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P-1010/1020/1030

Polarimeter

Instruction Manual

JASCO P-1000 for Windows®

JASCO

P/N:0302-0396C March 2000

Safety Considerations

To ensure operation safety, this instrument must be operated correctly and maintained regularly according to schedule. Carefully read to fully understand all safety precautions in this manual before operating the instrument. This manual denotes precautions against actions that can result in hazardous situations or equipment damage by using the signal words **WARNING**, **CAUTION**, and *Note*.

(1) Safety symbols



Instruction manual symbol. If the product is marked with this symbol, refer to the instrument manuals to protect the instrument against damage.

WARNING! A ***WARNING!*** indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury

CAUTION A **CAUTION** indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Do not proceed beyond a ***WARNING!*** or **CAUTION** notice until you understand the hazardous conditions and have taken the appropriate steps.

Note A *Note* provides additional information to aid the operator in obtaining optimal instrument performance.

(2) Warning Labels

Warning labels are attached at several locations on this instrument. Do not remove, deface or damage the warning labels. If a warning label peels off the instrument or becomes illegible, contact your local JASCO distributor for a replacement label. Be sure to indicate the part number (Part No.) on the label.

1) Warning for FUSE (Figs. 1, 2 or 3)

Only use fuses of the designated rating to protect both operator and instrument from fire and other hazards. The warning labels that pertain to fuse ratings are located on the rear panel of the instrument.

⚠ WARNING	
	FOR CONTINUED PROTECTION AGAINST RISK OF FIRE, REPLACE ONLY WITH FUSE OF THE SPECIFIED TYPE AND CURRENT RATINGS.

Part No. 0822-0102A

2) Warning for GROUND (Figs. 1, 2 or 3)

Be sure to ground the mains plug ground pin. Otherwise, ground the ground terminal on the rear panel of the instrument.

⚠ WARNING	
	MAINS PLUG GROUND PIN OR GROUND TERMINAL MUST BE CONNECTED TO GROUND.

Part No. 0822-0104A

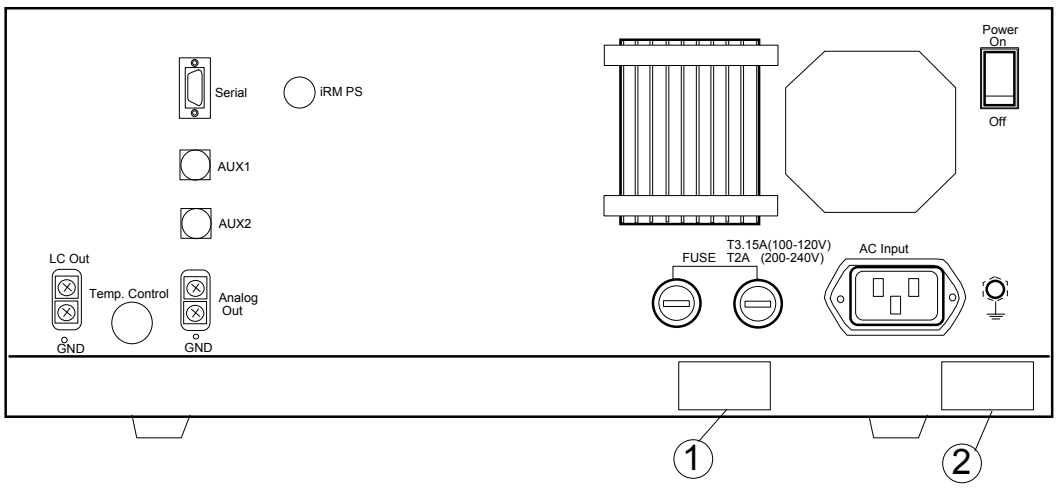


Fig. 1 Rear panel of P-1010

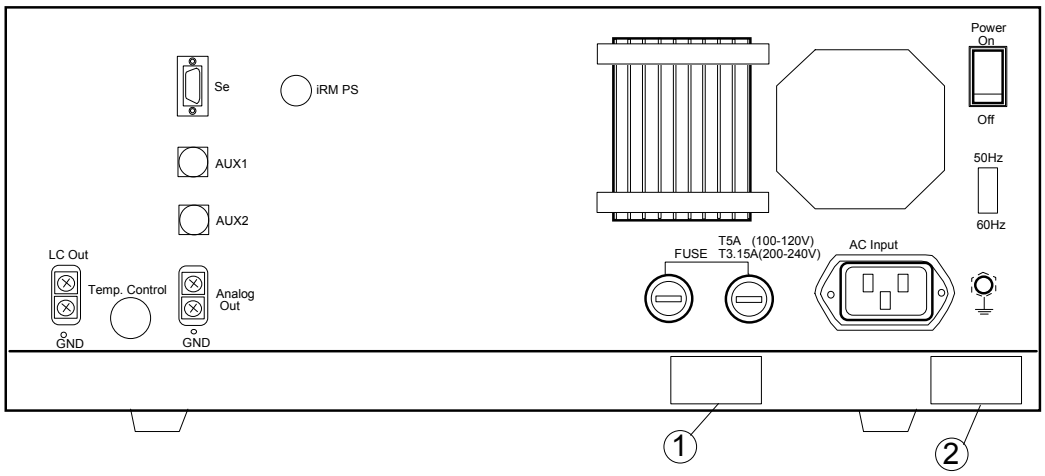


Fig. 2 Rear panel of P-1020

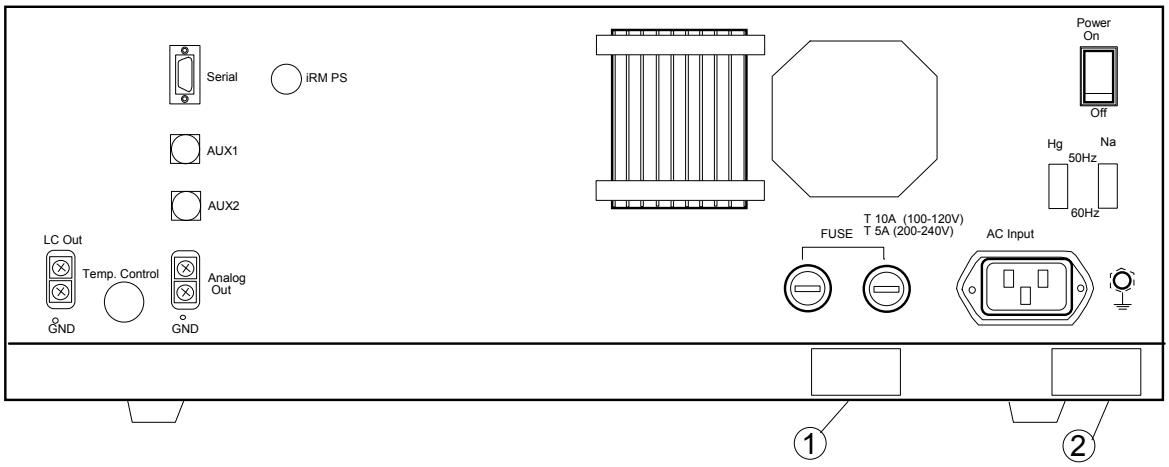


Fig. 3 Rear panel of P-1030

3) Warning for ULTRAVIOLET RADIATION (① on Fig. 4)

⚠ WARNINH
ULTRAVIOLET RADIATION WHEN Hg LAMP IS USED, HARMFUL ULTRAVIOLET RADIATION IS EMITTED THERERORE, TURN THE POWER SWITCH OFF BEFORE OPENING THIS COVER.

Part No.: 0822-0116A

4) Warning for HIGH TEMPERATURE (② on Fig. 4)

⚠ WARNINH	
	**HIGH TEMPERATURE** THE LAMP IS STILL VERY HOT WHEN THE POWER SWITCH IS TURNED OFF THEREFORE, WAIT AT LEAST FIVE MINUTES BEFORE TOUCHING THE LAMP.

Part No.: 0822-0118A

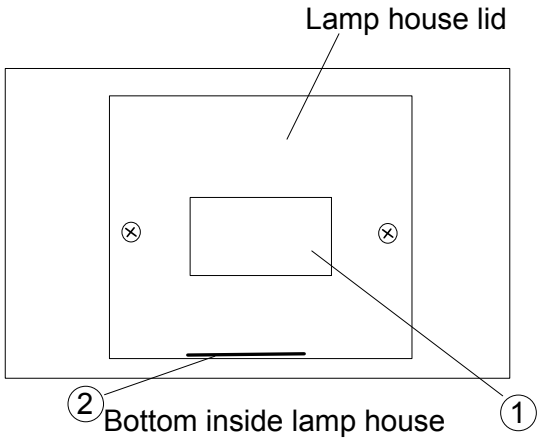


Fig. 4 Left side panel

Precautions

(1) Always keep the polarimeter clean. Take particular care to keep the sample chamber clean and do not leave sample cells in the chamber. When measuring samples that may generate harmful gas, cover and remove the cell from the sample chamber immediately after measurement.
(2) If the instrument must be left for approximately hour, be sure to leave the lamp on. The service life is shortened when the lamp is frequently turned on and off. Note that the lamp requires approximately 15 minutes to stabilize after being turned on.
(3) Always keep the cells clean. Clean a cell immediately after use and store in a clean, dust-free location.
(4) When sample has spilled in the sample chamber, wipe out immediately using gauze or other material. When acids or bases have been spilled, wipe out with gauze soaked in water then allow to dry.
(5) When the optical rotation of a sample exceeds ±50 °, the correct optical rotation may not be shown if a sample with a large optical rotation is placed in the sample chamber first. In this case, use the following procedure.

a) Beforehand, prepare a known sample with an appropriate optical rotation range of +30 ~ +50° or -30 ~ -50 °. As known samples, + and - polarizing plates are supplied as accessories. In addition, sucrose solution (concentration of approximately 50%, +) or fructose sugar (concentration of approximately 50%, -) can be used as easy samples. Place the samples in the cell with a 100mm light path length and use.
b) When the optical rotation of the unknown sample to be measured is to the + side, set the known sample with a + optical rotation prepared above in the sample chamber, measure, and let the optical rotation value stabilize to +30 ~ +50 °.
c) Next, in this condition, open the lid of the sample chamber, replace the known sample with the unknown sample , and close the lid. The optical rotation of the unknown sample will then be shown.

Note: Once the lid of the sample chamber has been opened, do not close the lid until the known sample has been replaced by the unknown sample.

d) After measuring the unknown sample, open the sample chamber lid, replace the unknown sample with the known sample used above, close the lid, and measure until the optical rotation stabilizes at +30 ~ +50 °.
e) Remove the known sample from the sample chamber and close the lid. The measurement value will return to zero.

Note: When the sign of the optical rotation of the unknown sample is minus, follow the same operations with the known sample that is minus.

Regulatory Statements

CE Notice

Marking by the symbol CE indicates compliance of this JASCO system to the EMC (Electromagnetic Compatibility) and Low Voltage Directives of the European Community. This symbol indicates that this JASCO system meets the relevant basic safety and health requirements of the EC Directive based on the following technical standards:

- EN55011 ---- "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment." ---- Group 1, Class A.

WARNING!: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

- EN50082-1 ---- Electromagnetic compatibility ---- Generic immunity standard Part 1: Residential, commercial, and light industry."
- IEC1000-4-2 ---- "Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements." ---- Severity level 3.
- IEC1000-4-3 ---- "Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements." Severity level 2.
- IEC1000-4-4 ---- "Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements." ---- Severity level 2.
- IEC1010-1: 1990 + Amd.1:1992 + Amd.2: 1995 ---- Safety requirements for electrical equipment for measurements, control and laboratory use.

A "Declaration of Conformity" in accordance with the above standards has been made and is on file at JASCO EUROPE srl, Via Confalonieri 25, 22060 CREMELLA (Lc), Italy.

Preface

This instruction manual serves as your guide book for using this instrument. It is intended to instruct first-time users on how to properly use the instrument, and to serve as a reference for experienced users.

Before using the instrument, please read this instruction manual carefully, and make sure you fully understand its contents. This manual should be easily accessible to the operator at all times during instrument operation. When not using the instrument, keep this manual stored in a safe place. Should this instruction manual be lost, order a replacement from your local JASCO distributor.

Installation Conditions

To ensure operation safety, observe the following conditions:

(1) Do not operate the instrument under voltage fluctuations exceeding 10% of the recommended line voltage. Otherwise, the instrument may not function properly.
(2) Use a three-prong electrical outlet with a ground.
(3) Operate the instrument in a temperature range between 10° ~ 35°C.
(4) Operate the instrument in a humidity range between 35% ~ 85%(RH). If ambient humidity exceeds 85%(RH), condensation may deteriorate optical components.
(5) Operate the instrument in an atmospheric pressure of between 750 ~ 1060hPa.
(6) Avoid strong magnetic fields and sources of high frequency. The instrument may not function properly when near a strong magnetic field or high frequency source.
(7) Avoid vibration from vacuum pumps, electric motors, processing equipment and machine tools.
(8) Avoid dust and corrosive gas. Do not install the instrument where exposed to dust, especially in locations exposed to outside air or ventilation outlets that discharge dust particles.
(9) Do not install the instrument where exposed to direct sunlight.
(10) Ensure that no air conditioner blows air directly on the instrument. This may inhibit stable measurement.

Note: The above conditions do not ensure optimal performance of this instrument.

Servicing

To service your instrument, contact your local JASCO distributor. Also contact your JASCO distributor before moving the instrument to another location.
Consumable parts should be ordered according to part number from your local JASCO distributor. If a part number is unknown, give your JASCO distributor the model name and serial number of your instrument.

Do not return contaminated products and parts that may constitute health hazards to JASCO employees.

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(2) MIRRORS IN THE LIGHT SOURCE SECTION, AND CELL WINDOWS
(3) FUSES, BATTERIES, GLASSWARE, CHART PAPER AND INK

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(2) TUBING AND FITTINGS (E.G., FERRULES, COMPRESSION SCREWS), AND FILTERS (E.G., INLET FILTERS, LINE FILTERS, OTHER SOLVENT FILTERS)
(3) PRE-COLUMNS AND GUARD COLUMNS

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JASCO Corporation
2967-5, Ishikawa-cho, Hachioji-shi
Tokyo 192, JAPAN

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1 Introduction
1.1 About this manual

This manual contains the configuration and operating procedure for the Model P-1000 series polarimeters. This manual consists of five sections, including this section. The contents of each section are briefly described below. In this manual, Models P-1010, P-1020 and P-1030 are all referred to as P-1000. In addition, Microsoft Windows is referred to as Windows and personal computer is abbreviated to PC.

Section 1. Introduction

Describes how to use this manual, notation conventions, screen configuration and special terms. Read this section first.

Section 2. Operating Procedure and [Spectra Manager]

Describes how to start up/shut down the instrument, how to open the [Spectra Manager] program and the contents of the [Spectra Manager] menus.

Section 3. Introduction of measurement/analysis program

Describes, using simple examples, how to perform optical rotation measurement and time course measurement using the measurement program. This section gives a comprehensive overview of the P-1000 and the measurement/analysis program. It is intended as a guide for those who are not experienced in the operation of the polarimeter.

Section 4. Measurement program: Reference

Contains reference information for the measurement program, including optical rotation measurement and time course measurement. This section also contains reference information for the various measurement modes available and an explanation of the environment settings.

Section 5. Appendix

Contains a troubleshooting guide, software installation instructions, and how to set up the communication port.

1.2 Foreword

P-1000W is an application program that runs on Windows95/98. A familiarity with the general procedures associated with Windows operation is essential in order to use the P-1000W. This manual does **NOT** explain basic Windows operations, such as:

- Starting up/shutting down the PC
- Starting/exiting Windows programs
- Opening (closing) a file
- Saving a file

- General printing operations

Inexperienced and first time users of Windows should read the Windows documentation and/or help files in order to understand basic Windows operations before using the P-1000W software.

1.3 Notation Used

The following notation is used throughout this manual.

Notation	Meaning
[Measurement] menu, [Parameters…] command, etc.	Names of windows, dialog boxes, menus, commands, and text boxes are enclosed in square brackets, [ ], followed by a description indicating whether the name refers to a window, dialog box, menu, etc.
<OK>	Names of buttons are enclosed in angular brackets, < >.

Keyboard operations

Notation	Meaning
Shift CTRL	Names of keys found on the keyboard are enclosed in boxes and are in bold face.
Alt, F	Keys that are to be pressed in sequence are separated by commas.. In this example, the Alt key is to be pressed and released, followed by the F key.
Shift + ?	Keys that are pressed simultaneously are separated by a "plus" sign. In this example, press the ? key with the Shift key held down.

Mouse operations

Notation	Meaning
Point	Move the mouse pointer (arrow displayed on the screen) to the specified item (command or other).
Click	Press the mouse (left button unless otherwise specified) and release it immediately.
Double click	Click the left mouse button twice in rapid succession.
Drag	Point to an item, click and hold down the left mouse button. With the button held down, move the pointer to the desired position and release the button.

1.4 P-1000W Software Features

Starting the P-1000 measurement program from Spectra Manager displays the following program window (see Fig. 1.1). Here, the various components of the program window are explained.

Note: The program window varies with program.

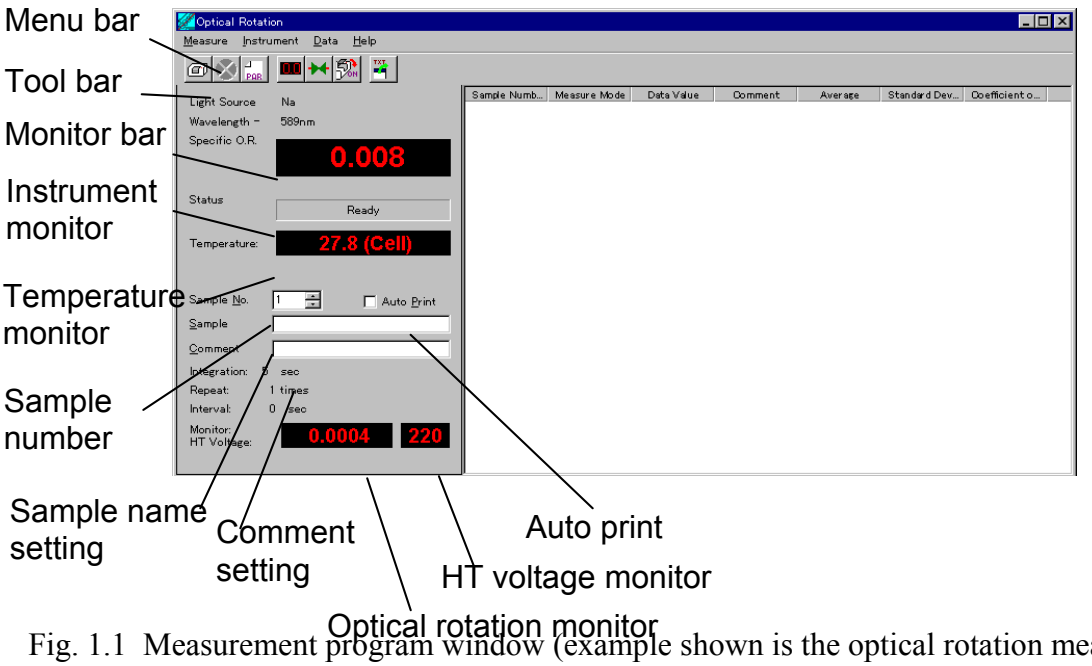


Fig. 1.1 Measurement program window (example shown is the optical rotation measurement window)

Item	Function
Control menu box	Displays the control menu for the program window. The control menu includes commands for changing the window size and moving the window.
Title bar	Displays the name of the program window. The title bar of an active window (on which the user is working) is displayed in a different color and brightness from other windows.
Menu bar	Displays the names of the available menus. Each menu contains commands (operations) that can be used.
Tool bar	Contains buttons corresponding to frequently used operations. By clicking the corresponding button on the toolbar these operations can be executed directly.
Instrument monitor	Displays the current status of the instrument.
Monitor bar	Displays the designated measurement mode and the

	current measured value. The measured value is the current optical rotation value converted for the currently designated measurement mode.
Temperature monitor	Displays the temperature measuring point and the current temperature at the temperature measuring point.
Sample number setting	Used to set the sample number.
Sample name setting	Used to enter a sample name.
Comment setting	Used to enter a comment.
Optical rotation monitor	Displays the current optical rotation value received from the P-1000 main unit.
HT voltage display	Displays the voltage applied to PMT.
Auto print	When this box is checked, data is automatically printed after measurement.

(1) [Spectra Manager] window

The following window (Fig. 1.2) opens when Spectra Manager is selected from the [JASCO] folder in the Windows' Start menu (Start-Programs-JASCO-Spectra Manager). In the [Spectra Manager] window the P-1000 and desired programs can be started/stopped. In addition, the communication port can be changed.

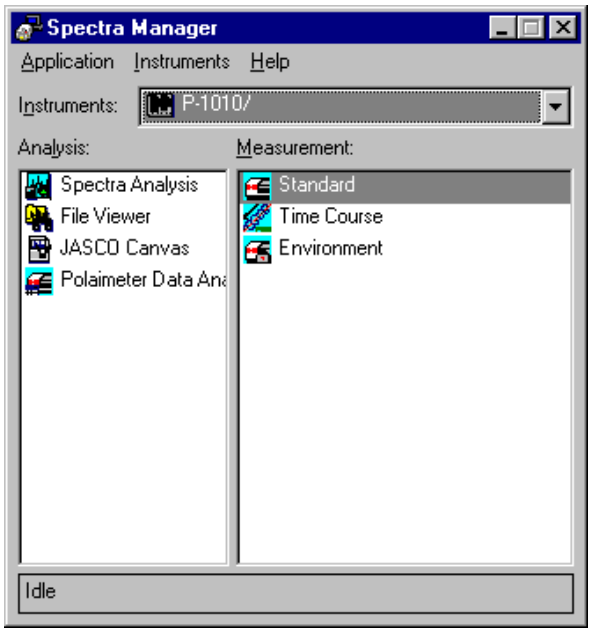


Fig. 1.2 [Spectra Manager] window

(2) [Standard], [Time Course] and [Environment] program windows

The following measurement programs are available for the P-1000 in the [Spectra Manager] window: [Standard], [Time Course] and [Environment]. Double click on the required program to start. The [Standard], [Time Course] and [Environment] windows are shown below.

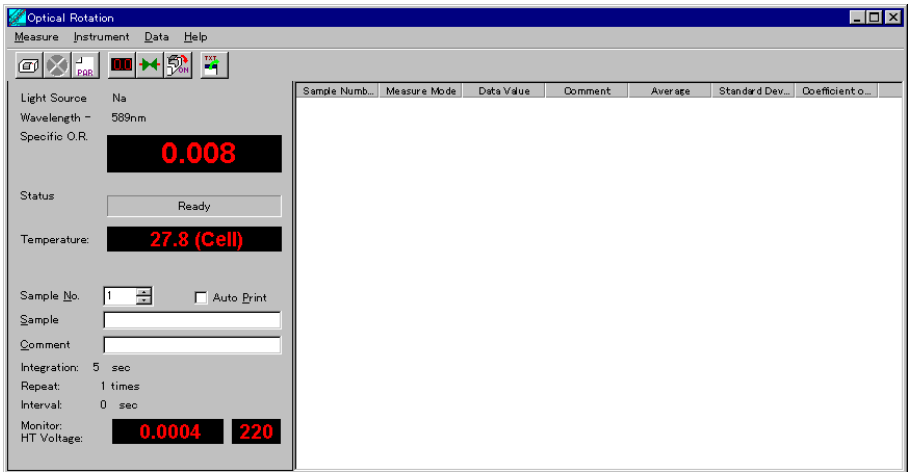


Fig. 1.3 [Standard] window

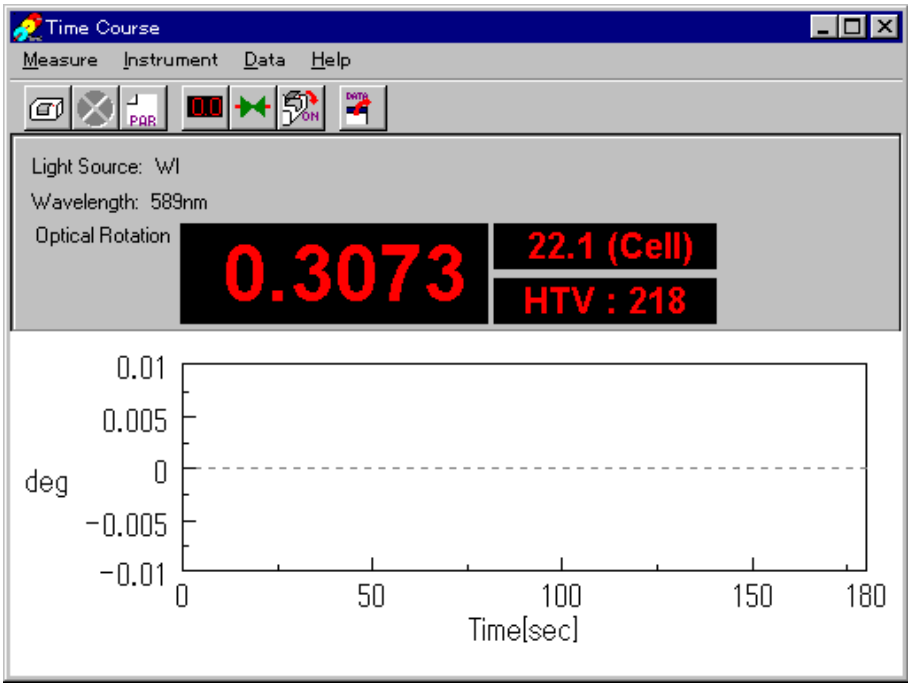


Fig. 1.4 [Time Course] window

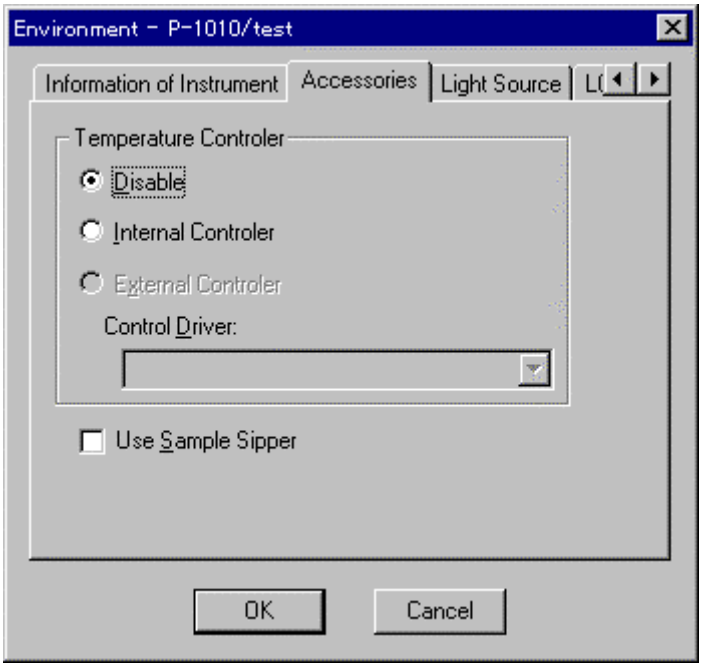


Fig. 1.5 [Environment] window

(3) [Spectra Analysis] window

The [Spectra Analysis] program can open multiple windows for displaying data. These windows are referred to as "Views" (see Fig. 1.6). Several of data can be overlaid in a single View. Immediately after time course measurement, the spectrum analysis program starts automatically and a View is opened, displaying the measurement data.

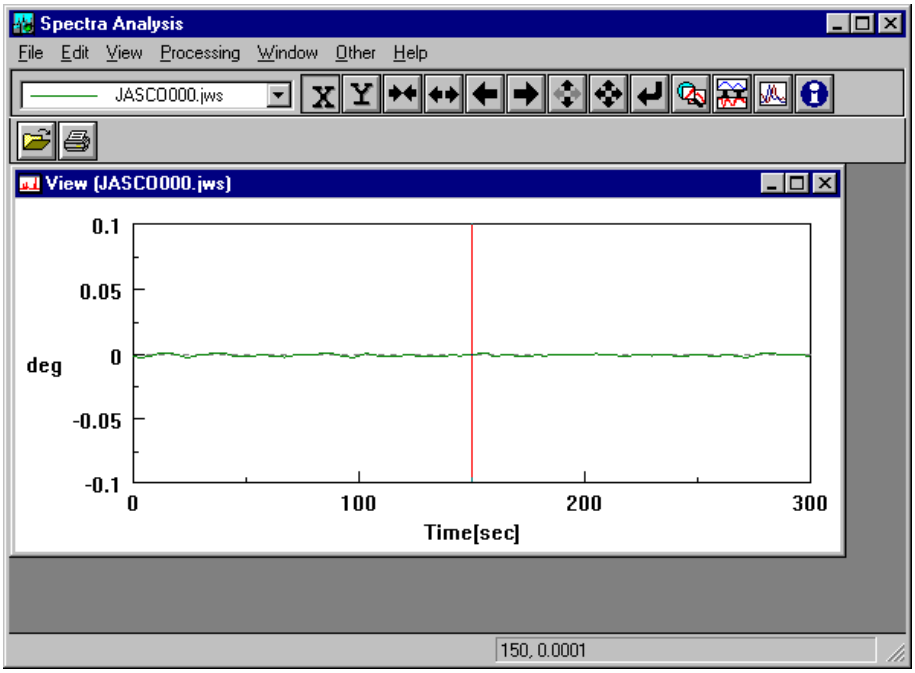


Fig. 1.6 [Spectra Analysis] window

2 Operating Procedure and [Spectra Manager]

2.1 Startup

2.1.1 Turning on the instrument

To turn on the instrument, push the “Power” switch to the ON position (upper right as viewed from the rear instrument in Fig. 2.1).

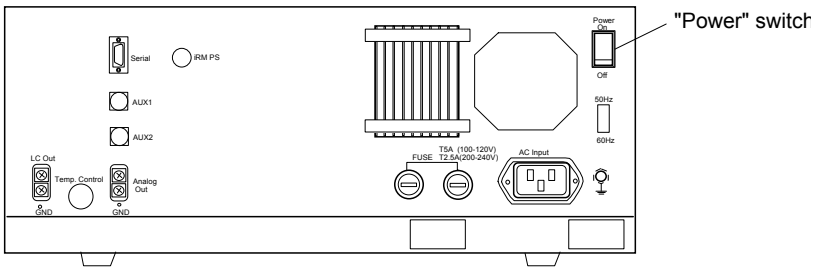


Fig. 2.1 Power switch (rear panel of P-1020)

The “Power” lamp at the top of the instrument is lit when the instrument is on.

2.1.2 Starting [Spectra Manager]

After starting up the PC and windows has loaded, use the following procedure to start the [Spectra Manager] program.

(1) Click on the [Start] button in the Windows task bar, point to Programs and then to Jasco. In the Jasco folder click Spectra Manager (see Fig. 2.2). The Spectra Manager window opens (Fig. 2.3).

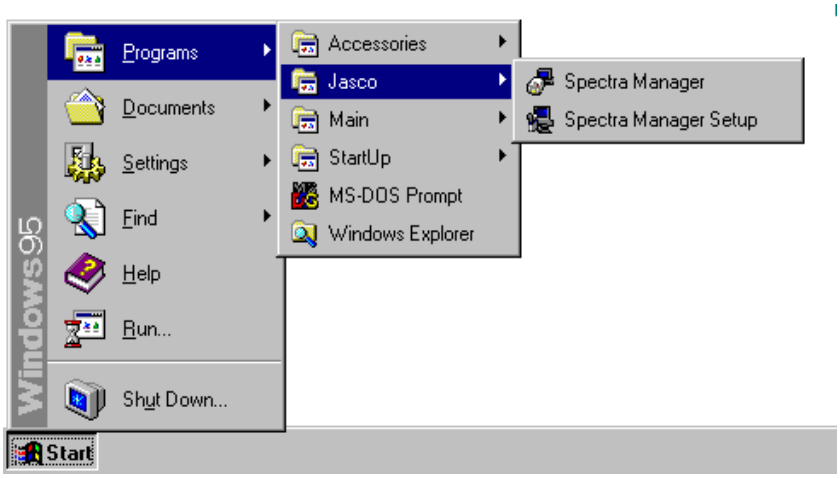


Fig. 2.2 Starting up [Spectra Manager]

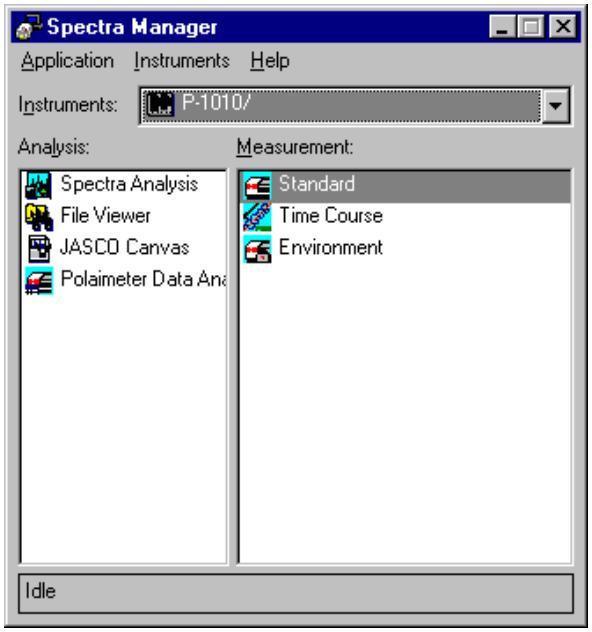


Fig. 2.3 [Spectra Manager] window

Note :	*The [Spectra Manager] window shows the analysis and measurement program menus. The programs available for the P-1000 are shown in Fig. 2.3. Optional application programs (not shown in Fig. 2.3), if available, are added here. Refer to Section 2.3 for more information about this window.*

(2) Double click the desired program. The program starts up and the program window appears.

Note:	*Starting up a measurement program after the P-1000 has been turned on initializes the instrument. Initialization takes approximately five minutes. The actions performed during startup are displayed in a message box (see Fig. 2.4).*

Note:	*Refer to Section 3 for more information about measurement program operation.*



Fig. 2.4 Message box displayed during initialization

2.2 Shutting down the instrument

The procedure for shutting down the instrument is described below.

(1) Exit all programs and shut down Windows.
(2) Turn off both the PC and display unit.
(3) Make sure the sample chamber is empty, and turn off the P-1000 (see Fig. 2.1).
(4) Wait for approximately five minutes for the light source to cool down and then place the dust cover over the instrument.

2.3 [Spectra Manager] Menus

In the [Spectra Manager] window the instrument and desired measurement and analysis programs can be started. In addition, the environment settings for the instrument and the communication port can also be changed.

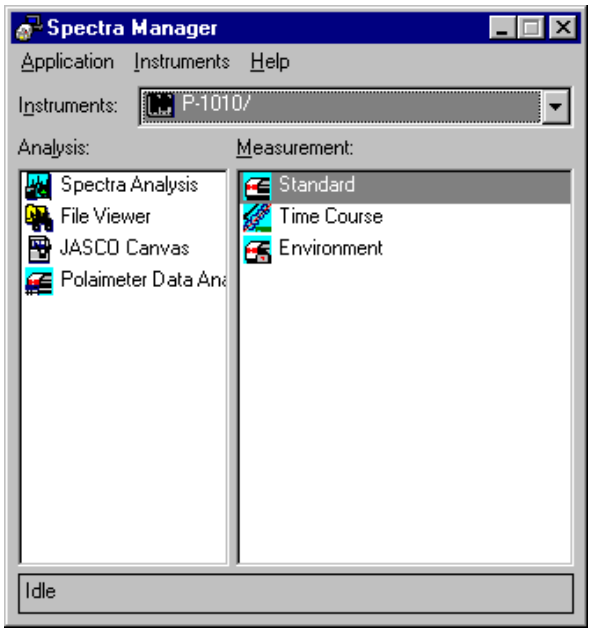


Fig. 2.5 [Spectra Manager] window

Figure 2.5 shows [Spectra Manager] window with the standard analysis and measurement programs displayed. Optional application programs, if installed, are also displayed here. The [Spectra Manager] window is divided into the [Analysis] pane on the left, and the [Measurement] pane on the right. Double clicking a program in these panes starts up the program and, if not yet started up, the P-1000 will start simultaneously.

2.3.1 [Application] menu

In addition to directly double clicking a program, a measurement or analysis program can be started from the [Application] menu.



Fig. 2.6 [Application] menu

Menu item	Description
Analysis	Starts up the currently selected program in the analysis pane. Refer to the Spectra Analysis instruction manual for more information.
Measurement	Starts up the currently selected program in the measurement pane.
Exit	Closes the [Spectra Manager] window.

2.3.2 [Instruments] menu

The commands in the [Instruments] menu start or stops the instrument, set the communication port or display the instrument version information.



Fig. 2.7 [Instruments] menu

Menu item	**Description**
Start	Initializes the P-1000 and starts communication. Intialization takes approximately five minutes. Normally, this operation is not necessary because starting up a measurement program automatically starts up the P-1000.
Stop	Stops communication with the P-1000. Normally, this operation is not necessary because exiting a measurement program automatically stops communication with the P-1000.
Port setting...	Opens the [Port Setting] dialog box used to select the serial port to connect to the P-1000.

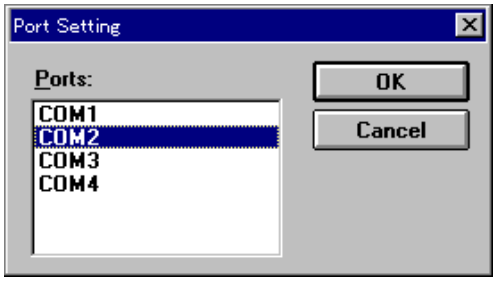


Fig. 2.8 [Port setting] dialog box

About...	Displays version information for the P-1000 control program.

2.3.3 [Help] menu

Displays system information of this software (see Fig. 2.10) and version information for the Spectra Manager program (see Fig. 2.11).

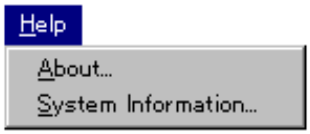


Fig. 2.9 [Help] menu

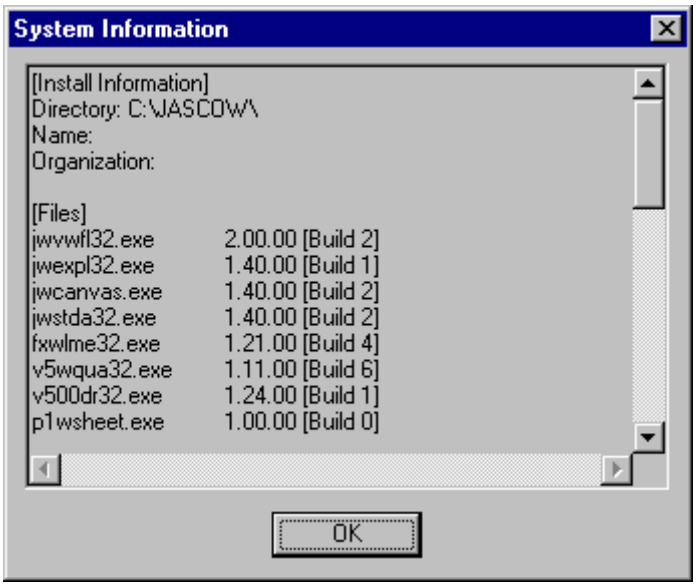


Fig. 2.10 [System Information] dialog box

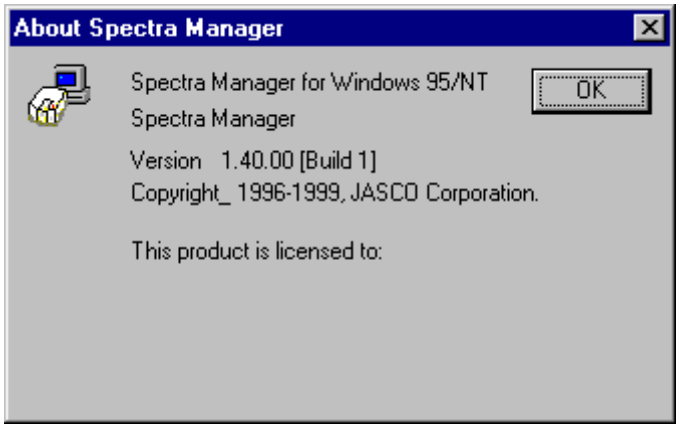


Fig. 2.11 Version Information

3 Standard and Time Course Measurement: Introduction

The P-1000 measures the optical rotation of optically active substances, and permits direct measurement of specific optical rotation, concentration, sugar scales, Brix purity and optical purity. Measurement substances include saccharides, amino acids, pharmaceuticals, perfumes and physiologically active substances. The P-1000 can also be used for quantitative analysis discrimination of isomers including D-optical isomers and L-optical isomers.
This section describes Standard measurement, Time Course measurement and aspects of spectra analysis. The description of parameters is minimized in order to place emphasis on operation flow. Refer to the appropriate section for more information.

3.1 Functions of Measurement Program

The major functions of the P-1000 measurement programs are as follows.

(1) 20°C temperature correction of optical rotation

Optical rotation is corrected to that at 20°C according to optical rotation measurement data, temperature and temperature correction factor. Refer to Section 4 for information regarding the conversion equation.

(2) Automatic measurement upon opening/closing the sample chamber lid

This function is convenient for successive sample measurements. Measurement starts automatically by closing the sample chamber lid after setting a sample in the sample chamber.

(3) Analyzer deactivation function

The analyzer gear transmits the revolution of the analyzer drive motor to the analyzer. The analyzer is the heart of the P-1000 with respect to instrument accuracy. Contamination with dust or a worn gear may adversely effect instrument accuracy. The analyzer is actuated during monitoring and will become worn over a long period.
The "analyzer stop" function stops the analyzer (stops monitoring) except when measurement is in progress to reduce wear of the analyzer gear when the function is actuated.

Starting measurement “operates the analyzer”.
Stopping measurement “stops the analyzer”.
For monitoring, invalidate the function.

(4) Automatic filter recognition function

This function can recognize fifteen different types of filters for the P-1000 according to measurement wavelength and light source. The currently mounted filter is displayed in the [Optical Rotation Measurement] window. The following table shows the types of light source and the corresponding filters.

Table 3.1 Correspondence between Filters and Light Sources

Light source	Wavelength (filter) in nm															
	None	880	633	589	577	546	435	405	365	334	325	313	302	296	280	254
Na	✓			✓												
Hg	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
WI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
External	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Monochromator	✓															

Note: Wavelengths (filters) marked with "✓" can be used with the corresponding light sources.

Note: If an incompatible filter is mounted or if the light source is changed over to one not compatible with the currently mounted filter, measurement, parameter settings and other functions will be limited.

Note: Store the removed filters in a safe place free from dust.

(1) Blank measurement and saving
Blank measurement can be made or blank data can be saved or loaded from a dialog box.
(2) Saving data in text format
Data can be saved in text file format. This data can be loaded in a commercially available spreadsheet program.
(3) Temperature control (option)
The cell holder temperature can be controlled by connecting the temperature control unit. Refer to the instruction manual for the temperature control unit for more information about the connection and operation.
(4) Sample sipper (option)
Multiple samples can be measured quickly by connecting a sample sipper [SHP-101]. Refer to the instruction manual for the SHP-101 for more information about connection and operation.

3.2 Standard measurement

This section describes the procedure for conducting optical rotation measurement using the P-1000.

3.2.1 Standard measurement program overview

3.2.1.1 Standard measurement program

The Optical Rotation Measurement program has the following functions.

- Measurement in six different measurement modes
- Statistical calculation function (average, standard deviation, and coefficient of variation)
- 20°C temperature correction of optical rotation data

- Automatic measurement upon opening/closing the sample chamber lid
- Automatic deactivation of analyzer after measurement
- Automatic filter recognition function
- Blank measurement and saving
- Data output in text format
- Temperature control (option)
- Sample sipper (option)

3.2.1.2 Operating procedure for Standard measurement program

Start up the Optical Rotation Measurement program — Refer to Section 3.2.2.1
↓
Set parameters — Refer to Section 3.2.2.2
↓
Prepare for measurement and clear to zero — Refer to Section 3.2.2.3
↓
Blank setting — Refer to Section 3.2.2.4
↓
Unknown sample measurement — Refer to Section 3.2.2.5
↓
Save measurement results — Refer to Section 3.2.2.6
↓
Exit Optical Rotation Measurement

3.2.2 Standard measurement program operations

3.2.2.1 Standard measurement program startup

Double click [Standard] in the [Measurement] pane of the [Spectra Manager] program window (see Fig. 3.1).

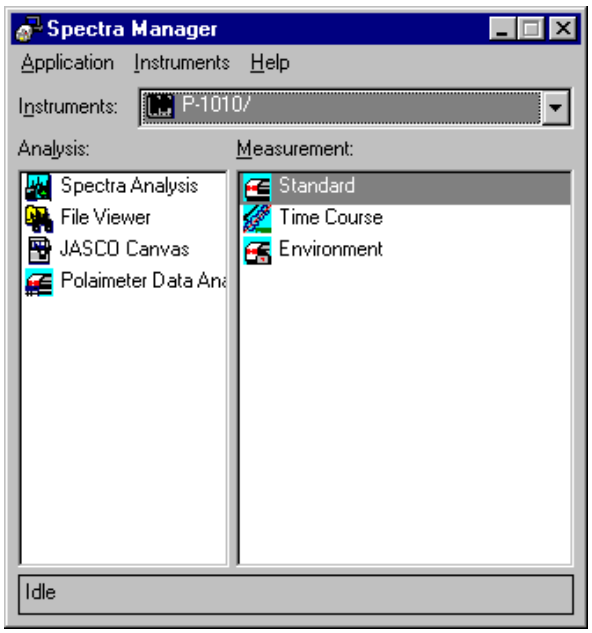


Fig. 3.1 [Spectra Manager] window

The message "Initializing" appears. After a while, the Standard measurement program starts up, displaying the following [Standard] window (see Fig. 3.2).

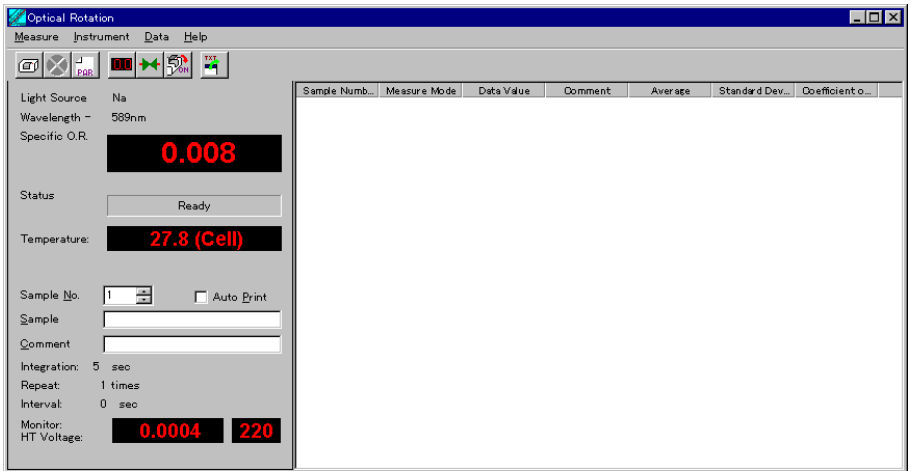


Fig. 3.2 [Standard] window

3.2.2.2 Setting measurement parameters

(1) Select [Parameter…] from the [Measurement] menu. The following dialog box appears.

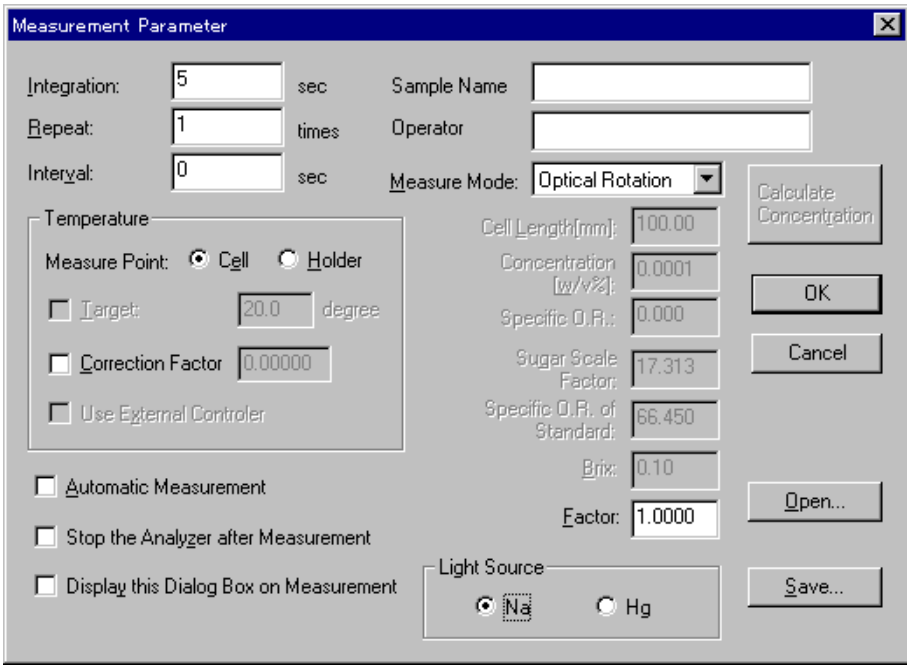


Fig. 3.3 [Measurement Parameter] dialog box

(2) Change parameters

Assuming parameters are set as shown in Fig. 3.3, the following parameter changes are described as an example.

- Integral time 5 sec → 1 sec
- Temperature measuring point Cell → Holder
- Temperature correction factor 0.000 → 0.0250
- Automatic measurement OFF → ON
- Measurement mode Optical rotation → Specific optical rotation
- Light source Na → Hg <P-1030 only>
- Concentration Use [Concentration Calculation] button

(a) In the [Integration] text box enter 1.
(b) In the [Temperature] group, click the [Holder] option button next to [Measure Point].
(c) In the [Temperature] group, place a check in the [Correction Factor] check box. In the [Correction Factor] text box at the right, enter 0.025.
(d) Place a check in the [Automatic Measurement] check box.
(e) Click on the arrow of the [Measurement Mode] drop-down box.. The measurement modes are listed. Click on [Specific Optical Rotation]. The measurement mode is set to [Specific Optical Rotation] and the related calculation parameters, that is, cell length, concentration and factor are activated and can be set.
(f) <For P-1030 only> Click on the [Hg] option button in the [Light source] group. The filter should be replaced with one compatible with the selected light source. (Refer to Table 3.2 "Correspondence between Filters and Light Sources".)
(g) Click the <Concentration Calculation (K)> button. The [Concentration Calculation] dialog box appears (see Fig. 3.4). In the [Sample] text box, enter the weight of sample solute. In the [Solvent] text box, enter the solvent volume. Click the <OK> button. The dialog box closes and the calculated results are displayed in the [Measurement Parameter] dialog box.

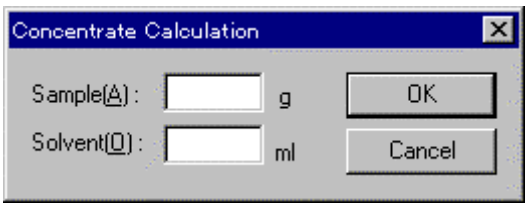


Fig. 3.4 [Concentration Calculation] dialog box

(1) To save parameters, click the <Save...> button to open the "Save As" dialog box. Navigate to the desired destination folder, enter a filename and click the <Save> button. Parameter files are saved with a ".par" file extension.
(2) To load a previously saved parameter file, click the <Open…> button to display the "Open" dialog box. Navigate to the desired folder, select the desired file and click the <Open> button.
(3) In the [Measurement Parameter] dialog box, click the <OK> button. The parameter settings are applied and transferred to the P-1000.

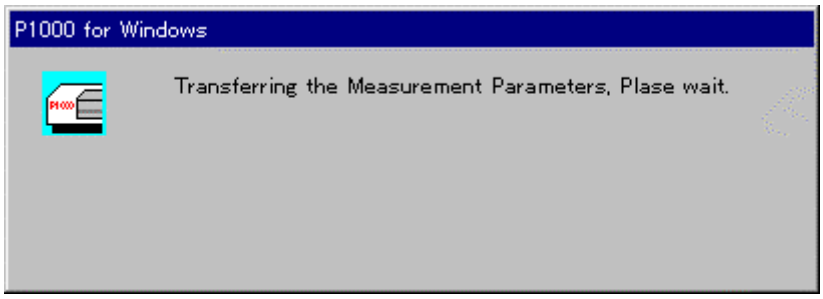


Fig. 3.5 Message box displayed during parameter transfer

3.2.2.3 Preparations for measurement and clearing to zero

(1) Prior to measurement, check the sample chamber aperture as follows. Open the sample chamber lid and adjust the diameter of the aperture to the diameter of the cell to be used. (The aperture is located at the left of the cell holder.) Use an 8mm rectangular cell or a 3mm or 1.8mm micro cell.
(2) Use the following procedure to clear to zero, that is, set optical rotation to zero.

(a) Open the sample chamber lid, make sure the sample chamber is empty and close the lid.
(b) Select [Zero Clear] from the [Measure] menu to clear to zero.

(3) Set a sample number. Input a sample number in the [Sample No.] text box in the [Standard] program window.

Note: The sample number increases by one each time a sample is measured. Sample number 999 is followed by 000. In blank measurement, the sample number does not increase each time a sample is measured.

3.2.2.4 Blank setting

The raw data obtained by this instrument is optical rotation data. For the other measurement modes, the raw data is appropriately converted for each measurement each mode using a conversion equation (see Section 4.1.1). The blank value is subtracted from the optical rotation raw data and is then converted for each measurement mode.

Select [Blank] from the [Measure] menu in the [Standard] program window. The [Blank] dialog box is displayed (see Fig. 3.8) which allows blank correction to be turned ON/OFF, a blank to be measured, direct input of blank values, and saving/loading of blank values.

Note: Blank correction cannot be made using a result obtained by measuring an unknown sample.

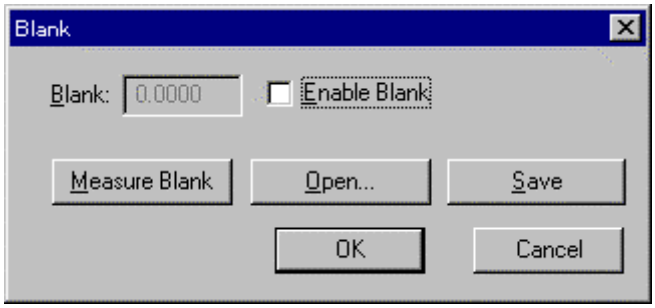


Fig. 3.8 [Blank] dialog box

(1) Turning blank correction ON/OFF

Place a check in the [Enable Blank] check box. Blank correction is activated (ON) and the current value indicated in the [Blank] text box is used. To turn blank correction off, remove the check mark.

(2) Use the following procedure to measure a blank.

(a) Put solvent in the cell and set it in the sample chamber.
(b) Click the < Measure Blank > button. The blank is measured and is automatically input in the [Blank] text box.

Note: If [Auto Measure ON (A)] is activated, closing the sample chamber lid starts blank measurement.

(1) Setting the blank value directly

Turn blank correction on as described in (1) to activate the [Blank] text box. Enter the desired value in the [Blank] text box.

(2) Saving a blank value

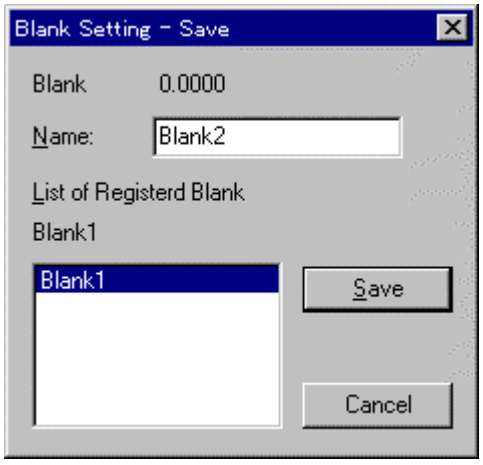


Fig. 3.9 [Blank Setting - Save] dialog box

(a) Click the <Save> button in the [Blank] dialog box. The [Blank Setting - Save] dialog box opens.
(b) Enter a name in the [Name] text box.
(c) Click the <Save> button to save the blank and close the [Blank Setting - Save] dialog box.

(1) Loading a blank value

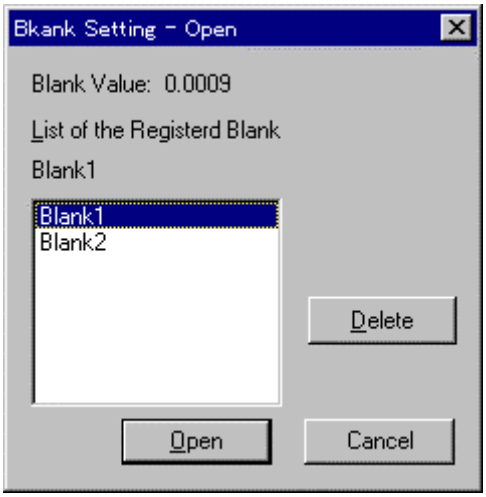


Fig. 3.10 [Blank Setting - Open] dialog box

(a) Click the <Open> button in the [Blank] dialog box. The [Blank Setting - Open] dialog box opens and the registered blanks are listed (see Fig. 3.10).
(b) Select a blank file to be loaded and click the <Open> button. The dialog boxes closes and the blank value is automatically input in the [Blank] text box in the [Blank] dialog box.
(c) A blank file can be deleted by selecting it from the list and clicking the <Delete> button.

3.2.2.5 Unknown sample measurement

(1) If necessary, enter a comment in the [Comment] text box in the [Standard] program window (see Fig. 3.2).
(2) Set a sample in the cell holder.
(3) If the temperature measuring point is set to "Cell", put the "Cell internal temperature measuring sensor" into the cell. Here, ensure that the end of the thermometer interrupts the incident beam.
(4) Select [Start] from the [Measure] menu in the [Standard] program window. Measurement begins and the measurement result appears in the data sheet at the right of the program window.

Note: If [Auto Measure ON (A)] is activated, closing the sample chamber lid will start sample measurement.

<Cautions when handling the cell>

(1) Use the same cell for unknown sample measurement and blank measurement. Before changing the sample in the cell, wash it with the same type of sample a few times so that no trace of the previous sample remains in the cell.
(2) Set the cell in the cell holder in the same position and at the same orientation. Setting it in a different position or orientation will adversely effect data repeatability.
(3) Ensure that the sample liquid surface does not interrupt the incident beam. In addition, remove any bubbles from the cell walls.

3.2.2.6 Printing measurement results

Select [Print Item] from the [Measure] menu in the [Standard] program window. The [Select Print Topic] dialog box opens. Place a check in the desired print item check boxes.

Auto print

Place a check in the [Auto print] check. Data is automatically printed after measurement.
Remove the check from the [Auto print] to turn auto printing off.

Manual printing

Select [Print Result] from the [Measure] menu in the [Standard] program window. The latest measurement results are printed.

3.2.2.7 Saving measurement results

Measurement data displayed in the data sheet can be saved to disk in text format. Two saving formats are available: "Work Sheet Only" and "All Data".
In order to use the data file in spreadsheet software such as Microsoft Excel, save the measurement data in "Work Sheet Only" format. If data including parameters are to be saved, save the data in "All Data" format.

Note: Up to 500 points of data can be saved.

Note: For both save formats, "Work Sheet Only" and "All Data", the ".txt" extension is attached to the saved file.

(1) Saving in "Work sheet only" format

In the [Data] menu, point to [Text Save] and then click [Work Sheet Only ...] to open the [Text Save - Work Sheet Only] dialog box. Navigate to the desired destination folder, enter a filename and click the <Save> button.

Note: Data items are delimited with Tabs.

(2) Saving in "All Data" format

In the [Data] menu, point to [Text Save] and then click [All Data...] to open the [Text Save – All Data] dialog box. Navigate to the desired destination folder, enter a filename and click the <Save> button.

Note: Data items are delimited with Tabs.

3.3 Time Course measurement Program

This section contains the measuring procedure for the time course measurement program.

3.3.1 Time course measurement and Spectra Analysis Overview

3.3.1.1 Time course measurement and Spectra Analysis

The time course measurement program has the following functions.

- Measurement in two measurement modes
- 20°C temperature correction of optical rotation data
- Automatic measurement upon opening/closing the sample chamber lid
- Automatic stop of analyzer after measurement
- Automatic filter recognition function
- Blank measurement and saving
- Setting measurement start time
- Automatic saving of data
- Data text output
- Temperature control (option)
- Sample sipper (option)

The time course measurement program has no function for printing out a time course curve. A time course curve can be printed from the spectrum analysis program.

The main functions of the spectrum analysis program are:

- Saves, loads and prints out spectra (or time course curves)
- Copies the spectrum (or time course curve) to the clip board, copies between Views and deletes spectra.
- Data processing

3.3.1.2 Operating procedure for the time course measurement program

Start up the time course measurement program	Refer to Section 3.3.2.1.
↓	
Set parameters	Refer to Section 3.3.2.2.
↓	
Prepare for measurement and clear to zero	Refer to Section 3.3.2.3.
↓	
Blank setting	Refer to Section 3.3.2.4.
↓	
Sample measurement	Refer to Section 3.3.2.5.
↓	
Save the time course curve	Refer to Section 3.3.2.6.
↓	
Print	Refer to Section 3.3.2.7.

3.3.1.3 Operating procedure for the Spectra Analysis program

Start up Spectra Analysis program — Refer to Section 3.3.3.1.

↓

Load and print spectra — Refer to Section 3.3.3.2.

↓

Exit (shut down the instrument)

3.3.2 Operation of the time course measurement program

3.3.2.1 Time course measurement program startup

Double click on [Time Course] in the [Measurement] pane of the [Spectra Manager] window.

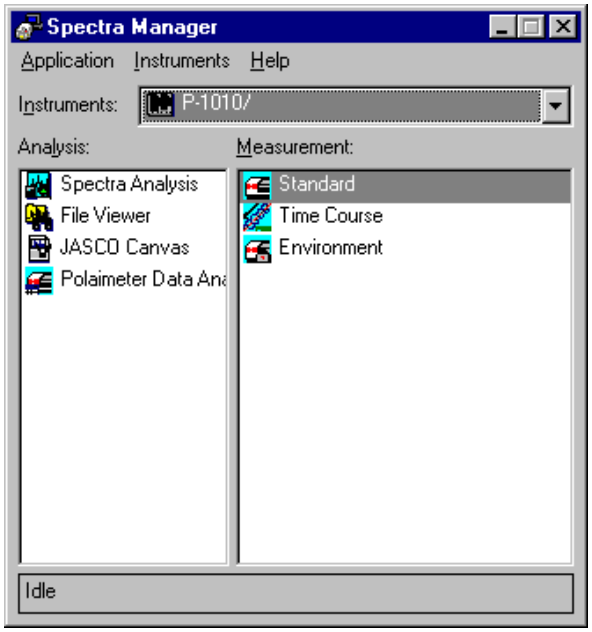


Fig. 3.13 [Spectra Manager] window

The message "Initializing" is displayed. After a while, the time course measurement program starts up and the following window appears (see Fig. 3.14).

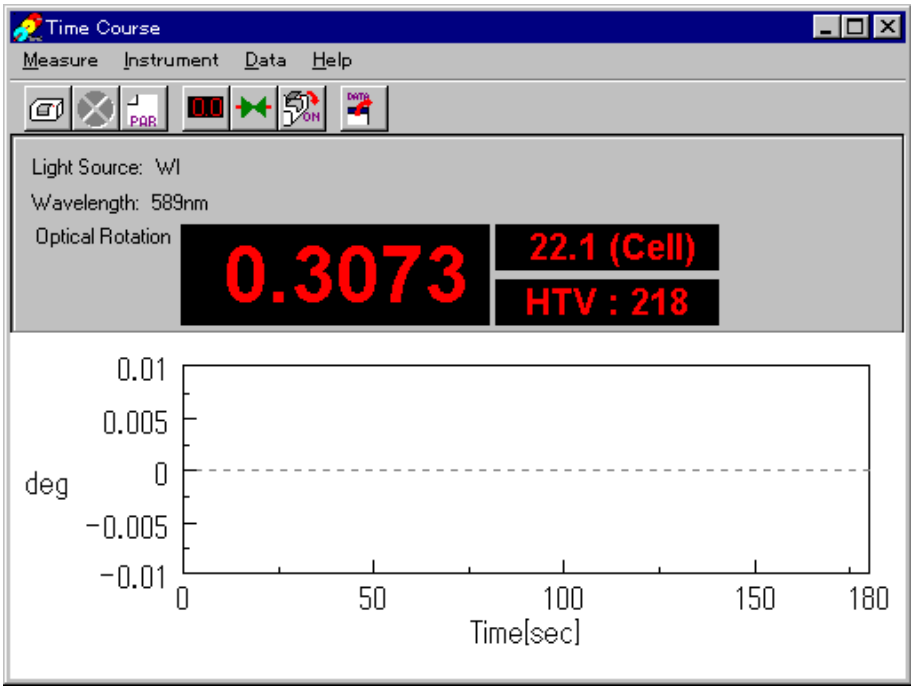


Fig. 3.14 [Time Course] window

3.3.2.2 Setting measurement parameters

(1) Select [Parameter] from the [Measure] menu in the [Time Course] window. The [Measurement Parameter] dialog box appears which contains five tabs as shown below (see Fig. 3.15).

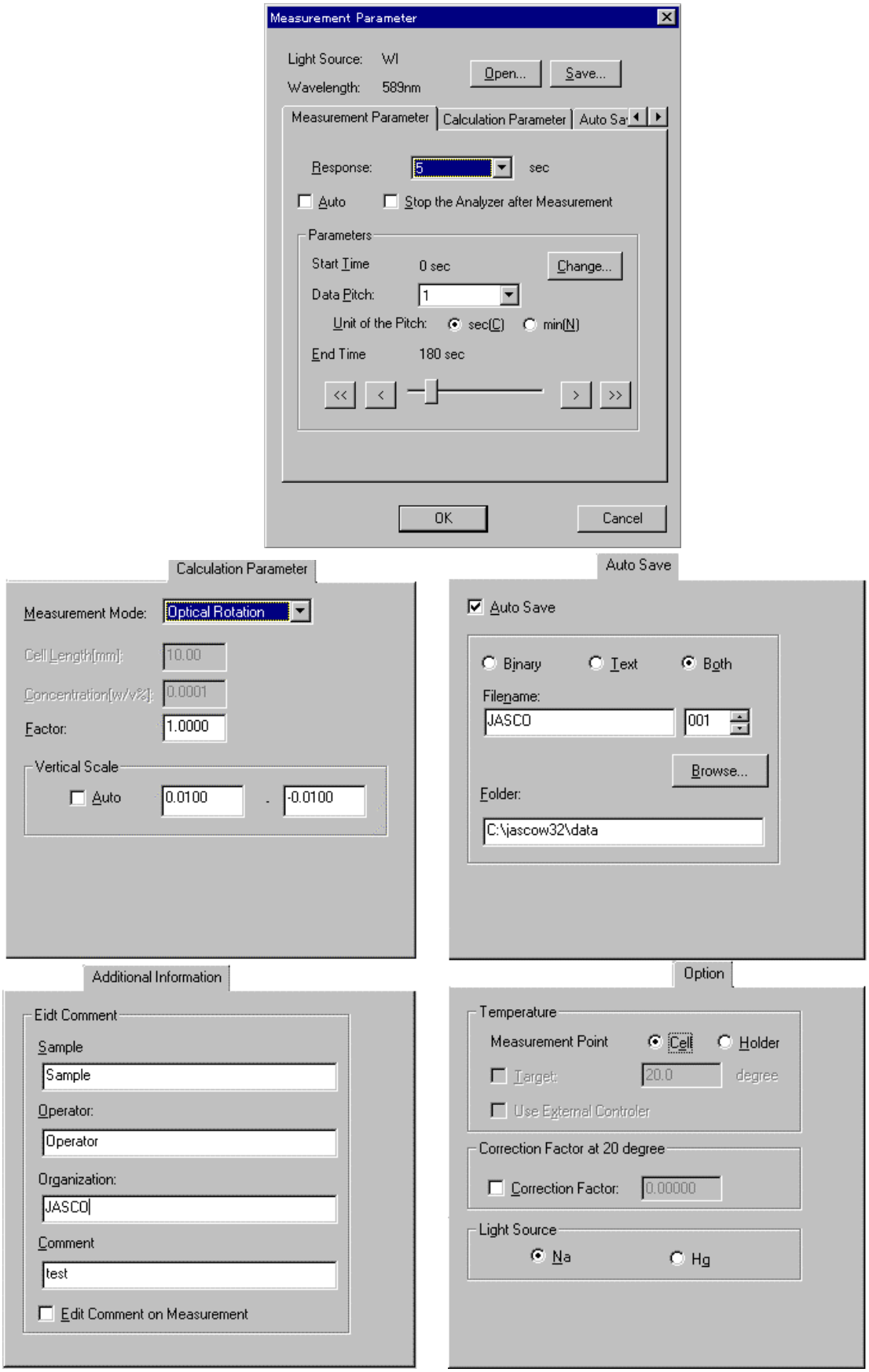


Fig. 3.15 [Measurement Parameter] dialog box

- [Measurement Parameter] tab
  Contains the response and temperature parameters as well as others.
- [Calculation Parameter] tab
  The measurement mode can be changed over and/or the corresponding calculating conditions in each mode can be set.
- [Auto Save] tab
  The automatic saving function can turned on/off, and the save filename and save destination can be set.
- [Additional Information] tab
  Sample name, operator, organization and comment can be entered.
- [Option] tab
  Contains the temperature, temperature measuring point and light source parameters (for P-1030 only).

(2) Change parameters

Assuming parameters are set as shown in Fig. 3.15, the following parameter changes are described as an example.

• Response	5 sec	→	1 sec
• Automatic measurement	OFF	→	ON
• Measurement start time	0 sec	→	10 sec
• Acquisition time	5 sec	→	1 sec
• Acquisition time unit	sec	→	min
• Measurement end time	180 sec	→	300 sec
• Measurement mode	Optical rotation	→	Specific optical rotation
• Vertical axis scale	0.01	→	1
• Automatic saving	OFF	→	ON
• Save contents	Text	→	Spectra
• Filename			
• Save destination			
• Additional information			
• Temperature measuring point	Cell	→	Holder
• Temperature correction factor	0.0000	→	0.0250
• Light source	Na	→	Hg (For P-1030 only)

a) Response: 5 sec → 1 sec

Change to the [Measurement Parameter] tab if not already displayed. is a drop-down box. Click on the arrow at the extreme right of the [Response] drop-down box. Registered parameters are listed, click on [1].

b) Automatic measurement: OFF → ON

In the [Measurement Parameter] tab, place a check in the [Auto] check box to activate automatic measurement.

c) Measurement start time: 0 sec → 10 sec

In the [Measurement Parameter] tab, click on the <Change...> button. The [Measurement Setting] dialog box appears. Enter 10 in the [Start Time] text box.

d) Acquisition time unit: sec → min

In the [Measurement Parameter] tab, click on the [min] option button to the right of [Acquisition time unit].

e) Measurement end time: 180 sec → 300 sec
In the [Measurement Parameter] tab, drag the [End Time] slider or click on the < <<< >, < < > < > > or < >>> > buttons to set the desired time.

f) Measurement mode: Optical rotation → Specific optical rotation
Change to the [Calculating Parameter] tab. Click on the arrow at the extreme right of the [Measurement mode] drop down box. Measurement modes are listed, click on [Specific Optical Rotation].

g) Vertical axis scale: 0.01 → 1
In the [Calculation Parameter] tab, enter 1 in the [Vertical Scale] text box.
Place a check in the [Auto] check box to activate auto scale.

h) Automatic save: ON → OFF
Change to the [Auto Save] tab. Place a check in the [Auto Save] check box to activate the automatic save function.

i) Save contents: Text → Spectra
In the [Auto Save] tab, click on the [Binary] option button of the [Save Contents] group.

j) Automatic save filename and extension
In the [Auto Save] tab, enter a filename in the [Filename] text box (a file extension is not required). The file extension is the sample number, which is incremented by one each time the sample is measured (999 is followed by 000). Enter the initial value in the text box at the right.

Note: If a file of the same name exists in the save destination directory, the file will be overwritten.

k) Save destination
In the [Auto Save] tab, enter the path of the save destination directory in the [Folder] text box. It can also be designated by opening the <Browse...> dialog box and navigating to the desired save destination folder.

l) Additional information
Change to the [Additional Information] tab. Enter the appropriate information in the text boxes within 128 alphanumeric characters.

m) Temperature measurement point: Cell → Holder
Change to the [Option] tab. Click on the [Holder] option button to the right of [Measurement Point].

n) Temperature correction factor: 0.0000 → 0.0250
In the [Option] tab, place a check in the [Correction Factor] check box. The text box at the right is activated. Enter 0.0250.

o) Light source: Na → Hg (for P-1030 only)
In the [Option] tab (for P-1030 only) click on the [Hg] option button in the [Light source] group. Change the filter to one compatible with the selected light source (see Table 3.1).

(3) To save parameters, click the <Save...> button to open the [Parameter – Save As] dialog box. Navigate to the desired destination folder, enter a filename and click the <Save> button. Parameter files are saved with a ".par" file extension.

(4) To load a previously saved parameter file, click the <Open…> button to display the [Parameter - Open] dialog box. Navigate to the desired folder, select the desired file and click the <Open> button. The following dialog box is displayed while the Parameters are transferred to the P-1000.

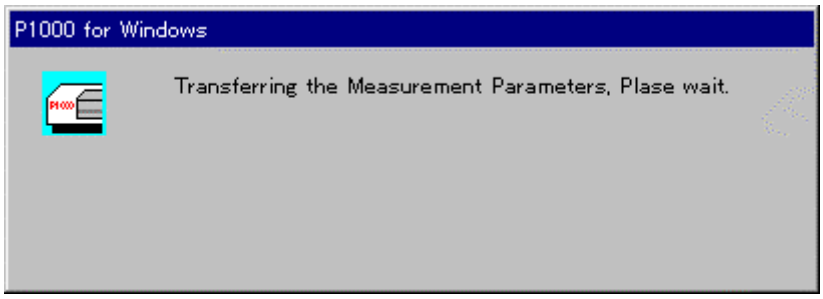


Fig. 3.16 Message box display during parameter transfer

3.3.2.3 Preparations for measurement and clearing to zero

(1) Check the sample chamber aperture
Open the sample chamber lid and adjust the aperture at the left of the cell holder to the diameter of the cell to be used. Use an 8mm rectangular cell or a 3mm or 1.8mm micro cell.
(2) Clear to zero (set optical rotation to zero)

a) Make sure the sample chamber is empty.
b) Click on [Zero Clear] in the [Measure] menu.

3.3.2.4 Blank setting

Select [Blank Setting] from the [Measure] menu in the [Time Course] window. The [Blank Setting] dialog box (see Fig. 3.17) opens. This dialog box allows blank correction to be turned on/off, blank measurement to be performed, direct input of blank values, and saving/loading of blank values.

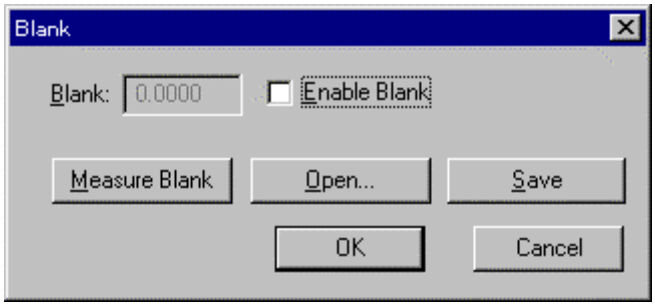


Fig. 3.17 [Blank] dialog box

The blank value set here is subtracted from the optical rotation data sent from the P-1000 and is reflected in the monitored/measured results. The raw data obtained by the instrument is optical rotation. For measurement modes other than optical rotation, data is calculated from the raw

data using a conversion equation (4.1.1). The blank value is subtracted from the optical rotation raw data and is converted for each measurement mode.

Note: The result obtained by measuring an unknown sample cannot be subjected to blank correction.

(1) To activate blank correction, place a check in the [Enable Blank] check box. The current value shown in the [Blank] text box is used.
(2) Blank measurement

a) Put solvent in the cell and set it in the sample chamber.
b) Click on the < Measure Blank > button. The blank is measured and the measured value appears in the [Blank] text box.

Note: If [Auto Measure ON (A)] is activated, closing the sample chamber lid starts blank measurement.

(3) To set the blank value directly, activate blank correction using the procedure in (1) and enter a value directly into the [Blank] text box.
(4) Saving the blank value

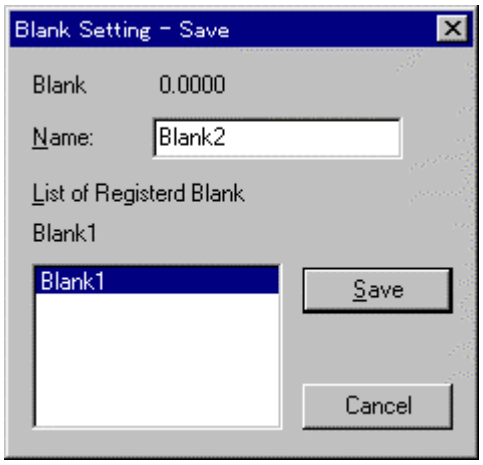


Fig. 3.18 [Blank Setting - Save] dialog box

a) Click on the <Save> button in the [Blank Setting] dialog box. The [Blank Setting - Save] dialog box opens (see Fig. 3.18).
b) Enter a name in the [Name] text box (up to 22 alphanumeric characters can be inputted.)
c) Click on the <Save> button to save the blank and close the [Blank Setting - Save] dialog box.

(5) Loading a blank value

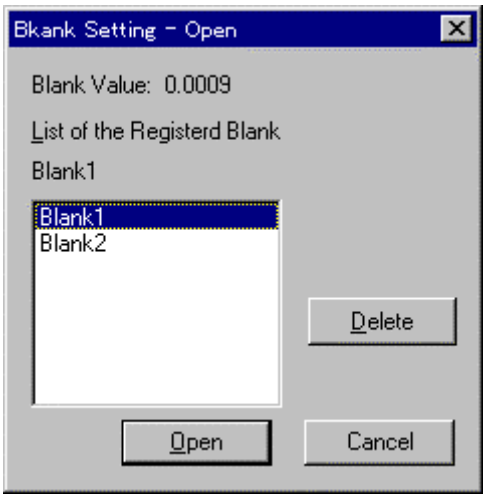


Fig. 3.19 [Blank Setting - Open] dialog box

a) Click on the <Open> button in the [Blank Setting] dialog box. The [Blank Setting - Open] dialog box opens and the saved blanks are listed (see Fig. 3.19).
b) Select a blank file to be loaded and click on the <OK> button. The blank value is automatically loaded in the [Blank] text box in the [Blank] dialog box.
c) A blank file can be deleted by selecting it from the list and pressing the <Delete> button.

(6) Exit
Click on the <OK> button in the [Blank Setting] dialog box. The dialog box closes and the changes are applied.

3.3.2.5 Unknown sample measurement

(1) Set a sample in the cell holder.
(2) If the temperature measuring point is set to "Cell", insert the "Cell inside measuring temperature sensor" into the cell. Ensure that the top of the thermometer interrupts the incident beam.
(3) Select [Start Measurement] from the [Measure] menu in the [Time Course] window. Measurement is executed and the measurement result appears.
(4) If either [Binary] or [Both] is used to save the data, the spectrum analysis program will start automatically and the time course curve will appear in the View. The time course curve can be printed out using the spectrum analysis program.

Note: If [Auto Measure ON (A)] is activated, closing the sample chamber lid will start unknown sample measurement.

<Cautions in handling the cell>

(1) Use the same cell in unknown sample measurement and blank measurement. Before changing the sample in the cell, wash it with the same type of sample a few times in order to rinse away the previous sample used.

(2) Set the cell on the cell holder in the same position and same orientation. Setting it in a different position or orientation will adversely effect data repeatability.
(3) Ensure that the sample liquid surface does not interrupt the incident beam. Remove any bubbles from the cell walls.

3.3.2.6 Saving the measurement results

The measured time course curve can be saved as follows.

(1) Select [Data Save...] from the [Data] menu in the [Time Course] window. The [Data Save] dialog box opens as shown below.

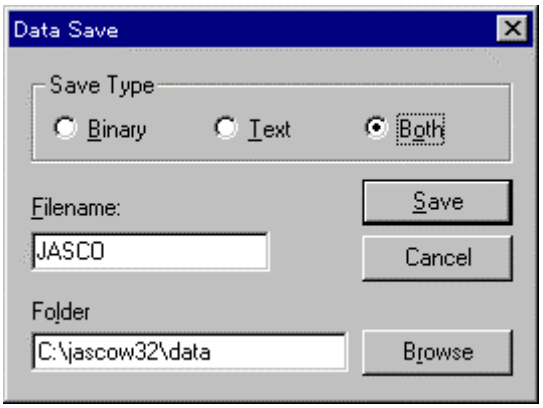


Fig. 3.20 [Data Save] dialog box

(2) Click on either [Binary], [Text] and [Both] in the [Save Type] group.

Binary: Saves the time course curve in JASCO spectrum format with the file extension .jws.
Text: Saves the time course curve in text format with the file extension .txt.
Both: Saves measurement data in both spectrum and text formats.

(3) Enter a filename in the [Filename] text box. A file extension is not required.
(4) Enter the path of the save destination directory in the [Folder] text box. The directory name can also be designated using the <Browse...> button.
(5) Click on the <OK> button.
(6) If [Binary] or [Both] is used to save the data, the spectrum analysis program will start automatically and the time course curve will appear in the View. The time course curve can be printed using the Spectrum Analysis program.

3.3.2.7 Printing the measurement results

To print measurement results, save the measured time course curve in JASCO format (Refer to Section 3.3.2.6) and open the file in the Spectrum Analysis program. The data can be printed using the Spectra Analysis program. (Refer to Section 3.3.3.2).

3.3.3 Spectra Analysis program operations

Printout of spectra (time course curves) that is one of the spectrum analysis functions is described below.
The spectrum analysis program can also execute data processing (peak picking, derivative, difference spectrum calculation, etc.), change of display style (scale, color, line style, etc.) and other functions releated to spectra. Refer to the "Instruction manual for spectrum analysis program" for more information.

3.3.3.1 Starting up Spectra Analysis program

Double click on [Spectra Analysis] in the [Analysis] pane of the [Spectra Manager] window. The spectrum analysis program starts and the following window opens.

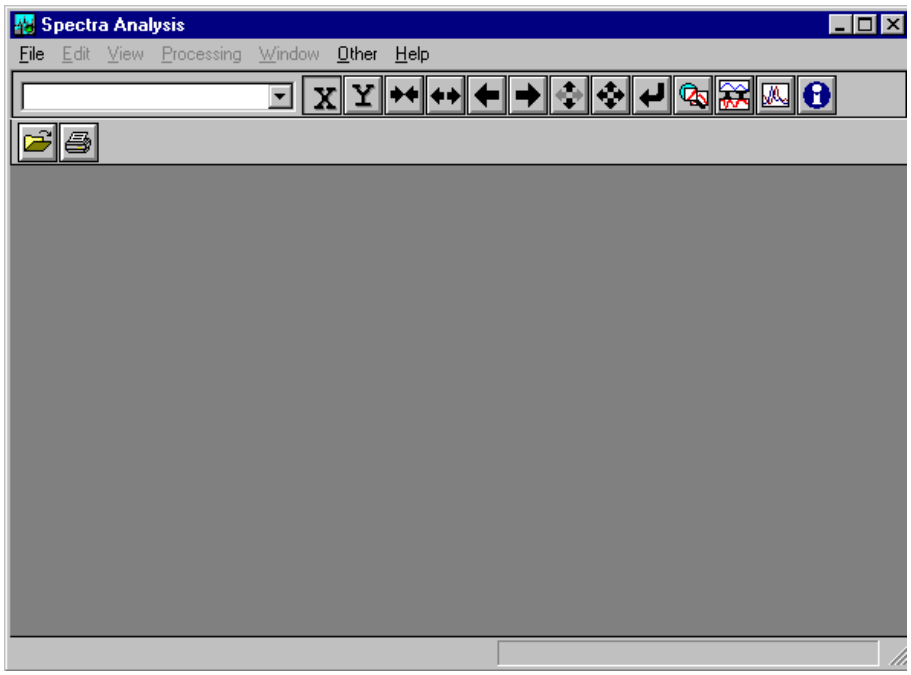


Fig. 3.21 [Spectra Analysis] window

The [Spectra Analysis] program starts automatically after completion of measurement if the Auto Save function is active. It also starts automatically when ″Save Data″ is executed.

3.3.3.2 Loading and printing spectra

To load previously saved spectra (time course curves), select [Open] from the [File] menu to display the [Open New File] dialog box. Navigate to the desired folder, select the desired file and click the <Open> button. The designated spectrum is displayed in a new View. To print the spectrum, select [Print] from the [File] menu.

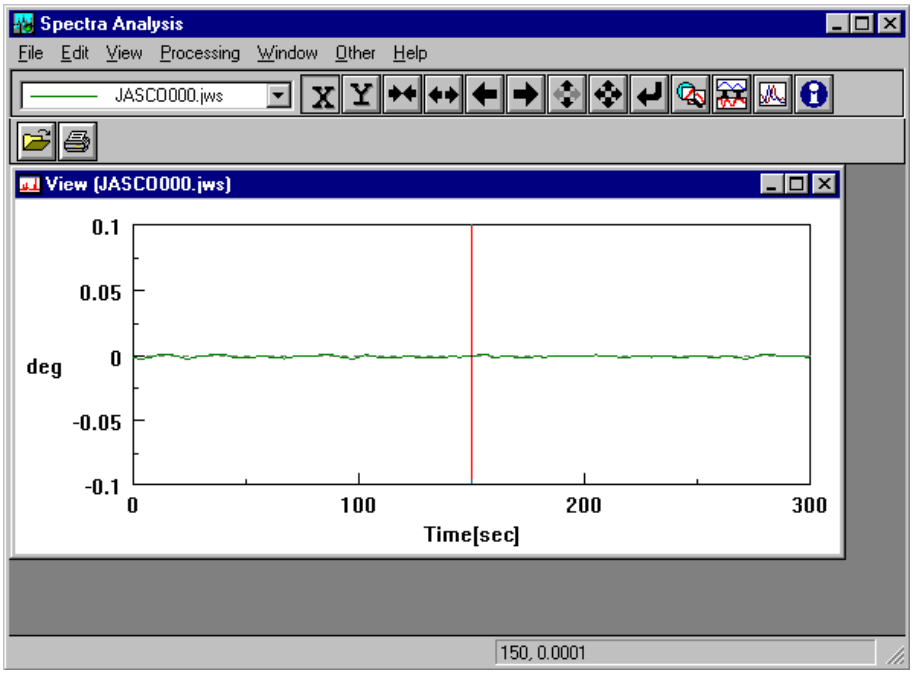


Fig. 3.22 Spectrum analysis [View] window

4 Measurement Program: Reference

4.1 [Standard] Program

4.1.1 Data Modes

Alpha: Optical rotation is the angle by which the plane of polarization rotates when polarized light passes through a sample. This is the fundamental value that is measured directly (in units of degrees) by the P-1000 series.

The optical rotation displayed on the screen is the temperature-corrected value after subtracting the blank value. The temperature correction expression is given below.

$$\alpha^{20} = \frac{\alpha^{t}}{1 + k(t - 20)}$$

α^{20} : Optical rotation corrected at 20°C
α^{t} : Optical rotation measured at t°C
t : Temperature measured by sensor
k : Temperature correction factor

The blank correction expression is given below.

$$\alpha = \alpha^{20} - \alpha_{blank}$$

α : Corrected optical rotation
α^{20} : Optical rotation corrected at 20°C
α_{blank} : Blank

[Alpha]: The specific optical rotation [α] is expressed by the following formula and is a material constant based on a standard concentration and cell length. This is the value mainly recorded in litarature.

$$[\alpha] = \frac{\alpha}{CL} \times 10000$$

α : Optical rotation (deg)
C : Concentration (W/V% or g/100 ml)
L : Cell length (mm)

For specific optical rotation measurement, be sure to input a concentration (W/V%) and cell length (mm).

Conc.: This data mode is used to find the sample concentration when the specific optical rotation is already known. Concentration C is expressed by the following formula.

$$c = \frac{\alpha}{[\alpha]L} \times 10000$$

α : Optical rotation (deg)
[α] : Specific optical rotation (deg)
L : Cell length (mm)

For concentration (W/V%) measurement, be sure to input a specific optical rotation and cell length.

Sugar: Sugar scale Z is expressed by the following formula.

$$Z = \frac{\alpha}{17.313 \times L} \times 10000$$

α : Optical rotation (deg)
L : Cell length (mm)
17.313 : Sugar scale factor

For sugar scale Z measurement, be sure to input a cell length (mm).

Brix purity: Brix purity is determined by using the calculation below. This is used in the quality control of sugar types.

Brix optical rotation: R

$$R = \frac{\alpha}{17.313 \times L} \times 10000$$

α : Optical rotation
17.313 : Sugar scale factor
L : Cell length (mm)
Temperature correction factor : -0.00037

Brix sugar scale: S

$$S = \frac{26}{99.718 \times Specific\ \ gravity} \times R$$

R : Brix optical rotation
Specific gravity : Value obtained from Table 5.1

Brix purity: Y

$$Y = \frac{S}{\text{Brix concentration}} \ X \ 100(\%)$$

S : Brix sugar scale
Brix concentration : Key entry

Specific gravity is required to calculate the Brix sugar scale. The specific gravity can be obtained from Table 4.1 based on the Brix concentration (value measured by the Brix meter). When the fractional value (after the decimal point) of the Brix concentration is input, the value is linearly supplemented, then calculation is performed.

For, Brix purity measurement, be sure to a input cell length (mm) and Brix concentration.

Table 4.1

Brix conc.	Specific gravity	Brix conc.	Specific gravity	Brix conc.	Specific gravity
0	1.00000	14	1.05677	28	1.11949
1	1.00389	15	1.06104	29	1.12422
2	1.00779	16	1.06534	30	1.12898
3	1.01172	17	1.06968	31	1.13378
4	1.01567	18	1.07404	32	1.13861
5	1.01965	19	1.07844	33	1.14347
6	1.02366	20	1.08287	34	1.14837
7	1.02770	21	1.08733	35	1.15331
8	1.03176	22	1.09183	36	1.15828
9	1.03586	23	1.09636	37	1.16329
10	1.03998	24	1.10092	38	1.16833
11	1.04413	25	1.10551	39	1.17341

12 13	1.04831 1.05252	26 27	1.11014 1.11480	40	1.17853

Optical purity: Optical purity indicates the mixture percentage of enantiomers and is expressed as follows:

Optical purity (%) = $100\times[\alpha]s/[\alpha]o = 100\times\{(R) - (S)\}/\{(R)+(S)\}$

$[\alpha]_s$: Specific optical rotation of sample

$[\alpha]_o$: Specific optical rotation of standard

(R) : Concentration of R-optical isomer

(S) : Concentration of S-optical isomer

4.1.2 Measurement screen

The [Standard] window is the basis of operations for the Optical Rotation Measurement program. This window displays the light source, filter, and instrument. It also displays measurement results and allows the sample number and comments to be monitored/set.
Starting up the Optical Rotation Measurement program opens the following window.

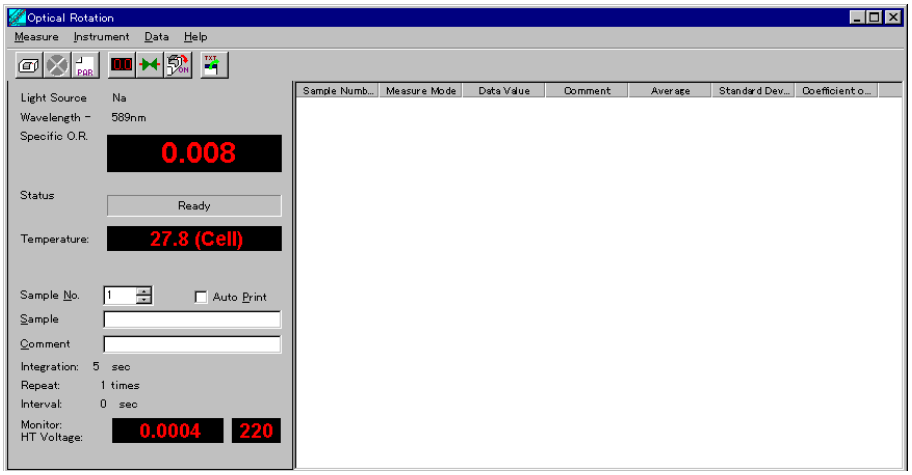


Fig. 4.1 [Standard] window

4.1.2.1 Monitor display

[Light source]	Displays the currently selected light source.
[Wavelength]	Detects the currently mounted filter (filter holder) and displays the wavelength.
"589 nm"	The program is able to detect 15 filters. The wavelengths that can be displayed range from 253 to 880 nm.
"User nm"	Displayed when a filter which is not recognized is mounted by the user or when a filter which is not compatible with the P-1000 series is mounted.
"--- nm"	No filter is set.
[Status]	Displays the instrument status.
[Auto]	Displays the automatic measurement setting status if the automatic measurement is ON.

[Measurement Mode] Displays a set measurement mode. Optical rotation is converted and monitored according to the measurement mode. If the analyzer is stopped, "----.----" will be displayed.

[Temperature °C] Displays the temperature and the temperature measuring point. The temperature measuring point is enclosed in brackets:

(Holder)	Cell holder thermometer
(Cell)	Thermometer in the cell
(Ext.)	Temperature information from optional accessory

[Auto print] When this box is checked, data is automatically printed after measurement.

[Integration] Displays an integral time.

[Repeat] Displays the number of times measurement will be repeated.

[Interval] Displays the time interval for repeat measurements.

[Monitor] Displays optical rotation data received from the P-1000. This value is raw data before blank correction and conversion for measurement modes other than optical rotation.

[HT Voltage] Displays the photomultiplier tube voltage.

4.1.2.2 Entering sample number, name and comment

[Sample No.] Displays the sample number and allows the sample number to be set. The sample number is incremented by one each time measurement is performed. The setting range is 000 to 999.

[Sample] A sample name can be entered. The sample name is applied to the next measurement.

[Comment] A comment can be entered. The comment is applied to the next measurement.

4.1.2.3 Displaying the measurement results

Measurement results are listed in table format in the [Standard] window. The latest measurement result is displayed on the top line.

[Sample No.] Displays the sample number. For repeat measurements, the number is enclosed in brackets. "(xx/yy)" means that the measurement is the xx-th of the set number of repeat measurements yy.

[Measurement Mode] Displays the data measurement mode.

[Data Value] Displays the measurement result.

[Comment] Displays a comment.

[Average] Displays the average value of the repeat cyclic measurement data. Calculated for all data up to and including the latest measurement result. The average (Avg.) is given by:

$$Avg. = \frac{1}{n}\sum_{i=1}^{n} Xi$$

n: Number of measuring points ([Repeat] value)
Xi: Data array (optical rotation, etc.)

[Standard Deviation] Displays the standard deviation of the repeat measurement data. Calculated for all data up to and included the latest measurement result. The standard deviation (SD (δn - 1)) is given by:

$$SD = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(Xi = \overline{X})^2}$$

n: Number of measuring points ([Repeat] value)
Xi: Data array (optical rotation, etc.)

[Coefficient of Variation] Displays the coefficient of variation of the repeat measurement data. Calculated for all data up to and including the latest measurement result. The coefficient of variation (RSD [%]) is expressed by:

$$RSD = \frac{SD}{\overline{X}} \times 100$$

SD: Standard deviation
$\overline{X}$: Average (Avg.)

4.1.3 [Measure] menu

The [Measure] menu is shown below (see Fig. 4.2).



Fig. 4.2 [Measure] menu

Menu item	Description
[Start] and [Stop]	Starts measurement. During measurement, [Stop] is displayed.
[Print Result]	Prints measurement data. During printing, a [Printing] message box is displayed. Click on the <Cancel> button to stop printing.
[Zero Clear]	Clears the optical rotation to zero. The optical rotation data is averaged using the [Integration] time set in the [Measurement Parameter] dialog box. Therefore, the time required to clear depends on the [Integration] setting.
[Parameter...]	Displays the [Measurement Parameter] dialog box used to set parameters. Refer to Section 4.1.3.1 for detailed explanation.
[Print Item…]	Displays the [Select Print Topic] dialog box used to set print items. Refer to Section 4.1.3.2 for detailed explanation.

[Blank…]	Displays the [Blank] dialog box used to set a blank value for blank correction. Refer to Section 4.1.3.3 for detailed explanation.
[Exit]	Exits the Optical Rotation Measurement program.

4.1.3.1 [Parameter...]

Displays the parameter setting screen (see Fig. 4.3).

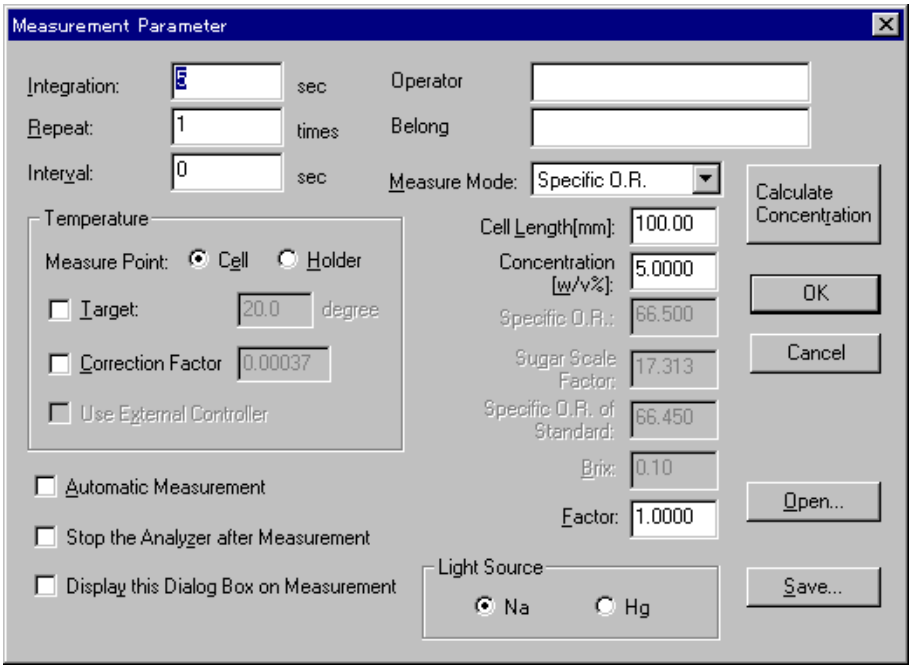


Fig. 4.3 [Parameter] dialog box

[Integration] Sets the integral time. The setting range is 0 to 100 sec.

[Repeat] Sets the number of repeat measurements.
The setting range is 1 to 99.

[Interval] Sets the time interval between repeat measurements. The setting range is 0 to 15000 sec.

Note: One measurement takes (integral time + α). Therefore, set the measurement interval to be greater than the integral time for it to be effective.

Temperature group

[Measure Point] Switches between the thermometer on the cell holder (Holder) and the thermometer in the cell (Cell).

[Target] Turns temperature controls either on or off. When temperature control is on, the text box to the right is active and the temperature can be set. The temperature setting range is 15.0 to 40.0°C for the internal temperature controller or according to the specifications of the external temperature controller, if provided.

[Correction Factor] Optical rotation can be corrected to the optical rotation value at 20°C using optical rotation data, the temperature and temperature correction factor. When temperature correction is on, the text box to the right is active and the temperature correction factor can be set. The setting range is -0.9999 to 0.9999.

[Use External Controller]
Only activate if an external temperature controller is connected.

[Automatic Measurement]
Measurement is automatically started by opening and closing the sample chamber lid. Automatic measurement is active when the box is checked.

[Stop the Analyzer after Measurement]
The analyzer is stopped except when measurement is being made. This is to reduce the wear of the analyzer gear. This function is activate when the box is checked.

[Display this Dialog Box on Measurement]
Displays the [Measurement Parameter] dialog box at the start of each measurement. This function is activate when the box is checked.

[Operator] Operator name can be set. The operator name is applied to subsequent measurements.

[Belong] Organization name can be set. The organization name is applied to subsequent measurements.

[Measure Mode] Sets the measurement mode. The available measurement modes are optical rotation, specific optical rotation, concentration, sugar scale, Brix purity and optical purity.

[Cell Length] Sets the light path length of the cell. The setting range is 0.01 to 200.00 mm

[Concentration] Sets the concentration (W/V%) of the sample for specific optical rotation measurement. The setting range is 0.0001 to 100.00 W/V%.

<Concentrate Calculation>
Opens the [Concentrate Calculation] dialog box used to calculate the concentration (W/V%) from the sample solute mass and solvent volume (see Fig. 4.4).

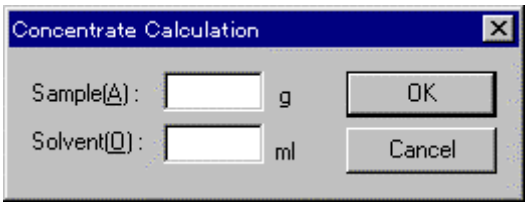


Fig. 4.4 [Concentrate Calculation] dialog box

[Sample] Enter the sample solute mass in g.

[Solvent] Enter the sample solvent volume in ml.

<OK> Calculates the concentration (W/V%) of the sample and displays the result in the [Concentration] field in the [Measurement Parameter] dialog box.

<Cancel> Closes the dialog box without calculating the concentration.

[Specific O.R.] Used in Concentration measurement mode. Enter the specific optical rotation of the Sample Factor. The setting range is -999.999 to 999.999.

[Sugar Scale] Used in Sugar Scale measurement mode. Enter the sugar scale factor of the sample. The setting range is 17.000 to 18.000.

[Standard Specific O.R.of Standard] Enter the standard specific optical rotation of sample in optical purity measurement. The setting range is -999.99 to 999.99.

[Brix] Use din Brix measurement mode. Enter the Brix degree of the sample. The setting range is 0.100 to 40.000.

[Factor] Enter a multiplication factor for correcting the calculation result in each measurement mode. The setting range is 0.0001 to 10.0000.

[Light Source] <<Displayed for P-1030 only>> The internal light source can be changed over from Na to Hg or vice versa.

<Save...> Displays the [Parameter - Save As] dialog box used to save the current parameters.

<Open> Displays the [Parameter - Open] dialog box used to load parameters.

<OK> Applies the current parameter setting changes, transfers them to the instrument and closes the dialog box.

<Cancel> Cancels the current parameter setting changes and closes the dialog box.

If any invalid parameter settings exist, the following error message appears (Fig. 4.5).

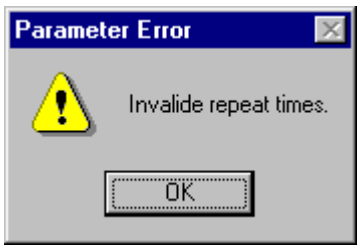


Fig. 4.5 Error message box displayed when invalid parameter settings exist.
Example: repeat times

Click the <OK> button to close the message box and return to the [Measurement Parameter] dialog box. The cursor position automatically moves to the incorrect parameter. Correct the parameter setting in order to proceed.

4.1.3.2 [Print Item]

Opens the [Select Print Topic] dialog box (see Fig. 4.6) used to set the items to be printed.

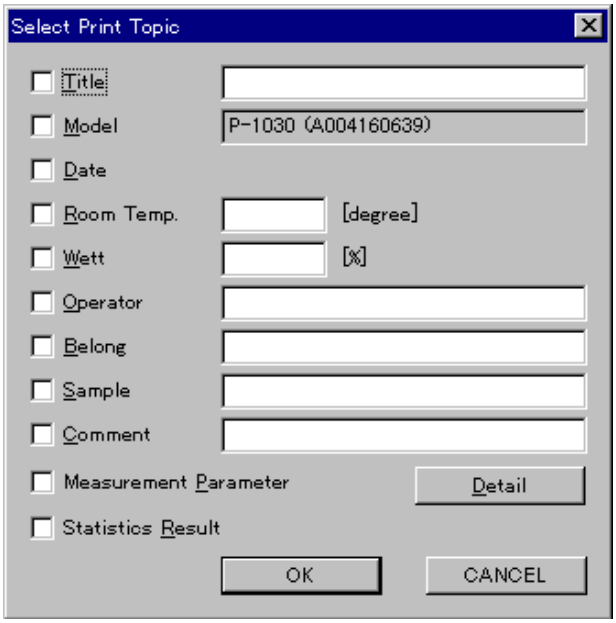


Fig. 4.6 [Select Print Topic] dialog box

Print items can be activated by placing a check in the desired check box(es).

[Detail] Displays the [Detail] dialog box (see Fig. 4.7). Additional print items can be activated by placing a check in the desired check box(es).

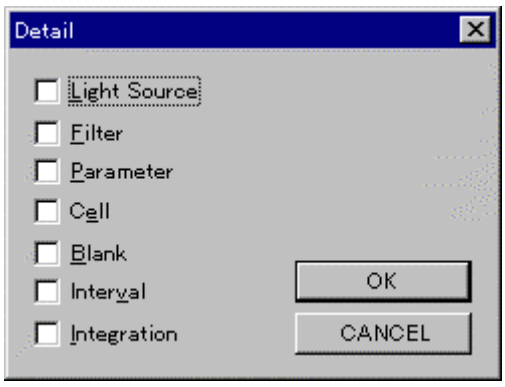


Fig. 4.7 [Detail] dialog box

<OK> Applies the print item settings and closes the dialog box.
<Cancel> Cancels the changes and closes the dialog box.

4.1.3.3 [Blank]

Opens the [Blank] dialog box (see Fig. 4.8) used to set the optical rotation blank value.

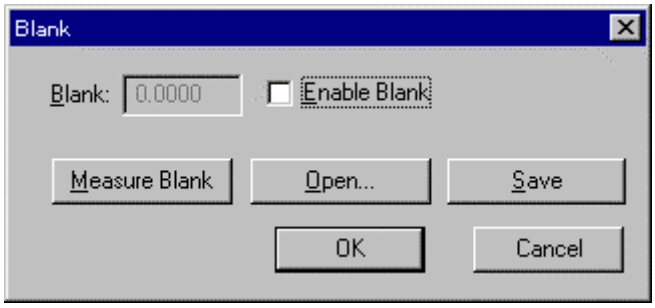


Fig. 4.8 [Blank] dialog box

[Enable Blank] Place a check in the check box to activate blank correction. The [Blank] text box becomes active. Blank correction is reflected in monitoring and measurement.

[Blank] Used to directly set the blank value. The setting range is -90.0000 to 90.0000.

< Measure Blank > Used to measure blank value. Set a blank sample in the sample chamber and click on this button to measure optical rotation. The measurement result is reflected in the [Blank] text box.

<Save...> Opens the [Blank Setting - Save] dialog box (see Fig. 4.9) used to save blank correction data.

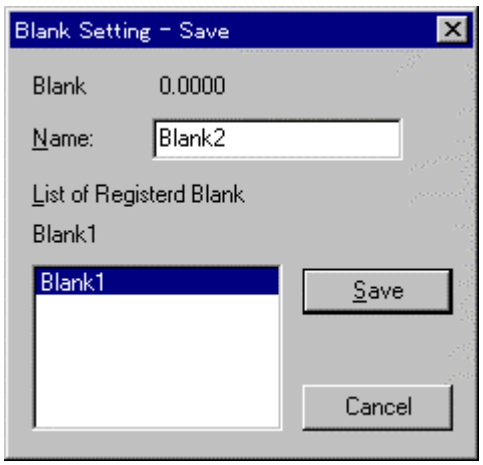


Fig. 4.9 [Blank Setting - Save] dialog box

[Blank] Displays the blank value to be saved.

[Name] Enter a name for the blank in the text box.

[List of Registered Blanks] Lists the currently registered blank data.

<Save> Saves the blank and closes the dialog box.

<Cancel> Cancels the changes and closes the dialog box.

<Open...> Opens the [Blank Setting - Open] dialog box (see Fig. 4.10) used to load registered blank data.

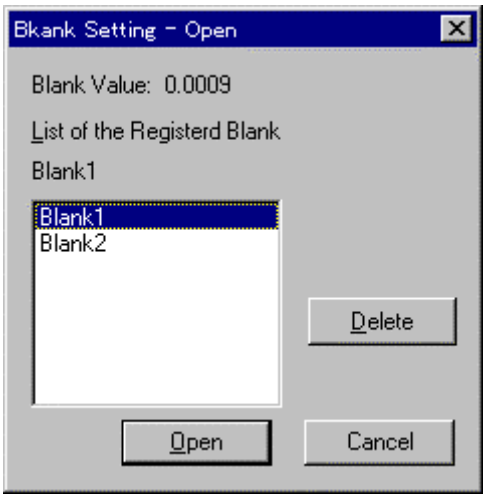


Fig. 4.10 [Blank Setting - Open] dialog box

[List of Registered Blank]
Lists the currently registered blank values.
[Blank Value] Displays the blank value of the currently selected blank name in the [List of Registered Blanks].
[Delete] Deletes the currently selected blank.
<Open> Loads the currently selected blank value in the [List of Registered Blanks] and closes the dialog box.
<Cancel> Cancels the changes and closes the dialog box.

<OK> Applies the changes and closes the dialog box.
<Cancel> Cancels the changes and closes the dialog box.

4.1.4 [Instrument] menu

The [Instrument] menu is shown below (see Fig. 4.11).

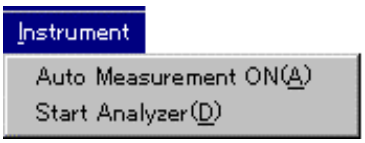


Fig. 4.11 [Instrument] menu

Menu item	Description
[Auto Measurement ON]	Displayed when automatic measurement is off. Select to turn automatic measurement on. When automatic measurement is on, closing the sample chamber lid starts measurement automatically. Measurement can be started manually by selecting [Start] from the [Measure] menu.
[Auto Measurement OFF]	Displayed when automatic measurement is on. Select to turn

	automatic measurement off.
[Start Analyzer (D)]	Displayed when the analyzer is stopped. Select to start the analyzer. During analyzer operation, data can be constantly monitored.
[Stop Analyzer (D)]	Displayed when the analyzer is operating. Select to stop the analyzer. Stopping the analyzer stops the action of the analyzer drive motor except during measurement. The analyzer starts when measurement starts and stops when measurement ends. Wear of the analyzer gear can be reduced, but data cannot be monitored except during measurement.

4.1.5 [Data] menu

The [Data] menu is shown below (see Fig. 4.12).

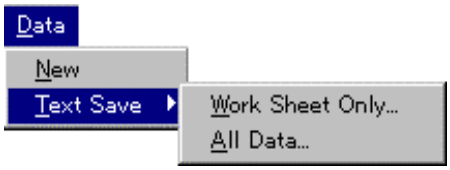


Fig. 4.12 [Data] menu

Menu item	Description
<New>	Creates a new blank worksheet. All data in the current work sheet is deleted. *Note: Once deleted, data cannot be restored.*
[Text Save...]	Data can be saved in one of two formats. Refer to Section 4.1.5.1 for detailed explanation.

4.1.5.1 [Text Save...]

Data can be saved in one of the two formats described below. Figure 4.13 shows the [Text Save-Worksheet only] dialog box.

[Text Save]-[Work Sheet Only]
Saves the contents of the work sheet, that is sample number, measurement mode, measurement data and statistical calculation results, in text format.

[Text Save]-[All Data] Saves the contents of the work sheet and parameter settings in text format.

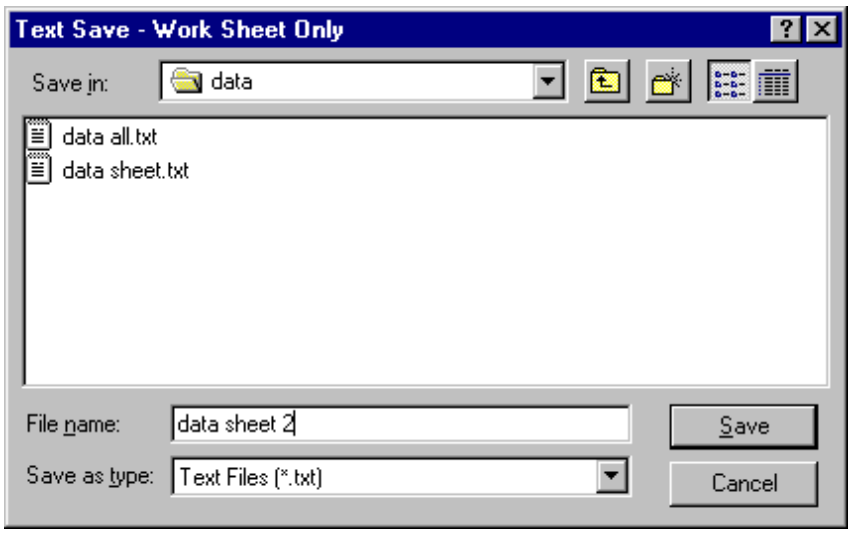


Fig. 4.13 [Text Save - Work Sheet Only] dialog box

Note: The maximum number of data points that can be saved is 500.

Note: With the exception of the title, the appearance and operation of the "Work Sheet Only" and "All Data" dialog boxes are the same.

4.1.6 [Help] menu

The [Help] menu is shown below (see Fig. 4.14).



Fig. 4.14 [Help] menu

Menu item	Description
[About...]	Opens the [About P-1000 Control Driver] dialog box which displays the version information of the measurement program.

4.2 [Time Course] Program

4.2.1 Data Mode Reference

Alpha: Optical rotation is the angle by which the plane of polarization rotates when polarized light passes through a sample. This is the fundamental value that is measured directly (in units of degrees) by the P-1000 series.

The optical rotation displayed on the screen is the temperature-corrected value after subtracting the blank value. The temperature correction expression is given below.

$$\alpha^{20} = \frac{\alpha^{t}}{1 + k(t - 20)}$$

α^{20} : Optical rotation corrected at 20°C
α^{t} : Optical rotation measured at t°C
t : Temperature measured by sensor
k : Temperature correction factor

The blank correction expression is given below.

$$\alpha = \alpha^{20} - \alpha_{blank}$$

α : Corrected optical rotation
α^{20} : Optical rotation corrected at 20°C
α_{blank} : Blank

[Alpha]: The specific optical rotation [α] is expressed by the following formula and is a material constant based on a standard concentration and cell length. This is the value mainly recorded in literature.

$$[\alpha] = \frac{\alpha}{CL} \times 10000$$

α : Optical rotation (deg)
C : Concentration (W/V% or g/100 ml)
L : Cell length (mm)

For specific optical rotation measurement, be sure to input a concentration (W/V%) and cell length (mm).

4.2.2 Measurement screen

The [Time Course] window is the basis of operations for the Time Course Measurement program. This window displays the current light source, filter, monitors, etc. Starting up the Time Course Measurement program opens the following window.

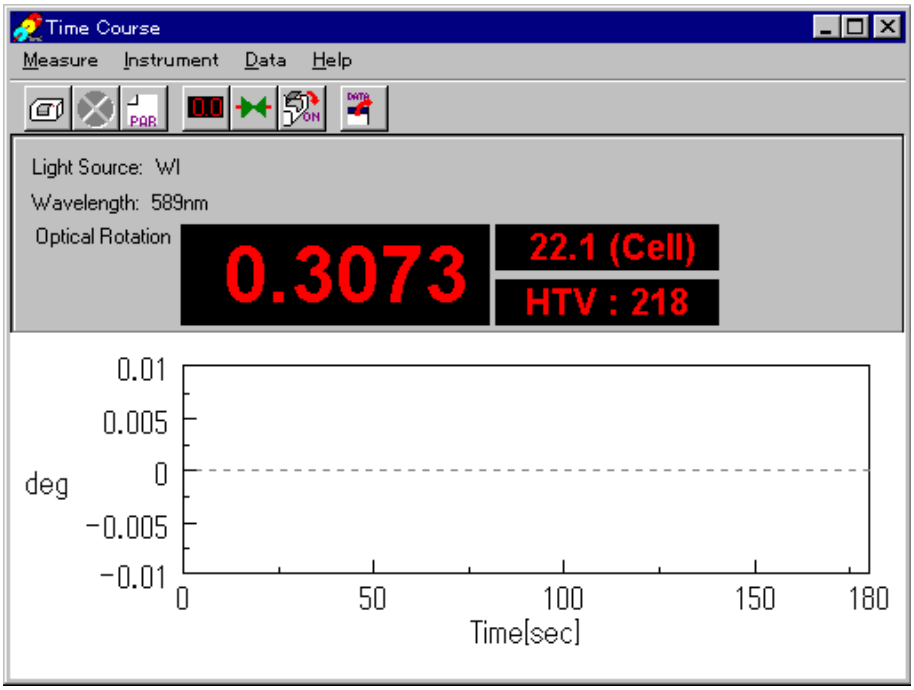


Fig. 4.15 [Time Course] window

[Light Source] Displays the currently selected light source.
[Wavelength] Detects the currently mounted filter (filter holder) and displays the wavelength.
"589 nm" The program is able to detect 15 filters. The wavelengths that can be displayed range from 253 to 880 nm.
"User nm" Displayed when a filter which is not recognized is mounted by the user or when a filter which is not compatible with the P-1000 series is mounted.
"--- nm" No filter is mounted.
[Measurement Mode] Displays the current measurement mode. Optical rotation data is converted and monitored according to the designated measurement mode. If the analyzer is not operating, "Turn off" is displayed.
[Temperature] Displays the temperature and the temperature measurement point. The temperature measurement point is enclosed in brackets.

(Holder) Cell holder thermometer
(Cell) Thermometer in the cell
(Ext.) Temperature information from optional accessory

[Monitor] Displays optical rotation data received from the P-1000. This value is raw data before blank correction and conversion for measurement modes other than optical rotation.
[HT Voltage] Displays the photomultiplier tube voltage.
[Time Course Graph] Displays a time course curve.
Horizontal axis: Time
Vertical axis: Measurement mode (optical rotation/specific optical rotation)

4.2.3 [Measure] menu

The [Measure] menu is shown below (see Fig. 4.16).



Fig. 4.16 [Measure] menu

Menu item	Description
[Start] and [Stop]	Starts measurement. During measurement, [Stop] is displayed.
[Zero Clear]	Clears optical rotation to zero. The optical rotation data is averaged using the [Integration] time set in the [Measurement Parameter] dialog box. Therefore, the time required to clear depends on the [Integration] setting.
[Parameter...]	Displays the [Measurement Parameter] dialog box used to set parameters. Refer to Section 4.2.3.1 for a detailed explanation.
[Blank…]	Displays the [Blank] dialog box used to set a blank value for blank correction. Refer to Section 4.2.3.2 for a detailed explanation.
[Exit]	Exits the Time Course Measurement program.

4.2.3.1 [Parameter...]

Displays the parameter setting screen (see Fig. 4.17).

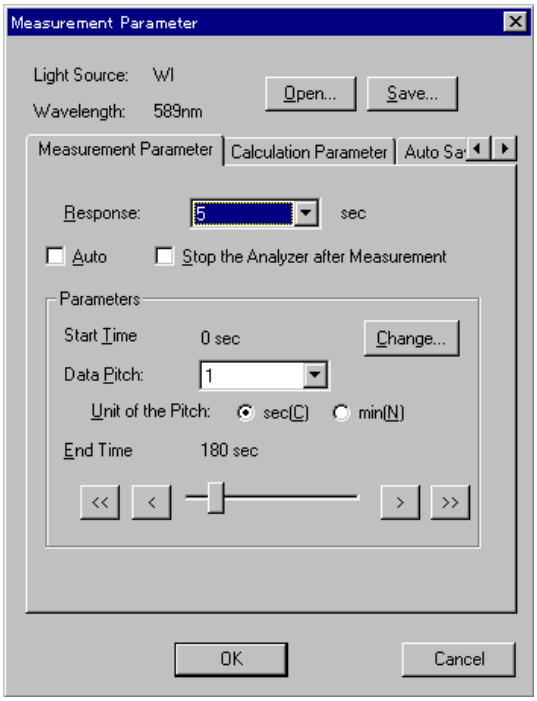


Fig. 4.17 [Parameter] dialog box ([Measurement Parameter] tab)

[Measurement Parameter] tab

[Response] Sets the response time. The setting range is 0 to 100 sec in 11 steps.

[Auto] Measurement is automatically started by opening and closing the sample chamber lid. Automatic measurement is active when the box is checked.

[Stop Analyzer after Measurement]
The analyzer is stopped except when measurement is being made. This is to reduce the wear of the analyzer gear. This function is active when the box is checked.

[Start Time] Displays the time delay after which measurement will start. To change, click on the <Change…> button to display the [Start Time] dialog box. Enter the time in the [Start Time] text box and click <OK>. The setting range is 0 to 60 sec.

[Data Pitch] Sets the time interval between data acquisition. The setting range is from 1 to 30 sec in eight steps.

[Unit of the Pitch] Changes the unit ([sec]/[min]) of the data acquisition time parameters. [End Time] Sets the time measurement will end. Use the < << >, < < > < > > or < >> > buttons to change the time. The setting range is from [Start Time] + [Data Pitch] ×11 to [Start Time] + [Data Pitch]×1201 sec.

Note: Changing [Start Time], [Data Pitch] or [Unit of the Pitch] may change the [End Time] setting. The measurement end time can be expressed by the following equation.

[End Time] = [Start Time] + [Data Pitch (Unit of the Pitch)] ×N (11≤N≤1201)

[Calculation Parameter] tab

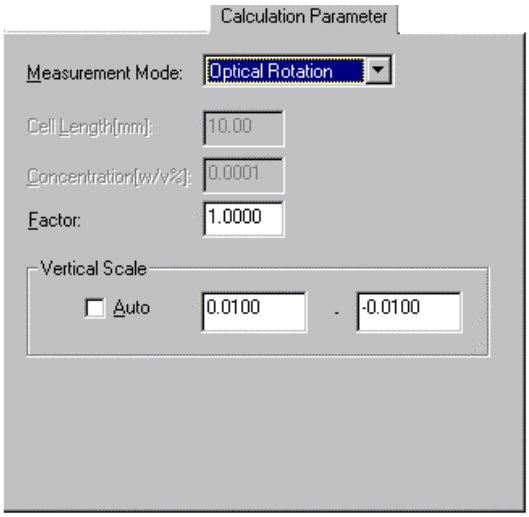


Fig. 4.18 [Calculation Parameter] tab

[Measurement Mode] Sets the measurement mode. The available measurement modes are optical rotation and specific optical rotation.

[Cell Length] Sets the light path length of the cell. Active only for specific optical rotation measurement. The setting range is from 0.01 to 200.00 mm.

[Concentration] Sets the concentration (W/V%) of the sample for specific optical rotation measurement. Active only for specific optical rotation measurement. The setting range is from 0.0001 to 100.00 W/V%.

[Factor] Input a multiplier for correcting the calculated result in each measurement mode. The setting range is from 0.0001 to 10.000.

[Vertical Scale] Sets the vertical axis scale of the time course curve. The setting range is from -100.0000 to 100.0000° when in [Optical Rotation] measurement mode, or from -9999.9999 to 9999.9999 when in [Specific Optical Rotation] measurement mode.

[Auto] Activates the automatic scale function. This function is active when the box is checked.

[Auto Save] tab

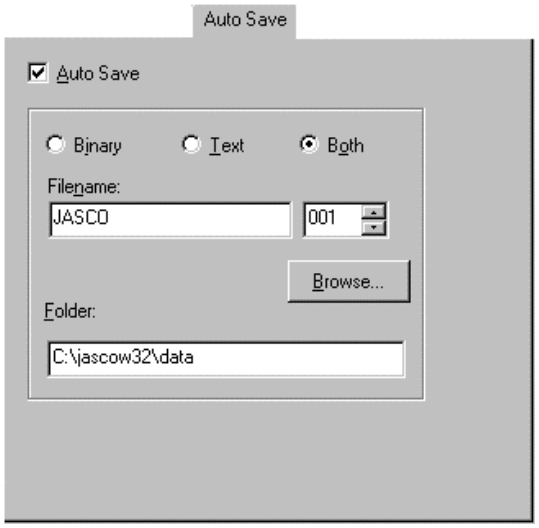


Fig. 4.22 [Auto Save] tab

[Auto Save] Activates the automatic saving function which automatically saves data in the designated directory in the designated format after measurement. The function is active when the box is checked.

Save Items Either [Binary], [Text] or [Both] can be selected. If [Binary] is selected, the spectrum (time course curve) is saved in JASCO spectrum format. If [Text] is selected, the time course curve data is saved in text format. If [Both] is selected, both [Binary] and [Text] are saved. If either [Binary] or [Both] is selected, the spectrum analysis program will start up after measurement and the spectrum (time course curves) will be automatically displayed in the View.

[Filename] Sets the auto save filename. Set an arbitrary name characterizing the data set in the left text box and a numeral corresponding to the sample number in the right text box. The setting range for the right text box is from 000 to 999. The sample number is incremented by one each time measurement is made. 999 is followed by 000.

[Folder] Sets the save destination directory. Enter the path of the save destination directory in the text box. It can also be designated by clicking the <Browse (B)...> button and navigating to the desired save destination folder.

Note: The [Binary] file extension is ".jsw" and the [Text] file extension is "*.txt". In the case of [Both], a [Binary] and a [Text] file are created.*

Note: If a file of the same name exists in the save destination directory, the file will be overwritten unconditionally.

[Additional Information] tab

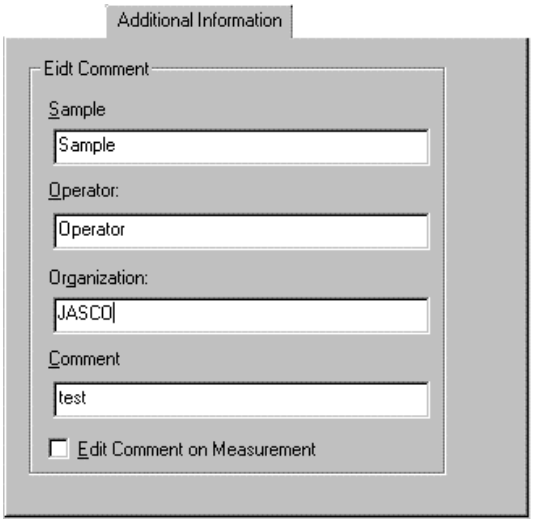


Fig. 4.23 [Additional Information] tab

Sets information appended to data saved in JASCO spectrum format.

[Sample Name] A sample name can be set.
[Operator] The operator's name can be set.
[Organization] The organization name can be set.
[Comment] Additional comments can be entered.
[Edit Comment on Measurement]
Displays the contents of the [Additional Information] tab ([Edit Comment] dialog box) each time measurement starts. The function is active when the box is checked.

[Option] tab

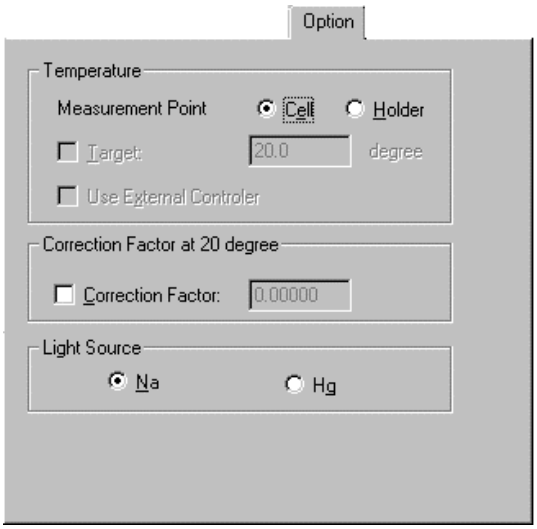


Fig. 4.24 [Option] tab

[Temperature setting] group

[Measure Point] Switches between the thermometer on the cell holder (Holder) and the thermometer in the cell (Cell).

[Target] Turns temperature controls either on or off. When temperature control is on, the text box to the right is active and the temperature can be set. The temperature setting range is 15.0 to 40.0°C for the internal temperature controller or according to the specifications of the external temperature controller, if provided.

[Use External controller] Only activate if an external temperature controller is connected.

[Optical rotation temperature correction] group

[Correction Factor] Optical rotation can be corrected to the optical rotation value at 20°C using optical rotation data, the temperature and temperature correction factor. When temperature correction is on, the text box to the right is active and the temperature correction factor can be set. The setting range is -0.9999 to 0.9999.

[Light source] group

[Light Source] <<Displayed for P-1030 only>> The internal light source can be changed over from Na to Hg or vice versa.

<Save...> Displays the [Parameter - Save As] dialog box used to save the current parameters.

<Open...> Displays the [Parameter - Open] dialog box used to load parameters.

<OK> Applies the current parameter setting changes, transfers them to the instrument and closes the dialog box.

<Cancel> Cancels the current parameter setting changes and closes the dialog box.

If any invalid parameter settings exist, the following error message appears (Fig. 4.25).



Fig. 4.25 Error message box displayed when invalid parameter settings exist. Example: repeat times

Click the <OK> button to close the message box and return to the [Measurement Parameter] dialog box. The cursor position automatically moves to the incorrect parameter. Correct the parameter setting in order to proceed.

4.2.3.2 [Blank]

Opens the [Blank] dialog box (see Fig. 4.26) used to set the optical rotation blank value.

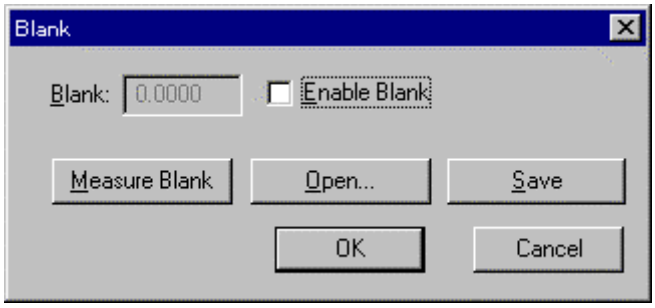


Fig. 4.26 [Blank] dialog box

[Enable Blank] Place a check in the check box to activate blank correction. The [Blank] text box becomes active. Blank correction is reflected in monitoring and measurement.

[Blank] Used to directly set the blank value. The setting range is -90.0000 to 90.0000.

< Measure Blank > Used to measure blank value. Set a blank sample in the sample chamber and click on this button to measure optical rotation. The measurement result is reflected in the [Blank] text box.

<Save...> Opens the [Blank Setting - Save] dialog box (see Fig. 4.27) used to save blank correction data.

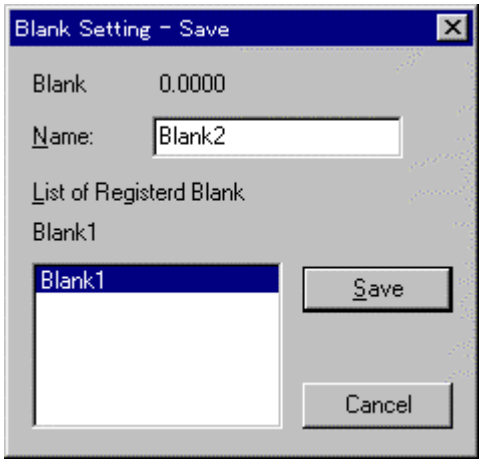


Fig. 4.27 [Blank Setting - Save] dialog box

[Blank] Displays the blank value to be saved.

[Name] Enter a name for the blank in the text box.

[List of Registered Blanks]
Lists the currently registered blank data.

<Save> Saves the blank and closes the dialog box.

<Cancel> Cancels the changes and closes the dialog box.

<Open...> Opens the [Blank Setting - Open] dialog box (see Fig. 4.10) used to load registered blank data.

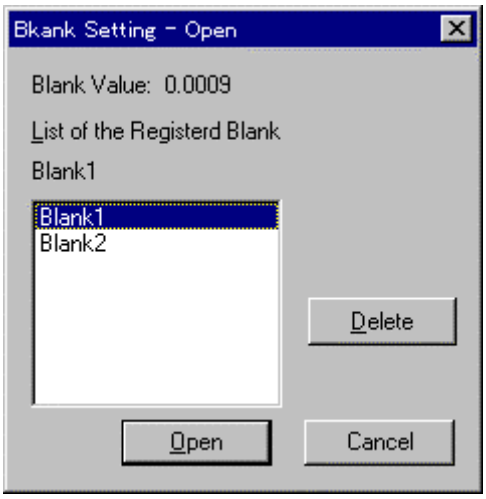


Fig. 4.28 [Blank Setting - Open] dialog box

[List of Registered Blank]
Lists the currently registered blank values.

[Blank Value] Displays the blank value of the currently selected blank name in the [List of Registered Blanks].

[Delete] Deletes the currently selected blank.

<Open> Loads the currently selected blank value in the [List of Registered Blanks] and closes the dialog box.

<Cancel> Cancels the changes and closes the dialog box.

<OK> Applies the changes and closes the dialog box.

<Cancel> Cancels the changes and closes the dialog box.

4.2.4 [Instrument] menu

The [Instrument] menu is shown below (see Fig. 4.29).

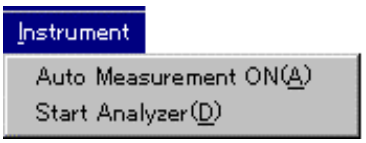


Fig. 4.29 [Instrument] menu

Menu item	Description
[Auto Measurement ON]	Displayed when automatic measurement is off. Select to turn automatic measurement on. When automatic measurement is on, closing the sample chamber lid starts measurement automatically. Measurement can be started manually by selecting [Start] from the [Measure] menu.
[Auto Measurement OFF]	Displayed when automatic measurement is on. Select to turn automatic measurement off.
[Start Analyzer (D)]	Displayed when the analyzer is stopped. Select to start the analyzer. During analyzer operation, data can be constantly monitored.
[Stop Analyzer (D)]	Displayed when the analyzer is operating. Select to stop the analyzer. Stopping the analyzer stops the action of the analyzer drive motor except during measurement. The analyzer starts when measurement starts and stops when measurement ends. Wear of the analyzer gear can be reduced, but data cannot be monitored except during measurement.

4.2.5 [Data] menu

The [Data] menu is shown below (see Fig. 4.30).



Fig. 4.30 [Data] menu

4.2.5.1 [Save As...]

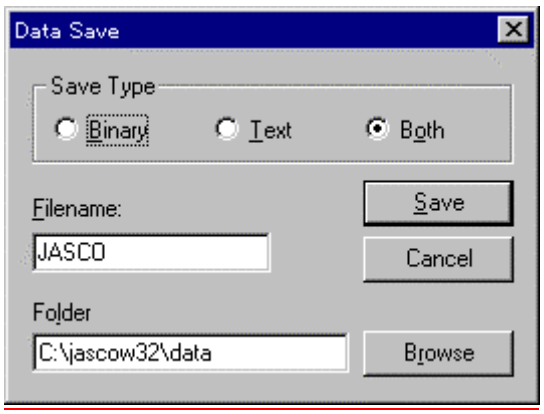


Fig. 4.31 [Data Save] dialog box

[Save Type] Select one of [Binary], [Text] and [Both]. If [Binary] is selected, only the spectrum (time course curve) is saved in the JASCO spectrum format. If [Text] is selected, the time course curve data is saved in the text format. If [Both] is selected, both [Binary] and [Text] are saved.
If either [Binary] or [Both] is selected, the spectrum analysis program will start up and the spectrum (time course curves) will be automatically acquired in the View.

[Filename] Input the name of the file in which data is to be saved. The extension may be omitted (automatically affixed).

[Folder] Set the saving directory. Input it in the text box or designate from the
[Folder Reference] by clicking on the <Browse...> button.

Note: The [Binary] file extension is ".jsw" and the [Text] file extension is "*.txt". In the case of [Both], a [Binary] and a [Text] file are created.*

Note: If a file of the same name exists in the save destination directory, the file will be overwritten unconditionally.

4.2.6 [Help] menu

The [Help] menu is shown below (see Fig. 4.32).



Fig. 4.32 [Help] menu

Menu item	Description
[About...]	Opens the [About P-1000 Control Driver] dialog box which displays the version information of the measurement program.

4.3 [Environment] Program

The Environment program is used to change hardware settings. To start the Environment program, double click [Environment] in the [Measurement] pane of the [Spectra Manager] program window. The following dialog box appears.

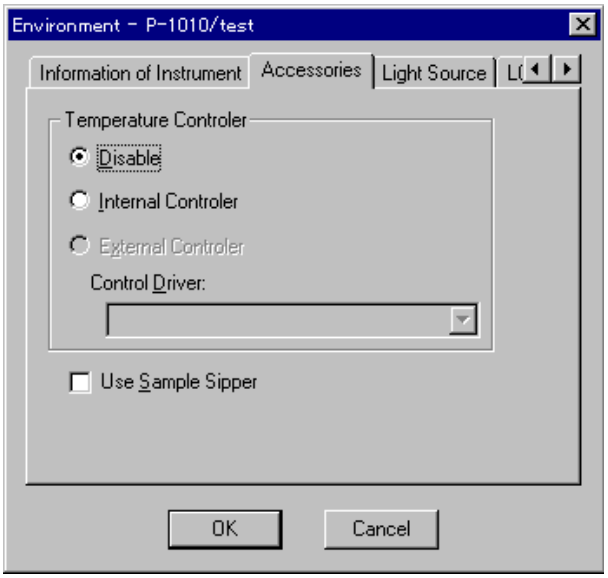


Fig. 4.33 [Environment] dialog box ([Accessories] tab)

4.3.1 [Accessories] tab

This tab contains the settings to for the temperature controller and sample sipper.

[Temperature Controller] group

[Disable] Select this option button to disable the temperature controller.

[Internal Controller] Select this option button if the air-cooled Peltier temperature controller PTC-102 is used.

[External Controller] Select this option button if an external temperature controller (connecting via serial CH2) is used. Select the appropriate control driver from the [Control Driver] drop-down list. (The control driver is installed from the Spectra Manager.)

[Use Sample Sipper] Check this check box if the sample sipper is used.

4.3.2 [Light Source] tab

This tab contains the settings to turn the light source ON, change between an external and internal light source and display operating time.

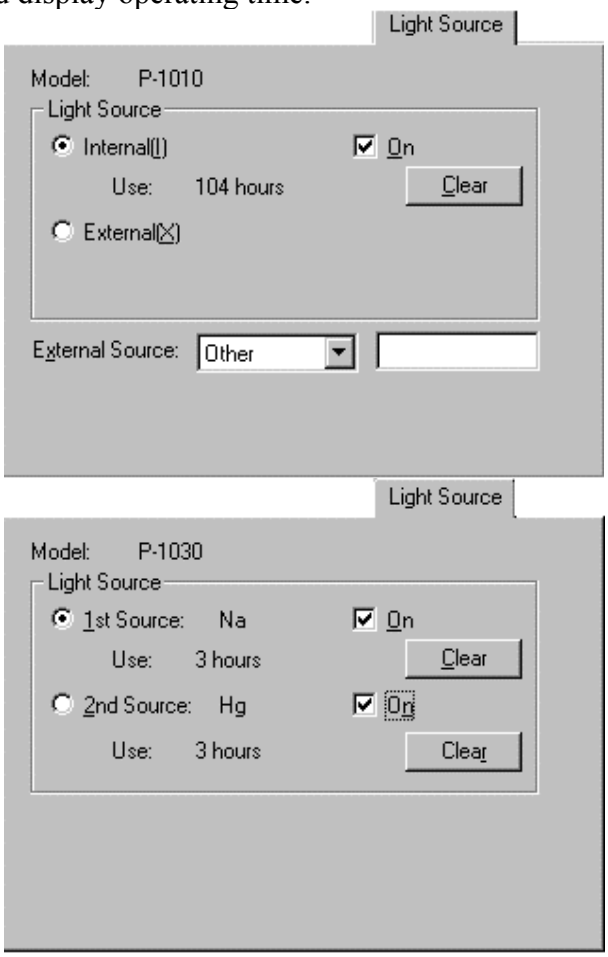


Fig. 4.34 [Light Source] tab.
(Top: P-1010, P1020. Bottom: P-1030)

For the P-1010 or P-1020

[Light Source] group

[Internal (I)] Select this option button to use the internal light source. A Halogen internal light source is supplied with the P-1010 and a Sodium or Mercury internal light source is supplied with the P-1020. Starting up the main unit changes over the light source to the internal light source .

[On] Used to control the internal light source. The light source is on when the box is checked.

[Clear] Resets the operating hours of the internal light source to zero.

[External (X)] Select this option button to use an external light source. Select the type of external light source from the [External Source] drop-down list. If [Other] is selected, enter the name of the light source in the text box to the right of the [External Source] drop-down list.

Note: An external light source cannot be controlled from the P-1000. Before selecting the external light source option, make sure the light source is lit and stabilized. If the external light source option is selected when the light source is not lit, the analyzer or PMT may be damaged.

For the P-1030

The P-1030 has two internal light sources, a Sodium and a Mercury light source.

[1st Source] Select this option button to use the Sodium light source.
[On] Used to control the internal Sodium light source. The light source is on when the box is checked.
[Clear] Resets the operating hours of the first light source to zero.
[2nd Source] Select this option button to use the Mercury light source.
[On] Used to control the internal Mercury light source. The light source is on when the box is checked.
[Clear] Resets the operating hours of the second light source to zero.

Note: The first and second light sources cannot be turned off simultaneously.

4.3.3 [LC OUT] tab ("LC Out" function)

The "LC Out" function can be executed from this tab. Executing the function stops the analyzer drive motor, converts a small optical rotation (within ±0.5°) of the sample into a voltage and outputs it from the [LC OUT] terminal on the rear of the instrument. The "LC Out" function is executed mainly to use the polarimeter as a detector for liquid chromatography (HPLC).

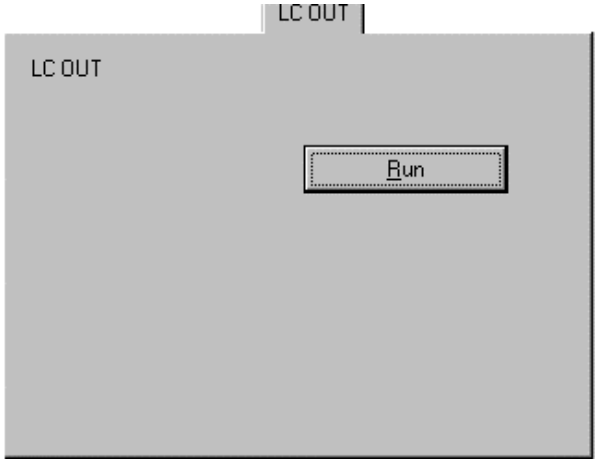


Fig. 4.35 [LC OUT] tab

<Run> Executes the LC OUT function and displays the [LC Out] dialog box (see Fig. 4.39).

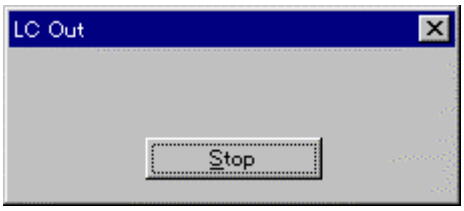


Fig. 4.36 [LC Out] dialog box

<Stop> Terminates the LC OUT function.

Note: This function cannot be used as the normal polarimeter when "LC OUT" is being executed.

Note: Before using this function, make sure the optical rotation of the sample is within ±0.5°. If optical rotation is out of this range, the relationship between the [LC Out] terminal output voltage and optical rotation will not be linear.

Note: An optical rotation of ±0.5° corresponds to a [LC OUT] terminal output voltage of ±5 V.

4.3.4 [Analog] tab ("Analog Out" function)

The "Analog Out" function is controlled from this tab. Executing the function outputs an optical rotation data signal from the [Analog Out] terminal on the rear of the instrument. The "Analog Out" function is used mainly for recording the change with time of the optical rotation data of a sample. Optical rotation data is always the output signal regardless of the current measurement mode. Even when this function is active, the measurement program can be started to operate as a normal polarimeter**.**

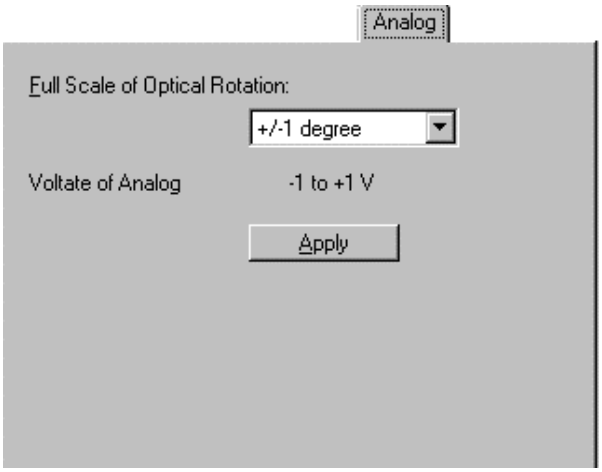


Fig. 4.37 [Analog] tab

[Full Scale of Optical Rotation]

Select the scale of optical rotation to be converted from the drop-down list. The scales available are ±100°, ±10°, ±1° and OFF.

The full scale of optical rotation set corresponds to the full scale (±1 V) of the output voltage at the [Analog Out] terminal. For example, if the full scale of optical rotation is set to ±10°, a 1° optical rotation corresponds to 0.1 V. If set to ±100°, a 1° optical rotation corresponds to 0.01 V.

[Apply] Click to apply the current settings.

Note: Set the function to "Off" if it is not used.

Note: Before using this function, make sure the optical rotation of the sample is within the full scale set in [Full Scale of Optical Rotation].

Note: The full scale set in [Full Scale of Optical Rotation] corresponds to an [Analog Out] terminal output voltage of ±1 V.

4.3.5 [Information of Instrument] tab

This tab displays instrument information.

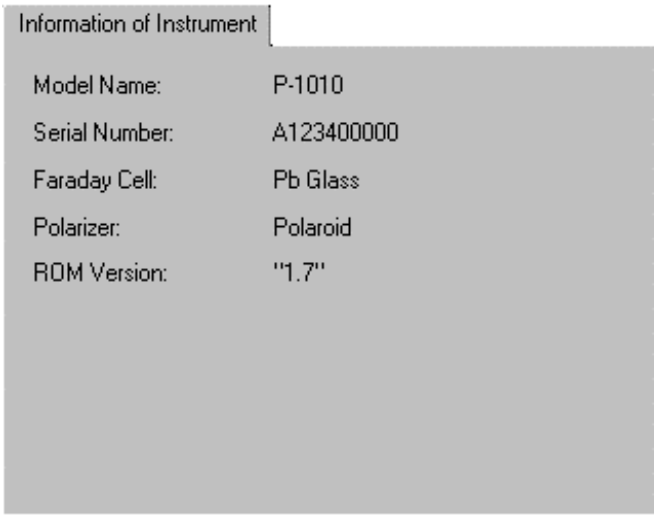


Fig. 4.38 [Information of Instrument] tab

5 Appendix

5.1 Supplements for Measurement

5.1.1 About cells

Table 5.1 shows the types of cells that can be used for measurement. A number of factors need to be considered when selecting a cell including, the volume of the sample, optical rotation, absorbance, and temperature change.

Table 5.1 Cell Types

Cell name	**Type and size (ID×light path length)**	**Remarks**
Rectangular glass cell/Rectangular quartz cell	10mm×100, 50, 20, 10, 5, 2, 1mm (7 types)	Generally used in VS/UV spectrophotometers
Cylindrical glass cell/Cylindrical quartz cell	ϕ 10×100, 50, 10mm (3 types) ϕ 3.5×100, 50, 10mm (3 types)	
Cylindrical glass cell with water jacket/Cylindrical quartz cell with water jacket	ϕ 10×100, 50, 10mm (3 types) ϕ 3.5×100, 50, 10mm (3 types)	Thermostatically controlled water can be circulated around the cylindrical cell. (A circulating thermostatically controlled bath is required)
Flow-through cell	ϕ 3.5×50mm ϕ 10×100mm	Continuous measurement can be made on a flowing sample.
Cylindrical quartz cell for ORD	ϕ 20×100, 50, 20, 10mm (4 types) ϕ 10×5, 2, 1, 0.5, 0.2, 0.05mm (6 types)	J (CD) series only. Dedicated V type cell holder is required.
Flow cell for LC		Used as a detector for LC.

Note: Use a quartz cell for measurement in the UV region.

Note: The standard cell is a cylindrical glass cell 10mm×100mm.

Take note of the following when using the cell.

(1) The cylindrical cells dedicated to the polarimeter include two types: 3.5mm ID and 10mm ID. If a large volume of the sample is available, use the 10-mm-ID cell and set the sample chamber aperture diameter to 8 mm. If the sample volume is small, the 3.5-mm-ID micro cell is recommended. In this case, set the sample chamber aperture diameter to 3 mm.
(2) If there is sample absorption at the measurement wavelength, use a cell with a short light path or dilute the solvent before measurement.
(3) Always set the cell in the same position and orientation in the sample chamber.

(4) Keep clean surface of the cell which intercepts the light path. Do not touch it. If contaminated, purge it with ethyl alcohol and lightly wipe it with gauze. Rubbing the surface may scratch it.

5.1.2 How to select solvent

Before selecting a solvent, a number of factors need to be considered including, sample solubility, transmittance at the measurement wavelength, interaction with sample, and optical inertness. Commonly used solvents include water, ethanol, methanol dioxane, and chloroform.

5.1.3 Concentration and light path length

A transparent sample can be measured with high accuracy at a concentration of 1 to 10% using a 100mm rectangular or cylindrical cell.
For colored substances, the absorbance of the solvent should be 0.5 or less if there is absorption at the measurement wavelength. If the measurement wavelength is near the point of inflection of the optical rotation dispersion curve, accurate data cannot be obtained in many cases, and it is generally used as reference data. In such a case, change the measurement wavelength.

5.1.4 Cautions in measuring optical rotation

In optical rotation measurement, correct values may not be obtained due to the condition of the sample solution. Factors that affect measurement include temperature, turbidity and coloring. Measures against them are given below.

5.1.4.1 Influence of temperature

(1) Change of optical rotation with temperature
Generally, optical rotation changes with temperature. If a sample subject to great temperature change is measured using an ordinary cell, its optical rotation will change with the temperature of the sample during measurement and an accurate value cannot be obtained. In such a case, use a thermostatically controlled cell in order to keep the cell temperature constant.
(2) Mutarotation due to temperature difference
If the temperature before and after injecting a sample into the cell is different, the optical rotation may change even after the solution temperature has stabilized.
[Example]
Fructose: Approximately 30 minutes is required after the temperature has stabilized in order for optical rotation to become constant.
1-sorbose: Approximately 1 hour is required after the temperature has stabilized
(1) Schlieren
If a temperature difference exists in an organic solvent or a mixed or thick solution, the refractive index will be non-uniform, resulting in Schlieren (streaks), deterioration of light transmission or disturbance of the plane of polarization. This phenomenon can be avoided

by controlling the temperature. Controlling the temperature increases Schlieren (streaks) temporarily, but as the solution temperature gradually stabilizes, it decreases and disappears in five to seven minutes.

5.1.4.2 Influence of turbidity

If a solution is turbid, dispersion will disturb the plane of polarization, deteriorating the accuracy of the optical rotation measurement (deterioration of signal-to-noise ratio, optical rotation variation). Before measurement, aim the plane of transmission of the cell at a room lamp or similar light source and check if it is turbid.

(1) Eliminating turbidity
Remove fine particles and foreign matter by filtration, centrifugal separation, etc. The micro cell is particularly sensitive to turbidity.
(2) If turbidity cannot be eliminated
In this case, measurement values with errors cannot be avoided. However, check the repeatability of the displayed values (how optical rotation changes) for 5 to 20 minutes. The variation will provide a guide as to the measurement accuracy.

Note: Even an apparently transparent solution may be subject to great variation in the case of a dispersion solution of fine particles. In such a case, it is important that large particles be eliminated, whenever possible.

5.1.5 Colored substances

Colored substances have absorption in the visible region. It is necessary to check using a spectrophotometer to see if the quantity of transmitted light is sufficiently high at the measurement wavelength.
(1) Measurement is hardly effected up to a transmittance of 20% to 30%.
(2) If transmittance is 10% or less, check the linearity by changing the cell length.
(3) Measurement error is generally large with optically active complex salt if the measurement wavelength is near the point of inflection of the optical rotation dispersion curve. In such a case, change the measurement wavelength.

5.2 Error Messages

If a problem occurs with the P-1000, an error message will appear in the measurement program window or a message box will appear with an error message.
Table 5.2 shows the possible errors which may occur and the corresponding corrective action(s). If the problem cannot be corrected, contact your local JASCO distributor.

Note: If any problem occurs during initialization (startup) of the P-1000, an error message box will appear and initialization will stop. After correcting the error, click on the [Retry] button to resume initialization. To stop the initialization (Startup), click on the [Close] button.

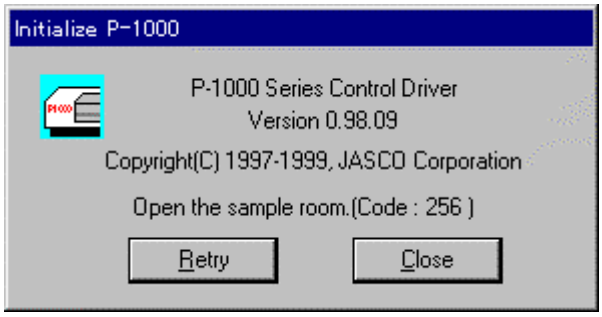


Fig. 5.1 Error display message box during initialization (when the sample chamber lid is open during initialization)

Table 5.2 Error Message and Corrective Actions

Error message	**Possible cause and corrective action**
Filter is not installed correctly.	The filter is installed incorrectly. (Action) Install it correctly.
Inappropriate filter	The light source and filter combination is not correct. (Action) Use an appropriate filter. Refer to Table 5.3.
HT voltage has exceeded higher limit	1. Lamp is not lit. (Action) Turn on lamp. 2. An obstacle in the sample chamber is blocking the light path. (Action) Remove the obstacle. 3. Sample concentration is too high. (Action) Dilute the sample.
Cannot open COM port.	1. The COM port (serial port) is being used by another application. (Action) Exit the application. 2. COM port setting is incorrect. (Action) Check the connection between the PC and P-1000, and set the COM port. (Refer to Section 5.4.)
Cannot communicate the instrument.	1. Power to the P-1000 is not turned on. (Action) Turn the power on and then execute Startup. 2. The cable connecting the PC and P-1000 is disconnected. (Action) Reconnect it and tighten the setscrew.
Error occurred	1. The air-cooled Peltier controller for the cell holder is out of control because the temperature was set far below room temperature. (Action) Turn off the power to the controller and wait for approximately 10 minutes to allow it to cool down. Then, turn it on and set the temperature properly. Refer to the relevant instruction manual for the temperature setting

	range. 2. (When the temperature measurement point is in the cell) The thermometer is not set in the sample. (Action) Turn off the power to the controller and wait for approximately 10 minutes to allow it to cool down. Set the thermometer in the sample. 3. (When the temperature measurement point is in the holder) The thermocouple is not set on the holder. (Action) Turn off the power to the controller and wait for approximately 10 minutes to allow it to cool down. Set the thermometer in the cell holder.
Light source does not turn on.	1. The light source needs replacing. (Action) Replace the light source. Contact your local JASCO distributor. 2. (For Na lamp) The glow discharge tube needs replacing. (Action) Replace the discharge tube. Contact your local JASCO distributor. 3. (Immediately after the P-1020 light source is changed over from Na to Hg or vice versa) The Na/Hg selection parameter set incorrectly. (Action) Turn off the power to the P-1020 and set correctly.
Temperature in light source chamber 1 is high. Temperature in light source chamber 2 is high.	1. The fan exhaust port at the rear of the P-1000 is plugged, causing the light source chamber to overheat. (Action) Turn off the power to the P-1000 and remove any obstructions from the exhaust port. Wait for approximately five minutes and then restart the instrument. If the same message reappears, contact your local JASCO distributor. 2. Others (Action) Turn off the power to the P-1000 and contact your local JASCO distributor.

Table 5.3 Table of Correspondence between Filters and Light Sources

Light source	Wavelength (filter) in nm															
	None	880	633	589	577	546	435	405	365	334	325	313	302	296	280	254
Na	✓			✓												
Hg	✓				✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
WI	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
External	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Monochromator	✓															

Note: If a filter not compatible with the light source is mounted or if the light source is changed over to one not compatible with the filter, measurement, parameter settings and other functions will be limited.

Note: Store the removed filters in a safe place free from dust.

5.3 Installing Spectra Manager

5.3.1 Before installing Spectra Manager

Before installing Spectra Manager, confirm the following:

- The computer and peripheral devices are connected correctly.
- Windows is set up.
- The destination hard disk has sufficient free space.

Note: Approximately 5M bytes of free space is required on the hard disk to install Spectra Manager.

5.3.2 Spectra Manager Installation Procedure

The Spectra Manager installation procedure for Windows can be summarized as follows.

- Start the setup program.
- Enter the operator′s name and organization.
- Designate the destination directory.
- Designate a directory in which data is to be stored.
- Set up the P-1000 measurement program.

The Spectra Manager installation procedure is as follows.

(1) Click on the [Start] button in the Windows task bar, point to [Settings] and then to [Control Panel] (Fig. 5.2). The [Control Panel] window (Fig. 5.3) appears.

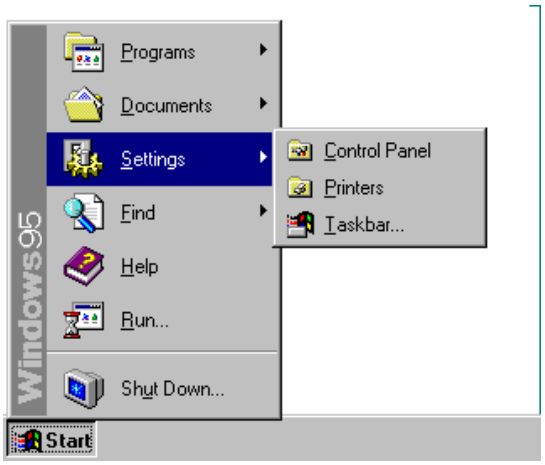


Fig. 5.2 Windows Task Bar



Fig. 5.3 [Control Panel] window

(2) Double click [Add/Remove Programs] in the [Control Panel] window. The [Add/Remove Programs Properties] window dialog box appears (Fig. 5.4).



Fig. 5.4 [Add/Remove Programs Properties] dialog box

(3) Click the [Install/Uninstall] tab and then click the <Install> button. The [Install Program from Floppy Disk or CD-ROM] dialog box appears.

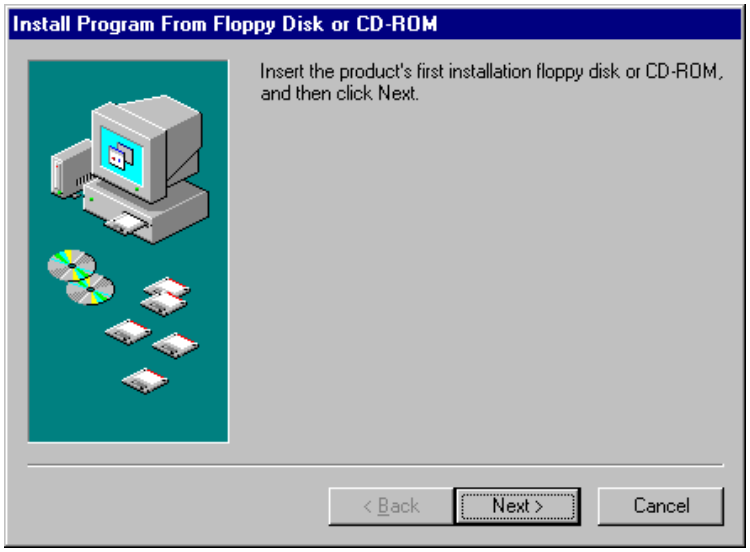


Fig. 5.5 [Install Program From Floppy Disk or CD-ROM] dialog box

(4) Insert the ″floppy disk″ or ″CD-ROM″ marked ″Spectra Manager″ in the floppy disk drive or CD-ROM drive. Click the <Next> button. The [Run Installation Program] dialog box appears.

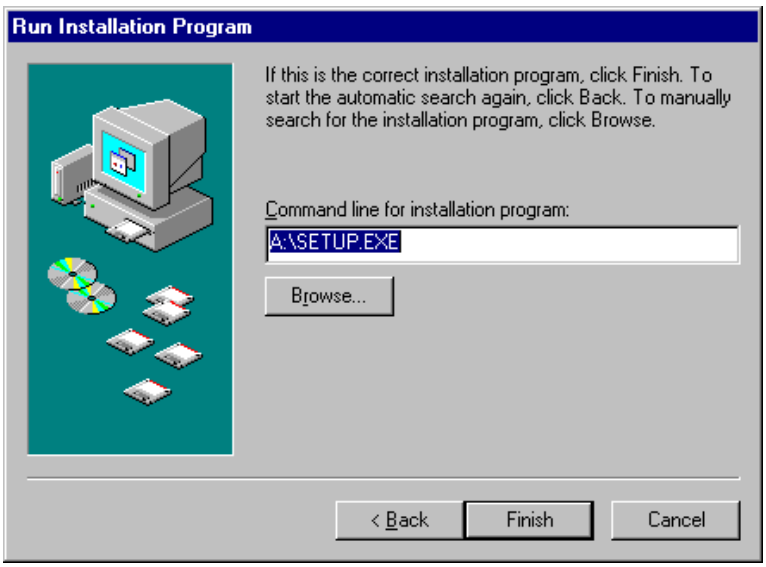


Fig. 5.6 [Run Installation Program] dialog box

(5) Windows automatically detects the installation program. Click the <Finish> button. After a short while, the ″Spectra Manager Setup″ window appears.

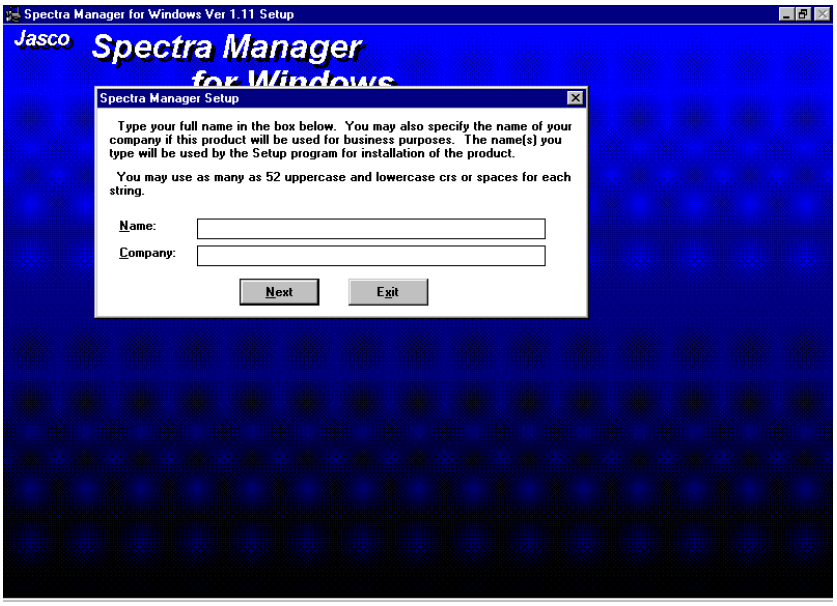


Fig. 5.7 [Spectra Manager Setup] window

(6) Enter the operator′s name and organization in the [Name] and [Company] text boxes, respectively. The name and organization entered are registered in the system.
(7) Click the <Next> button. The screen shown in Fig. 5.8 appears.



Fig. 5.8 Spectra Manager program installation directory

(8) Designate the Spectra Manager program directory. The directory shown in Fig. 5.8 is the default directory. If an alternative directory is preferred enter the path in the [Copy to] text box. Click the <Next> button.

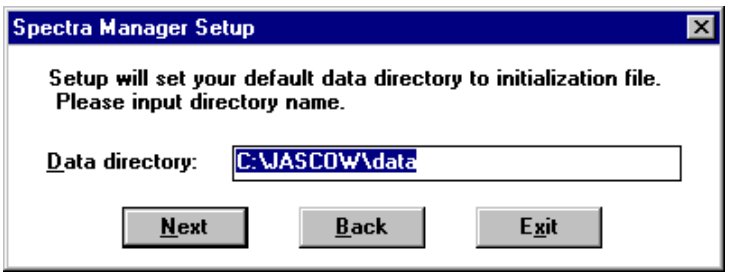


Fig. 5.9 Screen for inputting the directory for saving data

(9) Designate the Spectra Manager data directory. The directory shown in Fig. 5.9 is the default directory. If an alternative directory is preferred enter the path in the [Data Directory] text box. Click the <Next> button. The message box shown in Fig. 5.10 appears.



Fig. 5.10 Installing the P-1000 control driver

(10)Click the <Yes> button to install the Spectrometer control driver.



Fig. 5.11 Installing the Spectrometer control driver

(11)Insert the disk labeled "JASCO PWS-1080" in the floppy disk drive and click the <Next> button.

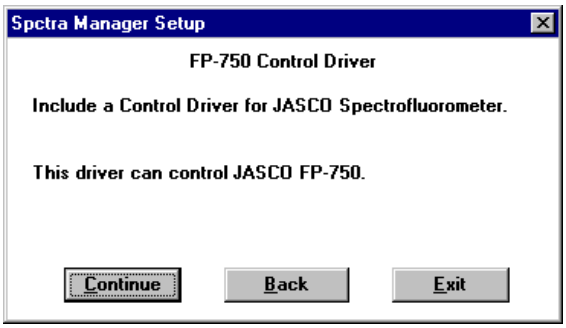


Fig. 5.12 Setting up the P-1000 control driver

(12)Click the <Continue> button.

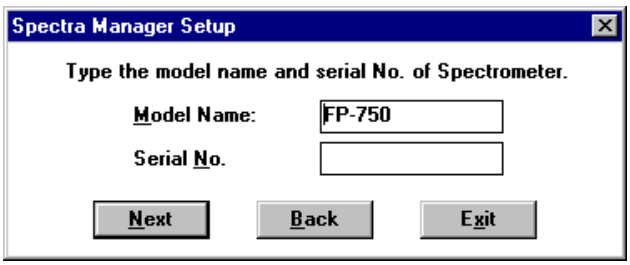


Fig. 5.13 Entering the model name and serial number

(13)Enter the model name of the P-1000 series instrument (P-1010, P-1020 or ″P-1030) and serial number and then click the <Next> button. The installation program begins copying files to the hard disk. A message may appear, prompting you to insert a floppy disk in the drive. Insert the correct floppy disk in the drive and click the <OK> button to continue with the installation. The installation is complete when files are no longer being copied and a Jasco group has been created in Windows.

5.4 Designating the Serial Port (RS-232C)

The default communication port is serial port COM1. If another port is used, it is necessary to change the communication port according to the following procedure.

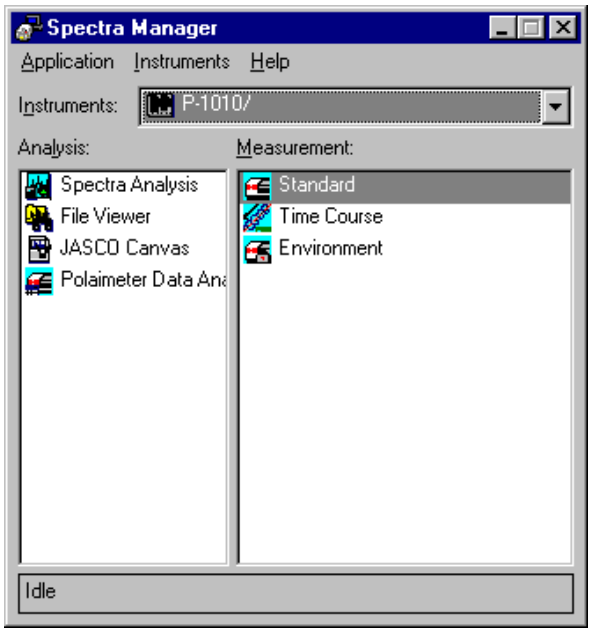


Fig. 5.14 [Spectra Manager] window

(1) Select [Port Setting] from the [Instrument] menu in the Spectra Manager window. The dialog box shown in Fig. 5.15 appears.

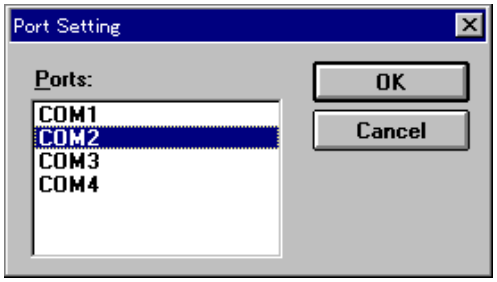


Fig. 5.15 [Port setting] dialog box

(2) Select a port to be used from the [Ports] list and click the <OK> button. The newly selected port is now set.

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