ADVANTEST

ADVANTEST CORPORATION

Q7761

User's Guide

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Safety Summary

To ensure thorough understanding of all functions and to ensure efficient use of this instrument, please read the manual carefully before using. Note that Advantest bears absolutely no responsibility for the result of operations caused due to incorrect or inappropriate use of this instrument.

If the equipment is used in a manner not specified by Advantest, the protection provided by the equipment may be impaired.

- **Warning Labels**

  Warning labels are applied to Advantest products in locations where specific dangers exist. Pay careful attention to these labels during handling. Do not remove or tear these labels. If you have any questions regarding warning labels, please ask your nearest Advantest dealer. Our address and phone number are listed at the end of this manual.

  Symbols of those warning labels are shown below together with their meaning.

  DANGER: Indicates an imminently hazardous situation which will result in death or serious personal injury.

  WARNING: Indicates a potentially hazardous situation which will result in death or serious personal injury.

  CAUTION: Indicates a potentially hazardous situation which will result in personal injury or a damage to property including the product.

- **Basic Precautions**

  Please observe the following precautions to prevent fire, burn, electric shock, and personal injury.

  - Use a power cable rated for the voltage in question. Be sure however to use a power cable conforming to safety standards of your nation when using a product overseas.
  - When inserting the plug into the electrical outlet, first turn the power switch OFF and then insert the plug as far as it will go.
  - When removing the plug from the electrical outlet, first turn the power switch OFF and then pull it out by gripping the plug. Do not pull on the power cable itself. Make sure your hands are dry at this time.
  - Before turning on the power, be sure to check that the supply voltage matches the voltage requirements of the instrument.
  - Connect the power cable to a power outlet that is connected to a protected ground terminal. Grounding will be defeated if you use an extension cord which does not include a protected ground terminal.
  - Be sure to use fuses rated for the voltage in question.
  - Do not use this instrument with the case open.
  - Do not place anything on the product and do not apply excessive pressure to the product. Also, do not place flower pots or other containers containing liquid such as chemicals near this

product.

- When the product has ventilation outlets, do not stick or drop metal or easily flammable objects into the ventilation outlets.
- When using the product on a cart, fix it with belts to avoid its drop.
- When connecting the product to peripheral equipment, turn the power off.

- **Caution Symbols Used Within this Manual**

Symbols indicating items requiring caution which are used in this manual are shown below together with their meaning.

DANGER: Indicates an item where there is a danger of serious personal injury (death or serious injury).

WARNING: Indicates an item relating to personal safety or health.

CAUTION: Indicates an item relating to possible damage to the product or instrument or relating to a restriction on operation.

- **Safety Marks on the Product**

The following safety marks can be found on Advantest products.

: ATTENTION - Refer to manual.

: Protective ground (earth) terminal.

: DANGER - High voltage.

: CAUTION - Risk of electric shock.

- **Replacing Parts with Limited Life**

The following parts used in the instrument are main parts with limited life.
Replace the parts listed below before their expected lifespan has expired to maintain the performance and function of the instrument.
Note that the estimated lifespan for the parts listed below may be shortened by factors such as the environment where the instrument is stored or used, and how often the instrument is used.
The parts inside are not user-replaceable. For a part replacement, please contact the Advantest sales office for servicing.

Each product may use parts with limited life.
For more information, refer to the section in this document where the parts with limited life are described.

Main Parts with Limited Life

Part name	Life
Unit power supply	5 years
Fan motor	5 years
Electrolytic capacitor	5 years
LCD display	6 years
LCD backlight	2.5 years
Floppy disk drive	5 years
Memory backup battery	5 years

- **Hard Disk Mounted Products**

The operational warnings are listed below.

- Do not move, shock and vibrate the product while the power is turned on.
  Reading or writing data in the hard disk unit is performed with the memory disk turning at a high speed. It is a very delicate process.

- Store and operate the products under the following environmental conditions.
  An area with no sudden temperature changes.
  An area away from shock or vibrations.
  An area free from moisture, dirt, or dust.
  An area away from magnets or an instrument which generates a magnetic field.

- Make back-ups of important data.
  The data stored in the disk may become damaged if the product is mishandled. The hard disc has a limited life span which depends on the operational conditions. Note that there is no guarantee for any loss of data.

- **Precautions when Disposing of this Instrument**

When disposing of harmful substances, be sure dispose of them properly with abiding by the state-provided law.

Harmful substances: (1) PCB (polycarbon biphenyl)
(2) Mercury
(3) Ni-Cd (nickel cadmium)
(4) Other
Items possessing cyan, organic phosphorous and hexadic chromium and items which may leak cadmium or arsenic (excluding lead in solder).

Example: fluorescent tubes, batteries

Environmental Conditions

This instrument should be only be used in an area which satisfies the following conditions:

- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- Altitude of up to 2000 m

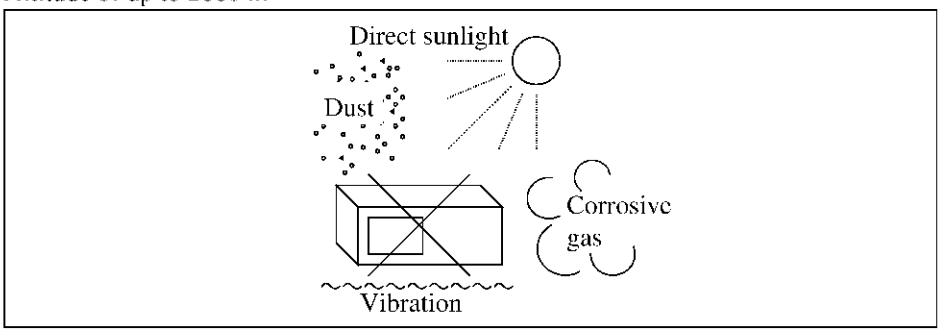


Figure-1 Environmental Conditions

- Operating position

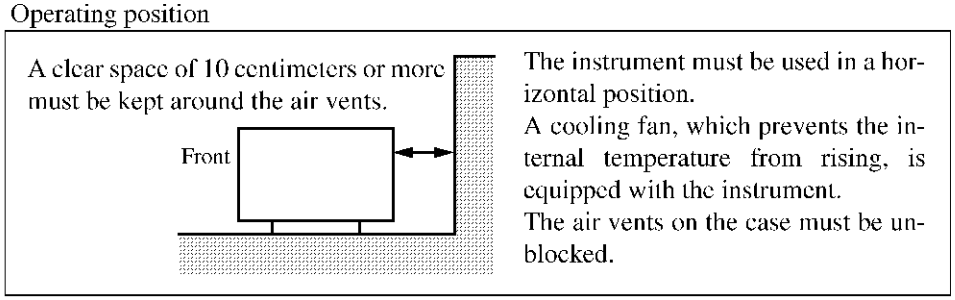


Figure-2 Operating Position

- Storage position

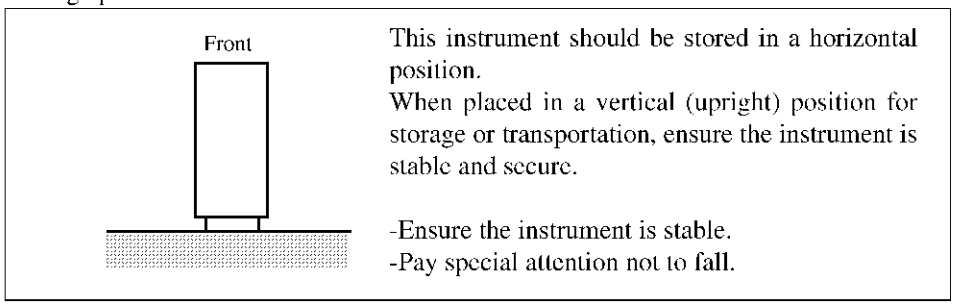


Figure-3 Storage Position

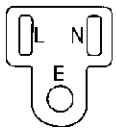
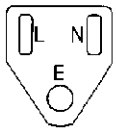
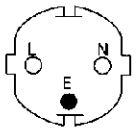
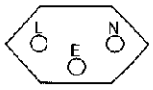
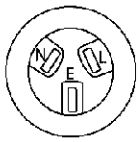
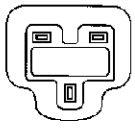
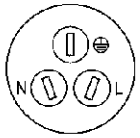
- The classification of the transient over-voltage, which exists typically in the main power supply, and the pollution degree is defined by IEC61010-1 and described below.

  Impulse withstand voltage (over-voltage) category II defined by IEC60364-4-443

  Pollution Degree 2

Types of Power Cable

Replace any references to the power cable type, according to the following table, with the appropriate power cable type for your country.

Plug configuration	Standards	Rating, color and length	Model number (Option number)
	PSE: Japan Electrical Appliance and Material Safety Law	125 V at 7 A Black 2 m (6 ft)	Straight: A01402 Angled: A01412
	UL: United States of America CSA: Canada	125 V at 7 A Black 2 m (6 ft)	Straight: A01403 (Option 95) Angled: A01413
	CEE: Europe DEMKO: Denmark NEMKO: Norway VDE: Germany KEMA: The Netherlands CEBEC: Belgium OVE: Austria FIMKO: Finland SEMKO: Sweden	250 V at 6 A Gray 2 m (6 ft)	Straight: A01404 (Option 96) Angled: A01414
	SEV: Switzerland	250 V at 6 A Gray 2 m (6 ft)	Straight: A01405 (Option 97) Angled: A01415
	SAA: Australia, New Zealand	250 V at 6 A Gray 2 m (6 ft)	Straight: A01406 (Option 98) Angled: ---------
	BS: United Kingdom	250 V at 6 A Black 2 m (6 ft)	Straight: A01407 (Option 99) Angled: A01417
	CCC:China	250 V at 10 A Black 2 m (6 ft)	Straight: A114009 (Option 94) Angled: A114109

CAUTIONS ON USING THE Q7761

1. Information for the Safety of Laser Used in the Q7761

The laser source specified by this operation manual is classified according to IEC 60825-1 Am.2 2001. The laser source complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to laser notice No.50, July 26, 2001.

Table-1 Information for the Laser Safety

Laser Type	FP-Laser		DFB-LD
Laser Class according to IEC 60825-1 Am.2 2001 - International	1	1	3R
Permissible Output Power	5 mW max	1.5 mW max	15 mW
Beam Diameter	9 µm	6 µm	9 µm
Numerical Aperture	0.1	0.1	0.1
Wavelength	1520 nm to 1630 nm	850 nm	1540 nm

2. Laser Safety Labels

This laser safety label is affixed on the front of the Q7761 before shipment. (see "a" of Figure-3)

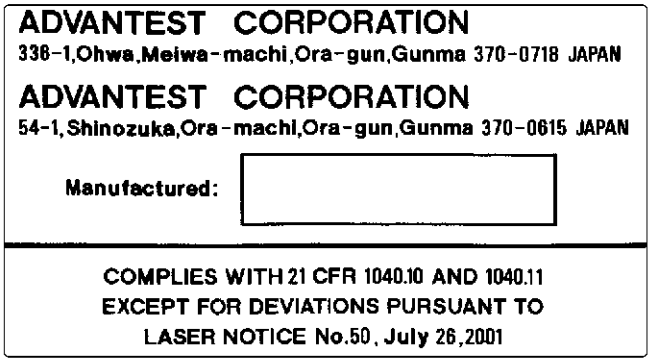


Figure-1 Laser Safety Label: For the U.S.A

This laser safety label is affixed on the front of the Q7761 before shipment. (see "b" of Figure-3)

Figure-2 Laser Safety Label: For All Countries (International)

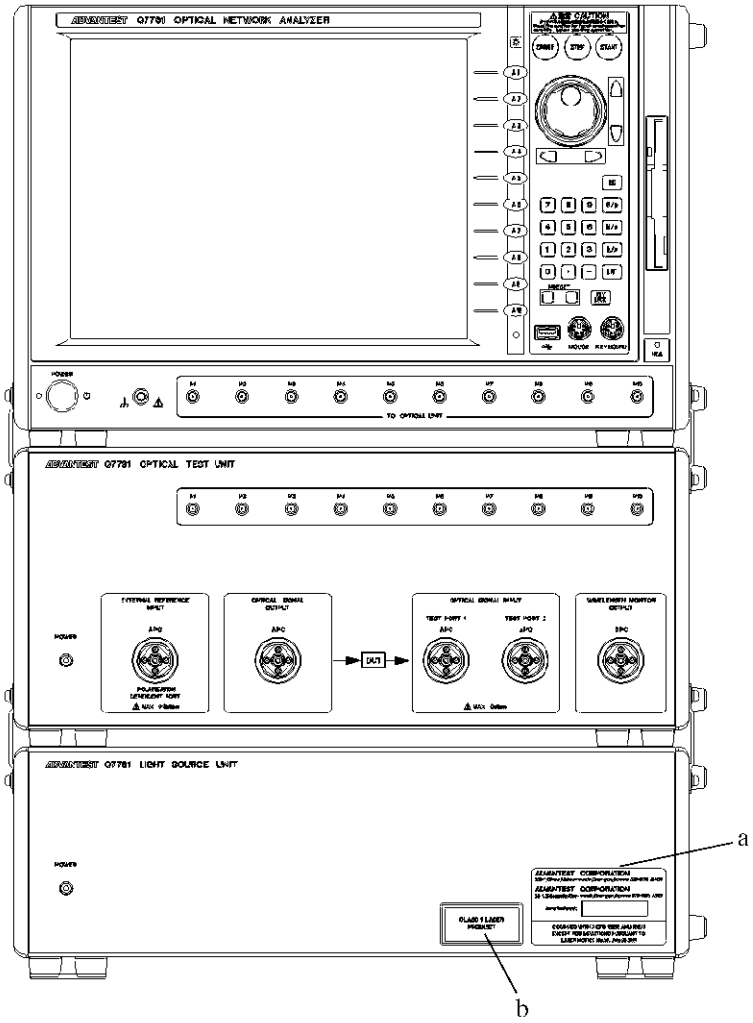


Figure-3 Position of Laser Safety Labels on the Q7761

3. Warnings on the Laser

1. Never attempt to emit a laser beam and must attach an attached light shield cap when no optical fiber cords are connected to optical output connectors on the front of the Q7761. (see "a" and "b" of Figure-4)

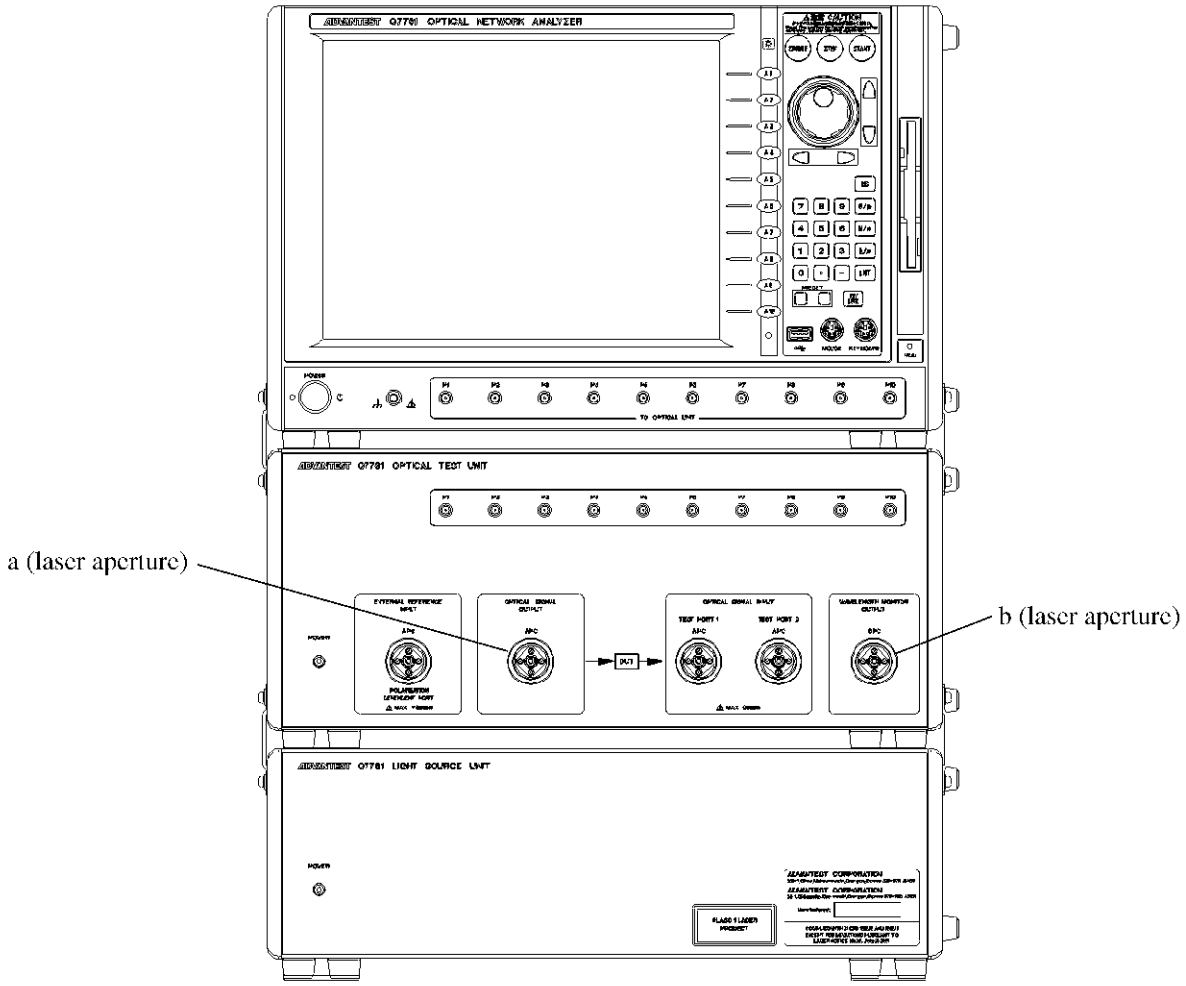


Figure-4 Position of Laser Apertures on the Front of the Q7761

2. While the laser beam is emitted, never attempt to stare into optical output connectors or the end of optical fiber cords, because an invisible laser radiation is emitted. The invisible laser radiation may seriously damage your eyesight.
3. Never attempt to stare into optical output connectors or the end of optical fiber cords to view the emitted laser beam with optical instruments. Your eyesight may be seriously damaged.
4. Never attempt to emit a laser beam when no optical fiber cord output from the Q7761 Light Source Unit is connected with the Light Source Input connector on the rear of the Q7761. (see "c" and "d" of Figure-5)

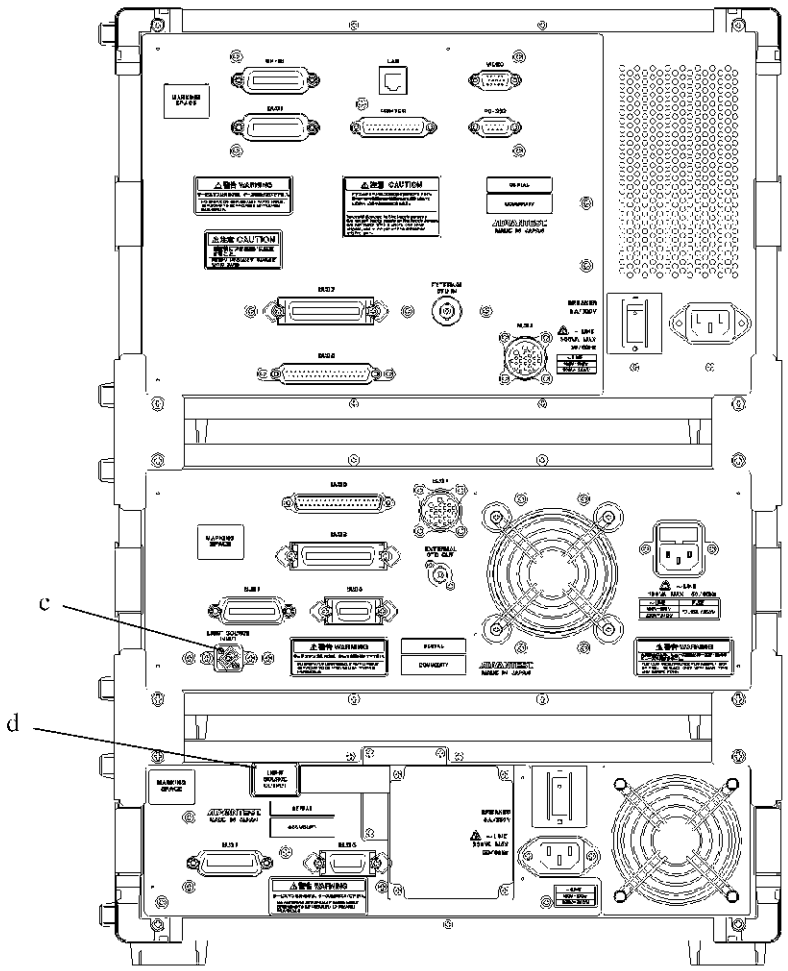


Figure-5 Position of Laser Apertures on the Rear of the Q7761

5. While the laser beam is emitted, never attempt to disconnect the optical fiber cord output from the Q7761 Light Source Unit. An invisible laser radiation is emitted from the end of this optical fiber cord. The invisible laser radiation may seriously damage your eyesight.
6. Do not attempt to open the Q7761. The Q7761 should be serviced only by ADVANTEST representatives. ADVANTEST assumes no responsibility for any damage caused by unauthorized service.

CAUTION: ***Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.***

Certificate of Conformity

CE

This is to certify, that

Optical Network Analyzer

Q7761

instrument, type, designation

complies with the provisions of the EMC Directive 89/336/EEC (All of these factors are revised by 91/263/EEC,92/31/EEC,93/68/EEC) in accordance with EN61326
and Low Voltage Directive 73/23/EEC (All of these factors are revised by 93/68/EEC) in accordance with EN61010.

ADVANTEST Corp.

Tokyo, Japan

ROHDE&SCHWARZ

Engineering and Sales GmbH
Munich, Germany

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1. INTRODUCTION

This chapter introduces you to the organization of this document and a product overview of the Q7761 Optical Network Analyzer (hereafter called "this instrument") to help you get the most out of this document.

1.1 Organization of This Document

This document addresses a broad spectrum of audiences, from first-time users of this instrument to experienced users. You may read through the document in sequence, beginning with Chapter 1, to gain an all-round knowledge of this instrument or you may refer to the table of contents found at the beginning of each chapter first and jump to sections of interest to you.

This document is organized into the following chapters:

Chapter 1, "INTRODUCTION"	Introduces you to the organization of this document and a product overview to help you get the most out of this document.
Chapter 2, "PRE-OPERATION TIPS"	Provides preliminary tips on using this instrument. Read this chapter before using this instrument.
Chapter 3, "SETUP"	Explains how to set up this instrument on delivery. After installing this instrument in position, switch it on to make sure that it starts up successfully.
Chapter 4, "QUICK START"	This section describes the basic operation and the functions of this unit's screen and panel.
Chapter 5, "EXAMPLES OF MEASUREMENTS"	Shows typical examples of measurement.
Chapter 6, "MENU MAP, FUNCTIONAL EXPLANATION"	Explains the menu configuration and function of the soft keys.
Chapter 7, "SPECIFICATIONS"	Summarizes the specifications of this instrument.
Chapter 8, "ACCESSORIES AND RACK-MOUNT KITS"	Introduces the separately sold options and measurement accessories that can be used with this instrument.
Chapter 9, "MAINTENANCE"	Explains what daily customer care procedures (such as cleaning, calibration, and storage) are needed to sustain the performance and functionality of this instrument. Also covers instructions on how to troubleshoot this instrument and recover the system.
APPENDIX	Provides the following information: • Setting Time and Time Zone • Installing the Printer Driver • Setting up the Network • Setting the Guest Account • Setting up File Sharing • Default Setting List • Technical Documents

1.2 Product Overview

The Q7761 Optical Network Analyzer enables high-speed and high-accuracy measurement of all optical parameters, including the amplitude characteristics, group delay characteristics, chromatic dispersion characteristics, chromatic dispersion slope characteristics, polarization mode dispersion characteristics, second order polarization mode dispersion characteristics, and polarization-dependent loss characteristics for optical components and optical fibers.

The major characteristics of this instrument are as follows:

1. Measurement parameters:

   Amplitude characteristics, group delay (GD) characteristics, chromatic dispersion (CD) characteristics, chromatic dispersion slope (CD slope) characteristics, polarization mode dispersion (PMD) characteristics, second order polarization mode dispersion (second order PMD) characteristics, polarization-dependent loss (PDL) characteristics, and fiber length.

2. Measurement wavelength range: 1525 nm to 1625 nm
3. Absolute wavelength accuracy: ±15 pm
4. Group delay characteristics measurement accuracy: ±0.06 ps (Relative level 0 dB to 8 dB, Modulation frequency 2.5 GHz)
5. PMD measurement accuracy: ±0.1 ps ±3% of PMD
6. Dynamic range: 58 dB (Typ. 60 dB)

1.3 Other Manuals Pertaining to This Instrument

Available manuals pertaining to this instrument include:

- User's Guide (Part Code: {EQ7761/U}, English, this manual)

  Contains information prerequisite to using the Q7761 Optical Network Analyzer, ranging from setup to basic operation, applied measurement, functionality, specifications, and maintenance.

- Programming Guide (Part Code: {EQ7761/P}, English)

  Covers programming information to use the Q7761 Optical Network Analyzer to automate measurement sequences, including a remote control overview, SCPI command references, and sample application programs.

- Performance Test Guide (Part Code: {EQ7761/T}, English)

  Covers information necessary to verify the performance of the Q7761 Optical Network Analyzer, including performance test procedures and specifications.

1.4 Conventions of Notation Used in This Document

In this document, panel keys, on-screen buttons and menus are represented by the following symbols:

On-panel hard keys

Sample	Represents an on-panel hard key labeled "Sample." Example: **START**, **STOP**

On-screen system menus

[Sample]	Represents an on-screen menu, tab, button or dialog box that is labeled "Sample" and that is selected or executed when touched. Example: **[File]** menu, **[Normal]** tab, **[Option]** button

On-screen function buttons

{Sample}	Represents an on-screen function button labeled "Sample." Example: **{FREQ}** button, **{SWEEP}** button

On-screen soft menu bar

Sample	Sample Represents an on-screen function button labeled "Sample." Example: **Center** key, **Span** key

On-screen system menu key operation

[File]→[Save As...]	Indicates a touch on the **[File]** menu followed by a choice of **[Save As...]**.

Sequential key operation

{FREQ}, **Center**	Indicates a touch on the **{FREQ}** button followed by a touch on the **Center** key.

Toggle key operation

ΔMarker On/Off (On)	Indicates a touch on the **ΔMarker On/Off** key to turn on the ΔMarker.

1.5 Trademarks and Registered Trademarks

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2. PRE-OPERATION TIPS

This chapter provides preliminary tips on using this instrument. Read this chapter before using this instrument.

2.1 If Faults Should Occur

If this instrument is found to smoke or deliver offensive odors or abnormal noises, switch off the power breaker and remove the power cable from the AC power connector to power off this instrument. Then, contact your dealer or us immediately.

2.2 Removing of Case

The case should not be opened except by service personnel of our company.

WARNING: ***High-voltage and high-temperature parts inside. You may get electrical shocks or burnt if you touch them.***

2.3 Overcurrent Protection

This instrument is protected from overcurrent flow by a power breaker or a fuse. Located on the rear panel, the power breaker automatically forces an interruption of the power supply when an overcurrent flows through this instrument. When the power breaker has turned off (○ is depressed), remove the power cable from the AC power connector to power off this instrument. Then, call upon your dealer or us for repair services to fix a possible fault that has occurred in this instrument.

2.4 Hard Disk Drive

This instrument has a built-in hard disk drive. When handling the hard disk drive, take notice of these instructions.

- Do not impact or vibrate the hard disk drive.
  Damage to the disk on which data is stored could result, increasing the chances of malfunctioning or failing during operations.
- Do not switch off this instrument while the HDD access lamp is lit.
  The data being accessed might be damaged.

CAUTION: ***We do not assume any responsibility for the loss or corruption of data stored on the hard disk drive that might result from its faults.***

2.5 Handling the Touch Screen

This instrument has a touch screen. When handling the touch screen, take notice of these instructions.

- Do not give strong impacts or apply undue force to the screen.
  The glass could be cracked.
- Use the touch screen panel pen included with this instrument to operate the screen.
  Use of a hard-pointed material (such as a mechanical pencil or ballpoint) could scratch the screen surface.

2.6 Getting the Software Running with Stability

The Q7761 Optical Network Analyzer has Microsoft Windows XP pre-installed.

The measuring function of this instrument is dependent on the Windows environment. Do not alter the Windows operating environment in any way other than as described in this manual.
Furthermore, this instrument is not a data processor. Operate it only as described in this manual.

1. Non-permitted actions:
   - Installing other application programs.
   - Changing or deleting items in the control panel (except for "A.2 Installing the Printer Driver" and "A.3 Setting up the Network").
   - Opening or operating the existing files on the C drive.
   - Operating other application programs during the measurement.
   - Upgrading the Windows operating system.
   - If this instrument does not function correctly due to any of the above, re-install the system using the system recovery disk.
     For more information on the system recovery method, refer to section 9.8, "System Recovery Procedure."
2. Computer viruses
   Depending on the operating environment and method, the system can be contaminated by a computer virus. To use the system securely, it is recommended to take the following countermeasures:
   - Run a virus check before loading a file or media from an outside source.
   - Make sure that any network has safety measures against computer viruses before connecting.

   [If infected with a computer virus:]
   - Delete all files on the D drive. Re-install the system using the recovery disk.
     For more information on the system recovery method, refer to section 9.8, "System Recovery Procedure."

2.7 Tip on Transportation

Extreme care as described below must be taken when carrying the Q7761.

- The Q7761 is heavy and must be carried by two or more workers, or on a transportation cart.
- This instrument is a product consisting of three units. Please carry each of the three units separately.
- If using a cart, ensure the Q7761 is secure.
  If using the R16904 cart provided by Advantest, place the Analysis unit and the OPT unit on the upper shelf and place the Light source unit on the middle shelf of the cart to not exceed the weight limit of each shelf.

2.8 Electromagnetic Interference

This instrument may cause electromagnetic interference and affect television and radio reception. If this instrument's power is turned off and the electromagnetic interference is reduced, then this instrument has caused the problem.

Electromagnetic interference may be prevented by doing the following:

- Change the direction of the antenna of the television or radio.
- Place this instrument on the other side of the television or radio.
- Place this instrument away from the television or radio.
- Use different lines for the power sources for the television or radio and this instrument.

2.9 Note for Power-on

At power-on, do not connect to this instrument even a device under test.

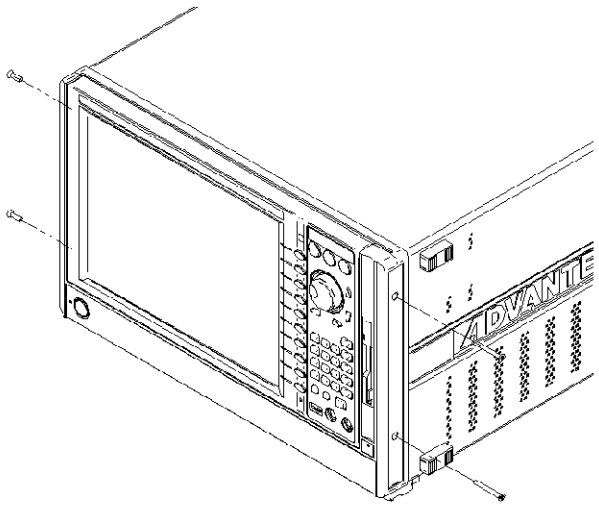
2.10 Notes for Removing and Attaching the Panel

This instrument can be used after removing the panel from the measuring area.

When removing the panel, take notice of these instructions.

MEMO: ***To use this instrument after removing the panel, a separately sold connecting cable is required.***

- If this instrument's power is turned on, turn off the power, remove the power cable, and then make sure that the operation of this instrument is terminated.
- When removing or attaching the panel, take care not to jam your finger.
- Place this instrument on a level and steady table when removing or attaching the panel.
- Take out the four screws that are exposed on the side of the front panel of this instrument.
- When taking out the screws, put a hand on the panel so that the panel will not unexpectedly fall off.
- After all four screws have been taken out, pull the panel forward.
- Remove the cable connecting the panel and the body of this instrument.
- Replace the cable with another one that is suitable for your use condition.
- If you have lost screws, use the following screws.
  For the 2 screws on the key side: flat-head Phillips screws M4X35 (steel or stainless steel)
  For the 2 screws on the liquid-crystal display: flat-head Phillips screws M4X14 (steel or stainless steel)



2.11 Changing and Disposing of the Battery

A backup battery (a Lithium battery) is used in the Q7761.

When changing the battery, contact Advantest or an Advantest representative .

When disposing of the battery, comply with the relevant laws of your country and waste-disposal regulations of your company.

2.12 Limitations Imposed when Using Windows XP

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2.13 Peripheral Equipment Operations

Not all the operations of peripheral equipment (PS/2 keyboard, PS/2 mouse, printer port, USB, and LAN), which can be connected to this instrument, are guaranteed.

3. SETUP

This chapter explains how to set up this instrument on delivery. Topics covered in this chapter are:

- 3.1 Unpacking Inspection
- 3.2 Locating This Instrument
- 3.3 Configuration of the Q7761 Optical Network Analyzer
- 3.4.1 Connecting the Keyboard and Mouse
- 3.5 Supply Description
- 3.6 Caution about the Optical Power Input Level of the Test Port
- 3.7 Instructions for Use
- 3.8 Operation Check

3.1 Unpacking Inspection

When the product is delivered, check it for its appearance and accessories included by following these steps:

1. Check to see if the box or the cushioning material in which the product was shipped has been damaged during transit.

IMPORTANT: ***If the box or the cushioning material is found damaged, leave them in their original condition until the inspection described below completes.***

---

2. Check the product surfaces for any damage.

WARNING: ***Do not power on this instrument if the cover, panels (front and rear), LCD display, power switch, connector or any other key component is found damaged. Electrical shock hazards could result from using damaged components.***

---

3. Check against the list in Table 3-1 that this instrument comes complete with all the standard accessories.

Contact your dealer or us in any of the following situations:

- The box or the cushioning material in which the product was shipped was damaged during transit, or there is evidence of a massive force having been applied to the cushioning material.
- The product surfaces are damaged.
- One or more standard accessories are missing or damaged.
- Defects have been detected in a subsequent product verification test.

Table 3-1 Standard Accessories

Name	Model	Quantity	Remarks
Power cable	A01402*	3	
GP-IB cable (L=1m)	DCB-SS1076X02	1	For BUS1 connection (between the analysis unit and the OPT unit)
GP-IB cable (L=2m)	DCB-SS1076X03	1	For BUS1 connection (between the analysis unit and the light source unit)
BUS2 cable	DCB-RR9980X01	1	For BUS2 connection
BUS3 cable	DCB-SS12190X01A	1	For BUS3 connection
BUS4 cable	DCB-SS12197X01A	1	For BUS4 connection
BUS5 cable	DCB-RR3994X03	1	For BUS5 connection
SMA(m)-SMA(m) semi-rigid cable	DCP-FF00432X01	10	Connection between the analysis unit and the OPT unit in the front panel
BNC cable	DCB-FF4894X04	1	For EXTERNAL STD signal
FC/APC-FC/SPC master optical fiber	DCP-HH00274X01	3	
FC/APC-FC/APC master optical fiber	DCP-HH00275X01	1	
FC/FC adapter (for APC)	JCH-AY001EX01	1	
FC/FC adapter	JCH-BD001EX01	3	
FC/SC adapter	JCH-BM001JX01	3	
SMA torque wrench	MAE-M6588B	1	
Joint set (rear)	MBT-127152A-1	4	
Joint set (front)	MBT-J7486A-1	4	
Screw for joint set	YKG-EN4X10-1	16	
Cover guard	MME-100328A001A-1	1	
Touch screen panel pen	AHN-STPEN-1	1	
Q7761 recovery disk	ASF-A776101-1	1	
Accessory case	MEE-128220A	1	
Power fuse	DFT-AA3R15A	1	3.15A fuse
Q7761 User's Guide	EQ7761/U	1	English
Q7761 Programming Guide	EQ7761/P	1	English
Q7761 Performance Test Guide	EQ7761/T	1	English

*: The power cable specified at the time of the order is used.

3.2 Locating This Instrument

This section describes the installation environment in which this instrument runs successfully.

3.2.1 Operating Environment

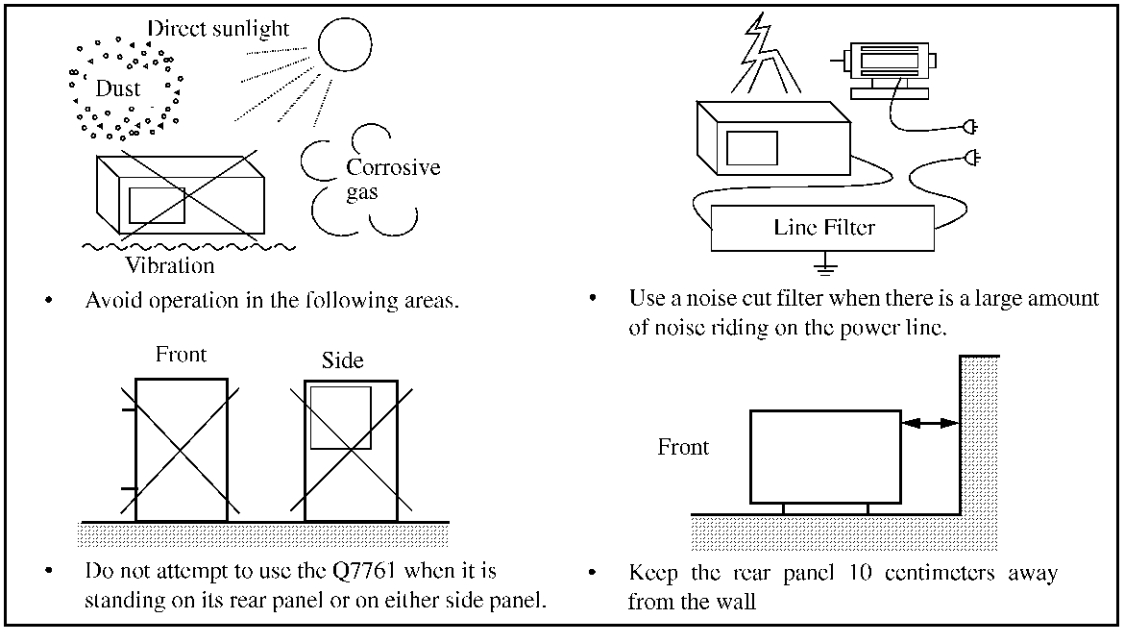
This instrument should only be used in a place that satisfies the following conditions:

- Ambient temperature: +15°C to +35°C (operating temperature)
  -20°C to +60°C (Storage temperature range)
- Relative humidity: RH80% or less (no condensation)
- An area free from corrosive gas
- An area away from direct sunlight
- A dust-free area
- An area free from vibrations
- Location solid enough to sustain the weight of this instrument

  The total weight of this instrument consisting of three units is approximately 80 kg. Install this instrument on a flat surface that is durable and solid enough to sustain its weight.
- A low noise area

  Although this instrument has been designed to withstand a certain amount of noise riding on the AC power line, it should be used in an area of low noise. Use a noise filter when ambient noise is unavoidable.
- An area allowing unobstructed airflow

  There is an exhaust-cooling fan on the rear panel or side panel and exhaust vents on both sides and the bottom (toward the front) of this instrument. Never block these vents. The resulting internal temperature rise will affect measurement accuracy. Keep the rear panel 10 centimeters away from the wall. In addition, do not attempt to use this instrument when it is standing on its rear panel or on either side panel.



- Avoid operation in the following areas.
- Use a noise cut filter when there is a large amount of noise riding on the power line.
- Do not attempt to use the Q7761 when it is standing on its rear panel or on either side panel.
- Keep the rear panel 10 centimeters away from the wall

Figure 3-1 Operating Environment

3.3 Configuration of the Q7761 Optical Network Analyzer

This instrument consists of three units: the analysis unit, which has a display and operation panel, the OPT unit, which has optical input/output ports, and the light source unit, which generates optical signals.

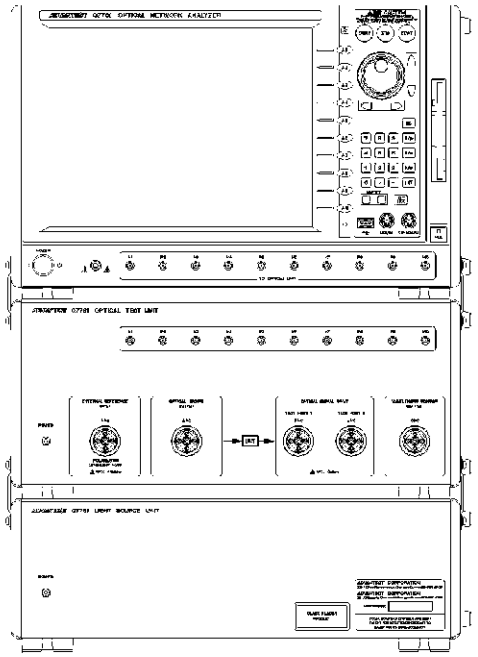


Figure 3-2 Configuration and Names of the Three Units

Set up these units according to the following procedure before you turn on the power of this instrument.

CAUTION: ***Please set up this instrument on a flat workbench that is strong enough to sustain its weight and with the power off.***

---

1. Stack the OPT unit on the light source unit.

   Place the light source unit on the workbench and stack the OPT unit on it.

   When stacking, correctly fit the protrusion of the foot on the near side of the bottom of the OPT unit into the groove on the near side of the top of the light source unit.

2. Stack the analysis unit on the OPT unit.

   Correctly fit the protrusion of the foot on the near side of the bottom of the analysis unit into the groove on the near side of the top of the OPT unit.

   CAUTION: ***Do not connect each connector to other equipment before you combine and fix all units.If connected, this instrument and the connected equipment may be damaged.***

   ---

3. Combine the three units.

   Combine the analysis unit, OPT unit, and light source unit using the joint set included with this instrument.

CAUTION:	***When you carry this instrument, use the joint set to uncombine the units previously combined, and carry the analysis unit, OPT unit, and light source unit separately.*** ***To uncombine the units, remove the connection cables between the units.***

Front panel connection

4. Connect the SMA connectors of the signal ports P1 to P10 on the front panels of the analysis unit and OPT unit using SMA semi-rigid cables.

   Tighten the SMA connectors to the torque specified by using the torque wrench included with this instrument.

CAUTION:	***When connecting the semi-rigid cables to the SMA connectors, to avoid stripping threads, first tighten slightly with your fingers and then tighten using the torque wrench.*** ***When the torque value is insufficient, the performance potential may not be fully realized.*** ***If you tighten the torque to exceed the specified torque without using the torque wrench, the unit may be damaged.***

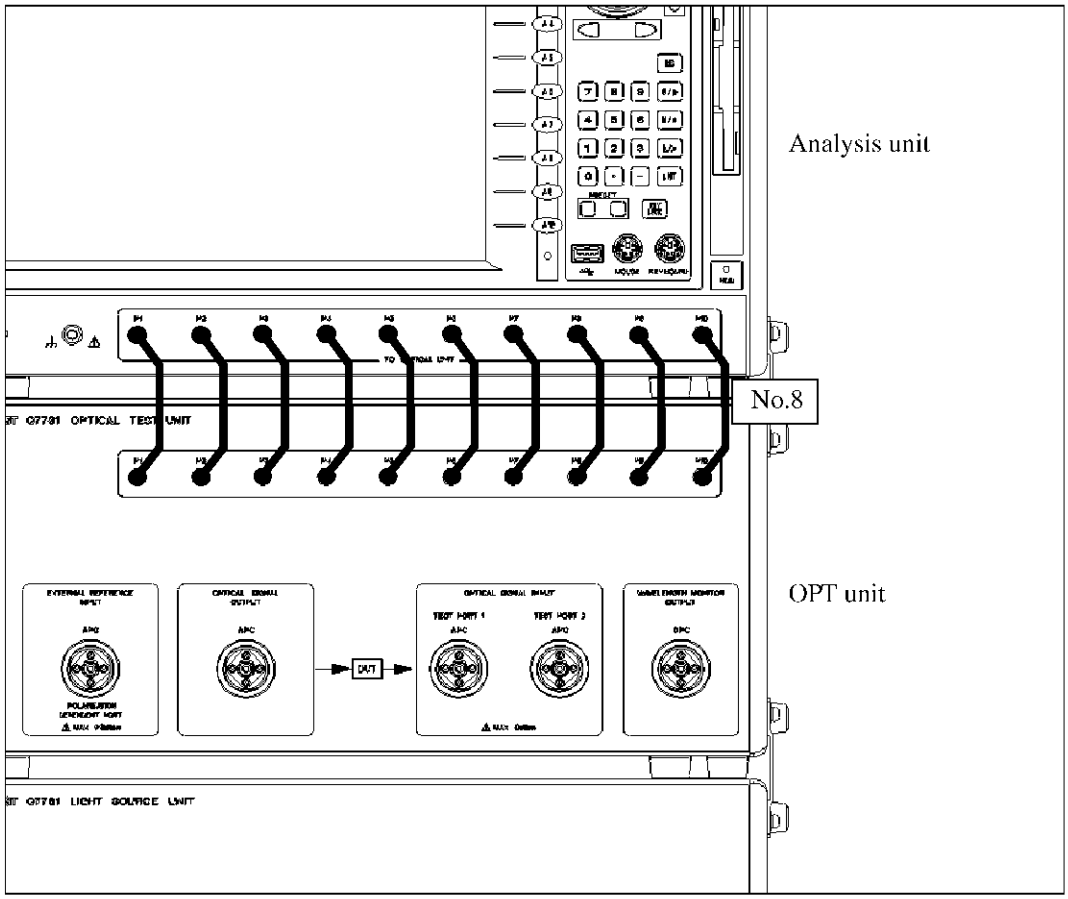


Figure 3-3 Front Panel Connection

Rear panel connection

5. Perform necessary connection on the rear panels using the cables included with this instrument.

   The required connections between units are as follows:

No.	Name	Model	Connection
1	GP-IB cable (L=1m)	DCB-SS1076X02	Between BUS1 of the analysis unit and BUS1 of the OPT unit
2	GP-IB cable (L=2m)	DCB-SS1076X03	Between BUS1 of the analysis unit and BUS1 of the light source unit
3	BUS2 cable	DCB-RR9980X01	Between BUS2 of the analysis unit and BUS2 of the OPT unit
4	BUS3 cable	DCB-SS12190X01A	Between BUS3 of the analysis unit and BUS3 of the OPT unit

No.	Name	Model	Connection
5	BUS4 cable	DCB-SS12197X01A	Between BUS4 of the analysis unit and BUS4 of the OPT unit
6	BUS5 cable	DCB-RR3994X03	Between BUS5 of the OPT unit and BUS5 of the light source unit
7	BNC cable	DCB-FF4894X04	Between EXTERNAL STANDARD INPUT of the analysis unit and EXTERNAL STANDARD OUTPUT of the OPT unit
8	SMA(m)-SMA(m) semi-rigid cable	DCP-FF00432X01	Between the analysis unit and the opt unit in the front panel.
9	Optical fiber code	-	Connect the optical fiber cord from LIGHT SOURCE OUUTPUT of the light source unit to LIGHT SOURCE INPUT of the OPT unit.

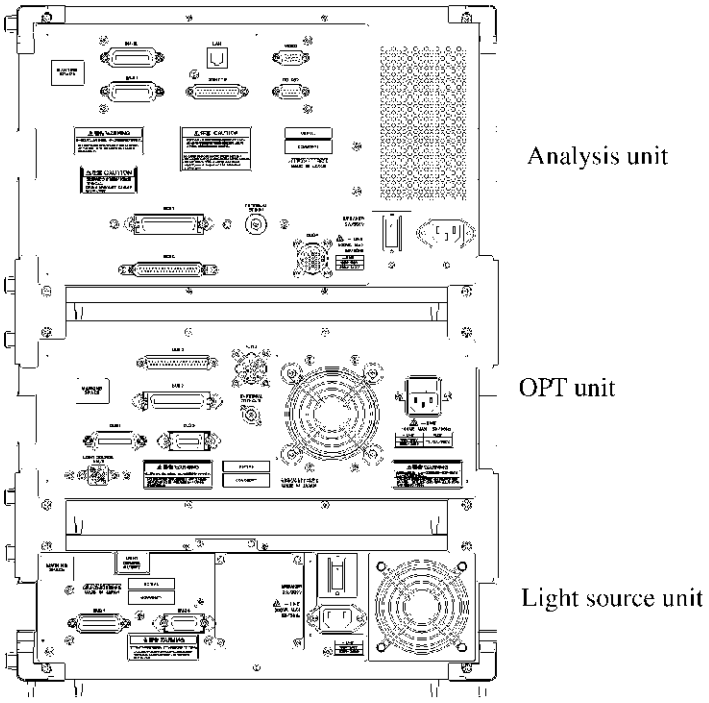


Figure 3-4 Q7761 Rear Panel

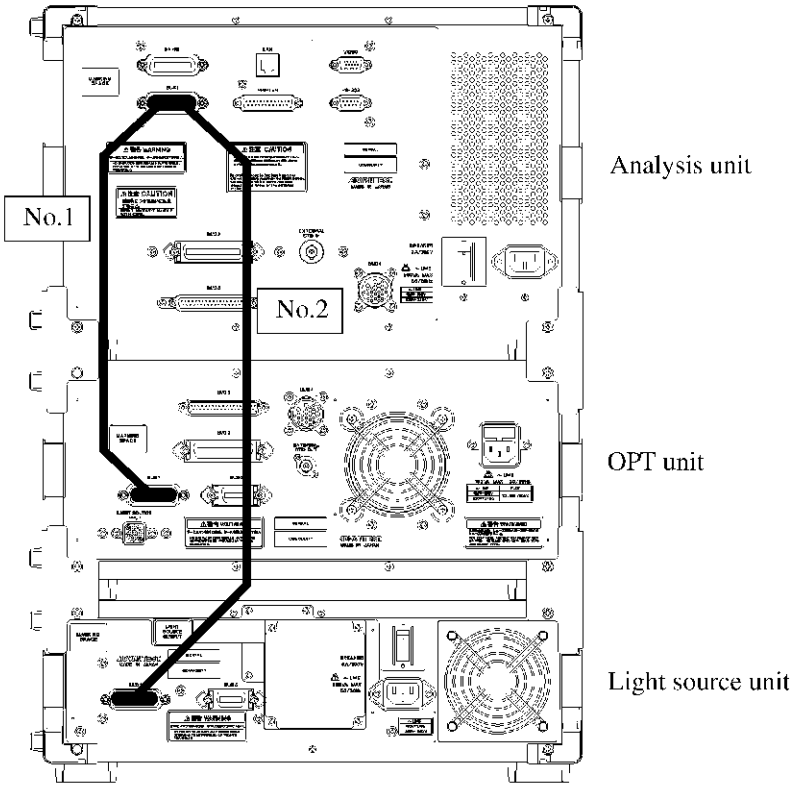


Figure 3-5 Rear Panel Connection (1)

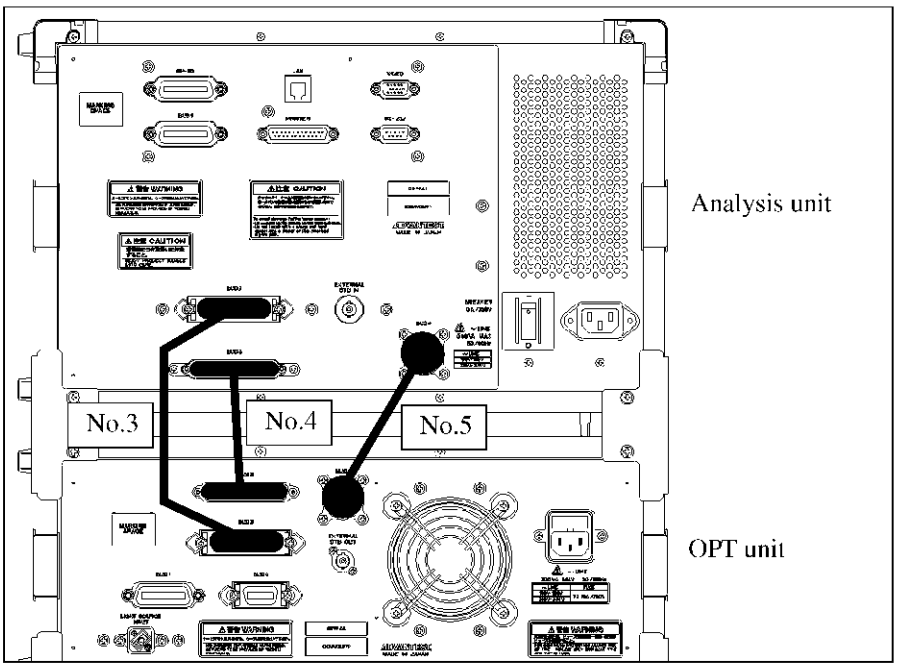


Figure 3-6 Rear Panel Connection (2)

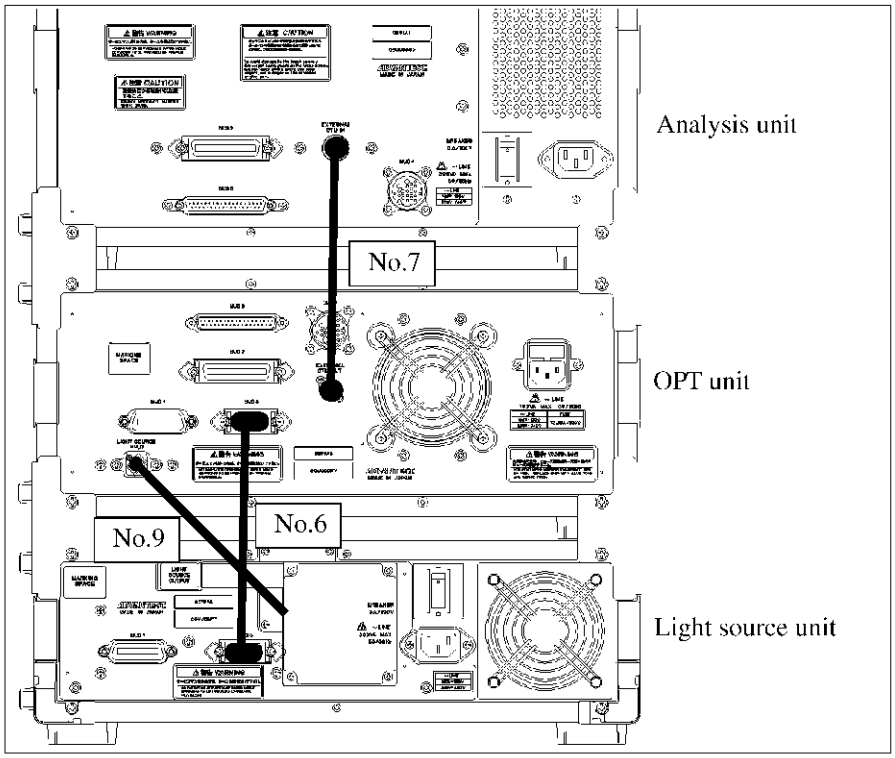


Figure 3-7 Rear Panel Connection (3)

CAUTION: ***The fiber No.9 must not be pulled strongly because it is nonremovable.***

3.4 Connecting Accessories

This section explains how to connect accessories to this instrument to run it.

3.4.1 Connecting the Keyboard and Mouse

Plug the keyboard and mouse into their respective front-panel connectors (KEYBOARD and MOUSE connectors). The keyboard and mouse must be plugged before turning on this instrument.

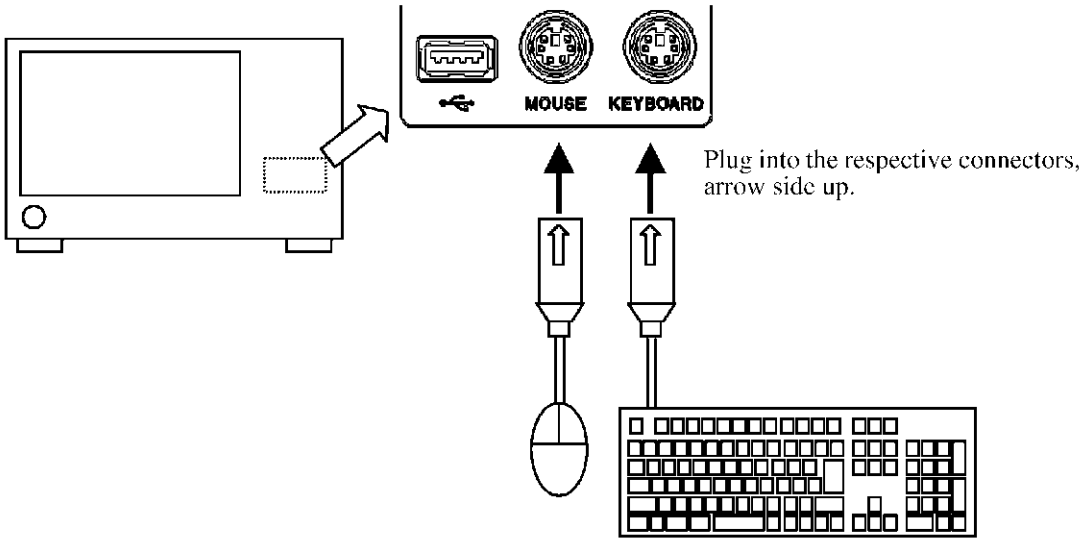


Figure 3-8 Connecting the Keyboard and Mouse

3.5 Supply Description

This section explains how to check the power supply specifications and connect the power cable.

3.5.1 Check the Supply Power

Table 3-2, Table 3-3, and Table 3-4 summarize the power supply specifications for this instrument. Make sure that the power supply available to this instrument meets these specifications.

Table 3-2 Power Specification of the Analysis Unit

	100 VAC Operation	200 VAC Operation	Remarks
Input voltage range	90 V to 132 V	198 V to 250 V	Automatically switches between input levels of 100 VAC and 200 VAC.
Frequency range	47 Hz to 63 Hz		
Power consumption	500 VA or below		

Table 3-3 Power Specification of the OPT Unit

	100 VAC Operation	200 VAC Operation	Remarks
Input voltage range	90 V to 132 V	198 V to 250 V	Automatically switches between input levels of 100 VAC and 200 VAC.
Frequency range	47 Hz to 63 Hz		
Power consumption	100 VA or below		

Table 3-4 Power Specification of the Light Source Unit

	100 VAC Operation	200 VAC Operation	Remarks
Input voltage range	90 V to 132 V	198 V to 250 V	Automatically switches between input levels of 100 VAC and 200 VAC.
Frequency range	47 Hz to 63 Hz		
Power consumption	300 VA or below		

WARNING: ***Be sure to provide a power supply that meets the specified power supply specifications for this instrument. Failure to meet the specifications could cause damage to this instrument.***

3.5.2 Power Fuse

The OPT unit uses a power fuse.

CAUTION: ***When the power fuse is blowed, some problems may have occurred in Q7761. Please contact us or our representatives.***
To prevent danger from fire, use a power fuse of the same capacity and type.

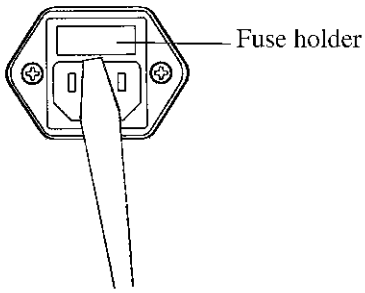
The power fuse is in the fuse holder on the rear panel of the OPT unit.Confirm and change the power fuse according to the following procedure:

1. Turn off the power switch to shut down power.
2. Disconnect the power cable from the AC power outlet.
3. Remove the fuse holder on the rear panel using a long, thin screwdriver.
4. Confirm (or change if required) the power fuse and return it to the fuse holder.

Table 3-5 Power Fuse of the OPT Unit

Model	Rated current
DFT-AA3R15A	T3.15A

1. Pull out the fuse holder using a long, thin screwdriver.



2. Confirm (or change if required) the power fuse and return the power fuse and fuse holder to the power plug.

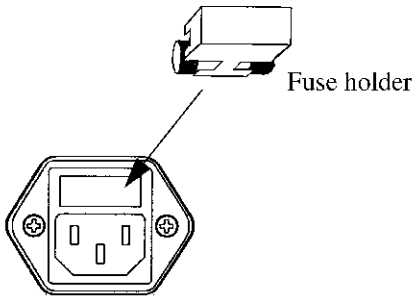


Figure 3-9 Changing Power Fuses

3.5.3 Connecting the Power Cable

This instrument comes with a three-core power cable with a grounding conductor. To guard against electrical shock hazards, ground this instrument by plugging the power cable into a three-pole power outlet.

1. Check the power cable included with this instrument for any damage.

WARNING: ***Never use a damaged power cable. Electrical shock hazards could result.***

---

2. Plug one end of the power cable included with this instrument into the AC power connector on this instrument rear panel and the other into a three-pole power outlet having a protecting grounding terminal (see Figure 3-10).

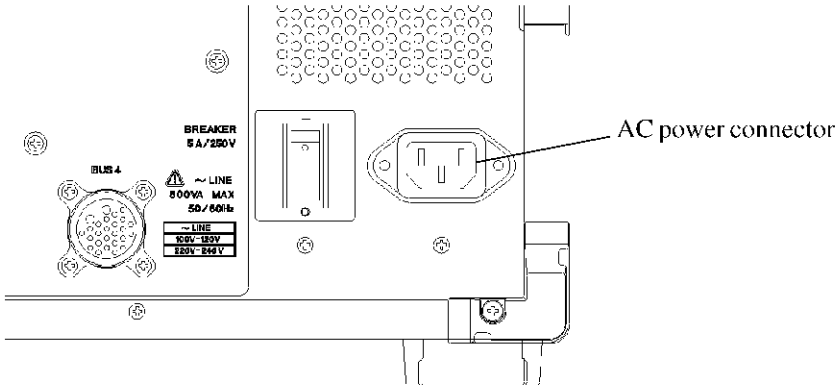


Figure 3-10 Connecting the Power Cable

WARNING:

1. ***Use a power cable rated for the voltage being used. Be sure however to use a power cable conforming to the safety standards of your country when using this instrument overseas (Refer to "Safety Summary").***
2. ***Plug the power cable into a three-pole power outlet having a protecting grounding terminal to guard against electrical shock hazards. Use of an extension cord without a protecting grounding terminal would override the protective grounding.***

3.6 Caution about the Optical Power Input Level of the Test Port

The maximum incidence light power level to the external reference optical input port (EXTERNAL REFERENCE INPUT) is +3 dBm.

CAUTION:

1. ***Use a laser product which is classified as Class 1 or 1M according to IEC 60825-1 Am.2 2001 as an external laser source for the external reference input.***
2. ***Use a laser product which is classified as Class 3A according to IEC 825-1 1993; EN 60825-1 1994 as an external laser source for the external reference input.***

The maximum incidence light power level to the optical signal input test port (OPTICAL SIGNAL INPUT) is 0 dBm.

When the optical input is connected to the test port, avoid excess input. Optical input exceeding the specified optical power level may cause damage to Q7761.

3.7 Instructions for Use

1. When the power switch is turned on before starting measurement, do not connect the DUT.
2. Only specified service personnels are allowed to open the case of this instrument. It is very dangerous because the temperature and voltage of some parts in this instrument can be very high.
3. If smoke, a strange smell, or a strange sound is detected from this instrument, turn the power switch off. Also disconnect the power plug from the outlet. Please contact us or our representatives.
4. Warm-up

   Turn on the power switch after this instrument has become room temperature, and use this instrument after warming it up for two hours or more.
5. Guarantee of absolute and relative wavelength accuracy.

   The Q7761 performs accurate absolute and relative wavelength measurements under the following conditions.

   - The Q7761 warms up for 2 hours or more after the power is turned on.
   - The light source unit is calibrated after warming up.
   - The light source unit is calibrated if the display in the light source of the status window changes to UNCAL.
   - The Q7761 is used on a horizontal plane.

MEMO: For more information on how to calibrate the light source unit, refer to 6.4.8, "[Calibration]" in the Light Source menu. The time required for calibration is ten minutes.

---

6. Guarantee of level accuracy.

   Herein Level accuracy refers to apart from the wavelength characteristics, the measurement accuracy. The Q7761 performs accurate measurements under the following conditions.

   - SThe Q7761 warms up for 2 hours or more after the power is turned on.
   - The measurement ports are calibrated before performing any measurements.
   - The measurement ports are calibrated every eight hours.
   - The measurement ports are calibrated after the light source unit calibration.
   - The Q7761 is recalibrated, if the wavelength setting range changes. However, if the wavelength setting changes within the original range, no calibration is necessary.

MEMO: For more information on how to calibrate the measurement ports, refer to 6.4.8, "[Calibration]" in the PMD Normalize Port1 menu and PMD Normalize Port2 menu.

3.8 Operation Check

This section explains how to make a simple operation check on this instrument by using its built-in auto calibration feature. To verify that this instrument runs correctly, follow these steps:

Starting up this instrument

1. Connect the power cable as instructed in 3.5.3, "Connecting the Power Cable."
2. Switch on the power breaker on the rear panel.
   Then wait for 3 seconds or more.

MEMO: A power breaker is located on each rear panel of the analysis unit and the light source unit.

---

3. Press the **POWER** switch to switch on the power.

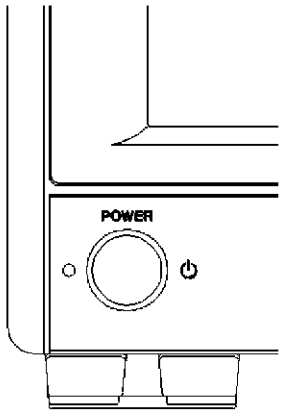


Figure 3-11 **POWER** Switch

CAUTION:

1. *If this instrument is abruptly powered off while in operation, such as by pulling the power cable out of position, the hard disk drive could fail. Even when the hard disk drive does not fail, Scandisk launches to check for possible corruptions in the data stored on it the next time this instrument starts up.*
2. *About Scandisk*
   If this instrument has been powered off without being shut down, Scandisk will launch to check for corruptions automatically. Do not abort Scandisk while it is running. If Scandisk locates corruptions, take appropriate remedial action as recommended by the display messages. The software in this instrument resumes automatically when Scandisk ends.

---

4. The power-on diagnostic program starts to perform a self-diagnosis and warm-up.

   The self-diagnosis and warm-up take about 2 hours or less.

   The initial screen shown in Figure 3-12 is displayed unless this instrument is tested faulty.

   The initial screen may give a different look from Figure 3-12, depending on the settings in effect the last time this instrument was powered off.

MEMO: Refer to Chapter 9, "MAINTENANCE" if error messages are displayed as a result of the self-diagnostics.

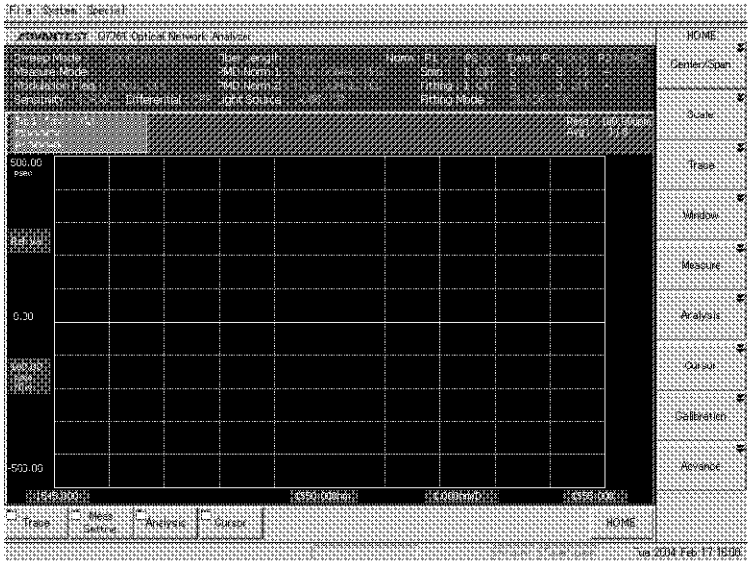


Figure 3-12 Initial Setup Screen

Switching off power

5. Press the **POWER** switch of the Q7761.

   The final processing of the system is performed and the power is automatically turned off.

4. QUICK START

This chapter explains the functions and basic operations of the individual components of this instrument's panel and screen, using a measurement example.

4.1 Explanations of the Panel and Screen

This section provides the names and functions of individual components of the front panel, screen, and rear panel.

4.1.1 Names and Functions of Individual Components of the Front Panel of the Analysis Unit

This section provides the names and functions of individual components of the front panel of the analysis unit.

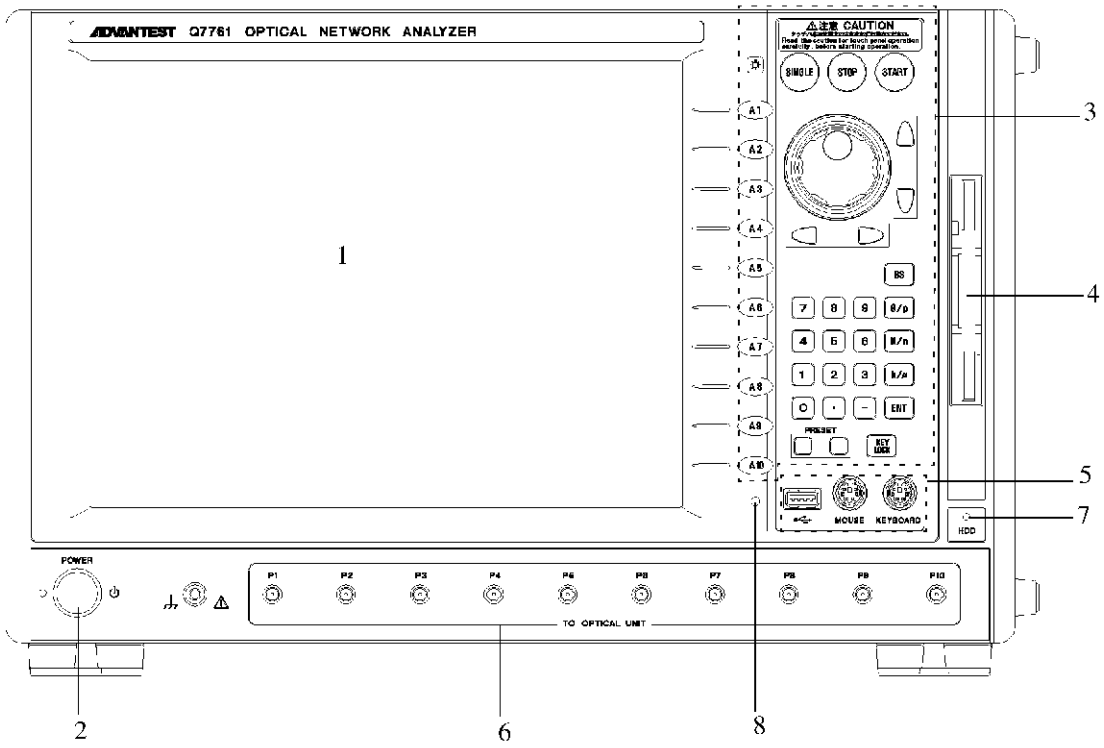


Figure 4-1 Front Panel

1. Touch screen display — Displays measurement data, setting conditions, and other information. Setting conditions can be changed with the touch screen function.

2. POWER switch — The power ON/OFF switch. When the power is turned off, the power goes off after the system has terminated.

4.1.1 Names and Functions of Individual Components of the Front Panel of the Analysis Unit

3.	Entry key block	The key switch block used for changing settings
4.	Floppy disk drive	The 3.5-inch floppy disk drive
5.	I/F connector block	The I/F connector block for the keyboard, mouse, and USB.
6.	Connectors P1 to P10	The connectors to the OPT unit. Connect to the P1 to P10 of the corresponding OPT unit.
7.	HDD access lamp	Lit while accessing the HDD (hard disk drive).
8.	Power lamp	Lit while the power is ON.

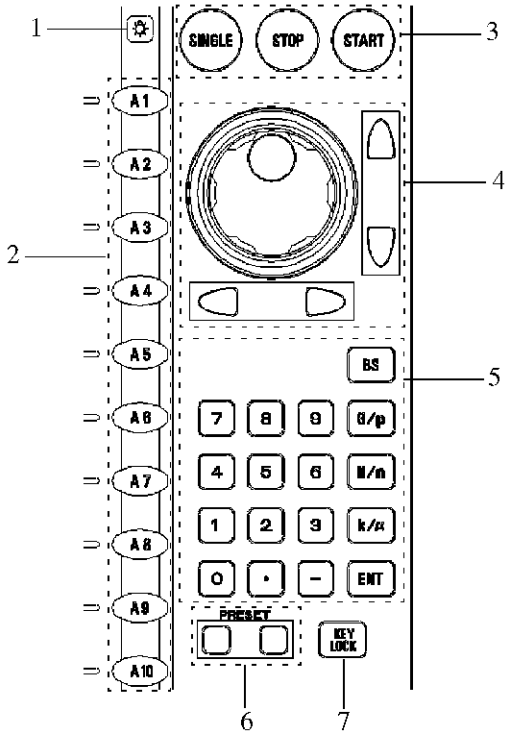


Figure 4-2 Entry Key Block

1. Backlight key — Turns on/off the backlight of the display.

2. Function key — Selects the soft menu of the display.

3. Measurement key — Used to control measurement.

   SINGLE: Starts a single measurement.

   STOP: Stops measurements.

   START: Starts repetitive measurements.

4. Data knob, step key — The data knob and step key.

   IMPORTANT: ***Turning the data knob continuously at high speed may cause an error because the rate at which the value changes cannot keep up with the rotation speed of the data knob.***

5. Number keys (ten keys) — Used to enter numeric values.

   BS: Backspace key

   G/p: For the wavelength information, the unit pm is applied to the keys. For the frequency information, the unit GHz is applied to the keys.

   M/n: For the wavelength information, the unit nm is applied to the keys. For the frequency information, the unit MHz is applied to the keys, and for the time information, the unit "nsec" is applied to the keys.

k/μ: For the wavelength information, the unit μm is applied to the keys. For the frequency information, the unit kHz is applied to the keys, and for the time information, the unit μsec is applied to the keys.

ENT: Basic unit key The unit of frequency is Hz, and the unit of time is msec.

6. PRESET key — Used to initialize this instrument.
This instrument is initialized when you press the left-side key while you continue pressing the right-side key.

7. KEY LOCK key — Locks the key input. Toggles the lock on/off.

CAUTION: ***KEY LOCK key is described on the soft screen as Panel Lock.***

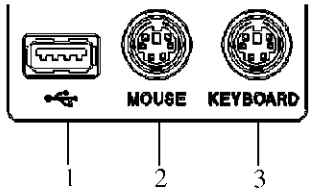


Figure 4-3 I/F Connector Block

1. USB connector — The USB connector used to connect accessories.

2. MOUSE connector — The connector used to connect a mouse.

3. KEYBOARD connector — The connector used to connect an external keyboard.

IMPORTANT: ***Connect a mouse and keyboard before you turn on the power.***

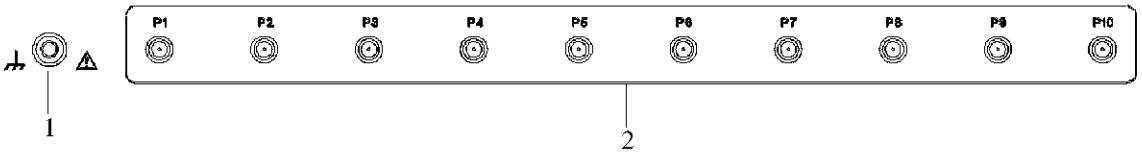


Figure 4-4 GND Terminal and Connectors P1 to P10

1. GND terminal — GND terminal

2. Connectors P1 to P10 — Connects to the P1 to P10 of the OPT unit using the cables included with this instrument.

CAUTION: ***Use the torque wrench supplied with this instrument when connecting the SMA connectors P1 to P10.***

4.1.2 Names and Functions of Individual Components of the Front Panel of the OPT Unit

This section provides the names and functions of individual components of the front panel of the OPT unit.

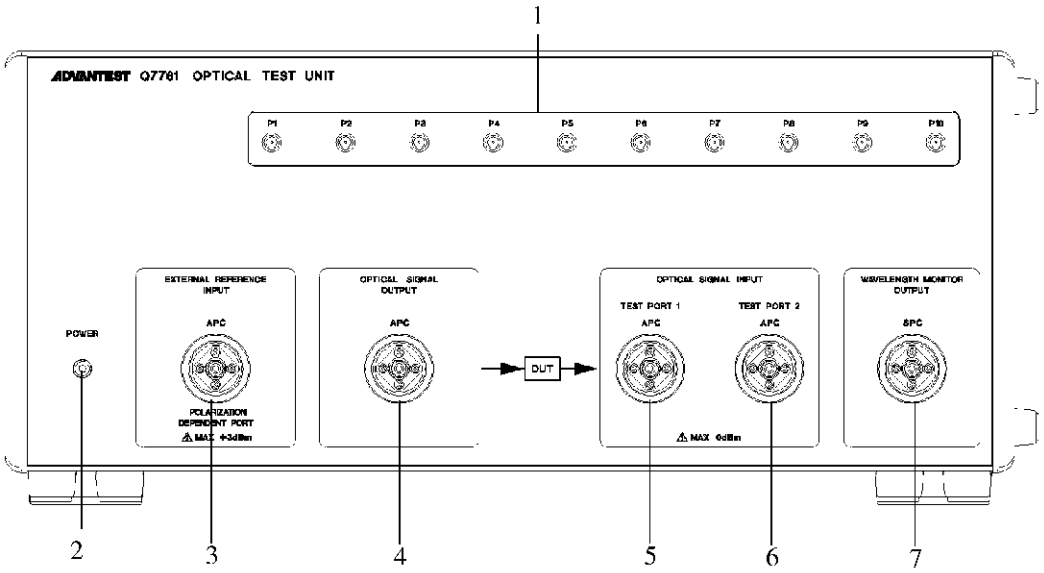


Figure 4-5 Front Panel of the OPT Unit

1. Connectors P1 to P10 — Connects to the P1 to P10 of the analysis unit using the cables included with this instrument.

2. POWER lamp — Lit while the power is ON.

3. EXTERNAL REFERENCE INPUT port
   The external reference optical input port for drift compensation. The Angled PC polished connector. A polarization maintaining fiber is used internally.
   Align the incident polarization with the connector key.

4. OPTICAL SIGNAL OUTPUT port
   Optical output port. Connect the optical output to the DUT. The Angled PC polished connector.

5. OPTICAL SIGNAL INPUT port 1
   The optical input port. Connect the optical signal from the DUT. The Angled PC polished connector.

6. OPTICAL SIGNAL INPUT port 2
   The optical input port. Connect the optical signal from the DUT. The Angled PC polished connector.

7. WAVELENGTH MONITOR OUTPUT
   The external wavelength monitor output. Connect to the optical input of the external wavelength meter. The Super PC polished connector.

4.1.3 Names and Functions of Individual Components of the Front Panel of the Light Source Unit

This section provides the names and functions of individual components of the front panel of the light source unit.

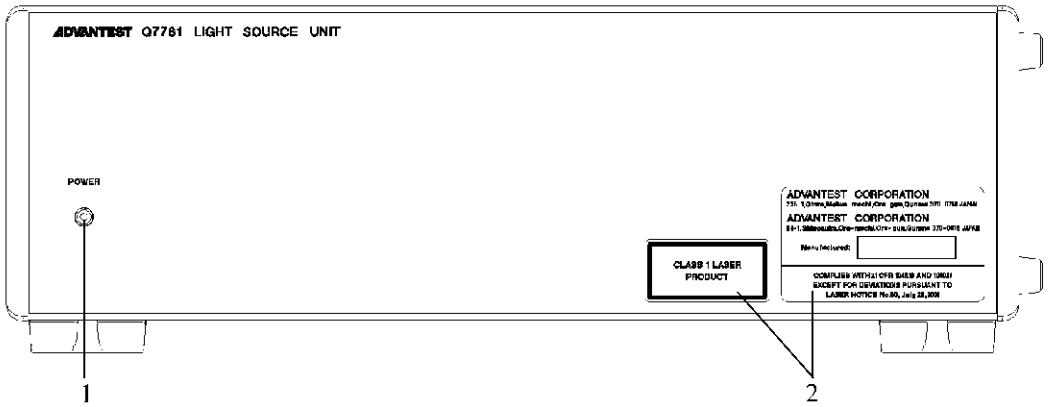


Figure 4-6 Front Panel of the Light Source Unit

1. POWER lamp — Lit while the power is ON.
2. Laser safety label — The label identifying the laser safety standard of the Q7761.

4.1.4 Names and Functions of Individual Components of the Rear Panel of the Analysis Unit

This section provides the names and functions of individual components of the rear panel of the analysis unit.

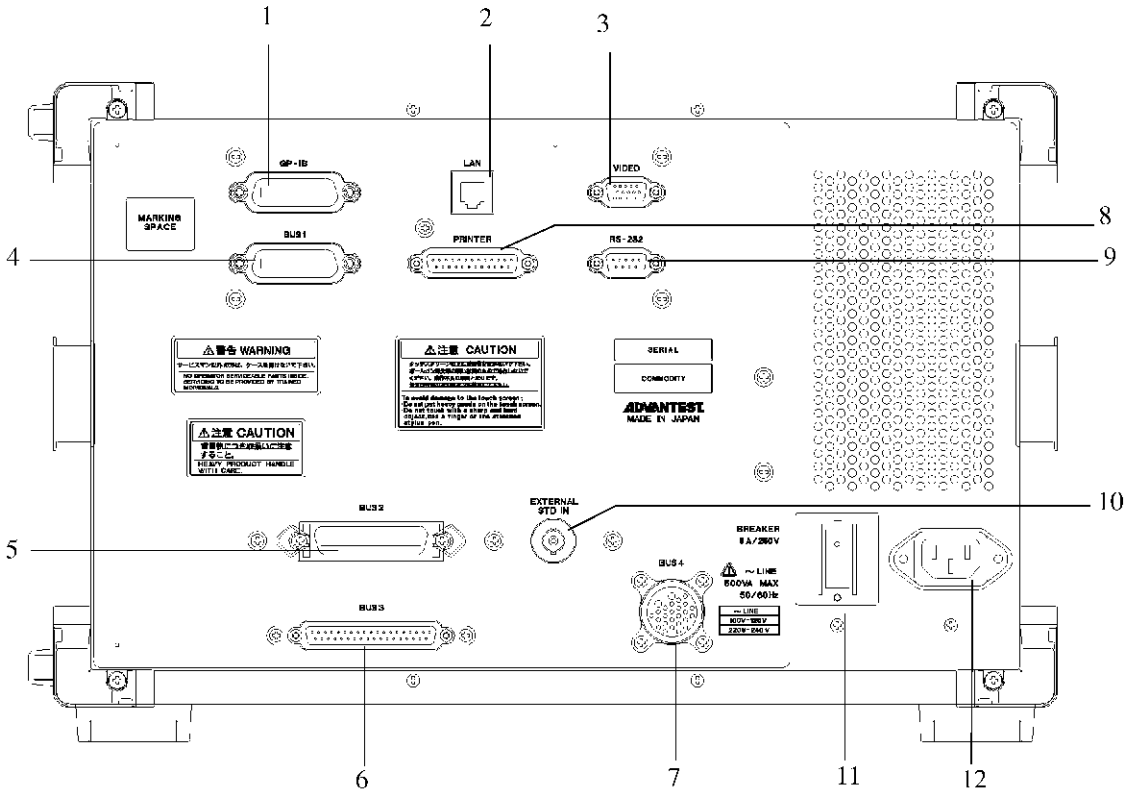


Figure 4-7 Rear Panel of the Analysis Unit

1.	GP-IB connector	Used to control the external equipment using GP-IB.
2.	LAN connector	Used to connect to LAN.
3.	VIDEO signal output connector	Used to connect an external monitor.
4.	BUS1 connector	Connects to the BUS1 connector of the OPT unit and light source unit using the cable included with this instrument.
5.	BUS2 connector	Connects to the BUS2 connector of the OPT unit using the cable included with this instrument.
6.	BUS3 connector	Connects to the BUS3 connector of the OPT unit using the cable included with this instrument.
7.	BUS4 connector	Connects to the BUS4 connector of the OPT unit using the cable included with this instrument.
8.	PRINTER port	Used to connect an external printer.

9.	RS-232 connector	Used to control the external equipment using RS-232.
10.	EXTERNAL STD IN connector	Connects to the EXTERNAL STD OUT connector 1 of the OPT unit using the cable included with this instrument.
11.	Power breaker switch	The power breaker switch of the analysis unit.
12.	AC power connector	Connects the power cable.

4.1.5 Names and Functions of Individual Components of the Rear Panel of the OPT Unit

This section provides the names and functions of individual components of the rear panel of the OPT unit.

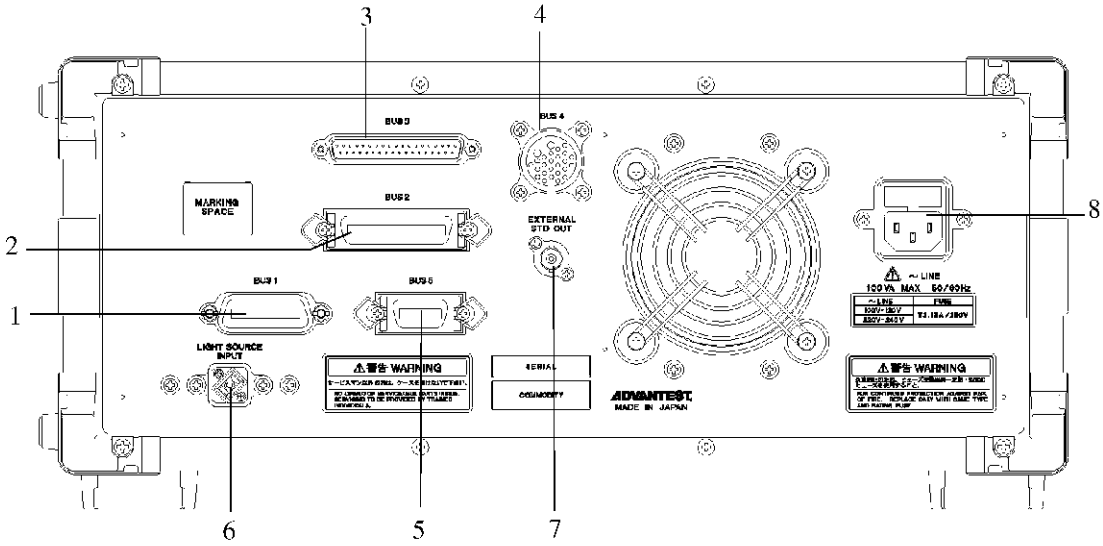


Figure 4-8 Rear Panel of the OPT Unit

1.	BUS1 connector	Connects to the BUS1 connector of the analysis unit using the cable included with this instrument.
2.	BUS2 connector	Connects to the BUS2 connector of the analysis unit using the cable included with this instrument.
3.	BUS3 connector	Connects to the BUS3 connector of the analysis unit using the cable included with this instrument.
4.	BUS4 connector	Connects to the BUS4 connector of the analysis unit using the cable included with this instrument.
5.	BUS5 connector	Connects to the BUS5 connector of the light source unit using the cable included with this instrument.
6.	LIGNT SOURCE INPUT connector	Connects the optical fiber cord of the light source unit.

7. EXTERNAL STD OUT connector
   Connects to the EXTERNAL STD IN connector of the analysis unit using the cable included with this instrument.
8. AC power connector — Connects the power cable.

4.1.6 Names and Functions of Individual Components of the Rear Panel of the Light Source Unit

This section provides the names and functions of individual components of the rear panel of the light source unit.

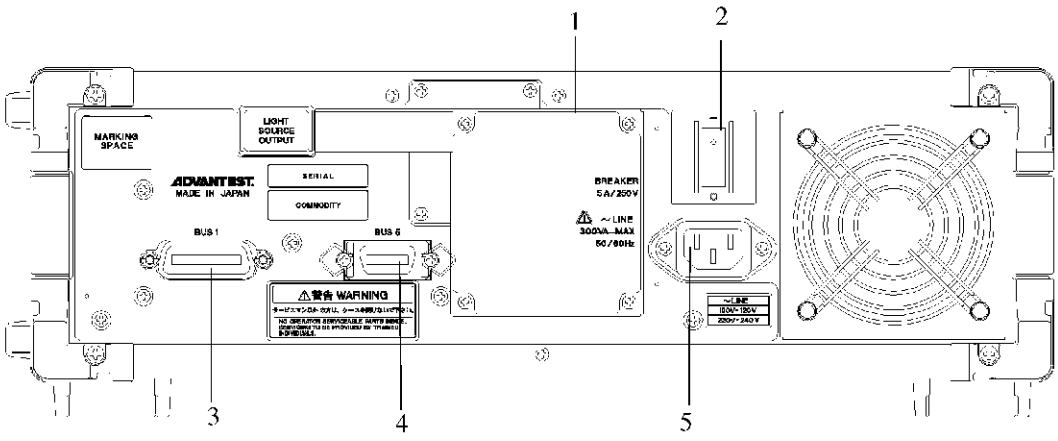


Figure 4-9 Rear Panel of the Light Source Unit

1. Optical fiber cord output — The output optical fiber cord from the optical source is stored. Connects to the LIGHT SOURCE INPUT of the OPT unit.
2. Power breaker — The power breaker switch of the light source unit.
3. BUS1 connector — Connects to the BUS1 connector of the analysis unit using the cable included with this instrument.
4. BUS5 connector — Connects to the BUS5 connector of the OPT unit using the cable included with this instrument.
5. AC power connector — Connects the power cable.

4.1.7 Names and Functions of Individual Components of the Screen

This section provides the names and functions of individual components of the screen of this instrument.

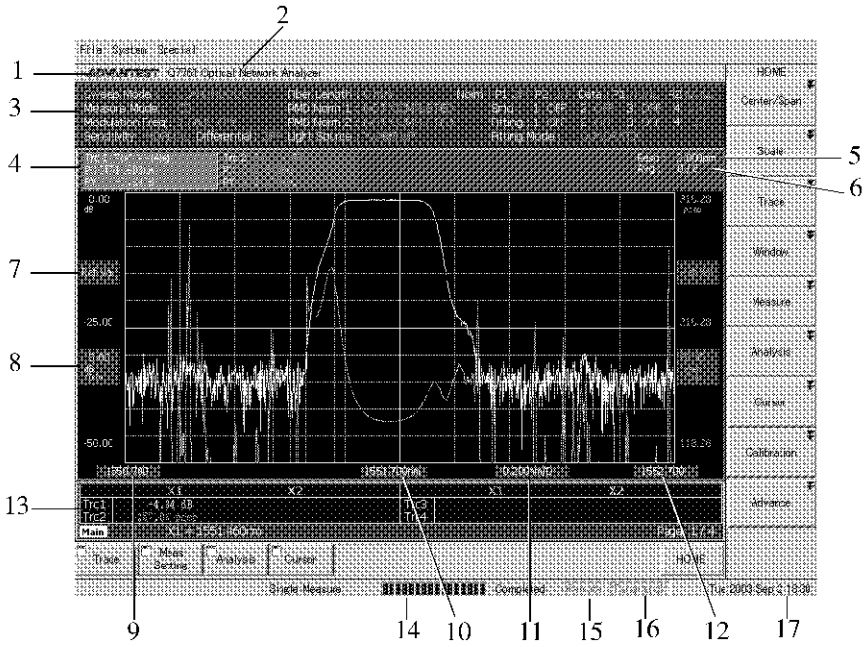


Figure 4-10 Names of Individual Components of the Screen

1.	ADVANTEST logo	The ADVANTEST logo is displayed.
2.	User's title	This area displays explanations on the details of the measured data.
3.	Status window	This area displays various types of measurement information.
4.	Trace information display	This area displays the port setting, trace mode, and peak value.
5.	Display resolution	The set value of the display resolution.
6.	Averaging count	Displays the set averaging count and the current averaging count.
7.	Reference value	Sets the reference level.
8.	/Div (Y axis)	Displays the division size of the Y-axis.
9.	Start wavelength (frequency)	Displays the start wavelength (frequency).
10.	Center wavelength (frequency)	Displays the center wavelength (frequency).
11.	/Div (X axis)	Displays the division size of the X-axis.
12.	Stop wavelength (frequency)	Displays the stop wavelength (frequency).
13.	Cursor information display	Displays the set value of the XY cursors or the trace data on the specified position.

14. Progress bar	Displays the progress of the function being executed in the bar.
15. Remote	Displayed when GPIB is in remote state.
16. Panel lock	Displayed when the panel keys are locked.
17. Date	The current date and time

4.1.8 Names and Functions of the Status Window

This section provides the names and functions of individual components of the screen of the status window.

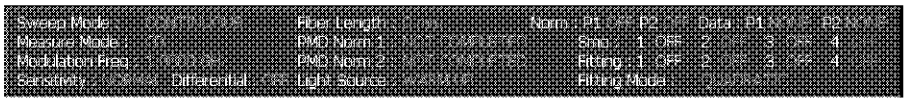


Figure 4-11 Status

Sweep Mode	Displays the setting of the sweep mode. (Refer to Sweep Mode in Section 6.4.5, "[Measure].")
Measure Mode	Displays the setting of the measurement mode. (Refer to Measure Mode in Section 6.4.5, "[Measure].")
Modulation Freq	Displays the set value of the modulation frequency. (Refer to Modulation Frequency in Section 6.4.5, "[Measure].")
Sensitivity	Displays the setting of the measurement sensitivity. (Refer to Sensitivity in Section 6.4.5, "[Measure].")
Differential	Displays whether the differential measurement is set to on or off. (Refer to Differential Measure in Section 6.4.5, "[Measure].")
Fiber Length	Displays the measurement result of the fiber length. (Refer to Section 6.4.9, "[Advance].")
PMD Norm1	Displays whether the PMD normalize data of port 1 is valid or not. (Refer to PMD Normalize Port1 in Section 6.4.8, "[Calibration].")
PMD Norm2	Displays whether the PMD normalize data of port 2 is valid or not. (Refer to PMD Normalize Port2 in Section 6.4.8, "[Calibration].")
Light Source	Displays the status of the light source unit calibration. (Refer to Light Source in Section 6.4.8, "[Calibration].")
Norm	Displays whether the normalize function of each port is turned on or off. (Refer to Normalize in Section 6.4.6, "[Analysis].")
Data	Displays whether the normalization compensation data of each port is saved. (Refer to Normalize in Section 6.4.6, "[Analysis].")

Smo	Displays whether the smoothing function of each trace is turned on or off. (Refer to Smoothing in Section 6.4.6, "[Analysis].")
Fitting	Displays whether the fitting function of each trace is turned on or off. (Refer to Fitting in Section 6.4.6, "[Analysis].")
Fitting Mode	Displays the fitting mode. (Refer to Fitting in Section 6.4.6, "[Analysis].")

4.1.9 Names and Functions of the Report Window

This section provides the names and functions of individual components of the screen of the report window.

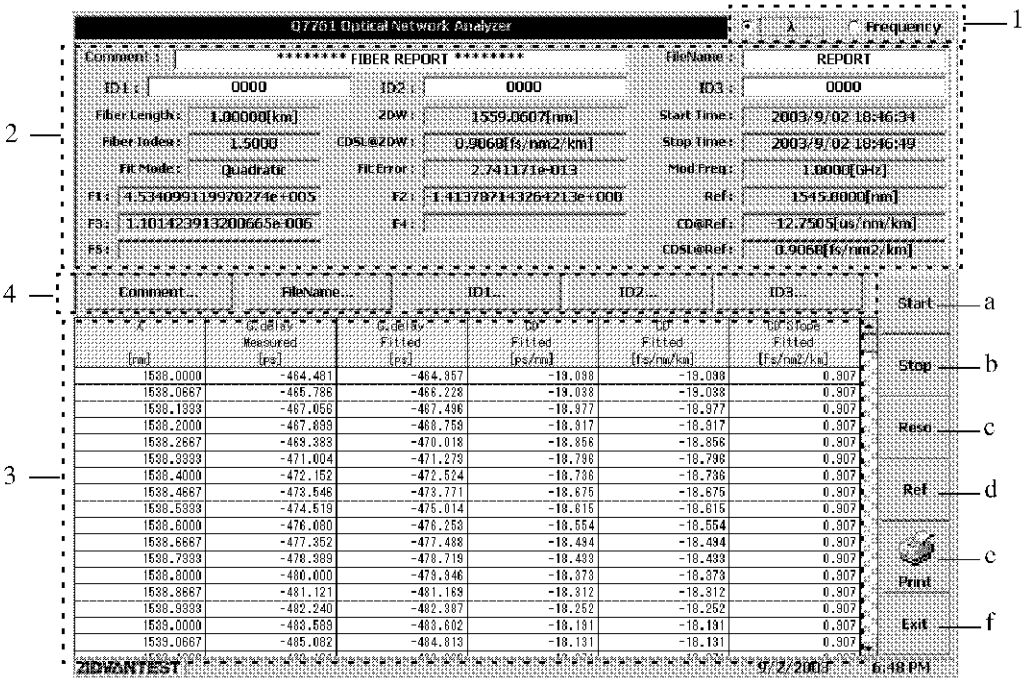


Figure 4-12 Report Window

1. X-axis mode switching section

λ / Frequency	Switches the mode between wavelength and frequency.

2. Parameter display section

Comment	This area displays explanations on the details of the measured data.
FileName	Displays the user-defined file name.
ID1	Displays the user-defined ID1 code.
ID2	Displays the user-defined ID2 code.
ID3	Displays the user-defined ID3 code.

Fiber Length	Displays the measured fiber length.
Fiber Index	Displays the set fiber refraction factor.
ZDW	Displays the zero-dispersion wavelength.
CDSL@ZDW	Displays the CD Slope value at the zero-dispersion wavelength per km.
Fit Mode	Displays the fitting mode.
Fit Error	Displays the statistical distribution value when fitting is performed. (Refer to Section A.7.7, "Curve Fitting Function and Statistical Variance.")
F1 to F5	Displays the fitting coefficient.
Start Time	Displays the start time of measurement.
Stop Time	Displays the finish time of measurement.
Mod Freq	Displays the set modulation frequency.
Ref	Displays the reference value of λ in the displayed report.
CD@Ref	Displays the CD value at the reference wavelength (frequency) per km.
CDSL@Ref	Displays the CD slope value at the reference wavelength (frequency) per km.

3. List display section

λ / Frequency	Displays a list of measured wavelengths (frequencies).
GD Measured	Displays a list of measured group delay times.
GD Fitted	Displays a list of group delay times to which a fitting is performed.
CD Fitted	Displays a list of chromatic dispersions to which a fitting is performed.
CD Fitted (/km)	Displays a list of chromatic dispersions per km to which a fitting is performed.
CD Slope Fitted (/km)	Displays a list of chromatic dispersion slopes per km to which a fitting is performed.

4. Parameter input section

Comment	Used to input the descriptions of the measured data.
FileName	Used to input the user-defined file name.
ID1	Used to input the user-defined ID1 code.
ID2	Used to input the user-defined ID2 code.
ID3	Used to input the user-defined ID3 code.

a.	Start	Used to change the start wavelength (frequency).
b.	Stop	Used to change the stop wavelength (frequency).
c.	Reso	Used to change the wavelength (frequency) resolution.
d.	Ref	Used to change the reference wavelength (frequency).
e.	Print	Prints the report results.
f.	Exit	Closes the report window.

NOTE: ***The report window can be operated with the touch panel.***

4.2 Basic Operations

This section explains the menu operation, data entry, and usage of the basic measurement functions.

4.2.1 Menu Operation and Data Entry

This section explains the operations of the panel keys and touch screen.

1. Operation menu

   Five types of operation menus are displayed on the screen. The menus can be operated using the touch screen or mouse. The side menus can be operated using the panel keys.

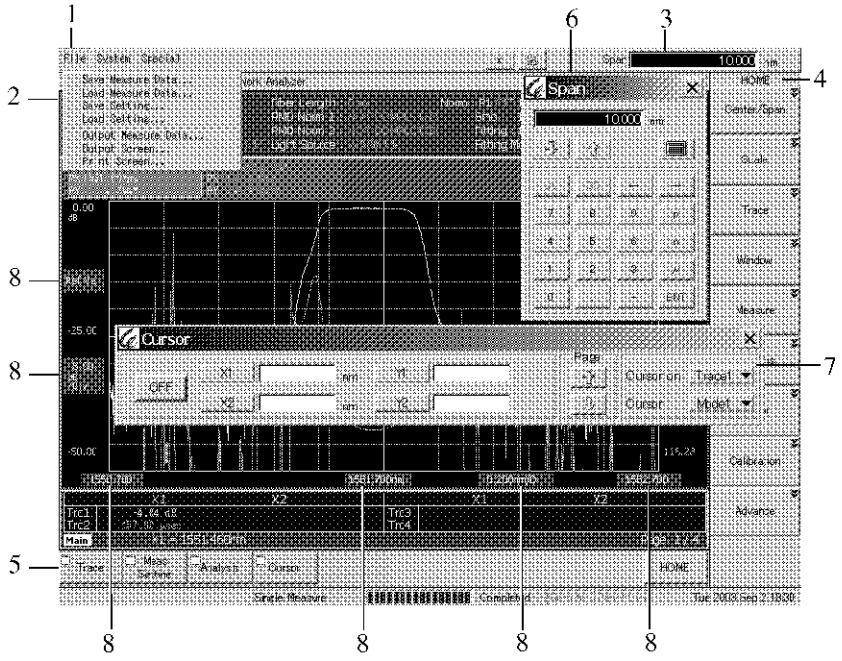


Figure 4-13 Explanations of the Operation Menu

1.	Menu bar	Displays system-related operation menus of this instrument. When you click on each menu, a drop-down menu is displayed.
2.	Drop-down menu	Menu items classified by function are displayed. When you click on the menu item followed by (...), a dialog box is displayed.
3.	Entry box 1	The box into which numeric values are input. This box is displayed when the application key involving numeric value entry is pressed or the numeric values entered into the entry box 2 are confirmed.
4.	Soft menu bar	Operations can be performed by using soft menu keys.

5. Function bar	This area displays the function buttons classified by the basic functions of this instrument. When you click on the function button HOME, the soft menu on the highest layer is displayed in the soft menu bar area. Other function buttons display dialog boxes containing convenient functions related to measurement.
6. Entry box 2	The box into which numeric values are input. This box is displayed when the soft key involving numeric value entry is clicked. When the numeric values entered are confirmed, this box disappears and entry box 1 is displayed. Entry box 1 inherits the input data.
7. Dialog box	Displays the entry boxes for data entry related to each function and the switching buttons used for selecting items.
8. Touch annotation	By annotation-touching operation, the basic settings related to measurement of this instrument are activated, and entry box 1 is displayed.

2. Data entry

When set values are displayed in entry box 1, you can change them by using ten keys, step key, data knob or entry box 2.

- Data entry using the number keys on the ten-key pad

  Data entry can be performed using the number keys (ten keys), decimal point key, BS (back-space) key, and - (minus) key. If you make a mistake while entering numbers using the ten keys, use the BS to delete one character at a time and then reenter the data. After entering the data, press the unit key to complete the entry.

- Data entry using the step key

  The step key is used for entering while increasing or decreasing the data at regular intervals.

- Data entry using the data knob

  The data knob is used for continuous data entry. It is convenient for fine adjustment of input data.

- Data entry using entry box 2

  When a soft menu key is pressed, entry box 2 is displayed on the left side of the button. You can change the set values by using this box.

  The variation in the set value is as follows:

  - [↑] key: Corresponds to one push of the step up key
  - [↓] key: Corresponds to one push of the step down key

  When you click on the numeric value part in entry box 2, the entry keys corresponding to the current unit system are displayed in entry box 2. Enter data using the displayed keys. If you make a mistake while entering data, use the BS key to delete one character at a time and then reenter the data.

IMPORTANT: ***If you press another menu key before you complete the entry by pressing the unit key, the input data becomes invalid.***

---

3. Display of a dialog box

When a soft menu key is pressed, a dialog box is displayed.

To select items and enter numeric values in the dialog box, the following methods can be used:

- Selecting items

  Use the step key.

- Selecting the set contents

  Select by turning the data knob, and confirm by pressing the ENT key.

- Entering numeric values

  Enter values using the ten keys and the unit key.

- Closing a dialog box

  In most cases, a dialog box is closed by touching (clicking) the close button (☒) in the title bar. However, some dialog boxes involving soft menu bar operations can be closed by touching (clicking) the **Return** menu in the soft menu bar.

5. EXAMPLES OF MEASUREMENTS

This chapter describes how to use this instrument by providing measurement examples.

The Q7761 has three basic measurement modes: the CD measurement mode, PMD measurement mode and Power measurement mode, and two combination modes: the CD+Power measurement mode and PMD+Power mode. The measurement items of the basic measurement mode are as follows.

Port	Item	Measurement mode				
		CD measurement mode		PMD measurement mode		Power measurement mode
		Diff measurement OFF	Diff measurement ON	Diff measurement OFF	Diff measurement ON	Diff measurement OFF only
Test Port1	Mag	○	○	○	○	○
	GD	○	○	○	○	×
	CD	○	○	○	○	×
	CDSL	○	○	○	○	×
	PMD	×	×	○	○	×
	2nd-order PMD	×	×	○	○	×
	PDL	×	×	○	○	×
Test Port2	Mag	○	○	○	○	○
	GD	○	○	○	○	×
	CD	○	○	○	○	×
	CDSL	○	○	○	○	×
	PMD	×	×	○	×	×
	2nd-order PMD	×	×	○	×	×
	PDL	×	×	○	×	×

5.1 Measuring FBG (Fiber Bragg Grating filter)

This section describes amplitude and group delay characteristics measurement examples of the FBG whose bandwidth is 50 GHz.

- 2 screen display: Displays 2 graphs at the same time.
- Cursor display: Reads the measured value by using the cursor.
- Bandwidth analysis: Analyzes the bandwidth.

Measuring conditions

Center wavelength:	1551.7 nm
Wavelength span:	1.2 nm
Sweep mode:	Continuous sweep and CD measurement modes
Modulation frequency:	2.5 GHz

NOTE: ***Use this instrument in a room with regulated temperature to perform accurate measurements. In addition, perform the calibration after a two-hour warm-up.***

Setup

1. Set up this instrument after connecting the optical network analyzer.

Turning on the power

2. Ensure the **POWER** switch on this instrument is turned off.
3. Connect the power cable to the outlet.
4. Turn ON the **POWER** switch.
   Internal initialization and self test are performed. The initial screen appears when the self test is complete (after approximately 5 minutes).

Initializing the measuring conditions

5. Press the two **PRESET** keys at the same time to initialize the measuring conditions.

Connecting the DUT

6. Connect the DUT optical input connector to the OPTICAL SIGNAL OUTPUT port (Angled PC polished) on the front panel.

NOTE: ***The optical connectors for OPTICAL SIGNAL OUTPUT, OPTICAL SIGNAL INPUT, and EXTERNAL REFERENCE INPUT of the Q7761 are angled PC polished connectors. Using other polished connectors such as the PC polished connector may damage the end face of the optical connector. Connect the conversion connector if needed.***

---

7. Connect the DUT optical output connector to TEST PORT1 (Angled PC polished) of the OPTICAL SIGNAL INPUT on the front panel.

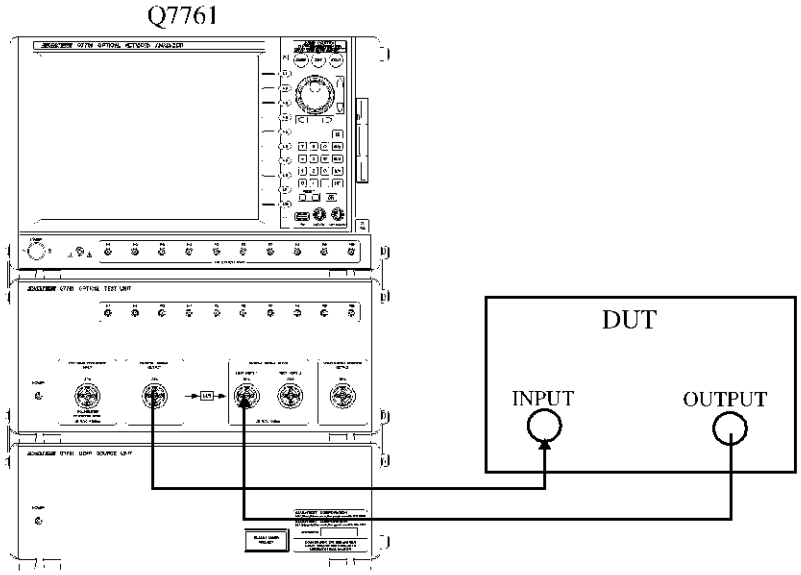


Figure 5-1 Connecting the DUT

Setting measurement conditions

8. Set the center wavelength to 1551.7 nm by pressing **{HOME}**, **Center/Span**, **Center**, **1**, **5**, **5**, **1**, **.**, **7**, and **M/n**.

9. Set the span to 1.2 nm by pressing **Span**, **1**, **.**, **2**, and **M/n**.

10. Set the measurement mode to the CD mode by pressing **{HOME}**, **Measure**, **Measure Mode**, and **CD**.

NOTE: The available five measurement modes are CD, PMD, CD+Power, PMD+Power, and Power. The CD mode does not measure polarization information such as PMD and PDL. The PMD measurement mode must be set when measuring the polarization information. The CD+Power mode is used to perform the Mag measurement in the CD mode with wider dynamic range. Compared to the CD mode, a longer measuring time is required.

11. Set the number of measurement points to 601 by pressing **{HOME}**, **Measure**, **Measure Points**, **Points**, **6**, **0**, **1**, and **ENT**.

12. Set the modulation frequency to 2.5 GHz by pressing **{HOME}**, **Measure**, **Modulation Frequency**, **2**, **.**, **5**, and **G/p**.

13. Set the sensitivity to Middle by pressing **{HOME}**, **Measure**, **Sensitivity**, and **Middle**.

NOTE: The four sensitivity settings are High, Middle, Normal, and Fast. When High is set, the measurement is performed with high S/N, but the sweep speed is slow. When Fast is set, the measurement is performed with low S/N, but the sweep speed is fast. Set the relevant sensitivity according to S/N and the sweep speed required for the measurement.

14. Set Main Trace 1 ON/OFF to ON by pressing **{HOME}**, **Trace**, **Trace ON/OFF**, and **Main Trace 1 ON/OFF**.
    Main Trace1 for which the measurement is performed is displayed.

NOTE:

1. *The data displayed in the Q7761 is called Trace. The two types of Trace are Main Trace, in which the measured data is stored, and Reference Trace in which the data saved in memory is stored. Measurement parameters of each four Traces can be independently specified for both Main Trace and Reference Trace. In addition, measurement parameters assigned to Trace can be changed anytime.*
2. *For the data displayed in the Q7761, at least one Trace must be set to ON. All Traces cannot be set to OFF at the same time.*

15. Set Trace 1 to Mag by pressing **{HOME}**, **Trace**, **Trace Mode**, and **Mag**.
    Main Trace 1, for which the measurement is performed, is displayed in the Mag view.

16. Set Main Trace 2 ON/OFF to ON by pressing **{HOME}**, **Trace**, **Trace ON/OFF**, and **Main Trace 2 ON/OFF**.

17. Set Active Trace to 2 by pressing **{HOME}**, **Trace**, and **Active Trace 1/2/3/4**.

18. Set Trace 2 to GD by pressing **{HOME}**, **Trace**, **Trace Mode**, and **GD**.

19. Set two-screen display by pressing **{HOME}**, **Window**, **Window Type**, and **Dual**.

NOTE: The data displayed in Trace is allocated based on the number of screens specified in Window. Measured values can be checked easily by displaying in multiple Traces.

20. Start measurement by pressing **SINGLE**.

    The measurement progress is displayed on the progress bar at the bottom of the screen.

NOTE: When measurement starts, internal calibration may be performed on the Q7761, if required. If internal CAL is performed, a longer measuring time may be required.

21. Optimize the vertical axis for measured values by pressing **{HOME}**, **Scale**, and **Auto Scale All Trace**.

    Optimize the vertical axis for measured values by pressing HOME, Scale, and Auto Scale All Trace. Change the graph waveform scale individually, if needed.

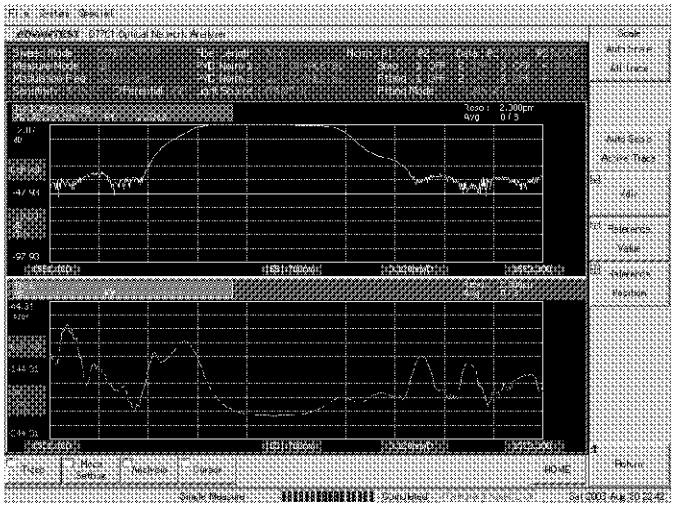


Figure 5-2 Mag and GD of FBG (Two-screen Display)

22. Set Trace 1 to Active by pressing **{HOME}**, **Trace**, and **Active Trace 1/2/3/4**.

    Set Trace 1, for which Mag is displayed, to Active to enable operations on the Mag waveform.

NOTE: Trace 1 can be set to Active either by pressing {HOME}, **Trace**, *and* **Active Trace 1/2/3/4** *or by touching the Trace information display area of the screen. Operations can be performed more easily by using the touch panel.*

23. Set Cursor display to ON by pressing **{HOME}**, **Cursor**, and **Cursor ON/OFF**.

    The cursor data appears at the bottom of the screen.

24. Set X1 to ON to display the vertical cursor X1 by pressing **X1 ON/OFF**.
    Move the cursor by using the data knob or step key.

25. In the same manner as above, set X2 to ON to display the vertical cursor X2 by pressing **X2 ON/OFF**.
    Move the cursor by using the data knob or step key.

26. Check the necessary values on the cursor information display.
    The value of each cursor and the difference between each cursor value is displayed on the cursor information display.

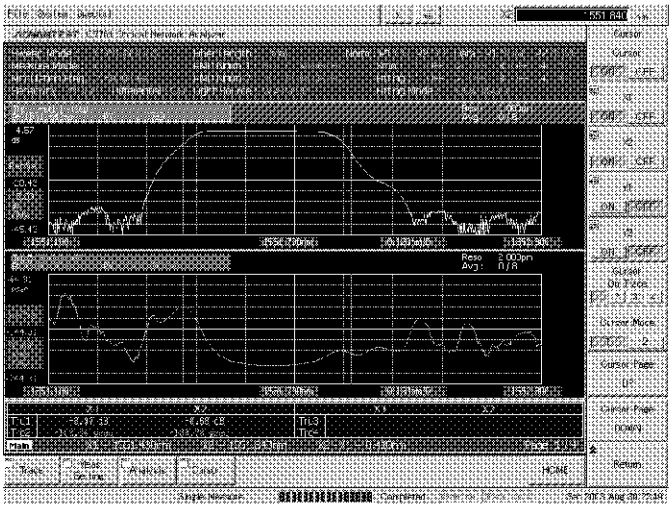


Figure 5-3 Mag and GD of FBG (Marker Display)

5.2 Measuring AWG (Arrayed Waveguide Grating)

This section describes how to perform the PMD measurement for AWG.

- Performs the necessary normalization for the PMD measurement.
- Measures and displays measured parameters.
- Displays waveforms in a one-, two-, or four-screen display if needed.

Measuring conditions

Center wavelength:	1552.3 nm
Wavelength span:	1.2 nm
Sweep mode:	Continuous sweep and PMD measurement modes
Number of points:	201 points
Modulation frequency:	1.5 GHz

Preparation for measurement

1. Set up the instrument, turn on the power, and initialize the setting conditions as described in Section 5.1.
   Two hours of warm up time is required to perform accurate measurements.

Setting measurement conditions

2. Set the center wavelength to 1552.3 nm by pressing **{HOME}**, **Center/Span**, **Center**, [1], [5], [5], [2], [.], [3], and [M/n].
3. Set the span to 1.2 nm by pressing **Span**, [1], [.], [2], and [M/n].
4. Set the measurement mode to the PMD mode by pressing **{HOME}**, **Measure**, **Measure Mode**, and **PMD**.

   NOTE: ***The PMD+Power mode is used to perform the Mag measurement in the PMD mode with wider dynamic range. Compared to the PMD mode, longer measuring time is required.***

5. Set the number of measurement points to 201 by pressing **{HOME}**, **Measure**, **Measure Points**, **Points**, [2], [0], [1], and [ENT].
6. Set the modulation frequency to 1.5 GHz by pressing **{HOME}**, **Measure**, **Modulation Frequency**, [1], [.], [5], and [G/p].
7. Set the sensitivity to Middle by pressing **{HOME}**, **Measure**, **Sensitivity**, and **Middle**.

8. Open the Trace dialog box by pressing **Trace** in the function bar at the bottom left of the screen.

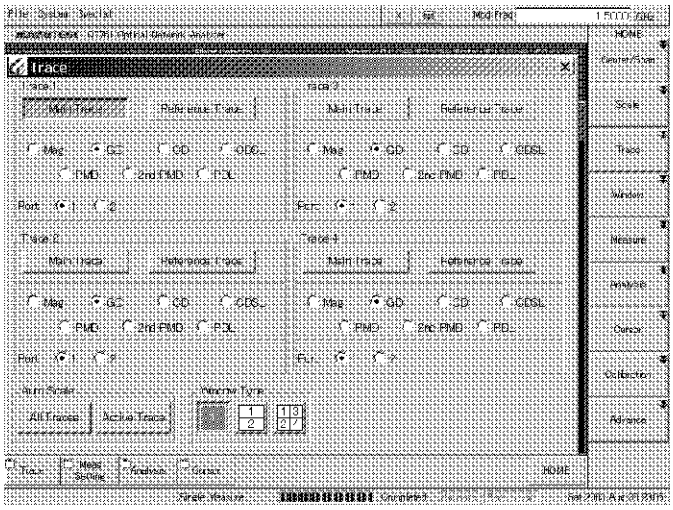


Figure 5-4 Trace Setting Dialog Box

9. Display Trace 2 by pressing **Main Trace** of Trace 2.
10. Display Trace 3 by pressing **Main Trace** of Trace 3.
11. Display Trace 4 by pressing **Main Trace** of Trace 4.
12. Display Trace 1 in the Mag view by pressing **Mag** of Trace 1.
13. Display Trace 2 in the GD view by pressing **GD** of Trace 2.
14. Display Trace 3 in the CD view by pressing **CD** of Trace 3.
15. Display Trace 4 in the PMD view by pressing **PMD** of Trace 4.
16. Select four-screen display of Window Type.
17. Close the Trace dialog box by pressing **×** (close button) at the upper right of the dialog box.

NOTE: ***Measured values can be checked easily because multiple Traces are displayed.***

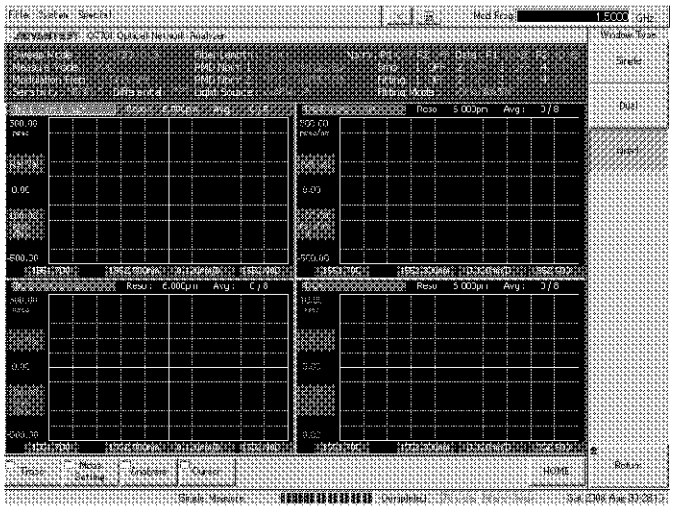


Figure 5-5 Four-screen Display

18. Connect the supplied patch cord for normalization between OUT PUT and TEST PORT 1 and carry out the through connection with the optical adapter.

    When measuring the optical transfer function matrix including polarization information such as PMD and PDL measurements, PMD Normalize must be executed before the measurement is started. PMD Normalize must be executed during the through connection status after connecting the supplied patch cord to the measurement ports.

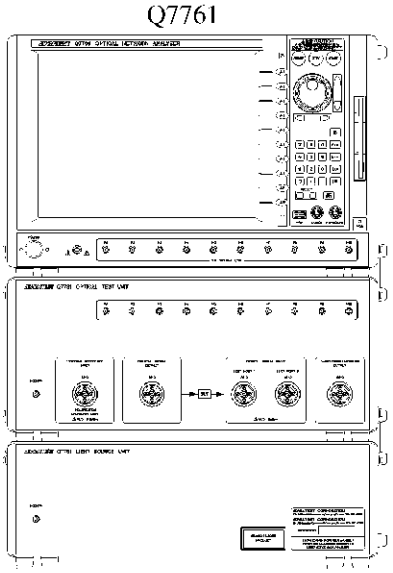


Figure 5-6 Optical Fiber Through Connection

19. Execute the PMD normalization by pressing **{HOME}**, **Calibration**, and **PMD Normalize Port1**.

    The progress of the PMD normalization complete can be checked on the progress bar.

NOTE: The PMD normalization must be performed individually for TEST PORT 1 and TEST PORT 2. To measure two ports, execute PMD Normalize Port 2 after connecting the supplied patch cord to TEST PORT 2.

20. Connect the patch cord to a DUT.

    After the PMD normalization for the necessary measurement ports is complete, connect a DUT to the end of the patch cord used for normalization.

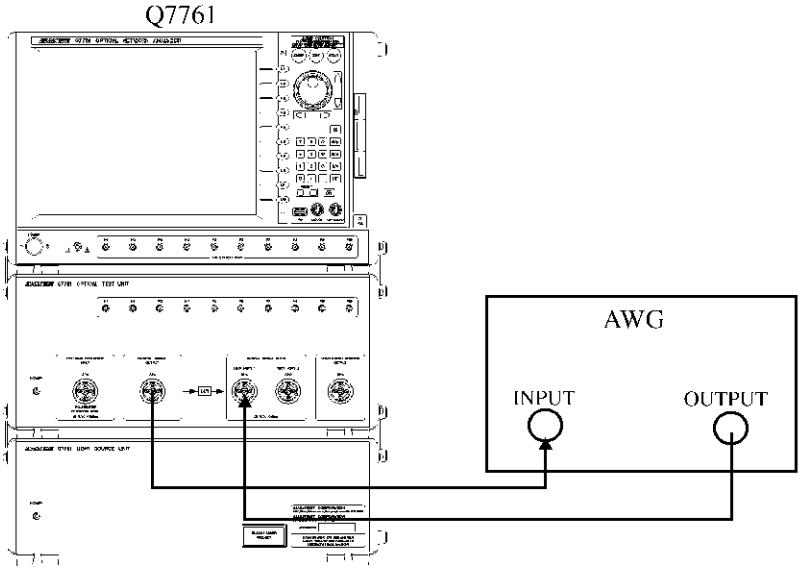


Figure 5-7 Connecting AWG

21. Set the measurement mode to the PMD mode by pressing **{HOME}**, **Measure**, **Measure Mode**, and **PMD**.

    The PMD measurement mode measures the optical transfer function matrix including polarization information and acquires the data required to calculate PMD, 2-dimensional PMD, and PDL. Therefore, the measurement must be performed in the PMD mode.

22. Start measurement by pressing **SINGLE**.

    The optical transfer function matrix measurement is started in the PMD measurement mode. The progress of the measurement complete can be checked on the progress bar.

23. Execute Auto Scale for all Traces by pressing **{HOME}**, **Scale**, and **Auto Scale All Trace**.
    The scale is adjusted to fit each parameter into the display screen.

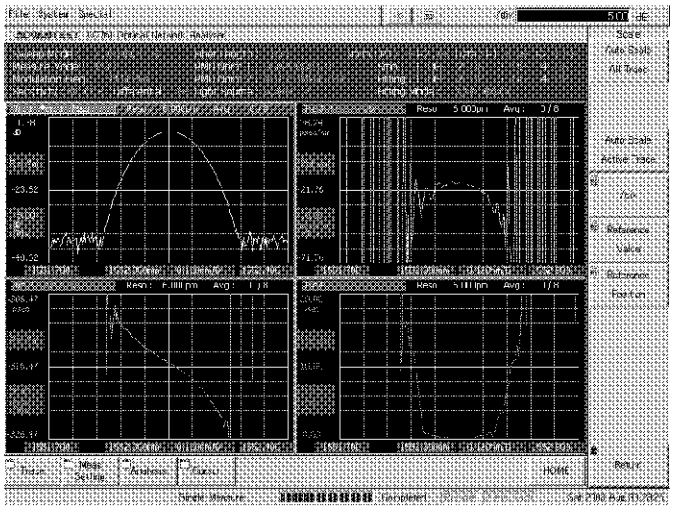


Figure 5-8 Example of AWG Measurement (Mag/GD/CD/PMD, Four-screen Display)

NOTE: ***The scale adjusted by Auto Scale may be different from the scale that was expected because the scale is adjusted to fit Trace into the display screen. Adjust the scale for each Trace, if needed.***

5.3 Measuring Optical Fiber

This section describes how to perform the GD and CD measurement for the optical fiber and the fiber length measurement.

- Measures the GD and CD of the optical fiber and acquires the zero-dispersion wavelength.
- Measures the fiber length.

Measuring conditions

Center wavelength:	1564.75 nm
Wavelength span:	30 nm
Sweep mode:	Continuous sweep and CD measurement modes
Modulation frequency:	2.5 GHz
Number of points:	601 points
Drift compensation function:	Active

Preparation for measurement

1. Set up the instrument, turn on the power, and initialize the setting conditions as described in Section 5.1.
   Two hours of warm up time is required to perform accurate measurements.

Setting measurement conditions

2. Set the center wavelength to 1564.75 nm by pressing {**HOME**}, **Center/Span**, **Center**, [1], [5], [6], [4], [.], [7], [5], and [**M/n**].
3. Set the number of measurement points to 601 by pressing {**HOME**}, **Measure**, **Measure Points**, **Points**, [6], [0], [1], and [**ENT**].
4. Set the measurement mode to the CD mode by pressing {**HOME**}, **Measure**, **Measure Mode**, and **CD**.
5. Set the span to 30 nm by pressing {**HOME**}, **Center/Span**, **Span**, [3], [0], and [**M/n**].
6. Set the modulation frequency to 2.5 GHz by pressing {**HOME**}, **Measure**, **Modulation Frequency**, [2], [.], [5], and [**G/p**].
7. Sets the sensitivity to Middle by pressing {**HOME**}, **Measure**, **Sensitivity**, and **Middle**.
8. Open the Trace dialog box by pressing **Trace** on the function bar.
9. Display Trace 2 by pressing **Main Trace** of Trace 2.
10. Display Trace 2 in the CD view by pressing **CD** of Trace 2.

11. Close the Trace dialog box by pressing ☒ (close button) at the upper right of the dialog box.

12. Enable the real-time GD drift compensation function by pressing **{HOME}**, **Measure**, **Differential Measure**, and **Differential Measure ON/OFF**.

    Because the optical fibers expand and contract based on the ambient temperature, group delay drifts and causes a measurement error. Enabling the real-time GD drift compensation function can minimize error factors even if group delay of the DUT drifts during the measurement.

    NOTE: ***The real-time GD drift compensation function setting takes effect in the CD, CD+Power, PMD, PMD+Power measurement mode. The real-time GD drift compensation function performs measurement by compensating GD drift based on an environment change such as temperature change around the DUT in real time, but Advantest does not guarantee that the function completely compensates all GD drifts. In addition, the real-time GD drift compensation function uses fixed wavelength reference light. Therefore, the DUT is required to transmit the reference light. If the reference light contained in this unit does not transmit correctly, a separate external reference light must be prepared.***

    ---

13. Start measurement by pressing **SINGLE**.

14. Optimize the scale by pressing **{HOME}**, **Scale**, and **Auto Scale All Trace**.

15. Set Fitting to ON by pressing **{HOME}**, **Analysis**, **Fitting**, and **Fitting ON/OFF**.

    The GD waveform is fitted by the specified fitting function.

16. Set Trace 2 to active by pressing **{HOME}**, **Trace**, and **Active Trace 1/2/3/4**.

17. Apply the fitting function to CD by pressing **{HOME}**, **Analysis**, **Fitting**, and **Fitting ON/OFF**.

    When the fitting is performed, zero-dispersion wavelengths and fitting errors are calculated and displayed so that they can be checked.

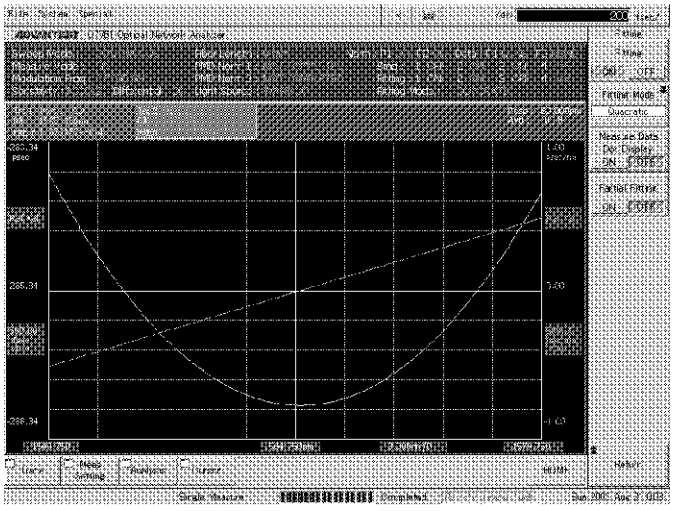


Figure 5-9 Measuring (GD/CD) Optical Fiber (DSF)

18. Start measuring the fiber length by pressing **{HOME}**, **Advance**, and **Fiber Length Meas Execute**.

    The fiber length measurement cannot be performed with any other measurement at the same time. The measurement progress is displayed on the progress bar by using the same method as a normal measurement. When the fiber length measurement is started, fiber length is displayed in the status window on the upper half of the screen. Measurement accuracy of the fiber length displayed immediately after the calculation is started is not high, but the fiber length measured values are gradually focused as the measurement proceeds.

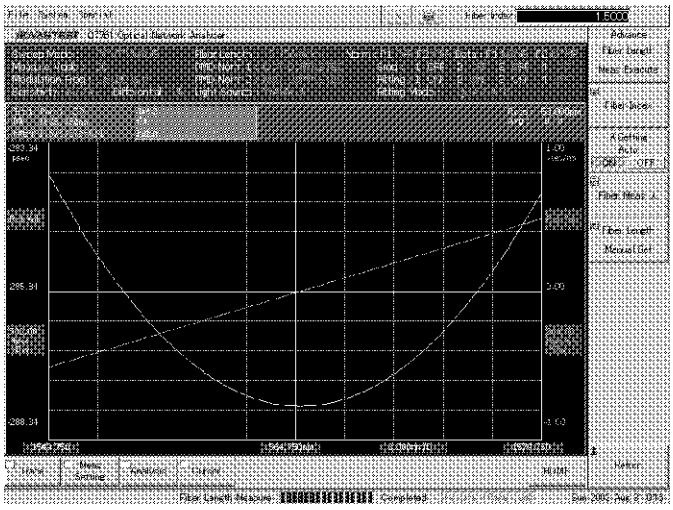


Figure 5-10 Measuring Fiber Length of Optical Fiber

6. MENU MAP, FUNCTIONAL EXPLANATION

This chapter describes the configurations and functions of the soft keys displayed on the touch screen.

MEMO:

1. *[.....] Used to enclose a menu name, key name, item name in the dialog box, button name, or the name of selected items in lists and menus.*
2. *{....} Shows a function button on the function bar.*
3. ▒▒▒ *Shows a soft key on the soft menu bar.*
4. *A dialog box is surrounded by a broken line.*
5. *Operations are supposed to be made through a touch screen, and "touch" means to press a button or a key.*

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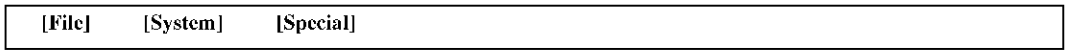
6.2 Menu bar

This section describes the functions displayed in the menu bar.

The system menu bar is shown below. The menu bar has three sub-menus: **[File]**, **[System]**, and **[Special]**.

When you touch the menu bar, a drop-down menu is displayed. Select the required item from the drop-down menu.



[File]: Executes save, load, and print.

[System]: Sets the GPIB address and networks, and system functions such as addition of printer driver, etc.

[Special]: Presets this instrument and displays the version information. This menu includes the maintenance function menu (Can only be used by Advantest customer service engineers).

6.2.1 [File]

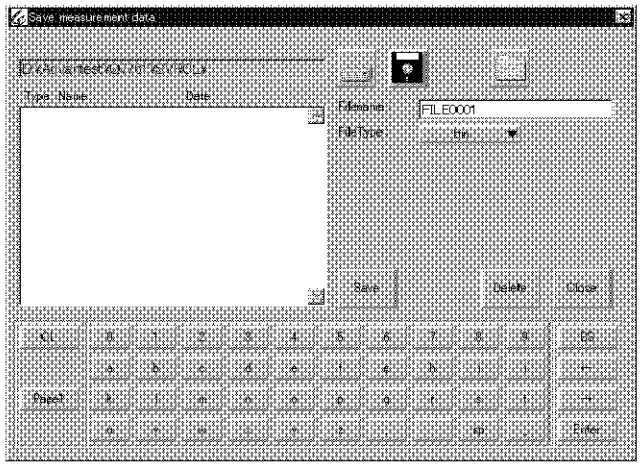
This subsection describes the drop-down menu items comprising the **[File]** menu bar.

When you touch the **[File]** menu bar, the following drop-down menu items are displayed:

[File]

- **[Save Measure Data...]**
- **[Load Measure Data...]**
- **[Save Setting...]**
- **[Load Setting...]**
- **[Output Measure Data...]**
- **[Output Screen...]**
- **[Print Screen...]**

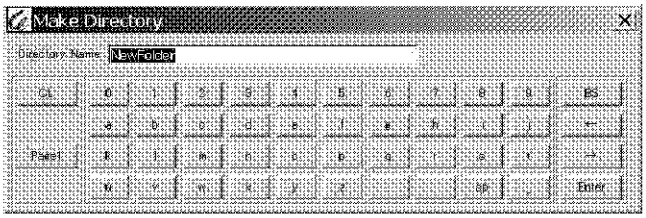
[Save Measure Data...]: Saves the measured waveform data and setting conditions. When you select **[Save Measure Data...]**, the following dialog box is displayed:



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

: Adds a folder to the directory being displayed. The following software keyboard is displayed to create a arbitrary folder name.



[CL]: Clears the input contents.

[BS]: Deletes the character before the cursor.

[sp]: Inserts a space.

[Page1/2]: Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[Filename]: Enter the file name to be saved.

[File Type]: Specifies the file type.

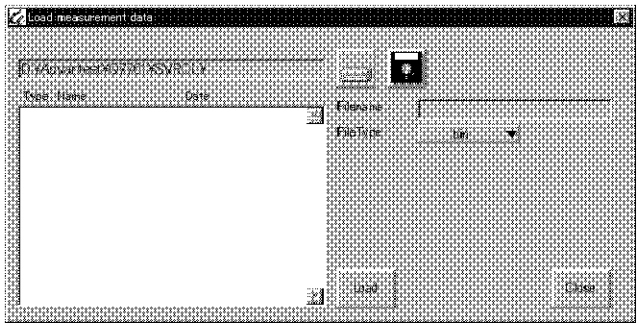
[Save]: Saves the measured waveform data and setting conditions.

[Delete]: Deletes the selected file.

[Close]: Closes a dialog box.

CAUTION: ***Saving data***
If Save Measure Data is executed, a measured-waveform data file (a file name.bin) and a setting condition data file (a file name.sav) are created.
If Save Setting is executed, only the setting condition data file (a file name.sav) is created.
If the name, which was used for the setting condition file created by Save Setting, is used when creating the setting condition file by Save Measure Data, the file created by Save Setting is overwritten.
The setting condition file (a file name.sav) created by Save Measure Data can be used.

[Load Measure Data...]: Loads the saved measured waveform data and setting conditions of this instrument.
When you select **[Load Measure Data...]**, the following dialog box is displayed: The measured waveform data and setting conditions are loaded by selecting the file name to be loaded and executing **[Load]**.



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

[Filename]: Enter the file name to be loaded.

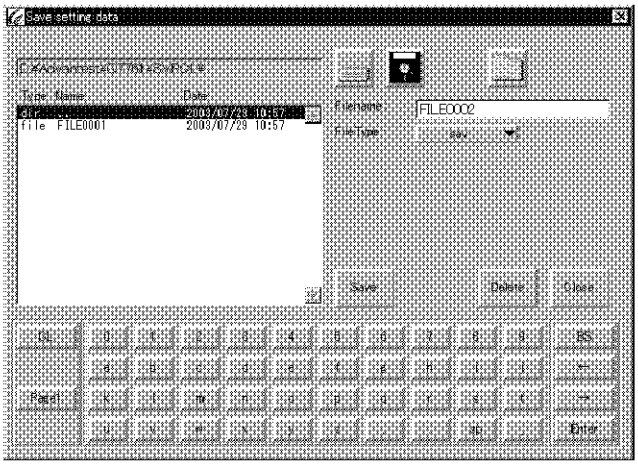
MEMO: ***You can select a file by touching the file name. You can change directories by touching twice in quick succession (double clicking).***

[File Type]: Specified the file type to be loaded.

[Load]: Performs loading.

[Close]: Closes a dialog box.

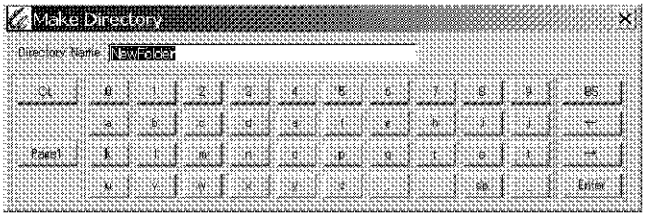
[Save Setting...]: Saves the setting conditions of this instrument as a file.
When you select **[Save Setting...]**, the following dialog box is displayed:



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

: Adds a folder to the directory being displayed. The following software keyboard is displayed to create a arbitrary folder name.



[CL]: Clears the input contents.

[BS]: Deletes the character before the cursor.

[sp]: Inserts a space.

[Page1/2]: Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[Filename]: Enter the file name to be saved.

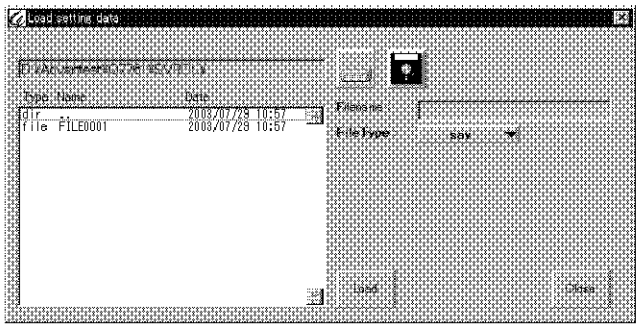
[File Type]: Specifies the file type to be saved.

[Save]: Saves the setting conditions.

[Delete]: Deletes the selected file.

[Close]: Closes a dialog box.

[Load Setting...]: Loads the saved setting conditions of this instrument.
When you select **[Load Setting...]**, the following dialog box is displayed. The setting conditions are loaded by selecting the file name to be loaded and executing **[Load]**.



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

[Filename]: Enter the file name to be loaded.

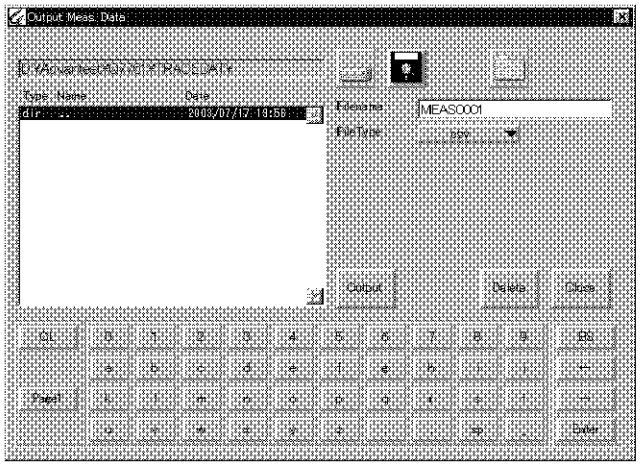
MEMO: ***You can select a file by touching the file name. You can change directories by touching twice in quick succession (double clicking).***

[File Type]: Specified the file type to be loaded.

[Load]: Performs loading.

[Close]: Closes a dialog box.

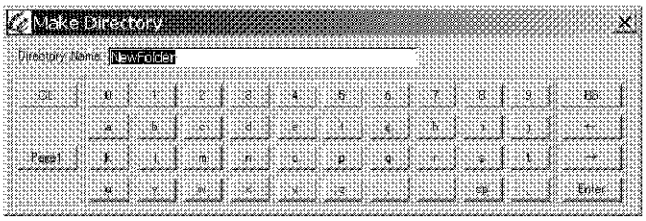
[Output Measure Data...]: Saves the measured waveform data and setting conditions in a text format file.
When you select **[Output Measure Data...]**, the following dialog box is displayed:



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

: Adds a folder to the directory being displayed. The following software keyboard is displayed to create a arbitrary folder name.



[CL]: Clears the input contents.

[BS]: Deletes the character before the cursor.

[sp]: Inserts a space.

[Page1/2]: Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[Filename]: Enter the file name to be saved.

MEMO: You can select a file by touching the file name. You can change directories by touching twice in quick succession (double clicking).

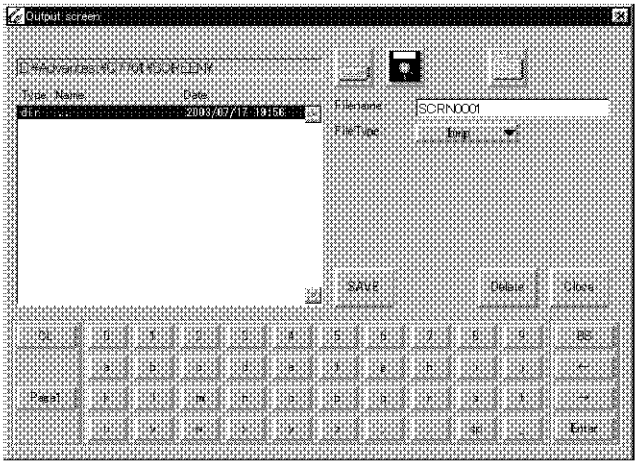
[File Type]: Specifies the file type to be saved.

[Output]: Executes save.

[Delete]: Deletes the selected file.

[Close]: Closes a dialog box.

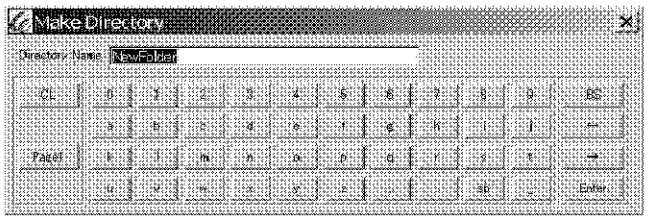
[Output Screen...]: Saves the screen data of this instrument in a file.
When you select **[Output Screen...]**, the following dialog box is displayed:



: Displays the contents of the standard directory in the file list.

: Displays the contents of the floppy disk in the file list.

: Adds a folder to the directory being displayed. The following software keyboard is displayed to create a arbitrary folder name.



[CL]: Clears the input contents.

[BS]: Deletes the character before the cursor.

[sp]: Inserts a space.

[Page1/2]: Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[Filename]: Enter the file name to be saved.

MEMO: ***You can select a file by touching the file name. You can change directories by touching twice in quick succession (double clicking).***

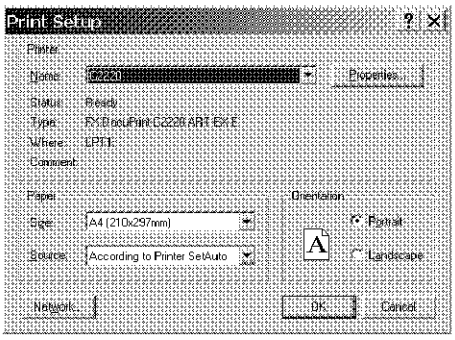
[File Type]: Specifies the file type to be saved. There are two file types available: the bit map file (bmp) format and the portable network graphics (png) format.

[Save]: Executes save.

[Delete]: Deletes the selected file.

[Close]: Closes a dialog box.

[Print Screen...]: Outputs the screen data of this instrument to the printer.
When you select **[Print]**, the following dialog box is displayed. The following example shows the condition in which the printer driver has already installed:



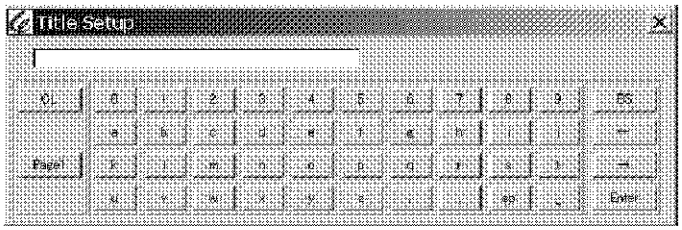
6.2.2 [System]

This subsection describes the drop-down menu items comprising the **[System]** menu bar.

When you touch the **[System]** menu bar, the following drop-down menu items are displayed:

[System]
- **[Title...]**
- **[GPIB Address...]**
- **[Network Setup...]**
- **[Guest Account...]**
- **[Printer Setup...]**
- **[Date and Time...]**
- **[Explorer...]**

[Title...]: Enter title characters which are displayed on the screen of this instrument. When you select **[Title...]**, the following software keyboard is displayed:



[CL]: Clears the input contents.

[BS]: Deletes the character before the cursor.

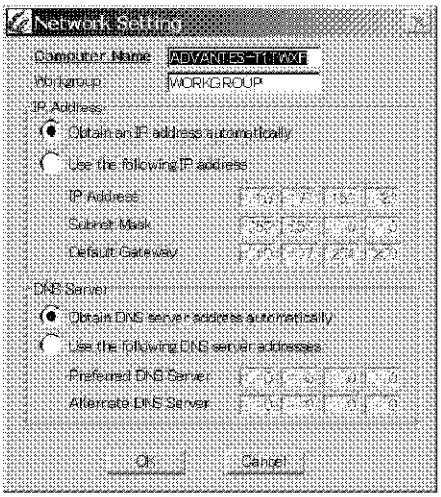
[sp]: Inserts a space.

[Page1/2]: Switches the type of characters to be entered. Single-byte lowercase alphabetical characters are entered by **[Page1]** and single-byte uppercase alphabetical characters are entered by **[Page2]**.

[GPIB Address...]: Sets the GPIB Address of this instrument.
When you select **[GPIB Address...]**, the following dialog box is displayed:

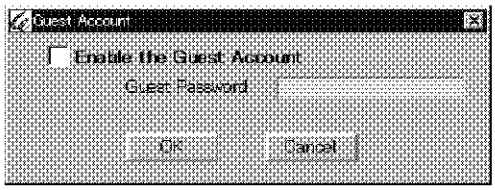
[Network Setup...]:

Sets the LAN network information of this instrument.
When you select **[Network Setup...]**, the following dialog box is displayed. For more information on each setting item, refer to A.3, "Setting up the Network."



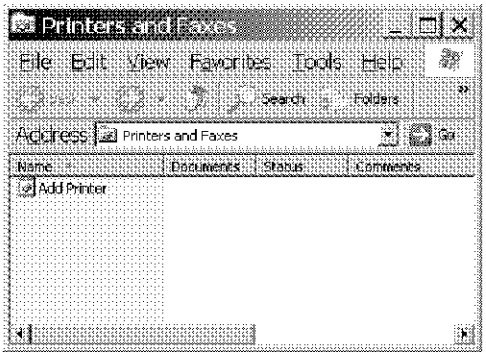
[Guest Account...]:

Sets the Guest account.
When you select **[Guest Account...]**, the following dialog box is displayed. To refer to a file on this instrument from an external PC, it is necessary to set the Guest Account. For more information on the Guest Account settings, refer to A.4, "Setting the Guest Account."



[Printer Setup...]:

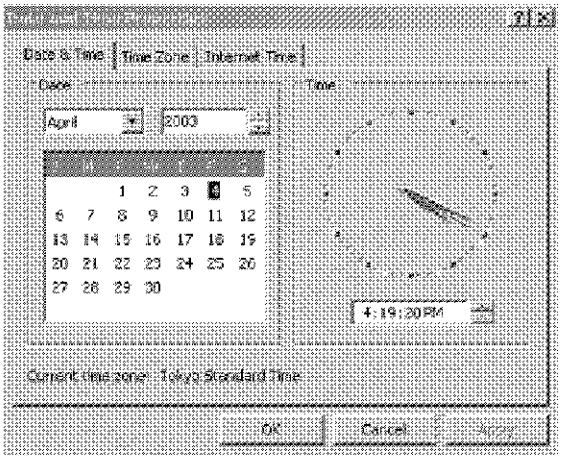
Installs the printer driver.
When you select **[Printer Setup...]**, the following dialog box is displayed. The following example shows the condition in which the printer driver has already installed:



6.2.2 [System]

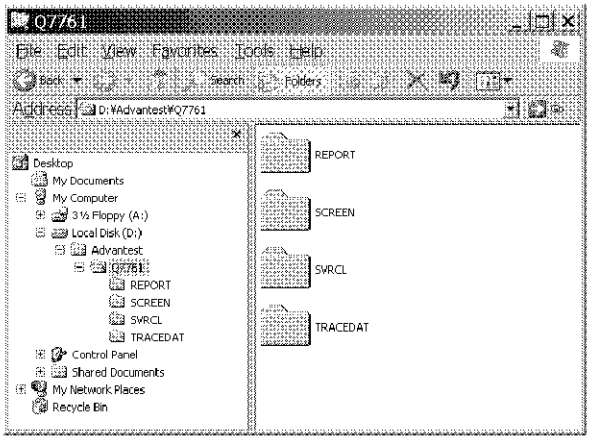
[Date and Time...]:

Sets the date, time and time zone of this instrument.
When you select **[Date and Time...]**, the following dialog box is displayed:



[Explorer...]:

Displays the following dialog box for file operation:



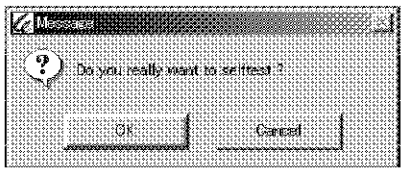
6.2.3 [Special]

This subsection describes the drop-down menu items comprising the **[Special]** menu bar.

When you touch the **[Special]** menu bar, the following drop-down menu items are displayed:

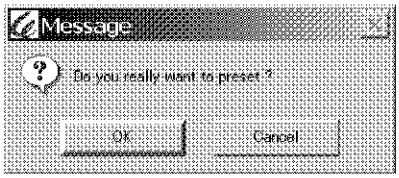
[Special]
- **[Self Test...]**
- **[Preset...]**
- **[Version]**
- **[Maintenance...]**

[Self Test...]: Displays the following dialog box to execute the self test of this instrument. When you touch OK, the self test starts.



CAUTION: ***If the result of the self test is fail, contact the Advantest service center.***

[Preset...]: Displays the following dialog box for presetting this instrument. When you touch OK, presetting is started.



[Version]: Displays the version information of this instrument.

[Maintenance...]: The maintenance menu (Can only be used by Advantest customer service engineers).

6.3 Function Bar

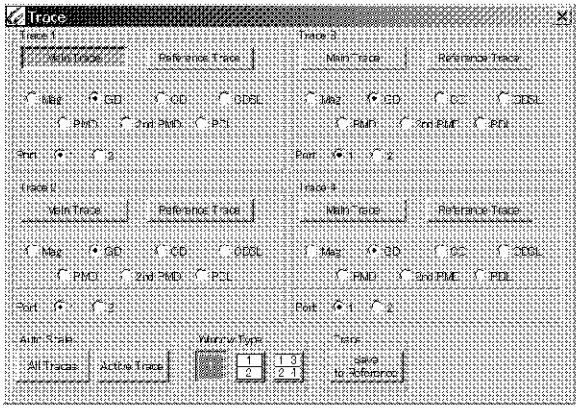
This section describes the functions of each function button displayed on the function bar. The configuration of the function buttons of this instrument is as follows:

When you touch a function button on the function bar, the associated dialog box is displayed. When you touch the **{HOME}** button, the relevant soft key is displayed on the soft menu bar.

The explanations start from the function button on the left and move toward the right.

6.3.1 {Trace}

When you touch the **{Trace}** button, the **[Trace]** dialog box, which enables setting related to trace, is displayed. These items can be set for each trace.



[Main Trace]: Switches the main trace display on and off.

[Reference Trace]: Switches the reference trace display on and off.

[Mag] to **[PDL]**: Selects the trace mode.

[Port]: Switches the input port between 1 and 2.

[All Traces]: Sets the vertical axis scale automatically according to the measurement results (displayed waveform) of the waveforms of all 4 traces.

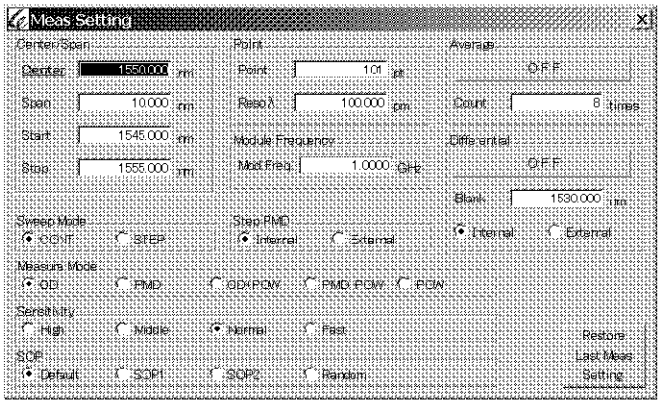
[Active Trace]: Sets the vertical axis scale on the active trace automatically according to the measurement results (displayed waveform) of the active trace.

[Window Type]: Sets the waveform display screen type.

[Save to Reference]: Saves the currently-displayed trace as the reference trace.

6.3.2 {Meas Setting}

When you touch the **{Meas Setting}** button, the **[Meas Setting]** dialog box, which enables setting of measurement conditions, is displayed.



[Center]: Sets the center wavelength (frequency) of the display.

[Span]: Sets the wavelength (frequency) span of the display.

[Start]: Sets the start wavelength (frequency) of the display.

[Stop]: Sets the stop wavelength (frequency) of the display.

[Point]: Sets the number of data points.

[Reso λ]: Sets the wavelength resolution. The number of data points is decided according to the wavelength resolution.

[Mod Freq]: Sets the modulation frequency.

[Average]: Switches the averaging function between on and off.
(Refer to Average ON/OFF in Section 6.4.5, "[Measure].")

[Count]: Sets the averaging count.

[Differential]: Switches the differential measurement function ON and OFF.

[Blank]: Sets the center wavelength in the wavelength area when the external fixed wavelength light source is selected.

[Internal], [External]: Selects the light source used to perform the differential measurement.

[Sweep Mode]: Sets the sweep mode.

[Step PMD]: Selects the polarization controller that is used when the STEP sweep mode or PMD measurement mode is set.

[Measure Mode]: Sets the measurement mode.

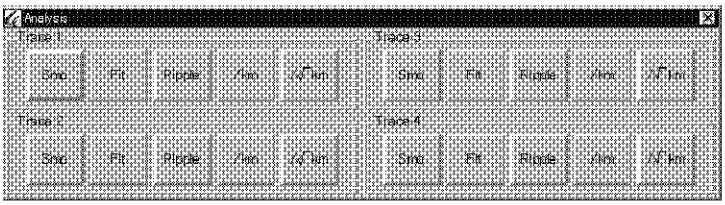
[Sensitivity]: Sets the measurement sensitivity.

[SOP]: Sets the polarization state.

[Restore Last Meas Setting]: Sets the measurement condition under which the most recent sweep was performed.

6.3.3 {Analysis}

When you touch the **{Analysis}** button, the **[Analysis]** dialog box, which enables setting related to data analysis, is displayed. These items can be set for each trace.



[Smo]: Switches the smoothing function ON and OFF.
(Refer to Smoothing ON/OFF in Section 6.4.6, "[Analysis].")

[Fit]: Switches the curve fitting function ON and OFF.
(Refer to Fitting ON/OFF in Section 6.4.6, "[Analysis].")

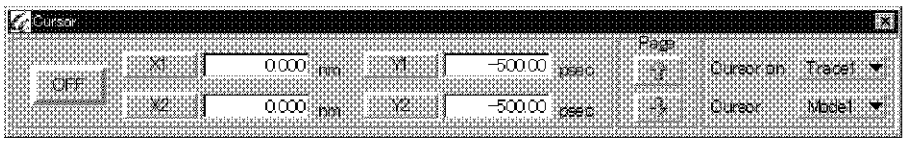
[Ripple]: Switches the function, which extracts only the ripple components from measurement data, ON and OFF.
(Refer to Ripple ON/OFF in Section 6.4.6, "[Analysis].")

[/km]: Switches the function, which displays the measurement data by converting it into a /km value, ON and OFF.
(Refer to /km in Section 6.4.6, "[Analysis].")

[/√km]: Switches the function, which displays the measurement data by converting it into a /√km value, ON and OFF.
(Refer to /√km in Section 6.4.6, "[Analysis].")

6.3.4 {Cursor}

When you touch the **{Cursor}** button, the **[Cursor]** dialog box, which enables cursor operation, is displayed.



[OFF], [ON]: Switches the read out window of the cursor information and the cursor display on and off.

[X1]: Switches the vertical cursor X1 on and off. By clicking on the numeric input box, the cursor value can be specified.

[X2]: Switches the vertical cursor X2 on and off. By clicking on the numeric input box, the cursor value can be specified.

[Y1]: Switches the horizontal cursor Y1 on and off. By clicking on the numeric input box, the cursor value can be specified.

[Y2]: Switches the horizontal cursor Y2 on and off. By clicking on the numeric input box, the cursor value can be specified.

[Page]: Switches the cursor page of the read out window up and down. (For more information, refer to Cursor Page UP and Cursor Page DOWN in Section 6.4.7, "[Cursor].")

[Cursor on]: The X1 and X2 cursors move on the points of the trace. The target trace can be selected.

[Cursor]: Selects the display format of the read out window when the cursor is used.

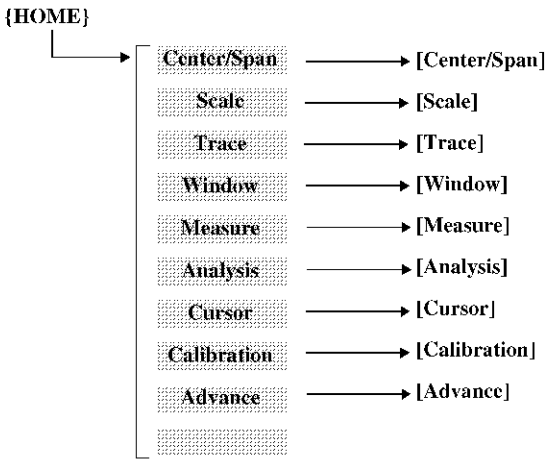
Mode1: Displays the cursor read out values on four traces. In this case, not all the X and Y cursor coordinates can be displayed at the same time.

Mode2: Displays the X and Y cursor coordinates on the selected trace. In this case, all the X and Y cursor coordinates on all the traces can be displayed at the same time.

6.3.5 {HOME}

When you touch the **{HOME}** button, the soft key on the highest layer is displayed on the soft menu bar.

The following shows the menu map:



Center/Span : Displays the Center/Span menu, which is used to set the display range such as Center and Span on the horizontal axis.

Scale : Displays the Scale menu, which is used to set the display range such as Auto Scale and /Div on the vertical axis.

Trace : Displays the Trace menu, which is used to set the waveform display ON/OFF and the display mode.

Window : Displays the Window menu, which is used to set the display mode of the scale screen.

Measure : Displays the Measure menu, which is used to set measurement conditions for dispersion measurement.

Analysis : Displays the Analysis menu, which is used to execute analysis functions.

Cursor : Displays the Cursor menu, which is used to display and operate the cursor.

Calibration : Displays the Calibration menu, which is used to execute calibrations.

Advance : Displays the Advance menu.

6.4 Soft Menu Bar

This section describes the soft menu bar.

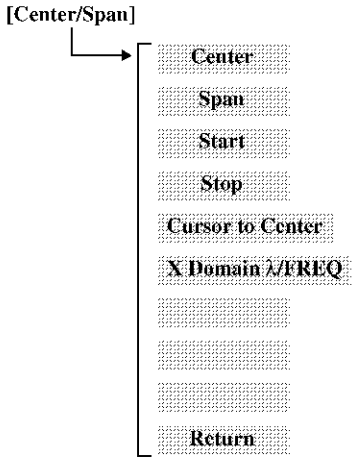
Functions of the soft menu bar can be operated through touch screen operation or application keys.

The soft menu bar has the following functions:

6.4.1 [Center/Span]

When you touch **Center/Span** in the soft menu bar, the menu is displayed.

The following shows the menu map:



Center : Sets the center wavelength (frequency) of the display.

Span : Sets the wavelength (frequency) span of the display.

Start : Sets the start wavelength (frequency) of the display.

Stop : Sets the stop wavelength (frequency) of the display.

Cursor to Center : Sets the wavelength (frequency) indicated by the cursor as the center wavelength (frequency).

X Domain λ/FREQ : Switches between the wavelength scale display and the frequency scale display.

λ: Displays in wavelength.

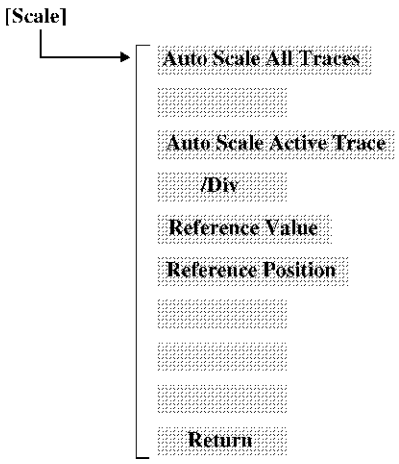
FREQ: Displays in frequency.

Return : Returns to the layer menu above.

6.4.2 [Scale]

When you touch **Scale** in the soft menu bar, the Scale menu is displayed.

The following shows the menu map:



Auto Scale All Traces : Automatically sets the vertical axis scale according to the measurement results (displayed waveforms) of the waveforms of all four traces.

Auto Scale Active Trace : Automatically sets the vertical axis scale on the active trace according to the measurement results (displayed waveform) of the active trace.

/Div : Regarding the active trace, sets the display value per division of the vertical axis scale.

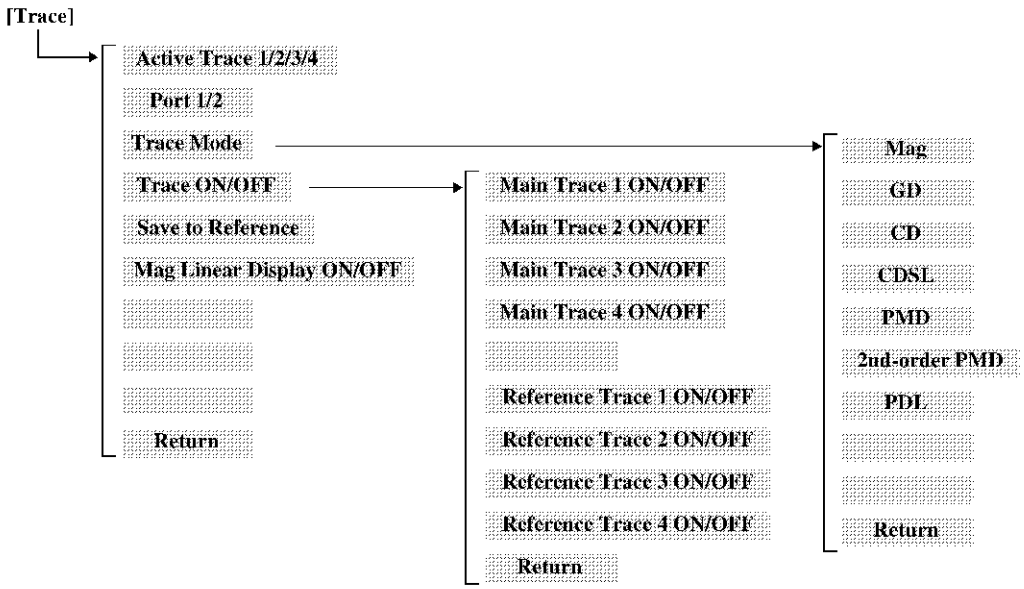
Reference Value : Regarding the active trace, sets the reference value for the vertical axis data.

Reference Position : Regarding the active trace, sets the reference position on the vertical axis for /div setting. The bottom limit on the vertical axis is 0% and the top limit is 100%. Setting can be made in each trace mode.

Return : Returns to the layer menu above.

6.4.3 [Trace]

When you touch **Trace** in the soft menu bar, the menu that enables setting of the trace is displayed. The following shows the menu map:



Active Trace 1/2/3/4: Selects the trace to be the target of operation.

Port 1/2: Switches the input port between 1 and 2.

1: Sets the input port to 1.

2: Sets the input port to 2.

Trace Mode: Displays the Trace Mode menu.

Mag: Sets the waveform display mode to the amplitude (log) mode.

GD: Sets the waveform display mode to the group delay mode.

CD: Sets the waveform display mode to the dispersion mode.

CDSL: Sets the waveform display mode to the dispersion slope mode.

PMD: Sets the waveform display mode to the polarization mode dispersion mode.

2nd-order PMD: Sets the waveform display mode to the second polarization mode dispersion mode.

PDL: Sets the waveform display mode to the polarization dependency loss mode.

Return : Returns to the layer menu above.

Trace ON/OFF : Displays the Trace ON/OFF menu.

Main Trace 1 ON/OFF : Switches display of main trace 1 between on and off.
ON: Displays trace 1 on the screen.
OFF: Does not display trace 1.

Main Trace 2 ON/OFF : Switches display of main trace 2 between on and off.
ON: Displays trace 2 on the screen.
OFF: Does not display trace 2.

Main Trace 3 ON/OFF : Switches display of main trace 3 between on and off.
ON: Displays trace 3 on the screen.
OFF: Does not display trace 3.

Main Trace 4 ON/OFF : Switches display of main trace 4 between on and off.
ON: Displays trace 4 on the screen.
OFF: Does not display trace 4.

Reference Trace 1 ON/OFF :Switches display of reference trace 1 between on and off.
ON: Displays reference trace 1.
OFF: Does not display reference trace 1.

Reference Trace 2 ON/OFF :Switches display of reference trace 2 between on and off.
ON: Displays reference trace 2.
OFF: Does not display reference trace 2.

Reference Trace 3 ON/OFF :Switches display of reference trace 3 between on and off.
ON: Displays reference trace 3.
OFF: Does not display reference trace 3.

Reference Trace 4 ON/OFF :Switches display of reference trace 4 between on and off.
ON: Displays reference trace 4.
OFF: Does not display reference trace 4.

Return : Returns to the layer menu above.

Save to Reference : Saves as the reference trace the trace currently being displayed.

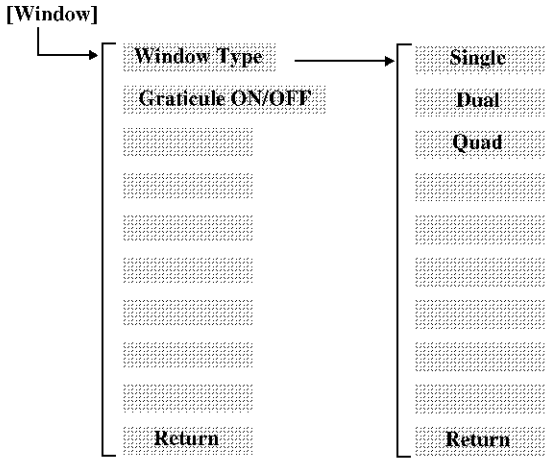
Mag Linear Display ON/OFF : Switches the amplitude display on the linear scale on and off.
ON: Displays the amplitude on a linear scale.
OFF: Displays the amplitude on a log scale.

Return : Returns to the layer menu above.

6.4.4 [Window]

When you touch **Window** in the soft menu bar, the Window menu, which enables setting related to the screen layout display, is displayed.

The following shows the menu map:



Window Type : Displays the Window Type menu.

Single : Sets the single-screen display mode.

Dual : Sets the dual (upper and lower)-screen display mode.

Quad : Sets the quad-screen display mode.

Return : Returns to the layer menu above.

Graticule ON/OFF : Switches display of the grid line on the waveform display screen between on and off.

ON: Displays the grid line.

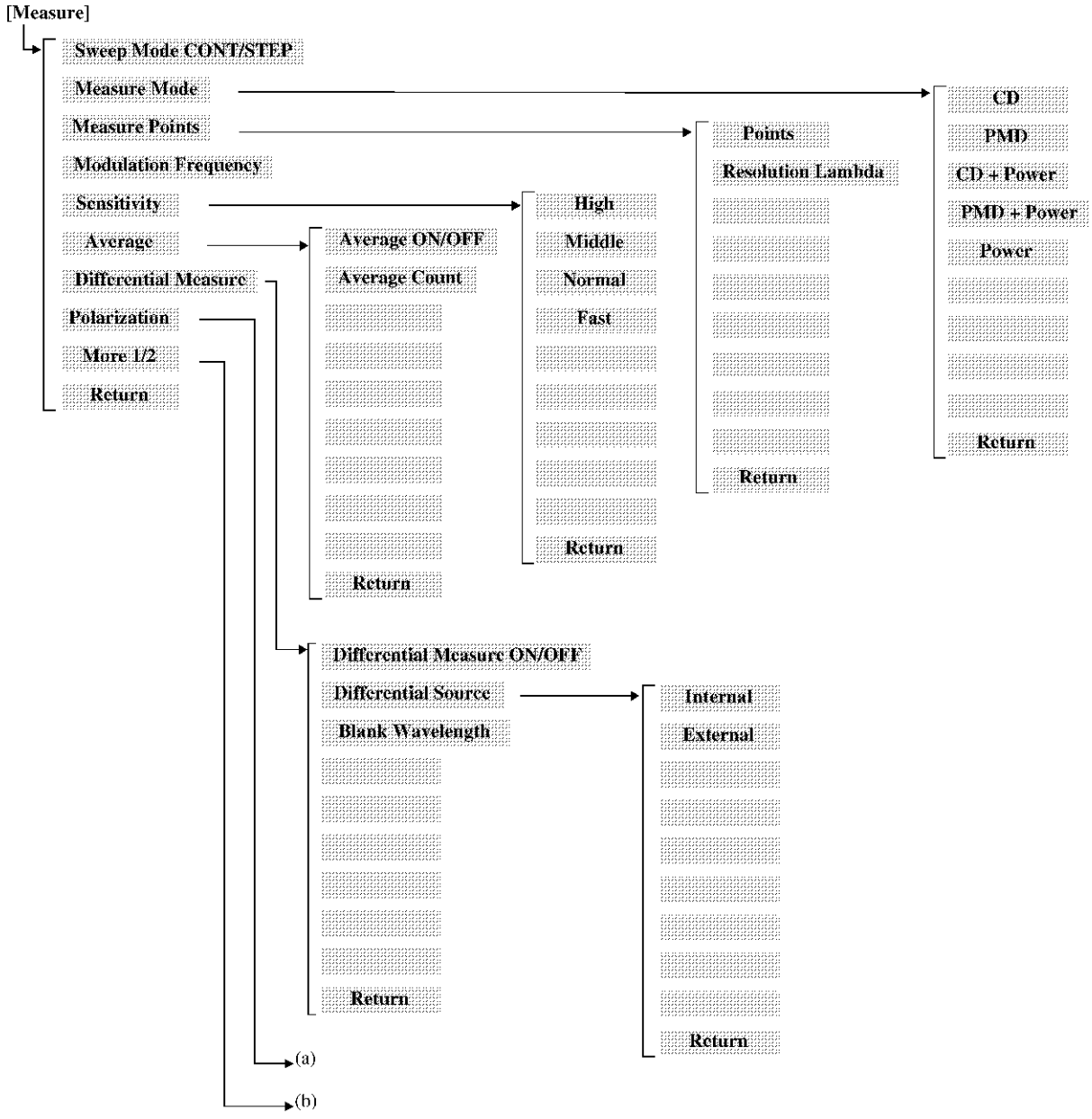
OFF: Does not display the grid line.

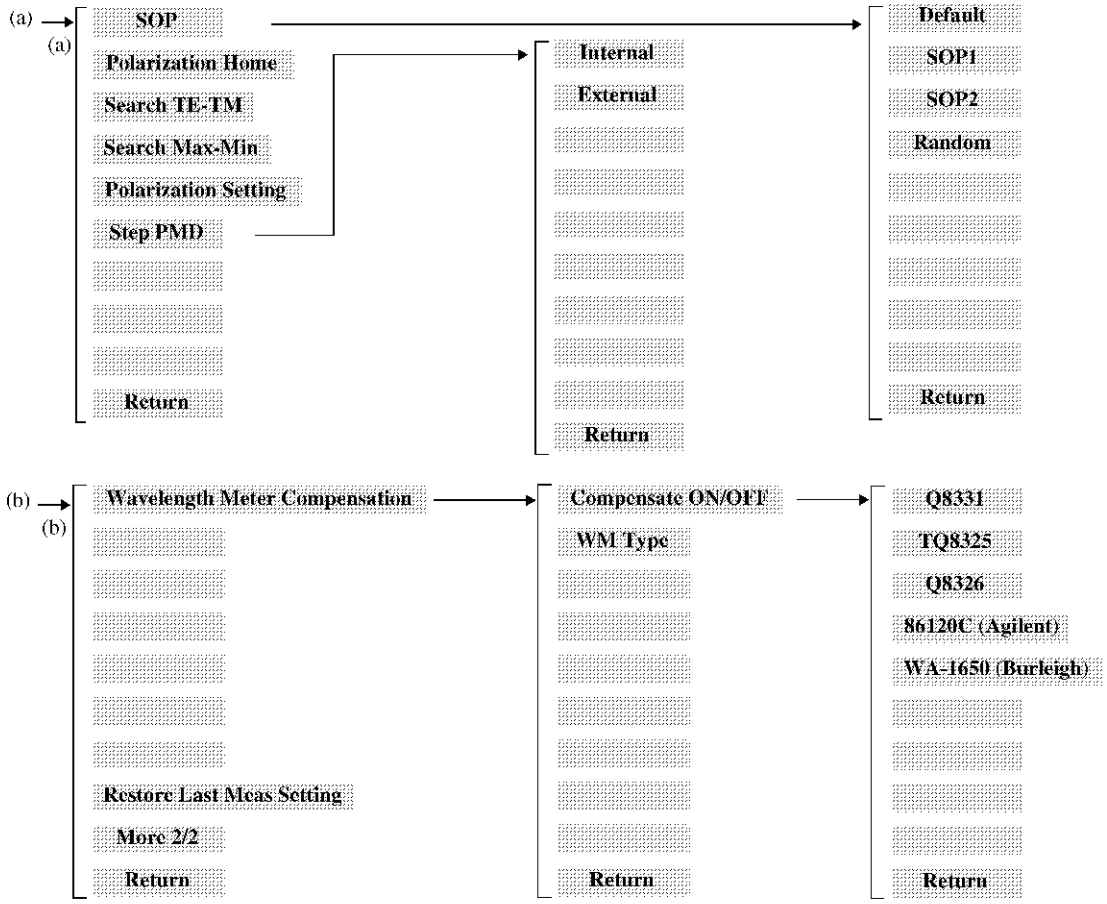
Return : Returns to the layer menu above.

6.4.5 [Measure]

When you touch **Measure** in the soft menu bar, the menu related to measurement conditions of dispersion measurement is displayed.

The following shows the menu map:





Sweep Mode CONT/STEP : Switches the sweep mode between CONT and STEP.

CONT: Sets to the continuous sweep mode.

STEP: Sets to the step sweep mode.

Measure Mode : Displays the Measure Mode menu.

CD : Sets the measurement mode to the dispersion measurement mode.

PMD : Sets the measurement mode to the polarization mode dispersion mode.

CD + Power : Sets the measurement mode to the dispersion measurement + power measurement mode.

PMD + Power : Sets the measurement mode to the polarization mode dispersion measurement + power measurement mode.

Power : Sets the measurement mode to the power measurement mode.

Return : Returns to the layer menu above.

Measure Points : Displays the Measure Points menu.

- **Points** : Sets the number of data points.
- **Resolution Lambda** : Sets the wavelength resolution. The number of data points is decided according to the wavelength resolution.
- **Return** : Returns to the layer menu above.

Modulation Frequency : Sets the modulation frequency.

Sensitivity : Displays the Sensitivity menu to set the measurement sensitivity.

- **High** : Sets to the high sensitivity mode.
- **Middle** : Sets to the middle sensitivity mode.
- **Normal** : Sets to the normal mode.
- **Fast** : Sets to the high-speed mode.
- **Return** : Returns to the layer menu above.

Average : Displays the Average menu.

- **Average ON/OFF** : Switches the averaging function between on and off.
  - ON: Results of the set number of measurements are averaged and displayed.
  - OFF: Measurement results are not averaged.
- **Average Count** : Sets the averaging count.
- **Return** : Returns to the layer menu above.

Differential Measure : Displays the Diff Measure menu to set differential measurement for drift cancellation.

- **Differential Measure ON/OFF** : Switches differential measurement between on and off.
  - ON: Sets to the differential measurement mode.
  - OFF: Cancels the differential measurement mode.
- **Differential Source** : Displays the Diff Source menu and selects the optical source to perform differential measurement.
  - **Internal** : Selects the internal optical source.
  - **External** : Selects the external fixed wavelength optical source.
  - **Return** : Returns to the layer menu above.
- **Blank Wavelength** : Sets the center wavelength in the wavelength area when the external fixed wavelength optical source is selected.
- **Return** : Returns to the layer menu above.

Polarization : Displays the Pola Control menu to set the polarization controller.

SOP : Displays the SOP menu.

Default : Sets the polarization to the factory setting.

SOP1 : Sets the mode that performs measurement under the SOP1 polarization state set in the **Polarization Setting** .

SOP2 : Sets the mode that performs measurement under the SOP2 polarization state set in the **Polarization Setting** .

Random : Sets the mode that performs measurement under the pseudo-random polarization state.

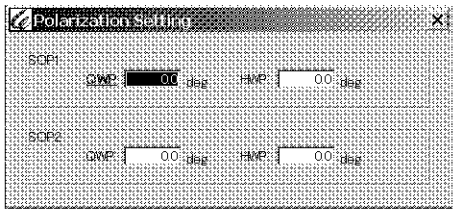
Return : Returns to the layer menu above.

Polarization Home : Returns the λ/4 wavelength plate and the λ/2 wavelength plate of **SOP1** and **SOP2** to the machine origin.

Search TE-TM : Connects the external PBS and searches for the polarization (when Port 1 is a maximum) in the TE mode and the polarization (when Port 2 is a maximum) in the TM mode.
After the polarizations have been found, **SOP1** and **SOP2** in the **Polarization Setting** are set to the TE mode and TM mode respectively.

Search Max-Min : Searches for the polarizations when the insertion loss of the DUT, which is connected to Port 1, is at a maximum and when the insertion loss of the DUT, which is connected to Port 1, is at a minimum.
After the polarizations have been found, **SOP1** and **SOP2** in the **Polarization Setting** are set to the Max mode and Min mode respectively.

Polarization Setting : Displays the **[Polarization Setting]** dialog box to set the polarization state.



[SOP1]: Sets the polarization state when **SOP** is set to **SOP1** .

[QWP]: Sets the l/4 wavelength plate angle of **SOP1** .

[HWP]: Sets the λ/2 wavelength plate angle of **SOP1** .

[SOP2]: Sets the polarization state when **SOP** is set to **SOP2** .

[QWP]: Sets the λ/4 wavelength plate angle of **SOP2** .

[HWP]: Sets the l/2 wavelength plate angle of **SOP2**.

Step PMD Selects the polarization controller that is used when the STEP sweep mode or PMD measurement mode is set.

Internal Uses the internal polarization controller.

External Uses the external polarization controller.

Return Returns to the layer menu above.

Return: Returns to the layer menu above.

More 1/2: Displays the Measure menu (2/2).

Wavelength Meter Compensation: Displays the WM Comp menu.

Compensate ON/OFF: Switches the compensation function based on the wavelength meter between on and off.

ON: Performs wavelength (frequency) compensation based on the measurement value of the wavelength meter.

OFF: Compensation based on the wavelength meter is not performed.

WM Type: Displays the WM Type menu.

Q8331: Sets the wavelength meter type to Q8331 (ADVANTEST).

TQ8325: Sets the wavelength meter type to TQ8325 (ADVANTEST).

Q8326: Sets the wavelength meter type to Q8326 (ADVANTEST).

86120C (Agilent): Sets the wavelength meter type to 86122A (Agilent).

WA-1650 (Burleigh): Sets the wavelength meter type to WA-1650 (Burleigh).

Return: Returns to the layer menu above.

Return: Returns to the layer menu above.

Restore Last Meas Setting: Restores the measurement condition under which a sweep is performed.

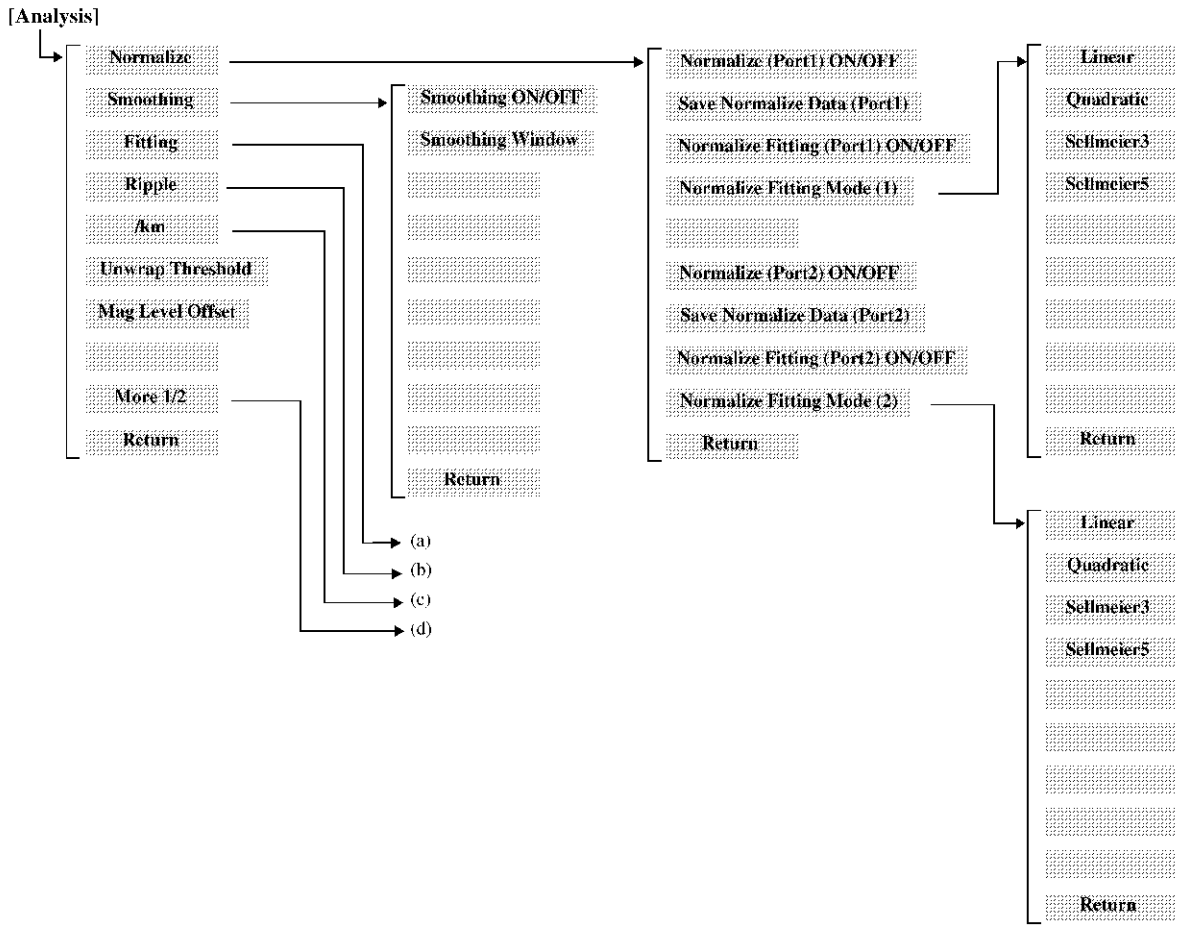
More 2/2: Displays the Measure menu (1/2).

Return: Returns to the layer menu above.

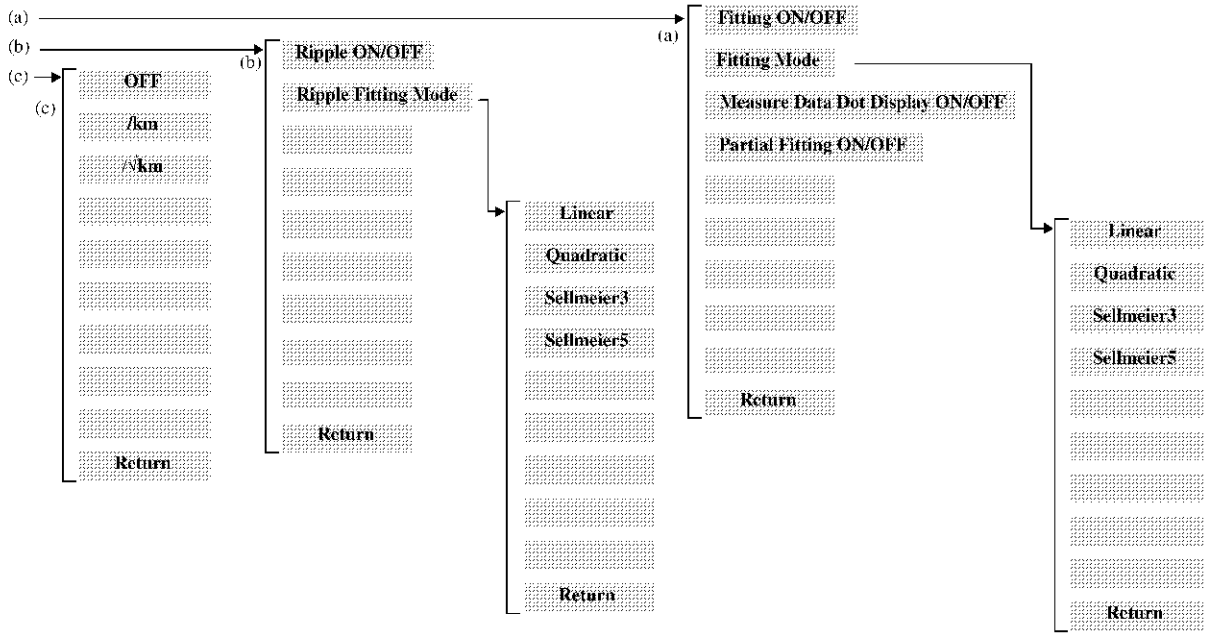
Return: Returns to the layer menu above.

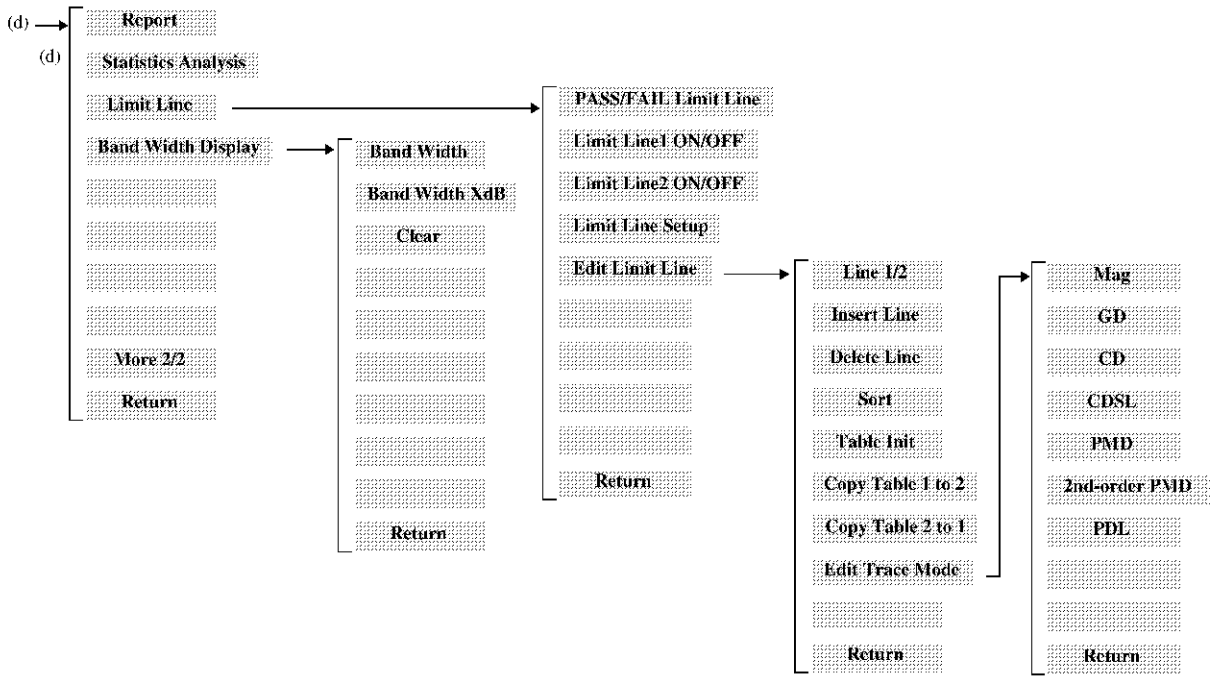
6.4.6 [Analysis]

When you touch **Analysis** in the soft menu bar, the menu related to analysis functions is displayed. The following shows the menu map:



6.4.6 [Analysis]





Normalize : Displays the Normalize menu.

Normalize (Port1) ON/OFF :
Switches the normalization compensation function of input port 1 between on and off.

ON: Turns on the normalization compensation function. Performs level compensation based on the data saved by **Save Normalize Data (Port1)** .

OFF: Cancels the normalization compensation function.

Save Normalize Data (Port1) :
Saves the current measurement value in the internal memory. The data is used as compensation data for the normalization compensation function (port 1).

Normalize Fitting (Port1) ON/OFF :
Switches curve fitting (port 1) to the compensation data between on and off.

ON: Performs curve fitting to the compensation data by using the approximate function specified by **Normalize Fitting Mode (1)** .

OFF: Cancels curve fitting.

Normalize Fitting Mode (1) :
Displays the Normalize Fitting menu and selects the mode in which curve fitting to the saved compensation data is performed.

Linear : Specifies a linear expression as the approximate function used for fitting.

Quadratic : Specifies a quadratic polynomial as the approximate function used for fitting.

Sellmeier3 : Specifies a 3-term Sellmeier expression as the approximate function used for fitting.

Sellmeier5 : Specifies a 5-term Sellmeier expression as the approximate function used for fitting.

Return : Returns to the layer menu above.

Normalize (Port2) ON/OFF :
Switches the normalization compensation function of input port 2 between on and off.

ON: Turns on the normalization compensation function. Performs level compensation based on the data saved by **Save Normalize Data (Port2)** .

OFF: Cancels the normalization compensation function.

Save Normalize Data (Port2) :
Saves the current measurement value in the internal memory. The data is used as compensation data for the normalization compensation function (port 2).

Normalize Fitting (Port2) ON/OFF:
Switches curve fitting (port 2) to the compensation data between on and off.

ON: Performs curve fitting to the compensation data by using the approximate function specified by **Normalize Fitting Mode (2)**.

OFF: Cancels curve fitting.

Normalize Fitting Mode (2):
Displays the Normalize Fitting menu and selects the mode in which curve fitting to the saved compensation data is performed.

Linear: Specifies a linear expression as the approximate function used for fitting.

Quadratic: Specifies a quadratic polynomial as the approximate function used for fitting.

Sellmeier3: Specifies a 3-term Sellmeier expression as the approximate function used for fitting.

Sellmeier5: Specifies a 5-term Sellmeier expression as the approximate function used for fitting.

Return: Returns to the layer menu above.

Return: Returns to the layer menu above.

Smoothing: Displays the Smoothing menu.

Smoothing ON/OFF: Switches the smoothing function between on and off.

ON: Performs smoothing of measurement results in the section specified by **Smoothing Window** to display.

OFF: Cancels smoothing.

Smoothing Window: Sets the range in which the smoothing function is executed.

Return: Returns to the layer menu above.

Fitting: Displays the Fitting menu.

Fitting ON/OFF: Switches the curve fitting function between on and off.

ON: Performs fitting using the approximate function specified by **Fitting Mode**.

OFF: Cancels fitting.

Fitting Mode: Displays the Fitting Mode menu.

Linear: Specifies a linear expression as the approximate function used for the fitting function.

Quadratic: Specifies a quadratic polynomial as the approximate function used for the fitting function.

Sellmeier3 : Specifies a 3-term Sellmeier expression as the approximate function used for the fitting function.

Sellmeier5 : Specifies a 5-term Sellmeier expression as the approximate function used for the fitting function.

Return : Returns to the layer menu above.

Measure Data Dot Display ON/OFF :
Displays the measurement data as dots, together with the fitting line. The measurement data and the fitting line can be compared.

ON: Displays the measurement data as dots.

OFF: Does not display the measurement data as dots.

Partial Fitting ON/OFF : The data to be the target of fitting calculation can be limited to the data between the X1 and X2 cursors.

ON: The data between the X1 and X2 cursors is to be calculated.

OFF: All data is to be calculated.

Return : Returns to the layer menu above.

Ripple : Displays the Ripple menu.

Ripple ON/OFF : Switches the function to extract only the ripple components from measurement data between on and off.

ON: Performs fitting using the approximate function specified by **Ripple Fitting Mode** .

OFF: Cancels fitting.

Ripple Fitting Mode : Displays the Ripple Fitting Mode menu.

Linear : Specifies a linear expression as the approximate function used for the fitting function.

Quadratic : Specifies a quadratic polynomial as the approximate function used for the fitting function.

Sellmeier3 : Specifies a 3-term Sellmeier expression as the approximate function used for the fitting function.

Sellmeier5 : Specifies a 5-term Sellmeier expression as the approximate function used for the fitting function.

Return : Returns to the layer menu above.

Return : Returns to the layer menu above.

/km : Displays the menu used to set /km and /√km.

OFF : Turns off the setting of /km and /√km.

/km : Displays the measurement data by converting it into a /km value. Before executing this mode, be sure to perform fiber length measurement or set the fiber length.

/^km : Displays the measurement data by converting it into a km value. Before executing this mode, be sure to perform fiber length measurement or set the fiber length.

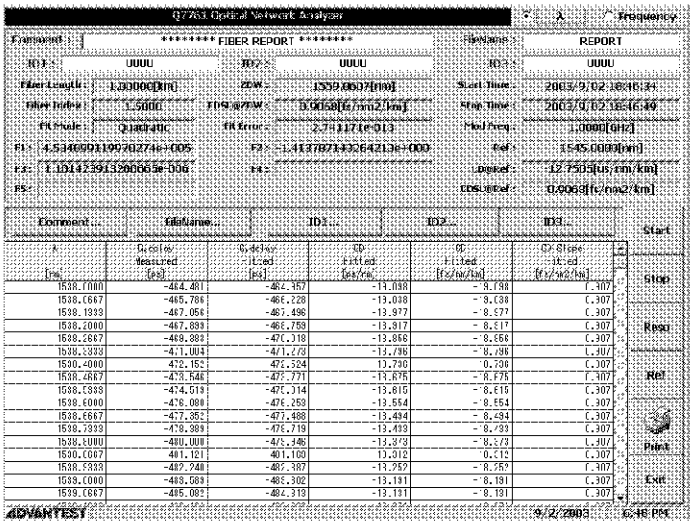
Return : Returns to the layer menu above.

Unwrap Threshold : Sets the range in which the phase unwrap function is executed. Set Unwrap Threshold[dB] based on the amplitude characteristics.
The phase unwrapping becomes valid in the range larger than this value.

Mag Level Offset : Adds Offset[dB] to which the power level is set based on the amplitude characteristics.

More 1/2 : Displays the Analysis menu (2/2).

Report : Performs the report process for the main Trace 1 and displays the report display screen.



[Start]: Sets the START wavelength in Report display.

[Stop]: Sets the STOP wavelength in Report display.

[Reso]: Sets the wavelength resolution in Report display.

[Ref]: Sets the REFERENCE wavelength in Report display.

[Comment]: Enters a comment in the comment field in Report display.

[File Name]: Enters a file name in the file name field in Report display.

[ID1] to **[ID3]**: Enters an ID in the ID field in Report display.

[Print]: Prints out the measurement results in Report display in report format.

[Exit]: Closes the report display screen.

Statistics Analysis: Displays the alpha parameter when the Maxwell distribution function is used for the MAX value, MIN value, average value, root-mean-square, standard deviation, and the histogram graph of PMD.

Limit Line: Displays the Limit Line menu.

PASS/FAIL Limit Line:
Performs pass/fail judgment.

Limit Line1 ON/OFF:
Switches display of limit line 1 between on and off.
Prepares two limit lines per trace (8 limit lines in total).
The ON/OFF switching affects all lines in common. The display/non-display status of an individual line depends on the existence of a data table.

ON: Displays limit line 1.

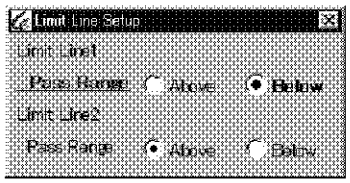
OFF: Does not display limit line 1.

Limit Line2 ON/OFF:
Switches display of limit line 2 between on and off.

ON: Displays limit line 2.

OFF: Does not display limit line 2.

Limit Line Setup: Displays the **[Limit Line Setup]** dialog box to perform setting of judgment conditions using the limit line.



[Limit Line 1]:

[Pass Range]: Sets the judgment condition by limit line 1

Above: Sets the range above limit line 1 as the range satisfying the Pass condition.

Below: Sets the range below limit line 1 as the range satisfying the Pass condition.

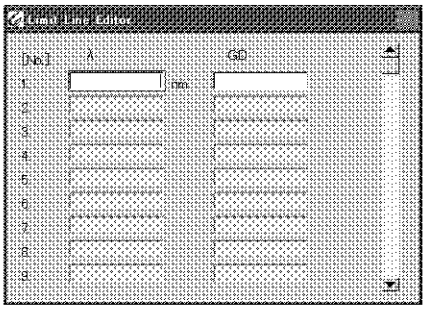
[Limit Line 2]:

[Pass Range]: Sets the judgment condition by limit line 2

Above: Sets the range above limit line 2 as the range satisfying the Pass condition.

Below: Sets the range below limit line 2 as the range satisfying the Pass condition.

Edit Limit Line : Displays the **[Limit Line Editor]** dialog box. Performs data entry into the limit line table.



Line 1/2 : Switches the limit lines into which the data is entered.

1: Selects limit line 1.

2: Selects limit line 2.

Insert Line : Inserts the data by inserting the same value into the cursor position in the dialog box.

Delete Line : Deletes the line on which the cursor position in the dialog box.

Sort : Sorts the data entered into the dialog box in order of the wavelength.

Table Init : Deletes all data in the dialog box.

Copy Table 1 to 2 :
Copies Limit Line 1 data to Limit Line 2.

Copy Table 2 to 1 :
Copies Limit Line 2 data to Limit Line 1.

Edit Trace Mode :
Switches the trace modes of the limit lines into which the data is entered.

Mag : Sets the trace mode to the amplitude (log) mode.

GD : Sets the trace mode to Group Delay.

CD : Sets the trace mode to the dispersion mode.

CDSL : Sets the trace mode to the dispersion slope.

PMD : Sets the trace mode to PMD.

2nd-order PMD :
Sets the trace mode to 2nd-order PMD.

PDL : Sets the trace mode to PDL.

Return : Returns to the layer menu above.

Return : Returns to the layer menu above.

Return : Returns to the layer menu above.

Band Width Display : Displays the menu to obtain the full width at half maximum (FWHM) of the Filter.

Band Width : Obtains the full width at half maximum (FWHM) of the Filter using the X-dB method.
Only the amplitude characteristic can be displayed on a logarithmic scale. When this key is pressed, two lines (used to show the half bandwidth) are displayed at the half bandwidth position, and a line (used to show the half bandwidth) is displayed at the position specified by **Band Width XdB**.

Band Width XdB : To obtain the FWHM, sets the difference between the maximum value and the declined level X[dB].

Clear : Clears the lines (two in vertical and one in horizontal) used to show the half bandwidth.

Return : Returns to the layer menu above.

More 2/2 : Displays the Analysis menu (1/2).

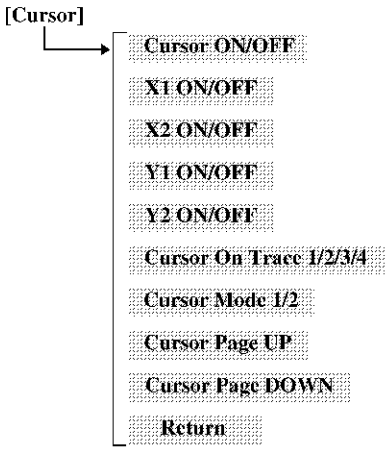
Return : Returns to the layer menu above.

Return : Returns to the layer menu above.

6.4.7 [Cursor]

When you touch **Cursor** in the soft menu bar, the menu related to operations of X and Y cursors is displayed.

The following shows the menu map:



Cursor ON/OFF : Switches display of the window and cursor for reading cursor information between on and off.

- ON: Displays the window and cursor for reading cursor information.
- OFF: Deletes the window and cursor for reading cursor information.

X1 ON/OFF : Switches vertical cursor X1 between on and off.

- ON: Displays vertical cursor X1 and activates the setting.
- OFF: Deletes vertical cursor X1.

X2 ON/OFF : Switches vertical cursor X2 between on and off.

- ON: Displays vertical cursor X2 and activates the setting.
- OFF: Deletes vertical cursor X2.

Y1 ON/OFF : Switches horizontal cursor Y1 between on and off.

- ON: Displays horizontal cursor Y1 and activates the setting.
- OFF: Deletes horizontal cursor Y1.

Y2 ON/OFF : Switches horizontal cursor Y2 between on and off.

- ON: Displays horizontal cursor Y2 and activates the setting.
- OFF: Deletes horizontal cursor Y2.

Cursor On Trace 1/2/3/4 : The X1 and X2 cursors move on the points of the trace. The target trace can be selected.

Cursor Mode 1/2 : Selects the display format of the read out window which is displayed when the cursor is used.

1: Displays the read values by a cursor on four traces. In this case, all read values by the X and Y cursors cannot be displayed at the same time.

2: Displays the read values by the X and Y cursors on the selected trace. In this case, the read values on all traces cannot be displayed at the same time.

Cursor Page UP : Each time the Cursor Page UP key is pressed, the display scrolls and the values below are displayed in order in the read out window.

In Cursor Mode 1:
Main trace (X1, X2)
⇒ Main trace (Y1, Y2)
⇒ Reference trace (X1, X2)
⇒ Reference trace (Y1, Y2)

In Cursor Mode 2:
Main trace 1 data
⇒ Main trace 2 data
⇒ Main trace 3 data
⇒ Main trace 4 data
⇒ Reference trace 1 data
⇒ Reference trace 2 data
⇒ Reference trace 3 data
⇒ Reference trace 4 data

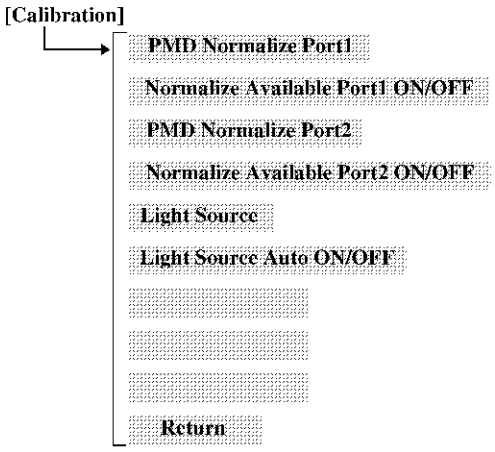
Cursor Page DOWN : The display scrolls in the opposite direction to **Cursor Page UP** and the read values are displayed in reverse order.

Return : Returns to the layer menu above.

6.4.8 [Calibration]

When you touch **Calibration** in the soft menu bar, the menu related to setting of calibration is displayed.

The following shows the menu map:



PMD Normalize Port1 : Performs calibration of Port1 for polarization mode dispersion measurement.
Port1 must be connected to the output port by using the supplied optical fiber before calibrating Port1.

Normalize Available Port1 ON/OFF :
When performing polarization mode dispersion measurement, selects whether to use the data measured by **PMD Normalize Port1** or the default setting data as the normalization compensation data.

ON: The data measured by **PMD Normalize Port1** is used as the normalization compensation data.

OFF: The default setting data is used as the normalization compensation data.

PMD Normalize Port2 : Performs calibration of Port2 for polarization mode dispersion measurement.
Be sure to perform the above after connecting Port2 and the output port using a fiber.

Normalize Available Port2 ON/OFF :
When performing polarization mode dispersion measurement, selects whether to use the data measured by **PMD Normalize Port2** or the default setting data as the normalization compensation data

ON: The data measured by **PMD Normalize Port2** is used as the normalization compensation data.

OFF: The default setting data is used as the normalization compensation data.

Light Source : Calibrates the light source unit.

MEMO: ***Calibrating the light source guarantees the accuracy of the measurement. The light source calibration status is displayed in the Light Source field of the status window. Descriptions of these statuses are as follows:***

WARM UP: ***This indicates that the Q7761 is warming up. The light source cannot be calibrated during the warm-up process.***

UNCAL: ***When the Q7761 warm-up is complete, the display changes from WARM UP to UNCAL and the light source can be calibrated. In the uncalibrated status, the accuracy of measurement value is not guaranteed.***

NORMAL: ***This indicates that the light source has been calibrated and the accuracy of measurement value is guaranteed.***
NORMAL changed to UNCAL at regular time intervals or if the operating temperature changes. In this case, re-calibrate the light source.

Light Source Auto ON/OFF : Switches the mode that automatically calibrates the light source unit ON and OFF.

ON: Sets the mode that calibrates the light source unit automatically.

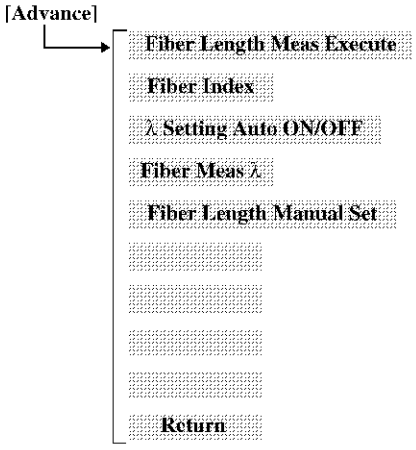
OFF: Cancels the mode that calibrates the light source unit automatically.

Return : Returns to the layer menu above.

6.4.9 [Advance]

When you touch **Advance** in the soft menu bar, the Advance menu is displayed.

The following shows the menu map:



Fiber Length Meas Execute : Measures the group delay time of the DUT and displays the fiber length calculated based on the refractive index set by **Fiber Index**.

Fiber Index : Sets the refractive index of the DUT. The fiber length is calculated based on this value.

λ Setting Auto ON/OFF : Selects the wavelength used for measuring the fiber length.

ON: Sets the currently set center wavelength to the wavelength used for measuring the fiber length.

OFF: Sets the wavelength set by **Fiber Meas λ** to the wavelength used for measuring the fiber length.

Fiber Meas λ : Sets the wavelength used for measuring the fiber length.

Fiber Length Manual Set : Input the fiber length without measuring the fiber length.

Return : Returns to the layer menu above.

7. SPECIFICATIONS

This chapter describes the specifications of this instrument.

The performance of this instrument is guaranteed when used under the following conditions, unless specially noted.

- The instrument is calibrated at regular calibration periods.
- The instrument has been warmed up for 2 hours or more after power is turned on under the specified environmental conditions.

7.1 Q7761 Performance Specifications

Performances *1

Item		Specifications
Measurement functions		Magnitude characteristics: IL
		Group delay time characteristics: GD
		Chromatic dispersion characteristics: CD
		Chromatic dispersion slope characteristics: CDS
		Polarization mode dispersion characteristics: PMD
		2nd order PMD characteristics
		Polarization dependency loss characteristics: PDL
		Fiber length
Measurement ports		Two optical input ports The two ports can perform synchronous measurement of all characteristics.
Dispersion characteristics	Measurable wavelength range	1525 nm to 1625 nm
	Relative accuracy of the wavelength measurement *2	±1.5 pm
	Absolute accuracy of the wavelength measurement *3	±15 pm (When an external wavelength meter is not used) ±1.5 pm (When Q8331 is used as an external wavelength meter at the same time)
	Wavelength set resolution	1 pm
	Wavelength sweep range	Enable to set arbitrarily from 100 pm to 100 nm.
	Maximum wavelength sweep speed	20 nm/s

<table>
<tr><th colspan="3">Item</th><th>Specifications</th></tr>
<tr><td rowspan="5">Magnitude characteristics</td><td rowspan="2">Dynamic range *4 *5</td><td>Power Mode</td><td>58 dB or more</td></tr>
<tr><td>CD Mode</td><td>43 dB or more</td></tr>
<tr><td rowspan="2">Linearity *5 *6</td><td>Power Mode</td><td>±0.15 dB (Relative level: 0 dB to -38 dB)
±0.45 dB (Relative level: -38 dB to -48 dB)</td></tr>
<tr><td>CD Mode</td><td>±0.15 dB (Relative level: 0 dB to -23 dB)
±0.25 dB (Relative level: -23 dB to -28 dB)</td></tr>
<tr><td colspan="2">Polarization dependency</td><td>±0.10 dB</td></tr>
<tr><td colspan="3">Repeatability of connection/ disconnection *7</td><td>±0.10 dB</td></tr>
<tr><td colspan="3">Optical power at optical output port *8</td><td>-18 dBm or more</td></tr>
<tr><td colspan="3">Optical power of optical monitor for optical wavelength meter *8</td><td>-25 dBm or more</td></tr>
<tr><td rowspan="4">Group delay time characteristics</td><td colspan="3">Maximum measurement time *9</td><td>100 µs</td></tr>
<tr><td colspan="3">Group delay time resolution</td><td>1 fs</td></tr>
<tr><td colspan="3">Relative group delay (RGD) measurement accuracy *6 *10</td><td><table><tr><th>Relative level</th><th>Accuracy (s)</th><th>At 2.5 GHz</th></tr><tr><td>0 dB to -8 dB</td><td>±0.015%/fm</td><td>±0.06 ps</td></tr><tr><td>-8 dB to -13 dB</td><td>±0.048%/fm</td><td>±0.192 ps</td></tr><tr><td>-13 dB to -18 dB</td><td>±0.15%/fm</td><td>±0.6 ps</td></tr><tr><td>-18 dB to -23 dB</td><td>±0.48%/fm</td><td>±1.92 ps</td></tr><tr><td>-23 dB to -28 dB</td><td>±1.5%/fm</td><td>±6 ps</td></tr></table></td></tr>
<tr><td colspan="3">Modulation frequency setting range</td><td>10 MHz to 2.5 GHz</td></tr>
<tr><td rowspan="3">Chromatic dispersion (CD) characteristics</td><td colspan="3">Maximum measurement range *9</td><td>10 µs/nm</td></tr>
<tr><td colspan="3">Measurement resolution</td><td>1 fs/nm</td></tr>
<tr><td colspan="3">Measurement accuracy *6 *10</td><td>±RGD accuracy/wavelength resolution ±(relative wavelength accuracy/wavelength resolution) % of CD</td></tr>
<tr><td rowspan="3">Polarization mode dispersion (PMD) characteristics</td><td colspan="3">Maximum measurement range</td><td>100 ps</td></tr>
<tr><td colspan="3">Measurement resolution</td><td>1 fs</td></tr>
<tr><td colspan="3">Measurement accuracy *11</td><td>±0.10 ps ±3% of PMD</td></tr>
<tr><td rowspan="2">2nd order PMD characteristics</td><td colspan="3">Maximum measurement range</td><td>1000 ps^2</td></tr>
<tr><td colspan="3">Measurement resolution</td><td>0.01 ps^2</td></tr>
</table>

Item		Specifications
Polarization dependency loss (PDL) characteristics	Maximum measurement range	3 dB
	Measurement resolution	0.001 dB
Fiber length measurement	Measurement range	0.2 m to 10,000 km
	Measurement resolution	0.01 m
	Input range of refractive index	1.0000 to 3.0000
	Repeatability of measurement *12	0.02 m
Fiber wavelength dispersion measurement *13	Repeatability of zero-dispersion wavelength measurement	0.015 nm
	Repeatability of dispersion slope measurement (at the zero-dispersion wavelength)	0.025 ps/nm^2, 0.002 ps/nm^2/km
	Waveform approximation function	Linear approximation, quadratic polynomial, 3-term Sellmeier expression, 5-term Sellmeier expression Drift compensation measurement function
Drift compensation measurement function *14	Real-time drift compensation function	
Polarization control function	Polarization extinction ratio	30 dB or more
	Angular setting resolution	0.1°
	Output function of linear polarization at the optical connector end of the outgoing port	When separately sold polarization reference accessory is used at the same time
Data processing function	Memory function	Data recording and reading
	Display function	Optical frequency display, superimpose display
	Operation/Analysis function	Averaging function, normalizing, smoothing, limit line function, parts fitting function, report output function, and ripple extraction
Optical input/output port and standard optical connector type *15	Optical output port	1 port: FC/Angled PC
	Optical input port	2 port: FC/Angled PC
	Optical monitor output for optical wavelength meter	1 port: FC/Super PC
	External reference optical input	1 port: FC/Angled PC

Item		Specifications
Input/Output interfaces	GP-IB	Compliant with IEEE-488.2, rear panel
	Floppy drive	2 modes compatibility (DD720 kB and HD1.4 MB)
	Printer port	Compliant with IEEE-1284-1994, rear panel
	Keyboard	PS/2 101/106 keyboard, front panel
	Display	12.1-inch SVGA TFT color liquid crystal touch panel display
	Mouse	PS/2 mouse, front panel
	LAN	10Base-T, protocol: TCP/IP, rear panel
	USB	Front panel
General specifications	Operating environment	Temperature range: 15°C to 35°C Relative humidity: 80% or less (no condensation)
	Storage environment	Temperature range: -20°C to +60°C Relative humidity: 80% or less (no condensation)
	Power source	Analysis unit: AC100 V-120 V, AC220 V-240 V, 50/60 Hz, 500 VA or less OPT unit: AC100 V-120 V, AC220 V-240 V, 50/60 Hz, 100 VA or less Light source unit: AC100 V-120 V, AC220 V-240 V, 50/60 Hz, 300 VA or less
	External dimensions	Analysis unit: Approx. 424 (W) × 266 (H) × 530 mm (D) OPT unit: Approx. 424 (W) × 177 (H) × 530 mm (D) Light source unit: Approx. 424 (W) × 132 (H) × 530 mm (D)
	Mass	Analysis unit: 33 kg or less OPT unit: 19 kg or less Light source unit: 26 kg or less

*1: At a constant temperature after the 2-hour warm-up
*2: 10 pm of the wavelength resolution at Sensitivity=Middle
*3: The external wavelength meter can be used only in the step measurement. No zero span measurement is included.
*4: The difference between the amplitude level and noise level (average value) in the through measurement. Sensitivity is set to High
*5: The POWER mode is used to measure the amplitude.
The DC mode is used to measure CD, GD, and the amplitude characteristics at the same time.
The values in the CD mode are specified at a fm of ≥100 MHz.
*6: The relative level is measured by using the amplitude level in the through measurement as the reference.
No group delay time fluctuation in the measured object is observed over time.
Sensitivity is set to High and the fm is ≥100 MHz.
*7: The FC/APC-FC/APC master optical fiber is connected and disconnected 10 times.
*8: Wavelength is 1550 nm, at the average power
*9: The modulation frequency is 10 MHz and the number of measurement points is 2401 or more.
*10: The real-time drift compensation function is not used.

*11: The average value measured when PMD is ≤5 ps, the modulation frequency is 2.5 GHz, the wavelength resolution is 100 pm, the insertion loss is ≤8 dB, PDL is 0 dB , and Sensitivity is set to Middle.
*12: The measurement is repeated three times by using a 12 km dispersion-shifted fiber.
Refractive index is 1.47
The real-time drift compensation function is set to ON.
*13: The measurement is repeated ten times by using a 12 km dispersion-shifted fiber and the modulation frequency is 2.5 GHz, the wavelength range is 1525 nm to 1625 nm, the number of measurement points is 501 (the wavelength resolution is 200 pm), Sensitivity is set to High, and the drift compensation function is used. By fitting to a quadratic polynomial
*14: When the internal reference light source is used, the device to be measured requires the pass band in the 1540 nm ±3.5 nm wavelength range.
*15: The optical connector can be replaced easily by using an accessory which is sold separately.

8. ACCESSORIES AND RACK-MOUNT KITS

This chapter introduces the accessories and rack-mount kits that can be used with this instrument.

8.1 Accessories

Table 8-1 Accessories

Accessory Name	Part Code
FC/APC-FC/APC master optical fiber	A180001
SC/APC-SC/APC master optical fiber	A180002
FC/APC-FC/SPC master optical fiber	A180003
Adapter for SC connector output	A180004
FC/FC adapter (for APC)	A180005
SC/SC adapter (for APC)	A180006
FC/FC adapter	A180007
FC/SC adapter	A180008
Polarization reference module	A180009
FC/APC-SC/SPC plug	A180010

8.2 Rack-Mount Kits

Rack-Mount Kits:

A slide rail set A02615 is required when mounting onto TR16801 of our company's rack.

When mounting onto a rack of other company, the user needs to prepare an L angle set A02642 or a tray to support this instrument.

Each unit (analysis, OPT, and optical source) requires a slide rail set or an L angle set.

- Analysis unit:
  EIA, with handle: A02714
  JIS, with handle: A02715
  EIA, without handle: A02724
  JIS, without handle: A02725
- OPT unit:
  EIA, with handle: A02710
  JIS, with handle: A02711
  EIA, without handle: A02720
  JIS, without handle: A02721
- Light source unit:
  EIA, with handle: A02708
  JIS, with handle: A02709
  EIA, without handle: A02718
  JIS, without handle: A02719

9. MAINTENANCE

This chapter describes the following matters related to the maintenance of this instrument in order to maintain its designed performance.

- 9.1 Replacing and Cleaning of the Optical Connector-Adapter
- 9.2 Cleaning
- 9.3 About Calibration
- 9.4 About Replacement of Limited-Life Parts
- 9.5 Method of Storing the Instrument
- 9.6 How to Move and Transport the Instrument
- 9.7 Notes for Requesting Repair, Replacement of Parts, and Periodic Calibration
- 9.8 System Recovery Procedure
- 9.9 List of Error Messages

9.1 Replacing and Cleaning of the Optical Connector-Adapter

Q7761 has an FC-type optical connector-adapter as standard. An SC-type optical connector-adapter is also prepared as an accessory (sold separately). The optical connector-adapter can be replaced easily by removing the adapter-fixing cap and pulling out the optical connector-adapter.

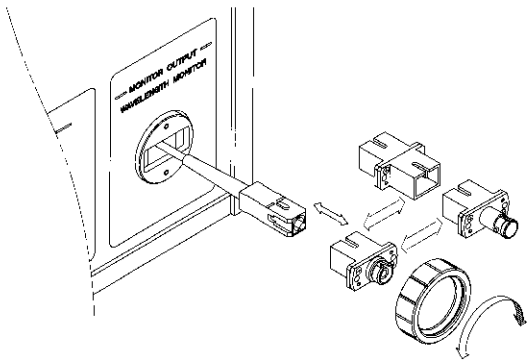


Figure 9-1 Replacing the Optical Connector-Adapter

When cleaning the adapter, remove it in the same way as that for replacement and clean the end of the adapter using alcohol or cleaner exclusively for the optical connector.

CAUTION:

1. ***After replacing the optical connector-adapter or cleaning the optical connector part, screw the adapter-fixing cap tightly.***
2. ***Do not pull the optical connector any more after you see a red mark band.***
3. ***When cleaning the optical connector, use cleaner exclusively for the optical connector to prevent damage to the end face of the optical connector.***

9.2 Cleaning

This section describes how to clean this instrument and some matters to note.

WARNING: ***Turn off the power breaker on the rear panel and extract the power cable from the wall socket to protect yourself from electric shock accidents.***
Never attempt to remove the cabinet cover to clean the inside of the instrument.

9.2.1 Cabinet Cleaning

Use the following procedure to clean the cabinet of this instrument.

Clean the cabinet surface with a soft dry cloth.

If the surface is not clean enough, try again with a cloth soaked in a weakened neutral detergent. Then wipe the surface with a soft dry cloth.

CAUTION: ***Do not allow water to splash into the inside of the instrument.***
Do not use organic solvent solutions such as benzene, toluene, xylene, or acetone for cleaning. They can cause the paint on the cabinet to come off, deform, or degrade. Do not use cleansers for cleaning.

9.2.2 Cleaning the Touch Screen

Cleaning with a soft dry cloth is sufficient for ordinary use. If dirt remains on the touch screen, wipe the surface with a soft cloth soaked in ethanol.

CAUTION: ***The screen surface may be scratched if you rub it powerfully.***
Handle the touch screen very carefully. It may be broken if it is exposed to strong physical shock because it contains glass.

9.2.3 Cleaning of Other Parts

Use appropriate caution to protect this instrument from dust.

WARNING: ***Remove dust periodically from wall sockets and power connector plugs.***
Dust that is wet with humidity may cause tracking that could cause a fire.
The rear panel is equipped with an exhaust cooling fan and the side and the bottom panels have exhaust vents. Keep these vents clean for sufficient exhaustion. If dust piled on the vents causes exhaustion to become poor, the temperature inside will rise and the instrument will not work correctly.

9.3 About Calibration

Calibration should be performed periodically to prevent performance deterioration or to adjust chronological performance changes.

The recommended period of regular calibration is once a year.

Calibration is done at the factory site.

For more information, call a sales representative.

9.4 About Replacement of Limited-Life Parts

The Table 9-1 also shows the number of operations for the expected life spans of each of these parts, to suggest a recommended time of replacement in terms of the number of times of operations. For replacement, call the Service Center (Advantest Customer Support (ACS)).

Note that the life span can become shorter than expected depending on the operation environment, frequency of use, and storage environment.

MEMO: ***The table shows the expected life spans or recommended time of replacement only for the user's reference. It does not guarantee the life of the components.***

Table 9-1 Limited-Life Parts Specified in This Instrument

Name	Life (Reference values provided by manufacturer)
Panel key switch	10^6 operations
LCD back light	50,000 hours
Rotary encoder	25×10^5 operations
Cooling fan	40,000 hours
Lithium battery cells for data backup	About 3 years
Input attenuator	10^6 operations
Mechanical relay, RF block	10^6 operations
Mechanical relay, IF block	10^5 operations
DC FAN MOTOR	About 10 years
1X2 optical switch	About 10 years
COAXIAL SWITCH	About 10 years
POL CONTROLLER	About 13 years
Stepping motor	About 10 years
Linear guide	About 10 years
Piezo actuator	About 10 years

9.5 Method of Storing the Instrument

When you store this instrument, keep it in an environment that meets the following requirements.

- Reduced vibration
- Not dusty
- Protected from direct sunlight
- Ambient temperature range: -20°C to +60°C
- Relative humidity: 80% or less (no condensation)

When you do not use the instrument for 90 days or more, store it in an appropriate moisture-proof bag with desiccant.

9.6 How to Move and Transport the Instrument

9.6.1 Moving

CAUTION: ***This instrument is a weighty item. Sufficient care is needed for moving or transporting it from one place to another. Use the following procedures to protect yourself from accidents.***

Use a cart with sufficient strength.

When you hand-carry the instrument, be sure to work with an assistant.

9.6.2 Transportation

For transportation, use the packing materials used for the shipping of this instrument. If you use other materials, double-pack the instrument using the following procedure.

1. Install the protection cover of the touch screen display on this instrument.
2. Cover the instrument with a protective plastic sheet. (Put desiccant inside for protection from moisture.)
3. Prepare an inner carton case.

   The panels of the case must be 5 mm or more thick. The inner dimensions must be 10 cm or more larger than the physical size of this instrument because cushioning materials are placed inside.

   Place the instrument so that it is covered with cushioning or plastic foam material on all sides. (The cushioning material must be 4 cm or more thick.)
4. Seal the carton case with an industrial stapler or packing tape.
5. Prepare an outer carton case.

   The panels of the case must be 5 mm or more thick. The dimensions must be 10 cm or more larger than the inner case on all sides. Place cushioning material 4 cm or more thick inside the outer case and put the inner case prepared in steps 3 and 4 therein.
6. Stuff the cushioning material in the space between the inner and outer cases and seal the outer case.
7. Fasten the outer case with packing strings.

9.7 Notes for Requesting Repair, Replacement of Parts, and Periodic Calibration

9.7.1 Work Request

Attach a tag indicating the following data to this instrument when you send it to a sales representative.

- Your company name and address
- Name of the person in charge
- Serial number (on the rear panel)
- What work to request (repair or periodic calibration)

9.7.2 Destination and Phone Number for Contact

Call Advantest Instrument Call Center: ICC.

9.8 System Recovery Procedure

This instrument adopts Microsoft Windows XP Embedded and Windows application programs for measurement functions.
The system files required for the operation of this instrument are stored in the built-in system drive.
If a system file is destroyed during operation of this instrument for any reason, the instrument may not operate normally.

In such a case, you can recover the built-in system drive to the factory-set state by using the System Recovery Disk attached to this instrument as an accessory.

IMPORTANT: ***The contents of the built-in system drive are lost by recovery operation. In other words, the settings of networks or printers made after you purchased the instrument are lost.***
Recovery of this instrument is impossible in the case of damage of disk partition information or disks. Call a sales representative for repair.

Recovery procedure

1. Make sure that the power of this instrument is turned off.

   When the instrument is operating, press the **POWER** switch on the front panel to terminate the operation of this instrument.

2. Insert the floppy disk with "System Recovery Disk" on the label into the disk drive.

3. Press the **POWER** switch on the front panel to turn on power.

   The recovery software is read from the system recovery disk and a dialog box is displayed.

4. Select **[Continue]** with the data knob for system recovery. Press the **ENT** button on the front panel.

   System recovery begins. System recovery takes about 5 minutes to complete.

   The Reboot dialog box shown in Figure 9-2 is displayed on completion of system recovery.

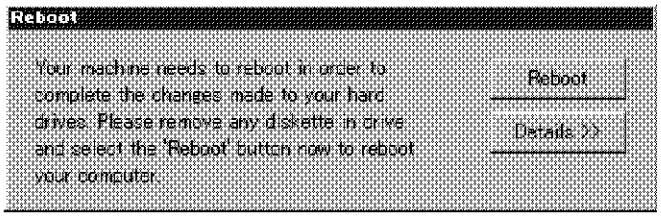


Figure 9-2 Reboot Dialog Box

5. Press the eject button on the floppy disk drive and extract the system recovery disk.

CAUTION: ***Do not press the eject button on the floppy disk drive while the access lamp on the drive is on. If you do, the floppy disk drive or floppy disk may be broken.***

6. Select **[Reboot]** with the data knob and press the **ENT** button on the front panel.

   The system restarts and the final processing is performed. It takes about 7 minutes to complete.

   Although restarting occurs several times during this period, it does not mean any error has occurred.

   After completion of the final processing, the firmware of this instrument operates.

9.9 List of Error Messages

9.9.1 Operation Errors and Messages that Inform of Abnormal States

This section describes the causes and solutions of operation errors, which are displayed in this instrument, and for messages that inform of abnormal states.

Error number	Message text	Description
-232	Invalid data format.	The file format is invalid. Check the file format or the extension.
-257	Bad File name.	The file name is incorrect. Change the file name.
-1250	No such file or directory.	The specified file or directory does not exist. Check the file name or the directory name.
-1251	Permission denied.	The file operation is prohibited. Check the drive, file, or directory.
-1252	Not enough space on the disk.	No enough space is left on the disk. Delete unnecessary files.
-1253	File read/write error.	An error occurred in file input and output.
-1254	Device is not ready	No disk is inserted.
-1255	No such file or directory	The specified file or directory does not exist.
-1256	Already Exists	The specified file already exists.
-2200	Can't execute during measurement.	Cannot be executed during the measurement.
-2201	"STEP" sweep mode is not available in zero span.	The step sweep mode cannot be set when zero span is used.
-2203	Not available in zero span.	Cannot be set when zero span is used.
-2205	There are no Normalize data.	Normalized data has not saved.
-2206	Out of range. Span/10 <= VALUE	The maximum window width is one tenth of the measured wavelength span.
-2207	Out of range. 1525 nm < = VALUE < = 1625 nm	The setting range is 1525 nm ≤ VALUE ≤ 1625 nm.
-2209	Out of range. 184.488 THz < = VALUE < = 196.585 THz	The setting range is 184.488 THz ≤ VALUE ≤ 196.585 THz.
-2211	Not available. Please change to PMD mode.	Cannot be executed unless the trace mode is set to PMD.
-2212	It is not available to turn off all traces.	Not all waveform displays can be turned off.
-2213	"CONT" sweep mode only.	Zero span cannot be used when the step sweep mode is set.
-2214	Lambda mode only.	Can be set in the wavelength mode.

Error number	Message text	Description
-2215	There are no Measurement data.	There is no data to be measured.
-2216	Can't Calculate	The condition cannot be calculated.
-2217	Can't execute in zero span.	Cannot be execute when zero span is used.
-2218	"PMD" and "PMD+Power" measure mode can't be used in zero span.	The PMD and the PMD + Power measurement modes cannot be used in zero span.
-2219	Can't execute when Light Source state is "WARM UP".	Cannot execute while the light source status is WARM UP.
-2220	"PMD+Power" measure mode cant't be used in "STEP" sweep mode.	The PMD + Power measurement modes cannot be used in the STEP sweep mode.
-2221	Point < = 1001 in "STEP" sweep mode.	The setting range of the point can be set to 1001 or less in the STEP sweep mode.
-2222	Point < = 12001 in "CONT" sweep mode	The setting range of the point can be set to 12001 or less in the CONT sweep mode.
-2223	Point > = 11	The setting range of the point must be 11 or greater.
-2224	Resolution < = 200 pm	The setting range of the resolution can be set to 200 pm or less.
-2225	Resolution > = 1 pm	The setting range of the resolution must be 1 pm or greater.
-2226	Start < Stop	The setting range of the start wavelength must be smaller than the stop wavelength.
-2227	Light Source state is "UNCAL". Please execute Light Source Calibration.	The light source status is UNCAL. Calibrate the light source.
-2228	Resolution < = 1 nm in "STEP PMD MODE"	The setting range of the resolution is 1 nm or less when the STEP sweep mode or PMD measurement mode is set.
-2300	Light Source Communication Error	A communication error occurred in the light source unit. *1
-2301	Polarization Controler Communication Error	A communication error occurred in the polarization controller. *1
-2302	Wavelength Meter Communication Error	A communication error occurred in the optical wavelength meter. *2
-2303	Fan 1 stopped.	FAN1 on the main unit has stopped. *3
-2304	Fan 2 stopped.	FAN2 on the main unit has stopped. *3
-2305	Fan 3 stopped.	FAN3 on the main unit has stopped. *3
-2306	Fan 4 stopped.	Power source FAN has stopped. *3
-2307	Optical Test Unit Fan stopped.	OPT unit FAN has stopped. *3
-2308	Light Source Unit Fan stopped.	Light source unit FAN has stopped. *3

Error number	Message text	Description
-2309	Power supply (24V line) out of range.	Power supply (24V line) is out of range. *3
-2310	Power supply (+15V line) out of range.	Power supply (+15V line) is out of range. *3
-2311	Power supply (+6V line) out of range.	Power supply (+6V line) is out of range. *3
-2312	Power supply (5V line) out of range.	Power supply (5V line) is out of range. *3
-2313	Power supply (-6V line) out of range.	Power supply (-6V line) is out of range. *3
-2314	Power supply (-15V line) out of range.	Power supply (-15V line) is out of range. *3
-2315	Optical Test Unit is overheated.	The OPT test unit has overheated. *4
-2500	PMD Normalize failed.	PMD normalization has failed. *5
-2501	Polarization Search failed.	Polarization control search has failed. *5
-2502	Internal Cal failed.	Internal CAL has failed. *3
-2503	Light Source Cal failed. (0x********) *6	The optical source CAL has failed. *3
-2504	Light Source Error	An optical source error occurred while sweeping. *3

*1: Check the connections on the rear panel and restart this unit.
If the same error message is displayed, contact an ADVANTEST sales representative.

*2: Check the connections on the rear panel, the type of wavelength meter and the GPIB address and restart this unit.
If the same error message is displayed, contact an ADVANTEST sales representative.

*3: Contact an ADVANTEST sales representative.

*4: Check whether the ambient temperature is within the specified range.
If the ambient temperature is within the specified range, re-start the unit. If the same error message is still displayed after re-starting the unit, contact Advantest or the Advantest representative office.

*5: Check the patch cord connections used for normalization and re-perform the PMD normalization.
If the same error message is displayed, contact an ADVANTEST sales representative.

*6: ******** is a numeric value.

9.9.2 Error Messages for Self Test

This section describes the causes and solutions of error messages for the self test results. The self test is automatically performed when the instrument is turned on. The self test is also performed manually. For information on the self-test procedure, refer to section 6.2.3, "[Special]."

Error message	Description
Bus Connection Error	A communication error between units has occurred. Check the cable connection on the rear panel and turn on the instrument again. Even if the cables are connected correctly, this message may be displayed if the error occurs in a unit. If the same error message is displayed, contact an Advantest sales representative.
DC Fan Stopped	The fan has stopped. Contact an Advantest sales representative.
Unit Maching Error	The serial numbers between each unit do not match. Check the combination of numbers.
Light Source Error	An abnormality was detected during the self test of the light source unit. Contact an Advantest sales representative.
Optical Circuit Error	An abnormality was detected during the self test of the OPT unit. Contact an Advantest sales representative.

APPENDIX

A.1 Setting Time and Time Zone

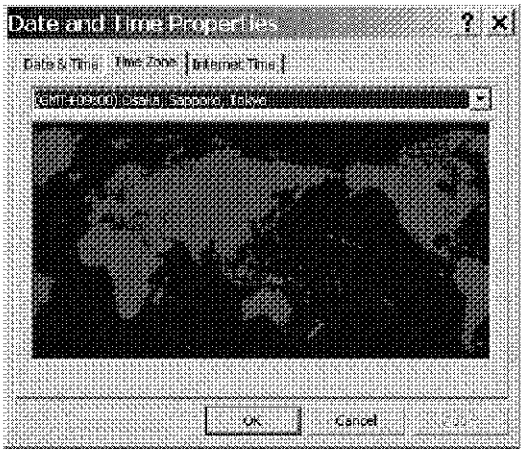
The default settings of time and time zone for this instrument are set to Japan time.

Therefore, if you use this instrument outside Japan, it is necessary to set the time and time zone. Otherwise, the time stamp for files will be incorrect.

This section describes procedures for setting the time and time zone.

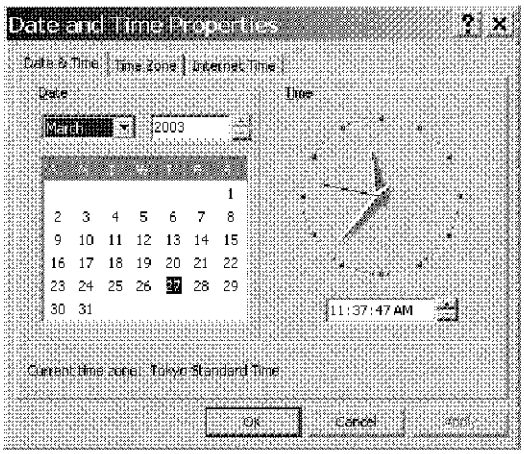
Procedures

1. Touch **[System]** on the menu bar and select **[Date and Time...]**.
   The **[Date and Time Properties]** dialog box will be displayed.
2. Touch the **[Time Zone]** tab on the opened **[Date and Time Properties]** dialog box.
3. Select the area in which this instrument will be used from the drop down list box for the time zone.



4. Touch the **[Date & Time]** tab on the opened **[Date and Time Properties]** dialog box.

   The dialog box for adjusting the date and time will be displayed. Set the date and time.



5. Touch the **[OK]** button and close the dialog box.

A.2 Installing the Printer Driver

This section describes the procedures for installing the printer driver.

Obtaining a printer driver

The printer driver used in this instrument is a printer driver for Windows XP.
Use a printer driver for Windows XP attached to the printer or obtain one from the website of the printer manufacturer.

IMPORTANT:

1. ***Before starting installation of the printer driver, press the STOP button on the front panel to hold measurement.***
2. ***Use a printer driver for Windows XP.***

Instablling the Printer Driver

Install the printer driver in accordance with the installation procedures attached to the printer.
If the driver is provided with a CD-ROM, install it using the CD-ROM drive of an external PC through a network.
This instrument does not support Standard TCP/IP Port.

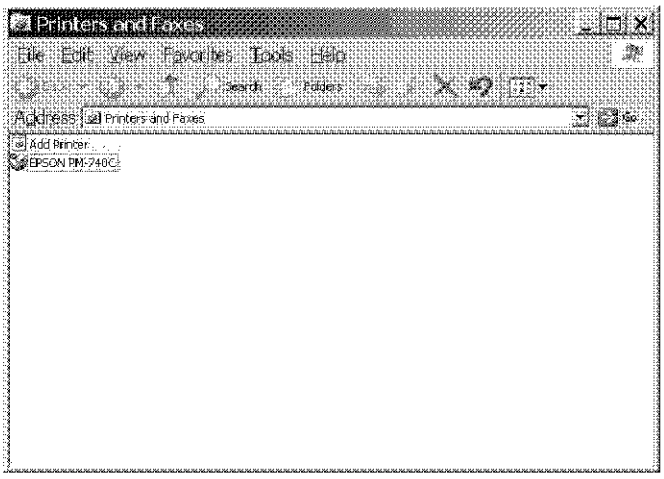
Setting the printer

Perform the setting for the printer from the **[Printers and Faxes]** window that is displayed by selecting **[Printers Setup...]** of **[System]** on the menu bar.

Uninstalling the Printer Driver

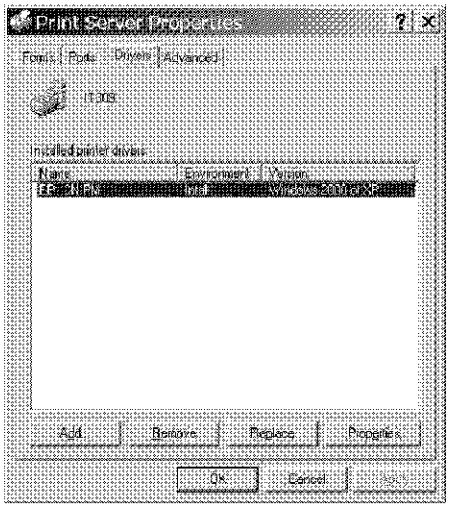
The printer driver is installed using the system area of this instrument. Therefore, the printer driver cannot be installed in certain cases, depending on the remaining system area for this installation. In such cases, it is necessary to perform new installation after uninstalling printer drivers that are not used, in accordance with the following procedures.

1. Select **[Printers Setup...]** of **[System]** and open the **[Printers and Faxes]** window.



2. From the window, select the printer drivers to be uninstalled and touch **[File]**. Select **[Delete]** and touch the **[Yes]** button of the displayed dialog to delete the drivers from the driver list.

3. If you touch the **[File]** menu on the **[Printers and Faxes]** window and select **[Server Properties]**, the **[Printers Server Properties]** dialog box shown below will be displayed.



4. Touch the **[Drivers]** tag in the **[Printers Server Properties]** dialog box to display the printer drivers installed on this instrument. From the displayed printer drivers, select the ones to be uninstalled by touching them and then touch the **[Remove]** button. After that, touch the **[Yes]** button in accordance with the instruction to complete the procedures to uninstall drivers.

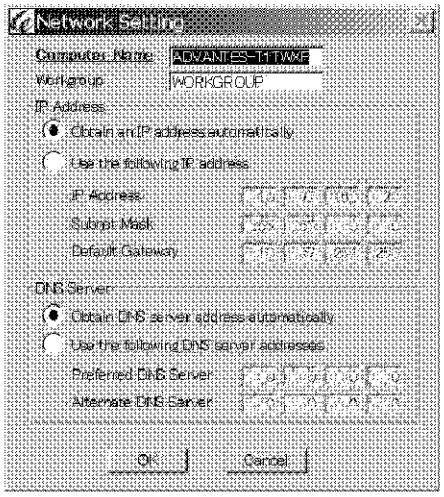
A.3 Setting up the Network

If you connect this instrument with a network, you can share files and folders with computers in the network.

This section describes each component in the network setting dialog box.

IMPORTANT: Before starting procedures for network setting, press the **STOP** *button on the front panel to hold measurement.*

Touch **[System]** on the menu bar and select **[Network Setup...]**.
The **[Network Setting]** dialog box will be displayed.



[Computer Name]: The computer name of this instrument will be displayed. If you change this item, the change becomes effective only after restarting the computer.

[Workgroup]: The Windows workgroup name will be displayed. If you change this item, the change becomes effective only after restarting the computer.

[IP Address]

[Obtain an IP address automatically]:
Select this command for obtaining the IP address from the DHCP server.

[Use the following IP address]:
Select this command for specifying the IP address manually.

[IP Address]: The current setting is displayed immediately after the IP address dialog box is displayed.

[Subnet Mask]: The current setting is displayed immediately after the subnet mask dialog box is displayed.

[Default Gateway]: The current setting is displayed immediately after the Default Gateway dialog box is displayed.

[DNS Server]

[Obtain DNS server address automatically]:
Select this command for obtaining DNS server information from the DHCP server.

[Use the following DNS server address]:
Select this command for setting the DNS server manually.

[Preferred DNS Server]:
The current setting is displayed immediately after the preferred DNS server address dialog box is displayed.

[Alternate DNS Server]:
The current setting is displayed immediately after the alternative DNS server address dialog box is displayed.

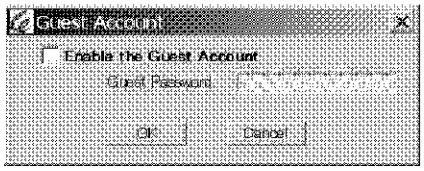
A.4 Setting the Guest Account

It is necessary to set the Guest Account in order to access this instrument from a remote PC through a network and share files.

Because the Guest Account is disabled in default status, perform this setting before sharing files.

This section describes each component in the Guest Account setting dialog.

Touch **[System]** on the menu bar and select **[Guest Account...]**.
The **[Guest Account]** setting dialog will be displayed.



[Enable the Guest Account]: If you check this box, the Guest Account will be enabled. You can enter **[Guest Password]** only when this box is checked.

[Guest Password]: This text box is used for entering the Guest Account password. The password is not displayed. If you press the **[OK]** button with this box empty, setting will be performed without a password.

A.5 Setting up File Sharing

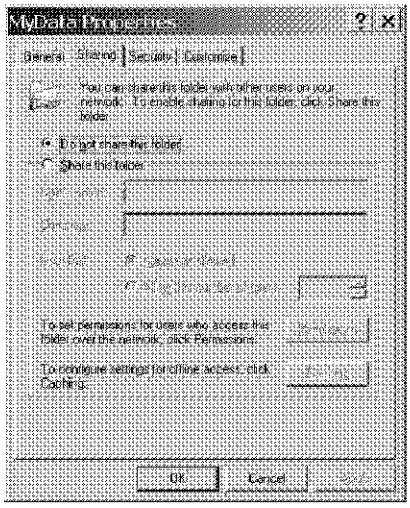
For referring to a file through the network, perform setting for file sharing from Explorer. When accessing a product through the network, enable the Guest Account.

For more information on the Guest Account settings, refer to A.4, "Setting the Guest Account."

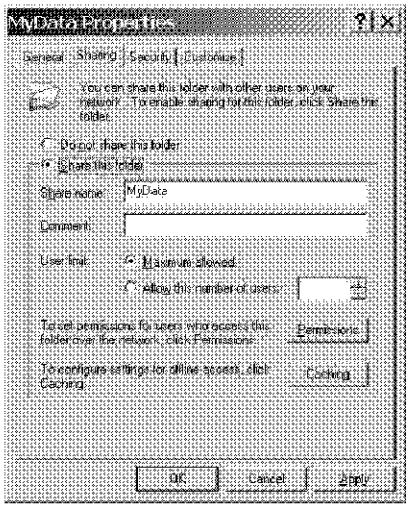
This section describes the procedures for setting for file sharing.

Procedures

1. Touch **[System]** on the menu bar and select **[Explorer]**.
   Explorer will be displayed.
2. Select from Explorer the folder for which setting for sharing will be made.
3. Touch **[File]** on the menu bar of Explorer and select **[Sharing and Security...]**.
   The **[Shared Documents Properties]** dialog box will be displayed.

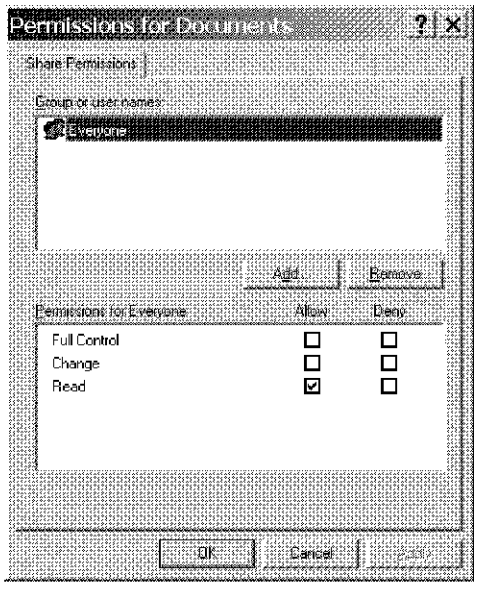


4. Select **[Share this folder]** and enter the share name into **[Share name]**.

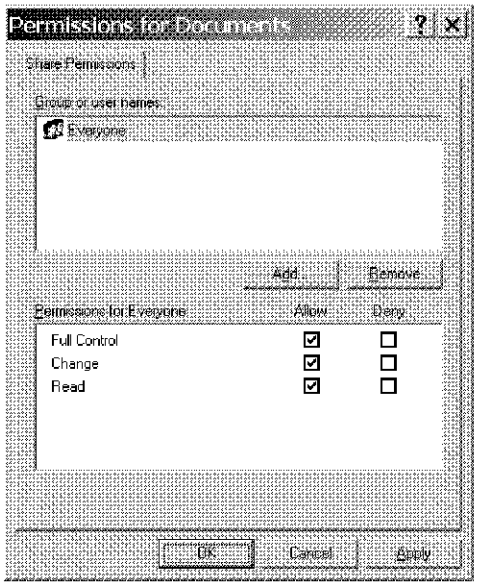


If you want to write from an external PC, perform the following setting.

5. Touch the **[Permissions]** button.
   The **[Permissions for Documents]** dialog box will be displayed.



6. Select the **[Full Control]** check box for setting for sharing of **[Everyone]**.



7. Press the **[OK]** buttons of all displayed dialog boxes to close the dialog boxes.

A.6 Default Setting List

This section describes the default preset parameter setting list.

Function			Default value	*1
Center/span	Center/span	Center wavelength	1550 nm	○
		Span wavelength	10 nm	○
		Start wavelength	1545 nm	○
		Stop wavelength	1555 nm	○
Scale	Y-axis scale operation	/Div	LinMag 1e-6	○
			Mag 1.0	○
			GD 100e-12	○
			CD 100e-12	○
			CDSL 100e-12	○
			PMD 1e-12	○
			2nd-order PMD 1e-12	○
			PDL 0.1	○
		Reference value	LinMag 0.0	○
			Mag 0.0	○
			GD 0.0	○
			CD 0.0	○
			CDSL 0.0	○
			PMD 0.0	○
			2nd-order PMD 0.0	○
			PDL 0.0	○

*1: ○ indicates that the latest set parameter is saved when the power is turned off, and the saved parameter is set the next time the power is turned on.

Function			Default value	*1
Scale	Y-axis scale operation	Reference position	LinMag 0%	○
			Mag 100%	○
			GD 50%	○
			CD 50%	○
			CDSL 50%	○
			PMD 0%	○
			2nd-order PMD 0%	○
			PDL 0%	○
Dispersion/PMD measurement	Sweep mode	Sweep mode	CONT	○
	Measurement mode	Measurement mode	CD	○
	Number of measurement points setting	Number of measurement points	101	○
	Modulation frequency	Modulation frequency	1 GHz	○
	Measurement sensitivity	Measurement sensitivity	NORMAL	○
	Differential	ON/OFF	OFF	○
		Reference optical source	INT	○
		External optical source wavelength	1530 nm	○
	Polarization controller settings	SOP	DEFAULT	○
		SOP1-QWP	0 deg	○
		SOP1-HWP	0 deg	○
		SOP2-QWP	0 deg	○
		SOP2-HWP	0 deg	○
	Wavelength meter calibration	Wavelength meter calibration	OFF	○
		Wavelength meter model selection	Q8331	○
	Average	Average	OFF	○
		Average setting count	8	○
Advance	Fiber length measurement	Fiber INDEX	1.5	○
		Measurable wavelength auto setting	ON	○
		Measurable wavelength setting	1550 nm	○

Function			Default value	*1
Trace	Waveform mode	Waveform display mode	GD	○
		MAG linear display	OFF	○
	Port	Port	Port 1	○
	Trace operation	Active trace	1	1
		Main trace	1:ON Other:OFF	1:ON Other: OFF
		Reference trace	1:ON	OFF
Analysis	Normalize	Normalize (Port 1)	OFF	OFF
		Normalization fitting (Port 1)	OFF	○
		Normalization fitting function (Port 1)	QUAD	○
		Normalize (Port 2)	OFF	OFF
		Normalization fitting (Port 2)	OFF	○
		Normalization fitting function (Port 2)	QUAD	○
	Smoothing	Smoothing	OFF	○
		Window	1 nm	○
	Fitting	Fitting	OFF	○
		Fitting function	QUAD	○
		Measured data dot display	OFF	○
		Partial fitting	OFF	○

Function			Default value	*1
Analysis	Ripple extraction	Ripple extraction	OFF	○
		Ripple fitting function	QUAD	○
	/km, /√km scale	/km, /√km scale	OFF	○
	UNWRAP limit	UNWRAP limit	-60 dB	○
	MAG level offset	MAG level offset	0	○
	Limit line	Limit line 1	OFF	○
		Limit line 2	OFF	○
		Limit line 1 PASS range	BELOW	○
		Limit line 2 PASS range	ABOVE	○
		Edit line 1/2	LINE1	○
		Edit trace mode	GD	○
	Pulse duration	band width XdB	3 dB	○
	Report	Wavelength/frequency switching	LMD	○
		Display start wavelength	1545 nm	○
		Display stop wavelength	1555 nm	○
		Display wavelength resolution	1 nm	○
		Reference wavelength	1545 nm	○
		Comment input (wavelength)	******* FIBER REPORT *******	○
		File name input (wavelength)	REPORT	○
		ID1 input (wavelength)	0000	○
		ID2 input (wavelength)	0000	○
		ID3 input (wavelength)	0000	○
		Comment input (frequency)	******* FIBER REPORT *******	○
		File name input (frequency)	REPORT	○
		ID1 input (frequency)	0000	○
		ID2 input (frequency)	0000	○
		ID3 input (frequency)	0000	○
Window	Switching the number of windows	Switching the number of windows	Single	○
	Grid display	Grid display	ON	○

Function			Default value	*1
Calibration	PMD normalization	Norm Available Port1	OFF	OFF
		Norm Available Port2	OFF	OFF
	Automatic execution of the light source calibration	Automatic execution of the light source calibration	ON	ON
Cursor	Operation	Whole cursor	OFF	OFF
		Setting X1 to ON/OFF and moving X1 with side keys	OFF	OFF
		Setting X2 to ON/OFF and moving X2 with side keys	OFF	OFF
		Setting Y1 to ON/OFF and moving Y1 with side keys	OFF	OFF
		Setting Y2 to ON/OFF and moving Y2 with side keys	OFF	OFF
		Moving X1 with GPIB and the dialog box	0	0
		Moving X2 with GPIB and the dialog box	0	0
		Moving Y1 with GPIB and the dialog box	0	0
		Moving Y2 with GPIB and the dialog box	0	0
	Display mode	Display mode	1	○
	Page	Page	1	○
	Cursor ON trace	Cursor ON trace	1	1
	Title label	Title label input	Q7761 Optical Network Analyzer	○

A.7 Technical Documents

This chapter describes the principle of measurement which is required to perform accurate measurement.

A.7.1 Principle of Measurement of the Phase Shift Method

This section describes the basic principle of measurement of this unit.

The Phase Shift method which is the basic of the Polarization Phase Shift method used in this unit is described.

The CW light from the tunable wave length source is incident to the optical intensity modulator and intensity is modulated by phase reference signals. The intensity-modulated light is incident to the DUT. The light, which is passed through the DUT, is converted to an electric signal by the O/E converter and is compared with the reference signal phase by using the phase comparator.

Measuring the change in the phase difference by changing the wavelength of the tunable wave length source can measure the DUT group delay characteristics.

Characteristics that do not depend on the polarization such as amplitude characteristics, magnitude characteristics, and group delay characteristics are measured by using the Phase Shift method as the basic principle of measurement.

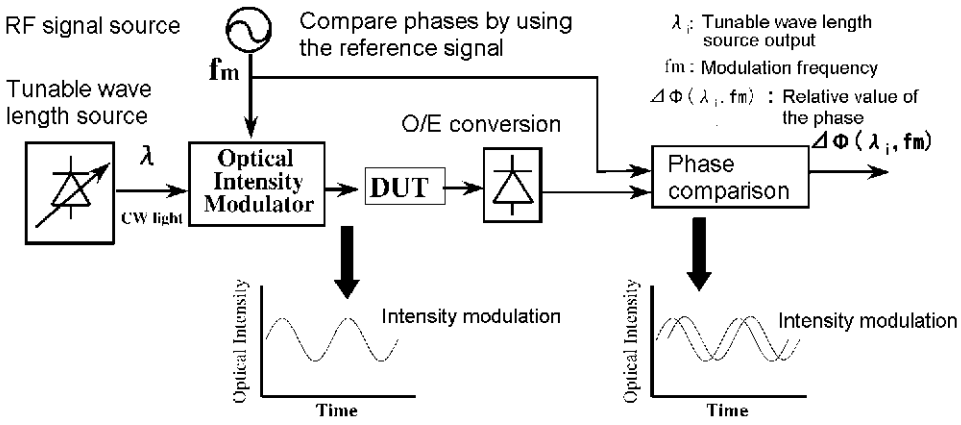


Figure A-1 Basic Principle of Group Delay Measurement of the Phase Shift Method

A.7.2 Principle of Measurement of the Polarization Phase Shift Method

This section describes the Polarization Phase Shift method which can measure the polarization characteristics and is used with this unit.

Principle of measurement of the Polarization Phase Shift method is shown below.

Linear polarization is incident to the DUT at an angle of 0 or 90 degrees by using the polarization controller. The amplitude and phase of each polarization status (P wave and S wave) are measured as functions of wavelength (optical frequency).

PMD is calculated by measuring the optical frequency change of the outgoing polarization angle from the DUT and the phase transition in two polarization statuses.

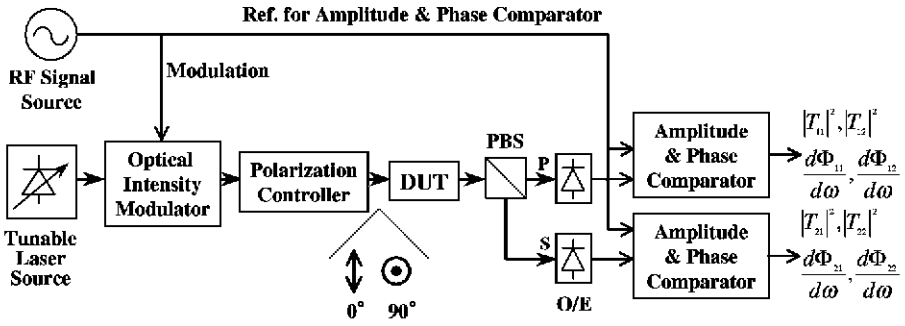


Figure A-2 Polarization Phase Shift Method which can Measure Polarization Information at the Same Time

A.7.3 Calculating the CD, CD Slope and Wavelength Axis

The CD is calculated as a change of rate of the group delay with respect to the wavelength. Based on this definition, the wavelength of CD is the center between two wavelengths whose values are derived from the targeted the Group delays (see Figure A-3). The group delay, CD and CD slope each can be expressed using unique wavelengths and unique data points.

λ_{cd_i} (the i-th wavelength of the CD) and d_{gd_i} (the calculated CD value at this wavelength) are calculated from the following expression. Where λ_{gd_i} and d_{gd_i} are the i-th wavelength and the measurement value at the ith wavelength within the group delay, respectively:

$d_{cd_i} = (d_{gd_i+1} - d_{gd_i})/(\lambda_{gd_i+1} - \lambda_{gd_i})$ $\lambda_{cd_i} = (\lambda_{gd_i+1} - \lambda_{gd_i})/2$

λ_{cds_i} (the ith wavelength of the CD slope) and d_{cds_i} (the measured value of the CD at this wavelength) are calculated from the following expression in the same manner.

$d_{cds_i} = (d_{cd_i+1} - d_{cd_i})/(\lambda_{cd_i+1} - \lambda_{cd_i})$ $\lambda_{cds_i} = (\lambda_{gds_i+1} - \lambda_{gds_i})/2$

The group delay, CD and CD slope can be expressed using the same wavelength axis, because differential coefficients can be analytically calculated along the entire wavelength while the curve fitting function is being used (refer to section A.7.7, "Curve Fitting Function and Statistical Variance").

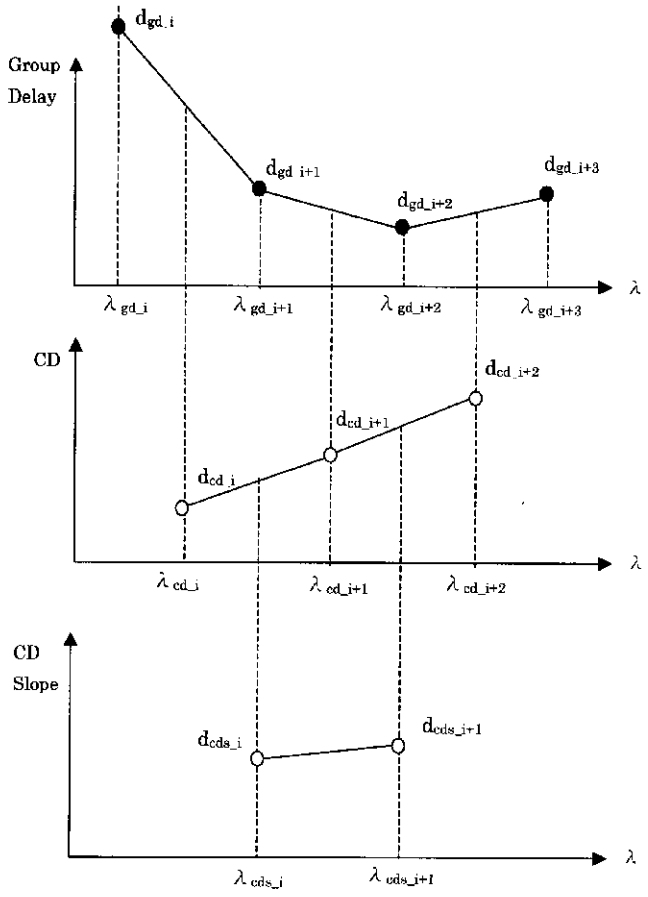


Figure A-3 Difference between the Group Delay and the CD Wavelength Axis

A.7.4 Modulation Frequency

The modulation frequency refers to the frequency of the modulation signal used for the light intensity modulator. In the phase shift method, the higher the modulation frequency is, the more accurately the phase difference between the reference phase signal and modulation frequency can be measured, which heightens the resolution of delay time.

The measurement range equals the modulation signal period, therefore, if the modulation frequency becomes higher, the effective range is narrower.

The effective range of group delay time, ΔT, is expressed using the modulation frequency of f_{mod} as follows:

$\Delta T = 1/f_{mod}$

For example, when the modulation frequency is 1 GHz, the effective range of group delay time is 1 nsec.

When the modulation frequency is determined, the influence on the sideband by the modulation must be considered. If the modulation frequency is set to f_{mod}, the sideband is generated on both sides of intensity-modulated light carriers away from the f_{mod} distance. This means the spectrums expand from the measured light and the practical Wavelength resolution is restricted from the sideband. The practical wavelength resolution $\Delta\lambda$ is described in the following formula using the modulation frequency f_{mod}:

$$\Delta\lambda = 2 \cdot \frac{\lambda^2 \cdot f_{mod}}{C}$$

In the above formula, λ expresses the wavelength, c expresses the light speed.
For example, when the wavelength is 1550 nm and the modulation frequency is 1 GHz then $\Delta\lambda$ is 0.016 nm.

A.7.5 Unwrap Function

When the measured value is between -180° and 180°, the phase shift method is executed to rotate the phase as shown in Figure A-4. As a result, the phase characteristic is dramatically changed.

When the difference between the measured and displayed values is 180° or greater, the unwrap function senses that the phase rotation has occurred, and unwraps the displayed value as shown in Figure A-4.

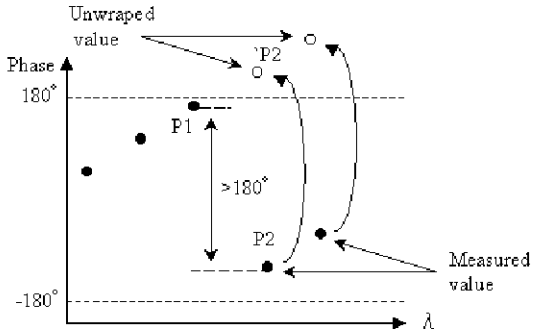


Figure A-4 Unwrap Function

Specific conditions and expressions for unwrapping are as follows:

When (P1 - P2) is greater than 180°, P2' = P2 + 360°

When (P1 - P2) is less than -180°, P2' = P2 - 360°

Where, P1 is the previous measured value, P2 is the measured value before unwrapping, and P2' is the measured value after unwrapping.

When the DUT magnitude level is low, noises from group delay time affect phase measurements. As a result, the phase measurements are unwrapped incorrectly.

Therefore, a threshold level which is specified by selecting THRESH from the menu can be used as the minimum magnitude level to be unwrapped. The minimum magnitude level (or lower) is not unwrapped. (See Figure A-5.)

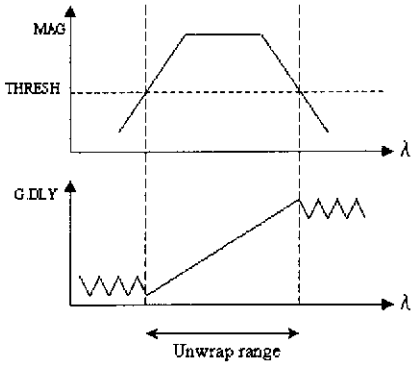


Figure A-5 Setting Threshold for Unwrapping

A.7.6 Smoothing Calculation

Use the following expressions to smooth data.

$$d'_i = \frac{1}{W}\sum_{k=0}^{n-1} a_k d_{k+i-(n-1)/2} \qquad (1)$$

$d_0, d_1 \ldots d_{N-1}$: Measured data

$d'_0, d'_1 \ldots d'_{N-1}$: Smoothed data

$a_0, a_1 \ldots a_{N-1}$: Weighting factor for smoothed data

$$a_i = 3m(m+1) - 1 - 5i^2 \quad (n = 2m+1) \qquad (2)$$

$$W = \frac{(4m^2 - 1)(2m+3)}{3} \qquad (3)$$

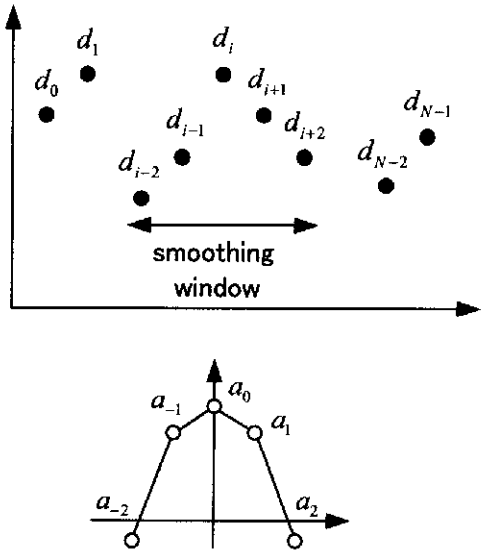
N: Number of measurement points

n: Number of points for smoothing

The number of points is found by the following equation that uses the smoothing zone width:

n = (Smoothing zone width/Wavelength span) × N (4)

For the smoothing zone width "n" in the above expression, the value of modulation frequency x 4, or the value of the range containing all the measurement points (N) can be set to the maximum.



$$d'_i = \frac{a_{-2}d_{i-2} + a_{-1}d_{i-1} + a_0 d_i + a_1 d_{i+1} + a_2 d_{i+2}}{W}$$

Figure A-6 Smoothing Calculation (n=5)

A.7.7 Curve Fitting Function and Statistical Variance

Curve fitting function

Linear expression (LINER): $F_1\lambda+F_2$

Quadratic polynomial (QUAD): $F_1\lambda^2+F_2\lambda+F_3$

Three-term Sellmeier's polynomial (SELM3): $F_1/\lambda^2+F_2+F_3\lambda^2$

Five-term Sellmeier's polynomial (SELM5): $F_1/\lambda^4+F_2/\lambda^2+F_3+F_4\lambda^2+F_5\lambda^4$

F_1 through F_5 represent fitting coefficients displayed on the report screen.

When the curve fitting is executed, the group delay time characteristics is approximated by the above expressions.

The dispersion characteristics can be obtained by differentiating the group delay time characteristics obtained by the curve fitting once with respect to λ. The dispersion slope characteristics can also be obtained by differentiating the group delay twice.

The statistical variance is shown by the following expression:

$$\text{Statistical variance} = \sqrt{\frac{1}{N}\sum_{i=0}^{N-1}(d_i - d'_i)^2}$$

$d_0, d_1, .., d_{N-1}$: Measured values

$d'_0, d'_1, .., d'_{N-1}$: Curve fitting values

N : Number of measurements

A.7.8 PMD Statistical Analysis Process

The analyzer enables the following statistical analysis for the PMD measurement values (τ_1, τ_2, ... τ_N):

Average: Avg = $\text{Avg} = \frac{1}{N}\sum_{i=1}^{N} \tau i$

Root-mean-square: $\text{Rms} = \sqrt{\frac{1}{N}\sum_{i=1}^{N} \tau i^2}$

Standard deviation: $\sigma = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N} (\tau i - \bar{\tau})^2}$

τi: PMD measurement value

N: Number of measurement points

In addition, the following statistical analysis with the Maxwell distribution function for the histogram of the PMD measurement value can not be performed:

$$P(x) = k\sqrt{\frac{2}{\pi}}\frac{x^2}{\alpha^3}\exp\left(-\frac{x^2}{2\alpha^2}\right) = kf(x)$$

$$f(x) = \sqrt{\frac{2}{\pi}}\frac{x^2}{\alpha^3}\exp\left(-\frac{x^2}{2\alpha^2}\right)$$

$$k = \frac{N}{\sum_{i=1}^{n} f_i(x)}$$

x: PMD Measurement value

The relationship between the above α and the M.P. Value shown in the figure below is described using the following formula:

α parameter : $\alpha = \frac{\text{Rms}}{\sqrt{3}}$

The most probable value : M. P. Value = $\sqrt{2}\alpha$

α : Maxwell distribution function α parameter

n: Number of classes. In the Figure 6-15, n must be 11.

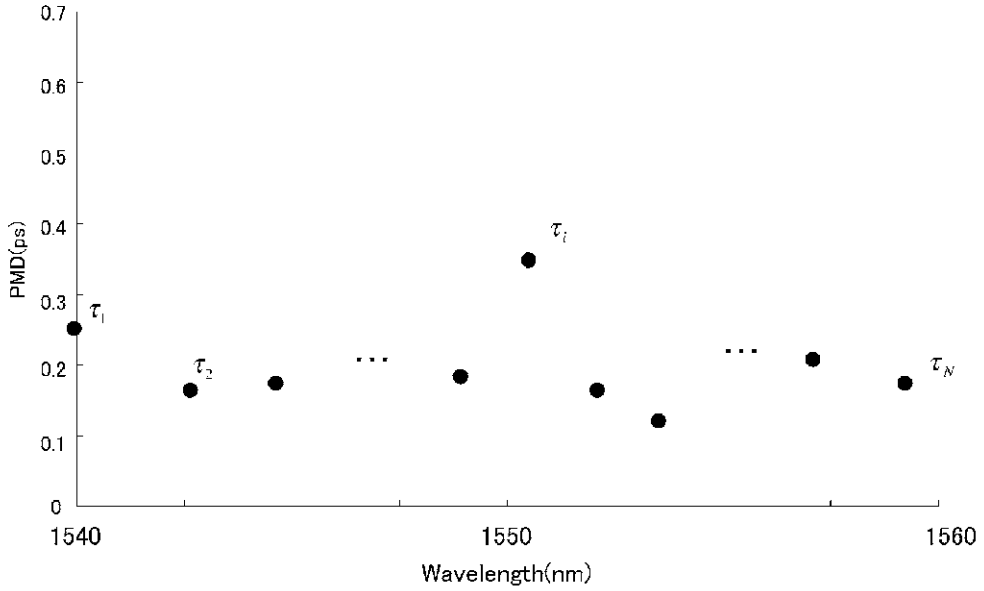


Figure A-7 PMD Wavelength Characteristics

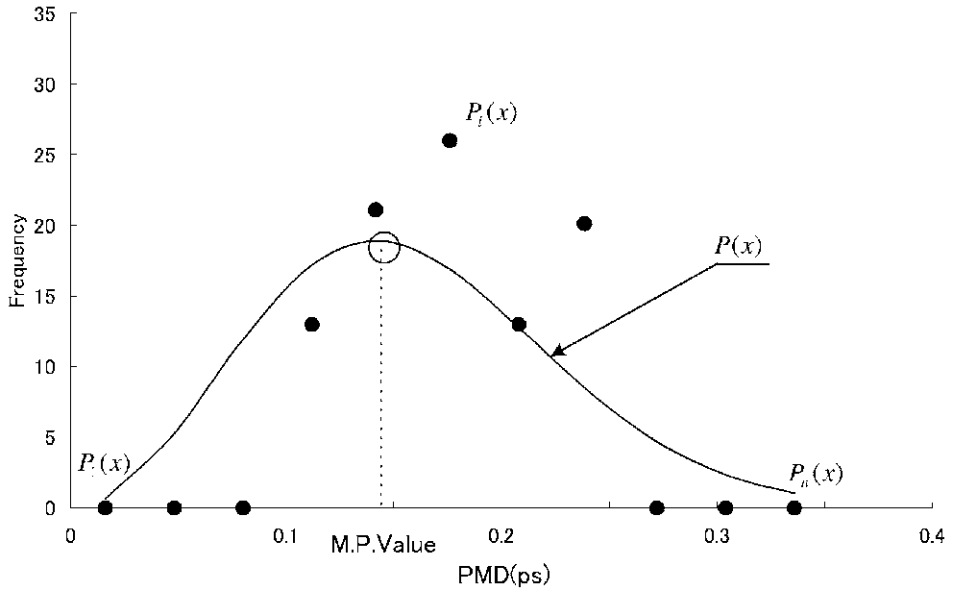


Figure A-8 Histogram of PMD Measurement Value

A.8 Measurement Data Text Output Format

The file data consists of the following two sections: One section is the information section, which describes measurement conditions and trace conditions, and the other section is the measurement data section which describes measurement data.

A.8.1 Information Section

The information section describes the following.

[FileInformation]	File information
Company	Company name
Product	Product name
Serial	Product serial number
SoftVersion	Software version
FileVersion	File format version
MakingTime	File creation time and date
DataType	Data type to be saved
[MeasurementConditions]	Measurement conditions
Title	Title
XAxisDomain	X-axis wavelength or frequency display
XAxisCenter	Center wavelength or center frequency
XAxisSpan	Span wavelength or span frequency
XAxisStart	Start wavelength or start frequency
XAxisStop	Stop wavelength or stop frequency
SweepMode	Sweep mode
MeasurementMode	Measurement mode
MeasurementPoint	Number of measurement points
WavelengthResolution	Wavelength resolution
ModulationFrequency	Modulation frequency
MeasurementSensitivity	Measurement sensitivity
DifferentialOnOff	Differential ON or OFF
WaveMeterCompensationOnOff	Wavelength compensation function ON or OFF
WaveMeterType	Wavelength meter type
AverageOnOff	Averaging ON or OFF
SettingAverageCount	Number of averaging which is set
MeasuredAverageCount	Number of averaging which is measured
FiberLength	Fiber length

FiberIndex	Fiber refractive index
FiberMeasurementLambdaAutoOnOff	Automatic fiber length measurement wavelength setting ON or OFF
FiberMeasurementLambda	Fiber length measurement wavelength when the automatic setting is OFF.
UnwrapThreshold	The range in which the phase unwrap function is executed.
[Trace1]	Information related to trace 1
MainDataTopLine	Top line of the main trace measurement data
MainPointNumber	Number of main trace measurement data
ReferenceDataTopLine	Top line of the reference trace measurement data
ReferencePointNumber	Number of reference trace measurement data
FittingDataTopLine	Top line of the fitting trace measurement data
FittingPointNumber	Number of fitting trace measurement data
PortNumber	Input port
TraceMode	Waveform display mode
MainTraceOnOff	Main trace ON or OFF
ReferenceTraceOnOff	Reference trace ON or OFF
NormalizeOnOff (Port1)	Normalize ON or OFF at Port1
NormalizeFittingOnOff (Port1)	Normalize fitting ON or OFF at Port1
NormalizeFittingFunction (Port1)	Normalize fitting function at Port1
NormalizeOnOff (Port2)	Normalize ON or OFF at Port2
NormalizeFittingOnOff (Port2)	Normalize fitting ON or OFF at Port2
NormalizeFittingFunction (Port2)	Normalize fitting function at Port2
SmoothingOnOff	Smoothing ON or OFF
SmoothingWindow	Smoothing window
FittingOnOff	Fitting ON or OFF
PartialFittingOnOff	Partial fitting ON or OFF
FittingFunction	Fitting function
FittingError	Fitting error
F1	Fitting coefficient
F2	Fitting coefficient
F3	Fitting coefficient
F4	Fitting coefficient
F5	Fitting coefficient
ZeroDispersionWavelength	Zero-dispersion wavelength
/Km	/Km conversion

RippleOnOff RippleFittingFunction MagLevelOffset	Ripple extractive function ON or OFF Ripple extractive fitting function Magnitude level offset value
[Trace2] The item is the same as Trace1.	Information related to trace 2
[Trace3] The item is the same as Trace1.	Information related to trace 3
[Trace4] The item is the same as Trace1.	Information related to trace 4

A.8.2 Measurement Data Section

The measurement data section consists of the measurement data and the header information which accompanies the measurement data.

1. Two lines are added as the header information at the top line of the measurement data.

The 1st line	<Data type>	Main1/ Main2/ Main3/ Main4/ Reference1/ Reference2/ Reference3/ Reference4 Fitting1/ Fitting2/ Fitting3/ Fitting4
The 2nd line	Information on the data following <Data type>	<X-axis> Wavelength/Frequency <Y-axis> Linear Mag/Log Mag/GD/CD/CDSL/PMD/ 2ndPMD/PDL

2. Measurement data

   - The top line number of each measurement data is displayed in DataPointTopLine of the information section and the number of data is displayed in DataPointNumber.
   - Output order of the measurement data

     Main1
     Reference1
     Fitting1
     Main2
     Reference2
     Fitting2
     Main3
     Reference3
     Fitting3
     Main4
     Reference4
     Fitting4

- Units of the measurement data

Wavelength	m
Frequency	Hz
Linear Mag	None
Log Mag	dB
GD	sec
CD	sec / nm
CDSL	sec / nm^2
PMD	sec
2ndPMD	sec • psec
PDL	dB

- Notes about the output waveform

  There is no data for PMD, PMD2, and PDL when the measurement mode is set to CD, CD+POW, or POW.

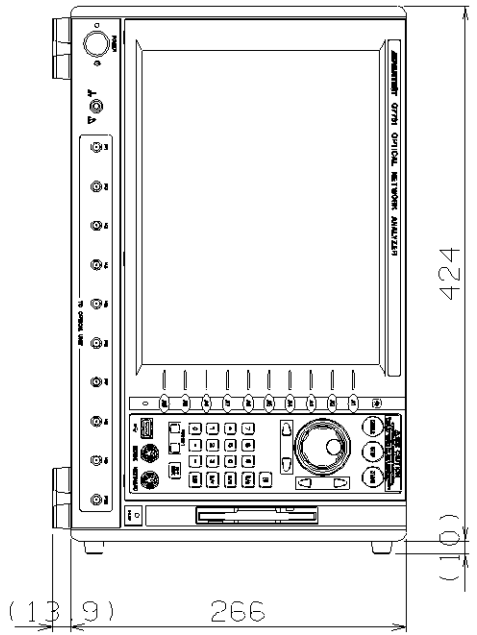
  There is no data for LINMAG, LOGMAG, PMD, PMD2, and PDL in the fitting trace measurement.

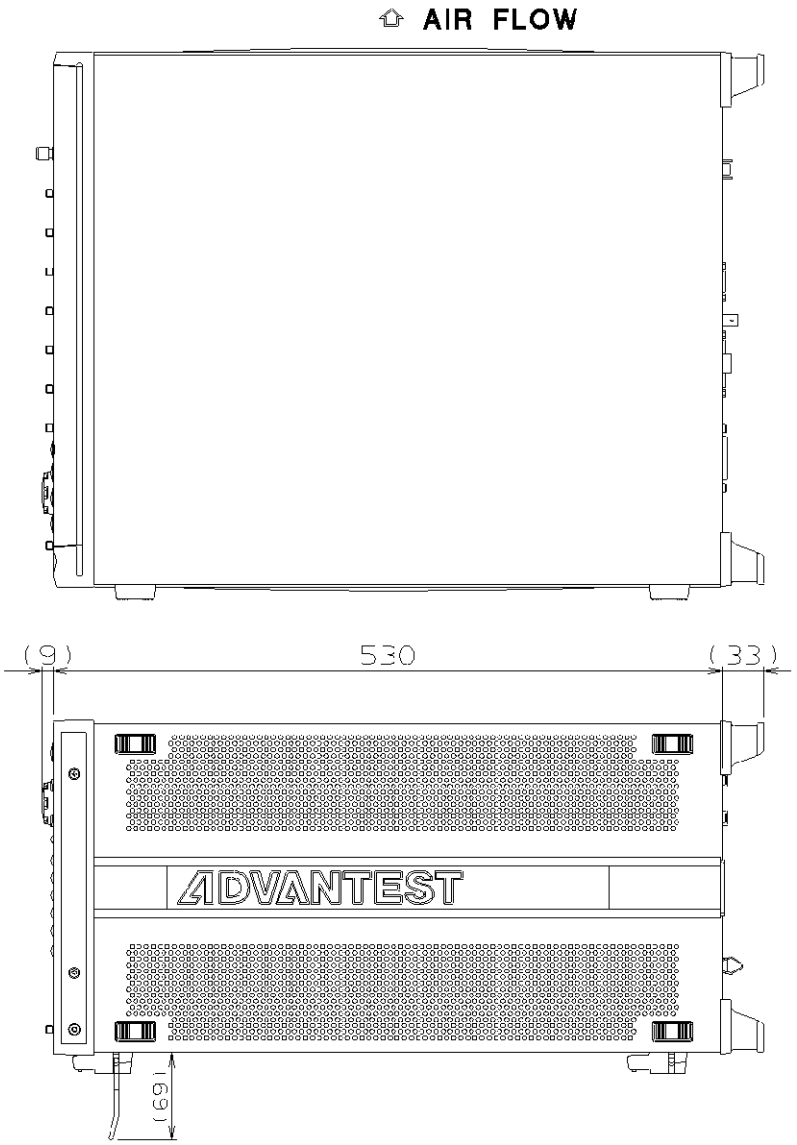
  The first and last data of the CD data do not exist.

  The first two data and the last two data of the CDSL data do not exist.

  All data is saved in a text file format and the delimiter of each line is CRLF.

  A comma is used to separate each data.

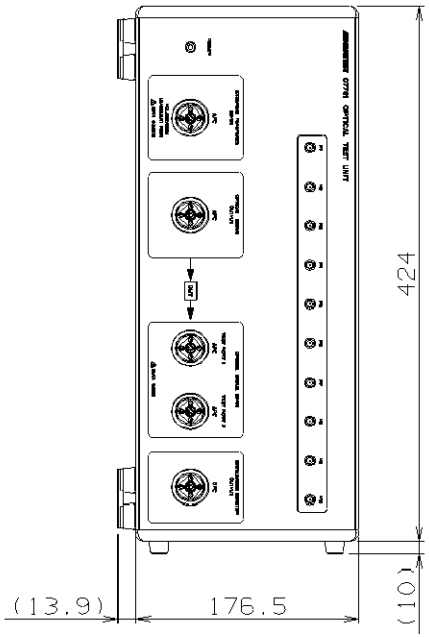


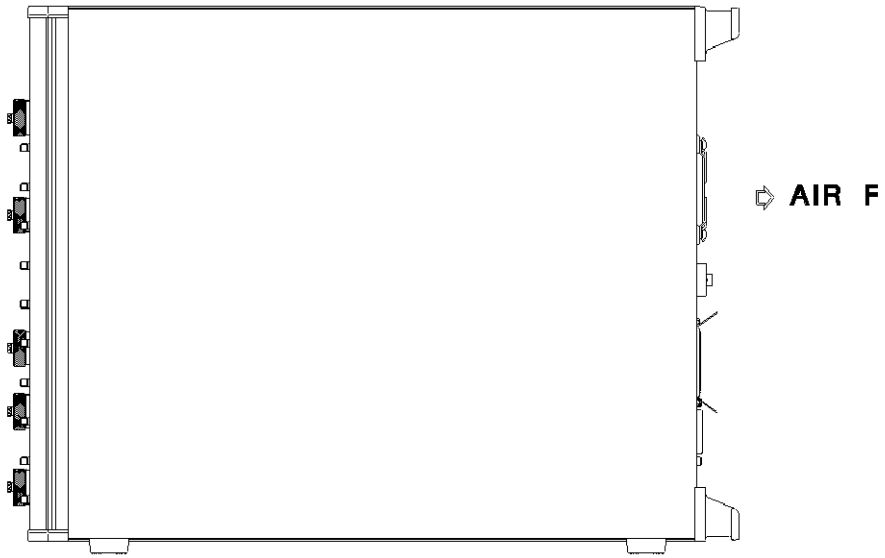


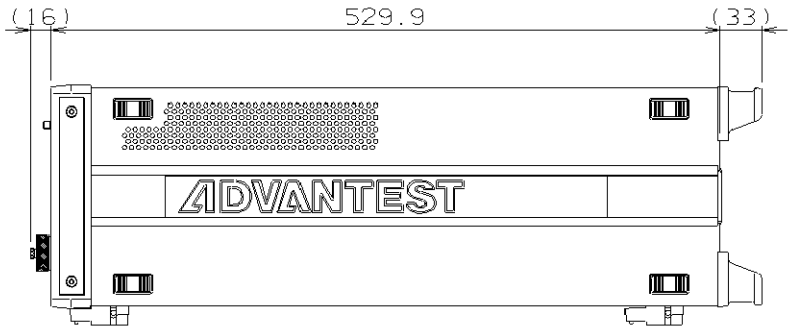
Unit : mm

NOTE
This drawing shows external dimensions of this instrument.
The difference in products and options used can cause a change in the appearance of the instrument.

ANALYSIS UNIT DIMENSIONAL OUTLINE DRAWING



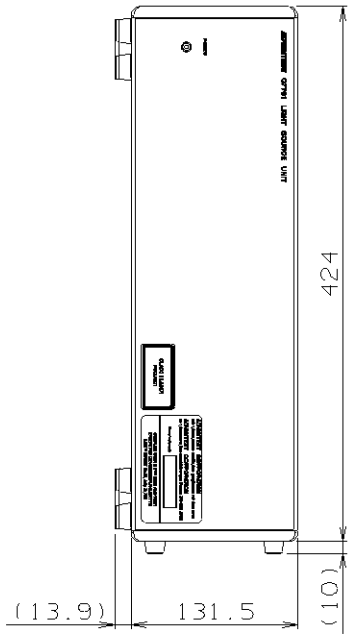


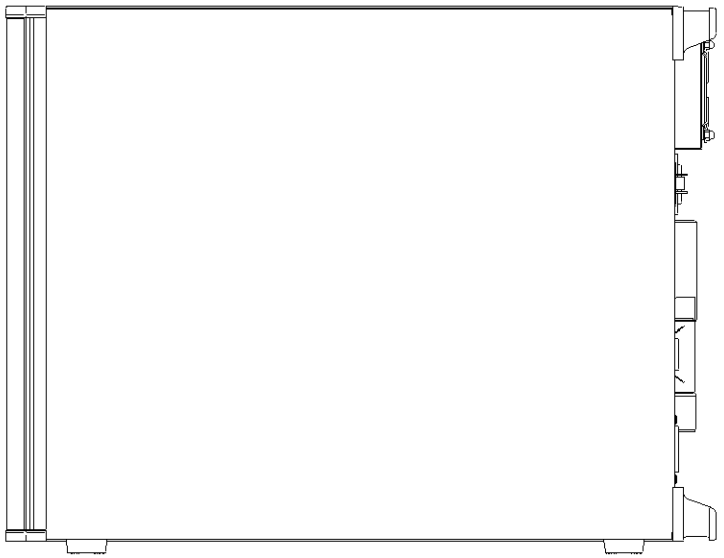


Unit : mm

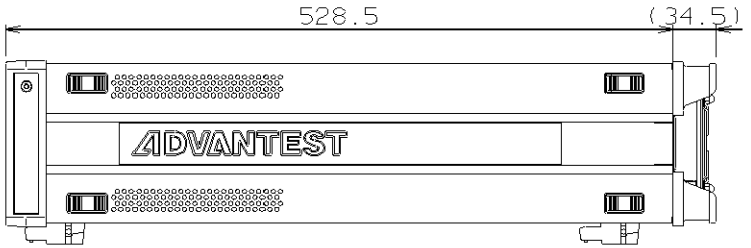
NOTE
This drawing shows external dimensions of this instrument.
The difference in products and options used can cause a change in the appearance of the instrument.

OPT UNIT DIMENSIONAL OUTLINE DRAWING





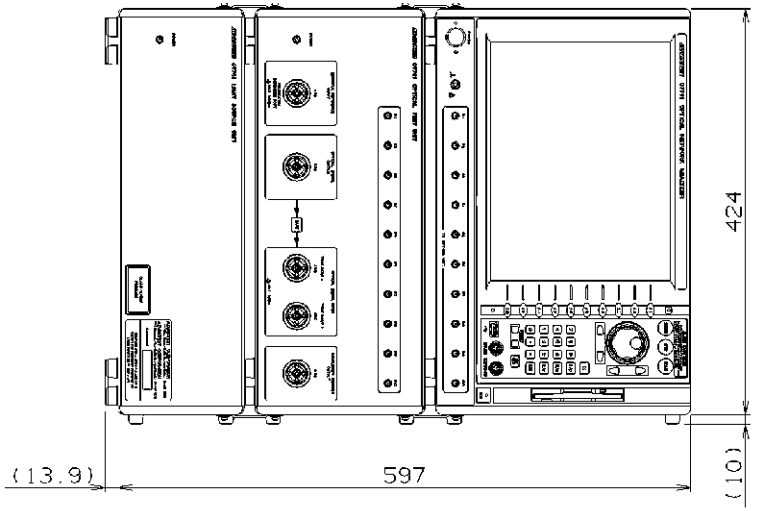
AIR FL

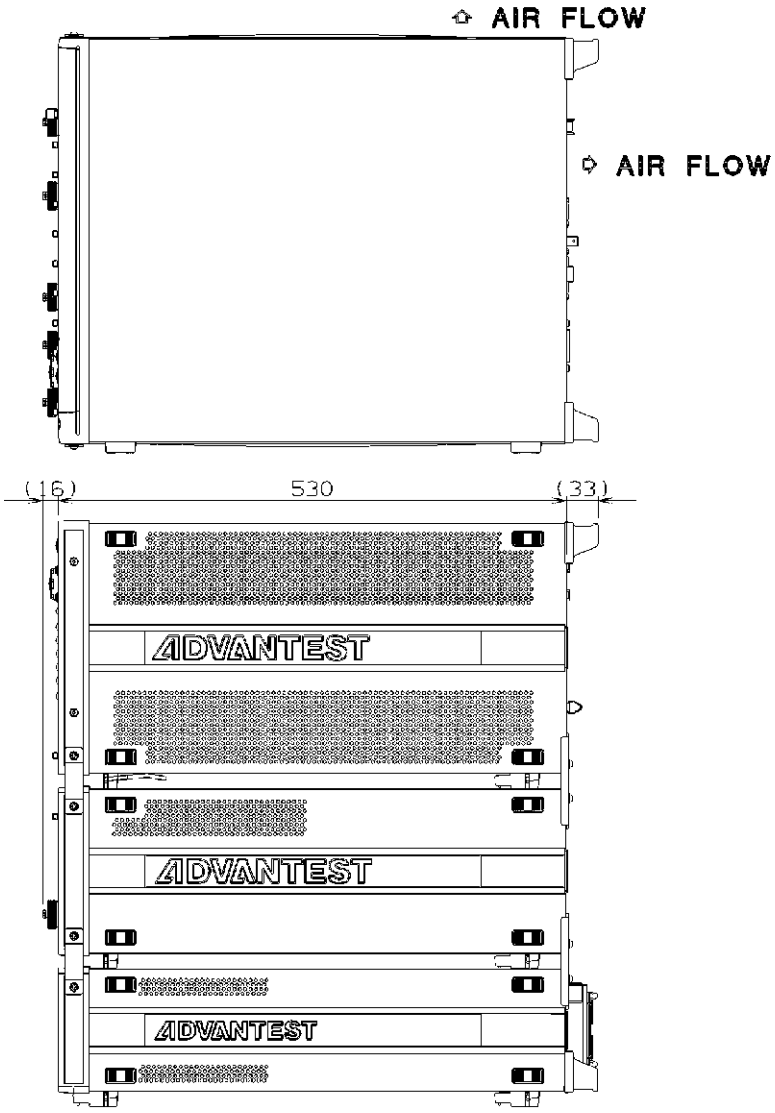


Unit : mm

NOTE
This drawing shows external dimensions of this instrument.
The difference in products and options used can cause a change in the appearance of the instrument.

LIGHT SOURCE UNIT DIMENSIONAL OUTLINE DRAWING





Unit : mm

NOTE
This drawing shows external dimensions of this instrument.
The difference in products and options used can cause a change in the appearance of the instrument.

Q7761 DIMENSIONAL OUTLINE DRAWING

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