MS9715B
WDM Tester
Operation Manual

First Edition

Read this manual before using the equipment.
Keep this manual with the equipment.

Measuring Instruments Division
Measurement Group
ANRITSU CORPORATION

Document No.: M-W1731AE-1.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Insure that you clearly understand the meanings of the symbols BEFORE using the equipment.
Some or all of the symbols may not be used on this equipment. In addition, when drawings are included in this manual, labels on the equipment may not be shown on them.

Safety Symbols Used in Manual

DANGER ⚠ This indicates a very dangerous procedure that could result in death or serious injury if not performed properly.

WARNING ⚠ This indicates a hazardous procedure that could result in death or serious injury if not performed properly.

CAUTION ⚠ This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

Safety Symbols Used on Equipment and/or in Manual

The following safety symbols are used inside or on the equipment near operation locations, and/or in manual to provide information about safety items and operation precautions. Insure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.

This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.

This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.

This indicates warning or caution. The contents are indicated symbolically in or near the triangle.

This indicates a note. The contents are described in the box.


These indicate that the marked part should be recycled.

MS9715B
WDM Tester
Operation Manual

1 July 2000 (First Edition)

For Safety

WARNING ⚠

1. ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.
   Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

2. When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, before supplying power to the equipment, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

Repair

WARNING ⚠

3. This equipment cannot be repaired by the user. DO NOT attempt to open the cabinet or to disassemble internal parts. Only Anritsu-trained service personnel or staff from your sales representative with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision parts.

Falling Over

4. This equipment should be used in the correct position. If the cabinet is turned on its side, etc., it will be unstable and may be damaged if it falls over as a result of receiving a slight mechanical shock.

For Safety

CAUTION ⚠

Changing Fuse

CAUTION ⚠

1. Before changing the fuses, ALWAYS remove the power cord from the poweroutlet and replace the blown fuses. ALWAYS use new fuses of the type and rating specified on the fuse marking on the rear panel of the cabinet.

   T3.15 A indicates a time-lag fuse.
   MS9715B uses time-lag 100 V 3.2 A and 200 V 1.6 A fuses.

   There is risk of receiving a fatal electric shock if the fuses are replaced with the power cord connected.

Cleaning

2. Keep the power supply and cooling fan free of dust.
   - Clean the power inlet regularly. If dust accumulates around the power pins, there is a risk of fire.
   - Keep the cooling fan clean so that the ventilation holes are not obstructed. If the ventilation is obstructed, the cabinet may overheat and catch fire.

3. The measurement data using the MS9715B is recorded and stored in a floppy disk. Please note that improper usage or a failure may cause important data loss in the floppy disk.

4. If this media is mishandled, important data may be lost. To prevent this chance occurrence, all important data and programs should be backed-up.

Anritsu will not be held responsible for lost data.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories including the Electrotechnical Laboratory, the National Research Laboratory and the Communication Research laboratory, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within 1 year after shipment due to a manufacturing fault, provided that this warranty is rendered void under any or all of the following conditions.

- The fault is outside the scope of the warranty conditions described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster including fire, flooding, earthquake, etc.
- The fault is due to use of non-specified peripheral equipment, peripheral parts, consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation will not accept liability for equipment faults due to unforeseen and unusual circumstances, nor for faults due to mishandling by the customer.

Anritsu Corporation Contact

If this equipment develops a fault, contact Anritsu Corporation or its representatives at the address in this manual.

Trademark

MS-DOS is a registered trademark of Microsoft Corporation.

CE Marking

Anritsu affix the CE Conformity Marking on the following product (s) in accordance with the Council Directive 93/68/EEC to indicate that they conform with the EMC directive of the European Union (EU).

CE Conformity Marking

CE

1. Product Name/Model Name

Product Name: WDM Tester
Model Name: MS9715B

2. Applied Directive

EMC : Council Directive 89/336/EEC
Safety: Council Directive 73/23/EEC

3. Applied Standards

EMC:

Electromagnetic radiation:

EN55011 (ISM, Group 1, Class A equipment)

Immunity:

EN50082-1

		Performance Criteria*
IEC801-2 (ESD)	4 kVCD, 8 kVAD	B
IEC801-3 (Rad.)	3 V/m	A
IEC801-4 (EFT)	1 kV	B

*: Performance Criteria

A: No performance degradation or function loss

B: Self-recovered temporary degradation of performance or temporary loss of function

Harmonic current emissions:

EN61000-3-2 (Class A equipment)

Safety: EN61010-1 (Installation Category II, Pollution Degree 2)

About This Manual

This instruction manual describes the operation, calibration and maintenance of the MS9715B WDM Tester. The basic functions and operations are described in Section 4. Section 5 describes the operations in accordance with the card displays.

☞ : This symbol points to the section providing related information.

If a computer is connected to the tester for remote control, the measurement results can also be obtained at the computer. For details of the interface between the computer and tester, read the MS9715B Remote Control Instruction Manual.

Table of Contents

Section 1 Outline

This section outlines the MS9715B WDM Tester and related peripheral equipment.

1.1 MS9715B WDM Tester

The MS9715B WDM Tester is a dedicated WDM tester for spectrum analysis using a diffraction grating.
It instantaneously measures the spectrum wavelengths, levels and SNR and can display the data as a waveforms or tables.
Furthermore, the tester is extremely powerful as WDM monitoring equipment.

1.2 Main Functions

The WDM Tester can measure the optical level at a resolution of at a maximum resolution of 0.05 nm over the wavelength range from 1450 to 1650 nm. The level measurement range is -85 to + 23 dBm.

At WDM measurement, the SNR and gain val for the peak level at the peak wavelength of each spectrum are calculated and displayed.

The total optical power over the 1450 to 1650 nm wavelength range is calculated after taking the fiber amplifier ASE into account.

When the WDM Tester is used as WDM monitoring equipment, the measurement results can be saved automatically to floppy disk (FD) at specified intervals. The data is saved in MS-DOS text format; up to 1000 data items can be saved to disk.

Calibrating the MS9715B using the MG9586A reference wavelength light source enables very high-accuracy wavelength measurement.

1.3 Features

The WDM Tester has the following features.

(1) Excellent polarization dependency and level linearity in WDM wavelength band
(2) Wide dynamic range and high sensitivity
(3) Full lineup of analysis functions for WDM evaluation
(4) Continuous test mode for WDM monitoring
(5) Built-in reference wavelength for high wavelength accuracy

1.4 Standard Composition

MS9715B WDM Tester

Standard Accessories

- AC Power Cord
- 3.15 A Fuse (100 V/240 V)
- Instruction Manual
- Front Cover
- Remote Control Instruction Manual
- Floppy Disks (2HD)
  Labview Driver (RS-232C)
  Labview Driver (GPIB)

1.5 Options

Tester Optical Connector

• E2000 (DIAMOND) Connector	MS9715B-27
• EC (RADIAL) Connector	MS9715B-31
• FC Connector	MS9715B-37
• ST Connector	MS9715B-38
• DIN Connector	MS9715B-39
• SC Connector	MS9715B-40
• HMS-10/A (DIAMOND) Connector	MS9715B-43

1.6 Peripherals

RS-232C Cable (9P-9P)	J0654A
RS-232C Cable (9P-25P)	J0655A
GPIB Cable	J0007
Exchnageable Optical Connectors	
• FC Connector	J0617B
• ST Connector	J0618D
• DIN Connector	J0618E
• HMS-10/A (DIAMOND) Connector	J0618F
• SC Connector	J0619B
Optical Fiber Cord	J0575
Ferrule Cleaner	Z0282
Ferrule Cleaner Tape	Z0283
Adapter Cleaner	Z0284

1.7 Main Specifications

The Tester specifications at 2 hours after power-on are listed below.

WDM Tester (MS9715A)

Wavelength Axis	Specification	Remark
Wavelength Range		
Spectrum measurement	1450 to 1650 nm	
Total power	1450 to 1650 nm	
Wavelength sweep width	0.2 to 200 nm	
Wavelength accuracy	±300 pm (1450 to 1650 nm)	
	±200 pm (1530 to 1570 nm)	
	±50 pm (1520 to 1620 nm)	After calibration with reference wavelength light source
	±20 pm (1530 to 1570 nm)	After calibration with reference wavelength light source
Wavelength repeatability	6 pm	
Wavelength stability	±10 pm	Over 1 minute
Wavelength linearity	±20 pm	
Resolution	1, 0.5, 0.2, 0.1, 0.07, 0.05 nm	

Level Axis	Specification	Remark
Measurement level range	-85 to +23 dBm	
Level accuracy	±0.4 dB	
Level stability	±0.02 dB	Over 1 minute
Level linearity	±0.05 dB	
Level flatness	±0.3 dB	1520 to 1620 nm
	±0.1 dB	1530 to 1570 nm
Polarization dependency	±0.05 dB	1550 nm/1600 resolution 0.5 nm min.
Dynamic range	58 dB	±0.4 nm from peak 0.07 nm of resolution or more
	42 dB	±0.2 nm from peak 0.07 nm of resolution or more
Reflection attenuation	35 dB	

General	Specification	Remark
Operating temperature range	0° to 50°C	+5° to +50°C for FD drive
Dimensions	177 H × 320 W × 350 D (mm)	16.5 kg max.
Power	85 to 132/170 to 250 Vac	
	47.5 to 63 Hz, 150 VA max.	

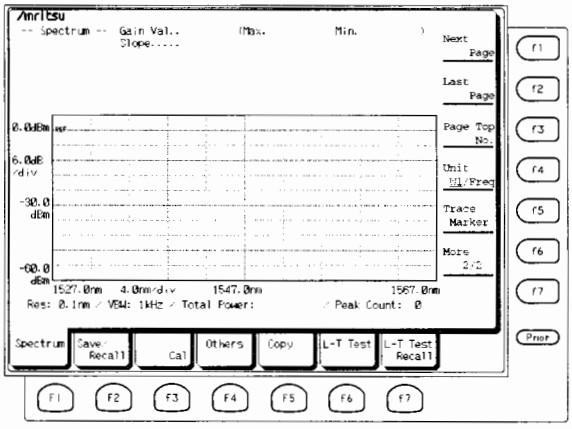
1.8 Switching Measurement Mode and Setting Functions

The measurement mode and setting functions are switched using the card-type displays. The cards are selected using the F keys (F1) to (F7) under the display. Each card contains a collection of similar functions which are selected using the f keys ((f1) to (f7)) on the right side of the display.

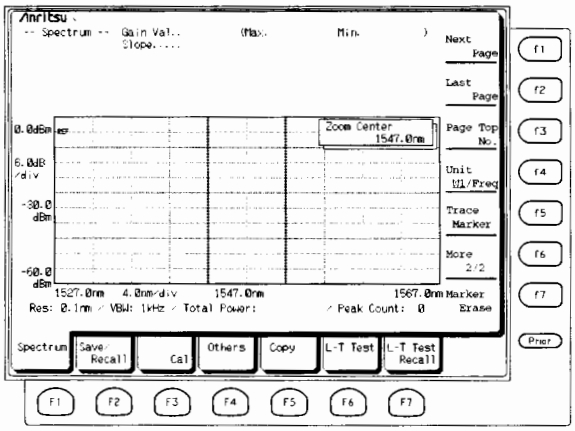
Spectrum Card	(Spectrum Measurement functions)
Save/Recall Card	(Saves/Recalls data)
Cal Card	(Calibration Functions)
Others Card	(Others Functions)
Copy Card	(Copy Functions)
L-T Test Card (Long-Term Test)	(Continuous Test Functions)
L-T Test Recall Card (Long-Term Test Recall)	(Long-Term Test Data Recall Functions)

In addition, the waveform can be enlarged and decreased, and the wavelength can be changed using the Zoom Marker functions.

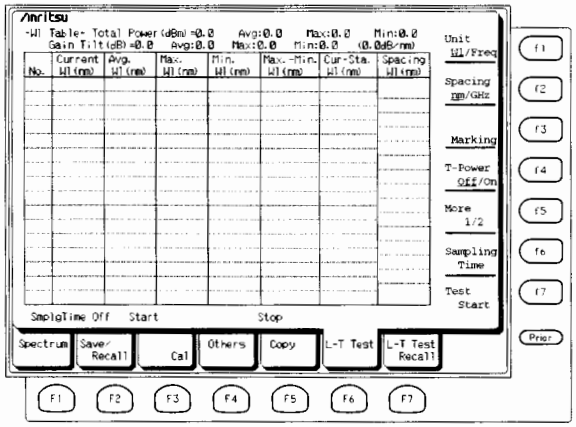
Section 5



Spectrum Measurement Display



Zoom Marker Display



Continuous Test Display

Section 2 Names and Functions of Parts

This section explains the names and functions of each part on the front and back panels of the tester; it also explains the operation in simple terms. refer to Section 4 for measurement examples using the main functions of the tester. Section 5 explains the operation methods using each display.

2.1 Unpacking

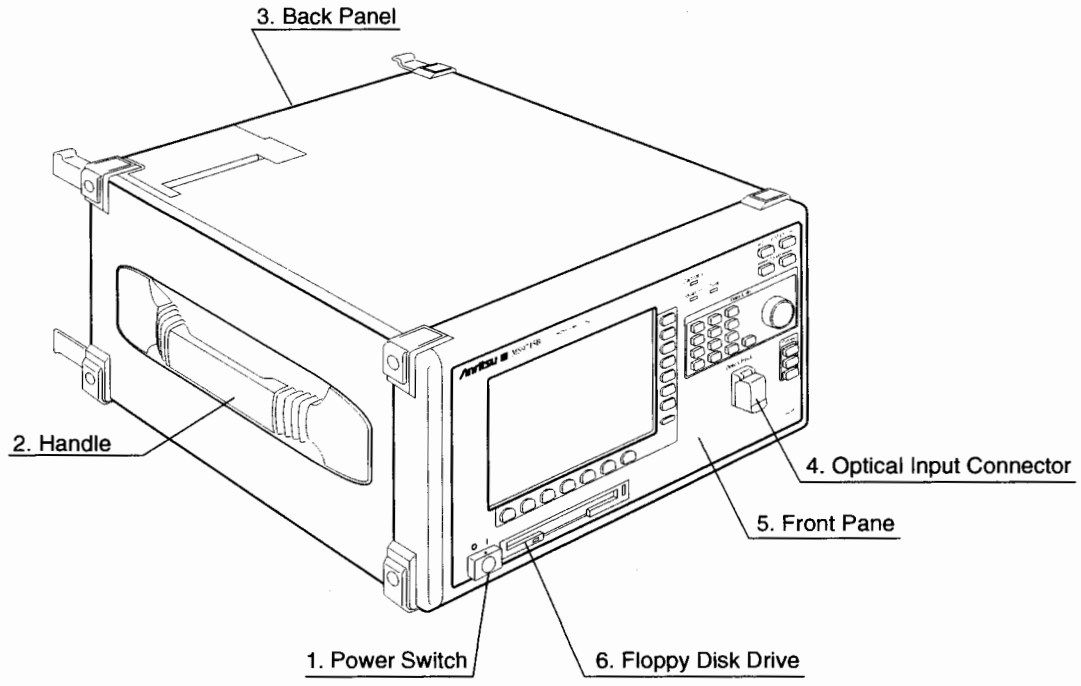
When unpacking the main unit and accessories from the packing box, check that the contents of the box match the packing list. If there has been a mistake or if any item is damaged, contact Anritsu Corporation or your sales agent immediately.

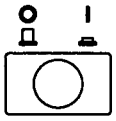
Packing List

Item Name	Qty	Code/Order No.
Main Unit		
WDM Tester	1	MS9715B
Standard Accessories		
AC Power Cord	1	
3.15 A Fuse (100 V/200 V)	2	T3.15A250V (100 V/200 V)
Instruction Manual	1	M-W1731AW
Front Cover	1	B0329G
Remote Control Instruction Manual	1	M-W1732AW
Floppy Disk	2	
Labview Drivers		
For RS-232C	1	MX971502S
For GPIB	1	MX971502G

2.2 Names and Functions of Parts

Check the names and functions of each part shown in the diagram below.



1. 

Power Switch

2. Handle

Handles are attached to the left and right sides.

CAUTION ⚠

When moving the WDM Tester, always carry it horizontally using both handles. Do not carry it by one handle because it contains precision parts that are easily damaged.

3. Back Panel

☞ Section 2.4

4. Optical Input

This connector is for inputting the measured optical signal. The maximum permissible input level is +23 dBm.

☞ Section 3.5

5. Front Panel

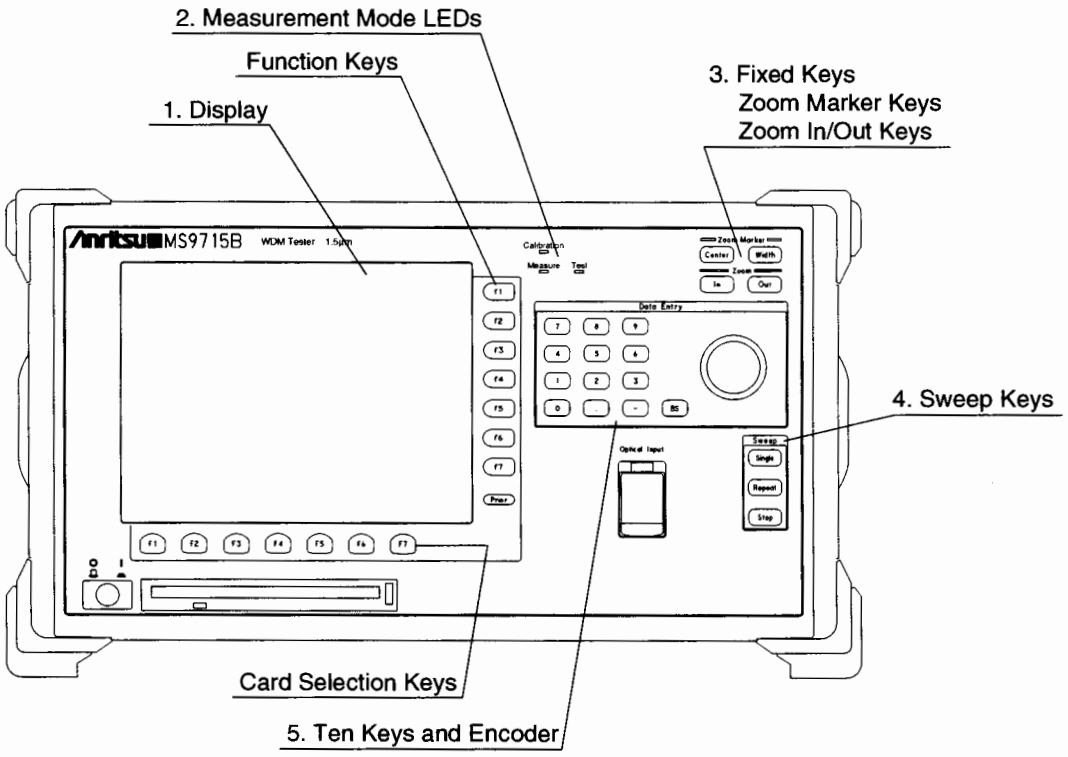
☞ Section 2.3

6. Floppy Disk Drive

The waveform displayed on the display and the results of continuous testing can be saved to FD inserted in the floppy disk drive (FDD).

☞ Section 3.4

2.3 Front Panel



1. Display

In addition to displaying the measured spectrum, the display displays cards for selecting the different functions of the WDM tester. The F1 to F7 keys under the display are used to select the seven function card tabs aligned along the bottom of the display. The seven function keys f1 to f7 on the right of the display are used to select the options on each card.
The Prior key Prior cancels the selected function, returns to the previous function and deletes the measured value display field.

Section 5

2. Measurement Mode LEDs

Measure	Flashes during spectrum measurement
Calibration	Flashes during calibration of optical section
Test	Lit during execution of continuous test

3. Zoom Marker Keys — Display and move zoom marker
   Zoom In/Out Keys — Enlarge/Reduce display

Section 5

4. Sweep Keys — Execute single and repeated sweeping, and stop sweeping

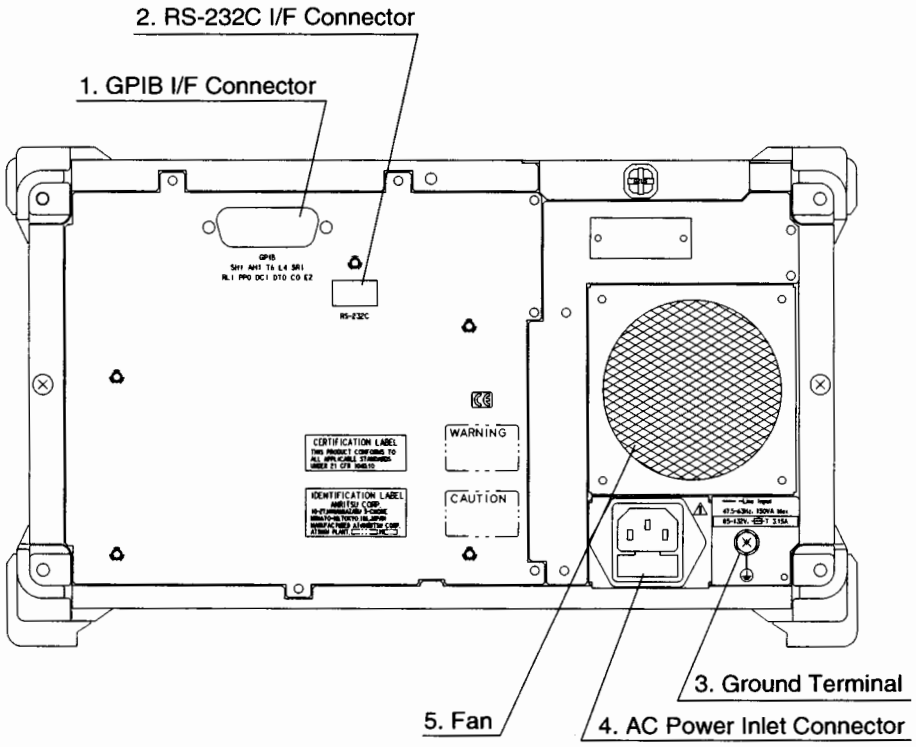
Section 2.7

5. Ten Keys and Encoder — For inputting numeric values

Section 2.8

2.4 Back Panel

Check the names and functions of the parts of the back panel.



1. GPIB I/F Connector — GPIB Interface for connecting external computer or printer

2. RS-232C I/F Connector — RS-232C Interface for connecting computer

3. Ground Terminal — Terminal for grounding WDM Tester to prevent accidental electric shock

Section 3.2

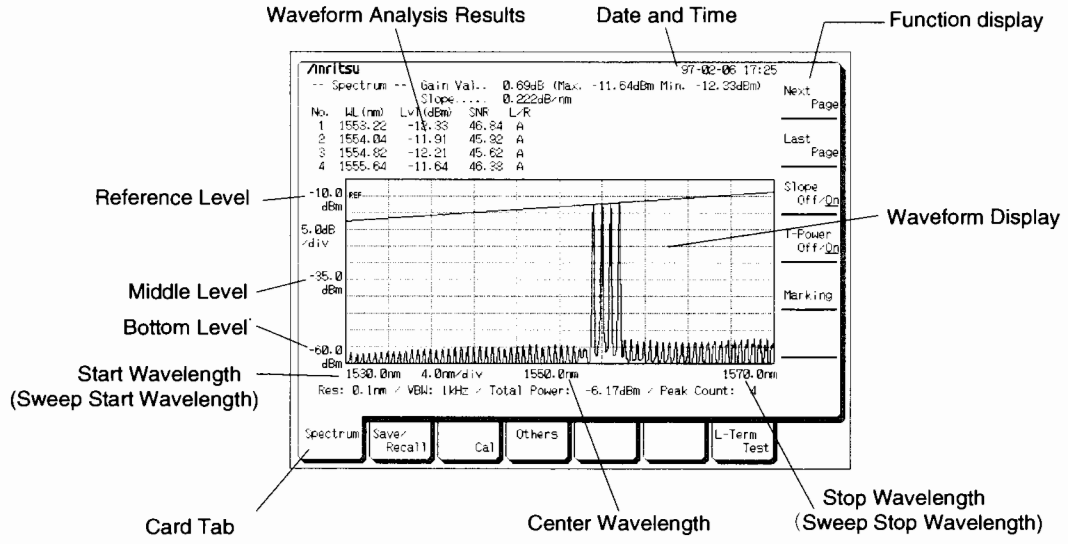
4. AC Power Inlet Connector

Inlet connector for AC power supply

5. Fan — Cooling fan for exhausting heat generated by circuits

2.5 Display

The information displayed on the display is shown below. The top right of the display displays the Setting Field and displays the current settings and is also used for inputting numeric values.



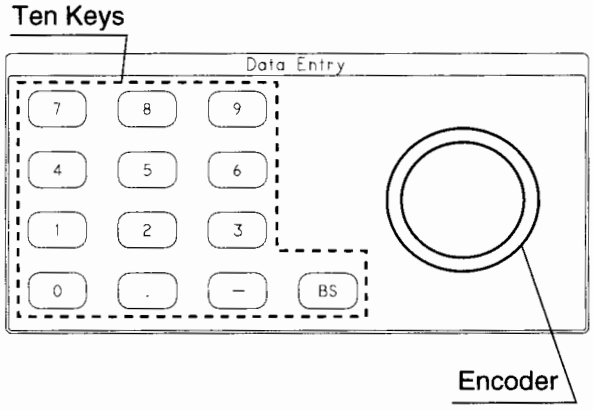
2.6 Zoom Marker Keys

Center	Sets Zoom Marker center wavelength
Width	Sets Zoom Marker width
In	Enlarges wavelength range between markers
Out	Returns to initial wavelength range

2.7 Sweep Keys

Single	Executes single sweep from Start wavelength to Stop wavelength and displays spectrum
Repeat	Executes repeated sweeps from Start wavelength to Stop wavelength and displays spectrum
Stop	Stops sweeping

2.8 Ten Keys and Encoder



2.8.1 Ten Keys

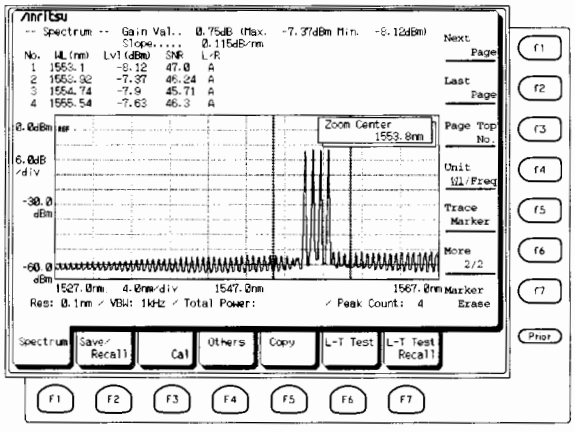
The ten keys are composed of the numeric keys 0 to 9, the decimal point key (.), the minus (-) key and the backspace key. They are used for inputting numeric values such as the Zoom Marker Center value.
They are convenient for inputting numeric values that are very different from the currently-set values.

Input using Ten Keys

This example explains how to input the Zoom Marker Center value using the ten keys.

(1) When the Zoom Marker Center key [Center] is pressed, the current Zoom Marker center wavelength is displayed and the WDM Tester enters the setting status.

(2) Input starts when any of the ten keys are pressed and the units are displayed at the function keys on the right side of the display as shown below. After completing input of the numeric value from the ten keys, press the appropriate function key to select the units. When Enter is displayed without units, press the Enter key to confirm the numeric input at the ten keys.



To correct the numeric input, press the backspace (BS) key to erase the value in front of the cursor and move the cursor one space to the left. In addition, if the Clear key is pressed, the current input is completely deleted and the original settings are returned.

(3) The numeric input is confirmed when the units function key is pressed and the new Zoom Marker Center wavelength is displayed on the display.

(4) The settings can be changed by pressing either another shortcut key or by selecting a different function card. Start input again from the ten keys as described in item (2) above.

2.8.2 Encoder

The Encoder knob is used to input numeric values such as the Zoom Marker Center wavelength. It is useful for inputting numeric values that are close to the current settings.

When the knob is turned clockwise, the value increases, and when the knob is turned counterclockwise, it decreases.

If the Encoder knob is turned before the units function key or the Enter key is pressed after inputting a numeric value from the ten keys, the value input at the ten keys is cleared and the value at the encoder takes priority.

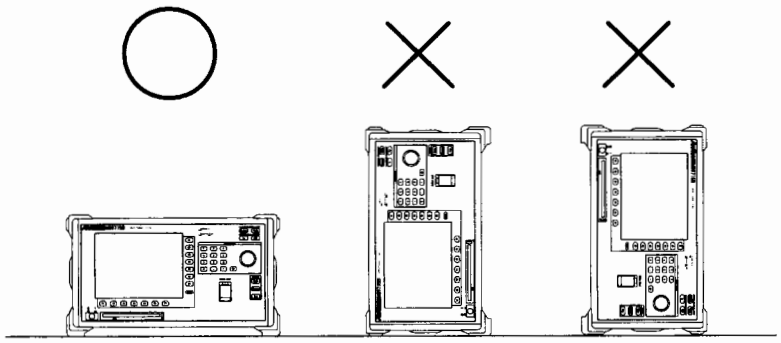
Section 3 Preparations before Use

This section describes the preparations to take before using the Tester to ensure safety and prevent accidents.

3.1 Installing

3.1.1 Orientation

Carry and use the WDM Tester in the horizontal position.



3.1.2 Operating Environment

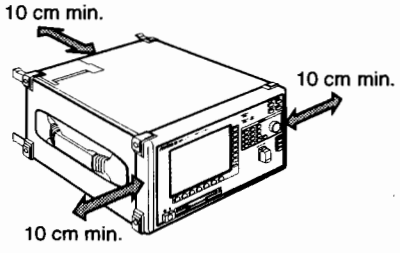
The operation environment temperature is 0° to 50°C. However, to prevent problems, do not use it:

- In locations subject to vibration
- In damp or humid locations
- In a slanted or sloped orientation
- In direct sunlight
- Where there are active or corrosive gases
- Where there are sudden changes in temperature

In addition, if the tester is moved to a warm location after being stored or operated in a cold location for a long time, condensation may occur inside the tester. If the power is switched on while there is condensation in the tester, the circuits may be damaged by a short circuit. Always allow the tester to dry out before power-on.

3.1.3 Fan Clearance

The Tester has an internal fan to remove internally-generated heat. Leave a clearance of at least 10 cm around the sides and back of the tester to allow sufficient air flow.



3.1.4 Power Supply Voltage

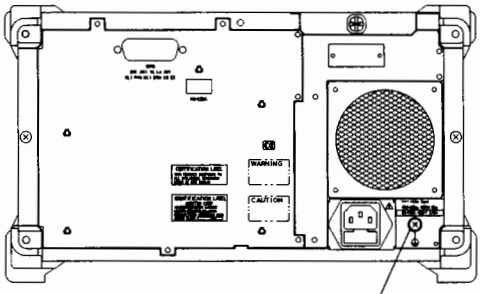
Use a power supply voltage of 100 to 120 Vac, or 200 to 225 Vac (47.5 to 63 Hz). It is not necessary to set the Tester for 100 V or 200 V systems. The power is 150 VA max.

3.2 Grounding

Use the supplied grounded 3-pin power cord to connect the Tester to the power outlet; this will ground the Tester safely. However, if a grounded power supply is not available, use the 3-to-2-pin adapter to connect to a 2-pin outlet and either connect the green wire of the adapter to ground, or ground the frame ground terminal on the back panel of the Tester.

WARNING ⚠

If this Tester is connected to a power supply without grounding as described above, there is a risk of receiving a serious or fatal accidental electric shock. ALWAYS either ground the green wire of the 3-to-2-pin adapter or the frame ground terminal on the back panel.



3.3 Vibration and Mechanical Shock Countermeasures

The internal optical components of the Tester use micron-level precision technology. It is very important to protect the Tester against excessive vibration and mechanical shock when using, storing and transporting it.

CAUTION ⚠

When moving the WDM Tester, always carry it horizontally using both handles. Do not carry it by one handle because it contains precision parts that are easily damaged.

3.4 Floppy Disks

Measured data can be saved to floppy disk. Before saving data to a new disk, the disk must be formatted. Disks formatted by the Tester are in MS-DOS format.

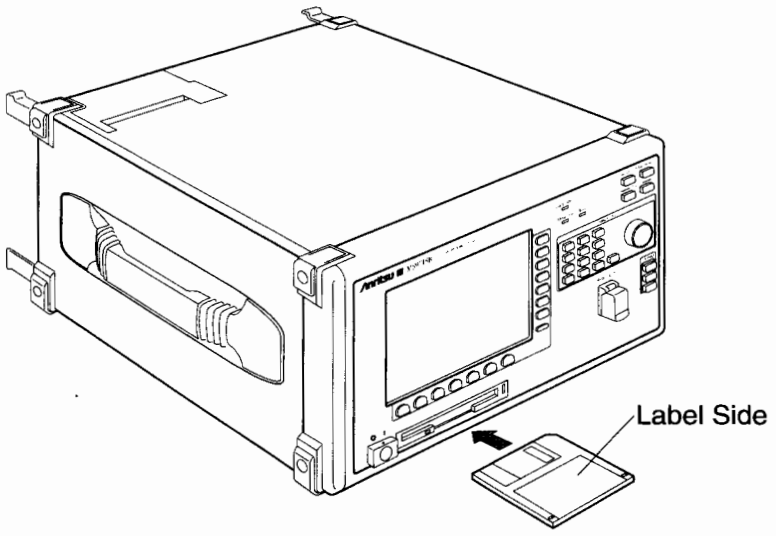
Either 2DD or 2HD disks can be used. 2HD floppy disks can be formatted at either 1.44 or 1.2 MB capacity.

FD Type	Format	Capacity
2DD		720 KB
2HD	PC compatible	1.44 MB
2HD	PC98 (NEC/Epson)	1.2 MB

When saving data to FD or when formatting a disk, ensure that the write-protect tab is set (hole closed) so that the FD can be written to.

3.4.1 Inserting Floppy Disk

Insert the FD into the FD drive with the label facing upwards as shown in the following diagram.



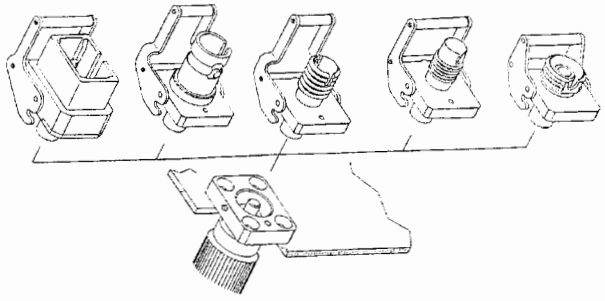
The FD drive operates normally at ambient temperatures of 5° to 50°C.

3.5 Changing Optical Connector

The input optical connector can be changed to one of the following connectors by removing the FC connector (MS9715B-37).

Name	Model
ST Connector	MS9715B-38
DIN (47256) Connector	MS9715B-39
SC Connector	MS9715B-40
HMS-10/A (DIAMOND) Connector	MS9715B-43

When the optical connector is removed to change it for one of the above connectors (sold separately), the inside of the connector can be cleaned.

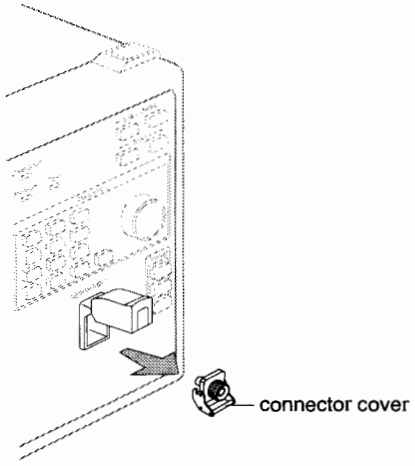


To remove the connector, follow the procedure described below. For the cleaning method, see section 7.1.

Section 7.1

(1) Open the connector cover.

(2) Lift the connector lever until it disengages from the latch and then gently slide the connector out.



(3) When fitting the connector, follow the reverse procedure, taking care not to damage the ferrule end face, etc.

3.6 Changing Fuse

If the fuse blows, find the reason why, remedy the cause and then change the fuse. Before changing the fuse, ALWAYS disconnect the Tester from the power supply by disconnecting the power cord.

WARNING ⚠

Before changing the fuse, ALWAYS disconnect the Tester from the power supply by disconnecting the power cord. If the power cord is not disconnected, there is a high risk of receiving a serious or fatal electric shock.

The replacement fuse must be of the same specification and rating as the blown fuse as indicated on the back panel of the Tester.

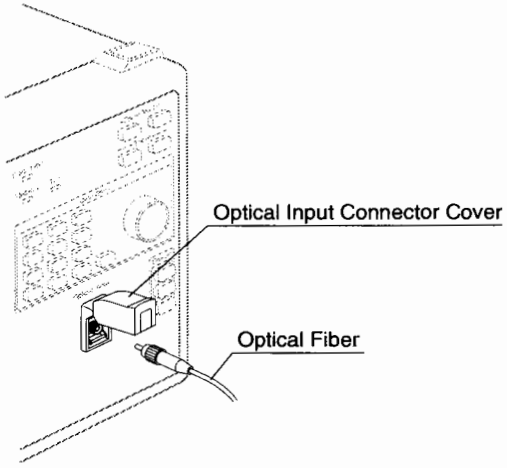
This Tester uses a T3.15 A fuse for 100 V/200 V systems. The T in the rating indicates a time-lag fuse.

Section 4 Operation

This section describes how to operate the Tester. Before operating the tester take sufficient time to read the explanations of the measurement procedures and the compositions of the front panel and the displays. For details of the displays, refer to Section 5.

4.1 Connecting Optical Fiber

Open the cover of the optical input connector on the front panel of the Tester and connect the optical fiber.



CAUTION ⚠

Before connecting the optical fiber to the input connector, clean the end face of the fiber. In addition, periodically clean the Tester optical input connector. If there is dirt on the end face of the fiber or in the input connector, there is a possibility that it may be scorched by the strong light passing through the connector, which will damage the parts. For the cleaning method, see section 7.1.

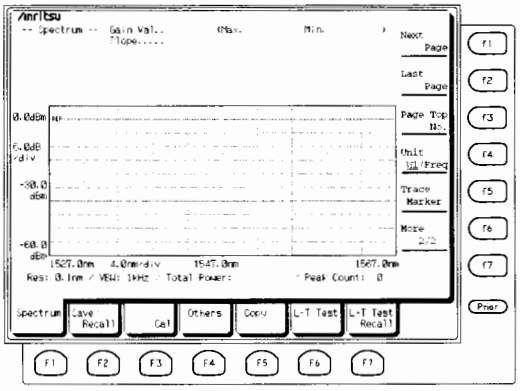
Before connecting the optical fiber, ensure that the optical level does not exceed the maximum permitted level of +23 dBm. If an optical level exceeding this specification is input, the optical system of the Tester may be damaged.

4.2 Power-on

(1) When using the 3-to-2-pin adapter to supply power to the Tester, ground the green cord of the adapter, or connect the frame ground terminal on the back panel to ground.

(2) Check that the POWER switch is OFF and connect the power cord to the power inlet on the back panel.

(3) Press the POWER switch on the front panel. The Startup display will be displayed for about 1 minute; when the display changes to the following display, the Tester can be used.



4.3 Spectrum Measurement Example

This section describes measurement of a light source producing four wavelengths as an example of spectrum measurement. This example uses a DFB-LD producing a mixture of four wavelengths in the 1.5 µm wavelength band.

(1) Turn the MS9715B on. The Spectrum measurement screen appears.
The measurement wavelength Full-Span value is set within the range from 1450 to 1650 nm at shipment.
When the zoom out key is pressed at the spectrum measurement screen, the measurement wavelength range is returned to the set full span value.
For setting Full-Span value, refer to Section 5.

(2) Connect the optical fiber cord to the optical input connector.

(3) Connect the other end of the optical fiber to the output of the light source.

(4) Execute the measurement.
When the Single key [Single] is pressed, one waveform sweep is executed and the measured waveform is displayed.

(5) Auto-level scale
The level scale (vertical axis) of this equipment cannot be changed manually. The best level scale is set automatically according to the measured waveform.

(6) Analysis of Measured Waveform
The measured waveform analysis results are displayed at the top of the display. The peak waveform, peak level, SNR, gain val, and slope are displayed as sequential numbers from the short wavelength end (peak No. 1).

(7) Enlarge the waveform display.
Use the following procedure to enlarge and display the measured waveform wavelength range.

(a) Press the Zoom Marker Center key [Center] or the Zoom Marker Width key [Width] to display the Zoom Markers.

(b)
- When Zoom Marker Center key pressed:
  The Zoom Marker width is fixed and the center wavelength of the Zoom Marker is changed to the value input using the ten keys or the encoder.
- When Zoom Marker Width Key pressed:
  The Zoom Marker center is fixed and the Zoom Marker width is changed to the value input using the ten keys or the encoder.

(c) When the Zoom In key [In] is pressed, the waveform for the wavelength range currently indicated by the Zoom Markers is enlarged and displayed.
The Zoom Markers move to the left and right sides of the display.

(d) When the Single or Repeat key is pressed, measurement starts at the currently-set wavelength range.

(e) When the Zoom Out key [Out] is pressed, the set wavelength range is returned to the set full-span value.

4.4 Saving and Recalling Measured Waveform

This section explains how to save and recall the measured waveform.

4.4.1 Floppy Disk Format

This Tester can save the measured data to floppy disk. In addition, saved data can be recalled and waveform analysis can be performed. To save the waveform data, a floppy disk must be prepared. The Tester default FD format is 1.44 MB but it can be switched to 1.2 MB (NEC/Epson format) using the File Option items.

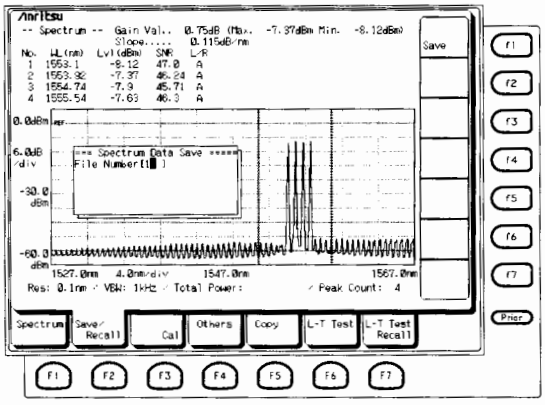
section 5.7 (f2)

Format the FD in the Tester using the format function, or format it on a PC. Remember that formatting completely erases any data on the disk.

4.4.2 Saving Measured Data

To save measured data, fetch the Save/Recall card by pressing (f2) at the Spectrum Measurement display and then select Save by pressing f1. Input the file name or file number.

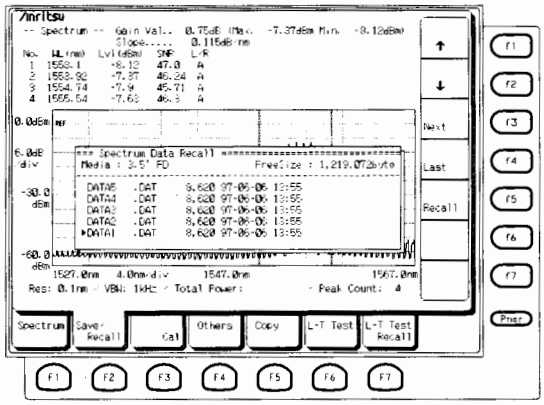
section 5.2 (f2)



This section explains how to save the data as file No. 1. When 1 is input as the file number, a file called data001.dat is created on the FD. The file name can be data001.bmp or data001.txt depending on the Save/Recall Option settings.

4.4.3 Recalling Saved Data

Data saved using the procedure described in item 4.4.2 can be recalled. To recall saved data, press f1 at the Save/Recall card. A list of saved files is displayed; move the cursor to the required file and execute Recall. (In this example, file to be recalled is data001.dat at the head of the list and this file is recalled.)

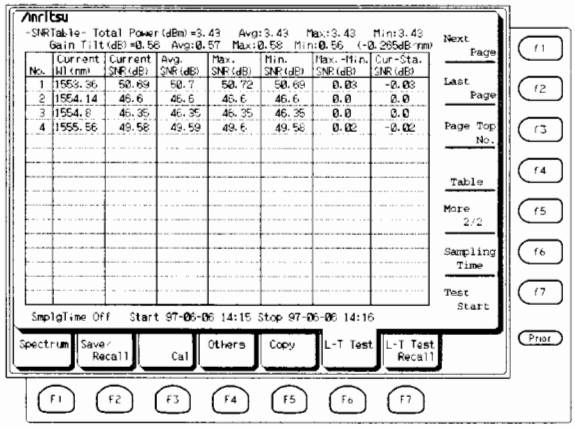


This operation recalls data saved using the operation described in section 4.4.2.

4.5 Continuous Testing

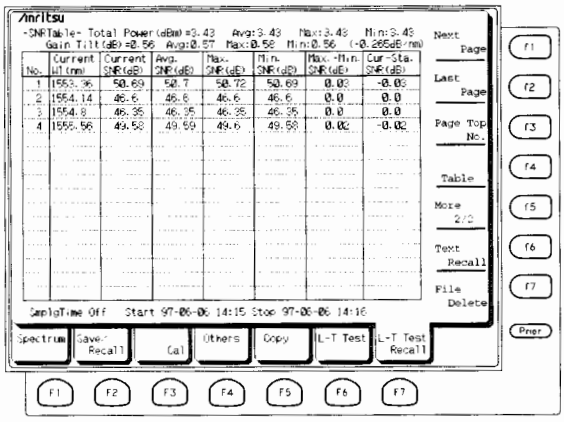
This Tester has a Continuous Testing mode as an WDM monitoring function. The measured data is processed at the set sampling interval and the data is written to FD.

In addition, a table is displayed while the continuous test is executing and this can be used to monitor and confirm changes in the measurement results.



4.6 Recalling Long-Term Test Data

Long-term test mode data can be saved in text format to FD. This saved data can be analyzed using spreadsheet software. Furthermore, if the long-term test data card is used, just the long-term data for a specific time period can be displayed on the screen.



Section 5 Explanation of Displays

This section explains how to select functions from the displays. The Tester functions are grouped on different displays that are switched using card tabs. When a card tab is clicked, the entire card is displayed and the displayed functions are selected by pressing the related function (f) keys.

Select functions related to the Zoom Marker with the Zoom Marker keys.

5.1 Spectrum Measurement Functions

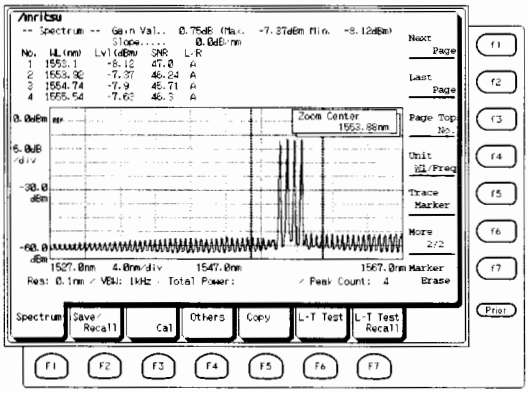
5.1.1 Setting Wavelength (F1 to F4 keys)

To set the measurement conditions related to wavelength (horizontal axis of display), select the measurement wavelength range with the Zoom Marker keys; the measurement wavelength range changes when the Zoom In key [In] is pressed subsequently.

5.1.2 Zoom Markers

(1) Zoom Marker Center

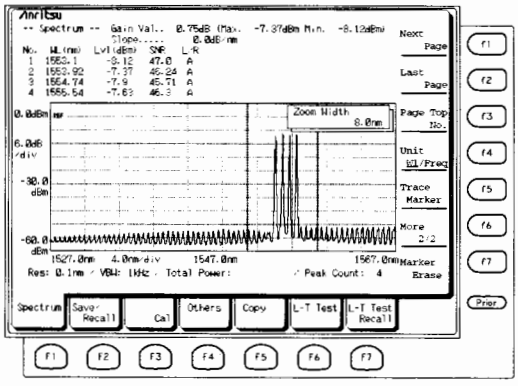
Press the Zoom Marker Center key [Center] to display the Zoom Markers.



Change the center wavelength of the wavelength range indicated by the Zoom Markers by turning the encoder or by inputting numerical values using the ten keys. The Zoom Marker width value is fixed.

(2) Zoom Marker Width

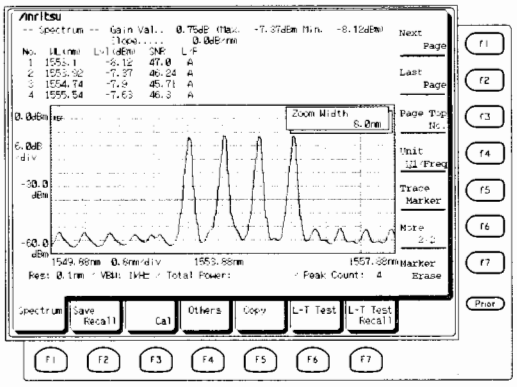
Press the Zoom Marker Width key [Width] to display the Zoom Markers.



Change the width of the wavelength range indicated by the Zoom Markers by turning the encoder or by inputting numerical values using the ten keys. However, the Zoom Marker can only be changed within the range of the Start and Stop wavelengths on the display. The Zoom Marker center value is fixed.

(3) Zoom In

Press the Zoom In key [In] to enlarge the display of the wavelength range indicated by the Zoom Markers. However, zooming-in is only possible when the Zoom Markers are displayed.

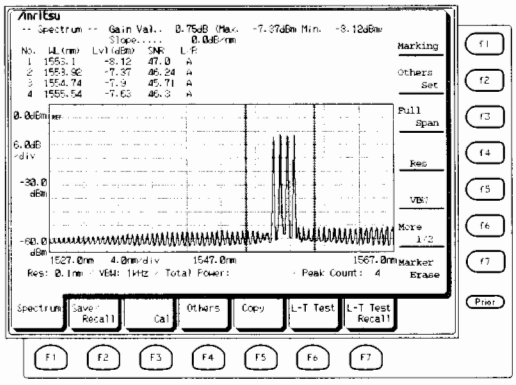


Moreover, when the zoomed-in waveform is displayed, when a value is input at Zoom Center or Zoom Width, the wavelength range indicated by the Zoom Markers changes when the Zoom In key [In] is pressed.

(4) Zoom Out

When the Zoom Out key [Out] is pressed, the measurement wavelength range is returned to the set full-span value.

The measurement wavelength range changes to the initial value regardless of whether or not the Zoom Marker is displayed.



(5) Full Span setting

Whenever the Zoom Out key [Out] is pressed, the wavelength range set by the Full Span is set.

When the Full Span key (F3) (More 2/2) is pressed, the following window appears. Input the center wavelength and span width to set the full span.

Full Span				Settable range
Center	WI	[	] nm	1450.10 nm ≤ Center WI ≤ 1649.90 nm
Span		[	] nm	0.2 nm ≤ Span ≤ 200 nm

- MS9715B automatically changes the number of measurement points according to the measurement wavelength range. Therefore, setting the full span value except the wavelength range not required for measurement will accelerate the measurement speed.

5.1.3 Setting Level

The level-related settings (vertical axis of display) are set automatically to the best reference level and log scale according to the measured waveform.

The peak level of the measured waveform is made the reference level. In addition, the best log scale is set automatically so that the minimum dip level can be displayed.

5.1.4 Setting the resolution and VBW

(1) Setting the resolution

Press the Res key (F4) to change the set resolution.

Resolution can be set to 1.0 nm, 0.5 nm, 0.2 nm, 0.1 nm, 0.07 nm, or 0.05 nm.

(2) Setting VBW

Press the VBW key (F5) to change the set VBW.

VBW can be set to 1 MHz, 100 kHz, 10 kHz, 1 kHz, 100 Hz, or 10 Hz.

VBW is an electric filter. Normally, when measuring optical signal higher than -60 dBm, set the VBW to 1 kHz or more. When measuring optical signal lower than -60 dBm, set the VBW to 1 kHz or less.

5.1.5 Marking Functions

MS9715B provides two marking functions; a marker is indicated at the specified peak wavelength of the WDM measurement waveform and a fixed marker is indicated in the WDM wavelength according to the ITU recommendation.

Marker indication for the measurement peak wavelength (DUT)

Wavelength marker is indicated at the peak No. previously marker set depending on the measurement results.

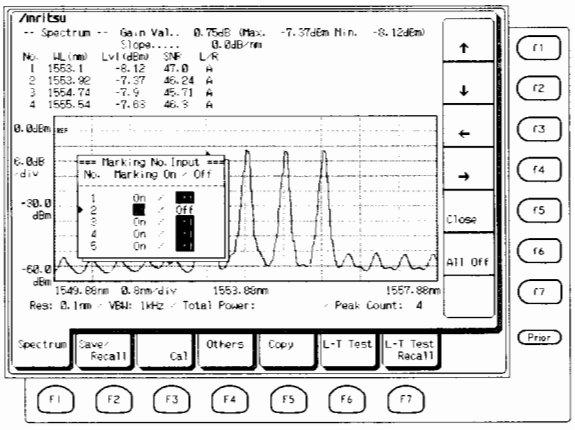
When the Others Set key (F2) (More 2/2) is pressed, the following window appears.

Others Set		
Total Power	On	Off
Slope	On	Off
Marking	DUT	ITU

Set the Marking items in DUT. (Press the Close key (F5) to determine.)

Press the Marking key (F1) (More 2/2), and then a window appears. Set the desired No. to On and press Close (F5) to close the window.

The Marking key (F5) for the Spectrum card (F1) is the same setting for the Marking key (F3) (More 2/2) of L-T Test (F6) and L-T Test ReCall (F7).



Marker indication for the wavelength of ITU recommendation (ITU)

The wavelength value of ITU recommendation is indicated by the fixed marker.

When the Others Set key (F2) (More 2/2) is pressed, the following window appears.

Others Set		
Total Power	On	Off
Slope	On	Off
Marking	DUT	ITU

Set the Marking items in ITU. (Press the Close key (F5) to determine.)

Pressing the Marking key (F1) (More 2/2) allows setting On/Off of marker indication of the ITU recommendation wavelength.

5.1.6 Other features

(1) Total power measurement

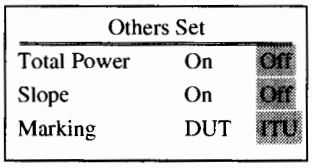
The total power (integral power) is calculated from the measurement waveform in the wavelength range from 1450 to 1650 nm and it is displayed.

Total power measurement performs measurement again within the wavelength range from 1450 to 1650 nm separately than the set wavelength in the indication screen. (When total power measurement is set to On, pressing the Single key starts the secondary measurement.)
If the total power measurement is not required, perform measurement with the total power measurement set to Off.

(2) Slope

By connecting the peaks of the WDM measurement waveform by straight line (approximated straight line), the slope is displayed as a slope value.

On/Off setting of total power and slope
When the Others Set key (F2) (More 2/2) is pressed, the following window appears.



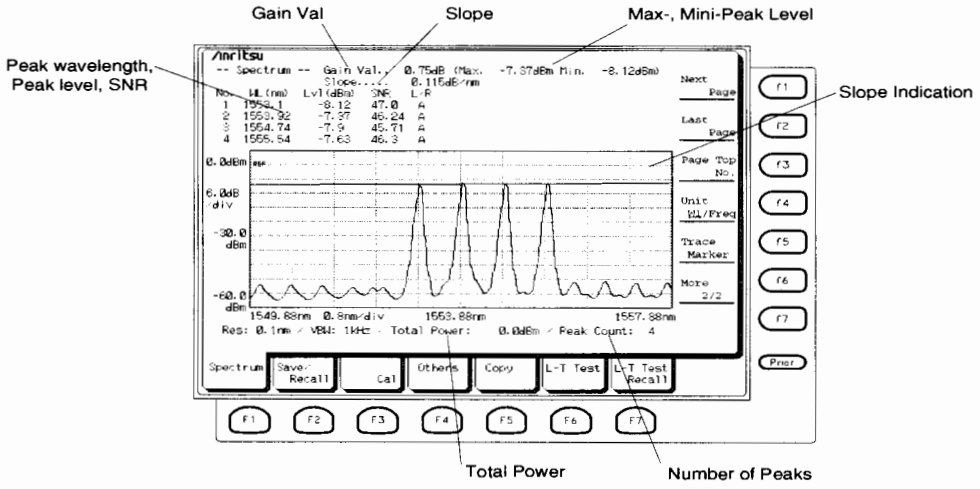
Set Total Power and Slope to On or Off, respectively.
(Press the Close key (F5) to determine.)

Trace Marker

Indicates the trace Marker operating on the measurement waveform.
When the Trace Marker key (F5) is pressed, the Trace Marker is displayed.
When the Marker Erase key (F7) is pressed, the Trace Marker is deleted.

5.1.7 Spectrum Analysis

The peak wavelength, peak level, SNR, gain val, slope, number of peaks and total power are calculated from the measured waveform.



(1) Peak wavelength and peak level

Peaks of WDM measurement waveform are numbered starting from the short wavelength side, and each peak wavelength and peak level can be listed on the screen. Up to 300 waves can be displayed.

Pressing the Next page key (f1) and the Last page key (f2) changes the indication to the peak No. on the next page and previous page, respectively. By pressing the Page Top No. key (f3), the beginning number to be listed can be specified.

Unit W1/Freq key (f4) allows switching the unit of the peak wavelength value that is listed to wavelength (nm) or frequency (THz).

(2) SNR

Peaks of WDM measurement waveform are numbered starting from the short wavelength side, and the SNR of each peak is listed.

SNR (dB) = peak level (dBm) - dip level (dBm)

The dip level of each peak is calculated by the following method:

For the SNR of peak wavelength No. 2, firstly, the minimum level value Ll between wavelengths of peak wavelength No. 1 and No. 2 and the minimum level value Lr between wavelengths of peak wavelength No. 2 and No. 3 are found. The average value level of them is defined as the dip level of No. 2.

The SNR of peak wavelength No. 2 (peak level Lp of peak wavelength No. 2) is as follows:
SNR (dB) = Lp - (Ll - Lr) / 2 (dBm)

A shown in the display indicates that the dip level is found by the above method (Average) to find the SNR.

(3) Gain valuation

The difference between the maximum peak level (L max) and minimum peak level (L min) of each peak level of the WDM measurement wavelength is defined as a gain valuation value.
Gain Val (dB) = L max - L min

Values in parentheses on the screen indicates L max and L min values.

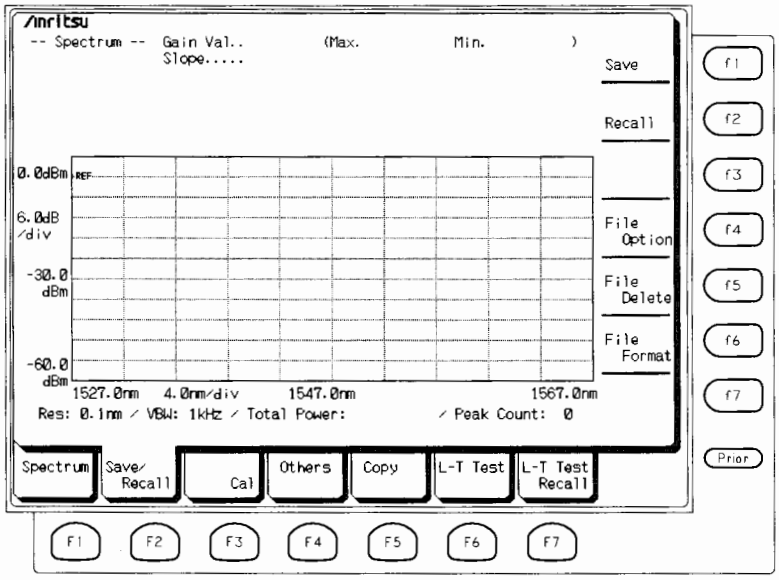
(4) Number of peaks

The number of measured peaks of WDM measurement waveform is displayed.
Up to 300 waves can be calculated.

* A in the screen indicates that calculation method of the dip level is the average of dip levels at short wavelength side and long wavelength side.

5.2 Saving and Recalling Measured Data (Save/Recall Card (F2))

The Save/Recall card is used to save/recall data to/from FD. In addition to using the Tester's own format, data can also be saved in Windows bitmapped format and DOS text format so that they can be read on a PC.



5.2.1 Saving Measured Data (Save function key (f1))

To save measured data to FD press the Save function key (f1) of the Save/Recall card. The data will be saved in the Tester basic format. In addition to this format, to save the data in both bitmapped and text format simultaneously, it is necessary to pre-specify the format by pressing the File Option function key.

In addition, the File Option function key allows the name of the saved file as a full name or as a number.

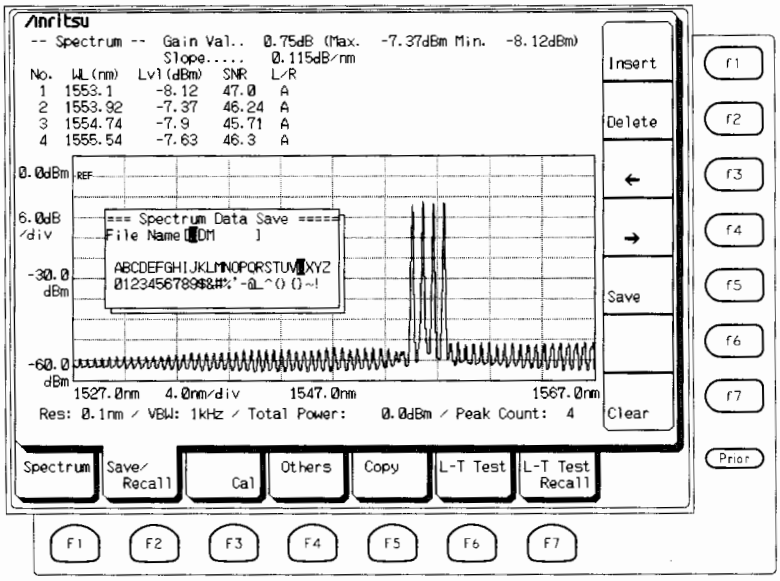
When the data is saved, if there is already a file of the same name or number, a file overwrite confirmation dialog is displayed even if the file formats are different. If it is OK to overwrite the existing file, select Yes, otherwise, select No. Note that if Yes is selected, the data for the existing file will be deleted. Take care not to overwrite an important file by mistake.

Note:

Do not eject the FD from the FD drive while the disk is being accessed.

(1) Saving File as File Name

The following type of display is displayed; input the file name and press the Save function key to save the data. Use the ten keys and function keys to input a file name of 8 or fewer characters.



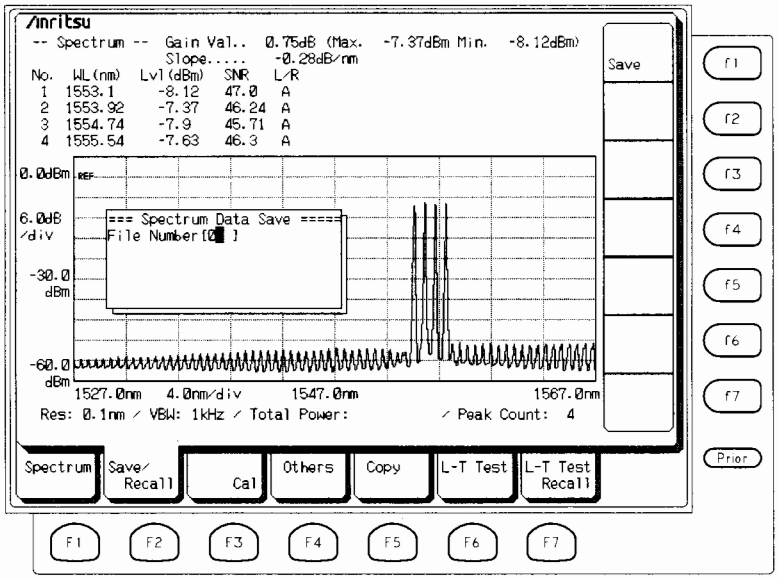
The functions of the function keys are listed below.

Key	Function
Insert	Inserts selected character at cursor position
Delete	Deletes character at cursor position
←	Moves cursor to left
→	Moves cursor to right
Save	Saves data as currently-set name
Clear	Clears file name

(2) Saving File as File Number

The following type of screen is displayed; input the file number from the ten keys and press the Save function key to save the data. The saved file is DATAOOO where OOO is the input three digits. When the file is saved again, the numeric section of the number is automatically incremented by one. If a file of the same number already exists, a file overwrite confirmation dialog is displayed. If it OK to overwrite, press the Overwrite function key, otherwise, press the Cancel function key.

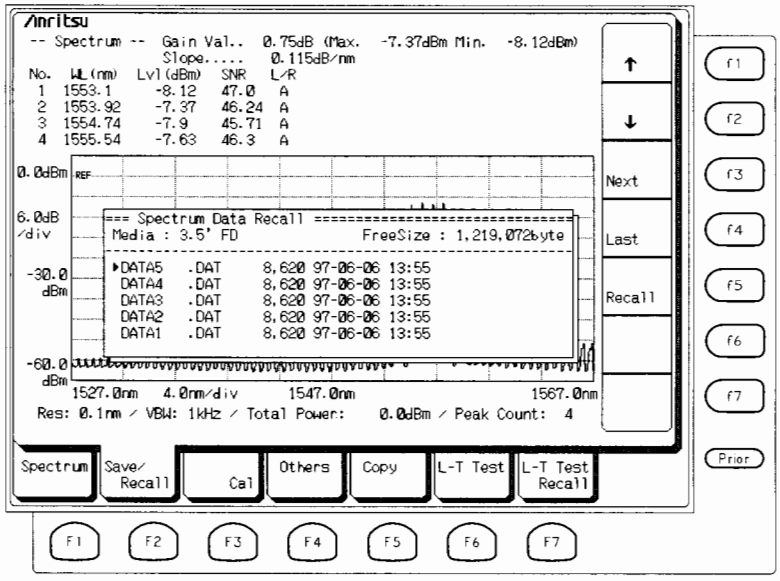
P5-10



5.2.2 Recalling Saved Data (Recall function key (f2))

To recall data saved in the basic file format from floppy disk, press the Recall function key (f2) at the Save/Recall card. Files saved in the bitmapped or text format cannot be recalled.

The following type of display is displayed; move the cursor to the file to be recalled and press the Recall function key to recall and display the selected file.



The functions of the function keys are listed below.

Key	Function
↑	Selects previous (upper) file
↓	Selects next (lower) file
Last	Displays list of files on previous page
Next	Displays list of files on next page
Recall	Recalls selected file

5.2.3 Setting Options (File Option function key f4)

The following items related to saving data can be selected.

Saved File Format

Basic Format, Bitmapped Format, Text Format

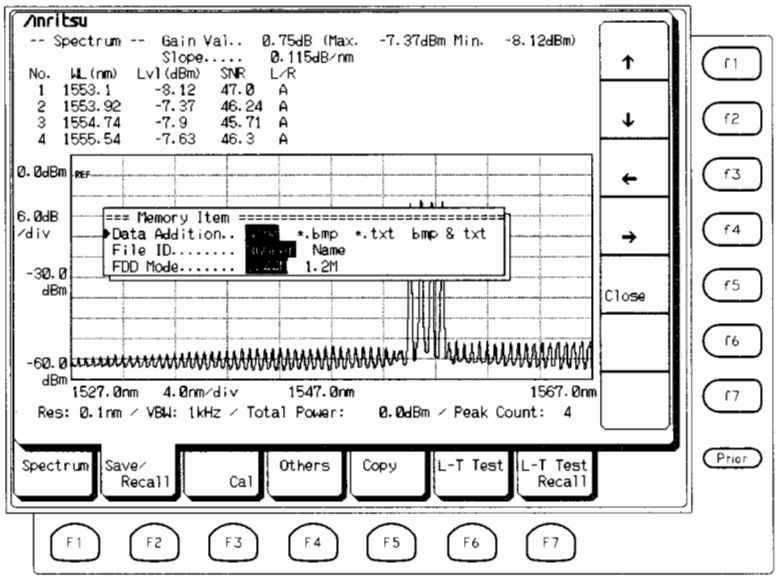
Saved File Name Input Method

File Name or File Number

Media Format

1.44 MB or 1.2 MB

Press the Save/Recall Option function key f4 at the Save/Recall card. The following screen is displayed. Use the functions keys to select the items to be set with the cursor (reverse displayed).



The functions of the function keys are listed below.

Key	Function
↑	Moves cursor up (selects setting item)
↓	Moves cursor down (selects setting item)
←	Moves cursor to left (changes setting)
→	Moves cursor to right (changes setting)
Close	Confirms setting and closes window

(1) Data Addition (Add Saved Data File)

When saving a data, the following four format options are available for the save format; the additional formats are saved with the same name as the basic file format except that each has a different extension. The meaning of each is explained below.

(a) None

Saves only basic-format file. The extension is .dat.

(b) *.bmp

In addition to basic-format file (*.dat), saves bitmapped file for Windows.

(c) *.txt

In addition to basic-format file (*.dat), saves text file.

(d) bmp&text

In addition to basic-format file (*.dat), saves both bitmapped file for Windows and text file.

(2) File ID (Saved File Name Specification Method)

This specifies whether the saved file will be saved using a name or a number.

(a) Number

Input a 3-digit number ; the saved file will be DATAOOO where OOO is the input number.

(b) Name

Input an alphabetic file name or 8 or fewer characters.

(3) FDD Mode

This selects the floppy disk format mode from either 1.44 MB or 1.2 MB (NEC/Epson). This setting becomes valid at the next power-on. This setting is disabled when a 2DD floppy disk (720 KB) is used.

(a) 1.44 MB

This sets the FD format mode to 1.44 MB commonly used by PC/AT computers. 1.44 MB is the factory default.

(b) 1.2 MB

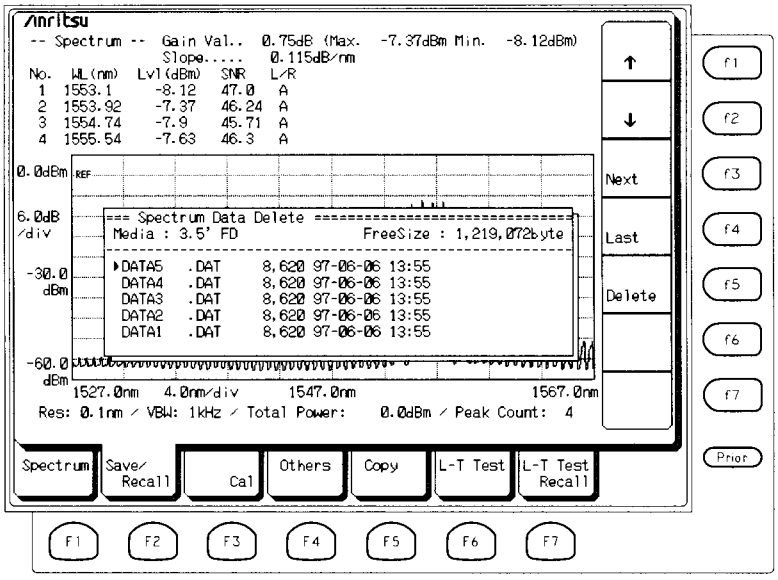
This sets the FD format mode to 1.2 MB commonly used by NEC/Epson computers.

5.2.4 Deleting File (File Delete function key f5)

To delete a saved basic-format file (*.dat) from a floppy disk, press the File Delete function key f5 at the Save/Recall card. Files deleted using this function cannot be recovered so take care not to delete important files.

Only basic-format files can be deleted by this method. Files used by an external computer cannot be deleted; use the computer to delete these files.

When the File Delete function key f5 is pressed, the following type of display is displayed. Use the function keys to move the cursor to the file to be deleted and select Delete; when Delete is selected, the Yes/No functions keys are displayed. To delete the selected file, select Yes, to cancel the deletion, select No.



The functions of the function keys are listed below.

Key	Function
↑	Selects upper file
↓	Selects lower file
Delete	Deletes selected file

5.2.5 Formatting Floppy Disk (File Format function key (f6))

To format a floppy disk, press the File Format function key (f6) at the Save/Recall card.

An unformatted floppy disk must be formatted before it can be used. However, note that formatting an already-formatted disk will delete all existing data on the disk.

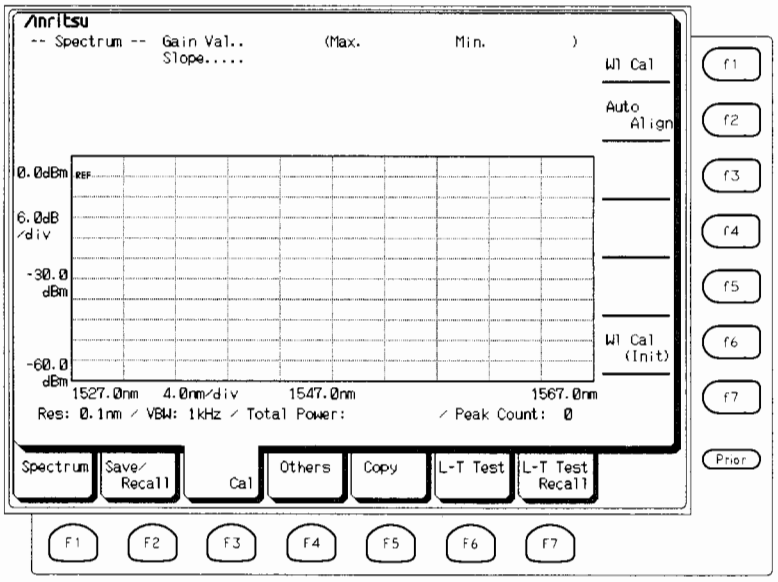
To read data saved to disk by the Tester on another device such as a PC, it is necessary to format the FD in the same format as that used by the PC. In this case, press the File Option function key at the Save/Recall card and select 1.44 MB or 1.2 MB at FDD MODE to match the format used by the PC.

Yes/No is displayed at the function keys; to format the inserted disk, select Yes, otherwise, select No. When Yes is selected a bar graph is displayed with the message FD Formatting at the top right. The FDD access lamp is lit while formatting is in progress. The bar graph indicates the formatting progress. Do not attempt to eject the FD while formatting is in progress.

Furthermore, if a 2DD disk is inserted, the Tester automatically recognizes the 2DD disk and sets the format to 720 kB.

5.3 Calibration (Cal Card F3)

The Int Cal card is used to calibrate the Tester. Calibration provides higher-accuracy measurement results.



5.3.1 Wavelength Calibration (WI Cal function key f1)

Wavelength is calibrated by using the MG9586A wavelength reference light source.

When the WI Cal function key f1 is pressed at the Int Cal card, the Execute and Cancel function keys are displayed at the right side of the display. To calibrate the Tester, press Execute. To stop calibration while it is executing, press Cancel.

Executing Auto Align (automatic alignment of optical axis) before calibrating will increase the calibration efficiency.

5.3.2 Auto-aligning Optical Axis (Auto Align function key f2)

This function automatically adjusts the optical alignment of the optical system based on the optical input.

When the Auto Align function key f2 is pressed at the Cal card, Execute, Cancel and Init are displayed at the function keys on the right side of the display. To align the optical axis, press Execute. To stop the alignment, press Cancel. Press Init to return the alignment to the factory default setting.

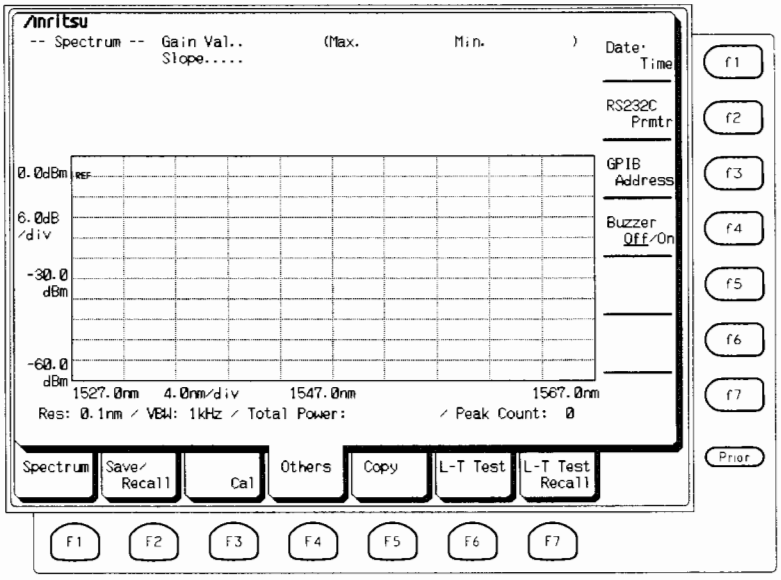
* Auto Align can be executed for WDM waveforms; always input the optical signal to be measured before executing Auto Align.

5.3.3 Calibrating Wavelength (WI Cal (Init) function key (f6))

This function returns the wavelength calibration auxiliary data to the factory defaults.
Press the WI Cal (Init) key and then press the Execute key to execute the function.

5.4 Other Functions (Others Card (F4))

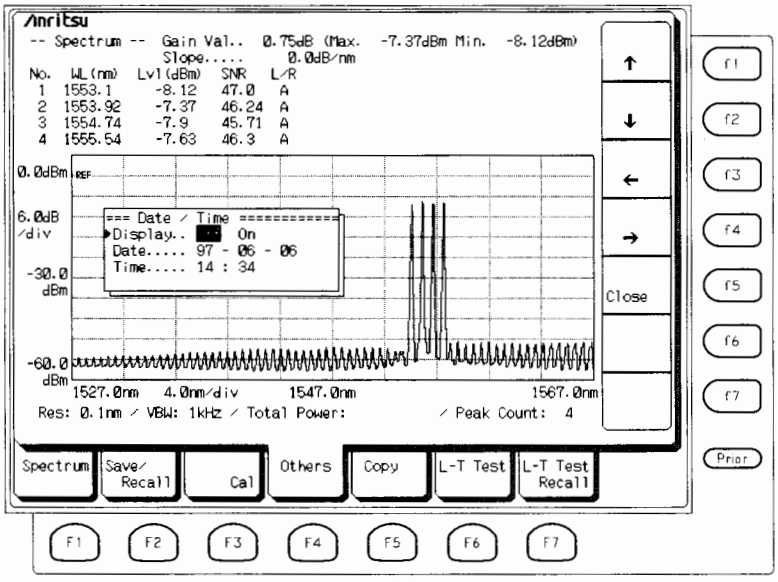
These functions perform settings related to the GPIB, date & time and displays, etc.



5.4.1 Setting Date and Time (Date/Time function key f1)

This function sets the date and time of the Tester internal timer.

The following display is displayed when the Date/Time function key f1 at the Others card is pressed.



Use the ↑ and ↓ function keys to move the cursor to the item to be set.

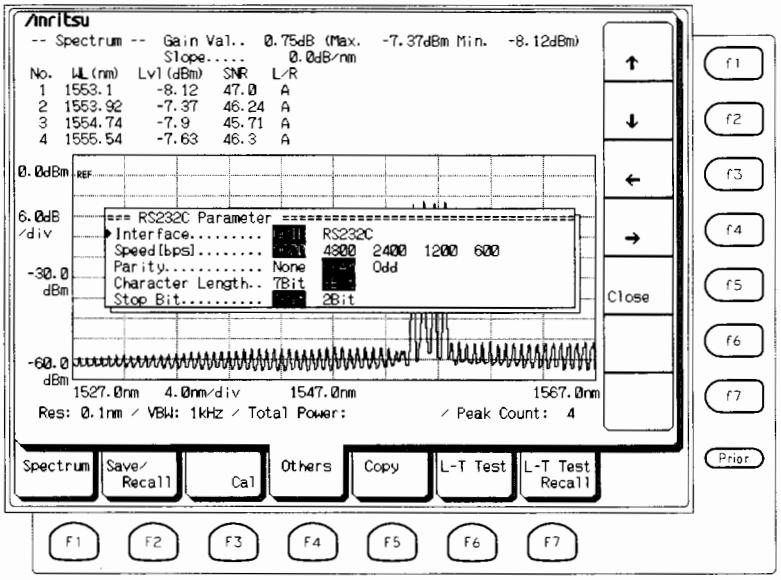
The method for setting each item is explained below; the cursor position and numeric values can be changed using the ←, → ↑, and ↓ functions keys or the encoder.

Item	Setting Method
Display	Sets whether or not to display date and time On ..... Displays date and time Off ..... Does not display date and time
Date	Sets date
Time	Sets time

5.4.2 Setting RS-232C (RS-232C Prmtr function key (f2))

This function sets the communications parameters for the RS-232C I/F when it is set as the interface for remote control.

Press the RS-232C function key (f2) at the Others card to display the following display.



The functions keys are used to select the I/F to use for remote control and the communication parameters.

Item	Setting
Speed	Select the communication speed from one of 9600, 4800, 2400, 1200 and 600 bps.
Parity	Select the parity None .. No parity bit is attached Even ... An even parity bit is attached. Odd .... An odd parity bit is attached.
Character Length	Select the data length. 7 ..... 7 bits 8 ..... 8 bits
Stop Bit	Select the number of stop bits. 1 ..... 1 stop bit is attached. 2 ..... 2 stop bits are attached.

5.4.3 Setting GPIB Address (GPIB Address function key f3)

This function sets the Tester GPIB address.
Press the GPIB function key f3 at the Others card and input the address using the ten keys or the encoder. When the ten keys are used, press the Enter function key f1 to confirm the setting.

(1) GPIB Address Setting Range
0 to 30

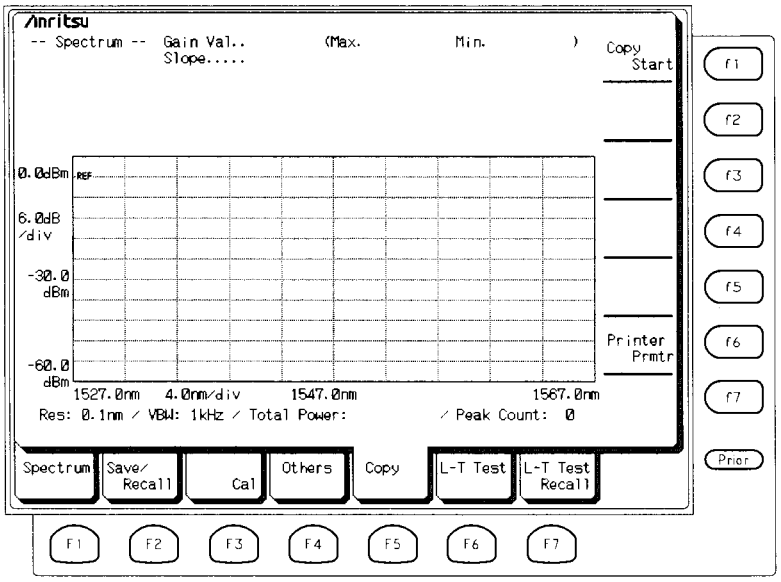
5.4.4 Setting Buzzer On/Off (Buzzer On/Off function key f4)

This function sets whether or not to sound the buzzer when an alarm occurs. It is toggled On/Off each time it is pressed in succession.

On Buzzer sounds
Off Buzzer does not sound

5.5 Copying (Copy Card (F5))

This function key outputs a hard copy of the screen to the specified printer.

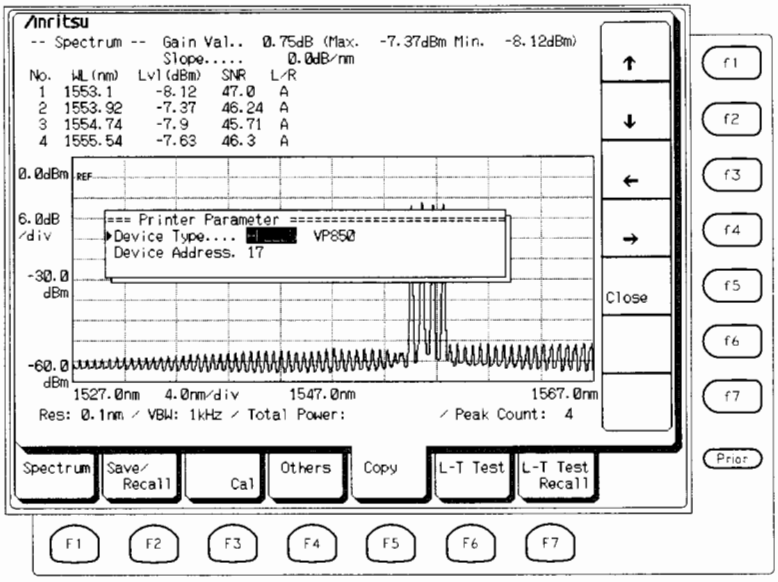


The function key displays the following items.

Items (Key Name)	Operation/Setting Contents
Copy Start	Starts hard-copying screen
Prmtr	Selects printer type, etc.

5.5.1 Setting Printer

The following screen is displayed when the Printer function key f6 is pressed.

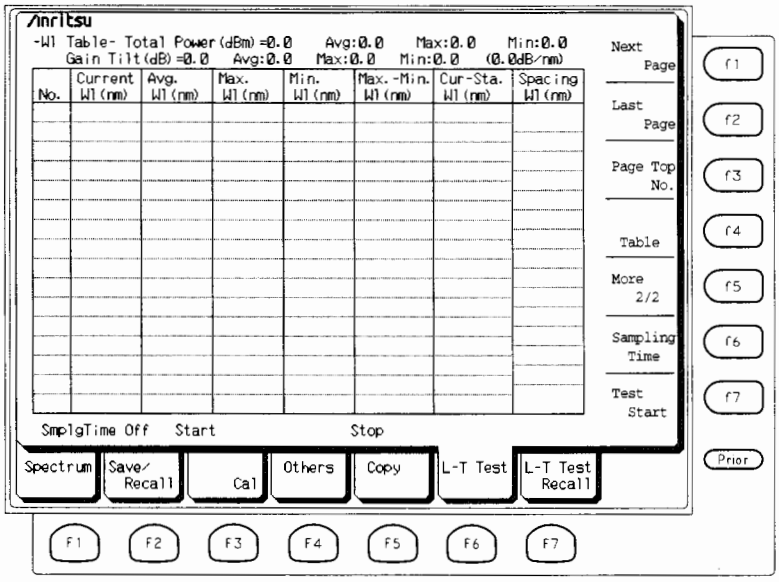


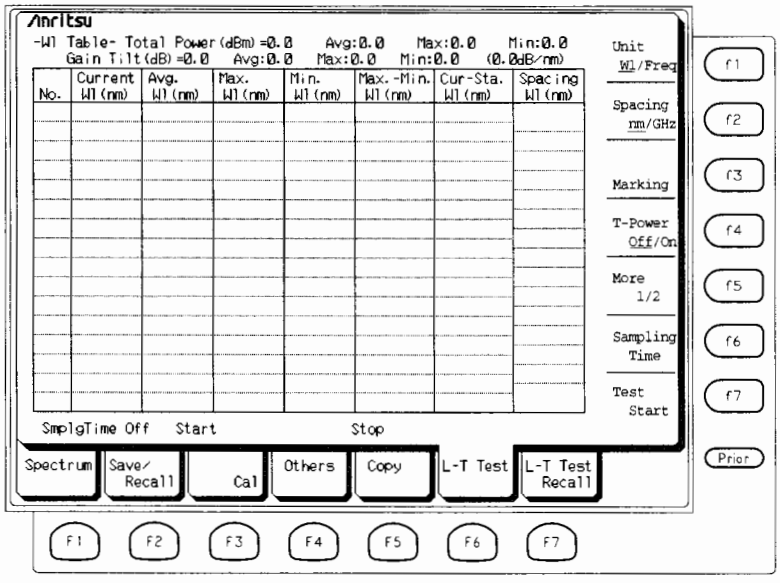
Move the cursor to the item to be changed using the ↑ ↓ function keys. Make the setting with the ← → function keys, encoder, or ten-key pad.

Item	Setting Meaning	
Device Type	HP225	Externally-connected printer
	VP800	Externally-connected printer
Device Address	Printer address	

5.6 Continuous Testing (L-T Test Card F6)

This function executes continuous WDM measurement for WDM monitoring and saves the measurement results to FD at a preset interval.



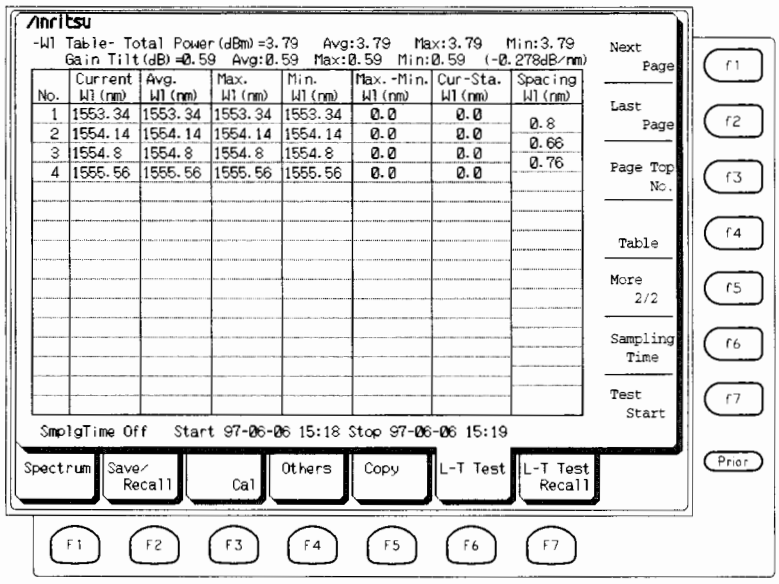


The functions keys are explained below.

Item (Key Name)	Operation/Setting
Next Page	Moves to next page of table displaying measurement results When the Next key is pressed, the data display shifts to the next 8 peaks.
Last Page	Moves to previous page of table displaying measurement results (Not displayed when WI Table is sellected.) When the Next key is pressed, the data display shifts to the previous 8 peaks.
Page Top No.	Specifies the No. which is the top of the Table indication.
Table	Selects Table to be indicated from wavelength Table (W1 Table), level Table (Lvl Table), or SNR Table.
Unit W1/Freq	Switches the unit, to wavelength (nm) or frequency (THz), in which the peak wavelength value is indicated in the Table.
Spacing nm/GHz	Switch the unit, to wavelength (nm) or frequency (GHz), in which the Spacing value is indicated in the W1 Table.
Marking	Sets number of peak to display in table This setting is the same as the Marking function key F1 at the Spectrum card F1.
T-Power On/Off	Selects whether to perform total power measurement in the continuous test.
Sampling Time	Sets the time interval to save the data of the continuous test results in FD. (in unit of minute)
Test Start	Starts continuous testing
Test Stop	Stops continuous testing

5.6.1 Table Display

(1) Wavelength Table



Current Wl : Peak wavelength at each peak No. of currently-measured waveform

Avg. Wl : Average peak wavelength at each peak No. of measured waveform until current measurement

Max. Wl : Maximum peak wavelength at each peak No. of measured waveform until current measurement

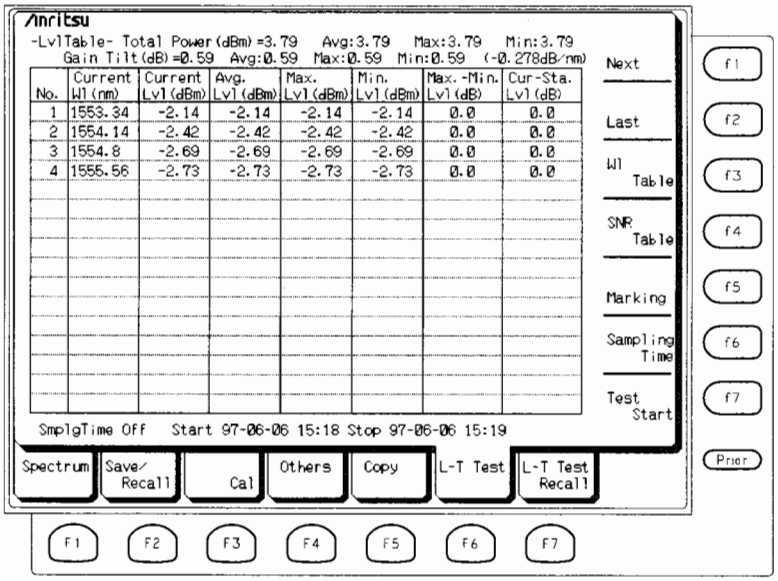
Min. Wl : Minimum peak wavelength at each peak No. of measured waveform until current measurement

Max. - Min. Wl : Difference between Max. and Min. Wl

Cur-Sta. Wl : Difference between the peak wavelength values of each No. measured just after the test is started and Current W1.

Spacing Wl : Difference in wavelength between peak No. and neighboring peak. The nm and GHz display can be selected.

(2) Level Table



Current Wl : Peak wavelength at each peak No. of currently-measured waveform

Current Lvl : Peak level at each peak No. of currently-measured waveform

Avg. Lvl : Average peak level at each peak No. of measured waveform until current measurement

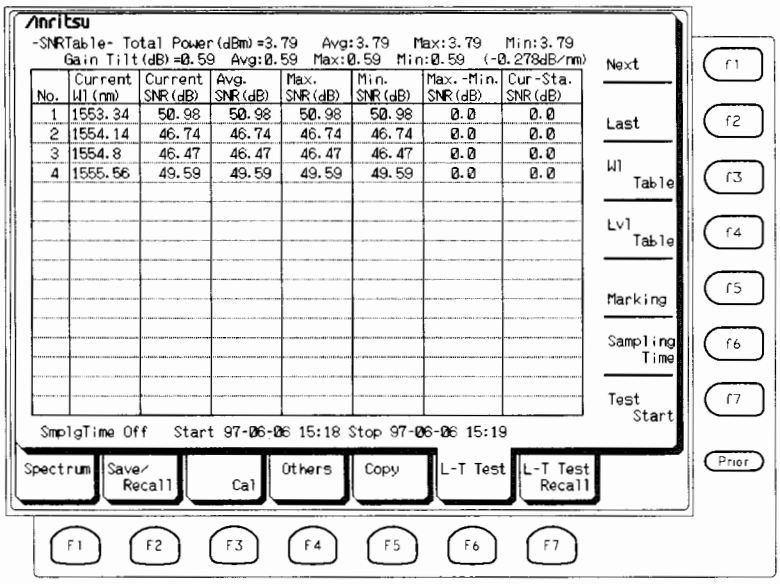
Max. Lvl : Maximum peak level at each peak No. of measured waveform until current measurement

Min. Lvl : Minimum peak level at each peak No. of measured waveform until current measurement

Max. - Min. Lvl : Difference between Max. and Min. Lvl

Cur-Sta. Lvl : Difference between the peak level of each No. measured just after the test is started and Current Lvl.

(3) SNR Table



Current Wl : Peak wavelength at each peak No. of currently-measured waveform

Current SNR : SNR at each peak No. of currently-measured waveform

Avg. SNR : Average SNR at each peak No. of measured waveform until current measurement

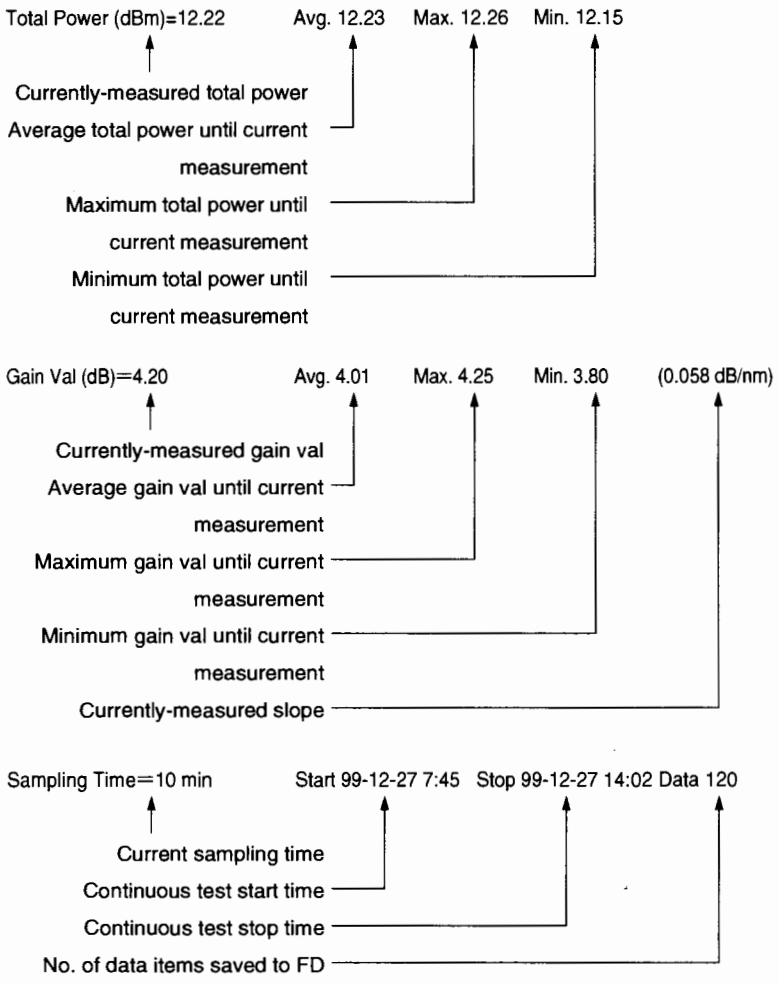
Max. SNR : Maximum SNR at each peak No. of measured waveform until current measurement

Min. SNR : Minimum SNR at each peak No. of measured waveform until current measurement

Max. -Min. SNR : Difference between Max. and Min. SNR

Cur-Sta. SNR : Difference between the SNR of each No. measured just after the test is started and Current SNR.

(4) Other Displayed Values



5.6.2 Continuous Test Procedure

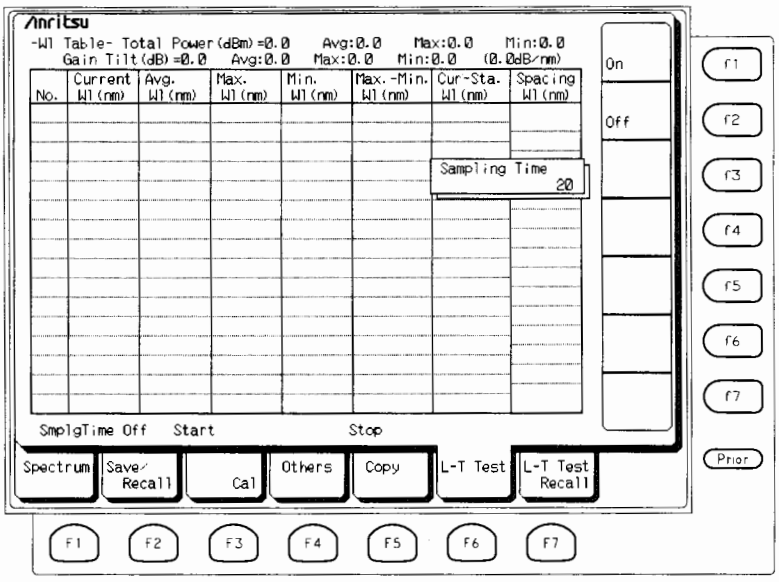
This section explains the continuous test procedure.

(1) Connect the optical fiber of the device to be tested to the optical input connector of the Tester.

(2) Select L-T Test (F6).

- L-T Test is performed under the same measurement condition as that for the spectrum measurement function. Select the measurement condition (Res, VB) at the Spectrum measurement function before starting the L-T Test. The test is performed with the wavelength range at the set Full-Span value.

(3) Set the Sampling Time ; 1 to 99 minutes and Off can be set.



This sets the interval at which measured data is saved to FD.

- When Sampling Time set to 10 minutes

  The Tester performs repeated sweeping for 10 minutes, calculates the average, maximum and minimum values, etc., for each peak and saves this data to FD as one group. (The display displays the results of each measurement.)

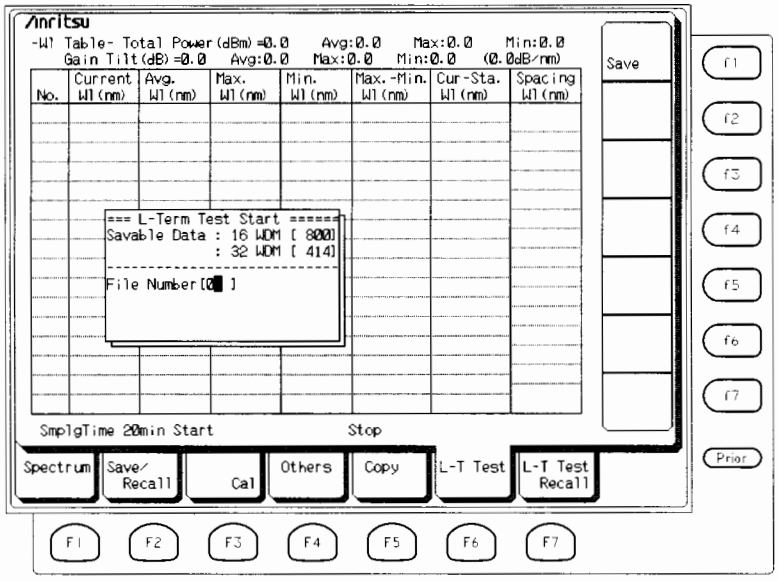
- When sampling time set to Off

  The data group is not saved to FD.

  The Tester performs repeated sweeping and calculates the average, maximum and minimum values, etc., for each peak for the accumulated data but only displays the results and does not save them to FD.

(4) Insert the FD in the FDD.

(5) Press Test Start f7 to start the test.
When Test Start f7 is pressed, the window and functions keys change for input of the file name of the data group saved to FD. (However, this is not displayed when Sampling Time is set to Off.)



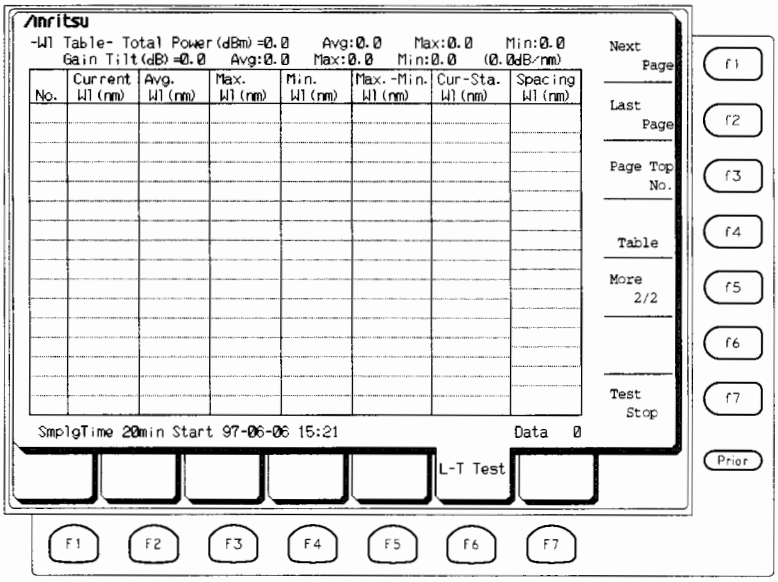
- When File ID at File Option F2 of the Save/Recall card F2 is set to Number, input a file number from 0 to 99. When it is set to Name, input a file name of 8 or less characters.

- The window displays the number of data groups that can be saved by calculating the remaining capacity of the FD. Check the remaining FD capacity and press Test Start f7 after inputting the file number or name to start the test.

Key	Function
f1 Insert	Inserts 1 blank space at cursor position
f2 Delete	Deletes 1 character at cursor position
f3 ←	Moves cursor 1 space left
f4 →	Moves cursor 1 space right
f5 Test Start	Starts test under input file name or number
f7 Clear	Clears input file number or name

* To format the FD, use the Save/Recall card F2.
To delete a file, use the L-T Test Recall Card F7.

(6) Stopping Continuous Test



The Test LED is lit while continuous testing is in progress.

The Table display and markings can be updated even while the test is in progress.

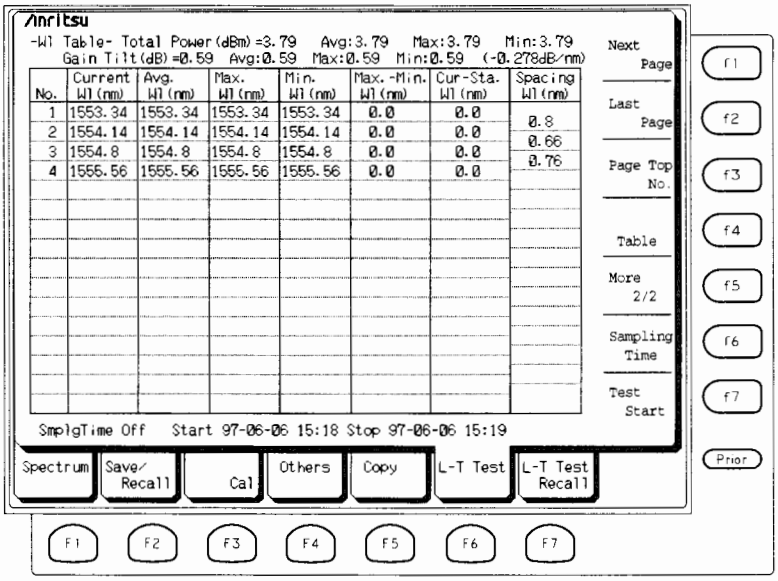
Only the L-T test card is displayed while the continuous test is executing. (The spectrum is not displayed.)

Continuous testing stops before it is completed if:

- Test Stop (f7) is pressed to stop the test immediately.
- 1000 data groups have been saved.
- The FD becomes full.

Start time displayed at the bottom of the L-Term Test card in the above example indicates the test start time. Displayed number indicates the current number of data groups saved to FD.

(7) Continuous Test Completed



The time when the continuous testing was completed is displayed at the bottom of the display in the format Stop 97-02-06 17:50 as shown in the above example.

5.6.3 Data Saved to FD

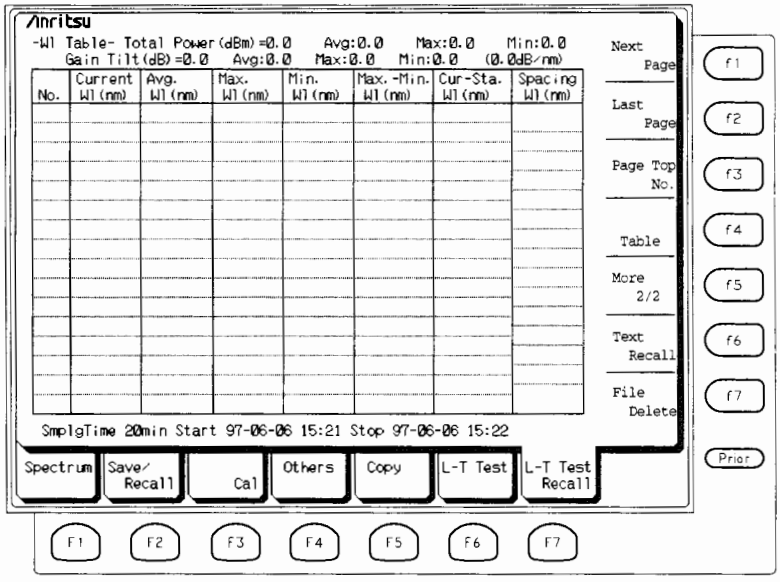
The continuous test (L-T Test) generates two files in the floppy disk:
List file (.LST) recording measured data in text format and Location file (.LOC) recording location of the measured data.

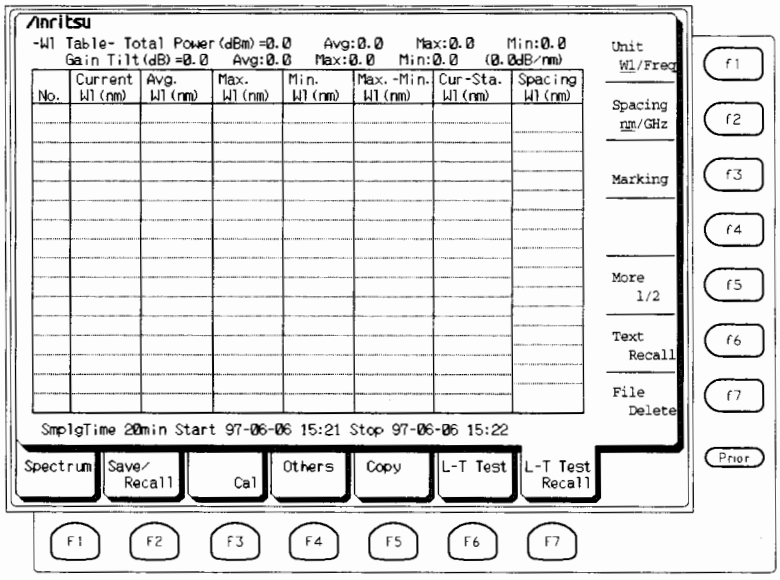
- First measurement after Test Start pressed
  Gain Val
  Slope
  Total Power
  Peak Wavelength, Peak Level and SNR for each Peak No.
- During set Sampling Time
  Average, max. and min. Gain Val
  Average, max. and min. Slope
  Average, max. and min. Total Power
  Average, max. and min. Peak Wavelength for each Peak No.
  Average, max. and min. Peak Level for each Peak No.
  Average, max. and min. SNR for each Peak No.

Each peak No. data item is separated by a comma (,) and data groups of No.16 and No.17 are only separated by a semicolon (;).

5.7 Function for Recalling Long-Term Test Data (L-T Test Recall Card (F7))

This function recalls long-term test data saved in text format and displays it on the screen.





The functions keys are explained below.

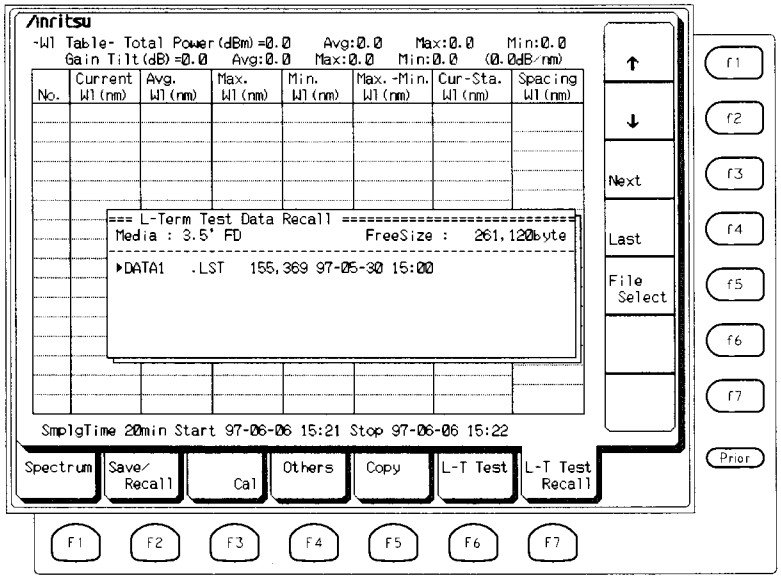
Item (Key Name)	Operation/Setting Contents
Next Page	Scrolls to next page displaying results data in table. When Next is pressed, eight peak data are shift-displayed.
Last Page	Returns to previous page displaying results data (not displayed when Wl Table selected). When Last is pressed, eight peak data are shift-displayed.
Page Top No.	Specifies the No. to be the top of the Table indication.
Table	Selects the Table to indication among wavelength Table (W1 Table), level Table (Lvl Table), or SNR Table.
Unit W1/Freq	Switches the unit, to wavelength (nm) or frequency (THz), in which the peak wavelength value is indicated in the Table.
Spacing nm/GHz	Switch the unit to wavelength (nm) or frequency (GHz), in which the Spacing value is indicated in W1 Table.
Marking	Specifies a peak No. to be displayed in high intensityin the Table . This setting is the same setting as the Marking key f5 in the Spectrum card F1.
Text Recall	Recalls text data
File Delete	Deletes FD list file (.LST) and location file (.LOC)

5.7.1 Procedure for Recalling Data Saved to FD

This section explains the procedure for recalling long-term test data saved to FD.

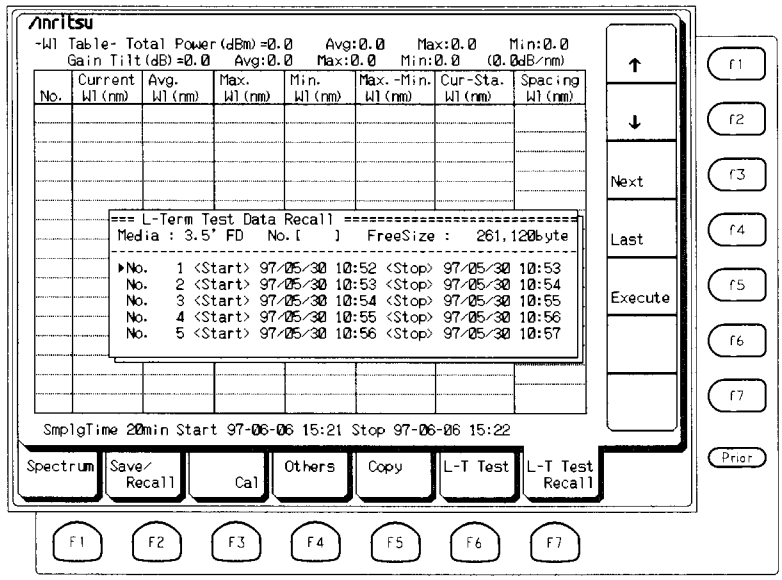
(1) Insert the FD into the FDD.

(2) Press the Text Recall key (f6).

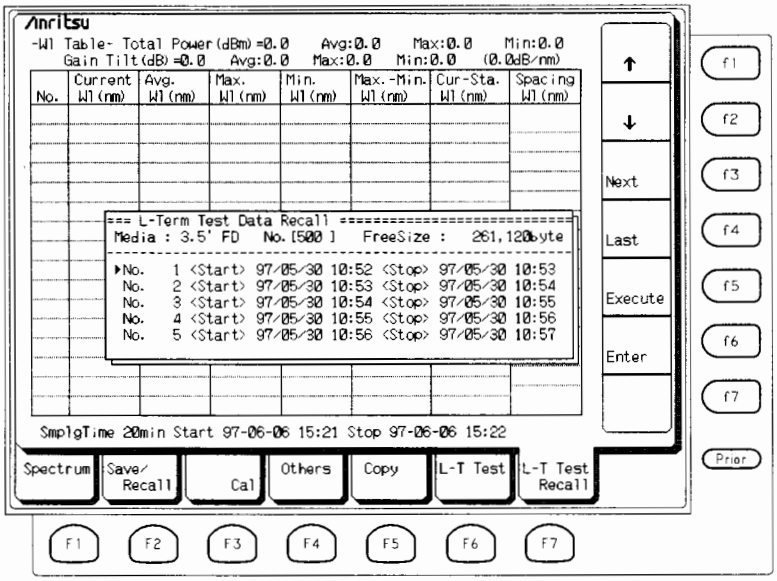


(3) Move the cursor to the name of the file to be recalled using the ↑ ↓ NEXT, or LAST function keys, or the rotary encoder.

(4) Specify the file to be recalled by pressing the File Select (f5) key.

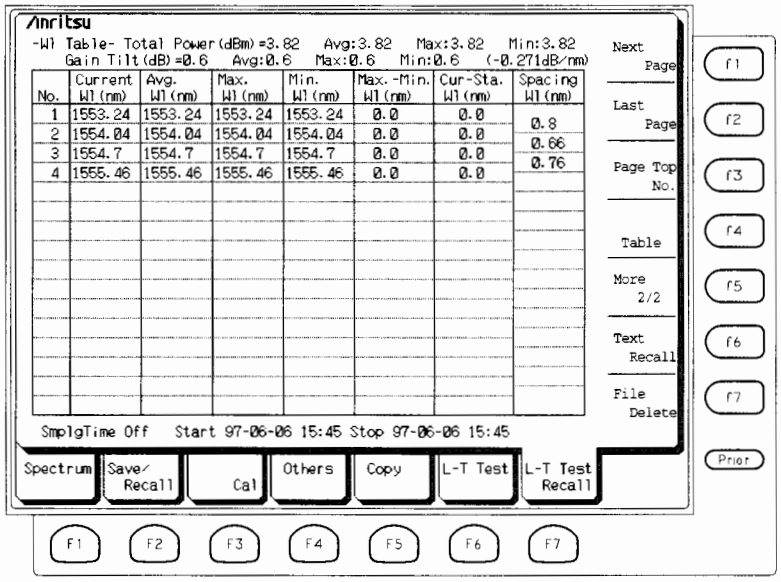


(5) Move the cursor to the No. (time) to be recalled using the ↑ ↓ NEXT, or LAST function keys, or the rotary encoder.



The No. of the file to be recalled can be input using the ten- key pad. At ten-key input, the Enter key is displayed at f6. Use the ten-key pad when inputting a large No.

(6) When Execute (f5) is pressed after moving the cursor to the No. to be recalled, the data for the recalled No. is displayed on the screen.



The recalled data are diasplayed in:

Current Wl = Avg Wl,

Current Lvl = Avg Lvl,

Current SNR = Avg SNR, and

Spacing is calculated from Avg Wl.

Section 6 Calibration

This section explains the wavelength calibration and optical axis alignment.

6.1 Calibrating Wavelength

MS9715B uses the MG99586A wavelength reference light source to perform wavelength calibration.

Press WI Cal (f1) at the Cal card and then press Execute.

During calibration, the message Calibration Execute is displayed and the Cal LED flashes. The calibration value is retained though the power is off.

6.2 Optical Axis Alignment

This Tester automatically aligns the axis of the optical section.

Optical axis alignment is performed using a WDM optical signal. Before executing optical axis alignment, always ensure that a WDM optical signal is input to the Tester.

Press Auto Align (f2) at the Cal card and then press Execute. The optical axis is aligned using the WDM optical signal. During alignment, Calibration Execute is displayed and the Cal LED flashes. During calibration, only the Cancel key is enabled; all other keys are disabled.

Section 7 Maintenance and Repacking

This section describes the regular maintenance procedures required to keep the Tester in optimum condition and the precaution to take when repacking the Tester for transport.

7.1 Regular Maintenance

7.1.1 Cleaning Outside

Clean the Tester if the cabinet becomes soiled or marked with fingerprints, etc., or before long-term storage. Use a soft cloth moistened with soapy water. Do not use thinners or benzene, etc., which might damage the cabinet.

7.1.2 Cleaning Screen

If the screen gets dirty or dusty, wipe it with a dry soft cloth. If it is very dirty, use a cloth moistened with soapy water.

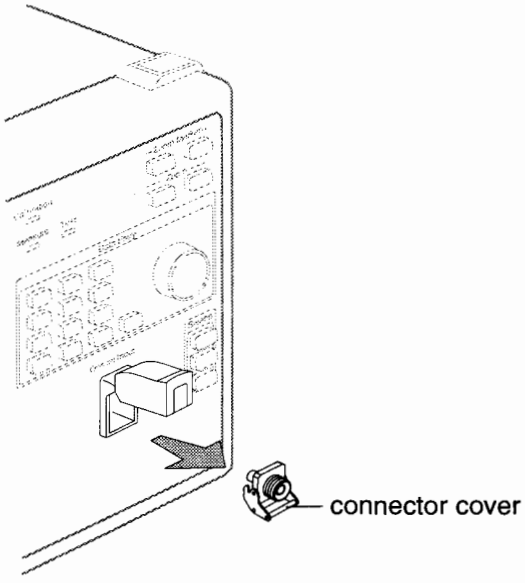
CAUTION ⚠

Do not disassemble or lubricate this Tester; it uses micron-level precision components and technology and may not work properly after disassembly or lubrication.

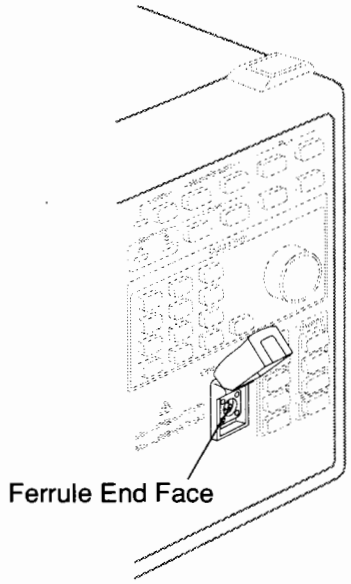
7.1.3 Cleaning Ferrule

Remove the optical connector as shown below and clean the inside of the ferrule periodically.

(1) Open the connector cover.
(2) Lift the lever to disengage the catch and carefully slide out the connector.



(3) Use the ferrule cleaner to remove any soiling from the end face of the ferrule.



(4) Reassemble in the reverse order of disassembly taking care not to damage the end face of the ferrule with the connector, etc.

7.2 Storage Precautions

Do not store the Tester:

- At temperatures above 60°C and below -20°C.
- In direct sunlight.
- In a very dusty or dirty location.
- In a very humid or damp location.
- Where there are active gases.

7.3 Repacking

Note the following points when repacking the Tester for transport.

- Use the original packing materials provided when the Tester was purchased.
- Tell the shipping agent that the package is fragile, easily damaged and must be kept horizontal.

If the original packaging has been lost or disposed of, pack as described below.

(1) Fit the protective front- and back-panel covers.
(2) Wrap the Tester in a plastic bag.
(3) Find a cardboard, wooden or aluminum packing case which is 10 to 15 cm larger than the wrapped Tester on all sides.
(4) Place 10 to 15 cm of shock-absorbent material in the bottom of the box and put the Tester in the box horizontally. Pack the sides and top of the Tester with 10 to 15 cm of shock-absorbent material. Close the box and secure it with string, tape, or bands.
(5) Mark the top of the box.

7.4 Troubleshooting

Problem	Cause	Solution
No power	Power switch ON?	Set to ON.
	Power cord connected?	Connect cord.
	Fuse blown?	Reme hange fuse. ☞ 3.6 Changing Fuses
Startup Display does disappear 2 minutes after power-on		Recycle power off and on again. If the same problem reoccurs, turn off the power immediately and call the service engineer.
Cannot connect optical fiber	Optical fiber connector and Tester optical input connector different?	Use correct connector. ☞ 3.5 Changing Optical Input Connector
	Fiber and connector misoriented?	Check orientation and reconnect.
Measured spectrum wavelength incorrect	Tester calibrated?	Use calibration functions (Int Cal card) to calibrate Tester. ☞ 5.3.1 Calibrating Wavelength ☞ 6 Calibration
Measured spectrum level incorrect (low)	Fiber cord end face or optical input connector dirty?	Clean. ☞ 3.5 Changing Optical Connector
	Fiber connected correctly to optical input connector?	Connect correctly.
	Fiber connected correctly to optical input connector?	Connect correctly.
	Calibration performed incorrectly?	Use calibration functions (Int Cal card) to calibrate Tester. ☞ 5.3.1 Calibrating Wavelength ☞ 6 Calibration
Unable to save measured data to FD	FD write-protected?	Close write-protect tab on FD.

Problem	Cause	Solution
Unable to save/read measured data to/from FD	FD not formatted or formatted in incompatible format?	Format FD using PC or Tester. ☞ 5.2 Saving and Recalling Measured Data
	Tester set to 1.2 MB format for 1.44 MB FD or vice versa?	Set format at File Option to match FD. ☞ 5.4 Other Functions
Unable to read text or bitmapped file from FD	Output file not set at File Option?	Set required output file format at File ☞ 5.4 Other Functions
Incorrect date and time		Set correct date and time. ☞ 5.4 Other Functions
GPIB/RS-232C not operating	GPIB/RS-232C cable securely connected?	Connect correctly.
	Incorrect RS-32C cable type?	Use RS-232C crossover cable. ☞ Remote Control Instruction Manual
GPIB/RS-232C not operating	GPIB/RS-232C switching set incorrectly?	Set correctly. ☞ 5.4 Other Functions ☞ Remote Control Instruction Manual
	Address, etc., settings incorrect?	Set correctly. ☞ 5.4 Other Functions ☞ Remote Control Instruction Manual

Appendix

Appendix A Specifications

This appendix gives the Tester specifications at 2-hours after power-on.

A.1 Wavelength

Wavelength range	1450 to 1650 nm
	1450 to 1650 nm (Total Power)
Wavelength sweep width	0.2 to 200 nm
Wavelength accuracy	±50 pm after Wl Cal
Minimum wavelength purity	6 pm max.

A.2 Resolution

Setting resolution	1, 0.5, 0.2, 0.1, 0.07, 0.05 nm

A.3 Level

Measurement level range	–85 to +23 dBm
Measurement level accuracy	±0.4 dB max.
Level linearity	±0.05 dB max. (–50 to +0 dBm)
Flatness	±0.1 dB (1550 ±20 nm) referenced to ML9050A Power Meter
Polarization dependency	±0.05 dB Connector: FC, SC, ST, DIN, HMS-10/A
Dynamic range	High dynamic range
	58 dB (0.4 nm from peak wavelength)
	42 dB (0.2 nm from peak wavelength)
Reflection attenuation	35 dB

A.4 Functions

Measurement	Spectrum, total power, continuous test
Display	Markings
Analysis	Peak wavelength, peak level, SNR, gain val, slope
Calibration	Optical axis auto-alignment, wavelength
Memory	Bitmapped and text waveform data to FD
I/O	GPIB, RS-232C

A.5 Environment

Power	Operating voltage 85 to 132 Vac/170 to 250 Vac
	Frequency 47.5 to 63 Hz
	Capacity 150 VA max.
Temperature/Humidity	Operating Temperature 0° to +50°C (FDD: 5° to 50°C)
	Storage −20° to +60°C
	Relative humidity 0 to 90% (no condensation) (FDD: 20 to 80%)

A.6 Dimensions/Mass

Dimensions	32 (W) × 350 (D) × 177 (H) mm
Mass	16.5 kg max.

Appendix B Defaults

The factory default measurement conditions are listed below.

Wavelength			
Center	:	1550 nm	
Span	:	200 nm	
Start	:	1450 nm	
Stop	:	1650 nm	
Level Scale			
Scale Select	:	Log	
Log (/div)	:	10 dB/div	
Reference Level	:	20 dBm	
Res/VBW/Avg			
Resolution	:	0.1 nm	
VBW	:	1 kHz	
Save/Recall			
File Option	:	File Option	: None
:		File ID	: Number
:		FDD Mode	: 1.44 MB
Others			
RS232C Parameter	:	Speed	: 4800
:		Parity	: None
:		Stop Bit	: 1
:		Chara Lenght	: 7
My GPIB Address	:	8	
File Parameter			
File Option	:	None	
File ID	:	Number	
File Mode	:	1.44 MB	
RS-232C Parameter			
Interface	:	GPIB	
Speed	:	9600	
Parity	:	Even	
Character Lenght	:	7 Bit	
Stop Bit	:	1 Bit	

Appendix C Error Codes

C.1 System Errors (000 to 099)

Code	Errors Message	Status	Output Condition
000	No error		
001	Optical Error (RAM)		RAM error
002	Optical Error (Slit-1)		Error at Slit 1
003	Optical Error (Slit-2)		Error at Slit 2
004	Optical Error (Wl Align)		Wavelength alignment error
005	Optical Error (Att)		Optical attenuator error
006	Not used		
007	Optical Error (Light Source)		Error at light source
008	Optical Error (Grating)		Error at diffraction grating
009	Optical Error (Offset)		Offset error
010	Optical Error (Over Power)		Excessive optical input

C.2 Measurement Errors (100 to 199)

Code	Errors Message	Status	Output Condition
101	Can't Find Peak	ESE-DDE	No optical peak detected
102 to 109	Not used		
110	Wl Cal Error (Optical Level)	ESE-DDE	Optical level insufficient for wavelength calibration
111	Wl Cal Error	ESE-DDE	Wavelength calibration error
112	Align Error (Optical Level)	ESE-DDE	Optical level insufficient for optical axis alignment
113	Align Error	ESE-DDE	Optical axis alignment error

C.3 Key Operation Errors (200 to 299)

Code	Errors Message	Status	Output Condition
200	Not used		
201	Input Value Error	ESE-EXE	Out-of-range input value
202 to 209	Not used		
210	Valid Only In Spectrum Mode	ESE-DDE	Only executed at spectrum measurement
211 to 214	Not used		
215	Invalid In Others Input	ESE-DDE	Not executed at Others input
216 to 269	Not used		
270	Invalid In L-Term Test	ESE-DDE	Not executed during continuous test
271	Invalid Cal	ESE-DDE	Not executed during calibration
272	Zoom Marker Not Display	ESE-DDE	Not executed when zoom markers not displayed

C.4 Device Errors (300 to 499)

Code	Errors Message	Status	Output Condition
	– FD Errors –		
300	FD Does Not Exist	ESE-DDE	FD not inserted in FDD
301	FD Format Error	ESE-DDE	Incorrect FD format
302	Can't Find File	ESE-DDE	Specified file not found
303	FD Memory Full	ESE-DDE	FD full
304	FD Write Protected	ESE-DDE	FD write-protect tab open (write protected)
305	File Incomplete	ESE-DDE	FD file incompletely created (file error)
	– GPIB/RS-232C Errors –		
400	Not used		
401	Command Error	ESE-CME	
402	Command Error	ESE-CME	Received undefined header
403	Command Error	ESE-CME	Incorrect numeric data integer value Incorrect numeric data real value, or real-format data input invalid
404	Command Error	ESE-CME	Incorrect numeric data pointer, or pointer-format data input invalid Incorrect suffix (units)
405	Command Error	ESE-CME	Number of arguments does not match
406	Command Error	ESE-CME	command syntax
407	Command Error	ESE-CME	*PCB command received but no control function

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