AQ6331
OPTICAL SPECTRUM ANALYZER

INSTRUCTION MANUAL

ANDO ELECTRIC CO., LTD.

AS-62610 REV.1.3

Thank you for purchasing an ANDO ELECTRIC product.

Warranty

ANDO ELECTRIC products are shipped after strict inspections based on ANDO ELECTRIC's quality assurance system. Should malfunctions caused by flaws in manufacturing or accidents during transportation result, please contact an ANDO ELECTRIC service division, the main office sales division, or the nearest ANDO ELECTRIC office or dealer.

ANDO ELECTRIC will provide free-of-charge servicing and repair for malfunctions for a period of one year from the date of delivery during the warranty period. This warranty however shall not apply to malfunctions and damages resulting from misuse, remodeling and modifications by the customer.

Repairs of this product shall be limited to within Japan.

Technical Enquiries

Please contact the following should you have any technical enquiries.

ANDO ELECTRIC CO,LTD
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Meanings and Use of Terms

The following defines the meaning and use of the terms appearing in this manual.

1. *DANGER, WARNING, CAUTION, NOTE,* footnotes

   (1) Order of importance of information
   As shown by the meaning of the terms described in (2) below, the order of importance of the information provided in this manual is *DANGER* > *WARNING* > *CAUTION* > *NOTE* > footnotes.

   (2) Meaning
   Human injuries and damages to property have been classified into three levels- *"DANGER"*, *"WARNING"*, and *"NOTE"* to indicate the importance of the information effectively.

   DANGER: Indicates an extremely dangerous situation which will result in death or serious injuries and damages.

   WARNING: Indicates a dangerous situation which may result in death or serious injuries and damages, or in frequent moderate injuries or physical damages.

   CAUTION: Indicates a dangerous situation in which there is only a slight possibility of serious injuries but danger resulting in injuries or physical damage is expected.

   Definition of serious injuries: These mean injuries such as blinding, bodily injuries, burns (high temperature, low temperature), electric shocks, fractures, poisoning, etc. which are accompanied by aftereffects and require hospitalization or long term outpatient treatment.

   Definition of injuries: These mean injuries, burns, electric shocks, etc., which do not require hospitalization and long term outpatient treatment.

   NOTE: Supplementary explanation related to "Exceptional cases", "Revisions", "Limitations". Information other than *DANGER, WARNING, CAUTION* and footnotes.

   Footnotes: Supplementary explanation of terms and symbols used in the text.
   Explanatory notes indicated at the bottom of the same page as the text. These can be referred by * or * and numerical combinations.

2. Reference
   Indicates which page to refer to. Where to refer to is indicated by an arrow, the section number and section title (→ 2.1.2 Inspection of Operations).

3. Indication of operation keys, etc. in this manual.
   Operation keys, etc. are indicated as follows.
   [ ] ..... Indicates panel switches.
   < > ..... Indicates soft keys.

Safety Precautions

○ Prior to use, read this instruction manual and this section "Safety Precautions" thoroughly to ensure correct use of the unit.
○ After reading, keep the manual close by so that it can be referred to any time.

1. Restrictions of using environment
   - Make sure that water does not leak into the unit and be careful not to wet the unit. Fire hazards, electric hazards, and malfunctions may result.
   - Ground the unit when using in a humid place.

2. Restrictions of using conditions
   - Do not use voltages other than the power supply voltages indicated. Fire hazards, electric hazards, and malfunctions may result.
   - When connecting with a commercial power supply, connect directly to an exclusive outlet. Do not use extension cords as it may result in overheating and fire hazards.

3. Installation

3.1 Precautions for Those Installing the Unit
   - Do not put many loads on one electric outlet. Fire hazards, electric hazards, and malfunctions may result.
   - Insert the power plug into the outlet properly. Touching the blade of the power plug with metals, etc. may result in fire and electric hazards.
   - When installing the unit on products with casters (trolley, etc.), lock the caster stoppers or the unit may move and fall over.

3.2 Restrictions of Installing Environment and Conditions, Prohibitions
   - Do not install in humid and dusty places. Electric hazards, and malfunctions may result.
   - Do not place the unit in unsteady places such as shaky tables, slanting places, etc. The unit may drop, turn over, resulting in injuries.
   - Do not install the unit where there is considerable shaking and impact. The unit may drop, turn over, resulting in injuries.
   - Do not insert or drop metal objects into openings. Fire hazards, electric hazards, and malfunctions may result.
   - Do not place the power cord near heating devices. The coating of the cord may melt, resulting in fire and electric hazards.
   - When disconnecting the power plug, always hold by the plug. Pulling the power cord may damage the cord, resulting in fire and electric hazards.
   - Do not connect and disconnect the power plug with wet hands. Electric hazards may result.
   - Do not place the unit where it may be exposed to direct sunlight and high temperature. The internal temperature may rise, resulting in fire hazards.

3.3 Prohibitions in Installation

- When moving the unit, disconnect the power plug from the outlet and check that external cables have been disconnected first. If not, the cord may be damaged or fire and electric hazards may occur.
- Do not cover up the ventilation ducts of this unit. Doing so well cause heat to build up inside, resulting in fire hazards.
- Do not scratch, damage, nor modify the power cord. Do not place heavy objects on the power cord, nor heat it or pull it. Doing so will damage the power cord, and result in fire and electric hazards.

4. Preparations Before Use
   - Read the instruction manual thoroughly.

5. Usage
   - Use the unit according to the procedures described in the instruction manual.
   - Do not place containers holding water and small metal objects on or near the unit. If the water spills or the objects drop inside the unit, fire and electric hazards may result.
   - Do not modify the power cord, bend it unnecessarily, twist it, nor pull it. Fire and electric hazards may result.
   - Do not disassemble and remodel the unit. Fire and electric hazards may result.
   - When not using the unit for a long period of time, be sure to disconnect the power plug from the outlet to ensure safety, as lightning may cause fire and electric hazards in some cases.
   - When closing the printer cover during the replacement of the recording paper, etc., be careful not to sandwich your finger nor injure it. Also be very careful of the cutter of the printer.

6. Maintenance and Inspection
   - Periodic maintenance and inspection is recommended. If dusts which have accumulated inside the unit is not cleaned for a long period of time, fire hazards and malfunctions may result. For inquiries, contact your nearest dealer listed at the end of this instruction manual.

7. Troubleshooting
   - Have the power cord replaced if it is damaged. Continued use will cause fire and electric hazards.
   - If foreign objects should drop inside the unit, first turn off the power switch of the main unit, disconnect the power plug from the outlet, and contact your nearest dealer. Continued use will cause fire and electric hazards.
   - If use is continued in abnormal conditions such as when smoke or abnormal smell is produced from the unit, fire hazards, electric hazards, and malfunctions may result. In such cases, turn off the power switch immediately, disconnect the power plug from the outlet, check that no more smoke is produced, and request for repair. Never attempt to repair the unit by yourself.
   - Should you drop or damage the unit accidentally, turn off the power switch of the unit, and disconnect the power plug from the outlet. Continuing use will result in fire hazards, electric hazards, and malfunctions.
   - Should the fan motor overheat due to over-increase in temperature, turn off the power switch of the unit and disconnect the power plug from the outlet. Continuing use will result in fire hazards, electric hazards, and malfunctions.

INTRODUCTION

This instruction manual describes the operations and maintenance of the AQ6331 Optical Spectrum Analyzer.

For information on the features and functions of the unit, refer to "Chapter 1 Outline".

For information on using the unit for the first time, be sure to read "Chapter 2 Preparations Before Use".

For information on operating the unit, "Chapter 3 Outline of Functions" and "Chapter 5 Details of Functions" describe the functions of the unit while "Chapter 4 Basic Measurements" and "Chapter 6 Applied Measurements" describe operations in detail including case studies.

Period maintenance of the unit is indispensable to maintaining the unit in a normal condition. "Chapter 10 Maintenance" describes period maintenance procedures, adjustments, and how to locate malfunctions.

This instruction manual uses specific applications and exploded views to describe operations specifically and clearly. We hope that functions of the unit will be made full use of.

Precautions

- Use a lithium battery for the backup circuits of the memory and clock of this unit.
- Even if the unit can be used normally, operations may not be carried out properly if the battery runs out. Replace the battery every 7 years.
- Battery replacement must be carried out at ANDO ELECTRIC. Contact your nearest ANDO ELECTRIC office (main office, branch office, dealer) when the battery needs to be replaced.

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OUTSIDE VIEW OF AQ6331 OPTICAL SPECTRUM ANALYZER(LEFT SIDE)	ASD-62610-1-3/4
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CHAPTER 1 OUTLINE

This chapter gives an outline of this unit.

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1.1 Outline of Unit

This unit is a portable optical spectrum analyzer developed as a measuring instrument compatible for the installation and maintenance of optical transmission systems such as the WDM system, by realizing compact and lightweight features..

The measuring wavelength range is 1200 to 1700 nm and optical spectrum analysis is possible.
In addition to such basic functions as high speed sweep, high sensitivity, high accuracy, broad dynamic range, and outstanding linearity, a wide variety of functions such as diverse data processing functions and program measuring functions have all be included in this compact body weighing merely 10 kg, enabling the unit to be carried out around easily and used to perform advanced measurements at the site of installation and maintenance.

Data output functions include making hard copies of the screen using the built in high speed printer or external printer, and reading/writing of the waveform program using the built in floppy disk.

Equipped with the GP-IB and RS-232C interface as standard, the full remote control is possible.

1.2 Specifications

Table 1-1 Specifications show the specifications of the unit.

Table 1-1 Specifications

Usable Fibers		Single mode fiber
Measuring wavelength range		1200 ~1700 nm (Vacuum wavelength)
Wavelength accuracy	(Note)	±0.02 nm (1520~1580nm) ±0.05 nm (1580~1620nm) ±0.3 nm (1200~1700nm)
Wavelength linearity	(Note)	±0.01 nm (1520~1580nm) ±0.02 nm (1580~1620nm)
Wavelength reproducibility	(Note)	±0.005 nm (1 min.)
Wavelength resolution	(Note)	0.05nm or less (Resolution setting: 0.05nm, 1520 to 1620nm) 0.1nm or less (Resolution setting: 0.1nm, 1520 to 1620nm) Resolution settings: 0.05,0.1, 0.2, 0.5, 1.0 nm Resolution accuracy:≦±5% (Resolution setting:≦0.2 nm)
Measuring level range	(Note)	-90~+20dBm (1200~1600nm, measuring sensitivity HIGH 3) -80~+20dBm (1600~1700nm, measuring sensitivity HIGH 3)
Level accuracy	(Note)	±0.3 dB typ.(1550/1600 nm, measuring sensitivity HIGH1~3, Resolution above 0.1nm,input -30 dBm)
Polarization dependency	(Note)	±0.05 dB (1550/1600nm, Resolution above 0.1nm)
Level linearity	(Note)	±0.05 dB (Input 0 to –50 dB, measuring sensitivity HIGH 1-3 Resolution above 0.1nm)
Level flatness	(Note)	±0.1 dB (1520~1580nm, Resolution above 0.1nm) ±0.1 dB (1580~1620nm, Resolution above 0.1nm)
Level reproducibility	(Note)	±0.02 dB (1550/1600nm,Input –23dBm, for 1 minute Resolution above 0.1nm)
Dynamic range	(Note)	40 dB (1523 nm, peak ±0.2 nm, resolution 0.05nm, measuring sensitivity HIGH1~3) 55 dB (1523 nm, peak ±0.4 nm, resolution 0.05nm measuring sensitivity HIGH1~3)
Light input connector return loss		30 dB typ. (1550/1600nm)
Sweep time		Within 500 ms (Span 50 nm less than, measuring sensitivity NORMAL HOLD, average number of times 1, sample AUTO)
Function	Automatic measurement	Program function (5 programs, 200 steps) Long term function
	Setting of measuring conditions	Span setting: 0 to 500 nm Measuring sensitivity settings: NORMAL HOLD/AUTO, HIGH 1/2/3 No. of averagings setting: 1~1000 Sample number setting: 11~20001, AUTO Automatic setting function of measuring conditions by automatic sweep Sweep-between-marker function 0 nm sweep function Pulse light averaging measurement function

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	Trace display	Level scale setting 0.1 to 10 dB and linear. Simultaneous display of 3 independent traces Max./Min. value display Sequential averaging display Subtraction-between-traces display Power density display, % display, display of horizontal axis frequency
	Data analysis	WDM waveform analysis (Wavelength/level/SNR list display), EDFA analysis (Gain/NF) Peak search, spectral width search, notch width search, Delta marker (Max. 100),line marker (analysis range specification), Graph display of long term measurement results
	Others	Self-wavelength calibration correction (built-in reference light source), wavelength, level compensation function, level function, help function
Memory	Built-in FDD	3.5 inch 2HD
	Built-in memory	8Mbytes
	File format	Waveform file, program file, measuring conditions file, Text file (waveform, analysis data, etc.), Graphics file (BMP, TIFF)
Data output	Printer	Built-in high speed printer
Interface	Remote control	RS-232C, GP-IB
	Others	Keyboard (IBM interchangeable), mouse (PS/2 interchangeable), Video (SVGA), printer (Centronix), PCMCIA (type 3 x 1 or type 2 x 2)
Display		8.4-inch color LCD (Resolution:800x600 dot)
Optical connector		FC-PC (Standard)
Power supply		100 to 120/200 to 240 VAC, 50/60 Hz
Environment conditions		Operating temperature:0 to 50°C Storing temperature: -20 to 60°C Humidity: Below 90% (No condensation)
Dimensions, weight		Approx. 200 (H) x 315 (W) x 255 (D) mm, Approx. 10 kg

(Note) 10 to 35 ℃ in use of 10/125 μm single mode fiber (FC-PC connector).

1.3 Options

Table 1-2. List of Options shows the options for this unit.

Table 1-2 List of Options

- Ethernet / RS-232C converter
  (This equipment can be remote controlled via the Ethernet.)
  Recommended product: FutureNet FA-11 (Made by CENTURY SYSTEMS)

- AQ-4303B White light source
  (For measuring loss wavelength characteristics)
  Luminous wavelength: 400 to 1800 nm
  Optical output level: Above -45 dBm
  (Wavelength of 850 nm and 1300 nm, wavelength frequency of 10 nm, G150/125 um fiber, CW light)
  Luminous element: Halogen lamp

- AQ-9313 Device adapter
  (For measuring characteristics of CAN type LD element)
  Suitable package: TO-5 (Standard), other packages (TO-46, TO-52, etc.) are also usable
  Fibers used: SM-10/125 um, FC plug, with collimator
  Constant current output: 5 to 150 mA

- AQ-9314B Parallel beam mount
  (For measuring loss wavelength characteristics of optical devices, optical materials, etc.)
  External dimensions of measured objects: Above 10 x 15 mm, below 50 x 50, below 12 mm thick
  Coupling loss: Below 5 dB (for 850 nm wavelength)
  Fiber used: 800 um diameter fiber (Optional)

- Quartz cell for measuring liquids
  (Combined with AQ-9314B parallel beam mount to measure transmittivity of liquids.)
  Recommended product: T-56A-UV-3-1 (Made by Nippon Quartz Glass)

- AQ-9343 Parallel beam measurement adapter
  (For measuring gas laser)
  Fiber used: SM10/125 um fiber with FC plug
  Maximum diameter: Parallel beam below beam diameter of ϕ 6mm
  Coupling loss: Below 5 dB

- AQ-9346 Spot light source measuring adapter
  (For measuring spot light source of LD, LED elements, etc.)
  Adapter suitable when LD, LED is incorporated in the system. Used attached to the following micromanipulator. Connect an optical fiber cord suitable for the light source to the optical spectrum analyzer.
  (This adapter is not provided with the optical fiber cord nor micromanipulator.)
  Output method: FC connector
  Micromanipulator: Σ-2001-(1) precision XYZ combo (Made by Sigma Kouki)

1.4 Configuration

The standard configuration of this unit is composed of the main unit and the accessories shown in Table 1-3. List of Standard Accessories.

Table 1-3 List of Standard Accessories

Accessory	Qty.	Remarks
Power cord	1	Approx. 3 m
Fuse	2	(Used)*
Instruction manual	1	
Recording paper	2 rolls	For built-in printer TP-312C
Floppy disk	2	3.5 inch 2HD

* When used at 100V to 120V:3.15A (Normal fusing type)
When used at 200V to 240V:2.0A (Normal fusing type)

CHAPTER 2 PREPARATIONS BEFORE USE

This chapter describes details of unpacking, repackaging, delivery inspection, and general precautions. Be sure to read this chapter prior to use to ensure proper use of the unit.

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2.1 Unpacking and Delivery Inspection

At shipment, this unit is inspected carefully mechanically and electrically to guarantee normal operations.

Upon receiving the unit, unpack it promptly, and check if it has been damaged during the transportation.

When unpacking, be careful not to break interior boxes and cushioning, etc. other than expendables for packaging such as packing paper. It is recommended that they be kept properly for reuse when moving the unit, etc. in the future.

2.1.1 Mechanical Inspections

The external view, switch operations, and connectors of this unit are inspected for damages incurred during transportation and defects.

Table 1-3 List of Standard Accessories show the types and quantity of accessories and spare parts.

2.1.2 Operational Inspections

If there exists no defects in mechanical operations, performance is inspected by performing operational tests to determine if the unit is operating according to the specifications shown in Section 1.2. Refer to Chapter 10 for the inspection method.

2.2 If Damages and Defects are Discovered

Should damage of the unit or defects against the specifications be discovered in the delivery inspection, notify ANDO ELECTRIC (main office branch offices, dealers) immediately.

2.3 Preparations and General Precautions

(1) Power supply
Use an AC100 to 240V power supply and a power frequency within 48 to 63 Hz. Also use rated voltage cables satisfying the voltage used.

(2) Power cables
The power cable used is a 3-pin plug type. The round pin in the center is the earthling. Use a 3-pin outlet as much as possible.
If using only the two pins, connected to the outlet using an adapter. Always connected the earthling terminal from the adapter to the external ground or earth.

(3) Fuse
Use a 3.15A fuse when using a 100 to 120V power supply voltage, and a 2A fuse when using a 200 to 240V power supply voltage.

2.4 Safe Handling if Power Supply

The unit will operate normally when connected to an AC100 to 240V, 48 to 63 Hz power supply, however the AC power must be supplied after taking measures to prevent the following.

- Injuries caused by electric hazards
- Damage to internal parts caused by abnormal voltage
- Problems caused by grounding current

Be sure to observe the following.

2.4.1 Polarity of Power Cords

As the 3-pole (ground type 2 pole) power supply outlet with ground E (Earth) terminal is to be connected to the voltage pole wire L (Live Line), ground wire (Neutral), and protection earthling wire (Earth) as shown in Fig. 2-1, the 3-pole cable cord has been designed so that just by inserting its plug in a 3-pole (ground type 2-pole) outlet, their power supply polarities match.

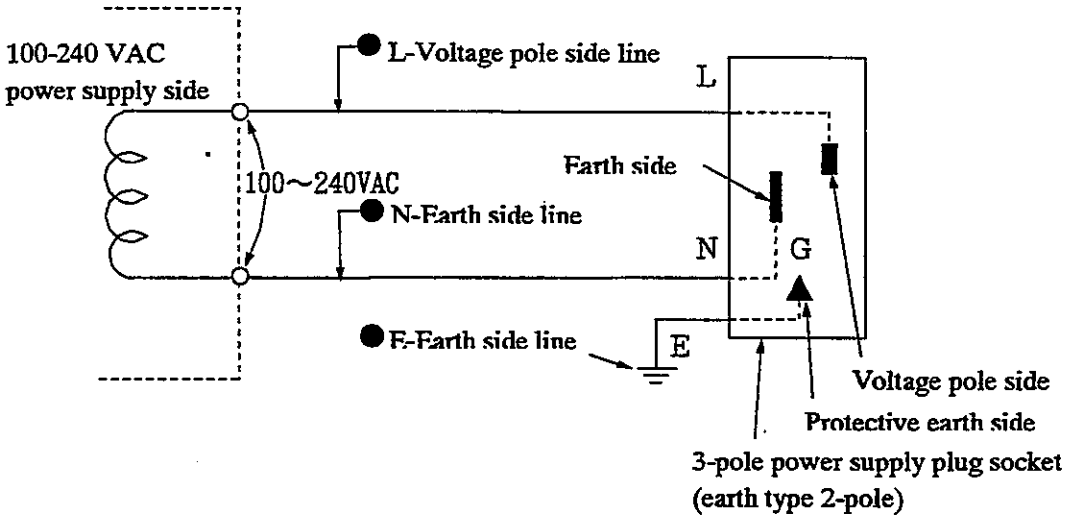

Fig 2-1 3-Pole Power Cord Plug and Outlet

2.4.2 Replacement of Fuse

A fuse is provided with the unit as standard. Table 1-3 (→ 1.4 Structure) shows the fuse provided. When replacing the fuse due to malfunction, check the cause of the malfunction, correct the cause, and then replace the fuse.

DANGER

- When replacing the fuse, be sure to turn off the power switch and remove the power plug from the outlet. Replacing the fuse with the power on may cause injuries by electric hazards.

- When turning on the power again after replacing the fuse, implement one of the protective earthling described in 2.4.2, and check that the AC power supply voltage is appropriate first before turning ON the power switch. Turning on the power switch without the protective grounding may cause injuries by electric hazards.
  In addition, if the AC power supply voltage is inappropriate, the internal parts of the unit may be damaged by abnormal voltage.

2.5 Precautions on Storage

This section describes the precautions for storing this unit over a long period of time.

2.5.1 Precautions Prior to Storage

(1) Remove dusts, fingerprints, other dirt, stains, etc. on the unit.

(2) Implement "10.2 Checking Operations" and check that the unit operates normally.

(3) Avoid storing the unit in the following places.

1) Where the unit will be exposed to direct sunlight or where it is very dusty
2) Where the humid is very high causing water droplets to adhere the unit or water droplets to be produced.
3) Where the unit will be exposed to activated gas or where the unit may oxidize.
4) Places with the following temperature and humidity

- Temperature > 60°C, < -20C
- Humidity > 90%

2.5.2 Recommended Storage Conditions

When storing the unit over a long period of time, apart from satisfying the precautions in 2..5.1 Precautions Prior to Storage, it is recommended that the unit be stored within the following environment conditions.

- Temperature 5 to 30C
- Humidity 40 to 70 %
- Place where temperature and humidity changes per day are slight

To resume use after storage, implement "10.2 Checking Operations" and check that the unit operates normally.

2.6 Repackaging and Transportation

Repackaging and transportation have to be taken into consideration when reusing or repairing the unit in distant places.

2.6.1 Repackaging

Use the packing materials that came with the unit. If the packing materials were thrown away or are damaged, pack the unit in the following way.

(1) Place cushioning over the protruding parts of the front and rear panels of the unit for protection.

(2) Wrap the unit in vinyl.

(3) Pack buffering material adequately in 10 to 15 cm spaces around the unit to absorb shock such as vibrations, etc.

(4) Secure the outside of the box firmly with packing string, adhesive tape, band, etc.

NOTE

As use of the packing material provided with the unit will facilitate repackaging, it is recommended that the packing material be kept properly.

2.6.2 Transportation

It is recommended that the unit be transported avoiding vibration as much as possible, and satisfying the "2.5.2 Recommended Storage Conditions".

CHAPTER 3 FUNCTIONS

This chapter describes the functions and operations of the unit.

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Contents of Diagrams

Contents of Tables

3.1 Names and Functions of Panels

Figs. 3-1 to 3-3 and Table 3-1 show the name and description of the panels of this unit. The numbers in the diagram correspond with those in the number column of the table.

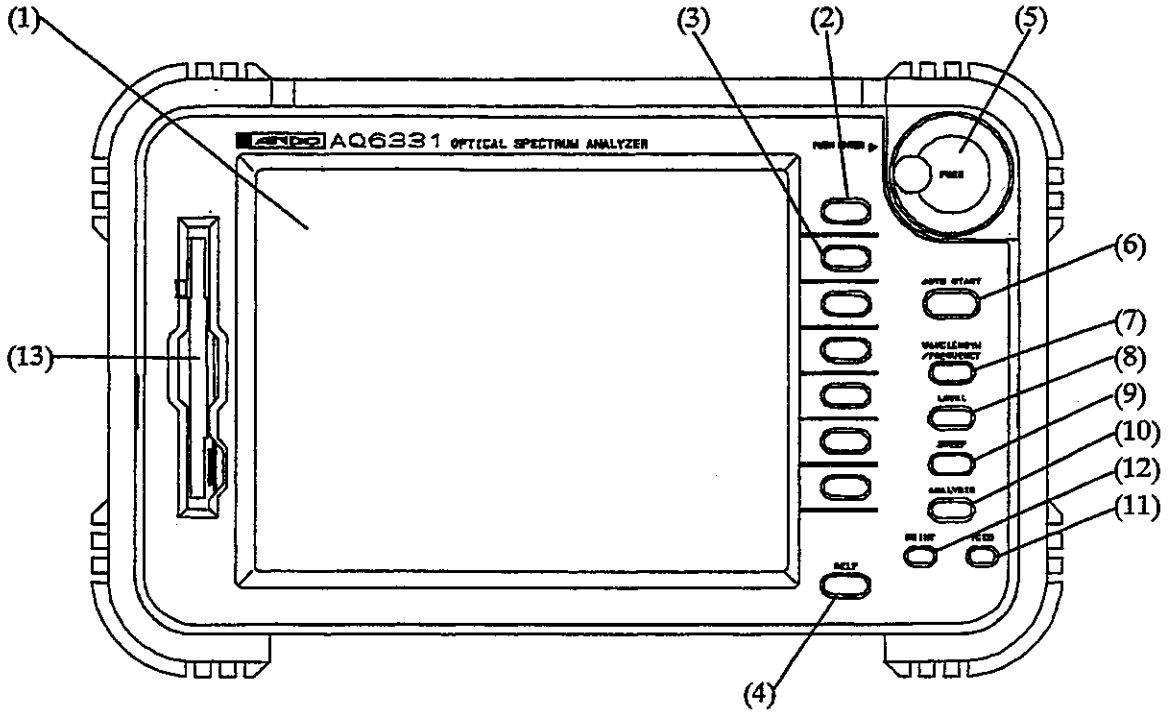


Fig. 3-1 AQ6331 Optical Spectrum Analyzer (Front View)

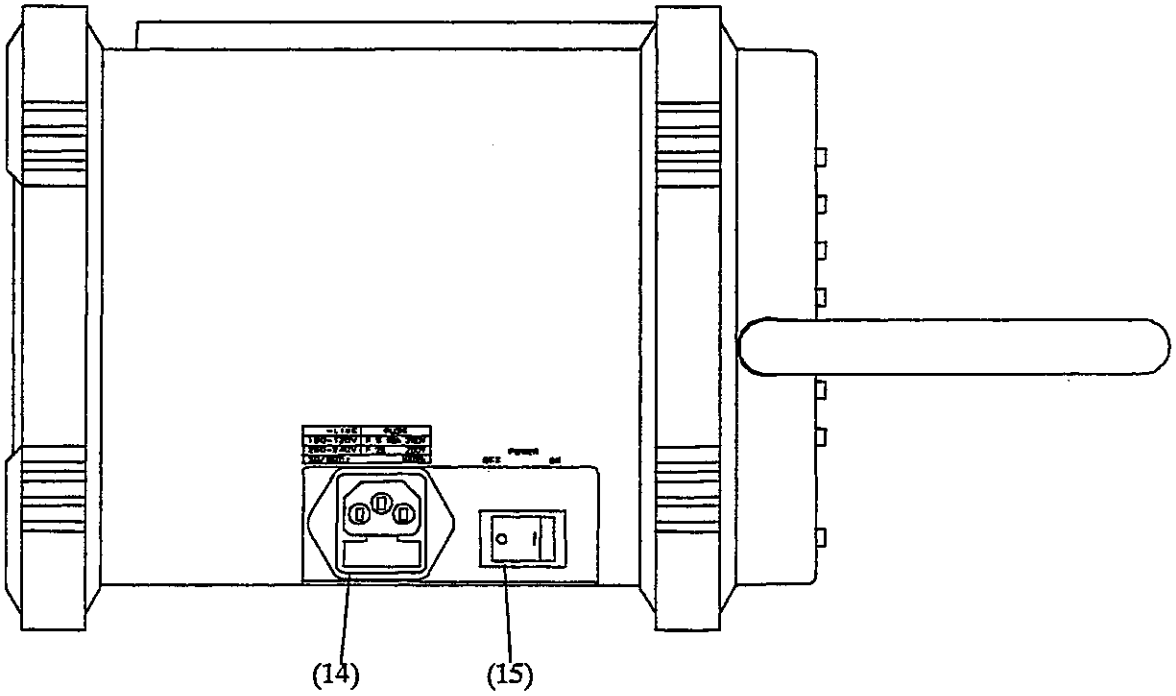


Fig. 3-2 AQ6331 Optical Spectrum Analyzer (Rear View)

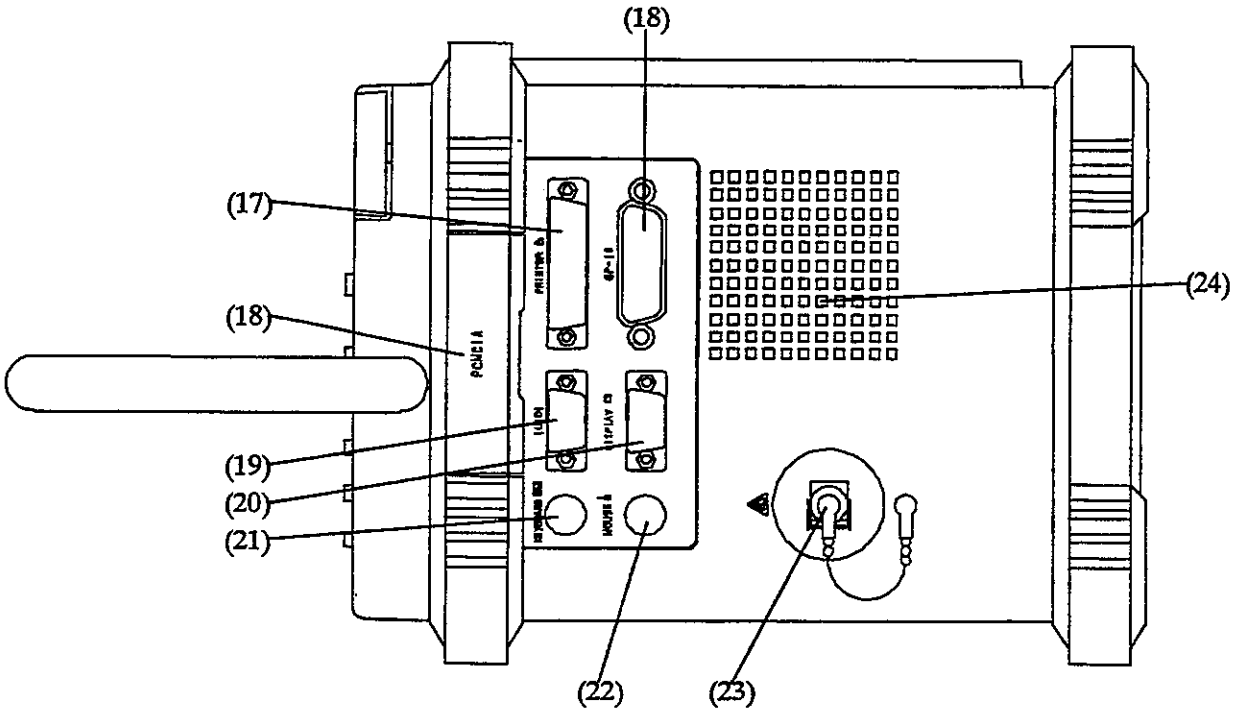


Fig. 3-3 AQ6331 Optical Spectrum Analyzer (Side View)

Table 3-1 Name and Description of Parts

No.	Name	Description
1	LCD display	Displays the measured waveform, measuring conditions, an measured values, etc.
2	MODE key	Switches the mode.
3	SOFT key	Executes the function displayed on the screen.
4	HELP key	Displays a brief explanation of the screen displayed.
5	ROTARY knob	Used for changing measuring conditions, moving marker scrolling the data screen, etc.
6	[AUTO START] key	Shortcut key to the PROGRAM START menu.
7	[WAVELENGTH/FREQUENCY] key	Shortcut key to the WL/FREQ SCALE menu.
8	[LEVEL] key	Shortcut key to the LEVEL SCALE menu.
9	[SWEEP] key	Shortcut key to the SWEEP menu.
10	[ANALYSIS] key	Shortcut key to the ANALYSIS menu.
11	[PRINT] key	Prints the screen displayed.
12	[FEED] key	Feeds paper.
13	Floppy disk drive (3.5 inch)	Use to store waveform data, programs, etc.
14	AC power connector	Supplies the AC power with the power cord provided.
15	[POWER] switch	Power switch.
16	PCMCIA slot	Mounts the optional HDD, SRAM card, etc.
17	Printer interface	Connector for connecting the printer.
18	GP-IB connector	Connector for connecting the GP-IB cable.
19	Serial port	Connector for connecting the serial port.
20	SVGA connector	Connector for connecting the display.
21	Keyboard connector	Connector for connecting the keyboard.
22	Mouse connector	Connector for connecting the mouse.
23	Optical connector	Optical connector.
24	Fan	Fan for radiating heat. Do not cover up the ducts.

3.2 Software Functions

All functions of the unit can be full remote controlled by the GP-IB and RS-232C. For details of the operations, refer to CHAPTER 8 REMOTE CONTROL FUNCTIONS.

3.3 Preparations and Checking Operations

This section describes the preparations and information required before using the unit.

3.3.1 Preparations Prior to Supplying Power

Check the following before inserting the power cord of this unit into a commercial power supply.

(1) Turn OFF the [POWER] switch.
(2) Check that the voltage of the power outlet is appropriate for the power supply voltage of this unit.
(3) To avoid electrical shock, be sure to ground the ground terminal of the rear panel or the ground terminal of the power cord.
(4) When replacing the fuse, be sure to turn [OFF] the [POWER] switch, and disconnect the power cord from the power outlet.
(5) Avoid using the unit where it will be exposed to intense vibrations, high humidity, dusts, direct sunlight, activated gas, and where it may tilt and turn over.

3.3.2 Connection with Other Devices

When connecting the keyboard, mouse, printer, CRT display, RS-232C, GP-IB equipment to the unit, be sure to check the wiring, and turn OFF the power switches of the unit and the devices connected first. Connecting with the power ON may result in damage.

3.3.3 Supplying Power and Screen Display

After checking the power and connections according to 3.3.1 and 3.3.2, turn ON the power as follows.

(1) Press the [POWER] switch to turn it ON.

(2) Check the internal memory and initialize the devices

(3) When initialization completes, the screen will be displayed.

(4) If the waveform display screen is not displayed even after 2 minutes since the power was turned ON, repairs will be required. Contact ANDO ELECTRIC (main office, branch office, dealer) promptly.

NOTE

In this unit, measuring conditions and settings of soft keys are memorized in the non-volatile memory. The settings when the power was last turned OFF will be recovered when the power is turned ON again.

3.3.4 Stopping the Unit

(1) Turn OFF the [POWER] switch.

(2) Remove the optical fiber cord connected to the [OPTICAL INPUT] connector, and close the cover.

(3) Disconnect the power cable from the power outlet.

3.4 Operations

This section describes the operations of the unit.

3.4.1 Description of Screen

The screen of the unit displays measuring waveform, measuring conditions, marker values, etc. Fig. 3-4 and Table 3-2 show the names and descriptions of each part of the screen.

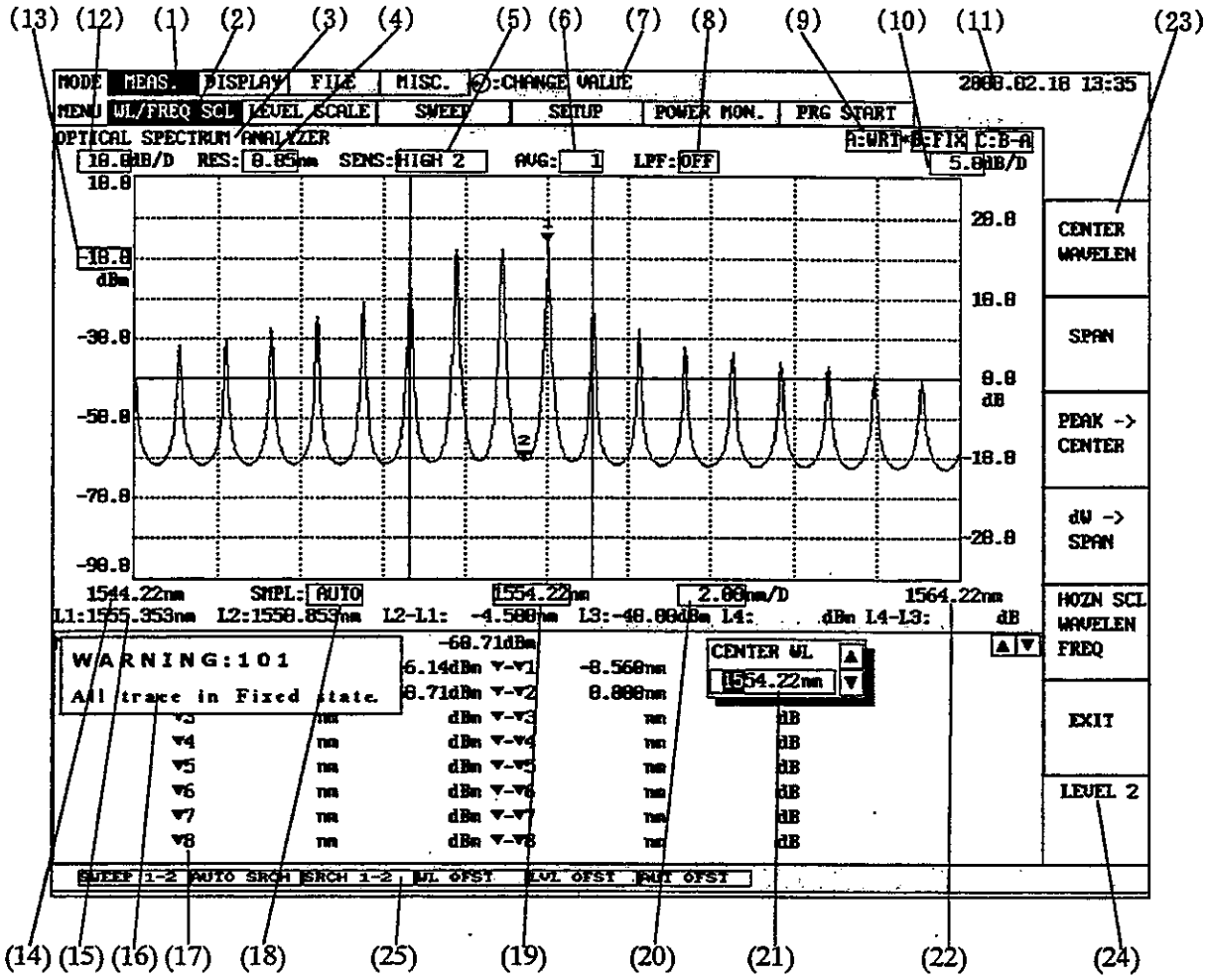


Fig. 3-4 Screen Displays

Table 3-2 Name and Description of Screen Parts

No.	Name	Description
1	MODE	Composed of four function modes. The mode selected by the rota knob will be highlighted.
2	MENU	The menu corresponding to the mode selected will be displaye The menu selected by the rotary knob or soft key will be highlighted
3	LABEL area	Displays the label.
4	RESOLUTION	Displays the resolution.
5	SENSITIVITY	Displays the measuring sensitivity.
6	AVERAGE TIMES	Displays the number of averagings.
7	Rotary knob functions	Displays the functions which can currently be executed by the rotar knob.
8	LOW PASS FILTER state	Displays the state of the low pass filter (LPF) used for pulse ligh measurement.
9	State of traces	Displays the state of each trace.
10	LEVEL SCALE per div (Sub scale)	Displays the value (level) per scale of the vertical axis of the sul scale.
11	Date and Time	Displays the current date and time. The time is displayed in the 24-hour system.
12	LEVEL SCALE per div (Main scale)	Displays the value (level) per scale of the vertical axis of the sul scale.
13	REFERENCE LEVEL	Displays the reference level.
14	START WAVELENGTH	Displays the sweep start wavelength. When the horizontal axis i displayed in frequency, displays the sweep frequency.
15	Line marker value	Liner marker values L1, L2, L2-L1, L3, L4 and L4-L3 are displayed
16	WARNING	Displays the warning.
17	Data area	Displays the results of marker and data analysis.
18	SAMPLE POINTS	Displays the number of measured samples.
19	CENTER WAVELENGTH	Displays the center wavelength. When the horizontal axis i displayed in frequency, displays the center frequency.
20	WAVELENGTH SCALE per div	Displays the value (wavelength or frequency) per scale of th horizontal axis.
21	Interrupt area	Displays the value set.
22	STOP WAVELENGTH	Displays the sweep stop wavelength. When the horizontal axis i displayed in frequency, displays the sweep end frequency.
23	Soft key function	Displays the functions of the soft keys.
24	Software level	Displays the operation level. LEVEL1:Upper level LEVEL2:Middle level LEVEL3:Lower level
25	ON/OFF key setting status	Indicates the statuses of various software-keys by which ON/OFF settings ca be made.

3.4.2 Selecting the Mode

The functions of this unit are assigned to soft keys.

① Select a mode from the four function modes using the MODE key.
Each time the MODE key is pressed, the mode switches and the menu corresponding to the mode selected will be displayed.

MEASUREMENT mode
Setting of the wavelength axis, level axis, and measuring conditions.
Execution of measurement
Program function, power monitor function

DISPLAY mode
Setting of the waveform display
Waveform analysis

FILE mode
Data recording and playback

MISCELLANEOUS mode
Program editing
Detailed setting of measurement, analysis, display, system status
Calibration

② Select the desired menu using the rotary knob or soft keys.

③ The soft key menu will be displayed.

④ Some menus can be directly displayed using the shortcut keys.

3.4.3 Shortcut Keys

The shortcut keys on the panels can be used to operate the unit.

① [AUTO START] key ····· Shortcut key to the <PROGRAM START> menu for executing the program.

② [WAVELENGTH/FREQUENCY] key ··· Shortcut key to the <WL/FREQ SCALE> menu for setting the wavelength and frequency axis.

③ [LEVEL] key ····· Shortcut key to the <LEVEL SCALE> menu for setting the level axis.

④ [SWEEP] key ····· Shortcut key to the <SWEEP> menu for executing measurement.

⑤ [ANALYSIS] key ····· Shortcut key to the <ANALYSIS> menu for analyzing the optical spectrum.

3.4.4 WARNING Display

In this unit, when errors occur due to incorrect operations or when the settings of other keys are forcibly changed because the settings of soft keys were changed, WARNING messages are displayed.

When the "BEEP" function at the <DISPLAY> menu in the <MISC> mode is set to ON, the buzzer will be sounded together with the display of a message to alert.

3.4.5 HELP Function

When the [HELP] key of this unit is pressed, details of the operations of each key corresponding to the screen will be displayed at the HELP screen.

To return to the normal screen, press any key of the unit.

CHAPTER 4 BASIC MEASUREMENTS

This chapter describes measurements for first-time users of this unit.

Contents

Contents of Diagrams

4.1 Turning ON the Power

(1) Turn ON the [POWER] switch.

(2) Check the internal memory and initialize the devices.

(3) When initialization completes, a screen will be displayed.

4.2 Measuring the Optical Spectrum

4.2.1 Auto Measurement

If the wavelength and level of the input light is unknown, use auto measurement.

(1) Connect the light source to be measured to the [OPTICAL INPUT] connector.

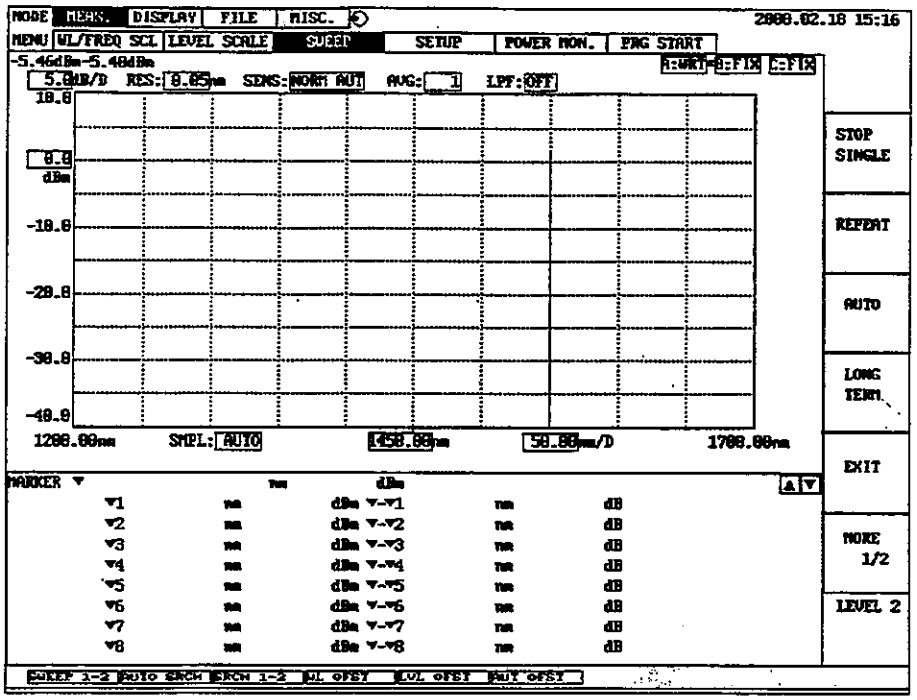
(2) Press the MODE key and set the MEASUREMENT mode.

(3) Set the SWEEP menu.
(Rotate the rotary knob, select, and press, or press the <SWEEP> softkey.

(4) Press the <AUTO> key.

(5) This unit analyzes the spectrum of the light input, and automatically sets the center wavelength, sweep width, reference level, and resolution
(A measuring example is shown in Fig. 4-1.)
When automatic setting is completed, sweep is repeatedly carried out.

(6) After completion of automatic setting, to change the measuring conditions, change at the WL/FREQ SCL menu, LEVEL SCALE menu, or SETUP menu of the MEASUREMENT mode.



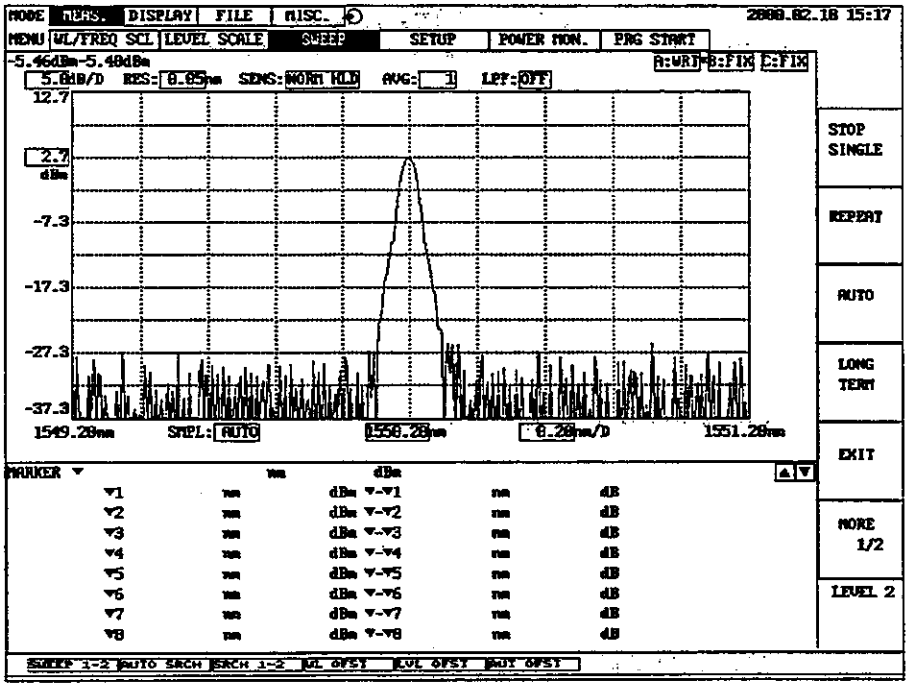


Fig. 4-1 Example of Measuring by Auto Measurement

4.2.2 Manual Measurement

In auto measurement, when the desired measuring conditions cannot be obtained, set the measuring conditions manually at the at the WL/FREQ SCL menu, LEVEL SCALE menu, or SETUP menu of the MEASUREMENT mode.

The measuring procedure is described using the following example.

E. g.: DFB-LD light source wavelength:Approx. 1550.20 nm, Level:Approx. 9.1 dBm

(1) Connect the light source to be measured to the [OPTICAL INPUT] connector.

(2) Set the wavelength of the light source.
(In this case, set the center wavelength to 1550.20 nm.)

① Press the MODE key, and set the MEASUREMENT mode.

② Set the WL/FREQ SCL menu.
(Rotate the rotary knob, select, and press, or press the <WL/FREQ SCL> softkey.

③ Press the <CENTER WAVELEN> key.

④ A window opens at the bottom right of the screen.
Rotate the rotary knob and change the value. Pressing the rotary knob will also change the digits to be changed.

(3) Set the sweep width.
Set a sweep width that is wider than the spectral width of the light source.
(In this case, set the sweep width to 2 nm.)

① Press the <SPAN> key.

② A window opens at the bottom right of the screen.
Rotate the rotary knob and change the value. Pressing the rotary knob will also change the digits to be changed.

(4) Set the reference level.
(In this case, set the reference level to 9.1 dBm.)

① Press the MODE key and set the MEASUREMENT mode.

② Set the LEVEL SCALE menu.
(Rotate the rotary knob, select, and press, or press the <LEVEL SCALE> softkey.)

③ Press the <REF LEVEL> key.

④ A window opens at the bottom right of the screen.
Rotate the rotary knob and change the value. Pressing the rotary knob will also change the digits to be changed.

(5) Set the level scale.
(In this case, set 10 dB/DIV.)

① Press the <LOG SCALE> key.

② A window opens at the bottom right of the screen.
Rotate the rotary knob and set the value.

(6) Set the resolution.
(In this case, set the resolution to MAX.)

① Press the MODE key, and set the MEASUREMENT mode.

② Set the SETUP menu.
(Rotate the rotary knob, select, and press, or press the <SETUP> softkey.

③ Press the <RESOLN> key.

④ A window opens at the bottom right of the screen.
Rotate the rotary knob and select 0.1 nm. The value can also be set by pressing the rotary knob or the <ENTER> key.

(7) Set the number of averagings
(In this case, set to one time.)

① Press the <AVERAGE TIMES> key.

② A window opens at the bottom right of the screen.
Rotate the rotary knob and change the value. Pressing the rotary knob will also change the digits to be changed.

(8) Set the measuring sensitivity.
(In this case, set "NORM RANG AUTO".)

① Press the <SENSITIVITY> key.

② A window opens at the bottom right of the screen.
Rotate the rotary knob and select "NORM AUTO". The value can also be set by pressing the rotary knob or the <ENTER> key.

(9) Perform repeated sweep.

① Press the MODE key, and set the MEASUREMENT mode.

② Set the SWEEP menu.
(Rotate the rotary knob, select, and press, or press the <SWEEP> softkey.

③ Press the <REPEAT> key.

(10) While observing the measured results (waveform), change the measuring conditions set at (3) to (8) to the appropriate values.
(Fig. 4-2 shows the example of measuring using manual operations.)
The following shows the appropriate settings.

- Center wavelength: Peak wavelength of the waveform
- Sweep width: Range in which the whole waveform can be seen
- Reference level: Peak level of waveform
- Resolution: Value at which the shape of the waveform will not change any further.
- No. of averagings: Refer to "(6)Selecting the No. of Averagings" in "5.2.4 Setting the Measuring Conditions".
- Measuring sensitivity: Refer to "(5)Selecting the Measuring Sensitivity" of "5.2.4 Setting the Measuring Conditions".

(11) To stop sweeping, press the <STOP> key of the SWEEP menu.

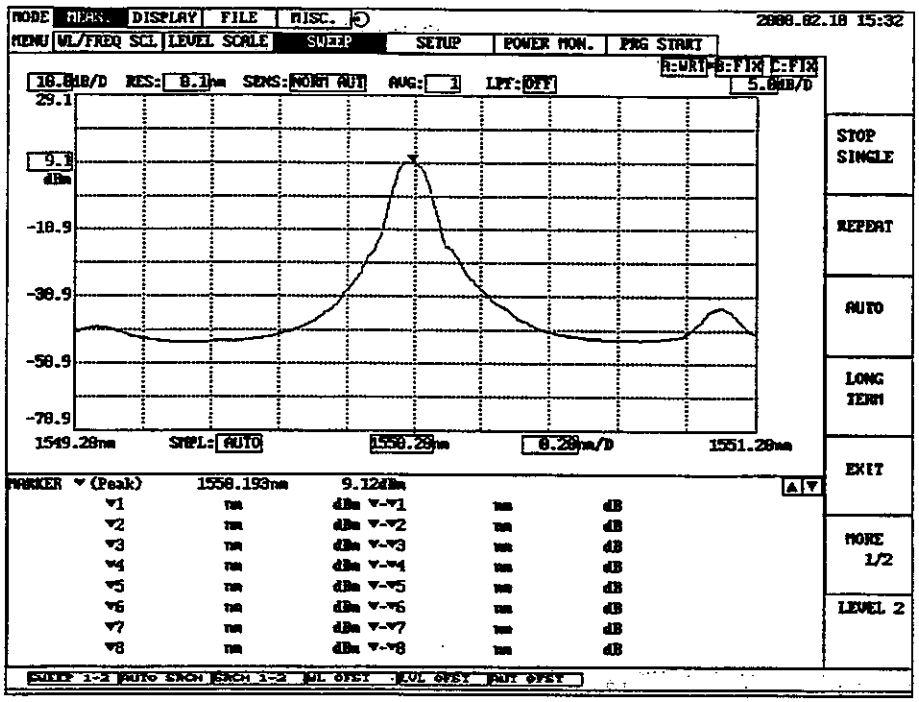


Fig. 4-2 Example of Measuring by Manual Measurement

4.3 Analysis by Optical Spectrum

4.3.1 WDM Analysis List

The analysis functions of this unit consist of a function which lists up the wavelength, level, SNR, etc. of each channel.

(1) Press the MODE key and set the DISPLAY mode.

(2) Set the <ANALYSIS> menu.
(Rotate the rotary knob, select, and press, or press the <ANALYSIS> softkey.

(3) Press the <WDM LIST> key. The screen shown in Fig. 4-3 will be displayed.

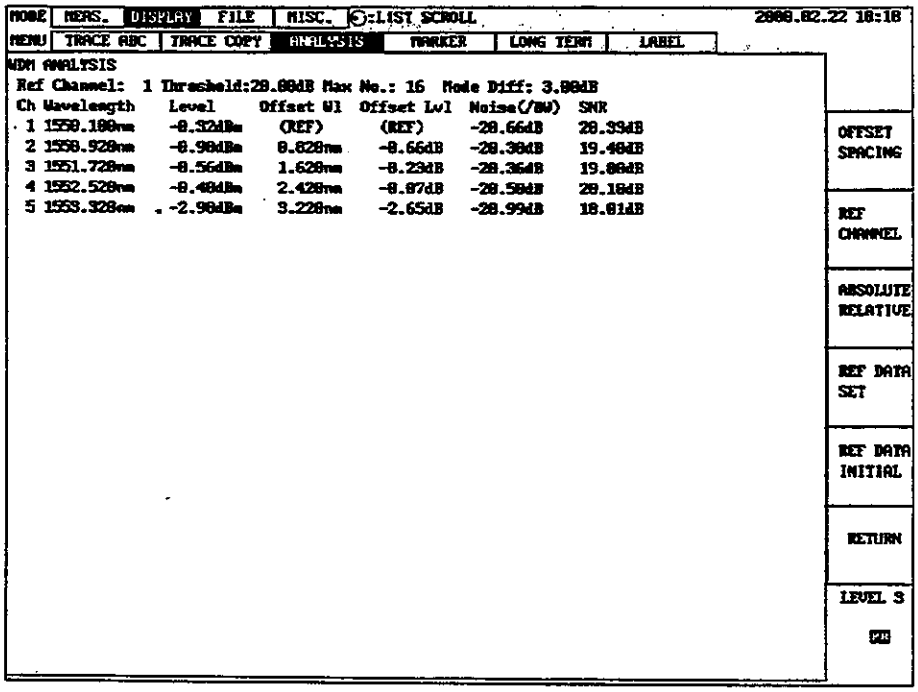


Fig. 4-3 WDM Analysis List

If more than one screen, scroll with the ROTARY KNOB STEP key.

Description of items

Wavelength: Wavelength of each channel peak (Note 1)
Level: Level of each channel peak
Offset Wl: Wavelength difference with the reference channel peak (Note 2)
Offset Lvl: Level difference with the reference channel peak (Note 2)
Noise (/BW): Noise level of channel peak (Calculation method is set separately.)
SNR: Difference between channel peak level and noise level
(Note 1) Displayed in frequency when the marker is displayed in frequency.
(Note 2) Changes to SPACING and Lvl Diff when SPACING is selected.

4.4 Printout

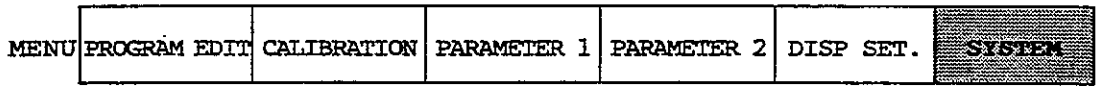
This section describes the output of the measured waveforms, etc. to the internal printer.

(1) Printout
Screens displayed can be printed out by a printer using the [PRINT] key.
Paper can also be fed using the [FEED] key.

(2) How to set

① Press the MODE key and set the MISC mode.

② Set the SYSTEM menu.
(Rotate the rotary knob, select, and press, or press the <SYSTEM> softkey.



③ The window for settings opens on the screen.
Rotate the rotary knob or press the <NEXT ITEM> key and select PRINTER PORT.
Pressing the rotary knob or the <ENTER> key here opens the setting conditions window.
To select a condition, use the <UP> or <DOWN> key or the rotary knob, and press the ENTER key or the rotary knob.

④ Set the "PRINTER PORT" and "EXTERNAL PRINTER" in the same way as ③.

⑤ Display the screen to be printed and then press the [PRINT] key.

(3) Operations

① When the [PRINT] key is pressed, key operations may not be accepted for several seconds to over ten seconds in some cases. This is not a fault.
(Differs according to the printer connected.)

② If the external printer and connecting cable are not connected properly, key operations may not be accepted when the [PRINT] key is pressed in some cases. This is not a fault.

NOTE

① Even if the printout format and printer match, in some rare cases, the data may not be printed out properly.
② Set the direction of the printer paper, printing position, etc. at the printer.
This unit does not have a function for these settings.

3/

CHAPTER 5 DETAILS OF FUNCTIONS

This chapter describes details of each function of the unit.

Contents

Contents of Diagrams

Contents of Tables

5.1 List of Functions

This unit has the functions shown in Table 5-1. List of Functions.

Table 5-1 List of Functions

Mode	Function	Key Displayed	Ref. Section
MEASUREMENT (Measuring function)	Setting of wavelength axis (frequency axis)	WL/FREQ SCALE	5.2.1
	Setting of level axis	LEVEL SCALE	5.2.2
	Execution of measuring	SWEEP	5.2.3
	Setting of measuring conditions	SETUP	5.2.4
	Power monitor function	POWER MONITOR	5.2.5
	Execution of program	PROGRAM START	5.2.6
DISPLAY (Data display, analysis function)	Setting of waveform display method	TRACE ABC	5.3.1
	Copy between waveform display memories	TRACE COPY	5.3.2
	Analysis of optical spectrum	ANALYSIS	5.3.3
	Marker display	MARKER	5.3.4
	Display of long term measuring results	LONG TERM	5.3.5
	Label function	LABEL	5.3.6
FILE (Data recording)	Recording of waveform data	SAVE	5.4.1
	Recalling of waveform data	RECALL	5.4.2
	Copy of waveform data	COPY	5.4.3
	Deletion of waveform data	DELETE	5.4.4
	Drive format	FORMAT	5.4.5
MISC (Other functions)	Editing of program	PROGRAM EDIT	5.5.1
	Detailed setting of measuring and analysis conditions	PARAMETERS 1, 2	5.5.2
	Setting of screen display	DISPLAY SETTING	5.5.3
	Setting of system status	SYSTEM	5.5.4
	Calibration function	CALIBRATION	5.5.5

5.2 Detailed Description of Measuring Functions

This section describes the *MEASUREMENT* mode.

WL/FREQ SCALE	····· Sets the wavelength axis, frequency axis, etc.	(→ Refer to section 5.2.1.)
LEVEL SCALE	····· Sets the level axis.	(→ Refer to section 5.2.2.)
SWEEP	····· Executes measuring.	(→ Refer to section 5.2.3.)
SETUP	····· Sets measuring conditions.	(→ Refer to section 5.2.4.)
POWER MONITOR	····· Sets the power monitor function.	(→ Refer to section 5.2.5.)
PROGRAM START	····· Executes the program.	(→ Refer to section 5.2.6.)

LEVEL 1

5.2.1 Setting the Wavelength Axis and Frequency Axis

This section describes the *WL/FREQ SCALE* menu for setting the wavelength axis and frequency axis.

(1) Description of screen

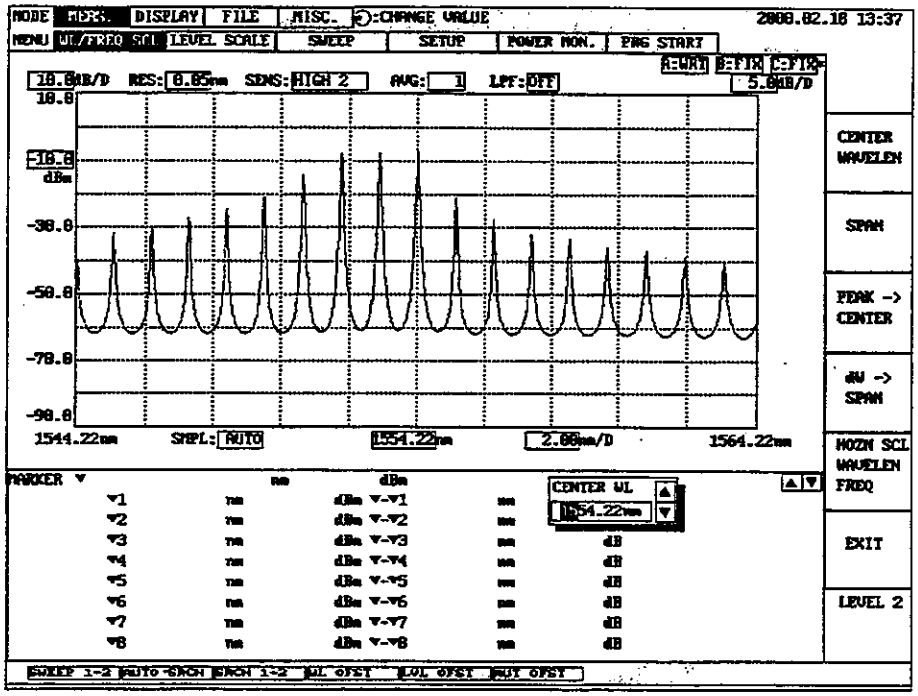


Fig. 5-2-1 Wavelength Axis and Frequency Axis Setting Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> Mode.

② Set the <WL/FREQ SCALE> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

③ The menu can also be set by pressing the [WAVELENGTH/FREQUENCY] key on the panel.

* At the <WL/FREQ SCL> menu, the horizontal axis setting method consists of the CENTER & SPAN method and START&STOP method. To set this, perform as follows.

① Press the MODE key and set the <MISC> mode.

② Set the <PARAMETER 2> menu.

③ A window opens.
Select the "CENTER&SPAN OR START&STOP" ITEM. (Select by pressing the <NEXT ITEM> soft key or rotating the rotary knob.)

④ After selecting, press the rotary knob, or press the <ENTER> soft key. The window for selecting the setting conditions will open.

⑤ Select the conditions to be set "CENTER&SPAN" or "START&STOP". If the settings are not to be changed, selected "CANCEL".

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value or changes the number of digits.

(4) Description of keys

When the horizontal axis is set to the CENTER & SPAN method

a. When the WL/FREQ SCALE menu is opened (Wavelength display mode)

CENTER WAVELEN	····· Sets the center wavelength. 1200–1700nm 0.01nm step
SPAN	····· Sets the sweep width. 0, 1–500nm 0.1nm step
PEAK → CENTER	····· Sets the peak to the center wavelength. 1200–1700nm 0.01nm step
Δλ → SPAN	····· Sets the spectral width to the sweep range. 0, 1–500nm 0.1nm step
HOZN SCL WAVELEN **FREQ**	····· Switches the wavelength display mode and frequency display mode. (→b)
EXIT	····· Returns to the MEASUREMENT mode menu.

LEVEL 2

b. When the WL/FREQ SCALE menu is opened (Frequency display mode)

CENTER FREQ	····· Sets the center wavelength. 176.5–250THz 0.001THz step
SPAN	····· Sets the sweep width. 0, 0.1–73.5THz 0.01THz step
PEAK → CENTER	····· Sets the peak to the center wavelength. 176.5–250THz 0.001THz step
Δf → SPAN	····· Sets the spectral width to the sweep range. 0, 0.1–73.5THz 0.01THz step
HOZN SCL **WAVELEN** FREQ	····· Switches the wavelength display mode and frequency display mode. (→a)
EXIT	····· Returns to the MEASUREMENT mode menu.

LEVEL 2

When the horizontal axis is set to the START&STOP method

c. When the WL/FREQ SCALE menu is opened (Wavelength display mode)

START WAVELEN	····· Sets the start sweep wavelength. 950–1700nm 0.01nm step
STOP WAVELEN	····· Sets the stop sweep wavelength. 1200–1950nm 0.01nm step
PEAK → CENTER	····· Sets the peak to the center wavelength. 1200–1700nm 0.01nm step
DW → SPAN	····· Sets the spectral width to the sweep range. 0, 1–500nm 0.1nm step
HOZN SCL WAVELEN FREQ	····· Switches the wavelength display mode and frequency display mode. (→d)
EXIT	····· Returns to the MEASUREMENT mode menu.

LEVEL 2

d. When the WL/FREQ SCALE menu is opened (Frequency display mode)

START FREQ	····· Sets the start sweep wavelength. 139.75–250THz 0.001THz step
STOP FREQ	····· Sets the stop sweep wavelength. 176.5–286.75THz 0.001THz step
PEAK → CENTER	····· Sets the peak to the center wavelength. 176.5–250THz 0.001THz step
Df → SPAN	····· Sets the spectral width to the sweep range. 0, 1–73.5nm 0.01THz step
HOZN SCL WAVELEN FREQ	····· Switches the wavelength display mode and frequency display mode. (→c)
EXIT	····· Returns to the MEASUREMENT mode menu.

LEVEL 2

When the horizontal axis setting is set to the CENTER&SPAN method

a. When the WL/FREQ SCALE menu is opened (Wavelength display mode)

① <CENTER WAVELEN> key

Sets the center wavelength.
The settable range is 1200 to 1700 nm (0.01 nm step) using the rotary knob.

② <SPAN> key

Sets the span (sweep width).
The settable range is 0, 1 to 500 nm (0.1 nm step) using the rotary knob.

③ <PEAK → CENTER> key

Searches internally for the peak of the waveform of the active trace and sets the center wavelength. After execution, displays the center wavelength set to the Interrupt Display area. At this time, the center wavelength, start sweep wavelength, and stop sweep wavelength settings will be changed. The center wavelength can be set next using the rotary knob. The settable range is 1200 to 1700 nm (0.01 nm step).

④ <Δλ → SPAN> key

Searches for the spectral width internally in respect to the wavelength of the active trace, and sets the value obtained to the center wavelength and span (sweep width).
The spectral width search is performed by RMS 20 dB, double magnification 6.00.
After execution, the span (sweep width) is set at the Interrupt Display area.
The span (sweep width) can be set next using the rotary knob.
The settable range is 0, 1 to 500 nm (0.1 nm step).

⑤ <HOZN SCL WAVELEN FREQ> key

Switches between the wavelength display mode and frequency display mode.
Pressing this key switches to the frequency display mode. (→ b)

⑥ <EXIT> key

Returns to the MEAUSREMENT mode menu.

b. When the WL/FREQ SCALE menu is opened (Wavelength display mode)

① <CENTER FREQ> key

Sets the center wavelength.
The settable range is 176.5 to 250 THz (0.001THz step) using the rotary knob.

② <SPAN> key

Sets the span (sweep width).
The settable range is 0, 0.1 to 73.5 THz (0.01THz step) using the rotary knob.

③ <PEAK → CENTER> key

Searches internally for the peak of the waveform of the active trace and sets the center wavelength, sets the center frequency, and rewrites the waveform. After execution, displays the center wavelength set to the Interrupt Display area. At this time, the center wavelength, start sweep wavelength, and stop sweep wavelength settings will be changed.
The center wavelength can be set next using the rotary knob. The settable range is 176.5 to 250 THz (0.001 THz step).

④ <Δλ → SPAN> key

Searches for the spectral width internally in respect to the wavelength of the active trace, and sets the value obtained to the center wavelength and span (sweep width).
The spectral width search is performed by RMS 20 dB, double magnification 6.00.
After execution, the span (sweep width) is set at the Interrupt Display area.
The span (sweep width) can be set next using the rotary knob.
The settable range is 0, 1 to 73.5 THz (0.01 THz step).

⑤ <HOZN SCL WAVELEN> FREQ key

Switches between the wavelength display mode and frequency display mode.
Pressing this key switches to the wavelength display mode. (→ a)

⑥ <EXIT> key

Returns to the MEAUSREMENT mode menu.

- When the horizontal axis setting is set to the START&STOP method -

c. When the WL/FREQ SCALE menu is opened (Wavelength display mode)

① <START WAVELEN> key

Sets the start sweep wavelength.
When pressed, the current start sweep wavelength will be displayed at the Interrupt Display area.
The settable range is 950 to 1700 nm (0.01 nm step) using the rotary knob.

② <STOP WAVELEN> key

Sets the stop sweep wavelength.
When pressed, the current stop sweep wavelength will be displayed at the Interrupt Display area.
The settable range is 1200 to 1950 nm (0.01 nm step) using the rotary knob.

③ <PEAK → CENTER> key

Searches internally for the peak of the waveform of the active trace and sets the center wavelength. After execution, displays the center wavelength set to the Interrupt Display area. At this time, the center wavelength, start sweep wavelength, and stop sweep wavelength settings will be changed. The center wavelength can be set next using the rotary knob. The settable range is 1200 to 1700 nm (0.01 nm step).

④ <dW →SPAN> key

Searches for the spectral width internally in respect to the wavelength of the active trace, and sets the value obtained to the center wavelength and span (sweep width).
The spectral width search is performed by RMS 20 dB, double magnification 6.00.
After execution, the span (sweep width) is set at the Interrupt Display area.
The span (sweep width) can be set next using the rotary knob. The settable range is 0, 1 to 500 nm (0.1 nm step).

⑤ <HOZN SCL WAVELEN FREQ> key

Switches between the wavelength display mode and frequency display mode.
Pressing this key switches to the frequency display mode. (→ d)

⑥ <EXIT> key

Returns to the MEAUSREMENT mode menu.

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d. When the WL/FREQ SCALE menu is opened (Frequency display mode)

① <START FREQ> key

Sets the start sweep frequency.
When pressed, the current start sweep frequency will be displayed at the Interrupt Display area.
The settable range is 139.75 to 250 THz (0.001THz step) using the rotary knob.

② <STOP FREQ> key

Sets the stop sweep frequency.
When pressed, the current stop sweep frequency will be displayed at the Interrupt Display area.
The settable range is 176.5 to 286.75 THz (0.001 THz step) using the rotary knob.

③ <PEAK → CENTER> key

Searches internally for the peak of the waveform of the active trace and sets the center wavelength. After execution, displays the center wavelength set to the Interrupt Display area. At this time, the center wavelength, start sweep wavelength, and stop sweep wavelength settings will be changed. The center wavelength can be set next using the rotary knob. The settable range is 176.5 to 250 THz (0.001 THz step).

④ <df → SPAN> key

Searches for the spectral width internally in respect to the wavelength of the active trace, and sets the value obtained to the center wavelength and span (sweep width).
The spectral width search is performed by RMS 20 dB, double magnification 6.00.
After execution, the span (sweep width) is set at the Interrupt Display area.
The span (sweep width) can be set next using the rotary knob. The settable range is 0, 1 to 73.5 nm (0.01 THz step).

⑤ <HOZN SCL WAVELEN> FREQ key

Switches between the wavelength display mode and frequency display mode.
Pressing this key switches to the frequency display mode. (→ c)

⑥ <EXIT> key

Returns to the MEAUSREMENT mode menu.

5.2.2 Setting the Level Axis

This section describes the *LEVEL SCALE* menu for setting the level axis.

(1) Description of screen

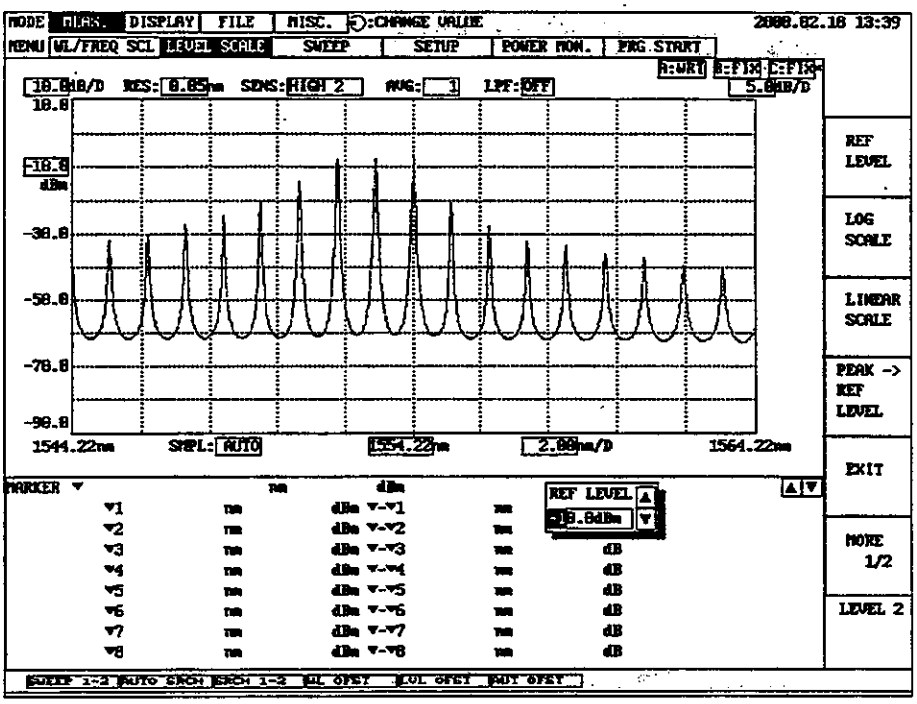

Fig. 5-2-2 Level Axis Setting Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> Mode.

② Set the <LEVEL SCALE> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

③ The menu can also be set by pressing the [LEVEL] key on the panel.

(3) Key operations

[MODE] key: Sets the MEASUREMENT mode
[F1] to [F6] keys: Execute the soft key menu.
[HELP] key: Describes the operations.
[AUTO START] key: Executes the PROGRAM START menu.
[WAVELENGTH /FREQUENCY key]: Executes the WL/FREQ SCALE menu.
[LEVEL] key: Executes the LEVEL SCALE menu.
[SWEEP] key: Executes the SWEEP menu.
[ANALYSIS] key: Executes the ANALYSIS menu.
[PRINT] key: Outputs the screen to the printer.
[FEED] key: Feeds the printer paper.
Rotary knob: Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value or changes the number of digits.

(4) Description of keys

a. When the level scale is set to the LOG scale

REF LEVEL	····· Sets the reference level. -90–+20dBm 0.1dBm step
LOG SCALE	····· Sets the level scale to LOG and the value per 1DIV. 0, 1–10dB 0.1dB step
LINEAR SCALE	····· Sets the level scale to LINEAR. (→b)
PEAK→ REFF LVEL	····· Sets the peak to the reference level. -90–+20dBm 0.1dBm step
EXIT	····· Returns to the MEASUREMENT mode menu.
MORE 1/2	····· Displays the second page of the soft key menu.

LEVEL 2

b. When the level scale is set to the LINEAR scale

REF LEVEL	····· Sets the reference level. 1pW–100mW
LOG SCALE	····· Sets the level scale to LOG and the value per 1DIV. (→ a)
LINEAR SCALE	····· Sets the level scale to LINEAR.
PEAK→ REFF LVEL	····· Sets the peak to the reference level. 1pW–100mW
EXIT	····· Returns to the MEASUREMENT mode menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→d)

LEVEL 2

c. When the sub scale is displayed in dB

SUB SCALE	····· Sets the value per 1DIV of the sub scale. 0.1–10dB 0.1dB step
SUB SCL OFFSET	····· Sets the offset value of the sub scale. -99.9–99.9dB 0.1dB step
MAIN SCL [dBm] [dBm/nm]	····· Switches the main scale to dBm display or dBm/nm display.
SUB SCALE [dB] [%]	····· Switches the sub scale to dB display or % display.
MORE 2/2	····· Displays the second page of the soft key menu. (→a)

LEVEL 2

d. When the sub scale is displayed in %

SUB SCALE	····· Sets the value per 1DIV of the sub scale. 0.1–125% 0.1% step
SUB SCL MINIMUM	····· Sets the offset value of the sub scale. 0–SUB SCL x 10 0.1% step
MAIN SCL [*W] [*W/nm]	····· Switches the main scale to W display or W/nm display.
SUB SCALE [dB] [%]	····· Switches the sub scale to dB display or % display.
MORE 2/2	····· Displays the second page of the soft key menu. (→a)

LEVEL 2

a. When the level scale is set to the LOG scale

① <REF LEVEL> key

Sets the reference level.
The settable range is -90.0 to +20.0 dBm (0.1 dBm step) using the rotary knob.

② <LOG SCALE> key

Switches the level axis to the LOG display and sets the level scale per 1DIV.
When pressed, sets the level axis to the LOG scale and displays the current value set in the Interrupt Display area. The settable range is 0, 1 to 10.0dB (0.1dB step) using the rotary knob.
When set to a scale greater than 5dB/DIV in the fixed range mode (SENS: NORMAL RANGE HOLD) or pulse light measuring mode, WARNING will be displayed because the top and bottom of the waveform cannot be measured properly.

③ <LINEAR SCALE> key

Sets the main scale to the linear scale. (→b)

④ <PEAK → REF LEVEL> key

Searches internally for the peak of the waveform of the active trace and sets the value obtained as the reference level.
After execution, displays the reference level (peak level) set the Interrupt Display area. The reference level can be set next using the rotary knob.
The settable range is -90.0 to +20.0dBm (0.1dBm step).
When the peak level value exceeds the settable range, sets the value nearest to the range, and displays the WARNING.

⑤ <EXIT> key

Returns to the MEAUSREMENT mode menu.

⑥ <MORE 1/2> key

Displays the second page of the soft key menu. (→c)

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b. When the level scale is set to the LINEAR scale

① <REF LEVEL> key

Sets the reference level.
The settable range is 1.00 pW to 100 mW using the rotary knob.

② <LOG SCALE> key

Sets the main scale to the LOG scale. (→a)

③ <LINEAR SCALE> key

Sets the main scale to the linear scale.

④ <PEAK → REF LEVEL> key

Searches internally for the peak of the waveform of the active trace and sets the value obtained as the reference level.
After execution, displays the reference level (peak level) set the Interrupt Display area.
The reference level can be set next using the rotary knob.
The settable range is 1.00 pW to 100mW.
When the peak level value exceeds the settable range, sets the value nearest to the range, and displays the WARNING.

⑤ <EXIT> key

Returns to the MEAUSREMENT mode menu.

⑥ <MORE 1/2> key

Displays the second page of the soft key menu. (→d)

c. When the sub scale is displayed in dB

① <SUB SCALE> key

Sets the value per 1DIV of the sub scale.
When pressed, displays the current value set in the Interrupt Display area.
The settable range is 0.1 to 10.0dB (0.1dB step) using the rotary knob.

② <SUB SCL OFFSET> key

Sets the offset value of the sub scale.
The settable range is -99.9 to +99.9dB (0.01dB step) using the rotary knob.

③ <MAIN SCL [dBm] [dBm/nm] > key

Switches the main scale to dBm display or dBm/nm display.
(Currently displayed in dBm.)
dBm: Power per resolution
dBm/nm: Power per nm (Power density)
Refer to (6) for details on which to use.

④ <SUB SCALE [dB] [%] > key

Switches the sub scale to dB display or % display.
(Currently displayed in dB.)

⑤ <MORE 2/2> key

Displays the first page of the soft key menu. (→a)

d. When the sub scale is displayed in %

① <SUB SCALE> key

Sets the value per 1DIV of the sub scale.
When pressed, displays the current value set in the Interrupt Display area.
The settable range is 0.1 to 125% (0.1% step) using the rotary knob.

② <SUB SCL OFFSET> key

Sets the offset value of the sub scale.
The settable range is 0 to SUB SCL x 10 (0.1% step) using the rotary knob.

(3) <MAIN SCL [*W] [*W/nm]> key

Switches the main scale to W display or W/nm display.
(Currently displayed in W.)

(4) <SUB SCALE [dB] [%]> key

Switches the sub scale to dB display or % display.
(Currently displayed in %.)

⑤ <MORE 2/2> key

Displays the first page of the soft key menu. (→a)

(5) Sub scale

When the subtraction waveform (A-B, B-A) is displayed, the level scale will be displayed in relative values (dB or %).
In this unit, the , the level scale displayed in relative values is called the sub scale.
When the above waveform is displayed overlapped with the waveform displayed in absolute values, the absolute value scale will be displayed on the left and the relative value scale on the right simultaneously.

(6) Power density display function

The level axis of the optical spectrum analyzer displays the absolute power per resolution. For instance, when the resolution is set to 0.1 nm, the power per 0.1 nm will be displayed.
In the case of the gas laser and semiconductor laser, because the optical spectrum by the resolution of this unit is narrow, all the power will be input to the frequency of one resolution. Consequently, the power measured (peak level) matches the total power of the light source. This unit is calibrated so that the accurate power is displayed under such conditions.
On the other hand, most light such as natural light, florescent light, and LED have broad frequency optical spectrum due to the resolution set in this unit. Consequently, when measuring these light with this unit, the power measured changes depending on the resolution set.
In this unit, the level axis display can be switched to the power density (dBm/nm, mW/nm, μW/nm, nW/nm, pW/nm) from the absolute power (dBm, mW, μW, nW, pW) per resolution by the <MAIN SCL [dBm] [dBm/nm] > (the one displayed will be highlighted).
The power density is displayed by converting the measured value to the power of 1nm. Consequently, a uniform measured value will always be obtained regardless of which resolution measured in.
The following describes how to differentiate use between the absolute power display and power density display.

Absolute power display: For measuring light sources with narrow spectral width such as gas laser, semiconductor laser, etc.

Power density display: For measuring light sources with broad spectral width such as natural light, LED, etc.

When using the subtraction function between the A-B(A/B) → C and B-A (B/A) → C traces, the subtraction results will be same for the absolute power display and power density display.
With the power measuring function, as calculation is carried out according to the level axis display, accurate results can be obtained for both displays.
When the NF measuring function and WDM analysis function are executed, the level axis will forcibly be changed to the absolute power display.

NOTE

The specifications of the unit such as the level accuracy, measuring level range, level linearity are prescribed for the absolute power display.

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5.2.3 Executing Measurement

This section describes the *SWEEP* menu for executing measurement.

(1) Description of screen

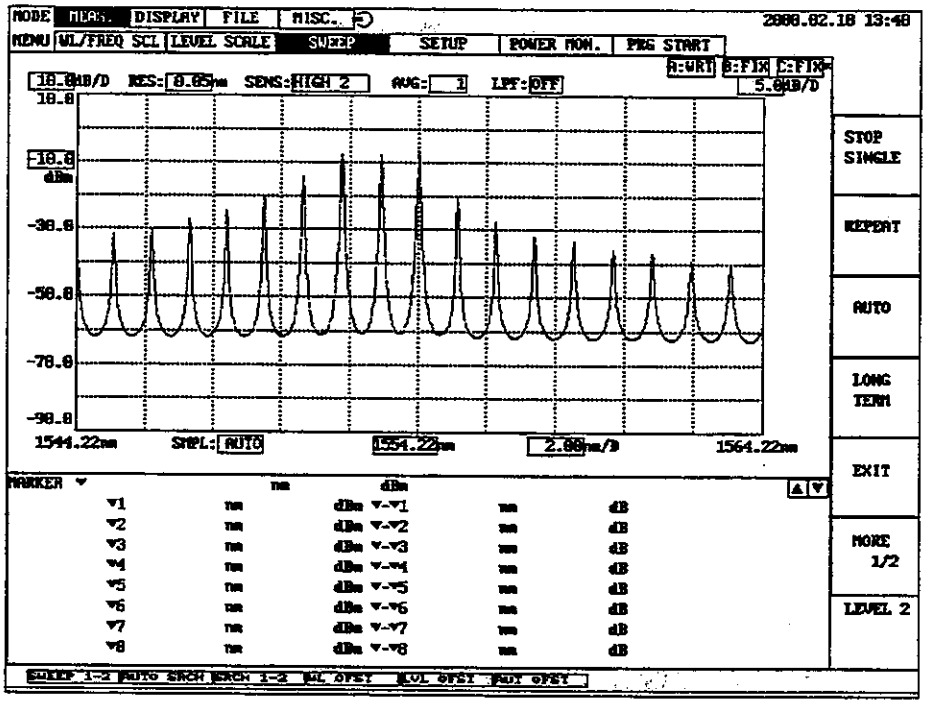


Fig. 5-2-3 Measurement Execution Level Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> Mode.

② Set the <SWEEP> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

③ The menu can also be set by pressing the [SWEEP] key on the panel.

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value or changes the number of digits.

(4) Description of keys

a. When the SWEEP menu is opened.

STOP SINGLE	····· Stops sweep or executes single sweep.
REPEAT	····· Repeats sweep.
AUTO	····· Automatically sets the measuring conditions and performs sweep repeatedly.
LONG TERM	····· Performs LONG TERM measurement.
EXIT	····· Returns to the MEASUREMENT mode menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→b)

LEVEL 2

b. When the <MORE 1/2> key is pressed

LONG TERM INTVL	····· Sets the LONG TERM measurement interval. 1 to 1000 min.
LONG TERM RPT TIMES	····· Sets the number of LONG TERM measuring times. 1 to 1000 times.
MORE 2/2	····· Displays the first page of the soft key menu. (→a)

LEVEL 2

a. When the SWEEP menu is opened

① <STOP SINGLE> key

When "STOP" is displayed
Sweep is stopped.
When "SINGLE" is displayed
Single sweep is started. When single sweep is ended, STOP is displayed again.

② <REPEAT> key

Performs sweeping repeatedly.
When pressed, the soft key is displayed highlighted, and repeated sweep is started.

③ <AUTO> key

Automatically sets the measuring conditions to the optimum state according to the light input.
When pressed, the soft key is displayed highlighted, and the optimum conditions (center wavelength, sweep width, reference level, resolution) for measuring the light input are sought.
When optimization ends, repeated sweep is performed.
When optimization cannot be performed, sweep is stopped, and WARNING is displayed.
While this key is being executed, only <STOP SINGLE> and <REPEAT> keys are effective.

④ <LONG TERM> key

Performs LONG TERM measurement.
When pressed, the soft key is displayed highlighted.

⑤ <EXIT> key

Returns to the MEAUSREMENT mode menu.

⑥ <MORE 1/2> key

Displays the second page of the soft key menu.

b. When <MORE 1/2> key is pressed

① <LONG TERM INTVL> key

Sets the measuring interval for LONG TERM measurement.
The settable range is 1 to 1000 minutes (1 minute step) using the rotary knob.

② <LONG TERM RPT TIMES> key

Sets the number of measurements for LONG TERM measurement.
The settable range is 1 to 1000 times using the rotary knob.

③ <MORE 2/2> key

Displays the first page of the soft key menu.

(5) LONG TERM measurement

Performs sweep and WDM analysis after every certain period of time and preserves the WDM analysis results (peak wavelength, level, SNR of each channel).
The analysis results will be displayed at the <LONG TERM> menu of the <DISPLAY> mode (also during measurement).
The measuring conditions are those set when this key is pressed.
The WDM analysis conditions are set by the <ANALYSIS> menu of the <DISPLAY> mode and <PARAMETER1> menu of the <MISC> mode.

(6) Sweep between marker function

The sweep between marker function is performed between wavelength line marker 1 and wavelength line marker 2.
As the sweep range is limited to between markers 1 and 2, sweep can be performed at high speed.
This is a useful function for observing the changes in specific portions of the spectrum.

① Open the MARKER menu of the DISPLAY mode.

② Press the <L1> key and move to the position to be set while rotating the rotary knob.
Set in the same way for L2.

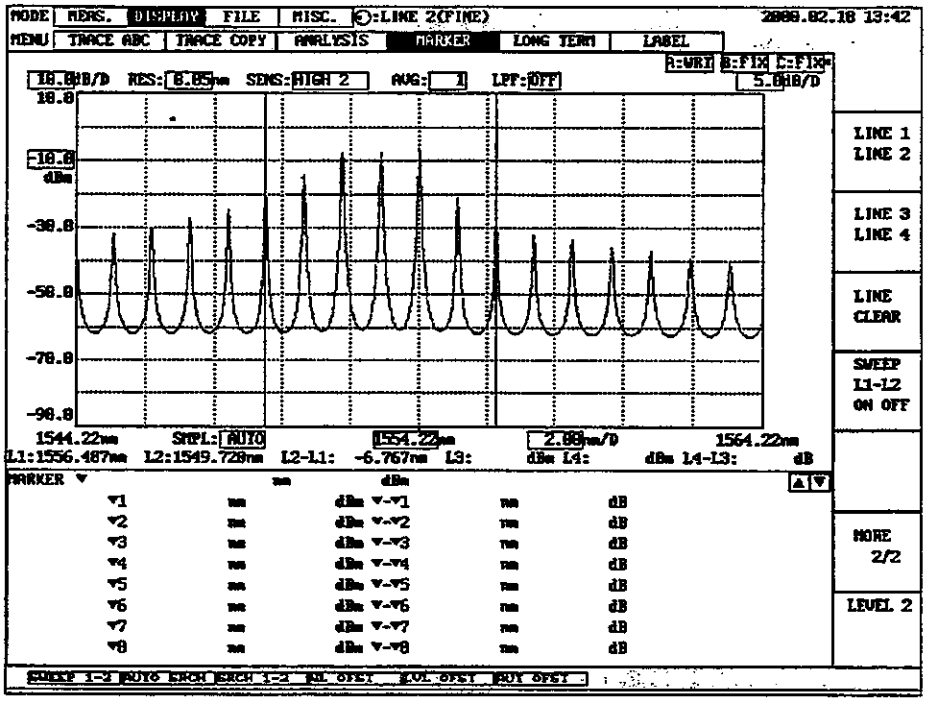


Fig. 5-2-4 Setting of Sweep Between Marker Range

③ Press the <SWEEP L1-L2 ON OFF> key to set the ON state.
(ON state when "ON" is highlighted.)

④ Open the SWEEP menu of the MEASUREMENT mode.

⑤ When the <STOP SINGLE> key or <REPEAT> key is pressed, the sweep between marker function is executed, and single or repeated sweep is performed between the wavelength line marker 1 and wavelength line marker 2.

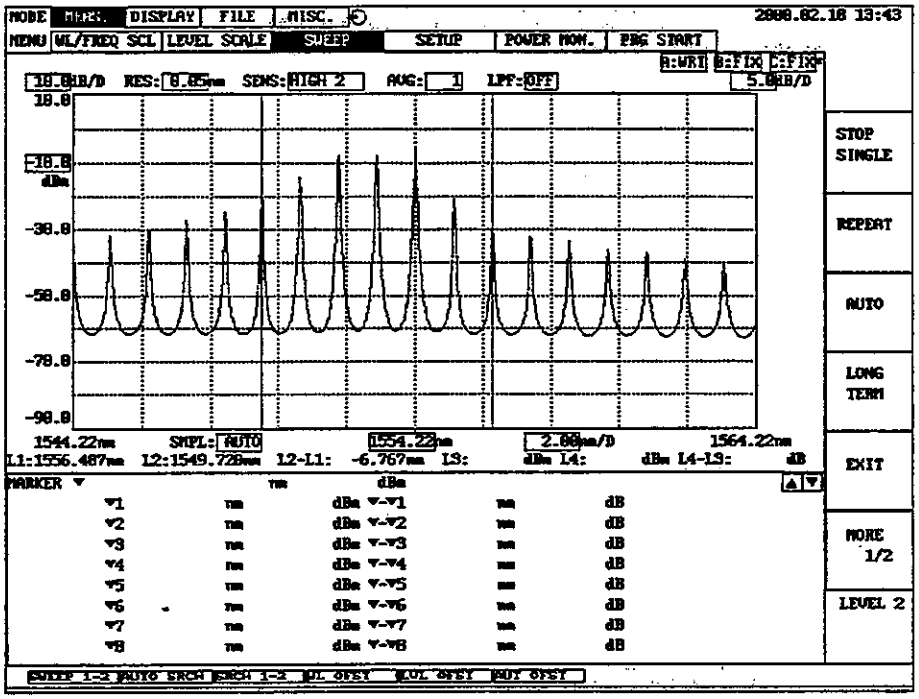


Fig. 5-2-5 After Executing the Sweep Between Markers

⑥ To cancel the sweep between markers function, set the <SWEEP L1-L2 ON OFF> key at the MARKER menu of the DISPLAY mode to OFF.
When canceled, the sweep between markers is canceled and sweep is performed in the while range of the screen.

(7) 0 nm sweep function

Function for measuring the change in the level with time at the specific wavelength.
This is a useful function for adjusting the optical axis when inputting light into the optical fiber.
Fig. 5-2-6 shows the example of inputting the spatial light of the He-Ne gas laser (1553.05 nm) into the optical fiber.

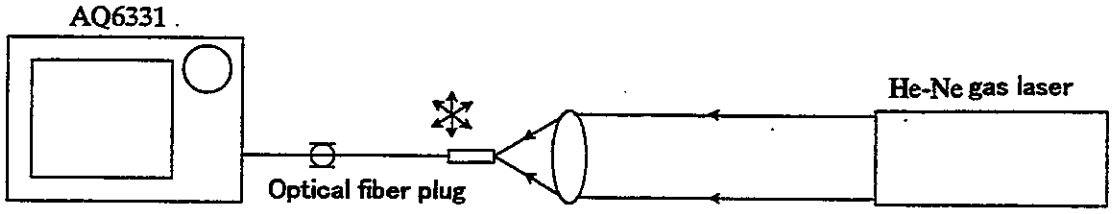


Fig. 5-2-6 Input of Spatial Light to Optical Fiber

① Set the center wavelength of this unit to 1553.05 nm, and set the resolution to MAX.

② Set the sweep width to 0 nm for 0 nm sweep.
When the sweep width is set to 0 nm, the start sweep wavelength, center wavelength, and end steep wavelength will all be set to 1553.05 nm.

③ Open the SWEEP menu of the MEASUREMENT mode.

④ When the <REPEAT> key is pressed, repeated sweep is carried out, enabling the change in level at 1553.05 nm with time to be observed. When set to 0 nm sweep, the time for sweeping from the left to right of the screen can be set.

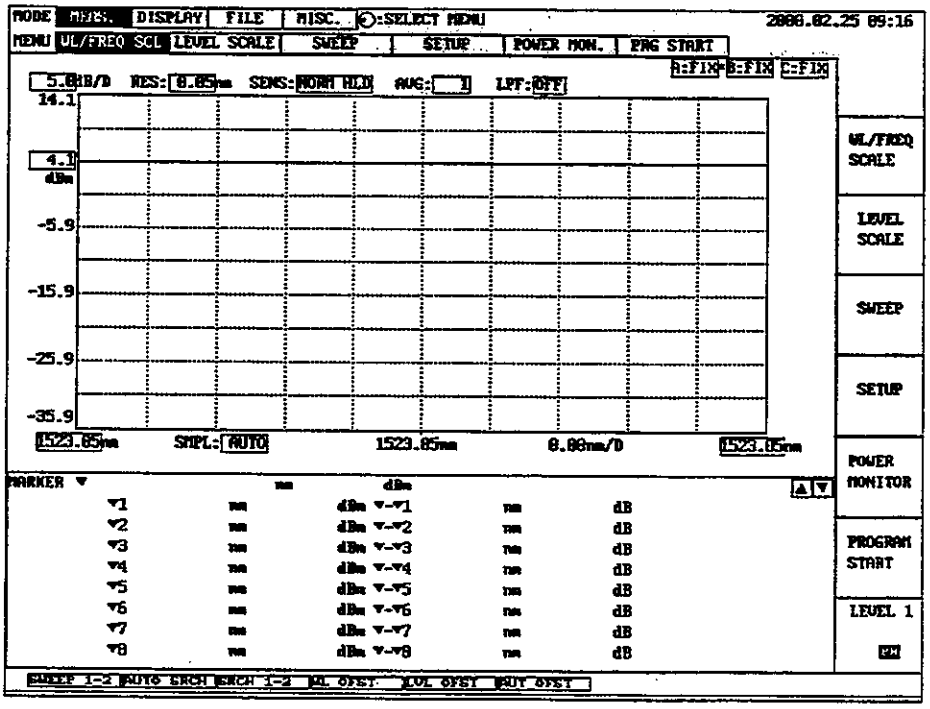


Fig. 5-2-7 0 nm Sweep

⑤ While observing the waveform displayed, move the optical fiber flag finely, and gradually adjust the amount of light input to the peak.

5.2.4 Setting the Measuring Conditions

This section describes the SETUP menu for setting the measuring conditions.

(1) Description of screen

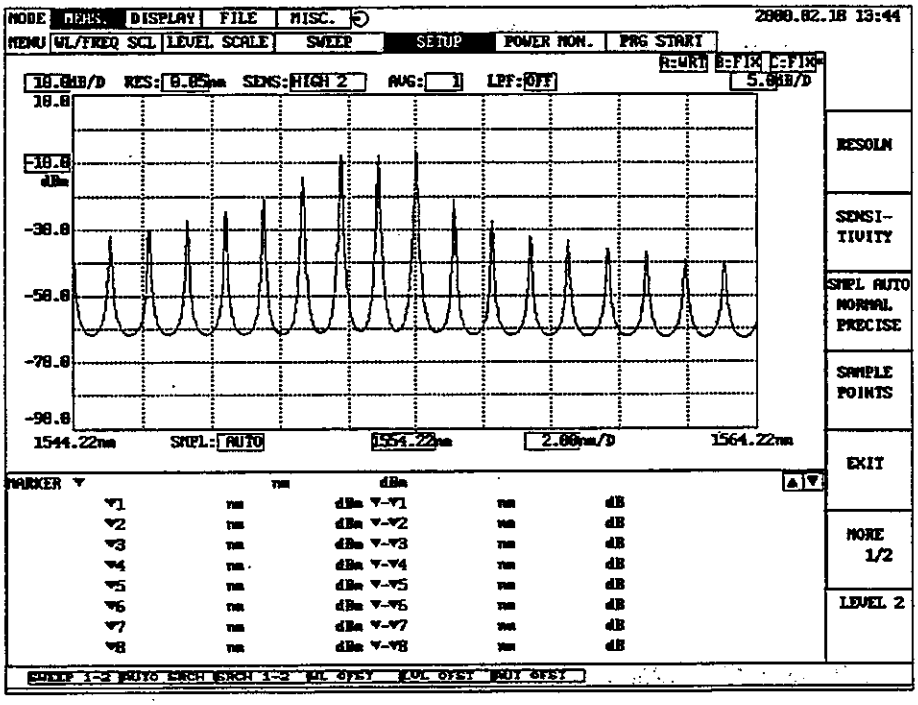


Fig. 5-2-8 Measuring Conditions Setting Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> Mode.

② Set the <SETUP> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the condition
Pressing the rotary knob: Fixes the condition

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value or changes the number of digits.

(4) Description of keys

a. When the SETUP menu is opened

RESOLN	····· Sets the resolution. (→c) 0.05, 0.1,0.2, 0.5, 1.0nm
SENSI- TIVITY	····· Sets the measuring sensitivity. (→c) NORMAL HOLD, NORMAL AUTO, HIGH1, HIGH2, HIGH3
SMPL AUTO NORMAL PRECISE	····· Automatically sets a sample number (NORMAL or PRECISE).
SAMPLE POINTS	····· Sets the number of samples. 11–20001 1 step
EXIT	····· Returns to the MEASUREMENT mode menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→b)

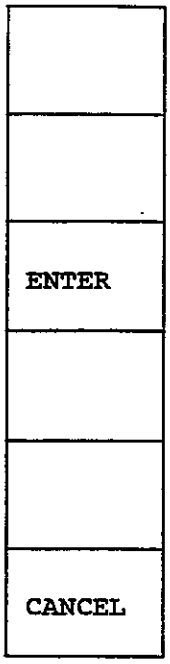
LEVEL 2

b. When the <MORE 1/2> key is pressed

AVERAGE TIMES	····· Sets the number of averagings. 1 to 1000 times 1 step
LPF ON OFF	····· Switches the LPF ON/OFF.
MORE 2/2	····· Displays the first page of the soft key menu. (→a)

LEVEL 2

c. When setting RESOLN, SENSITIVITY



LEVEL 3

ENTER ..... Renews the settings to the conditions selected, and returns the first page of the soft key menu. (→a)

CANCEL ..... Stops the setting, and returns the first page of the soft key menu. (→a)

a. When the SETUP menu is opened

① <RESOLN> key

Sets the resolution.
When pressed, the current resolution will be displayed in the Interrupt Display area. Sets the frequency when in the frequency mode.
The settable range is 0.05,0.1, 0.2, 0.5, 1.0 nm using the rotary knob.

② <SENSITIVITY> key

Sets the measuring sensitivity.
In this unit, measuring sensitivity can be selected from 5 choices according to the purpose.
The settable range is NORMAL HOLD, NORMAL AUTO, HIGH1, HIGH2, HIGH3 using the rotary knob.

NOTE

The valid level axis range when the measuring sensitivity is set to "NORMAL RANGE HOLD"

When the measuring sensitivity is set to "NORMAL RANGE HOLD", the gain of the internal amplifier will be fixed. For this reason, the effective range of the measured data limits the value that can be set for the reference level to the following R (dBm) equation.

R-30 < (Valid Range) < R+10

When the level scale is set to 10 dB/DIV, as it will be displayed exceeding the valid range, the 10 dB range from the top of the screen and the 40 dB range from the bottom will be inaccurate.
Therefore when the measuring sensitivity is set to "NORMAL RANGE HOLD", it is recommended that the level scale be used below 5 dB/DIV. If set above 5 dB/DIV, a warning message will be displayed, and the data at the top and bottom of the screen will not be displayed accurately. To display the spectrum accurately at 10 dB/DIV, set the measuring sensitivity to "NORM AUTO" or "HIGH1–3".

③ <SMPL AUTO NORMAL PRECISE> key

A sampling number for measurement (number of points to be measured per sweep) is automatically set corresponding to the span. Pressing this key highlights either the SAMPLING AUTO NORMAL or SAMPLING AUTO PRECISE, thereby turning on the automatic setup mode (pressing the key highlights them alternately).
If you switch to this key when the <SAMPLE POINTS> key is currently selected, either of the automatic setup modes (NORMAL or PRECISE) being specified in the preceding operation will be selected.
When you select the SAMPLE AUTO PRECISE (when the SMPL AUTO PRECISE is highlighted), more specific data can be obtained because the sampling intervals become narrower comparing to those when the SAMPLE AUTO NORMAL (when the SMPL AUTO NORMAL is highlighted) is selected. (when a span is larger than 5 nm)
When canceling the automatic setup mode, press the <SAMPLE POINTS> key.

④ <SAMPLE POINTS> key

Sets the number of sample points during measurement.
When pressed, the current number of sample points will be displayed at the Interrupt Display area.
The settable range is 11 to 20001 (1 step) using the rotary knob.

NOTE

"Warning (UNCAL) Indication during a Sample Number Selection"
If a sample number is too small compared with a selected span, necessary data may not be collected. In such case, namely when a sample number is too small, the AQ6330 indicates a warning. As long as the warning is turned on, correct measurement is unavailable. Turn off the warning by decreasing the currently selected span or increasing the sample number.
When the AUTO mode is turned on for the sample number selection, you can obtain an optimum sample number for a span specified.

⑤ <EXIT> key

Returns to the MEAUSREMENT mode menu.

⑥ <MORE 1/2> key

Displays the second page of the soft key menu. (→c)

b. When the <MORE 1/2> key is pressed

① <AVERAGE TIMES> key

Sets the number of averagings for every measuring point.
When pressed, the current average times will be displayed at the Interrupt Display area.
The settable range is 1 to 1000 times using the rotary knob.

NOTE

Measuring sensitivity: When the average times is set to high using HIGH1 to 3 to perform measurement, sweep will become considerably long.

② <LPF ON OFF> key

Sets the pulse light to the mode for measuring using the LPF (low pass filter).
Switches the LPF ON or OFF when pressed.

③ <MORE 2/2> key

Displays the first page of the soft key menu. (→a)

c. When RESOLN, SENSITIVITY is set:

① <ENTER> key

Renews the settings to the conditions selected, and returns the first page of the soft key menu. (→a)

② <CANCEL> key

Stops the setting, and returns the first page of the soft key menu. (→a)

(5) Selecting the measuring sensitivity

In this unit, the measuring sensitivity can be selected from 5 types.

① To select the measuring sensitivity, set using the <SENSITIVITY> key of the <SETUP> menu. When pressed, the current measuring sensitivity will be displayed at the Interrupt Display area. Select the sensitivity from NORMAL RANGE HOLD, NORMAL RANGE AUTO, HIGH1,HIGH2, HIGH3 using the rotary knob or step key.
Table 5-2 shows the details of each sensitivity.

Table 5-2 Selection of Measuring Sensitivity

Measuring Sensitivity	Details	Measuring Sensitivity Display Area
NORMAL RANGE HOLD	Fixes the amplifier range and measures.	SENS: NORMAL HLD
NORMAL RANGE HOLD	Measures the amplifier range automatically (automatic selection according to the level of the input light).	SEND: NORMAL AUT
HIGH1	Chops the light measured and measures using the sync detection method.	SENS: HIGH1
HIGH2	"HIGH1", "HIGH2", and "HIGH3" are available according to the limit of the auto range and frequency width.	SENS: HIGH2
HIGH3	Although the measuring sensitivity is best at "HIGH3", the measuring speed will on the other hand be very slow.	SENS: HIGH3

② When the reference measuring sensitivity is set to NORMAL ("NORMAL": NORMAL RANGE HOLD, NORMAL RANGE AUTO), the measuring speed will decrease (become slower), the higher the measuring sensitivity in the order of HIGH1, HIGH2, HIGH3.

③ The measuring sensitivity selected will be displayed on the Measuring Sensitivity Display Area on the screen.

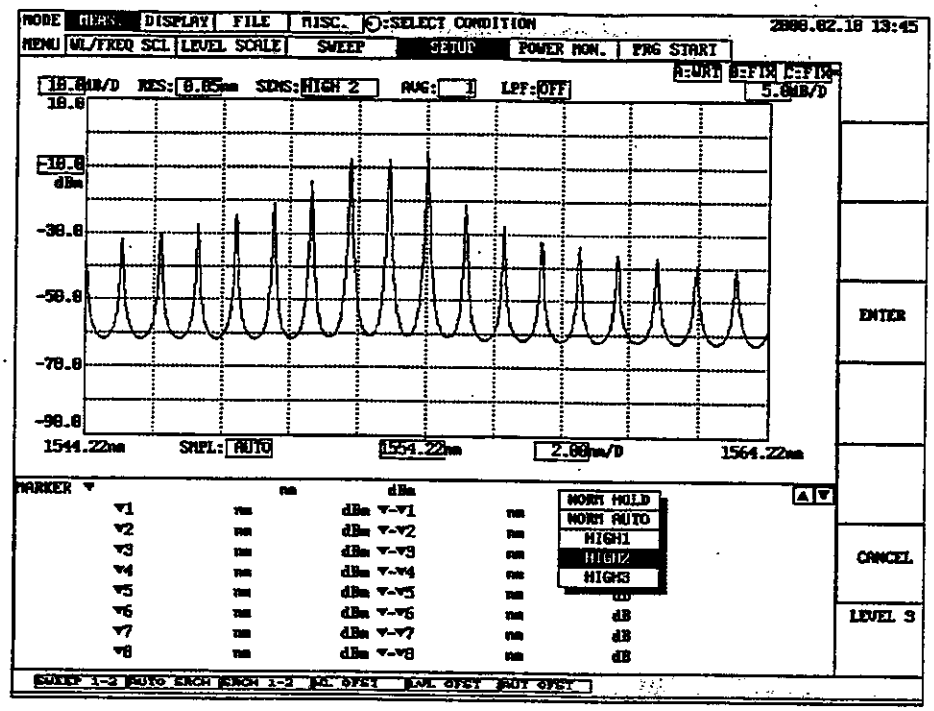


Fig. 5-2-9 Display When <SENSITIVITY> Key is Pressed

(6) Selecting the Number of Averagings

When the level of the light source is inconsistent or the light source is fluctuating (less than several KHz), the waveform will be inconsistent and measurements cannot be carried out accurately.
In this case, increasing the number of averagings will enables the spectrum to be measured accurately.
To measure the number of averagings, press the <AVERAGE TIMES> key of the <SETUP> menu.
The current number of averagings will be displayed at the Interrupt Display area.
The number of averagings can also be selected from the range of 1 to 1000 times using the rotary knob.

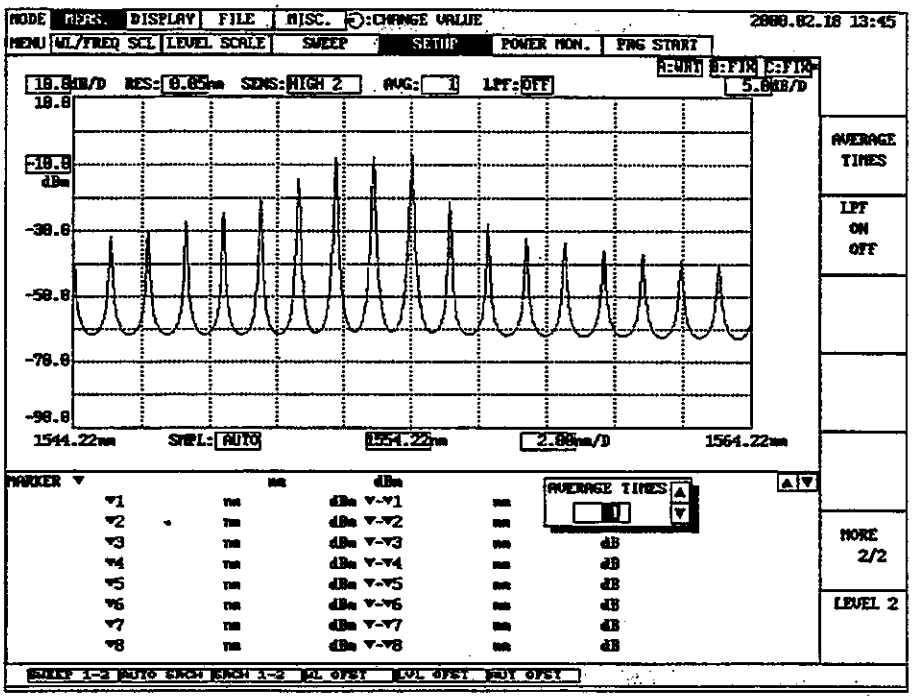


Fig. 5-2-10 Display When AVERAGE TIMES Key is Pressed

(7) Pulse Light Measuring Function

① Setting Method

Press the <LPF ON OFF> key of the <SETUP> menu.

② Function

Averages the pulse light using the low pulse filter so that the average level of the pulse light can be measured.
It enables pulse light above 5 KHz frequency to be repeatedly measured (below 200 μs period).
At the same time, by increasing the number of averagings (set by the <AVERAGE TIMES> key at the <SETUP> menu), lower repeating frequencies can be measured.
The lowest repeating frequency which can be measured when the number of averagings is set to n time is around $5/\sqrt{n}$KHz.
The level measures is the average pulse light level. For instance, if the pulse light is a completely square waveform, the measured level is the (peak pulse light level) x (duty of pulse light). Consequently, when the duty of the pulse light is small, the measured level will be low.
This function is valid only when the measuring sensitivity is NORMAL.

③ When the pulse light measuring function is not used

When the pulse light measuring function is not used, the pulse light can be measured if the repeating frequency of the pulse light is relatively high. In this case, the average level is measured. The repeating frequency which can be measured differs according t the measuring sensitivity (set using the <SENSITIVITY> key of the <SETUP> menu).

- When the measuring sensitivity is SENS:NORM

Pulse light with above 500 KHz repeating frequency can be measured.
At the same time, by increasing the number of averagings (set by the <AVERAGE TIMES> key at the <SETUP> menu), lower repeating frequencies can be measured. The lowest repeating frequency which can be measured when the number of averagings is set to n time is around $100/\sqrt{n}$KHz.

- When the measuring sensitivity is SENS:HIGH 1 to 3

Pulse light above repeating frequencies of 1KHz can be measured. Even if the number of averagings is increased, the lowest repeating frequency which can be measured is the same.

5.2.5 Power Monitor Function

This section describes the *POWER MONITOR* menu for setting the power monitor function.

(1) Description of screen

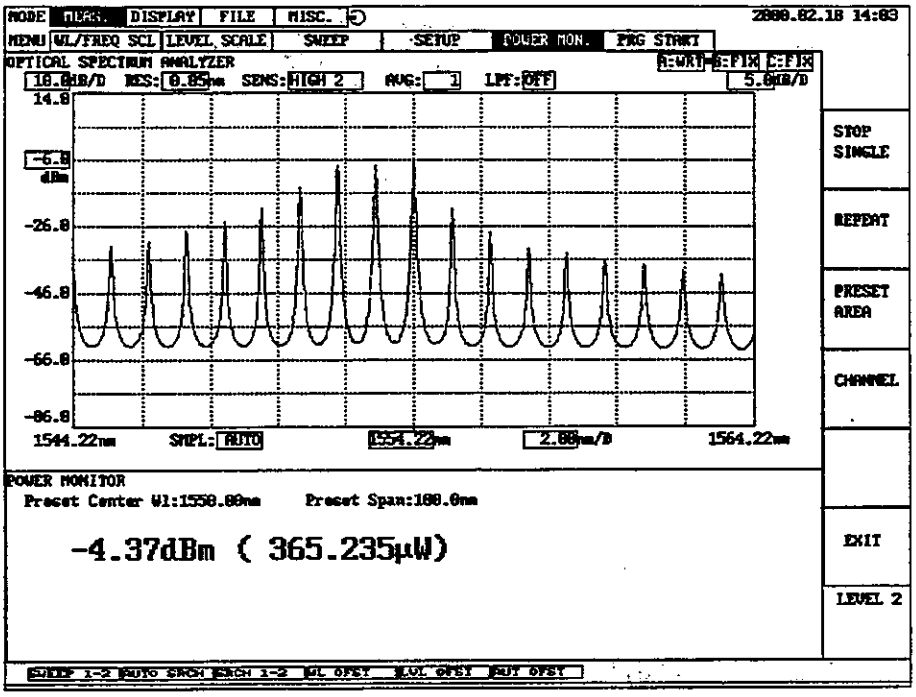


Fig. 5-2-11 Power Monitor Function Setting Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> mode.

② Set the <POWER MONITOR> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value or changes the number of digits.

(4) Description of keys

STOP SINGLE	····· Executes or stops single measurement.
REPEAT	····· Executes repeated measurement.
PRESET AREA	····· Sets the preset measuring wavelength area.
CHANNEL	····· Sets the measuring wavelength to a specific channel. 1 to 256 1 step
EXIT	····· Returns to the MEASUREMENT mode menu.

LEVEL 2

① <STOP SINGLE> key

When "STOP" is displayed
State in which the power monitor measurement is stopped.
When the key is pressed, "SINGLE" is displayed highlighted.
When "SINGLE" is displayed
Single measurement is started, measurement is carried out once, the results are displayed in the window, and "STOP" is displayed highlighted.

② <REPEAT> key

Performs repeated measurement and displays the results in the window.
When pressed, "REPEAT" is displayed, and repeated measurement is started.

③ <PRESET AREA> key

Sets the preset measuring wavelength area.
The following items can be set at the <PARAM2> menu in the <MISC> mode.
PRESET CENTER WL ···· Preset center wavelength value
PRESET SPAN ····· Preset span value
CHANNEL WIDTH ····· Preset channel width value
For details, refer to section 5.5.2.

④ <CHANNEL> key

Sets the measured wavelength to a specific channel.
You can specify the channel in the range of 1 to 256 channels (in step of 1 channel) from the rotary knob.
You can set a wavelength for respective channels at the <PARAM1> menu (CHANNEL WAVELENGTHS) in the <MISC> mode. Likewise, a width can be set at the <PARAM2> menu (CHANNEL WIDTH) in the <MISC> mode.

⑤ <EXIT> key

Returns to the MEAUSREMENT mode menu.

(5) Power monitor function

① Outline

In this unit, the following measurements are performed in the power monitor mode.
In the power monitor mode, sweeping is carried out internally in the wavelength range set in the <MISC> mode, the total power is calculated for the spectrum after the measurement, and the results are displayed in the window.
At this time, the spectrum measured internally is subjected to wavelength sensitivity compensation, thus enabling power measurement that does not depend on the wavelength.

② Setting method

Set the power monitor mode at the <POWER MON.> menu of the <MEASUREMENT> mode.
The center wavelength, sweep width (span), channel width preset values can be set in the <MISC> mode.

5.2.6 Executing Program

This section describes the *PROGRAM START* menu for executing the program.

(1) Description of screen

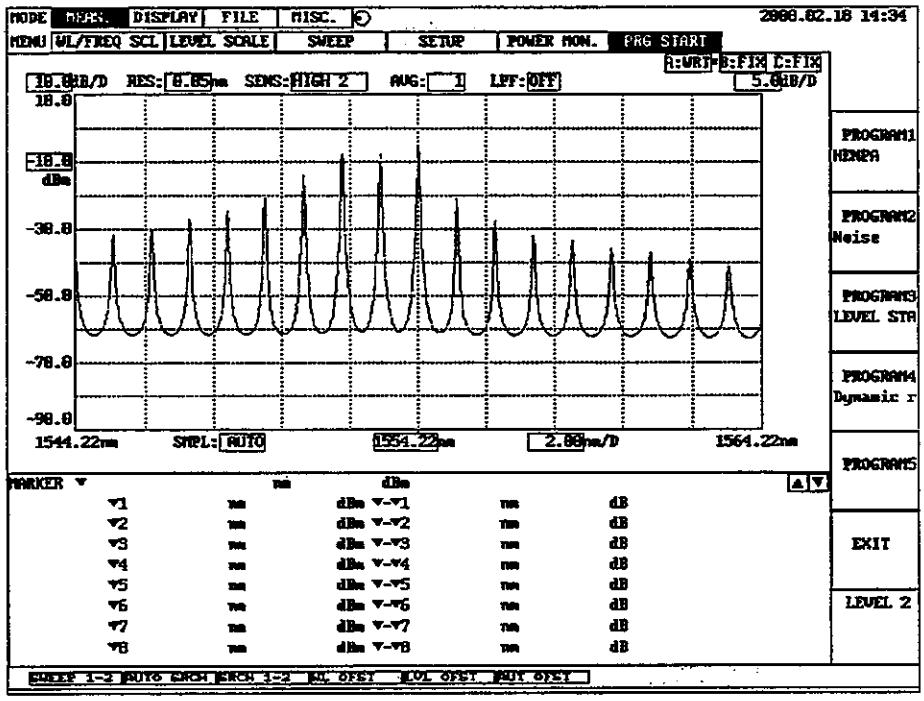


Fig. 5-2-12 Program Execution Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> mode.

② Set the <PROGRAM START> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

③ The menu can also be set by pressing the [AUTO START] key on the panel.

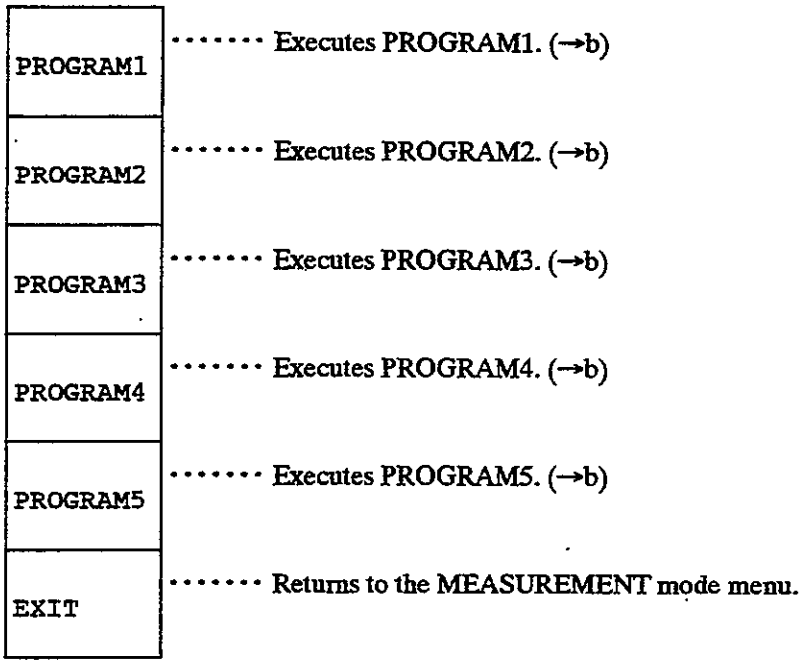
(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

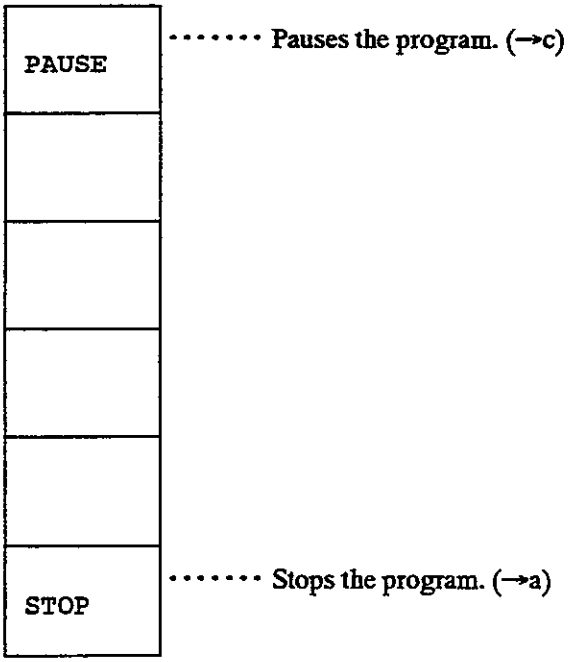
(4) Description of keys

a. When the <PROGRAM START> menu is selected



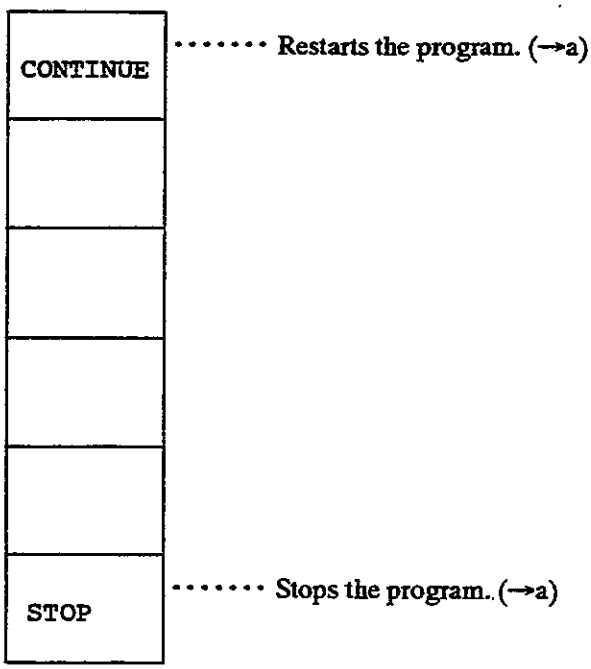
LEVEL 2

b. When the <PROGRAM1> to <PROGRAM5> menu is selected



LEVEL 3

c. When the <PAUSE> key is pressed



a. When the <PROGRAM START> menu:

① <PROGRAM1> key

Executes program 1.

② <PROGRAM2> key

Executes program 2.

③ <PROGRAM3> key

Executes program 3.

④ <PROGRAM4> key

Executes program 4.

⑤ <PROGRAM5> key

Executes program 5.

* Input for programs① to⑤ at the <PROGRAM EDIT> menu of the <MISC> mode. For details, refer to section 5.5.1 and Chapter 6. Program Functions. (→b)

⑥ <EXIT> key
Returns to the MEAUSREMENT mode menu.

b. When the <PROGRAM1> to <PROGRAM5> menu is selected:

① <PAUSE> key

Pauses the program.
When pressed, "CONTINUE" is displayed. (→c)

② <STOP> key

Stops the program. (→a)

c. When the <PAUSE> key is pressed:

① <CONTINUE> key

Restarts the program. (→a)

② <STOP> key

Stops the program. (→a)

5.3 Details of Data Display and Analysis Functions

This section describes the *DISPLAY* mode.

TRACE ABC	····· Sets the waveform display method.	(→ Refer to section 5.3.1.)
TRACE COPY	····· Sets copy between waveform display memories.	(→ Refer to section 5.3.2.)
ANALYSIS	····· Analyzes the light spectrum.	(→ Refer to section 5.3.3.)
MARKER	····· Displays the results of long term measurement.	(→ Refer to section 5.3.4.)
LONG TERM	····· Displays the long term measuring results.	(→ Refer to Section 5.3.5.)
LABEL	····· Sets the label function.	(→ Refer to Section 5.3.6.)

LEVEL 1

5.3.1 Setting the Waveform Display Method

This section describes the *TRACE ABC* menu for setting the waveform display method.

(1) Description of screen

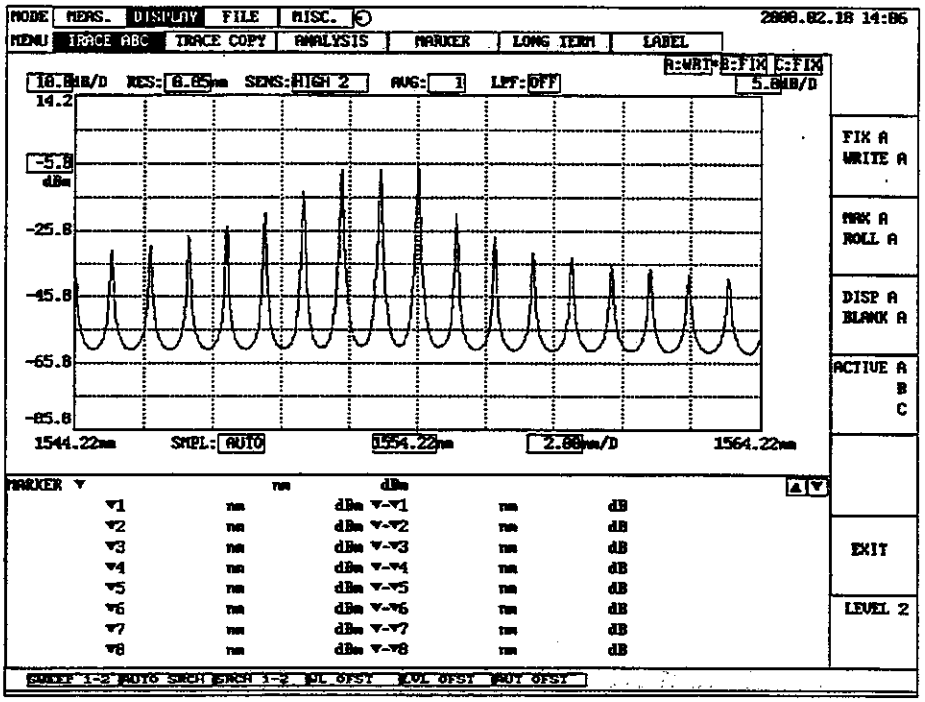


Fig. 5-3-1 Waveform Display Method Setting Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <TRACE ABC> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

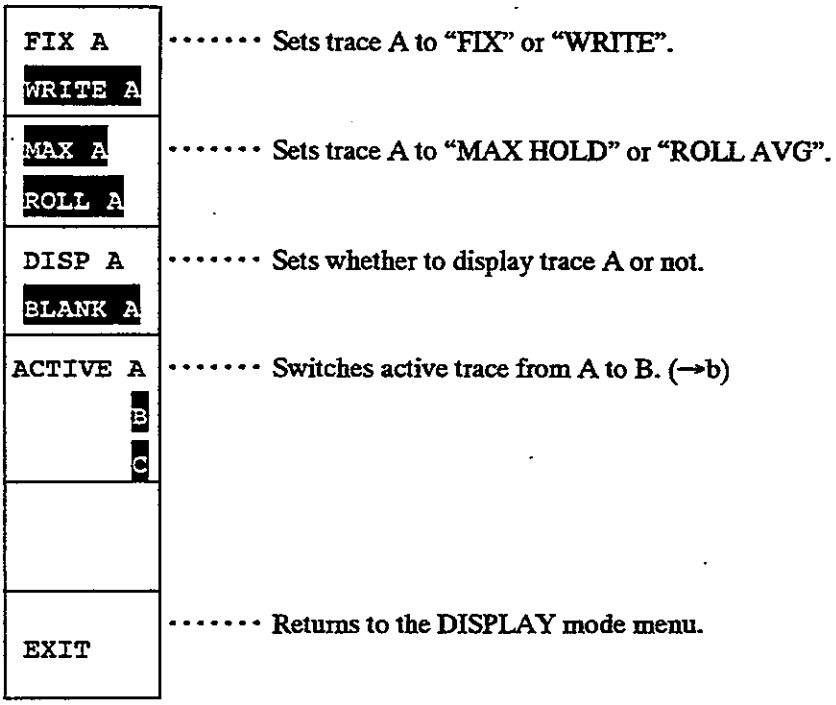
(3) Key operations

[MODE] key:	Sets the DISPLAY mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key :	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

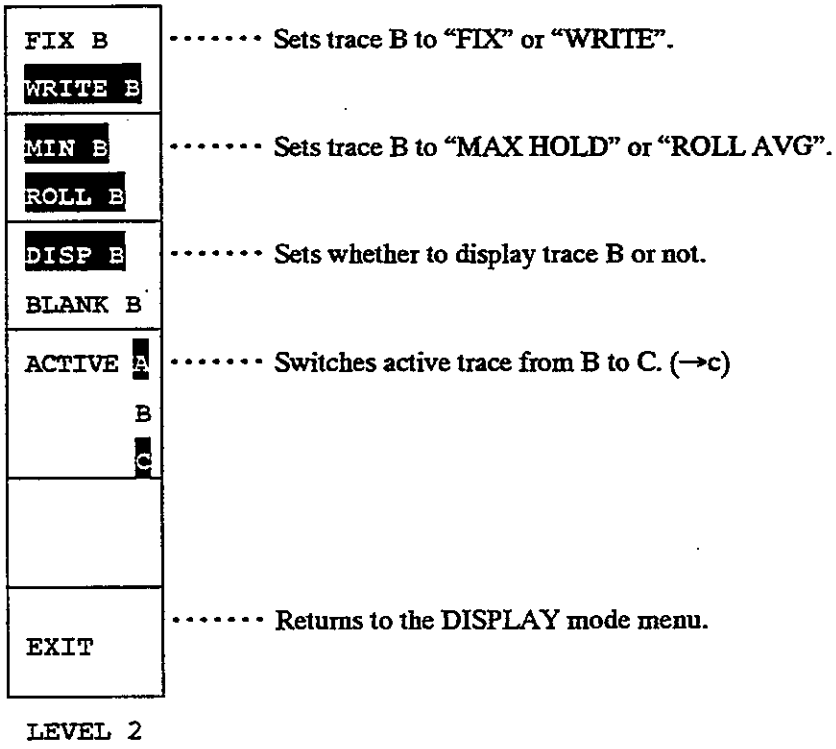
✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

(4) Description of keys

a. Setting trace A



b. Setting trace B



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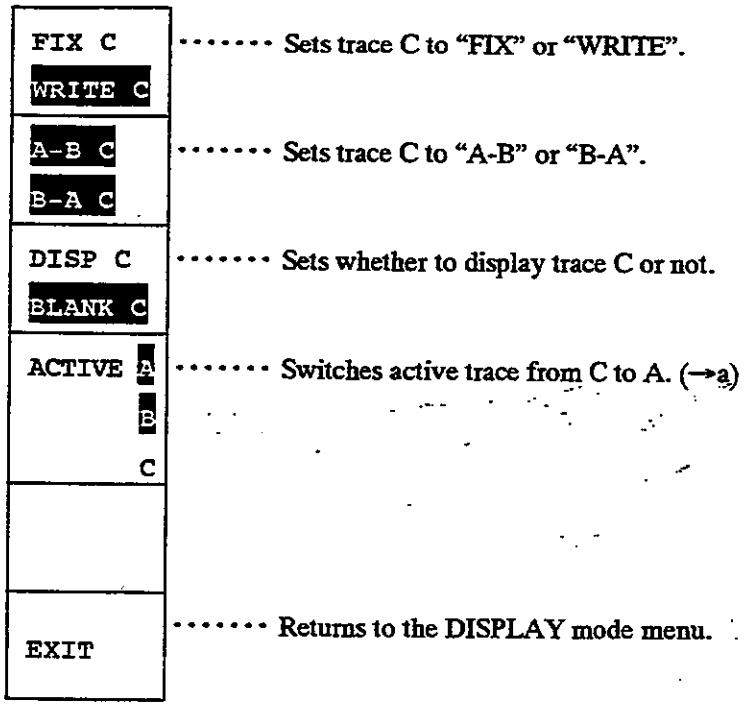
c. Setting trace C



a. Setting trace A

① <FIX A WRITE A> key

When "FIX A" is displayed:

Trace A is set to the data fixing mode.

In this mode, the data of trace A will not changed even if measurement is performed. For this reason, the waveform on the screen will also not change. The Trace display in the on the right of the Label area will display "FIX".

When this key is pressed during sweep to change to "FIX A", it will be fixed at the state currently displayed. When traces A, B, and C are all set to "FIX", WARNING will be displayed.

When "WRITE A" is displayed:

Trace A will be set to the write mode.

In this mode, the waveform measured will become the data of trace A and displayed on the screen. The Trace display in the on the right of the Label area will display "WRITE".

② <MAX A ROLL A> key

When "MAX A" is displayed:

Trace A is set to the maximum detection mode.

In this mode, the data of each measurement point will be compared with the previous measured values each time measurement is performed, and the greater data will be written in trace A.

The Trace display in the on the right of the Label area will also change "MAX".

When "ROLL A" is displayed:

Trace A will be set to the sequential addition mode.

In this mode, sequential addition and averaging will be performed with the previous measured data each time measurement is performed, and the data will be written in trace A.

After execution, the current number of averagings will be displayed in the Interrupt Display area.

The number of averagings can be changed within the range of 2 to 1000 times (1 step) using the rotary knob. (The number of averagings can be set using the <TRACE AB ROLL AVG TIMES> key at the <PARAM2> menu of the <MISC> mode.)

The sequential addition is not affected by the NOISE MASK value set. NOISE MASK is performed when the results of sequential addition are displayed.

The Trace display in the on the right of the Label area changes to "ROLL".

Averaging is carried out according to the following equation.

$$Wj(i) = Wj-1(i) \cdot \frac{n-1}{n} + W(i)\frac{1}{n} \quad (i=1, 2 \cdots\cdots N)$$

Where:

Wj(i)	:New waveform displayed
Wj-1(i)	:Waveform displayed until now
W(i)	:New waveform obtained
N	:Number of samples
n	:Number of averagings

③ <DISP A BLANK A> key

Selects whether to display trace A or not on the screen.
When pressed, "DISP A" or "BLANK A" will be displayed highlighted.
When "DISP A" is displayed:
The waveform will be displayed on the screen.
When "BLANK A" is displayed:
No waveform will be displayed on the screen. The marker and marker value will disappear.

④ <ACTIVE A B C> key

Selects the active trace.
When pressed, highlighted displayed in the order of A → B → C → A.

NOTE

Active trace means the trace when the following functions are executed.
- PEAK CENTER, PEAK REF LEVEL
- Moving marker display
- PEAK SEARCH
- ANALYSIS

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

b. Setting trace B

① <FIX B WRITE B> key

When "FIX B" is displayed:
Trace B is set to the data fixing mode.
In this mode, the data of trace B will not changed even if measurement is performed. For this reason, the waveform on the screen will also not change. The Trace display in the on the right of the Label area will display "FIX".
When this key is pressed during sweep to change to FIX B, it will be fixed at the state currently displayed. When traces A, B, and C are all set to "FIX", WARNING will be displayed.
When "WRITE B" is displayed:
Trace B will be set to the write mode.
In this mode, the waveform measured will become the data of trace B and displayed on the screen. The Trace display in the on the right of the Label area will display "WRITE."

② <MIN B ROLL B key>

When "MIN B" is displayed:

Trace B is set to the minimum detection mode.

In this mode, the data of each measurement point will be compared with the previous measured values each time measurement is performed, and the smaller data will be written in trace B.

The Trace display in the on the right of the Label area will also change "MIN".

When "ROLL B" is displayed:

Trace B will be set to the sequential addition mode.

In this mode, sequential addition and averaging will be performed with the previous measured data each time measurement is performed, and the data will be written in trace B.

After execution, the current number of averagings will be displayed in the Interrupt Display area.

The number of averagings can be changed within the range of 2 to 1000 times (1 step) using the rotary knob. (The number of averagings can be set using the <TRACE AB ROLL AVG TIMES> key at the <PARAM2> menu of the <MISC> mode.)

The sequential addition is not affected by the NOISE MASK value set. NOISE MASK is performed when the results of sequential addition are displayed

The Trace display in the on the right of the Label area changes to "ROLL".

Averaging is carried out according to the following equation.

$$Wj(i) = Wj-1(i)\cdot\frac{n-1}{n} + W(i)\frac{1}{n} \quad (i=1, 2 \cdots\cdots N)$$

Where:

Wj(i)	:New waveform displayed
Wj-1(i)	:Waveform displayed until now
W(i)	:New waveform obtained
N	:Number of samples
n	:Number of averagings

③ <DISP B BLANK B> key

Selects whether to display trace B or not on the screen.

When pressed, "DISP B" or "BLANK B" will be displayed highlighted.

When "DISP B" is displayed:

The waveform will be displayed on the screen.

When "BLANK B" is displayed:

No waveform will be displayed on the screen. The marker and marker value will disappear.

④ <ACTIVE A B C> key

Selects the active trace.

When pressed, highlighted displayed in the order of A → B → C → A.

⑤ <EXIT> key

Switches between the wavelength display mode and frequency display mode.

Pressing this key switches to the wavelength display mode. (→ a)

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c. Setting trace C

① <FIX C WRITE C> key

When "FIX C" is displayed:

Trace C is set to the data fixing mode.

In this mode, the data of trace C will not changed even if measurement is performed. For this reason, the waveform on the screen will also not change. The Trace display in the on the right of the Label area will display "FIX".

When this key is pressed during sweep to change to "FIX C", it will be fixed at the state currently displayed. When traces A, B, and C are all set to "FIX", WARNING will be displayed.

When "WRITE C" is displayed:

Trace C will be set to the write mode.

In this mode, the waveform measured will become the data of trace C and displayed on the screen. The Trace display in the on the right of the Label area will display "WRITE".

② <A-B C B-A C> key

When "A-B C" is displayed:

The data of trace B is subtracted from trace A (LOG value) and the results are written in trace C.

When both traces A and B are set to BLANK, the subs scale is displayed on the left side of the screen. Other than that, the sub scale will be displayed on the right side of the screen.

When the waveform is recalled to traces A and B, calculation and display will be performed again. In addition, when the center wavelength and span are changed, calculation and display will be performed again based on the new waveform data.

The Trace display in the on the right of the Label area will also change to "A-B".

When the measuring conditions (RESOLUTION) of traces A and B match, WARNING will be displayed.

In either case, calculation and display will be performed.

When "B-A C" is displayed:

The data of trace C is subtracted from trace B (LOG value) and the results are written in trace C.

When both traces A and B are set to BLANK, the subs scale is displayed on the left side of the screen. Other than that, the sub scale will be displayed on the right side of the screen.

When the waveform is recalled to traces A and B, calculation and display will be performed again. In addition, when the center wavelength and span are changed, calculation and display will be performed again based on the new waveform data.

The Trace display in the on the right of the Label area will also change to "B-A".

When the measuring conditions (RESOLUTION) of traces A and B match, WARNING will be displayed.

In either case, calculation and display will be performed.

③ <DISP C BLANK C> key

Selects whether to display trace C or not on the screen.

When pressed, "DISP C" or "BLANK C" will be displayed highlighted.

When "DISP C" is displayed:
The waveform will be displayed on the screen.
When "BLANK C" is displayed:
No waveform will be displayed on the screen. The marker and marker value will disappear.

④ <ACTIVE A B C> key

Selects the active trace.
When pressed, highlighted displayed in the order of A → B → C → A.

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

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5.3.2 Setting Copy Between Waveform Display Memories

This section describes the *TRACE COPY* menu for copying between waveform display memories.

(1) Description of screen

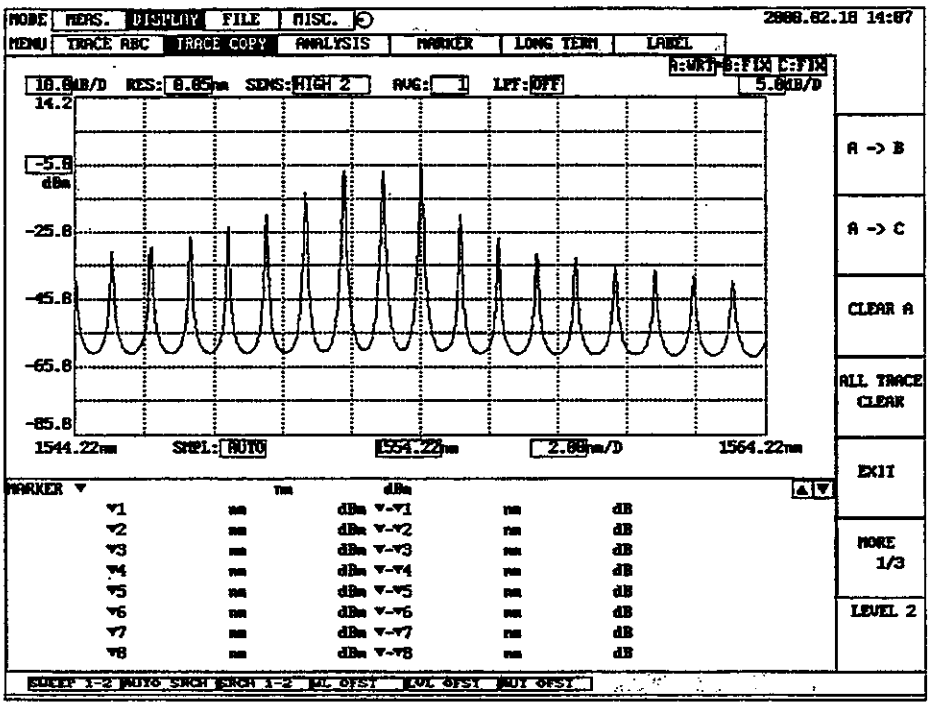


Fig. 5-3-2 Copy Between Waveform Display Memories Setting Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <TRACE COPY> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the DISPLAY mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key :	Executes the PROGRAM START menu. Invalid
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

6/

(4) Description of keys

a. When the TRACE COPY menu is opened:

A→B	····· Copies trace A to B and sets B to "FIX".
A→C	····· Copies trace A to C and sets C to "FIX".
CLEAR A	····· Clears the waveform of trace A.
ALL TRACE CLEAR	····· Clears the waveform of traces A, B, C.
EXIT	····· Returns to the DISPLAY mode menu.
MORE 1/3	····· Displays the second page of the soft key menu. (→b)

LEVEL 2

b. When the <MORE 1/3> key is pressed:

B→A	····· Copies trace B to A and sets A to "FIX".
B→C	····· Copies trace B to C and sets C to "FIX".
CLEAR A	····· Clears the waveform of trace B.
ALL TRACE CLEAR	····· Clears the waveform of traces A, B, C.
MORE 2/3	····· Displays the third page of the soft key menu. (→c)

LEVEL 2

c. When the <MORE 2/3> key is pressed:

C→A	····· Copies trace C to A and sets A to "FIX".
C→B	····· Copies trace C to B and sets B to "FIX".
CLEAR C	····· Clears the waveform of trace C.
ALL TRACE CLEAR	····· Clears the waveform of traces A, B, C.
MORE 3/3	····· Displays the third page of the soft key menu. ····· (→a)

LEVEL 2

a. When the TRACE COPY menu is opened:

① <A→B> key

Copies the data of trace A to trace B.
After copying, changes trace B to "FIX".
The Trace display in the on the right of the Label area also changes to "FIX".

② <A→C> key

Copies the data of trace A to trace C.
After copying, changes trace C to "FIX".
The Trace display in the on the right of the Label area also changes to "FIX".

③ <CLEAR A> key

Clears the waveform of trace A.

④ <ALL TRACE CLEAR> key

Clears the waveform of traces A, B, C.

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

⑥ <MORE 1/3> KEY

Displays the second page of the soft key menu. (→b)

b. When the <MORE 1/3> key is pressed:

① <B→A> key

Copies the data of trace B to trace A.
After copying, changes trace A to "FIX". The Trace display in the on the right of the Label area also changes to "FIX".

② <B→C> key

Copies the data of trace B to trace C.
After copying, changes trace C to "FIX". The Trace display in the on the right of the Label area also changes to "FIX".

③ <CLEAR B> key

Clears the waveform of trace B.

④ <ALL TRACE CLEAR> key

Clears the waveform of traces A, B, C.

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

⑥ <MORE 2/3> KEY

Displays the third page of the soft key menu. (→c)

c. When the <MORE 2/3> key is pressed:

① <C→A> key

Copies the data of trace C to trace A.
After copying, changes trace A to "FIX". The Trace display in the data area also changes to "FIX".

② <C→B> key

Copies the data of trace C to trace B.
After copying, changes trace B to "FIX". The Trace display in the on the right of the Label area also changes to "FIX".

③ <CLEAR C> key

Clears the waveform of trace C.

④ <ALL TRACE CLEAR> key

Clears the waveform of traces A, B, C.

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

⑥ <MORE 3/3> KEY

Displays the first page of the soft key menu. (→a)

5.3.3 Analysis of Optical Spectrum

This section describes the *ANALYSIS* menu for analyzing the optical spectrum.

(1) Description of screen

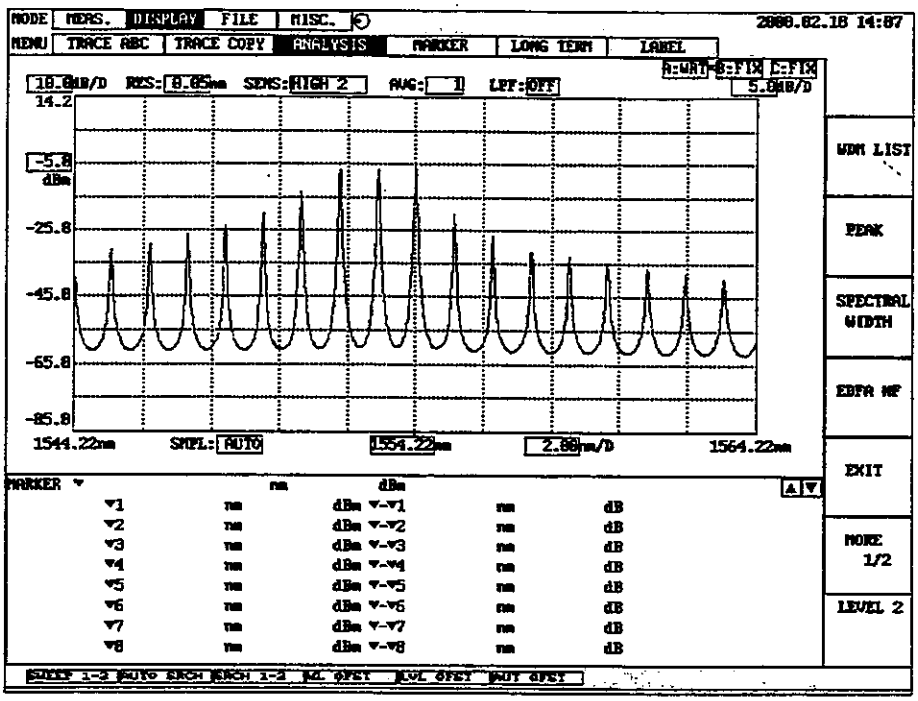


Fig. 5-3-3 Optical Spectrum Analysis Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <ANALYSIS> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key	:Sets the DISPLAY mode
[F1] to [F6] keys	:Execute the soft key menu.
[HELP] key	:Describes the operations.
[AUTO START] key	:Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key	:Executes the WL/FREQ SCL menu.
[LEVEL] key	:Executes the LEVEL SCALE menu.
[SWEEP] key	:Executes the SWEEP menu.
[ANALYSIS] key	:Executes the ANALYSIS menu.
[PRINT] key	:Outputs the screen to the printer.
[FEED] key	:Feeds the printer paper.
Rotary knob	:Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob :Changes the value.
Pressing the rotary knob :Fixes the value or changes the digits.

✧ When displayed as "LIST SCROLL"
Rotating the rotary knob :Scrolls the data area list.
Pressing the rotary knob :Changes the rotary knob function display to "DELTA MARKER (FINE)".

✧ When displayed as "DELTA MARKER (FINE)"
Rotating the rotary knob :Moves the cursor on the waveform screen dot by dot.
Pressing the rotary knob :Changes the rotary knob function display to "DELTA MARKER (COARSE)".

✧ When displayed as "DELTA MARKER (COARSE)"
Rotating the rotary knob :Moves the cursor on the waveform screen 1/4 div at a time.
Pressing the rotary knob :Changes the rotary knob function display to "LIST SCROLL".

(4) Description of keys

a. When the ANALYSIS menu is opened:

WDM LIST	····· Displays the WDM analysis list. (→d or e)
PEAK	Sets the ∇ marker to the peak. Also enables the marker to be moved using the rotary knob. (→f)
SPECTRAL WIDTH	····· Displays the spectral width. (→g)
EDFA NF	····· Calculates and displays NF and GAIN using the waveform of traces A and B. (→h or i)
EXIT	····· Returns to the DISPLAY mode menu.
MORE 1/3	····· Displays the second page of the soft key menu. (→b)

LEVEL 2

b. When the <MORE 1/3> key is pressed:

WDM-NF	····· Calculates and displays center wavelength of each channel and signal light level, output light level, ASE level, NF and GAIN using the waveform of traces A and B.
SMSR	····· Calculates and displays the SMSR.
PMD	····· Calculates and displays the PMD.
AUTO SEARCH ON OFF	····· Switches whether to execute the selected ANALYSIS for every sweep.
SEARCH L1-L2 ON OFF	····· Switches whether to perform ANALYSIS between line markers 1 and 2 or for the whole area.
MORE 2/3	····· Displays page 3 of the soft key menu. (→c)

LEVEL 2

c. When the <MORE 2/3> key is pressed:

POWER	····· Displays the integrated power.
MORE 3/3	····· Displays page 1 of the soft key menu. (→a)

LEVEL 2

d. - WDM Analysis List -

When REF CHANNEL DEFINE is set to No.:

OFFSET **SPACING**	····· Switches the WDM analysis list display to "OFFSET" or "SPACING".(→e)
REF CHANNEL	····· Sets the channel serving as reference during OFFSET calculation. 1~256ch 1ch STEP
ABSOLUTE **RELATIVE**	····· Sets whether to display the wavelength, level, noise, SNR in the absolute value or in the relative value in respect to the reference data.
REF DATA SET	····· Sets the latest WDM analysis results to the reference data.
REF DATA INITIAL	····· Sets the preset value to the reference data.
RETURN	····· Returns to the ANALYSIS menu.

LEVEL 3

e. - WDM Analysis List -

When REF CHANNEL DEFINE is set to WAVELENGTH

OFFSET SPACING	····· Switches the WDM analysis list display to "OFFSET" or "SPACING".(→d)
REF CHANNEL	····· Sets the channel serving as the reference in OFFSET calculation in wavelength. 1200~1600nm 0.01nm STEP
ABSOLUTE RELATIVE	····· Sets whether to display the wavelength, level, noise, SNR in the absolute value or in the relative value in respect to the reference data.
REF DATA SET	····· Sets the latest WDM analysis results to the reference data.
REF DATA INITIAL	····· Sets the preset value to the reference data.
RETURN	····· Returns to the ANALYSIS menu.

LEVEL 3

*REF CHANNEL DEFINE can be set at "WDM:CHANNEL DEFINE" if the <PARAMETER 1> menu of the <MISC> mod For details, refer to section 5.5.3.

f. When the <PEAK> key is pressed at the ANALYSIS menu:

NEXT PEAK →	Displays the marker at the mode peak on the right side of the current ∇ marker position.
NEXT PEAK ←	····· Displays the marker at the mode peak on the left side of the current ∇ marker position.
SET MARKER	····· Sets the fixed marker at the ∇ marker position.
CLEAR	····· Clears the last ∇ marker set.
ALL CLEAR	····· Clears the ∇ marker and fixed marker.
RETURN	····· Returns to the ANALYSIS menu.

LEVEL 3

g. When the <SPECTRAL WIDTH> key is pressed at the ANALYSIS menu:

THRESH **THRESH (FIT)**	******* Switches the algorithm of the spectral width to THRESH or THRESH (MODE FIT).
RMS **PEAK RMS**	******* Switches the algorithm of the spectral width to RMS or PEAK RMS.
ENV **NOTCH**	******* Switches the algorithm of the spectral width to ENVELOPE or NOTCH.
THRESH VALUE	******* Sets the threshold value of the spectral width search. 0.01–50dB 0.01dB STEP
RETURN	******* Returns to the ANALYSIS menu.

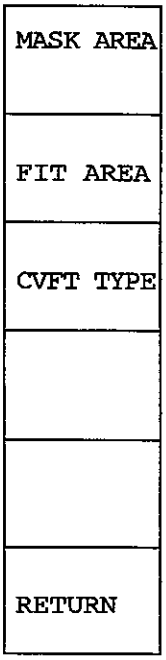
LEVEL 3

h. When the <EDFA NF> key is pressed at the ANALYSIS menu (Wavelength display mode)

MASK AREA	Sets the curve fit mask area. 0–99.99nm 0.01nm STEP
FIT AREA	******* Sets the curve fit area. 0–99.99nm 0.01nm STEP
CVFT TYPE	******* Specifies the curve fit algorithm. GAUSSIAN, LORENZIAN, 3RD, 4TH, 5TH
RETURN	******* Returns to the ANALYSIS menu.

LEVEL 3

i. When the <EDFA NF> key is pressed at the ANALYSIS menu (Frequency display mode)



MASK AREA ····· Sets the curve fit mask area.
0~9.999THz 0.001THz STEP

FIT AREA ····· Sets the curve fit area.
0~9.999THz 0.001THz STEP

CVFT TYPE ····· Specifies the curve fit algorithm.
GAUSSIAN, LORENZIAN, 3RD, 4TH, 5TH

RETURN ····· Returns to the ANALYSIS menu.

LEVEL 3

*Set the "waveform display mode" and "frequency display mode" using the <HOZN SCL WAVE LEN FREQ> key of the <MEAS.> mode.

a. When the ANALYSIS menu is opened:

① <WDM LIST> key

Displays the WDM analysis list. (→d or e)

② <PEAK> key

Performs peak search (maximum level detection) and sets the moving marker in respect with the waveform of the active trace, and displays the marker value in the data area. When the peal level exceeds the top or bottom of the screen, the marker will be displayed at the top or bottom, but the exact marker value will be displayed.
When executed, the marker can be moved using the rotary knob. (→f)

③ <SPECTRAL WIDTH> key

Displays the spectral width.

④ <EDFA NF> key

Calculates the NF (NOISE FIGURE) taking that the waveforms before and after the optical amplitudes are in traces A and B, and displays in the data area.
If the measuring conditions of traces A and B differ, WARNING will be displayed. (→h or i)

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

⑥ <MORE 1/3> KEY

Displays the second page of the soft key menu. (→b)

b. When the <MORE 1/3> key is pressed:

① <WDM-NF> key

Like WDM Analysis, calculates and displays center wavelength of each channel and signal light level, output light level, ASE level, NF and GAIN using the waveform of traces A and B.

② <SMSR> key

Displays the SMSR (Side-Mode Suppression Ratio) by the waveform of the active trace.
Measures the side mode suppression ratio, sets the moving marker and fixed marker 1 to the peak level of the waveform, and the fixed marker 2 to the next highest level, and displays the results in the data area. Used mainly for the measurement of the DFB laser. If no data exists for the active trace, WARNING will be displayed.

③ <PMD> key

Calculates and displays the PMD.

④ <AUTO SEARCH ON OFF> key

This is for switching over between "executing the selected ANALYSIS (setting to ON)"and "not executing the selected ANALYSIS (setting to OFF)" at each sweeping. When the setting is made to "ON", "SRCH1-2" appearing at the bottom section on the display will become reversed.

⑤ <SEARCH L1-L2 ON OFF> key

This is for switching over between "executing the ANALYSIS for the range between the line marker 1 and the line marker 2 (setting to ON)" and "executing the ANALYSIS throughout the whole range (setting to OFF)". When the setting is made to "ON", "SRCH1-2" appearing at the bottom section on the display will become reversed.

⑥ <MORE 2/3> KEY

Displays the third page of the soft key menu. (→c)

c. When the <MORE 2/3> key is pressed:

① <POWER> key

Performs power measurement in respect to the active trace waveform.
When "SEARCH L1-L2" is ON, displays the integrated power value of the area enclosed by wavelength markers 1 and 2 in the data area.
When "SEARCH L1-L2" is OFF, calculates the power in the effective area of the screen.
When "SEARCH L1-L2" is ON, if wavelength line marker 1 or 2 is set outside the area, it is determined that no data exists and WARNING will be displayed.
The area calculated differs according to the setting of the wavelength line markers.
In Fig. 5-3-4, the shaded portion is the area totaled for each setting.

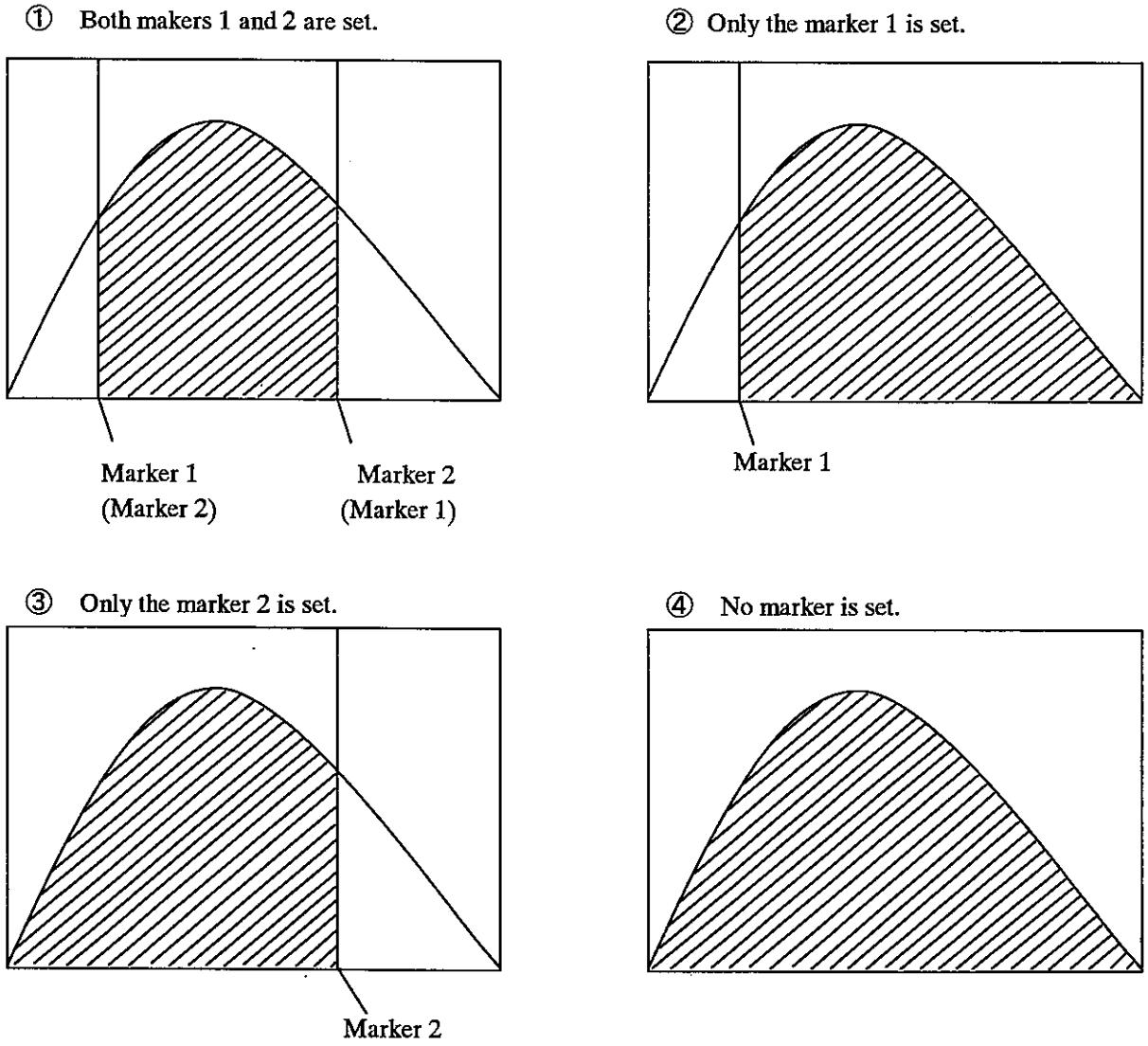


Fig. 5-3-4 Area of Power Between Markers

The power measured is calculated using the following equation.

$$P = S \times \Sigma (Pi / Ri)$$

For the A-B, B-A waveforms:

$$P = S \times \Sigma Pi$$

Where:

P :Power measured
S :Wavelength difference between the displayed points [SPAN/1000]
Pi :Level of each point
Ri :Actual resolution of the wavelength of each point (Memorized by the unit.)

② <MORE 3/3> KEY

Displays the first page of the soft key menu. (→a)

d. - WDM Analysis List -

When REF CHANNEL DEFINE is set to No.

① <OFFSET SPACING> key

Selects the WDM display item.
When "OFFSET" is displayed:
Displays the offset value with a random channel as the reference.
When "SPACING" is displayed
Displays the offset value for the next channel.

② <REF CHANNEL> key

Sets the channel serving as the reference during OFFSET calculation.
1 to 256ch 1ch steps

③ <ABSOLUTE RELATIVE> key

When "ABSOLUTE" is displayed:
Displays the wavelength, level, noise, SNR in the absolute value.
When "RELATIVE" is displayed:
Displays the wavelength, level, noise, SNR in the relative value for the reference data.

④ <REF DATA SET> key

Sets the latest WDM analysis results as the reference data.

⑤ <REF DATA INITIAL> key

Sets the preset value as the reference data.

⑥ <RETURN> KEY

Returns to the ANALYSIS menu.

e. - WDM Analysis List -

When REF CHANNEL DEFINE is set to WAVELENGTH.

① <OFFSET SPACING> key

Selects the WDM display item.
When "OFFSET" is displayed:
Displays the offset value with a random channel as the reference.
When "SPACING" is displayed
Displays the offset value for the next channel.

② <REF CHANNEL> key

Sets the channel serving as the reference in OFFSET calculation in wavelength.
1200 to 1700nm 0.01nm step

③ <ABSOLUTE RELATIVE> key

When "ABSOLUTE" is displayed:
Displays the wavelength, level, noise, SNR in the absolute value.
When "RELATIVE" is displayed:
Displays the wavelength, level, noise, SNR in the relative value for the reference data.

④ <REF DATA SET> key

Sets the latest WDM analysis results as the reference data.

⑤ <REF DATA INITIAL> key

Sets the preset value as the reference data.

⑥ <RETURN> KEY

Returns to the ANALYSIS menu.

f. When the <PEAK> key is pressed at the ANALYSIS menu

① <NEXT PEAK → > key

At the active trace waveform, sets the moving marker to the next right side peak (large value) of the moving marker value (Level) set currently. If no such peak exists, the moving marker is displayed at the same position.
Even if the peak exceeds the top or bottom of the screen, the exact marker value will be displayed.

② <NEXT PEAK ← > key

At the active trace waveform, sets the moving marker to the next left side peak (large value) of the moving marker value (Level) set currently. If no such peak exists, the moving marker is displayed at the same position.
Even if the peak exceeds the top or bottom of the screen, the exact marker value will be displayed.

③ <SET MARKER> key

Sets the fixed marker at the moving marker position and displays the marker value in the data area. Even after fixing, the moving marker can be moved using the rotary knob.

④ <CLEAR> key

Clears the marker last set.

⑤ <ALL CLEAR> key

Clears all markers displayed.

⑥ <RETURN> KEY

Returns to the ANALYSIS menu.

g. When the <SPECTRAL WIDTH> key is pressed at the ANALYSIS menu:

① <THRESH THRESH (FIT)> key

When "THRESH" is displayed:
When spectral width search is executed by the threshold method, sets the algorithm of the spectral width to the position at which the level matches the threshold level .
When "THRESH (FIT)" is displayed:
.When spectral width search is executed by the threshold method as the algorithm of the spectral width, sets the marker to the peak of the mode.

② <RMS PEAK RMS> key

When "RMS" is displayed:
The limit value of the spectral width search by the RMS method can be set.
When "PEAK RMS" is displayed:
The limit value of the spectral width search by the PEAK RMS method can be set.

③ <ENV NOTCH> key

When "ENV" is displayed:
The limit value of the spectral width search by the envelope method can be set.
When "NOTCH" is displayed:
The threshold value of the notch width measurement can be set.

④ <THRESH VALUE> key

Sets the threshold value of the spectral width search.
0.01 to 50dB 0.01dB step

⑤ <RETURN> KEY

Returns to the ANALYSIS menu.

h. When <EDFA NF> key of the ANALYSIS menu is pressed (Wavelength display mode)

① <MASK AREA> key

Specifies the mask range when masking the signal light in NF calculation.
When executed, the current mask area will be displayed at the Interrupt Display area.
The mask area can be changed in the range of 0 to 99.99nm (0.01nm step) using the rotary knob.

② <FIT AREA> key

Sets the threshold value when performing curve fit during NF calculation.
When executed, the current setting will be displayed at the Interrupt Display area.
The threshold value can be changed in the range of 0 to 99.99nm (0.01nm step) using the rotary knob.

③ <CVFT TYPE> key

Selects the type of curve fit (appropriate equation).
When executed, the current setting will be displayed at the Interrupt Display area.
The curve fit type can be changed using the rotary knob.
The curve fit can be selected from the following five types.

- GAUSSIAN (Regular distribution curve)
- LORENZIAN (Lorenzian curve)
- 3RD POLY (Cubic expression)
- 4TH POLY (Biquadratic expression)
- 5TH POLY (Pentagonal expression)

④ <RETURN> KEY

Returns to the ANALYSIS menu.

i. When <EDFA NF> key of the ANALYSIS menu is pressed (Frequency display mode)

① <MASK AREA> key

Specifies the mask range when masking the signal light in NF calculation.
When executed, the current mask area will be displayed at the Interrupt Display area.
The mask area can be changed in the range of 0 to 9.999THz (0.001THz step) using the rotary knob.

② <FIT AREA> key

Sets the threshold value when performing curve fit during NF calculation.
When executed, the current setting will be displayed at the Interrupt Display area.
The threshold value can be changed in the range of 0 to 9.999THz (0.01THz step) using the rotary knob.

③ <CVFT TYPE> key

Selects the type of curve fit (appropriate equation).
When executed, the current setting will be displayed at the Interrupt Display area.
The curve fit type can be changed using the rotary knob.
The curve fit can be selected from the following five types.

- GAUSSIAN (Regular distribution curve)
- LORENZIAN (Lorenzian curve)
- 3RD POLY (Cubic expression)
- 4TH POLY (Biquadratic expression)
- 5TH POLY (Pentagonal expression)

④ <RETURN> KEY

Returns to the ANALYSIS menu.

(5) NF Measurement Function

① Outline

Measures the NF (Noise Figure) of the optical fiber amplifier.
Inputs the optical spectrum of the signal light to trace A and the optical spectrum after the signal light is amplified by the optical fiber amplifier to trace B. When this function is executed, the following item will be calculated and displayed in the data area.

ASE (Amplified Emission) level
Gain
NF

The data of trace B is used for the calculation of ASE, however the optical spectrum of the signal must be masked. The masking area can be set freely.
As for the measuring resolution during the ASE level measurement required for calculating the NF, half of the optical spectrum before amplification is taken as the resolution.
These marking areas and measuring resolutions are displayed.
Level offset can be imposed on the optical spectrum before and after amplification.
If an isolator or coupler is connected to the input/output of the optical fiber amplifier, this compensate the loss.

② Operation

1. Set trace A to "WRITE" and measure the optical spectrum of the signal light (light input to the optical fiber amplifier). After measuring, set trace A to "FIX".

2. Set trace B to "WRITE" and measure the optical spectrum of the output light (light amplified by the optical fiber amplifier). After measuring, set trace B to "FIX".

3. Press the <EDFA NF> key of the <ANALYSIS> menu of the <DISPLAY> mode.

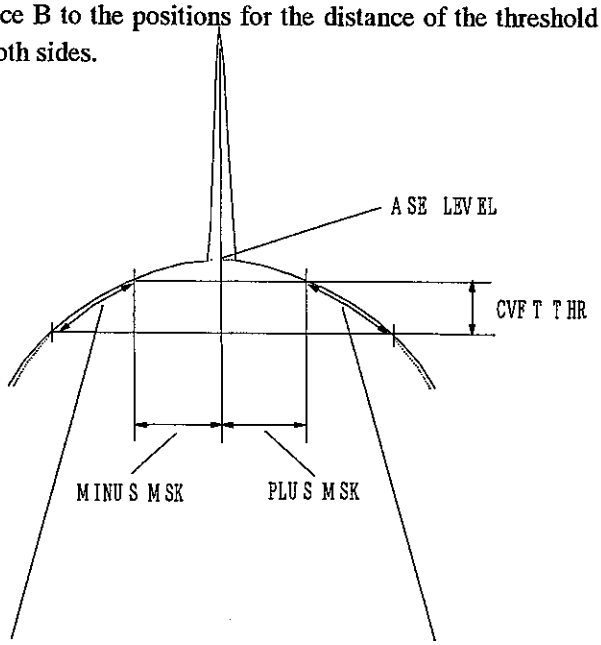
4. The NF measurement function will be executed and the results will be displayed in the data area. As the next soft key will also be displayed, press the required key and input the parameter using the rotary knob.

   - <MASK AREA key> ・・・・・・Masking area during the ASE calculation
   - <CVFT TYPE key>・・・・・・・・Approximate equation of the ASE curve
     GAUSSIAN :Regular distribution curve
     LORENZIAN :Lorenzian curve
     3RD POLY :Cubic expression
     4TH POLY :Biquadratic expression
     5TH POLY :Pentagonal expression
   - <FIT AREA> key ・・・・・・・・・Threshold value in the approximation of the ASE curve

② Calculating method

1. ASE level P ASE

Perform approximation by the function specification by the <CVFT TYPE> key for the data from position of the peak wavelength ± masking area (set by the <MASK AREA> key) based on the waveform data of trace B to the positions for the distance of the threshold value (set by the <FIT AREA> key) on both sides.



Perform approximation using the function specified by the <CVFT TYPE> key for the data of this area. When obtaining the approximation curve, the whole trace B waveform will normally be taken into consideration for the approximation. However, by setting the wavelength line markers using the <LINE1> and <LINE 2> keys at the <MARKER> menu of the <DISPLAY> mode, and setting the <SEARCH L1-L2> key at the <ANALYSIS> menu of the <DISPLAY> mode to ON, only the area enclosed by the line markers will be taken into consideration for the approximation.

2. Gain G

$G = (PB-PASE) / PA$

PA :Peak level of the signal light
PB :Peak level of the light amplified by the optical fiber amplifier

3. NF

$$NF = \frac{PASE}{\Delta\nu \cdot G \cdot h \cdot \nu} + \frac{1}{G}$$

$\Delta\nu$:Measuring resolution
Value obtained by calculating half the width of the waveform of trace A and converting to frequency
h :Blank constant
ν :Value obtained by calculating the peak wavelength of the waveform of trace B and converting to frequency

(6) WDM analysis function

Obtains the following values from the WDM waveform. The results will be displayed in a list.

Peak wavelength for each channel (WAVELENGTH)	λi
Peak level for each channel (LEVEL)	Li
Noise level for each channel peak (NOISE)	LNi
Difference between the peak level and noise level of each channel (SNR)	SNi
Wavelength difference of the reference channel peak	
Level difference of the reference channel peak	

However i=1,2,.....n

* Differentiating channels
  - When CHANNEL-DETECTION is AUTO
    ① All maximum and minimum points of the waveform are obtained.
    ② Maximum points which have a level difference of more than the MODE DIFF with the minimum points on both sides, and level difference of less than the THRESHOLD in respect to the greatest maximum point are determined as the channel peak λi.
    The maximum channel peak is up to the CHANNEL No.
    ③ The i number is CHANNEL 1, 2, ···· in order from the short wavelength of the channel peak.
  - When CHANNEL DETECTION is PRESET
    ① The center point with the left and right channels is obtained for each channel set by CHANNEL WAVELENGTH.
    ② The peak in the area from the center point of the left channel to that of the right channel is obtained for each channel, and that point is determined as the channel λi.

※ "MODE DIFF", "THRESHOLD", "REF CHANNEL NO.", "REF CHANNEL WAVELENGTH" are set at the PARAM1 menu of the MISC mode.

* Calculating the noise
  - When NOISE DETECTION is FIXED
    ① The levels E_{Li} and E_{Ri} of the points separated for the left and right NOISE POINTs (nm) are obtained for each channel.
    ② The noise level LNi is obtained.

$$L_{Ni} = \frac{E_{Li} + E_{Ri}}{2}$$

    L_{Ni} is the value converted to power density per NOISE BANDWIDTH(nm).
  - When NOISE DETECTION is CENTER
    ① The noise level LNi of each channel peak is obtained.
      - This is to compute the center point level Ei between each channel.
      - The average value of the left and right Ei values is obtained for each channel. (Linear interpolation)
      - It further converts this value (preset power per 1-resolution) into the power density per NOISE-BANDWIDTH (nm), or the LNi.

      ※ As for the "noise point" and "noise bandwidth", respective values can be set on the PARAM 1 menu under the MISC mode.

* When OFFSET is selected

The waveform difference OFFSET WL and level difference OFFSET LVL for an arbitrary reference channel is obtained.

* When SPACING is selected

The wavelength difference SPACING and level difference LVL DIFF for one short wavelength channel is obtained.

※ The wavelength of each channel peak and wavelength difference are displayed in frequency when the marker is displayed in frequency.

(7) Power between markers measuring function

The total power of the area enclosed by the wavelength line markers 1 and 2 can be obtained in the waveform displayed.
This function is effective for ASE evaluation of the optical amplifier.

① Set wavelength line markers 1 and wavelength line markers 2 on the two sides of the area whose total power is to be measured.

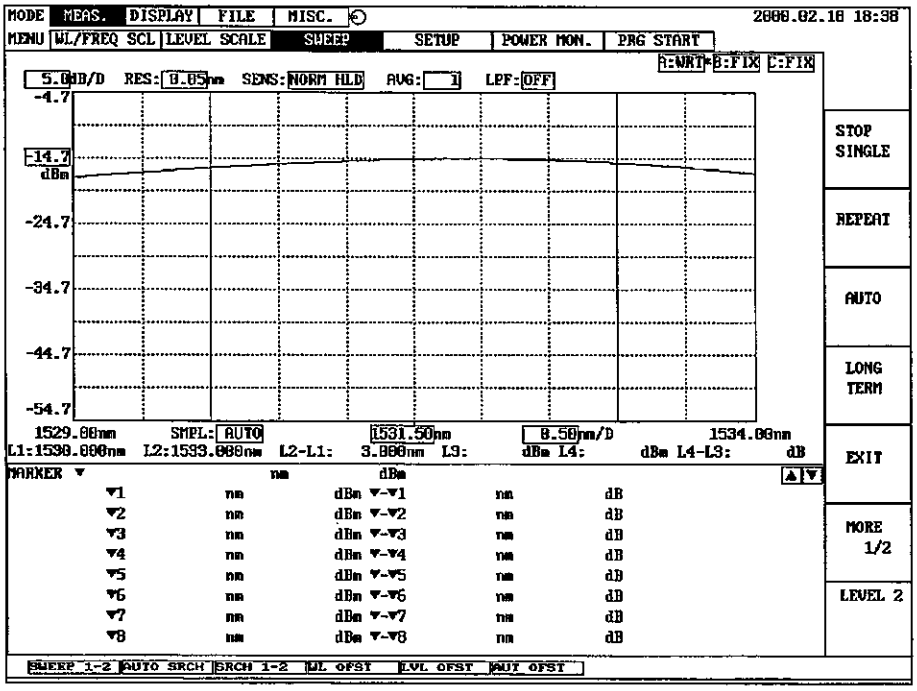


Fig. 5-3-5 Setting of Area for Measuring Power Between Markers

② After selecting the ANALYSIS menu of the DISPLAY mode, press the <MORE 1/2> key, and then press the <SEARCH L1-L2 ON OFF> key from the soft key menu displayed to highlight "ON".

③ Next, press the <POWER> key from the soft key menu displayed.
Pressing the <POWER> key when "OFF" of the <SEARCH L1-L2 ON OFF> key is highlighted will calculate the total power of the whole screen.

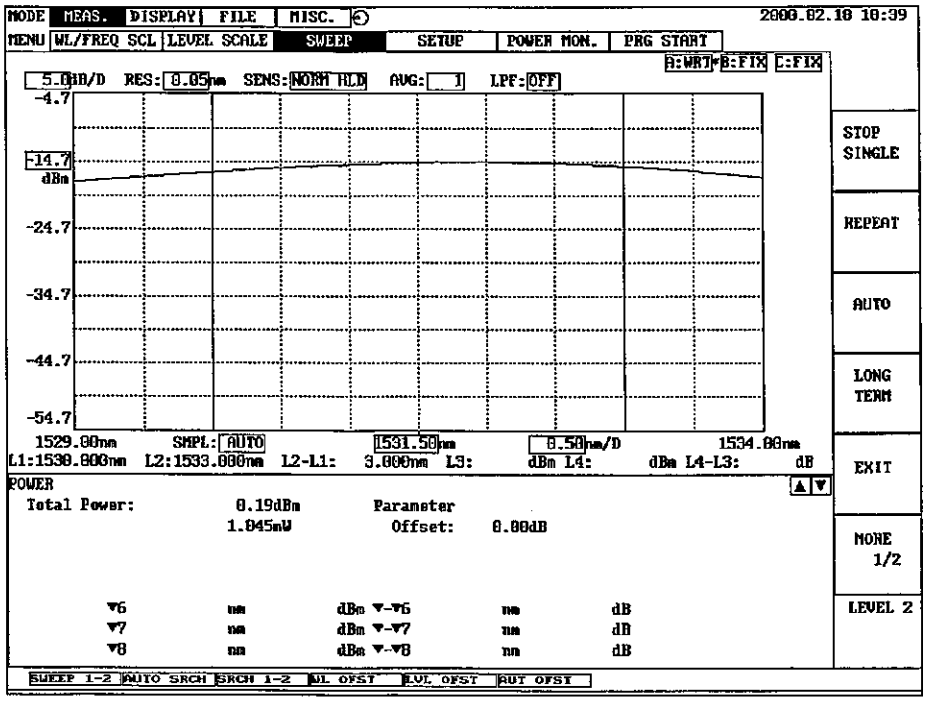


Fig. 5-3-6 After Executing Power Between Markers Measuring Function

④ To cancel the power between markers measuring function, press the ANALYSIS menu, and press the <SPECTRAL WIDTH> or <SMSR> soft key.

(8) Spectral width measurement

The spectral width of LDs, LEDs, etc. can be measured.

① To measure the spectral width of the waveform displayed on the screen, press the ANALYSIS menu.

② When pressed, the soft key menu will be displayed, calculation of the spectral width will be performed according to the algorithm selected amongst the spectral width algorithms shown in Table 5-3, and markers will be displayed.

Table 5-3 Spectral Width Algorithm

Algorithm	Details
ENV method	Obtains the spectral width from the envelope of the waveform.
THRESH method	Obtains the spectral width from the width of the point at which the waveform intersects the threshold value.
RMS method	Obtains the spectral width from the standard deviation of the waveform.

④ When the ANALYSIS menu is pressed, the $\Delta\lambda$ value is displayed in the data area, and this value is the spectral width. The λc displayed in the data area indicates the center of the spectral width $\Delta\lambda$.

④ To measure the spectral width each time sweep is performed, display "ON" highlighted of the <AUTO SEARCH ON OFF> key using the soft key menu displayed when the ANALYSIS menu is pressed. This function is useful for monitoring the spectral width while performing repeat sweep.

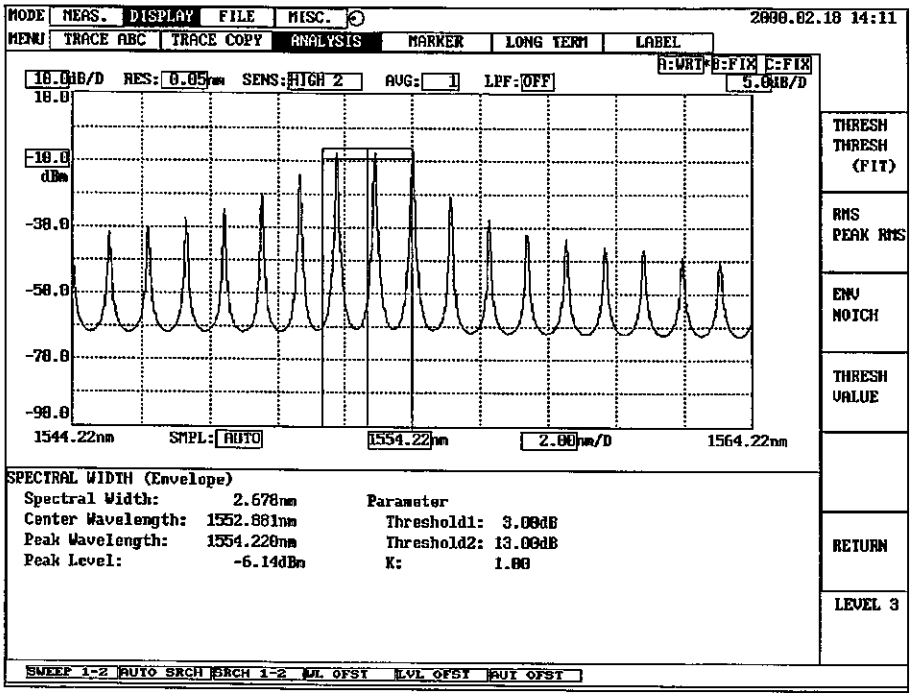


Fig. 5-3-7 Example of Spectral Measurement by ENV Method

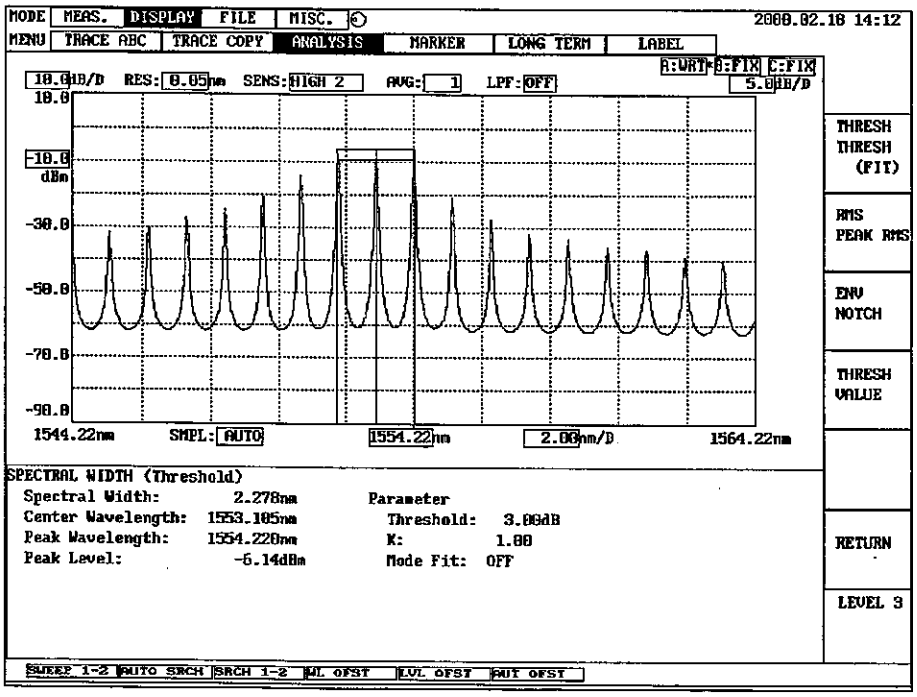


Fig. 5-3-8 Example of Spectral Measurement by THRESH Method

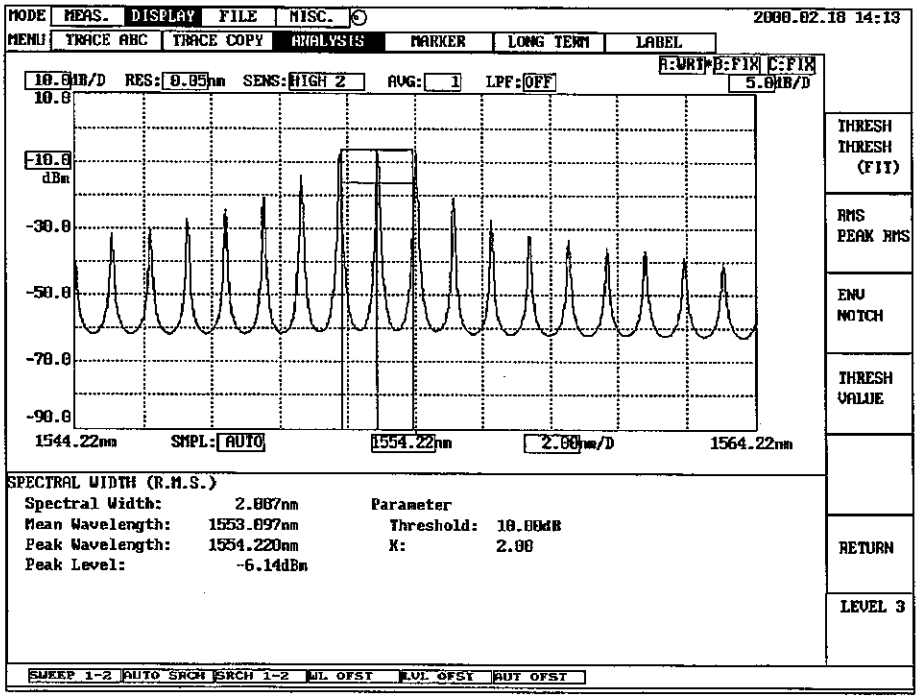


Fig. 5-3-9 Example of Spectral Measurement by RMS Method

(9) SMSR measurement

This function can be used to measure the SMSR of the DFB-LD.

NOTE

SMSR stands for Side-Mode Suppression Ratio. SMSR indicates the level difference between the peak level and side model level. It serves as one value for evaluating the performance of DFB-LD, etc.

The following describes the procedure of SMSR measurement.

① Select the ANALYSIS menu.

② Press the <SMSR *> key from the soft key menu.

③ The definition currently set in the definitions of SMSRs 1 and 2 is displayed in the Interrupt Display area, and SMSR measurement is executed according to this definition.

④ The definition of the SMSR selected is set by the "SMSR:ALGORITHM" in the PARAM2 menu of the MISC mode. Markers are displayed accordingly.

⑤ The definitions of SMSR1 and 2 are shown in (i) and (ii).

(i) When SMSR1 is selected

The level difference between the largest mode peak and the next largest mode peak (excluding the mark setting area) will be obtained by one-touch.

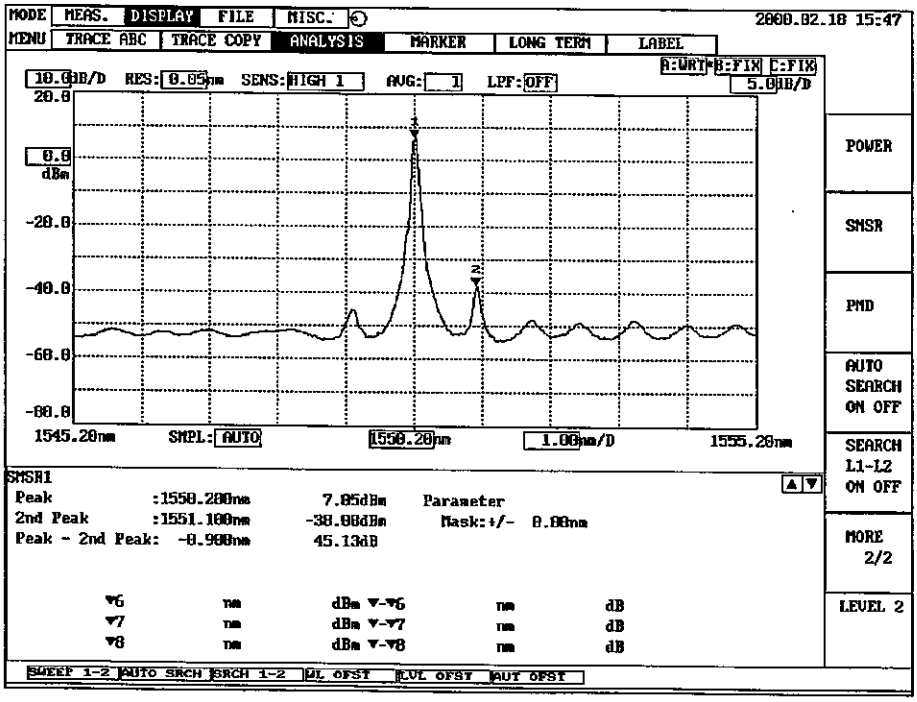


Fig. 5-3-10 When SMSR1 is Selected

(ii) When SMSR2 is selected

The level difference between the largest mode peak and the larger mode peak between its left and right sides will be obtained by one-touch.

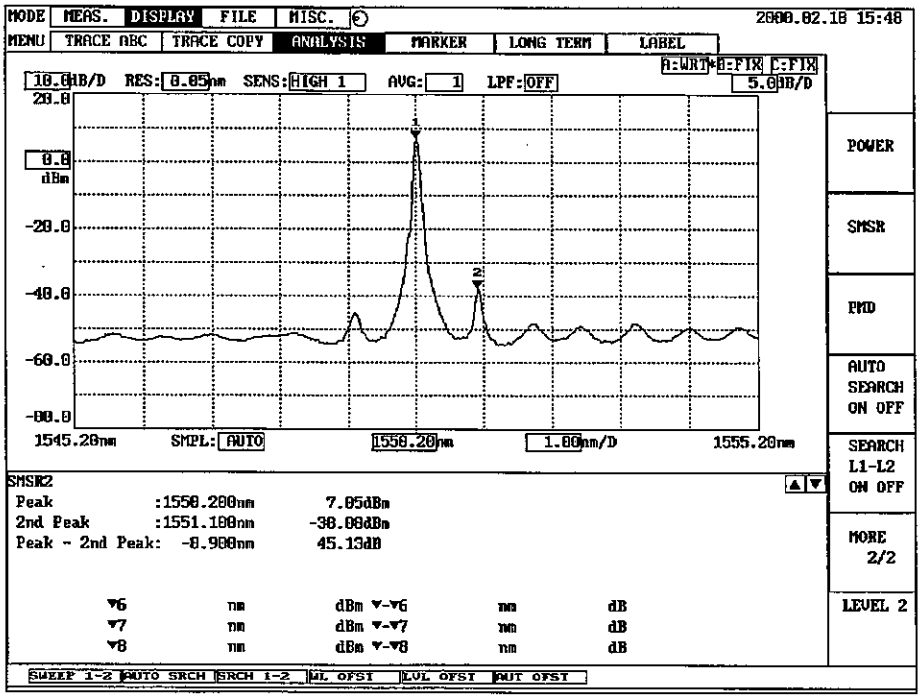


Fig. 5-3-11 When SMSR2 is Selected

(10) Spectrum width data calculation algorithm

This section describes the methods of calculating the spectral width of the waveform displayed and the algorithm of the NOTCH width measurement.

1. Envelope method

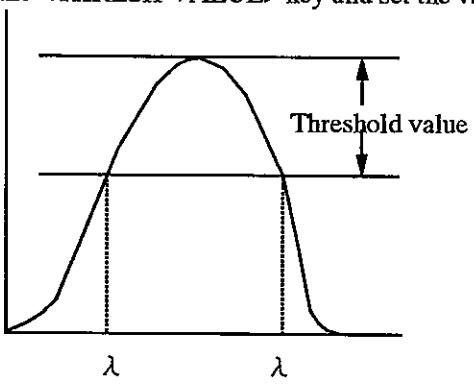
① Mode search is performed and the mode peak is obtained.
After the mode is determined by the peak level difference (set by "PEAK SEARCH MODE DIFF" at the PARAM1 menu of the MISC mode), a mode peak above the threshold value TH2 (set by "SPECTRAL WIDTH:TH2 FOR ENVELOPE" at the PARAM2 menu of the MISC mode) is obtained.

② The spectral width is obtained.

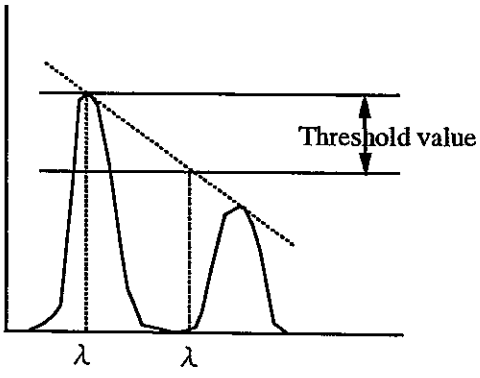
(a) When less than one mode peak
Taking the wavelengths at which the spectrum and threshold value TH1 intersect as λ_1, λ_2, λ_2-λ_1 is taken as the spectral width $\Delta\lambda$.

※ Setting TH1

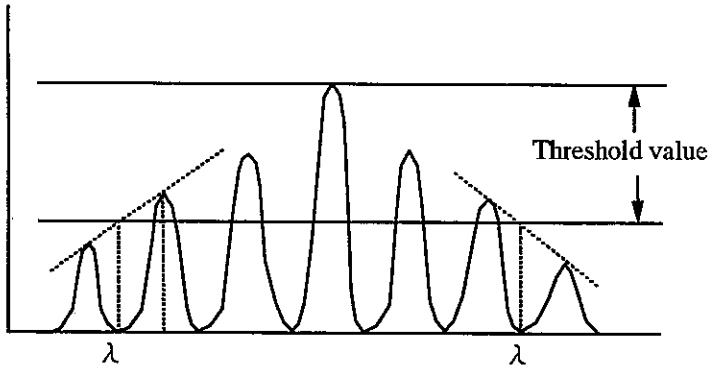
1. Press the <SPECTRAL WIDTH> key at the ANALYSIS menu of the DISPLAY mode.
2. Press the <ENV NOTCH> key so that "ENV" is displayed highlighted.
3. Next press the <THRESH VALUE> key and set the value using the rotary knob.



(b) When two mode peaks
The difference between the wavelength λ_2 at which the straight line (envelope) joining the two mode peaks intersect with the threshold value TH1 and the peak wavelength λ_1 (λ_2-λ_1) is taken as the spectral width $\Delta\lambda$.
However if the envelope does not intersect with the threshold value TH1, the wavelengths of the two mode peaks are taken as λ_1 and λ_2.



(c) When more than 3 mode peaks



(i) The mode peaks are joined by a straight line (envelope).

(ii) When the wavelengths at which the envelope intersects with the threshold value TH1 are taken as λ_1 and λ_2, λ_2-λ_1 is taken as the spectral width $\Delta\lambda$.
However, if the envelope does not intersect with the threshold value TH1, the mode peak with the lowest level is taken as λ_1 or λ_2.

③ The spectral width $\Delta\lambda$ obtained is multiplied by K (set by "SPECTRAL WIDTH:K FOR ENVELOPE" at the PARAM2 menu of the MISC mode).

④ The λc displayed in the data area indicates the center of the spectral width $\Delta\lambda$.

⑤ The MODE displayed in the data area indicates the number of mode peaks above the threshold value TH2.

2. Threshold method

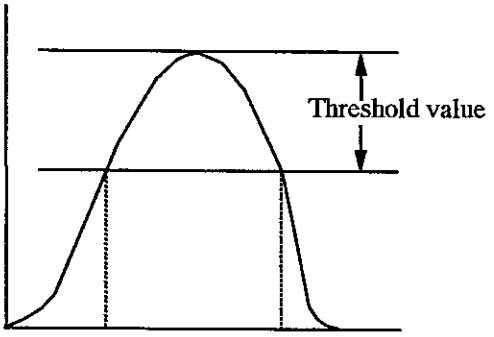
① Mode search is performed and the mode peak is obtained.
The mode peak is obtained by determining the mode by the peak level difference (set by "PEAK SEARCH MODE DIFF" at the PARAM1 menu of the MISC mode).

② The spectral width is obtained.
The method is described below.

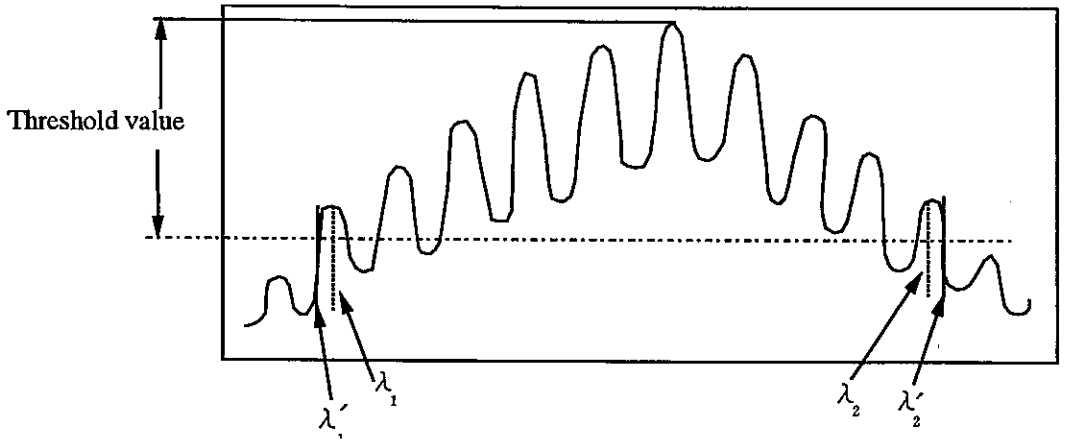
(a) When less than one mode peak
Taking the wavelengths at which the spectrum and threshold value TH intersect as λ_1, λ_2, λ_2-λ_1 is taken as the spectral width $\Delta\lambda$.

※ Setting TH

1. Press the <SPECTRAL WIDTH> key at the ANALYSIS menu of the DISPLAY mode.
2. Press the <THRESH THRESH (FIT)> key so that "THRESH" is displayed highlighted.
3. Next press the <THRESH VALUE> key and set the value using the rotary knob.



(b) When two mode peaks



(i) The wavelengths of the mode peaks on the outermost side that are larger than the threshold value TH are taken as λ_1 and λ_2.

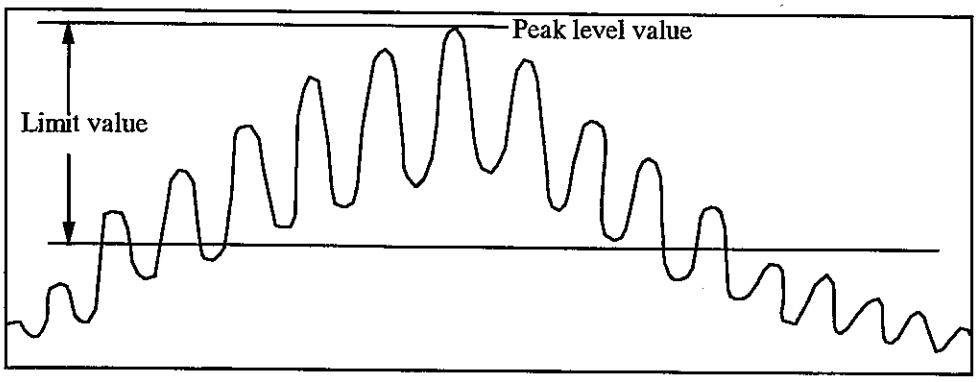
(ii) When "THRESH (FIT)" is ON (highlighted), λ_2-λ_1 becomes the spectral width.
When "THRESH (FIT)" is OFF (not highlighted), the wavelengths λ_1' and λ_2' at which the spectral intersects the threshold value on the outside of λ_1 and λ_2 are obtained.
Consequently, λ_2'-λ_1' becomes the spectral width.

③ The spectral width $\Delta\lambda$ obtained is multiplied by K (set by "SPECTRAL WIDTH:K FOR ENVELOPE" at the PARAM2 menu of the MISC mode).

④ The λc displayed in the data area indicates the center of the spectral width $\Delta\lambda$.

⑤ The MODE displayed in the data area indicates the number of mode peaks above the threshold value TH2.

3. RMS (actual value) method



① Data points above the threshold value TH as shown in the above figure in the waveform displayed are extracted and the spectral width is obtained using the following calculation.

※ Setting TH

1. Press the <SPECTRAL WIDTH> key at the ANALYSIS menu of the DISPLAY mode.
2. Press the <RMS PEAK RMS> key so that "RMS" is displayed highlighted.
3. Next press the <THRESH VALUE> key and set the value using the rotary knob.

② In the case of the RMS method, all the points above the threshold value TH are calculated.
In the case of the PK RMS method, mode search is performed for the waveform displayed, and only the mode peak above the threshold value TH is calculated.

③ When the wavelength at each point is taken as λ_1 and the level at that point as Pi, the center wavelength λc is obtained from the following equation.

$$\lambda c = \frac{\sum Pi \cdot \lambda i}{\sum Pi}$$

④ Using the center wavelength λc obtained at ③, the spectral width $\Delta\lambda$ is obtained from the following equation.

$$\Delta\lambda = K \times \sqrt{\frac{\sum Pi \cdot (\lambda_i - \lambda_c)^2}{\sum Pi}}$$

K :Indicates the rate at which the spectral width is multiplied.
(Set by "SPECTRAL WIDTH:K FOR RMS" at the PARAM2 menu of the MISC mode.)

⑤ In the case of the PK PMS method, the MODE displayed in the data area indicates the number of mode peaks above the threshold value TH.

4. Notch Width Measurement Method

The threshold value **.* dB is set for the waveform of the active trace, and the notch width Δλ and the center wavelength λc is obtained.

① The minimum level λmin is obtained.

② The maximum point λ0 on the left side of λmin and the maximum point λ1 on the right side of λmin are obtained.
The levels of λ0 and λ1 are compared, and the larger level is set as L.

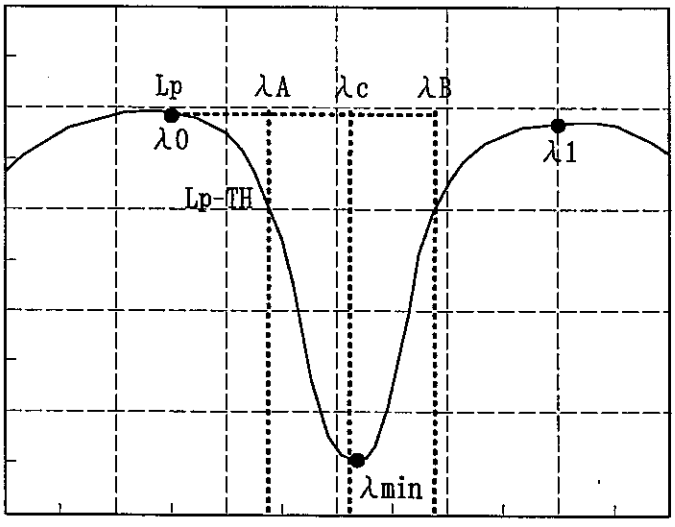
③ The leftmost wavelength at which the spectrum intersects with the Lp-TH level (LOG value) between λ0 and λmin is taken as λA.
The rightmost wavelength at which the spectrum intersects with the Lp-TH level (LOG value) between λ0 and λmin is taken as λB.

④ The center wavelength λc is obtained from the following equation.

$$\lambda c = \frac{\lambda A + \lambda B}{2}$$

⑤ The notch width Δλ is obtained from the following equation.

$$\Delta\lambda = \lambda B - \lambda A$$



(11) WDM-NF Analysis Function

① Outline

The WDM-NF analysis function is for obtaining the following values for each WDM channel in block from the WDM waveforms before and after being amplified with the optical fiber amplifier:

- Center wavelength (WAVELENGTH)
- Signal light level (INPUT LEV)
- Output light level (OUTPUT LEV)
- ASE (Spontaneously emitted light) level (ASE LEV)
- Measuring resolution (RESOLN)
- Gain (GAIN)
- Noise Figure (NF)

(Measurement Example)

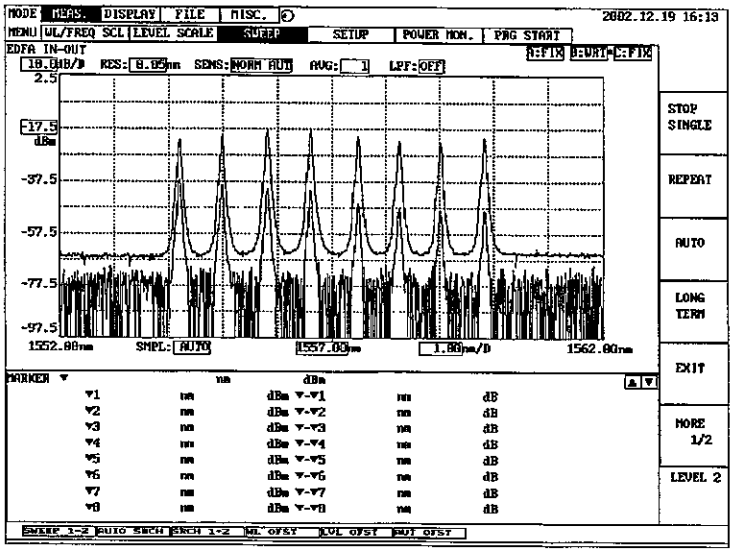


Fig.5-3-12 Example of WDM Waveforms Before and After Being Amplified by Optical Fiber Amplifier

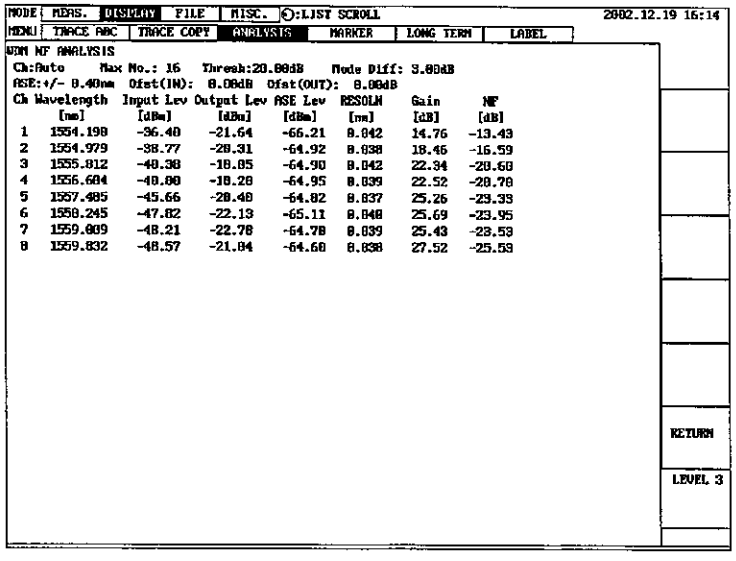


Fig.5-3-13 Execution Example of WDM-NF Analysis Function

The ASE level is obtained from the data of Trace B, but at the time it is necessary to set the ASE level measurement point.
The measuring resolution at the ASE level measuring time necessary for the NF calculation uses the half bandwidth of the optical spectrum after amplification as the value measured for each channel.
It is possible to apply level offset to the optical spectrum before and after amplification. This enables to compensate losses in measure when isolators or couplers are connected to the input and output ports of the optical fiber amplifier.

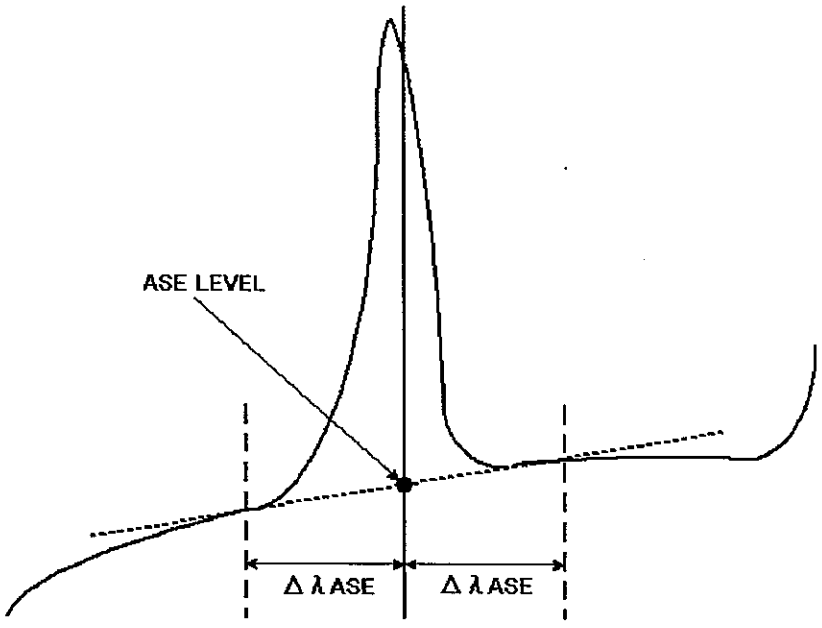
② Operation

1. Set Trace A to "WRITE" and measure the optical spectrum of the signal light (light input to the optical fiber amplifier). After the measurement, set Trace A to "FIX".
2. Set Trace B to "WRITE" and measure the optical spectrum of the output light (light amplified by the optical fiber amplifier). After the measurement, set Trace B to "FIX".
3. Press the <WDN-NF> key of the <ANALYSIS> menu of the <DISPLAY> mode.
4. The WDM-NF measuring function is executed, and the result is displayed in a list.

③ Calculating Method

The WDM-NF analysis takes the following processes:

1. Execute the WDM analysis for the waveform data of Trace A and detect channels.
2. Obtain the center wavelength λ i of each channel and the signal light level PAi from the waveform data of Trace A.
3. Obtain the output light level PBi of each channel from the waveform data of Trace B. Also, obtain the spectrum half bandwidth from the waveform data of Trace A and make the value that was transformed into frequency the measuring resolution ⊿ν i.
4. From the waveform data of Trace B,2 positions (λ i±Δλ ASE) that are far only the ASE level measurement point (Δλ ASE) from the center wavelength λ i of each channel are obtained. The ASE level (PASEi) is obtained from the middle position of them.



Method of obtained of the ASE level in the WDM-NF analysis

5. Calculate the gain Gi and the NF value of each channel from the following equation:

$$Gi = (PBi - PASEi) / PAi$$

PAi : Signal light level of each channel
PBi : Output light level amplified with the optical fiber amplifier of each channel
PASEi : ASE level of each channel

$$NF = \frac{PASEi}{\Delta \nu i \cdot Gi \cdot h \cdot \nu i} + \frac{1}{Gi}$$

$\Delta \nu i$: Measuring resolution of each channel
h : Planck's Constant
νi : Center frequency of each channel
(The value obtained by converting the center wavelength λi of each channel into frequency)

5.3.4 Marker Display

This section describes the *MARKER* menu for displaying the markers.
Use of markers enables measurement of wavelength difference and level difference, peak wavelength, peak level, and spectrum width search to be performed.

(1) Description of screen

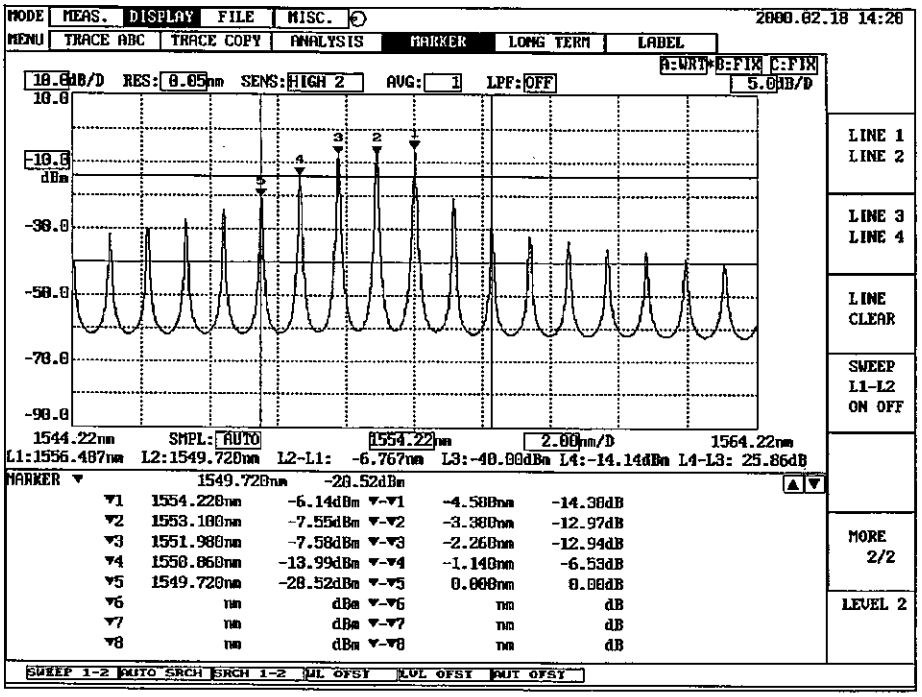


Fig. 5-3-14 Marker Display Setting Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <MARKER> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the DISPLAY mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCL menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

✧ When displayed as "LIST SCROLL"
Rotating the rotary knob :Scrolls the data area list.
Pressing the rotary knob :Changes the rotary knob function display to "DELTA MARKER (FINE)".

✧ When displayed as "DELTA MARKER (FINE)"
Rotating the rotary knob :Moves the cursor on the waveform screen dot by dot.
Pressing the rotary knob :Changes the rotary knob function display to "DELTA MARKER (COARSE)".

✧ When displayed as "DELTA MARKER (COARSE)"
Rotating the rotary knob :Moves the cursor on the waveform screen 1/4 div at a time.
Pressing the rotary knob :Changes the rotary knob function display to "LIST SCROLL".

(4) Description of keys

a. When the MARKER menu is opened:

SET	******* Sets the fixed marker at the V marker position. Enables the V marker to be moved using the rotary knob.
CLEAR	******* Clears the fixed marker last set.
ALL CLEAR	******* Clears the V marker and fixed marker.
EXIT	******* Returns to the DISPLAY mode menu.
MORE 1/2	******* Displays the second page of the soft key menu. (→b)

LEVEL 2

b. When the <MORE 1/2> key is pressed:

LINE1 LINE2	******* Displays the wavelength line marker 1. If you press the key again, the wavelength line marker 2 will be displayed.
LINE3 LINE4	******* Displays the level line marker 3. If you press the key again, the level line marker 4 will be displayed.
LINE CLEAR	******* Clears the line markers.
SWEEP L1-L2 ON OFF	******* Sets sweep between the L1 and L2 markers.
MORE 2/2	******* Displays the first page of the soft key menu. (→a)

LEVEL 2

a. When the MARKER menu is opened:

① <SET> key

Sets the fixed marker at the ∇ marker position and displays the marker value in the data area. After fixing, the ∇ marker can be moved using the rotary knob.

② <CLEAR> key

Clears the fixed marker last set.

③ <ALL CLEAR> key

Clears the ∇ marker and fixed marker displayed and clears the marker value in the data area.

④ <EXIT> key

Returns to the DISPLAY mode menu.

⑤ <MORE 1/2> key

Displays the second page of the soft key menu. (→b)

b. When the MORE 1/2 key is pressed

① <LINE1 LINE 2> key

Displays the wavelength line markers 1 and 2.
When the ∇ marker is displayed, displays the position of the ∇ marker. When the ∇ marker is not displayed, the wavelength line markers 1 and 2 will appear at the positions 1/4 away from the leftmost and rightmost edges of the screen, respectively. You can move the displayed wavelength line markers 1 or 2 to a desired wavelength.
When the wavelength line markers 1 and 2 are already on the screen, pressing this key highlights LINE 1 and LINE 2 alternately without changing their display positions. The highlighted wavelength line marker is made active (movable).

② <LINE3 LINE4> key

Displays the level line markers 3 and 4.
When the ∇ marker is displayed, displays the position of the ∇ marker. When the ∇ marker is not displayed, the level line markers 3 and 4 will appear at the positions 1/4 away from the top and bottom the screen, respectively. You can move the displayed level line markers 3 or 4 to a desired level.
When the level line markers 3 and 4 are already on the screen, pressing this key highlights LINE 3 and LINE 4 alternately without changing their display positions. The highlighted level line marker is made active (movable).

③ <LINE CLEAR> key

Clears all the line marker values displayed.

④ <SWEEP L1-L2 ON OFF> key

Sets a sweep range.
When the ON is highlighted, sweep takes place only for the range between the wavelength line marker 1 and the wavelength line marker 2 and SRCH1-2 is highlighted at the bottom section on the display. When the OFF is highlighted, sweep is executed in the whole range.

⑤ <MORE 2/2> key

Displays the first page of the soft key menu. (→a)

(5) ∇ marker

Press the <SET> key at the MARKER menu to display the ∇ marker on the screen.
The marker that appears is called the moving marker. It moves according to the marker value (wavelength value and level value) in the data area set using the rotary knob.
When the moving marker is moved to a position and the <SET> key is pressed, the fixed marker will appear at that position. Up to 256 fixed markers can be displayed. The wavelength and level differences between the marker value of the fixed marker and moving marker are also displayed in the data area.
The following describes the setting method.

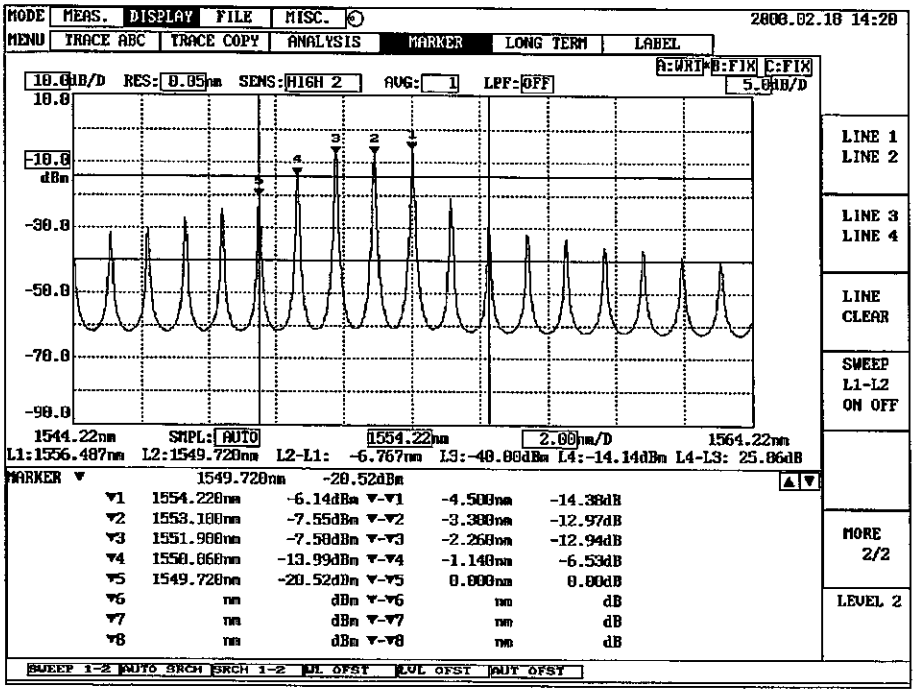


Fig. 5-3-15 Marker Display Example

① Press the <SET> key at the MARKER menu of the DISPLAY mode.
The moving marker will be displayed on the active trace waveform at the center of the screen, and the marker value will be displayed in the data area.

② To set the moving marker, rotate the rotary knob and press the <SET> key.

To move the moving marker to the right :Rotate the rotary knob to the right.
To move the moving marker to the left :Rotate the rotary knob to the left.

③ Pressing the <CLEAR> will clear the marker before.
Pressing the <ALL CLEAR> key clears all the ∇ markers and marker values displayed the screen.

(6) Line marker

When you want to display a wavelength or level line marker, press the <LINE 1 LINE 2> or <LINE 3 LINE 4> key from the MARKER menu.

① Press the <LINE 1 LINE 2> and <LINE 3 LINE 4> keys at the MARKER menu of the DISPLAY mode. While the ∇ marker is being displayed, wavelength and level line markers will appear at the ∇ marker position. When the ∇ marker is not on the screen, wavelength line markers appear at the position 1/4 away from the rightmost or leftmost position of the screen. Likewise, in this case, level line markers are displayed in the position 1/4 away from the top or bottom of the screen. And at the same time, the marker values are displayed at top space of the data area.
When the wavelength line markers 1 and 2 are displayed at the same time, a difference between wavelengths (L2-1) will be indicated. And, when the level line markers 3 and 4 are simultaneously displayed, a difference between levels (L4-3) will be indicated.

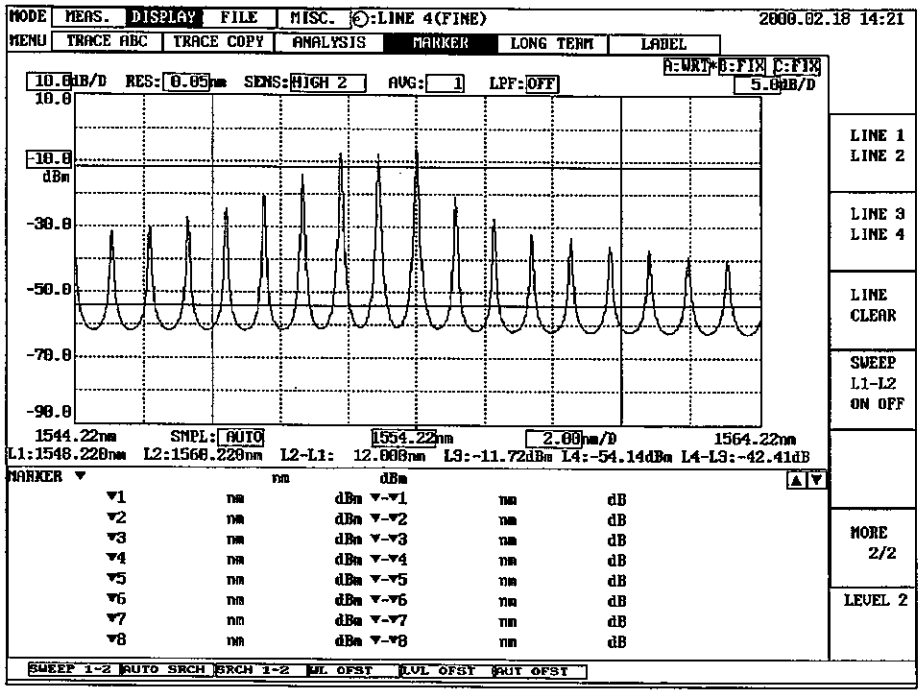


Fig. 5-3-16 Example of Wavelength Line Marker Display

② Moving the marker

To move the line marker to the right :Rotate the rotary knob to the right.
To move the line marker to the left :Rotate the rotary knob to the left.
The marker value will also change at real-time as the marker moves.
When other keys are pressed, the marker will be fixed, when the same key is pressed again, it can be moved again.

③ Pressing the <LINE CLEAR> key clears all the lien markers and marker values displayed on the screen.

(7) Automatic search

The peak level and peak wavelength can automatically be searched each time sweep is performed. This function is useful for observing the changes in the peak level and peak wavelength while performing repeated sweeping.

① Press the ANALYSIS menu, next press the <MORE 1/2> soft key, and press the <AUTO SEARCH ON OFF> key from the soft key menu displayed to highlight "ON".

② Press the <AUTO SEARCH ON OFF> key to highlight "ON" and press the <PEAK> key. The peak level and peak wavelength will automatically be searched each time sweep is performed, and the moving mark will be displayed.

③ To clear automatic search, press the <AUTO SEARCH ON OFF> key, and display "OFF" highlighted.

(8) Measuring the wavelength difference and level difference

The wavelength difference and level difference can be measured using the fixed marker.

① Press the ANALYSIS menu and select the <PEAK> key to display the moving marker.
(Or press the MARKER menu and select the <SET> key.)

② Move the moving marker to any desired position and press the <SET MARKER> key. As a result, the fixed marker 1 will appear at that position, and the wavelength value and level value of the fixed marker 1 will simultaneously be displayed at ∇1 in the data area.

③ When the moving marker is further moved, the wavelength difference and level value with the fixed marker 1 will simultaneously be displayed on the right side of the Label area.
This wavelength difference and level difference will change according to the movement of the moving marker.

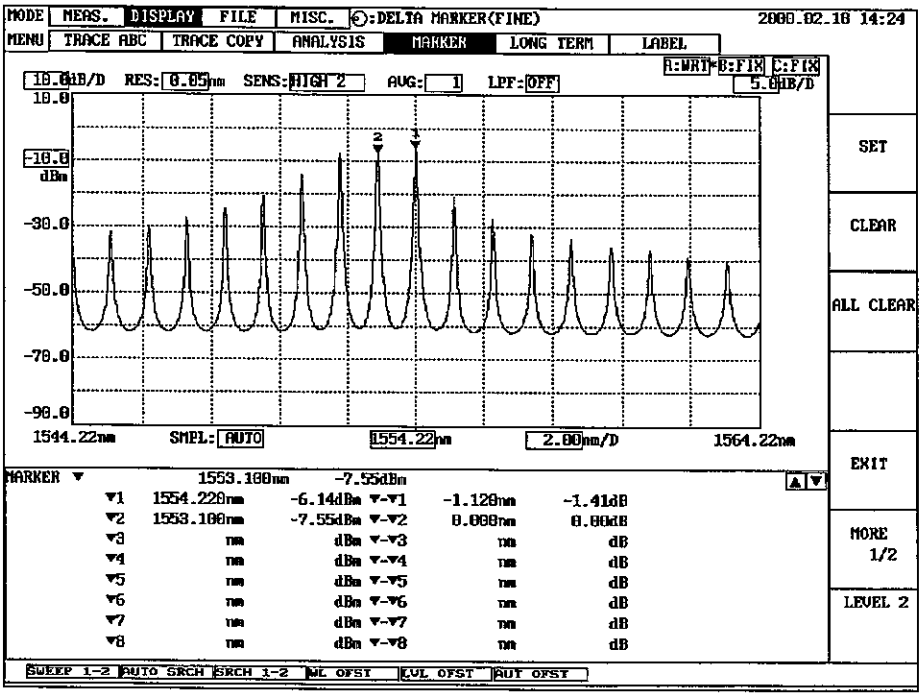


Fig. 5-3-17 Measurement of Wavelength Difference

④ Move the moving marker to the desired position, and press the <SET MARKER> key. The fixed marker 2 will appear at that position, and the wavelength difference and level difference of the fixed marker 1 and fixed marker 2 will be fixed.

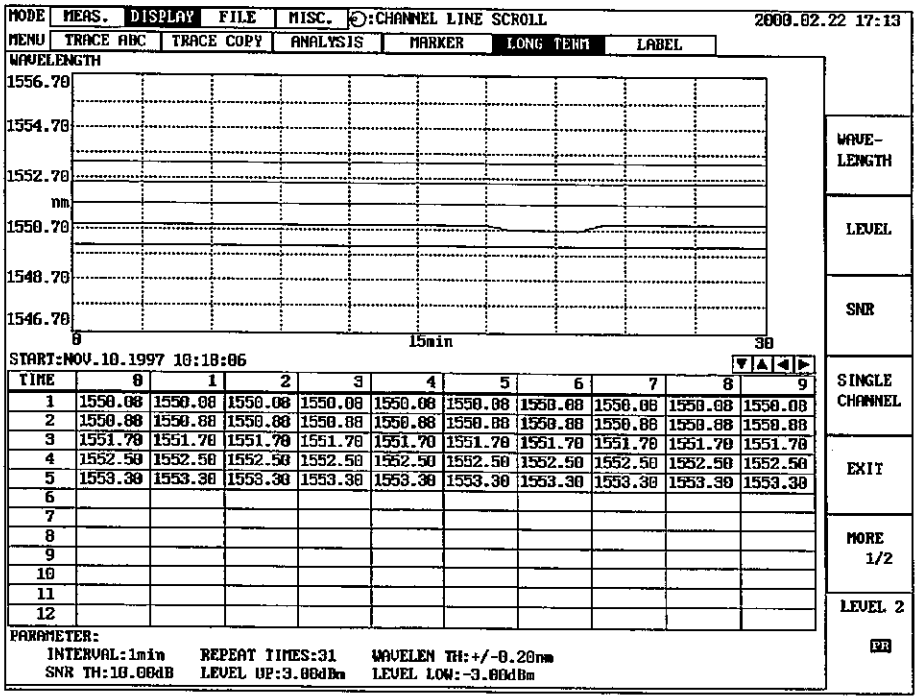
NOTE

The level difference displayed is (fixed marker 2 - fixed marker 1) when the level axis is the LOG scale, and (fixed marker 2/fixed marker 1) when the level axis is the linear scale.

5.3.5 Displaying the Long Term Measurement Results

This section describes the *LONG TERM* menu for displaying the long term measurement results.

(1) Description of screen



TIME	0	1	2	3	4	5	6	7	8	9
1	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00
2	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00	1550.00
3	1551.70	1551.70	1551.70	1551.70	1551.70	1551.70	1551.70	1551.70	1551.70	1551.70
4	1552.50	1552.50	1552.50	1552.50	1552.50	1552.50	1552.50	1552.50	1552.50	1552.50
5	1553.30	1553.30	1553.30	1553.30	1553.30	1553.30	1553.30	1553.30	1553.30	1553.30
6										
7										
8										
9										
10										
11										
12										

Fig. 5-3-18 Long Term Measurement Results Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <LONG TERM> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the DISPLAY mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCL menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

(4) Description of keys

a. When all channels are displayed together:

WAVE-LENGTH	····· Displays the wavelength list of all channels.
LEVEL	····· Displays the level list of all channels.
SNR	····· Displays the SNR of all channels.
SINGLE CHANNEL	····· Moves to the display of the single channel. (→b)
EXIT	····· Returns to the DISPLAY mode menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→c)

LEVEL 2

b. When channels are displayed individually:

CHANNEL SELECT	····· Selects the display channel.
MULTIPLE CHANNEL	····· Moves to the display of all channels.
EXIT	····· Returns the DISPLAY mode menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→c)

LEVEL 2

c. When the <MORE 1/2> key is pressed:

ABSOLUTE RELATIVE	····· Selects whether to display the wavelength, level, noise, and SNR in the absolute value or in the relative value in respect to the reference data.
REF DATA SET	····· Sets the latest WDM analysis results as the reference data.
REF DATA INITIAL	····· Sets the preset value as the reference data.
DATA CLEAR	····· Returns the DISPLAY mode menu.
MORE 2/2	····· Displays the second page of the soft key menu. (→c)

LEVEL 2

a. When all channels are displayed together

① <WAVELENGTH> key

Displays the wavelength list of all channels.
When pressed, the vertical axis is displayed in wavelength.
Pressing the <ABSOLUTE RELATIVE> key and setting to "ABSOLUTE" displays in the absolute value, while setting to "RELATIVE" displays in the relative value based on the channel with the cursor.

② <LEVEL> key

Displays the level list of all channels.
When pressed, the vertical axis is displayed in level.
Pressing the <ABSOLUTE RELATIVE> key and setting to "ABSOLUTE" displays in the absolute value, while setting to "RELATIVE" displays in the relative value based on the channel with the cursor.

③ <SNR> key

Displays the SNR of all channels.
When pressed, the vertical axis is displayed in SNR.
Pressing the <ABSOLUTE RELATIVE> key and setting to "ABSOLUTE" displays in the absolute value, while setting to "RELATIVE" displays in the relative value based on the channel with the cursor.

④ <SINGLE CHANNEL> key

Displays for only one channel.
Displays the measurement results for the selected channel.
Pressing the <ABSOLUTE RELATIVE> key and setting to "ABSOLUTE" displays in the absolute value, while setting to "RELATIVE" displays in the relative value based on the channel with the cursor.

⑤ <EXIT> key

Returns to the DISPLAY mode menu.

⑥ <MORE 1/2> key

Displays the second page of the soft key menu.

b. When channels are displayed individually

① <CHANNEL SELECT> key

Selects the channel to be displayed in the individual channel display.

② <MULTIPLE CHANNEL> key

Displays all channels together.
In multiple channel display, the vertical axis can be displayed in WAVELENGTH, LEVEL or SNR.

③ <EXIT> key

Returns to the DISPLAY mode menu.

④ <MORE 1/2> key

Displays the second page of the soft key menu.

c. When the <MORE 1/2> key is pressed:

① <ABSOLUTE RELATIVE> key

"ABSOLUTE" display
The wavelength, level, noise, and SNR are displayed in the absolute value.
"RELATIVE" display
The wavelength, level, noise, and SNR are displayed in the relative value in respect to the reference data.

② <REF DATA SET> key

When set to RELATIVE display, use this key to set the reference value.

③ <REF DATA INITIAL> key

When pressed, the PRESET data input when parameters are set become the reference value.

④ <DATA CLEAR> key

Clears the reference value, and returns to the DISPLAY mode menu.

⑤ <MORE 2/2> key

Displays the first page of the soft key menu.

5.3.6 Label Function

This section describes the *LABEL* menu for inputting labels.

(1) Description of screen

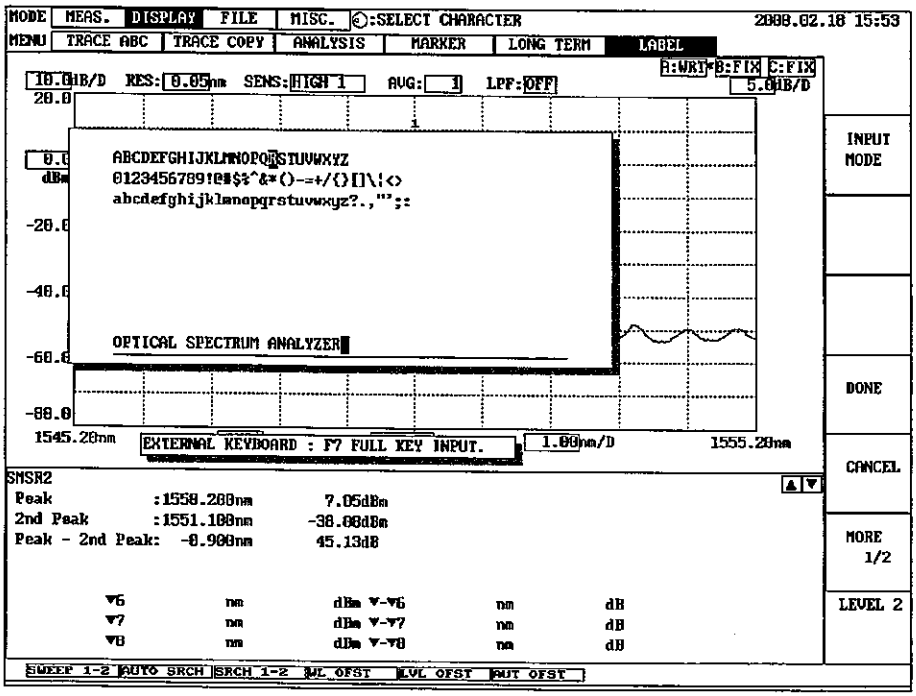


Fig. 5-3-19 LABEL Function Screen

(2) Setting method

① Press the MODE key and set the <DISPLAY> mode.

② Set the <LABEL> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the DISPLAY mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key :	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCL menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob :Selects the menu.
Pressing the rotary knob :Opens the menu.

✧ When displayed as "SELECT CHARACTER"
Rotating the rotary knob :Selects the character.
Pressing the rotary knob :Fixes the character.

(4) Description of keys

a. When the LABEL menu is opened:

INPUT MODE	******* Sets the INPUT mode. (→c)
DONE	******* Fixes the selected character.
CANCEL	******* Cancels the setting, and returns to the DISPLAY menu.
MORE 1/2	******* Displays the second page of the soft key menu. (→b)

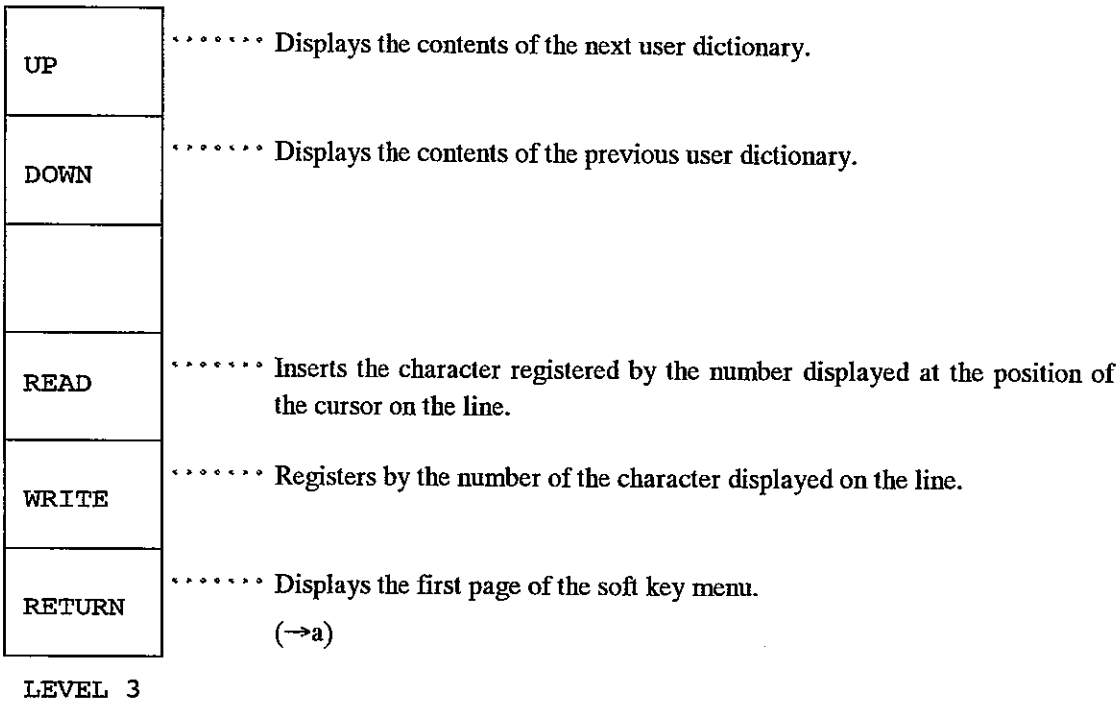
LEVEL 2

b. When the <MORE 1/2> key is pressed:

→	******* Moves the label cursor to the right.
←	******* Moves the label cursor to the left.
INSERT	******* Leaves a space at the position of the label cursor.
DELETE	******* Deletes the character at the position of the label cursor.
CLEAR	******* Deletes the whole label being input.
MORE 2/2	******* Displays the first page of the soft key menu. (→a)

LEVEL 2

c. When INPUT MODE



(5) Inputting labels

① Set the LABEL menu according to "(2) Setting method".

② Move the cursor to the character to be input using the rotary knob, and press the rotary knob to fix it. (The cursor will move to the right.)

③ If the character input is incorrect
Press the <→>, <←> keys to move the cursor at the input position. Select the character to be input using the rotary knob and press to overwrite the character.

④ To insert characters in the label
Move the cursor to the position at which the character is to be input, and press the <INSERT> key. A space for one character will be created at the position of the cursor. Press the rotary knob to insert the character selected.

⑤ To delete characters in the label
Move the cursor to the position of the character to be deleted, and press the <DELETE> key. The character at the cursor will be deleted.

⑥ After inputting the characters, press the <DONE> key to fix the label and incorporate on the screen.

⑦ To delete the whole label being input, press the <CLEAR> key. The characters input will be deleted, and the cursor will move to the head.

(6) User dictionary function

This function registers labels frequently used and reads. It can register up to 100 labels.

To register:

① Create the label as described.
② Press the <INPUT MODE> key.
③ Select the number to be registered by rotating the rotary knob, and press to set.
④ Press the <WRITE> key to register.

To read:

① Press the <INPUT MODE> key.
② Select the registration number of the label to be read by rotating the rotary knob, and press to set.
③ Press the <READ> key to read the label.
④ The label read can also be changed on the screen for inputting character.

5.4 Recording Data

This section describes the *FILE* mode.

SAVE	..... Saves the measured data and waveform.	(→ Refer to section 5.4.1.)
RECALL	..... Recalls the recorded file.	(→ Refer to section 5.4.2.)
COPY	..... Copies files of measured data and waveform.	(→ Refer to section 5.4.3.)
DELETE	..... Deletes files of measured data and waveform.	(→ Refer to section 5.4.4.)
FORMAT	..... Formats drives.	(→ Refer to section 5.4.5.)

5.4.1 Recording Waveform Data

This section describes the SAVE menu for saving measured data and waveform.

(1) Description of screen

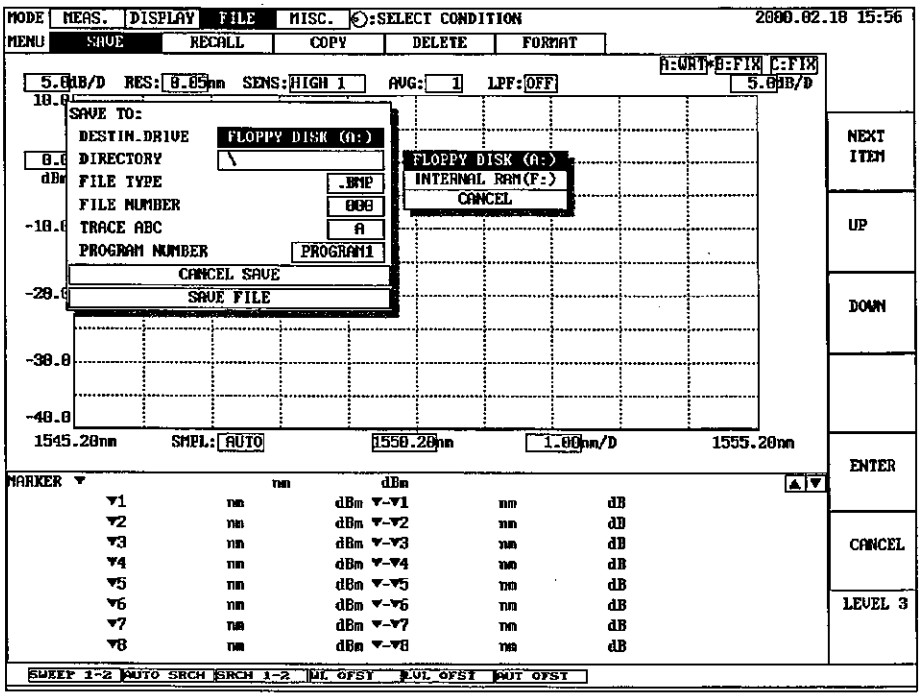


Fig. 5-4-1 Waveform Data Recording Setting Screen

(2) Setting method

① Press the MODE key and set the <FILE> mode.
② Set the <SAVE> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.

✧ When displayed as "SELECT DIRECTORY"
Rotating the rotary knob: Selects the directory to be recorded to.
Pressing the rotary knob: Fixes the directory to be recorded to.

✧ When displayed as "CHANGE FILE No."
Rotating the rotary knob: Selects the file number.
Pressing the rotary knob: Fixes the file number.

✧ When displayed as "SCROLL"
Rotating the rotary knob: Scrolls the directory displayed.
Pressing the rotary knob: Selects the directory.

(4) Setting items

① DESTIN.DRIVE: Sets the drive to be recorded to.
FLOPPY DISK (A:)/INTERNAL RAM (F:)/CANCEL

② DIRECTORY: Sets the directory to be recorded to.

③ FILE TYPE: Sets the file type to be recorded.
.WV4/.DT4/.ST4/.PG4/.TXT/.LT4/.BMP/.TIF/CANCEL

④ FILE NUMBER: Sets the number of the file to be recorded.

⑤ TRACE ABC: Sets the trace to be recorded.
A/B/C/CANCEL

⑥ PROGRAM NUMBER:Sets the program No. to be recorded.
PROGRAM1/PROGRAM2/PROGRAM3/PROGRAM4/PROGRAM5/CANCEL

(5) Setting the drive to be recorded to

① Select "DESTIN.DRIVE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the drive to be recorded to using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the drive to be recorded to.

(6) Setting the directory to be recorded to

① Select "DIRECTORY" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the directory to be recorded to using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the directory to be recorded to.

(7) Setting the file type to be recorded

① Select "FILE TYPE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the file type to be recorded using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the file type to be recorded.

(8) Setting the file number to be recorded

① Select "FILE NUMBER" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the file number to be recorded using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the file number to be recorded.

(9) Setting TRACE ABC to be recorded

Set which trace in the waveform displayed to be recorded.

① Select "TRACE ABC" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the trace to be recorded using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the trace to be recorded.

(10) Setting the program number to be recorded

Set when recording the program file (.PG4).

① Select "PROGRAM NUMBER" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the program number to be recorded using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the program number to be recorded.

(11) Executing recording

① Set setting items (4) to(9).
② Press the <SAVE FILE> key at the <SAVE> menu to execute.

(12) File types

① .WV4 (Waveform file)
② .DT4 (Data file)
③ .ST4 (Measuring conditions file)
④ PG4 (Program file)
⑤ .TXT (Text file)
⑥ .LT4 (LONG TERM results file)
⑦ .BMP (Screen graphics)
⑧ .TIF (Screen graphics)

(13) Description of keys

a. When the SAVE menu is opened

DIRECTRY	····· Opens the directory. (→b)
NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the setting conditions of the item. (→c)
CANCEL SAVE	····· Cancels setting, and returns to the FILE mode.
SAVE FILE	····· Records the file with the conditions set.

LEVEL 2

b. When the <DIRECTORY> key is pressed

UP	····· Moves up the directory cursor.
DOWN	····· Moves down the directory cursor.
PAGE UP	····· Scrolls up the page.
PAGE DOWN	····· Scrolls down the page.
EXIT	····· Returns to the SAVE menu. (→a)

LEVEL 3

c. When setting each item (other than FILE NUMBER)

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· Sets the measuring conditions, and returns to the SAVE menu. (→a)
CANCEL	····· Cancels the setting, and returns to the SAVE menu. (→a)

LEVEL 3

d. When setting FILE NUMBER

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
COARSE ADJUST	····· Adjusts the file number for every 10 steps. (→e)
ENTER	····· Sets the file number, and returns to the SAVE menu. (→a)
CANCEL	····· Cancels the setting, and returns to the SAVE menu. (→a)

LEVEL 3

e. When the <COARSE ADJUST> key is pressed

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
FINE ADJUST	····· Adjusts the file number for every 10 steps. (→d)
ENTER	····· Sets the file number, and returns to the SAVE menu. (→a)
CANCEL	····· Cancels the setting, and returns to the SAVE menu. (→a)

LEVEL 3

5.4.2. Recalling Waveform Data

This section describes the *RECALL* menu for recalling the recorded files.

(1) Description of screen

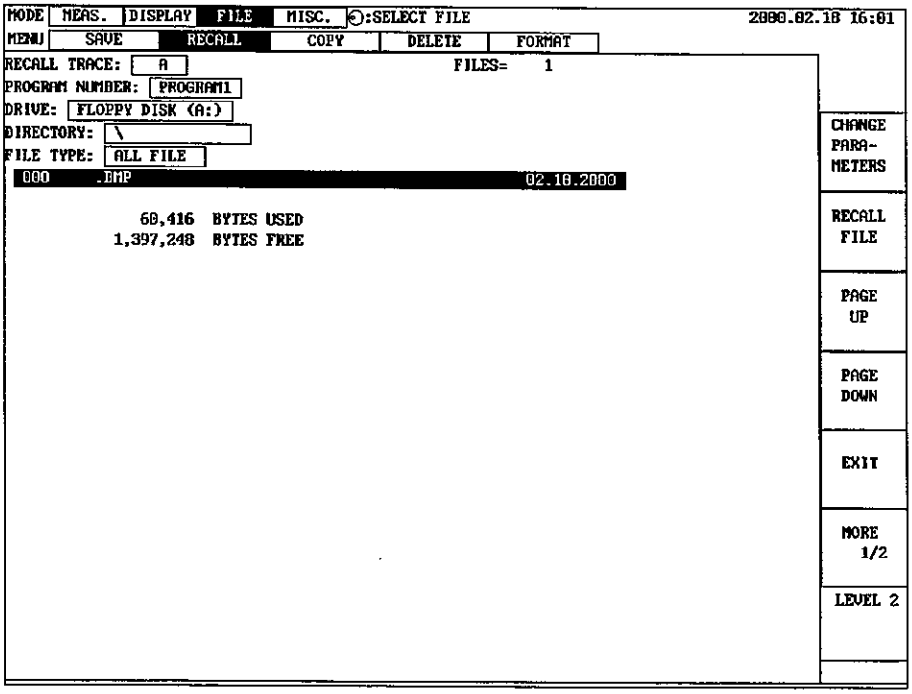


Fig. 5-4-2 Waveform Data Recalling Screen

(2) Setting method

① Press the MODE key and set the <FILE> mode.
② Set the <RECALL> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.
✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.
✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.
✧ When displayed as "SELECT DIRECTORY"
Rotating the rotary knob: Selects the directory.
Pressing the rotary knob: Fixes the directory.

(4) Setting items

① RECALL TRACE: Sets the trace of the waveform to be recalled.
A/B/C/CANCEL
② PROGRAM NUMBER: Sets the program number to be played back.
PROGRAM1/PROGRAM2/PROGRAM3/PROGRAM4/PROGRAM5/CANCEL
③ DRIVE: Sets the drive to be recalled.
FLOPPY DISK(A:)/INTERNAL RAM(F:)/CANCEL
④ DIRECTORY: Sets the directory to be recalled.
⑤ FILE TYPE: Sets the file type to be recalled.
ALL FILE/TRACE/DATA/SETTING/PROGRAM/GRAPHIC/LONG TERM/CANCEL

(5) Setting the trace to be recalled

① Press the <CHANGE PARAMETERS> key.
② Select "RECALL TRACE" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the trace to be recalled using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the trace to be recalled.

(6) Setting the program number to be recalled

① Press the <CHANGE PARAMETERS> key.
② Select "PROGRAM NUMBER" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the program number to be recalled using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the program number to be recalled.

(7) Setting the drive to be recalled

① Press the <CHANGE PARAMETERS> key.
② Select "DRIVE" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the drive to be recalled using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the drive to be recalled.

(8) Setting the directory to be recalled

① Press the <CHANGE PARAMETERS> key.
② Select "DIRECTORY" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the directory to be recalled using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the directory to be recalled.

(9) Setting the file type to be recalled

① Press the <CHANGE PARAMETERS> key.
② Select "FILE TYPE" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the file type to be recalled using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the file type to be recalled.

(10) Executing recall

① Set setting items (4) to (9).
② Press the <RECALL FILE> key at the <RECALL> menu to execute.

(11) Sort function

This function sorts the files in the desired order.

① Press the <SORT BY...> key on the second page of the soft key menu.
② Select the condition to be set next using the rotary knob or the <UP/DOWN> keys.
The conditions are as follows.

FILE NUMBER:	Sorts files in numerical order starting from the smallest number.
FILE TYPE:	Sorts files according to type (extension) in alphabetical order.
FILE DATA:	Sorts file in chronological order starting from the latest.
FILE LABEL:	Sorts files according to the alphabetical order of the labels.

③ Press the <ENTER> key to execute sorting.

(12) Description of keys

a. When the RECALL menu is opened

CHANGE PARA-METERS	····· Changes parameters. (→c)
RECALL FILE	····· Opens the selected file.
PAGE UP	····· Displays the next page.
PAGE DOWN	····· Displays the previous page.
EXIT	····· Returns to the FILE mode.
MORE 1/2	····· Displays the second page of the soft key menu.

LEVEL 2

b. When the <MORE 1/2> key is pressed:

SORT BY...	····· Executes sort.
PRINT LIST	····· Prints out the file list.
MORE 2/2	····· Displays the first page of the soft key menu.

LEVEL 2

c. When the <CHANGE PARAMETERS> key is pressed

NEXT ITEM	******* Selects the next item.
UP	******* Moves up the cursor.
DOWN	******* Moves down the cursor.
ENTER	******* Sets at the selected conditions, and returns to the first page of the soft key menu.
CANCEL	******* Cancels the setting, and returns to the first page of the soft key menu.

LEVEL 3

d. When the <SORT BY...> key is pressed

UP	******* Moves up the cursor.
DOWN	******* Moves down the cursor.
ENTER	******* Sets the conditions, and returns to the first page of the soft key menu. (→a)
CANCEL	******* Cancels the setting, and returns to the first page of the soft key menu. (→a)

LEVEL 3

5.4.3 Copying the Waveform Data

This section describes the *COPY* menu for copying files of the measured waveform data.

(1) Description of screen

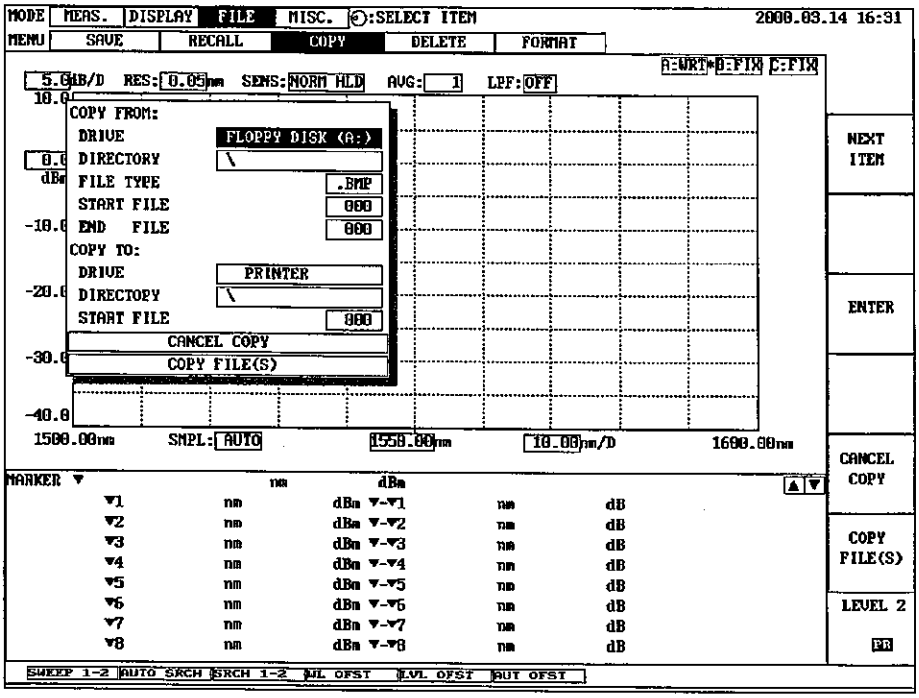


Fig. 5-4-3 Waveform Data Copy Setting Screen

(2) Setting method

① Press the MODE key and set the <FILE> mode.
② Set the <COPY> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key: Sets the MEASUREMENT mode
[F1] to [F6] keys: Execute the soft key menu.
[HELP] key: Describes the operations.
[AUTO START] key: Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key: Executes the WL/FREQ SCALE menu.
[LEVEL] key: Executes the LEVEL SCALE menu.
[SWEEP] key: Executes the SWEEP menu.
[ANALYSIS] key: Executes the ANALYSIS menu.
[PRINT] key: Outputs the screen to the printer.
[FEED] key: Feeds the printer paper.
Rotary knob: Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.
✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.
✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.
✧ When displayed as "SELECT DIRECTORY"
Rotating the rotary knob: Selects the directory.
Pressing the rotary knob: Fixes the directory.
✧ When displayed as "CHANGE FILE No."
Rotating the rotary knob: Selects the file number.
Pressing the rotary knob: Fixes the file number.

(4) Setting items

① COPY FROM:DRIVE: Sets the drive to be copied from.
FLOPPY DISK(A:)/INTERNAL RAM(F:)/CANCEL
② COPY FROM:DIRECTORY: Sets the directory to be copied from.
③ COPY FROM:FILE TYPE: Sets the file type to be copied.
.WV4/.DT4/.ST4/.PG4/.TXT/.LT4/.BMP/.TIF/CANCEL
④ COPY FROM:STATR FILE: Sets the start file number to be copied.
⑤ COPY FROM:END FILE: Sets the end file number to be copied.
⑥ COPY TO:DRIVE: Sets the drive to be copied to.
FLOPPY DISK(A:)/INTERNAL RAM(F:)/PRINTER/CANCEL
⑦ COPY TO:DIRECTORY: Sets the directory to be copied to.
⑧ COPY TO:START FILE: Sets the starting file to be copied to.

(5) Setting the drive to be copied from

① Select "COPY FROM:DRIVE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the drive using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the drive.

(6) Setting the directory to be copied from

① Select "COPY FROM:DIRECTORY" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the directory using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the directory.

(7) Setting the file type to be copied

① Select "COPY FROM:FILE TYPE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the file type using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the file type.

(8) Setting the start file number to be copied

① Select "COPY FROM:START FILE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the start file number using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the start file number.

(9) Setting the end file number to be copied

① Select "COPY FROM:END FILE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the end file number using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the end file number.

(10) Setting the directory to be copied to

① Select "COPY TO:DIRECTORY" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the directory using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the directory.

(11) Setting the start file number to be copied to

① Select "COPY TO:START FILE" using the <NEXT ITEM> key or the rotary knob.
② Press the <ENTER> key or the rotary knob to open the window.
③ Select the start file number using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the start file number.

(12) Executing copying

① Set setting items (4) to (10).
② Press the <COPY FILE(S)> key at the <COPY> menu to execute.

(13) Description of keys

a. When the COPY menu is opened

NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the window of the item selected. (→b)
CANCEL COPY	····· Cancels the setting, and returns to the FILE mode.
COPY FILE(S)	····· Copies the file set, and returns to the FILE mode.

LEVEL 2

b. When the <ENTER> key is pressed

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· Sets at the selected conditions, and returns to the COPY menu. (→a)
CANCEL	····· Cancels the setting, and returns to the COPY menu. (→a)

LEVEL 3

5.4.4 Deleting the Waveform Data

This section describes the *DELETE* menu for deleting files of the measured waveform data.

(1) Description of screen

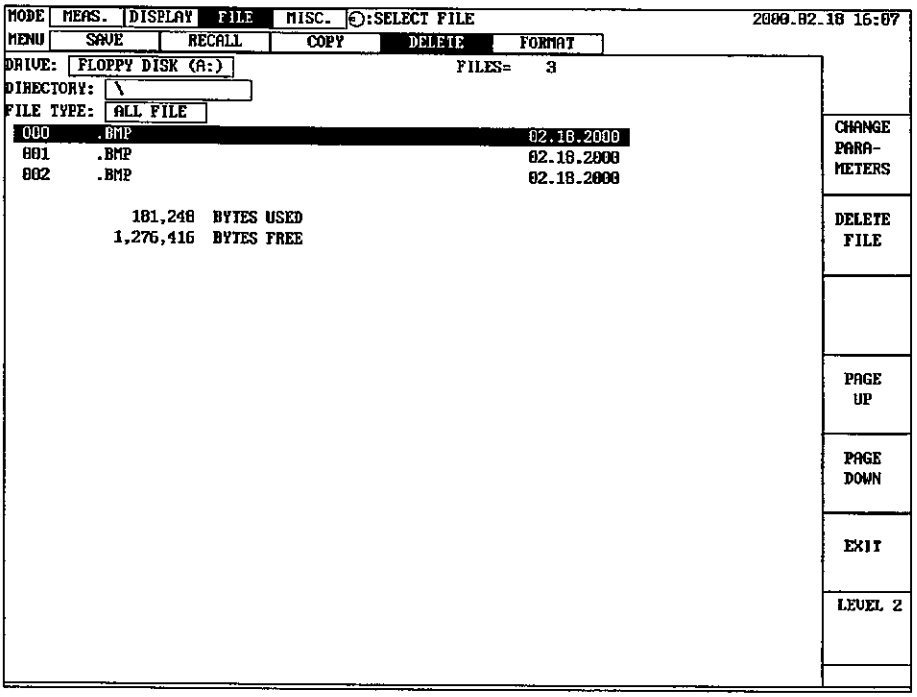


Fig. 5-4-4 Waveform Data Deletion Setting Screen

(2) Setting method

① Press the MODE key and set the <FILE> mode.
② Set the <DELETE> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.
✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.
✧ When displayed as "SELECT FILE"
Rotating the rotary knob: Selects the file number.
Pressing the rotary knob: Fixes the file number.

(4) Setting items

① DRIVE: Sets the drive to be deleted from.
FLOPPY DISK(A:)/INTERNAL RAM(F:)/CANCEL
② DIRECTORY: Sets the directory to be deleted from.
③ FILE TYPE: Sets the file type to be deleted.
ALL FILE/TRACE/DATA/SETTING/PROGRAM/GRAPHIC/LONG TERM/CANCEL

(5) Setting the drive to be deleted from

① Select the <CHANGE PARAMETERS> key.
② Select DRIVE using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the drive using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the drive.

(6) Setting the directory to be deleted from

① Select the <CHANGE PARAMETERS> key.
② Select "DIRECTORY" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the directory using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the directory.

(7) Setting the file type to be deleted

① Select the <CHANGE PARAMETERS> key.
② Select "FILE TYPE" using the <NEXT ITEM> key or the rotary knob to open the window.
③ Select the file type using the <UP/DOWN> keys or the rotary knob.
④ Press the <ENTER> key or the rotary knob to set the file type.

(8) Executing deletion

① Set setting items (4) to (6).
② Rotate the rotary knob, and execute the file to be deleted.
③ Press the <DELETE FILE> key at the <DELETE> menu.
④ Press the <YES DELETE FILE> key, or select "YES" in the window by rotating the rotary knob and pressing to execute deletion.

(9) Description of keys

a. When the DELETE menu is opened:

CHANGE PARA-METERS	····· Changes parameters. (→b)
DELETE FILE	····· Deletes the file. (→c)
PAGE UP	····· Displays the list of files of the previous page.
PAGE DOWN	····· Displays the list of files of the next page.
EXIT	····· Returns to the FILE mode.

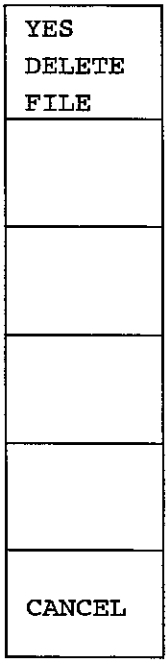
LEVEL 2

b. When the <CHANGE PARAMETERS> key is pressed

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
PAGE DOWN	····· Sets at the selected conditions, and returns to the DELETE menu. (→a)
EXIT	····· Cancels the setting, and returns to the DELETE menu. (→a)

LEVEL 3

c. When the <DELETE FILE> key is pressed



YES DELETE FILE ····· Deletes the selected file, and returns to the DELETE menu. (→a)

CANCEL ····· Cancels the setting, and returns to the DELETE menu. (→a)

LEVEL 3

5.4.5 Formatting the Drive, Etc.

This section describes the *FORMAT* menu for formatting drives and creating new directories.

(1) Description of screen

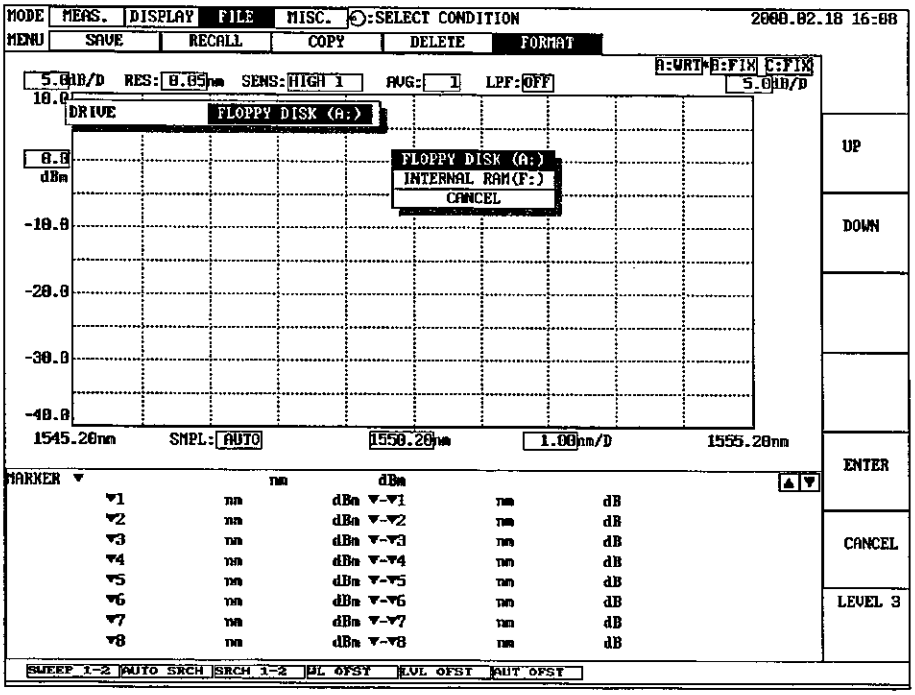


Fig. 5-4-5 Drive Selection Screen

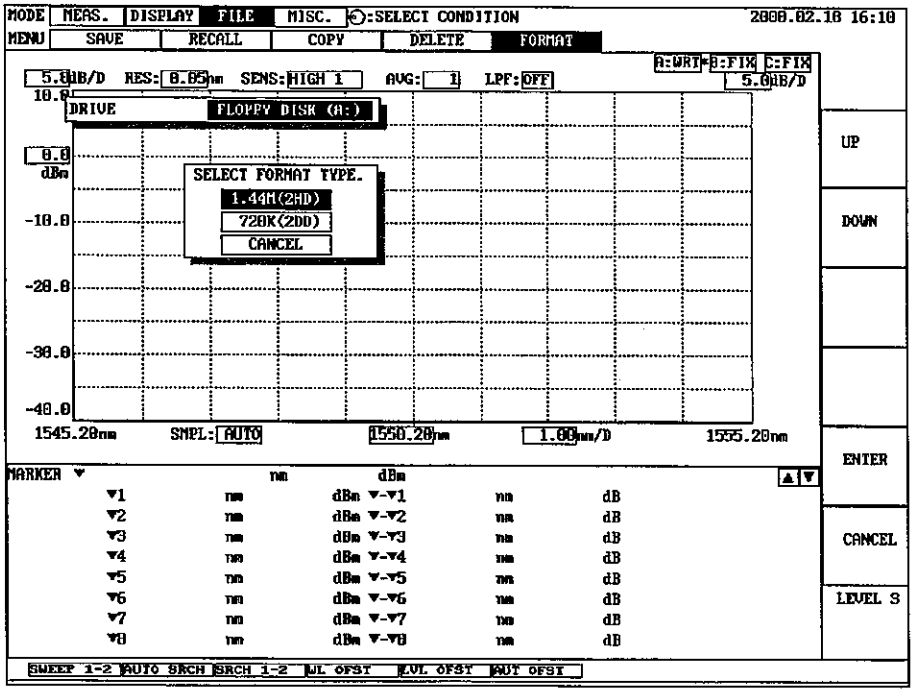


Fig. 5-4-6 Format Type Selection Screen

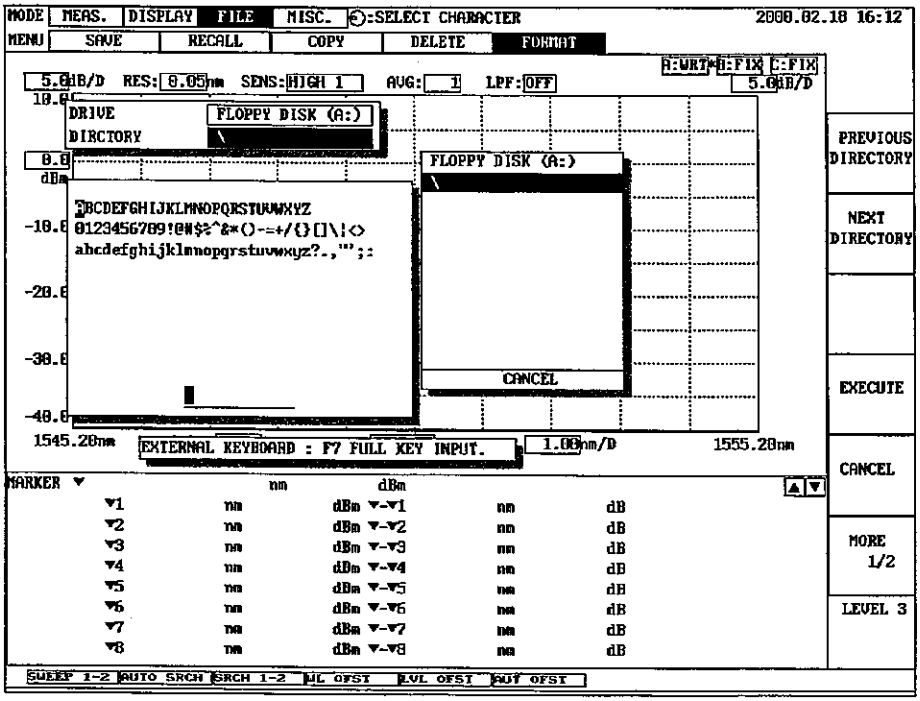


Fig. 5-4-7 New Drive Creation Screen

(2) Setting method

① Press the MODE key and set the <FILE> mode.
② Set the <FORMAT> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.
✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.
✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.
✧ When displayed as "SELECT DIRECTORY"
Rotating the rotary knob: Selects the directory.
Pressing the rotary knob: Fixes the directory.
✧ When displayed as "SELECT FILE"
Rotating the rotary knob: Selects the file number.
Pressing the rotary knob: Fixes the file number.
✧ When displayed as "SELECT CHARACTER"
Rotating the rotary knob: Selects the character.
Pressing the rotary knob: Selects the character.

(4) Setting items

① DRIVE: Sets the drive to be formatted.
FLOPPY DISK(A:)/INTERNAL RAM(F:)/CANCEL
② FORMAT TYPE: Sets the format type.
1.44M(2HD)/720K(2DD)/CANCEL

(5) Setting the format

① Press the <SELECT DRIVE> key to open the window.
② Select the drive to be formatted using the <UP/DOWN> keys or the rotary knob.
③ Press the <ENTER> key or the rotary knob to set the drive.
④ Next press the <FORMAT DRIVE> key.
⑤ - When FLOPPY DISK(A:) is selected at SELECT DRIVE -
Select the format type using the <UP/DOWN> keys or the rotary knob. Execute formatting by pressing the <ENTER> key or the rotary knob.
- When INTERNAL RAM (F:) is selected at SELECT DRIVE -
Press the <YES FORMAT DRIVE> key or select the "YES" in the window by rotating the rotary knob and pressing to execute formatting.

(6) Creating a new directory

① Press the <CREATE DIRECTORY> key.
② Press the <PREVIOUS DIRECTORY> or <NEXT DIRECTORY> keys and select the directory.
③ Input the directory name using the rotary knob. (Refer to 5.3.6. Label Function.)
④ Press the <EXECUTE> key to create the directory.

(7) Description of keys

a. When the FORMAT menu is opened

SELECT DRIVE	····· Selects the drive. (→b)
FORMAT DRIVE	····· Executes formatting.
CREATE DIRECTORY	····· Creates a new directory.
EXIT	····· Returns to the FILE mode.

LEVEL 2

b. When the <SELECT DRIVE> key or <FORMAT DRIVE> key is pressed (When the SELECT DRIVE is set to FLOPPY DISK)

UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· Sets at the selected conditions, and returns to the FORMAT menu. (→a)
CANCEL	····· Cancels the setting, and returns to the FORMAT MENU. (→a)

LEVEL 3

c. When the <FORMAT DRIVE> key is pressed (When the SELECT DRIVE is set to INTERNAL RAM)

YES FORMAT DRIVE	····· Formats the drive, and returns to the FILE mode.
CANCEL	····· Cancels the setting, and returns to the FORMAT menu. (→a)

LEVEL 3

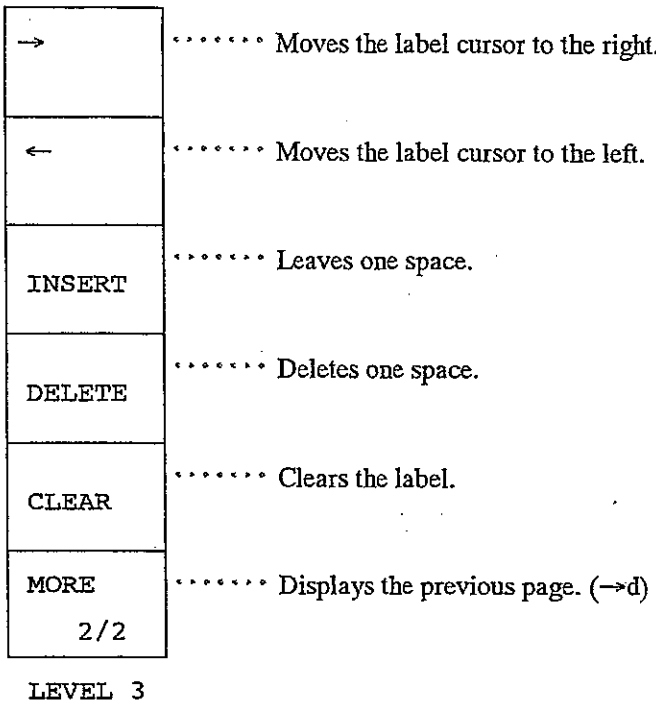
- Creating a new directory -

d. When the <CREATE DIRECTORY> key is pressed

PREVIOUS DIRECTORY	····· Selects the previous directory.
NEXT DIRECTORY	····· Selects the next directory.
EXECUTE	····· Creates the directory, and returns to the FORMAT menu. (→a)
CANCEL	····· Cancels the setting, and returns to the FORMAT menu. (→a)
MORE 1/2	····· Displays the next page. (→e)

LEVEL 3

e. When the <MORE 1/2> key is pressed at the d soft key menu



LEVEL 3

5.4.6 Printing Out Waveform Data

Pressing the [PRINT] key on the panel screen outputs the hard copy or lists currently displayed to the printer.

The [PRINT] key can be set at the PRINTER PORT in the SYSTEM menu of the MISC mode, and can be switched from the internal printer, Centronics, RS-232C, file.

(1) Pressing the [PRINT] key outputs the hard copy of the screen currently displayed from the printer.

(2) Pressing the [PRINT] key during sweep stops sweep, prints, and then resumes sweep.

(3) If the printer paper runs out during printing, or when the [PRINT] key is pressed without setting the printer paper, "Printer paper empty" will be displayed.
If the [PRINT] key is pressed with the headup lever raised, the "Printer head up" warning will be displayed.
If the [PRINT] key is pressed after setting the printer paper or pushing down the headup lever, printing will start.

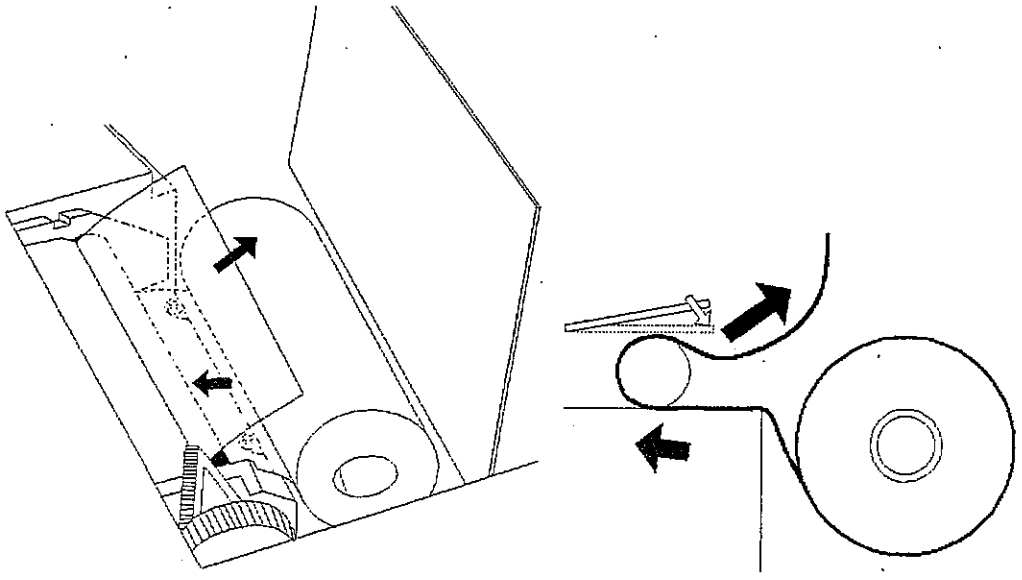
(4) Set the printer paper as follows.

① Open the cover on the top panel of the unit, and set the printer paper in the paper holder. Set the printer paper so that the top face of the paper faces up when the tip of the paper is opened outwards.

② Raise the headup lever. Remove any paper edges remaining, insert the tip of the printer paper set at① as shown below, and feed about 5 cm.

③ Push down the headup lever. Next, continue pressing the [FEED] key until the printer paper comes out of the recording window on the top panel.

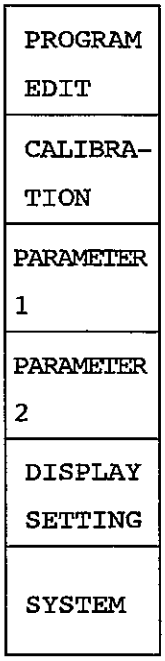
④ Close the cover on the top panel.



5.5 Other Functions

This section describes the MISC mode.

MISC mode



PROGRAM EDIT ····· Displays the setting windows related to program functions. (→ Refer to section 5.5.1.)

CALIBRA-TION ····· Displays the setting windows related to the parameters of measuring and analysis functions. (→Refer to section 5.5.2.)

PARAMETER 1 ····· Displays setting windows related to the parameters of measuring and analysis functions. (→ Refer to section 5.5.2.)

PARAMETER 2 ····· Displays setting windows related to display. (→ Refer to section 5.5.3.)

DISPLAY SETTING ····· Displays setting windows setting to system settings. (→ Refer to section 5.5.4.)

SYSTEM ····· Displays setting menus related to calibration functions. (→ Refer to section 5.5.5.)

5.5.1 Editing the Program

This section describes the *PROGRAM EDIT* menu for setting program functions.

(1) Description of screen

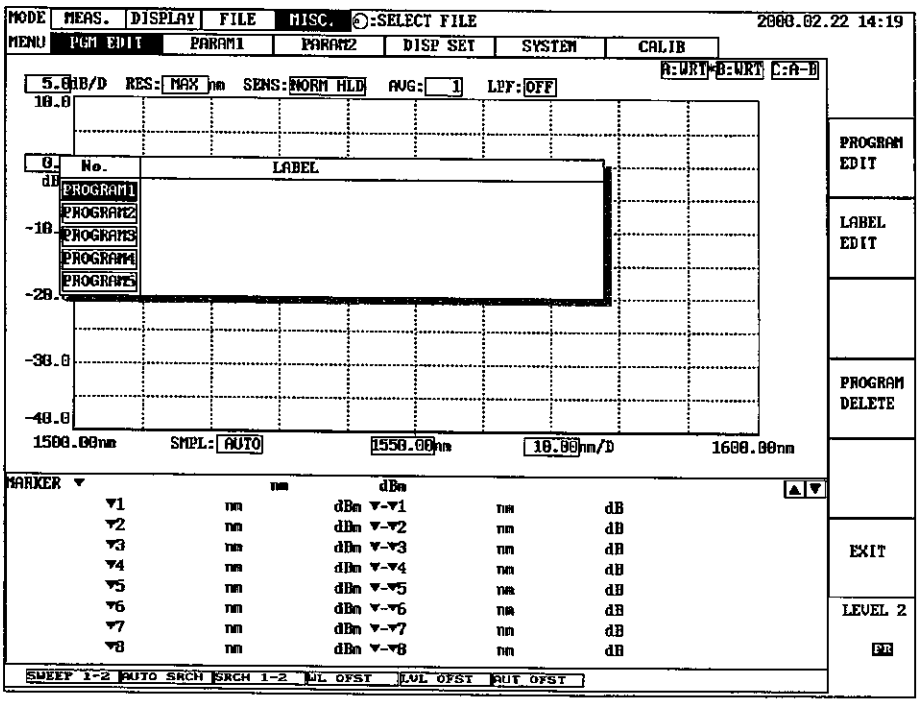


Fig. 5-5-1 Program Editing Setting Screen

(2) Setting method

① Press the MODE key and set the <MEAS.> Mode.
② Set the <PROGRAM EDIT> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "LIST SCROLL"
Rotating the rotary knob: Selects the line.
Pressing the rotary knob: Fixes the line.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CHARACTER"
Rotating the rotary knob: knob:Selects the character.
Pressing the rotary knob: Fixes the character.

(4) Description of keys

a. When the PROGRAM EDIT menu is opened

PROGRAM EDIT	····· Displays the program list for editing the program. (→b)
LABEL EDIT	····· Inputs the name to the program selected from the list. (→f)
EXIT	····· Returns to the MISC mode.

LEVEL 2

b. When the <PROGRAM EDIT> key is pressed:

COMMAND SELECT	····· Displays the command list. (→d)
PARAMETER EDIT	····· Edits the parameters of the command registered to the line selected. (→e)
LINE INSERT	····· Inserts a blank line before the line selected.
PRINT LIST	····· Prints the program displayed in the Program area.
EXIT	····· Returns to the PROGRAM EDIT menu. (→a)
MORE 1/2	····· Displays the second page of the soft key menu. (→c)

LEVEL 3

c. When the <MORE 1/2> key is selected

AREA SELECT	····· Sets the selected line at the head of the line to be copied or deleted, for the line area to be selected.
COPY	····· Copies the line selected or the line area selected to the buffer.
CUT	····· Copies the line selected or the line area selected to the buffer, and deletes.
PASTE INSERT	····· Pastes the line copied to the buffer on the line selected using the <COPY> and <CUT> keys.
PASTE OVERWRITE	····· Overwrites the line copied to the buffer on the line selected using the <COPY> and <CUT> keys.
MORE 2/2	····· Returns to the first page of the soft key menu. (→a)

LEVEL 3

d. When the <COMMAND SELECT> key is pressed at the PROGRAM EDIT menu

UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· Sets the command at the position of the cursor.
CANCEL	····· Cancels the setting, and displays the first page of the soft key menu. (→b)

LEVEL 3

e. When the <PARAMETER EDIT> key is pressed at the b soft key menu

UP	····· Increases the parameter value.
DOWN	····· Decreases the parameter value.
NEXT FIGURE	····· Moves the cursor to the next digit.
ENTER	····· Fixes the value set.
CANCEL	····· Cancels the setting, and displays the first page of the soft key menu. (→b)

LEVEL 3

- When inputting the program label -

f. When pressing the <LABEL EDIT> key

INPUT MODE	····· Sets the INPUT mode. (→h)
DONE	····· Fixes the character selected.
CANCEL	····· Cancels the setting, and returns to the PROGRAM EDIT menu.
MORE 1/2	····· Displays the second page of the soft key menu. (→g)

LEVEL 3

g. When the <MORE 1/2> key is pressed

→	····· Moves the label cursor to the right.
←	····· Moves the label cursor to the left.
INSERT	····· Leaves one space at the label cursor.
DELETE	····· Deletes the character at the label cursor.
CLEAR	····· Deletes the whole label input.
MORE 2/2	····· Displays the first page of the soft key menu. (→f)

LEVEL 3

h. When the <INPUT MODE> key is pressed

UP	····· Displays the contents of the next user dictionary.
DOWN	····· Displays the contents of the previous user dictionary.
READ	····· Inserts the character registered by the number displayed at the position of the cursor on the line.
WRITE	····· Registers with the number displaying the character on the line.
RETURN	····· Displays the first page of the soft key menu. (→f)

LEVEL 3

5.5.2 Detailed Setting of Measuring and Analysis Conditions

This section describes the *PARAMETER1, 2* menus for setting the measuring and analysis conditions in detail.

(1) Description of screen

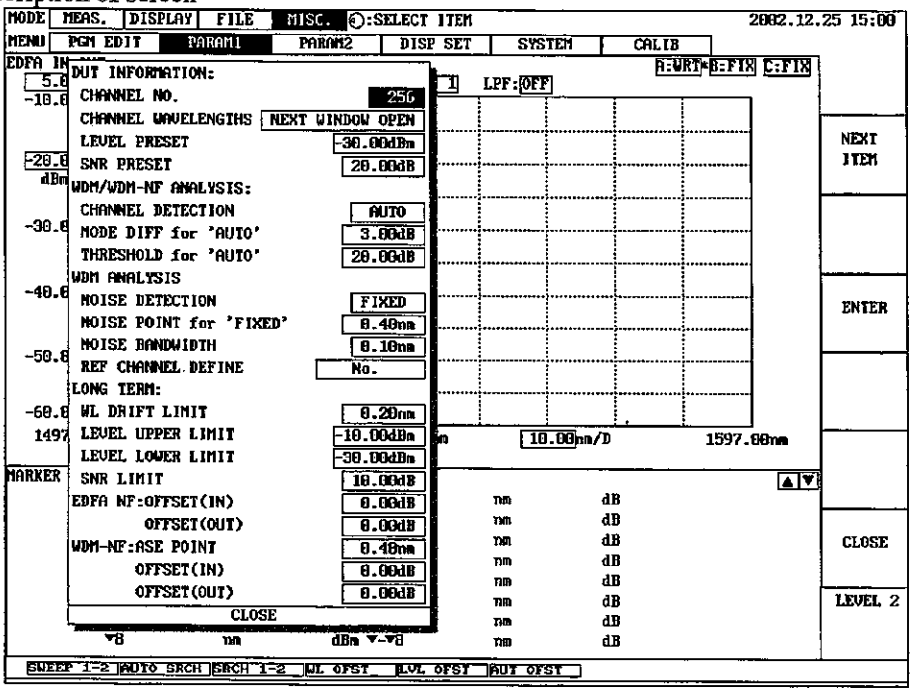


Fig. 5-5-2 PARAMETER1 Setting Screen

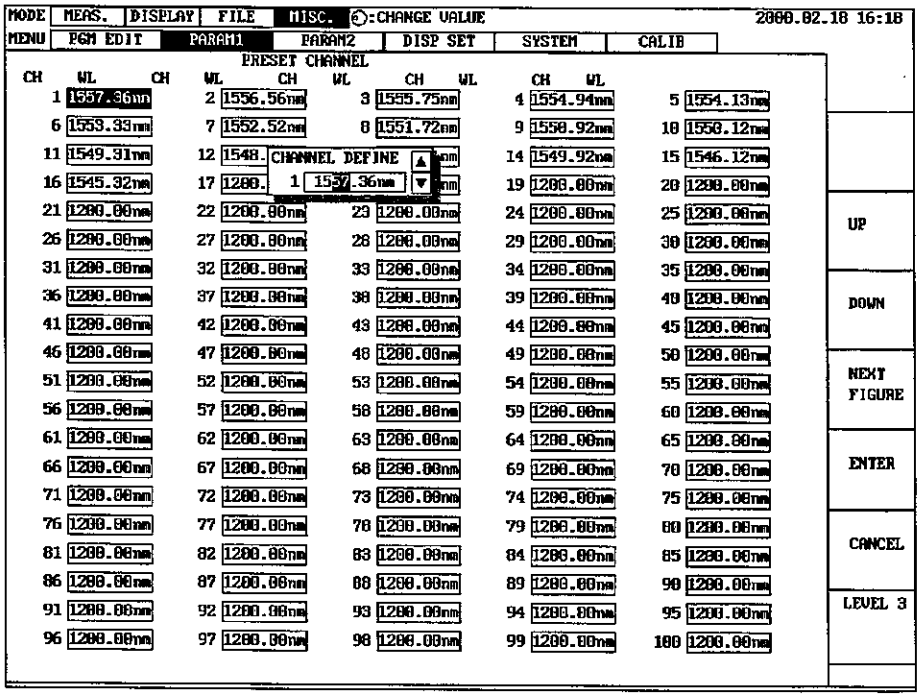


Fig. 5-5-3 PRESET CHANNEL Setting Screen

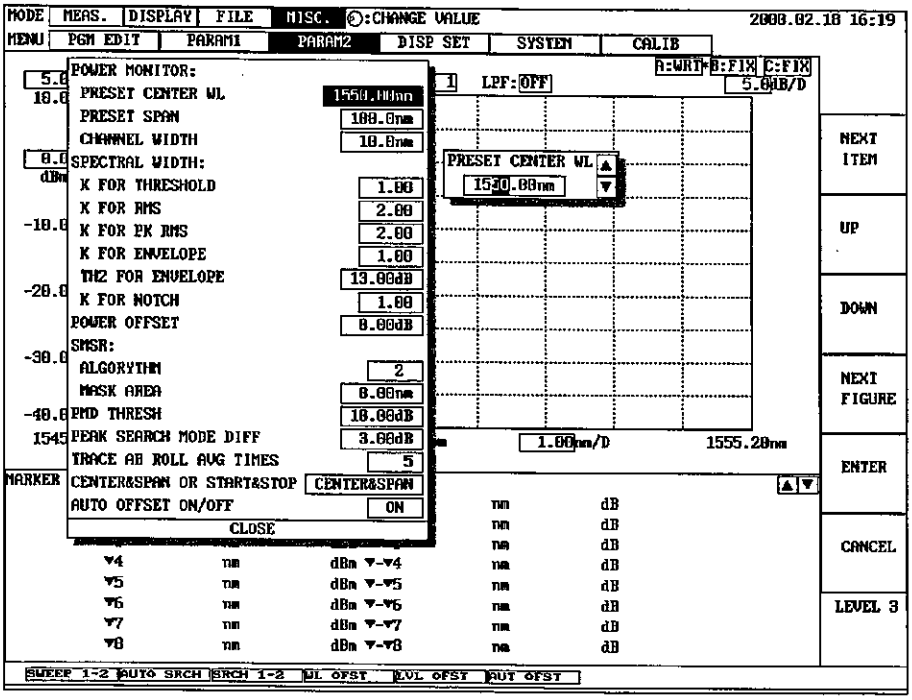


Fig. 5-5-4 PARAMETER2 Setting Screen

(2) Setting method

① Press the MODE key and set the <MISC> Mode.
② Set the <PARAMETER1> or <PARAMETER2> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value.

(4) Setting items

- "PARAMETER1" setting items -

① DUT INFORMATION: Inputs the number of WDM analysis maximum channels.
CHANNEL NO.
1~256 1 step

② DUT INFORMATION:
CHANNEL WAVELENGTH: Edits the wavelength of channels.
CHANNEL 1~256 WAVELENGTH 1200~1600nm 0.01nm step

③ DUT INFORMATION:
LEVEL PRESET Sets the preset LEVEL value.
-90~+20dBm 0.01dB step

④ DUT INFORMATION:
SNR PRESET: Sets the preset SNR value.
0~50dBm 0.01dB step

⑤ WDM/WDM−NF ANALYSIS:
CHANNEL DETECTION: Selects whether to number mode peaks with channel numbers by referring to the preset wavelength or by numbering in order from the left.

⑥ WDM/WDM−NF ANALYSIS:
MODE DIFF for 'AUTO': Inputs the peak difference.
0.1~50dB 0.01dB step

⑦ WDM/WDM−NF ANALYSIS:
THRESHOLD for 'AUTO': Inputs the WDM analysis threshold value.
0.1~50dB 0.01dB step

⑧ WDM ANALYSIS:
NOISE DETECTION: Selects whether to set the noise measuring point to the center of the mode or to the fixed point.
CENTER/FIXED/CANCEL

⑨ WDM ANALYSIS:
NOISE POINT for 'FIXED': Sets the measuring point of the noise.
0~10nm 0.01nm step

⑩ WDM ANALYSIS
NOISE BANDWIDTH Sets a bandwidth for the noise level calculation.
0.01~1.00nm 0.01step

⑪ WDM ANALYSIS:
REF CHANNEL DEFINE: Selects whether to specify the reference channel by number or wavelength.
WAVELENGTH/No./CANCEL

⑫ LONG TERM:
WL DRIFT LIMIT: Sets the wavelength deviation limit value.
0~99.99nm 0.01nm step

⑬ LONG TERM:
LEVEL UPPER LIMIT: Sets the upper limit for LEVEL.
-90~20dBm 0.01dB step

⑭ LONG TERM:
LEVEL LOWER LIMIT: Sets the lower limit for LEVEL.
-90~20dBm 0.01dB step

⑮ LONG TERM:
SNR LIMIT: Sets the SNR limit value.
-90~20dBm 0.01dB step

⑯ EDFA NF:
OFFSET(IN): Offsets the input.
-99.99~+99.99dB 0.01 step

⑰ EDFA NF:
OFFSET(OUT): Offsets the output.
-99.99~+99.99dB 0.01 step

⑱ WDM－NF:
ASE POINT: Defines the ASE measurement point value.
±0.00~10.00nm 0.01nm step

⑲ WDM－NF:
OFFSET(IN): Offsets the input.
-99.99~+99.99dB 0.01 step

⑳ WDM－NF:
OFFSET(OUT): Offsets the output.
-99.99~+99.99dB 0.01 step

- "PARAMETER2" setting items -

① POWER MONITOR:
PRESET CENTER WL: Sets the center wavelength of the wavelength area measured when "PRESET AREA" is selected using the power monitor function.
1200~1700nm 0.01nm STEP

② POWER MONITOR:
PRESET SPAN: Sets the sweep width of the wavelength area measured when "PRESET AREA" is selected using the power monitor function.
1~500nm 0.1nm STEP

③ POWER MONITOR:
CHANNEL WIDTH: Sets the sweep width of channels when "CANCEL" is selected using the power monitor function.
0.1~100nm 0.1nm STEP

④ SPECTRAL WIDTH
K FOR THRESHOLD: Sets the THRESHOLD, THRESHOLD (MODE FIT) K rate.
0.1~10 0.01 step

⑤ SPECTRAL WIDTH
K FOR RMS: Sets the RMS K rate.
1~10 0.01 step

⑥ SPECTRAL WIDTH:
K FOR PK RMS Sets a PEAK RMS rate.
1~10 0.01 step

⑦ SPECTRAL WIDTH
K FOR ENVELOPE: Sets the ENVELOPE K rate
1~10 0.01 step

⑧ SPECTRAL WIDTH
TH2 FOR ENVELOPE: Sets the ENVELOPE limit value.
0.01~50dB 0.01dB step

⑨ SPECTRAL WIDTH
K FOR NOTCH: Sets the NOTCH K rate.
1~10 0.01 step

⑩ POWER OFFSET: Inputs the power calculation offset level.
-10~+10dB 0.01dB step

⑪ SMSR:
ALGORYTHM: Selects the SMSR measurement algorithm.
1/2/CANCEL

⑫ SMSR:
MASK AREA: Sets the mask area.
0~99.99nm 0.01nm step

⑬ PMD THRESH: Sets the limit value for PMD measurement.
0.01~50dB 0.01dB step

⑭ PEAK SEARCH MODE DIFF: Inputs the peak difference serving as reference in determining the mode peak during peak search, spectral width search, etc.
0.1~50dB 0.01dB step

⑮ TRACE AB ROLL AVG TIMES: Sets the number of ROLL AVG of traces A and B.
2~1000 1 step

⑯ CENTER&SPAN OR START&STOP: Select the horizontal axis setting method.
CENTER&SPAN/START&STOP/CANCEL

⑰ AUTO OFFSET ON/OFF: Set the auto offset.
ON/OFF/CANCEL

(5) Description of keys

a. When the menu is opened:

NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the windows of items. (→b, c, e)
CLOSE	····· Cancels settings, and returns to the MISC mode menu.

LEVEL 2

b. Parameter setting soft key menu ①

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· After setting, returns to the "a" soft key menu.
CANCEL	····· Cancels the setting, and returns to the "a" soft key menu.

LEVEL 3

c. Parameter setting soft key menu ②

NEXT ITEM	------- Selects the next item.
UP	------- Moves up the cursor.
DOWN	------- Moves down the cursor.
NEXT FIGURE	------- After setting, returns to the "a" soft key menu.
ENTER	------- Cancels the setting, and returns to the "a" soft key menu.
CANCEL	------- Cancels the setting, and returns to the "a" soft key menu.

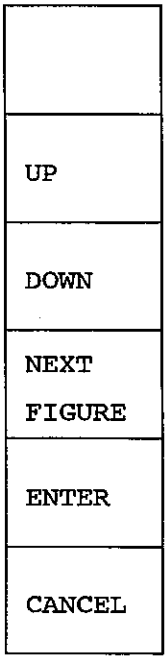
LEVEL 3

d. When "WDM:PRESET CHANNEL" is set:

ENTER	------- Opens the window for setting. (→e)
CLOSE	------- Cancels the setting, and returns to the "a" soft key menu..

LEVEL 3

e. When the ENTER key is pressed at the "d" soft key menu:



LEVEL 3

- UP ····· Moves up the cursor.
- DOWN ····· Moves down the cursor.
- NEXT FIGURE ····· Moves to the next digit.
- ENTER ····· Sets, and returns to the "d" soft key menu.
- CANCEL ····· Cancels the setting, and returns to the "d" soft key menu.

- PARAMETER2 -

a. When the PARAMETER2 menu is opened

NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the windows of items. (→b, c)
CLOSE	····· Cancels the setting, and returns to the MISC mode menu.

LEVEL 2

b. When setting SMSR:ALGORITHM, AUTO OFFSET ON/OFF

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· Sets, and returns to the "a" soft key menu.
CANCEL	····· Cancels the setting, and returns to the "a" soft key menu.

LEVEL 3

5.5.3 Setting the Screen Display

This section describes the *DISP SET* menu for setting the screen displays.

(1) Description of screen

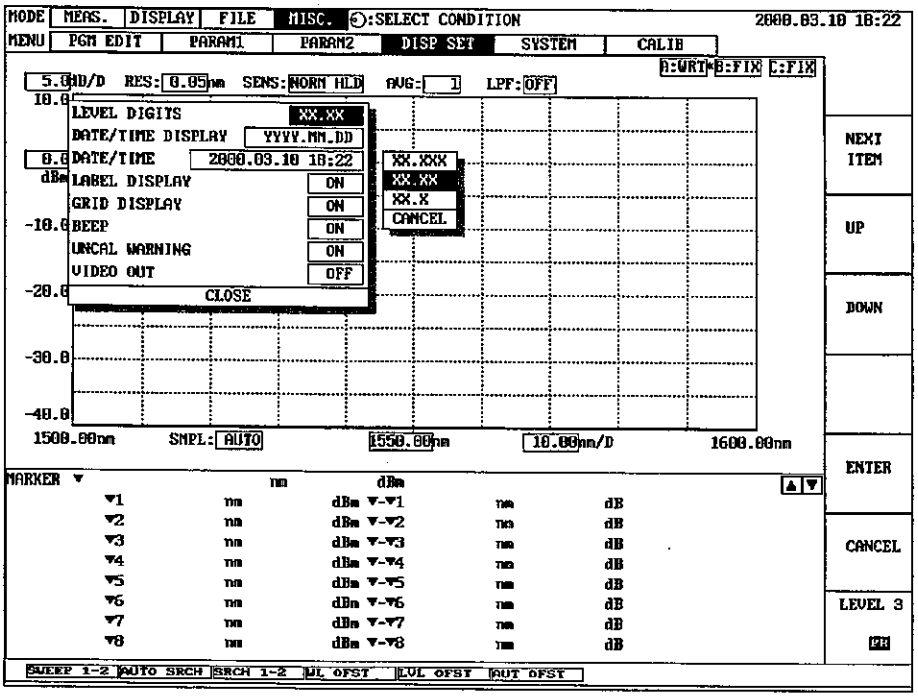


Fig. 5-5-5 Screen Display Setting Screen

(2) Setting method

① Press the MODE key and set the <MISC> mode.
② Set the <DISP SET> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value.

(4) Setting items

① LEVEL DIGITS: Sets the number of digits of LEVEL.
XX.XXX/XX.XX/XX.X/CANCEL
② DATE/TIME DISPLAY:Sets the date and time format.
MMM.DD.YYYY/DD.MMM.YYYY/YYYY.MM.DD./OFF/CANCEL
③ DATE/TIME: Sets the date and time.
④ LABEL DISPLAY: Sets whether to display label.
ON/OFF/CANCEL
⑤ GRID DISPLAY: Sets whether to display grid.
ON/OFF/CANCEL
⑥ BEEP: Sets whether to turn ON or OFF the warning beep.
ON/OFF/CANCEL

⑦ UNCAL WARNING: ON/OFF/CANCEL — Used for Specifying if the warning is to be turned on or not when UNCAL (when an inappropriate sample number is selected for the span) is detected. Selection is available from ON, OFF or CANCEL.

⑧ VIDEO OUT: ON/OFF/CANCEL — This is to preset whether or not to make the video outputs. When you desire to show the screen displays on CRT, set it to ON. (It is set to OFF when making these screen displays on the LCD.) Meanwhile, when the power is turned on, this is always set to OFF.(LCD)
(Remark) This equipment will not make simultaneous indications on both LCD and CRT.

(5) Description of keys

a. When the DISP SET menu is opened:

NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the windows of items. (→b, c)
CLOSE	····· Cancels settings, and returns to the MISC mode menu.

LEVEL 2

b. When setting DATE/TIME:

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
NEXT FIGURE	····· Moves to the next digit.
ENTER	····· Sets, and returns to the "a" soft key menu.
CANCEL	····· Cancels the setting, and returns to the "a" soft key menu.

LEVEL 3

c. When setting other than "b"

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
ENTER	····· After setting, returns to the "a" soft key menu.
CANCEL	····· Cancels the setting, and returns to the "a" soft key menu.

LEVEL 3

5.5.4 Setting the System Status

This section describes the *SYSTEM* menu for setting the screen displays.

(1) Description of screen

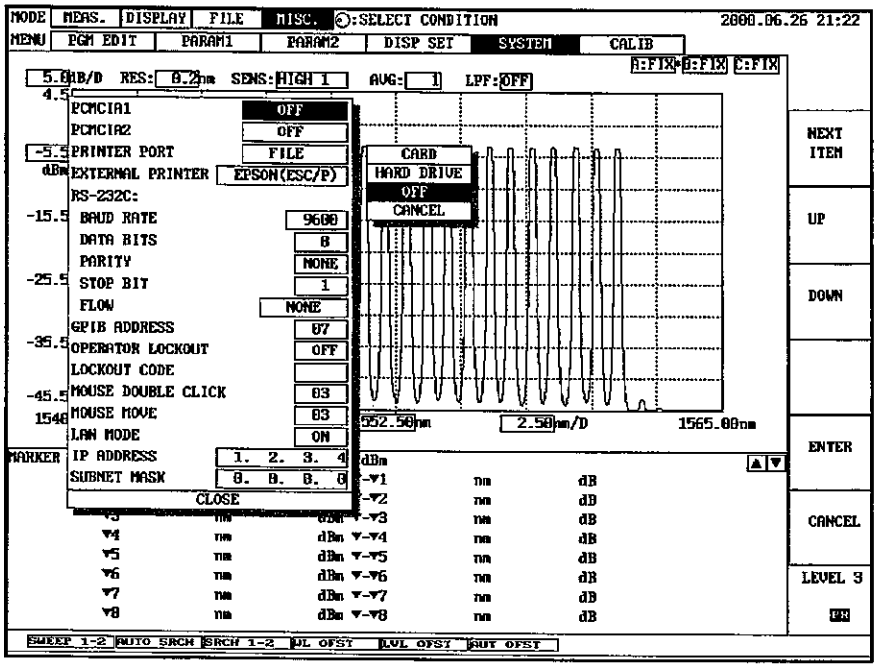


Fig. 5-5-6 System Status Setting Screen

(2) Setting method

① Press the MODE key and set the <MISC> mode.
② Set the <SYSTEM> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CONDITION"
Rotating the rotary knob: Selects the function.
Pressing the rotary knob: Fixes the function.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value.

(4) Setting items

① PCMCIA1: Sets the status of PCMCIA1.
CARD/HARD DRIVE/OFF/CANCEL

② PCMCIA2: Sets the status of PCMCIA2.
CARD/HARD DRIVE/OFF/CANCEL

③ PRINT TYPE: Sets the printout format.
HORIZONTAL/VERTICAL/SCREEN/CANCEL

④ PRINTER PORT: Sets the interface of the printer.
INTERNAL/CENTRONICAS/RS-232C/FILE/CANCEL

⑤ EXTERNAL PRINTER: Sets the external printer.
EPSON(ESC/P)/CANON(LIPS)/NEC(PC-PR)/HPGL/PCL/POSTCRIPT/SEIKO(DPU411)/SEIKO(DPU412)/CANCEL

⑥ RS-232C:
BAUD RATE: Sets the communication speed of RS-232C.
300/600/1200/2400/4800/9600/19200/CANCEL

⑦ RS-232C:
DATA BITS: Sets the communication data length of RS-232C.
5/6/7/8/CANCEL

⑧ RS-232C:
PARITY: Sets the parity of RS-232C.
NONE/ODD/EVEN//CANCEL

⑨ RS-232C:
Sets the stop bits of RS-232C.
1/1.5/2/CANCEL

⑩ RS-232C:
FLOW: Sets the RS-232C flow.
Xon/Xoff/HARDWARE/NONE/CANCEL

⑪ GPIB ADDRESS: Sets the GP-IB address.
0~30 1 step

⑫ OPERATOR LOCKOUT:Sets the lock function.
ON/OFF/CANCEL

⑬ LOCKOUT CODE: Sets the 4-digit password.

⑭ MOUSE DOUBLE CLICK: Sets the time for acknowledging the double click of the mouse.
1~10 (Long to Short)

⑮ MOUSE MOVE: Sets the moving distance of the mouse.
1~10 (Short to Long)

⑮ LAN MODE: Make this setting when controlling this equipment externally using
ON/OFF/CANCEL the Ethernet/RS-232C converter (optional) via the network.

(5) Precautions on use of PCMCIA

When a memory card, hard disk card, etc. is inserted into the PCMCIA card slot with the power of the unit ON, the PCMCIA may not operate properly in some cases. If this occurs, turn OFF the power of the unit, insert the card into the PCMCIA card slot, and turn ON the power.

(6) Lock function

Function which locks the measuring conditions of the unit so that they cannot be changed unless the password is input.

- Setting -

① Set the <SYSTEM> menu of the <MISC> mode.
② Press the <NEXT ITEM> key or rotate the rotary knob and move the cursor to "LOCKOUT CODE".
③ Press the <ENTER> key or the rotary knob to open the window for setting the password of the lock function.
④ Press the <UP/DOWN> keys or rotate the rotary knob to set one digit at a time, and press the <NEXT FIGURE> key or the rotary knob to fix that digit.
⑤ After setting the 4-digit password, press the <ENTER> key or the rotary knob. Be sure to note down the password in case you forget it.
⑥ Next press the <NEXT ITEM> key or rotate the rotary knob, move the cursor to "OPERATOR LOCKOUT", and press the <ENTER> key or the rotary knob to open the window.
⑦ Select "ON" and press the <ENTER> key or the rotary knob to fix the setting of the lock function. This will lock the measuring conditions.

- Releasing -

① Set the <SYSTEM> menu of the <MISC> mode.
② Press the <NEXT ITEM> key or rotate the rotary knob and move the cursor to "LOCKOUT CODE".
③ Press the <ENTER> key or the rotary knob to open the window for setting the password of the lock function.
④ Set the 4-digit password. See above for how to set.
⑤ Next press the <NEXT ITEM> key or rotate the rotary knob, move the cursor to "OPERATOR LOCKOUT", and press the <ENTER> key or the rotary knob to open the window.
⑥ Select "OFF" and press the <ENTER> key or the rotary knob to fix the setting of the lock function. This will release the lock and enable the measuring conditions to be changed.
⑦ Regarding the LAN mode
This is the function to make RS-232C controls of this equipment via the Ethernet/RS-232C converter using a personal computer being connected to the network. Meanwhile, when making use of this function, the converter, etc. become necessary in addition to this equipment.
Also, when this function is set to ON , this equipment will go under the LAN mode and the RS-232C port settings are internally changed to make supplemental indications of the IP address and the sub-net mask setting items (converter setting) in the SYSTEM menu.

(8) Description of keys

a. When the SYSTEM menu is opened

NEXT ITEM	····· Selects the next item.
ENTER	····· Opens the windows of items. (→b, c)
CLOSE	····· Cancels settings, and returns to the MISC mode menu.

LEVEL 2

b. When setting the LOCKPUT CODE

NEXT ITEM	····· Selects the next item.
UP	····· Moves up the cursor.
DOWN	····· Moves down the cursor.
NEXT FIGURE	····· Moves to the next digit.
ENTER	····· Sets, and returns to the "a" soft key menu.
CANCEL	····· Cancels the setting, and returns to the "a" soft key menu.

LEVEL 3

5.5.5 Calibration Function

This section describes the CALIBRATION menu for setting the calibration functions.

(1) Description of screen

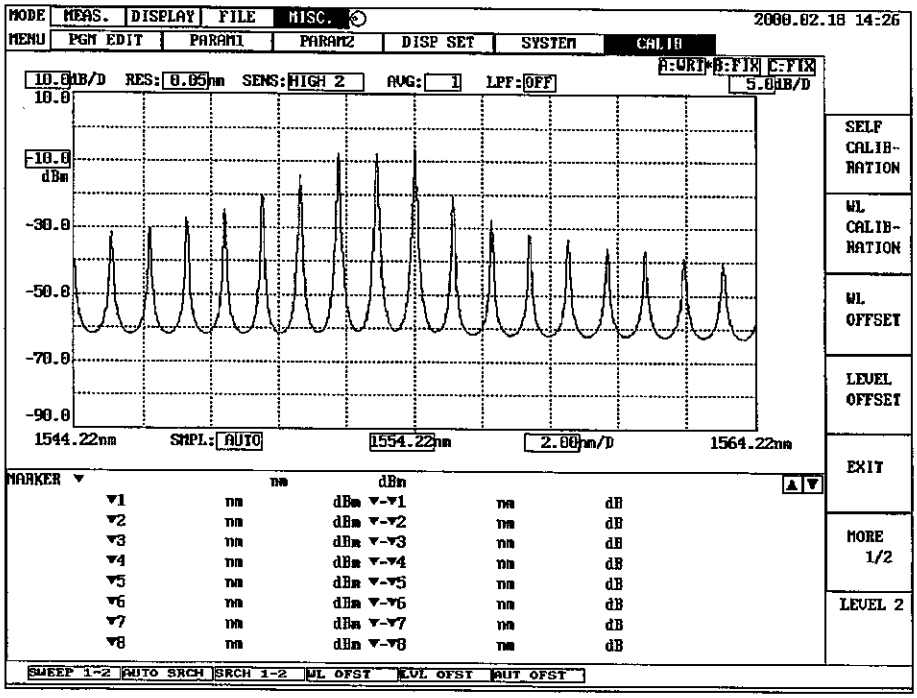


Fig. 5-5-7 Calibration Function Setting Screen

(2) Setting method

① Press the MODE key and set the <MISC> mode.
② Set the <CALIBRATION> menu.
(Press the soft key or rotate the rotary knob, select, and press it.)

(3) Key operations

[MODE] key:	Sets the MEASUREMENT mode
[F1] to [F6] keys:	Execute the soft key menu.
[HELP] key:	Describes the operations.
[AUTO START] key:	Executes the PROGRAM START menu.
[WAVELENGTH/ FREQUENCY] key:	Executes the WL/FREQ SCALE menu.
[LEVEL] key:	Executes the LEVEL SCALE menu.
[SWEEP] key:	Executes the SWEEP menu.
[ANALYSIS] key:	Executes the ANALYSIS menu.
[PRINT] key:	Outputs the screen to the printer.
[FEED] key:	Feeds the printer paper.
Rotary knob:	Operates according to the function.

✧ When displayed as "SELECT MENU"
Rotating the rotary knob: Selects the menu.
Pressing the rotary knob: Opens the menu.

✧ When displayed as "SELECT ITEM"
Rotating the rotary knob: Selects the item.
Pressing the rotary knob: Fixes the item.

✧ When displayed as "SELECT CHARACTER"
Rotating the rotary knob: Selects the character.
Pressing the rotary knob: Fixes the character.

✧ When displayed as "CHANGE VALUE"
Rotating the rotary knob: Changes the value.
Pressing the rotary knob: Fixes the value.

(4) Description of keys

a. When the CALIBRATION menu is opened:

SELF CALIB- RATION	Calibrates the wavelength using the built-in wavelength reference light source. Switches ON and OFF with each press. When set to ON, wavelength calibration is automatically performed every hour using the built-in wavelength reference light source.
WL CALIB- RATION	When this key is pressed, wavelength calibration is executed (external light source). Executed after the input of the calibration wavelength. 1200~1700nm 0.01nm step
WL OFFSET	····· Inputs wavelength offset. -5~+5nm 0.001dBm 0.001dBm step
LEVEL OFFSET	····· Inputs level offset. -30~+30nm 0.001dBm step
EXIT	····· Returns to the MISC mode menu.
MORE 1/2	····· Displays the second page of the soft key menu.

LEVEL 2

b. When the <MORE 1/2> key is pressed:

WL CALIB TABLE	····· Edits the wavelength CAL table.
LABEL CALIB TABLE	····· Edits the level CAL table.
TEST MODE	····· Moves to the test mode. (This function is used for the factory adjustments of the unit. It normally cannot be used as it is secured by a password.)
MORE 2/2	····· Displays the first page of the soft key menu.

LEVEL 3

c. When the <TEST MODE> key is pressed

UP	******* Selects the right character.
DOWN	******* Selects the left character.
DONE	******* Fixes the selected character.
CANCEL	******* Cancels the setting, and returns to the CALIBRATION menu (2/2).
MORE 1/2	******* Displays the second page of the soft key menu.

LEVEL 3

d. When the <MORE 1/2> key is pressed

→	******* Moves the label cursor to the right.
←	******* Moves the label cursor to the left.
INSERT	******* Leaves a space at the label cursor.
DELETE	******* Deletes the character at the label cursor.
CLEAR	******* Deletes the whole label input.
MORE 2/2	******* Displays the first page of the soft key menu.

LEVEL 3

CHAPTER 6 APPLIED MEASUREMENTS

This chapter describes applied measurements using the functions of the unit.

Contents

Contents of Diagrams

6.1 LONG TERM Measurement

This section This section describes the LONG TERM measurement.

6.1.1 Outline

In LONG TERM measurement, sweeping is carried out every certain period of time at the conditions currently set and WDM analysis results (peak wavelength, level, and SNR of each channel) are preserved. This measurement enables changes over a long period of each WDM channel to be studied. The analysis results are displayed at the LONG TERM menu of the DISPLAY mode. The results can also be displayed while measuring.

6.1.2 Setting Parameters

Several parameters must be set beforehand in order to perform LONG TERM measurement. The following describes how to set the parameters.

Set parameters at the PARAM1 menu of the MISC mode.

(1) Setting the number of WDM channels

Open the PARAM1 menu of the MISC mode, and adjust to the number of channels of the system measuring "DUT INFORMATION:CHANNEL NO.".

(2) Setting the wavelength of channels

Next, open CHANGE WAVELENGTHS, and set the wavelength of the channels set at (1). For channel greater than the number of channels set at (1), no settings need to be carried out in particular. The wavelength of each channel depends on the specifications of the measuring system.

(3) Setting CHANNEL DETECTION

Open the PARAM1 menu of the MISC mode, and set CHANNEL DETECTION OF WDM ANALYSIS. This setting consists of AUTO and PRESET.

- When "AUTO" is selected:

WDM analysis is performed, and the channels are set as CHG1, 2, • • • in order from the ones with the shortest wavelength.

For this reason, when the power of one channel drops. All channels with wavelengths longer than that channel will deviate.

Example)

When the light of 4 wavelengths-1551.70, 1552.50, 1553.3, 1554.1 nm is measured:

1551.70 nm is set as channel 1, 1552.50 nm as channel 2, 1553.3 nm as channel 3, and 1554.1 nm as channel 4.

Taking that the light of the 1552.50 nm wavelength is not output, channel 1 will output normally at 1551.70 nm, but channel 2 will be determined as having changed from 1552.50 nm to 1553.30 nm. This also applies to channel 3.

- When "PRESET" is selected:

  Each channel will be detected centering mainly around the wavelength set at (2).

For this reason, if the wavelength deviates and moves nearer to the wavelength set for the next channel, it will be acknowledged as the next channel.

Example)

When the light of 4 wavelengths-1551.70, 1552.50, 1553.3, 1554.1 nm is measured:

1551.70 nm is set as channel 1, 1552.50 nm as channel 2, 1553.3 nm as channel 3, and 1554.1 nm as channel 4.

Taking that the wavelength of channel 2 which was originally the 1552.50 nm wavelength changed, when it becomes 1553.0 nm, it actually must be detected that channel 2 deviated by 0.5 nm, but in the case of PRESET operations, it will be determined that channel 3 deviated by 0.3 nm.

Taking into consideration the features of "AUTO" and "PRESET", when the wavelength of all channels tend to fluctuate greatly, select AUTO. If the power of each channel fluctuates greatly, select PRESET.

(4) Setting WL DRIFT LIMIT

When the deviation of the wavelength of each channel exceeds this value, the wavelength displayed on the screen becomes red.

(5) Setting LEVEL UPPER LIMIT

When the level of each channel exceeds this value greatly, the level displayed on the screen becomes red.

(6) Setting LEVEL LOWER LIMIT

When the level of each channel becomes smaller than this value, the level displayed on the screen becomes red.

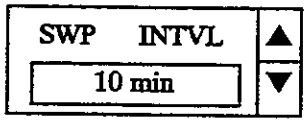
6.1.3 Setting Conditions

After completing the setting of parameters described in the previous section, set the measuring interval and number of measurements to be performed as the actual measuring conditions.

Set other measuring conditions such as resolution and span in the same way as normal measurements.

(1) Setting the measuring interval

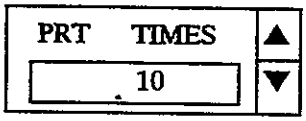
Selecting LONG TERM INTVL on page 2/2 of the SWEEP menu of the MEAS mode will display the screen for inputting the measuring interval.



Rotate the rotary knob and set the desired value. Pressing the rotary knob will change the digit input to the 100th place. Pressing another time will return to the 1st place.

(2) Setting the number of measurements.

Selecting LONG TERM RPT TIMES the second page of the SWEEP menu of the MEAS mode will display the screen for inputting the number of measurements.



Rotate the rotary knob and set the desired value. Pressing the rotary knob will change the digit input to the 100th place. Pressing another time will return to the 1st place.

6.1.4 Measurements

After completing the setting of parameters and measuring conditions, LONG TERM measurement can be performed.

Execute LONG TERM at the SWEEP menu of the MEAS mode. Measurements will be performed according to the conditions, and ended after the set number of measurements have been completed.

6.1.5 Displaying Measurement Results

The measurement results can be displayed on the screen in graph form during and after measurements. To display the measurement results, select the LONG TERM function at the DISPLAY menu.

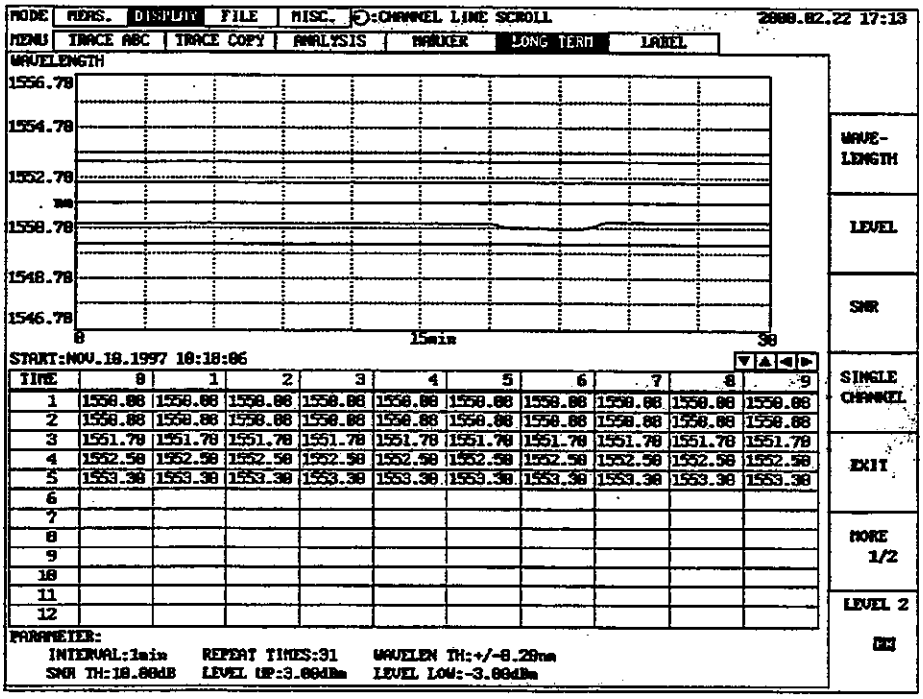


Fig. 6-1-1 LONG TERM Measurement Results

(1) Setting the reference value

The LONG TERM measurement can be displayed in two ways-by the absolute value display (ABSOLUTE) or relative value display (RELATIVE). When the relative value display is selected, the reference value must be set.

When REF DATA SET on page 2/2 of the LONG TERM menu is executed, the data at which the cursor is positioned currently will be set as the reference value. When REF DATA INITIAL is executed, the PRESET data input when setting the parameters will become the reference value.

6.1.6 MULTIPLE CHANNEL Display

The results of LONG TERM measurement can be displayed in two ways-by the MULTIPLE CHANNEL display method which displays for all channels simultaneously or the SINGLE CHANNEL display method which displays only the desired channel.

The following describes the MULTIPLE CHANNEL display method.

① Operating the rotary knob

Rotating the rotary knob moves the cursor on the graph and the enclosed portion in the table below the graph. At the same time, "TIME LINE SCROLL" will be displayed at the top right of the screen.

Next pressing the rotary knob once and rotating it will change the channels. At the same time, "CHANNEL LINE SCROLL" will be displayed at the top right of the screen.

Pressing the rotary knob again will move the cursor on the graph again.

② Wavelength display

Pressing the <WAVELENGTH> key changes the vertical axis to wavelength.

At this time, when the <ABSOLUTE RELATIVE> key on page 2/2 of the LONG TERM menu is set to ABSOLUTE, the wavelength will be displayed in the absolute value. When set to RELATIVE, the wavelength will be displayed in the relative value based on the channel indicated by the cursor.

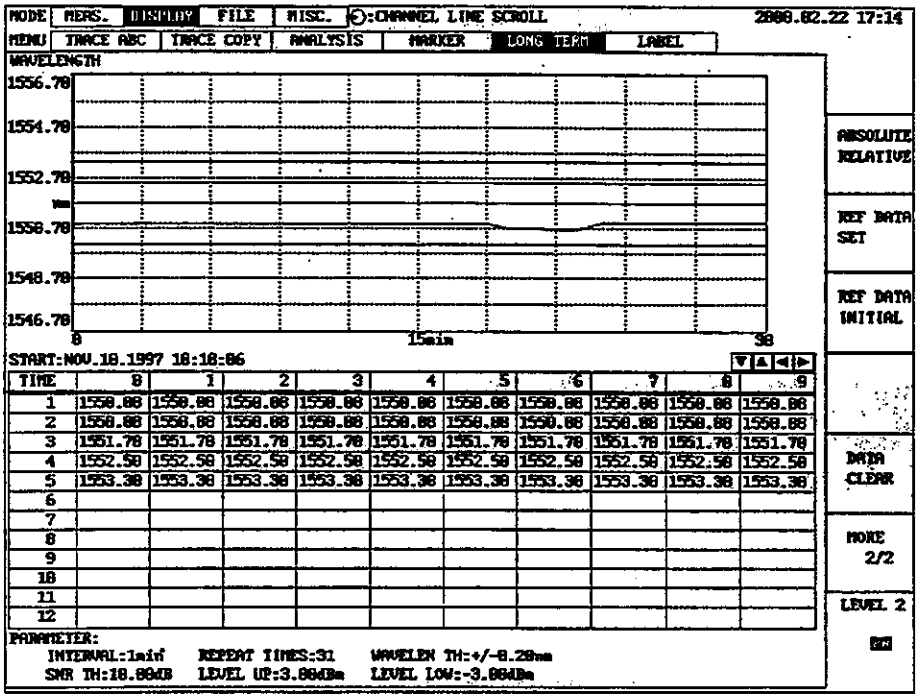


Fig. 6-1-2 WAVELENGTH Display ABSOLUTE

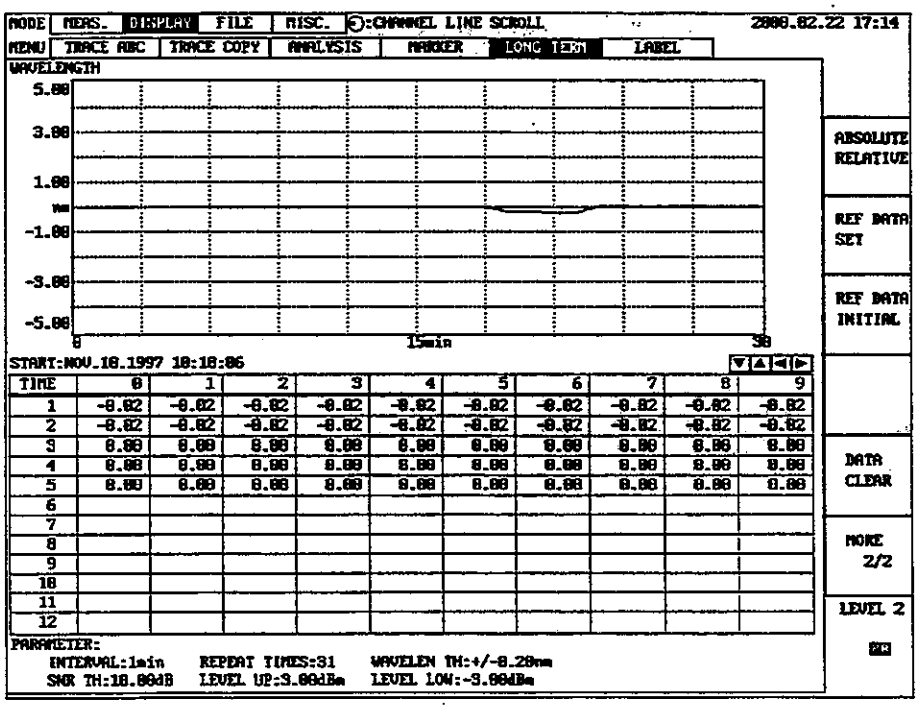


Fig. 6-1-3 WAVELENGTH Display RELATIVE

122.

③ Level display

Pressing the LEVEL key changes the vertical axis to level.

At this time, when the <ABSOLUTE RELATIVE> key on page 2/2 of the LONG TERM menu is set to ABSOLUTE, the level will be displayed in the absolute value. When set to RELATIVE, the level will be displayed in the relative value based on the channel indicated by the cursor.

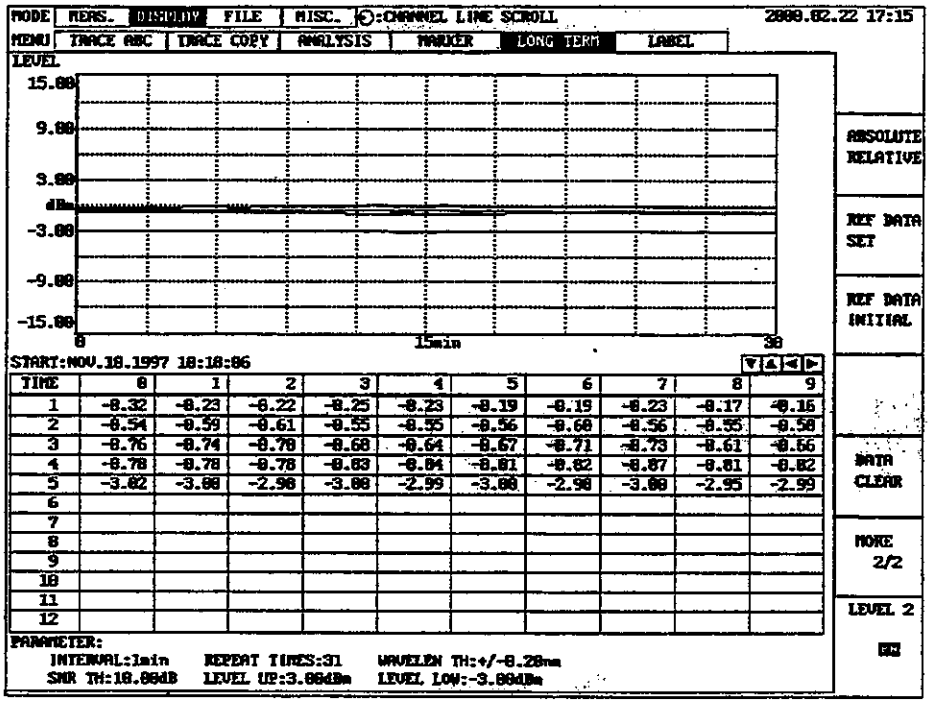


Fig. 6-1-4 LEVEL Display ABSOLUTE

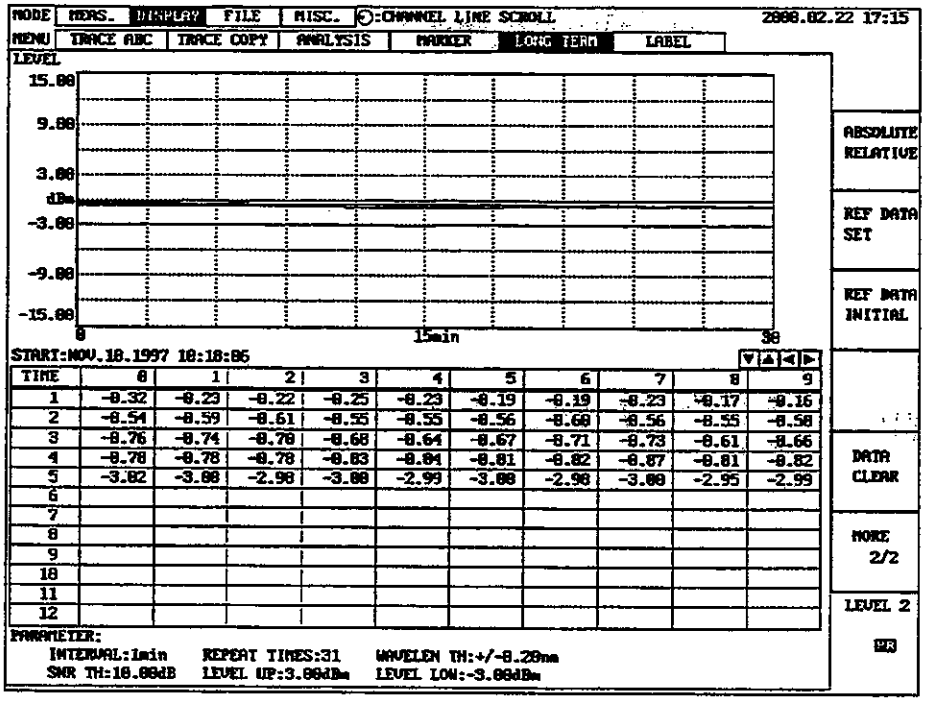


Fig. 6-1-5 LEVEL Display RELATIVE

④ SNR display

Pressing the <SNR> key changes the vertical axis to SNR.

At this time, when the <ABSOLUTE RELATIVE> key on page 2/2 of the LONG TERM menu is set to ABSOLUTE, SNR will be displayed in the absolute value. When set to RELATIVE, SNR will be displayed in the relative value based on the channel indicated by the cursor.

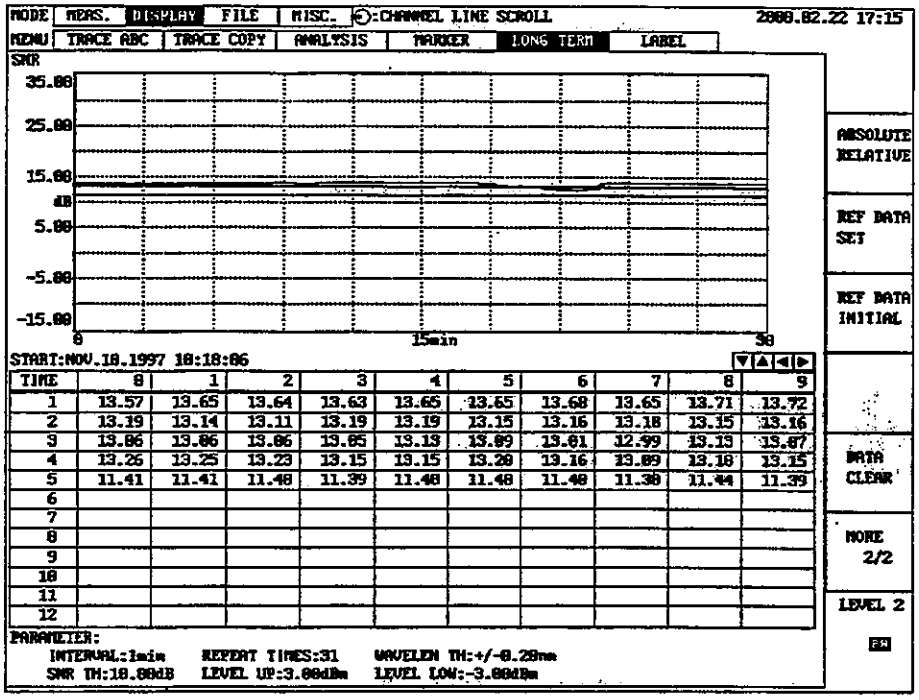


Fig. 6-1-6 SNR Display ABSOLUTE

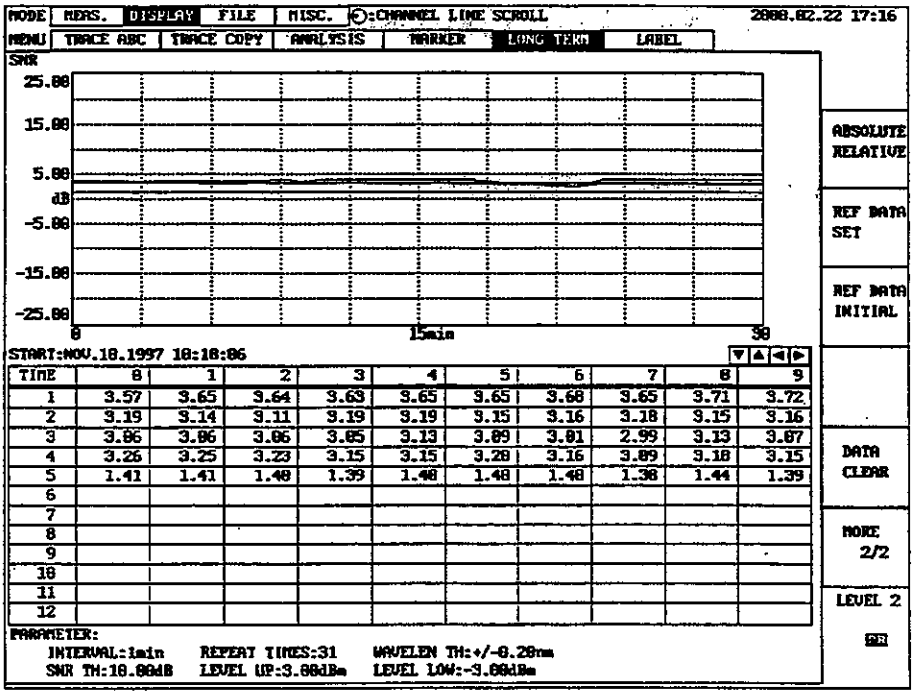


Fig. 6-1-7 SNR Display RELATIVE

6.1.7 SINGLE CHANNEL Display

This section describes the SINGLE CHANNEL display.

① Selecting the channel

Pressing the CHANNEL SELECT key enables selection of the channel to be displayed.

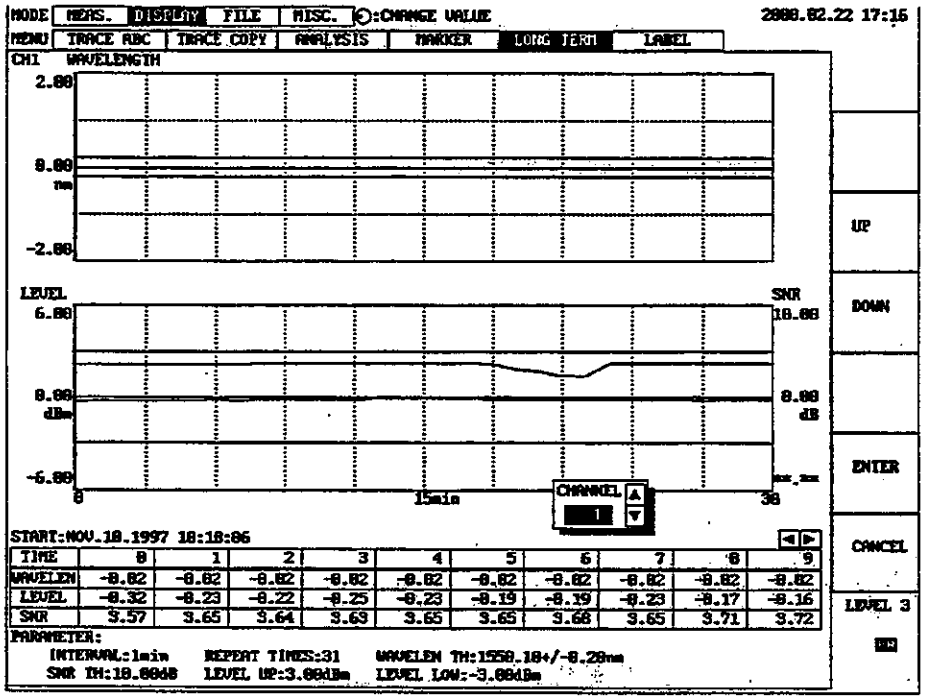


Fig. 6-1-8 Channel Selecting Screen

Select the channel using the <UP> and <DOWN> keys and then press the <ENTER> key to fix the channel.

The measurement results for the channel selected will be displayed.

② Switching between the absolute display and relative display

As for the MULTIPLE CHANNEL display, setting the ABSOLUTE RELATIVE key on page 2/2 of the LONG TERM menu to ABSOLUTE sets the absolute value display, and setting it to RELATIVE sets the relative value display based on the value set by REF DATA.

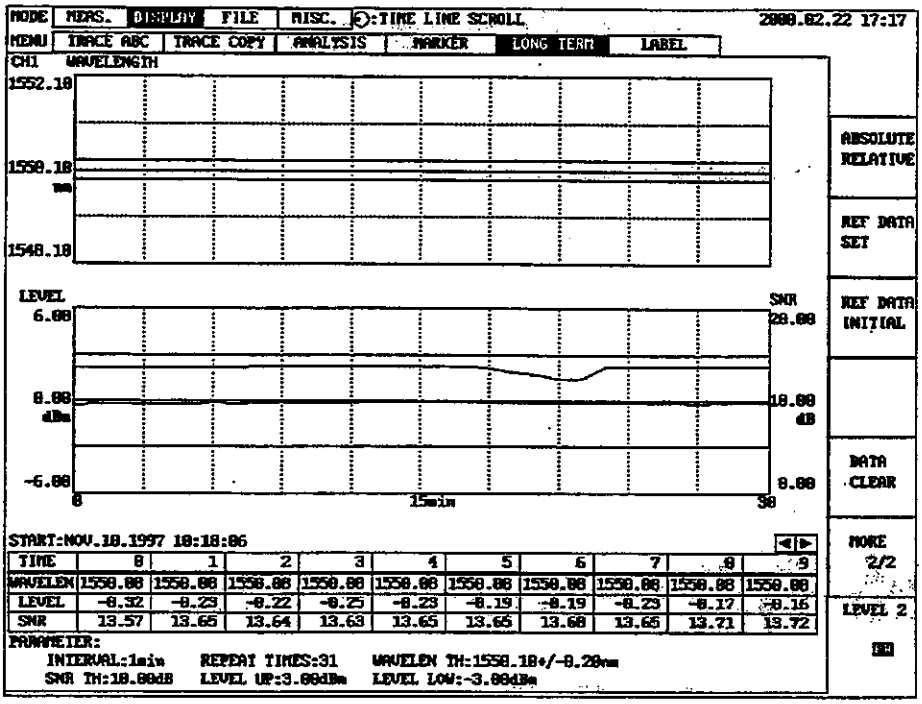


Fig. 6-1-9 SINGLE CHANNEL Display ABSOLUTE

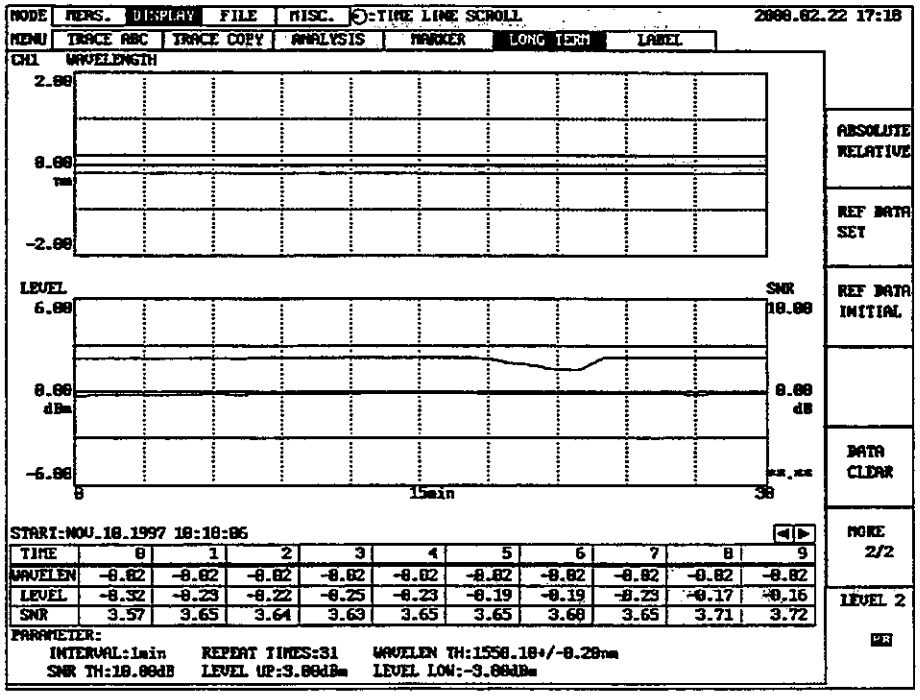


Fig. 6-1-10 SINGLE CHANNEL Display RELATIVE

6.2 Lost Wavelength Characteristics Measurement

The subtraction calculation function can be used to measure the lost wavelength characteristics of optical filters(1550nm BPF).

6.2.1 Outline

Using the measurement results of only the reference fiber and the measurements results of the filter (filter to be measured) connected in place of the reference fibers, the lost wavelength characteristics of the filter to be measured can be obtained.

6.2.2 Measuring System

(1) Measurement of the reference value

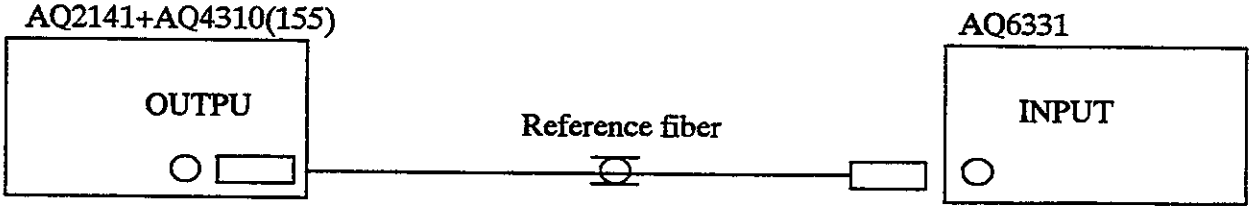


Fig. 6-2-1 Reference Value Measuring System

(2) Measurement of comparison values

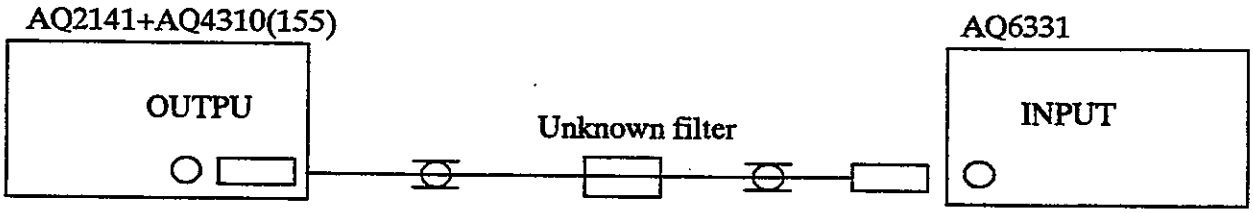


Fig. 6-2-2 Comparison Value Measuring System

6.2.3 Measurement Conditions

(1) Measured wavelength

When set to "CENTER&SPAN":

MEAS mode, WL/FREQ SCALE menu

CENTER WAVELENGTH : 1550 nm

SPAN : 20 nm

When set to "START&STOP":

MEAS mode, WL/FREQ SCALE menu

START WAVELENGTH : 1540 nm

STOP WAVELENGTH : 1560 nm

(2) Resolution

MEAS mode, SETUP menu

RESOLN : max

(3) Number of sample points

MEAS mode, SETUP menu

SAMPLE AUTO

(4) Measuring sensitivity

MEAS mode, SETUP menu

SENSITIVITY : HIGH1

6.2.4 Measuring Procedure

(1) Measuring the reference value

① As described at (1)Measuring the reference value in 6.2.2 Measurements, connect this unit and the ASE light source using the reference fiber (short fiber).

② Open the TRACE ABC menu of the DISPLAY mode.

③ Select "A" of the <ACTIVE ABC> key.

④ Select "DISP" A of the <DISP A BLANK A> key.

⑤ Select "WRITE A" of the <FIX A WRITE A> key.

⑥ Open the SWEEP menu of the MEAS mode.
Next select "SINGLE" of the <STOP SINGLE> key to perform measurement of the reference value.

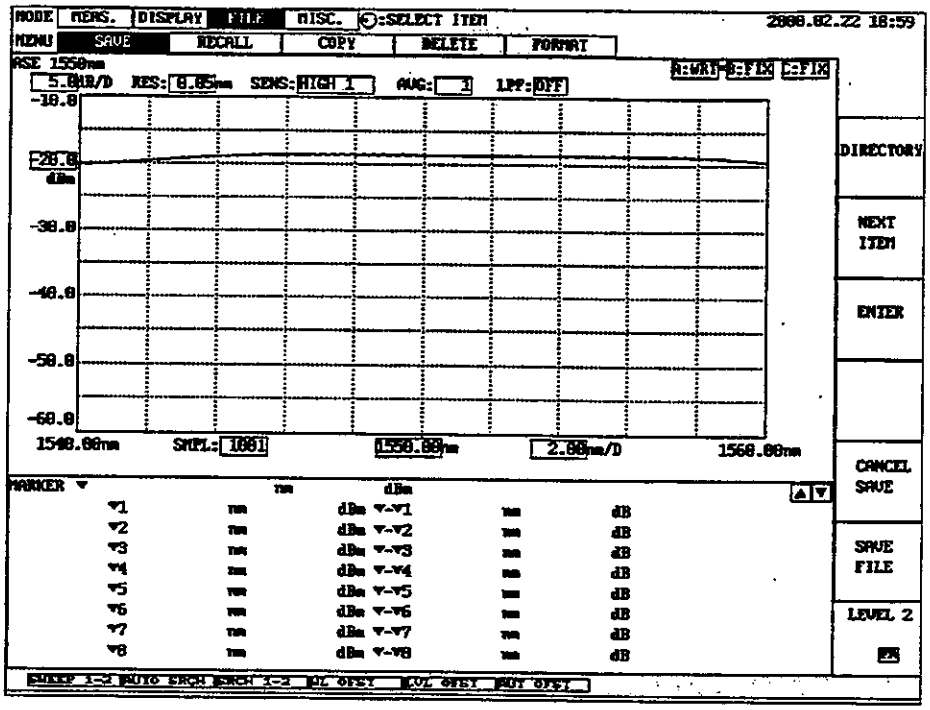


Fig. 6-2-3 Reference Value Measurement Results

⑦ After completing sweep, and the "STOP" of the <STOP SINGLE> key is displayed, open the TRACE ABC menu of the DISPLAY mode, select "FIX A" of the <FIX A WRITE A> key, and fix TRACE A.

(2) Measuring the comparison value

① As described at (2) Measuring the comparison value in 6.2.2 Measuring System, connect this unit and the ASE light source using the filter to the measured.

② Open the TRACE ABC menu of the DISPLAY mode.

③ Select "B" of the <ACTIVE ABC> key.

④ Select "DISP B" of the <DISP B BLANK B> key.

⑤ Select "WRITE B" of the <FIX B WRITE B> key.

⑥ Open the SWEEP menu of the MEAS mode.
Next select "SINGLE" of the <STOP SINGLE> key to perform measurement of the comparison value.

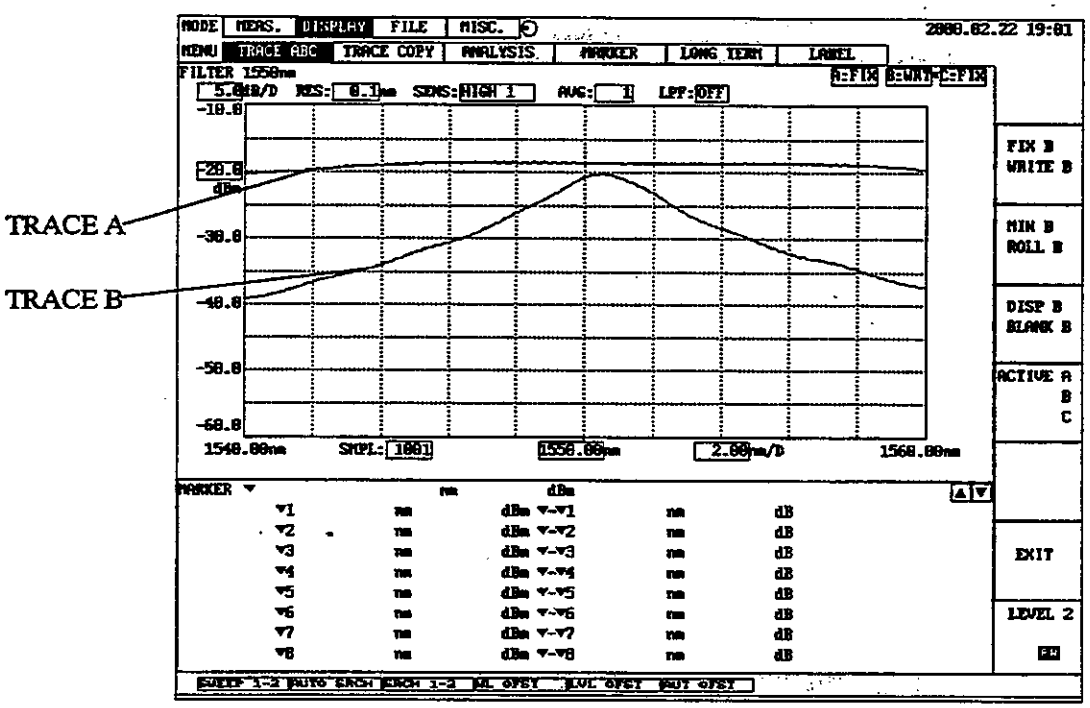


Fig. 6-2-4 Comparison Value Measurement Results

(3) Subtraction calculation

① Open the TRACE ABC menu of the DISPLAY mode.

② Select "C" of the <ACTIVE ABC> key.

③ Select "DISP C" of the <DISP C BLANK C> key.

④ Select "A-B C" of the <A-B C B-A C> key.
The results of subtracting "TRACE B" from "TRACE A" will be input to "TRACE C", and the sub scale will also be displayed.

⑤ If the results of "TRACE A" and "TRACE B" need not be displayed, change the <ACTIVE ABC> key and select "BLANK A" "BLANK B".

⑥ To change the sub scale, open the LEVEL SCALE menu of the MEAS mode and change using the <SUB SCALE> key and <SUB SCL OFFSET> key on page 2/2 of the TRACE ABC menu.

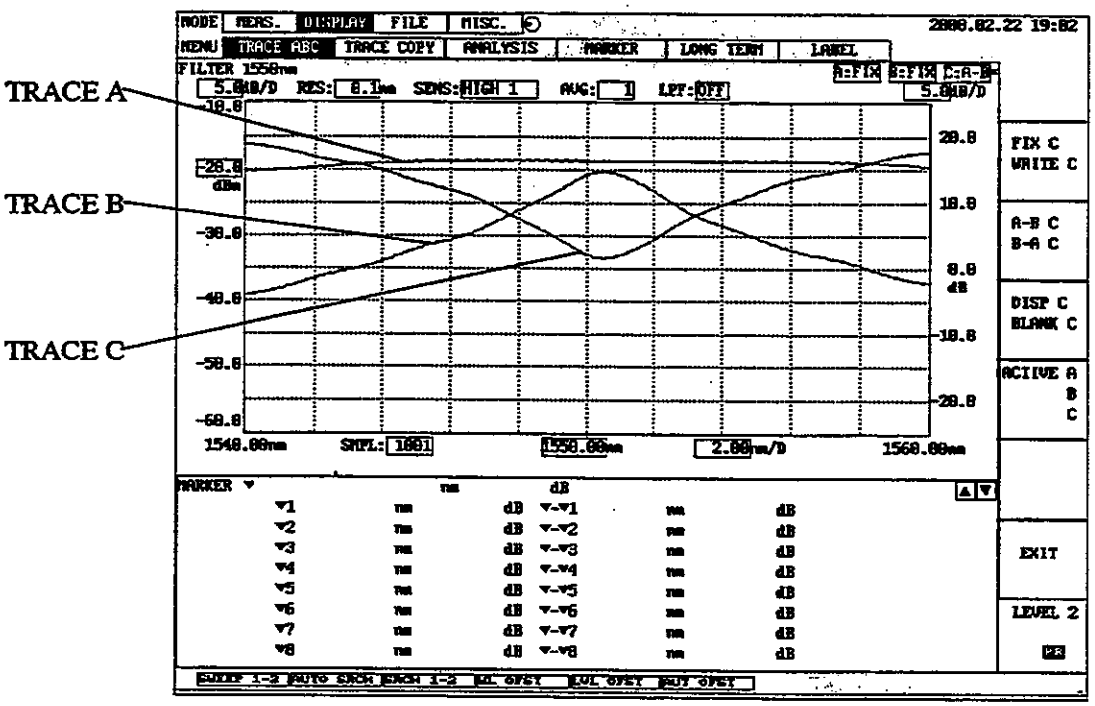


Fig. 6-2-5 Loss Wavelength Measurement Results

6.3 PMD Measurement

This unit is provided with a evaluation function for the polarization mode distribution.

6.3.1 Outline

By combining a broad frequency light source such as the ASE light source, high output LED light source, etc. together with the polarization wave controller and detector, the polarization mode distribution (PMD) of the object measured (optical fiber, etc.) can be calculated.

Note: Use a light source whose peak power is above -60 dBm with the resolution set to MAX.

6.3.2 Measuring System

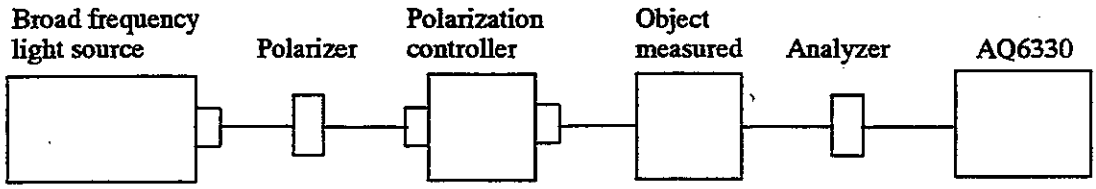


Fig. 6-3-1 PMD Measuring System

6.3.3 Measuring Procedure

① Prepare the measuring system described in section 6.3.2.
② Set the required measuring conditions, and measure the spectrum.
Set the resolution to "MAX".
Set other conditions such was wavelength according to the light source used.
Set SWEEP to "REPEAT".
③ While observing the waveform subject to repeat sweep, adjust the polarization controller so that the peak difference of the spectrum (difference between the maximum and minimum levels) becomes maximum.
④ After adjusting the polarization controller, set SWEEP to "SINGLE".

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⑤ After completing single sweep, open the ANALYSIS menu of the DISPLAY mode, and press the <PMD> key on page 2/2.
PMD will automatically be calculated from the measured spectrum.

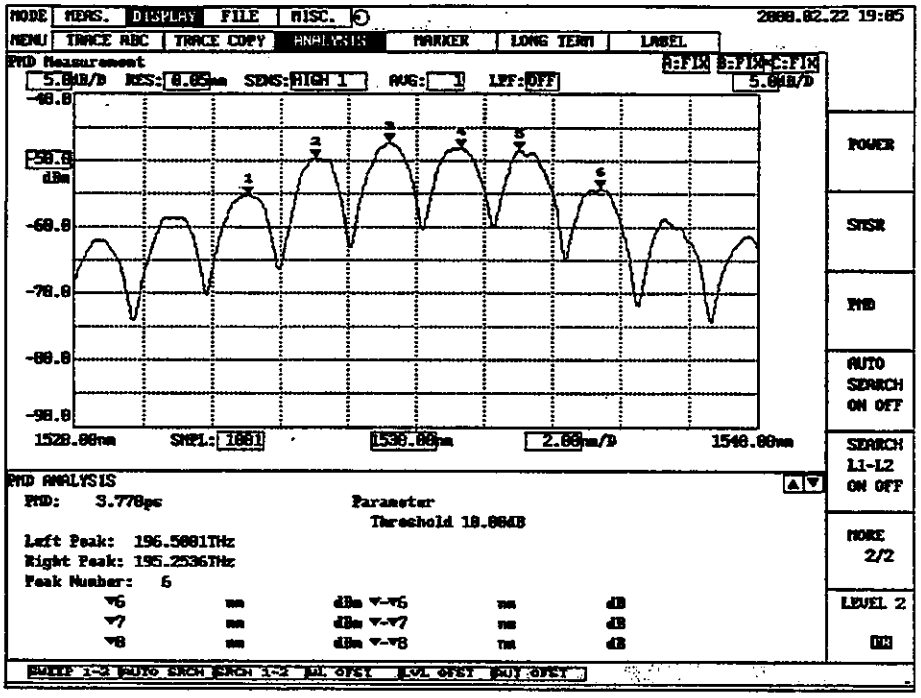

Fig. 6-3-2 PMD Measurement Results

⑥ Setting the threshold level

When performing PMD measurement, the changes of waveforms which have decreased for more than a certain value from the peak will not be reflected in the measured results. This certain value is known as the threshold value, and is set by "PMD THRESH" in the PARAM2 menu in the MISC mode.

Set so that only level differences which have exceeded a certain value on the measured waveform are acknowledged as the peak difference using "PEAK SEARCH MODE DIFF" in the PARAM2 menu.

The "PMD THRESH" and "PEAK SEARCH MODE DIFF" values in respect to the waveform are as shown in the following figure.

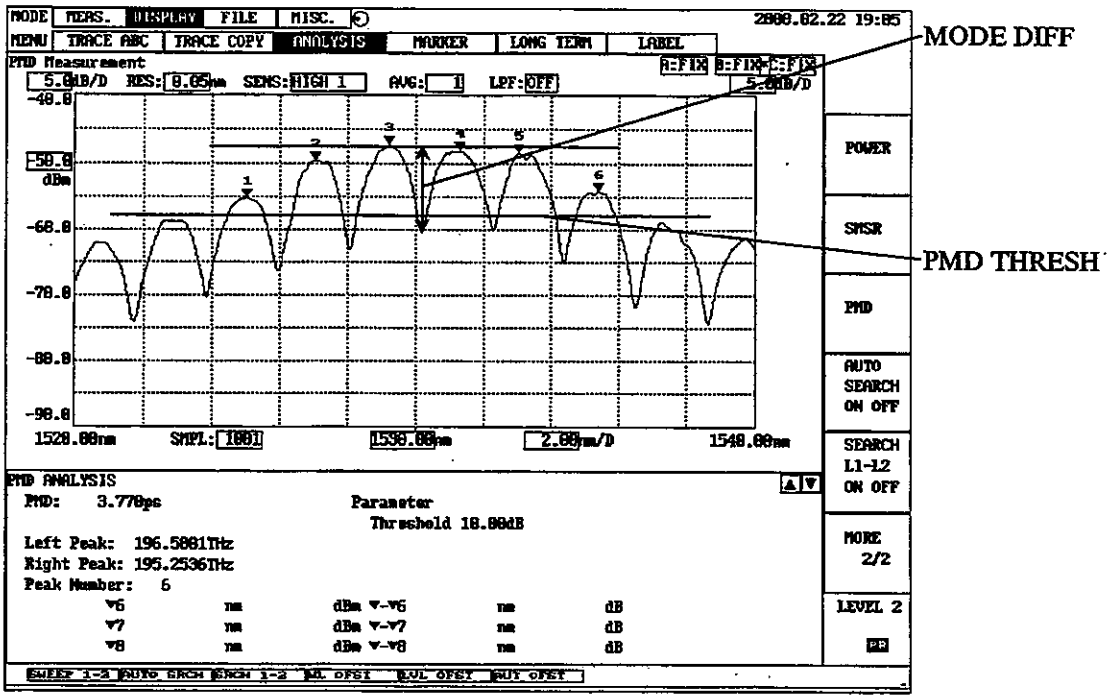

Fig. 6-3-3 PMD THRESH and MODE DIFF

CHAPTER 7 PROGRAM FUNCTIONS

This chapter describes the program functions.

Contents

Contents of Diagrams

Contents of Tables

7.1 Outline

The program function is executed by registering measuring conditions and measuring procedures, etc. Each program consists of 200 steps. Up to 5 programs can be constructed.

The program constructed can also be stored in the non-volatile memory and saved on the built-in floppy disk.

Use of this function enables automatic measurements to be performed using an external computer.

7.2 Inputting the Program

Press the <PROGRAM EDIT> key of the <MISC> mode.
The screen shown in Fig. 7-1 will be displayed.

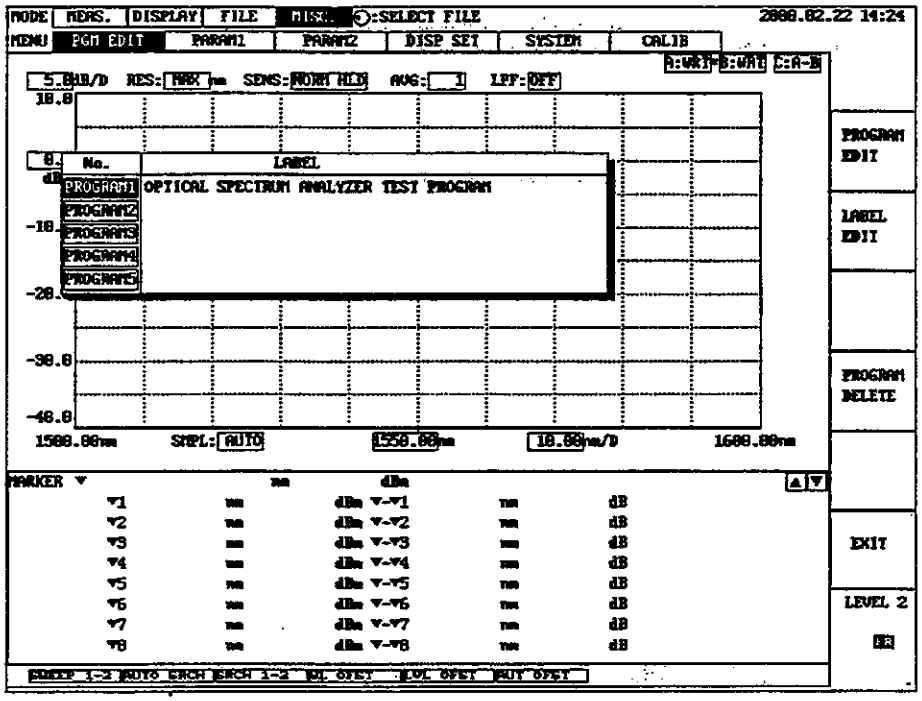

Fig. 7-1 Screen When <PROGRAM EDIT> Key is Pressed

The No. area shows PROGRAM 1 to PROGRAM 5.
The LABEL area shows the name of the program.

7.2.1 Inputting and Changing the Program Name

The program can be attached with a program name consisting of up to 50 characters.

At the screen shown in Fig. 7-1, highlight the program number in No. area using the rotary knob to input the program name or select the program number to be changed.

After selecting the number, press the <LABEL EDIT> key. A window for selecting the characters to be input and an area for inputting the program name appear as shown in the following figure, and the same contents as the Program Name area will be displayed in the Input Program Name area.

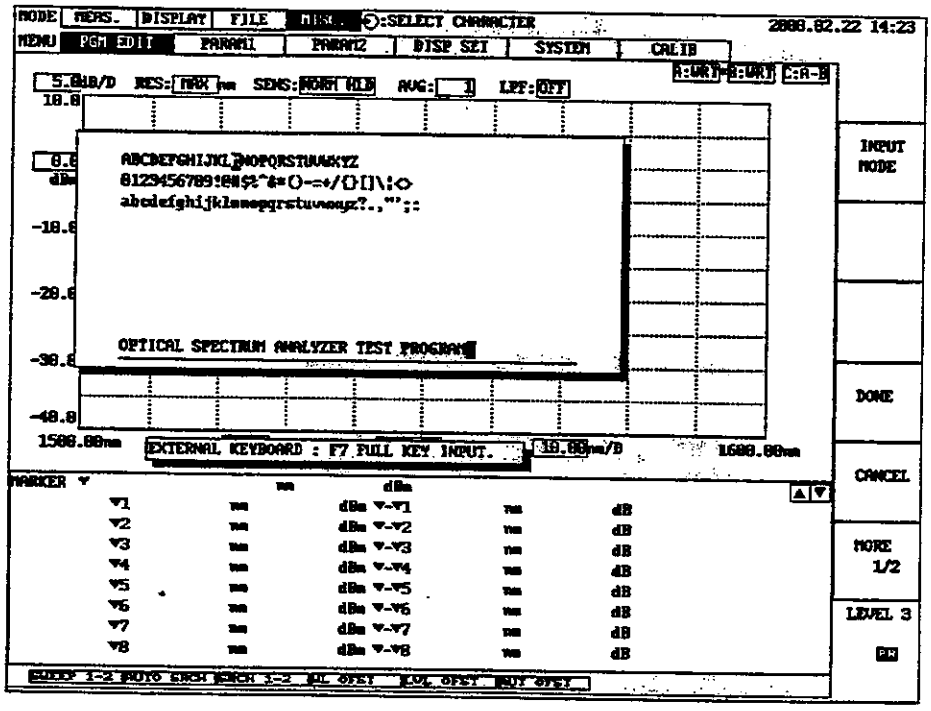

Fig. 7-2 Input Program Name Area

In the same way as inputting the label, input or change the program name in the Input Program Name area, and press the <DONE> key. The program name will be registered and the window will disappear.

NOTE

① The program name can also be input before registering the program.

② To execute a program registered in GP-IB, specify the program number.

③ When the program name is input for the program registered to the <PROGRAM1> to <PROGRAM5> keys (soft keys displayed when the [AUTO START] key is pressed), the program name (9 characters) will also be displayed at these soft keys. This will not be displayed even if the program name is input if the list does not exist in the program registered.

7.2.2 Inputting and Changing the Program

After highlighting the program number to be input or changed in No. area of the screen shown in Fig. 7-1, press the <PROGRAM EDIT> key to set the Input Program screen shown in Fig. 7-3.

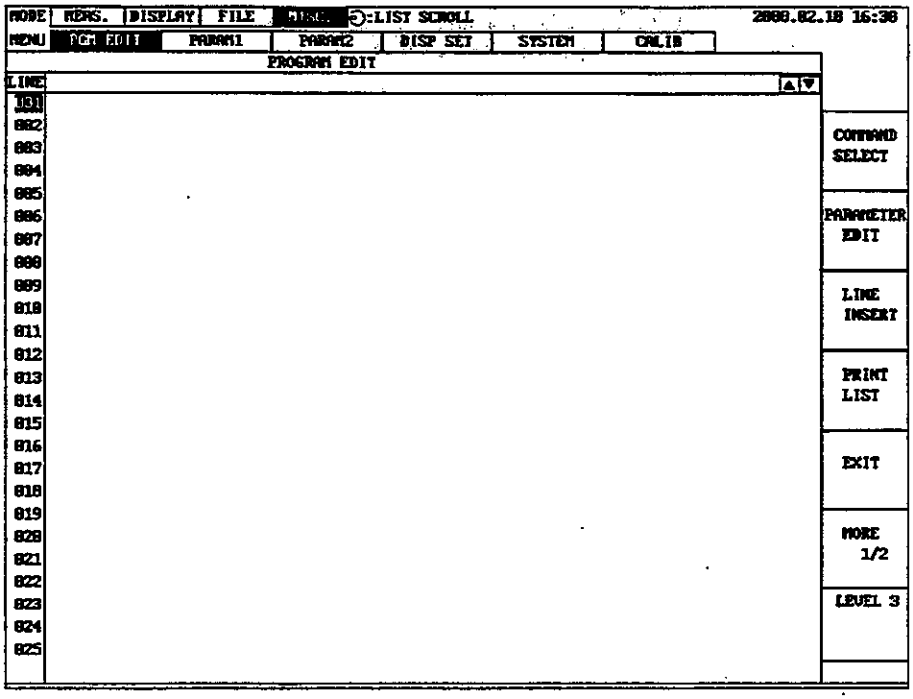

Fig. 7-3 Program Input Screen

- The Program area will display the program contents registered and the line number.

The line number of the Program area will be highlighted. Select the line number to be input or changed using the rotary knob, and edit the contents to be registered in the Program area.

- The command list will be displayed on the right of the screen when the <COMMAND SELECT> key is selected.

If "SPECIAL:COMMAND1" or "SPECIAL:COMMAND2" is selected when the <COMMAND SELECT> key is selected, the Special Command List will be displayed.

- Pressing the <EXIT> key returns to the screen shown in Fig. 7-1.

The commands registered in the program area consist of the commands for executing the same functions as the panel switch (including soft key), and other special commands. The special commands consist of the jump command, program control commands such as evaluating conditions, control commands of external equipment, commands to output characters to the printer, etc.

(1) To register the function of the panel switch (including the soft keys)

① Highlight the line number to be input or changed in the Program area at the Program Input screen.

② Press the <COMMAND SELECT> key at the <PROGRAM EDIT> menu of the <MISC.> mode. A command list corresponding to the Switch on the right side of the screen will be displayed, and a command in the list will be highlighted.

Select the command to be registered using the rotary knob or <UP><DOWN> keys, and press the <ENTER> key or rotary knob. The selected command will be displayed in the Program area.

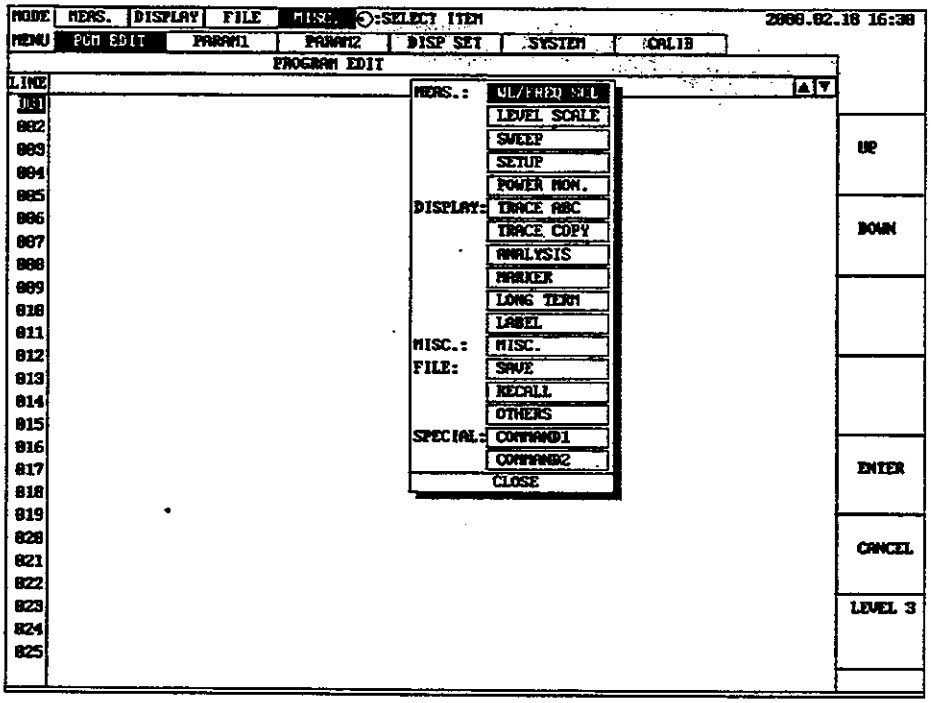

Fig. 7-4 Command List Registering Screen

If the command displayed in the Program area is attached with parameters, the current value set or the initial value set for each command will be displayed, and the parameter area will be highlighted.

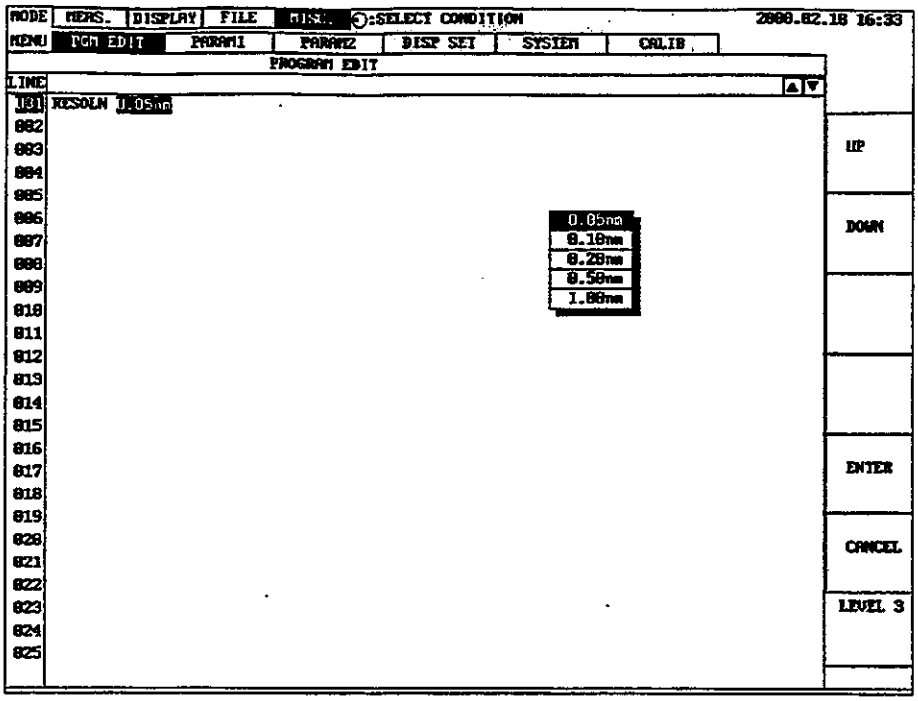

Fig. 7-5 Parameter Registering Screen

③ If the parameter attached needs to be changed, change it using the rotary knob, or the <UP>, <DOWN>, <NEXT FIGURE> key.

When the label command or floppy disk command to be input with characters is selected, the characters will be input at the parameter area.

A window for selecting the characters to be input and an area for inputting the program name will appear. Input in the same way as inputting the label, and press the <DONE> key.

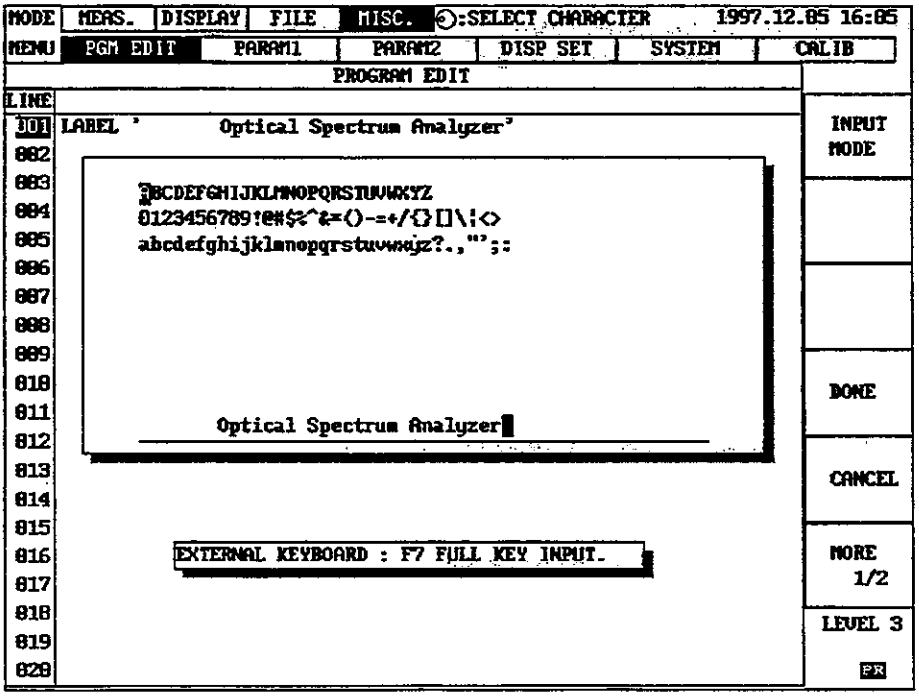

Fig. 7-6 Label Command, Floppy Command Registering Screen

④ After registering the command in the Program area (if attached with parameters, after registering the parameters), the next line number will be highlighted.

(2) To register a special command

① Highlight the line number to be input or changed in the Program area at the Program Input screen.

② Press the <COMMAND SELECT> key, and select "SPECIAL:COMMAND1" or "SPECIAL:COMMAND2". The Special Command List will be displayed and a command in the list will be highlighted.

Select the command to be registered using the rotary knob or <UP>, <DOWN> keys, and press the <ENTER> key or rotary knob. The selected command will be displayed in the Program area.

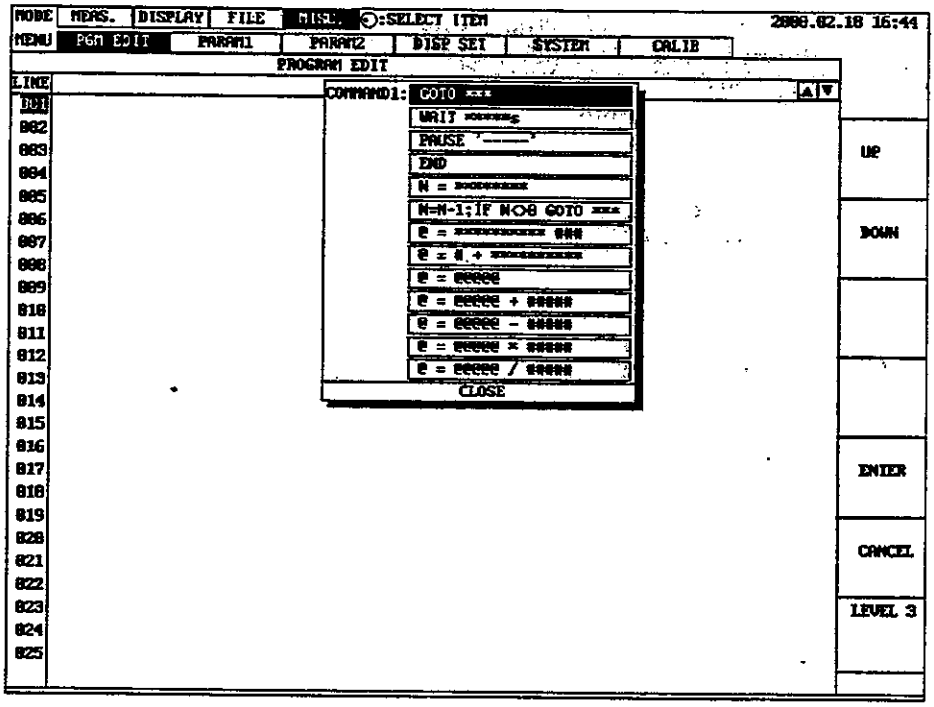

Fig. 7-7 Command Registering Screen

If the command displayed in the Program area is attached with parameters, the initial value set for each command will be displayed, and the parameter area will be highlighted.

③ If the parameter attached needs to be changed, change it using the rotary knob, or the <UP>, <DOWN> key, and press the ENTER key.

When a print command requiring characters to be input is selected, the characters will be input at the parameter area. A window for selecting the characters to be input and an area for inputting the program name will appear. Input in the same way as inputting the label, and press the <DONE> key.

④ After registering the command in the Program area (if attached with parameters, after registering the parameters), the next line number will be highlighted.

7.2.3 Changing the Parameter of Registered Commands

To change only the parameters of registered commands in the Program area, perform as follows.

① Highlight the line number of the command to be changed using the rotary knob.

② Press the <PARAMETER EDIT> key. If the command is attached with parameters, the parameter of the command displayed in the Program area will be highlighted, enabling it to be changed.

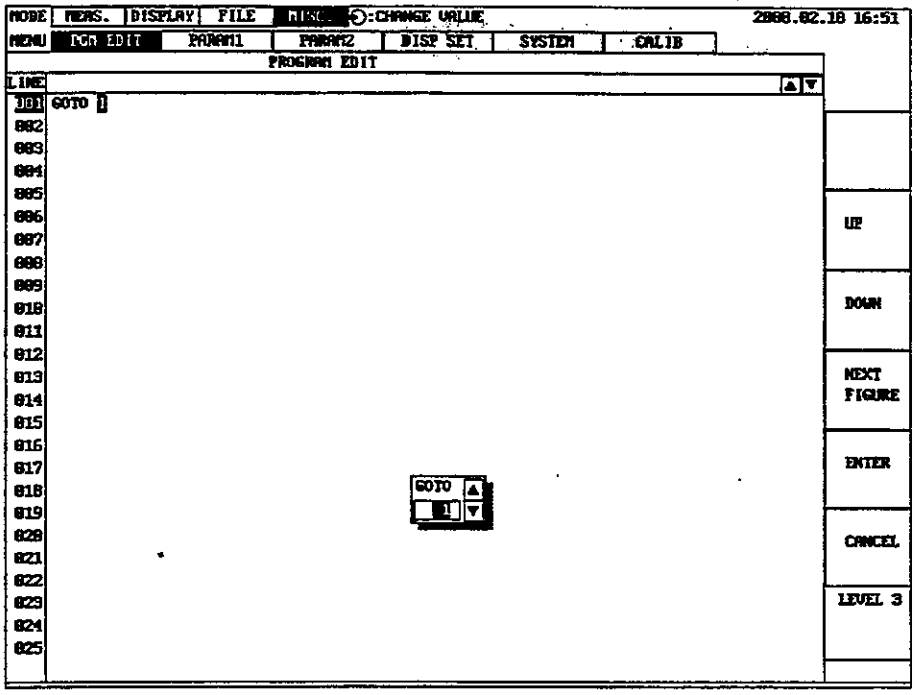

Fig. 7-8 Registered Command Parameter Changing Screen

③ Change the parameter in the same way as when inputting the program, and press the <ENTER> key. The command after changing the parameter will be registered in the Program area.

7.2.4 Inserting/Deleting Lines and Printing the Program List

The lines in the Program area can be added and deleted at the Program Input screen.

(1) Inserting lines

Highlight the line number in the Program area at which the line is to be inserted, and press the <LINE INSERT> key.

A blank line will be inserted, and lines after the line highlighted will be shifted forward by one. However, lines cannot be inserted if all 200 lines of the program have already been registered, or if the lines exceed 200 during the insertion of lines.

(2) Deleting lines

Highlight the line number in the Program area to be deleted, and press the <CUT> key. The highlighted line will be deleted, and each line will be inserted, and lines after that will be line shifted backward by one.

Pressing the <CUT> key with the range of lines to be deleted set using the <AREA SELECT> key will delete the lines in the whole area, and the program will shift to the first line of the area set thereafter.

(3) Copying lines

Highlight the line in the Program area to be copied using the rotary knob, and press the <COPY> key. Then move to the line to be inserted or overwritten, and press the <PASTE INSERT> or <PASTE OVERWRITE> key to overwrite.

To insert or overwrite the area of lines set, set the area to be copied using the <AREA SELECT> key before pressing the <COPY> key.

(4) Printing the program list

Press the <PRINT LIST> key to output the first to last lines of the program being edited to the printer.

7.3 Executing the Program

When executing registered programs, press the [AUTO START] key or the <PROGRAM1> to <PROGRAM5> keys at the <PRG START> menu of the <MEAS.> mode. In this case, the program must be registered in the <PROGRAM1> to <PROGRAM5> keys.

7.3.1 Selecting the Executing Program

① Press the [AUTO START] key or select the <PRG START> menu of the <MEAS.> mode.

② Press the program key from <PROGRAM1> to <PROGRAM5> keys.

7.3.2 Executing the Program

When the <PROGRAM1> to <PROGRAM5> key is pressed, the programs registered to each will be executed.

The program is executed from line 001 in order and ended by the "END" command or a blank line. To stop the execution of the program, press the <STOP> key.

7.3.3 Pausing the Program

Using the "PAUSE" command in the program pauses execution at that point.
A window will appear and a message will be displayed.

To continue the execution, press the <CONTINUE> key. The window will disappear and the program will be continued.

When a program is executed by GP-IB, the "PAUSE" command will be ignored and the next process performed.

7.3.4 Errors During Execution of Program

When errors occur during the execution of a program, a window will appear to display the number corresponding to the error type, and execution will be stopped.

NOTE

When errors occur during the execution of a program, a window will appear as always, the numbe corresponding to the error type will be displayed, and the program will be continued.

- Classification of Error Numbers
  The error numbers are classified as follows.

300 - 319	Error when a setting that cannot be performed manually is performed
320 - 339	Special command error
340 - 359	Input/output error
360 - 379	Floppy disk error
380 - 399	Other errors

The above numbers can be read as talk data for the talker command of GP-IB "WARN?".

7.4 Description of Commands

The commands used for the program consist of commands input from the panel switches and other special commands.

These commands are shown in Table 7-2 List of Commands and Table 7-3 List of Special Commands.

7.4.1 Description of Variables

The following lists the variables which can be used in the program.

Table 7-1 List of Variables

Variable	Function
I	General variable.
J	General variable.
K	General variable.
S	Serves as a serial port, and saves the status byte received. Can also be used as a general variable.
X	General variable.
Y	General variable.
Z	General variable.
A$	Saves the data received by the GP-IB port.
FILE$	File name when the floppy disk was last accessed.
TIME$	Date and time. (Ex:2000 Jan 08 20:45:37)
WM	Wavelength value of the moving marker.
W1	Wavelength value of fixed marker 1.
W2	Wavelength value of fixed marker 2.
W2-W1	Wavelength difference between fixed markers 1 and 2.
LM	Level value of the moving marker.
L1	Level of fixed marker 1.
L2	Level of fixed marker 2.
L2-L1	Level difference between fixed markers 1 and 2.
SPWD	Number of modes when spectral width search is executed.
PKWL	Peak wavelength value when peak search or spectral width search is executed.
PKLVL	Peak level value when peak search or spectral width search is executed.
MODN	Number of modes when spectral width search is executed.
SMSR	Side mode compression ratio (level difference) when SMSR measurement is executed.
MKPWR	Power when power between markers measurement is executed.
EDFNF	NF value when EDFA NF measurement is executed.
GAIN	GAIN value when EDFA NF measurement is executed.
ASELV	ASE LEVEL value when EDFA NF measurement is executed.
PWMTR	A power value used in the measurement. This value can be determined by the power monitor function.

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
MEAS.: WL/FREQ SCL	CENTER WL ****.**nm	Sets the center wavelength. 1200.00 - 1700.00 nm (0.01 step)
	CENTER FREQ ***.***THz	Sets the center wavelength. 176.5 - 250.0 THz (0.001 step)
	CENTER @@@@@	Sets the variable @@@@@ value to the center wavelength. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, or PKWL using the rotary knob.
	START WL ****.**nm	Sets the measurement start length. 950 - 1700 nm (0.01 step)
	STOP WL ****.**nm	Sets the measurement end length. 1200 - 1950 nm (0.01 step)
	START FREQ ***.***THz	Sets the measurement start length. 139.75 - 250.0 THz (0.001 step)
	STOP FREQ ***.***THz	Sets the measurement end length. 176.5 - 250.0 THz (0.001 step)
	SPAN WL ***.*nm	Sets the span. 0,1 - 500 nm (0.1 step)
	SPAN FREQ **.**THz	Sets the span. 0, 0.1 - 73.5 THz (0.01 step)
	SPAN @@@@@	Sets the variable @@@@@ value to the span. Select @@@@@ from the variables I, J, K, S, X, Y, Z, W2-W1 or SPWD using the rotary knob.
	PEAK → CENTER	Sets the peak wavelength of the waveform on the active trace to the center wavelength.
	dW → SPAN	Performs spectral width search, and sets the results as the span.
	XUNIT #####	Sets the X axis unit. nm: Wavelength mode THz: Frequency mode
LEVEL SCALE	REF LEVEL ***.*dBm	Sets the reference level value for the LOG scale. -90.0 - 20.0 dBm (0.1 step)
	REF LEVEL ***.*##	Sets the reference level value for the LIN scale. 1 pW - 100 mW
	REF LEVEL @@@@@	Sets the variable @@@@@ value to the reference level. Select @@@@@ from the variables I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR, or ASELV using the rotary knob.
	PEAK → REF LEVEL	Sets the peak level of the waveform on the active trace to the reference level.
	LEVEL SCALE **.*dB	Sets the level scale value. LINEAR, 0.1 - 10.0 dB (0.1 step) [Becomes LINEAR when set to 0.]
	LEVEL SCALE @@@@@	Sets the variable @@@@@ value to the level scale value. Select @@@@@ from the variables I, J, K, S, X, Y, Z, L2-L1, SMSR, EDFNF, or GAIN using the rotary knob.
	LEVEL UNIT ######	Sets the level scale unit. dBm, dBm/nm

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
	SUB LOG **.*dB/D	Sets the sub scale value for the dB scale. 0.1 - 10.0 dB/DIV (0.1 step)
	SUB SCL ***.*%/D	Sets the sub scale value for the % scale. 0.1 - 125% (0.1 step)
	OFST LVL **.*dB	Sets the offset value of the sub scale for the LOG scale. -99.9 - 99.9 dB (0.1 step)
	SCALE MIN ****%	Sets the bottom end value of the sub scale for the % scale. 0.1 - SUB SCL×10% (0.1 step)
SWEEP	AUTO	Performs automatic sweep.
	REPEAT	Performs repeated sweep.
	SINGLE	Performs single sweep.
	STOP	Stops sweep.
	SWEEP MKR L1-L2 ###	Turns ON/OFF the sweep between markers function. Select ON or OFF for ### using the rotary knob.
SETUP	RESOLN **.*nm	Sets the resolution. (Wavelength display mode) 0.05, 0.1, 0.2, 0.5, 1nm
	RESOLN ****GHz	Sets the resolution. (Frequency display mode) 5, 10, 20, 50, 100GHz
	RESOLN @@@@@	Sets the variable @@@@@ value to the resolution. Select @@@@@ from the variables I, J, K, S, X, Y, Z, W2-W1, or SPWD using the rotary knob.
	SENS HIGH 1	Sets the measuring sensitivity to the high sensitivity mode 1.
	SENS HIGH 2	Sets the measuring sensitivity to the high sensitivity mode 2.
	SENS HIGH 3	Sets the measuring sensitivity to the high sensitivity mode 3.
	SENS NORM RANGE HOLD	Sets the measuring sensitivity to the normal range fixing mode.
	SENS NORM RANGE AUTO	Sets the measuring sensitivity to the normal automatic range mode.
	AVERAGE TIMES *****	Sets the number of averagings. 1 - 1000 (1 step)
	AVERAGE TIMES @	Sets the variable @ value to the number of averagings. Select @ from the variables I, J, K, S, X, Y, Z, or N using the rotary knob.
	SAMPLING PT ****	Sets the sampling point per 1 sweep. 11 - 20001 (1 step)
	SAMPLING PT @	Sets the variable @ value to the number of samples Select @@@@@ from the variables I,J,K,S,X,Y,Z, or N using the rotary knob.
	SAMPLING AUTO NORMAL	Sets sampling points per sweep automatically.
	SAMPLING AUTO PRECISE	Sets sampling points per sweep automatically. In this case, more sampling points must be specifie than when SAMPLING AUTO NORMAL is selected.
	LPF###	Turns ON or OFF the LPF. ###: ON, OFF.
POWER MON.	POWER METER REPEAT	Performs repeated measurement using the power monitor function.
	POWER METER SINGLE	Performs single measurement using the power monitor function.
	POWER METER STOP	Stops measurement using the power monitor function.

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
POWER MON.	AREA PRESET	Sets the wavelength range to the preset range using the power monitor function.
	AREA CH***	Sets the wavelength range to channel using the power monitor function. 1 – 256 (1 step)
DISPLAY: TRACE ABC	WRITE A	Sets trace A to the writing mode.
	FIX A	Sets trace A to the data fixing mode.
	MAX HOLD A	Sets trace A to the maximum value detection mode.
	ROLL AVG A	Sets trace A to the sequential calculation mode.
	DISPLAY A	Sets trace A to the data display mode.
	BLANK A	Sets trace A to the data non-display mode.
	ACTIVE TRACE A	Sets trace A to the active trace.
	WRITE B	Sets trace B to the writing mode.
	FIX B	Sets trace B to the data fixing mode.
	MIN HOLD B	Sets trace B to the maximum value detection mode.
	ROLL AVG B	Sets trace B to the sequential calculation mode.
	DISPLAY B	Sets trace B to the data display mode.
	BLANK B	Sets trace B to the data non-display mode.
	ACTIVE TRACE B	Sets trace B to the active trace.
	WRITE C	Sets trace C to the writing mode.
	FIX C	Sets trace C to the data fixing mode.
	A-B → C	Sets trace C to the trace A-B subtraction display mode (LOG).
	B-A → C	Sets trace C to the trace B-A subtraction display mode (LOG).
	DISPLAY C	Sets trace C to the data display mode.
	BLANK C	Sets trace C to the data non-display mode.
	ACTIVE TRACE C	Sets trace C to the active trace.
TRACE COPY	TRACE A → B	Copies trace A to trace B.
	TRACE A → C	Copies trace A to trace C.
	TRACE B → A	Copies trace B to trace A.
	TRACE B → C	Copies trace B to trace C.
	TRACE C → A	Copies trace C to trace A.
	TRACE C → B	Copies trace C to trace B.
	ALL TRACE CLEAR	Erases the waveforms of traces B and C, and clears the data.
	CLEAR A	Clears trace A.
	CLEAR B	Clears trace B.
	CLEAR C	Clears trace C.
ANALYSIS	PEAK SEARCH	Executes peak search for the waveform on the active trace.
	NEXT SRCH RIGHT	Searches for the peak on the right of the marker of the waveform on the active trace.
	NEXT SRCH LEFT	Searches for the peak on the left of the marker of the waveform on the active trace.
	MARKER CLEAR	Erases the marker.
	AUTO SEARCH ###	Selects the ON/OFF of the ANALYSIS function performed for every sweep.

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
	MODE FIT ###	Sets the ON/OFF of the function which sets the marker to the mode peak when the spectral width search is executed by the THRESH method. Sets ### to ON or OFF using the rotary knob.
	SPEC WD THRESH **.**dB	Performs spectral width search by the THRESH method using the specified threshold value. 0.01 - 50.0 dB (0.01 step)
	SPEC WD RMS **.**dB	Performs spectral width search by the RMS method using the specified threshold value. 0.01 - 50.0 dB (0.01 step)
	SPEC WD PK RMS **.**dB	Performs spectral width search by the PEAK-RMS method using the specified threshold value. 0.01 - 50.0 dB (0.01 step)
	SPEC WD ENV **.**dB	Performs spectral width search by the envelope method using the specified threshold value. 0.01 - 50.0 dB (0.01 step)
	SPEC WD NOTCH **.**dB	Performs notch width measurement using the specified threshold value. 0.01 - 50.0 dB (0.01 step)
	SMSR*	Specifies the mode, and performs side mode compression ratio measurement. 1, 2
	PMD	Performs PMD measurement.
	WDM NF ANALYSIS	Performs WDM-NF measurement.
	EDFA NF	Performs NF measurement.
	EDFA MASK WL±**.**nm	During ASE level measurement, specifies the left and right mask area according to the peak wavelength, and performs NF measurement of the optical amplifier. 0 - 99.99 nm (0.01 step)
	EDFA MASK FREQ±*.***THz	During ASE level measurement, specifies the left and right mask area according to the peak wavelength, and performs NF measurement of the optical amplifier. 0 - 9.999 THz (0.001 step)
	EDFA FIT WL ± **.**nm	During ASE level measurement, specifies the left and right fitting area according to the peak wavelength, and performs NF measurement of the optical amplifier. 0 - 99.99 nm (0.01 step)
	EDFA FIT FREQ±*.***THz	During ASE level measurement, specifies the left and right fitting area according to the peak wavelength, and performs NF measurement of the optical amplifier. 0 - 9.999 THz (0.001 step)
	EDFA CVFT TYPE GAUSSIAN	Sets the CVFT type for the NF measurement to GAUSSIAN (regular distribution curve).
	EDFA CVFT TYPE LORENZIAN	Sets the CVFT type for the NF measurement to LORENZIAN (lorenzian curve).
	EDFA CVFT TYPE 3RD POLY	Sets the CVFT type for the NF measurement to 3RD POLY.
	EDFA CVFT TYPE 4TH POLY	Sets the CVFT type for the NF measurement to 4TH POLY.
	EDFA CVFT TYPE 5TH POLY	Sets the CVFT type for the NF measurement to 5TH POLY.
	WDM ANALYSIS	Performs WDM analysis.
	WDM REF CHANNEL ****.**nm	Sets the reference channel of WDM analysis to wavelength. 1200.00 - 1700.00 nm (0.001 step)
	WDM REF CHANNEL NO***	Sets the reference channel of WDM analysis. 1 – 256 (1 step)
	WDM OFFSET LIST	Displays the offset value for the reference channel during WDM analysis.
	WDM SPACING LIST	Displays the offset value for the next channel during WDM analysis.

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
MARKER	WDM DATA SET	Sets the latest WDM analysis results to the reference data.
	WDM DATA INITIAL	Sets the preset value to the reference data.
	POWER	Performs power measurement.
	MARKER ****.***nm	Sets the marker to the specified wavelength position of the active trace waveform. (According to the wavelength value) 950 - 1950 nm (0.001 step)
	MARKER ***.****THz	Sets the marker to the specified frequency position of the active trace waveform. (According to the frequency value) 139.75 - 286.57 THz (0.0001 step)
	MARKER @@@@@	Sets the marker to the wavelength position of the variable @@@@@. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, or PKWL using the rotary knob.
	SET MARKER	Sets the fixed marker.
	MARKER ALL CLEAR	Clears all the ▽ markers.
	MARKER CLEAR	Clears the marker. (Only the last marker set.)
	LINE MKR1 ****.***nm	Sets the line marker 1 to the specified wavelength. 950 - 1950 nm (0.001 step)
	LINE MKR1 ***.****THz	Sets the line marker 1 to the specified frequency. 139.75 – 286.57 THz (0.0001 step)
	LINE MKR1 @@@@@	Sets the line marker 1 to the wavelength position of the variable @@@@@. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, or DOMWL using the rotary knob.
	LINE MKR2 ****.***nm	Sets the line marker 2 to the specified wavelength. 950 - 1950 nm (0.001 step)
	LINE MKR2 ***.****THz	Sets the line marker 2 to the specified frequency. 139.75 – 286.57 THz (0.0001 step)
	LINE MKR2 @@@@@	Sets the line marker 2 to the wavelength position of the variable @@@@@. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, or DOMWL using the rotary knob.
	LINE MKR3 ****.**dBm	Sets the line marker 3 to the specified level. -170.00 - 40.00 dBm (0.01 step)
	LINE MKR3 ****.***dB	Sets the line marker 3 to the specified level. -149.900 - 149.900 dBm (0.01 step)
	LINE MKR3 *.***##	Sets the line marker 3 to the specified level. 0 - 999.9 (##: pW, nW, μW) or 0 – 100 (##: mW) * Both in 0.0001 step.
	LINE MKR3 ****.*%	Sets the line marker 3 to the specified level. 0 - 2500.0 (0.1 step)
	LINE MKR3 @@@@@	Sets the line marker 3 to the level position of the variable @@@@@. For @@@@@, select one of the variables I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR or ASELV by the rotary knob.
	LINE MKR4 ****.**dBm	Sets the line marker 4 to a specified level. -170.00 – 40.00 dBm (0.01 step)

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
	LINE MKR4 ****.***dB	Sets the line marker 4 to a specified level. -149.900 – 149.900 dBm (0.001 step)
	LINE MKR4 *.***##	Sets the line marker 4 to a specified level. 0 - 999.9 (##: pW, nW, μW) or 0 - 100 (##: mW) * Both in 0.0001 step.
	LINE MKR4 ****.*%	Sets the line marker 4 to a specified level. 0 - 2500.0 (0.1 step)
	LINE MKR4 @@@@@	Sets the line marker 4 to the level position of the variable @@@@@. For @@@@@, select one of the variables I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR or ASELV by the rotary knob.
	LINE MAKER CLEAR	Clears the line marker.
	SEARCH L1-L2 ###	Sets ON/OFF the analysis function in the area enclosed by line markers 1 and 2.
LONG TERM	LONG TERM SWEEP	Execute LONG TERM measurement.
	LONG TERM INTVL ****	Sets the interval for LONG TERM measurement. 1 – 1000 min (1 step)
	LONG TERM TIMES ****	Sets the number of times for LONG TERM measurement. 1 - 1000 times (1 step)
	LONG TERM WAVELENGTH	Lists and displays the wavelengths of all channels during LONG TERM measurement.
	LONG TERM LEVEL	Lists and displays the levels of all channels during LONG TERM measurement.
	LONG TERM SNR	Lists and displays the SNRs of all channels during LONG TERM measurement.
	LONG TERM CH***	Selects the display channel during LONG TERM measurement. 1 – 256 (1 step)
	LONG TERM ABSOLUTE	Displays the wavelength, level, noise, SNR in the absolute value during LONG TERM measurement.
	LONG TERM RELATIVE	Displays the wavelength, level, noise, SNR in the relative value in respect to the reference data during LONG TERM measurement.
	LONG TERM REF SET	Sets the latest WDM analysis results during LONG TERM measurement as the reference data. (The measurement count data indicated by the cursor is used as the reference data.)
	LONG TERM REF INIT	Sets the preset value during LONG TERM measurement as the reference data.
	LONG TERM CLEAR	Clears the data during LONG TERM measurement.
LABEL	LABEL '-----'	Displays comments in the LABEL area. When a semicolon ; is attached to the end of the comment, the comment (variable value) specified by the next LABEL command will be displayed next.
	LABEL @@@@@	Displays the contents of the variable @@@@@ in the Label area. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL. MODN, SMSR, MKPWR, EDFNF, GAIN, ASELV, PWMTR, A$, FILE$, or TIME$ using the rotary knob.
	LABEL @@@@@;	Displays the contents of the variable @@@@@ in the Label area. The comment (variable value) specified by the next LABEL command will be displayed next.
FILE: SAVE	LABEL CLEAR	Clears the label area.
	SAVE 'PATH'	Sets the file name saved. (Max. 50)
	SAVE TRACE A	Specifies a trace to be saved as A.
	SAVE TRACE B	Specifies a trace to be saved as B.
	SAVE TRACE C	Specifies a trace to be saved as C.

Table 7-2 List of Commands

Soft Key	Soft Key, List Display	Parameter Function and Range
	SAVE EXECUTE	Executes file saving.
RECALL	RECALL 'PATH'	Sets the file name to be recalled. (Max. 50)
	RECALL TRACE A	Specifies a trace to be recalled as A.
	RECALL TRACE B	Specifies a trace to be recalled as B.
	RECALL TRACE C	Specifies a trace to be recalled as C.
	RECALL EXECUTE	Recalls the file.
OTHERS	DELETE 'PATH'	Sets the file name to be deleted. (Max. 50)
	DELETE EXECUTE	Deletes the file.
	FORMAT ###	Specifies the drive to be formatted. (###: Selects a drive among those displayed)
	FORMAT EXECUTE	Executes file formatting.
MISC.	WL CAL ****.**nm	Sets the wavelength of the light source and calibrates the absolute value of the wavelength. (External light source) 1200.00 - 1700.00 nm (0.001 step)
	WL SHIFT **.***nm	Sets the wavelength shift amount. -5.00 - 5.00 nm (0.01 step)
	LEVEL SHIFT ***.***dBm	Sets the level shift amount. -30.00 - 30.00 dB (0.01 step)
	AUTO OFFSET ###	Selects the function for periodically canceling the DC offset of the amplifier. Set ### to ON or OFF using the rotary knob.
	BUZZER WARNING ###	Sounds the buzzer when warning errors, etc. occur. Set ### to ON or OFF using the rotary knob.
	UNCAL WARNING ###	Used for specifying if the warning is to be turned on or not when UNCAL (when an inappropriate sample number is selected for the span) is detected. ### represents ON or OFF and selected from the rotary knob.
	SELF WAVELENGTH CAL	Calibrates the wavelength by the internal light source.

Table 7-3 List of Special Commands

Program Area Display	Description of command, Precautions, Parameter Range
GOTO***	***:1 to 200, 1 step Jumps to *** line.
WAIT*****s	*****:1 to 99999, 1 step Waits for ***** seconds.
PAUSE'—'	Pauses execution and the message window appears. The window displays the message ' ' and a description of the <CONTINUE> key. When the <CONTINUE> key is pressed, the window closes, and execution is restarted. However, when the program is started by the GP-IB, it is not paused.
END	Ends the program.
N=********	*********:1 to 999999999, 1 step Substitutes the variable N with a value.
N=N-1;IF N<>0 GOTO ***	***:1 to 200, 1 step Subtracts 1 from the variable N, and is not 0, jumps to the *** line.
@=**********###	Substitutes the variable @ with a value. The **.** can be specified with a real number less than 10 digits including symbols and decimal point. Select @ from the variables I, J, K, S, X, Y, or Z using the rotary knob. Select ### from nm, THz, dB, dBm, pW, nW, μW, mW, W, or ' ' (no unit) using the rotary knob.
@=#+**********	Add the **.** value to the variable #, and substitute in the variable @. The **.** can be specified with a real number less than 10 digits including symbols and decimal point. By setting a negative value, it will be subtracted from the variable #.
@=@@@@@	Copies the contents of variable @@@@@ to variable @. Select @ and # from the variables I, J, K, N, S, X, Y, or Z using the rotary knob. Select @@@@@ from the variables I, J, K, N, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL. MODN, SMSR, MKPWR, EDFNF, GAIN, ASELV, or PWMTR using the rotary knob.
@=@@@@@+##### @=@@@@@-##### @=@@@@@*##### @=@@@@@/#####	Performs ?? calculation between Select @ from the variables I, J, K, S, X, Y or Z using the rotary knob. Select @@@@@ and ##### from the variables I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL. MODN, SM.SR, MKPWR, EDFNF, GAIN, ASELV, or PWMTR using the rotary knob.
PRINT '.....'	Prints the comments enclosed by the single quote. When a semicolon ; is attached to the end of the comment, the comment (variable value) specified by the following PRINT command will be printed next without changing to a new line.
PRINT @@@@@	The variable @@@@@ is printed with units. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL. MODN, SMSR, MKPWR, EDFNF, GAIN, ASELV, PWMTR, A$, FILE$, or TIME$ using the rotary knob.
PRINT @@@@@;	The variable @@@@@ is printed with units. After printing, the comment (variable value) specified by the following PRINT command will be printed next without changing to a new line. Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL. MODN, SMSR, MKPWR, EDFNF, GAIN, ASELV, PWMTR, A$, FILE$, or TIME$ using the rotary knob.
PRINT DATA AREA	Prints the contents of the data area.

Table 7-3 List of Special Commands

Program Area Display	Description of command, Precautions, Parameter Range
@ = LEVEL (****.**nm)	Substitutes the variable @ with the level of the wavelength ****.*** nm point (active trace). Select @ from the variables I, J, K, S, X, Y, or Z using the rotary knob.****.**:950 - 1950 (0.01 step).
@ = LEVEL (@@@@@)	Substitutes the variable @ with the level of the wavelength @@@@ (variable) point (active trace). Select @ from the variables I, J, K, S, X, Y, or Z using the rotary knob. Select @@@@ from I, J, K, S, X, Y, Z, WM, W1, W2, or PKWL.
IF@@@@@<@@@@@GOTO***	If the relation between the two variables meet the inequality sign, jumps to the *** line.
IF@@@@@=<@@@@@GOTO***	If the relation between the two variables meet the equality, inequality sign, jumps to the *** line.
IF@@@@@=@@@@@GOTO***	If the relation between the two variables meet the equality sign, jumps to the *** line.
IF@@@@@<>@@@@@GOTO***	If the relation between the two variables meet the inequality sign, jumps to the *** line.
	Select @@@@@ from the variables I, J, K, S, X, Y, Z, WM, W1, W2, W2-W1, LM, L1, L2, L2-L1, SPWD, PKWL, PKLVL, MODN, SMSR, MKPWR, EDFNF, GAIN, ASELV, PWMTR, N using the rotary knob.***:1-200 (1 step).
BEEP **	Sounds the buzzer for ** × 100 msec.**:1-99 (1 step).
HARD COPY	Hard copies the screen displayed.
FEED **	Feeds the printer paper. 1-10 (1 step)
@ = CENTER	Substitutes @ with the current center wavelength. For @, select one of the variables I, J, K, S, X, Y, Z, WM, W1, W2, or PKWL using the rotary knob.
@ = SPAN	Substitutes @ with the current sweep width. For @, select one of the variables I, J, K, S, X, Y, Z, W2-W1 or SPWD using the rotary knob.
@ = REF LEVEL	Substitutes @ with the current reference level. For @, select one of the variables I, J, K, S, X, Y, Z, LM, L1, L2, PKLVL, MKPWR, PWMTR or ASELV using the rotary knob.
@ = RESOLN	Substitutes @ with the current resolution. For @, select one of the variables I, J, K, S, X, Y, Z, W2-W1 or SPWD using the rotary knob.
@ = SAMPL POINT	Substitutes @ with the current number of samples. For @, select one of the variables I, J, K, N, S, X, Y or Z using the rotary knob.
INIT	Sets all parameters to the initial state. (The variable will not be cleared.)

7.4.2 Principle of ?? Calculation by Variable

The following shows whether units are attached after calculation.

(1)	With units	*	no units	=	With units
(2)	With units	/	no units	=	With units
(3)	No units	+	no units	=	No units
(4)	No units	-	no units	=	No units
(5)	No units	*	no units	=	No units
(6)	No units	/	no units	=	No units
(7)	nm	+	nm	=	nm
(8)	nm	-	nm	=	nm
(9)	nm	/	nm	=	No units
(10)	dB	+	dB	=	dB
(11)	dB	-	dB	=	dB
(12)	dBm	+	dB	=	dBm
(13)	dBm	-	dB	=	dBm
(14)	dBm	-	dBm	=	dB
(15)	#W	+	#W	=	#W
(16)	#W	-	#W	=	#W
(17)	#W	/	#W	=	No units

For the dBm/nm, W/nm, dB/Km, and % units, it is taken as dBm, W, dB, no units in respect of the variable.

Calculation is performed as above according to the unit of the variable, and the unit is attached to the results after calculation.

When calculation is performed in combinations other than the above (when variables with different units are added, subtracted, multiplied, and divided), the calculation results will not be attached with units.

The unit for #W is as follows.

1mW	=	1
1μW	=	0.001
1nW	=	0.000001
1pW	=	0.000000001

7.4.3 "@=VAL (A$)" Command Specifications

(1) The character string other than the number in front of the value (starts with symbol or number) in the A$ character string will be ignored, and "," or the number up to the next character strong or delimit will be converted.

(2) If no value exists in the A$ character string, the variable @ is substituted with "0".

7.5 Program Examples

The following describes the program example.

(1) After measuring conditions are set, single sweep is performed.

The spectral width, and peak wavelength are searched and output to the Label area and printer. After waiting for 3 seconds, this is repeated 10 times.

```
001   CENTER WL 1552.10nm
002   SPAN 20.0nm
003   REFERENCE LEVEL -10.0dBm
004   RESOLUTION 0.1nm
005   AVERAGE TIMES 1
006   SENS NORMAL RANGE HOLD
007   N = 10
008   SINGLE
009   SPEC WD THRESH 20.0dB
010   PRINT' Wd = ;
011   LABEL' Wd = ;
012   PRINT SPWD;
013   LABEL SPWD;
014   PEAK SEARCH
015   PRINT' Pk = ;
016   LABEL' Pk = ;
017   PRINT PKWL
018   LABEL PKWL
019   WAIT 3S
020   N = N-1; IF N <> 0 GOTO 8
021   END
```

[Description of Program]

- Line 001 to 006 Sets the measuring conditions
- Line 007 Sets 10 to the loop counter N.
- Line 008 Performs single sweep.
- Line 009 Performs spectral width search.
- Line 010 to 013 Outputs the spectral width to the printer and Label area.
- Line 014 Performs peak search.
- Line 015 to 018 Outputs the peak wavelength value to the printer and Label area.
- Line 019 Waits for 3 seconds.
- Line 020 Subtracts 1 from the loop counter N, and if not 0, jumps to line 008.
- Line 021 Ends the program.

When the program is executed, it is output to the screen and

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CHAPTER 8 AUTOMATIC SETTINGS BY REMOTE OPERATIONS

This chapter describes automatic settings performed by remote operations.

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This unit comes equipped with a GP-IB (conforms to IEEE-488.1) and RS-232C interface as standard, enabling automatic settings to be performed by connecting a personal computer (controller).

8.1 Automatic Measurements by GP-IB

This unit is capable of external control by GP-IB (conforms to IEEE-488.1). A GP-IB port (connector) is attached to the right side of the unit.

8.1.1 Connecting the GP-IB Connector

Turn OFF the power supply of this unit and the power supplies of all the equipments connected to this unit. Connect the bus cable to the [GP-IB] connector shown Right View of the unit and tighten the fixing screw firmly.

NOTE

When connecting or disconnecting the GP-IB bus cable, turn OFF the power supplies of al equipments connected to the bus cable.

Disconnecting and disconnecting the bus cable with the power ON will cause faulty operation and damages of the unit.

8.1.2 GP-IB Address Setting

① Set the MISC mode.
(Select using the mode key.)

MEAS.	DISPLAY	FILE	MISC.

② Set the SYSTEM menu.
(Press the soft key, or rotate the rotary knob and press to set the menu.)

PROGRAM EDIT	CALIBRATION	PARAMETERS1	PARAMETERS2	DISP SET	SYSTEM

③ Select "GP-IB ADDRESS" and press the rotary knob, or press the <ENTER> key. The address can be varied within the range of 0 to 30 by rotating the rotary knob. Next press the rotary knob at the value to be set, or press the <ENTER> key to set the address.
It is set to address "7" at shipment.

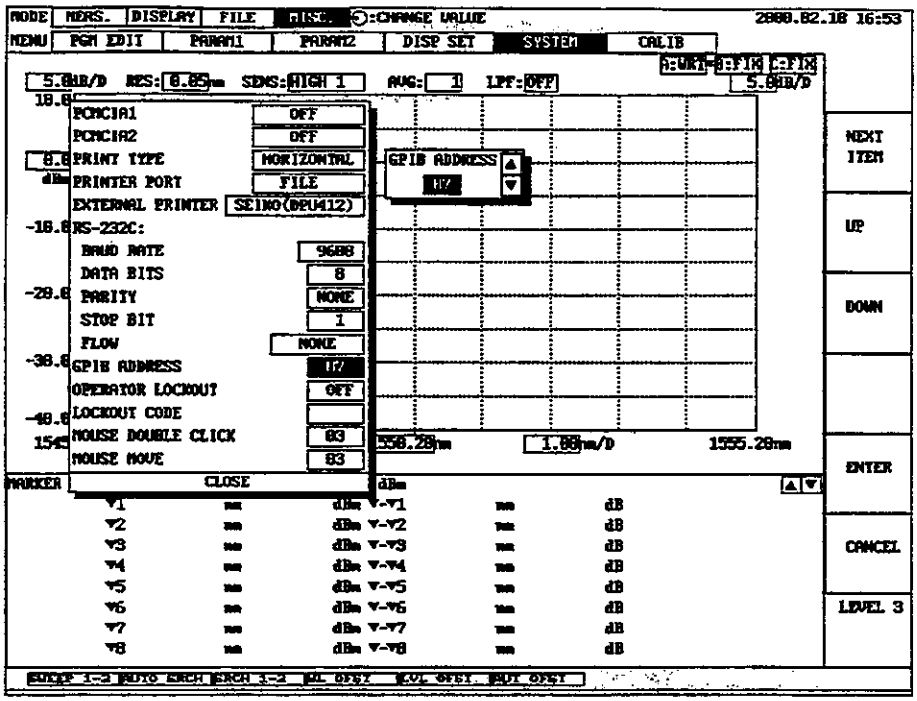

Fig. 8-1 GP-IB Address Setting

8.1.3 Interface Function

Table 8-1 shows the interface functions of this unit.

Table 8-1 Interface Functions

Code	Interface Function
SH1	All transmission functions
AH1	All reception functions
T6	Clears the talker by the basic talker serial poll MLA
L4	Clears the listener by the basic listener MTA
SR1	All service request functions
RL1	All remote local functions
PP0	No parallel poll function
DC1	All device clear functions
DT1	All device trigger functions
C0	No controller function
E1	Open collector driver

8.1.4 Remote Local Function

(1) Set REN and ATN to "True" using the controller and send the listen address to the unit. This unit will set into the remote state.

(2) In the remote state, all panel switches and soft keys will become ineffective except for the <LOCAL> key.

(3) Pressing the <LOCAL> key returns the unit to the local state and enables the panel switches to be used.

(4) Send the GTL (Go To Local) message from the controller, or set REN to "False" to set the unit into the local state again.

(5) Send the LLO (Local Lock Out) message from the controller. This unit will set into the local lockout state. In this state, the unit will not return to the local state even if the <LOCAL> key is pressed. To clear the local lockout state, set REN to "False" using the controller.

8.1.5 Program Codes (Commands)

(1) Table 8-2 shows the list of program codes (commands) of this unit.
When these program codes are sent using the controller in the remote state, this unit will perform the operations shown in the table.

(2) Several program codes can be sent together by linking them using ",".
However, the reception buffer of this unit is 512 bytes. If the number of characters excluding blanks (including control codes) exceeds 512 bytes, the excess program codes will be ignored.

(3) The following two delimiters are effective.
- CRLF
- EOI

(4) All blanks are ignored.
Numbers will be set correctly if the number of digits set excluding decimal point is less than 8.

(5) All incorrect program codes will be ignored.

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Table 8-2 GP-IB Program Codes(1/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
WL/FREQ SCALE				
CENTER WAVELEN	CTRWL****.**	Sets the center wavelength (Unit:nm) ****.**:1200.00~1700.00(0.01 step)	CTRWL?	1200.00~1700.00
	CTRF***.***	Sets the center frequency (Unit:THz) ***.***:176.500~250.000(0.001 step)	CTRF?	176.500~250.000
START WAVELEN	STAWL****.**	Sets the measurement start wavelength (Unit:nm) ****.**:950.00~1700.00(0.01 step)	STAWL?	950.00~1700.00
	STAF***.***	Sets the measurement start frequency (Unit:THz) ***.***:139.750~250.000(0.001 step)	STAF?	139.750~250.000
STOP WAVELEN	STPWL****.**	Sets the measurement end wavelength (Unit:nm) ****.**:1200.00~1950.00(0.01 step)	STPWL?	1200.00~1950.00
	STPF***.**	Sets the measurement end frequency (Unit:THz) ***.***:176.500~286.750(0.001 step)	STPF?	176.500~286.750
PEAK → CENTER	CTR=P	Sets the waveform peak to the center wavelength.	None	
SPAN	SPAN***.*	Sets the span (Unit:nm) ***.*:0,1.0~500.0(0.1 step)	SPAN?	0, 1.0~500.0
	SPANF**.**	Sets the span (Unit:THz) **.**:0,1.00~73.50 (0.01 step)	SPANF?	0, 1.00~73.50
Δλ → SPAN	SPN=W	Sets the span according to the spectral width.	None	
HOZN SCL WAVELEN FREQ	XUNT*	Sets the X axis unit. *=0:Wavelength mode 1:Frequency mode	XUNT?	Output Wavelength mode 0 Frequency mode 1
LEVEL SCALE				
REF LEVEL	REFL***.*	Sets the reference level (When LOG) (Unit:dBm) ***.*:-90.0~20.0 (0.1 step)	REFL?	-90.0~20.0
	REFLP*.**	Sets the reference level (When linear) (Unit:pW) *.**:1.00~9.99 (0.01 step) 10.0~99.9 (0.1 step) 100~999 (1 step)		PW1.00~999
	REFLN*.**	Sets the reference level (When linear) (Unit:nW) *.**:1.00~9.99 (0.01 step) 10.0~99.9 (0.1 step) 100~999 (1 step)		NW1.00~999
	REFLU*.**	Sets the reference level (When linear) (Unit:μW) *.**:1.00~9.99 (0.01 step) 10.0~99.9 (0.1 step) 100~999 (1 step)		UW1.00~999

Table 8-2 GP-IB Program Codes(2/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
	REFLM*.**	Sets the reference level (When linear) (Unit:mW) *.**:1.00~9.99 (0.01 step) 10.0~100.0 (0.1 step)	REFL?	MW1.00~100.0
LOG SCALE	LSCL**.*	Sets level axis scale. **.*:0.1~10.0 (0.1 step unit dB/DIV) or LIN LIN (Linear scale)	LSCL?	0.1 to 10.0 Output 0 for LIN
PEAK→REF LEVEL	REF=P	Sets peak to reference level.	None	
MAIN SCALE [dBm][dBm/nm]	LSUNT*	Switches the level axis scale display to dBm (W) or dBm/nm (W/nm). *=0:When dBm (W) 1: When dBm/nm (W/nm)	LSUNT?	Output dBm(W) 0 dBm/nm(W/nm) 1
SUB SCALE	SLOG**.*	Sets the sub scale (When LOG) **.*:0.1~10.0 (0.1 step)	SLOG?	0.1~10.0
	SPS***.*	Sets the sub scale to %/D. ***.*:0.5~125.0 (0.1 step)	SPC?	0.5~125.0
SUB SCL OFST	LOFST***.*	Sets the offset level of the sub scale (Unit:dB). ***.*:-99.9~99.9 (0.1 step)	LOFST?	-99.9~99.9
SUB SCL MINIMUM	SMINP***.*	Sets the lower end values of the scale when the % subscale is set. ***.*:0~(/DIV)×10	SMINP?	0~1250
SWEEP				
STOP SINGLE	STP	Stops sweep.	SWEEP?	Output the measurement state. Measurement state Output STOP 0 SINGLE 1 REPEAT 2 AUTO 3
	SGL	Starts single sweep.		
REPEAT	RPT	Starts repeat sweep.		
AUTO	AUTO	Starts automatic sweep.		
LONG TERM SWEEP	LTSWP	Executes LONG TERM measurement.	None	
LONG TERM INTVL	LTINTVL****	Sets the LONG TERM measurement interval. ****:1~1000min	LTINTVL?	0～1000
LONG TERM RPT TIMES	LTTIME****	Sets the number of LONG TERM measurements. ****:1～1000	LTTIME?	0～1000

Table 8-2 GP-IB Program Codes(3/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
SETUP				
RESOLN	RESLN*.**	Sets the resolution.(Unit:nm) *.**:0.05, 0.1, 0.2, 0.5, 1 (0:MAX)	RESLN?	0.05, 0.1, 0.2, 0.5, 1.0
	RESLNF***	Sets the resolution.(Unit:GHz) ***:5, 10,20,50,100 (0:MAX)	RESLNF?	5, 10, 20, 50, 100
SENSITIVITY				
SENS NORM RANGE HOLD	SNHD	Sets the measuring sensitivity.	SENS?	Outputs the measuring sensitivity. Measuring sensitivity Output SENS HIGH1 1 SENS HIGH2 2 SENS HIGH3 3 SENS NORM RANG HOLD 4 SENS NORM RANG AUTO 5
SENS NORM RANGE AUTO	SNAT			
SENS HIGH1	SHI1			
SENS HIGH2	SHI2			
SENS HIGH3	SHI3			
SAMPL POINTS	SMPL*****	Sets the number of measurement samplings. ****:11~20001 (1 step)	SMPL?	11~20001,0
	SMPLPR*	Sets the number of measurement samplings. *0: (AUTO NORMAL) 1: (AUTO PRECISE)	SMPLPR?	Output AUTO NORMAL 0 AUTO PRECISE 1
AVERAGE TIMES	AVG****	Sets the number of measurement averaging. ****:1~1000 (1 step)	AVG?	1~1000
LPF ON OFF	LPF*	Mode which measures the chop light using the low pass filter. *=0:OFF 1:ON	LPF?	Output OFF 0 ON 1
PROGRAM START				
PROGRAM1~5	EXEC*	Executes program. *=1~5:Program number	EXEC?	Output Executing: 1 Stopping 0
STOP	PREXT	Stops the program.	None	
POWER MONITOR				
STOP SINGLE	PMSTP	Stops the power monitor function.	PMST?	Output STOP 0 SINGLE 1 REPEAT 2
	PMSGL	Sets the single measurement.		
REPEAT	PMRPT	Sets the repeated measurement.		
PRESET AREA CHANNEL	AREA***	Sets preset area or channel No.. ***=0:PRESET AREA 1~256:CHANNEL	AREA?	Output PRESET AREA 0 CHANNEL 1~256

Table 8-2 GP-IB Program Codes(4/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
TRACE ABC				
FIX A WRITE A	FIXA	Sets the data fixing mode of trace A.	TRA?	Output WRITE 0 FIX 1 MAX HLD 2 ROL AVG 3+number of AVG times
	WRTA	Sets the writing mode of trace A.		
MAX A ROLL A	MAXA	Sets the maximum value detection mode of trace A.		
	RAVA	Sets the sequential calculation mode of trace A.		
DISP A BLANK A	DSPA	Switches whether or not to display for trace A.	DSPA?	Output BLANK 0 DISP 1
	BLKA			
ACTIVE A B C	ACTV*	Selects the active trace. *=0:Trace A 1:Trace B 2:Trace C	ACTV?	Output Trace A 0 Trace B 1 Trace C 2
FIX B WRITE B	FIXB	Sets the data fixing mode of trace B.	TRB?	Output WRITE 0 FIX 1 MIN HLD 2 ROL AVG 3+number of AVG times
	WRTB	Sets the writing mode of trace B.		
MIN B ROLL B	MINB	Sets the minimum value detection mode of trace B.		
	RAVB	Sets the sequential calculation mode of trace B.		
DISP B BLANK B	DSPB	Switches whether or not to display for trace B.	DSPB?	Output BLANK 0 DISP 1
	BLKB			
FIX C WRITE C	FIXC	Sets the data fixing mode of trace C.	TRC?	Output WRITE 0 FIX 1 A-B 2 B-A 3
	WRTC	Sets the writing mode of trace C.		
A-B C B-A C	A-BC	Subtracts trace B from trace A, and copies to trace C (LOG value calculation).		
	B-AC	Subtracts trace A from trace B, and copies to trace C (LOG value calculation).		
DISP C BLANK C	DSPC	Switches whether or not to display for trace C.	DSPC?	Output BLANK 0 DISP 1
	BLKC			

Table 8-2 GP-IB Program Codes(5/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
TRACE COPY				
A → B	B=A	Copies trace A to trace B.	None	
A → C	C=A	Copies trace A to trace C.	None	
CLEAR A	CLR A	Clears trace A.	None	
B → A	A=B	Copies trace B to trace A.	None	
B → C	C=B	Copies trace B to trace C.	None	
CLEAR B	CLR B	Clears trace B.	None	
C → A	A=C	Copies trace C to trace A.	None	
C → B	B=C	Copies trace C to trace B.	None	
CLEAR C	CLR C	Clears trace C.	None	
ALL TRACE CLEAR	CLR	Clears traces A, B and C.	None	
ANALYSIS				
WDM LIST	WDMAN	Performs WDM analysis.	None	
OFFSET SPACING	WDMOS*	Selects items of the WDM list to be displayed. *=0:OFFSET 1:SPACING	WDMOS?	Output OFFSET 0 SPACING 1
REF CHANNEL	WDMRW****.**	Sets the channel peak closest to the wavelength set to the reference (Unit:nm) ****.**:1200.00~1700.00 (0.01 step)	WDMRW?	1200.00 ~ 1700.00
	WDMRN***	Sets the channel peak of the set number to the reference. ***:1 ~ 256 (1 step)	WDMRN?	1 ~ 256
ABSOLUTE RELATIVE	WDMABS	Displays wavelengths, noises and SNRs in absolute values.	None	
	WDMREL	Displays wavelengths, noises and SNRs in relative values.		
REF DATA SET	WDMREFSET	Sets the latest WDM analysis results to the reference data.	None	
REF DATA INITIAL	WDMREFINI	Sets the preset value to the reference data.	None	
PEAK	PKSR	Detects the maximum level value.	None	
NEXT PEAK →	NSRR	Detects the maximum value on the right of the moving marker.	None	

Table 8-2 GP-IB Program Codes(6/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
NEXT PEAK ←	NSRL	Detects the maximum value on the left of the moving marker.	None	
SPECTRAL WIDTH	SW*	Measures the spectral width. *=0: ENVELOPE 1: THRESH 2: RMS 3: PEAK RMS 4: NOTCH	SW?	Output ENVELOPE 0 THRESH 1 RMS 2 PEAK RMS 3 NOTCH 4
THRESH (FIT)	SWTHR	Sets the spectral width measurement by the threshold method.	None	
	MODFT*	When executing spectral width by the threshold method (at a magnification rate of 1): Sets the marker to the mode peak:2 Sets the marker to the position where the level coincides with the threshold level:1	MODFT?	Sets the marker to the mode peak:0 Sets the marker to the position at which the level coincides with the threshold level:1
THRESH VALUE	THRTH**.**	Sets the threshold value of spectral width search by the threshold method. (Unit:dB) **.**: 0.01~50.00 (0.01 step)	THRTH?	0.01 ~ 50.00
RMS	SWRMS	Sets spectral width measurement by the RMS method.	None	
THRESH VALUE	PMSTH**.**	Sets the limit value of spectral width search by the PMS method. (Unit:dB) **.**: 0.01 ~ 50.00 (0.01 step)	PMSTH?	0.01 ~ 50.00
PK RMS	SWPRM	Sets spectral width measurement by the PK RMS method.	None	
THRESH VALUE	PRMTH**.**	Sets the limit value of spectral width search by the PK RMS method. (Unit:dB) **.**: 0.01 ~ 50.00 (0.01 step)	PRMTH?	0.01 ~ 50.00
ENV	SWENV	Sets spectral width measurement by the envelope method.	None	
THRESH VALUE	ENVT1**.**	Sets the threshold value of spectral width search by the envelope method (Unit:dB) **.*: 0.01 ~ 50.00 (0.01 step)	ENVT1?	0.01 ~ 50.00
NOTCH	SWNCH	Sets notch width measurement.	None	
THRESH VALUE	NCHTH**.**	Sets the threshold value of notch width measurement. (Unit:dB) **.**:0.01~50.00 (0.01 step)	NCHTH?	0.01 ~ 50.00

Table 8-2 GP-IB Program Codes(7/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
EDFA NF	EDNF	Executes NF calculation.	None	
MASK AREA	EDFMSK**.**	Sets the mask range. **.**: 0 ~ 99.99 (0.01 step)	EDFMSK?	0 ~ 99.99
	EDFMSKF*.***	Sets the mask range.(Unit:THz) *.***: 0 ~ 9.999 (0.001 step)	EDFMSKF?	0 ~ 9.999
FIT AREA	EDFFIT**.**	Sets the curve fit range. (Unit:dB) ***.**: 0 ~ 99.99 (0.01 step)	EDFFIT?	0 ~ 99.99
	EDFFITF*.***	Sets the curve fit range. (Unit:THz) *.***: 0 ~ 9.999 (0.001 step)	EDFFITF?	0 ~ 9.999
CVFT TYPE	EDFCVF*	Sets the curve fit type during NF calculation. *=0:GAUSSIAN 1:LORENZIAN 2:3RD POLY 3:4TH POLY 4:5TH POLY	EDFCVF?	Output GAUSSIAN 0 LORENZIAN 1 3RD POLY 2 4TH POLY 3 5TH POLY 4
WDM-NF	WNFAN	Executes WDM-NF calculation.	None	
POWER	PWR	Sets the power between markers measurement.	None	
SMSR	SMSR*	Sets the measurement reference for the side mode compression ratio. *=1:SMSR1 2:SMSR2	SMSR?	Output SMSR1 1 SMSR2 2
PMD	PMD	Calculates and displays PMD.	None	
AUTO SEARCH ON OFF	ATANA*	After ending sweep, carries out execution of the set function automatically. *=1:When ON 0:When OFF	ATANA?	Output ON: 1 OFF 0
SEARCH L1-L2 ON OFF	SRLMK*	Sets whether to execute detection of the peak value between L1 and L2 or not. *=1:When ON 0: When OFF	SRLMK?	Output ON: 1 OFF 0

Table 8-2 GP-IB Program Codes(8/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
MARKER				
SET	WMKR****.***	Sets the moving marker to the specified wavelength position. (Unit:nm) ****.***:950.000~1950.000	MKR?	Outputs the position of the moving marker (or frequency) and level.
	FMKR***.****	Sets the moving marker to the specified frequency position. (Unit:THz) ***.****: 139.7500~286.5700		
	MKR1	Sets the moving marker to the fixed marker 1.	MKR?1	Outputs the wavelength and level at fixed marker 1.
	MKR2	Sets the moving marker to the fixed marker 2. (Ineffective when no fixed marker 1.)	MKR?2	Outputs the wavelength and level at fixed marker 2.
	SMKR	Sets the fixed marker. (When the fixed marker is set in the range of 3-100).	MKR?* *:3~100	Outputs a wavelength and level at the fixed marker *.
CLEAR	MCLR	Clears the ▽ marker (the one set last).	None	
ALL CLEAR	MKCL	Erases the moving marker, fixed marker, and data area marker values.	None	
LINE 1	L1MK****.***	Sets line marker 1. (Unit:nm) ****.***: 950.000~1950.000	L1MK?	Outputs a wavelength at the line marker 1.
	L1FMK***.****	Sets line marker 1. (Unit:THz) ***.****: 139.7500~286.5700		Outputs a frequency at the line marker 1.
LINE 2	L2MK****.***	Sets line marker 2. (Unit:nm) ****.***: 950.000~1950.000	L2MK?	Outputs a wavelength at the line marker 2.
	L2FMK***.****	Sets line marker 2. (Unit:THz) ***.****: 139.7500~286.5700		Outputs a frequency at the line marker 2
LINE 3		Sets the line marker 3.	L3MK?	Outputs a level at the line marker 3.
LOG Scale	L3DBM****.**	****.**:-170.00~40.00dBm		
SUBLOG Scale	L3DB****.**	****.**:-149.90~149.90dB		
LIN Scale	L3LN*.***E±**	*.****E±**:0~2.500E+03		
LINE 4		Sets the line marker 4.	L4MK?	Outputs a level at the line marker 4.
LOG Scale	L4DBM****.**	****.**:-170.00~40.00dBm		
SUBLOG Scale	L4DB****.**	****.**:-149.90~149.90dB		
LIN Scale	L4LN*.***E±**	*.****E±**:0~2.500E+03		
LINE CLEAR	LMKCL	Erases the line marker and line marker value	None	
SWEEP L1-L2 ON OFF	SWPM*	Switches ON/OFF sweep between markers. *=1:When ON 0: When OFF	SWPM?	Output ON 1 OFF 0

Table 8-2 GP-IB Program Codes(9/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
LONG TERM				
WAVELENGTH	LTWL	Displays the wavelength list of all channels.	None	
LEVEL	LTL	Displays the level list of all channels.	None	
SNR	LTSNR	Displays the SNR list of all channels.	None	
SINGLE CH DISPLAY	LTCH***	Displays one channel. ***: 1 ~ 256	LTCH?	1~256
ABSOLUTE	LTABS	Displays wavelength, level, noise, SNR in absolute value.	None	
RELATIVE	LTREL	Displays wavelength, level, noise, SNR in relative value in respect to the reference data.	None	
REF DATA SET	LTREFSET	Sets the latest WDM analysis results to the reference data.	None	
REF DATA INITIAL	LTREFINI	Sets the preset value to the reference data.	None	
DATA CLEAR	LTCLR	Clears the data.	None	
OTHERS	LTCHCUR***	In the long term display, it moves the cursor on to a channel to be selected. ***:1~256(Channel)	None	
	LTTMCUR****	In the long term display, it moves the cursor on to a measurement count to be selected. ****:1~1000 (measurement count)	None	
LABEL				
LABEL	LBL '***...***'	Sets the label input mode. ***...***: Character string (MAX50).	LBL?	Character string currently displayed.
CLEAR	LBLCL	Deletes every character string in the label input area.	None	
SAVE				
	FDA*,%%%	Specifies a device and file name into which data is to be saved. *:Specify the device. *=0:FD 3:PCMCIA1 1:Internal memory 4:PCMCIA2 2:None %: Specifies the address %%%=001~999	FDAR	Outputs a device and file name on which data is currently saved. *,% *=0:FD 3:PCMCIA1 1:Internal memory 4:PCMCIA2 2:None %=001~999
	DIR$^{C}_{R}{}^{L}_{F}$ ********	Specifies the directory. (specifies the directory name after the control command [DIR] has been executed.) ********:Directory name	DIRR	Output the currently set directory name. ********:Directory name
	FF*	Selects the file format. *=0:Waveform file (.WV4) 1:Data file (.DT4) 2:Measuring conditions file (.ST4) 3:Program file (.PG4) 4:Text file (.TXT) 5:Long term results file(.LT4) 6:Screen information (.BMP) 7:Screen information (.TIF)	FFR	Outputs the currently selected file format. Output Waveform file (.WV4) 0 Data file (.DT4) 1 Measuring conditions file (.ST4) 2 Program file (.PG4) 3 Text file (.TXT) 4 Long term results file(.LT4) 5 Screen information (.BMP) 6 Screen information (.TIF) 7

Table 8-2 GP-IB Program Codes(10/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
	FTW*	Sets the trace to be recorded. *=0:traceA 1:traceB 2:traceC	None	
	FPG*	Sets the program No. To be recalled or recorded. *=1~5(Program No.)	None	
	FST	Record a measured waveform in the specified file. If another file with the same file number is present, the waveform is not overwritten on it.	None	
	RFS	Overwrites a measured waveform in the specified file. If another file with the same file number is not present, no action will be taken.	None	
	None	Requests for the recorded capacity from the file. Outputs the capacity in units of bytes. *:Specifies the drive *=0:FD 1:Internal memory 2:HD 3:PCMCIA1 4:PCMCIA2	FSR* *:0~4 (see the description provided in the left).	*****..... To request recorded file capacity. The capacity is output in bytes.
	None	Requests for the recorded file no. from the file. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 %:Specifies the directory #:Specifies the file type #=0:Waveform file (.WV4) 1:Data file (.DT4) 2:Measuring conditions file (.ST4) 3:Program file (.PG4) 4:Text file (.TXT) 5:Long term results file(.LT4) 6:Screen information (.BMP) 7:Screen information (.TIF)	FAR*, %, # *:0~4 (see the description provided in the left). %:directory #:0~7 (see the description provided in the left).	***,***,...,*** To request recorded file number.

Table 8-2 GP-IB Program Codes(11/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
	None	Requests the recordable number of waveforms from the file. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 #:Specifies the file type #=0:Waveform file (.WV4) 1:none 2:Measuring conditions file (.ST4) 3:Program file (.PG4) 4:none 5:none 6:Screen information (.BMP) 7:Screen information (.TIF)	FUR*, #	*** To request the number of waveforms which can be recorded in files.
RECALL				
	FRC	Reads a waveform from the specified file. You cannot, however, recall data other than the waveform, measuring conditions, program or text file. (To execute recall, specify the drive, file name, directory and file type by FDA, DIR and FF commands.)	None	
	FP*, %	Prints the list of files in the specified drive and directory. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 %:Specifies the directory	None	
	FTR*	Sets the trace of the waveform to be recalled. *=0:traceA 1:traceB 2:traceC	None	

Table 8-2 GP-IB Program Codes(12/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
COPY				
	CPS*,%,#,$,@	Specifies the copy source file. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 %:Specifies the directory #:Specifies the file type #=0:Waveform file (.WV4) 1:Data file (.DT4) 2:Measuring conditions file (.ST4) 3:Program file (.PG4) 4:Text file (.TXT) 5:Long term results file (.LT4) 6:Screen information (.BMP) 7:Screen information(.TIF) $:Start file no.***:000 – 999 @:End file no.***:000-999	CPSR	To request specifies the copy source file. *,%,#,$,@ *: Setting of drive. Output FD 0 Internal RAM 1 PCMCIA1 3 PCMCIA2 4 %: Specification of directory. #: Specification of file type. Output Waveform file (.WV4) 0 Data file (.DT4) 1 Measuring conditions file (.ST4) 2 Program file (.PG4) 3 Text file (.TXT) 4 Long term results file (.LT4) 5 Screen information (.BMP) 6 Screen information(.TIF) 7 $: Starting file no. ***=(000 – 999) @: Ending file no. ***=(000 - 999)
	CPD*,%,#	Specifies the copy destination file. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 %:Specifies the directory #:Start file no.***:000-999	CPDR	To request specifies the copy destination file. *,%,# *:Setting of drive. Output FD 0 Internal RAM 1 PCMCIA1 3 PCMCIA2 4 n: Specification of directory. p :Starting file no.***=(000-999)
	CP	Executes copying.	None	
DELETE				
	DEL	Executes deletion. (To execute recall, specify the drive, file name, directory and file type by FDA, DIR and FF commands.)	None	

Table 8-2 GP-IB Program Codes(13/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
FORMAT				
	FIN*	Executes formatting. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 5:FD(720KB format)	None	
	DRM*,%	Creates the directory. *:Specifies the drive *=0:FD 1:Internal RAM 2:None 3:PCMCIA1 4:PCMCIA2 %:Specifies the name of the directory to be created. Specifies the full pass even for hierarchies.	None	
CALIBRATION				
SELF CALIBRATION	WCALS*	Calibrates the wavelength by the internal light source. *=1:ON 0:OFF	None	
WAVELENGTH CALIBRATION	WCAL****.***	Calibrates the absolute value of the wavelength. (Unit:nm) ****.***: 1200.000~1700.000 (0.001 step)	WCAL?	1200.000~1700.000
WAVELENGTH OFFSET	WLSFT**.**	Sets the shift amount of the wavelength. (Unit:nm) **.**:-5.00~5.00 (0.01 step)	WLSFT?	-5.00~5.00
LEVEL OFFSET	LVSFT***.**	Sets the shift amount of the level. (Unit:dB) ***.**: -30.00~30.00 (0.01 step)	LVSFT?	-30.00~30.00
WAVELENGTH CALIB TABLE	WCALT****,±%.%%%	Sets the wavelength CAL table (Unit:nm) ****:Table wavelength 1200-1700 (1 step) %.%%%:Compensation value –0.200 ~ 0.200 (0.001 step)	WCALT?****	For **** of the talker command , specify table wavelength. –0.200 ~ 0.200
LEVEL CALIB TABLE	LCALT****,±%.%%%	Sets the level CAL table (Unit:nm) ****:Table wavelength 1200-1700 (1 step) ±%.%%%:Compensation value –1.000 ~ 1.000 (0.001 step)	LCALT?****	For **** of the talker command , specify table wavelength. –1.000 ~ 1.000
PARAMETER1,2				
(DUT INFORMATION) CHANNEL NO.	WDMMAX***	Sets the maximum number of channel peaks. ***:1~256	WDMMAX?	1~256

Table 8-2 GP-IB Program Codes(14/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
CHANNEL WAVELENGTH	DUTCH***,%%%%.%%	Sets the wavelength of each channel. ***:1~256 %%%%.%%: Wavelength 1200.00~1700.00 (0.01 step)	DUTCH***?	Outputs the specified channel wavelength by specifying the channel number and executing the command. 1200.00~1700.00
LEVEL PRESET	DUTLEV***.**	Sets the existing value for level. ***.**:-90 ~ 20 dBm (0.01 step)	DUTLEV?	-90.00 ~ 20.00
SNR PRESET	DUTSNR**.**	Sets the existing value for SNR. **.**:0 ~ 50 00dBm (0.01 step)	DUTSNR**.**?	0 ~ 50.00
(WDM/WDM-NF ANALYSIS) CHANNEL DETECTION	WDMCHAUT*	When attaching channel numbers to the mode peak, selects whether to refer to the preset wavelength or number in order from the left edge. *=0:PRESET 1:AUTO	WDMCHAUT?	Output PRESET 0 AUTO 1
MODE DIFF for 'AUTO'	WDMDIF**.**	Sets the minimum value of the peak difference when detecting the channel peak (Unit:dB). **.**: 0.01 ~ 50.00 (0.01 step)	WDMDIF?	0.01 ~ 50.00
THRESHOLD for 'AUTO'	WDMTH**.**	Sets the threshold value of the channel peak. (Unit:dB) **.**: 0 ~ 50.00 (0.01 step)	WDMTH?	0 ~ 50.00
(WDM ANALYSIS) NOISE DETECTION	WDMNOI*	Selects whether to set the noise measuring point to the center of the mode or to the fixed point. *=0:FIXED 1:CENTER	WDHNOI?	Output FIXED 0 CENTER 1
NOISE POINT for 'FIXED'	WDMNOIP**.**	Sets the measuring point of the noise. **.**:0 ~ 10.00 nm (0.01 step)	WDHNOIP?	0 ~ 10.00
NOISE BANDWIDTH	WDMNOIBW*.**	Sets a bandwidth of the noise level calculation. *.**:0.01 ~ 1.00 nm (0.01 step)	WDMNOIBW?	0.01 ~ 1.00
(LONG TERM) WAVELENGTH DRIFT LIMIT	LTWLLIM**.**	Sets the tolerance value for wavelength deviation. **.**:0 ~ 99.99 nm (0.01 step)	LTWLLIM?	0 ~ 99.99
LEVEL LOWER LIMIT	LTLLOW***.**	Sets the tolerance value for level (upper limit) ***.**:-90.00 ~ 20.00 dBm (0.01 step)	LTLLOW?	-90.00 ~ 20.00
LEVEL UPPER LIMIT	LTLHI***.**	Sets the tolerance value for level (lower limit) ***.**:-90.00 ~ 20.00 dBm (0.01 step)	LTLHI?	-90.00 ~ 20.00
SNR LIMIT	LTSNRLIM***.**	Sets the tolerance value for SNR. ***.**:-90.00 ~ 20.00 dB (0.01 step)	LTSNRLIM?	-90.00 ~ 20.00
(EDFA NF) OFFSET(IN)	OFIN***.**	Sets the offset value of the signal light. (Unit:dB) ***.**: -99.99 ~ 99.99 (0.01 step)	OFIN?	-99.99 ~ 99.99

Table 8-2 GP-IB Program Codes(15/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
(EDFA NF) OFFSET(OUT)	OFOUT***.**	Sets the offset value of the output light. (Unit:dB) ***.**: -99.99 ~ 99.99 (0.01 step)	OFOUT?	-99.99 ~ 99.99
(WDM-NF) ASE POINT	WNFNP**.**	Sets the ASE measurement point.(Unit:nm) **.**:0.00~10.00 (0.01 step)	WNFNP?	0.00 ~ 10.00
OFFSET(IN)	WNFOFI***.**	Sets the offset value of the signal light. (Unit:dB) ***.**: -99.99 ~ 99.99 (0.01 step)	WNFOFI?	99.99 ~ 99.99
OFFSET(OUT)	WNFOFO***.**	Sets the offset value of the signal light. (Unit:dB) ***.**: -99.99 ~ 99.99 (0.01 step)	WNFOFO?	99.99 ~ 99.99
(POWER MONITOR) PRESET CENTER	PMCTRWL****.**	Sets the preset value of the center wavelength. 1200.00~1700.00nm(0.01 step)	PMCTRWL?	1200.00~1700.00
PRESET SPAN	PMSPN***.**	Sets the preset value of the sweep width. 1.0~500.0nm(0.01 step)	PMSPAN?	1.0~500.0
CHANNEL WIDTH	PMBW***.*	Sets the measuring wavelength to a specific channel. 0.1~100.0nm(0.1 step)	PMBW?	0.1~100.00
(SPECTRAL WIDTH) K FOR THRESHOLD	THRK**.**	Sets the magnification of spectral width search by the threshold method. **.**: 1.00 ~ 10.00 (0.01 step)	THRK?	1.00 ~ 10.00
K FOR RMS	RMSK**.**	Sets the magnification of spectral width search by the RMS method. **.**: 1.00 ~ 10.00 (0.01 step)	RMSK?	1.00 ~ 10.00
K FOR PK RMS	PRMK**.**	Sets the magnification of spectral width search by the PK RMS method. **.**: 1.00 ~ 10.00 (0.01 step)	PRMK?	1.00 ~ 10.00
K FOR ENVELOPE	ENVK**.**	Sets the magnification of spectral width search by the envelope method. **.**: 1.00 ~ 10.00 (0.01 step)	ENVK?	1.00 ~ 10.00
TH2 FOR ENVELOPE	ENVT2**.**	Sets the limit value of spectral width search by the envelope method (Unit:dB) **.*: 0.01 ~ 50.00 (0.01 step)	ENVT2?	0.01 ~ 50.00
K FOR NOTCH	NCHK**.**	Sets the magnification of notch width measurement. **.*:0.01~50.00 (0.01 step)	NCHK?	1.00 ~ 10.00
(POWER) POWER OFFSET	POFS***.**	Sets the compensation value of power between marker measurement. (Unit:dB) ***.**: -10.00~10.00 (0.01 step)	POFS?	-10.00 ~ 10.00
(SMSR) MASK AREA	SSMSR**.**	Set the mask rang near the peak during SMSR1 measurement. 0 ~ 99.99 nm (0.01 step)	SSMSR?	0 ~ 99.99
(PMD) PMD THRESH	PMDTH**.**	Sets the limit value of PMD measurement. **.**:0.01 ~ 50.00 dB(0.01 step)	PMDTH?	0.01 ~ 50.00

Table 8-2 GP-IB Program Codes(16/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
(PEAK) PEAK SEARCH MODE DIFF	MODIF**.**	Sets the level difference for determining the mode. (Unit:dB) **.**:0.1 ~ 50.0 (0.01 step)	MODIF?	0.1 ~ 50.0
(TRACE ABC) TRACE AB ROLL AVG TIMES	RAVG***	Sets the number of roll averages. ***:2 ~ 1000 (1 step)	RAVG?	2 ~ 1000
(WL/FREQ SCL) CENTER&SPAN OR START&STOP	HMODE*	Sets CENTER&SPAN or START&STOP. *=0: CENTER&SPAN 1: START&STOP	HMODE?	Output CENTER&SPAN 0 START&STOP 1
AUTO OFFSET ON/OFF	ATOFS*	Turns ON or OFF the amplifier auto offset function. *=1: ON 0: OFF	ATOFS?	Output ON 1 OFF 0
DISPLAY SETTING				
LEVEL DIGITS	FIG*	Sets the number of digits to be displayed after the decimal point of the dB value. *=0:3 digits after the decimal point 1:2 digits after the decimal point 2:1 digit after the decimal point	FIGR	To request the number of digits to be displayed after the decimal point of the dB value. Output 3 digits after the decimal point 0 2 digits after the decimal point 1 1 digit after the decimal point 2
DATE/TIME DISPLAY	DTE*	Sets presence of date display, form. *=0:None 1:MM.DD.YYYY 2:DD.MM.YYYY 3:YYYY.MM.DD	DTER	To request presence of date display , form. Output None 0 MM.DD.YYYY 1 DD.MM.YYYY 2 YYYY.MM.DD 3
DATE/TIME	YEA****	Sets the year. ****:1980 ~ 2100	YEAR	1980 ~ 2100
	MTH**	Sets the month. **:01 ~ 12	MTHR	01 ~ 12
	DAY**	Sets the day. **:01 ~ 31	DAYR	01 ~ 31
	HOU**	Sets the hour. **:00 ~ 23	HOUR	00 ~ 23
	MIN**	Sets the minute. **:00 ~ 59	MINR	00 ~ 59
LABEL DISPLAY	LD*	Sets whether label is displayed. *=0:No 1:Yes	LDR	To request whether label is displayed. Output No 0 Yes 1

Table 8-2 GP-IB Program Codes(17/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
GRID DISPLAY	GD*	Sets whether grid is displayed. *=0:No 1:Yes	GDR	To request whether grid is displayed. Output No 0 Yes 1
BEEP	BEEP*	Sets whether the beep is sounded. *=0:No 1:Yes	BEEPR	To request whether the beep is sounded. Output No 0 Yes. 1
UNCAL WARNING	UCWRN*	Specifies if the warning display is to be turn ON or OFF when UNCAL is detected. *=0:OFF 1:ON	UCWRN?	Outputs which of display ON or OFF is selected when UNCAL is detected. Output No 0 Yes. 1
SYSTEM				
PCMCIA1	PCMA*	Specifies the type of PCMCIA1 slot card. *=0:OFF 1:CARD 2:HARD DRIVE	PCMAR	To request the type of PCMCIA1 slot card. Output OFF 0 CARD 1 HARD DRIVE 2
PCMCIA2	PCMB*	Specifies the type of PCMCIA2 slot card. *=0:OFF 1:CARD 2:HARD DRIVE	PCMBR	To request the type of PCMCIA1 slot card. Output OFF 0 CARD 1 HARD DRIVE 2
PRINT TYPE	PRD*	Sets the printing direction and display method of the printer. *=0:Vertical 1:Horizontal 2:Screen	PRDR	To request the printing direction and display method of the printer. Output Vertical 0 Horizontal 1 Screen 2
PRINTER PORT	PRO*	Specifies the printout port. *=0:Built-in printer 1:Centronics 2:RS-232C 3:File	PROR	To request the printout port. Output Built-in printer 0 Centronics 1 RS-232C 2 File 3

Table 8-2 GP-IB Program Codes(18/19)

Function	Control Command	Description	Talker Command	Talker Output Data Format
EXTERNAL PRINTER	EP*	Specifies the type of external printer. *=0:EPSON 1:CANON 2:NEC 3:None 4:PCL 5:Postscript 6:Seiko DPU411 (TYPE2) 7:Seiko DPU412	EPR	To request the type of external printer. Output EPSON 0 CANON 1 NEC 2 None 3 PCL 4 Postscript 5 Seiko DPU411 (TYPE2) 6 Seiko DPU412 7
PRINT				
	CPY	Prints out the display.	None	
	None		PRSR	State of internal printer Output Printable 0 Printing 1 No printing 2 Headup 3 Temperature problem 4
FEED				
	FED*	Feeds the built-in printer paper for * lines. 1≦*≦999 *:1~999 (1step)	None	
Others				
Delimiter specification	SD*	Specifies the string delimiter *=0:, 1:CRLF	SD?	Output , 0 CRLF 1
	BD*	Specifies the block delimiter *=0:CRLF 1:LF+EOI	BD?	Output CRLF 0 LF+EOI 1
SRQ ON/OFF	SRQ*	Permission or inhibition of service request. *=1:ON(permission) 0:OFF(inhibition) Default = " OFF "	SRQ?	Output ON 1 OFF 0
Initialization of non-volatile data	INIT	Initializes excluding the program/memory	None	
Talker data header information ON/OFF	HD*	Adds the header to the talker data for the output request command *=1:When ON 0:When OFF The default is OFF	HD?	Output ON 1 OFF 0
Waveform data output request command	LDATA R*****-R*****	Trace A level data ****:1~20001 R1-R20001 when the underline is omitted		According to Table 8-4 Output Data Format

Table 8-2 GP-IB Program Codes(19/19)

Function	Control	Description	Talker Command	Talker Output Data Format
Waveform data output request command	LDATB R*****-R*****	Trace B level data ****:1~20001 R1-R20001 when the underline is omitted		According to Table 8-4 Output Data Format
	LDATC R*****-R*****	Trace C level data ****:1~20001 R1-R20001 when the underline is omitted		
	WDATA R*****-R*****	Trace A wavelength data ****:1~20001 R1-R20001 when the underline is omitted		
	WDATB R*****-R*****	Trace B wavelength data ****:1~20001 R1-R20001 when the underline is omitted		
	WDATC R*****-R*****	Trace C wavelength data ****:1~20001 R1-R20001 when the underline is omitted		
LOG data digit-number specifications	LDTDIG*	Specifies the number of digits output after the decimal point during the level data (LOG) GP-IB output *=2 second decimal place Immediately after power is turned ON 3 :third decimal place	LDTDIG?	Output 2nd decimal place 2 3rd decimal place 3
Marker value output request command	None	Moving → marker value request	MKR?	According to Table 8-4 Output Data Format
	None	Marker value output request ***: 1 ~ 100	MKR?***	
	None	Fixed ▽ marker 1 value request	MKR?1	
	None	Fixed ▽ marker 2 value request	MKR?2	
	None	Line marker 1 value (wavelength) request	L1MK?	
	None	Line marker 2 value (wavelength) request	L2MK?	
ANALYSIS results output request command	None	ANALYSIS results request	ANA?	
Output request command used in the LONG TERM measurement	None	Measuring conditions to be employed in the LONG TERM measurement are requested.	LTST?	
	None	Measurement data obtained from the LONG TEMR measurement are requested.	LTDAT?****	
Power monitor function Measured results request command	None	Request for data by power monitor function	PMTR?	
FD directory information output request command	None	Directory output	DIR?	
Command requesting output of file name for accessing FD	None	Request for file name read just before	FNAME?	
Warning error number output request command	None	Request for warning error number last generated	WARN?	
Equipment data output request command	None	Equipment data are requested.	*IDN?	

8.1.6 Output Data

When this unit is specified as the talker by the controller, this unit outputs the data. In this case, it will be necessary to specify the contents of the output data using program codes. Table 8-4 shows the list of output data request codes and output data formats.

When the power is turned ON, the output data string delimiter (punctuation character between data) will be set to "," while the block delimiter (character at the end of the data) will be set to CRLF+EOI. These can be changed. Table 8-3 shows the delimiter specification codes.

When changed to the delimiter, the "," and CRLF of the output data formats in Table 8-4 will be changed to the delimiter changed to.

Table 8-3 Delimiter Specification Codes

Program Code	Contents
SD0	Sets the string delimiter to ",".
SD1	Sets the string delimiter to CRLF.
BD0	Sets the block delimiter to CRLF+EOI.
BD1	Sets the block delimiter to LF+EOI.

Table 8-4 Output Data Format(1/4)

Data Output Item	Output Request Command	Talker Output Data Format
Data when LOG scale (dBm, dBm/nm, dB) Data in trace A Data in trace B Data in trace C	LDATA R****-R**** LDATB R****-R**** LDATC R****-R**** ****:1~20001	Continues for number of data present (Header) *****(SD) ± ***.**(SD) ···· ± ***.**(BD) No. of data (1~20001) Data (+210.00 ~ -210.00) (Header) "DBM" in the case of absolute value "DB△" in the case of relative value ※ (SD) String delimiter (BD)Block delimiter △:Space
Data when LIN scale (*W, *W/nm, sub scale LIN%) Data in trace A Data in trace B Data in trace C	LDATA R****-R**** LDATB R****-R**** LDATC R****-R**** ****:1~20001	Continues for number of data present (Header) *****(SD)*.***E ± **(SD) ···· *.***E± **(BD) No. of data (1~20001) Data (1.000E+21 ~ 1.000E-21) (Header) "LNW" in the case of absolute value "LN△" in the case of relative value ※ (SD) String delimiter (BD)Block delimiter △:Space
Data in trace A (Wavelength axis) Data in trace B (Wavelength axis) Data in trace C (Wavelength axis)	WDATA R****-R**** WDATB R****-R**** WDATC R****-R**** ****:1~20001	Continues for number of data present NM*****(SD)****.***(SD) ···· ****.***(BD) No. of data (1~20001) Data (1200.00 ~ 1700.00nm) ※ (SD) String delimiter (BD)Block delimiter
Moving ▽ marker value Fixed marker 1 value Fixed marker 2 value	MKR? MKR?1 MKR?2 MKR?*** ***:1~256	(For waveform display, LOG scale) WMKR△ △****.***(SD)±***.**(BD) WMKR 1△****.***(SD)±***.**(BD) WMKR 2△****.***(SD)±***.**(BD) Wavelength (nm) Level (dBm or dB) △:Space (For frequency display, LOG scale) FMKR△ △***.****(SD)±***.**(BD) FMKR 1△***.****(SD)±***.**(BD) FMKR 2△***.****(SD)±***.**(BD) Frequency (THz) Level (dBm or dB) △:Space	(For waveform display, LIN scale) WMKR△ △****.***(SD)*.***E± **(BD) WMKR 1△****.***(SD)*.***E± **(BD) WMKR 2△****.***(SD)*.***E± **(BD) Wavelength (nm) Level (W or no units) △:Space (For frequency display, LIN scale) FMKR△ △***.****(SD)*.***E± **(BD) FMKR 1△***.****(SD)*.***E± **(BD) FMKR 2△***.****(SD)*.***E± **(BD) Frequency (THz) Level (W or no units) △:Space
Line marker 1 value (Wavelength) Line marker 2 value (Wavelength)	L1MK? L2MK?	(For wavelength display) LMKR 1△****.***(BD) LMKR 2△****.***(BD) Wavelength (nm)	(For frequency display) LFMK 1△***.****(BD) LFMK 2△***.****(BD) Frequency (THz)

(Note)
The portion underlined (***.**) of the talker output data format in the table is output to the third decimal place (LDTDIG 3) when the number of digits after the decimal points is specified as 3.

Table 8-4 Output Data Format(2/4)

Data Output Item	Output Request Command	Talker Output Data Format	
Line marker 3 value (Level) Line marker 4 value (Level)	L3MK? L4MK?	(For LOG scale) LMKR 3Δ±***.** (BD) LMKR 4Δ±***.** (BD) Level (dBm or dB)	(For LIN scale) LMKR 3Δ*.*** E± ** (BD) LMKR 4Δ*.*** E± ** (BD) Level (W or no units)
ANALYSIS results	ANA?	(SPECTRAL WIDTH) (When marker is displayed in wavelength) (Header) Δ****.***(SD)****.***(SD)***(BD) Center wavelength (nm) Spectral width (nm) Mode number (When marker is displayed in frequency) (Header) Δ***.***(SD)***.***(SD)***(BD) Center wavelength (THz) Spectral width (THz) Mode number (Header): ENV → "SWEN" THRESH→ "SWTH" RMS → "SWRM" PK RMS → "SWPR"	
		(For POWER LOG scale) PDBMΔ±***.**(BD) Power (dBm)	(For POWER LIN scale) PLNWΔ*.***E±**(BD) Power (W)
		(EDFA NF) EDNFΔ***.**(SD)****.***(SD)±***.**(SD)***.**(BD) Gain (dB) Measured resolution (nm) ASE power (dBm) NF (dB)	
		(WDM) (When marker is displayed in wavelength. (Absolute value display)) WDM***(SD)****.***(SD)***.**(SD)***.**(SD) ····· (BD) Mode number Peak wavelength (nm) Peak level (dBm) SNR (dB) Items 2 to 4 are repeated (When marker is displayed in frequency. (Absolute value display)) WDM***(SD)***.****(SD)***.**(SD)***.**(SD) ····· (BD) Mode number Peak frequency (THz) Peak level (dBm) SNR (dB) Items 2 to 4 are repeated	

(Note)
The portion underlined (***.**) of the talker output data format in the table is output to the third decimal place (LDTDIG 3) when the number of digits after the decimal points is specified as 3.

Table 8-4 Output Data Format(3/4)

Data Output Item	Output Request Command	Talker Output Data Format
ANALYSIS results		(WDM) (When marker is displayed in wavelength. (Relative value display)) WDM***(SD)****.***(SD)***.**(SD)***.**(SD) ····· (BD) Mode number / Relative wavelength (nm) / Relative level (dB) / Relative SNR (dB) / Items 2 to 4 are repeated (When marker is displayed in frequency. (Relative value display)) WDM***(SD)***.****(SD)***.**(SD)***.**(SD) ····· (BD) Mode number / Relative frequency (THz) / Relative level (dBm) / Relative SNR (dB) / Items 2 to 4 are repeated
		(WDM−NF) WDMNFΔ***,***.**(SD)±***.**(SD)±***.**(SD)±***.**(SD) ****.***(SD)±***.**(SD)±***.** ····· (BD) Number of channels ↑ / Input level(dBm) ↑ / ASE levele(dBm) ↑ / Gain(dB) ↑ / Items 2 to 8 are repeated Peak wavelength(nm) / Output level(dBm) / Measured resolution(nm) / NF(dB)
		(NOTCH) (When marker is displayed in wavelength) SWNC****.***(SD)****.***(BD) Center wavelength (nm) / Notch width (nm) (When marker is displayed in frequency) SWNC****.***(SD)****.***(BD) Center wavelength (THz) / Notch width (THz)
		(PMD) PMDΔ***.****(SD)***.****(SD)*****.***(BD) Left side mode peak (THz) ↑ / PMD(ps) / Right side mode peak(THz)
LONG TERM measurement	LTST?	LTSTΔ***(SD)****(SD)****(BD) Number of channels ↑ / Time interval between repetition / Repeat count
	LTDAT? ****: Data No. (1~1000)	LTDATΔ***(SD)****.***(SD)±***.**(SD)***.**(SD) · · · · (BD) Number of channels ↑ / Peak level(dBm) ↑ / Repetition of items 2 to 4. Peak wavelength(nm) / SNR(dB)
Power monitor function measurement data	PMTR?	(Absolute value LOG scale) PMDBMΔ±***.**(BD) Power (dBm) · When OVER, the number is replaced with OVR · When UNDER, the number is replaced with UND

(Note)
The portion underlined (***.**) of the talker output data format in the table is output to the third decimal place (LDTDIG 3) when the number of digits after the decimal points is specified as 3.

Table 8-4 Output Data Format(4/4)

Data Output Item	Output Request Command	Talker Output Data Format
FD directory	DIR?	DIR Δ ***(SD)**********(SD)****(SD)********.*** Δ**-**-** Δ**:**(SD) File number Volume name Remaining ********.*** Δ**-**-** Δ **:**(SD) capacity (KByte) ********.*** Δ**-**-** Δ**:**(SD) File name Date Hour:Minute
File name read last on the FD	FNAME?	FN Δ ********.***(BD) File name
Warning error number	WARN?	WARN Δ ***(BD) Number
Output of equipment data	*IDN?	ANDO, AQ6331, 1, MR**.** SR**.** ↓ ↓ ↓ ↓ ↓ Maker Model name Fixed Code Software version

(Note)
The portion underlined (***.**) of the talker output data format in the table is output to the third decimal place (LDTDIG 3) when the number of digits after the decimal points is specified as 3.

3.1.7 Service Request Function

This transmits the SRQ signal when measurement ends, printing ends, or when the printer paper runs out. When serial poll is performed next with the controller, it transmits the status byte. Table 8-6 shows the details of the status bytes.

The transmission of the SRQ can be permitted and prohibited using the program codes.

It is prohibited when the power is turned on. Table 8-5 shows the program codes related to SRQ transmission.

The details of the status bytes are cleared when serial poll is performed in the SRQ transmission permitted state and when the DCL or SDC message is received.

Table 8-5 Program Codes Related to SRQ Transmission

Program Code	Details
SRQ1	Permits the transmission of the SRQ signal.
SRQ0	Prohibits the transmission of the SRQ signal.

(1) SRQ function of GP-IB port

This function receives the device message SRQ1, and when set to the SRQ transmission mode, sets the following status byte +RQS bit for the cause of generation, and performs service request.

① Function and setting conditions of bits

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	RQS	BUFOVR	0	CMDERR	WARN	DONE	DTRDY

Table 8-6 Details of Status Bytes

Bit	Function and Setting Condition	Clearing Timing
bit7	0	
bit6	Transmits the SRQ signal.	· During serial poll · When DCL or SDC is received
bit5	Sets "1" when data exceeding the receiving buffer capacity 512 bytes is received.	· During serial poll · When DCL or SDC is received · When measurement starts
bit4	0	
bit3	Sets "1" when the command data error is generated.	· During serial poll · When DCL or SDC is received · When measurement starts
bit2	Sets "1" when the warning error (including the error when program is executed) is generated. A number can be output by the talker command "WARN?" for the details of the warning error.	· When the warning error display goes off · During serial poll · When DCL or SDC is received · When measurement starts
bit1	Sets "1" when execution of the floppy disk, copy, program ends.	· During serial poll · When DCL or SDC is received · When measurement starts
bit0	Sets 1 when sweep ends.	· During serial poll · When DCL or SDC is received · When measurement starts

② Mask function of bits

By setting the bit to be masked by the GP-IB command "SRMSK*** (0 to 255)" to 1, the bits will not be set even when a factor occurs.

For instance, in the case of the "SRMSK5" command, bits 0 and 2 are masked, and these bits are not set even if a corresponding factor occurs. The RQS bit (bit+6) will also not be set for only the bit with the masked factor.

When the mask data includes bit 6, the RQS bit will not be set even when SRQ transmission is possible.

(2) Device clear function

Upon receiving DCL or SDC, this function clears the receiving buffer or the output queue (talker data).

(3) Device trigger function

During GET reception, single sweep is performed.

8.1.8 Precautions on Programming

(1) Program codes which correspond to functions which can be invalidated by manual operations will be ignored. In this case, the same warning messages as those in manual operations will be displayed on the screen.

(2) When program codes for performing sweep and printing are sent continuously with other program codes, the subsequent program codes will be executed promptly without waiting for sweep and printing to end. Take note in particular that most commands will be invalid during printing.
Use the service request function to find out if sweep and printing have ended.

(3) When talker is specified during sweep, waveform data output will be performed after sweep has ended.

(4) When using the service request function, perform serial poll after permitting SRQ transmission at the beginning of the program to read blank status bytes.
The contents of the status bytes are maintained until serial poll is performed. During this time, the SRQ signal will not be cleared. Consequently, if the SRQ signal is generated before the program is executed, SRQ will not be generated normally if blank status bytes are not read first.

8.2 Automatic Measurement by RS-232C

8.2.1 Connecting the Connector

Turn OFF the power supply of this unit and the power supplies of all the equipments connected to this unit. Connect the cable to the connector for RS-232C at the top of this unit.

NOTE

When connecting or disconnecting the cable, turn OFF the power supplies of all equipments connected to the cable.
Disconnecting and disconnecting the cable with the power ON will cause faulty operations and damages of the unit.
Use a cross cable for the RS-232C cable.

8.2.2 Measuring by Remote Operations

This unit is able to perform remote operations by device messages.

(1) Control commands and transmission data formats

Table 8-1 shows the list of commands, Table 8-2 shows the control commands, and Table 8-3 shows the request commands. The command commands can be punctuated by ","and transmitted within the reception buffer. The reception buffer of this unit is 512 bytes (characters). However, send commands containing "," independently. (For example, WDMm, n, etc.)

(2) Delimiter

The effective delimiter of this unit is "CRLF".

(3) Error command processing

① The blanks between commands and numbers are ignored.
Example
"R_1, PW_6_" will be reread as "R1, PW6" and processed.
(_ indicate a blank.)

② If the control command contains an error, it will be ignored. Inappropriate values in the parameter set will also be ignored.

③ If the request command contains an error, "?" will be transmitted.
If no data is transmitted, "?" will be transmitted.

CHAPTER 9 USING THE OPTIONS

This chapter describes the options available for this unit.

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9.1 Using the Mouse

9.1.1 Connecting the Mouse

① Turn [OFF] the power of the unit.

② Connect the mouse to the mouse connector on the right side of the unit, and turn [ON] the power.

9.1.2 Operating the Mouse

(1) Operating Modes and Menus

Clicking the mode and function keys on the screen with the left mouse button executes the same operations as the mode and functions keys of the unit.

(2) Changing the parameters displayed on the screen

Clicking the parameters with a ☐ (window) on the screen will enable the value to be changed.

(3) Printing

Clicking [PR] at the bottom right of the screen with the left mouse button executes printing.
Clicking [FE] feeds paper.

(4) Scrolling the data area

Clicking the [△] or [▽] at the bottom right of the screen scrolls the data area.

NOTE

Normal operations can be performed from the panel of the unit even when the mouse is connected.

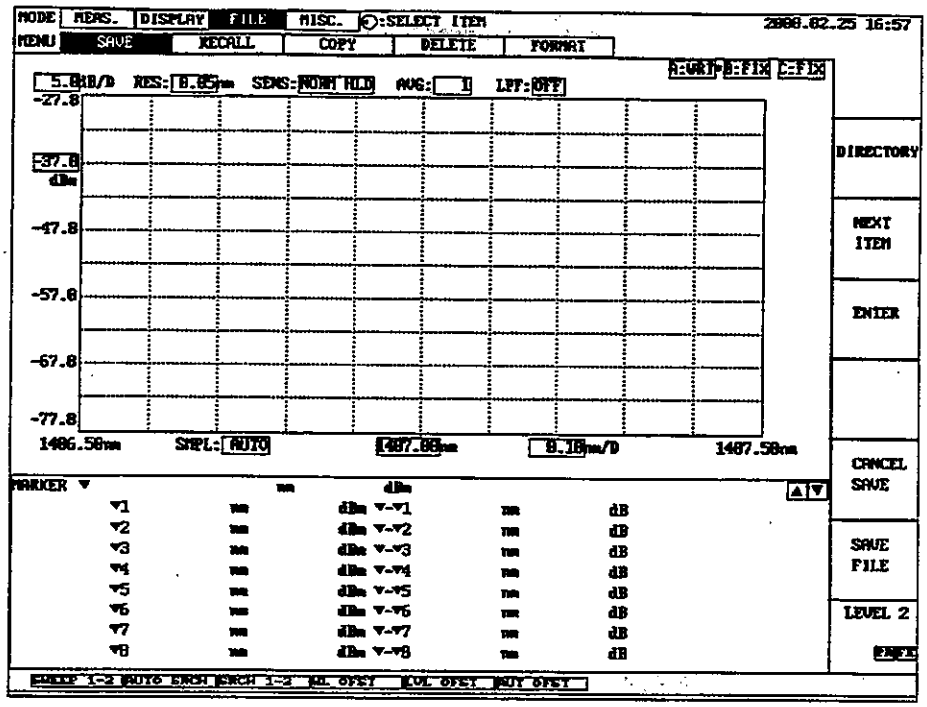

Fig. 9-1 Screen When Using Mouse

9.2 Using the Keyboard

9.2.1 Connecting the Keyboard

① Turn OFF the power of the unit.

② Connect the keyboard to the keyboard connector on the right side of the unit, and turn ON the power.

9.2.2 Operating the Keyboard

(1) Operating the keyboard ①

The keys of this unit and those of the keyboard correspond as follows.

Table 9-1 Keyboard Correspondence Table ①

External Keyboard	Keys of This Unit
M	Mode key
F1	Function key 1
F2	Function key 2
F3	Function key 3
F4	Function key 4
F5	Function key 5
F6	Function key 6
Alt	[HELP] key
A	[AUTO START] key
H	[WAVELENGTH/FREQUENCY] key
V	[LEVEL] key
R	[SWEEP] key
S	[ANALYSIS] key
P	[PRINT] key
F	[FEED] key
→	Rotate the rotary knob to the right
←	Rotate the rotary knob to the left
Enter	Press the rotary knob

(2) Operating the keyboard ②

The keys of this unit and those of the keyboard correspond as follows at the Label menu.

Table 9-2 Keyboard Correspondence Table ②

External Keyboard	Keys of This Unit
F1	Function key 1
F2	Function key 2
F3	Function key 3
F4	Function key 4
F5	Function key 5
F6	Function key 6
Alphabet/Numerical keys	[HELP] key
→	Rotate the rotary knob to the right (To select characters)
←	Rotate the rotary knob to the left (To select characters)
Enter	Press the rotary knob (To fix characters)
F7	Alphabets and numbers can directly be input from the external keyboard during the Label mode. (Full key input mode)

NOTE

Normal operations can be performed from the panel of the unit even when the keyboard is connected.

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9.3 Corresponding IC Memory Card

This unit is equipped with a memory card interface conforming to OCMCIA 2.0/JEIDA 4.1 and onwards. Memory cards to be used with this unit should satisfy the following conditions.

(1) Standard : PCMCIA 2.0 onwards
JEIDA 4.1 onwards

(2) Memory type : SRAM

(3) Capacity : 256 Kbyte
512 Kbyte
1 Mbyte
2 Mbyte
4 Mbyte

CHAPTER 10 MAINTENANCE

This chapter describes the maintenance of this unit.

Contents

10.1 Mechanical Inspections

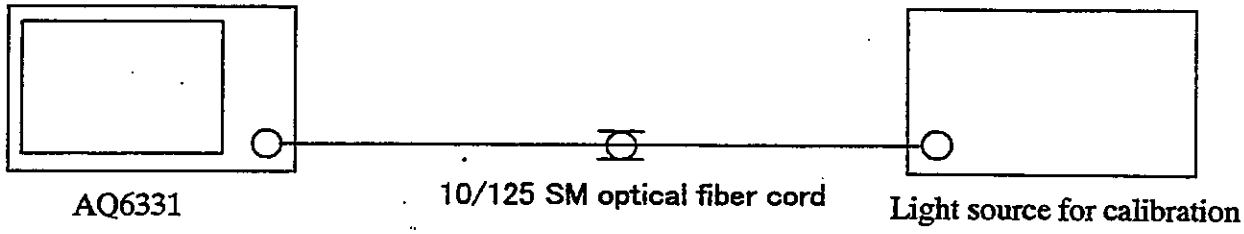
Inspect the exterior and mechanical operations of the control panel from outside the unit.
Visually check the exterior for damage, distortion, and check switches, connectors, and other assembly parts if they are loose and they operate smoothly.

If problems are detected, contact Ando Electric promptly with the details.

10.2 Checking Operations

10.2.1 Checking Wavelength Accuracy

Check the wavelength accuracy using the following measuring system.



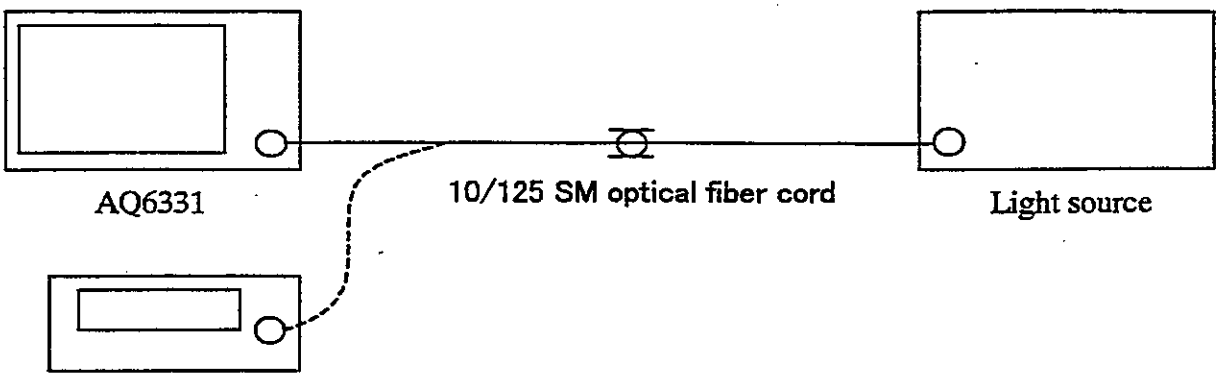
(1) Measure a light source for calibration whose accuracy wavelength is known such as the gas laser, and check that the peak wavelength of the waveform displayed matches the wavelength (within the wavelength accuracy) of the light source for calibration.
The wavelength accuracy of this unit is ±0.02 nm when 1520 to 1580 nm, and ±0.05 nm when 1580 to 16200 nm.,and ±0.3 nm when 1200 to 1700 nm.

(2) When a significant error is recognized in the wavelength, it must be corrected according to the following procedure.
Select the CALIBRATION menu "WAVELENGTH CALIBRATION" option from the MISC mode. Adjust the wavelength displayed in the window to that of the light source used for calibration. In this case, first select the wavelength being employed for the light source from the rotary knob, then press the software key <ENTER> to execute calibration of the wavelength.

(3) If wavelength calibration cannot be executed because the wavelength error margin is above ±5 nm, or if there exists a wavelength error margin in other wavelengths after wavelength calibration has been performed, the monochromator needs to be re-adjusted. Contact Ando Electric in this case.

10.2.2 Checking Level Accuracy

Check the level accuracy using the following measuring system.



(1) Prepare a 1550 or 1600 nm light source. However use a light source with a small spectrum so that all the spectral fits within 10 nm (e.g.: gas laser or DFB-LD).

(2) Connect the light source and this unit with a SM optical fiber cord, and set the resolution of this unit to 10 nm. Perform measurements and obtain the peak level value.

(3) Disconnect the SM optical fiber cord from the unit, and connect it to the optical power meter. Perform measurements and obtain the power value.

(4) Check if the peak level value obtained by this unit and that obtained by the optical power meter match (within the level accuracy).
The level accuracy of this unit is ±0.3 typ.(1550/1600nm) dB.(1550/1600nm)

10.3 Cleaning

10.3.1 Main Unit

When the case of this unit or the CRT surface becomes dirty, first wipe off the dirt with a soft cloth moistened with water or warm water, and wipe over with a dry cloth.

Note

Do not use thinners, benzene, alcohol, etc. as it will damage the surface.

10.3.2 Floppy Disk Drive

When the magnetic head of the floppy disk drive becomes dirty, writing/reading errors may result. Obtain a floppy head cleaner (for both drives) sold by manufacturers of floppy disks, etc., and clean the head periodically.

10.4 Cleaning the Optical Connector

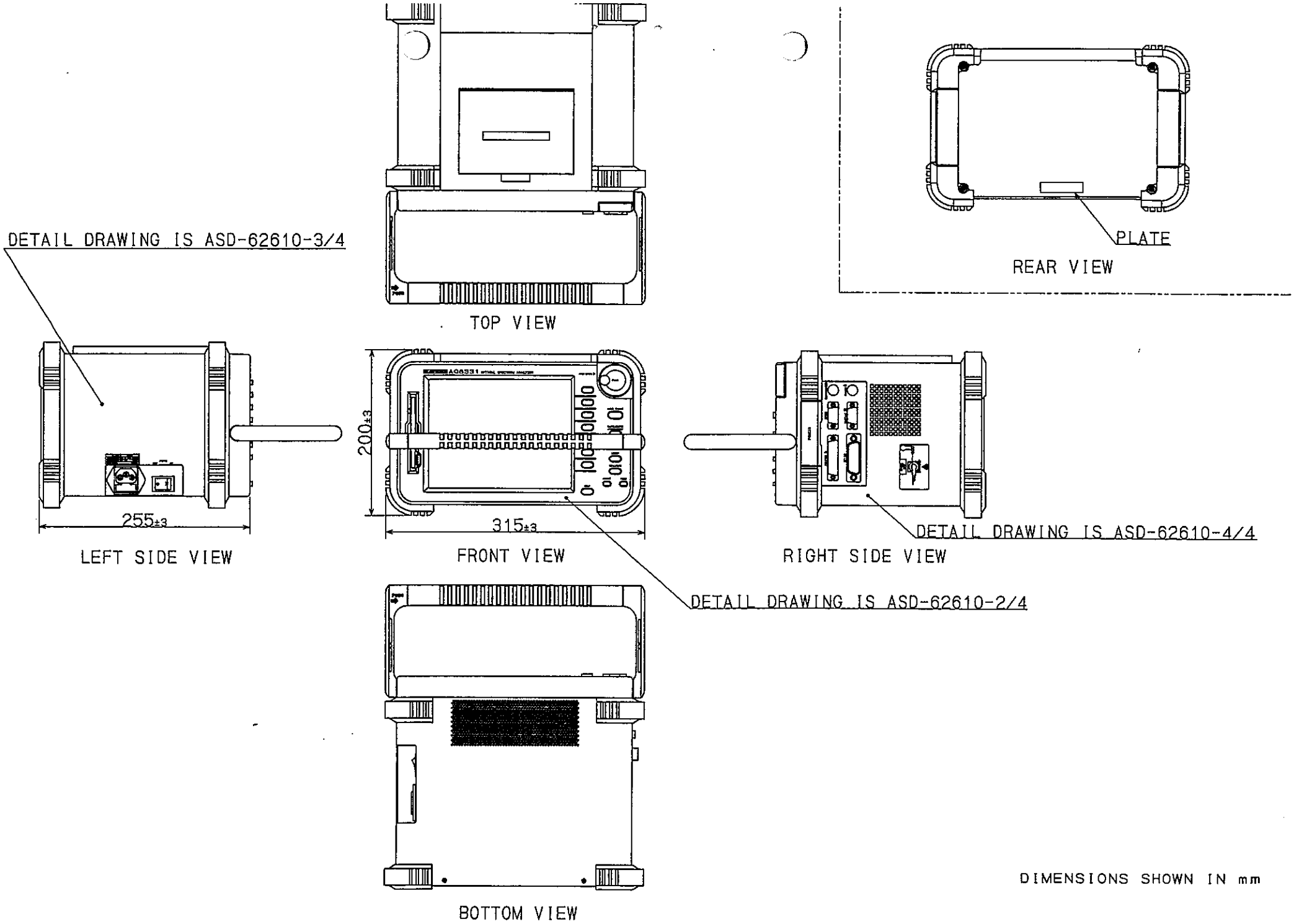
A dirty optical connector can causes performance to drop. Always make sure it is clean. The following explains cleaning of the FC connector.

(1) Turn OFF the Power switch.

(2) Raise the knobs on both sides of the optical output.

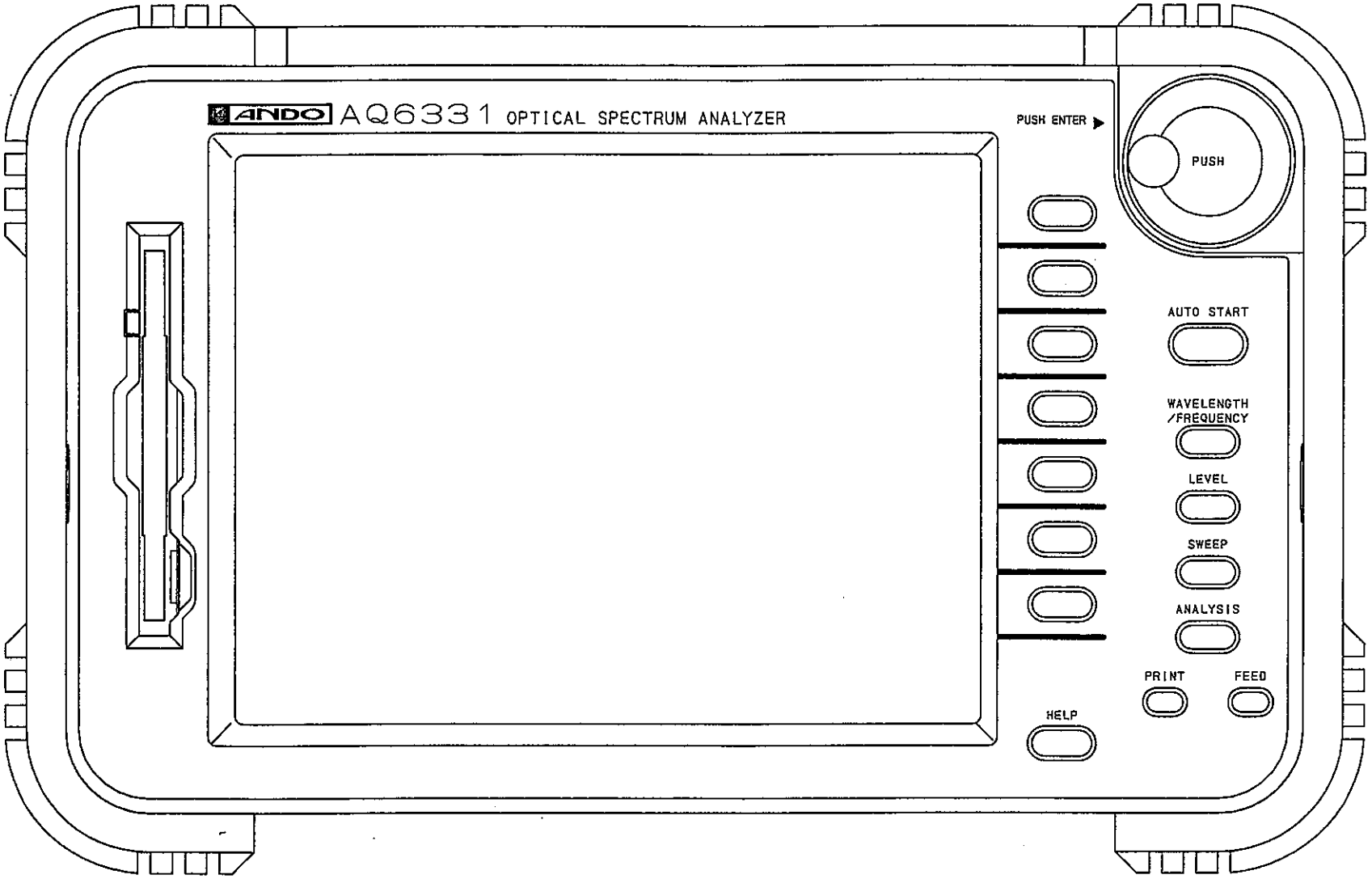
(3) The adapter inside can be removed by pulling adapter's lever. Clean the inside of the adapter with a wiping paper moistened slightly with absolute alcohol.
Or blow off the dirt accumulated using a spray for optical parts.

(4) Clean the tip of the optical plug with a wiping paper moistened slightly with absolute alcohol.
Or blow off the dirt accumulated using a spray for optical parts.

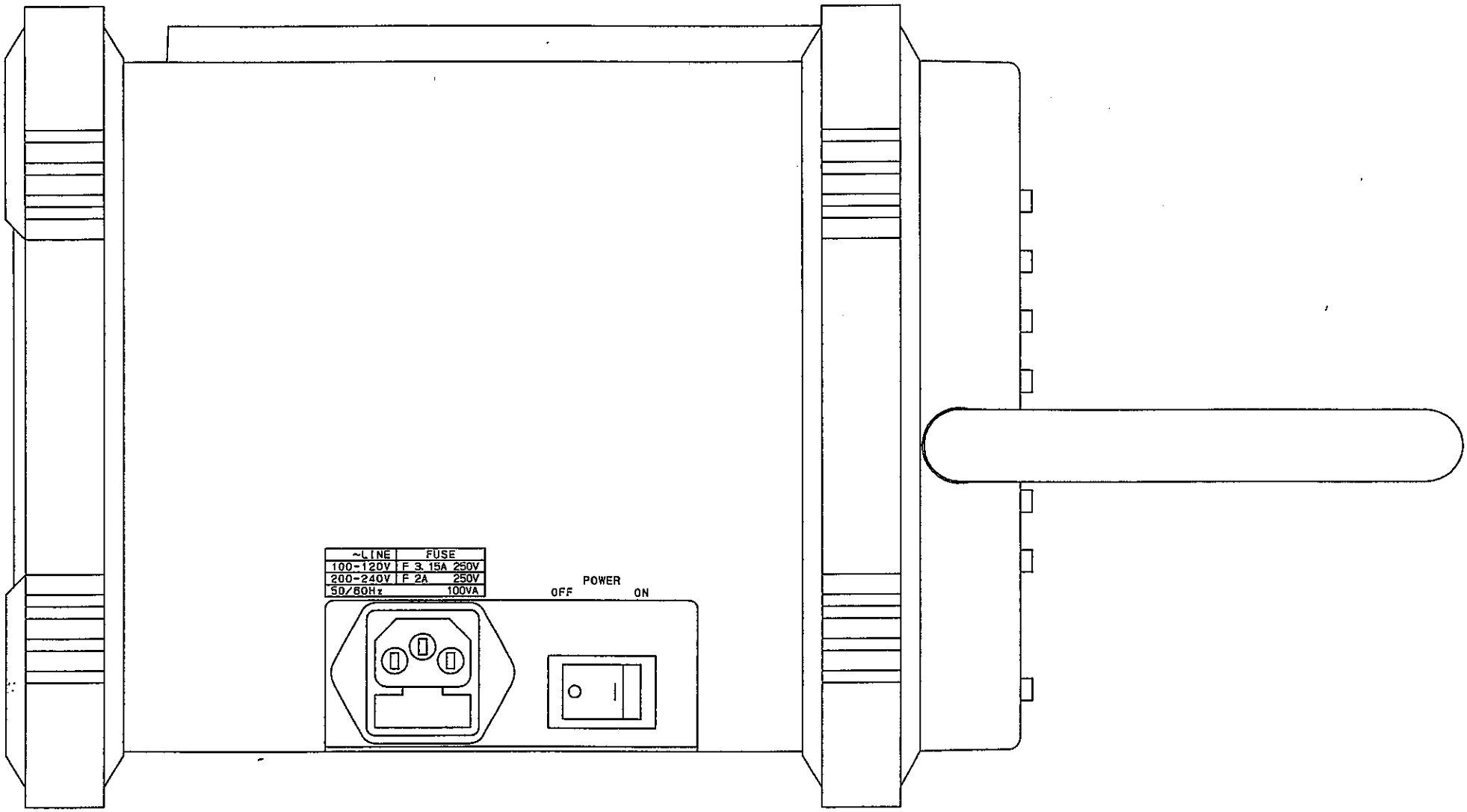


DIMENSIONS SHOWN IN mm

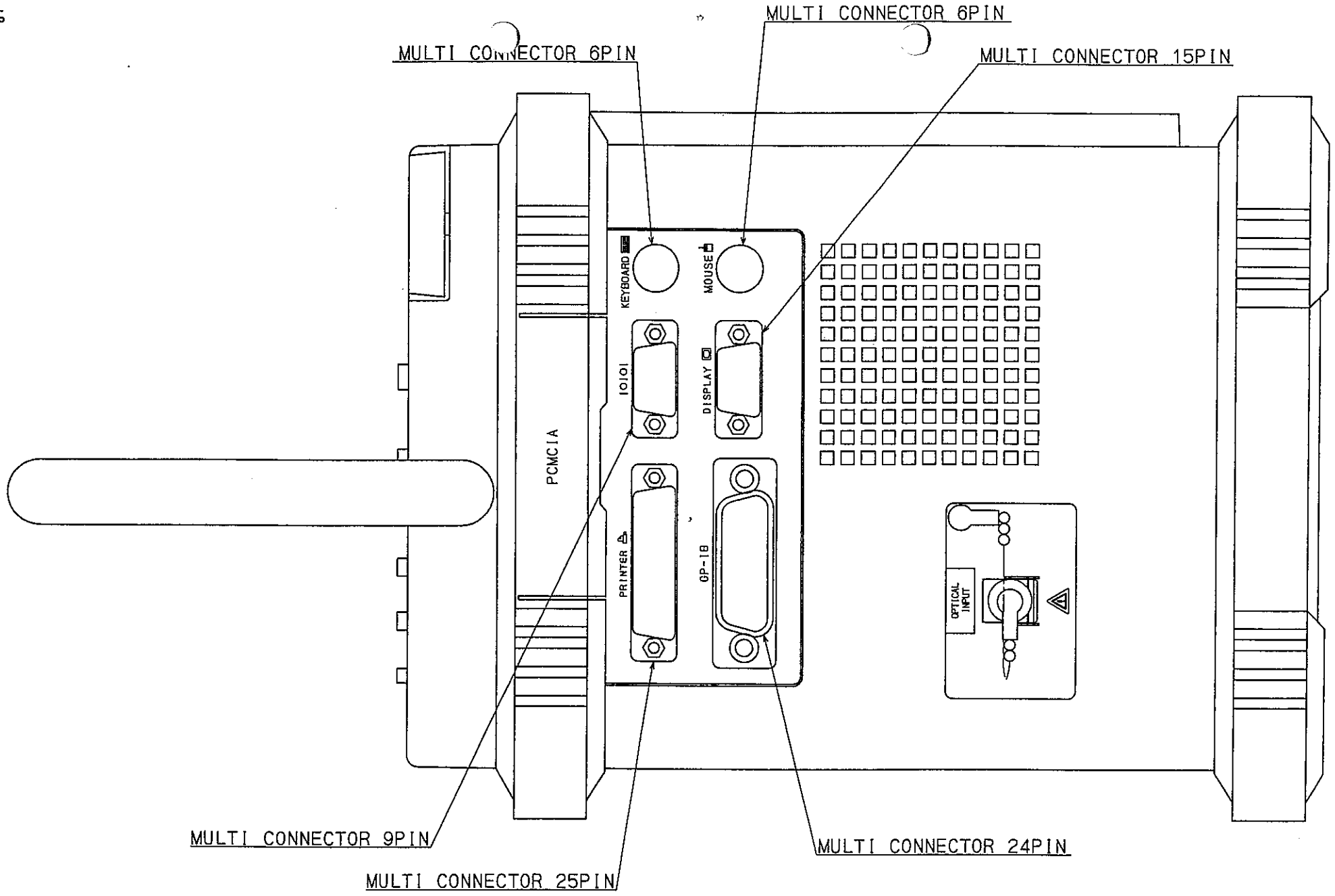
OUTSIDE VIEW OF AQ6331 OPTICAL SPECTRUM ANALYZER



OUTSIDE VIEW OF AQ6331 OPTICAL SPECTRUM ANALYZER
(FRONT)



OUTSIDE VIEW OF AQ6331 OPTICAL SPECTRUM ANALYZER
(LEFT SIDE)



OUTSIDE VIEW OF AQ6331 OPTICAL SPECTRUM ANALYZER
(RIGHT SIDE)

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