User's Manual

AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ1210-01EN
2nd Edition

Thank you for purchasing the AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR (Optical Time Domain Reflectometer).
This user's manual explains the features, operating procedures, and handling precautions of the instrument. To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference.
The instrument comes with the following manuals. Please read all manuals.

Manual Title	Manual No.	Description
AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester User's Manual	IM AQ1210-01EN	This document. A PDF file of the manual is contained in the internal memory of the instrument. The manual explains all the features and how to use them. For viewing instructions, see page 15 in the Getting Started Guide, IM AQ1210-02EN.
AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester Getting Started Guide	IM AQ1210-02EN	This guide explains the handling precautions, basic operations, and specifications of this instrument.
AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester Communication Interface User's Manual	IM AQ1210-17EN	A PDF file of the manual is contained in the internal memory of the instrument. The manual explains the communication interface features and instructions on how to use them. For viewing instructions, see page 15 in the Getting Started Guide, IM AQ1210-02EN.
Model 739884 Battery Pack Handling Precautions	IM 739884-01EN	This document explains the handling precautions of the battery pack.
AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester User's Manual	IM AQ1210-92EN	Document for China.

The "-EN" in the manual number is the language code.

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 continuing improvements to the instrument's performance and functions. The figures given in this manual may differ from those that actually appear on your screen.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
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Revisions

1st Edition: April 2019

2nd Edition: April 2019

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 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 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 1.

Character Notations

Panel Key Names and Button Names in Bold Characters
Indicate panel keys that are used in the procedure and buttons that appear on the screen.

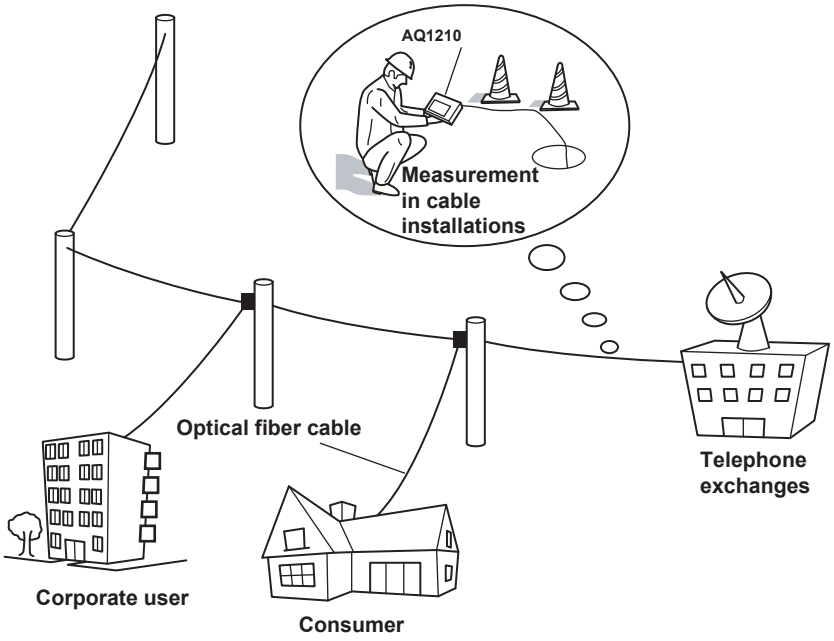
Unit

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

Contents

1.1 Overview

This instrument is an OTDR (Optical Time Domain Reflectometer) with the features listed below. It is used in the optical fiber and line installation and maintenance servicing of access networks, which link telephone exchanges and service providers with subscribers, and user networks, which enable communication within a corporation or building.



OTDR Features

OTDR stands for optical time domain reflectometer. The instrument displays waveforms (TRACE mode) or icons (MAP mode) 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)
- Network between telecom carriers

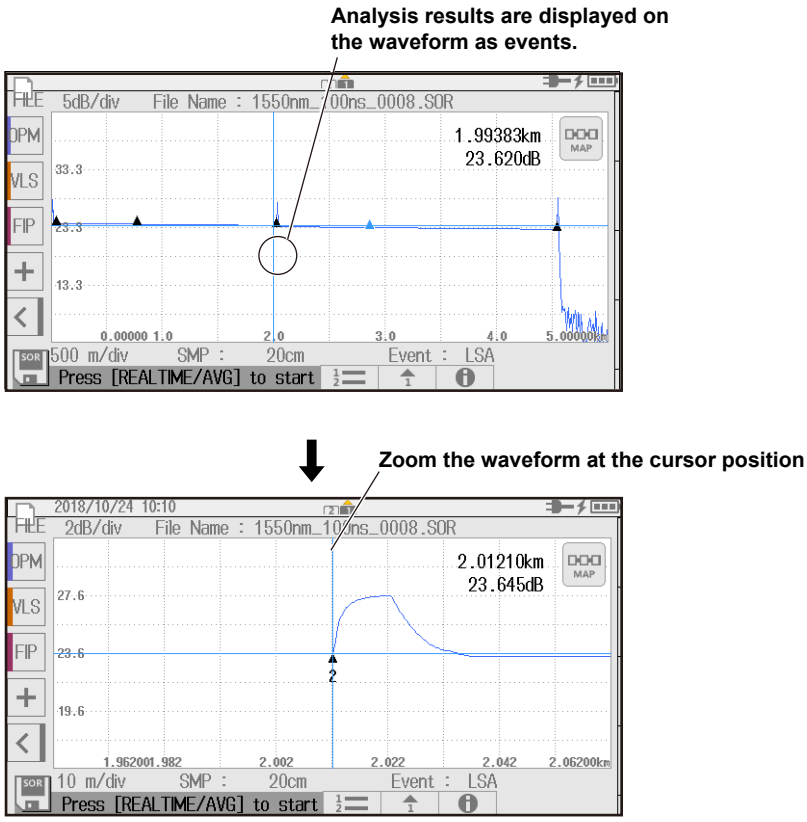
1 SM: Single mode

Optical Pulse Measurement

- **Averaged Measurement (TRACE mode)**
  A measurement in which measurements are taken several times and the measured values are averaged to display the waveform.
- **Averaged Measurement (MAP mode)**
  After averaged measurement is performed, the OTDR waveform is automatically analyzed, and the results are displayed using icons for each event type.
- **Real-Time Measurement (TRACE mode)**
  While optical pulse measurement is in progress, measured values are updated and displayed as a waveform in real time.

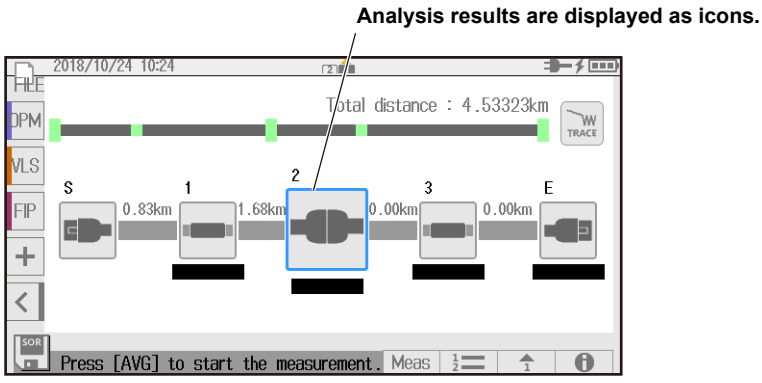
Optical Pulse Waveform Display (TRACE mode)

The results of optical pulse measurement is displayed as a waveform. The displayed waveform can be zoomed and moved.



Event Icon Display (MAP mode)

The instrument can perform an averaged measurement and then automatically display the measured result events as icons on the screen. In addition, if pass/fail judgment conditions are specified, judgment results are displayed with icon colors. For details on the pass/fail judgment function, see section 1.5.



Optical Pulse Analysis

- **Waveform Analysis**

  The following events can be analyzed using cursors and markers.
  - Distance
  - Splice loss
  - Return loss

    Return loss between markers can be analyzed.

- **Event Analysis**
  Events are automatically detected. In addition, you can edit events. Adjustments can be made when certain events cannot be detected or when noise is detected as events.

USB Feature

Connecting USB Storage Devices, Communication Dongles, and Fiber Inspection Probes (Type A)

USB storage devices complying with USB1.0/1.1/2.0 can be used. Up to two devices can be connected. You can save waveform data and measurement conditions to USB memory devices. By using a communication dongle (LAN, WLAN), you can remotely control the instrument over a network and transfer measured waveform data to an external server. You can connect a probe that is used in Fiber Inspec Probe, which is an application of this instrument. For the recommended communication dongles that can be used with this instrument, contact your nearest YOKOGAWA dealer.

Connecting to a PC (Type C)

The instrument can be accessed as a mass storage device from a PC, and the files and folders in the internal memory can be displayed and manipulated. You can also connect a PC to the instrument and control it using communication commands. For details, see the communication interface user's manual, IM AQ1210-17EN.

Utility Features (simultaneous use of multiple functions)

On the OTDR screen, you can call up optical power meter, visible light source, and other features and measure optical power and the like simultaneously with the OTDR measurement. In a measurement that takes a certain time to complete such as in an OTDR averaged measurement, measurement of other fibers can be executed simultaneously to effectively use the measurement wait time and improve work efficiency.

Light Source Feature (utility)

Stabilized Light Source

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. The wavelength of the measurement light is the same as that of the optical pulse of the OTDR.

Visible Light Source (/VLS option)

This is used to view the fault locations or check the cores of multi-core optical fiber cables. The VLS port transmits a visible light (CW, CHOP (2Hz)) with an emission wavelength of 650 nm.

Fiber in Use Alarm (utility)

Power Checker (/PC option)

The OTDR port enables you to check the presence of communication light (fiber in use) within the optical fiber cable under measurement and view its power value.

Optical Power Meter Feature (utility)

Standard Optical Power Meter (/SPM option)

This feature is used to measure through the OPM port the optical power for loss measurement or the optical power of a communication device. This is also used as an optical power meter for the Auto Loss Test, which is an application of this instrument.

High Power Optical Power Meter (/HPM option)

This feature measures through the OPM port the high power (+27 dBm max.) optical power for loss measurement. This is also used as an optical power meter for the Auto Loss Test, which is an application of this instrument.

PON Optical Power Meter (/PPM option)

This feature measures through the OPM port the optical power of a passive optical network (PON) for three wavelengths (1310 nm/1490 nm/1550 nm) simultaneously.

Smart Mapper Feature (application)

This feature performs multiple measurements automatically with a single operation, combines the measured results, and maps the events that occurred on the optical fiber cable as icons. Because a map display is used in place of a waveform display, complex line configurations can be easily understood even by inexperienced workers. You can also automatically judge measured results by setting thresholds. Furthermore, you can view the multiple measured waveforms which are the bases of the map display.
Events can also be displayed as icons on the map display of the OTDR feature, but the map display of the OTDR feature converts the analysis results of averaged measurements. If multiple measured waveforms, which form the bases, are required, the smart mapper feature is convenient.

Multi-Fiber Measurement Feature (application)

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-fiber 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. In addition, the AQ7933 Emulation Software can be used to create projects, and the project files can be loaded into this instrument.

List

Cores are listed on the screen. You can identify cores that have been measured, cores that have not been measured, and cores that are not to be measured. For each core in the list, you can perform average measurement, real-time measurement, optical power management, and fiber inspection probe operations. This prevents unintended omission in core measurements and allows measurements to be performed 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.

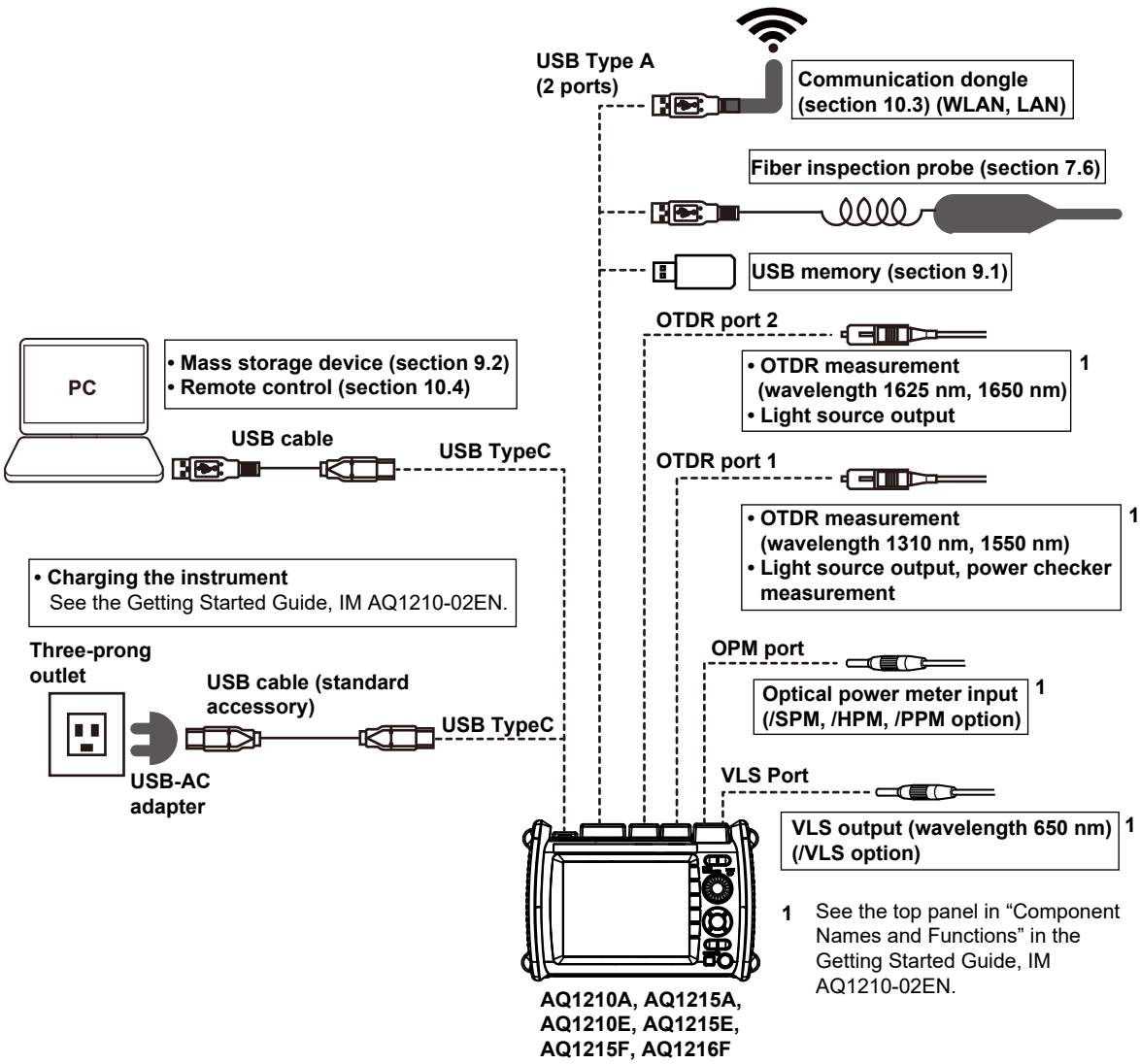
Fiber Inspec Probe (application)

A YOKOGAWA-specified fiber inspection probe can be used to view stains on the optical fiber cable end face on the instrument screen. The fiber inspection probe is not included with the instrument. Please purchase your own fiber inspection probe. For information about compatible fiber inspection probes, contact your nearest YOKOGAWA dealer.

Loss Test/Multi-Core Loss Test (Application)

By using two instruments, one as a light source and another as an optical power meter, the optical fiber loss can be measured. In a multi-core loss test, the loss of a multi-core optical fiber can be measured. As a light source, the instrument automatically switches between two wavelengths (1310 nm and 1550 nm) and outputs them.
As an optical power meter, the instrument automatically detects the wavelength of the input light, switches its wavelength setting, and measures the optical power.

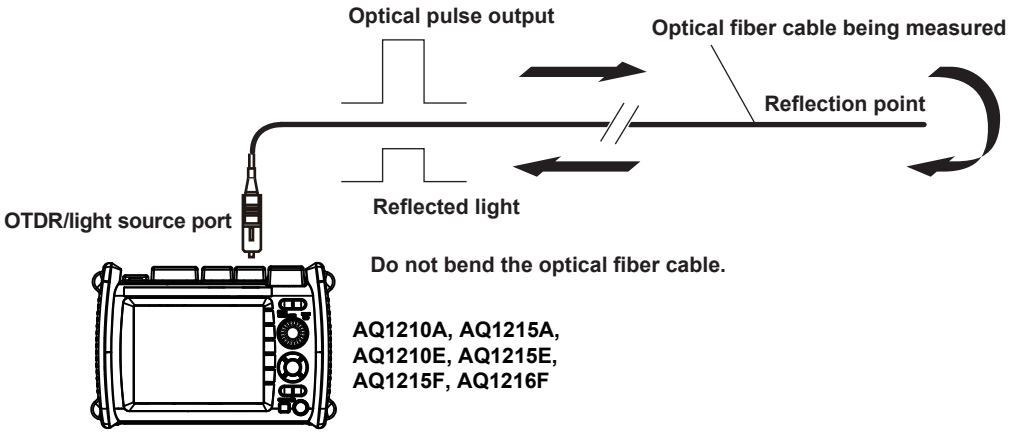
System Configuration



1 See the top panel in “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN.

1.2 Optical Pulse Measurement (OTDR)

The instrument 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 instrument 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.



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. Real-time measurement is not possible in MAP mode (the mode is automatically switched to TRACE mode before making a measurement).

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 instrument 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.

- **Multi Wavelength Measurement**
  Two wavelengths, 1310 nm and 1550 nm, can be measured with one measurement operation. When a measurement is started, an averaged measurement is performed at 1310 nm. Then, the wavelength is automatically switched to 1550 nm, and another measurement is made.

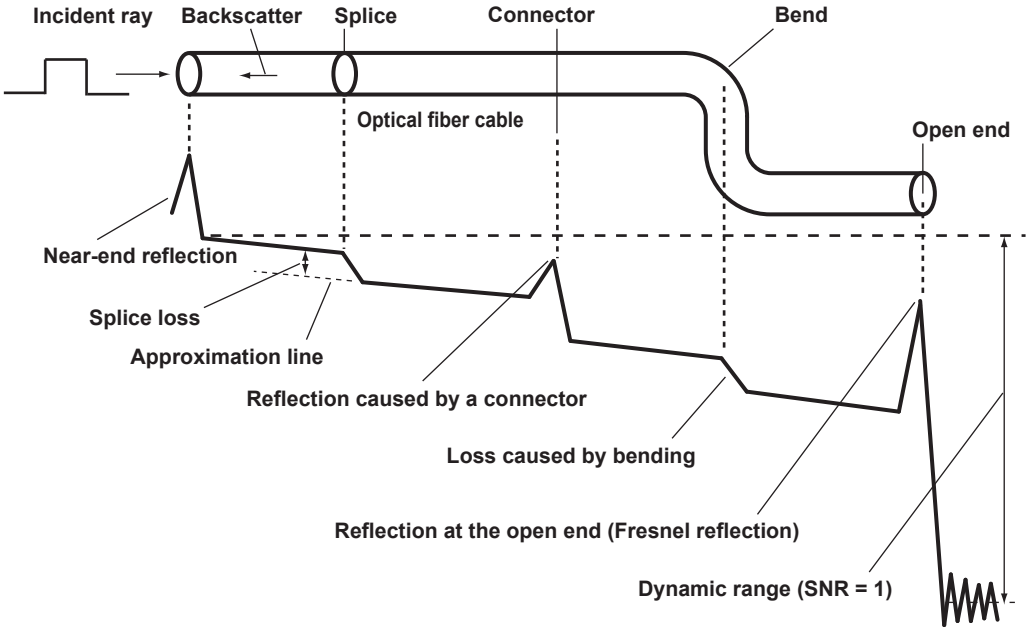
Auto Check before Measurement

- **Fiber-In-Use Alarm**
  The instrument 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 instrument and an optical fiber cable. When this feature is set to on, you can prevent light from being transmitted from the instrument OTDR port if an optical fiber cable is not connected to the instrument or if the cable is not connected correctly.

1.3 Displaying Measured Data (OTDR)

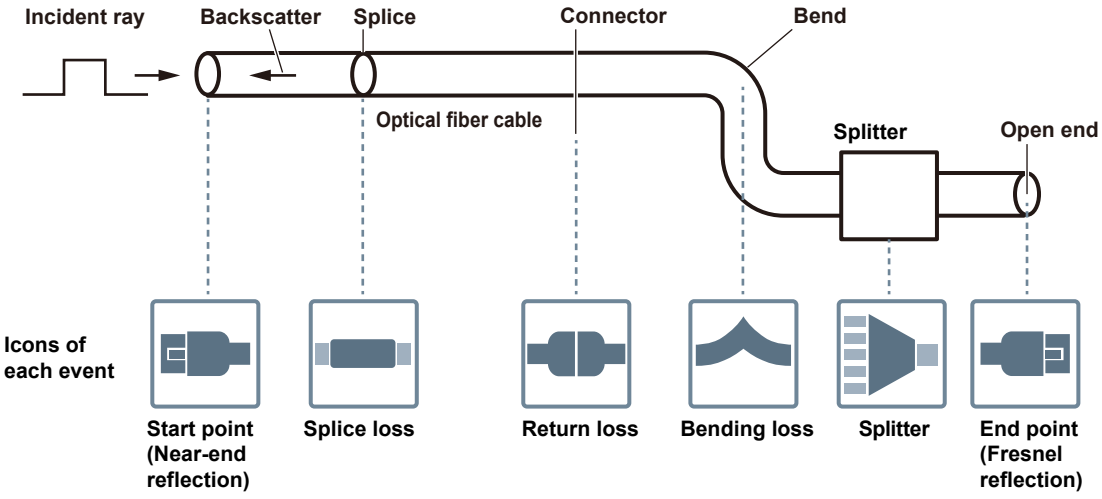
How to View Optical Pulse Waveforms (TRACE mode)

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.



How to View the Icon Display (MAP mode)

Losses and reflections that occur at connections, bent sections, and open ends are displayed using icons. Events in the section from the measurement start point to the open end are displayed in order from the start point.

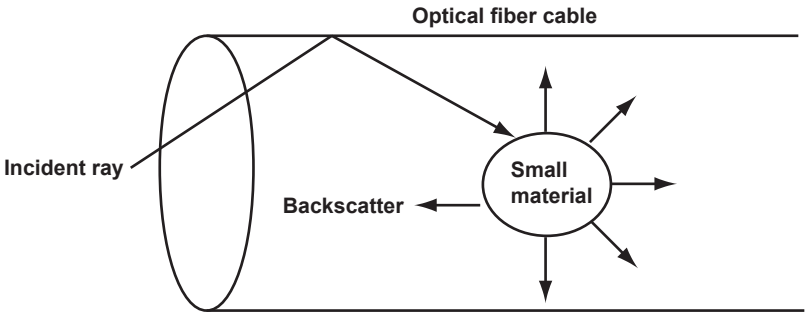


Near-end Reflection

This is the reflection that occurs at the point where the instrument and the optical fiber cable are connected. This also includes the instrument'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.

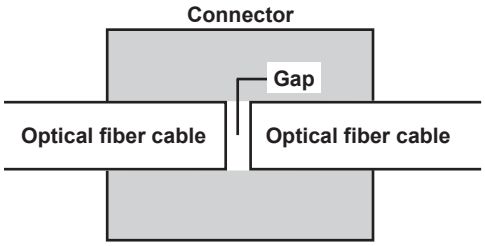


Splice Loss

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.

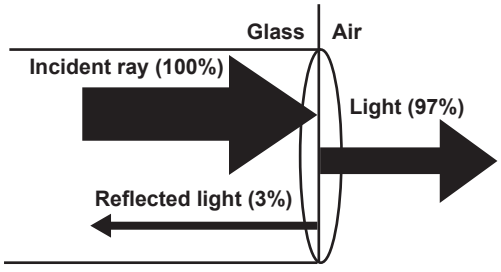
Reflection at the Connection Point of Connectors

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.



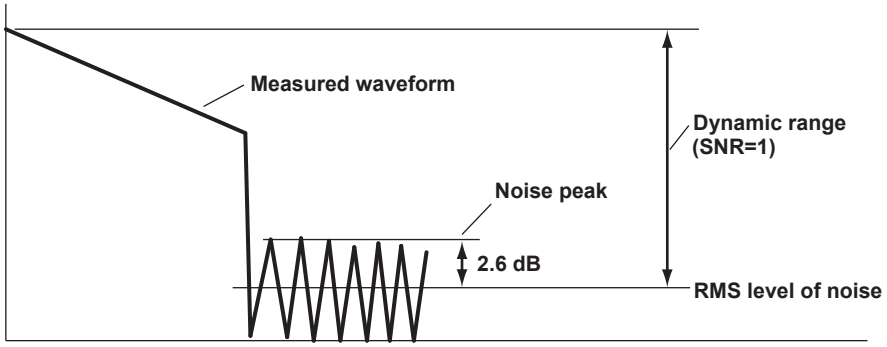
Fresnel Reflection at the Open End of the Fiber

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.



Dead Zone

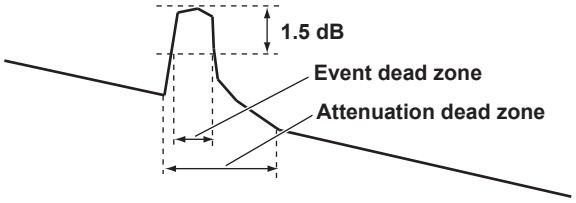
An area where the influence of a large event such as a connector's connection point makes it impossible to recognize other events that exist in that area is a dead zone. There are the following types of dead zones.

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.

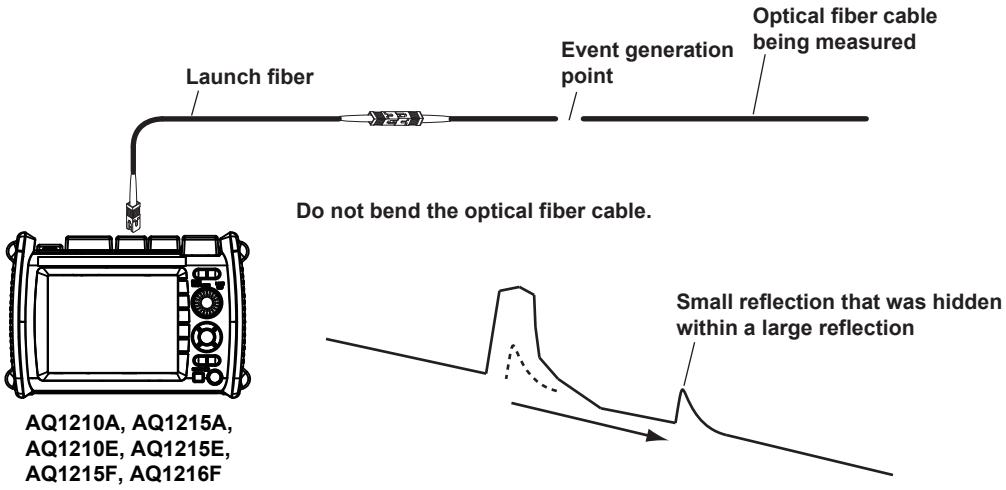
Attenuation Dead Zone

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.



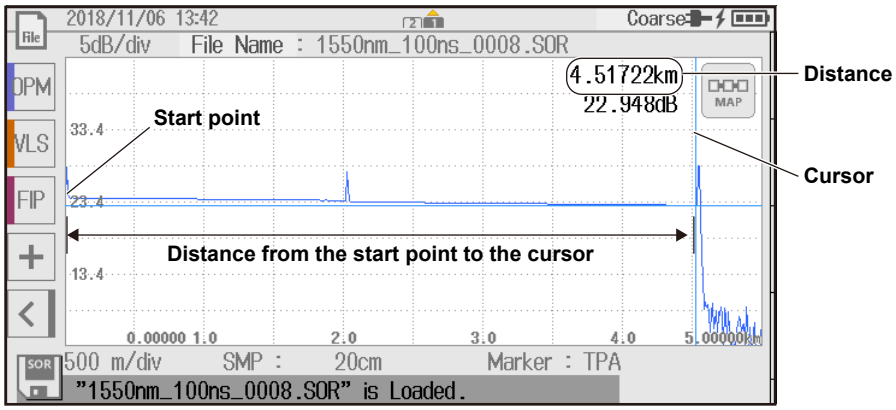
1.4 Analyzing Measured Data (OTDR)

Marker Analysis (TRACE mode)

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

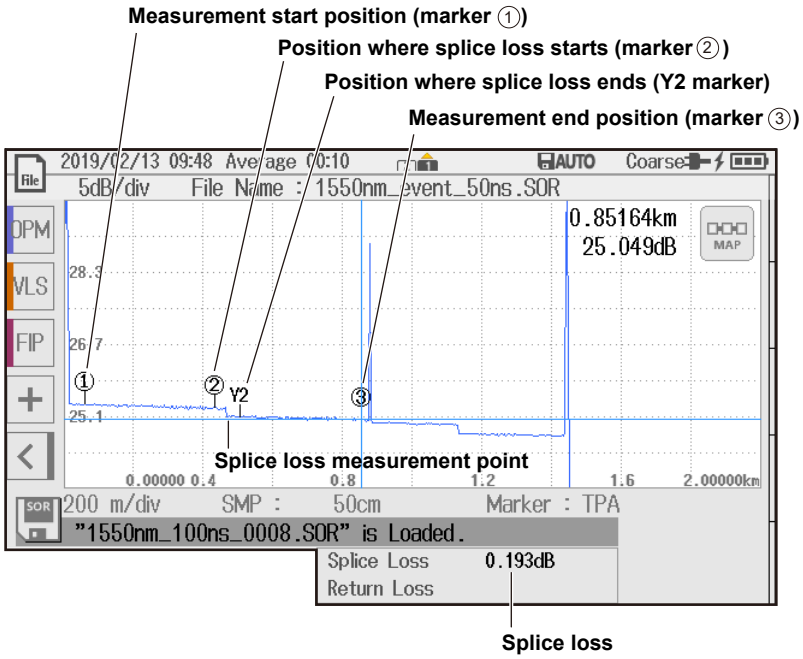
Distance between Two Points

The distance from the start point to the cursor position is displayed.



Splice Loss

When you place four markers as shown in the following figure, the splice loss from the measurement start position to the measurement end position is calculated, and the value is displayed.

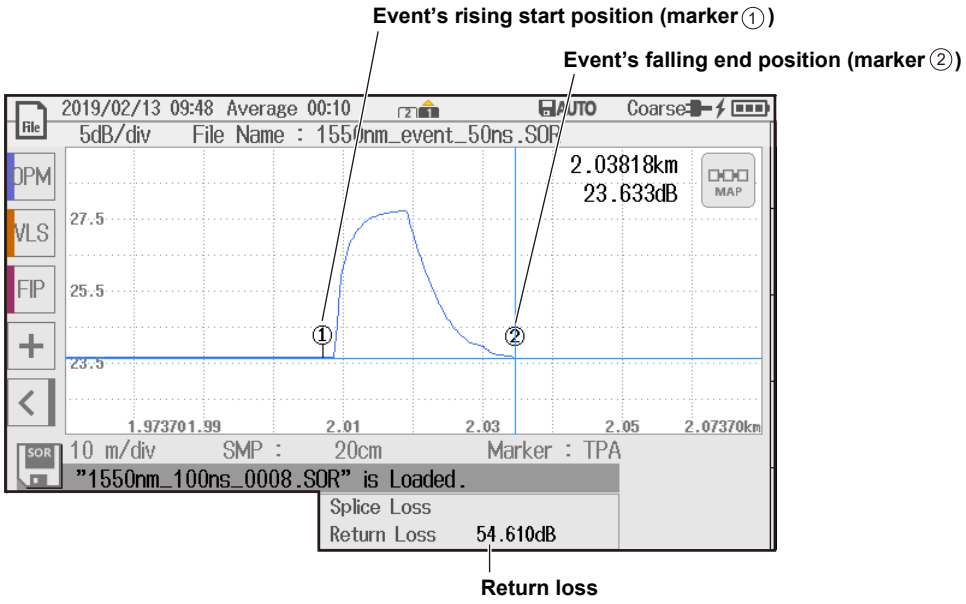


Note

In addition to the above method, the splice loss can be measured by using six markers or by using line markers. For details, see section 6.1.

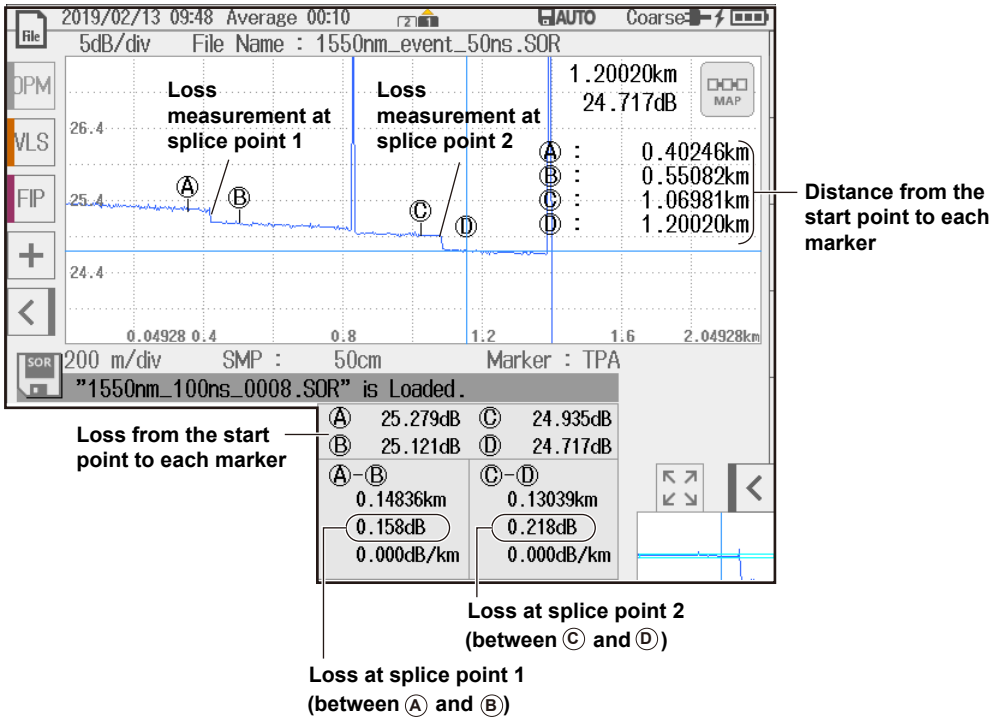
Return Loss

When you place two markers as shown in the following figure, the return loss is calculated, and the value is displayed.



Splice Loss at Two Locations (4 Point Monitor)

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



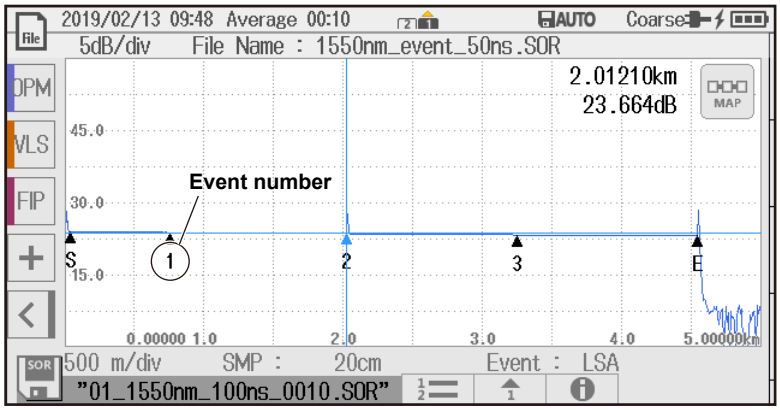
Event Analysis

All events are automatically detected from the waveform of optical pulse measurement, and the types of each event and analysis results (splice loss, return loss, etc.) are displayed on the screen.

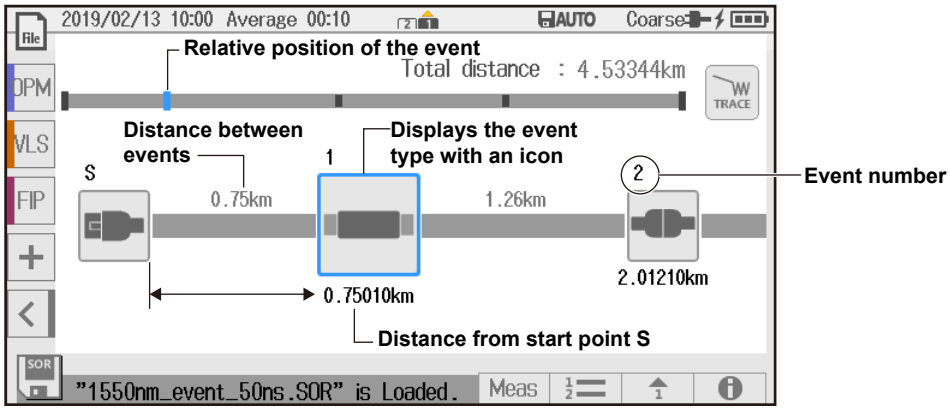
Event Display

In TRACE mode, detected events are displayed on the measured waveform. In MAP mode, the types of events are displayed using icons along with the distances of each from the measurement start position.

TRACE mode



MAP mode

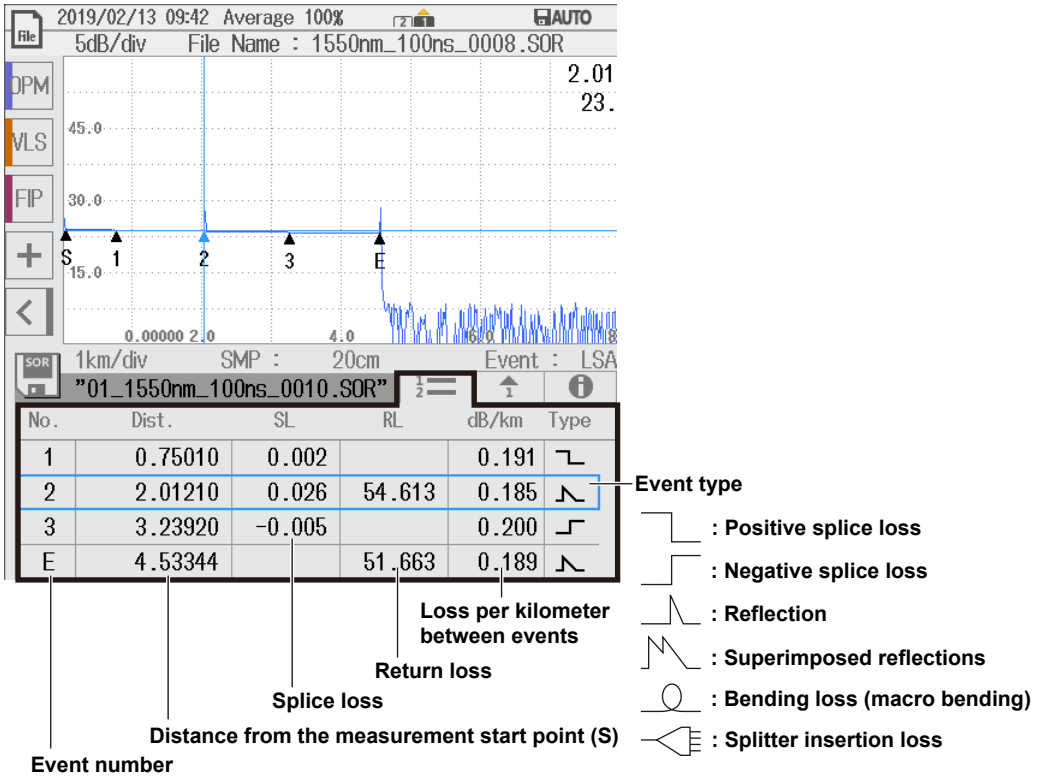


Event Information Display

The distance, splice loss, return loss, and the like of each event are displayed. This is a feature common to TRACE mode and MAP mode.

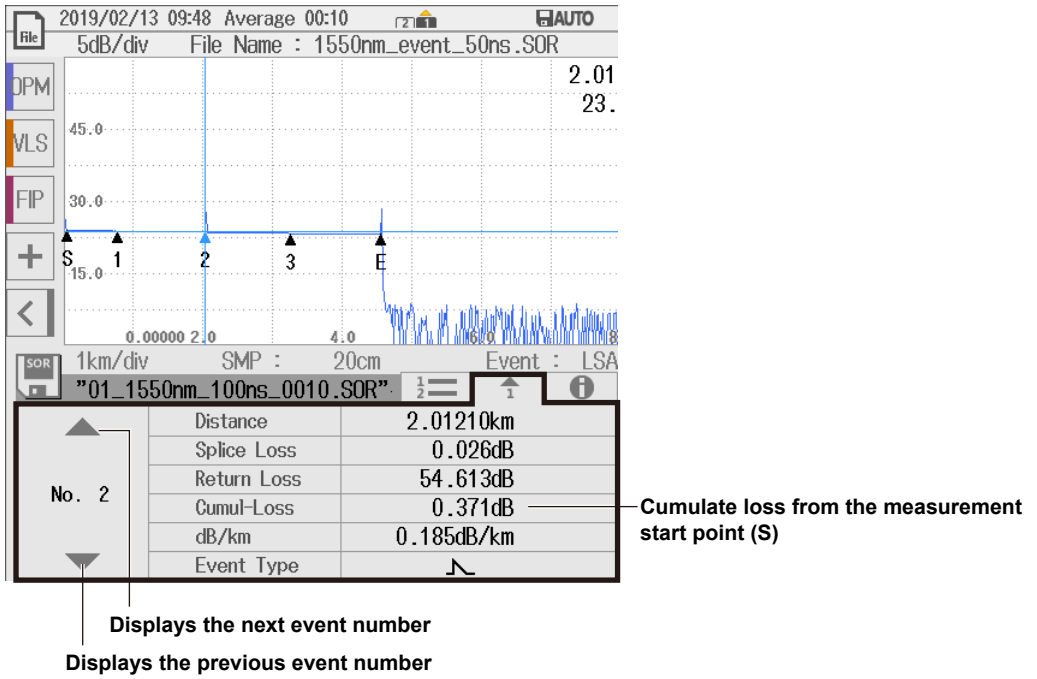
- **List Display**

  All detected events are listed.



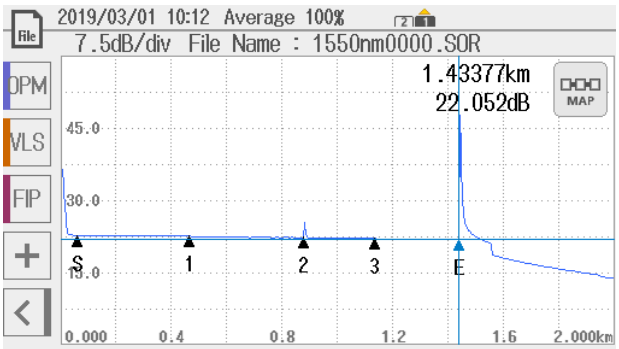
- **Individual Event Information**

  The measured data of the selected event number is displayed.



- **Measurement Total of Events**

  The total values of detected events are displayed.



Event Analysis Conditions

You can set event search conditions.

- **Splice Loss (Splice/Connection)**

  The instrument recognizes that an event has occurred when it detects a measured result that is greater than the specified value.

- **Return Loss**

  The instrument recognizes that an event has occurred when it detects a measured result that is less than the specified value.

- **End of Optical Fiber**

  The instrument recognizes that an end-of-fiber (E) event has occurred when it detects a measured result that is greater than the specified value.

- **Bending Loss**

  You can select whether to detect bending losses. If you select to detect bending loss, the instrument recognizes that an event has occurred when it detects a measured result that is greater than the specified threshold.

- **Near-end Dead Zone Prevention (Launch Fiber Setting)**

  To prevent near-end reflections, if a launch fiber is connected to the measurement start point, the length of the launch fiber is automatically corrected in the calculations.
  For details on near-end dead zone prevention, see “Dead Zone” in section 1.3.

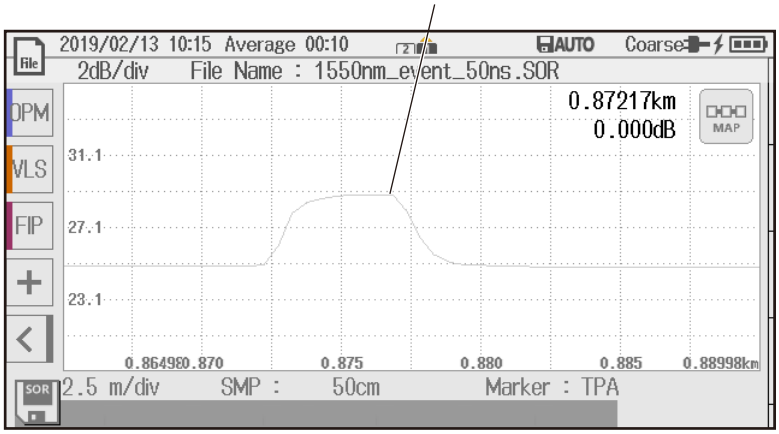
- **Splitter Loss**

  If splitters are inserted, you can select whether to detect the losses caused by them. If you select to detect splitter loss, the instrument recognizes that an event has occurred when it detects a measured result that is greater than the specified threshold.

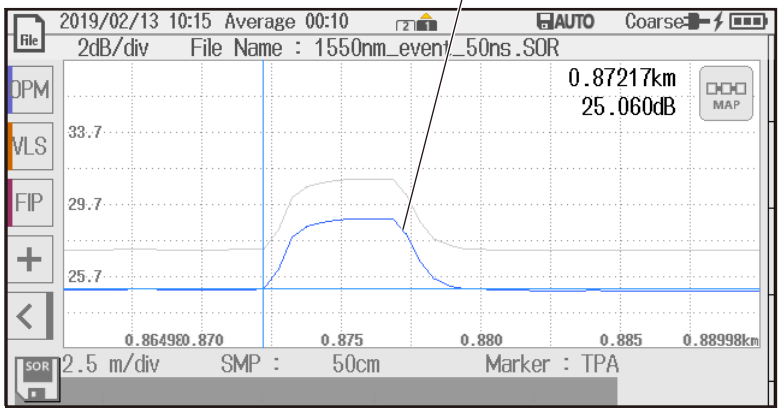
Setting a Reference Trace

You can perform averaged measurements or real-time measurements while retaining the previous waveform on the screen (reference trace). You can display the waveform being measured and the reference waveform at the same time to compare them. Waveform data loaded from a file can also be used as a reference trace.

Reference trace (white: when Screen Color is set to Color1)



Superimposed on the waveform currently being measured



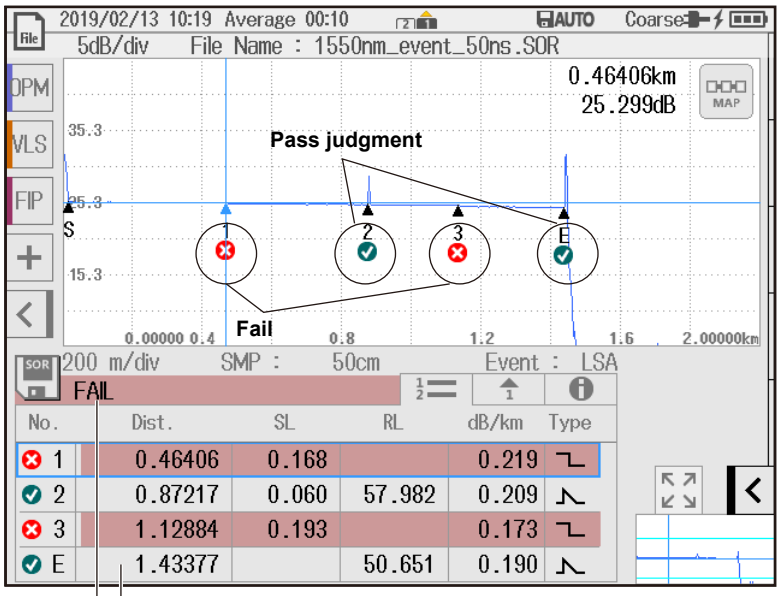
1.5 Pass/Fail Judgment (OTDR)

In pass/fail judgment, the instrument automatically determines whether preset conditions are met based on the event analysis data and displays the results on the screen.

Judgment Conditions

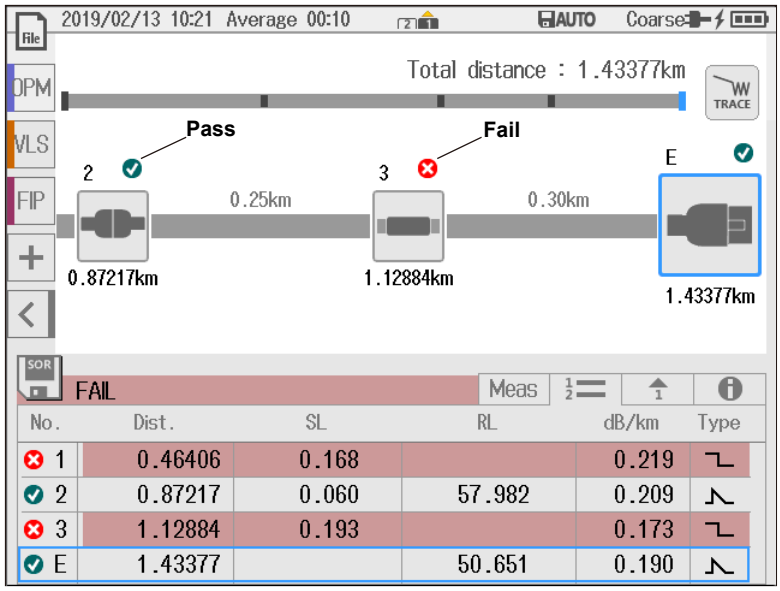
Set a pass/fail judgment threshold on each measurement item (splice loss, return loss, dB/km, total loss). When the measurement value does not exceed the threshold, the corresponding event is indicated as pass. When the measurement value is greater than the threshold, the corresponding event is indicated as fail.

TRACE mode



The pass judgment result and value of each event are displayed.
When all events are judged as Pass, the bar turns green.

MAP mode



1.6 Utilities

Light Source

The light source is used to make loss measurements. The following measurement light wavelengths can be generated.

Model	Measurement Light Wavelength
AQ1210A	1310 nm, 1550 nm
AQ1215A	1310 nm, 1550 nm
AQ1210E	1310 nm, 1550 nm, 1625 nm
AQ1215E	1310 nm, 1550 nm, 1625 nm
AQ1215F	1310 nm, 1550 nm, 1650 nm
AQ1216F	1310 nm, 1550 nm, 1650 nm

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

Visible Light Source

The features listed for the visible light source are available on models with the /VLS option.
A visible light source 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
AQ1210A AQ1215A AQ1210E AQ1215E AQ1215F AQ1216F	650 nm

Optical Power Meter

The optical power meter feature can be applied to models with the /SPM (standard), /HPM (high power), or /PPM (PON) option. An optical power meter can be used for the following purposes.

- Measure the loss in an optical line that uses optical fibers
- Measure the optical signal power of an optical communication device

The following measurement lights can be measured.

Model	Measurement Wavelength		
	/SPM option	/HPM option	/PPM option
AQ1210A AQ1215A AQ1210E AQ1215E AQ1215F AQ1216F	800 nm to 1700 nm	800 nm to 1700 nm	1310 nm, 1490 nm, 1550 nm

Logging

You can measure 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 signal power at a specified location or the maximum, minimum, and average within a specified area. The logging results can be saved to a file in CSV format.

Power Checker (/PC option)

The power checker feature is used to check the power of the loss-measurement light source in a simplified manner.

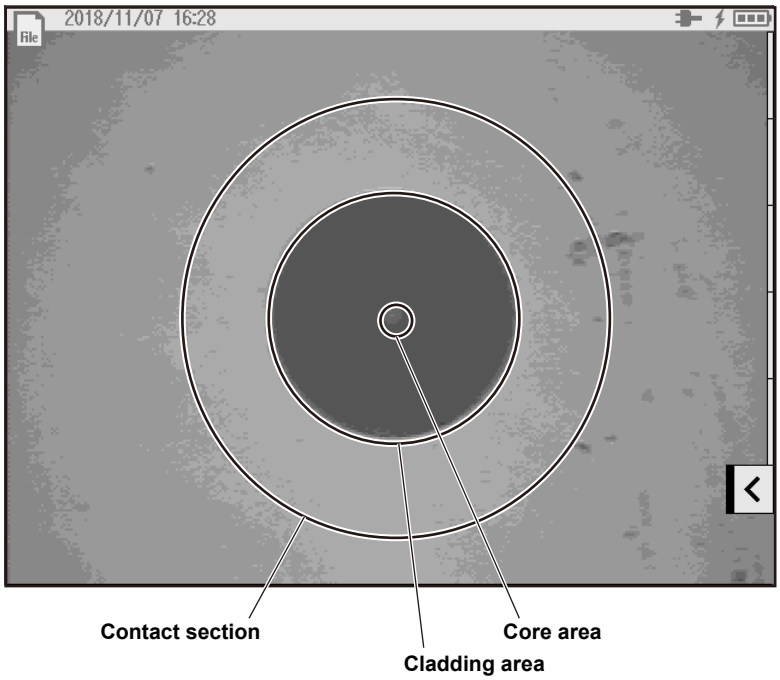
The following measurement lights can be measured.

Model	Measurement Wavelength
AQ1210A	1310nm, 1490nm, 1550nm, 1625nm, 1650nm
AQ1215A	
AQ1210E	
AQ1215E	
AQ1215F	
AQ1216F	

Fiber End Face Inspection (/FST option)

You can use a fiber inspection probe recommended by YOKOGAWA to take a photograph that shows the state of a fiber end face. You can display this photograph on the instrument screen and save it. You can also perform a pass/fail judgment on the state of the cable end face shown on the photograph.

Example of an end face image of an optical fiber cable



Pass/fail judgments can be performed separately on each of the contact areas, cladding areas, and core areas.

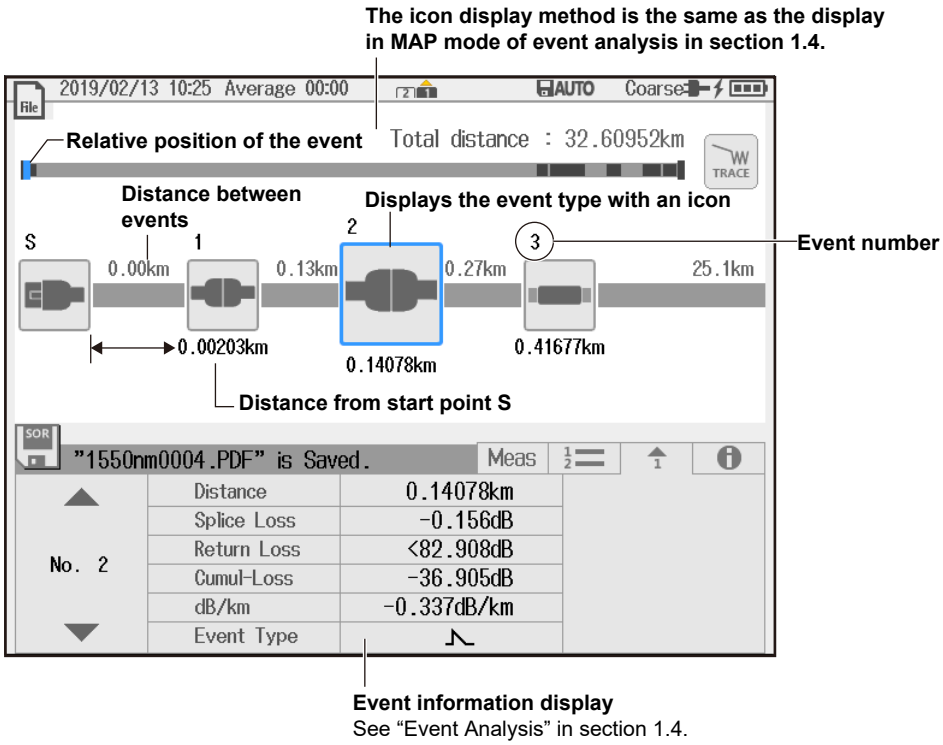
1.7 Application

Smart Mapper

The Smart Mapper feature repeats the averaged measurements of the OTDR feature on the same wavelength using different pulse widths, and then when measurements are completed, automatically executes the event analysis of the OTDR feature.
Like the OTDR feature, when measurements are completed, you can select between MAP mode and TRACE mode.

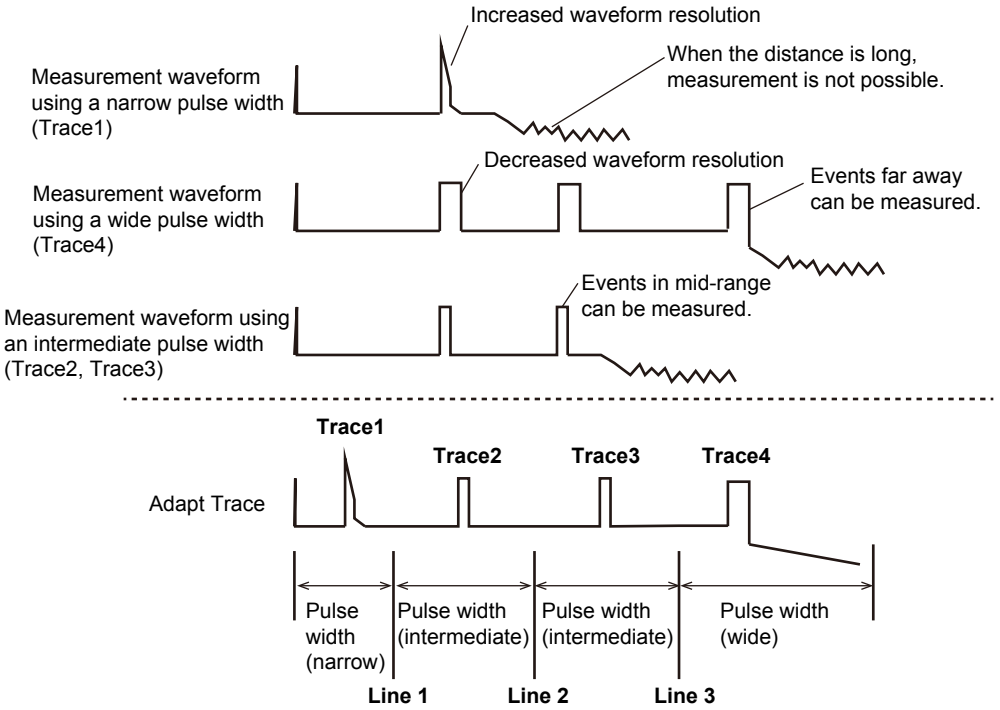
Event Analysis Using MAP Mode

When you select MAP mode, various events on the optical fiber cable path can be detected and displayed as icons on the screen.



Adapt Trace Using TRACE Mode (waveform editing)

When you select TRACE mode, waveforms measured at different pulse widths can be displayed. 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 multiple different pulse widths for the same wavelength and combining the multiple waveforms on the screen. The instrument automatically determines the pulse widths depending on the specified distance range and wavelength.



You can change the effective range of Trace1 to Trace4 by moving the lines marking the sections.

Optical Pulse Measurement of Multi-core Optical Fiber Cables

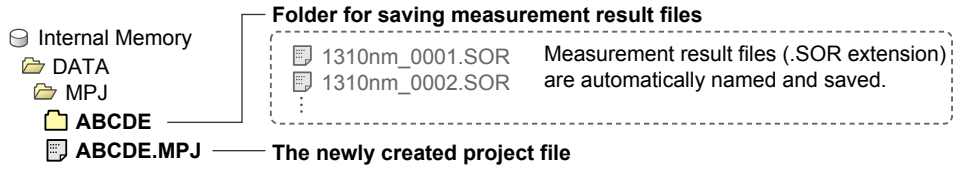
Projects

Projects are group of items for measuring multi-core fibers. The default project name is “NewProject.” In the instrument 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 the explanation in section 2.4.

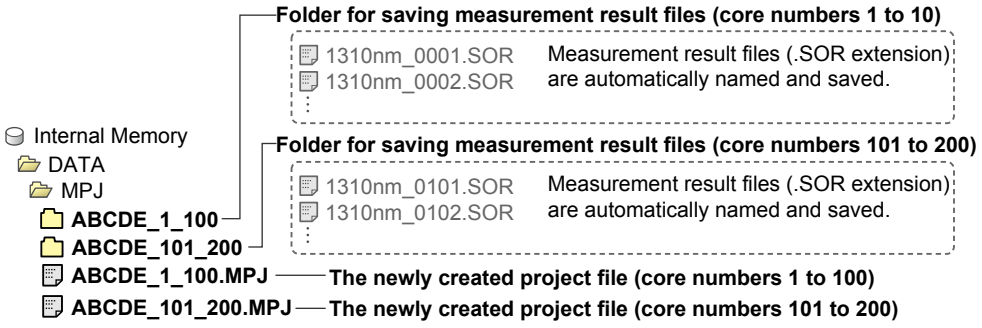
- **Project File Structure**

  When you create a new project name, a new project file (.MPJ extension) and a new folder for saving measurement result files (.SOR extension) are created. At this point, you can select whether to inherit the fiber information, measurement conditions, and analysis conditions from an existing project file or reset them to default values.

Example of when the project file name is “ABCDE”



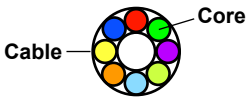
If the number of fibers exceeds 100, the folder for saving the project file and that for saving measurement result files will be divided. The folder is automatically divided every 100 fibers. The divided folder names will be the project name followed by the start core number and end number set in the project.



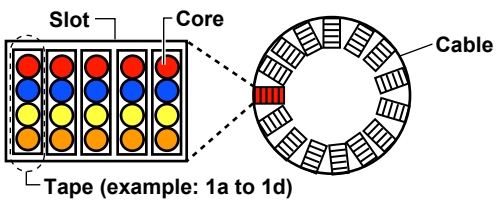
Number of Fibers, Number of Fibers in Each Division, Tape Number

The core number indications and settings vary depending on the type of multi-core fiber cable.

Normal core cable (example with eight cores)
Eight cores are bundled into one.



Ribbon slotted core cable (example of 300 fiber type 4-fiber ribbon)
This is an example of a 300 fiber type with 15 slots (20 fibers) containing five 4-fiber tapes.
The following settings need to be entered to set the information of this core cable in a project of this instrument.
• Num of Fibers (per slot): 20
• Tape No.: a-d(4)

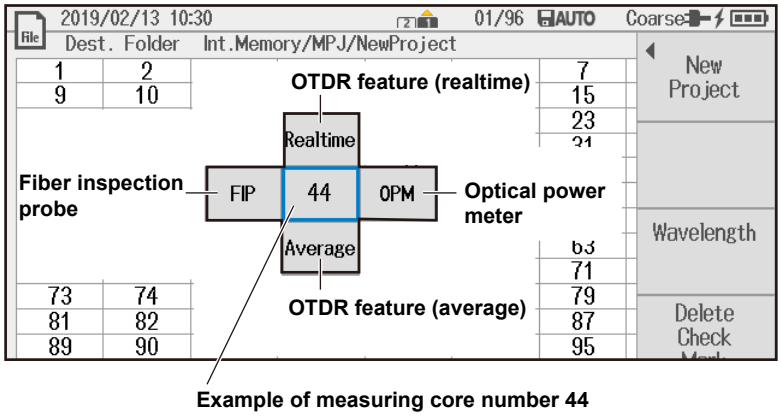


Multi-Fiber Measurement

The following four measurements can be performed in multi-fiber measurement.

- OTDR measurement (Realtime)
- OTDR measurement (Average)
- Optical power measurement
- Fiber Inspec Probe

The four measurement features use the same features as the OTDR feature for measuring a single fiber explained in section 1.1, the optical power meter (excluding the logging feature) explained in section 1.6, and the fiber end face inspection explained in section 1.6. You can run and use these four measuring features from the main view screen of multi-fiber measurement.



Saving Measurement Result Data

You can save the results of multi-fiber measurement for each fiber. The data is saved in the folder explained in “Project File Structure” on the previous page. For details on the data format, see section 9.4.

- **OTDR Feature (Realtime, Average)**
  For each fiber, waveform data is saved in SOR format in a single file.
- **Fiber Inspec Probe**
  For each fiber, screen capture data is saved in BMP format in a single file.
- **Optical Power Meter**
  For each project, data is saved in tab-separated CSV format in a single file.

Auto Loss Test (combination of light source and optical power meter)

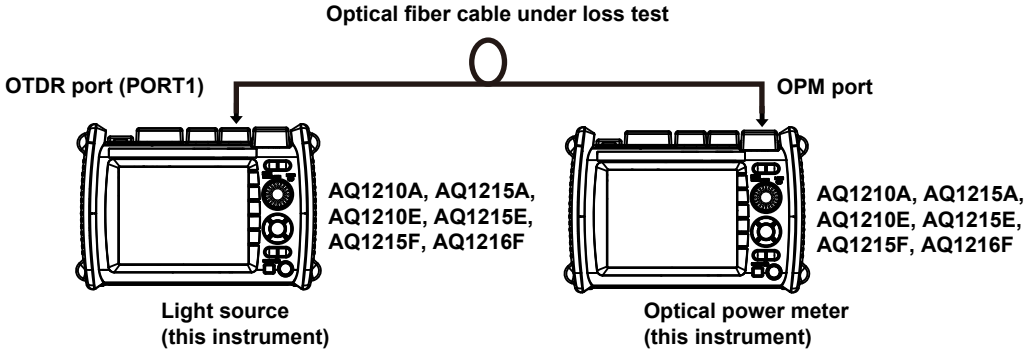
Using the instrument as a light source and optical power meter, you can easily measure optical fiber cable and line degradation. You can also use the AQ1100/AQ1200A/AQ1200B/AQ1200C/AQ1200E/AQ1205A/AQ1205E/AQ1205F in the multi-field tester series instead of this instrument as the light source or optical power meter.

Light Source Feature

You can set up to two measurement light wavelengths and produce them in order. You can produce a constant level of light if you use the optical power adjustment feature.

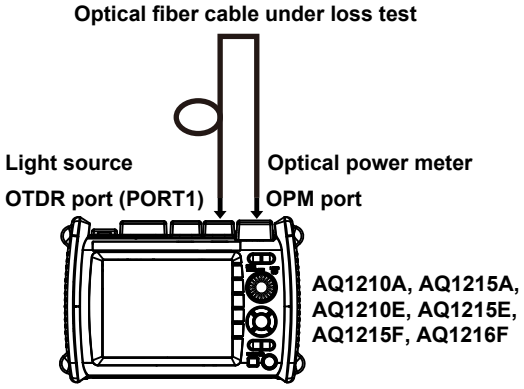
Optical Power Meter Feature

The instrument automatically identifies the measurement light from the opposing instrument or AQ1100/AQ1200A/AQ1200B/AQ1200C/AQ1200E/AQ1205A/AQ1205E/AQ1205F that it is connected to and measures the optical power.



Loopback Feature

You can use the light source and optical power meter features on a single instrument to perform a loop-back loss test on an optical fiber cable or line. To perform loss testing, connect one end of the optical fiber cable that you want to perform loss testing on to the the instrument's OTDR port (PORT1) and the other end to the OPM port on the same instrument.



Multicore Loss Test

You can efficiently measure multicore optical fiber cable and optical line degradation.

Projects

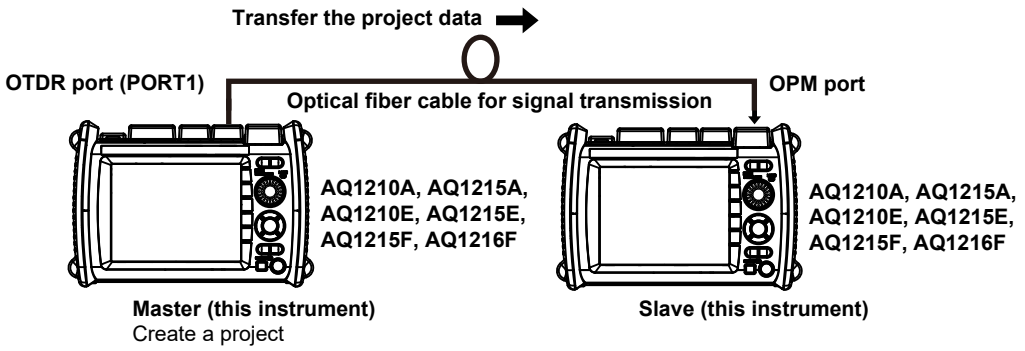
Projects are group of items for measuring multi-core fibers.
This feature is the same as that explained in “Optical Pulse Measurement of Multi-core Optical Fiber Cables” on page 1-21.

- **Number of Fibers, Number of Fibers in Each Division, Tape Number**
  The core number indications and settings vary depending on the type of multi-core fiber cable. These features are the same as those explained in “Optical Pulse Measurement of Multi-core Optical Fiber Cables” on page 1-21.

Master and Slave

Connect two instruments and specify the optical power meter as the master and the light source as the slave. You can also use the AQ1100/AQ1200A/AQ1200B/AQ1200C/AQ1200E/AQ1205A/AQ1205E/AQ1205F in the multi-field tester series instead of this instrument as the master or slave. The preparation involves the following steps.

- **Connecting an Optical Fiber Cable for Signal Transmission (step 1)**
  To transmit, between the master and slave, project setup information and information about the fiber under loss test, you must specify a fiber cable from the multi-core optical fiber cable to use for the signal transmission. Connect one end of the optical fiber cable for signal transmission to the OTDR port (PORT1) of the instrument specified as the master (optical power meter side) and the other end to the OPM port of the instrument specified as the slave (light source side).
- **Transferring Object Information from the Master to the Slave (step 2)**
  On the master instrument, create a project. Transfer the project information to the slave instrument through the optical fiber cable for signal transmission.



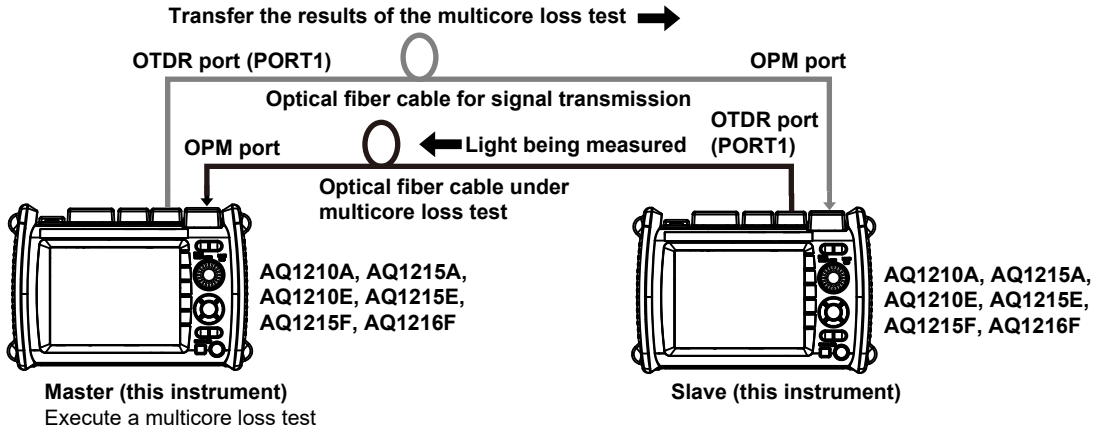
- **Connecting the Optical Fiber Cable to Perform Multi-Core Loss Test On (step 3)**
  Multi-core loss test is performed on all optical fiber cables other than the optical fiber cable for signal transmission. Connect one end of the optical fiber cable to be tested to the OPM port of the master instrument and the other end to the OTDR port (PORT1) of the slave instrument.

Executing the Multi-Core Loss Test

First, start the multi-core loss test on the master instrument. The core number information of the cores to be tested is transmitted from the master side through the optical fiber cable for signal transmission. When the core numbers to be measured are received through the OPM port, the slave instrument will be ready to execute a multi-core loss test.

Execute the multi-core loss test on the slave side. The light to be measured is output from the OTDR port (PORT1) on the slave side. This light enters the OPM port on the master side, and the loss in the optical fiber cable with the target core number is measured.

The measurement results are sent from the master to the slave instrument through the optical fiber cable for signal transmission.

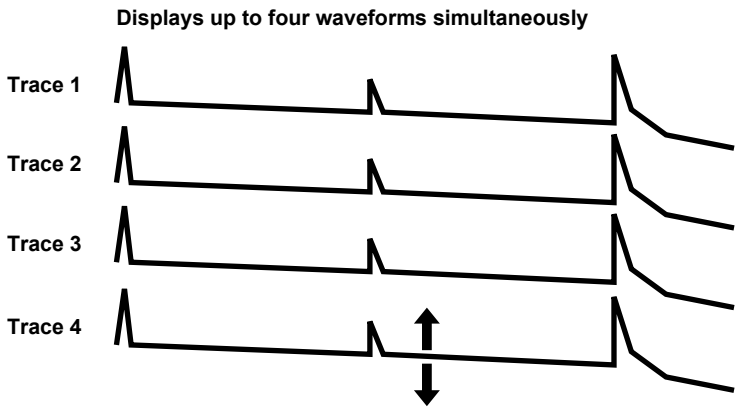


If you cancel an ongoing multi-core loss test, the completed portion of the measurement results are held, so you can resume the test from the optical fiber cable with the next target core number.

Advanced Analysis

Multi Trace Analysis

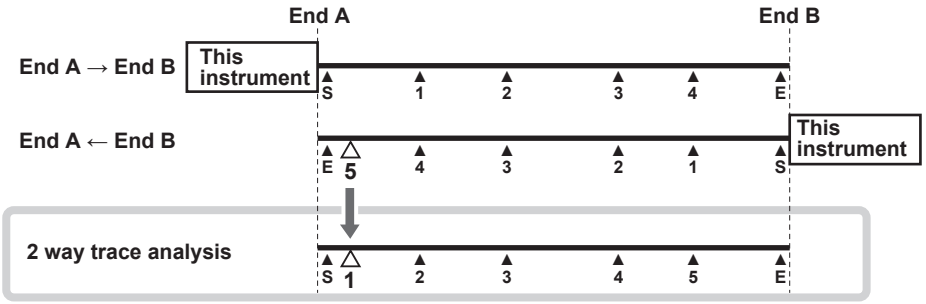
You can load up to four waveforms that have been measured on the instrument and display them simultaneously for comparison. You can adjust the vertical display position of each loaded waveform.



You can move a waveform over another waveform to compare the two.

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.



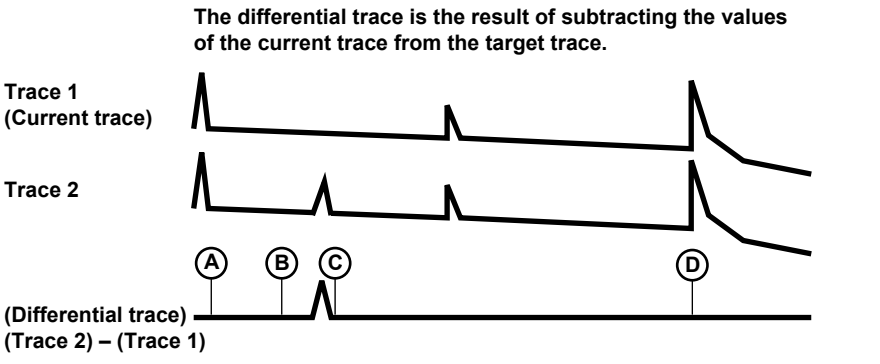
An event of the other waveform that exists within 6% of the position of an event of the current trace will be considered part of the current trace event.
If multiple events of the other waveform that exists within 6% of the position of an event of the current trace, the closest event will be considered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

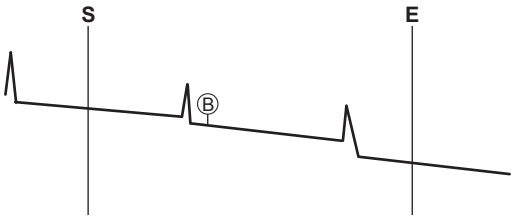
You can load two waveforms that have been measured on the instrument and display their difference as a waveform.
The screen can display the loaded waveforms and the differential trace simultaneously.
The differential trace is the result of subtracting the values of the current trace from those of the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

- Loss between markers (dB)
  Loss between Ⓐ and Ⓑ and between Ⓒ and Ⓓ
- Distance to each marker
  Distance between Ⓐ and Ⓑ and between Ⓒ and Ⓓ



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.



1.8 File Features

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

Saving and Loading Files

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 instrument, the waveform data is displayed on the instrument screen. If event list data is stored, 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 instrument at a different site.

  Only SOR files (waveform data) measured with conditions that are valid for the instrument can be loaded.

- **.PDF**
  A file for saving the current waveform displayed on the instrument screen or waveform data of an already saved file in a PDF report format.

- **.CFG**
  A file for saving the instrument system settings (device, connection, etc.). This file is useful when you want to apply the same system settings to several instruments.

- **.BMP, JPG**
  A file for saving a screen image of the instrument. 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 instrument.

- **.SOZ**
  A file for saving multiple waveforms measured simultaneously.

- **.SMP**
  A file for saving waveforms measured with a feature equivalent to Smart Mapper.

Selecting Drives

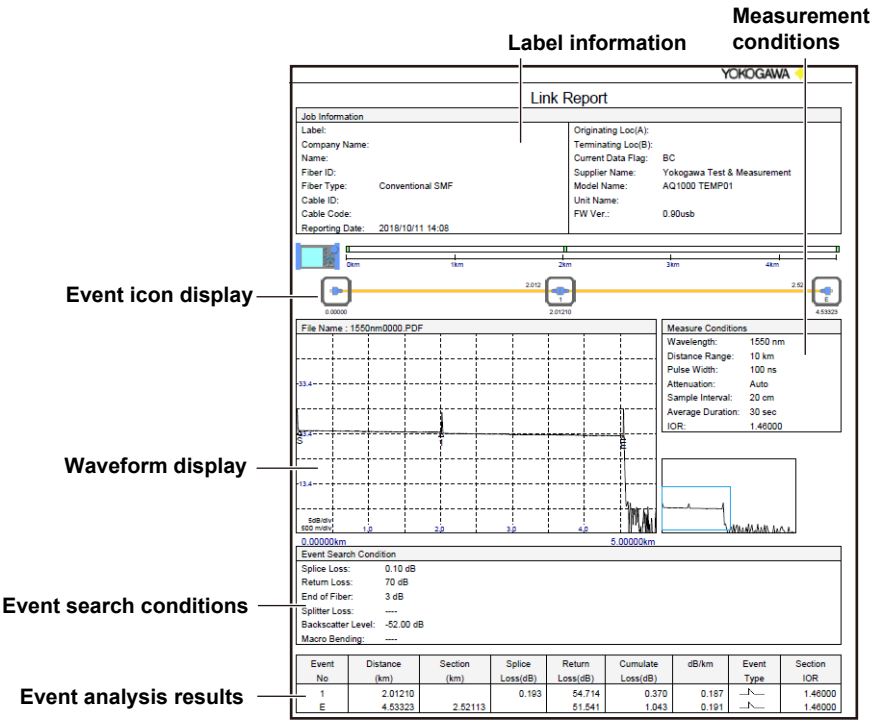
You can set the save destination to the following internal and external memories.

- **Internal Memory**
  The memory inside the instrument. The size is about 256 MB. It cannot be removed.
- **USB Memory**
  USB storage device.

Creating Reports

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.

File Operations

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. In the settings for automatically saving measure data explained in section 4.4, you can set the name of the folder in which to save the results automatically. When you select a folder that you created with a name of your choice, measurement results can be saved automatically to this folder.

1.9 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 USB-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. You can turn off the display except when viewing the measured data to suppress battery consumption.

Auto Sleep

If the instrument is turned on and is not accessed for a certain time, the instrument automatically switches to sleep mode to suppress battery consumption.

Factory Default Settings

Setup

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

- OTDR feature setup (chapter 2)
- Utility feature (chapter 7)
- Application feature (chapter 8)
- System settings (chapter 10, except the date and time)

All

All the above setup conditions are reset to their factory defaults. All the files in the USER folder of the internal memory are also deleted. The files in the following folders are not deleted.

- **BACKUP** (contains system files)
  The files in this folder are deleted once, and factory default files are created again.
- **USERS_MANUAL** (contains the user's manuals)
  These files are not delete.

Configuring Network Settings

You can use a communication dongle (wired LAN adapter or wireless LAN adapter) to remotely control the instrument from a PC (OTDR Remote Controller) and transfer measured results in the instrument's internal memory to a network server (File Transfer@OTDR Data Transporter).

- **User Name and Password**
  Set user names and passwords for authenticating connections from PCs to the instrument.
- **Timeout Period**
  If a communication command is not sent from a PC or measured results are not downloaded within the timeout period, the instrument 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 instrument.

WLAN Application (wireless LAN)

You can use a communication dongle (wireless LAN adapter) to remotely control the instrument from a PC (OTDR Remote Controller) and transfer measured results in the instrument's internal memory to a network server (OTDR Data Transporter).

- **Application Setup**
  You can set user names and passwords for authenticating connections from PCs to the instrument.
- **Access Point Mode Setup**
  You can set network information for running the instrument as an access point. This is used to connect the instrument and terminals directly without connecting a wireless router or other network device.

Other Features

Language Selection

You can change the language used on the instrument screen.

Start Menu

You can select the screen that is displayed when the instrument starts.

- Trace
  When the instrument starts, a screen with the data display area set to waveform display appears.
- Map
  When the instrument starts, a screen with the data display area set to icon display appears.
- Setup Info.
  When the instrument starts, the OTDR setup menu appears.

Screen Color

You can set the screen color (color 1, color 2, or black and white).

Alarm

The instrument can generate sound when an operation error message is displayed.

USB (TypeC)

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

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.

- **Mode**
  Changing from Simple Mode to another mode
- **Laser light output**
  When an operation to emit the following laser light is performed
  Optical pulse (OTDR), light source (measurement light), VLS

Expiration Date

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.

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.

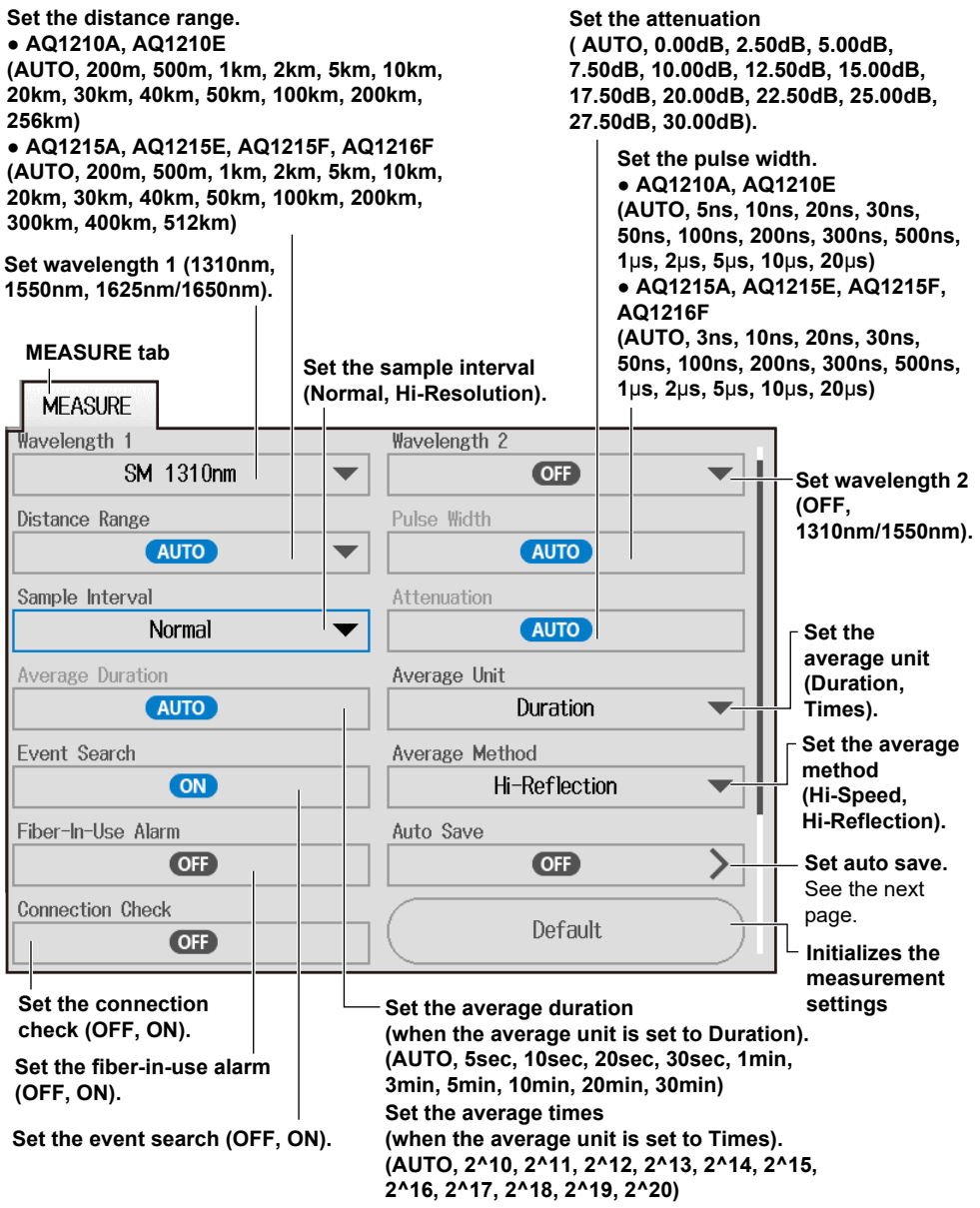
Installing Options

You can install additional option licenses (sold separately) for the AQ1210.
For details on the available option licenses, see Getting Started Guide, IM AQ1210-02EN.

2.1 Measurement (Measure) Conditions

Procedure

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.
3. Press **SETUP** to display the setup screen.
4. Tap the **MEASURE** tab to display the following screen.



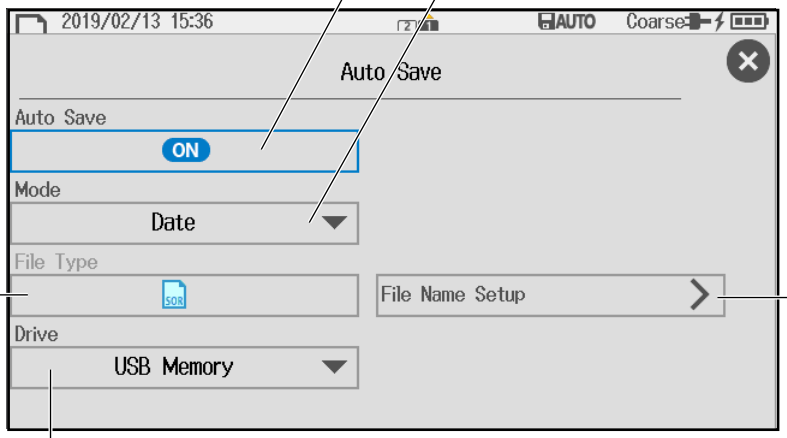
Configuring Auto Save (when averaged measurement is complete)

Tap **Auto Save** to display the Auto Save screen.

Set auto save (OFF, ON).

Set the mode (Date, UserDefine).
Select how to specify the save destination folder. You can set this when auto save is ON.

When the mode is set to Date

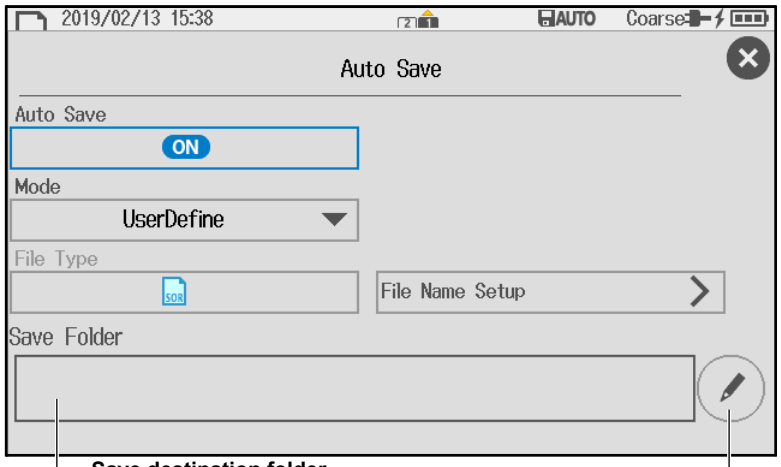


Set the file name.
See section 2.4.

Select the destination drive (internal memory, USB memory).
This is displayed when the mode is set to Date, in which case you can set it.

Set the file type (*.SOR).
The data save format is fixed to waveform data (SOR extension).

When the mode is set to UserDefine



Save destination folder
The current file path is displayed.
This is displayed when the mode is set to User Define.

Displays the file list of the folder displayed in the current file path.
For details on file operations, see section 9.6.

Explanation

Wavelength

You can enter the following wavelengths.

Model	Optical Pulse Wavelength
AQ1210A	1310 nm, 1550 nm, 1310 nm/1550 nm (multi wavelength measurement)
AQ1215A	1310 nm, 1550 nm, 1310 nm/1550 nm (multi wavelength measurement)
AQ1210E	1310 nm, 1550 nm, 1625 nm, 1310 nm/1550 nm (multi wavelength measurement)
AQ1215E	1310 nm, 1550 nm, 1625 nm, 1310 nm/1550 nm (multi wavelength measurement)
AQ1215F	1310 nm, 1550 nm, 1650 nm, 1310 nm/1550 nm (multi wavelength measurement)
AQ1216F	1310 nm, 1550 nm, 1650 nm, 1310 nm/1550 nm (multi wavelength measurement)

1310 nm/1550 nm (multi wavelength measurement)

In a single measurement, 1310 nm and 1550 nm are measured one at a time.
If 1310 nm/1550 nm is selected, the wavelength of optical pulse being measured is displayed on the screen.

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 instrument 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
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

Cable Length	Distance Range
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	256 km, 300 km
240 km to 320 km	400 km
320 km to 400 km	512 km

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/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns			
500 m	3 ns/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns			
1 km	3 ns/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns	1 µs		
2 km	3 ns/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns	1 µs		
5 km	3 ns/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns	1 µs		
10 km	3 ns/5 ns[1]	10 ns	20 ns	30 ns	50 ns	100 ns	200 ns	300 ns	500 ns	1 µs		
20 km	3 ns/5 ns[1]	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	50 ns	100 ns	200 ns	300 ns	500 ns	1 µs	2 µs	5 µs	10 µs	20 µs		

1 The pulse width is 5 ns on the AQ1210A/AQ1210E and 3 ns on the AQ1215A/AQ1215E/AQ1215F/AQ1216F.

Sample Interval

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

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

Hi-Resolution: The instrument 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.

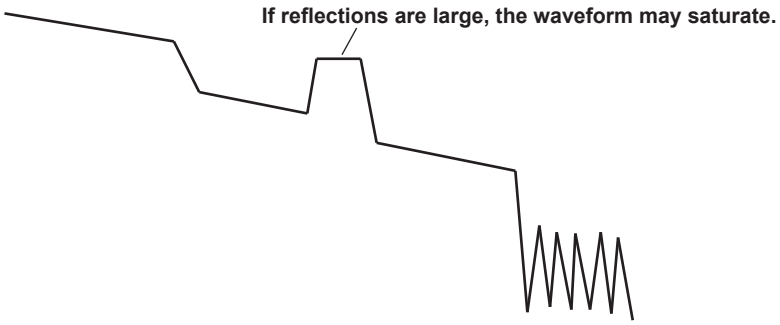
Pulse Width (Example)	Selectable Attenuations
3 ns/5 ns[1], 10 ns, 20 ns, 30 ns, 50 ns	0dB, 2.50dB, 5.00dB, 7.50dB, 10.00dB, 12.50dB, 15.00dB
100 ns, 200 ns, 300 ns, 500 ns, 1 µs	0dB, 2.50dB, 5.00dB, 7.50dB, 10.00dB, 12.50dB, 15.00dB, 17.50dB, 20.00dB
2 µs, 5 µs	0dB, 2.50dB, 5.00dB, 7.50dB, 10.00dB, 12.50dB, 15.00dB, 17.50dB, 20.00dB, 22.25dB, 25.00dB
10 µs, 20 µs	0dB, 2.50dB, 5.00dB, 7.50dB, 10.00dB, 12.50dB, 15.00dB, 17.50dB, 20.00dB, 22.25dB, 25.00dB, 27.50dB, 30.00dB

1 The pulse width is 5 ns on the AQ1210A/AQ1210E and 3 ns on the AQ1215A/AQ1215E/AQ1215F/AQ1216F.

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 instrument 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 instrument 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

Time: 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.

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

Average Count and Average Duration

You can select the following values.

Duration: 5sec, 10sec, 20sec, 30sec, 1min, 3min, 5min, 10min, 20min, 30min
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 instrument'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.

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 chapter 5.

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.

Fiber-in-Use Alarm

The instrument 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 instrument and an optical fiber cable. When this feature is set to on, you can prevent light from being transmitted from the instrument OTDR port or light source port if an optical fiber cable is not connected to the instrument or if the cable is not connected correctly.

OFF: Connections are not checked.

ON: Connections are checked.

Auto Save

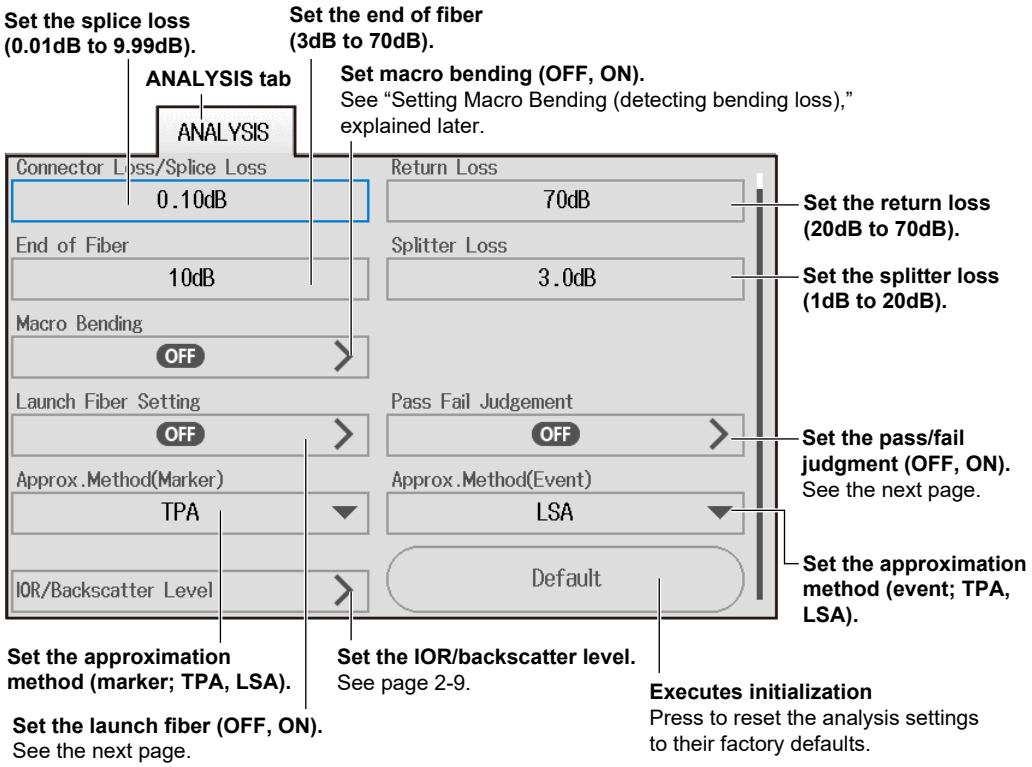
After an averaged measurement of the optical pulse is complete, the measurement waveform is automatically saved.

- **Set the mode.**
  Select how to specify the save destination folder.
  - Date: Folders that are named with dates are automatically created in the selected drive.
  - UserDefine: 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.

2.2 Analysis (ANALYSIS) Conditions

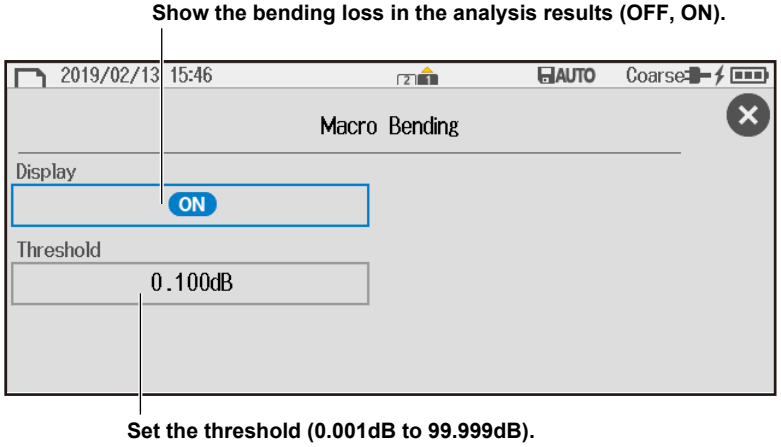
Procedure

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.
3. Press **SETUP** to display the setup screen.
4. Tap the **ANALYSIS** tab to display the following screen.



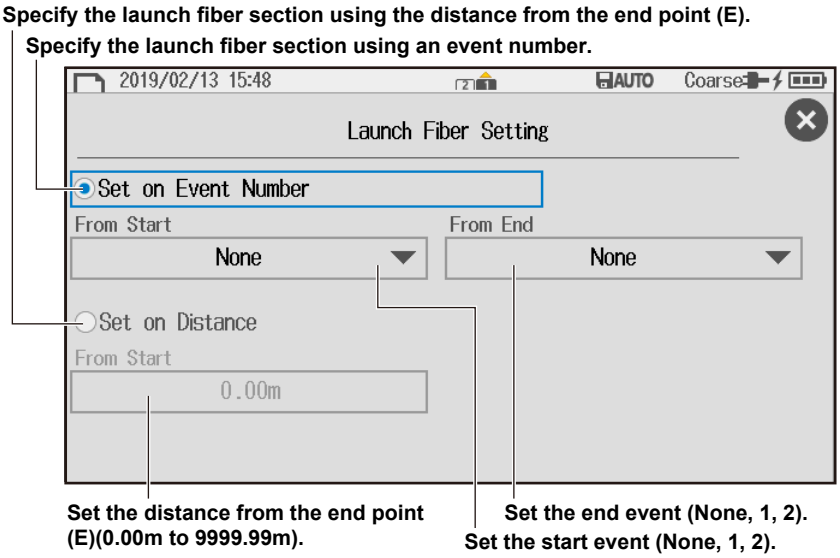
Setting Macro Bending (detecting bending loss)

5. Tap **Macro Bending** to display the Macro Bending screen.



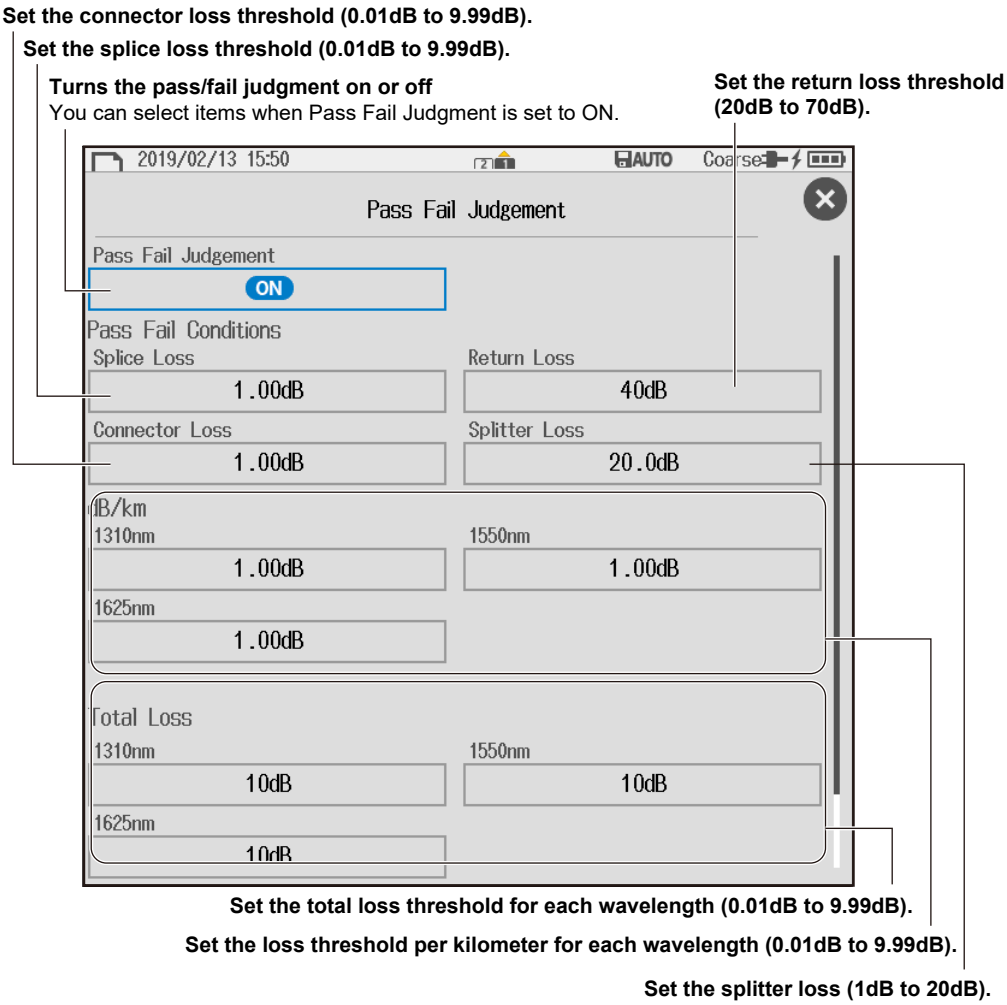
Setting a Launch Fiber

5. Tap **Launch Fiber Setting** to display the Launch Fiber Setting screen.



Configuring Pass/Fail Judgments

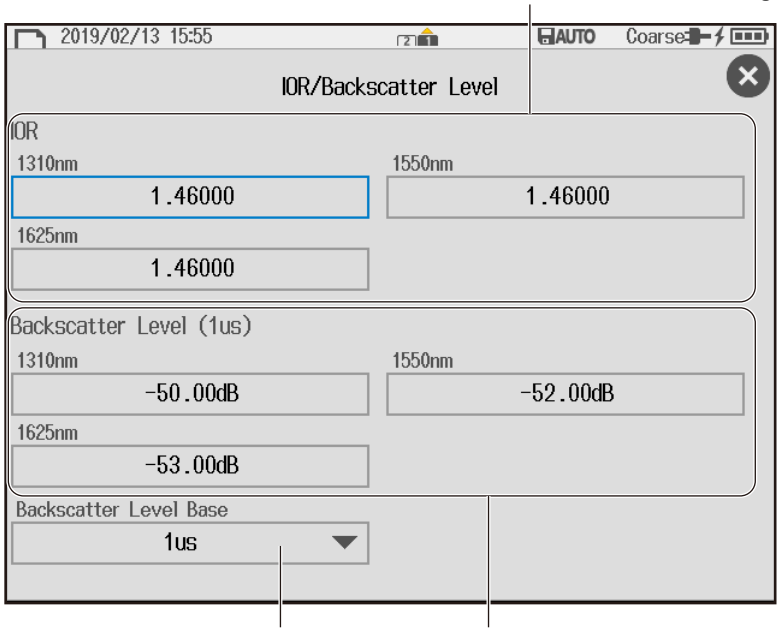
5. Tap **Pass Fail Judgment** to display the Pass Fail Judgment screen.



Setting the IOR/Backscatter Level

5. Tap **IOR/Backscatter Level** to display the IOR/Backscatter Level screen.

Set the IOR each wavelength (1.3000 to 1.7999).



Set the backscatter level base (1µs, 1ns).

Set the backscatter level for each wavelength.
1 µs pulse width*: –10.00dB to –64.99dB
1 ns pulse width*: –40.00dB to –94.99dB
* Pulse width used as a base for the backscatter level

Explanation

Splice Loss

If 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 Loss

Events whose loss exceeds this value are assumed to be optical splitters according to the number splits.
The range is 1 dB to 20 dB.

Macro Bending (Bending Loss)

When an optical pulse measurement is performed in multi wavelength measurement (when wavelength setting is 1310 nm/1550 nm), 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.
The range is 0.001 dB to 99.999 dB.

Launch Fiber Setting

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.

Pass Fail Judgment

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 (see section 1.5).
OFF: Pass/fail judgment is set to OFF, and events that have exceeded their thresholds are not displayed with an asterisk attached to them.

Approximation Method

When the instrument calculates splice loss, it extrapolates straight lines. These straight lines are known as approximation lines.

There are the following two kinds of approximation lines.

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

LSA

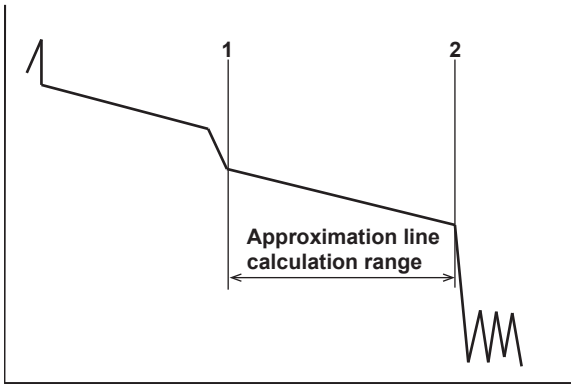
The instrument calculates the loss between two points by using the least squares method on all the data between the two points (between 1 and 2).

This method has the following characteristics.

Advantage: 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.

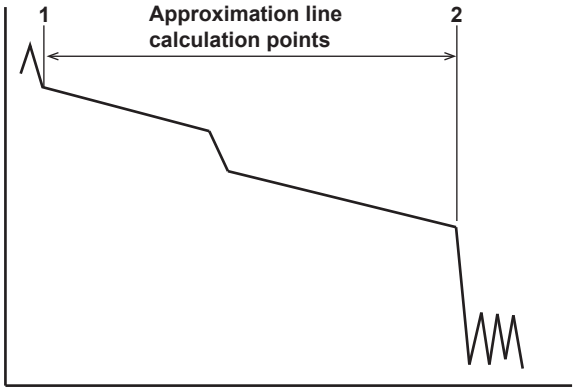
Disadvantage: If a large reflection or splice loss is present in the section whose loss is being calculated, those values are also included in the calculation, so large errors result.

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 instrument 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.



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 instrument 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 instrument, 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 instrument has the following preset backscatter levels that correspond to each wavelength.

Wavelength	1 µs pulse width	1 ns pulse width
1310 nm	–50dB	–80dB
1550 nm	–52dB	–82dB
1625 nm	–53dB	–83dB
1650 nm	–53dB	–83dB

Index of Refraction (IOR)

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

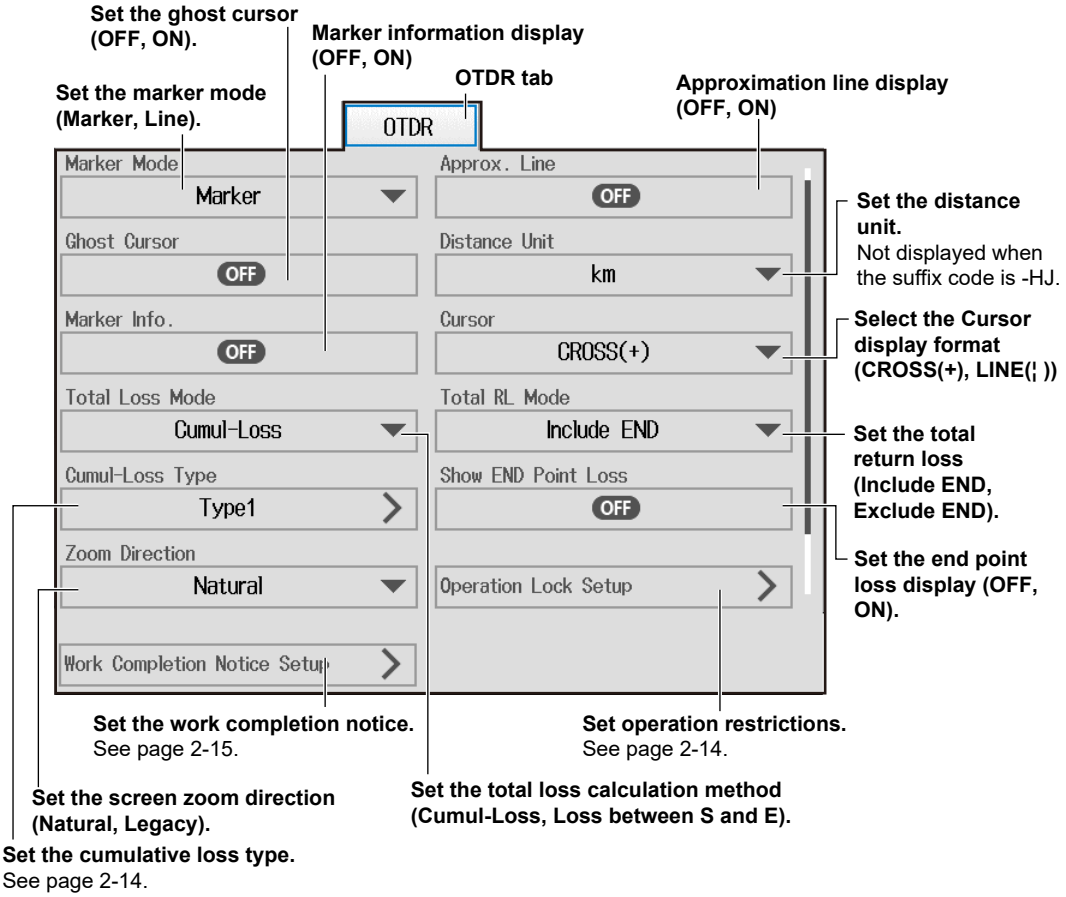
Wavelength	Index of Refraction (IOR)
1310 nm	1.46000
1550 nm	1.46000
1625 nm	1.46000
1650 nm	1.46000

You can specify a value from 1.30000 to 1.79999.

2.3 Display (OTDR) Conditions

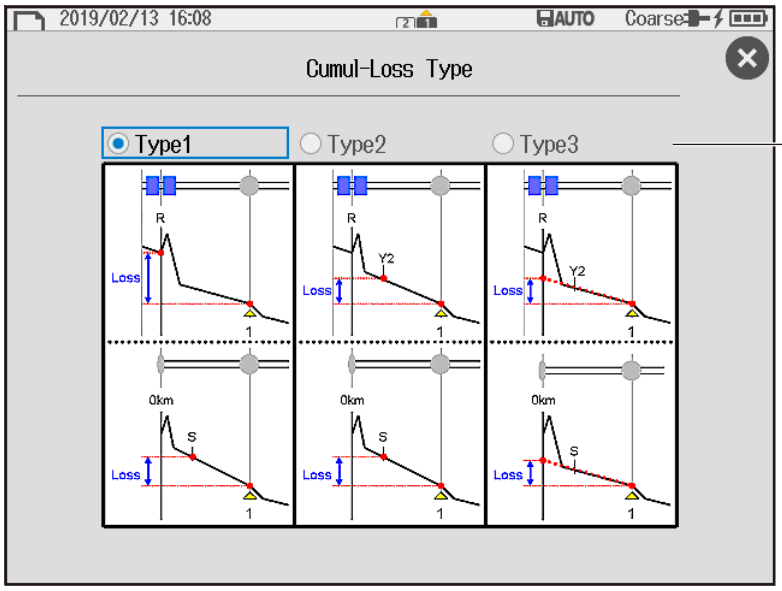
Procedure

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.
3. Press **SETUP** to display the setup screen.
4. Tap the **OTDR** tab to display the following screen.



Setting the Cumulative Loss Type

5. Tap **Cumul-Loss Type** to display the Cumul-Loss Type screen.



Select type 1, 2, or 3.

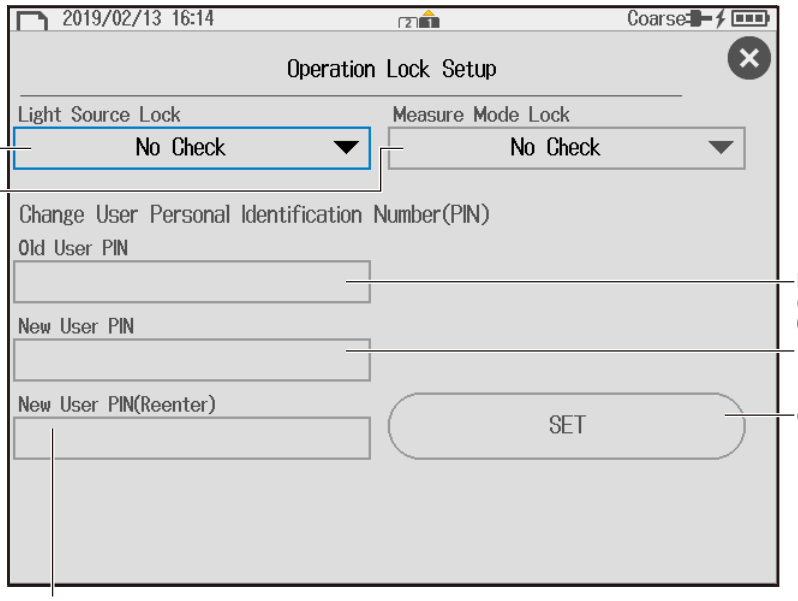
Note

With Type1, loss is measured from the measurement start point to the measurement point.
With Type2, loss is measured from the event marker (Y2) to the measurement point.
With Type3, loss is measured from the approximation line of the event marker (Y2) to the measurement point.
For each type, the loss measurement range varies depending on whether the distance reference is set (top illustration in the screen) or not set (bottom illustration in the screen). For details, see "Explanation" in this section.

Setting Operation Restrictions

5. Tap **Operation Lock Setup** to display the Operation Lock Setup screen.

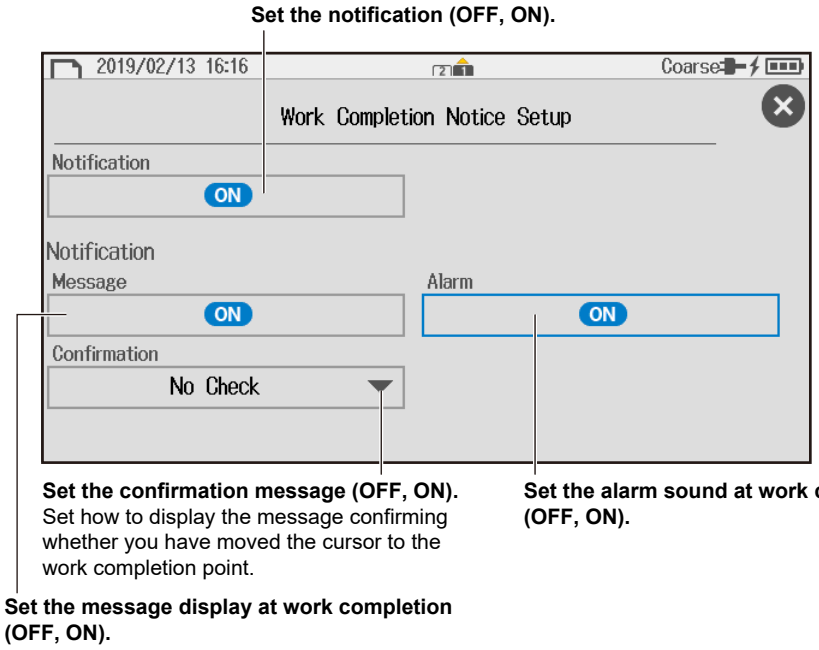
Select the restriction mode.
- No Check: Operation possible without entering the PIN.
- Check only once: Enter the PIN only for the first operation.
- Check everytime: Enter the PIN for every operation.



Enter the old PIN (the default value is 0000).
Enter the new PIN.
Confirms the input
Enter the new PIN again for confirmation.

Configure the work completion notification.

5. Tap **Work Completion Notice Setup** to display the Work Completion Notice Setup screen.



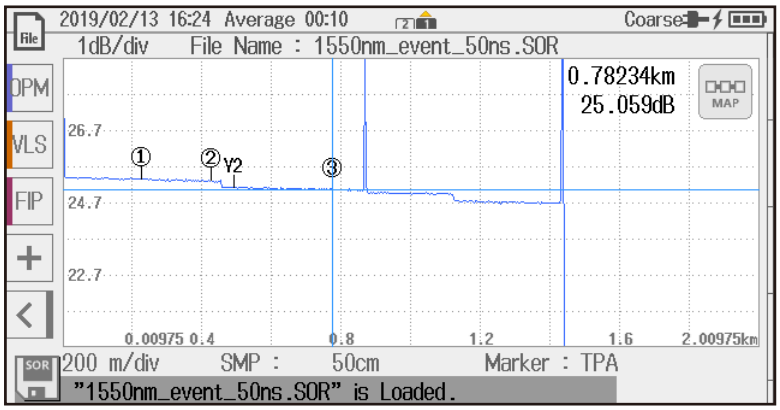
Explanation

Marker Mode

Markers

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. For instructions on how to use markers, see section 6.1.

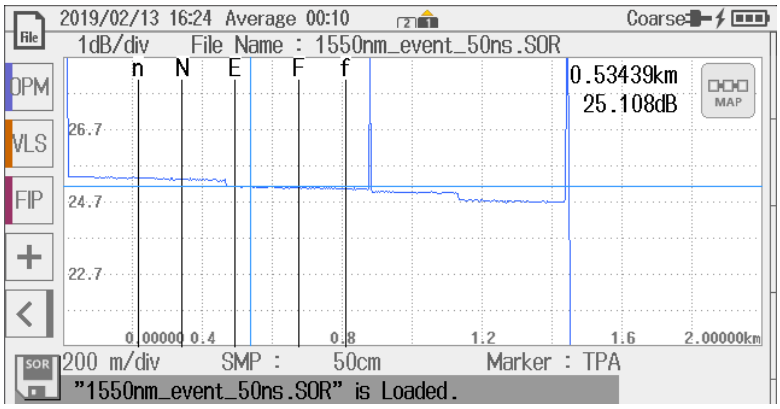
Example of 4 Point Markers: Marker ① ② Y2 ③



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. For instructions on how to use markers, see section 6.1.

Example of 5 Point Markers: Line n N E F f



Note

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

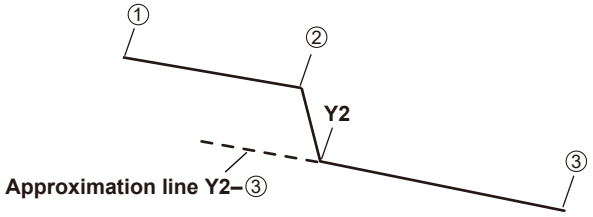
Displaying Approximation Lines

In the 4 Point (marker mode set to Marker) or 5 Point (marker mode set to Line) marker modes, you can display the approximation lines that are used to calculate splice loss or return loss.

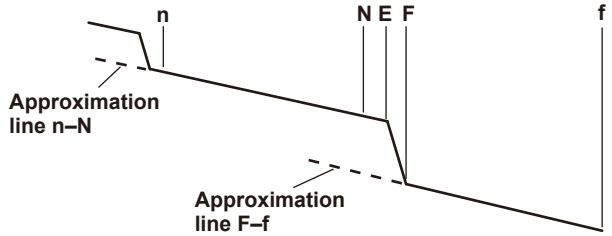
OFF: Approximation lines are not displayed.

ON: Approximation lines are displayed.

Example of 4 Point Markers: Marker ① ② Y2 ③



Example of 5 Point Markers: Line n N E F f

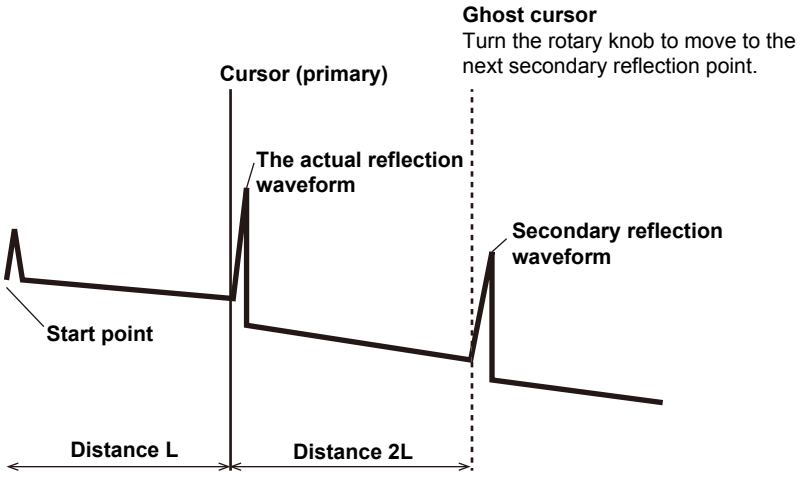


Ghost Cursor

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. The ghost cursor is automatically displayed at twice the distance from where the cursor (primary) is placed. The ghost cursor moves in sync with the cursor (primary).

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.

  ↓

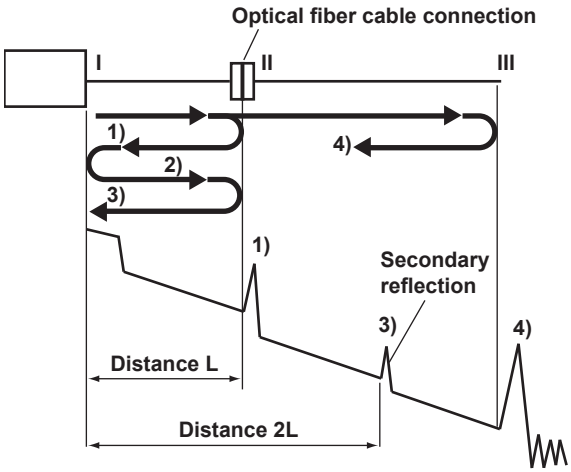
  Light ray A that is reflected at connection II in the figure is reflected again at connection I and propagates in the direction of II as light ray B.

  At this point, the instrument detects A as an event.

  ↓

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

  Because the instrument 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.



Distance Unit

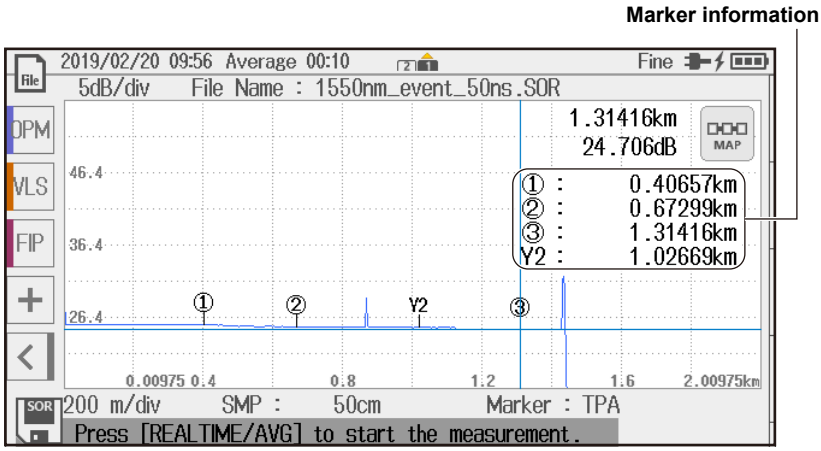
Set the unit of distance to show in the screen. The default setting is km.

Marker Information

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.

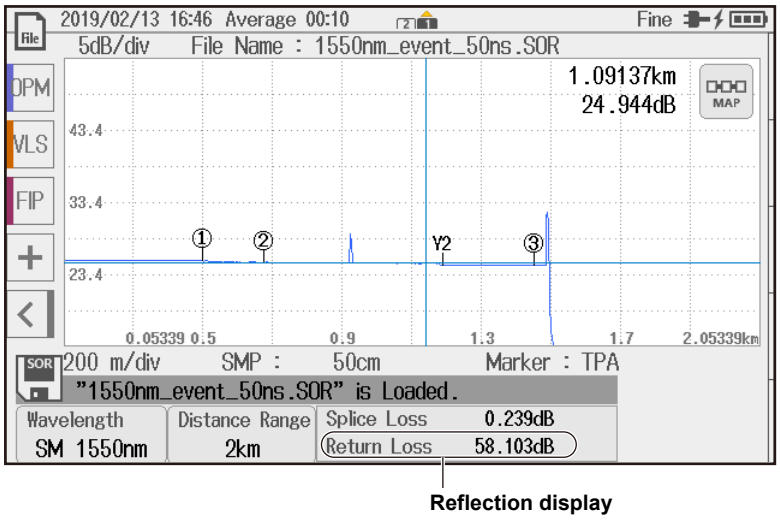


Reflection Display (when the suffix code is -HJ)

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.

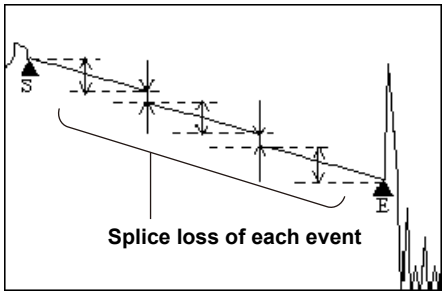
Reflection level: The reflected optical power level is displayed.



Calculation Method for Total Loss

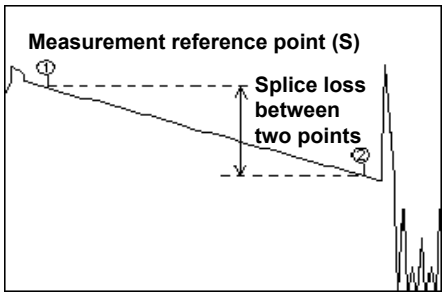
Cumul-Loss

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



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

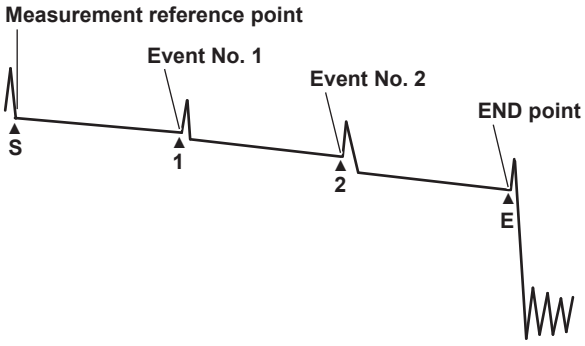
If Loss between S and E is selected, markers ① and ② are placed automatically at the measurement reference point (S) and the END point (E) when event analysis is executed.

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 value is included in the total return loss.

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



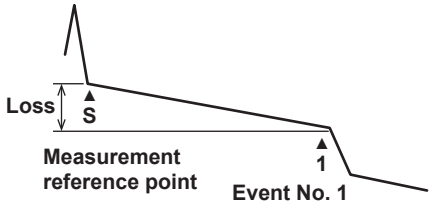
Display of the END Point Loss

The END point splice loss is shown in addition to return loss.

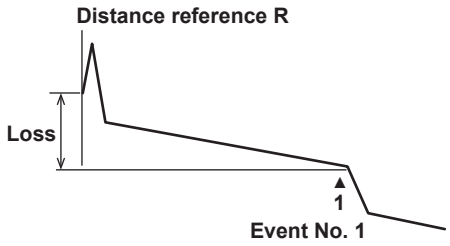
Cumulative Loss Type

You can select the cumulative loss measurement method from the following three types in the event analysis settings.

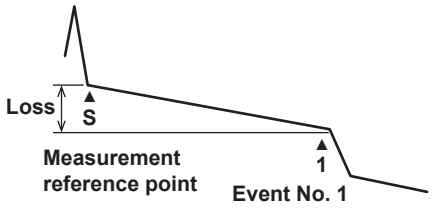
Type 1 (without distance reference)
This method does not include the near-end reflection in the cumulate loss value. The loss from measurement start point S to the start point of event No. 1 is measured.



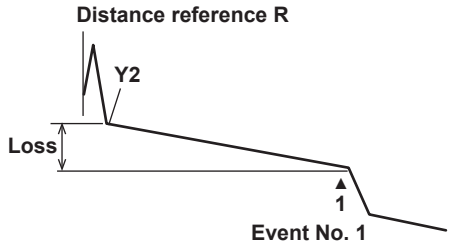
Type 1 (with distance reference)
This method includes the near-end reflection in the cumulate loss value. The distance reference is set to the start point of the near-end reflection. The loss from distance reference R to the start point of event No. 1 is measured.



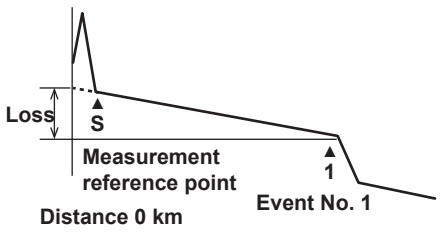
Type 2 (without distance reference)
This method does not include the near-end reflection in the cumulate loss value. The loss is measured using the same method as type 1 (without distance reference).



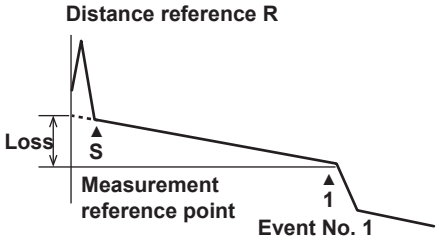
Type 2 (with distance reference)
This method does not include the near-end reflection in the cumulate loss value. The distance reference is set to the start point of the near-end reflection. The loss from near-end reflection end point Y2 to the start point of event No. 1 is measured.



Type 3 (without distance reference)
This method includes the near-end reflection in the cumulate loss value. The loss is measured from where the approximation line between measurement start point S and event No. 1 intersects distance 0 km to the start point of event No. 1.



Type 3 (with distance reference)
This method includes the near-end reflection in the cumulate loss value. The distance reference is set to the start point of the near-end reflection. The loss is measured from the intersection of the approximation line between distance reference R and event No. 1 and the start point of event No. 1.

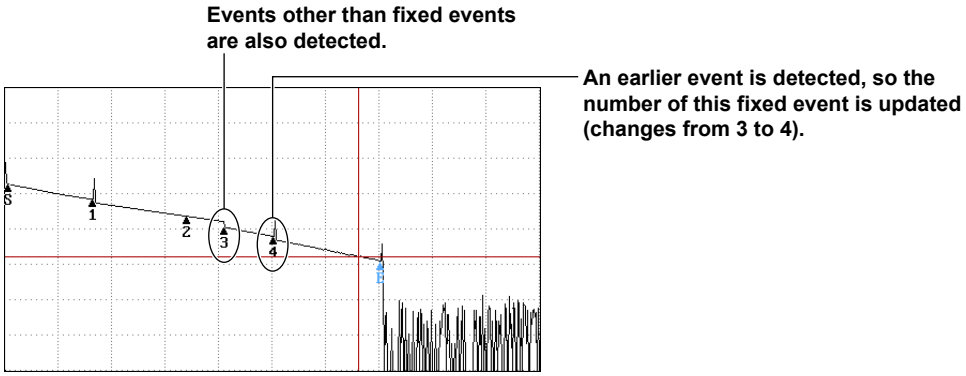


Event Fix Mode

Event positions can be fixed. Fixed events are handled as master events. You can configure the instrument so that in subsequent event analysis only master events are analyzed.
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:

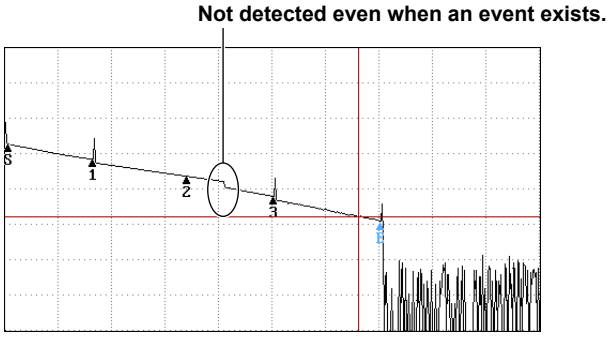
- **When Event Fix Mode Is Set to Mode1**

  Events detected at positions other than the master event positions are also displayed in the event list.



- **When Event Fix Mode Is Set to Mode2**

  Only the events that are detected at the master event positions are displayed in the event list.

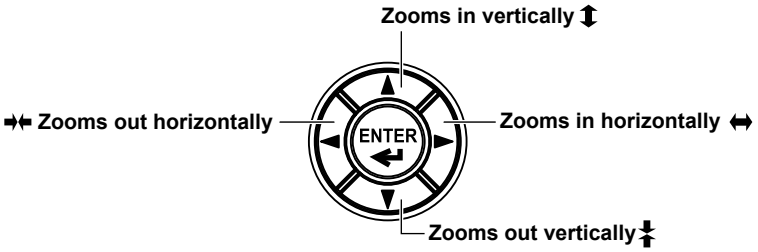


Zoom Direction

You can select the zoom behavior of the waveform display that is controlled with the arrow keys.

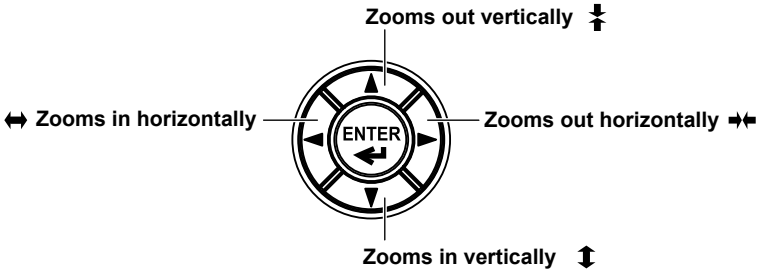
- **Natural**

  The waveform is zoomed.



- **Legacy**

  The waveform display range is zoomed. For example, if you expand the waveform display range to the entire waveform, the displayed waveform will appear smaller. If you reduce the waveform display range to a portion of the waveform, the displayed waveform will appear larger.



Operation Lock

You can lock the following operations using a PIN (password).

Operations That Can Be Locked

- This instrument's emission of light
- The REAL TIME and AVG keys of the OTDR function
- The light source or visible light source ON soft key when an light source option (/SLT, /HLT, /VLS) is installed
- The LS Power Adjust soft key in an auto loss test (LS, loopback test)
- The LS Power Adjust soft key in an multi-core loss test (LS, loopback test)
- The Loss Test START soft key for executing the LS or loopback test of the auto loss test
- The **Loss Test START** soft key for executing the multi-core loss test
- Changing the measurement mode of the OTDR feature
- Changing the measurement mode from Simple mode to Detail mode
- Changing the measurement mode from Simple mode to multi wavelength measurement mode

PIN

The following two PINs are available.

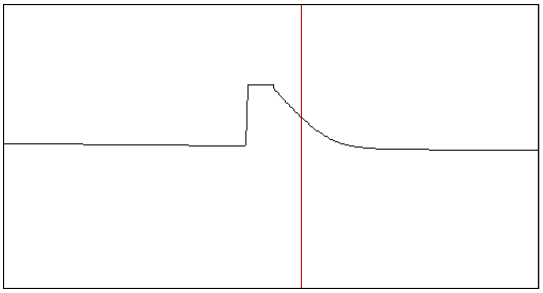
- **User PIN**
  A PIN required to perform the above operations. The default value is 0000.
- **Administrator PIN**
  A PIN required to set the user PIN and restrict the above operations.
  The default value is 0000.

Cursor Display Format

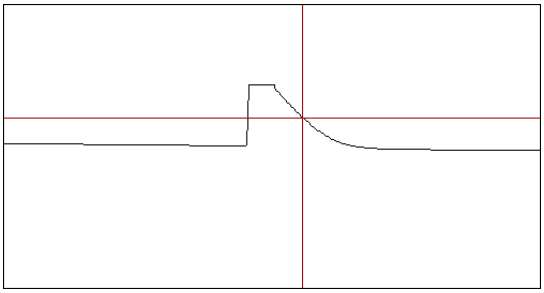
You can select the cursor display format from the following.

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

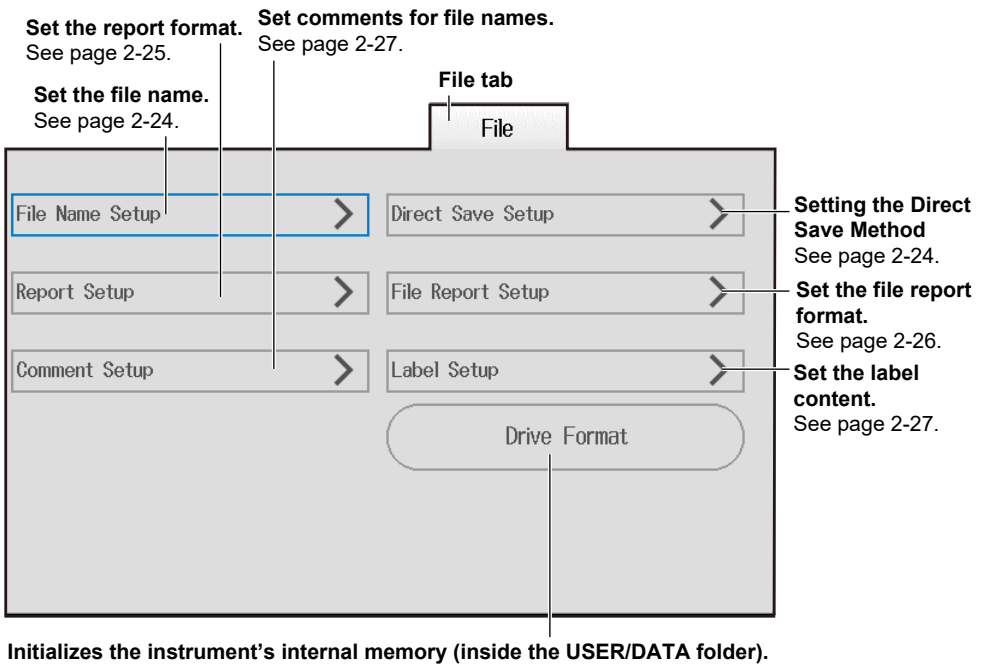
Work Completion Notice

For details, see the explanation in section 3.3.

2.4 File Conditions

Procedure

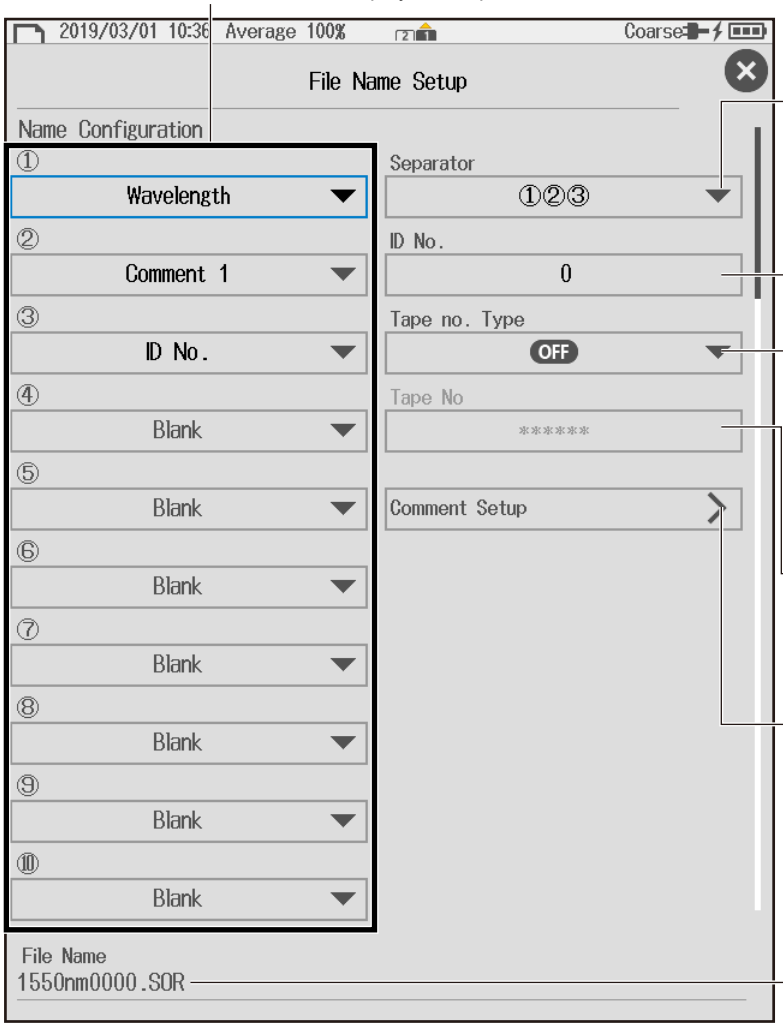
1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.
3. Press **SETUP** to display the setup screen.
4. Tap the **File** tab to display the following screen.



Setting the File Name

5. Tap **File Name Setup** to display the File Name Setup screen.

Set the parts of the file name
(ID No., Wavelength, Distance Range, Pulse Width, Comment 1 to Comment 10, Company Name, Name, Cable ID, Fiber ID, Cable Code, Originating Loc (A), Terminating Loc (B)).
Set the items that will be displayed into parts ①to ⑩of the file name.



Set the separator (①②③,①_②_③, ① ② ③, ①^ ②^ ③).

Set the ID number (0 to 9999).

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.

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 comments.
See page 2-27.

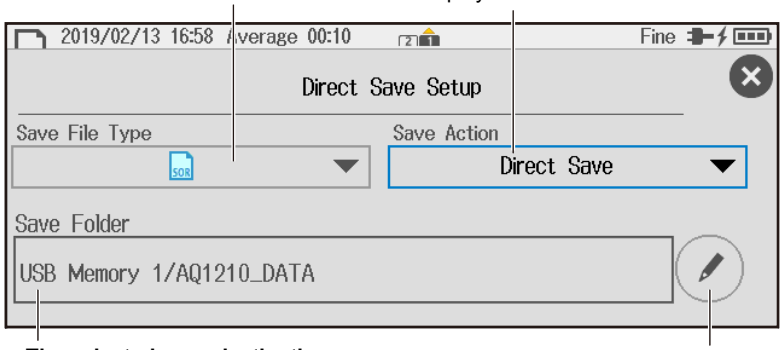
File name that will be assigned

Setting the Direct Save Method

5. Tap **Direct Save Setup** to display the Direct Save Setup screen.

Set the file type (*.SOR, *.pdf, *.SOR+*.PDF).

Set the save action (Direct Save, Select ID).
Set the action to be taken when you tap the save icon of the displayed waveform on the measurement screen.

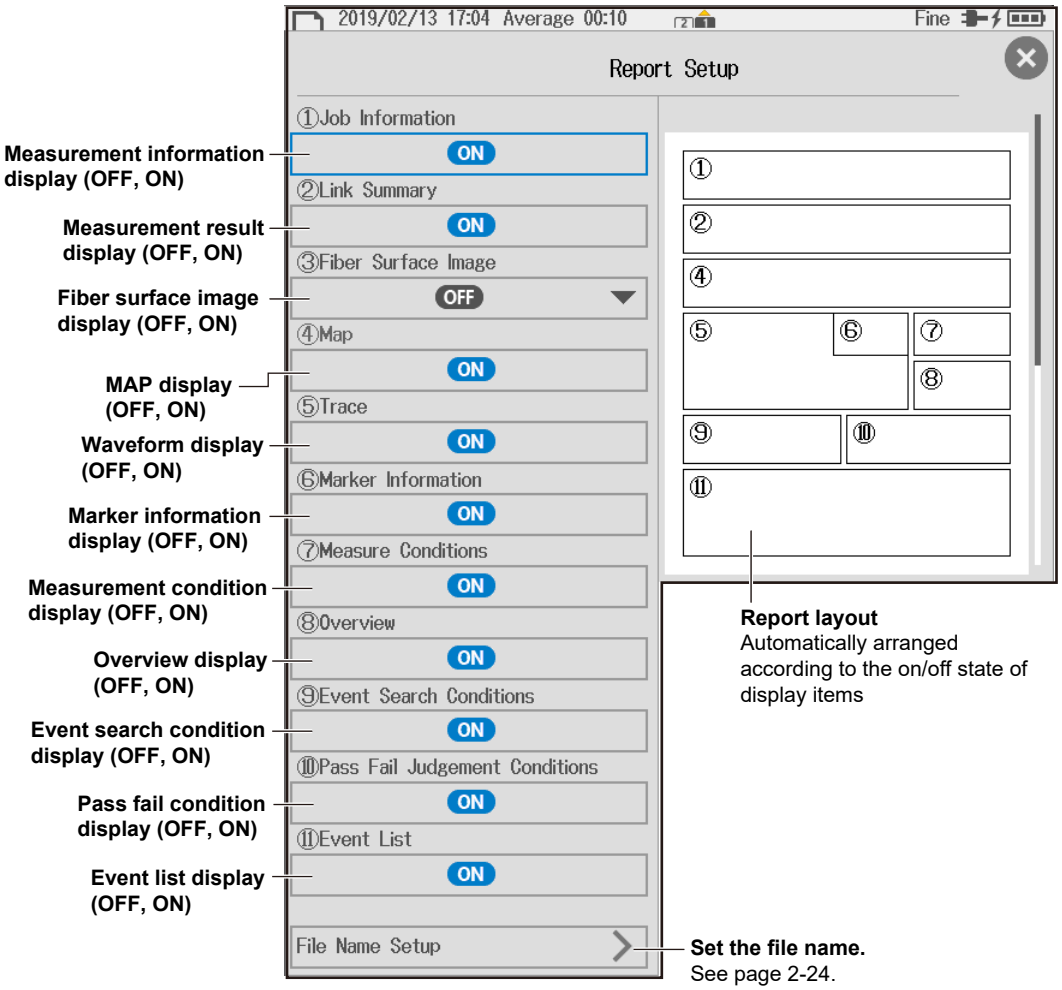


The selected save destination is displayed.

Displays the file list of the folder shown in Save Folder.
For details on file operations, see section 9.6.

Setting the Report Format

5. Tap **Report Setup** to display the Report Setup screen.



Note

For details on the items, see “Explanation” in this section.

Setting the File Report Format

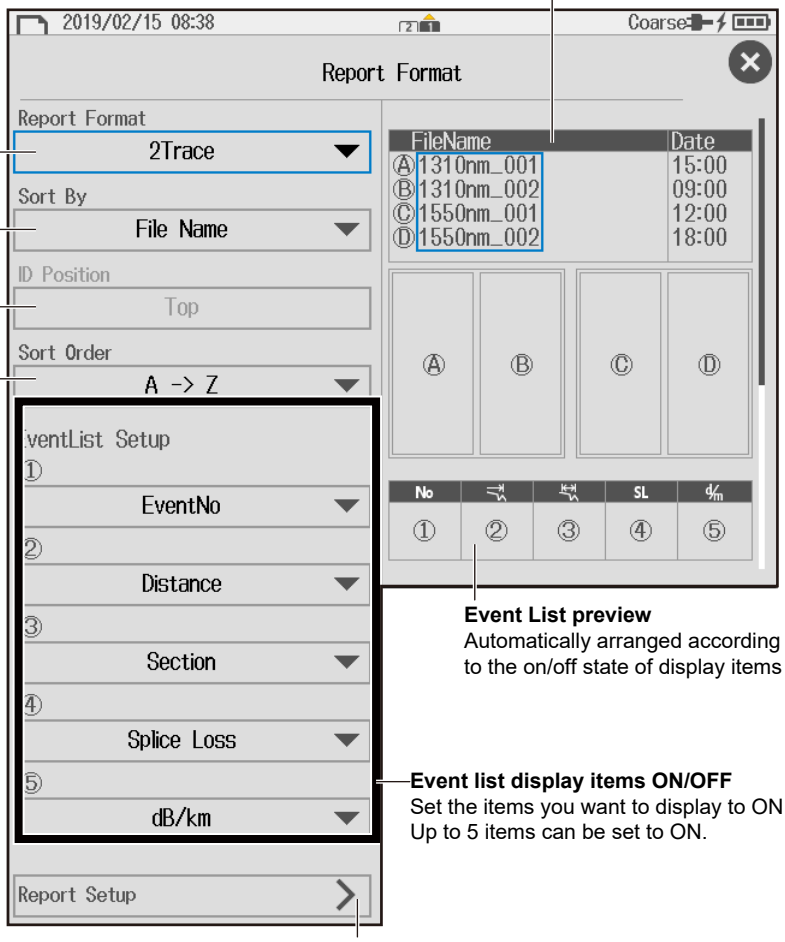
5. Tap **File Report Setup** to display the Report Format screen.

ID Position (Top, Bottom)
Set the ID position of the file name.
You can select this when the order is set to ID.

Order (File Name, Date, ID)
Select the file export order
(by file name, by date, by ID).

Number waveforms to display (1Trace, 2Trace)
Select the number of waveforms to show in a single page.
You can select the following items only when 2Trace is selected.

Preview of the order in which files will be exported.



Sort Order (A -> Z, Z -> A)
Selects the output sort order

Event List preview
Automatically arranged according to the on/off state of display items

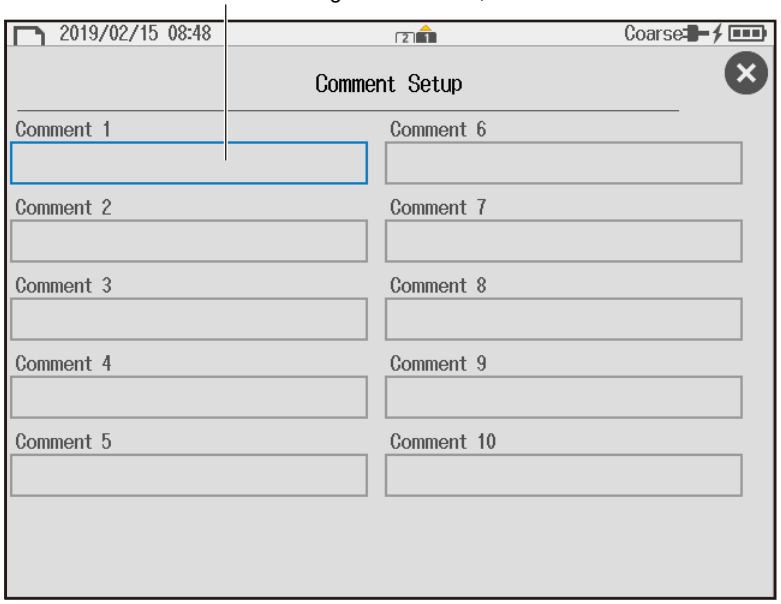
Event list display items ON/OFF
Set the items you want to display to ON.
Up to 5 items can be set to ON.

Set the report format.
See the previous page.

Setting Comments

5. Tap **Comment Setup** to display the Comment Setup screen.

Set a comment (up to 30 characters).
Enter a comment by following the procedure provided in “Entering Text” in the Getting Started Guide, IM AQ1210-02EN.

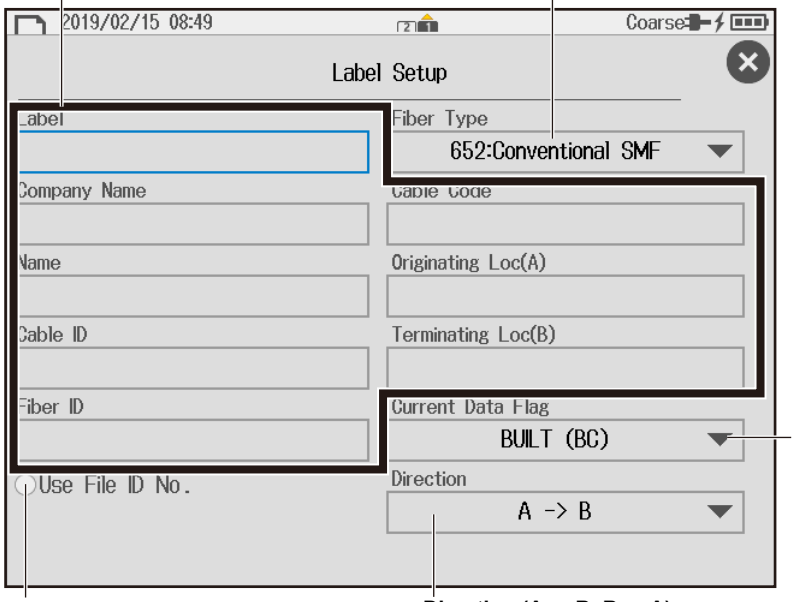


Setting Labels

5. Tap **Label Setup** to display the Label Setup screen.

Label, Company Name, Name, Cable ID, Fiber ID, Cable Code, Originating Loc (A), Terminating Loc (B)
Enter a comment by following the procedure provided in “Entering Text” in the Getting Started Guide, IM AQ1210-02EN. You can enter up to 36 characters.

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 current data flag (BUILT (BC), REPAIRED (RC), OTHER (OT), and CURRENT (CC)).

Select the check box to use the file ID (ID number) as the fiber ID. For details on ID numbers, see “Setting the File Name” on page 2-24.

Direction (A -> B, B -> A)
Shows from which side the optical fiber cable connecting the start position (A) and stop position (B) was measured.

Explanation

File Names and Comments

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	

- 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.

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.

Saving Directly

- **Setting the File Type**

  Set whether to make the measurement results to be saved into waveform data or a report.
  *.SOR: Saved as waveform data
  *.PDF: Saved in a report format
  .SOR+.PDF: Both waveform data and report format are saved simultaneously.

- **Setting the Save Operation**

  Set how to save the file when you save data.
  Direct Save: A file name as assigned automatically according to the file name setup conditions, and the file is saved.
  Select ID: A file name as assigned automatically according to the file name setup conditions. Then, you set a 2-digit ID to be appended to the file name. Finally, the file is saved.

Report Format

Measure Conditions (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 creation date and time[1]	

1 Automatically included by the instrument
2 Firmware version

Information such as label and company name can be specified on the Label Setup screen explained in “Setting Labels.” Set these if necessary.

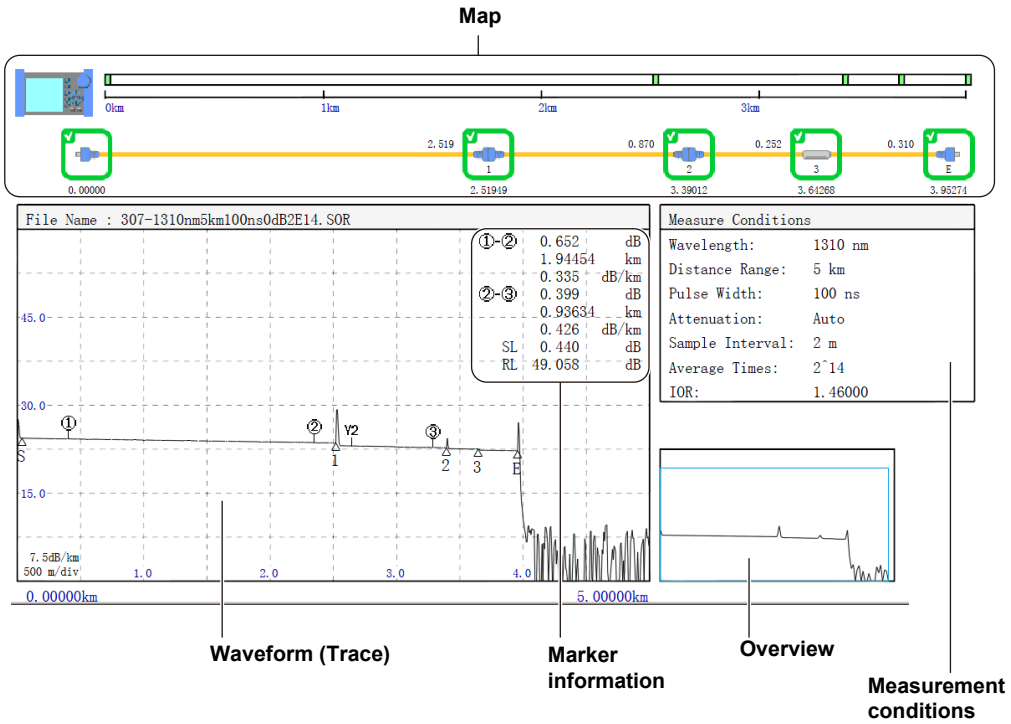
Measured Results (Link Summary)

The following information is included.

- Total distance
- Total loss
- Total return loss
- Number of events
- Fault events
- Pass/fail judgments
- Measured date

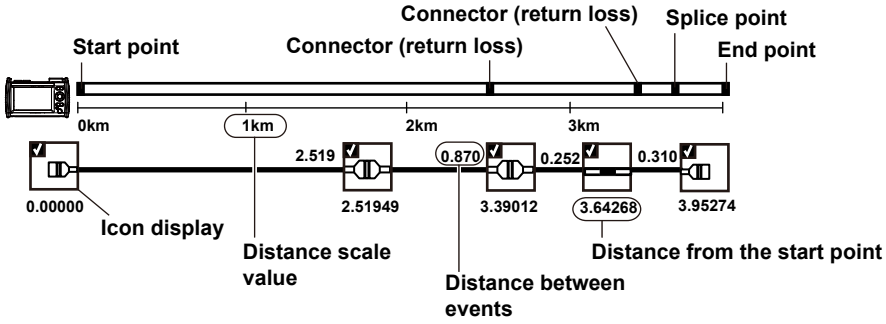
Map, Waveform, Marker Information, Measurement Conditions, and Overview

These are included as shown below.



- **Map**

The events in the event list are mapped as icons. Up to 100 events can be mapped. For a description of icons, see section 1.3.



Event Search Conditions

The following information is included.

- Splice loss
- Return loss
- End of fiber
- Splitter loss
- Backscatter level
- Macro bending

Pass/fail Judgment Conditions

The following information is included.

- Connector loss
- Splice loss
- Return loss
- Splitter loss
- dB/km
- Total loss

EventList Setup

The following information is included.

- Event number
- Distance
- Section
- Splice loss
- Return loss
- Cumulate loss
- dB/km
- Event type
- Section group index

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 to Display (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.

Sort By

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 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.

* For the file name format, see “Filename Setup Screen” in section 6.3.

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.

EventList Setup

Set the items to show in the event list. If the number waveforms the display (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.

Setting Labels

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	
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	
Originating Loc (A)	Up to 36 characters	
Terminating Loc (B)	Up to 36 characters	
Current Data Flag	Shows the operation state. BUILT (BC), REPAIRED (RC), OTHER (OT), and CURRENT (CC)	

3.1 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.

French

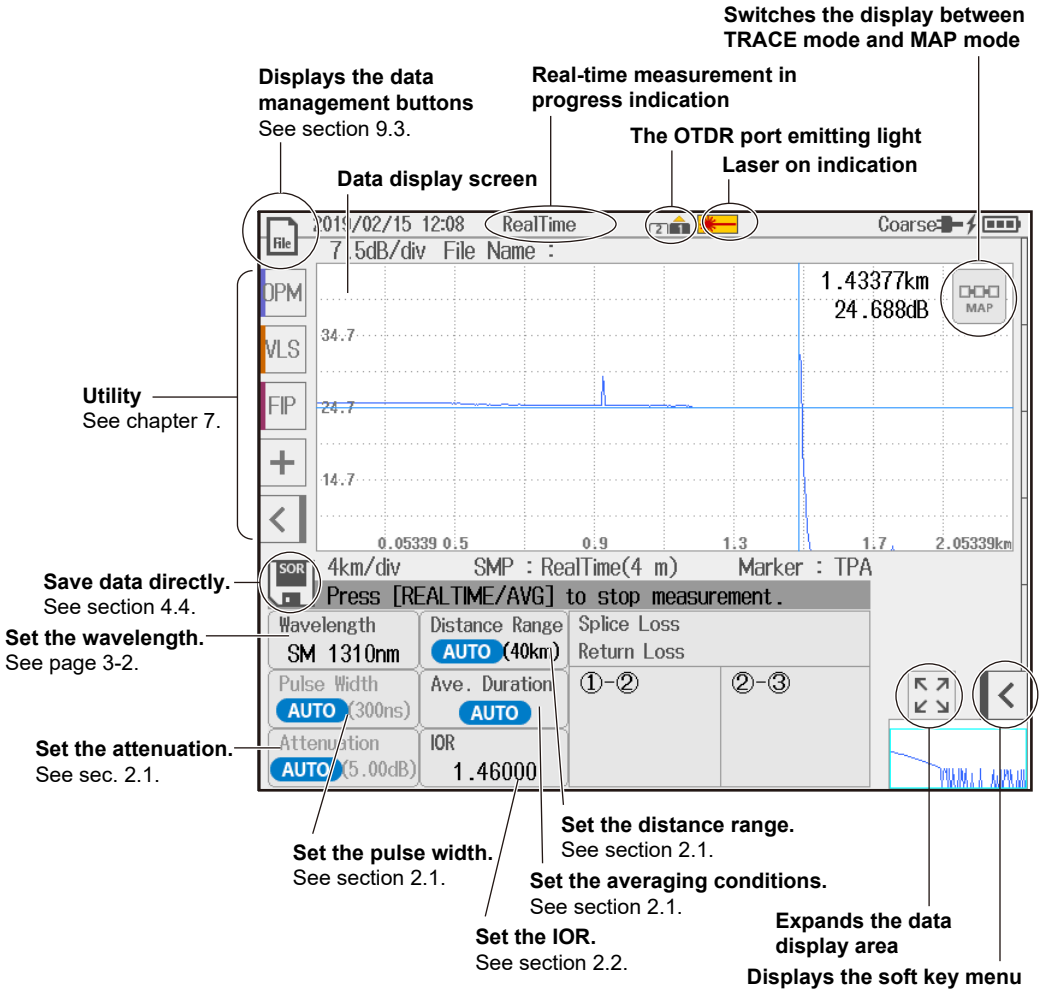
AVERTISSEMENT

Lorsque instrument 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.

Procedure

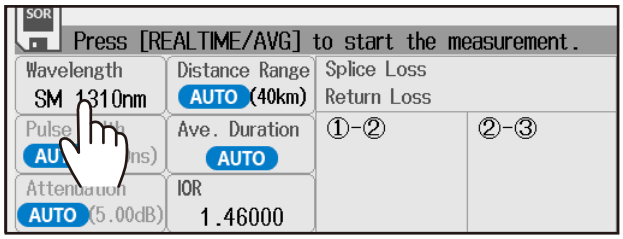
Real-Time Measurement Screen (OTDR screen)

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.



Executing a Real-Time Measurement

3. Tap **Wavelength** to set the wavelength.



4. Press **REAL TIME** to start a real-time measurement.

During measurement, a mark appears at the top of the display to indicate that the laser light is on. Pressing REAL TIME again stops the measurement.

Note

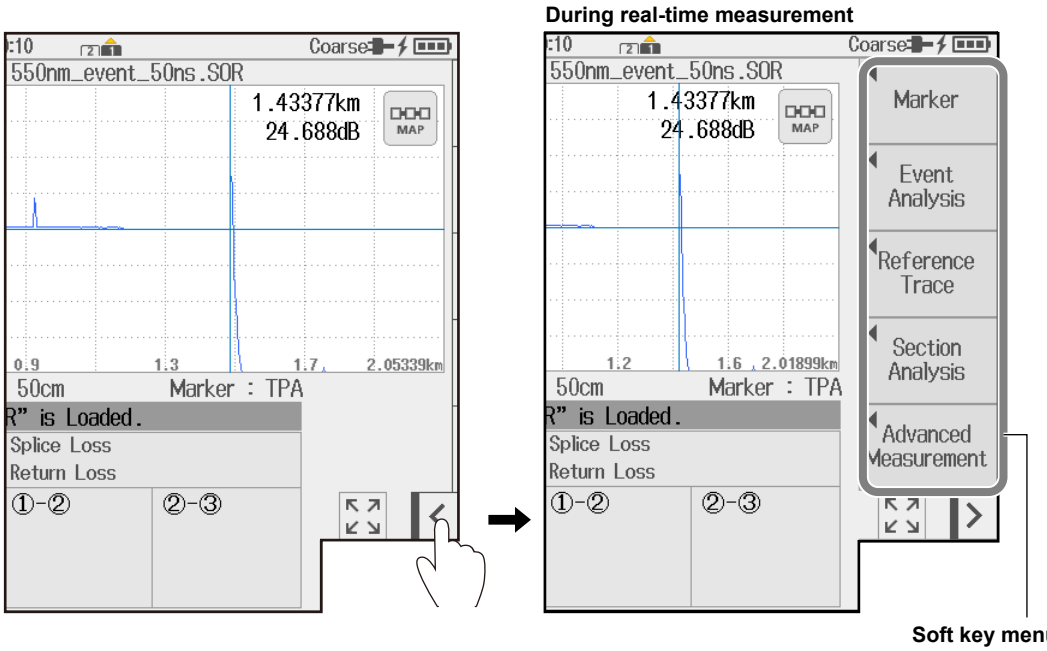
- You can select the initial screen that appears when the instrument starts in system settings. For details on operation, see the explanation in section 10.1.
- If distance range and pulse width are set to auto, the instrument automatically selects the optimal values internally immediately before starting a real-time measurement. Change these values if necessary. For details, see section 2.1.

Soft Key Menu (during real-time measurement)

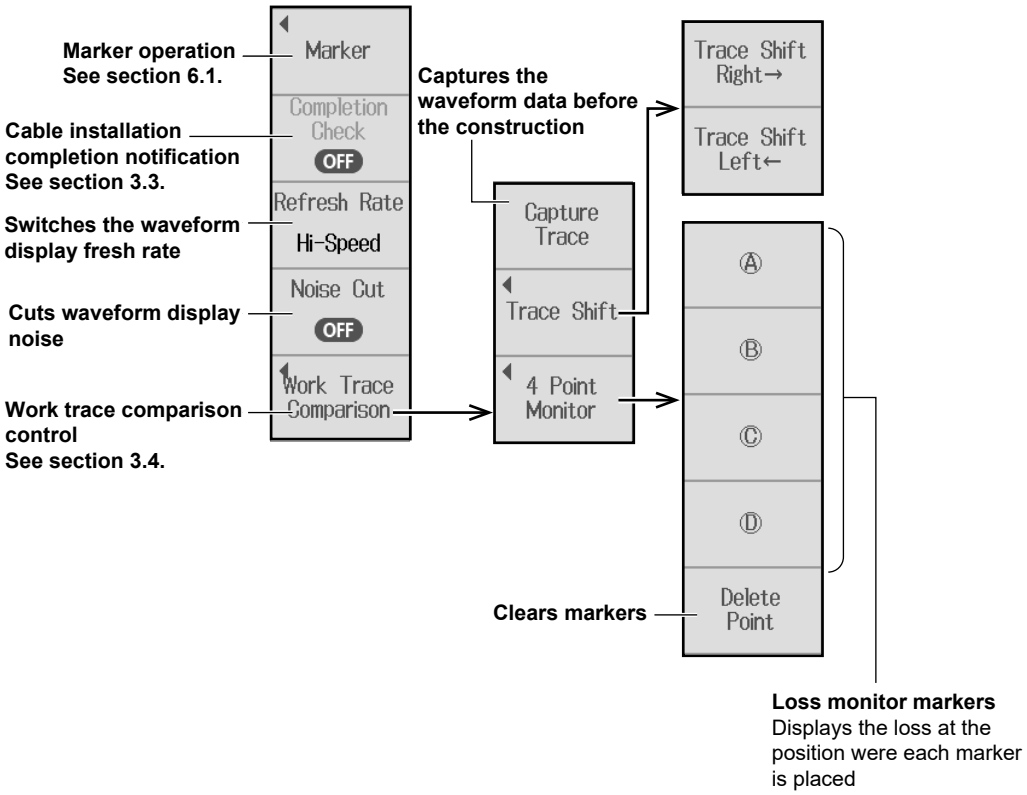
5. Tap the soft key menu display button.

The menu that can be used during real-time measurement or the menu that can be used not during real-time measurement is displayed automatically depending on the usage condition.

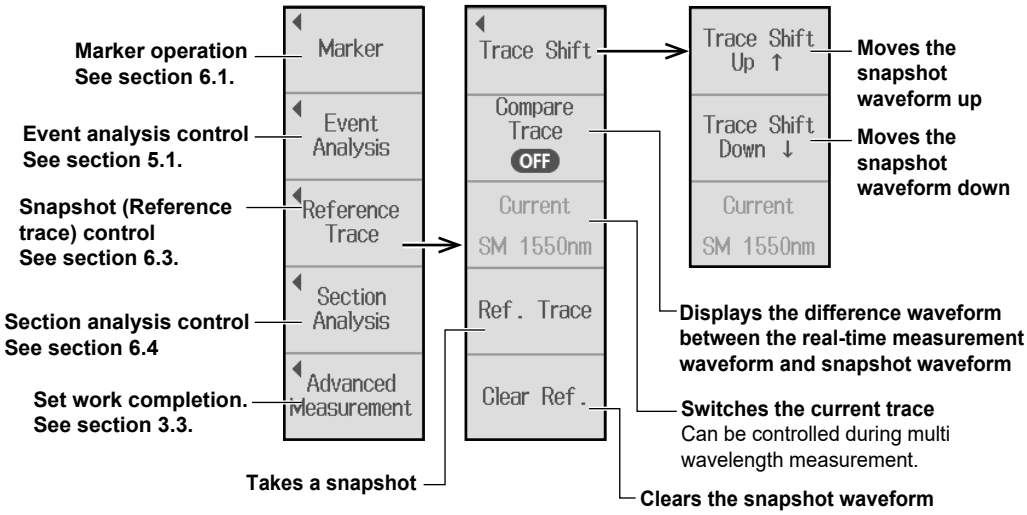
During real-time measurement



- **When Real-Time Measurement Is in Progress**



- **When Real-Time Measurement Is Not in Progress**



Explanation

Real-time Measurement

In real-time measurement, the waveform display is updated in real time. This feature is used to monitor the waveforms. Because averaged measurement requires a certain amount of measurement time, checking (monitoring) whether waveforms can be displayed correctly on the data display screen before starting averaged measurement can save time. In addition, you can operate markers and cursors during measurement. For cursor operation, see sections 3.2 and 6.1. For marker operation, see section 6.1.

Distance Range

With the auto setting, the instrument detects the open end (end point) at the start of a real-time measurement and automatically calculates the length of the optical fiber cable. When setting the distance range manually, set a distance range appropriate for the length of the optical fiber cable to be measured. For details on the appropriate distance range, see section 2.1.

Pulse Width

With the auto setting, when the distance range is set to auto, the minimum pulse width that can measure the distance to the open end (end point) is selected. When setting the pulse width manually, set a pulse width appropriate for the distance range. For details on the appropriate pulse width, see section 2.1.

Attenuation

With the auto setting, an attenuation value is selected according to the distance range and the loss in the optical fiber cable being measured. If you want to set the attenuation value manually, select a value appropriate for the pulse width. For details on the attenuation value appropriate for the pulse width, see section 2.1.

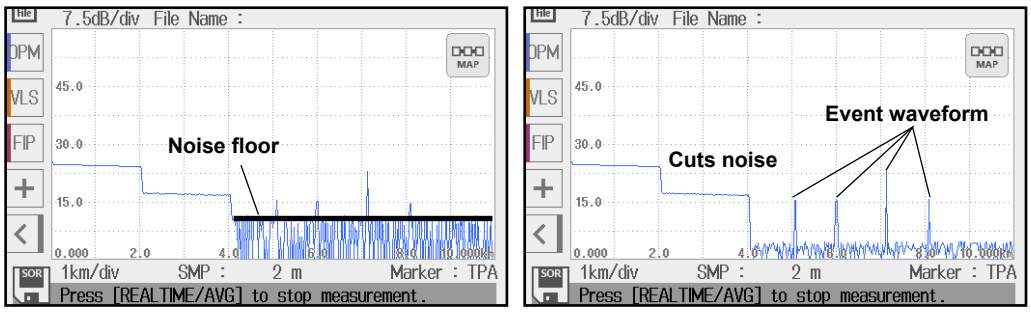
Switching the Waveform Display Refresh Rate

The real-time measurement waveform display updates the displayed waveform each time an optical fiber cable is measured. This update rate can be changed according to your application.

- Hi-Speed: The quality of the displayed waveforms decreases slightly, but the waveform display is updated quickly.
  Reflections on the displayed waveform may saturate or may be buried in noise.
- Hi-Reflection: The quality of the display waveforms is prioritized. Waveforms are displayed and updated with high precision.

Cutting the Waveform Display Noise

This feature removes noise at the far-end point.



Switching the Display between TRACE Mode and MAP Mode

When you start a real-time measurement, the data display screen automatically switches to TRACE mode.

Saving Waveforms during Real-Time Measurement

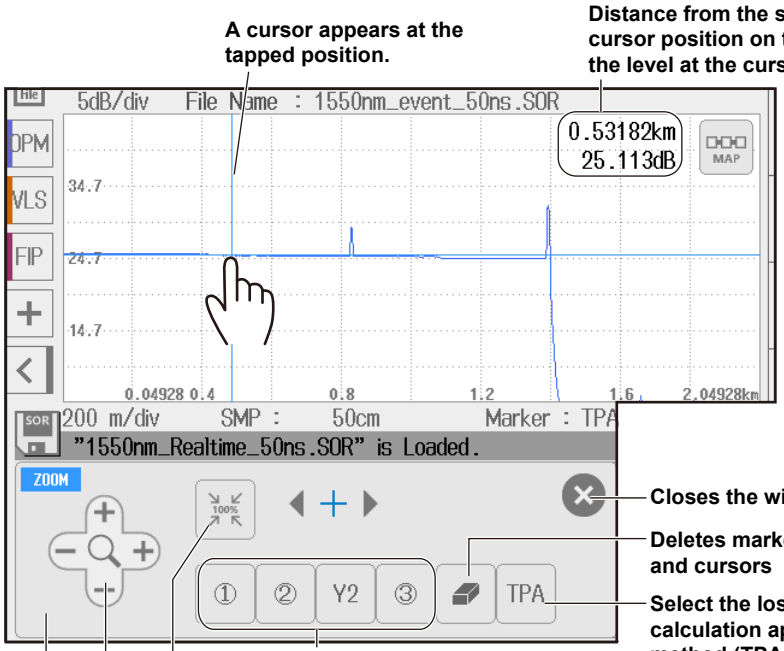
If you save waveforms during real-time measurement, waveform data at that point is saved in memory. If real-time measurement has been completed, waveforms shown on the data display screen are saved in memory. If event analysis is performed on real-time measurement waveforms, MAP display data is also saved in memory.

3.2 Measuring with Cursors

Procedure

Displaying the Cursors

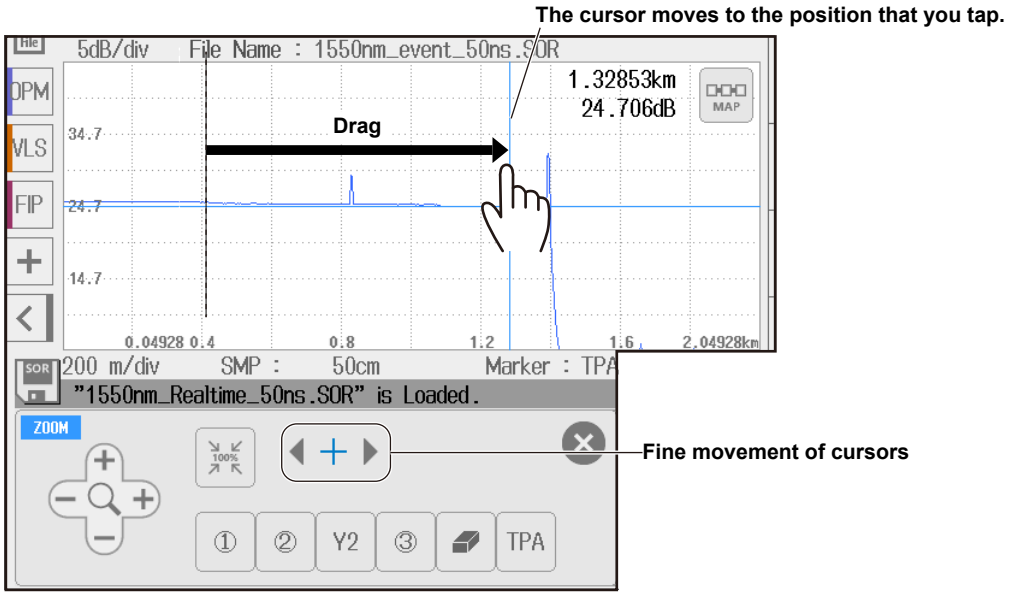
1. Tap the waveform display screen. A cursor appears at the tapped position.



If you do not use markers or cursors for about 8 seconds, the screen will close automatically.

Moving the Cursor

2. Tap the position on the waveform display screen that you want to move the cursor to. The cursor moves to the position that you tapped. You can also drag the cursor on the waveform display screen.

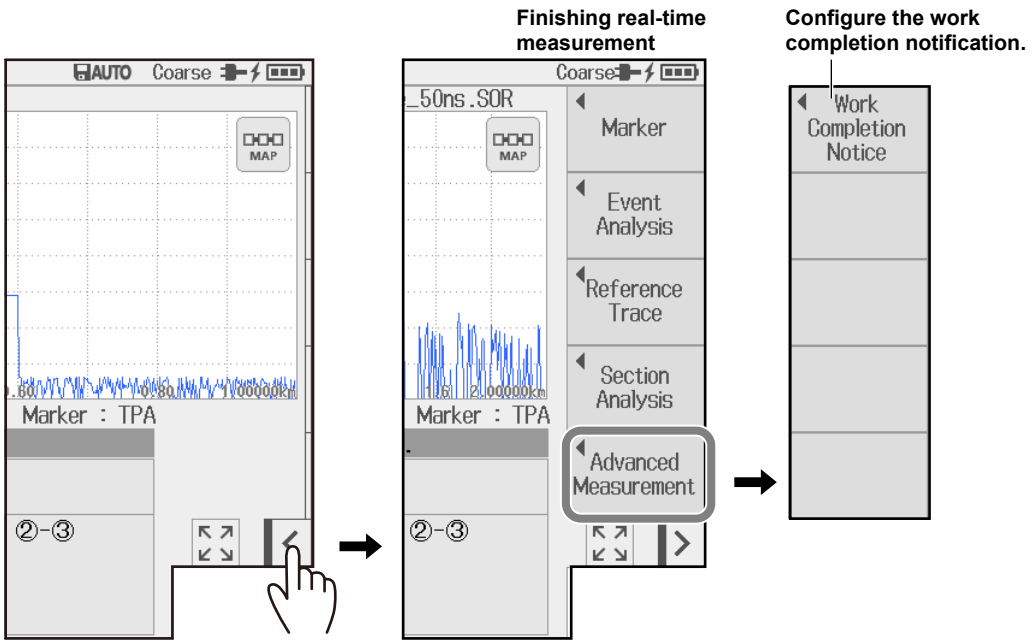


3.3 Cable Installation Completion Notification

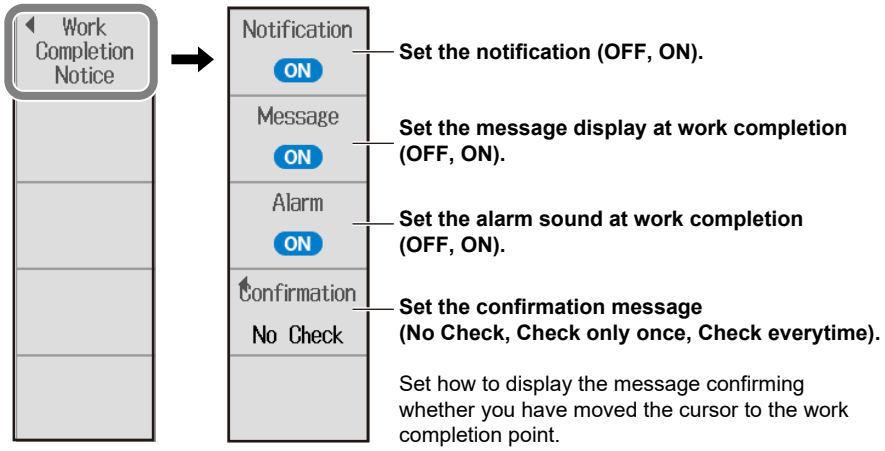
Procedure

Soft Key Menu (Work Completion Notice)

1. Tap the soft key menu display button (when real-time measurement is not in progress).



2. Tap the **Advanced Measurement** soft key and then the **Work Completion Notice** soft key. The Work Completion Notice screen appears.



Issuing a Work Completion Notice

WARNING

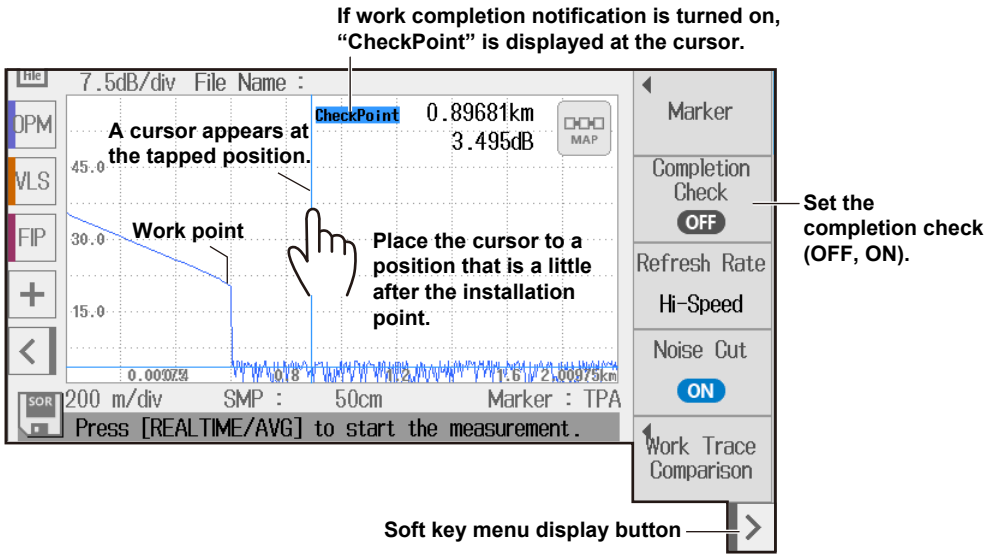
During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.

French

AVERTISSEMENT

Lorsque instrument 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.

3. Press **REAL TIME** to start a real-time measurement.
   During measurement, a mark appears at the top of the display to indicate that the laser light is on. Pressing REAL TIME again stops the measurement.
4. Tap the waveform display screen. A cursor appears at the tapped position.
   If Notification is set to on in step 2, the word "CheckPoint" appears at the top area of the cursor.



5. Tap the soft key menu display button. The soft key menu is displayed.
6. Tap the **Completion Check** soft key to select ON.
   If the prior confirmation message is set to Only once or Check everytime in step 2 on page 3-7, when you tap the Completion Check soft key, a message appears on the screen for you to confirm whether the cursor has been moved to the work completion point.
   When the measurement to the Check Point distance is complete, a completion message is displayed.

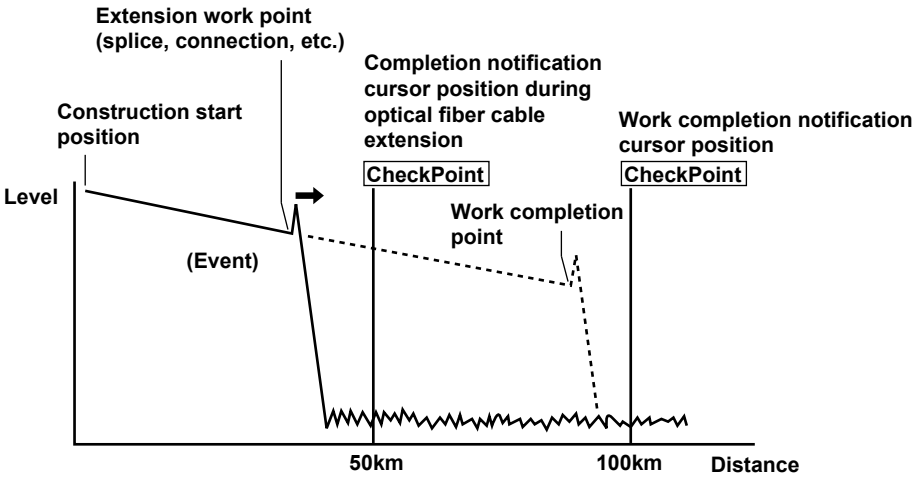
Note

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 instrument notifies you of the work completion, which is your sign to measure the connection loss at that point (splice, connection, etc.).

Explanation

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 instrument gives a notification (message indication and alarm sound) that the cable installation is complete.



Notification

Turns on or off the work completion notice feature.
OFF: The work completion notice feature is disabled.
ON: The work completion notice feature is enabled.

Notification (Message)

OFF: Work completion is not notified with a message.
ON: Work completion is notified with a message.

Notification (Alarm)

OFF: Work completion is not notified with an alarm sound.
ON: Work completion is notified with an alarm sound.

Confirmation

No Check:	A confirmation message is not displayed on the screen even if you tap the Completion Check soft key.
Check only once:	A confirmation message is displayed on the screen once when you tap the Completion Check soft key the first time.
Check everytime:	A confirmation message is displayed on the screen every time you tap the Completion Check soft key.

3.4 Rerouting Work

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.

French

AVERTISSEMENT

Lorsque instrument 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.

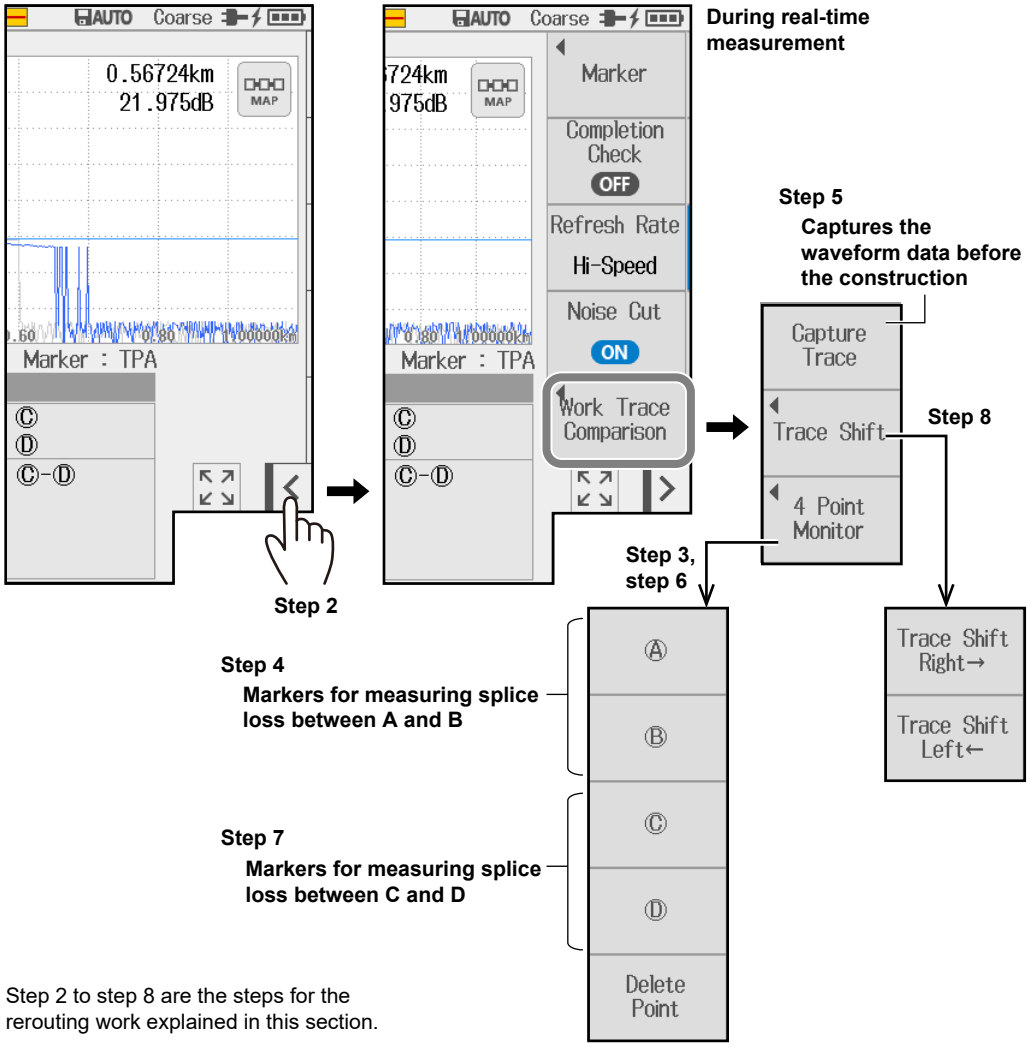
When installed fibers are moved because of road construction or other external factors (rerouting work), using this feature enables you to compare the event waveform before the construction to that after the construction. This makes it easy to check the presence of obstacles caused as a result of the rerouting work.

Procedure

1. Press **REAL TIME** to start a real-time measurement.
   During measurement, a mark appears at the top of the display to indicate that the laser light is on. Pressing REAL TIME again stops the measurement.

Soft Key Menu (Work Trace Comparison)

2. Tap the soft key menu display button (when real-time measurement is in progress).



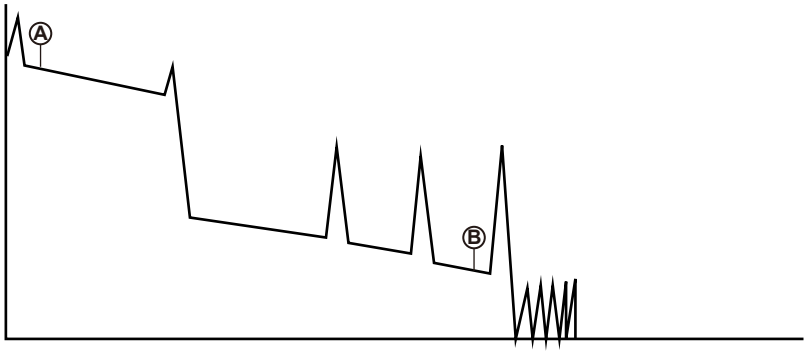
Step 2 to step 8 are the steps for the rerouting work explained in this section.

Measuring the Connection Loss between the Measurement Start Point and Measurement Endpoint before the Construction

3. Tap the **Work Trace Comparison** soft key and then the **4 Point Monitor** soft key. A marker soft key menu appears for monitoring loss values (see the previous page).

4. Place the Ⓐ marker at the measurement start point and the Ⓑ marker at the measurement end point.

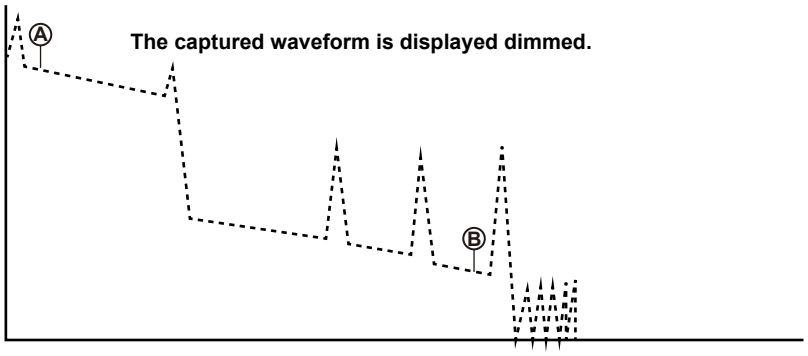
The connection loss between A and B is measured.



Capture the Waveform Data before the Construction

5. Tap the **Work Trace Comparison** soft key and then the **Capture Trace** soft key.

The waveforms displayed on the current screen are captured. Because markers are not captured, separately record the connection loss value between A and B before the construction.

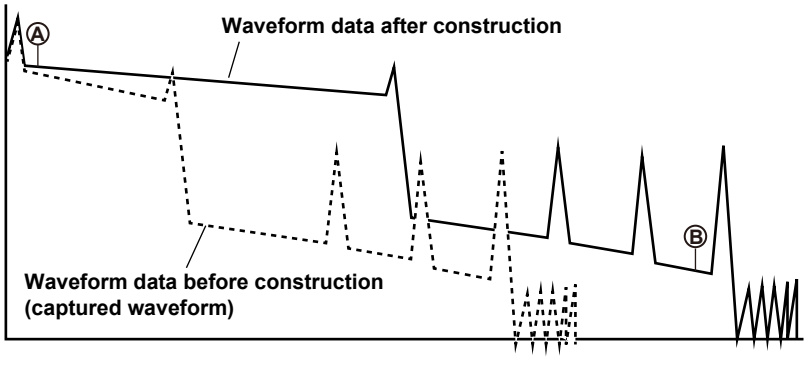


Measuring the Connection Loss between the Measurement Start Point and Measurement Endpoint after the Construction

6. Tap the **Work Trace Comparison** soft key and then the **4 Point Monitor** soft key. A marker soft key menu appears for monitoring loss values (see the previous page).

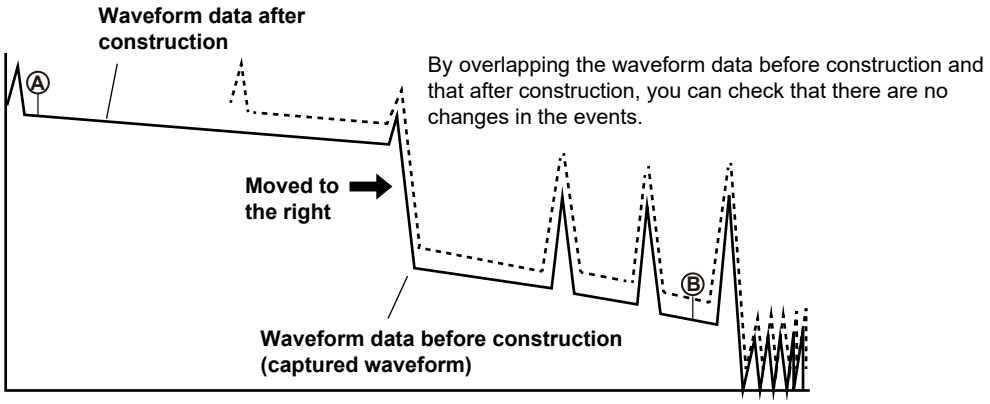
7. Place the Ⓐ marker at the measurement start point and the Ⓑ marker at the measurement end point.

The connection loss between A and B is measured. Check that there are no problems in the connection loss value before the construction and the connection loss value after the construction.



Comparing waveform data before the construction and after the construction

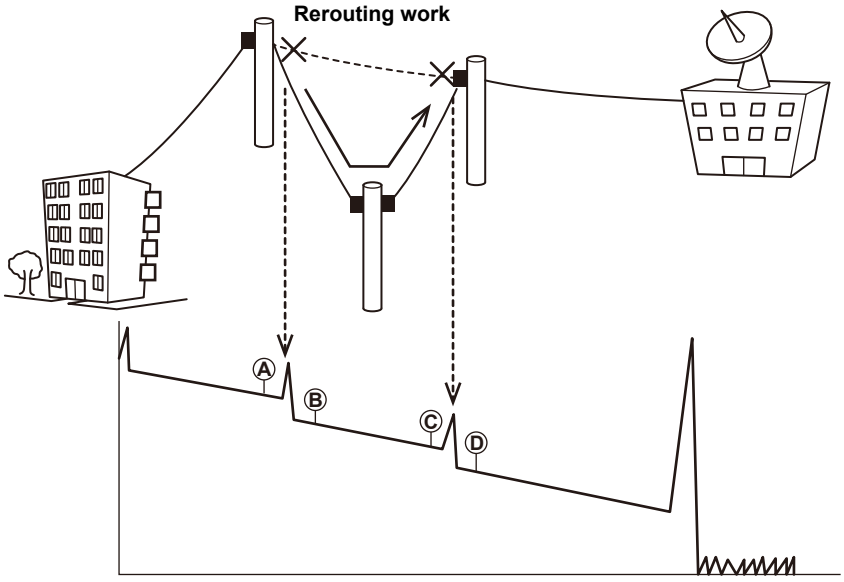
8. Tap the **Work Trace Comparison** soft key, the **Trace Shift** soft key, and then the **Trace Shift Right** soft key. The waveform data (captured waveform) before the construction moves to the right side of the screen. Use **Trace Shift Right** or **Trace Shift Left** depending on the differences in the start points before the construction and after the construction. In this example, because the distance between the start point and the end point after the construction is long, the waveform data before the construction is moved to the right side.



Explanation

When installed fibers are moved because of road construction or other external factors (rerouting work), using this feature enables you to compare the event waveform before the construction to that after the construction. This makes it easy to check the presence of obstacles caused as a result of the rerouting work.

The markers of 4 Point Monitor are used to measure two sections as loss measurements for when the optical fiber is switched. The measurement of the two sections is performed the marker pairs Ⓐ and Ⓑ and the marker pairs Ⓒ and Ⓓ.



4.1 Measuring in TRACE Mode

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.

French

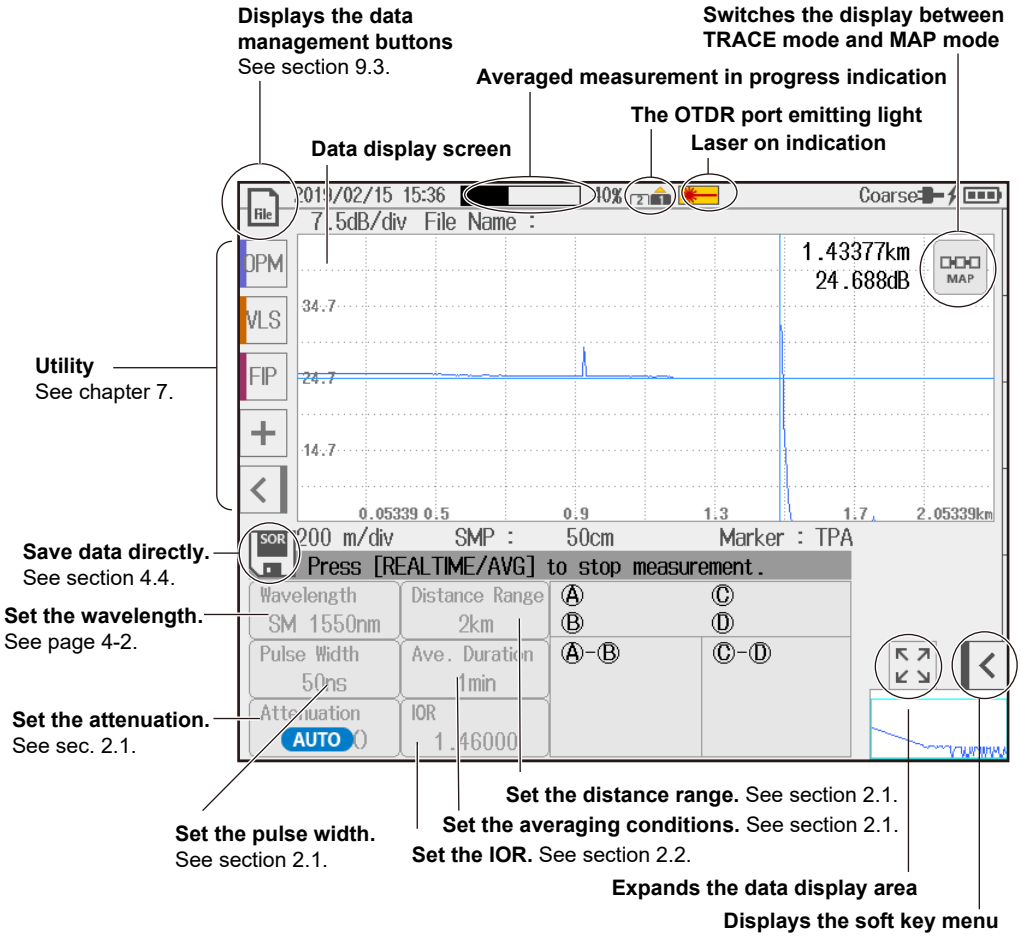
AVERTISSEMENT

Lorsque instrument 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.

Procedure

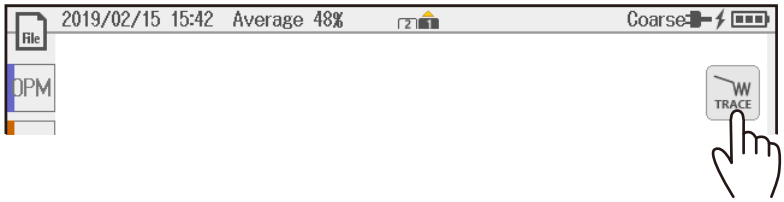
Averaged Measurement Screen (OTDR screen TRACE mode)

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.



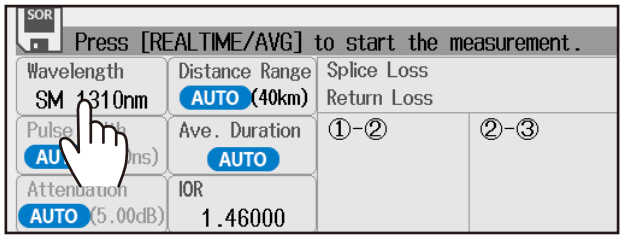
- **Switching the Display between TRACE Mode and MAP Mode**

3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.



Executing an Averaged Measurement

4. Tap **Wavelength** to set the wavelength.



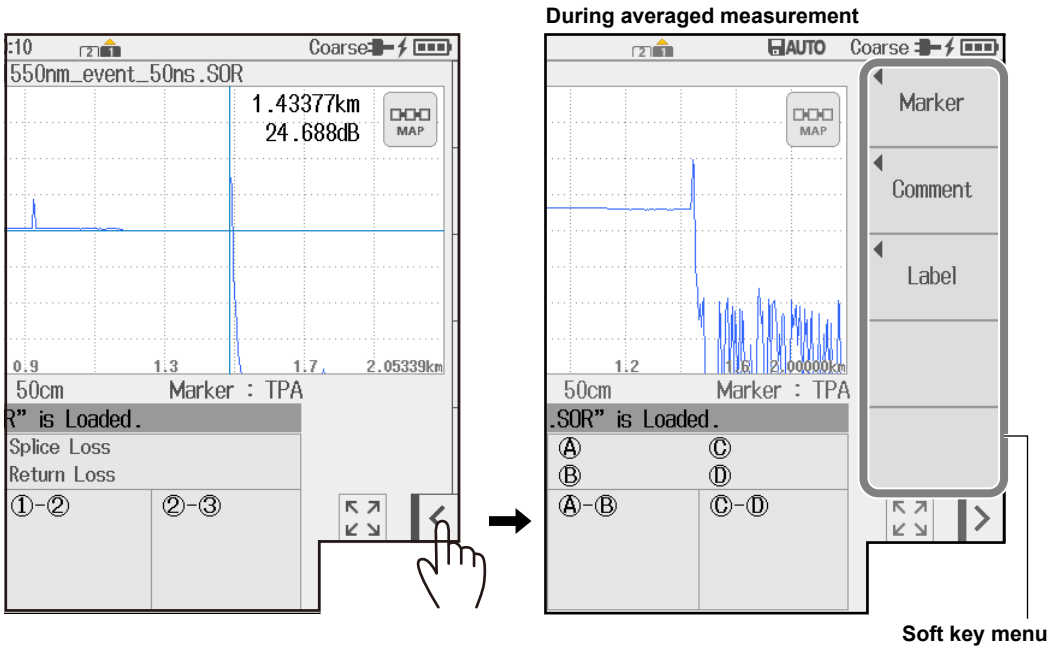
5. Press **AVG**. The measurement begins, and the data display screen shows the waveform.
   During averaged measurement, the duration to average over is displayed in the top area of the screen. Also, during measurement, a mark appears at the top of the display to indicate that the laser light is on. When averaged measurements are completed, measurement is stopped automatically, event analysis is executed, and the analysis results are displayed on the screen. If you press AVG again during averaged measurement, measurement is stopped.

Note

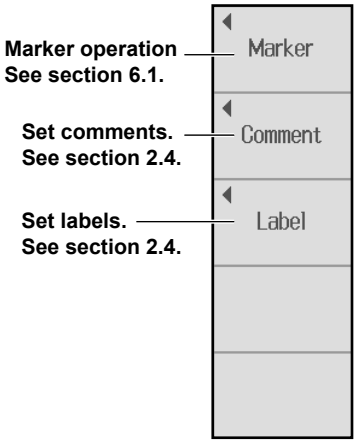
- You can select the initial screen that appears when the instrument starts in system settings. For details on operation, see the explanation in section 10.1.
- If distance range and pulse width are set to auto, the instrument automatically selects the optimal values internally immediately before starting a measurement. Change these values if necessary. For details, see section 2.1.

Soft Key Menu (during averaged measurement)

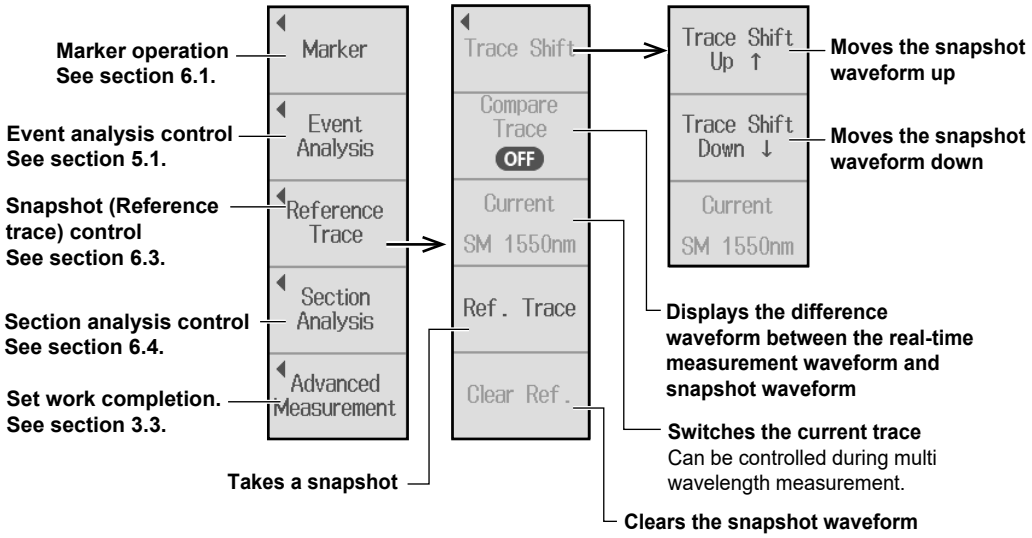
6. Tap the soft key menu display button.
   The menu that can be used during averaged measurement or the menu that can be used not during averaged measurement is displayed automatically depending on the usage condition.



- **When Averaged Measurement Is in Progress**



- **When Averaged Measurement Is Not in Progress**



Explanation

Averaged Measurement (AVG)

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

Distance Range

With the auto setting, the instrument detects the open end (end point) at the start of an averaged measurement and automatically calculates the length of the optical fiber cable. When setting the distance range manually, set a distance range appropriate for the length of the optical fiber cable to be measured. For details on the appropriate distance range, see section 2.1.

Pulse Width

With the auto setting, when the distance range is set to auto, the minimum pulse width that can measure the distance to the open end (end point) is selected. When setting the pulse width manually, set a pulse width appropriate for the distance range. For details on the appropriate pulse width, see section 2.1.

Average Count and Average Duration

With the auto setting, the average method is selected according to the distance range and the loss in the optical fiber cable being measured.

Attenuation

With the auto setting, an attenuation value is selected according to the distance range and the loss in the optical fiber cable being measured. If you want to set the attenuation value manually, select a value appropriate for the pulse width. For details on the attenuation value appropriate for the pulse width, see section 2.1.

Switching the Display between TRACE Mode and MAP Mode

You can switch the data display screen.

TRACE mode: The data display screen shows the waveform of optical pulse measurement.
MAP mode: The data display screen shows the events detected through event analysis and displays them with icons.

4.2 Measuring in MAP Mode

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.

French

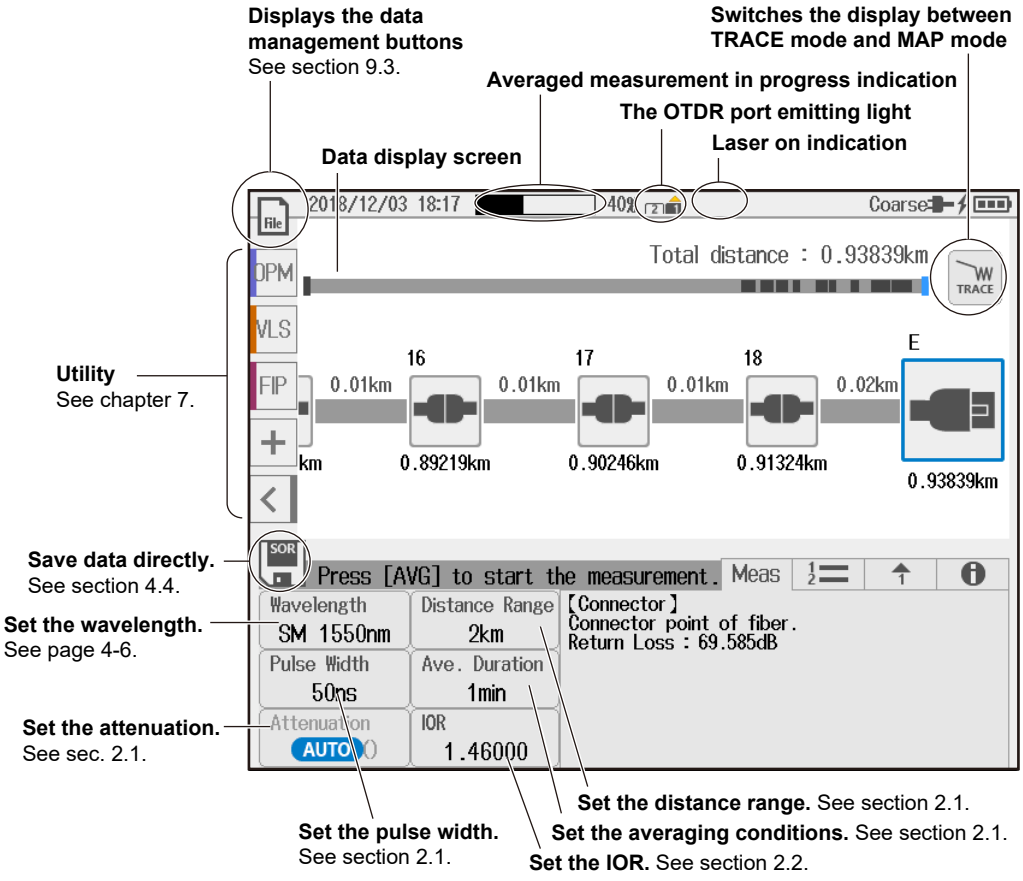
AVERTISSEMENT

Lorsque instrument 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.

Procedure

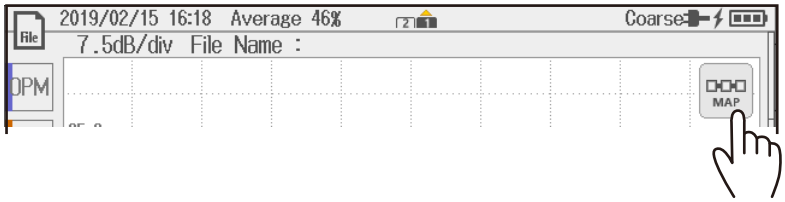
Averaged Measurement Screen (OTDR screen MAP mode)

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.



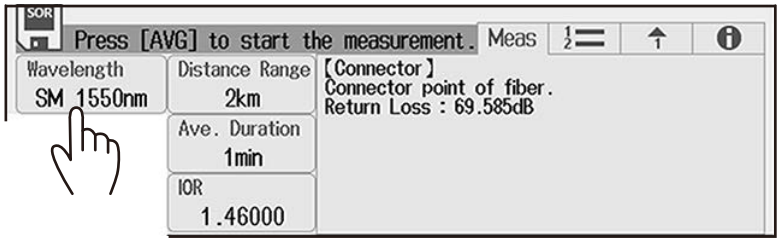
- **Switching the Display between TRACE Mode and MAP Mode**

4. Tap the **TRACE/MAP** button to set the data display screen to MAP mode.
When the data display screen is in MAP mode, the button is TRACE.



Executing an Averaged Measurement

5. Tap **Wavelength** to set the wavelength.



6. Press **AVG**. The measurement begins, and the data display screen shows the waveform.
During averaged measurement, the duration to average over 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 averaged measurements are completed, measurement is stopped automatically, event analysis is executed, and the analysis results are displayed on the screen. If you press AVG again during averaged measurement, measurement is stopped.

Note

- You can select the initial screen that appears when the instrument starts in system settings. For details on operation, see the explanation in section 10.1.
- If distance range and pulse width are set to auto, the instrument automatically selects the optimal values internally immediately before starting a measurement. Change these values if necessary. For details, see section 2.1.

Explanation

Averaged Measurement (AVG)

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

Distance Range

With the auto setting, the instrument detects the open end (end point) at the start of an averaged measurement and automatically calculates the length of the optical fiber cable. When setting the distance range manually, set a distance range appropriate for the length of the optical fiber cable to be measured. For details on the appropriate distance range, see section 2.1.

Pulse Width

With the auto setting, when the distance range is set to auto, the minimum pulse width that can measure the distance to the open end (end point) is selected. When setting the pulse width manually, set a pulse width appropriate for the distance range. For details on the appropriate pulse width, see section 2.1.

Average Count and Average Duration

With the auto setting, the average method is selected according to the distance range and the loss in the optical fiber cable being measured.

Attenuation

With the auto setting, an attenuation value is selected according to the distance range and the loss in the optical fiber cable being measured. If you want to set the attenuation value manually, select a value appropriate for the pulse width. For details on the attenuation value appropriate for the pulse width, see section 2.1.

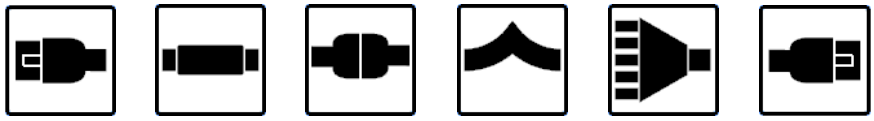
Switching the Display between TRACE Mode and MAP Mode

You can switch the data display screen.

TRACE mode: The data display screen shows the waveform of optical pulse measurement.
MAP: The data display screen shows the events detected through event analysis and displays them with icons.

- **Event Icon Display**

  The following events are displayed using icons.



Start point (Near-end reflection) | **Splice loss** | **Return loss** | **Bending loss** | **Splitter** | **End point (Fresnel reflection)**

Note

When the data display screen is in MAP mode, the following features cannot be used.

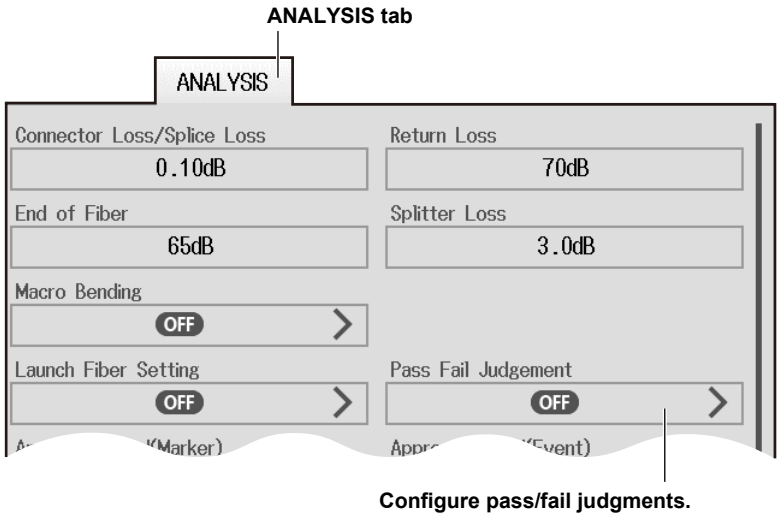
- Operating the cursors
- Performing marker analysis
- Zooming In on or Out of Waveforms

4.3 Performing Pass/Fail Judgments on Measured Results

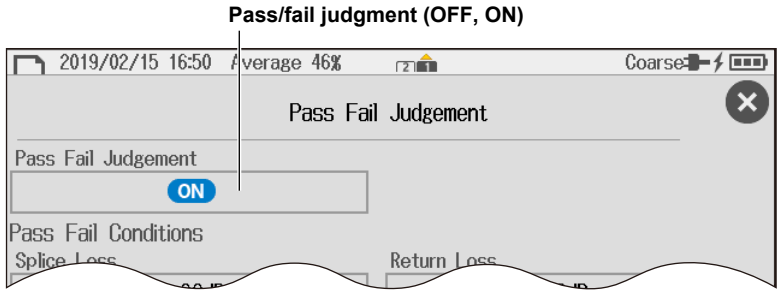
Procedure

Turning On the Pass Fail Judgment Feature

1. Press **SETUP** to display the setup screen.
2. Tap the **ANALYSIS** tab to display the analysis setup screen.
3. Tap **Pass Fail Judgment** to display the Pass Fail Judgment screen.
   For description of the Pass Fail Judgment screen, see “Configuring the Pass/Fail Judgment” in section 2.2.



4. Tap the **Pass Fail Judgment** button on the Pass Fail Judgment screen.
   The Past Bill Judgment feature turns on. Each time you tap, the value switches between ON and OFF.
   The result of the pass/fail judgment on the waveform data shown on the data display screen.



Executing an Averaged Measurement

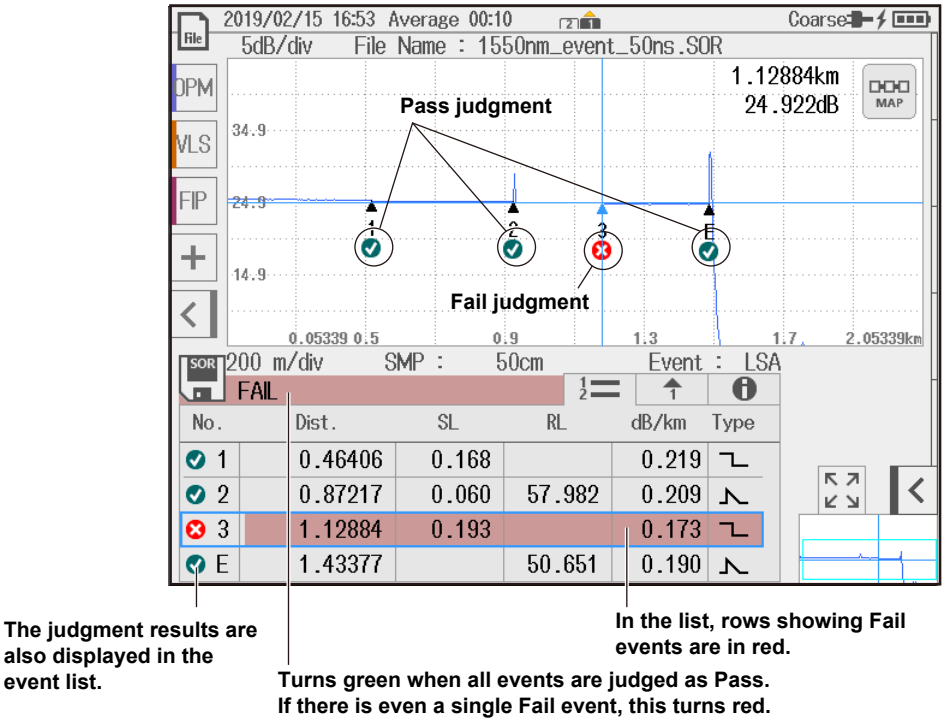
5. Press **AVG**. The measurement begins, and the data display screen shows the waveform and the judgment result.

Note

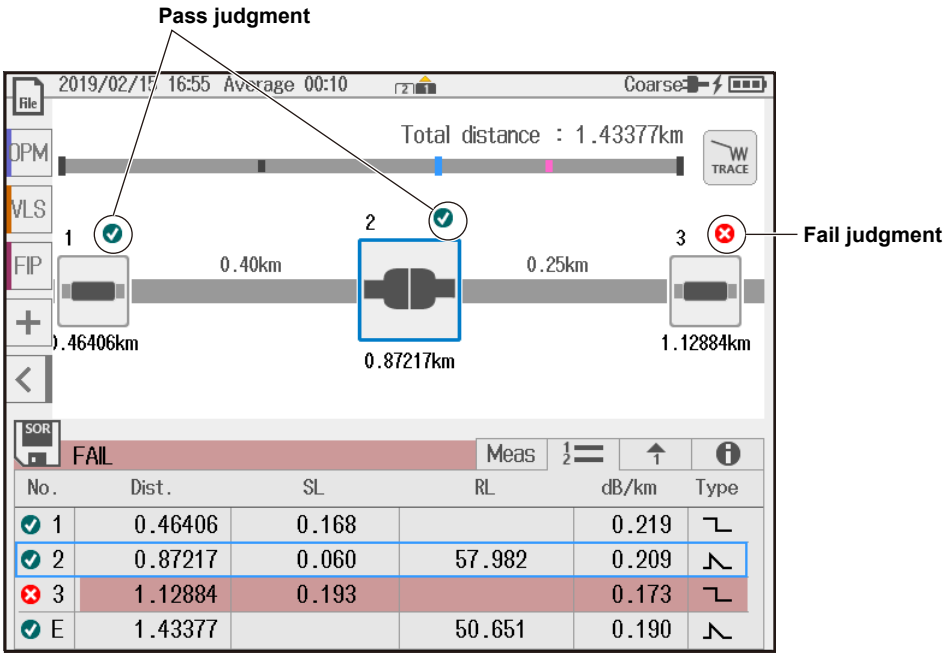
When averaged measurements are completed, event analysis is executed automatically, and judgment results based on whether the specified pass/fail judgment conditions are met are displayed. If waveform data is displayed on the screen before the Pass Fail Judgment is turned on, the pass/fail judgment result appears when the feature is turned on. For details on setting the pass/fail judgment conditions, see “Configuring the Pass/Fail Judgment” in section 2.2.

Explanation

Pass/fail Judgment Display in TRACE Mode



Pass/fail Judgment Display in MAP Mode



4.4 Saving Measured Data

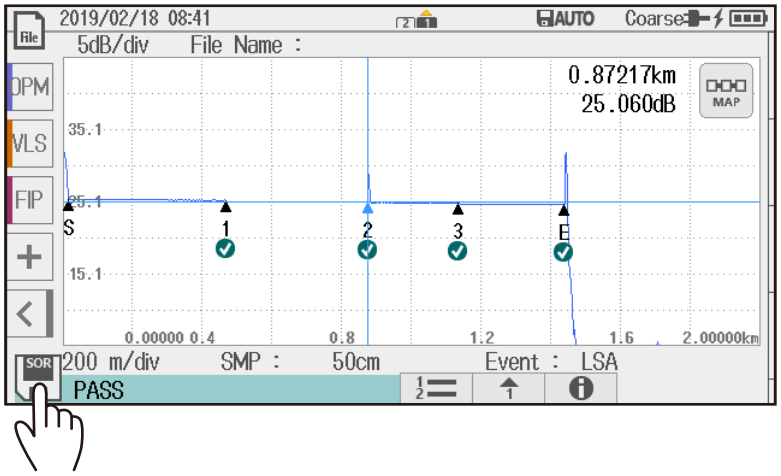
Procedure

Saving Measured Data Directly

You can save measured waveforms and event analysis data by tapping an icon on the data display screen.

To change the save destination folder or file name, see “Setting the Direct Save Method” in section 2.4.

1. Tap the floppy disk icon. The measured data is saved.

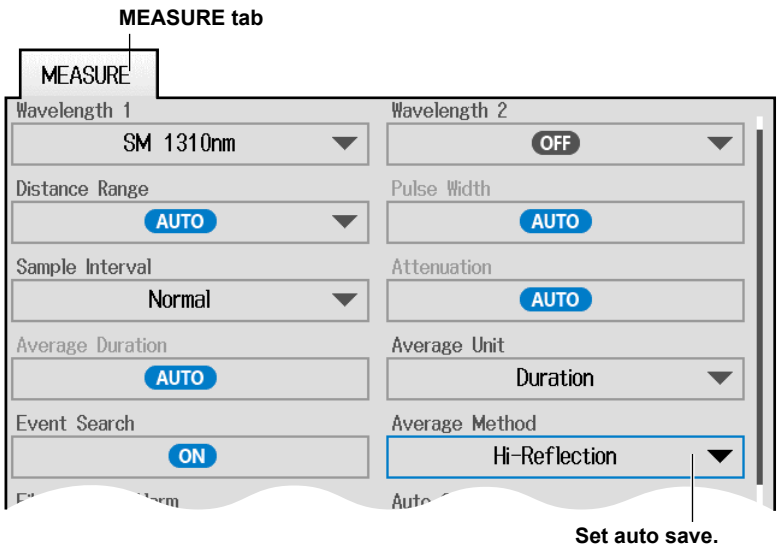


Turning on the Auto Save Feature for Measurement Data

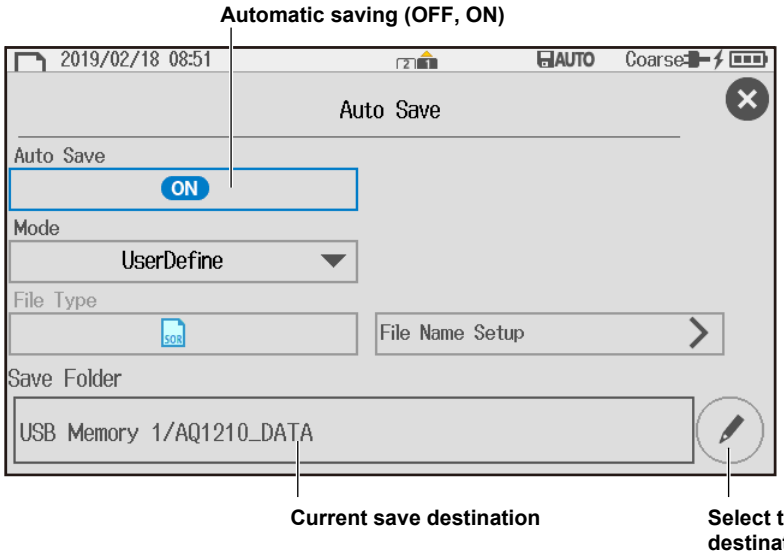
Measured waveforms and event analysis data can be saved automatically when averaged measurements are completed.

To change the save destination folder or file name, see “Configuring Auto Save (when averaged measurement is complete)” in section 2.1.

1. Press **SETUP** to display the setup screen.
2. Tap the **MEASURE** tab to display the measurement setup screen.
3. Tap **Auto Save** to display the Auto Save screen.
   For a description of the auto save screen, see “Configuring Auto Save (when averaged measurement is complete)” in section 2.1.



4. Tap the **Auto Save** button on the auto save screen.
   The auto save feature is turned on. Each time you tap, the value switches between ON and OFF.
   For details on the auto save screen, see “Configuring Auto Save (when averaged measurement is complete)” in section 2.1.



Explanation

Saving Directly

When you tap the floppy disk icon, measured data is saved. The file save format is shown on the floppy disk icon.

When the icon displays SOR
Measured data is saved as waveforms.

When the icon displays PDF
Measured data is saved as a report file in PDF format.

When the icon displays SOR+PDF
Waveform data is saved as waveforms and as a report file simultaneously.

Saving Waveforms during Averaged Measurement

You cannot save waveforms during averaged measurement. Save measured data after averaged measurements have been completed. When measured data is saved, MAP display data is also saved in memory.
If you set the auto save feature to on, waveforms and MAP display data are saved in memory when averaged measurements are completed.

Saving Waveforms during Real-Time Measurement

If you save waveforms during real-time measurement, waveform data at that point is saved in memory. If real-time measurement has been completed, waveforms shown on the data display screen are saved in memory. If event analysis is performed on real-time measurement waveforms, MAP display data is also saved in memory.

5.1 Analyzing in TRACE Mode

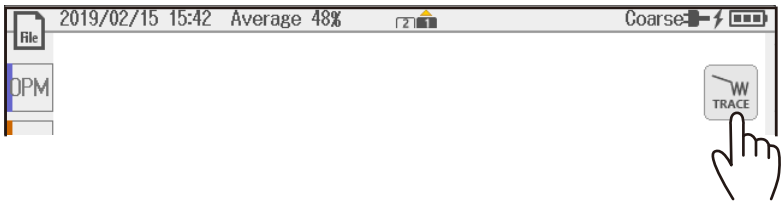
Procedure

Waveform Data Display

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.



- **Displaying Waveform Data**

4. Press **AVG**. The measurement begins, and the data display screen shows the waveform.
   When averaged measurement is completed, event analysis is automatically executed, and the event analysis results are shown on the data display screen. For details on averaged measurement, see section 4.1.

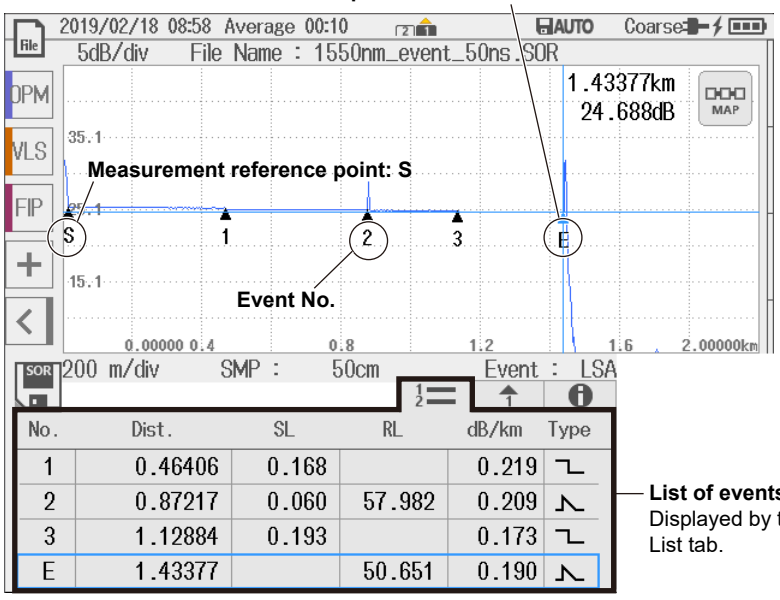
Note

If you display waveform data using the following methods, you need to manually execute event analysis. See "Soft Key Menu (during event analysis)" explained later.

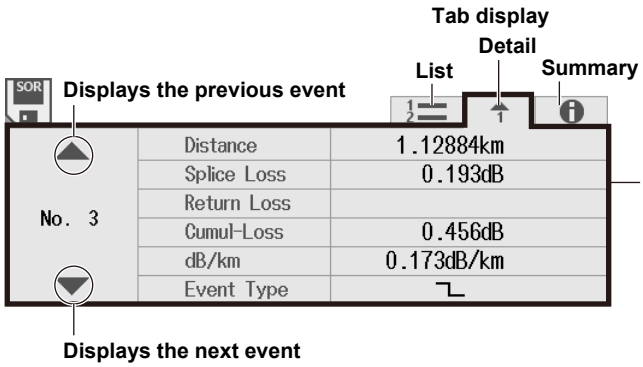
- When a real-time measurement is performed
- When waveform data (without event analysis information) is loaded from a USB memory device or internal memory Event analysis information is not included in waveform data of real-time measurement or waveform data of averaged measurement that is aborted in the middle of a measurement.

Displaying Event Analysis Results

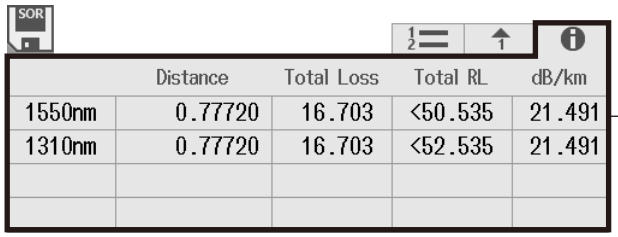
Event detected as the end of the optical fiber cable: E



List of events
Displayed by tapping the List tab.



Display of separate events
Displayed by tapping the Detail tab.

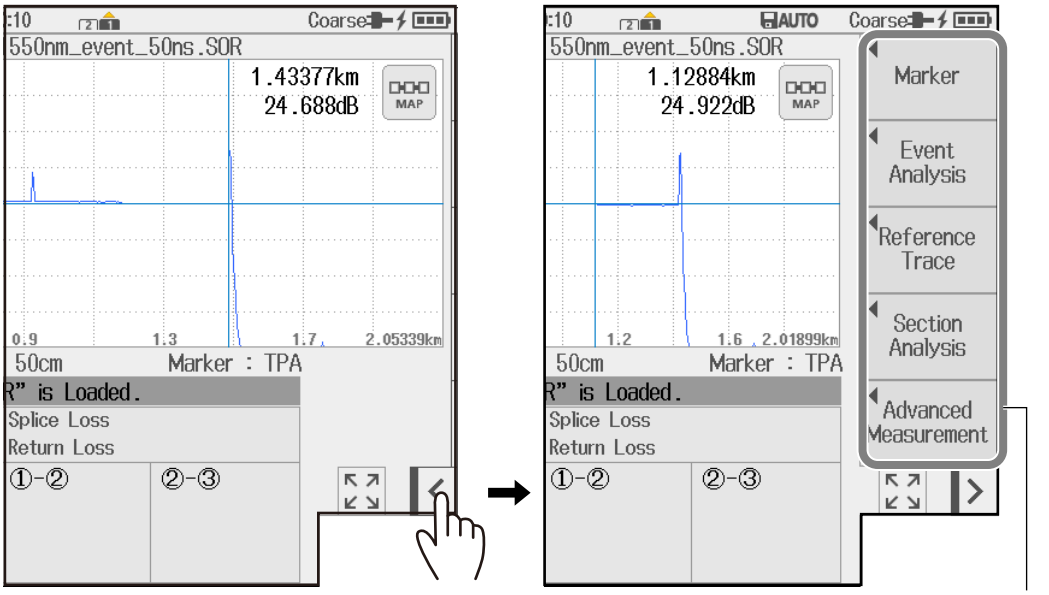


Cumulative display of events
Displayed by tapping the Summary tab.

Soft Key Menu (event analysis)

4. Tap the soft key menu display button.

When Real-Time Measurement or Averaged Measurement Is Not in Progress



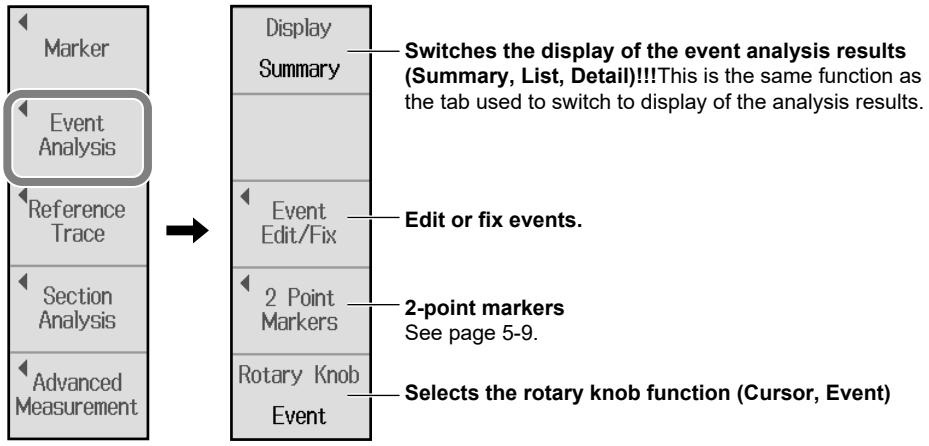
Executing an Event Analysis

5. Tap the **Event Analysis** soft key. Event analysis is performed, and the event results are displayed on the waveform data. For details on the event analysis results, see “Displaying Event Analysis Results” On page 5-1.

Note

If you display waveform data using the following methods, you need to manually execute event analysis.

- When a real-time measurement is performed
- When waveform data (without event analysis information) is loaded from a USB memory device or internal memory Event analysis information is not included in waveform data of real-time measurement or waveform data of averaged measurement that is aborted in the middle of a measurement.

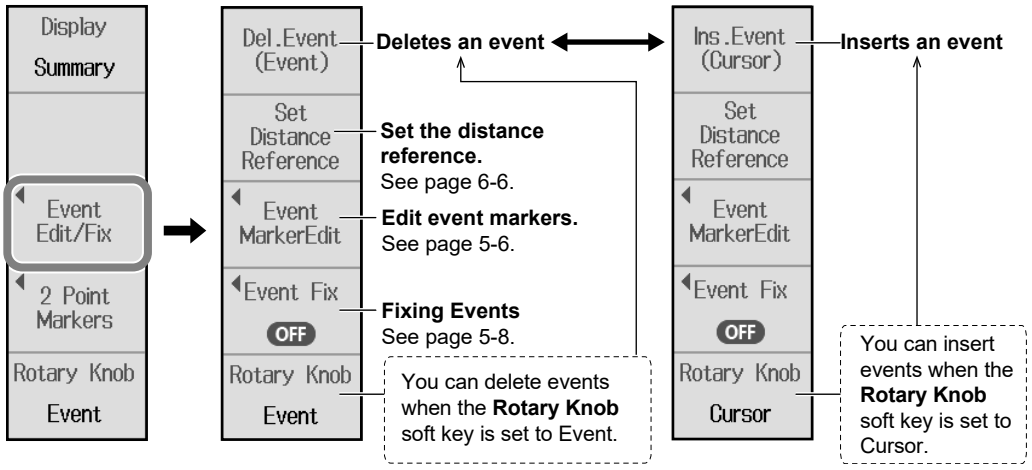


Editing or Fixing Events

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:

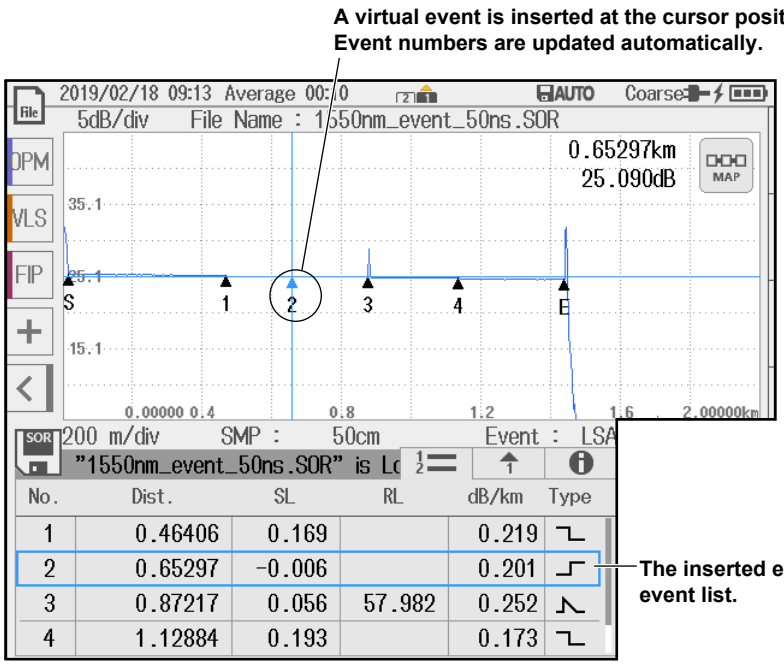
- Insert events
- Delete events
- Edit event markers
- Fix event positions

6. Tap the **Event Edit/Fix** soft key. An event edit soft key menu appears.



- **Inserting an Event**

7. Tap the **Rotary Knob** soft key to select Cursor.
8. Turn the **rotary knob** to move the cursor to the position where you want to insert an event.
9. Press the **Ins. Event (Cursor)** soft key. An event is inserted 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 6-6.
- 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.

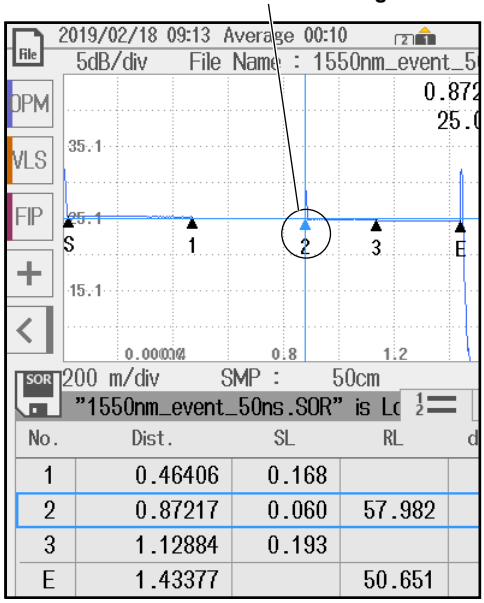
- **Deleting an Event**

7. Tap the **Rotary Knob** soft key to select Event.

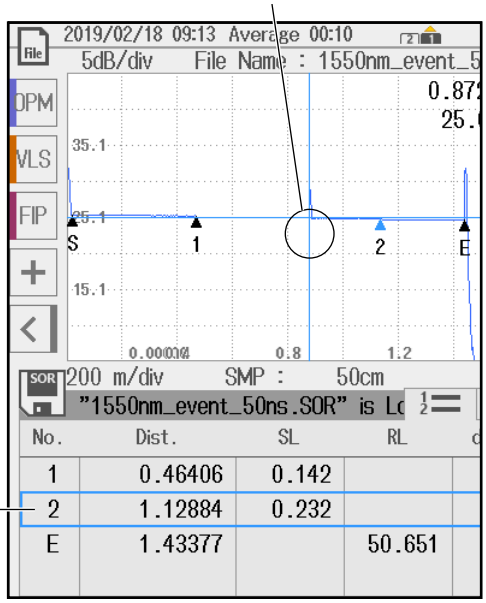
8. Turn the **rotary knob** to select the event you want to delete.

9. Press the **Del.Event (Event)** soft key. The selected event is deleted.

The color of the selected event changes.



The event is deleted virtually. When the event is deleted, the subsequent event numbers are each decreased by one.



The deleted event is deleted from the event list.

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.

- **Editing Event Markers**

  You can move an event marker to recalculate return loss and splice loss.

7. Press the **Event MarkerEdit** soft key. An event marker edit soft key menu appears.

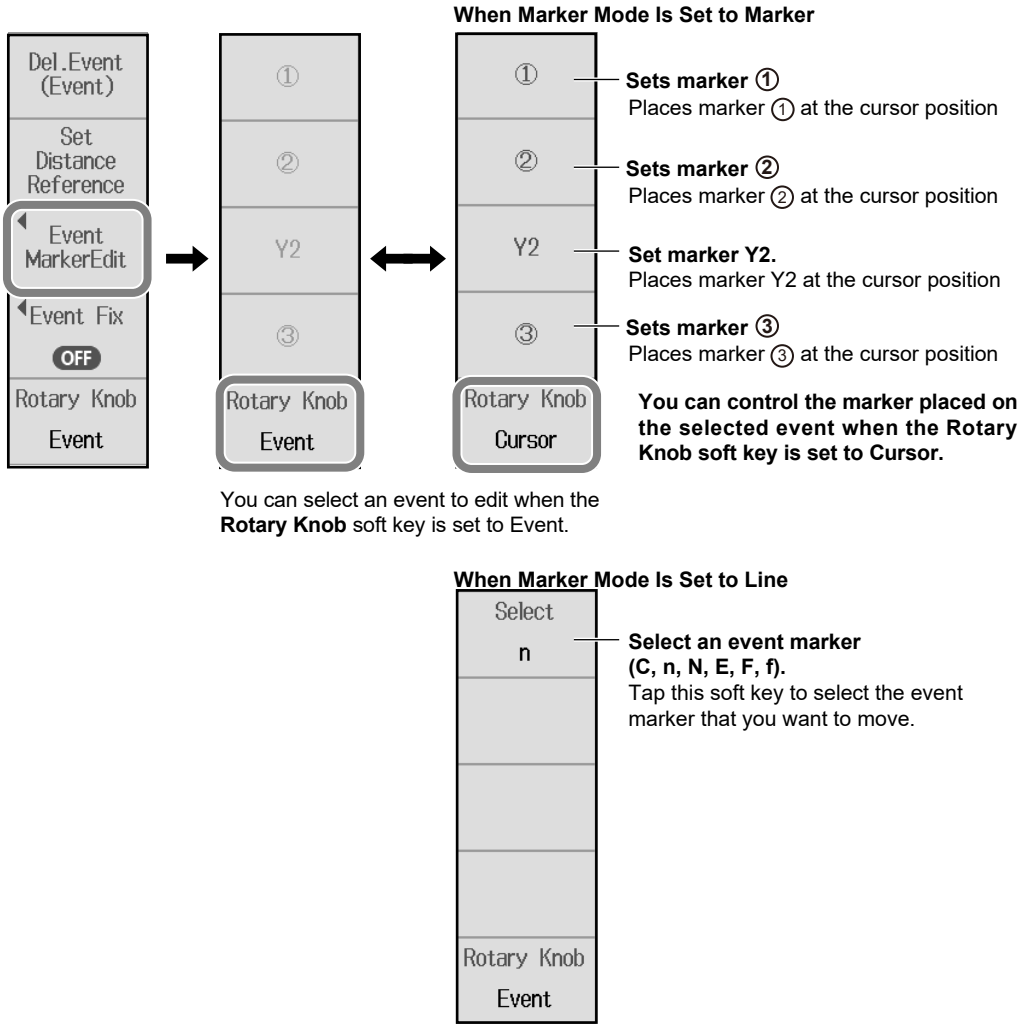
8. Tap the **Rotary Knob** soft key to select Event.

9. Turn the **rotary knob** to select the event you want to edit.

The color of the selected event changes.

10. Tap the **Rotary Knob** soft key to select Cursor.

You can now use the marker menu.

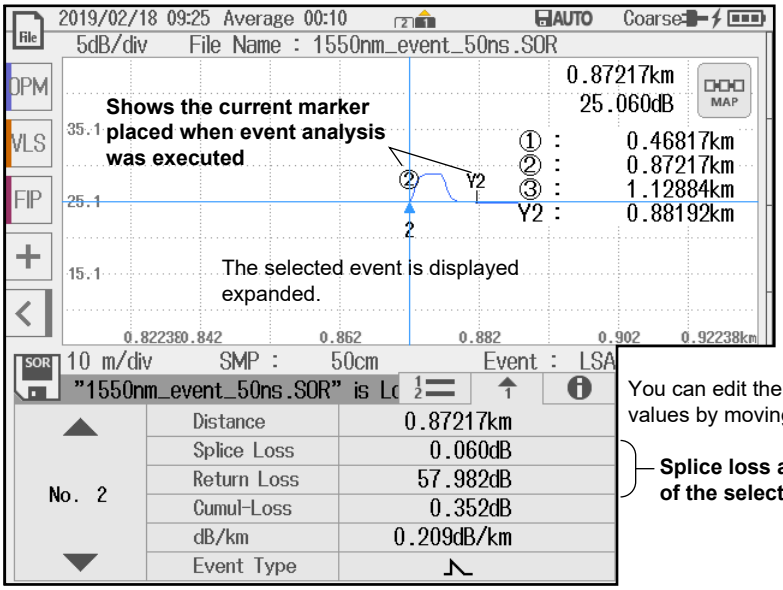


Note

For details on how to set markers, see “4 Point Markers” on page 6-8 (marker mode is Marker).

For details on how to set line markers, see “5 Point Markers” on page 6-10 (marker mode is Line).

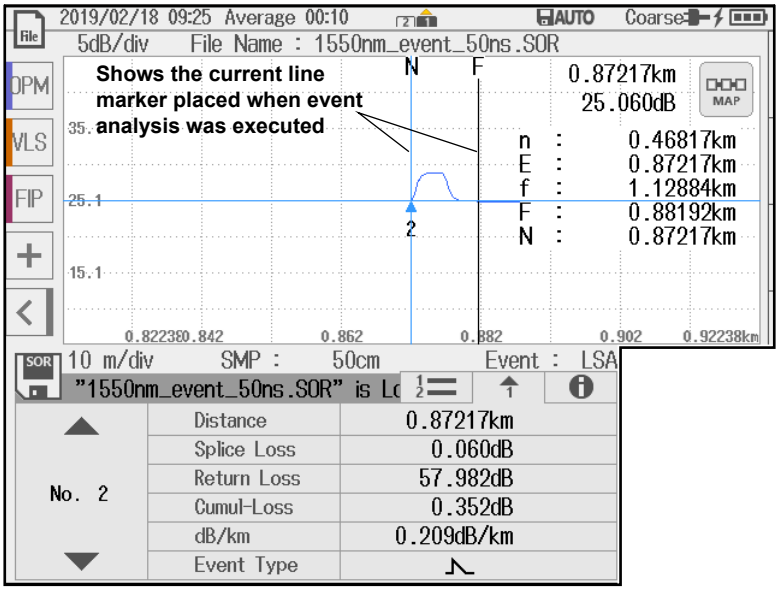
Example When Marker Mode Is Set to Marker



You can edit the splice loss and return loss values by moving the market position.

Splice loss and return loss of the selected event

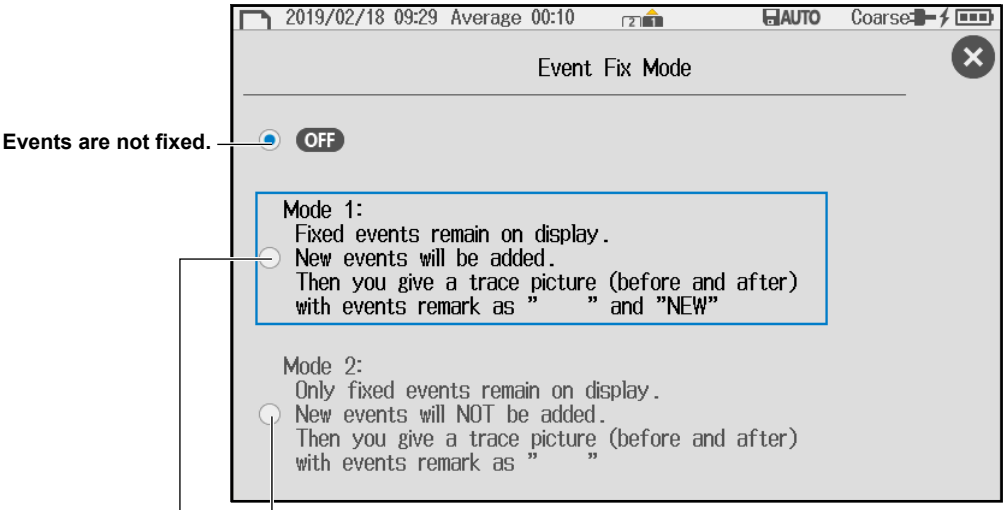
Example When Marker Mode Is Set to Line



- **Fixing Events**

  Event positions can be fixed. Fixed events are handled as master events. You can configure the Instrument so that in subsequent event analysis only master events are handled.

7. Tap the **Event Fix** soft key to display an Event Fix Mode screen.



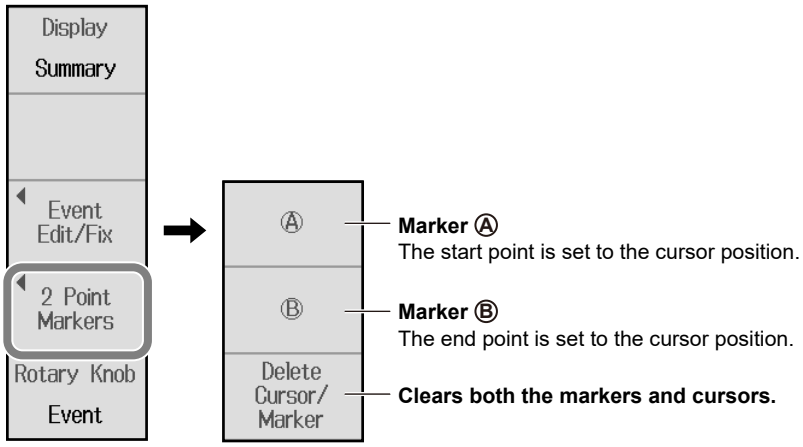
Master mode
Registers the current placed event as the master.
New events are not detected even when the waveform data is updated.
Only the master event is displayed on the updated waveform data.

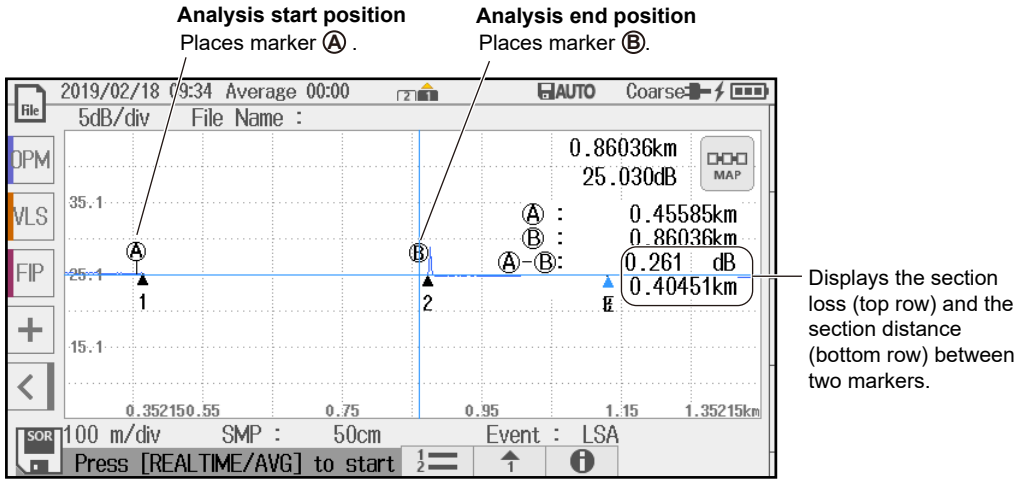
Add mode
Registers the current placed event as the master.
New events are detected when the waveform data is updated.
Both the master event and the new detected events are displayed on the updated waveform data.

2 Point Markers

The section distance and section loss between two markers are measured.

6. Tap the **2 Point Markers** soft key. A soft key menu for the 2 markers method appears.
7. Turn the **rotary knob** to move the cursor to the analysis start position.
8. Tap the Ⓐ soft key. Marker Ⓐ is displayed at the cursor position.
9. Turn the **rotary knob** to move the cursor to the analysis end position.
10. Tap the Ⓑ soft key. Marker Ⓑ is displayed at the cursor position.





Explanation

Event Analysis Results

Event No.

A number is displayed on the waveform next to the event. The measurement reference point is displayed as S and the fiber end point as E. In the section between S to E, the numbers are in ascending order from the left of the display.

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 6-6.

Splice Loss

The splice loss for each event is displayed.

Return Loss

The return loss for each event is displayed.

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.

dB/km

The loss per kilometer between events is displayed.

Event Types

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

: Superimposed reflections

Total Loss

Displayed in the following manner depending on the total loss calculation method. For the setup procedure, see section 2.3.

Cumulate loss: The integrated value of the splice losses at each event from 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.

Total Return Loss

The integrated value of the return losses of each event.

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.

Inserting an Event

- 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. For details on the distance reference, see page 6-6.
- 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.

Deleting an Event

- 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.

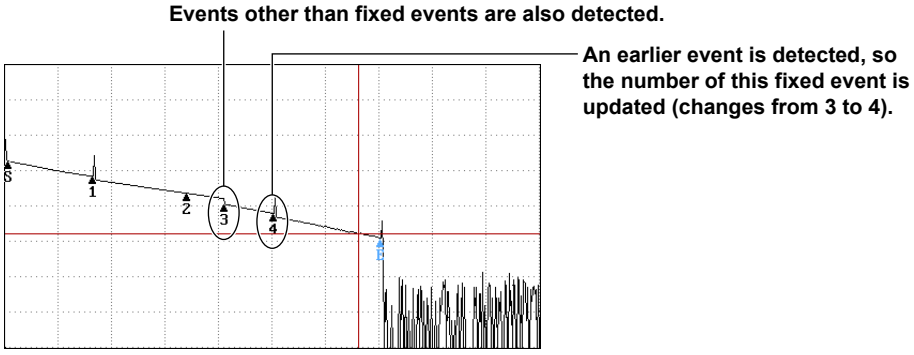
Editing Event Markers

Event markers are used to calculate the splices losses and reflection losses at event positions. Normally, event markers are automatically assigned, but when event markers are assigned to noise and other undesirable waveforms, correct values cannot be calculated. In such cases, you can obtain correct values by moving event markers.

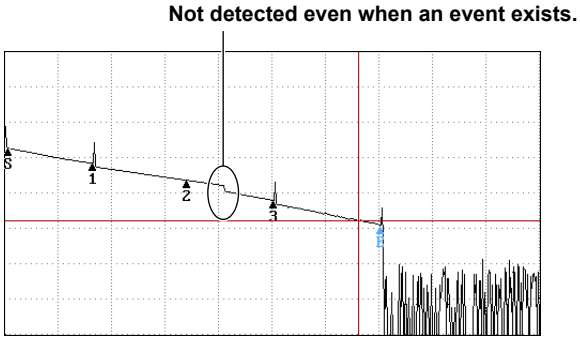
Turning the Event Position Fix Feature On and Off

Event positions can be fixed. Fixed events are handled as master events. You can configure the Instrument so that in subsequent event analysis only master events are handled.
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**
  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**
  Only the events that are detected at the master event positions are displayed in the event list.



5.2 Analyzing in MAP Mode

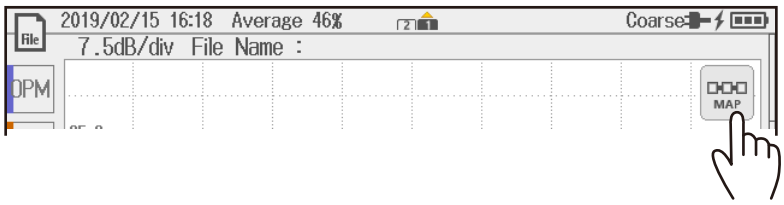
Procedure

Executing an Event Analysis

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

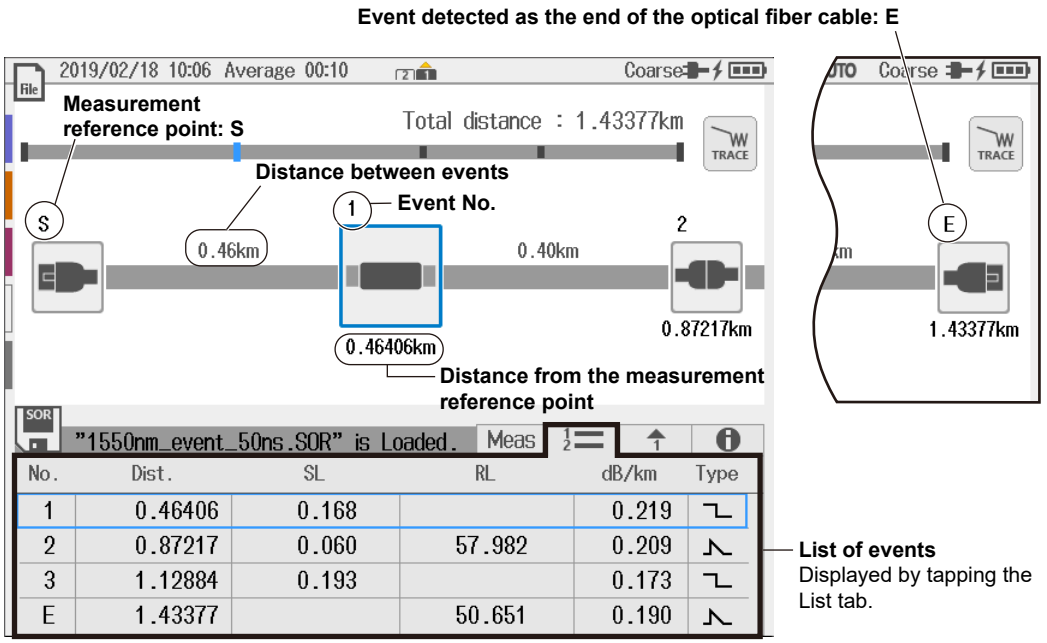
3. Tap the **TRACE**/**MAP** button to set the data display screen to MAP mode.
   When the data display screen is in MAP mode, the button is TRACE.

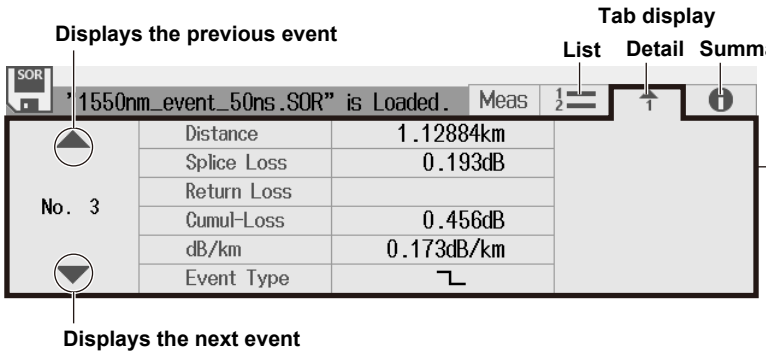


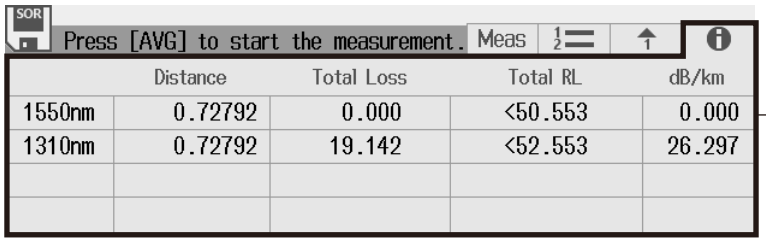
Note

If you switch the data display screen to MAP mode, event analysis is automatically performed.
The results of event analysis are displayed with icons.

Displaying Event Analysis Results

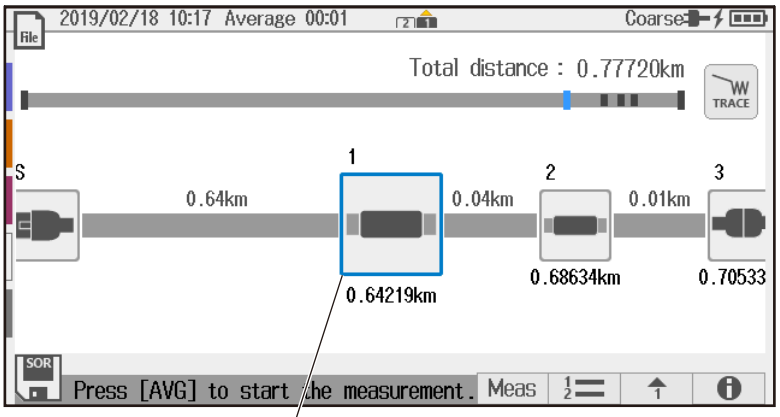


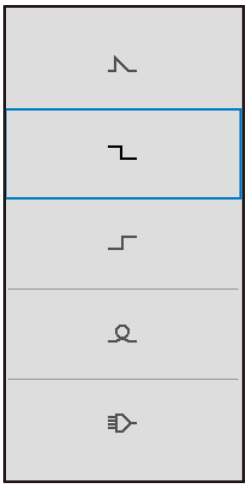




Editing Events

3. Tap an icon in the data display area. The icon is displayed in the center position.
4. Tap the icon displayed in the center position. An event type edit screen appears.
5. Select the event type you want to change to.





Explanation

Event Analysis Results

Event No.

A number is displayed on the waveform next to the event. The measurement reference point is displayed as S and the fiber end point as E. In the section between S to E, the numbers are in ascending order from the left of the display.

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 6-6.

Splice Loss

The splice loss for each event is displayed.

Return Loss

The return loss for each event is displayed.

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.

dB/km

The loss per kilometer between events is displayed.

Event Types

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


: Superimposed reflections

Total Loss

Displayed in the following manner depending on the total loss calculation method. For the setup procedure, see section 2.analytical–3.

Cumulate loss: The integrated value of the splice losses at each event from 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.

Total Return Loss

The integrated value of the return losses of each event.

6.1 Operating Cursors and Markers

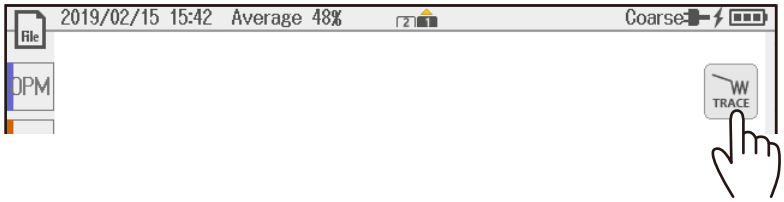
Procedure

Waveform Data Display

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.

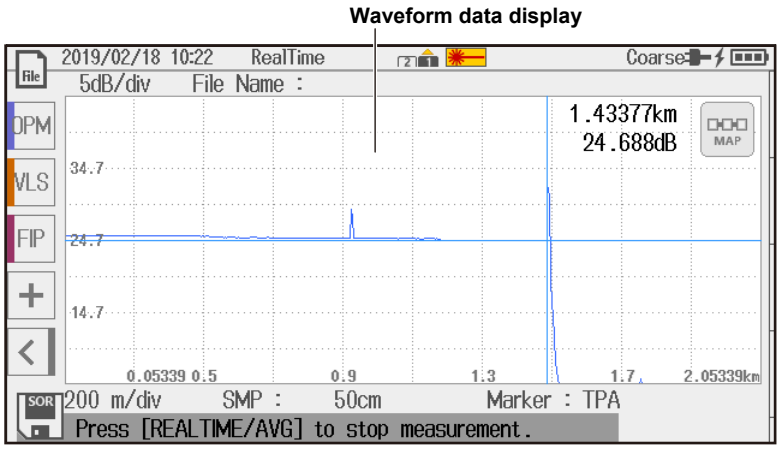


Note

You can operate cursors and markers only in TRACE mode.

- **Displaying Waveform Data**

4. Press **REALTIME**. A real-time measurement begins, and the data display screen shows the waveform.

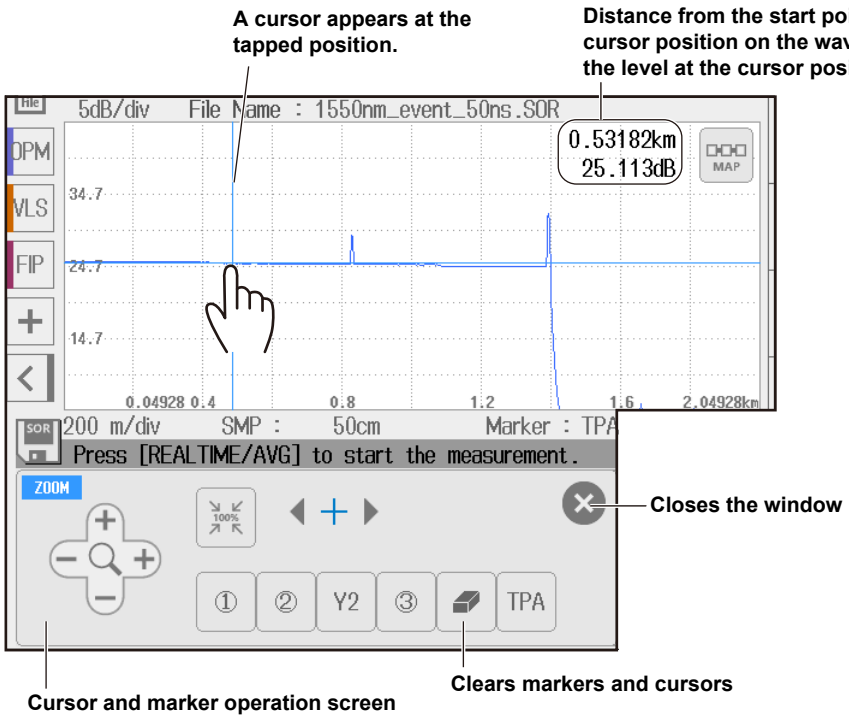


Note

- For instructions on how to use real-time measurement, see section 3.1.
- You can use cursors and markers also when you load waveform data from a USB memory device or internal memory. For instructions on how to load waveform data, see section 9.4.

Displaying the Cursors

5. Tap the data display screen. A cursor appears at the tapped position.



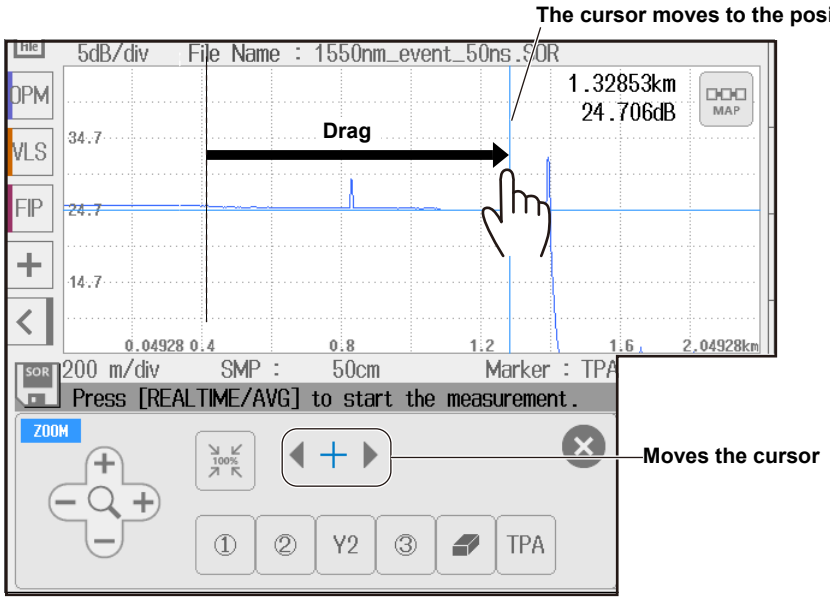
If you do not use markers or cursors for about 8 seconds, the screen will close automatically.

Note

When you turn the rotary knob to the right, a cursor appears at the left edge of the data display screen.

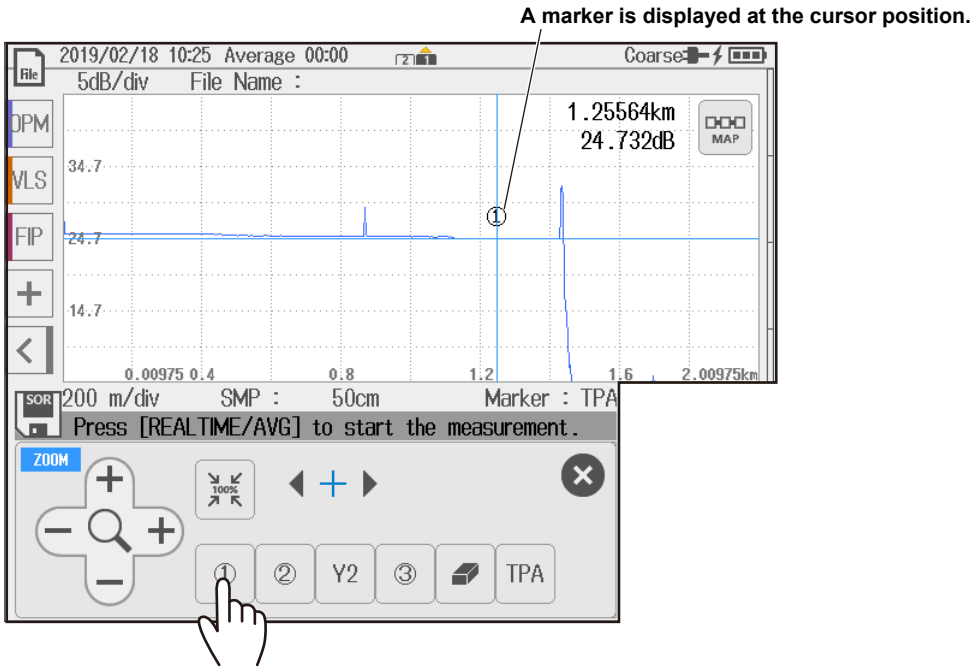
Moving the Cursor

6. Tap the position on the data display screen that you want to move the cursor to. The cursor moves to the position that you tapped. You can also move the cursor by dragging the cursor on the data display screen or by turning the rotary knob. By pressing the rotary knob, you can set the amount the cursor moves when the rotary knob is turned. For details, see "Explanation" in this section.



Marker Operation (4 Point Markers)

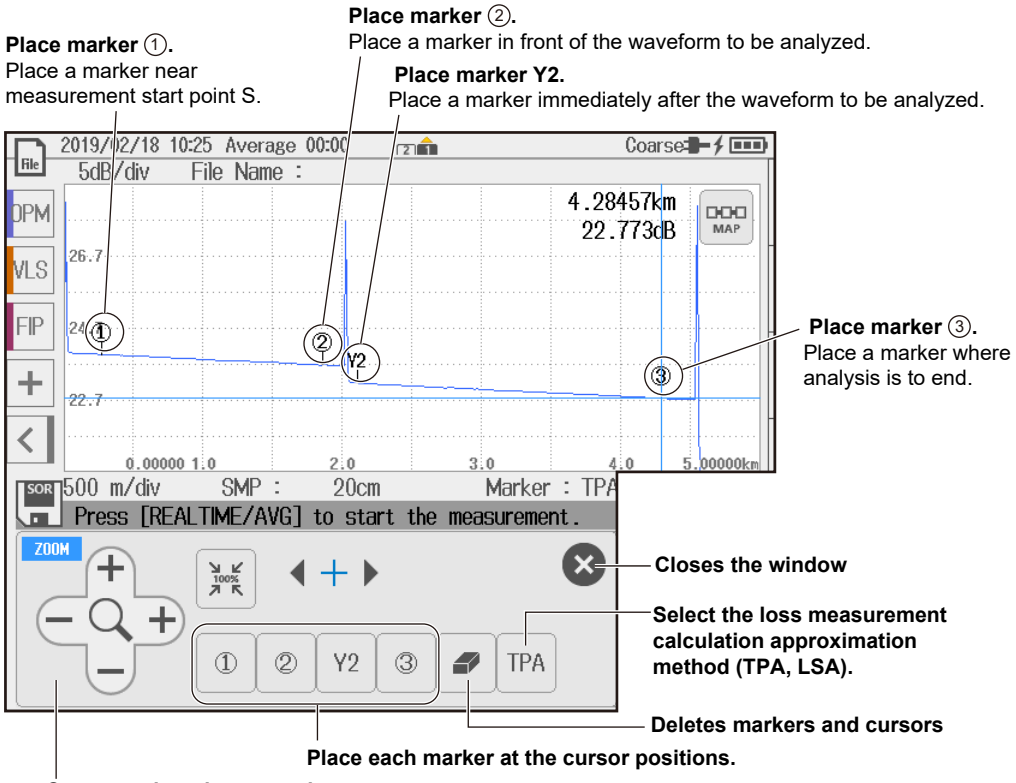
7. Tap a marker button. The selected marker is displayed at the cursor position.



Setting Markers on a Waveform

Set four markers in order starting from the position closest to measurement reference point S (example of 4 point markers).

For details on how to perform waveform analysis using markers, see the explanation.



Note

- When you set the markers, set them so that the ① marker is on the measurement start point S side.
- 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.
- For details on the approximation method, see “Approximation Method (Markers)” in section 2.2.
- For details on how to use 2 Point Markers, 5 Point Markers, 6 Point Markers, see “Soft Key Menu (Markers).”

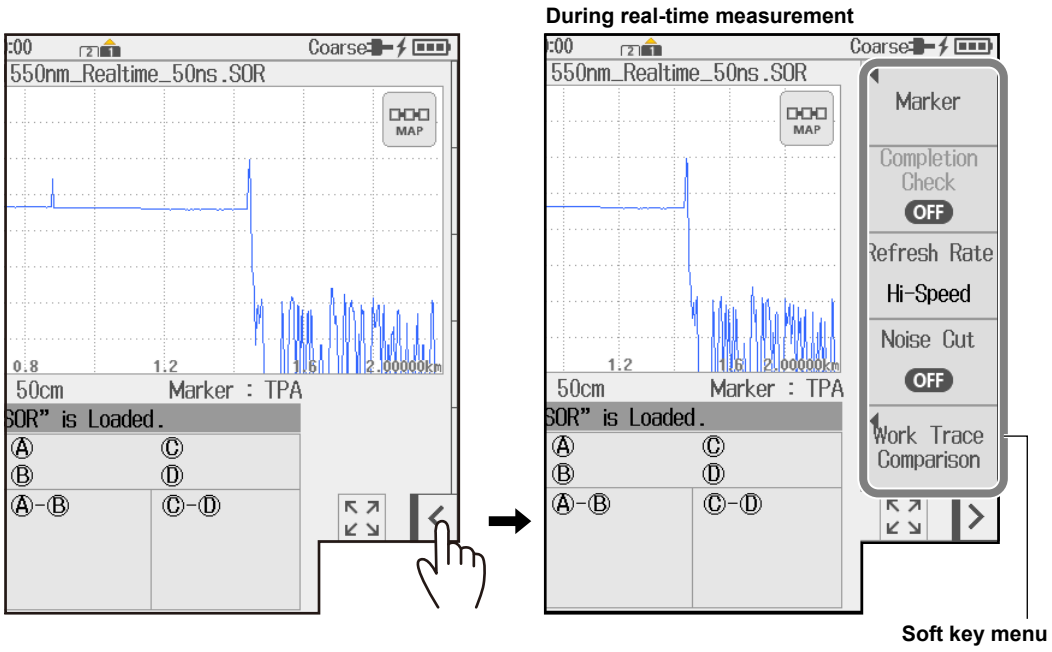
Marker Analysis Results

Splice loss and return loss values are displayed on the screen as marker analysis results.
For the analysis procedure of splice loss and return loss, see the explanation.

Soft Key Menu (Markers)

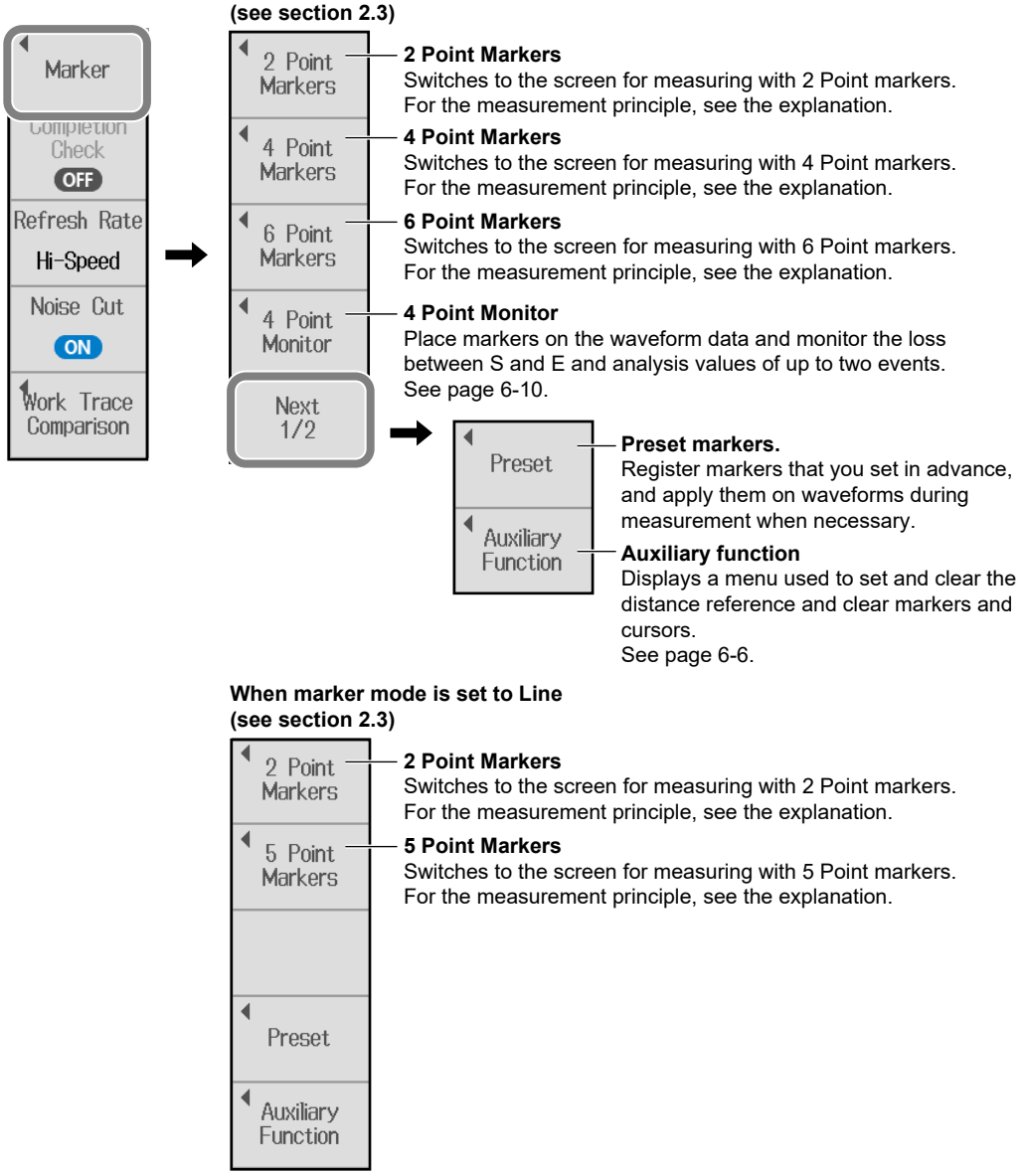
5. Tap the soft key menu display button.

The menu that can be used during real-time measurement or the menu that can be used not during real-time measurement is displayed automatically depending on the usage condition. The marker soft keys are displayed in either usage condition.



Marker Menu

6. Tap the **Marker** soft key to display the marker soft key menu.



2 Point Markers
Switches to the screen for measuring with 2 Point markers. For the measurement principle, see the explanation.

4 Point Markers
Switches to the screen for measuring with 4 Point markers. For the measurement principle, see the explanation.

6 Point Markers
Switches to the screen for measuring with 6 Point markers. For the measurement principle, see the explanation.

4 Point Monitor
Place markers on the waveform data and monitor the loss between S and E and analysis values of up to two events.
See page 6-10.

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

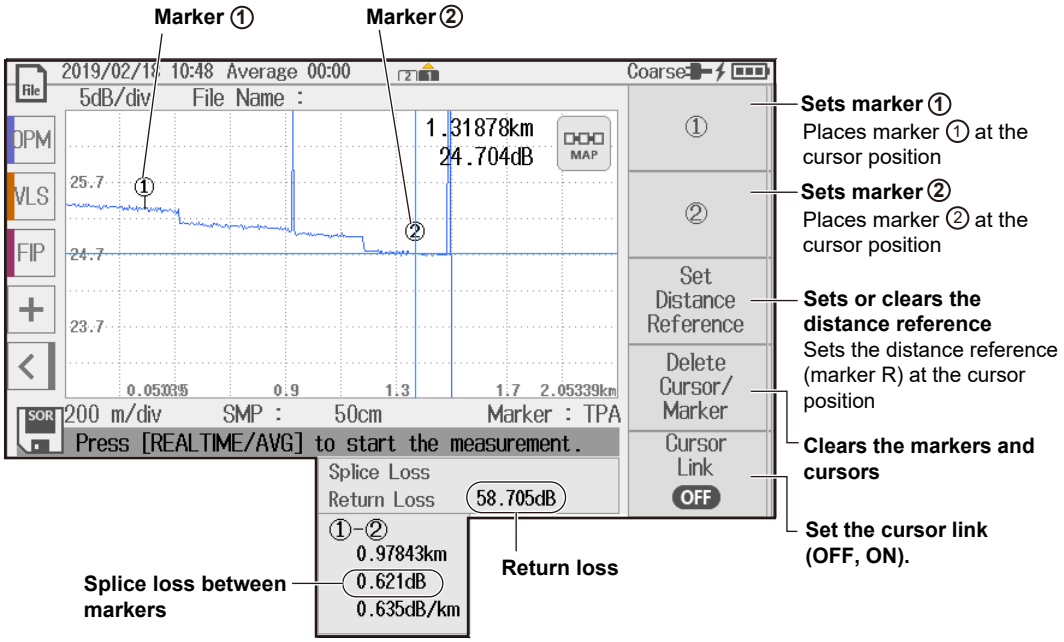
Auxiliary function
Displays a menu used to set and clear the distance reference and clear markers and cursors.
See page 6-6.

2 Point Markers
Switches to the screen for measuring with 2 Point markers. For the measurement principle, see the explanation.

5 Point Markers
Switches to the screen for measuring with 5 Point markers. For the measurement principle, see the explanation.

2 Point Markers (when the marker mode is Marker)

7. Tap the **2 Point Markers** soft key. A soft key menu for the 2 markers method appears.

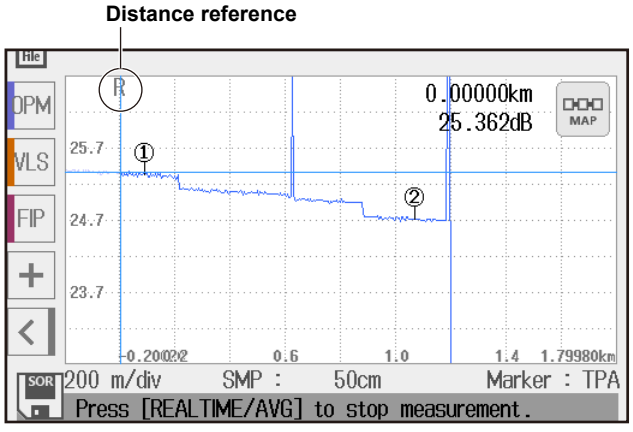


Note

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

- **Distance Reference**

  Normally, the location where the instrument 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.

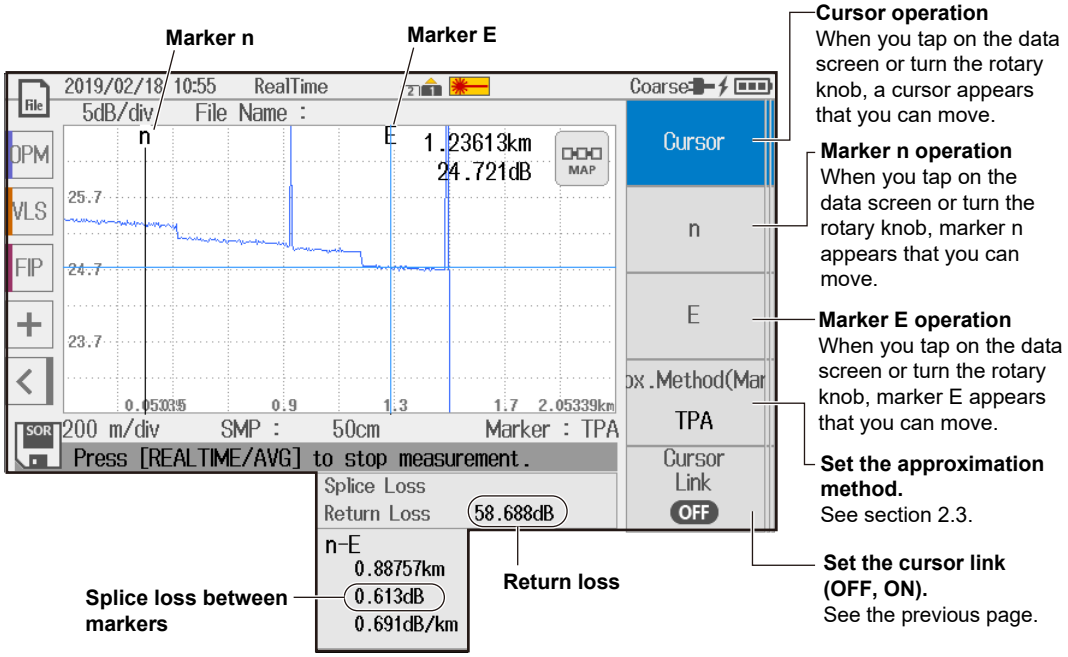


- **Cursor Link (Moving all markers together)**

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

2 Point Markers (when the marker mode is Line)

7. Tap the **2 Point Markers** soft key. A soft key menu for the 2 markers method appears.

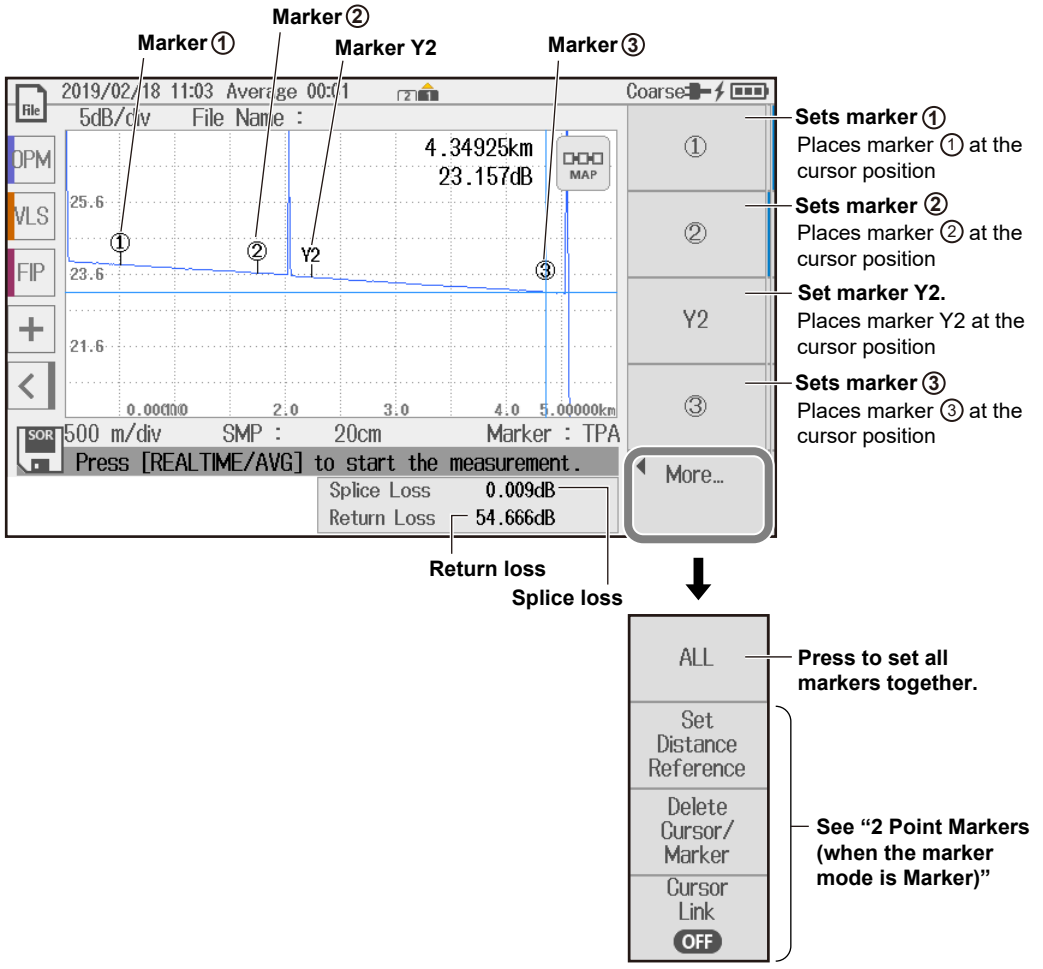


Note

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

4 Point Markers

7. Tap the **4 Point Markers** soft key. A soft key menu for the 4 markers method appears.

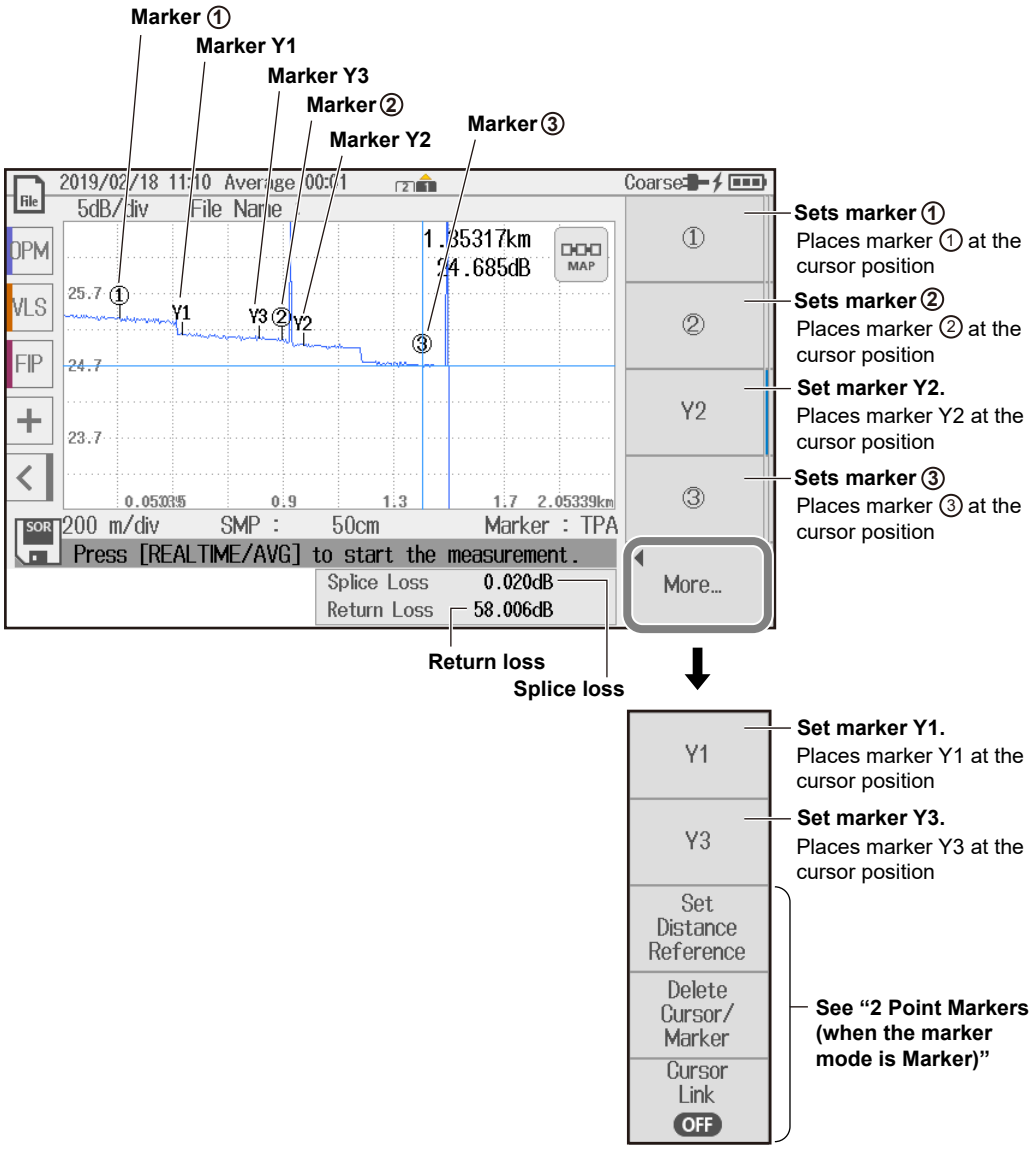


Note

- 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.

6 Point Markers

7. Tap the **6 Point Markers** soft key. A soft key menu for the 6 markers method appears.

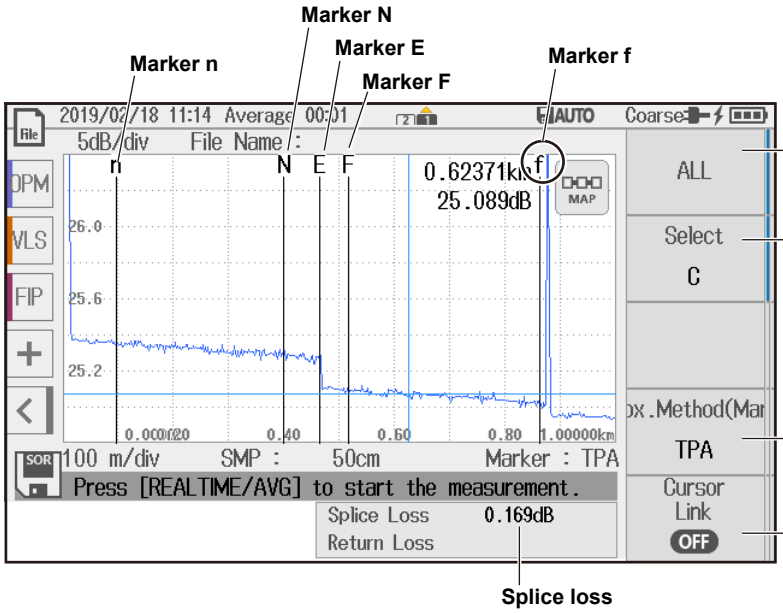


Note

- 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.

5 Point Markers (when the marker mode is Line)

7. Tap the **5 Point Markers** soft key. A soft key menu for the 5 markers method appears.



Press to set all markers together.
Sets all markers at once.

Select the marker you want to control (C, n, N, E, F, f).
Press this soft key to select the marker that you are operating. When you tap on the data screen or turn the rotary knob, the selected marker or cursor appears that you can move.

Set the approximation method.
See section 2.3.

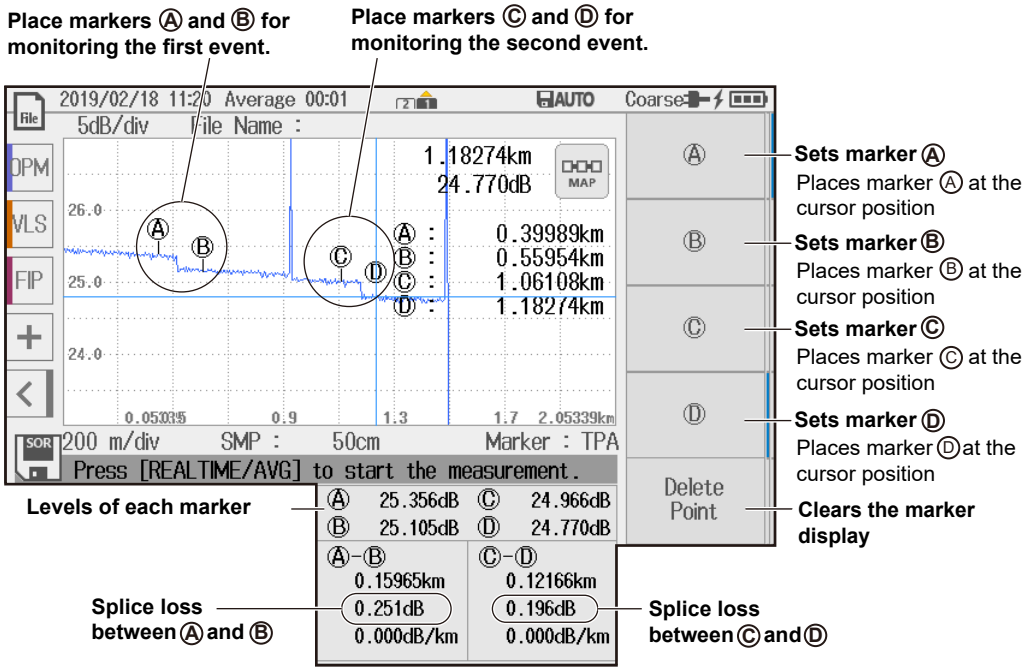
Set the cursor link (OFF, ON).
See "2 Point Markers (when the marker mode is Marker)"

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 marker E to the correct position. The splice loss changes greatly depending on the position of E.

4 Point Monitor (splice loss at two locations)

7. Tap the **4 Point Monitor** soft key to display the 4 Point Monitor soft key menu.



Sets marker Ⓐ
Places marker Ⓐ at the cursor position

Sets marker Ⓑ
Places marker Ⓑ at the cursor position

Sets marker Ⓒ
Places marker Ⓒ at the cursor position

Sets marker Ⓓ
Places marker Ⓓ at the cursor position

Clears the marker display

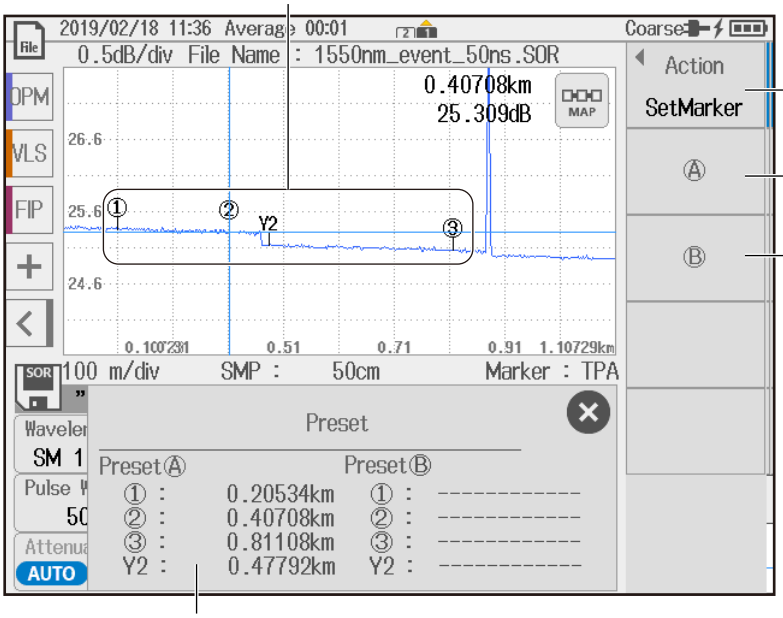
Presetting Markers

7. Using 2 Point Markers, 4 Point Markers, or 6 Point Markers (pages 6-6 to 6-9), place markers on the waveform data.

8. Tap the **Preset** soft key to display the preset soft key menu.

Select the action (Register, Delete, SetMarker)
Select the action to perform when you tap the Ⓐ or Ⓑ soft key.
Register: Registers the markers on the current waveform data to preset A or preset B.
Delete: Deletes the markers registered in preset A or preset B.
SetMarker: Displays the markers registered in preset A or preset B on the waveform.

Registers the markers (e.g., 4 Point Markers) on the current waveform data.



Executes the action on preset A

Executes the action on preset B

Displays the information of the markers registered in the preset.

- **Registering Markers**

9. Tap the **Action** soft key to select **Register**.

10. Tap the Ⓐ or Ⓑ soft key. The markers applied to the waveform are registered, and the marker information is displayed on the preset information display screen.

- **Setting the Markers Registered in Preset A or Preset B**

11. Display the measurement target waveform data on the data display screen.

12. Tap the **Action** soft key to select **SetMarker**.

13. Tap the Ⓐ or Ⓑ soft key. The markers registered in preset A or preset B are displayed on the waveform data.

Note

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

- **Deleting the Markers Registered in Preset A or Preset B**

9. Tap the **Action** soft key to select **Delete**.

10. Tap the Ⓐ or Ⓑ soft key. The markers registered in preset A or preset B are deleted.

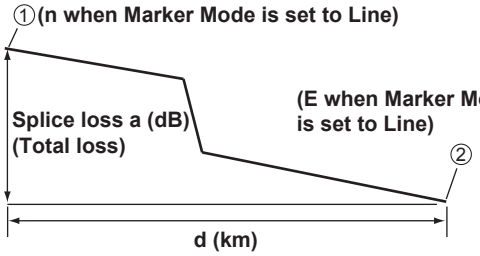
Note

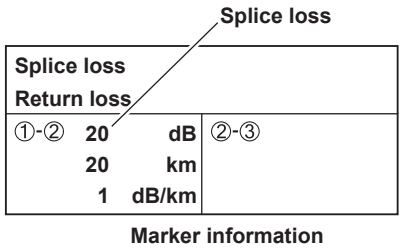
A marker applied to the waveform is not cleared. To delete markers set on the waveform, tap the Delete Cursor/Marker soft key. See page 6-6.

Explanation

2 Point Markers

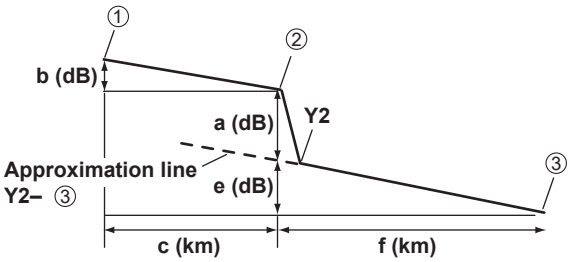
The instrument measures the distance and the loss between two points. If reflection is detected between the two points, the return loss is also measured. The splice loss value changes depending on the approximation method that you have specified. This can be used when Marker Mode is set to Marker or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

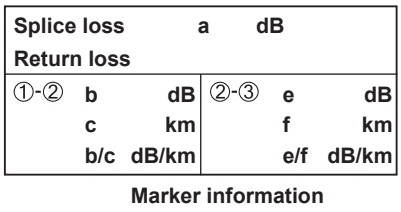




4 Point Markers

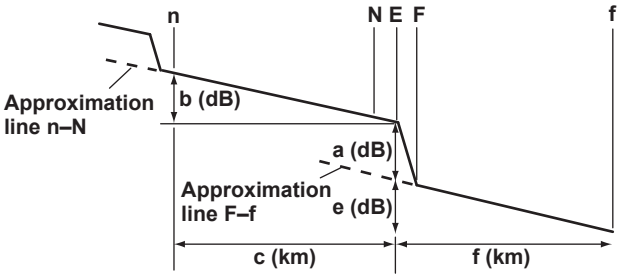
The instrument uses the following four points to perform the measurement: the measurement start point ①, the splice loss start point ②, the splice loss end point Y2, and the measurement end point ③ . At position ②, the level difference between the approximation line ②–① and the approximation line Y2–③ 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.

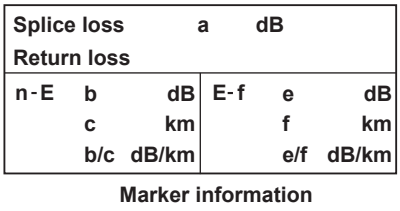




5 Point Markers (when the marker mode is Line)

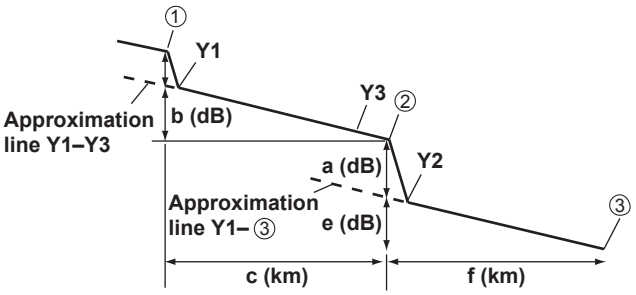
The instrument uses the following five points to perform the measurement: the near-end point (n), a point (N) that is used to calculate the near-end side's approximation line, a point (E) where splice loss is detected, a point (F) that is used to calculate the far-end side's approximation line, and the far-end point (f). At position E, the level difference between the approximation line n–N and the approximation 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.





6 Point Markers

The instrument measures using the 6-point method when there are two adjacent splice loss events. The instrument uses the following six points to perform the measurement: the first splice loss start point ①, start point Y1 used to calculate the approximation line, end point Y3 used to calculate the approximation 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 approximation line Y1–Y3 and the approximation line Y2–③ is calculated as the splice loss.



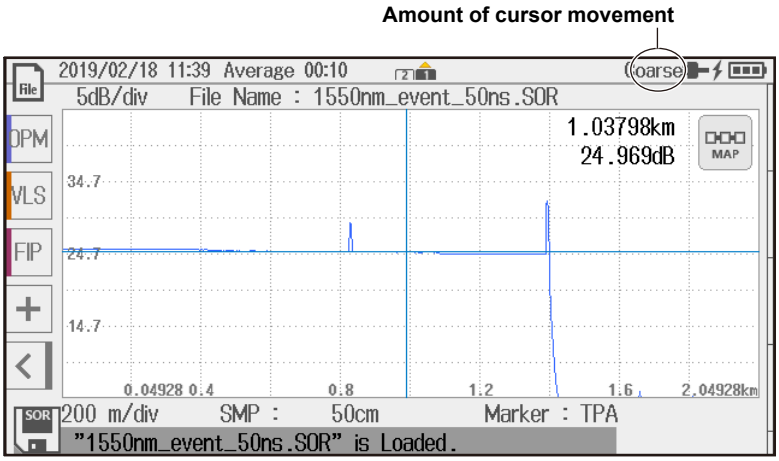
Splice loss		a	dB			
Return loss						
①-②	b		dB	②-③	e	dB
	c		km		f	km
	b/c		dB/km		e/f	dB/km

Marker information

Setting the Amount That the Cursor Moves

Press the rotary knob to set whether to move the cursor in coarse steps or fine steps. Tap the screen to set the cursor to move in fine steps.
COARSE: The cursor moves a large amount.
FINE: The cursor moves a small amount.

The amount that the cursor is set to move is displayed in the upper right of the screen.



6.2 Zooming In on or Out of Waveforms

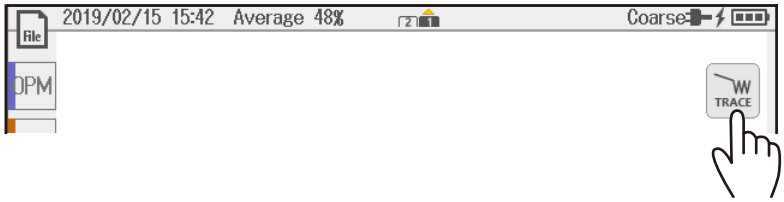
Procedure

Waveform Data Display

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

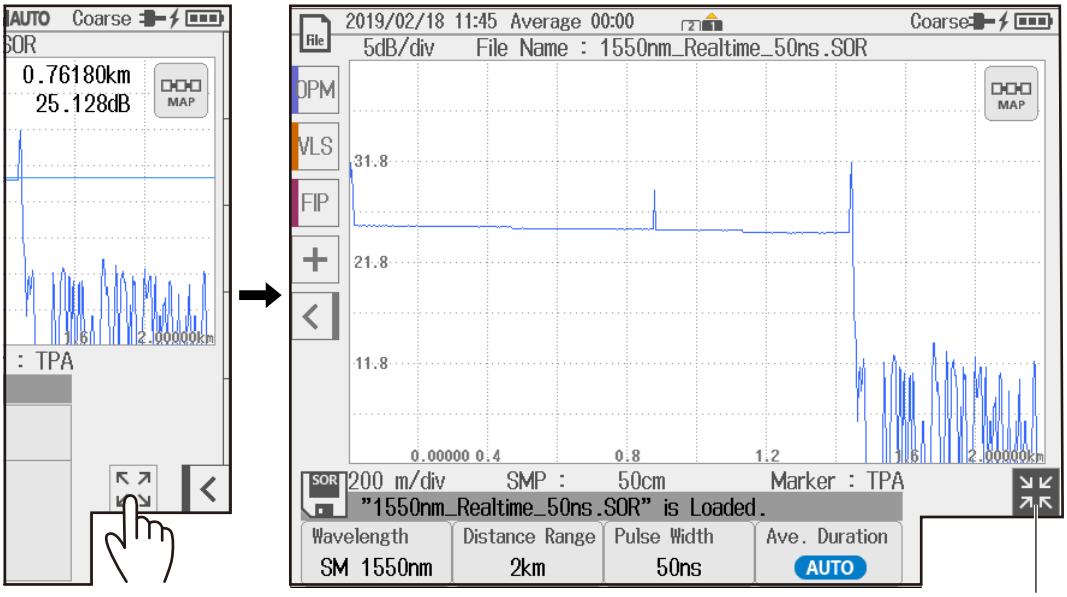
3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.



4. Perform a measurement or load a file to display a waveform on the screen.
   When performing an averaged measurement, wait for the measurement to complete. When loading a waveform data file, use an SOR file that has been measured and saved with the instrument.

Expanding the Data Display Screen

5. Tap the data display screen expand button. The area for displaying the waveform data is expanded.



Returns to the original display

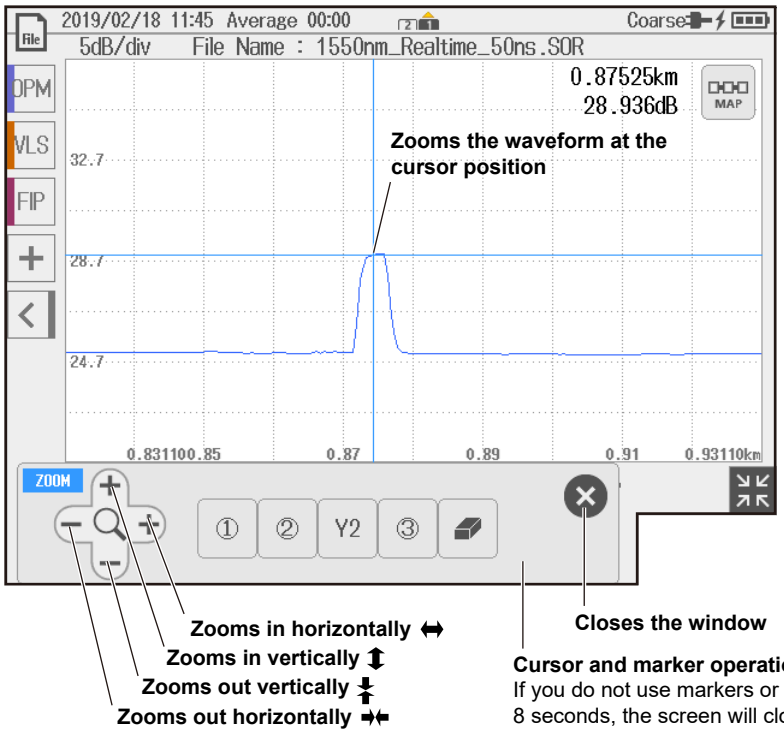
Note

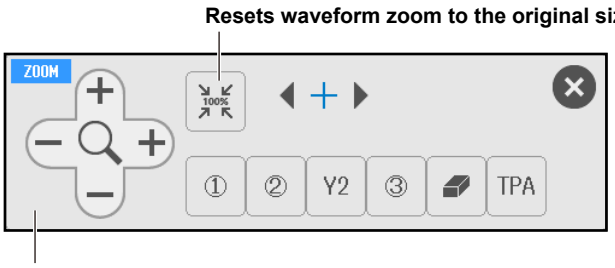
You can zoom waveforms without expanding the data display screen. Expand the data display screen if necessary. While the data display screen is expanded, you cannot use the soft key menu.

Zooming in on Waveforms

6. Display a cursor at the waveform position you want to zoom. A marker and cursor operation screen or an event edit screen appears.

For the cursor operation procedure, see section 6.1.

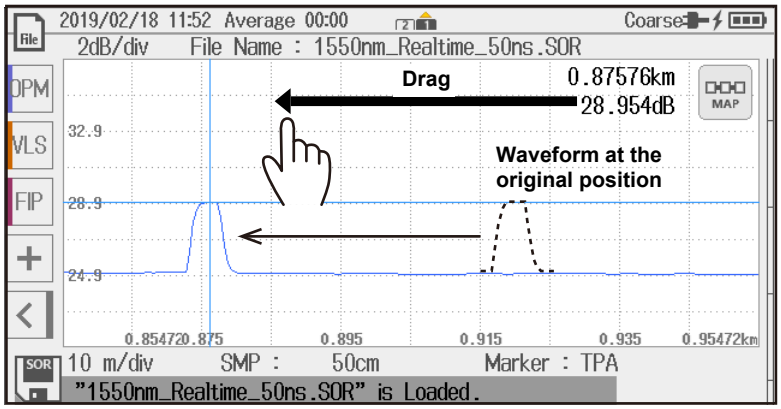




For details on the operation of the arrow keys, see “Screen Operations” in the Getting Started Guide, IM IMAQ1210-02EN.

Moving Zoom Waveforms

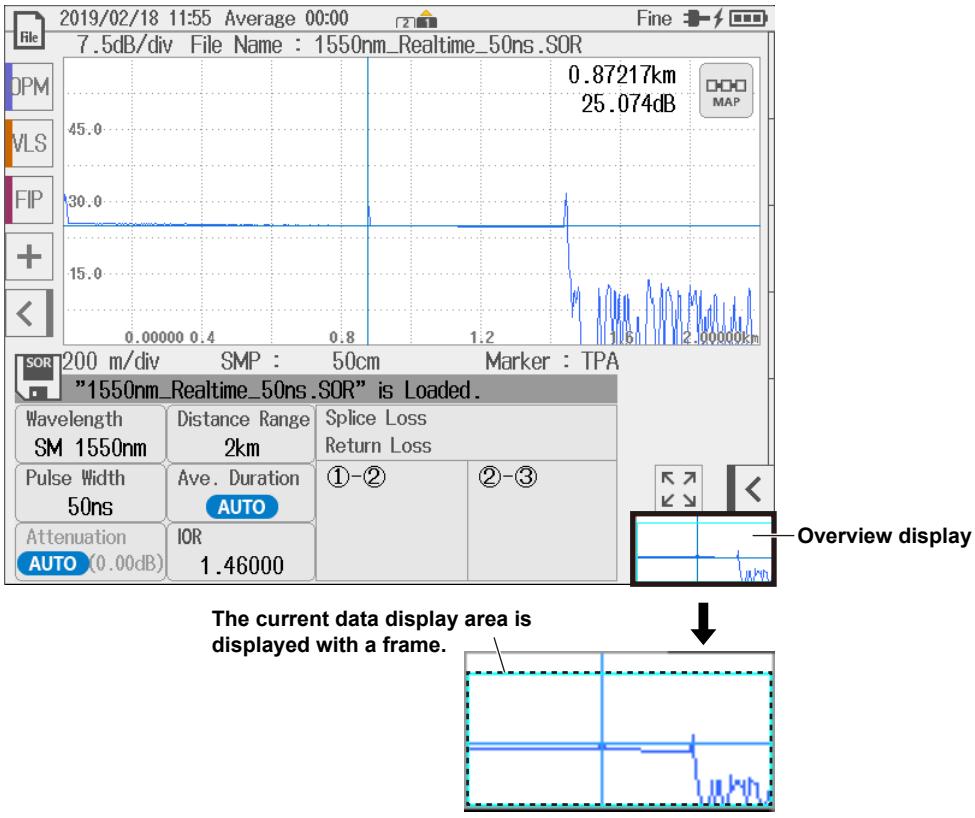
You can move zoom waveforms by dragging on the data display screen. Drag an area besides the waveform or cursor display area.



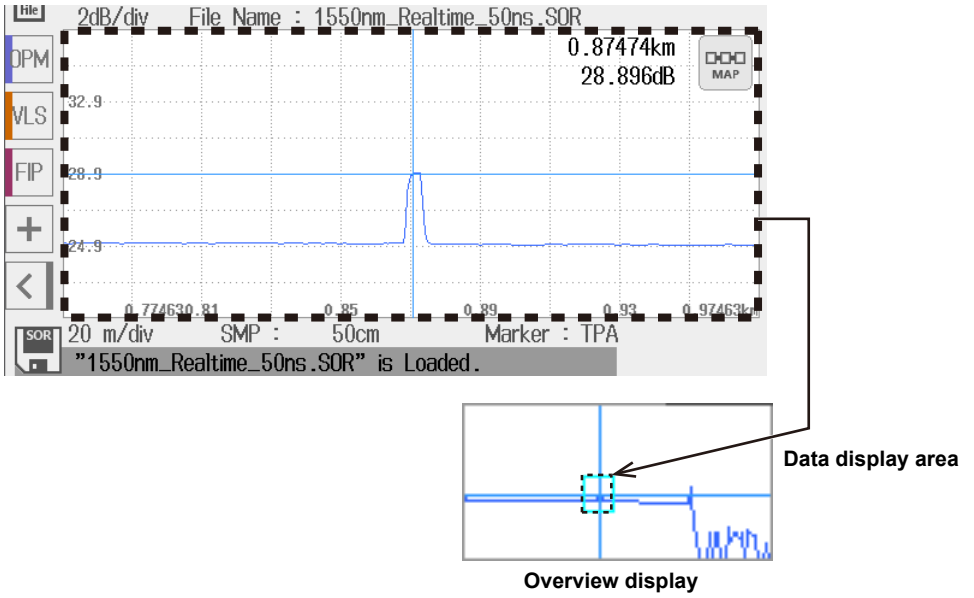
Overview Display

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

- **Example of a Full Display**



- **Example of a Zoom Display**



6.3 Displaying a Reference Trace

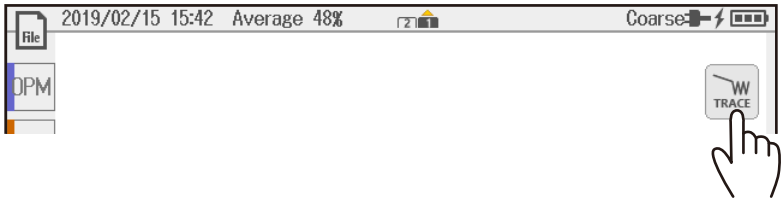
Procedure

Waveform Data Display

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.

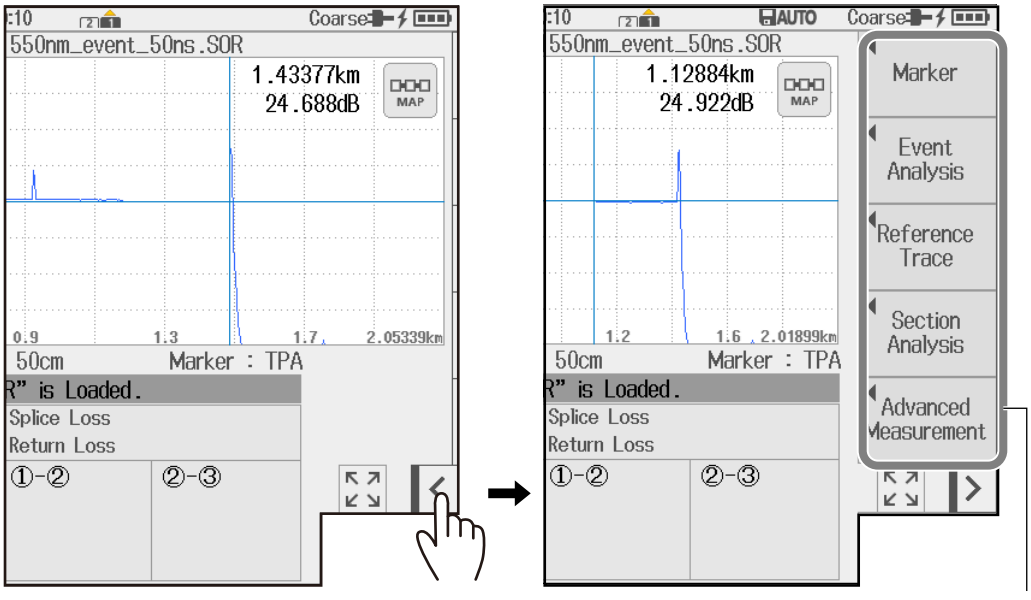


Displaying the Reference Source Waveform

4. Perform a measurement or load a file to display a waveform on the screen.
   When performing an averaged measurement, wait for the measurement to complete. When loading a waveform data file, use an SOR file that has been measured and saved with the instrument.
5. If you performed a measurement, display the waveform on the screen, and then end the measurement.

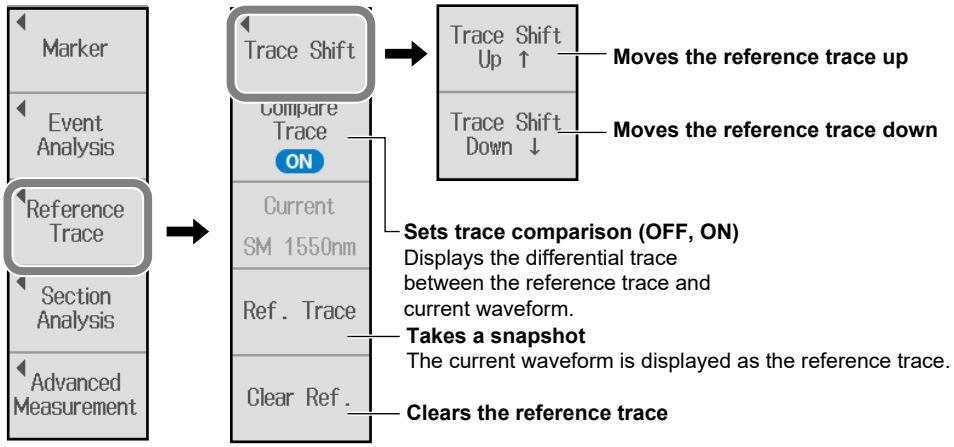
Soft Key Menu (Snapshot)

6. Tap the soft key menu display button.
   A soft key menu that can be used when real-time measurement or averaged measurement is not in progress is displayed.



Snapshot Menu

7. Tap the **Reference Trace** soft key to display the snapshot soft key menu.

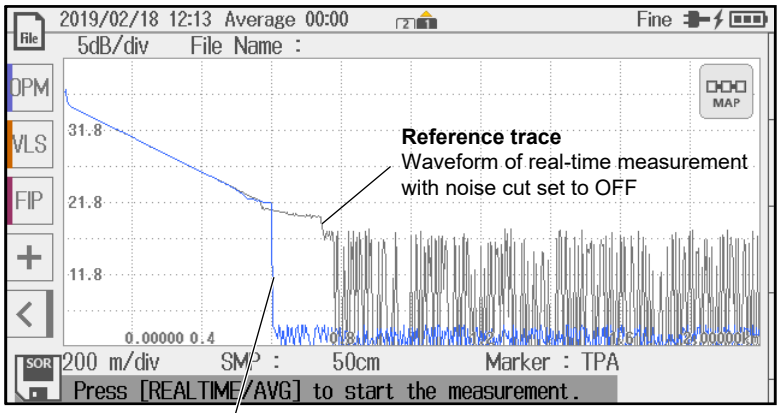


Taking a Snapshot

8. Tap the **Ref. Trace** soft key. The waveform data shown on the data display screen (current waveform) is captured as a reference trace. The reference trace is displayed with a different color from the current waveform.

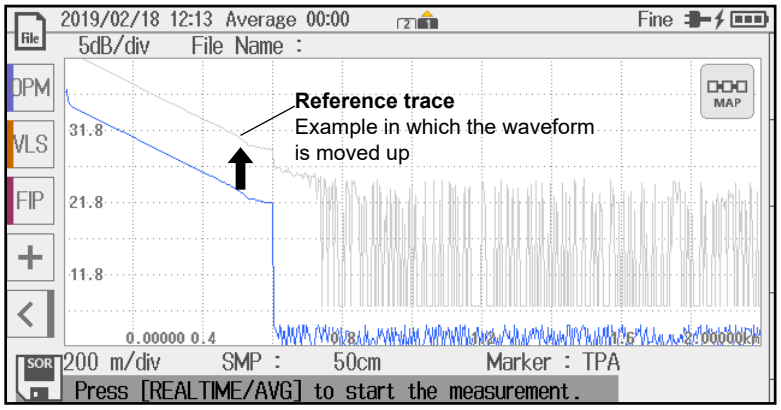
- **Displaying Both the Current Waveform and Reference Trace**

9. Execute a real-time measurement or averaged measurement to display the measurement target waveform data.



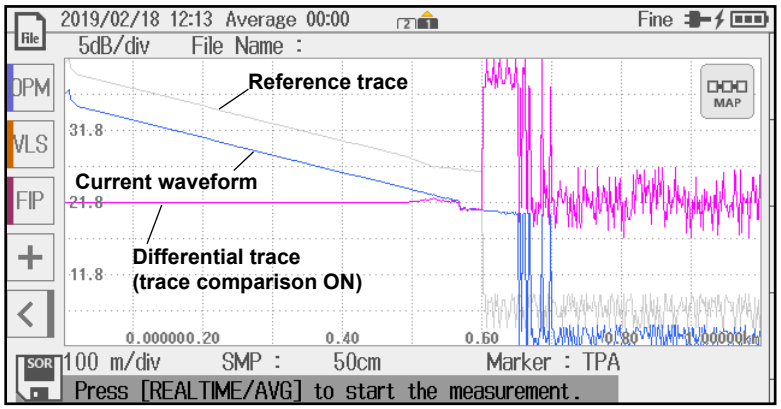
Moving the Reference Waveform Vertically

10. Tap the **Trace Shift** soft key and then the **Trace Shift Up** or **Trace Shift Down** soft key. The reference trace will move vertically.



Comparing Traces

11. Tap the **Compare Trace** soft key to select ON. Each time you tap, the value switches between ON and OFF.



Clearing the Reference Trace

12. Tap the **Clear Ref.** soft key. The reference trace will be cleared. If the differential trace is displayed at this point, it will also be cleared.

Explanation

You can perform averaged measurements or real-time measurements while retaining the previous waveform on the screen (reference trace). You can display the waveform being measured and the reference waveform at the same time to compare them. Waveform data loaded from a file can also be used as a reference trace.

Note

- You cannot perform waveform analysis or event analysis on a reference trace.
- When you load waveform data from a file, the existing reference trace is cleared.

6.4 Analyzing Sections

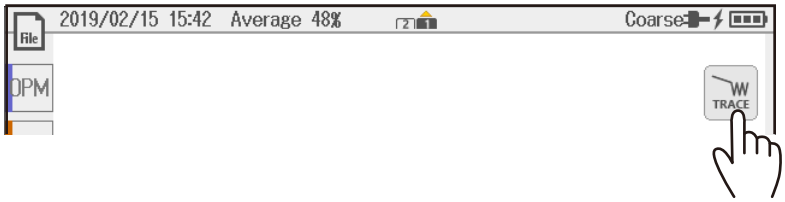
Procedure

Waveform Data Display

1. Press **MENU** to display the MENU screen.
   For details on the MENU screen, see the Getting Started Guide, IM AQ1210-02EN.
2. Tap **OTDR** to display the OTDR screen.

- **Switching the Display between TRACE Mode and MAP Mode**

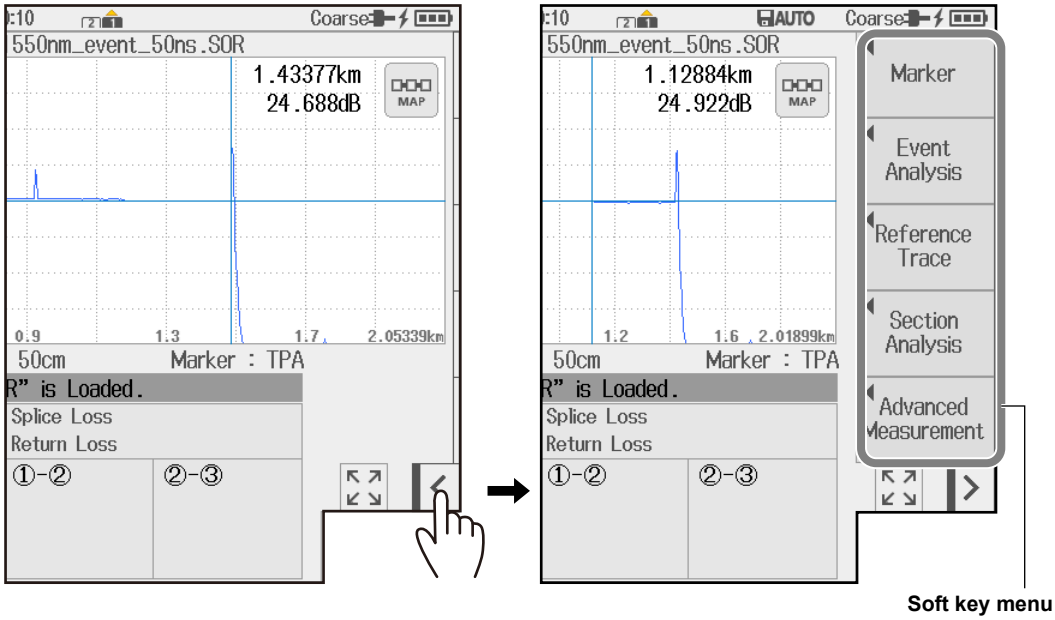
3. Tap the **TRACE**/**MAP** button to set the data display screen to TRACE mode.
   When the data display screen is in TRACE mode, the button is MAP.



4. Perform a measurement or load a file to display a waveform on the screen.
   When performing an averaged measurement, wait for the measurement to complete. When loading a waveform data file, use an SOR file that has been measured and saved with the instrument.

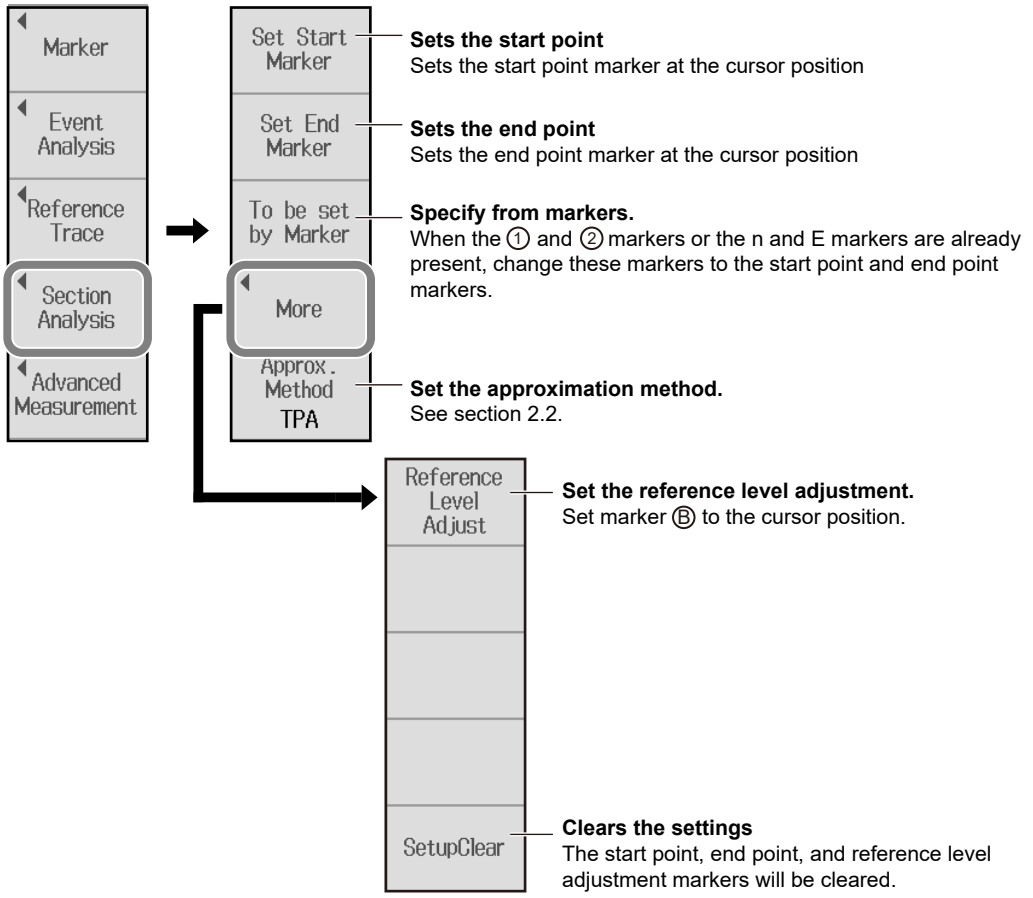
Soft Key Menu (section analysis)

5. Tap the soft key menu display button.
   A soft key menu that can be used when real-time measurement or averaged measurement is not in progress is displayed.



Section Analysis Menu

6. Tap the **Section Analysis** soft key to display the section analysis soft key menu.



Sets the start point
Sets the start point marker at the cursor position

Sets the end point
Sets the end point marker at the cursor position

Specify from markers.
When the ① and ② markers or the n and E markers are already present, change these markers to the start point and end point markers.

Set the approximation method.
See section 2.2.

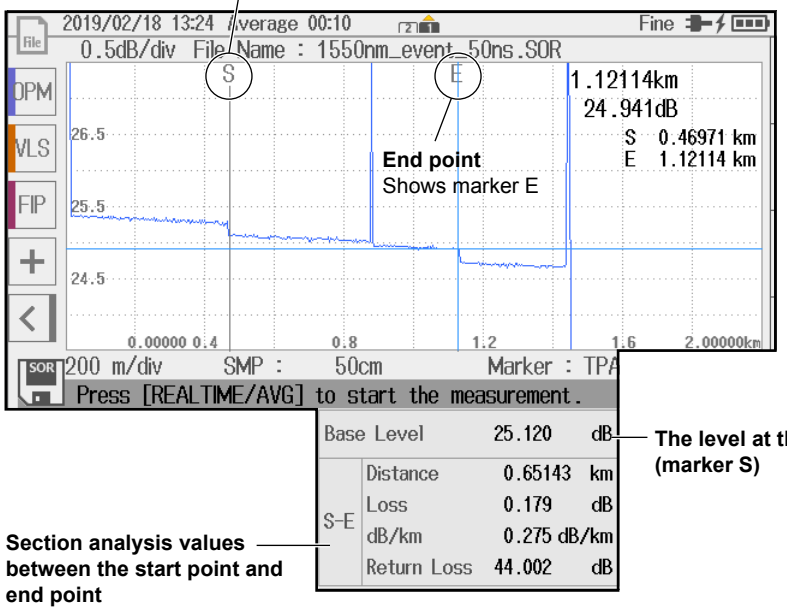
Set the reference level adjustment.
Set marker Ⓑ to the cursor position.

Clears the settings
The start point, end point, and reference level adjustment markers will be cleared.

Setting the Start and End Points

7. Move the cursor to the start point position. For the cursor operation procedure, see section 6.1.
8. Tap the **Set Start Marker** soft key to display the S marker.
9. Move the cursor to the end point position.
10. Tap the **Set End Marker** soft key to display the E marker.

Start point
Shows marker S. If a reference point (marker Ⓑ) is not specified using reference point adjustment, the start point becomes the reference point.



The level at the reference point (marker S)

Section analysis values between the start point and end point

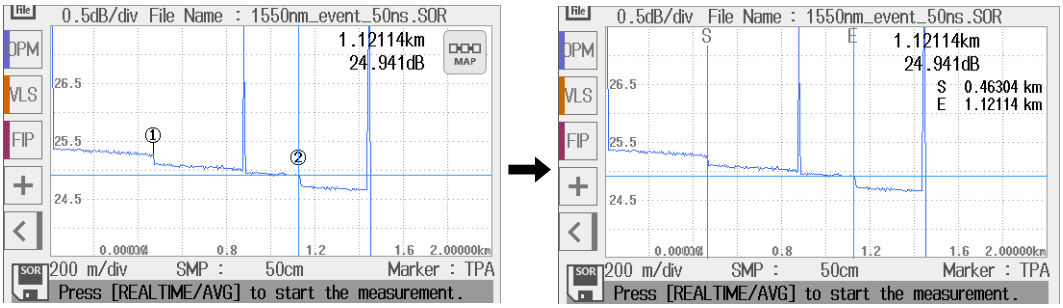
Setting the Start or End Point to a Set Marker (①, ②, n, or E)

7. Tap the **To be set by Marker** soft key. The position of marker ① or n already set on the waveform data changes to a start point and the position of marker ② or E changes to an end point.

Markers ① and ②

Tap the To be set by Marker **soft key.**

Markers S and E

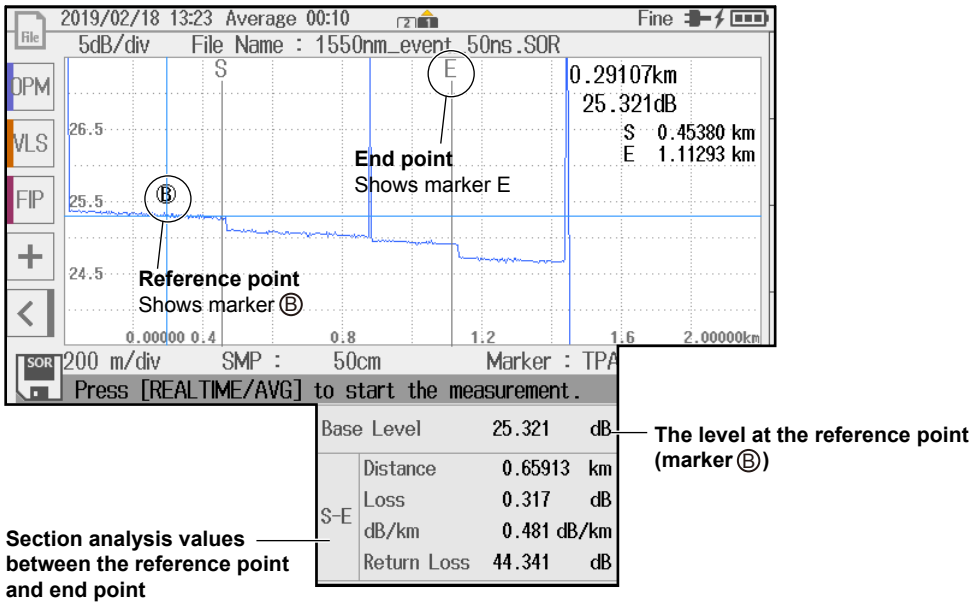


Note

For details on how to set markers ①, ②, n, and E, see section 6.1.

Adjusting the Reference Level

7. Tap the **More** soft key and then the **Reference Level Adjust** soft key. Marker Ⓑ appears.



Explanation

Section Analysis

In section 6.1, each item was measured with the distance reference as the reference point, but in section analysis, each item is measured with the location that is specified as the start point within the specified section as the reference point.

The distance, return loss, total loss, and loss per division (dB/km) between the S and E markers are displayed on the screen.

Marker Auto Setting (set from markers)

You can automatically set marker ① or marker n as the start point and marker ② or marker E as the end point.

You can use this feature to automatically set markers on waveform data in which marker ① and ② or n and E are already set.

Adjusting the Reference Level

If you set marker Ⓑ, which represents the reference point, the return loss is measured with this location as the reference. The instrument uses the backscattering light level of the reference point to calculate the return loss. If you do not set the reference point, the start point is used as the reference point.

7.1 Using the Light Source

WARNING

During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. Visual impairment may occur if the light enters the eye.

French

AVERTISSEMENT

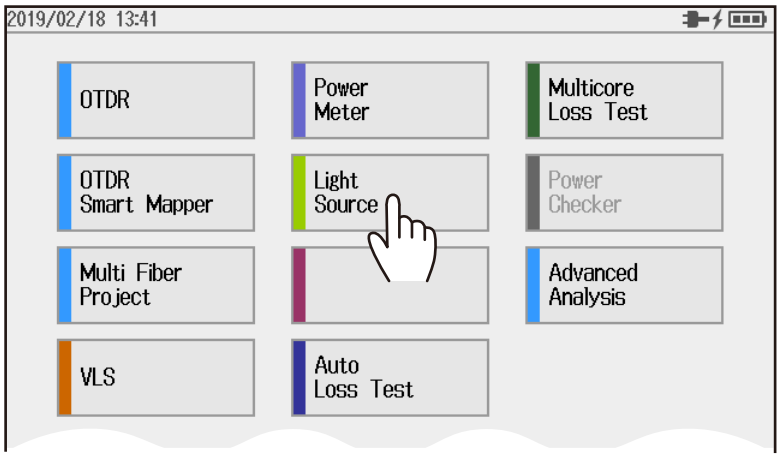
Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.

Procedure

Displaying the Light Source Screen

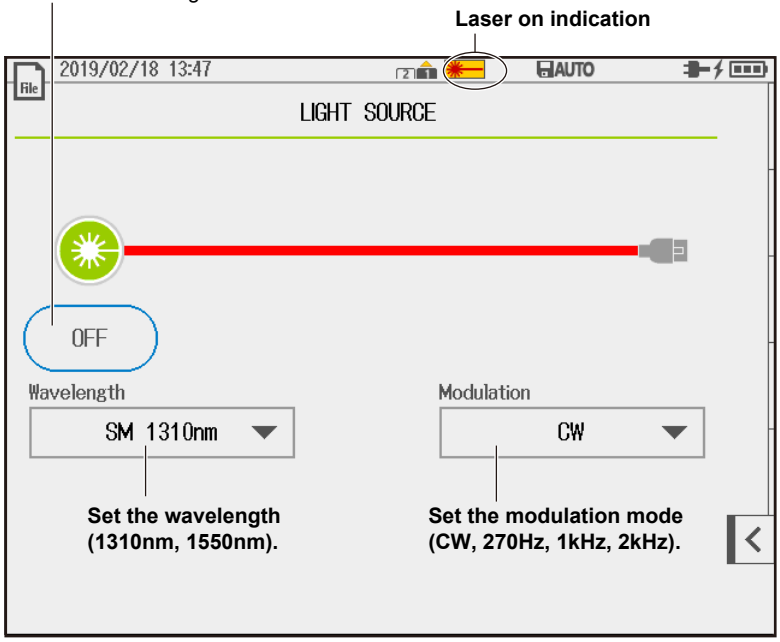
1. Press **MENU** to display the MENU screen.
2. Tap **Light Source** to display the LIGHT SOURCE screen.

MENU screen



Light Source Screen

Turns the optical output on and off
When you tap the ON button, the measurement light turns on. The button changes to OFF, and a mark appears on the instrument display to indicate that the light is on. When you tap the OFF button, the measurement light turns off.

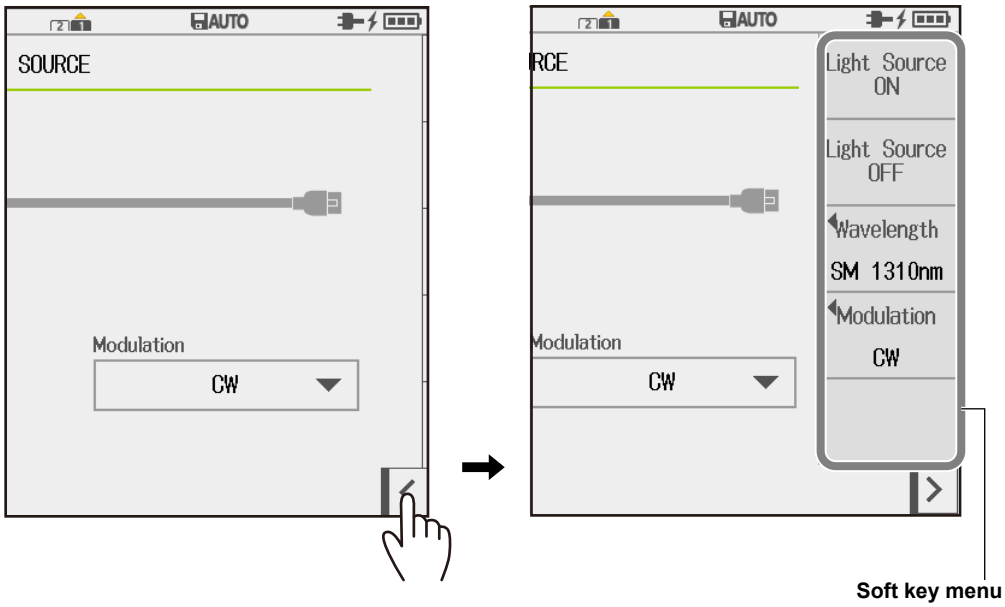


Note

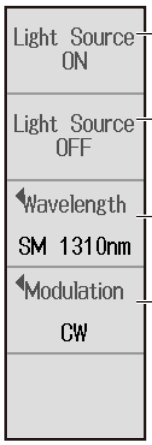
- Check the wavelength and modulation mode settings before turning on the light source.
- This section explains the utility Light Source menu. You can also control the light source feature from the utility Power Meter menu. For details on the light source feature of the Power Meter menu, see page 7-11.

Soft Key Menu (Light source)

3. Tap the soft key menu display button. A light source soft key menu appears.



Light Source Menu



Turns the light on
Outputs the measurement light
A mark appears on the instrument display to indicate that the light is on.

Turns the light off
Stops the measurement light
The light mark disappears.

Set the wavelength.
The options vary depending on the model.

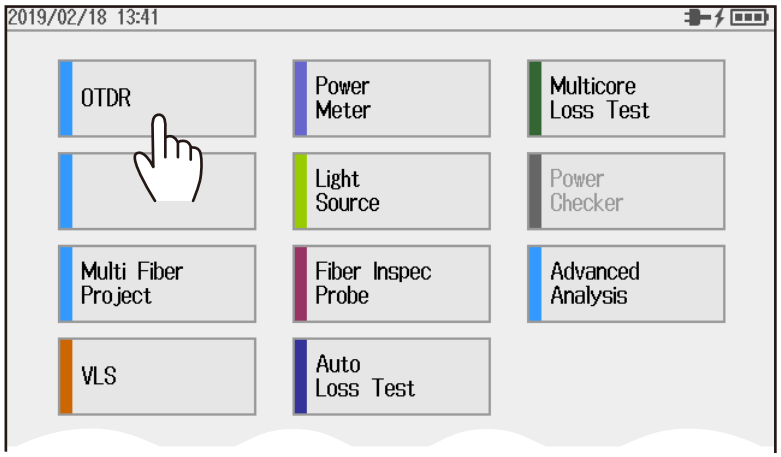
Set the modulation mode.
The options vary depending on the model.

Using the Light Source from the OTDR Screen (utility button)

Displaying the OTDR Screen

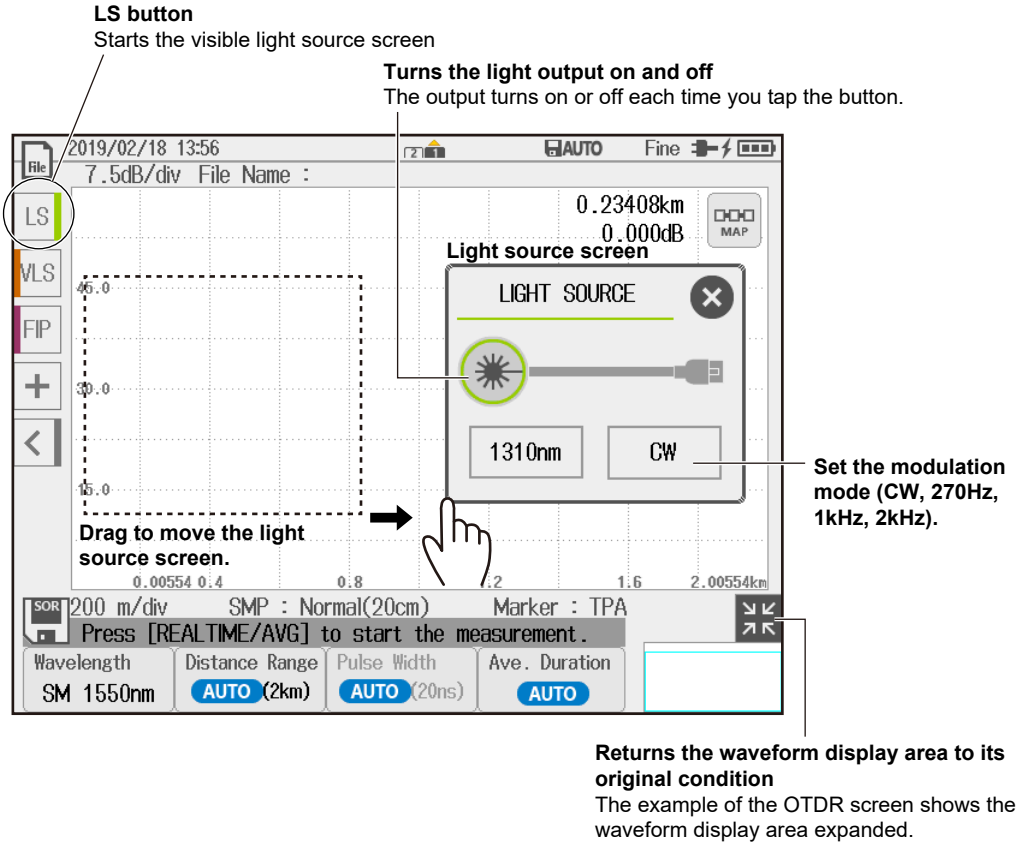
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.

MENU screen



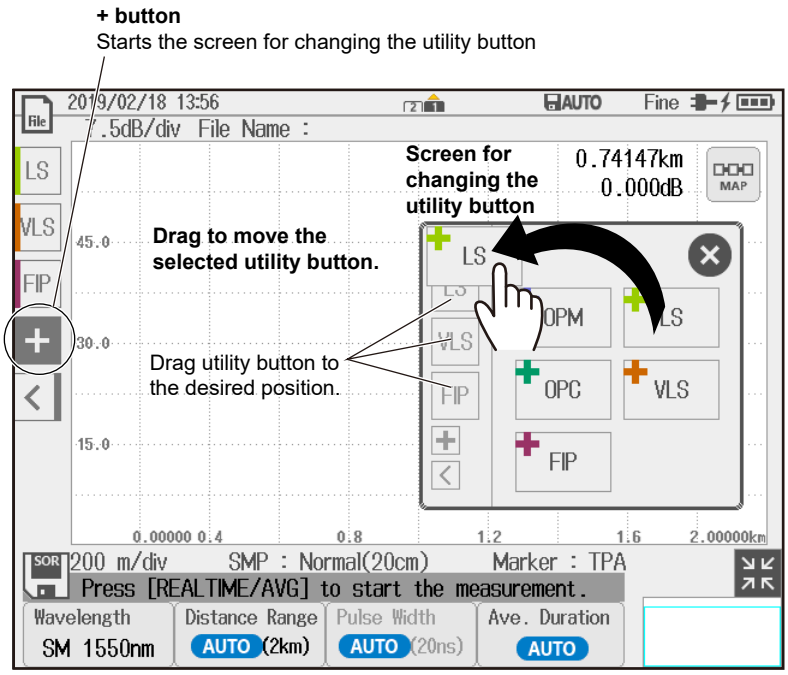
OTDR Screen

3. Tap **LS** to display the light source screen.
   If the LS button is not displayed, proceed to step 4.



- **Changing a Utility Button**

4. Tap **+** to display the utility button edit screen.



Explanation

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
AQ1210A	1310 nm, 1550 nm
AQ1215A	1310 nm, 1550 nm
AQ1210E	1310 nm, 1550 nm, 1625 nm
AQ1215E	1310 nm, 1550 nm, 1625 nm
AQ1215F	1310 nm, 1550 nm, 1650 nm
AQ1216F	1310 nm, 1550 nm, 1650 nm

7.2 Using the Visible Light Source (/VLS option)

WARNING

During measurement, light is transmitted from the VLS port. Do not disconnect the connected optical fiber cable. Visual impairment may occur if the light enters the eye.

French

AVERTISSEMENT

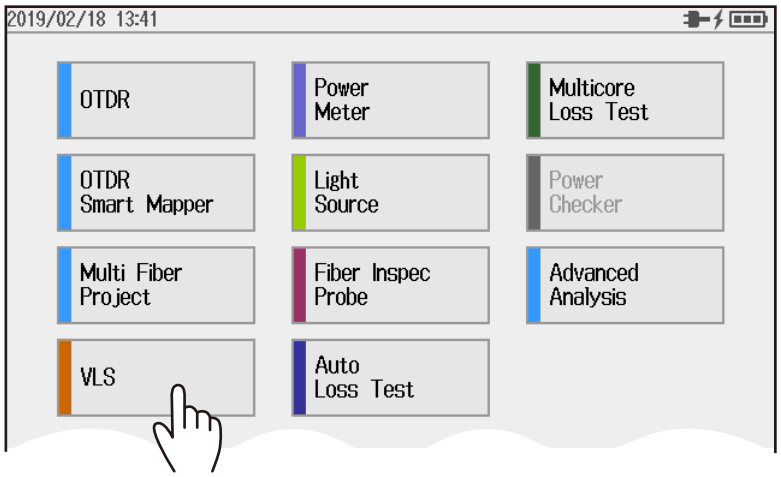
Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.

Procedure

Displaying the Visible Light Source Screen

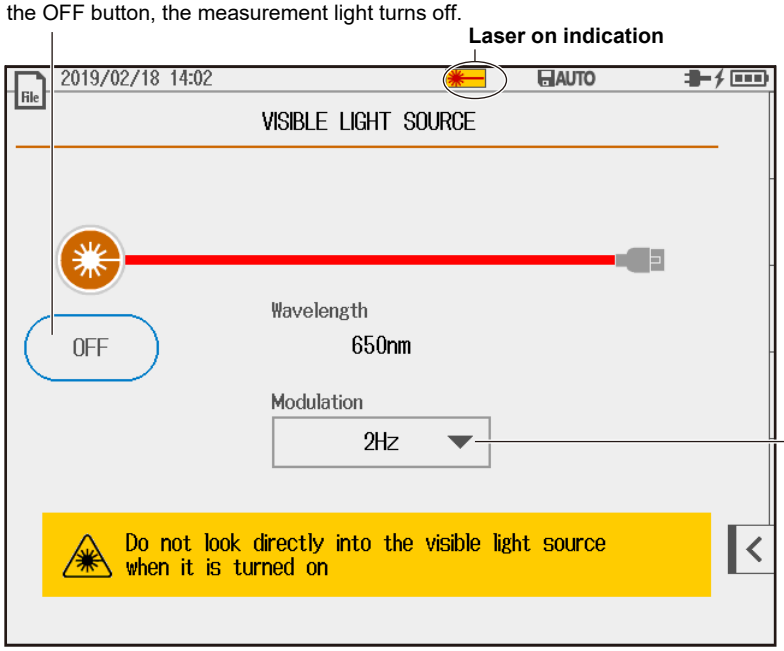
1. Press **MENU** to display the MENU screen.
2. Tap **VLS** to display the VISIBLE LIGHT SOURCE screen.

MENU screen



Visible Light Source Screen

Turns the optical output on and off
When you tap the ON button, the measurement light turns on. The button changes to OFF, and a mark appears on the instrument display to indicate that the light is on. When you tap the OFF button, the measurement light turns off.

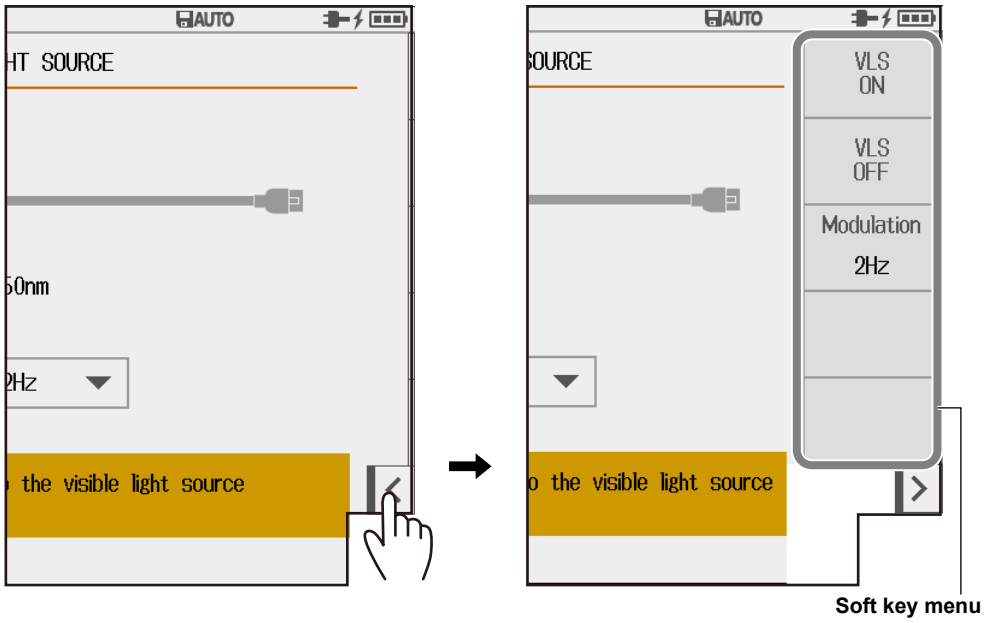


Note

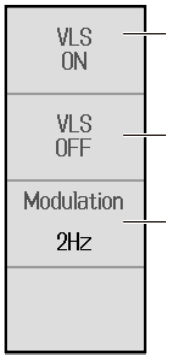
Connect an optical fiber cable to the VLS port (/VLS option).

Soft Key Menu (Visible light source)

3. Tap the soft key menu display button. A light source soft key menu appears.



VLS Menu



Turns the light on
Outputs the measurement light
A mark appears on the instrument display to indicate that the light is on.

Turns the light off
Stops the measurement light
The light mark disappears.

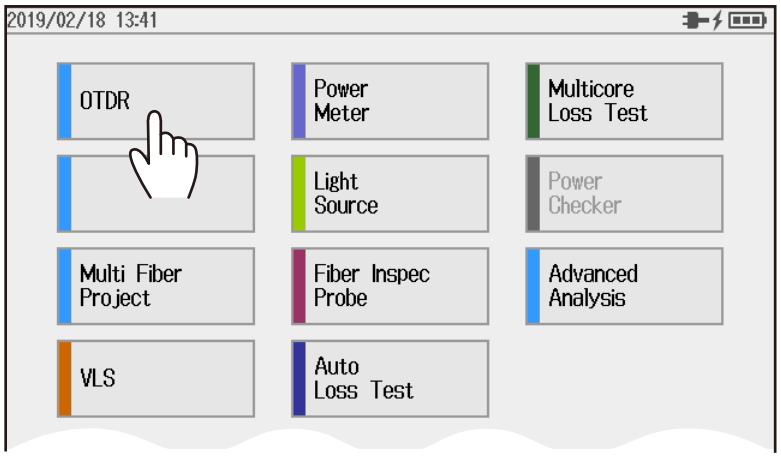
Set the modulation mode (CW, 2Hz).

Using the VLS from the OTDR Screen (utility button)

Displaying the OTDR Screen

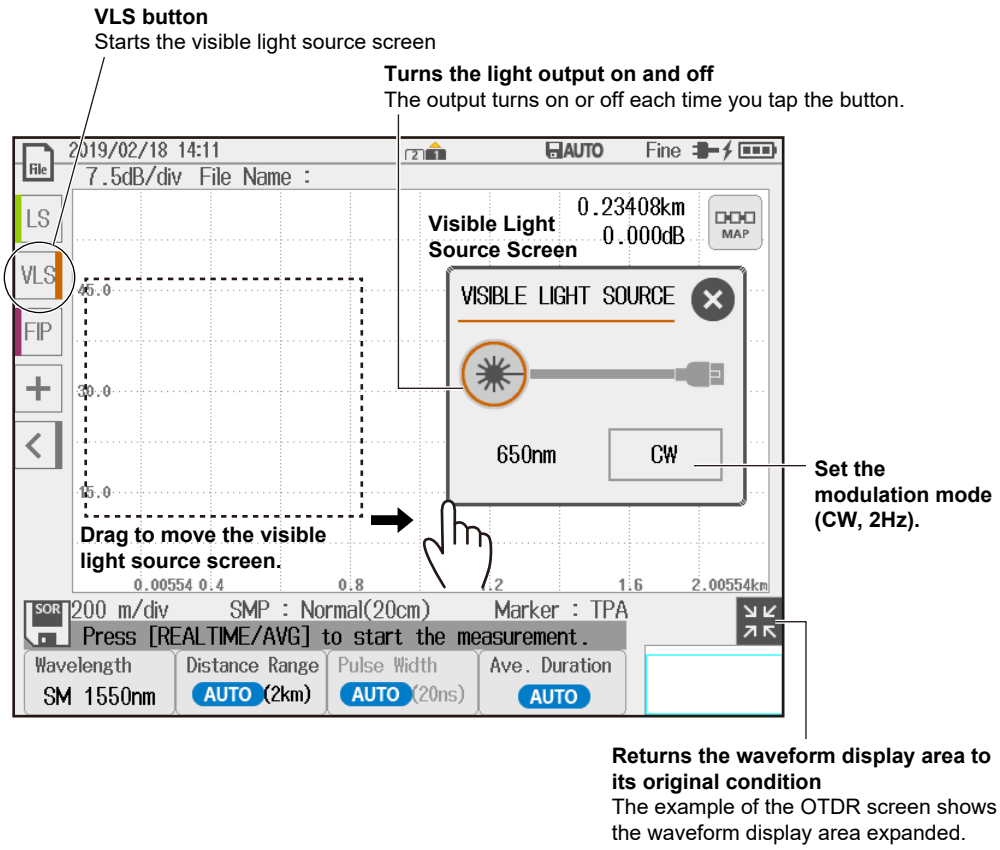
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.

MENU screen



OTDR Screen

3. Tap **VLS** to display the visible light source screen.



Note

If the VLS button is not displayed, see “Changing a Utility Button” under “Using the Light Source from the OTDR Screen (utility button)” in section 7.1.

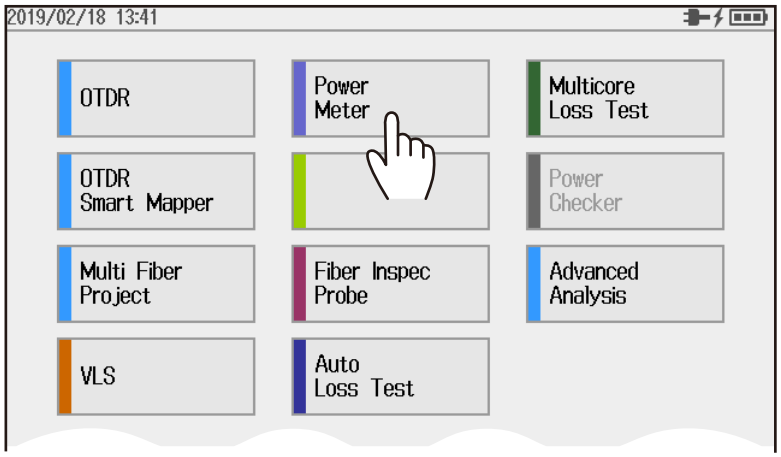
7.3 Using the Optical Power Meter

Procedure

Displaying the Optical Power Meter Screen

1. Press **MENU** to display the MENU screen.
2. Tap **Power Meter** to display the POWER METER screen.

MENU screen



Power Meter Screen

Enter a value and assign it to the reference value (–80 to 40dBm)
The reference value appears if you press the DREF soft key or set the unit to dB. Tapping the value or the word Reference displays a number input screen.

Sets the reference value to the current measured value (–80 to 40dBm).
The reference value appears if you press the DREF soft key or set the unit to dB.

Set the unit (dB, dBm, W).

Minimum value

Measured value

Maximum value

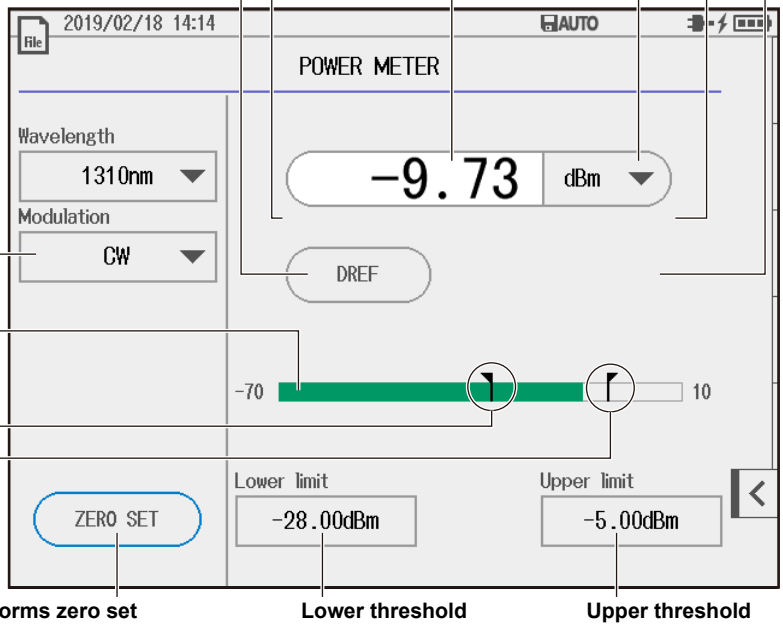
Set the wavelength.[1]
The wavelength you can set varies depending on the selected wavelength mode described on the next page.

Set the modulation mode
(CW, 270Hz, 1kHz, 2kHz).

Bar graph display of the measured value

Line indicating the lower threshold

Line indicating the upper threshold



Performs zero set

Lower threshold

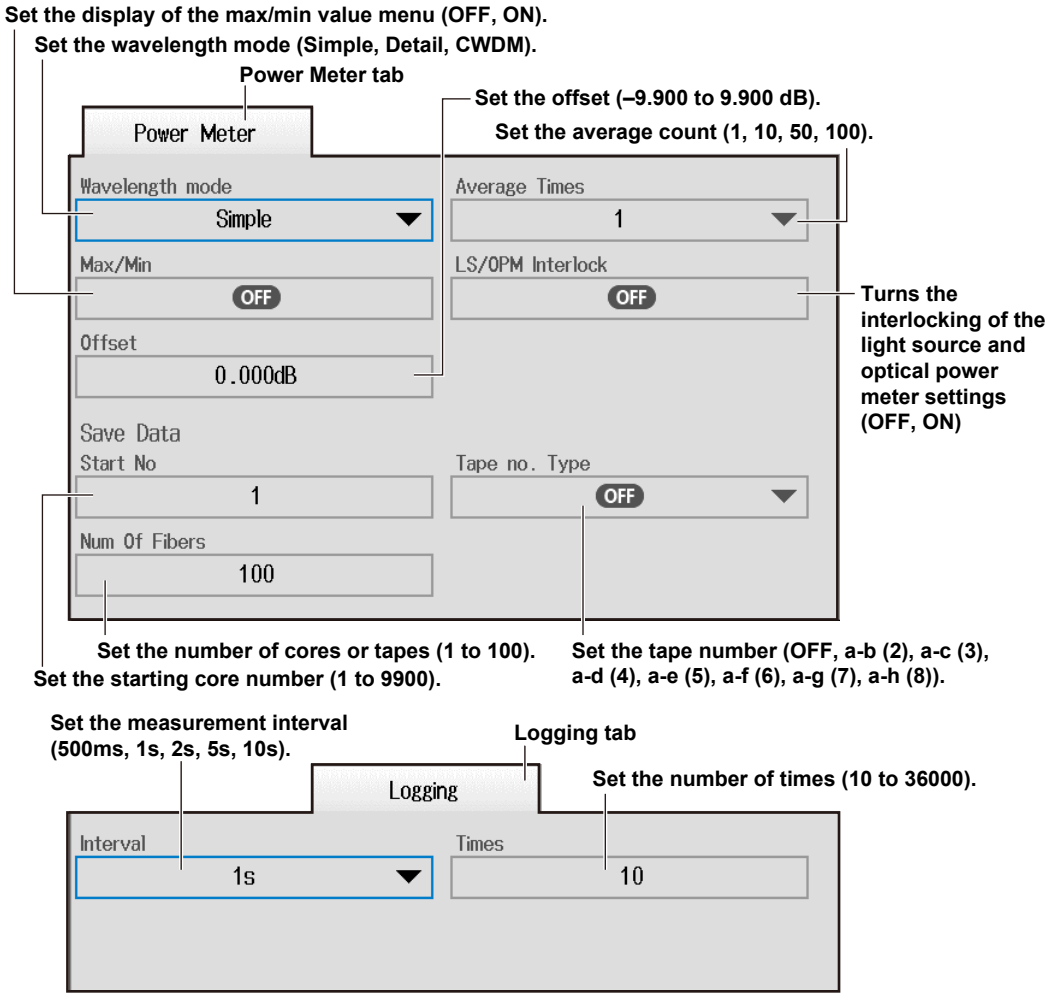
Upper threshold

1 Available wavelengths depending on the wavelength mode selection

Simple: 850nm, 1300nm, 1310nm, 1490nm, 1550nm, 1625nm, 1650nm
Detail: 800nm to 1700nm (1 nm steps)
CWDM: 1270nm, 1290nm, 1310nm, 1330nm, 1350nm, 1370nm, 1390nm, 1410nm,1430nm1450nm, 1470nm, 1490nm, 1510nm, 1530nm, 1550nm, 1570nm,1590nm, 1610nm

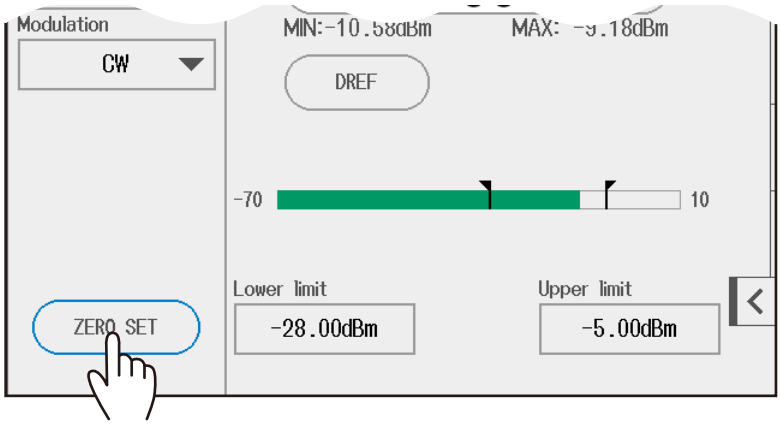
Performing Setup

3. Press **SETUP** to display the optical power meter setup screen.
4. Tap the **Power Meter** tab or **Logging** tab to display the following screen.



Executing the Zero Set

5. After step 4, close the optical power meter screen. The screen returns to the power meter screen.
6. Tap **ZERO SET**.
   Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.



Note

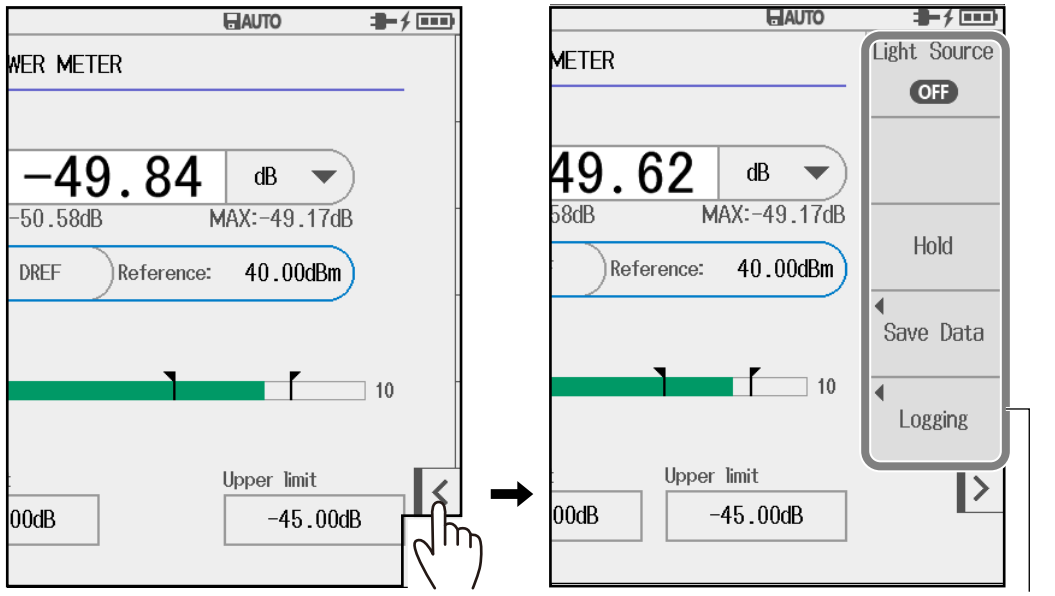
Perform a zero-set whenever necessary, such as after you have turned on the power or when the ambient temperature changes. Performing a zero-set adjusts the internal deviation of the optical power measurement section and enables you to obtain more accurate absolute optical power values.

Measuring the Optical Power

7. Set the wavelength.
8. Connect an optical fiber cable to the OPM port. The measured value is displayed on the power meter screen. For the position of the OPM port, see “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN.

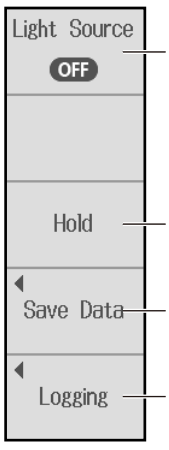
Soft Key Menu (optical power meter)

9. Tap the soft key menu display button. An optical power meter soft key menu appears.



Soft key menu

Optical Power Meter Menu



Set the light source feature for lost tests (OFF, ON).
When set to ON, you can use the loss test feature (loopback).

Holds the measured value display

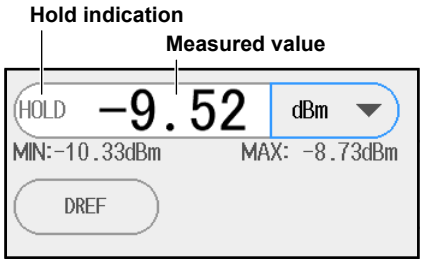
Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables. See page 7-12.

Logging
A screen appears for performing logging measurements of optical power values. See page 7-13.

Holding the Measured Value Display

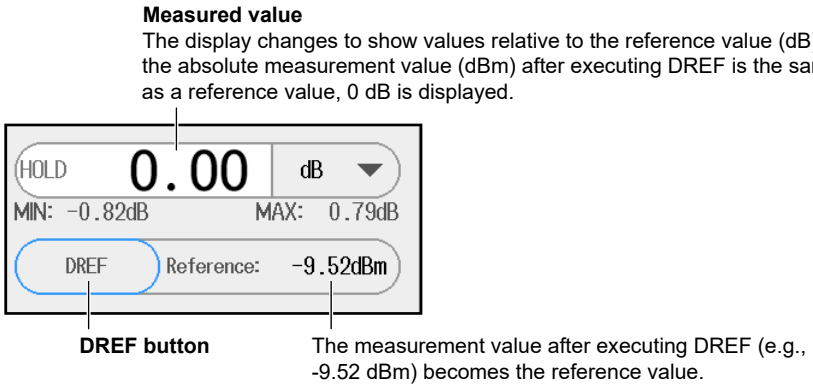
10. Tap the **HOLD** soft key. The measured value at that point remains displayed.

When you tap the soft key again, the hold mode will be cleared.



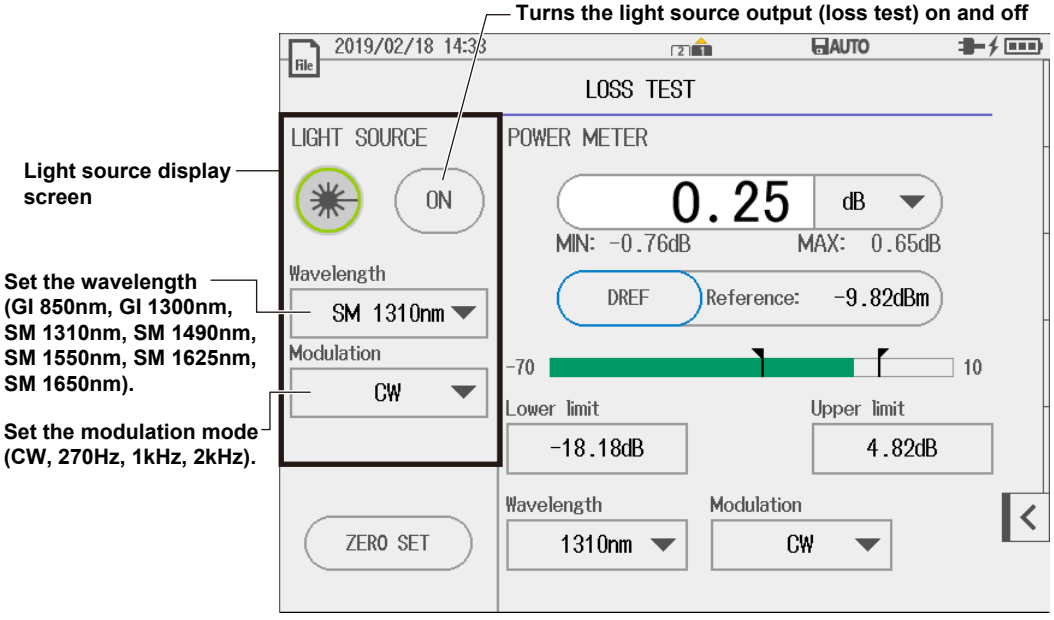
Setting the Reference Value to the Currently Displayed Measured Value

10. Tap the **DREF**. The reference value is set to the current measured value, and the measurement display changes to dB units. The measurement display indicates a value relative to the reference value.



Setting the Light Source Feature for Loss Tests

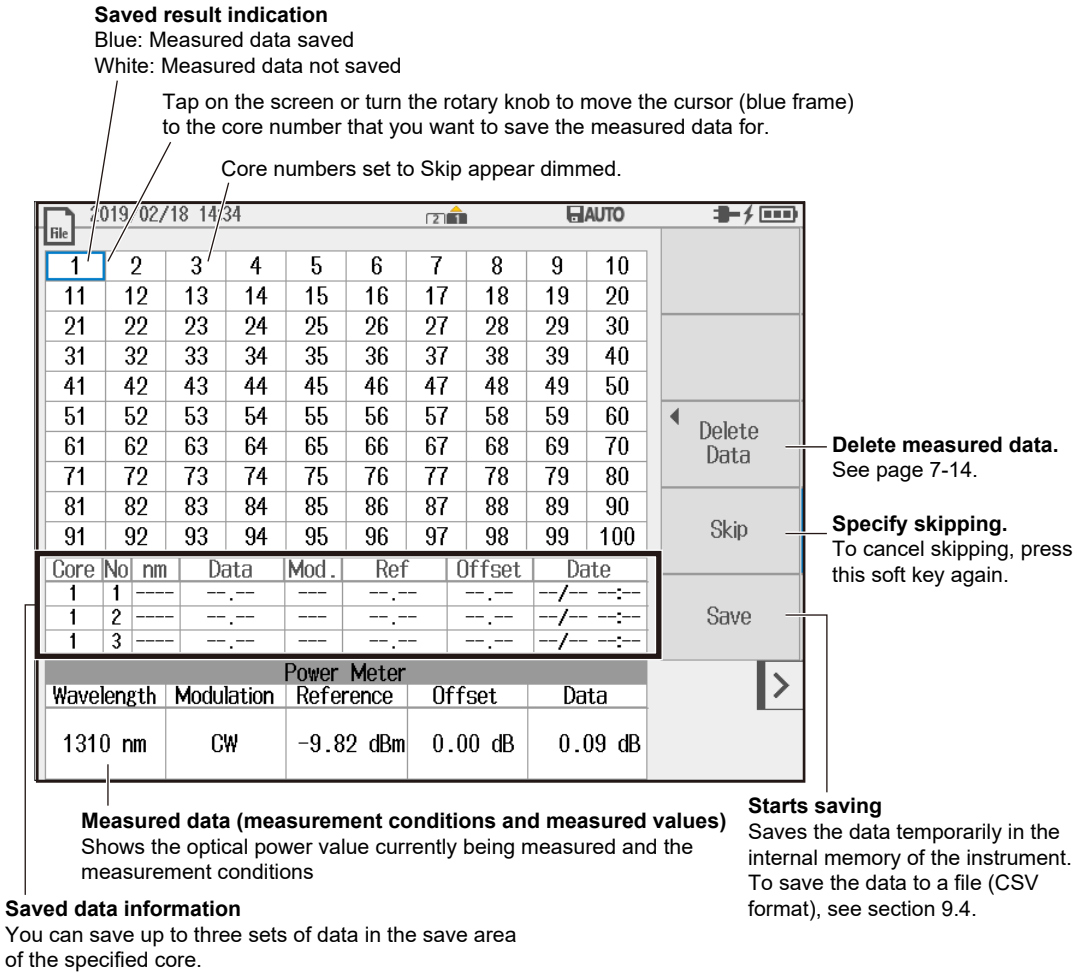
10. Tap the **Light Source** soft key. When set to on, the screen changes from a power meter display to a loss tests display.



For the settings other than those for the light source (power meter settings), see page 7-8.

Saving the Results of Optical Power Measurements for Multi-Fiber Cables (saving data)

10. Tap the **Save Data** soft key. A screen appears for saving the results of optical power measurements for multi-fiber cables.



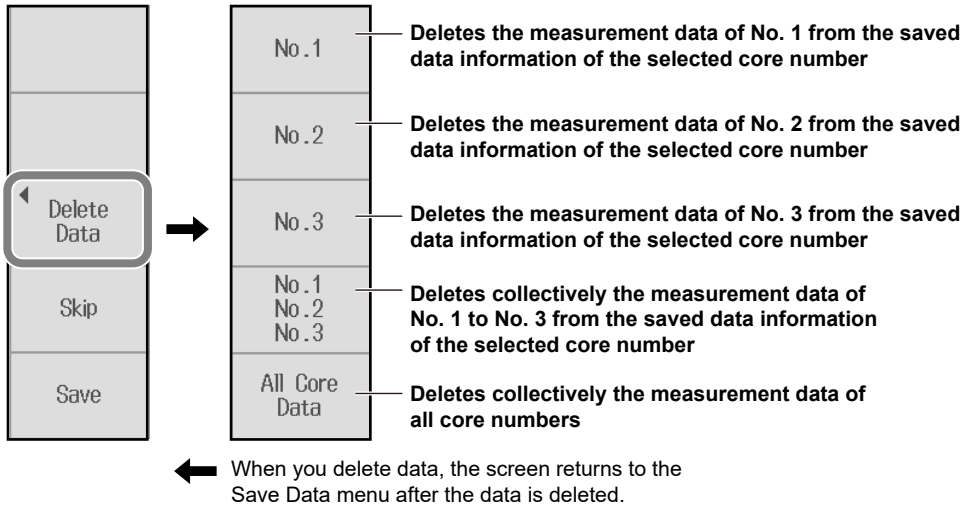
Note

You can save the optical power meter measurement results by following the procedure explained in section 9.4. The “Save Data” feature explained in this action is for saving multiple measurement results (such as the measurement of a multi-fiber cable) in a single file. Even when you save the data according to the instructions in this section, save the data according to the procedure explained in section 9.4 (CSV format). Simply saving the data according to the instructions in the section does not save the data to a file in CSV format.

If you save the data according to the procedure explained in section 9.4 without using the “Save Data” feature explained in this section, the optical power measurement of a single fiber is saved to a file in CSV format. Each time you save the data according to the procedure explained in section 9.4, a CSV file with a new name is saved.

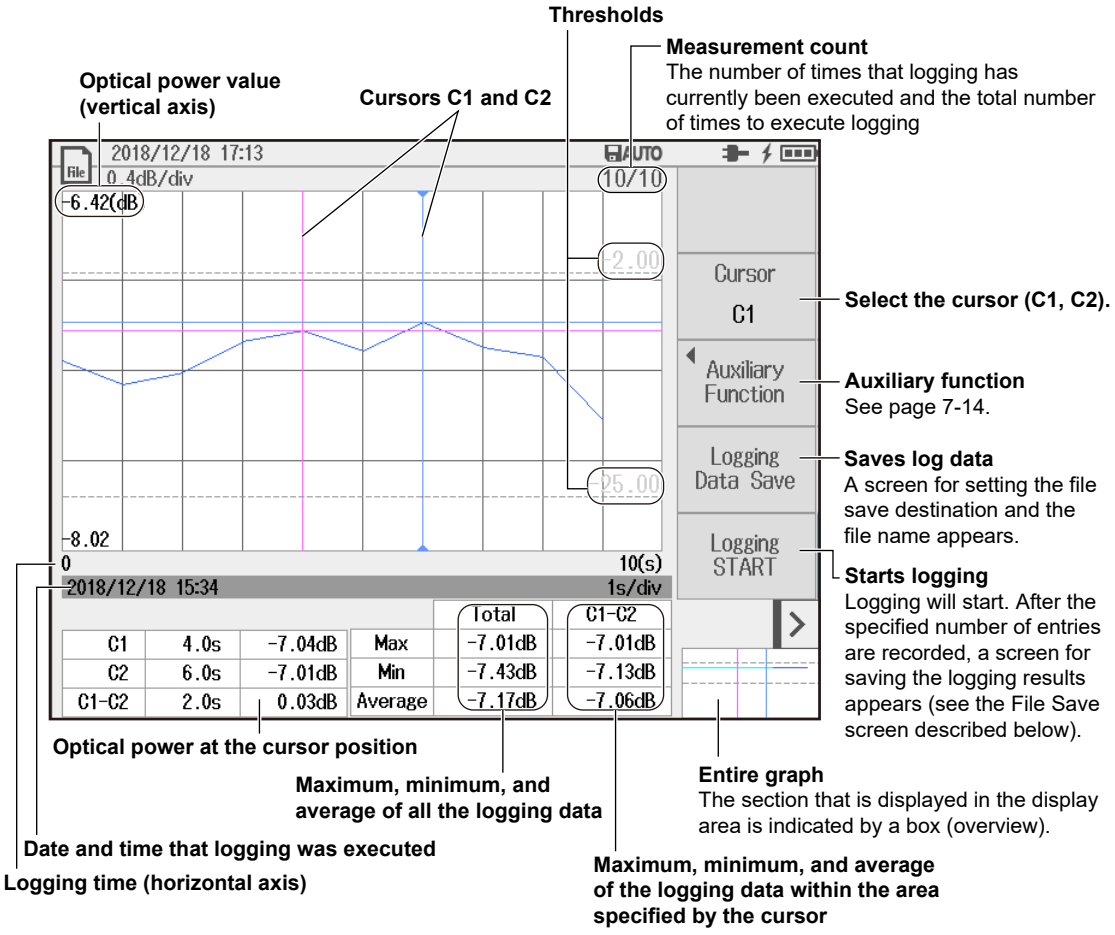
- **Deleting Measured Data**

11. Tap the **Delete Data** soft key. A data delete soft key menu appears.



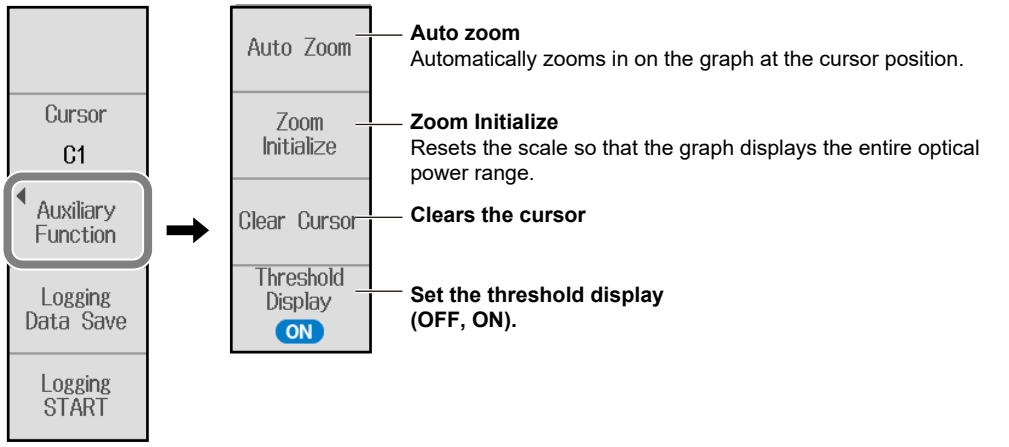
Logging Measurement of Optical Power Values (logging)

10. Tap the **Logging** soft key. A logging measurement screen appears.



- **Deleting Measured Data**

11. Tap the **Auxiliary Function** soft key. A soft key menu appears for the auxiliary function of the logging screen.

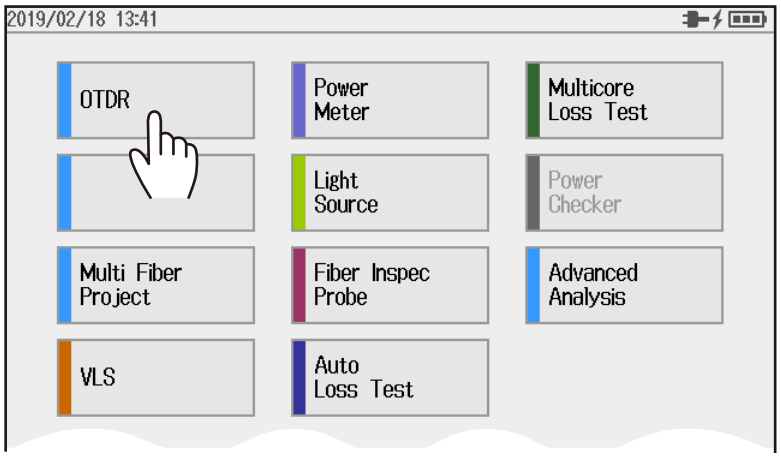


Using the Optical Power Meter from the OTDR Screen (utility button)

Displaying the OTDR Screen

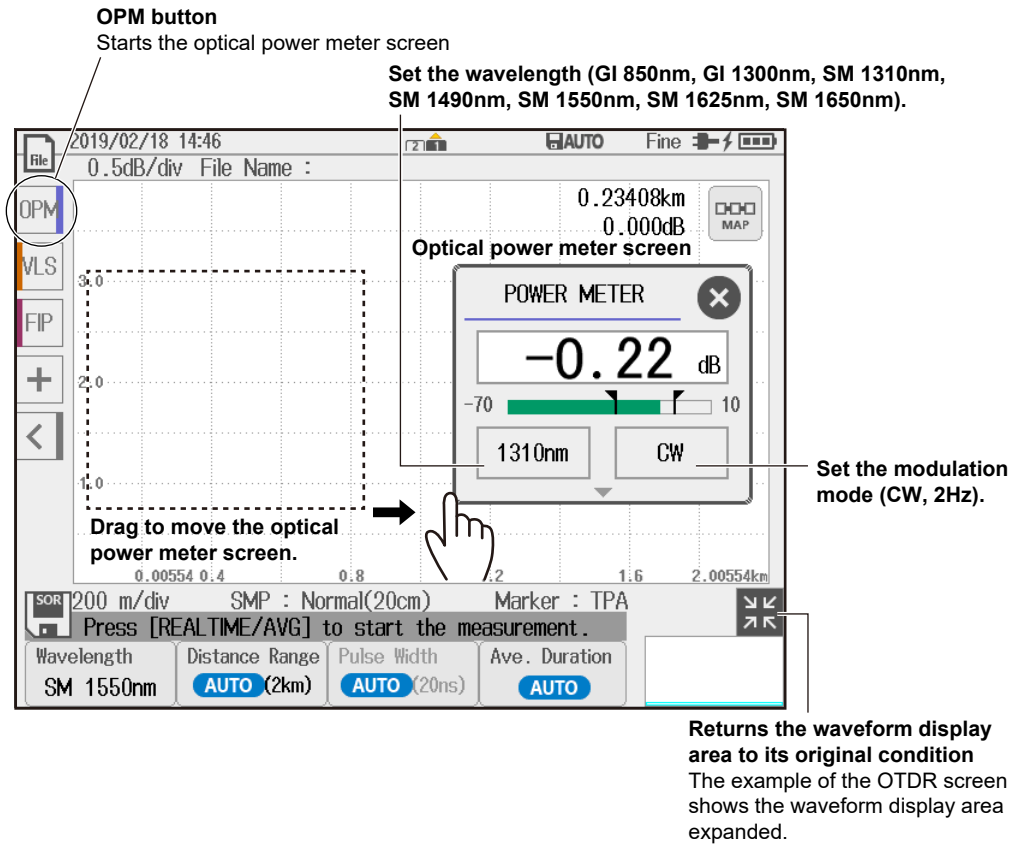
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.

MENU screen



OTDR Screen

3. Tap **OPM** to display the optical power meter screen.



Note

If the OPM button is not displayed, see “Changing a Utility Button” under “Using the Light Source from the OTDR Screen (utility button)” in section 7.1.

Explanation

Wavelength

The photodetector in the optical power measurement area has wavelength sensitivity characteristics. The photodetector corrects the sensitivity according to the set wavelength and measures optical power more accurately.

The wavelength setting range and setting step very depending on the wavelength mode set in the detailed setup screen. Set the wavelength in the following range.

/SPM or /HPM Option

Wavelength Mode	Setting Range and Setting Step
Simple	Select from 850 nm, 1300 nm, 1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm.
Detail	Set the wavelength to a value from 800 nm to 1700 nm in 1 nm steps.
CWDM	Set the wavelength to a value from 1270 nm to 1610 nm in 20 nm steps.

Modulation Mode

You can select the modulation mode of the light to be measured from the following:

CW (continuous light), 270 Hz, 1 kHz, 2 kHz

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.

  $P_{dBm} = 10 \times \log (P_w \times 10^3)$

  P_{dBm}: optical power (unit dBm), P_w: optical power (unit W)

Reference Value

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

- When you tap the DREF button, the displayed measured value becomes the reference value. From this point, relative values will be displayed. The unit changes to dB.
- When you tap the DREF button 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 dBm to 40 dBm.
- When you set the unit to dBm or W, the Reference box disappears, and the absolute measured values will be displayed.

Wavelength Mode

You can select the wavelength mode of the light to be measured from the following:

Simple, Detail, CWDM

Like the “wavelength” item described earlier, the setting range and setting step vary depending on the mode.

Average Times

The average value is displayed as the measured value. Select the average count from the following.

1, 10, 50, 100

Turning the Interlocking of the Light Source and Optical Power Meter Settings On and Off

You can connect an optical fiber between the light source port of an Instrument and the optical power measurement port of another Instrument and use this setting so that the power meter settings are synchronized to the light source wavelength and modulation mode settings.

On	After On is selected, the power meter settings are synchronized to the light source settings.
Off	The power meter settings are not synchronized to the light source settings.

Turning the Display of the Max/Min Value Menu On and Off

A menu can be displayed in the soft key menu for displaying the maximum and minimum measured values.

ON	The menu is displayed.
OFF	The menu is not displayed.

Turning the Maximum and Minimum Value Display On and Off

On the menu displayed in the parameter screen, you can start the maximum and minimum measurement display. During measurement, the displayed maximum and minimum values are constantly updated.

ON	The displayed maximum and minimum values are updated starting from when the setting is turned on.
OFF	The maximum and minimum values are not updated. When set to off, the maximum and minimum values are reset.

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 dB 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 dBm 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.

Holding the Measured Value Display

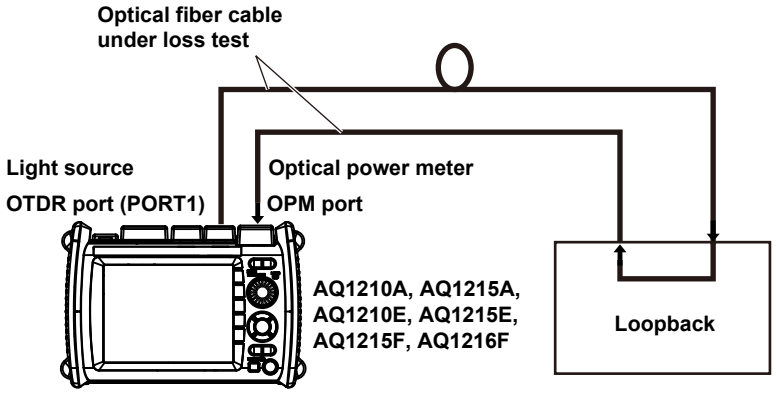
When you tap the HOLD soft key, the measured values, bar graph, maximum value, minimum value, and the on/off state of the maximum and minimum value display are no longer updated. The values at the time that you tapped the HOLD soft key remains displayed. To release the hold, tap the HOLD soft key again.

Zero Set

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

Loss Test

The loss test loops back the other end of the optical fiber cable being measured to measure the optical power emitted by the light source of this instrument with the optical power meter of this instrument. This allows you to check the level of loss that occurs relative to the optical output power value of the light source.



Saving the Results of Optical Power Measurements for Multi-Fiber Cables

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.

Executing a Save Operation

When you execute a save operation, up to three sets of data can be saved temporarily in the save area of the specified core number.
For details on saving data to files, see section 9.4.

Deleting Data

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

Starting Core Number

Set the starting core number in the following range.
1 to 9900

Tape Number 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, ...

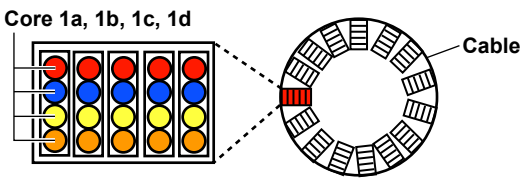


Illustration of how tape No. a-d(4) are used

Number of Cores or Tapes

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

Tape Number Type	Number of Cores or Tapes
Off	Number of cores: 10 to 100
a-b(2)	Number of tapes: 10 to 50
a-c(3)	Number of tapes: 10 to 33
a-d(4)	Number of tapes: 10 to 25
a-e(5)	Number of tapes: 10 to 20
a-f(6)	Number of tapes: 10 to 16
a-g(7)	Number of tapes: 10 to 14
a-h(8)	Number of tapes: 10 to 12

Note

The data saved in the save area of 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 instrument.

Logging Measurement of Optical Power Values

Executing Logging and Saving

While the optical power meter screen is displayed, the instrument is constantly measuring the optical power. To save the measured values, execute logging.

- Tap 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.
- The logging results can be saved in csv format.

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

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.

- **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.
- **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.
- **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 in or out vertically. (The up arrow key zooms in; the down arrow key zooms out.)
  Zoom factors are ×1, ×2, ×5, ×10, ×20, and ×50.

  Left and right arrow keys: Zooms in or out horizontally. (The right arrow key zooms in; the left arrow key zooms 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.

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 instrument to display the graphs.

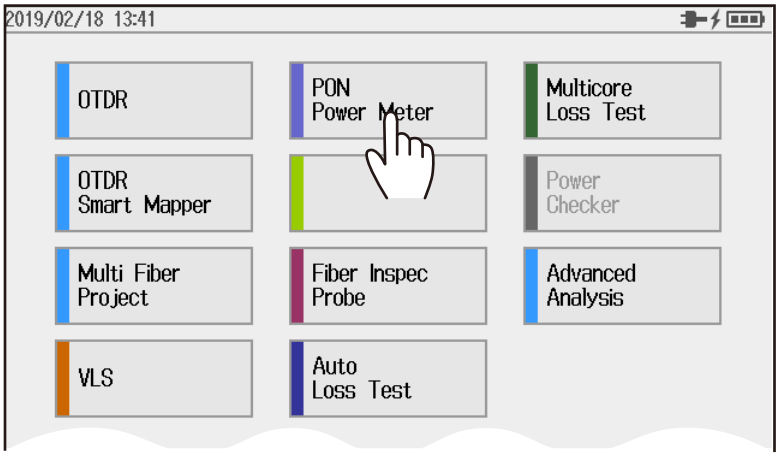
7.4 Using the PON Power Meter (/PPM option)

Procedure

Displaying the PON Power Meter Screen

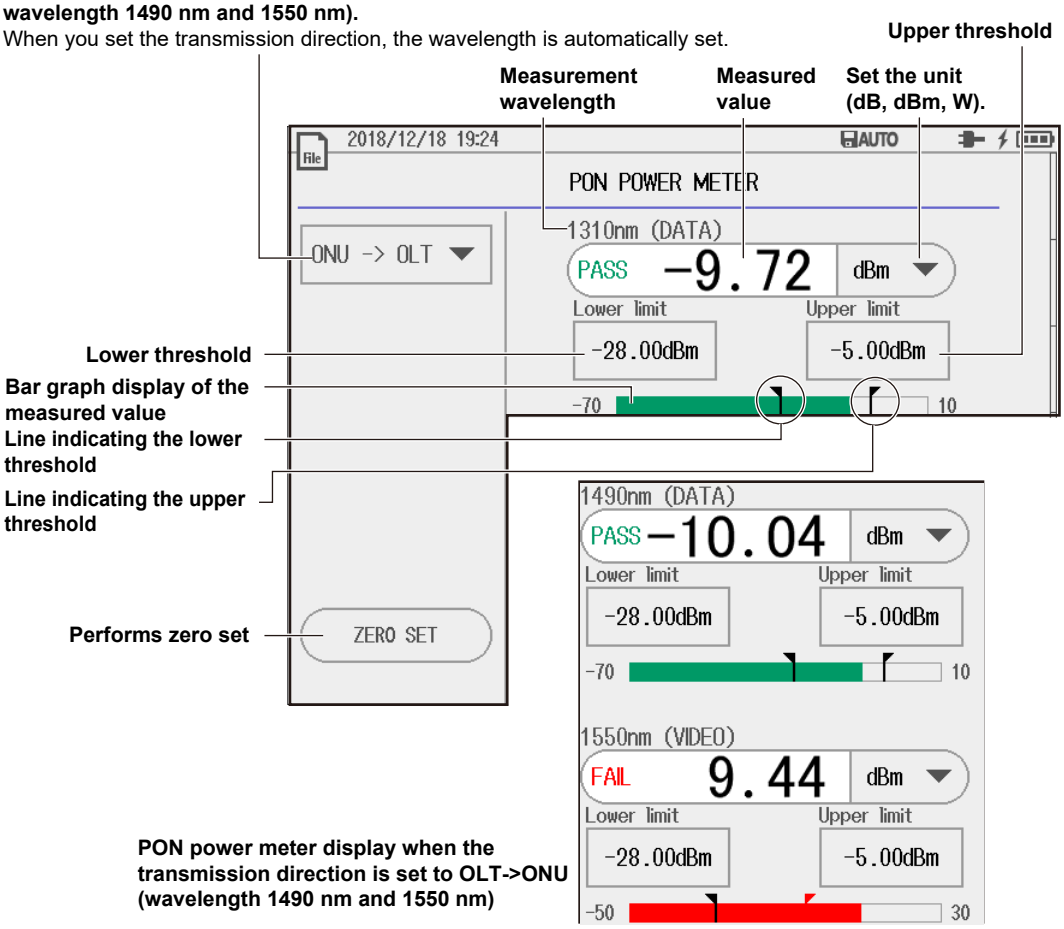
1. Press **MENU** to display the MENU screen.
2. Tap **PON Power Meter** to display the PON POWER METER screen.

MENU screen



PON Power Meter Screen

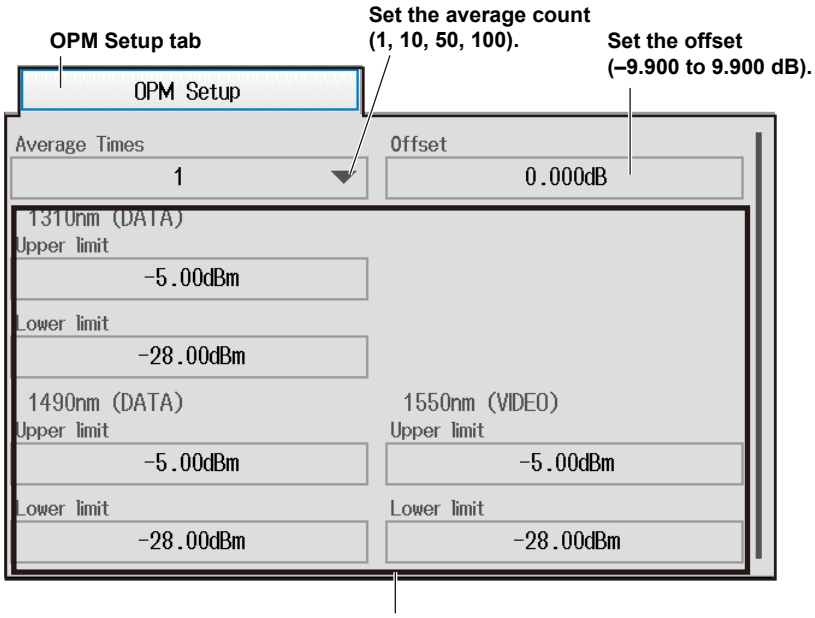
Set the transmission direction (ONU -> OLT(wavelength 1310 nm), OLT -> ONU wavelength 1490 nm and 1550 nm).
When you set the transmission direction, the wavelength is automatically set.



PON power meter display when the transmission direction is set to OLT->ONU (wavelength 1490 nm and 1550 nm)

Performing Setup

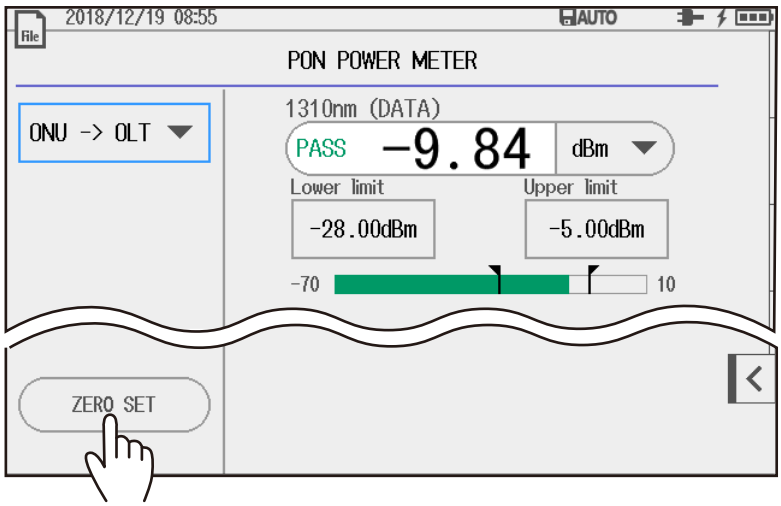
3. Press **SETUP** to display the optical power meter setup screen.
4. Tap the **OPM Setup** tab to display the following screen.



Set the threshold (–80 to 40dBm).
Set the upper and lower limits for each wavelength of the PON system.

Executing the Zero Set

4. After step 3, close the optical power meter screen. The screen returns to the PON power meter screen.
5. Tap **ZERO SET**.
   Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.



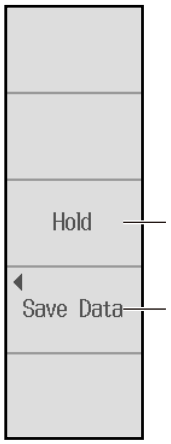
Measuring the Optical Power

6. Set the transmission direction.
7. Connect an optical fiber cable to the OPM port. The measured value is displayed on the power meter screen. For the position of the OPM port, see “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN.

Soft Key Menu (PON power meter)

8. Tap the soft key menu display button. An PON power meter soft key menu appears.

PON Power Meter Menu

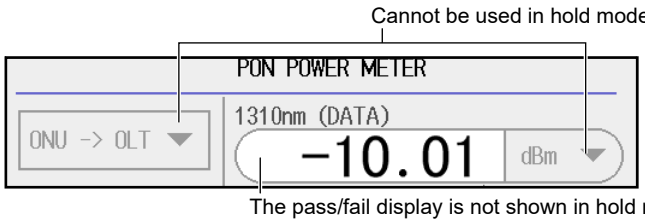


Holds the measured value display

Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables. See page 7-23.

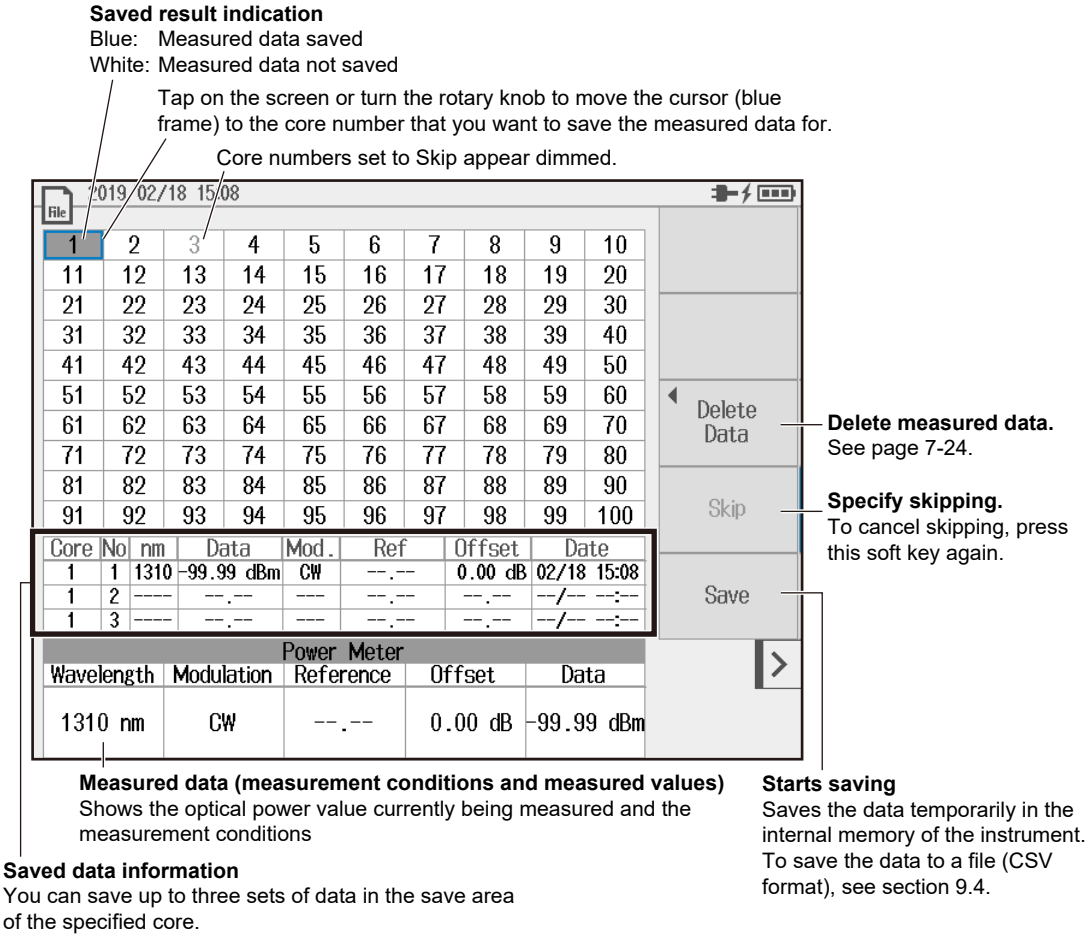
Holding the Measured Value Display

9. Tap the **HOLD** soft key. The measured value at that point remains displayed. When you tap the soft key again, the hold mode will be cleared.



Saving the Results of Optical Power Measurements for Multi-Fiber Cables (saving data)

9. Tap the **Save Data** soft key. A screen appears for saving the results of optical power measurements for multi-fiber cables.



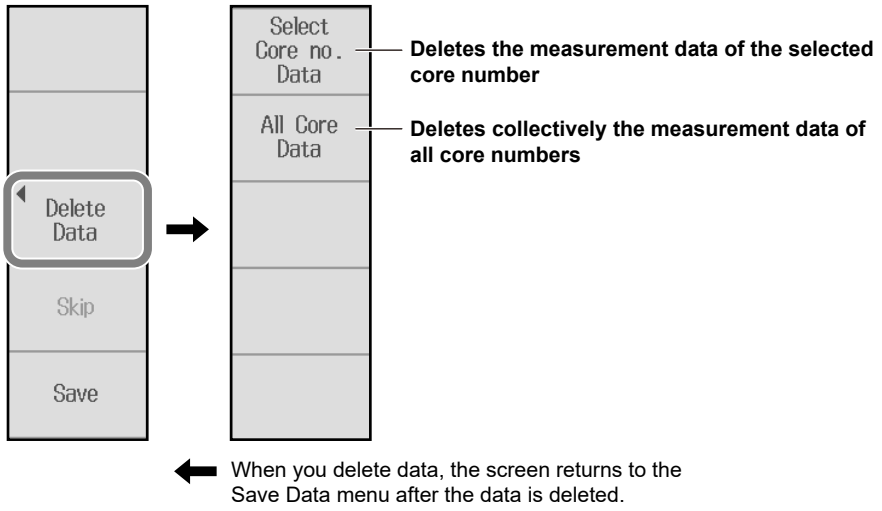
Note

You can save the optical power meter measurement results by following the procedure explained in section 9.4. The “Save Data” feature explained in this action is for saving multiple measurement results (such as the measurement of a multi-fiber cable) in a single file. Even when you save the data according to the instructions in this section, save the data according to the procedure explained in section 9.4 (CSV format). Simply saving the data according to the instructions in the section does not save the data to a file in CSV format.

If you save the data according to the procedure explained in section 9.4 without using the “Save Data” feature explained in this section, the optical power measurement of a single fiber is saved to a file in CSV format. Each time you save the data according to the procedure explained in section 9.4, a CSV file with a new name is saved.

- **Deleting Measured Data**

10. Tap the **Delete Data** soft key. A data delete soft key menu appears.



Explanation

The PON power meter features can be applied only to models with the /PPM option.

Wavelength

The wavelength when measuring the optical power of a PON system is shown below. It is different depending on the transmission direction.

Transmission direction	Wavelength
ONU -> OLT[1]	1310 nm
OLT -> ONU[2]	1490 nm and 1550 nm

1 Measures the optical power of the signal wavelength in the upstream direction, from the ONU (Optical Network Unit: optical line termination on the subscriber side) to the OLT (Optical Line Termination: optical line termination on the station side). Measures the optical power of the signal whose wavelength is 1310 nm (for data).

2 Measures the optical power of the signal wavelength in the downstream direction from the OLT to the ONU. Measures the optical power of the signals whose wavelength is 1490 nm (for data) and 1550 nm (for video).

Unit

Set the optical power display unit from the following.

dBm (absolute value), W (absolute value)

- Unt 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.

  $P_{dBm} = 10 \times \log (P_w \times 10^3)$

  P_{dBm}: optical power (unit dBm), P_w: optical power (unit W)

Average Times

The average value is displayed as the measured value. Select the average count from the following.

1, 10, 50, 100

Offset

For each wavelength, 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

For each wavelength, 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. The word “PASS” is displayed in the measurement value area.
- If the measured values exceeds the upper limit or fall below the lower limit, the corresponding bar graph is displayed in red. The word “FAIL” is displayed in the measurement value area.

Holding the Measured Value Display

When you press the HOLD soft key, the measure value and bar graph are no longer updated. The value at the time that you pressed the HOLD soft key remains displayed. To release the hold, press the HOLD soft key again.

Saving the Results of Optical Power Measurements for Multi-Fiber Cables

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.

Executing a Save Operation

When you execute a save operation, up to three sets of data can be saved temporarily in the save area of the specified core number.
For details on saving data to files, see section 9.4.

Deleting Data

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

Note

The data saved in the save area of 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 instrument.

Zero set

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

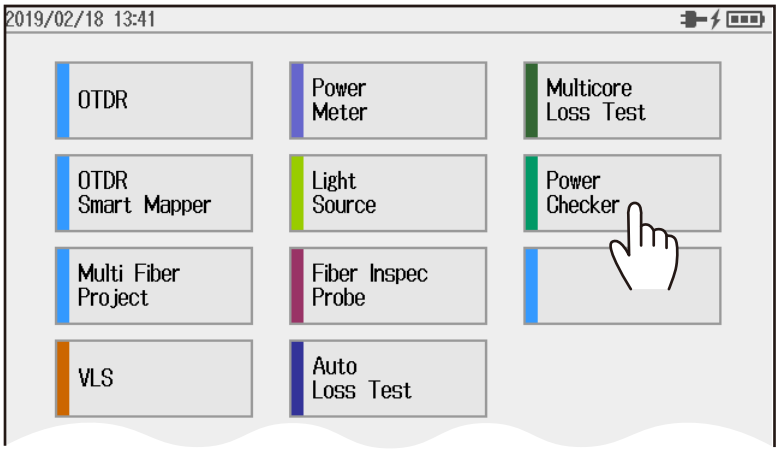
7.5 Using the Power Checker (/PC option)

Procedure

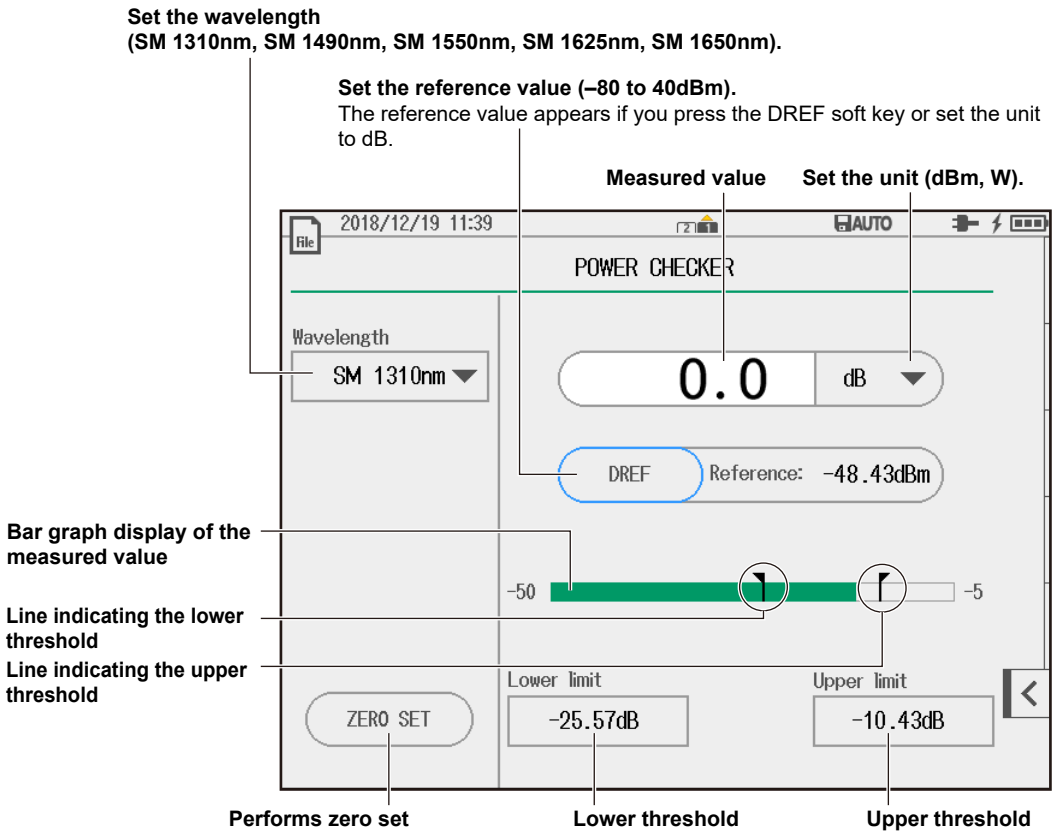
Displaying the Power Checker Screen

1. Press **MENU** to display the MENU screen.
2. Tap **Power Checker** to display the POWER CHECKER screen.

MENU screen



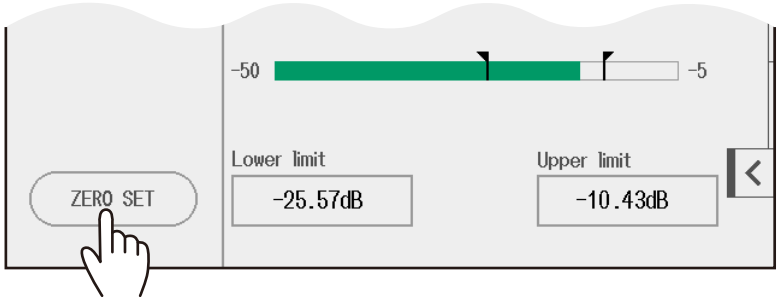
Power Checker Screen



Executing the Zero Set

3. Tap **ZERO SET**.

Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.



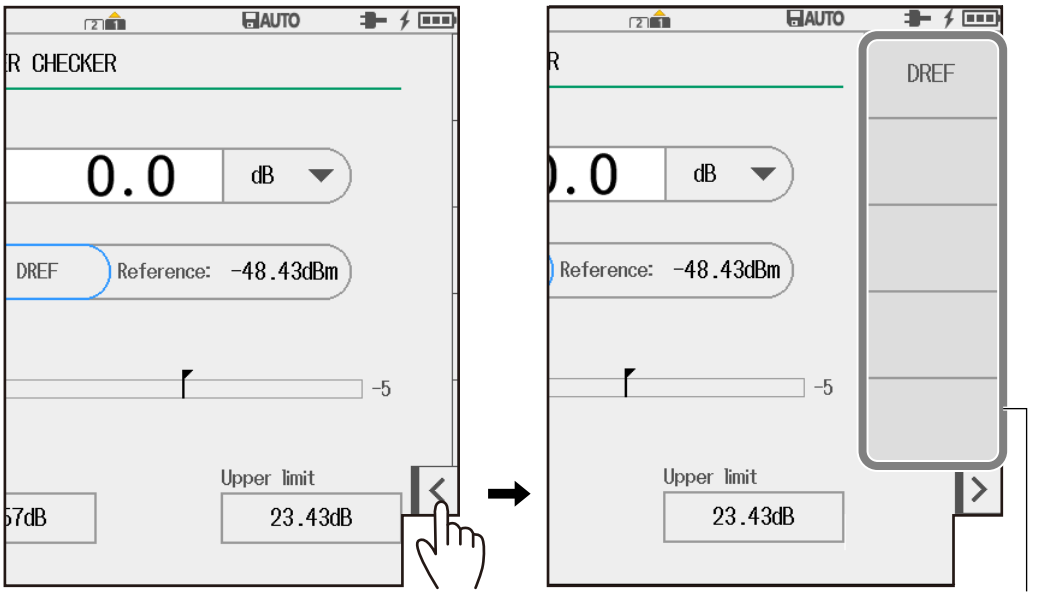
Measuring the Optical Power

4. Set the wavelength.

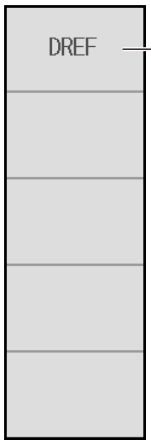
5. Connect an optical fiber cable to the OTDR port (PORT1). The measured value is displayed on the power meter screen. For the position of the OTDR port (PORT1), see “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN.

Soft Key Menu (power checker)

6. Tap the soft key menu display button. A power checker soft key menu appears.



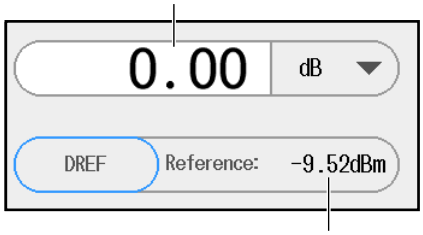
Power Checker Menu



Setting the Reference Value to the Currently Displayed Measured Value

7. Tap the **DREF** soft key. The reference value is set to the current measured value, and the measurement display changes to dB units. The measurement display indicates a value relative to the reference value.

Measured value
The display changes to show values relative to the reference value (dB). If the absolute measurement value (dBm) after executing DREF is the same as a reference value, 0 dB is displayed.



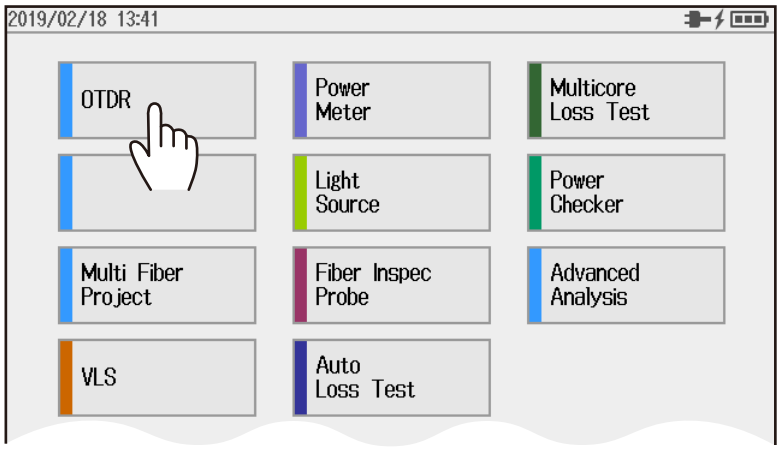
The measurement value after executing DREF (e.g., -9.52 dBm) becomes the reference value.

Using the Power Checker from the OTDR Screen (utility button)

Displaying the OTDR Screen

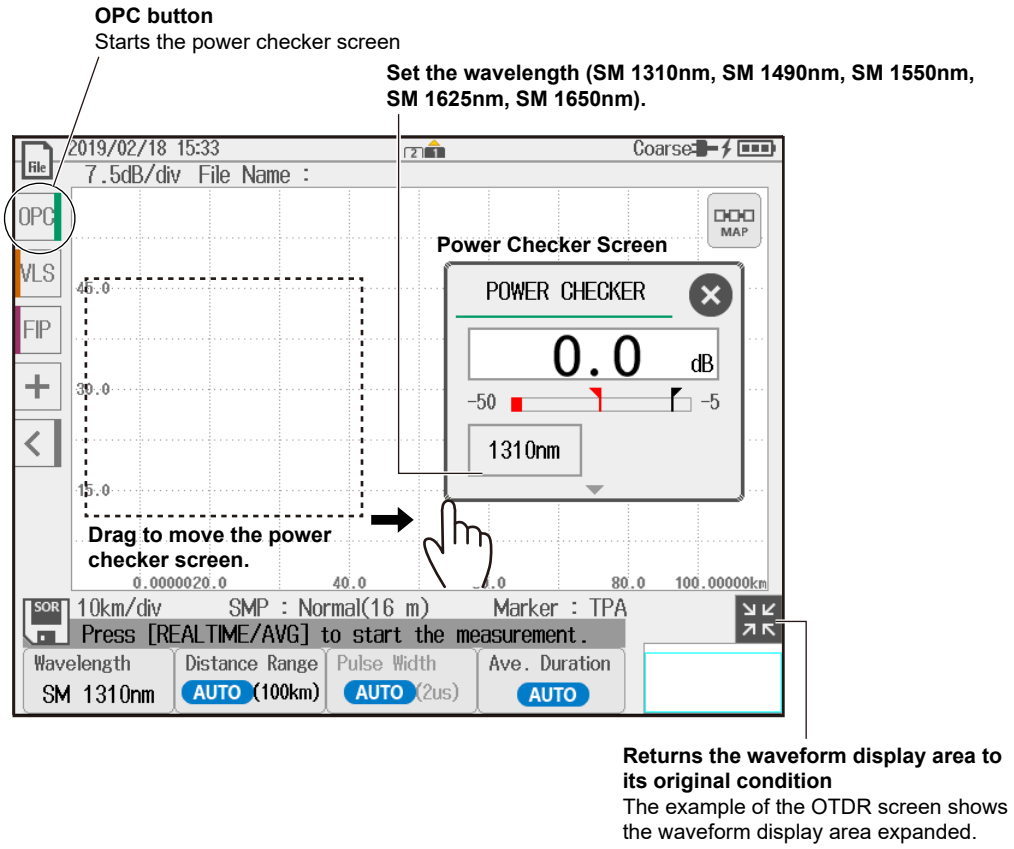
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.

MENU screen



OTDR Screen

3. Tap **OPC** to display the optical power meter screen.



Note

If the OPC button is not displayed, see “Changing a Utility Button” under “Using the Light Source from the OTDR Screen (utility button)” in section 7.1.

Explanation

Wavelength

The photodetector of the optical power checker has wavelength sensitivity characteristics. The photodetector corrects the sensitivity according to the set wavelength and measures optical power more accurately. Select the wavelength from the following:

1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm

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.

  $P_{dBm} = 10 \times \log (P_w \times 10^3)$

  P_{dBm}: optical power (unit dBm), P_w: optical power (unit W)

Reference Value

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

- When you tap 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 tap 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 dBm to 40 dBm.
- When you set the unit to dBm or W, the Reference box disappears, and the absolute measured values will be displayed.

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 dBm 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.

Zero Set

Perform a zero-set whenever necessary, such as after you have turned on the power or when the ambient temperature changes.

Performing zero set adjusts the internal deviation of the optical power measurement section and enables you to obtain more accurate absolute optical power values. Perform zero set on the optical power meter.

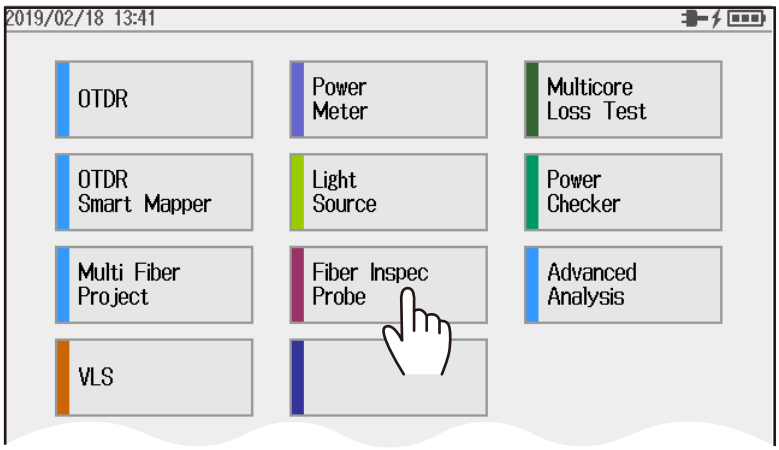
7.6 Using the Fiber Inspection Probe (/FST option)

Procedure

Displaying the Fiber Inspection Probe Screen

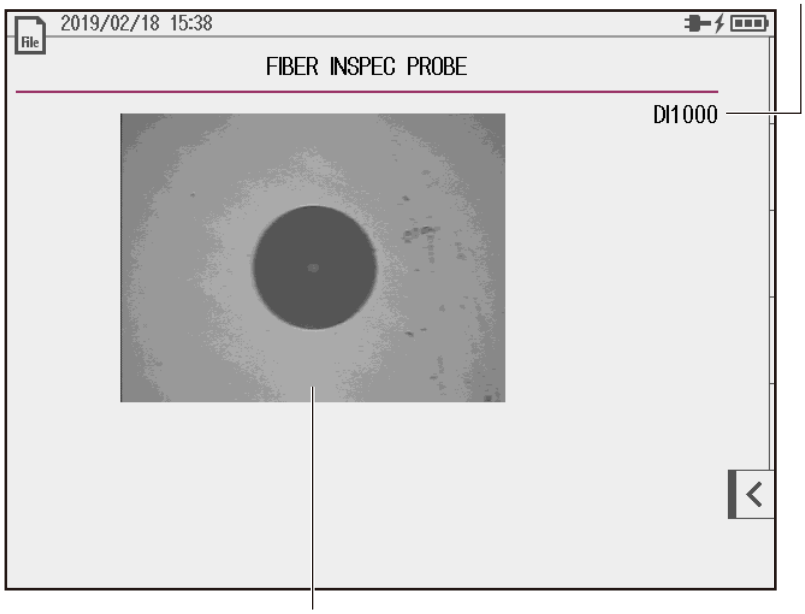
1. Press **MENU** to display the MENU screen.
2. Tap **Fiber Inspec Probe** to display the FIBER INSPEC PROBE screen.

MENU screen



Fiber Inspection Probe Screen

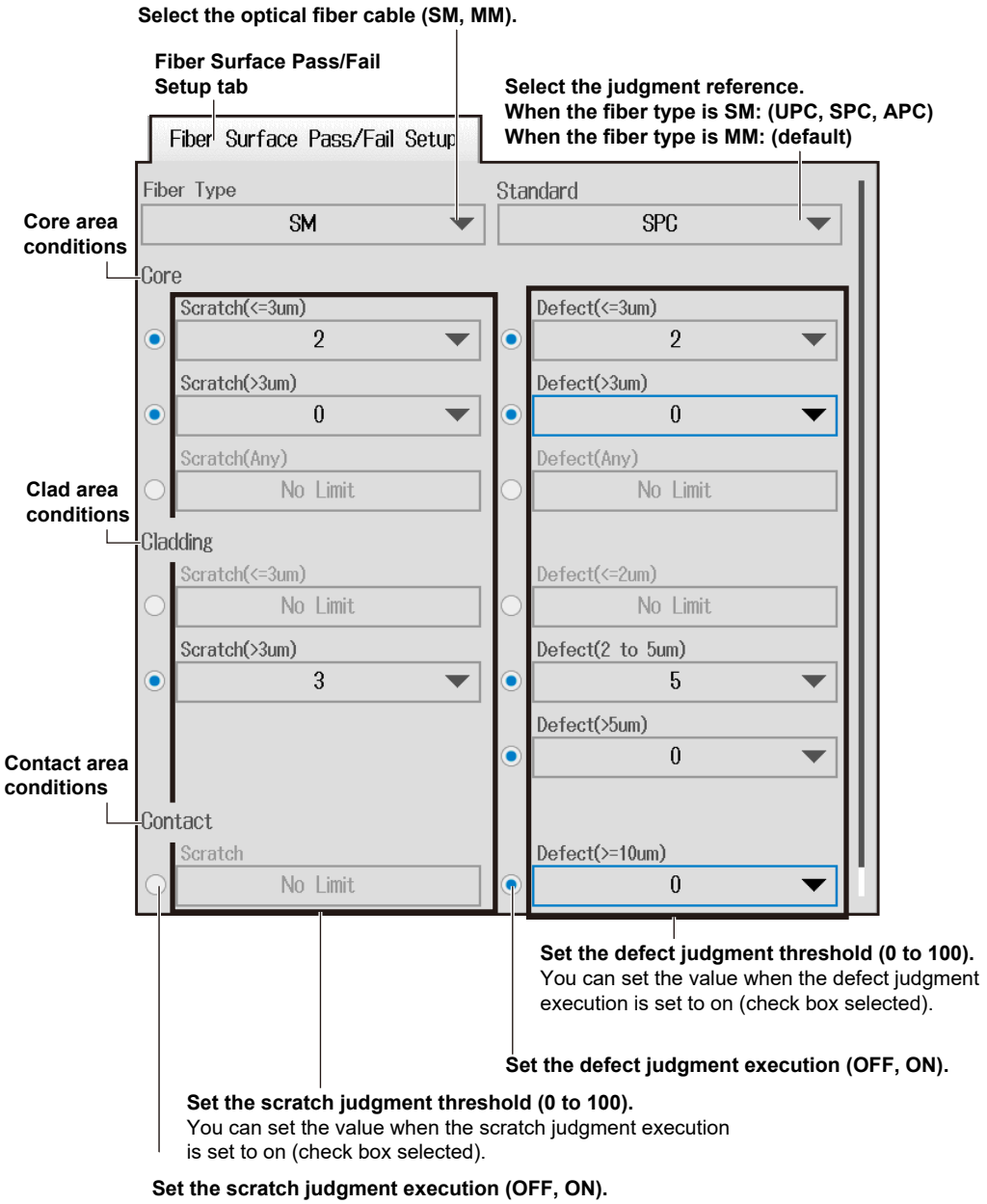
The model name of the probe is appeared on the display when the probe is automatically recognized by the instrument. "Unknown" is appeared when the probe is not recognized. Pass/fail judgment cannot be performed when "Unknown" is appeared.



Shows the fiber end face image

Performing Setup

3. Press **SETUP** to display the Fiber Surface Pass/Fail Setup screen.
4. Tap the **Fiber Surface Pass/Fail Setup** tab to display the Fiber Surface Pass/Fail Setup screen.



Connecting the Fiber Inspection Probe

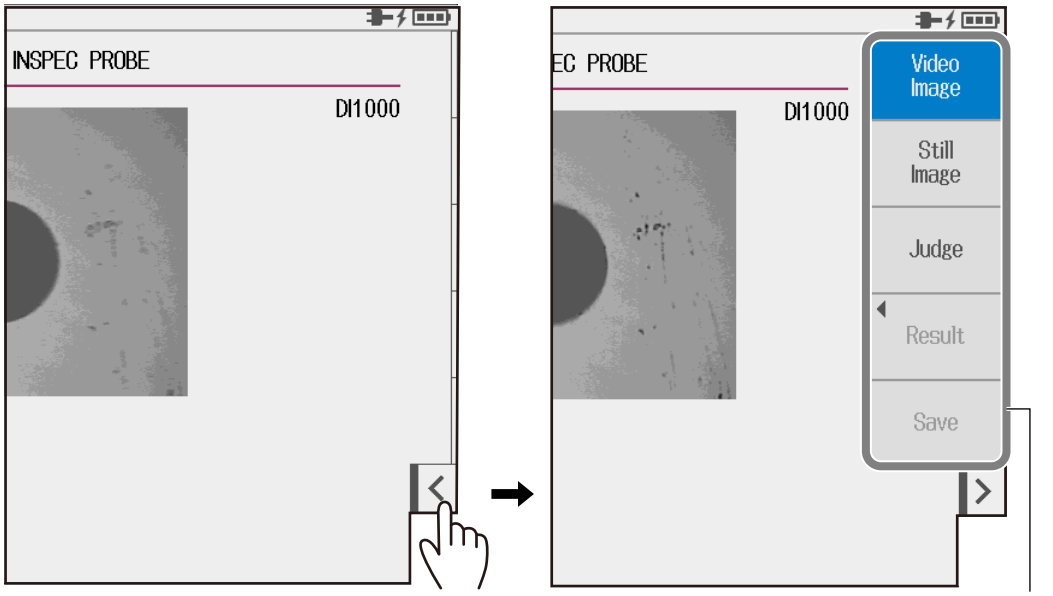
3. Connect the fiber inspection probe to the USB port (Type A) of this instrument.
4. Connect the probe of the fiber inspection probe to the end face of the optical fiber cable.

Note

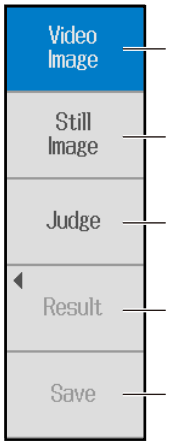
For instructions on how to use the fiber inspection probe, see the user's manual for the probe.

Soft Key Menu (fiber inspection probe)

5. Tap the soft key menu display button. A soft key menu for the fiber inspection probe appears.



Fiber Inspection Probe Menu



Displays the image in real time

Holds the image display (HOLD)

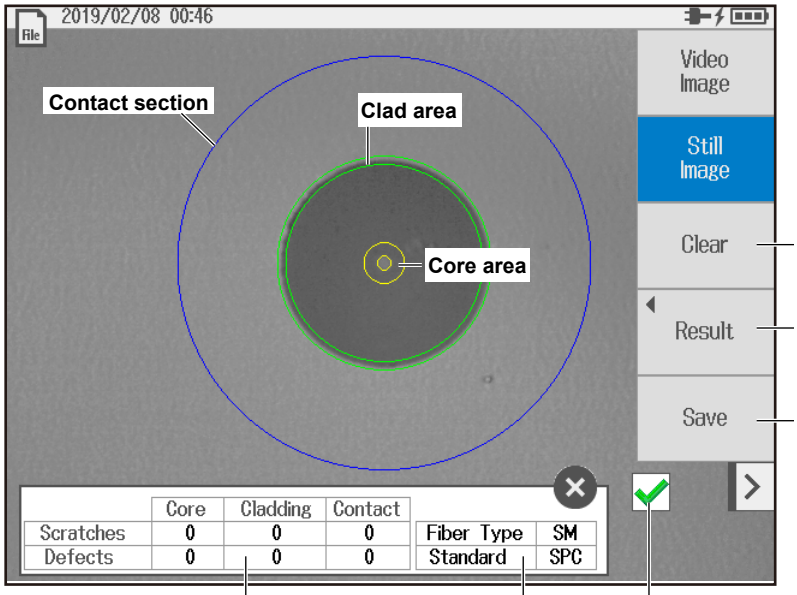
Executes pass/fail judgment
A pass/fail judgment is performed, and the result (summary) is displayed.

Displays results
Displays the judgment results (detail)

Starts saving
Press this soft key to save the still image to a BMP file. For the procedure to set the file save destination and file name, see section 9.4.

Executing a Judgment

4. Press the **Judge** soft key. A judgment is performed, and the result (summary) is displayed. Before executing pass/fail judgment, adjust the fiber inspection probe knob to focus on the image.



Clear
Clears the judgment results

Displays results
Displays the judgment results (detail)

Starts saving
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 9.4.

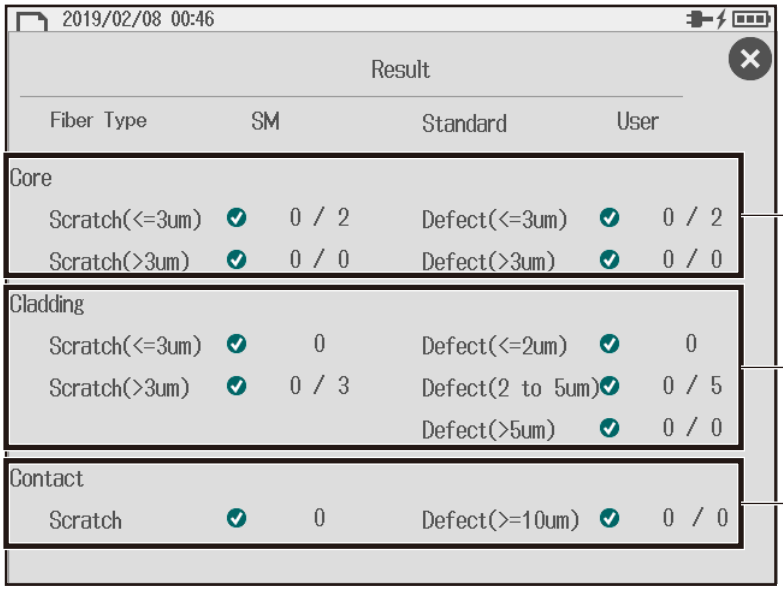
Judgment results (summary)
Appears when pass/fail judgment is performed.

Pass/fail result (mark)

Optical fiber cable type
Appears at all times for still images.

Displaying Judgment Results (Details)

5. Press the **Result** soft key to display the following screen.



Results in the core area

Results in the cladding area (excluding the core area)

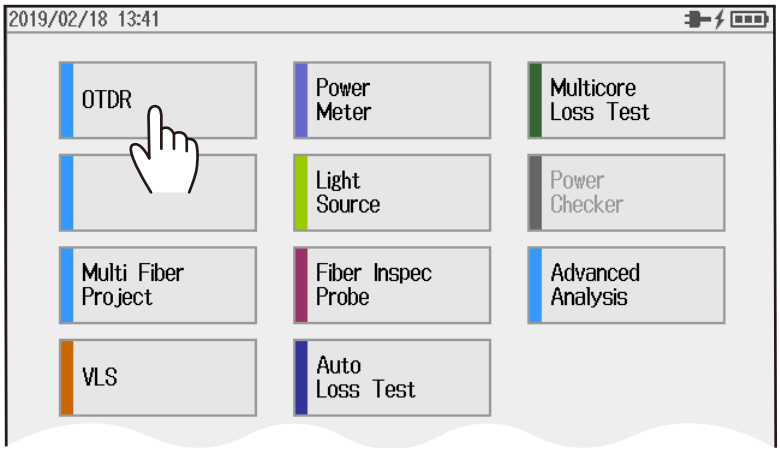
Results in the contact area (excluding the core and cladding area)

Using the Fiber Inspection Probe from the OTDR Screen (utility button)

Displaying the OTDR Screen

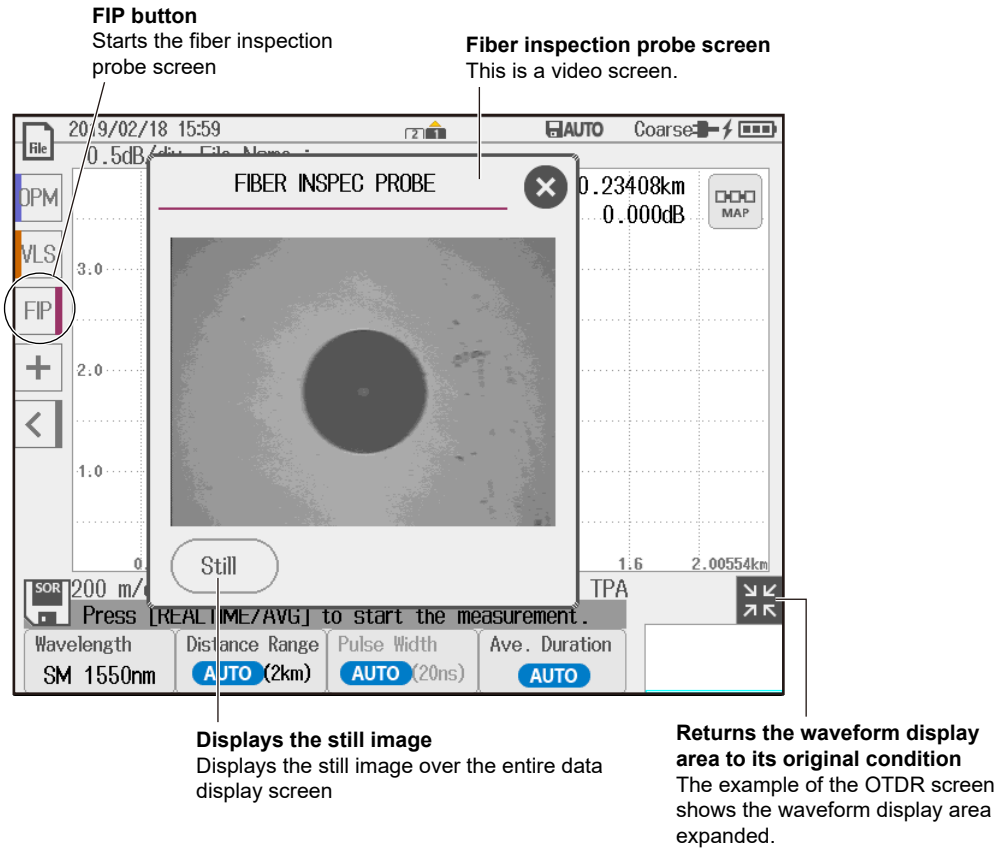
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.

MENU screen



OTDR Screen

3. Tap **FIP** to display the FIBER INSPEC PROBE screen.

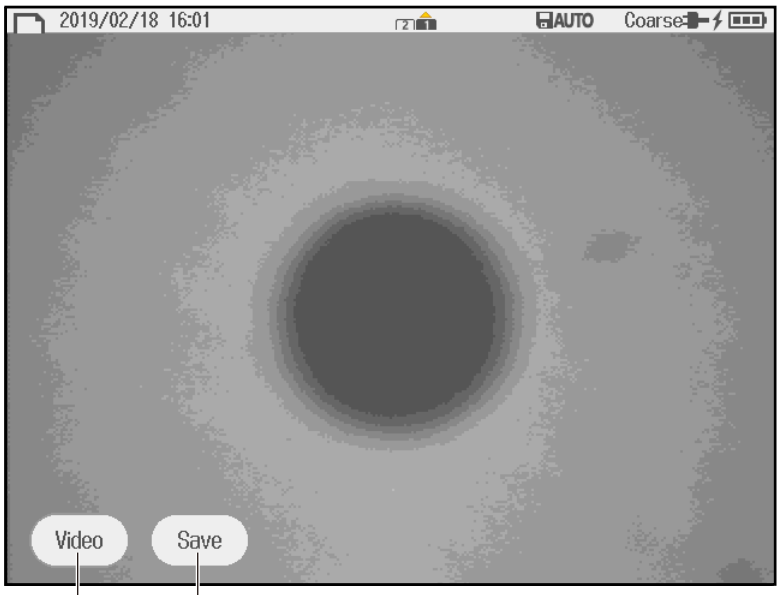


Note

If the FIP button is not displayed, see “Changing a Utility Button” under “Using the Light Source from the OTDR Screen (utility button)” in section 7.1.

Displaying the Still Image

4. Tap **Still** to display the still image 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 instrument is on or off.

If you connect a USB fiber inspection probe while the instrument is on, the instrument will automatically identify the probe.

For cautions regarding connecting the probe, see Note in section 9.1.

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.

Executing a Save Operation

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

- **Selecting 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**

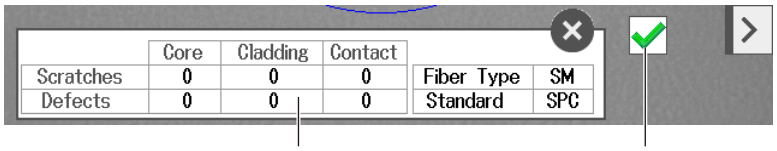
  Judgment of scratches and defects are executed separately by size. The size value is fixed. Clearing the check box turns off the judgment execution. Pass/fail judgment is not performed on scratches or defects whose check box has been cleared.

- **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.



Number of detected scratches and defects

Judgment result
Pass: Check mark (green)
Fail: × (red)

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(<=3um): Scratches that are 3 µm or less

Scratch(>3um): Scratches that exceed 3 µm

Defect(2 to 5um): Defects that are 2 µm to 5 µm

Executing a Save Operation

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.

8.1 Displaying a Map of the Line Configuration and Events (OTDR Smart Mapper)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. 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

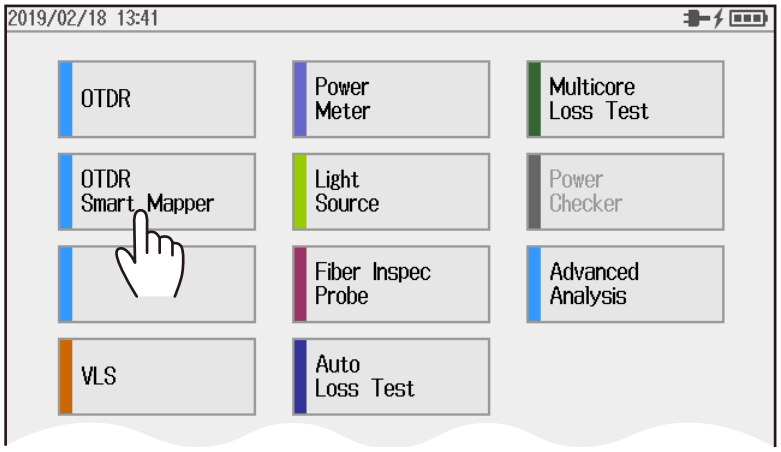
- Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. 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.

Procedure

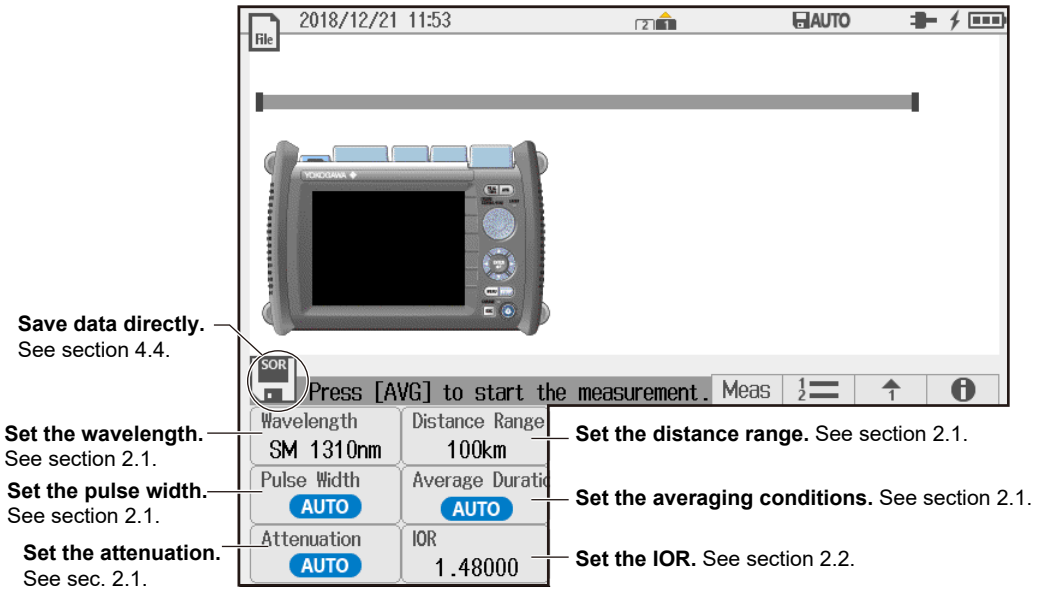
Displaying the OTDR Smart Mapper Screen

1. Press **MENU** to display the MENU screen.
2. Tap **OTDR Smart Mapper** to display the OTDR Smart Mapper screen.

MENU screen



OTDR Smart Mapper Screen

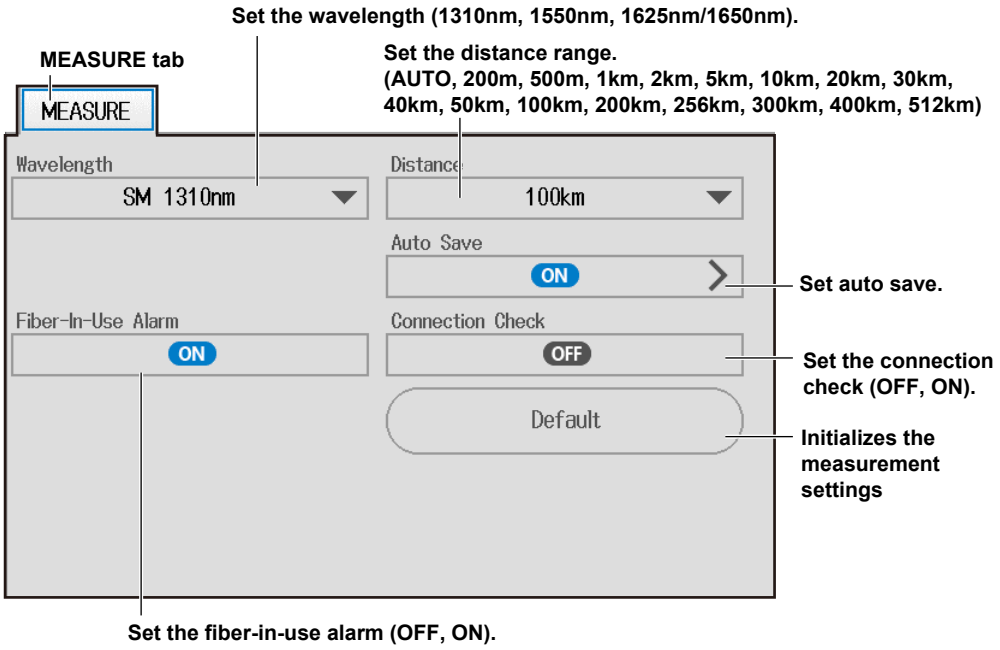


Performing Setup

3. Press **SETUP** to display the OTDR Smart Mapper setup screen.

Measurement (Measure) Conditions

4. Tap the **MEASURE** tab to display the following screen.

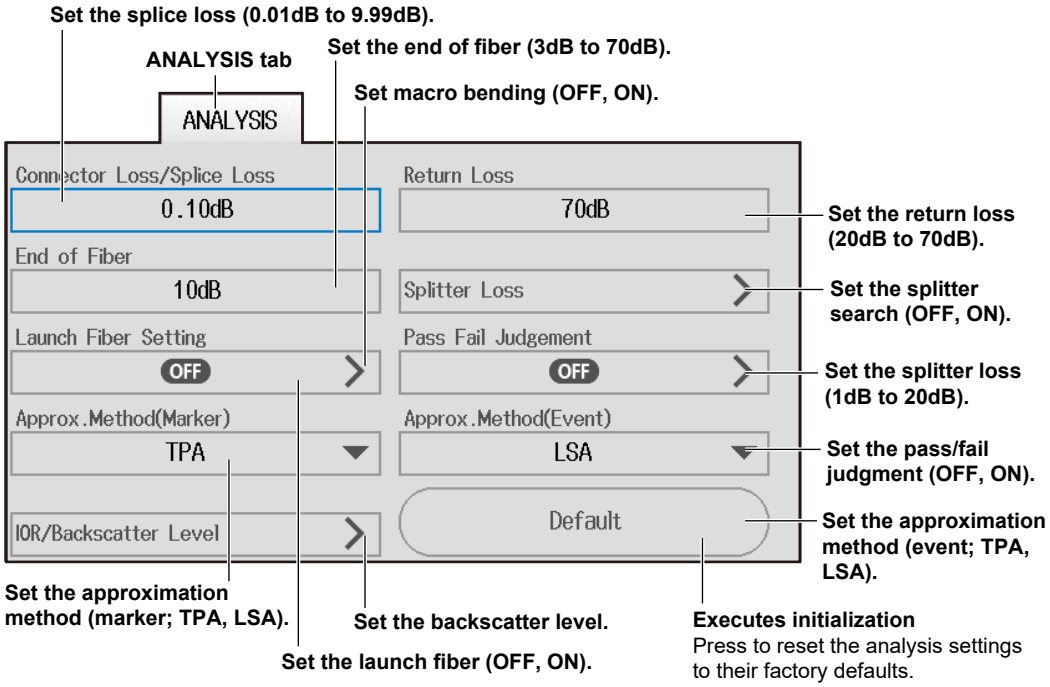


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.1.

Analysis (Analysis) Conditions

4. Tap the **ANALYSIS** tab to display the following screen.

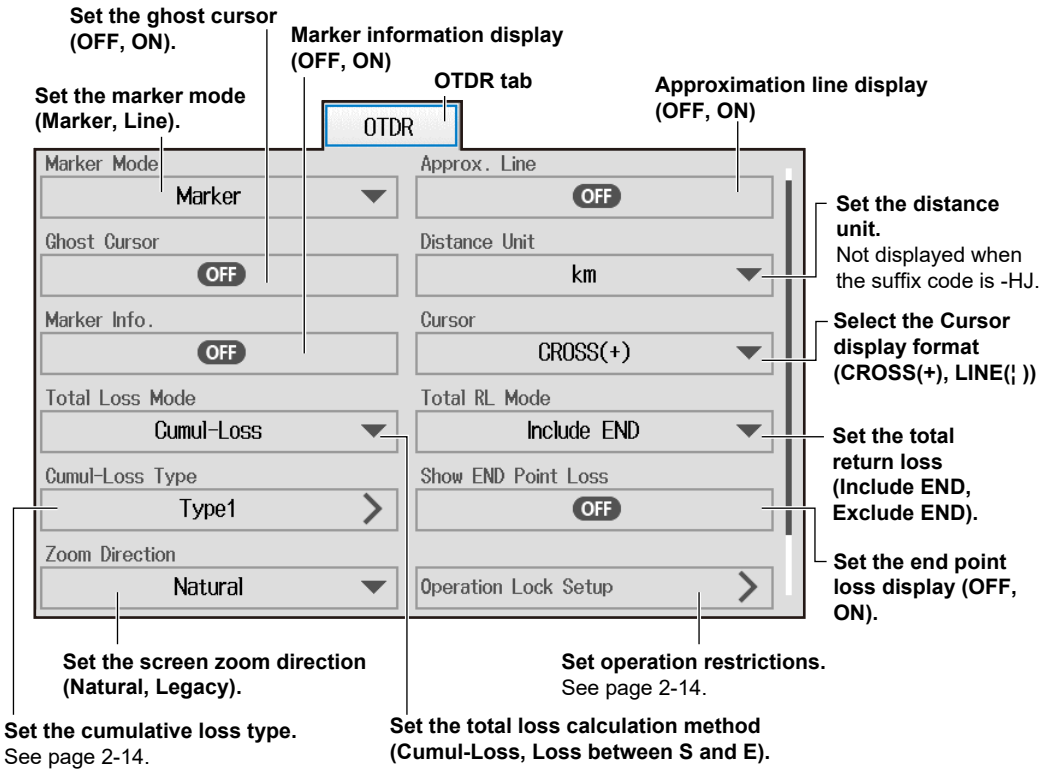


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.2.

Display (OTDR) Conditions

4. Tap the **OTDR** tab to display the following screen.

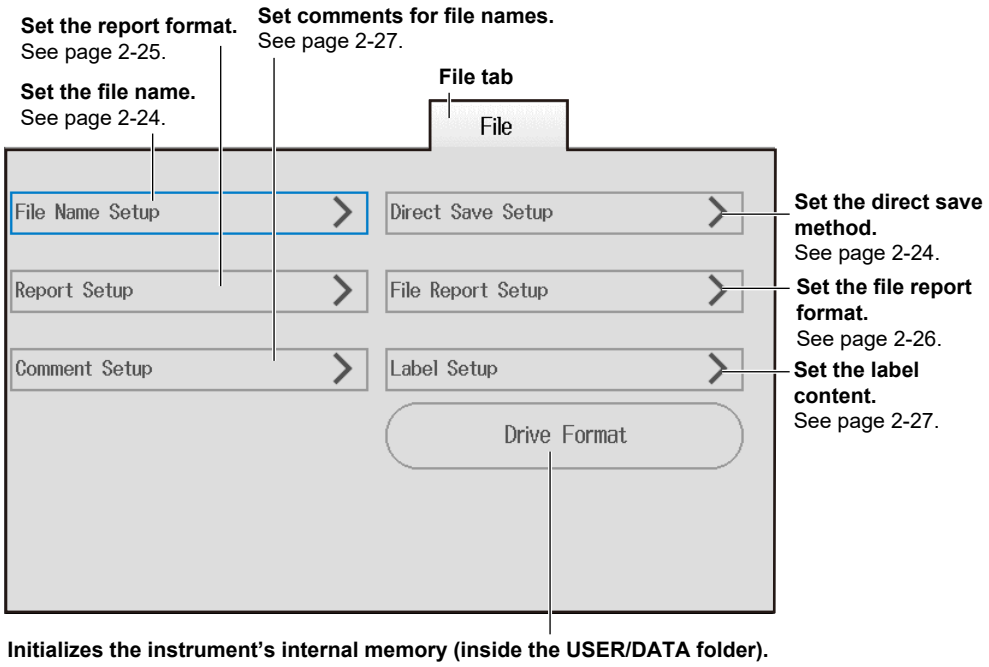


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.3.

File (FILE) Conditions

4. Tap the **File** tab to display the following screen.

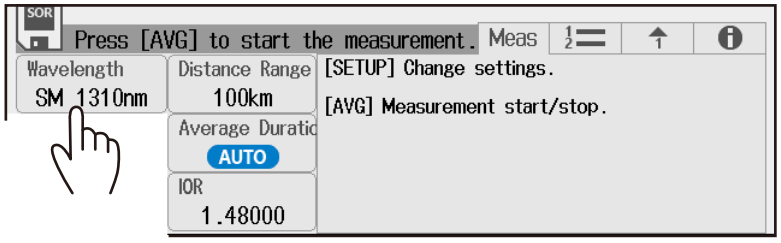


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.4.

Executing an Averaged Measurement

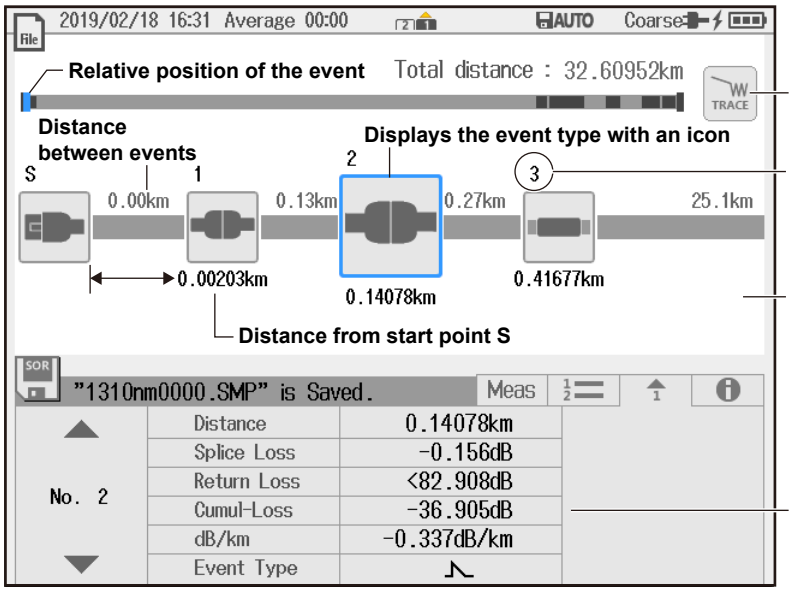
5. Tap **Wavelength** to set the wavelength.



6. Press **AVG**. A measurement will start.

Measurements are performed four times using the set averaging conditions. A wait screen is displayed while the measurement is in progress.
Also, during measurement, a mark appears at the top of the display to indicate that the laser light is on. When averaged measurements are completed, measurement is stopped automatically, event analysis is executed, and the analysis results are displayed using icons on the screen. If you press AVG again during averaged measurement, the measurement is aborted. When you abort the measurement, the measurement results are not displayed.

Map Display of the Measurement Results



View and edit waveforms in trace mode.

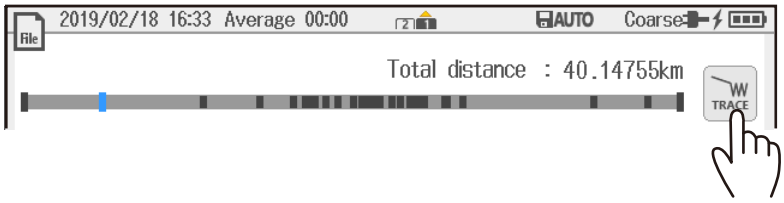
Event number

The icon display method is the same as the display in MAP mode of event analysis in section 1.4.

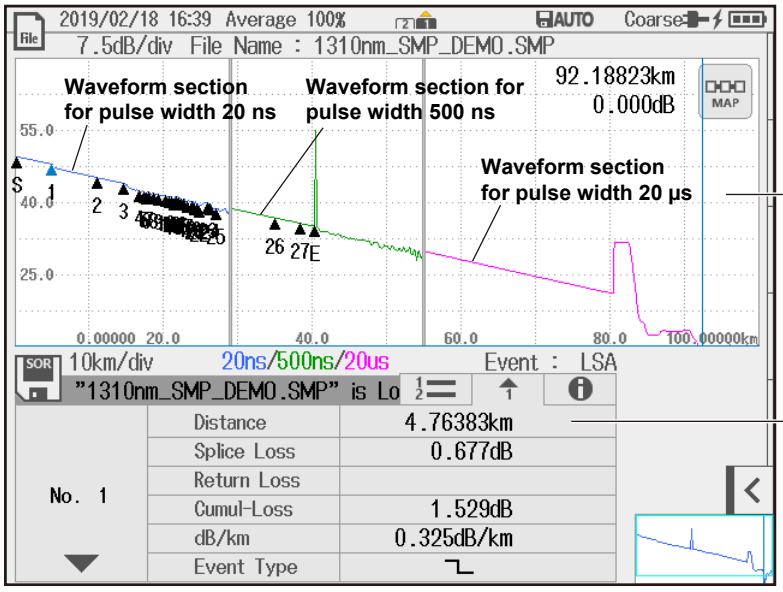
Event information display
See "Event Analysis" in section 1.4.

Viewing and Editing Waveforms in Trace Mode

7. Tap the **TRACE/MAP** button to set the data display screen to TRACE mode.
A waveform view/edit screen appears.



Waveform View/Edit Screen



Composite waveform display

Event information display
See "Event Analysis" in section 1.4.

Soft Key Menu (waveform view/edit)

3. Tap the soft key menu display button. A soft key menu appears for operating the core selection screen of multi-fiber measurement. You cannot operate in MAP mode.

Waveform View/Edit Menu

Edit the composite waveform display.
Edit the display area of the waveforms measured at each pulse width. See page 8-7.

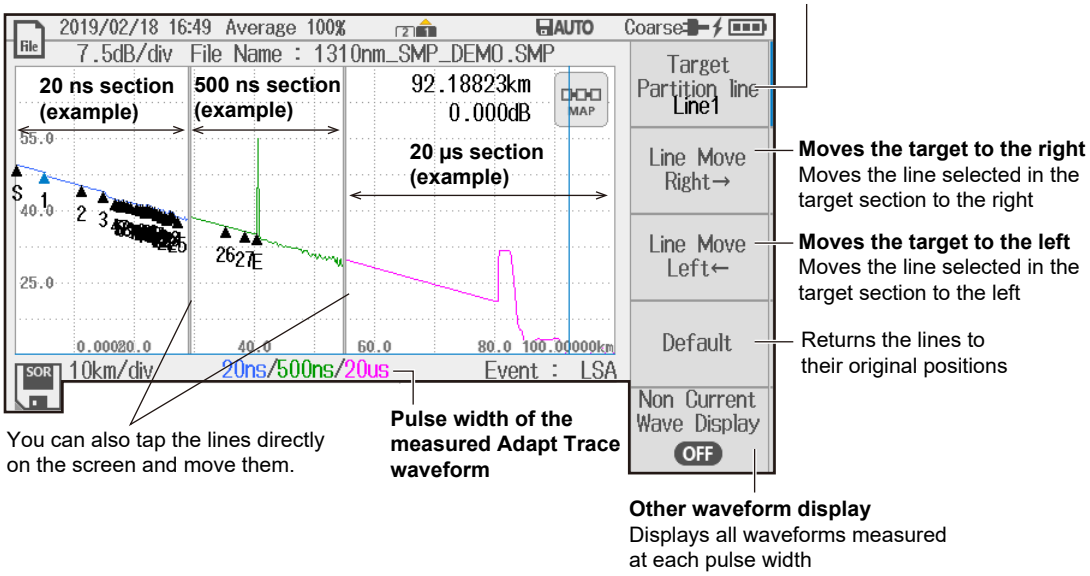
Edit or fix events.
See section 5.1.

Returns to the previous screen

Editing the Composite Waveform Display

4. Tap the **Waveform Edit** soft key. A soft key menu appears for operating the composite waveform display.

Target sections (Line1, Line2, Line3)
The number of lines varies depending on the number of measured pulse widths. In this screen example, the number of target segment lines is two because the number of pulse widths is three. You can also tap the lines directly on the screen and move them.



Moves the target to the right
Moves the line selected in the target section to the right

Moves the target to the left
Moves the line selected in the target section to the left

Returns the lines to their original positions

You can also tap the lines directly on the screen and move them.

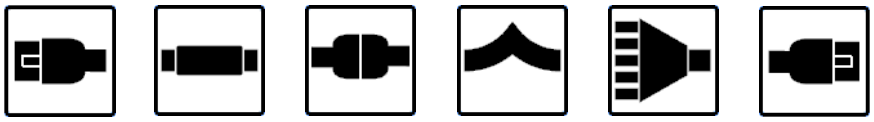
Pulse width of the measured Adapt Trace waveform

Other waveform display
Displays all waveforms measured at each pulse width

Explanation

Event Icon Display

The following events are displayed using icons.



Start point (Near-end reflection) | **Splice loss** | **Return loss** | **Bending loss** | **Splitter** | **End point (Fresnel reflection)**

8.2 Measuring a Multi-Core Optical Fiber Cable (Multi-Fiber Project)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. 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

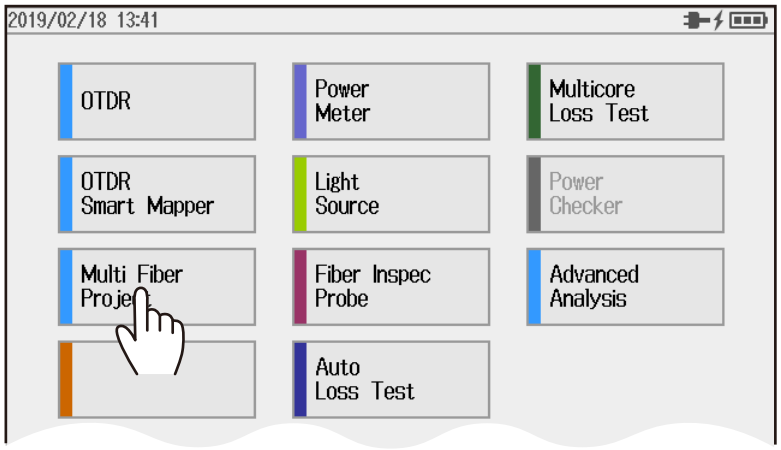
- Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. 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.

Procedure

Displaying the Multi-Fiber Measurement Screen

1. Press **MENU** to display the MENU screen.
2. Tap **Multi Fiber Project** to display the Multi Fiber Project screen.

MENU screen



Multi-Fiber Measurement Screen

Saved result indication
Gray: Measured data saved
Green: Measured data saved, pass judgment
Red: Measured data saved, fail judgment

If the measurement result of one waveform is saved in a multi wavelength measurement, the color appears in half of the cell. If the measurement results of two waveforms are saved, the color appears over the entire cell.

The save destination drive/folder name/project name of the current project

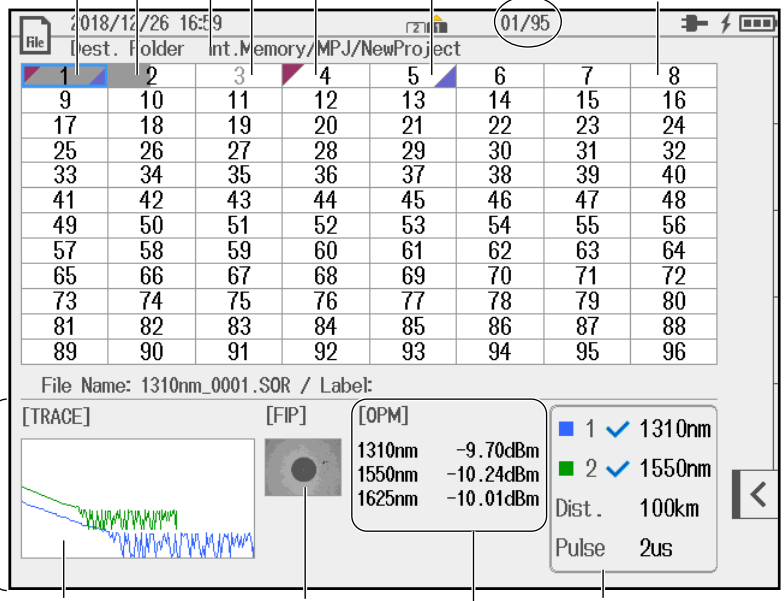
Core numbers set to Skip appear dimmed.

Observation data of the fiber end face already saved

Measured data of optical power already saved

The number of cores whose measurement results have been saved

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



Waveform data

Test data of the fiber end face

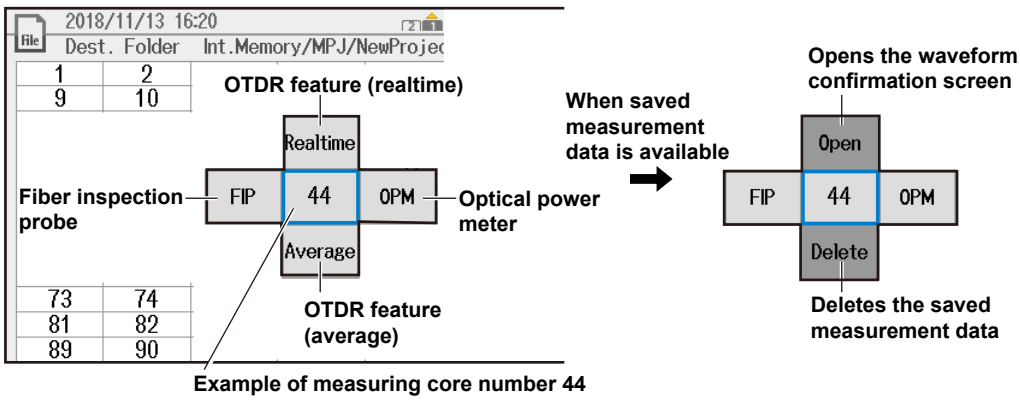
Measured data of the optical power meter

Measurement conditions of the waveform data
Displays the set wavelength, distance, and pulse width values. Check marks appear next to the wavelengths for which measured data is saved.

Preview area
Information about the core number at the cursor location

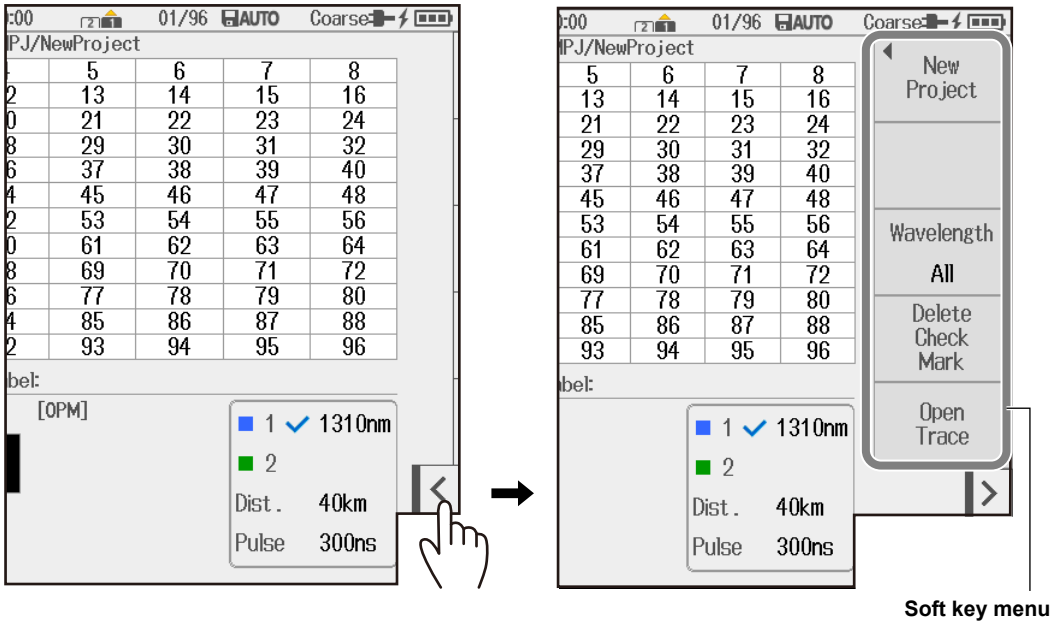
Menu for Executing Measurements

When you tap a core number on the multi-fiber measurement screen, a menu appears for executing measurements. The displayed content of the menu varies depending on whether there is measurement data that has been saved.

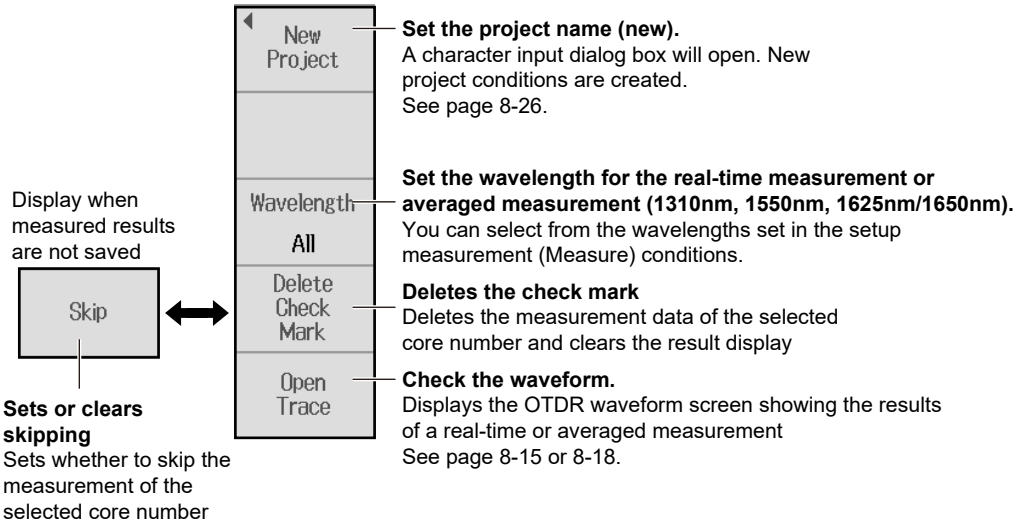


Soft Key Menu (core selection screen)

3. Tap the soft key menu display button. A soft key menu appears for operating the core selection screen of multi-fiber measurement.



Core Selection Menu for Multi-Fiber Measurement



Performing Setup

3. Press **SETUP** to display the multi-fiber measurement setup screen.

Project Conditions

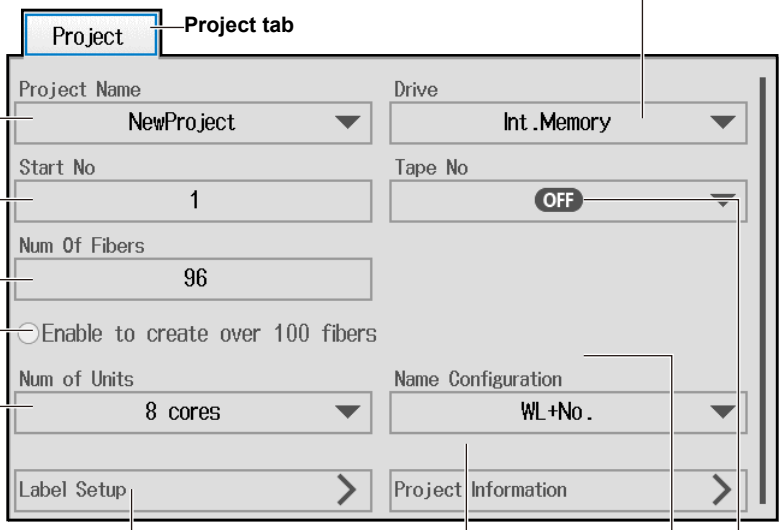
4. Tap the **Project** tab to display the following screen.

Set the number of cores or tapes (1 to 2000).
Create a project with more than 100 cores
Selected: The selectable range of number of cores is 100 to 2000.
Not selected: The selectable range of number of cores is 1 to 100.

Set the starting core number (1 to 9900).

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

Select the drive (Int.Memory, USB Memory, USB Memory 2).
Selectable when auto save is ON.



Set the label.
The same label can be entered for all cores.
See section 2.4.

Project information
You can view the project settings and measurement settings in a table.
See page 8-26.

Set the number of cores in each division (8 cores, 10 cores).
You can set this when the tape number is set to OFF.

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

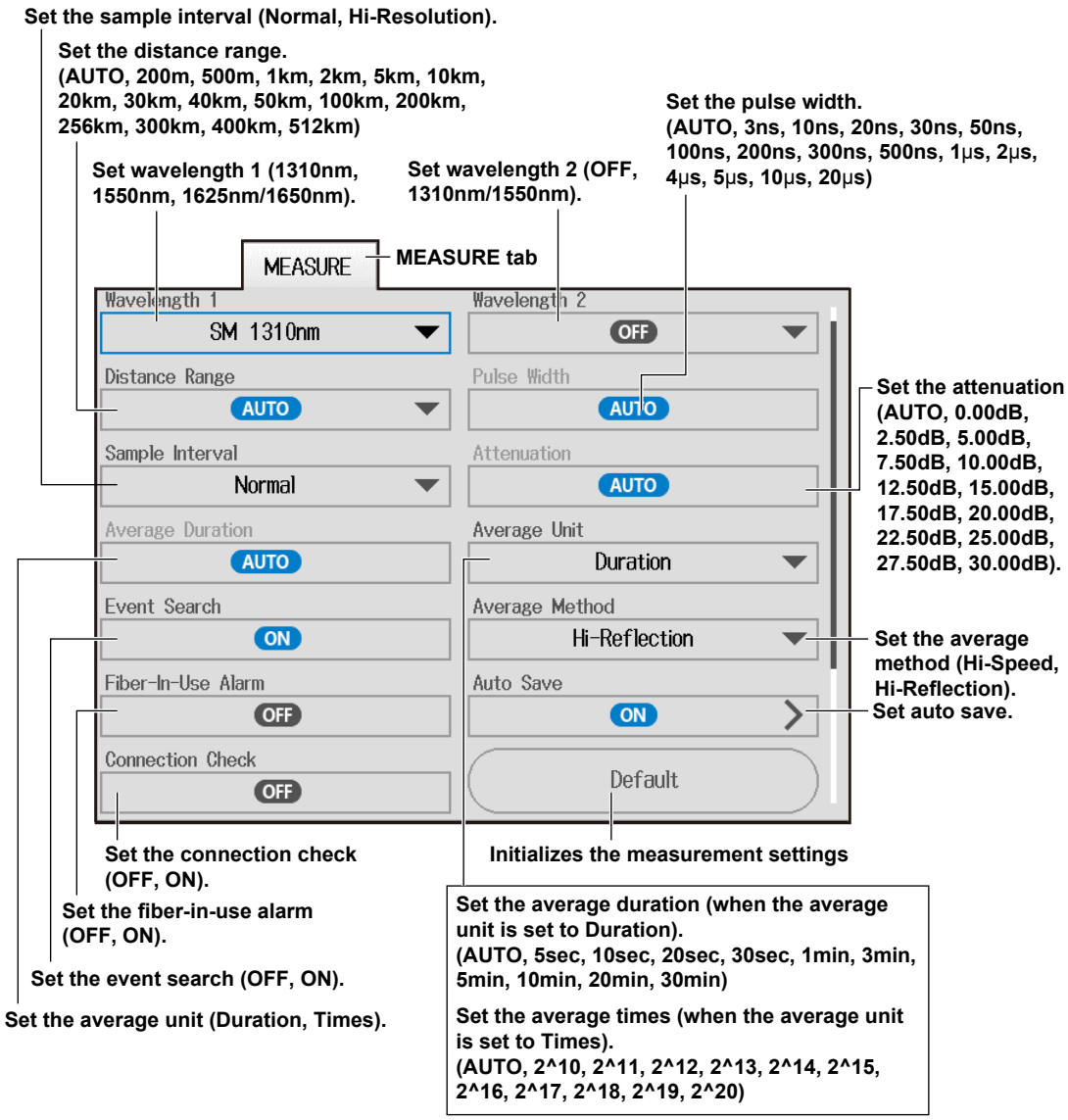
Set the tape number (OFF, a-b (2), a-c (3), a-d (4), a-e (5), a-f (6), a-g (7), a-h (8)).

Note

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

Measurement (Measure) Conditions

4. Tap the **MEASURE** tab to display the following screen.

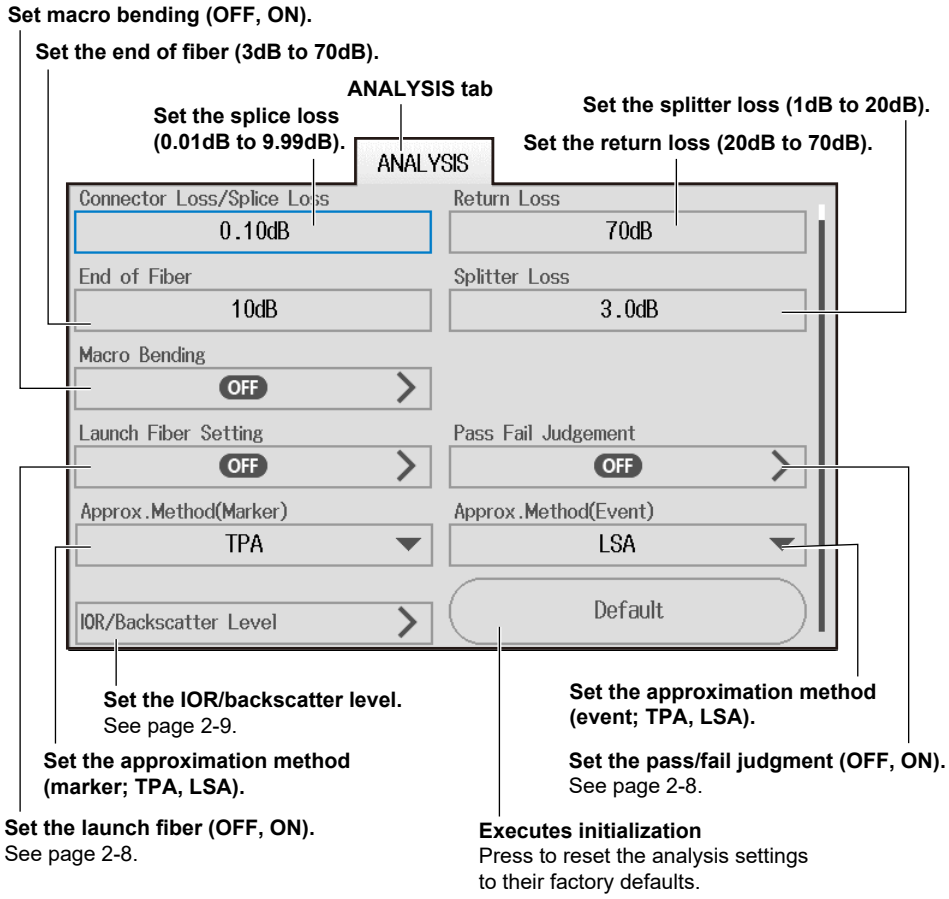


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.1.

Analysis (Analysis) Conditions

4. Tap the **ANALYSIS** tab to display the following screen.

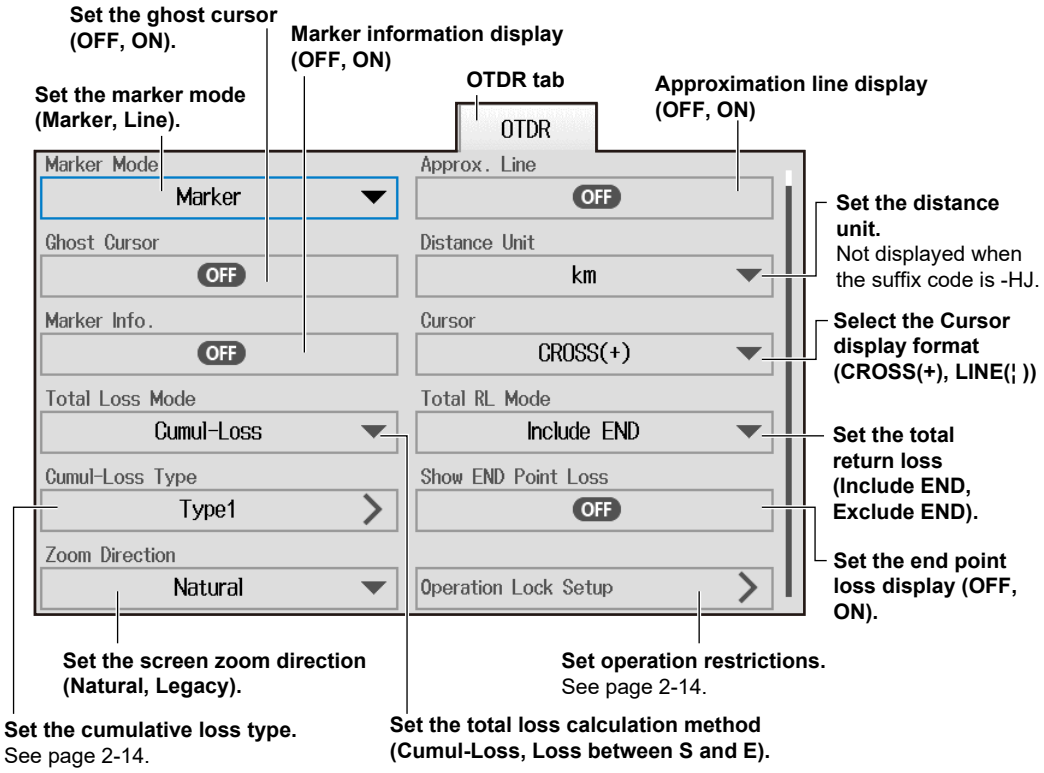


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.2.

Display (OTDR) Conditions

4. Tap the **OTDR** tab to display the following screen.

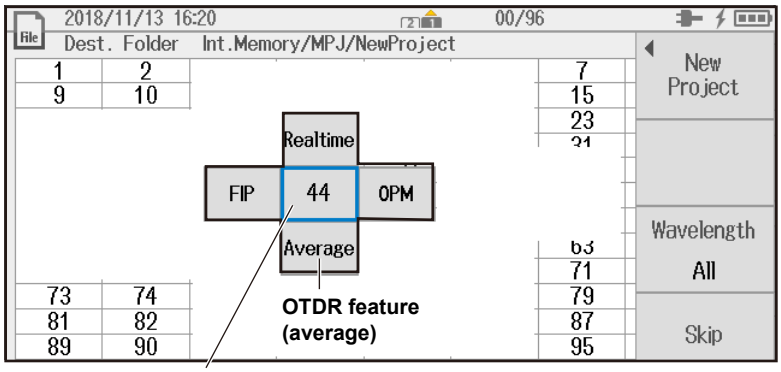


Note

For details on the setup screen that appears when you select a setting and the descriptions of the settings, see section 2.3.

Performing Averaged Measurements

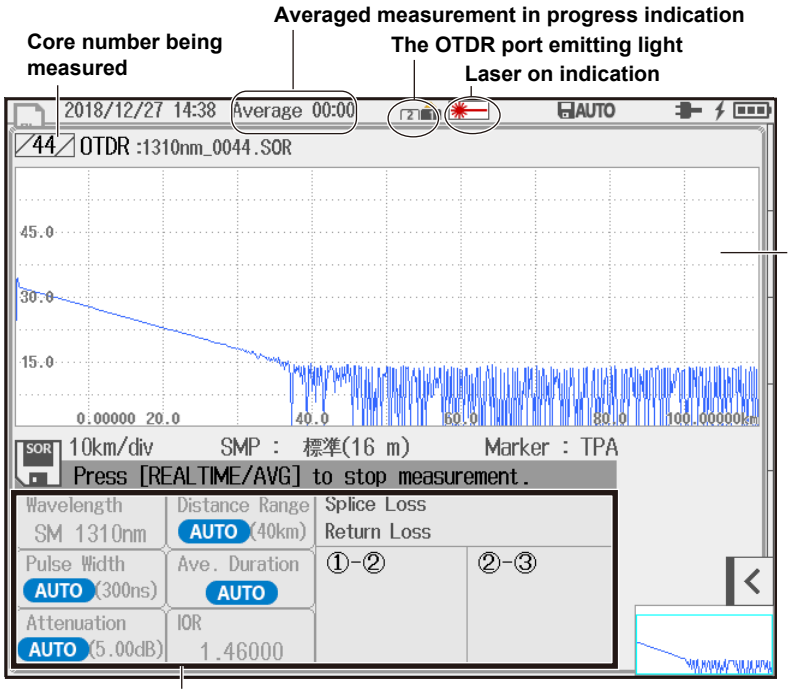
5. Tap the core number you want to perform averaged measurement on. A menu appears for executing a measurement.



Example of measuring core number 44

6. Tap the **Average** menu to start an averaged measurement.

The measured waveform is displayed on the screen, and while the measurement is in progress, a laser emitting mark is displayed at the top of the screen.



Cannot be controlled on the OTDR waveform screen of multi-fiber measurement. When event search is set to on in the setup measurement (Measure) conditions, the analysis results are displayed when the measurement is complete.

Note

- If Wavelength on the multi-fiber measurement 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.
- You can also execute an averaged measurement using the AVG key.

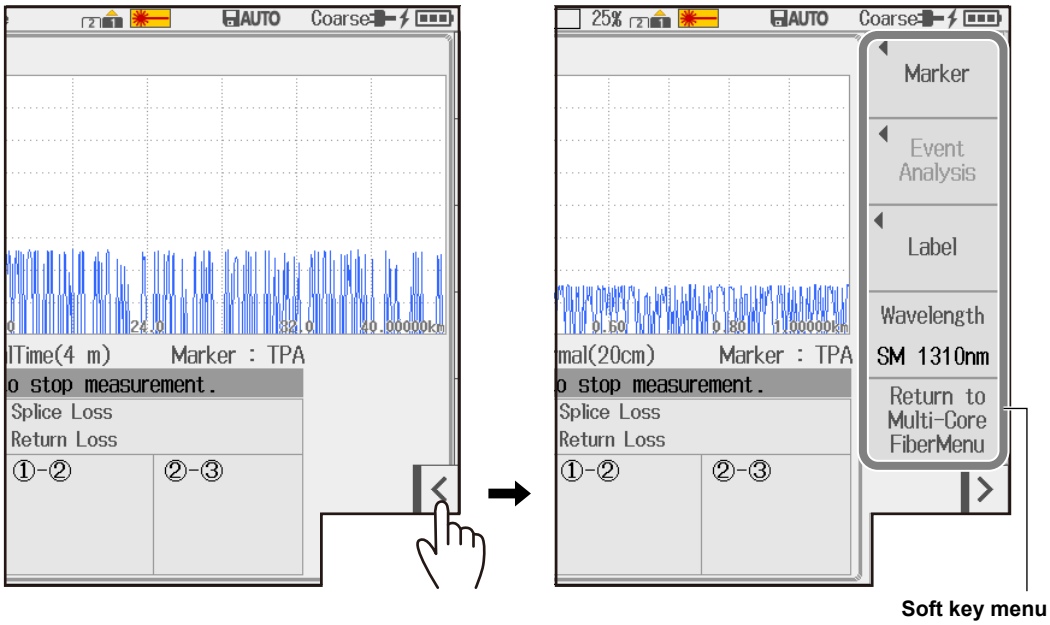
- **When Auto Save is Set to ON in the Measurement (Measure) Conditions of Setup**

  When measurement is complete, the measured results are automatically saved. The screen returns automatically to the multi-fiber measurement screen, 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 Measurement (Measure) Conditions of Setup**
  When measurement is complete, the measured results are not automatically saved. The OTDR waveform screen will be displayed. To return to the multi-fiber measurement screen, display the soft key menu, and tap Return to Multi-Core FiberMenu. When returning to the multi-fiber measurement screen, a message appears for confirming the saving of the measured results. If necessary, save the measured results.

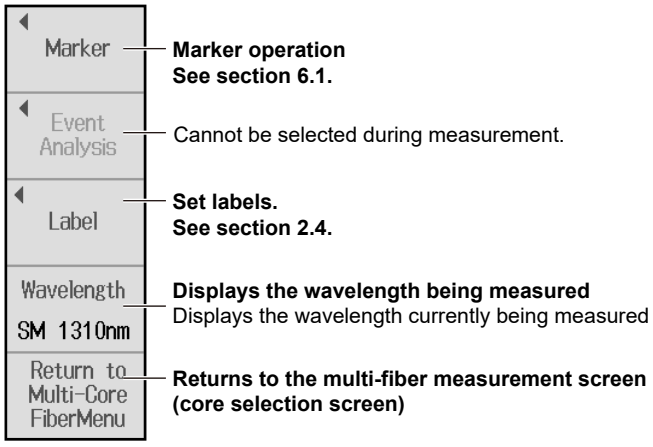
Soft Key Menu (averaged measurement)

7. Tap the soft key menu display button. A soft key menu appears for operating the OTDR screen of averaged measurement.

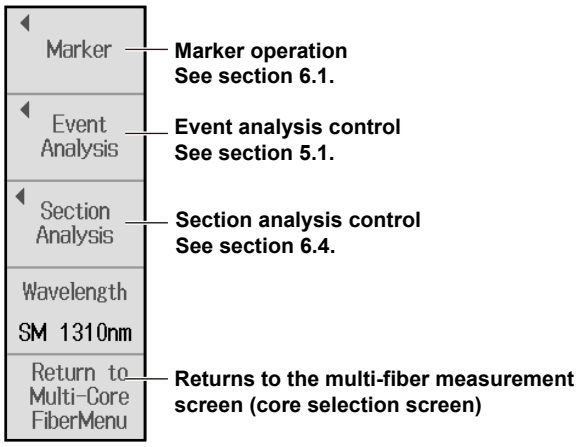


OTDR Screen Menu of Averaged Measurement

- **When Averaged Measurement Is in Progress**

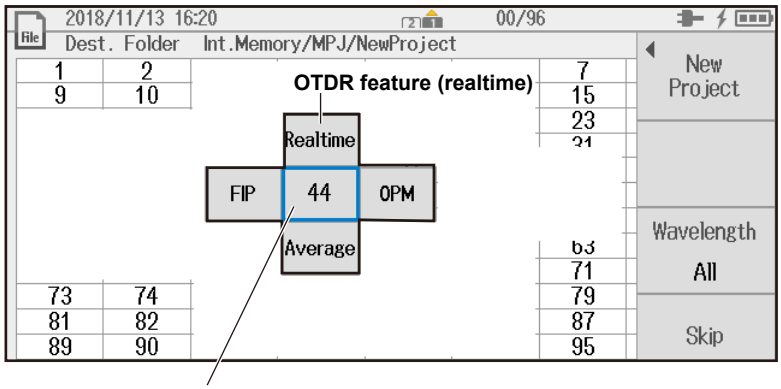


- **When Averaged Measurement Is Not in Progress**



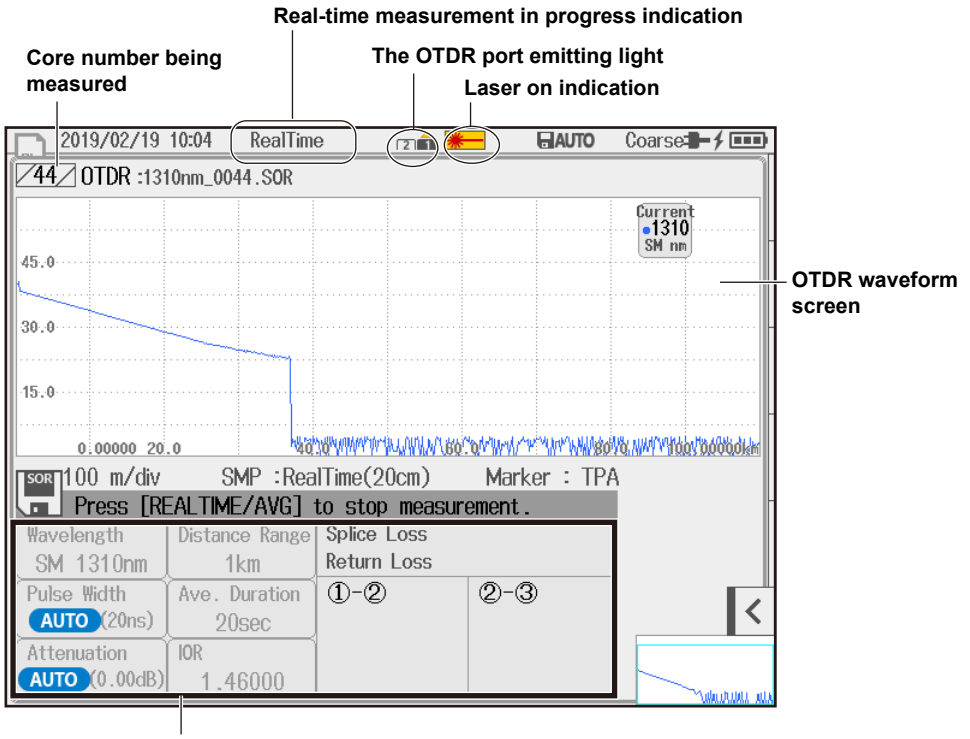
Performing Real-time Measurement

5. Tap the core number you want to perform real-time measurement on. A menu appears for executing a measurement.



6. Tap the **Realtime** menu to start a real-time measurement.

The measured waveform is displayed on the screen, and while the measurement is in progress, a laser emitting mark is displayed at the top of the screen.



7. Press **REALTIME** to stop the real-time measurement.

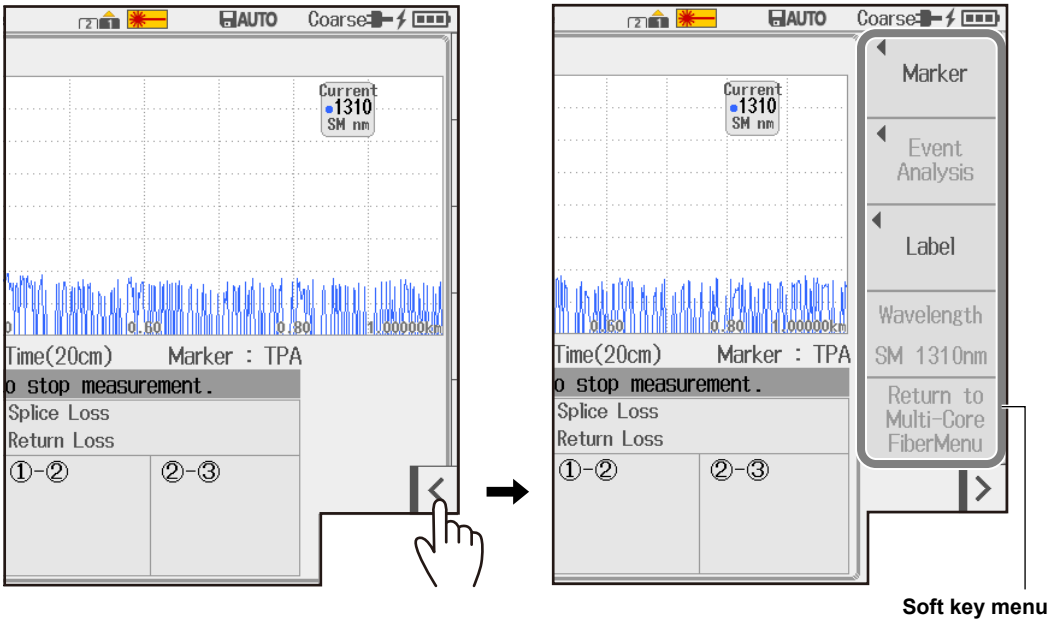
To return to the multi-fiber measurement screen, display the soft key menu, and tap Return to Multi-Core FiberMenu. When returning to the multi-fiber measurement screen, a message appears for confirming the saving of the measured results. If necessary, save the measured results.

Note

- In real-time measurement, measured results are not automatically saved.
- If Wavelength on the multi-fiber measurement 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 soft key 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 at once for all cores.

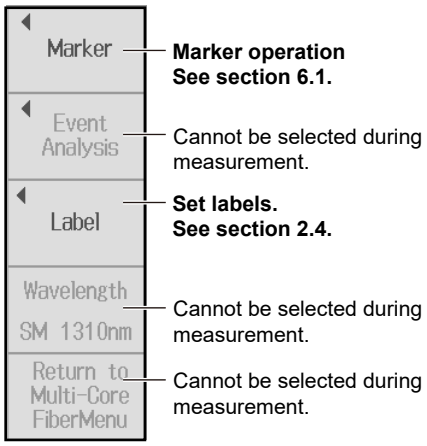
Soft Key Menu (real-time measurement)

7. Tap the soft key menu display button. A soft key menu appears for operating the OTDR screen of real-time measurement.

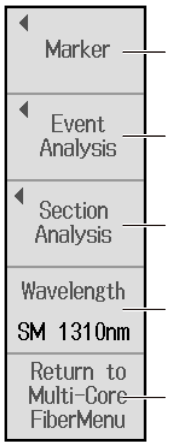


OTDR Screen Menu of Real-Time Measurement

- **When Real-Time Measurement Is in Progress**



- **When Real-Time Measurement Is Not in Progress**



Marker operation
See section 6.1.

Event analysis control
See section 5.1.

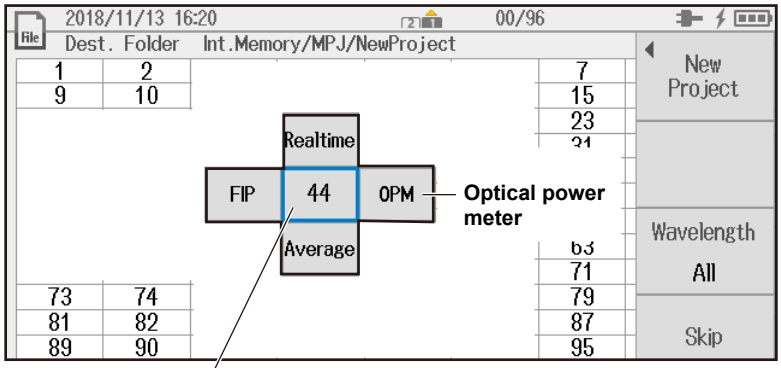
Section analysis control
See section 6.4.

Set the wavelength.
Switches the wavelength to perform real-time measurement

Returns to the multi-fiber measurement screen (core selection screen)

Measuring the Optical Power

5. Tap the core number you want to measure the optical power of. A menu appears for executing a measurement.

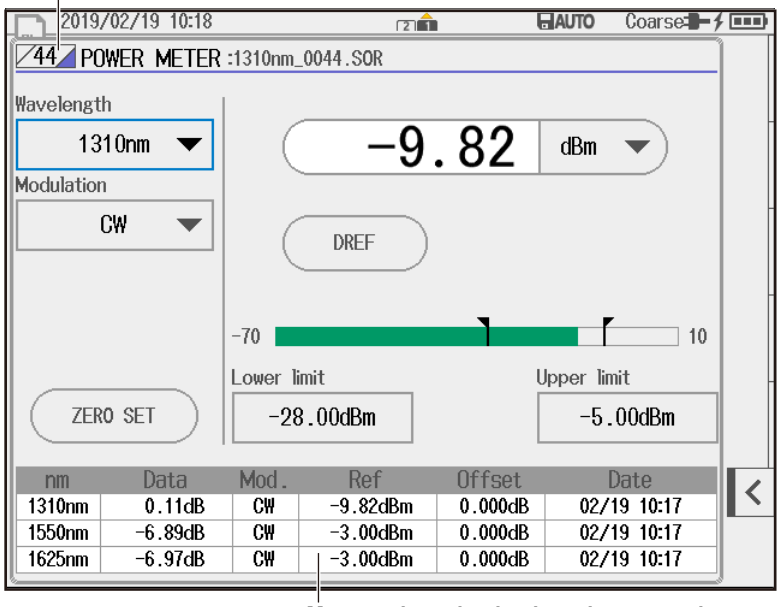


Example of measuring core number 44

6. Tap the **OPM** menu to display the power meter screen.

   For details on how to operate the optical power meter, see section 7.3.
   To return to the previous screen, tap Return to Multi-Core FiberMenu on the soft key menu (see the next page).

Core number being measured



Measured results that have been saved

Performing Setup

7. Press **SETUP** to display the optical power meter setup screen.
8. Tap the **Power Meter** tab to display the POWER METER screen.

   For details on how to set up the optical power meter, see section 7.3.

Executing the Zero Set

9. After step 8, close the optical power meter screen. The screen returns to the power meter screen.
10. Tap **ZERO SET**.

    For details on how to perform zero set on the optical power meter, see section 7.3.
    Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.

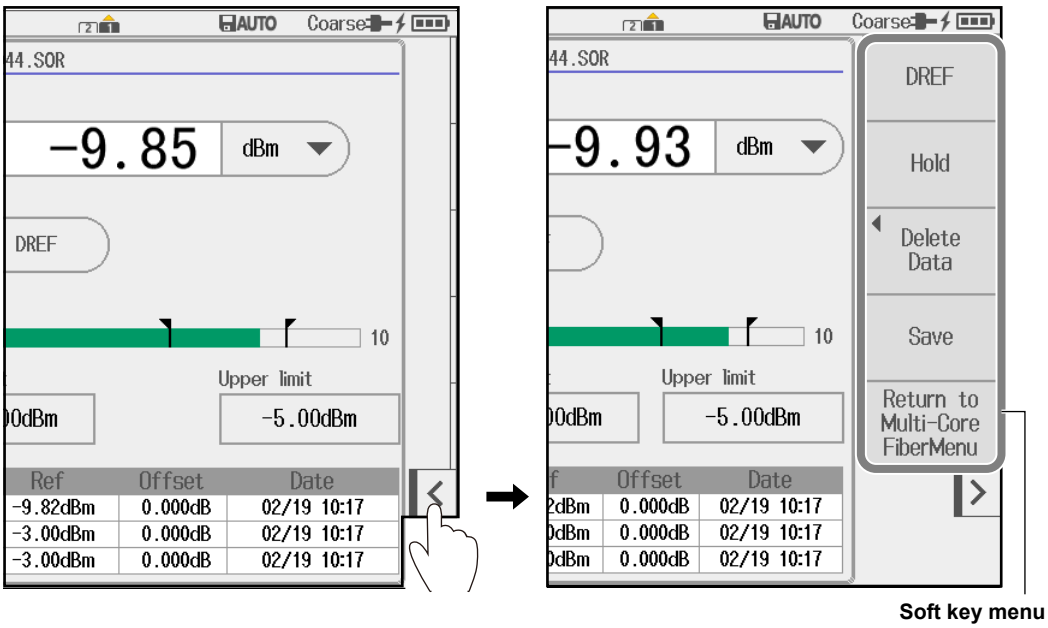
Measuring the Optical Power

11. Set the wavelength.

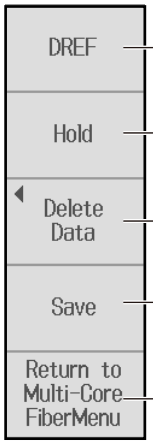
12. Connect an optical fiber cable to the OPM port. The measured value is displayed on the power meter screen. For the position of the OPM port, see “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN.

Soft Key Menu (optical power meter)

13. Tap the soft key menu display button. An optical power meter soft key menu appears.



Optical Power Meter Menu



Sets the reference to the currently displayed measured value
See page 7-11.

Holds the measured value display
See page 7-11.

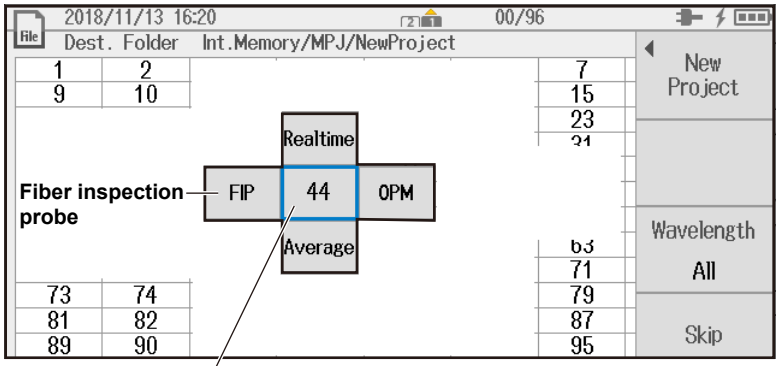
Deletes the measurement data of the core number
See page 7-13.

Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables.
See page 7-12.

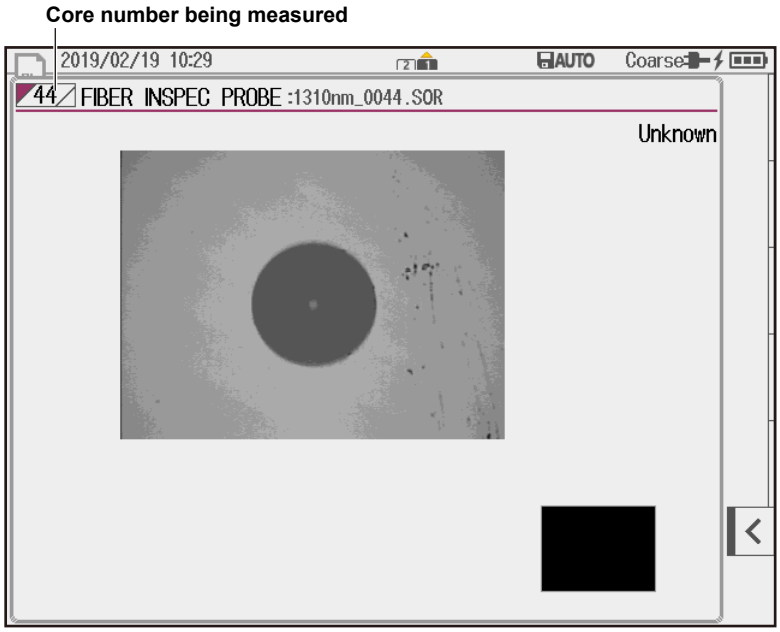
Returns to the core selection screen of multi-fiber measurement

Using the Fiber Inspection Probe (/FST option)

5. Connect the fiber inspection probe to the core of the optical fiber cable you want to inspect.
6. Tap the core number that you are connecting the fiber inspection probe to. A menu appears for executing a measurement.

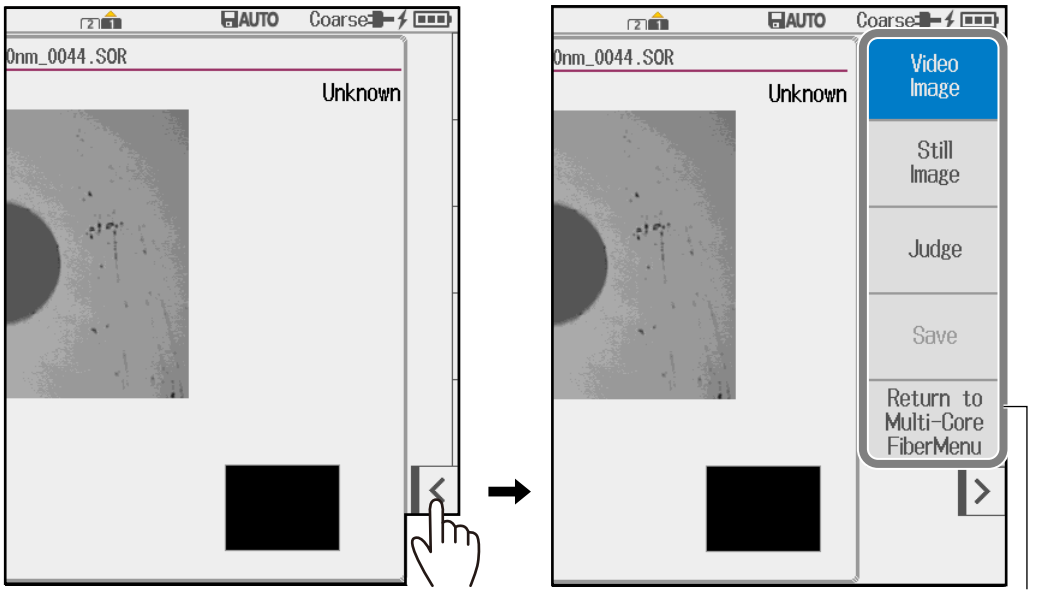


7. Tap the **FIP** menu to display the FIBER INSPEC PROBE screen.
   For details on how to use the fiber inspection probe, see section 7.6.
   To return to the previous screen, tap Return to Multi-Core FiberMenu on the soft key menu (see the next page).



Soft Key Menu (fiber inspection probe)

8. Tap the soft key menu display button. A soft key menu for the fiber inspection probe appears.



Soft key menu

Fiber Inspection Probe Menu

Displays the image in real time

Holds the image display (HOLD)

Executes pass/fail judgment
A pass/fail judgment is performed, and the result (summary) is displayed.
See section 7.6.

Starts saving
Press this soft key to save the still image to a BMP file. For the file save destination, see section 9.4. For the procedure to set the file name, see section 2.4.

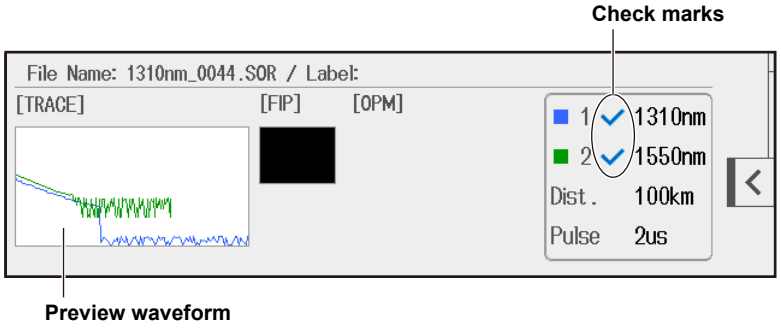
Returns to the core selection screen of multi-fiber measurement

Previewing Measured Results

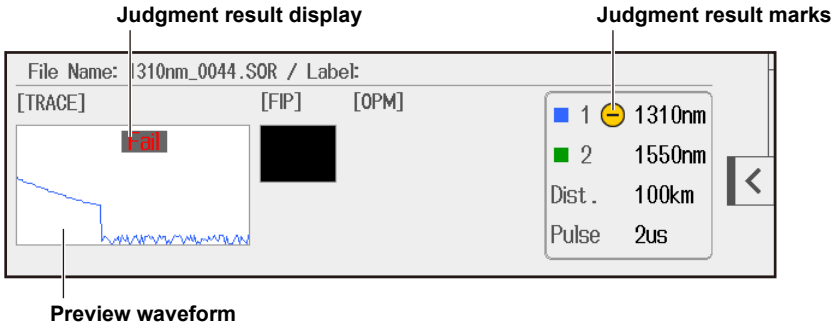
Using the **arrow keys** or the **rotary knob**, move the cursor to a core number cell with a pass/fail judgment result indication on the multi-fiber measurement screen. The preview area at the bottom of the screen displays the measurement conditions, measurement date, and the measurement result waveform of the selected core number. For details on pass/fail judgment, see section 4.3.

Real-Time/Averaged Measurement Preview

- **When Pass/Fail Judgment Is Set to OFF**
  Check marks appear next to the wavelengths for which measured data is saved.

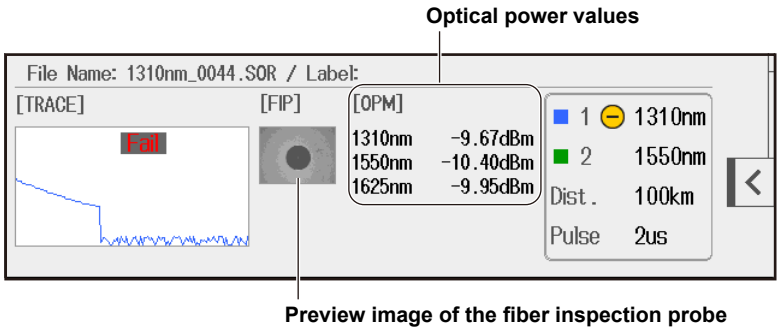


- **When Pass/Fail Judgment Is Set to ON**
  Judgment result marks appear next to the wavelengths for which measured data is saved.



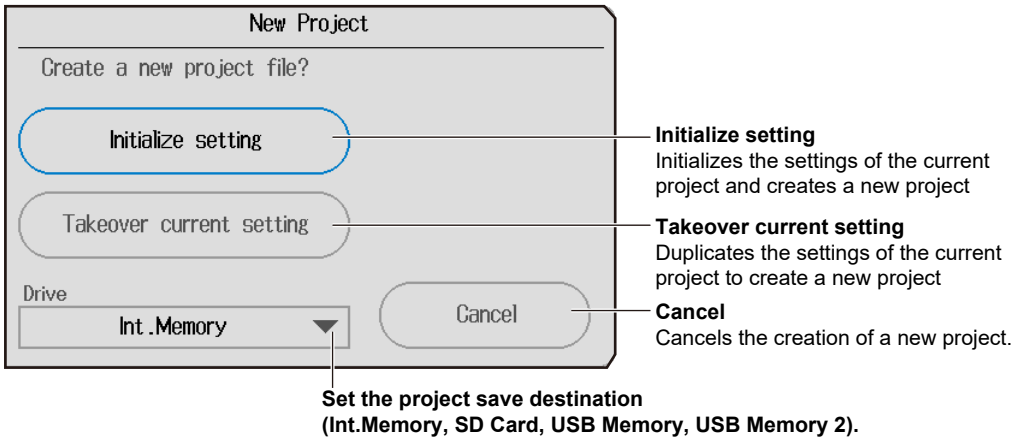
Optical Power Measurement Results and Fiber Inspection Probe Observation Results

The optical power of the measured wavelength is displayed. An image data is displayed for the fiber inspection probe observation results.



Creating a New Project

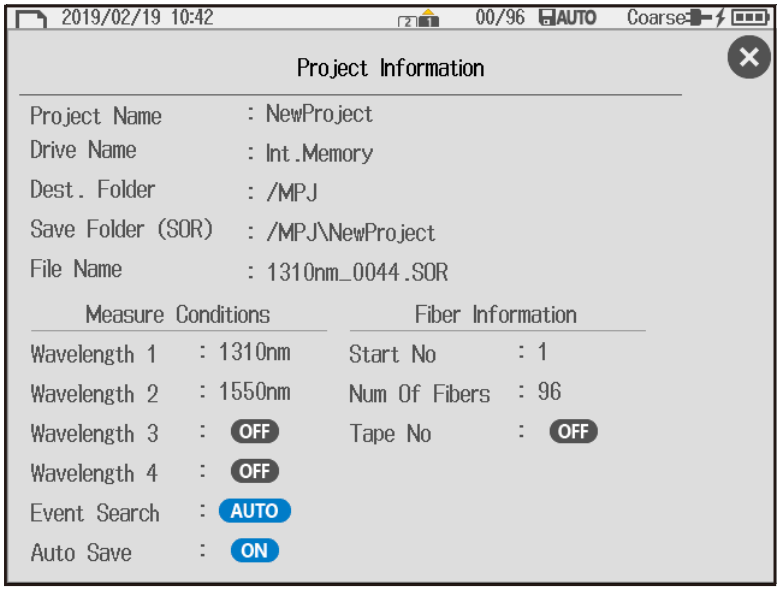
Tap the **New Project** soft key. A character input dialog box will open. Enter a project name by following the procedure provided in “Entering Text” in the Getting Started Guide, IM 1210-02EN.
Tapping **Enter** in the character input dialog box displays the following screen.



Tap **Initialize setting** or **Takeover current setting**. A new project is created, and a multi-fiber measurement screen appears.
To change the project settings, see “Setup” on page 8-11.

Viewing the Project Information

Tap **Project Information** to display the following screen. You can check the settings.



Explanation

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 9.4.

Note

Decompressing MPZ Files

On the AQ7933 OTDR emulation software, run Utility > MPZ Converter. Select the source file (MPZ file) and the conversion destination. An MPJ file and SOR files will be extracted.
AQ7933 (sold separately) is a PC software application for analyzing and creating reports of waveform data measured by the instrument.

Loading a Project

An MPJ file created using the “Multi-Fiber Project” feature included in the AQ7933 OTDR Emulation Software can be loaded into the instrument.

Note

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

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 judgment is set to ON. If this occurs, you can turn off the display of pass/fail judgment 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.

8.3 Performing an Auto Loss Test (Auto Loss Test)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. 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

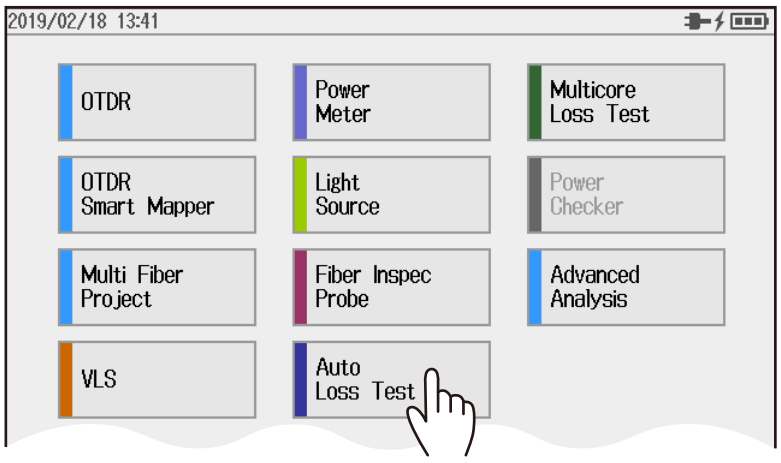
- Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. 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.

Procedure

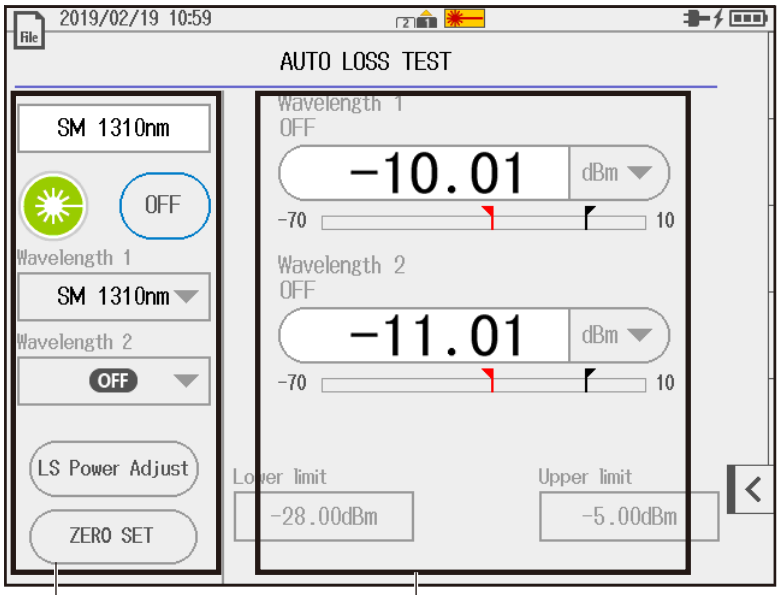
Displaying the Auto Loss Test Screen

1. Press **MENU** to display the MENU screen.
2. Tap **Auto Loss Test** to display the AUTO LOSS TEST screen.

MENU screen

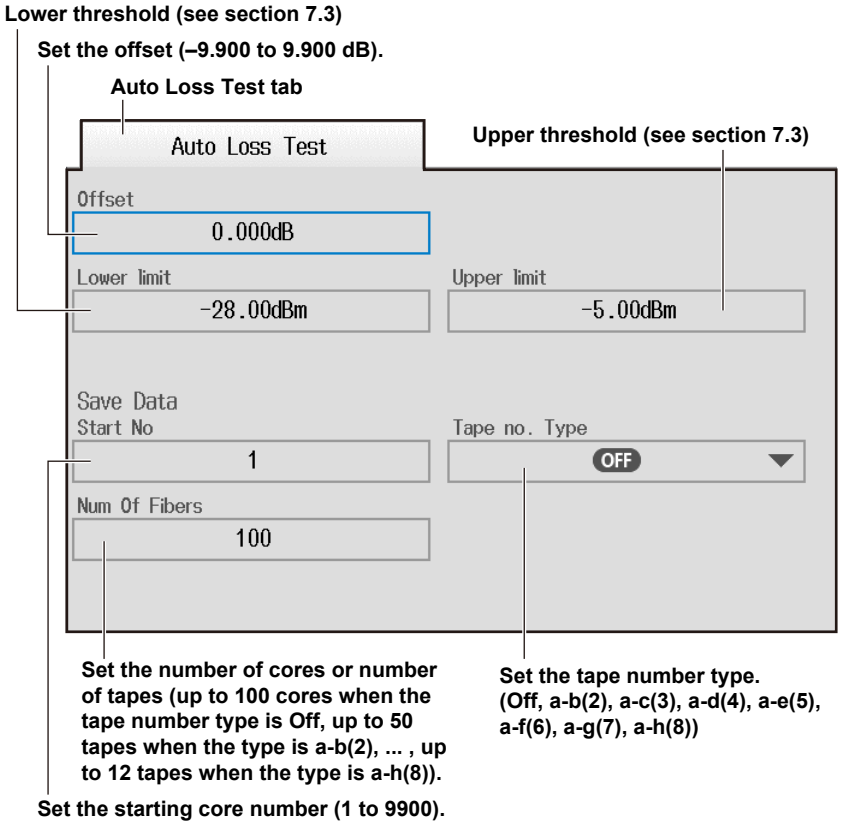


Auto Loss Test Screen



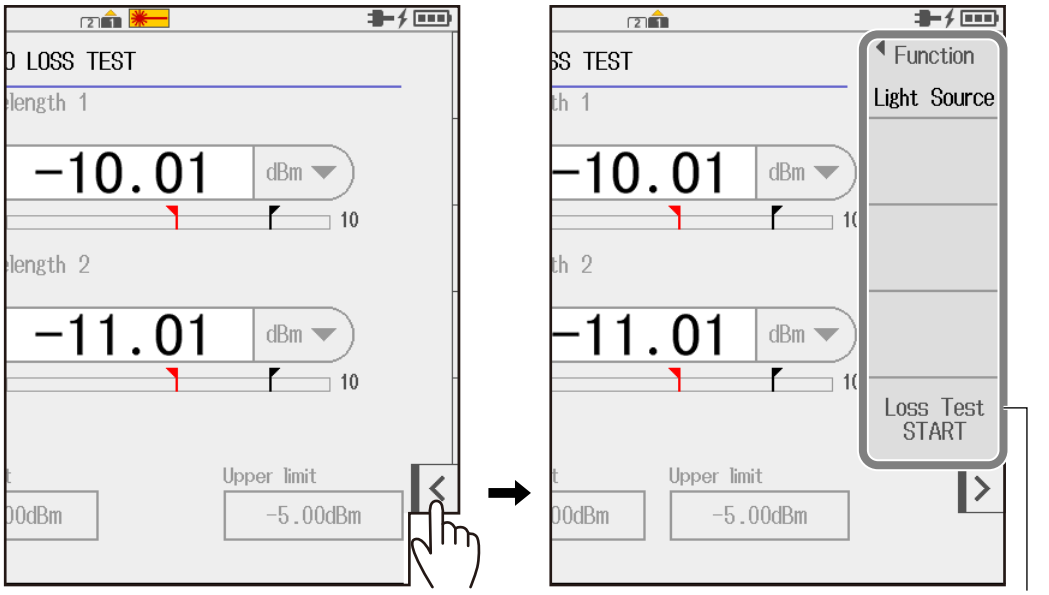
Performing Setup

3. Press **SETUP** to display the auto loss test screen.
4. Tap the **Auto Loss Test** tab to display the following screen.



Soft Key Menu (auto loss test)

5. Tap the soft key menu display button. An auto loss test soft key menu appears.



Soft key menu

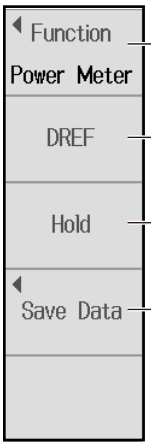
Auto Loss Test Menu

• When the function is set to Light Source
Configure the light source display screen.

Select the function (Light Source, Power Meter, Loopback).

Starts the loss test
The light source generates the specified wavelengths of measurement light in order. The optical power meter measures the optical power of the light that it receives.

• When the function is set to Power Meter
Configure the power meter display screen.



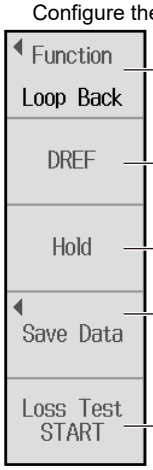
Select the function (Light Source, Power Meter, Loopback).

Sets the reference to the currently displayed measured value
See page 7-11.

Holds the measurement values
See page 7-11.

Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables.
See page 7-12.

• When the function is set to Loopback
Configure the loopback display screen.



Select the function (Light Source, Power Meter, Loopback).

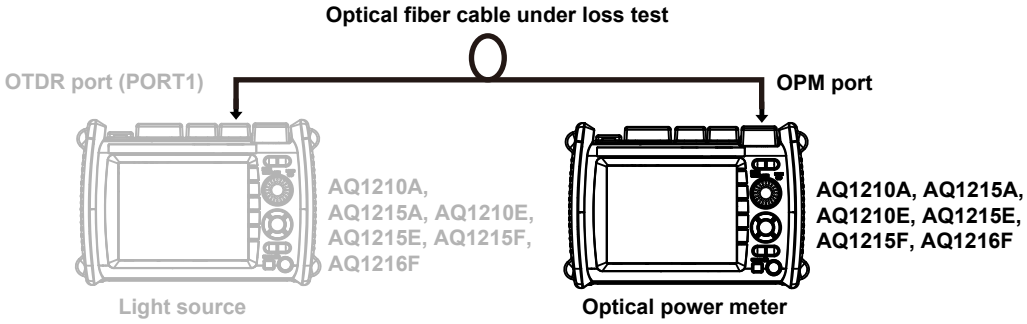
Sets the reference to the currently displayed measured value
See page 7-11.

Holds the measurement values
See page 7-11.

Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables.
See page 7-12.

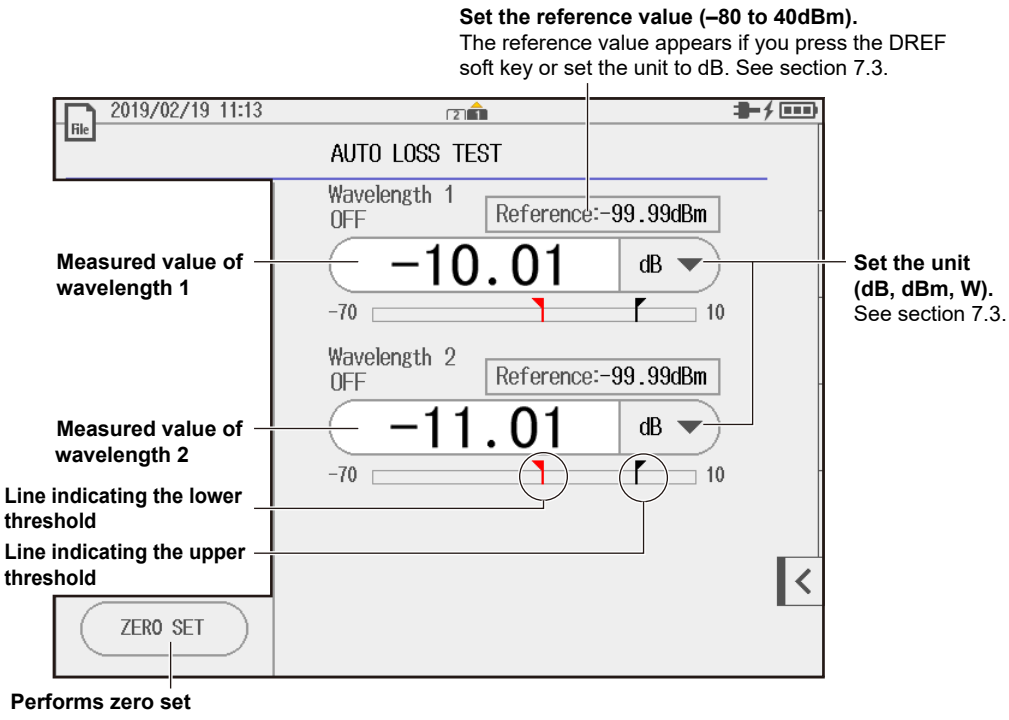
Starts the loss test
The light source generates the specified wavelengths of measurement light in order. The optical power meter measures the optical power of the light that it receives.

Operation on the Optical Power Meter Side



Optical Power Meter Display Screen

6. Tap the **Function** soft key to select **Power Meter**. You can now operate the optical power meter display screen.



Executing the Zero Set

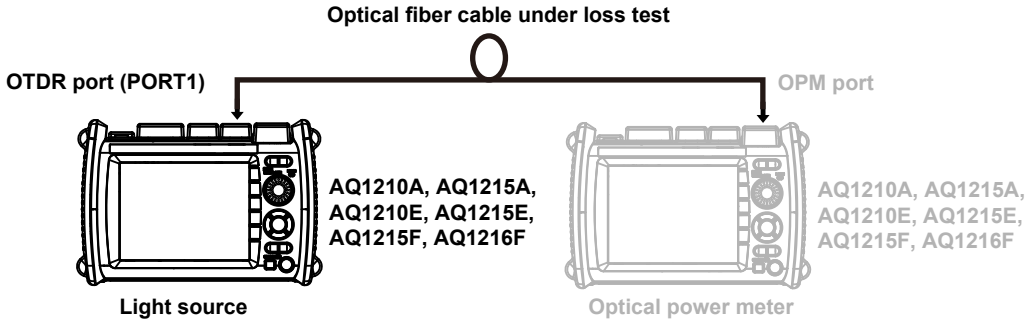
7. Tap **ZERO SET**.

Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.

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.

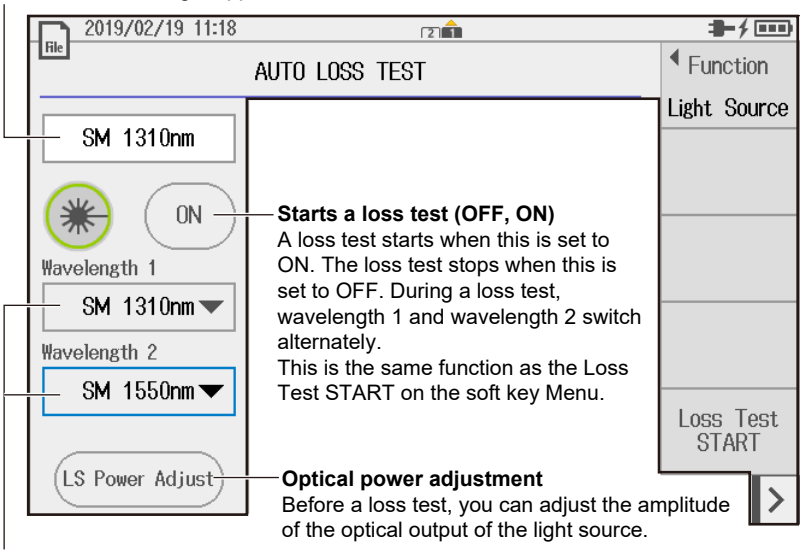
Operation on the Light Source Side



Light Source Display Screen

6. Tap the **Function** soft key to select **Light Source**. A light source soft key menu appears, and you will be able to operate the light source display screen.

Output wavelength
When you start a loss test, the instrument generates the specified wavelengths in order.
The current wavelength appears here.



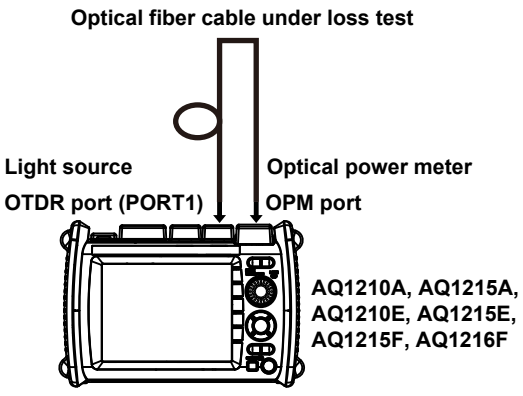
Starts a loss test (OFF, ON)
A loss test starts when this is set to ON. The loss test stops when this is set to OFF. During a loss test, wavelength 1 and wavelength 2 switch alternately.
This is the same function as the Loss Test START on the soft key Menu.

Optical power adjustment
Before a loss test, you can adjust the amplitude of the optical output of the light source.

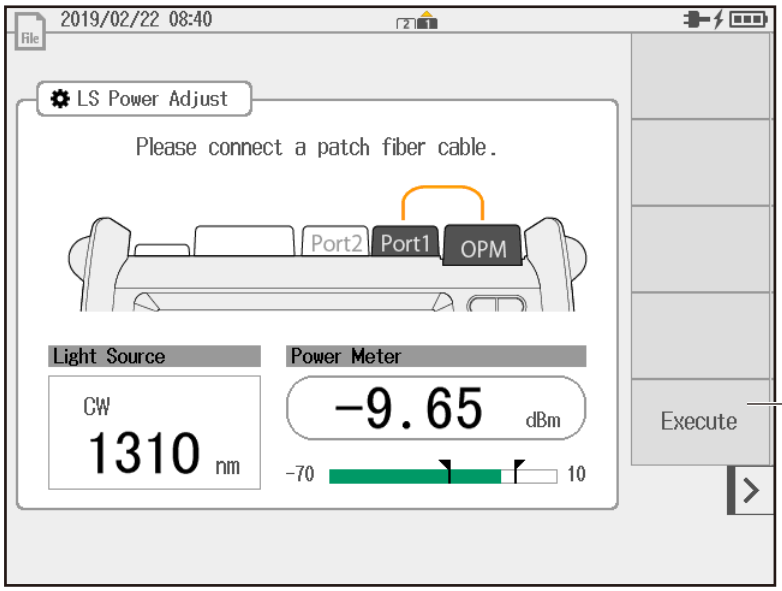
Set the wavelength
(GI 850nm, GI 1300nm, SM 1310nm, SM 1490nm, SM 1550nm, SM 1625nm, SM 1650nm).

Adjusting the Optical Power

7. Before starting the loss test, directly connect the OTDR port (PORT1) of the instrument (light source side) to the OPM port with a short optical fiber cable.



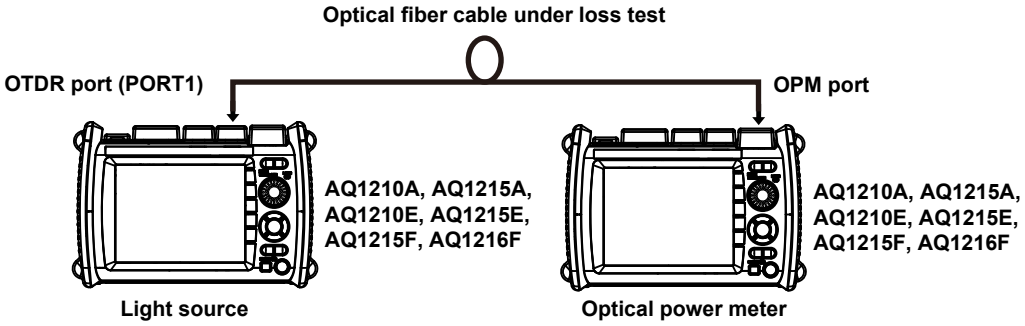
8. Tap **LS Power Adjust** to display the following screen.



Starts optical power adjustment
The measurement light turns on.
When adjustment ends normally, the instrument returns to the previous screen.

Executing a Loss Test

9. Connect the OTDR port (PORT1) of the instrument (light source side) to the OPM port of the instrument (optical power meter side) with an optical fiber cable.



10. On the light source side of the instrument, tap the **Loss Test START** soft key. The loss test starts, and the soft key display changes to Loss Test STOP. Then, on the power meter side of the instrument, the optical power value of the wavelength is displayed on the screen.

On the light source side of the instrument, tap the Loss Test STOP soft key to end the loss test.

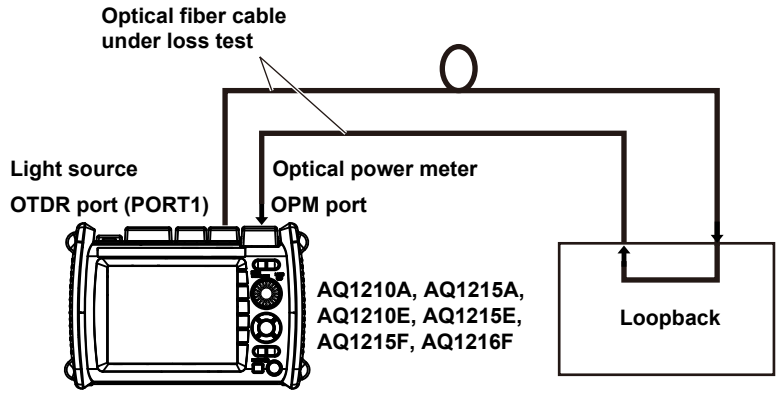
Note

When you start a loss test, the optical power values of wavelength 1 and wavelength 2 (if the wavelength is set) are measured once. Then, the soft key display changes to Loss Test STOP, which you can use to end the loss test. In addition, you can abort the loss test by tapping the loss test start ON/OFF button on the light source display screen.

Saving Data

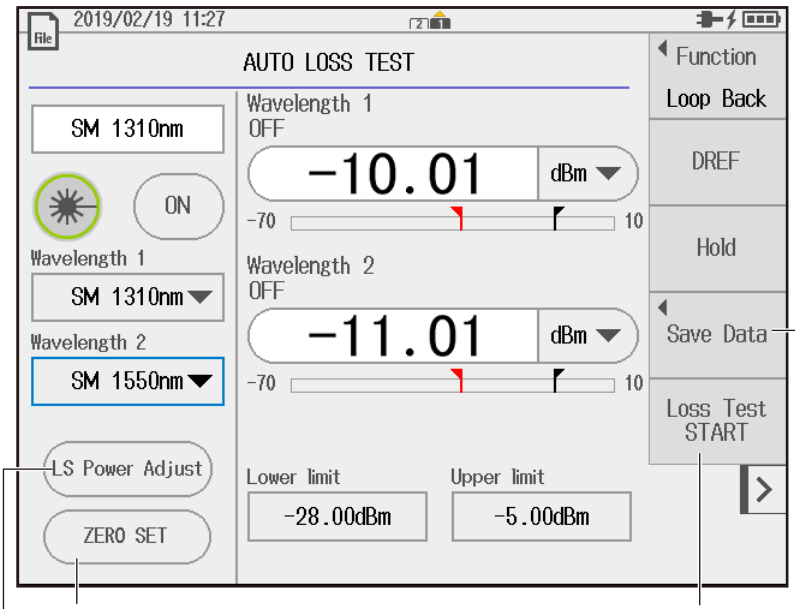
11. On the optical power meter side of the instrument, tap the Save Data soft key. A screen appears for saving the results of optical power measurements for multi-fiber cables. For details, “Saving the Results of Optical Power Measurements for Multi-Fiber Cables” (page 7-12) in section 7.3.

Loopback Operation (operation of the light source and optical power meter)



Loopback Display Screen

6. Tap the **Function** soft key to select **Loop Back**. You can now operate the loopback display screen. On the loopback display screen, you can operate the light source screen and the optical power meter screen. For descriptions of the display screens, see page 8-30 (optical power meter) and page 8-31 (light source).



Saves data
A screen appears for saving the results of optical power measurements for multi-fiber cables. See page 7-12.

Optical power adjustment
Before a loss test, you can adjust the amplitude of the optical output of the light source.

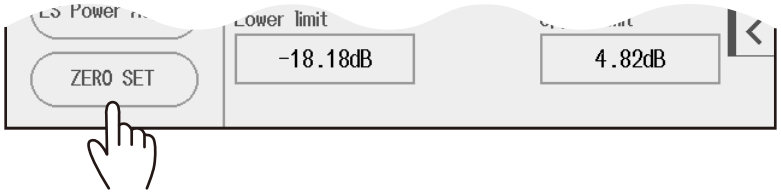
Performs zero set

Starts the loss test
The light source generates the specified wavelengths of measurement light in order. The optical power meter measures the optical power of the light that it receives.

Executing the Zero Set

7. Tap **ZERO SET**.

Remove the optical fiber cables from the instrument and close the OPM port covers, or make sure that the power meter is not receiving any light, and then start the optical power meter zero set procedure.

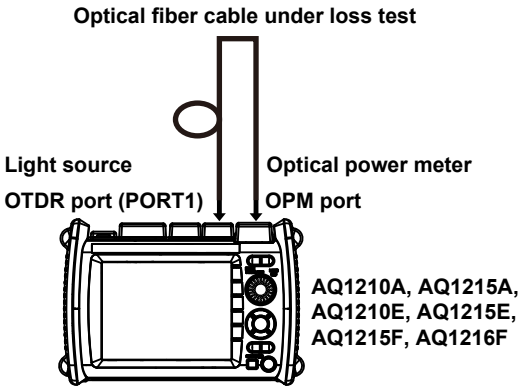


Note

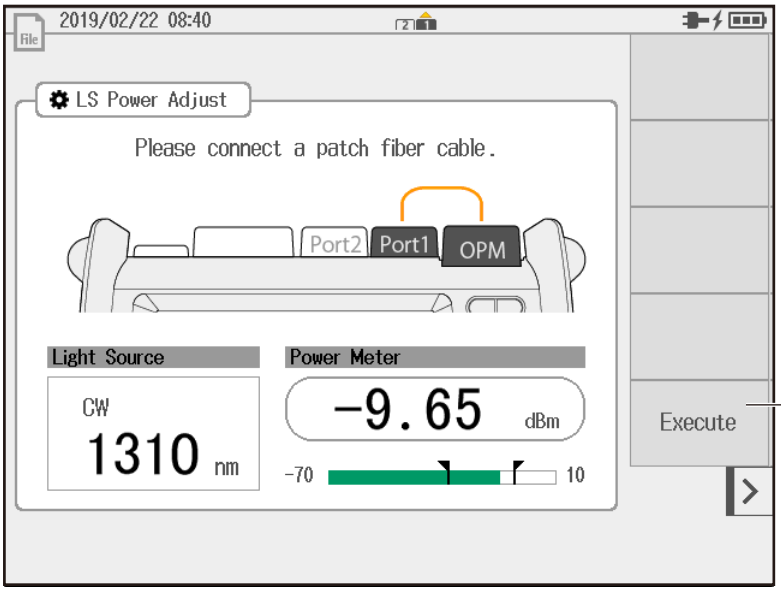
Perform a zero-set whenever necessary, such as after you have turned on the power or when the ambient temperature changes. Performing a zero-set adjusts the internal deviation of the optical power measurement section and enables you to obtain more accurate absolute optical power values.

Adjusting the Optical Power

8. Before starting the loss test, directly connect the OTDR port (PORT1) of the instrument (light source side) to the OPM port with a short optical fiber cable.



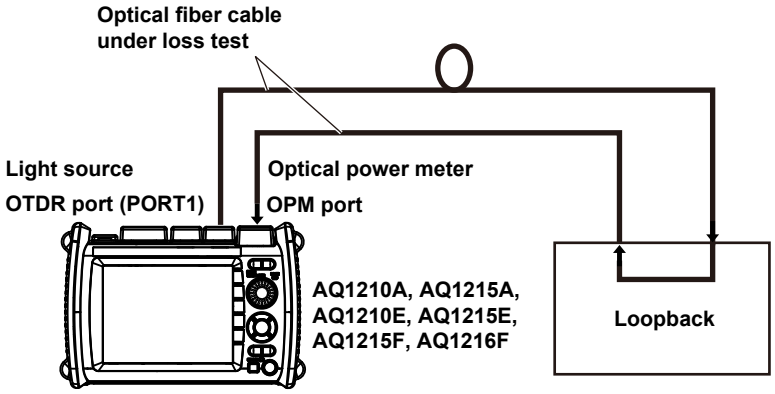
9. Tap **LS Power Adjust** to display the following screen.



Starts optical power adjustment
The measurement light turns on.
When adjustment ends normally, the instrument returns to the previous screen.

Executing a Loss Test

10. Loop back the optical fiber cable connected to the OTDR port (PORT1) of the instrument at the far end of the cable installation, and connect the other end of the optical fiber cable to the OPM port of the instrument.



11. Tap the **Loss Test START** soft key. The loss test starts, and the soft key display changes to Loss Test STOP. Then, the optical power value of the wavelength is displayed on the instrument screen.

Tap the Loss Test STOP soft key to end the loss test.

Note

When you start a loss test, the optical power values of wavelength 1 and wavelength 2 (if the wavelength is set) are measured once. Then, the soft key display changes to Loss Test STOP, which you can use to end the loss test. In addition, you can abort the loss test by tapping the loss test start ON/OFF button on the light source display screen.

Saving Data

12. Tap the **Save Data** soft key. A screen appears for saving the results of optical power measurements for multi-fiber cables. For details, “Saving the Results of Optical Power Measurements for Multi-Fiber Cables” (page 7-12) in section 7.3.

Explanation

This feature is available on models with the /SPM or /HPM option.
Models with the /PPM option do not have the Auto Loss Test feature, so combine these models with a light source and the optical power meter feature to perform the loss test. For details, see sections 7.1 and 7.3.

Zero Set

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

Optical Power Adjustment

Adjust the optical power of the light source as necessary. When you execute optical power adjustment, the Instrument automatically identifies the optical power level and adjusts itself accordingly. Perform optical power adjustment on the light source side.

- Press the Execute soft key to execute the optical power adjustment. When adjustment ends normally, the Instrument returns to the previous screen. While adjusting, the word “Execute” on the menu changes to “Abort.” All soft keys other than Abort will be invalid.
- When you press the Abort soft key, the optical power adjustment will be aborted. The word “Abort” On the menu returns to “Execute.” The adjustment value returns to the previous value before the execution.
- Connect an optical fiber that is no longer than a few meters. Make sure that the fiber is free from dirt, scratches, bends, and other potential causes of optical degradation.
- The default adjustment value is set to the factory default value.

Executing an Auto Loss Test

Configure the optical power meter side and the light source side. Connect the optical fiber or optical circuit to be tested to the optical power measurement port on the optical power meter side and the light source port on the light source side. Then execute the loss test. The optical power of the light passing through the optical fiber or optical circuit to be tested is measured on the optical power meter side.

8.4 Performing a Multicore Loss Test (Multicore Loss Test)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. 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

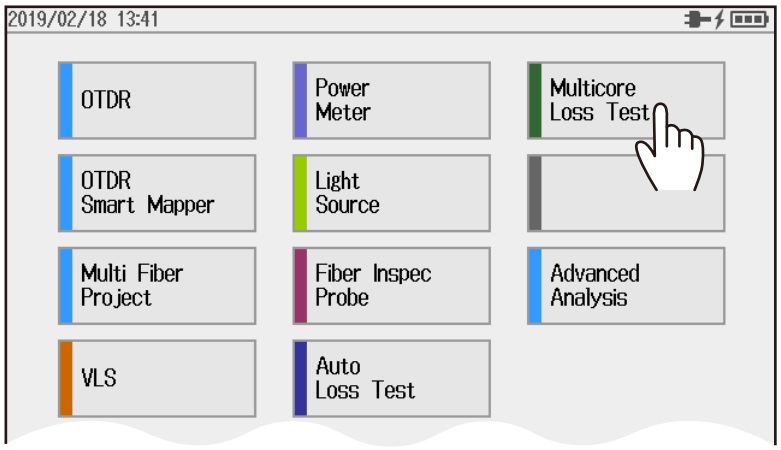
- Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. 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.

Procedure

Displaying the Multicore Loss Test Screen

1. Press **MENU** to display the MENU screen.
2. Tap **Multicore Loss Test** to display the MULTICORE LOSS TEST screen.

MENU screen

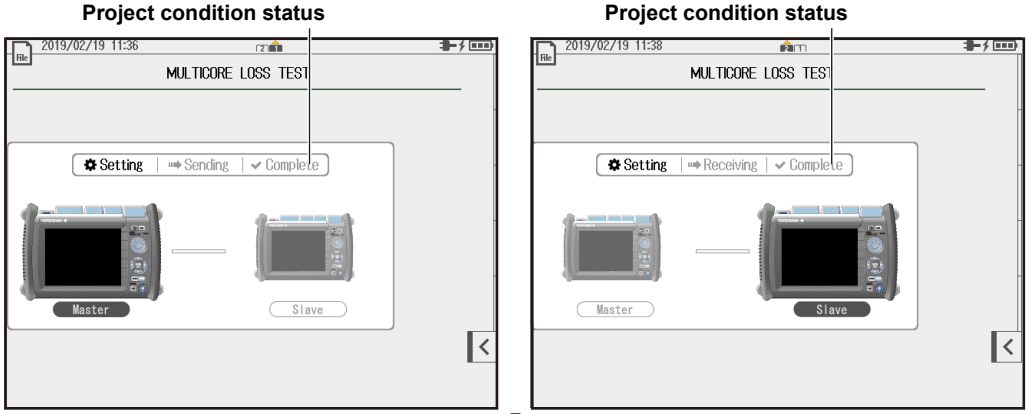


Multicore Loss Test Screen

Master **Slave**

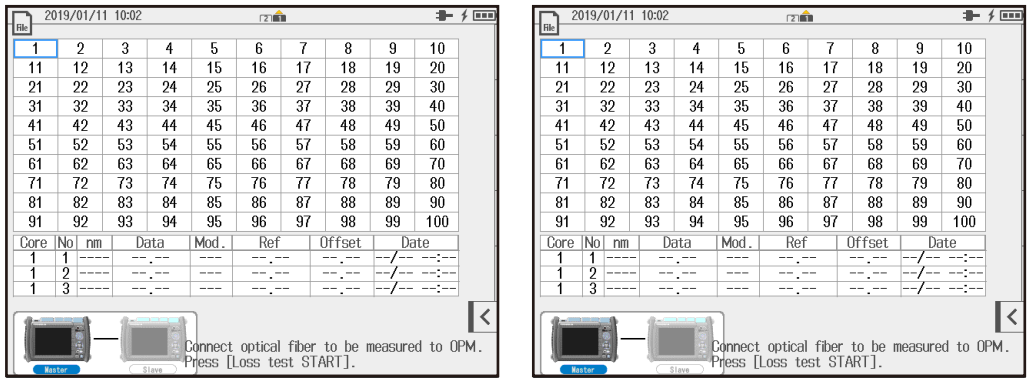
Before loading project conditions (setup)

Project condition status **Project condition status**



After loading project conditions (setup)

A screen for executing multicore loss tests



- **Project Condition Status**

  Before starting a multicore loss test, set the conditions (e.g., number of cores) of the multi-core fiber cable to be measured. The project conditions are created on the master side and then sent to the slave side.

  On the slave side, the project conditions sent from the master side are received and loaded into the instrument.

  Setting: Indicates that the master and slave are being selected or the project information is being created.

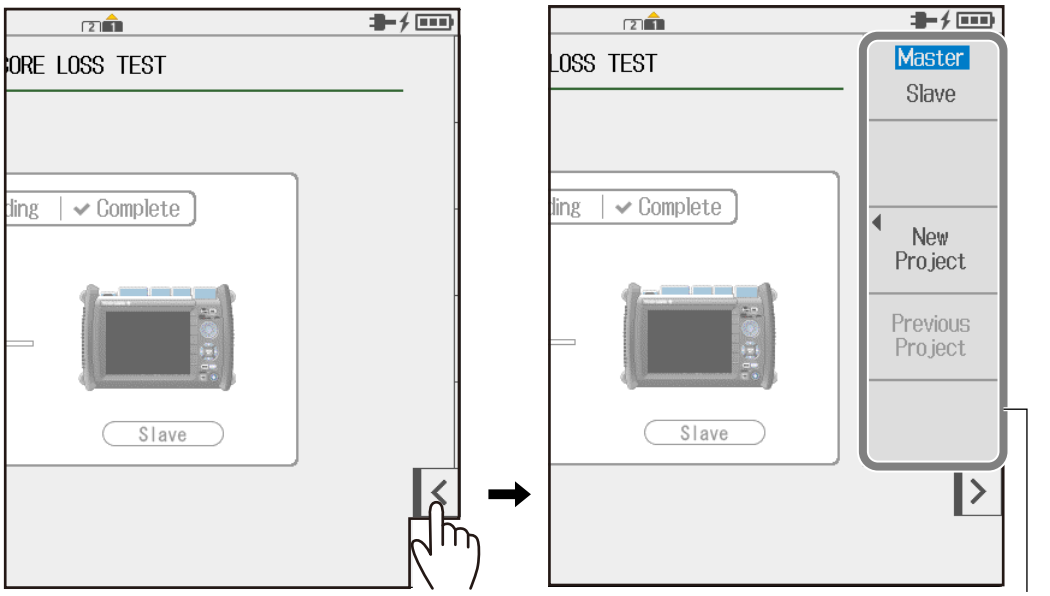
  Sending: Indicates that the project conditions are being sent from the matter side to the slave side.

  Receiving: Indicates that the project conditions sent from the master side are being received on the slave side.

  Complete: Indicates that the transmission of the project conditions has been completed between the master side and slave side. After completion, a screen appears for executing multicore loss tests.

Soft Key Menu (multicore loss test)

3. Tap the soft key menu display button. An multicore loss test soft key menu appears.



Soft key menu

Multicore Loss Test Menu

• When the function is set to Master
You can configure the master settings.

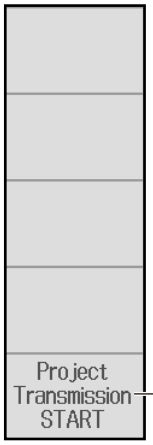
Select the function (Master, Slave).

Creates a new project
See page 8-41.

A screen for creating project conditions

Complete

Loads the previous project
Loads the project conditions that were in use the last time a multicore loss test was run To load other project conditions that were created separately, see section 9.4 (page 9-9).



Sends project conditions to the slave
The project conditions that you created are sent to the slave. See page 8-43.

• When the function is set to Slave
You can configure the slave settings.

Select the function (Master, Slave).

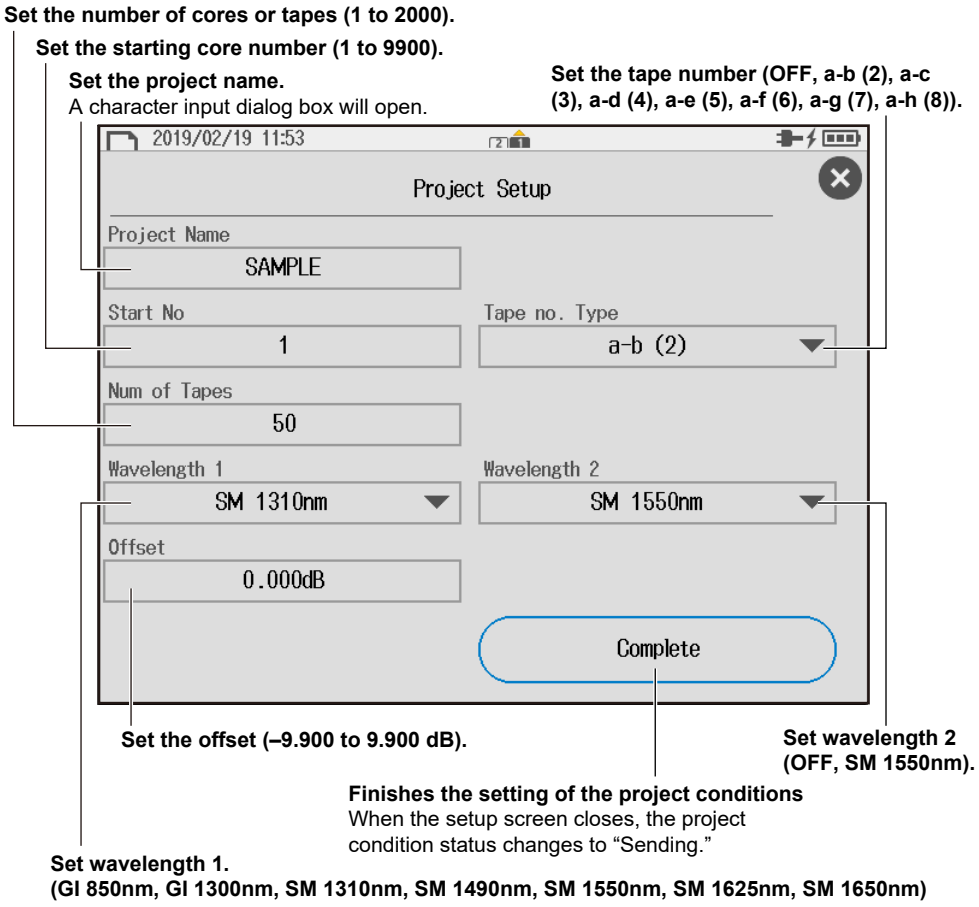
Optical power adjustment
Before a loss test, you can adjust the amplitude of the optical output of the light source.
See page 8-42.

Receives project conditions from the master
Project conditions created on the master are loaded.
While project conditions are being received, the “Receive Project from Master” soft key changes to “Stop.”
When reception is complete, the “Stop” soft key changes back to “Receive Project from Master,” and the loss test screen appears. See page 8-44.

Creating New Project Conditions

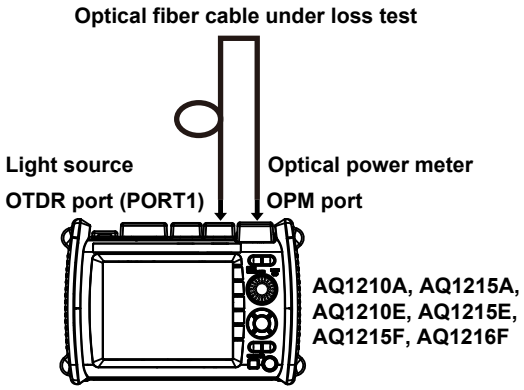
4. Tap the Function soft key to select **Master**.

5. Tap the **New Project** soft key to display a Project Setup screen.

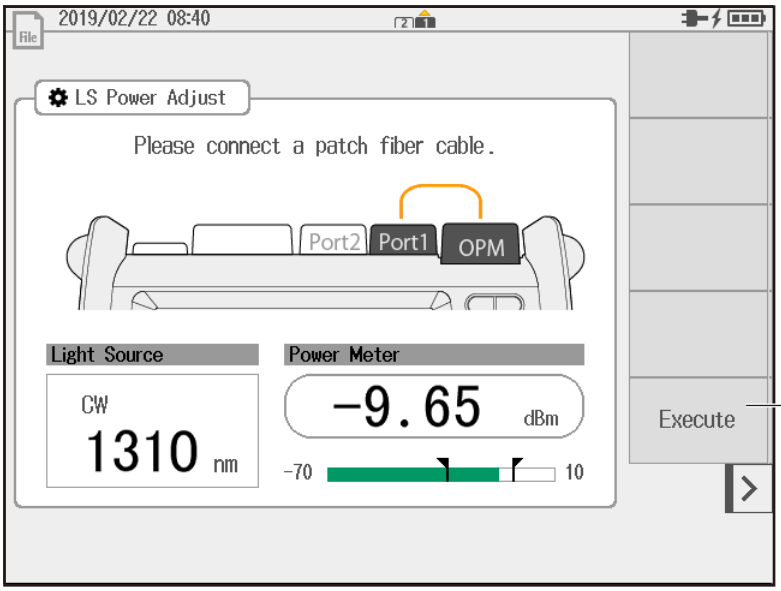


Adjusting the Optical Power

6. Before starting the multicore loss test, directly connect the OTDR port (PORT1) on the slave side of the instrument to the OPM port with a short optical fiber cable.



7. Tap **LS Power Adjust** to display the following screen.

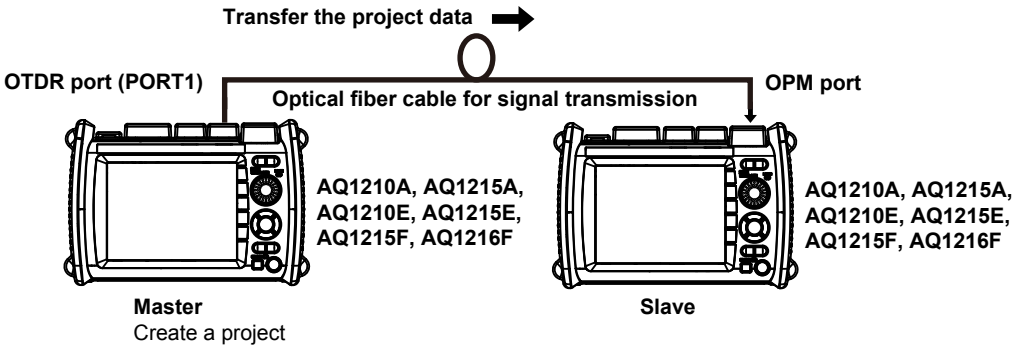


Starts optical power adjustment
The measurement light turns on.
When adjustment ends normally, the instrument returns to the previous screen.

Sharing the Project Conditions

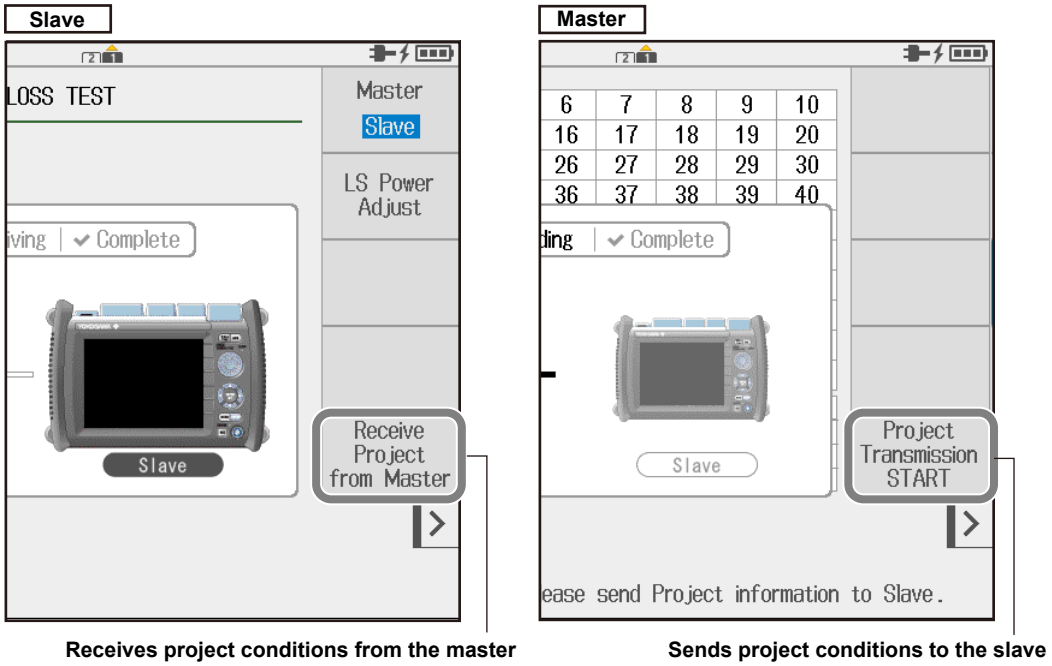
Send the project conditions created on the master side to the slave side.

8. Connect the OTDR port (PORT1) of the instrument on the master side and the OPM port of the instrument on the slave side with an optical fiber cable.



9. On the slave side, tap the **Receive Project from Master** soft key. The soft key changes to "Stop."

10. On the master side, tap the **Project Transmission START** soft key.

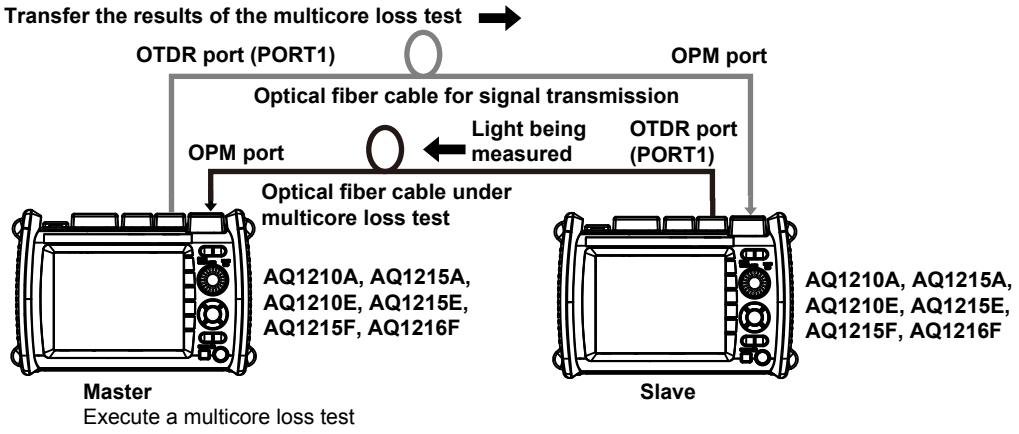


Receives project conditions from the master **Sends project conditions to the slave**

When the transmission of the project conditions is completed between the master side and slave side, a screen appears for executing multicore loss tests.

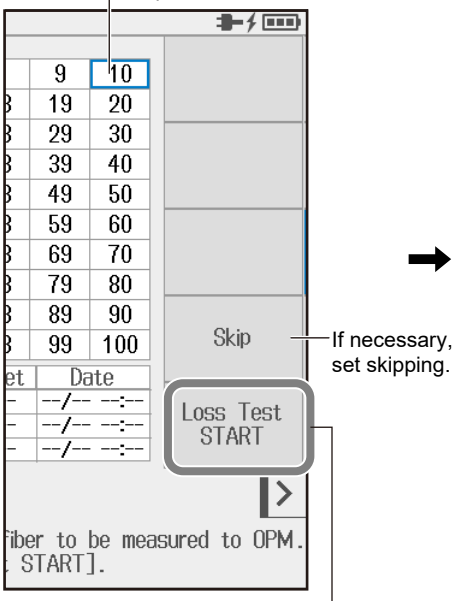
Executing the Multi-Core Loss Test

11. In addition to the optical fiber connected in step 8, connect the OPM port of the instrument on the master side and the OTDR port (PORT1) of the instrument on the slave side with an optical fiber cable.



Master

12. Tap the core number you want to perform a loss test on.

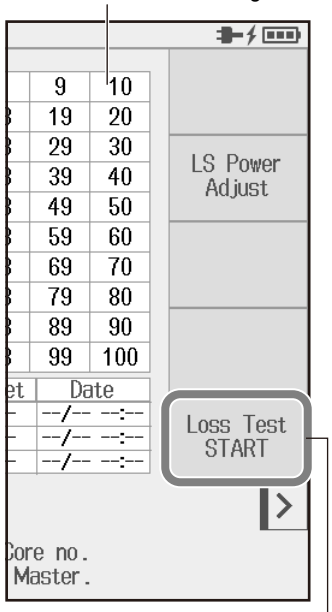


If necessary, set skipping.

13. Starts a loss test
The target core numbers are sent from the master to the slave.

Slave

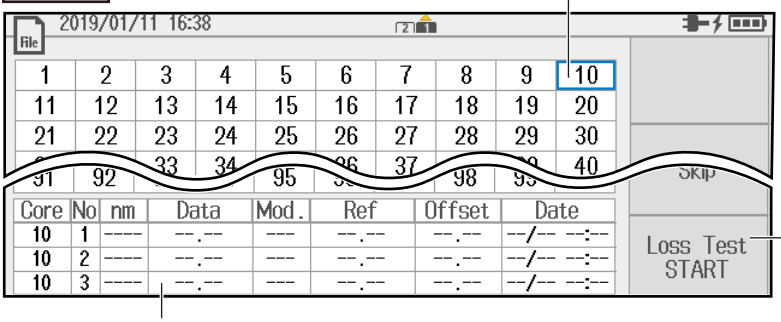
Indicates the target core numbers



14. Starts a loss test
The light to be measured is output from the OTDR port (PORT1) on the slave side.

Master

The color changes when the loss test of the target core is completed.



When the lost test of the target cores completed, you can start the loss test of the next core.

The measurement results are displayed when the loss test of the target core is completed.

15. Repeat steps 12 to 14 to execute the multicore loss test.

Explanation

This feature is available on models with the /SPM or /HPM option.
The same project conditions must be shared between the master and slave. The project conditions can be shared using the following methods.

Sending Project Conditions

Send the project conditions from the master to the slave.
Decide in advance which optical fiber cable to use to transmit the project conditions (signal transmission optical fiber cable). Before sending the project conditions, connect one end of the signal transmission optical fiber cable to the OTDR port (PORT1) on the master side and the other end to the OPM port on the slave side.

- On the slave side, prepare to receive the project conditions.
- On the master side, check that the slave is ready to receive the test conditions, and send the conditions.

Note

When a project is sent, loss test results and skip information are not transmitted.

Loading a Project File

Load the same project file into the master and the slave. Have the project file stored in the internal memory of the instrument or a USB memory device in advance.

Restarting an Interrupted Loss Test

In a multicore optical fiber cable loss test, you may need to interrupt the test before the loss tests have been completed on all cores. If you want to resume the loss test using the same shared project, the test can be resumed while retaining the data of the completed tests. Data is maintained even when you turn the Instrument off.

- The loss test must be performed using the same project.
- If you reload the project file, the data of the loss test up to that point will be deleted and cannot be recovered.

Optical Power Adjustment

Adjust the optical power of the light source as necessary. When you execute optical power adjustment, the Instrument automatically identifies the optical power level and adjusts itself accordingly. Perform optical power adjustment on the light source side.

- Press the Execute soft key to execute the optical power adjustment. When adjustment ends normally, the Instrument returns to the previous screen. While adjusting, the word “Execute” on the menu changes to “Abort.” All soft keys other than Abort will be invalid.
- When you press the Abort soft key, the optical power adjustment will be aborted. The word “Abort” On the menu returns to “Execute.” The adjustment value returns to the previous value before the execution.
- Connect an optical fiber that is no longer than a few meters. Make sure that the fiber is free from dirt, scratches, bends, and other potential causes of optical degradation.
- The default adjustment value is set to the factory default value.

8.5 Performing Advanced Analysis (Advanced Analysis)

WARNING

- During measurement, light is transmitted from the light source ports. Do not disconnect the connected optical fiber cable. 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

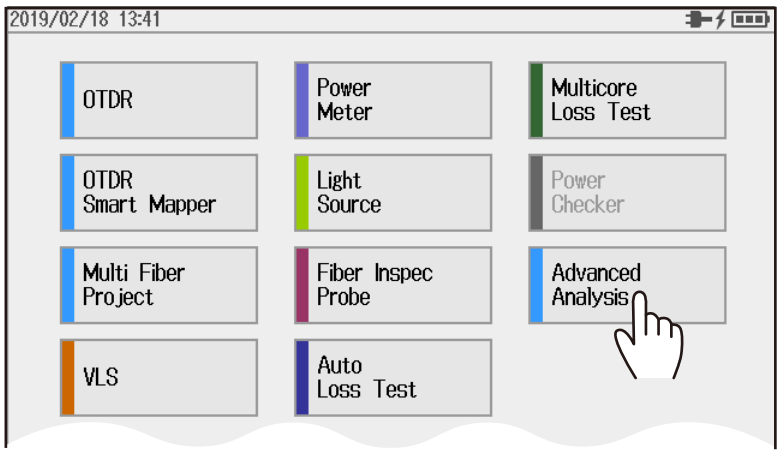
- Lorsque instrument génère de la lumière, la lumière est émise à travers les ports de source lumineuse. Ne pas débrancher les câbles de fibre optique connectés. Des lésions oculaires peuvent être causées si le faisceau lumineux pénètre l'œil.
- Couvrir les caches des ports de source lumineuse libres. 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.

Procedure

Displaying the Advanced Analysis (Waveform Analysis) Screen

1. Press **MENU** to display the MENU screen.
2. Tap the **Advanced Analysis** tab to display the Advanced Analysis screen.

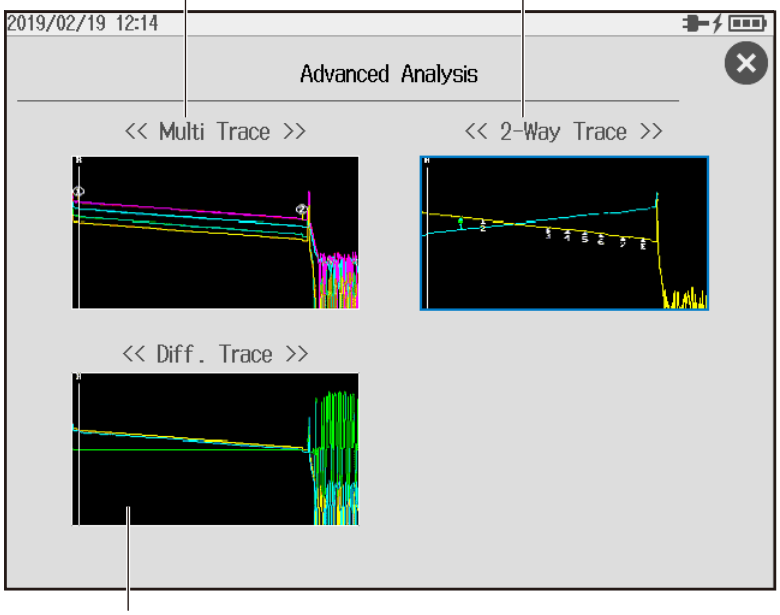
MENU screen



Advanced Analysis (Waveform Analysis) Screen

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

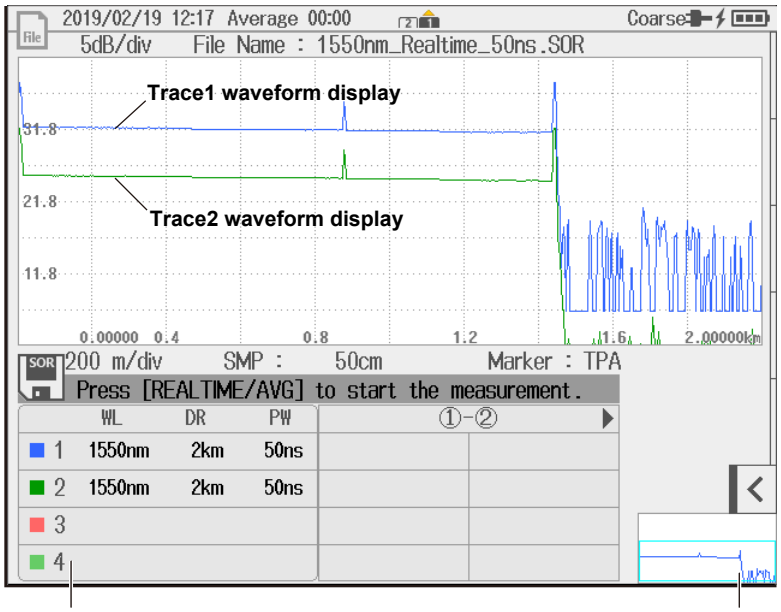
2 way trace analysis
The waveform measured from each end can be combined and compared.



Differential trace
You can display a waveform obtained by subtracting the values of one waveform from those of another waveform selected as the current trace.

Multi Trace Analysis

3. Tap the **Multi Trace** item to display the Multi Trace screen.

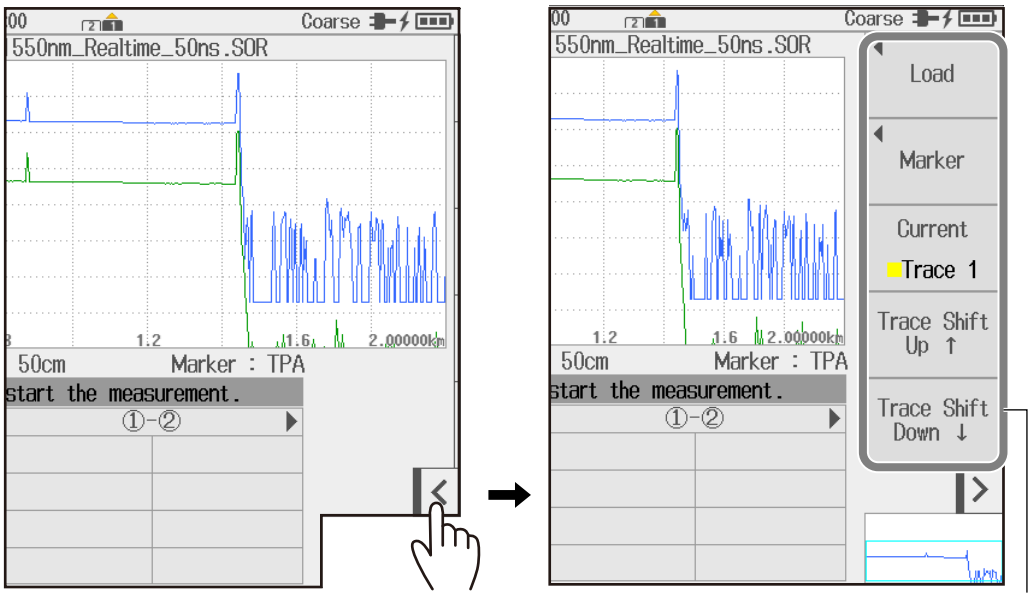


Displays the waveform information loaded into Trace1 to Trace4 (wavelength, dynamic range, power value)

Overview display
See section 6.2.

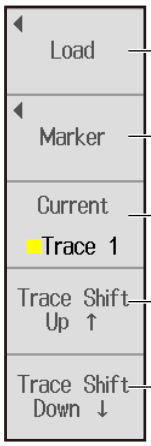
Soft Key Menu (multi trace)

4. Tap the soft key menu display button. A multi trace soft key menu appears.



Soft key menu

Multi Trace Analysis Menu



Load analysis waveforms.

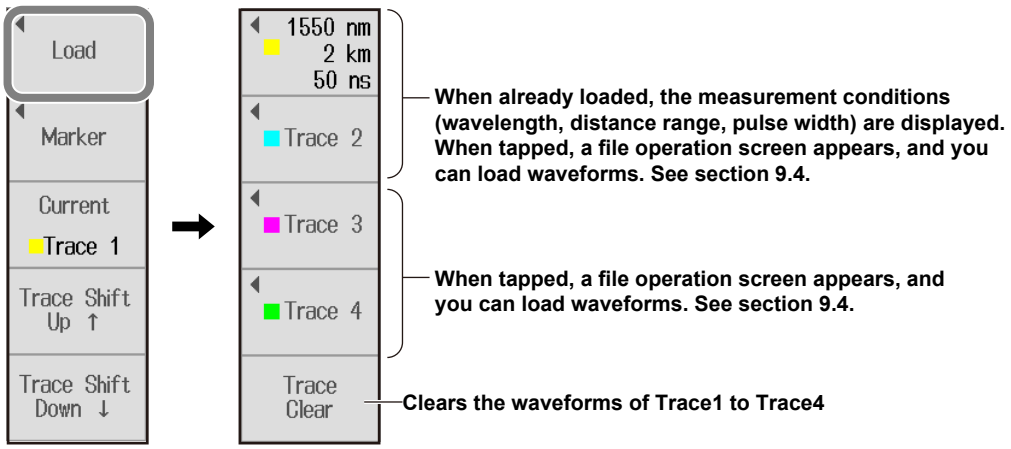
Set markers (4 Point Markers).
See page 6-8.

Selects the current trace (Trace 1, Trace 2, Trace 3, Trace 4)
Select the waveform to place markers and cursors on or move vertically.

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

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

- **Loading Waveform Analysis**

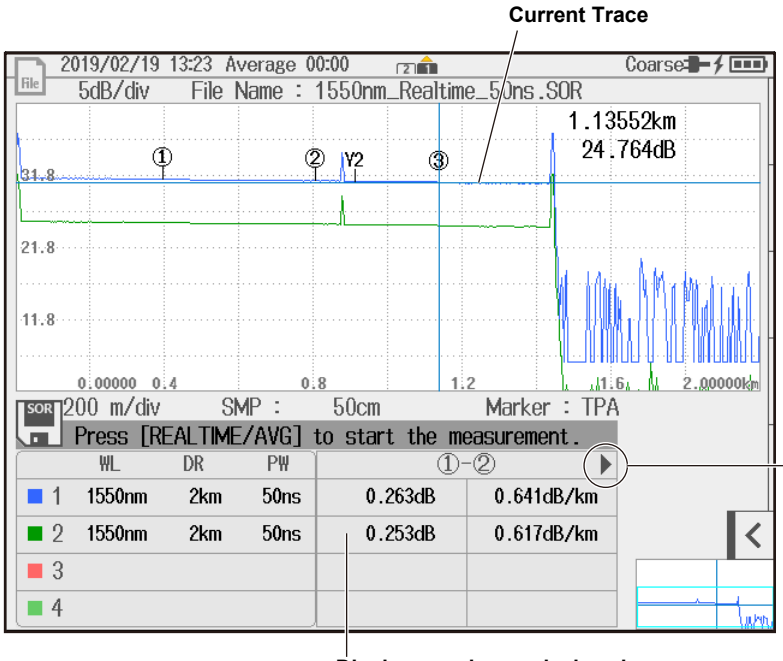


When already loaded, the measurement conditions (wavelength, distance range, pulse width) are displayed. When tapped, a file operation screen appears, and you can load waveforms. See section 9.4.

When tapped, a file operation screen appears, and you can load waveforms. See section 9.4.

Clears the waveforms of Trace1 to Trace4

Waveform Display Example

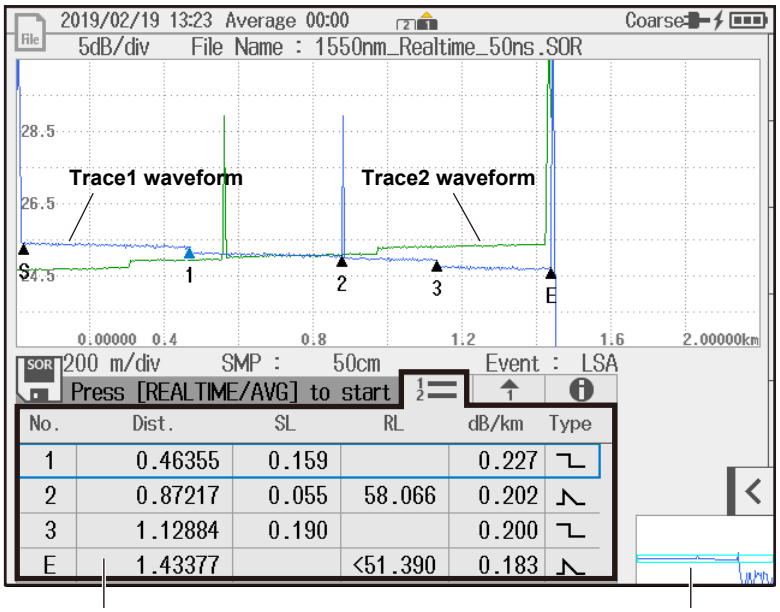


Note

- 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.

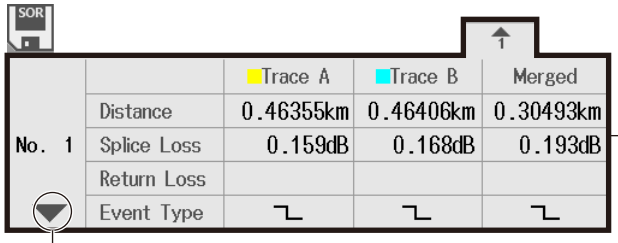
2-Way Trace Analysis

3. Tap the **2-Way Trace** item to display the 2-Way Trace screen.



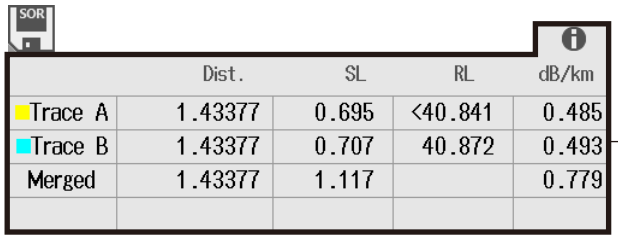
List of events
Displayed by tapping the List tab.
For details on events, see the explanation in section 5.1.

Overview display
See section 6.2.



Display of separate events
Displayed by tapping the Detail tab.

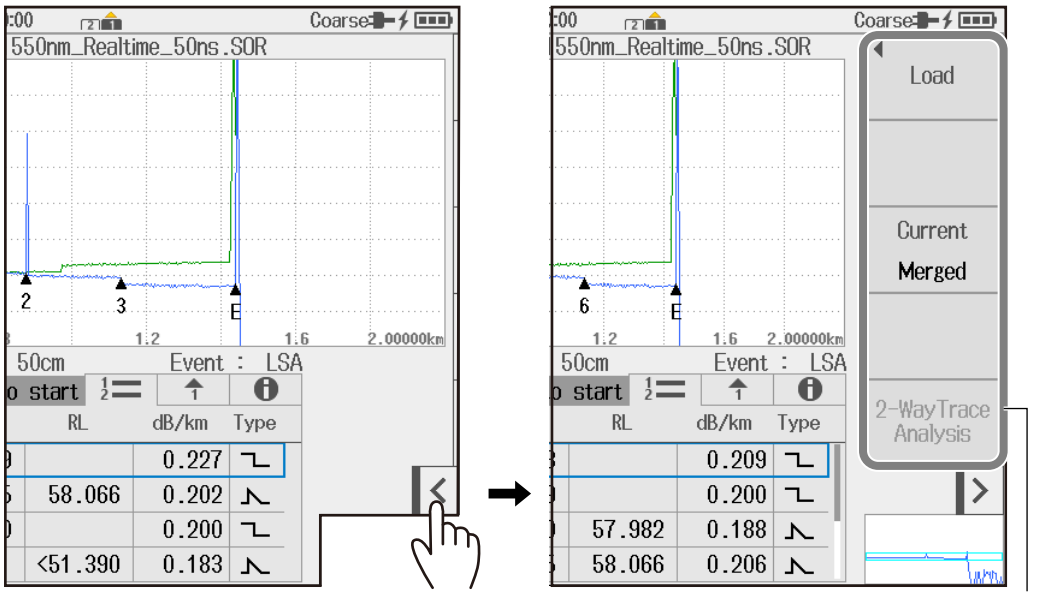
Displays the next event



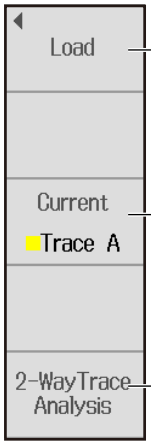
Cumulative display of events
Displayed by tapping the Summary tab.

Soft Key Menu (2-Way Trace)

4. Tap the soft key menu display button. A 2-Way Trace soft key menu appears.



2-Way Trace Menu

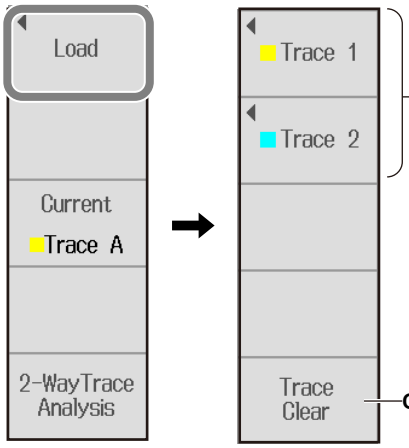


Load analysis waveforms.

Selects the current trace (Trace A, TraceB, Merged)
Select the trace to display on the screen. When Merged is selected, the event information is combined and displayed.

Combines the waveforms of each direction
Combined with the waveform viewed from the other direction. The display direction of the trace that is not the current trace is reversed.

- **Loading Analysis Waveforms**

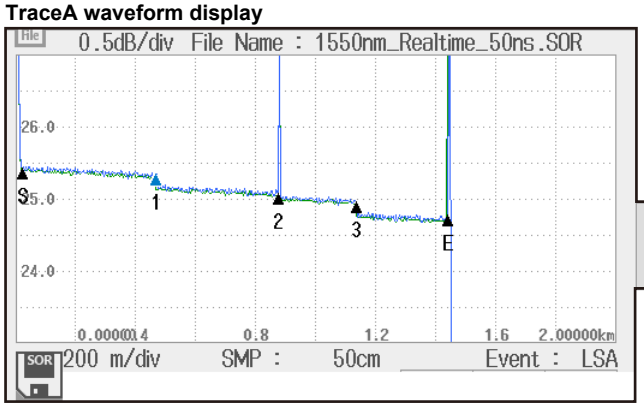


When tapped, a file operation screen appears, and you can load waveforms. See section 9.4.

Clears the waveforms of Trace1 to Trace2

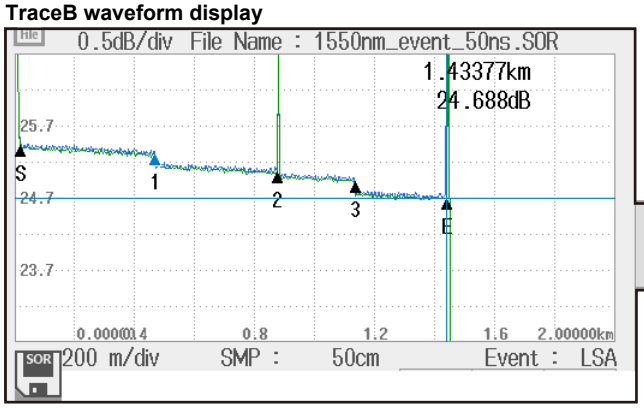
- **Combining the Waveforms from Each Direction**
  To display the two waveforms obtained by measuring the same section from two directions, one of the waveforms can be reversed and superimposed on the other waveform, which is specified as the current waveform.

TraceA waveform display



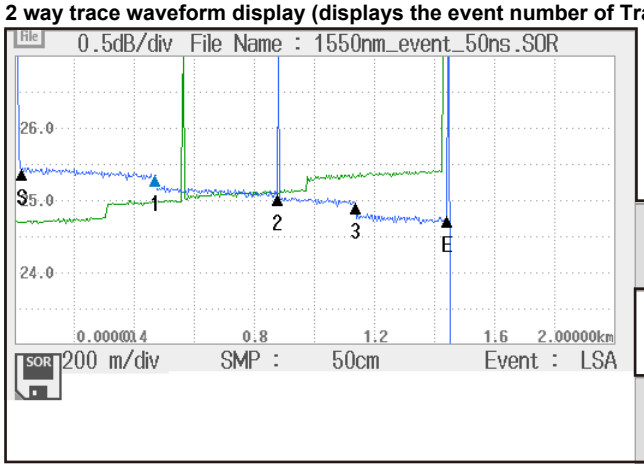
Displays the waveform viewed from one end

TraceB waveform display



Displays the waveform viewed from the other end

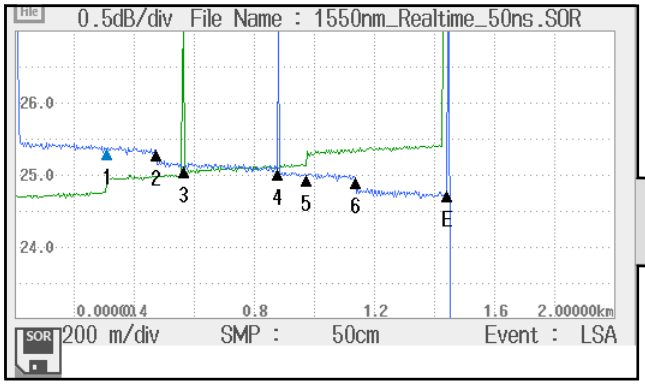
2 way trace waveform display (displays the event number of TraceA of the current trace)



Combines the waveform viewed from one end and that viewed from the other end and displays the result

Executes 2 way trace

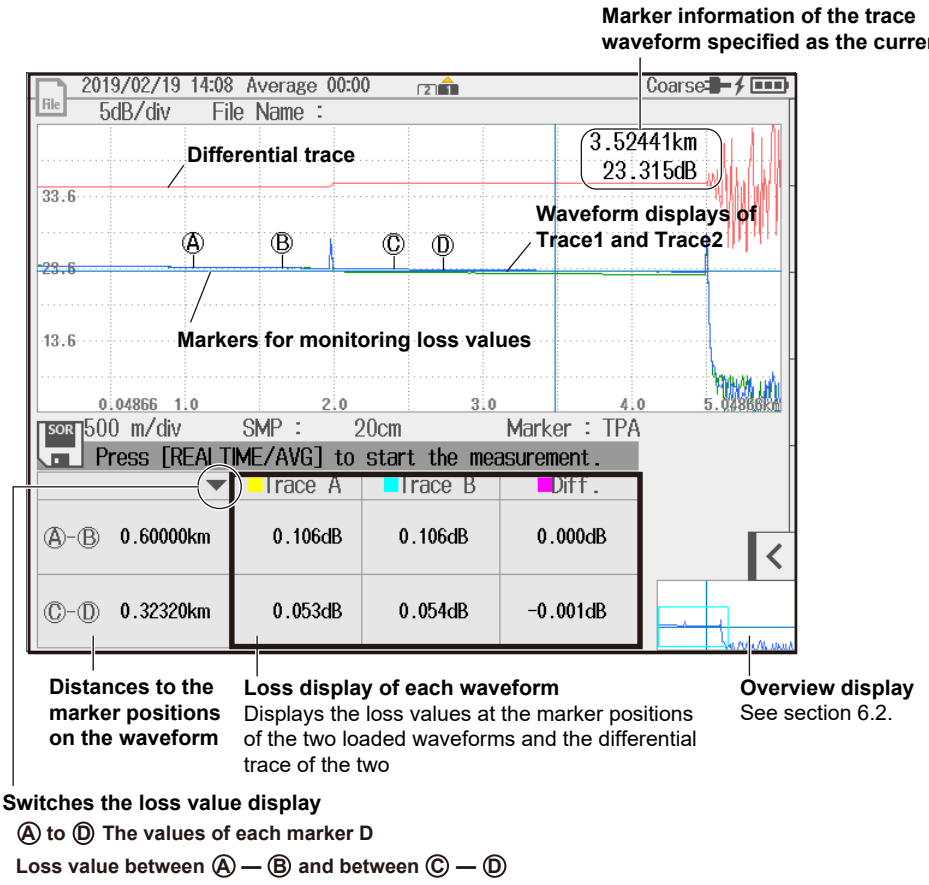
2 way trace waveform display (Combines and displays the events of TraceA and TraceB)



When Merged is selected, the events of TraceA and TraceB are combined.

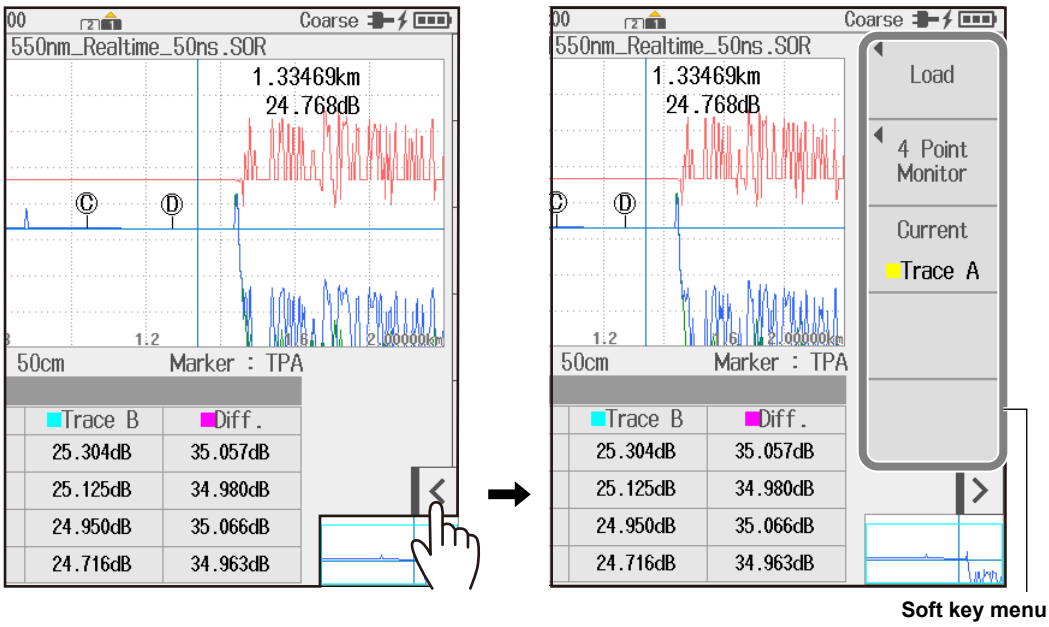
Differential Trace

3. Tap the **Diff. Trace** item to display the Diff. Trace screen.

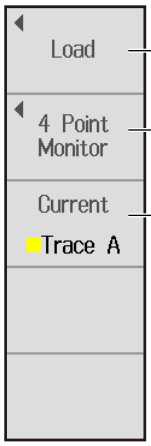


Soft Key Menu (Diff. Trace)

4. Tap the soft key menu display button. A Diff. Trace soft key menu appears.



Differential Trace Menu

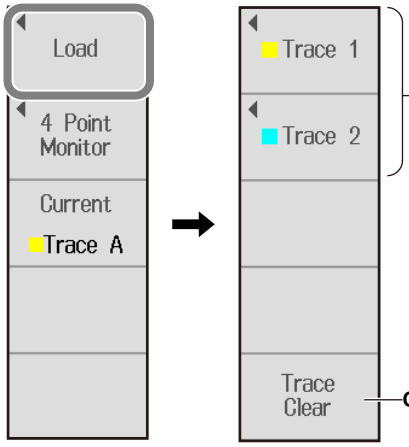


Load analysis waveforms.

4 Point Monitor
Loss values can be measured for TraceA, TraceB, and differential trace.

Selects the current trace (Trace A, TraceB, Diff.)
Select the waveform to place 4 Point Monitor markers and cursors on.

- **Loading Analysis Waveforms**

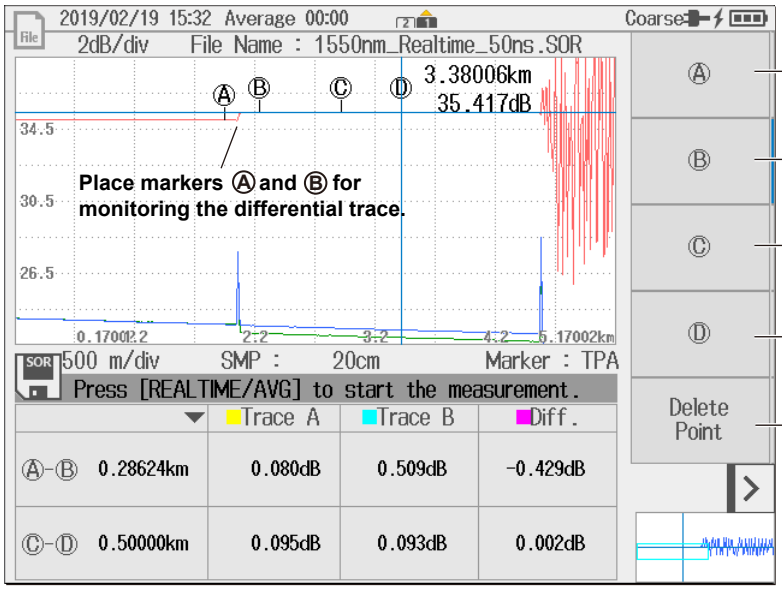


When tapped, a file operation screen appears, and you can load waveforms. See section 9.4.

Clears the waveforms of Trace1 to Trace2

- **4 Point Monitor**

This is an example of placing 4 Point Monitor markers on the differential (Diff.) trace.



Sets marker Ⓐ
Places marker Ⓐ at the cursor position

Sets marker Ⓑ
Places marker Ⓑ at the cursor position

Sets marker Ⓒ
Places marker Ⓒ at the cursor position

Sets marker Ⓓ
Places marker Ⓓ at the cursor position

Clears the marker display

Explanation

Multi Trace Analysis

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 in line with the current trace. 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.

Current Trace

You can select the current trace from Trace 1 to Trace 4.
When you expand or reduce the current trace, other traces are adjusted accordingly.
Cursors are displayed on the current trace. Distance and splice loss that are displayed in the marker information are those of the current trace.

2 way Trace Analysis

Loading Waveform Data

The type of file that you can load is SOR.
Traces that meet the following conditions can be combined.

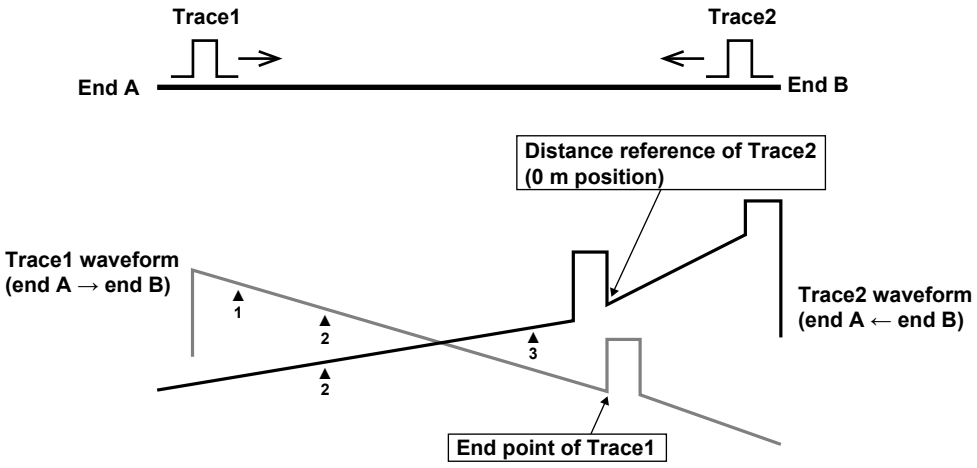
- Event lists are available.
- The wavelengths and pulse widths of the two traces are the same.
- The distances from the measurement reference (S) to the end event (E) are the same.

Current Trace

The current trace can be set to one of the combined traces.
Cursors are displayed on the current trace.

Waveform Display of 2 Way Trace Analysis

The horizontal axes of the combined traces are aligned so that the end point of the Trace1 (in the end A to end B direction) match the 0 m position (distance reference) of the Trace2 (in the end B to end A direction).



Differential Trace

Loading Waveform Data

The type of file that you can load is SOR.
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. Distance and splice loss that are displayed in the marker information are those of the current trace.

Differential Trace Analysis

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

- **4 Point Monitor**
  You can place cursors and 4 Point Monitor cursors on the current trace or differential trace and monitor the following values.
  - Loss (dB)
  - Distance (km)

The differential trace cannot be saved.

9.1 Connecting USB Storage Device 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 device (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 device. Connect it directly to a type A USB port of the instrument.
Hot-plugging is supported: you can connect or disconnect the USB device at any time, regardless of whether the instrument is on or off.
When the power is on, the instrument automatically detects the USB memory device after it is connected.

Note

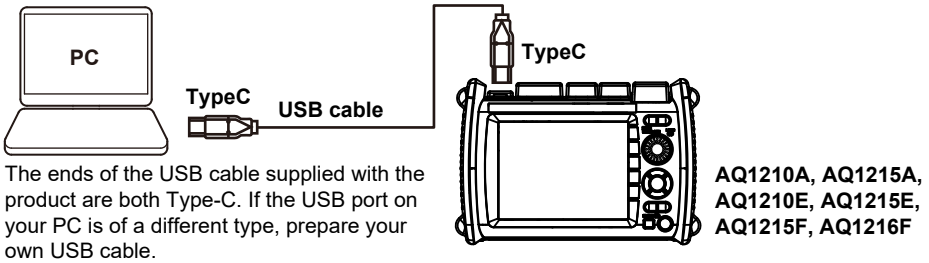
- Use a portable USB memory device for the USB storage device. Do not connect incompatible USB memory devices.
- Connect USB memory devices directly to the instrument, not through a USB hub.
- You cannot use protected USB memory devices (such as those that contain encrypted content).
- Do not remove 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 instrument is turned on until key operation becomes available.
- USB memory devices complying with USB 1.0/1.1/2.0 can be used.

9.2 Using the Instrument as a Mass Storage Device

Procedure

1. Turn on the instrument.
2. Connect the type C USB port on the top panel of the instrument to the USB port of the PC with an USB cable.

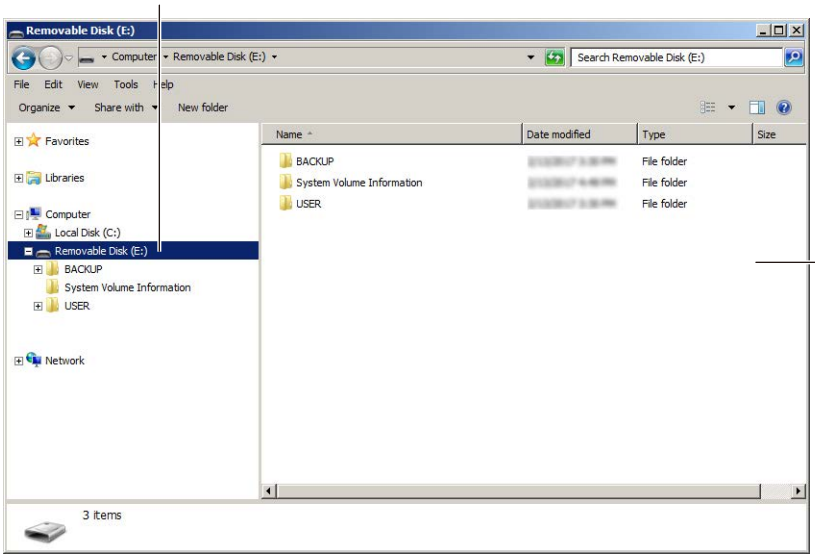
   For a description of the top panel, see “Component Names and Functions” in the Getting Started Guide, IM AQ1210-02EN. If the instrument is connected to the PC for the first time as a mass storage device, a USB driver is automatically installed in the PC.



The ends of the USB cable supplied with the product are both Type-C. If the USB port on your PC is of a different type, prepare your own USB cable.

3. Press **SETUP** to display the system setup screen.
4. Set **USB Function** to **Storage**. For the procedure, see section 10.1.
5. On your PC, start Explorer or another browser.

Select Removable Disk.



Instrument’s internal memory

Note

- The ends of the USB cable supplied with the product are both Type-C. If the USB port on your PC is of a different type, prepare your own USB cable.
- The BACKUP folder is an instrument system folder. Do not change or delete this folder. If you change or delete it by mistake, restart the instrument. The folder will be created automatically when it restarts.
- Waveform data and report files of measured results are saved in the USER folder. The necessary folders are created automatically for each file operation. You can view the contents of the USER folder through file operations on the instrument.
- Do not save files in the root folder (same folder level as BACKUP and USER). Doing so can reduce the processing capability of the instrument. Files saved in the root folder are automatically deleted the next time the instrument is started.

9.3 Displaying the Data Management Buttons

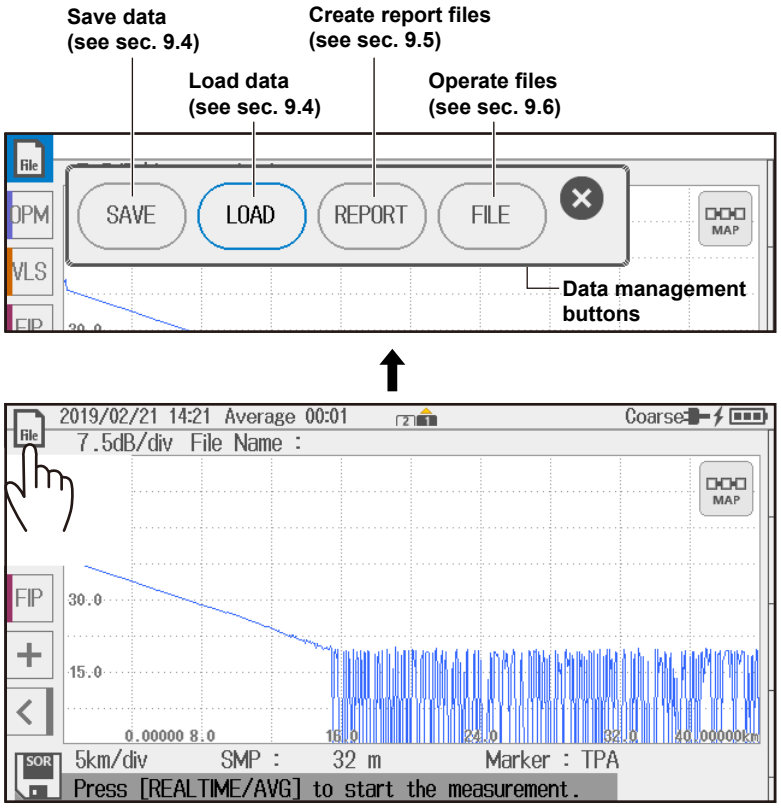
This section explains how to display the buttons used to save and load data, export reports, and operate files.

Procedure

Displaying the Data Management Buttons Using the FILE Icon

You can display the data management buttons using the FILE icon shown on the data display screen of the OTDR, power meter, and the like. This FILE icon can be used with all features (OTDR and other features that can be selected on the MENU screen). The following procedure is an example of using the icon with the OTDR feature.

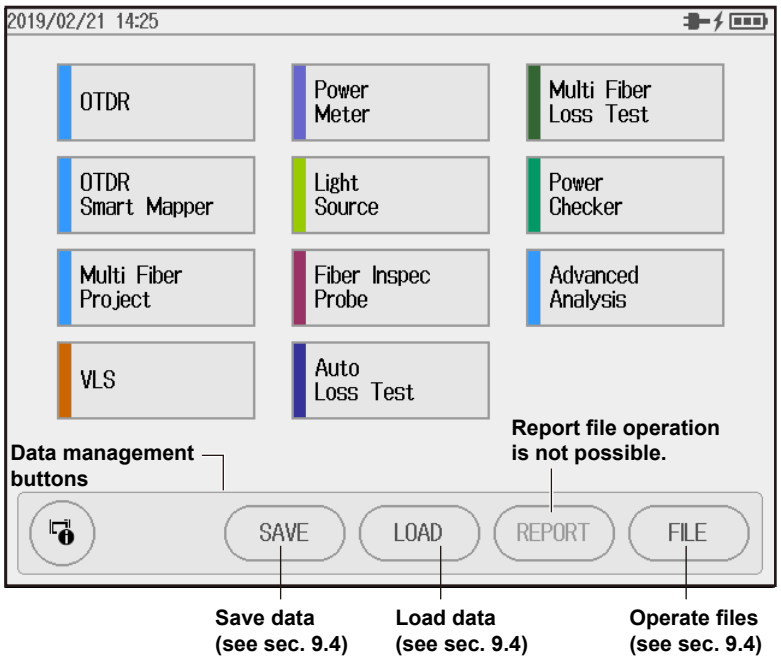
1. Tap the **File** icon to display the data management buttons.



Displaying the Data Management Buttons Using the MENU key

1. Press **MENU** to display the MENU screen. The data management buttons appear.

MENU screen



Explanation

Displaying the Data Management Buttons Using the FILE Icon

The available data management buttons vary depending on the feature (e.g., OTDR) selected from the MENU screen. Unavailable buttons appear dimmed. For details on the file types that can be saved and loaded, see section 9.4.

Features selected from the MENU screen	Data management buttons			
	SAVE	LOAD	REPORT	FILE
OTDR	Available	Available	Unavailable (dimmed)	Available
Multi-Core Fiber Measurement	Available	Available	Available	Available
SmartMapper	Available	Available	Available	Available
Power meter	Available	Available	Available	Available
Power meter (Logging feature)	Available	Available	Unavailable (dimmed)	Available
PON power meter	Available	Available	Unavailable (dimmed)	Available
Power checker	Unavailable (dimmed)	Unavailable (dimmed)	Unavailable (dimmed)	Available
Light source	Unavailable (dimmed)	Unavailable (dimmed)	Unavailable (dimmed)	Available
VLS	Unavailable (dimmed)	Unavailable (dimmed)	Unavailable (dimmed)	Available
Fiber inspection probe	Available	Available	Unavailable (dimmed)	Available
Fiber inspection probe (Pass/fail feature)	Available	Available	Unavailable (dimmed)	Available
Auto loss testing	Available	Available	Unavailable (dimmed)	Available
Multicore loss testing	Available	Available	Unavailable (dimmed)	Available
Advanced Analysis	Available	Available	Unavailable (dimmed)	Available

Displaying the Data Management Buttons Using the MENU key

For details on the file types that can be saved and loaded, see section 9.4. Depending on the content of the loaded file, the appropriate feature (feature selected from the MENU screen) automatically starts.

MENU screen	Data management buttons			
	SAVE	LOAD	REPORT	FILE
MENU screen (top)	Available	Available	Unavailable (dimmed)	Available

9.4 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 device (USB memory or internal memory) or corrupt its data.

French

ATTENTION

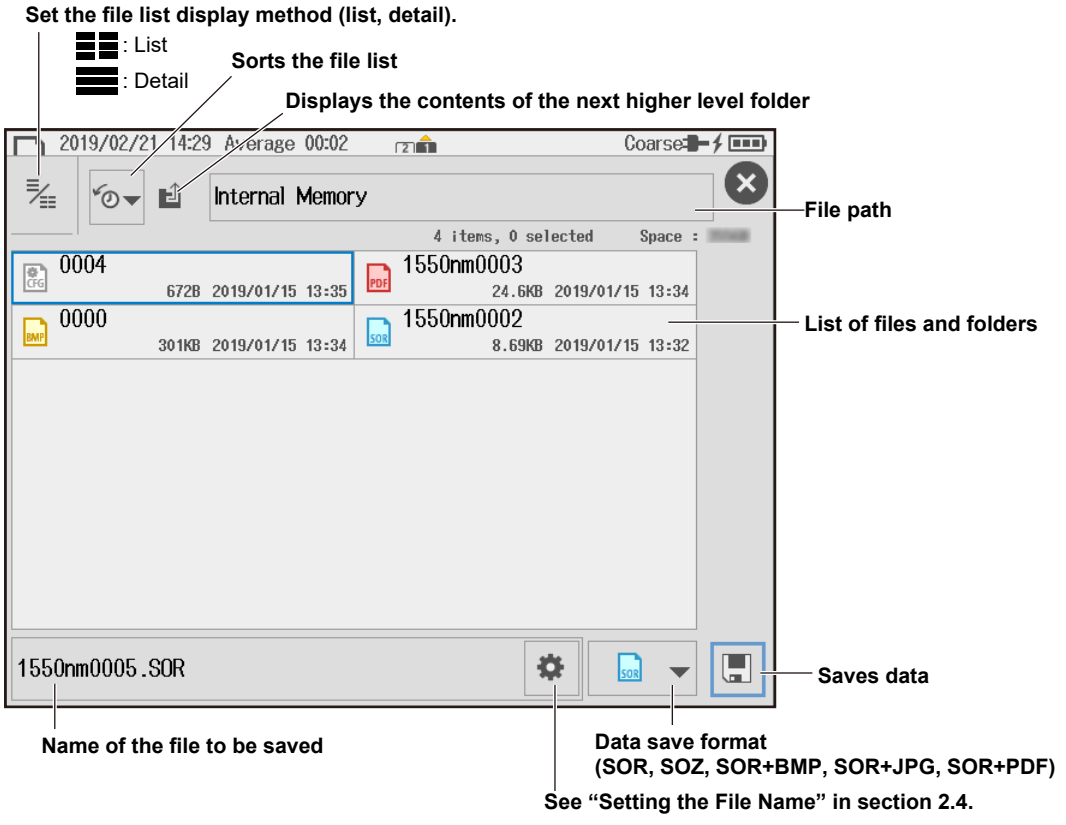
N’enlevez pas un dispositif de mémoire USB et ne coupez pas l’alimentation électrique lorsque l’indicateur d’accès à la mémoire USB clignote ou lorsque les données sont en train d’être enregistrées ou chargées à partir d’une mémoire interne. Vous risqueriez d’endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu’il contient.

Procedure

Saving Data (excluding system settings)

1. Tap the **File** icon to display the data management buttons.
2. Tap **SAVE**. A file list screen for saving data appears.
3. Select the data save format.
4. Execute the data save operation. A file is created in the selected save format.

File List Screen for Saving Data



Saving the Data of Multi Wavelength Measurement (1310 nm/1550 nm) (SOZ format)

You can save the two waveforms of multi wavelength measurement as a single data file in SOZ format. When the data is saved in SOR format, the current waveform is saved. To save the two wavelengths separately, save each file by switching the current waveform display. The wavelength indication in the file name is automatically set to the wavelength of the current waveform.
Files in SOZ format can only be loaded into this instrument. To perform analysis on a PC using the AQ7933 OTDR emulation software, save each wavelength in SOR format.

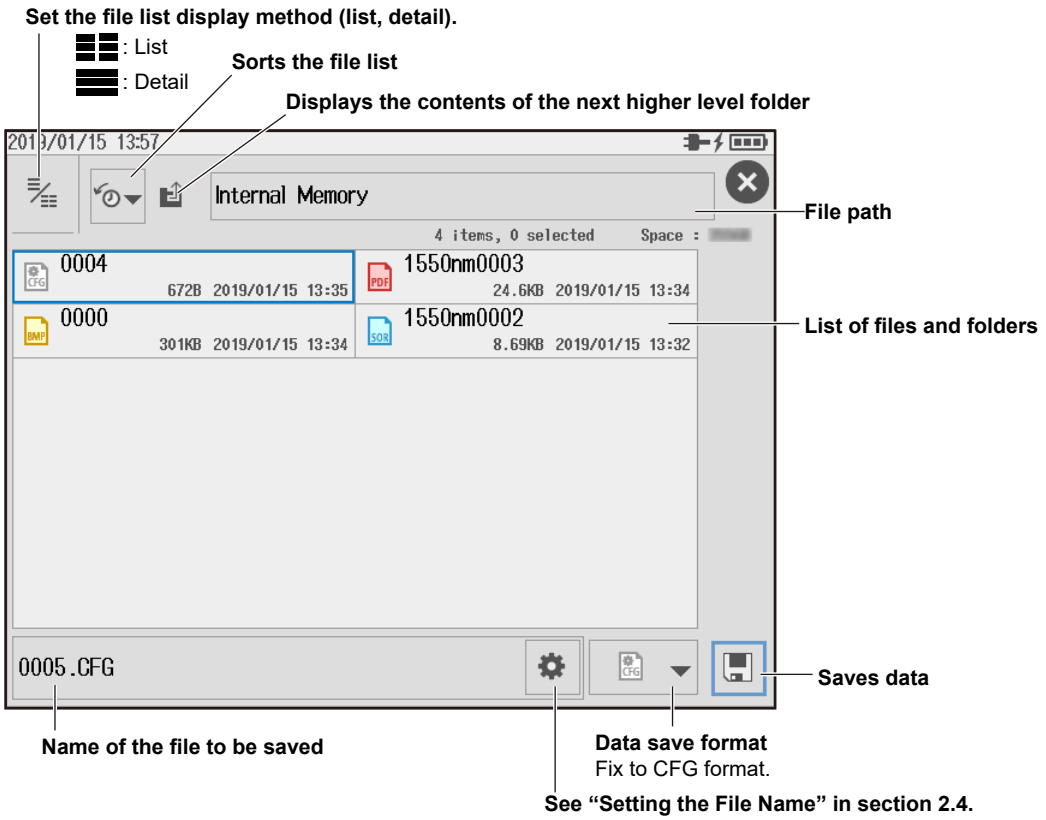
Note

- You cannot use this when the power meter logging feature is in use.
- For details on file operation, see section 9.6.

Saving the System Setup Data (CFG format)

1. Press **MENU** to display the MENU screen.
2. On the data management button window, tap **SAVE**. A file list screen for saving data appears.
   For a description of the data management buttons, see section 9.3.
3. Execute the data save operation. A file is created in CFG format.

File List Screen for Saving Data (system setup)



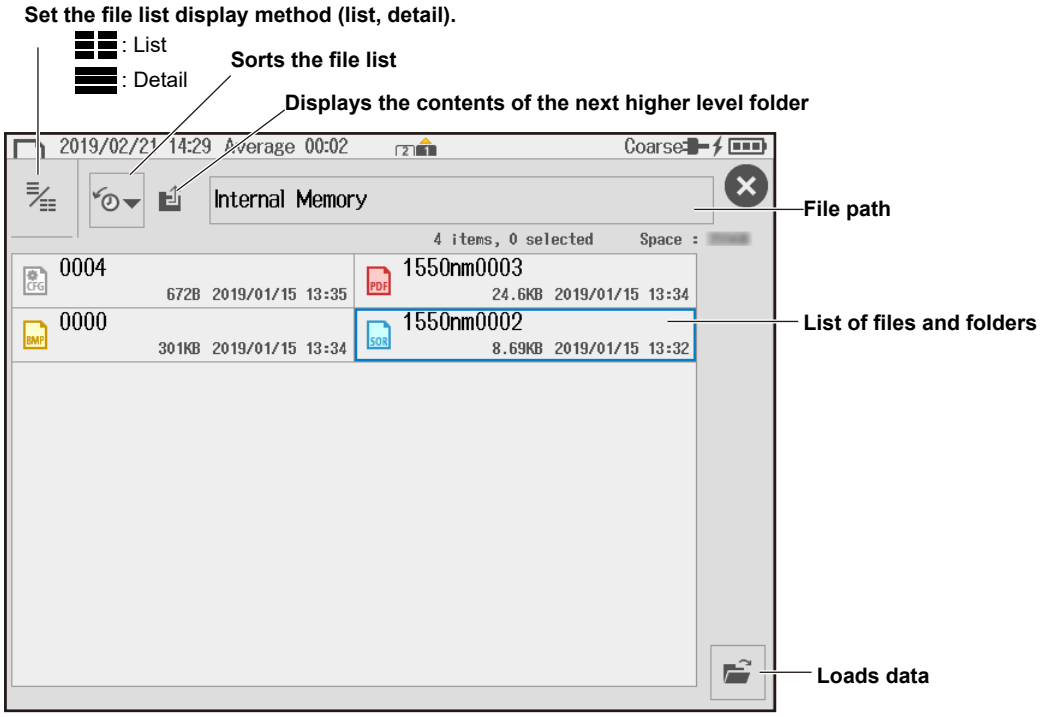
Note

- System setup data can be saved only from the data management button window of the MENU screen. It cannot be saved using the data management buttons shown with the File icon.
- For details on file operation, see section 9.6.

Loading Data (excluding system settings)

1. Tap the **File** icon to display the data management buttons.
2. Tap **LOAD**. A file list screen for loading data appears.
3. Tap an SOR file to select it.
4. Execute the data load operation. A feature starts according to the content of the file.

File List Screen for Loading Data



Note

- The instrument can load SOR files (waveform data) and CFG files (configuration data). Data in SOX, BMP, JPG, or PDF format cannot be loaded.
- You cannot use this when the power meter logging feature is in use.

Loading the System Setup Data (CFG format)

1. Press **MENU** to display the MENU screen.
2. On the data management button window, tap **LOAD**. A file list screen for loading data appears. The file the screen is the same as the one shown above.
3. Tap a CFG file to select it.
4. Execute the data load operation. The system settings are loaded.

Explanation

Saving Data

The following types of files can be saved.

- **System setup**

Extension	Description
CFG	System settings are saved to a file in CFG format.

- **OTDR feature**

Extension	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.
SOZ	Optical pulse waveform data (including the measurement conditions) for two wavelengths measured with the multi wavelength measurement feature is saved in an SOZ file.
BMP	Screen image of the waveform data is saved to a BMP file.
JPG	Screen image of the waveform data is saved to a JPEG file.
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.

The screen image immediately before entering the file operation screen is saved.

- **OTDR Smart Mapper**

Extension	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 of the waveform data is saved to a BMP file.
JPG	Screen image of the waveform data is saved to a JPEG file.
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.

- **Multi-Fiber Measurement Feature**

Extension	Description
SOR	An MPJ folder name is automatically generated, and under MPJ, a project name folder is automatically created. And in this folder, waveform data (including measurement conditions) obtained by measuring a multi-core fiber is saved in an SOR file format that conforms to Telcordia SR-4731.
BMP	An MPJ folder name is automatically generated, and under MPJ, a project name folder is automatically created. And in this folder, a BMP file saved using Fiber Inspec Probe is saved.
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 8.2.
CSV	Multi-core fiber measurement conditions, waveform data summary information, and optical power measurements are saved to a tab separated file.
TXT	Multi-core fiber measurement conditions, waveform data summary information, and optical power measurements are saved to a tab separated file.

- **Power Meter, Auto Loss Test, Multicore Loss Test**

Extension	Description
CSV	CSV file that contains measurement data. Measurement data (including measurement conditions such as wavelength and offset) for the specified number of fibers and tape number type is saved.
LTS	A file containing the measurement conditions of the optical power meter and the light output conditions is saved.

Loading Data

The following types of files can be loaded.

- **System setup**

Extension	Description
CFG	System setup information file.

- **OTDR feature**

Extension	Description
SOR	File in a format that conforms to Telcordia SR-4731 or Bellcore GR-196-CORE (must be a data file with measurement conditions that can be set on the instrument)
SOZ	Optical pulse waveform data (including the measurement conditions) for two wavelengths measured with the multi wavelength measurement feature. This file can only be loaded into this instrument.

- **OTDR Smart Mapper**

Extension	Description
SOR	File in a format that conforms to Telcordia SR-4731 or Bellcore GR-196-CORE (must be a data file with measurement conditions that can be set on the instrument)
SMP	Adapt Trace data measured from an optical pulse (including the measurement conditions).

- **Multi-Fiber Measurement Feature**

Extension	Description
MPJ	Project information file for multi-core measurement. For details, see section 8.2.

Save Destination Drive

Select the destination drive from the following.

Display	Description
Internal Memory	Instrument internal memory
USB Memory 1	The first USB storage device connected to a type A USB port of the instrument
USB Memory 2	The second USB storage device connected to a type A USB port of the instrument

File Conditions

For details on the file name and comment feature, see section 2.4.

9.5 Creating Report 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 device (USB memory or internal memory) or corrupt its data.

French

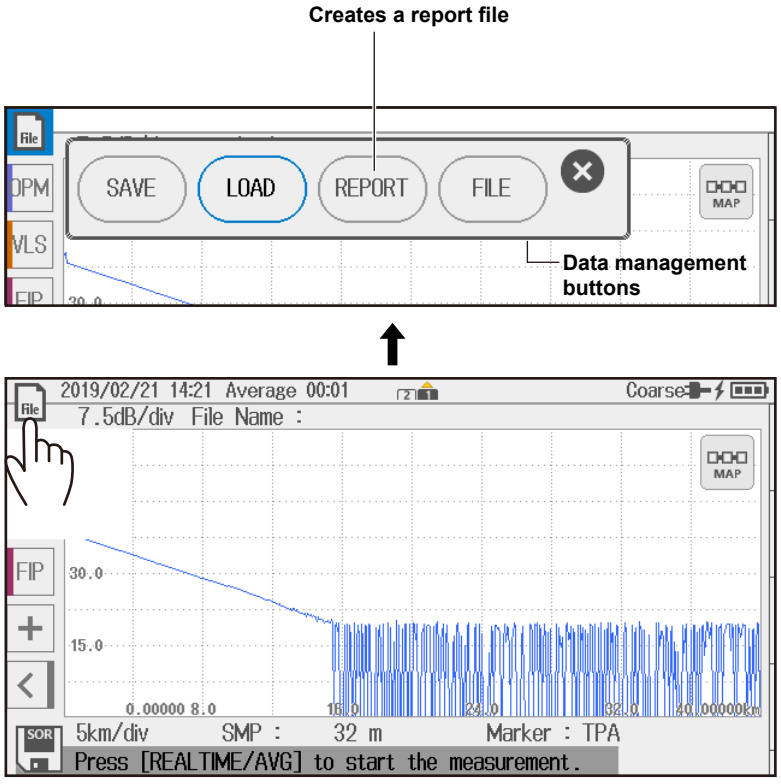
ATTENTION

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.

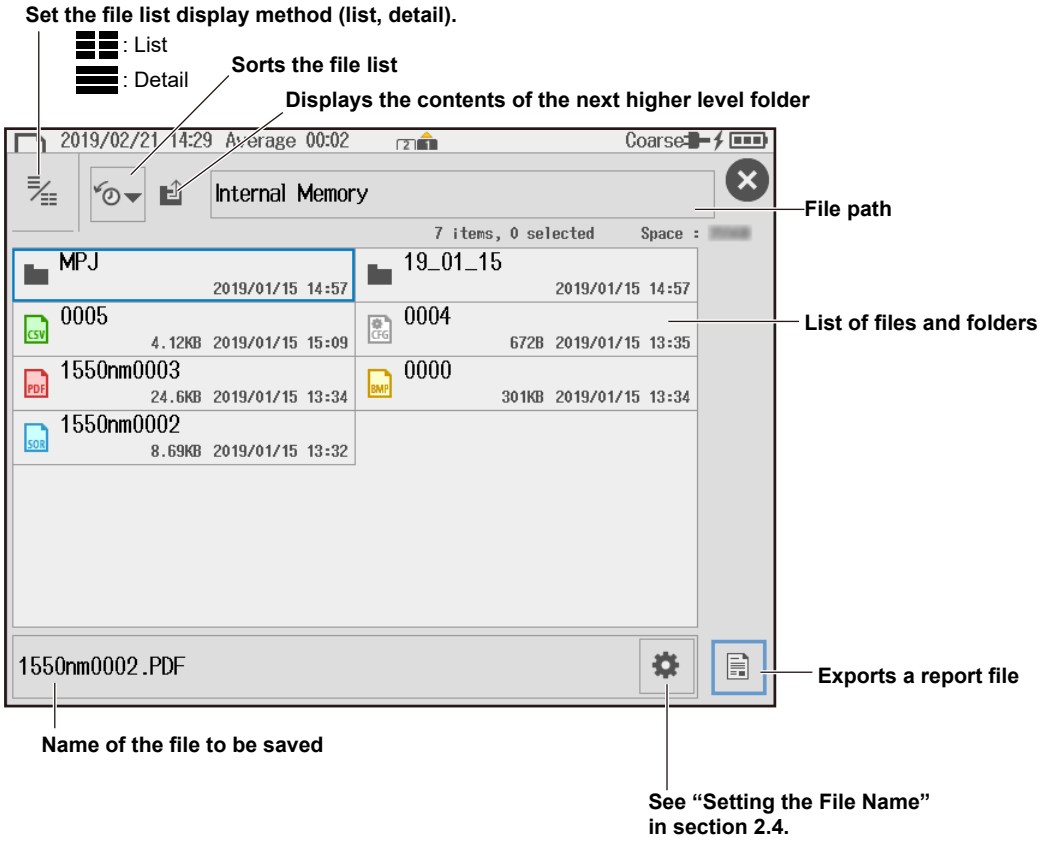
Procedure

Exporting the Waveforms on the Screen to Report Files

1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.
3. Tap the **File** icon to display the data management buttons.
4. Tap **REPORT** to display the file list screen.



File List Screen for Creating Reports

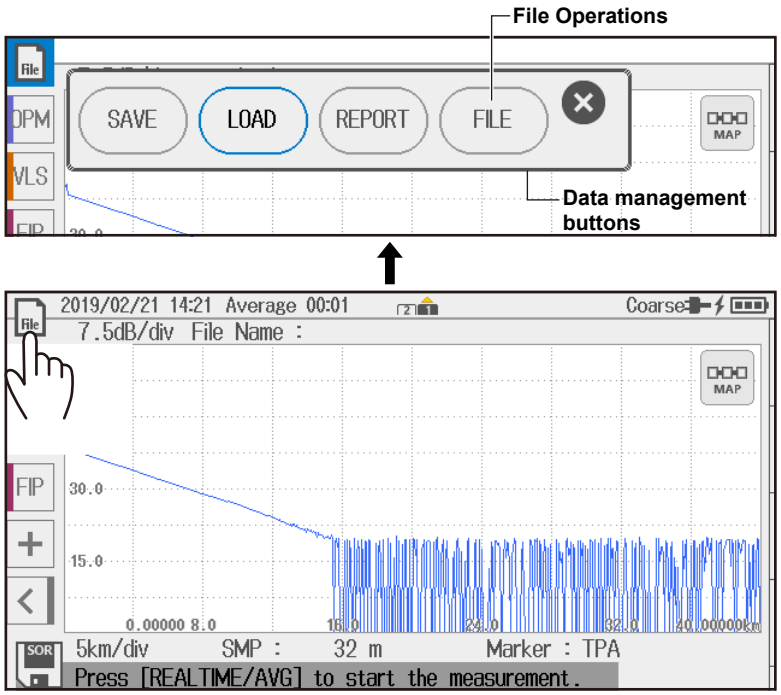


Note

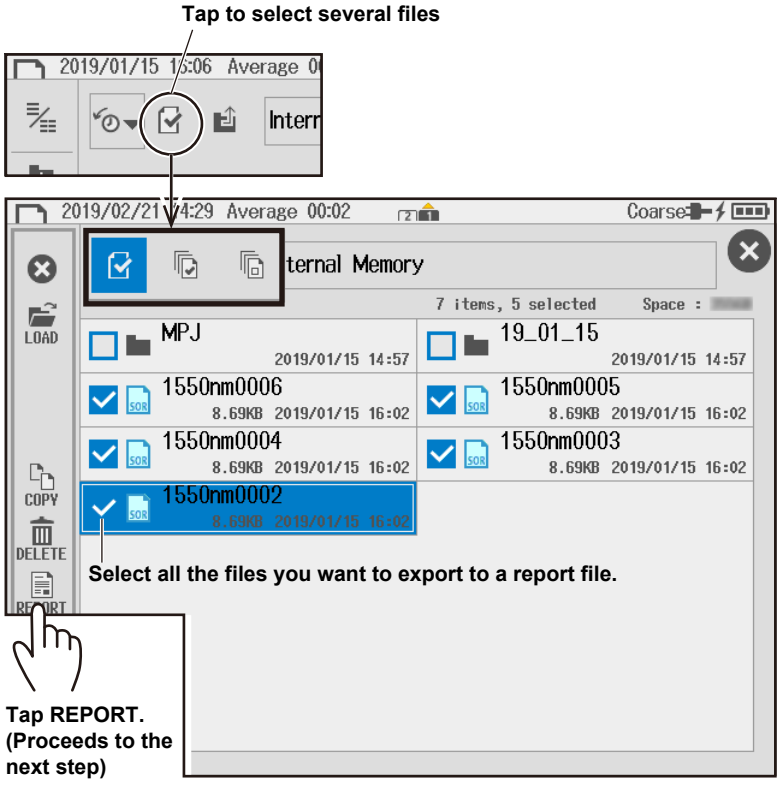
- The waveform shown on the data display screen is exported to a PDF report file. To select a waveform data file in the file list and export a report file, see “Exporting File List Data to Report Files” on the next page.
- Report files can only be saved in SOR format (waveform data).
- To view PDF report files, you need Adobe Reader 5.0 or later.

Exporting File List Data to Report Files

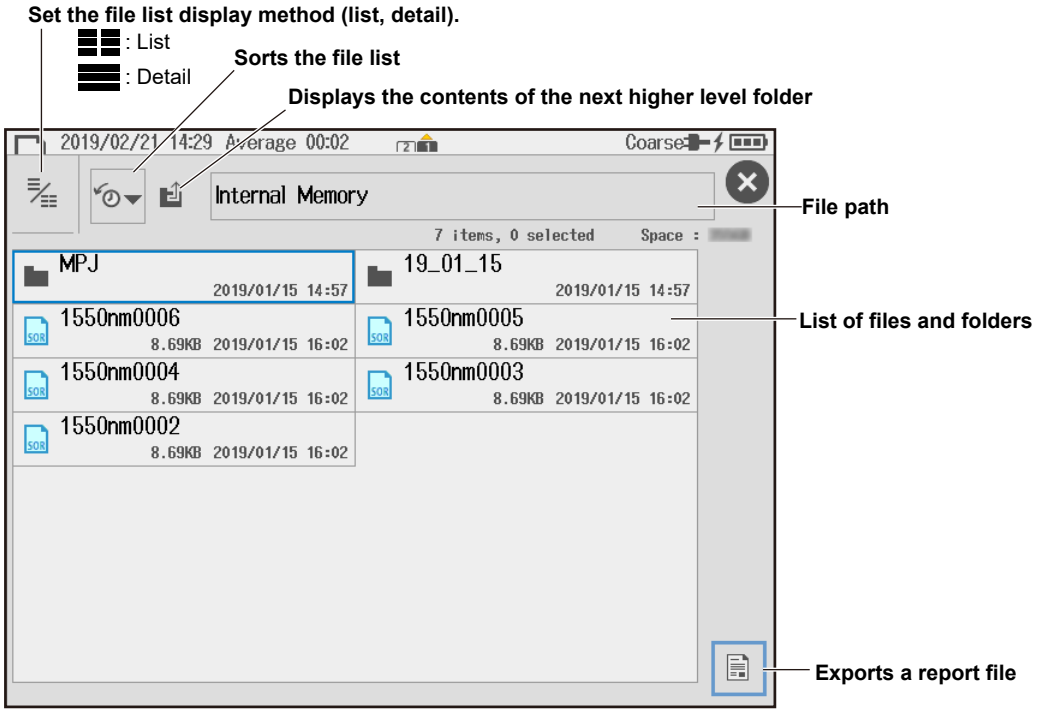
1. Press **MENU** to display the MENU screen.
2. Tap **OTDR** to display the OTDR screen.
3. Tap the **File** icon to display the data management buttons.
4. Tap **FILE** to display the file list screen.



5. Select the waveform data file to export to a report file.
   For instructions on how to select multiple files, see section 9.6.



5. Tap the export report icon. A report file will be created.



Note

- Report files can only be saved in SOR format (waveform data).
- To view PDF report files, you need Adobe Reader 5.0 or later.

Setting the Report File Format

See “Setting the Report Format” or “Setting the File Report Format” in section 2.4.

Explanation

This section explains how to export waveform data saved according to the procedure in section 9.4 as a report file in PDF format. To directly export the current waveform shown on the data display screen as a report file in PDF format, see the following sections.

Auto save: In “Setting Auto Save” in section 2.4, set the file type to *.pdf. When averaged measurements are completed, a report file is automatically created.

9.6 Performing File Operations

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 device (USB memory or internal memory) or corrupt its data.

French

ATTENTION

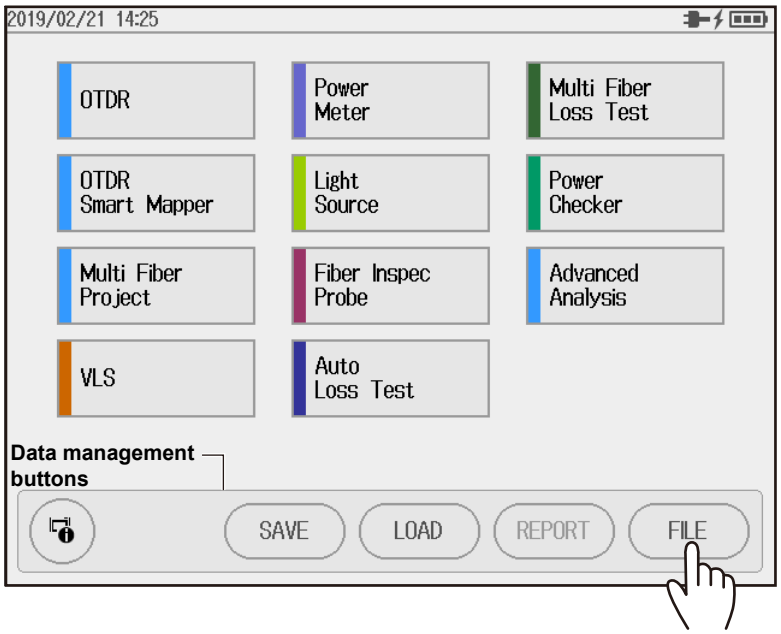
N'enlevez pas un dispositif de mémoire USB et ne coupez pas l'alimentation électrique lorsque l'indicateur d'accès à la mémoire USB clignote ou lorsque les données sont en train d'être enregistrées ou chargées à partir d'une mémoire interne. Vous risqueriez d'endommager le support de stockage (mémoire USB ou mémoire interne) ou les données qu'il contient.

Procedure

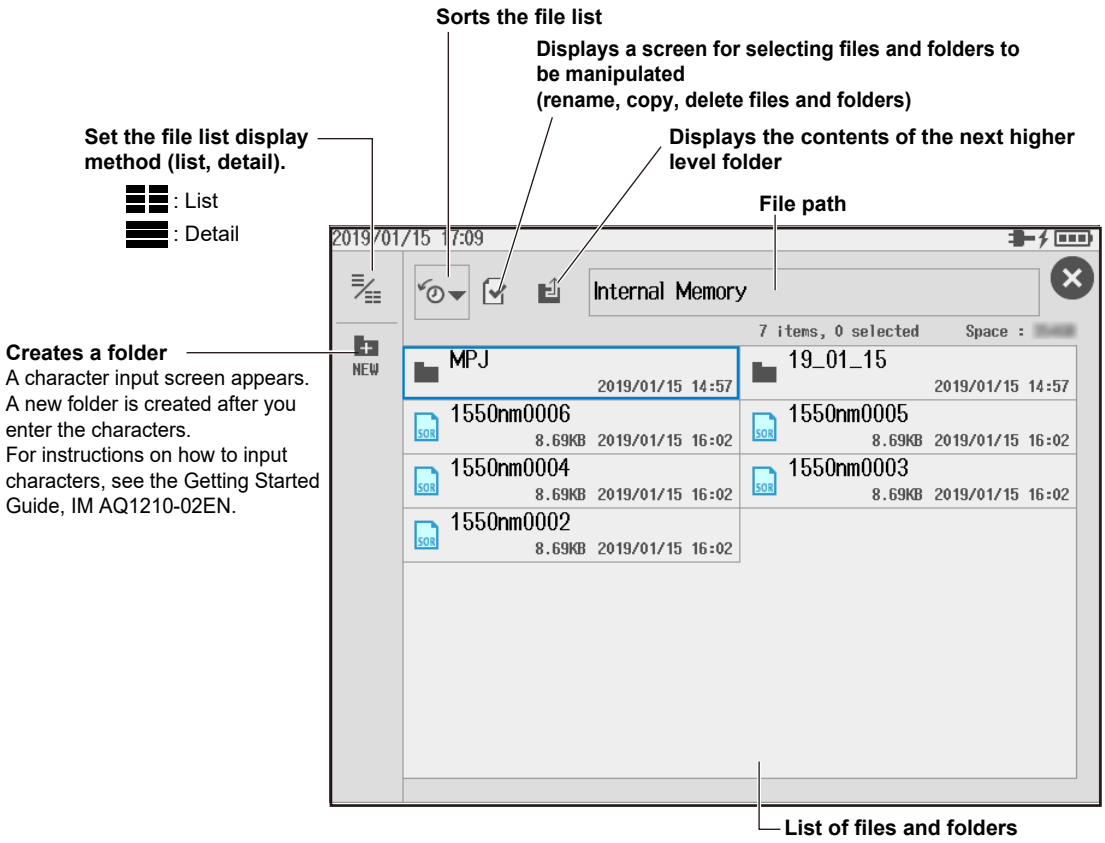
Manipulating Files and Folders

1. Press **MENU** to display the MENU screen. The data management buttons appear.
2. Tap **FILE**. A file list screen for manipulating files appears.
   This screen can also be displayed by following the procedure explained in sections 9.4 and 9.5.

MENU screen



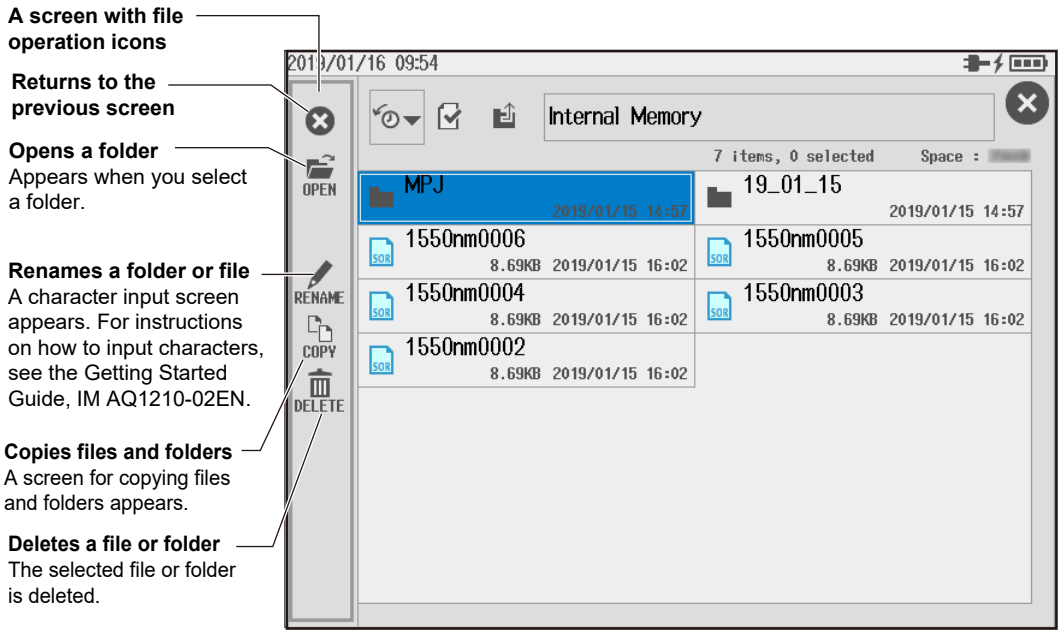
File List Screen for Manipulating Files



Renaming, Copying, and Deleting Files and Folders

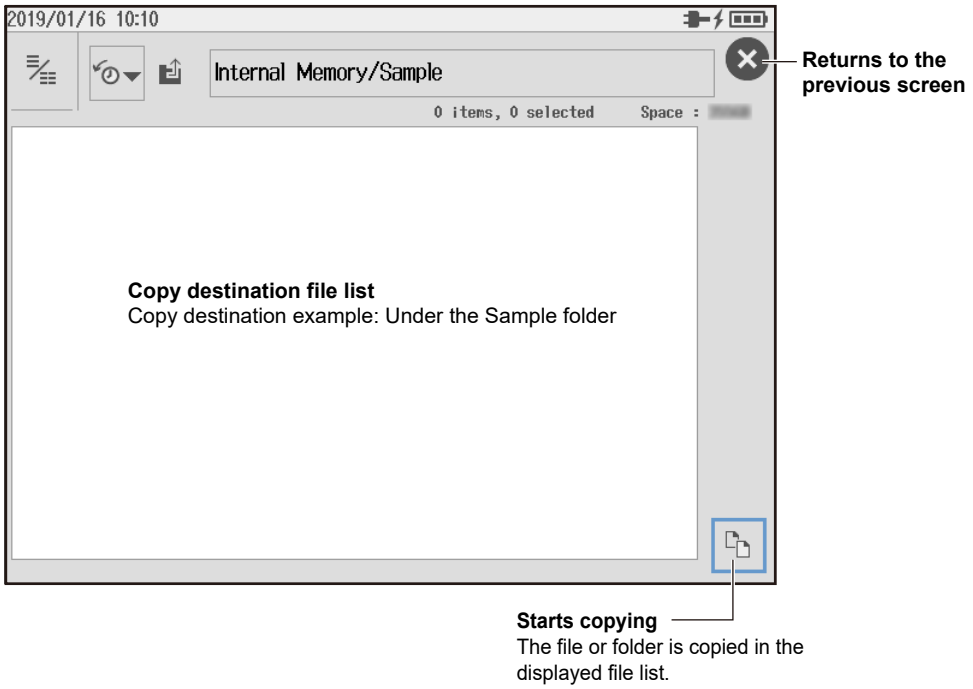
3. Tap the file or folder you want to manipulate. A screen with file operation icons appears.

4. Tap the file operation you want to execute.



- **Copying Files and Folders**

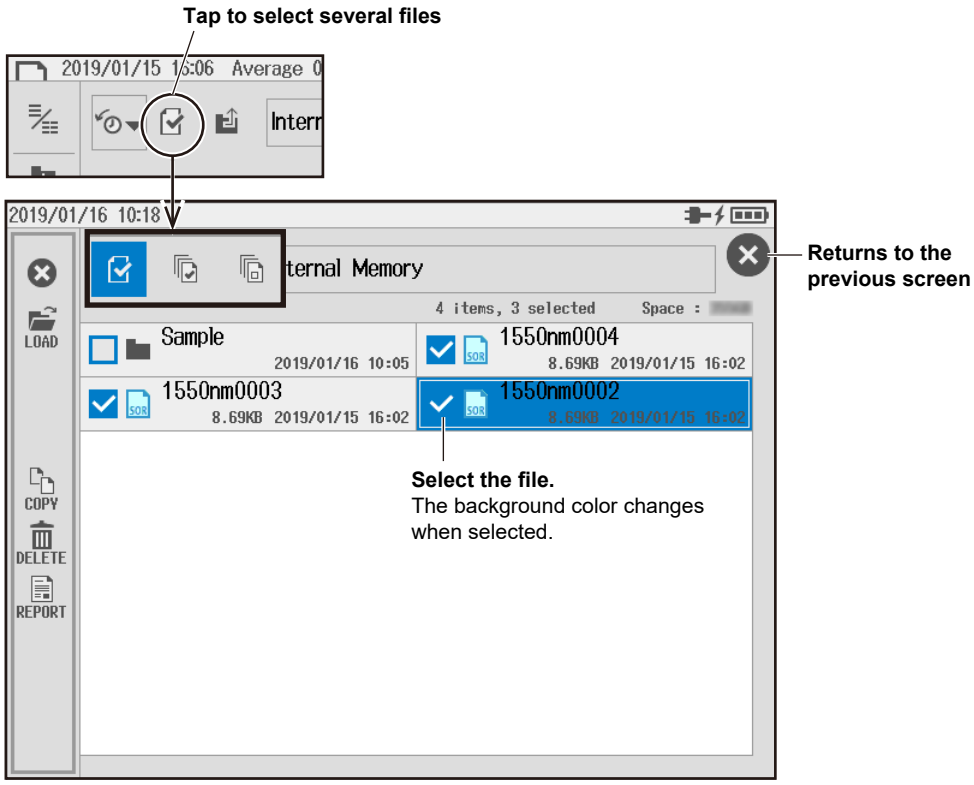
5. Tap the COPY icon. A file list screen of the copy destination folder appears. Change the folder as necessary.



Selecting Multiple Files and Folders

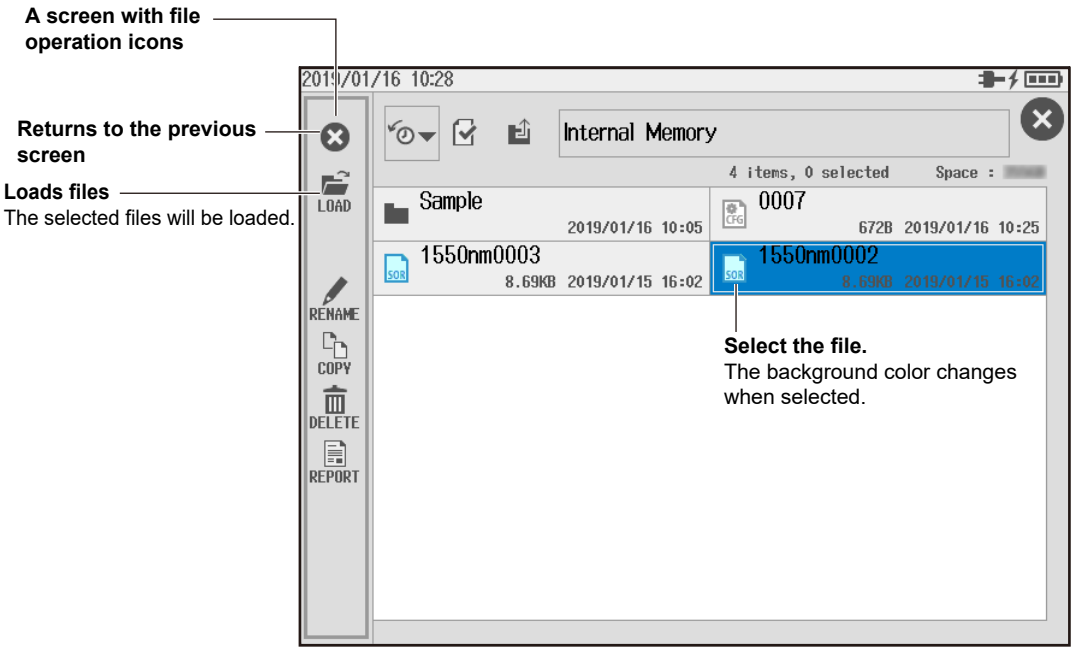
3. Tap the icon. A screen for selecting files and folders to be manipulated appears.

4. Select the files or folders you want to manipulate.



Loading Files (SOR Format, CFG Format)

3. Select the file you want to load. A screen with file operation icons shows a load file icon.



Note

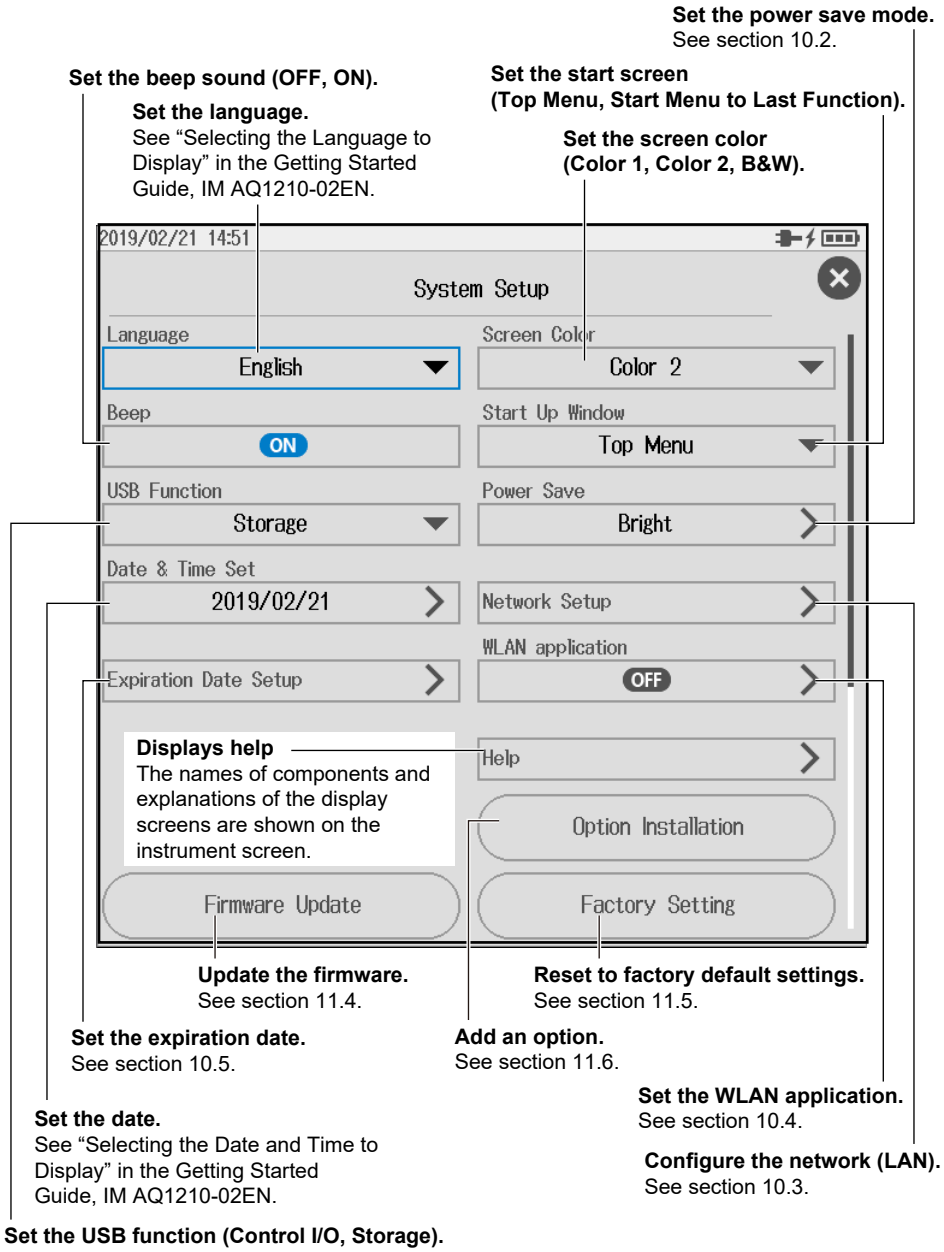
Files can also be loaded using the procedure explained in section 9.4.

10.1 Displaying the System Setup Screen

Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.

   You can display the system setup screen by pressing the SETUP key on screens other than the MENU screen, such as those of the OTDR feature and power meter feature. Depending on the feature, you may need to tap the System tab after displaying the setup screen with the SETUP key. The settings are applied globally regardless of which screen system setup is executed from.



Explanation

Screen Color

Select the screen color from the following:

Color 1	Color scheme based on black
Color 2	Color scheme based on white
B&W	This setting is suitable when you want to print data saved in BMP or JPG format in black and white on an external printer.

Beep

The instrument can generate a sound when an averaged measurement is finished or when an operation error message is displayed.

ON	Beep sound is on.
OFF	Beep sound is off.

Start Up Window

Set the first screen that appears when you start the instrument.

Top Menu	The MENU screen appears.
Start Menu to Last Function	The screen of the feature that was executed immediately before the power was turned off appears.

USB Function

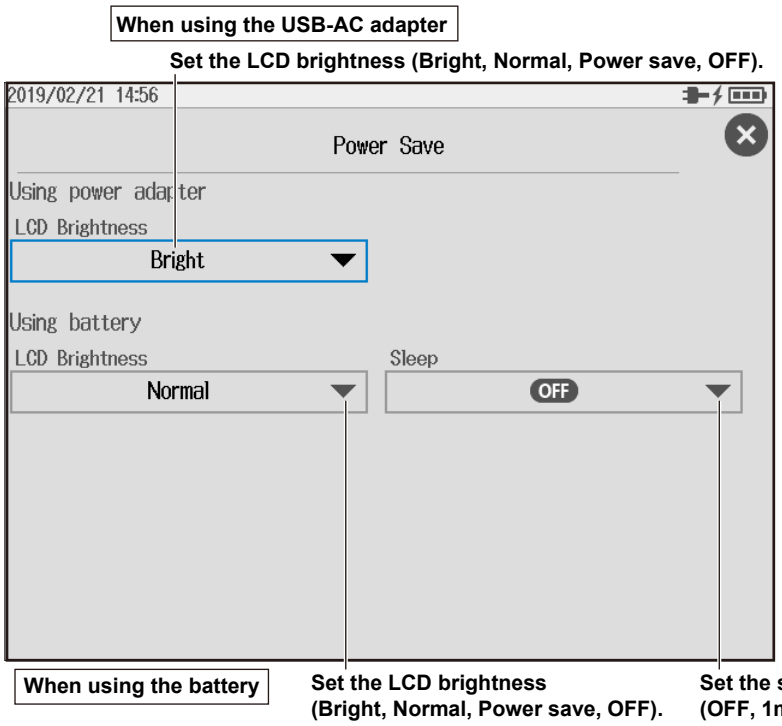
Set the function of the Type C USB port.

Storage	You can access the instrument internal memory from an external device, and load and save data.
Communication	You can control the instrument remotely from external devices. For instructions on how to use remote control, see the communication interface user's manual, IM AQ1210-17EN.

10.2 Using the Power Save Mode

Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.
3. Tap **Power Save** to display the Power Save screen.



Explanation

Setting the Power Save Mode

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 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 lasts longer than the Normal setting.
OFF	The LCD backlight is turned off. The battery lasts longer, even longer than the Power Save setting. When you press any key, the backlight turns on for approximately 10 seconds.

Sleep

If the instrument is left standing for a certain period with the power turned on, the power will be automatically switch to sleep mode.
If the instrument is left standing for 2 hours in sleep mode, the power automatically turns off. This does not apply during averaged measurement or real-time measurement.

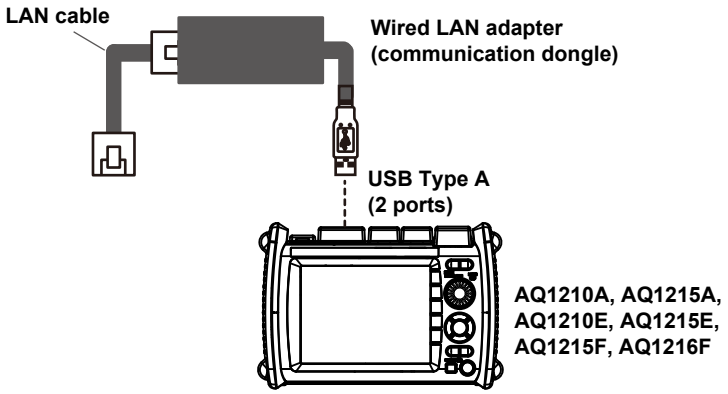
OFF	The power will not be turned off.
1 min	If you do not operate the instrument for 1 minute, the power will be automatically switched to sleep mode.
5 min	If you do not operate the instrument for 5 minutes, the power will be automatically switched to sleep mode.
10 min	If you do not operate the instrument for 10 minutes, the power will be automatically switched to sleep mode.
30 min	If you do not operate the instrument for 30 minutes, the power will be automatically switched to sleep mode.

10.3 Using the Network (LAN)

Procedure

Connecting the Wired LAN Adapter (communication dongle)

1. Connect a wired LAN adapter to the Type A USB port of the instrument.

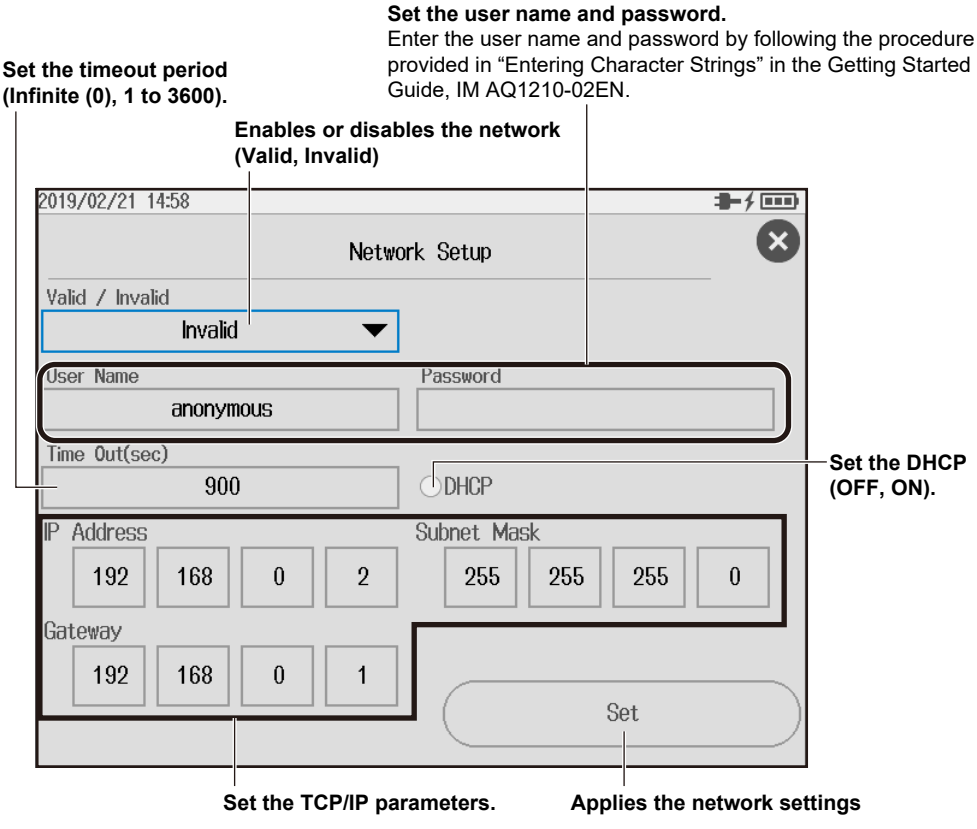


Note

Please use your own communication dongle. For the recommended communication dongles that can be used with this instrument, contact your nearest YOKOGAWA dealer.

Network Setup Screen

2. Press **MENU** to display the MENU screen.
3. Press **SETUP** to display the system setup screen.
4. Tap **Network Setup** to display the Network Setup screen.



Explanation

To use the network, you need to connect a USB Type A wired LAN adapter (communication dongle) to the instrument. With a network connection, you can control the instrument using communication commands.
For details on DHCP and TCP/IP, contact your network administrator.
Please use your own communication dongle. For the recommended communication dongles that can be used with this instrument, contact your nearest YOKOGAWA dealer.

Enabling and Disabling the Network Feature

Set the user name, password, timeout value, and TCP/IP parameters, and then select Valid.
When you enter the network settings, you can start communicating over the network. You do not have to restart the instrument.

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 instrument 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

If there is no access to the instrument within the specified period, the network connection between the instrument and the PC is automatically disconnected.

Selectable range: Infinite (0), 1 to 3600 s

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 instrument 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

If there is a DHCP server on the network to which the instrument 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.

TCP/IP

IP Address

Set the IP address to assign to the instrument. 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 netmask address.
If DHCP is available and you set DHCP above to ON, the IP address is assigned automatically.

Gateway

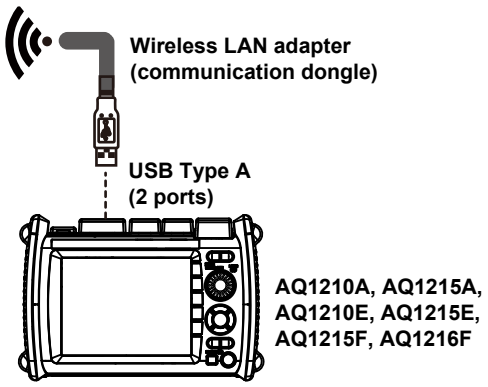
Set the IP address of the default gateway used to communicate with other networks. The default gateway has features for controlling the communication between multiple networks so that data exchange is performed smoothly.
Consult your network administrator for the gateway address.
If DHCP is available and you set DHCP above to ON, the IP address is assigned automatically.

10.4 Using the WLAN Application

Procedure

Connecting the Wireless LAN Adapter (communication dongle)

1. Connect a wireless LAN adapter to the Type A USB port of the instrument.



Note

Please use your own communication dongle. For the recommended communication dongles that can be used with this instrument, contact your nearest YOKOGAWA dealer.

Starting the Wireless LAN Application

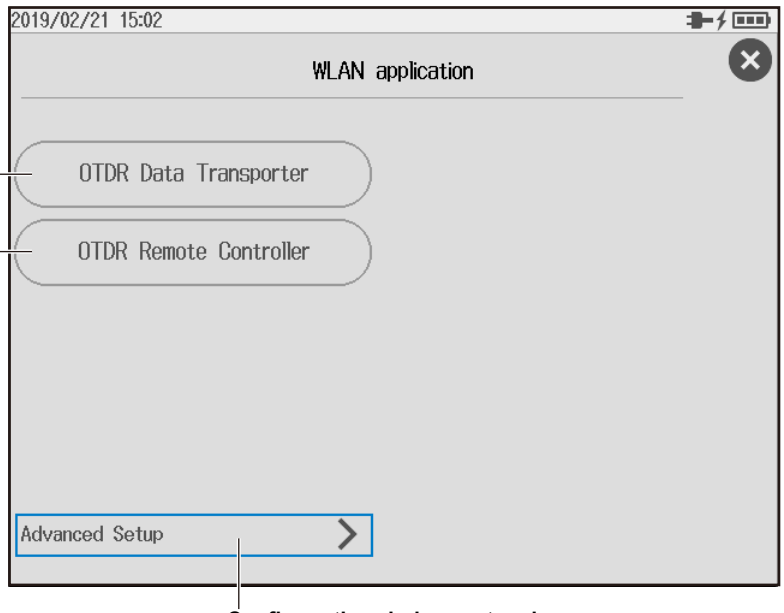
2. Press **MENU** to display the MENU screen.

3. Press **SETUP** to display the system setup screen.

4. Tap **WLAN application** to display the WLAN application screen.

Executes an OTDR remote operation (standby)
See page 10-9.

Executes a waveform data transfer (standby)
See page 10-8.



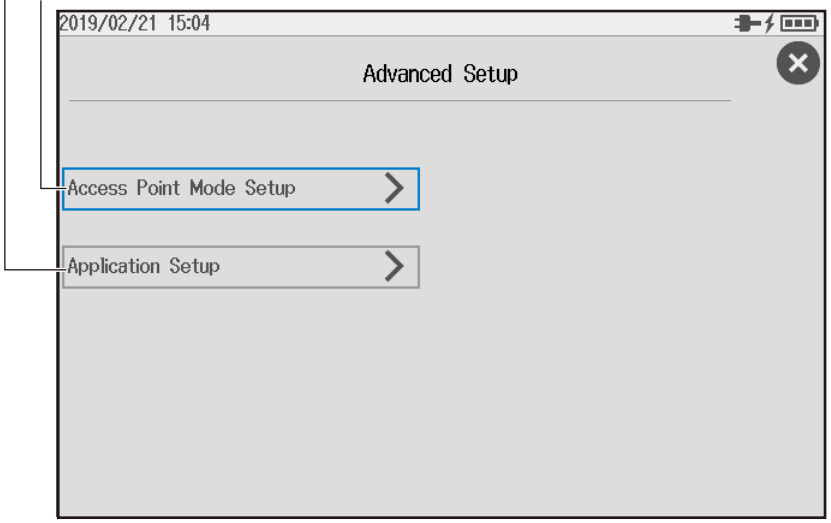
Configure the wireless network.

Configuring the Wireless Network

5. Tap the **Advanced Setup** button to display the Advanced Setup screen.

Set the remote control login information.

Set the access point.



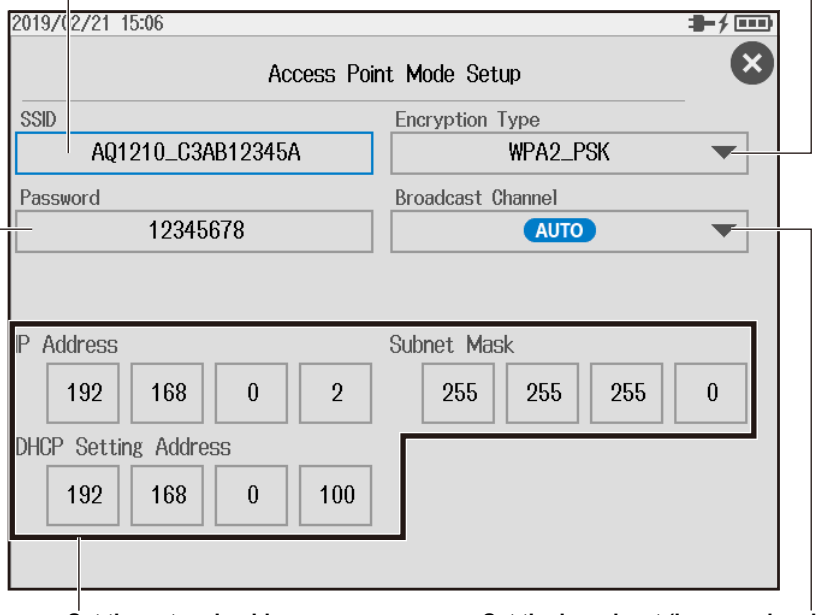
Setting the Access Point

6. Tap **Access Point Mode Setup** to display the Access Point Mode Setup screen.

Set the authentication password.
A character input screen appears. For instructions on how to input characters, see the Getting Started Guide, IM AQ1210-02EN.

Set the ID name (SSID).
A character input screen appears. For instructions on how to input characters, see the Getting Started Guide, IM AQ1210-02EN.

Set the encryption key (None, WPA2_PSK).



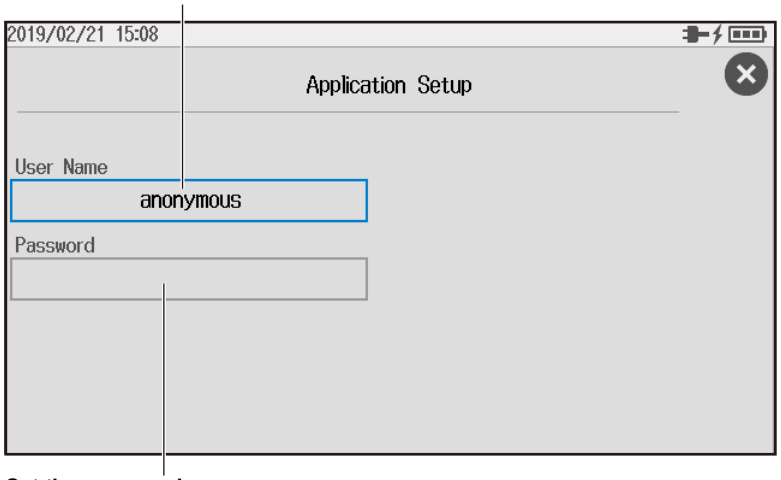
Set the network address.
A numeric keypad appears.

Set the broadcast (beacon signal) channel to the wireless terminal (AUTO, 1ch, 2ch, 3ch, 4ch, 5ch, 6ch, 7ch, 8ch, 9ch, 10ch, 11ch).

Setting the Remote Control Login Information

7. Tap **Application Setup** to display the Application Setup screen.

Set the user name.
A character input screen appears. For instructions on how to input characters, see the Getting Started Guide, IM AQ1210-02EN.



Set the password.
A character input screen appears. For instructions on how to input characters, see the Getting Started Guide, IM AQ1210-02EN.

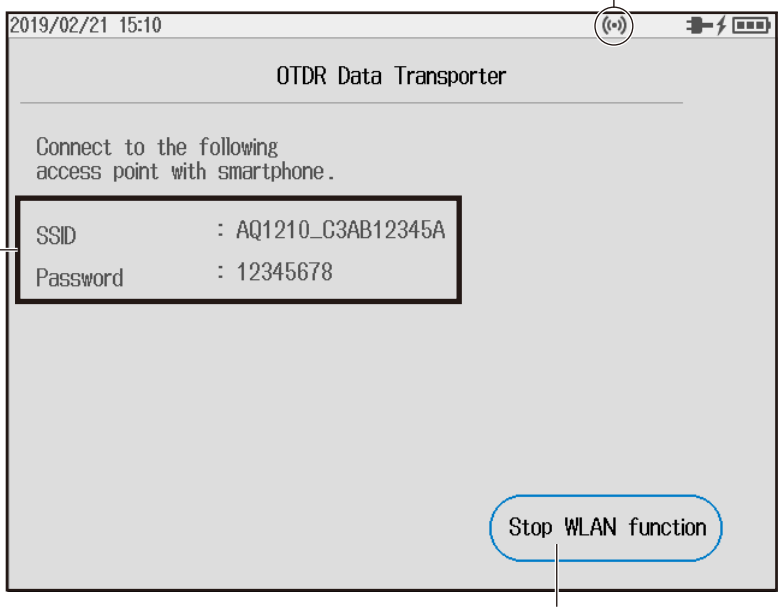
Transferring the Waveform Data

Executing a Waveform Data Transfer (Access Point Standby State)

5. Continuing from step 4 on page 10-6, tap **OTDR Data Transporter**. A standby screen appears for the waveform data transfer.

An icon indicating that the wireless LAN is in use
If you execute the Stop WLAN function, the wireless LAN operation ends, and the icon disappears. In addition, even if you stop accessing from the wireless terminal, the wireless LAN operation does not end, so you can access from the wireless terminal again.

Access point information



Cancels waveform data transfer

- **Operation on the Wireless Terminal**

6. Search for the access point from the wireless terminal, and connect to the access point. Check that the SSID is the same as that of the instrument.
7. Start OTDR Data Transporter on the wireless terminal. For the operating procedure of the application, see the application software's help.

Note

Only a single wireless terminal can access the instrument at any given time. (Multiple wireless terminals cannot access the instrument simultaneously.)

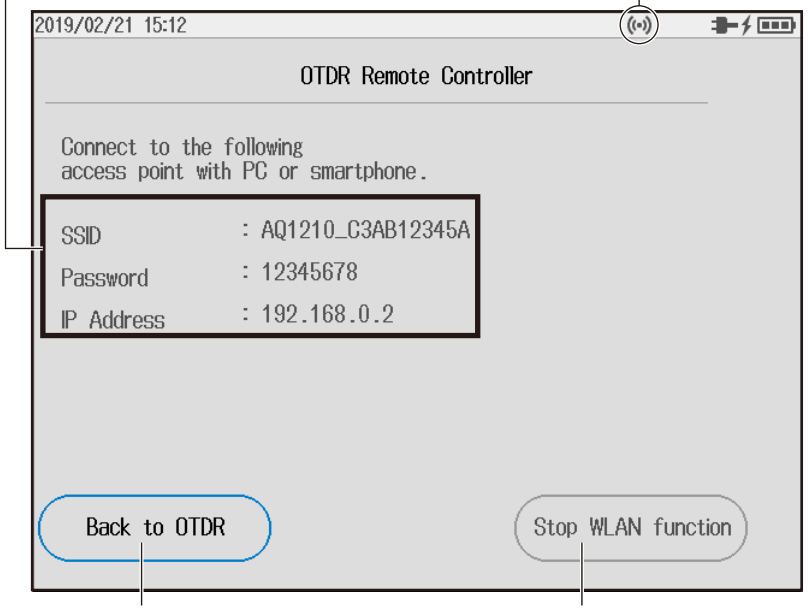
Controlling the OTDR Remotely

Executing OTDR Remote Control (Access Point Standby State)

5. Continuing from step 4 on page 10-6, tap **OTDR Remote Controller**. A standby screen appears for OTDR remote control. An icon indicating that the wireless LAN is in use appears at the top of the screen.

An icon indicating that the wireless LAN is in use
If you execute the Stop WLAN function, the wireless LAN operation ends, and the icon disappears.
If you select Back to OTDR, the wireless operation does not end, and the icon remains displayed. In addition, even if you stop accessing from the wireless terminal, the wireless LAN operation does not end, so you can access from the wireless terminal again.

Access point information



Returns to the previous screen
You can monitor the operation through remote control or control the OTDR directly.

Cancels waveform data transfer

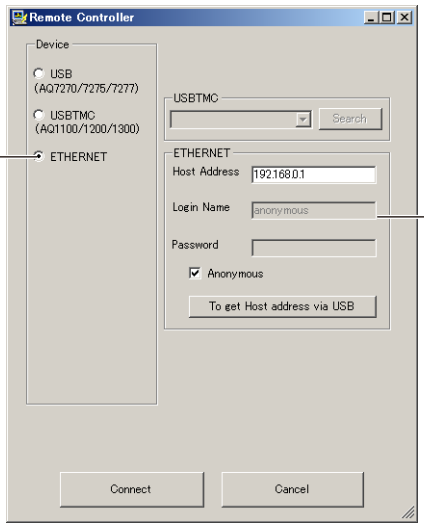
Operation on the Wireless Terminal (Yokogawa OTDR Remote Controller)

6. Continuing from step 5 on page 10-9, search for the access point from the wireless terminal, and connect to the access point.
Check that the SSID is the same as that of the instrument.

7. Start Yokogawa OTDR Remote Controller on the wireless terminal.
For the operating procedure of the application, see the application software's help.

8. From the **File** menu, select **Connect**.
This is an example on a PC.

Remote Controller's Connect screen



Select ETHERNET.

Set the access point information that will be displayed on the instrument.

Note

Only a single wireless terminal can access the instrument at any given time. (Multiple wireless terminals cannot access the instrument simultaneously.)

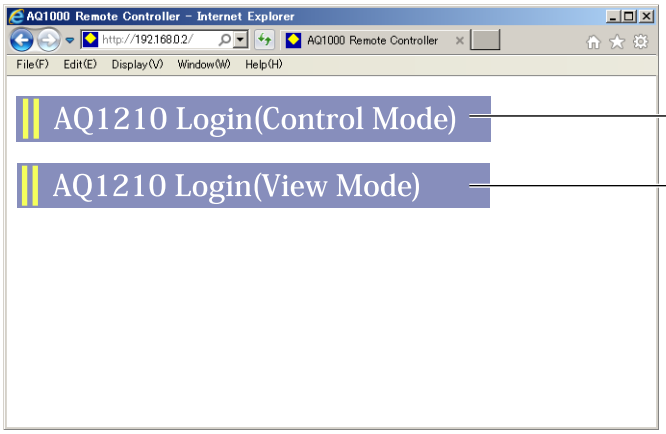
Operation on the Wireless Terminal (Web Browser)

6. Continuing from step 5 on page 10-9, search for the access point from the wireless terminal, and connect to the access point.
Check that the SSID is the same as that of the instrument.

7. On the wireless terminal, start Internet Explorer or other Web browser.
If you are using Internet Explorer, use version 9.0 or later.

8. In the address box, enter "http://IP address" to connect to the instrument. The IP address is that of the access point shown on the instrument.
A page for selecting the connection mode appears.

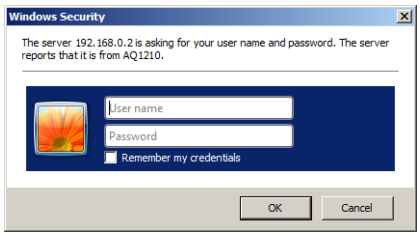
Connection mode selection screen



Connection mode (Control mode)

Connection mode (View mode)

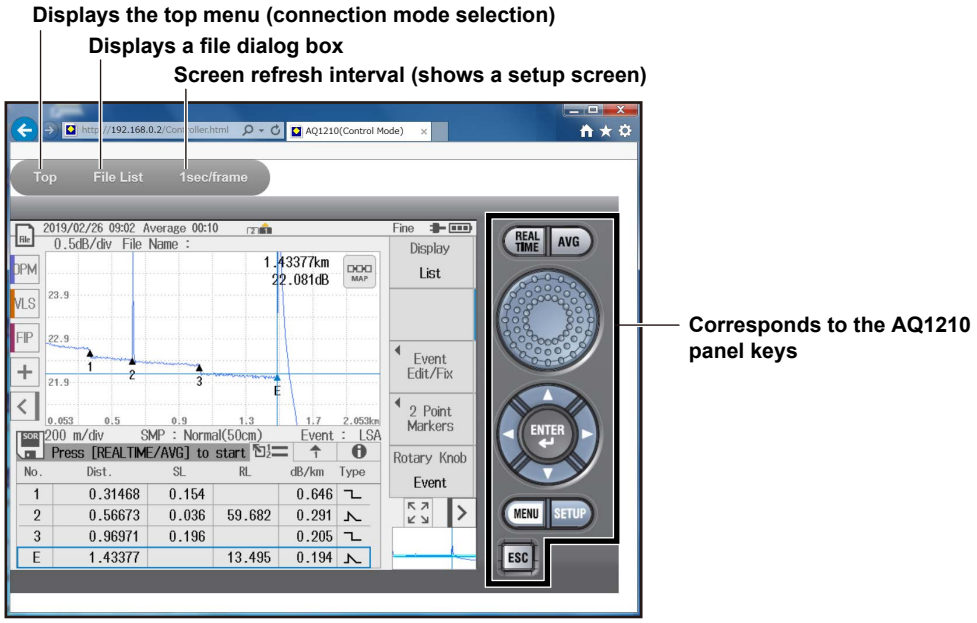
9. Click a connection mode. An authentication dialog box appears.



10. To connect in Control Mode, enter the user name and password that you specified in “Remote Control Login Information” on page 10-7, and click OK.

The AQ1210 screen and control panel appear on the wireless terminal screen. You can control the AQ1210 with a mouse or through the touch panel.

Control screen

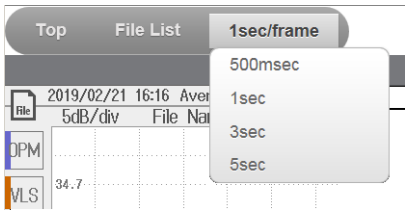


Note

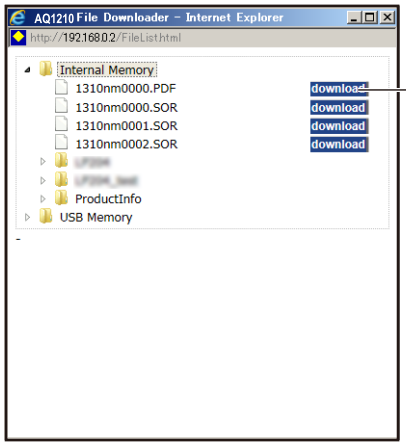
- If you set the user name in the network settings to “anonymous,” enter “anonymous” for the user name. You do not have to enter the password.
- To connect in View Mode, enter “guest” for the user name and “yokogawa” for the password.
- User name and password are case-sensitive.

- **Setting the Screen Refresh Interval**

  You can set the interval for refreshing the content displayed on the wireless terminal 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.



- **Displaying the File Dialog Box**
  Click **File List** at the top of the screen. A folder structure of the instrument internal memory and USB memory devices connected to the instrument appears.
  Click download to download the corresponding file to the wireless terminal.



Explanation

Access Point

SSID (ID name)

This is the name of the access point that is displayed when access points are searched for from a wireless terminal.

Password

This is the authentication password for connecting to the access point from the wireless terminal.

Encryption Type

This is the encryption key used in the communication with the wireless terminal.

None:	An encryption key is not used.
WPA2_PSK:	A WPA2-PSK encryption key is used.

Broadcast Channel (Beacon Signal)

Specify the channel on which to receive beacon signals when access points are searched for from a wireless terminal.

AUTO:	The channel is selected automatically when sending a broadcast.
1ch to 11ch:	When there are wireless communication interference signals in the surrounding area, manually select a channel to avoid the interference.

TCP/IP Settings

Set the address for performing a one-to-one communication between the instrument (access point) and the wireless terminal. The address format is IPv4.

- **IP Address**
  Set the IP address to assign to the instrument. The IP address is an ID number assigned to each computer connected to a network.

- **Subnet Mask**
  Set the mask value for determining the subnet network address from the IP address. Subnet mask is a value that defines how many bits of the IP address is used for network identification.

- **DHCP Setting Address**
  This is the IP address assigned to the wireless terminal that has accessed the access point (instrument).
  Addresses are assigned in order from the specified address.

Remote Control Login Information (Application Setup)

User Name

You can use up to 15 characters. The default setting is “anonymous.”

Password

You can use up to 15 characters.

Transferring the Waveform Data

You can transfer data saved on the instrument to a wireless terminal. To use this feature, you need to install OTDR Data Transporter (a YOKOGAWA software application) in the wireless terminal.
This software application is a freeware. Visit the YOKOGAWA webpage below, and download OTDR Data Transporter.

http://www.yokogawa.co.jp/tm/F-SOFT/

Waveform data can also be transferred by remotely controlling the instrument. See “Displaying the File Dialog Box” on the previous page.

Remote Controlling the OTDR

Operation on the Wireless Terminal (Yokogawa OTDR Remote Controller)

You can install Yokogawa OTDR Remote Controller in the wireless terminal and remotely control the instrument from the software application.
This software application is a freeware. Visit the YOKOGAWA webpage below, and download Yokogawa OTDR Remote Controller.

http://www.yokogawa.co.jp/tm/F-SOFT/

Operation on the Wireless Terminal (Web Browser)

You can remotely control the instrument from a Web browser of your wireless terminal.

- **Connection Mode**
  There are two connection modes: Control and View.
  Control Mode:
  The instrument screen is displayed on the wireless terminal screen. You can control the instrument with a mouse or through the touch panel of the wireless terminal. You can also download files from the instrument.
  View Mode:
  The instrument screen is displayed on the wireless terminal screen, but you cannot control the instrument from the wireless terminal. However, you can download files from the instrument.

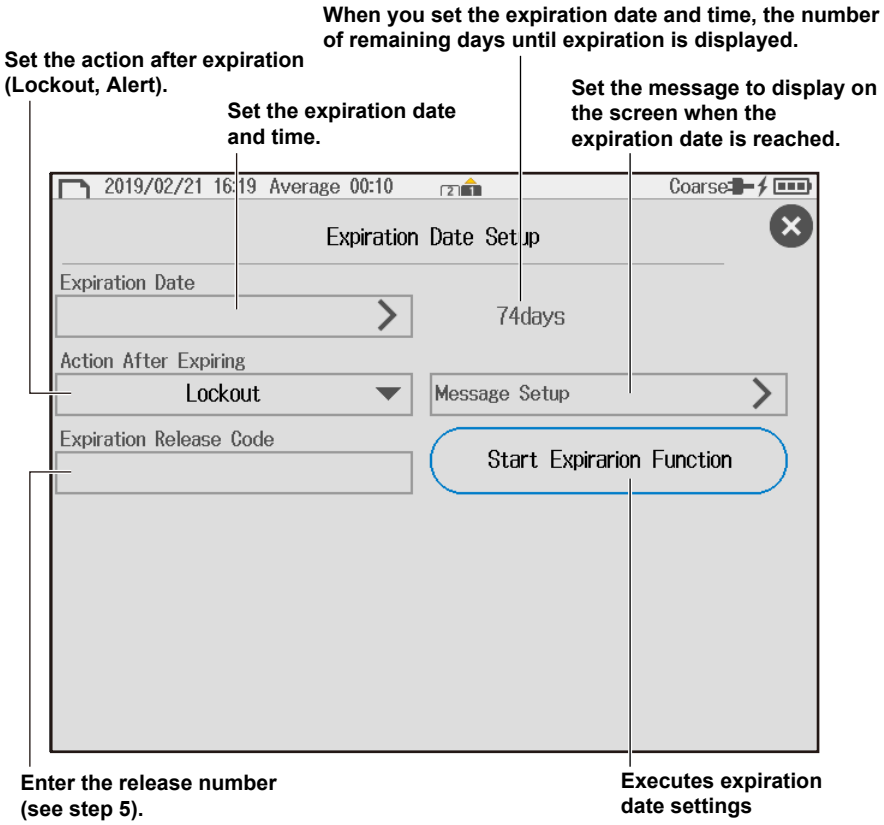
- **Touch Panel Remote Control**
  The instrument's touch panel remote control only supports tap operations.
  You can perform the equivalent of tapping by clicking the mouse.
  Dragging and pinching are not possible.

- **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.

10.5 Specifying the Expiration Date

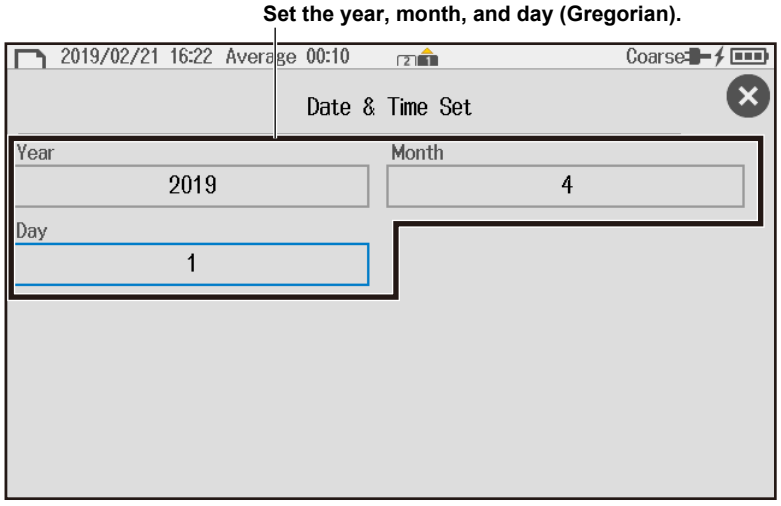
Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.
3. Tap **Expiration Date Setup** to display the Expiration Date Setup screen.



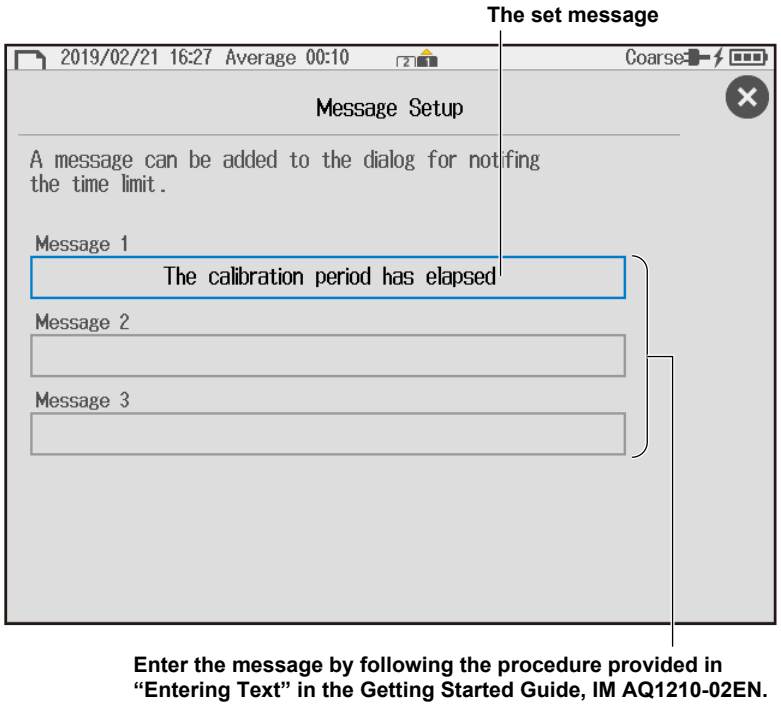
Setting the Expiration Date

4. Tap **Expiration Date** to display the Date & Time Set screen.



Setting the Expiration Message

5. Tap **Message Setup** to display the Message Setup screen.



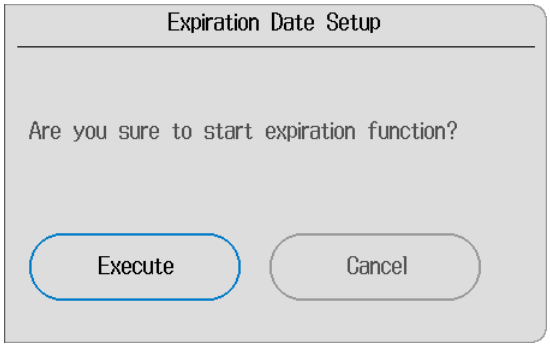
Enabling the Expiration Date Settings

6. Continuing from step 3, tap Expiration Release Code to display a number input screen.

7. Enter a release number.

8. Tap **Start Expiration Function** to display the Expiration Date Setup screen.

9. Tap Execute. The expiration date setting is enabled.

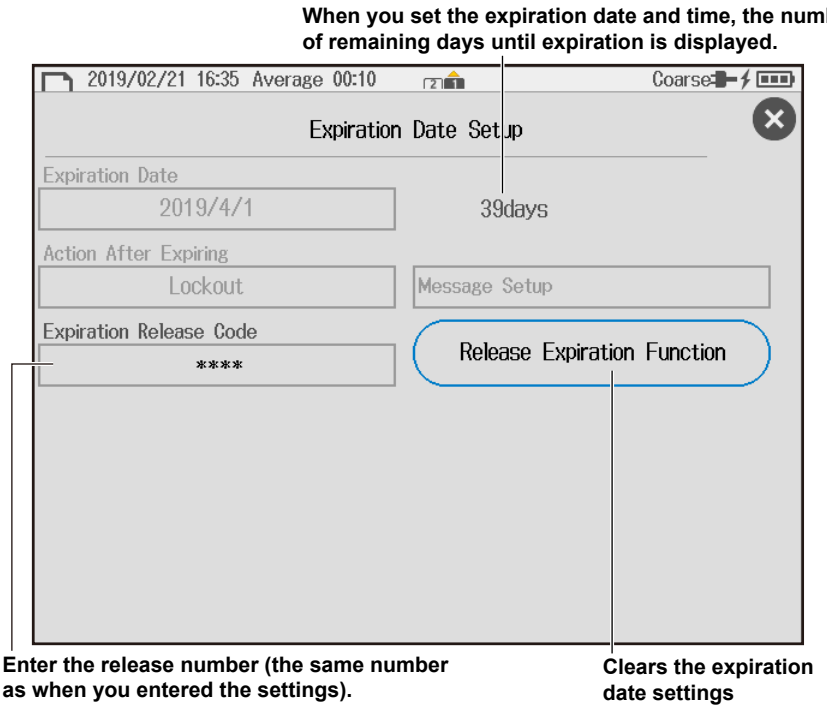


Clearing the Expiration Date Settings

10. Continuing from step 3, tap **Expiration Release Code** to display a number input screen.

11. Enter a release number.
This is the same number that you entered when you set the expiration date.

12. Tap **Release Expiration Function**. The expiration date setting is disabled.



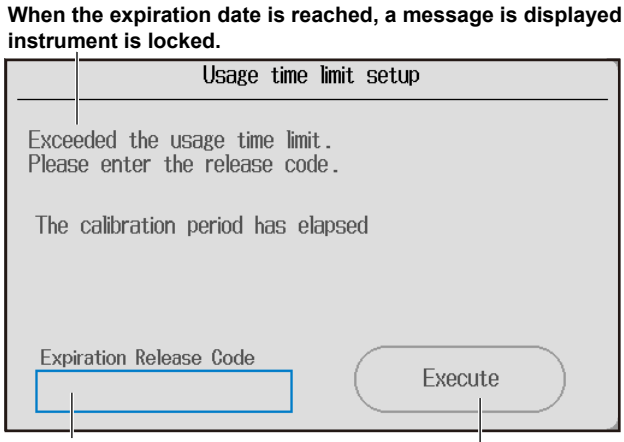
Releasing the Locked State

When the expiration date is reached, a screen indicating that the instrument is locked is displayed at startup.

1. Tap **Expiration Release Code** to display a number input screen.

2. Enter a release number.
This is the same number that you entered when you set the expiration date.

3. Tap **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

11.1 Troubleshooting

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 USB-AC adapter, make sure that the plug is connected firmly to the outlet, the power cord is connected firmly to the USB-AC adapter, and the USB-AC adapter's DC plug is connected firmly to the instrument.	—[1]
	Charge the battery, and make sure that the POWER LED 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 instrument is within the operating temperature range.	—[1]
	Holding down the power switch for at least 2 seconds.	—[1]
	The backup file in the instrument 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 MENU key, press the power switch. 2. Keep holding down the key until the instrument starts.	—[1]
The display disappears after some time passes.	The instrument turns off automatically when its battery level is low. Check the battery level.	—[1]
	If you have specified a time for the Power Save setting, the instrument will turn off automatically if there is no user activity for the specified time. Check the settings.	11.2
The screen is dark.	The screen will appear dark when the LCD Brightness setting is set to "Power save." Check the settings.	11.2
	The LCD may be worn out. Servicing is required.	11.2
	If the instrument or its battery becomes hot, the LCD brightness is reduced automatically to prevent damage. Make sure that the temperature of the area where you are using the instrument is within the operating temperature range.	—[1]
The power turns off automatically while the instrument is in use.	The instrument 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 instrument back on. If the Auto Power OFF feature is enabled in Power Save mode, the instrument automatically turns off after a certain time elapses.	11.2 11.2[2]
The battery cannot be charged.	The battery may be too cold or too hot. Make sure that the temperature of the area where you are using the instrument is within the operating temperature range. Let the instrument sit for about an hour at room temperature.	—[1]
	The battery may be approaching the end of its service life. Contact your nearest YOKOGAWA dealer.	—
The power turns off automatically while the instrument is starting.	You may have accidentally pressed the power switch twice.	—
Touch panel operations do not work.	Touch operation is not possible with gloves. Touch the screen with bare hands.	—[1]

1 See the Getting Started Guide, IM AQ1210-02EN.
2 When it is likely that the usage limitations of the instrument will be exceeded, the instrument will display a warning message and turn off automatically to prevent damage. For the conditions under which such messages appear, see section 11.2.

11.2 Error Message Display

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 “Setting the Language and Date and Time” in the Getting Started Guide IM AQ1210-02EN). If the corrective action states that serving is required, contact your nearest YOKOGAWA dealer.

Error in Execution

Code	Message
18	Test succeeded.
19	Success
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.
35	The optical plug may not be connected securely.
38	Shutting down
39	This file cannot be supported by the firmware with this product. This firmware do not support some of new functions. Please update into the latest firmware.
45	The warm-up was ended.
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.
48	Self test executing. Please wait…
49	MENU : Close the Touch Screen window ENTER : Clear the display
51	Need the AC power supply to measure for a long time. Please connect the AC adapter.
52	Expiration function start success.
53	Expiration function release success.
70	The following option was installed. To activate the option, restart the AQ1210.
221	Setting conflict.
223	Data invalid
500	The measurement condition cannot be replicated. Please modify the measurement setup where ****** is shown.
501	Not executable during measurement. Please stop the measurement and execute again.
505	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
506	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
507	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
508	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
510	PLUG CHECK Error. Please check or clean the connector.
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
521	Operation is stopped outside of operating environmental condisions.
522	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
523	OFFSET_CALIBRATE_ERROR(AMP OFFSET3)
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.
529	OFFSET_CALIBRATE_ERROR(AMP OFFSET2)
560	When the event fix is ON, the distance reference setup cannot be performed.
563	Conditions of the macro bending do not match.
564	When the launch fiber is enable, the distance reference setup cannot be performed.
565	Judgement failure. The surface of fiber is too dirty.
566	Judgement failure. Too many scratches.

Code	Message
567	Judgement failure. The radius of fiber is too small.
568	Judgement failure. Unfocused.
602	Can not recognize file system. -Internal memory : Contact Yokogawa's representatives. -USB memory : Try the other media or format again with FAT
605	Same file name or folder name exists.
608	Invalid file name or folder name
612	Invalid path name
614	Unknown file or folder
620	Free space is not enough
623	Folder is not empty.
629	Writing to USB memory is not allowed.
636	Failed to delete the folder. The hierarchy below the specified folder is too deep.
641	Failed to copy the folder. The hierarchy below the specified folder is too deep.
645	The path name is too long.
646	USB memory can not be recognized
648	Can not make file or folder in this folder. (Max 550 files/folder)
649	Failed to copy the file or folder. Same path source and destination.
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.
708	Cannot be saved. This data is not taken with this instrument.
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 400km.
715	File cannot be retrieved. Sampling intervals exceed 64m.
716	File cannot be retrieved. Actual averaging times or duration is not set.
717	Duplicate file name.
718	File is damaged. Check the file.
719	File name too long. Maximum length is 60 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
732	ID No. is not selected in File Name. Please include ID No. in File Name if using direct save(Select ID).
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.
824	Power Supply Test Error occurred.
825	WLAN Test Error occurred.
854	In USB Storage mode, all keys are locked. Please disconnect the USB Cable.
902	Battery is low. Please power it off, and charge the battery or replace the battery. Or, please use the power supply.
903	Backup battery is low Please contact Yokogawa's representatives.

11.2 Error Message Display

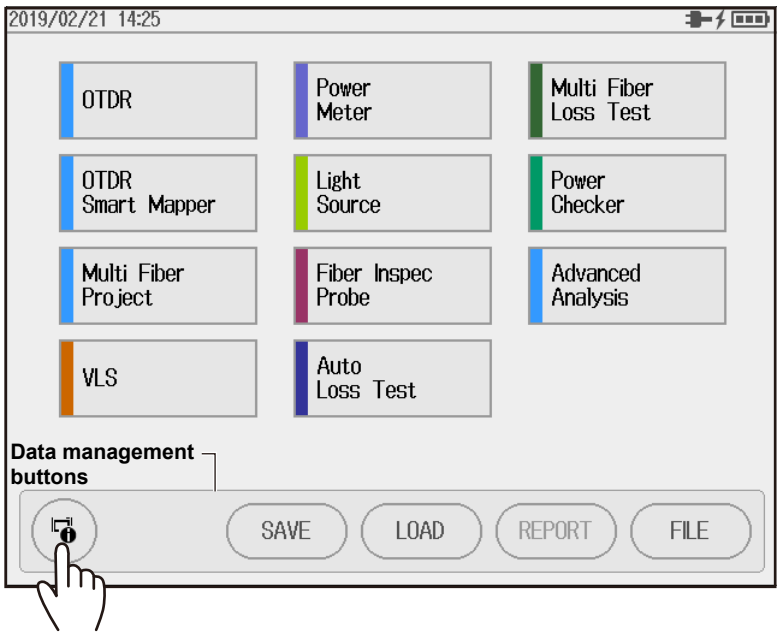
Code	Message
904	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
906	Battery is low. The instrument will be powered off in 10 sec.
909	The temperature inside the instrument is too high. The instrument may be damaged if used in this condition. The instrument will be powered off in 10 sec. Please turn off power to allow instrument to cool down.
919	Non-standard battery is connected. The instrument may be damaged if it is kept using in this condition. The instrument will be powered off in 10 sec. Please replace the battery.
922	Incorrect date and time setting. Set the correct date and time.
925	Please use AC adapter.
933	Setting conflict.
934	Communication not allowed during measurement
935	USB port over current error.
936	Invalid license key. Option was not installed.
937	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.
938	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.
939	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.
940	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.
941	The voltage of a module 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 the power adapter.
942	The voltage of a module 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 the power adapter.
943	The voltage of a module 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 the power adapter.
944	The voltage of a module 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 the power adapter.
945	The voltage of a module 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 the power adapter.
946	The voltage of a module 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 the power adapter.
947	Battery is low. The light source cannot be turned on.
948	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
949	Hardware failed, and needs to be repaired. Please contact Yokogawa's representatives.
950	Failed to control WLAN module.

11.3 Viewing the Product Information

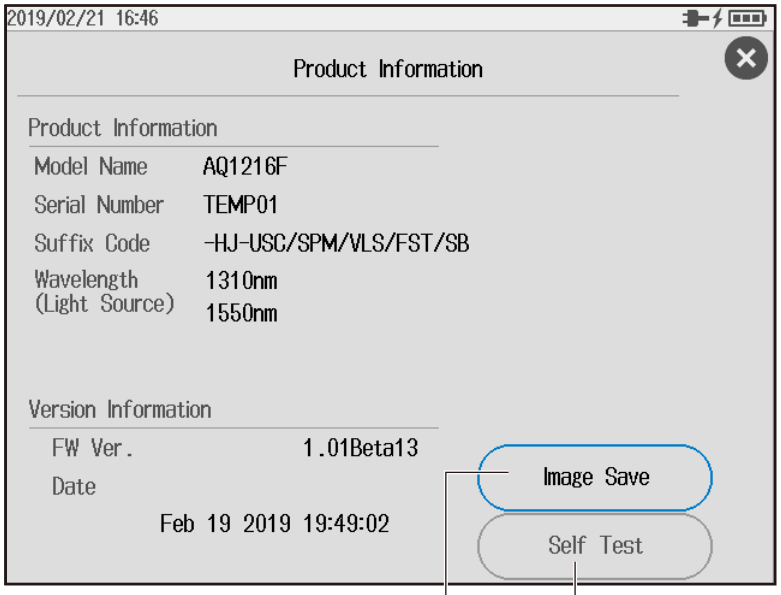
Procedure

1. Press **MENU** to display the MENU screen. The data management buttons appear.
2. Tap the  icon to display the product information screen.

MENU screen



Product Information Screen



Executes a self-test

Saves the hardware information screen as an image.
The image is saved to a BMP file.

Explanation

Instrument Information

The Product Information screen displays the information (model, serial number, suffix code) inscribed on the name plate affixed to the instrument, and measurement light wavelength.

Version Information

The firmware version and update date information are displayed.

Screen Capture

The screen image of the product information can be saved in internal memory.
Folder name: ProductInfo
File name: Systeminfo.BMP

Self-Test

The self-test checks the operation of the following items.

- Internal memory
- Battery 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.

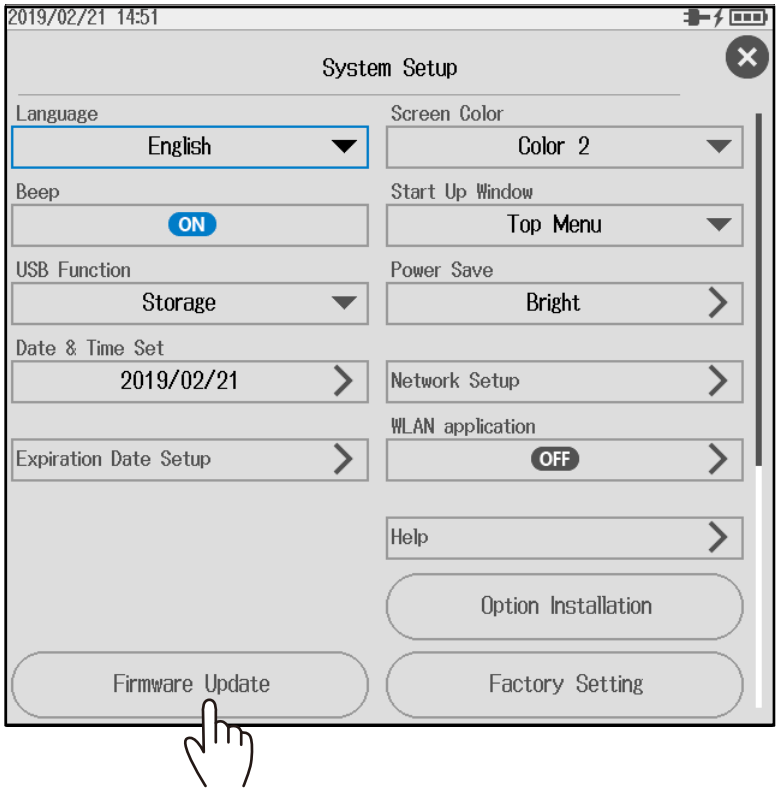
If an Error Occurs during a Self-Test

If an error occurs, contact your nearest YOKOGAWA dealer.

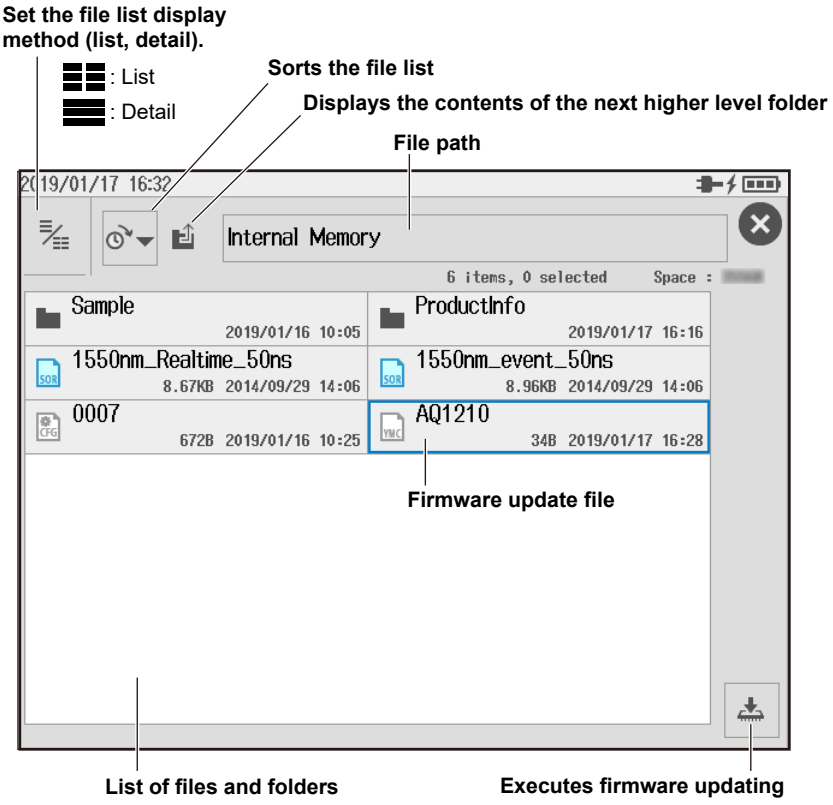
11.4 Updating the Firmware

Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.
   You can display the system setup screen by pressing the SETUP key on screens other than the MENU screen, such as those of the OTDR feature and power meter feature. Depending on the feature, you may need to tap the System tab after displaying the setup screen with the SETUP key. The settings are applied globally regardless of which screen system setup is executed from.
3. Tap **Firmware Update**. A file list screen for selecting the firmware file appears.



File List Screen for Selecting the Firmware File



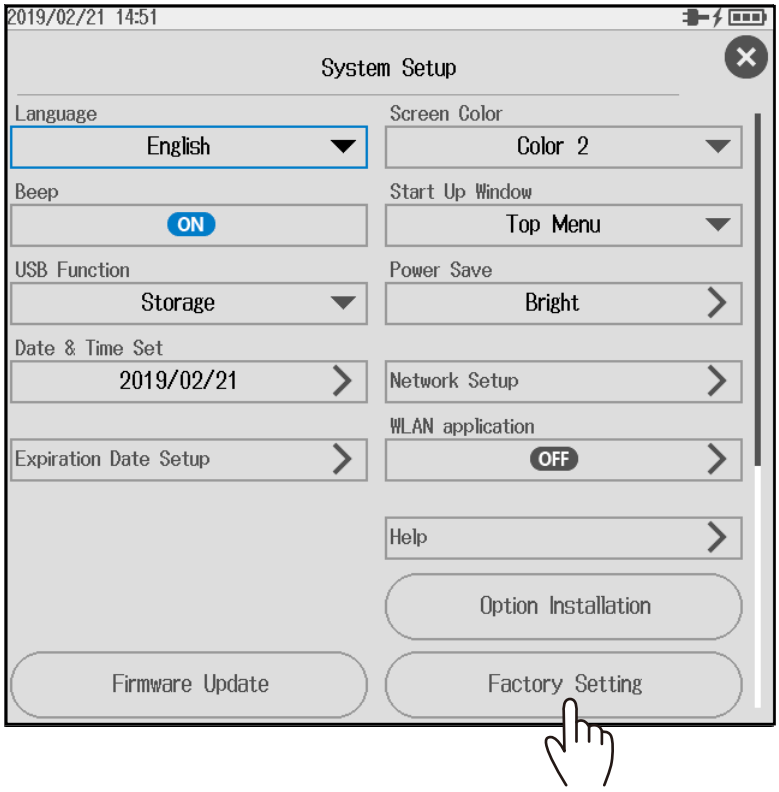
Explanation

- Firmware update files are YMC files (e.g., AQ1210.YMC).
- If necessary, you can change the file name, but on the extension. For details, see section 9.6.
- When updating the firmware, connect the USB-AC adapter to the instrument.
- When a firmware update completes successfully, the instrument 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 11.3.

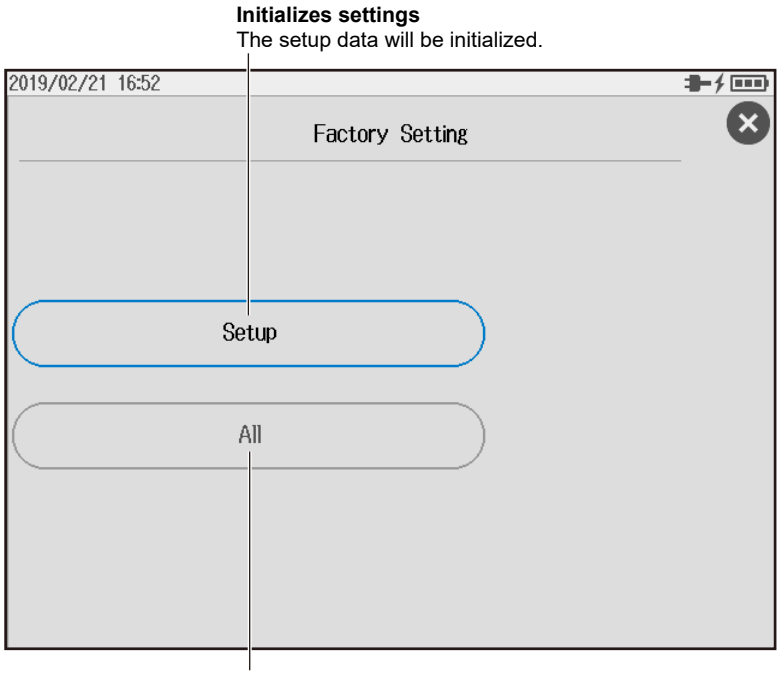
11.5 Factory Default Settings

Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.
   You can display the system setup screen by pressing the SETUP key on screens other than the MENU screen, such as those of the OTDR feature and power meter feature. Depending on the feature, you may need to tap the System tab after displaying the setup screen with the SETUP key. The settings are applied globally regardless of which screen system setup is executed from.
3. Tap **Factory Setting**. A Factory Setting screen appears.



Factory Settings Screen



Note

- The USERS_MANUAL folder in the USER folder and the PDF user's manuals in the USERS_MANUAL folder will not be deleted.
- The time setting will not be initialized.

Explanation

Setup

The setup data will be initialized. Data in the USER folder in the instrument internal memory will not be deleted.

All

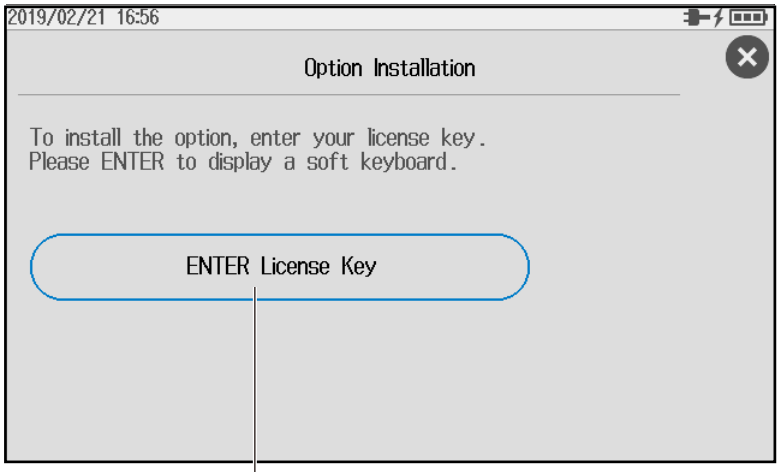
The setup data will be initialized. All data (except the user's manual) in the USER folder in the instrument internal memory will not be deleted.

11.6 Adding Options

Procedure

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the system setup screen.
   You can display the system setup screen by pressing the SETUP key on screens other than the MENU screen, such as those of the OTDR feature and power meter feature. Depending on the feature, you may need to tap the System tab after displaying the setup screen with the SETUP key. The settings are applied globally regardless of which screen system setup is executed from.
3. Tap **Option Installation** to display the Option Installation screen.

Option Installation Screen



Enter the license key.
Enter the license key by following the procedure provided in “Entering Text” in the Getting Started Guide, IM AQ1210-02EN.

For details, see the manual included with the additional option license you purchased.

11.7 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 instrument 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 instrument to operate abnormally.

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 instrument 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.

Mechanical Inspection

Make sure that:

- The exterior of the instrument 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 instrument on to start it. Check the following to verify that the instrument is running normally.

- The start screen appears after power-on.
- The screen can be switched using the control keys.
- Touch panel operations work.

11.8 Routine Maintenance

Cleaning the Outside of the Instrument

To clean the LCD or the outside of the instrument, turn the power off, and remove the USB-AC adapter from the instrument. 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

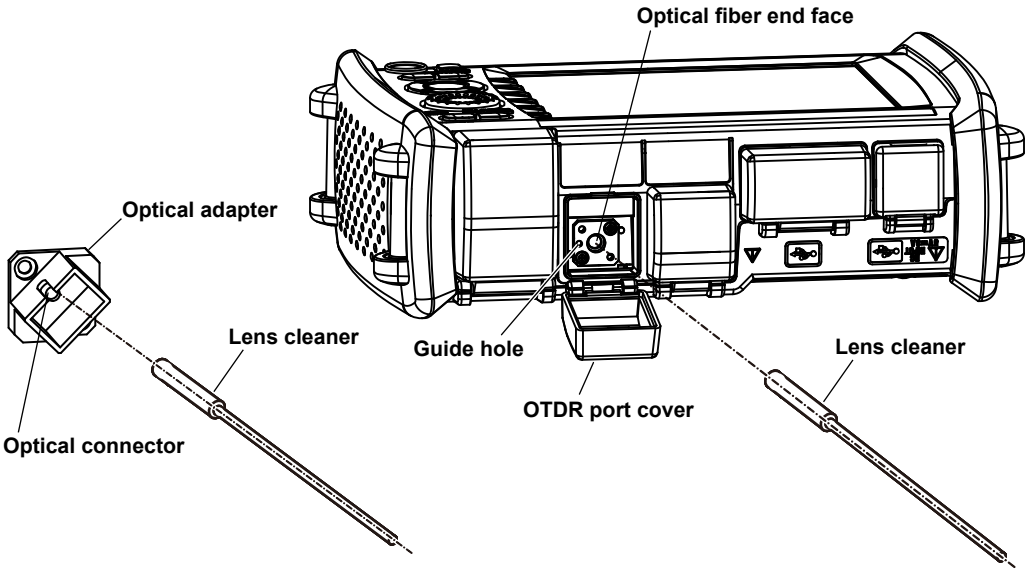
When cleaning the light emitter, turn off the instrument to prevent the light from accidentally being emitted from the light source port. Cleaning the light emitter with the instrument turned on may cause the emitted light to accidentally enter the eye. This can cause eye damage or vision impairment.

French

AVERTISSEMENT

Lors du nettoyage de l’émetteur de lumière, mettre instrument hors tension pour empêcher l’émission accidentelle de lumière provenant du port de la source lumineuse. Le nettoyage de l’émetteur de lumière avec instrument 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. Make sure that the instrument is turned off.
2. Open the cover of the OTDR port or light source port (option).
3. Remove the optical adapter.
   For instructions, see “Replacing the Optical Adapter” in the Getting Started Guide, IM AQ1210-02EN.
4. Use a lens cleaner to clean the optical fiber end face.
5. Insert the lens cleaner slowly into the optical adapter’s optical connector and turn the lens cleaner to clean the inner walls.



Note

- Use a lens cleaner that does not produce fuzz or residue to clean the optical components.
- The OTDR port or light source port can be cleaned with a stick type lens cleaner with the optical adapter attached, but we recommend that you remove the optical adapter to clean it.

11.9 Storage Precautions

Before Storage

Clean the instrument before storage. For details on cleaning, see section 11.8.

Storage Conditions

Store the instrument 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 instrument for one month or longer, charge the battery, and store the instrument away from direct sunlight in a location that has an ambient temperature of 10 to 30°C.

Reuse

When using the instrument after long-term storage, check its operation (see section 11.7).

Packing

Follow the procedure below to pack the instrument.

1. Wrap the instrument in a thick plastic sheet or the like to prevent dust from entering the inside of the instrument.
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 instrument.
4. Place cushioning material at the bottom of the box.
5. Place cushioning material in the gaps between the instrument and the box.
6. Seal the box securely with adhesive tape or the like.

Transportation

- When transporting the instrument, avoid vibration.
- Transport in an environment that meets the storage conditions.
- This instrument contains a battery pack (lithium-ion cell). For information on transporting the instrument by air, see the requirement for each packing instruction in the latest IATA Dangerous Goods Regulations. For details, contact your airline company in advance.

  Lithium battery packing instruction:
  - Transporting only the battery pack : UN3480 PI965 Section II
  - Transporting the battery pack and instrument (with the battery pack removed) : UN3481 PI966 Section II

Appendix 1 Using Open Source Software

Using Open Source Software

This product includes open source software.

For the open source software licenses, see TermsAndConditions_OpenSourceSoftware.pdf in the USER\DATA\USERS_MANUAL folder of this instrument.

For instructions on how to access the USERS_MANUAL folder in the internal memory of this instrument, see the “How to View the User’s Manual” in the Getting Started Guide, IM AQ1210-02EN.

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