User's Manual

AQ7270
OTDR

YOKOGAWA
Yokogawa Electric Corporation

IM 735020-01E
2nd Edition

Product Registration

Thank you for purchasing YOKOGAWA products.

YOKOGAWA provides registered users with a variety of information and services.
Please allow us to serve you best by completing the product registration form accessible from our homepage.

http://www.yokogawa.com/tm/

Thank you for purchasing the AQ7270 OTDR (Optical Time Domain Reflectometer).
This user's manual contains useful information about the instrument's functions and operating procedures and lists the handling precautions of the AQ7270. To ensure correct use, please read this manual thoroughly before beginning operation.
After reading the manual, keep it in a convenient location for quick reference whenever a question arises during operation.
Two manuals, including this one, are provided as manuals for the AQ7270. Please read all of them.

Manual Title	Manual No.	Description
AQ7270 OTDR User's Manual	IM 735020-01E	This manual. Explains all functions and procedures of the AQ7270 excluding the remote control functions.
AQ7270 OTDR Communication Interface User's Manual	IM 735020-17E	Explains the functions for controlling the AQ7270 using communication commands.

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

Trademarks

- Microsoft, Windows, and Windows XP are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are trademarks of Adobe Systems Incorporated.
- For purposes of this manual, the TM and ® symbols do not accompany their respective trademark names or registered trademark names.
- Other company and product names are trademarks or registered trademarks of their respective holders.

Revisions

- 1st Edition: December 2006
- 2nd Edition:January 2007

2nd Edition : January 2007 (YK)

Checking the Contents of the Package

Unpack the box and check the contents before operating the instrument.
If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

AQ7270

MODEL

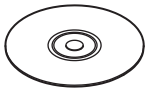
MODEL	Suffix Code	Description	
735020		1550 nm, 32 dB	
735021		1650 nm, 28 dB	
735022		1310/1550 nm, 34/32 dB	
735023		1310/1550 nm, 40/38 dB	
735024		1550/1625 nm, 38/35 dB	
735025		1310/1490/1550 nm, 34/30/32 dB	
735026		1310/1550/1625 nm, 34/32/28 dB	
735027		1310/1550/1650 nm, 34/32/28 dB	
735028		1310/1550/1625 nm, 40/38/35 dB	
735029		850/1300 nm, 22.5/24 dB	
735030		850/1300/1310/1550 nm, 22.5/24/34/32 dB	
Optical connector	-SCC	SC connector (fixed)	
	-FCC	FC Connector (fixed)	
	-NON	No universal adapter	
	-USC	SC universal adapter	
	-UFC	FC universal adapter	
Language	-HE	English	
	-HC	Chinese/English	
	-HK	Korean/English	
	-HR	Russian/English	
Power cord	-D	UL/CSA standard	Max. rated voltage: 125 V
	-F	VDE standard	Max. rated votlage: 250 V
	-R	AS standard	Max. rated votlage: 250 V
	-Q	BS standard	Max. rated votlage: 250 V
	-H	GB standard	Max. rated votlage: 250 V
Options	/PM	Optical power monitor function (not supported by the MMF of 735021 735029 and 735030)	
	/LS	Light source function (not supported by the MMF of the 735029 and 735030)	
	/PL	Internal printer and LAN (Ethernet interface)	
	/DF	Dummy fiber (SMF) (not supported by 735029 and 735030)	
	/SB	Shoulder belt	

- **No. (Instrument No.)**
  When contacting the dealer from which you purchased the instrument, please give them this number.

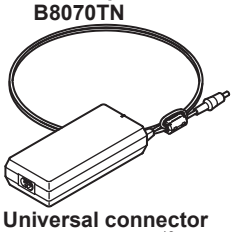
Standard Accessories

The standard accessories below are supplied with the instrument.

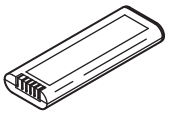
AQ7270 OTDR User's Manual B8070TH



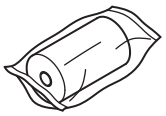
AC adapter B8070TN



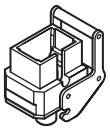
Battery pack B8070TL



Printer roll paper A9010ZP*1

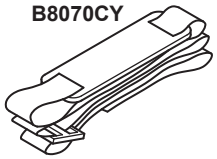


Universal connector (SC) A1022PJ*2

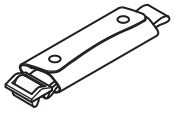


Universal connector (FC) A1023PJ*3

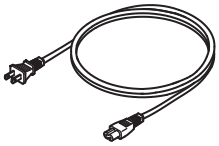
Shoulder belt*4 B8070CY



Hand belt B8070CX

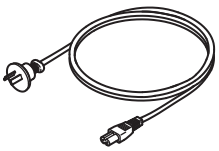


Power cord UL/CSA St'd A1068WD

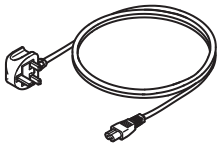


Power cord VDE St'd A1071WD

Power cord AS St'd A1070WD



Power cord BS St'd A1069WD



Power cord BS St'd A1069WD

***1 Included if the suffix code is /PL.**
***2 Included if the suffix code is -USC.**
***3 Included if the suffix code is -UFC.**
***4 Included if the suffix code is /SB.**

Optional Accessories (Sold Separately)

The optional accessories below are available for purchase separately.

Name	Part Number	Notes
Soft carrying case	738960	Soft case
Emulation software	735070	Waveform analysis application
Printer roll paper	A9010ZP	80 mm width × 25 m roll: 10 rolls per unit
Battery pack(reserve)	739880	
Universal adapter(SC)	SU2005A-SCC	SC type
Universal adapter(FC)	SU2005A-FCC	FC type
Shoulder belt	B8070CY	
AC adapter(reserve)	739870-D	UL/CSA standard
	739870-F	VDE standard
	739870-R	AS standard
	739870-Q	BS standard
	739870-H	GB standard, Complied with CCC

Safety Precautions

To use the instrument safely and effectively, be sure to observe the precautions given in the user's manual.

The following symbols are used on this instrument.

Warning: handle with care. Refer to the user's manual or service manual. This symbol appears on dangerous locations on the instrument which require special instructions for proper handling or use. The same symbol appears in the corresponding place in the manual to identify those instructions.

Direct current

Stand-by (power)

Recycle

Ni-MH

Double insulation mark (equipment protected throughout by double insulation or reinforced insulation)

Waste Electrical and Electronic Equipment (WEEE), Directive 2002/96/EC

This product complies with the WEEE Directive (2002/96/EC) marking requirement.

The affixed product label (see below) indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category

With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product. Do not dispose in domestic household waste. To return unwanted products, contact your local Yokogawa Europe B. V. office.

Be sure to comply with the precautions below. Not complying might result in injury or death.

WARNING

Use the Correct Power Supply

Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the AC adapter and that it is within the maximum rated voltage of the provided power cord.

Use the Correct Power Cord

Use only the power cord that comes with the instrument. Do not use it for other devices.

Use the Correct AC Adapter

Use only the AC adapter specified for the instrument. Do not use it for other devices.

Use Only the Designated Battery

Use only the battery specified for the instrument. Do not use it for other devices.
Use only this instrument or a charger specified by YOKOGAWA to charge the battery. If the charging of the battery does not complete within a specified time, stop charging the battery immediately.
Because the electrolyte solution inside the battery is alkaline, harm can be done to the clothes or skin, if the battery leaks or explodes and the solution comes in contact. If the electrolyte solution enters the eye, it can cause blindness. In such cases, do not rub the eye. Rinse thoroughly with water and immediately consult your eye doctor.
To prevent the possibility of electric shock and accidents, always turn OFF the power switch and remove the AC adapter power supply from the instrument when replacing the Ni-MH battery.
Do not throw the battery into fire or apply heat to it. This can cause dangerous explosions or spraying of the electrolytes.

Do Not Look at the Laser Light

Do not look at the laser's direct ray, reflected ray from a mirror, or indirect ray without the proper protective eyewear. In addition, avoid being exposed to the laser light. It can cause blindness or damage to the eye.

Do Not Operate in an Explosive Atmosphere

Do not use the thermocouple in a location where any flammable or explosive gas/vapor is present. Operation in such an environment constitutes a safety hazard.

Safety Precautions for Laser Products

This instrument uses a laser light source. This instrument is a Class 1M laser product as defined by EN60825-1 Safety of Laser Products-Part 1: Equipment Classification, Requirements and User's Guide. In addition, the AQ7270 complies with 21CFR1040.10 except for the items that deviate from the standard as a result of complying with Laser Notice No.50 dated on July 26, 2001.

INVISIBLE LASER RADIATION
DO NOT VIEW DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 1M LASER PRODUCT

MODEL	Class	Center Wavelength	Output Power
735020	1M	1550 nm	CW: ≤ 5 mW@1550 nm PULSE: ≤ 200 mW@1550 nm PULSE width: ≤ 20 us@1550 nm (duty cycle: ≤ 2.5%)
735021	1M	1650 nm	CW: ≤ 5 mW@1650 nm PULSE: ≤ 32 mW@1650 nm PULSE width: ≤ 20 us@1650 nm (duty cycle: ≤ 2.5%)
735022	1M	1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)
735023	1M	1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)
735024	1M	1550/1625 nm	CW: ≤ 5 mW@1550/1625 nm PULSE: ≤ 200 mW@1550/1625 nm PULSE width: ≤ 20 us@1550/1625 nm (duty cycle: ≤ 2.5%)
735025	1M	1310/1490/1550 nm	CW: ≤ 5 mW@1310/1490/1550 nm PULSE: ≤ 200 mW@1310/1490/1550 nm PULSE width: ≤ 20 us@1310/1490/1550 nm (duty cycle: ≤ 2.5%)
735026	1M	1310/1550/1625 nm	CW: ≤ 5 mW@1310/1550/1625 nm PULSE: ≤ 200 mW@1310/1550/1625 nm PULSE width: ≤ 20 us@1310/1550/1625 nm (duty cycle: ≤ 2.5%)
735027	1M	1310/1550/1650 nm	CW: ≤ 5 mW@1310/1550/1650 nm PULSE: ≤ 200 mW@1310/1550 nm PULSE: ≤ 32 mW@1650 nm PULSE width: ≤ 20 us@1310/1550/1650 nm (duty cycle: ≤ 2.5%)
735028	1M	1310/1550/1625 nm	CW: ≤ 5 mW@1310/1550/1625 nm PULSE: ≤ 200 mW@1310/1550/1625 nm PULSE width: ≤ 20 us@1310/1550/1625 nm (duty cycle: ≤ 2.5%)
735029	1M	850/1300 nm	PULSE: ≤ 50 mW@850 nm,PULSE: ≤ 100 mW@1300 nm PULSE width: ≤ 1 us@850 nm (duty cycle: ≤ 5%) ≤ 5 us@1300 nm (duty cycle: ≤ 0.6%)
735030	1M	850/1300 nm	PULSE: ≤ 50 mW@850 nm,PULSE: ≤ 100 mW@1300 nm PULSE width: ≤ 1 us@850 nm (duty cycle: ≤ 5%) ≤ 5 us@1300 nm (duty cycle: ≤ 0.6%)
		1310/1550 nm	CW: ≤ 5 mW@1310/1550 nm PULSE:≤ 200 mW@1310/1550 nm PULSE width: ≤ 20 us@1310/1550 nm (duty cycle: ≤ 2.5%)

If the instrument is used in a manner not specified in this manual, the protection provided by the instrument may be impaired. Yokogawa Electric Corporation assumes no liability for the customer's failure to comply with these requirements.

Conventions Used in This Manual

Markings

The following markings are used in this manual.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the users manual for special instructions. The same symbol appears in the corresponding place in the user' s manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

CAUTION Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note Calls attention to information that is important for proper operation of the instrument.

Subheadings

On pages that describe the operating procedures in chapters 4 through 17, the following symbols, displayed characters, and terminology are used to distinguish the procedures from their explanations.

Procedure Carry out the procedure according to the step numbers. All procedures are written with inexperienced users in mind; experienced users may not need to carry out all the steps.

Explanation This section describes the setup items and the limitations regarding the procedures. It may not give a detailed explanation of the function. For a detailed explanation of the function, see chapter 2.

Displayed Characters and Terminology Used in the Procedural Explanations

Panel Keys and Soft keys

Bold characters used in the procedural explanations indicate characters that are marked on the panel keys or the characters of the soft keys or menus displayed on the screen.

SHIFT+Key

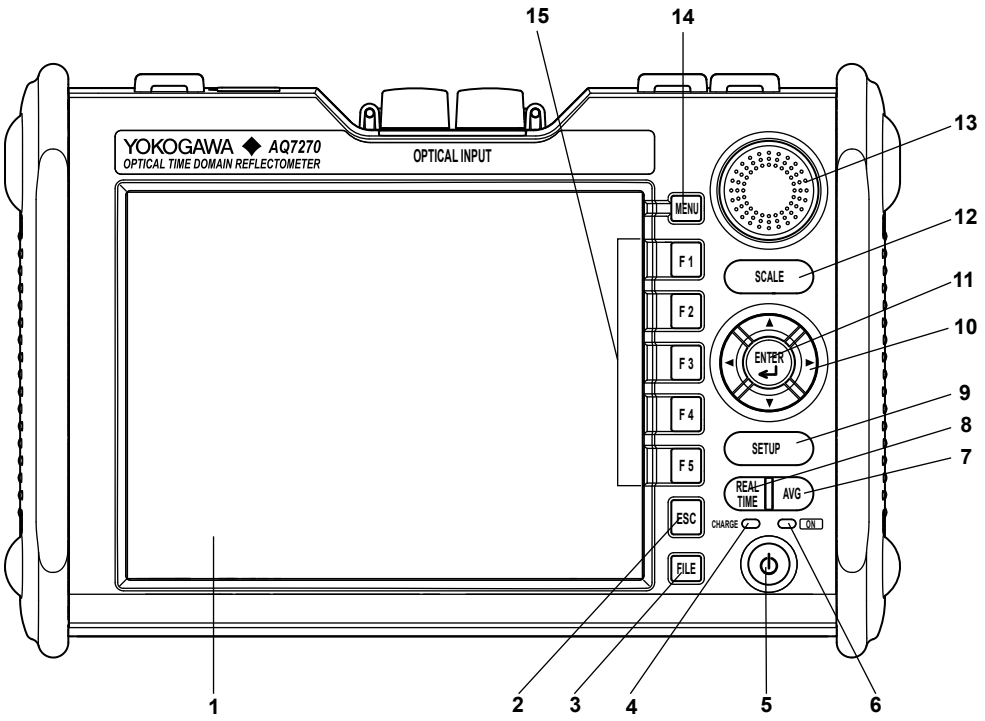
SHIFT+key means you will press the SHIFT key to turn ON the SHIFT key followed by the panel key. The setup menu marked in purple below the panel key that you pressed appears on the screen.

Unit

k	Denotes 1000. Example: 12 kg, 100 kHz

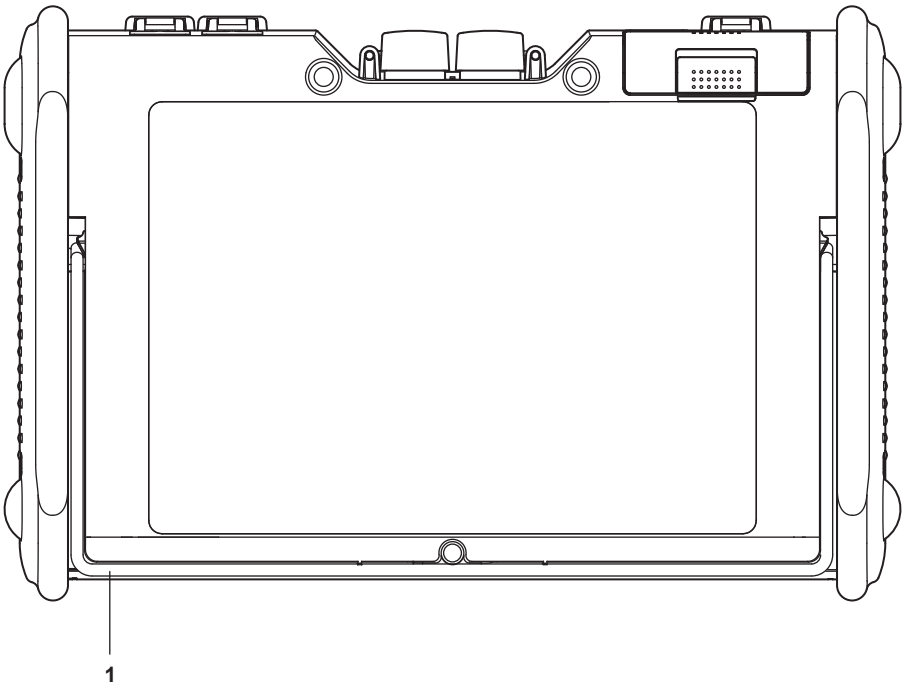
Contents

1.1 Front Panel



Number	Name	Function
1	LCD	Displays the measured waveforms, measurement conditions, etc.
2	ESC key	Cancels an operation or returns to the previous display.
3	FILE key	Operate files and print waveforms
4	CHARGE lamp	Illuminates while the battery pack is being charged(Green). Turns off when the charging of the battery pack is complete. Blinks when the battery pack cannot be charged(Green).
5	POWER switch	Turns the instrument on/off
6	POWER lamp	Illuminates while the instrument is turned on(Green). When the battery level is low(Red).
7	AVERAGE key	Starts or stop the averaging measurement.
8	REALTIME key	Starts or stop the realtime measurement.
9	SETUP key	Sets measurement conditions and system configuration.
10	Arrow keys	Moves, expands, and reduces waveforms, moves cursors, etc.
11	ENTER key	Confirms the operation
12	SCALE key	Expands, reduces, and moves waveforms.
13	Rotary knob	Moves cursors and markers, sets values, etc.
14	MENU key	Returns to the initial screen at startup. (Selects OTDR, optical power monitor, light source, and one-button measurement.)
15	Soft keys	Executes functions that are assigned to the soft keys displayed at the right edge of the LCD.

1.2 Rear Panel



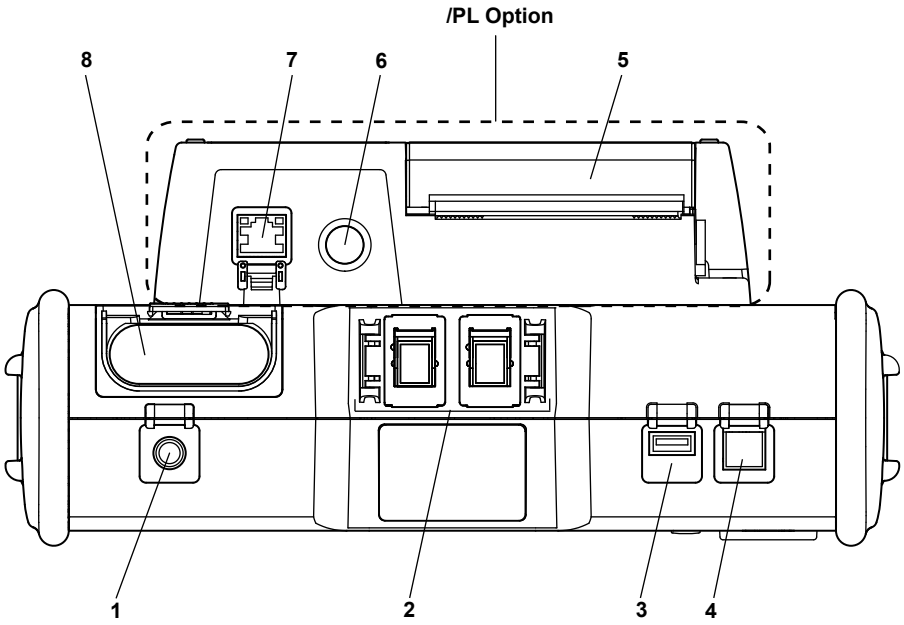
Number	Name	Function
1	Stand	Tilts the instrument.

Note

- The /PL option does not come with a stand.
- Use the stand only to tilt the AQ7270.
- If you are tilting the AQ7270, check that the stand is fixed in place.

1.3 Side Panel

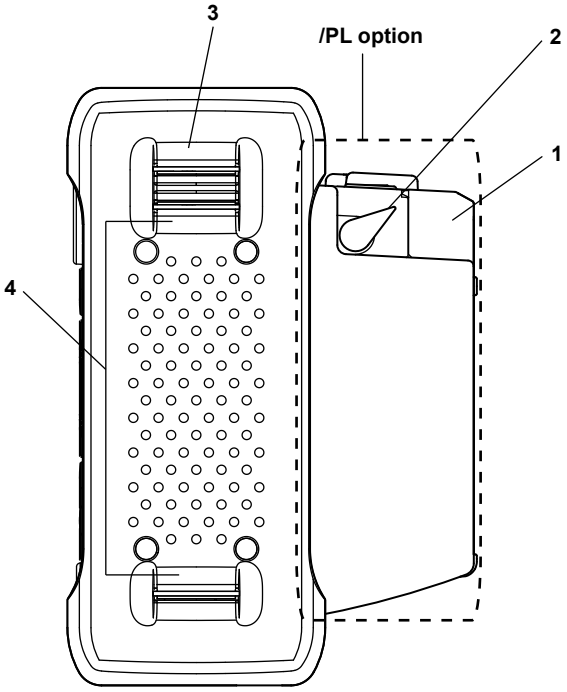
Top View



Number	Name	Function
1	DC power connector	Connects the AC adapter.
2	Optical connector	Connects the optical fiber cable. *1
3	USB 1.1 connector (Type A)	Connects a USB memory, USB printer, etc.
4	USB 1.1 connector (Type B)	Used for remote control, storage, etc.
5	Internal printer	Prints waveforms and event lists.(/PL option)
6	Printer paper feed button	Feeds the paper.(/PL option)
7	Ethernet connector	Used for remote control.(/PL option)
8	Battery pack storage	Stores the battery pack.

*1 The /PM option supports only PORT1. PORT2 (MMF) and 1650-nm wavelength are not supported.

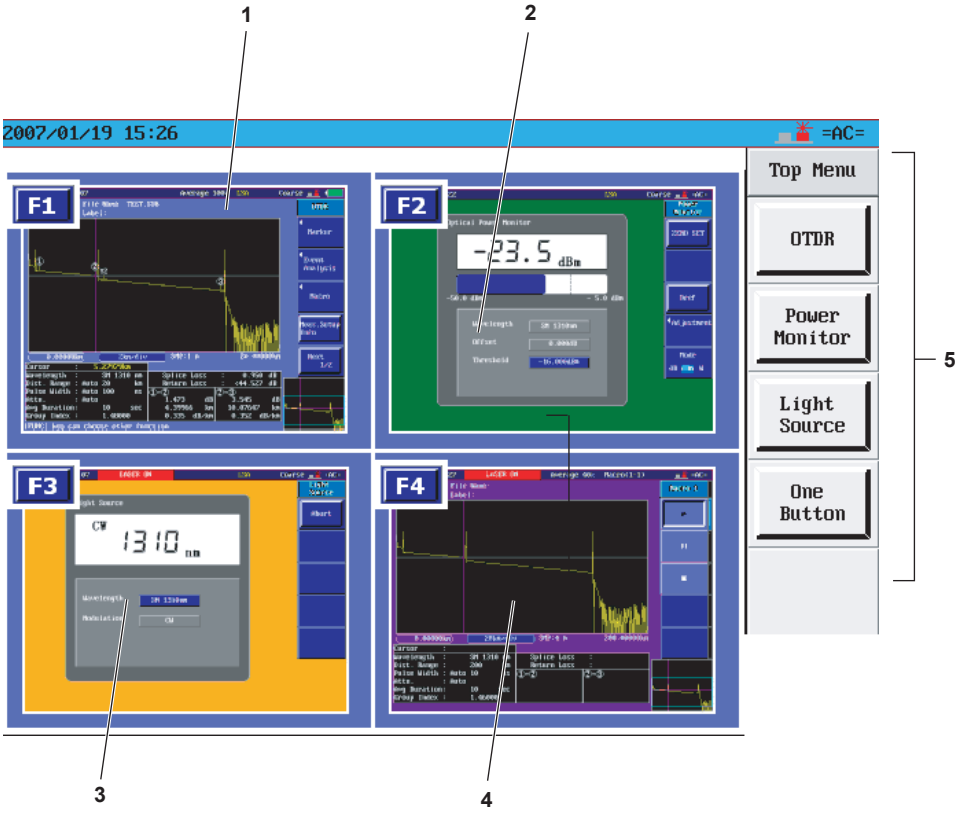
Right View



Number	Name	Function
1	Printer cover	Stores the paper.
2	Lock lever	Fixes the printer cover in place.
3	Shoulder belt bracket	Attaches the shoulder belt.
4	Hand belt bracket	Attaches the hand belt.

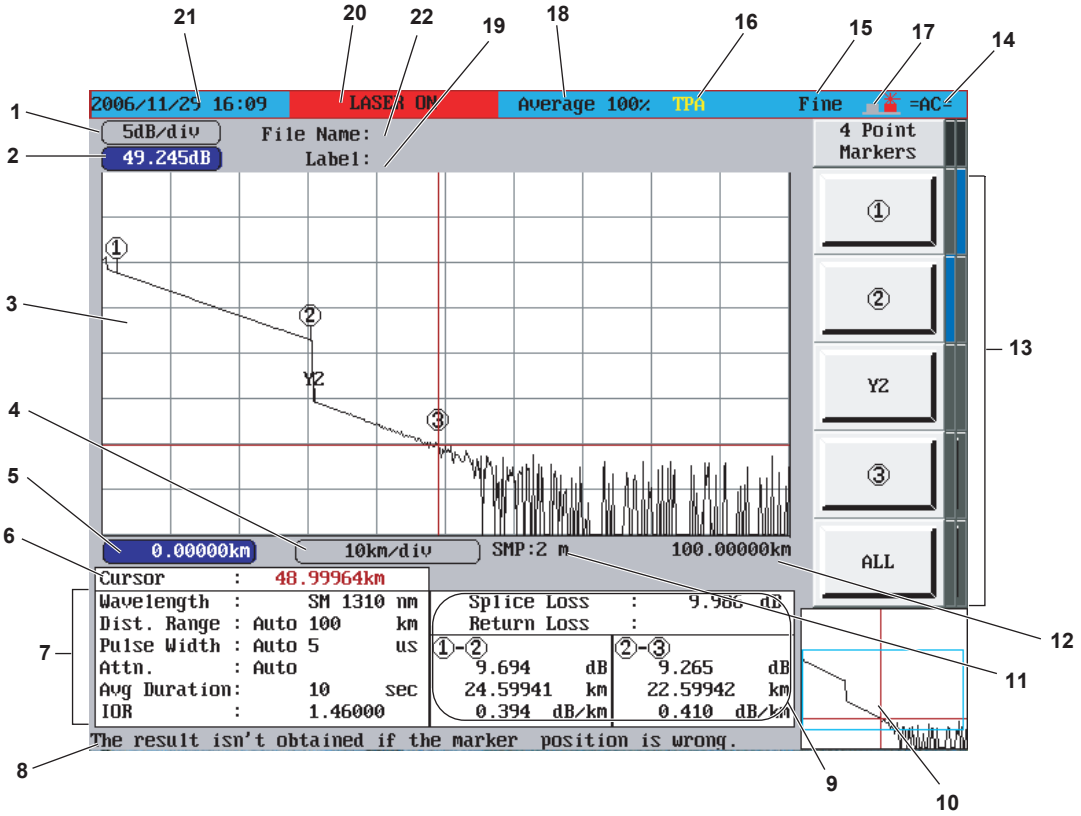
1.4 Display

Top



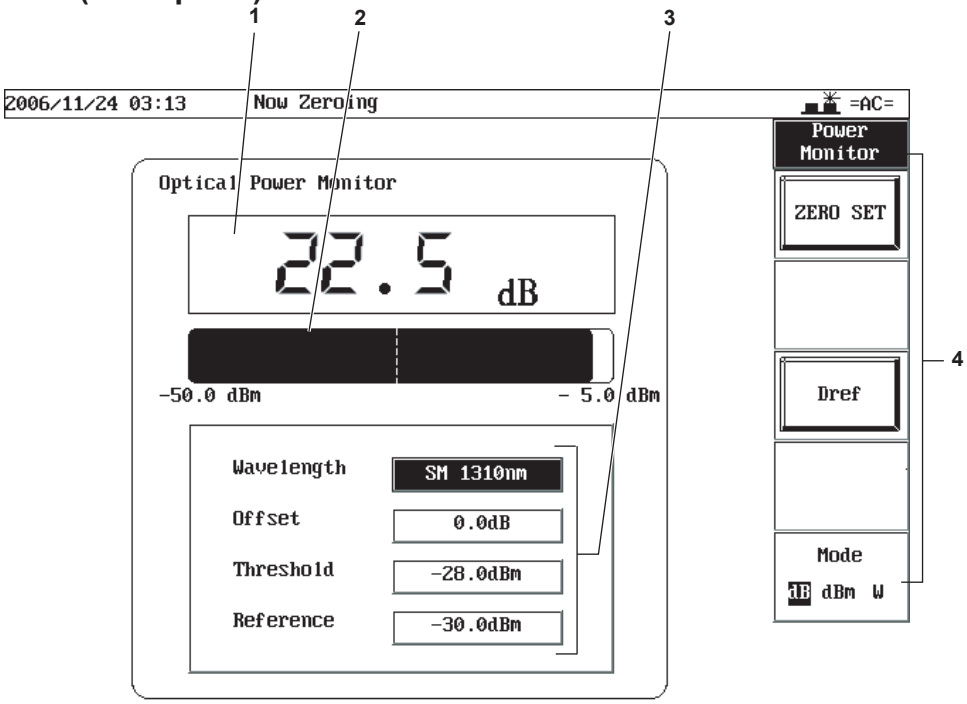
Number	Function
1	Optical pulse measurement (OTDR) screen.
2	Optical power monitor screen (/PM option).
3	Light source screen (/LS option).
4	One-button measurement screen.
5	Displays the soft key menu.

Optical Pulse Measurement (OTDR)



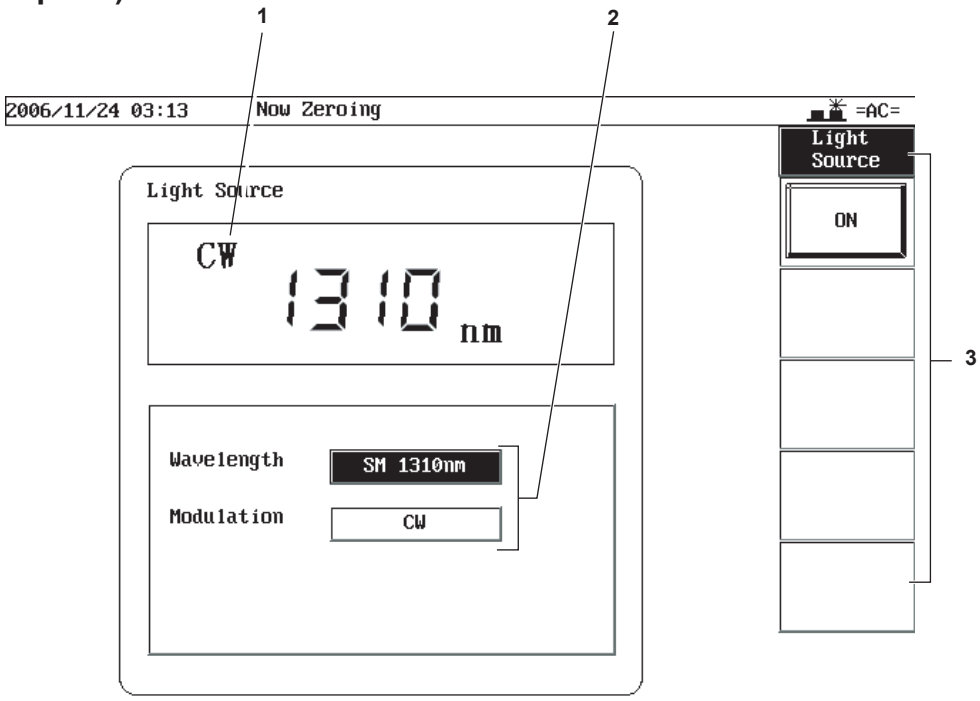
Number	Function
1	Displays the value per scale mark on the vertical axis.
2	Shows the display start level of the vertical axis (top edge of the waveform display area)
3	Waveform display area
4	Displays the value per scale mark on the horizontal axis.
5	Shows the display start distance of the horizontal axis (left edge of the waveform display area)
6	Displays the distance from the measurement reference point of the horizontal axis to the cursor position.
7	Displays the measurement conditions.
8	Displays an explanation of the function
9	Displays the computed result of the measured data.
10	Displays the full screen of the waveform display area. The section displayed in the waveform display area is indicated with a frame (overview).
11	Displays the sampling resolution.
12	Shows the display end distance of the horizontal axis (right edge of the waveform display area)
13	Displays the soft key menu.
14	Displays the type of power in use (battery or AC adapter)
15	Displays the cursor movement setting.
16	Displays the approximation method.
17	Displays in red the connector in which the optical pulse is output.
18	Displays the progress of the averaging measurement (AVE).
19	Label area
20	Displays the operating status of the instrument
21	Displays the year, month, day, and time.
22	FILE name area

Optical Power Monitor(/PM option)



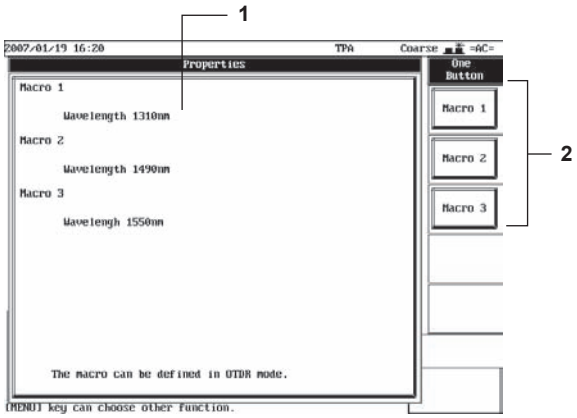
Number	Function
1	Displays numerically the optical input power value.
2	Displays a graph of the optical input power value.
3	Measurement condition display area
4	Soft key menu

Light Source(/LS option)



Number	Function
1	Displays the wavelength value.
2	Measurement condition display area
3	Soft key menu

One-Button Measurement

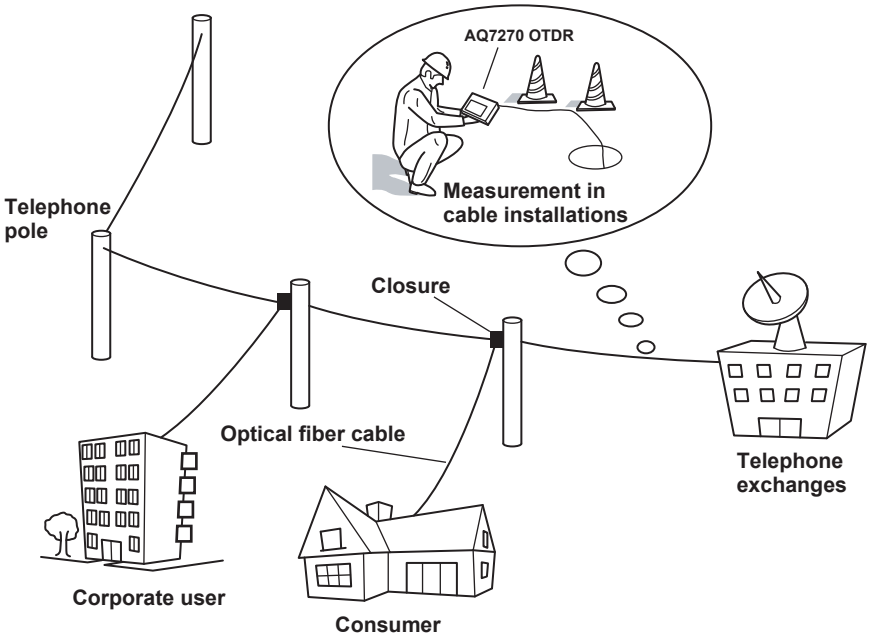


Number	Function
1	Displays the contents of the macro that is being defined (used to enter the macro while viewing the contents).
2	Soft key menu

2.1 Measurement Configuration

Overview of the AQ7270

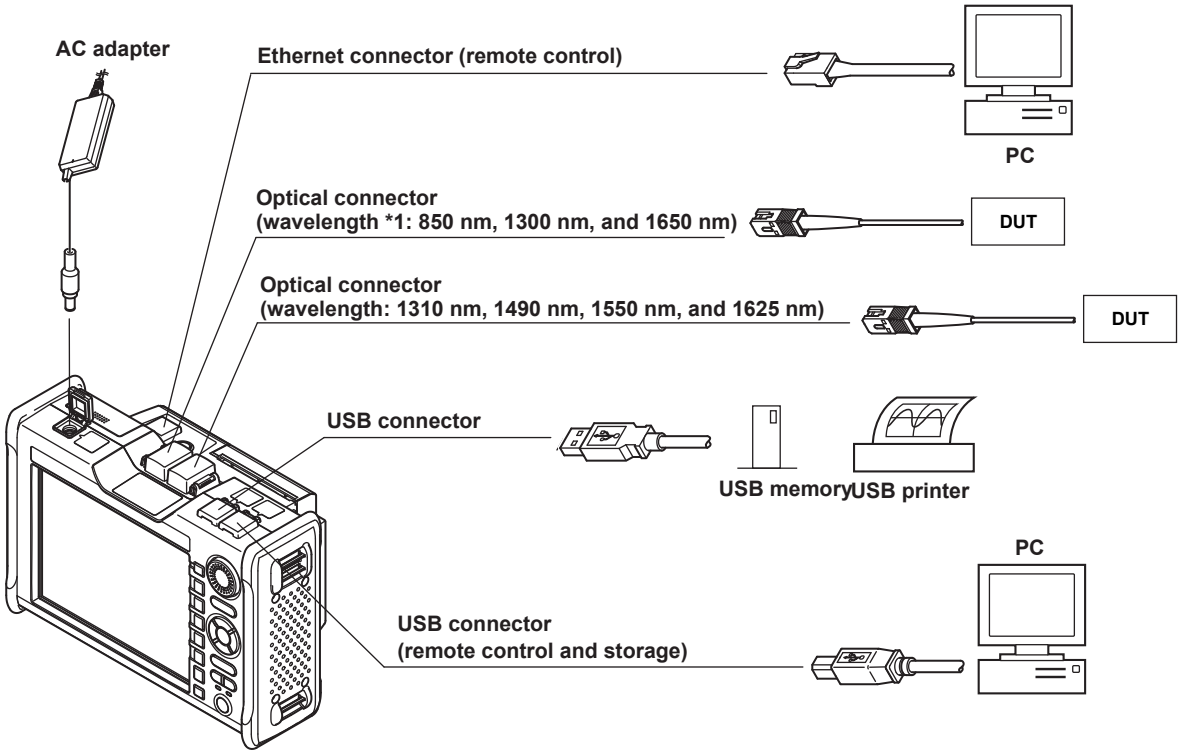
The AQ7270 is an optical time domain reflectometer that measures optical fiber lengths and losses and identifies failure locations. It is mainly used in the optical fiber installation and maintenance servicing of access networks (communications links between telephone exchanges and telephone poles) and user networks (communications links between user sites and telephone poles). The light source and optical power monitor functions can also be used as options.



Analysis Using the Emulation Software

The waveform data that is measured by the AQ7270 can be analyzed on your PC using the AQ7932 OTDR emulation software (version 3.0 or later). The software comes with a report creation wizard that is convenient in creating construction reports.

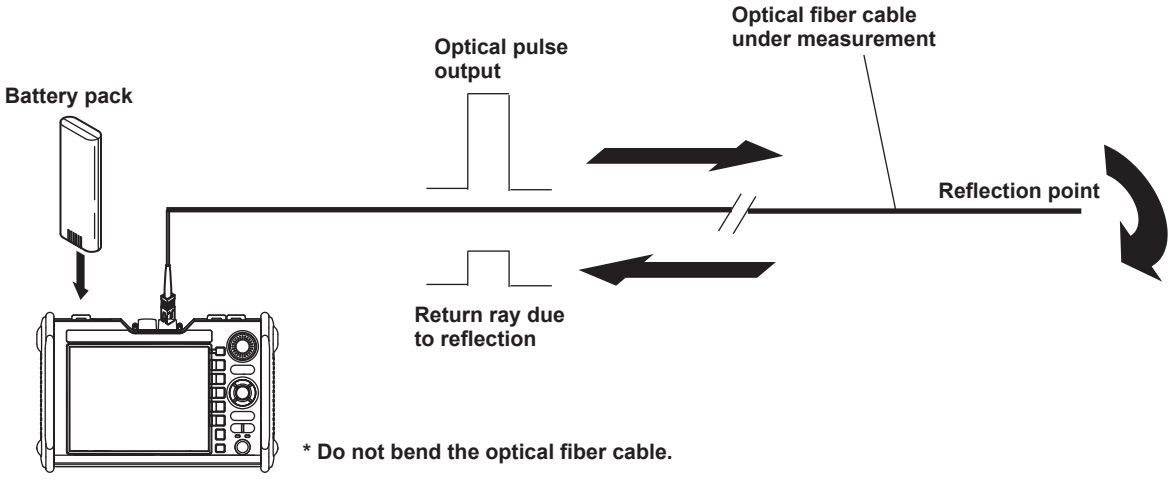
Configuration of Peripheral Devices



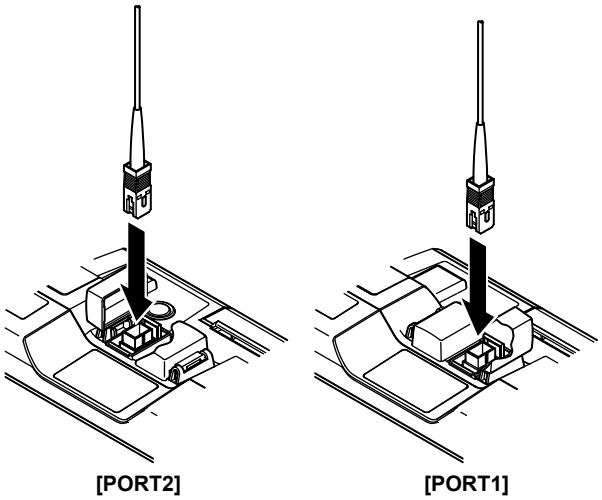
*1 The 735021 outputs 1650 nm from PORT1. The 735029 outputs 850 nm and 1300 nm from PORT1. The /PM option supports only PORT1. PORT2 (MMF) and 1650-nm wavelength are not supported.

Optical Pulse Measurement (OTDR) Configuration

Install the battery pack and connect the optical fiber cable under measurement.



There are two optical connectors on the top panel of the AQ7270.Because the connector that delivers the optical pulse is fixed depending on the wavelength, connect the cable to the appropriate connector according to the condition of the optical fiber cable to be measured. You can view the indicator shown on the display (see page 1-5) to choose the appropriate connector.



This also applies when using the optional optical power monitor or light source function.

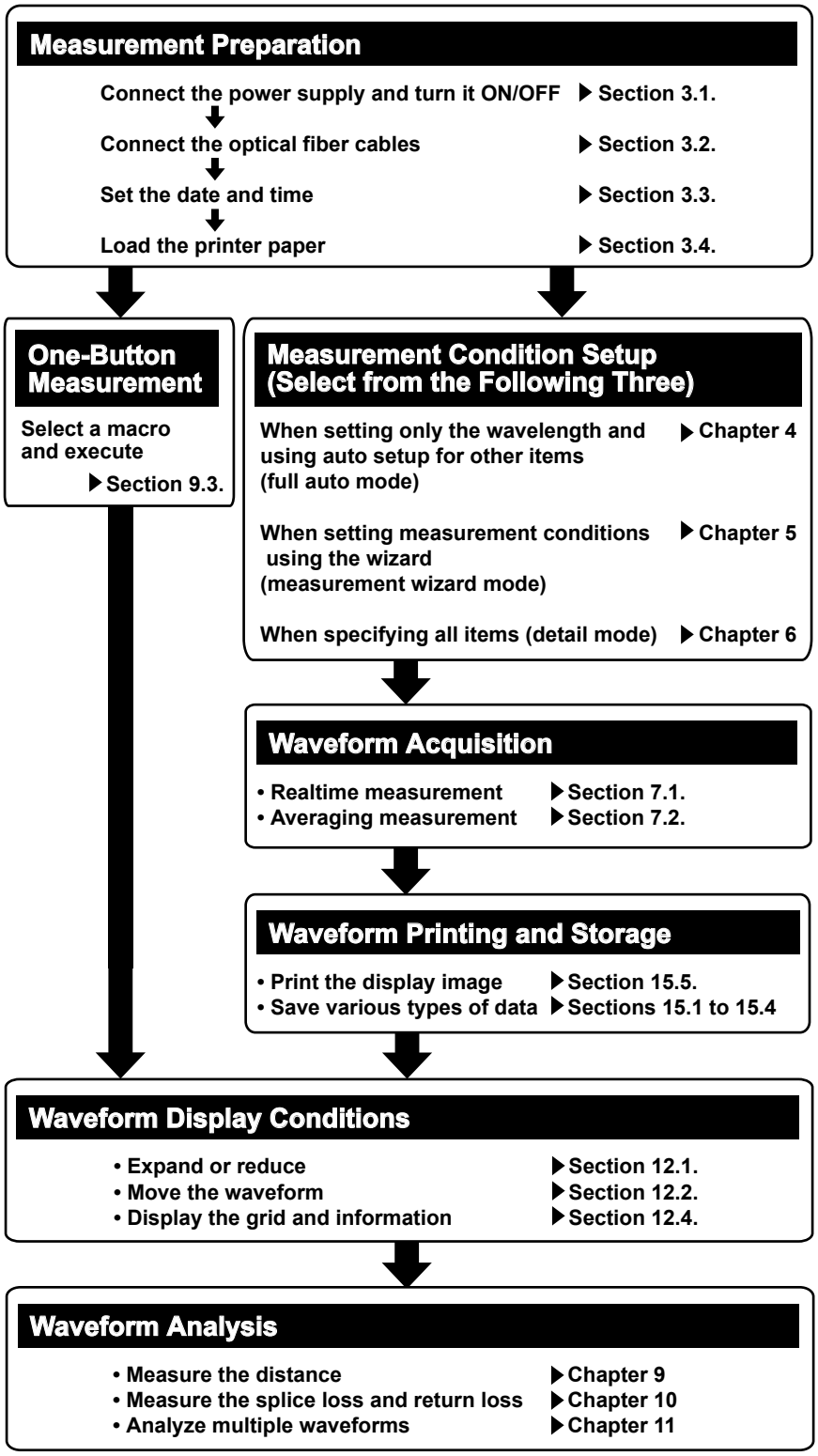
Note

- The 735021 outputs 1650 nm from PORT1.
- The 735029 outputs 850 nm and 1300 nm from PORT1.
- The /PM option supports only PORT1. PORT2 (MMF) and 1650-nm wavelength are not supported.

2.2 Measurement Procedure

Flow of Operation

The figure below is provided to familiarize the first-time user with the general flow of the AQ7270 operation. For details on each item, see the relevant section or chapter.



One-Button Measurement <<For procedures, see section 9.3.>>

If you enter the settings such as the optical pulse measurement conditions, waveform acquisition mode, and data format for storage in advance, you can carry out the measurement and storage through a single-step operation. If you enter multiple sets of settings such as the wavelengths to be measured, you can carry out measurements sequentially using different measurement conditions through one-step operation.

Easy Setting of Measurement Conditions

There are three modes for setting the measurement conditions: Detail, Measurement Wizard, and Full Auto.

In Detail mode, the user sets each measurement condition as in the past.

In Measurement Wizard mode, a wizard is displayed when the user sets each measurement condition. This feature is convenient for users that are not used to the work.

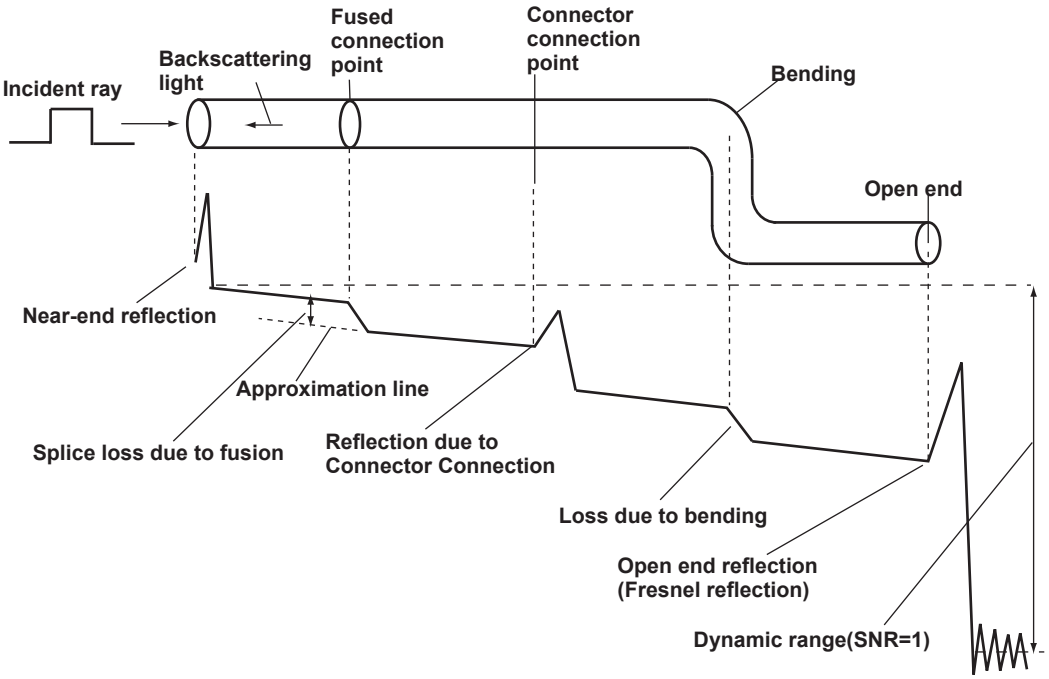
In Full Auto mode, all optical pulse measurement conditions are automatically set when you select the wavelength to be measured, and the measured waveform is displayed. This feature is convenient when you are not sure about the installation conditions of the optical fiber cable.

Waveform Acquisition and Measurement Using Markers and Cursors

The AQ7270 has the following two measurement functions.

- Acquire the waveform
- Position markers or cursors on the acquired waveform and measure the values.

2.3 Viewing the Optical Pulse Measurement Waveform



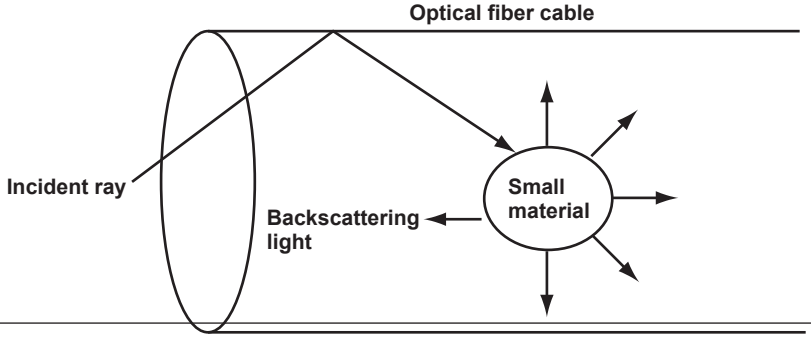
An optical pulse that enters the optical fiber cable incurs loss due to reflection at the connection points, etc. The measured result is displayed with the distance along the horizontal axis and loss level along the vertical axis. Waveform refers to the display of this result on the AQ7270. The losses and reflections detected on the waveform are called events.

Near-End Reflection

A reflection occurs in the connection point between the AQ7270 and the connector for the optical fiber cable. This section also includes the internal reflection of the OTDR. Losses and reflections of the connection points cannot be detected in the section in which this reflection is detected. This section is called a near-end dead zone. If the near-end reflection affects the measurement of a short distance, connect a dummy fiber provided as an option to clear the effects.

Loss by the Optical Fiber Cable due to Rayleigh Scattering

When light propagates through the optical fiber cable, a phenomenon called Rayleigh Scattering occurs due to the nonuniformity of the density or constituents of materials smaller than the wavelength unit. The scattered light that is transmitted opposite to the direction of propagation is called backscattering light.

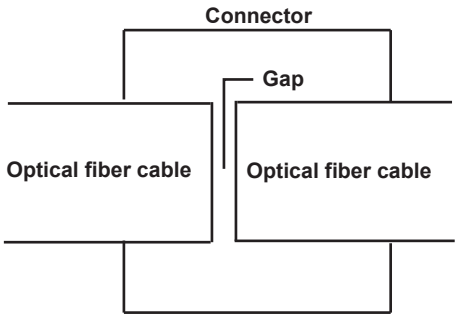


Splice Loss due to Fusion

Because the unevenness in the density or constituents of the materials in the fused section becomes large, the loss due to Rayleigh Scattering increases, and a splice loss occurs.

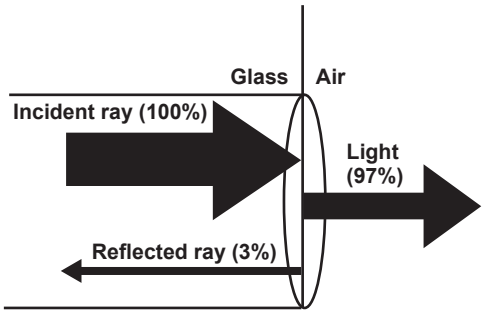
Reflection due to Connector Connection

Unlike the fused section, a slight gap occurs in the connection section of connectors. Because the group refraction index changes in this gap, a reflection occurs causing a loss.



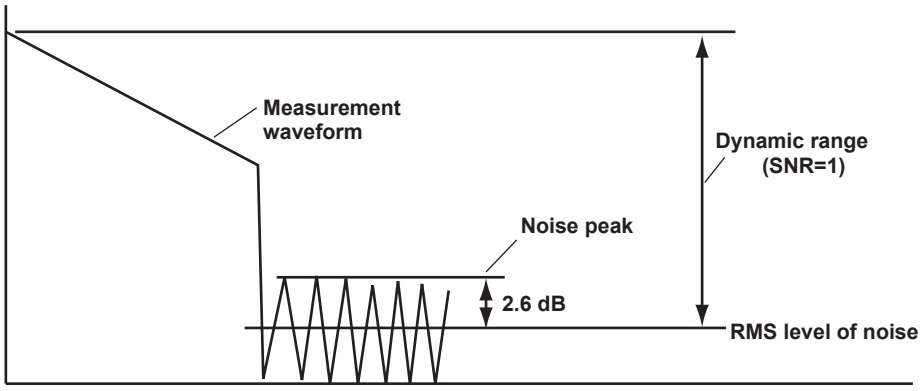
Fresnel Reflection at the Far End of the Optical Fiber Cable

Fresnel reflection occurs at the location where the optical fiber cable is broken or a location where the group refraction index changes such as the far end of the cable (glass and air) when light enters the cable. If the end face of the optical fiber cable is vertical, approximately 3 % (–14.7 dB) of the incident light power is reflected.



Dynamic Range

The backscattering light level that the AQ7270 can measure.



2.4 Distance Measurement

Accuracy

The AQ7270 calculates the distance (L) by measuring the time until the transmitted light pulse returns and using the equation indicated below.

$L = C \times T/(2N)$ [m]

C: The speed of light travelling through a vacuum.

T: The time from when the pulse is transmitted until the light returns.

N: Group refraction index

The reason why the equation divides by 2 is because the round-trip time of the optical pulse is measured.

An error will occur in the distance measurement unless an accurate group refraction index is specified.

Group Refraction Index Settings

The following group refraction indexes are assigned according to the wavelength on the AQ7270.

850 nm: 1.46000
1300 nm: 1.46000
1310 nm: 1.46000
1490 nm: 1.46000
1550 nm: 1.46000
1625 nm: 1.46000
1650 nm: 1.46000

The selectable range is 1.30000 to 1.79999.

For the accurate group refraction index, check with the manufacturer of the optical fiber cable.

Optical Fiber Cable Length and Distance Range

Select a distance range that is longer than the optical fiber cable you want to measure. If the distance range is longer, the measurement time also increases accordingly.

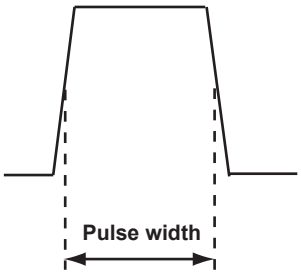
Cable Length	Distance Range
Unknown	Auto
0 to 400 m	500 m
400 m to 800 m	1 km
800 m to 1.6 km	2 km
1.6 km to 4 km	5 km
4 km to 8 km	10 km
8 km to 16 km	20 km
16 km to 40 km	50 km
40 km to 80 km	100 km
80 km to 160 km	200 km
160 km to 240 km	300 km

Selectable Pulse Widths for the Distance Measurement

The pulse width has the following characteristics.

Short pulse width: Allows events (reflection point and loss) that are close together to be measured separately. However, long distance cannot be measured.

Long pulse width: Long distance can be measured. However, multiple events that are close together may appear as a single event.



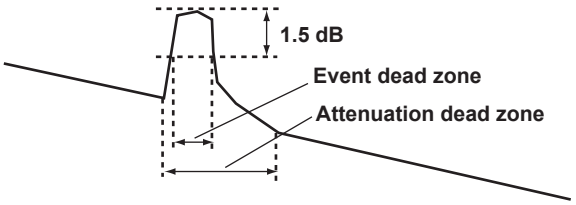
Distance Range	Selectable Pulse Widths
500 m	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns
1 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
2 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
5 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
10 km, 20 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
50 km or longer	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs, 2 μs, 5 μs, 10 μs, 20 μs

If the wavelength is 850 nm, you cannot use 3ns, 2 μs, 5 μs, 10 μs, and 20 μs.
If the wavelength is 1300 nm, you cannot use 3ns, 10 μs and 20 μs.

Dead Zone in Which the Distance Cannot Be Measured

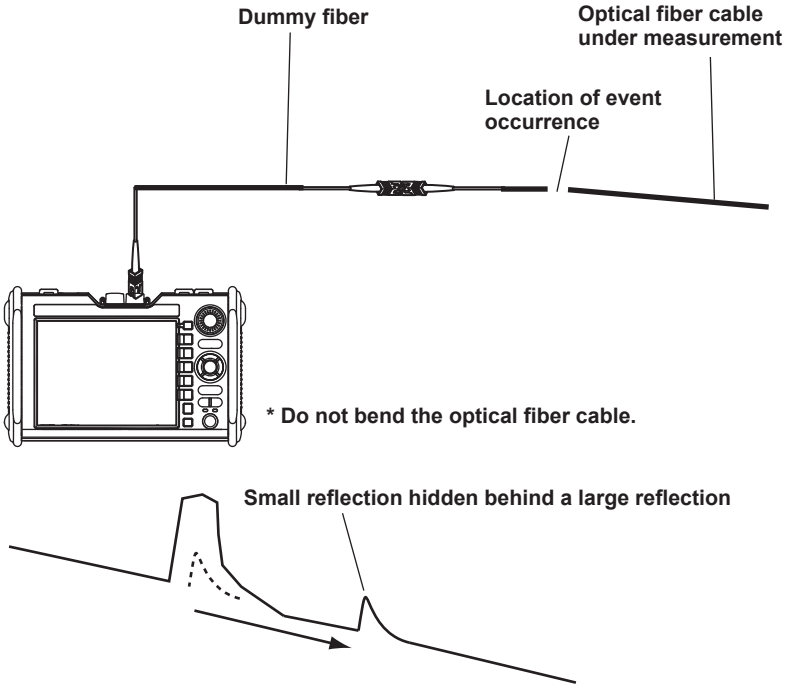
The locations where measurements cannot be made due to the effects of connection point of connectors, etc. The following types of dead zones are available.

- Event dead zone
  Area in which two reflections that are close together cannot be separated. A zone defined by a pulse width whose level is 1.5 dB less than the peak value.
- Attenuation dead zone
  A zone in which the splice loss cannot be measured due to a large reflection nearby.



Circumventing the Near-End Dead Zone Using a Dummy Fiber

Losses and reflections of the connection points cannot be detected in the section in which a near-end reflection is detected. When measuring a short distance, connect the dummy fiber to move the events that are hidden behind the near-end reflection by the length of the dummy fiber.



The AQ7270 OTDR product series allow a 100-m dummy fiber to be built in (/DF option).

3.1 Connecting the Power Supply

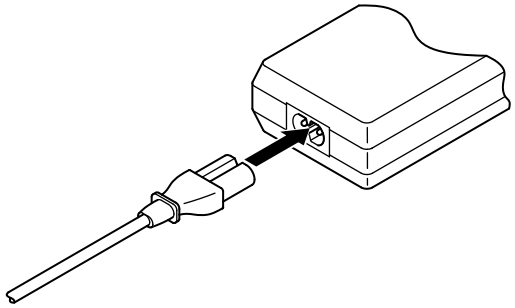
Using the AC Adapter

WARNING

Make sure that you observe the following points before connecting the AC adapter. Failure to do so may cause electric shock or damage to the instrument.

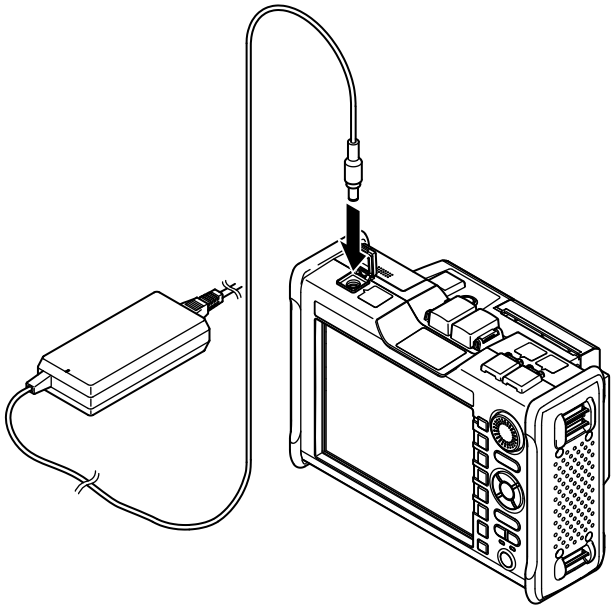
- Check that the AQ7270 is turned OFF before connecting the AC adapter.
- Use only the power cord supplied by YOKOGAWA for the instrument.
- Before connecting the power cord, ensure that the source voltage matches the rated supply voltage of the AC adapter and that it is within the maximum rated voltage of the provided power cord.
- Only use YOKOGAWA's AC adapters.
- When unplugging the power cord from the outlet, never pull the cord itself. Always hold and pull by the plug. If the power cord is damaged, contact your dealer for replacement.
- Do not plug or unplug the AC adapter while the instrument is turned ON.
- If you are using the instrument for an extended time with the AC adapter connected, remove the battery pack from the instrument.
- If you are not going to use the instrument for an extended time, unplug the power cord of the AC adapter from the outlet.
- Be sure nothing is placed on top of the AC adapter or power cord or let heat generating objects come in contact with them.
- If an AC outlet that matches the power cord provided is unavailable, do not use the instrument.

1. Connect the power cord to the AC adapter.



2. Connect the AC adapter plug to the instrument.

3. Connect the power plug to the outlet.

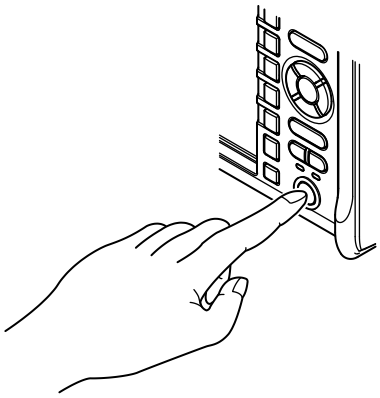


Note

If the DC power connector cover comes off, bend the axis section of the cover and attach it.

Turning the Power ON

4. Press the power switch on the front panel of the instrument. The POWER lamp illuminates.

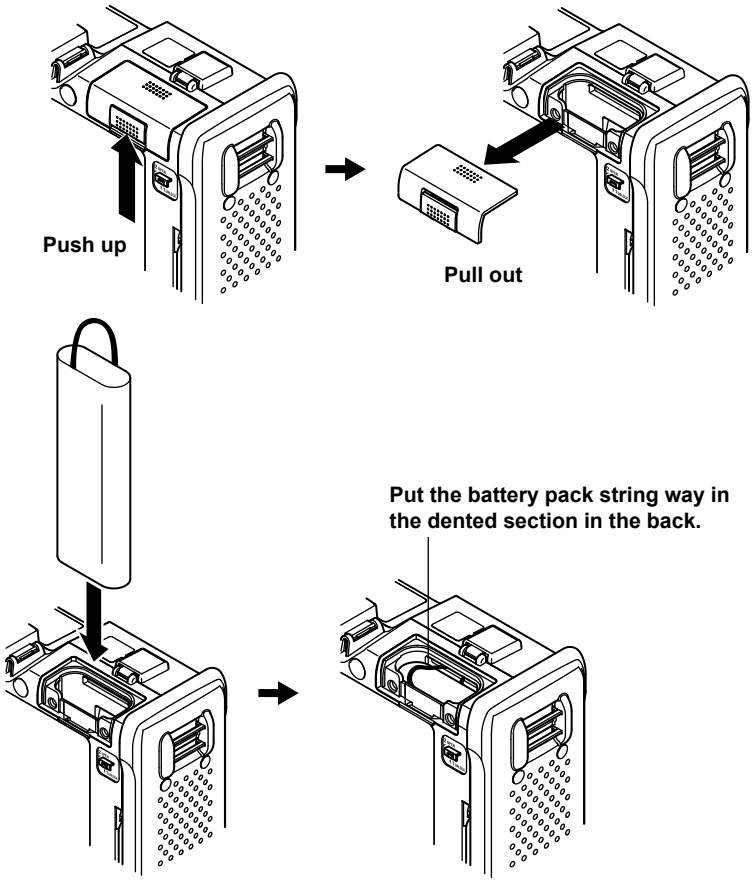


Using the Battery Pack

WARNING

- Do not load the battery pack while the instrument is turned ON.
- To prevent problems with the battery pack, periodically check the physical appearance for cracks, deformation, and leaks.
- Charge the battery pack using the instrument. Be sure to observe the environmental conditions when charging the battery pack. Otherwise, leaks, overheating, smoke, explosion, or fire may occur.

1. Push up the battery cover lock.
2. Pull out the battery cover while pushing the lock up.
3. Insert the battery pack. Pay attention to the direction.
4. Put the battery pack string way in the dented section in the back.
5. Close the battery pack cover and securely lock the battery cover.



Warm-up

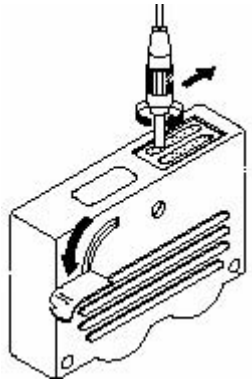
Allow the instrument to warm up for at least 30 minutes after turning ON the power. Sufficient warm-up produces more accurate measurements.

3.2 Connecting the Optical Fiber Cable

Cleaning the Connector End Face of the Optical Fiber Cable

Clean the connector end face of the optical fiber cable under measurement before connecting it to the AQ7270. If dust is adhered to the connector end face, it may damage the optical connector of the AQ7270. If this happens, the AQ7270 will not be able to make correct measurements.

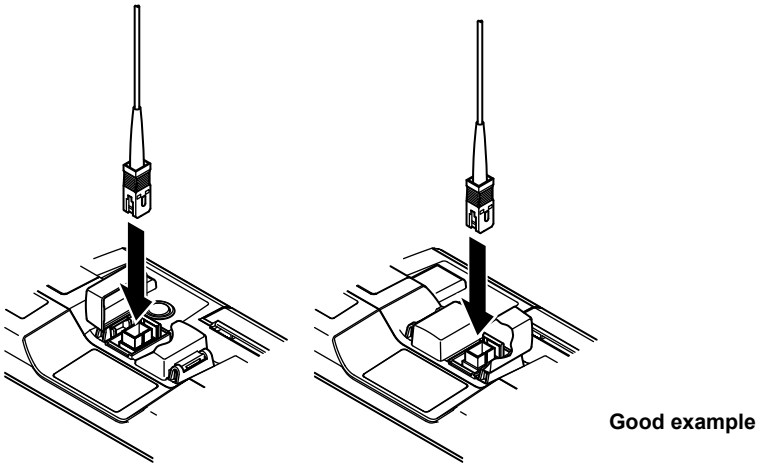
1. Press the connector end face of the optical fiber cable firmly against the cleaning surface of the cleaner.
2. Turn the cable around once with the end face pressed against the cleaner.
3. Rub the end face against the cleaner.
4. Repeat steps 1 to 3.



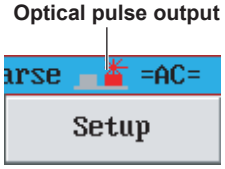
Note

- If you do not press the connector end face of the optical fiber cable firmly against the cleaner, the end face may not be cleaned completely.
- You can purchase an optical fiber connector cleaner from NTT-ME corporation.

Connecting the Optical Fiber Cable to the AQ7270



Good example



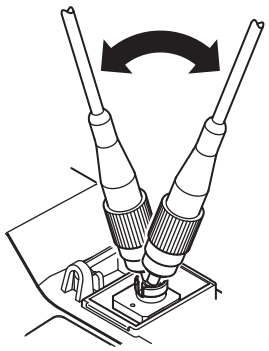
1. Open the optical connector cover at the top of the AQ7270.
2. Match the direction of the optical fiber cable connector to the optical connector, and insert it.

Note

- The connector to which the cable is to be connected varies depending on the wavelength. Connect the cable to the connector that is indicated by the red indicator at the top of the AQ7270 display.
- Power monitor measurement uses only PORT1.

CAUTION

When connecting the optical fiber cable connector, insert it vertically and slowly into the optical connector. If you tilt the connector or insert the connector by force, the optical connector may break.



Bad example

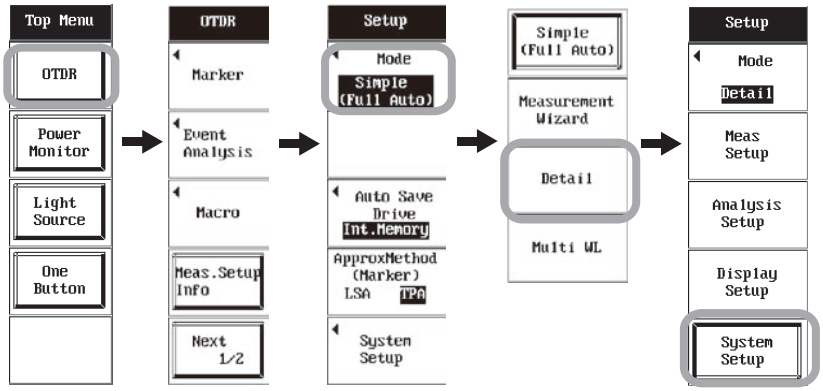
Note

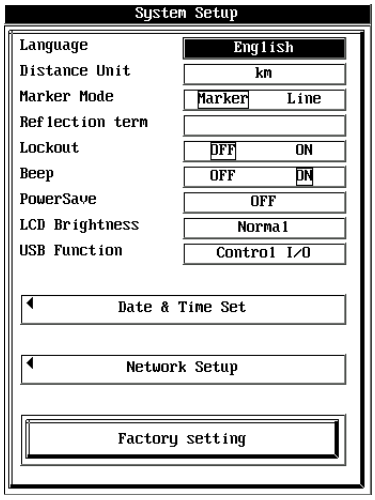
If the suffix code is -NON, -USC, or -UFC, attach the optical universal adapter. For details, see section 18.8.

3.3 Setting the Date and Time

Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. Soft keys for the settings appear.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. Soft keys for the Detail mode appear.
5. Press the **System Setup** soft key. The system setup screen appears.



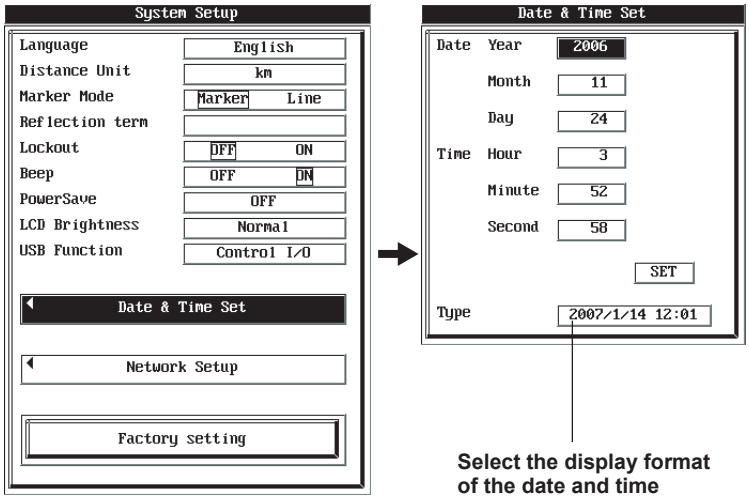


Note

- The setup menu does not appear even if you press SETUP if you press a soft key other than OTDR.
- You can also set the AQ7270 using Simple (Full Auto) mode.

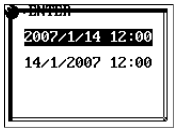
Selecting the Date and Time

6. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Date&Time Set.
7. Press **ENTER**. The screen for setting the date and time appears.
8. Move the cursor to the item you want to set using the **arrow keys** or the **rotary knob**.
9. Press **ENTER**. The screen for setting the value appears.
10. Turn the **rotary knob** to set the date or time value.
11. Press **ENTER**. The screen for setting the value closes.
12. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Setup.
13. Press **ENTER**. The date and time are set to the AQ7270.



Date and Time Display Format

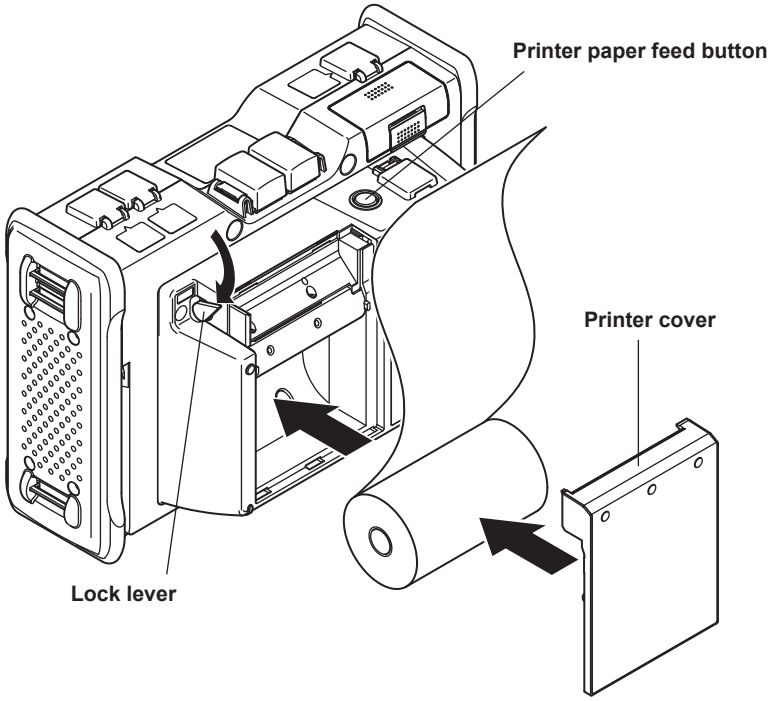
14. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Type.
15. Press **ENTER**. The screen for setting the type appears.
16. Move the cursor using the **arrow keys** or the **rotary knob** to select the type.
17. Press **ENTER**. The screen for setting the type closes.
18. Press **ESC**. The screen for setting the date closes.
19. Press **ESC**. The system setup screen closes.
20. Press **ESC**. The setup screen of the Detail mode closes, and the optical pulse measurement screen appears.



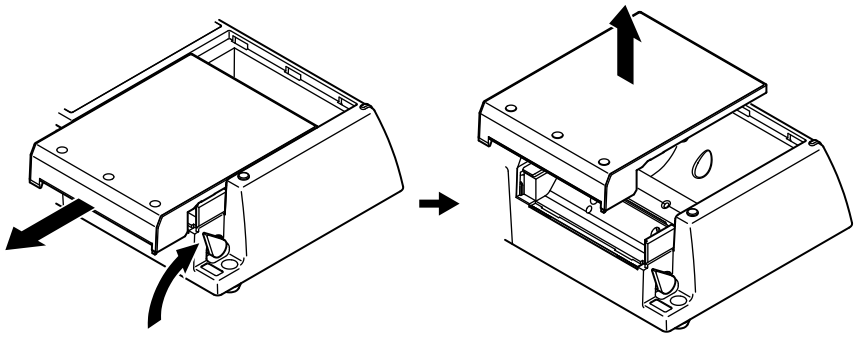
Note

The date and time values displayed in Type are examples. They do not indicate the actual date and time.

3.4 Loading the Printer Roll Paper (Option)



1. Push the lock lever toward the arrow and remove the printer cover.

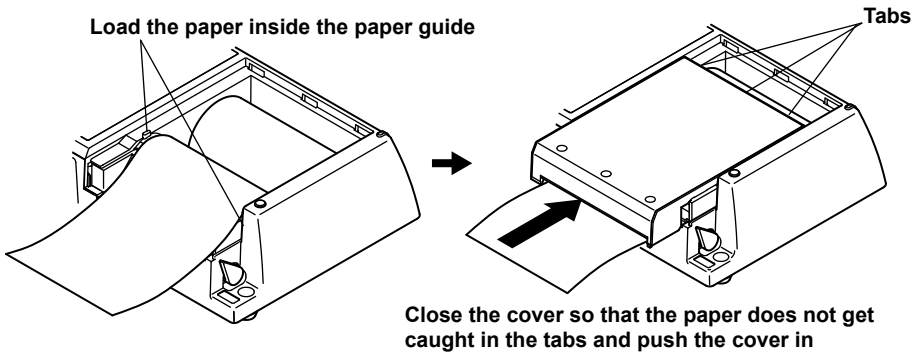


Push the lock toward the arrow and slide the cover

Pick up the cover and remove it

2. Load the printer roll paper. See the figure below for the orientation of the roll paper.

3. Attach the printer cover.



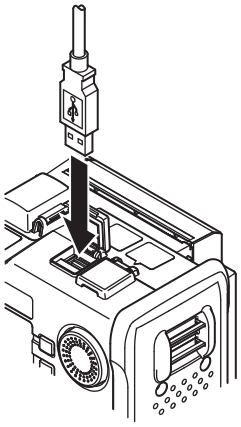
Close the cover so that the paper does not get caught in the tabs and push the cover in

4. Press the printer paper feed button to feed the paper to the appropriate position.

3.5 Connecting the USB Interface

Connecting a USB Printer or USB Memory

1. Open the top cover.
2. Connect a USB cable to the Type A connector.

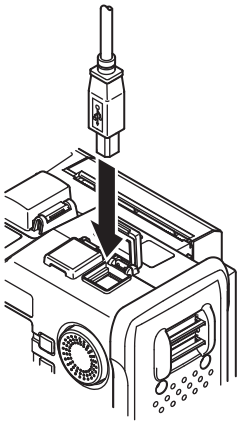


Note

A single USB printer can be connected. Multiple printers will not be detected.

Connecting a USB Cable to Remotely Control the AQ7270 or Accessing the Internal Memory

1. Open the top cover.
2. Connect a USB cable to the Type B connector.



Note

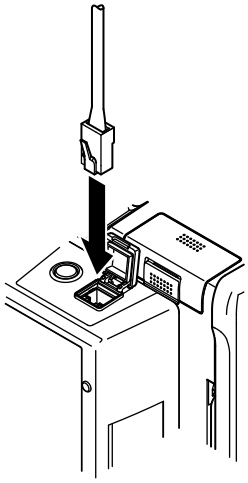
- If the cover comes off, bend the cover axis with your fingers and attach it.
- The system must be configured for operation. See section 17-1.

3.6 Connecting the Ethernet Interface (Option)

You can control the AQ7270 via the Ethernet interface.

Connection Procedure

Connect a UTP (Unshielded Twisted-Pair) cable or an STP (Shielded Twisted-Pair) cable that is connected to a hub, for example, to the AQ7270 connector.



Note

- Be sure to use a straight cable via a hub to connect the AQ7270 to the PC.
- If you are using a UTP cable (straight), use a cable of category 5.
- If the cover comes off, bend the cover axis with your fingers and attach it.
- The system must be configured for operation. See section 17-3.

3.7 Attaching the Belt

A hand belt is supplied as a standard accessory. On models with the /SB option, a shoulder belt is also included. This section explains how to attach the belt.

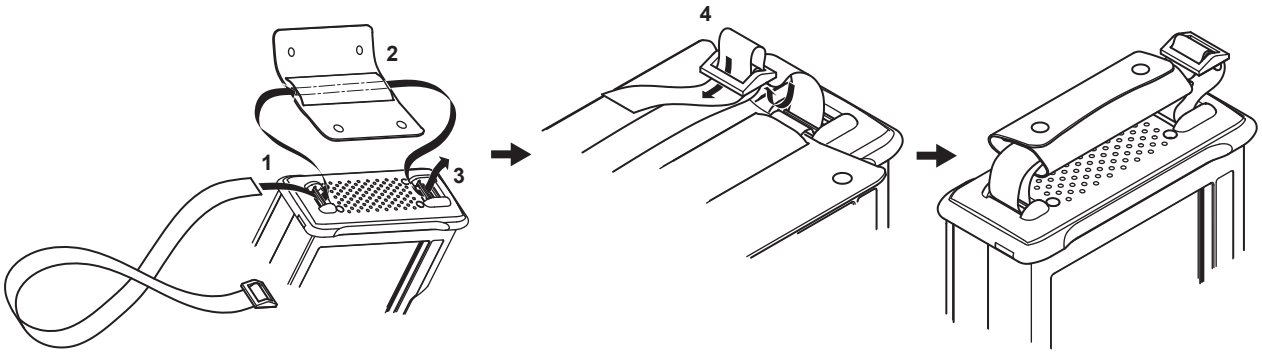
CAUTION

Pass the belt through the buckle and fasten it firmly according to the procedure in this section. If the belt is loose or the belt is passed through only one of the holes in the buckle, the belt may slip off and the instrument may fall.

How to Attach the Hand Belt

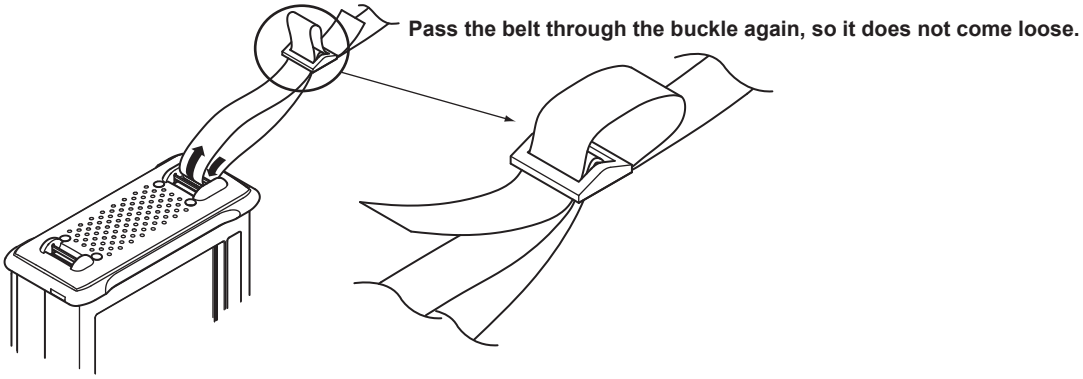
The hand belt can be attached to the left or right side of the instrument. Attach the belt to the desired side. There are two hand belt attachment sections. Securely attach the hand belt at the two sections.

1. Pass the hand belt through the lower hand belt attachment section on the side of the instrument.
2. Pass the hand belt through the hand belt cover.
3. Pass the hand belt through the upper hand belt attachment section (the second attachment section from the top) on the side of the instrument.
4. Pass the hand belt through the buckle.
5. Fasten the buttons of the hand belt cover.



How to Attach the Shoulder Belt

The shoulder belt can be attached to the shoulder belt attachment section on the left and right sides of the AQ7270. As shown in the figure below, securely attach the shoulder belt by passing the belt through the top belt attachment section on each side of the instrument and then pass it through the buckle.



4.1 Selecting the Test Wavelength

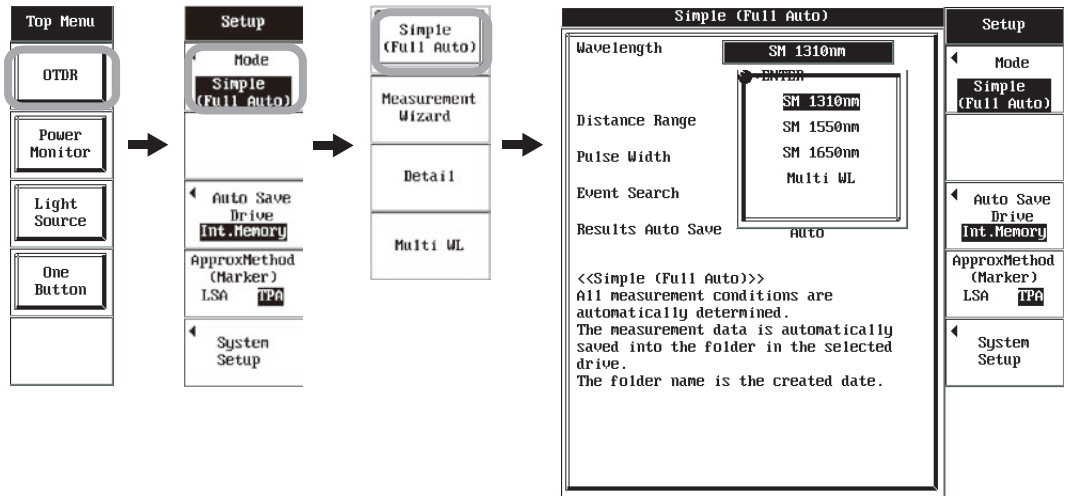
Procedure

Select the Simple Setup Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Simple (Full auto)** soft key. The Simple (Full Auto) setup screen appears.

Selecting the Test Wavelength

5. Press **ENTER**. A screen for selecting the wavelength appears.
6. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.
7. Press **ENTER**. A screen for selecting the wavelength closes.
8. Press **ESC**. The Simple (Full Auto) Setup screen closes, and the optical pulse measurement screen appears.



Note

- The selectable test wavelengths vary depending on the model. For details, see section 19.1.
- The optical pulse output port changes depending on the wavelength.
- The setting is stored in the internal memory. The AQ7270 will start up using the stored settings when the power is turned ON the next time.

Explanation

The following measurement conditions are automatically detected.

- Distance range
- Pulse width
- Event detection
- Measurement result file storage

The list below contains the measurement conditions for the Simple (Full Auto) mode. You can view the following information in the measurement setup information. For details, see section 7.3.

Item	Setting
Distance range	Auto
Pulse width	Auto
Attenuation	Auto
Averaging duration	Auto
Averaging method	High reflection
Averaging unit	Duration

4.2 Selecting the Calculation Method of the Distance Measurement

Procedure

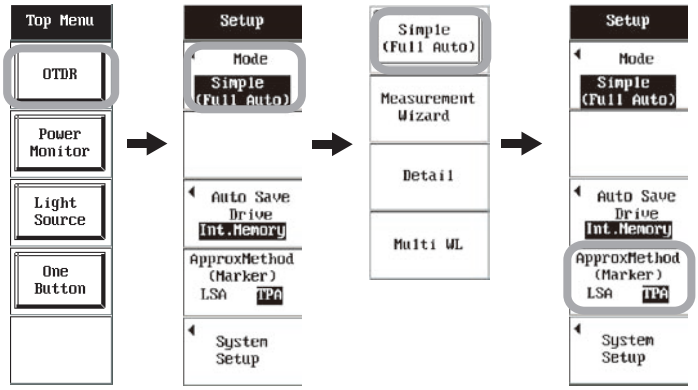
Parameters such as the splice loss and return loss are calculated using linear approximation. There are two linear approximation methods: least square and two point.

Select the Simple Setup Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Simple (Full auto)** soft key. The Simple (Full Auto) setup screen appears.

Selecting the Approximation Method

5. Press the **ApproxMethod (Marker)** soft key. The cursor moves, and the approximation method switches.



Note

- Approximation method (event) is fixed to LSA(least square).
- There are two approximation methods: LSA and TPA (two point). For a detailed explanation, see section 6.1.

4.3 Setting Other Items

Procedure

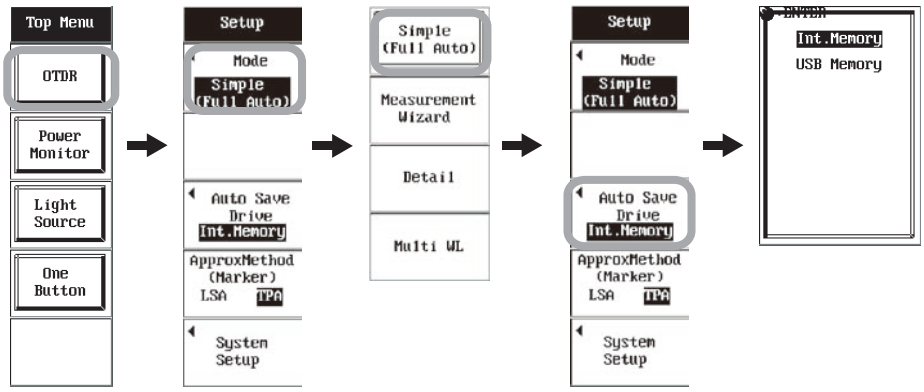
This section describes system settings such as the save destination of the measured result, language setting, and date/time setting in addition to the measurement condition settings.

Select the Simple Setup Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Simple (Full auto)** soft key. The Simple (Full Auto) setup screen appears.

Selecting the Auto Save Destination

5. Press the **Auto Save Drive** soft key.
6. A screen for selecting the save destination appears.
7. Move the cursor to the save destination you want to select using the **arrow keys** or the **rotary knob**.
8. Press **ENTER**. A screen for selecting the save destination closes.
9. Press **ESC**. The Simple (Full Auto) Setup screen closes, and the optical pulse measurement screen appears.



Selecting the Language and Setting the Date and Time

- **Selecting the Language**

  5. Press the **System Setup** soft key. The system setup screen appears.

  6. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Language.

  7. Press **ENTER**. A screen for selecting the language appears.

  8. Move the cursor to the language you want to select using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The language is confirmed.

  10. Press **ESC**. The system setup screen closes.

  11. Press **ESC**. The Simple (Full Auto) Setup screen closes, and the optical pulse measurement screen appears.

- **Selecting the Date and Time**

  5. Press the **System Setup** soft key. The system setup screen appears.

  6. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Date & Time Set.

  7. Press **ENTER**. The screen for setting the date and time appears.

  8. Move the cursor to the item you want to set using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The value is confirmed.

  10. Turn the **rotary knob** to set the date or time value.

  11. Press **ENTER**. The screen for setting the value closes.

  12. Move the cursor using the **arrow keys** or the **rotary knob** to highlight SET.

  13. Press **ENTER**. The date and time are set to the AQ7270.

- **Date and Time Display Format**

  14. Move the cursor using the **arrow keys** or the **rotary knob** to highlight Type.

  15. Press **ENTER**. The screen for setting the type appears.

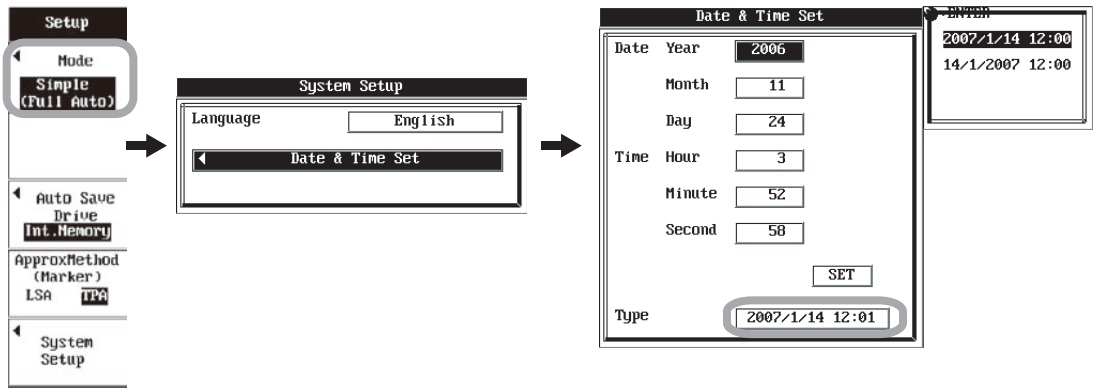
  16. Move the cursor using the **arrow keys** or the **rotary knob** to select the type.

  17. Press **ENTER**. The type is confirmed.

  18. Press **ESC**. The screen for setting the date closes.

  19. Press **ESC**. The system setup screen closes.

  20. Press **ESC**. The Simple (Full Auto) Setup screen closes, and the optical pulse measurement screen appears.



Explanation

Auto Save

The AQ7270 creates folders indicating the date and time in the selected drive and automatically saves the measurement result files.

File type	SOR
File name format	Wavelength + ID number

5.1 Setting the Measurement Conditions

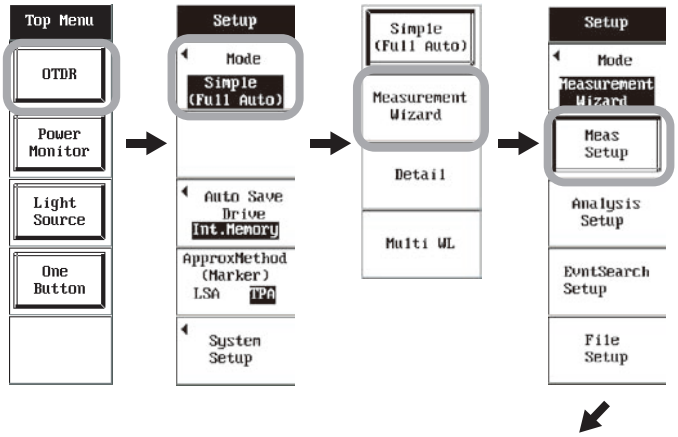
Procedure

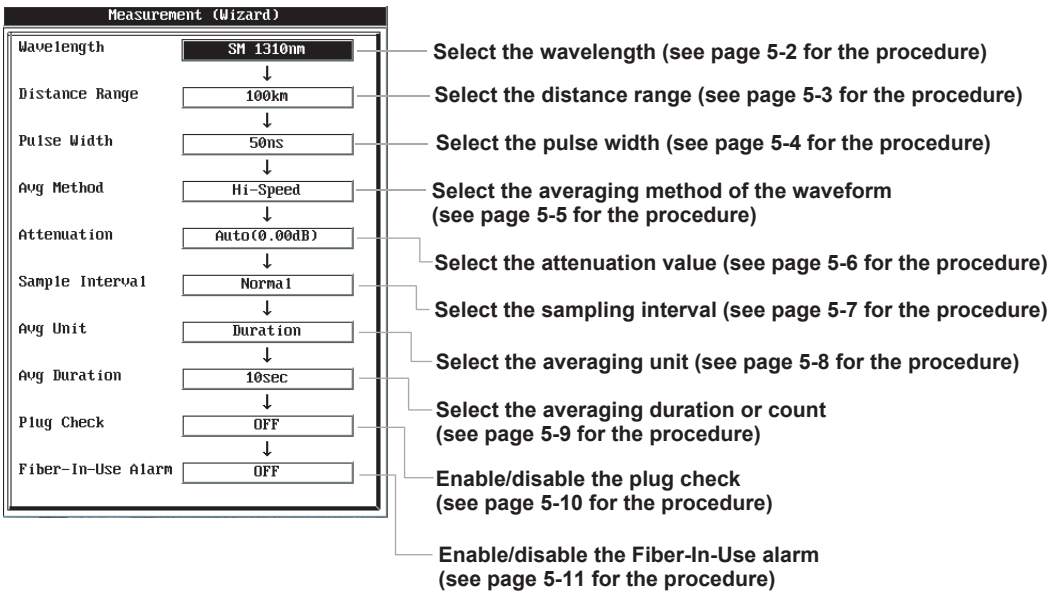
Selecting the Measurement Wizard Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Measurement Wizard** soft key. A soft key menu for the measurement setup (wizard) appears.

Setting the Measurement Conditions

5. Press the **Meas Setup** soft key. The Measurement (Wizard) screen appears.





Select the wavelength (see page 5-2 for the procedure)

Select the distance range (see page 5-3 for the procedure)

Select the pulse width (see page 5-4 for the procedure)

Select the averaging method of the waveform (see page 5-5 for the procedure)

Select the attenuation value (see page 5-6 for the procedure)

Select the sampling interval (see page 5-7 for the procedure)

Select the averaging unit (see page 5-8 for the procedure)

Select the averaging duration or count (see page 5-9 for the procedure)

Enable/disable the plug check (see page 5-10 for the procedure)

Enable/disable the Fiber-In-Use alarm (see page 5-11 for the procedure)

- **Selecting the Wavelength**

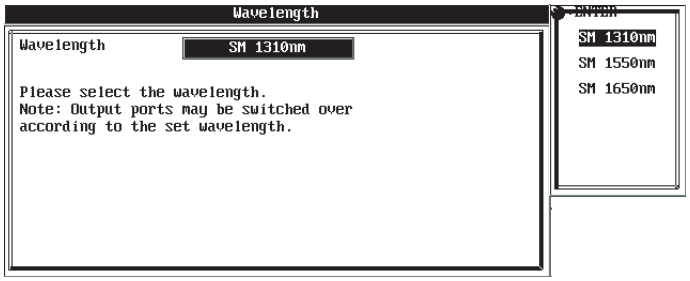
  6. Move the cursor to Wavelength using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A wizard screen for selecting the wavelength appears.

  8. Press **ENTER**. A screen for selecting the wavelength appears.

  9. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.

  10. Press **ENTER**. The wavelength is confirmed.



Note

- The selectable test wavelengths vary depending on the model. For details, see section 19.1.
- The optical pulse output port changes depending on the wavelength.
- The setting is stored in the internal memory. The AQ7270 will start up using the stored settings when the power is turned ON the next time.

- **Select the Distance Range**

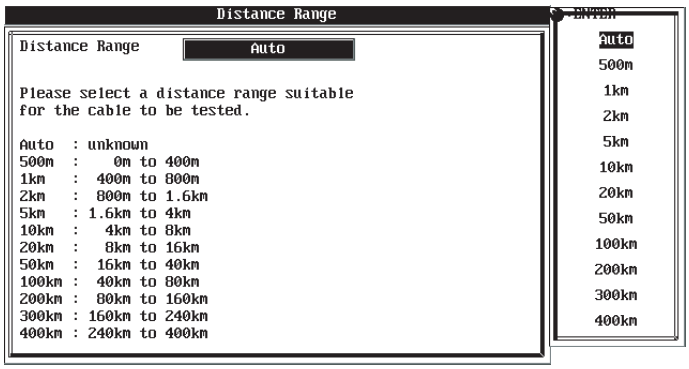
11. Move the cursor to Distance Range using the **arrow keys** or the **rotary knob**.

12. Press **ENTER**. A wizard screen for selecting the distance range appears.

13. Press **ENTER**. A screen for selecting the distance range appears.

14. Move the cursor to the distance range you want to select using the **arrow keys** or the **rotary knob**.

15. Press **ENTER**. The distance range is confirmed.



Note

For a detailed explanation, see section 6.1.

- **Selecting the Pulse Width**

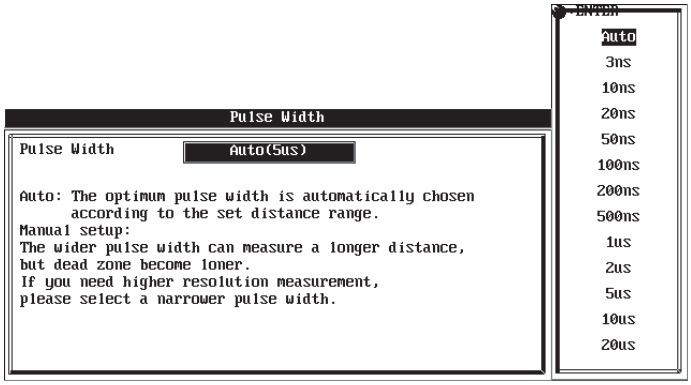
16. Move the cursor to Pulse Width using the **arrow keys** or the **rotary knob**.

17. Press **ENTER**. A wizard screen for selecting the pulse width appears.

18. Press **ENTER**. A screen for selecting the pulse width appears.

19. Move the cursor to the pulse width you want to select using the **arrow keys** or the **rotary knob**.

20. Press **ENTER**. The pulse width is confirmed.



Note

- You cannot select the pulse width if the distance range is set to auto.
- For a detailed explanation, see section 6.1.

- **Selecting the Averaging Method**

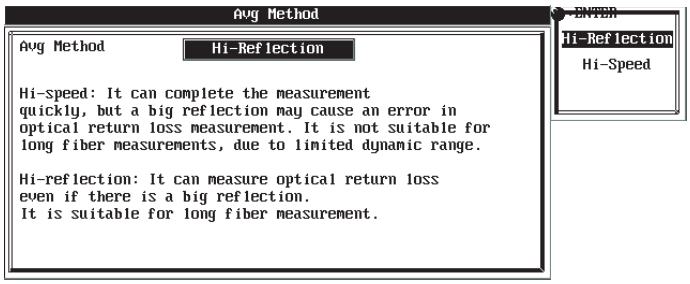
  21. Move the cursor to Avg Method using the **arrow keys** or the **rotary knob**.

  22. Press **ENTER**. A wizard screen for selecting the averaging method appears.

  23. Press **ENTER**. A screen for selecting the averaging method appears.

  24. Move the cursor to the averaging method you want to select using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The averaging method is confirmed.



Note

For a detailed explanation, see section 6.1.

- **Setting the Attenuation**

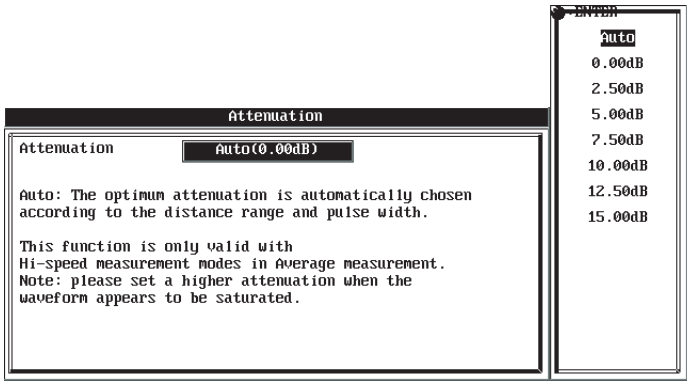
  26. Move the cursor to Attenuation using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. A wizard screen for setting the attenuation appears.

  28. Press **ENTER**. The screen for setting the attenuation appears.

  29. Move the cursor to the attenuation value you want to select using the **arrow keys** or the **rotary knob**.

  30. Press **ENTER**. The attenuation is confirmed.



Note

- For a detailed explanation, see section 6.1.
- You cannot select the attenuation if the averaging method is set to high reflection.

- **Selecting the Sampling Interval**

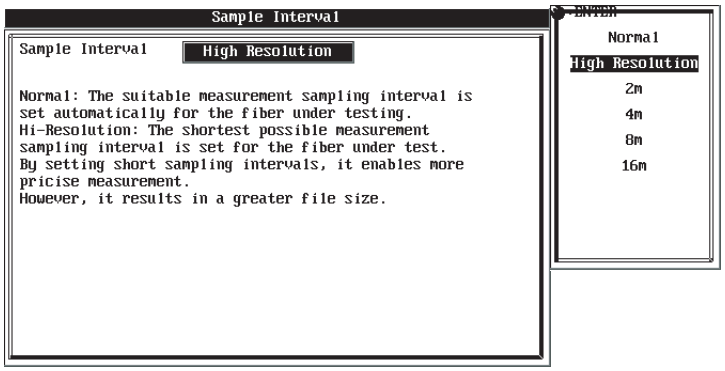
  31. Move the cursor to Sample Interval using the **arrow keys** or the **rotary knob**.

  32. Press **ENTER**. A wizard screen for selecting the sampling interval appears.

  33. Press **ENTER**. A screen for selecting the sampling interval appears.

  34. Move the cursor to the sampling interval you want to select using the **arrow keys** or the **rotary knob**.

  35. Press **ENTER**. The sampling interval is confirmed.



Note

For a detailed explanation, see section 6.1.

- **Selecting the Averaging Unit**

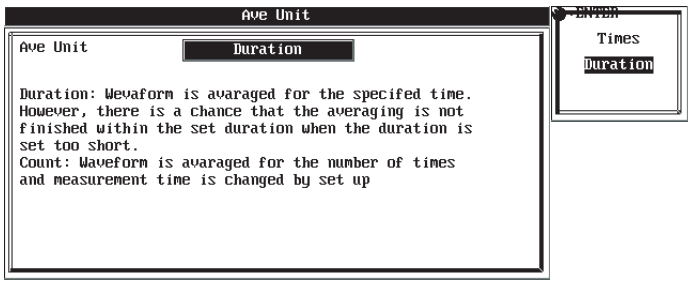
  36. Move the cursor to Avg Unit using the **arrow keys** or the **rotary knob**.

  37. Press **ENTER**. A wizard screen for selecting the averaging unit appears.

  38. Press **ENTER**. A screen for selecting the averaging unit appears.

  39. Move the cursor to the averaging unit you want to select using the **arrow keys** or the **rotary knob**.

  40. Press **ENTER**. The averaging unit is confirmed.



Note

For a detailed explanation, see section 6.1.

- **Selecting the Averaging Duration or Count**

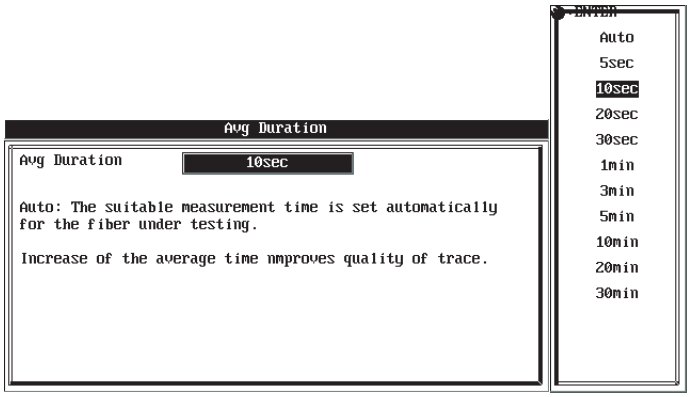
  41. Move the cursor to Avg Duration/Times using the **arrow keys** or the **rotary knob**.

  42. Press **ENTER**. A wizard screen for selecting the averaging duration or count appears.

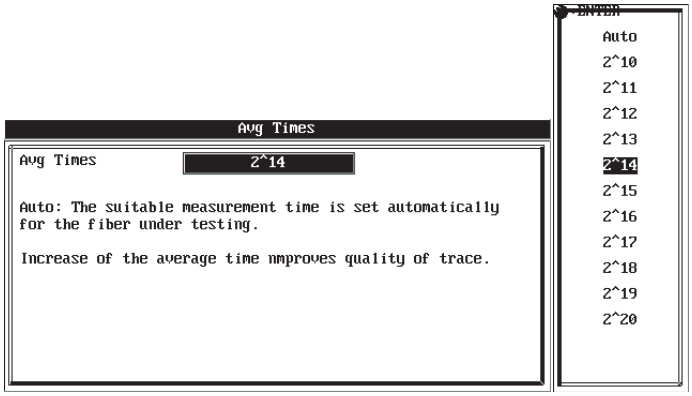
  43. Press **ENTER**. A screen for selecting the averaging duration or count appears.

  44. Move the cursor to the averaging duration or count you want to select using the **arrow keys** or the **rotary knob**.

  45. Press **ENTER**. The averaging duration or count is confirmed.



If averaging unit is set to Duration



If averaging unit is set to Times

Note

For a detailed explanation, see section 6.1.

- **Selecting the Plug Check Mode**

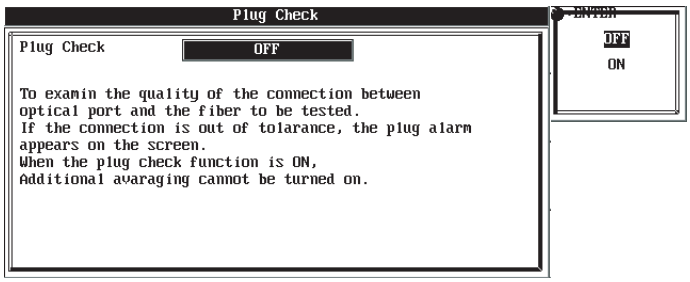
  46. Move the cursor to Plug Check using the **arrow keys** or the **rotary knob**.

  47. Press **ENTER**. A wizard screen for selecting the plug check mode appears.

  48. Press **ENTER**. A screen for selecting the plug check mode appears.

  49. Move the cursor to the plug check mode you want to select using the **arrow keys** or the **rotary knob**.

  50. Press **ENTER**. The plug check mode is confirmed.



Note

For a detailed explanation, see section 6.1.

- **Selecting the Fiber-In-Use Alarm**

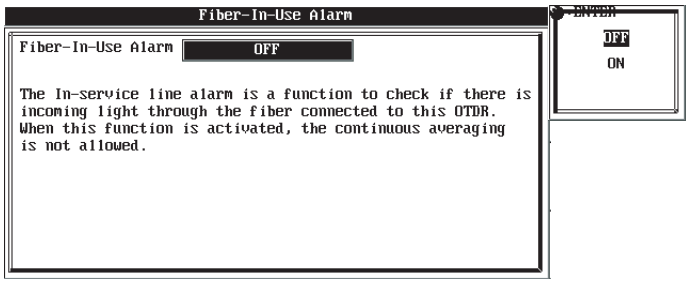
  51. Move the cursor to Fiber-In-Use Alarm using the **arrow keys** or the **rotary knob**.

  52. Press **ENTER**. A wizard screen for selecting the fiber-in-use alarm appears.

  53. Press **ENTER**. A screen for selecting the fiber-in-use alarm appears.

  54. Move the cursor to the fiber-in-use alarm mode you want to select using the **arrow keys** or the **rotary knob**.

  55. Press **ENTER**. The fiber-in-use alarm mode is confirmed.



Note

For a detailed explanation, see section 6.1.

5.2 Setting the Analysis Conditions

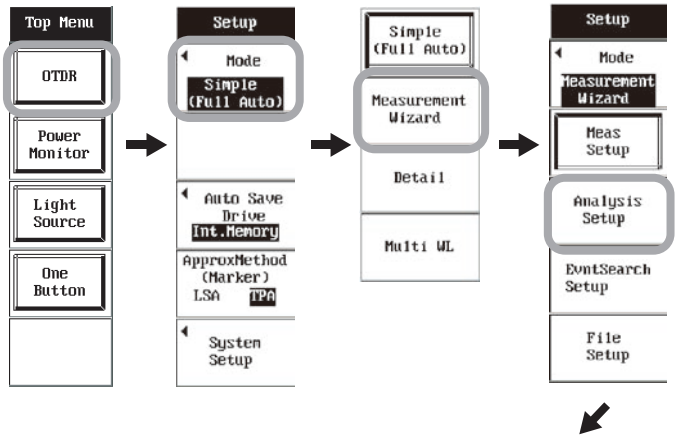
Procedure

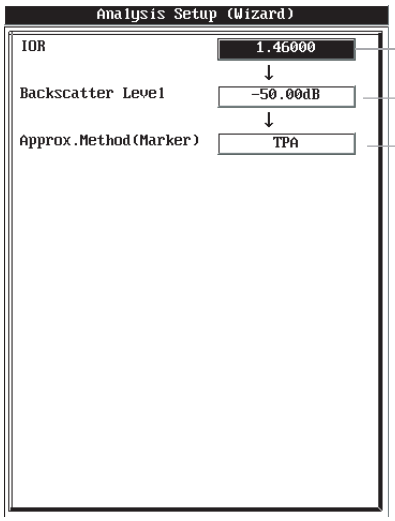
Selecting the Measurement Wizard Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Measurement Wizard** soft key. A soft key menu for the measurement setup (wizard) appears.

Setting the Analysis Conditions

5. Press the **Analysis Setup** soft key. The Analysis Setup (Wizard) screen appears.





Select the group refraction index (see page 5-13 for the procedure)

Select the backscattering light level (see page 5-14 for the procedure)

Select the approximation method of the marker (see page 5-15 for the procedure)

- **Setting the Group Refraction Index**

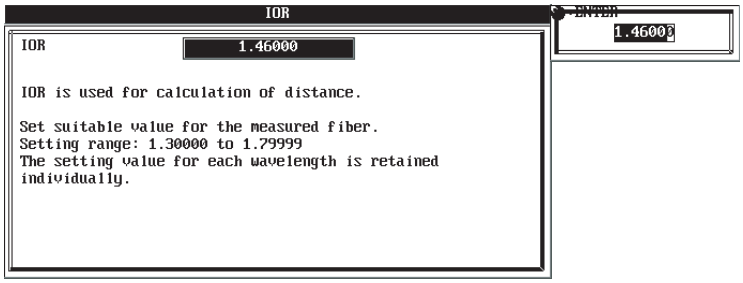
  6. Move the cursor to IOR using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A wizard screen for setting the group refraction index appears.

  8. Press **ENTER**. The screen for setting the group refraction index appears.

  9. Turn the **rotary knob** to set the group refraction index.

  10. Press **ENTER**. The group refraction index is confirmed.



Note

For a detailed explanation, see section 6.2.

- **Setting the Backscattering Light Level**

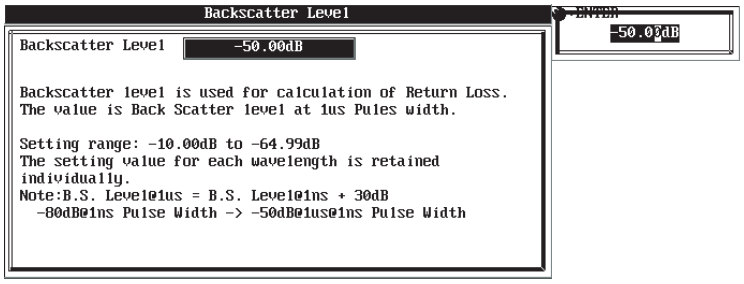
  11. Move the cursor to Backscatter Level using the **arrow keys** or the **rotary knob**.

  12. Press **ENTER**. A wizard screen for setting the backscattering light level appears.

  13. Press **ENTER**. The screen for setting the backscattering light level appears.

  14. Turn the **rotary knob** to set the backscattering light level.

  15. Press **ENTER**. The backscattering light level is confirmed.



Note

For a detailed explanation, see section 6.2.

- **Selecting the Marker Approximation Method**

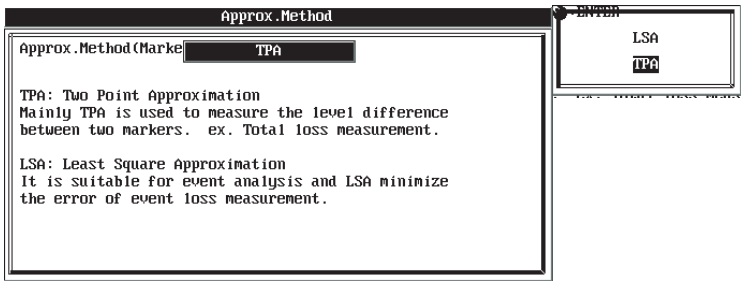
  16. Move the cursor to Approx.Method (Marker) using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER**. A wizard screen for selecting the marker approximation method appears.

  18. Press **ENTER**. A screen for selecting the marker approximation method appears.

  19. Move the cursor to marker approximation method you want to select using the **arrow keys** or the **rotary knob**.

  20. Press **ENTER**. The marker approximation method is confirmed.



Note

For a detailed explanation, see section 6.2.

5.3 Setting the Detection Conditions of Reflection and Loss Waveforms

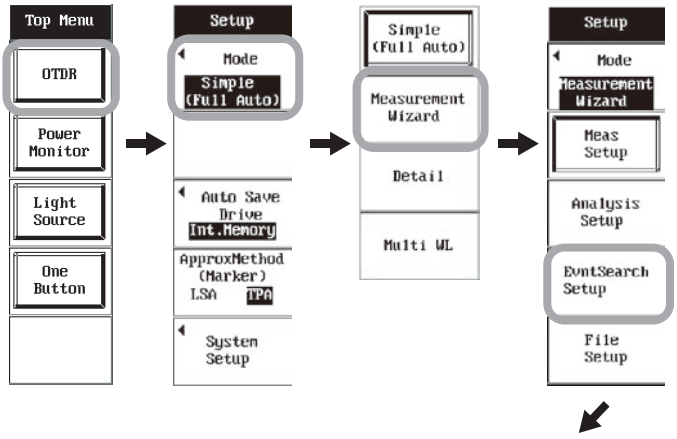
Procedure

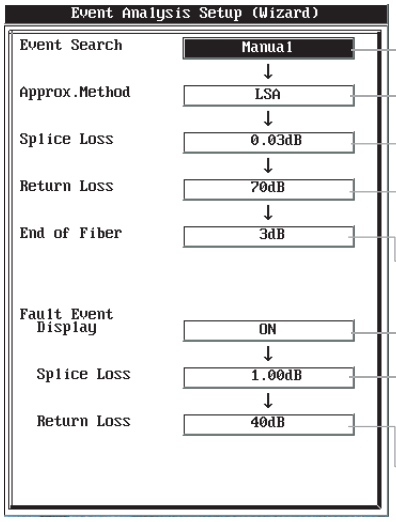
Selecting the Measurement Wizard Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Measurement Wizard** soft key. A soft key menu for the measurement setup (wizard) appears.

Setting the Event Conditions

5. Press the **EvntSearch Setup** soft key. The Event Analysis Setup (Wizard) screen appears.





Select the event detection method (see page 5-17 for the procedure)

Select the approximation method of the event detection (see page 5-18 for the procedure)

Select the threshold level of the splice loss (see page 5-19 for the procedure)

Select the threshold level of the return loss (see page 5-20 for the procedure)

Select the threshold level of the end of the fiber (see page 5-21 for the procedure)

Show/hide the fault event display (see page 5-22 for the procedure)

Select the threshold level of the splice loss to be detected as a fault event (see page 5-23 for the procedure)

Select the threshold level of the return loss to be detected as a fault event (see page 5-24 for the procedure)

- **Selecting the Event Detection Method**

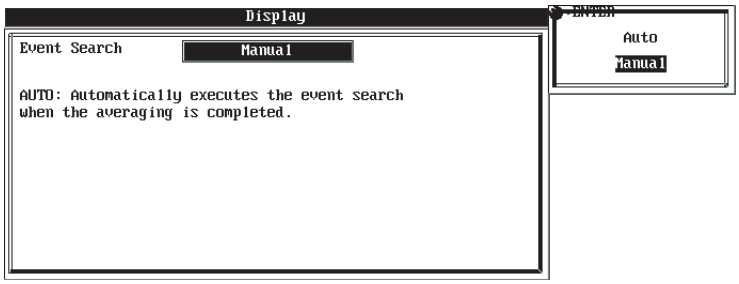
  6. Move the cursor to Event Search using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A wizard screen for selecting the event detection method appears.

  8. Press **ENTER**. A screen for selecting the event detection method appears.

  9. Move the cursor to the event detection method you want to select using the **arrow keys** or the **rotary knob**.

  10. Press **ENTER**. The event detection method is confirmed.



- **Selecting the Approximation Method**

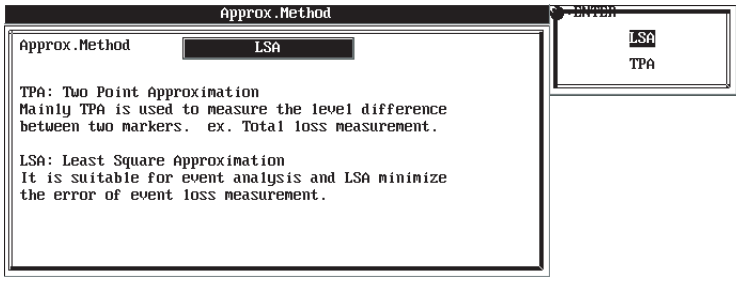
  11. Move the cursor to Approx.Method using the **arrow keys** or the **rotary knob**.

  12. Press **ENTER**. A wizard screen for selecting the approximation method appears.

  13. Press **ENTER**. A screen for selecting the approximation method appears.

  14. Move the cursor to approximation method you want to select using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER**. The approximation method is confirmed.



Note

For a detailed explanation, see section 6.2.

- **Setting the Threshold Level of the Splice Loss Detection Level**

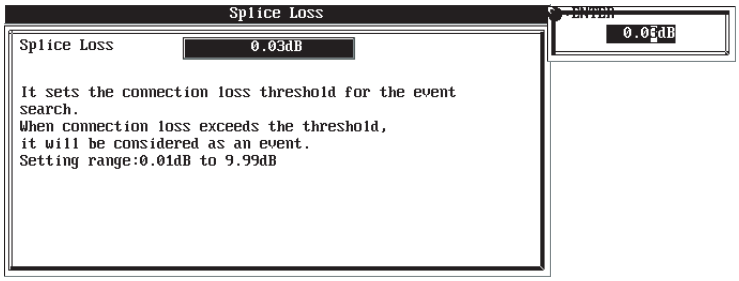
  16. Move the cursor to Splice Loss using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER**. A wizard screen for setting the splice loss appears.

  18. Press **ENTER**. The screen for setting the splice loss appears.

  19. Turn the **rotary knob** to set the splice loss value.

  20. Press **ENTER**. The splice loss is confirmed.



- **Setting the Threshold Level of the Return Loss Detection Level**

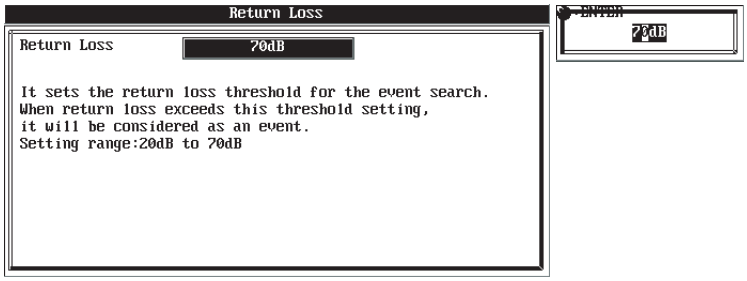
  21. Move the cursor to Return Loss using the **arrow keys** or the **rotary knob**.

  22. Press **ENTER**. A wizard screen for setting the return loss appears.

  23. Press **ENTER**. The screen for setting the return loss appears.

  24. Turn the **rotary knob** to set the return loss value.

  25. Press **ENTER**. The return loss is confirmed.



- **Setting the Threshold Level of the End of the Fiber (Fresnel Reflection)**

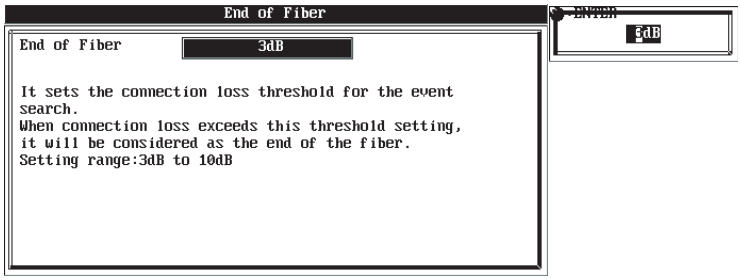
  26. Move the cursor to End of Fiber using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. A wizard screen for setting the end-of-fiber value appears.

  28. Press **ENTER**. The screen for setting the end-of-fiber value appears.

  29. Turn the **rotary knob** to set the end-of-fiber value.

  30. Press **ENTER**. The end-of-fiber value is confirmed.



- **Selecting the Fault Event Display**

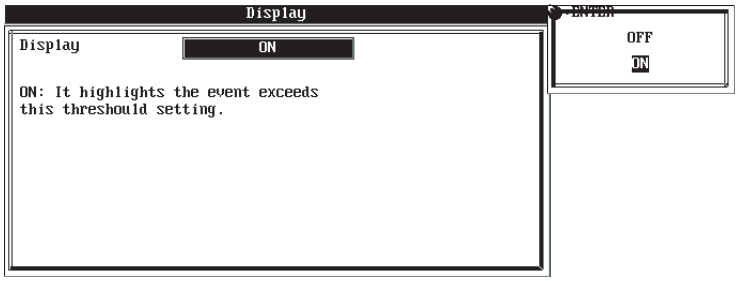
  31. Move the cursor to Fault Event Display using the **arrow keys** or the **rotary knob**.

  32. Press **ENTER**. A wizard screen for selecting the fault event display appears.

  33. Press **ENTER**. A screen for selecting the fault event display appears.

  34. Move the cursor to ON or OFF using the **arrow keys** or the **rotary knob**.

  35. Press **ENTER**. The fault event display mode is confirmed.



- **Setting the Threshold Level of the Splice Loss Detection Level of the Fault Event**

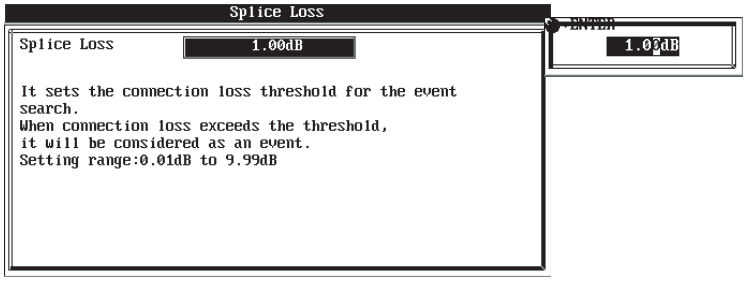
36. Move the cursor to Splice Loss using the **arrow keys** or the **rotary knob**.

37. Press **ENTER**. A wizard screen for setting the splice loss appears.

38. Press **ENTER**. The screen for setting the splice loss appears.

39. Turn the **rotary knob** to set the splice loss value.

40. Press **ENTER**. The splice loss is confirmed.



Note

You cannot select this item if the fault event display is turned OFF.

- **Setting the Threshold Level of the Return Loss Detection Level of the Fault Event**

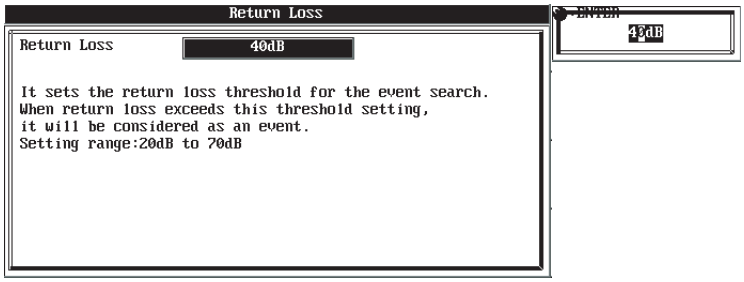
  41. Move the cursor to Return Loss using the **arrow keys** or the **rotary knob**.

  42. Press **ENTER**. A wizard screen for setting the return loss appears.

  43. Press **ENTER**. The screen for setting the return loss appears.

  44. Turn the **rotary knob** to set the return loss value.

  45. Press **ENTER**. The return loss is confirmed.



Note

You cannot select this item if the fault event display is turned OFF.

5.4 Setting the File

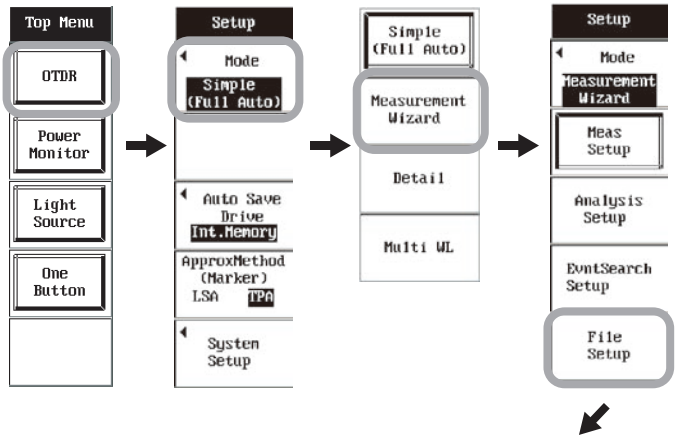
Procedure

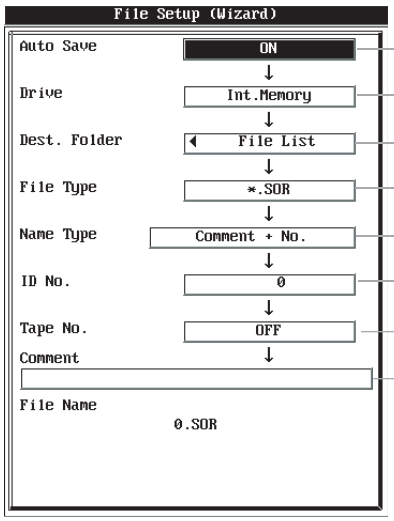
Selecting the Measurement Wizard Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Measurement Wizard** soft key. A soft key menu for the measurement setup (wizard) appears.

Setting the Storage Conditions of Measurement Results

5. Press the **File Setup** soft key. The File Setup (Wizard) screen appears.





Enable/disable the auto save operation (see page 5-26 for the procedure)

Select the auto save destination drive (see page 5-27 for the procedure)

Select the auto save destination folder (see page 5-28 for the procedure)

Select the file type for auto saving (see page 5-29 for the procedure)

Select the file name type (see page 5-30 for the procedure)

Select the number to be attached to the file name (see page 5-31 for the procedure)

Select the tape ID number (see page 5-32 for the procedure)

Enter the file name (see page 5-33 for the procedure)

- **Selecting the Auto Save Mode**

  6. Move the cursor to Auto Save using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A wizard screen for selecting the auto save mode appears.

  8. Press **ENTER**. A screen for selecting the auto save mode appears.

  9. Move the cursor to ON or OFF using the* arrow keys *or the* rotary knob*.

  10. Press **ENTER**. The auto save mode is confirmed.

- **Selecting the Save Destination Media Type**

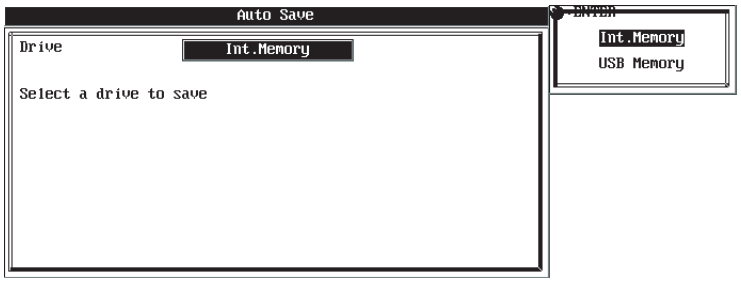
  11. Move the cursor to Drive using the **arrow keys** or the **rotary knob**.

  12. Press **ENTER**. A wizard screen for selecting the save destination drive appears.

  13. Press **ENTER**. A screen for selecting the save destination drive appears.

  14. Move the cursor to the save destination drive you want to select using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER**. The save destination drive is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Selecting the Save Destination Folder**

  16. Move the cursor to Dest. Folder using the **arrow keys** or the **rotary knob**.

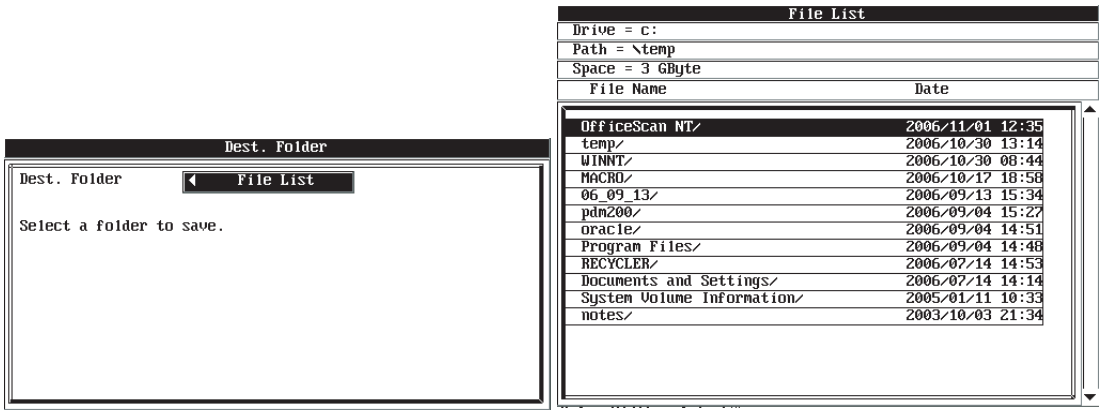
  17. Press **ENTER**. A wizard screen for selecting the save destination folder appears.

  18. Press **ENTER**. The File List screen for selecting the save destination folder appears.

  19. Move the cursor to the save destination folder using the **arrow keys** or the **rotary knob**.

  20. Press **ENTER**. The contents in the save destination folder are displayed.

  21. Press **ESC**. The save destination folder is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Selecting the Storage Data Type**

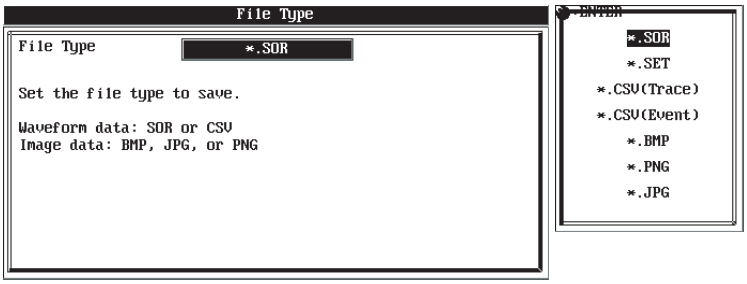
  22. Move the cursor to File Type using the **arrow keys** or the **rotary knob**.

  23. Press **ENTER**. A wizard screen for selecting the file type appears.

  24. Press **ENTER**. A screen for selecting the file type appears.

  25. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

  26. Press **ENTER**. The file type is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Selecting the File Name Type**

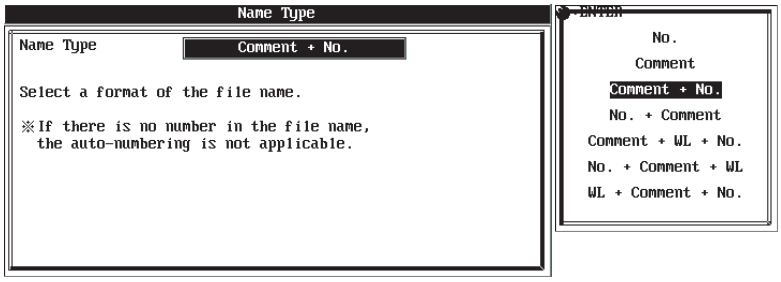
  27. Move the cursor to Name Type using the **arrow keys** or the **rotary knob**.

  28. Press **ENTER**. A wizard screen for selecting the file name type appears.

  29. Press **ENTER**. A screen for selecting the file name type appears.

  30. Move the cursor to file name type you want to select using the **arrow keys** or the **rotary knob**.

  31. Press **ENTER**. The file name type is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Setting the File ID Number**

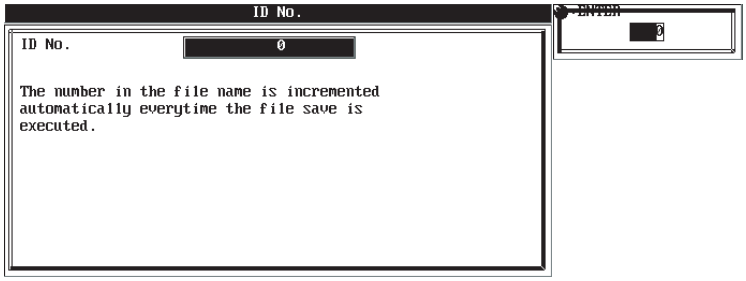
  32. Move the cursor to ID No. using the **arrow keys** or the **rotary knob**.

  33. Press **ENTER**. A wizard screen for setting the ID number appears.

  34. Press **ENTER**. The screen for setting the ID number appears.

  35. Turn the **rotary knob** to set the ID number.

  36. Press **ENTER**. The ID number is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Setting the ID Number for the Tape Fiber and the Like**

  37. Move the cursor to Tape ID using the **arrow keys** or the **rotary knob**.

  38. Press **ENTER**. A wizard screen for selecting the tape ID appears.

  39. Press **ENTER**. A screen for selecting the tape ID appears.

  40. Move the cursor to tape ID you want to select using the **arrow keys** or the **rotary knob**.

  41. Press **ENTER**. The tape ID is confirmed.

Note

You cannot select this item if the auto save mode is turned OFF.

- **Attaching a Comment to the File Name**

42. Move the cursor to Comment using the **arrow keys** or the **rotary knob**.

43. Press **ENTER**. A wizard screen for entering the comment appears.

44. Press **ENTER**. The character input screen for entering the comment appears.

***45.Enter the comment using the* arrow keys, rotary knob *and* ENTER.**

46. Press the **OK** soft key. The character input screen closes.

47. Press **ESC**. The wizard screen for entering the comment closes.

48. Press **ESC**. The File Setup screen closes, and the optical pulse measurement screen appears.

Note

- You cannot select this item if the auto save mode is turned OFF.
- For the procedures to enter characters, see section 16.6.

6.1 Setting the Measurement Conditions

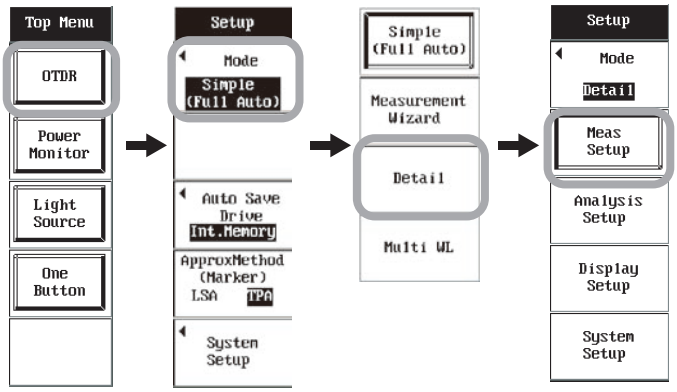
Procedure

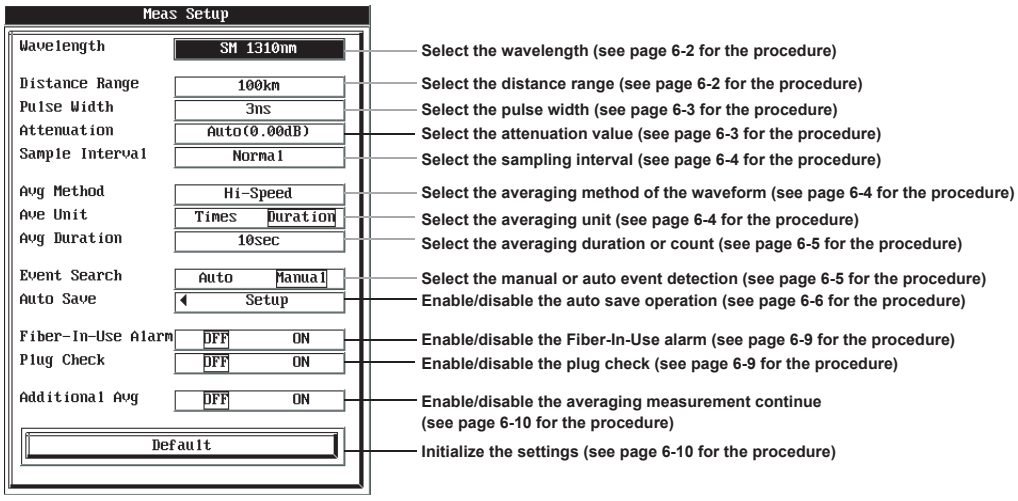
Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. A soft key menu for the Detail mode appears.

Setting the Measurement Conditions

5. Press the **Meas Setup** soft key. The Meas Setup screen appears.





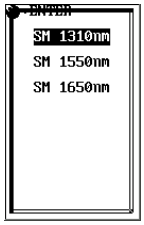
- **Selecting the Wavelength**

  6. Move the cursor to wavelength using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A screen for selecting the wavelength appears.

  8. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The wavelength is confirmed.



Note

- The selectable test wavelengths vary depending on the model. For details, see section 19.1.
- The optical pulse output port changes depending on the wavelength.
- The setting is stored in the internal memory. The AQ7270 will start up using the stored settings when the power is turned ON the next time.

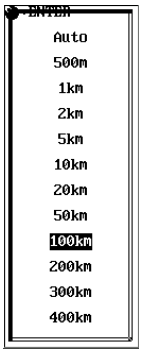
- **Select the Distance Range**

  10. Move the cursor to Distance Range using the **arrow keys** or the **rotary knob**.

  11. Press **ENTER**. A screen for selecting the distance range appears.

  12. Move the cursor to the distance range you want to select using the **arrow keys** or the **rotary knob**.

  13. Press **ENTER**. The distance range is confirmed.



Note

- Set the distance range to a value longer than the length of the optical fiber cable to be measured.
  Otherwise, correct measurements cannot be made.
- The longer the distance range, the longer the measurement time will be.
- If you set the distance range, the pulse width and attenuation are automatically set to optimal values.

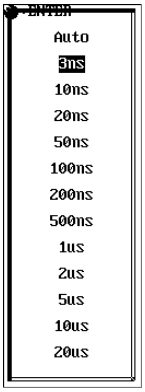
- **Selecting the Pulse Width**

  14. Move the cursor to Pulse Width using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER**. A screen for selecting the pulse width appears.

  16. Move the cursor to the pulse width you want to select using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER**. The pulse width is confirmed.



Note

- You cannot select the pulse width if the distance range is set to auto.
- If you set the pulse width, the attenuation is automatically set to the optimal value.

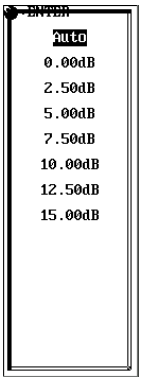
- **Selecting the Attenuation**

  18. Move the cursor to Attenuation using the **arrow keys** or the **rotary knob**.

  19. Press **ENTER**. The screen for setting the attenuation appears.

  20. Move the cursor to the attenuation value you want to select using the **arrow keys** or the **rotary knob**.

  21. Press **ENTER**. The attenuation is confirmed.



Note

- You cannot select the attenuation if the distance range or pulse width is set to auto or the averaging method is set to high reflection.
- Measurements cannot be performed at high resolution if the waveform is saturated. If this is the case, increase the value.
- The attenuation setting is valid in realtime measurement or when the averaging method is averaging measurement in high-speed measurement.

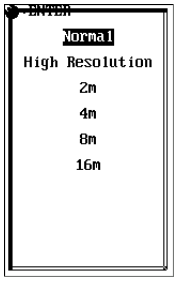
- **Selecting the Sampling Interval**

  22. Move the cursor to Sample Interval using the **arrow keys** or the **rotary knob**.

  23. Press **ENTER**. A screen for selecting the sampling interval appears.

  24. Move the cursor to the sampling interval you want to select using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The sampling interval is confirmed.



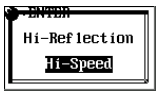
- **Selecting the Averaging Method**

  26. Move the cursor to Avg Method using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. A screen for selecting the averaging method appears.

  28. Move the cursor to the averaging method you want to select using the **arrow keys** or the **rotary knob**.

  29. Press **ENTER**. The averaging method is confirmed.



Note

We recommend that you make measurements with the averaging method set to high speed only if the optical fiber cable is short and there is no reflection.

- **Selecting the Averaging Unit**

  30. Move the cursor to Avg Unit using the **arrow keys** or the **rotary knob**.

  31. Press **ENTER**. The cursor moves to Duration or Times by Avg Unit.

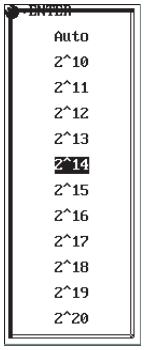
- **Selecting the Averaging Count or Duration**

  32. Move the cursor to Avg Duration/Times using the **arrow keys** or the **rotary knob**.

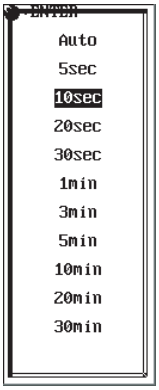
  33. Press **ENTER**. A screen for selecting the averaging duration or count appears.

  34. Move the cursor to the averaging duration or count you want to select using the **arrow keys** or the **rotary knob**.

  35. Press **ENTER**. The averaging duration or count is confirmed.



The averaging unit is count



The averaging unit is duration

Note

- The measurement time may be shorter or longer than the specified time due to the effects of other measurement conditions.
- Increasing the count or duration value results in highly accurate measurements, but the measurement takes longer.
  Set the value by taking into consideration the dynamic range of the AQ7270 and the loss in the optical fiber cable.
- The duration or count display depends on the setting specified for the averaging unit.

- **Selecting the Event Detection Method**

  36. Move the cursor to Event Search using the **arrow keys** or the **rotary knob**.

  37. Press **ENTER**. The cursor moves to Auto or Manual by Event Search.

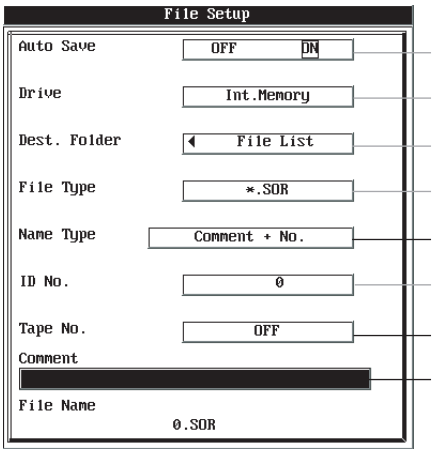
Note

If you set the auto save mode to ON, be sure to set the save destination folder before starting the measurement, because the measured data is saved automatically after the averaging measurement.

- **Enabling or Disabling the Auto Save Function**

38. Move the cursor to Auto Save using the **arrow keys** or the **rotary knob**.

39. Press **ENTER**. The File Setup screen appears.



Enable/disable the auto save operation (see page 6-6 for the procedure)

Select the auto save destination drive (see page 6-6 for the procedure)

Select the auto save destination folder (see page 6-7 for the procedure)

Select the file type for auto saving (see page 6-7 for the procedure)

Select the file name type (see page 6-8 for the procedure)

Select the number to be attached to the file name (see page 6-8 for the procedure)

Select the tape ID number (see page 6-8 for the procedure)

Enter the file name (see page 6-9 for the procedure)

40. Press **ENTER**. The cursor moves to ON or OFF by Auto Save.

- **Selecting the Save Destination Media Type**

  41. Move the cursor to Drive using the **arrow keys** or the **rotary knob**.

  42. Press **ENTER**. A screen for selecting the save destination drive appears.

  43. Move the cursor to the save destination drive you want to select using the **arrow keys** or the **rotary knob**.

  44. Press **ENTER**. The save destination drive is confirmed.

Note

You cannot select this item if the auto save mode is turned OFF.

- **Selecting the Save Destination Folder**

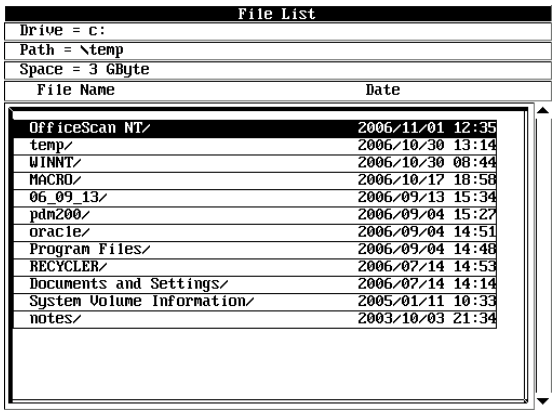
  45. Move the cursor to Dest. Folder using the **arrow keys** or the **rotary knob**.

  46. Press **ENTER**. The File List screen for selecting the save destination folder appears.

  47. Move the cursor to the save destination folder using the **arrow keys** or the **rotary knob**.

  48. Press **ENTER**. The contents in the save destination folder are displayed.

  49. Press **ESC**. The File List screen for selecting the save destination folder closes.



Note

You cannot select this item if the auto save mode is turned OFF.

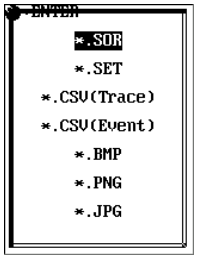
- **Selecting the File Type**

  50. Move the cursor to File Type using the **arrow keys** or the **rotary knob**.

  51. Press **ENTER**. A screen for selecting the file type appears.

  52. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

  53. Press **ENTER**. The file type is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

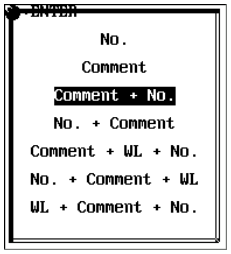
- **Selecting the File Name Type**

  54. Move the cursor to Name Type using the **arrow keys** or the **rotary knob**.

  55. Press **ENTER**. A screen for selecting the file name type appears.

  56. Move the cursor to file name type you want to select using the **arrow keys** or the **rotary knob**.

  57. Press **ENTER**. The file name type is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Setting the File ID Number**

  58. Move the cursor to ID No. using the **arrow keys** or the **rotary knob**.

  59. Press **ENTER**. The screen for setting the ID number appears.

  60. Turn the **rotary knob** to set the ID number.

  61. Press **ENTER**. The ID number is confirmed.

Note

You cannot select this item if the auto save mode is turned OFF.

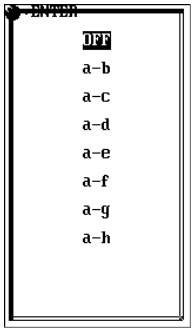
- **Setting the ID Number for the Tape Fiber and the Like**

  62. Move the cursor to Tape ID using the **arrow keys** or the **rotary knob**.

  63. Press **ENTER**. A screen for selecting the tape ID appears.

  64. Move the cursor to tape ID you want to select using the **arrow keys** or the **rotary knob**.

  65. Press **ENTER**. The tape ID is confirmed.



Note

You cannot select this item if the auto save mode is turned OFF.

- **Attaching a Comment to the File Name**

  66. Move the cursor to Comment using the **arrow keys** or the **rotary knob**.

  67. Press **ENTER**. The character input screen for entering the comment appears.

  68. Enter the comment using the **arrow keys**, **rotary knob** and **ENTER**.

  69. Press the **OK** soft key. The characters are confirmed.

  70. Press **ESC**. The File Setup screen closes, and the optical pulse measurement screen appears.

Note

- You cannot select this item if the auto save mode is turned OFF.
- For the procedures to enter characters, see section 16.6.

- **Selecting the Fiber-In-Use Alarm**

  71. Move the cursor to Fiber-In-Use Alarm using the **arrow keys** or the **rotary knob**.

  72. Press **ENTER**. The cursor moves to ON or OFF by Fiber-In-Use Alarm.

Note

You cannot select averaging measurement continue if you turn fiber-in-use alarm ON.

- **Selecting the Plug Check Mode**

  73. Move the cursor to Plug Check using the **arrow keys** or the **rotary knob**.

  74. Press **ENTER**. The cursor moves to ON or OFF by Plug Check.

Note

- If the averaging measurement continue was turned ON, it is turned OFF.
- The plug check always detects that the plug is connected on models with the /DF option.

- **Selecting the Averaging Measurement Continue**

  75. Move the cursor to Additional Avg using the **arrow keys** or the **rotary knob**.

  76. Press **ENTER**. The cursor moves to ON or OFF by Additional Avg.

Note

You cannot select averaging measurement continue if the distance range is set to auto, if the plug check is turned ON, or if the fiber-in-use alarm is turned ON.

- **Initializing the Measurement Conditions**

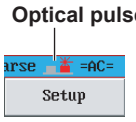
  77. Move the cursor to Default using the **arrow keys** or the **rotary knob**.

  78. Press **ENTER**. The measurement conditions are initialized to factory default settings.

Explanation

Selecting the Wavelength

The optical pulse output port changes depending on the specified wavelength. Check the optical pulse output port indicator on the AQ7270, and connect the optical fiber cable to the output port indicated in red.



Selecting the Distance Range

Set the distance range to match the cable length. The selectable distance range varies depending on the wavelength.

Cable Length	Distance Range
Unknown	Auto
0 to 400 m	500 m
400 m to 800 m	1 km
800 m to 1.6 km	2 km
1.6 km to 4 km	5 km
4 km to 8 km	10 km
8 km to 16 km	20 km
16 km to 40 km	50 km
40 km to 80 km	100 km
80 km to 160 km	200 km
160 km to 240 km	300 km
240 km to 400 km	400 km

Selecting the Pulse Width

The pulse width has the following characteristics.

- A short pulse width allows measurements in high resolution but cannot measure long distances.
- A long pulse width allows long-distance measurements but cannot measure in high resolution.

The selectable pulse width varies depending on the wavelength and distance range. See the table below.

Distance Range	Selectable Pulse Widths
500 m	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns
1 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
2 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
5 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
10 km, 20 km	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs
50 km or longer	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs, 2 μs, 5 μs, 10 μs, 20 μs

If the wavelength is 850 nm, you cannot use 3ns, 2 μs, 5 μs, 10 μs, and 20 μs.
If the wavelength is 1300 nm, you cannot use 3ns, 10 μs and 20 μs.

Selecting the Attenuation

If a large reflection occurs at a connection point of the optical connector or at the point where the optical fiber cable is broken, the waveform may saturate. Attenuation is used to prevent saturation.

The selectable attenuation values vary depending on the pulse width. See the table below.

Pulse Width	Selectable Attenuation Values
3 ns to 50 ns	0 dB, 2.50 dB, 5.00 dB, 7.50 dB, 10.00 dB, 12.50 dB, 15.00 dB
100 ns to 1 µs	0 dB, 2.50 dB, 5.00 dB, 7.50 dB, 10.00 dB, 12.50 dB, 15.00 dB, 17.50 dB, 20.00 dB
2 µs to 5 µs	0 dB, 2.50 dB, 5.00 dB, 7.50 dB, 10.00 dB, 12.50 dB, 15.00 dB, 17.50 dB, 20.00 dB, 22.50 dB, 25.00 dB
10 µs to 20 µs	0 dB, 2.50 dB, 5.00 dB, 7.50 dB, 10.00 dB, 12.50 dB, 15.00 dB, 17.50 dB, 20.00 dB, 22.50 dB, 25.00 dB, 27.50 dB

If the wavelength is 850 nm or 1300 nm

Pulse Width	Selectable Attenuation Values
10 ns to 50 ns	0 dB, 2.5 dB, 5 dB, 7.5 dB, 10 dB, 12.5 dB
100 ns or longer	0 dB, 2.5 dB, 5. dB, 7.5 dB, 10.0 dB, 12.5 dB, 15.0 dB, 17.5 dB

Selecting the Sampling Interval

The maximum number of sampling data points is 50000. The shortest sampling interval is determined by the distance range.

Normal: Measures at the optimal sampling interval.
High resolution: Measures at the shortest sampling interval.

Changes can be measured in more detail by setting the sampling interval short. However, the data size of the measured results become large. For the sampling intervals that are selectable depending on the distance range, see below.

Distance Range	Selectable Sampling Interval
500 m	5 cm, 10 cm, 20 cm, 50 cm, 1 m
1 km	5 cm, 10 cm, 20 cm, 50 cm, 1 m, 2 m
2 km	5 cm, 10 cm, 20 cm, 50 cm, 1 m, 2 m, 4 m
5 km	10 cm, 20 cm, 50 cm, 1 m, 2 m, 4 m, 8 m
10 km	20 cm, 50 cm, 1 m, 2 m, 4 m, 8 m
20 km	50 cm, 1 m, 2 m, 4 m, 8 m, 16 m
50 km	1 m, 2 m, 4 m, 8 m, 16 m
100 km	2 m, 4 m, 8 m, 16 m
200 km	4 m, 8 m, 16 m, 32 m
300 km	8 m, 16 m, 32 m
400 km	8 m, 16 m, 32 m

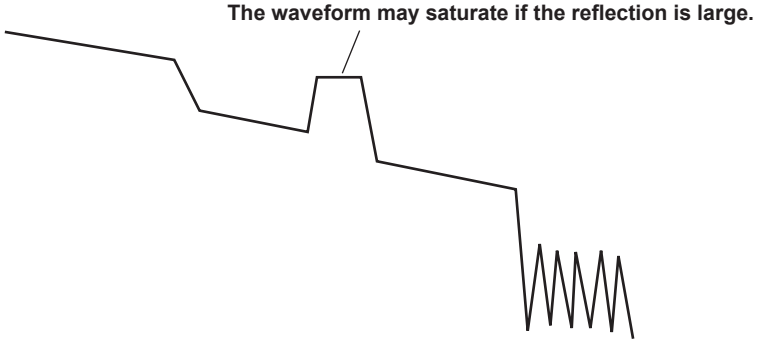
Note

When performing high resolution measurement in realtime, you can set the sampling interval to 5 cm to the upper interval limit in all distance ranges. For details, see section 7.4.

Selecting the Averaging Method

High Speed

The high speed mode is used to measure all sections using the specified attenuation. If the attenuation is not appropriate and a large reflection occurs, the corresponding section of waveform may saturate.



High Reflection

The high reflection mode allows accurate measurements even if there are large reflections (excluding extremely large reflections such as those caused by an open end). In high reflection mode, the optimal attenuation is set according to the backscattering light level for each section to make the measurements. Consequently, the measurement takes longer than the high speed mode. The division of sections and optimal attenuation values are automatically set.

Selecting the Averaging Unit

Duration: Measures for the specified duration. If you set a short duration, the measurement may not complete within the specified duration depending on the measurement conditions.

Times: Measures for the specified number of times.

Selecting the Averaging Count or Duration

The selectable values are as follows:

Duration: 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 3 min, 5 min, 10 min, 20 min, and 30 min

The units sec and min represent seconds and minutes, respectively.

Times: 2^10 (1024 times), 2^11 (2048 times), 2^12 (4096 times), 2^13 (8192 times), 2^14 (16384 times), 2^15 (32768 times), 2^16 (65536 times), 2^17 (131072 times),
2^18 (262144 times), 2^19 (524288 times), 2^20 (1048576 times)
2~10 represents 2 to the power of 10 (1024 times).

Note

Because the maximum averaging count is 2^20, measurement will stop before the specified averaging duration elapses if you set the averaging duration greater than this maximum.

Selecting the Event Detection

The event detection function automatically detects events from the acquired data after the averaging measurement.

Auto: Automatically detects events after the averaging measurement, creates a list, and shows the event analysis menu.

Manual: Displays the waveform after the averaging measurement but does not detect events.

Automatic Storage of Measured Results

The measured data acquired after the averaging measurement can be saved automatically to a specified destination folder.

OFF: Does not save the measured data after the averaging measurement.

ON: Automatically saves the measured data after the averaging measurement.

Selecting the Plug Check Mode

The plug check function verifies the connection between the AQ7270 and the optical fiber cable. If this function is turned ON and the optical fiber cable is not connected to the AQ7270 or the connection is not appropriate, the AQ7270 does not transmit light from the optical pulse output port.

OFF: Does not perform a plug check.

ON: Perform a plug check.

Selecting the Fiber-In-Use Alarm (/PM Option Only)

The wavelength of the optical pulse used by the AQ7270 is the same as that used in optical communications. If optical communication is ongoing in the optical fiber cable, applying the light from the AQ7270 will affect the communication. This communication light is called in-service light. The fiber-in-use alarm checks whether communication light is passing through the optical fiber cable that you are trying to measure. If an in-service light is detected, an alert is displayed asking whether you want to continue with the measurement. For details on the message, see section 18.2.

Selecting the Averaging Measurement Continue

The averaging measurement continue function continues the averaging measurement on an already acquired waveform if the waveforms are acquired repetitively.

OFF: Does not perform averaging measurement continue.

ON: Performs averaging measurement continue.

Averaging measurement is performed up to 2^{20} times.

The averaging measurement continue is invalid if any of the following settings is ON.

- The distance range is set to auto.
- Plug check.
- Fiber-in-use alarm

6.2 Setting the Analysis Conditions

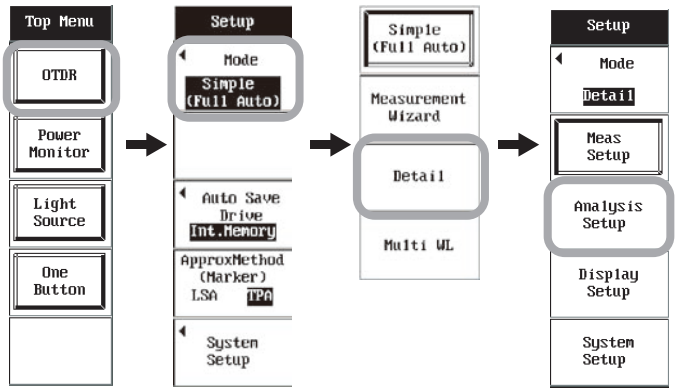
Procedure

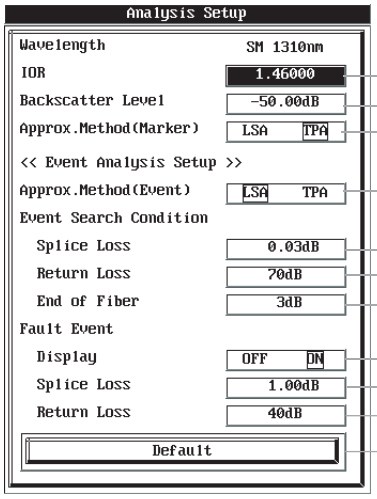
Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. A soft key menu for the Detail mode appears.

Setting the Analysis Conditions

5. Press the **Analysis Setup** soft key. The Analysis Setup screen appears.





- Set the group refraction index (see page 6-13 for the procedure)
- Set the backscattering light level (see page 6-13 for the procedure)
- Select the approximation method of the marker (see page 6-13 for the procedure)
- Select the approximation method of the event detection (see page 6-13 for the procedure)
- Set the threshold level of the splice loss (see page 6-13 for the procedure)
- Set the threshold level of the return loss (see page 6-14 for the procedure)
- Set the threshold level of the end of the fiber (see page 6-14 for the procedure)
- Show/hide the fault event display (see page 6-14 for the procedure)
- Set the threshold level of the splice loss to be detected as a fault event (see page 6-14 for the procedure)
- Set the threshold level of the return loss to be detected as a fault event (see page 6-14 for the procedure)
- Initialize the settings (see page 6-14 for the procedure)

- **Setting the Group Refraction Index**

  6. Move the cursor to IOR using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. The screen for setting the group refraction index appears.

  8. Set the group refraction index value using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The group refraction index is confirmed.

Note

- The AQ7270 measures the distance using the group refraction index. If you do not set the group refraction index correctly, an error will occur in the measured distance.
- The group refraction index varies depending on the wavelength. The default value indicates the group refraction index corresponding to each wavelength.
- The selectable range is between 1.30000 and 1.79999.

- **Setting the Backscattering Light Level**

  10. Move the cursor to Backscatter Level using the **arrow keys** or the **rotary knob**.

  11. Press **ENTER**. The screen for setting the backscattering light level appears.

  12. Set the backscattering light level using the **arrow keys** or the **rotary knob**.

  13. Press **ENTER**. The backscattering light level is confirmed.

Note

- If you do not set the backscattering light level correctly, an error will occur in the measured return loss and total return loss.
- The default value varies depending on the wavelength. The default value indicates the backscattering level corresponding to each wavelength.
- The selectable range is –10.00 to –64.99.

- **Selecting the Marker Approximation Method**

  14. Move the cursor to Approx.Method (Marker) using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER**. The cursor moves to LSA or TPA by Approx.Method (Marker).

- **Selecting the Event Approximation Method**

  16. Move the cursor to Approx.Method (Event) using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER**. The cursor moves to LSA or TPA by Approx.Method (Event).

- **Setting the Threshold Level of the Splice Loss Detection Level**

  18. Move the cursor to Splice Loss using the **arrow keys** or the **rotary knob**.

  19. Press **ENTER**. The screen for setting the splice loss appears.

  20. Set the splice loss using the **arrow keys** or the **rotary knob**.

  21. Press **ENTER**. The splice loss is confirmed.

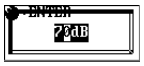
- **Setting the Threshold Level of the Return Loss Detection Level**

  22. Move the cursor to Return Loss using the **arrow keys** or the **rotary knob**.

  23. Press **ENTER**. The screen for setting the return loss appears.

  24. Set the return loss using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The return loss is confirmed.



- **Setting the Threshold Level of the End of the Fiber (Fresnel Reflection)**

  26. Move the cursor to End of Fiber using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. The screen for setting the end-of-fiber value appears.

  28. Set the end-of-fiber value using the **arrow keys** or the **rotary knob**.

  29. Press **ENTER**. The end-of-fiber value is confirmed.

- **Selecting the Fault Event Display**

  30. Move the cursor to Fault Event Display using the **arrow keys** or the **rotary knob**.

  31. Press **ENTER**. The cursor moves to ON or OFF by Fault Event Display.

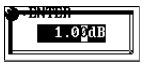
- **Setting the Threshold Level of the Splice Loss Detection Level of the Fault Event**

  32. Move the cursor to Splice Loss using the **arrow keys** or the **rotary knob**.

  33. Press **ENTER**. The screen for setting the splice loss appears.

  34. Set the splice loss using the **arrow keys** or the **rotary knob**.

  35. Press **ENTER**. The splice loss is confirmed.



- **Setting the Threshold Level of the Return Loss Detection Level of the Fault Event**

  36. Move the cursor to Return Loss using the **arrow keys** or the **rotary knob**.

  37. Press **ENTER**. The screen for setting the return loss appears.

  38. Set the return loss using the **arrow keys** or the **rotary knob**.

  39. Press **ENTER**. The return loss is confirmed.

- **Initializing the Analysis Conditions**

  40. Move the cursor to Default using the **arrow keys** or the **rotary knob**.

  41. Press **ENTER**. The analysis conditions are initialized to factory default settings.

Explanation

Setting the Group Refraction Index

The following group refraction indexes are assigned according to the wavelength on the AQ7270.

850 nm:	1.46000
1300 nm:	1.46000
1310 nm:	1.46000
1490 nm:	1.46000
1550 nm:	1.46000
1625 nm:	1.46000
1650 nm:	1.46000

The selectable range is 1.30000 to 1.79999.

Setting the Backscattering Light Level

A phenomenon called Rayleigh scattering occurs in the light that traverse through an optical fiber cable. Within the Rayleigh scattering, the portion of the light that scatters in the direction opposite to the propagation direction of light is called backscattering. The backscattering light level setting is used to calculate the return loss and total return loss. The following backscattering light levels are assigned according to the wavelength on the AQ7270.

850 nm:	–32 dB
1300 nm:	–41 dB
1310 nm:	–50 dB
1490 nm:	–52 dB
1550 nm:	–52 dB
1625 nm:	–53 dB
1650 nm:	–53 dB

The selectable range is -10.00 to -64.99.

Approximation Method

A line is assumed when calculating the splice loss. This line is the approximation line.
The following two types of linear approximations are available.

- Least squares approximation (LSA)
- Two point approximation (TPA)

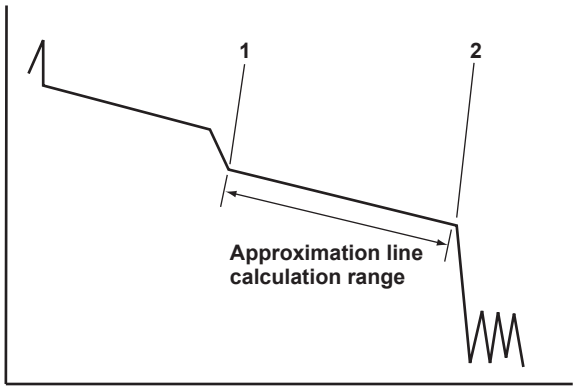
LSA

The loss between two points (between 1 and 2 in the figure below) is calculated using the least squares method.
This method has the following characteristics.

Advantage: The calculation error is small, because all the data between the two points are used.
Variation in the calculated value decreases, and the reproducibility of the calculated value improves.

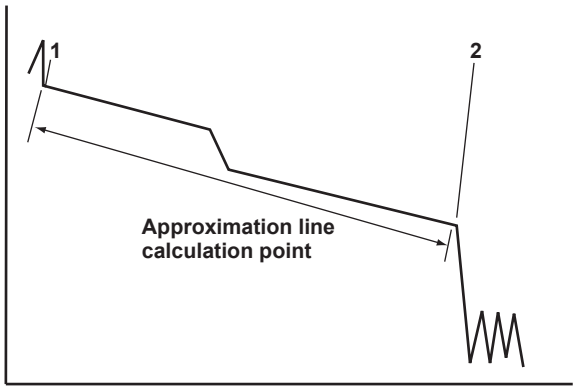
Disadvantage: If a large reflection or splice loss is present in the section in which the loss is calculated, the error becomes large because this value is also included.

LSA allows calculation with less error than TPA if there are no return or splice loss events.



TPA

Calculates the loss using the difference in the levels of the specified two points. The calculated value may vary greatly, and the reproducibility may be poor. TPA allows calculation with less error than LSA if there are return or splice loss events.



Event Detection Conditions

Splice Loss

If a splice loss that is greater than or equal to the specified threshold level occurs, it is detected as an event.
The selectable range is 0.01 dB to 9.99 dB.

Return Loss

If a return loss that is less than or equal to the specified threshold level occurs, it is detected as an event.
Because the reflection is smaller as the return loss increases, the event is detected when the reflection is less than or equal to the threshold level.
The selectable range is 20 dB to 70 dB.

End of Fiber (Fresnel Reflection)

If a reflection that is greater than or equal to the specified threshold level occurs, it is detected as an end of fiber.
The selectable range is 3 dB to 10 dB.

Displaying Fault Events

An event that is greater than or equal to the specified threshold level (less than or equal to the specified threshold level for reflections) is displayed as a fault event.

OFF: Does not display events that do not exceed the threshold level.
ON: Display events that do not exceed the threshold level.

Set the threshold levels used to display splice loss and return loss as fault events.

Splice loss: The selectable range is 0.01 dB to 9.99 dB.
Return loss: The selectable range is 20 dB to 70 dB.
End of fiber: The selectable range is 3 dB to 10 dB.

Because the end of fiber is handled as a splice loss or reflection, there is no fault event solely for the end of fiber.

6.3 Setting the Multi Wavelength Measurement Conditions

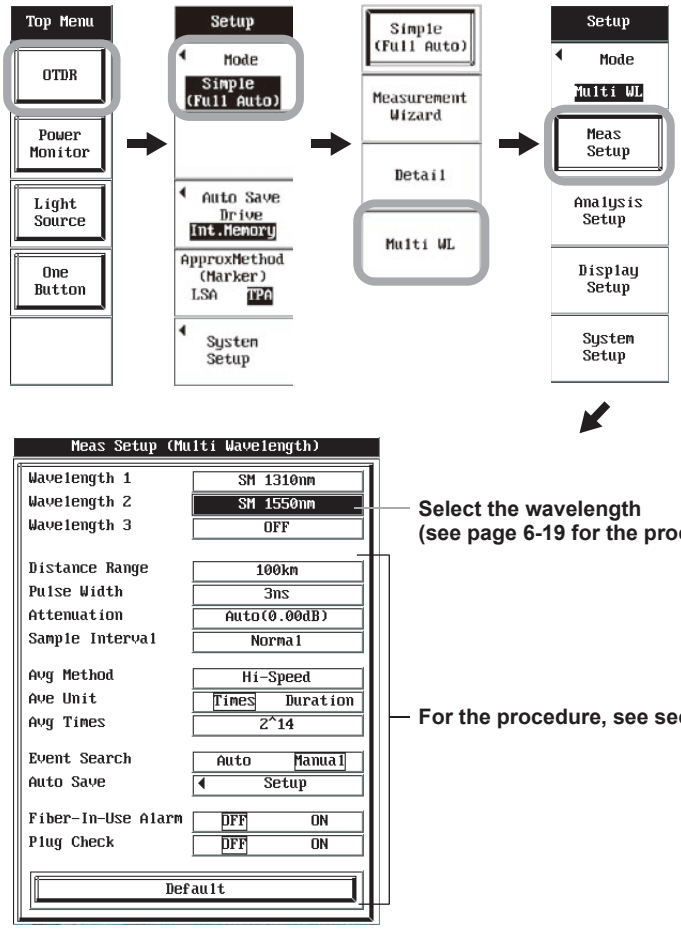
Procedure

Selecting the Multi Wavelength Measurement Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Multi WL** soft key. A soft key menu for the multi wavelength measurement appears.

Setting the Measurement Conditions

5. Press the **Meas Setup** soft key. The Meas Setup (Multi Wavelength) screen appears.



- **Selecting the Wavelength**

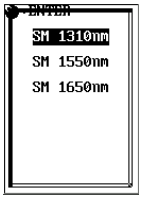
  6. Move the cursor to any wavelength between Wavelength 1 and Wavelength 3 using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A screen for selecting the wavelength appears.

  8. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. A screen for selecting the wavelength closes.

  10. Repeat steps 6 to 9 to set the wavelengths to be measured.



Note

- If multi wavelength measurement is selected, measurement is performed on the following wavelengths: 850nm, 1300nm, 1310 nm, 1490 nm, 1550 nm, and 1625 nm.
- The conditions that are common among the selected wavelengths are selectable for the following items.
  - Distance range
  - Pulse width
  - Attenuation
- For details on the settings other than the wavelengths, see section 6.1.

6.4 Setting the Multi Wavelength Analysis Conditions

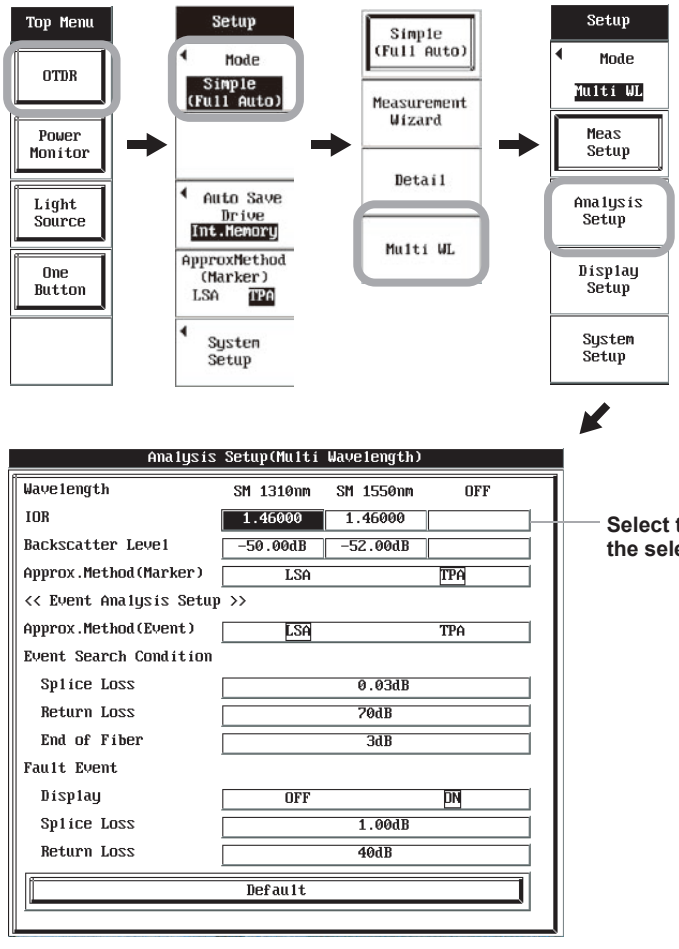
Procedure

Selecting the Multi Wavelength Measurement Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Multi WL** soft key. A soft key menu for the multi wavelength measurement appears.

Setting the Analysis Conditions

5. Press the **Analysis Setup** soft key. The Analysis Setup (Multi Wavelength) screen appears.



Note

For details on the settings other than the wavelengths, see section 6.2.

7.1 Realtime Measurement

Procedure

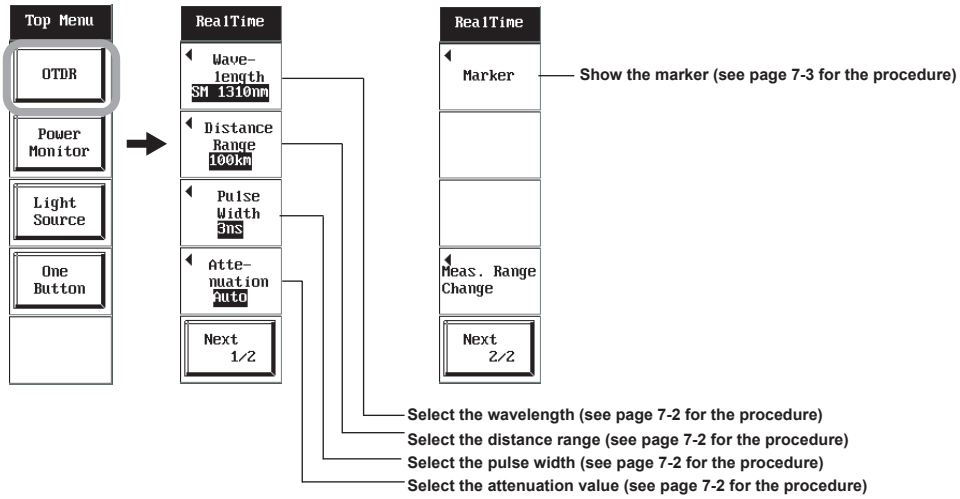
In realtime measurement, measurement is performed using the averaging count specified in advance. Because you can change the conditions while the measurement is in progress, you can view the waveform changes in realtime.

WARNING

Do not remove the optical fiber cable, because light is emitted from the optical pulse output port of the AQ7270 while the measurement is in progress. Visual impairment may occur if the light enters the eye.

Starting the Realtime Measurement

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **REALTIME**. The words LASER ON and the measured waveform are indicated on the screen, and the measurement starts. In addition, a soft key menu for the realtime measurement appears.



Note

You set the measurement conditions before the measurement. However, you can change the measurement conditions and make adjustments to the markers, cursors, cursor movement interval, and the like while the realtime measurement is in progress. The screen returns to the original display if you stop the measurement.

Changing the Measurement Conditions

- **Selecting the Wavelength**

  3. Press the **Wavelength** soft key. A screen for selecting the wavelength appears.

  4. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.

  5. Press **ENTER**. The wavelength is confirmed.

- **Select the Distance Range**

  6. Press the **Distance Range** soft key. A screen for selecting the distance range appears.

  7. Move the cursor to the distance range you want to select using the **arrow keys** or the **rotary knob**.

  8. Press ENTER. The distance range is confirmed.

Note

Auto is not available for the distance range.

- **Selecting the Pulse Width**

  9. Press the **Pulse Width** soft key. A screen for selecting the pulse width appears.

  10. Move the cursor to the pulse width you want to select using the **arrow keys** or the **rotary knob**.

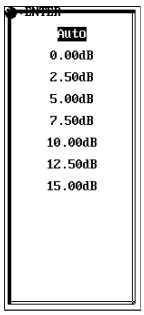
  11. Press **ENTER**. The pulse width is confirmed.

- **Selecting the Attenuation**

  12. Press the **Attenuation** soft key. The screen for selecting the attenuation appears.

  13 Move the cursor to the attenuation you want to select using the **arrow keys** or the **rotary knob**.

  14. Press **ENTER**. The attenuation is confirmed.



Note

- You can only change the wavelength in Simple (Full Auto) mode.
- You cannot change the attenuation if the averaging method is set to high reflection.
- For details, see section 6.1.

Use the Cursor

- **Displaying the Cursor**

  3. Turn the **rotary knob**. A cursor is displayed on the screen.

- **Selecting the Cursor Movement Interval**
  You can select whether to move the cursor at fine or coarse intervals.

  3. Press the **Meas. Range Change** soft key. A soft key menu for the measurement range appears.

  4. Press the **CursorOperate** soft key. The cursor moves to Coarse or Fine.

- **Deleting the Cursor**

  3. Press the **Marker** soft key. A soft key menu for the marker appears.

  4. Press the **More** soft key. The auxiliary function soft key menu appears.

  5. Press the **Delete Cursor** soft key. The cursor on the screen disappears.

  6. Press **ESC** to return to the soft key menu for the marker.

  7. Press **ESC** to return to the realtime measurement display.

Note

For details on the cursor, see section 11.1.

- **Marker and Cursor Operation**
  See section 11.1.

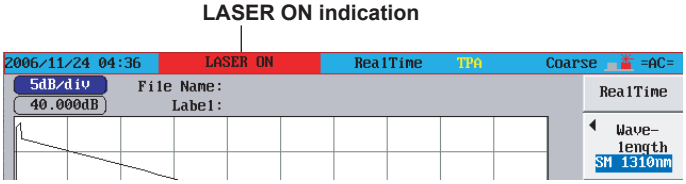
Stopping the Realtime Measurement

3. Press **REALTIME** again. The measurement stops, and the LASER ON indication on the screen disappears.

Explanation

The LASER ON indication is displayed on the screen while the measurement is in progress.

LASER ON indication



7.2 Averaging Measurement

Procedure

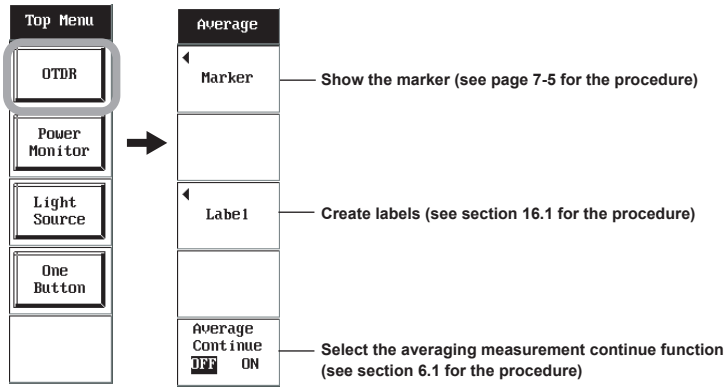
In averaging measurement, the AQ7270 acquires the data for each pulse, takes an average of the data acquired for each pulse, and displays the result. The averaging measurement improves the signal-to-noise ratio (S/N ratio). It is useful when detecting minute events that are buried in the noise.

WARNING

Do not remove the optical fiber cable, because light is emitted from the optical pulse output port of the AQ7270 while the measurement is in progress. Visual impairment may occur if the light enters the eye.

Starting the Averaging Measurement

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **AVG**. The words LASER ON and the measured waveform are indicated on the screen, and the measurement starts. A value indicating the progress of the averaging operation is displayed while the measurement is in progress. If the averaging measurement completes at the specified condition, the measurement automatically stops.



Note

- A soft key menu for the averaging measurement appears while the measurement is in progress.
- Press AVG again while the measurement is in progress to stop the measurement.
- The time it takes to complete the measurement varies depending on the measurement conditions such as the distance range and averaging count.
- If you operate the marker while the measurement is in progress, the marker screen automatically closes when the measurement is complete.
- If you are creating or editing a label, the edit screen does not close when the measurement is complete.

Use the Cursor

- **Displaying the Cursor**

  3. Turn the **rotary knob**. A cursor is displayed on the screen.

- **Deleting the Cursor**

  3. Press the **Marker** soft key. A soft key menu for the marker appears.

  4. Press the **More** soft key. The auxiliary function soft key menu appears.

  5. Press the **Delete Cursor** soft key. The cursor on the screen disappears.

  6. Press **ESC** to return to the soft key menu for the marker.

  7. Press **ESC** to return to the realtime measurement display.

Note

For details on the marker and cursor, see section 8.2 and 11.1.

Changing the Label

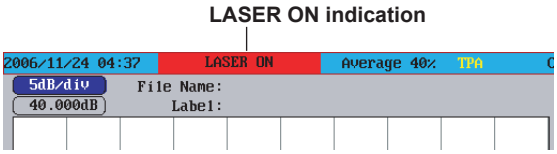
See section 16.1.

Changing the Averaging Measurement Continue Mode

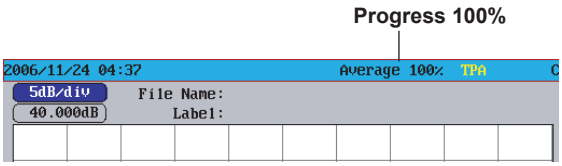
See section 6.1.

Explanation

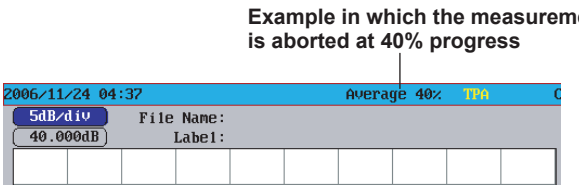
The LASER ON indication is displayed on the screen while the measurement is in progress.



The averaging measurement automatically stops when the measurement is completed. If the measurement completes normally, 100% is indicated. If you were making measurements with a marker while the averaging measurement was in progress, the operation screen used to make measurements with the marker closes when the measurement completes normally (100%). If the event detection is set to AUTO, the event detection screen is displayed when the measurement completes normally.



Measurement stops if you press AVE again while the averaging measurement is in progress. The progress of the averaging measurement until the measurement was stopped is indicated.

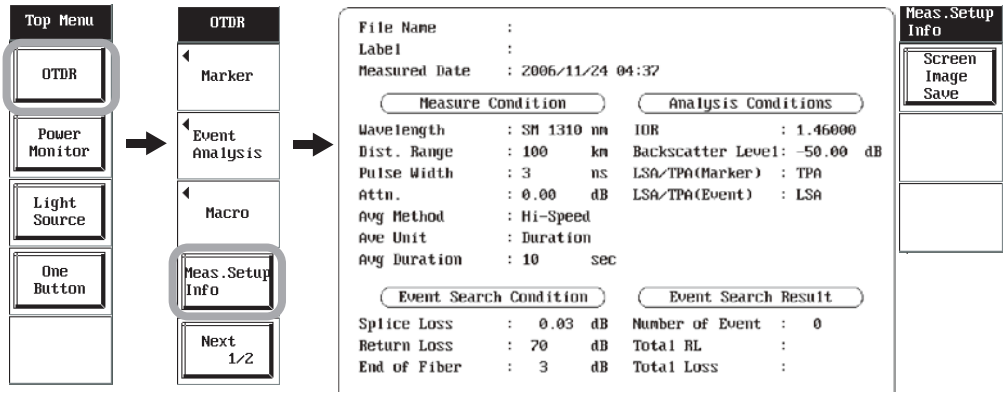


7.3 Displaying the Measurement Conditions

Procedure

If you set the measurement conditions to auto, the settings are determined at the time of measurement. This function is used to view the settings. The values set manually are also displayed.

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Next 1/2** soft key.
3. Press the **Meas. Setup Info** soft key. The measurement condition list and a soft key menu for the measurement setup information are displayed.



Saving the List Screen

4. Press the **Screen Image Save** soft key. The screen image is saved to the root folder of the internal memory with the file name MeasureInfo.BMP.

Note

The colors of the saved screen image are the same as the colors of the displayed screen. To select other colors, see section 17.2.

7.4 High Resolution Measurement of the Selected Location

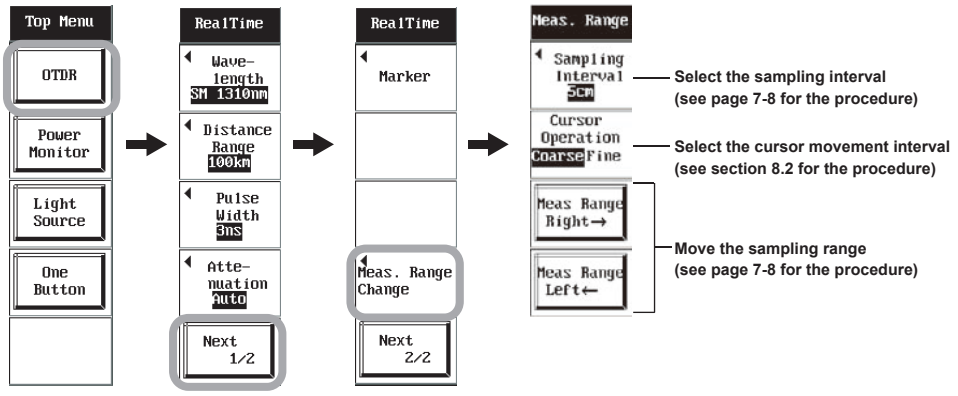
Procedure

You can limit the location for making measurements in high resolution.

1. Press the **OTDR** soft key. The optical pulse measurement display appears.

High Resolution Measurement in Realtime

2. Press **REALTIME**. The words LASER ON and the measured waveform are indicated on the screen, and the measurement starts. In addition, a soft key menu for the realtime measurement appears.
3. Press the **Next 1/2** soft key.
4. Press the **Meas. Range Change** soft key. A soft key menu for the measurement range appears.



Setting the Location to Be Analyzed in Detail

- **Displaying the Cursor**

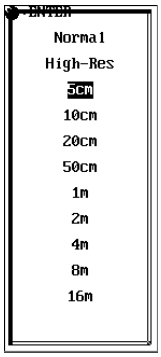
5. Turn the **rotary knob**. A cursor is displayed on the screen.
6. Turn the **rotary knob** to move the cursor to the section on the waveform you want to analyze.

Note

You can adjust the interval for moving the cursor using the CursorOperate soft key. For the procedure, see section 8.2.

Selecting the Sampling Interval

7. Press the **Sampling Interval** soft key. A screen for selecting the sampling interval appears.



8. Move the cursor to the sampling interval you want to select using the **arrow keys** or the **rotary knob**.

9. Press **ENTER**. The sampling interval is confirmed, and the waveform in a limited range according to the sampling interval is displayed around the cursor position.

Moving the Measurement Range

10. Press the **Meas. Range Right** → soft key. The limited range moves to the right.

11. Press the **Meas. Range Left** → soft key. The limited range moves to the left.

Note

- The overview screen at the lower right of the display shows the location of the limited range with respect to the entire measurement range.
- The Meas. Range Right and Meas. Range Left soft keys are valid only when the measurement range is limited. The movement interval depends on the coarse/fine setting.

High Resolution Measurement through Averaging

If you set the high resolution measurement conditions in realtime measurement, you can perform the averaging measurement using the same settings.

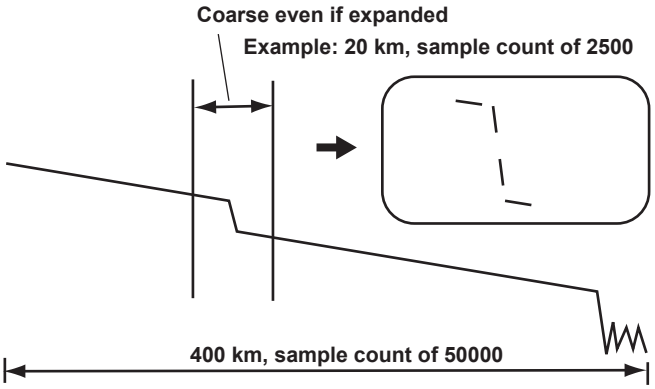
10. Press **AVG**. The averaging measurement is performed using the high resolution conditions.

Note

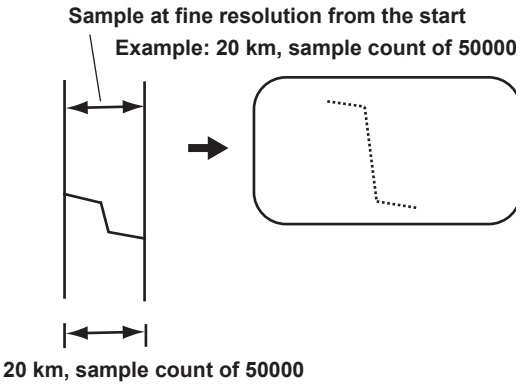
- The waveform range is displayed using the distance corresponding to the selected sampling interval around the cursor position.
- To reset the display, set the sampling interval of the measurement conditions again. For the procedure, see section 6.1.

Explanation

In normal measurement, the interval is set so that the data is sampled over the entire distance according to the specified distance range. The maximum number of data samples is 50000 on the AQ7270. Therefore, if the distance range is large such as 400 km, the interval between each data sample becomes large, and events that occur between samples cannot be analyzed in detail. The waveform zoom function explained in chapter 8 only magnifies the result measured at the sampling resolution specified for each distance range. It does not increase the resolution.



In high resolution measurement, you move the cursor to the location you want to analyze in detail and select the sampling resolution. Here, you can select any sampling interval regardless of the distance range. The measurement range is determined by the sampling resolution with the cursor at the center of the range. If there is no cursor, the left end of the current measurement range becomes the reference.

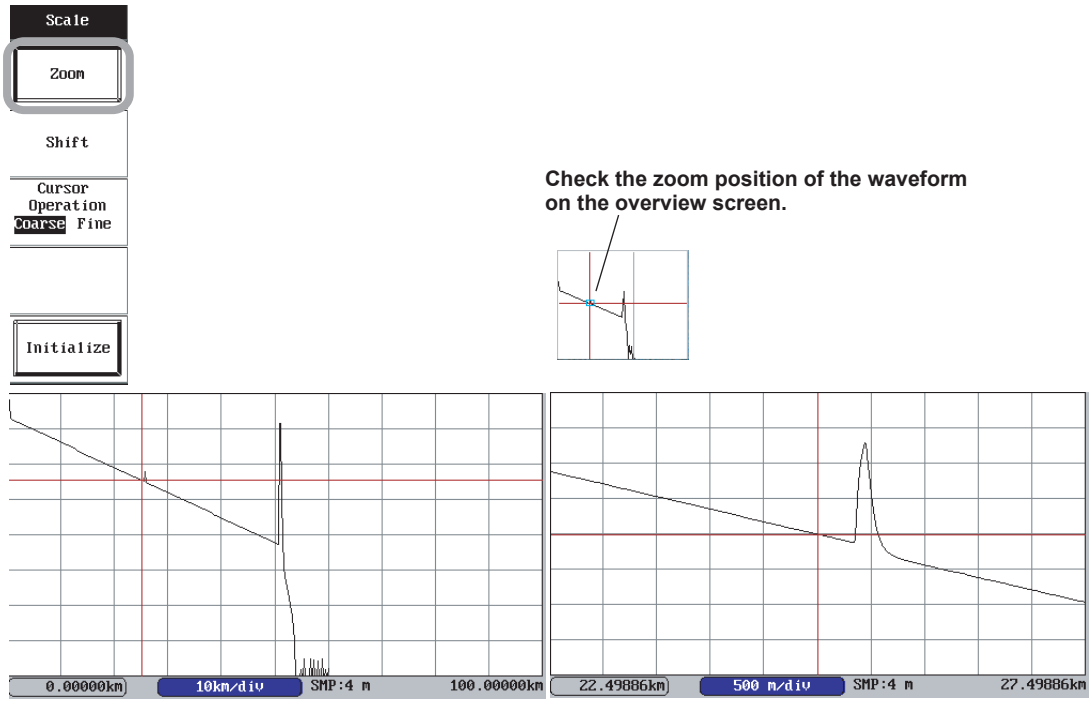


Example when the distance range is 400 km
The highest resolution that you can select in the measurement conditions in detail mode corresponds to a sampling interval of 8 m as calculated by 400 km/50000. Using the high resolution measurement function, you can select the smallest interval of 5 cm. In this case, the distance range that can be displayed is 2.5 km as calculated by 5 cm × 50000. You can display a range of 2.5 km around the cursor.
You can zoom or shift the limited measurement range. For the procedure, see sections 8.1 and 8.2.
To reset the measurement range, set the distance range again.

8.1 Zooming the Display

Procedure

1. Press **SCALE**. A soft key menu for the scale appears.
2. Turn the **rotary knob** to move the cursor to the waveform you want to zoom.
3. Press the **Zoom** soft key.
4. Press the **arrow keys**. The waveform is zoomed around the cursor.



Normal scale

Zoom scale

Explanation

↓: The waveform is expanded vertically.
↑: The waveform is reduced vertically.
←: The waveform is expanded horizontally.
→: The waveform is reduced horizontally.

You can check the location of the current display in the overview screen at the lower right of the display.

8.2 Moving the Waveform

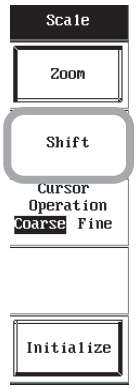
Procedure

Scrolling the Screen

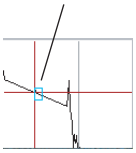
1. Press **SCALE**. A soft key menu for the scale appears.
2. Press the **Shift** soft key.
3. Press the **arrow keys**. The waveform moves.

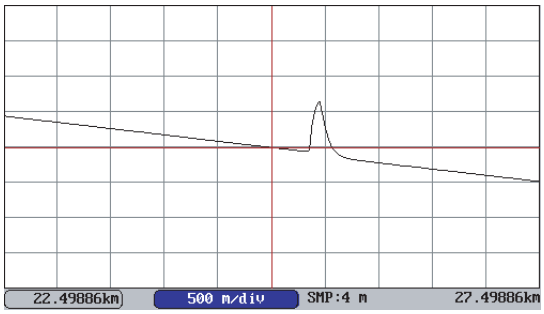
- **Selecting the Cursor Movement Interval**
  You can select whether to move the cursor at fine or coarse intervals.

4. Press the **Cursor Operation** soft key to select Coarse or Fine.

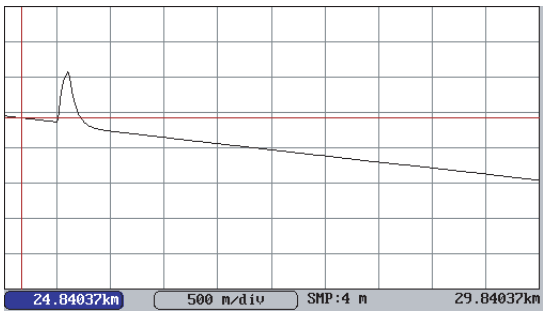


The waveform display area (the section enclosed in a square) within the entire screen moves.





Before moving the waveform display area



Move the waveform display area to the right

Note

- You can also select the cursor movement interval by pressing the rotary knob.
- The shift interval depends on the cursor movement interval setting.

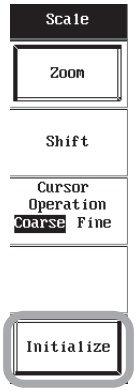
Explanation

↓: Moves the waveform display area down.
↑: Moves the waveform display area up.
←: Moves the waveform display area to the left.
→: Moves the waveform display area to the right.

8.3 Initializing the Waveform Display

Procedure

1. Press **SCALE**. A soft key menu for the scale appears.
2. Press the **Initialize** soft key. The waveform display returns to the original size and position.



Note

In high resolution measurement, the scale within the limited range is initialized.

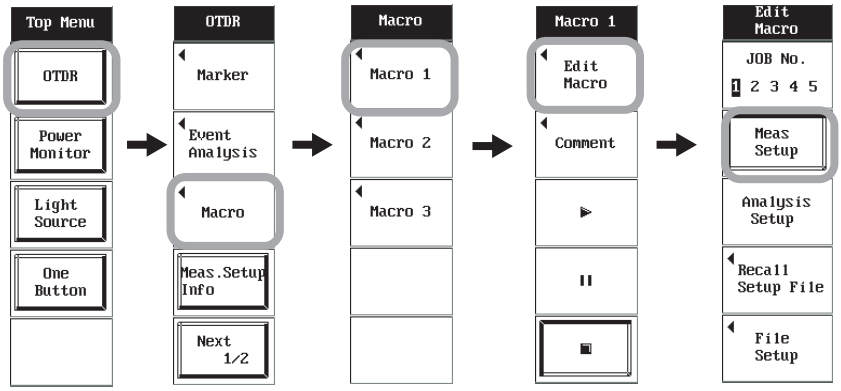
9.1 Creating the Measurement Conditions (Defining the Macro Conditions)

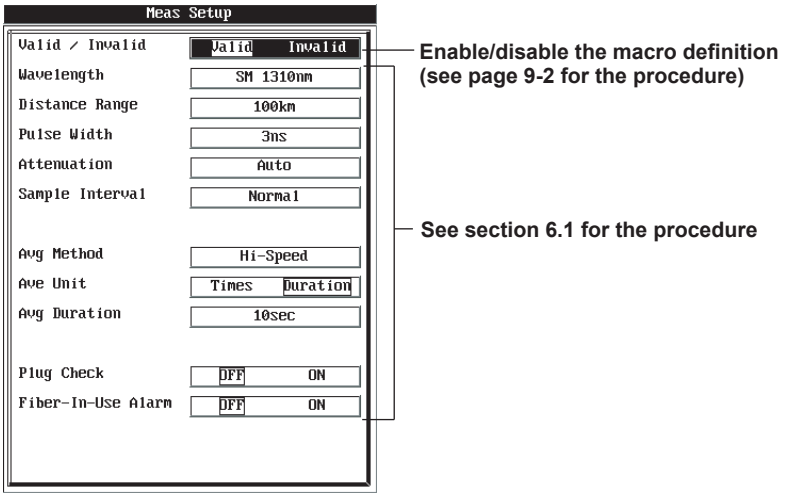
Procedure

Define the macro before performing one-button measurement.

Displaying the Macro Definition Screen

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Macro** soft key. The soft key menu for Macro 1 to 3 appears.
3. Press the soft key corresponding to the macro you want to create from Macro 1 to 3. The soft key menu for executing the macro appears.
4. Press the **Edit Macro** soft key. A soft key menu for defining the macro appears.





Creating the First Macro

5. Press the **JOB No.** soft key to move the cursor to 1.

- **Setting the Measurement Conditions**

6. Press the **Meas Setup** soft key. The Meas Setup screen appears.
7. Move the cursor to Valid or Invalid using the **arrow keys** or the **rotary knob**.
8. Press **ENTER**. The cursor moves to Valid or Invalid by Valid/Invalid.

- **Setting the Analysis Conditions**

9. Press the **Analysis Setup** soft key. The Analysis Setup screen appears.
10. Move the cursor to Valid or Invalid using the **arrow keys** or the **rotary knob**.
11. Press **ENTER**. The cursor moves to Valid or Invalid by Valid/Invalid.

Creating Subsequent Macros

12. Press the **JOB No.** soft key to move the cursor to a number greater than 1.
13. Repeat steps 6 to 11.

Note

For the settings other than Valid and Invalid, see section 6.1.

Adding a Comment to the Defined Macro

Add a comment to identify the macro when a list of macros that you want to execute using the one-button function is displayed. You can view the comment in the properties of the one-button measurement screen.

4. Press the **Comment** soft key. The character input screen appears.
5. Enter a comment for identification.

Note

For details on entering characters, see section 16.1.

Explanation

For Macro 1 to 3, you can define up to 5 macros in each macro definition. The macros are executed in order from 1. Macros set to invalid in the definition are not executed.

9.2 Saving the Macro Measurement Results

Procedure

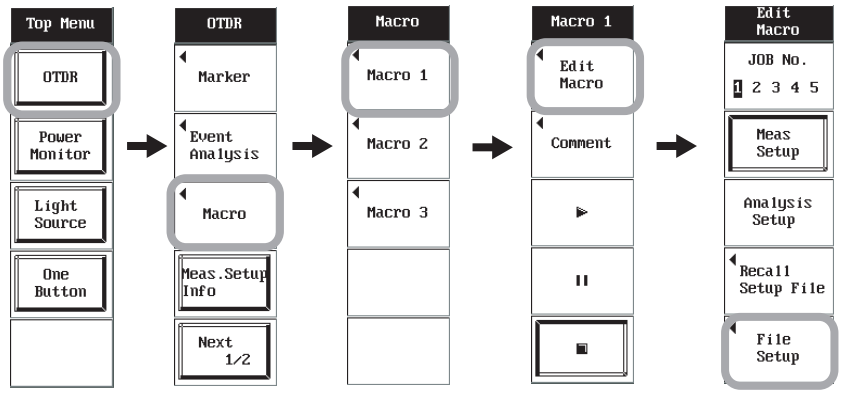
Set the method for saving the waveforms measured by executing macros. A folder indicating the date and time is created automatically in the MACRO folder in the internal memory, and the waveforms are stored in the folder.

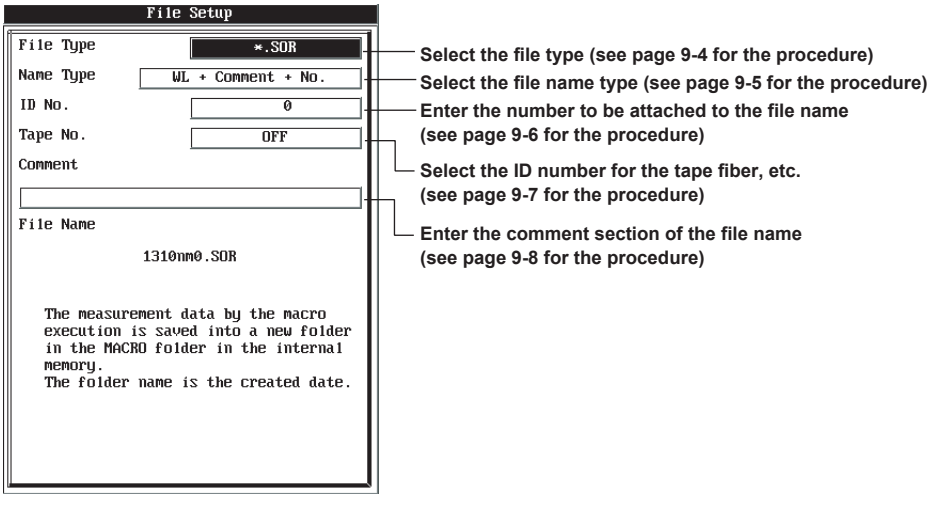
Displaying the Macro Definition Screen

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Macro** soft key. The soft key menu for Macro 1 to 3 appears.
3. Press the soft key corresponding to the macro you want to create from Macro 1 to 3. The soft key menu for executing the macro appears.
4. Press the **Edit Macro** soft key. A soft key menu for defining the macro appears.

Storage Format of Measurement Conditions

5. Press the **File Setup** soft key. The File Setup screen appears.





- **Selecting the Storage Data Type**

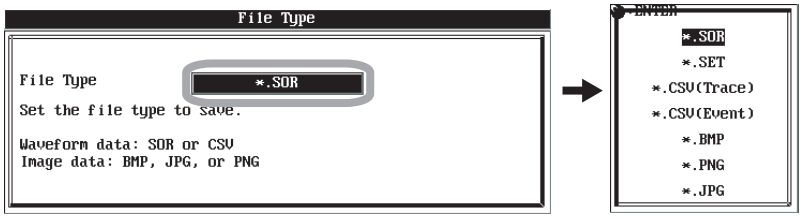
  6. Move the cursor to File Type using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A wizard screen for selecting the file type appears.

  8. Press **ENTER**. A screen for selecting the file type appears.

  9. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

  10. Press **ENTER**. The file type is confirmed.



- **Selecting the File Name Type**

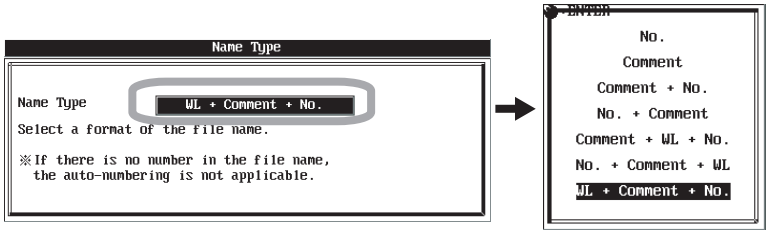
  11. Move the cursor to Name Type using the **arrow keys** or the **rotary knob**.

  12. Press **ENTER**. A wizard screen for selecting the file name type appears.

  13. Press **ENTER**. A screen for selecting the file name type appears.

  14. Move the cursor to file name type you want to select using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER**. The file name type is confirmed.



Note

Auto numbering is not performed for types that does not include a number.

- **Setting the File ID Number**

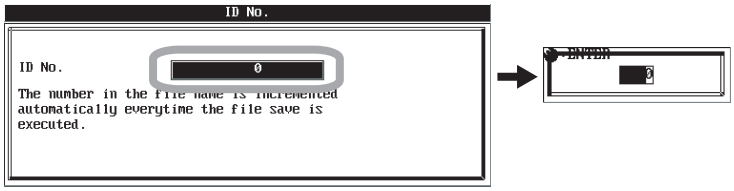
  16. Move the cursor to ID No. using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER**. A wizard screen for setting the ID number appears.

  18. Press **ENTER**. The screen for setting the ID number appears.

  19. Turn the **rotary knob** to set the ID number.

  20. Press **ENTER**. The ID number is confirmed.



Note

The number is incremented each time a file is saved.

- **Setting the ID Number for the Tape Fiber and the Like**

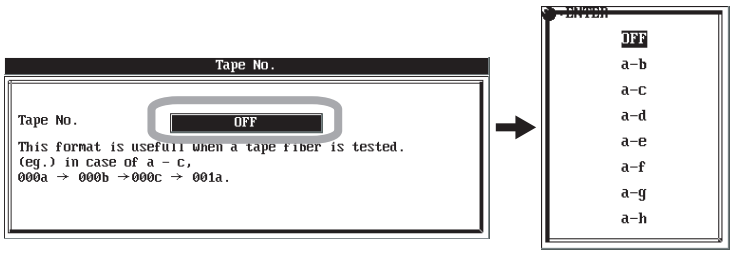
  21. Move the cursor to Tape ID using the **arrow keys** or the **rotary knob**.

  22. Press **ENTER**. A wizard screen for selecting the tape ID appears.

  23. Press **ENTER**. A screen for selecting the tape ID appears.

  24. Move the cursor to tape ID you want to select using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The tape ID is confirmed.



Note

Example if a-c is specified: 000a → 000b → 000c → 001a → 001b → 001c...

- **Attaching a Comment to the File Name**

  26. Move the cursor to Comment using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. A wizard screen for entering the comment appears.

  28. Press **ENTER**. The character input screen for entering the comment appears.

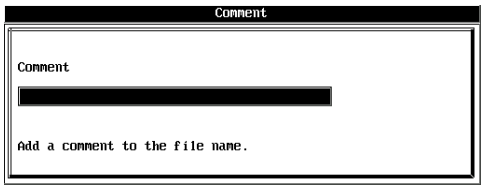
  29. Enter the comment using the **arrow keys**, **rotary knob** and **ENTER**.

  30. Press the **OK** soft key. The characters are confirmed.

  31. Press **ESC**. The wizard screen for entering the comment closes.

  32. Press **ESC**. The File Setup screen closes, and the Measurement Setup or Analysis Setup screen of the macro definition appears.

  33. Press **ESC**. The Measurement Setup or Analysis Setup screen closes, and the optical pulse measurement screen appears.



Note

For details on entering characters, see section 16.6.

9.3 Loading the Measurement Conditions

Procedure

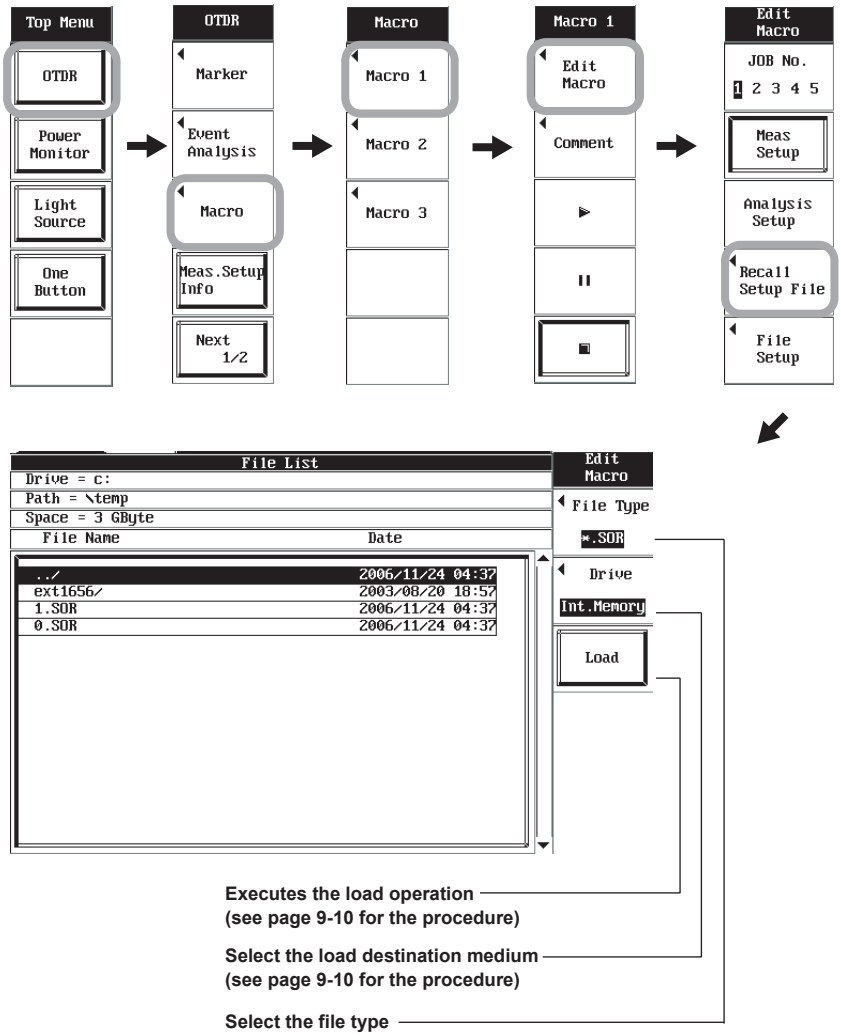
The settings can be reused to define macro conditions. You can reuse the settings by loading an existing measurement result.

Displaying the Macro Definition Screen

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Macro** soft key. The soft key menu for Macro 1 to 3 appears.
3. Press the soft key corresponding to the macro you want to create from Macro 1 to 3. The soft key menu for executing the macro appears.
4. Press the **Edit Macro** soft key. A soft key menu for defining the macro appears.

Loading the Measurement Conditions

5. **JOB No.** soft key to move the cursor to any job number from 1 to 5.
6. Press the **Recall Setup File** soft key. A soft key menu for loading the conditions and a file list screen appear.

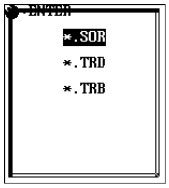


Selecting the File Type

7. Press the **File Type** soft key. A screen for selecting the file type appears.

8. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

9. Press **ENTER**. The file type is confirmed.



Note

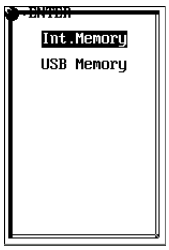
- If the loaded file contains information of the marker, cursor, and distance reference, those items are also loaded.
- For details on the file types, see section 16.1.

Selecting the Medium

10. Press the **Drive** soft key. A screen for selecting the load source drive appears.

11. Move the cursor to the load source drive you want to select using the **arrow keys** or the **rotary knob**.

12. Press **ENTER**. The load source drive is confirmed.



Loading a File

13. Move the cursor to the file you want to load using the **arrow keys** or the **rotary knob**.

14. Press the **Load** soft key. The file is loaded.

15. Press **ESC** to return to the soft key menu screen for the macro definition.

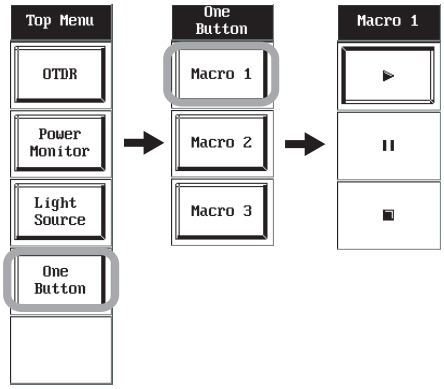
9.4 Executing the Macro

Procedure

There are two ways to execute a macro. One way is to execute a macro as a one-button measurement function when using the AQ7270. The other is to play the defined macro for verification.

One-Button Measurement

1. Press the **One Button** soft key. The macro execution screen appears.
2. Press the soft key corresponding to the macro you want to execute from Macro 1 to 3. The optical pulse measurement display appears, and the measurement starts. In addition, the soft key menu for executing the macro appears.



- **Pausing the Macro Execution**

3. Press the || soft key. The measurement pauses.

- **Starting the Macro Execution**

4. Press the ▶ soft key. The measurement starts or resumes.

- **Stopping the Macro Execution**

5. Press the ■ soft key. The measurement stops.

Note

- If you press the Pause soft key, the macro pauses when the job number currently in progress is completed (up to the saving of the measured results).
- If you press the Stop soft key, the measurement stops if the measurement is in progress. In this case, the measured results are not saved.

Checking the Macro Definition

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Macro** soft key. The soft key menu for Macro 1 to 3 appears.
3. Press the soft key corresponding to the macro you want to check from Macro 1 to 3. The soft key menu for executing the macro appears.

- **Starting the Macro Execution**

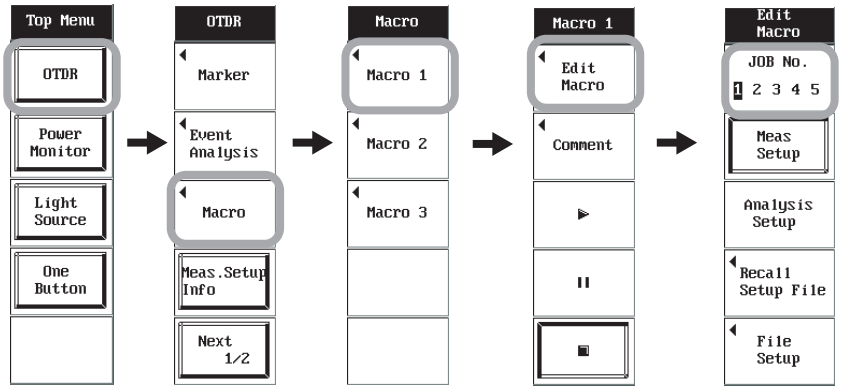
4. Press the ▶ soft key. The measurement starts or resumes.

- **Pausing the Macro Execution**

5. Press the || soft key. The measurement pauses.

- **Stopping the Macro Execution**

6. Press the ■ soft key. The measurement stops.



Note

- If you press the Pause soft key, the macro pauses when the job number currently in progress is completed (up to the saving of the measured results).
- If you press the Stop soft key, the measurement stops if the measurement is in progress. In this case, the measured results are not saved.

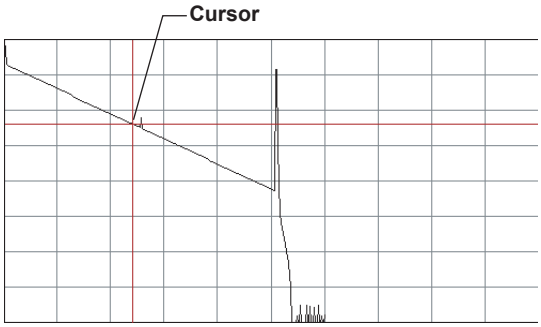
10.1 Measuring the Distance from the Instrument

Procedure

The distance to the event such as reflections and splice loss can be measured by placing the cursor on the acquired waveform.

Displaying the Cursor

1. Turn the **rotary knob**. A cursor is displayed on the screen.



Note

For details on the cursor, see section 11.1.

Explanation

The point where the optical fiber cable is connected to the AQ7270 is the distance measurement reference.
To measure more accurately, zoom the waveform.

10.2 Moving the Measurement Reference

Procedure

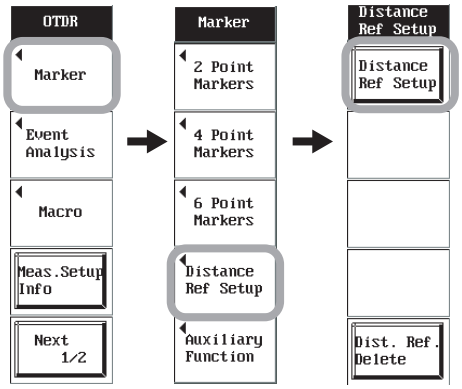
Normally, the point where the optical fiber cable is connected to the AQ7270 is the measurement reference. This point is used as the distance reference to calculate the distance at the cursor and marker positions. If you are making measurements with a dummy fiber connected, the distance reference is moved by the length of the dummy fiber for the measurements.

Moving the Distance Reference

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **Distance Ref Setup** soft key. The soft key menu for setting the distance reference appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.
4. Move the cursor to the point where you want to specify the distance reference on the waveform.
5. Press the **Distance Ref Setup** soft key. A line indicating the distance reference appears.

Resetting the Distance Reference

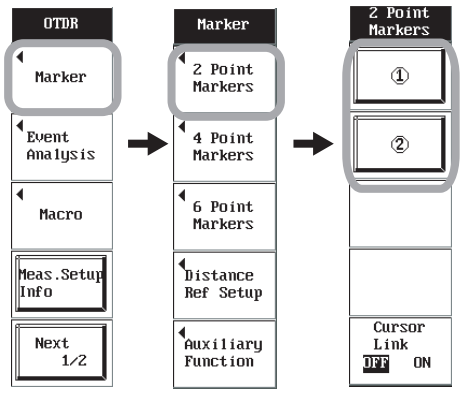
6. Press the **Dist. Ref. Delete** soft key. The line indicating the distance reference disappears.

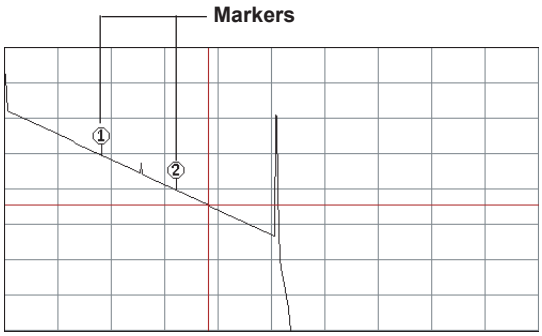


You can measure the distance of a section in the middle of the cable (not from the measurement reference) by using markers.

Measuring the Distance of a Section Using Markers

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** soft key. The soft key menu for the 2 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.
4. Move the cursor to the start position of the measurement section on the waveform.
5. Press the ① soft key. The ① marker is displayed on the screen.
6. Move the cursor to the end position of the measurement section on the waveform.
7. Press the ② soft key. The ② marker is displayed on the screen, and the distance of the section is displayed in the calculation results screen for the measured data.





Note

For details on the marker and cursor, see section 11.1.

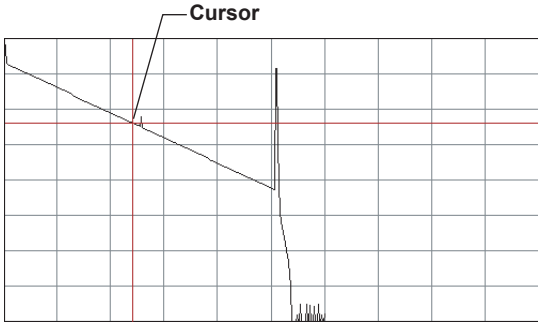
11.1 Marker and Cursor Operation

Procedure

You can use markers to measure the distance, splice loss, and return loss between two points. This section explains how to operate the markers. For details on the calculation of the splice loss between markers, see the explanation. For a description of the measurement screens, see chapter 10, "Measuring the Distance," section 11.2, "Measuring the Splice Loss," and section 11.4, "Measuring the Return Loss and Reflection Level."

Displaying and Moving the Cursor

1. Turn the **rotary knob**. A cursor is displayed on the screen.

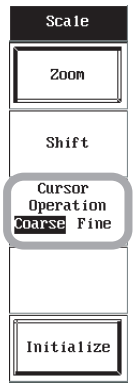


Selecting the Cursor Movement Interval

You can select whether to move the cursor at fine or coarse intervals.

1. Press **SCALE**. A soft key menu for the scale appears.

2. Press the **CursorOperate** soft key. The cursor moves to Coarse or Fine.

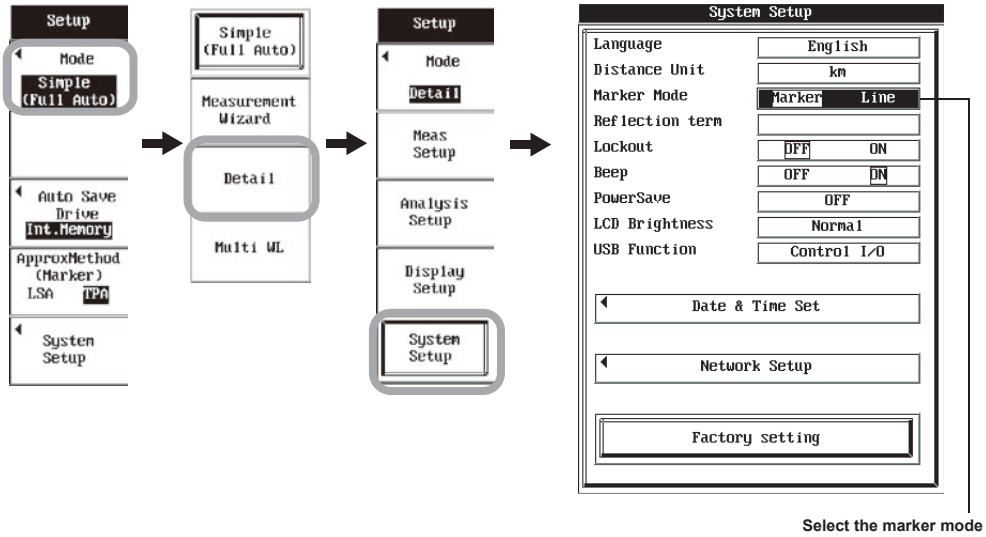


Note

- You can select the cursor movement interval by pressing the rotary knob.
- The cursor disappears if you turn the rotary knob to the left and the cursor moves to the left edge of the screen.

Selecting the Marker Mode

1. Press **SETUP**. A soft key menu for the settings appears.
2. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
3. Press the **Detail** soft key. A soft key menu for the Detail mode appears.
4. Press the **System Setup** soft key. The system setup screen appears.
5. Move the cursor to Marker Mode using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The marker mode is confirmed, and the optical pulse measurement screen appears.



Note

Line mode is used often by users outside Japan. Select Marker mode if you are used to using Yokogawa's predecessor models.

Operating the Markers (Marker Mode)

2 Markers Method

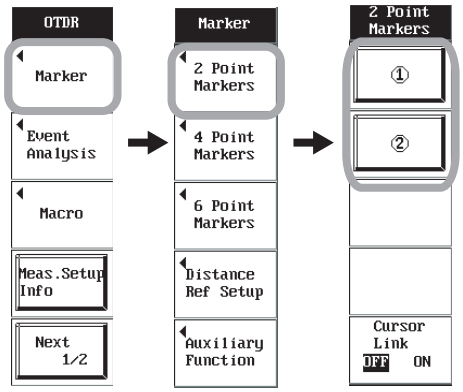
1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** soft key. The soft key menu for the 2 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.

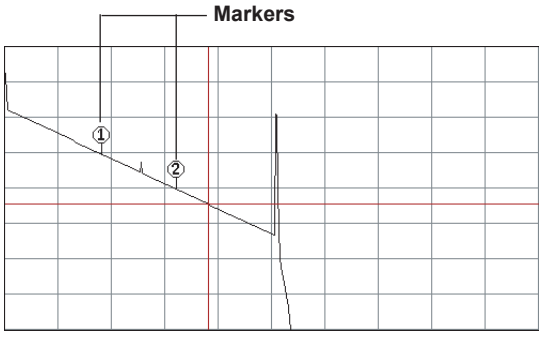
- **Setting the Measurement Start Position**

4. Move the cursor to the start position of the measurement section on the waveform.
5. Press the ① soft key. The ① marker is displayed on the screen.

- **Setting the Measurement End Position**

6. Move the cursor to the end position of the measurement section on the waveform.
7. Press the ② soft key. The ② marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.





4 Markers Method

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **4 Point Markers** soft key. The soft key menu for the 4 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.

- **Setting the Measurement Start Position**

4. Move the cursor to the start position of the measurement section on the waveform.
5. Press the ① soft key. The ① marker is displayed on the screen.

- **Setting the Start Position of the Splice Loss Event**

6. Move the cursor to the event start position on the waveform.
7. Press the ② soft key. The ② marker is displayed on the screen.

- **Setting the End Position of the Splice Loss Event**

8. Move the cursor to the event end position on the waveform.
9. Press the **Y2** soft key. The Y2 marker is displayed on the screen.

- **Setting the Measurement End Position**

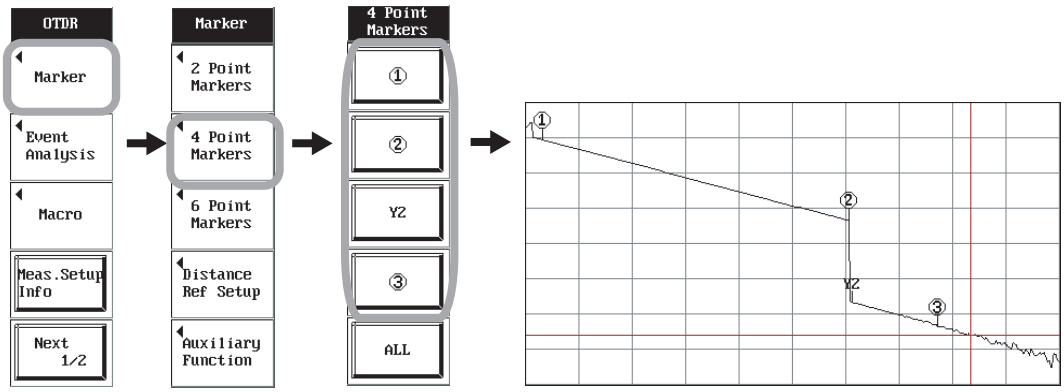
10. Move the cursor to the end position of the measurement section on the waveform.
11. Press the ③ soft key. The ③ marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.

- **Setting the Markers Automatically**

4. Move the cursor to the event start position on the waveform.
5. Press the **ALL** soft key. All the markers are set on the screen, and values are displayed in the calculation results screen for the measured data.

- **Adjusting the Interval of the Markers Set Automatically**

6. Press the **ALL** soft key. The ① and ③ markers moves in on the ② marker. When they move to the closes position, they return to their original positions.



6 Markers Method

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **6 Point Markers** soft key. The soft key menu for the 6 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.

- **Setting the Start Point of the First Splice Loss**

4. Move the cursor to the start position of the first splice loss on the waveform.
5. Press the ① soft key. The ① marker is displayed on the screen.

- **Setting the End Point of the First Splice Loss**

6. Move the cursor to the end position of the first splice loss on the waveform.
7. Press the **More** soft key. The soft key menu for the auxiliary markers appears.
8. Press the **Y1** soft key. The Y1 marker is displayed on the screen.

- **Setting the Point Used to Calculate the Approximation Line**

9. Move the cursor to the end position of the approximate line section on the waveform.
10. Press the **More** soft key. The soft key menu for the auxiliary markers appears.
11. Press the **Y3** soft key. The Y3 marker is displayed on the screen.
12. Press **ESC**. The auxiliary marker screen closes.

- **Setting the Start Position of the Splice Loss Event**

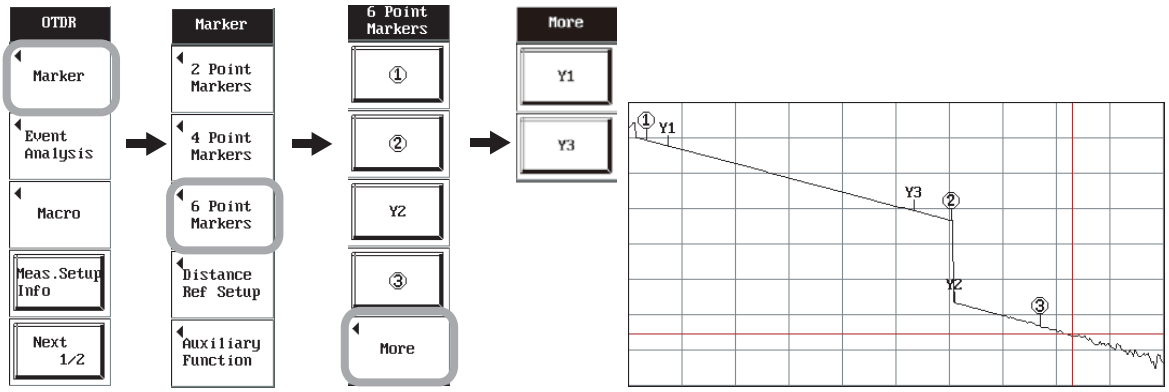
13. Move the cursor to the event start position on the waveform.
14. Press the ② soft key. The ② marker is displayed on the screen.

- **Setting the End Position of the Splice Loss Event**

15. Move the cursor to the event end position on the waveform.
16. Press the **Y2** soft key. The Y2 marker is displayed on the screen.

- **Setting the Measurement End Position**

17. Move the cursor to the end position of the measurement section on the waveform.
18. Press the ③ soft key. The ③ marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.



Operating the Markers (Line Mode)

2 Markers Method

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** soft key. The soft key menu for the 2 markers method appears.

- **Setting the Measurement Start Position**

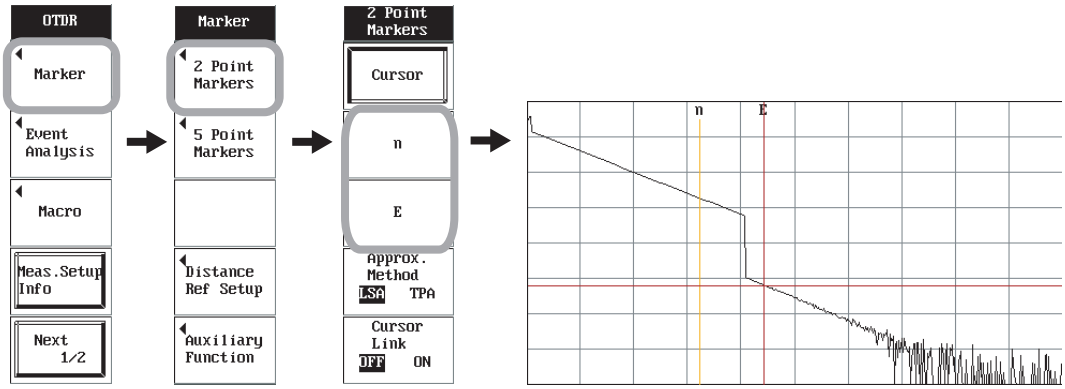
3. Press the **n** soft key.
4. Turn the **rotary knob**. The n cursor is displayed on the screen.
5. Turn the **rotary knob** to move the n cursor to the start position of the measurement section on the waveform.

- **Setting the Measurement End Position**

6. Press the **E** soft key.
7. Turn the **rotary knob**. The E cursor is displayed on the screen.
8. Turn the **rotary knob** to move the E cursor to the end position of the measurement section on the waveform. The values are displayed in the calculation results screen for the measured data.

- **Displaying the Cursor**

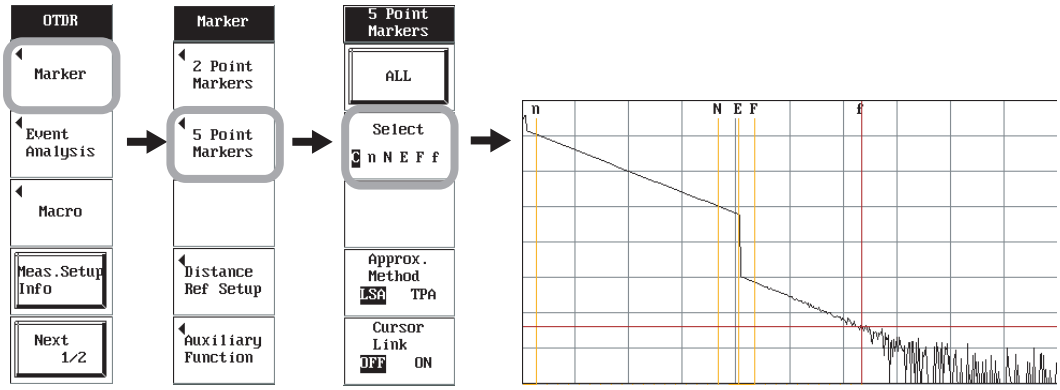
9. Press the **Cursor** soft key.
10. Turn the **rotary knob**. A cursor is displayed on the screen.



5 Markers Method

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **5 Point Markers** soft key. The soft key menu for the 5 markers method appears.

- **Setting the Near-End Point**
  3. Press the **Select** soft key to move the cursor to n.
  4. Turn the **rotary knob**. The n cursor is displayed on the screen.
  5. Turn the **rotary knob** to move the n cursor to the measurement start position (near-end point) on the waveform.
- **Setting the Point Used to Calculate the Approximation Line at the Near End**
  6. Press the **Select** soft key to move the cursor to N.
  7. Turn the **rotary knob**. The N cursor is displayed on the screen.
  8. Turn the **rotary knob** to move the N cursor to end point of the approximate line section on the waveform.
- **Setting the Detection Point of the Splice Loss**
  9. Press the **Select** soft key to move the cursor to E.
  10. Turn the **rotary knob**. The E cursor is displayed on the screen.
  11. Turn the **rotary knob** to move the E cursor on the waveform at the splice loss.
- **Setting the Point Used to Calculate the Approximation Line at the Far End**
  12. Press the **Select** soft key to move the cursor to F.
  13. Turn the **rotary knob**. The F cursor is displayed on the screen.
  14. Turn the **rotary knob** to move the F cursor to start point of the approximate line section on the waveform.
- **Setting the Far-End Point**
  15. Press the **Select** soft key to move the cursor to f.
  16. Turn the **rotary knob**. The f cursor is displayed on the screen.
  17. Turn the **rotary knob** to move the f cursor on the waveform at the far end.
- **Setting the Cursor**
  18. Press the **Select** soft key to move the cursor to C.
  19. Turn the **rotary knob**. A cursor is displayed on the screen.

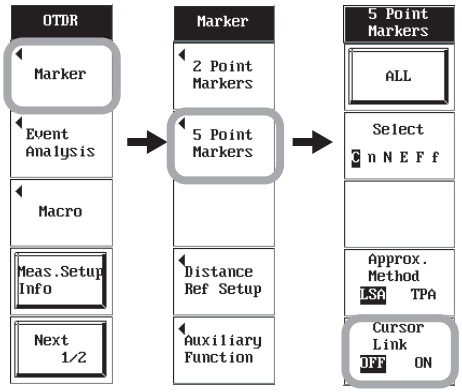


Other Operations

Selecting the Cursor Link

You can move the marker positions while maintaining the distance between the markers.

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** or **5 Point Markers** soft key. A soft key menu for the 2 markers method or 5 markers method appears.
3. Press the **Cursor Link** soft key. The cursor moves to ON or OFF.



Note

You can also set the cursor link from the soft key menu for the 2 markers method.

Deleting the Markers

4. Press the **More** soft key. A soft key menu for the auxiliary function appears.
5. Press the **Delete Marker** soft key. The markers disappears.

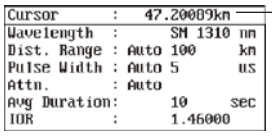
Deleting the Cursor

6. Press the **Delete Cursor** soft key. The cursor disappears.

Explanation

Cursor Display

The distance from the distance reference is displayed if you move the cursor.



Distance display

- The direction of cursor movement changes according to the direction you turn the rotary knob.
  - Clockwise: The cursor moves to the right.
  - Counterclockwise: The cursor moves to the left.
- If a waveform is displayed, the cursor moves along the waveform.
- You can move the cursor between the start point to the end point of the measured data. If you move the cursor to the left of the start point of the measured data, the cursor turns OFF. If you move the rotary knob clockwise at the measurement end point, the cursor does not move.

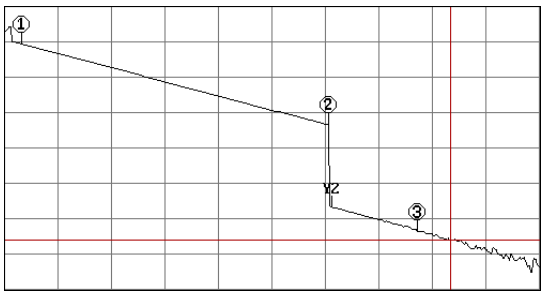
Differences between the Marker and Line Modes of the Marker

Marker Mode

A marker is set on the waveform. To measure the return loss or splice loss, set the markers as defined by the measurement method. The relevant values are calculated.

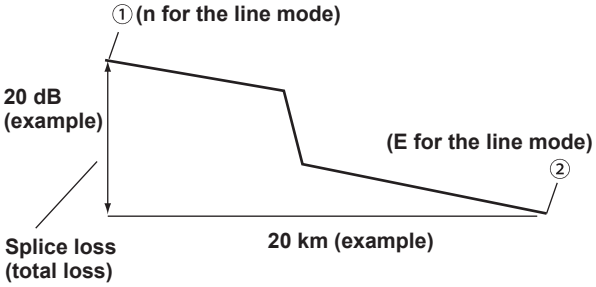
Line Mode

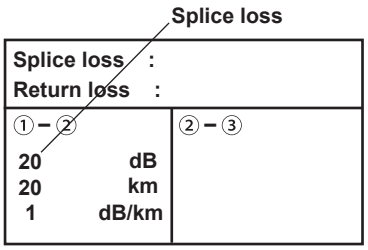
Multiple line markers are used to calculate the values in the sections between the line markers and measure the return loss or splice loss. The values are calculated in realtime as you move the line markers.



2 Markers Method

The loss between two points is measured. If a reflection is detected between the two points, the return loss is also measured.

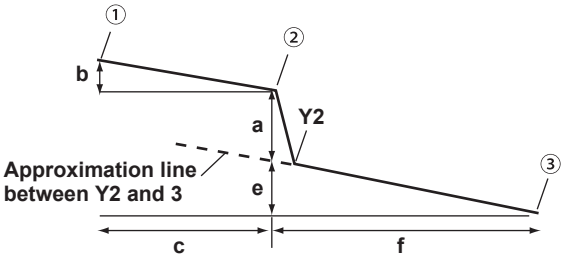


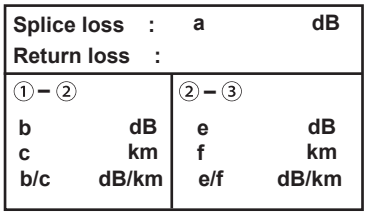


The measured values between the markers vary greatly depending on the specified approximation method.

4 Markers Method

Measurements are performed on the following four points: the measurement start point (①), the start point of the splice loss (②), the end point of the splice loss (Y2), and the measurement end point (③). The splice loss is calculated using the difference between the approximation line ①-② and the approximation line Y2-③.

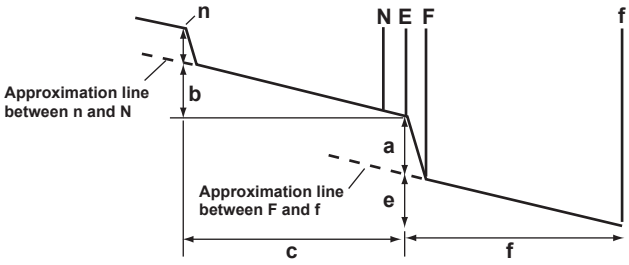




- The measured values between the markers vary greatly depending on the specified approximation method.
- Set the ② marker to the accurate position. The splice loss value varies greatly depending on the ② position.

5 Markers Method

This function is available only when the marker mode is set to Line. Measurement is performed on the following five points: the near-end point (n), the point used to calculate the approximation line at the near end (N), the splice loss detection point (E), the point used to calculate the approximation line at the far end (F), and the far-end point (f). The splice loss is calculated using the difference between the approximation line n-N and the approximation line F-f.



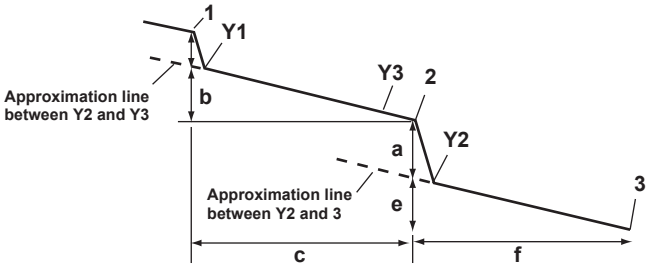
Splice loss :	a	dB
Return loss :		

n-E		E-f	
b	dB	e	dB
c	km	f	km
b/c	dB/km	e/f	dB/km

- The measured values between the lines vary greatly depending on the specified approximation method.
- Set the E line to the accurate position. The splice loss value varies greatly depending on the E position.

6 Markers Method

The 6 markers method is used if there are two splice loss events. Measurement is performed using the following six points: the start point of the first splice loss (①), the end point of the first splice loss (Y1), the point used to calculate the approximation line (Y3), the start point of the second splice loss (②), the end point of the second splice loss (Y2), and the measurement end point (③). The splice loss is calculated using the difference between the approximation line Y1-Y3 and the approximation line Y2-③.



Splice loss :	a	dB
Return loss :		

① – ②		② – ③	
b	dB	e	dB
c	km	f	km
b/c	dB/km	e/f	dB/km

- The measured values between the markers vary greatly depending on the specified approximation method.
- Set the ② marker to the accurate position. The splice loss value varies greatly depending on the ② position.

Cursor Link Function

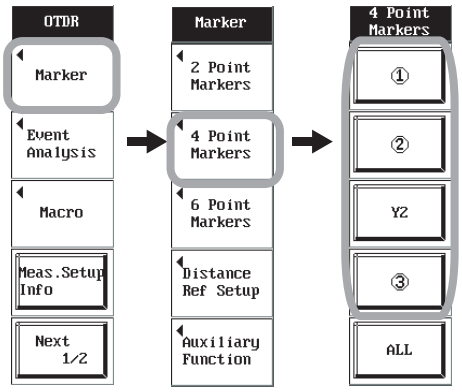
This function keeps the spacing between the markers (① to ③ and Y1 to Y3) constant. If the cursor link is turned ON, the markers move while maintaining the spacing between them when you move the cursor.

11.2 Measuring the Splice Loss

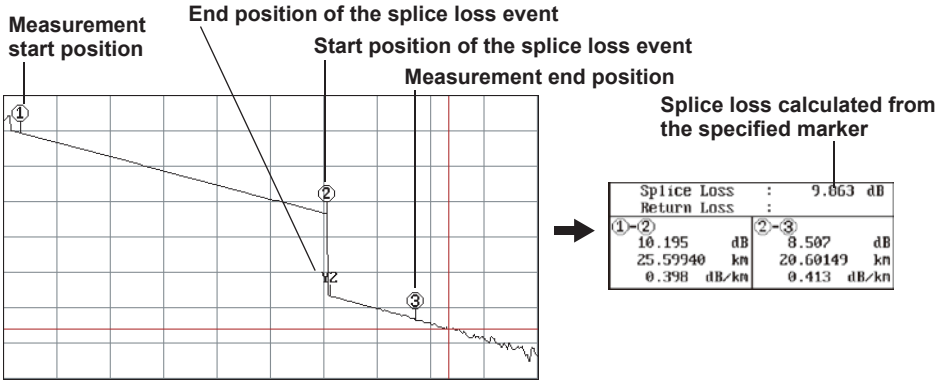
Procedure

If the Marker Mode Is Set to Marker

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **4 Point Markers** soft key. The soft key menu for the 4 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.



- **Setting the Measurement Start Position**
  4. Move the cursor to the start position of the measurement section on the waveform.
  5. Press the ① soft key. The ① marker is displayed on the screen.
- **Setting the Start Position of the Splice Loss Event**
  6. Move the cursor to the event start position on the waveform.
  7. Press the ② soft key. The ② marker is displayed on the screen.
- **Setting the End Position of the Splice Loss Event**
  8. Move the cursor to the event end position on the waveform.
  9. Press the **Y2** soft key. The Y2 marker is displayed on the screen.
- **Setting the Measurement End Position**
  10. Move the cursor to the end position of the measurement section on the waveform.
  11. Press the ③ soft key. The ③ marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.



- **Setting the Markers Automatically**

  4. Move the cursor to the event start position on the waveform.

  5. Press the **ALL** soft key. All the markers are set on the screen, and values are displayed in the calculation results screen for the measured data.

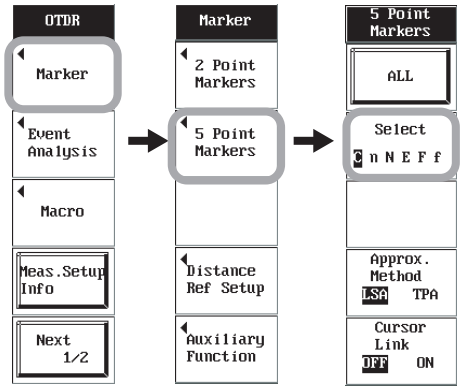
- **Adjusting the Interval of the Markers Set Automatically**

  6. Press the **ALL** soft key. The ① and ③ markers moves in on the ② marker. When they move to the closes position, they return to their original positions.

If the Marker Mode Is Set to Line

1. Press the **Marker** soft key. A soft key menu for the marker appears.

2. Press the **5 Point Markers** soft key. The soft key menu for the 5 markers method appears.



- **Setting the Near-End Point**

  3. Press the **Select** soft key to move the cursor to n.

  4. Turn the **rotary knob**. The n cursor is displayed on the screen.

  5. Turn the **rotary knob** to move the n cursor to the measurement start position (near-end point) on the waveform.

- **Setting the Point Used to Calculate the Approximation Line at the Near End**

  6. Press the **Select** soft key to move the cursor to N.

  7. Turn the **rotary knob**. The N cursor is displayed on the screen.

  8. Turn the **rotary knob** to move the N cursor to end point of the approximate line section on the waveform.

- **Setting the Detection Point of the Splice Loss**

  9. Press the **Select** soft key to move the cursor to E.

  10. Turn the **rotary knob**. The E cursor is displayed on the screen.

  11. Turn the **rotary knob** to move the E cursor on the waveform at the splice loss.

- **Setting the Point Used to Calculate the Approximation Line at the Far End**

  12. Press the **Select** soft key to move the cursor to F.

  13. Turn the **rotary knob**. The F cursor is displayed on the screen.

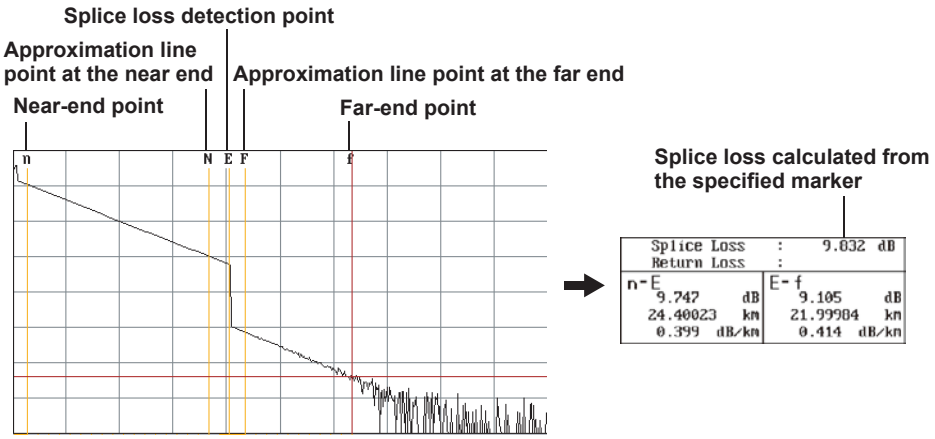
  14. Turn the **rotary knob** to move the F cursor to start point of the approximate line section on the waveform.

- **Setting the Far-End Point**

  15. Press the **Select** soft key to move the cursor to f.

  16. Turn the **rotary knob**. The f cursor is displayed on the screen.

  17. Turn the **rotary knob** to move the f cursor on the waveform at the far end.



- **Setting the Markers Automatically**

  3. Move the cursor to the event start position on the waveform.

  4. Press the **ALL** soft key. All the markers are set on the screen, and values are displayed in the calculation results screen for the measured data.

- **Adjusting the Interval of the Markers Set Automatically**

  5. Press the **ALL** soft key. The n and f markers moves in on the E marker. When they move to the closes position, they return to their original positions.

Note

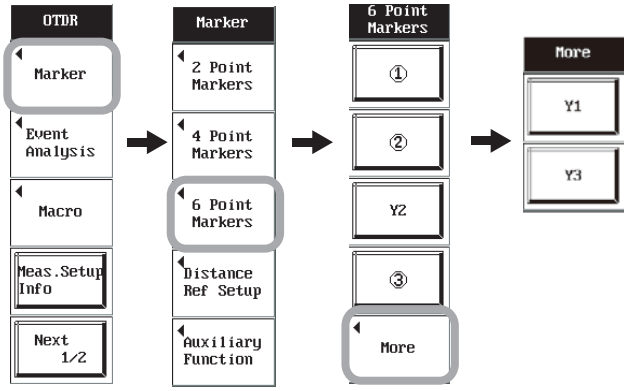
For details on the marker mode, 4 markers method, and 5 markers method, see section 11.1.

11.3 Measurement Taking the Adjacent Splice Loss into Consideration

Procedure

This method is used to calculate the approximation lines when two events are detected and measure the splice loss.

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **6 Point Markers** soft key. The soft key menu for the 6 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.



- **Setting the Start Point of the First Splice Loss**
  4. Move the cursor to the start position of the first splice loss on the waveform.
  5. Press the ① soft key. The ① marker is displayed on the screen.
- **Setting the End Point of the First Splice Loss**
  6. Move the cursor to the end position of the first splice loss on the waveform.
  7. Press the **More** soft key. The soft key menu for the auxiliary markers appears.
  8. Press the **Y1** soft key. The Y1 marker is displayed on the screen.
- **Setting the Point Used to Calculate the Approximation Line**
  9. Move the cursor to the end position of the approximate line section on the waveform.
  10. Press the **Y3** soft key. The Y3 marker is displayed on the screen.
- **Setting the Start Position of the Splice Loss Event**
  11. Press **ESC**. The auxiliary marker screen closes.
  12. Move the cursor to the event start position on the waveform.
  13. Press the ② soft key. The ② marker is displayed on the screen.

- **Setting the End Position of the Splice Loss Event**

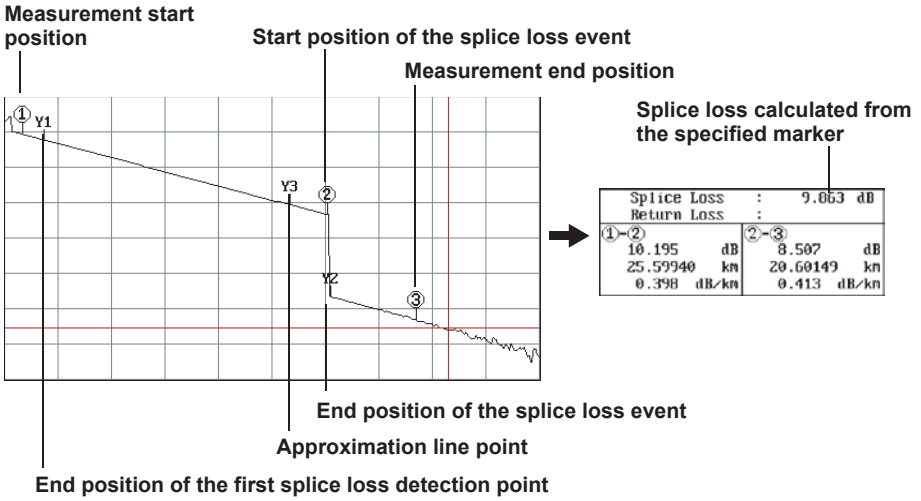
  14. Move the cursor to the event end position on the waveform.

  15. Press the **Y2** soft key. The Y2 marker is displayed on the screen.

- **Setting the Measurement End Position**

  16. Move the cursor to the end position of the measurement section on the waveform.

  17. Press the ③ soft key. The ③ marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.



Note

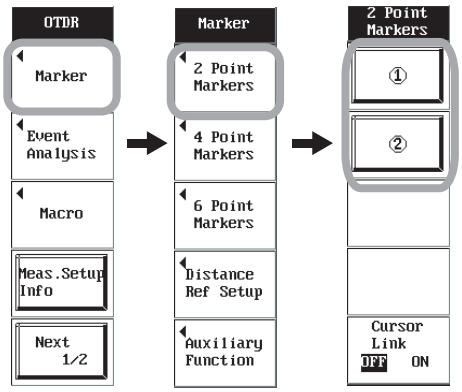
- Use the markers in waveform mode.
- For details on the marker mode and 6 markers method, see section 11.1.

11.4 Measuring the Return Loss and Reflection Level

Procedure

If the Marker Mode Is Set to Marker

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** soft key. The soft key menu for the 2 markers method appears.
3. Turn the **rotary knob**. A cursor is displayed on the screen.

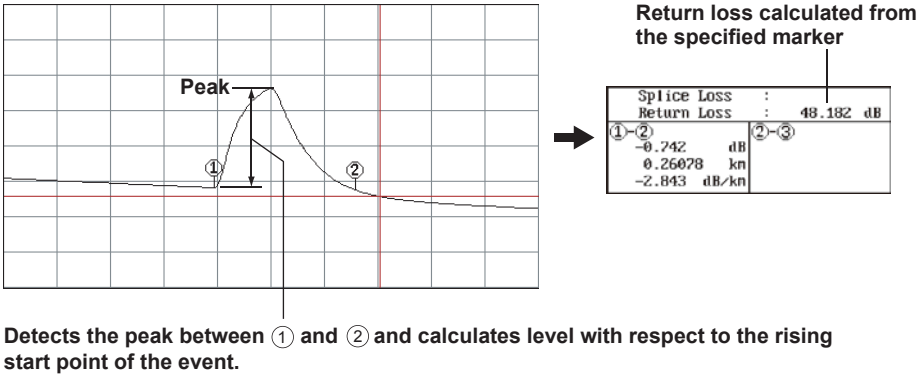


- **Setting the Measurement Start Position**

4. Move the cursor to the detection start position of the event on the waveform.
5. Press the ① soft key. The ① marker is displayed on the screen.

- **Setting the Measurement End Position**

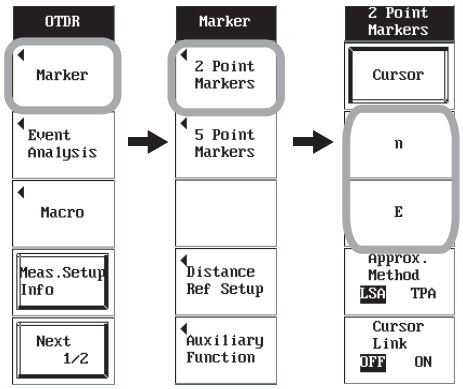
6. Move the cursor to the detection end position of the event on the waveform.
7. Press the ② soft key. The ② marker is displayed on the screen, and values are displayed in the calculation results screen for the measured data.



Detects the peak between ① and ② and calculates level with respect to the rising start point of the event.

If the Marker Mode Is Set to Line

1. Press the **Marker** soft key. A soft key menu for the marker appears.
2. Press the **2 Point Markers** soft key. The soft key menu for the 2 markers method appears.



- **Setting the Measurement Start Position**

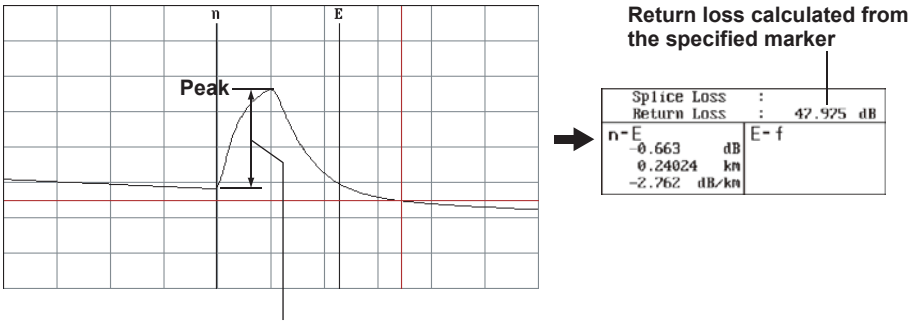
3. Press the **n** soft key.
4. Turn the **rotary knob**. The n cursor is displayed on the screen.
5. Turn the **rotary knob** to move the n cursor to the detection start position of the event on the waveform.

- **Setting the Measurement End Position**

6. Press the **E** soft key.
7. Turn the **rotary knob**. The E cursor is displayed on the screen.
8. Turn the **rotary knob** to move the E cursor to the detection end position of the event on the waveform. The values are displayed in the calculation results screen for the measured data.

- **Displaying the Cursor**

9. Press the **Cursor** soft key.
10. Turn the **rotary knob**. A cursor is displayed on the screen.



Detects the peak between n and E and calculates level with respect to the rising start point of the event.

Note

For details on the marker mode and 6 markers method, see section 11.1.

Explanation

- You can select the reflection display method from return loss and reflection level. The selected value is displayed in the calculation results screen. For the operating procedure, see section 17.1.
- If a < mark is displayed in the return loss value display, the measured waveform is saturated. If the waveform is saturated, the actual reflection level is greater than the displayed value. The following methods are available to keep the waveform from saturating.
  - Select a larger attenuation and remeasure.
  - Set the averaging method to high reflection and remeasure.
  - Select a larger pulse width and remeasure.
- If the reflection is small (approximately 0.5 dB or less), the return loss nor the reflection level is displayed.

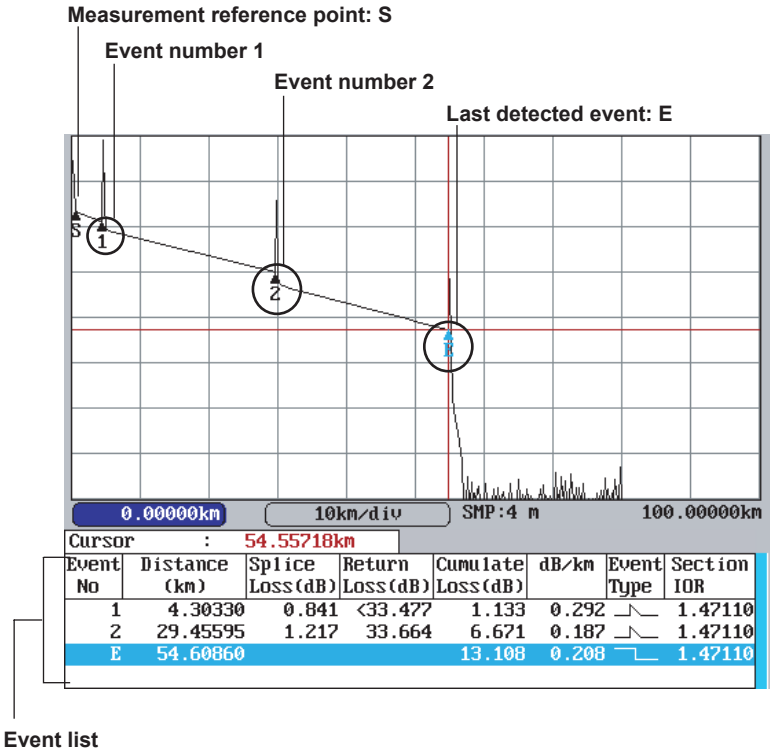
Note

For the operating procedure, see section 6.1.

12.1 Viewing the Measured Results

The AQ7270 detect events from the acquired waveform and displays the splice or return loss. You can edit the values and insert or delete events in the list of event detection results if you want to make adjustments by taking the actual environment into consideration.

Event List Screen (Waveform and List)



Event Number

A number is displayed near an event on the waveform. The events are numbered in order from the left edge. Events that have an asterisk displayed before the number are fault events.

Distance (km)

The distance from the measurement reference to each event is displayed. If you moved the distance reference, the distance from the distance reference to each event is displayed. For details, see section 12.2.

Splice Loss

The value of each event is displayed. If the fault event display is ON and the value is exceeding the threshold level of the splice loss fault event, it is displayed in red.

Return Loss

The value of each event is displayed. If the fault event display is ON and the value is exceeding the threshold level of the return loss fault event, it is displayed in red.

Cumulative Loss
The cumulative loss from the measurement reference is displayed. For details, see section 12.2.

dB/km
The loss per kilometer between events is displayed.

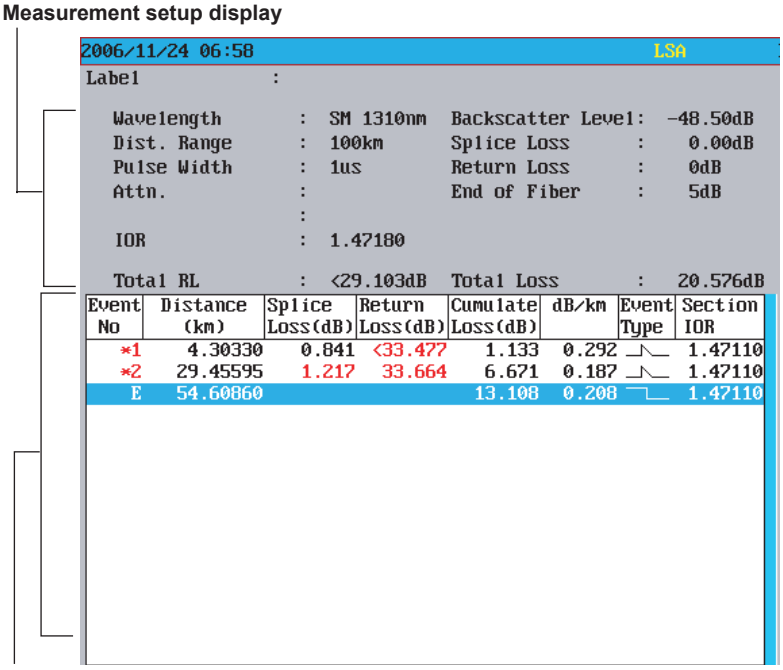
Event Type
One of the following events is identified and indicated.

: Indicates a negative splice loss.
: Indicates a positive splice loss.
: Indicates a reflection.

Section Group Index
The refraction index between events is displayed.

Event List Screen (List)

Measurement setup display



Event list

Note
- Press the soft keys to switch the screen. For details, see section 12.2.
- You can edit the distance, return loss, section group index of events on the list screen. For details, see section 12.3.

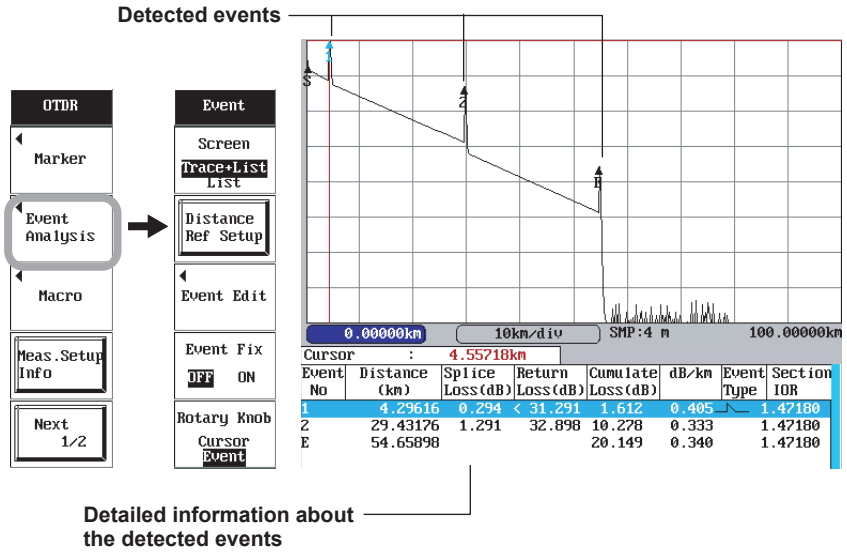
12.2 Editing the Waveform

Procedure

It is possible that an event is not detected because the backscattering light level at the reflection point of the optical fiber cable is too small, or the noise may be detected as an event. If this happens, you can make adjustments by inserting, deleting, and moving events.

Detecting Events (If the Event Detection Method Is Set to Manual)

1. Press the **Event Analysis** soft key. The event is detected, and a soft key menu for the event display appears.

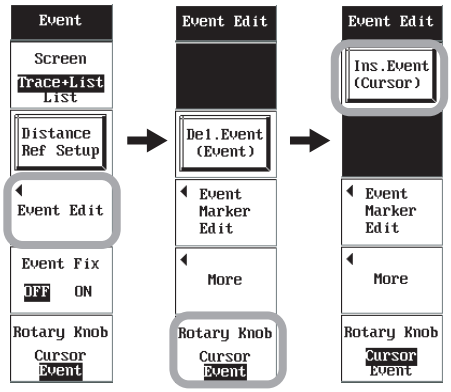


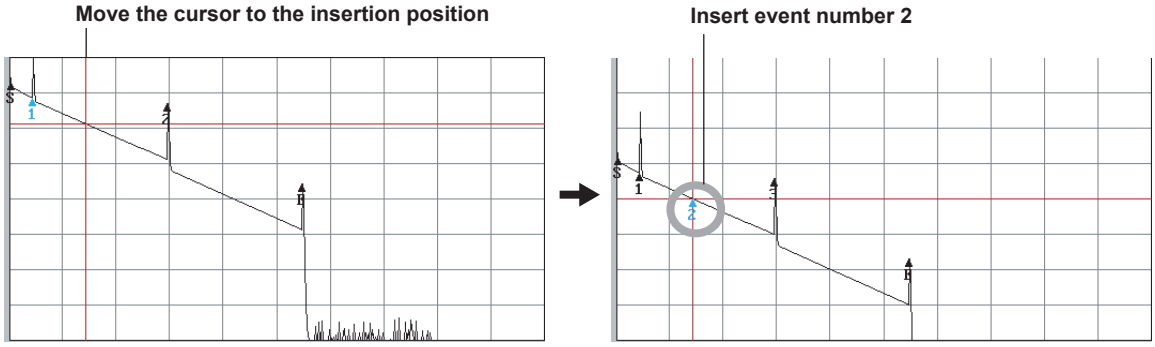
Note

If the event detection method is set to auto, events are detected after the averaging measurement is completed.

Inserting an Event

2. Press the **Event Edit** soft key. A soft key menu for editing events appears.
3. Press the **Rotary Knob** soft key to move the cursor to Cursor. The Ins. Event (Cursor) soft key appears in the soft key menu.
4. Turn the **rotary knob** to move the cursor to the position on the waveform you want to insert an event.
5. Press the **Ins. Event (Cursor)** soft key. The inserted event number is displayed on the waveform, and the values of the inserted event are displayed in the list.



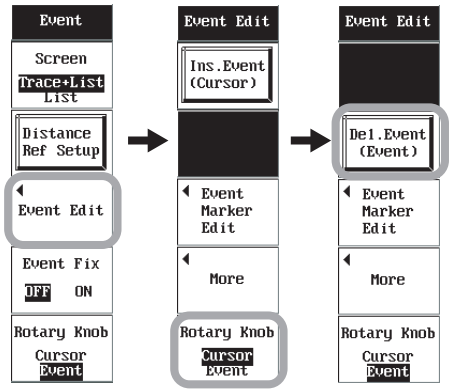


Note

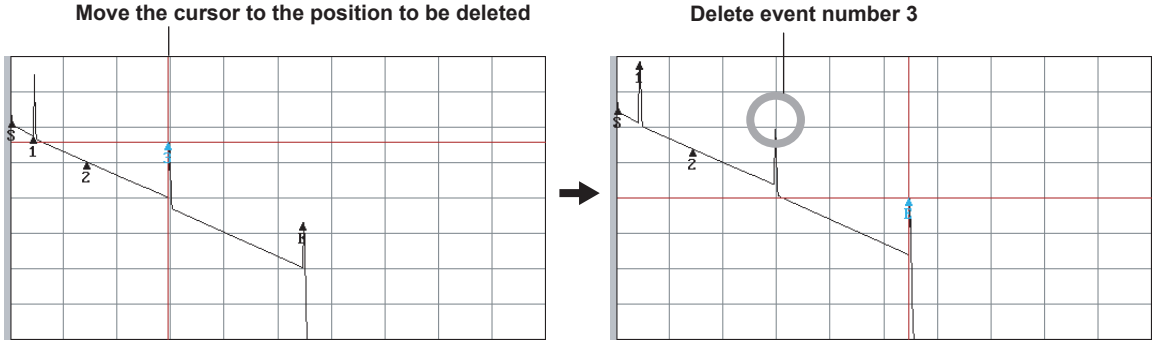
- The maximum number of events that can be displayed in the event list is 100.
- If you insert an event between two displayed events, the event numbers are renumbered in order from the left.
- You cannot insert an event to the left of the S point. You can move the S point using the Set Start Position soft key.
- You cannot insert an event to the left of the distance reference. You can move the distance reference using the Distance Ref Setup soft key.
- If you insert an event to the right of the E event, the inserted event becomes the E event, and a new number is assigned to the original E event.

Deleting an Event

2. Press the **Event Edit** soft key. A soft key menu for editing events appears.
3. Press the **Rotary Knob** soft key to move the cursor to Event. The Del. Event (Event) soft key appears in the soft key menu.
4. Turn the **rotary knob** to move the cursor to the event you want to delete. The color of the event selected with the cursor changes.
5. Press the **Del. Event (Event)** soft key. The event number that was displayed on the waveform disappears, and the event in the list also disappears.



Move the cursor to the position to be deleted **Delete event number 3**



Note

- You cannot delete events if only the S point and the E event are displayed.
- If you delete an event between events, the events are renumbered in order from the left.
- You cannot delete the S point.
- If you set the distance reference (R point), the S point disappears. In this case, the measurement reference is the distance reference. If you delete the distance reference, the S point returns to the original position.
- If you delete the E event, the event with the largest number becomes the E event.

Moving an Event

- **If the Marker Mode Is Marker**

2. Press the **Event Edit** soft key. A soft key menu for editing events appears.

3. Press the **Rotary Knob** soft key to move the cursor to Event.

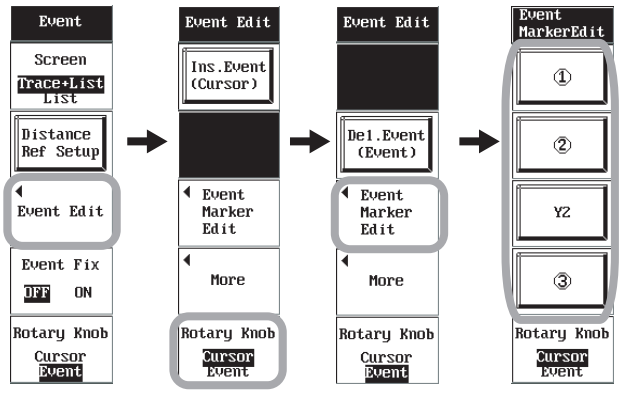
4. Turn the **rotary knob** to move the cursor to the event you want to move The color of the event selected with the cursor changes.

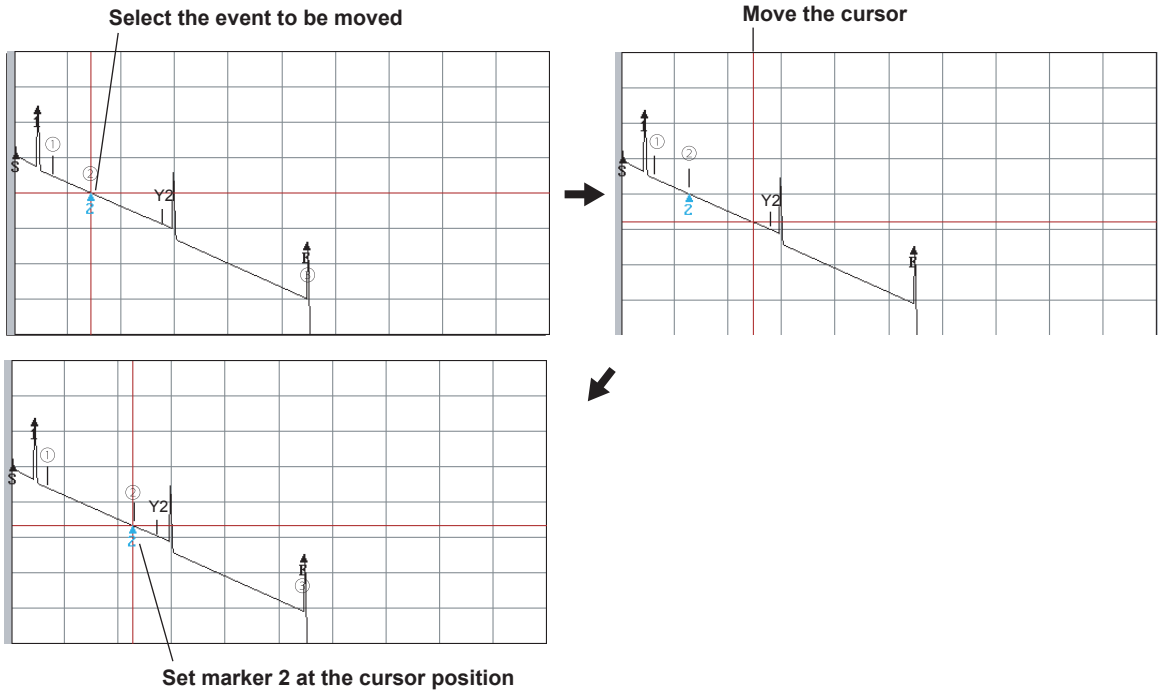
5. Press the **Event Marker** soft key. The soft key menu for editing the event marker appears.

6. Press the **Rotary Knob** soft key to move the cursor to Event. The event marker soft keys appears in the soft key menu (①, ②, Y2, and ③).

7. Turn the **rotary knob** to move the cursor to the position on the waveform you want to move the event.

8. Press the ② soft key. The event moves along with the ② marker.





- **If the Marker Mode Is Line**

  2. Press the **Event Edit** soft key. A soft key menu for editing events appears.

  3. Press the **Rotary Knob** soft key to move the cursor to Event.

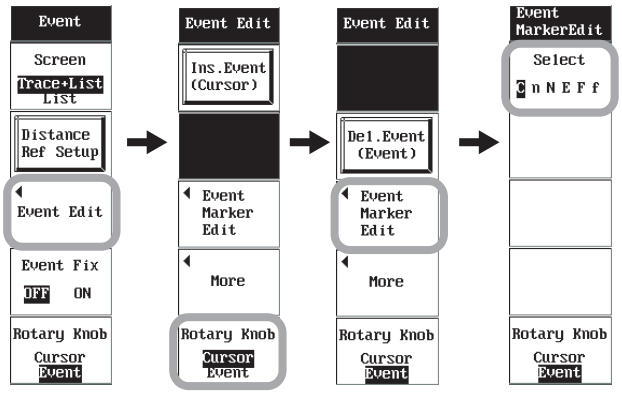
  4. Turn the **rotary knob** to move the cursor to the event you want to move The color of the event selected with the cursor changes.

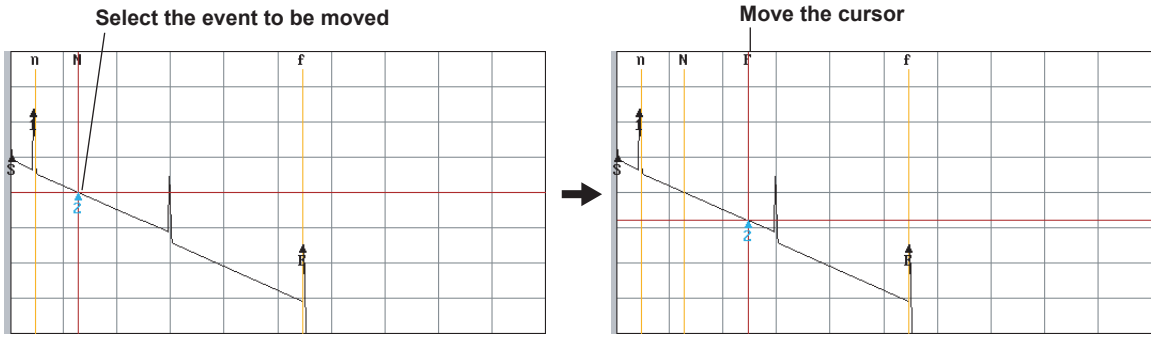
  5. Press the **Event Marker** soft key. The soft key menu for editing the event marker appears.

  6. Press the **Rotary Knob** soft key to move the cursor to Cursor.

  7. Press the **Select** soft key to move the cursor to E.

  8. Turn the **rotary knob** to move the E marker. The event moves along with the E marker.





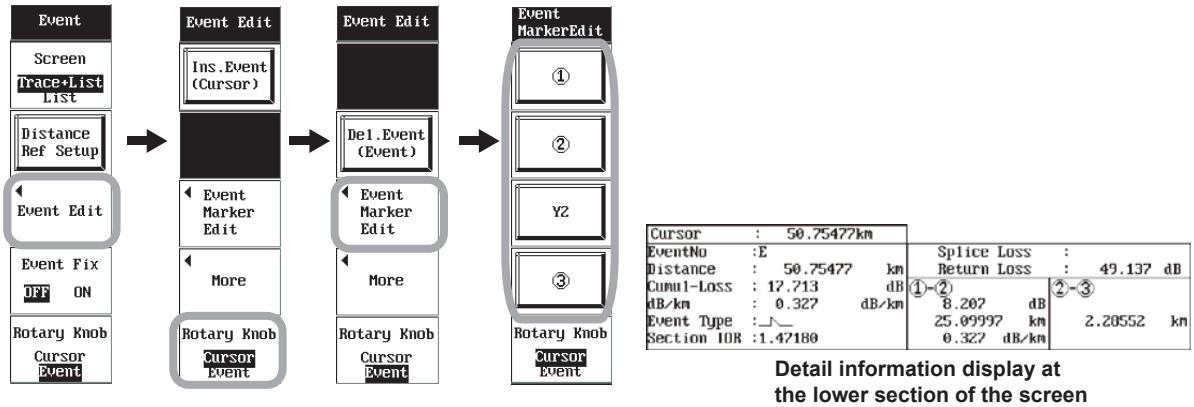
Editing the Event Markers

The splice or return loss for detected events are measured with the event marker. The splice loss value varies depending on the event marker position. If an event marker is assigned to a location on the waveform that is not an event (such as noise), you can measure the value correctly by moving the marker to the correct position.

Editing the Return or Splice Loss

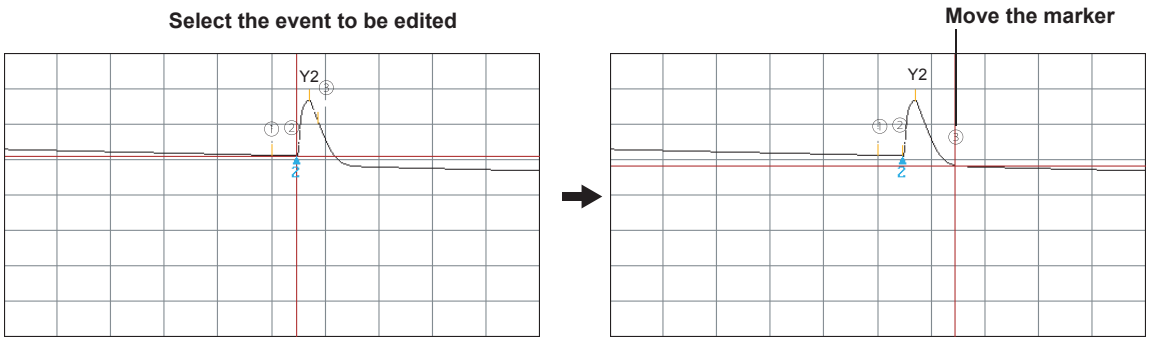
- **If the Marker Mode Is Marker**

2. Press the **Event Edit** soft key. A soft key menu for editing events appears.
3. Press the **Rotary Knob** soft key to move the cursor to Event.
4. Turn the **rotary knob** to move the cursor to the event you want to edit. The color of the event selected with the cursor changes.
5. Press the **Event Marker** soft key. The soft key menu for editing the event marker appears.
6. Press the **Rotary Knob** soft key to move the cursor to Cursor. The event marker soft keys appears in the soft key menu (①, ②, Y2, and ③).
7. Turn the **rotary knob** to move the cursor to the position on the waveform you want to move the event.
8. Press the soft key corresponding to the event marker you want to move. The event is moved to the cursor position. The return and splice loss values are recalculated and displayed in the detail information at the bottom section of the screen.



Detail information display at the lower section of the screen

Select the event to be edited **Move the marker**



Editing example of a splice loss value

Note

For details on each event marker, see 4 markers method in section 11.1.

- **If the Marker Mode Is Line**

  2. Press the **Event Edit** soft key. A soft key menu for editing events appears.

  3. Press the **Rotary Knob** soft key to move the cursor to Event.

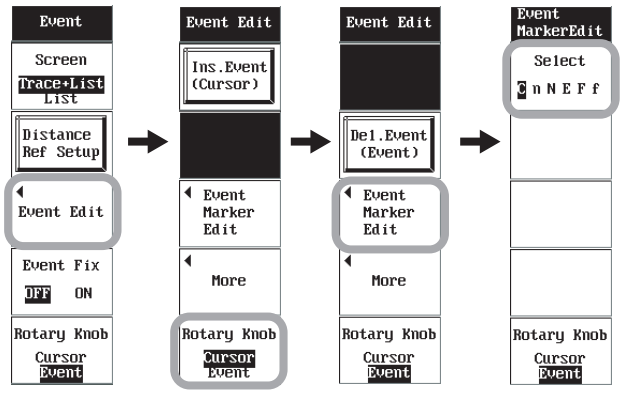
  4. Turn the **rotary knob** to move the cursor to the event you want to edit. The color of the event selected with the cursor changes.

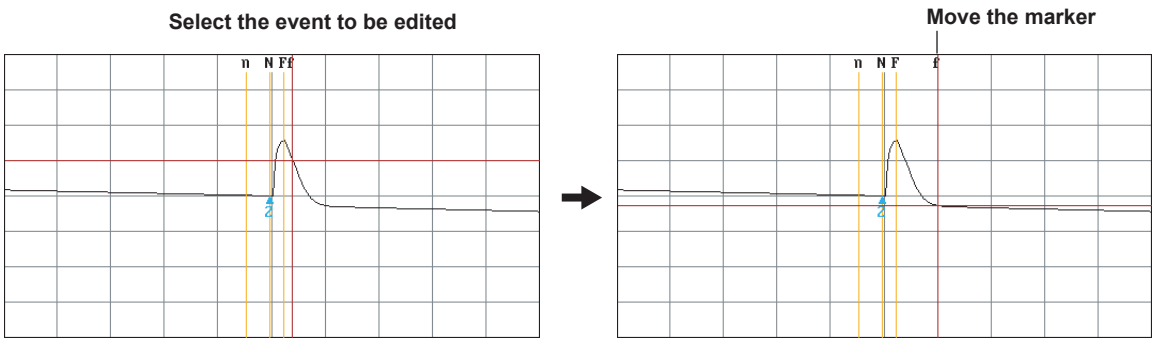
  5. Press the **Event Marker** soft key. The soft key menu for editing the event marker appears.

  6. Press the **Rotary Knob** soft key to move the cursor to Cursor.

  7. Press the **Select** soft key to move the cursor to the event marker you want to move.

  8. Turn the **rotary knob** to move the event marker. The return and splice loss values are recalculated and displayed in the detail information at the bottom section of the screen.





Editing example of a splice loss value

Note

For details on each event marker, see 5 markers method in section 11.1.

Measuring by Moving the Position for Starting the Distance Calculation

Moving the Distance Reference

- **Moving the Cursor to the Start Position**

  2. Press the **Rotary Knob** soft key to move the cursor to Cursor.

  3. Turn the **rotary knob** to move the cursor to the position for starting the distance calculation.

- **Setting the Distance Reference**

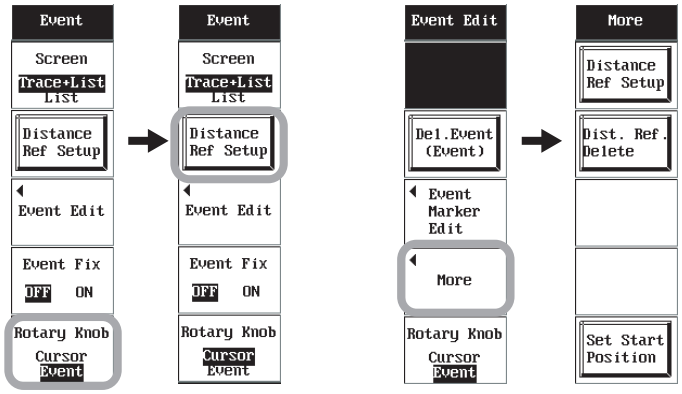
  4. Press the **Distance Ref Setup** soft key. The R line indicating the distance reference is displayed at the position for starting the distance calculation.

- **Clearing the Distance Reference**

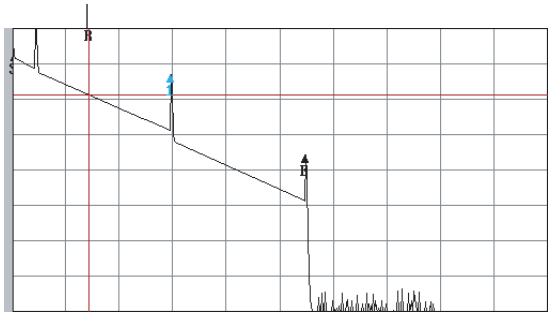
  5. Press the **Event Edit** soft key. A soft key menu for editing events appears.

  6. Press the **More** soft key. The auxiliary function soft key menu appears.

  7. Press the **Dist. Ref. Delete** soft key. The R line display disappears.



Distance reference indication



Note

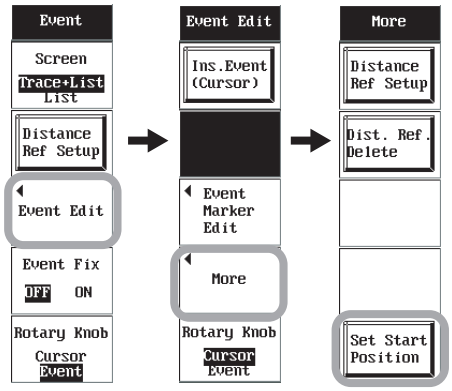
- Because all of the information are measured between the distance reference (R) and the E event, events are displayed after the distance reference.
- If you change the distance reference, the event information is recalculated.

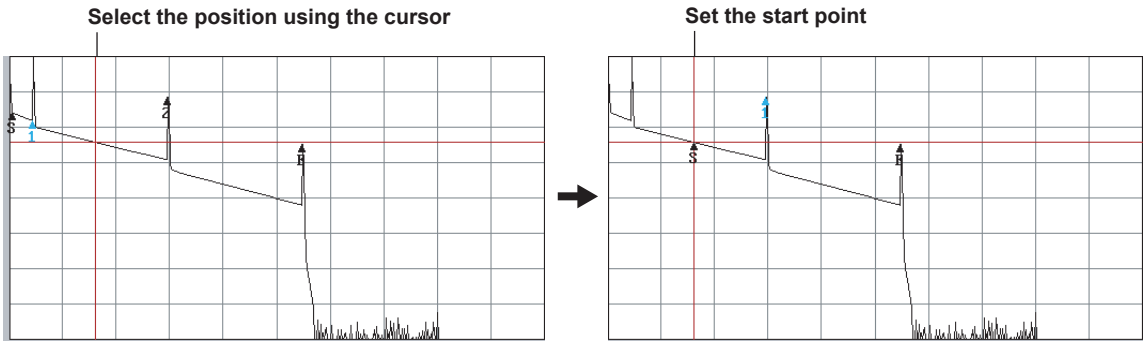
Moving the Event Detection Position

2. Press the **Event Edit** soft key. A soft key menu for editing events appears.
3. Press the **Rotary Knob** soft key to move the cursor to Cursor.
4. Turn the **rotary knob** to move the cursor to the position for starting the distance calculation.

- **Setting the Start Position**

5. Press the **More** soft key. The auxiliary function soft key menu appears.
6. Press the **Set Start Position** soft key. The S point moves to the start point.

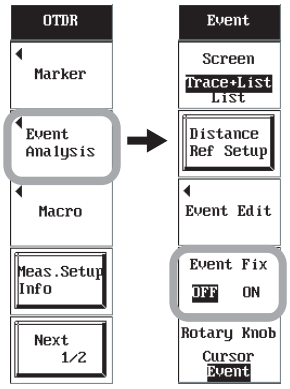




Fixing Events

You can create a template of the event positions and measure the return and splice loss at given positions.

2. Press the **Event Analysis** soft key. The event is detected.
3. Press the **Event Fix** soft key to move the cursor to ON.



Note

The event fix function turns OFF under the following conditions.

- If the distance range or sampling resolution is changed.
- If you change the sampling interval of the measurement range during realtime measurement.
- If the distance range is set to auto, the event fix function turns OFF when you start the measurement.

Explanation

Event Fix Function

- If Event Fix is turned ON, the event positions displayed at that point are fixed.
- Events other than the template positions are also displayed.
- If an E event is detected before or after the E event position on the template, the text “END point by Auto Search” is set in the event note of the newly detected E event.

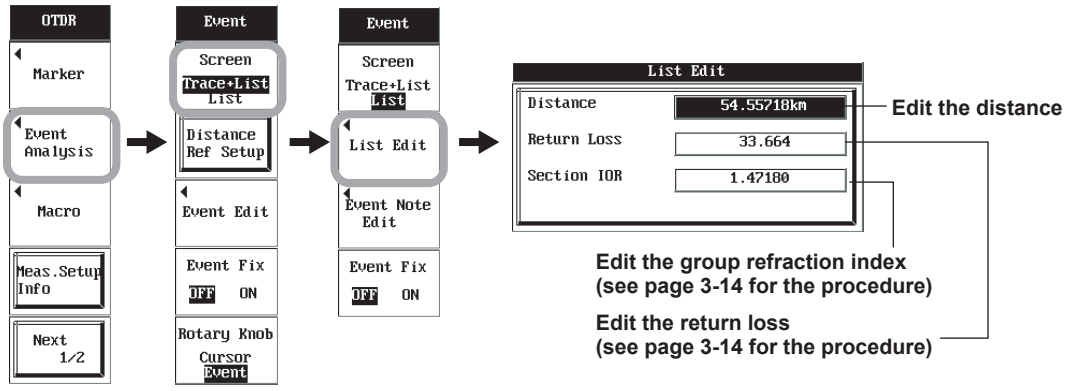
12.3 Editing the List

Procedure

The AQ7270 measures events using the information of the acquired waveform and the optical fiber cable conditions. However, if these conditions are known and you enter the values, you can find out the section group index and the backscattering light level of the optical fiber cable.

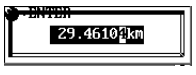
Editing Events

1. Press the **Event Analysis** soft key. The event is detected, and a soft key menu for the event display appears.
2. Press the **Screen** soft key. The list screen is displayed.
3. Move the cursor to the event you want to edit using the **arrow keys** or the **rotary knob**.
4. Press the **List Edit** soft key. The List Edit screen appears.



Editing the Distance

5. Move the cursor to Distance using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The screen for setting the distance appears.
7. Select a digit using the **arrow keys** and set the value using the **arrow keys** or **rotary knob**.
8. Press **ENTER**. The distance is confirmed.

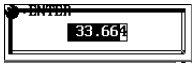


Note

- If you change the distance of an event, the section group index is recalculated.The distance may not exactly match the specified distance.
- Changing the distance of an event affects the values of other events.

Editing the Return Loss

5. Move the cursor to Return Loss using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The screen for setting the return loss appears.
7. Select a digit using the **arrow keys** and set the value using the **arrow keys** or **rotary knob**.
8. Press **ENTER**. The return loss is confirmed.



Note

If you change the return loss of an event, the backscattering light level is recalculated. The return loss of other events is measured using the recalculated backscattering light level.

Editing the Section Group Index

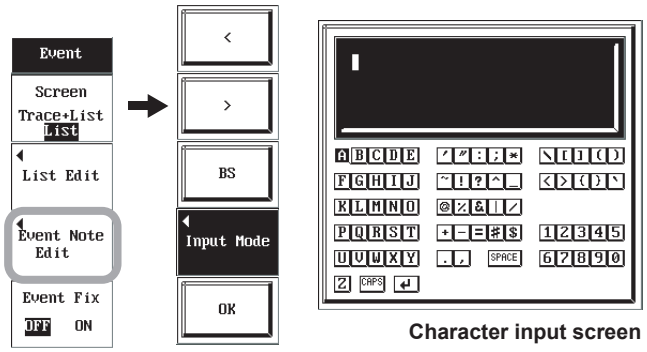
5. Move the cursor to Section IOR using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The screen for setting the section group index appears.
7. Select a digit using the **arrow keys** and set the value using the **arrow keys** or **rotary knob**.
8. Press **ENTER**. The section group index is confirmed.

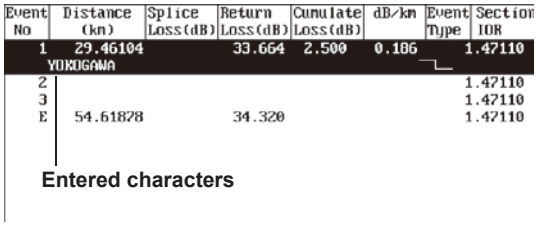
Note

If you change the section group index of an event, the distance is recalculated.

Inserting a Comment

4. Press the **Event Note Edit** soft key. The character input screen appears.
5. Enter a comment for identification.
6. Press **ENTER**. The comment is displayed under the event information display.





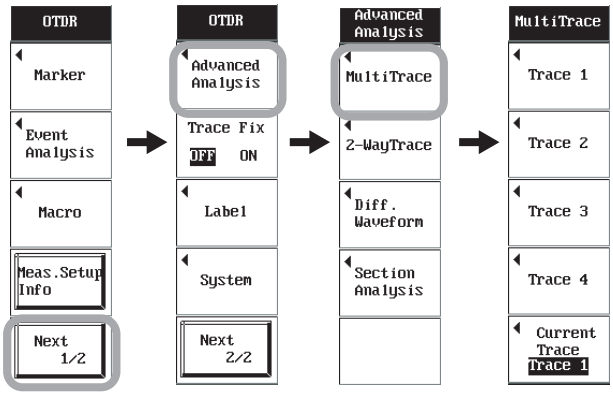
Note

- For details on entering characters, see section 16.6.
- You can enter the comment using up to 36 characters.

13.1 Displaying the Multiple Waveforms

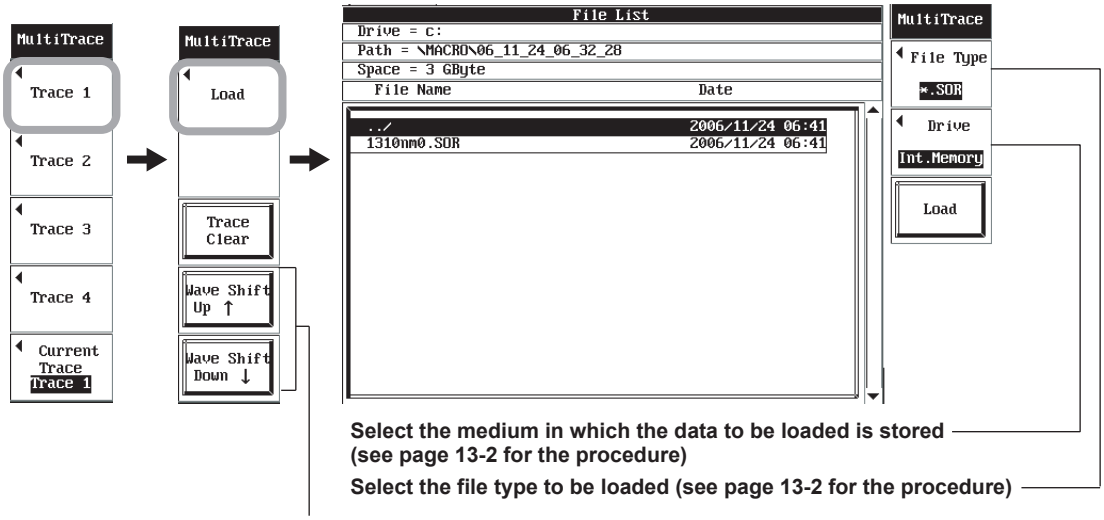
Procedure

1. Press the **Next 1/2** soft key.
2. Press the **Advanced Analysis** soft key. A soft key menu for the waveform analysis appears.
3. Press the **MultiTrace** soft key. A soft key menu for the multiple waveform analysis appears.



Loading the Waveforms

4. Press the **TRACE1 to 4** soft key. A soft key menu for the TRACE conditions appears.
5. Press the **Load** soft key. The soft key menu for loading waveform data and the file list screen appear.

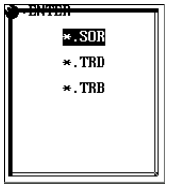


Selecting the File Type

6. Press the **File Type** soft key. A screen for selecting the file type appears.

7. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

8. Press **ENTER**. The screen for selecting the file type closes.



Selecting the Medium

9. Press the **Drive** soft key. A screen for selecting the drive appears.

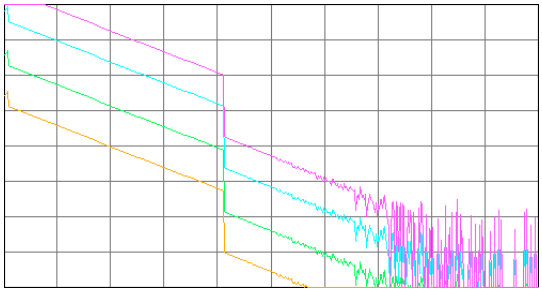
10. Move the cursor to the drive you want to select using the **arrow keys** or the **rotary knob**.

11. Press **ENTER**. The screen for selecting the drive closes.

Loading a File

12. Move the cursor to the file you want to load using the **arrow keys** or the **rotary knob**.

13. Press the **Load** soft key. The waveform is loaded.



Moving the Waveform

14. Press the **Wave Shift Up** soft key. The display of the loaded waveform moves up.

15. Press the **Wave Shift Down** soft key. The display of the loaded waveform moves down.

Clearing the Waveform Display

16. Press the **Trace Clear** soft key. The waveform display of the screen disappears.

Note

Up to four waveforms can be displayed. Repeat steps 3 to 12.

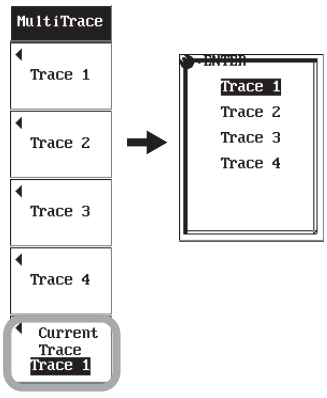
Specifying the Waveform to Be Analyzed

17. Press **ESC**. The multiple trace analysis screen moves back by one screen.

18. Press the **Current Trace** soft key. A screen for selecting TRACE 1 to 4 appears.

19. Move the cursor to the trace you want to select using the **arrow keys** or the **rotary knob**.

20. Press **ENTER**. The screen for selecting the trace closes.



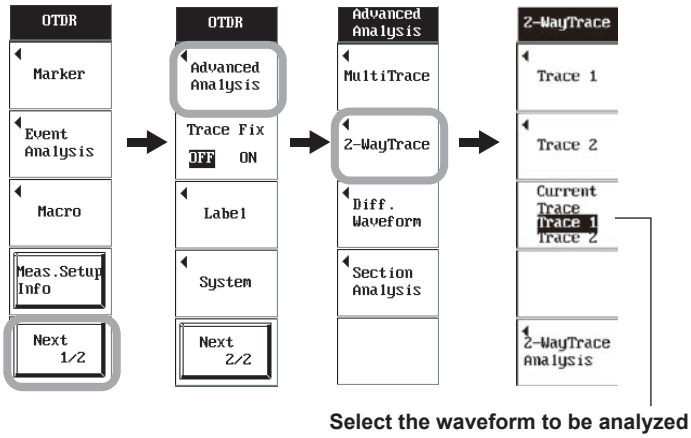
Note

- The cursor is displayed on the waveform of the trace selected by Current Trace.
- The return and splice loss values are displayed for the waveform selected by Current Trace.
- You can save the displayed waveform by pressing FILE. For the procedure, see section 16.1.

13.2 2-Way Trace

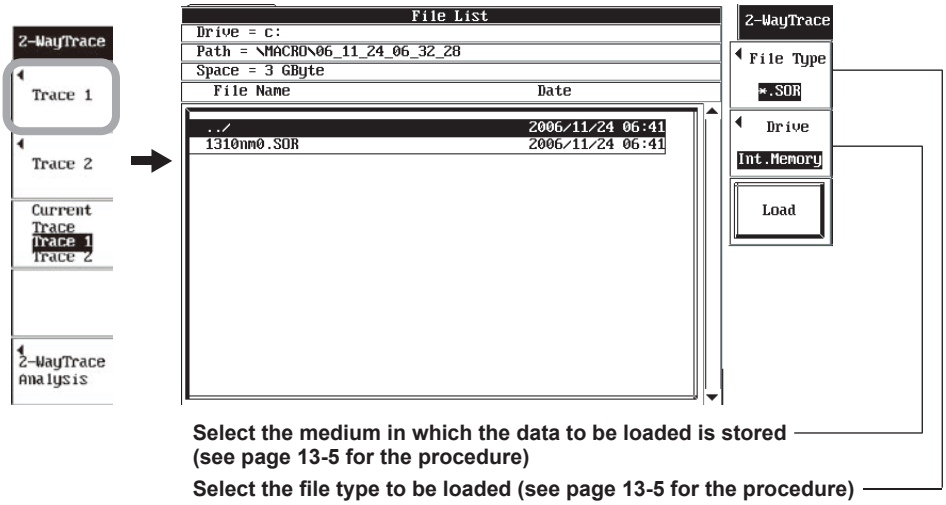
Procedure

1. Press the **Next 1/2** soft key.
2. Press the **Advanced Analysis** soft key. A soft key menu for the waveform analysis appears.
3. Press the **2-WayTrace** soft key. A soft key menu for the 2-way trace appears.



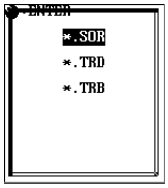
Loading the Waveforms

4. Press the **TRACE1** or **TRACE2** soft key. The soft key menu for loading waveform data and the file list screen appear.



Selecting the File Type

5. Press the **File Type** soft key. A screen for selecting the file type appears.
6. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.
7. Press **ENTER**. The screen for selecting the file type closes.

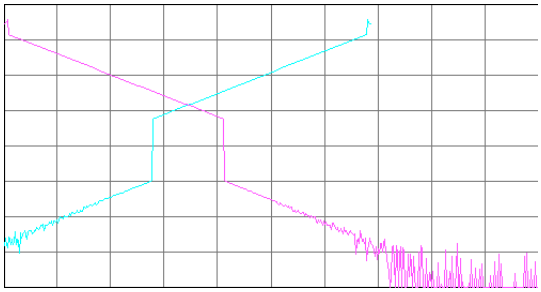


Selecting the Medium

8. Press the **Drive** soft key. A screen for selecting the drive appears.
9. Move the cursor to the drive you want to select using the **arrow keys** or the **rotary knob**.
10. Press **ENTER**. The screen for selecting the drive closes.

Loading a File

11. Move the cursor to the file you want to load using the **arrow keys** or the **rotary knob**.
12. Press the **Load** soft key. The waveform is loaded.



Specifying the Waveform to Be Analyzed

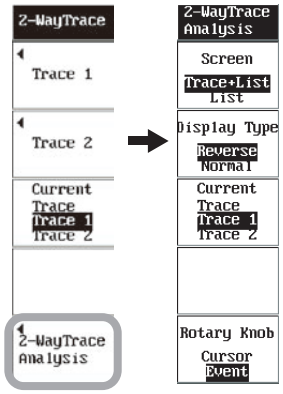
13. Press the **Current Trace** soft key. The cursor moves to TRACE1 or TRACE2.

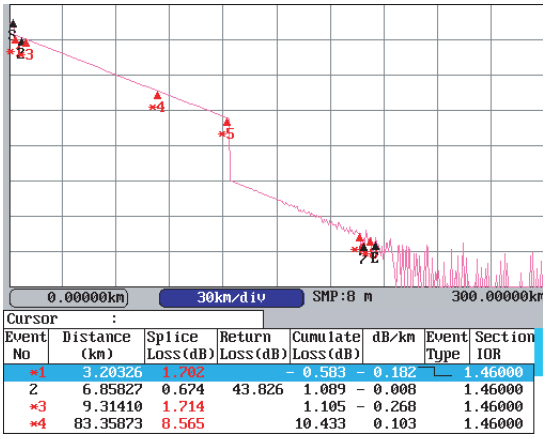
Note

The cursor is displayed on the waveform of the trace selected by Current Trace.

2-Way Trace Analysis of Waveforms

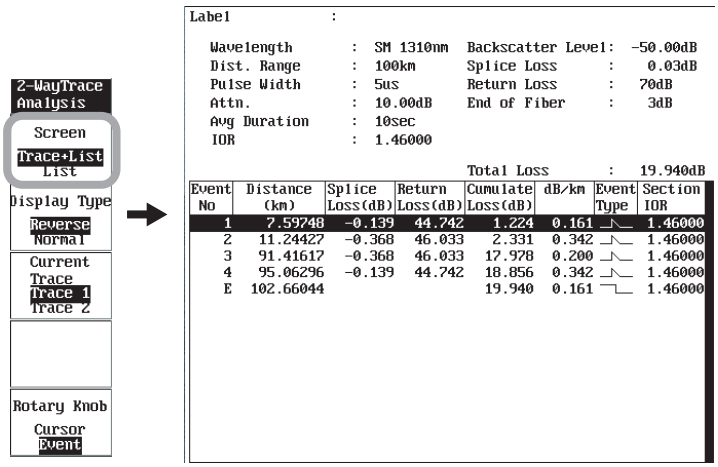
14. Press the **2-WayTrace Analysis** soft key. A soft key menu for the 2-way trace analysis and the event list screen appear.





Switching the Screen

15. Press the **Screen** soft key. The screen switches between Trace+List and List.



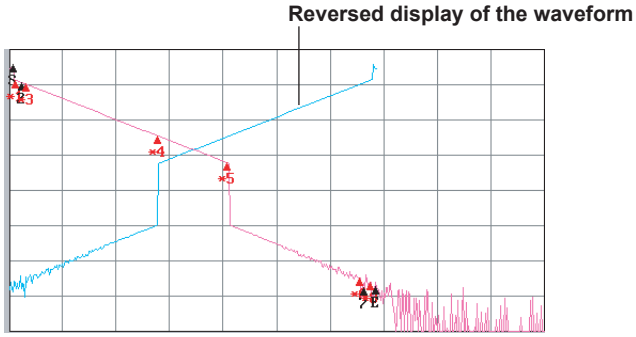
Note

Set the measurement conditions as follows to perform 2-way trace analysis.

- The event list is present.
- The measurement start position has not been changed (see the explanation in section 7.4 for details).
- The distance between the measurement reference (R) and the E event is the same.
- You can save the displayed waveform by pressing FILE. For the procedure, see section 16.1.

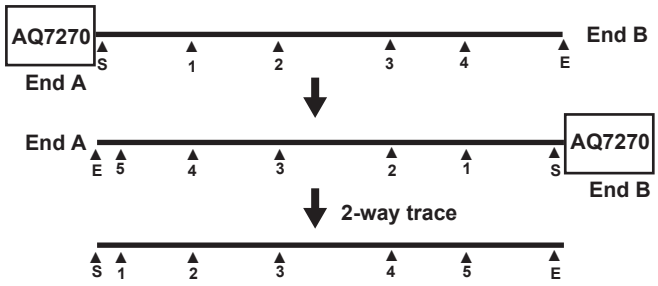
Reversing the Waveform Display

16. Press the **Display Type** soft key. The display direction of the waveform not selected as the Current Waveform is reversed.



Explanation

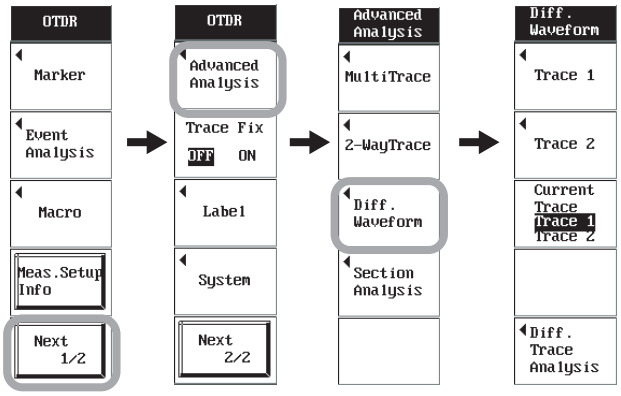
The 2-way trace function combines the events of the waveform measured from end A to end B of the optical fiber cable with the events of the waveform measured from end B to end A. In the figure below, the event that was in the dead zone of the near-end reflection (point S) when measured from end A is detected as event number 5 when measured from end B. In the 2-way trace, this event is displayed as event number 1.



13.3 Difference Waveform

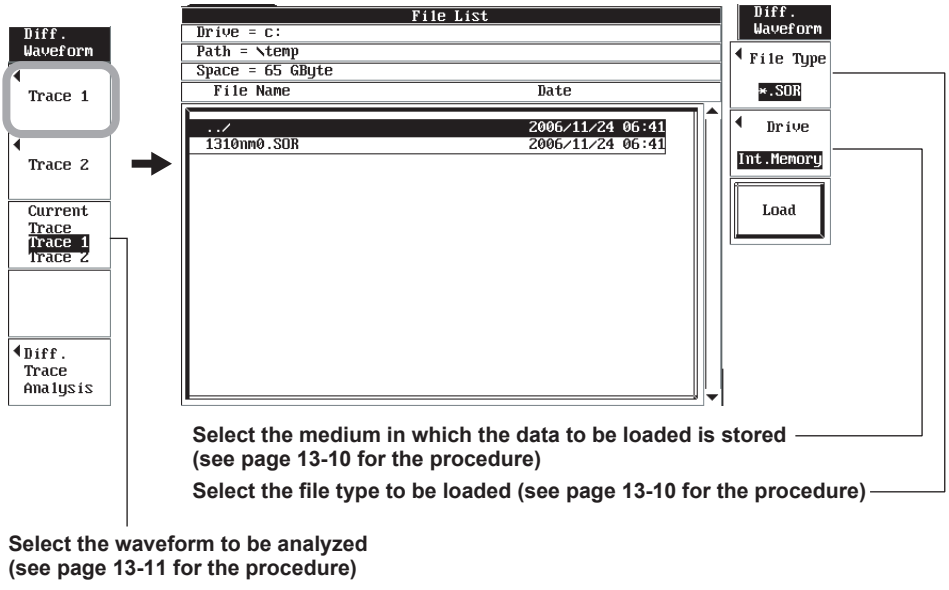
Procedure

1. Press the **Next 1/2** soft key.
2. Press the **Advanced Analysis** soft key. A soft key menu for the waveform analysis appears.
3. Press the **Diff. Waveform** soft key. A soft key menu for the difference waveform appears.



Loading the Waveforms

4. Press the **TRACE1** or **TRACE2** soft key. The soft key menu for loading waveform data and the file list screen appear.

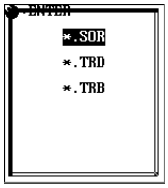


Selecting the File Type

5. Press the **File Type** soft key. A screen for selecting the file type appears.

6. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.

7. Press **ENTER**. The screen for selecting the file type closes.

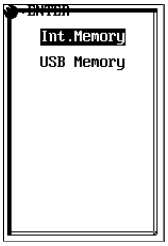


Selecting the Medium

8. Press the **Drive** soft key. A screen for selecting the drive appears.

9. Move the cursor to the drive you want to select using the **arrow keys** or the **rotary knob**.

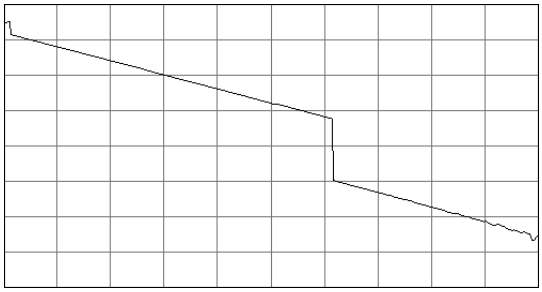
10. Press **ENTER**. The screen for selecting the drive closes.



Loading a File

11. Move the cursor to the file you want to load using the **arrow keys** or the **rotary knob**.

12. Press the **Load** soft key. The waveform is loaded.



Specifying the Current Waveform

13. Press the **Current Trace** soft key. The cursor moves to TRACE1 or TRACE2.

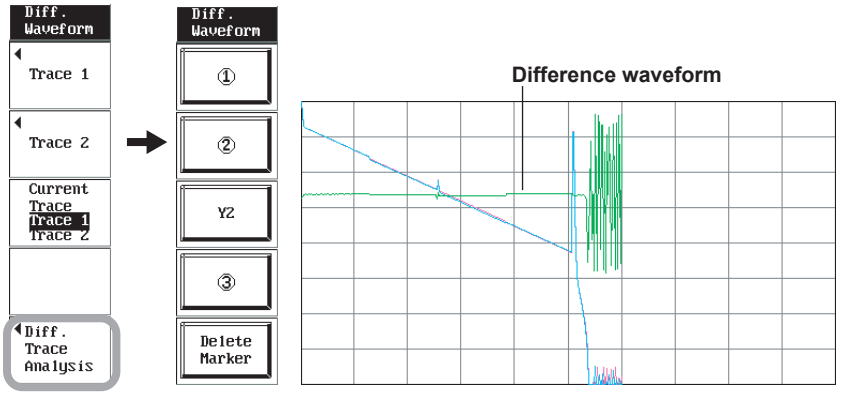
Note

- The cursor is displayed on the waveform of the trace selected by Current Trace.
- The return and splice loss values are displayed for the waveform selected by Current Trace.

Difference Analysis of Waveforms

The return and splice loss of the difference waveform is measured using markers.

14. Press the **Diff. Trace Analysis** soft key. The difference waveform is displayed on the screen, and a soft key menu for the difference waveform analysis appears.



Note

- The difference waveform is obtained by subtracting the values of the waveform selected as the current waveform from the other waveform.
- If the marker mode is marker, see 4 markers method in section 11.1.
- If the marker mode is line, see 5 markers method in section 11.1.
- The return and splice loss values of the difference waveform cannot be saved.
- Set the measurement conditions as follows to perform difference waveform analysis.
  - Sampling resolution
  - Measurement start position
- You can save the displayed waveform by pressing FILE. For the procedure, see section 16.1.

13.4 Section Analysis

Procedure

The total return and splice loss can be measured in a specified section.

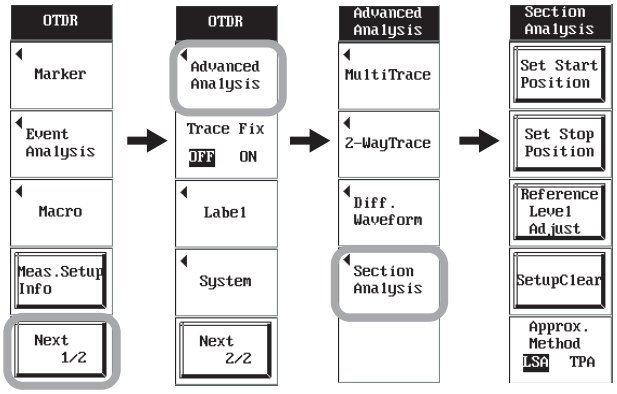
1. Press the **Next 1/2** soft key.
2. Press the **Advanced Analysis** soft key. A soft key menu for the waveform analysis appears.
3. Press the **Section Analysis** soft key. The section analysis soft key menu appears.

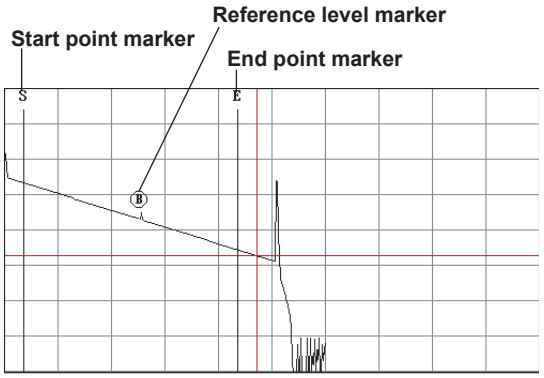
Setting the Start Point

4. Turn the **rotary knob**. A cursor is displayed on the screen.
5. Turn the **rotary knob** to move the cursor to the section start point on the waveform.
6. Press the **Set Start Position** soft key. The S marker appears.

Setting the End Point

7. Turn the **rotary knob** to move the cursor to the section end point on the waveform.
8. Press the **Set Stop Position** soft key. The E marker appears, and the distance between the S and E markers, the total return loss, and total loss are measured and displayed.





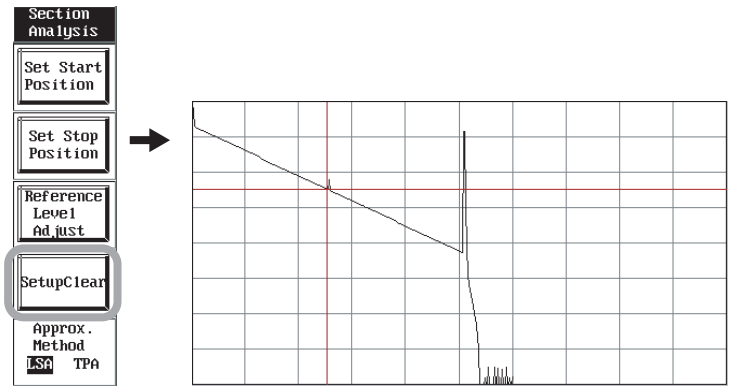
Changing the Reference Level of the Return Loss Measurement

9. Turn the **rotary knob** to move the cursor to the point where you want to set the reference on the waveform.

10. Press the **Reference Level Adjust** soft key. The B marker appears, and the total return loss is measured and displayed.

Clearing of the Settings

11. Press the **SetupClear** soft key. All markers and the measured results of total return loss and total loss are cleared.



Explanation

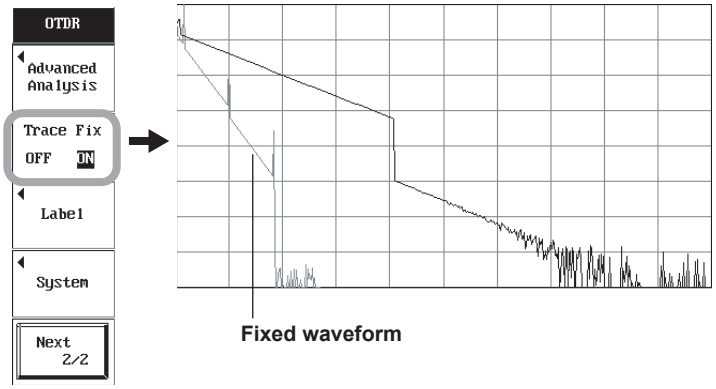
The total return loss is measured using the backscattering light level of the arbitrary positioned marker point in the reference level adjustment.

13.5 Fixing the Waveform

Procedure

You can keep a previously displayed waveform on the screen and perform waveform measurement. It is displayed along with the waveform currently being measured.

1. With a waveform displayed on the screen, press the **Trace Fix** soft key. The cursor moves to ON.
2. The previous waveform and the current waveform being measured are displayed simultaneously.



Note

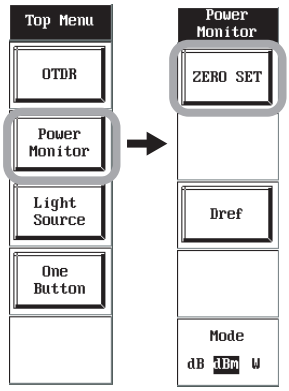
- You can also compare waveforms by loading stored waveform data.
- For the procedure to load waveforms, see section 16.1.
- The fixed waveform is cleared when you perform waveform analysis.

14.1 Calibration before the Measurement

Procedure

Selecting the Power Monitor

1. Close the optical connector cover on the AQ7270 with the optical fiber cable removed from the AQ7270.
2. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a soft key menu for the power monitor appears.
3. Press the **ZERO SET** soft key. The message “Now Zeroing’ appears on the screen. The message disappears when the calibration is completed.



Explanation

By setting the zero level, the offset inside the optical power monitor section is adjusted, and the measurement of accurate absolute values becomes possible.

Note

Power monitor measurement uses only PORT1.

14.2 Setting the Reference

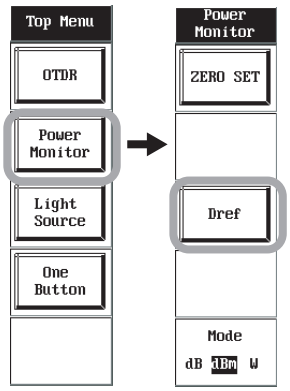
Procedure

1. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a setup screen and soft key menu for the power monitor appear.

Setting the Reference Using a Measured Value

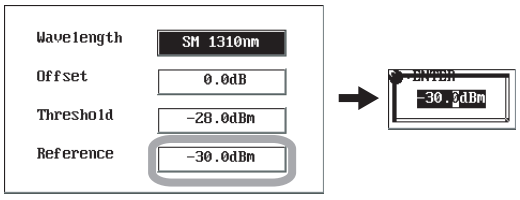
This function sets the reference value to the current displayed value.

2. Press the **Dref** soft key. The reference value of the screen changes.



Entering the Reference Manually

2. Press the **Mode** soft key to move the cursor to dB.
3. Move the cursor to Reference using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The screen for setting the reference appears.
5. Turn the **rotary knob** to set the reference value.
6. Press **ENTER**. The screen for setting the reference closes.



Note

- You cannot set the reference if the display unit is set to dBm or W.
- The display unit automatically changes to dB if you press the Dref soft key.

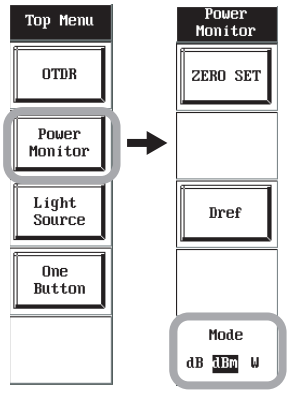
Explanation

The reference of the relative value measurement is set to the measured value at the specified point. The subsequent measurements display relative values with respect to the reference. The reference value is updated each time you set it.

14.3 Selecting the Display Unit

Procedure

1. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a soft key menu for the power monitor appears.
2. Press the **Mode** soft key to move the cursor to dB, dBm, or W.



Explanation

The following power display units are available.

dB	Relative value
dBm	Absolute value
W	Absolute value

The relationship between the different power display units are shown below.

PdBm = 10 × log (Pinput (mW)) or 10 × log (Pinput (W)/10^3)

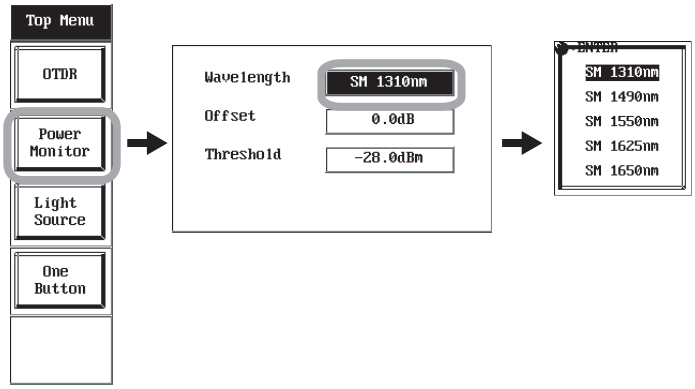
PdBm: Optical input power (dBm)

Pinput: Optical input power (W)

14.4 Selecting the Wavelength

Procedure

1. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a setup screen for the power monitor appears.
2. Move the cursor to Wavelength using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. A screen for selecting the wavelength appears.
5. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The screen for selecting the wavelength closes.



Note

The selectable test wavelengths vary depending on the model. For details, see section 19.1.

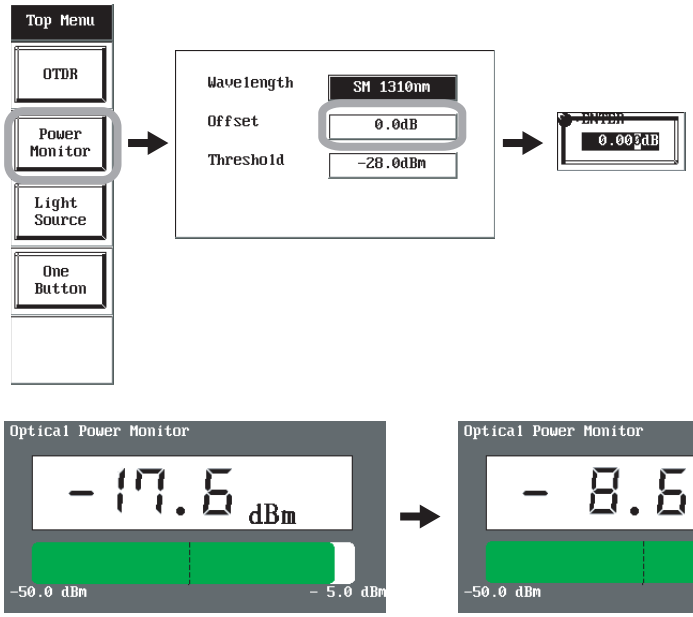
Explanation

The light receiving element of the optical power monitor has a wavelength sensitivity distribution. Because the AQ7270 has a function for correcting the wavelength sensitivity, power can be monitored accurately by setting the optical wavelength.

14.5 Setting the Offset

Procedure

1. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a setup screen for the power monitor appears.
2. Move the cursor to Offset using the **arrow keys** or the **rotary knob**.
3. Press **ENTER**. The screen for setting the offset appears.
4. Select a digit using the **arrow keys** and set the offset value using the **arrow keys** or **rotary knob**.
5. Press **ENTER**. The screen for setting the offset closes.



Note

The selectable range is –9.9 to 9.9 dB.

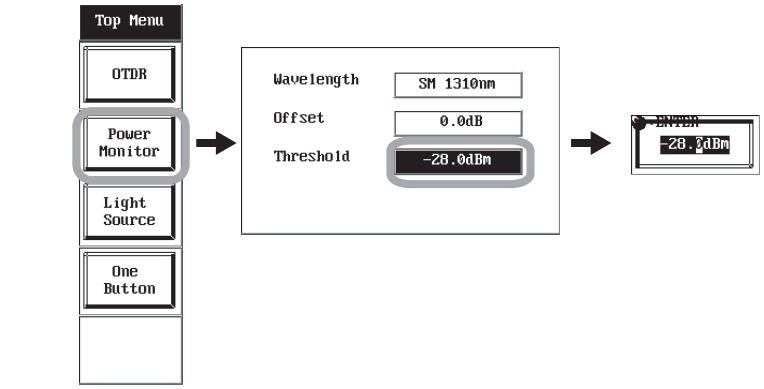
Explanation

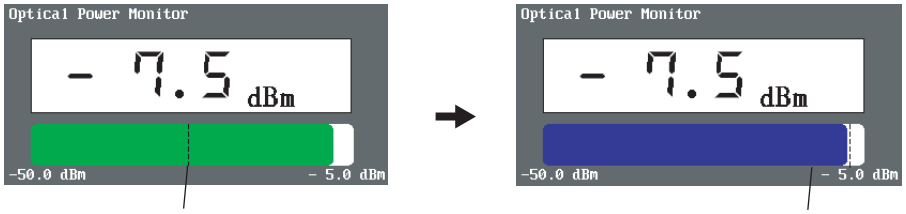
If you set an offset, the optical input power (dBm) is displayed with the offset value added.

14.6 Set the Threshold Level

Procedure

1. Press the **Power Monitor** soft key. The screen switches to the optical power monitor display, and a setup screen for the power monitor appears.
2. Move the cursor to Threshold using the **arrow keys** or the **rotary knob**.
3. Press **ENTER**. The screen for setting the threshold level appears.
4. Select a digit using the **arrow keys** and set the threshold level using the **arrow keys** or **rotary knob**.
5. Press **ENTER**. The screen for setting the threshold level closes.





The threshold level is –25 dB, and the value is exceeding the threshold level

The threshold level is –7 dB, and the value is not exceeding the threshold level

Note

The selectable range is –50.0 dB to –5.0 dB.

Explanation

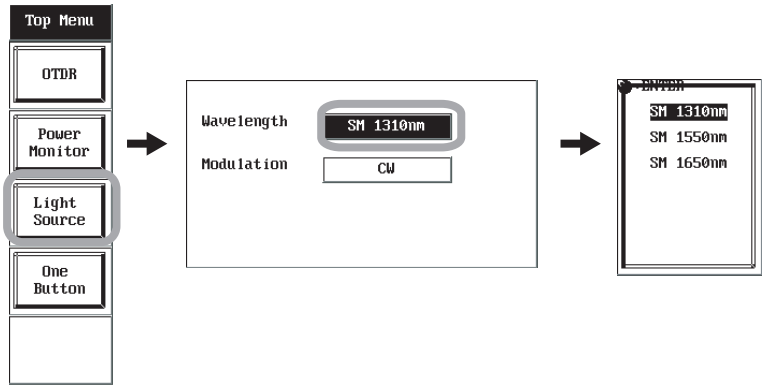
Set the detection level to monitor the optical pulse during the optical pulse test.
The ratio of the level is displayed in the progress bar on the screen while monitoring the power. If the level is less than the threshold level, the progress bar is displayed in blue. If the level exceeds the threshold level, the progress bar is displayed in green. If an optical input greater than –4.0 dBm is received, an alert message is displayed.
You cannot select other functions (OTDR and Light Source) while the alert message is displayed. Because the AQ7270 may malfunction, remove the optical fiber cable from the AQ7270.

15.1 Selecting the Wavelength

Procedure

The AQ7270 can be used as a light source.

1. Press the **Light Source** soft key. The screen switches to the light source display, and a setup screen for the light source appears.
2. Move the cursor to Wavelength using the **arrow keys** or the **rotary knob**.
3. Press **ENTER**. A screen for selecting the wavelength appears.
4. Move the cursor to the wavelength you want to select using the **arrow keys** or the **rotary knob**.
5. Press **ENTER**. The screen for selecting the wavelength closes.



Note

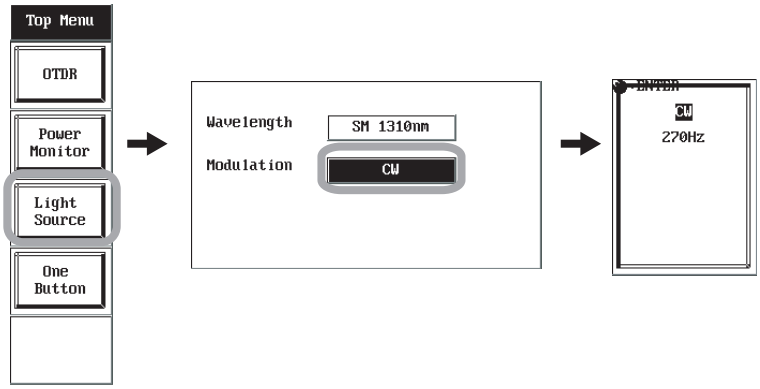
The selectable test wavelengths vary depending on the model. For details, see section 19.1.

15.2 Selecting the Modulation Light

Procedure

The optical output can be modulated.

1. Press the **Light Source** soft key. The screen switches to the light source display, and a setup screen for the light source appears.
2. Move the cursor to Modulation using the **arrow keys** or the **rotary knob**.
3. Press **ENTER**. A screen for selecting the modulation appears.
4. Move the cursor to the modulation you want to select using the **arrow keys** or the **rotary knob**.
5. Press **ENTER**. The screen for selecting the modulation closes.



Explanation

You can select the following frequencies.

- CW (continuous light)
- 270 Hz

15.3 Executing the Optical Output

Procedure

WARNING

Do not remove the optical fiber cable, because light is emitted from the optical pulse output port of the AQ7270 while the measurement is in progress. Visual impairment may occur if the light enters the eye.

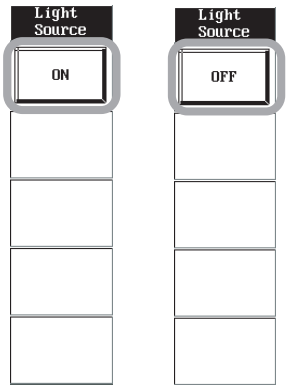
1. Press the **Light Source** soft key. The screen switches to the light source display, and a soft key menu for the light source appears.

Turning ON the Output

2. Press the **ON** soft key. The soft key changes to OFF, and LASER ON indicator appears on the screen.

Stopping the Output

3. Press the **OFF** soft key. The LASER ON indicator on the screen disappears.



16.1 Loading and Saving Waveforms

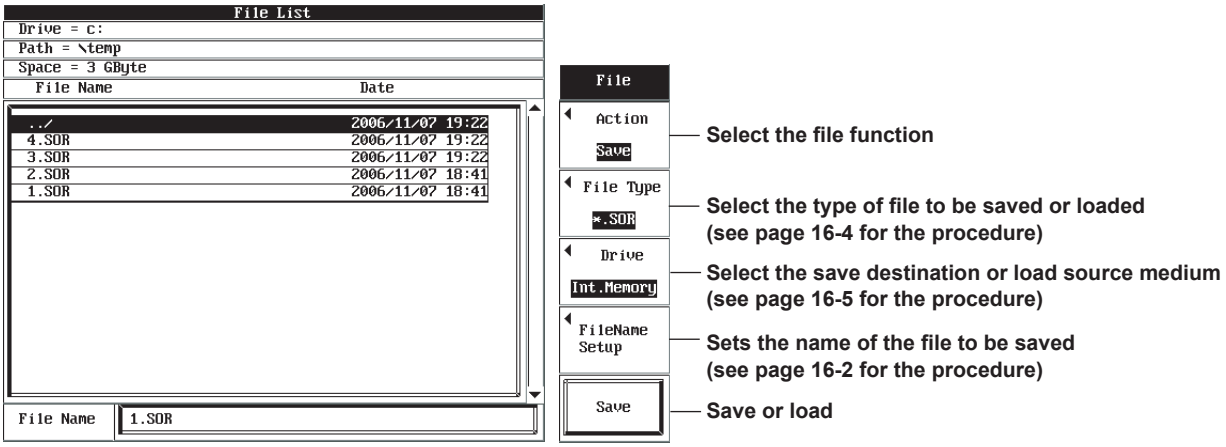
CAUTION

Do not remove the USB memory or turn the power OFF if the USB memory access indicator is illuminated or the operating status display indicates that the data is being saved. Doing so can damage the storage medium (USB memory or internal memory) or destroy the data on the medium.

Procedure

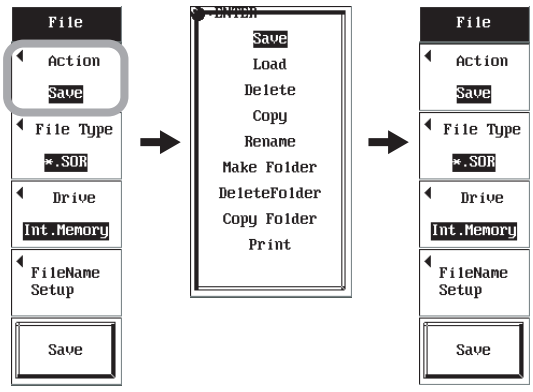
Carry out the steps below to save measured waveforms or load waveforms saved in the past to be displayed.

1. Press **FILE**. The soft key menu for operating the waveform data and the file list screen appear.



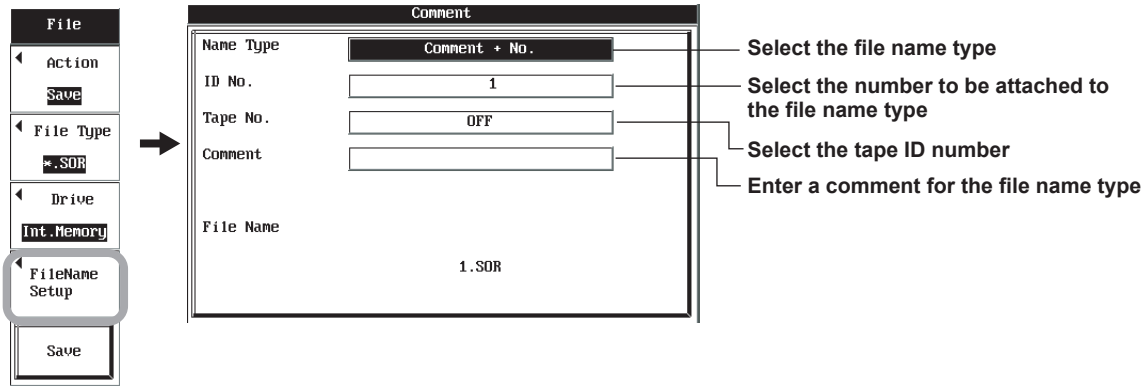
Saving the Waveform

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Save using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for saving the waveform appears.



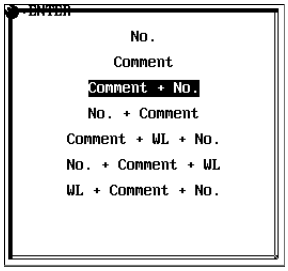
Selecting the File Name Type

5. Press the **FileName Setup** soft key. The screen for entering the file name appears.



6. Move the cursor to Name Type using the **arrow keys** or the **rotary knob**.

7. Press **ENTER**. A screen for selecting the file name type appears.



8. Move the the cursor to file name type you want to select using the **arrow keys** or the **rotary knob**.

9. Press **ENTER**. The file name type is confirmed.

Note

Auto numbering is not performed for types that does not include a number.

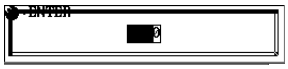
Setting the File ID Number

10. Move the cursor to ID No. using the **arrow keys** or the **rotary knob**.

11. Press **ENTER**. The screen for setting the ID number appears.

12. Set the ID number using the **arrow keys** or the **rotary knob**.

13. Press **ENTER**. The ID number is confirmed.



Note

- The number is incremented each time a file is saved.
- You cannot set the ID number if the file name type to Comment.

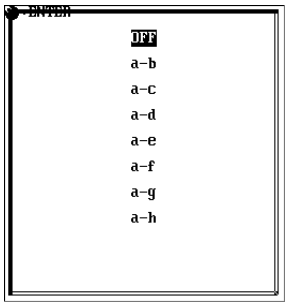
Setting the ID Number for the Tape Fiber and the Like

14. Move the cursor to Tape ID using the **arrow keys** or the **rotary knob**.

15. Press **ENTER**. A screen for selecting the tape ID appears.

16. Move the cursor to tape ID you want to select using the **arrow keys** or the **rotary knob**.

17. Press **ENTER**. The tape ID is confirmed.



Note

Example: If a-c is specified when the ID number and tape ID are combined: 000a → 000b → 000c → 001a → 001b → 001c...

Entering the Comment Section of the File Name

18. Move the cursor to Comment using the **arrow keys** or the **rotary knob**.

19. Press **ENTER**. The character input screen for entering the comment appears.

20. Enter the comment using the **arrow keys**, **rotary knob** and **ENTER**.

21. Press the **OK** soft key. The characters are confirmed.

Note

For details on entering characters, see section 16.6. The file name is set to comment + tape ID.

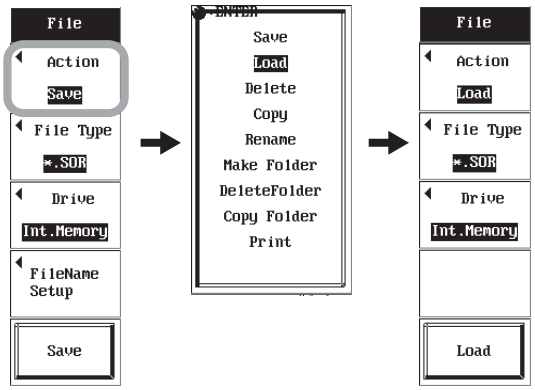
Saving the Waveform

22. Press the **Save** soft key. The waveform is saved.

23. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Loading the Waveform

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Load using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for loading the waveform appears.

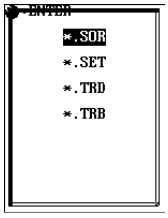


Loading the Waveform

5. Move the cursor to the file you want to load in the file list screen using the **arrow keys** or the **rotary knob**.
6. Press the **Load** soft key. The file is loaded.

Selecting the File Type

2. Press the **File Type** soft key. A screen for selecting the file type appears.
3. Move the cursor to file type you want to select using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The file type is confirmed.



Selecting the Medium

2. Press the **Drive** soft key. The screen for selecting the load source drive appears.
3. Move the cursor to the save destination or load source drive you want to select using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The save destination or load source drive is confirmed.

Explanation

Selecting the Medium

You can select the following medium types for saving or loading the waveform.

- Internal memory: The memory inside the AQ7270.
- USB memory: An external USB memory.

File Type

You can select the following file types when saving the waveform.

SOR(Telcordia)	A file conforming to Telcoria SR-4731.
SET	A measurement condition file.
CSV (waveform)	A CSV file.
CSV (event)	A CSV file.
BMP	A BMP file.
PNG	A PNG file.
JPG	A JPG file.

You can select the following file types when loading a file.

SOR	A file conforming to Telcoria SR-4731 and Bellcore GR-196-CORE.
SET	A measurement condition file.
TRD	A file type created by YOKOGAWA's AQ7260 OTDR.
TRB	A file type created by YOKOGAWA's AQ7250 OTDR.

File Name Type

You can select the following file name types when saving the waveform.

Type	File Name
Number	****.$$$
Comment	@@@@.$$$
Comment+number	@@@@****.$$$
Number+comment	****@@@@.$$$
Comment+wavelength+number	@@@@####****.$$$
Number+comment+wavelength	***@@@@####.$$$
Wavelength+comment+number	####@@@@****.$$$

*: number, @: comment, #: wavelength, and $: extension

The value of the measurement condition is displayed for the wavelength.

Setting the File ID Number

The selectable range is 0 to 999 (in 1 steps).

Entering the File Name

The structure of the file name is given below. The maximum number of characters is 36.

Comment	30 characters
Number	3 characters
Wavelength	6 characters
Tape ID	1 character
Extension	4 characters

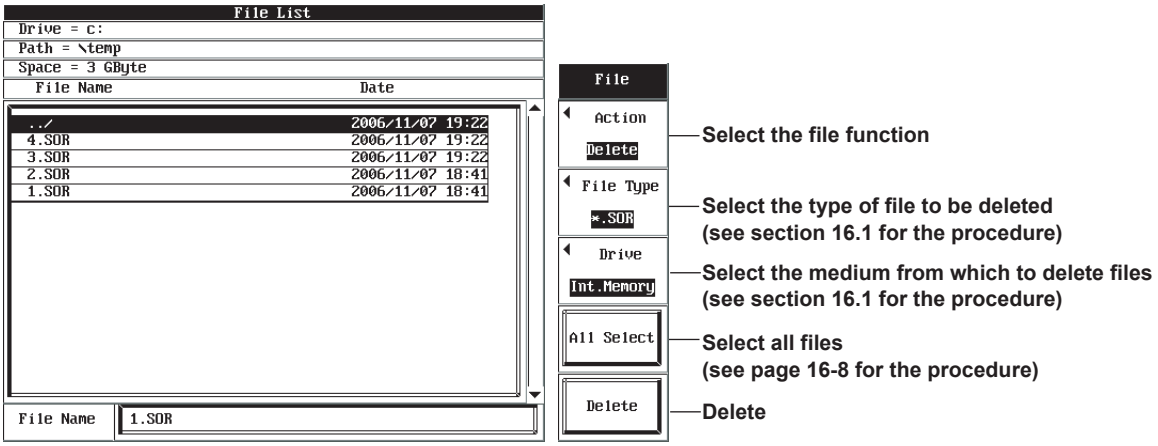
If the file name exceeds 36 characters, a section of the comment is deleted.

16.2 Deleting or Copying the Waveform Data

Procedure

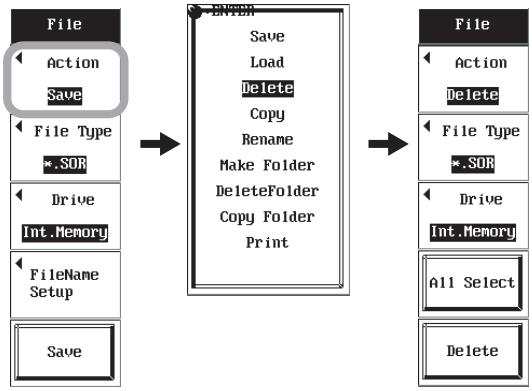
Carry out the steps below to delete waveforms saved in the past or copy them to another medium.

1. Press **FILE**. The soft key menu for operating the waveform data and the file list screen appear.



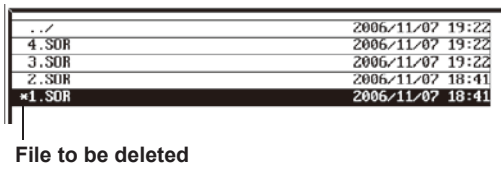
Deleting a Waveform

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Delete using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for the deleting waveforms appears.



Deleting a File

5. Move the cursor to the file you want to delete in the file list screen using the **arrow keys** or the **rotary knob**. An asterisk is displayed before the file name at the cursor.
6. Press **ENTER**. An asterisk is displayed before the file name.



7. Press the **Delete** soft key. The file is deleted.
8. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

- If you want to delete one file, select the file using the cursor.
- If you want to delete multiple files, select the file using the cursor, and press ENTER.

Deleting All Files

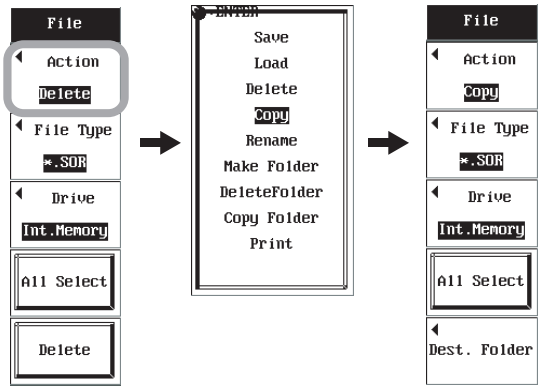
5. Move the cursor to the folder containing the files you want to delete in the file list screen using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The files in the folder are displayed.
7. Press the **All Select** soft key. An asterisk is displayed before every file name.
8. Press the **Delete** soft key. The file is deleted.
9. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

You can deselect a selected file by pressing ENTER again.

Copying Waveforms

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Copy using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. A soft key menu for copying the waveforms appears.



Copying the Waveforms

5. Move the cursor to the file you want to copy in the file list screen using the **arrow keys** or the **rotary knob**. An asterisk is displayed before the file name at the cursor.
6. Press **ENTER**. An asterisk is displayed before the file name.

File to be copied

7. Press the **Dest. Folder** soft key. The File List screen for selecting the copy destination appears.
8. Move the cursor to the copy destination folder in the file list screen using the **arrow keys** or the **rotary knob**.
9. Press **ENTER**. The contents of the copy destination folder are displayed.
10. Press the **Copy** soft key. The file is copied.
11. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

- If you want to copy one file, select the file using the cursor.
- If you want to copy multiple files, select the file using the cursor, and press ENTER.

Copying All Files

5. Move the cursor to the folder containing the files you want to copy in the file list screen using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The files in the folder are displayed.
7. Press the **All Select** soft key. An asterisk is displayed before every file name.
8. Press the **Dest. Folder** soft key. The File List screen for selecting the copy destination appears.
9. Move the cursor to the copy destination folder in the file list screen using the **arrow keys** or the **rotary knob**.
10. Press **ENTER**. The contents of the copy destination folder are displayed.
11. Press the **Copy** soft key. The files are copied.
12. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

You can deselect a selected file by pressing ENTER again.

Selecting the File Type

See section 16.1.

Selecting the Medium

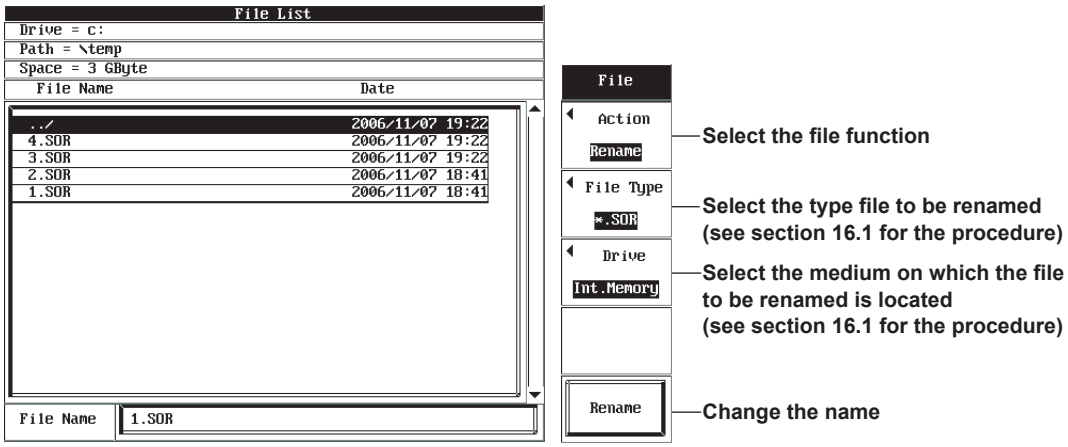
See section 16.1.

16.3 Renaming the Data File

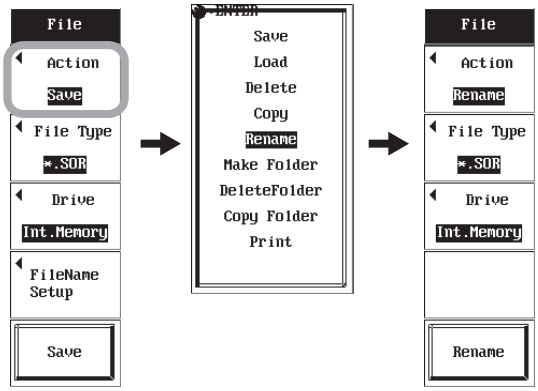
Procedure

Carry out the steps below to change the file name.

1. Press **FILE**. The soft key menu for operating the waveform data and the file list screen appear.



2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Rename using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for renaming files appears.



5. Move the cursor to the file you want to rename in the file list screen using the **arrow keys** or the **rotary knob**.
6. Press the **Rename** soft key. The screen for entering characters appears.
7. Enter the comment using the **arrow keys**, **rotary knob** and **ENTER**.
8. Press the **OK** soft key. The characters are confirmed.

Note

For details on entering characters, see section 16.6.

Selecting the File Type

See section 16.1.

Selecting the Medium

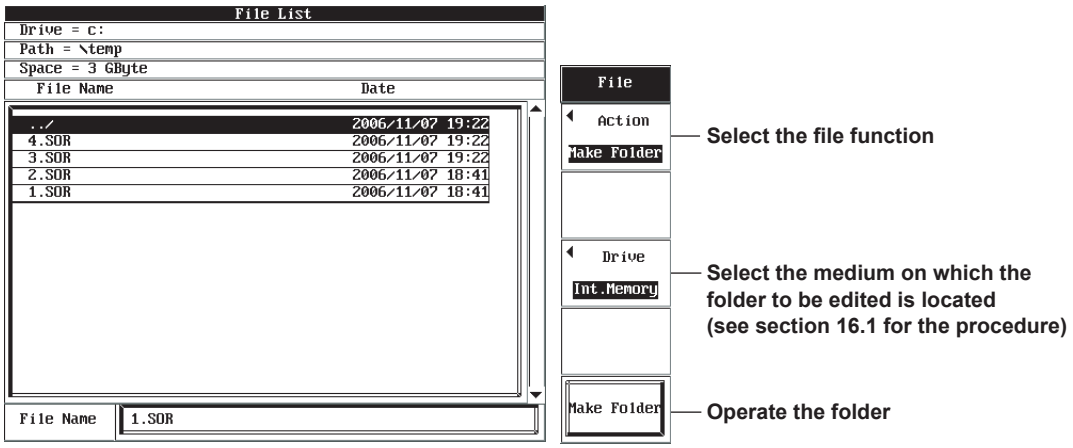
See section 16.1.

16.4 Creating, Deleting, and Copying Folders

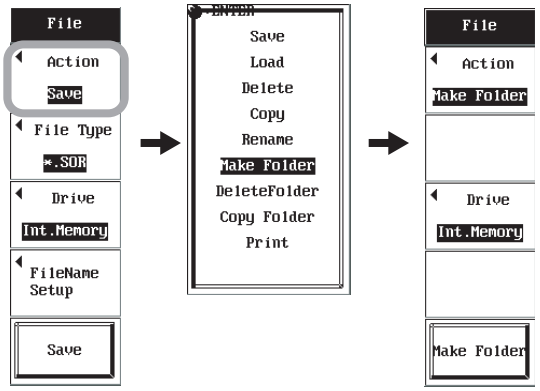
Procedure

Creating a Folder

1. Press **FILE**. The soft key menu for operating the waveform data and the file list screen appear.



2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Make Folder using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for creating folders appears.



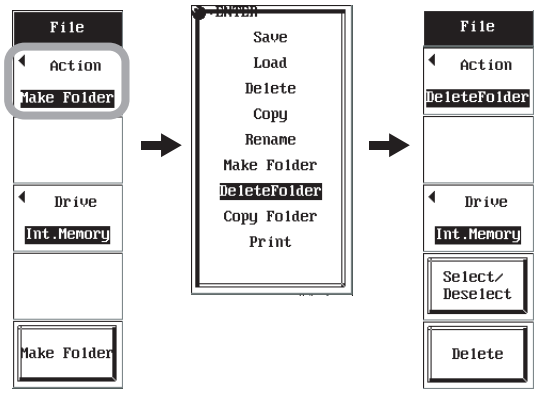
5. Move the cursor to the folder in which you want to create a new folder in the file list screen using the **arrow keys** or the **rotary knob**.
6. Press **ENTER**. The files in the folder are displayed.
7. Press the **Make Folder** soft key. The screen for entering characters appears.
8. Enter the comment using the **arrow keys**, **rotary knob** and **ENTER**.
9. Press the **OK** soft key. The characters are confirmed, and the folder is created.

Note

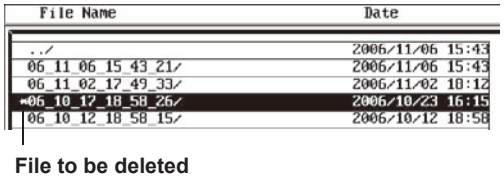
For details on entering characters, see section 16.6.

Deleting a Folder

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to DeleteFolder using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for the deleting folders appears.



5. Move the cursor to the folder you want to delete in the file list screen using the **arrow keys** or the **rotary knob**. An asterisk is displayed before the file name at the cursor.
6. Press the **Select/Deselect** soft key. An asterisk is displayed before the folder name.



File to be deleted

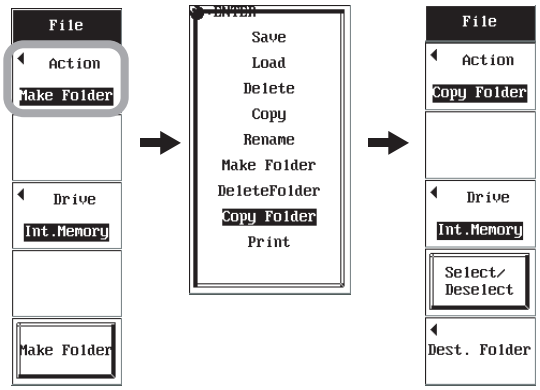
7. Press the **Delete** soft key. The folder is deleted.
8. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

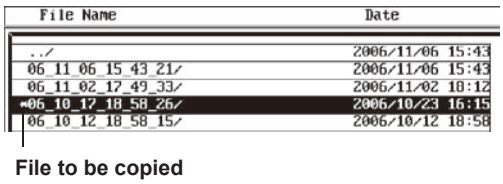
- You can deselect a selected folder by pressing Select/Deselect.
- If the level of sub folders in the selected folder is deep, the folder may not be deleted.

Copying a Folder

2. Press the **Action** soft key. The screen for operating the files appears.
3. Move the cursor to Copy Folder using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for the copying folders appears.



5. Move the cursor to the file you want to copy in the file list screen using the **arrow keys** or the **rotary knob**. An asterisk is displayed before the file name at the cursor.
6. Press the **Select/Deselect** soft key. An asterisk is displayed before the folder name.



File to be copied

7. Press the **Dest. Folder** soft key. The File List screen for selecting the copy destination appears.
8. Move the cursor to the copy destination folder in the file list screen using the **arrow keys** or the **rotary knob**.
9. Press **ENTER**. The contents of the copy destination folder are displayed.
10. Press the **Copy** soft key. The folder is copied.
11. Press **ESC**. The file list screen closes, and the optical pulse measurement screen appears.

Note

- You can deselect a selected folder by pressing Select/Deselect.
- If the level of sub folders in the selected folder is deep, the folder may not be copied.

Selecting the Medium

See section 16.1.

Explanation

When copying a folder, only the combinations below are allowed for the drives. You cannot copy from the internal memory to the internal memory or from a USB storage device to the USB storage device.

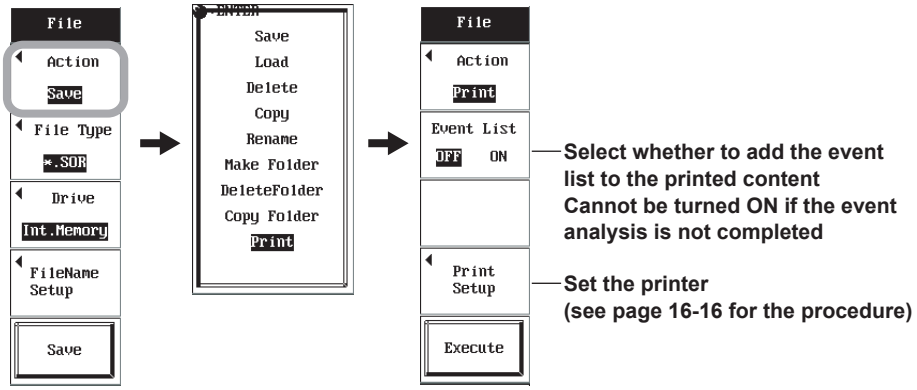
Copy Source	Copy Destination
Internal memory	USB
USB	Internal memory

16.5 Printing Waveforms

Procedure

Set the printer used to print the measured results.

1. Press **FILE**. The soft key menu for operating the file appears.



Note

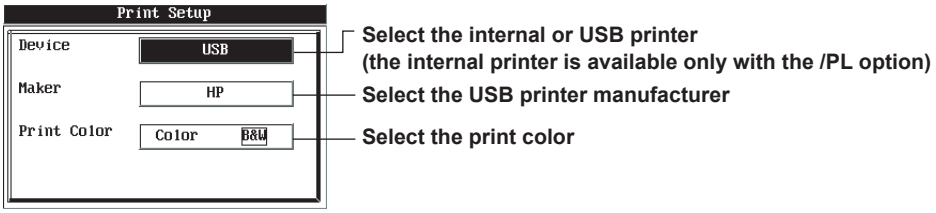
Hold down the FILE key for 1 second to directly set the file action to Print.

Selecting the Printed Contents

2. Press the **Event List** soft key to move the cursor to ON.

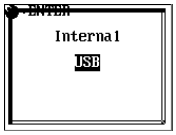
Setting the Printer

3. Press the **Print Setup** soft key. The Print Setup screen appears.



Selecting the Printer Type

4. Move the cursor to Device using the **arrow keys** or the **rotary knob**.
5. Press **ENTER**. The screen for selecting the device appears.
6. Move the cursor to the device you want to select using the **arrow keys** or the **rotary knob**.
7. Press **ENTER**. The device is confirmed.



If the USB Printer Is Selected

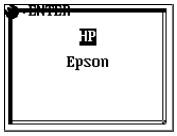
- **Selecting the Manufacturer**

  8. Move the cursor to Maker using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The screen for selecting the manufacturer appears.

  10. Move the cursor to the manufacture you want to select using the **arrow keys** or the **rotary knob**.

  11. Press **ENTER**. The manufacturer is confirmed.



- **Selecting the Print Color**

  12. Move the cursor to Print Color using the **arrow keys** or the **rotary knob**.

  13. Press **ENTER**. The cursor moves to Color or B&W.

  14. Press **ESC**. The print setup screen closes.

Printing

15. Press the **Execute** soft key. The printing starts.

Explanation

Setting the Printer

You can use the internal printer (option) or connect a USB printer to the AQ7270. The following USB printer manufacturers are supported.

HP	deskjet5160 and deskjet5740
EPSON	PX-V500 and Stylus C45

Printed Contents (Event List ON/OFF)

Select the information to be printed.

If event list is set to ON

Prints the displayed contents of the screen (hard copy) and the event list (event detection results).

Note that the event list is printed only if the event analysis is performed and events are detected.

If event list is set to OFF

Prints only the displayed contents of the screen (hard copy).

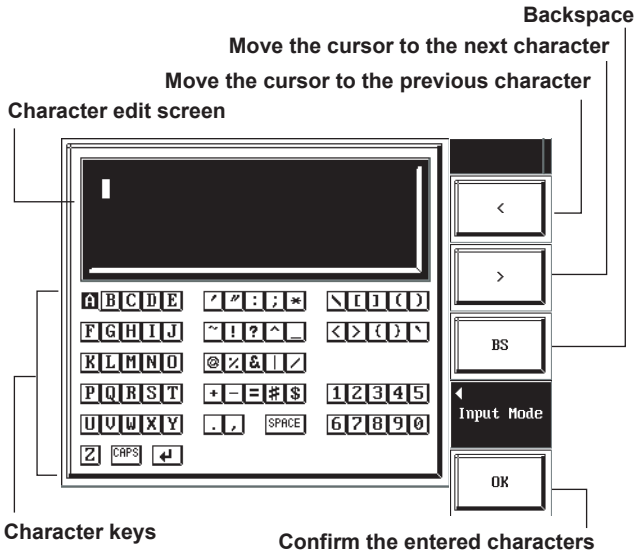
16.6 Entering Characters

Procedure

Entering Characters

You can enter file names and comments from the character input screen when saving the measured waveforms.

Character Input Screen



1. Move the cursor to the character you want to enter using the **arrow keys** or the **rotary knob**.
2. Press **ENTER**. The character appears in the character edit screen.
3. As necessary, use the edit functions of each soft key.
4. Press the **OK** soft key. The characters are confirmed.

Note

- If there is a limit in the number of allowed characters, the characters exceeding the limit are not applied.

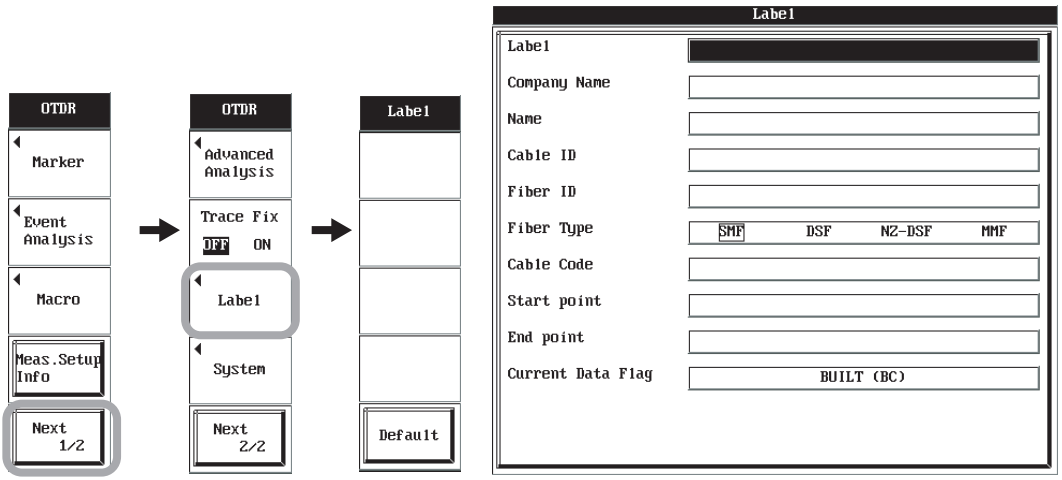
16.7 Creating Labels

Procedure

Setting a Label

You can enter detailed information such as the measurement conditions as comments. You can also enter detailed information such as the name of the company that measured the optical fiber cable or the name of the person in charge.

1. Press the **Next 1/2** soft key.
2. Press the **Label** soft key. The soft key menu for entering a label and the label input screen appear.
3. Move the cursor to the item you want to enter using the **arrow keys** or the **rotary knob**.
4. Press **ENTER**. The soft key menu for entering characters and a keyboard screen for selecting characters appear.
5. Enter the characters.
6. Move the cursor to Fiber Type using the **arrow keys** or the **rotary knob**.
7. Press **ENTER** to move the cursor to the fiber type you want to select.
8. Move the cursor to Current Data Flag using the **arrow keys** or the **rotary knob**.
9. Press **ENTER** to move the cursor to the flag you want to select.



Note

- For details on entering characters, see section 16.6.
- The information that you enter is held until you enter new information.
- The information is saved along with the waveform if the waveform is saved in the SOR type.

Initializing the Setup Conditions

10. Press the **Default** soft key. The characters that you entered are cleared and reset to factory default settings.

Explanation

Entering Labels

- The maximum label length is 36 characters.
- You cannot enter the label while the measurement is in progress.

Entering the Company Name

The maximum number of characters is 36.

Entering the Name

The maximum number of characters is 36.

Entering the Cable ID

The maximum number of characters is 36.

Entering the Fiber ID

The maximum number of characters is 36.

Selecting the Fiber Type

The following optical fiber cable types are selectable.

SMF	Single mode fiber
DSF	Dispersion shifted fiber
NZ-DSF	Non-zero dispersion shifted single-mode fiber
MMF	Multi-mode fiber

Entering the Cable Code

The maximum number of characters is 36.

Entering the Start Point

The maximum number of characters is 36.

Entering the End Point

The maximum number of characters is 36.

Selecting the Current Data Flag

You can indicate the work status as a flag.

BUILT (BC)
REPAIRED (RC)
OTHER (OT)
Current Condition (CC)

17.1 Setting the System

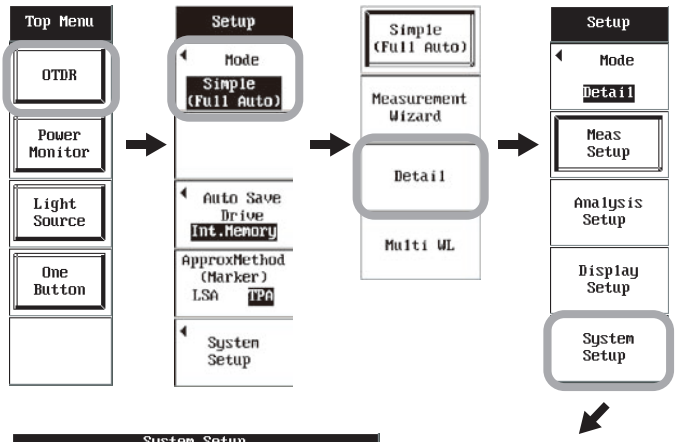
Procedure

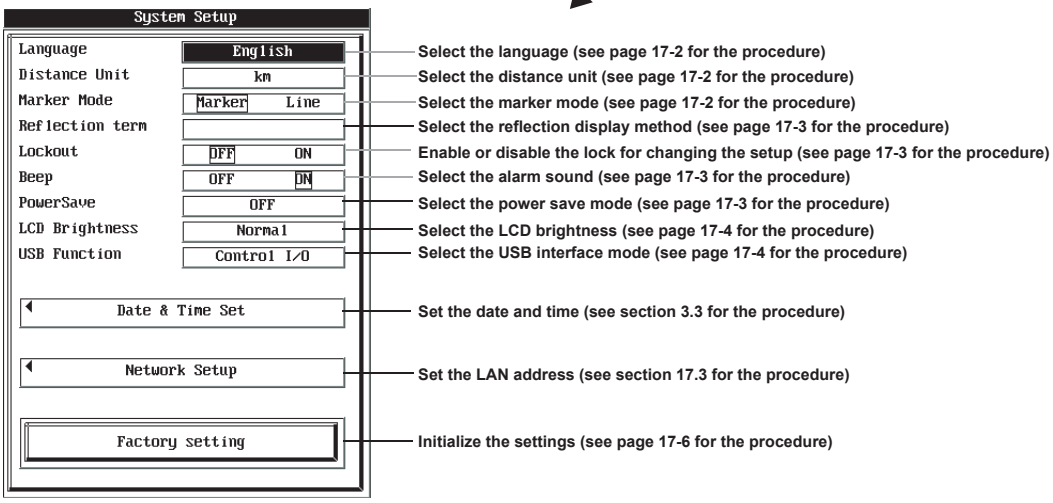
Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. A soft key menu for the Detail mode appears.

Setting the System

5. Press the **System Setup** soft key. The system setup screen appears.





- **Selecting the Language**

  6. Move the cursor to Language using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER**. A screen for selecting the language appears.

  8. Move the cursor to the language you want to select using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER**. The language is confirmed.

- **Selecting the Distance Unit**

  10. Move the cursor to Distance Unit using the **arrow keys** or the **rotary knob**.

  11. Press **ENTER**. The screen for selecting the distance unit appears.

  12. Move the cursor to the distance unit you want to select using the **arrow keys** or the **rotary knob**.

  13. Press **ENTER**. The distance unit is confirmed.

Note

If you set the language to Japanese, the distance unit is fixed to km (you cannot change it).

- **Selecting the Marker Mode**

  14. Move the cursor to Marker Mode using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER** to move the cursor to Marker or Line.

Note

For details on the marker mode, see section 11.1.

- **Enabling or Disabling Local Lockout**

  16. Move the cursor to Lockout using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER** to move the cursor to ON or OFF.

- **Enabling or Disabling the Alarm Sound**

  18. Move the cursor to Beep using the **arrow keys** or the **rotary knob**.

  19. Press **ENTER** to move the cursor to ON or OFF.

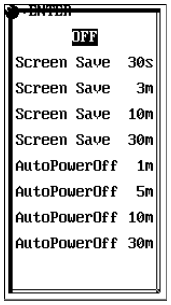
- **Selecting the Power Save Mode**

  20. Move the cursor to PowerSave using the **arrow keys** or the **rotary knob**.

  21. Press **ENTER**. The screen for selecting the power save mode appears.

  22. Move the cursor to the item you want to select using the **arrow keys** or the **rotary knob**.

  23. Press **ENTER**. The power save mode is confirmed.



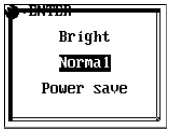
- **Selecting the LCD Brightness**

  24. Move the cursor to LCD Brightness using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The screen for selecting the LCD brightness appears.

  26. Move the cursor to the setting you want to select using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. The LCD brightness is confirmed.



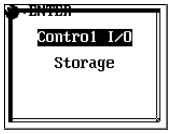
- **Selecting the USB Function**

  28. Move the cursor to USB Function using the **arrow keys** or the **rotary knob**.

  29. Press **ENTER**. The screen for selecting the USB function appears.

  30. Move the cursor to the USB function you want to select using the **arrow keys** or the **rotary knob**.

  31. Press **ENTER**. The USB function is confirmed.

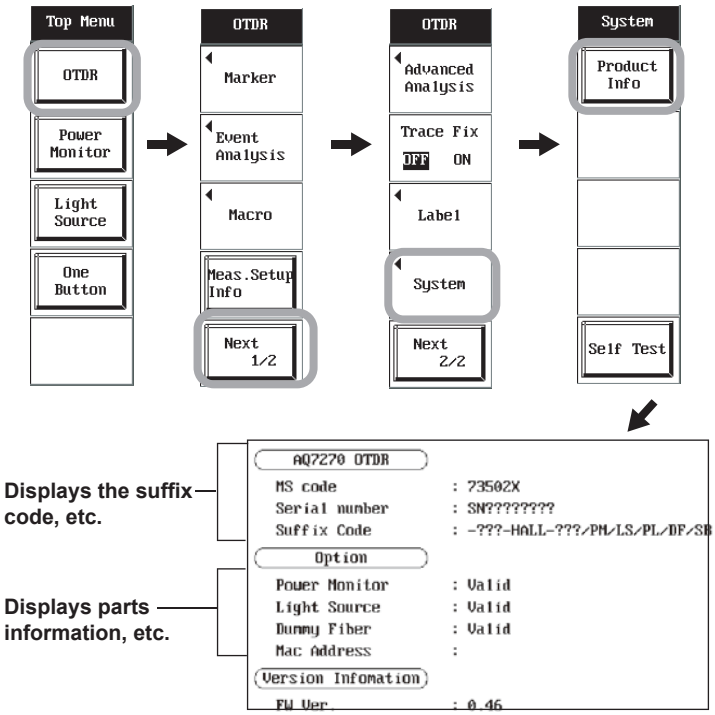


Note

- You cannot change the display while the AQ7270 is being remotely controlled.
- Select Storage to read or write the measured results in the AQ7270 internal memory from the PC.
- The AQ7270 cannot be remotely controlled while the storage function is in operation. Remote control via the Ethernet interface is also not possible.

Viewing the System Information

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Next 1/2** soft key.
3. Press the **System** soft key. The soft key menu for the system appears.
4. Press the **Product Info** soft key. The system information screen appears.



Saving the List Screen

5. Press the **Screen Image Save** soft key. The screen image is saved to the root folder of the internal memory with the file name SystemInfo.BMP.

Note

The colors of the saved screen image are the same as the colors of the displayed screen. To select other colors, see section 17.2.

Explanation

Selecting the Distance Unit

You can select the distance unit that is displayed on the screen. If you set the language to Japanese, the distance unit is fixed to km.
km, mile, and kfeet

Enabling or Disabling Local Lockout

This function protects the measurement conditions and system settings from being changed by another person.

OFF	Releases the lockout.
ON	Sets the lockout.

Enabling or Disabling the Alarm Sound

A beep is generated such as when an error message is displayed if the alarm sound is enabled.

OFF	Disables the alarm sound.
ON	Enables the alarm sound.

Setting the Power Save Mode

If the AQ7270 is left with the power turned ON, the LCD backlight is automatically turned off to save power. You can select the following modes.

OFF	Disables the power save mode.
Screen Save 30s	Switches to power save mode if the AQ7270 is not operated for 30 seconds.
Screen Save 3m	Switches to power save mode if the AQ7270 is not operated for 3 minutes.
Screen Save 10m	Switches to power save mode if the AQ7270 is not operated for 10 minutes.
Screen Save 30m	Switches to power save mode if the AQ7270 is not operated for 30 minutes.
AutoPowerOff 1m	The power is turned OFF if the AQ7270 is not operated for 1 minute.
AutoPowerOff 5m	The power is turned OFF if the AQ7270 is not operated for 5 minutes.
AutoPowerOff 10m	The power is turned OFF if the AQ7270 is not operated for 10 minutes.
AutoPowerOff 30m	The power is turned OFF if the AQ7270 is not operated for 30 minutes.

If you select auto power off, the AQ7270 switches to the power save mode after half of the time until the power is turned off elapses.

Selecting the Brightness

The visibility of the LCD varies greatly by its brightness.
In general, the following characteristics apply.

- **Bright**
  If the environment is bright, the visibility improves, but the power consumption increases. If the AQ7270 is running on the battery pack, pay attention to the battery level.
- **Power save**
  The visibility degrades slightly, but it is bright enough to be viewed in a dark environment. If the AQ7270 is running on the battery pack, the operation time is longer than when the brightness is set high.

Selecting the USB Function

There are two USB interfaces on the AQ7270. Select the appropriate interface according to the usage.

Communication (Type B)	Specify this setting to remotely control the AQ7270 from the PC.
Storage (Type B)	Select this setting to read or write the measured results in the AQ7270 internal memory from the PC.

17.2 Setting the Display

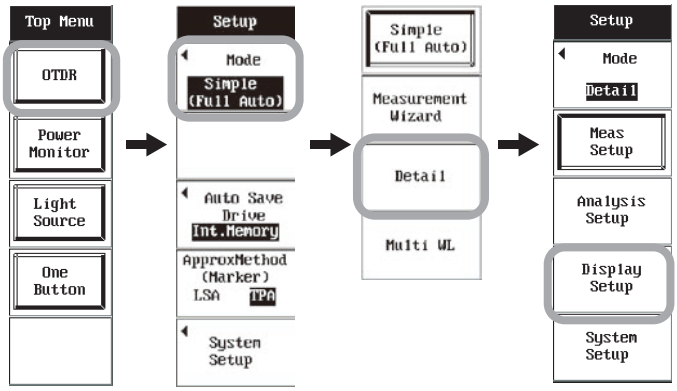
Procedure

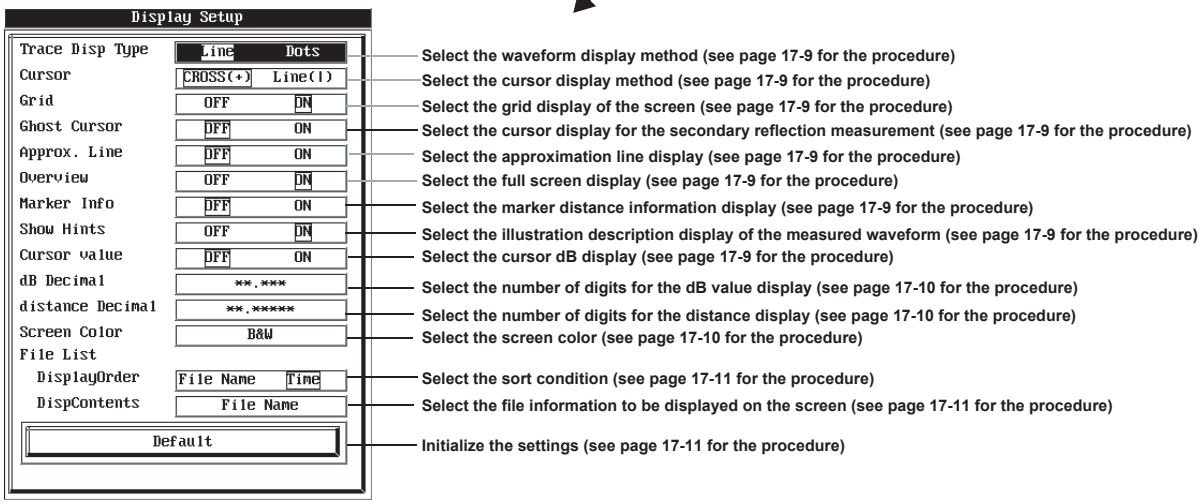
Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. A soft key menu for the Detail mode appears.

Setting the Display Setup

5. Press the **Display Setup** soft key. The Display Setup screen appears.





- **Selecting the Waveform Display Type**

  6. Move the cursor to Trace Disp Type using the **arrow keys** or the **rotary knob**.

  7. Press **ENTER** to move the cursor to Line or Dot.

- **Selecting the Cursor Type**

  8. Move the cursor to Cursor using the **arrow keys** or the **rotary knob**.

  9. Press **ENTER** to move the cursor to Cross(+) or Line(|).

- **Showing or Hiding the Grid**

  10. Move the cursor to Grid using the **arrow keys** or the **rotary knob**.

  11. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Second Cursor**

  12. Move the cursor to Ghost Cursor using the **arrow keys** or the **rotary knob**.

  13. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Approximation Line**

  14. Move the cursor to Approx. Line using the **arrow keys** or the **rotary knob**.

  15. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Overview**

  16. Move the cursor to Overview using the **arrow keys** or the **rotary knob**.

  17. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Marker Information**

  18. Move the cursor to Marker Info using the **arrow keys** or the **rotary knob**.

  19. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Functional Explanation Display**

  20. Move the cursor to Show Hints using the **arrow keys** or the **rotary knob**.

  21. Press **ENTER** to move the cursor to ON or OFF.

- **Showing or Hiding the Cursor dB Display**

  22. Move the cursor to Cursor Value using the **arrow keys** or the **rotary knob**.

  23. Press **ENTER** to move the cursor to ON or OFF.

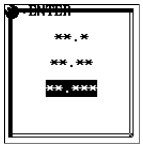
- **Selecting the Digits of the dB Display**

  24. Move the cursor to dB Decimal using the **arrow keys** or the **rotary knob**.

  25. Press **ENTER**. The screen for selecting the dB display digits appears.

  26. Move the cursor to the digit format you want to select using the **arrow keys** or the **rotary knob**.

  27. Press **ENTER**. The dB display digits is confirmed.



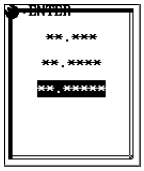
- **Selecting the Digits of the Distance Display**

  28. Move the cursor to Distance Decimal using the **arrow keys** or the **rotary knob**.

  29. Press **ENTER**. The screen for selecting the number of displayed digits of the distance appears.

  30. Move the cursor to the digit format you want to select using the **arrow keys** or the **rotary knob**.

  31. Press **ENTER**. The digits of the distance display is confirmed.



- **Selecting the Screen Color**

  32. Move the cursor to Screen Color using the **arrow keys** or the **rotary knob**.

  33. Press **ENTER**. The screen for selecting the screen color appears.

  34. Move the cursor to the color format you want to select using the **arrow keys** or the **rotary knob**.

  35. Press **ENTER**. The screen color is confirmed.

- **Selecting the Display Order on the File List Screen**

  36. Move the cursor to File List DisplayOrder using the **arrow keys** or the **rotary knob**.

  37. Press **ENTER** to move the cursor to File Name or Time.

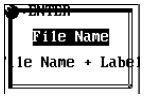
- **Selecting the Displayed Contents on the File List Screen**

  38. Move the cursor to File List DispContents using the **arrow keys** or the **rotary knob**.

  39. Press **ENTER**. The screen for selecting the displayed contents appears.

  40. Move the cursor to the displayed content format you want to select using the **arrow keys** or the **rotary knob**.

  41. Press **ENTER**. The displayed contents are confirmed.



- **Resetting the Display Setup to Factory Default Conditions**

  42. Move the cursor to Default using the **arrow keys** or the **rotary knob**.

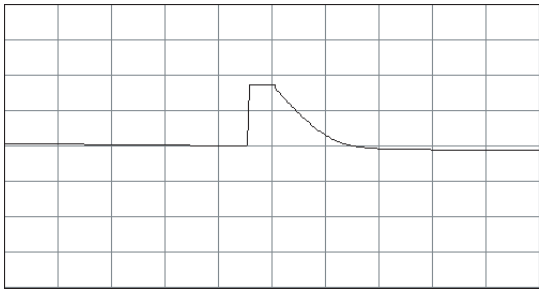
  43. Press **ENTER**. The display settings are initialized.

Explanation

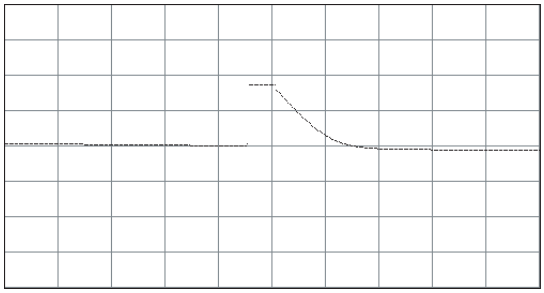
Selecting the Waveform Display Type

You can select the waveform display type from the following:

Line	Connects the sampling data with lines for the display.
Dot	Displays the sampled data with dots.



Line display

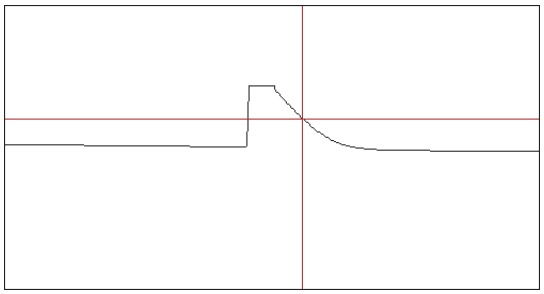


Dot display

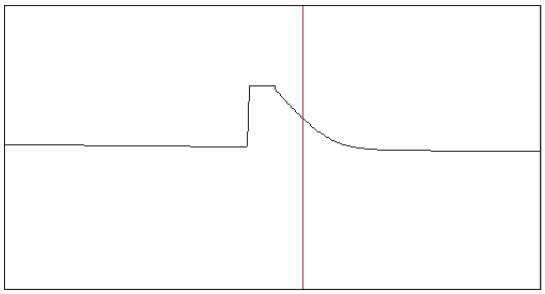
Selecting the Cursor Type

You can select the cursor type from the following:

Cross(+)	Uses a crosshair to indicate a position on the waveform.
Line(|)	Uses a line to indicate a position on the waveform.



Crosshair display

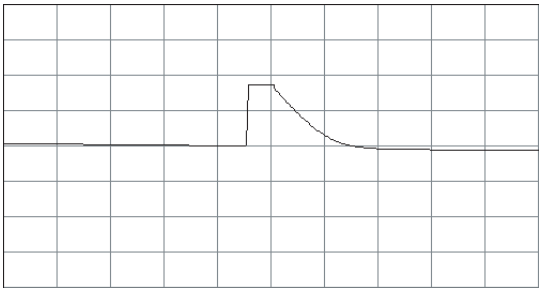


Line display

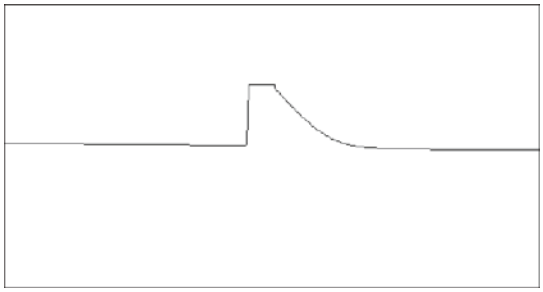
Showing or Hiding the Grid

You can select the grid display from the following:

OFF	Disables the grid display.
ON	Enables the grid display.



Show the grid

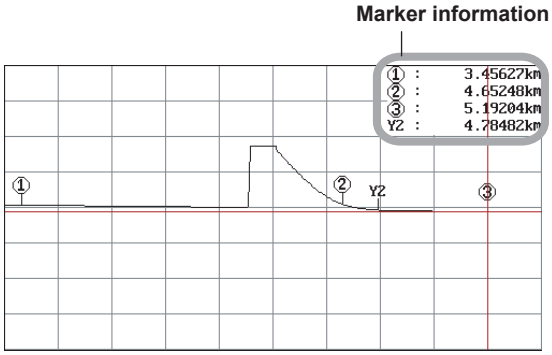


Hide the grid

Showing or Hiding the Marker Information

You can display the distance from the measurement reference to each marker in the waveform display area.

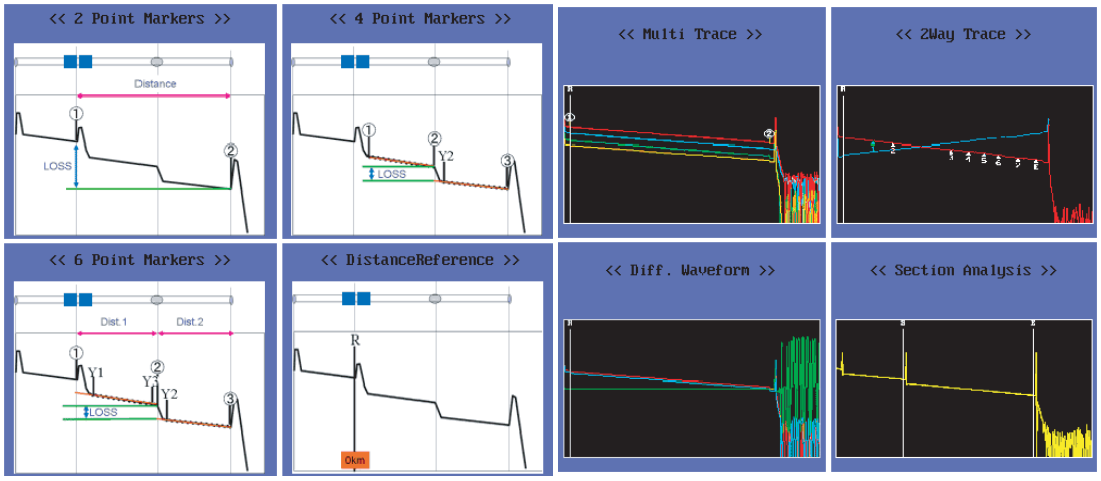
OFF	Disables the marker information display.
ON	Enables the marker information display.



Showing or Hiding the Functional Explanation Display

You can display an explanation screen at the start of the marker operation screen and waveform analysis.

OFF	Hides the functional explanation.
ON	Shows the functional explanation.



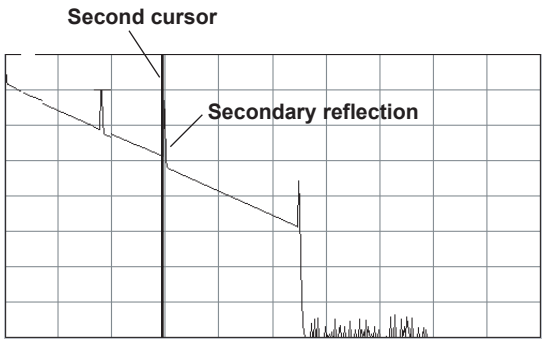
Marker operation

Waveform analysis

Showing or Hiding the Second Cursor

The second cursor is used to check the secondary reflection. A secondary reflection is a reflection that is detected at a location where there is no actual event. You can select the following modes.

OFF	Hides the second cursor.
ON	Shows the second cursor.



Principle behind Secondary Reflections

The optical pulse output from position I moves towards II.

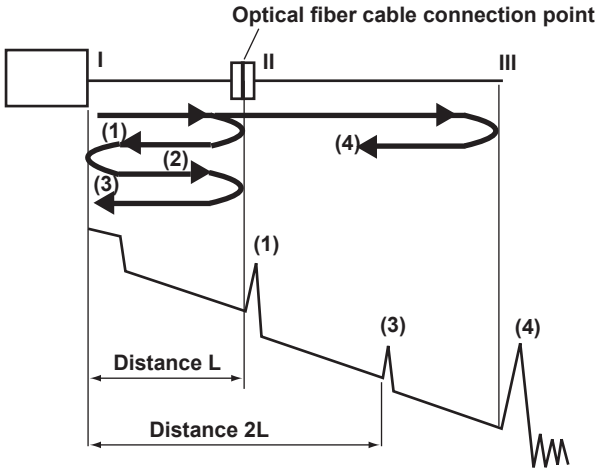
↓

The light reflected at the spliced surface of II (1) is reflected back at the spliced surface of I and moves toward II (2).
The AQ7270 detects (1) as an event.

↓

A reflected ray (3) occurs at the spliced surface of II due to the light of (2). The AQ7270 detects (3) as an event.

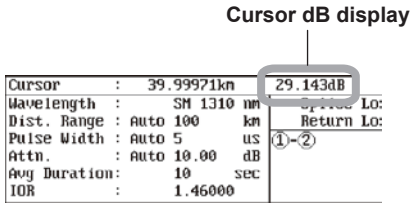
Because the AQ7270 measures all the reflected rays (1, 3, and 4), the AQ7270 detects (3) as an event in the same way as an actual occurring reflection. Therefore, it appears as though an event exists at a location where an actual event does not exist.



Showing or Hiding the Cursor dB Display

In addition to the distance information of the cursor, dB values can be displayed.

OFF	Shows only the distance information at the cursor position.
ON	Shows the distance to the cursor value and dB value.



Selecting the Digits of the dB Display

You can select the number of digits of the dB display.

**.*	Displays the value with one decimal digit.
.	Displays the value with two decimal digits.
.*	Displays the value with three decimal digits.

Selecting the Digits of the Distance Display

You can select the number of digits of the distance display.

.*	Displays the value with three decimal digits.
.**	Displays the value with four decimal digits.
.***	Displays the value with five decimal digits.

Selecting the Screen Color

You can select the screen color from color patterns 1 to 3 and black and white.

Selecting the File List Display Method

You can select the display method of the file list screen.

Display order	File name	Displays the file names from the top in alphabetical order.
	Time	Displays the file names from the top in order from the newest file.
Displayed contents	File name	Displays the name of the file you entered when saving the file.
	File name+label	Displays the characters you entered for the file name and comment.

17.3 Setting the Network (/PL Option)

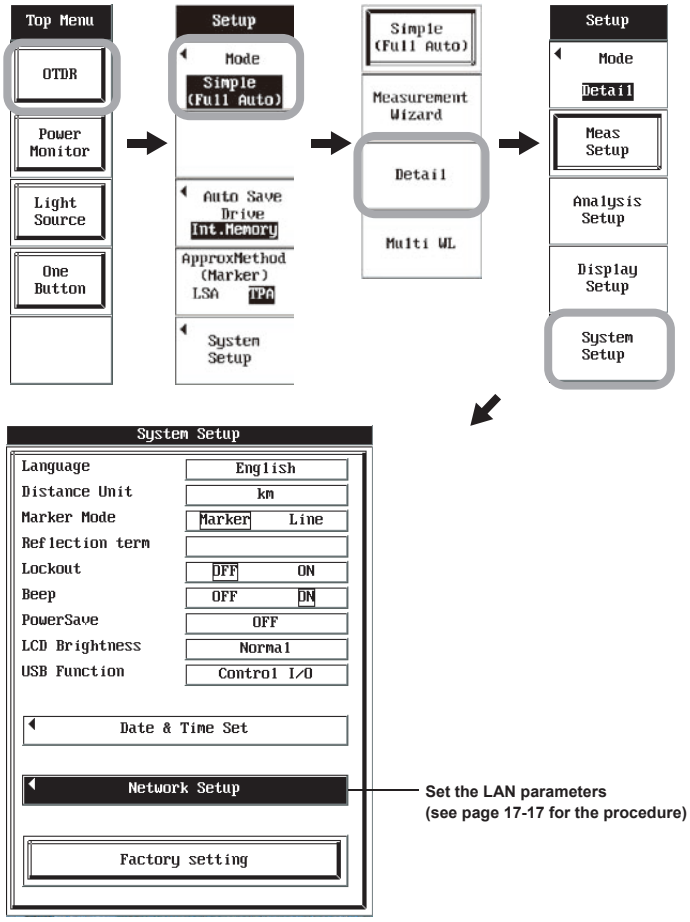
Procedure

Selecting the Detail Mode

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press **SETUP**. A soft key menu for the settings appears.
3. Press the **Mode** soft key. A soft key menu for selecting the setup mode appears.
4. Press the **Detail** soft key. A soft key menu for the Detail mode appears.

Displaying the System Setup Screen

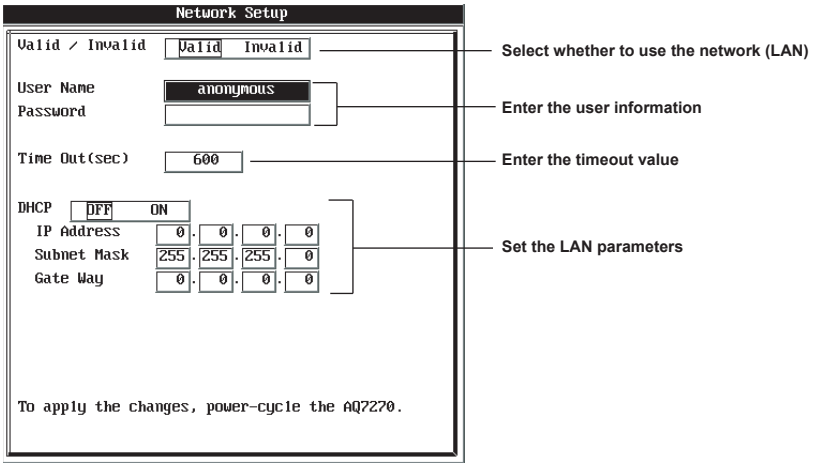
5. Press the **System Setup** soft key. The system setup screen appears.



Displaying the Network Setup Screen

6. Move the cursor to Network Setup using the **arrow keys** or the **rotary knob**.

7. Press **ENTER**. The Network Setup screen appears.



Note

Power up takes a long time if you power up the AQ7270 with the Valid/Invalid item set to Valid when the AQ7270 not connected to the network.

- **Enabling the Network Setup**

8. Press **ENTER**. The cursor moves, and the item text color turns white.

- **Entering the User Name**

9. Move the cursor to the User Name using the **arrow keys** or the **rotary knob**.

10. Press **ENTER**. The screen for entering characters appears.

11. Enter the user name.

Note

For details on entering characters, see section 16.6.

- **Entering the Password**

12. Move the cursor to Password using the **arrow keys** or the **rotary knob**.

13. Press **ENTER**. The screen for entering characters appears.

14. Enter the password.

Note

For details on entering characters, see section 16.6.

- **Setting the Timeout Value**

  15. Move the cursor to Time Out using the **arrow keys** or the **rotary knob**.

  16. Press **ENTER**. The screen for setting the timeout value appears.

  17. Use the **rotary knob** to set the value.

  18. Press **ENTER**. The timeout value is confirmed.

Note

The selectable range is 1 to 9999.

- **Setting the Address (Auto)**

  19. Move the cursor to DHCP using the **arrow keys** or the **rotary knob**.

  20. Press **ENTER** to move the cursor to ON.

Note

- You cannot set the address manually if the DHCP function is turned ON.
- A DHCP server is required on the network to use the DHCP function.

- **Setting the Address (Manual)**

  21. Move the cursor to IP Address using the **arrow keys** or the **rotary knob**.

  22. Press **ENTER**. The screen for setting the address appears.

  23. Use the **rotary knob** to set the value.

  24. Press **ENTER**. The address is confirmed.

  25. Move the cursor to Subnet Mask using the **arrow keys** or the **rotary knob**.

  26. Press **ENTER**. The screen for setting the address appears.

  27. Use the **rotary knob** to set the value.

  28. Press **ENTER**. The address is confirmed.

  29. Move the cursor to Gate Way using the **arrow keys** or the **rotary knob**.

  30. Press **ENTER**. The screen for setting the address appears.

  31. Use the **rotary knob** to set the value.

  32. Press **ENTER**. The address is confirmed.

Note

- If you change the LAN parameters, power cycle the AQ7270.
- You cannot change the display while the AQ7270 is being remotely controlled.

Explanation

Set the Ethernet parameters of the AQ7270.
The IP address of the AQ7270 must be set correctly to use this function correctly.
If a DHCP server is available on the network to which the AQ7270 is connected, the IP address is automatically assigned. In this case, turn ON DHCP on the AQ7270.
For details on the network to which the AQ7270 is connected, consult your network administrator.

Setting the User Name and Password

The Ethernet interface has a user verification function. Set a user name and password for the AQ7270 in advance.

- **Setting the User Name**
  Enter the user name using up to 15 characters. The default setting is “anonymous.’
- **Setting the Password**
  Enter the password using up to 15 characters.

Setting the Timeout Value

The connection to the network is automatically disconnected if there is no access to the AQ7270 for the specified time.

Setting the TCP/IP Parameters

You must set the following TCP/IP parameters to use the Ethernet interface function.

- IP address
- Subnet mask
- Gateway

Note

- If the user verification fails, the connection to the AQ7270 is disconnected.
- A password is not required if the user name is “anonymous.’

18.1 Troubleshooting

Troubleshooting

- If a message is displayed on the screen, read the next section.
- If servicing is necessary or if the software is not operating correctly after performing the corrective actions, contact your nearest YOKOGAWA dealer.

Problem and Corrective Action		Reference Section
Nothing is displayed even if the power switch is turned ON.		
	If you are using the AC adapter, check that the power plug is connected to the outlet, the power cord is connected to the AC adapter, and the plug at the DC end of the AC adapter is connected to the AQ7270.	3.1
	If you are using the battery pack, install it securely.	3.1
	Charge the battery pack and check that the ON lamp is illuminated.	1.1
	The LCD display darkens in high temperatures. The display speed slows down in low temperatures. Check that the temperature at the operating location is within the operating temperature range.	19
The display turns off after some time elapses.		
	The power turns OFF automatically when the battery level is low. Check the battery level of the battery pack.	18.7
	If a time value is specified in power save mode, the display is turned off if you do not operate the AQ7270 for the specified time. Check the settings.	17.1
The display is dark.		
	If the LCD brightness is set to Power save, the display appears dark. Check the settings.	17.1
	The LCD may be worn out. Servicing is required.	18.11
	If the AQ7270 or the battery pack becomes hot, the LCD brightness is lowered automatically to prevent malfunction. Check that the temperature at the operating location is within the operating temperature range.	19
The measurement conditions cannot be changed.		
	You cannot change the conditions if lockout is ON. Check the settings.	17.1
The power turns OFF while in use.		
	The AQ7270 turns OFF automatically if an abnormal condition is detected. A warning message is displayed before the power is turned OFF. Check the message.	18.2*
	Fix the problem indicated by the warning message, and turn the power switch back ON.	
The battery pack cannot be charged.		
	The battery pack may be too cold or too hot. Check that the temperature at the operating location is within the operating temperature range.	19
The power turns OFF while starting up.		
	You may have pressed the power switch twice.	–

* To prevent malfunction, the AQ7270 displays a warning message and automatically turns the power OFF if the operating conditions are close to exceeding the allowed range. For the conditions that cause a message to be displayed, see section 18.2.

18.2 Error Messages

Error Messages

A message may appear on the screen during operation. This section describes the meanings of the messages and their corrective actions. The messages can be displayed either in English or Japanese (see section 17.1). If the corrective action requires servicing, contact your nearest YOKOGAWA dealer for repairs.
In addition to the error messages listed below, there are communication error messages. Communication error messages are given in the *Communication Interface User's Manual (IM735020-17E)*.

Error in Execution

Code	Message
20	Network Option is not installed.
21	Power Monitor Option is not installed.
22	Light source option is not installed.
23	Internal Printer Option is not installed.
24	One or more conditions in this file are not supported by this product.
25	The Real Time measurement is executed. Thus, the setting mode has been changed from Multi-wavelength Mode to Advanced Mode.
27	The end point is different between acquired data and reference data. Please check the connected fiber cable.
28	The measurement may not be completed within the specified duration.
29	In remote control mode, all keys are locked except F1 key. Please hit F1 key to exit the remote control mode.
31	<Pause - Macro> Macro will be paused when the current job has been completed.
33	File operation is cancelled.
34	Printing is cancelled.
35	The optical plug may not be connected securely.
36	Either of the analysis information below could not be retrieved. (Cursor info, Free marker info., Event info.)
37	The end point distance does not match with the master end point.
500	The measurement condition is failed. Please reset ****** in SETTING menu.
501	Not executable during measurement. Please stop the measurement and execute again.
502	The measurement cannot be started during printing. Please either wait until the end of the printing or interrupt the printing.
503	The measurement cannot be started during the file operation. Please either interrupt the file operation or wait until the end of the file operation.
504	The measurement could not be completed within the specified averaging duration. Please modify the averaging duration.
505	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
506	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
507	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
508	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
509	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
510	PLUG CHECK Error. Please check or clean the connector.
511	This parameter is not valid in Simple (Full Auto) mode.
512	ZERO SET ERROR
513	ZERO SET ERROR
514	Exceeding limit. It may cause damage of the instrument. Please disconnect the plug.
515	ZERO SET ERROR

Code	Message
550	The event list does not exist in either of trace or both.
551	Measurement range of those two traces are not same reference points. Please set the origin (0m).
552	Fiber lengths do not match. The end point distance error between two traces must be within 3%.
553	Total number of events exceeds 100 for the 2-way analysis.
555	The differential trace cannot be created. Trace conditions are not same.
556	The differential trace cannot be created. No trace data available.
557	The differential trace cannot be created. The sampling resolutions are not same.
558	The differential trace cannot be created. The group indices are not same.
559	The differential trace cannot be created. The start points are not same.
560	When the event fix is ON, the distance reference setup cannot be performed.
601	Cannot save onto the media. This media is for read-only.
602	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
603	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
604	Storage media has been disconnected while the media is being accessed.
605	Duplicate file name.
606	File system failed. Please use another media.
607	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
608	Invalid file name
609	Invalid file format
610	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
611	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
612	Invalid path name
613	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
614	Unknown file or folder
615	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
616	Cannot save onto the media. This media is for read-only.
617	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
618	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
619	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
620	Disk Full.
621	File system failed. Please try another media.
622	Unknown folder
623	Folder is not empty.
624	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
625	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
626	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
627	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
628	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
629	Cannot save onto the media. This media is for read-only.
630	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
631	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
632	File system failed and needs to be repaired. Please contact Yokogawa's representatives.
633	File system failed. Please try another media.
634	Folder cannot be deleted. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
635	Folder cannot be deleted. The path name or the file name is too long.

18.2 Error Messages

Code	Message
636	Folder cannot be deleted. The hierarchy below the specified folder is too deep.
637	Folder cannot be deleted. The path name is invalid.
638	Folder cannot be deleted. It failed in the deletion of the file. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
639	Folder cannot be copied. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
640	Folder cannot be copied. The path name or the file name is too long.
641	Folder cannot be copied. The hierarchy below the specified folder is too deep.
642	Folder cannot be copied. The destination path name is invalid.
643	Folder cannot be copied. It failed in the creation of the destination folder. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
644	Folder cannot be copied. It failed in the copy of the file. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
690	Cannot save the measurement data. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
691	There is **** files in the destination folder. Please use other folder.
692	Media is full. Please install new media.
693	Cannot make a folder. Please change the folder name.
694	Cannot open the file. Please confirm the following. - Media is correctly inserted. - Media is not changed.
695	One or more conditions in this file cannot be restored. The instrument automatically determines those conditions.
696	Folder cannot be deleted. Please confirm the following. -There is no file or folder in this folder.
697	Folder can’t be copied. The destination folder is a subfolder of the source folder.
698	Folder can not be copied. Please confirm the following. -There is no file or folder in this folder. - Media is correctly inserted. - Media is formatted. - Media is not read-only.
700	File system failed. Please try another media.
701	File system failed. Please try another media.
702	File system failed. Please try another media.
703	File system failed. Please try another media.
704	File system failed. Please try another media.
705	Cannot be saved. No trace data.
706	Cannot be saved. No event data.
707	One or more measurement conditions are not specified. Please confirm the measurement conditions.
708	Cannot be saved. This data is not taken with this instrument.
709	File cannot be retrieved. Distance range exceeds 400km.
710	File cannot be retrieved. Invalid wavelength

Code	Message
711	File cannot be retrieved. Invalid distance range
712	File cannot be retrieved. Invalid pulse width
713	File cannot be retrieved. Invalid sampling points
714	File cannot be retrieved. Distance range exceeds 400km.
715	File cannot be retrieved. Sampling intervals exceed 64m.
716	File cannot be retrieved. Actual averaging times or duration is not set.
717	Duplicate file name.
718	File is damaged. Check the file.
719	File name too long. Maximum length is 37 letters.
720	File is now being accessed. Execute after access is released.
750	Difficulty in printing. Please confirm the following matter. Is the printer connected? Does the printer cover close? Is the setting of the printer correct? Has there been a paper in the printer head?
751	The temperature of the printer head has got heat up. Please do not print until the temperature of the printer head falls.
752	Print Error. Printer cannot be found.
753	No paper.
754	USB printer error Perform the power cycle.
755	USB printer is offline.
756	No paper (USB printer)
757	USB printer cannot be found. Perform the power cycle.
758	The printer is out of order, and needs to be repaired. Please contact Yokogawa's representatives.
759	Event list cannot be printed because event analysis is not performed.
760	Cannot execute it while printing.
800	This function is not supported.
814	Failed network initialize. Please confirm network connection and setting.
816	Network setting is updated. Rebooting is required to reflect the changes.
817	Test Error occurred.
818	Test succeeded.
853	In Lockout mode, all keys are locked. Please cancel the lockout.
854	In USB Storage mode, all keys are locked. Please disconnect the USB Cable.
855	While a measurement is progressed or a file is accessed, it cannot go to USB storage mode. Please try again after stopping a measurement or a file access.
900	Backup data is damaged. this instrument starts up with the factory setting.
901	Optical connector is not correctly connected. Please clean and reconnect the connector again.
902	Battery is low Please power it off, and charge the battery or replace the battery. Or, please use the AC power supply.
903	Backup battery failed, and needs to be repaired. Please contact Yokogawa's representatives.

18.2 Error Messages

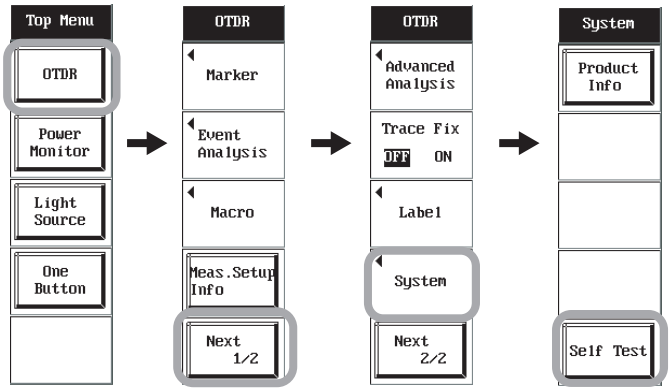
Code	Message
904	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
905	Battery error. Please replace the battery.
906	Battery is low. The instrument will be powered off in 10 sec.
907	Battery temperature is too high. The instrument will be powered off in 10 sec. Please do not power it on till the battery is cooled down.
908	Battery temperature is too low. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please do not power it on till the battery is cooled down.
909	The temperature inside the instrument is too high. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please do not power it on till the battery is cooled down.
910	The temperature inside the instrument is too low. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please do not power it on till the battery is cooled down.
911	The Voltage of AC power supply is too low. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please make sure of using the dedicated AC adapter.
912	The Voltage of AC power supply is too high. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please make sure of using the dedicated AC adapter.
913	Battery is low. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please use AC adapter.
914	Errors in the battery or in the charging circuit. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please remove the battery and use AC adapter.
915	Battery temperature is too high. Please stop measuring, and wait for a while.
916	Battery temperature is too high.The measurement was aborted. Please power it off.
917	The temperature inside the instrument is increasing. Please stop measuring, and wait for a while.
918	The temperature inside the instrument is too high. The measurement was aborted. Please power it off.
921	There is incoming light. Or, optical module may be damaged.
922	Incorrect date and time setting. Set the correct date and time.
923	The ambient temperature is out of range. The light source cannot be turned on.
924	The writing processing to the EEPROM failed.

18.3 Self Test

Procedure

Carry out the steps below to perform a self test.

1. Press the **OTDR** soft key. The optical pulse measurement display appears.
2. Press the **Next 1/2** soft key.
3. Press the **System** soft key.
4. Press the **Self Test** soft key. The self test starts.



Note

A message is displayed when the self test is complete.

Explanation

The self test checks the operation of the following items.

- Internal memory
- RTC battery check

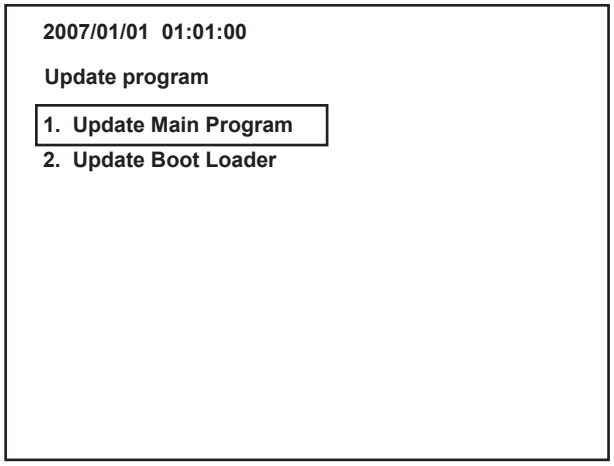
18.4 Updating the Firmware

Procedure

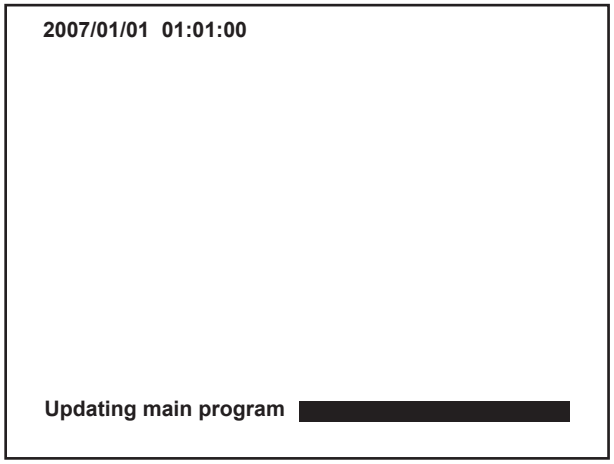
The firmware in the AQ7270 can be updated if the firmware version is updated such as when a new function is added. There are two firmware programs: a main program that provides the functions of the AQ7270 and a boot program that starts the system.

Updating the Main Program

1. Store the updated program file in the root directory of a USB memory.
2. Connect the AC adapter to the AQ7270 and connect the power plug to an outlet.
3. Press the power switch while holding down F1. The AQ7270 starts and the update screen appears.
4. Connect the USB memory to the USB connector (Type A) of the AQ7270.
5. Check that the access lamp of the USB memory turns OFF.
6. Move the cursor to Update Main Program using the **arrow keys**.



7. Press **ENTER**. A progress bar indicating the progress of the program updating operation is displayed. When the operation is complete, a message is displayed.



8. Turn the power OFF.
9. Turn the power ON. The AQ7270 starts.

Note

- You cannot update the firmware while using the battery pack.
- The main program file name is AQ7270.BIN.
- Store the program file in the root folder of the USB memory.
- If the firmware updating completes successfully, the following message appears on the screen.

  It succeeded in renewal the main program
- If the updating fails, the following message appears.

  It failed in renewal the main program

  Check that the program file is stored correctly, and carry out the updating procedure again.

18.5 Mechanical Inspection

WARNING

Turn the power OFF when you are performing an inspection.

CAUTION

- Operation errors or malfunction may result if a foreign object is clogged in the various connectors.
- If the connectors are loose, the AQ7270 may not operate correctly.
- If there are problems, contact your nearest YOKOGAWA dealer.

Check the following items.

- Check that there is no damage or deformation in the external appearance.
- Check that there are no loose parts in the switches, connectors, and other components.
- Check that the operation of the switches or the like is smooth.

18.6 Checking the Operation

Checking the Operation of the Switches

Turn the power ON, operate all the switches once, and check that the AQ7270 operates correctly.

Checking the Operation of the Internal Printer (Option)

1. Load paper in the internal printer.
2. Press the paper feed button, and check that the printer paper is fed correctly.
3. Show the screen to be printed on the LCD.
4. Check that the displayed screen can be printed.

Note

- For the procedure to load the printer paper, see section 3.4.
- For the procedure to print the screen, see section 16.5.

18.7 Replacing the Battery

WARNING

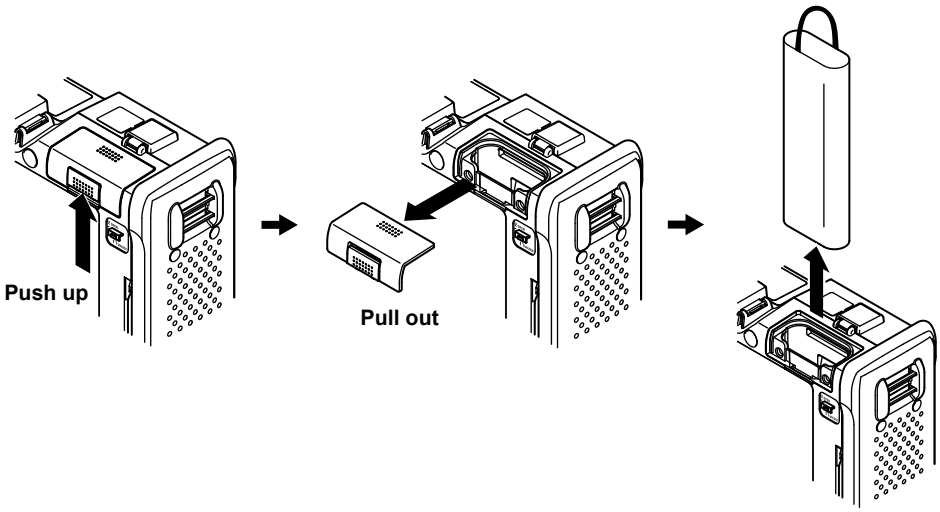
- Because the electrolyte solution inside the battery is alkaline, harm can be done to the clothes or skin, if the battery leaks or explodes and the solution comes in contact. If the electrolyte solution enters the eye, it can cause blindness. In such cases, do not rub the eye. Rinse thoroughly with water and immediately consult your eye doctor.
- To prevent the possibility of electric shock and accidents, always turn OFF the power switch and remove the AC adapter power supply from the instrument when replacing the Ni-MH battery.
- Only use the Ni-MH battery pack provided by YOKOGAWA.
- Do not leave the battery in strong direct sunlight, inside a hot vehicle, or near fire. This may cause leakage or degrade the performance and life of the battery.
- Do not disassemble or modify the battery. This can compromise the protection function provided by the battery and cause excessive heating and explosions.
- Do not short the battery. You can receive burns from the generated heat.
- Do not throw the battery into fire or apply heat to it. This can cause dangerous explosions or spraying of the electrolytes.
- Do not throw the battery or apply strong shock to it. This can cause leaks, excessive heating, and explosions.
- Do not use the battery if abnormal symptoms are present such as leakage, deformity, and discoloration.
- Do not carry the battery along with metallic objects such as paper clips. This may short the battery.

CAUTION

- When opening the battery pack cover, do not turn the AQ7270 upside down. The battery pack may fall.
- Do no touch the electrodes of the battery pack. Doing so may cause malfunction.
- Check the orientation of the battery.
- After installing the battery pack, close the battery pack cover securely. Damage may result if the cover is not closed.
- If heat or abnormal odor is emitted while charging the battery, immediately remove the AC adapter from the AQ7270 or remove the power cord from the AC adapter.
- When disposing of the batteries, follow the proper disposal regulations as specified by the relevant ordinance in your area.
- Due to its nature, Ni-MH batteries that have been over discharged cannot be recharged. If you are not going to use the instrument for an extended time, charge the battery all the way before storing it to prevent over-discharge.

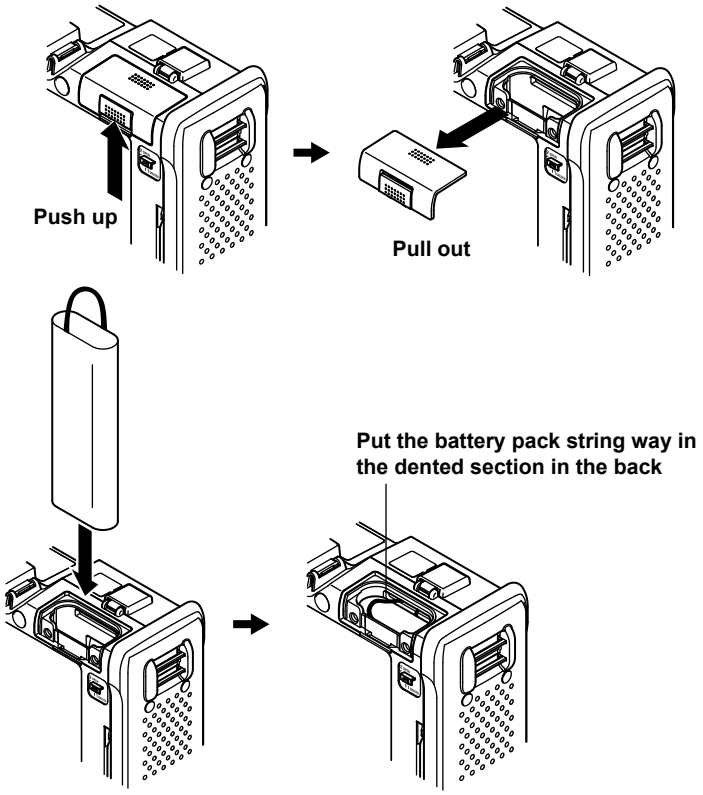
Removing the Battery

1. Turn the power switch OFF.
2. Push up the battery cover lock.
3. Pull out the battery cover while pushing the lock up.
4. Pull out the battery.



Loading the Battery

1. Push up the battery cover lock.
2. Pull out the battery cover while pushing the lock up.
3. Insert the battery pack. Pay attention to the direction.
4. Put the battery pack string way in the dented section in the back.
5. Close the battery pack cover and securely lock the battery cover.

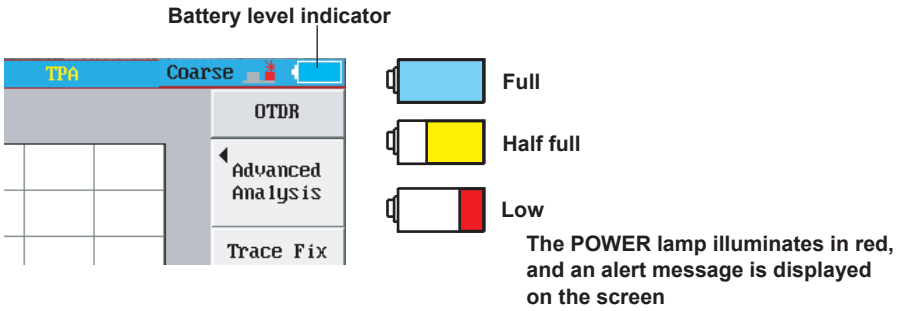


Charging the Battery Pack

A warning message appears when the battery level is low. If you see the message, charge the battery pack.

1. Connect the AC adapter to the AQ7270.
2. Connect the power cord to the AC adapter.
3. Insert the power plug to an outlet. The CHARGE lamp on the AQ7270 illuminates(Green).

The battery level is displayed at the top section of the screen.



Note

- The power automatically turns OFF a few minutes after the warning message is displayed.
- If the battery pack is hot, let the battery cool to room temperature before charging it.
- If the charging is complete, the CHARGE lamp turns OFF.
- If the charging does not start, the CHARGE lamp blinks(Green).
- The battery power may drain in about an hour and half depending on the usage conditions such as setting the LCD brightness to high or using the printer (an option).

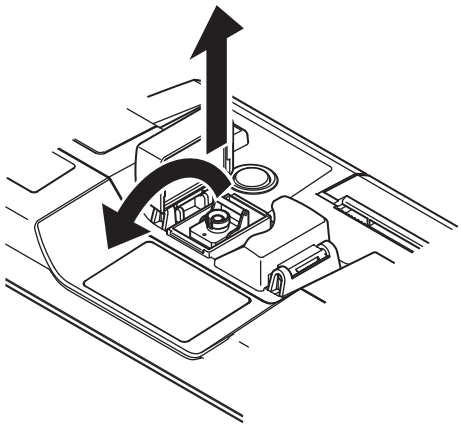
18.8 Replacing the Optical Adapter

WARNING

- Do not replace the optical adapter while the power is turned ON. If the laser light enters the eye, it may cause damage to the eye or eyesight.
- Close the cover for the optical connector that is not in use. On models with two optical connectors, if you are using only one of the connectors and you leave the other optical connector open, the laser light from the other optical connector may enter the eye.

Removing the Optical Adapter

1. Open the optical connector cover at the top of the AQ7270.
2. Tip the lock lever of the optical adapter inward to release the lock.
3. Pull out the optical adapter.

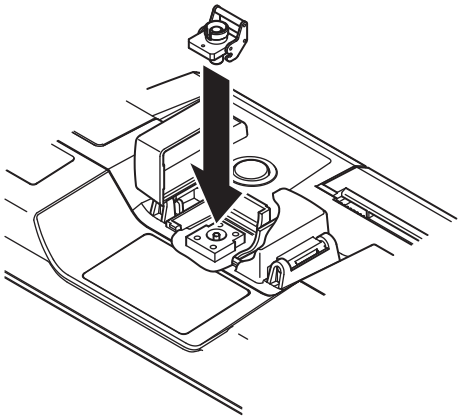


Note

- If the cover comes off, bend the axis section of the cover with your fingers and attach it.
- Because the optical connector is fixed on the -SCC and -FCC options, you cannot remove it.

Installing the Optical Adapter

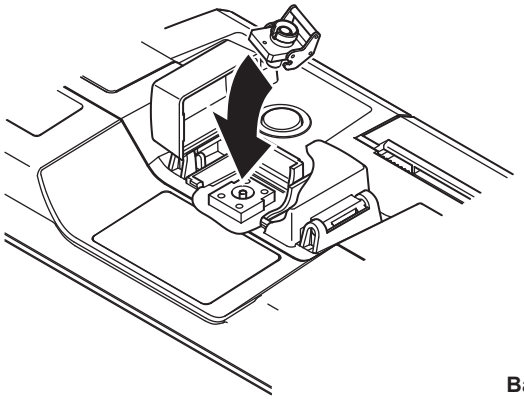
1. Open the optical connector cover at the top of the AQ7270.
2. Insert the optical adapter straight into the rear shell.
3. Tip the lock lever of the optical adapter outward to lock.



Good example

Note

When inserting the optical adapter, insert it slowly and straight. If you swing the optical adapter left or right or remove it by force, the optical adapter or the ferrule section of the optical connector may break.



Bad example

18.9 Routine Maintenance

Cleaning the Outside of the Instrument

Wipe dirt from the LCD and the outer case using a cloth containing water or lukewarm water that has been wrung well. Then, wipe with a dry cloth.

Note

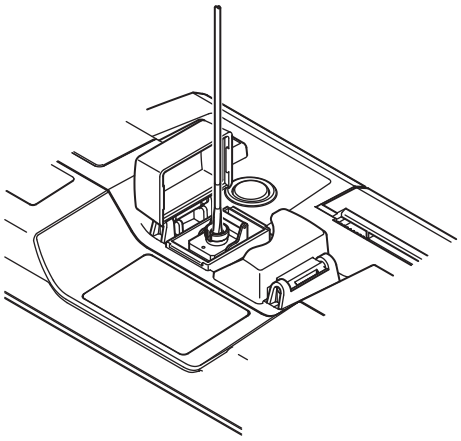
- Turn the power OFF when you are cleaning the instrument.
- Using chemicals such as benzene, thinner, or alcohol will cause deformation and discoloration of the outer case.
- Wring the cloth well so that water does not enter the instrument.

Cleaning the Optical Adapter

WARNING

Do not clean the optical adapter while the power is turned ON. If the laser light enters the eye, it may cause damage to the eye or eyesight.

1. Open the optical connector cover at the top of the AQ7270.
2. Clean the surface inside the optical adapter using a dedicated stick. Hold as close to the end of the stick as possible.



Note

We recommend you use the following cleaner to clean the optical adapter.
Recommended cleaner: CLETOP Stick Type (by NTT Advanced Technology Corporation)

18.10 Storage Precautions

Before Storing the AQ7270

Clean the AQ7270 before storage.

Note

For details on cleaning, see section 18.9.

Storage Conditions

Store the AQ7270 under the following conditions.

- A location in which the temperature and humidity are within the allowed range.
- A location where the temperature and humidity changes are small throughout the day.
- A location not in direct sunlight.
- A location with little dust
- A location free of corrosive gases.

Note

If you are not using the AQ7270 for an extended time, remove the battery pack from the AQ7270 for storage. For the procedure to remove the battery pack, see section 18.7.

Using the AQ7270 after Long Storage

If you are using the AQ7270 after prolonged storage, check the operation.

Packing the AQ7270

Carry out the steps below to pack the AQ7270.

1. Cover the AQ7270 with a thick plastic bag to prevent dust from entering the instrument.
2. Place a cushioning material against the LCD for protection.
3. Prepare a box that allows 10 to 15 cm of spacing around the instrument.
4. Pack cushioning material at the bottom of the box.
5. Pack cushioning material in the space between the instrument and the box.
6. Close the box firmly with adhesive tape.

Transporting the AQ7270

- Avoid vibrations when transporting the AQ7270.
- Transport the AQ7270 in an environment that meets the storage conditions.
- If you are transporting the battery packs in a aircraft, do not include more than 12 battery packs in a package. Check with your air carrier in advance, because the air carrier may refuse to transport the battery packs.

18.11 Recommended Replacement Parts

The one-year warranty applies only to the main unit of the instrument (starting from the day of delivery) and does not cover any other items nor expendable items (items which wear out).
Contact your nearest YOKOGAWA dealer to have parts replaced.

Parts Name	Replacement Period
Internal printer	Under normal usage, 3000 rolls of paper (part No.: A9010ZP)

The items below are expendable items. We recommend the parts be replaced according to the period indicated below.
Contact your nearest YOKOGAWA dealer to have parts replaced.

Parts Name	Recommended Replacement Period
Backup battery (lithium battery)	5 years
LCD backlight	Approx. 25000 hours under normal use

18.12 Calibration

Periodic calibration is a good way to maintain the performance of the instrument over an extended period and to find problems in an early stage. We recommend that the AQ7270 be calibrated once a year.

19.1 Models

Item	Specifications	
Model	Wavelength	Dynamic Range
735020	1550 nm	32 dB
735021	1650 nm	30 dB
735022	1310 nm	34 dB
	1550 nm	32 dB
735023	1310 nm	40 dB
	1550 nm	38 dB
735024	1550 nm	38 dB
	1625 nm	35 dB
735025	1310 nm	34 dB
	1490 nm	30 dB
	1550 nm	32 dB
735026	1310 nm	34 dB
	1550 nm	32 dB
	1625 nm	28 dB
735027	1310 nm	34 dB
	1550 nm	32 dB
	1650 nm	30 dB
735028	1310 nm	40 dB
	1550 nm	38 dB
	1625 nm	35 dB
735029	850 nm	22.5 dB
	1300 nm	24 dB
735030	850 nm	22.5 dB
	1300 nm	24 dB
	1310 nm	34 dB
	1550 nm	32 dB

19.2 Optical Section

MODEL 735020

Item	Specifications
Center wavelength	1550 nm ± 25 nm
Event dead zone[*5]	0.8 m (max.)
Attenuation dead zone[*6]	8 m (typ.)
Dynamic range (min.)[*4]	32 dB
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)[*3]	±0.5 dB or less (/PM option)

MODEL 735021

Item	Specifications
Center wavelength	1650 nm ± 5 nm[*1], ±10 nm[*2]
Measuring pulse optical output	≤15 dBm (max.)
Event dead zone[*5]	0.8 m (max.)
Attenuation dead zone[*6]	12 m (typ.)
Dynamic range (min.)[*4,10]	30 dB
Light source (optical output)	–5 dBm or more (/LS option)

MODEL 735022

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m(typ.)@1550 nm
Dynamic range (min.)*4	34 dB@1310 nm, 32 dB@1550 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735023

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m(typ.)@1550 nm
Dynamic range (min.)*4	40 dB@1310 nm, 38 dB@1550 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735024

Item	Specifications
Center wavelength	1550 nm ± 25 nm, 1625 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	8 m (typ.)@1550 nm, 12 m(typ.)@1625 nm
Dynamic range (min.)*4	38 dB@1550 nm, 35 dB@1625 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735025

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1490 nm ± 25 nm, 1550 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m (typ.)@1490 nm, 8 m (typ)@1550 nm
Dynamic range (min.)*4	34 dB@1310 nm, 30 dB@1490 nm, 32 dB@1550 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735026

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1625 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ)@1625 nm
Dynamic range (min.)*4	34 dB@1310 nm, 32 dB@1550 nm, 28 dB@1625 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735027

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1650 nm ± 5 nm*1, ± 10 nm*2
Measuring pulse optical output	≤15 dBm (max.)@1650 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ)@1650 nm
Dynamic range (min.)*4,10	34 dB@1310 nm, 32 dB@1550 nm, 30 dB@1650 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735028

Item	Specifications
Center wavelength	1310 nm ± 25 nm, 1550 nm ± 25 nm, 1625 nm ± 25 nm
Event dead zone*5	0.8 m (max.)
Attenuation dead zone*6	7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm, 12 m (typ)@1625 nm
Dynamic range (min.)*4	40 dB@1310 nm, 38 dB@1550 nm, 35 dB@1625 nm
Light source (optical output)	–5 dBm or more (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less (/PM option)

MODEL 735029

Item	Specifications
Center wavelength	850 nm ± 30 nm, 1300 nm ± 30 nm
Event dead zone*9	2 m (typ.)
Attenuation dead zone*6	7 m (typ.)@850 nm, 10 m(typ.)@1300 nm
Dynamic range (min.)*8	22.5 dB@850 nm, 24 dB@1300 nm

MODEL 735030

Item	Specifications
Center wavelength	850 nm ± 30 nm, 1300 nm ± 30 nm, 1310 nm ± 25 nm, 1550 nm ± 25 nm
Event dead zone*5,9	2 m (typ.)@850/1300 nm, 0.8 m@1310/1550 nm
Attenuation dead zone*6	7 m (typ.)@850 nm, 10 m (typ.)@1300 nm, 7 m (typ.)@1310 nm, 8 m (typ.)@1550 nm
Dynamic range (min.)*4,8	22.5 dB@850 nm, 24 dB@1300 nm, 34 dB@1310 nm, 32 dB@1550 nm
Light source (optical output)	–5 dBm or more@1310/1550 nm (/LS option)
Optical power monitor (input level)	–50 dBm to –5 dBm@1310/1550 nm (/PM option)
Optical power monitor (accuracy)*3	±0.5 dB or less@1310/1550 nm (/PM option)

*1 ±5 nm: 20 dB point from the peak value of the pulse optical output.

*2 ±10 nm: 60 dB point from the peak value of the pulse optical output.

*3 When applying input with λ = 1310 nm at –10 dBm.

*4 Pulse width of 20 μs, distance range of 200 km, sampling resolution of 32 m, averaging duration of 3 min.

*5 Pulse width 3 ns, return loss 45 dB or more, 1.5 dB point below the peak value at unsaturated condition.

*6 Pulse width 10 ns, return loss 45 dB or more, at a point where the backscattering light level is within 0.5 dB of the steady-state value.

*8 Pulse width of 500 ns (850 nm)/1 μs (1300 nm) , averaging duration of 3 min, sampling resolution of 8 m.

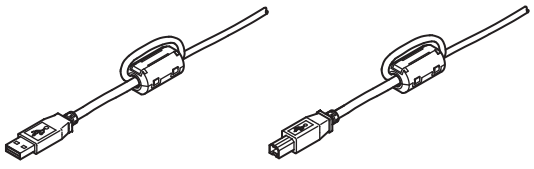
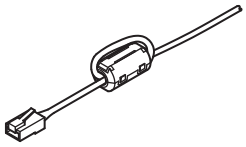
*9 Pulse width of 10 ns, return loss 45 dB or more, at a point where the backscattering light level is within 1.5 dB of the steady-state value.

*10 1.65 μs: With background light (1550 nm ± 75 nm, –19 dBm, CW light).

- Dummy fiber option may cause the reduction of dynamic range (0.5dB or less).
- Typical value represents a typical or average value. It is not strictly warranted.
- The ampersand after the values in the optical specifications indicate that the value correspond to the wavelength after the ampersand.

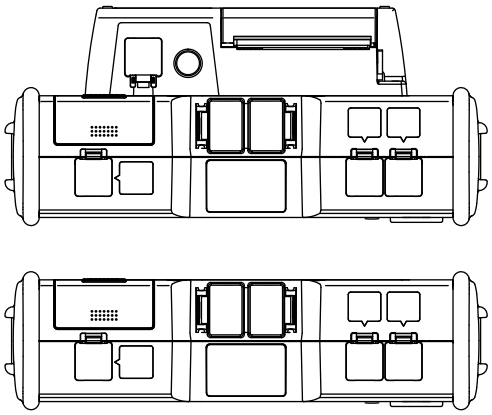
19.3 General Specifications

General Specifications

Item	Specifications
Display	8.4-inch color TFT (640 × 480 dots)
Distance range	500 m, 1 km, 2 km, 5 km, 10 km, 20 km, 50 km, 100 km, 200 km, 300 km, 400 km
Reading resolution	1 cm min.
Sampling resolution	5 cm, 10 cm, 20 cm, 50 cm, 1 m, 2 m, 4 m, 8 m, 16 m, 32 m
Number of data samples	Up to 50000 points
Group refraction index	1.30000 to 1.79999 (0.00001 steps)
Distance unit	km mile and kf for English display
Pulse Width	3 ns, 10 ns, 20 ns, 50 ns, 100 ns, 200 ns, 500 ns, 1 μs, 2 μs, 5 μs, 10 μs, 20 μs *1 5 μs for 850 nm (MM) *2 Exclude 3 ns for 850/1300 nm (MM)
Distance measurement accuracy	±1 + measured distance × 2 × 10^{-5} ± sampling resolution
Internal memory	Saves up to 1000 waveforms
USB (1.1)	Type A (printer and external memory) Type B (remote and storage)
LAN (option)	10/100BASE-T
Internal printer (option)	576-dot/line thermal printer, chart paper width: 80 mm
AC power supply	100 to 240 VAC 50/60 Hz
Battery pack	Duration: 6 hours (under specified operating conditions), charge time: within 5 hours
Weight (excluding options)	Approx. 2.8 kg
Dimensions (projections excluded)	287 (W) × 197 (H) × 85 (D) 287 (W) × 197 (H) × 135 (D) with the /PL option
Temperature range	During use: 0°C to 45°C During storage –20°C to 60°C When using the printer 0°C to 35°C (80%RH or less) When charging the battery pack 0°C to 35°C
Maximum relative humidity	85%RH or less (without condensation)
Emission	
Complying standard	EN61326 Class A, (C-Tick AS/NZS CISPR11) EN61000-3-2 EN61000-3-3 This instrument is a Class A (for industrial environment) product. Operation of this product in a residential area may cause radio interference in which case the user is required to correct the interference.
Cable conditions	• USB Use a shielded cable. Use cables of length 3 m or less. Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA part number: A1190MN) with two windings at the AQ7270 end (see the figure below).  • Ethernet interface connector Use LAN cables of length 30 m or less. Attach a ferrite core (TDK: ZCAT2035-0930A, YOKOGAWA part number: A1190MN) with two windings at the AQ7270 end (see the figure below). 

Item	Specifications
Immunity	
Complying standard	EN61326 industrial environment
Cable conditions	Same as the cable conditions for emission.
Safety standards	
Conforming standards	EN61010-1
	IEC60825-1

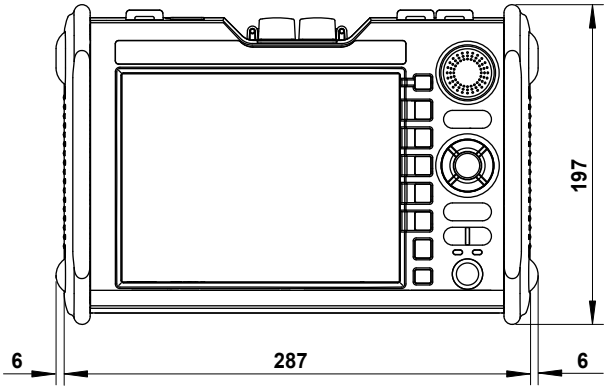
19.4 External Dimensions



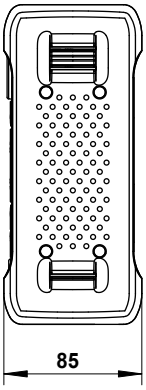
Unit: mm
Unless otherwise specified, tolerance is ±3%
(however, tolerance is ±0.3 mm when below 10 mm).

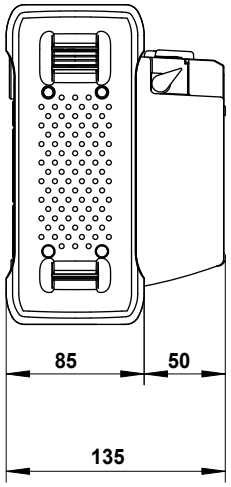
Option /PL: LAN and internal printer options

Top view



Front view





Right view (/PL)

Appendix 1 Terminology

Attenuation

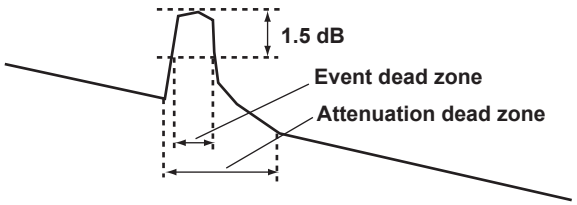
The amplification level of the amplifier built into the AQ7270. The amplification level increases as the displayed attenuation value decreases. Waveforms with good S/N ratio can be acquired with small attenuation values. However, the waveform may saturate in a section with high reflection levels. Select the amplification level best suited to the DUT.

Attenuation Dead Zone

The distance range where the return loss of the optical connector is greater than or equal to 45 dB and the backscattering light level is within ±0.5 dB of the steady-state value.

Event Dead Zone

The event dead zone is also called the spatial resolution.
It is the distance range from the event peak value of return loss greater than or equal to 45 dB (condition in which the event is not saturated) to the location that is – 1.5 dB.



Event Note

A comment attached to an event.

Event List

A list of information (distance, splice loss, return loss, etc.) of events that are detected through auto detection.

S/N

An abbreviation for signal-to-noise ratio. The expression “S/N is poor’ indicates that the waveform contains a high level of noise components.

LSA

An abbreviation for Least Squares Approximation.

Far end

The far end and its surrounding area of the optical fiber cable.
If the end of the optical fiber cable cannot be detected due to noise, far end indicates the cross point of the noise and optical fiber and its surrounding area.

OTDR

An abbreviation for Optical Time Domain Reflectometer. An OTDR emits optical pulse into the optical fiber cable and acquires the reflected rays. It processes the acquired data and displays the loss distribution on the optical fiber cable.
The OTDR is also called optical fiber analyzer or optical pulse tester.

Distance Measurement Accuracy

The OTDR calculates the distance (L) by measuring the time until the transmitted light pulse returns and using the equation indicated below.

$L = C \times T/(2N)$ [m]

- C: The speed of light travelling through a vacuum.
- T: The time from when the optical pulse is transmitted until the light returns.
- N: Group refraction index

The reason why the equation divides by 2 is because the round-trip time of the optical pulse is measured.
An error will occur in the distance measurement unless an accurate group refraction index is specified.

Distance Range

The length of the distance to be measured. Select a distance range that is longer than the optical fiber cable you want to measure. If the distance range is longer, the measurement time also increases accordingly.

Near End

The point where the optical fiber cable is connected to the AQ7270 and its surrounding area.

Spatial Resolution

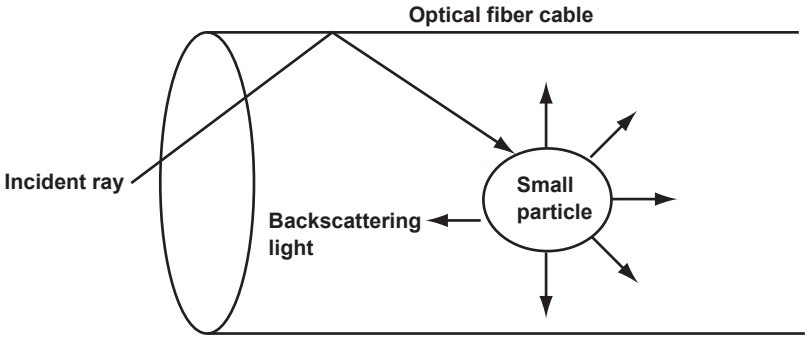
It is also called the event dead zone.

Group Refraction Index

Group refraction index (N) is a ratio of the speed of light travelling through a vacuum with respect to the speed of light travelling through a material. The equation is shown below.
N = Speed of light travelling through a vacuum/Speed of light travelling through a material
A typical SMF group refraction index N is a value around 1.46000.

Backscattering Light

When light propagates through the optical fiber cable, a phenomenon called Rayleigh Scattering occurs due to the nonuniformity of the density or constituents of materials smaller than the wavelength unit. The scattered light that is transmitted opposite to the direction of propagation is called backscattering light.



Least Squares Method

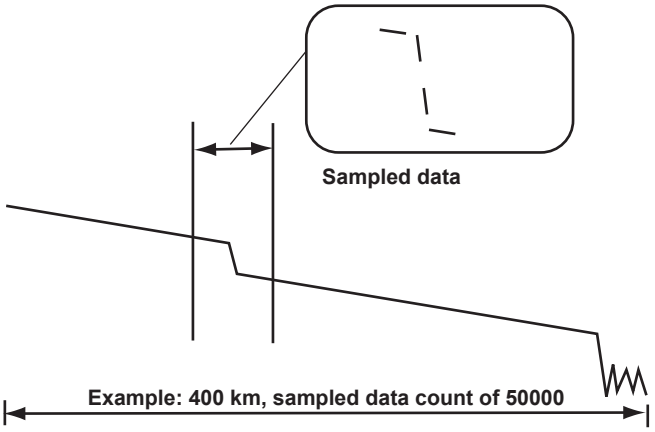
A method used to calculate the loss of an optical fiber cable. It is calculated using all the data values between two points.

Number of Data Samples

The number of data values acquired for each waveform.

Sampling Resolution

The interval at which data values are acquired.



Splice Loss

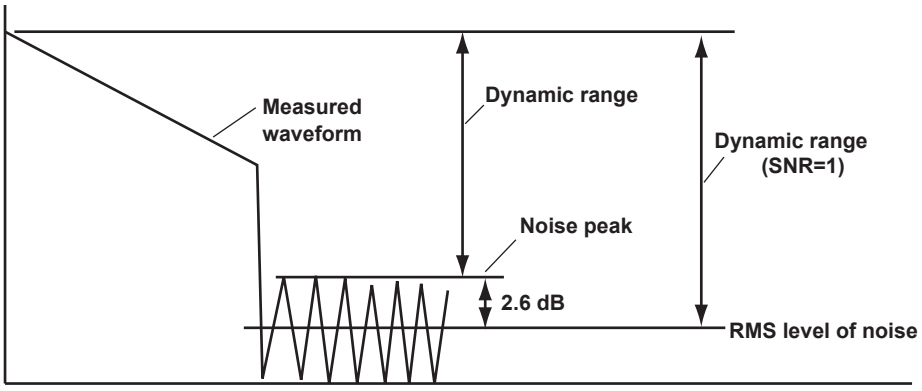
The loss that occurs at the fused points or the like of an optical fiber cable.

Connection Point

The location where the optical fiber cable is fused (including a mechanical connection) or the location where the connectors are connected with an optical adapter.

Dynamic Range

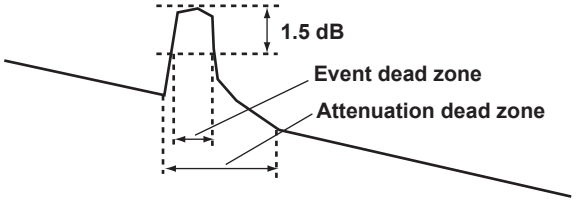
The backscattering light level that the AQ7270 can measure.



Dead Zone

A location where measurements cannot be performed due to effects such as Fresnel reflection. The following types of dead zones are available.

- **Event Dead Zone**
  A zone in which the reflection cannot be measured because a larger reflection is present. A zone defined by a pulse width whose level is 1.5 dB less than the peak value.
- **Attenuation Dead Zone**
  A zone in which the splice loss cannot be measured due to a large reflection nearby.



TPA

An abbreviation for Two Point Approximation.

Secondary Reflection

A phenomenon in which an event is detected at a location that does not actually exist when a large reflection is present in the optical fiber cable under measurement causing another reflection at the measurement reference.

2 Markers Method

A method used to calculate the loss of an optical fiber cable. It calculates the level difference between two points.

Broken Point

The location where the optical fiber cable is cut or the end of the cable.

Return Loss

The return loss (RL) is a ratio of the total optical power (Pr) that is reflected by optical parts or optical fiber cables with respect to the incident optical power (Pi) expressed in decibels. It is calculated using the following equation.

RL = –10log(Pr/Pi) [dB]

Reflection Point

A location where reflection is detected such as a location where the optical fiber cable is connected. The following two types of reflections are available.

- **Connection point**
  A reflection at the optical connector section.
- **Broken Point**
  A spacial reflection occurs due to the gap in the cable.

Pulse Width

The width of the optical pulse that the AQ7270 transmits. It is defined using a half width. The pulse width has the following characteristics.

Short pulse width: Distance can be measured with high accuracy. However, long distance cannot be measured.

Long pulse width: Long distance can be measured. However, the distance cannot be measured with high accuracy.

Fresnel Reflection

Fresnel reflection occurs at the location where the optical fiber cable is broken or a location where the group refraction index changes such as the far end of the cable (glass and air) when light enters the cable. If the end face of the optical fiber cable is vertical, approximately 3 % (–14.7 dB) of the incident light power is reflected.

Resolution

Indicates how precise the distance to the event in the optical fiber cable can be measured. The following types of resolution are available.

- **Sampling Resolution**
  Because the maximum number of sampled data points is fixed, the resolution is determined by the interval at which the measured data is sampled.
  Example: If the distance of 400 Km is measured with 50000 data points, each sampling interval is 8 m. This value is the sampling resolution.
- **Spatial Resolution**
  A resolution determined by the optical pulse width. If the optical pulse width is short, the distance the light propagates through the optical fiber cable is shortened by the pulse width time. Consequently, the spatial resolution increases.

Label

A comment that can be attached to the waveform.

Realtime Measurement

The act of measuring the optical fiber cable in advance using the small averaging count preset in the AQ7270.

Index

I

J

L

M

N

O

P

R

S

T

U

W

Y

Z