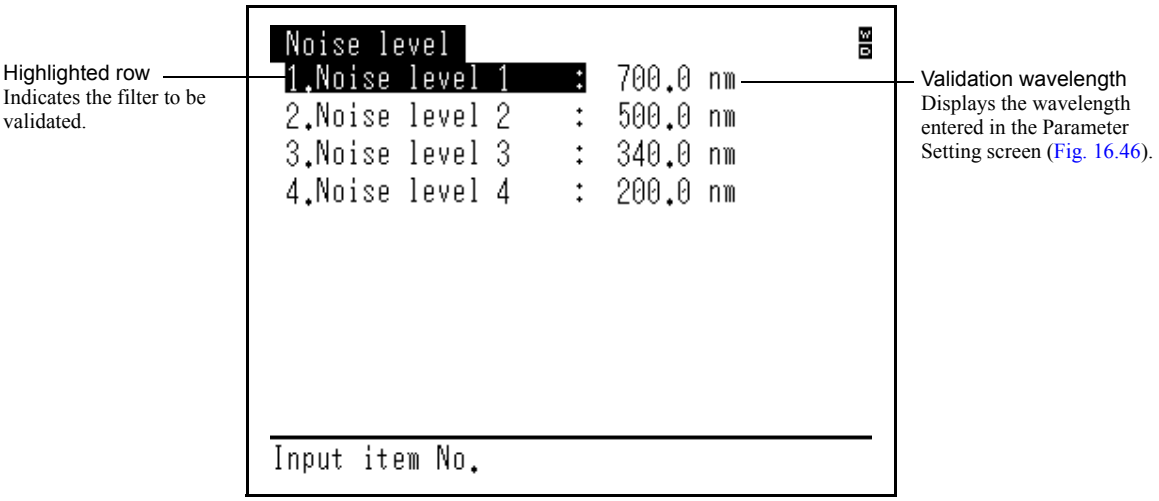


Fig. 16.45 Validation Wavelength Selection screen for noise level

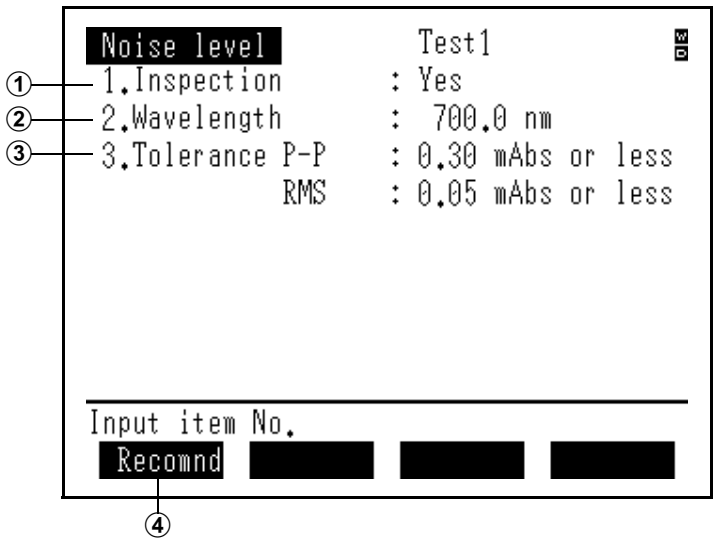


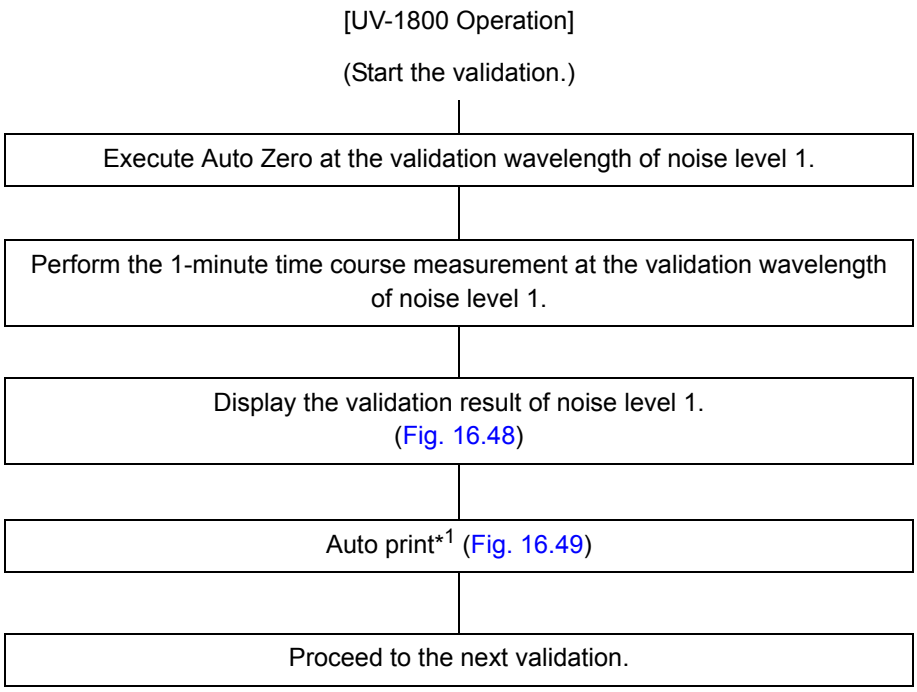
Fig. 16.46 Parameter Input screen for noise level (noise level 1)

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>①</td><td>1</td><td>[Inspection]</td><td>Select [Yes] or [No] to specify whether the validation is performed or not.
Each pressing of the key toggles between [Yes] and [No].</td></tr>
<tr><td>②</td><td>2</td><td>[Wavelength]</td><td>Enter a wavelength at which to measure noise level.</td></tr>
<tr><td>③</td><td>3</td><td>[Tolerance]</td><td>Enter the tolerance (range) used to evaluate the measurement result of noise level in a range between 0.01 and 9.99 (mAbs). In the validation of noise level, both of the P-P (maximum noise width) value and the RMS value are evaluated. Therefore, the tolerances for both values need to be entered.</td></tr>
<tr><td>④</td><td>F1</td><td>[Recomnd]</td><td>This allows you to set the recommended values (default values) when measuring at the following wavelengths as noise level 1 to 4.
The recommended values for each noise level are shown below.
<table>
<tr><th></th><th>Noise level 1</th><th>Noise level 2</th><th>Noise level 3</th><th>Noise level 4</th></tr>
<tr><td>Validation</td><td>700 nm</td><td>500 nm</td><td>340 nm</td><td>200 nm</td></tr>
<tr><td rowspan="2">Tolerance (recommended value)</td><td>(P-P) 0.30 mAbs</td><td>(P-P) 0.60 mAbs</td><td>(P-P) 2.4 mAbs</td><td>(P-P) 2.4 mAbs</td></tr>
<tr><td>(RMS) 0.05 mAbs</td><td>(RMS) 0.1 mAbs</td><td>(RMS) 0.4 mAbs</td><td>(RMS) 0.4 mAbs</td></tr>
</table>
NOTE
The values above are the tolerances for the periodic inspection performed by Shimadzu.</td></tr>
<tr><td>–</td><td>RETURN</td><td>–</td><td>Returns to the Validation Wavelength Selection screen (Fig. 16.45).</td></tr>
</table>

■ Validation flow

The validation is automatically implemented.

The validation flow of the noise level 1 is shown below. If multiple validation wavelengths are to be used for the validation, the following procedure is performed for each wavelength.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.47 Validation flow of noise level

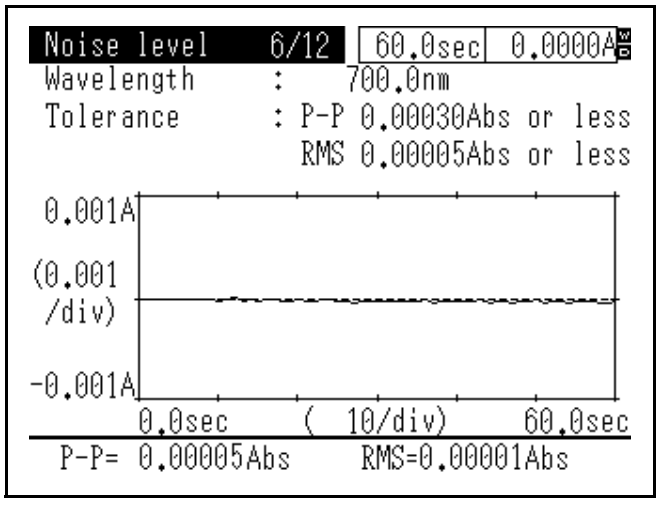


Fig. 16.48 Validation Results screen for noise level

The format of the validation result that is printed out after the validation is shown below.

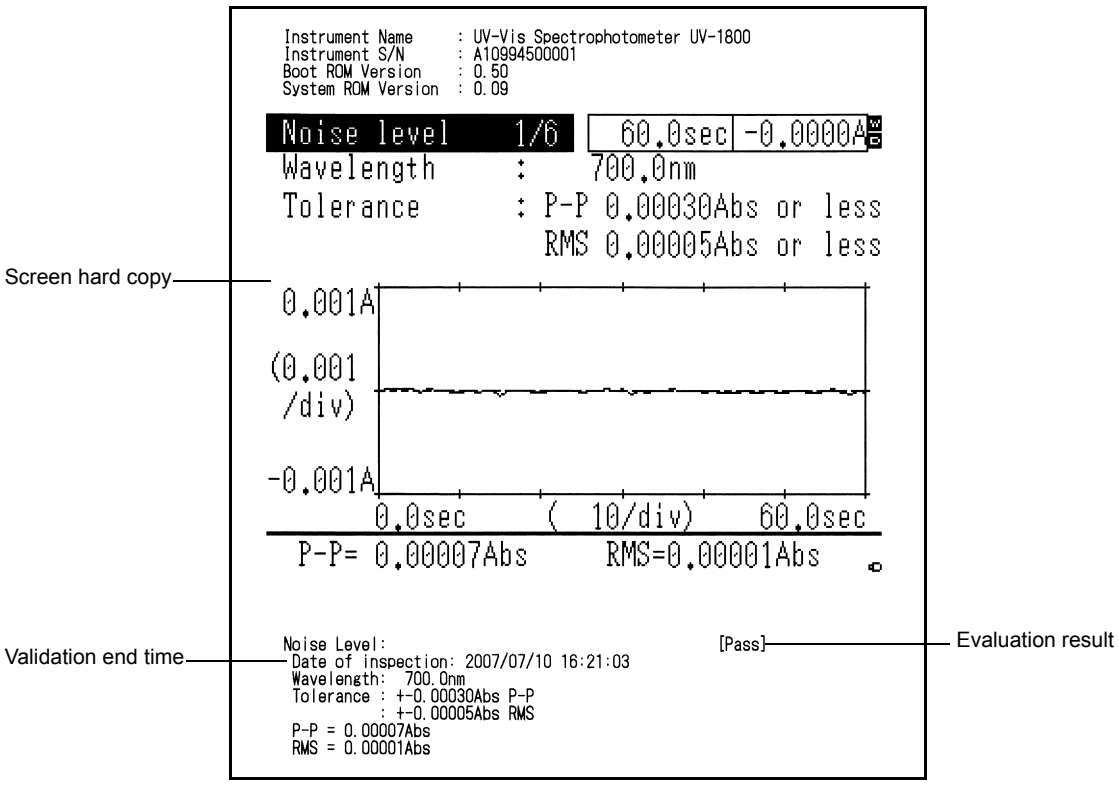


Fig. 16.49 Auto print format for noise level

The evaluation result is printed out next to the title of the validation item. If the maximum noise width (P-P) at the validation wavelength and the RMS value obtained from the measurement result are within the tolerance, [Pass] is printed. If not, [>>Fail<<] is printed out.

16.6.2 Baseline Flatness

In the validation of baseline flatness, the baseline is corrected without putting a sample in the sample module. Immediately after the correction, the wavelengths are scanned. The curvature of the spectrum obtained at that time is defined as baseline flatness, and this value is evaluated.

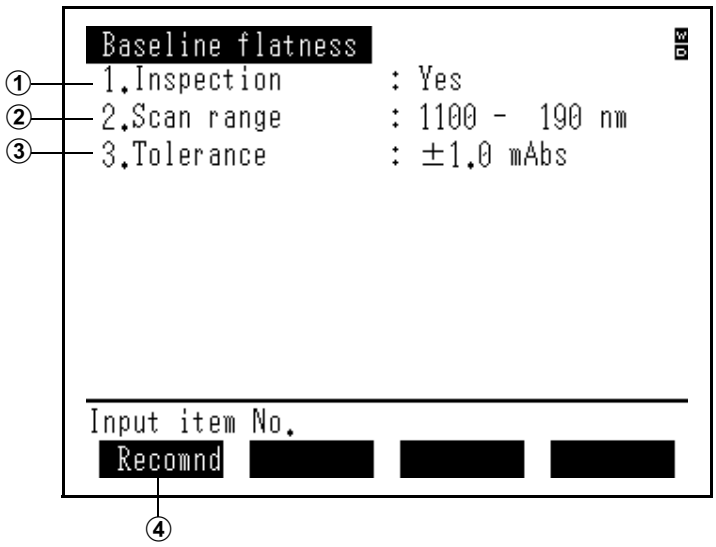


Fig. 16.50 Parameter Input screen for baseline flatness

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the validation is performed or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Scan range]	Enter the wavelength range in which baseline flatness is to be measured. The input range is between 190 and 1100.
③	3	[Tolerance]	Enter the tolerance (range) used to evaluate the measurement result of baseline flatness in a range between 0.1 and 9.9.
④	F1	[Recomnd]	Resets the validation wavelength and tolerance for baseline flatness to the recommended values (default values). The recommended tolerance value is within ± 1 mAbs. **NOTE** The values above are the tolerances for the periodic inspection performed by Shimadzu.
–	RETURN	–	Returns to the [Setting of Auto items] screen (Fig. 16.4).

■ Validation flow

The validation is automatically implemented.

The validation of baseline flatness must be performed when the UV-1800 is in a stable state. Therefore, unless at least one hour has elapsed after the power has been turned ON, you are prompted to select either forcibly performing the validation or postponing it until one hour elapses.

To select [Yes] or [No], move the cursor with the ◄(-) ► keys, and confirm with the ENTER key.

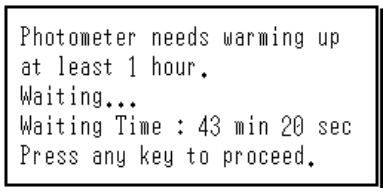
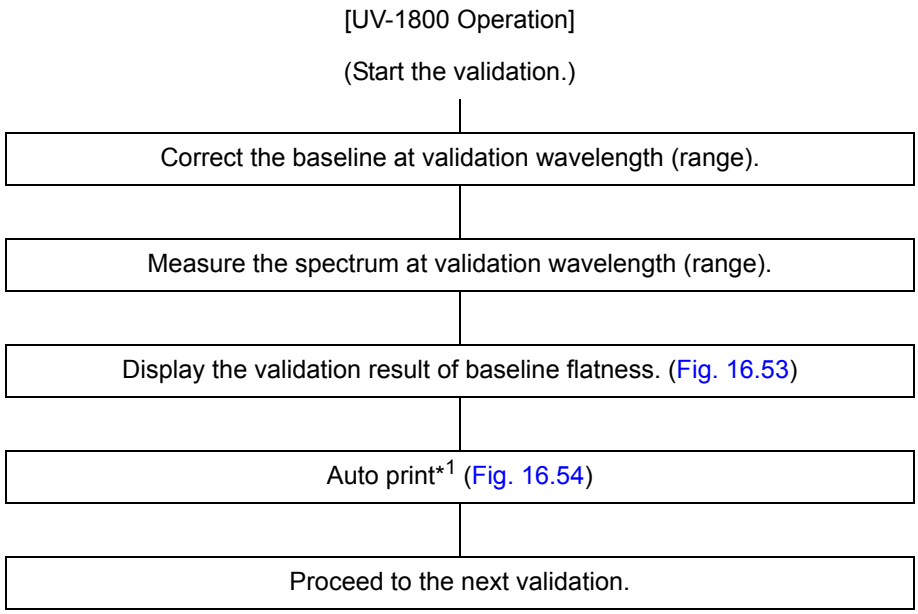


Fig. 16.51 Selection screen for validation execution

[Yes]: The validation of the baseline flatness is started with the current status.

[No]: The UV-1800 displays a message that the validation is currently on hold, and the validation automatically starts one hour after the power has been turned ON.

The validation flow of the baseline flatness is shown below.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.52 Validation flow of baseline flatness

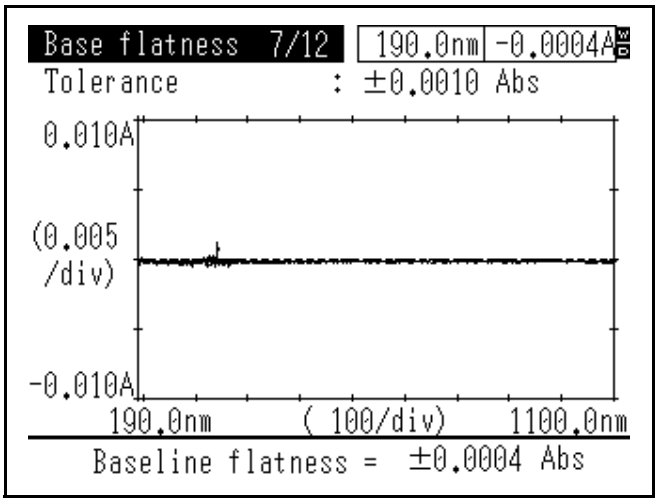


Fig. 16.53 Validation Results screen for baseline flatness

The format of the validation result that is printed out after the validation is shown below.

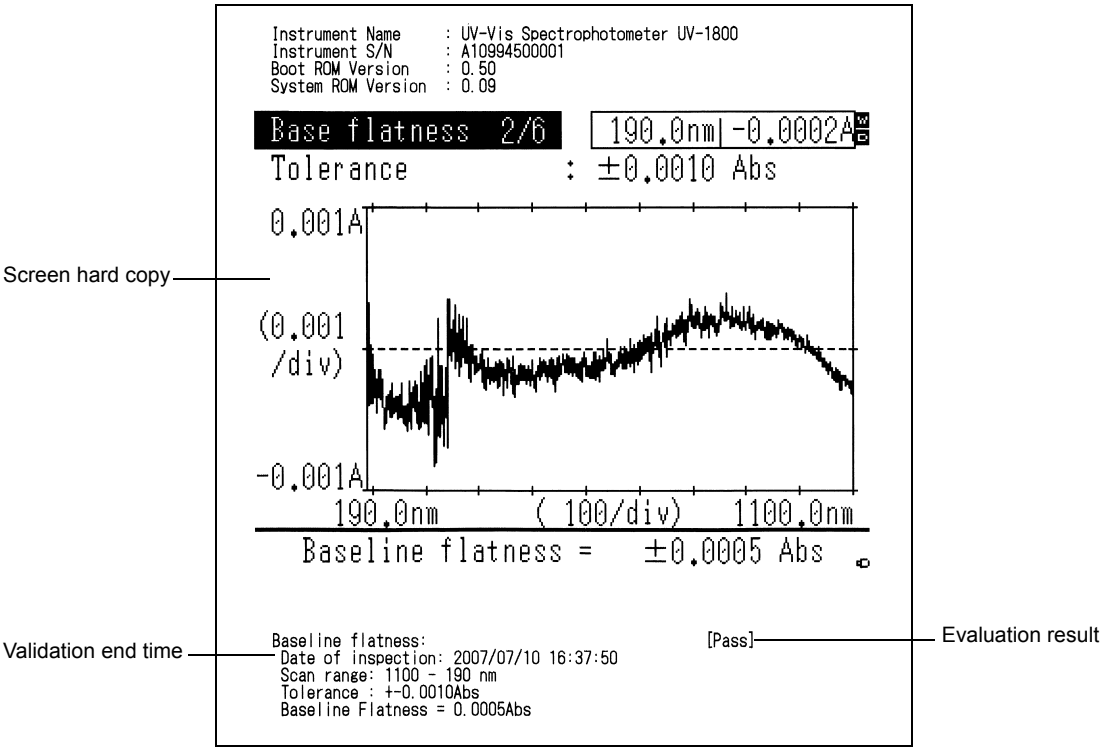


Fig. 16.54 Auto print format for baseline flatness

The evaluation result is printed out next to the title of the validation item. If the curvature of the baseline is within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6.3 Baseline Stability

In the validation of baseline stability, the time changes around absorbance of 0 Abs are measured and then the measured change per hour is defined as baseline stability. The value for baseline stability is evaluated.

In this validation, two wavelengths can be validated (Fig. 16.55).

If you press one of the numeric keys corresponding to the item numbers, the Parameter Input screen for the item (Fig. 16.56) is displayed. Press the RETURN key to return to the Validation Options screen for the auto-validation items (Fig. 16.4).

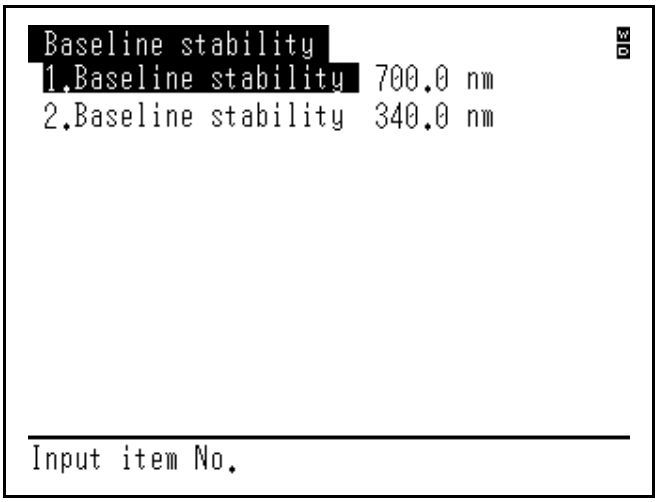


Fig. 16.55 Validation Wavelength Selection screen

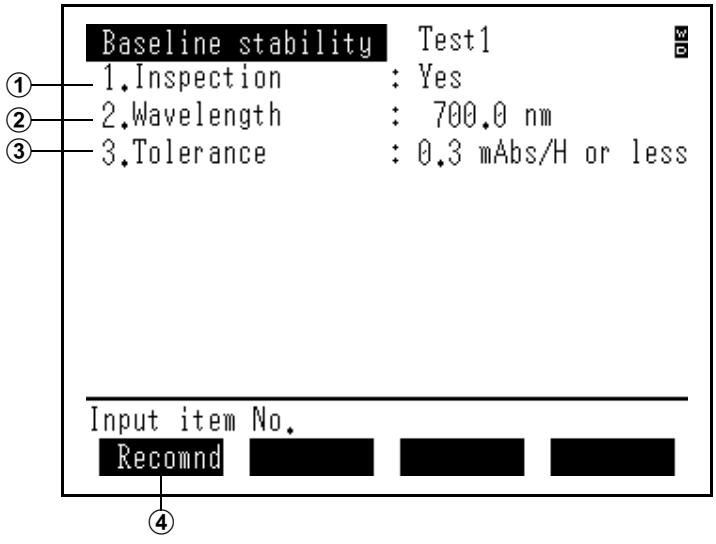


Fig. 16.56 Parameter Input screen for baseline stability (baseline stability 1)

<table>
<tr><th>No.</th><th>Key Operation</th><th>Display</th><th>Description</th></tr>
<tr><td>①</td><td>1</td><td>[Inspection]</td><td>Select [Yes] or [No] to specify whether the validation is performed or not.
Each pressing of the key toggles between [Yes] and [No].</td></tr>
<tr><td>②</td><td>2</td><td>[Wavelength]</td><td>Enter the wavelength at which to measure baseline stability.
The input range is between 190 and 1100 (nm).</td></tr>
<tr><td>③</td><td>3</td><td>[Tolerance]</td><td>Enter the tolerance used to evaluate the measurement result of baseline stability in a range between 0.1 and 9.9 (mAbs/H).</td></tr>
<tr><td>④</td><td>F1</td><td>[Recomnd]</td><td>This allows you to set the recommended values (default values) when measuring at the following wavelengths as baseline stability 1 to 2.
The recommended values for each baseline stability are shown below.
<table>
<tr><th></th><th>Baseline Stability 1</th><th>Baseline Stability 2</th></tr>
<tr><td>Validation</td><td>700 nm</td><td>340 nm</td></tr>
<tr><td>Tolerance (recommended value)</td><td>Within 1.0 mAbs/H</td><td>Within 1.0 mAbs/H</td></tr>
</table>
NOTE
The values above are the tolerances for the periodic inspection performed by Shimadzu.</td></tr>
<tr><td>–</td><td>RETURN</td><td>–</td><td>Returns to the [Setting of Auto items] screen (Fig. 16.4).</td></tr>
</table>

■ Validation flow

The validation is automatically implemented.

The validation of baseline stability must be performed when the UV-1800 is in a stable state. Therefore, unless at least one hour has elapsed after the power has been turned ON, you are prompted to select forcibly performing the validation or holding it until one hour elapses.

To select [Yes] or [No], move the cursor with the ◄(-) ► keys, and confirm with the ENTER key.

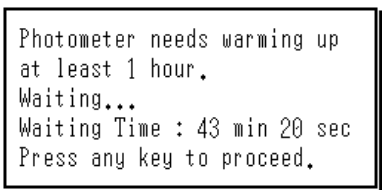
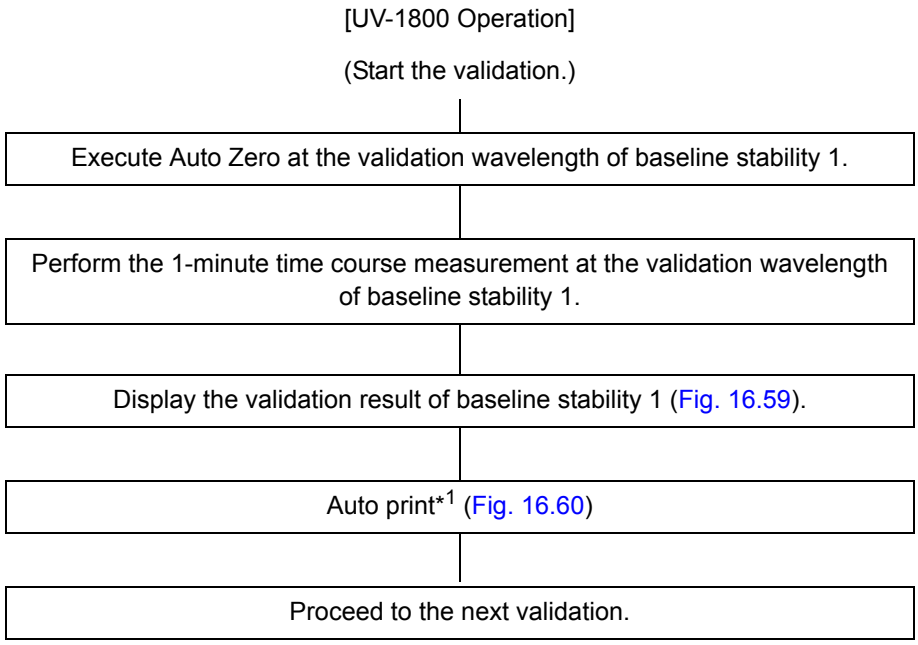


Fig. 16.57 Selection screen for validation execution

[Yes]: The validation of the baseline stability is started with the current status.

[No]: The UV-1800 displays a message that the validation is currently on hold, and the validation automatically starts one hour after the power has been turned ON.

The validation flow of the baseline stability is shown below.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.58 Validation flow of baseline stability

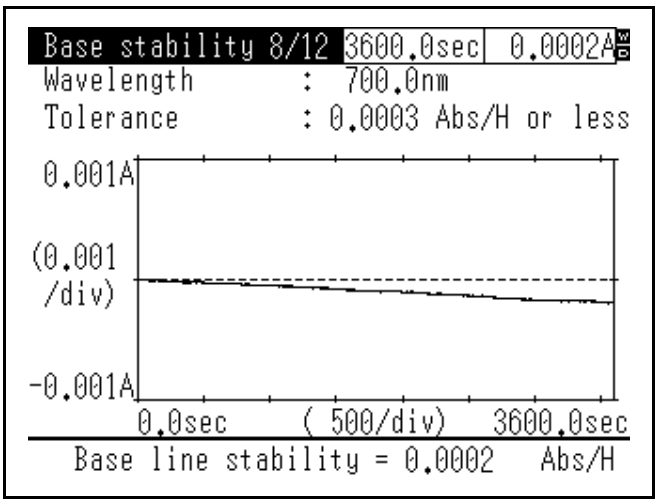


Fig. 16.59 Validation Results screen for baseline stability

The format of the validation result that is printed out after the validation is shown below.

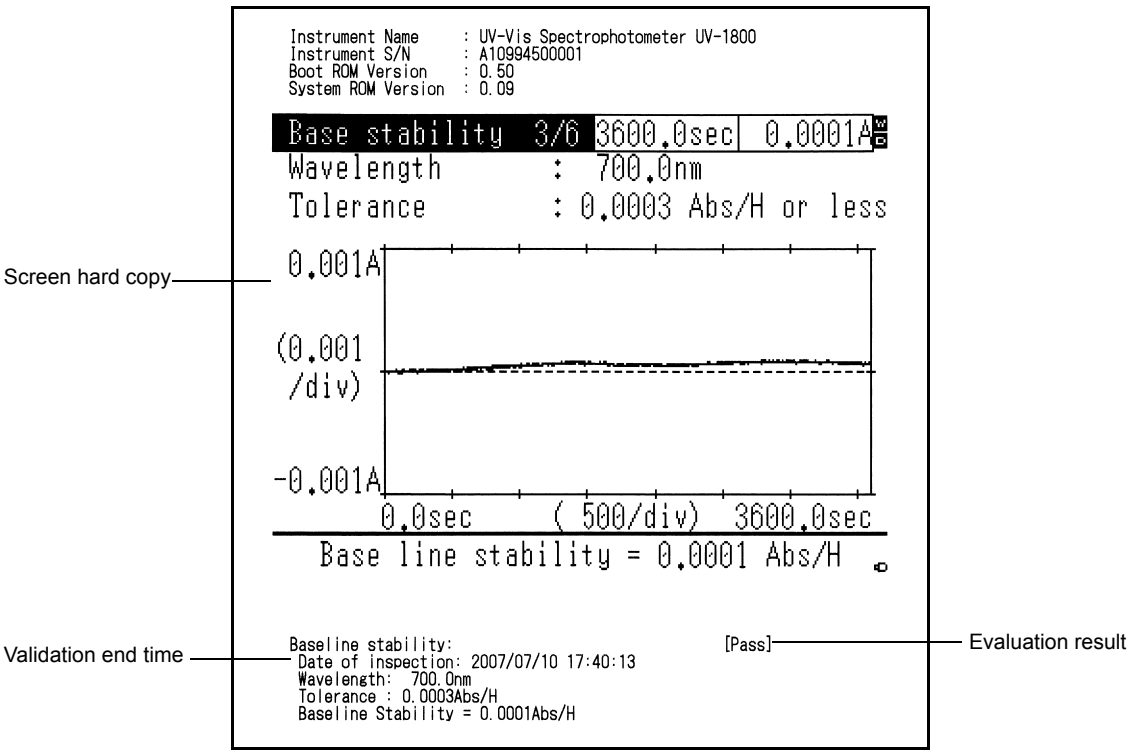


Fig. 16.60 Auto print format for baseline stability

The evaluation result is printed out next to the title of the validation item. If the curvature of the baseline is within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6.4 Resolution D_2

In the validation of resolution, emission lines radiated from the deuterium (D_2) lamp used as the light source for the UV-1800 are measured. The half-value width (spectrum bandwidth) of the obtained spectral waveform for the emission lines is defined as the resolution, and this value is evaluated.

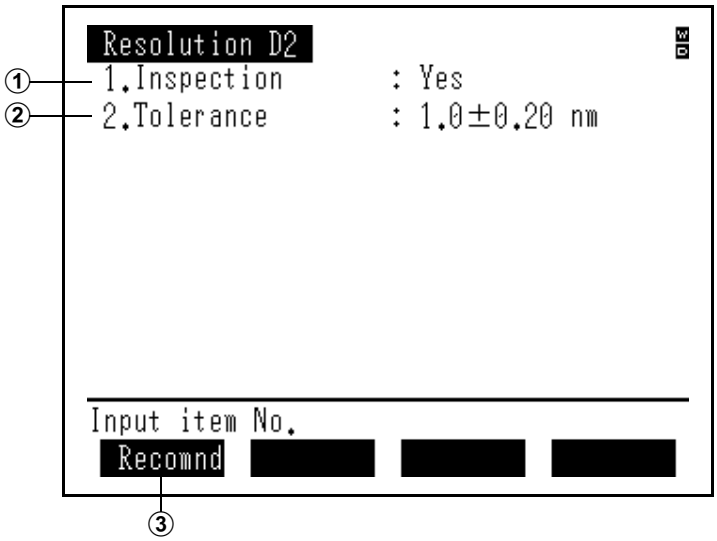


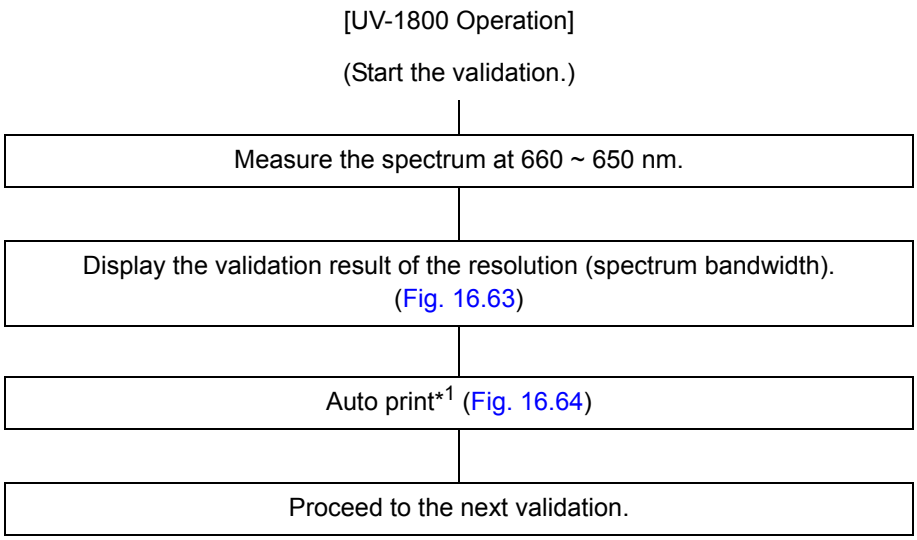
Fig. 16.61 Parameter Input screen for resolution D_2

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the validation is performed or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Tolerance]	Enter the tolerance used to evaluate the measurement result of resolution in a range between 0.01 and 0.50 (nm).
③	F1	[Recomnd]	Resets the tolerance for resolution to the recommended value (default value). The recommendation value is 1.0 nm ± 0.20 max. **NOTE** The values above are the tolerances for the periodic inspection performed by Shimadzu.
–	RETURN	–	Returns to the [Setting of Auto items] screen (Fig. 16.4).

■ Validation flow

The validation is automatically implemented.

The validation flow of the resolution D2 is shown below.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.62 Validation flow of resolution D2

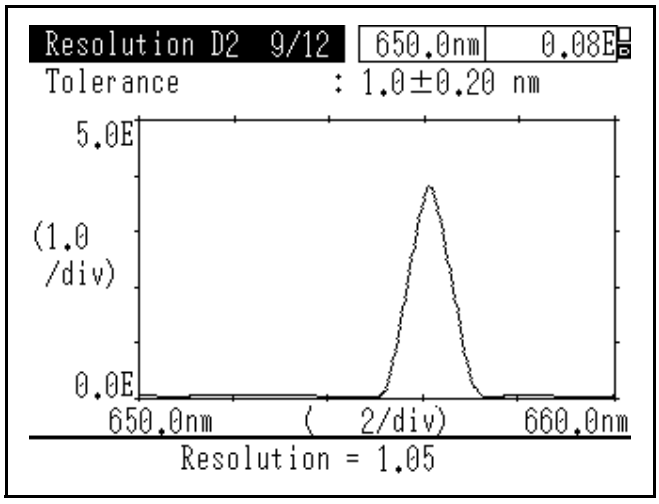


Fig. 16.63 Validation Results screen for resolution D2

The format of the validation result that is printed out after the validation is shown below:

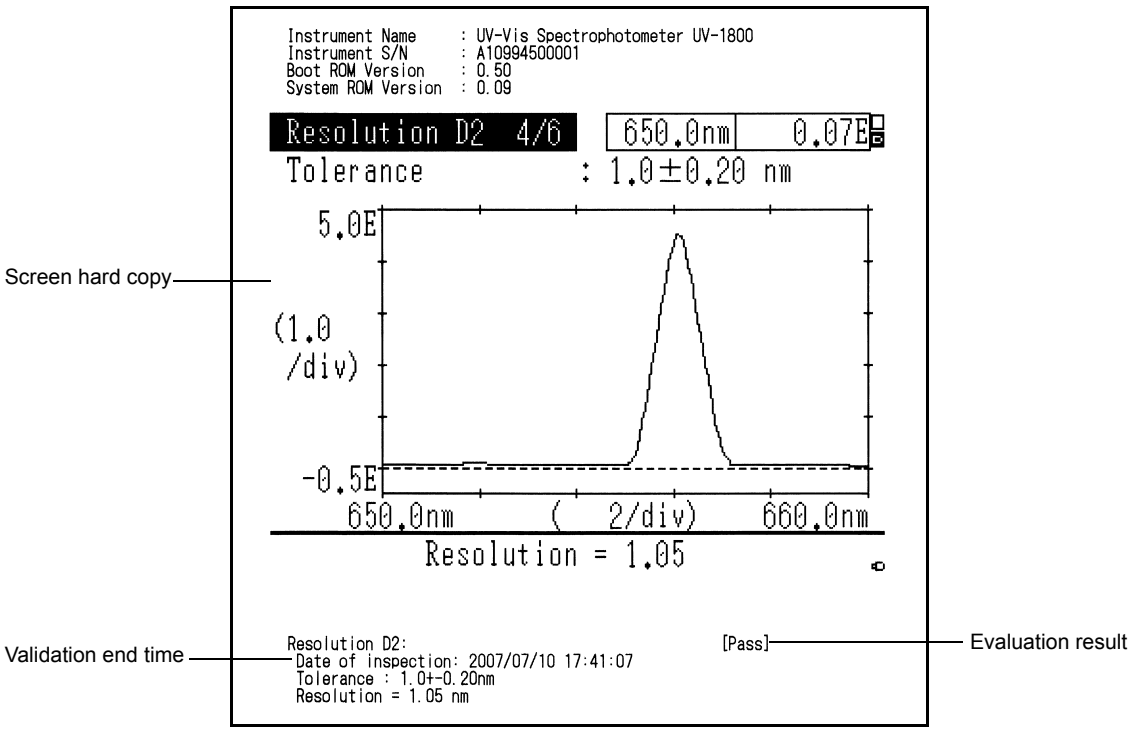


Fig. 16.64 Auto print format for resolution D2

The evaluation result is printed out next to the title of the validation item. If the resolution obtained from the spectrum for the measured emission lines is equal to or less than the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6.5 Wavelength Accuracy D_2

In the validation of wavelength accuracy, emission line radiated from the deuterium (D_2) lamp used as the light source for the UV-1800 is measured, and then the deviation from the emission line wavelength is used to evaluate the validation result.

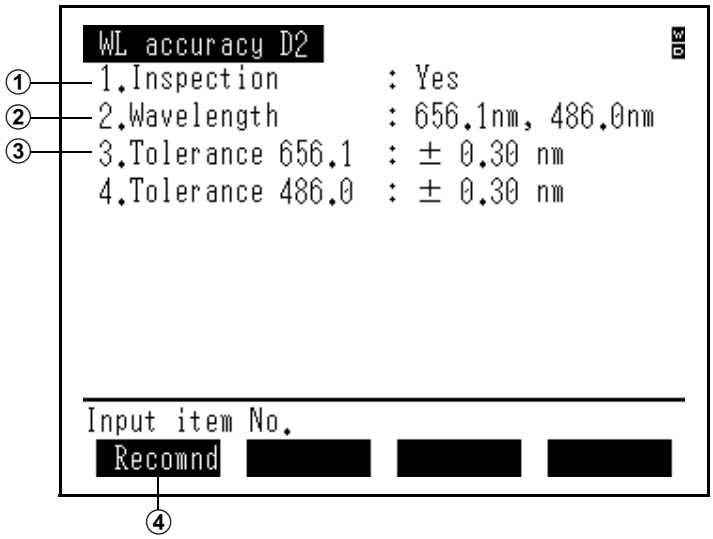
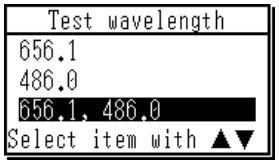


Fig. 16.65 Parameter Input screen for wavelength accuracy D_2

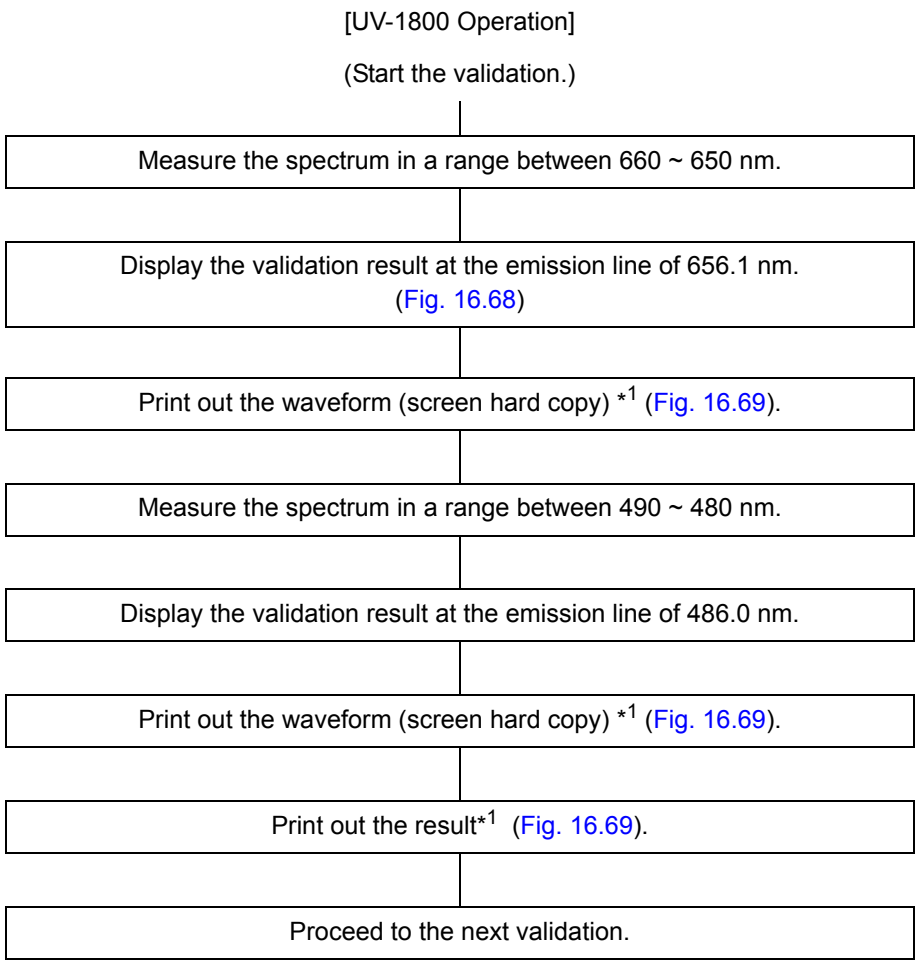
No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the photometric accuracy D_2 is validated or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Wavelength]	Emission lines at 486.0 and 656.1 nm are radiated from the D_2 lamp. Select which emission line is used or whether both emission lines are used or not. To select the validation wavelength, move the cursor to the desired wavelength with the ▲ ▼ keys, and confirm with the ENTER key.  Fig. 16.66 [Test wavelength] Selection screen
③	3	[Tolerance]	Enter the tolerance used to evaluate the validation result of accuracy D_2 in a range between 0.1 and 9.9 (nm).

No.	Key Operation	Display	Description
④	F1	[Recomnd]	Resets the tolerance for wavelength accuracy D2 to the recommended value (default value). The recommended value is within ± 0.3 nm. **NOTE** The values above are the tolerances for the periodic inspection performed by Shimadzu.
⑤	RETURN	–	Returns to the [Setting of Auto items] screen (Fig. 16.4).

■ Validation flow

The validation is automatically implemented.

The validation flow of the wavelength accuracy using D2 lamp (only for 656.1 nm) is shown below.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.67 Validation flow of wavelength accuracy with D2

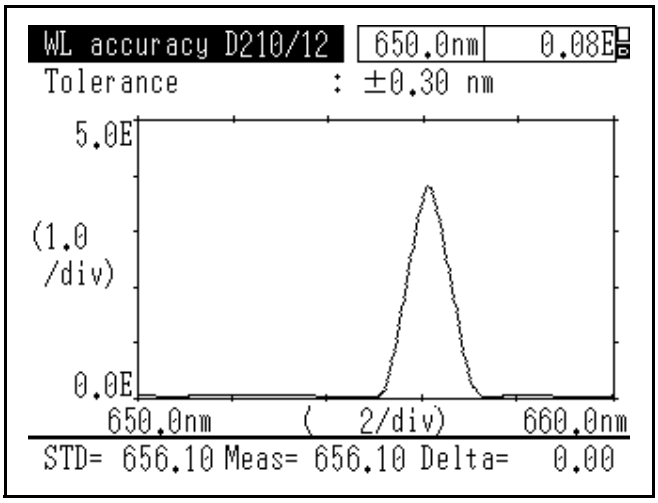


Fig. 16.68 Validation Results screen for wavelength accuracy with D2 (in progress)

The format of the validation result that is printed out after the validation is shown below:

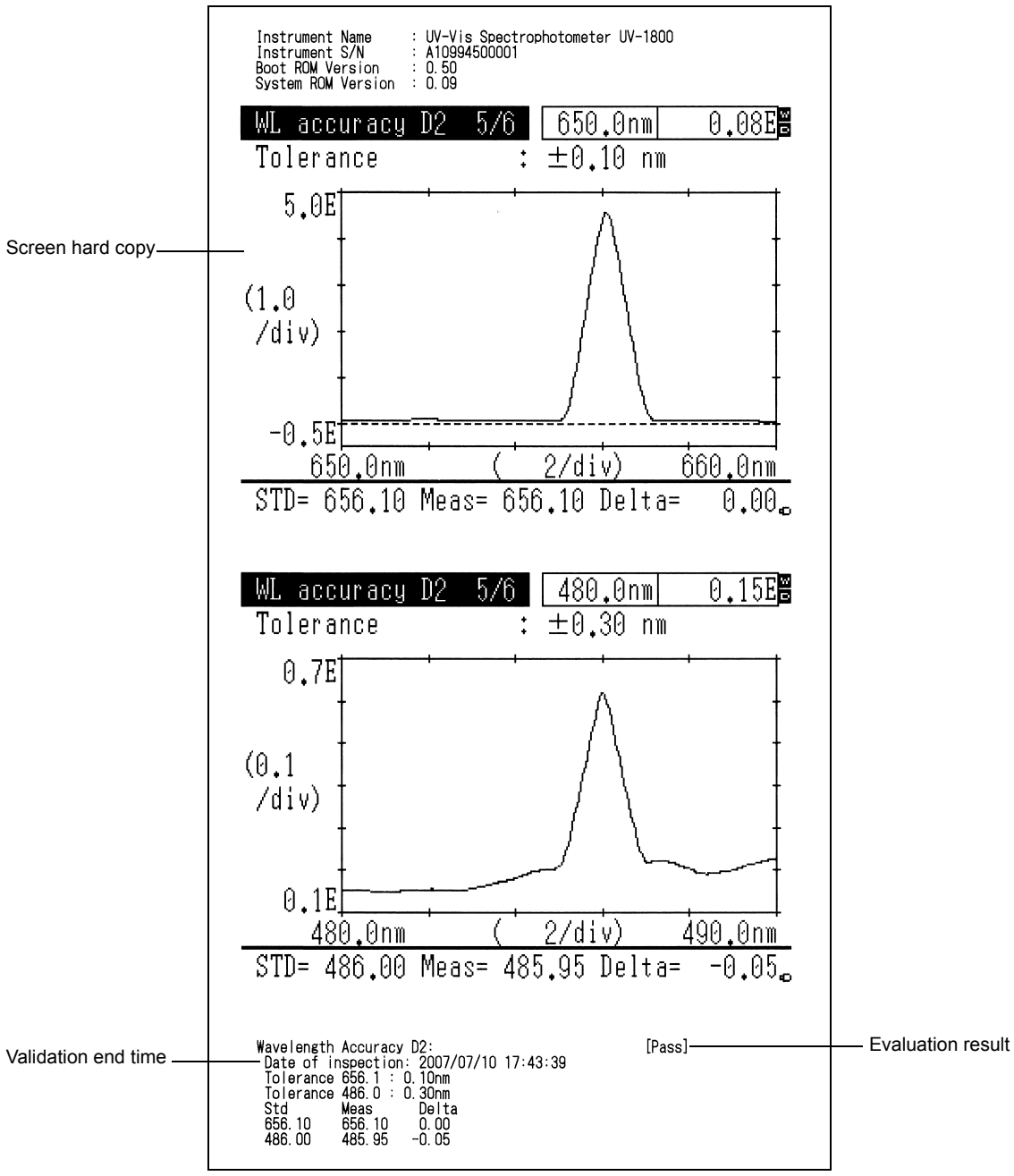


Fig. 16.69 Auto print format for wavelength accuracy with D2

The evaluation result is printed out next to the title of the validation item. If the deviations at all the validation wavelengths are within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6.6 Wavelength Repeatability D_2

In the validation of wavelength repeatability, the mean value is obtained from the detected wavelengths at which the same emission lines as those radiated from the UV-1800 light source deuterium (D_2) lamp (656.1 nm and 486.0 nm) have been measured three times, and then the deviation of the measured values from that mean value is used to evaluate the results.

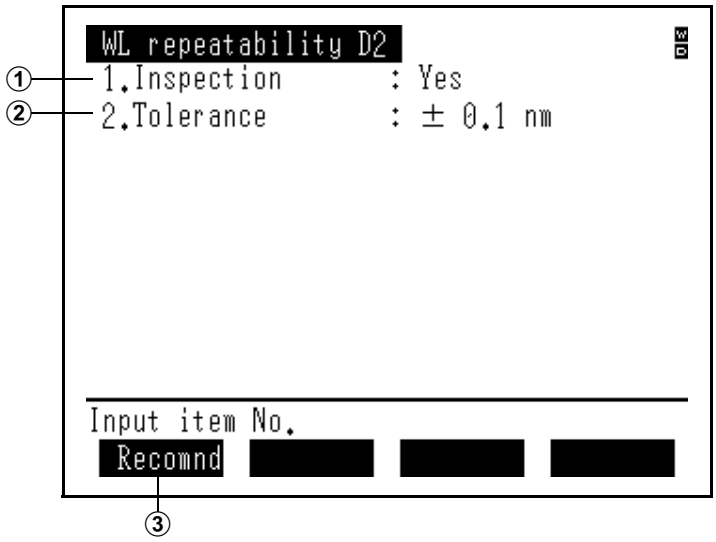


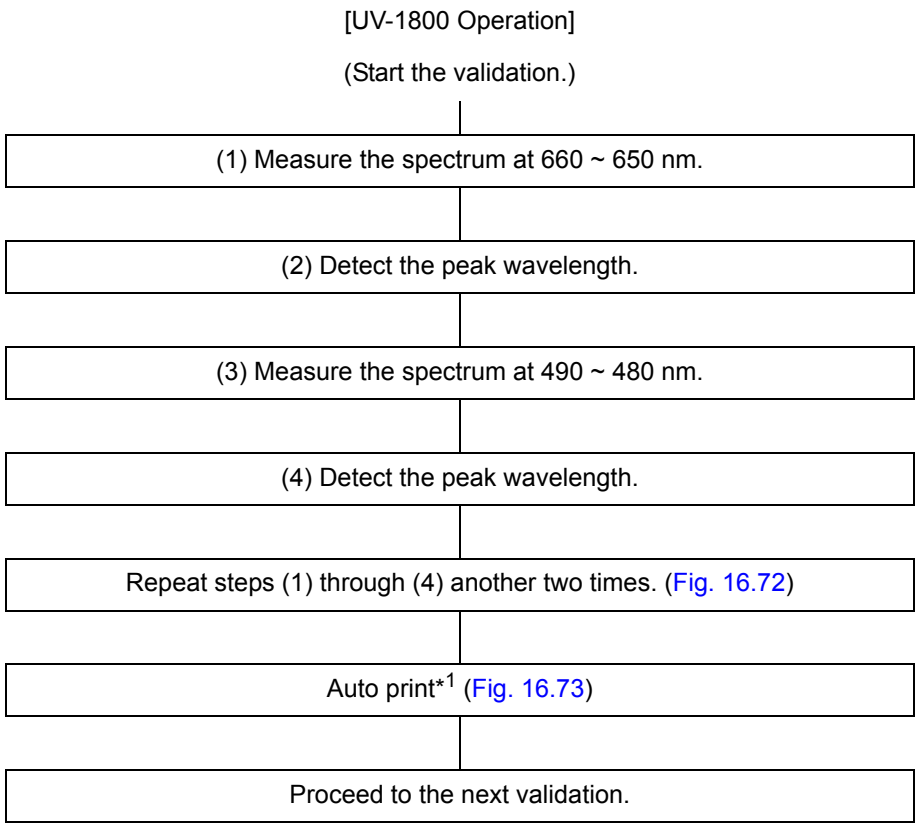
Fig. 16.70 Parameter Input screen for wavelength repeatability D_2

No.	Key Operation	Display	Description
①	1	[Inspection]	Select [Yes] or [No] to specify whether the validation is performed or not. Each pressing of the key toggles between [Yes] and [No].
②	2	[Tolerance]	Enter the tolerance used to evaluate the measurement result of wavelength repeatability D_2 in a range between 0.1 and 9.9.
③	F1	[Recomnd]	Resets the tolerance for wavelength repeatability to the recommended value (default value). The recommended value is within ± 0.2 nm. **NOTE** The values above are the tolerances for the periodic inspection performed by Shimadzu.
–	RETURN	–	Returns to the [Setting of Auto items] screen (Fig. 16.4).

■ Validation flow

The validation is automatically implemented.

The validation flow of the wavelength repeatability is shown below.



*1 Auto print is performed only when [Settings] / [1. Auto print] is set to "ON". (☞ "16.3.3 Validation Options")

Fig. 16.71 Validation flow of wavelength repeatability

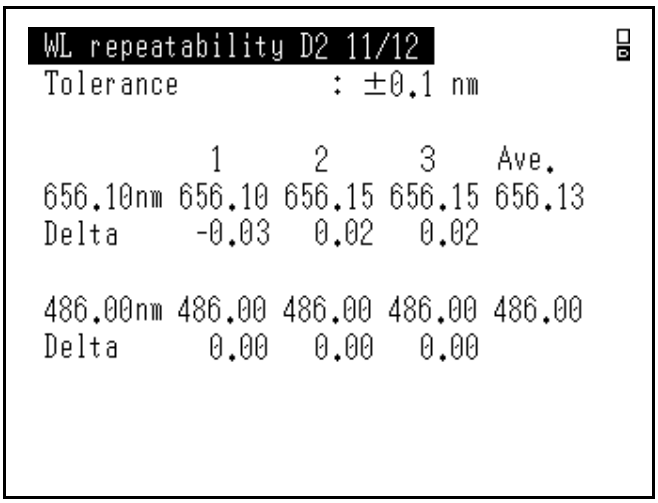


Fig. 16.72 Validation Results screen for wavelength repeatability

The format of the validation result that is printed out after the validation is shown below:

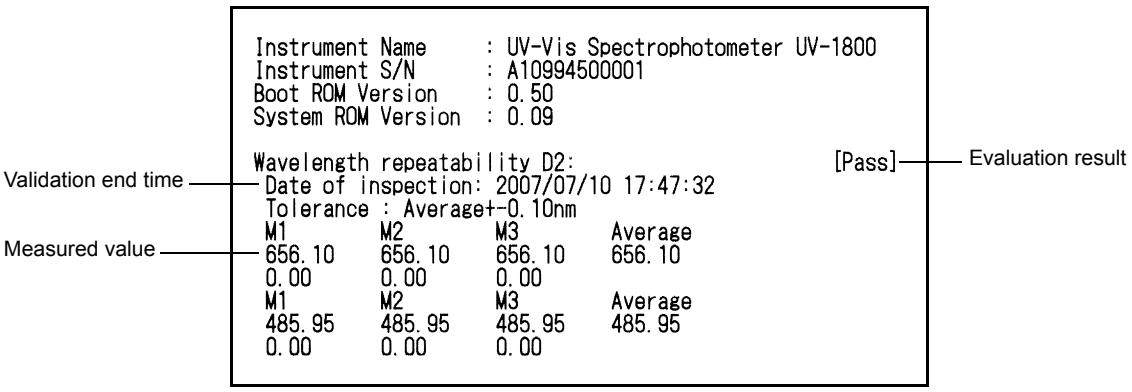


Fig. 16.73 Auto print format for wavelength repeatability

The evaluation result is printed out next to the title of the validation item. If the deviations at all the validation wavelengths are within the tolerance, [Pass] is printed out. If not, [>>Fail<<] is printed out.

16.6.7 Initialization Record

Every time the UV-1800 is turned ON, it is initialized and various self-diagnostics are performed. (See "1.1 Application of Power".)

If the validation is started when the parameter [Print init. status] is set to [ON] in the Validation Settings screen (Fig. 16.6), the results of the initialization and various self-diagnostics that have been performed when the power is turned ON can be printed out.

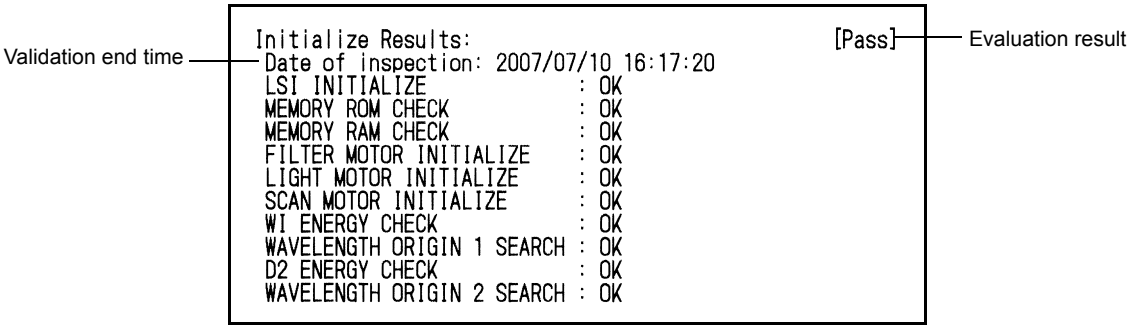


Fig. 16.74 Auto print format for initialization record

This page is intentionally left blank.

Chapter 17 PC Control

PC Control Mode is the mode in which the UV-1800 is controlled by an external personal computer (PC). When this mode is selected, you can control the UV-1800 using the packaged UVProbe software or an arbitrarily created control program.

CONTENTS

17.1 Connecting to a PC

To control the UV-1800 from an external computer, a device driver "Virtual COM port driver" must be installed on the computer.

NOTE
To install the "Virtual COM port driver", it is required to use the UVProbe Installation CD that is packaged with the instrument.

If the driver is installed, the computer recognizes the UV-1800 as a COM port device, even though they are physically connected between USB ports. Therefore, to control the UV-1800, you need to refer to the COM port No., which is indicated as "UV-1800 Series" in [Ports (COM & LPT)] on the device manager.

The following describes the procedures for installing the "Virtual COM port driver" and verifying the COM port No. used for the PC Control.

1 **Set the UV-1800 to the PC Control mode.**

In the [Mode menu] screen (Fig. 2.1), switch the UV-1800 to the PC Control mode by pressing the **F4** [PC Ctrl] key.

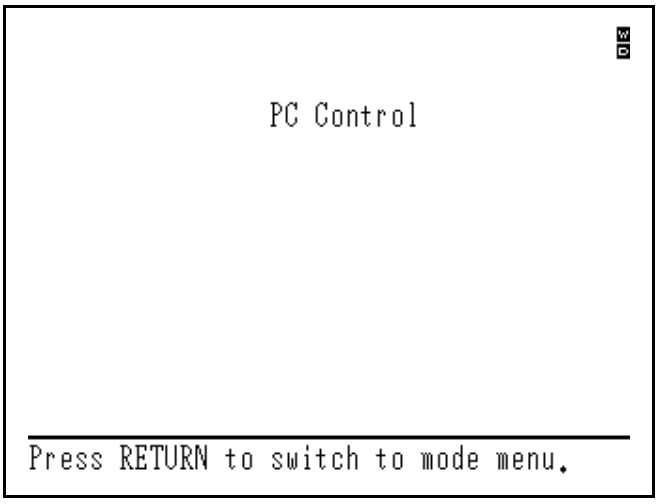


Fig. 17.1 PC Control Mode screen

2 **Connect a USB cable.**

Plug one end of a USB cable into the USB connector which is situated on the left side of the UV-1800 (refer to "Fig. 1.3" in the System User's Guide) and the other end into the USB connector on your computer.

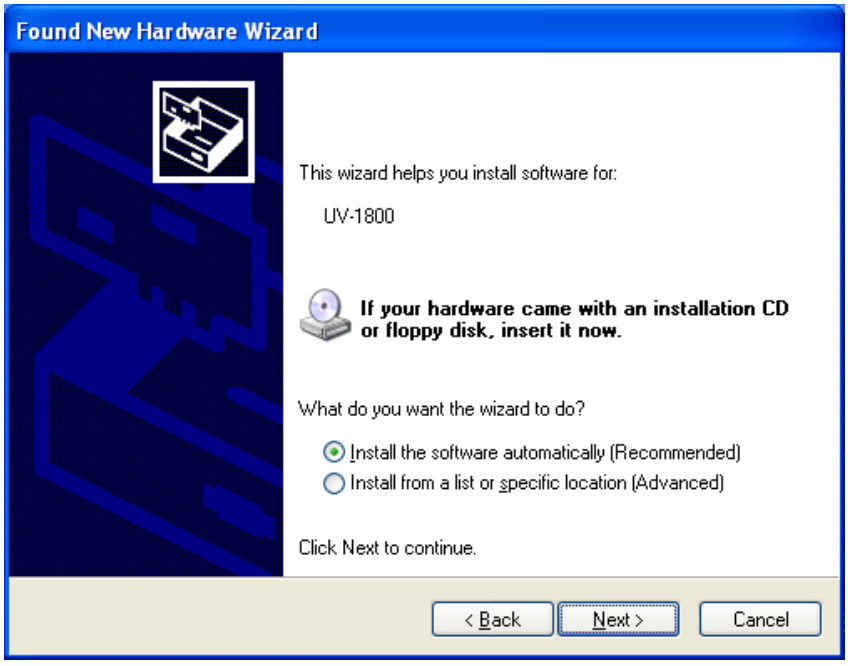
NOTE
For the connection between the UV-1800 and PC, use a USB cable capable of USB 1.1 transfer.

3 **Install the "Virtual COM port driver".**

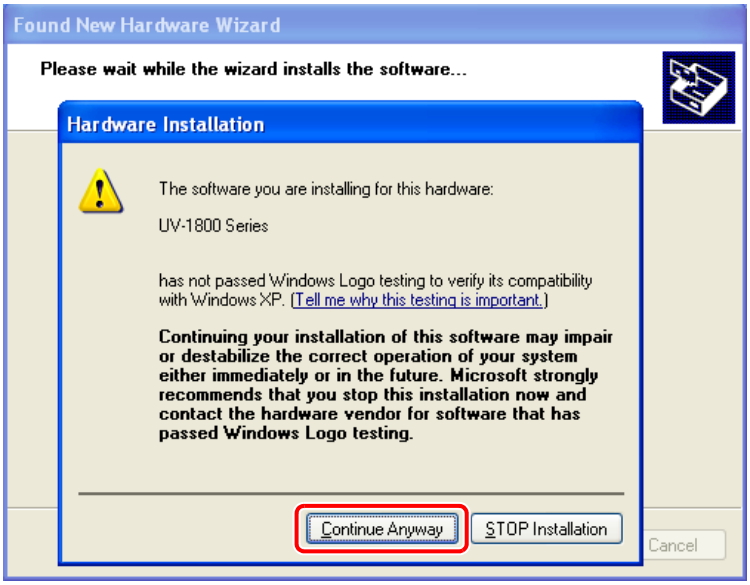
When you connect the UV-1800 to the computer on which the "Virtual COM port driver" is not installed, the operating system will prompt you to install the driver.

1) First, the screen appears asking whether or not Windows can connect to Windows Update. Select "No, not this time", and click [Next].

2) When the screen to select the installation method is displayed, insert the UVProbe Installation CD to the drive. Verify that "Install the software automatically (Recommended)" is selected, and click [Next].



3) The alerting message "This software has not passed windows logo testing." appears. Click "Continue Anyway".



NOTE

The message "This software has not passed…" appears when you have attempted to install a driver which has not been tested by Microsoft. Since Shimadzu has already completed the performance validation of this driver, there is no problem with continuing the installation process by clicking the [Next] button.

4) After the installation is completed, "Completing the Found New Hardware Wizard" appears. Click the [Finish] button.

4 Verify the COM port No. on the device manager screen.

In the operating system, select [Control Panel] - [System]. From the opened [System Property], select [Hardware] tab and click [Device Manager…]. Verify the port No. indicated as "UV-1800 Series" in [Ports (COM & LPT)] on the device manager, which will be used for the later setting.

(In the example shown in Fig. 17.2, "COM 3" will be the COM port to control the UV-1800.)

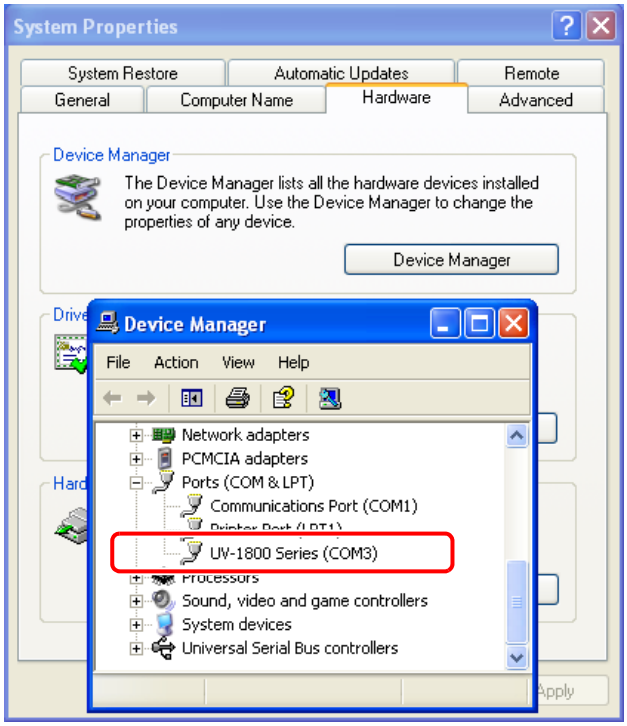


Fig. 17.2 Device Manager window

17.2 Controlling with UVProbe Software

You can control the UV-1800 simply using the UVProbe software that is packaged with the instrument.

17.2.1 UVProbe Installation and Instrument Addition

First, install the UVProbe and then add the instrument information to the UVProbe.

1 **Install the UVProbe software.**

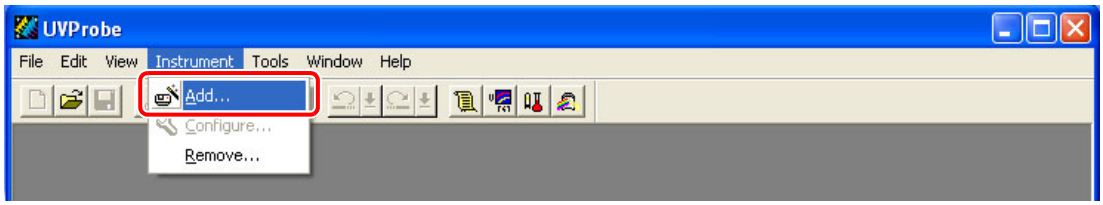
For details on the installation of the UVProbe software, refer to "UVProbe Tutorial" (Instruction manual) that are supplied with the instrument.

2 **Add and configure an instrument.**

The information selected or entered here (except COM port No.) will be recorded as file information in all data files which will be measured or acquired using the UVProbe software.

1) Double click the UVProbe icon  on the desktop to launch the UVProbe software.

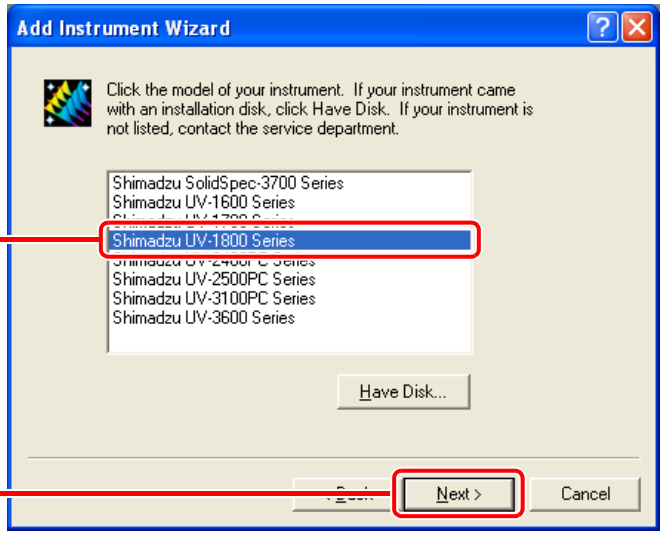
2) From the [Instrument] menu of the UVProbe, select [Add]. The Add Instrument Wizard is started.

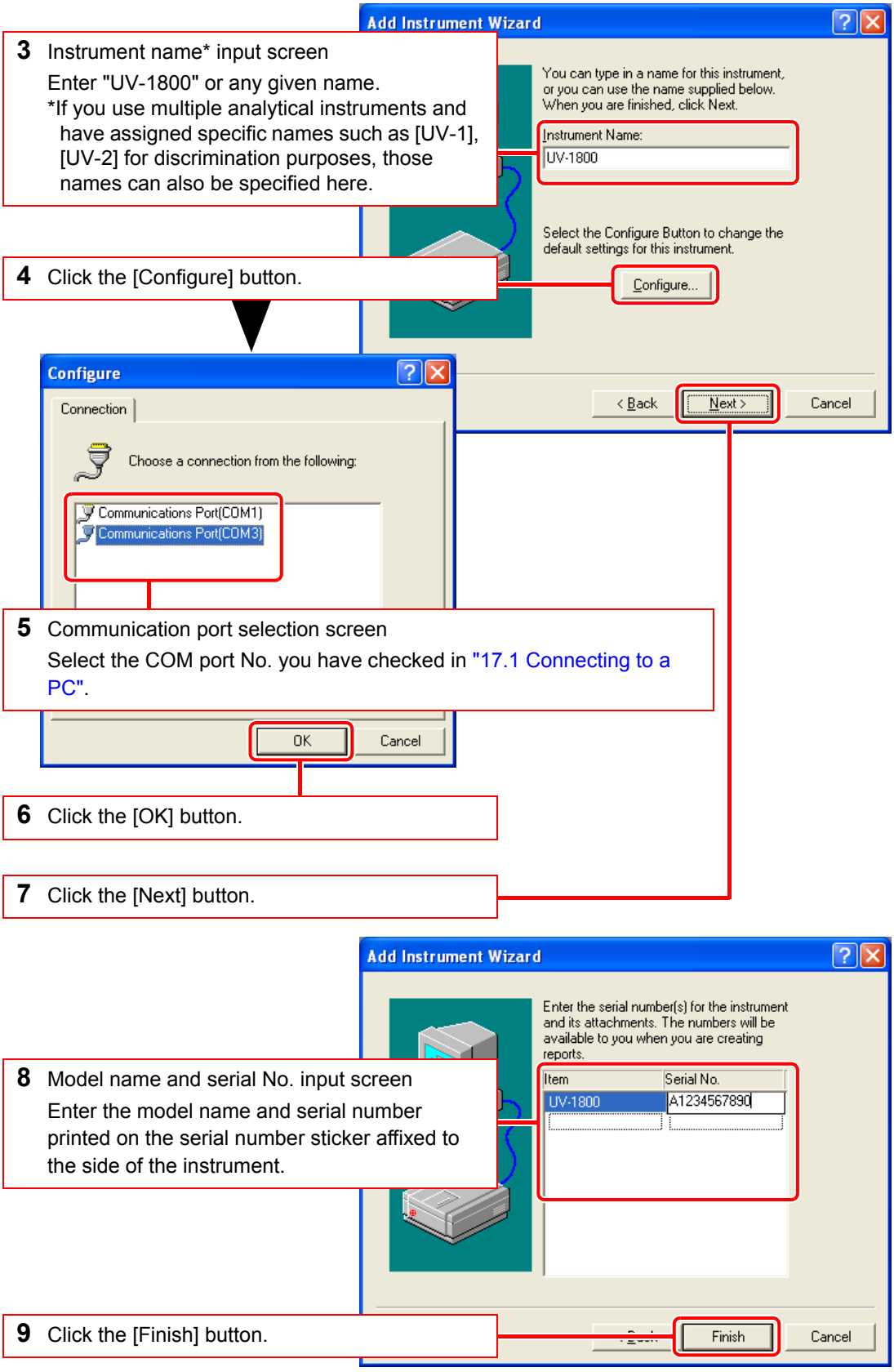


3) Follow the instructions displayed in the Add Instrument Wizard. Select or enter the instrument information, and click the [Next] button to proceed to the next screen. Finally, click the [Finish] button to confirm the information you have entered or selected.

1 Instrument model selection screen
Select (click) "Shimadzu UV-1800 Series".

2 Click the [Next] button.





3 Instrument name* input screen

Enter "UV-1800" or any given name.

*If you use multiple analytical instruments and have assigned specific names such as [UV-1], [UV-2] for discrimination purposes, those names can also be specified here.

4 Click the [Configure] button.

5 Communication port selection screen

Select the COM port No. you have checked in "17.1 Connecting to a PC".

6 Click the [OK] button.

7 Click the [Next] button.

8 Model name and serial No. input screen

Enter the model name and serial number printed on the serial number sticker affixed to the side of the instrument.

9 Click the [Finish] button.

17.2.2 UVProbe Startup and Communication Establishment

The following describes the operation procedure from starting up the UVProbe to the establishment of communication with the UV-1800.
For details on the other procedures for operating the UVProbe, refer to "UVProbe Tutorial" (Instruction manual).

1 Set the UV-1800 to the PC Control mode.

1) Turn ON the power switch located on the right side of the UV-1800.
2) After the instrument initialization has completed, the [Mode menu] screen (Fig. 2.1) will be displayed.
3) Press the F4 [PC Ctrl] key to switch the UV-1800 to the PC Control mode.

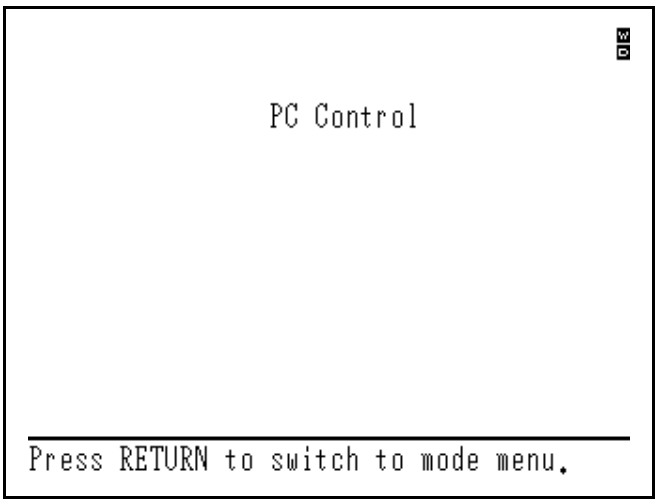
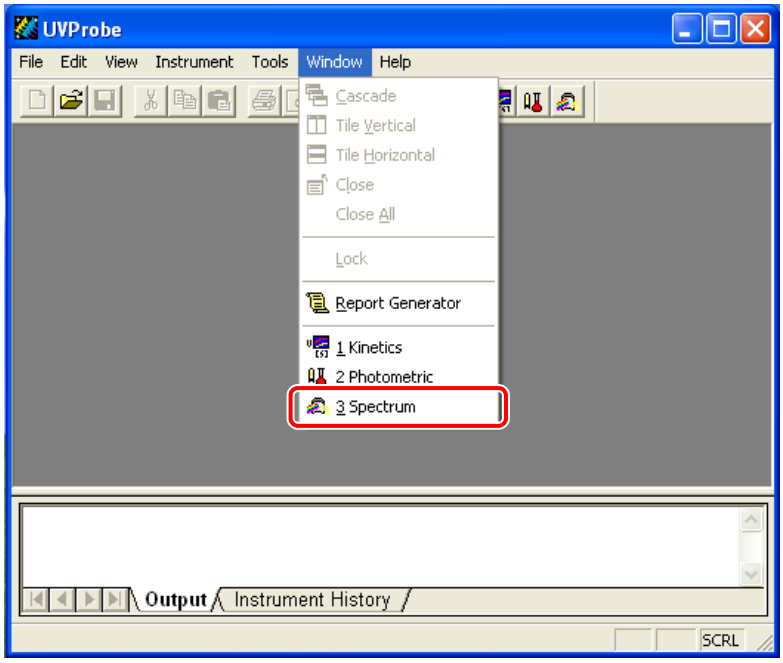


Fig. 17.3 PC Control Mode screen

2 Start up the UVProbe and open the desired measurement module screen (for here, Spectrum module).

1) Double click the UVProbe icon  on the desktop to launch the UVProbe software.

2) The basic window is displayed. From the menu bar, Select [Window] - [Spectrum].



3) The measurement window for the Spectrum module is displayed.

The measurement module (UVProbe- [Spectrum]) is displayed in the title bar.

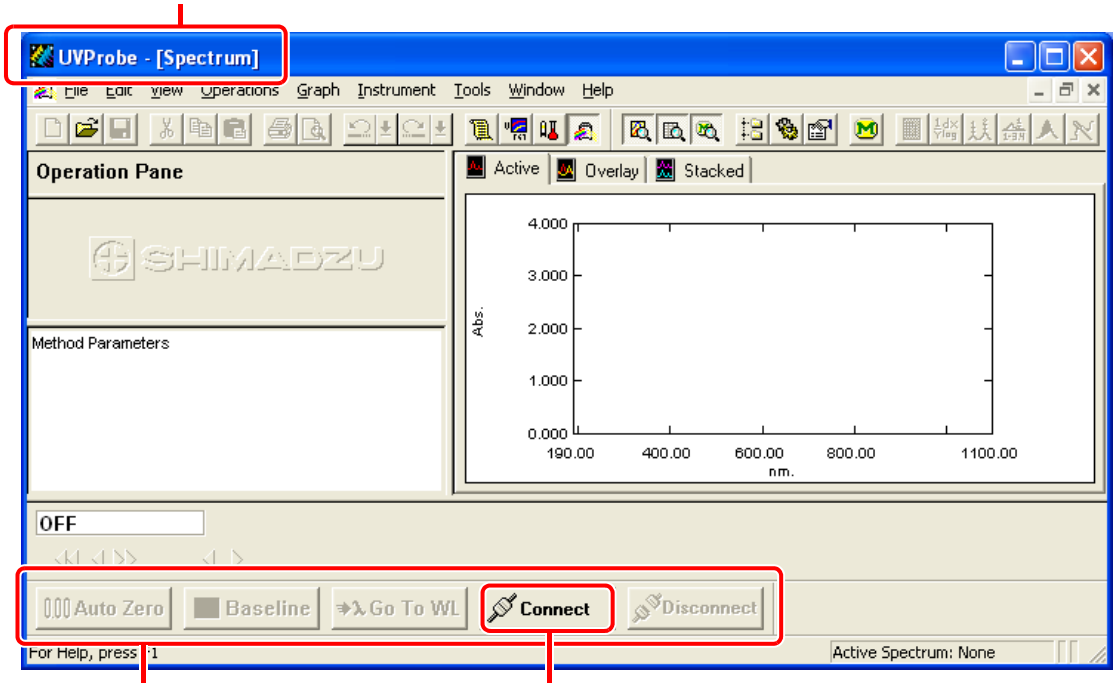


Fig. 17.4 Spectrum Module Measurement screen

3 Establish the communication with the UV-1800.

1) Click [Connect] on the [Instrument] bar to connect the UV-1800 to the computer.
2) When the communication with the UV-1800 is established, the [Connect] button changes to [Disconnect] button and the [Instrument Status] bar starts indicating the current wavelength and photometric value.
   To disconnect the communication, click the [Disconnect] button.

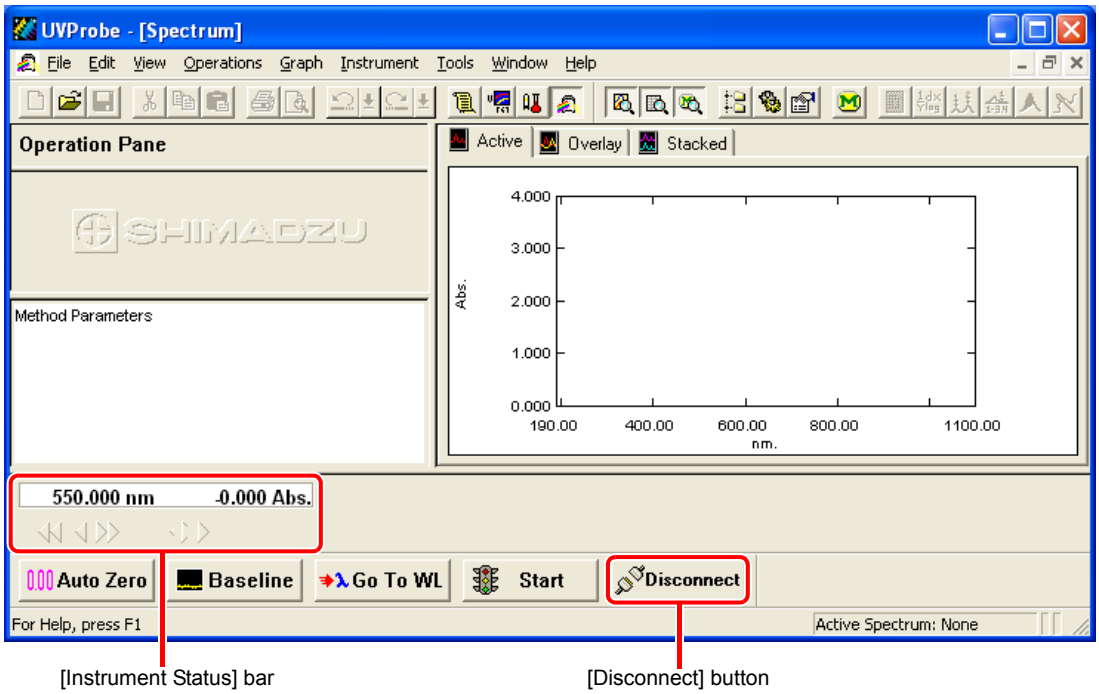


Fig. 17.5 Spectrum Module Measurement screen (When communication is established)

4 Exit the PC Control mode.

Press the RETURN key on the UV-1800 in the screen shown in Fig. 17.6 to return to the [Mode menu] screen (Fig. 2.1).

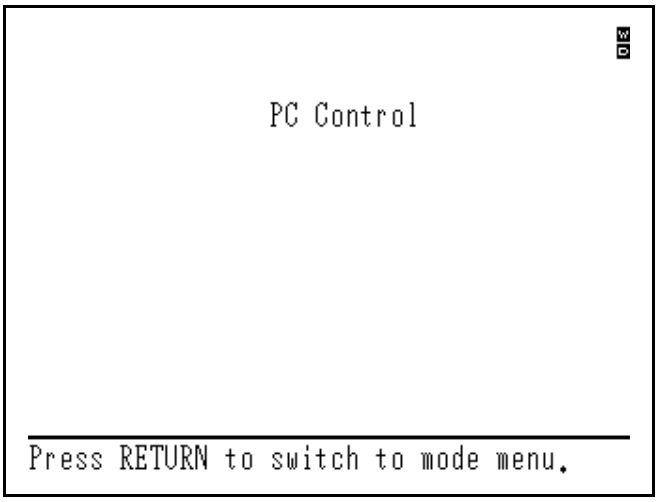


Fig. 17.6 PC Control Mode screen

NOTE

When attempting to exit the PC Control mode, the current user's password is prompted if the security function is ON (Fig. 17.7) (☞ "15.2 Security Functions"). If the function is ON, no one except the current user can shutdown the communication to directly control the UV-1800 without permission.
This function prevents users from changing system status such as baseline correction record, etc. without leaving instrument history (☞ "A.1.2 Common Screen Frame"), when managing history information with the UVProbe software (standard accessory).

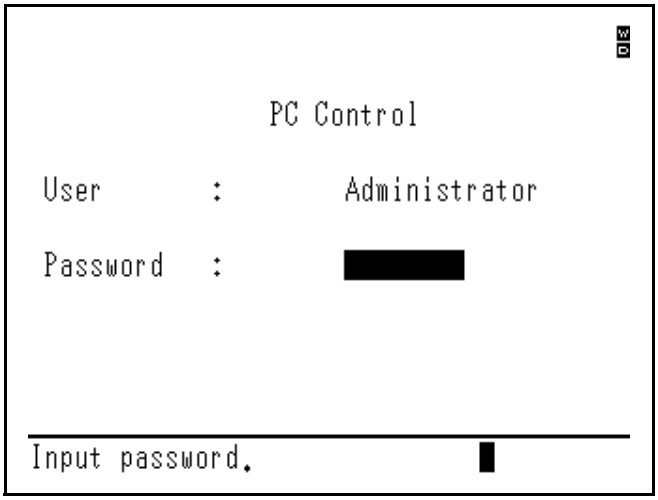


Fig. 17.7 PC Control Mode Exit screen (Only when the security function is ON)

17.2.3 Precautions When Controlling the UV-1800 from UVProbe

■ The Minimum Resolution of Measured Data

The UV-1800 handles its obtained data in floating-point form.
However, when the UVProbe software controls the UV-1800 to acquire data, the resolution is limited as follows since photometric values are transmitted in fixed-point form.

- Transmittance: Minimum resolution ≒ 0.00152587 %
- Absorbance: Minimum resolution ≒ 0.0000152587 Abs

■ Data Accumulation Time

For the UV-1800, you can specify data accumulation time for data acquisition in the Utilities Menu screen (☞ "14.1.5 Setting Data Accumulation Time").

However, when controlling the UV-1800 from the UVProbe software, the data accumulation time specified in the Utilities Menu screen is ignored and the value is fixed to the minimum value [0.05 msec].

NOTE

For spectrum measurements, the accumulation time is determined depending on "Scan speed" specified as measurement parameters, as is the case with the UV-1800 operation (☞ "6.1 Measurement Parameter Configuration Screen").

17.3 Controlling with External Commands

You can also control the UV-1800 from the computer using a control program besides the UVProbe software.

17.3.1 Receiving Commands and Protocol

When you select the F4 [PC Ctrl] key in the [Mode menu] screen, the following screen is displayed. It becomes possible to communicate with PC via the USB interface.

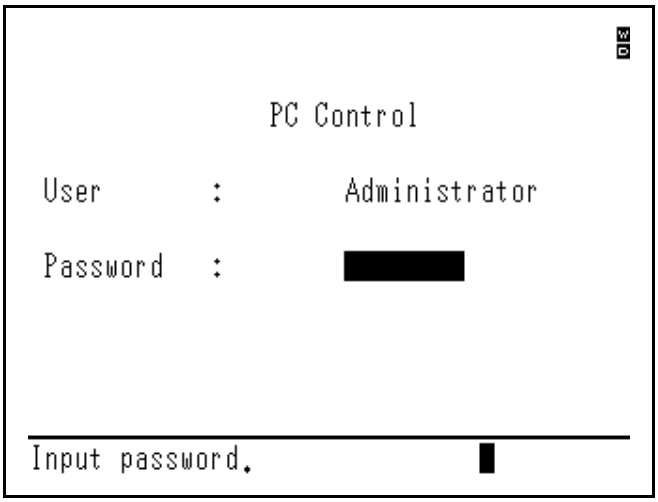


Fig. 17.8 PC Control Mode screen

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 exchange 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-1800 and a PC.

Table 17.1 Control Codes

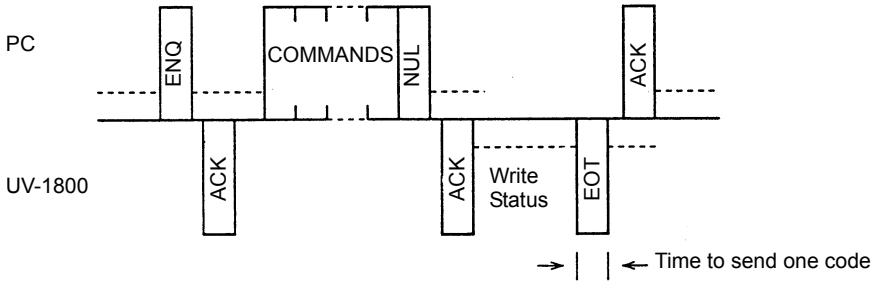
Control Code (Hexadecimal)	Direction	Function
ENQ ($05) (Enquiry)	Master to Slave	Enquiry code sent when you wish to send commands or data. In particular, the first ENQ of a series of transactions also indicates the start of communication.
EOT ($04) (Enquiry)	Master to Slave	Code for announcing the end 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) (Enquiry)	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)	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 types of commands sent from the PC to the UV-1800 can be generally classified as follows according to the direction of the data flow.

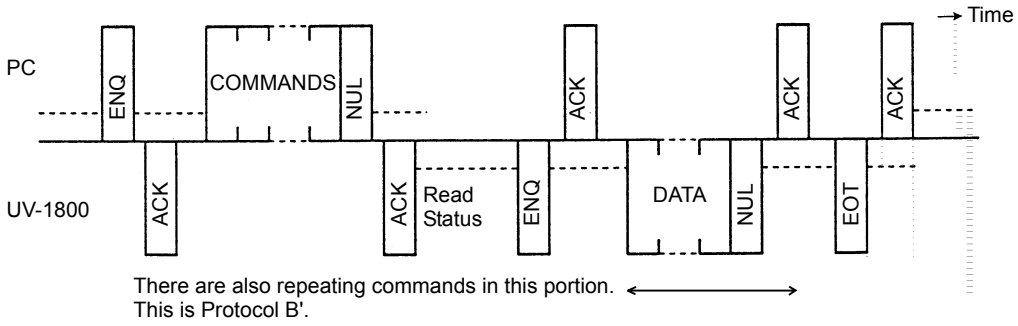
a. Write command..... Sets the status of the UV-1800.
b. Read command..... Recognizes the status of the UV-1800.

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'.

17.3.2 Example of Programming

This section further details the three transmission procedures, protocol types A, B, and B' described in the previous section, so that they can be used for your programming purpose.
N in the text stands for repetition count and is assumed to be 5 in this example.
In the flow chart, repetition count and time-out checks are omitted.

■ Protocol type A

(1) Establishment of communication link ① in flowchart 1

Before transmitting a command, the master station (PC in this example) issues the ENQ code to a subordinate station (the UV-1800 in this example) to prompt it to receive the command data. The subordinate station returns ACK to notify the master station that it is ready to receive the command data.

<Error handling>

- If NAK is returned in response to the transmission of ENQ, ENQ is retransmitted. If NAK is still returned after this retry has been made N times (5 times in this example), the master station determines that there is an error at the subordinate station and ends the retries.
- If any code other than ACK and NAK is returned, the master station ignores it and waits for the next reply.
- If there is no reply for a given time, the master station retransmits ENQ. If no reply is received after the Nth retransmission, the master station determines that there is an error at the subordinate station and ends the retransmission.

(2) Transmission of command data ② in flowchart 1

If the communication link is established successfully, the master station (PC in this example) transmits the command data. When the subordinate station (the UV-1800 in this example) receives the command data successfully, it returns ACK to the master station. At this point, the master station and the subordinate station change over to each other.

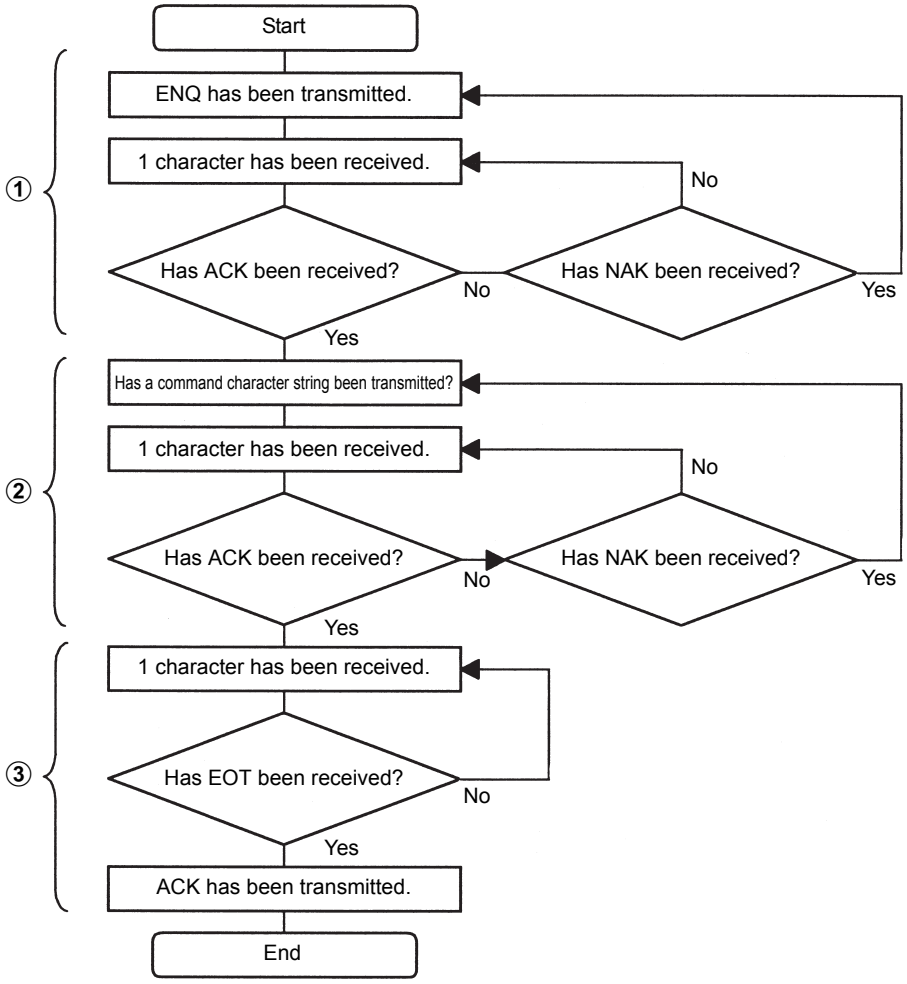
<Error handling>

- If NAK is returned in response to the transmission of the command data, the previously transmitted data is retransmitted. If NAK is still returned after the Nth retransmission, the master station determines that an error has occurred at the subordinate station, and ends the retransmission.
- If any code other than ACK and NAK is received, the master station ignores it and waits for the next reply.
- If there is no reply for a given time, the master station retransmits ENQ. If no reply is received after the Nth retransmission, the master station determines that an error has occurred at the subordinate station and ends the retransmission.

(3) Ending ③ in flowchart 1

When the master station (the UV-1800 in this example) processes the command data and finishes this processing, it transmits EOT to the subordinate station (PC in this example). The subordinate station waits until EOT is transmitted, and then returns ACK to end the communication.

Flowchart 1


Start
ENQ has been transmitted.
1 character has been received.
No
Has ACK been received?
No
Has NAK been received?
Yes
Yes
①
Has a command character string been transmitted?
1 character has been received.
No
Has ACK been received?
No
Has NAK been received?
Yes
Yes
②
1 character has been received.
Has EOT been received?
No
Yes
③
ACK has been transmitted.
End

■ Protocol types B and B'

(1) Establishment of communication link
This is the same as in protocol type A.

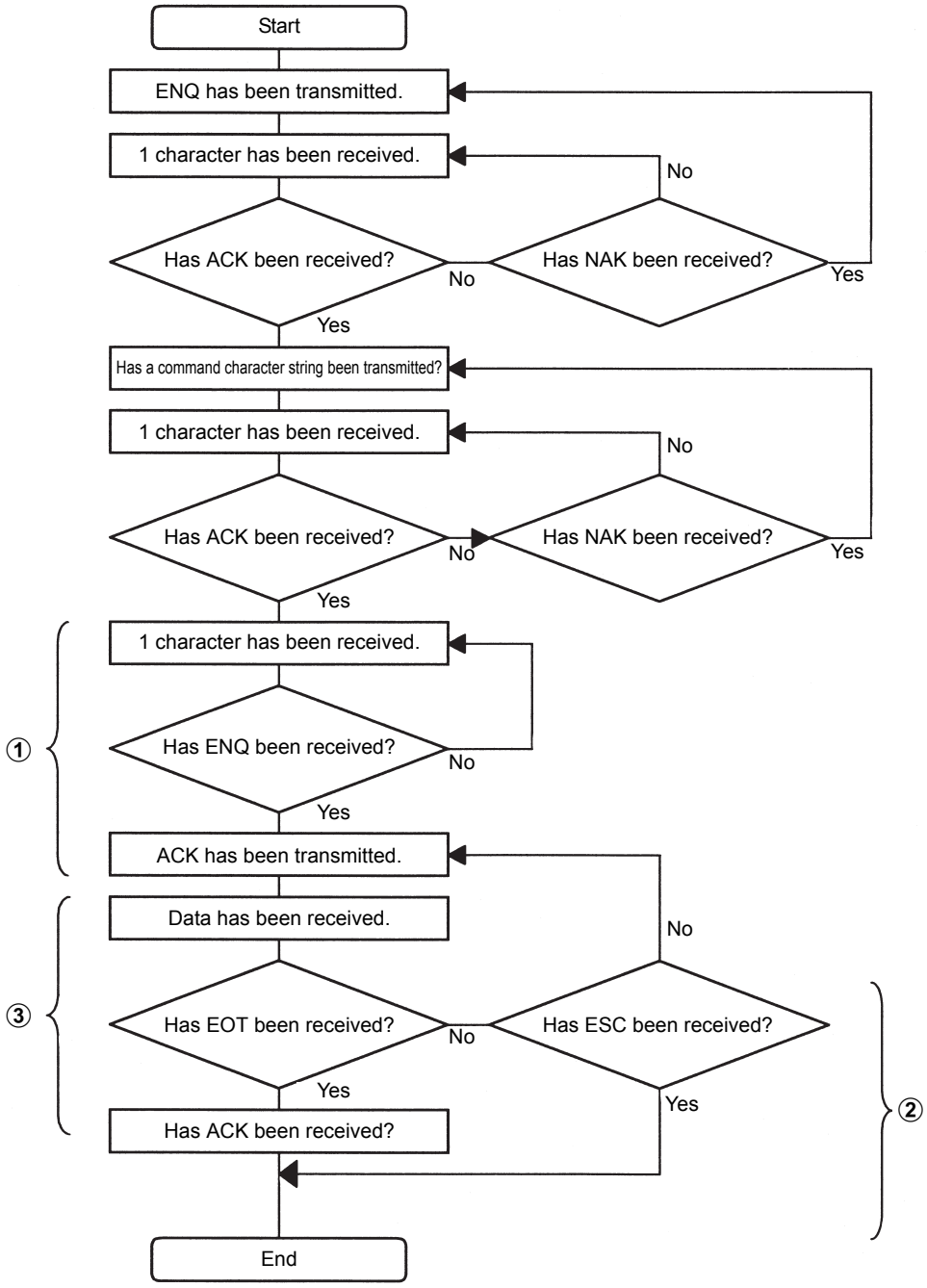
(2) Transmission of command data
This is the same as in protocol type A.

(3) Reception of answered-back data ① in flowchart 2
When the master station (the UV-1800 in this example) processes the command data and finishes this processing, it issues the ENQ code to prompt the subordinate station (PC in this example) to receive the data. The subordinate station waits until ENQ is received, and then returns ACK to notify the master station (the UV-1800 in this example) that it is ready to receive the data. Receiving this ACK, the main station (the UV-1800 in this example) starts sending the data.
In the case of protocol B', there are multiple data sets involved. Therefore, each time the subordinate station (PC in this example) receives data, it transmits ACK to notify the master station (the UV-1800 in this example) that it has received the data.
<Error handling>
- If no answered-back data is transmitted for a given time, ENQ is retransmitted. If no data is returned after the Nth retransmission, the master station (the UV-1800 in this example) determines that an error has occurred at the subordinate station and ends the retransmission.
- If the next character is not received for a given time when character string data is being received on a character basis, NAK is immediately returned.

(4) Abortion of data reception ② in flowchart 2
When the subordinate station (PC in this example) is receiving multiple data sets using protocol type B', it transmits ESC rather than ACK if it wants to abort the data reception.
The master station (the UV-1800 in this example) aborts the data transmission and closes the communication link. If the master station (the UV-1800 in this example) becomes unable to transmit data due to any error that has occurred during the data transmission, it transmits ESC rather than the data to close the communication link.

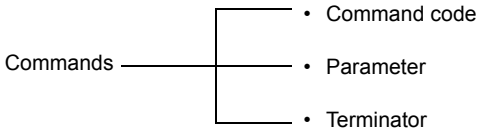
(5) Ending ③ in flowchart 2
When the master station (the UV-1800 in this example) finishes transmitting all the data, it sends EOT. Receiving EOT, the subordinate station (PC in this example) determines that the data reception has been finished, and then sends ACK to ends the communication.

Flowchart 2

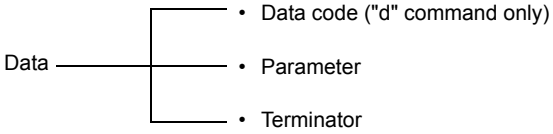

Start
ENQ has been transmitted.
1 character has been received.
No
Has ACK been received?
No
Has NAK been received?
Yes
Yes
Has a command character string been transmitted?
1 character has been received.
No
Has ACK been received?
No
Has NAK been received?
Yes
Yes
1 character has been received.
Has ENQ been received?
No
Yes
ACK has been transmitted.
Data has been received.
No
Has EOT been received?
No
Has ESC been received?
Yes
Yes
Has ACK been received?
End
①
②
③

17.3.3 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 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). The symbol "," (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 UV-1800 have the following structure.



Only "d" command has a Data Code "d"; any other commands have no Data 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.

CAUTION

Do NOT send communication commands from the PC unless using standard UVProbe software during the initialization of the UV-1800 (Fig. 1.1). If you do, it is most likely that the photometer initialization will not finish correctly.
In case you wish to externally control the UV-1800 using software other than UVProbe (optional), make sure to send commands only after confirming the end of initialization and entering the **F4** [PC Ctrl] key from the [Mode menu] screen.

17.3.4 Programming with Visual Basic

This section describes the programming method using Visual Basic*. You will define the Windows API functions on Visual Basic, and by calling up the functions, you can control the UV-1800 from the external computer.
Note that the UV-1800 cannot be controlled from the SerialPort class newly added in Visual Basic MSComm control and in .NET Framework 2.0.
This chapter assumes readers have basic knowledge of Visual Basic, and use Visual Basic Ver.6.0, Visual Basic .NET 2005 and 2003 as their development environment.

■ Programming with Visual Basic Ver.6.0

1 Defining the API Functions

Define the four Windows API functions (CreateFile, WriteFile, ReadFile, and CloseHandle) required for the UV-1800 external control as described below.
(In Visual Basic Ver.6.0, you can import the definitions of API functions from the bundled "API viewer" software. For the detailed procedure, refer to the Microsoft help services.)

```
'Start Communication:  Define CreateFile
Public Declare Function CreateFile Lib "kernel32" Alias "CreateFileA" ( _
        ByVal lpFileName As String, _
        ByVal dwDesiredAccess As Long, _
        ByVal dwShareMode As Long, _
        ByVal lpSecurityAttributes As Long, _
        ByVal dwCreationDisposition As Long, _
        ByVal dwFlagsAndAttributes As Long, _
        ByVal hTemplateFile As Long _
) As Long

'Send command:  Define WriteFile
Public Declare Function WriteFile Lib "kernel32" ( _
        ByVal hFile As Long, _
        lpBuffer As Any, _
        ByVal nNumberOfBytesToWrite As Long, _
        lpNumberOfBytesWritten As Long, _
        ByVal lpOverlapped As Long _
) As Long

'Receive data: Define ReadFile
Public Declare Function ReadFile Lib "kernel32" ( _
        ByVal hFile As Long, _
        lpBuffer As Any, _
        ByVal nNumberOfBytesToRead As Long, _
        lpNumberOfBytesRead As Long, _
        ByVal lpOverlapped As Long _
) As Long

'End communication: Define CloseHandle
Public Declare Function CloseHandle Lib "kernel32" ( _
        ByVal hObject As Long _
) As Long
```

* Microsoft® is a registered trademark. Visual Basic and Windows are registered trademarks of Microsoft Corporation in the United States and/or other countries.

2 Using the API Functions

You can externally control the UV-1800 using the defined API functions as follows:

1) Starting Communication
Start communication using the CreateFile function.

Example) Start communication through the COM1 port.

```
Dim hCom As Long
Dim strComPort As String
strComPort = "COM1"

'Start communication:
hCom = CreateFile( strComPort, _
            GENERIC_READ Or GENERIC_WRITE, _
            0, 0, OPEN_EXISTING, _
            0, 0 )
```

2) Sending Command
Send a command to the UV-1800 using the WriteFile function.

Example) Send ENQ($05).

```
Dim bRet As Boolean
Dim lBytesWritten As Long

'Send command:
bRet =  WriteFile( hCom, &H5, 1, lBytesWritten, 0 )
```

3) Receiving data
Receive data from the UV-1800 using the ReadFile function.

Example) 1 character is received.

```
Dim bRet As Boolean
Dim lBytesRead As Long
Dim wDataReadAry(100)   As Byte

'Receive data:
bRet = ReadFile( hCom, wDataReadAry(0), 1, lBytesRead, 0 )
```

4) Ending communication
End the communication using the CloseHandle function.

Example) End the existing communication.

```
'End communication:
CloseHandle ( hCom )
```

■ Programming with Visual Basic .Net (2005 and 2003)

1 Defining the API Functions

Define the four Windows API functions (CreateFile, WriteFile, ReadFile, and CloseHandle) required for the UV-1800 external control as described below.

```
'Start Communication:  Define CreateFile
Public Declare Auto Function CreateFile Lib "kernel32.dll" ( _
        ByVal lpFileName As String, _
        ByVal dwDesiredAccess As Int32, _
           ByVal dwShareMode As Int32, _
        ByVal lpSecurityAttributes As IntPtr, _
           ByVal dwCreationDisposition As Int32, _
        ByVal dwFlagsAndAttributes As Int32, _
           ByVal hTemplateFile As IntPtr _
) As IntPtr

'Send command:  Define WriteFile
Public Declare Auto Function WriteFile Lib "kernel32.dll" ( _
        ByVal hFile As IntPtr, _
           ByVal lpBuffer As Byte(), _
        ByVal nNumberOfBytesToWrite As Int32, _
           ByRef lpNumberOfBytesWritten As Int32, _
        ByVal lpOverlapped As IntPtr _
) As Boolean

'Receive data: Define ReadFile
Public Declare Auto Function ReadFile Lib "kernel32.dll" ( _
        ByVal hFile As IntPtr, _
           ByVal lpBuffer As Byte(), _
        ByVal nNumberOfBytesToRead As Int32, _
           ByRef lpNumberOfBytesRead As Int32, _
        ByVal lpOverlapped As IntPtr _
) As Boolean

'End communication: Define CloseHandle
Public Declare Auto Function CloseHandle Lib "kernel32.dll" ( _
        ByVal hObject As IntPtr _
) As Boolean
```

2 Using the API Functions

You can externally control the UV-1800 using the defined API functions as follows:

1) Starting Communication
Start communication using the CreateFile function.

Example) Start communication through the COM1 port.

```
Dim hCom As IntPtr
Dim strComPort As String
strComPort = "COM1"

'Start communication:
hCom = CreateFile( strComPort, _
                   GENERIC_READ Or GENERIC_WRITE, _
                   0, IntPtr.Zero, OPEN_EXISTING, _
                   FILE_ATTRIBUTE_NORMAL, IntPtr.Zero )
```

2) Sending Command
Send a command to the UV-1800 using the WriteFile function.

Example) Send ENQ($05).

```
'Define the object that converts Unicode strings to ASCII strings(for Visual Basic
.Net 2005*):
Dim oEnc As System.Text.Encoding _
=System.Text.Encoding.GetEncoding ("windows-1252")

Dim bRet As Boolean
Dim byBuffer () As Byte
Dim nBytesWritten As Int32

'Obtain the ASCII string:
byBuffer = oEnc.GetBytes(Chr (&H5))

'Send command:
bRet =  WriteFile( hCom, byBuffer, byBuffer.Length, nBytesWritten, IntPtr.Zero )
```

* For Visual Basic .Net 2003, define the object that converts Unicode strings to ASCII strings as follows:
Dim oEncoder As System.Text.ASCIIEncoding
Dim oEnc As System.Text.Encoding = oEncoder.GetEncoding ("windows-1252")

3) Receiving data
Receive data from the UV-1800 using the ReadFile function.

Example) 1 character is received.

```
Dim bRet As Boolean
Dim byBuffer() As Byte
Dim nBytesRead As Int32

'Receive data:
bRet = ReadFile( hCom, byBuffer, 1, nBytesRead, IntPtr.Zero )
```

4) Ending communication
End the communication using the CloseHandle function.

Example) End the existing communication.

```
'End communication:
CloseHandle ( hCom )
```

17.3.5 Command List

The terminator symbol has been omitted from the command format places in the command list. When sending to the UV-1800, send a terminator code (NUL) appearing right after the content shown in the table as the actual command. The symbols "n" and "m" in the command format indicate parameters. The protocol types are A, B, and B' and correspond with the time chart in the table.

Table 17.2 Command List

Command	Protocol	Name	Processing Content and Usage Notes
a	A	Measure	Performs wavelength scan. The measured data are stored in the continuous data memory area in the UV-1800. Use the f command when retrieving data.
cn	A	Baseline correction	Performs baseline correction. The parameter n corresponds with the baseline number as shown below. n = 0: baseline correction n = 1: instrument baseline correction This corrects the baseline every 1.0 nm over the domain set by the scan range h command. The instrument baseline is corrected for the entire wavelength range at 0.1 nm intervals.
d	B	Data output trigger	Outputs the current data. When this command is sent, the UV-1800 performs one measurement and outputs the data as shown below. dk The parameter k is the current data and is formatted as shown below, according to the measurement mode. Abs: ±x.xxxy Not Abs: ±xxx.xy The sign of the parameter is output only if the parameter is negative, while a space is output if the parameter is positive. In addition, y is output if "Decimal Display" of "Utilities" is set to "Abs (4) %T (2)".
hn, m	A	Scanning range	Sets the scanning range. The parameters n and m correspond with the start wavelength and end wavelength. Use the symbol "," (comma) as the delimiter between the parameters. $190 \leq n,m \leq 1100$ $n-m \geq 10$
jn	A	Scanning speed	Sets the scanning speed. The parameter n corresponds with the speed number as shown below. n = 1: Fast n = 2: Medium n = 3: Slow n = 4: Very Slow
ln	A	Light source switching	Switches the light source position. The parameter n corresponds with the light source position as shown below. n = 0: WI lamp n = 1: D2 lamp n = 2: Optional lamp This command is valid only if the measurement mode is "Energy".

Command	Protocol	Name	Processing Content and Usage Notes
vn	A	Measurement mode	Sets the measurement mode. The parameter n corresponds with the mode number as shown below. n = 1: %T n = 2: Abs n = 3: Energy
wn	A	Wavelength setting (go to λ)	Sets the wavelength. The parameter n uses the value which is 10 times the wavelength being set. To set a wavelength of 500.0 nm, set 5000. n must meet the following condition. 1900 ≤ n ≤ 11000
x	A	Auto zero	Performs auto-zeroing (sets the absorbance under the current conditions at zero, or the current transmittance at 100 %).
y	A	WI lamp ON/OFF	Controls the ON/OFF of the WI light source lamp. The parameter n corresponds with the lamp illumination status as shown below. n = 0 : OFF n = 1 : ON
z	A	D2 lamp ON/OFF	Controls the ON/OFF of the D2 light source lamp. The parameter n corresponds with the lamp illumination status as shown below. n = 0 : OFF n = 1 : ON

Command	Protocol	Name	Processing Content and Usage Notes
fn	B'	Transfer file data	Retrieves data which have been stored in the memory of the UV-1800 by the measure command a. The parameter n is the number of data points that you wish to retrieve, and allows you to retrieve n pieces of data from the start of the file (in the case of a spectrum, from the long wavelength end). If you set the parameter to a number which is greater than the number of data points saved in memory, processing will end at the point where you run out of data. N meets the following condition. $1 \leq n \leq 2001$ The data will be output as follows. k For the data which is sent, it is necessary to send an ACK response for each piece of data. The parameter k is a pairing of the wavelength at the time of measurement and the data. The format is as follows, depending on the measurement mode at the time (Top is Abs, bottom is not Abs). zzzz.z ΔΔ±x.xxxy zzzz.z ΔΔ±xxx.xy z is the wavelength, x and y are the measurement data and Δ represents "space" data. The sign of the parameter is output only if the parameter is negative, while a space is output if the parameter is positive. In addition, y is output if "Decimal Display" of "Utilities" is set to "Abs (4) %T (2)".
Nx, y, z	A	Syringe sipper control	Controls the syringe sipper. The parameters x, y, and z correspond with the suction speed, operation mode, and capacity, as shown below. Use a "," (comma) as the delimiter between the parameters. Suction speed (ml/sec) x = 1 : 1.2 x = 2 : 0.6 x = 3 : 0.3 x = 4 : 0.2 x = 5 : 0.1 Operation mode y = 0 : Initialization y = 1 : Suction y = 2 : Discharge (discard) y = 3 : Discharge (return) y = 4 : Cancel initialization Capacity (ml) $0 \leq z \leq 1000$ (x 0.01 ml) This command is valid only if the syringe sipper is connected to the UV-1800 sample compartment.

Command	Protocol	Name	Processing Content and Usage Notes
Sn	A	Syringe sipper lamp ON/OFF	Controls the ON/OFF of the syringe sipper indication lamp. The parameter n corresponds with the lamp illumination status as shown below. n = 0 : OFF n = 1 : ON This command is valid only if the syringe sipper is connected to the UV-1800 sample compartment.
o	A	Sipper suction	Executes the sipper suction operation. The settings done on the UV-1800 are used for the sipper parameters at the Spectrum mode, such as pump speed and sip time, etc. This command is valid only if a sipper 160 is connected to the sample compartment module.
p	A	Sipper purge	Executes the sipper purge operation. The settings done on the UV-1800 are used for the sipper parameters at the Spectrum mode, such as pump speed and purge time, etc. This command is valid only if a sipper 160 is connected to the sample compartment module.
qn	A	Move cell position	Moves the cell position of the Multicell Sample Compartment, MMC-1600 or CPS-240. Parameter n decides the direction. n = 1: Move 1 cell forward n = 2: Move to the cell 1 (Multicell/MMC-1600) Move 1 cell backward (CPS-240) This command is valid only if a Multicell Sample Compartment, MMC-1600 or CPS-240 is connected to the sample compartment module.
q	B	Check cell position	Checks the cell position in the Multicell Sample Compartment, MMC-1600 or CPS-240. When this command is executed, data are returned from the UV-1800 as follows. k The parameter k corresponds with the cell position number as follows. $1 \leq k \leq 16$ This command is valid only if a Multicell Sample Compartment, MMC-1600 or CPS-240 is connected to the sample compartment module.

Command	Protocol	Name	Processing Content and Usage Notes
r	B	Check ASC nozzle	Checks the nozzle condition in the auto-sample changer ASC-5 (optional). If this shows that the nozzle is lowered, the sample suction operation can begin. When this command is executed, data are returned from the UV-1800 as follows. k The parameter k corresponds with the nozzle status number as follows. 0 = nozzle is raised 1 = nozzle is lowered This command is valid only when the ASC-5 is connected.
mn	A	Option initialization	Executes the initialization of option unit connected to the sample compartment. n = 0: initialization (standard cell) n = B: Multicell Sample Comparment (6 cell) n = C: CPS-240 n = D: MMC-1600 (8 cell) n = E: MMC-1600 (16 cell)

Chapter 18 Sample Module Control (Multi-cell, Sipper Operation)

CONTENTS

18.1 Sample Module Control (Multi-cell, Sipper Operation)

When you call up the Sample Control screen from the Measurement Parameter Configuration screen in the different modes, you can set the measurement parameters for the sample module.

1 Press the F2 [SmplCmpt] key to display the Sample Compartment Control screen (Fig. 18.1).

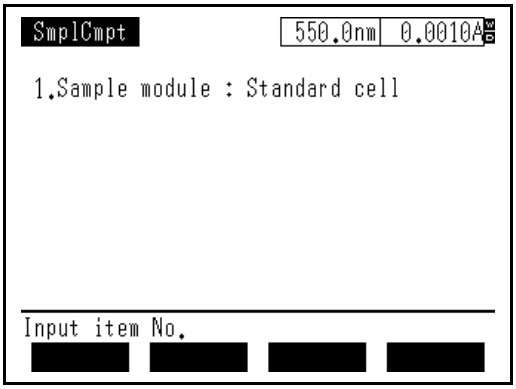


Fig. 18.1 Sample Compartment Control screen (When standard cell is selected)

2 If you wish to change the sample module, press the F1 [Sample module] key. The Sample Module Selection screen will be displayed (Fig. 18.2).

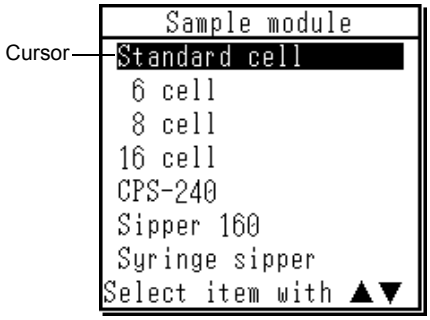


Fig. 18.2 Sample Module Selection screen

3 To select the sample module, move the cursor to the desired module with the ▲ ▼ keys, and confirm with the ENTER key.

The following 5 accessories can be mounted in place of the standard sample module and operated along with the main instrument.

Sample Module	Accessory Name (Optional)	Description
[6 cell]	Multicell Sample Compartment	The cell holder can hold up to six 10 mm square cells. ☞ "18.2 Multi-cell Holder"
[8 cell] [16 cell]	MMC-1600/C	A micro multi-cell holder capable of handling 8 or 16 position micro multi-cell holder ☞ "18.2 Multi-cell Holder"
[CPS-240]	CPS-240A/B	6-position Micro Multi-cell equipped with temperature control function ☞ "18.2 Multi-cell Holder"
[Sipper 160]	Sipper 160L/C/U/T	Performs measurements while drawing sample into a flow cell using a peristaltic pump). ☞ "18.3 Sipper 160"
[Syringe sipper]	Syringe Sipper N/CN	Performs measurements while drawing sample into a flow cell using a syringe. ☞ "18.4 Syringe Sipper"

Refer to "Chapter 4 Replacing the Sample Compartment Parts" in the System User's Guide for the instructions for mounting the various accessories.

18.2 Multi-cell Holder

When using the Multicell Sample Compartment, MMC-1600, and CPS-240, multiple samples can be measured sequentially.

NOTE
To connect the CPS-240 to the UV-1800, "USB ADAPTOR for CPS (P/N 206-25234-91)" is separately required.

However, the availability of sequential measurement varies, and also a use limitation exists according to the measurement mode. Check the following table to learn the variations:

Measurement Mode	Sequential Measurement	Remark
Photometric measurement (One-wavelength) ☞Chapter 4	○	–
Photometric measurement (Multi-wavelength) ☞Chapter 5	○	The motion in the sequential measurement differs depending on the set value for the function switching samples for each measurement wavelength. (☞"5.2.2 Changing Sample")
Spectrum mode ☞Chapter 6	○	• The blank correction function (reagent blank correction, cell blank correction) is not available. (☞"18.5 Blank Correction Function") • Only the data for the last cell can be saved or printed after measurement. However, if the auto print function is enabled, the measurement result can be printed for each cell. (☞"6.1 Measurement Parameter Configuration Screen" [Auto-Print])
Quantitation mode ☞Chapter 7	○	When performing a repeated measurement, the sequential measurement of multiple cells is not available.
Kinetics measurement ☞Chapter 8	○	When performing background correction (BG correction: ON), the sequential measurement of multiple cells is not available. (☞"8.2 Measurement Parameter Configuration Screen")
Kinetics rate measurement ☞Chapter 9	×	–
Time scan mode ☞Chapter 10	○	–

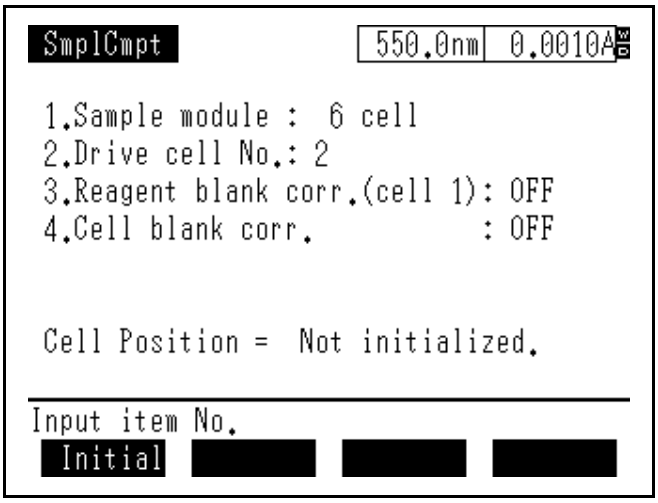
Measurement Mode	Sequential Measurement	Remark
Multi-component quantitation mode ☞Chapter 11	×	–
Bio-method mode ☞Chapter 12	○	When performing a repeated measurement, the sequential measurement of multiple cells is not available.

When you select [6 cell], [8 cell], [16 cell] or [CPS-240] in the Sample Module screen (Fig. 18.2), the Sample Compartment Control screen (Fig. 18.3) will be displayed.

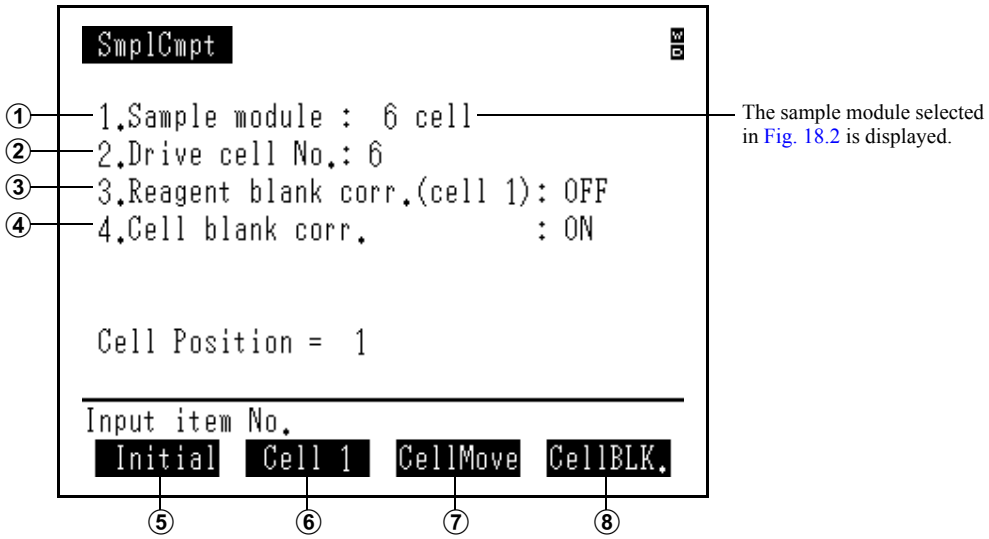
To use the 6-position Multi-cell holder and MMC-1600, it is necessary to initialize them (i.e., to detect the origin of the cell position) when they are installed on the UV-1800.
To perform the initialization, verify that the 6-position Multi-cell holder or MMC-1600 is mounted to the sample compartment, and press the F1 key.

NOTE

- The initialization of CPS-240 is executed independently when the designated controller power is turned ON.
- Before the initialization, check to be sure that the name of the cell holder mounted to the instrument is displayed in [1. Sample module] in Fig. 18.3.
- When the MMC-1600 is connected, be sure to perform the initialization with the micro multi-cells mounted to the cell holder.



(When the cell position is not initialized)



(When the cell position is initialized)

Fig. 18.3 Sample Compartment Control screen
(When 6-/8-/16-position Micro Multi-cell holder, or CPS-240 is selected)

No.	Key Operation	Display	Description
①	1	[Sample module]	Changes the sample module being used. ☞ "18.1 Sample Module Control (Multi-cell, Sipper Operation)"
②	2	[Drive cell No.]	Enters the number of cells being used.

No.	Key Operation	Display	Description
③	3	[Reagent blank corr. (cell 1)]	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].
④	4	[Cell blank corr.]	Sets 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 Blk] F4 appears. Note that the cell blank correction function is not available in the Spectrum mode.
⑤	F1	[Initial]	Detects the origin of the cell position. When CPS-240 is selected, [Initial] is not displayed. **NOTE** To detect the origin of the CPS-240 cell holder, turn ON the designated controller power.
⑥	F2	[Cell 1]	Moves cell 1 (the cell inserted into the front-most cell holder) into the measurement light path.
⑦	F3	[CellMove]	Moves to the next cell. If cell 6 is currently in the light path, the holder will move to cell 1 when you press this key.
⑧	F4	[CellBLK.]	Acquires and saves absorbance (transmittance) at each cell (cell position). The cell blank correction is performed using the saved data by this function (☞ 18.5 Blank Correction Function). When [4. Cell blank corr.] is set to [ON], be sure to perform the cell blank correction after placing the cells to be used.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen (Fig. 18.1).

18.3 Sipper 160

When you select [Sipper 160] in the Sample Module Selection screen (Fig. 18.2), the Sample Compartment Control screen (Sipper 160) (Fig. 17.4) will be displayed.

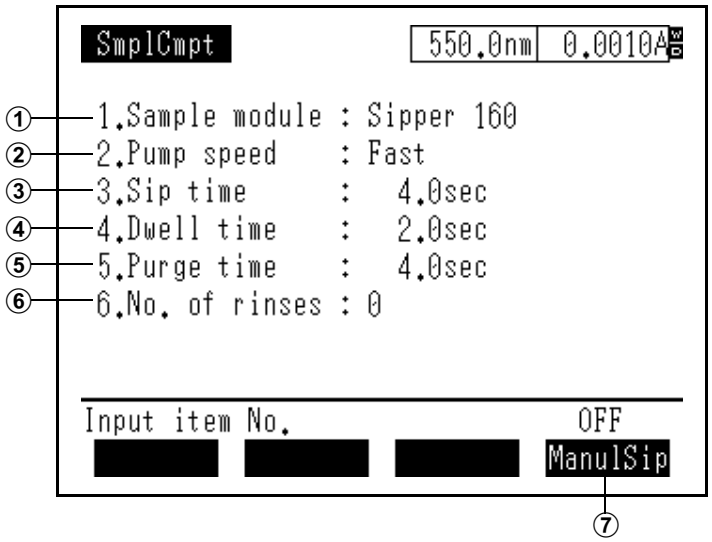
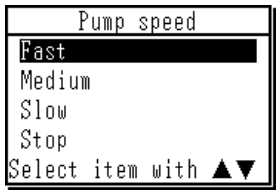


Fig. 18.4 Sample Compartment Control screen (Sipper 160)

No.	Key Operation	Display	Description
①	1	[Sample module]	Changes the sample module being used. ☞ "18.1 Sample Module Control (Multi-cell, Sipper Operation)"
②	2	[Pump speed]	Sets the pump rotation speed. If you select [Pump speed], the screen for selecting the pump rotation speed will appear. Move the cursor to the desired pump rotation speed with the ▲ ▼ keys, and confirm with the ENTER key.  Fig. 18.5 Pump Speed Selection screen Select the pump speed from Fast/Medium/Slow/Halt. Select [Halt] when using the electromagnetic valve.
③	3	[Sipping time]	Sets the time that the sample will be aspirated. The input range is 0.0 to 64.0 seconds.
④	4	[Dwell time]	Sets the time interval between aspiration of a sample and measurement. Input range is 0.0 to 64.0 seconds.

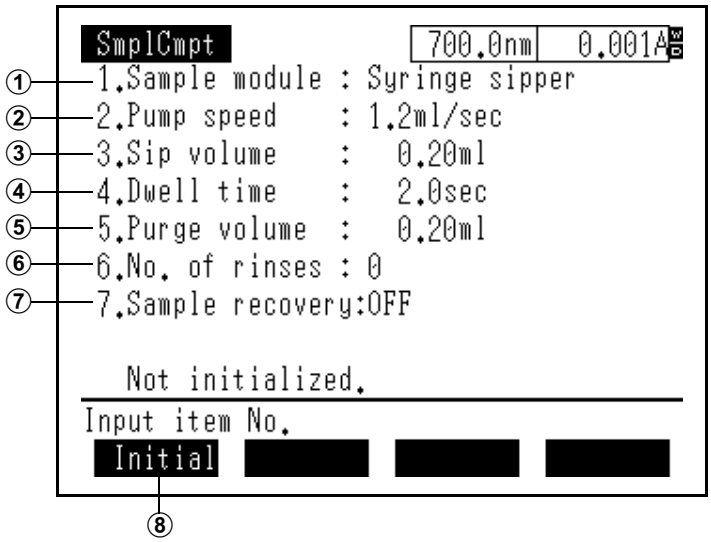
No.	Key Operation	Display	Description
⑤	5	[Purge time]	Sets the time after measurement is completed that the sample will be purged. The input range is from -64.0 to 64.0 seconds. When set to a negative value, the pump will reverse to purge the sample. To suction and retrieve the sample which has already been measured, enter a negative value.
⑥	6	[No. of rinses]	Sets the number of times that the inside of the flow cell will be rinsed before measurement. The sip-purge operation will be repeated up to the number of times set here. Measurement is not performed during this operation. Input range is from 0 to 4 times.
⑦	F4	[Manu. Sip]	This key switches the manual suction function ON/OFF. Each time you press this key, the function toggles between [ON] and [OFF]. Manual sipping draws the sample while the sipper lever is pressed, regardless of the sipping time setting, and no measurement is performed.
–	RETURN	–	Returns to the Measurement Parameter Configuration screen.

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

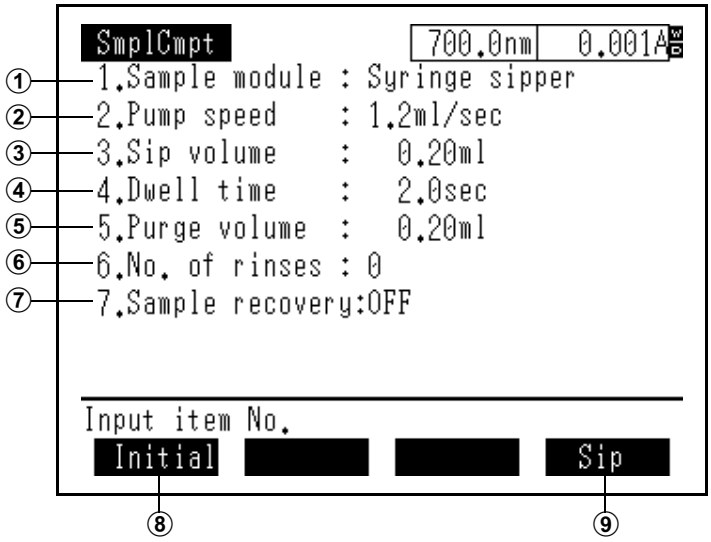
To connect the ASC-5 to the UV-1800, "USB ADAPTOR for ASC (P/N 206-25235-91)" is separately required.

18.4 Syringe Sipper

When you select [Syringe sipper] in the Sample Module screen (Fig. 18.2), the Sample Compartment Control screen (syringe sipper) (Fig. 18.6) will be displayed.



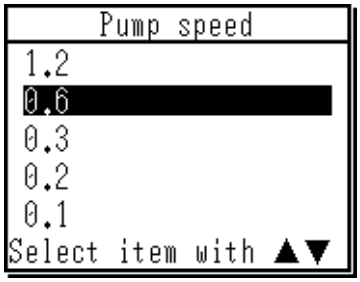
(Before Initialization)



(After Initialization)

Fig. 18.6 Sample Compartment Control screen (syringe sipper)

No.	Key Operation	Display	Description
①	1	[Sample module]	Changes the sample module being used. ☞ "18.1 Sample Module Control (Multi-cell, Sipper Operation)"

No.	Key Operation	Display	Description
②	2	[Pump speed]	Selects the pump operating speed from 5 steps: 1.2/ 0.6/0.3/0.2/0.1 ml/sec. If you select [Pump speed], the screen for selecting the pump operating speed will appear. Move the cursor to the desired pump operating speed with the ▲ ▼ keys, and confirm with the ENTER key.  Fig. 18.7 Pump Speed Selection screen
③	3	[Sip volume]	Sets the sample sipping volume in the unit of ml. Input range is from 0.00 to 10.00 ml.
④	4	[Dwell time]	Sets the time from sample sipping to measurement start in the unit of second. Input range is from 0.00 to 9.99 seconds.
⑤	5	[Purge volume]	Sets the sample purge volume after measurement in the unit of ml. Input range is from 0.00 to 10.00 ml.
⑥	6	[No. of rinses]	Sets the number of times that the inside of the flow cell will be rinsed before measurement. The sip and purge operation will be repeated up to the number of time set here. Measurement is not performed during this operation. Input range is from 0 to 4 times.
⑦	7	[Sample recovery]	Selects the direction in which the sample is purged after measurement, the drain nozzle side or the sipping nozzle side. The 7 key is used to toggle between [Return] (ON) and [Discharge] (OFF).
⑧	F1	[Initial]	Starts initializing the syringe pump. When the unit is connected after turning ON the power, the accessories must be initialized. If they have not been initialized, the set capacity of sample may not be sipped or drained.
⑨	F4	[Sip]	Suctions/discharges sample at the volume specified in [3. Sip. volume] in the Sample Compartment Control screen (Fig. 18.6).
–	RETURN	–	Returns to the Measurement Parameter Configuration screen.

18.5 Blank Correction Function

When connecting 6-position Micro Multi-cell, MMC-1600, or CPS-240, and using the blank correction function (reagent blank correction, cell blank correction), you can obtain already-corrected values as measurement results.

NOTE
The blank correction function is not available in the Spectrum mode.

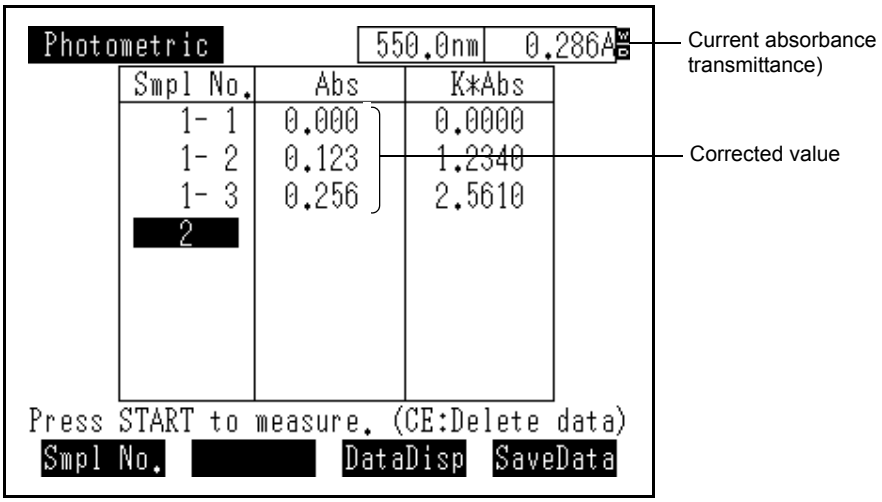


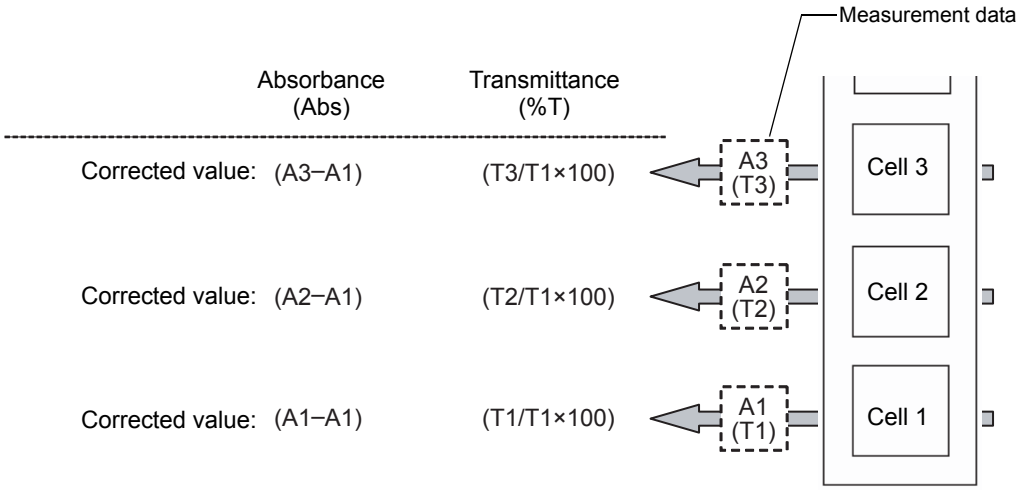
Fig. 18.8 Measurement with blank correction (E.g. Photometric (one-wavelength))

The following explains about each type of the blank corrections.

■ Reagent blank correction

Using the sample placed in cell position 1 as a blank, the cells in the other positions (2-16) are measured. In other words, after the samples in cell positions 2 through 16 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.

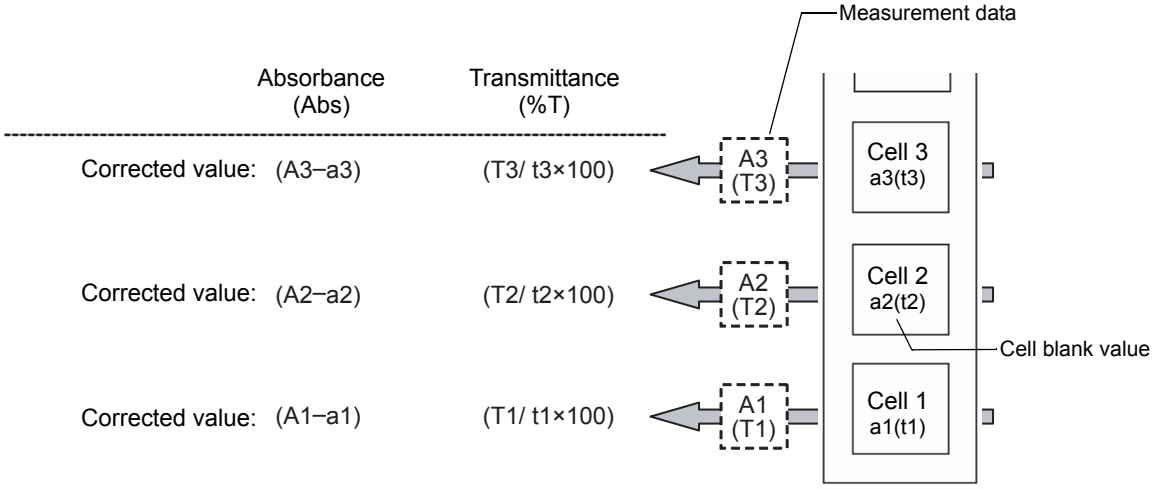


- For Abs: The measured value at Cell 1 (blank) is subtracted from the absorbance at each cell.
- For %T: The transmittance at each cell is divided by the measured value at Cell 1 (blank).

Fig. 18.9 Calculation for Reagent Blank Correction

■ 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 (cell blank 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.

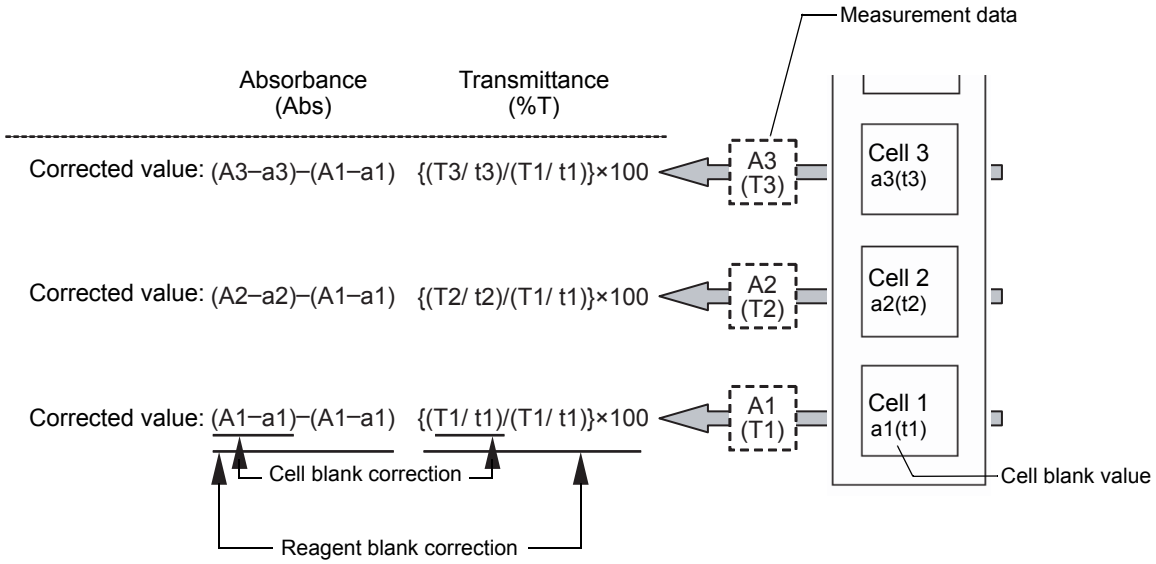


- For Abs: Each cell blank value (absorbance) is subtracted from the measured value at each cell.
- For %T: The measured value at each cell is divided by each cell blank value (transmittance).

Fig. 18.10 Calculation for Cell Blank Correction

■ Reagent blank correction + Cell blank correction

If both blank correction methods are enabled, the cell blank correction is executed for each cell, and the reagent blank correction is executed using the Cell 1 sample value on the measured values of the other cell positions.



- The cell blank correction and reagent blank correction are performed on each cell.

Fig. 18.11 Calculation for Reagent Blank Correction + Cell Reagent Blank Correction

Appendix A UVProbe Basic Operation

The UV-1800 can be controlled using the packaged UVProbe software.
This appendix describes the basic operation of the UVProbe software. For details on the functions and operation procedure of the UVProbe, refer to the UVProbe Tutorial or the UVProbe Help function.

CONTENTS

A

A-1 UVProbe Overview

A.1.1 Module Configuration

The UVProbe software consists of three measurement modules and one report generation module.

You can switch between these modules by selecting them from the [Window] menu.

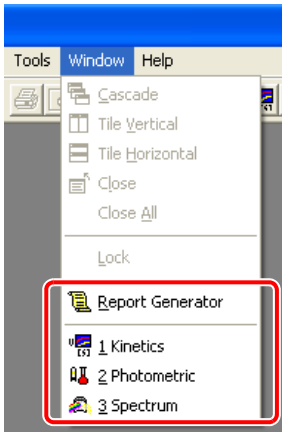
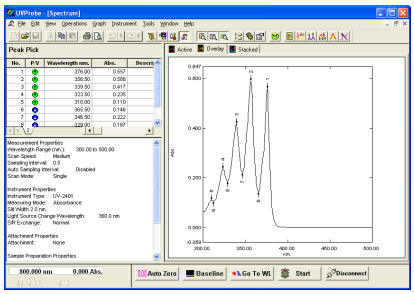


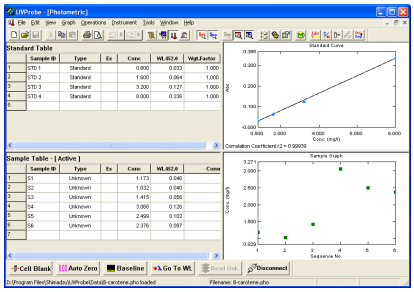
Fig. A-1



[Spectrum Module]

Scans within the specified wavelength range and records photometric value at each sampling pitch.

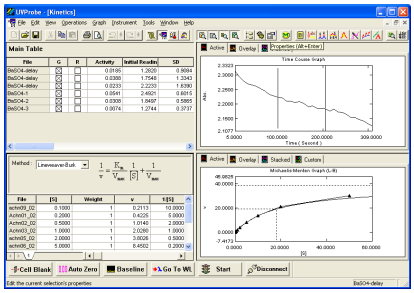
☞ "UVProbe Tutorial"
/"Chapter 2 The Spectrum Module, Lesson 1"



[Photometric Module]

Measures photometric values at single or multiple wavelengths (Photometric measurement). This module is also equipped with a quantitation function using various calibration methods (i.e., Multi-point calibration method, one point calibration method, and K-factor method).

☞ "UVProbe Tutorial"
/"Chapter 3 The Photometric Module, Lesson 2"

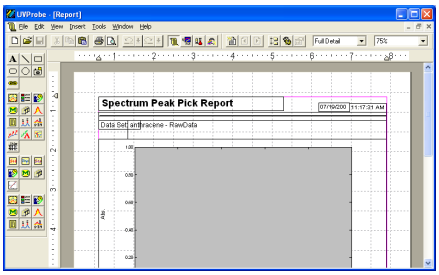


[Kinetics Module]

Measures time course change of photometric values at fixed wavelength (Time course measurement). The activity value can also be calculated in this module.

☞ "UVProbe Tutorial"
/"Chapter 4 The Kinetics Module, Lesson 3"

A

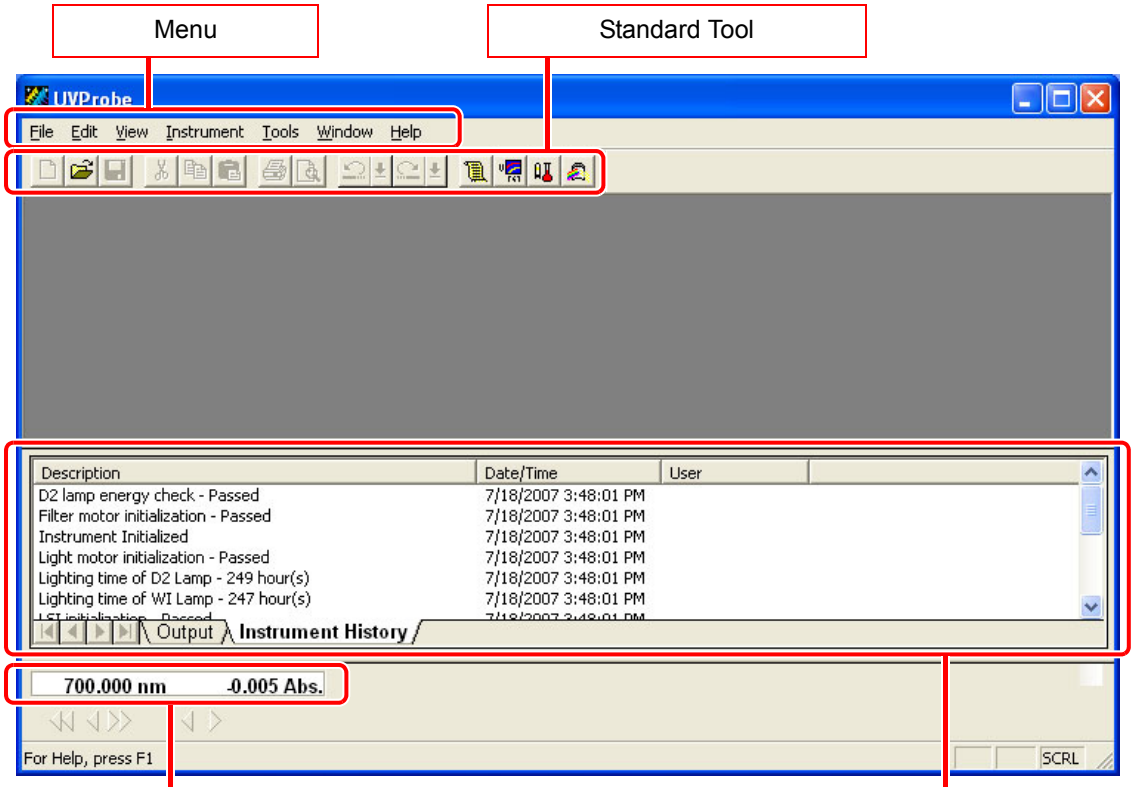


[Report Generator]

Allows you to freely create layouts of various objects such as measurement data and graphs on reports. You can register the created layout as a separate user template and use it as a printout.

☞ "UVProbe Tutorial"
/"Chapter 5 The Report Generator, Lesson 4"

A.1.2 Common Screen Frame



Instrument Status Window
Displays the current wavelength and photometric value in real time. Also displays a calculated value of a simple operation using measured photometric values.

Output Window
- "Output" displays various messages from the system (e.g. during print process).
- "Instrument history" displays the content and time of executed instrument initialization, time of baseline correction, etc.

Fig. A-2

A.1.3 Data File Structure

The data files created in the spectrum module and kinetics module are hierarchically structured (such as "File" - "Storage" - "Data set"), allowing you to manage multiple data by only using a single file.

For example, if you perform derivative processing on spectrum data acquired from measurement, both the measured data (raw data) and its converted data are stored in the same file, allowing easy data management.

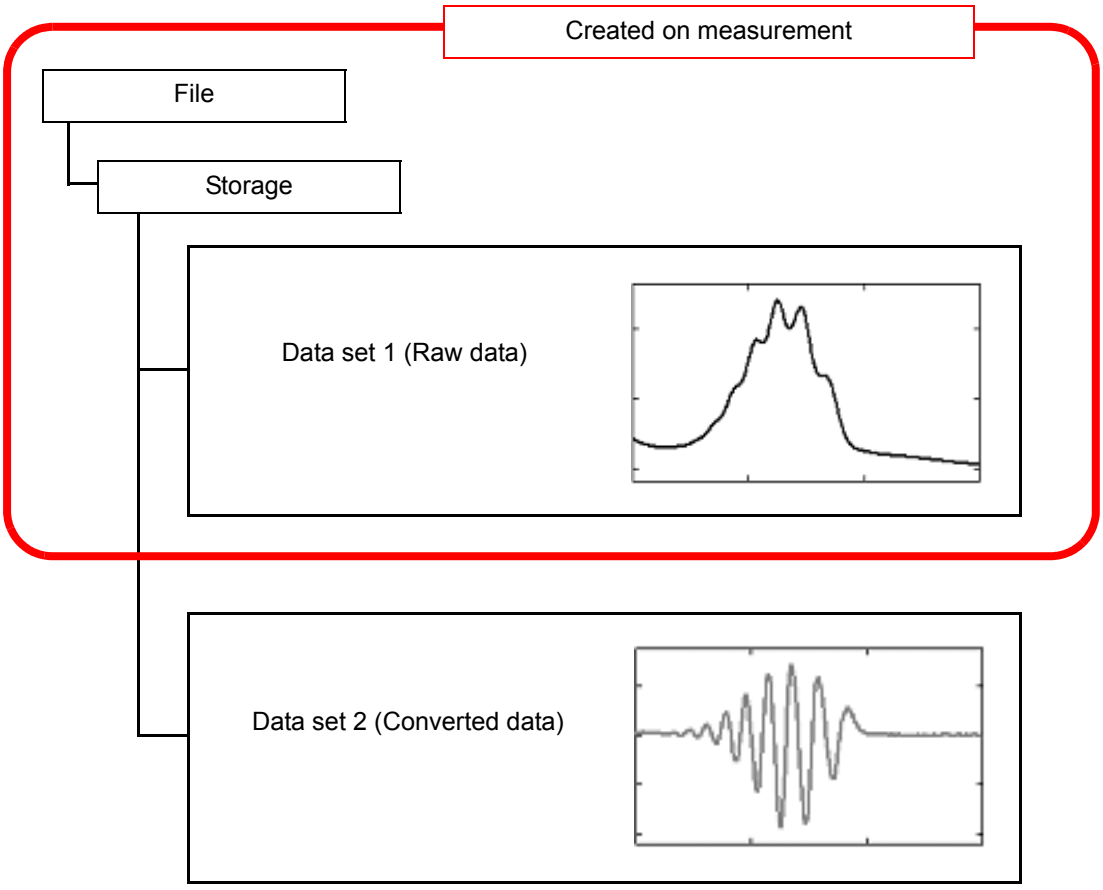


Fig. A-3

NOTE

For example, the following naming convention may be useful for easy measurement data management.

- Use "sample name" for the file name (e.g. Glass_plate).
- Use "date and time" for the storage name (e.g. 20020830).
- Use "data status" for the data set name. ("RawData" is set as default name.)

A.1.4 Help Functions

The UVProbe software is equipped with various help functions enabling you to understand its features and operation procedures as you use the software.

■ Pop-up Helps

The pop-up helps display explanations of screen elements such as buttons.

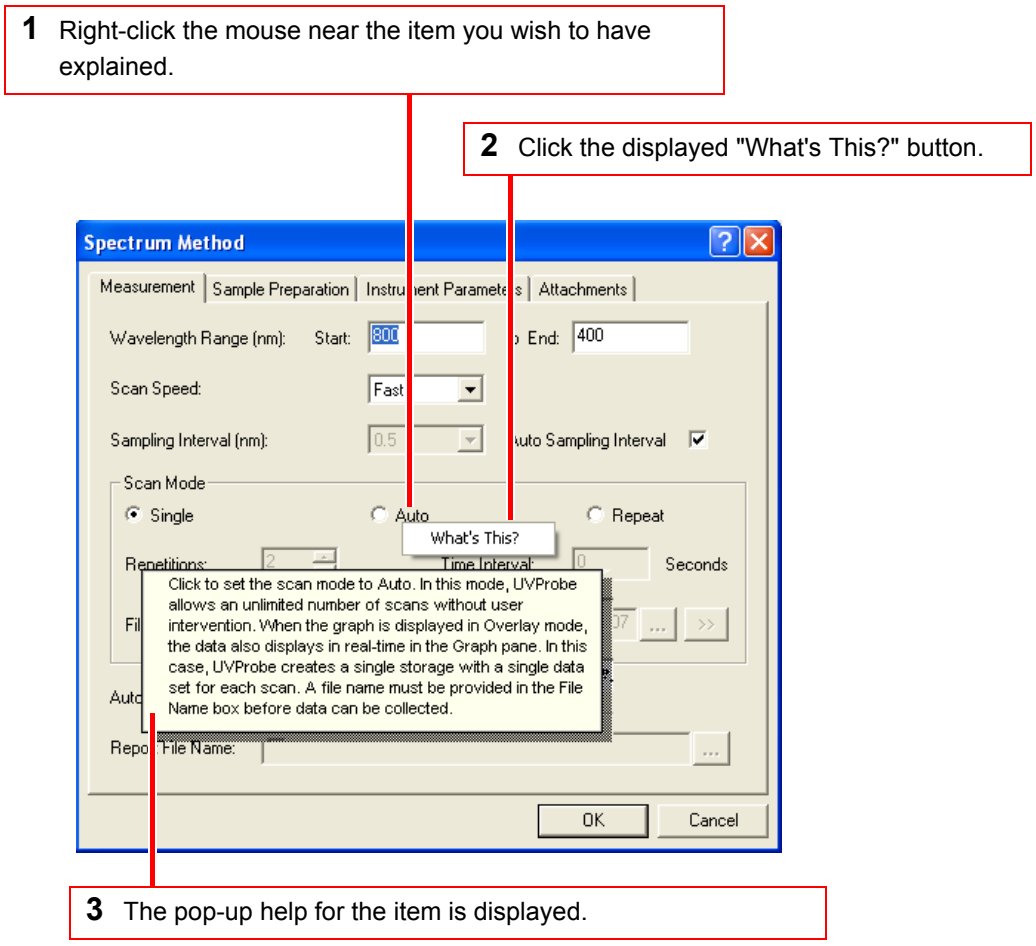


Fig. A-4

■ Help Topics

Select "Help Topics" from the [Help] menu to display the [UVProbe Help] window.

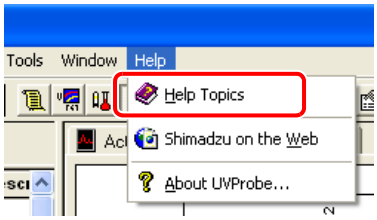


Fig. A-5

-Contents-

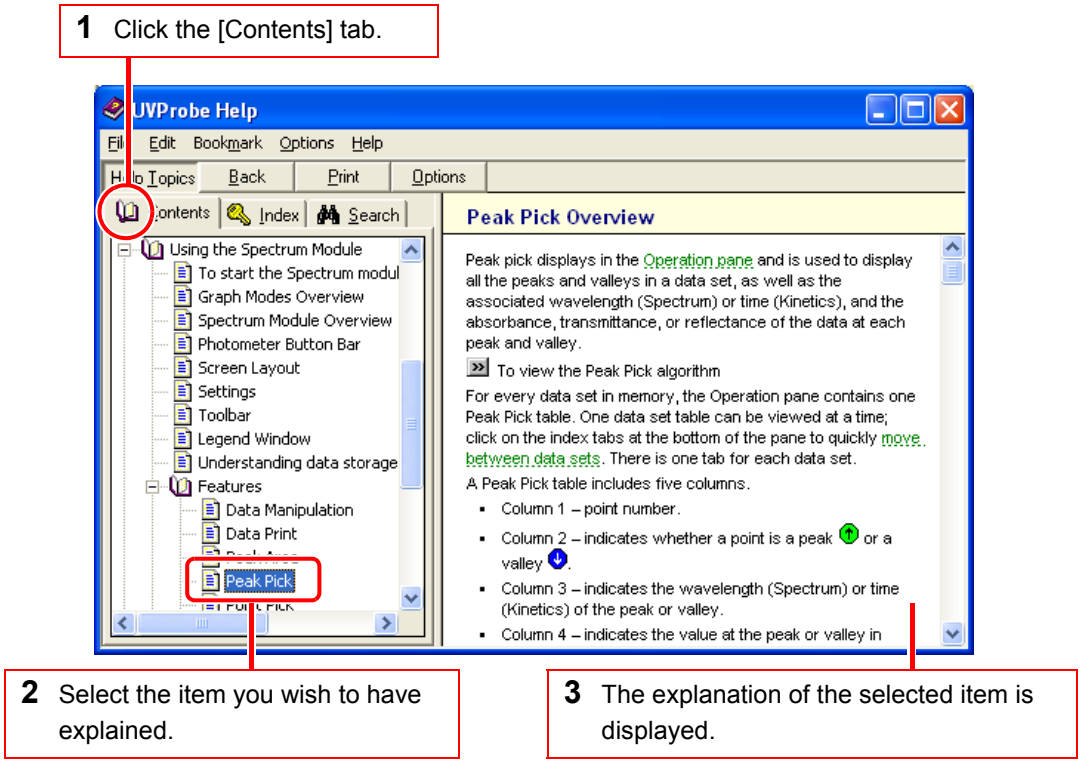
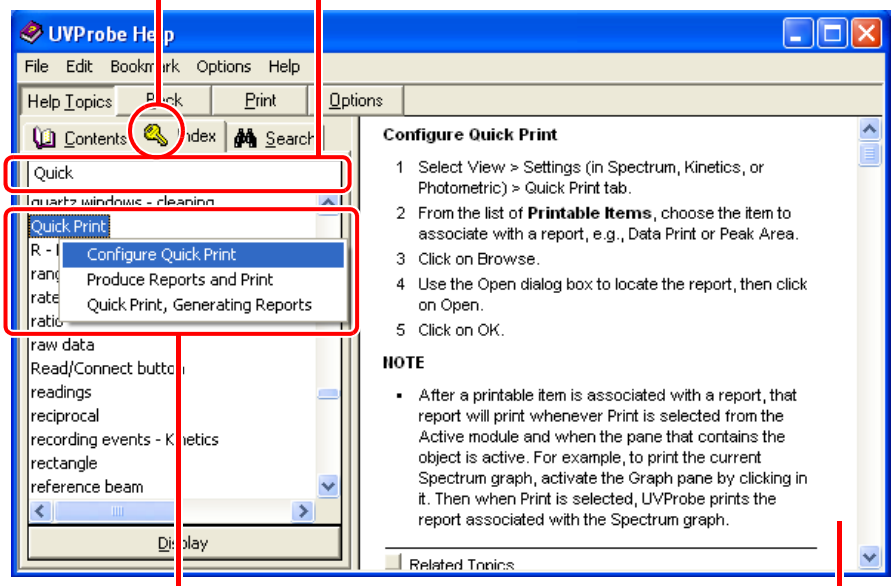


Fig. A-6

-Keyword-

1 Click the [Index] tab.

2 Enter the keyword related to the item you wish to have explained.



3 The item including the entered keyword is highlighted.

4 Select the item you wish to have explained.

5 The explanation of the selected item is displayed.

Fig. A-7

-Search-

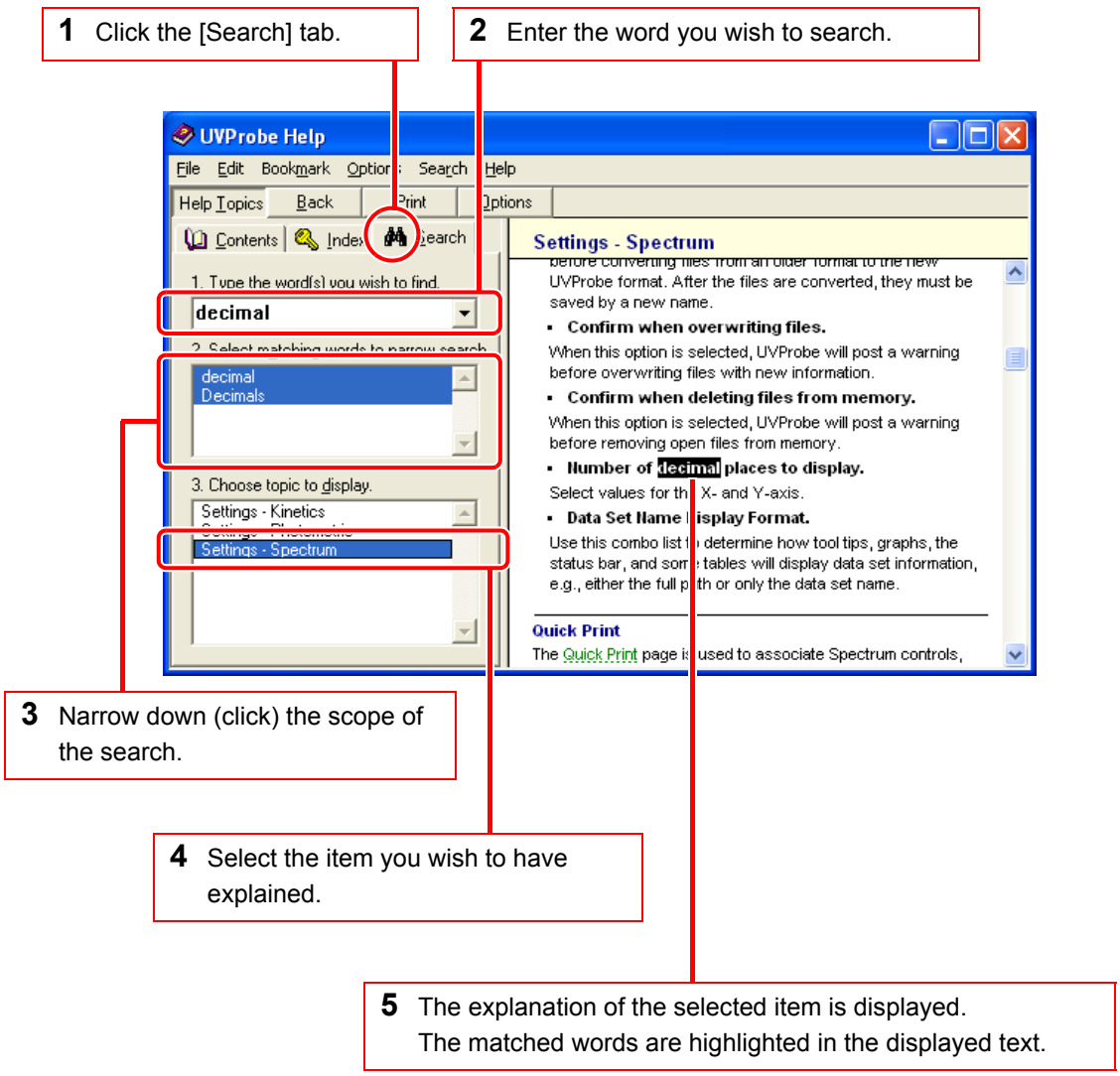


Fig. A-8

A.2.1 UVProbe Startup/Shutdown

■ Starting UVProbe

1 Click the UVProbe icon  on the PC desktop.

2 If the software has been installed in security mode* or GLP mode*, the User Login screen appears.

Enter the user ID and password registered to the UVProbe, and click the [OK] button.

* For details on application modes, refer to the UVProbe Tutorial "Chapter 1 Introduction".

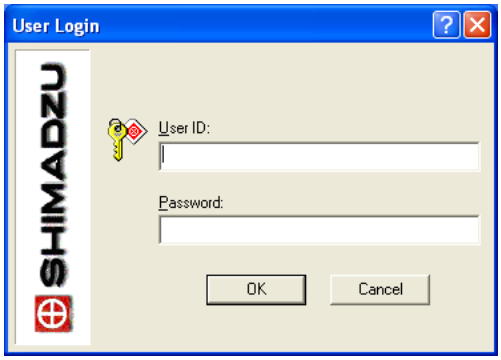


Fig. A-9

NOTE

The setting for the UV-1800 security function is not linked to that for the UVProbe software security mode. Be sure to complete the user registration and passsword setting separately on the UVProbe software.

☞ "1.8 System Administration" in "Chapter 1 Introduction" of "UVProbe Tutorial"

3 The UVProbe software is started up.
For the procedure for establishing the connection with the UV-1800, refer to "17.2.2 UVProbe Startup and Communication Establishment".

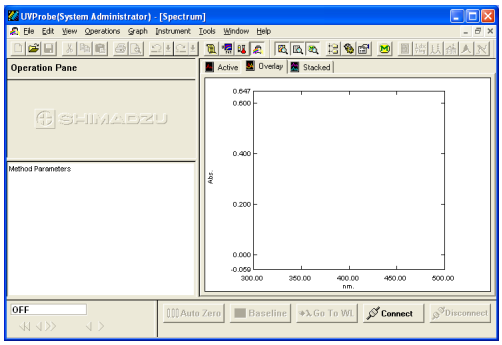


Fig. A-10

■ Shutting Down UVProbe

1 Click the [Disconnect] button to end the communication with the UV-1800.

2 Click the "X" button on the upper right of the UVProbe window to close it.

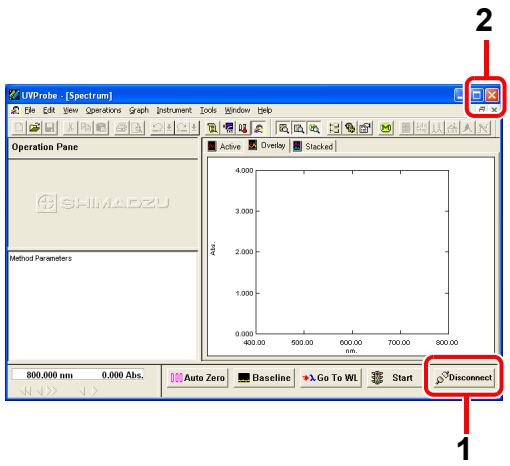


Fig. A-11

A.2.2 Open/Close Data Files

■ Opening Data Files

1 Select [Open] from the [File] menu.

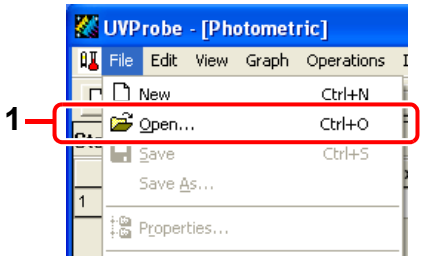


Fig. A-12

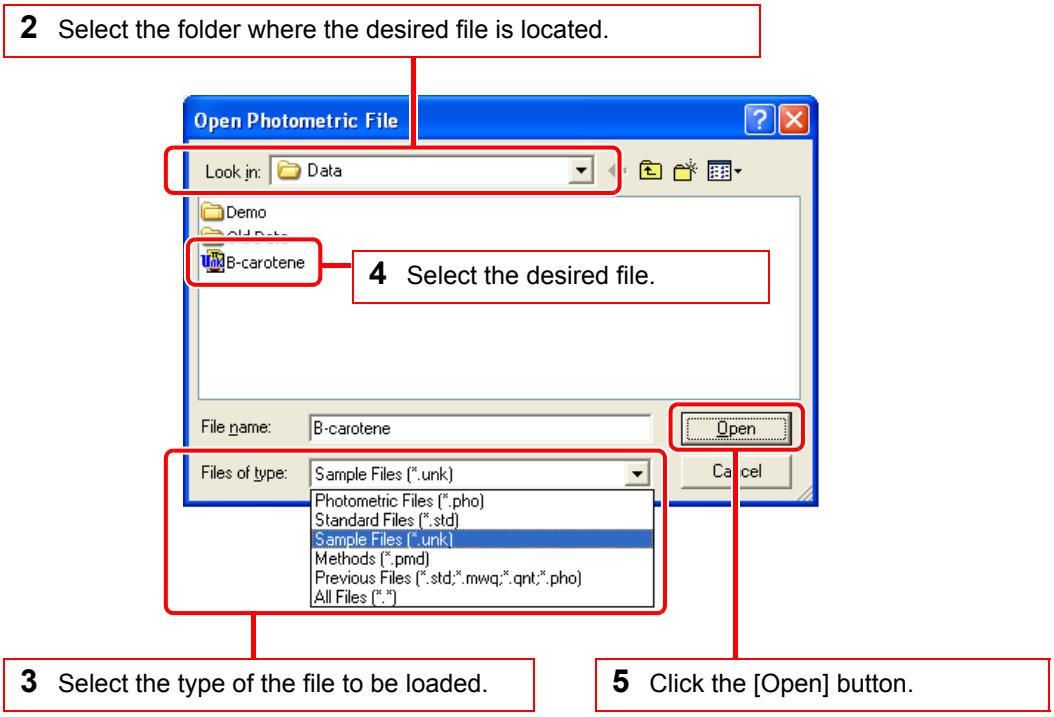


Fig. A-13

■ Closing Data Files

FOR SPECTRUM/KINETICS MODULE

1 Select [Properties] from the [File] menu.

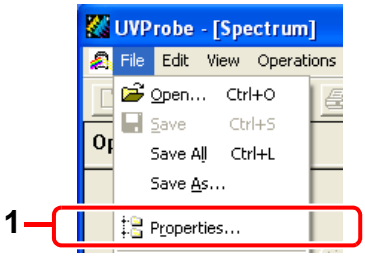


Fig. A-14

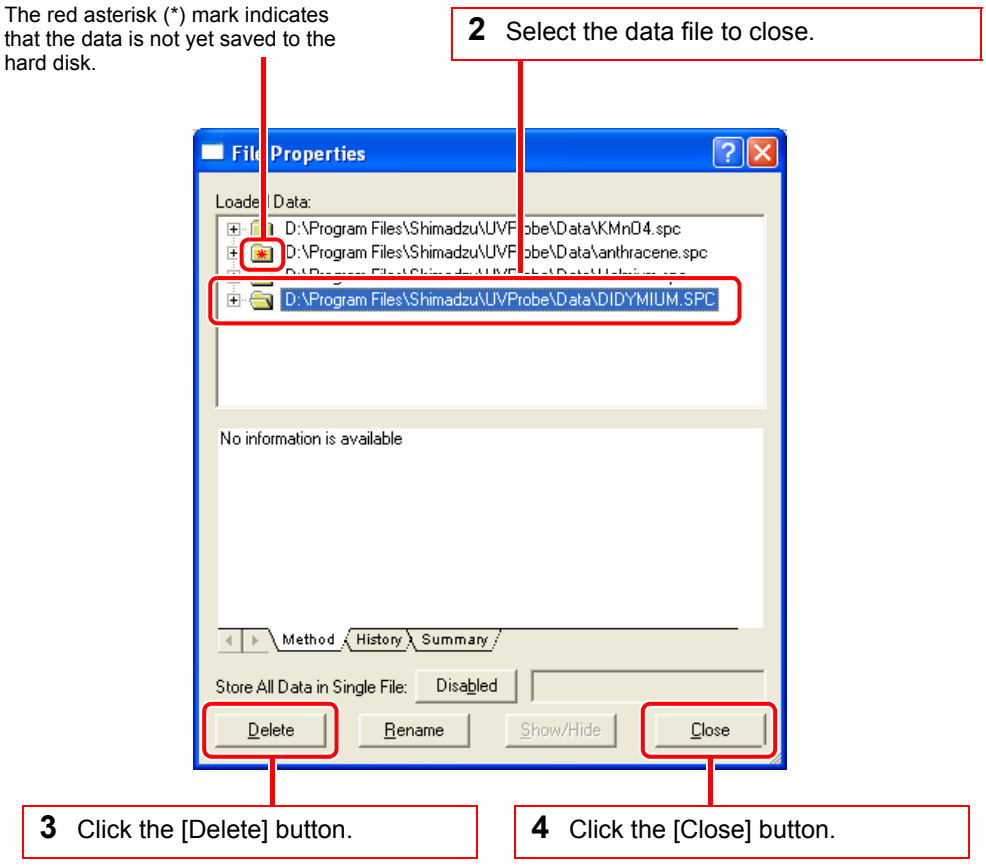


Fig. A-15

FOR PHOTOMETRIC MODULE
The photometric module does not have a function to close data files.
Therefore, simply open another data file or create a new data file to discard data existing in PC memory.

1 Select [New] on the [File] menu.

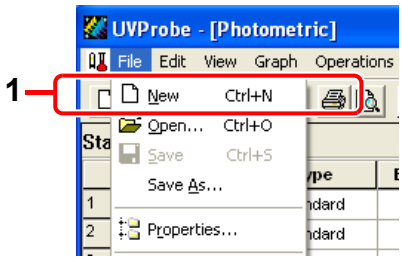


Fig. A-16

A.2.3 Change Graph Scales

In the UVProbe software, you can change graph axis scales directly on the graph.

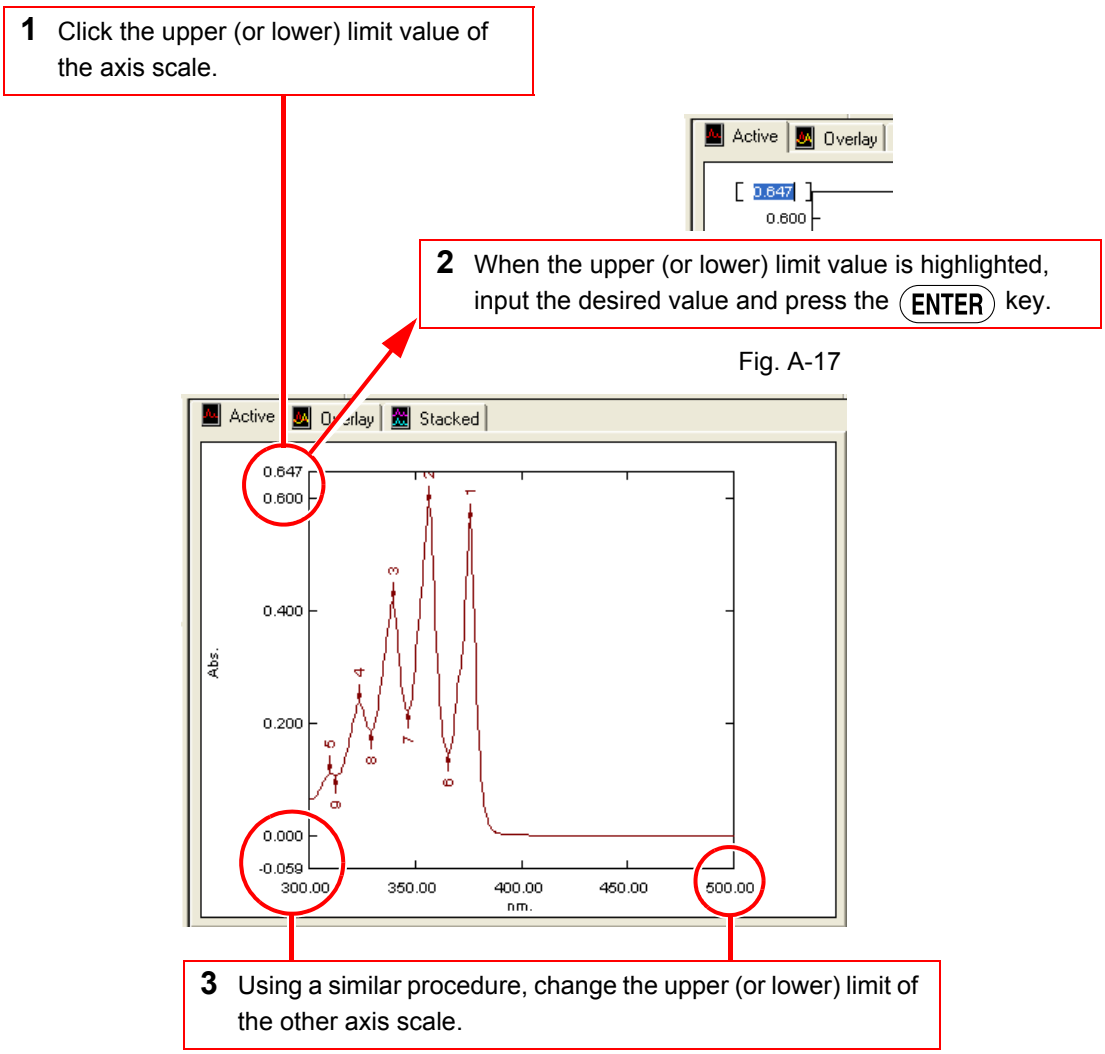


Fig. A-17

Fig. A-18

A.2.4 Change Graph Display Settings

From [Customize] on the graph shortcut menu, you can control the width and colors of graph lines as well as the format and size of label fonts.

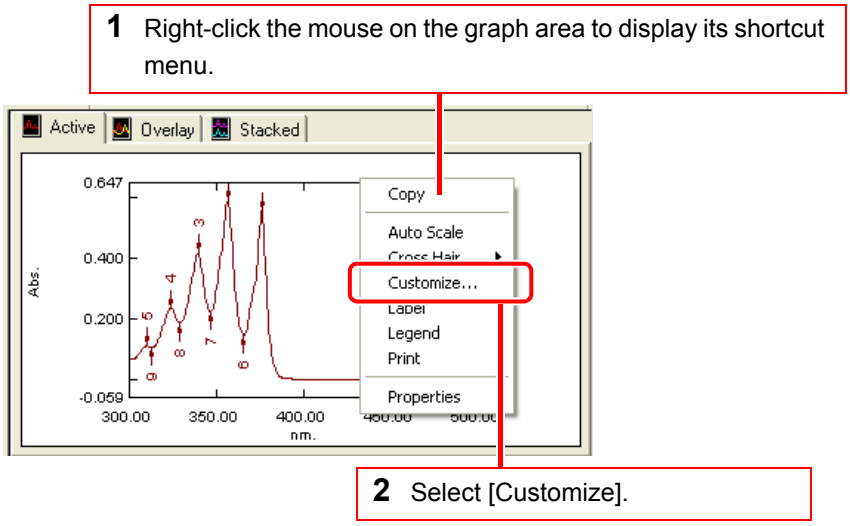


Fig. A-19

■ Changing Graph Line Colors

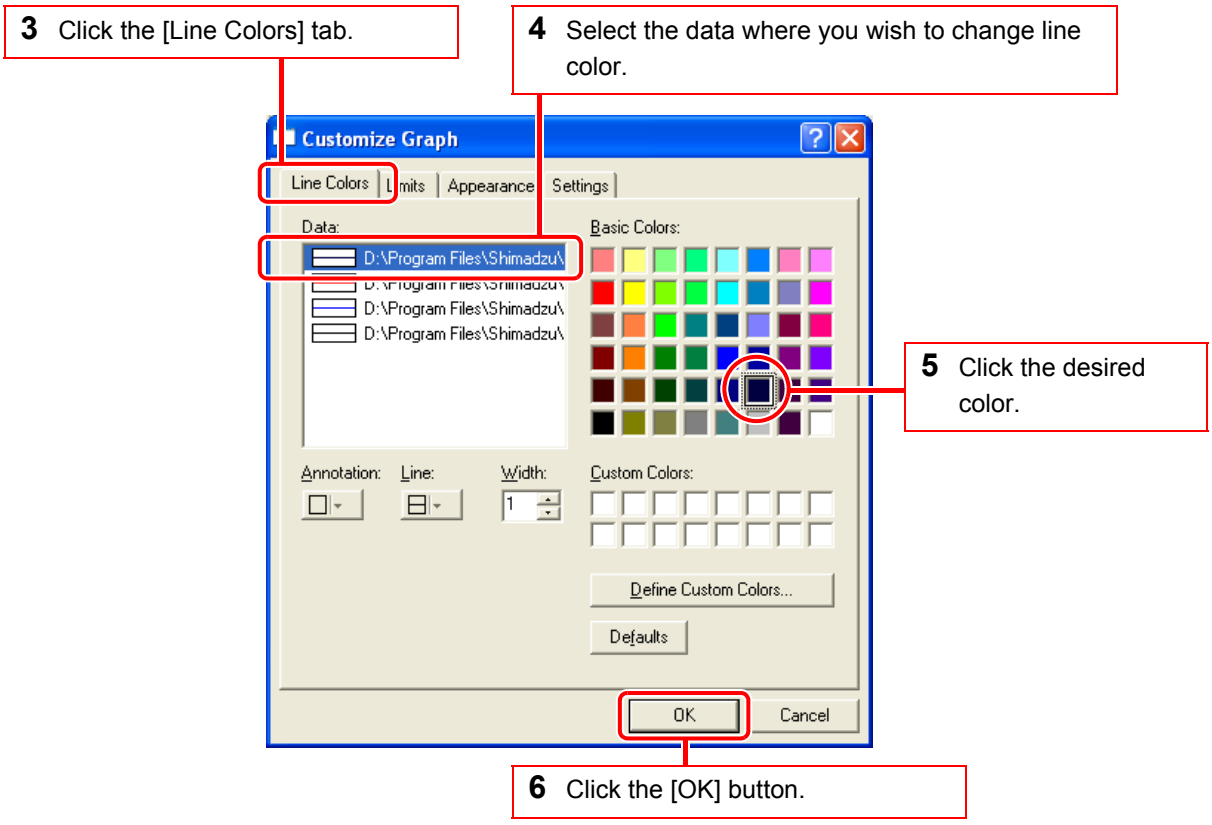
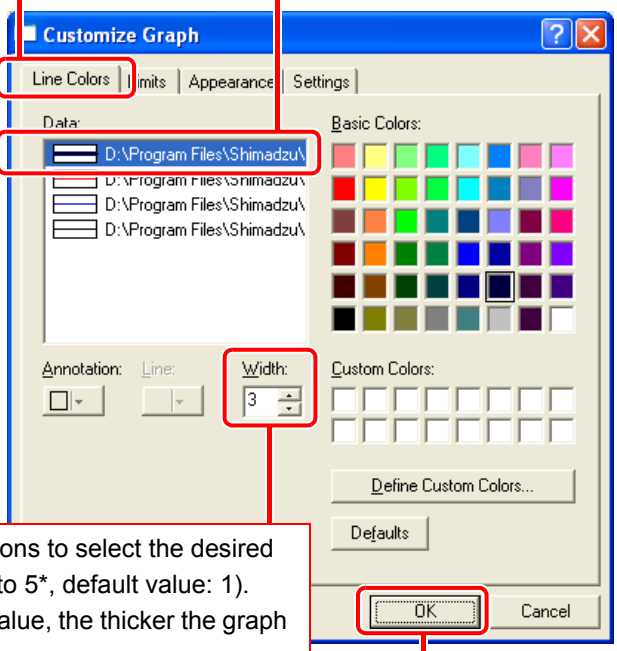


Fig. A-20

■ Changing Graph Line Width

3 Click the [Line Colors] tab.

4 Select the data where you wish to change line width.



5 Click the ▲▼ buttons to select the desired line width (from 1 to 5*, default value: 1).
*The greater the value, the thicker the graph line.

6 Click the [OK] button.

Fig. A-21

■ Changing Axis Label Font

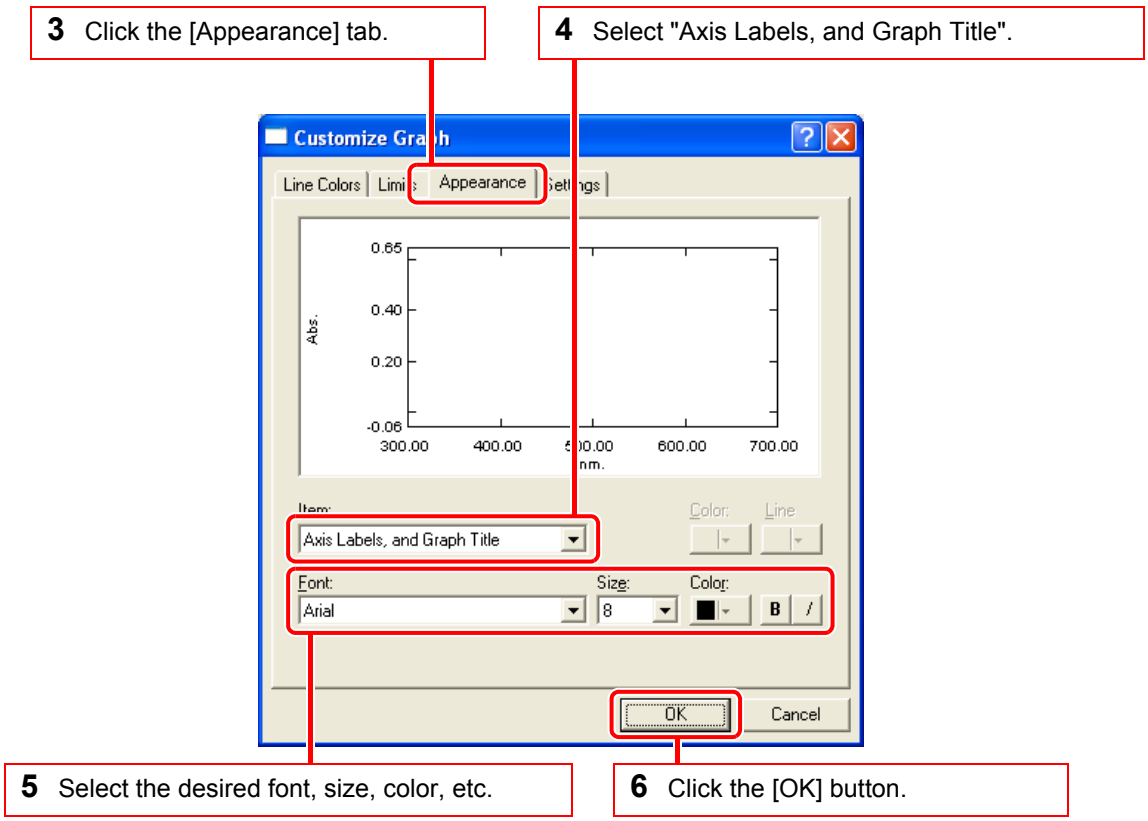


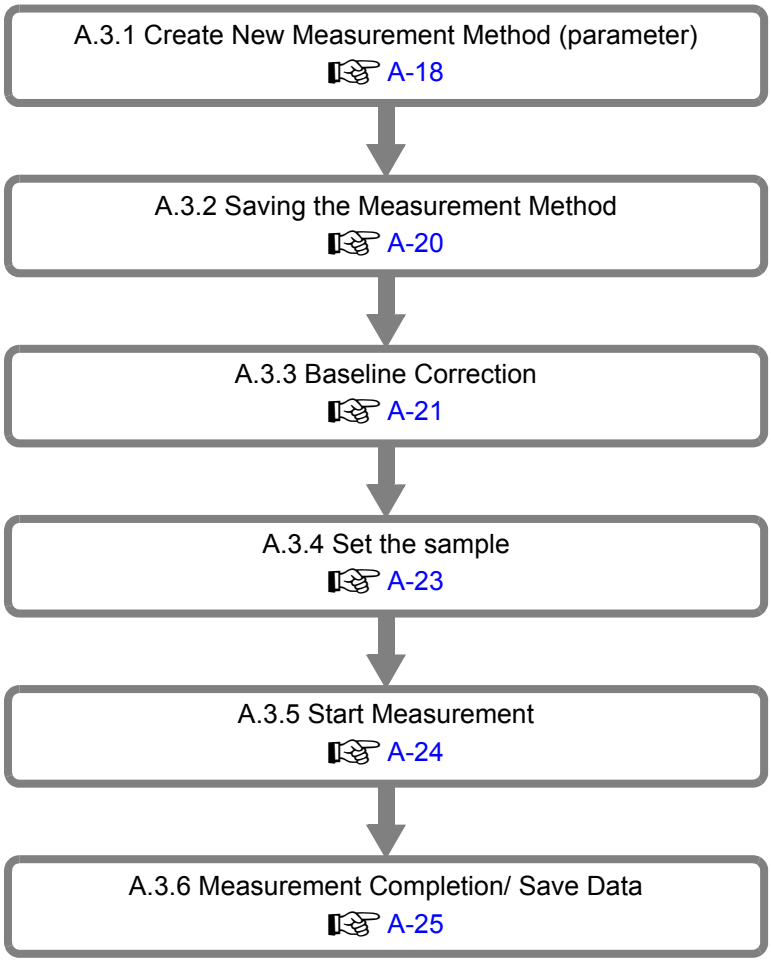
Fig. A-22

A-3 Measurement Procedure

This chapter briefly describes the UVProbe measurement flow and operation procedure using the spectrum module as an example.
For the operation procedure involving other measurement modules, refer to the UVProbe Tutorial (instruction manual).

Spectrum Module ☞ "Chapter 2 The Spectrum Module, Lesson 1"
Photometric Module ☞ "Chapter 3 The Photometric Module, Lesson 2"
Kinetics Module ☞ "Chapter 4 The Kinetics Module, Lesson 3"

When measuring samples in the spectrum module, the measurement flow roughly consists of the following steps:



A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

Click [Method] from the [Edit] menu to display the [Spectrum Method] window.

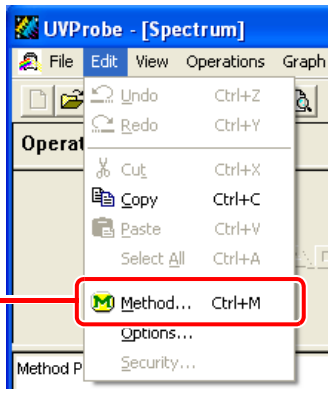


Fig. A-23

■ [Measurement] Tab Parameters

1 Select the [Measurement] tab.

2 Enter the [Wavelength Range (nm)].

3 Use the [▼] key to select [Scan Speed].

4 Select [Single].

5 Select the checkbox [Auto Sampling Interval].

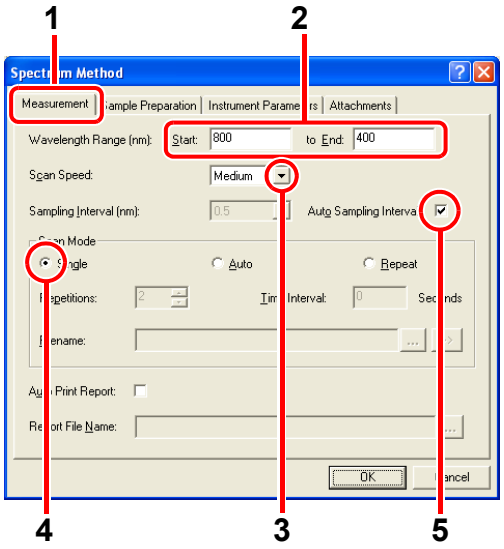


Fig. A-24

■ [Instrument Parameter] Tab.

1 Select the [Instrument Parameters] tab.

2 Use the [▼] key to select [Measuring Mode].

3 Press [OK].

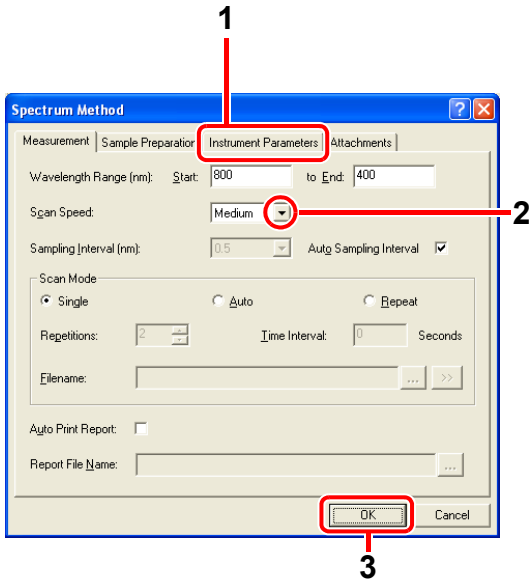


Fig. A-25

A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

Click [Save as] from the [File] menu to display the [Save Spectrum File] window.

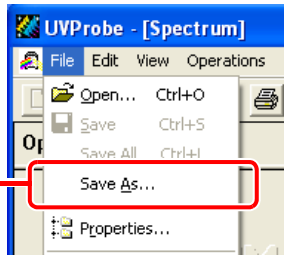


Fig. A-26

Save the parameters of the current measurement method.

The [Save Spectrum File] dialog box is displayed.

1 Enter the file name.

2 Press [▼] and select [Method File (*.smd)] for the file type.

3 Press [Save].

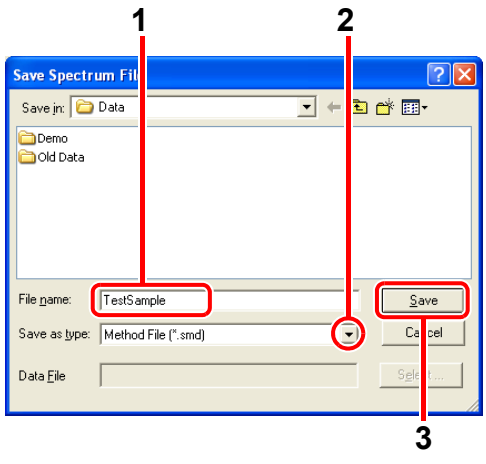


Fig. A-27

A

A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

NOTE

- Perform baseline correction if the instrument is turned ON after long periods of disuse, and if measurement conditions have been changed.
- When baseline correction is selected, the default correction range indicated will vary depending on the measurement module that is being used. For the spectrum module, the wavelength range specified by the measurement method is indicated as the default correction range. Refer to the "UVProbe Tutorial" and the on-line help menu for details.

The system corrects the baseline so that the current 0 (zero) Abs line (100 % transmittance/ reflectance line) is leveled in the specified wavelength range.

1 Verify that no sample is placed in the sample compartment.

2 Click [Baseline] on the [Instrument Control Button] bar to display [Baseline Parameter] window.

3 Verify that the displayed correction range is the same as the wavelength range specified in the "measurement method", and click the [OK] button.

4 The baseline correction initiates.
DO NOT open the sample compartment cover before the baseline correction process is completed.

The instrument status is displayed in the instrument status window.

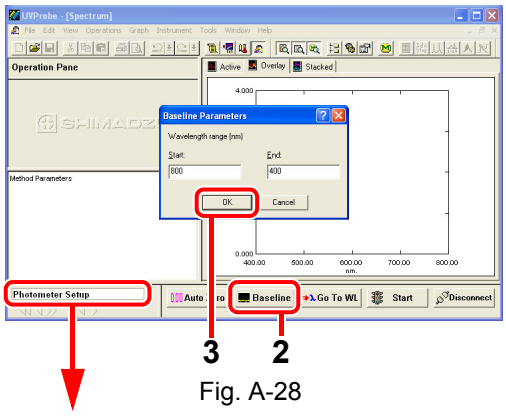


Fig. A-28

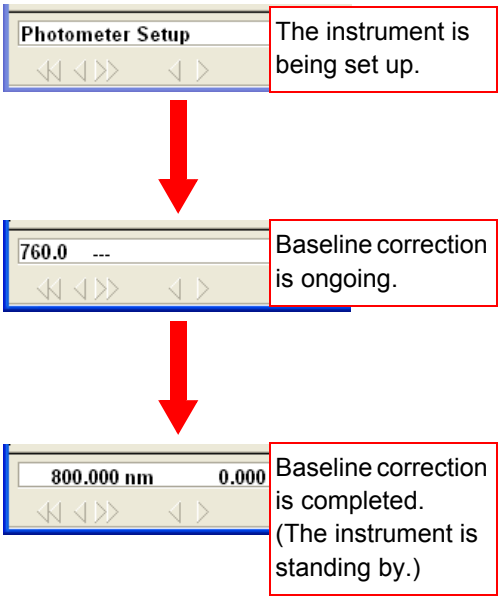


Fig. A-29

A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

1 Open the sample compartment cover and insert the cell with sample into the cell holder on the sample side.

2 Then close the sample compartment cover.

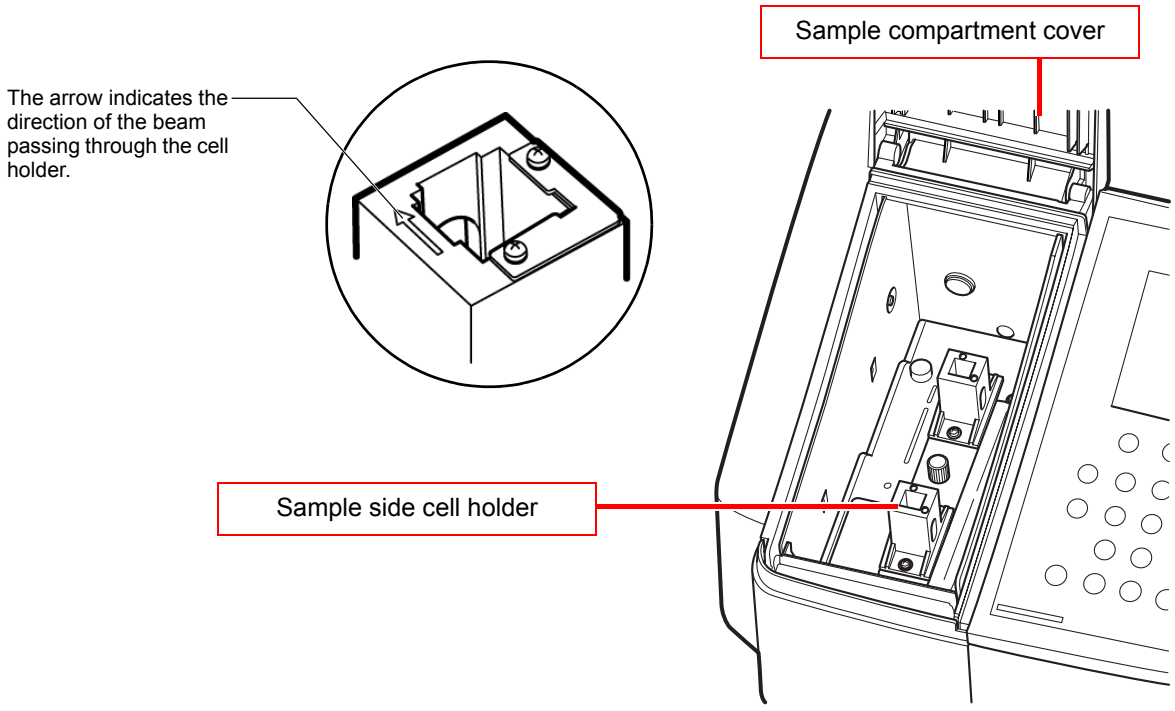


Fig. A-30

A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

Click [Start] on the [Instrument Control Button] bar.

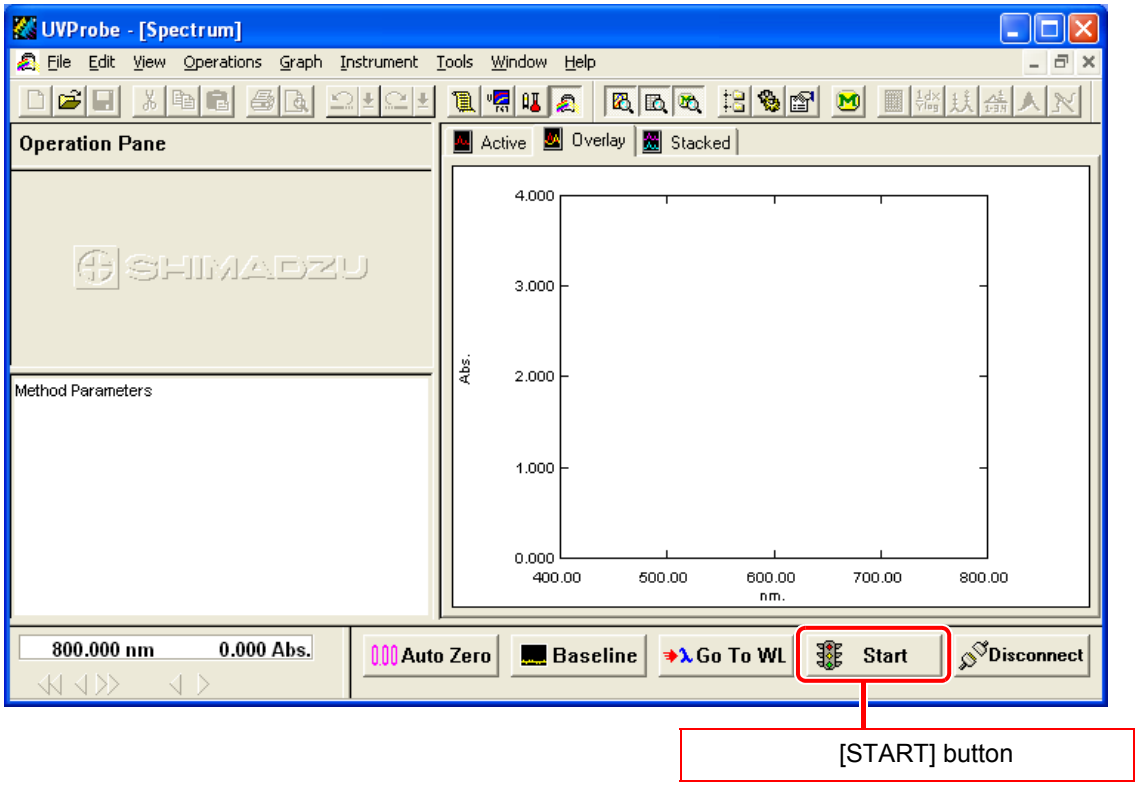


Fig. A-31

A.3.1 Create New Measurement Method (parameter)

A.3.2 Saving the Measurement Method

A.3.3 Baseline Correction

A.3.4 Set the sample

A.3.5 Start Measurement

A.3.6 Measurement Completion/ Save Data

After measurement is completed, the [New Data Set] window (Fig. A-32) is displayed. Enter filename, data storage name (☞ "A.1.3 Data File Structure"), analyst name, and any comments as necessary. Then click the [OK] button.

The procedure for entering file names is given in the following:

1 Click the [Browse] button to display the [New Filename] window (Fig. A-33).

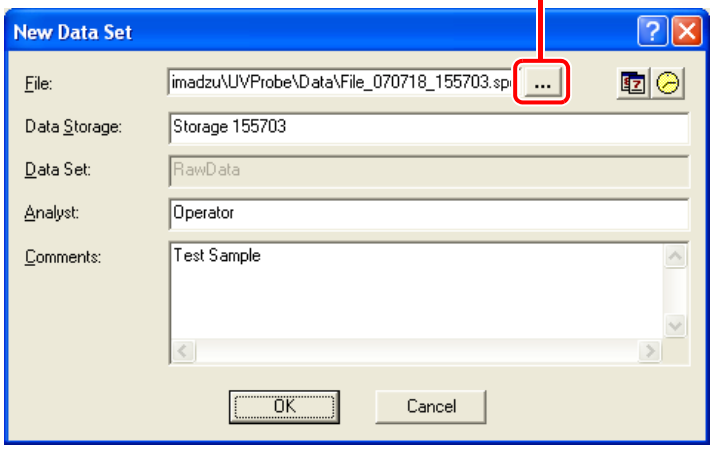
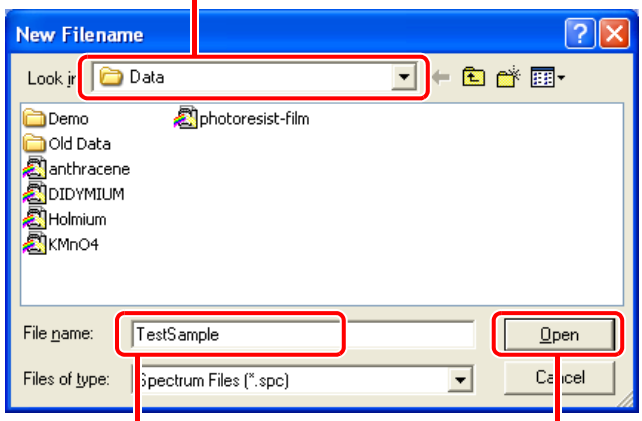


Fig. A-32

2 Select the destination folder to save the data file.



3 Enter the file name.

4 Click the [Open] button to close the [New Filename] window.
In the [File name] column of the [New Data Set] window, the path of the folder specified in (2) and the file name entered in (3) are displayed.

Fig. A-33

NOTE
Raw data saved by [New Data Set] is stored only in the memory and is lost upon exiting UVProbe. Save this data to a disk by selecting [File] - [Save As], or [File] - [Save] to store the data on the memory.

Click [Save] from the [File] menu.
To change the file name, select [Save As] from the [File] menu.

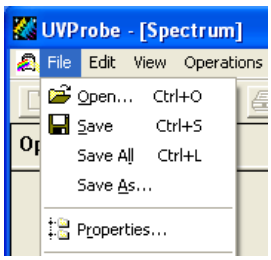


Fig. A-34

A-4 Peak Pick

The peak pick function automatically detects peaks and valleys on spectrum data and time course data (time course change of photometric values), and displays the wavelength (time) and photometric values as tabulated data (Peak Pick Table).
The peak pick operation is executed automatically when data is created after measurement, and the obtained results are saved with the measured data.

Clicking [Peak Pick] on the [Operations] displays the peak pick table.

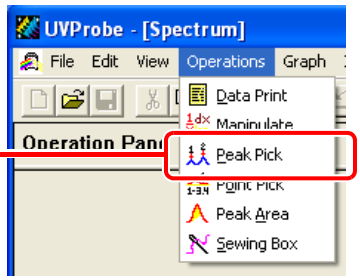
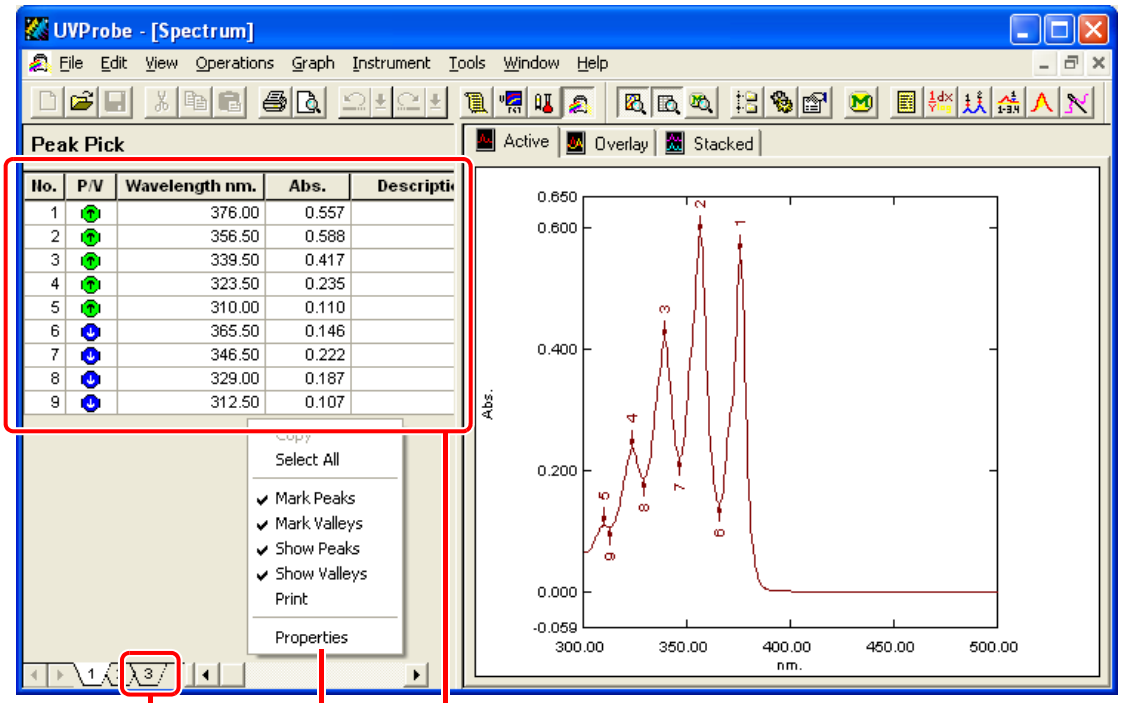


Fig. A-35



"File" Tab
Click the tab to switch between multiple data.

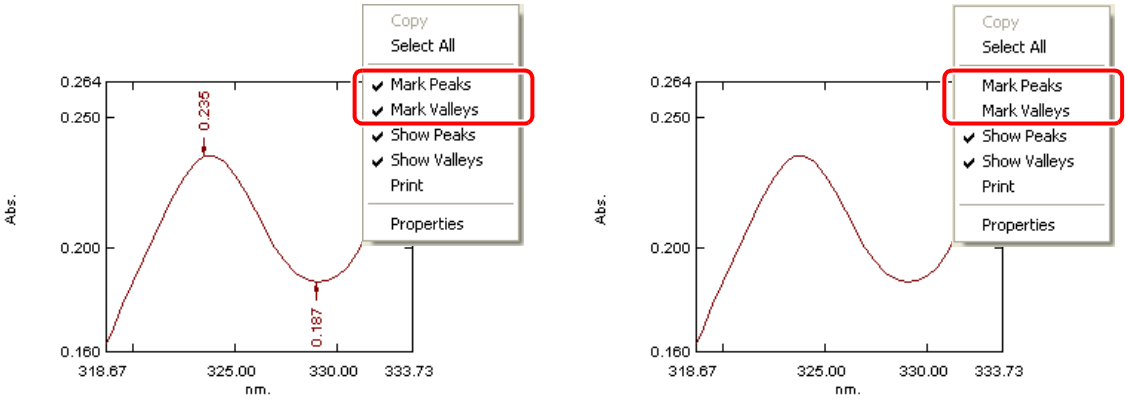
Peak Pick Table
No: Point number that is picked.
P/V: Indicates whether the data is a peak (▲) or valley (▼).
Wavelength (nm):
Wavelength that corresponds to the peak or valley.
Abs: Absorbance, transmittance, reflectance, or energy that corresponds to the peak or valley.
Description:
Enter notes and comments about the data directly into the cell.

Shortcut Menu (Peak Pick Table)
If you right-click the mouse on the pane where the peak pick table is displayed, the shortcut menu appears.

Fig. A-36

A.4.1 Show/Hide Peak (Valley) Marks on Graph

Each click [Mark Peaks] (Mark Valleys) on the shortcut menu toggles between showing and hiding labels and marks on the graph.

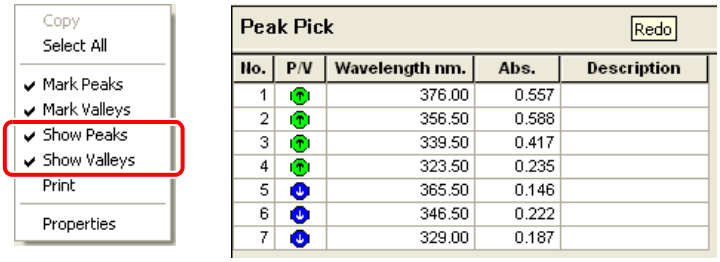


(Showing peak and valley marks) (Hiding peak and valley marks)

Fig. A-37

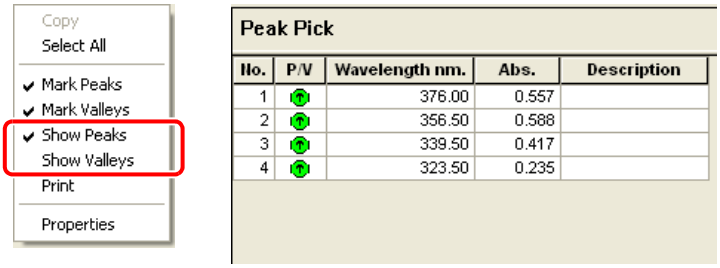
A.4.2 Show/Hide Peaks (Valleys) on Peak Pick Table

Each click [Show Peaks] (Show Valleys) on the shortcut menu toggles between showing and hiding peak (valley) data on the peak pick table.



No.	P/V	Wavelength nm.	Abs.	Description
1	↑	376.00	0.557	
2	↑	356.50	0.588	
3	↑	339.50	0.417	
4	↑	323.50	0.235	
5	↓	365.50	0.146	
6	↓	346.50	0.222	
7	↓	329.00	0.187	

(Showing peak and valley data)



No.	P/V	Wavelength nm.	Abs.	Description
1	↑	376.00	0.557	
2	↑	356.50	0.588	
3	↑	339.50	0.417	
4	↑	323.50	0.235	

(Hiding valley data)

Fig. A-38

A.4.3 Specify Peak Pick Threshold (Changing Parameters)

By changing the peak pick parameters (Threshold, Points), you can control graph-displayed data so that unnecessary peaks and noises will not be detected.

Threshold: Refers to the distance from a peak point to the line connected between two valley points (or assumed valley points) neighboring the peak.

Points: When photometric values continuously increase and decrease at a number of data points more than that specified by [Points], the maximum value within the range is detected as a peak.
If photometric values continuously decrease and increase at a number of data points more than that specified, the minimum value within the range is detected as a valley.

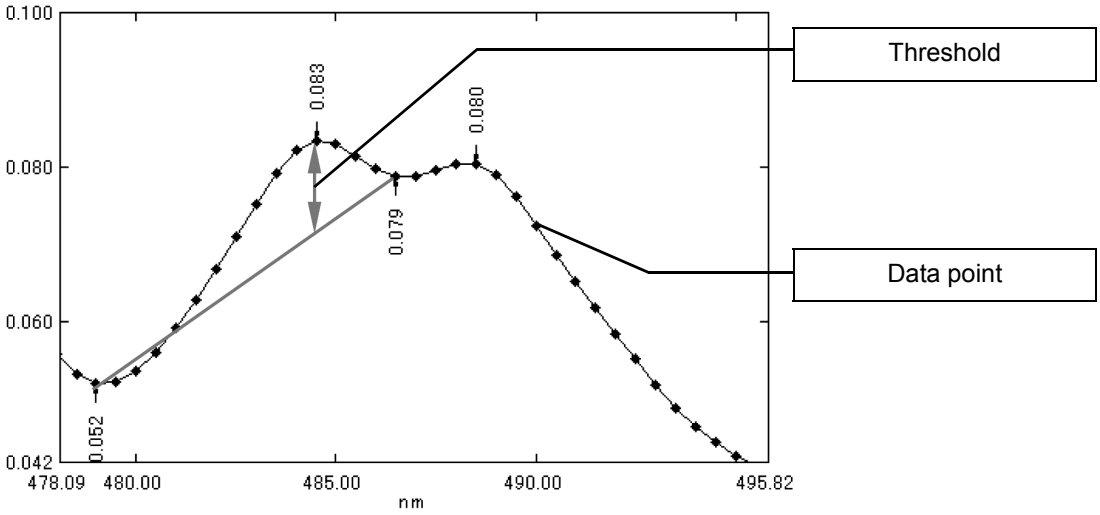
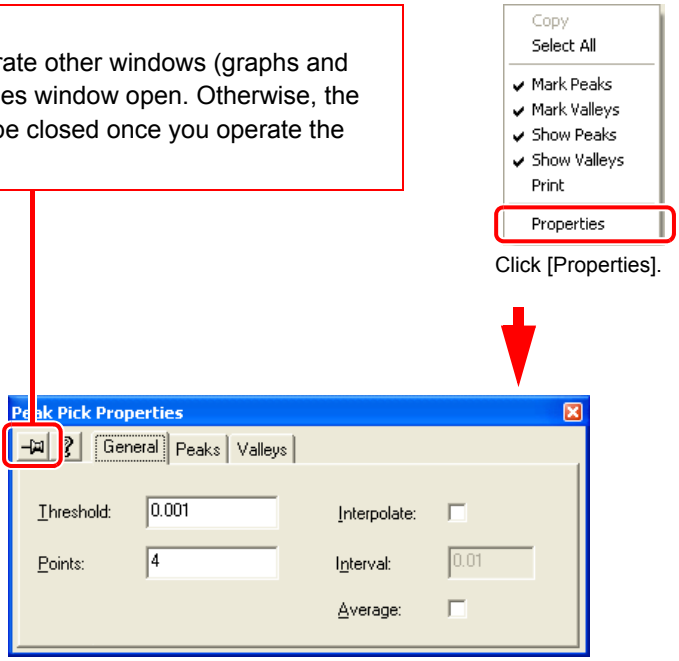


Fig. A-39

Select [Properties] on the shortcut menu to display the properties window to set peak pick parameters (Threshold, Points).

[Pin] button
Click this button to operate other windows (graphs and tables) with the properties window open. Otherwise, the properties window will be closed once you operate the other windows.



(Peak Pick Properties window)

Fig. A-40

■ Example of changing "Threshold"

Threshold: 0.001
(Default value)

Threshold: Changed to 0.009

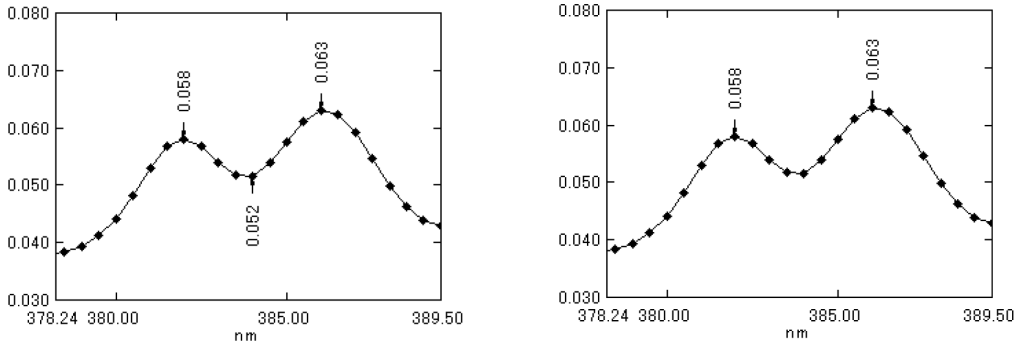


Fig. A-41

■ Example of changing "Points"

Points: 4
(Default value)

Points: Changed to 5

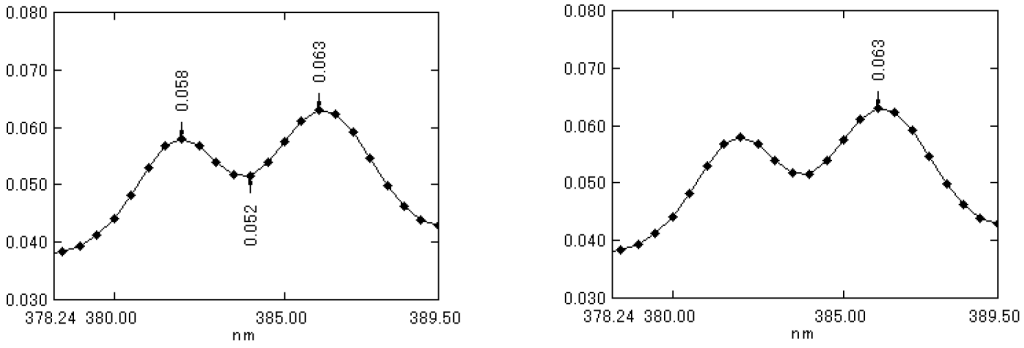


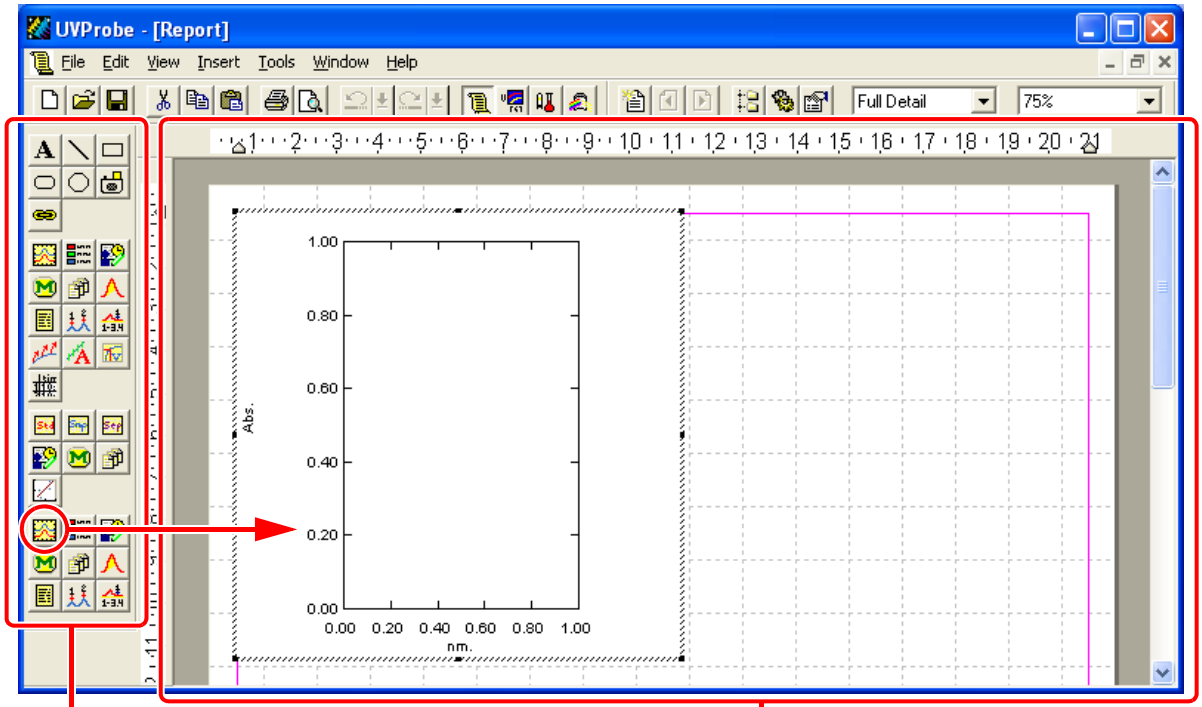
Fig. A-42

A.5.1 UVProbe Printing Function

Using the UVProbe "Report Generator", you can freely create layouts and print various graphs and operation tables. The created layout can also be saved as a separate report file.

To add printed objects on the report, click the [Insert] menu or the object tool buttons.

For detailed functions and operation procedures for creating and editing report files, refer to the UVProbe Tutorial "Chapter 5 the Report Generator" or the UVProbe help files.



Object Toolbar
You can select items to be printed (Object) from this tool bar.
Clicking a tool button inserts the corresponding object on the report editing area.

Report Editing Area
Adjust the size and position of inserted objects and perform other settings in this area.

Fig. A-43

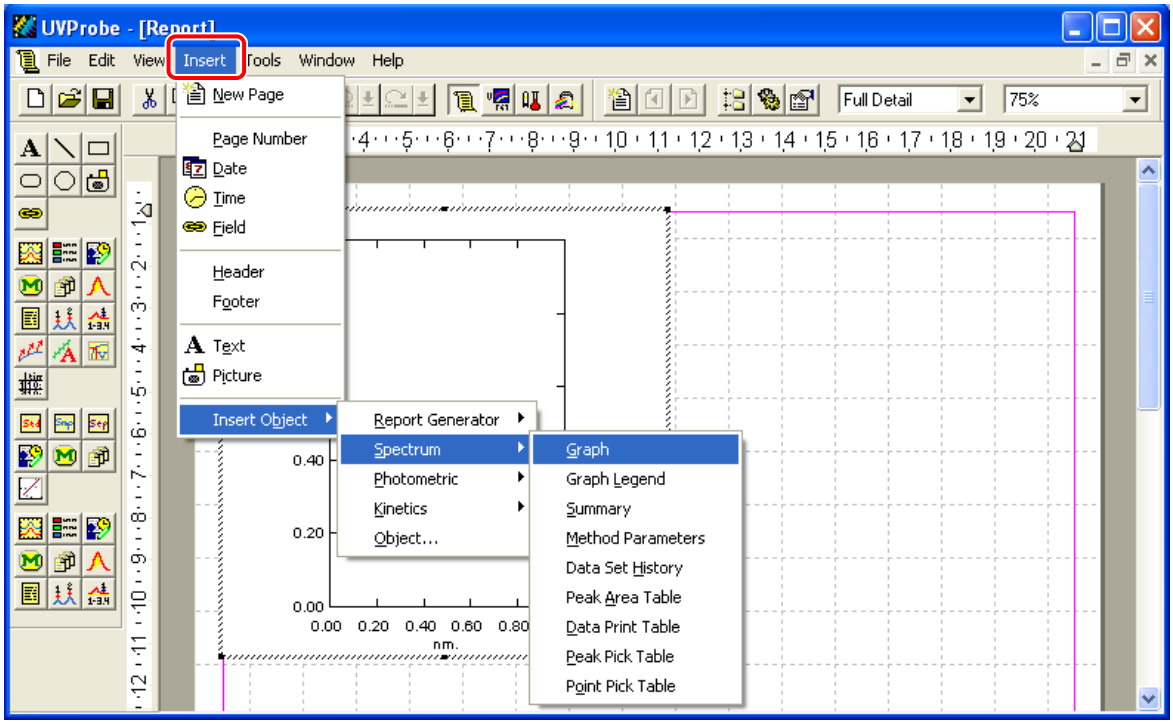

UVProbe - [Report]
File Edit View Insert Tools Window Help
New Page
Page Number
Date
Time
Field
Header
Footer
Text
Picture
Insert Object
Report Generator
Spectrum
Photometric
Kinetics
Object...
Graph
Graph Legend
Summary
Method Parameters
Data Set History
Peak Area Table
Data Print Table
Peak Pick Table
Point Pick Table
Full Detail
75%
0.40
0.20
0.00
0.00 0.20 0.40 0.60 0.80
nm.

Fig. A-44

A.5.2 Printing Procedure

This section describes the procedure for printing measured data directly from different modules using pre-installed report files (Quick Print).

When the UVProbe software is installed, various report*1 files are also installed in the installation folder*2.

Each of the report files is linked to the graph screens or data operation tables on each measurement module.

The following is the procedure for the Quick Print function, using as an example the report file "Spc Point Pick.rpt" linked to the peak pick table in the spectrum module.

*1 These are print template files created on the UVProbe Report Generator. Titles, graph area, and table area have already been arranged at arbitrary positions. These files can be edited with the Report Generator. For details, refer to the UVProbe Tutorial "Chapter 5 The Report Generator".

*2 This refers to the folder where the UVProbe application files are installed. If you have not arbitrarily changed the location at installation time, the report files are located in this folder at the following path: [C:\Program Files\Shimadzu\UVProbe\Reports]

1 Open the peak pick table.

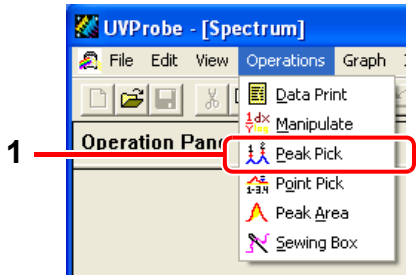
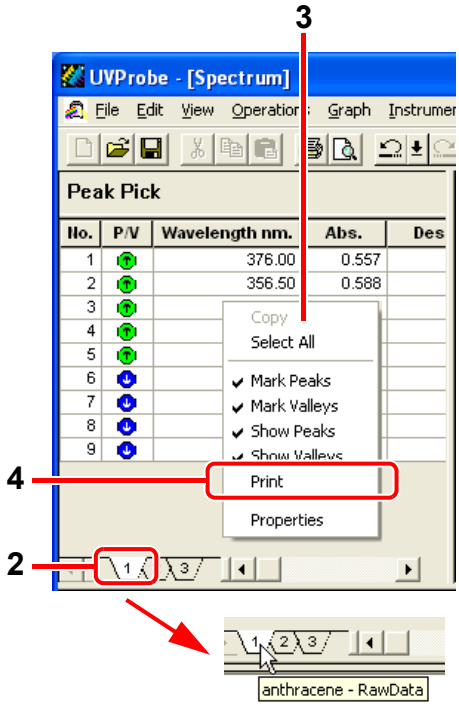


Fig. A-45

2 When multiple files are currently loaded, click the [File] tab and select a peak pick table to be prited.

3 Right-click the mouse on the peak pick table to display the shortcut menu.

4 Click [Print] to start the printing process.



Placing the mouse pointer on the tab displays the filename.

Fig. A-46

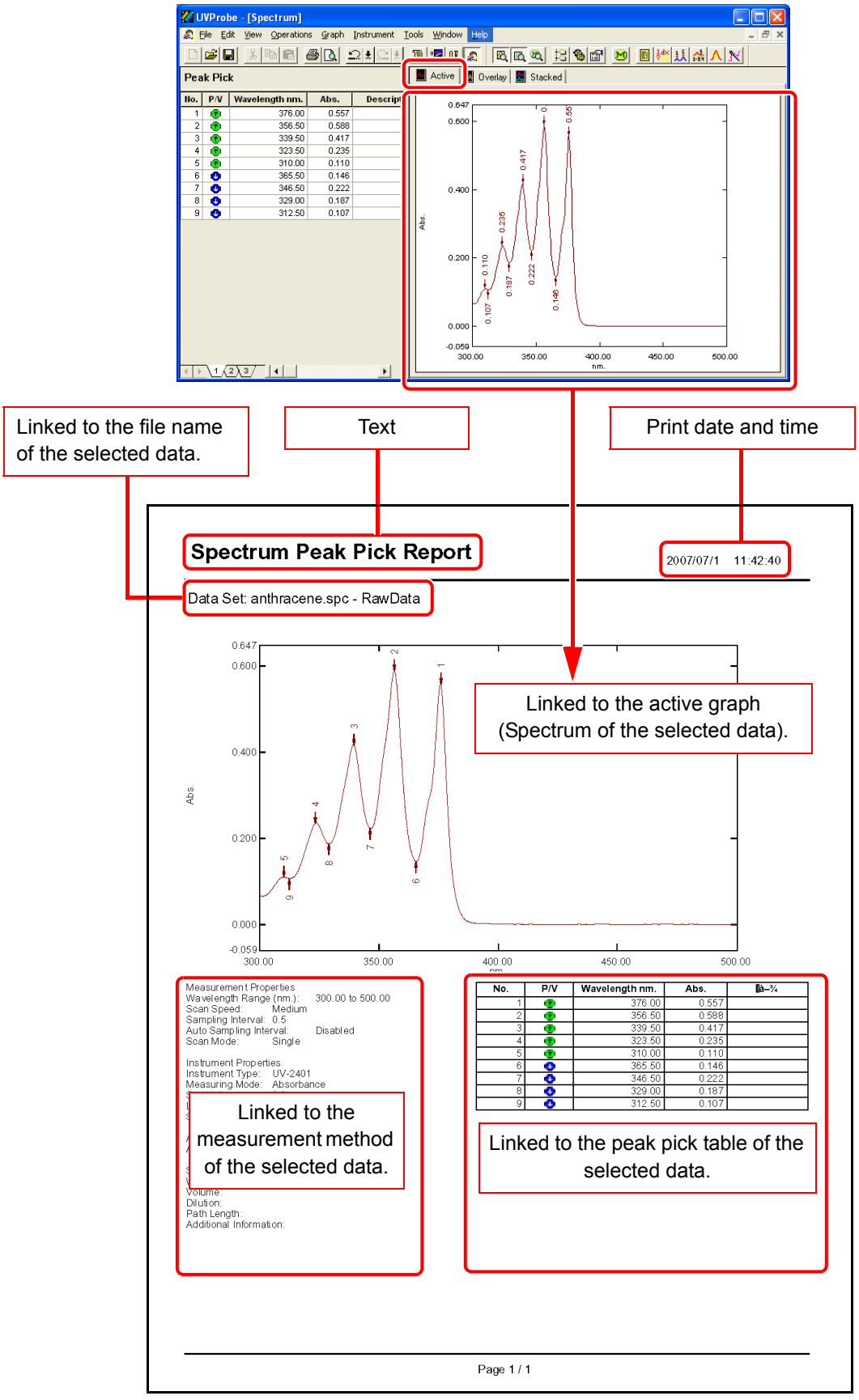


Fig. A-47 Printout example of report file "Spc Point Pick.rpt"

This page is intentionally left blank.

Index

Symbols

Numerics

A

B

C

D

M

N

O

P

R

S

T

U

V

W

Z

Record of Revision

Date	Revision	Changed Page	Description
2/2008	A	A: Section 14.2 A: Record of Revision	

Note)

A ...Added Page No.

D ...Deleted Page No.