User's Manual

AQ7280
OTDR

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ7280-01EN
10th Edition

Thank you for purchasing the AQ7280 OTDR (Optical Time Domain Reflectometer).
This user's manual explains the features, operating procedures, and handling precautions of the AQ7280. To ensure correct use, please read this manual thoroughly before beginning operation. Keep this manual in a safe place for quick reference in the event that a question arises.
The AQ7280 comes with the following manuals. Please read all manuals.

List of Manuals

Manual Title	Manual No.	Description
AQ7280 OTDR User's Manual (included in CD)	IM AQ7280-01EN	This manual. The manual explains all the AQ7280 features other than the communication command features.
AQ7280 OTDR Getting Started Guide	IM AQ7280-02EN	This guide focuses on the handling precautions, basic operations, and specifications of the AQ7280.
AQ7280 OTDR Communication Interface User's Manual (included in CD)	IM AQ7280-17EN	This manual explains the feature for controlling the AQ7280 using communication commands.
Model 739883 Battery Pack Handling Precautions	IM 739883-01EN	This document explains the handling precautions of the battery pack.
AQ7280 OTDR User's Manual	IM AQ7280-92Z1	A document for China.
Safety Instruction Manual	IM 00C01C01-01Z1	Safety manual (European languages)

The "EN" and "Z1" in the manual numbers are the language codes.

Contact information of Yokogawa offices worldwide is provided on the following sheet.

Document No.	Description
PIM 113-01Z2	List of worldwide contacts

Notes

- The contents of this manual are subject to change without prior notice as a result of improvements to the instrument's performance and functionality. Refer to our website to view our latest manuals.
- 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.
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Revisions

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Conventions Used in This Manual

Notes

The notes and cautions in this manual are categorized using the following symbols.

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 user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the user's 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 attention to actions or conditions that could cause light injury to the user or cause damage to the instrument or user’s data, and precautions that can be taken to prevent such occurrences.

French

AVERTISSEMENT Attire l’attention sur des gestes ou des conditions susceptibles de provoquer des blessures graves (voire mortelles), et sur les précautions de sécurité pouvant prévenir de tels accidents.

ATTENTION Attire l’attention sur des gestes ou des conditions susceptibles de provoquer des blessures légères ou d’endommager l’instrument ou les données de l’utilisateur, et sur les précautions de sécurité susceptibles de prévenir de tels accidents.

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

Symbols and Conventions Used in Procedural Explanations

The contents of the procedural explanations are indicated using the following symbols.

Procedure Carry out the procedure according to the step numbers. All procedures are written under the assumption that you are starting operation at the beginning of the procedure, so you may not need to carry out all the steps in a procedure when you are changing the settings.

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

Character Notations

Panel Key Names and Soft Key Names in Bold Characters	
Indicate panel keys that are used in the procedure and soft keys and menu items that appear on the screen.	

Unit

k	Denotes 1000. Example: 400 km
K	Denotes 1024. Example: 400KB (file size)

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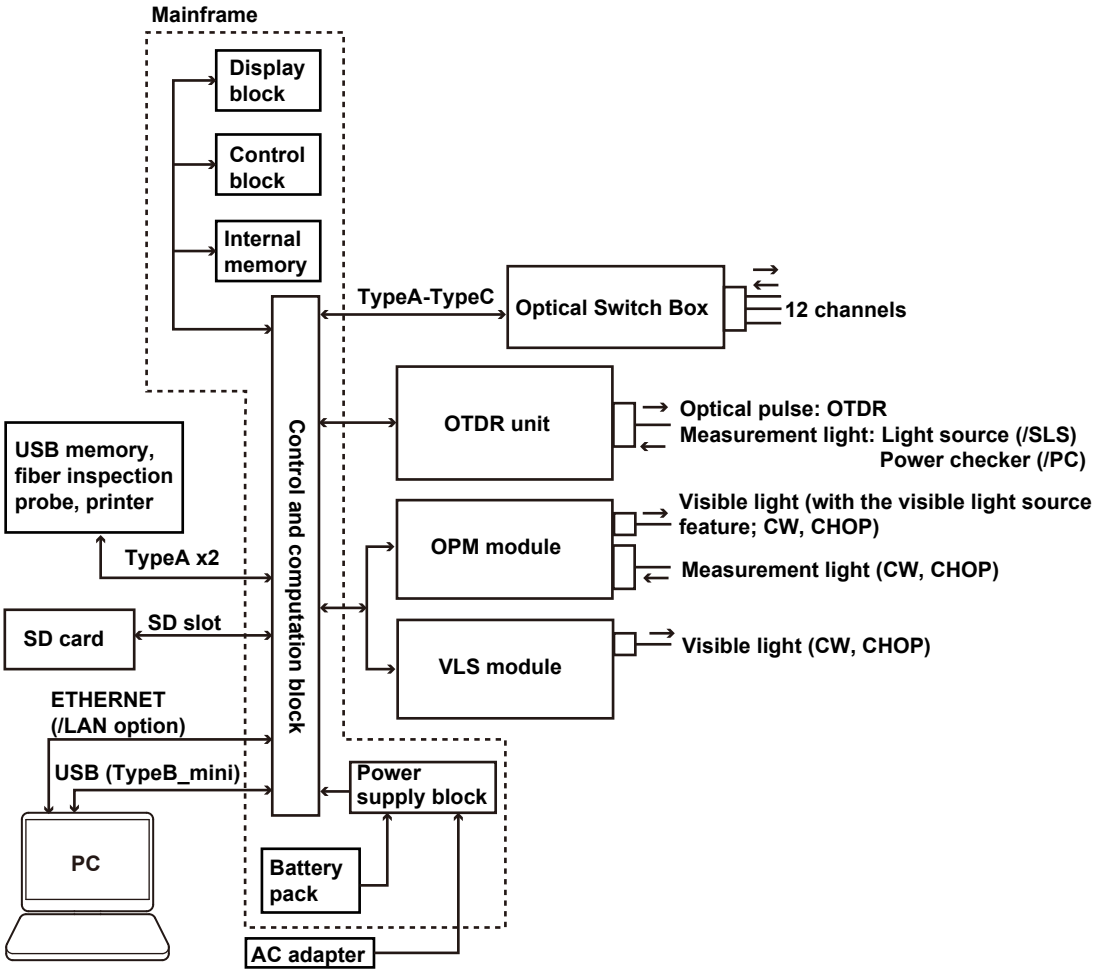
1.1 Overview

System Configuration

The AQ7280 consists of a mainframe and OTDR unit. If necessary, an OPM module can be installed into the mainframe to measure loss in optical fiber cables and view the power of communication light. An VLS module can be installed to visually check the fault location.



Mainframe

The AQ7280 OTDR mainframe. In combination with an OTDR unit, the mainframe can test for breaks, connections, losses, and the like. In addition, by installing an option module, you can use the mainframe as an optical power meter or visible light source.

The main processes performed on the mainframe are as follows:

- Key and touch panel operations
- Set measurement conditions
- 8.4 inch large LCD
- Multi touch support
- Battery driven
- System that enables both units and modules to be controlled
- Remote control through external interfaces (USB, Ethernet (/LAN option))

The mainframe runs on an AC adapter (sold separately) or internal battery. The AC adapter (sold separately) is required to charge the internal battery.

OTDR Unit

Install the OTDR unit into the mainframe to use the AQ7280 as an OTDR. There are several types of OTDR units available for different wavelengths, dynamic ranges, and the like. You can choose the one that suits your application.
Based on user input through the mainframe, the light emitter (LD; laser diode) is driven, and the generated optical pulse is emitted from the OTDR port into the optical fiber cable under measurement.
The backscatter and reflected light that occur in the optical fiber cable under measurement returns to the OTDR port. The returned measurement light is received by the light detector (APD: Avalanche photodiode), read as a digital signal by the A/D section, subjected to averaging and other waveform processing, and output to the mainframe where the OTDR waveform is displayed.

With the light source option (/SLS), based on user input through the mainframe, the light emitter (LD; laser diode) is driven, and CW or CHOP measurement light is emitted.

With the optical power checker option (/PC), the communication light (fiber in use) present in the optical fiber cable under measurement is detected at the OTDR port, and its power level is measured.

OPM Module

Install the OPM module into the mainframe to use the AQ7280 as an optical power meter (OPM). The measurement light applied to the optical port is received by the light detector (PD: photodiode), read as a digital signal by the A/D section, and output as measured values to the mainframe where they are displayed.

Modules with the visible light source function (AQ2780V, AQ2781V) can emit visible light like the VLS module. The wavelength of the visible light source is 650 nm.

VLS Module

The VLS (visible light source) module is designed to test for breaks, connections, losses, and the like in optical fiber networks. It can be used as a visible light source by installing it as an option to the AQ7280 OTDR mainframe. The wavelength of the visible light source is 650 nm.

Optical Switch

When connected to the mainframe, this switch can be used to change the route of the measurement light. You can control the switch from the mainframe's control panel or remotely from a PC connected to the mainframe.

OTDR Features

OTDR stands for optical time domain reflectometer. The AQ7280 displays waveforms that you can use to detect fault locations in optical fiber cables and monitor fault conditions (transmission loss, splice loss, etc.). It is mainly used in the following optical fiber cable installation and maintenance situations.

- Access network connecting telecom carriers and subscribers, including service providers (SM[1] optical fiber cable)
- Core network between telecom carriers (multi-core SM optical fiber cable)
- Local area network in buildings (MM[2] optical fiber cable)

1 SM: Single mode

2 MM: Multi mode

Optical Pulse Measurement

- **Averaged Measurement**
  A measurement in which measurements are taken several times and the measured values are averaged to display the result.
- **Icon Display of Results after Averaged Measurement (/SMP option)**
  After averaged measurement is performed, the OTDR waveform is automatically analyzed, and the results are displayed using icons for each event type. To use this feature, start OTDR Smart Mapper from the top menu.
- **Display of the Distances to Breaks after Averaged Measurement**
  After averaged measurement is performed, the OTDR waveform is automatically analyzed, breaks (faults) are detected, and the distances to the breaks are displayed. To use this feature, start Fault Locator from the top menu.
- **Real-time Measurement**
  While optical pulse measurement is in progress, measured values are updated and displayed in real time.
- **Multi-core Optical Fiber Cable Measurement**
  Multi-core fiber measurement takes time and effort. This feature makes it possible to efficiently measure multi-core optical fiber cables through a dedicated menu. To use several measurement functions such as power meter and connector end face testing in addition to OTDR (optical pulse measurement), start Multi Fiber Project from the top menu.
- **Optical Fiber Cable Monitoring (/MNT option)**
  This feature performs optical pulse measurement at regular intervals so that you can monitor for errors in the optical fiber cable. To use this feature, start Schedule Measurement from the top menu.

Optical Pulse Waveform Display

This feature zooms in and out of displayed waveforms and moves waveforms.

Optical Pulse Analysis

- **Waveform Analysis**
  The following events can be analyzed using cursors and markers.
  - Distance
  - Splice loss
  - Return loss or reflection level*

    * Reflection level can be displayed only when the language is set to Japanese in the system settings.

  Analysis is performed over the entire waveform or a section of the waveform using the following features.
  - Multi trace analysis
    Up to four waveforms can be displayed simultaneously for comparison.
  - 2 way trace analysis
    The waveform measured from one end of the optical fiber cable and that measured from the other end are combined to verify events that could not be detected because of dead zones.
  - Differential trace
    The difference between two waveforms is displayed to analyze the differences between event values.
  - Section analysis
    Return loss between markers can be analyzed.
- **Event Analysis**
  Events are automatically detected. In addition, you can edit events and event lists. Adjustments can be made when certain events cannot be detected or when noise is detected as events.

Light Source Feature

Stabilized Light Source (/SLS option)

This is used as a light source for measuring optical loss or as a light source for optical fiber identification. The measurement light (CW, CHOP) is emitted from the OTDR port of the OTDR unit.* The wavelength of the measurement light is the same as that of the optical pulse of the relevant OTDR unit.

* AQ7282M is supported on firmware version 2.01 and later.

Visible Light Source (VLS module, OPM module with a VLS function)

This is used to view the fault locations or check the cores of multi-core optical fiber cables. A 650 nm visible light (CW, CHOP (2 Hz)) is emitted from the optical output port of the VLS module or that of the OPM module with a visible light source.

Optical Power Meter Feature

Optical Power Meter (OPM module)

This is used as an optical power meter for measuring optical loss or for measuring the power of communication light. It measures the power of the light entering the optical input port of the OPM module. By logging and graphing the fluctuation in the optical power value, you can view the fluctuation in the optical power and loss.

Power Checker (/PC option)

The OTDR port* of the OTDR unit (except AQ7282M) is equipped with an optical power checker feature (/PC option) that enables you to check the presence of communication light (fiber in use) within the optical fiber cable under measurement and view its power value.

* Not applicable to the port 2 of AQ7283E and AQ7283F.

Optical Switch Feature

Optical Switch Box Connection (Type A)

You can use this feature to change the route of the measurement light during optical pulse measurement. Selecting a test target switch number from the menu on the optical pulse measurement screen causes the route of the measurement light (optical fiber cable under test) to change. During multi-fiber measurement, selecting a route of the measurement light (core under test) causes the target switch number on the optical switch box to change automatically.
During schedule measurement, several measurement light routes can be monitored periodically by automatically switching the route on a regular basis.
Further, by combining the light source feature and optical power meter feature, you can observe the fluctuations in the optical power and loss by switching between multiple measurement light routes (optical fiber cables under test).

USB Feature

USB Storage Medium Connection (Type A)

USB storage media complying with USB1.0/1.1/2.0 can be used. Up to two media can be connected. You can save waveform data and measurement conditions to them.

Fiber Inspection Probe Connection (Type A)

A fiber inspection probe specified by Yokogawa can be used to view stains on the optical fiber cable end face on the AQ7280 screen. To use this feature, start Fiber Inspection Probe from the top menu. The fiber inspection probe is not included with the AQ7280. Please purchase your own fiber inspection probe. For information about compatible fiber inspection probes, contact your nearest YOKOGAWA dealer.

PC Connection (Type B mini)

You can connect a PC to the AQ7280 and control it using communication commands. For details, see the communication interface user's manual, IM AQ7280-17EN.

ETHERNET Feature (/LAN option)

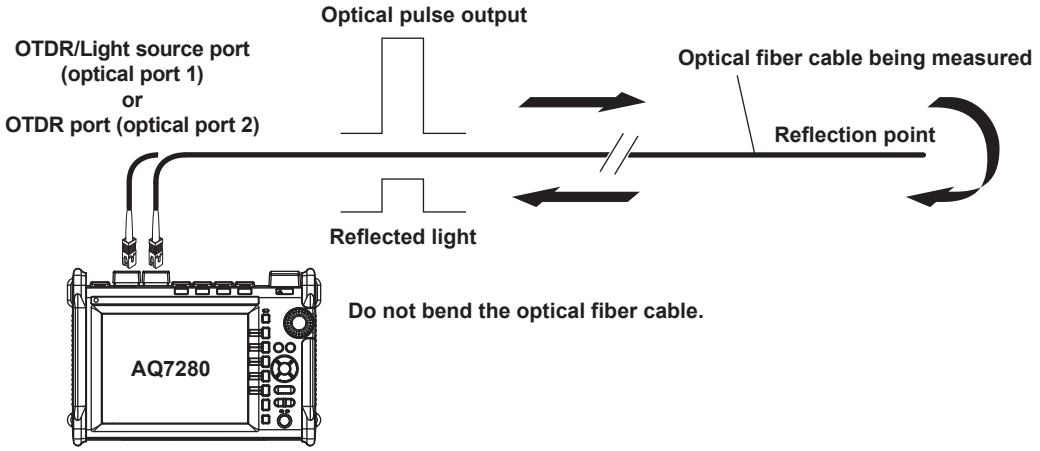
You can connect a PC to the AQ7280 and control it using communication commands. For details, see the communication interface user's manual, IM AQ7280-17EN.

SD Card

You can use SD cards. Only one SD card can be inserted at any given time. You can save waveform data and measurement conditions to them. SD cards are not included with the AQ7280. Please use your own SD cards. For information about compatible SD cards, contact your nearest YOKOGAWA dealer.

1.2 Optical Pulse Measurement

The AQ7280 applies an incident optical pulse to the connected optical fiber cable and measures the power level of the reflected light from the different sections of the optical fiber cable such as its connections, bent sections, and the open end of the fiber. The AQ7280 uses the measured power level to determine the distance to the different points (splices, breaks, etc.) of the optical fiber cable and the loss and other phenomena that occur at those points. For details on how to view optical pulse waveforms, see section 1.3.



Measurement Mode

Simple Mode

In optical pulse measurement, there are measurement conditions related to measurement resolution—such distance range and pulse width—and analysis conditions related to the optical fiber cable—such as index of refraction and backscatter. These conditions must be set according to the item being measured or analyzed. The AQ7280 can perform an optical pulse measurement immediately before the actual measurement, calculate the distance, splice loss, and the like beforehand, determine the suitable range from these values, and perform the actual measurement.

Detail Mode

If the distance to the measurement target or the optical fiber cable characteristics are known or if you want to measure or analyze a specific event in detail, you can set the values individually as necessary. If you set the measurement conditions—such as the distance range and pulse width—to Auto, the AQ7280 will determine the suitable range and perform the measurement like in Simple Mode, described above.

PON Mode

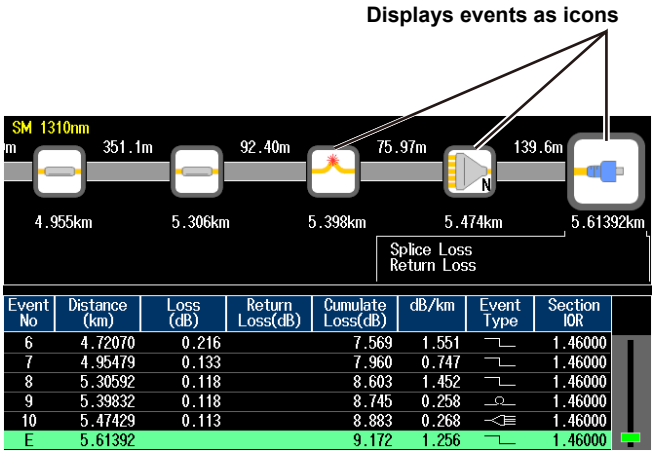
If the optical fiber cables to be measured are connected to a PON (passive optical network) system, optical splitters that divide the optical fiber cables into the PON system is installed. The measurement and analysis conditions will vary depending on the installation conditions of the optical splitters. In PON mode, the AQ7280 determines the suitable measurement and analysis conditions based on the number of optical splitter stages, route information, and distance range to set the optimal values. These values can be changed if necessary.

Averaged Measurement

Averaged measurement is effective when you want to detect reflections, splice loss, and other faint events that are generated from connections or splice points but are buried in noise. The AQ7280 derives the measured data by averaging the specified number of optical pulse measurements or by averaging optical pulse measurements over the specified duration. During averaged measurement, you cannot change the measurement conditions. You can stop an averaged measurement before it completes.

Icon Display of Results after Averaged Measurement (/SMP option)

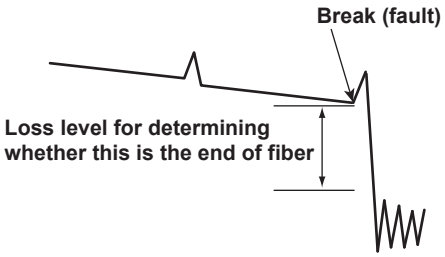
The AQ7280 can perform an averaged measurement and then automatically display the measured result events as icons on the screen. Detailed event analysis results are displayed along with the displayed icons. In addition, if pass/fail judgment specified, icons are displayed in different colors depending on the results.



Event No	Distance (km)	Loss (dB)	Return Loss(dB)	Cumulate Loss(dB)	dB/km	Event Type	Section IOR
6	4.72070	0.216		7.569	1.551		1.46000
7	4.95479	0.133		7.960	0.747		1.46000
8	5.30592	0.118		8.603	1.452		1.46000
9	5.39832	0.118		8.745	0.258		1.46000
10	5.47429	0.113		8.883	0.268		1.46000
E	5.61392			9.172	1.256		1.46000

Display of the Distances to Breaks after Averaged Measurement

The AQ7280 can perform an averaged measurement and then automatically search for breaks (faults) in the optical fiber cable or optical line and display the distances to the breaks on the screen. If there are no faults in the middle of the optical fiber cable, the end of the cable is detected as a fault. You can specify the search wavelength or the loss level that is used to determine the end of the optical fiber cable. You can also zoom the display scale of the measured waveform and move the display position.



Real-time Measurement

Real-time measurement is a feature that measures optical pulses while updating and displaying the measured values. You can monitor in real time events, such as splice loss and return loss, while installing optical fiber cables. You can also view the changes in the waveform as you change the measurement conditions,* such as the wavelength, distance range, and pulse width.

* The measurement conditions that you can change vary depending on the measurement mode. For details on the measurement conditions, see the procedural explanations in chapter 3.

Optical Pulse Measurement of Multi-core Optical Fiber Cables

Multi-core fiber measurement takes time and effort. This feature makes it possible to efficiently measure multi-core optical fiber cables through a dedicated menu.

Projects

Items required to make multi-core optical fiber cable measurements such as measurement conditions, analysis conditions, and core information are managed as projects.
By creating a project before a measurement, you can measure cores under the same conditions.
You can save projects to files. You can load a previously saved project and make measurements under the same conditions.

List

Cores are listed. You can easily distinguish between cores that have been measured, cores that have not been measured, and cores that do not to be measured. This list prevents you from forgetting measurements and from making unnecessary measurements. (You can make measurements efficiently.)

Saving Measured Results

Measurement results of each core are automatically saved to a folder that is automatically created in the folder that the project file is saved in. The folder will have the same name as the project file.

Optical Fiber Cable Monitoring (/MNT option)

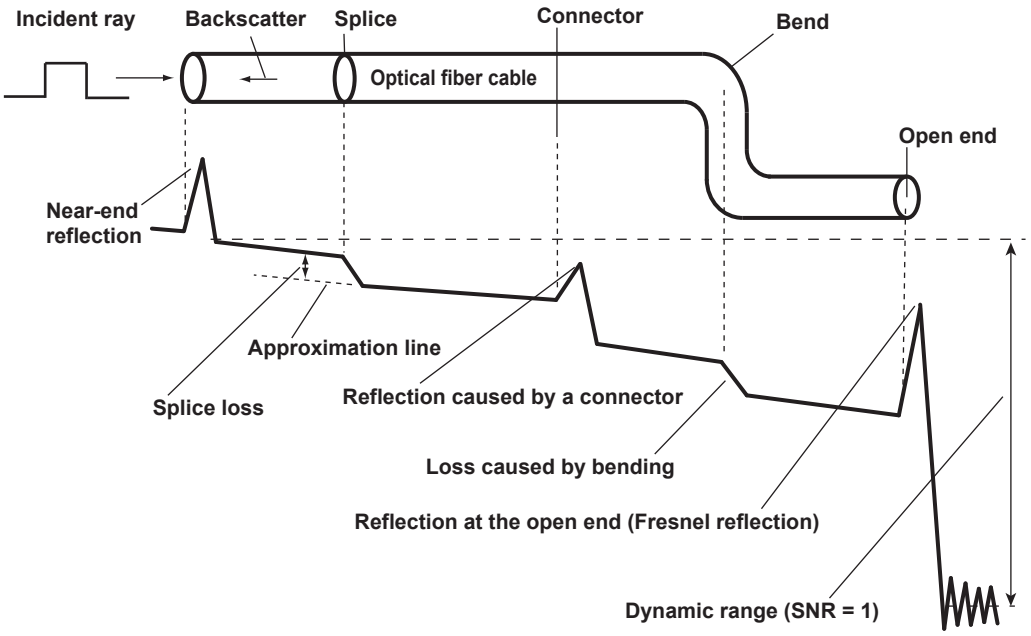
This feature performs optical pulse measurement at regular intervals so that you can monitor for errors in the optical fiber cable. Results measured at regular intervals are saved to memory in CSV or SOR format (waveform data). Data and folders saved in memory are automatically assigned names with timestamps. During monitoring (while schedule measurement is in progress), measurement items, such as the loss between two points, of the logged optical pulses are shown on the AQ7280 screen. Because the changes in the measurement items, such as the loss between two points, can be seen on the time axis, if an interruption occurs in the optical pulse input, you can determine when the optical power level fell on the AQ7280 screen. After determining the time, you can view the measured results in the file with the corresponding timestamp. Up to four measurement items can be monitored.

1.3 Optical Pulse Waveform Display

You can display the measured result as a waveform on the screen. You can zoom the displayed waveform and move the position that is displayed.

How to View Optical Pulse Waveforms

The optical pulse applied to the optical fiber cable is reflected at different points of the optical fiber such as its connections, bent sections, and the open end of the fiber. These sections generate loss. The measured result is displayed as a waveform that has distance represented in the horizontal direction and loss level represented in the vertical direction. On the waveform, detected losses or reflections are known as events.

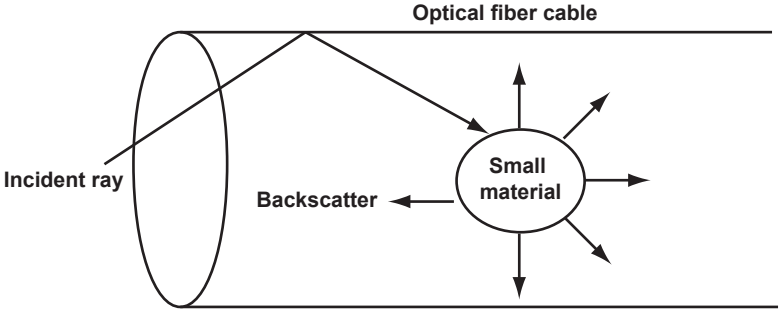


Near-end Reflection

This is the reflection that occurs at the point where the AQ7280 and the optical fiber cable are connected. This also includes the AQ7280's internal reflection. In the section where this near-end reflection is detected, even if there are other connections, the loss and reflections that occur at these points cannot be detected. This section is the near-end dead zone.
When you are measuring a short distance, connect a launch fiber cable to reduce the effect of the near-end reflection.

Backscatter

When light travels through an optical fiber cable, Rayleigh scattering caused by changes in the density of materials that are smaller than the light's wavelength and inconsistencies in the fiber's composition generates loss in the optical fiber itself. The portion of the scattered light that travels in the direction opposite to the direction of propagation is known as backscatter.

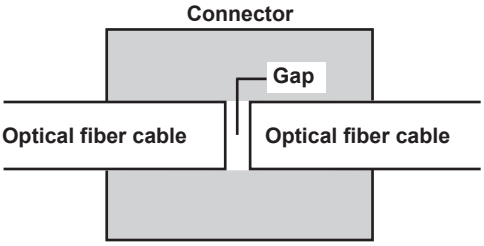


Splice Loss

Because spliced sections of optical fiber cables have a great number of changes in the material's density and inconsistencies in the cable's composition, loss due to Rayleigh scattering becomes large, and splice loss occurs in these sections.

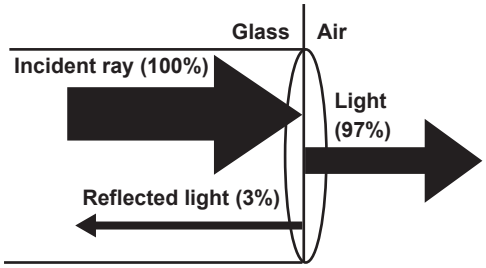
Reflection at the Connection Point of Connectors

Using a connector to connect two optical fibers is different from splicing them together in that a small gap remains between the two fibers. Because this gap has a different index of refraction, reflection occurs.



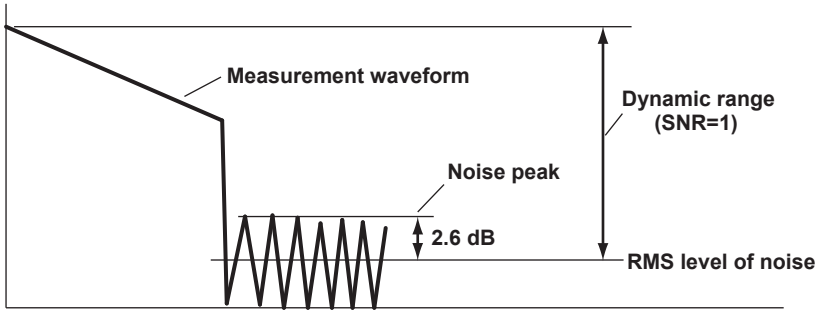
Fresnel Reflection at the Open End of the Fiber

This is the reflection that occurs at locations where the index of refraction changes (glass to air) such as where there are tears in the optical fiber cable or at the end of it. When the optical fiber cable end face is vertical, approximately 3% of the incident optical power (–14.7 dB) is reflected.



Dynamic Range

Dynamic range refers to the range of optical power levels that can be measured. The larger the dynamic range, the greater the distance that optical pulses can be measured over.



Zooming the Waveform Display Scale

You can zoom the displayed waveform in the direction of the optical power level (vertically) or in the direction of the distance (horizontally). A rectangular frame that shows the zoom position is displayed on the overview screen that appears in the bottom right of the screen.

Moving the Waveform Display Position

You can move the displayed waveform in the direction of the optical power level (vertically) or in the direction of the distance (horizontally). A rectangular frame that shows the display position is displayed on the overview screen that appears in the bottom right of the screen. This is the same rectangular frame that shows the zoom position.

1.4 Optical Pulse Analysis

Waveform Analysis

You can use cursors and markers to measure values such as the distance, splice loss, and return loss between two points.

Measuring Distance

The AQ 7280 measures the time that it takes for an incident optical pulse to be reflected and return to the device. It uses this information and the following equation to calculate the distance (L).

L=C×T/(2N) [m]

C: The speed of light in a vacuum 2.99792×10^8 [m/s]

T: The time measured from when the incident optical pulse was generated to when the reflected light was received [s]

N: Index of refraction

In the above equation, the division by two accounts for the fact that the measured time represents the total time taken by the optical pulse to reach the reflection point and to return from it.

If the correct index of refraction is not specified, there will be errors in the distance measurement.

Setting the Index of Refraction

The AQ7280 has preset indices of refraction that correspond to each wavelength. For details on the settings, see section 2.1. Contact the optical fiber manufacturer for the optical fiber cable's correct index of refraction.

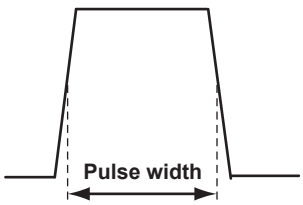
Distance Range

You must select a distance range that is longer than the cable length of the optical fiber cable that you want to measure. As the distance becomes greater, the measurement time also increases. For details on the setting range, see section 2.1.

Pulse Width

The following features are available depending on the length of the pulse width. The pulse width that you can select varies depending on the distance range that you have specified. For details on the settings, see section 2.1.

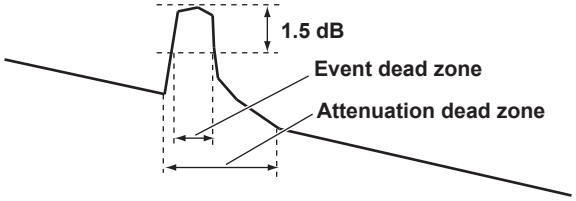
- **Short Pulse Width**
  You can separate and measure adjacent events (reflection points and losses). However, you cannot measure long distances.
- **Long Pulse Width**
  You can measure long distances. However, multiple adjacent events may be seen as one single event.



Dead Zone

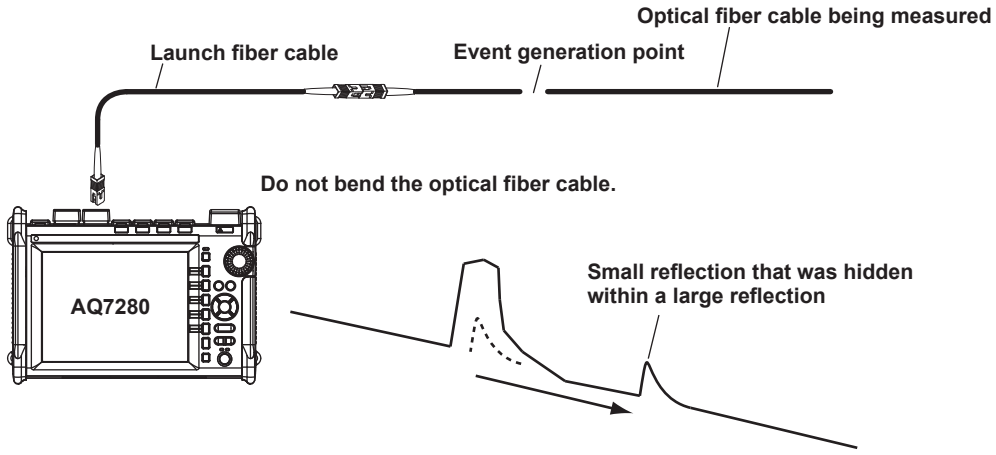
An area where the influence of a large event such as a connector's connection point makes it impossible to recognize other events that exist in that area is a dead zone. There are the following types of dead zones.

- **Event Dead Zone**
  An area where adjacent reflections cannot be separated. This is the area represented by the pulse width between the two points on the waveform at the level that is 1.5 dB below the peak value.
- **Attenuation Dead Zone**
  An area where, because there is a large reflection, the surrounding splice losses cannot be measured.



Near-end Dead Zone Prevention

In sections where near-end reflection is detected, loss and reflections that occur at connections cannot be detected. If you are measuring a short distance, connect a launch fiber cable to move events that are hidden in the near-end reflection the distance of the launch fiber cable.

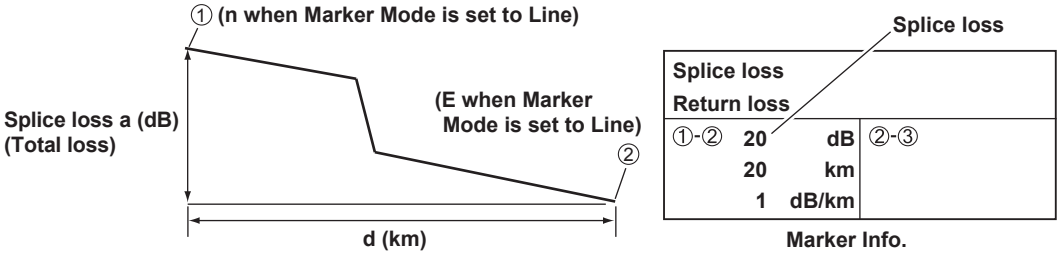


Splice Loss

The AQ7280 measures the distance and the loss between the specified points.

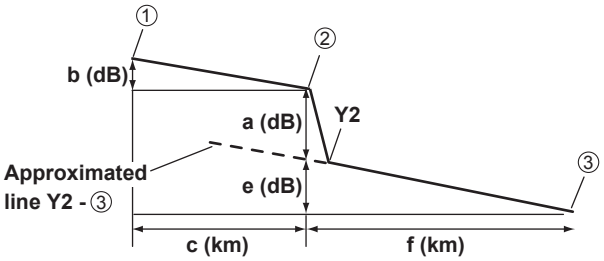
2-point Method

The AQ7280 measures the distance and the loss between two points. If reflection is detected between the two points, the return loss is also measured. The splice loss value changes depending on the approximation method that you have specified. This can be used when Marker Mode is set to Marker or Line.



4-point Method

The AQ7280 uses the following four points to perform the measurement: the measurement start point ①, the splice loss start point ②, the splice loss end point Y2, and the measurement end point ③. At position ②, the level difference between the approximated line ②–① and the approximated line Y2–③ is calculated as the splice loss. The splice loss changes greatly depending on the position of ②. Set the correct position for ②. The splice loss value changes depending on the approximation method that you have specified. This can only be used when Marker Mode is set to Marker.

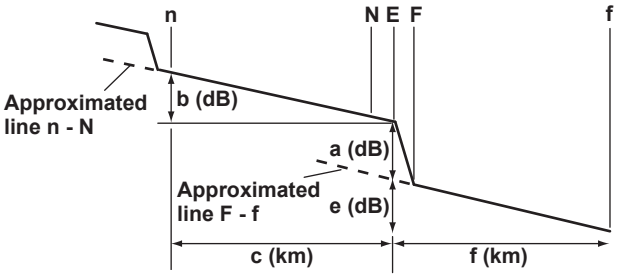


Splice loss		a	dB			
Return loss						
①-②	b		dB	②-③	e	dB
	c		km		f	km
	b/c		dB/km		e/f	dB/km

Marker Info.

5-point Method

The AQ7280 uses the following five points to perform the measurement: the near-end point (n), a point (N) that is used to calculate the near-end side's approximated line, a point (E) where splice loss is detected, a point (F) that is used to calculate the far-end side's approximated line, and the far-end point (f). At position E, the level difference between the approximated line n–N and the approximated line F–f is calculated as the splice loss. The splice loss changes greatly depending on the position of E. Set the correct position for E. The splice loss value changes depending on the approximation method that you have specified. This can only be used when Marker Mode is set to Line.

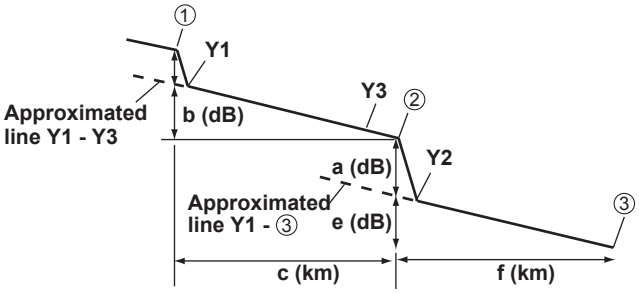


Splice loss		a	dB			
Return loss						
n-E	b		dB	E-f	e	dB
	c		km		f	km
	b/c		dB/km		e/f	dB/km

Marker Info.

6-point Method

The AQ7280 measures using the 6-point method when there are two adjacent splice loss events. The AQ7280 uses the following six points to perform the measurement: the first splice loss start point ①, start point Y1 used to calculate the approximated line, end point Y3 used to calculate the approximated line, the second splice loss start point ②, the second splice loss end point Y2, and the measurement end point ③. At the position of marker ②, the level difference between the approximated line Y1–Y3 and the approximated line Y2–③ is calculated as the splice loss.



Splice loss		a	dB			
Return loss						
①-②	b		dB	②-③	e	dB
	c		km		f	km
	b/c		dB/km		e/f	dB/km

Marker Info.

Return Loss or Reflection Level

Return loss RL is the ratio, in dB, of the reflected optical power level Pr to the incident optical power level Pi. It is calculated using the following equation. The larger the return loss, the smaller the reflected optical power. This implies that the performance of the measured optical line is good.

RL = –10log(Pr/Pi) [dB]

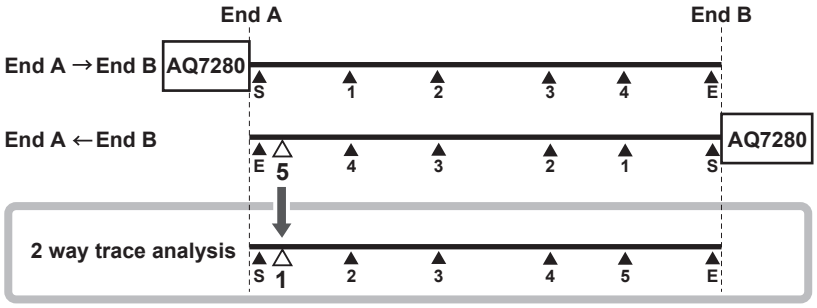
Reflection level is the reflected optical power level expressed in decibels. This can be displayed only when the language is set to Japanese in the system settings.

Multi Trace Analysis

You can load up to four waveforms that have been measured on the AQ7280 and display them simultaneously for comparison. You can adjust the vertical display position of each loaded waveform.

2 Way Trace Analysis

Waveform events that have been measured from optical fiber cable end A to end B and those measured from end B to end A can be combined. This combination enables displaying of events that could not otherwise be measured because of dead zones.
In the figure below, the event that is in the near-end dead zone (point S) when measured from end A is detected as event number 5 when measured from end B. In the 2 way trace analysis display, it is displayed as event number 1.



An event of the other waveform that exists within 6% of the position of an event of the current trace will be considered part of the current trace event.
If multiple events of the other waveform that exists within 6% of the position of an event of the current trace, the closest event will be considered part of the current trace event.
Waveforms that meet the following conditions can be combined.

- Both have the same wavelength.
- Both have the same pulse width.
- Their end position offset is within 6%.
- Both have event lists.

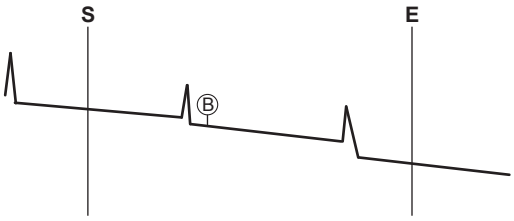
Differential Trace

You can load two waveforms that have been measured on the AQ7280 and display their difference as a waveform.
The screen can display the loaded waveforms and the differential trace simultaneously.
The differential trace is the result of subtracting the values of the current trace from those of the other trace.
You can use markers to read the following values of the differential trace.

- Loss between markers (dB)
- Distance between markers (km)
- Loss per unit distance between markers (dB/km)
- Distance to each marker

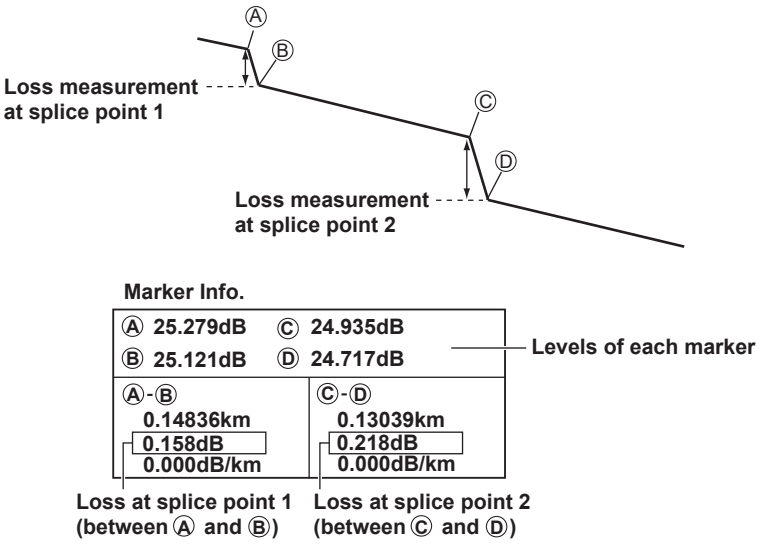
Section Analysis

You can set two markers, start point S and end point E, to measure the return loss and total loss in the section that you have specified. By setting reference point B, you can calculate the return loss using the backscatter level you specify.



Splice Loss at Two Locations (4 Point Monitor)

Splice losses at two locations can be measured simultaneously using four markers.

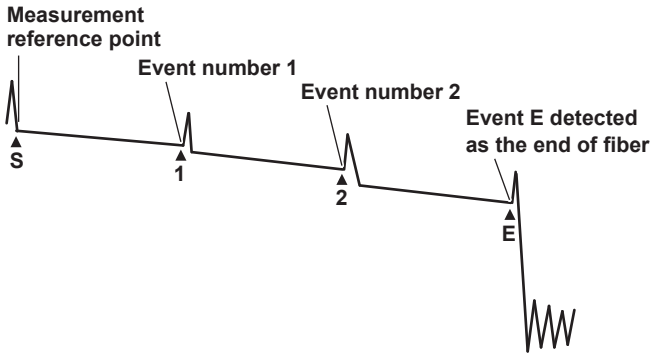


Event Analysis

You can search for events in the optical pulse measurement waveform and measure the splice loss and the return loss.

Editing Events

You can insert and delete events on the event screen. When you edit an event marker, the splice loss and the return loss can be recalculated.



Editing Event Lists

You can set indices of refraction for each event period on the event list. Setting the indices of refraction in accordance with the connected optical fiber cable makes accurate distance measurements possible. These indices only affect event analysis. The do not affect the waveform display.
You can also change event distances. However, the events shown on the screen will not change.

1.5 Light Source and Optical Power Meter

Loss-Measurement Light Source

The loss-measurement light source feature can be applied to models with the /SLS option of the OTDR unit. The following measurement light wavelengths can be generated.

Model	Measurement Light Wavelength
AQ7282A	1310 nm, 1550 nm
AQ7283A	
AQ7284A	
AQ7285A	
AQ7283E	1310 nm, 1550 nm, 1625 nm
AQ7283F	1310 nm, 1550 nm, 1650 nm

Model	Measurement Light Wavelength
AQ7282G	1310 nm, 1490 nm, 1550 nm
AQ7283H	1310 nm, 1550 nm, 1625 nm
AQ7284H	
AQ7283J*	1310 nm, 1550 nm, 1625 nm
AQ7283K	1310 nm, 1490 nm, 1550 nm, 1625 nm
AQ7282M	850 nm, 1330 nm

* Not applicable for 1383 nm for AQ7283J.

You can produce continuous light or light that has been modulated at the selected frequency (modulation mode).

Visible Light Source

The visible light source feature can be applied to models on which the OPM module with a visible light source or the VLS module was installed.

Visible light can be used for the following purposes.

- Determine visually breaks in the optical fiber cable under test
- Check the cores of multi-core optical fiber cables

Model	Measurement Light Wavelength
AQ2780V	650 nm
AQ2781V	
AQ4780	

Optical Power Meter

The optical power meter feature can be applied to models on which the OPM module was installed. OPM modules are used as optical power meters for measuring loss and the power of the communication light. The following measurement lights can be measured.

Model	Measurement Wavelength
AQ2780	800 nm to 1700 nm (in 1 nm steps)
AQ2780V	
AQ2781	
AQ2781V	

Logging

The logging feature can be applied to models on which the OPM module was installed. This feature measures short-term optical power stability. The optical power value during logging can be displayed on a graph, and you can calculate the maximum, minimum, and average. In addition, you can use cursors to calculate the optical power at a specified location or the maximum, minimum, and average within a specified area. The logging results can be saved to memory in CSV format.

Power Checker (/PC option)

The /PC option of OTDR units is used as a power checker.

The following measurement lights can be measured.

Model	Measurement Wavelength
AQ7282A	1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm
AQ7283A	
AQ7284A	
AQ7285A	
AQ7283E*	
AQ7283F*	

Model	Measurement Wavelength
AQ7282G	1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm
AQ7283H	
AQ7284H	
AQ7283J	
AQ7283K	

* Not applicable to the port 2 of AQ7283E and AQ7283F.

1.6 Optical Switch Control

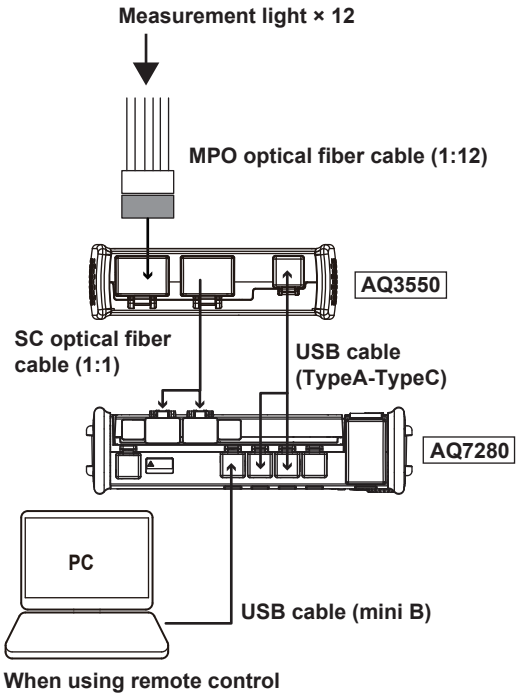
Optical Switch Box

You will need an optical switch box that is compatible with this instrument's optical switch control.

Name	Model	Notes
Optical switch box	AQ3550	Port configuration: 1 × 12

Instrument Connection

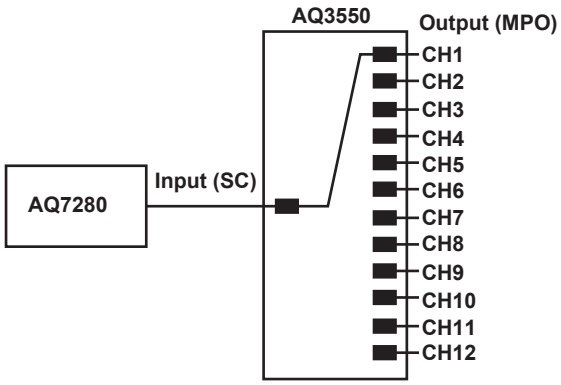
The following figure shows how this instrument (AQ7280) and an optical switch box (AQ3550) can be connected.



When using remote control

Optical Switch Structure

The input port (SC) route can be connected to any of the 12 output port (MPO) channels through switching.



1.7 File Operation and Printing

File Operation

Measured results (waveform data, screen images, etc.), measurement and analysis conditions, system settings, and the like can be saved as files to internal memory or external memory (USB memory and SD card). You can efficiently configure multiple AQ7280s to the same conditions by loading a file containing measurement and analysis conditions, system settings, and the like. In addition, the AQ7280 can save measured waveform data as PDF data in report format.

Saving and Loading Files

The following types of files can be saved.

- **.SOR**
  A file for saving optical pulse measurement results. Measurement and analysis conditions, waveform data, event list data (when event analysis is executed) are stored in this file. When an SOR file is loaded, the measurement and analysis data is loaded into the AQ7280, the waveform data is displayed on the AQ7280 screen. If event list data is stored in the file, the event analysis results are also displayed. This file is useful when you want to save an SOR file at a site where optical fiber cables are being installed and load the file into another AQ7280 at a different site.
- **.SET**
  A file for saving the optical pulse measurement and analysis conditions. This file does not include waveform data or event list data. Loading this file into the AQ7280 causes the saved measurement and analysis conditions to be applied to it. This file is useful when you want to set several AQ7280s to the same measurement and analysis conditions.
- **.BMP, .JPG**
  A file for saving a screen image of the AQ7280. This file is useful when you want to view the screen content on the PC screen. BMP and JPG files cannot be loaded into the AQ7280.
- **.CFG**
  A file for saving the AQ7280 system settings (device, connection, etc.). This file is useful when you want to apply the same system settings to several AQ7280s.
- **.CSV**
  A file for saving the results of optical pulse measurement or optical power meter measurement in ASCII format.
  Measurement and analysis conditions are stored at the front of the file, and then data is stored in a comma-separated format.
  This file is useful when you want to analyze the data using a spreadsheet application on the PC.
- **.PDF**
  A file for saving the current waveform displayed on the AQ7280 screen or waveform data of an already saved file in a PDF report format.

The following types of files can be loaded depending on the feature that you are using.

- Top screen (.CFG)
- OTDR feature (.SOR, .SET)
- Optical power meter feature (.CSV)
- Schedule measurement feature (.CSV)
- Multi-core fiber measurement feature (.MPJ)
- OTDR Smart Mapper (.SMP)

SOR files saved with the AQ7275 series or AQ1200 series can also be loaded.

Copying and Deleting Files

You can copy or delete all the files and folders in the internal memory or external memory. You can also copy or delete selected files or folders.

Renaming Files

You can rename existing files and folders.

Creating Folders

You can create a folder with a name of your choice in which optical pulse measurement results are saved automatically. You can automatically save measured results to the specified folder by setting the destination folder mode to UserDefine and selecting a folder that you created in the measurement condition settings in section 2.1.

Creating Reports

You can save the current optical pulse measurement and analysis conditions, waveforms, and events as a report on a single sheet in a PDF file. You can choose which items to include in the report.

File Reporting

You can specify several saved SOR files and save the content of the files one at a time as a report on a single sheet in a PDF file. You can choose which items to include in the report.

Selecting Drives

You can set the save destination to the following internal and external memories.

- **Internal Memory**
  The memory inside the AQ7280. The size is 480 MB. It cannot be removed.
- **SD Card**
  SD cards are not included with the AQ7280. Please use your own SD cards.
- **USB Memory 1, USB Memory 2**
  USB storage media. Up to two media can be connected.

Printing

You can print the screen image of measured results to a printer.
The following printers can be used.

- Seiko Instruments printers (thermosensitive, black and white printing)
- HP printers (color/black and white printing)
- Epson printers (color/black and white printing)

Printing

Screen images of waveform data and analysis condition screen can be printed. In addition, the time of measurement and event list can be added to screen images (when a Seiko Instruments printer is connected). Note file list screens cannot be printed.

File Printing

You can specify several saved SOR files and print screen images one at a time.

1.8 System Features

Power-Save Mode

To suppress battery consumption, you can set the screen brightness and a screen saver. You can set different screen brightness levels for battery operation and AC adapter operation.

LCD Brightness

You can select from four brightness levels (including OFF). You can choose the appropriate level depending on the ambient light during outdoor use. In addition, when using the optical fiber cable monitoring (/MNT option) feature, the optical power meter's logging feature, or the like, you can turn off the display except when viewing the measured data to suppress battery consumption.

Auto Power Off

When battery operated, the AQ7280 can be automatically shut down if no key operation, touch operation, communication command input, or the like is detected for a certain period of time when measurement is not in progress.

Screen Saver

When battery operated, the backlight can be automatically turned off if no key operation, touch operation, communication command input, or the like is detected for a certain period of time when measurement is not in progress.

Factory Default Settings

Setup

The following setup conditions are reset to their factory defaults. Note that files in the internal memory are not deleted.

- Measurement Mode
- Measurement settings
- Analysis settings
- OTDR settings
- Optical power meter settings
- Visible light source settings
- System settings (except the date and time)

All

All the above setup conditions are reset to their factory defaults. All the files in the internal memory are deleted.

Operation Restrictions

You can set a PIN to restrict the following operations. This feature prevents settings from being changed or laser light to be emitted by mistake.

Measurement Mode

Changing from Simple Mode to another mode

Laser light output

When an operation to emit the following laser light is performed

- Optical pulse
- Measurement light
- Visible light

Network Settings (/LAN option)

You can use the Ethernet port to send communication commands from a PC to the AQ7280 or download measured results in the AQ7280 internal memory to a PC.

User Name and Password

Set user names and passwords for authenticating connections from PCs to the AQ7280.

Timeout Period

If a communication command is not sent from a PC or measured results are not downloaded within the timeout period, the AQ7280 releases the network connection.

TCP/IP

Set network address information.

Enabling and Disabling Network Connection

Remote control can be disabled. When disabled, a PC cannot connect to the AQ7280.

UPnP Port Forwarding

Data can be transferred through a NAT router that supports Universal Plug and Play (UPnP).

Other Features

Language Selection

If you are using an AQ7280 with a language suffix code that supports multiple languages, you can change the language used on the screen. For details on suffix codes, see the Getting Started Guide, IM AQ7280-02EN.

Start Menu

You can start the AQ7280 with the screen of a feature that you were using previously.

- Top Menu
  The top menu is displayed after startup.
- Start Menu to Last Function
  The menu of the feature that you were using immediately before you turned off the AQ7280 the last time is displayed after startup.
  The waveform data that was displayed then is not displayed.

Display Color

You can set the screen color (color or black and white).

Touch Control

You can turn the touch panel control on and off.

Beep

The AQ7280 can generate sound when the rotary knob is turned or when an operation error message is displayed.

UTIL Key Assign

You can assign one of the following features to the UTIL key. You can execute a feature that you use often with a single button.

- Save (see section 7.3)
- Print (see section 7.10)
- Report (see section 7.8)
- Utility menu (see section 2.10)
- Power meter (see section 5.2)
- Power checker (see section 5.2)
- Light source (see section 5.1)
- Visible light source (see section 5.1)
- Fiber inspection probe (see section 9.6)
- File name setup (see section 7.3)

File List Setting

You can select how file lists are displayed.
Detail, file name only, user defined

USB (TypeB_mini)

You can use USB port type B to send communication commands from a PC to the AQ7280 or download measured results from the AQ7280 internal memory or SD card to a PC.

SD Card with a Wireless LAN Function (FlashAir) Auto Timeout Value

You can set the FlashAir auto timeout value. If the FlashAir installed in the AQ7280 and an external wireless LAN device is connected, the connection is automatically turned off if FlashAir is not accessed for a specified time period.

Version Update

You can update the firmware by storing a new firmware in a USB memory device and connecting it to USB port type A.

Self-Test

Degradation of the AQ7280 touch panel, internal memory status, and so on can be diagnosed. Optical performance cannot be diagnosed.

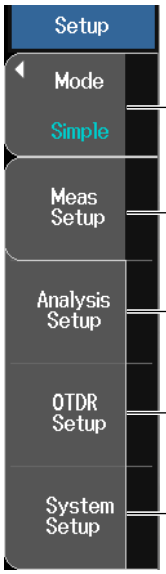
Expiration Date Setup

You can lock the panel keys or display a specific message when the specified date arrives.

2.1 Setting the Measurement and Analysis Conditions

Setup Menu

1. From the top menu, select **OTDR**.
2. Press **SETUP** to display the Setup menu.



Set the measurement mode (Simple, Detail, PON).

Set the measurement conditions.

Set the analysis conditions.

Configure the waveform display.
See section 3.2.

Configure the system.
See chapter 8.

Setting the Measurement Mode

Simple: In Simple mode, you set only a portion of the measurement and analysis conditions (wavelength, approximation method, etc.), and the AQ7280 automatically detects and sets the rest of the measurement conditions related to measurement resolution—such distance range and pulse width—and analysis conditions related to the optical fiber cable—such as index of refraction and backscatter.

Detail: In Detail mode, you set the measurement and analysis conditions individually. If you set the measurement conditions—such as the distance range and pulse width—to Auto, the AQ7280 will determine the suitable range and perform the measurement like in Simple Mode, described above.

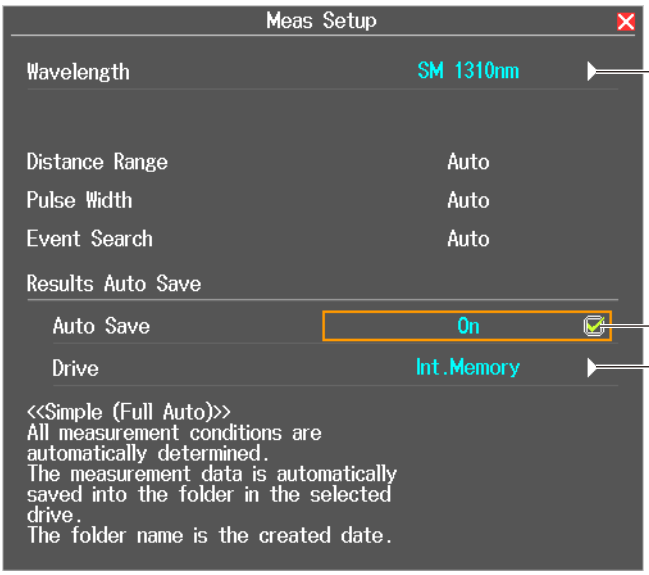
PON: In PON mode, the AQ7280 determines the suitable measurement and analysis conditions based on the number of optical splitter stages, route information, and distance range to set the optimal values. These values can be changed if necessary.

Note

When you change from Simple mode to Detail or PON mode, you may be asked to enter a password. This means that there are restrictions placed on operating the AQ7280. To change the measurement mode, you need to verify with the AQ7280 administrator. For details on operation restrictions, see “Operation Restrictions” in section 8.6.

Setting Measurement Conditions in Simple Mode

Press the **Meas Setup** soft key to display the following screen.



Set the wavelength (850nm, 1300nm, 1310nm, 1383nm, 1490nm, 1550nm, 1625nm, 1650nm, Multi WL).
The available options vary depending on the OTDR unit.

Set auto save (OFF, ON).

Select a drive (Int. Memory, SD card, USB memory 1, USB memory 2).
Selectable when auto save is ON.

Wavelength

850 nm, 1300 nm, 1310 nm, 1383 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm

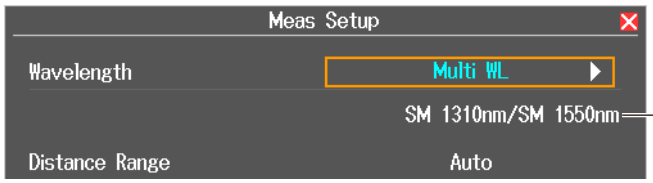
Depending on the OTDR unit, you can set the following wavelengths.

Model	Optical Pulse Wavelength
AQ7282A	1310 nm, 1550 nm
AQ7283A	
AQ7284A	
AQ7285A	
AQ7283E	1310 nm, 1550 nm, 1625 nm
AQ7283F	1310 nm, 1550 nm, 1650 nm
AQ7282G	1310 nm, 1490 nm, 1650 nm
AQ7283H	1310 nm, 1550 nm, 1625 nm
AQ7284H	

Model	Optical Pulse Wavelength
AQ7283J	1310 nm, 1383 nm, 1550 nm, 1625 nm
AQ7283K	1310 nm, 1490 nm, 1550 nm, 1625 nm
AQ7286A	1310 nm, 1550 nm
AQ7286H	1310 nm, 1550 nm, 1625 nm
AQ7286J	1310 nm, 1383 nm, 1550 nm, 1625 nm
AQ7282M	850 nm, 1300 nm

Multi Wavelength Measurement (Multi WL)

In a single measurement, multiple supported wavelengths are measured one at a time.
If multi wavelength measurement is selected, the wavelength of optical pulse being measured is displayed on the screen.



Wavelength of the optical pulse being measured

Auto Save

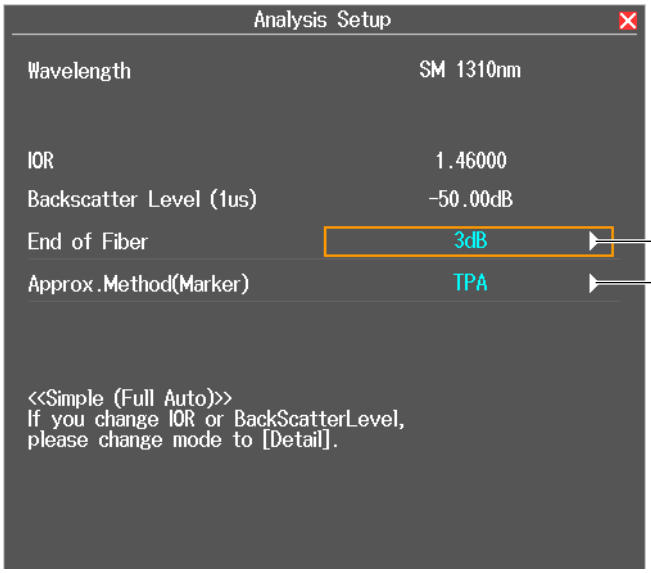
After an optical pulse measurement is complete, the measurement waveform is automatically saved. The AQ7280 creates a folder using the current date for its name in the root folder of the drive and saves the file.

Drive

Folders are automatically created. File names are automatically assigned. For details on file names, see section 7.3.

Setting Analysis Conditions in Simple Mode

Press the **Analysis Setup** soft key to display the following screen.



End of Fiber

If a reflection that exceeds the specified threshold occurs, it is detected as the end of the optical fiber cable (Fresnel reflection).
The range is 3 dB to 65 dB.

Approximation Method

When the AQ7280 calculates splice loss, it extrapolates straight lines. These straight lines are known as approximated lines.
There are the following two kinds of approximated lines.

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

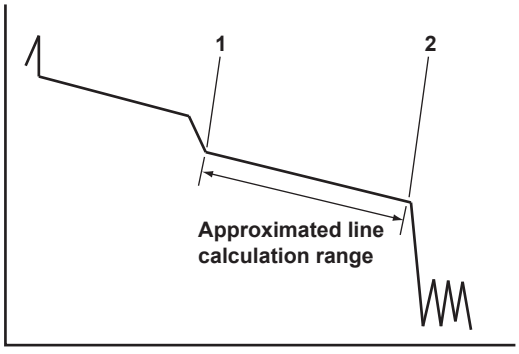
LSA

The AQ7280 calculates the loss between two points by using the least squares method on all the data between the two points (between 1 and 2).
This method has the following characteristics.

Merits: Because all the data between the two points is used, errors in the calculated value are small. Fluctuations in the calculated values are reduced, and highly reproducible values can be obtained.

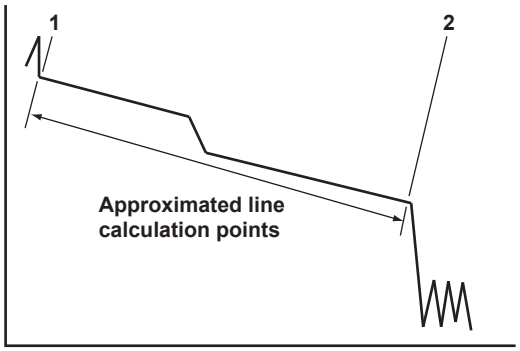
Demerit: If a large reflection or splice loss is present in the section whose loss is being calculated, those values are also included in the calculation, so large errors result.

If no events such as reflections and splice losses are present in the section being calculated, the LSA provides a value that has a smaller degree of error than the TPA.



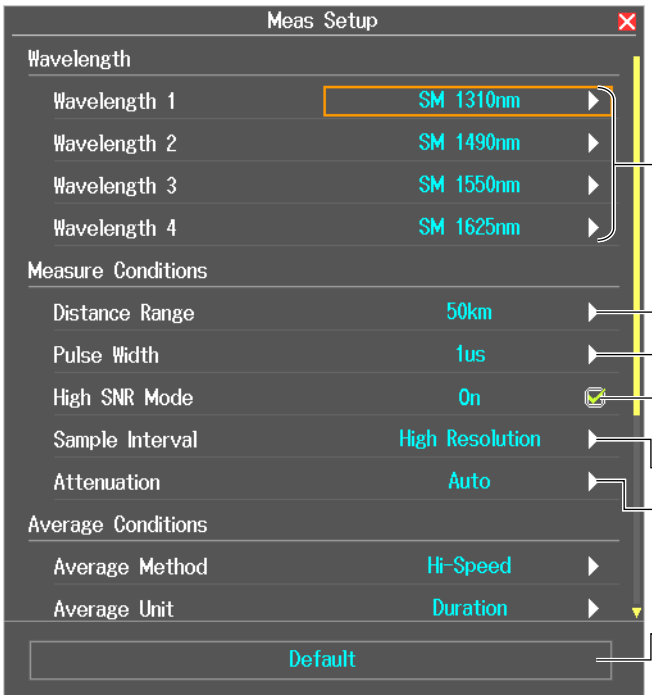
TPA

The AQ7280 uses the difference between the levels of the two specified points to calculate the loss. The level of fluctuation and reproducibility in the calculated value may vary greatly. If events such as reflections and splice losses are present in the section being calculated, the TPA provides a value that has a smaller degree of error than the LSA.



Setting Measurement Conditions in Detail Mode

Press the **Meas Setup** soft key to display the following screen.



Set the wavelength[1] (850nm, 1300nm, 1310nm, 1383nm, 1490nm, 1550nm, 1625nm, 1650nm).

Set the distance range[1] (Auto, 200m, 500m, 1km, 2km, 5km, 10km, 20km, 30km, 50km, 100km, 200km, 300km, 400km, 512km).

Set the pulse width[1] (Auto, 3ns, 10ns, 20ns, 30ns, 50ns, 100ns, 200ns, 300ns, 500ns, 1µs, 2µs, 5µs, 10µs, 20µs).

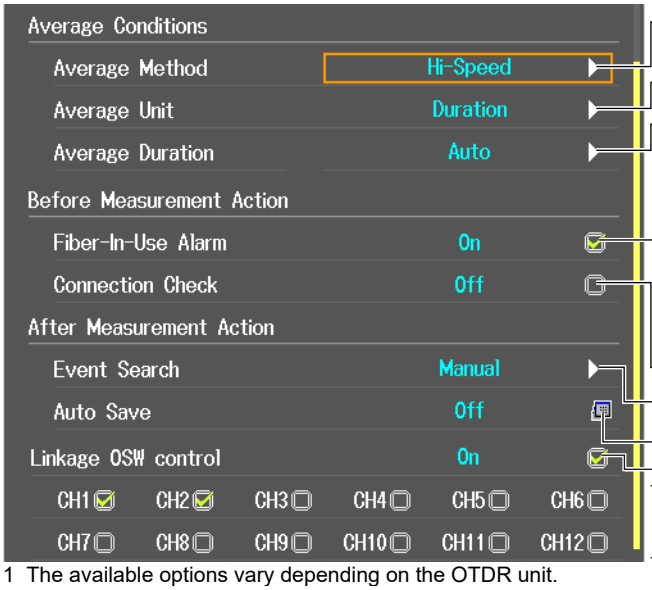
Set the high SNR mode (OFF, ON).

Set the sample interval (Normal, High Resolution).

Set the attenuation[1] (Auto, 0.00dB, 2.50dB, 5.00dB, 7.50dB, 10.00dB, 12.50dB, 15.00dB, 17.50dB, 20.00dB, 22.50dB, 25.00dB, 27.50dB, 30.00dB).

Executes initialization
Press to reset the measurement settings to their factory defaults.

When the screen is scrolled



Set the average method (Hi-Speed, Hi-Reflection).

Set the average unit (Duration, Times).

When the average unit is set to Duration:
Set the average duration (Auto, 5sec, 10sec, 20sec, 30sec, 1min, 3min, 5min, 10min, 20min, 30min).

When the average unit is set to Times:
Set the average count (Auto, 2^10, 2^11, 2^12, 2^13, 2^14, 2^15, 2^16, 2^17, 2^18, 2^19, 2^20).

Set the fiber-in-use alarm (OFF, ON).

Set the connection check (OFF, ON).

Set the event search (Auto, Manual).

Set auto save (OFF, ON).

Set the linkage OSW control (OFF, ON).

Select measurement target channels.

1 The available options vary depending on the OTDR unit.

Wavelength

The wavelengths set in Wavelength 1 to Wavelength 4 are measured one at a time (multi wavelength measurement). You can set only the wavelengths of the same OTDR port.

For the wavelengths that you can set, see page 2-2.

Distance Range

Set the distance range according to the length of the optical fiber cable. The distance range that you can select varies depending on the wavelength. Specify a distance range value that is greater than the length of the optical fiber cable that you will measure. If you specify a shorter value, the AQ7280 will not be able to perform measurements properly. The longer the distance that you specify, the more time measurements will take. When you specify the distance range, the optimum pulse width and attenuation values are set automatically.

Cable Length	Distance Range	Notes
Unknown	Auto	
0 m to 160 m	200 m	
160 m 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 24 km	30 km	
24 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 320 km	400 km	Cannot be specified for wavelengths 850 nm or 1300 nm
320 km to 400 km	512 km	Cannot be specified for wavelengths 850 nm or 1300 nm

Pulse Width

The pulse width has the following characteristics.

- A short pulse width enables you to measure with a high resolution, but you cannot measure long distances.
- A long pulse width enables you to measure long distances, but you cannot measure with a high resolution. Also, dead zones are larger with long pulse widths.

The pulse widths that you can select vary depending on the distance range, as shown in the following table.

Distance Range	Selectable Pulse Widths
200 m	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns
500 m	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns
1 km	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs
2 km	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs
5 km	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs
10 km	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs
20 km	3 ns, 10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs, 2 µs
30 km	10 ns, 20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs, 2 µs
50 km, 100 km	20 ns, 30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs, 2 µs, 5 µs, 10 µs, 20 µs
200 km	30 ns, 50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs, 2 µs, 5 µs, 10 µs, 20 µs
300 km or more	50 ns, 100 ns, 200 ns, 300 ns, 500 ns, 1 µs, 2 µs, 5 µs, 10 µs, 20 µs

High SNR Mode

If the optical fiber cable to be measured is connected to a passive optical network (PON) system, because an optical splitter for splitting the optical fiber cable is installed in the system, you will not be able to measure optical pulses that are reflected from a position further away than the optical splitter using normal measurement. This feature enables you to correctly measure optical pulses that are reflected from positions such as this.

OFF: Optical pulses excluding those from PON systems can be measured.

ON: PON system optical pulses can be measured.

Note

- High SNR mode can be turned on when the pulse width is set in the range of 50 nm to 1 µm.
- This cannot be used when the wavelength is 850 nm or 1300 nm.

Sample Interval

The maximum number of sample data points is 256000. The shortest sample interval is determined by the distance range.

Normal: The AQ7280 uses the optimum sample interval for the measurement method to perform measurements.

High Resolution: The AQ7280 uses a sample interval that would result in the greatest number of data points.

If you use a short sample interval, you can measure for finer changes. However, the data size of the measured result becomes large.

Attenuation

If large reflections are caused by connectors or by breaks in the optical fiber cable, the waveform may be saturated. Specify attenuation to prevent the waveform from being saturated.
The attenuations that you can select vary depending on the pulse width, as shown in the following table.

Pulse Width (Example)	Selectable Attenuations
3 ns, 10 ns, 20 ns, 30 ns, 50 ns	0 dB, 2.50 dB, 5.00 dB, 7.50 dB, 10.00 dB, 12.50 dB, 15.00 dB
100 ns, 200ns, 300 ns, 500 ns, 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, 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, 22.25dB, 25.00 dB
10 µs, 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, 22.25dB, 25.00 dB, 27.50 dB, 30.00 dB

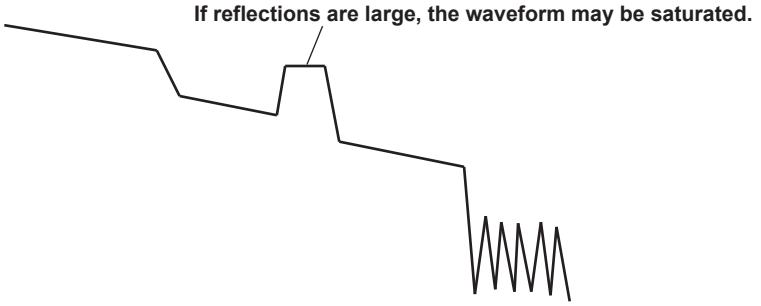
Note

- If the distance range or pulse width is set to Auto or if the average method is set to High Resolution, you cannot select the attenuation.
- If the waveform is saturated, you cannot perform measurements with high sensitivity, so specify a large value.
- The pulse widths that you can set vary depending on the OTDR unit.

Average Method

Hi-Speed

In Hi-Speed mode, all sections are measured according to the specified attenuation. If the specified attenuation value is not appropriate and a large reflection occurs, the waveform for that section may be saturated.



Hi-Reflection

In Hi-Reflection mode, the AQ7280 can perform measurements correctly even if large reflections (excluding extremely large reflections caused by sections of the fiber such as the open end of the fiber) occur. In Hi-Reflection mode, the AQ7280 sets the optimum attenuation according to the backscatter level for each section, and performs the measurement. Therefore, the measurement time is longer than in Hi-Speed mode. The partitioning of the optical fiber into sections and the specifying of the optimum attenuation are done automatically.

Note

Except when the optical fiber cable is short and there are no reflections, we recommend that you measure with the average method be set to Hi-Reflection.

Average Unit

Duration: Measurements are performed only over the specified duration. If you specify a short duration, depending on the measurement conditions, measurements may not have finished when the specified time elapses.

Times: Measurements are performed only the specified number of times.

Average Count and Average Duration

You can select the following values.

Duration: 5 sec, 10 sec, 20 sec, 30 sec, 1 min, 3 min, 5 min, 10 min, 20 min, 30 min
Sec is seconds, and min is minutes.

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 is 2 to the power of 10 (1024 times).

- The maximum average count is 2^20. If you specify a duration to average over that causes this number of times to be exceeded, the measurement will finish before the duration to average over elapses.
- Due to the influence of other measurement conditions, a measurement may take less time than the duration you have specified or it may not complete when the specified duration elapses.
- If you specify a large value for the number of times or the duration, you can perform highly precise measurements, but the measurement time becomes longer. Keep the AQ7280's dynamic range and the loss of the optical fiber cable under measurement in mind when you specify these values.
- The display of the duration or the number of times is determined by the specified average unit.
- If Auto is selected, one of the options above is used.

Fiber-In-Use Alarm

The AQ7280 uses the same wavelength that is used in real communication to measure optical pulses. If communication light is present in the optical fiber cable that you want to measure, the communication will be affected. When this communication light is present, we say that the fiber is in use. The fiber-in-use alarm is a feature that checks if communication light is being transmitted along the optical fiber cable that you are trying to measure. If the fiber is in use, a warning message is displayed asking whether you want to continue the measurement.

Connection Check

The connection check is a feature that checks the state of the connection between the AQ7280 and an optical fiber cable. When this feature is set to on, you can prevent light from being transmitted from the AQ7280 OTDR port or light source port if an optical fiber cable is not connected to the AQ7280 or if the cable is not connected correctly.

OFF: Connections are not checked.

ON: Connections are checked.

Event Search

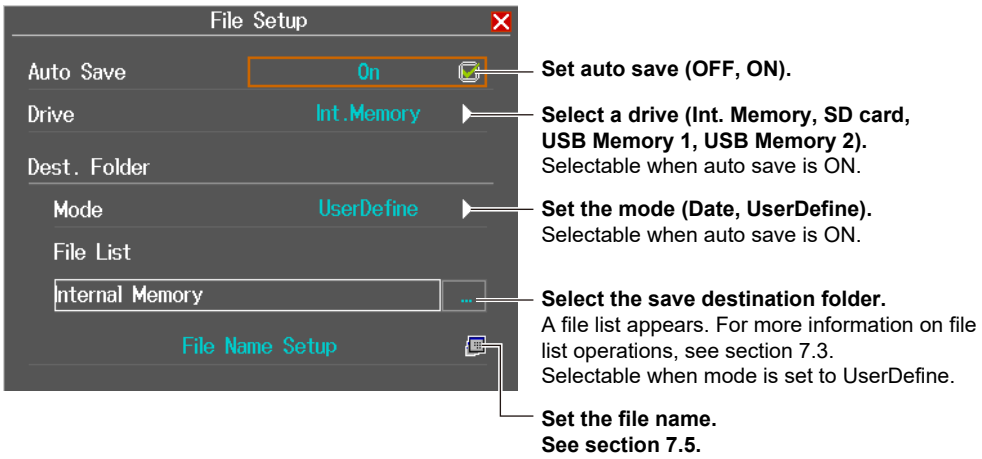
Event search is a feature that automatically searches for losses and reflections in the data that is acquired during averaged measurements. Losses and reflections detected in waveform data are known as events. For details on analyzing detected events, see section 4.2.

Auto: After averaged measurements complete, events are automatically searched for and listed, and the event screen and event analysis menu are displayed.

Manual: After averaged measurements complete, the waveform is displayed, but events are not searched for.

Auto Save

Using the **rotary knob** and **ENTER**, set Auto Save to **OFF** or **ON**. The following screen appears.



Mode

Select how to specify the save destination folder.

Date: In this mode, folders that are named with dates are automatically created in the selected drive.

UserDefine: In this mode, specify the save destination folder.

Destination Folder

Create a folder of your choice in advance in the selected drive, and select this folder as the save destination folder.

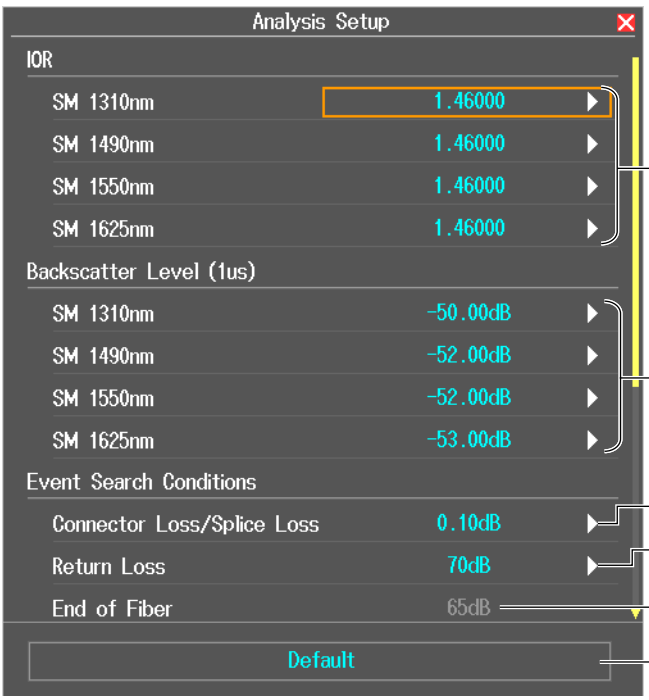
Selecting Measurement Target Channels

When “Linkage OSW control” is set to ON, the measurement of the next selected channel begins when the averaged measurement of the current channel is completed.

To use the Linkage OSW control feature, set Auto Save to ON. If Auto Save is set to OFF, waveforms cannot be saved because the display showing the measured waveforms is cleared when the target channel is changed.

Setting Analysis Conditions in Detail Mode

Press the **Analysis Setup** soft key to display the following screen.



Set the index of refraction (1.30000 to 1.7999).

Set the backscatter level
For a pulse width* of 1 µs:
–10.00 dB to –64.99 dB
For a pulse width* of 1 ns
–40.00 dB to –94.99 dB
*: the reference pulse width for the backscatter level

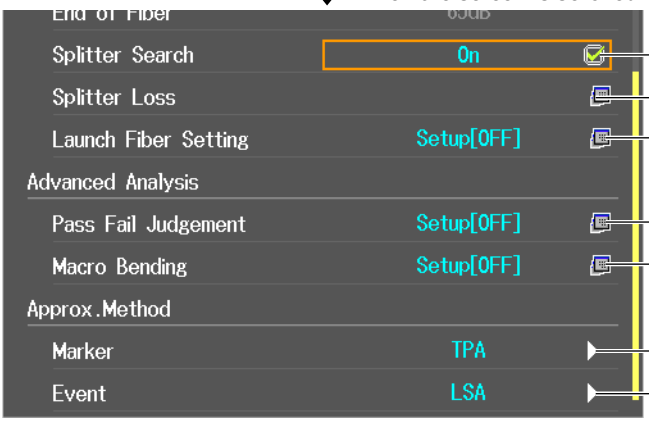
Set the splice loss (0.01dB to 9.99dB).

Set the return loss (20dB to 70dB).

Set the end of fiber (3dB to 65dB).
Selectable when the splitter search is OFF.

Executes initialization
Press to reset the analysis settings to their factory defaults.

When the screen is scrolled



Set the splitter search (OFF, ON).

Set the splitter loss.

Set the launch fiber cable (Setup[OFF], Setup[ON]).

Set the pass/fail judgment (Setup[OFF], Setup[ON]).

Set macro bending (Setup[OFF], Setup[ON]).

Set the approximation method (marker). See page 2-3.

Set the approximation method (event). See page 2-3.

Index of Refraction (IOR)

The AQ7280 uses the index of refraction to calculate the distance. If you do not set the index of refraction correctly, the distance measurement will be incorrect. The index of refraction varies depending on the connected optical fiber cable. Enter the value recommended by the manufacture of the cable.

The AQ7280 has the following preset indices of refraction that correspond to each wavelength.

Wavelength	Index of Refraction	Wavelength	Index of Refraction
850 nm	1.46000	1490 nm	1.46000
1300 nm	1.46000	1550 nm	1.46000
1310 nm	1.46000	1625 nm	1.46000
1383 nm	1.46000	1650 nm	1.46000

You can specify a value from 1.30000 to 1.79999.

Backscatter Level

Light that travels through an optical fiber cable displays a phenomenon known as Rayleigh scattering. Due to this phenomenon, light is sent backwards, in the direction opposite to the direction of propagation. This phenomenon is known as backscattering. The backscatter level setting is used when the AQ7280 calculates the return loss and total return loss.

If you do not set the correct backscatter level, the return loss and total return loss measurements will be incorrect.
On the AQ7280, you can select the reference pulse width for the backscatter level (see section 3.2).
The selectable range of backscatter levels vary depending on the reference pulse width.

1 µs: The range is –10.00 to –64.99.
1 ns: The range is –40.00 to –94.99.

The AQ7280 has the following preset backscatter levels that correspond to each wavelength.

Wavelength	1 µs Pulse Width	1 ns Pulse Width	Wavelength	1 µs Pulse Width	1 ns Pulse Width
850 nm	–37 dB	–67 dB	1490 nm	–52 dB	–82 dB
1300 nm	–44 dB	–74 dB	1550 nm	–52 dB	–82 dB
1310 nm	–50 dB	–80 dB	1625 nm	–53 dB	–83 dB
1383 nm	–51 dB	–81dB	1650 nm	–53 dB	–83 dB

Event Search Conditions

Connector Loss/Splice Loss

If a connector loss or a splice loss that exceeds the specified threshold occurs, it is detected as an event.
The 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 occurs, it is detected as an event.
The larger the reflection, the smaller the return loss, so events (reflections) are detected when the return loss is less than or equal to the threshold.
The range is 20 dB to 70 dB.

End of Fiber

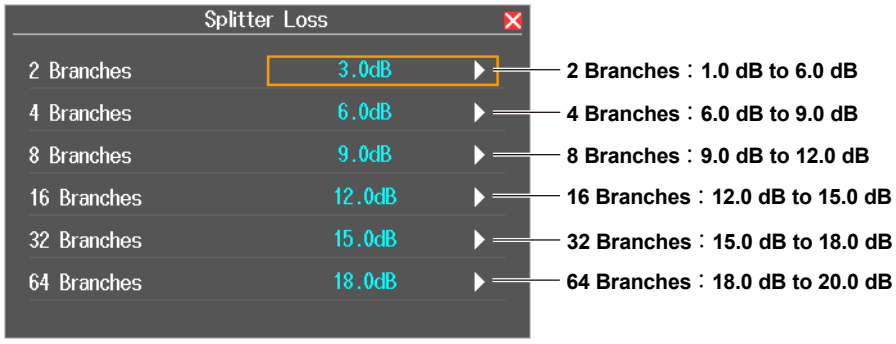
If a reflection that exceeds the specified threshold occurs, it is detected as the end of the optical fiber cable (Fresnel reflection).
The range is 3 dB to 65 dB.

Splitter Search

ON: Losses (reflections) that exceed optical splitter loss are displayed as optical splitters. The threshold at the end of the fiber is automatically set to its maximum value.
OFF: Losses (reflections) that exceed splitter loss are displayed as normal events.

Splitter Loss

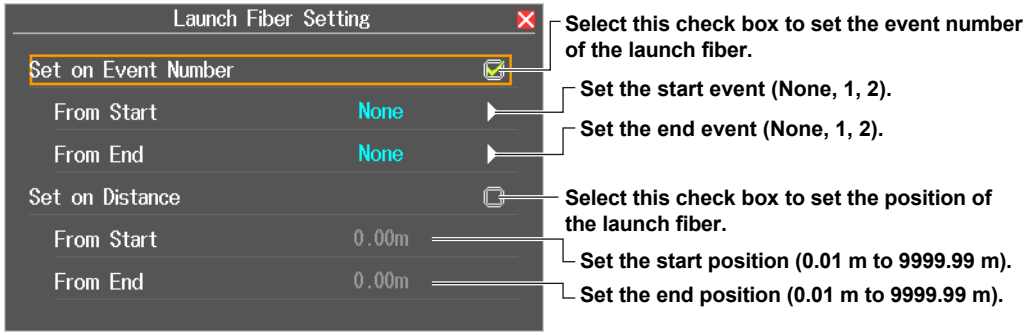
Using the **rotary knob** and **ENTER**, set the splitter loss. The following screen appears.



If splitters are inserted, you can select whether to detect the losses caused by them.
If you set a threshold for each number of splitter splits, the number of splitter splits can be determined automatically from the measured loss.

Launch Fiber Setting

Using the **rotary knob** and **ENTER**, set Launch Fiber Setting to **Setup[OFF]** or **Setup[ON]**. The following screen appears.

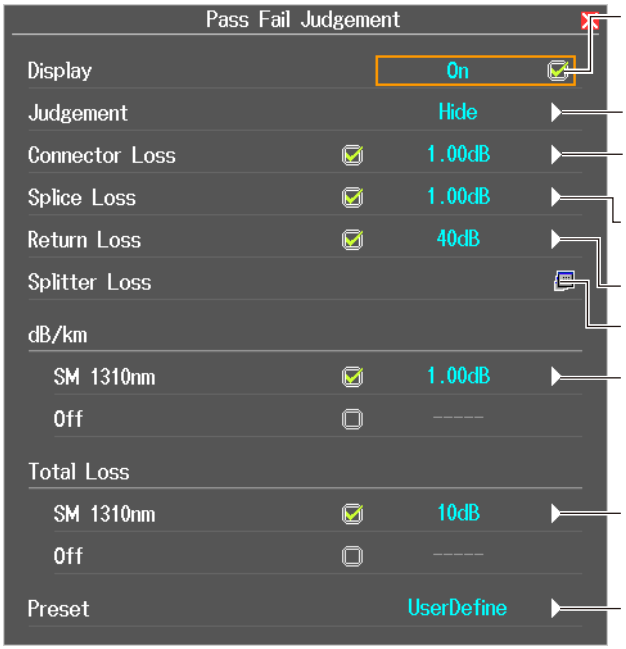


When you connect a launch fiber cable to avoid near-end dead zones, you can set the launch fiber cable events (start point and end point) or start position so that the event information in the launch fiber section is excluded from the analysis conditions.

Advanced Analysis

Pass Fail Judgement

Using the **rotary knob** and **ENTER**, set Pass Fail Judgement to **Setup[OFF]** or **Setup[ON]**. The following screen appears.



Turns the pass/fail judgment on and off. When the pass/fail judgment is ON, you can select the following items.

Set the judgment information (Hide, Display)

Set the connector loss threshold (0.01dB to 9.99dB).

Set the splice loss threshold (0.01dB to 9.99dB).

Set the return loss threshold (20dB to 70dB).

Set the splitter loss threshold.

Set the dB/km loss threshold (0.01dB to 9.99dB).

Set the total loss threshold (1dB to 65dB).

Set the preset (UserDefine, Preset 1, Preset 2, Preset 3).

Display

A judgment is performed on the events detected in the target waveform, and those that exceed the specified threshold are displayed as fault events on the event screen.

ON: Pass/fail judgment is set to ON, and events that have exceeded their thresholds are displayed with an asterisk attached to them.

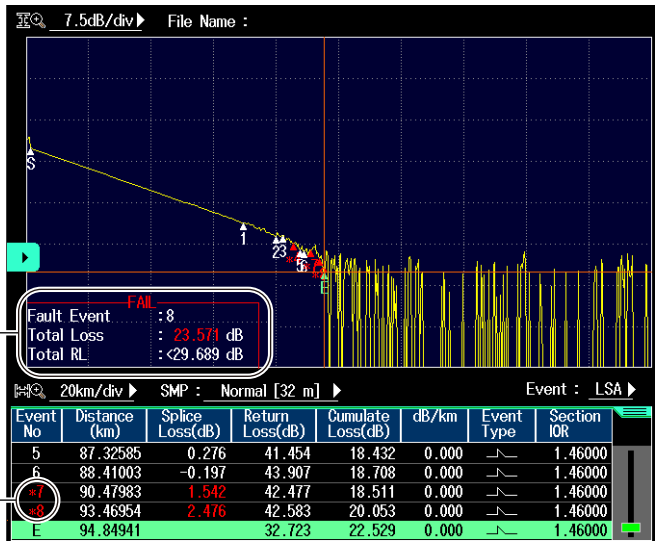
OFF: Pass/fail judgment is set to OFF, and events that have exceeded their thresholds are not displayed with an asterisk attached to them.

Judgement

The judgment information is displayed in the lower left of the waveform display area of the even screen.

Display: The number of fault events, total loss, and total return loss are displayed.

Hide: The judgment information is not displayed.



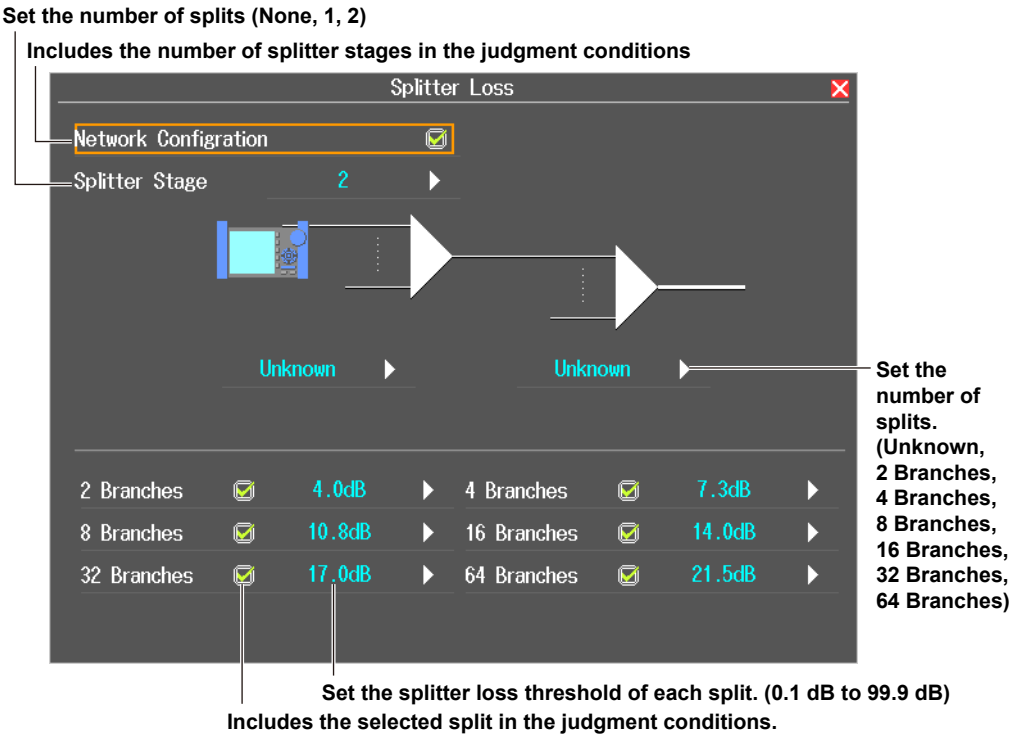
Judgment information display

Events judged as Fail

Connector Loss, Splice Loss, Return Loss, Splitter Loss, dB/km, Total Loss

Set the threshold values that are used to display fail judgment events.

- **Connector Loss**
  Values greater than the threshold value are judged as fail. The range is 0.01 dB to 9.99 dB.
- **Splice Loss**
  Values greater than the threshold value are judged as fail. The range is 0.01 dB to 9.99 dB.
- **Return Loss**
  Values less than the threshold value are judged as fail. The range is 20 dB to 70 dB.
- **Splitter Loss**
  Using the **rotary knob** and **ENTER**, set the splitter loss. The following screen appears.
  Values greater than the threshold value are judged as fail.



Note

Splitter Loss Judgment Conditions

- When the number of detected splitter splits is different from the setting
- When the detected splitter loss is greater than the splitter loss threshold of each split

Values greater than the threshold value are judged as fail. The range is 1.0 dB to 20.0 dB.

- **dB/km**
  Values greater than the threshold value are judged as fail. The range is 0.01 dB to 9.99 dB.
- **Total Loss**
  Values greater than the threshold value are judged as fail. The range is 1 dB to 65 dB.

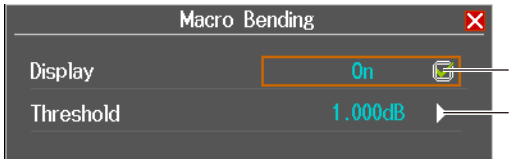
Because the end of fibers is handled as either a splice loss or a reflection, there is no fault event just for the end of fibers.

Preset

Select the pass/fail judgment reference. Three splice loss threshold examples are defined. Select the reference according to the optical connector's insertion loss and splice loss included in the optical fiber cable under measurement.

Macro Bending (Bending Loss)

Using the **rotary knob** and **ENTER**, set Macro Bending to **Setup[OFF]** or **Setup[ON]**. The following screen appears.



Turns the display on and off

Set the threshold (0.001dB to 99.999dB).

When an optical pulse measurement is performed in multi wavelength measurement, you can compare the splice losses at each wavelength and display on the screen bending loss events that are caused by bends in the optical fiber cable.

Display

This function displays the detected bending losses in the event list on the event screen when optical pulses are measured.

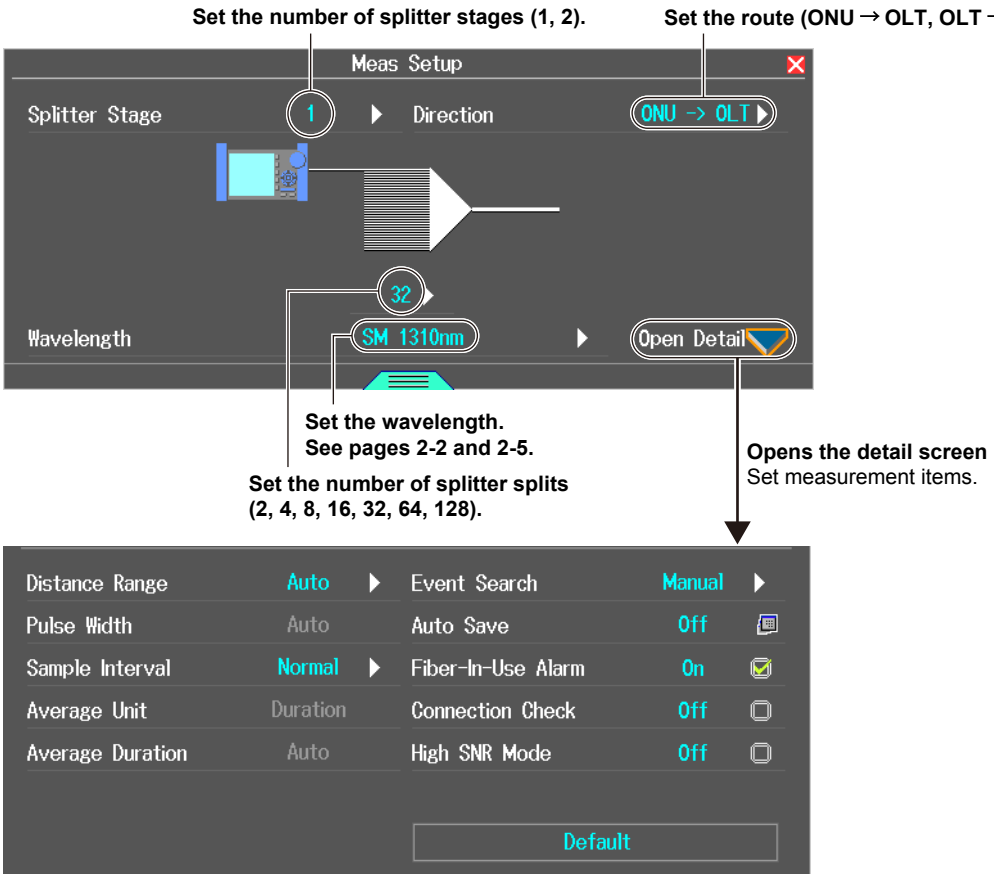
OFF: The bending losses are not displayed in the event list.
ON: The bending losses are displayed in the event list.

Threshold

This is the threshold of the difference between the splice losses of each wavelength when optical pulses are measured.
When the difference between the splice losses of each wavelength for the same event is larger than this value, the event is detected as a bending loss.

Setting Measurement Conditions in PON Mode

Press the **Meas Setup** soft key to display the following screen.



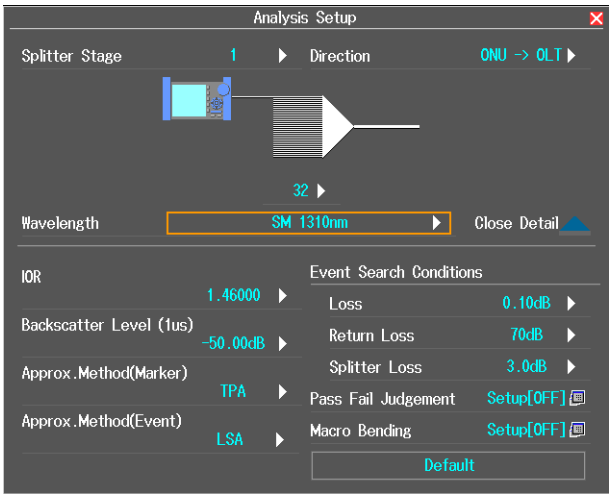
The settings change to values that are suitable for the measurement of the specified number of stages and splits. You can also change the settings according to your measurement conditions. For details on measurement items, see pages 2-6 to 2-9.

Note

The total number of splits when the number of splitter stages is set to 2 is up to 128.

Setting Analysis Conditions in PON Mode

Press the **Analysis Setup** soft key to display the following screen.



Set the splitter and wavelength.
See "Setting Measurement Conditions in PON Mode."

For details on analysis items, see pages 2-10 to 2-15.

2.2 Performing Averaged Measurements

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

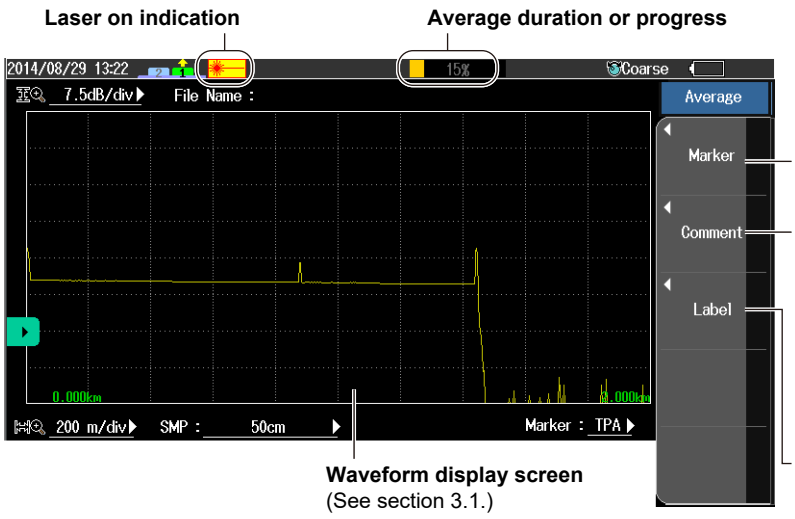
In averaged measurements, the data that is acquired from each pulse is averaged and displayed. By performing averaged measurements, you can improve the signal-to-noise (S/N) ratio.
This is effective when you want to detect faint events that are buried in noise.

Procedure

Starting and Stopping Measurements

1. From the top menu, select **OTDR**.
2. Press **AVG**. The measurement begins, and the measurement waveform is displayed on the screen.

   The Average menu appears. The average duration or progress is displayed in the top area of the screen. Also, during measurement, a mark appears at the top of the display to indicate that the laser light is on.



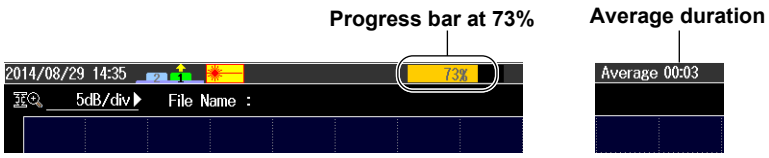
When the averaged measurement completes in accordance with the specified conditions, the measurement stops automatically, and the screen switches to the OTDR menu.
During multi wavelength measurement, when the averaged measurement of all waveforms completes, the measurement stops automatically. To stop the averaged measurement in progress, press AVG.

Explanation

Averaged Measurement

A progress bar is displayed during averaged measurement. When the measurement finishes, the progress bar stops automatically. If you set Avg Duration to Auto, the duration to average over is displayed in the top area of the screen. If you specify a setting other than Auto, a value that indicates the progress is displayed. When the measurement completes correctly, 100% is displayed. The time it takes to complete a measurement varies depending on settings such as the distance range and the average count.

If you are using markers to measure distance, loss, and the like during an averaged measurement, when the measurement completes correctly (100%), the AQ7280 automatically closes the marker measurement screen. If Event Search is set to Auto, the event screen appears when the measurement is completed correctly.



2.3 Performing Averaged Measurement and Displaying the Results with Icons (/SMP option)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

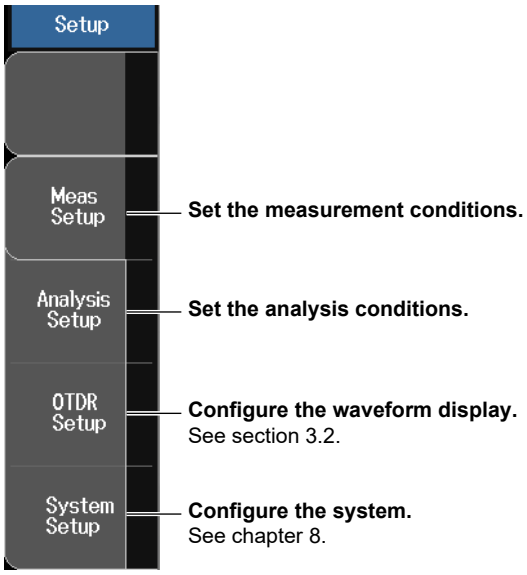
- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

The AQ7280 is equipped with a feature that detects various events along the optical fiber cable route and displays them as icons. This feature works by performing an OTDR averaged measurement and then automatically performing an OTDR event analysis after the measurement is complete.
Detailed event analysis results are displayed along with the icon of each event.

Procedure

Setup Menu

1. From the top menu, select **OTDR Smart Mapper**.
2. Press **SETUP** to display the Setup menu.



Set the measurement conditions.

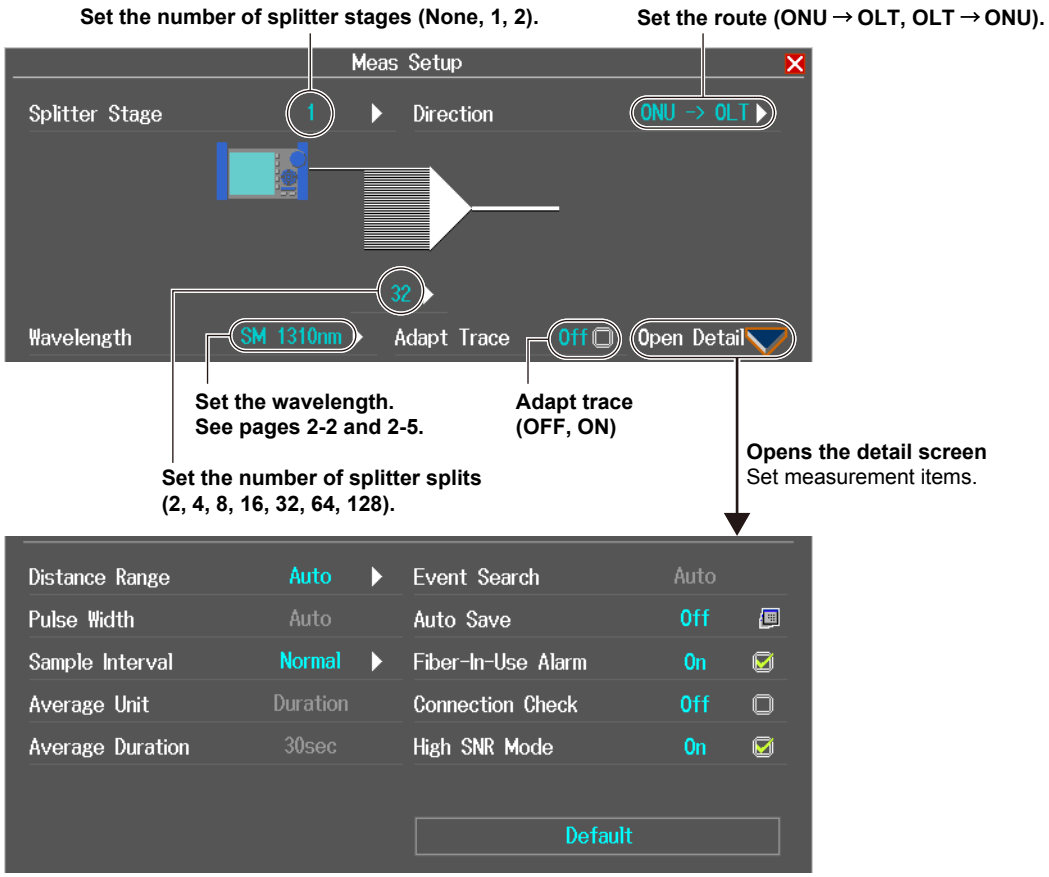
Set the analysis conditions.

Configure the waveform display.
See section 3.2.

Configure the system.
See chapter 8.

Setting the Measurement Conditions

Press the **Meas Setup** soft key to display the following screen.



For details on measurement items, see pages 2-6 to 2-9.

Event Search

This is fixed to Auto.

Adapt Trace

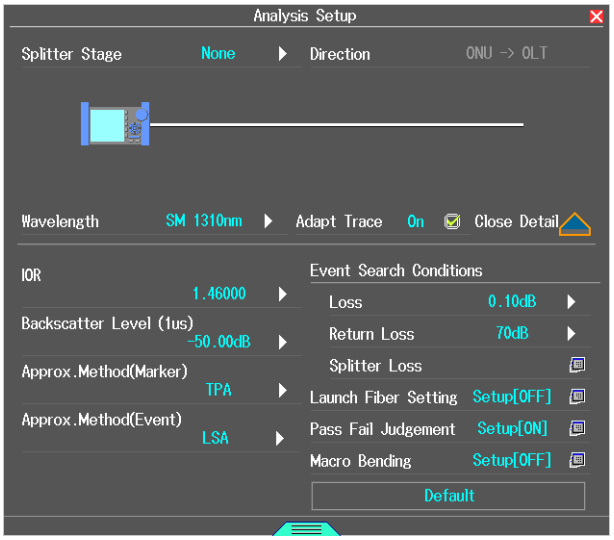
This feature uses three different pulse widths to measure the same wavelength and then combines the three measurement waveforms. Based on the specified distance range, the AQ7280 automatically sets a pulse width best suited to short range measurement, that best suited to mid-range measurement, and that best suited to long range measurement and performs measurements. After the measurements, you can use waveform editing to combine the best data of each measurement to create the waveform data.

ON: Adapt Trace is enabled. Waveform data is saved in SMP format. SOR waveform data cannot be loaded. Multi wavelength measurement is not possible.

OFF: Adapt Trace is disabled. Waveform data is saved in SOR format. SOR waveform data can be loaded. Multi wavelength measurement is possible.

Setting Analysis Conditions

Press the **Analysis Setup** soft key to display the following screen.



Set the splitter and wavelength.
See "Setting Measurement Conditions" on the previous page.

For details on analysis items, see pages 2-10 to 2-15.

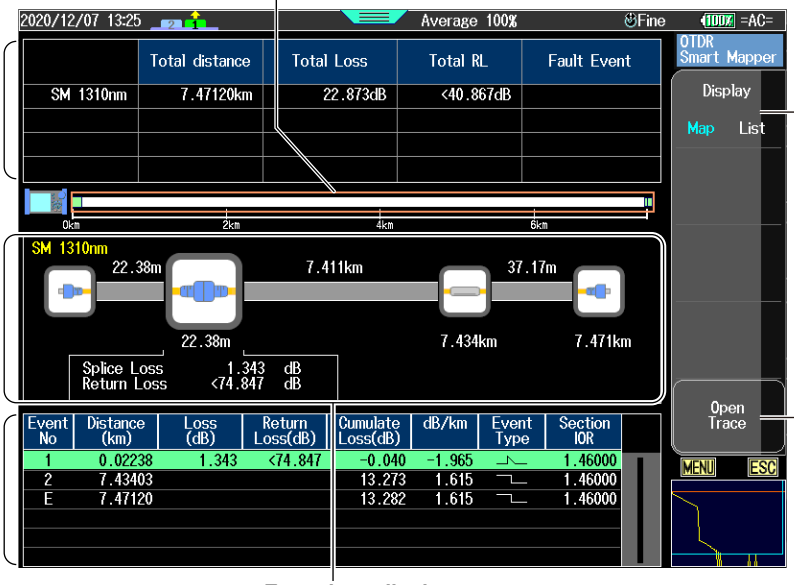
Starting and Stopping Measurements

3. Press **AVG**. Averaged measurement begins, and a screen indicating that the measurement is in progress appears. When the averaged measurement finishes, icons and analysis results of events are automatically displayed.

4. Using the **rotary knob** and **ENTER**, select the icon of the event you want to display the details of. The icon of the selected event appears in the center of the screen.

The event positions displayed on the screen is enclosed in a frame.

The total value of each event (the value of each waveform in multi wavelength measurement)



Selects the display screen (Map, List)
The example shown here is Map.

Event screen
See section 4.2.

Check the waveform.
The screen will change from Map/List display to measurement waveform display.

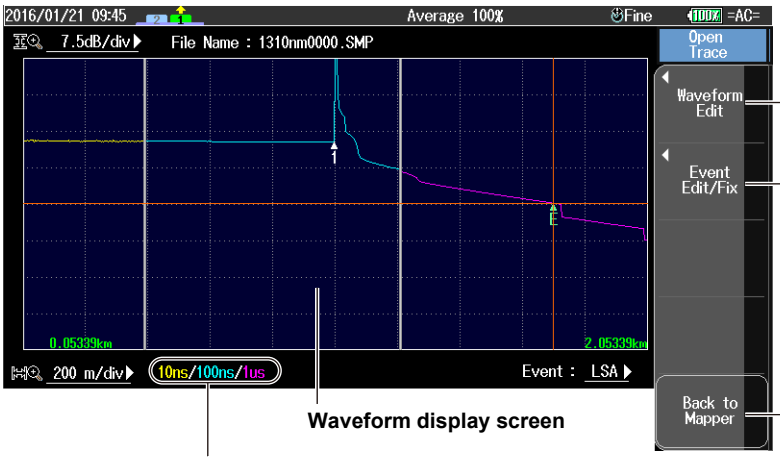
Event icon display
The event selected on the event screen appears in the center, and the splice loss and return loss are displayed. Drag the icon screen to move it horizontally. Tap the icon screen to change the event type.

Note

- To stop the averaged measurement in progress, press AVG. The averaged measurement will stop, and the screen that was showing before the measurement will reappear.
- During averaged measurement, you cannot set the measurement conditions.
- You can start averaged measurement by pressing AVG even while the measurement setting screen is showing.
- In OTDR Smart Mapper, real-time measurement is not possible.

Checking and Editing Waveforms

Press the **Open Trace** soft key to display the following screen.



Edit the waveform.
You can edit the Adapt Trace waveform.

Edit or fix events.
See section 4.2.
You cannot edit event markers.

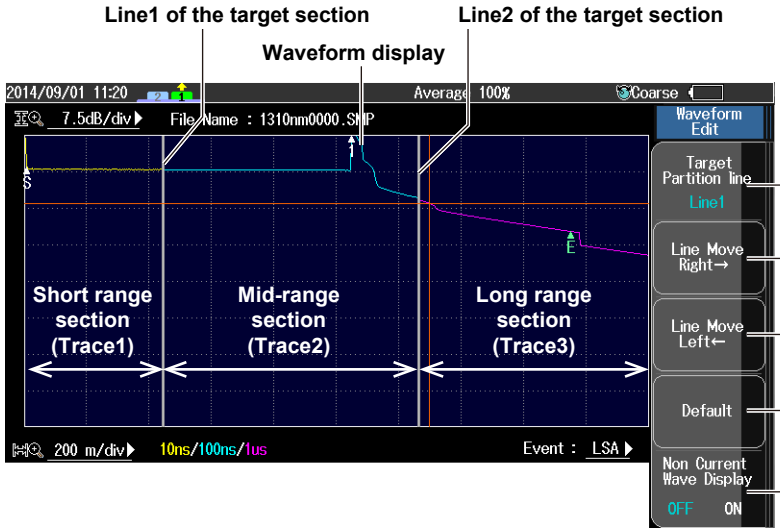
Returns to the previous screen

Waveform display screen

Pulse width of the measured Adapt Trace waveform

Editing Waveforms

Press the **Waveform Edit** soft key to display the following screen.



Select the target (Line1, Line2).

Moves the target to the right

Moves the target to the left

Resets the line positions of the target section

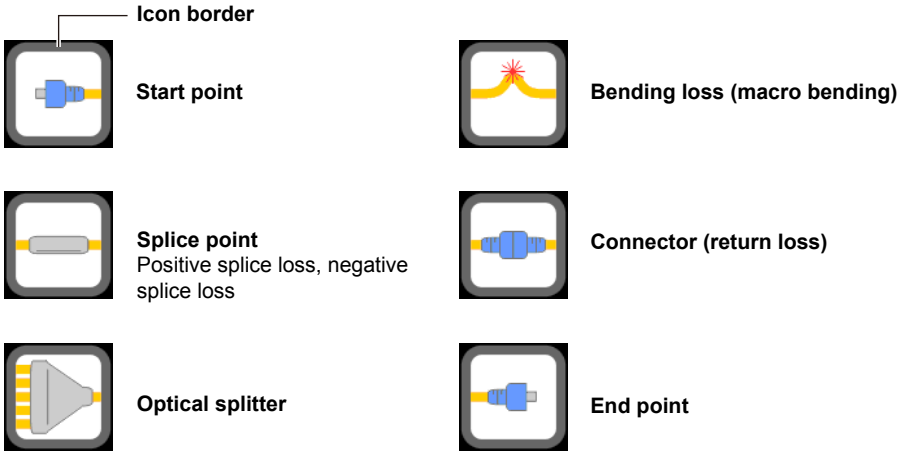
Waveform display outside the target section (OFF, ON)

You can change the distance sections by moving the lines between the sections.
You can also move the line by touching the screen.

Explanation

Event Icon Display

The following events are displayed using icons. The icon border is usually gray.



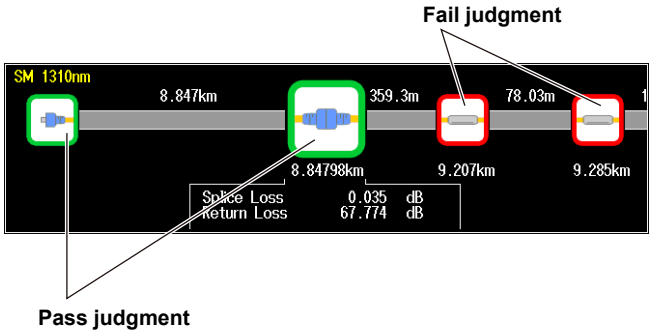
Pass Fail Judgement

Icon Display

If Pass Fail Judgement is set to ON, the judgment result is displayed using the icon border color.

Pass: Green

Fail: Red



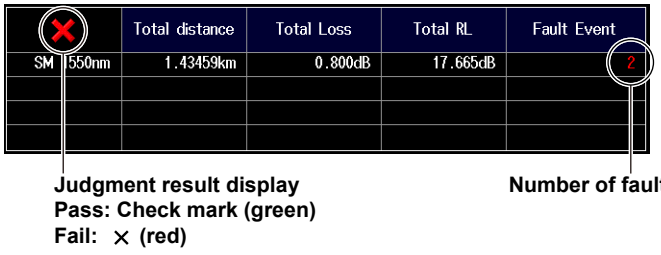
Fault Events

If Pass Fail Judgement is set to ON, fail judgment events are displayed as fault events on the event screen.

For details, see “Pass Fail Judgement” in section 2.1.

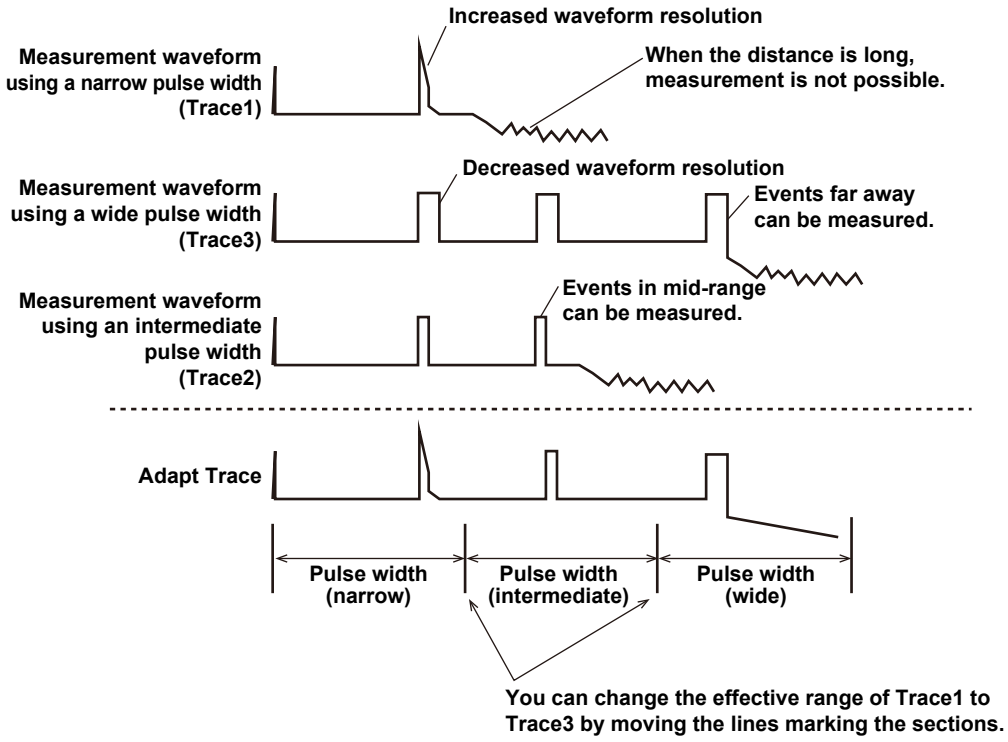
- **Judgment result**

  The judgment result is displayed in the row displaying the total values of each event. The judgment will be Fail if there is even only a single fault event.



Adapt Trace (Waveform editing)

In an optical fiber cable measurement, reducing the pulse width of optical pulse measurement increases the measurement resolution of the waveform in the near-end section but causes the optical pulse to attenuate in the far-end section, preventing correct measurement. Conversely, increasing the pulse width of optical pulse measurement allows correct measurement in the far-end section but decreases the measurement resolution of the waveform in the near-end section. The Adapt Trace feature compensates for these measurement accuracy degradations by performing optical pulse measurement using three different pulse widths for the same wavelength and combining the three waveforms on the screen. The AQ7280 automatically determines the pulse widths depending on the specified distance range and wavelength.



Note

Adapt Trace turns on and off automatically depending on the loaded waveform data.

- When waveform data in SMP format is loaded, Adapt Trace is turned on.
- When waveform data in SOR format is loaded, Adapt Trace is turned off.

2.4 Performing Averaged Measurement and Measuring the Distances to Breaks

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

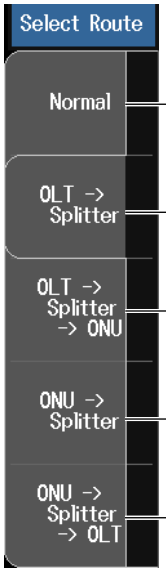
- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

The AQ7280 is equipped with a feature that you can use to locate and display faults in optical fiber cables. This feature works by performing an OTDR averaged measurement and then automatically performing an OTDR event analysis after the measurement is complete.
Use the OTDR feature to analyze waveforms.

Procedure

Selecting the Route

1. From the top menu, select **Fault Locator**. A soft key menu for selecting the route appears.



Normal
Searches for fault points in the optical fiber cable connecting OLT[1] and ONU[2]

OLT->Splitter
Searches the route from the OLT to the optical splitter

OLT->Splitter->ONU
Searches the routes from the OLT through the optical splitter to each ONU

ONU->Splitter
Searches the route from an ONU to the optical splitter.

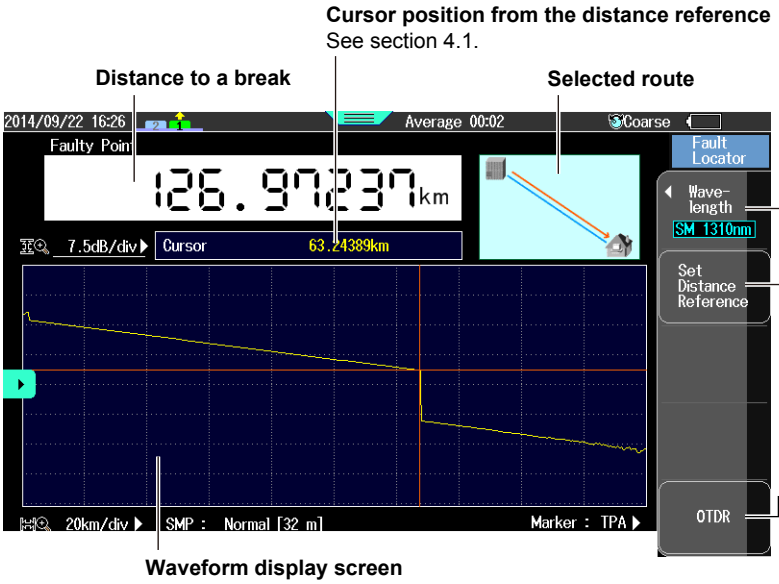
ONU->Splitter->OLT
Search the route from an ONU through the optical splitter to each OLT.

1 OLT (Optical Line Termination): Optical line termination on the station side
2 ONU (Optical Network Unit): Optical line termination on the subscriber side

2. Using the **rotary knob** and **ENTER**, select the route to be measured. The Select Route screen closes.

Fault Locator Screen

3. Press **AVG**. The measurement begins, and the measurement waveform is displayed on the screen. When the averaged measurement completes, the distance to a break is automatically displayed.

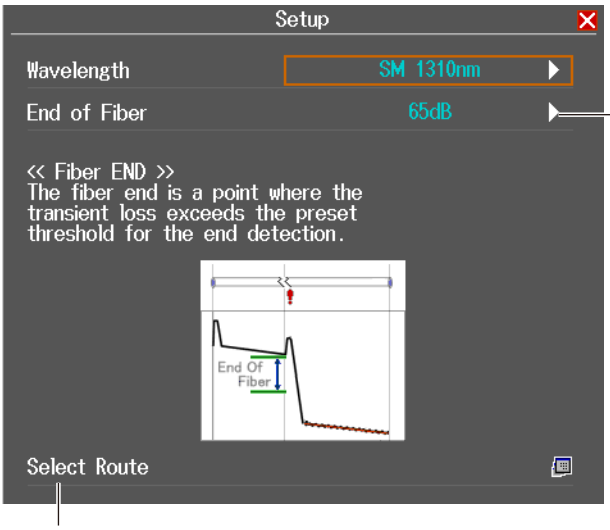


Note

You can save measured data, but saved waveform data cannot be loaded on the AQ7280. For details on saving measured data, see section 7.3.

Changing Settings

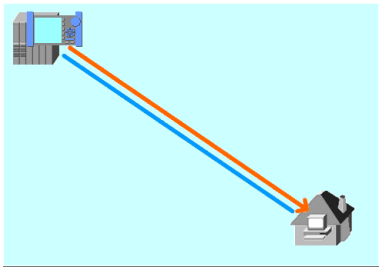
Press **SETUP** to display the following screen.



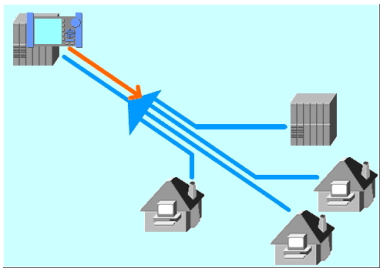
Explanation

Selecting the Route

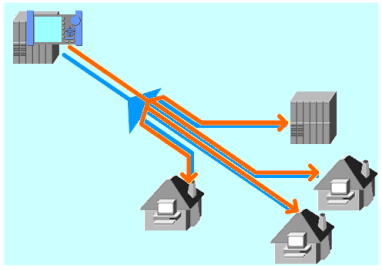
Before starting the fault locator feature, you can select the route in which to search for breaks. After confirming the route, press ENTER. The optimal measurement conditions for the selected route will automatically be selected.



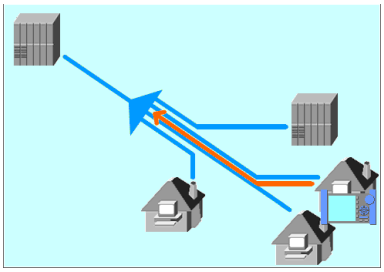
Normal
Measures between the OLT and ONU. This route does not have an optical splitter.



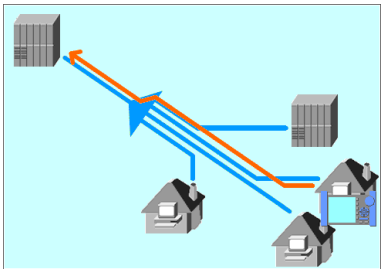
OLT->Splitter
Measures between the OLT and optical splitter.



OLT->Splitter->ONU
Measures from the OLT side to the ONU side. This route has an optical splitter.



ONU->Splitter
Measures between an ONU and optical splitter.



ONU->Splitter->OLT
Measures from the ONU side to the OLT side. This route has an optical splitter.

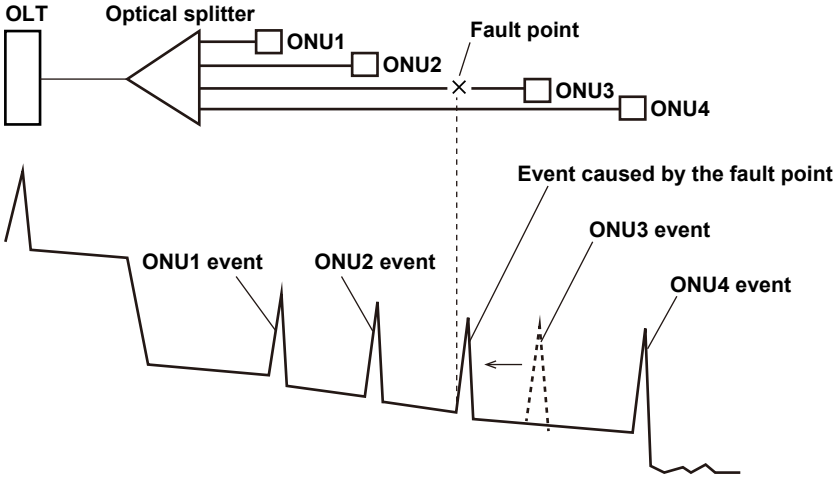
Fault Location Display

The fault locator uses averaged measurements to detect faults. The cursor position is automatically set to a fault location on the waveform, and the distance from the measurement reference point to the fault is displayed.

Faults are not detected during real-time measurement. During a fault locator's real-time measurement, you can perform cursor operations or select the wavelength during measurements. If you cancel measurements prematurely, faults will not be detected.

How to View Fault Points of Multi Split Routes (OLT->Splitter->ONU)

If the route is set to OLT->Splitter->ONU, the number of connected ONUs will be equal to the number of splits. As such, to determine which route each fault point belongs to, you need to check the events on the displayed waveform.



In the example shown above, reflections from ONU3 are not detected due to a fault point on the ONU3 route. The event of the fault point is detected instead. When an event is detected closer than the actual ONU3 position, we can assume that there is a fault point on the ONU3 route.

Note

If the route is set to OLT->Splitter->ONU, even if there are breaks, they are not detected because other split routes are overlapped. The position of the end of the cable will be considered to be the position of the break, and the distance to that position will be displayed.
In such a case, verify the event position on the displayed waveform with the distance to the installed ONU.

2.5 Performing Real-time Measurement

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

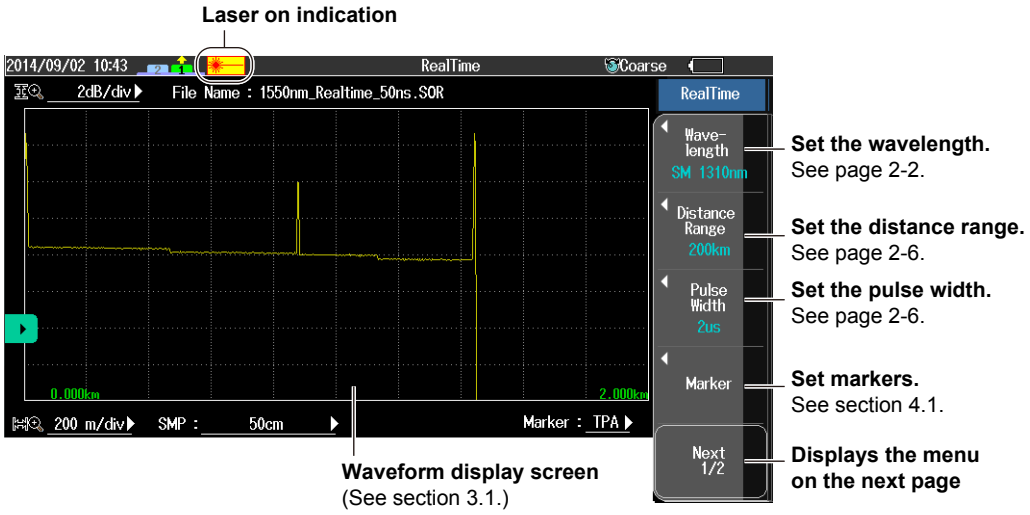
- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

In real-time measurement, you can view the waveform changes in real time. You can change the conditions during measurement.

Procedure

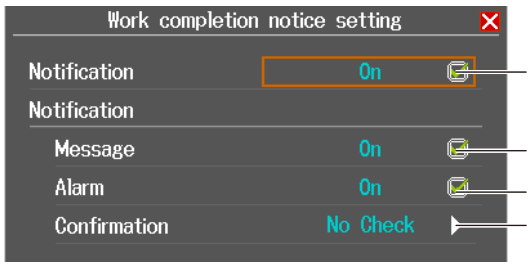
Starting and Stopping Measurements

1. From the top menu, select **OTDR**.
2. Press **REAL TIME** to start a measurement. The screen shows the measurement waveform, and the RealTime menu appears. A mark appears in the top area of the screen to indicate that the laser light is on.
3. During measurement, press **REAL TIME** to stop the measurement. The OTDR menu appears. The mark that indicates that the laser light is on disappears.



Cable Installation Completion Notification

1. On the OTDR menu, press the **Advanced Measurement** soft key and then the **Work Completion Notice** soft key. The following screen appears.



Turns the completion notification on or off

Turns the message display on or off

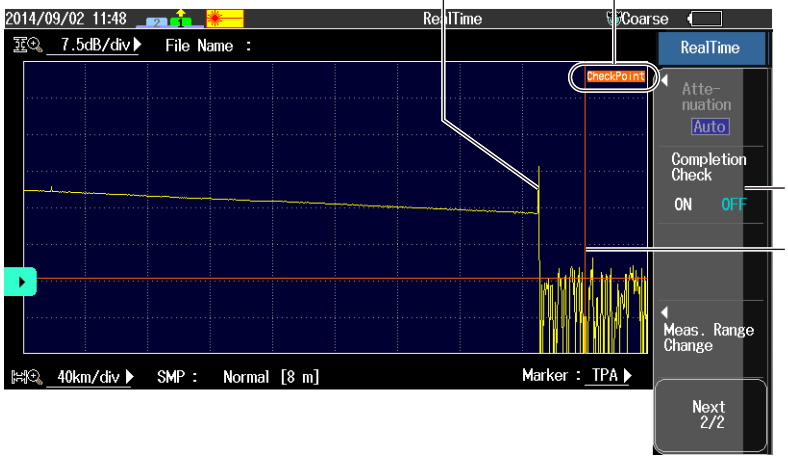
Turns the alarm on or off

Set the confirmation (No Check, Check only once, Check everytime).

2. Set Notification to **ON**.
3. Set Message to **ON**.
4. Press **REAL TIME**to start a measurement. The screen shows the measurement waveform, and the RealTime menu appears. The words “Check Point” appears at the cursor on the screen.
5. Press the **Next** soft key and then the **Completion Check** soft key to select ON.
   When the measurement to the Check Point distance is complete, a completion message is displayed.

End of fiber

When the work completion notice is set to ON, “CheckPoint” appears at the cursor.



Set the work completion confirmation (ON, OFF).

Move the cursor to a position that is slightly after the installation point.

You can perform measurements efficiently by moving the cursor to a position slightly after the installation point (depending on how fast the optical fiber cable will be installed). This is because the AQ7280 notifies you of the work completion, which is your sign to measure the connection loss at that point (splice, connection, etc.).

Explanation

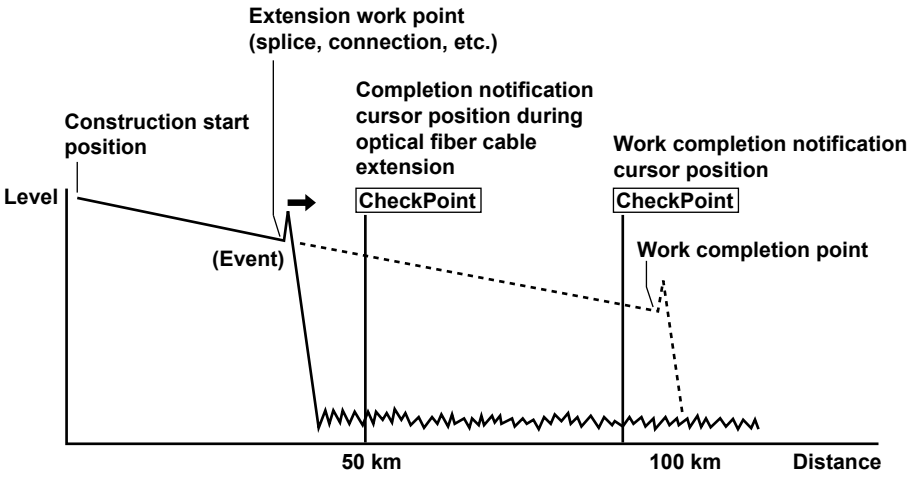
Real-time Measurement

Measurement conditions are set before the actual measurement takes place, but during real-time measurement you can change the measurement conditions and adjust markers and the cursor. When you stop a measurement, the AQ7280 returns to the previous screen.

- In Simple mode, you can only change the wavelength.
- You cannot change the attenuation if the average method is set to Hi-Reflection. For details, see page 2-7.

Cable Installation Completion Notification

Before you check whether the work is complete, move the cursor slightly after the extension work point or before the work completion point on the optical fiber cable, and turn on the work completion notification. When the fiber end detection position (the event) during real-time measurement is the same as the cursor position (CheckPoint), the AQ7280 gives a notification (message indication and alarm sound) that the cable installation is complete.



2.6 Performing High Resolution Measurement

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

When analyzing waveforms in real-time measurement, you can limit the range to be analyzed and measure at high resolution to obtain detailed measurements.

Procedure

Executing a Measurement

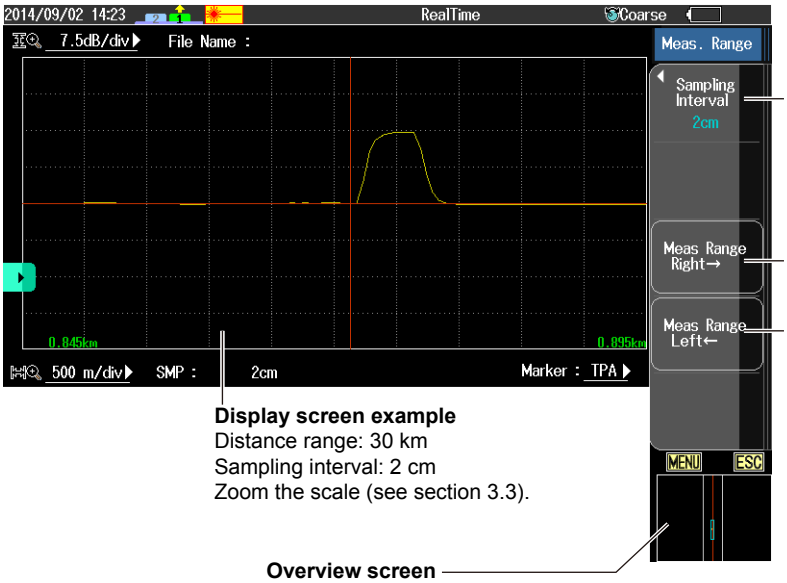
1. From the top menu, select **OTDR**.
2. Press **REAL TIME** to start a measurement. The screen shows the measurement waveform, and the RealTime menu appears. A mark appears in the top area of the screen to indicate that the laser light is on.

Specifying a Range

3. Press the **Next** soft key and then the **Meas. Range Change** soft key.
4. Turn the **rotary knob** to move the cursor to the center of the range you want to analyze.

Setting the Sampling Interval

5. Press the **Sampling Interval** soft key to set the sampling interval.
The waveform measured at the specified sampling interval is displayed.



Set the sampling interval (Normal, High Reso., 2cm, 5cm, 10cm, 20cm, 50cm, 1m, 2m, 4m, 8m, 16m, 32m).

Moves the current measurement scope to the right

Moves the current measurement scope to the left

Display screen example
Distance range: 30 km
Sampling interval: 2 cm
Zoom the scale (see section 3.3).

Overview screen
Shows the range displayed on the screen relative to the entire distance range.
White frame: Shows the range that can be displayed at the specified sampling interval
Blue frame: Shows the display range of the zoomed waveform display

Note

The amount of measurement scope movement varies depending on the amount of cursor movement (see section 3.3).

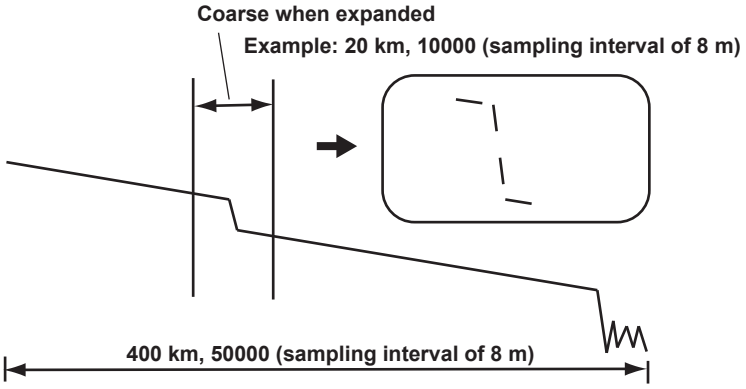
Averaged Measurement with High Resolution Setting

If the high resolution measurement conditions are specified in real-time measurement, averaged measurement can be performed with those conditions.

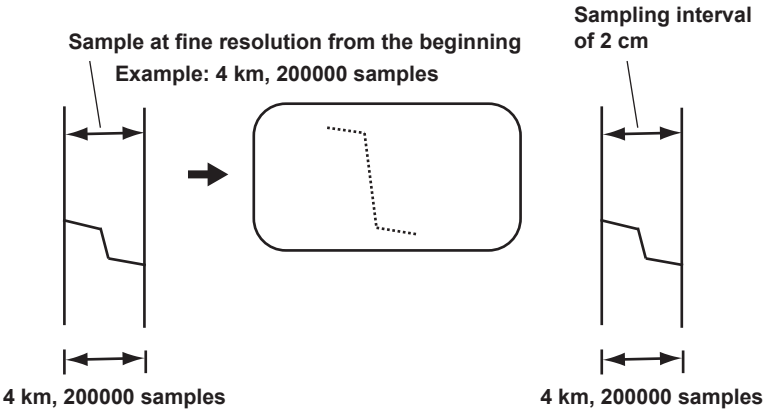
6. Press **AVG** to perform averaged measurement while maintaining the high-resolution conditions.

Explanation

In normal measurement, the sampling interval is set so that data can be sampled at all distances according to the specified distance range. The maximum number of data samples on the AQ7280 is 256000 (when the distance range is 512 km).
Therefore, if the distance range is large (e.g., 400km), the sampling interval becomes long, and events occurring between samples cannot be analyzed in detail. Waveform zooming explained in section 3.3 simply expands the measured results at the sampling resolution set for each distance range; it does not increase the resolution.



In high resolution measurement, you move the cursor to the location where you want to analyze in detail and set the sampling resolution. The sampling resolution that you can select here is all intervals regardless of the distance range. The measurement scope is determined by the selected sampling resolution with the cursor at the center. If there is no cursor, the left edge of the present measurement scope becomes the reference.



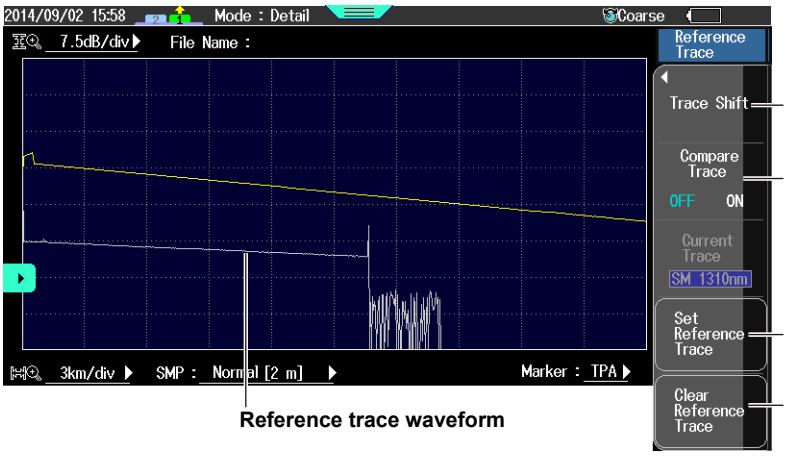
2.7 Displaying Reference Trace Waveforms

You can measure waveforms while retaining the previous waveform on the screen (a reference trace). The AQ7280 displays the measurement waveform and the reference trace waveform at the same time.

Procedure

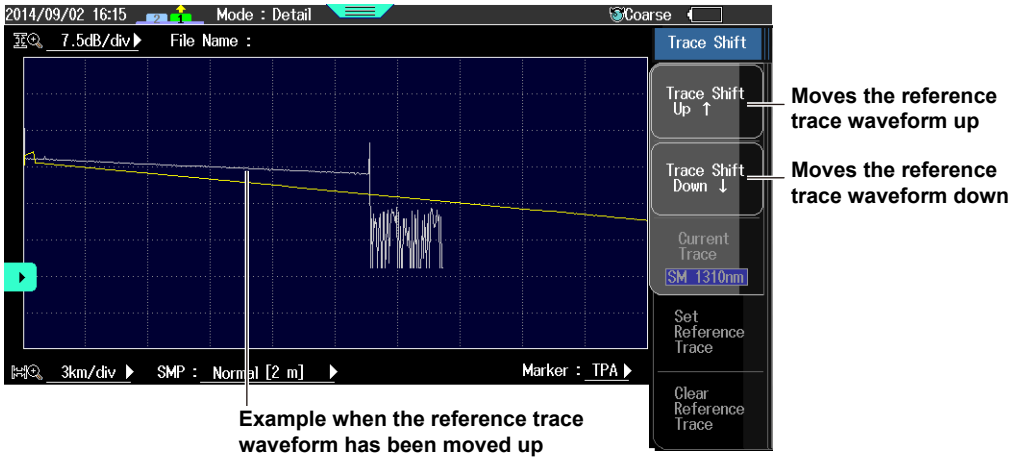
Reference Trace Screen

1. From the top menu, select **OTDR**.
2. Display the waveform on the screen. Press the **Reference Trace** soft key and then the **Set Reference Trace** soft key. The reference trace waveform is displayed in white.



Moving the Reference Trace Waveform

On the Reference Trace menu, press the **Trace Shift** soft key and then the **Trace Shift Up** ↑ or **Trace Shift Down** ↓ soft key. The reference trace waveform will move.



Explanation

Reference Trace

You can also create a reference trace from waveforms that you load from files. By creating a reference trace before work, you will be able to check the work progress. For details on loading waveforms, see section 7.3.

Comparing Traces

The AQ7280 displays the differential trace of the current waveform and reference trace waveform.

2.8 Performing Multi-Core Fiber Measurement

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

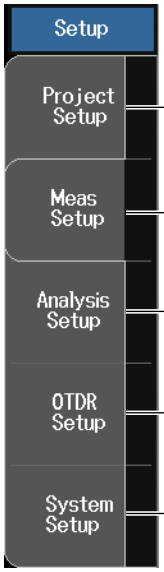
French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

Setup Menu

1. From the top menu, select **Multi Fiber Project**.
2. Press **SETUP** to display the Setup menu.



Set the measurement core information.

Set the measurement conditions.
See page 2-5.

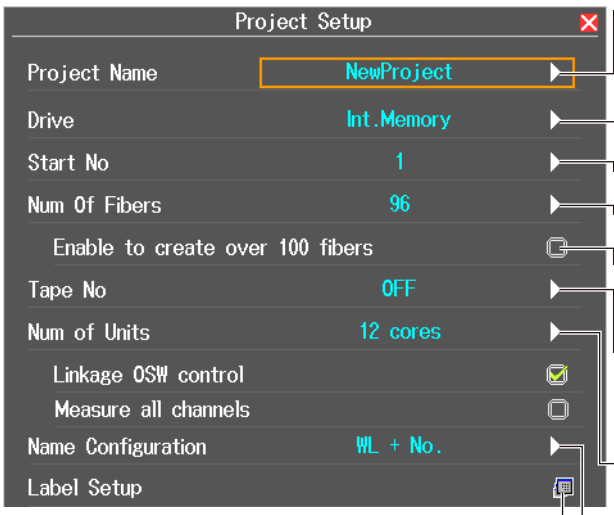
Set the analysis conditions.
See page 2-10.

Configure the waveform display.
See section 3.2.

Configure the system.
See chapter 8.

Entering Measurement Core Information

Press the **Project Setup** soft key to display the following screen.



Set the project name.
A character input dialog box will open.

Select a drive (Int. Memory, SD card, USB memory 1, USB memory 2).
Selectable when auto save is ON.

Set the starting core number (1 to 9900).

Set the number of cores or tapes (1 to 2000).
Not selected: The selectable range of number of cores is 1 to 100.
Selected: The selectable range of number of cores is 100 to 2000.

Set the tape number (OFF, a-b(2), a-c(3), a-d(4), a-e(5), a-f(6), a-g(7), a-h(8)).
This is available when the "Enable to create over 100 fibers" is set to OFF (check box unselected).

Set the number of cores in each division (8 cores, 10 cores, 12 cores).
You can set this when the tape number is set to OFF. The "Linkage OSW control" and "Measure all channels" items appear when the number of cores in each division is set to 12.

Set the label.
The same label can be entered for all cores.
See section 7.3.

Set the file name type (WL + No., No. + WL, Project Name + WL + No., No. + Project Name + WL, WL + Project Name + No.).

Note

When you change the measurement core information, all the previous core measurements are discarded.

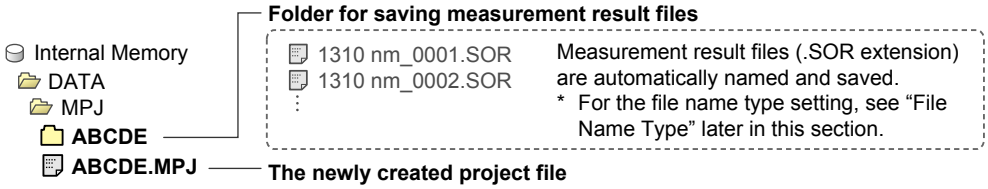
Setting the Project Name

Projects are group of items for measuring multi-core fibers. The default project name is "NewProject." In the AQ7280 internal memory, core information, measurement conditions, analysis conditions, measured results, and the like are linked with the project name and saved. You can set up to 15 characters for the project name. For the types of strings and characters that you can use, see section 7.3.

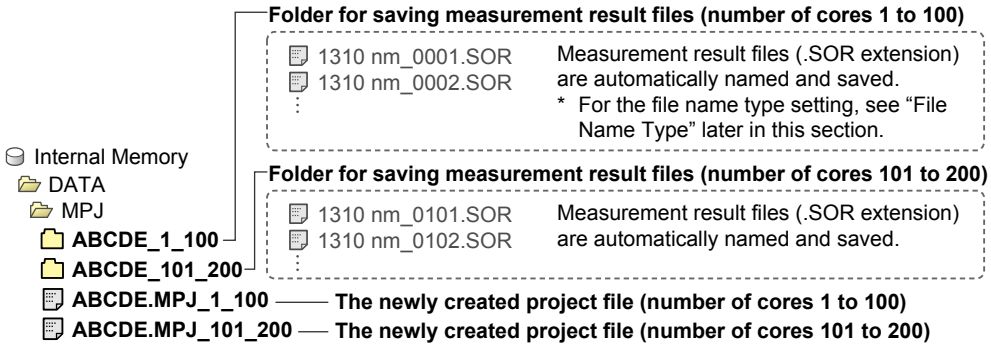
Note

- When you set a different project name, a new project file (.MPJ extension) and a new folder for saving measurement result files (.SOR extension) are created. At this point, a message will appear asking you whether you want to inherit the core information, measurement conditions, and analysis conditions from the current project or reset them to their default values. Select whichever is appropriate.
  - **Initialize setting**
    All the project settings will be initialized.
  - **Takeover current setting**
    A project with the same settings as the current project will be created.
- The project file name and the folder name for saving measurement results files will both be set to the project name that you entered.

When the number of cores is 100 or less



When the number of cores exceeds 100



The start and end core numbers in the project are appended to the project name. If you will set the number of cores to 97 or higher, first set Num of Units to 10 cores (see next page). Numbers are rounded to the nearest hundred and appended.

Example when the number of cores is 150:

If the start number is 1, ABCDE_1_100.MPJ, ABCDE_101_200.MPJ (151 to 200 are skipped)

If the start number is 121, ABCDE_101_200.MPJ (101 to 120 are skipped), ABCDE_201_300.MPJ (271 to 300 are skipped)

Since numbers are rounded to the nearest hundred, the end number is 200 or 300 even when there are only 150 cores.

If the “Enable to create over 100 fibers” check box is selected, a message confirming whether a project with 100 or more cores is to be created appears when you press ESC to close the project setup screen.

- If you select OK and press ENTER, a project with 100 or more cores is created.
- If you select Cancel and press ENTER, a message confirming whether the project setup screen is to be closed without creating a project appears.
  - If you select OK and press ENTER, the project setup screen is closed, and the main view screen returns.
  - If you select Cancel and press ENTER, the original project setup screen returns.

Number of Cores or Tapes

Set the number of cores or tapes in the following range.

Tape No	Number of Cores or Tapes	
OFF	Number of cores: 10 to 100 (10 cores)	8 to 96 (8 cores)
a-b(2)	Number of tapes: 10 to 50	1 to 50
a-c(3)	Number of tapes: 10 to 33	1 to 33
a-d(4)	Number of tapes: 10 to 25	1 to 25
a-e(5)	Number of tapes: 10 to 20	1 to 20
a-f(6)	Number of tapes: 10 to 16	1 to 16
a-g(7)	Number of tapes: 10 to 14	1 to 14
a-h(8)	Number of tapes: 10 to 12	1 to 12

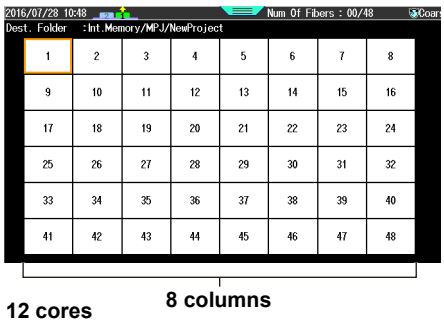
You can set the number of cores in steps of 8 when the number of cores in each division is set to “8 cores” and in steps of 10 when the number of cores in each division is set to “10 cores.”

Example: When the number of cores in each division is set to “8 cores,” even if you set the number of cores to 12, it will be set to 16.

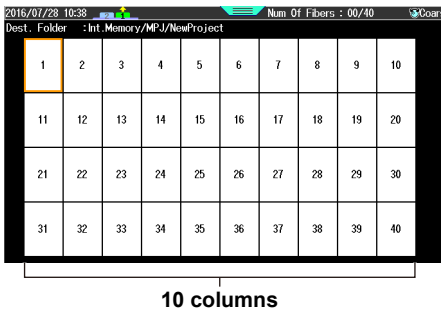
Number of Cores in Each Division

When Tape No is set to OFF, you can set the number of columns shown on the main view screen. If you will set the number of cores to 97 or higher, first set Num of Units to 10 cores.

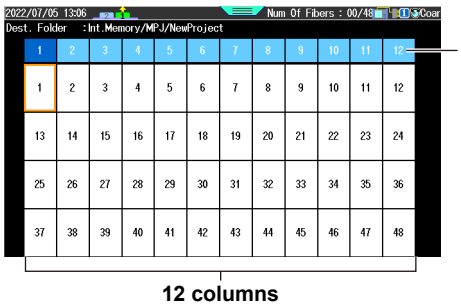
8 cores



10 cores



12 cores



In the project settings, setting "Linkage OSW control" to ON causes optical switch port numbers to appear. When you select the numbers of the cores to be measured and execute a measurement, the optical switch changes automatically.
When "Measure all channels" is set to ON, after the averaged measurement of the selected core is completed, the channel is switched to measure the next core, and the averaged measurement continues.

File Name Type

Set the file name type for measurement result files (.SOR extension) to one of the following options.

- WL + No. Example: 1310 nm_0001.SOR
- No. + WL
- Project Name + WL + No.
- No. + Project Name + WL
- WL + Project Name + No.

Measurement Conditions

After a project setup is complete and multi-core fiber measurement is started, if measured data is already saved, changing the following measurement conditions will cause a confirmation screen for deleting the measured data to appear. If you confirm, all measured data is deleted.

- Wavelength
- Distance Range
- Pulse Width
- Attenuation
- Sample Interval
- Average Method
- Average Unit
- Average count and average duration
- Initialization

For details on measurement conditions, see page 2-5 and subsequent pages.

Analysis Conditions

After a project setup is complete and multi-core fiber measurement is started, if measured data is already saved and event analysis has already been executed, changing the following analysis conditions will cause a confirmation screen for re-executing the entire event search to appear. If you confirm, event search will be executed.

- Index of refraction (IOR)
- Backscatter level
- Event search conditions

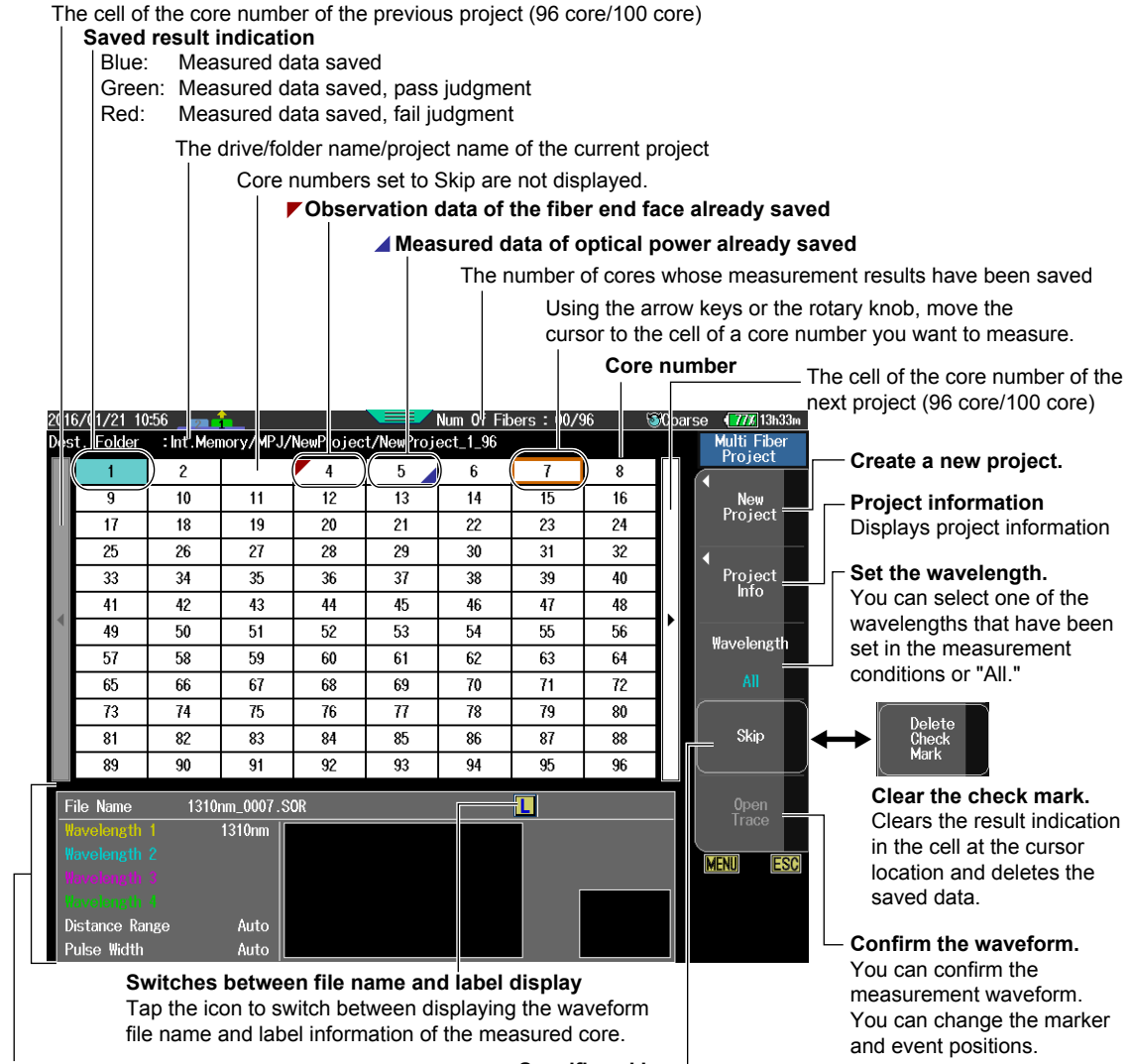
If Pass Fail Judgement is set to ON, pass/fail judgment will be re-executed. The measured data up to that point will be retained.
If you change the Pass Fail Judgement conditions, pass/fail judgment will be re-executed on all waveforms.
For details on analysis conditions, see page 2-10 and subsequent pages.

Note

- When you change measurement core information, measurement conditions, or analysis conditions, the project file (.MPJ extension) is automatically overwritten.
- If the number of cores exceeds 100, measurement conditions and analysis conditions cannot be changed.

Main View Screen

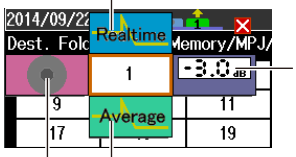
1. From the top menu, select **Multi Fiber Project** to display the following screen.



2. Using the **arrow keys** or the **rotary knob**, move the cursor to the cell of a core number you want to measure.

Note

To measure the optical power and observe the fiber end face, tap a core No.



Realtime
Performs real-time measurement. Operates in the same manner as the REALTIME key.

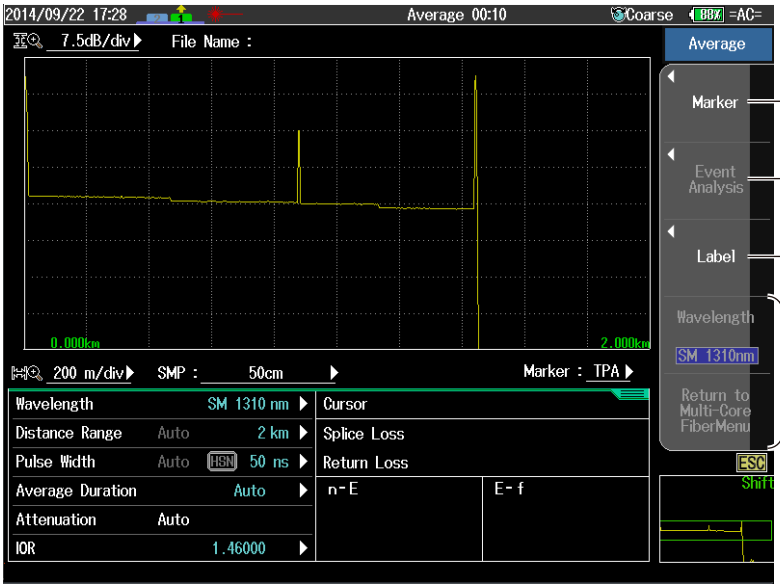
Optical power measurement (see section 5.2)

Average
Performs averaged measurement. Operates in the same manner as the AVG key.

Fiber inspection probe
Observe the fiber end face. See section 9.6.

Averaged Measurement

3. Press **AVE** to start an averaged measurement.
   The screen shows the measurement waveform, and the Average menu appears. During measurement, a mark appears at the top of the display to indicate that the laser light is on.



Set markers.
See section 4.1.

Cannot be selected during measurement.

Create labels.
You can enter a label for each core. Enter the label characters by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

Cannot be selected during measurement.

Note

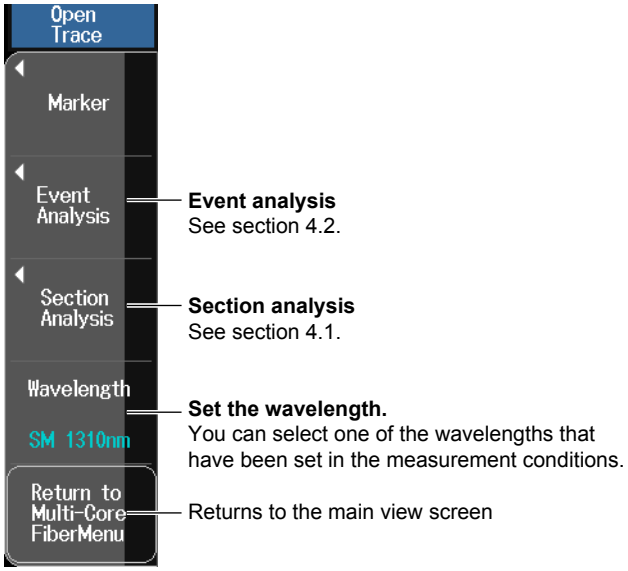
- If Wavelength on the main view screen is set to “All,” measurement is executed using multiple wavelengths for each core.
- If you enter the label characters in the label setting of the project setup screen, the same label characters can be entered at once for all cores.

When Auto Save is Set to ON in the Project Measurement Conditions

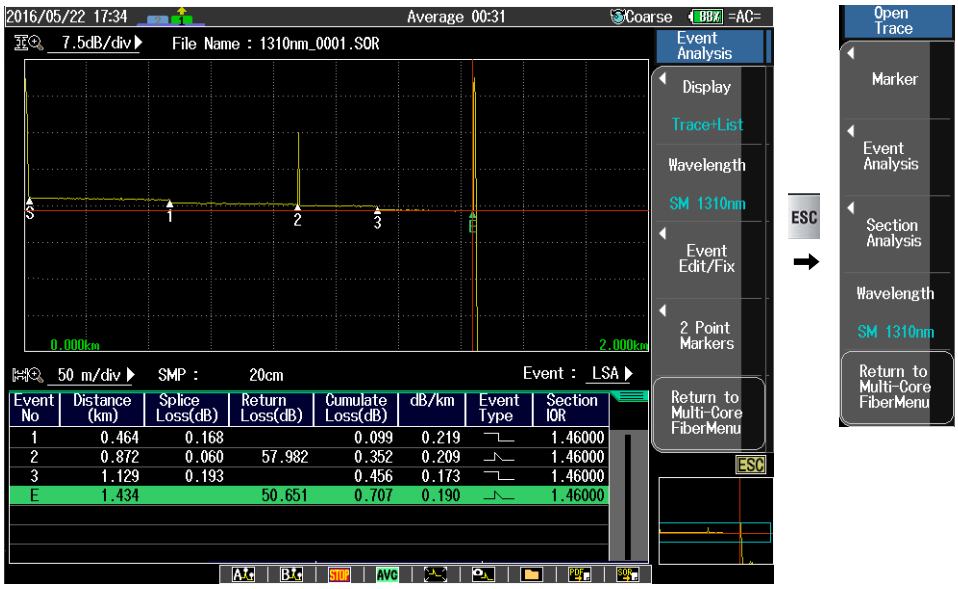
When measurement is complete, the measured results are automatically saved. The main view screen appears, and pass/fail judgment indications appear in the core number cells whose measurement results have been saved.

When Auto Save is Set to OFF in the Project Measurement Conditions

When measurement is complete, the measured results are not automatically saved. The Open Trace menu appears. When returning to the main view screen, a message for confirming the saving of the measured results appears. If necessary, you can save the measured results.



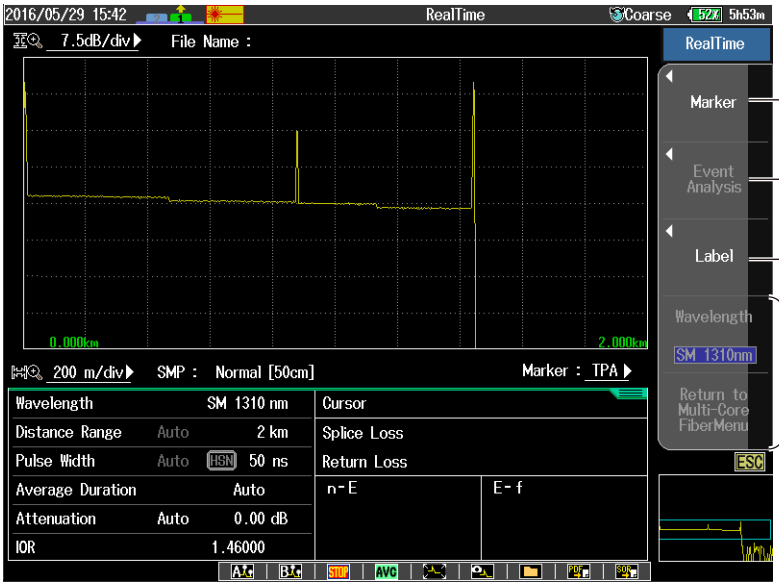
- If Event Search is set to Auto, after measurement is complete, the event screen and event analysis menu appear.



Real-time Measurement

3. Press **REAL TIME** to start the measurement of “Wavelength 1.”

The screen shows the measurement waveform, and the RealTime menu appears. During measurement, a mark appears at the top of the display to indicate that the laser light is on.



Set markers.
See section 4.1.

Cannot be selected during measurement.

Create labels.
You can enter a label for each core. * Enter the label characters by following the procedure provided in “Entering Character Strings” in the Getting Started Guide IM AQ7280-02EN.

Cannot be selected during measurement.

4. During measurement, press **REAL TIME** to stop the measurement.

The Open Trace menu appears (see the Open Trace menu for the averaged measurement on the previous page). When returning to the main view screen, a message for confirming the saving of the measured results appears. If necessary, you can save the measured results.

Note

- In real-time measurement, measured results are not automatically saved.
- If Wavelength on the main view screen is set to “All,” measurement of “Waveform 1” is executed. To measure “Wavelength 2” and later, save the measured results of “Waveform 1,” and then press the **Wavelength** soft key in the Open Trace menu to switch the wavelength.
- If you enter the label characters in the label setting of the project setup screen, the same label characters can be entered for all cores.

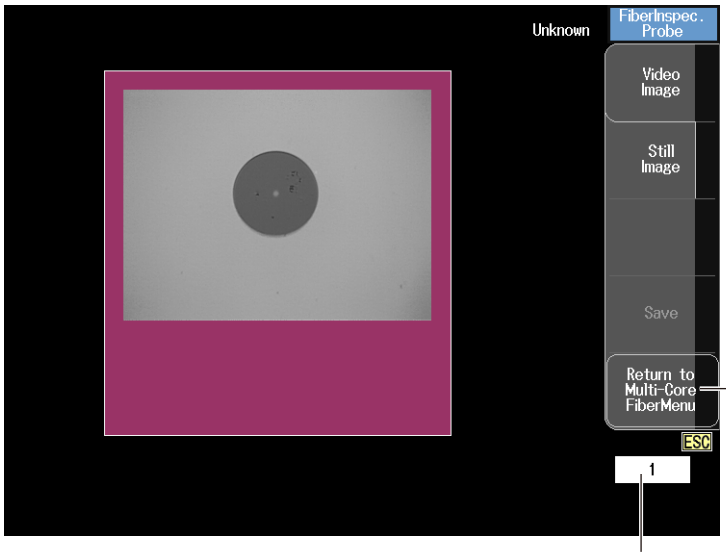
Optical Power Measurement

3. Tap a **core number** to display a measurement item menu.
4. Tap **Power Meter** to display the following screen.
   For details on how to operate the optical power meter, see section 5.2.

5. Press the **Save** soft key. Up to three sets of measured data will be saved.

Observing the Fiber End Face

3. Tap a **core number** to display a measurement item menu.
4. Tap **FiberInspec. Probe** to display the following screen.
   For details on how to use the fiber inspection probe, see section 9.6.



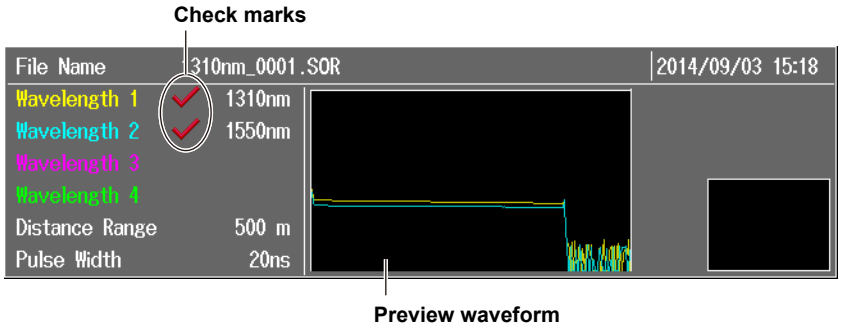
Previewing Measured Results

Using the **arrow keys** or the **rotary knob**, move the cursor to a core number cell with a pass/fail judgment result indication on the main view screen. The preview area at the bottom of the screen displays the measurement conditions, measurement date, and the measurement result waveform of the selected core number. For details on pass/fail judgment, see page 2-13.

Optical Pulse Measurement Results

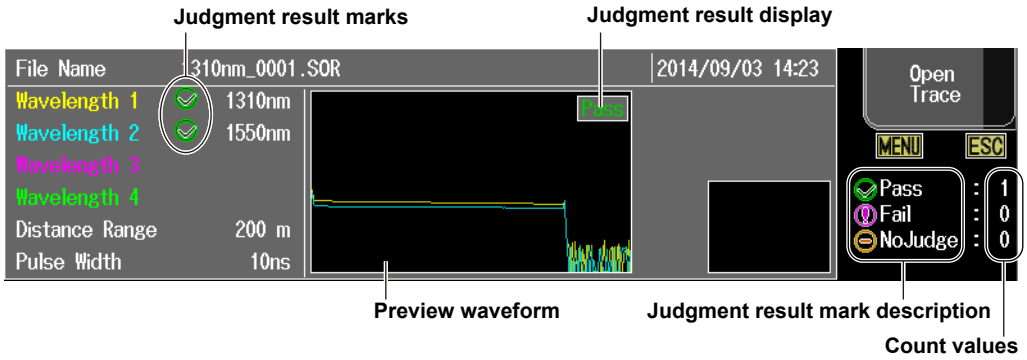
- **When Pass Fail Judgement Is Set to OFF**

  Check marks appear next to the wavelengths for which measured data is saved.



- **When Pass Fail Judgement Is Set to ON**

  Judgment result marks appear next to the wavelengths for which measured data is saved.



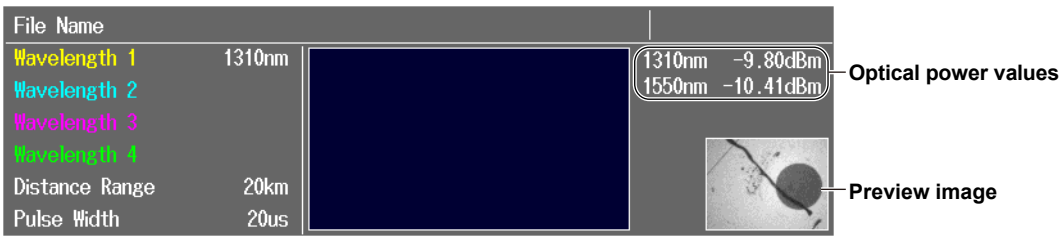
Note

NoJudge display

If an MPJ file of an older version is loaded, the file may contain core information whose event analysis has not been executed even when Pass Fail Judgement is set to ON. If this occurs, you can turn off the display of Pass Fail Judgement setting once and then turn it back on so that pass/fail judgment is executed again on the measured data and pass or fail is indicated.

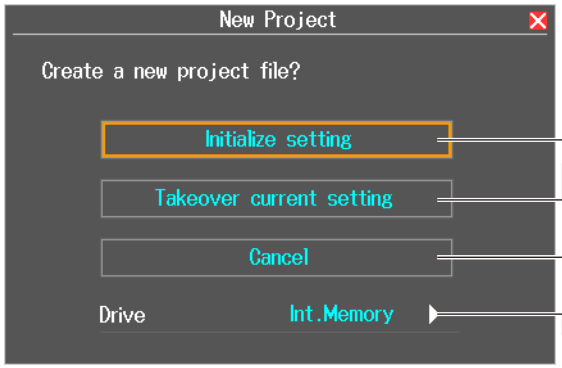
Optical Power Measurement Results and Fiber End Face Observation Results

The optical power of the measured wavelength is displayed. An image data is displayed for the observation result the fiber end face.



Creating a New Project

Press the **New Project** soft key. A character input dialog box will open. Enter a project name by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN. Tap **Enter** on the character input dialog box to display the following screen.



Initialize setting
Initializes the settings of the current project and creates a new project

Takeover current setting
Duplicates the settings of the current project to create a new project

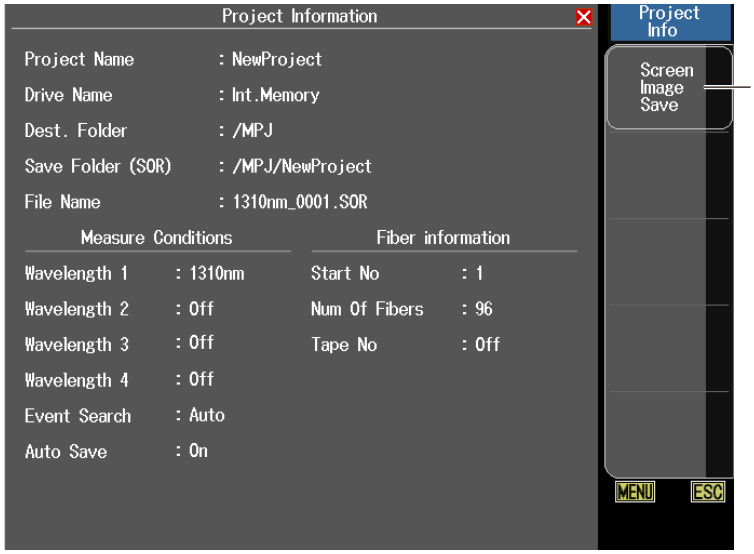
Cancel
Cancels the creation of a new project.

Set the project save destination (Int.Memory, SD Card, USB Memory 1, USB Memory 2).

Tap **Initialize setting** or **Takeover current setting**. A new project will be created, and the main view screen will appear. To change the project settings, see “Entering Measurement Core Information” on page 2-37.

Viewing the Project Information

Press the **Project Info** soft key to display the following screen. You can check the settings.



Saves a screen image

Saving the Project

The project file and measurement result files of each core can be compressed in MPZ format and saved.

For the procedure to save files, see section 7.3.

Note

Decompressing MPZ Files

On the File menu of the AQ7932 OTDR Emulation Software (version 5.01 or later), click Batch Conversion and then MPZ. Select the source file (MPZ file) and the conversion destination. An MPJ file and SOR files will be extracted.

AQ7932 (sold separately) is a PC software application for analyzing and creating reports of waveform data measured by the AQ7280.

Loading a Project

An MPJ file created using the “multi-core fiber project editor” feature included in the AQ7932 OTDR Emulation Software can be loaded in to the AQ7280.

Note

- On the AQ7280, you can only create projects whose measurement conditions of all cores are the same. The “multi-core fiber project editor” can be used to create projects whose measurement conditions are different for each core.
- To load a past project into the AQ7280, you need an MPJ file and an SOR file (data saved with the project).

2.9 Monitoring Optical Fiber Cables (/MNT option)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

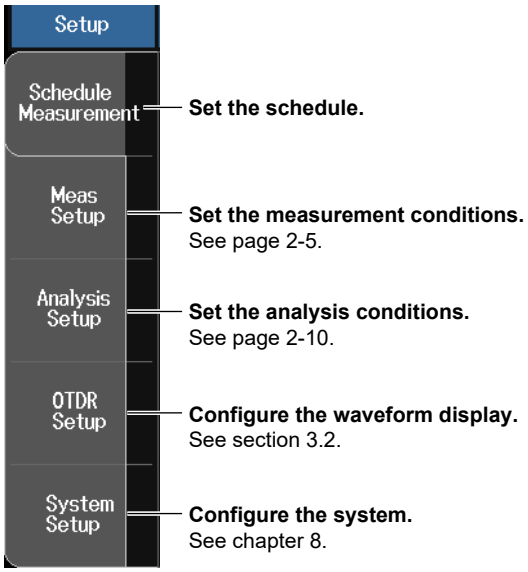
French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

Setup Menu

1. From the top menu, select **Schedule Measurement**.
2. Press **SETUP** to display the Setup menu.



Set the schedule.

Set the measurement conditions.
See page 2-5.

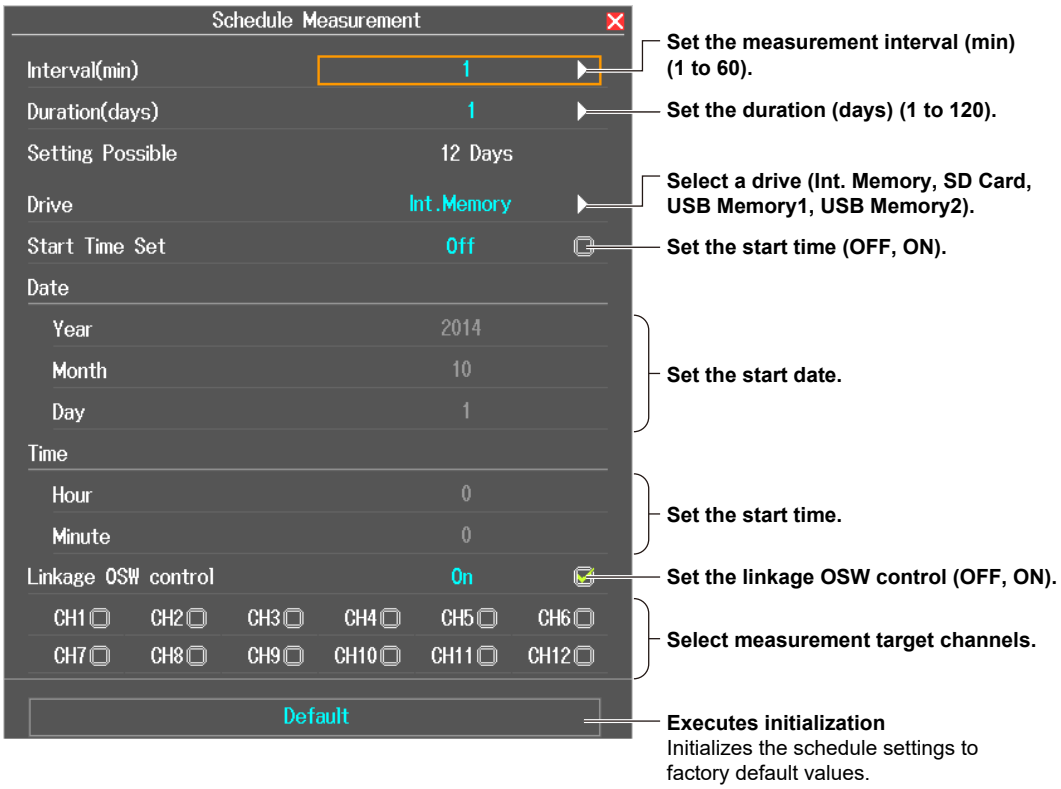
Set the analysis conditions.
See page 2-10.

Configure the waveform display.
See section 3.2.

Configure the system.
See chapter 8.

Setting the Schedule

Press the **Schedule Measurement** soft key to display the following screen.



Interval (min)

Set the interval to measure optical pulses. The range is 1 to 60 minutes (in 1 minute steps).

Duration (days)

Set the duration to measure optical pulses. The range is 1 to 120 days (in 1 day steps).

Setting Possible

The number of days is automatically calculated from the measurement interval and the size of the memory in which measured data will be saved. The result is displayed here. Select the drive according to the required duration. Note that even if a number greater than 120 is displayed, the maximum duration (days) that you can set is 120.

Start Time Set

Measurement can be started from the specified time.

OFF: Measurement starts immediately.

ON: Measurement starts at the specified date and time.

Selecting Measurement Target Channels

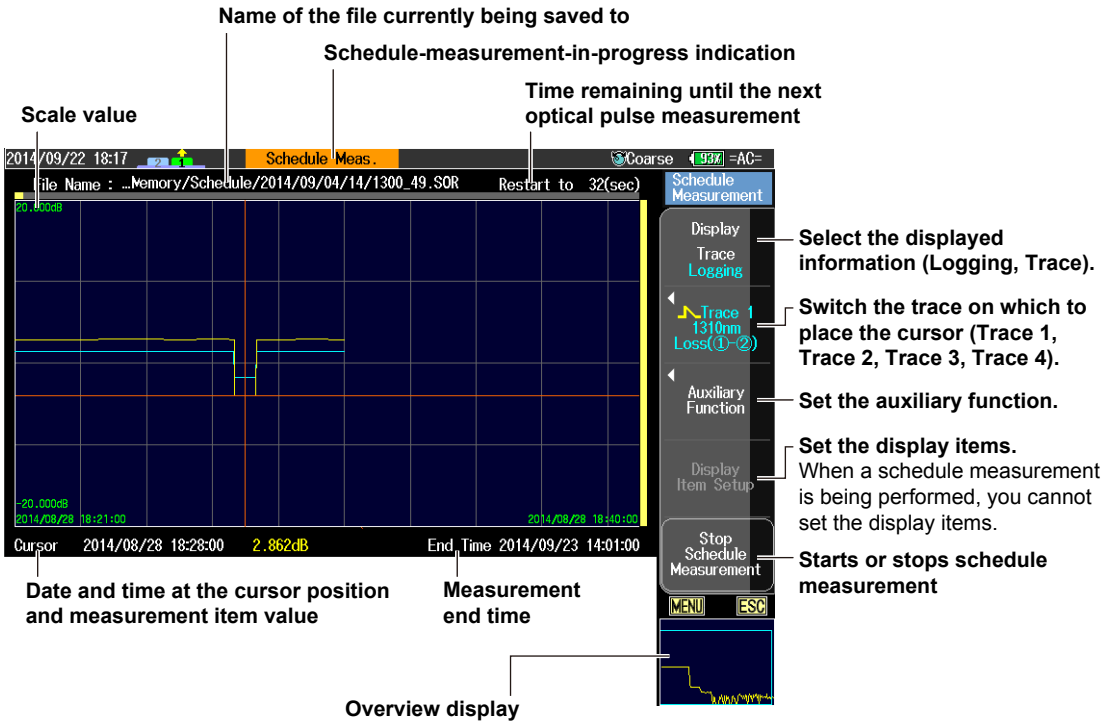
Select the channels for schedule measurement. When “Linkage OSW control” is set to ON, the optical switch for the target channel in schedule measurement switches automatically in sync with the measurements.

Note

- When a schedule measurement is being performed, you cannot change the schedule.
- When a schedule measurement is being performed, you cannot perform marker analysis or event analysis. When a schedule measurement is stopped, you can perform marker analysis or event analysis on the measurement waveform data. But, you cannot save the analysis results.

Main View Screen

1. From the top menu, select **Schedule Measurement** to display the following screen.



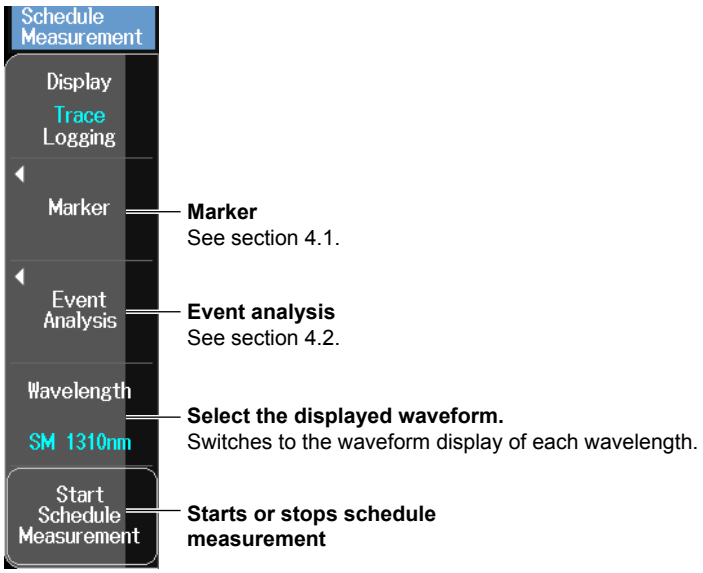
Displayed Information

- **Logging**

  The measured optical pulse power values are logged on the time axis. You can view the places where the optical power is changing. Also, you can view the date and time and the power value at the cursor position.

- **Trace**

  You can display the waveform data at the cursor position. While waveform data is being displayed, the menu changes.



Note

The following operations cannot be performed when optical pulse measurement is in progress.

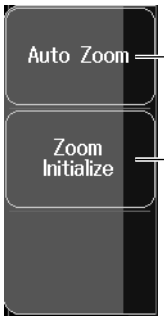
- Moving the cursors
- Switching the display (between waveform and logging)
- Auxiliary function

Switch the Trace on Which to Place the Cursor

Switches the logging data to display on the screen. If the monitor item is set to off as described later in “Setting Display Items,” Trace is not displayed.

Auxiliary Function

Press the **Auxiliary Function** soft key to display the following menu.

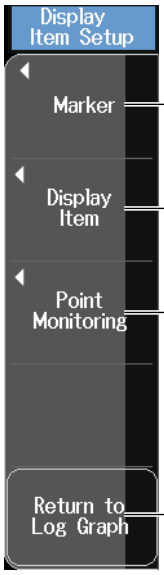


Auto zoom
Automatically zooms the logging data scale

Zoom initialization
Initializes the scale

Setting the Display Items

2. Press the **Display Item Setup** soft key. A message screen appears (set the markers need for item displaying in advance).
3. Select OK, and press **ENTER**. A display item setup menu appears.



Marker
See section 4.1.

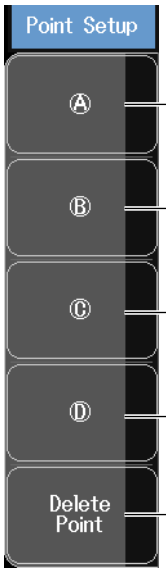
Set display items.

Set point monitoring.

Returns to the main view screen

Setting Points

4. Press a **point setting** soft key to dislay a point setup menu.



Sets point Ⓐ
Sets point Ⓐ at the cursor position.

Sets point Ⓑ
Sets point Ⓑ at the cursor position.

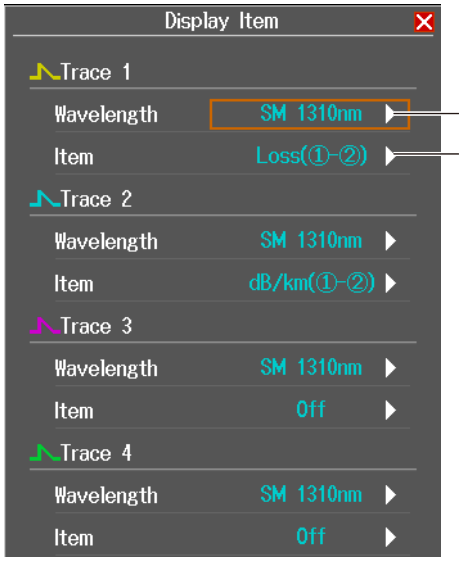
Sets point Ⓒ
Sets point Ⓒ at the cursor position.

Sets point Ⓓ
Sets point Ⓓ at the cursor position.

Clears the point display

Setting Display Items

5. Press the **Display Item** soft key to display the following screen.



Set the wavelength.

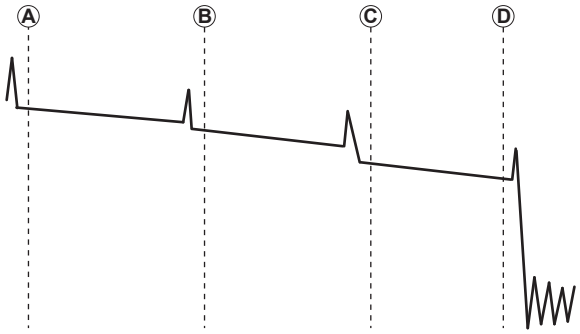
Select the monitor item (Splice Loss, Return Loss, Loss (① - ②), dB/km (① - ②), Loss (② - ③), dB/km (② - ③), Point Ⓐ, Point Ⓑ, Point Ⓒ, Point Ⓓ, OFF)

Note

- If markers are not set, after the first measurement, a ① marker is set automatically to the near end of the waveform data and a ② marker to the far end.
- When a schedule measurement is being performed, you cannot set the display items.
- When a schedule measurement is being performed, you cannot perform marker or event analysis even if you switch to waveform display.

- **Monitoring Measured Values between Markers (Splice loss, return loss, loss(①−②), dB/km(①−②), loss(②−③), dB/km(②−③))**
  To display monitor items, you need to set markers. Averaged measurement and real-time measurement can be performed even when the schedule measurement screen is displayed. Connect the optical fiber cable to be monitored and execute an optical pulse measurement. Then set the markers necessary for item display (events). For details on how to set markers, see section 4.1. For details on the items, see “Splice Loss” in section 1.4.

- **Monitoring Measured Values at Fixed Points (Point Ⓐ, Point Ⓑ, Point Ⓒ, Point Ⓓ)**
  Monitors the variation in the measured values at the specified points. You can set up to four points.

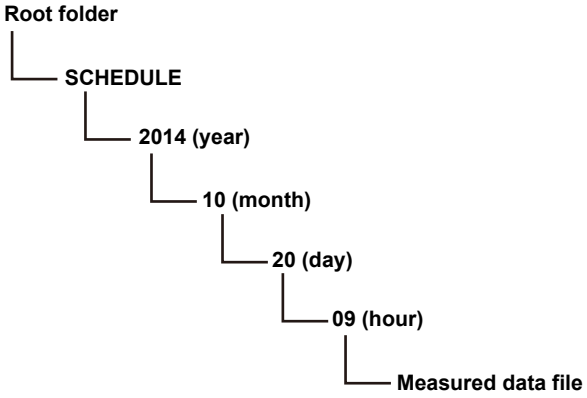


Starting a Schedule Measurement

5. Press the **Start Schedule Measurement** soft key. Measurement will start according to the start time setting.
To stop an ongoing schedule measurement, press the **Stop Schedule Measurement** soft key.

Save Destination File Name

Schedule measurement data is saved to the following path.



In the above example, the save destination of a file saved at 9:00 on October 20, 2014 is shown.
The file name is
wavelength_min.SOR.
The name of the file for 1310 nm and 9:20 is
1310_20.SOR

Schedule Data (Logging graph data)

When a schedule measurement finishes, logging graph data in CSV format is automatically saved in root folder/SCHEDULE. The time when a scheduled measurement begins is used for the file name.

Example:

If a measurement started at 13:01 on October 23, 2014, the file name is 201410231301.CSV.

Loading Schedule Data

If the CSV file and SOR waveform data during the scheduled period are saved in a similar file and folder configuration as described above, you will be able to analyze the graph and waveform again when the CSV file is loaded into the AQ7280.

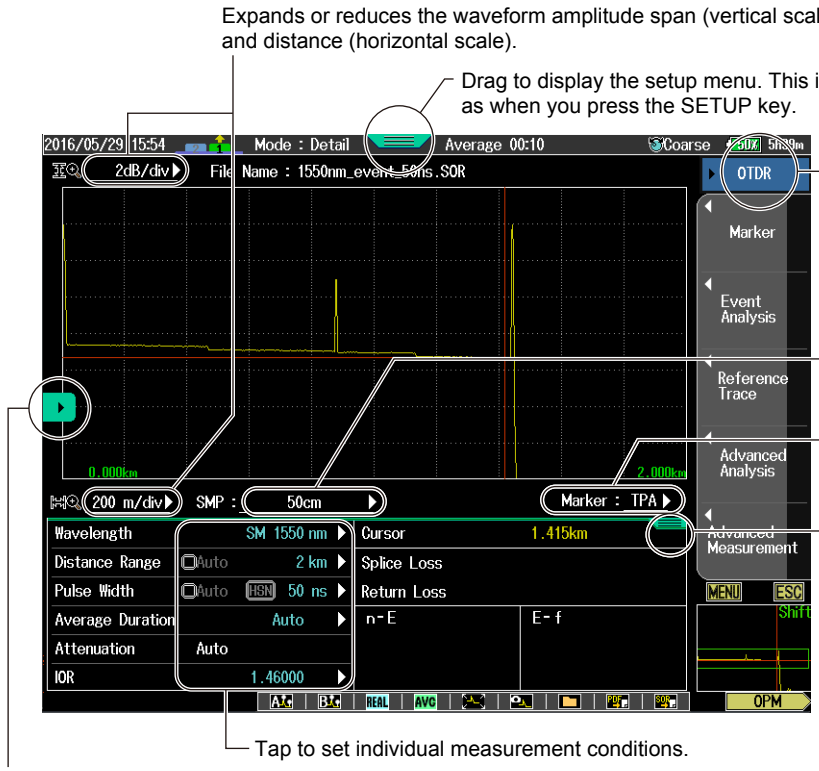
Note

- Set the average duration in the measurement conditions to a value other than Auto.
- Set the average duration to a value shorter than the measurement interval (min).

2.10 Using Convenient Touch Operation Features

The AQ7280 screen is a touch panel. On the screen, there are several setup menus and measurement functions that you can access through the touch panel. You can start a different function while a measurement function is running or view the waveform by zooming in.

Screen (OTDR)



Zooming the Screen

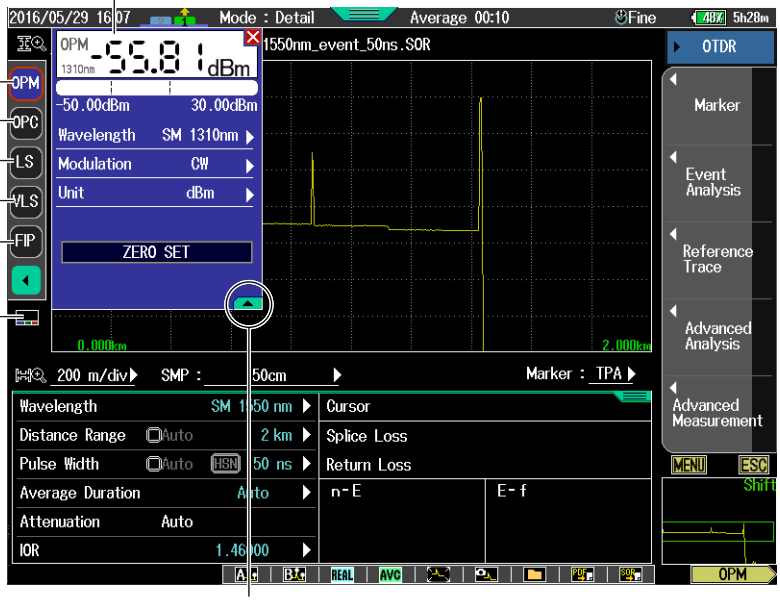
You can reduce the menu display area and expand the waveform display area.

Starting the Light Source or Optical Power Meter (Utility menu)

When an optical pulse measurement is in progress, you can use the OPM module or VLS module that is installed in the AQ7280.

Tap a function name to start the operation screen for the optical power meter, light source, and so on.

Example in which the optical power meter is displayed on the optical pulse measurement screen



Optical power meter

Power checker

Light source

Visible light source

Fiber end face inspection probe

Arrange the operation screen for the light source, optical power meter, and so on

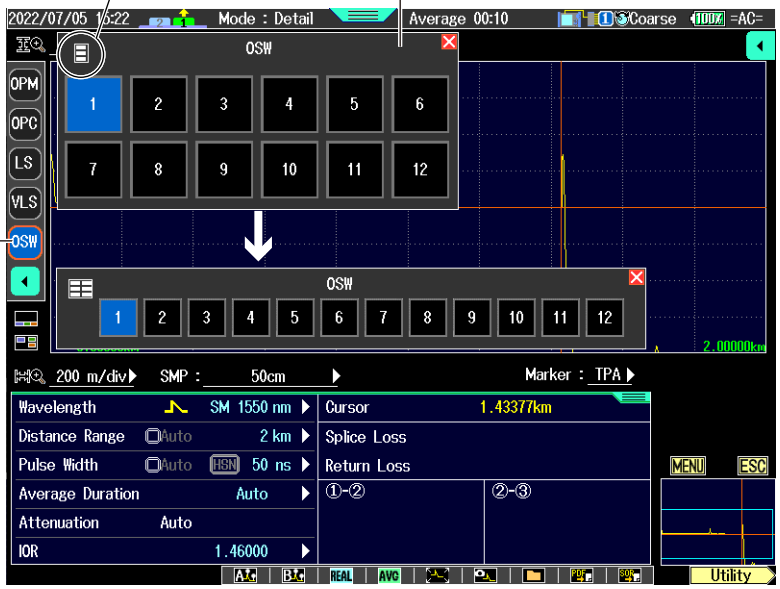
Tap to move the operation screen arrangement.

* The optical power meter and power checker cannot be displayed simultaneously.

Tap to hide the setup menu.

Tapping this causes the optical switch to be displayed in a single row.

Example in which the optical switch is displayed on the optical pulse measurement screen



Optical switch control

When an optical switch box is connected, this indicator changes from FIP to OSW.

Arranging the Operation Screen for the Light Source, Optical Power Meter, and So On

You can switch the arrangement of the operation screens as follows.

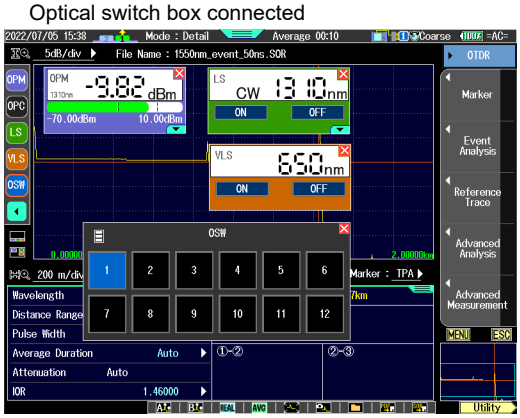
: Arranges over the entire screen

: Arranges at the bottom of the screen

- **Arrange over the entire screen**
  The setup menu for the light source and optical power meter can be used.

Optical switch box not connected

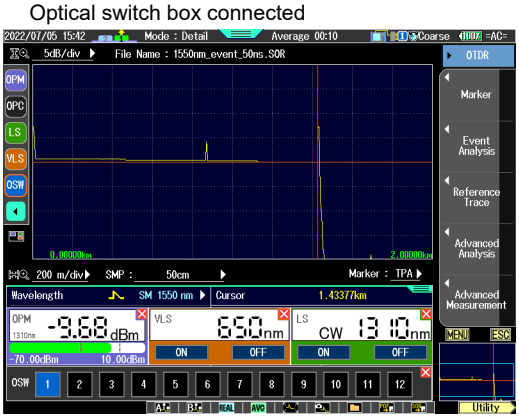
Optical switch box connected



- **Arrange at the bottom of the screen**
  The operation screens are arranged at the bottom. You can use the light source and optical power meter while measuring OTDR waveforms.

Optical switch box not connected

Optical switch box connected



When arranged at the bottom of the screen, the operation screens are arranged in order from the bottom left. The light source, optical power meter, and other operation screens have an order of precedence. If you close an operation screen with a higher order of precedence, the other operation screens will shift to the left fill in the space. If an operation screen with a higher order of precedence is opened, it will be inserted on the left side.

Order of precedence: 1: Fiber end face inspection probe
2: Optical power meter, power checker
3: Visible light source
4: Light source

For details on how to operate the OPM module and VLS module, see the following sections.

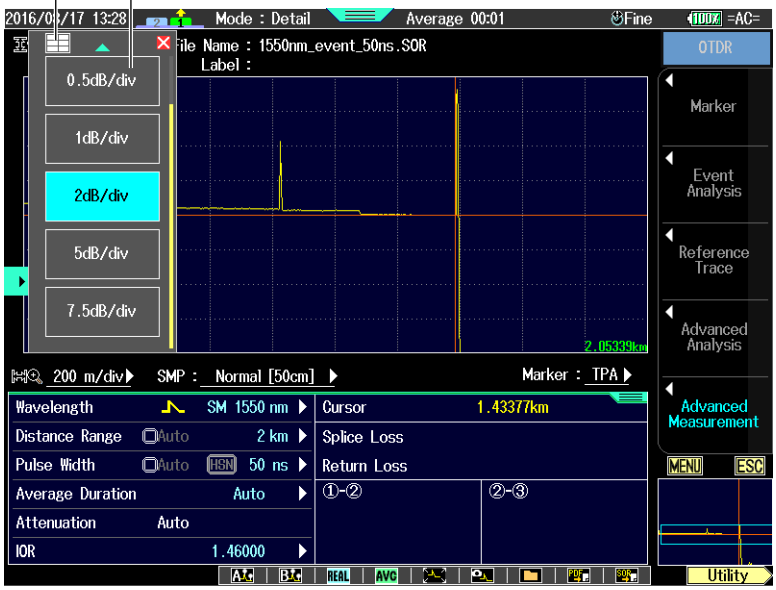
- Optical power meter: Section 5.2
- Power checker: Section 5.2
- Light source, visible light source: Section 5.1
- Fiber end face inspection probe: Section 9.6
- Optical switch control: Chapter 6

Changing the Scale

You can set the waveform amplitude span and the distance axis.

Switch the menu display.
Tap to switch the menu display.

Set the display range.
Flick to scroll the menu.



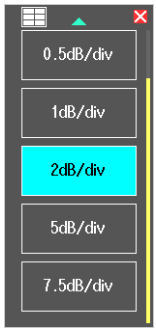
Switching the Menu Display

You can switch the menu display as follows.

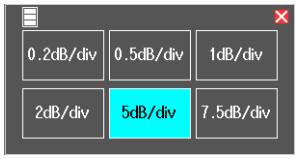
: The menu is displayed in a tabular form.

: The menu is displayed in a scrollable form.

- **Scrollable form**



- **Tabular form**



Other Convenient Features

Cursor Movement

Tap a waveform display area to move the cursor to that position. You can also drag the cursor to move it.

Setting Markers and Adding and Deleting Events

When you move the cursor, marker setting icons for 4 Point Markers (when Marker Mode is set to Marker) or 5 Point Markers (when Marker Mode is set to Line) above the cursor. You can set a marker at the cursor position simply by tapping an icon. When you move the cursor on the event screen, an icon for adding or deleting an event appears. You can set markers directly and add and delete events without using the marker or event edit soft key menu.

Zooming In and Out

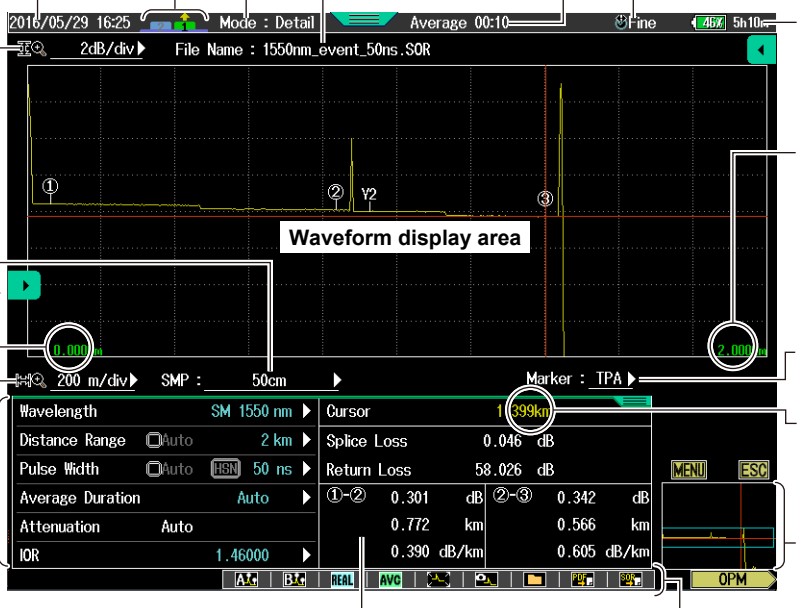
Double-tap a waveform display area to zoom the waveform display relative to that position. When you double-tap, the vertical and horizontal scales are zoomed with the same magnification. Pinch out on the waveform display area to zoom in vertically or horizontally depending on the direction of your finger movement. Pinch in on the waveform display area to zoom out vertically or horizontally depending on the direction of your finger movement.

Shortcut Execution

You can perform functions such as starting and stopping measurement and saving files by tapping the shortcut icons displayed at the bottom of the screen without displaying the soft key menu for those functions. For details on shortcut icons, see section 3.1.

3.1 Waveform Display Screen

Display Screen



Value per division on the vertical axis

Date and time
See the Getting Started Guide, IM AQ7280-02EN.

The OTDR port emitting light

Measurement mode
See section 2.1.

File name
The name of the measurement data file that is currently displayed For details on file names, see section 7.5.

Progress during averaged measurements (AVG)
The progress bar behind the characters indicates progress. See section 2.2.

Cursor movement resolution See section 3.3.

Battery level/AC
See the Getting Started Guide, IM AQ7280-02EN.

Position of the right edge of the screen
When the distance reference is set, this displays the distance from the distance reference to the position of the right edge of the screen.

Waveform display area

Sample interval
See page 2-6.

Marker approximation method
See pages 2-3 and 2-4.

Distance from the horizontal axis' measurement reference point to the cursor position
See section 4.1.

Full screen display of the waveform display area
The section that is displayed in the waveform display area is represented by a box (overview). See section 3.3.

Measurement conditions
See section 2.1.

Marker section measured values
The attenuation, distance, and attenuation per km between the markers are displayed.

Distance per division on the horizontal axis

Shortcut icons
Shortcut feature for starting measurement, saving data, and so on.

Position of the left edge of the screen
When the distance reference is set, the position of the distance reference is 0, and this displays the distance from the distance reference to the position of the left edge of the screen as a negative value.

Shortcut Icons

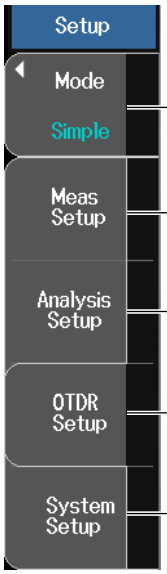
Tapping a shortcut icon performs one of the following functions.

Icon	Function
	Preset marker Ⓐ is applied to the waveform. (see section 4.1).
	Preset marker Ⓑ is applied to the waveform. (see section 4.1).
REAL STOP	Starts or stops real-time measurement (see section 2.5). The icon toggles every time you tap.
AVG STOP	Starts or stops averaged measurement (see section 2.2). The icon toggles every time you tap.
	Initializes the scale (see section 3.3).
*	Makes a reference trace (see section 2.7).
	Displays a file list (see section 7.3).
*	Converts waveform data into a PDF file (see section 7.8).
	Saves waveform data (see section 7.3).

3.2 Configuring the Waveform Display

Setup Menu

1. From the top menu, select **OTDR**.
2. Press **SETUP** to display the Setup menu.



Set the measurement mode.
See section 2.1.

Set the measurement conditions.
See section 2.1.

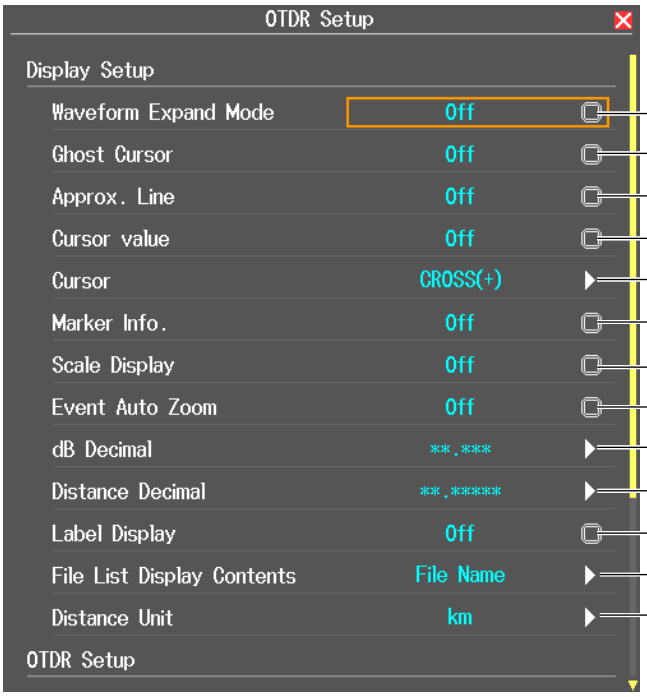
Set the analysis conditions.
See section 2.1.

Configure the waveform display.

Configure the system.
See chapter 8.

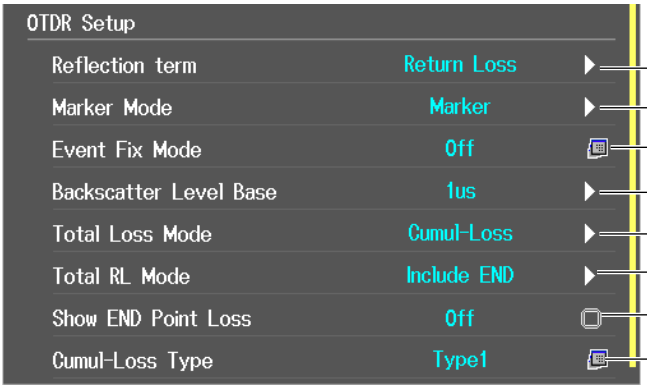
Configuring the Waveform Display

Press the **OTDR Setup** soft key to display the following screen.



Wavelength area expanded display (OFF, ON).
Ghost cursor display (OFF, ON)
Approximated line display (OFF, ON)
Cursor dB value display (OFF, ON)
Cursor display format (CROSS(+), LINE(¦))
Marker information display (OFF, ON)
Scale display (OFF, ON)
Event auto zoom display (OFF, ON)
dB decimal places (.*, **.**, **.***)**
Distance decimal places (.*, **.**, **.***)**
Label display (OFF, ON)
Set the file list (File Name, File Name + Label).
Set the distance unit (km, mi(mile), kf(kfeet)).*

When the screen is scrolled



Set the reflection term (Return Loss, Reflectance)
Set the marker mode (Marker, Line)
Set the event fix mode. See section 4.2.
Set the backscatter level base (1µs, 1ns).
Set the calculation method for total loss (Cumul-loss, Loss between S and E).
Set the calculation method for total return loss (Include END, Exclude END).
END point loss display (ON, OFF) (Firmware version 2.02 and later)
Set the cumul-loss type (Type1, Type2, Type3) (Firmware version 2.02 and later)

* Displayed when the language is not set to “Japanese” in the system setup. If set to “Japanese,” you can select whether to displaythe return loss or reflection level for the reflection value. (See section 3.2 in IM AQ7280-01JA.)

Waveform Expand Mode

You can reduce the measurement condition display area and the display area for measured values of the marker section and expand the waveform display area.

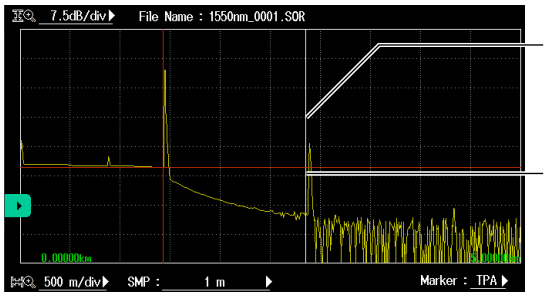
OFF: The waveform display area is not expanded.
ON: The waveform display area is expanded.

Ghost Cursor

The ghost cursor is used to check for secondary reflections. A secondary reflection is a reflection that is detected in a location where no event actually occurs.

OFF: The ghost cursor is not displayed.

ON: The ghost cursor is displayed.



- **How Secondary Reflections Are Generated**

  The optical pulse that is generated from position I in the following figure propagates in the direction of II.

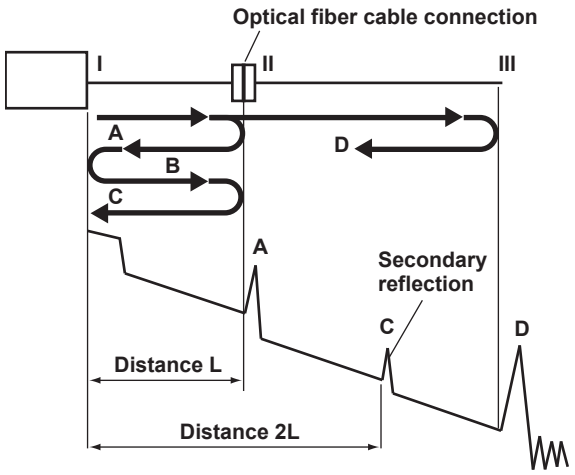
  ↓

  Light ray A that is reflected at connection II in the figure is reflected again at connection I and propagates in the direction of II as light ray B. At this point, the AQ7280 detects A as an event.

  ↓

  B is again reflected by connection II, and this generates reflected light ray C. At this point, the AQ7280 detects C as an event.

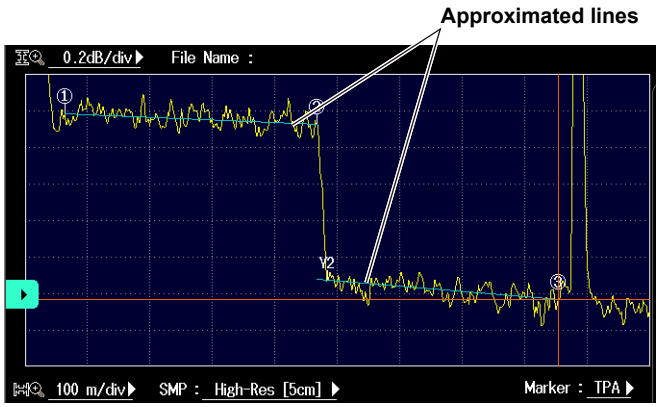
  Because the AQ7280 measures all the reflected light rays, A, C, and D, C is also detected as an event in the same manner that an actually generated reflection is. Therefore, while there is no actual event in this location, it appears as if an event has in fact occurred.



Approximated Lines

In the 4 Point or 5 Point marker modes, you can display the approximated lines that are used to calculate splice loss or return loss.

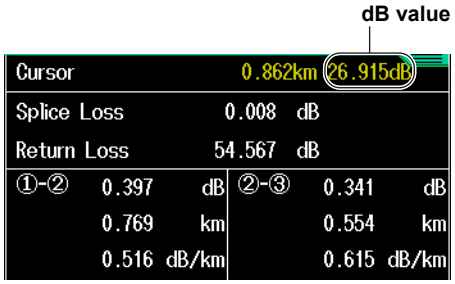
OFF: Approximated lines are not displayed.
ON: Approximated lines are displayed.



Cursor dB Value

You can display not only the distance at the cursor position, but also the dB value.

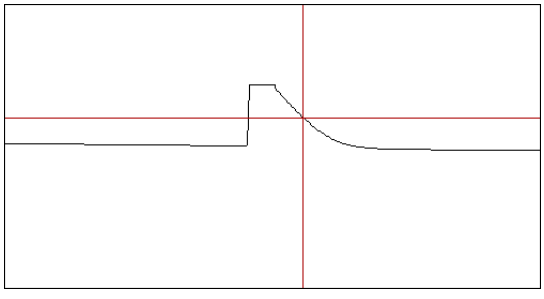
OFF: Only the distance at the cursor position is displayed.
ON: he distance and the dB value at the cursor position are displayed.



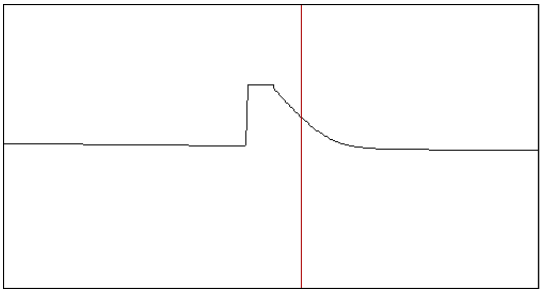
Cursor Display Format

You can select the cursor display format from the following.

CROSS(+): The position on the waveform is displayed with vertical and horizontal cursors that intersect.
LINE(¦): The position on the waveform is displayed with a vertical cursor.



Crosshair display

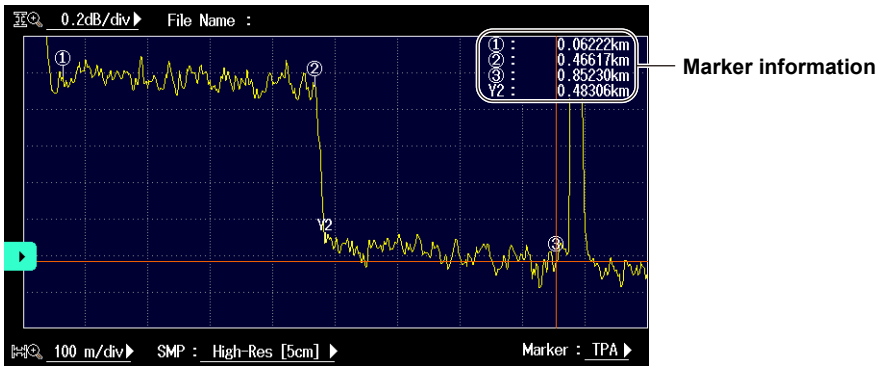


Line display

Marker Info.

You can display the distance from the measurement reference point to each marker on the waveform display area.

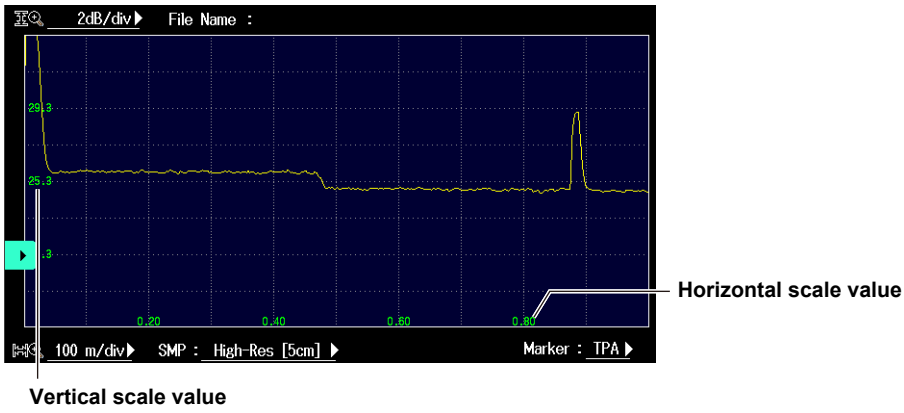
OFF: Marker information is not displayed.
ON: Marker information is displayed.



Scale Display

You can display the scale values on the vertical and horizontal axes.

OFF: Scale values are not displayed.
ON: Scale values are displayed.



Event Auto Zoom

When events have been detected, you can zoom in on the event at the cursor position or the selected event. Each time that you select a different event, the zoom ratio of the vertical and horizontal axes is adjusted automatically. For details about event editing, see section 4.2.

dB Decimal

You can select the number of decimal places of the dB display.

**.*: 1 decimal place
.: 2 decimal places
.*: 3 decimal places

Distance Decimal

You can select the number of decimal places of the distance display.

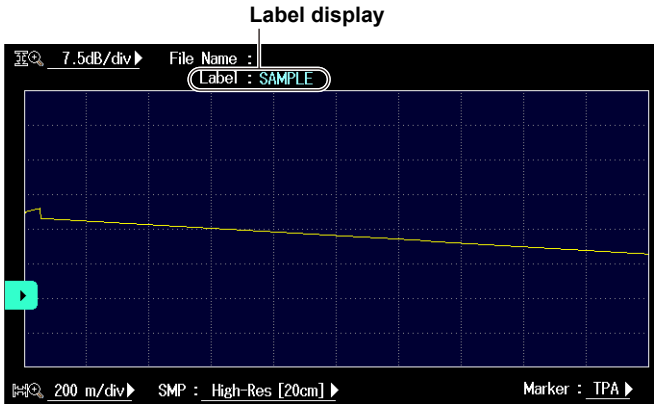
.*: 3 decimal places
.**: 4 decimal places
.***: 5 decimal places

Label Display

You can display labels at the top of the screen. For details on creating labels, see section 7.3.

OFF: Labels are not displayed.

ON: Labels are displayed.



Setting the File List

Select the file information you want to display on the screen.

File Name: FileName, Size, and Date are displayed on the file list screen.

File Name + Label: FileName, Label, Size, and Date are displayed on the file list screen.

Reflection Term

You can set the reflection display at the calculation result display area of measurement data to either of the following settings.

Return loss: The ratio of the incident optical power level and the reflected optical power level is displayed.

Reflectance: The reflected optical power level is displayed.

Marker Mode

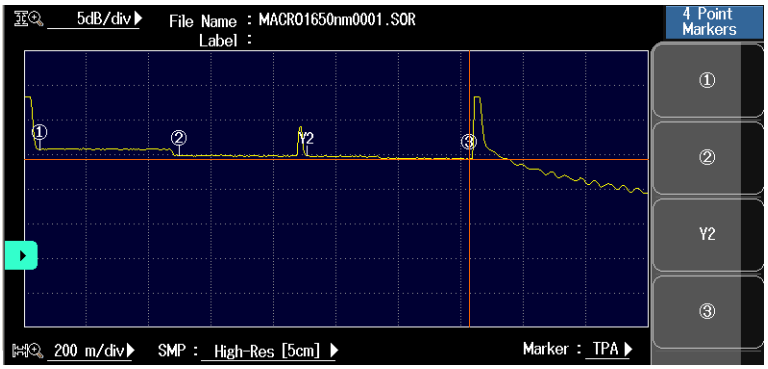
- **Marker**

  Move the cursor to the location that you want to measure, and set a marker. When you are measuring return loss and splice loss, they are calculated automatically when you set all the markers that are necessary for the measurement method that you are using.

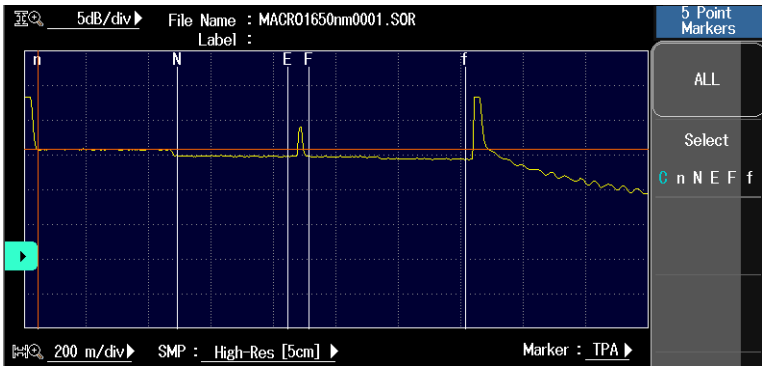
- **Line**

  After you select the line marker that you want to operate from a set of multiple line markers, move the selected line marker directly. The value of the line marker's section is calculated, and the return loss and splice loss are measured. Each value is calculated in real time as you move the line marker.

Marker mode



Line mode



Note

Line is often used outside of Japan. Marker is often used within Japan. It is used on existing YOKOGAWA models.

Backscatter Level Base

Select the reference pulse width for detecting backscatter. The selectable range of backscatter levels in the analysis conditions vary depending on the reference value. For details on backscatter, see page 2-10.

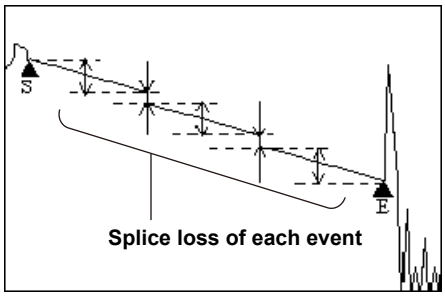
1µs: The range is –64.99 to –10.00.

1 ns: The range is –94.99 to –40.00.

Calculation Method for Total Loss

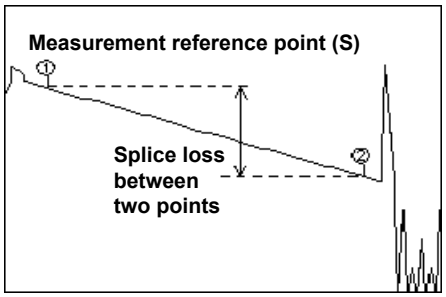
- **Cumul-Loss (Cumulate Loss)**

  The integrated value of the splice losses at each event from the measurement reference point (S) is displayed. This is the conventional calculation method (firmware version 1.02 and earlier).



- **Loss between S and E**

  The loss (TPA approximation method) between the measurement reference point (S) and the end of fiber (E) is displayed.



Note

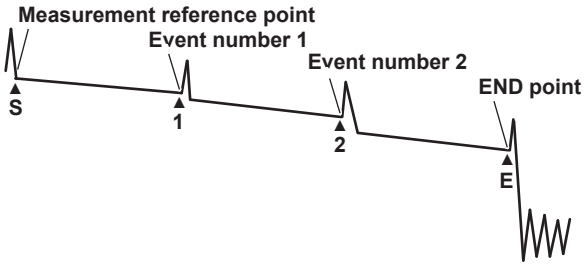
If Loss between S and E is selected, markers ① and ② are placed automatically at the measurement reference point (S) and the END point (E) when event analysis is executed.

Calculation Method for Total Return Loss

Select whether to include the return loss value at the end of fiber (E) in the total return loss.

Include END: The total return loss is calculated including the reflection at the END point. This is mainly used when a launch fiber is connected to the far end of the optical fiber cable under measurement and end event T is set in the launch fiber settings. The total return loss is calculated including the END point of the optical fiber cable under measurement and the connection point of the optical fiber.

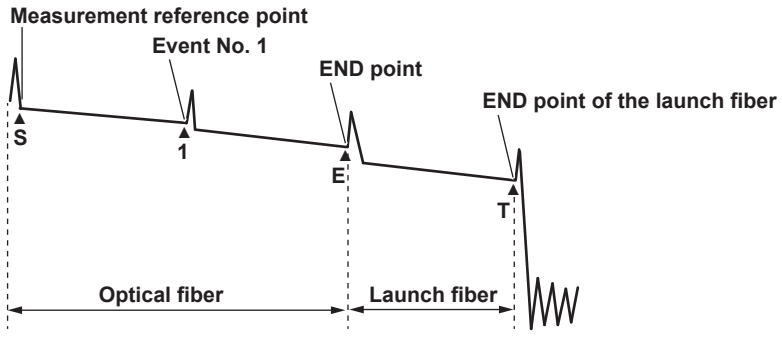
Exclude END: The value is not included in the total return loss.



Show END Point Loss (Firmware version 2.02 and later)

ON: The END point splice loss is shown in addition to return loss. This is mainly used when a launch fiber is connected to the far end of the optical fiber cable under measurement and end event T is set in the launch fiber settings. The splice loss at the END point is calculated, and the value is displayed. Consequently, the splice loss at the connection point of the optical fiber under measurement and launch fiber will also be displayed correctly.

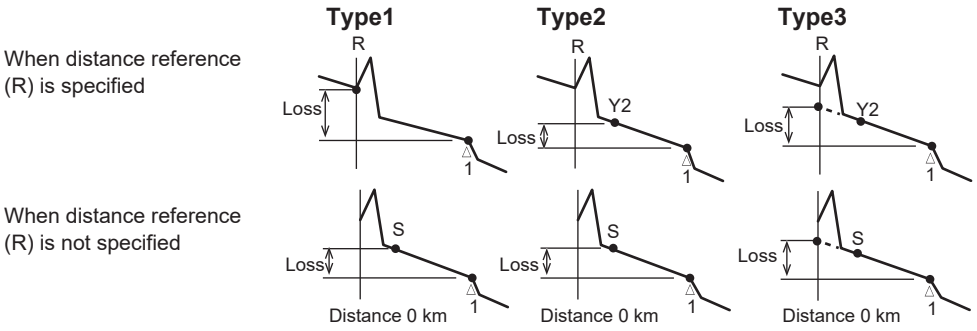
OFF: The splice loss at the END point is not displayed.



Cumulate Loss Type (available in firmware versions 2.02 and later)

You can select from the following three types.

Type	When a distance reference (Distance Reference) is specified	When a distance reference is not specified
Type 1	The loss from the distance reference (R) to the measurement point is measured.	The loss from point S to the measurement point is measured.
Type 2	The loss from the event marker (Y2) to the measurement point is measured.	The loss from point S to the measurement point is measured.
Type 3	The loss from the distance reference position on an extended line that connects the event marker (Y2) and the measurement point to the measurement point is measured.	The loss from the distance 0 position on an extended line that connects point S and the measurement point to the measurement point is measured.

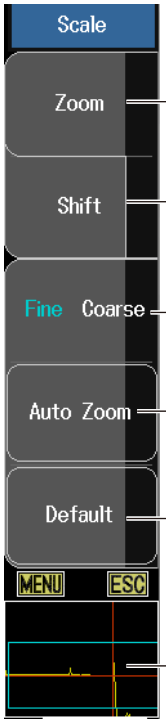


3.3 Zooming and Moving Displayed Waveforms

Procedure

Scale Menu

1. From the top menu, select **OTDR**.
2. Press **SCALE** to display the Scale menu.



Zoom in or out
Pressing this soft key enables you to zoom in and out using the arrow keys.

Move vertically or horizontally
Pressing this soft key enables you to move using the arrow keys.

Set the cursor movement resolution (Fine, Coarse).
Set whether to move the cursor in fine steps or coarse steps.

Auto zoom
Automatically zooms in on the waveform at the cursor position.

Initializes the display scale and position

Overview screen
This indicates where in the entire waveform display area the currently displayed waveform area is.

Zooming the Displayed Waveform

3. Press the **Zoom** soft key.
4. Press the arrow keys to zoom the displayed waveform in or out.

Moving the Displayed Waveform

3. Press the **Shift** soft key.
4. Press the arrow keys to move the displayed waveform.

Note

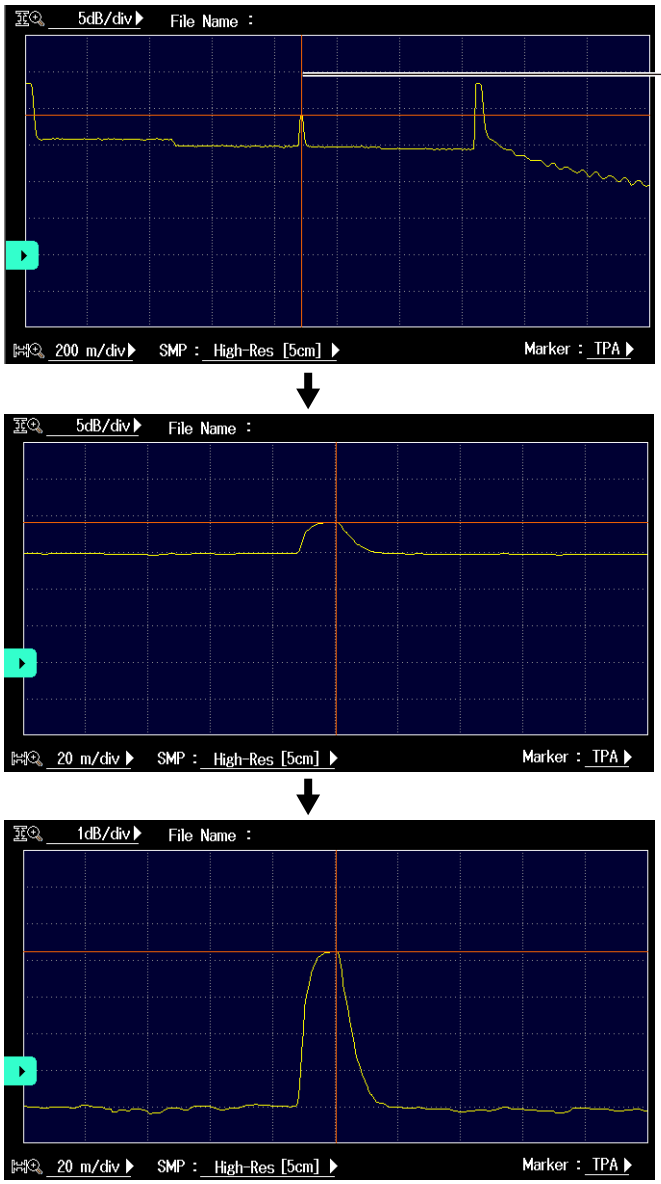
You can zoom and shift the waveform regardless of whether measurement is in progress.

Explanation

Zooming In and Out

You can press the arrow keys to zoom the displayed waveform in or out.
When the cursor is displayed, the waveform is zoomed at the cursor position.
When the cursor is not displayed, the waveform is zoomed at the left edge of the display.

Down arrow key: Zoom in vertically on the waveform.
Up arrow key: Zoom out vertically of the waveform.
Left arrow key: Zoom in horizontally on the waveform.
Right arrow key: Zoom out horizontally of the waveform.



Cursor position

Press the left arrow key to zoom the displayed waveform horizontally.

Press the down arrow key to zoom the displayed waveform vertically.

Auto Zoom

The auto zoom feature contains the following two types of zoomed displays.

- **Zoom the waveform at the cursor position**
  The cursor on the waveform display screen is shown in the center of the zoomed display.
- **Zoom the waveform at event positions**
  When the AQ7280 has detected events during event analysis, the selected event is zoomed and displayed.

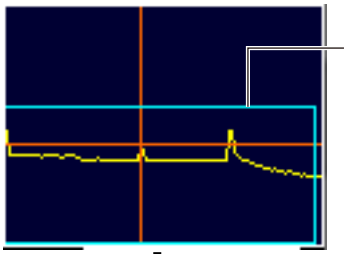
Shifting the Horizontal and Vertical Axes

You can move the screen by pressing the arrow keys.

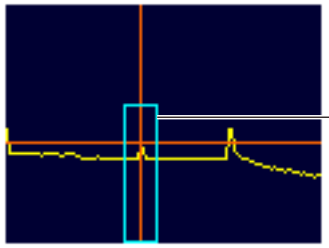
Down arrow key: The screen moves down.
Up arrow key: The screen moves up.
Left arrow key: The screen moves left.
Right arrow key: The screen moves right.

Overview Display

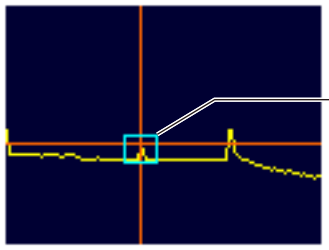
The overview display is linked to the zoomed waveform display. The blue box indicates where in the entire waveform display area the zoomed waveform display is showing.



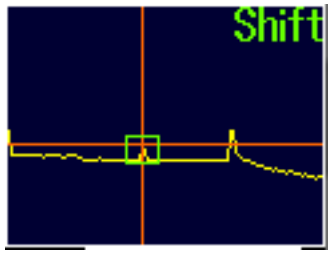
When the entire waveform is being displayed
Everything within the box is displayed.



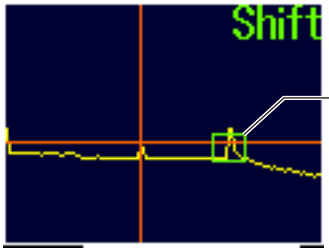
When the display is zoomed horizontally
The area shown within the box is zoomed and displayed in the waveform display area.



When the display is then zoomed vertically
The area shown within the box is zoomed and displayed in the waveform display area.



When vertical or horizontal shift is selected
“Shift” appears on the screen. The frame color turns green.



When you move the screen, the box that represents the display area also moves.

4.1 Analyzing Waveforms

Switching the Waveform to Be Analyzed

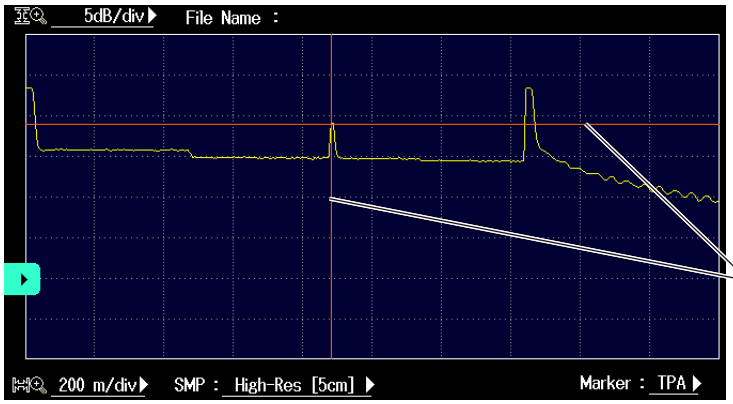
When data measured under multi wavelength conditions is loaded into the AQ7280, a soft key for switching the waveform with the wavelength to be analyzed appears on the OTDR menu.

1. From the top menu, select **OTDR**.
2. Press the **Current Trace** soft key to switch the waveform with the wavelength to be analyzed.

Switches the current trace
Switches the trace displayed on the screen

How to Use Cursors

1. From the top menu, select **OTDR**.
2. Turn the rotary knob to display the cursor.



Cursor (crosshair cursor example)

Note

- The direction that the cursor moves differs depending on the direction that you rotate the rotary knob.
  Clockwise: The cursor moves to the right.
  Counterclockwise: The cursor moves to the left.
- If you turn the rotary knob counterclockwise to the point where the cursor reaches the left side of the screen, the cursor will disappear. If you reach the measurement end point, the cursor will not move forward even if you turn the rotary knob clockwise.
- For details on the cursor display format, see section 3.2.
- You can change the cursor movement resolution (fine or coarse). For the procedure, see section 3.3.
- When you move the cursor, marker setting icons (4 Point Markers or 5 Point Markers) are displayed above the cursor. When you move the cursor on the event screen, an icon for adding or deleting an event appears. By tapping the icons, you can set markers directly and add and delete events without using the marker menu (next page) or event edit menu (section 4.2).

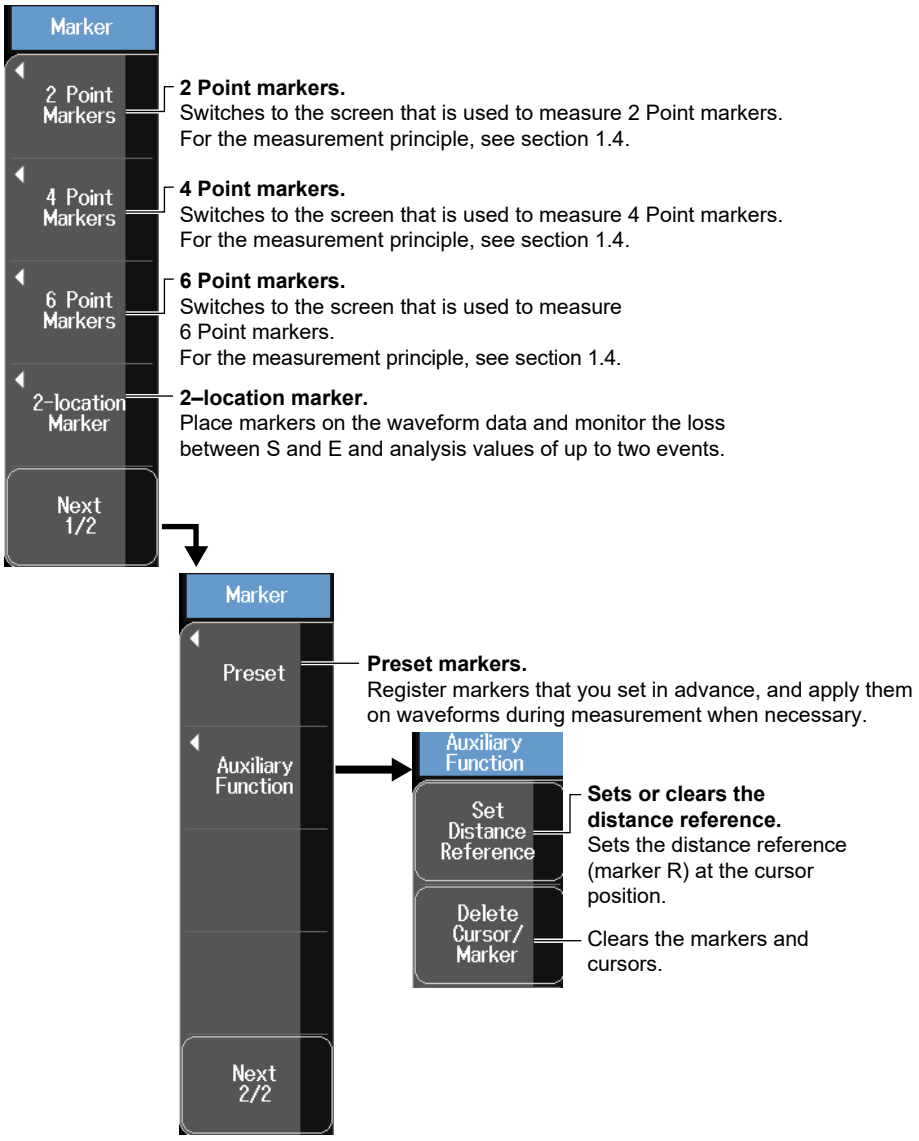
How to Use Markers

You can use markers to measure values such as the distance, splice loss, or return loss between two points.

* A portion of the marker menu and operation vary depending on the marker mode. For details on setting the marker mode, see section 3.2.

Marker Menu (Marker Mode: Marker)

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key to display the marker menu.



2 Point markers.
Switches to the screen that is used to measure 2 Point markers.
For the measurement principle, see section 1.4.

4 Point markers.
Switches to the screen that is used to measure 4 Point markers.
For the measurement principle, see section 1.4.

6 Point markers.
Switches to the screen that is used to measure
6 Point markers.
For the measurement principle, see section 1.4.

2–location marker.
Place markers on the waveform data and monitor the loss between S and E and analysis values of up to two events.

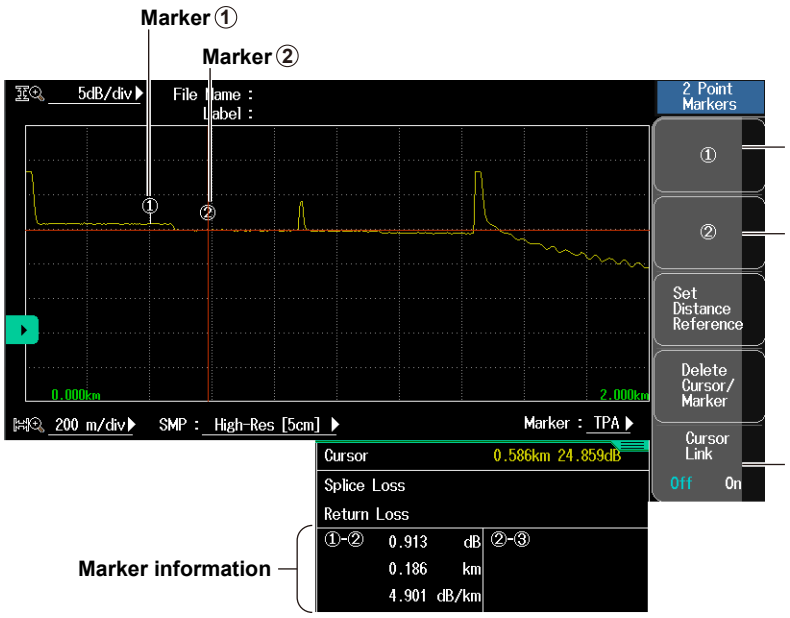
Preset markers.
Register markers that you set in advance, and apply them on waveforms during measurement when necessary.

Sets or clears the distance reference.
Sets the distance reference (marker R) at the cursor position.

Clears the markers and cursors.

2 Point Markers

Press the **2 Point Markers** soft key to display the following screen.

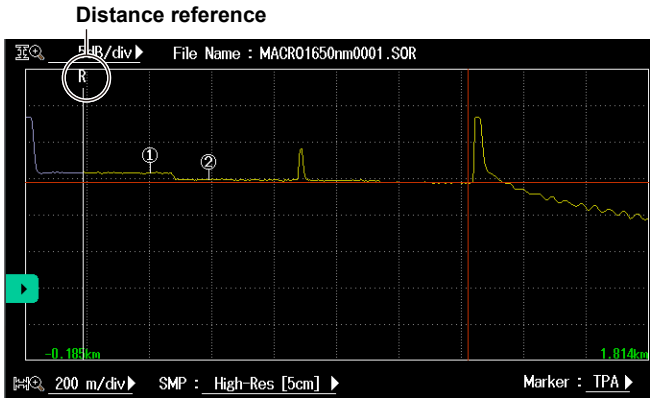


Note

- When you set the marker positions, set them so that the ① marker is the measurement start point (the distance reference).
- The measured loss value differs depending on the specified approximation method.

- **Distance Reference**

  Normally, the location where the AQ7280 and the optical fiber cable are connected is the measurement reference point. This reference point is the distance reference. It is used to calculate the distance to the cursor and markers. If you are using a launch fiber to perform measurements, move the distance reference the length of the launch fiber before performing measurements.



- **Cursor Link (Moving all markers together)**

  You can move all markers while maintaining the distance between them.

4 Point Markers

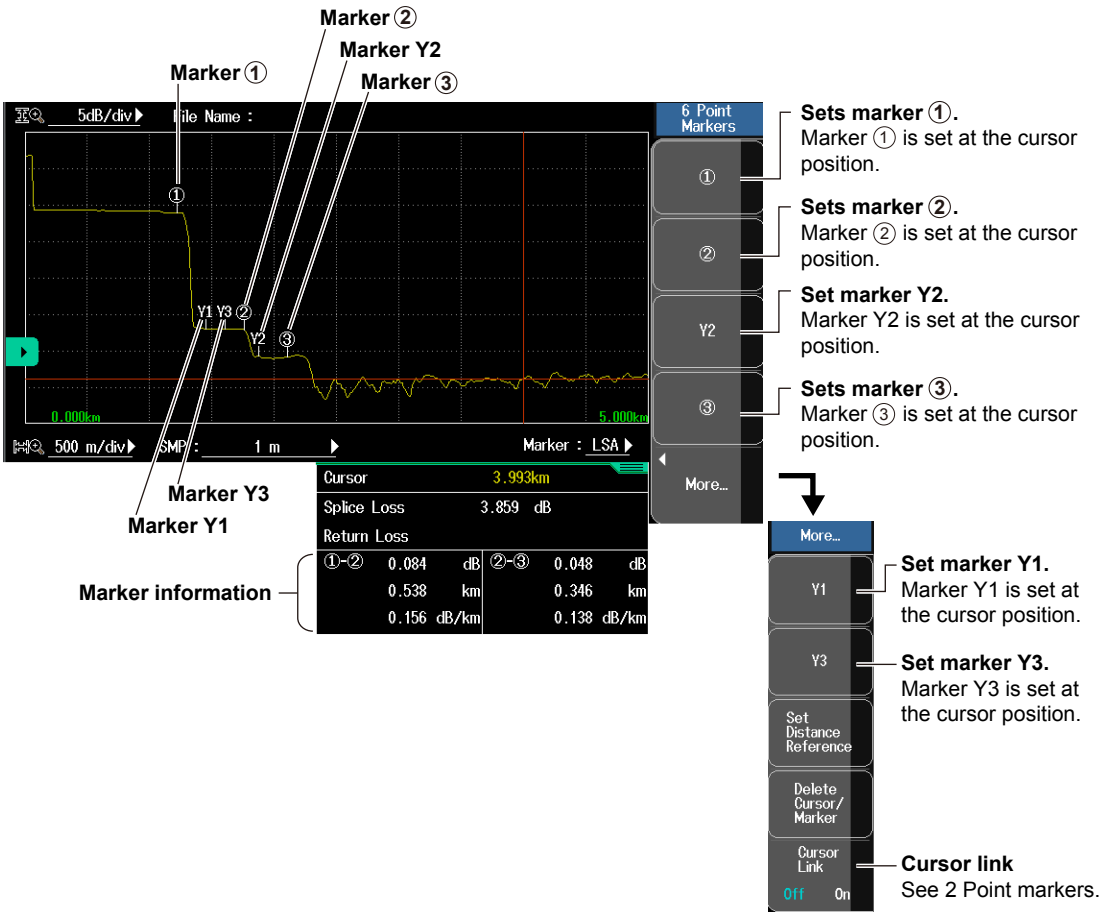
Press the **4 Point Markers** soft key to display the following screen.

Note

- Set the markers in the order shown above, starting with the measurement start point (the distance reference).
- The measured loss value differs depending on the specified approximation method.
- Set the correct position for ②. The splice loss changes greatly depending on the position of ②.
- When Marker Mode is set to Marker and you move the cursor, marker setting icons for 4 Point Markers are displayed above the cursor. You can set a marker at the cursor position simply by tapping an icon.

6 Point Markers

Press the **6 Point Markers** soft key to display the following screen.

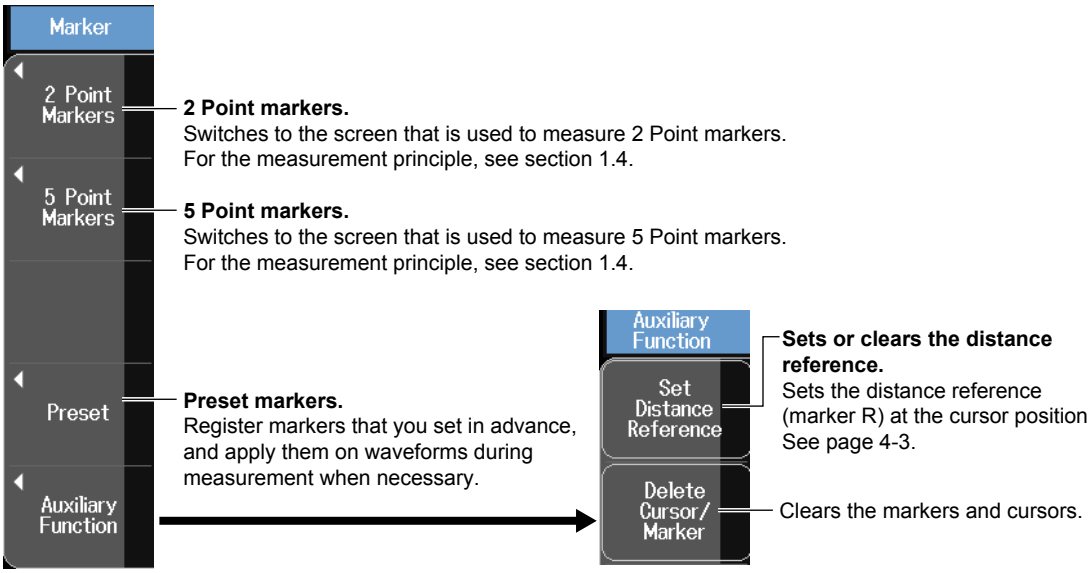


Note

- Set the markers in the order shown above, starting with the measurement start point (the distance reference).
- The measured loss value differs depending on the specified approximation method.
- Set the correct position for ②. The splice loss changes greatly depending on the position of ②.

Marker Menu (Marker Mode: Line)

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key to display the marker menu.



2 Point markers.
Switches to the screen that is used to measure 2 Point markers.
For the measurement principle, see section 1.4.

5 Point markers.
Switches to the screen that is used to measure 5 Point markers.
For the measurement principle, see section 1.4.

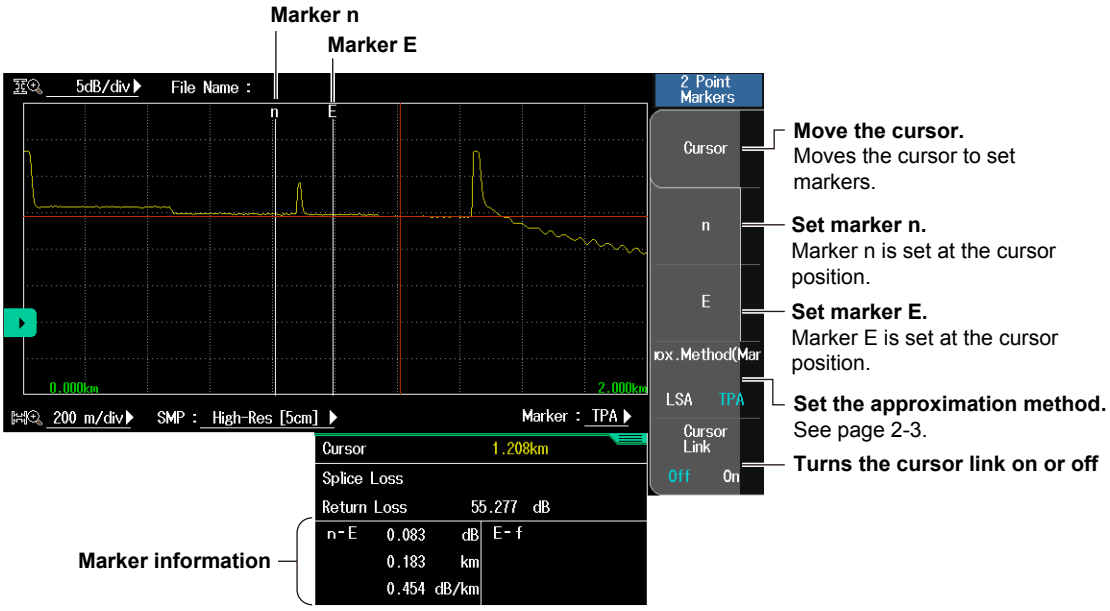
Preset markers.
Register markers that you set in advance, and apply them on waveforms during measurement when necessary.

Sets or clears the distance reference.
Sets the distance reference (marker R) at the cursor position
See page 4-3.

Clears the markers and cursors.

2 Point Markers

Press the **2 Point Markers** soft key to display the following screen.



Move the cursor.
Moves the cursor to set markers.

Set marker n.
Marker n is set at the cursor position.

Set marker E.
Marker E is set at the cursor position.

Set the approximation method.
See page 2-3.

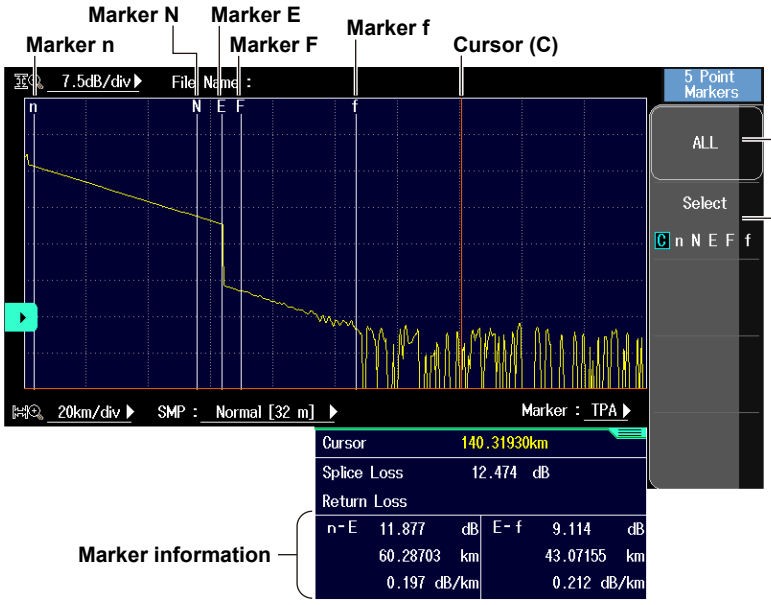
Turns the cursor link on or off

Note

- When you set the marker positions, set them so that the n marker is the measurement start point (the distance reference).
- The measured loss value differs depending on the specified approximation method.

5 Point Markers

Press the **5 Point Markers** soft key to display the following screen.



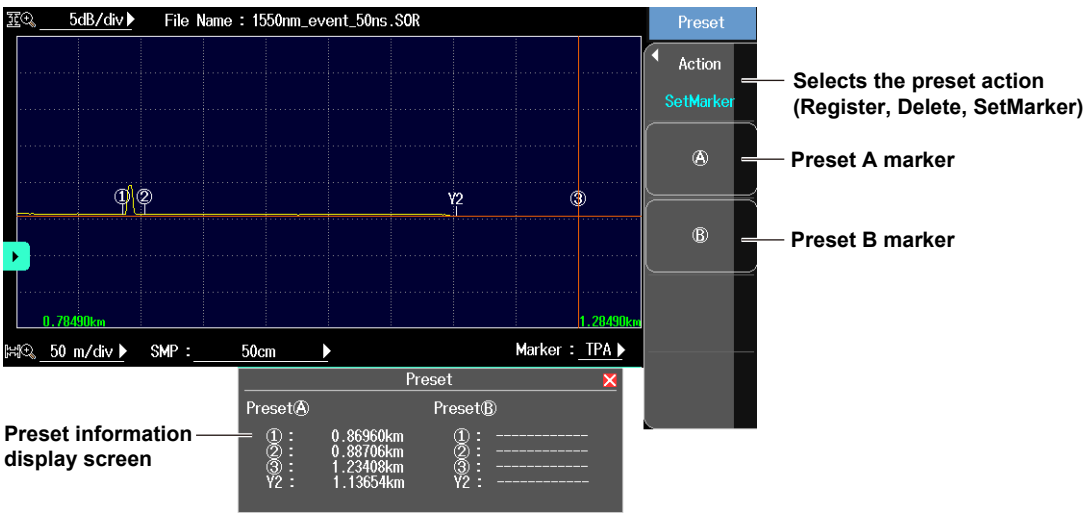
Note

- Set the markers in the order shown above, starting with the measurement start point (the distance reference).
- The measured loss value differs depending on the specified approximation method.
- Set the correct position for marker E. The splice loss changes greatly depending on the position of E.
- When Marker Mode is set to Line and you move the cursor, marker setting icons for 5 Point Markers are displayed above the cursor. You can set a marker at the cursor position simply by tapping an icon.

Presetting Markers

This function can be used to register markers that you set from the marker menu (2 Point Markers, 4 Point Markers, 5 Point Markers, 6 Point Markers) in advance and apply them on waveforms with a single touch operation. Up to two sets of markers can be registered. This function is convenient when measuring the same event repeatedly for each core such as in a multi-core fiber measurement.

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **Next** soft keyto display the marker menu.
3. Press the **Preset** soft key to display the preset menu.

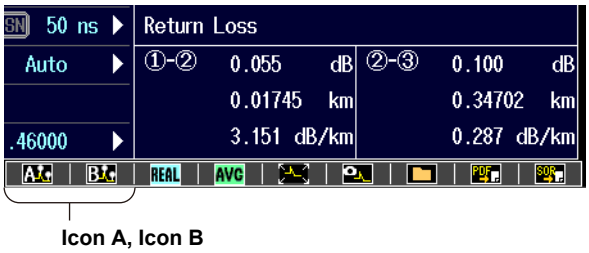


Registering a Preset Marker

4. Press the **Action** soft key to select Register.
5. Press the **A** or **B** soft key. The marker applied on the waveform is registered, and the marker information is displayed on the preset information display screen.

Applying a Preset Marker

6. Display measured waveform data on the screen.
7. Tap the A or B icon. The A or B preset marker is applied to the waveform.



Note

Preset markers exceeding the distance range of the waveform display cannot be applied.

Preset markers can also be applied from the preset menu.

6. Display measured waveform data on the screen.
7. Press the **Action** soft key to select SetMarker.
8. Press the **A** or **B** soft key. The preset marker is applied to the waveform.

Deleting a Preset Marker

4. Press the **Action** soft key to select Delete.
5. Press the **A** or **B** soft key. Marker information on the preset information display screen is cleared.

Note

A marker applied to the waveform is not cleared. To clear a marker applied to the waveform, press the Delete Cursor/Marker soft key explained on page 4-2 or 4-6.

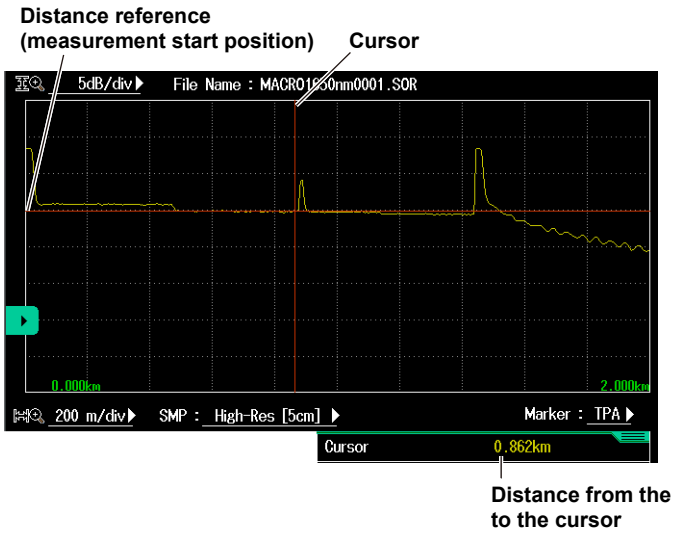
Measuring Distance

By placing the cursor on the acquired waveform, you can measure the distance to events such as reflections and splice losses.

Using the Cursor to Measure the Distance

Follow the procedure below to measure the distance between the distance reference and the cursor.

1. From the top menu, select **OTDR**.
2. Turn the rotary knob to display the cursor.
3. Move the cursor to a position where an event is displayed.



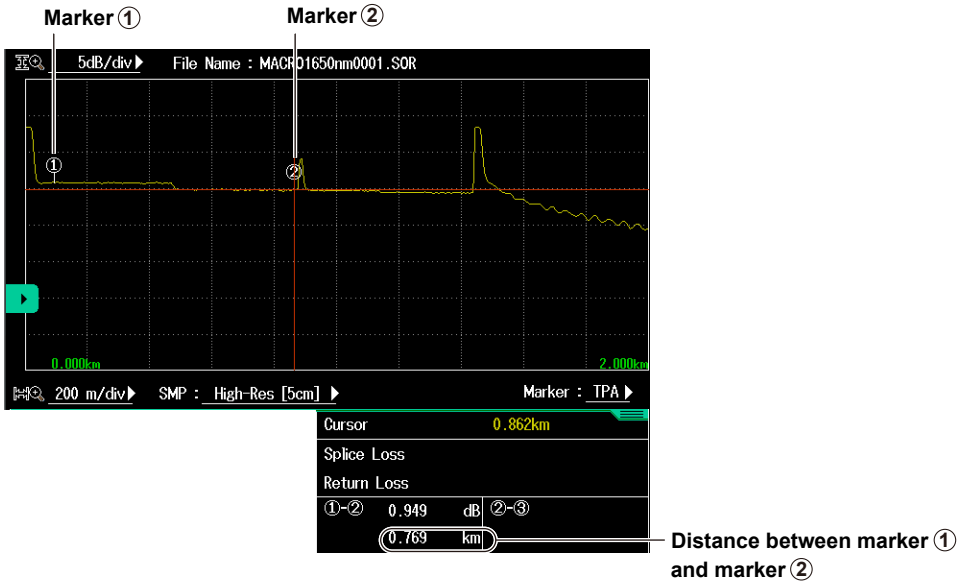
Note

The location where the AQ7280 and the optical fiber cable are connected is the distance reference. To perform more accurate measurements, zoom in on the waveform.

Using Markers to Measure the Distance

Follow the procedure below to measure the distance between two markers.

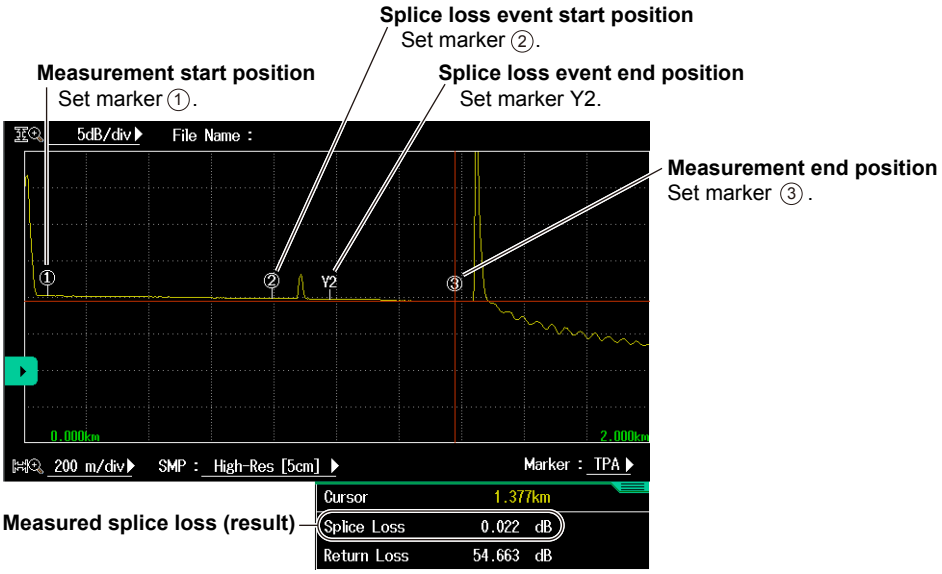
1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **2 Point Markers** soft key to display the following screen.
3. Set marker ① and marker ② at positions where events are displayed.



Measuring Splice Loss

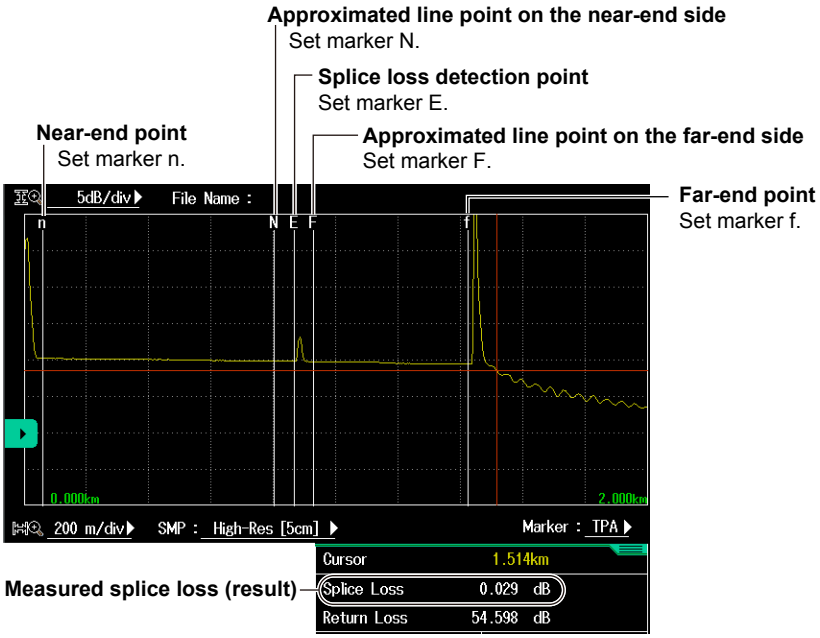
When Marker Mode Is Set to Marker

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **4 Point Markers** soft key to display the following screen.



When Marker Mode Is Set to Line

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **5 Point Markers** soft key to display the following screen.



Measuring the Return Loss or Reflection Level

* Reflection level can be displayed only when the language is set to Japanese in the system settings.

When Marker Mode Is Set to Marker

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **2 Point Markers** soft key to display the following screen.
3. Set marker ① and marker ② at positions where events are displayed.

Peak value
The AQ7280 detects the peak between the markers, and calculates the level between the peak and the rising start point of the event.

Event detection start position
Set marker ①.

Event detection end position
Set marker ② .

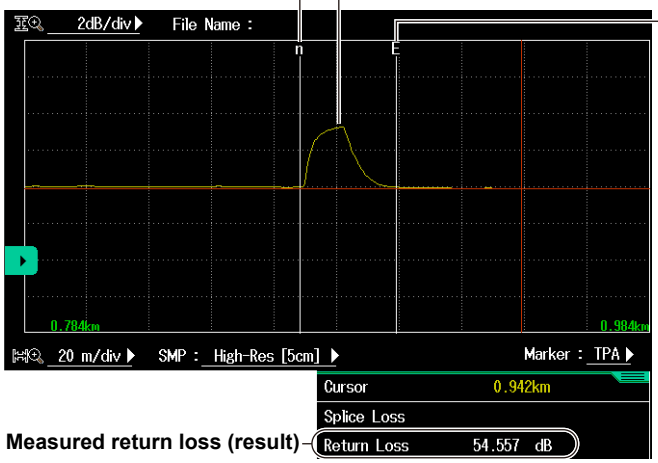
Measured return loss (result)

When Marker Mode Is Set to Line

1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **2 Point Markers** soft key to display the following screen.
3. Set marker n and marker E at positions where events are displayed.

Peak value
The AQ7280 detects the peak between the markers, and calculates the level between the peak and the rising start point of the event.

Event detection start position
Set marker **n**.



Event detection end position
Set marker E.

Measured return loss (result)

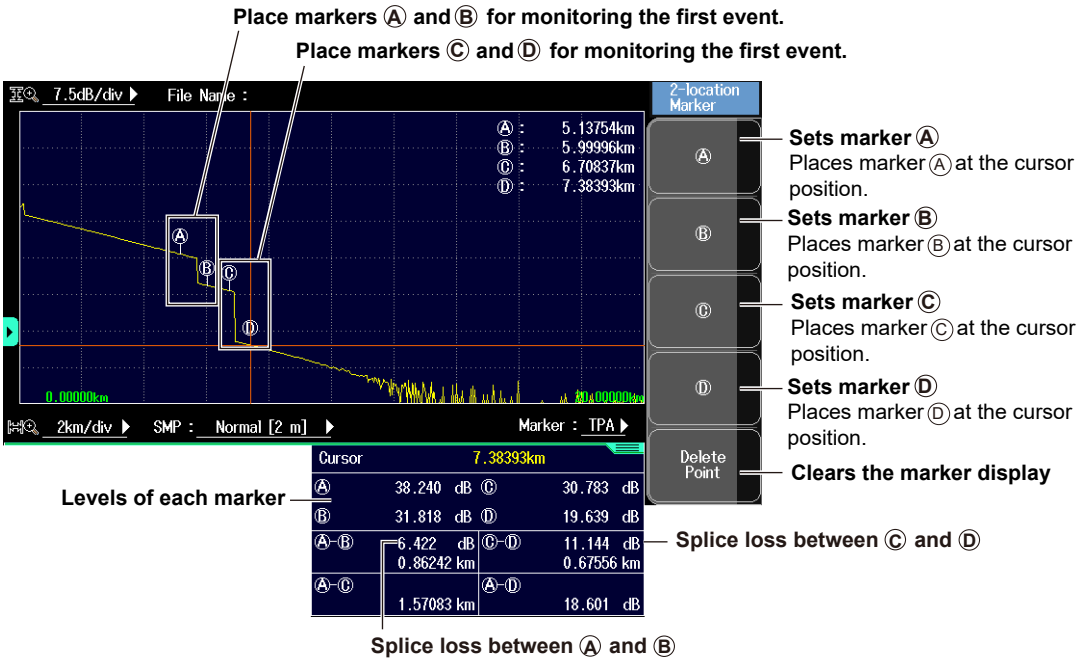
Note

- If "<" is displayed next to the return loss value, the measurement waveform is saturated. If the waveform is saturated, the actual reflection value is larger than the value shown. To prevent a waveform from being saturated, you can:
  - Select a large attenuation value, and perform the measurement again.
  - Select Hi-Reflection for the average method, and perform the measurement again.
  - Select a large pulse width value, and perform the measurement again.
- When reflections are small (less than or equal to about 0.5 dB), the return loss and reflection level are not displayed.

2–location Marker (splice loss at two locations)

This function can only be used when Marker Mode is set to Marker.

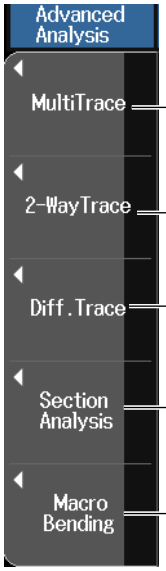
1. From the top menu, select **OTDR**.
2. Press the **Marker** soft key and then the **2–location Marker** soft key to display the following screen.



Analyzing Multiple Waveforms

Waveform Analysis Menu

1. From the top menu, select **OTDR**.
2. Press the **Advanced Analysis** soft key to display the Advanced Analysis menu.



Multi trace analysis
Up to four waveforms can be displayed and compared.

2-way trace
Waveforms of a measurement target measured from each end can be combined.

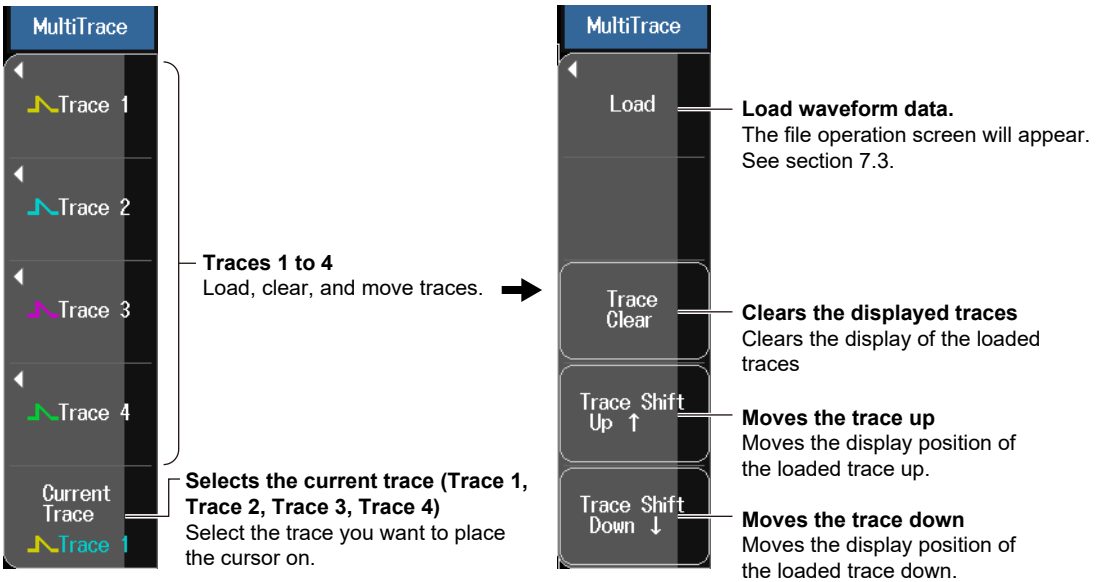
Displays the differential trace
You can load two waveforms that have been measured on the AQ7280 and display their difference as a waveform.

Section analysis
Each item can be measured with the location that is specified as the start point within the specified section as the reference point.

Performs macro bending
Bending loss events can be displayed on the screen. See section 4.2.

Multi Trace Analysis

Press the **MultiTrace** soft key to display the MultiTrace menu.



Traces 1 to 4
Load, clear, and move traces.

Selects the current trace (Trace 1, Trace 2, Trace 3, Trace 4)
Select the trace you want to place the cursor on.

Load waveform data.
The file operation screen will appear. See section 7.3.

Clears the displayed traces
Clears the display of the loaded traces

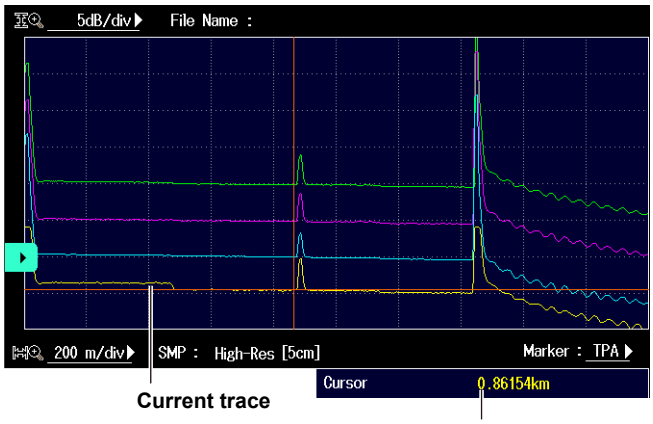
Moves the trace up
Moves the display position of the loaded trace up.

Moves the trace down
Moves the display position of the loaded trace down.

Loading Waveform Data

Up to four traces can be loaded. Loaded traces are displayed on a single screen, so you can compare them. The type of file that you can load is SOR. Loaded traces are displayed according to the current trace scale. They are displayed at the 0 m position on the horizontal axis or so that their distance references match that of the current trace. Each loaded trace can be shifted vertically as you like.

Waveform display example

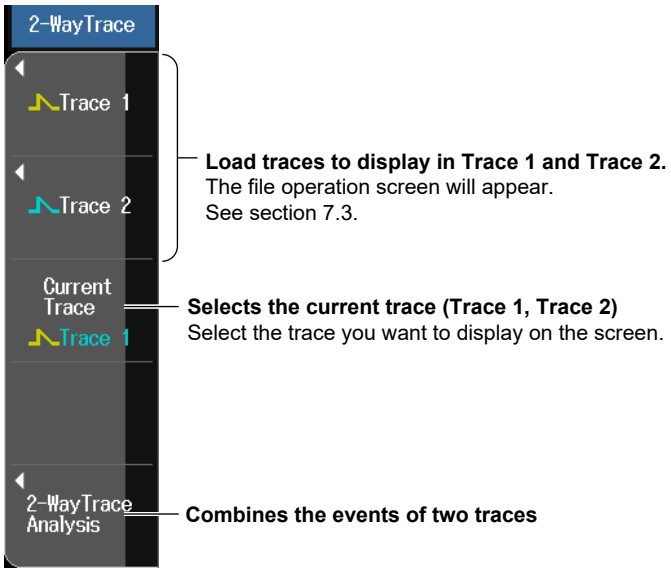


Note

- The current waveform display before switching to the multi trace analysis screen is read into the trace that is selected as the current trace.
- Changing the current trace clears the vertical waveform shift.

2-Way Trace

Press the **2-WayTrace** soft key to display the 2-WayTrace menu.



Loading Waveform Data

Traces that meet the following conditions can be combined.

- Event lists are available.
- The wavelengths and pulse widths of the two traces are the same.
- The distances from the measurement reference (S) to the end event (E) are the same.

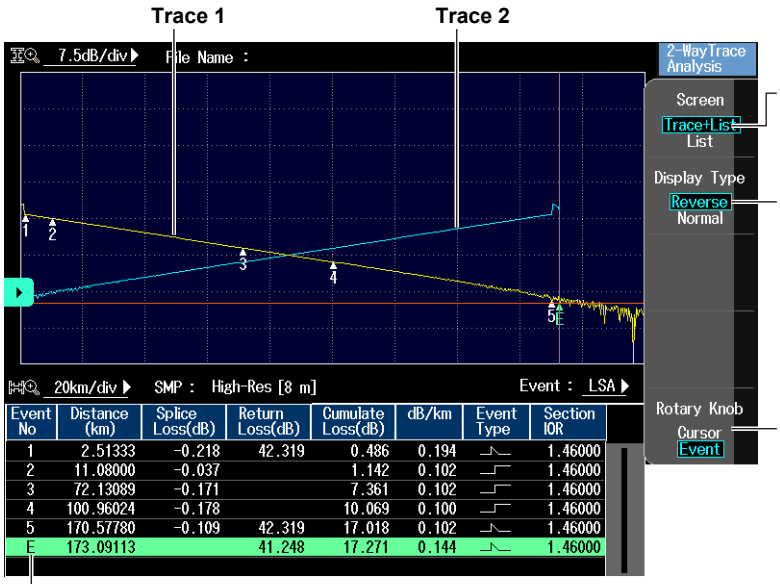
Selecting the Current Trace

Select the trace you want to display on the screen. Events of the two traces that have been combined are displayed on the current trace.

Combining the Events of Two Traces

Press the **2-WayTrace Analysis** soft key to display the 2-WayTrace Analysis menu.

Example when the current trace is set to Trace 1



Display (Trace+List, List)
See section 4.2.

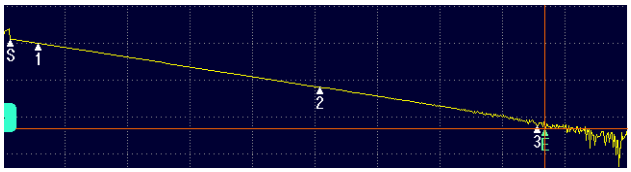
Display type (Reverse, Normal)

Selects the rotary knob function (Cursor, Event)

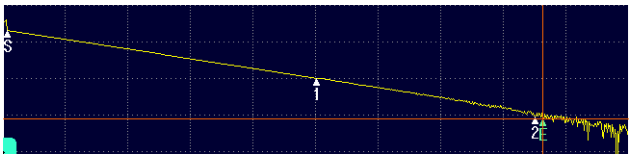
The event numbers in this example correspond to the following event numbers before combining.

No.1: No.2 of Trace 2
No.2: No.1 of Trace 1
No.3: No.1 of Trace 2
No.4: No.2 of Trace 1
No.5: No.3 of Trace 1

Event information of Trace 1 before combining



Event information of Trace 2 before combining

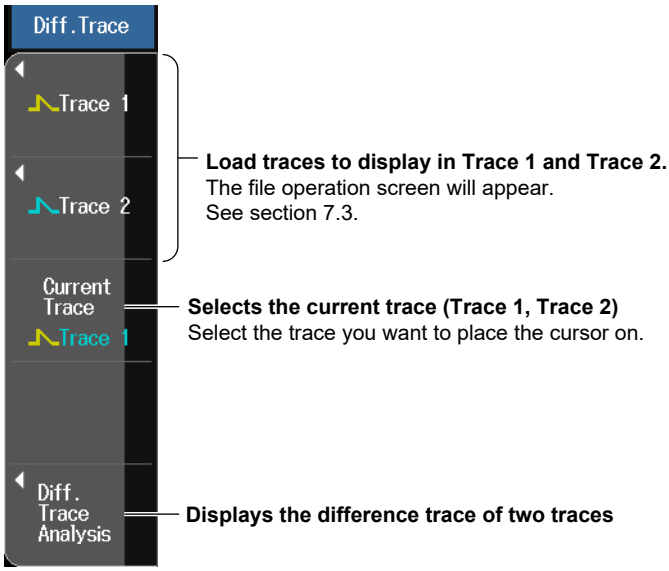


- **Display Type**

  Reverse: The display direction of the trace that is not the current trace is reversed.
  Normal: The display direction of the trace that is not the current trace is not reversed.

Displaying the Difference Trace

Press the **Diff. Trace** soft key to display the Diff. Trace menu.



Loading Waveform Data

The type of file that you can load is SOR.

Note

A differential trace of traces that meet the following conditions can be displayed.

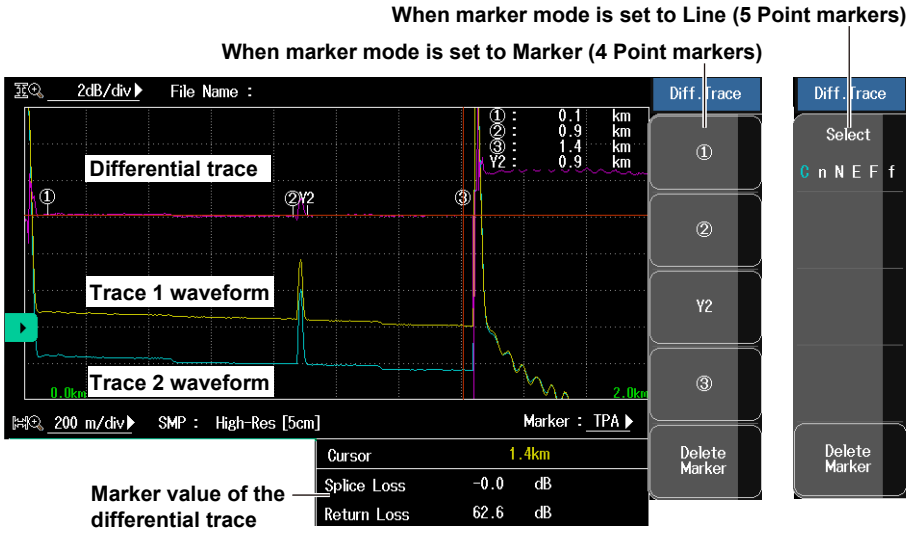
- Sample interval
- Measurement start position

Current Trace

The current trace can be set to one of the traces that are used for taking the difference. Cursors are displayed on the current trace. Return loss and splice loss that are displayed in the measurement conditions are those of the current trace.

Displaying the Difference Trace of Two Traces

Press the **Diff. Trace Analysis** soft key to display the Diff. Trace Analysis screen.



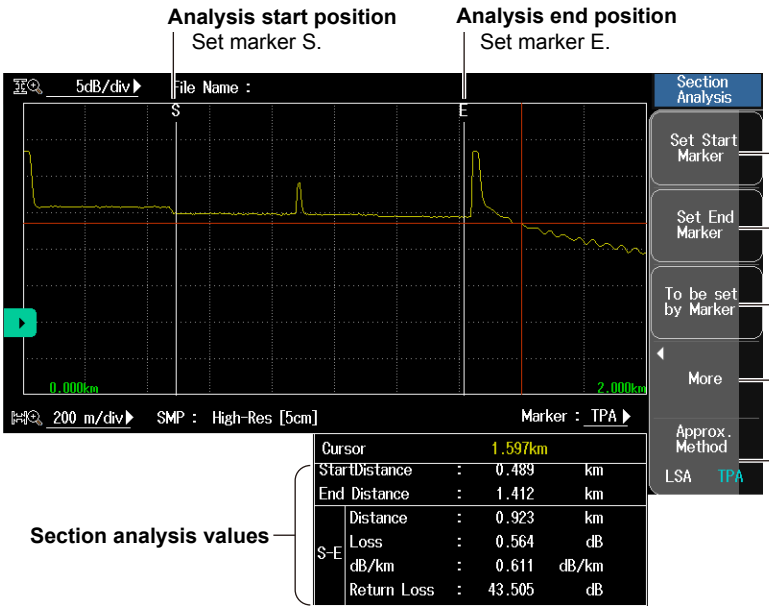
The differential trace is the result of subtracting the values of the current trace from those of the other trace.

- **Marker Features**

  You can place cursors and markers on the differential trace.
  You can display the distance at each cursor position as well as the following values between markers.
  - Loss (dB)
  - Distance (km)
  - dB/km
  - For the operations when marker mode is set to Marker, see “4 Point Markers” on page 4-4.
  - For the operations when marker mode is set to Line, see “5 Point Markers” on page 4-7.
  - The return loss and splice loss of differential traces cannot be saved.

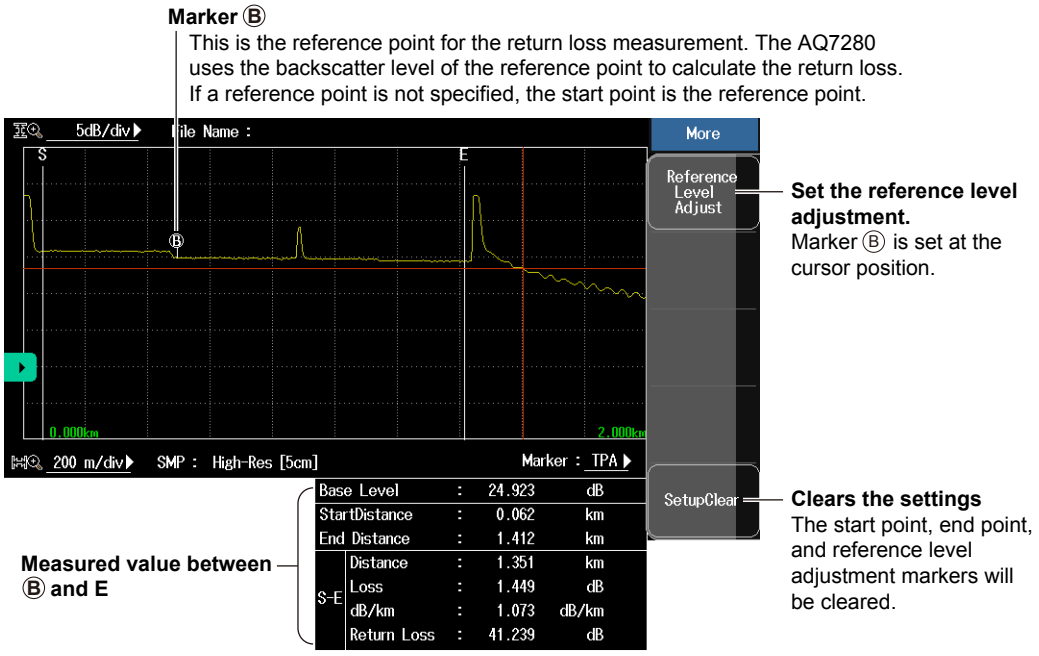
Section Analysis

Press the **Section Analysis** soft key to display the following screen.



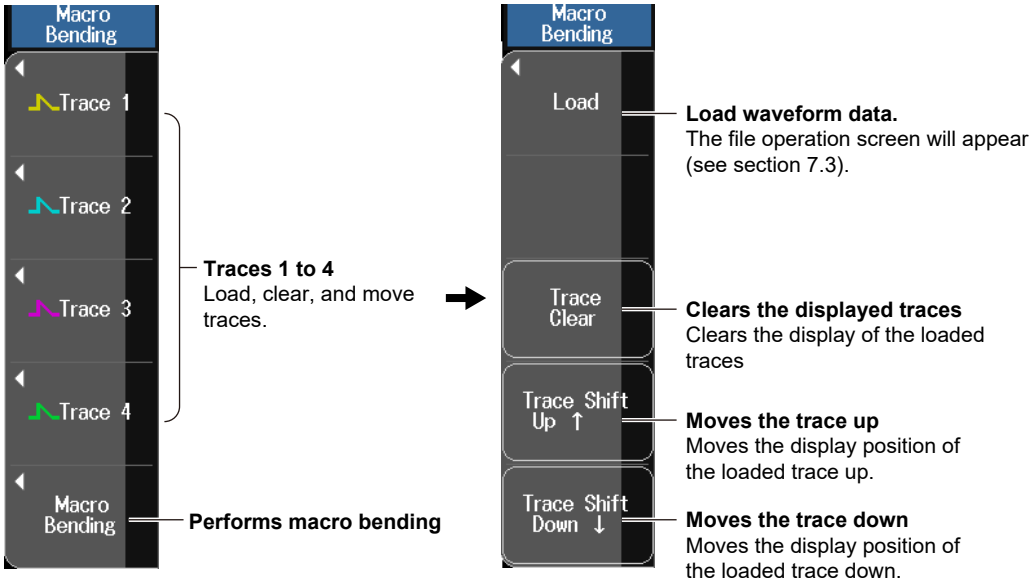
Adjusting the Reference Level

Press the **More** soft key to display the following screen.



Performing Macro Bending

1. From the top menu, select **OTDR**.
2. Press the **Advanced Analysis** soft key and then the **Macro Bending** soft key to display the Macro Bending menu.



Loading Waveform Data

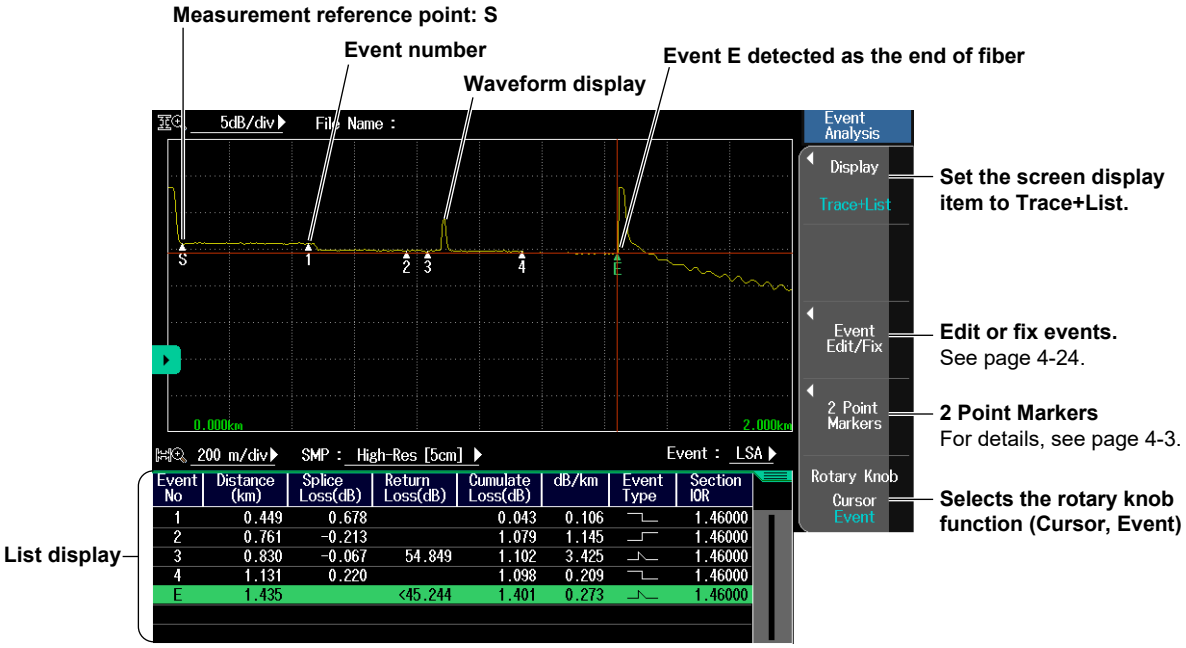
Load waveforms of at least two wavelengths. The type of file that you can load is SOR.

4.2 Analyzing Events

Event Screen

Screen Display Items: Trace+List

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key to display the following screen.



Event Number

A number is displayed on the waveform next to the event. The numbers are in ascending order from the left of the display. If there is an asterisk to the left of an event's number, the event is a fault event. For details about fault events, see page 2-13.

Distance

The distance from the measurement reference point to each event is displayed. If you move the distance reference, which is the measurement reference point, the distance from the distance reference to each event is displayed. For details about the distance reference, see page 4-3.

Splice Loss

The splice loss for each event is displayed. When the pass/fail judgment is set to ON, splice losses that exceed the fault event threshold are displayed in red characters.

Return Loss

The return loss for each event is displayed. When the pass/fail judgment is set to ON, return losses that exceed the fault event threshold are displayed in red characters.

Cumulate Loss

The loss from the measurement reference point is displayed. If the distance reference is specified, the distance reference is the measurement reference point. If the distance reference is not specified, the measurement reference point (S) is the measurement reference.

Event Type

The type of each event is displayed with the following symbols.

: Positive splice loss

: Negative splice loss

: Reflection

: Bending loss (macro bending)

: Splitter insertion loss

Section Group Index and Event Fix Type

- **Section Group Index**

  If Event Fix Mode is set to off as described later in “Fix event positions,” the section group index is displayed.

- **Event Fix Type**

  If Event Fix Mode is set to Append Mode (Mode 1) or Master Mode (Mode 2) as described later in “Fix event positions,” the event fix type is displayed.

  NEW: Displayed for events that are detected after Event Fix Mode is set to Append Mode (Mode 1).

Event No	Distance (km)	Splice Loss(dB)	Return Loss(dB)	Cumulate Loss(dB)	dB/km	Event Type	Event Fix Type
1	0.37115	-0.203	51.443	3.238	14.875		
2	0.64887	-1.049	49.377	6.043	10.833		
3	0.73921	0.641	45.301	6.794	19.915		
4	0.77823	-4.368	49.393	12.260			
5	0.82802	-2.115	43.569	14.738			NEW
E	1.41272		56.914	14.414	3.063		NEW
END point by Auto Search							

Event fix type display

Rotary Knob Feature

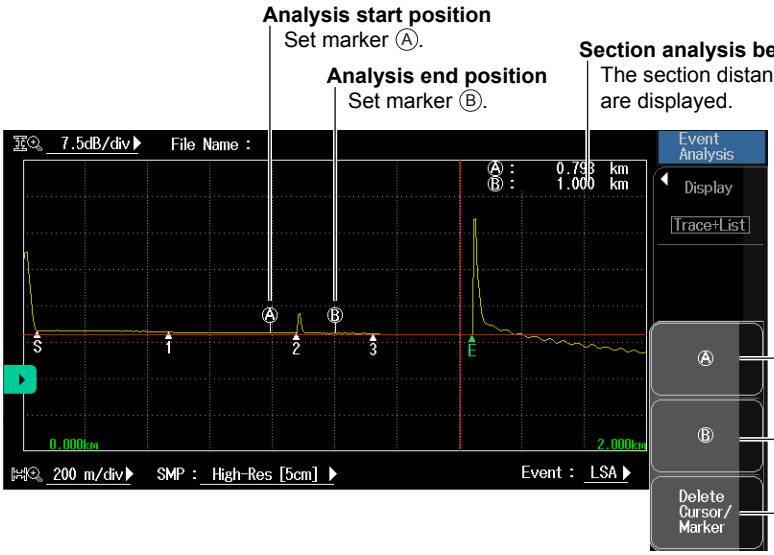
You can select the operation that occurs when you turn the rotary knob from the following.

Cursor: The cursor moves continuously.

Event: The cursor moves directly between detected events.

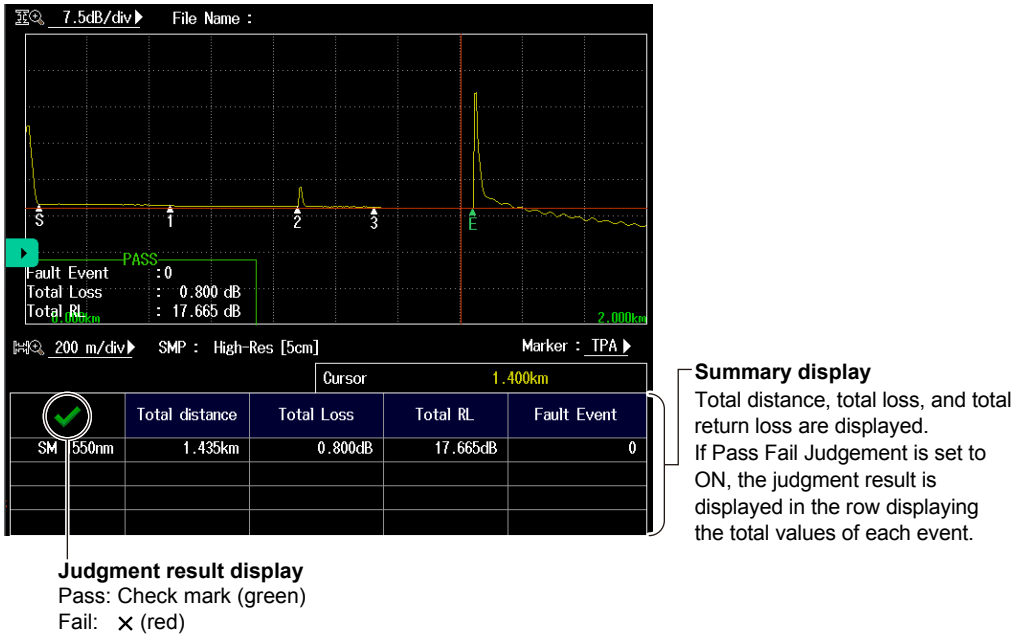
2 Point Markers

Press the **2 Point Markers** soft key to display the following screen.



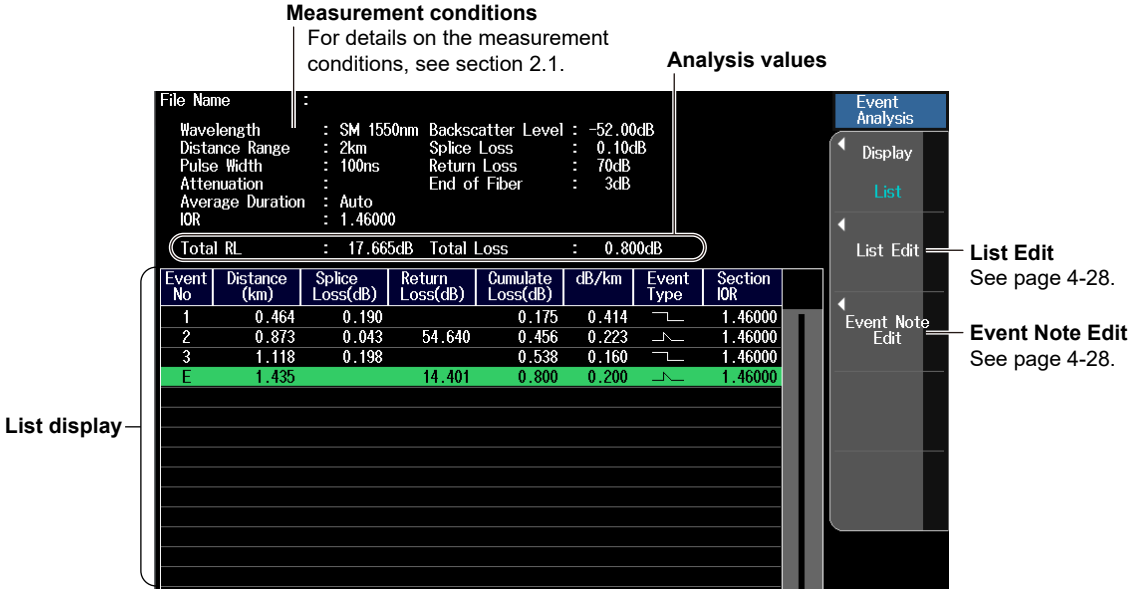
Screen Display Items: Trace+Summary

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key and then the **Display** soft key to select **Trace+Summary**. The following screen appears.



Screen Display Item: List

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key and then the **Display** soft key to select **List**. The following screen appears.



Analysis values

- **Total RL**

  The integrated value of the return losses of each event.

- **Total Loss**

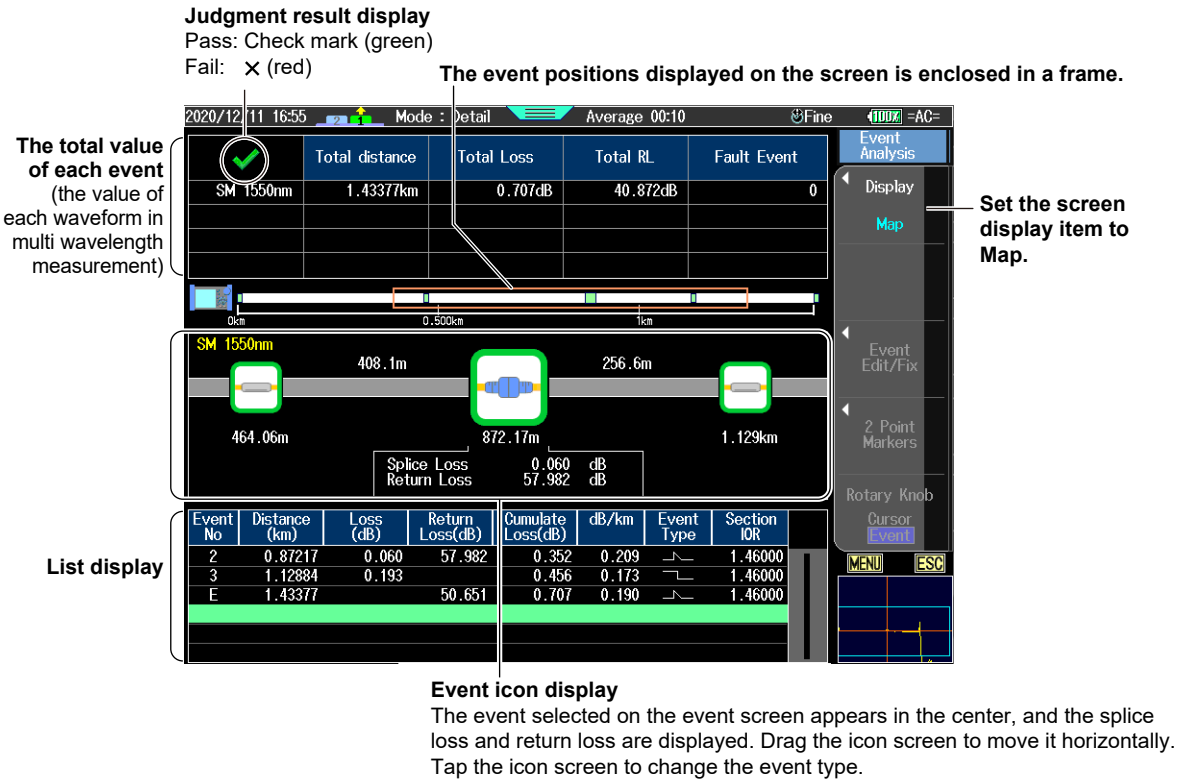
  Displayed in the following manner depending on the total loss calculation method.

  Cumulate loss: The integrated value of the splice losses at each event from the measurement reference point (S) is displayed.

  Loss between S and E: The loss between the measurement reference point (S) and the end of fiber (E) is displayed.

Screen Display Item: Map

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key and then the **Display** soft key to select **Map**. The following screen appears.



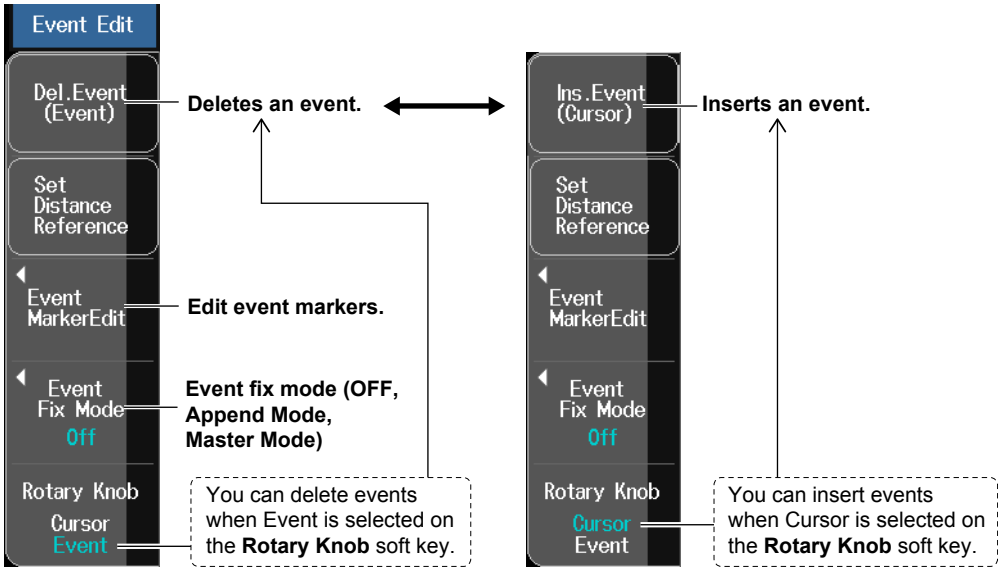
Editing Events

There may be cases where, because the backscattering light level is too small at a reflection point in an optical fiber cable, the reflection cannot be detected as an event, or there may be cases where noise is detected as an event. In such cases, you can adjust the events by editing them as follows:

- Insert events
- Delete events
- Edit event markers
- Fix event positions

Event Edit Menu

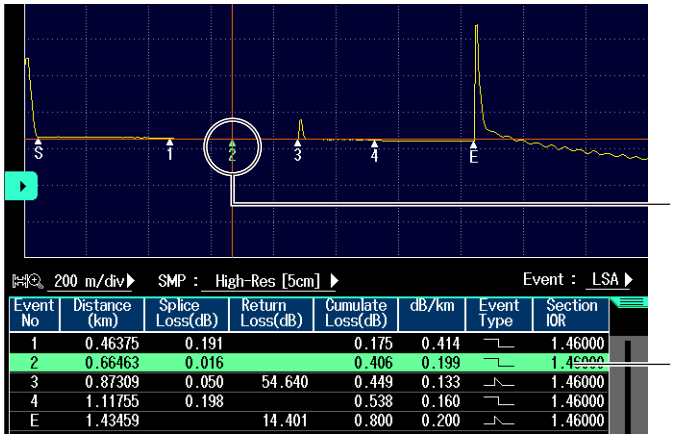
1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key and then the **Event Edit/Fix** soft key to display the Event Edit menu.



Inserting and Deleting Events

Inserting an Event

3. Press the **Rotary Knob** soft key to select Cursor.
4. Turn the rotary knob to move the cursor to the position where you want to insert an event.
5. Press the **Ins. Event (Cursor)** soft key to insert an event at the cursor position.

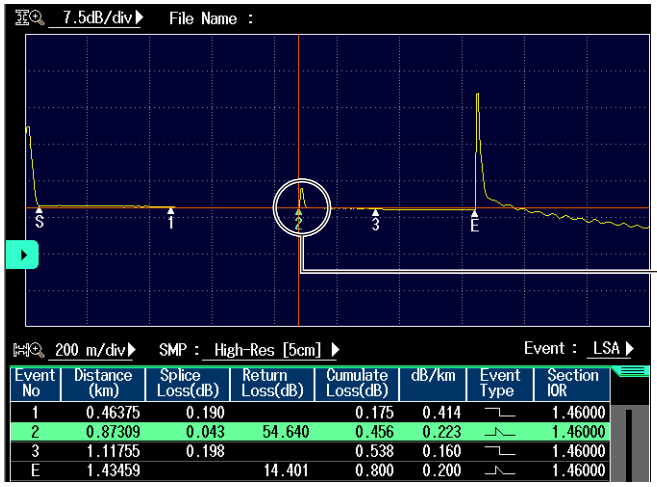


Note

- The event list can display up to 100 events.
- If you insert an event between two events that are displayed, the new event takes on the number that follows the event on the left, and all subsequent event numbers are increased by one. You cannot insert events to the left of the S point.
- You cannot insert events to the left of the distance reference. You can use the **Set Distance Reference** soft key to move the distance reference. For details on the distance reference, see page 4-3.
- 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 former E event.
- When you move the cursor on the event screen, an icon for adding ( ) or deleting ( ) an event appears above the cursor. You can add an event at the cursor position or delete the event that the cursor is pointing to simply by tapping an icon.

Deleting an Event

3. Press the **Rotary Knob** soft key to select Event.
4. Turn the rotary knob to select the event you want to delete.
5. Press the **Del.Event (Event)** soft key to delete the event.



Note

- If only the S point and the E event are displayed, you cannot delete any events.
- If you delete an event, the subsequent event numbers will all be reduced by one.
- You cannot delete the S point.

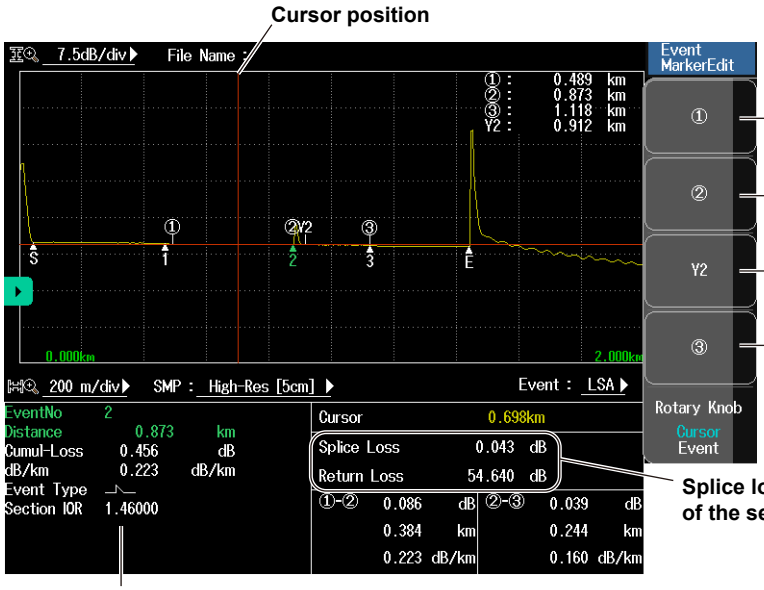
- If you set a distance reference (R point), the S point disappears from the screen. In this situation, the measurement reference point is the distance reference. If you delete the distance reference, the S point is displayed again at its original position.
- If you delete the E event, the event that has the largest number becomes the E event.
- When you move the cursor on the event screen, an icon for adding ( ) or deleting ( ) an event appears above the cursor. You can add an event at the cursor position or delete the event that the cursor is pointing to simply by tapping an icon.

Editing Event Markers

3. Press the **Event MarkerEdit** soft key to display the Event MarkerEdit menu.
4. Press the **Rotary Knob** soft key to select Event.
5. Turn the rotary knob to select the event you want to edit.
   The color of the selected event changes.
6. Press the **Rotary Knob** soft key to select Cursor.
   You can now use the marker menu.

When Marker Mode Is Set to Marker

7. Turn the rotary knob to move the cursor on the waveform to the position that you want to move an event to.
8. Press the appropriate event marker soft key.
   The event moves to the cursor position. The reflection loss and splice loss are recalculated and displayed in the detail display area at the bottom of the screen.

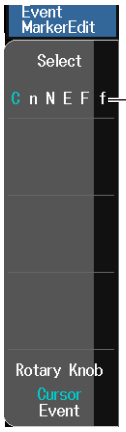


Note

For details on how to set markers, see “4 Point Markers” in section 1.4.

When Marker Mode Is Set to Line

7. Press the **Select** soft key to select the event marker that you want to move.



Selects an event marker (C, n, N, E, F, f)
Press this soft key to select the event marker that you want to move.

Note

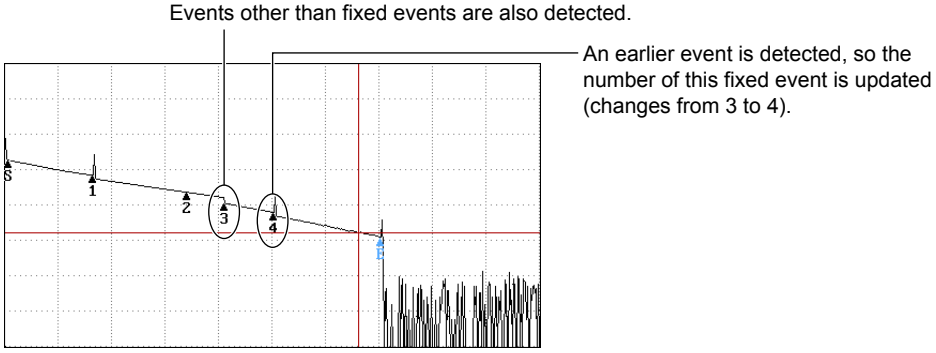
For details on how to set markers, see “5 Point Markers” in section 1.4.

Fix event positions

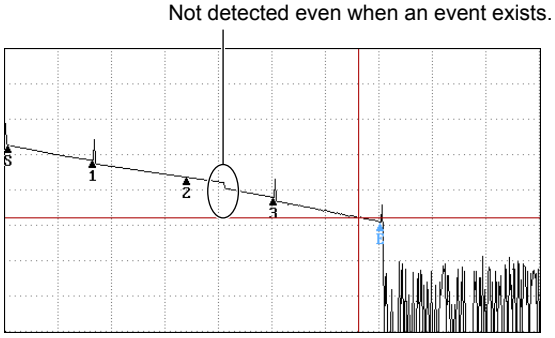
An event in which the Event Fix Mode is changed from OFF to some other setting is referred to as a master event. To change the master event, set the Event Fix Mode to OFF first, and then set the master event.

How the events that are detected at positions other than the master event positions are displayed varies depending on the Event Fix Mode as follows:

- **When Event Fix Mode Is Set to Append Mode (Mode 1)**
  Events detected at positions other than the master event positions are also displayed in the event list.



- **When Event Fix Mode Is Set to Master Mode (Mode 2)**
  Only the events that are detected at the master event positions are displayed in the event list.



List Edit

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key, the **Display** soft key, and then the **List Edit** soft key to display the following screen.

Edit the distance.
Edit the return loss.
Edit the section group index (section IOR).
Edit the event type.

- **Editing the Distance**
  When you change the distance of an event, the section group index (section IOR) is recalculated. When the event cannot be set at the specified position, the distance is adjusted to a position where the event can be set.
  Changing the distance of an event affects the values of other events.
  You cannot change the distance of the distance reference (point R).

- **Editing the Return Loss**
  When you change the return loss of an event, the backscatter level is recalculated. The return losses of other events are measured on the basis of the recalculated backscatter level.

- **Editing the Section Group Index (Section IOR)**
  When you change the section group index (section IOR) of an event, the distance is recalculated. You cannot change the section group index (section IOR) of the distance reference (point R).

- **Editing the Event Type**
  You can change the event type. For details on event type, see page 4-19.

Editing Event Notes (Inserting Comments)

1. From the top menu, select **OTDR**.
2. Press the **Event Analysis** soft key, the Display soft key, and then the **List Edit soft** key to display a character input screen.
3. Enter a comment that describes the content.

   Follow the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.
4. Press **ENTER**. The entered comment appears below the event information display.

Entered text

Event No	Distance (km)	Splice Loss(dB)	Return Loss(dB)	Cumulate Loss(dB)	dB/km	Event Type	Section IOR
1	0.46406	0.168		0.099	0.219		1.46000
	YOKOGAWA						
2	0.87217	0.060	57.982	0.352	0.209		1.46000
3	1.12884	0.193		0.456	0.173		1.46000
E	1.43377		50.651	0.707	0.190		1.46000

Note

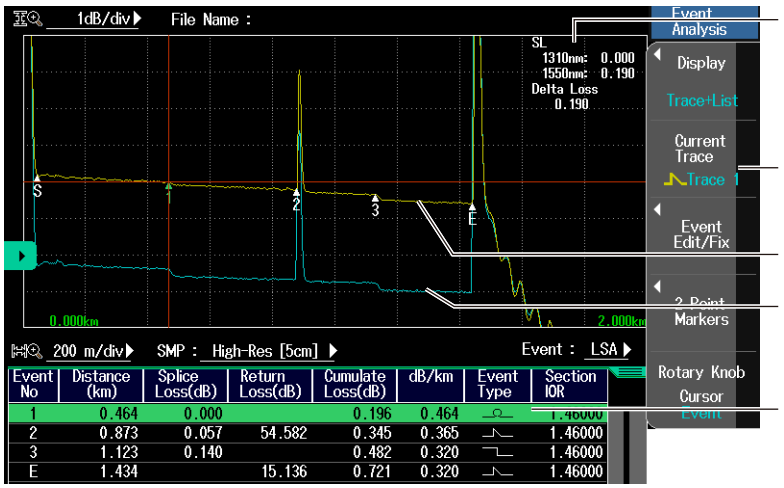
You can enter up to 36 characters for a comment.

Displaying Macro Bending (Bending Loss) Events

When an optical pulse measurement is performed in multi wavelength measurement, you can compare the splice losses at each wavelength and display on the screen bending loss events that are caused by bends in the optical fiber cable.

Displaying Events

Press the **Macro Bending** soft key to display the following menu.



Move the cursor to a bending loss event to display the values.

Selects the current trace

1310 nm wavelength

1550 nm wavelength

Bending loss events are displayed in this event list.

In this example, the current trace has been set to the waveform with 1310 nm wavelength. The bending loss event for 1550 nm wavelength (event number 1) will be displayed on the waveform with 1310 nm wavelength, which is the current trace.

Displaying Bending loss Events during Measurement

To display bending loss events during measurement, perform multi wavelength measurement (at least two wavelengths from 1310 nm, 1490 nm, 1550 nm, and 1625 nm).

Note

If the waveforms of the two wavelengths are not being acquired, bending losses cannot be detected.

5.1 Outputting Light (/SLS option, VLS)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

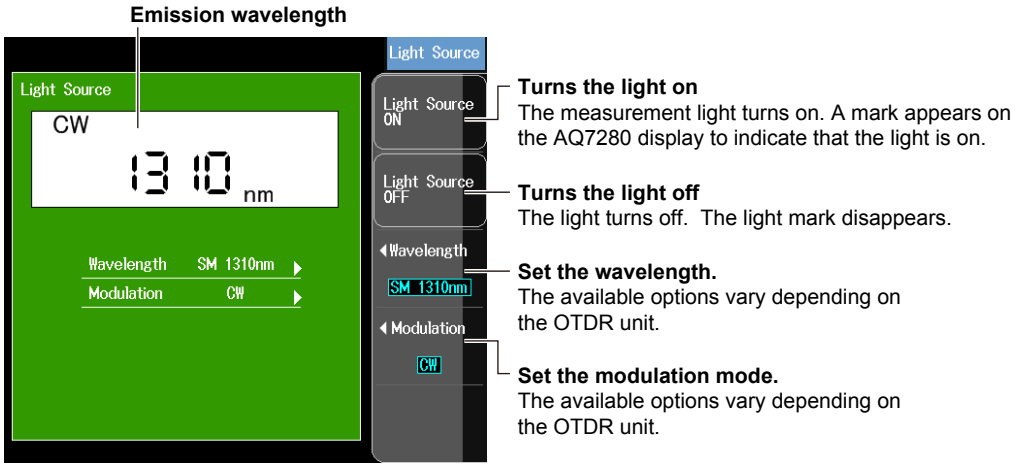
French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

Outputting Measurement Light (/SLS option of the OTDR unit)

1. From the top menu, select **Light Source** to display the following screen.



Setting the Wavelength and the Modulation Mode

The following measurement light wavelengths can be generated.

You can produce continuous light (CW) or light that has been modulated at the selected frequency (modulation mode).

Model	Measurement Light Wavelength	Modulation Mode
AQ7282A	1310 nm, 1550 nm	CW, 270 Hz, 1kHz, 2kHz
AQ7283A		
AQ7284A		
AQ7285A		
AQ7283E	1310 nm, 1550 nm, 1625 nm	
AQ7283F	1310 nm, 1550 nm, 1650 nm	
AQ7282G	1310 nm, 1490 nm, 1550 nm	
AQ7283H	1310 nm, 1550 nm, 1625 nm	
AQ7284H		
AQ7283J[1]		
AQ7283K	1310 nm, 1490 nm, 1550 nm, 1625nm	
AQ7282M[2]	850 nm, 1300 nm	CW, 270 Hz

1 Not applicable for 1383 nm for AQ7283J.

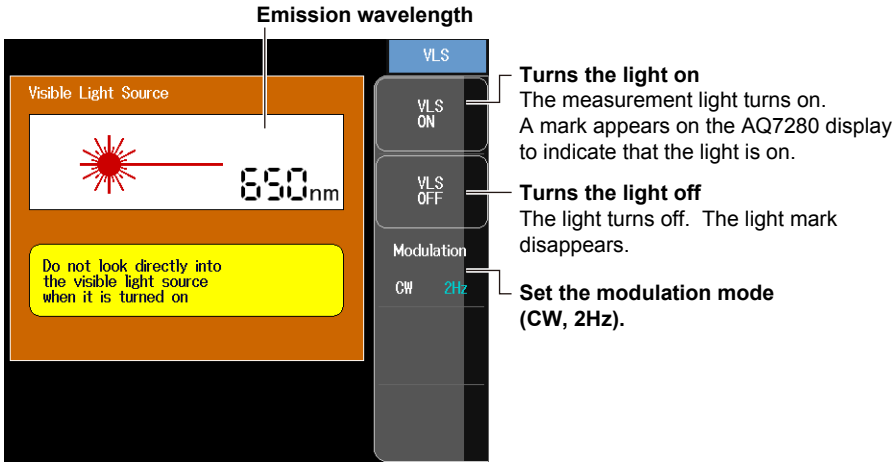
2 Supported on firmware version 2.01 and later.

Note

- Connect an optical fiber cable to the OTDR port of an OTDR unit with the /SLS option.
- The AQ7283E's 1625 nm and the AQ7283F's 1650 nm measurement lights are emitted from OTDR port 2. Other measurement lights are emitted from OTDR port 1.
- Turn the light source on after you set the wavelength and the modulation mode.
- You can also start the light source feature from the OTDR display screen. For the procedure, see section 2.10.

Outputting Visible Light (VLS module)

1. From the top menu, select **VLS** to display the following screen.



Note

- Connect an optical fiber cable to the optical output port of a VLS module or OPM module (with a visible light source).
- You can also start the visible light source feature from the OTDR display screen. For the procedure, see section 2.10.

5.2 Measuring Optical Power (OPM, /PC option)

Measuring Optical Power Using the Optical Power Meter (OPM Module)

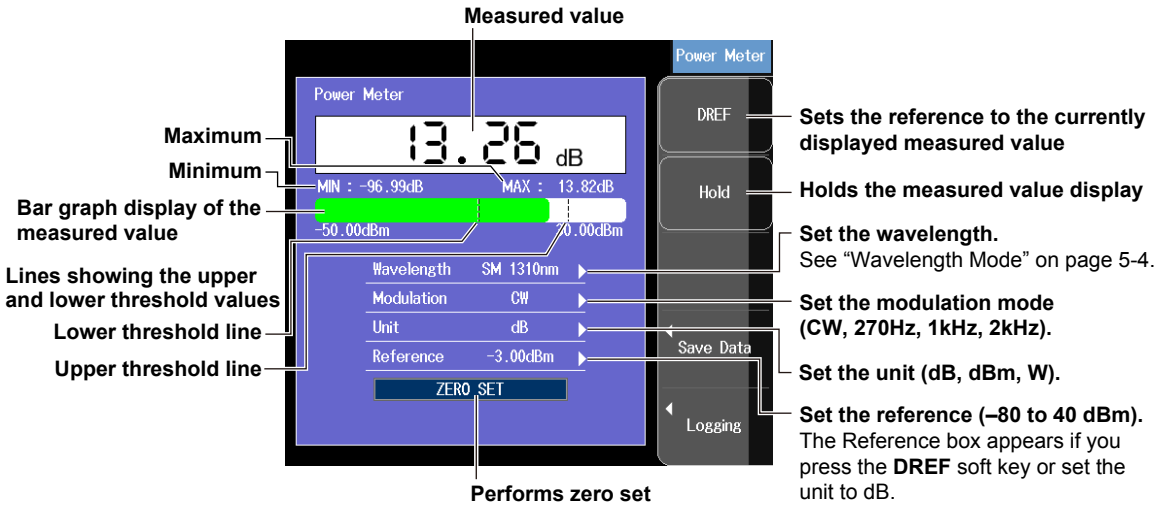
Absolute power (dBm, W) and loss (dB) can be measured. You can set the measurement conditions such as the wavelength and modulation.

Making Preparations for Measurements

Remove the optical fiber cables from the AQ7280 and close the optical connector covers, or make sure that the optical power meter section is not receiving any light, and then start the optical power meter zero-set procedure.

Performing Zero-Set

1. From the top menu, select **Power Meter** to display the following screen.



2. Execute **zero-set**.

Note

Perform a zero-set whenever necessary, such as after you have turned on the power or when the ambient temperature changes. Performing a zero-set adjusts the internal deviation of the optical power measurement section and enables you to obtain more accurate absolute optical power values.

Setting the Screen Display and Measurement Conditions

Unit

Set the optical power display unit from the following.
dB (absolute value), dBm (absolute value), W (absolute value)

- Unit W is preceded by a prefix m(10^{-3}), μ(10^{-6}), n(10^{-9}), or p(10^{-12}).
- The following relation holds between the absolute display unit dBm and W.
  PdBm = 10×log(Pw×10^{-3})
  PdBm: Optical power (unit dBm), Pw: Optical power (unit W)

Reference

You can set a reference value and display the relative measured values (the differences from the reference value).

- When you press the **DREF** soft key, the displayed measured value becomes the reference value. From this point, relative values will be displayed. The unit changes to dB.
- When you press the **DREF** soft key or set the unit to dB, the Reference box appears on the power meter screen.
- You can set the reference value in the Reference box. The range is –80 to 40 dBm.
- When you set the unit to dBm or W, the Reference box disappears, and the absolute measured values will be displayed.

Note

If Wavelength mode is set to Simple, a different reference value can be set and retained for each waveform. If set to Detail or CWDM, the reference value must be reset when the wavelength is changed.

Bar Graph and Threshold Display

The upper and lower threshold values specified on the optical power meter setup screen are displayed with broken lines. While the bar is within the threshold boundaries, it is displayed in green. Otherwise, it is displayed in red.

Holding the Measured Value Display

You can stop the measured value, bar graph, and maximum and minimum values from being updated. The values when you apply HOLD remain displayed. To release the hold, press the **HOLD** soft key again.

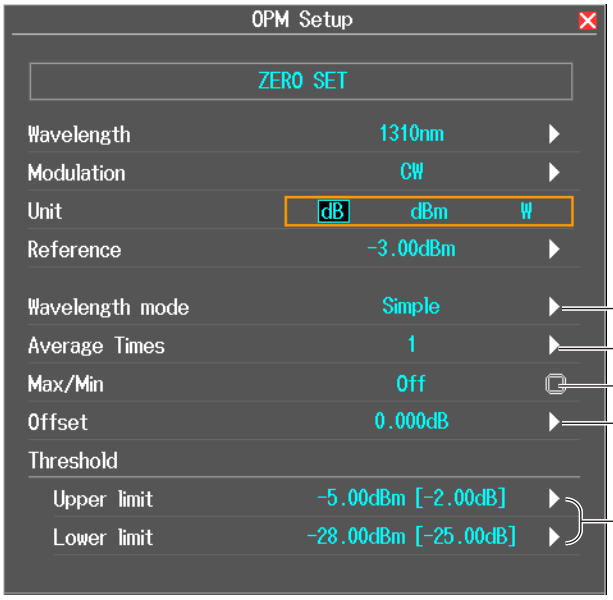
Display hold in progress

Note

You can also start the optical power meter feature from the OTDR display screen. For the procedure, see section 2.10.

Setting Detailed Measurement Conditions

1. From the top menu, select **Power Meter** to display the Power Meter menu.
2. Press **SETUP** and then the **OPM Setup** soft key to display the following screen.



Set the wavelength mode (Simple, Detail, CWDM).

Set the average count (1, 10, 50, 100).

Turns the display of the max/min value menu on and off

Set the offset (–9.900 to 9.900dB).

Set the threshold (–80 to 40dBm).
Set the upper and lower limits.

Wavelength Mode

You can set the wavelength setting step.

Simple: 850 nm, 1300 nm, 1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm

Detail: You can set the wavelength in 1 nm steps within the measurement scope.

CWDM: You can set the wavelength to a value from 1270 nm to 1610 nm in 20 nm steps.

Average Times

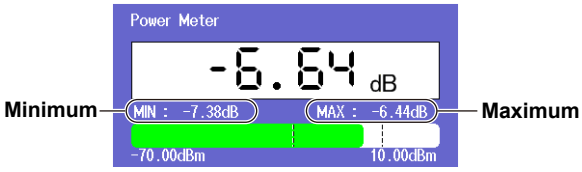
The value after averaging the specified number of times is displayed as the measured value. Select the average count from the following.

1, 10, 50, 100

Maximum and Minimum Display

You can display the maximum and minimum measured optical power values. During measurement, the displayed values are constantly updated.

ON: Displayed
OFF: Not displayed



Offset

You can add a specified value (the offset value) to measured input optical power values and display the results as measured values.
The range is –9.900 to 9.900 dB.

Threshold

You can set upper and lower threshold values and determine whether or not the measured values fall within them.

- The range for upper and lower threshold values is –80 to 40 dBm. The upper limit must be greater than the lower limit.
- If the measured values are less than or equal to the upper limit and greater than or equal to the lower limit, the corresponding bar graph is displayed in green.
- If the measured values exceeds the upper limit or fall below the lower limit, the corresponding bar graph is displayed in red.

Measuring Optical Power Values of Multi-Core Fiber

You can save data (measurement conditions and measured value) to the AQ7280 internal memory by specifying the core number and tape number type. You can also save the data to a CSV file.

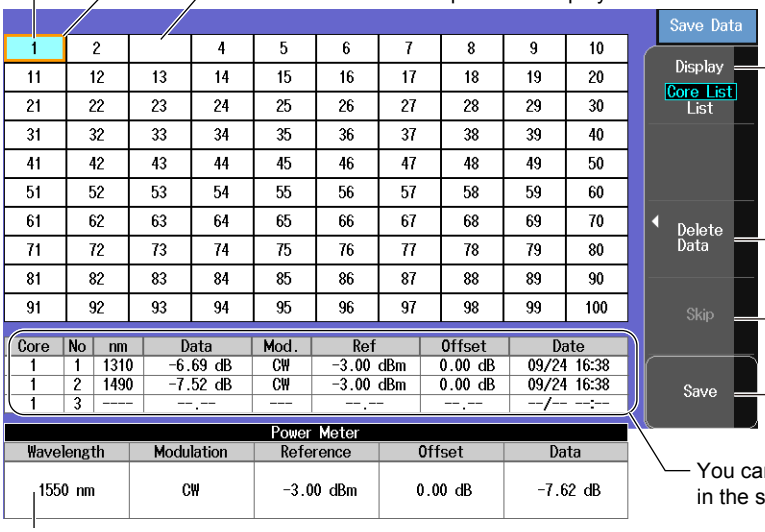
1. From the top menu, select **Power Meter** to display the Power Meter menu.
2. Press the **Save Data** soft key to display the following screen.

- **When the Display is set to Core List**

Saved result indication
Blue: Measured data saved
White: Measured data not saved

Turn the rotary knob to move the cursor (orange frame) to the core number that you want to save the measured data for.

Core numbers set to Skip are not displayed.



1	2		4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Measured data (measurement conditions and measured values)
Displays the optical power value measured on page 5-3 and the measurement conditions specified on page 5-4.

Skip

When Skip is selected, the corresponding core is not measured. By specifying Skip on cores that do not need to be measured, you can save time.

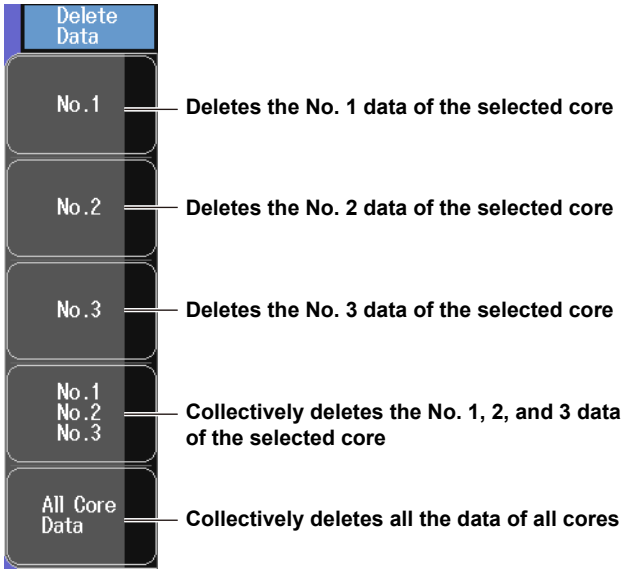
Saving the Data

You can save up to three sets of data in the save area of the specified core number. To confirm whether the optical fiber cable installation has any effect, you can save the measured values before and after the installation for comparison later.
For details on saving data to files, see section 7.3.

Deleting Optical Power Measurement Data

You can delete data from the save areas for each core number individually or all cores at once.

Press the **Delete Data** soft key to display the Delete Data menu.



When you delete data, the screen returns to the Save Data menu after the data is deleted.

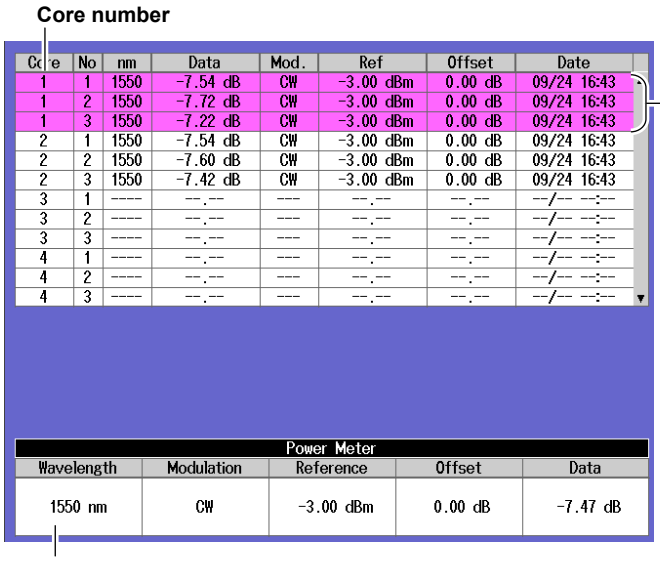
Switching the Display

You can select from two screen displays.

Core List: A list of core numbers and save areas is displayed. An example is shown on page 5-5.

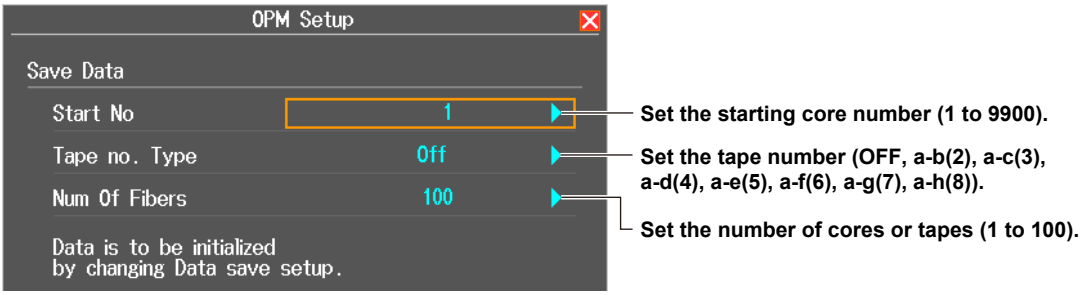
List: Only a list of save areas is displayed.

- **When the Display is set to List**



Setting the Data Save Conditions

1. From the top menu, select **Power Meter** to display the Power Meter menu.
2. Press **SETUP** and then the **Save Data** soft key to display the following screen.



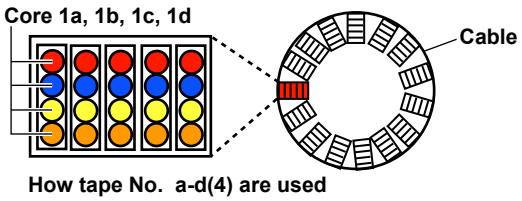
Tape no. Type

By setting the tape number type, you can the tape number accordingly.

The core number display will be as follows.

OFF: 1, 2, 3, ...

a-d(4): 1a, 1b, 1c, 1d, 2a, 2b, 2c, 2d, 3a, 3b, 3c, 3d, ...



How tape No. a-d(4) are used

Number of Cores or Tapes

Set the number of cores or tapes in the following range.

You can set the number of cores in steps to 10.

Tape Number	Number of Cores or Tapes	Total Number of Applicable Cores
OFF	10 to 100 cores (in steps of 10)	—
a-b(2)	Number of tapes: 10 to 50	20 to 100
a-c(3)	Number of tapes: 10 to 33	30 to 99
a-d(4)	Number of tapes: 10 to 25	40 to 100
a-e(5)	Number of tapes: 10 to 20	50 to 100
a-f(6)	Number of tapes: 10 to 16	60 to 96
a-g(7)	Number of tapes: 10 to 14	70 to 98
a-h(8)	Number of tapes: 10 to 12	80 to 96

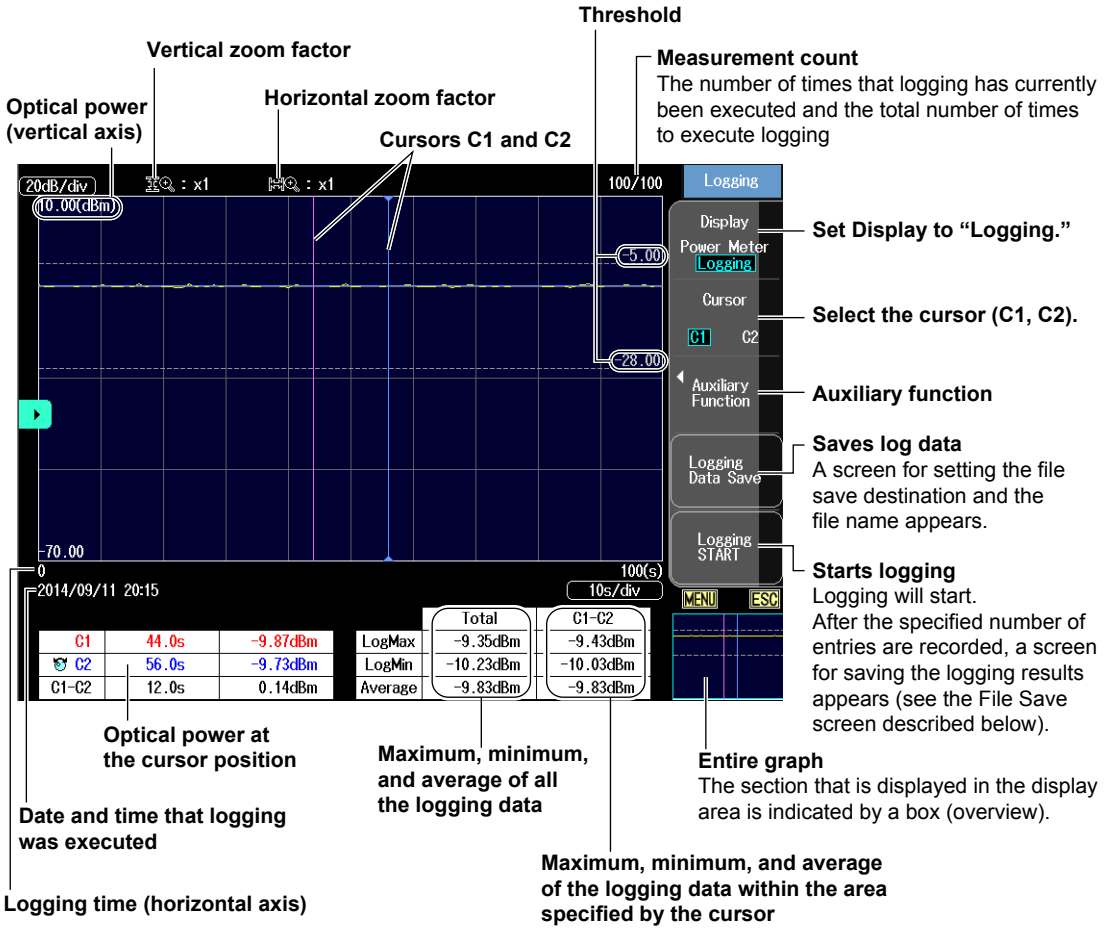
Note

Data in the save area saved in the core number list can be consolidated and saved in a single CSV file. The data that you save can be edited in a spreadsheet application. The file can also be loaded into the AQ7280.

Logging Measurement of Optical Power Values

1. From the top menu, select **Power Meter** to display the Power Meter menu.
2. Press the **Logging** soft key and then the **Display** soft key to display the following screen.

- **Display Item: Logging**



Graph Display of Logging Data

Set Display to Logging to display the measured values on a graph in real time during logging.
Logging results that have been saved in CSV format cannot be displayed on a graph.

- **Zooming In and Out**

  You can press the arrow keys to zoom the displayed graph in or out. The graph is zoomed at the cursor position.

  Up and down arrow keys: Zooms vertically (up to zoom in, down to zoom out).
  Zoom factors are ×1, ×2, ×5, ×10, ×20, and ×50.

  Left and right arrow keys: Zooms horizontally (right to zoom in, left to zoom out).
  Zoom factors are ×1, ×2, ×5, ×10, ×20, and ×50.

  You cannot zoom in on the graph so much that there are less than 11 logging data points on the screen.

- **Display Item**

  Set Display to Power Meter to execute logging and switch to the optical power meter screen. For the procedure, see page 5-3.

Selecting the Cursor

You can switch between the two cursors (C1 and C2) that are displayed on the screen. If the selected cursor is outside of the display area, the display position is automatically changed so that the cursor is in the center of the screen. If the cursor is at the left or right edge of the screen, because the sections that are outside of the measurement range cannot be displayed, even if you switch to the other cursor, the selected cursor will not be displayed in the center of the screen.

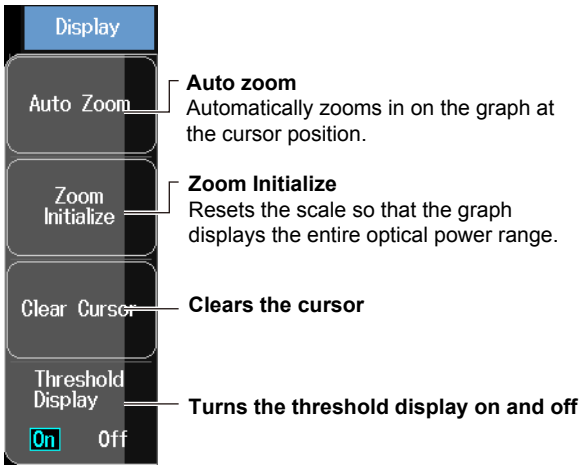
Executing Logging and Saving

While the power meter feature is running, the AQ7280 is constantly measuring the optical power. To save the measured values, execute logging.

- Press the **Logging START** soft key to start logging. While logging, the Logging START soft key changes to Logging STOP.
- When the specified number of entries have been logged or when you press the Logging STOP soft key, logging stops. The **Logging STOP** soft key changes to Logging START, and the file save screen appears. For details on saving files, see section 7.3.
- The logging results can be saved in CSV format. Data saved in CSV format will take on values that are 1000 times the measured values.

Auxiliary Function

You can control the graph display.
Press the **Auxiliary Function** soft key to display the Display menu.



- **Auto Zoom**

  The vertical zoom factor is set automatically so that all the logging data is displayed.
  The median value between the maximum and minimum of the logging data is the center position on the screen.
  If there is no logging data, auto zoom is not performed.

- **Zoom Initialize**

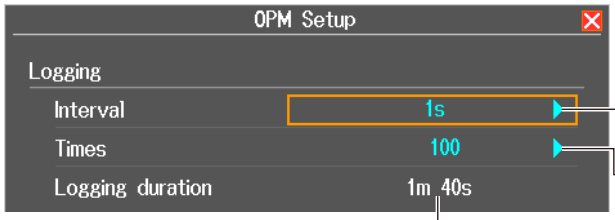
  Zoom initialization returns the vertical and horizontal zoom factors to ×1.

Note

The logging results are saved in a CSV file, so you can open it with a spreadsheet application. The file can also be loaded into the AQ7280 to display the graphs.

Setting the Logging Conditions

3. Press **SETUP** and then the **Logging** soft key to display the following screen.



Set the measurement interval (500ms, 1s, 2s, 5s, 10s).

Set the number of times (10 to 36000).

Logging time
The time to perform logging measurements over is calculated automatically from the measurement interval and the logging count and displayed.

Interval

Set the interval for logging the measured values from the following.
500 ms, 1 s, 2 s, 5 s, 10 s

Times

Set the number of times to log in the following range.
10 to 36000

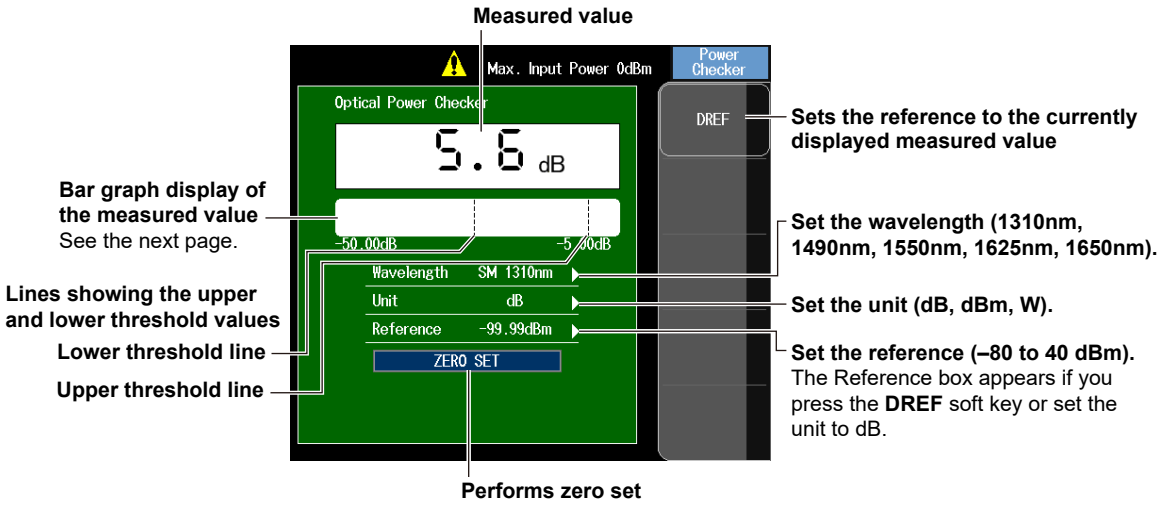
Measuring Optical Power Using the Power Checker (/PC option of the OTDR unit)

Making Preparations for Measurements

Remove the optical fiber cables from the AQ7280 and close the optical connector covers, or make sure that the OTDR port is not receiving any light, and then start the power checker zero-set procedure.

Performing Zero-Set

1. From the top menu, select **Power Checker** to display the following screen.



2. Execute **zero-set**.

Note

- Perform a zero-set whenever necessary, such as after you have turned on the power or when the ambient temperature changes. Performing a zero-set adjusts the internal deviation of the power checker section and enables you to obtain more accurate absolute optical power values.
- You can also start the power checker feature from the OTDR display screen. For the procedure, see section 2.10.

Setting the Screen Display and Measurement Conditions

Setting the Wavelength

Measurement light with the following wavelengths can be measured.

1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm

Note

This is not available on port 2 of the AQ7283E and AQ7283F, or on the AQ7282M.

Unit

Set the optical power display unit from the following. dB (absolute value), dBm (absolute value), W (absolute value)

- Unit W is preceded by a prefix m(10–3), μ(10–6), n(10–9), or p(10–12).
- The following relation holds between the absolute display unit dBm and W.
  PdBm = 10 × log (Pw × 10–3)
  PdBm: Optical power (unit dBm), Pw: Optical power (unit W)

Reference

You can set a reference value and display the relative measured values (the differences from the reference value).

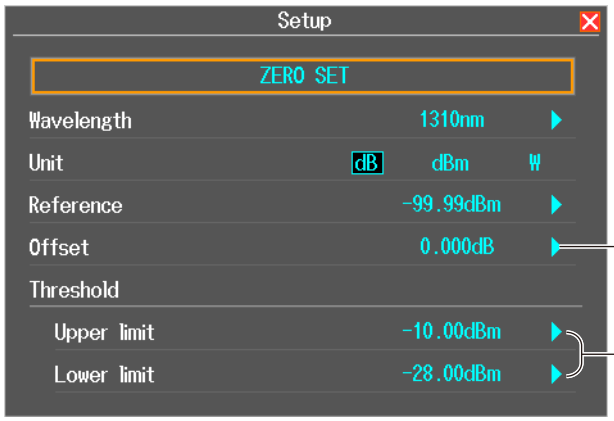
- When you press the **DREF** soft key, the displayed measured value becomes the reference value. From this point, relative values will be displayed. The unit changes to dB.
- When you press the **DREF** soft key or set the unit to dB, the Reference box appears on the power meter screen.
- You can set the reference value in the Reference box. The range is –80 to 40 dBm.
- When you set the unit to dBm or W, the Reference box disappears, and the absolute measured values will be displayed.

Bar Graph and Threshold Display

The upper and lower threshold values specified on the optical power meter setup screen are displayed with broken lines. While the bar is within the threshold boundaries, it is displayed in green. Otherwise, it is displayed in red.

Setting Detailed Measurement Conditions

1. From the top menu, select **Power Checker** to display the following screen.
2. Press **SETUP** to display the following screen.



Set the offset (-9.900 to 9.900 dB).
See page 5-5.

Set the threshold (-80 to 40 dBm).
Set the upper and lower limits.
See page 5-5.

Note

With the /PC option of the OTDR unit, you cannot save measured data to files. If you need to save data, use the OPM module, explained earlier.

6.1 Controlling the Optical Switch

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables from this instrument or from the optical switch. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. Visual impairment may occur if light that is mistakenly emitted from these ports enters the eye.

French

AVERTISSEMENT

- Lorsque l'AQ7280 génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'oeil.
- Couvrir les caches des ports de source lumineuse libres. Sur les modèles dotés de deux ports de source lumineuse ou plus, protéger les yeux contre l'émission accidentelle de lumière depuis le mauvais port.

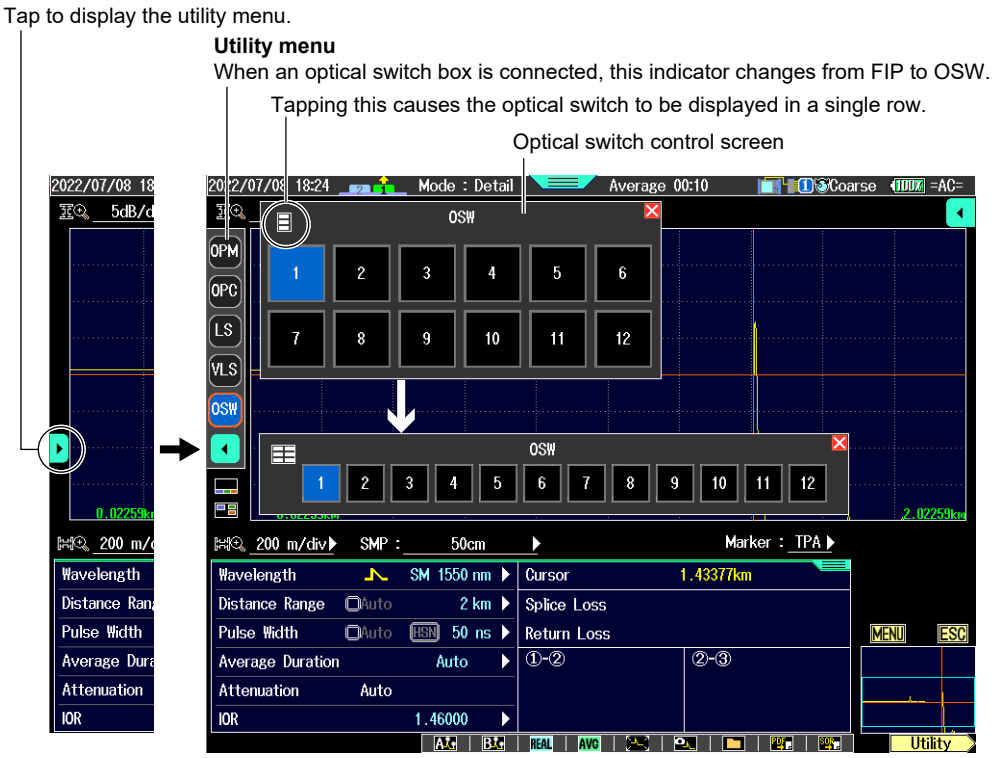
Controlling the Optical Switch during Optical Pulse Measurement

1. From the top menu, select **OTDR**.
2. Tap the Utility button.

   The Utility menu appears.
3. On the Utility menu, tap **OSW**.

   An optical switch control screen appears.
4. Tap the number buttons on the control screen.

   The optical switch changes to the optical port corresponding to the number you tapped.



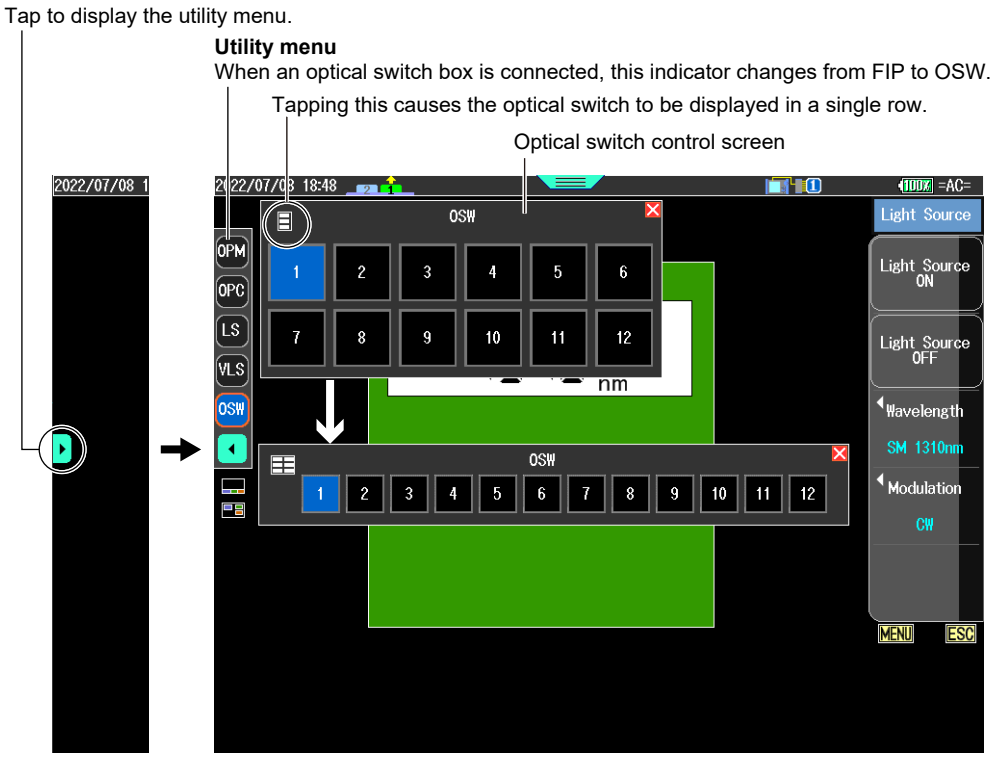
Controlling the Optical Switch When Using a Light Source, Visible Light Source, Power Meter, or Power Checker

1. From the top menu, select **Light Source**, **Visible Light Source**, **Power Meter**, or **Power Checker**.
2. Tap the Utility button.

   The Utility menu appears.
3. On the Utility menu, tap **OSW**.

   An optical switch control screen appears.
4. Tap the number buttons on the control screen.

   The optical switch changes to the optical port corresponding to the number you tapped.



Controlling the Optical Switch during Multi-Fiber Measurement (OTDR)

Setting “Linkage OSW control” to ON in the multi-fiber measurement project settings causes the optical switch to change automatically when you select a measurement target core number and execute a measurement. The optical switch control screen does not appear. For details, see section 2.8.

Controlling the Optical Switch during Schedule Measurement

When “Linkage OSW control” is set to ON in the schedule measurement settings, the optical switch for the target channel in schedule measurement switches automatically in sync with the measurements. The optical switch control screen does not appear. For details, see section 2.9.

7.1 Connecting USB Storage Media to the USB Ports

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Use a portable USB memory device for the USB storage media. Connect it directly to a type A USB port of the AQ7280.
Hot-plugging is supported: you can connect or disconnect the USB device at any time, regardless of whether the AQ7280 is on or off.
When the power is on, the AQ7280 automatically detects the USB memory device after it is connected.

Note

- Use a portable USB memory device for the USB storage media. Do not connect incompatible USB memory devices.
- Connect USB memory devices directly to the AQ7280, not through a USB hub.
- You cannot use protected USB memory devices (such as those that contain encrypted content).
- Do not remove and connect a USB memory device at short intervals. Provide at least a 10-second interval between removal and connection.
- Do not connect or remove a USB memory device from the time when the AQ7280 is turned on until key operation becomes available.
- USB memory devices complying with USB 1.0/1.1/2.0 can be used.

7.2 Connecting an SD Card

CAUTION

- Before connecting an SD card, turn off the power.
- Do not insert the SD card in the wrong direction. Doing so may damage the SD card or the AQ7280 or both.

French

ATTENTION

- Coupez l'alimentation électrique avant de connecter une carte SD.
- N'introduisez pas la carte SD dans le mauvais sens. Cela pourrait endommager la carte SD ou l'AQ7280, voire les deux.

Compatible SD Cards

You can use SDHC compliant memory cards with the AQ7280. For details, contact your nearest YOKOGAWA dealer.

Note

- When using an SD card with a PC, make sure that the PC is compatible with it. Also, depending on the type of PC, some of the SD cards listed above may not function properly. Check it in advance.
- SDXC is not supported.

SD card with a wireless LAN function (FlashAir)

The AQ7280 supports SD cards with a wireless LAN function (FlashAir). By using an SD card with a wireless LAN function, you can access files in FlashAir and transfer data from a PC, smartphone, or tablet.* From the PC, smartphone, or tablet, search for the wireless LAN access point and connect to it. For details on searching, see the relevant manual.

* OTDR Data Transporter for Android can be downloaded from the Yokogawa Website, and OTDR Data Transporter for iOS can be downloaded from the App Store (free software).

- **Setting the auto timeout value**
  You can set the FlashAir auto timeout value. For the setup procedure, see section 8.7.

How to Insert an SD Card

See the Getting Started Guide, IM AQ7280-02EN.

7.3 Saving and Loading Data

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

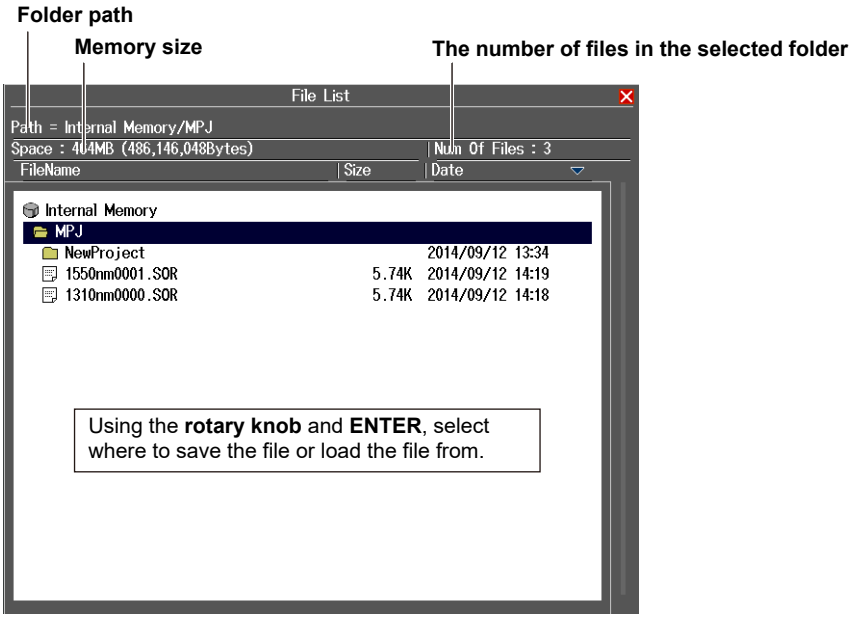
French

ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

File List Screen



You can specify the items to display in the file list. For details, see section 7.9.

Note

- Do not save files directly to the root folder. Create a folder, and save files to that folder. If there are many folders in the root folder, it will take some time to access files to a folder that is at a lower level in the folder hierarchy.
- The number of folders and files that can be saved in the root folder is 50. If this limit is exceeded, an error message will be displayed.
- If more than 250 files and folders are saved in a single folder, a warning message will be displayed. Saving is possible, but file operations will slow down.
- No more than 550 files or folders can be saved in a single folder. If you do, an error message will appear.

File Menu

Press **FILE** to display the File menu.

The file menu on the AQ7280 varies depending on the feature in use.

When the OTDR, OTDR Smart Mapper, Fault Locator, or power meter feature of the top screen or top menu is in use

Set the action (Save, Load).

Set the file type.
Set the extension for saving or loading.
For details, see the explanation later in this section.

Set the save destination drive
(Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Set the file name.
Set the file name format. You can set this when Action is set to Save.

Start saving or loading.
This soft key is Save or Load depending on the Action setting.

When the multi-core fiber measurement or schedule measurement feature is in use

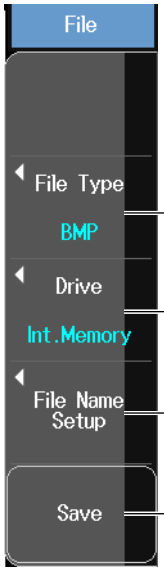
Set the action (Save, Load).
Save can be used for multi-core fiber measurement.

The file type is fixed. The extension for saving or loading is displayed. For details, see the explanation later in this section.

Set the save destination drive
(Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Start saving or loading.
This soft key is Save or Load depending on the Action setting.

When the fiber inspection probe feature is in use



Set the file type.
Set the extension for saving or loading.
For details, see the explanation later in this section.

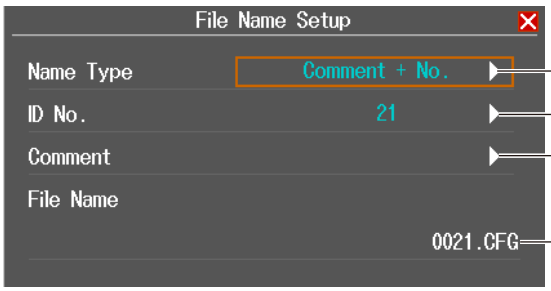
Set the save destination drive
(Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Set the file name.
Set the file name format. You can set this when Action is set to Save.

Start saving.

File Name Setup Screen

When a top screen feature is in use



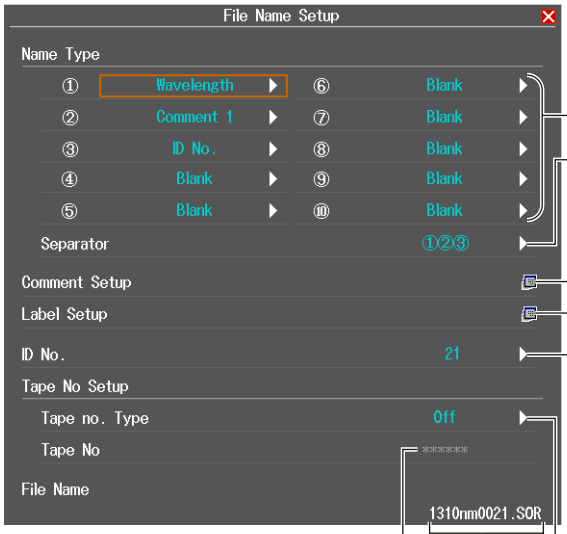
Set the file name type
(No., Comment, Comment + No., No. + Comment).

Set the ID number (0 to 9999).

Set a comment (up to 30 characters).
Enter a comment by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

File name
The file name that is determined by the above settings is displayed.

When the OTDR, OTDR Smart Mapper, Fault Locator, or power meter feature is in use



Set the file name type (ID No., Wavelength, Comment 1 to Comment 10, Company Name, Name, Cable ID, Fiber ID, Cable Code, Originating Loc, Terminating Loc, Distance Range, Pulse Width, Attenuation, Average Method, Duration/Times).
Set the items that will be entered into parts ① to ⑩ of the file name. For Duration/Times, either one is displayed depending on the average unit setting.

Set the separator
(①②③, ①_②_③, ①~②~③, ①^②^③)

Set a comment (up to 30 characters).
Enter a comment by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

Set the label.
On the screen that appears, enter the values for the items according to “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN or select from the displayed options. The label items are company name, name, cable ID, fiber ID, fiber type, cable code, start position, end position, and current data flag.

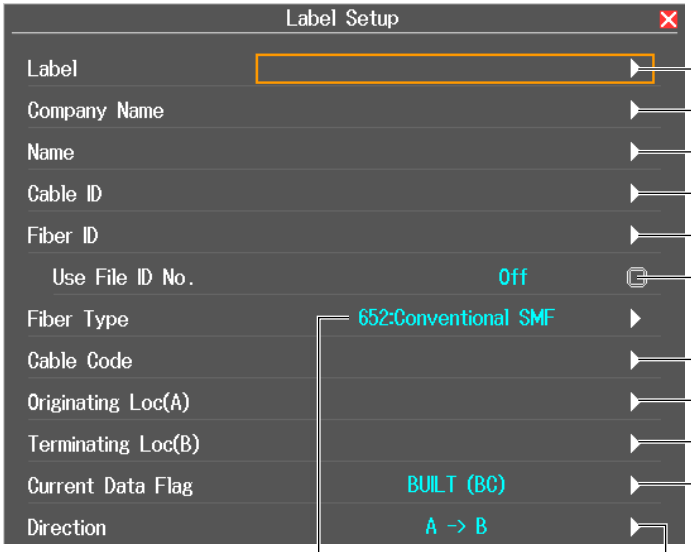
Set the ID number (0 to 9999).

Set the tape number type (Off, a-b(2), a-c(3), a-d(4), a-e(5), a-f(6), a-g(7), a-h(8)).

Set the tape number start character.
Set, within the specified tape number type range, the tape number start character that will be attached to the file name.

File name
The file name that is determined by the above settings is displayed.

Setting Labels



Set the label.*
Set the company name.*
Set the name.*
Set the cable ID.*
Set the fiber ID.*
When set to ON, the same character string as the file ID (ID number) is set. (Firmware version 2.02 and later)
Set the cable code.*
Set the start position.*
Set the end position.*
Set the current data flag (BUILT (BC), REPAIRED (RC), OTHER (OT), and CURRENT (CC))

Set the fiber type (652:Conventional SMF, 653:Dispersion Shifted SMF, 654:Cut-Off Shifted SMF, 655:Non-Zero Dispersion Shifted SMF, 656:NZDSF for Wideband Transport, 657:Bend Optimized SMF, 651:Multi-Mode Fiber)

Set the direction (A -> B, B -> A).
This is available only for multi-core fiber measurement.

* A character input dialog box will open. Enter the label by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

Explanation

Action

Select Save or Load.

You cannot use this when the power meter logging feature is in use.

File Type

Set the extension depending on the type of data to save or load.

You cannot use this when the power meter logging feature is in use.

Saving

The following types of files can be saved.

- **Top Screen**

Display	Description
*.CFG	System settings are saved to a file in CFG format.
*.BMP	A screen image file of the product information is saved to the root folder with the name Systeminfo.BMP.

- **OTDR Feature, Fault Locator Feature**

Display	Description
*.SOR	Waveform data measured from an optical pulse (including the measurement conditions) is saved in an SOR file format that conforms to Telcordia SR-4731.
*.BMP	Screen image data is saved to a file in BMP format.
*.JPG	Screen image data is saved to a file in JPG format.
.SOR|.BMP	Both SOR and BMP files are saved.
.SOR|.JPG	Both SOR and JPG files are saved.
.SOR|.PDF	Both waveform data and report format are saved simultaneously.
*.SET	Measurement conditions are saved to a file in SET format.
*.CSV (waveform)	Waveform data measured from an optical pulse is saved to a file in CSV format.
*.CSV (event)	Event data is saved to a file in CSV format.

The screen image immediately before entering the file operation screen is saved.

Description of the CSV (waveform) data

```
Label
Date/Time          Mon Feb 28 10:40:08 2022

Wavelength         SM 1310nm
Distance Range     30km
Pulse Width        200ns
Attenuation
Average Duration   Auto
IOR                1.46
Data Size          15000
Sample Interval    2 m

[km]               [dB]
0                  47.812
0.00205            47.807
0.00411            47.807
0.00616            47.809
  ↑                  ↑
Distance           Return loss
```

Label and date

Measurement conditions

Measurements

Description of the CSV (event) data

```
Label
Date/Time          Mon Feb 28 10:40:08 2022

Wavelength         SM 1310nm
Distance Range     30km
Pulse Width        200ns
Attenuation
Average Duration   Auto
IOR                1.46
Data Size          15000
Sample Interval    2 m

Approx.Method      LSA
Backscatter Level  -52.00dB
Splice Loss        0.10dB
Return Loss        70dB
End of Fiber       3dB

Distance           1.43377km
Total Loss                0.707dB
Total RL           40.872dB
Number of Event    4

EventNo   Distance(km)   Splice Loss(dB)   Return Loss(dB)  ···
    1     0.46406        0.168
    2     0.87217        0.06              57.982
    3     1.12884        0.193
    4     1.43377                          50.651
```

Label and date

Measurement conditions

Analysis conditions

Measurements

Event information

- **Multi-Core Fiber Measurement**

Display	Description
—	Waveform data from measuring multi-core fiber (including the measurement conditions) is saved in an SOR file format that conforms to Telcordia SR-4731. When Action is set to Save or Load, file type cannot be changed. Moreover, SOR files do not appear in the file list.
—	Screen image data of the fiber inspection probe is saved to a file in BMP format. When Action is set to Save or Load, file type cannot be changed. Moreover, BMP files do not appear in the file list.
*.MPZ	SOR files, MPJ files, and BMP files are compressed and saved to MPZ files. They can be used as storage files. For the decompression procedure, see “Note” under “Saving the Project” in section 2.8.
*.TXT	Multi-core fiber measurement conditions, waveform data summary information, and optical power measurements are saved to a tab separated file (firmware version 1.07 and later).

- **Schedule Measurement**

Display	Description
—	Waveform data measured according to the specified schedule (including the measurement conditions) is saved in an SOR file format that conforms to Telcordia SR-4731. When Action is set to Save or Load, file type cannot be changed. Moreover, SOR files do not appear in the file list.
*.CSV	Schedule information and measured optical power values (including measurement conditions) are saved to a file in CSV format.

- **OTDR Smart Mapper**

Display	Description
*.SOR	Waveform data measured from an optical pulse (including the measurement conditions) is saved in an SOR file format that conforms to Telcordia SR-4731.
*.BMP	Screen image data is saved to a file in BMP format.
*.JPG	Screen image data is saved to a file in JPG format.
.SOR|.BMP	Both SOR and BMP files are saved.
.SOR|.JPG	Both SOR and JPG files are saved.
*.CSV (waveform)	Waveform data measured from an optical pulse is saved to a file in CSV format.
*.CSV (event)	Event data is saved to a file in CSV format.
*.SMP	Adapt Trace data measured from an optical pulse (including the measurement conditions) is saved to a file in SMP format.

The screen image immediately before entering the file operation screen is saved.

- **Power Meter**

Display	Description
*.CSV	Measured optical power values (including measurement conditions) are saved to a file in CSV format.

Description of the CSV data

```
Company          Yokogawa Test and Measurement Corporation

Model    AQ2780V
Function PowerMeter
Start No  1
Tape No Type      off        ── Data storage settings
Number Of Fibers  100
                                                    Measurements
                                                    |
Data   Ver1.01
Core   No   nm    Data     Unit  Modulation  Reference(dBm)  Offset(dB)        Date            SKIP
1      1    1310  -9.886   dBm   CW          0               0                 2022/4/1 19:05
1      2  <--Up to three sets of data can be stored for each core.
1      3    Example in which a set of data is stored in core number 1
2      1                                                                                        SKIP
2      2                                                  Example in which c 2 has been skipped--> SKIP
2      3                                                                                        SKIP
↑
Core number
```

- **Fiber Inspection Probe**

Display	Description
*.BMP	Screen image data is saved to a file in BMP format.
*.JPG	Screen image data is saved to a file in JPG format.

Loading

The following types of files can be loaded.

- **Top Screen**

Display	Description
*.CFG	System settings are loaded.

- **OTDR feature**

Display	Description
*.SOR	Optical pulse waveform (including measurement conditions) in SOR format that conforms to Telcordia SR-4731 is loaded.
*.SET	Measurement conditions are loaded.

- **Multi-Core Fiber Measurement**

Display	Description
*.MPJ	A summary screen image data of the multi-core fiber measurement conditions, waveform data summary information, optical power measurement values, and fiber inspection probe is loaded. To load the file, the file and folder configuration of the SOR file measured with the multi-core fiber measurement feature must be the same as when the file was saved.

- **Schedule Measurement**

Display	Description
*.CSV	Schedule information and measured optical power values (including measurement conditions) are loaded. To load the file, the file and folder configuration of the SOR file measured with the schedule measurement feature must be the same as when the file was saved.

Description of the CSV data

```
Company                 Yokogawa Test and Measurement
Corporation
Model     AQ7282A
Function Schedule Measurement
Start Date              2022/4/4 13:13
Start TimeT             1649077980

Data      Ver1.02
Wavelength1             1310
Wavelength2
Wavelength3
Wavelength4
Trace1(Wavelength)      1310
Trace1(Item)            4
Trace1(CH)              -1
Trace2(Wavelength)      1310
Trace2(Item)            0
Trace2(CH)              -1
Trace3(Wavelength)      1310
Trace3(Item)            0
Trace3(CH)              -1
Trace4(Wavelength)      1310
Trace4(Item)            0
Trace4(CH)              -1
Interval(min)           1
Duration(days)          1
MeasureCount            2
MonitoringPointA        -1
MonitoringPointB        -1
MonitoringPointC        -1
MonitoringPointD        -1
LinkageOswControl 0     -1

Trace1  Trace2  Trace3  Trace4
3890    0       0       0
3889    0       0       0
```

Measurement start date and time

Measurement wavelength settings

Display item settings
Monitor items (Item)
1：Splice Loss
2：Return Loss
3：Loss(①-②)
4：dB/km(①-②)
5：Loss(②-③)
6：dB/km(②-③)
7：Point Ⓐ
8：Point Ⓑ
9：Point Ⓒ
10：Point Ⓓ
0：OFF

Schedule measurement settings

Number of times measurements have been completed

Fixed point measurement settings

OSW linkage setting

Schedule measurement results (Example for two measurements)

- **OTDR Smart Mapper**

Display	Description
*.SOR	Optical pulse waveform (including measurement conditions) in SOR format that conforms to Telcordia SR-4731 is loaded.
*.SMP	Adapt Trace data measured from an optical pulse (including the measurement conditions) is loaded.

Save Destination Drive

Select the destination drive from the following.

Display	Description
Int. Memory	AQ7280 internal memory
SD Card	SD card (external memory) inserted into the AQ7280
USB Memory 1	The first USB storage medium connected to a type A USB port of the AQ7280
USB Memory 2	The second USB storage medium connected to a type A USB port of the AQ7280

Note

- Do not save files directly to the root folder. Create a folder, and save files to that folder. If there are many folders in the root folder, it will take some time to access files to a folder that is at a lower level in the folder hierarchy.
- The number of folders and files that can be saved in the root folder is 50. If this limit is exceeded, an error message will be displayed when saving files.
- If more than 250 files and folders are saved in a single folder, a warning message will be displayed. Saving is possible, but file operations will slow down.

File Name

File Name Type

- **When the OTDR, OTDR Smart Mapper, Fault Locator, or power meter feature is in use**

  You can select up to 10 items to be used for file names. The items specified for fields ① to ⑩ under Name Type are displayed in order as a file name. The longest file name is 60 characters.

Item	Description
ID No.	Four digit number The range is 0 to 9999. Four characters are assigned for the file name. For example, if you set the number to “1,” “0001” will be used in the file name.
	One character (tape number) If you select to use the ID number for the file name, when Tape Number Type is set to anything other than Off, the tape number is automatically appended to the ID number. Example: If you have a combination of ID No. “0” and Tape Number Type “a to c (3),” the file names will be set as follows: 0000a → 0000b → 0000c → 0001a → 0001b → 0001c.
Wavelength	Six characters containing the wavelength number and unit (Example: 1310 nm)
Comment	Up to 30 characters. However, because the entire file name must be within 60 characters, you may not be able to set 30 characters.
Company name	You can select some of the label items. For details, see the table under “Label” later in this section.
Name	
Cable ID	
Fiber ID	
Cable code	
Start position	
End position	
Extension	Four characters, including the period

  - If the whole file name is longer than 60 characters, the excessive characters will be deleted.
  - Blank cannot be specified for field ① under Name Type.
  - You cannot set duplicate items for Name Type.

- **When the top screen is displayed**

  Select the Name Type from the following.

  No., Comment, Comment + No., No. + Comment

  For details on the number (ID No.) and comment, see above.

- **When the multi-core fiber measurement is in use**

  File Name Type of Measured Waveform Data (.SOR)

  Files are saved in the file name type format specified on the project setup screen (see section 2.8).

  File Names for measurement condition files (.MPJ) and storage files (.MPZ)

  Storage files are saved with the same name as the project name that has been assigned on the project setup screen (see section 2.8).

Types of Characters and Strings Allowed in File and Folder Names

The following restrictions apply to the types of characters and strings allowed in file and folder names.

- The following exact strings cannot be used due to MS-DOS limitations:
  AUX, CON, PRN, NUL, CLOCK, CLOCK$, LPT0, LPT1, LPT2, LPT3, LPT4, LPT5, LPT6, LPT7, LPT8, LPT9, COM0, COM1, COM2, COM3, COM4, COM5, COM6, COM7, COM8, COM9
- Of those characters on the keyboard that appears on the screen, the characters that can be used are 0-9, A-Z, a-z, _, —, =, (,), {, }, [,], #, $, &, ~, !, `, and @.
  @ cannot be entered consecutively.
- Keep the full path name (absolute path from the root folder) within 200 characters. If this is exceeded, an error will occur when you perform file operations (save, copy, rename, create folder, etc.).
  Full path name: When you are operating a folder, it is the path up to the folder name.
  When you are operating a file, it is the path up to the file name.

Label

When you are using the OTDR, OTDR Smart Mapper, Fault Locator, or power meter feature, you can specify the following items. If you save waveform data measured from an optical pulse to a file in SOR format, the following label information is also saved.

Item	Description	
Company name	Up to 36 characters	
Name	Up to 36 characters	
Cable ID	Up to 36 characters	
Fiber ID	Up to 36 characters This can be set to the same character string as the file name management number.	
Fiber type	652:Conventional SMF	General purpose single mode
	653:Dispersion Shifted SMF	Dispersion shifted
	654:Cut-Off Shifted SMF	Cut-off shifted
	655:Non-Zero Dispersion Shifted SMF	Non-zero, dispersion shifted, single mode
	656:NZDSF for Wideband Transport	Wideband non-zero, dispersion shifted, single mode
	657:Bend Optimized SMF	Bend optimized single mode
	651:Multi-Mode Fiber	Multi mode
Cable code	Up to 36 characters	
Start position	Up to 36 characters	
End position	Up to 36 characters	
Current data flag	Shows the operation state. BUILT (BC), REPAIRED (RC), OTHER (OT), and CURRENT (CC)	
Direction*	Shows from which side the optical fiber cable connecting the start position (A) and stop position (B) was measured.	
	A -> B	Measured with the AQ7280 connected to the start position (A)
	B -> A	Measured with the AQ7280 connected to the stop position (B)

* This is available only for multi-core fiber measurement. It is not displayed for other functions.

7.4 Copying and Deleting Files

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

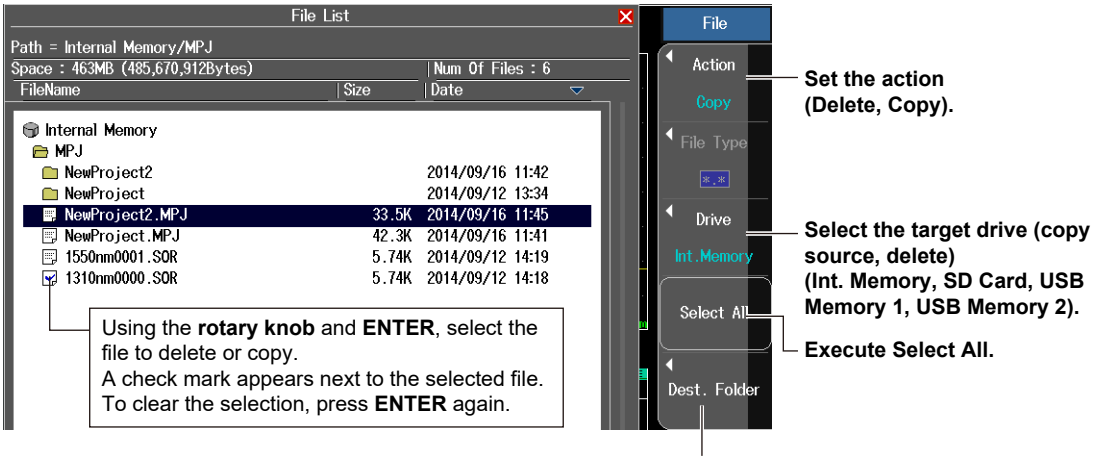
ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Copying and Deleting Files

Press **FILE** to display the following screen.



Using the **rotary knob** and **ENTER**, select the file to delete or copy.
A check mark appears next to the selected file.
To clear the selection, press **ENTER** again.

Set the action (Delete, Copy).

Select the target drive (copy source, delete) (Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Execute Select All.

Delete or set the copy destination.
This soft key is Delete or Dest. Folder depending on the Action setting.

Pressing the **Dest. Folder** soft key displays a screen for selecting the copy destination folder.
After selecting a folder on this screen, pressing the **Copy** soft key displays a confirmation message for executing the operation. Tap **OK** to execute it.

Explanation

Action
Select Delete or Copy.

File Type
You can delete and copy all file types (fixed to *.*).

Save Destination Drive
For details, see the explanation in section 7.3.

Executing Select All
All the files in the selected folder will be selected for deleting and copying.

- Pressing the **Select All** soft key changes it to a Clear All soft key.
- Pressing the **Clear All** soft key changes it back to a Select All soft key.
  All the files in the selected folder will be excluded from deleting and copying.

Executing the Delete Operation
The selected files will be deleted.

Setting the Copy Destination and Executing the Copy Operation
After selecting the files to be copied, set the copy destination folder, and then execute the copy operation.

Note

If you send files and folders in the AQ7280 internal memory to a PC using the AQ7280 mini-B USB port, they can be downloaded at the data rate depending on the PC performance. To use this feature, the AQ7280 mini-B USB port function must be set to Storage (see section 8.7).
Folders other than USER/DATA are used by the AQ7280; do not save files in the other folders. If you do, the files will be deleted. In addition, do not manipulate the other folders. If you do, the AQ7280 will not be able to start properly.

Internal memory structure when the AQ7280 is accessed from a PC

Removable disk

- **BACKUP**
- **USER**
  - **DATA** → Save files in this folder.
  - **IMAGE**

7.5 Renaming Files

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

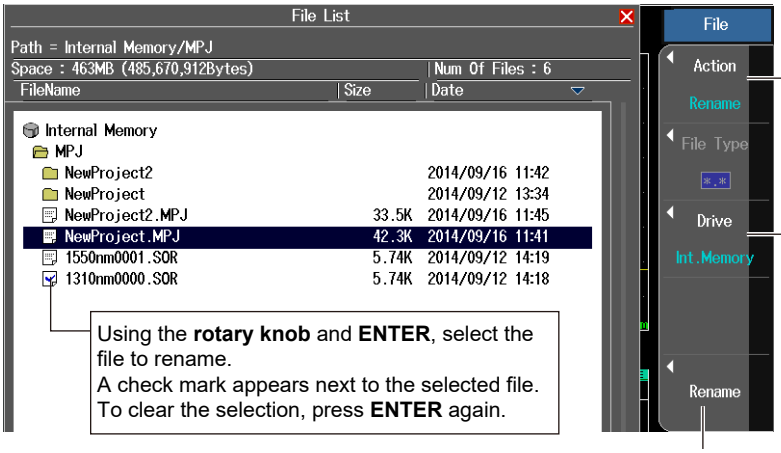
ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Renaming a File

Press **FILE** to display the following screen.



Using the **rotary knob** and **ENTER**, select the file to rename.
A check mark appears next to the selected file.
To clear the selection, press **ENTER** again.

Set the action (Rename).

Select the target drive (Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Enter a new file name.
A character input dialog box will open.
Enter the file name and extension by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.
Tapping **Enter** in the character input dialog box changes the file name to the name you entered.

Note

Do not select more than one file (check mark).

Explanation

Action
Select Rename.

File Type
You can delete and copy all file types (fixed to *.*).

Save Destination Drive
For details, see the explanation in section 7.3.

Entering the File Name
In the character input dialog box that appears, enter the file name. Follow the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

- Enter the extension also in the character input dialog box.
- When you tap the **Enter** in the character input dialog box, the file name will change to the specified name.

7.6 Creating Folders

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

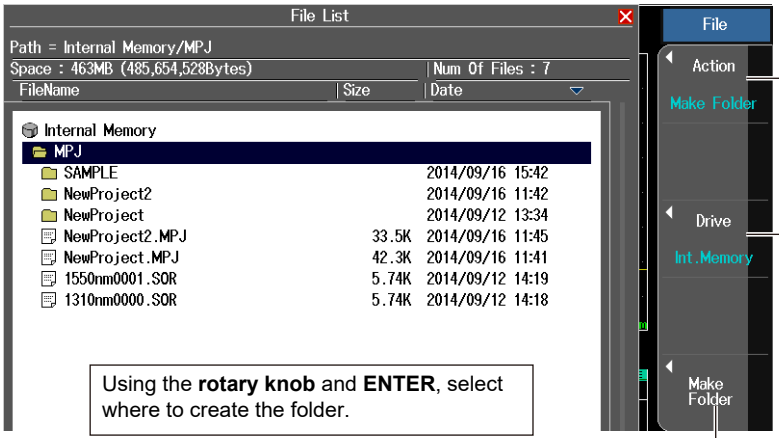
ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Creating a Folder

Press **FILE** to display the following screen.



Using the **rotary knob** and **ENTER**, select where to create the folder.

Set the action (Make Folder).

Select the target drive (Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Create the folder.
A character input dialog box will open.
Enter the folder name by following the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.
Tapping **Enter** in the character input dialog box changes the folder name to the name you entered.

Explanation

Action

Select Make Folder.

Note

If you create a folder deep within the folder hierarchy, you may not be able to delete or copy the folder.

Save Destination Drive

For details, see the explanation in section 7.3.

Entering the Folder Name

In the character input dialog box that appears, enter the folder name. You can use up to 20 characters. Follow the procedure provided in “Entering Character Strings” in the Getting Started Guide, IM AQ7280-02EN.

When you tap the **Enter** in the character input dialog box, a folder with the specified name will be created.

7.7 Copying and Deleting Folders

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

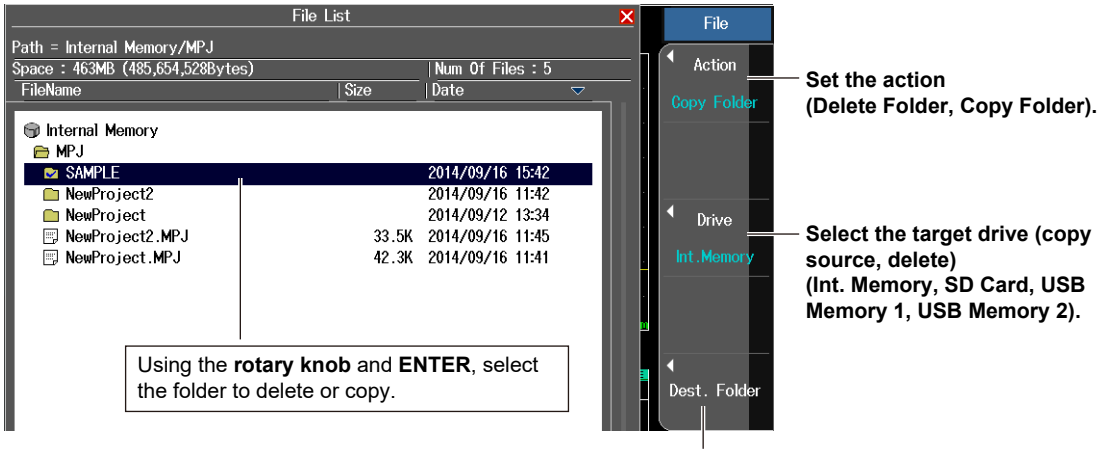
ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Copying or Deleting Folders

Press **FILE** to display the following screen.



Using the **rotary knob** and **ENTER**, select the folder to delete or copy.

Set the action (Delete Folder, Copy Folder).

Select the target drive (copy source, delete) (Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Delete or set the copy destination.
This soft key is Delete or Dest. Folder depending on the Action setting.

Pressing the **Dest. Folder** soft key displays a screen for selecting the copy destination folder.
After selecting a folder on this screen, pressing the **Copy** soft key displays a confirmation message for executing the operation. Tap **OK** to execute it.

Explanation

Action
Select Delete Folder or Copy Folder.

Save Destination Drive
For details, see the explanation in section 7.3.

Executing the Delete Operation
The selected folders will be deleted.

Setting the Copy Destination and Executing the Copy Operation
After selecting the folders to be copied, set the copy destination folder, and then execute the copy operation.

You cannot copy to the same drive as detailed below.

- Internal memory to internal memory
- SD card to SD card
- USB memory 1 to USB memory 1
- USB memory 2 to USB memory 2

Select a folder on a different drive for the copy destination.

Note

If you want to send files and folders in the AQ7280 internal memory to a PC using the AQ7280 mini-B USB port, the AQ7280 mini-B USB port function must be set to Storage (see section 8.7).

7.8 Creating Reports of Waveform Data as PDF Data

CAUTION

Do not remove a USB memory device or turn off the power when the USB memory access indicator is blinking or when data is being saved or loaded from internal memory. Doing so may damage the storage medium (USB memory or internal memory) or corrupt its data.

French

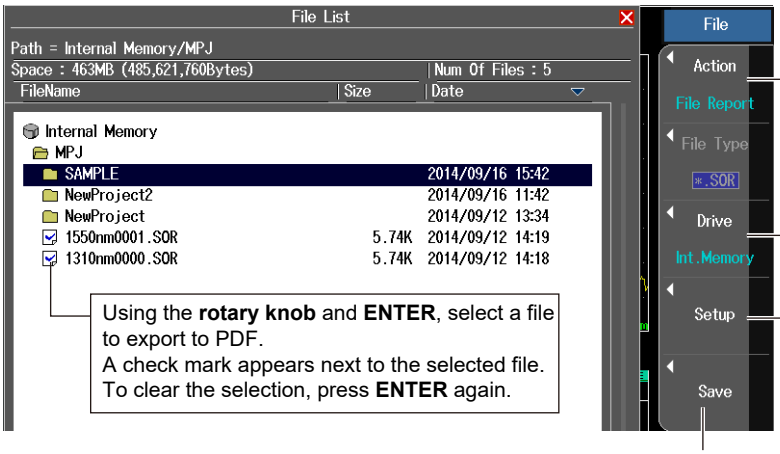
ATTENTION

N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Exporting a Report of Waveform Data to PDF (Measurements other than multi-fiber measurements)

Press **FILE** to display the following screen.



Using the **rotary knob** and **ENTER**, select a file to export to PDF.
A check mark appears next to the selected file.
To clear the selection, press **ENTER** again.

Set the action (Report, File Report).

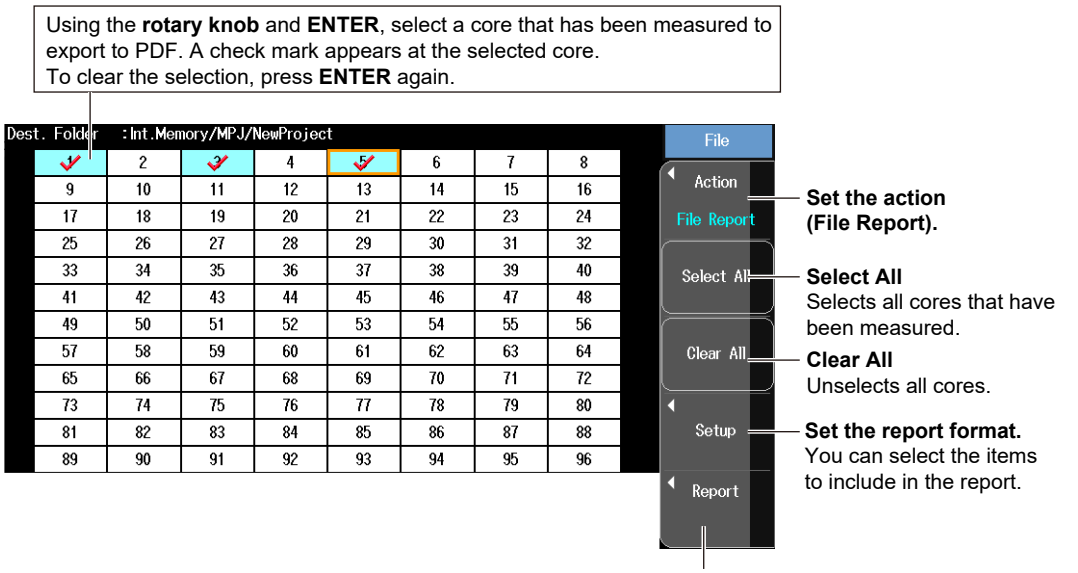
Select the target drive (Int. Memory, SD Card, USB Memory 1, USB Memory 2).

Set the report format.
You can select the items to include in the report.

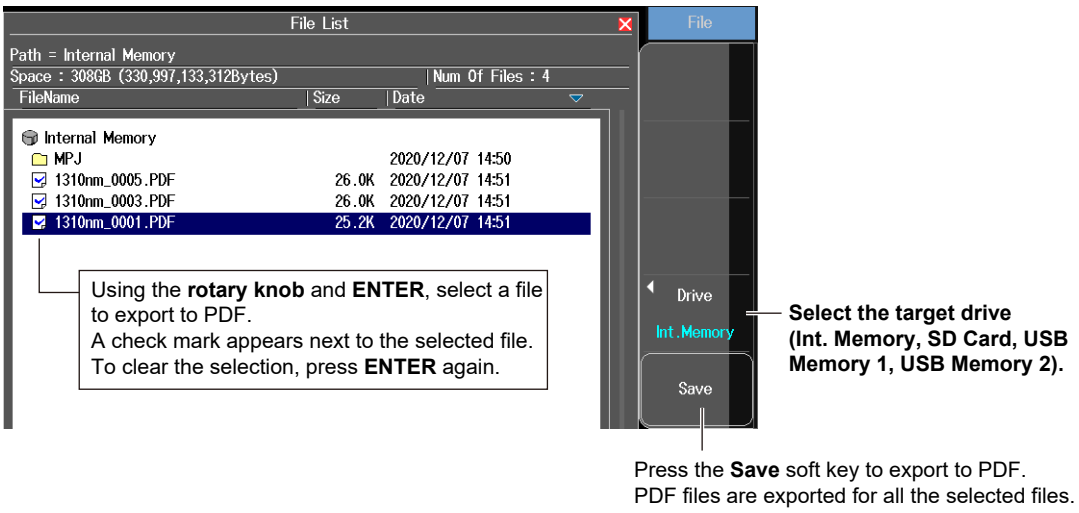
Pressing the **Save** soft key displays a screen for selecting the PDF output folder.
Select a folder on this screen, and press the **Save** soft key to export to PDF.
PDF files are exported for all the selected files.

Exporting a Report of Waveform Data to PDF (Multi-fiber measurements)

Press **FILE** to display the following screen.



Press the **Report** soft key to display the following screen.



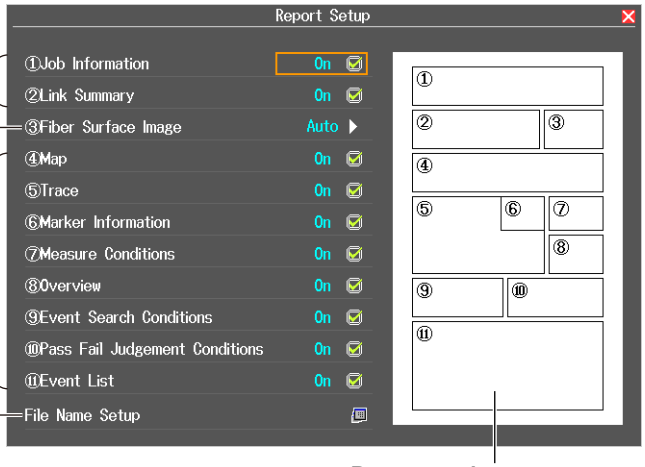
Setting the Report Format (Report)

Press the **Setup** soft key to display the following screen.

When Action is set to Report

Select the items to include in the report.
For details on the items, see “Explanation” in this section.

Fiber end face image (OFF, Manual, Auto)

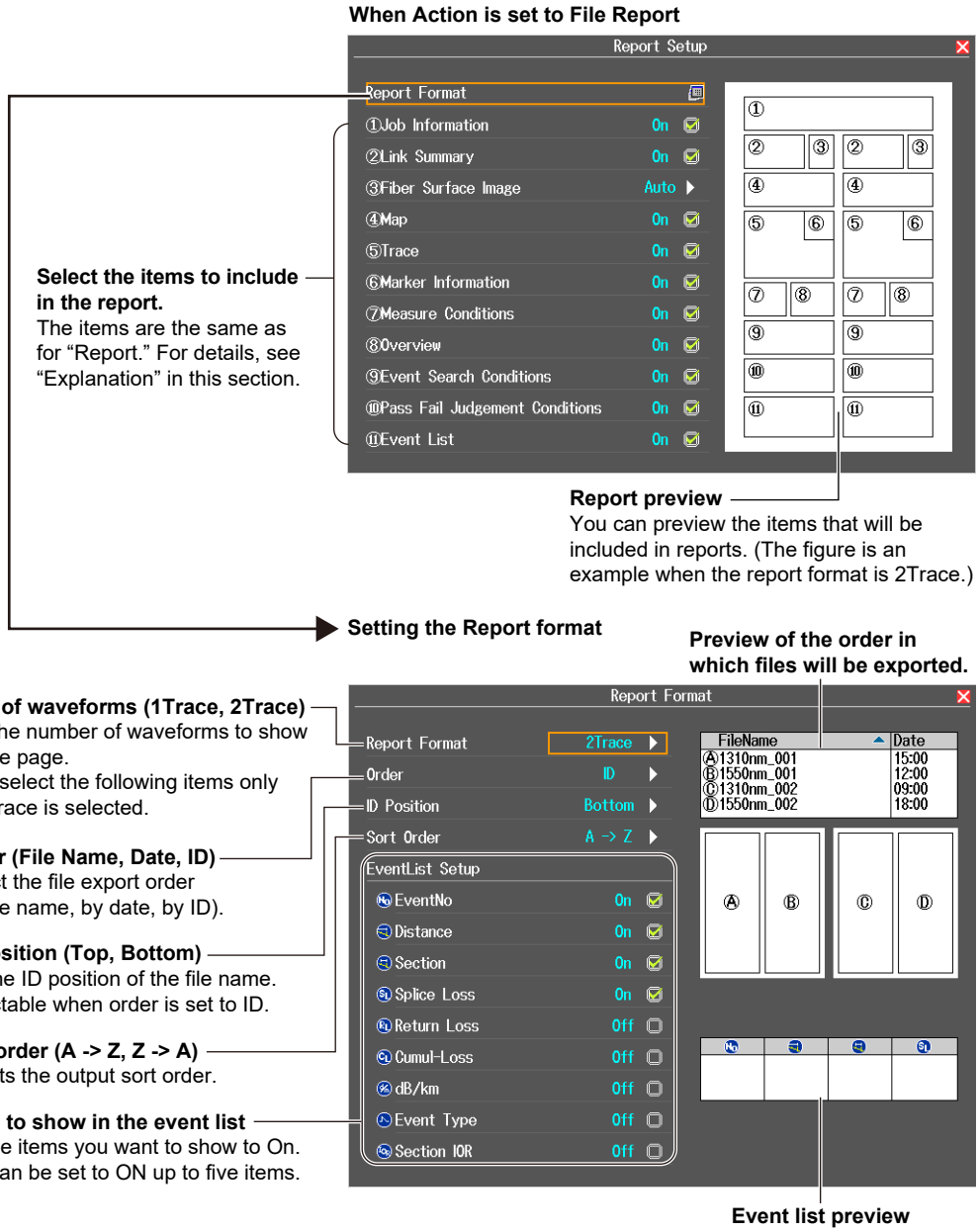


Set the file name.
See “File Name Setup Screen” in section 7.3.

Report preview
You can preview the items that will be included in reports.

Setting the Report Format (File Report)

Press the **Setup** soft key to display the following screen.



Note

- For File Report, SOR and SMP files can be exported to PDF.
- You cannot view PDF files on the AQ7280. Use a PC for this purpose. To view the PDF files, you need Adobe Reader 5.0 or later.
- If you execute File Report from the top screen, you cannot use the **Action** soft key.
- When waveform data (SOR format) saved without performing event analysis is exported to PDF, event analysis is performed automatically on the AQ7280, and an event list is displayed.

Explanation

Action

Select Report or File Report.

Report: The current waveform displayed on the screen is included in the report and exported to PDF.

File Report: Waveform data from a saved file is selected for the report and exported to PDF.

Save Destination Drive

For details, see the explanation in section 7.3.

Report Form

Select the items to include in the report. You can use preview to check the appearance of the report.

Job Information

The following information is included.

Label	Originating Loc
Company Name	Terminating Loc
Name	Current Data Flag
Fiber ID	Supplier Name[1]
Fiber Type	Model Name[1]
Cable ID	Unit Name[1]
Cable Code	FW Ver.[1, 2]
Report Date[1]	

1 Automatically included by the AQ7280
2 Firmware version

Information such as label and company name can be specified in Label Setup on the file name setup screen when the file action is set to Save. Set these if necessary. For details, see section 7.3.

Link Summary

The following information is included.

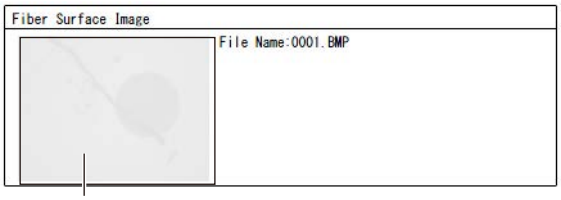
- Total distance
- Total loss
- Total return loss
- Number of events
- Fault events
- Pass/fail judgments

Fiber Surface Image

Set how to include the fiber end face image (BMP format) in the report form.

OFF	The fiber end face image is not included.
Manual	Select the fiber end face image to include (through file operation) at the time a report is created. This option is not available when File Report is executed.
Auto	When there is a fiber end face image in BMP format with a same ID number (see page 7-11) as that of the waveform data in SOR format to be included in the report, the image data is automatically selected and included in the report.

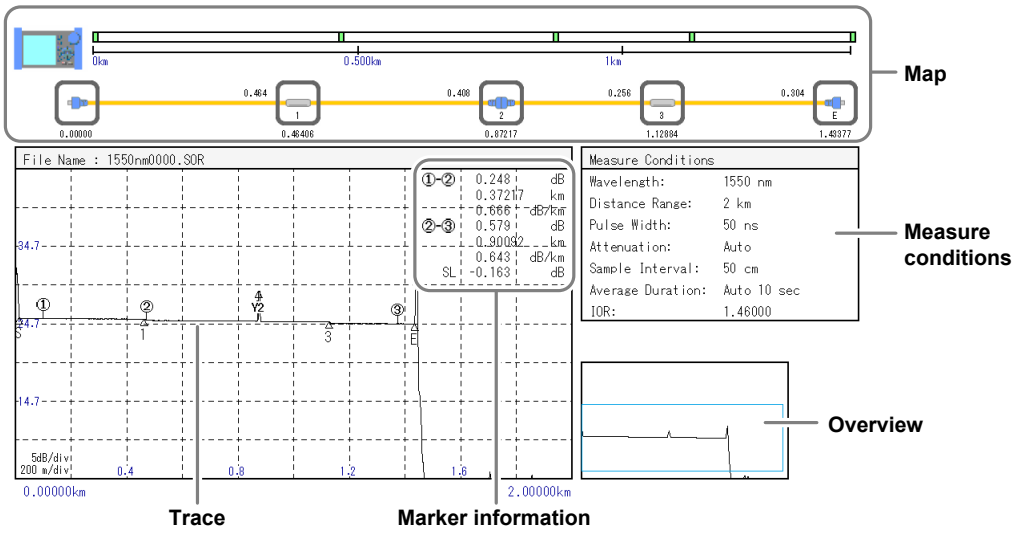
It is included as shown below.



Image

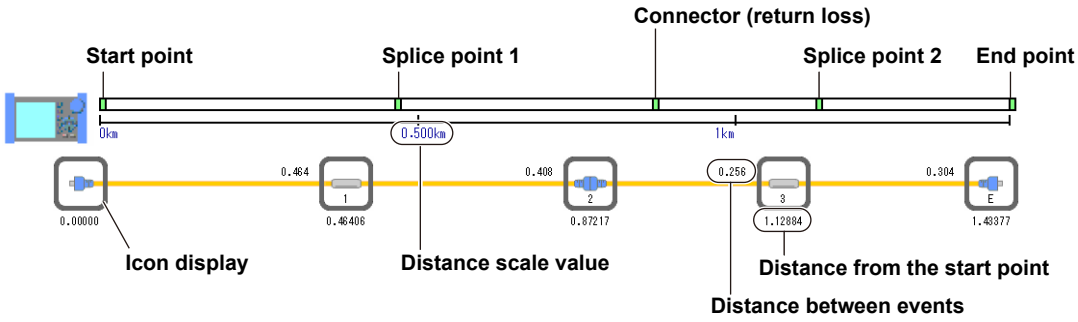
Map, Trace, Marker Information, Measure Conditions, and Overview

These are included as shown below.



Map

The events in the event list are mapped as icons. Up to 100 events can be mapped.



Icon Types

The following six types of icons are displayed.

Start point

Bending loss (macro bending)

Splice point
Positive splice loss, negative splice loss

Connector (return loss)

Optical splitter

End point

Event Search Conditions

The following information is included.

- Splice loss
- Return loss
- End of fiber
- Splitter loss
- Backscatter level
- Macro bending

Pass Fail Judgement Conditions

The following information is included.

- Connector loss
- Splice loss
- Return loss
- Splitter loss
- dB/km
- Total loss

Event List

The following information is included.

- Event number
- Distance
- Section
- Splice loss
- Return loss
- Cumulate Loss
- dB/km
- Event type
- Section Group Index

If the file action is set to File Report and the report format is 2Trace, up to five items can be displayed in the event list. For details, see “Event List Setup” in the next section.

Report Format

If the file action is set to File Report, you can select the number of waveforms to display in a page. If you select 2Trace, you can select the export order, sort order, and event list items.

Number of Waveforms (Report Format)

1Trace: The waveform information of a single file is included in a single page.
2Trace: The waveform information of two files is included in a single page.

Order

Select the file export order when exporting multiple selected files to PDF.

File Name: Files are exported to PDF in order by the file name string.
Date: Files are exported to PDF in order by date.
ID: Files are exported to PDF in order by ID number (ID No.).

ID Position

Set where in the file name the ID (ID number) of the selected file is located.* Files with ID numbers set to positions other than top or bottom cannot be exported to PDF in the correct order. Set this when Order is set to ID.

* For details on the file name format, see “File Name Setup Screen” in section 7.3.

Top: The four digit number in the beginning of the file name is identified as the ID number.
Bottom: The four digit number in the end of the file name is identified as the ID number.

Sort Order

A -> Z: In the case of numbers, the order is 0 to 9. In the case of alphabet characters, the order is a to z.
Z -> A: In the case of numbers, the order is 9 to 0. In the case of alphabet characters, the order is z to a.

Event List Setup

Set the items to show in the event list. If the Number of waveforms (Report Format) is 2Trace, up to five items can be displayed in the event list. If five items are On, other items cannot be set to On.

ON: Events are displayed in the event list.
OFF: Events are not displayed in the event list.

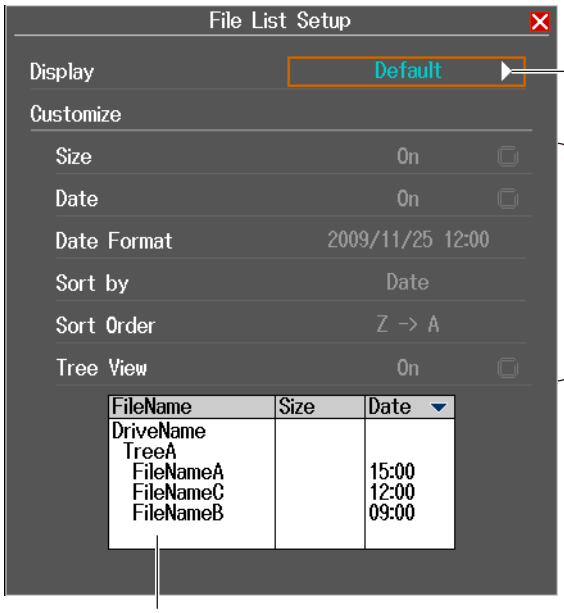
7.9 Setting the Items to Display in File Lists

Procedure

File List Setup Screen

1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **File List Setup** to display the following screen.

When Display is set to Default or File List

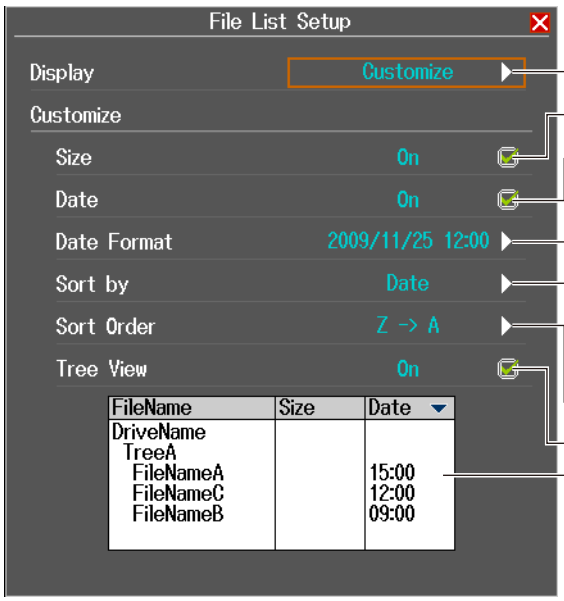


Set Display to Default or File List.

You cannot set these.

File list preview
You can check the way that the File List will be displayed on the file list screen (see section 7.3).

When Display is set to Customize



Set Display to Customize.

Turns the file size display on or off

Turns the display of the date when the file was saved on or off

Set the save date display format (year/month/day hour:minute:second, year/month/day hour:minute, abbreviated year/month/day hour:minute, month/day hour:minute, hour:minute).

Set what to sort by (Date, File Name).

Set the sort order (A -> Z, Z -> A).

Turns the tree view on or off

Preview
See above.

Explanation

You can select the items that are displayed in the internal memory and USB memory file lists.
You can also display a preview of the file list display.

Default

File names, file sizes, and dates are displayed.

File List

Only file names are listed. File names can be displayed up to their first 36 characters.

Customize

You can specify the items you want to display in the file list.

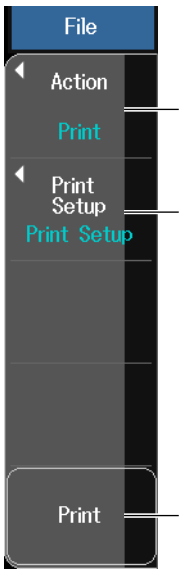
- Data size (ON/OFF), date (ON/OFF), tree view (ON/OFF)
- Date format, what to sort by, and sort order

7.10 Printing the Current Displayed Waveform

Procedure

File Menu

Press **FILE** to display the File menu.



Set the action (Print).

Configure the print settings.
Set the printer maker and print color.
When the OTDR, OTDR Smart Mapper, or Fault Locator is in use, you can also turn the printing of the event list on or off and the printing of the measurement date on or off.

Start printing.

Explanation

Action

Select Print.

Configuring the Print Settings

Maker

You can select from the following manufacturers.

HP, Epson, Seiko Instruments

Print Color

You can select from the following print color modes.

Color, B&W

Event List

You can print the event list when an event analysis has been performed and events have been detected.

OFF: Only the content on the screen (hard copy) is printed.

ON: The content on the screen (hard copy), event list (event search results), measurement conditions, and analysis conditions (index of refraction, event threshold) are printed.

Measured Date

The date of waveform measurement can be printed (not the date of printing).

OFF: The date is not printed.

ON: The date is printed.

Starting to Print

A screen image will be printed.

Note

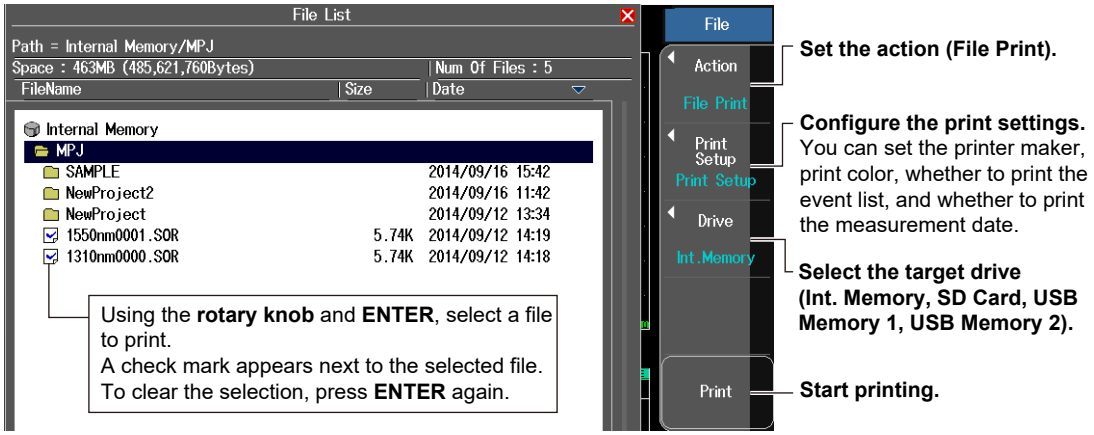
- Do not connect an incompatible printer.
- For USB printers that have been tested for compatibility, contact your nearest YOKOGAWA dealer.

7.11 Printing Saved Waveforms

Procedure

File Menu

Press **FILE** to display the File menu.



Explanation

Action

Select File Print.

Configuring the Print Settings

Maker

Fixed to Seiko Instruments. You cannot change it.

Print Color

Fixed to black and white printing. You cannot change it.

Event List

See the explanation in section 7.10.

Measured Date

The date when the waveform was saved can be printed (not the date of printing).

OFF: The date is not printed.

ON: The date is printed.

Save Destination Drive

For details, see the explanation in section 7.3.

Starting to Print

You can specify several saved SOR files and print screen images one at a time.

Note

- Do not connect an incompatible printer.
- For USB printers that have been tested for compatibility, contact your nearest YOKOGAWA dealer.
- Only SOR files can be printed.

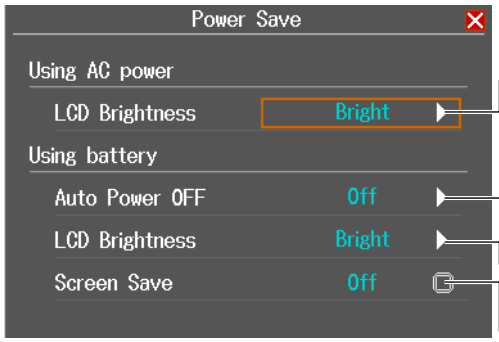
8.1 Setting the Power Save Mode

Even when you set LCD Brightness to OFF, if you press a panel key, the backlight turns on at the “Power save” brightness level.
If you do not perform any operations for 10 seconds, the backlight automatically turns off. This feature is useful when you move the AQ7280 to a dark place after setting LCD Brightness to OFF.

Procedure

Power Save Setup Screen

1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **Power Save** to display the following screen.



When using the AC adapter

Set the LCD brightness (Bright, Normal, Power save, OFF).

When using the battery

Set the auto power off feature (OFF, 1m, 5m, 10m, 30m).

Set the LCD brightness (Bright, Normal, Power save, OFF).

Turns the screen saver on or off

Explanation

You can specify separate power save settings for AC adapter operation and battery pack operation.

Auto Power OFF

If the AQ7280 is left standing for a certain period with the power turned on, the power will be automatically turned off. The power will not be automatically turned off, however, when measuring with the OTDR feature.

OFF	The power will not be turned off.
1m	If you do not operate the AQ7280 for 1 minute, the power will be automatically turned off.
5m	If you do not operate the AQ7280 for 5 minutes, the power will be automatically turned off.
10m	If you do not operate the AQ7280 for 10 minutes, the power will be automatically turned off.
30m	If you do not operate the AQ7280 for 30 minutes, the power will be automatically turned off.

LCD Brightness

You can set the LCD brightness.

Bright	The screen is set bright. Use this setting in a bright environment. This setting uses a lot of power. During battery pack operation, pay attention to the battery level.
Normal	Normal brightness.
Power save	Slightly darker the normal brightness. This setting can be used in a dark environment. The battery pack lasts longer than the Normal setting.
OFF	The LCD backlight is turned off. The battery pack lasts longer, even longer than the Power save setting. When you press any key, the backlight turns on for approximately 10 seconds.

Turning the Screen Saver On and Off

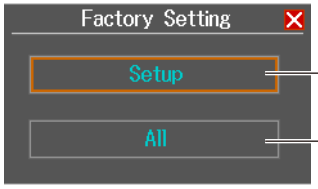
When the AQ7280 is running of battery, the display will turn off automatically after 15 seconds of no user activity. Press any key to turn on the display. Touch panel operations are not possible in screen save mode.

8.2 Initializing the AQ7280 to Its Factory Default Condition

Procedure

Initialization Screen

1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **Factory Setting** to display the following screen.



Executes setup initialization
Measurement, analysis, OTDR, and system settings are initialized to their factory default values.

Executes all initialization
All settings are initialized to their factory default values. The internal memory will also be formatted.

Explanation

You can initialize the AQ7280 settings to their factory default conditions.

Executing Setup Initialization

Measurement, analysis, OTDR, and system settings are initialized to their factory default values. The internal memory and the day and time settings (excluding the display type) are not initialized.

Executing All Initialization

All settings are initialized to their factory default values. The internal memory will also be formatted, and all data will be erased. If necessary, back up the data before initializing. The day and time settings (excluding the type) are not initialized.

Note

If you send files and folders in the AQ7280 internal memory to a PC using the AQ7280 mini-B USB port, they are downloaded at the data rate depending on the PC performance. To use this feature, the AQ7280 mini-B USB port function must be set to Storage (see section 8.7).

8.3 Setting Operation Restrictions

Procedure

Operation Lock Setup Screen

1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **Operation Lock Setup** to display the following screen.

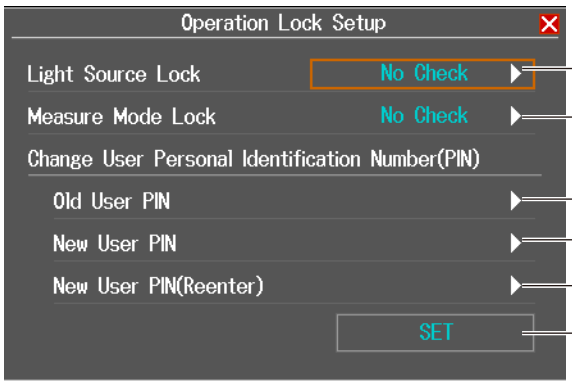
Enter the Administrator PIN.
The default value is 0000.

Confirms the input

Change the Administrator PIN.

Setting Operation Restrictions

Using the **rotary knob** and **ENTER**, enter the PIN, and then select **SET**. The following screen appears.



Select the restriction mode.
- **No Check**
  Operation possible without entering the PIN.
- **Check only once**
  Enter the PIN only for the first operation.
- **Check everytime**
  Enter the PIN for every operation.

Enter the old PIN (the default value is 0000).

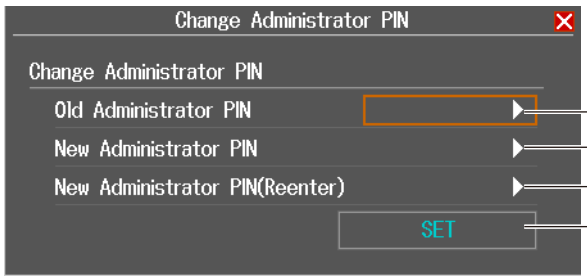
Enter the new PIN.

Enter the new PIN again for confirmation.

Confirms the input

Changing the Administrator PIN

Using the **rotary knob** and **ENTER**, select **Change Administrator PIN** to display the following screen.



Enter the old PIN
(the default value is 0000).

Enter the new PIN.

Enter the new PIN again for confirmation.

Confirms the input

Initializing the PIN

When you change the setting, both the administrator PIN and user PIN will be initialized. For details, see section 8.2.

Explanation

You can apply operation restrictions with a PIN (password) to prevent mistakenly emitting the laser at a place where it is prohibited and prevent operators from changing the detailed measurement conditions of the AQ7280.

Light Source Lock

The following operations can be restricted.

- The **REAL TIME** and **AVG** keys of the OTDR function.
- The **Light Source ON** or **VLS ON** soft key when the light source feature (/SLS option on the OTDR unit, VLS module) is in use.

Measure Mode Lock

The following operations can be restricted.

- Changing the measurement mode from Simple mode to Detail mode.
- Changing the measurement mode from Simple mode to PON mode.

PIN

The following two PINs are available.

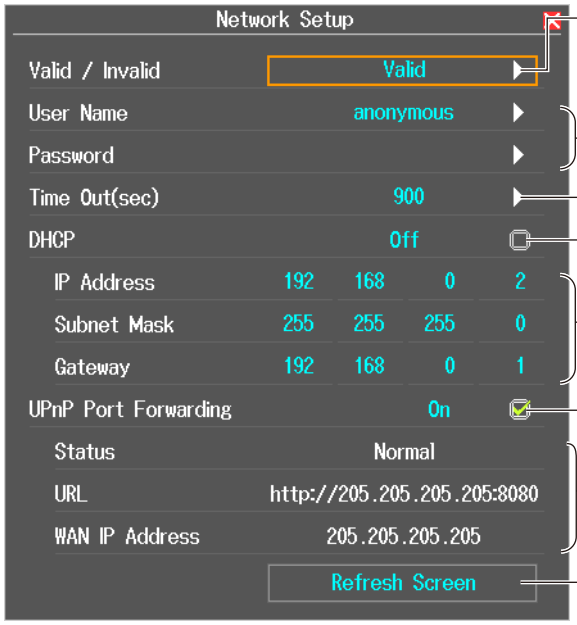
- **User PIN**
  A PIN required to perform the above operations. The default value is 0000.
- **Administrator PIN**
  A PIN required to set the user PIN and restrict the above operations.
  The default value is 0000.

8.4 Configuring Network Settings (/LAN option)

Procedure

Network Setup Screen

1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **Network Setup** to display the following screen.



Enable or disable the network feature.

Set the user name and password.
Enter the user name and password by following the procedure provided in "Entering Character Strings" in the Getting Started Guide, IM AQ7280-02EN.

Set the timeout value.

Turns the DHCP on or off.

Set the TCP/IP parameters.

Enables or disables port forwarding

Settings of a router with a UPnP compatible NAT

Manually updates the display of settings
When port forwarding is enabled, the display of settings is updated automatically every minute.

Explanation

Network settings apply models with the /LAN option.
You can use communication commands through the Ethernet port to control the AQ7280 or access the AQ7280 from a PC that has an FTP client and download the data that is stored on the AQ7280 internal memory.
For details on DHCP and TCP/IP, contact your network administrator.

Enabling and Disabling the Network Feature

Set the user name, password, timeout value, and TCP/IP parameters, and then select Valid.
When you enable the network feature, you can start communicating over the network. You do not have to restart the AQ7280.

Valid: Communication is possible using the network feature.
Invalid: Communication is not possible using the network feature.

User Name and Password

Set the user authentication user name and password for accessing the AQ7280 from a PC.

User Name

You can use up to 15 characters. The default setting is "anonymous."

Password

You can use up to 15 characters.

Note

- If a user authentication error occurs, communication will not possible using the network feature.
- You do not need to enter a password when the user name is set to “anonymous.”

Time Out(sec)

If there is no access to the AQ7280 within the specified period, the network connection between the AQ7280 and the PC is automatically disconnected.

Range: Infinite (0), 1 to 3600s

If you set the value to 0, “Infinite” is displayed, and the timeout value is set to infinity. If the network connection is disconnected because of external factors, not a normal disconnection from the remote device, the AQ7280 will keep the network connected unless the power is turned off. To prevent this from happening, we recommend that you set the timeout value to a finite period.

DHCP

DHCP

If there is a DHCP server on the network to which the AQ7280 is connected and you want to use DHCP, set this to ON. Consult your network administrator to verify if DHCP is available.

ON: IP address, netmask, and gateway parameters are assigned automatically.

OFF: IP address, netmask, and gateway parameters must be assigned manually.

IP Address

Set the IP address to assign to the AQ7280. The IP address is an ID number assigned to each computer connected to the Internet or an intranet network.

Obtain the IP address from your network administrator.

If DHCP is available and you set DHCP above to ON, the IP address is assigned automatically.

Subnet Mask

Set the mask value for determining the subnet network address from the IP address. In a network such as the Internet, networks are divided and managed in small subnets. Subnet mask is a value that defines how many bits of the IP address is used for network identification.

Consult your network administrator for the subnet mask address.

If DHCP is available and you set DHCP above to ON, the IP address is assigned automatically.

Gateway

Set the IP address of the default gateway used to communicate with other networks. The default gateway has features for controlling the communication between multiple networks so that data exchange is performed smoothly.

Consult your network administrator for the gateway address.

If DHCP is available and you set DHCP above to ON, the IP address is assigned automatically.

Port Forwarding (UPnP)

UPnP Port Forwarding

If the AQ7280 is connected to a network through a router with a NAT function, the AQ7280 cannot be controlled from a PC over the router. The AQ7280 has a function for transferring data with routers with a NAT function that support Universal Plug and Play (UPnP). When this function is enabled, the AQ7280 can be controlled from a PC over a router. This function is called UPnP port forwarding.

ON: The UPnP port forwarding function is enabled.
OFF: The UPnP port forwarding function is disabled.

Status

Displays the communication status between the AQ7280 and a UPnP compatible NAT router.

---: The UPnP port forwarding is disabled.
Normal: Configuration required for port forwarding is complete between the AQ7280 and router.
Setting: Port forwarding is being configured.
Set up failure: Port forwarding cannot be configured.
Router searching failure: A UPnP compatible NAT router could not be found.

URL

Displays the URL of the UPnP compatible NAT router. Enter this URL in the PC browser when controlling the AQ7280 from the PC.

--: The UPnP port forwarding is disabled. Or, the status is not showing Normal.
http://xxx.xxx.xxx.xxx:8080/:
The IP address of the router's WAN port is shown in x. 8080 is a fixed port number.

WAN IP Address

Displays the IP address of the UPnP compatible NAT router.

--: The UPnP port forwarding is disabled. Or, the status is not showing Normal.
xxx.xxx.xxx.xxx:
The IP address of the router's WAN port is shown in x.

Refresh Screen

Refreshes the status, URL, WAN IP address information.
The AQ7280 communicates with a UPnP compatible NAT router at 1 minute intervals to update the port forwarding settings. Clicking Refresh Screen displays the current port forwarding settings.

Note

- If port number 8080 of the UPnP compatible NAT router is used by another service, the UPnP port forwarding function cannot be used.
- The UPnP port forwarding function cannot be used on some UPnP compatible NAT routers if the transport destination and source numbers are not the same. The port number that the AQ7280 uses for UPnP port forwarding destination is 80.
- Depending on the UPnP compatible NAT router, the UPnP port forwarding function may be disabled. In such a case, enable the function.

8.5 Web Server Feature

Procedure

Connecting the AQ7280 to your PC

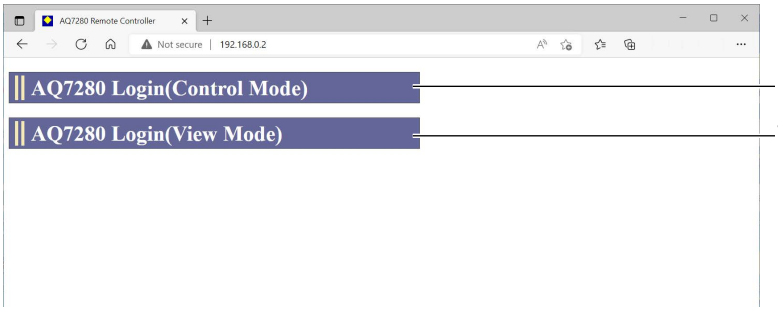
Connect the AQ7280 to your PC through an Ethernet network.

Configuring the AQ7280

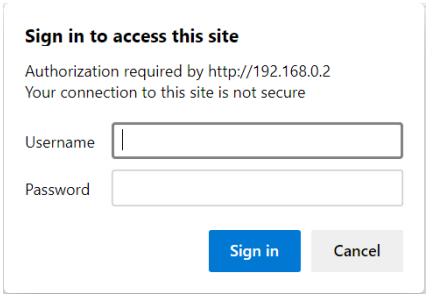
Enable the AQ7280 network function by following the instructions in section 7.4.

Connecting to the AQ7280 from Your PC

1. On your PC, start Internet Explorer or other Web browser.
   If you are using Internet Explorer, use version 9.0 or later.
2. In the address box, enter “http://IP address” to connect to the AQ7280.
   Use the IP address that you specified on the AQ7280.
   A page for selecting the connection mode appears.



3. Click a connection mode. An authentication dialog box appears.



4. To connect in Control Mode, enter the user name and password that you specified in the AQ7280 network settings, and click OK.

   If you set the user name in the network settings to “anonymous,” enter “anonymous” for the user name. You do not have to enter the password.

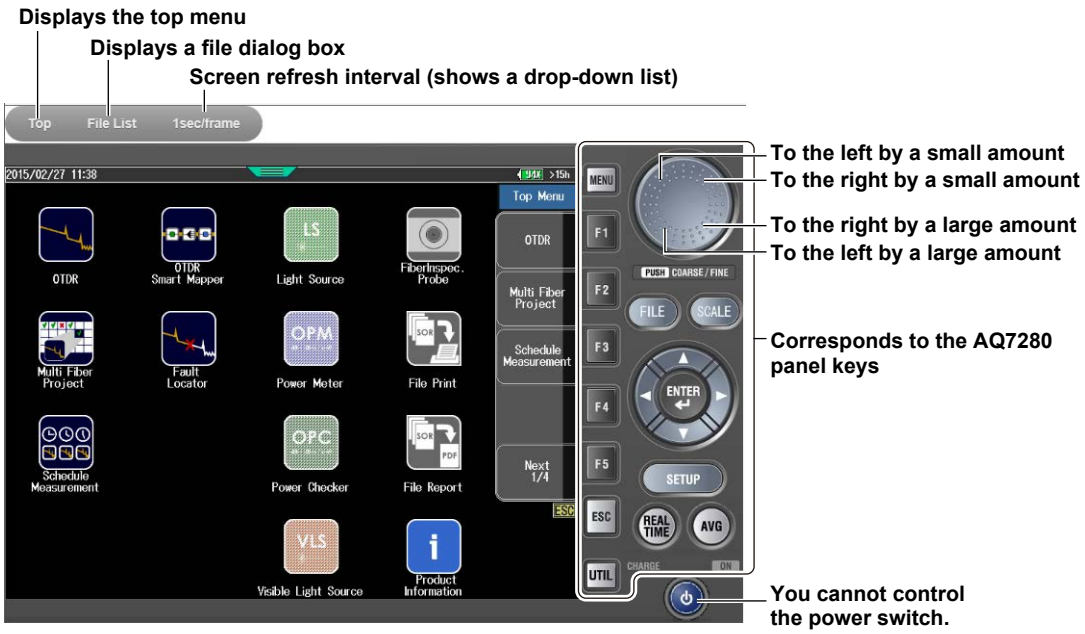
   To connect in View Mode, enter “guest” for the user name and “yokogawa” for the password, and click OK.

   User name and password are case-sensitive.

   The AQ7280 screen and control panel appear on the PC screen.

Controlling from the PC

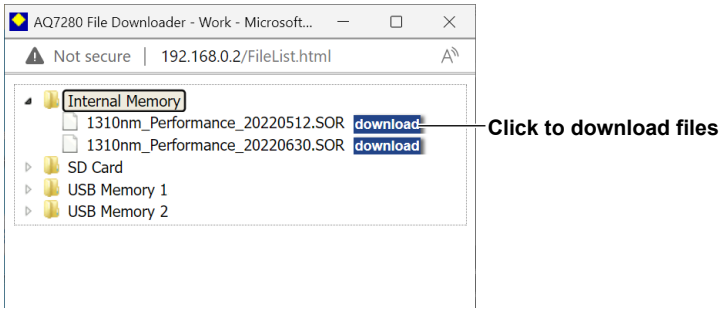
You can control the AQ7280 with a mouse or through the touch panel of your PC.



Displaying the File Dialog Box and Downloading Files

Click **File List** at the top of the screen. A directory structure of the AQ7280 internal memory, SD card, and USB memory devices connected to the AQ7280 appears.

Click **download** to download the corresponding file to your PC.

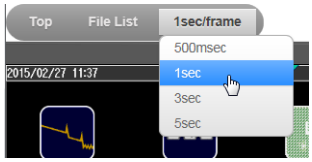


Setting the Refresh Interval

You can set the interval for refreshing the content displayed on the PC screen.

Click the refresh interval at the top of the screen. A drop-down list for setting the interval appears.

Click the refresh interval you want to use.



Explanation

You can control an AQ7280 connected to a network from your PC.

Connection Mode

There are two connection modes: Control and View.

Control Mode: The AQ7280 screen is displayed on your PC screen. You can control the AQ7280 with a mouse or through the touch panel of your PC. You can also download files from the AQ7280.

View Mode: The AQ7280 screen is displayed on your PC screen, but you cannot control the AQ7280 from your PC. You can, however, download files from the AQ7280.

Controlling the AQ7280

If you connect in Control Mode, you can control the AQ7280 from your PC.

Rotary Knob Operation

The operation varies depending on where on the rotary knob you click.

Upper right: Equivalent to turning the rotary knob to the right by a small amount (1 point).
Lower right: Equivalent to turning the rotary knob to the right by a large amount (10 points).
Upper left: Equivalent to turning the rotary knob to the left by a small amount (1 point).
Lower left: Equivalent to turning the rotary knob to the left by a large amount (10 points).

AQ7280 Touch Panel Operation

The AQ7280 touch panel only supports tapping. You can perform the equivalent of tapping by clicking the mouse.

Downloading Files

- Only files that are 1400 KB or less in size can be downloaded. The download button does not appear for files that cannot be downloaded.
- The download destination varies depending on your browser.
- Multiple files cannot be downloaded at once.

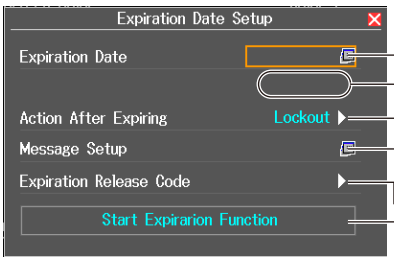
8.6 Setting the Expiration Date

Procedure

This feature is valid in firmware versions 2.02 and later.

Expiration Date Setup Screen

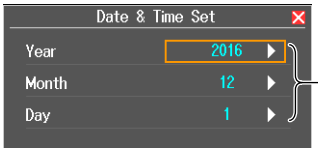
1. On the top menu, press **SETUP** to display the System Setup screen.
2. Using the **rotary knob** and **ENTER**, select **Expiration Date Setup**. The following screen appears.



Displaying the Date & Time Set Screen
When you set the date and time, the number of remaining days until expiration is displayed.
Set the action after expiration (Lockout, Alert).
Displays the Message Setup screen
Enter the release number (see step 5).
Confirms the expiration date settings

Setting the Date and Time (Expiration Date)

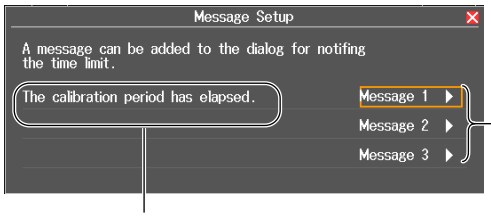
3. Using the **rotary knob** and **ENTER**, select **Expiration Date**. The following screen appears.



Set the year, month, and day.

Setting the Message

4. Using the **rotary knob** and **ENTER**, select **Message Setup**. The following screen appears.

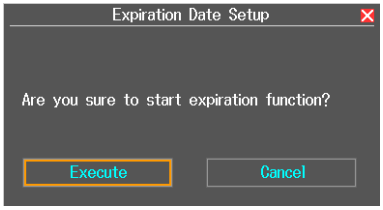


Enter messages by following the procedure provided in "Entering Character Strings" in the Getting Started Guide, IM AQ7280-02EN.

Displays the set message

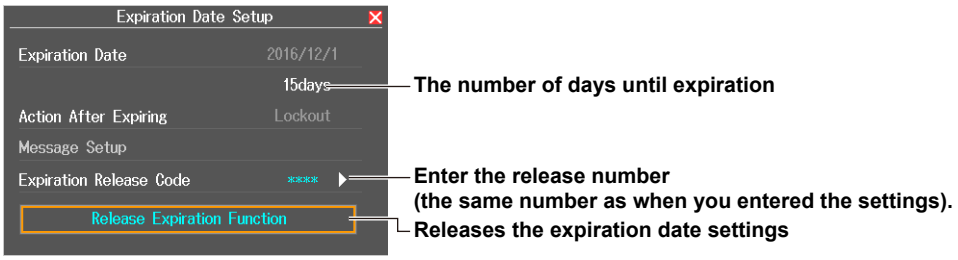
Enabling the Expiration Date Settings

5. After step 2, using **rotary knob** and **ENTER**, select **Expiration Release Code**.
6. Using the **rotary knob** and **ENTER**, enter the release number.
7. Using the **rotary knob** and **ENTER**, select **Start Expiration Function**. The Expiration Date Setup screen appears.
8. Using the **rotary knob** and **ENTER**, select Execute. The expiration date setting is enabled.



Releasing the Expiration Date Settings

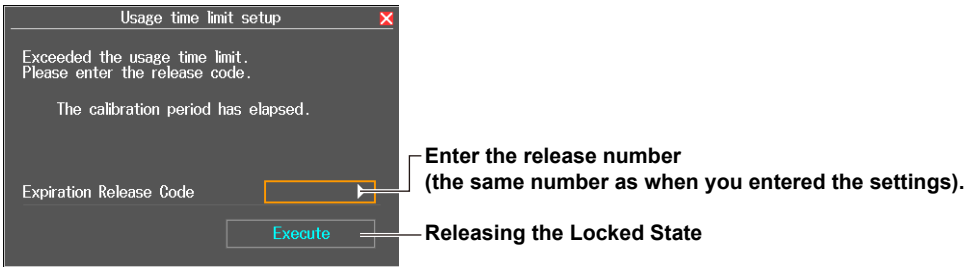
9. After step 2, using **rotary knob** and **ENTER**, select **Expiration Release Code**.
10. Using the **rotary knob** and **ENTER**, enter the release number.
    This is the same number that you entered when you set the expiration date.
11. Using the **rotary knob** and **ENTER**, select **Release Expiration Function**. The expiration date setting is disabled.



Releasing the Locked State

When the expiration date is reached, a screen indicating that the instrument is locked is displayed at startup.

1. Using **rotary knob** and **ENTER**, select **Expiration Release Code**.
2. Using the **rotary knob** and **ENTER**, enter the release number.
   This is the same number that you entered when you set the expiration date.
3. Using the **rotary knob** and **ENTER**, select **Execute**. The locked state is released.



Note

If you forget the release number, you will not be able to release the expiration date settings. The release number cannot be initialized. Be sure to manage the release number carefully. If you forget the release number, contact your nearest YOKOGAWA dealer.

Explanation

This feature displays a message at startup or locks the instrument when the specified expiration date arrives. You can display a message that urges you to calibrate the instrument or the like when the recommended calibration period elapses.

Expiration Date

The year is displayed according to the Gregorian calendar. The instrument supports leap years. When the number of remaining days until expiration reaches 7 days (1 week before expiration), a message that you specified in the message settings is displayed on the screen when the instrument starts.

Action After Expiring

Lockout: When the expiration date is reached, you need to enter a release number when the instrument starts. If you do not enter the correct number, the instrument will not start. Note that if the expiration date arrives while you are using the instrument (startup completed condition), the instrument is not locked.

Alert: When the expiration date is reached, a message that you specified in the message settings is displayed on the screen when the instrument starts. When you close the message screen, the instrument starts normally. While the expiration date setting is enabled, the message is displayed every time the instrument starts.

Message Setup

Enter the message to be displayed on the screen when the expiration date is reached. You can set up to three messages. You can enter the following number of characters in each message.

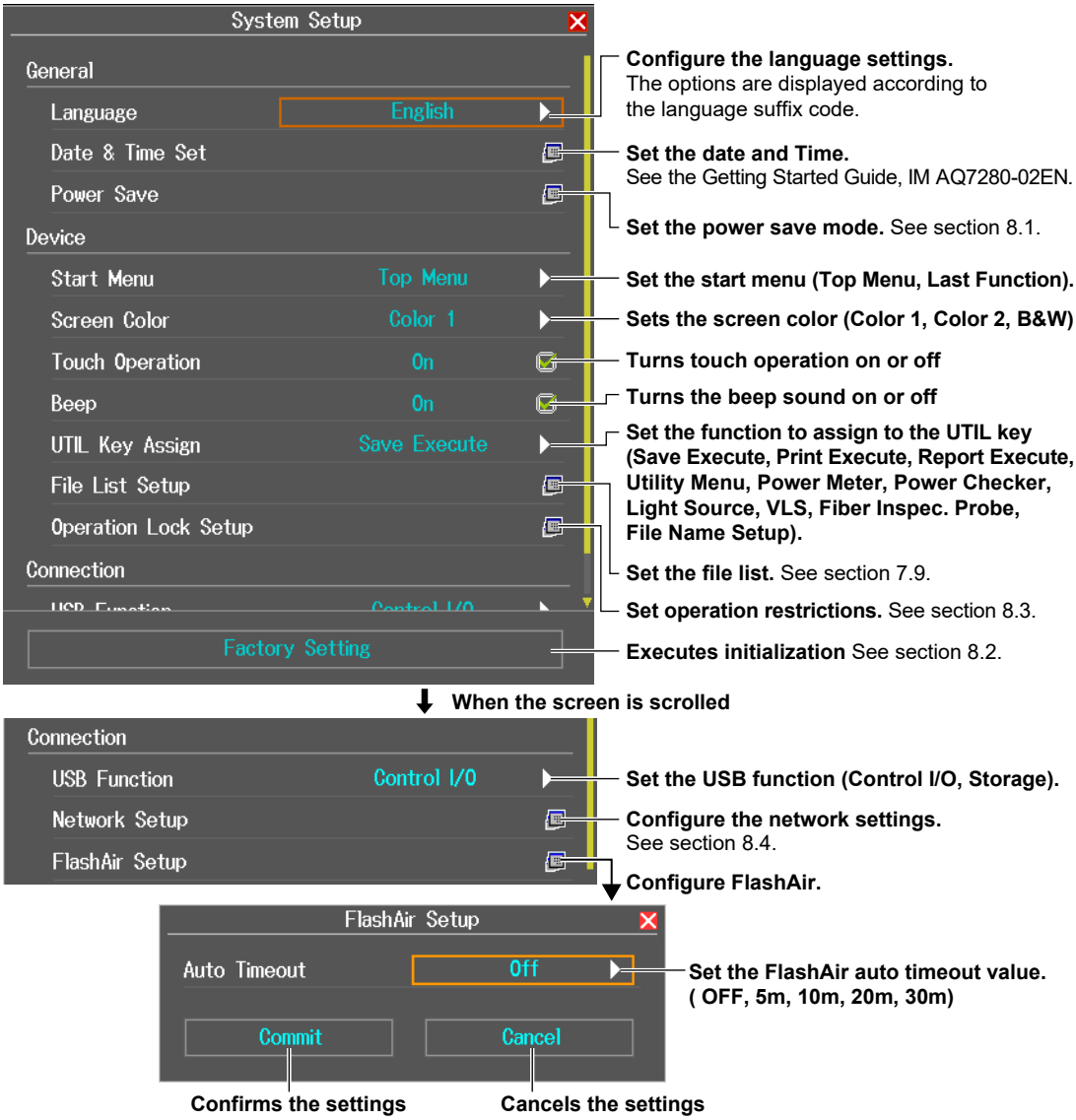
When the input mode is English: 40 characters
When the input mode is Japanese: 20 characters

8.7 Other Features

Procedure

System Setup Screen

On the top menu, press **SETUP** to display the following screen.



Explanation

Language

Set the language used on the AQ7280 screen. The options are displayed according to the language suffix code of each product. For details on the language suffix codes, see the Getting Started Guide, IM AQ7280-02EN.

Start Menu

Set the first screen that appears when you start the AQ7280.

Top Menu	The top menu appears.
Last Function	The screen that was displayed immediately before the power was turned off appears when you start the AQ7280.

Screen Color

Select the screen color from the following:
Color 1, Color 2, B&W

Touch Operation

You can touch the screen to operate the AQ7280.

ON	Touch control is enabled.
OFF	Touch control is disabled.

Beep

The AQ7280 can generate sound when the rotary knob is turned or when an operation error message is displayed.

ON	Beep sound is on.
OFF	Beep sound is off.

UTIL Key Assign

You can set how the AQ7280 operates when the UTIL key is pressed.

Function	Description	Reference
Save Execute	Data is saved.	Section 7.3
Print Execute	A screen image is printed.	Section 7.10
Report Execute	The current waveform display is exported to PDF.	Section 7.8
Utility Menu	When an optical pulse measurement is in progress, a setup menu (for touch control) for using the OPM module or VLS module that is installed in the AQ7280 is displayed.	Section 2.10
Power Meter	An optical power meter is displayed on the optical pulse measurement screen, and measurement is executed.	Sections 2.10 and 5.2
Power Checker	An optical power checker is displayed on the optical pulse measurement screen, and measurement is executed.	Sections 2.10 and 5.2
Light Source	A light source is displayed on the optical pulse measurement screen, and a measurement light is emitted.	Sections 2.10 and 5.1
VLS	A visible light source is displayed on the optical pulse measurement screen, and a visible light is emitted.	Sections 2.10 and 5.1
Fiber Inspec. Probe	A fiber end face image is displayed on the optical pulse measurement screen.	Sections 2.10 and 8.6
File Name Setup	A screen for setting the file name format when saving files is displayed.	Section 7.3

USB Function

You can set the mini-B USB port feature.

Storage	You can access the AQ7280 internal memory from an external device, and load and save data.
Communication	You can control the AQ7280 remotely from external devices.

Note

When USB Function is Storage

- You cannot control the AQ7280 while the AQ7280 is being accessed from an external device.
- Do not save files in folders other than the USER/DATA folder on the AQ7280.
- Do not manipulate (create, delete, and rename) the folders on the AQ7280 from an external device. If you do, the AQ7280 may not be able to start correctly and may cause a screen prompting to initialize the internal memory to appear. For details on initialization, see section 8.2.
- Do not manipulate (create, delete, and rename) the folders on the AQ7280 from an external device.

FlashAir Auto Timeout Value

You can set the FlashAir auto timeout value. If the FlashAir installed in the AQ7280 and an external wireless LAN device is connected, the connection is automatically turned off if FlashAir is not accessed for a specified time period.

OFF	The connection will not be turned off.
5 m	The connection is turned off automatically if FlashAir is not accessed for 5 minutes.
10 m	The connection is turned off automatically if FlashAir is not accessed for 10 minutes.
20 m	The connection is turned off automatically if FlashAir is not accessed for 20 minutes.
30 m	The connection is turned off automatically if FlashAir is not accessed for 30 minutes.

- Pressing Commit applies the settings.
- Pressing Cancel discards the changes.

9.1 If a Problem Occurs

Faults and Corrective Actions

- If a message appears on the screen, see the following pages for reference.
- If servicing is necessary, or if the instrument does not operate properly even after you have attempted to deal with the problem according to the instructions in this section, contact your nearest YOKOGAWA dealer.

Symptom	Corrective Action	Reference
Nothing appears on the screen even when the power is turned on.	If you are using an AC adapter, make sure that the plug is connected firmly to the outlet, the power cord is connected firmly to the AC adapter, and the AC adapter's DC plug is connected firmly to the AQ7280.	—[1]
	If you are using a battery pack, make sure that it is attached firmly.	—[1]
	Charge the battery pack, and make sure that the ON indicator is illuminated.	—[1]
	The LCD turns black at high temperatures. At low temperatures, the display slows down. Make sure that the temperature of the area where you are using the AQ7280 is within the operating temperature range.	—[1]
	The backup file in the AQ7280 may be corrupt due to an improper shutdown execution. Turn the power off, and restart by following the procedure below. 1. While holding down the ESC key, press the power switch. 2. Keep holding down the key until the AQ7280 starts.	—
The display disappears after some time passes.	The AQ7280 turns off automatically when its battery level is low. Check the battery level of the battery pack.	—[1]
	If you have specified a time for the Power Save setting, the AQ7280 will turn off automatically if there is no user activity for the specified time. Check the settings.	8.1
The screen is dark.	The screen will appear dark when the LCD Brightness setting is set to "Power save." Check the settings.	8.1
	The LCD may be worn out. Servicing is required.	9.11
	If the AQ7280 or its battery pack becomes hot, the LCD brightness is reduced automatically to prevent damage. Make sure that the temperature of the area where you are using the AQ7280 is within the operating temperature range.	—[1]
The power turns off automatically while the AQ7280 is in use.	The AQ7280 turns off automatically when it detects an error. A warning message will appear when this happens. Read the message. Fix the problem indicated in the message, and then turn the AQ7280 back on. If the Auto Power OFF feature is enabled in Power Save mode, the AQ7280 automatically turns off after a certain time elapses.	8.1 9.2[2]
The battery pack cannot be charged.	Turn off the power, and check that the battery pack is loaded properly.	—[1]
	The battery pack may be too cold or too hot. Make sure that the temperature of the area where you are using the AQ7280 is within the operating temperature range. Remove the battery pack from the AQ7280 and let it sit for about an hour at room temperature.	—[1]
	The battery pack may be approaching the end of its service life. Replace with a new one.	9.11
The power turns off automatically while the AQ7280 is starting.	You may have accidentally pressed the power switch twice.	—
When the power is turned on, a screen that prompts to initialize the internal memory appears.	If an improper file operation takes place, the AQ7280 may not be able to start correctly and may require internal memory initialization. Follow the instructions on the screen. Back up necessary files to a PC, and initialize the internal memory.	8.2
Touch panel operations do not work.	If touch operation is turned off in the system settings, you cannot use the feature. Check the settings.	8.6
	If Screen Save is set to ON in Power Save mode, touch operation is not possible when the AQ7280 is in screen save mode. Check the settings.	8.1
	Touch operation is not possible with gloves. Touch the screen with bare hands.	—[1]

1 See the Getting Started Guide, IM AQ7280-02EN.
2 When it is likely that the usage limitations of the AQ7280 will be exceeded, the AQ7280 will display a warning message and turn off automatically to prevent damage. For the conditions under which such messages appear, see section 9.2.

9.2 Error Messages

Error Messages

Messages may appear on the screen during operation. This section describes the error messages and how to respond to them. Messages are displayed according to the language setting (see section 8.7). If the corrective action states that serving is required, contact your nearest YOKOGAWA dealer.

In addition to the following messages, there are also communications error messages. These error messages are described in the Communication Interface User's Manual (IM AQ7280-17EN).

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.
24	One or more conditions in this file are not supported by this product.
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.
30	In Local Lockout mode, all keys are locked. Please cancel the local lockout.
33	File operation 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.
40	No more averaging is allowed. (already MAX averaging condition) Set "Average Continue"OFF for new measurement.
41	Now updating firmware. Please wait. It takes approx. 20 seconds. Do not turn off power during update. Restart automatically after successful updating.
46	A lot of files are saved in the root folder. The file manipulation slows when saved any further. Please make a folder in the root folder, and save files in that.
47	Please start measurement after executing unchecking this fiber.
48	Now Logging. Please Wait.
49	ESC: Close the Touch Screen Test window, ENTER: Clear the display
54	Auto save setting is required to use this function. Please turn on auto save setting.
60	Now Logging. Please Wait.
61	Logging process is completed. Please Save File.
62	Now adjusting LS power. Please wait.
63	LS power adjustment is completed.
64	Failed to adjust LS power. Please check whether the patch fiber cable is properly connected between LS port and OPM port.
69	Optical fiber is found at the cursor position. Please stop the measure by pressing "REALTIME".
500	The measurement condition is failed. Please reset ****** in SETUP 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 error has occurred.
506	Hardware error has occurred.
507	Hardware error has occurred.
508	Hardware error has occurred.
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.

Code	Message
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
516	Fiber In Use Alarm Error 1
517	Fiber In Use Alarm Error 2
518	ZERO SET ERROR
519	ZERO SET ERROR
520	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
521	Operation is stopped outside of operating environmental condisions
522	Hardware error has occurred.
524	Failure to initialize the option module.
525	The Interval is too short. Please change the inteval value.
526	Please set Avg Duration.
527	Need the AC power supply to measure. Please connect the AC adapter.
528	Free space is not enough. Please set the interval or the period again.
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.
554	2-Way Trace cannot be executed due to difference in wavelengths of those two traces.
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.
561	① - ② has not been set. This function is effective only when ① - ② is set.
562	n-E has not been set. This function is effective only when n-E is set.
563	Conditions of the macro bending do not match.
601	Cannot save onto the media. This media is for read-only.
602	Can not recognize file system. -Internal memory: Contact Yokogawa's representatives. - USB memory or SD card: Try the other media or format again with FAT
604	Storage media has been disconnected while the media is being accessed.
605	Same file name or folder name exists.
608	Invalid file name or folder name
609	Invalid file format
612	Invalid path name
614	Unknown file or folder
616	Cannot save onto the media. This media is for read-only.
620	Free space is not enough.
622	Unknown folder
623	Folder is not empty.
629	Writing to USB memory or SD card is not allowed.
634	Failed to delete the folder. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
635	Failed to delete the folder. The path name or the file name is too long.
636	Failed to delete the folder. The hierarchy below the specified folder is too deep.
637	Failed to delete the folder. The path name is invalid.
638	The folder could not be deleted. Failed to delete files in the folder. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
639	Failed to copy the folder. 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	Failed to copy the folder. The hierarchy below the specified folder is too deep.
642	Failed to copy the folder. The path name is invalid.
643	The folder copy could not be completed. Failed to create a destination folder. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
644	The folder copy could not be completed. Failed to copy the files in the folder. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
645	The path name is too long.

9.2 Error Messages

Code	Message
646	USB memory or SD card can not be recognized.
648	Can not make file or folder in this folder. (Max 550 files/folder)
690	Cannot save the measurement data. Please confirm the following. - Media is correctly installed. - Media is formatted. - Media is not read-only.
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	Failed to open the file.
701	Failed to close the file.
702	Failed to read the file.
703	Irregular file format.
704	Failed to write the file.
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 400 km.
710	File cannot be retrieved. Invalid wavelength
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 400 km.
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 36 letters.
720	File is now being accessed. Execute after access is released.
721	Cannot load this file. Invalid file format or this firmware version is old.
722	Recall Setup File cannot load the measurement condition which sampling interval has been changed to shorter than the standard sampling interval at Meas. Range Change function.
723	This file cannot be supported by the firmware with this product. Please update into the latest firmware to read this file.
724	The model name of the instrument and model name in the file is different. This file cannot be read with this instrument.
725	Can't use the following characters. \ / : ; * ? " < > | % . ,
726	This file cannot be read with this instrument. This file that tries to be loaded includes the measurement condition that cannot be measured with this instrument.
727	This file cannot be read with this instrument. This file that tries to be loaded includes the measurement condition that cannot be measured with this instrument. - Distance Range
728	This file cannot be read with this instrument. This file that tries to be loaded includes the measurement condition that cannot be measured with this instrument. - Pulse Width
729	Project file load failed. Create new project file
730	This project file has individual settings. Conditions cannot be changed using SETUP. Please create new project file to change setting. Select "Revise project name" to create new file.
731	Checked SOR file does not exist. Please check the SOR files in the folder.
752	Print Error. Printer cannot be found.
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.
761	This operation is not executed while light is emitting. Stop emitting the light then execute the operation.
800	This function is not supported.
801	FTP Error : Pwd Please confirm network connection and setting.

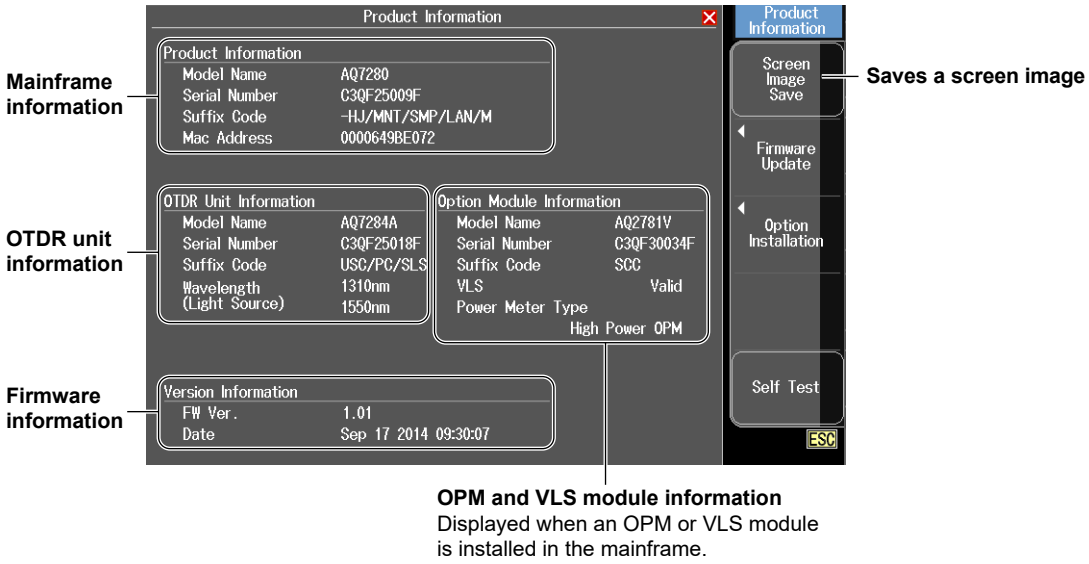
Code	Message
802	FTP Error : Cwd Please confirm network connection and setting.
803	FTP Error : Rm Please confirm network connection and setting.
804	FTP Error : List Please confirm network connection and setting.
805	FTP Error : Mkdir Please confirm network connection and setting.
806	FTP Error : Rmdir Please confirm network connection and setting.
807	FTP Error : Get Please confirm network connection and setting.
808	FTP Error : Put Please confirm network connection and setting.
809	FTP Error : GetData Please confirm network connection and setting.
810	FTP Error : PutData Please confirm network connection and setting, and desk capacity.
811	FTP Error : AppedData Please confirm network connection and setting, and desk capacity.
812	FTP Error : Client Handle Please confirm network connection and setting.
813	FTP Error : Others Please confirm network connection and setting.
814	Failed network initialize. Please confirm network connection and setting.
815	Different passwords are entered. Please try again.
817	Test Error occurred.
818	Test succeeded.
819	ROM Test Error occurred.
820	RAM Test Error occurred.
821	System File Test Error occurred.
822	Battery Test Error occurred.
823	Temperature Test Error occurred.
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 is low.
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 turn off power to cool battery
908	Battery temperature is too low. The instrument may be damaged if used in this condition. The instrument will be powered off in 10 sec. Please turn off power and use battery with proper operating temperature.
909	The temperature inside the instrument is too high. The instrument may be damaged if used in this condition. The instrument will be powered off in 10 sec. Please turn off power to allow instrument to cool down.
910	The temperature inside the instrument is too low. The instrument may be damaged if it is used in this condition. The instrument will be powered off in 10 sec. Please turn off power until internal temperature is increased.
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.
919	The operation of the battery is not confirmed normally. After stopping the measurement, turn off the power. Please check the connection of battery.
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.
925	Please use AC adapter.
937	OSW is not connected correctly. Please confirm the connection of OSW.

9.3 Viewing the Product Information

Procedure

Product Information Screen

On the top menu, press **SETUP** and then the **Product Information** soft key to display the following screen.



Explanation

The Product Information screen displays the information (model, serial number, suffix code) inscribed on the name plate affixed to the AQ7280, measurement light wavelength, and firmware version information.

Saving the Screen Image

The screen image of the product information can be saved in internal memory.
File name: Systeminfo.BMP

9.4 Executing a Self-Test

Procedure

System Setup Menu

On the top menu, press **SETUP** to display the following menu.

Note

Perform a self-test with the battery pack installed in the AQ7280.
If the battery pack is not installed, the test will result in error.

Explanation

Self-Test

The self-test checks the operation of the following items.

- Internal memory
- Battery pack voltage

If the self-test result is successful, the message “Test succeeded” will appear. If there is an error, the message “Test Error occurred” will appear.

If an Error Occurs during a Self-Test

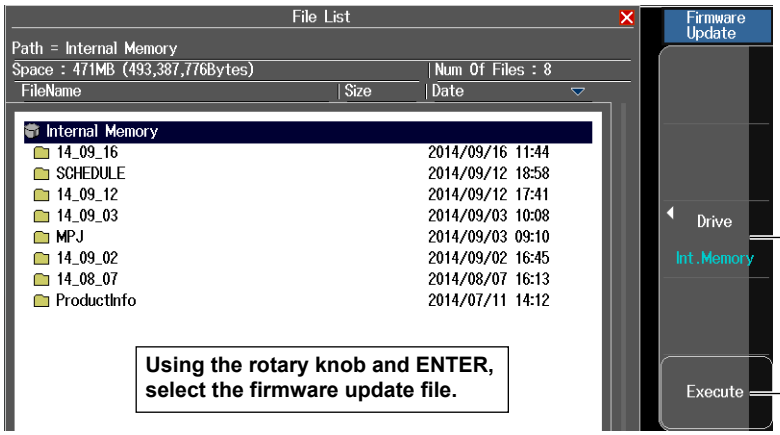
If an error occurs, contact your nearest YOKOGAWA dealer.

9.5 Updating the Firmware

Procedure

Firmware Update Screen

On the top menu, press **SETUP** and then the **Firmware Update** soft key to display the following screen.



Set the save destination drive of the firmware update file (Int. Memory, USB Memory 1, USB Memory 2, SD Card).

Executes firmware updating

Explanation

- Firmware update files are YMC files (e.g., AQ7280.YMC).
- If necessary, you can change the file name, but on the extension. For details, see section 7.5.
- When updating the firmware, connect the AC adapter to the AQ7280.
- When a firmware update completes successfully, the AQ7280 will restart automatically.
- If it fails, an error message will appear.
  Check the format and version of the firmware update file. For the procedure, see section 9.3.

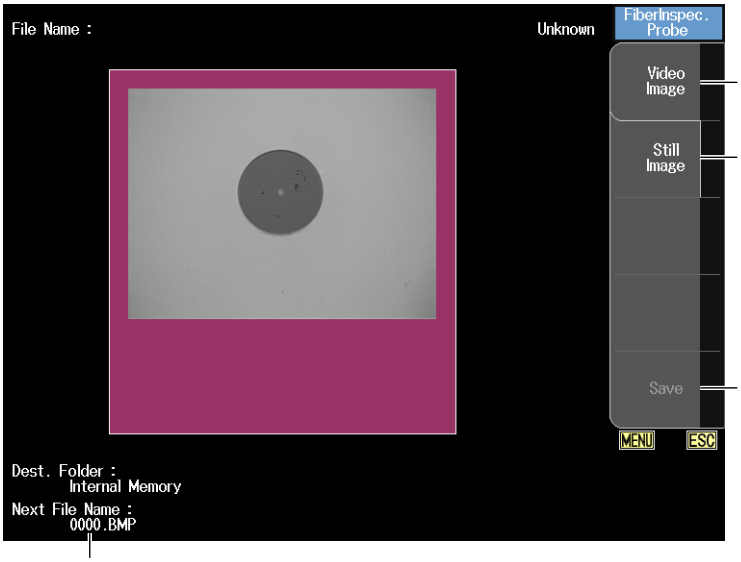
9.6 Checking the Optical Fiber End Face for Stains

By connecting an off-the-shelf fiber inspection probe (with a USB interface) to an AQ7280 USB port, you can display the image of optical fiber end face on the AQ7280 display. You can save the image to a file.

Procedure

Fiber End Face Check Screen

From the top menu, select **FiberInspec. Probe** to display the following screen.



Displays the image in real time

Holds the image display (HOLD)

Start saving
Press this soft key to save the screen that is displayed. For the procedure to set the file save destination, file type, and file name, see section 7.3.

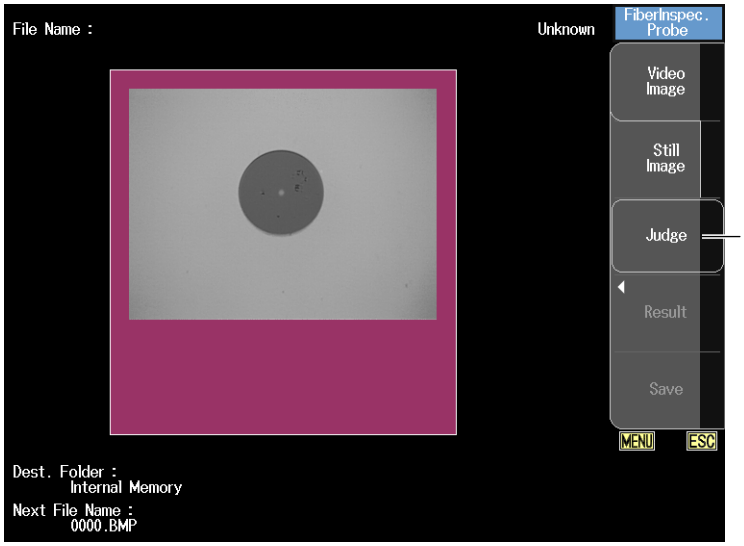
The name of the file that will be saved the next time

Pass/Fail Judgment (/FST Option)

AQ7280 firmware versions 1.07 and later support this function.

A judgment is performed on scratches and defects detected in the end face image, and those that exceed the specified threshold are displayed as fail (Fail).

1. From the top menu, select **FiberInspec. Probe** to display the following screen.



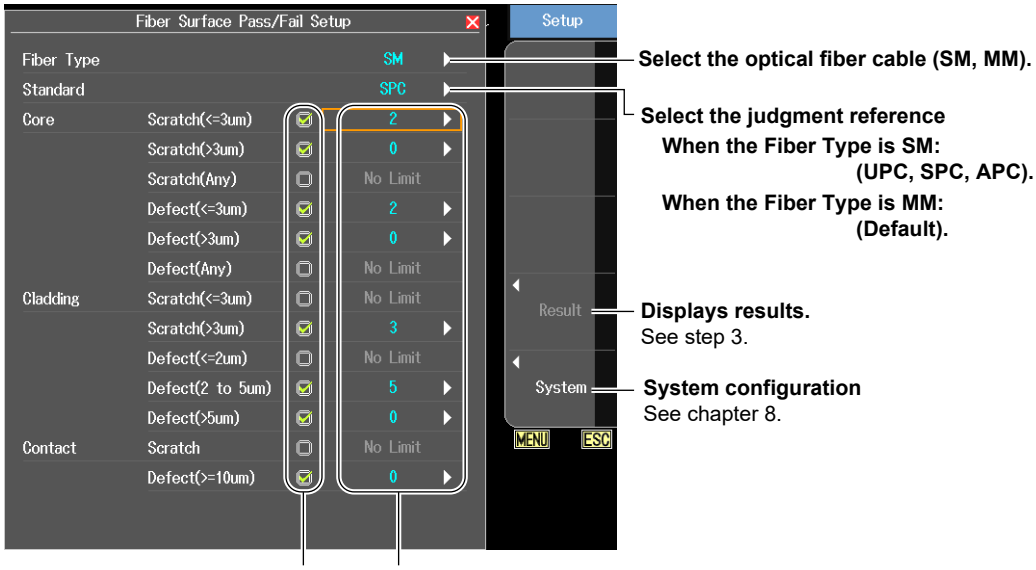
Executes judgment
Executes pass/fail judgment and displays the judgment results (summary).

Note

- The pass/fail judgment function is supported only by the following fiber inspection probes.
  DI-1000 (Lightel)
  DI-1000L (Lightel)
- Pass/fail judgment complies with IEC 61300-3-35.

Configuring the Pass/Fail Judgment

2. Press **SETUP** to display a fiber end face pass/fail setup screen.



Select the optical fiber cable (SM, MM).

Select the judgment reference
When the Fiber Type is SM: (UPC, SPC, APC).
When the Fiber Type is MM: (Default).

Displays results.
See step 3.

System configuration
See chapter 8.

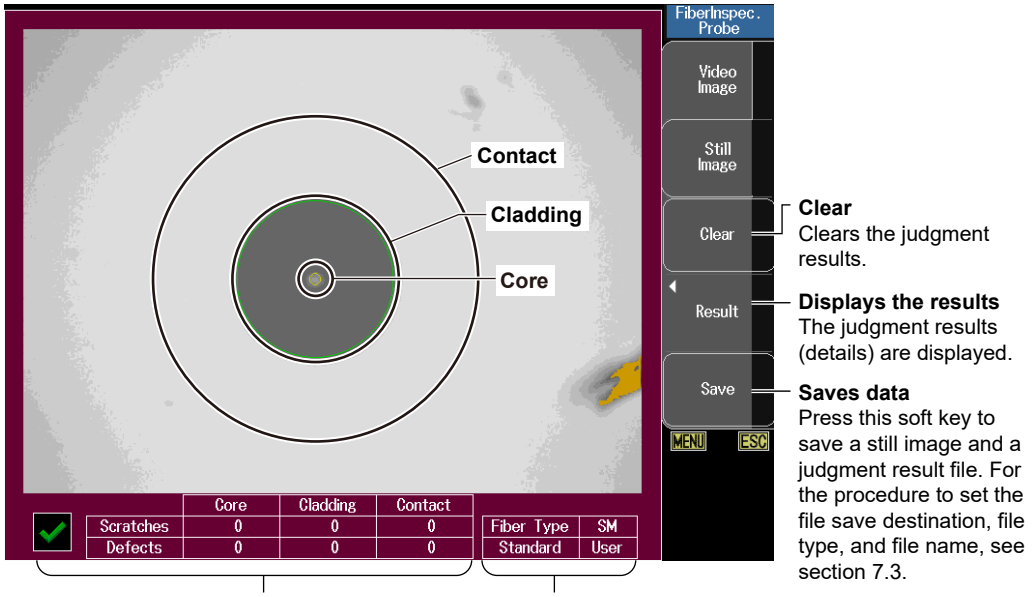
Turn judgment execution on or off

Set the scratch or defect judgment threshold values (0 to 100).
You can set this when the turn judgment execution is set to ON (check box selected).

When configuration is complete, press ESC to return to the fiber inspection probe screen.

Executing Pass/Fail Judgments

3. Press the **Judge** soft key. Executes pass/fail judgment and displays the judgment results (summary). Before executing pass/fail judgment, adjust the fiber inspection probe knob to focus on the image.



Clear
Clears the judgment results.

Displays the results
The judgment results (details) are displayed.

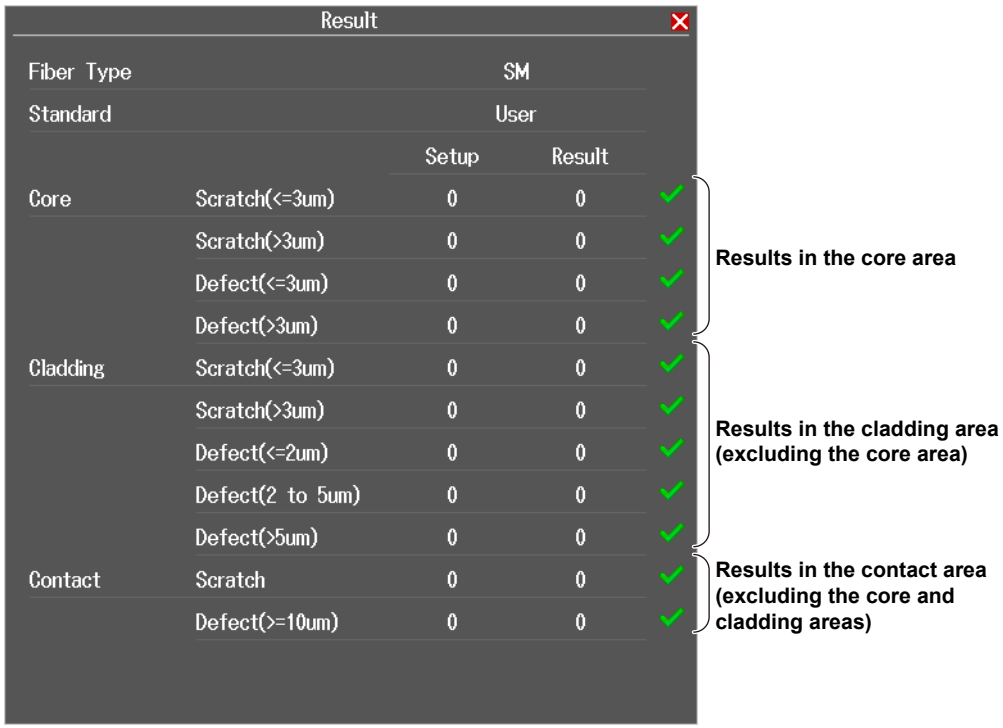
Saves data
Press this soft key to save a still image and a judgment result file. For the procedure to set the file save destination, file type, and file name, see section 7.3.

Judgment results (summary)
Appears when pass/fail judgment is performed.

Optical fiber cable type
Appears at all times for still images.

Displaying Judgment Results (Details)

4. Press the **Result** soft key to display the following screen.



Explanation

Connecting a Fiber Inspection Probe

Hot-plugging is supported; you can connect or disconnect a USB device at any time, regardless of whether the AQ7280 is on or off.

If you connect a USB fiber inspection probe while the AQ7280 is on, the AQ7280 will automatically identify the probe.

For notes on connecting USB devices, see Note in section 7.1.

For information about compatible fiber inspection probes, contact your nearest YOKOGAWA dealer.

Holding the Image Display

The still image size is VGA for both the USB2.0 and USB1.1 fiber inspection probes.

Note

If a USB2.0 fiber inspection probe is connected, it will take some time to display the still image.

Saving the Screen Image

You can save the still image. Video cannot be saved.

Pass/Fail Judgment (/FST Option)

Configuring the Pass/Fail Judgment

- **Selecting the Optical Fiber Cable**

  Select the type of optical fiber cable to be judged.

  SM: Single mode
  MM: Multi mode

- **Select the Judgment Reference**

  Select the ferrule's polished surface of optical fiber cable to be judged. The judgment reference varies depending on the polished surface.

  UPC, SPC: For spherical surface polishing
  APC: For angled spherical surface polishing
  User: When judgment execution and threshold are set manually (when any of the settings is changed, the judgment reference is automatically set to User)

  When you select the polished surface, the judgment execution on/off and scratch or defect judgment threshold values explained below are set automatically.

- **Turning Judgment Execution On or Off**

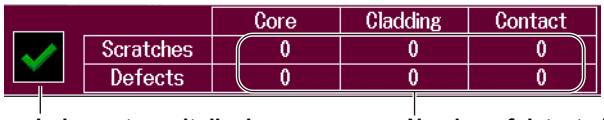
  Executes judgment of scratches and defects separately by size. The size value is fixed. Clearing the check box turns off the judgment execution. Pass/fail judgment is not performed on scratches and defects whose check box is not selected.

- **Setting the Scratch or Defect Judgment Threshold Values**

  Set the number of scratches and defects that will be judged as fail. The range is 0 to 100. If the judgment execution check box explained above is cleared, No Limit is displayed.

Judgment Results (Summary)

Displays the judgment results and the number of detected scratches (Scratch) and detects (Defect). The detection count is displayed separately for the core, cladding, and contact areas.
The judgment will be fail if there is even only a single fail (×) judgment.



Judgment result display
Pass: Check mark (green)
Fail: × (red)

Number of detected scratches and defects

Judgment Results (Details)

For each of the core, cladding, and contact areas, the threshold (Setting) and detection count (Result) are displayed.
If the detection count (Result) exceeds the threshold (Setting), the judgment will be fail (×).
Scratches and defects are detected separately by size.

Example

Scratch (<=3 um): Scratches less than or equal to 3 µm
Scratch (>3 um): Scratches exceeding 3 µm
Defect (2 to 5 um): Defects between 2 µm and 5 µm

Saving Data

The judgment result image and a judgment result file (including judgment settings) in CSV format are saved with the same file name (excluding the extension). Video cannot be saved.

9.7 Mechanical Inspection and Operation Check

WARNING

Before performing a mechanical inspection, be sure to turn off the power. Inspecting the OTDR port or light source port with the AQ7280 turned on may cause the emitted light to accidentally enter the eye. This can cause eye damage or vision impairment.

CAUTION

- Connectors clogged with foreign objects can cause abnormal operation or malfunction.
- Loose connectors may cause the AQ7280 to operate abnormally.
- If the screws fixing the OTDR unit, OPM/VLS module, or battery cover are loose, the AQ7280 may not operate properly.

French

AVERTISSEMENT

Veiller à couper le courant avant d'effectuer une inspection mécanique. L'inspection du port OTDR ou du port de source lumineuse avec l'AQ7280 sous tension peut permettre à la lumière émise de pénétrer accidentellement dans les yeux. Ceci peut provoquer des lésions oculaires ou une déficience visuelle.

ATTENTION

- Si des corps étrangers se retrouvent emprisonnés dans les différents connecteurs, un dysfonctionnement ou un endommagement risque de se produire.
- Si l'ajustement de l'un des différents types de connecteurs n'est pas parfait, l'instrument risque de ne pas fonctionner normalement.
- L'AQ7280 peut ne pas fonctionner correctement si les vis fixant l'unité OTDR, le module OPM/VLS ou le couvercle de la batterie sont desserrées.

Mechanical Inspection

Make sure that:

- The exterior of the AQ7280 is not damaged or deformed.
- Switches, connectors, and screws are not loose.
- Switches and moving parts work smoothly.

If there are any problems, contact your nearest YOKOGAWA dealer.

Operation Check

Turn the AQ7280 on to start it. Check the following to verify that the AQ7280 is running normally.

- The tops screen appears after startup.
- The screen can be switched using the control keys.
- Touch panel operations work.

9.8 Replacing the Optical Adapter

WARNING

When replacing the optical adapter, turn off the AQ7280 to prevent the light from accidentally being emitted from the light source port. Replacing the optical adapter (universal adapter or connector adapter) with the AQ7280 turned on may cause the emitted light to accidentally enter the eye. This can cause eye damage or vision impairment.

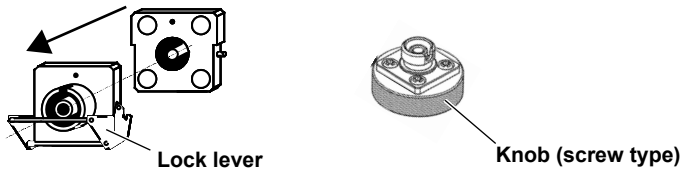
French

AVERTISSEMENT

Lors du remplacement d'un adaptateur optique, mettre l'AQ7280 hors tension pour empêcher l'émission accidentelle de lumière depuis le port de la source lumineuse. Le remplacement de l'adaptateur optique (adaptateur universel) ou (adaptateur de connecteur) avec l'AQ7280 sous tension peut permettre à la lumière émise de pénétrer accidentellement dans les yeux. Ceci peut provoquer des lésions oculaires ou une déficience visuelle.

Removal

1. Check that the AQ7280 is turned off.
2. Open the optical port cover.
3. Flip the optical adapter's lock lever down inward to release the lock. If it is a screw type, turn the knob to the left to loosen.
4. Pull out the optical adapter.

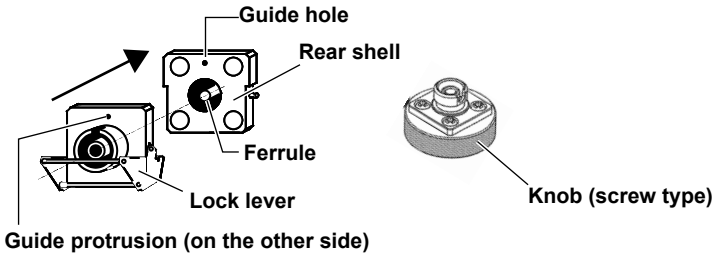


Note

- A lock lever type optical adapter is installed in the OTDR unit.
- A screw type optical adapter is installed in the optical power measurement port of the OPM module.
- If the optical port cover comes off, bend the cover axle with your fingers and reattach it.

Installation

1. Check that the AQ7280 is turned off.
2. Open the optical port cover.
3. Insert the optical adapter straight so that the guide protrusion part engages the rear shell guide hole.
4. Flip the optical adapter's lock lever down outward to lock it. If it is a screw type, turn the knob to the right to tighten.



Note

Insert the optical adapter slowly and straight. If you shake it to the left and right or remove or install with force, the optical adapter or the rear shell ferrule may be damaged.

9.9 Routine Maintenance

Cleaning the Outside of the AQ7280

To clean the LCD or the outside of the AQ7280, turn the power off, and remove the AC adapter from the AQ7280. Use a damp, well-wrung cloth to clean the outside and then wipe it off with a dry cloth. Do not use chemicals such as thinner, benzene, or alcohol. Doing so may cause deformation and discoloring.

Cleaning the Optical Adapter and Optical Fiber End Faces

WARNING

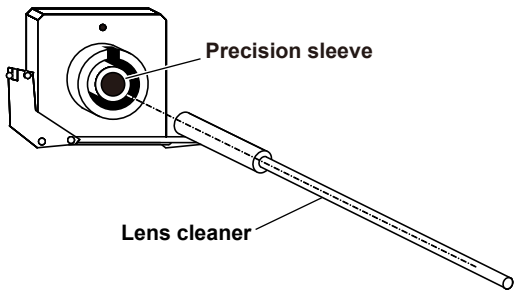
When cleaning the light emitter, turn off the AQ7280 to prevent the light from accidentally being emitted from the light source port. Cleaning the light emitter with the AQ7280 turned on may cause the emitted light to accidentally enter the eye. This can cause eye damage or vision impairment.

French

AVERTISSEMENT

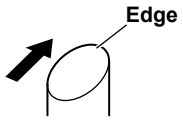
Lors du nettoyage de l'émetteur de lumière, mettre l'AQ7280 hors tension pour empêcher l'émission accidentelle de lumière provenant du port de la source lumineuse. Le nettoyage de l'émetteur de lumière avec l'AQ7280 sous tension peut permettre à la lumière émise de pénétrer accidentellement dans les yeux. Ceci peut provoquer des lésions oculaires ou une déficience visuelle.

1. Check that the AQ7280 is turned off.
2. Open the optical port cover.
3. Remove the optical adapter.
   For the procedure, see section 9.8.
4. Use a lens cleaner to clean the optical fiber end face.
5. Slowly insert the lens cleaner into the optical connector adapter's precision sleeve to clean the inner walls.



If the optical fiber end face is slanted

If the optical fiber end face is slanted, such as on a model with the /ASC option, clean from the bottom of the end face upward to prevent the cleaner from tearing or becoming fuzzy due to the sharp top edge of the fiber end face.



Note

- Use a lens cleaner that does not produce fuzz or residue to clean the optical components.
- The light source port can be cleaned with a stick type cleaner with the optical adapter attached, but we recommend that you remove the optical adapter to clean it.

9.10 Storage Precautions

Before Storage

Clean the AQ7280 before storage. For details on cleaning, see section 9.9.

Storage Conditions

Store the AQ7280 under the following conditions.

- In a place where the temperature and humidity are within their allowable ranges.
- In a place where the temperature and humidity do not change greatly over a day
- Out of direct sunlight
- In a place with little dust
- In a place without corrosive gas

Note

- To avoid over discharging, if you will not use the AQ7280 for one week or longer, charge the battery pack, remove it from the instrument, and store the battery pack away from direct sunlight in a location that has an ambient temperature of 10 to 30°C.
- When you store the battery pack for six months or longer, to replace the power that has been lost through self-discharge, recharge the battery using the AQ7280 once every six months. For the procedure to remove the battery pack, see the Getting Started Guide, IM AQ7280-02EN.
- Avoid storing the battery pack for an extended period of time when it is fully charged (after it has just been charged) or when it has no power left (when the AQ7280 will not turn on). Storing the battery pack under these conditions will degrade its performance and reduce its longevity. It is best to store the battery back when it is 40 to 50% charged.

Reuse

When using the AQ7280 after long-term storage, check its operation (see section 9.7).

Packing

Follow the procedure below to pack the AQ7280.

1. Wrap the AQ7280 in a thick plastic sheet or the like to prevent dust from entering the inside of the AQ7280.
2. Apply cushioning material to the LCD to protect it.
3. Prepare a box with a 10 to 15 cm gap on each side of the AQ7280.
4. Place cushioning material at the bottom of the box.
5. Place cushioning material in the gaps between the AQ7280 and the box.
6. Seal the box securely with adhesive tape or the like.

Transportation

- When transporting the AQ7280, avoid vibration.
- Transport in an environment that meets the storage conditions.
- When transporting battery packs by air, follow the rules of the airline company and United Nations. For details, contact your airline company in advance.

9.11 Recommended Part Replacement

YOKOGAWA guarantees the AQ7280 for the period and under the conditions of the product warranty. Under the conditions of the warranty, the following parts with limited service life and consumable parts are excluded. For part replacement and purchase, contact your nearest YOKOGAWA dealer.

Parts with Limited Service Life

Part Name	Service Life	Notes
Battery pack	300 charges	The actual service life varies depending on the operating environment.

Consumable Parts

We recommend replacing them at the following intervals.

Part Name	Recommended Replacement Interval*	Notes
Backup battery (lithium battery)	5 years	Replacement at our factory
LCD	Approx. 50000 hours	Replacement at our factory
Ferrule	1 year	Replacement at our factory
Universal adapter	1 year	New purchase
Connector adapter	1 year	New purchase
DC power supply connector	5000 times	Replacement at our factory
USB port	1500 times	Replacement at our factory
RJ-45 connector	200 times	Replacement at our factory
SD connector	1500 times	Replacement at our factory
Cooling fan	Approx. 30000 hours	Replacement at our factory

* The recommended replacement period varies greatly depending on the operating environment and frequency of use. The values in the above table are guidelines.

9.12 Calibration

Periodic calibration is an effective means of keeping the instrument performing correctly for a long time and of detecting malfunctions at an early stage. We recommend that you calibrate the AQ7280 once a year.

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