User's Manual

AQ7933
OTDR Emulation Software

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ7933-01EN
6th Edition

Thank you for purchasing the AQ7933 OTDR Emulation Software.
This user's manual explains the handling precautions, features, and operating procedures of the software. To ensure correct use, please read this manual thoroughly before operation.
Keep this manual in a safe place for quick reference.

List of Manuals

The following manuals, including this one, are provided as manuals for the AQ7933 OTDR Emulation Software. Please read all manuals.

Manual Title	Manual No.	Description
AQ7933 OTDR Emulation Software User's Manual	IM AQ7933-01EN	This document. Explains how to configure and operate the software.
AQ7933 OTDR Emulation Software Installation Manual	IM AQ7933-02EN	Explains how to install and start the software.

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

- For the handling precautions, features, and operating procedures of the OTDR mainframe that this software supports and the handling and operating procedures of Windows, see the relevant manuals.

Notes

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

Trademarks

- Microsoft, Excel, Windows, Windows 10, and Windows 11 are registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe and Acrobat are either registered trademarks or trademarks of Adobe Systems Incorporated.
- In this manual, the ® and TM symbols do not accompany their respective registered trademark or trademark names.
- Other company and product names are trademarks or registered trademarks of their respective holders.

Revisions

1st Edition: April 2019
2nd Edition: February 2020
3rd Edition: October 2020
4th Edition: November 2021
5th Edition: September 2022
6th Edition: February 2023

6th Edition: February 2023 (YMI)

Terms and Conditions of the Software License

Yokogawa Test & Measurement Corporation, a Japanese corporation (hereinafter called “Yokogawa”), grants permission to use this Yokogawa Software Program (hereinafter called the “Licensed Software”) to the Licensee on the conditions that the Licensee agrees to the terms and conditions stipulated in Article 1 hereof.
You, as the Licensee (hereinafter called “Licensee”), shall agree to the following terms and conditions for the software license (hereinafter called the “Agreement”) based on the use intended for the Licensed Software.
Please note that Yokogawa grants the Licensee permission to use the Licensed Software under the terms and conditions herein and in no event shall Yokogawa intend to sell or transfer the Licensed Software to the Licensee.

Licensed Software Name: AQ7933 OTDR Emulation Software
Number of Client License: 1

Article 1 (Scope Covered by these Terms and Conditions)

1.1 The terms and conditions stipulated herein shall be applied to any Licensee who purchases the Licensed Software on the condition that the Licensee consents to agree to the terms and conditions stipulated herein.
1.2 The “Licensed Software” herein shall mean and include all applicable programs and documentation, without limitation, all proprietary technology, algorithms, and know-how such as a factor, invariant or process contained therein.

Article 2 (Grant of License)

2.1 Yokogawa grants the Licensee, for the purpose of single use, non-exclusive and non-transferable license of the Licensed Software with the license fee separately agreed upon by both parties. Yokogawa allows the Licensee to use only one instance of the software for use on one device, whether that device is physical or virtual. If the Licensee want to use the software on more than one virtual device, the Licensee must obtain a separate Licensed Software for each instance.
2.2 The Licensee is, unless otherwise agreed in writing by Yokogawa, not entitled to copy, change, sell, distribute, transfer, or sublicense the Licensed Software.
2.3 The Licensed Software shall not be copied in whole or in part except for keeping one (1) copy for back-up purposes. The Licensee shall secure or supervise the copy of the Licensed Software by the Licensee itself with great, strict, and due care.
2.4 In no event shall the Licensee dump, reverse assemble, reverse compile, or reverse engineer the Licensed Software so that the Licensee may translate the Licensed Software into other programs or change it into a man-readable form from the source code of the Licensed Software. Unless otherwise separately agreed by Yokogawa, Yokogawa shall not provide the Licensee the source code for the Licensed Software.
2.5 The Licensed Software and its related documentation shall be the proprietary property or trade secret of Yokogawa or a third party which grants Yokogawa the rights. In no event shall the Licensee be transferred, leased, sublicensed, or assigned any rights relating to the Licensed Software.
2.6 Yokogawa may use or add copy protection in or onto the Licensed Software. In no event shall the Licensee remove or attempt to remove such copy protection.
2.7 The Licensed Software may include a software program licensed for re-use by a third party (hereinafter called “Third Party Software”, which may include any software program from affiliates of Yokogawa made or coded by themselves.) In the case that Yokogawa is granted permission to sublicense to third parties by any licensors (sub-licensor) of the Third Party Software pursuant to different terms and conditions than those stipulated in this Agreement, the Licensee shall observe such terms and conditions of which Yokogawa notifies the Licensee in writing separately.
2.8 Yokogawa software products may contain open source software (hereafter referred to as OSS). For the OSS, terms and conditions provided separately apply with higher precedence than those of this agreement.

Article 3 (Restriction of Specific Use)

3.1 The Licensed Software shall not be intended specifically to be designed, developed, constructed, manufactured, distributed or maintained for the purpose of the following events:
  a) Operation of any aviation, vessel, or support of those operations from the ground;,
  b) Operation of nuclear products and/or facilities;,
  c) Operation of nuclear weapons and/or chemical weapons and/or biological weapons; or
  d) Operation of medical instrumentation directly utilized for humankind or the human body.
3.2 Even if the Licensee uses the Licensed Software for the purposes in the preceding Paragraph 3.1, Yokogawa has no liability to or responsibility for any demand or damage arising out of the use or operations of the Licensed Software, and the Licensee agrees, on its own responsibility, to solve and settle the claims and damages and to defend, indemnify or hold Yokogawa totally harmless, from or against any liabilities, losses, damages and expenses (including fees for recalling the Products and reasonable attorney’s fees and court costs), or claims arising out of and related to the above-said claims and damages.

Article 4 (Warranty)

4.1 The Licensee shall agree that the Licensed Software shall be provided to the Licensee on an “as is” basis when delivered. If defect(s), such as damage to the medium of the Licensed Software, attributable to Yokogawa is found, Yokogawa agrees to replace, free of charge, any Licensed Software on condition that the defective Licensed Software shall be returned to Yokogawa’s specified authorized service facility within seven (7) days after opening the Package at the Licensee’s expense. As the Licensed Software is provided to the Licensee on an “as is” basis when delivered, in no event shall Yokogawa warrant that any information on or in the Licensed Software, including without limitation, data on computer programs and program listings, be completely accurate, correct, reliable, or the most updated.
4.2 Notwithstanding the preceding Paragraph 4.1, when third party software is included in the Licensed Software, the warranty period and terms and conditions that apply shall be those established by the provider of the third party software.
4.3 When Yokogawa decides in its own judgement that it is necessary, Yokogawa may from time to time provide the Licensee with Revision upgrades and Version upgrades separately specified by Yokogawa (hereinafter called “Updates”).
4.4 Notwithstanding the preceding Paragraph 4.3, in no event shall Yokogawa provide Updates where the Licensee or any third party conducted renovation or improvement of the Licensed Software.
4.5 THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF QUALITY AND PERFORMANCE, WRITTEN, ORAL, OR IMPLIED, AND ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED BY YOKOGAWA AND ALL THIRD PARTIES LICENSING THIRD PARTY SOFTWARE TO YOKOGAWA.
4.6 Correction of nonconformity in the manner and for the period of time provided above shall be the Licensee’s sole and exclusive remedy for any failure of Yokogawa to comply with its obligations and shall constitute fulfillment of all liabilities of Yokogawa and any third party licensing the Third Party Software to Yokogawa (including any liability for direct, indirect, special, incidental or consequential damages) whether in warranty, contract, tort (including negligence but excluding willful conduct or gross negligence by Yokogawa) or otherwise with respect to or arising out of the use of the Licensed Software.

Article 5 (Infringement)

5.1 If and when any third party should demand injunction, initiate a law suit, or demand compensation for damages against the Licensee under patent right (including utility model right, design patent, and trade mark), copy right, and any other rights relating to any of the Licensed Software, the Licensee shall notify Yokogawa in writing to that effect without delay.
5.2 In the case of the preceding Paragraph 5.1, the Licensee shall assign to Yokogawa all of the rights to defend the Licensee and to negotiate with the claiming party. Furthermore, the Licensee shall provide Yokogawa with necessary information or any other assistance for Yokogawa’s defense and negotiation. If and when such a claim should be attributable to Yokogawa, subject to the written notice to Yokogawa stated in the preceding Paragraph 5.1, Yokogawa shall defend the Licensee and negotiate with the claiming party at Yokogawa’s cost and expense and be responsible for the final settlement or judgment granted to the claiming party in the preceding Paragraph 5.1.
5.3 When any assertion or allegation of the infringement of the third party’s rights defined in Paragraph 5.1 is made, or when at Yokogawa’s judgment there is possibility of such assertion or allegation, Yokogawa will, at its own discretion, take any of the following countermeasures at Yokogawa’s cost and expense.
  a) To acquire the necessary right from a third party which has lawful ownership of the right so that the Licensee will be able to continue to use the Licensed Software;
  b) To replace the Licensed Software with an alternative one which avoids the infringement; or
  c) To remodel the Licensed Software so that the Licensed Software can avoid the infringement of such third party’s right.
5.4 If and when Yokogawa fails to take either of the countermeasures as set forth in the preceding subparagraphs of Paragraph 5.3, Yokogawa shall indemnify the Licensee only by paying back the price amount of the Licensed Software which Yokogawa has received from the Licensee. THE FOREGOING PARAGRAPHS STATE THE ENTIRE LIABILITY OF YOKOGAWA AND ANY THIRD PARTY LICENSING THIRD PARTY SOFTWARE TO YOKOGAWA WITH RESPECT TO INFRINGEMENT OF THE INTELLECTUAL PROPERTY RIGHTS INCLUDING BUT NOT LIMITED TO, PATENT AND COPYRIGHT.
5.5 Regardless of this article, the terms and conditions provided separately apply to demands for compensation or the like arising from the use of the Third-Party Software or OSS.

Article 6 (Liabilities)

6.1 If and when the Licensee should incur any damage relating to or arising out of the Licensed Software or service that Yokogawa has provided to the Licensee under the conditions herein due to a reason attributable to Yokogawa, Yokogawa shall take actions in accordance with this Agreement. However, in no event shall Yokogawa be liable or responsible for any special, incidental, consequential and/or indirect damage, whether in contract, warranty, tort, negligence, strict liability, or otherwise, including, without limitation, loss of operational profit or revenue, loss of use of the Licensed Software, or any associated products or equipment, cost of capital, loss or cost of interruption of the Licensee's business, substitute equipment, facilities or services, downtime costs, delays, and loss of business information, or claims of customers of Licensee or other third parties for such or other damages. Even if Yokogawa is liable or responsible for the damages attributable to Yokogawa and to the extent of this Article 6, Yokogawa's liability for the Licensee's damage shall not exceed the price amount of the Licensed Software or service fee which Yokogawa has received. Please note that Yokogawa shall be released or discharged from part or all of the liability under this Agreement if the Licensee modifies, remodels, combines with other software or products, or causes any deviation from the basic specifications or functional specifications, without Yokogawa's prior written consent.

6.2 All causes of action against Yokogawa arising out of or relating to this Agreement or the performance or breach hereof shall expire unless Yokogawa is notified of the claim within one (1) year of its occurrence.

6.3 In no event, regardless of cause, shall Yokogawa assume responsibility for or be liable for penalties or penalty clauses in any contracts between the Licensee and its customers.

Article 7 (Limit of Export)

Unless otherwise agreed by Yokogawa, the Licensee shall not directly or indirectly export or transfer the Licensed Software to any countries other than those where Yokogawa permits export in advance.

Article 8 (Term)

This Agreement shall become effective on the date when the Licensee receives the Licensed Software and continues in effect unless or until terminated as provided herein, or the Licensee ceases using the Licensed Software by itself or with Yokogawa's thirty (30) days prior written notice to the Licensee.

Article 9 (Injunction for Use)

During the term of this Agreement, Yokogawa may, at its own discretion, demand injunction against the Licensee in case that Yokogawa deems that the Licensed Software is used improperly or under severer environments other than those where Yokogawa has first approved, or any other condition which Yokogawa may not permit.

Article 10 (Termination)

Yokogawa, at its sole discretion, may terminate this Agreement without any notice or reminder to the Licensee if the Licensee violates or fails to perform this Agreement. However, Articles 5, 6, and 11 shall survive even after the termination.

Article 11 (Jurisdiction)

Any dispute, controversies, or differences between the parties hereto as to interpretation or execution of this Agreement shall be resolved amicably through negotiation between the parties upon the basis of mutual trust. Should the parties fail to agree within ninety (90) days after notice from one of the parties to the other, both parties hereby irrevocably submit to the exclusive jurisdiction of the Tokyo District Court (main office) in Japan for settlement of the dispute.

Article 12 (Governing Law)

This Agreement shall be governed by and construed in accordance with the laws of Japan. The Licensee expressly agrees to waive absolutely and irrevocably and to the fullest extent permissible under applicable law any rights against the laws of Japan which it may have pursuant to the Licensee's local law.

Article 13 (Severability)

In the event that any provision hereof is declared or found to be illegal by any court or tribunal of competent jurisdiction, such provision shall be null and void with respect to the jurisdiction of that court or tribunal and all the remaining provisions hereof shall remain in full force and effect.

Article 14 (Change in Agreement)

The contents of this contract, contents of this product, specifications of the licensed software, related support and other related services can be changed at Yokogawa's discretion.

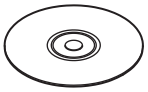
Checking the Contents of the Package

After receiving the product and opening the package, check the items described below. If the wrong items have been delivered or if items are missing, contact your nearest YOKOGAWA dealer.

Product Information
(PI AQ7933-01)
1 sheet

Inquiries
(PIM 113-01Z2)
1 sheet

CD
(Suffix code: -SC01 model (with CD))
1 disc



* If you purchase the standard version with CD, a CD containing the software and the manual (see the table below) is included.

Product Information

The following items are indicated. Please keep this sheet in a safe place.

- **Model name and suffix code of the software**
- **Serial number**
- **License key**
  You need to enter the license key before starting the software.
- **Download page URL**
  You can download the zip file containing the software and manual (the following table) from this URL.

Model	Suffix Code	Description
AQ7933		AQ7933 OTDR Emulation Software
Grade, licenses	-SP01	Standard version, 1 license
	-SC01	Standard version with CD, 1 license

Manuals

The following user's manuals are contained in the zip file downloaded from the above URL. If the suffix code is-SC01, they are provided in the included CD.

Manual Title	Manual No.
AQ7933 OTDR Emulation Software User's Manual	IM AQ7933-01EN
AQ7933 OTDR Emulation Software Installation Manual	IM AQ7933-02EN

To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

PC System Requirements and Compatible Models

PC System Requirements

PC		
	Clock speed:	Speed at which the operating system can run smoothly
	Storage:	Free space of at least 10 GB
	Memory size:	At least 4 GB (at least 8 GB recommended) * Continuous output and continuous printing of reports may require large amounts of memory. If there is not enough memory, the software may not run properly.
	Display:	Resolution: 1600×900 or higher
	Disk drive:	CD-ROM drive (if you purchased the standard version with CD)
Operating System		Windows 10, Windows 11

Supported models

Model*	Model Name	Firmware Version
AQ7270 series		
AQ7270	735020, 735021, 735022, 735023, 735024, 735025, 735026, 735027, 735028, 735029, 735030	2.03 and later
AQ7275	735031, 735032, 735033, 735034, 735035, 735036, 735037, 735038, 735040, 735041	R3.08 and later
AQ7277 series		
AQ7277	AQ7277, AQ7277B	R1.01 and later
AQ7280 series		
AQ7280	AQ7282A, AQ7283A, AQ7284A, AQ7285A, AQ7283E, AQ7283F, AQ7282G, AQ7283H, AQ7284H, AQ7283J, AQ7283K, AQ7282M, AQ7286A, AQ7286H, AQ7286J	R3.02 and late
AQ1000		
AQ1000	AQ1000	R1.04 and later
AQ1200 series		
AQ1200	AQ1200A, AQ1200B, AQ1200C, AQ1200E, AQ1205A, AQ1205E, AQ1205F	R3.03 and later
AQ1210 series		
AQ1210	AQ1210A, AQ1215A, AQ1210D, AQ1210E, AQ1215E, AQ1215F, AQ1216F	R1.08 and later

* Hereafter in this manual, the names in the Model column in the above table are used to refer to the types of models appearing in the explanations.

Conventions Used in This Manual

Notes

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

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.

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

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 to 4.

Character Notations

Operation Menu, Tab, in Button Names in Bold Characters
Indicates controls such as operation menus, tabs, and buttons.

Prefixes k and K

Prefixes k and K used before units are distinguished as follows:

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

WARNING

Standard Version with CD

Never play the included CD in an audio CD player. Doing so may cause loss of hearing or speaker damage due to the large sounds that may be produced.

Contents

List of Manuals i
Checking the Contents of the Package iv
PC System Requirements and Compatible Models v
Conventions Used in This Manual vi

Chapter 1 Overview
1.1 Product Overview 1-1
1.2 Functions of the Parts of the Display Window 1-11

Chapter 2 Basic Operation
2.1 Starting and Exiting the Software 2-1
2.2 Basic Operation of the Main Window 2-3
2.3 Setting the Language, Distance Decimal, and dB Decimal Settings 2-4
2.4 Changing the Color Scheme of the Waveform Area 2-5

Chapter 3 File Operation
3.1 Loading Files 3-1
3.2 Managing the File List 3-4
3.3 Saving Files 3-11
3.4 Exporting Files 3-13

Chapter 4 Waveform Analysis (normal analysis)
4.1 Displaying Waveforms 4-1
4.2 Performing Analysis Using Markers 4-8
4.3 Analyzing Events 4-18
4.4 Batch Processing 4-36
4.5 Multi Trace Processing 4-40

Chapter 5 2way Analysis (Two Way)
5.1 Loading Files 5-1
5.2 Editing the Forward-Direction and Reverse-Direction File Lists 5-4
5.3 Displaying Waveforms 5-7
5.4 Combining and Analyzing Two Waveforms 5-9

Chapter 6 SMP File Analysis
6.1 Displaying the Composite Waveform of SMP Files 6-1
6.2 SMP File Analysis 6-3

Chapter 7 Creating Reports
7.1 Overview of Creating Reports 7-1
7.2 Creating a Report Layout 7-3
7.3 Editing the Report Layout 7-8
7.4 Editing the Content of the Report 7-11
7.5 Exporting Reports 7-20

Chapter 8 Multi-Fiber Project Editor

8.1 Overview of the Multi-Fiber Project Editor 8-1
8.2 Creating a New Project 8-6
8.3 Loading a Project File 8-15

Chapter 9 Other Features

9.1 Decompressing an MPZ File 9-1
9.2 Collectively Editing the Fiber ID, File Name, and Waveform Information 9-2
9.3 Displaying the Trace Table 9-4
9.4 Configuring Analysis Settings 9-6
9.5 Viewing the Version Information and License Information 9-9
9.6 Using YOKOGAWA Applications 9-10

Chapter 10 Troubleshooting

10.1 Troubleshooting 10-1
10.2 View help 10-2

Index

1.1 Product Overview

This software application is used to display and analyze the waveform data measured on a YOKOGAWA OTDR* and create and output reports of analysis results on a personal computer (PC).

* Optical pulse measurement: Optical Time Domain Reflectometer

The Multi-Fiber Project Editor can create project files to be loaded and used in the multi-fiber measurement feature of the OTDR. A project file contains multi-fiber information and other measurement conditions.

Main Features

Feature				Description
Analysis (emulation)				
	Analysis	File load*		File type: SOR, SOZ, MPZ, MPJ, SMP
		File save		File type: SOR, SMP
		File export		File type: CSV, TXT, BMP
		Multi trace processing		Target: All loaded SOR files
			Master event setting	Sets events at once
			Auto search	Detects events at once
			Trace information	Sets trace Information at once
			Loop analysis	Loopback analysis and analysis result export (file type: CSV)
		SOR file analysis		
			Waveform display	Up to 24 waveforms, multi-trace display
			Analysis method	One way analysis (normal analysis), two-way analysis (2way Analysis)
			Marker analysis	Loss and distance between two points, splice loss, return loss, section analysis
			Event analysis	Event editing, AutoSearch, Batch Processing, Pass Fail Judgment
		SMP file analysis		
			Waveform display	Up to 10 waveforms, multi-trace display
			Composite waveform editing	Pass Fail judgment
	Report creation		Layout selection	Seven types of templates
			Layout editing	Set and edit displayed items
			Preview window	Set and edit displayed content
			Report output	Printing, PDF file, Excel file
Multi-Fiber Project Editor				
			New, load, save	File type: MPJ
			Set/edit	Analysis Setup, Other Setup, Group Settings
Utility				MPZ Converter, Fiber ID editing tool, Trace Table
OTDR Apps				Yokogawa OTDR Remote Controller, File Transfer

* When an SOZ or MPZ file is loaded, the SOR files contained within are loaded. When an MPJ file is loaded, the associated SOR files are loaded.

File Types Saved on the OTDR

Series Name/Model Name	File Type					
	SOR	SOZ	SMP	BMP	MPJ	MPZ
AQ7270 series						
AQ7270						
735020, 735021, 735022, 735023, 735024, 735025, 735026, 735027, 735028, 735029, 735030	Y	–	–	Y	Y	Y
AQ7275						
735031, 735032, 735033, 735034, 735035, 735036, 735037, 735038, 735040, 735041	Y	–	–	Y	Y	Y
AQ7277 series						
AQ7277, AQ7277B	Y	–	–	Y	–	–
AQ7280 series						
AQ7282A, AQ7283A, AQ7284A, AQ7285A, AQ7283E, AQ7283F, AQ7282G, AQ7283H, AQ7284H, AQ7283J, AQ7283K, AQ7282M, AQ7286A, AQ7286H, AQ7286J	Y	–	Y	Y	Y	Y
AQ1000 series						
AQ1000	Y	Y	–	–	–	–
AQ1200 series						
AQ1200A, AQ1200B, AQ1200C, AQ1200E, AQ1205A, AQ1205E, AQ1205F	Y	–	–	Y	Y	Y
AQ1210 series						
AQ1210A, AQ1215A, AQ1210D, AQ1210E, AQ1215E, AQ1215F, AQ1216F	Y	Y	Y	Y	Y	Y

About the File Types

SOR: A file for saving waveform data (including measurement conditions) of real-time measurements and averaged measurements performed on the OTDR.

SOZ: An SOZ file containing waveform data (including the measurement conditions) for two wavelengths measured with the multi wavelength measurement function of the OTDR.

SMP: A file for saving adapt trace data (including measurement conditions) of averaged measurements performed using the OTDR Smart Mapper.

BMP: A file for saving screen image data of the fiber inspection probe feature.

MPJ: A project file containing items for measuring and analyzing multi-core optical fiber cables on the OTDR.

MPZ: A file containing compressed SOR, MPJ, and BMP files. It is used as a storage file. For the decompression procedure, see section 9.1.

Analysis Feature

File Operation

Loading and Saving Files

You can load SOR or SMP files and save the results of editing events and markers to files. An SOZ or MPZ file containing multiple SOR files can also be loaded directly.

Up to 1000 SOR files and 10 SMP files can be loaded.

Exporting Files

Loaded files can be exported in the following file types.

- CSV (current waveform's data or event list)
- TXT (list of measured results)
- BMP (image file)

It is also possible to export all files at once (BMP, CSV).

Waveform Display

Loaded files are displayed as waveforms in a window.

- You can show and hide waveforms. You can show multiple waveforms simultaneously and compare them.

  Up to 24 waveforms can be displayed simultaneously in the case of SOR files and 10 waveforms in the case of SMP files.
- Displayed waveforms can be zoomed and moved.

Multi Trace Processing

Master Event Setting

This feature assigns events to all loaded waveform data at once.
Common events can be calculated based on specified generation conditions and event search conditions from an event list of each waveform that has been automatically searched or an event list in each file, and events can be set at the same positions of all target waveforms. You can also load a waveform file as a reference (master) and apply event positions to multiple waveforms.

Auto Search

This feature detects events for all loaded waveform data at once.

Trace Information

This feature assigns trace information to all loaded waveform data at once.

Loop Analysis

This feature loads waveform data to be analyzed for the A->B and B->A directions and performs loopback analysis. You can export the analysis results in CSV format.

Normal Analysis (One Way)

Marker Analysis

You can place markers on waveforms and analyze the following measurement values.

- Distance, splice loss, return loss, return loss between markers (section analysis)

Event Analysis

Event analysis information (connections, splices, etc.) of loaded SOR files are displayed.
The splice loss or return loss is displayed for each event. If events cannot be detected or if noise is detected as events, you can use the event edit feature to change the threshold for detecting various values to make adjustments to events.

Auto Search

If event analysis information is not available in an SOR file measured on an OTDR, you can set analysis conditions on the software and execute an auto search.

Setting and Changing Analysis Conditions

- Analysis conditions
  You can change the backscatter level and IOR.
- Pass fail conditions
  This feature checks whether measured values are within the threshold that you set for each event for the analysis results of the current waveform. The checked results are judged as pass or fail, and the results can be displayed.
- Launch fiber setting
  When you set launch fiber cable events (start point and end point) or a start position to avoid near-end dead zones, the event information in the launch fiber section can be excluded from the analysis conditions.

Batch Processing

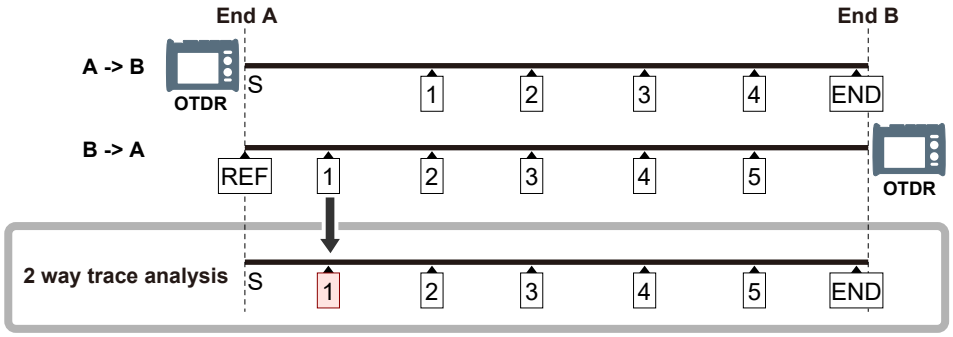
This feature assigns the following settings collectively to multiple waveforms.

- Event, marker, event search conditions, event analysis conditions, pass fail conditions, print range
- Labels

2way Analysis (Two Way)

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.
You can save the analysis results in CSV format.

In the figure below, the event that is in the dead zone of the near-end reflection point (point S) when measured from end A is detected as event number 1 when measured from end B. It is shown in the 2 way trace analysis display.



SMP File Analysis

When files in SMP format saved on an OTDR with the Smart Mapper feature is loaded, a composite waveform is displayed. You can edit the composite waveform by moving the line (division line) indicating the combined target waveform section of each pulse width.
The smart mapper function repeats optical pulse measurements on the same wavelength using different pulse widths to combine waveforms in order to compensate for measurement accuracy degradation.

* The number of measurements and pulse widths vary depending on the OTDR model and the distance range and wavelength set at the time of measurement.

Report Feature

You can export the loaded waveform's optical pulse measurement and analysis conditions, waveforms, and events as a report on a single sheet. You can choose which items to include in the report.

Layout Selection

You can create a layout from the seven available templates (Blank Layout, 1 Trace, 2 Trace, 4 Trace, 6 Trace, 8 Trace, Total Table, Summary Table) and save it. Layouts that you saved can be selected from a list.

Layout Editing

You can create an original layout by combining the following parts.

- Job Information
- Link Summary
- Event Map (Large/Small)
- Summary Table
- Trace (Large/Small)
- Fiber Surface Image
- Event List (Large/Small)
- Measure Conditions
- Event Search Conditions
- Total Table

Previewing Reports

On an overview screen, you can view and edit the content that will actually be exported as a report.
The layout set on the layout edit screen will be applied.
If the report spans multiple pages, you can scroll the pages to preview the subsequent pages.

Editing the Exported Content

You can set the details of each part exported to reports.

Part Name	Settings	
Report Settings	Logo	File path, whether to enlarge the logo
	Report Title	Up to 16 characters
	Print Direction	Vertical, Horizontal
Job Information	Number of Columns	1 to 3
	Use File Information	Enable/Disable
	Displayed items	File Name, Label, Company Name, Name, Cable ID, Cable Code, Fiber ID, Fiber Type, Location (A), Location (B), Direction, Current Data Flag, Model Name, Firmware Version
	Comments	Show/Hide When showing the comments, each entry (up to six) can be shown or hidden.
	Title	Up to 15 characters
	Comment	Up to 256 characters
	Reporting Date	The reporting date is included in the label information.
Trace	Show the event markers	Show/Hide
	Show the markers	Show/Hide
	Show the overview	Show/Hide
	Show trace header	Show/Hide
	Displayed items	When showing the trace header, select three of the following items to show. No Item., File Name, Core No./Fiber ID, Total Loss, Total Return Loss, Total Distance, Direction, Label, Measured Date.
	Use short header title	ON/OFF
Measure Conditions	—	Wavelength, Pulse Width, Distance Range, IOR, Attenuation, Average Method & Value
Link Summary	Measured Date	Show/Hide
	Show fiber surface image	File path
	Show marker information	Show/Hide If shown, the following information can be shown or hidden.
	Show M1, M2 marker distance	Show/Hide
	Show marker 2-3	Show/Hide
Fiber Surface Image	Fiber Surface Image loading settings	File path
Event Search Conditions	Show the Pass Fail Conditions	Show/Hide
Event Map	—	—
Event List	Displayed items	Total Distance, Section Distance, Splice Loss, Return Loss, Reflection level, Reflectance, Cumul-Loss, dB/distance, Event Type, IOR, Comment
Total Table	Number of Display Fibers	All files or Combine with others
	Displayed items	Splice Loss, Return Loss
Summary Table	Number of Display Fibers	All files, Combine with others, or For Each Wavelength
	Displayed items	Judgement, Direction, Wavelength, Total Loss, Total Distance, Number of Events, Connector Loss (Max), Splice Loss (Max), Return Loss (Max), Total Return Loss, Label
	Use Summary Total Table	Show/Hide
	Displayed items	Total Loss, Total Return Loss, Splice Loss, Connector Loss, Return Loss, dB/km

Report Output

The reports that you create can be printed or exported to PDF or Excel files.

Multi-Fiber Project Editor

This is a feature for creating, on a PC, MPJ files (project files) used by the OTDR multi-fiber measurement feature.

- Create a new project file
  You can set measurement conditions, analysis conditions, information about the core to be measured, trace information, and so on.
- Edit a project file
  You can also load a previously saved MPJ file and edit the conditions.
- Set groups
  It is useful when it is necessary to distinguish fibers by route or measurement conditions.
  This function is not available in OTDR.

Other Features

Utility Menu

MPZ Converter

This feature can decompress a measurement result file (MPZ file) of a multi-fiber project saved on an OTDR into an MPJ file, several SOR files, and the like.

Fiber ID Editing Tool

You can run a tool that collectively sets the fiber ID, file name, and waveform information.

Traces Table

The measurement results of each core are shown in a list.

OTDR Apps Menu

You can run the following YOKOGAWA applications from the software menu.

- Yokogawa OTDR Remote Controller
- File Transfer

Setting Menu

Common

- Set the display language (English, Japanese, Korean, Polish, German, Simplified Chinese, Traditional Chinese, Indonesian, Russian, French)
- Set the number of distance decimal places
- Set the number of dB decimal places

Analysis

- Analysis settings (total loss setting, cumulate loss type)
- Display items settings of event lists
- Display settings (Use the Cross cursor(+), Indicate End point's loss, Make the decimal point comma[,], Include the End point in the Return Loss(Max) of the summary table)

Color

You can change the colors of the following objects in the waveform area.

- Waveforms (traces)
- Background and grid
- Other items (cursors, cursor measurement values, etc.)

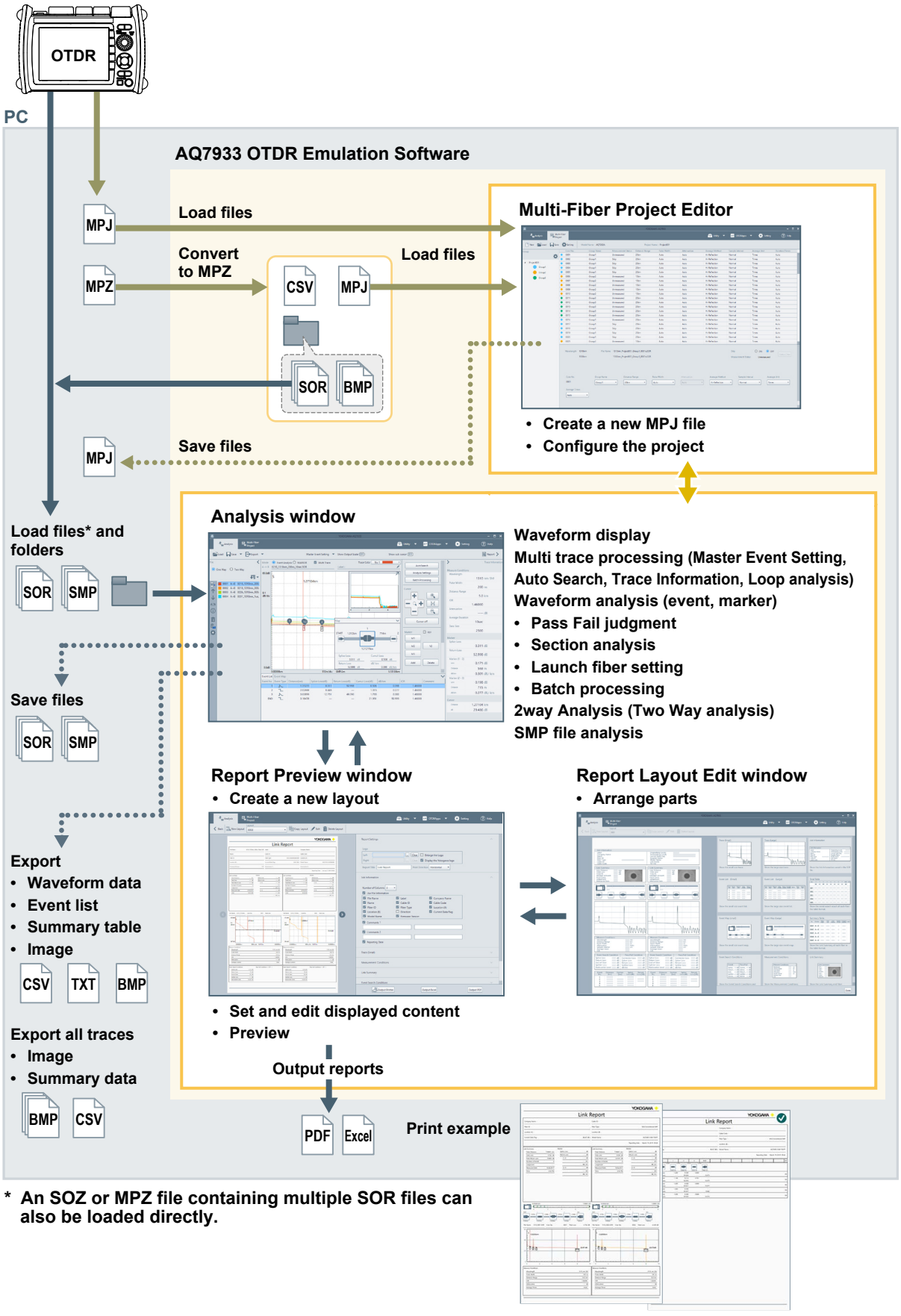
License

- View the version information
- View license information

Help

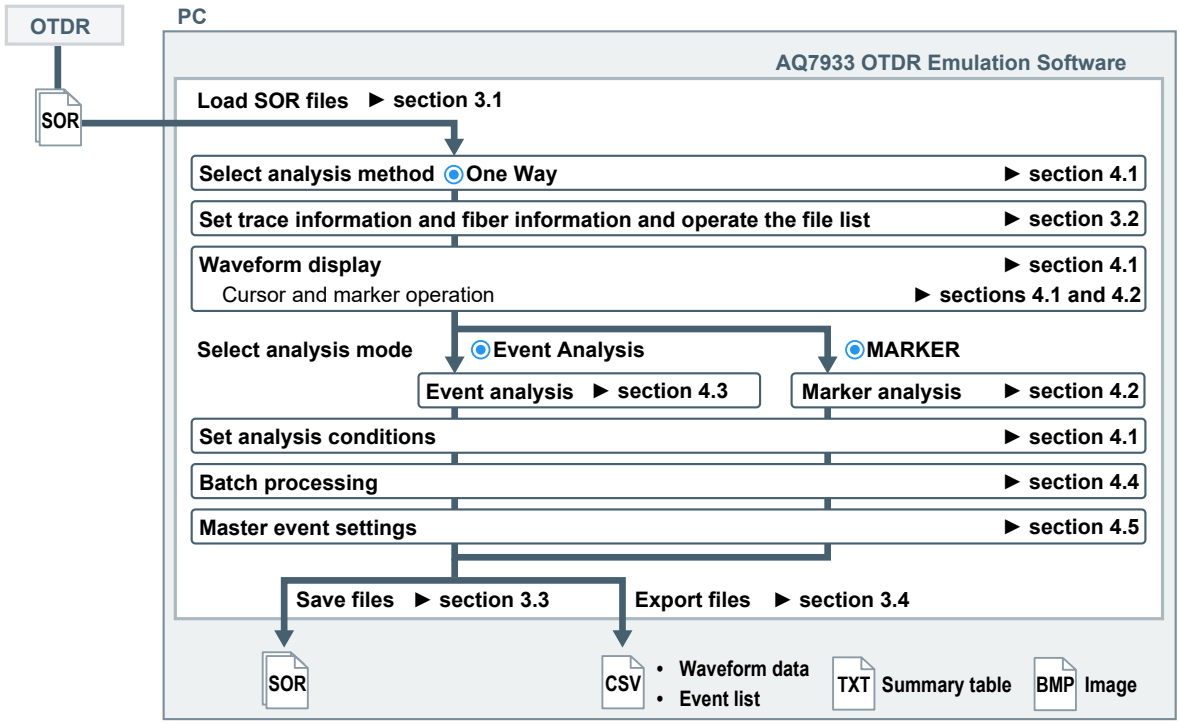
You can open the PDF of the user's manual (this manual) from the help menu.

Workflow

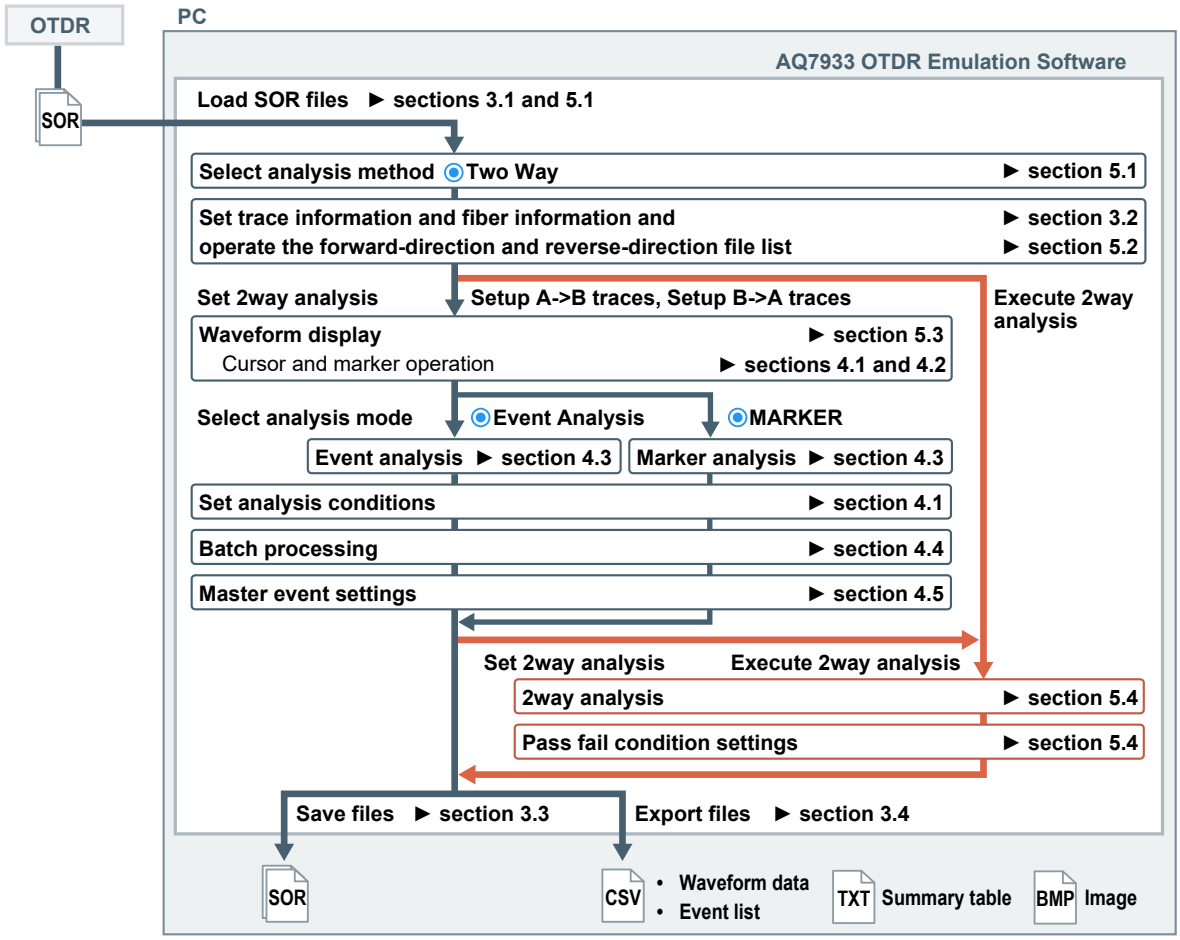


* An SOZ or MPZ file containing multiple SOR files can also be loaded directly.

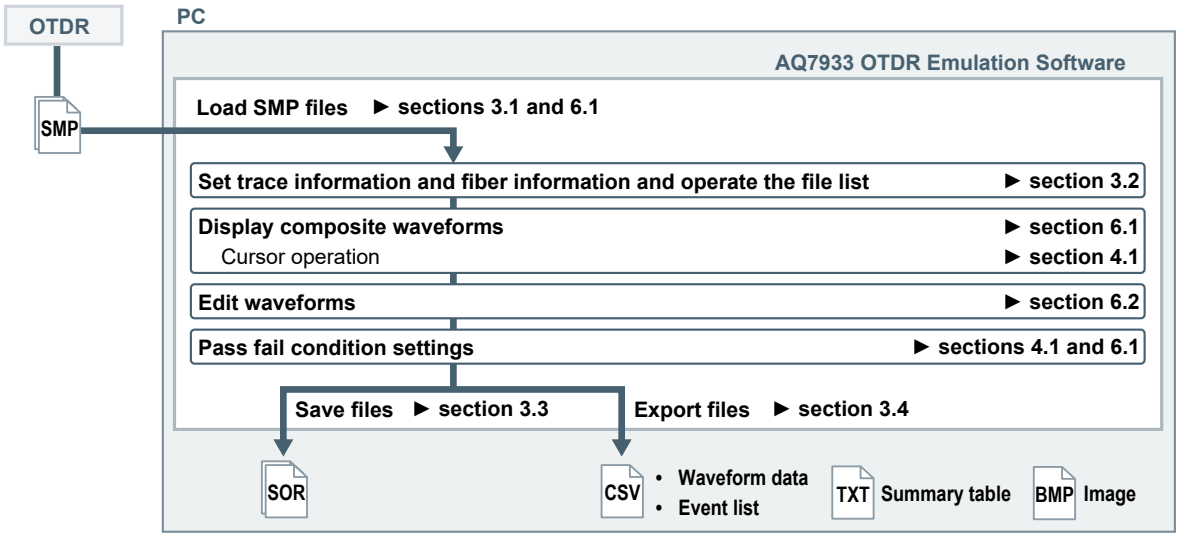
Normal (One Way) Analysis



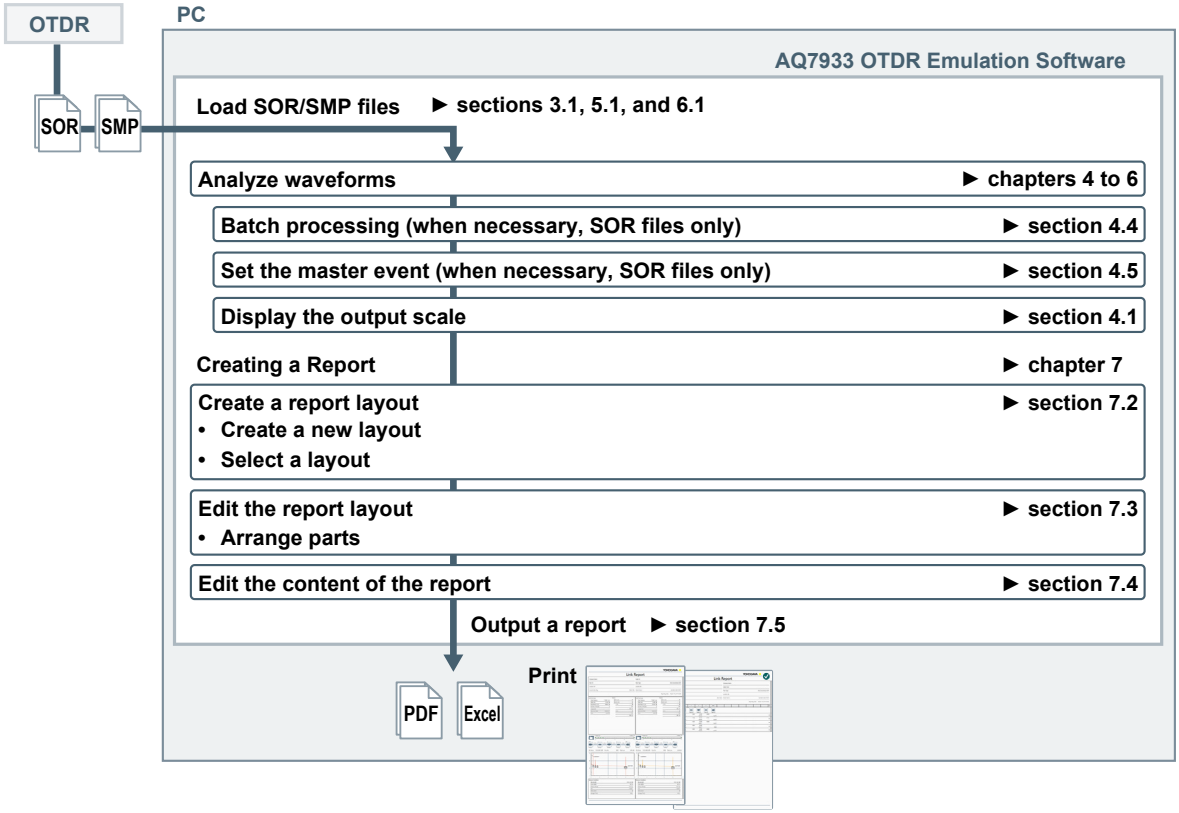
2way Analysis (Two Way)



Analyzing an SMP File



Creating a Report

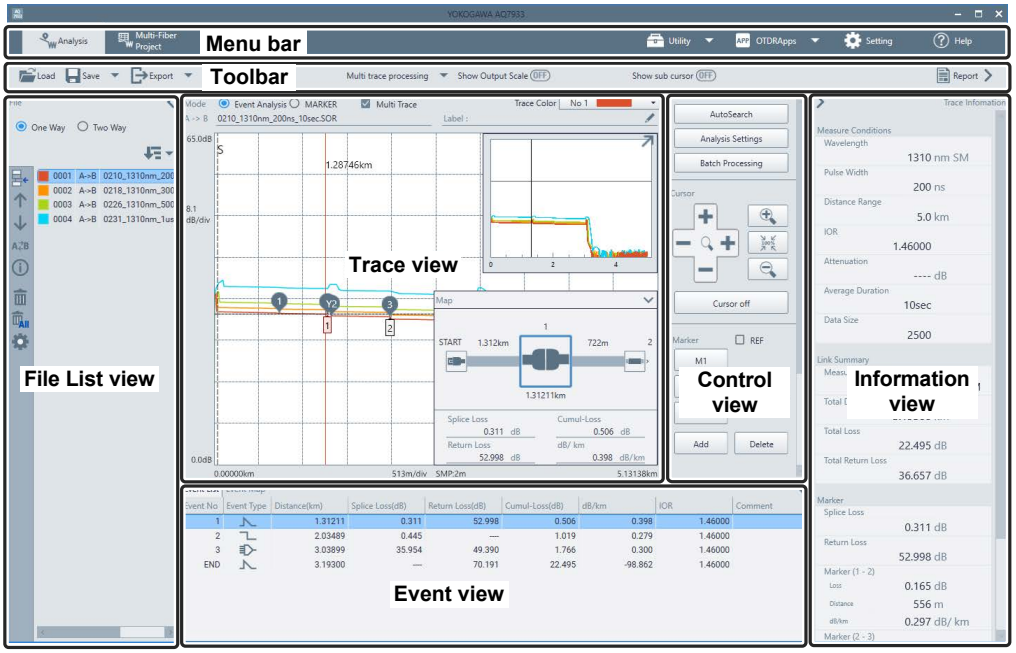


Using the Multi-Fiber Project Editor

► section 8.1

1.2 Functions of the Parts of the Display Window

The following figure shows the configuration of the analysis window.



Menu Bar

You can select the functions the use on the **Analysis** or **Multi-Fiber Project** tab.
Utility, OTDR Apps, Setting, and Help menus are shown.
Click **Help** to view the User's Manual (IM AQ7933-01EN) of this software.
► section 2.2

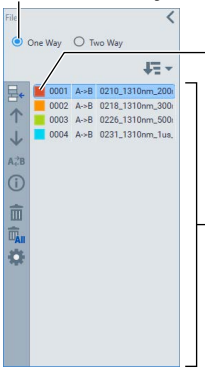
Toolbar (Analysis)

If you click **Load** and load a waveform file, tools such as Save and Export become available.
If you click **Report**, a report creation window will appear.
► section 2.2

File List View

A list of loaded files is displayed. You can select the analysis direction (one way, two way). You can set the waveform display conditions of each file and the order of the files. ► section 3.2

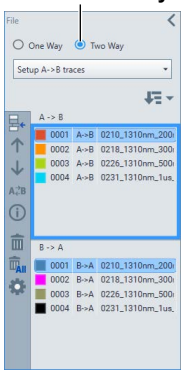
Select One Way.



Click here to turn waveform display on and off.
► "Trace View" on the next page

File list

Select Two Way.



To perform two way analysis, set the analysis method to **Two Way**. A file list appears for each measurement direction.

A -> B (forward direction) file list

B -> A (reverse direction) file list

Trace View

The waveforms of the loaded file are displayed. You can show or hide each waveform by controlling the file list in the File List view.

Select the analysis mode.

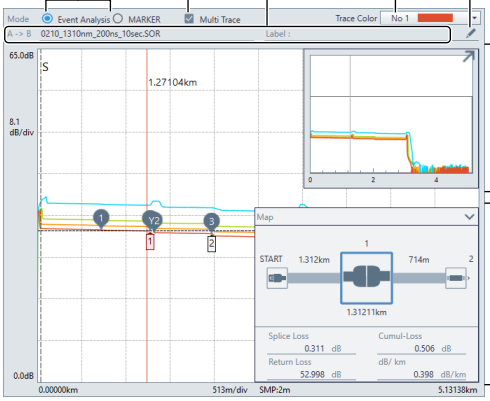
- **Event Analysis** ► section 4.3
  Event information (splice loss, return loss, etc.) stored in the loaded waveforms is displayed.
- **MARKER** ► section 4.2
  Use cursors and markers to measure values such as the splice loss 2 Point Markers, 4 Point Markers, 6 Point Markers) and return loss.

Turns Multi Trace on and off

Measurement direction, file name, and label of the current waveform

Changes the waveform color ► section 4.1

Set trace information. ► sections 3.2 and 4.1

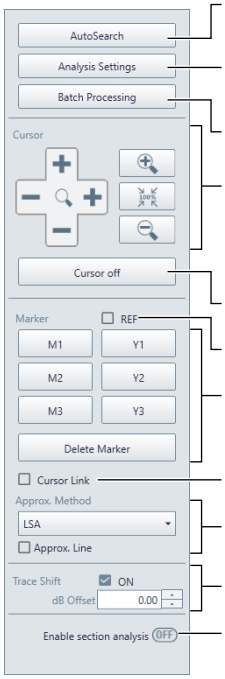


Overview
In relation to the entire displayed waveform, a rectangle frame appears indicating the current display area (zoom area). Click ↗ or ↙ at the upper right to show or minimize the Overview view.

Map view
When event analysis is selected, information about the selected event of the displayed waveform and the preceding and succeeding event is displayed. Click ⌄ or ⌃ at the upper right to show or minimize the Map view.

Control View

On the Control view, you can expand or reduce the display scale of the Trace view, move displayed waveforms, set analysis conditions, place markers on displayed waveforms, and analyze events.



Auto search
Set event search conditions and launch fiber and execute an auto search.

Analysis settings
Set analysis conditions, pass fail conditions, and launch fiber.

Batch processing
The file information set here can be applied to all files loaded in the file list.

Zoom the waveform display scale
Zoom the displayed waveform in the direction of the optical power level (vertically) and in the direction of the distance (horizontally). The zoom area is displayed with the rectangular frame in the overview.

Deletes the cursor

Select the check box to set the distance reference (REF).

Marker operation

Cursor link (marker analysis only)

Set the approximation method and show or hide the approximation line.

Trace shift (moves the displayed waveform)
Moves the displayed waveform in the direction of the optical power level (vertically)

Enables or disables section analysis
Analyzes return loss between markers.

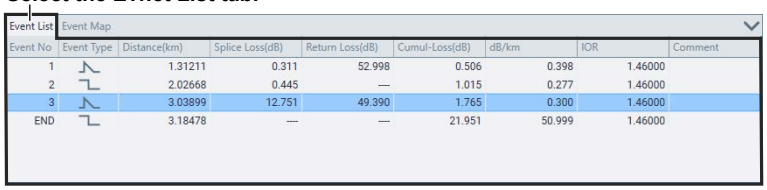
Event View

You can view the event information of the current waveform in a list or with icons.

Event List

The event information of the current waveform is displayed.

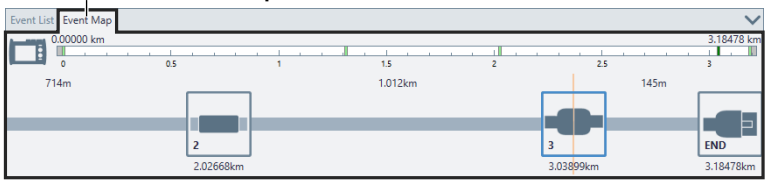
Select the Evnet List tab.



Event Map

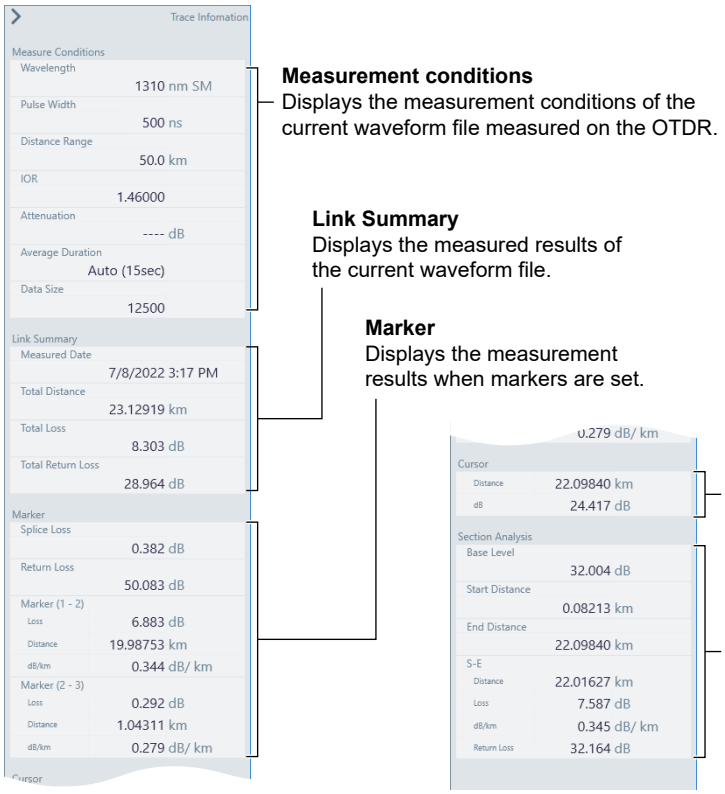
The events of the current waveform are displayed with icons indicating each event type.

Select the Evnet Map tab.



Information View

Current waveform's measurement conditions and measured results as well as analysis results based on markers and cursors are displayed. If a display item is not available, the value area is displayed as -----.



Measurement conditions
Displays the measurement conditions of the current waveform file measured on the OTDR.

Link Summary
Displays the measured results of the current waveform file.

Marker
Displays the measurement results when markers are set.

Cursor
Displays the cursor information

Section analysis
Displays the analysis results when section analysis is enabled.
► "Control View" on the previous page

Explanation

Current Waveform

This is the target waveform that you set or edit markers and cursors on and perform analysis on. The waveform file selected on the File List view or the waveform selected on the Trace view becomes the current waveform.

Changing the View Size

If necessary, you can change the size of each view.

File List View, Information View, Event View

You can drag the boundary lines of each view to change the size to your liking.

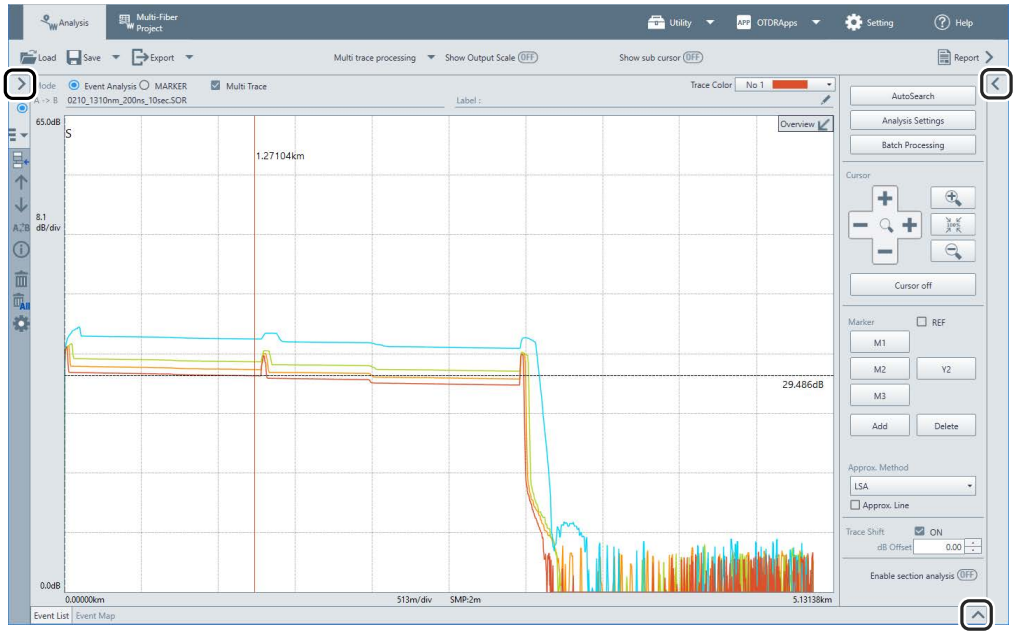
You can also click <, >, ∨, or ∧ of each view to show or minimize it.

Control View

When you minimize the size of the Event view, the display area of the Control view will be expanded.

Trace View

When you minimize the size of the File List view, Information view, or Event view, the display area of the Trace view will be expanded.



Preserved Window State

The view size information is saved when the software is closed. The software starts with the same view size the next time it is started.

2.1 Starting and Exiting the Software

Procedure

Starting the Software

You can start the software using one of the following two methods.

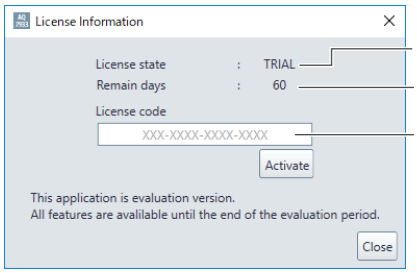
- Double-click the shortcut icon on the desktop.
- From the Windows start menu, select in the following order.
  Windows 10: Click **Yokogawa** > **AQ7933**.
  Windows 11: Click **All apps** > **Yokogawa** > **AQ7933**.

Start menu (on Windows 10)

Shortcut icon

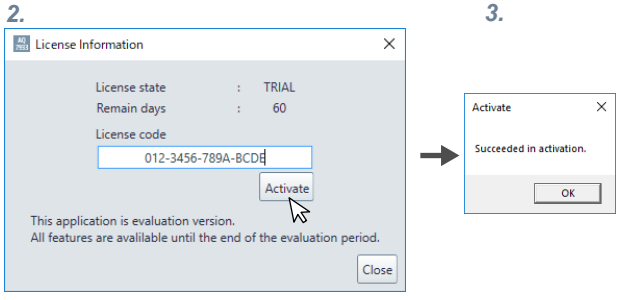
License Activation

1. When you start the software for the first time, the following License Information window appears.



License status
Number of days remaining
Enter or view the license key.

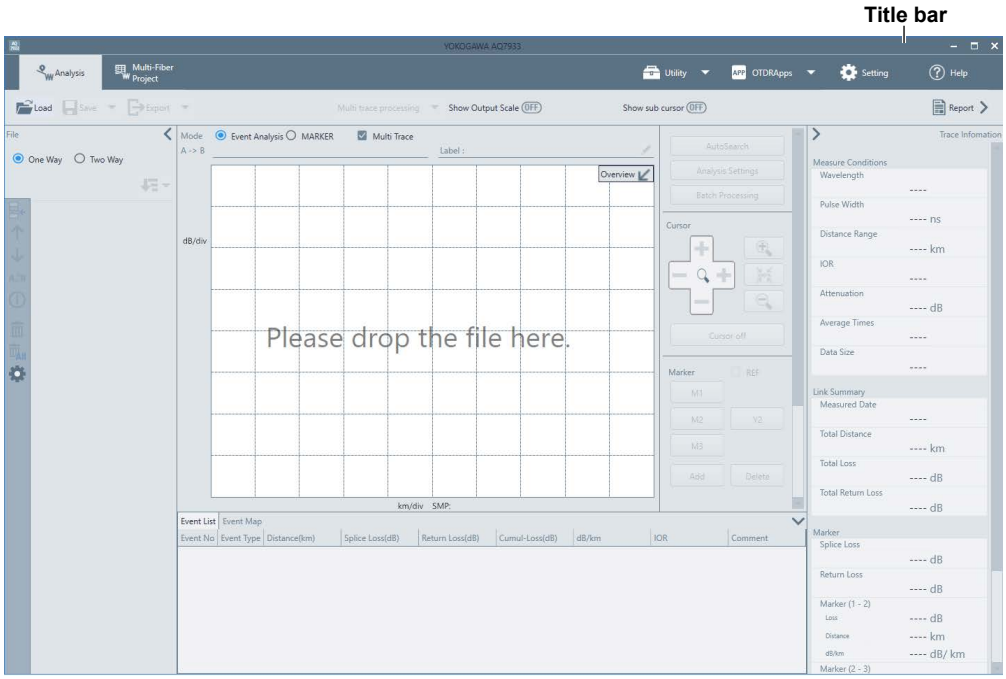
2. Enter the license key, and click **Activate**. The license key is written on the Product Information sheet.
3. When the license is activated, a message appears indicating the successful activation. Click **OK** to close the message window.



Note

- If you enter a wrong license key, an activation failure message will appear. If this happens, click **OK**, and reenter the license key in the license input window.
- For details on the license status, see section 9.5.

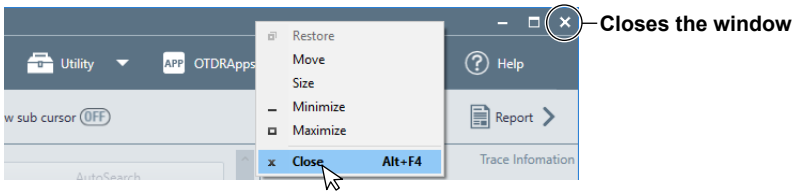
The start window opens.



Exiting from the Software

You can exit from the software using one of the following two methods.

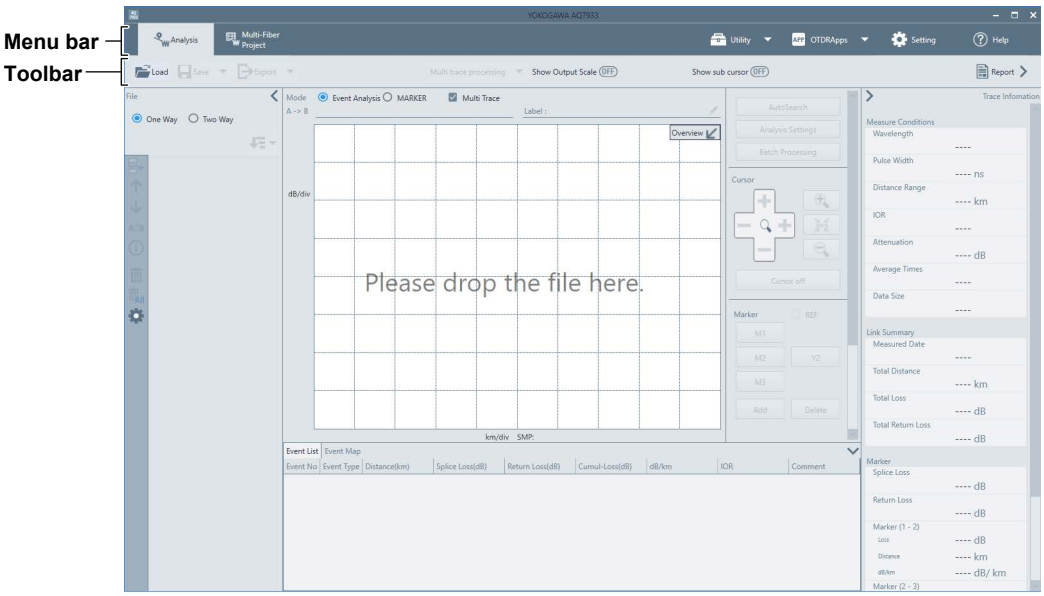
- Right-click the title bar, and from the drop-down menu, select **Close**.
- Click **[x]** at the right edge of the title bar.



The software closes.

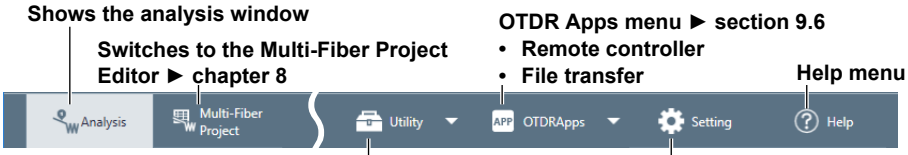
2.2 Basic Operation of the Main Window

Procedure



Menu Bar

You can use the menu bar to switch between the analysis feature and Multi-Fiber Project Editor as well as specify the following settings.



Shows the analysis window

Switches to the Multi-Fiber Project Editor ► chapter 8

OTDR Apps menu ► section 9.6
- **Remote controller**
- **File transfer**

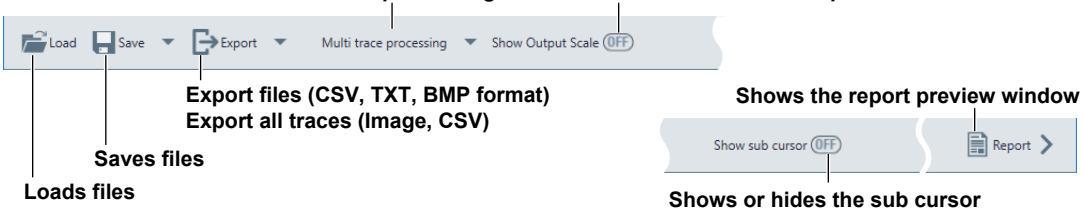
Help menu ► chapter 10

Utility menu
- **MPZ Converter ► section 9.1**
- **Fiber ID editing tool ► section 9.2**
- **Trace table ► section 9.3**

Setting menu
- **Common settings ► section 2.3**
- **Display color settings ► section 2.4**
- **Analysis settings ► section 9.4**
  - **Total loss calculation method and cumulative loss type settings.**
  - **Event list item visibility settings**
  - **Display settings**
  - **Other**
- **View the version and license information ► section 9.5**

Toolbar (Analysis)

When you load a waveform file, you can save and export the data as well as perform the following operations.



Multi trace processing*

Shows or hides the output scale

Export files (CSV, TXT, BMP format)
Export all traces (Image, CSV)

Saves files

Loads files

Shows the report preview window

Shows or hides the sub cursor

* This does not appear if you load SMP files.

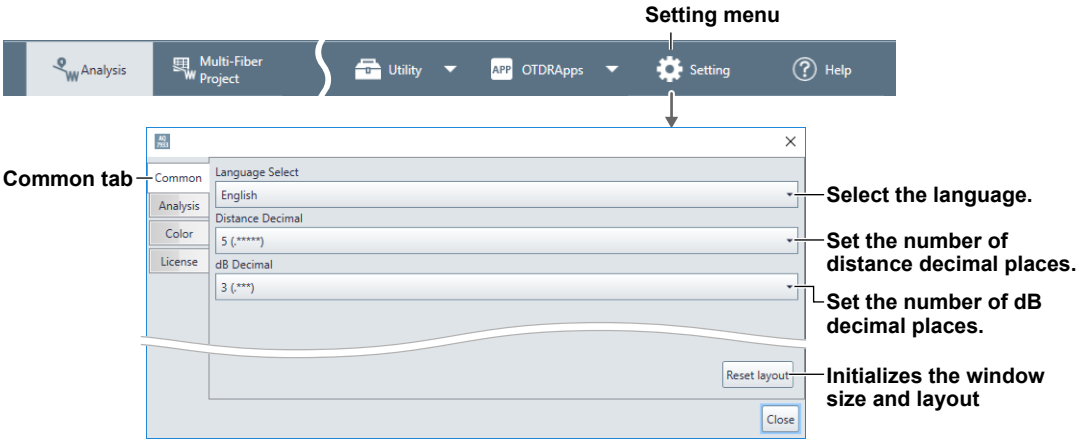
2.3 Setting the Language, Distance Decimal, and dB Decimal Settings

Procedure

Common Settings

1. On the menu bar, click **Setting** and then the **Common** tab to display the following window.

   Click each item, and from the drop-down menu, select the language and the number of decimal places to display for the distance and decibel.



2. Restart the software.

Explanation

Available Languages

You can set the language displayed on the screen to any of the following:

English, Japanese, Korean, Polish, German, Simplified Chinese, Traditional Chinese, Indonesian, Russian, French

Note

If you select a language that is different from the OS language, it may not be displayed properly.

Distance Decimal

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

- 3 (.***): Up to three decimal places are displayed.
- 4 (.****): Up to four decimal places are displayed.
- 5 (.*****): Up to five decimal places are displayed.

dB Decimal

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

- 1 (.*): Up to one decimal place is displayed.
- 2 (.**): Up to two decimal places are displayed.
- 3 (.***): Up to three decimal places are displayed.

Initializing the Window Size and Layout

If you click **Reset layout**, the window size and the size and arrangement of each view are reset to their default settings.

2.4 Changing the Color Scheme of the Waveform Area

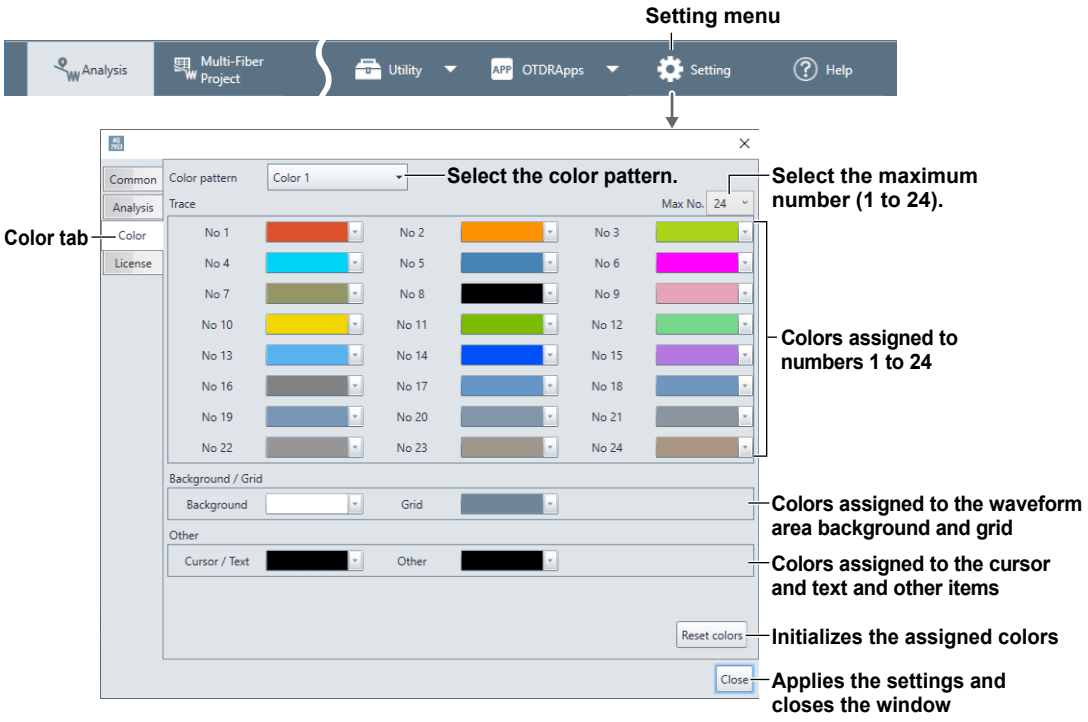
Procedure

Display Color Settings

1. On the menu bar, click **Setting** and then the **Color** tab to display the following window.

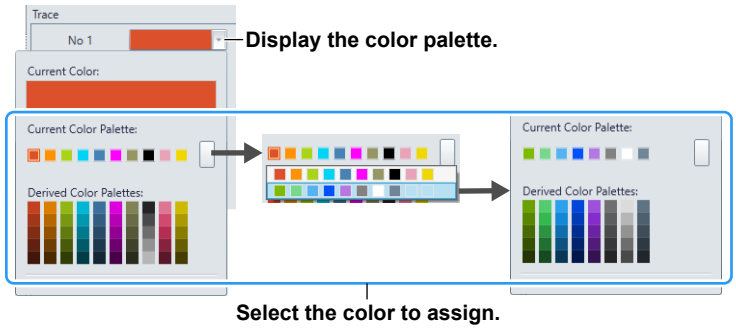
From the color pattern drop-down list, select Color 1, Color 2, Color 3, or Black and White.

The assigned colors of each object are shown according to the selected color pattern.
When the color pattern is set to Color 1, Color 2, or Color 3, you can select up to 24 colors.



Changing the Color Pattern Colors Individually

Click each color setting, and select the color to assign to it from the color palette.



2. Click **Close**. The color scheme of the waveform area changes.

Explanation

Color Pattern

You can select the trace view (waveform area) color pattern from the following four types.

- Color 1: A color pattern with a white trace background
- Color 2: A color pattern with a gray trace background
- Color 3: A color pattern with a black trace background
- Black and White: Monochrome color pattern

Objects Whose Colors Can Be Changed

You can change the color pattern colors individually.

Trace

- When the color pattern is set to Color 1, Color 2, or Color 3
  Select the maximum number: 1 to 24.
  You can select waveform colors from No 1 to No 24 (maximum number). Waveforms after No 24 (maximum number) are automatically assigned the colors of traces No 1 to No 24 (maximum number) in order.
- When the color pattern is set to Black and White
  The maximum number is fixed to 1.
  The waveform color can only be set to No 1.

Background

You can change the background color of the waveform area.

Grid

You can change the grid color of the waveform area.

Cursor/Text

You can change the colors of the following objects.

- Cursor position distance, cursor dB value
- Horizontal cursor
- Cursor in the overview
- Sub cursors

For details on each cursor, see section 4.1.

Other

You can change the colors of the following objects.

- Approximation line
- Reverse waveform of the 2 way trace
- Section analysis markers

Initializing the Assigned Colors

Clicking **Reset colors** resets the changed object colors to the initial color pattern setting.

3.1 Loading Files

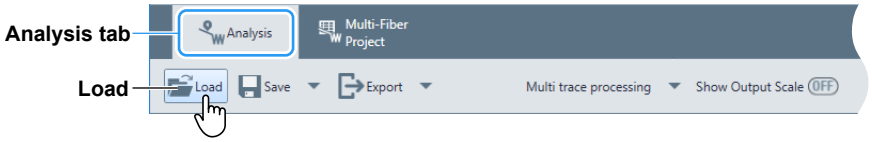
This section explains how to load waveform data (SOR file, SMP file).
The following two methods are available.

- Using the Load button on the toolbar
- Loading by dropping files

Procedure

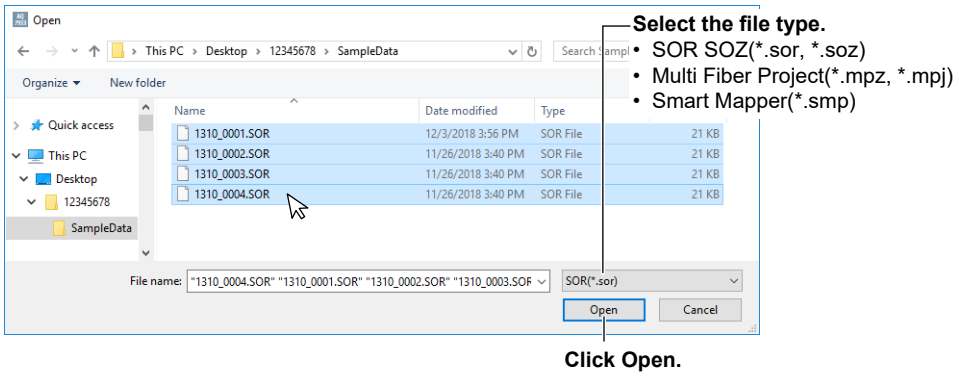
Using the Load Button

1. On the menu bar, click the **Analysis** tab, and click **Load** on the toolbar. A file selection dialog box opens.



2. Select the file type and then the file to load. You can select multiple files by holding down the Shift key and clicking.
   - An SOZ or MPZ file containing multiple SOR files can also be loaded directly.
   - If the associated SOR files are available, MPJ files can also be loaded directly.
   - Multiple MPZ and MPJ files cannot be selected simultaneously.

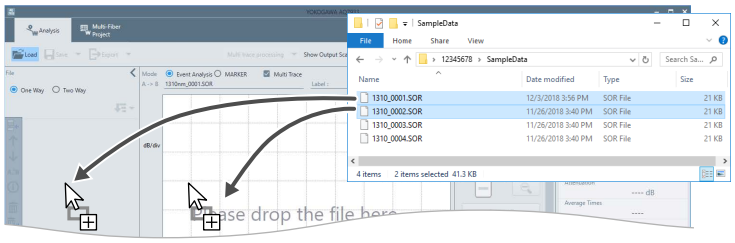
Example when multiple files are selected



3. Click **Open**. The files are loaded.

Loading by Dropping Files

1. On the menu bar, click the **Analysis** tab to display the Analysis window.
2. Open Explorer, and select the files to load.
3. Drag and drop the files on the Trace view or the file list. The files are loaded.

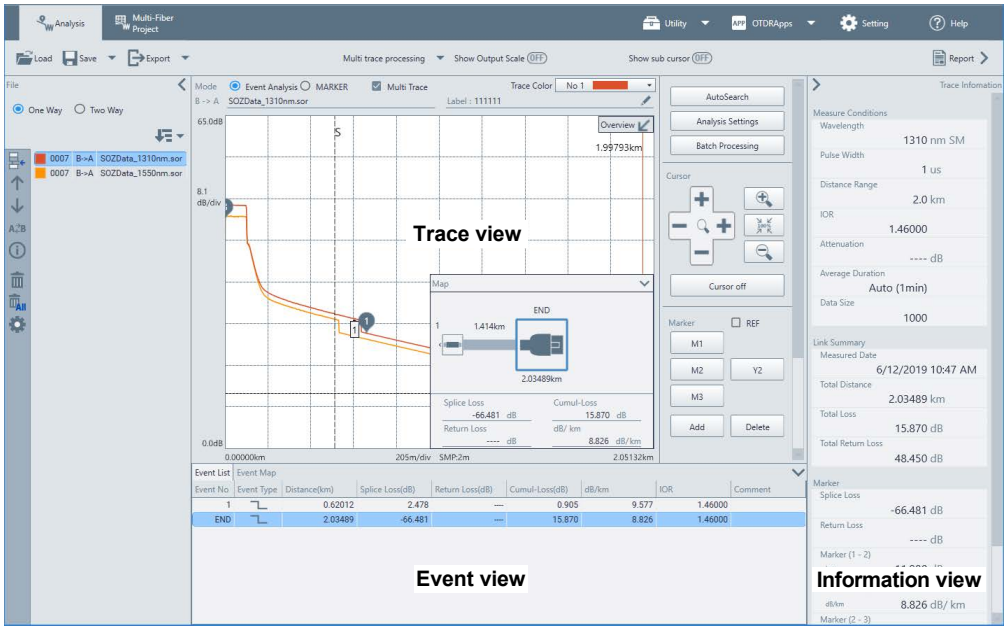


Note

If you select a folder and drop it, the files in the folder will be loaded.

The loaded files are added to the file list, and the current waveform information is displayed in the Trace view, Information view, and Event view.

When SOR or SOZ Files Are Loaded

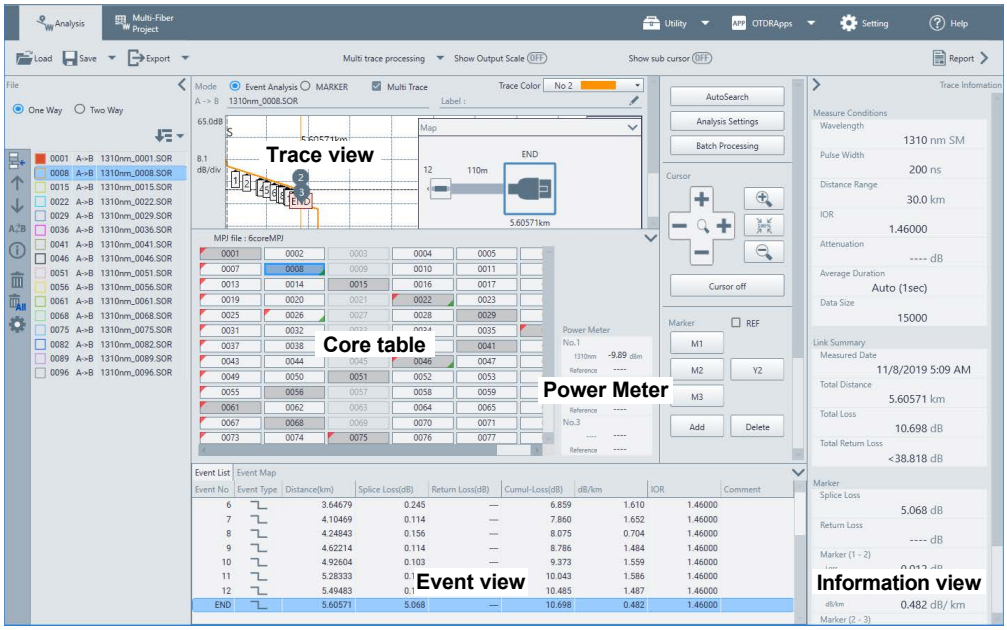


Note

When loading SOR files,* if the instrument detects the possibility that the measurement information was edited after it was saved by the instrument, a message appears in the lower left corner of the screen and loading is not possible.

* SOR files that have been saved by an AQ1210 series OTDR unit with firmware version R1.08 or later

When an MPZ or MPJ File Is Loaded



Explanation

Loading Files

The following types of files can be loaded.

File Type	Description
SOR, SOZ	Waveform data measured from an optical pulse (including the measurement conditions) is loaded. When an SOZ file is loaded, a decompressed folder (containing SOR files) is saved in the same directory as the SOZ file.
MPZ, MPJ	The core table and measured waveform data of the multi-fiber measurement and the measured data of the optical power meter are loaded. When an MPZ file is loaded, a decompressed folder (containing MPJ, SOR, and other files) is saved in the same directory as the MPZ file.
SMP	Adapt Trace data measured from an optical pulse (including the measurement conditions) is loaded. This corresponds to the waveform measured using Smart Mapper of the AQ7280 or AQ1210.

To combine two waveforms and analyze, see chapter 5.

To analyze an SMP file, see chapter 6.

You can change the path to the BMP file of the fiber surface image in the Fiber Settings of the File List view. ► section 3.2

File List

Loaded files are added to the file list.

In the case of SOR files, up to 1000 files can be loaded.

In the case of SMP files, up to 10 files can be loaded. ► section 6.1

The file list automatically sorts the files in ascending order by file name when they are loaded.

Trace View

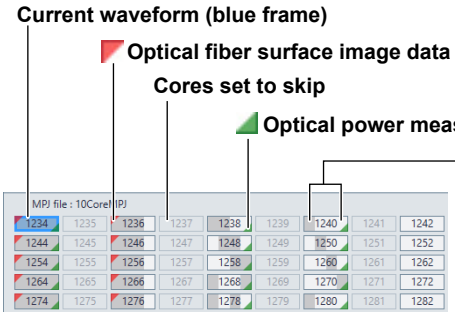
The waveforms of the loaded files are displayed in the Trace view.

In the case of SOR files, up to 24 waveforms can be displayed simultaneously and compared.

In the case of SMP files, up to 10 composite waveforms can be displayed simultaneously and compared. ► section 6.2

Core Table

The core table shows the measurement information of a multi-core fiber cable stored in an MPJ file. The table can be used to identify measured cores, unmeasured cores, and skipped cores in multi-core fiber measurements.



Power Meter

The measured data of the power meter is displayed.

When the optical power display unit is dB, Reference is also displayed.

3.2 Managing the File List

Manage the loaded files on the File List. This section explains the following settings and operations.

- Selecting the analysis method (SOR files only)
- Sorting the file list
- Trace information
- File list operations (selecting and switching the current waveform, showing/hiding waveforms, changing the order, adding blank lines, excluding a selected file)
- Changing the measurement direction
- Fiber Settings
- Excluding all files from the list

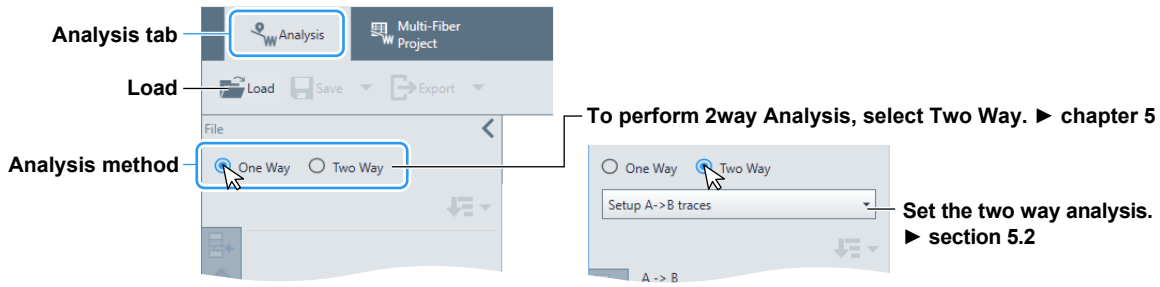
Procedure

Loading Files

1. On the menu bar, click **Analysis** tab.

Selecting the Analysis Method

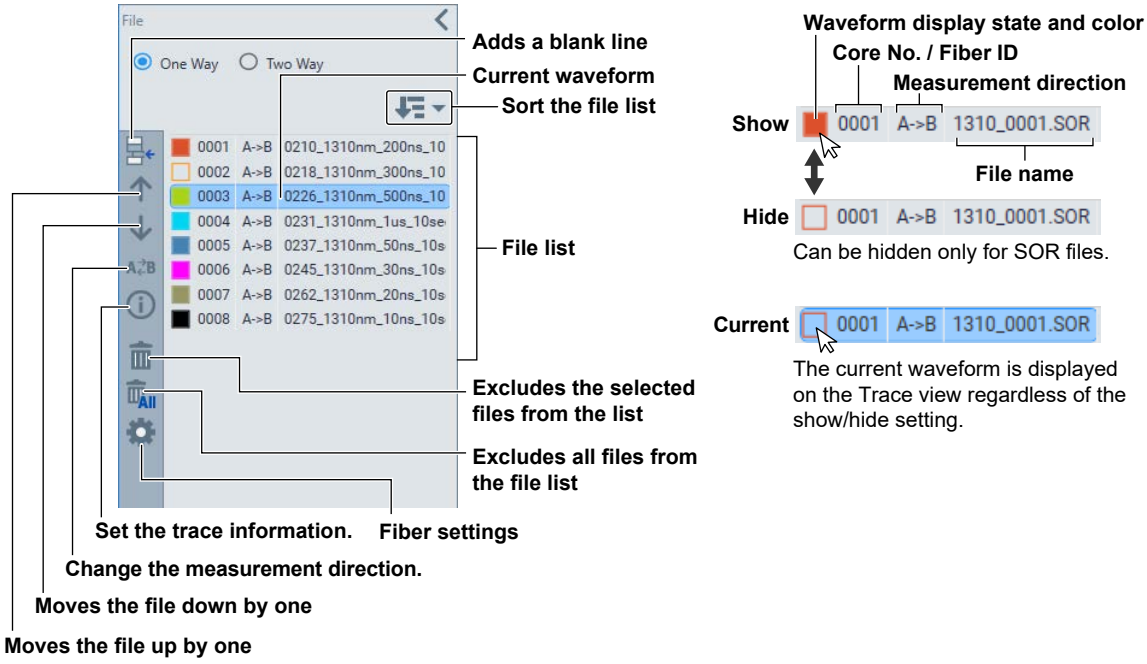
2. When loading SOR files, select **One Way** or **Two Way** in the top area of the File List view.
   * You can also change the analysis method, after loading SOR files.



3. On the toolbar, click **Load**. Or, drag and drop files to load them. ► section 3.1

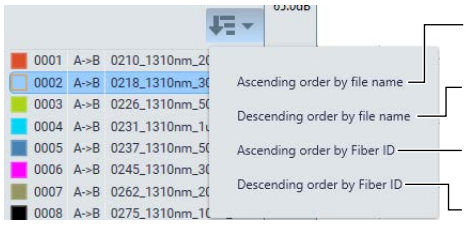
   Loaded files are displayed in the file list.

File List View (When the analysis method is One Way)



Sorting the file list

1. Click . The following menu appears.



Ascending order by file name:
Sorts in ascending order of file name

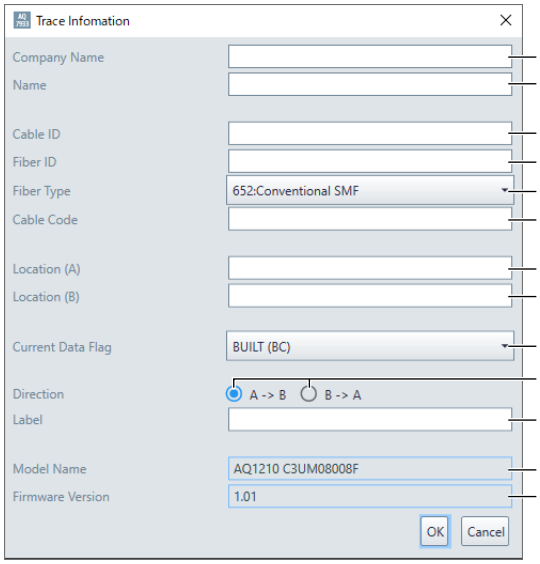
Descending order by file name:
Sorts in descending order of file name

Ascending order by Fiber ID:
Sorts in ascending order of fiber ID

Descending order by Fiber ID:
Sorts in descending order of fiber ID

Setting the Trace Information

1. Click . The following window appears.



Set the company name.
Set the name.

Set the cable ID.
Set the fiber ID.
Set the fiber type.
Set the cable code.

Set the start position.
Set the end position.

Set the current data flag.

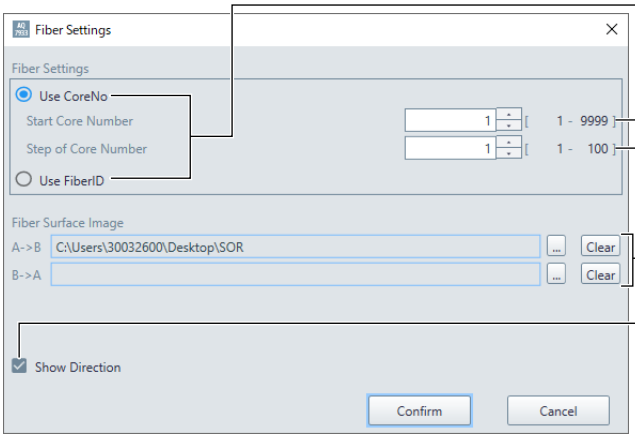
Sets the measurement direction.

Set the label.

Displays the model name.
Displays the firmware version.

Fiber Settings

1. Click . The following window appears.



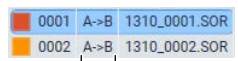
Selects whether to display core numbers or fiber IDs in the file list.

Set the core number.
- **Start number**
- **Number of steps**

Specify the folder containing the fiber surface image data.

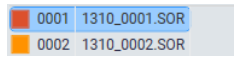
Shows or hides the measurement direction

ON:



The measurement direction is shown.

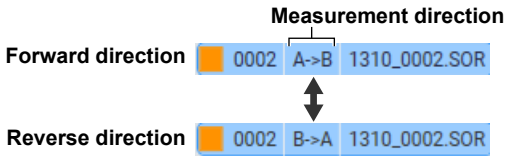
OFF:



The measurement direction is not shown.

Changing the Measurement Direction

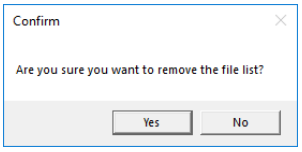
1. Click A⇄B to switch the measurement direction of the current waveform.



Specify the following settings as necessary.

Excluding All Files from the List

1. Click All. The following confirmation message appears.



2. Click **Yes**. All files are excluded from the file list.

Controlling the File List (When the analysis method is One Way)

When the analysis method is Two Way, see section 5.2.

Selecting and Switching the Current Waveform

1. Click to select a file loaded in the file list. When a file is selected, you can use the up and down keys on the keyboard to switch the selection. The selected file becomes the current waveform.

Showing and Hiding Waveforms

You can show and hide waveforms only when SOR files are loaded.

1. Click inside a square box representing the display color of the waveform. The show/hide state of the waveform on the Trace view is switched.

Changing the Order

1. Select the file you want to change the order of to make it the current waveform.
2. Click the up and down arrows to the left of the file list. The selected file is moved one file up or one file down.

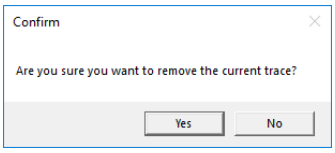
Adding a Blank Line

1. Select the file at the position you want to add a blank line to make it the current waveform.
2. Click to the left of the file list.

   A blank line is added to the list, and the current waveform and all subsequent files are moved down by one file.

Excluding a Selected File

1. Select a file you want to exclude from the file list to make it the current waveform.
2. Click  to the left of the file list. The following confirmation message appears.



3. Click **Yes**. The file you selected in step 1 is excluded from the file list.

Explanation

Analysis Method

When you load SOR files, select the analysis method from below. This does not appear if you load SMP files.

One Way

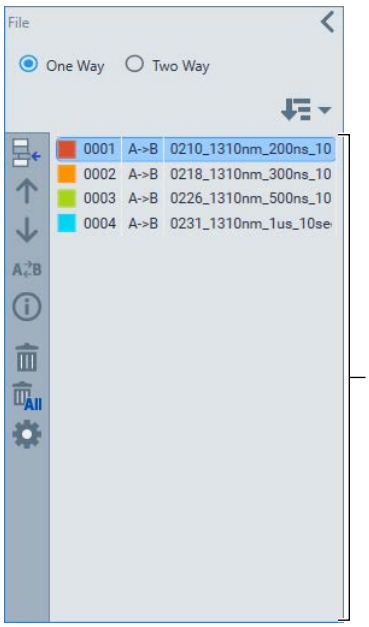
Select this mode to analyze SOR files containing the results of measuring the optical fiber from one end (normal SOR while analysis). The File List view will show only the file list of the forward direction (A->B).

Two Way

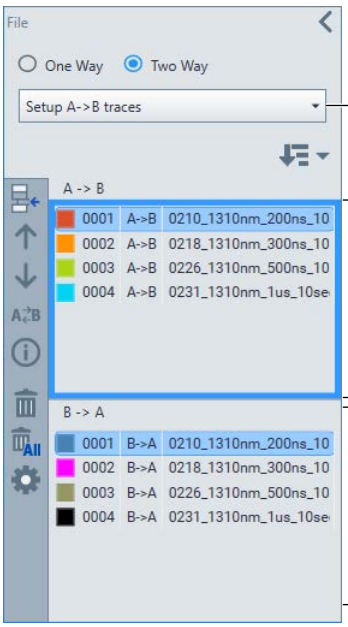
Select this mode to analyze SOR files containing the results of measuring the optical fiber from both ends. The File List view will show the file list of the forward direction (A->B) and that of the reverse direction (B->A).

For details on two way analysis (2way Analysis), see section 5.4.

- **When the analysis method is One Way**



- **When the analysis method is Two Way**



Set the two way analysis.
► section 5.2

A -> B (forward direction) file list
► sections 5.1 and 5.2

B -> A (reverse direction) file list
► sections 5.1 and 5.2

Sorting the File List

Ascending order by file name, Ascending order by Fiber ID:

In the case of numbers, the order is 0 to 9. In the case of alphabet characters, the order is a to z.

Descending order by file name, Descending order by Fiber ID:

In the case of numbers, the order is 9 to 0. In the case of alphabet characters, the order is z to a.

Note

- When the analysis method is Two Way, file list sorting applies to both the forward-direction file list and reverse-direction file list.
- Similar to the Windows Explorer's file list, the numbers included in file names can be sorted as numbers.
  ► See section 9.4, "Use natural sort order," (page 9-8).

Trace Information

You can view or edit the trace information of the currently selected file.

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	
Location (A)	Up to 36 characters	
Location (B)	Up to 36 characters	
Current Data Flag	Shows the operation state. CURRENT (CC), BUILT (BC), REPAIRED (RC), OTHER (OT)	
Direction	Changes the measurement direction of the SOR files This appears dimmed when the setting is invalid such as when an SMP file is loaded or a 2way Analysis waveform is being displayed.	
Label	Up to 36 characters	
Model Name	Shows the OTDR model name In the case of the AQ7280 series, model names and serial numbers are displayed in the order of mainframe and OTDR unit.	
Firmware Version	Shows the OTDR firmware version	

Note

You can also use the Fiber ID Editing Tool to collectively set the fiber ID, file name, and waveform information. ► section 9.2

Changing the Measurement Direction

You can change the measurement direction of the SOR files. The measurement direction is either A -> B (forward direction) or B -> A (Reverse direction).

Fiber Settings

Set the following items for loading waveforms in the file list. You can also change the settings after loading the files.

Item	Description
Fiber Settings	
Use Core No/ Use Fiber ID	Selects whether to display core numbers or fiber IDs in the file list. When you select core numbers, you can set the start number and the number of steps of the core numbers. This setting also applies to the displayed items in the report waveform header and those in the trace list.
Start number	Set the start core number. Selectable range: 1 to 9999
Steps	Set the core number interval. Selectable range: 1 to 100 **Start number: 1** **Number of steps: 1** 0001 A->B 1310_0001.SOR 0002 A->B 1310_0002.SOR 0003 A->B 1310_0003.SOR **Start number: 100** **Number of steps: 5** 0100 A->B 1310_0001.SOR 0105 A->B 1310_0002.SOR 0110 A->B 1310_0003.SOR
Path to the fiber surface image	Specify the folder containing the fiber surface image data. When the name of the BMP file in the specified folder matches the four digit number at the end of the waveform file name loaded in the file list, the BMP image is loaded as a fiber surface image. Example: If the waveform file is 1310_0001.SOR, 0001.BMP is loaded as a fiber surface image. The loaded image is displayed in the top area of the information view. **When the analysis method is One Way** / **When two-way trace analysis is running** **Judgment result** **: PASS** **: FAIL** **Image** Trace Infomation Fiber Surface Image (A->B) Measure Conditions Wavelength 1310 nm SM Pulse Width 500 ns Distance Range 50.0 km IOR 1.46000 Attenuation ---- dB Average Duration Fiber Surface Image (B->A) **Judgment result** When analysis result data (CSV format) with the same file name as the BMP image exists in the same folder, the CSV file will also be loaded. Example: If the image file is 1310nm0001.BMP, 1310nm0001.CSV will be loaded. The judgment result is displayed in the upper left of the fiber surface image.
Show Direction	ON: The measurement direction is shown in the file list. OFF: The measurement direction is not shown in the file list.

Note

When the analysis method is Two Way, the fiber settings apply to both the forward-direction file list and reverse-direction file list.

Excluding All Files from the List

You can exclude all loaded waveforms from the file list.

Controlling the File List (When the analysis method is One Way)

When the analysis method is Two Way, see section 5.2.

Selecting and Switching the Current Waveform

The file selected in the file list becomes the current waveform.
You can also switch the current waveform by clicking and by using the up and down arrow keys on the keyboard.

Showing and Hiding Waveforms

In the case of SOR files, up to 24 waveforms can be displayed simultaneously.
In the case of SMP files, the waveforms are always displayed.
The current waveform is always displayed in the Trace view.

Waveform Color

Each waveform color is assigned automatically based on the color pattern.
► See “Display Color Settings” in section 2.4

Adding Blank Lines

You can add blank lines to the file list.
By adding blank lines, you can reflect the actual measurement status on the file list such as when there are cores that are not being measured.
In 2way analysis, you can use blank lines to adjust the file list sequence in order to align the waveform pairs to be analyzed.

Excluding the Selected File

You can exclude the current waveform from the File List view.

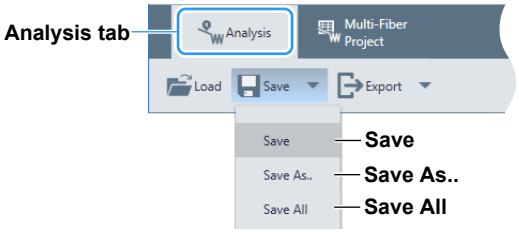
3.3 Saving Files

This section explains how to save SOR files and SMP files.

- Save
- Save As
- Save All

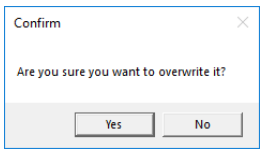
Procedure

1. On the menu bar, click the **Analysis** tab, click **Save** on the toolbar. The drop-down menu appears.



Save

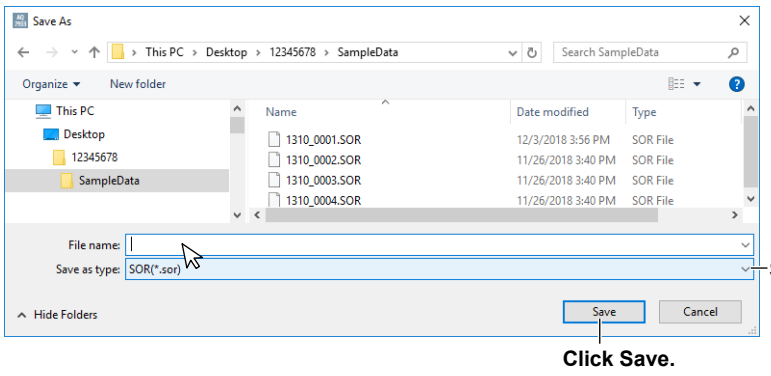
2. Select **Save** from the drop-down menu. A confirmation dialog box opens.



3. Select **Yes**. The current file is overwritten.

Save As

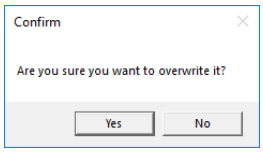
2. Select **Save As..** from the drop-down menu. The following window appears.



3. Enter the file name, and click **Save**. The current file is saved with the file name you entered.

Save All

2. Select **Save All** from the drop-down menu. A confirmation dialog box opens.



3. Select **Yes**. All the files loaded in the file list are overwritten.

Explanation

Save

The following types of files can be saved.

Display	Description
*.SOR	Waveform data measured from an optical pulse (including the measurement conditions) is saved in an SOR file format that conforms to Telcordia SR-4731.
*.SMP	Adapt Trace data measured from an optical pulse (including the measurement conditions) is saved to a file in SMP format.

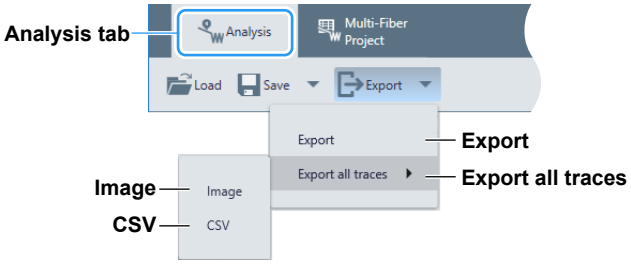
3.4 Exporting Files

This section explains how to export SOR or SMP files that have been loaded and edited with this software to other file types.

- Export
- Export all traces (Image, CSV)

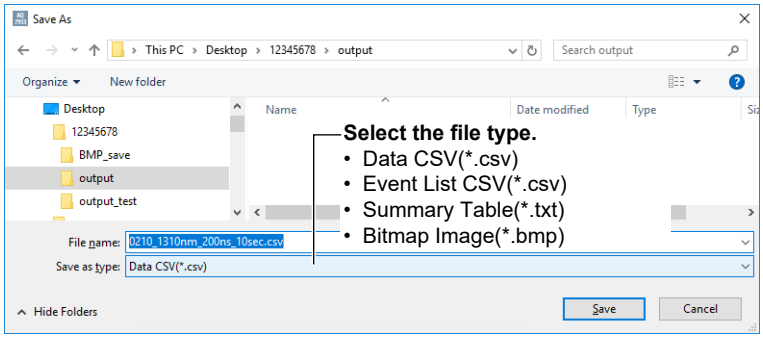
Procedure

1. On the menu bar, click the **Analysis** tab, and click **Export** on the toolbar. The following window appears.



Export

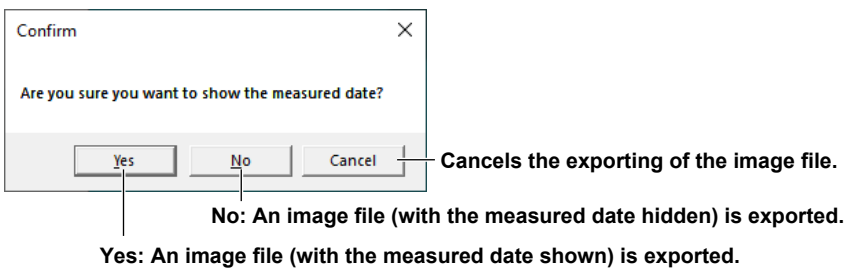
2. Select **Export** from the drop-down menu. The following window appears.



3. Select the file type and click **Save**.
   - **When Data CSV(*.csv), Event List CSV(*.csv), or Summary Table(*.txt) is selected**
     The file is exported in the selected file type.
   - **When Bitmap Image(*.bmp) is selected**
     A dialog box appears for you to confirm whether to show or hide the measured dates. Proceed to step 4.

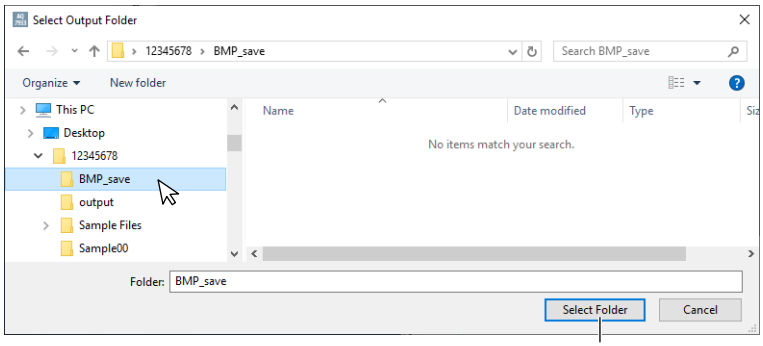
Exporting Image Files

4. Click **Yes** or **No**.



Exporting All Image Files at Once

2. From the drop-down list, select **Export all traces** and then **Image**. The following window appears.



Click Select Folder.

3. Select the export destination folder, and click **Select Folder**.

   A dialog box appears for you to confirm whether to show or hide the measured dates (see the previous page).

4. Click **Yes** or **No**.

   The files loaded in the file list are exported as BMP image files to the selected folder.

Exporting to CSV (Summary Data) at Once

2. From the drop-down list, select **Export all traces** and then **CSV**. A Save As dialog box appears.
3. Enter the file name, and click **Save**.

   The information of all files loaded into the file list is exported collectively to a single CSV file.

Explanation

File Type

Trace Data (.csv)

Measuring conditions and waveform data are exported a CSV file.

Output Example

Label				
Measured Date	26-Sep	2017	16:26	
Wavelength	1310nm SM			
Distance Range	10.0km			
Pulse Width	100ns			
Attenuation				
Average Times	Auto			
IOR	1.46			
Data Size	10000			
SMP	1m			
[km]	[dB]			
0	29			
0.00103	41.887			
0.00205	48.131			
0.00308	51.156			
0.00411	52.621			
0.00513	53.331			
0.00616	53.675			
0.00719	53.842			
0.00821	53.922			
0.00924	53.961			
0.01027	53.98			
0.01129	51.809			

Event List (.csv)

Measuring conditions, event search conditions, and event list are exported to a CSV file.

► See “Event List” in section 4.3

Output Example

Label									
Measured Date	26-Sep	2017	16:26						
Wavelength	1310nm SM								
Distance Range	10.0km								
Pulse Width	100ns								
Attenuation									
Average Times	Auto								
IOR	1.46								
Data Size	10000								
SMP	1m								
Approx. Method	LSA								
Backscatter Level	-50.00dB								
Splice Loss	0.10dB								
Return Loss	70dB								
End of Fiber	3dB								
Event No.	Distance(km)	Section Dist.(km)	Splice Loss(dB)	Return Loss(dB)	Cumulative Loss(dB)	Slope(dB/km)	Event Type	IOR	Comment
1	0.5	0.5	1.146	----	0.277	0.61	S+	1.46	
2	0.99999	0.49999	0.212	30.03	1.545	0.244	R	1.46	
3	1.49999	0.5	0.761	----	2.005	0.496	S+	1.46	
END	7.99891	6.49892	----	10.075	4.349	0.244	R	1.46	

Summary Table (.txt)

The measurement results of loaded SOR or SMP files are arranged in a list and exported to a text file.

Output Example

[Header]

Txt File Release 0.1

Base AQ7933

S/N C3SE17007F

Date 25/2/2019

Time 14:42

Filename C:¥Users¥12345678¥Desktop¥12345678¥SampleData¥Summary_001.txt

Nb File 4

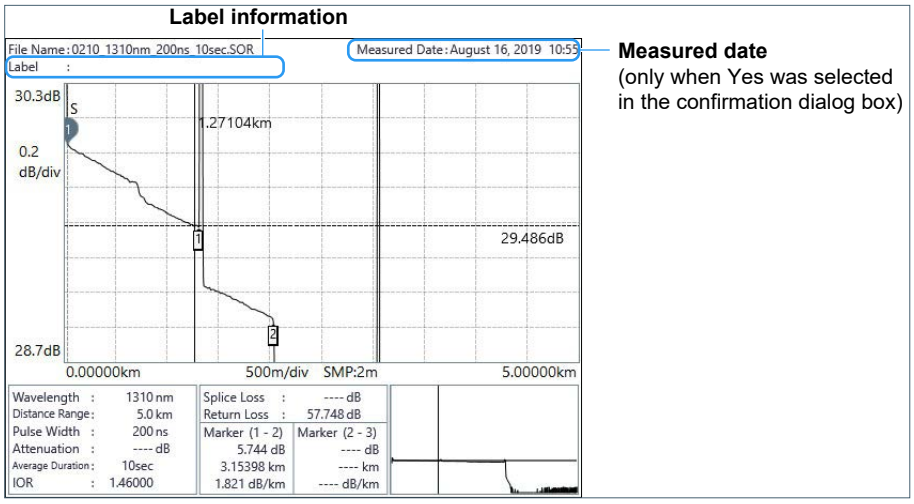
[Results]

Fib #	Direction	Wavelength	Total Loss	Total distance		Number of Event		Connector Loss(MAX)
Splice Loss(MAX)		Total RL	Label					
0001	A->B	1310nm SM	3.780	7.99891	4	0.300	1.200	19.865
0002	A->B	1310nm SM	4.377	7.99891	4	0.212	1.146	23.034
0003	A->B	1310nm SM	4.871	7.99891	4	0.300	1.200	21.888
0004	A->B	1310nm SM	6.496	7.99891	4	0.300	1.500	24.354

Image File (.bmp)

The measurement conditions of the loaded SOR or SMP file and waveform data image are exported to a BMP file.

Output Example



Measured date
(only when Yes was selected in the confirmation dialog box)

Exporting All Traces

Image File (.bmp)

All the SOR or SMP files loaded in the file list are exported to BMP files. The measurement conditions of each file and waveform data images are exported collectively to the selected folder.

Summary Data (.csv)

The information of all SOR or SMP files loaded into the file list is exported collectively to a single CSV file.

The CSV file header is as follows:

- File Name
- Measured Date
- Core No.
- Direction
- Wavelength
- Distance Range
- Pulse Width
- Attenuation
- Average Duration/Times
- Backscatter Level
- IOR
- Data Size
- Sample Interval
- Marker Splice Loss(dB)
- Marker Return Loss(dB)
- Marker1-2 Loss(dB)
- Marker1-2 Distance(km)
- Marker1-2 dB/km
- Marker2-3 Loss(dB)
- Marker2-3 Distance(km)
- Marker2-3 dB/km
- Cursor(km)
- Cursor(dB)
- Label

Output Example

[File Name]	[Measured Date]	[Core No.]	[Direction]	[Wavelength]	[Distance Range]	[Pulse Width]	[Attenuation]	[Average Duration/Times]	[Backs
0210_1310nm	August 16 2019	1	A->B	1310nm SM	5.0km	200ns	----	10sec	-50.00
0218_1310nm	August 16 2019	2	A->B	1310nm SM	5.0km	300ns	----	10sec	-50.00
0226_1310nm	August 16 2019	3	A->B	1310nm SM	5.0km	500ns	----	10sec	-50.00
0231_1310nm	August 16 2019	4	A->B	1310nm SM	5.0km	1us	----	10sec	-50.00
0237_1310nm	August 16 2019	5	A->B	1310nm SM	5.0km	50ns	----	10sec	-50.00
0245_1310nm	August 16 2019	6	A->B	1310nm SM	5.0km	30ns	----	10sec	-50.00
0262_1310nm	August 16 2019	7	A->B	1310nm SM	5.0km	20ns	----	10sec	-50.00

4.1 Displaying Waveforms

This section explains how to set and control waveforms displayed on the Trace view in normal analysis (One Way).

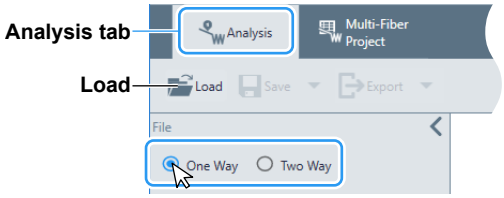
- Multi trace
- Moving cursors
- Deleting the cursor
- Changing the waveform display scale
- Set the trace information
- Moving the waveform display range
- Trace shift
- Multi trace processing
- Output scale
- Sub cursors

Procedure

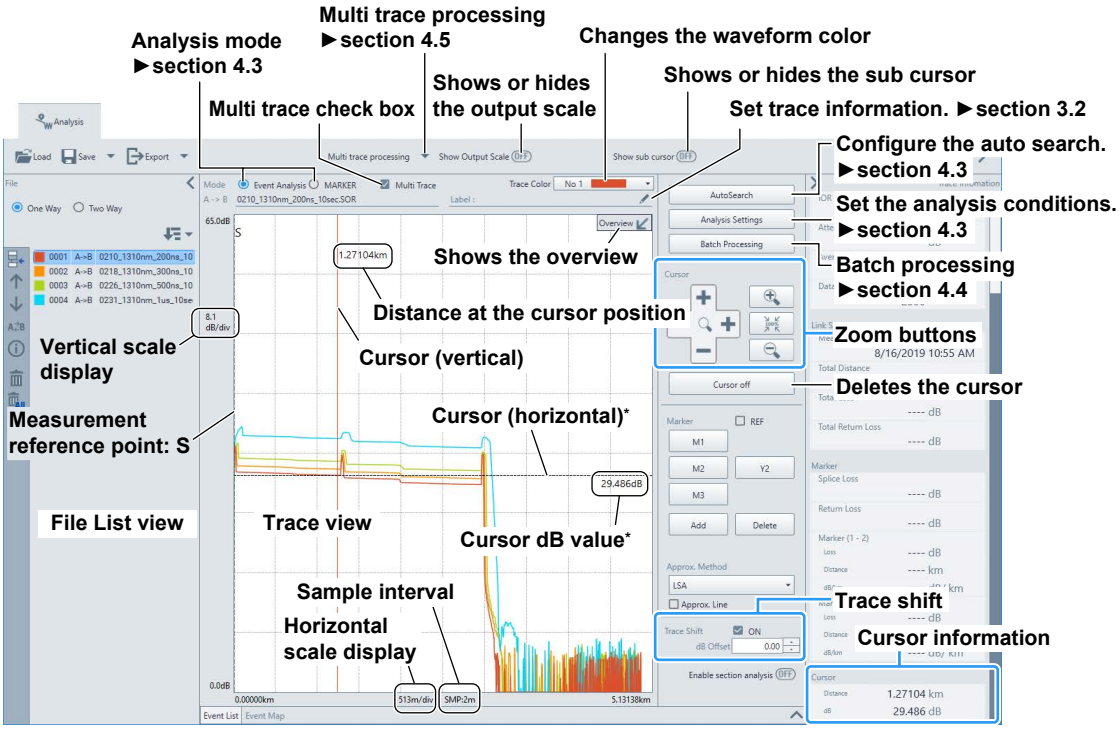
Loading Files

Selecting the Analysis Method

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **One Way**.



2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1, 3.2
The following window appears.



* The horizontal cursor and cursor dB value are displayed when the crosshair cursor is in use.

Multi Trace

3. If you want to display multiple waveforms and compare them, **Multi Trace** check box.
   The waveforms of all the files set to “show” in the file list are displayed on the Trace view.

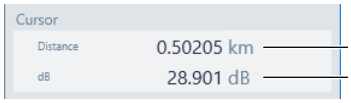
Moving Cursors

4. You can move a cursor using one of the following three ways.
   - Drag the cursor to the destination.
   - Click an empty area on the Trace view.
     The cursor moves to the position that you clicked.
   - Move the cursor by using the left and right arrow keys of the keyboard.
     The amount of movement increases if you press the arrow keys while holding down the Shift key.

   The distance and dB value indicated by the data point at the cursor are displayed on the Information view.

   * When a crosshair cursor is in use, a horizontal cursor and the dB value at the cursor are displayed on the Trace view. You can change the cursor display format using Display Settings on the **Analysis** tab of the **Setting** menu. ► section 9.4

Example of cursor information displayed on the Information view



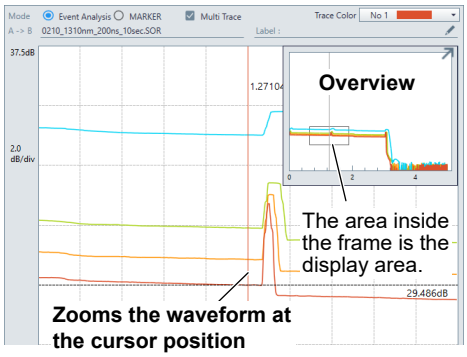
Deleting the Cursor

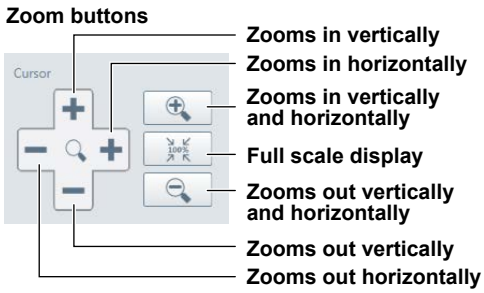
4. To delete the cursor, click **Cursor off**.
   - To redisplay the cursor, click any area in the Trace view, or press the left or right key on the keyboard. Readjust the position by moving the cursor.

Changing the Waveform Display Scale

Zooming with the Zoom Buttons

4. When you click a zoom button on the Control view, the waveform display scale is changed while keeping the cursor position at the center.





Overview

A rectangular frame appears indicating the zoom area in sync with the zooming of the waveform display.

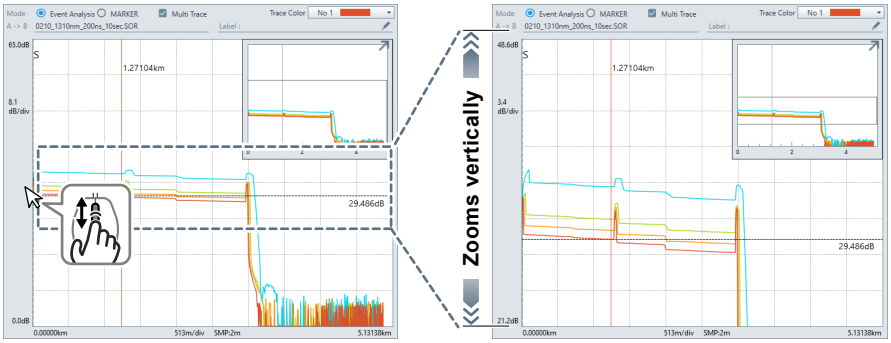
Displaying Waveforms at Full Scale

5. Click  to adjust the scale so that the entire current waveform is displayed.

Zooming with the Mouse Wheel

4. You can also use the mouse wheel to zoom in and zoom out. Zooming is performed while keeping the mouse pointer position at the center.

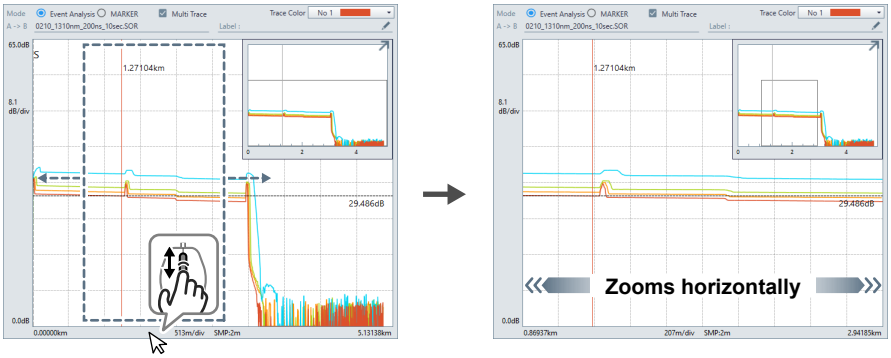
- **Controlling the mouse wheel while pointing to the vertical scale area**



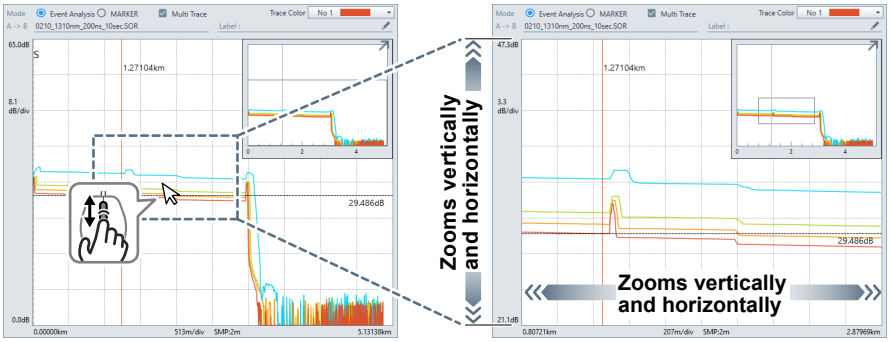
Note

To control the vertical axis, move the pointer near the Trace view of the vertical scale area.

- **Controlling the mouse wheel while pointing to the horizontal scale area**

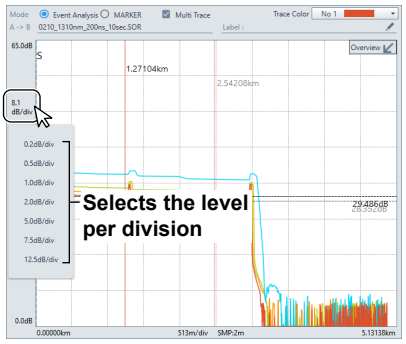


- **Controlling the mouse wheel while pointing to the position you want to zoom on the Trace view**



Zooming by Setting the Vertical Scale

4. By clicking the vertical scale display, you can set the level per division of the vertical axis.

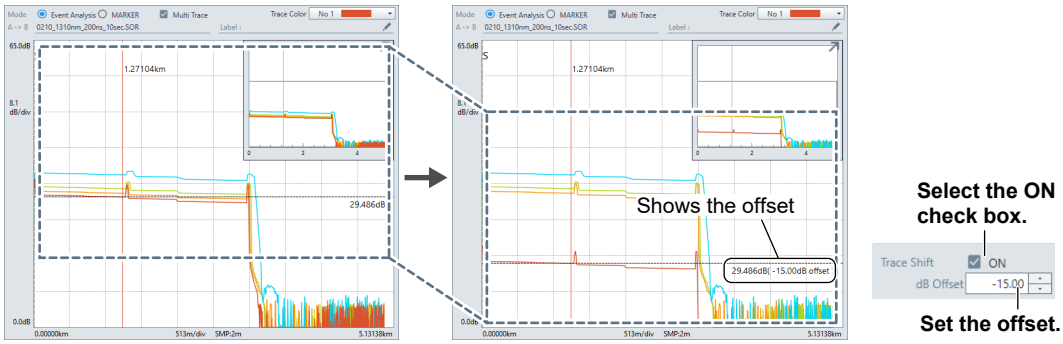


Moving the Waveform Display Range

4. Dragging an empty area on the Trace view moves the waveform display range.

Trace Shift

4. On the Control view, select the **ON** check box next to Trace Shift. The offset value input is enabled.
5. Set the offset value. The current waveform moves vertically.
   Selectable range: 40.00 dB to -20.00 dB



Multi Trace Processing

This feature becomes available when SOR files are loaded.

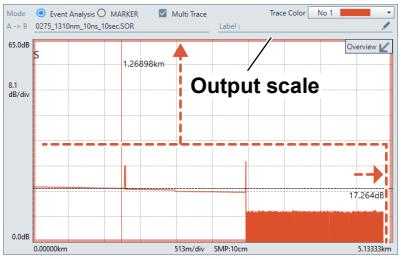
Master Event Setting, AutoSearch, and Trace Information can be processed collectively for all loaded SOR files. ► section 4.5

Output Scale

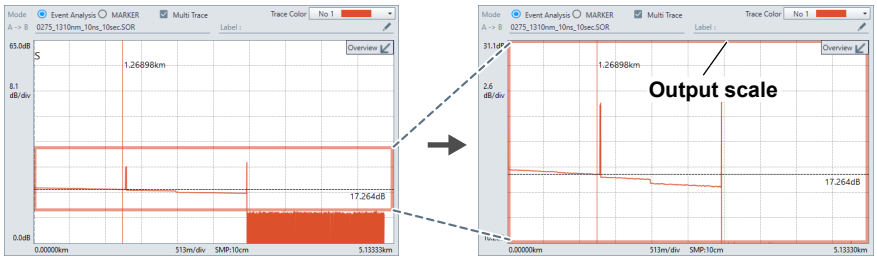
6. On the toolbar, set **Show Output Scale** to ON. The following options appear on the toolbar. The report output range of the waveform is displayed with a thick frame using the same color as the waveform color on the Trace view.

Set display area as output scale of all files
The scale information of all the waveforms loaded in the File List view is set to the display area of the Trace view.

Set display area as output scale
The scale information of the SOR file is set to the display area of the Trace view.

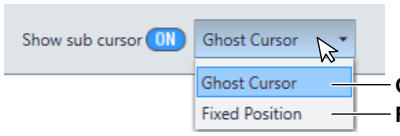


Zoom in output scale
The Trace view display is zoomed using the scale information stored in the SOR file.

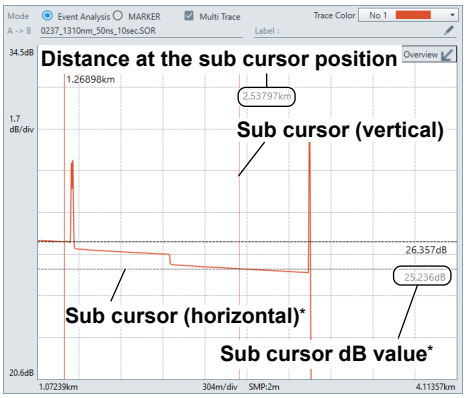


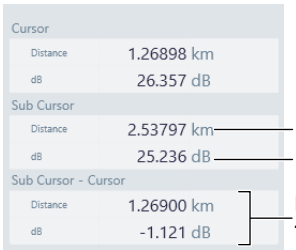
Sub Cursors

7. On the toolbar, set **Show sub cursor** to ON. From the drop-down list, select the sub cursor type. The distance and dB value indicated by the data point at the sub cursor are displayed on the Information view.



Ghost cursor
Fixed position





Distance at the sub cursor
dB value at the sub cursor
Distance and dB value between the sub cursor and cursor

* When a crosshair cursor is in use, a horizontal cursor and the dB value at the cursor are displayed on the Trace view. You can change the cursor display format using **Display Settings** on the Analysis tab of the **Setting** menu. ► section 9.4

Changing the Waveform Color

8. To change the current waveform color, click the waveform color button in the top area of the trace view, and select the desired color from the drop-down list.

Setting the Trace Information

9. To set the label and other trace information, click in the upper area of the Trace view.
The same screen as when you click in the file list view is displayed.

Explanation

Scale Display

Vertical Scale (dB/div)

The vertical scale is displayed as a level per one grid division (1 div).
As there are 8 divisions on the vertical axis of the Trace view, the entire display range is dB/div×8.

Horizontal Scale (cm/div, m/div, km/div)

The horizontal scale is displayed as a distance per one grid division (1 div).
As there are 10 divisions on the horizontal axis of the Trace view, the entire display range is cm/div × 10, m/div × 10, or km/div × 10.

Sample Interval (SMP)

This is one of the measurement conditions on the OTDR. For details, see the OTDR user's manual.

Multi Trace Check Box

ON: The current waveform and waveforms of the files set to "show" in the file list are displayed on the Trace view. Up to 20 waveforms can be displayed simultaneously.
OFF: Only the current waveform is displayed.

Output Scale

Set the output scale for exporting reports.
Set this when you want to use the scale information stored in the SOR files for the scale for exporting reports.
► section 7.4

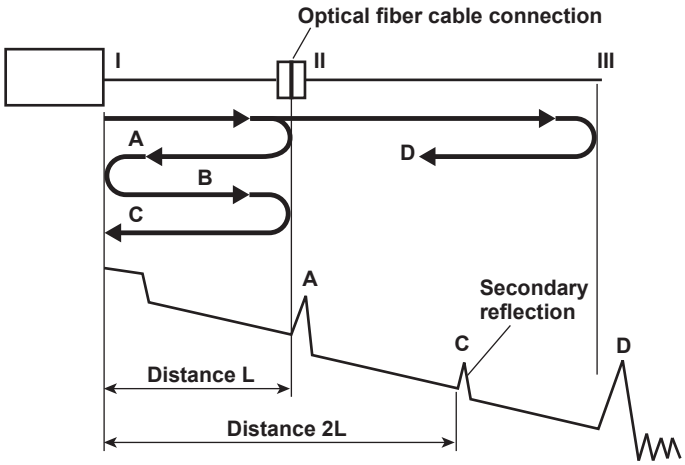
Sub Cursors

Ghost Cursor

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).
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.

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 software 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 software 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.



Fixed Position

The sub cursors operate in the same way as normal cursors.

Changing the Waveform Color

The colors that you can select from the waveform color drop-down list are colors assigned to trace numbers 1 to 24 of the color pattern. For details on the color pattern, see section 2.4.

Setting the Trace Information

You can view and edit the trace information of the selected file. ► section 3.2

4.2 Performing Analysis Using Markers

You can place markers on the waveform to draw an approximation line and measure the splice loss.
This section explains the following items:

- Marker operation
- Distance reference
- Approximation method (TPA, LSA)
- Loss and distance between two points
- Splice loss (4 point markers, 6 point markers)
- Return loss
- Section analysis

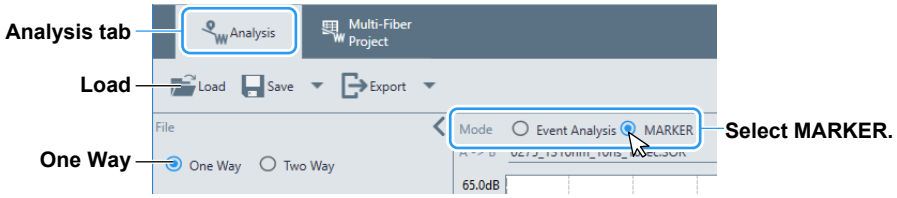
Procedure

Displaying Waveform Data

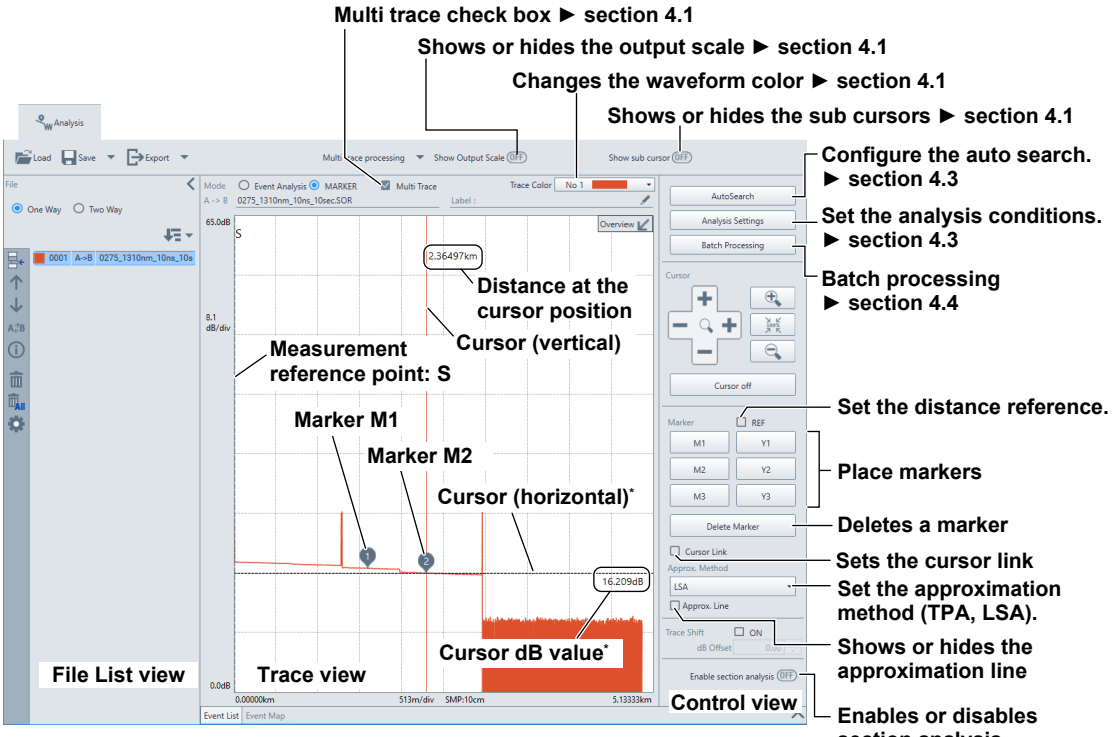
1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **One Way**.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1, 3.2
3. If necessary, set the display scale, display range, and the like of the waveform. ► section 4.1

Selecting the Analysis Mode

4. Select **MARKER** in the top area of the Trace view to switch to the marker analysis mode.



The following window appears.



* The horizontal cursor and cursor dB value are displayed when the crosshair cursor is in use.

Marker Operation

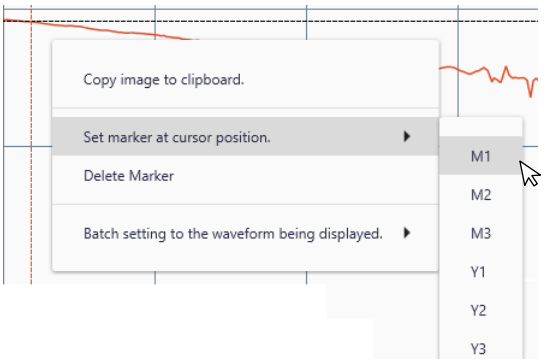
Placing Markers

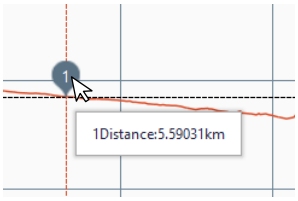
1. Move the cursor to the position where you want to place a marker, and specify the marker.
   - A marker is placed on the current waveform.
   - Moving the cursor ► section 4.1

Specifying a Marker

You can specify the marker to place using one of the following three methods.

- On the Control view, click **M1**, **M2**, **M3**, **Y1**, **Y2**, or **Y3**.
- Right-click on the Trace view, select **Set marker at cursor position**, and click the marker type.
- On the keyboard, press the shortcut key (see the table below) for the appropriate marker.





The marker icon is shown on the waveform. When you point to the icon, the distance is shown.

Icon	Marker type	Keyboard shortcut	Position
1	M1	1	Before Y1
2	M2	2	Between Y3 and Y2
3	M3	3	After Y2
Y1	Y1	Ctrl + 1	Between M1 and Y3
Y2	Y2	Ctrl + 2	Between M2 and M3
Y3	Y3	Ctrl + 3	Between Y1 and M2

Moving a Marker

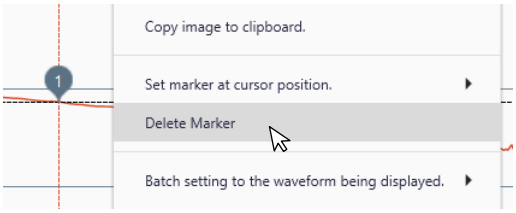
2. You can move a marker using one of the following two methods.
   - Drag the marker icon and drop it at the destination.
     The marker icon turns light blue while it is being moved and turns back to gray when movement is complete.
   - Move the cursor to the destination and specify the marker to move.
     For instructions on how to specify a marker, see “Placing Markers” (previous section).

Cursor Link

If you select the **Cursor Link** check box, all the markers of the current waveform move in sync when you drag the cursor or move it using the left and right keys of the keyboard.
This allows you to move multiple markers by retaining their relative positions.

Deleting Markers

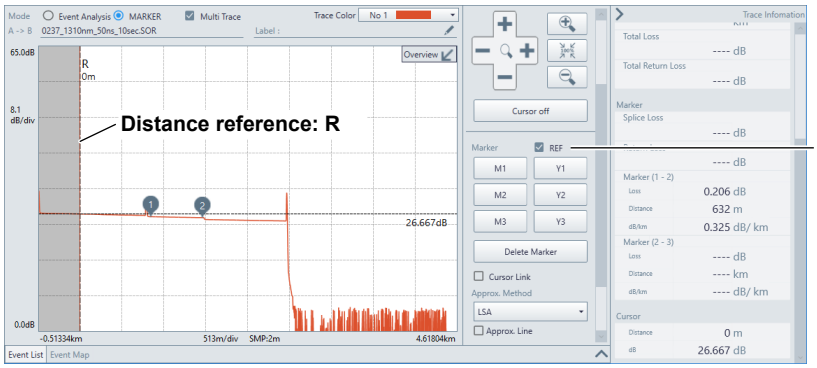
3. You can delete markers using one of the following two methods.
   - On the Control view, click **Delete Marker**.
   - Right-click on the Trace view, and click **Delete Marker**.



All markers will be deleted.

Distance Reference (REF)

1. Move the cursor to the position where you want to set the distance reference.
2. On the Control view, the **REF** check box. The distance reference marker R is displayed.



Setting the Approximation Method

1. On the Control view, click Approx. Method, and select TPA (two point approximation) or LSA (least squares approximation).

Loss and Distance between Two Points

This section explains how to measure the loss and distance between two specific points on a waveform.

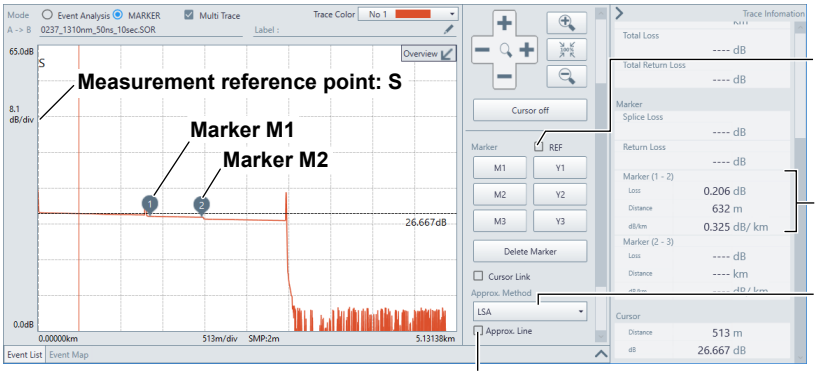
2 Point Markers

Placing Markers Using the Auto Search Feature ► section 4.3

1. On the Control view, click **AutoSearch**, and on the **Event Search Conditions** tab, set **Set Marker on S and E** to ON.
2. Click **Execute**. Markers M1 and M2 are automatically placed, and the measurement results are displayed in the Information view.

Placing Markers Manually

1. Set marker M1 to the measurement start position.
2. Set marker M2 to the measurement end position. Measurement results are displayed in the Information view.



Note

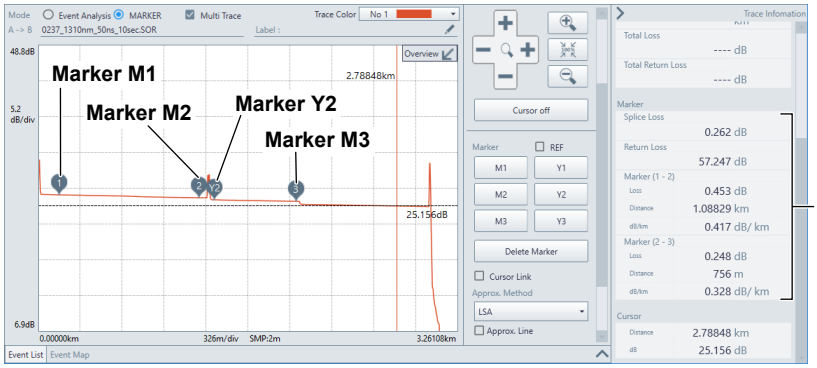
- When you set the markers, set them so that marker M1 is on the measurement start point (distance reference) side.
- The splice loss value changes depending on the approximation method that you have specified.

Splice Loss

This section explains how to measure the splice loss using the 4 Point Markers and 6 Point Markers methods.

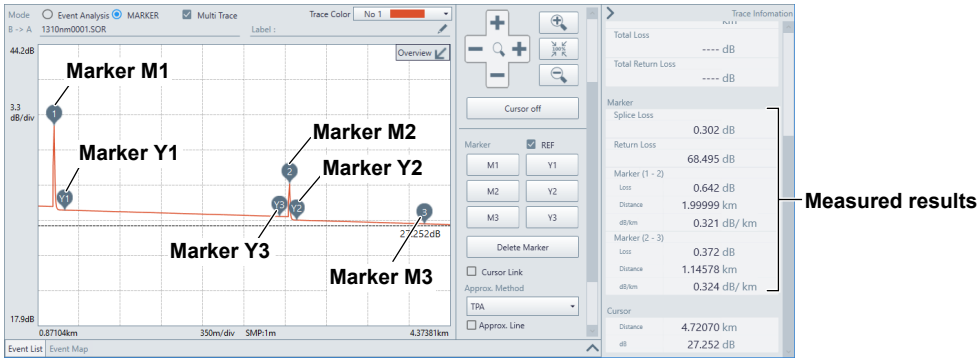
4 Point Markers

1. Place marker M1 at the position where the previous connection step ends.
2. Place marker M2 immediately before the connection step.
3. Place marker Y2 at the position where the connection step ends.
4. Place marker M3 before the next connection step. Measurement results are displayed under Splice Loss in the Information view.



6 Point Markers

1. Place marker M1 at the peak of the previous connection step.
2. Place marker Y1 at the position where the previous connection step ends.
3. Place marker Y3 before the connection step.
4. Place marker M2 at the peak of the connection step.
5. Place marker Y1 at the position where the connection step ends.
6. Place marker M3 before the next connection step. Measurement results are displayed under Splice Loss in the Information view.



Note

- Set the markers in the order shown in the figure above, starting with the measurement start point (the distance reference).
- Set marker M2 to the accurate position. The splice loss changes greatly depending on the position of M2.
- The splice loss value changes depending on the approximation method that you have specified.

Return Loss

This section explains how to measure return loss.

1. Place marker M1 before the connector connection point (Fresnel reflection point).
2. Place marker M2 at the peak of the connector connection point (Fresnel reflection point). The return loss measurement result is displayed under Return Loss on the Information view.

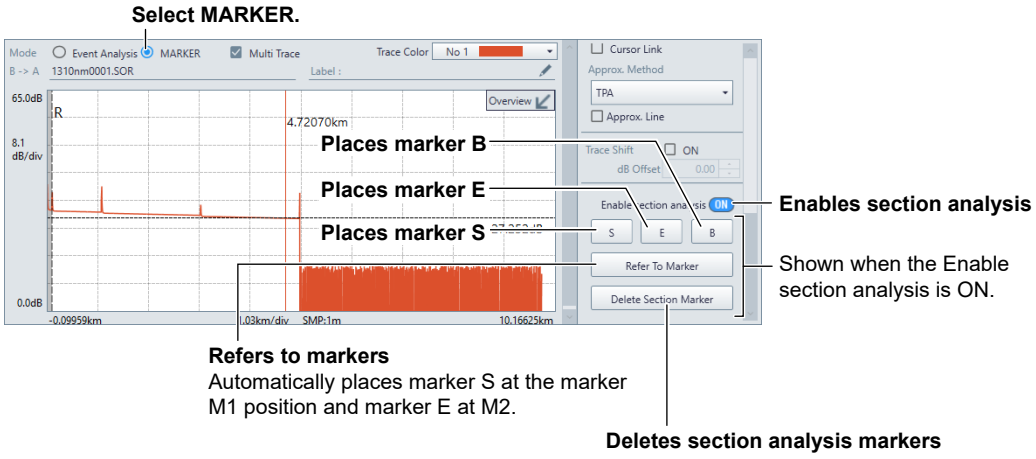
Note

Depending on the measured waveform, the waveform may saturate due to the Fresnel reflection light. If this happens, the return loss measurement will not be displayed correctly.

Section Analysis

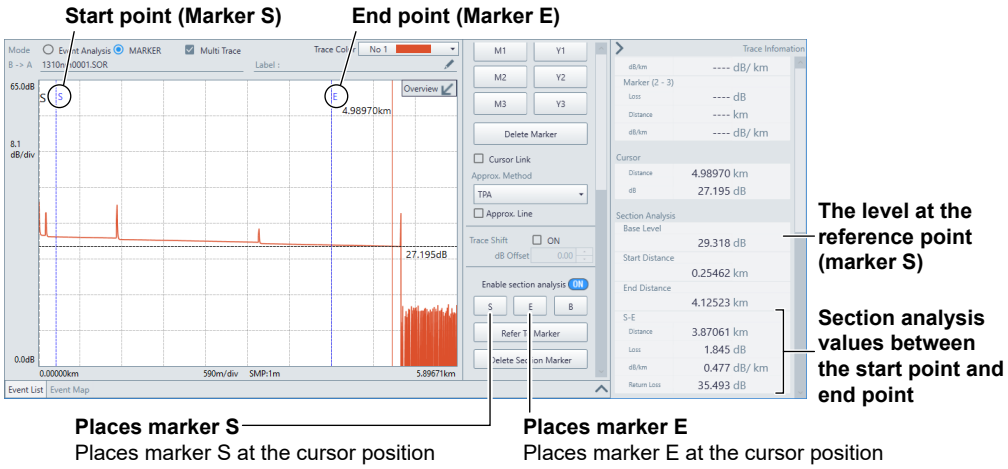
You can display section analysis markers on the Trace view, and measure the distance, return loss, total loss, and loss per unit length (dB/Km) in the specified section.

1. On the Control view, set **Enable section analysis** to ON. The following items are displayed in the Control view.



Setting the Start and End Points

2. Move the cursor to the start point position. Click **S** to display the marker S.
   If a reference point (marker B) is not specified using reference point adjustment, the start point becomes the reference point.
3. Move the cursor to the end point position. Click **E** to display the marker E.



Setting the Start or End points to a Set Marker M1 or M2

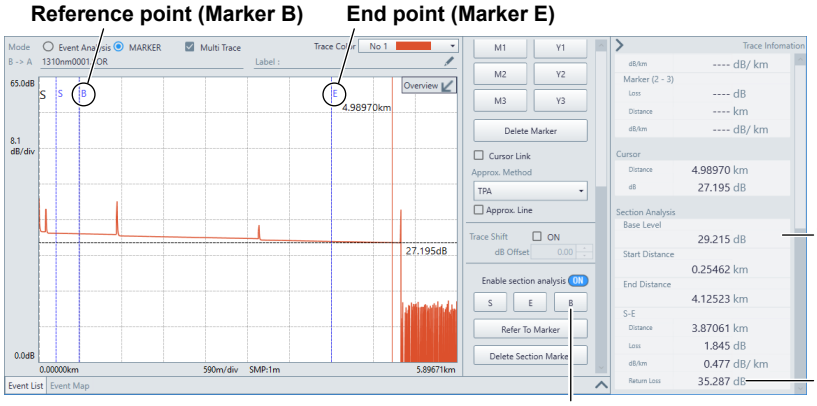
The position of marker M1 already set on the waveform data changes to a start point and the position of marker M2 changes to an end point.

2. Click **Refer To Marker**. The position of marker M1 changes to the start point, and the position of marker M2 changes to the end point.

Adjusting the Reference Level

2. Move the cursor to the reference point position. Click **B** to display the marker B.

   The position of marker B is the reference point for the return loss measurement. The instrument uses the backscatter level of the reference point to calculate the return loss. If a reference point is not specified, the start point is the reference point.



Explanation

Marker Operation

You can move point S (measurement reference point), point R (distance reference), markers, section analysis markers, and event markers (see section 4.3) by dragging the corresponding icons.

Distance Reference (REF)

Normally, the location where the OTDR 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.

Set the approximation method.

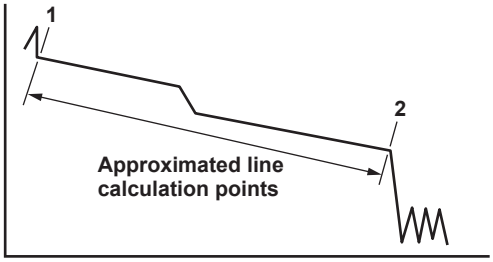
When the instrument calculates splice loss, it extrapolates straight lines. These straight lines are known as approximation lines.

There are the following two kinds of approximation lines.

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

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.



LSA

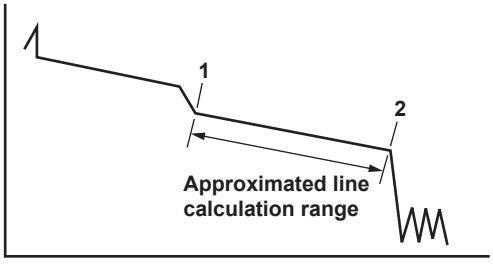
The instrument calculates the loss between two points by using the least squares method on all the data between the two points (between 1 and 2).

This method has the following characteristics.

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

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

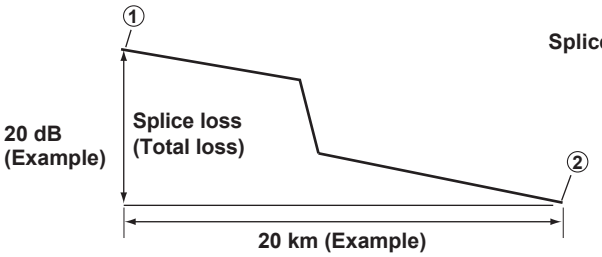
If no events such as reflections and splice losses are present in the section being calculated, the LSA provides a value that has a smaller degree of error than the TPA.



Loss and Distance between Two Points

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.

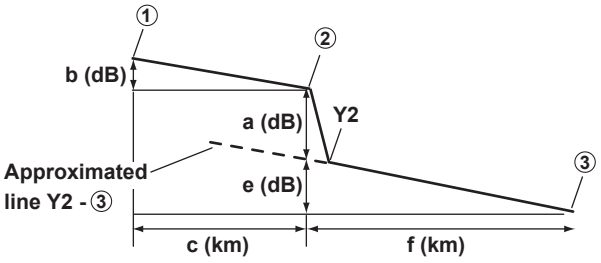


Marker	
Splice Loss	---- dB
Return Loss	---- dB
Marker (1 - 2)	
Loss	20 dB
Distance	20 km
dB/km	1 dB/km
Marker (2 - 3)	
Loss	---- dB
Distance	---- km
dB/km	---- dB/km

Splice Loss

4 Point Markers

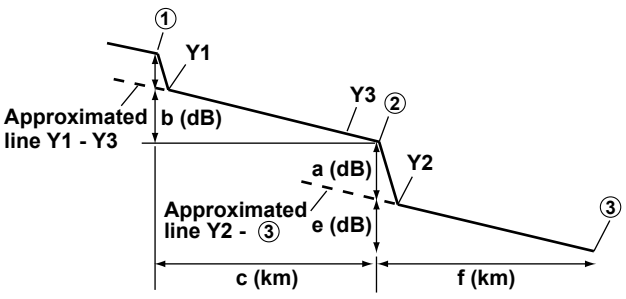
The instrument uses the following four points to perform the measurement: the measurement start point ①, the splice loss start point ②, the splice loss end point Y2, and the measurement end point ③. At position ②, the level difference between the approximated line ②–① and the approximated line Y2–③ is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



Marker	
Splice Loss	a dB
Return Loss	---- dB
Marker (1 - 2)	
Loss	b dB
Distance	c km
dB/km	b/c dB/km
Marker (2 - 3)	
Loss	e dB
Distance	f km
dB/km	e/f dB/km

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 approximated line, end point Y3 used to calculate the approximated line, the second splice loss start point ②, the second splice loss end point Y2, and the measurement end point ③. At the position of marker ②, the level difference between the approximated line Y1–Y3 and the approximated line Y2–③ is calculated as the splice loss.



Marker	
Splice Loss	a dB
Return Loss	---- dB
Marker (1 - 2)	
Loss	b dB
Distance	c km
dB/km	b/c dB/km
Marker (2 - 3)	
Loss	e dB
Distance	f km
dB/km	e/f dB/km

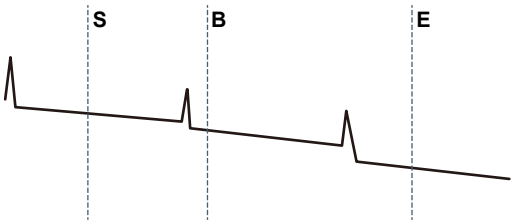
Return loss

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

$$RL = -10 \log(Pr/Pi) \text{ [dB]}$$

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 the reference point B marker, you can calculate the return loss using the backscatter level you specify.



4.3 Analyzing Events

Event information such as connections and splice points of the optical fiber stored in the loaded waveform data is displayed, and the distance, loss, and type of each event can be determined. You can specify TPA or LSA for the calculation method.

- Displaying event analysis information
- Event edit feature
- Executing auto searches
- Map view
- Event list/event map display
- Setting analysis conditions

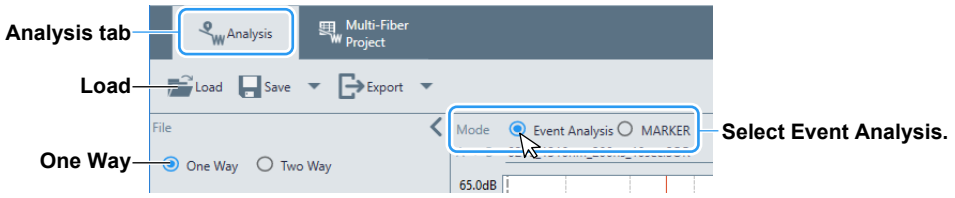
Procedure

Displaying Waveform Data

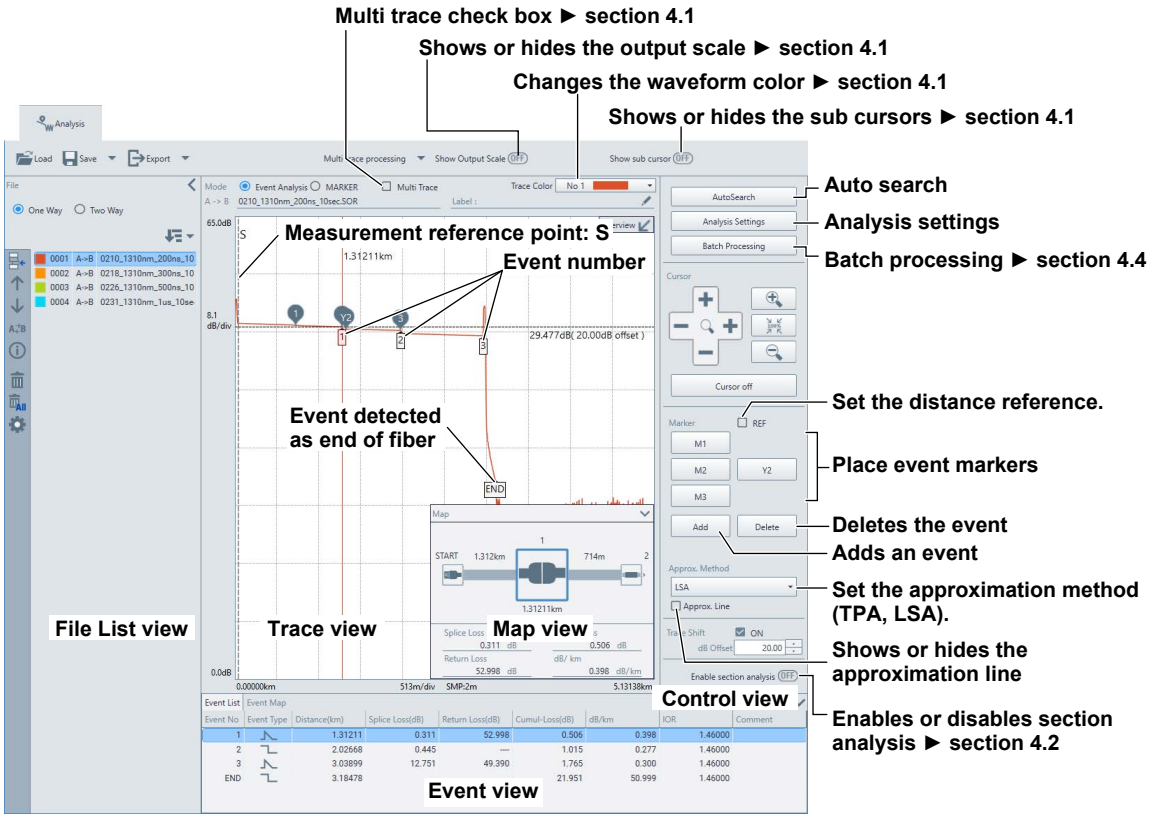
1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **One Way**.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1, 3.2
3. If necessary, set the display scale, display range, and the like of the waveform. ► section 4.1

Selecting the Analysis Mode

4. Select **Event Analysis** in the top area of the Trace view to switch to the event analysis mode.



The following window appears.



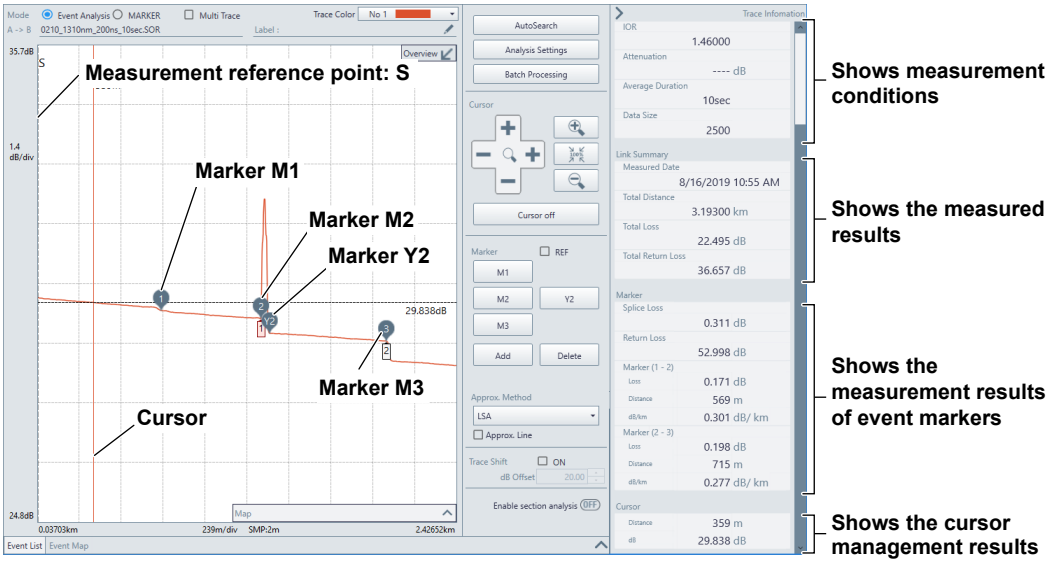
If the File Contains Event Analysis Information

The waveform and event information of the loaded file are displayed in the Trace view and Event view. Markers M1, M2, Y2, and M3 are placed.

If the File Does Not Contain Event Analysis Information

The waveforms of the loaded files are displayed in the Trace view. You can set analysis conditions and analyze events. ► page 4-25

The measurement conditions and marker and cursor measurement information are displayed on the Information view.



Switching the Current Event

The event selected with the following operation becomes the current event.

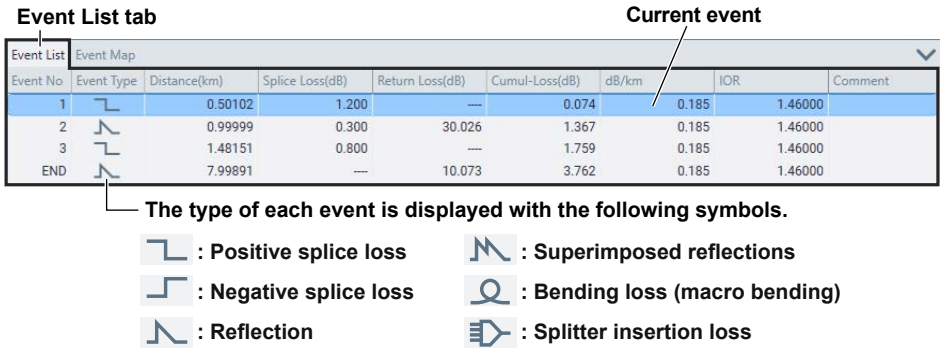
- Click an event number on the Trace view.
- Click an event icon on the Map view or event map.
- Click an event on the Event list.

Event View

The event list of the current waveform is displayed. If event information is not available, it is not displayed. You can switch the display by clicking the Event List or Event Map tab.

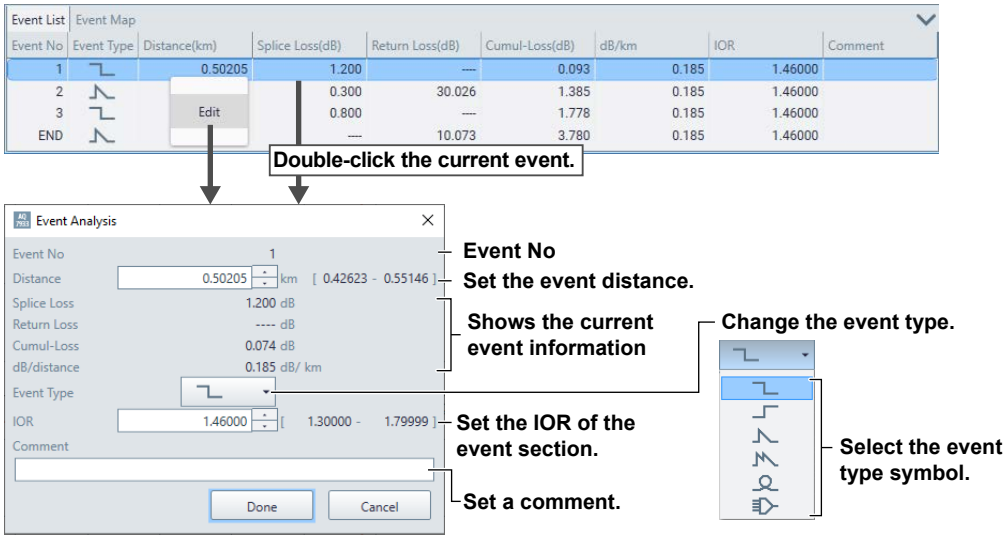
Event List

1. Click the **Event List** tab. The events detected in the auto event analysis are displayed in a list.



Editing Event Analysis

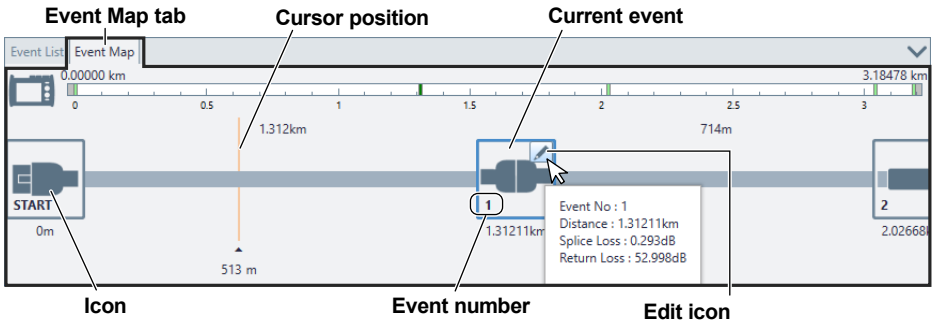
2. When you right-click the current event and select **Edit** or double-click the current event, the following window appears.



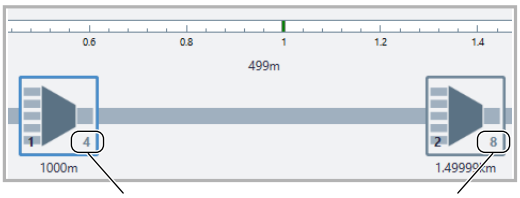
Event Map

1. Click the **Event Map** tab. The events detected in the auto event analysis are displayed with icons. When you click an icon, that event becomes the current event.

   ► See “How to View the Icon Display,” provided later.

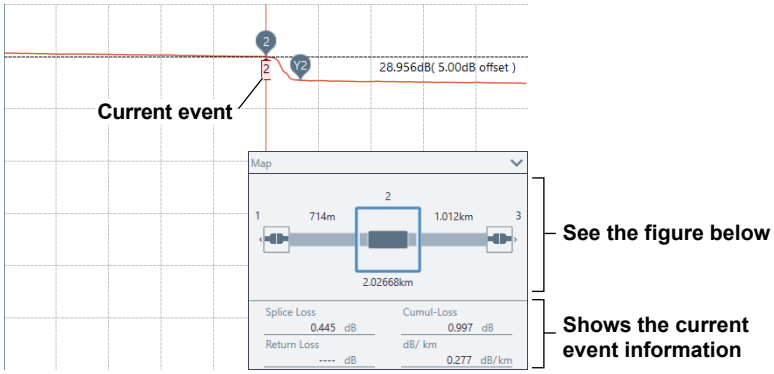


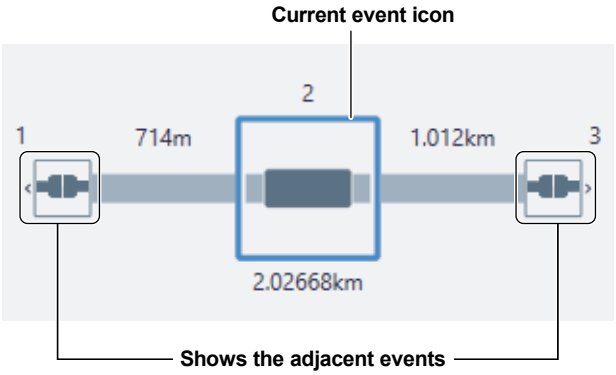
Splitter Display Example



Map View

1. The icon and the measurement results of the current event are displayed. When you click an icon, the corresponding event is zoomed on the Trace view.





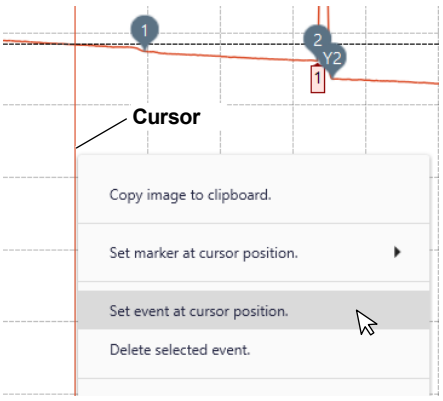
Editing Events

You can delete unnecessary events or add events if necessary events have not been detected.

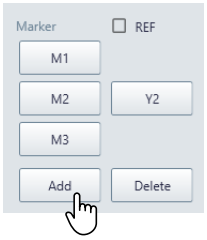
Adding an Event

1. Move the cursor to the position where you want to insert an event.
   Moving the cursor ► section 4.1
2. You can add events using one of the following two methods.
   - Right-click on the Trace view, and select **Set event at cursor position**.
   - On the Control view, click **Add**.

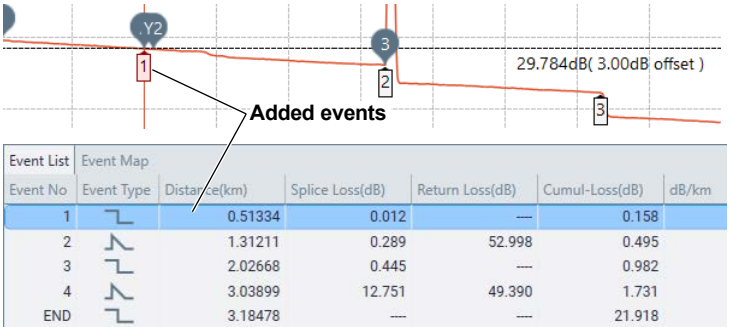
Right-click the Trace view.



Control view



The event is added, and markers M1, M2 (event position), Y2, and M3 are placed automatically from the left. All the event numbers are updated.



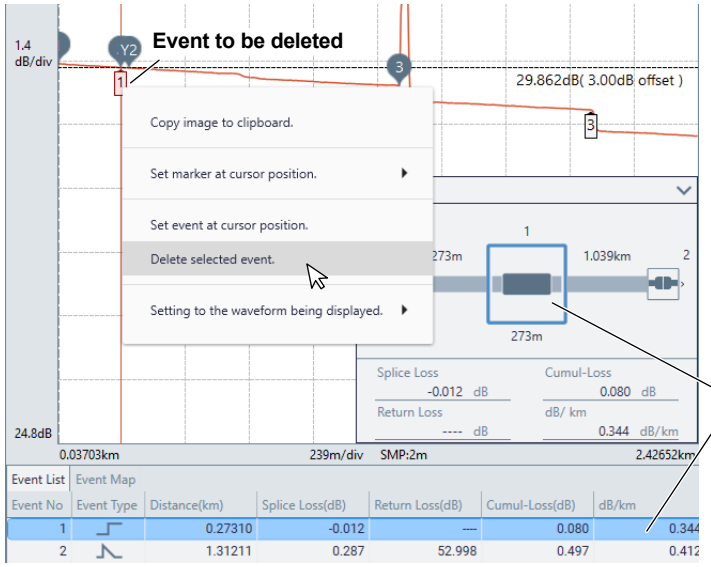
Note

- If you add 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 add events to the left of measurement reference point S.
- You cannot add events to the left of distance reference R.
- If you add an event to the right of event No. END, the inserted event becomes event No. END, and a new number is assigned to the former No. END event.

Deleting an Event

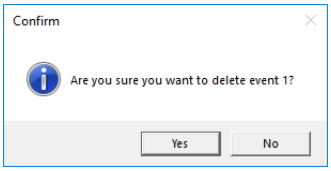
1. Click the event you want to delete to select it.
2. You can delete an event using one of the following two methods.
   - Right-click on the Trace view, and select **Delete selected event**.
   - On the Control view, click **Delete**.

Right-click the Trace view.



Control view

A confirmation message appears.



3. Click **Yes**. The selected event is deleted, and all the event numbers are updated.

Note

- If the only displayed events are measurement reference point S and event No. END, you cannot delete any events.
- If you delete an event, the subsequent event numbers will all be reduced by one.
- You cannot delete measurement reference point S.
- If you delete event No. END, the event that has the largest number becomes event No. END.

Moving Events

You can move an event by moving marker M2, which is the auxiliary marker of the event.

Moving an Event Marker

1. You can move a marker using one of the following two methods. ► section 4.2
   - Drag the marker icon and drop it at the destination.
   - Move the cursor to the destination and specify the marker to move.
     Moving the cursor ► section 4.1

Specifying a Marker

- On the Control view, click **M1**, **M2**, **Y2**, or **M3**.
- Right-click on the Trace view, select **Set marker at cursor position**, and click the marker type.
- On the keyboard, press the shortcut key (see the table below) for the appropriate marker.

Icon	Marker type	Keyboard shortcut	Possible position
1	M1	1	Before M2
2	M2	2	Between M1 and Y2
Y2	Y2	Ctrl + 2	Between M2 and M3
3	M3	3	After Y2

Note

A event marker can be set or moved within the range that satisfies the following relationship: marker M1 < M2 < Y2 < M3. If a marker cannot be moved to the cursor position, the following message appears in the bottom area of the window.

Distance Reference (REF)

1. Move the cursor to the position where you want to set the distance reference.
2. On the Control view, the **REF** check box. The distance reference marker R is displayed.

Note

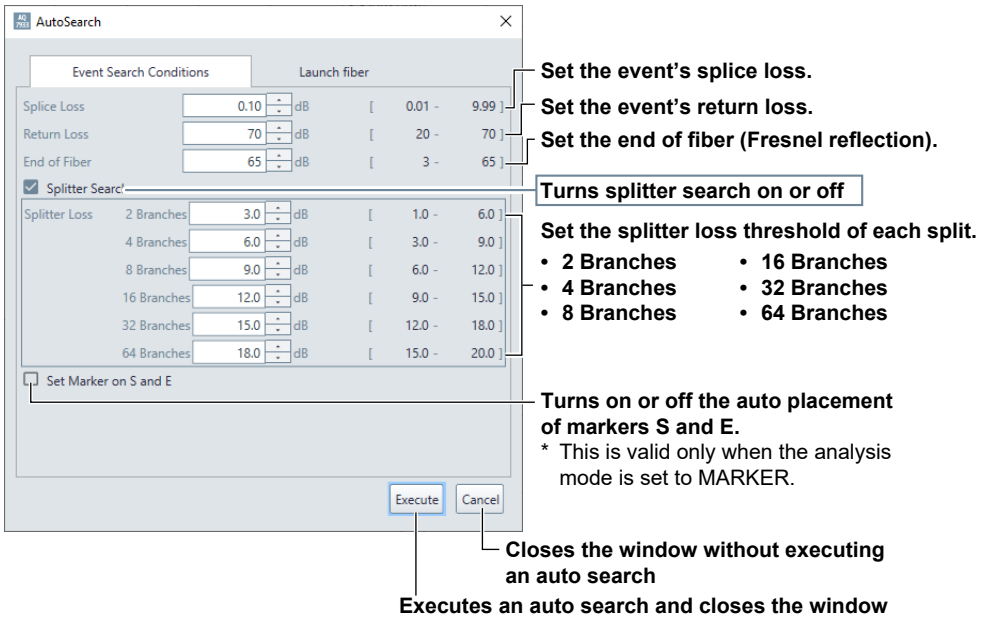
If you add distance reference R, measurement reference point S will disappear from the screen. In this situation, the measurement reference point is distance reference R. If you delete distance reference R, measurement reference point S reappears at its original position.

Auto Search

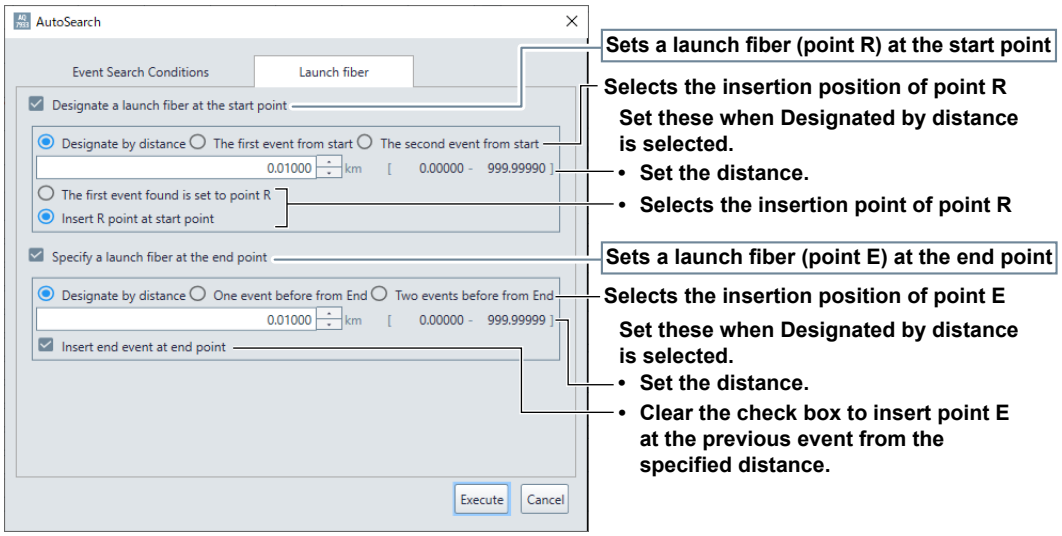
You can set analysis conditions and execute an auto search.

1. On the Control view, click **AutoSearch**. The following window appears.
2. Click the tabs, and set the necessary items.

- **Event Search Conditions**



- **Launch fiber**

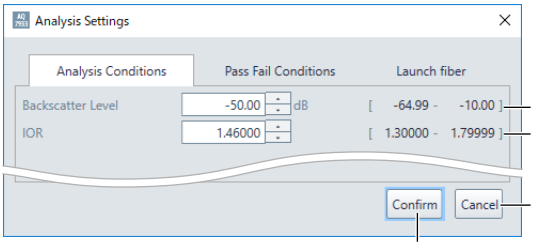


3. Click **Execute**. An auto search is executed according to the set conditions.

Setting Analysis Conditions

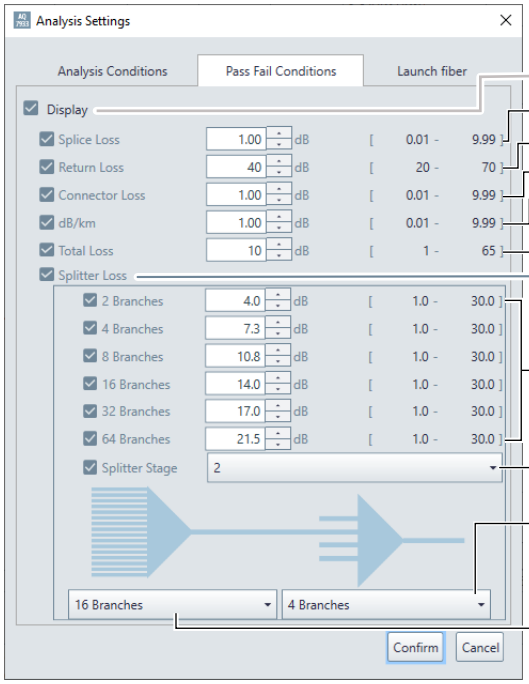
1. On the Control view, click **Analysis Settings**. The following window appears.
2. Click the tabs, in set the necessary items.

- **Analysis Conditions**



Backscatter level (-64.99 to -10.00)
IOR (1.30000 to 1.79999)
Cancels the settings
Applies the settings and closes the window

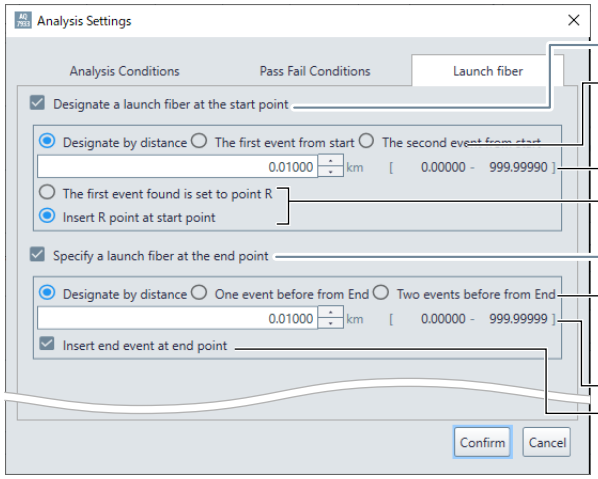
- **Pass Fail Conditions**



Showing or hiding pass/fail judgment results
Splice loss
Return loss
Connector loss
dB/km
Total loss
Showing or hiding splitter loss
Enable or disable each split, and set the splitter loss threshold.
- **2 Branches**
- **4 Branches**
- **8 Branches**
- **16 Branches**
- **32 Branches**
- **64 Branches**

Set the number of splitter stages (None, 1, 2).
When the number of stages is set to 1 or 2
- **Set the number of splits of stage 1 (Unknown, 2 Branches, 4 Branches, 8 Branches, 16 Branches, 32 Branches, 64 Branches)**
- **Set the number of splits of stage 2 (range: see stage 1).**

- **Launch fiber**



Sets a launch fiber (point R) at the start point
Selects the insertion position of point R
Set these when Designated by distance is selected.
- **Set the distance.**
- **Selects the insertion point of point R**

Sets a launch fiber (point E) at the end point
Selects the insertion position of point E
Set these when Designated by distance is selected.
- **Set the distance.**
- **Clear the check box to insert point E at the previous event from the specified distance.**

3. Click **Confirm**.

Explanation

Event Analysis

You can search for events in the waveforms loaded from files and measure the splice loss and the return loss.

Editing Event Analysis

When you display the event analysis edit screen from the event list or event map, you can edit the following items. For instructions on how to display the event analysis edit screen, see pages page 4-20 and page 4-21.

Distance

You can set the event distance.

Event Type

You can change the event type.

IOR

You can set indices of refraction for each event period. Setting the indices of refraction in accordance with the connected optical fiber cable makes accurate distance measurements possible.

Selectable range: 1.30000 to 1.79999

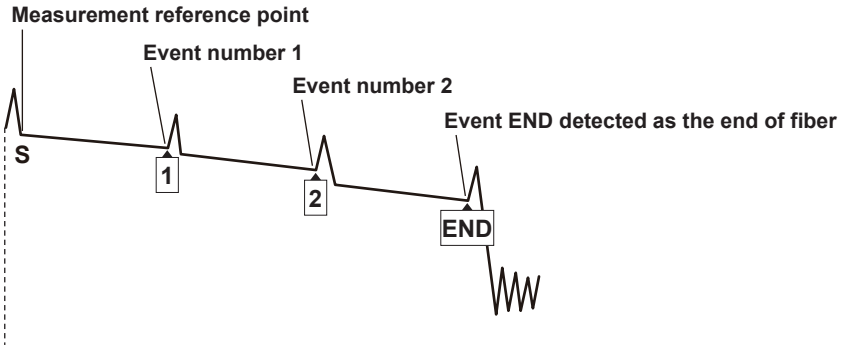
* These indices only affect event analysis. However, they are reflected in the waveform display.

Comment

You can enter a comment for each event period. Up to 60 characters.

Editing Events

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



Event List

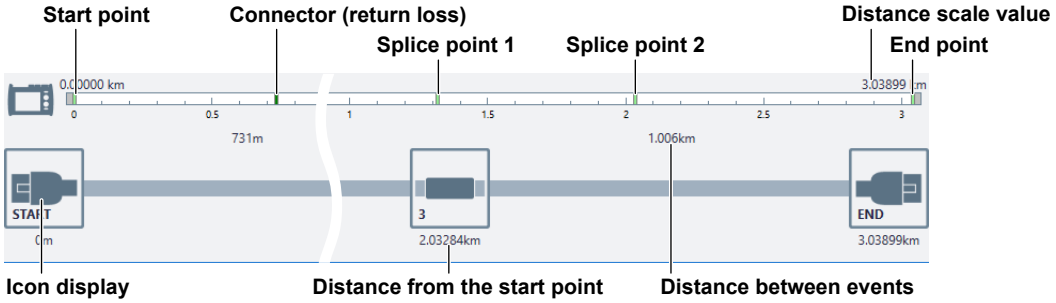
Displays a list of event analysis results for the current waveform.

Item		Description	
Event No		A number is displayed on the waveform next to the event. The numbers are in ascending order from the left of the display. Events with an asterisk displayed to the left of the event number in the event list are failed events. For details on failed events, see page 4-34.	
Event Type		The type of each event is displayed with the following symbols. When the event list is export to a csv format file, the event type is displayed as a string in ().	
	(S+)	Positive splice loss	An event without a reflection
	(S-)	Negative splice loss	An event without a reflection with an apparent negative loss
	(R)	Reflection	An event with a reflection
	(DR)	Superimposed reflections	An event with consecutive reflections
	(B)	Bending loss (macro bending)	An event with bending
	(SE)	Splitter insertion loss	A splitter event
Distance (km)		The distance from the measurement reference point to each event is displayed. If you move the distance reference, which is the measurement reference point R, the distance from the distance reference to each event is displayed. You can set the distance reference R on the Control view. Distance reference R also moves automatically according to the distance when a launch fiber is set.	
Splice Loss		The splice loss for each event is displayed. When the pass/fail judgment is set to ON, splice losses that exceed the fail event threshold are displayed in red characters.	
Return Loss		The return loss for each event is displayed. When the pass/fail judgment is set to ON, return losses that exceed the fail event threshold are displayed in red characters.	
Cumulate Loss		The loss from the measurement reference point is displayed. If the distance reference is specified, the distance reference is the measurement reference point. If the distance reference is not specified, the measurement reference point (S) is the measurement reference.	
dB/km		The loss per kilometer between events is displayed.	
IOR		The IOR between the current event and the previous event (0 km (or REF point) if there is no previous event)	
Comment		Comment for each event	

For details on the settings of the displayed items in the event list, see section 9.4.

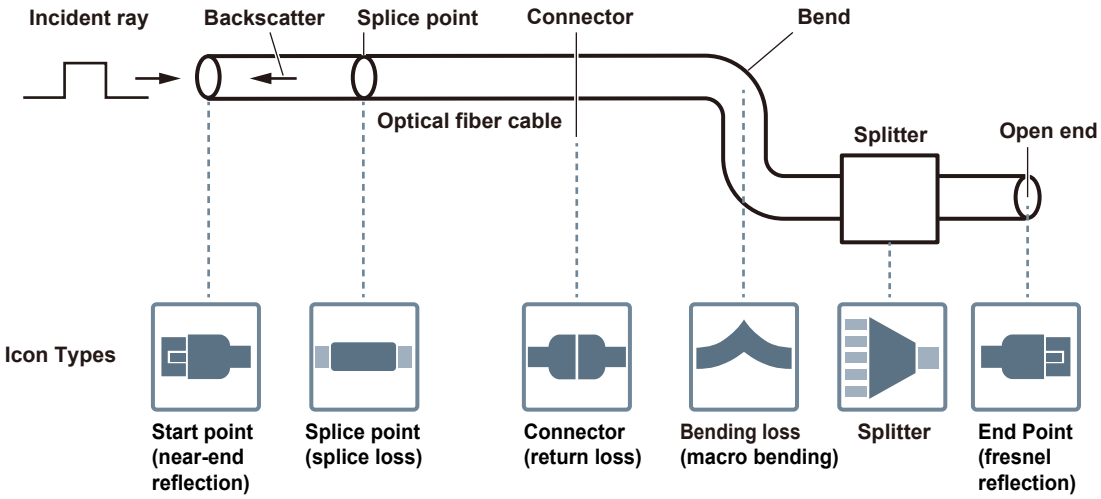
Event Map

The events in the event list are mapped as icons. Up to 100 events can be mapped.



How to View the Icon Display

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.



Auto Search

If necessary, you can set the following items and execute an auto search.

Event Search Conditions

Splice Loss

If a splice loss that exceeds the specified threshold occurs, it is detected as an event.
Selectable range: 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.
Selectable range: 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).
Selectable range: 3 dB to 65 dB

Splitter Search

ON: You can set the threshold for each of the optical splitters. When a measured result greater than the specified threshold is detected, it is identified as a splitter event and displayed along with the number of splits.

OFF: Losses (reflections) that exceed splitter loss are displayed as normal events.

- **Splitter Loss**

  Events whose loss exceeds this value are assumed to be optical splitters according to the number splits.

  Selectable range: 1.0 dB to 20.0 dB (common to all splits)

  * Set each split value so that the following relationship is met: 2 Branches ≤ 4 Branches ≤ 8 Branches ≤ 16 Branches ≤ 32 Branches ≤ 64 Branches.
    A split value cannot be set greater than the next split value.
    Example: The 2 Branches value cannot be set greater than 4 Branches.

Set Marker on S and E

This is valid only when the analysis mode is set to MARKER.

ON: Markers M1 and M2 are placed automatically when an auto search is executed.

OFF: Markers M1 and M2 are not placed automatically when an auto search is executed.

Launch Fiber

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 the start position as a distance so that the event information in the launch fiber section is excluded from the analysis conditions used when an auto search is executed.

Designate a launch fiber at the start point

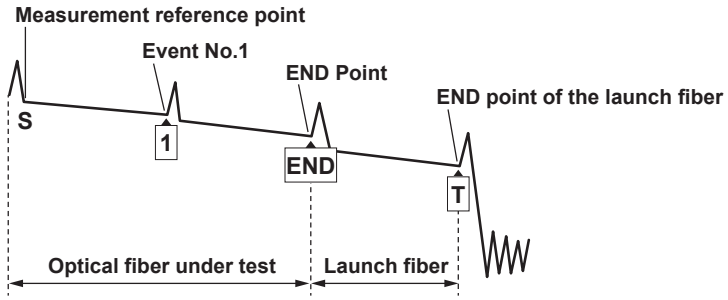
Point REF is placed at the specified distance or the specified event position and makes it the start point.

- **Designate by distance**
  Setting range: 0.0000 km to 999.99998 km
  Select either of the following:
  - The first event found is set to point R: Point R is inserted at the first event after the specified distance.
  - Insert R point at start point: Point R is inserted at the specified distance.
- **The first event from start**
  Point R is inserted at the first event from start.
- **The second event from start**
  Point R is inserted at the second event from start.

Specify a launch fiber at the end point

Point E is placed at the specified distance or the specified event position and makes it the end point.

- **Designate by distance**
  Setting range: 0.0000 km to 999.99999 km
  - Insert end event at end point
    ON: Point E is inserted at the specified distance.
    OFF: Point E is set to the event one event before the specified distance.
- **One event before from End**
  Point E is set to one event before from end.
  Select this when a launch fiber is connected to the far end of the optical fiber cable under measurement and end event T is set in the launch fiber settings.

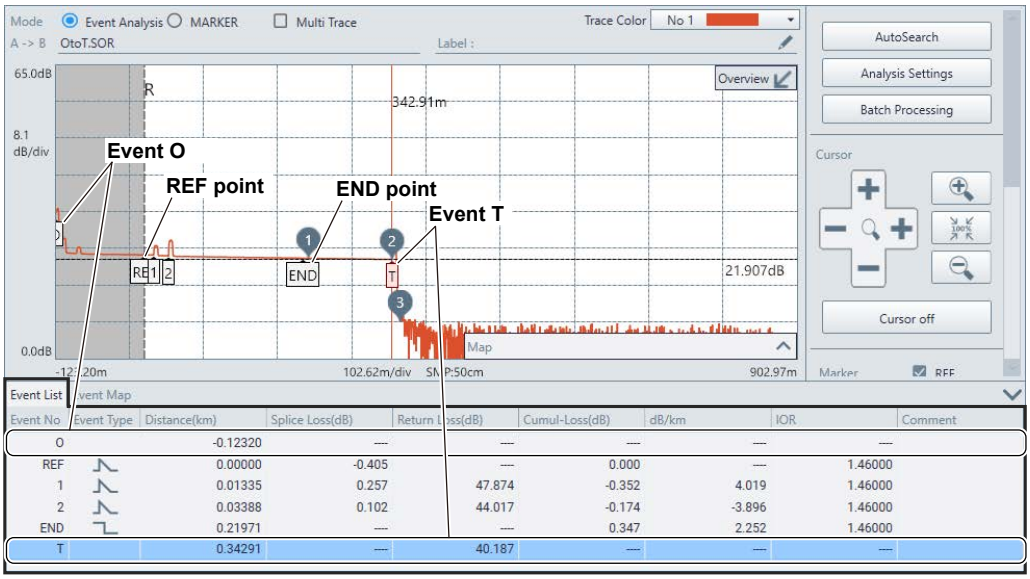


- **Two events before from End**
  Point E is set to two events before from end.

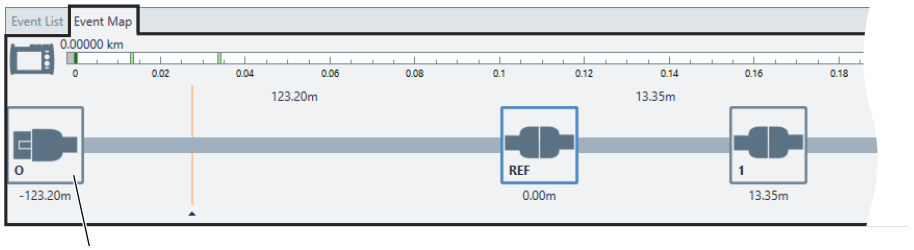
Display when a launch fiber is set

- When you set a start point launch fiber (point R), analysis can be performed by assuming the start point of the launch fiber to be the origin event (O). The length of the launch fiber (the distance) from the origin (O) to the distance reference (REF) is displayed.
- When you set an end point launch fiber (point E), analysis can be performed by assuming the end point of the launch fiber to be the end event (T). The length of the launch fiber (the distance) from the END point to the end event (T) is displayed.

See the next page for display examples.

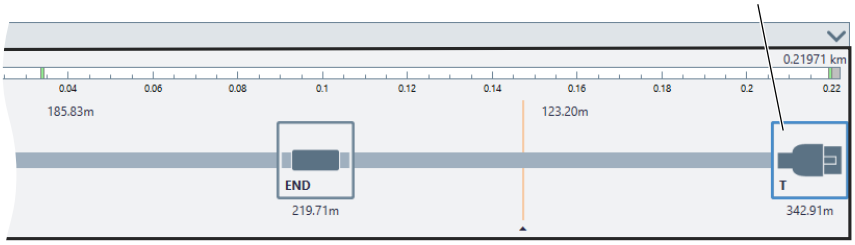


Event Map



Origin event: O

End event: T



Setting Analysis Conditions

Set the parameters to use to calculate the waveform distance.

Analysis Conditions

Backscatter Level

Set the backscatter level at the measurement wavelength of the selected file.
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.
Set the backscatter level correctly. Otherwise, the return loss and total return loss measurements will be incorrect.

Wavelength	Backscatter level*
850 nm	–37.00 dB
1300 nm	–44.00 dB
1310 nm	–50.00 dB
1383 nm	–51.00 dB

Wavelength	Backscatter level*
1490 nm	–52.00 dB
1550 nm	–52.00 dB
1625 nm	–53.00 dB
1650 nm	–53.00 dB

* 1 µs pulse width

Selectable range: –64.99 dB to –10.00 dB

IOR

The software uses the index of refraction to calculate the distance. Set the IOR value correctly. Otherwise, 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.

Wavelength	IOR
850 nm	1.46000
1300 nm	1.46000
1310 nm	1.46000
1383 nm	1.46000

Wavelength	IOR
1490 nm	1.46000
1550 nm	1.46000
1625 nm	1.46000
1650 nm	1.46000

Selectable range: 1.30000 to 1.79999

Pass Fail Conditions

Set the conditions to use in pass/fail judgments. Set the threshold values that are used to display fail judgment events for each item.

Showing or Hiding Pass/Fail Judgment Results

ON: The settings of each item are enabled. If a condition is met, the detection result is displayed as fail.

OFF: Judgment results are not displayed.

Splice Loss

If the splice loss of the splice event is greater than the threshold, it is detected as fail.

Selectable range: 0.01 dB to 9.99 dB

Return Loss

If the return loss is less than the threshold, it is detected as fail.

Selectable range: 20 dB to 70 dB

Connector Loss

If the splice loss of the reflection event is greater than the threshold, it is detected as fail.

Selectable range: 0.01 dB to 9.99 dB

dB/km

If the dB/km value is greater than the threshold, it is detected as fail.

Selectable range: 0.01 dB to 9.99 dB

Total Loss

If the total loss value is greater than the threshold, it is detected as fail.

Selectable range: 1 dB to 65 dB

Showing or Hiding Splitter Loss

If splitters are inserted, you can select whether to detect the losses caused by them.

If you set a threshold for each number of splitter splits, the number of splitter splits can be determined automatically from the measured loss.

- A failure is detected in the following cases:
  - The detected splitter configuration is different from the network configuration setting.
  - The splitter event splice loss is greater than the threshold.
- Selectable range: 1.0 dB to 30.0 dB (common to all splits)
  - * A split value can be greater than the next split value.
    Example: The 2 Branches value can be set greater than 4 Branches.

Launch Fiber

When you connect a launch fiber cable and set launch fiber cable events (start point and end point) or a start position using distance, the event information in the launch fiber section can be excluded from the analysis conditions. The details of the settings are the same as those of the launch fiber settings of auto search (page 4-31).

Showing or Hiding Pass/Fail Judgment Results

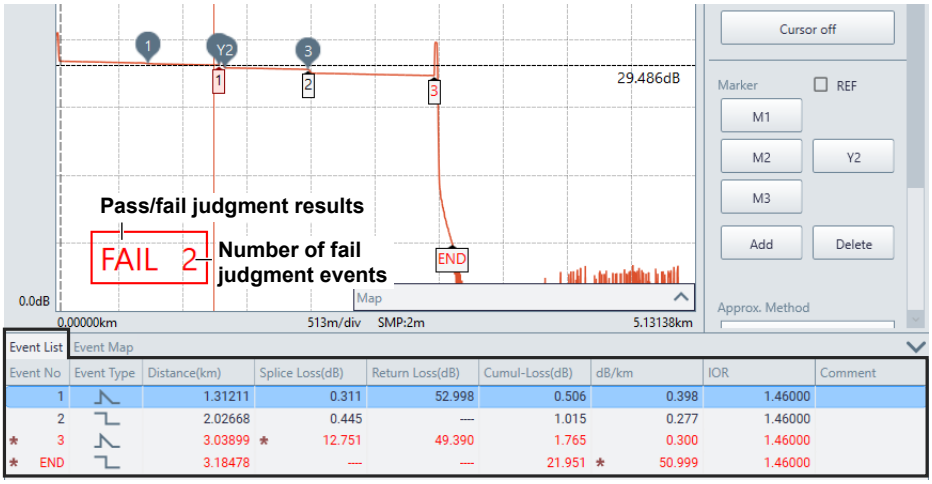
The pass/fail judgment results are displayed on the Trace view, event list, and event map.

Trace View

The analysis result (pass/fail) of the trace, the pass/fail result of the total loss value, and the number of fail judgment events are displayed.

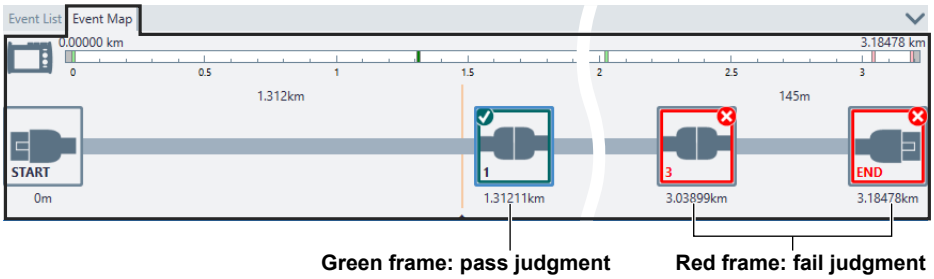
Event List

The pass/fail judgment results of each event are displayed. An asterisk is marked on failed events, and the conditions that failed are indicated in red.



Event Map

The pass/fail judgment results are indicated in the icons of each event.



4.4 Batch Processing

This feature copies the set items collectively to multiple waveform files.

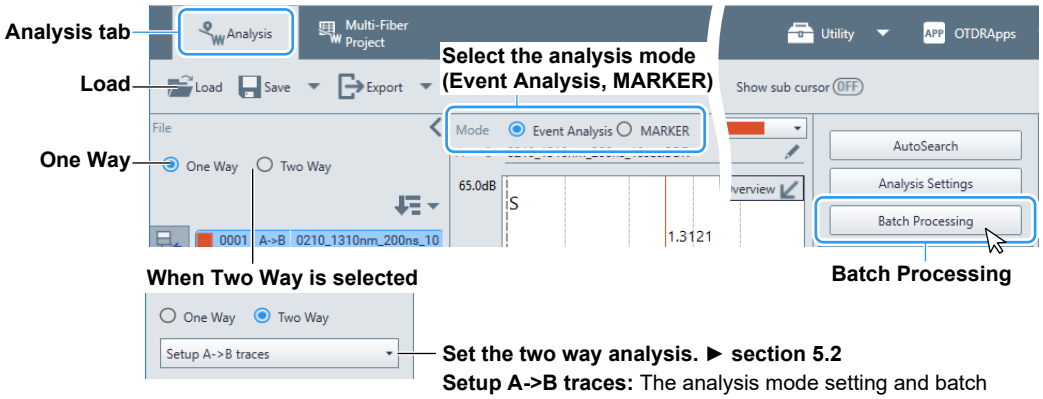
Procedure

Displaying Waveform Data

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **One Way** or **Two Way**.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1, 3.2
3. If necessary, set the display scale, display range, and the like of the waveform. ► section 4.1

Selecting the Analysis Mode

4. Select **Event Analysis** or **MARKER** in the top area of the Trace view.



Set the two way analysis. ► section 5.2

Setup A->B traces: The analysis mode setting and batch processing are valid.

Setup B->A traces: The analysis mode setting and batch processing are valid.

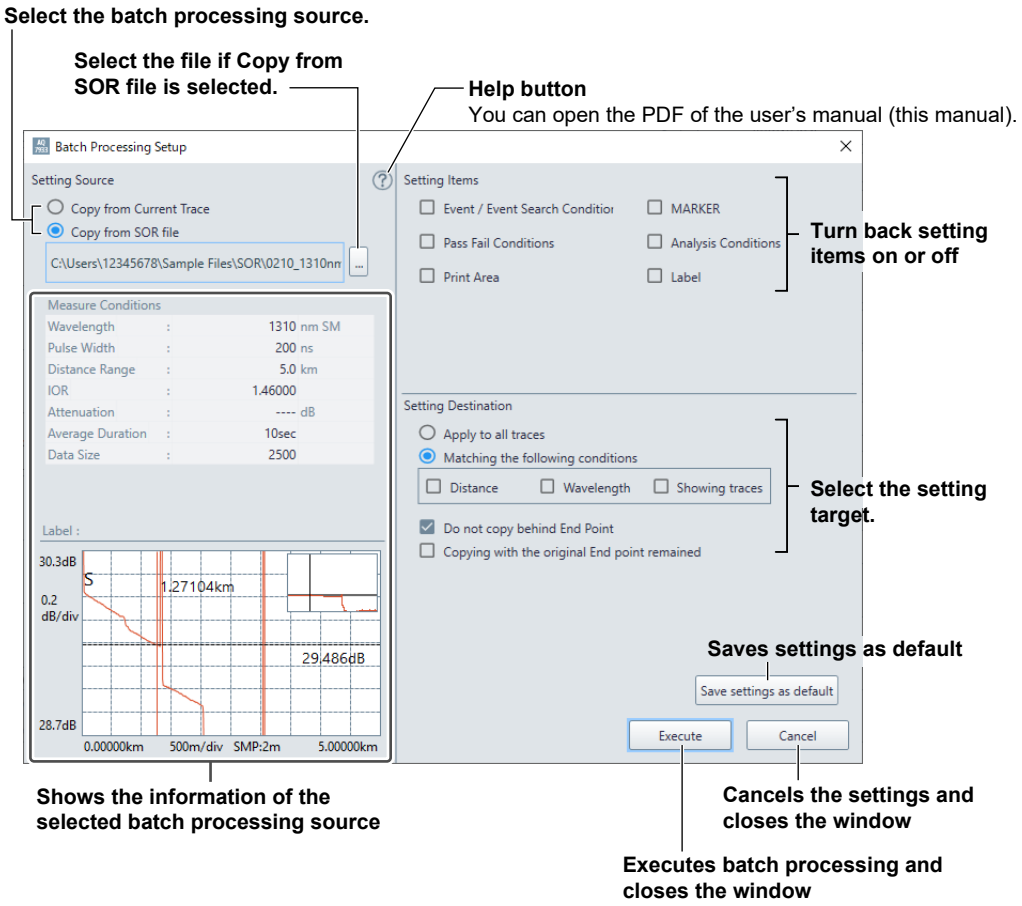
Execute 2way Analysis: The analysis mode setting is invalid. Batch processing is not displayed.

Batch Processing

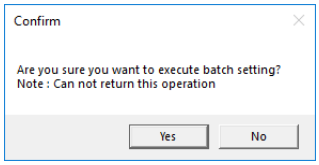
5. On the Control view, click **Batch Processing**. The following window appears.
6. Set Batch Processing Source to **Copy from Current Trace** or **Copy from SOR file**.

   If you select Copy from SOR file, click the [...] button and select the file.

   The measurement conditions, labels, and waveforms of the selected copy source file are displayed.
7. Set Batch Processing Items and Setting Destination.



8. Click **Execute**. A confirmation message appears.



9. When you click **Yes**, the items set here are copied from the batch processing source data to the specified destination. If you click **No**, the confirmation message closes, and the Batch Processing window is displayed.

Explanation

Batch Processing

Selecting the Batch Processing Source

Select the current trace or a file for the copy source data. The information about the selected file (measurement conditions, labels, and waveforms) is displayed in the batch processing window as the copy source data information.

- **Copy from Current Trace**
  The copy source data is set to the file assigned to the current waveform.
- **Copy from SOR file**
  You can select an SOR file saved in a PC or USB memory device as the copy source.

Batch Processing Items

The following items can be copy collectively. You can select and copy multiple items.

- **Event/Event Search Conditions**
  Event marker positions, event search conditions, and point R information or copied. The END event of each waveform is retained.
- **MARKER**
  The free marker positions or copied to other waveforms.
- **Pass Fail Conditions**
  The enabled/disabled state of pass/fail judgment in the judgment conditions are copied.
- **Analysis Conditions**
  The backscatter level and IOR settings are copied. However, they are not copied to files with wavelengths different from the copy source.
- **Print Area**
  The set output scale information is copied.
- **Label**
  The label information is copied. You can set the label information of the current waveform by selecting Trace Information on the File List view and entering the information in the text box.
  ► section 3.2

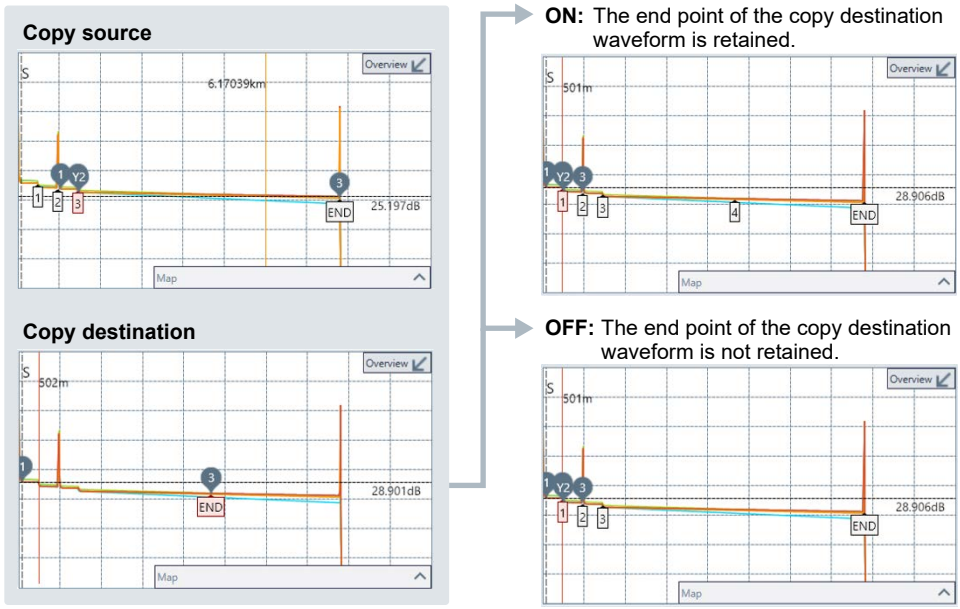
Setting Destination

Select the copy destination waveforms as follows:

- **Apply to all traces**
  The items are copied to all loaded waveforms.
- **Matching the following conditions**
  The items are copied to waveforms that meet the specified conditions among the loaded waveforms. If you select multiple conditions, waveforms that meet all the conditions are applicable.
  The conditions that you can set are as follows:
  - Distance
  - Wavelength
  - Showing traces

- **Do not copy behind End Point**
  ON: If the data to be copied (e.g., markers and events) falls after point E (end point) of the copy destination, that information is not copied.
  OFF: Even if the data to be copied (e.g., markers and events) falls after point E of the copy destination, that information is copied.

- **Copying with the original End point remained**
  ON: Point E, the copy destination, is retained. Markers, events, and other types of data are copied.
  OFF: Point E, the copy destination, is not retained. Markers, events, and other types of data are copied.



Save settings as default

You can save the batch processing conditions set here as default settings.

4.5 Multi Trace Processing

This feature becomes available when SOR files are loaded. The following items can be processed collectively.

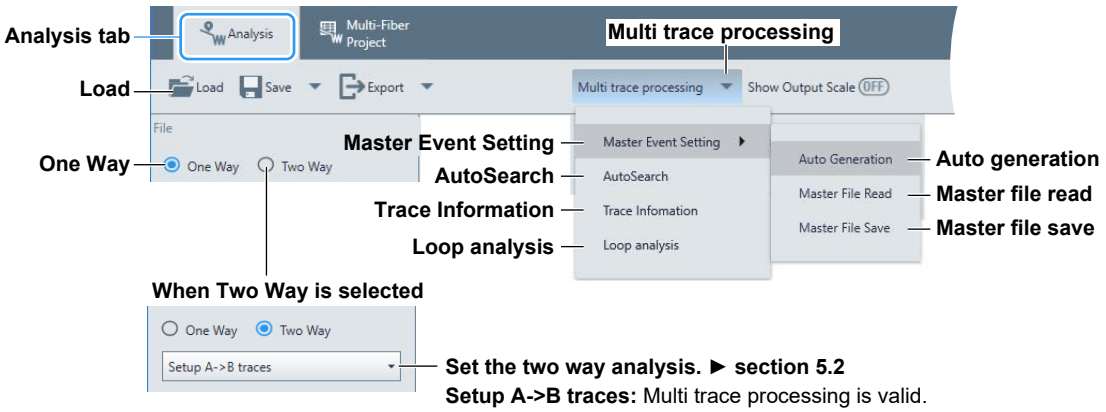
- Master event setting
- Trace information
- Auto search
- Loop analysis

Procedure

For the loop analysis (loopback analysis) procedure, see page 4-45.

Displaying Waveform Data

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **One Way** or **Two Way**.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1, 3.2
3. If necessary, set the display scale, display range, and the like of the waveform. ► section 4.1



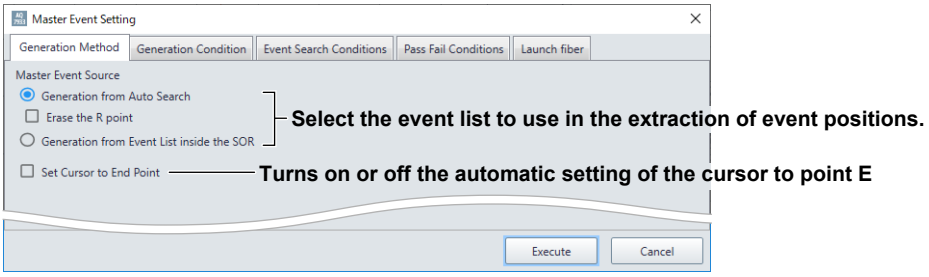
Master Event Setting

You can assign events to all loaded waveforms at once. You can also load a waveform file as a reference (master) and apply event positions to all waveforms.

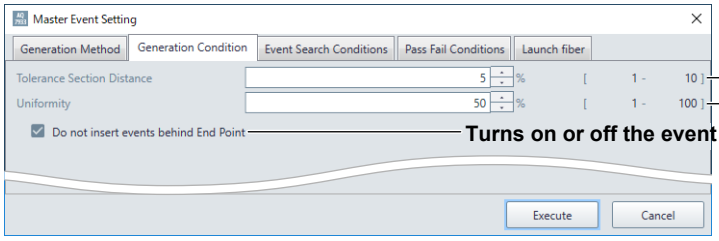
Auto Generation of Master Events

4. On the toolbar, click **Multi trace processing**, **Master Event Setting**, and then **Auto Generation**. A Master Event Setting window appears.
5. Click the tabs, in set the necessary items.

- **Generation Method**



- **Generation Condition**

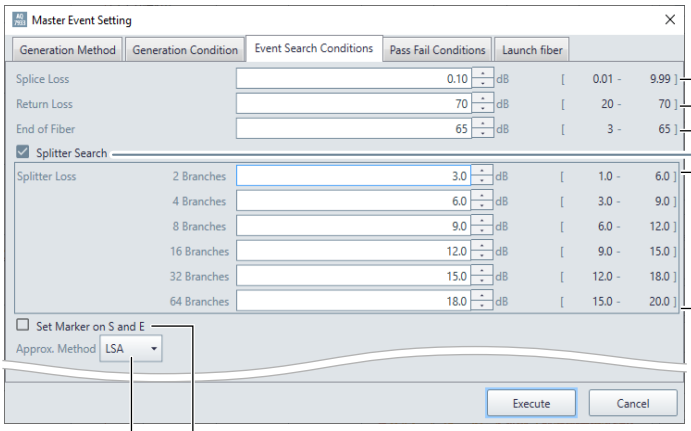


Tolerance section distance (1 to 10)%

Uniformity (1 to 100)%

Turns on or off the event insertion after point E

- **Event Search Conditions**



Set the event's splice loss.

Set the event's return loss.

Set the end of fiber (Fresnel reflection).

Turns splitter search on or off

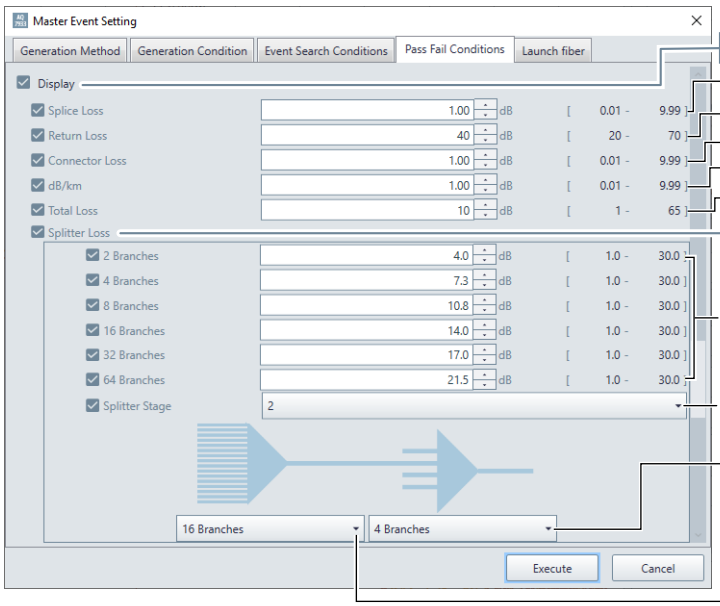
Set the splitter loss threshold of each split.

- 2 Branches
- 4 Branches
- 8 Branches
- 16 Branches
- 32 Branches
- 64 Branches

Turns on or off the auto placement of markers S and E.

Set the approximation method (TPA, LSA).

- **Pass Fail Conditions**



Showing or hiding pass/fail judgment results

Splice loss

Return loss

Connector loss

dB/km

Total loss

Showing or hiding splitter loss

Enable or disable each split, and set the splitter loss threshold.

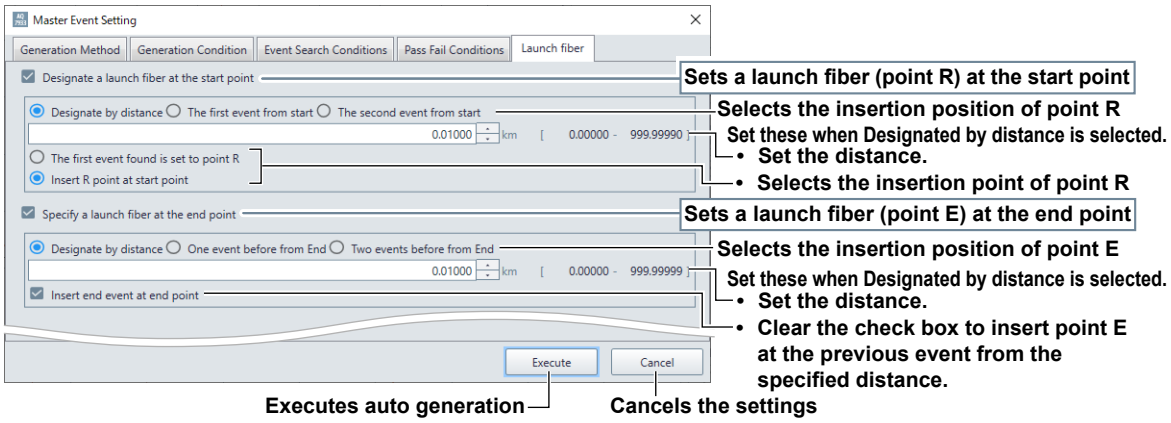
- 2 Branches
- 4 Branches
- 8 Branches
- 16 Branches
- 32 Branches
- 64 Branches

Set the number of splitter stages (None, 1, 2).

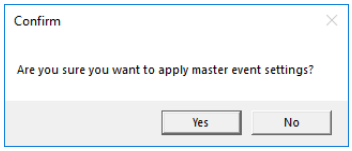
When the number of stages is set to 1 or 2

- Set the number of splits of stage 1 (Unknown, 2 Branches, 4 Branches, 8 Branches, 16 Branches, 32 Branches, 64 Branches)
- Set the number of splits of stage 2 (range: see stage 1).

- **Launch fiber**



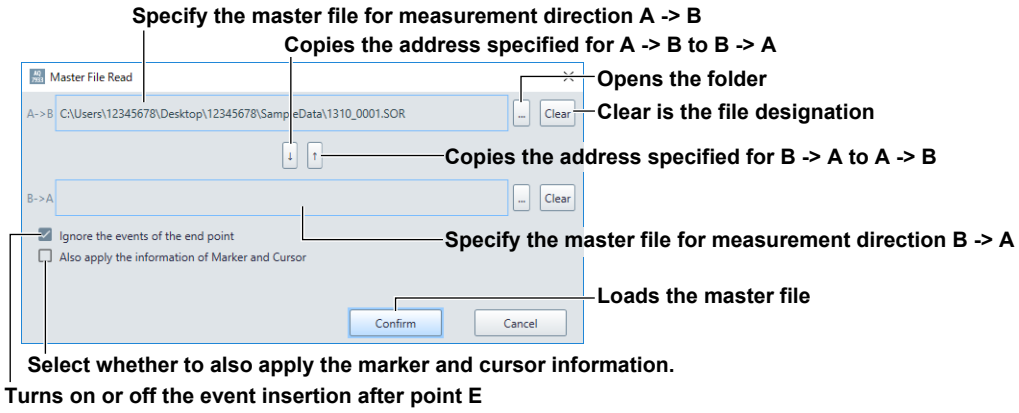
6. Click **Execute**. The following confirmation message appears.



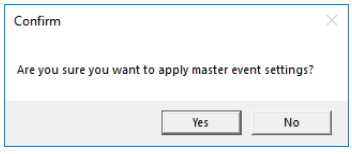
7. Click **Yes**. Based on the method and conditions set in step 5, events are set to the same positions on all loaded waveforms in the file list.

Loading a Master File

4. On the toolbar, click **Multi trace processing**, **Master Event Setting** and then **Master File Read**. The following window appears.



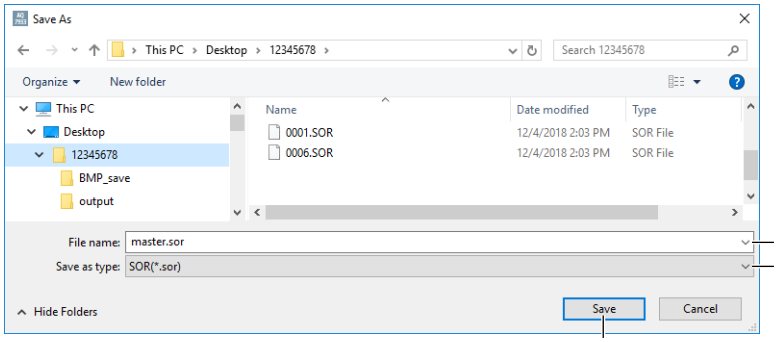
5. Click **Confirm**. The following confirmation message appears.



6. Click **Yes**. The master event information of the loaded file is applied to all loaded waveforms in the file list.

Saving the Master File

4. On the toolbar, click **Multi trace processing**, **Master Event Setting** and then **Master File Save**. The following window appears.



5. Specify the file name in the save destination, and click **Save**. The current waveform is saved as the master file.

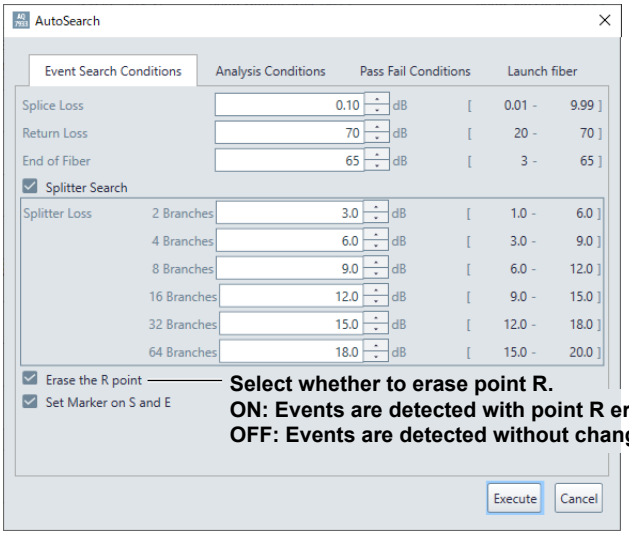
AutoSearch (collective processing)

Events of all loaded waveforms are detected at once.

4. On the toolbar, click **Multi trace processing**, and then **AutoSearch**. An auto search setting window appears.
5. Click the tabs, and set the necessary conditions.

- **Event Search Conditions**

  All items except those shown in the following figure are the same as when you click **AutoSearch** on the Control view.
  ► page 4-25



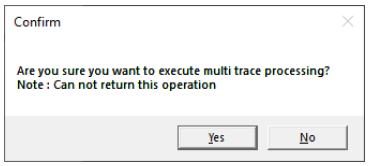
- **Analysis Conditions and Pass Fail Conditions**

  This is the same as when you click **Analysis Settings** on the Control view. ► page 4-26

- **Launch fiber**

  This is the same as when you click **AutoSearch** on the Control view. ► page 4-25

6. Click **Execute**. The following confirmation message appears.



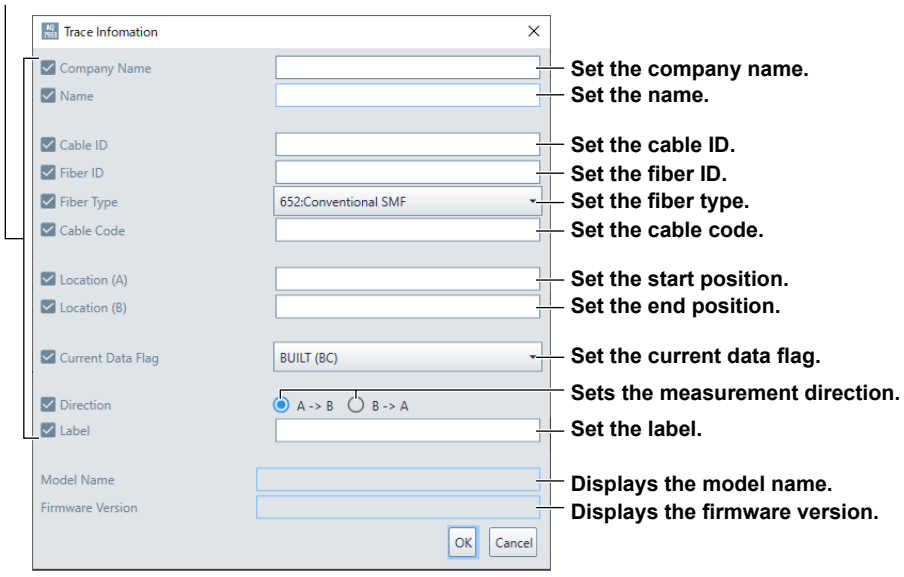
7. Click **Yes**. Auto search is performed on all waveforms with the conditions set in step 5.

Trace Information (collective processing)

Information of all loaded waveforms is assigned at once.

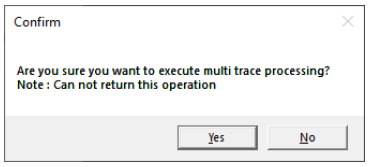
4. On the toolbar, click **Multi trace processing**, and then **Trace Information**. The following window appears.
5. Select the check boxes for the items to be processed collectively, and enter the necessary information.

Select the check boxes for the items you want to set collectively.



Description of the settings ► page 3-8

6. Click **OK**. The following confirmation message appears.

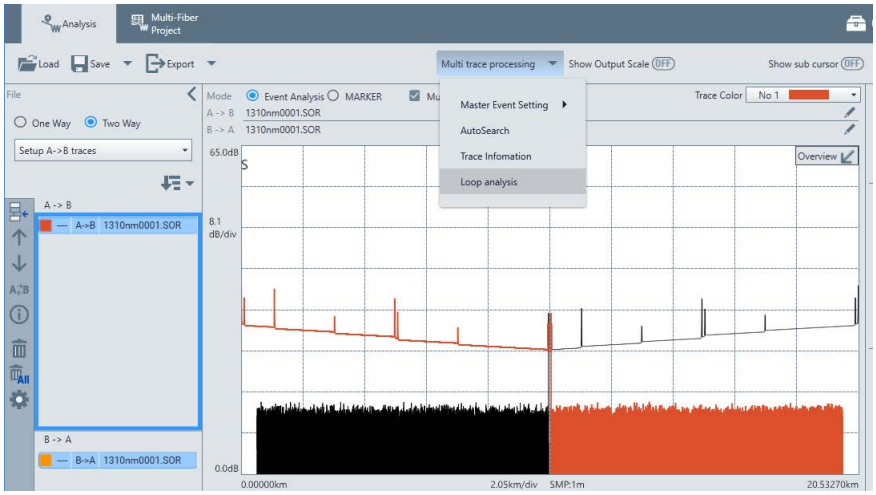


7. Click **Yes**. The contents of the items whose check boxes are selected are applied to the information of all waveforms.

Loop Analysis

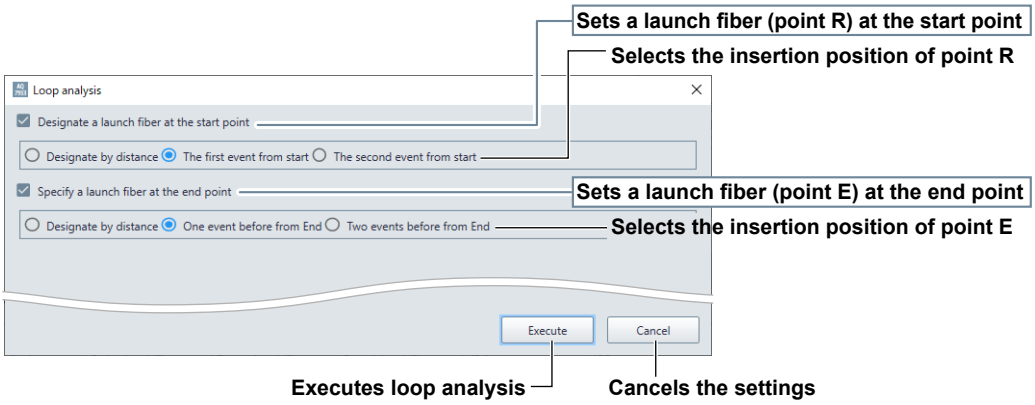
This feature loads waveform data to be analyzed for the A->B and B->A directions and performs loopback analysis.

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select Two Way.
2. On the toolbar, click **Load**. Or, drag and drop files to load them into the A->B and B->A directions. ► sections 3.1, 3.2
3. On the toolbar, click **Multi trace processing**, and then **Loop analysis**.

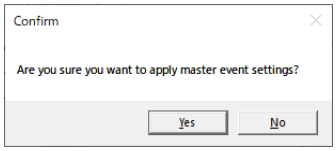


A loop analysis setting screen appears.

4. Select the check boxes for the items you want to use.

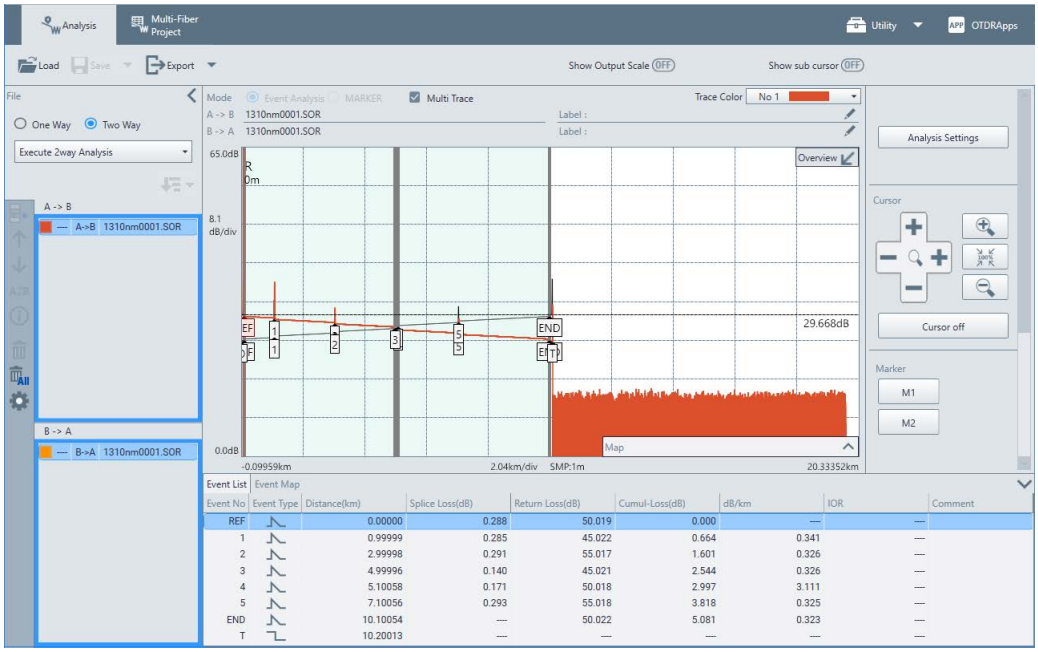


5. Click **Execute**. A confirmation message appears.



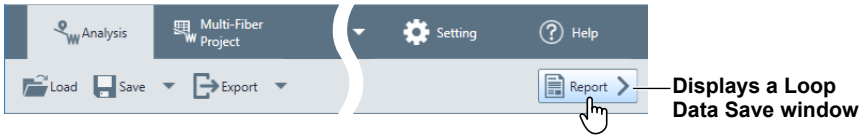
6. Click **Yes**. An analysis is performed. A log and progress bar are shown in the Completed window while the analysis is in progress.

7. On the Completed window, click **Close**. The Completed window closes, and the analysis results are displayed in the trace view.

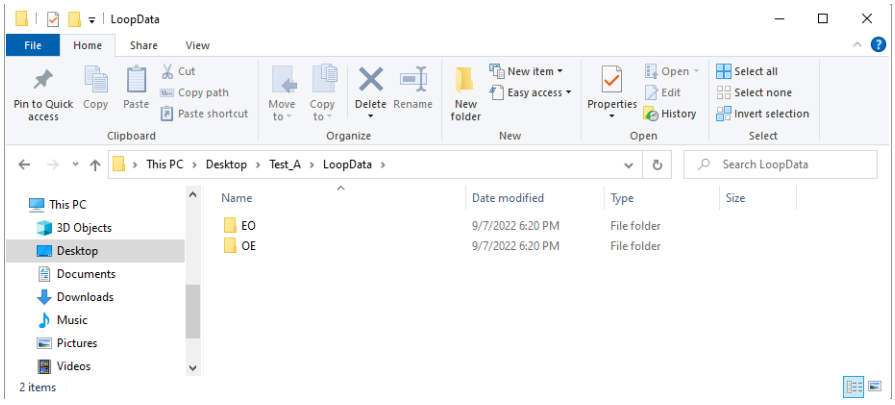


Exporting Loopback Analysis Results

8. On the toolbar, click Report. A window appears for setting the export folder.



9. Specify the save destination and folder name. The file type is Loop Data(*).
10. Click **Save**. Folders “EO” and “OE” are created in the specified folder.



Analysis results are exported in CSV format to each folder.

- EO: Results of analysis performed from end to start
- OE: Results of analysis performed from start to end

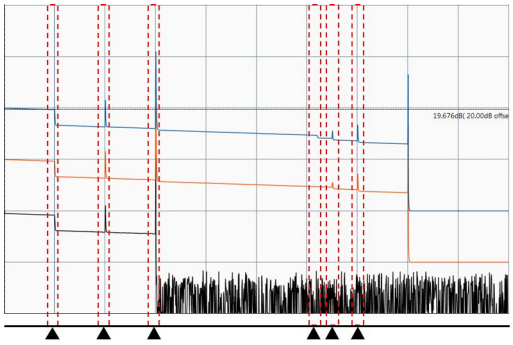
Explanation

How Master Events Are Automatically Generated and Applied

Based on specified generation conditions and event search conditions from an event list of each waveform that has been automatically searched or an event list in each file, events can be set at the same positions of all target waveforms.

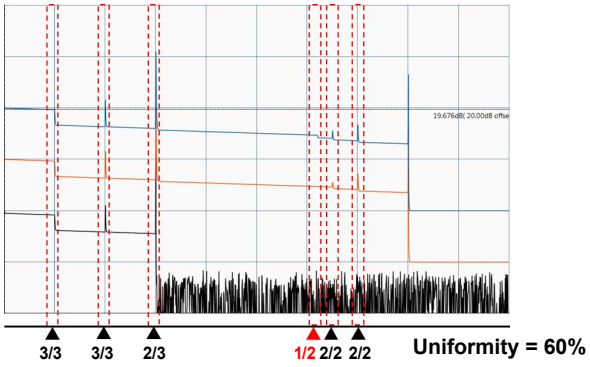
Tolerance Section Distance

1. Event positions are extracted from the event list of each waveform. An area indicated with a red line (extraction area) is called Tolerance Section Distance.



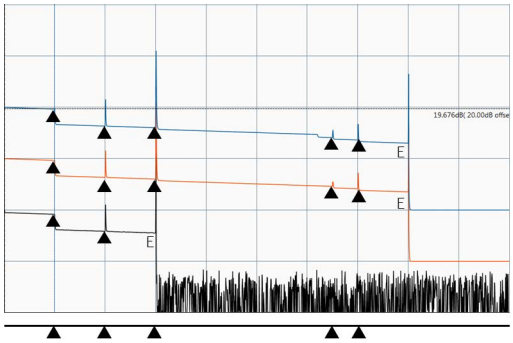
Uniformity

2. The event incidences at the extracted positions are calculated, and those exceeding the threshold are considered master events. This threshold is called uniformity.



3. Events are deleted from all waveforms.

4. The acquired master events are inserted in all waveforms. However, the END event of each waveform is retained.



Generation Method

Select the event list to use in the extraction of event positions.

Master Event Source

- **Generation from Auto Search**

  Auto search is executed on all waveforms according to the event search conditions. From the event list obtained from the results, master events are generated.
  You can set event search conditions by clicking the Event Search Conditions tab.

  Erasing point R

  ON: Events are detected with point R erased from all waveforms.
  OFF: Events are detected without changing the condition of point R.

- **Generation from Event List inside the SOR**

  Master events are generated from the event list contained in each waveform. Waveforms that do not have an event list are excluded from the master event calculation.
  Select this when you inserted or deleted events or made other edits to SOR files.

Set Cursor to End Point

ON: The cursor is automatically set to point E.
OFF: The cursor is not automatically set to point E.

Generation Condition

Set the following items.

Tolerance Section Distance (%)

Selectable range: 1% to 10%

Tolerance distance (km) =
section distance of the reference event (km) × tolerance section distance (%)
Example: When the section distance is 3 km and the tolerance section distance is 10%, the events in the range from the reference event to ±300 m are extracted as the same event.

Uniformity (%)

Selectable range: 1% to 100%

Do not insert events behind End Point

ON: Events are not inserted after point E.
OFF: Events are inserted even if they fall after point E.

Event Search Conditions

Set the event search conditions to use when the generation method is set to Generation from Auto Search. The same conditions are applied to all waveforms.
The settings are the same as the normal event search settings. ► section 4.3

Pass Fail Conditions

Judgment is performed by applying the same pass fail conditions to all waveforms.
The settings are the same as the normal pass fail conditions. ► section 4.3

Launch fiber

Set a launch fiber to the waveform after setting master events.
The launch fiber settings are the same as the normal launch fiber settings. ► section 4.3

Loading a Master File

You can load a file containing master event information and apply the information to all waveforms in the file list.

A -> B

The master file is applied to files whose measurement direction is A -> B.

B -> A

The master file is applied to files whose measurement direction is B -> A.

Ignore the events of the end point

This is the same setting as that used in auto generation of master events.

Also apply the information of Marker and Cursor

ON: Marker information and cursor information contained in the master file are also applied to all waveforms.

OFF: Marker information and cursor information contained in the master file are not applied to all waveforms.

Saving the Master File

The current waveform is saved as a master file in SOR format.

Default Master File Name Setting

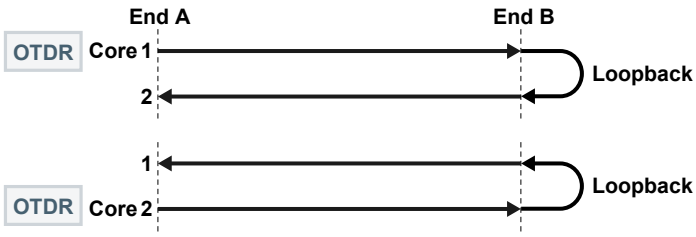
When you execute Master File Save, a default file name corresponding to the measurement direction of the current waveform appears in the file name box.

- When the measurement direction of the current waveform is forward: master.sor
- When the measurement direction of the current waveform is reverse: master_reverse.sor

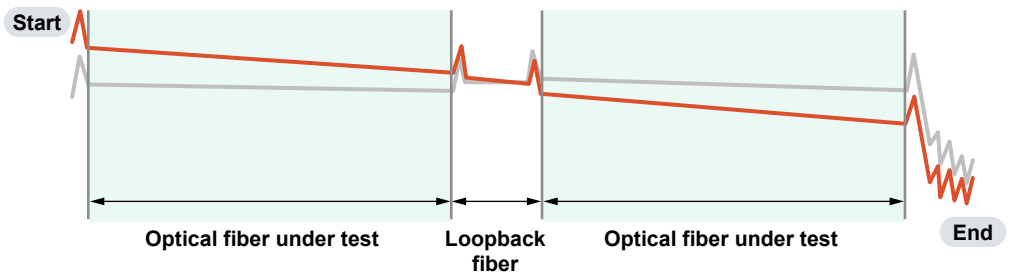
You can change the master file name if necessary.

Loop Analysis

When making loopback measurements, connect two optical fibers under test with a loopback fiber, and measure in both directions (from end A of core 1 and from end A of core 2).



This software loads and analyzes measurement data to be analyzed for the A->B and B->A directions. The launch fiber settings are the same as the normal launch fiber settings. ► section 4.3



The sections of the optical fibers under test (core 1 and core 2 in this example) are displayed with a different color.

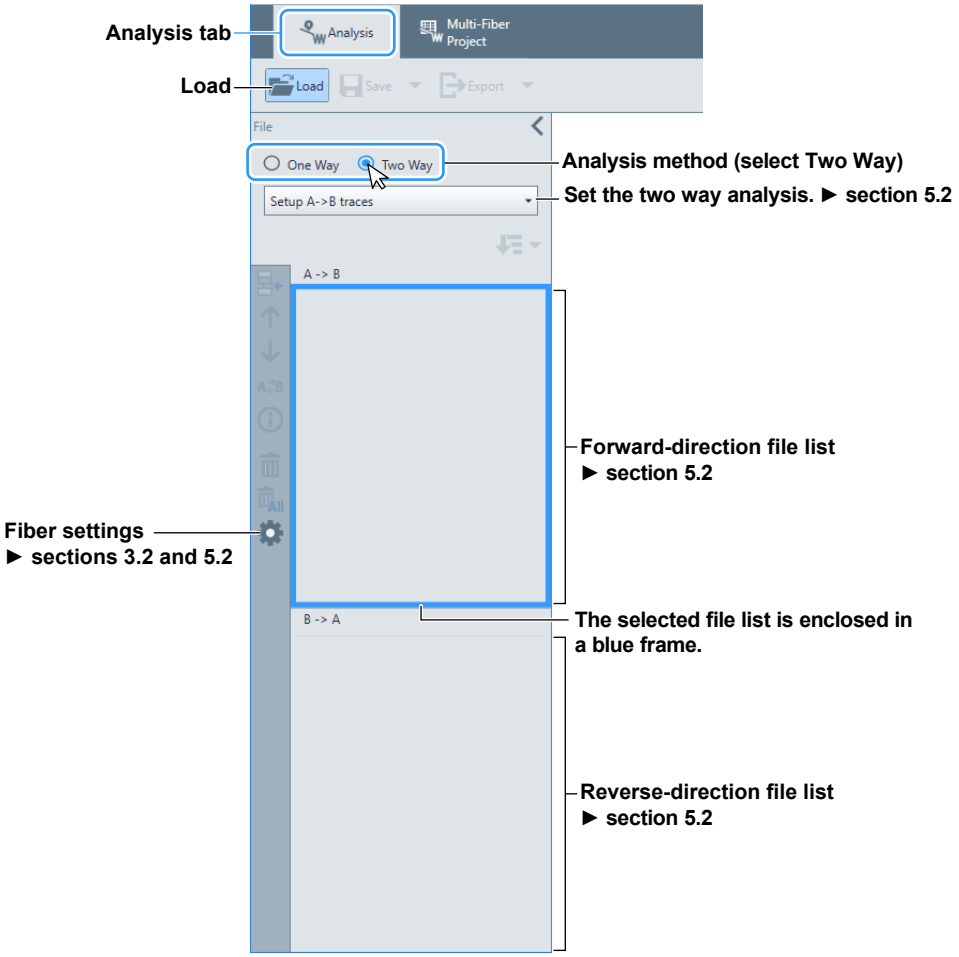
5.1 Loading Files

This section explains how to load SOR files when combining two waveforms to be analyzed.

Procedure

Selecting the Analysis Method

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **Two Way**. Settings for two-way analysis, forward-direction file list, and reverse-direction file list are displayed.
   * You can also change the analysis method after loading SOR files.



Loading Files

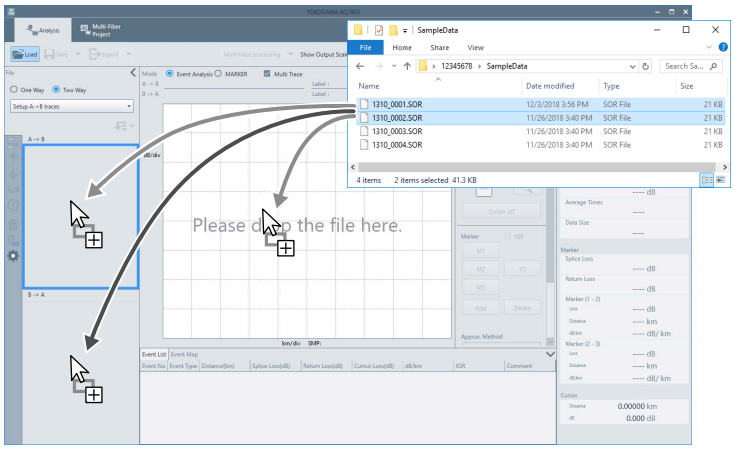
Using the Load Button

2. Click the forward-direction or reverse-direction file list to select the file list to load files in.
3. Click **Load** on the toolbar, and load one set of waveform files that you want to perform two way analysis on.
   The procedure is the same as in normal analysis (One Way). ► section 3.1
4. Repeat steps 2 and 3 to load the other set of waveform files into the other file list.

Loading by Dropping Files

2. Drag the waveform files that you want to perform two way analysis on to the forward-direction and reverse-direction file lists.

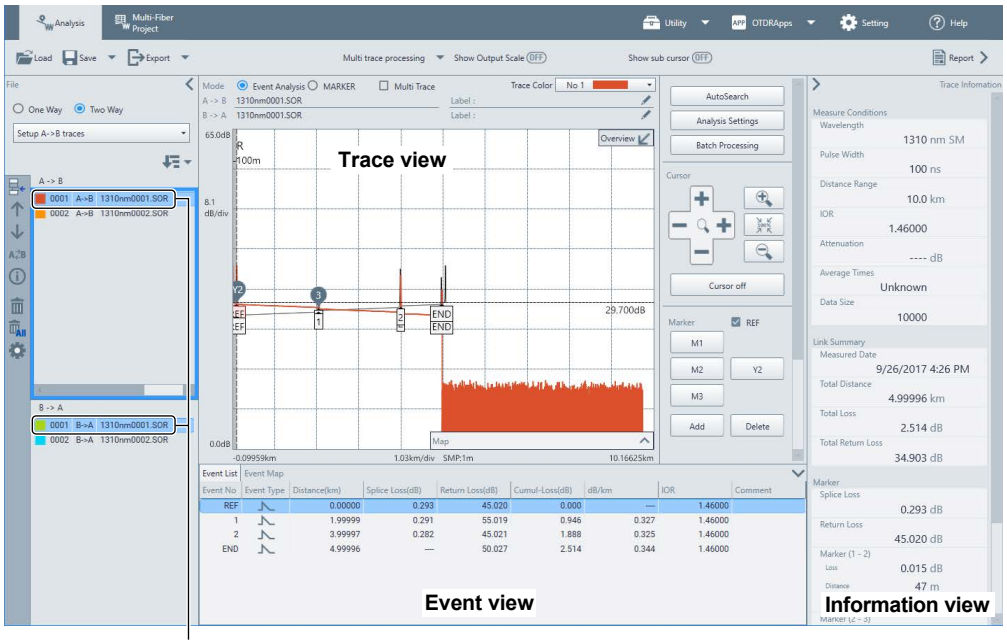
If you want to drag files to the Trace view, first select the file list you want to load the files in.



Note

By changing the measurement direction of a file on a file list, you can move the file to the forward-direction or reverse-direction file list. ► section 5.2

The loaded files are added to the forward-direction or reverse-direction file list, and the current waveform information is displayed in the Trace view, Information view, and Event view.
In the forward-direction and reverse-direction file lists, the files displayed in sequence from the top of the list form pairs for two way analysis.
Selecting a file in either file list will also select its pair.



Explanation

Analysis method

Select Two Way to perform two way analysis. ► section 3.2

Fiber Settings

► section 3.2

Loading Files

The type of file that you can load for two way analysis is SOR.
An SOZ file containing two waveforms can also be loaded directly.

Note

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.

File List

The loaded files are added to the forward-direction file list or the reverse-direction file list. Up to 1000 files total can be read in the forward and reverse directions. ► section 3.1

Trace View

The waveforms of the loaded files are displayed in the Trace view. Up to 24 waveforms can be displayed simultaneously and compared. ► section 3.1

5.2 Editing the Forward-Direction and Reverse-Direction File Lists

This section explains how to edit the SOR files shown in the forward-direction and reverse-direction file lists.

- Two Way Analysis (Setup A->B traces, Setup B->A traces, Execute 2way Analysis)
- Measurement direction
- Selecting and switching the current waveform
- Showing and hiding waveforms
- Controlling the File List

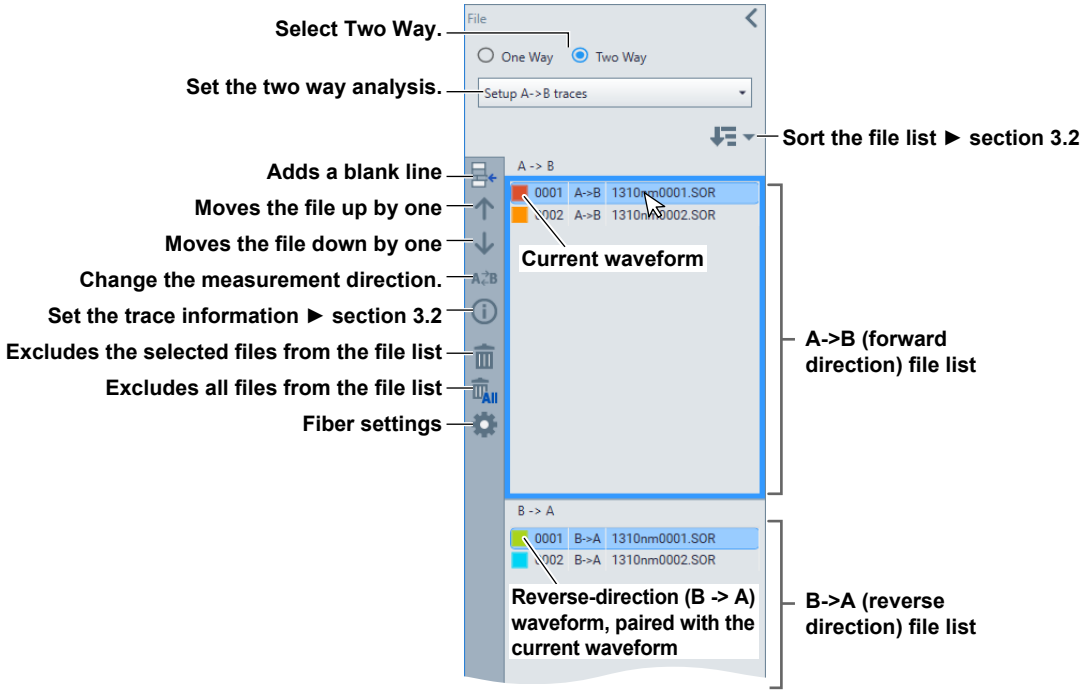
Procedure

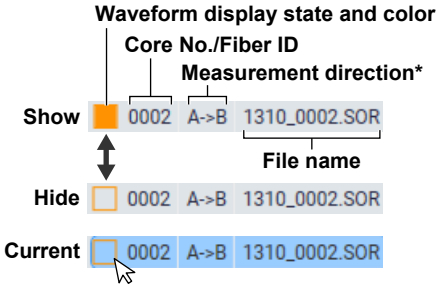
Loading Files

Selecting the Analysis Method

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **Two Way**. Settings for two-way analysis, forward-direction file list, and reverse-direction file list are displayed.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1 and 5.1
   Loaded files are displayed in the file list.

File List View (When the analysis method is Two Way)





* You can change whether to show the measurement direction by clicking  and selecting or clearing the Show Direction check box.
► Next page

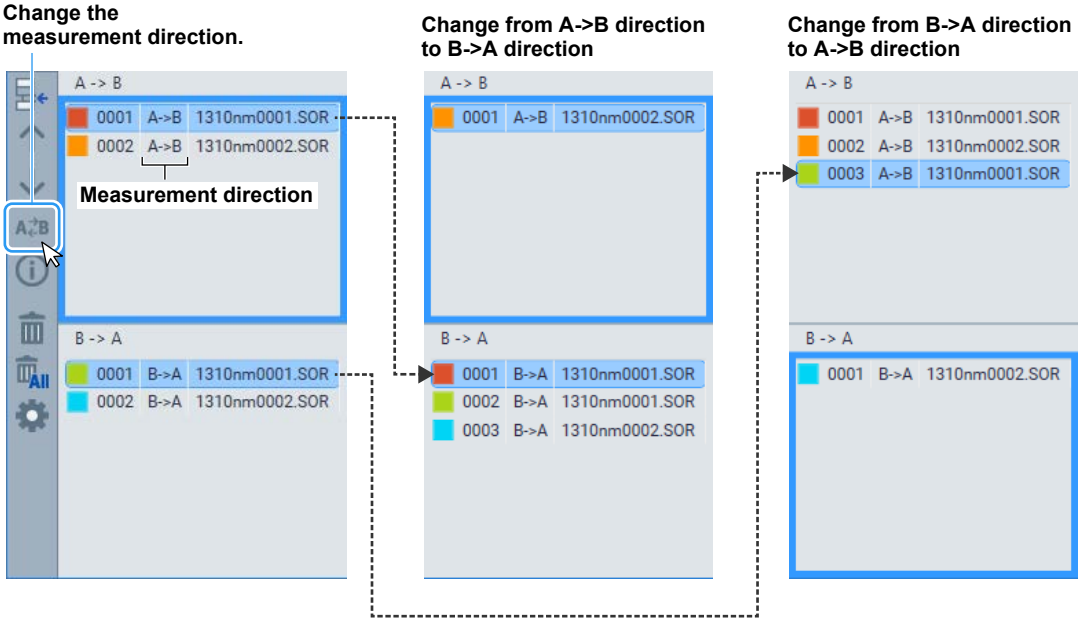
The current waveform is displayed on the Trace view regardless of the show/hide setting.

Setting the Two Way Analysis

1. From the drop-down menu, select **Setup A->B traces**, **Setup B->A traces**, or **Execute 2way Analysis**.

Setting the Measurement Direction

1. If the measurement direction is not displayed in the file list, click and then select the Show Direction check box in Fiber Settings. The measurement direction will be shown in the file list. ► section 3.2
2. Click to switch the measurement direction of the selected file and change the display position in the file list.



Editing the Forward-Direction and Reverse-Direction File Lists

Selecting and Switching the Current Waveform

1. In the forward-direction or reverse-direction file list, click a file to select it. When a file is selected, you can use the up and down keys on the keyboard to switch the selection.
   The selected file becomes the current waveform, and its pair is also selected in two way analysis.

Changing the Order

This is the same as when the analysis method is One Way. ► section 3.2

Adding Blank Lines

This is the same as when the analysis method is One Way. ► section 3.2

Excluding a Selected File

This is the same as when the analysis method is One Way. ► section 3.2

Excluding All Files

This is the same as when the analysis method is One Way. ► section 3.2
All files are excluded from the forward-direction and reverse-direction file lists.

Explanation

Fiber Settings

► section 3.2

Setting the Two Way Analysis

Setup A->B traces

The forward-direction waveforms before the waveforms are combined can be analyzed in the same manner as normal analysis (One Way).

Setup B->A traces

The reverse-direction waveforms before the waveforms are combined can be analyzed in the same manner as normal analysis (One Way).
Normal analysis (One Way) ► chapter 4

Execute 2way Analysis

In the forward-direction and reverse-direction file lists, two waveforms that form a pair in two way analysis are combined and analyzed.
► section 5.4

Setting the Measurement Direction

You can change the measurement direction of the SOR files. The measurement direction is either A -> B (forward direction) or B -> A (Reverse direction).

When the two way analysis setting is Setup A->B traces

The measurement direction of the current waveform changes to B -> A, and the file moves to the reverse-direction file list.

When the two way analysis setting is Setup B->A traces

The measurement direction of the current waveform changes to A -> B, and the file moves to the forward-direction file list.

Adding Blank Lines

► section 3.2

5.3 Displaying Waveforms

This section explains the waveform display on the Trace view when two way analysis is selected. Settings and operations on the displayed waveforms are the same as those for normal analysis (One Way). ► section 4.1

Procedure

Loading Files

Selecting the Analysis Method

1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **Two Way**. Settings for two-way analysis, forward-direction file list, and reverse-direction file list are displayed.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1 and 5.1
   Loaded files are displayed in the file list. ► section 5.2

Setting the Two Way Analysis

3. From the drop-down menu, select **Setup A->B traces**, **Setup B->A traces**, or **Execute 2way Analysis**.

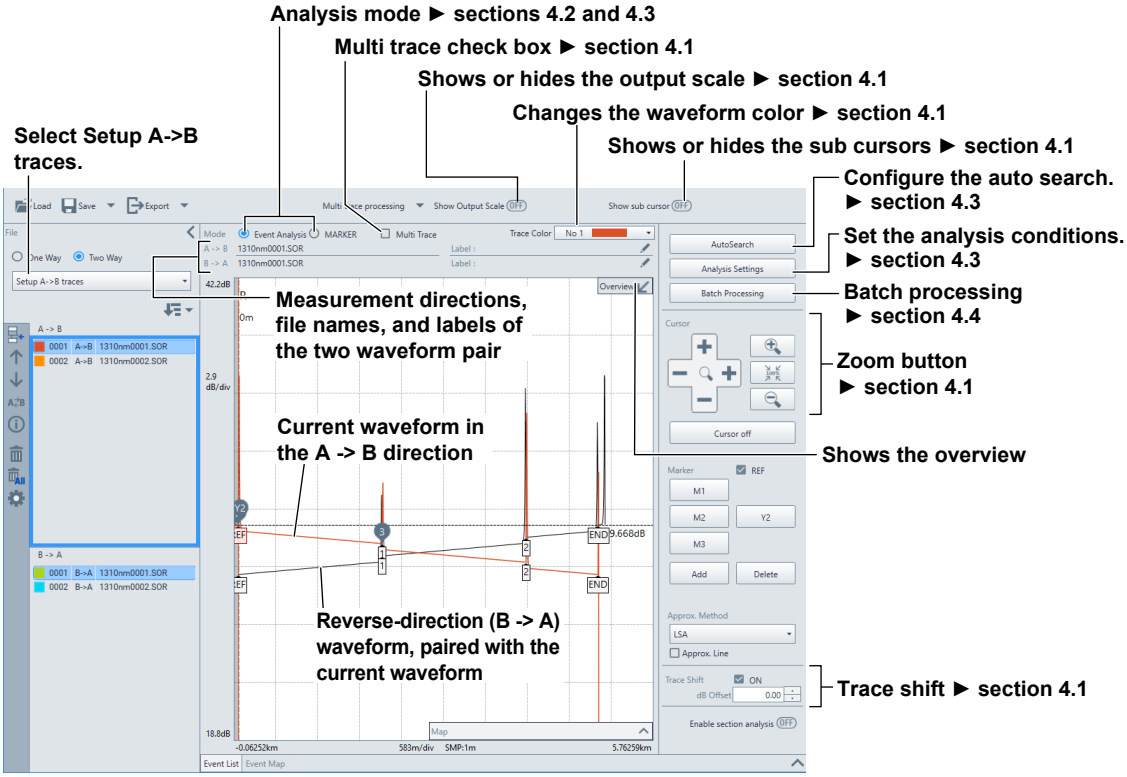
Editing the Forward-Direction and Reverse-Direction File Lists

4. Control the file lists, and select the current waveform. ► section 5.2

Displaying Waveform Data

When the two way analysis setting is Setup A->B traces

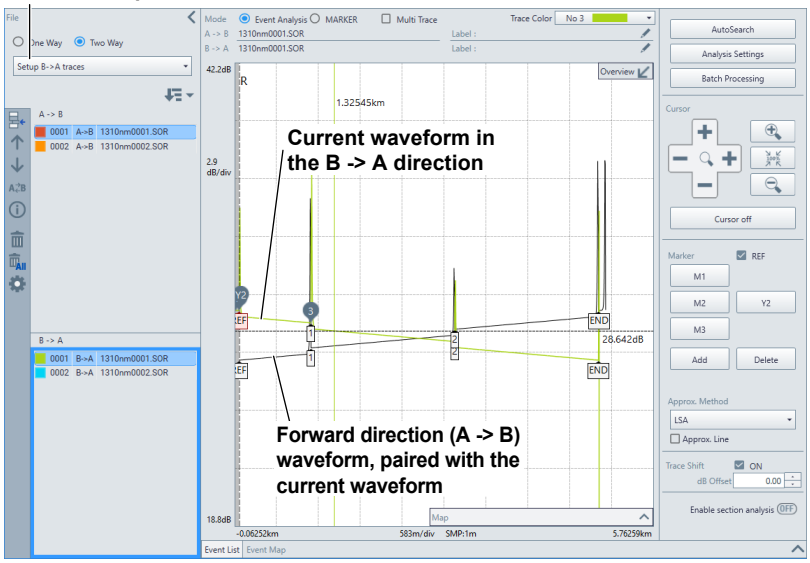
The file selected in the forward-direction (A -> B) file list becomes the current waveform and displayed on the Trace view. If the Multi Trace check box is selected, the other waveforms in the forward-direction file list are also displayed (up to 24 waveforms).
The reverse-direction (B -> A) waveform, paired with the current waveform, is displayed in gray.



When the two way analysis setting is Setup B->A traces

The file selected in the reverse-direction (B -> A) file list becomes the current waveform and displayed on the Trace view. If the Multi Trace check box is selected, the other waveforms in the reverse-direction file list are also displayed (up to 24 waveforms).
The forward direction (A -> B) waveform, paired with the current waveform, is displayed in gray.

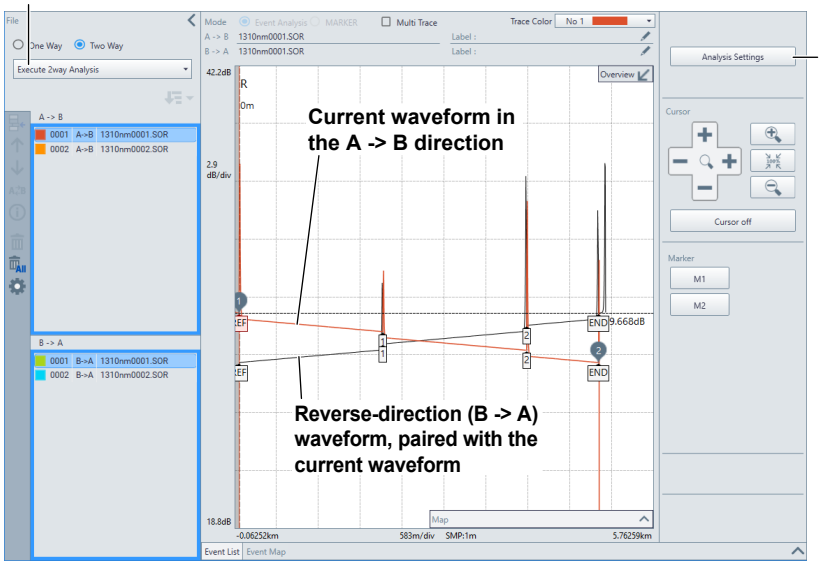
Select Setup B->A traces.



When the two way analysis setting is Execute 2way Analysis

A two way trace analysis is executed. ► section 5.4
The file selected in the forward-direction (A -> B) file list becomes the current waveform and displayed on the Trace view. If the Multi Trace check box is selected, the other waveforms in the forward-direction file list are also displayed (up to 24 waveforms).
The reverse-direction (B -> A) waveform, paired with the current waveform, is displayed in gray.

Select Execute 2way Analysis.



Set the analysis conditions. ► section 5.4

5.4 Combining and Analyzing Two Waveforms

Procedure

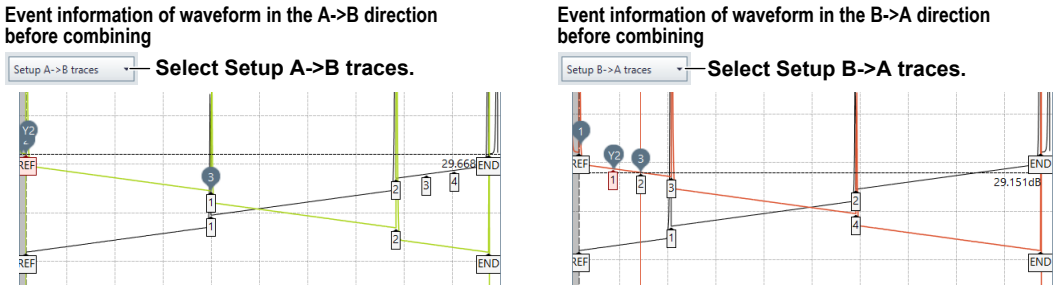
Displaying Waveform Data

Selecting the Analysis Method

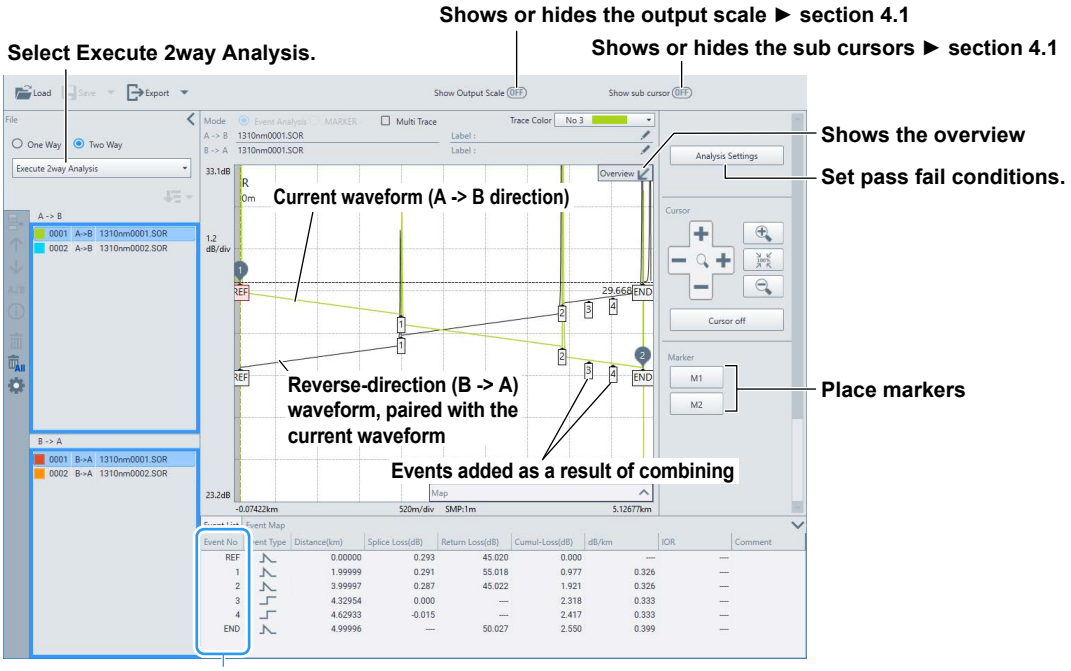
1. On the menu bar, click the **Analysis** tab, and in the top area of the File List view, select **Two Way**. Settings for two-way analysis, forward-direction file list, and reverse-direction file list are displayed.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1 and 5.1
   Loaded files are displayed in the file list. ► section 5.2

Setting the Two Way Analysis

3. To view the waveform in the A->B direction or that in the B->A direction before combining, select **Setup A->B traces** or **Setup B->A traces** from the drop-down menu. ► section 5.3
   For details on analyzing each waveform, see “Normal Analysis (One Way).” ► chapter 4



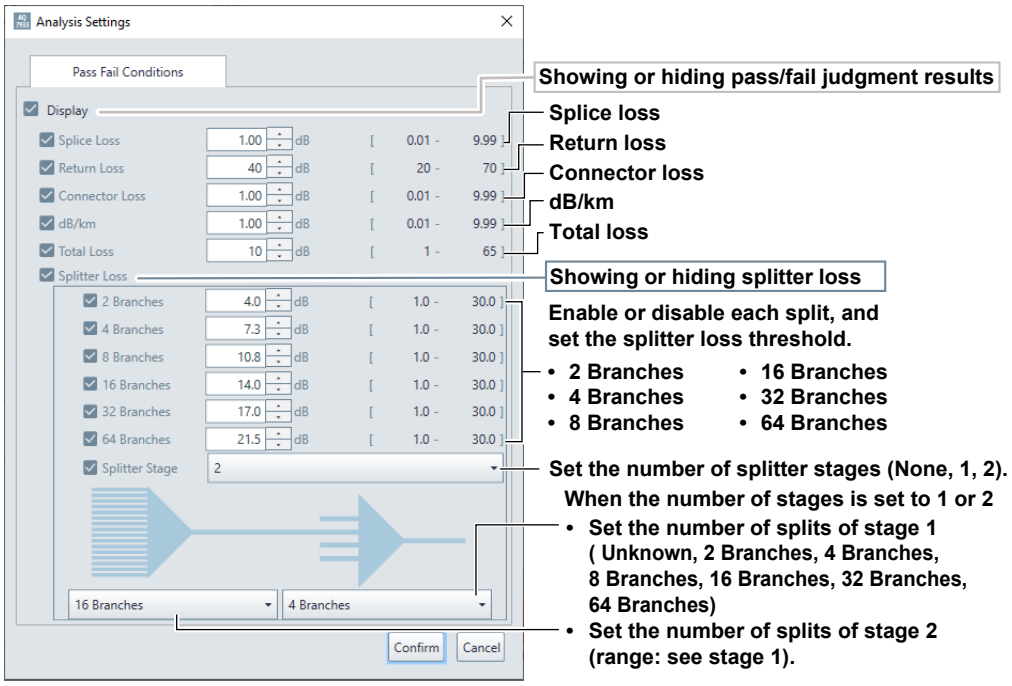
4. From the drop-down list, select **Execute 2way Analysis**. The following window appears.



The event numbers in this example correspond to the following event numbers before combining.
1: Combined result of the current waveform (1) and its pair (1)
2: Combined result of the current waveform (2) and its pair (2)
3: Paired waveform (3)
4: Paired waveform (4)
For details on two way analysis, see “2way Analysis (Two Way)” in section 1.1 or page 5-11.

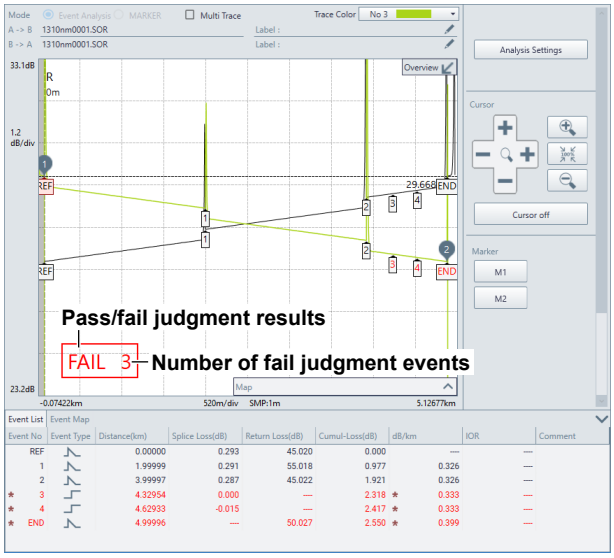
Setting Pass Fail Conditions

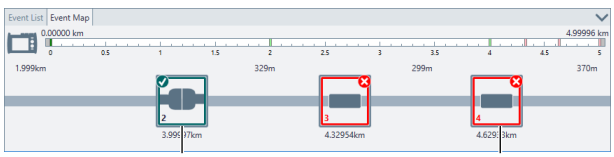
3. On the Control view, click **Analysis Settings**. The following window appears.



For the settings of these items, see section 4.3.

4. Click **Confirm**. The pass/fail judgment results are displayed on the Trace view, event list, and event map. ► section 4.3





Green frame: pass judgment

Red frame: fail judgment

Marker Operation

Placing and Moving Markers

You can control markers M1 and M2. ► section 4.2

Explanation

Selecting the Analysis Mode

When the two way analysis setting is Setup A->B traces or Setup B->A traces

Like normal analysis (One Way), forward-direction waveforms can be analyzed using Event Analysis or MARKER analysis mode.
Normal analysis (One Way) ► chapter 4

When the two way analysis setting is Execute 2way Analysis

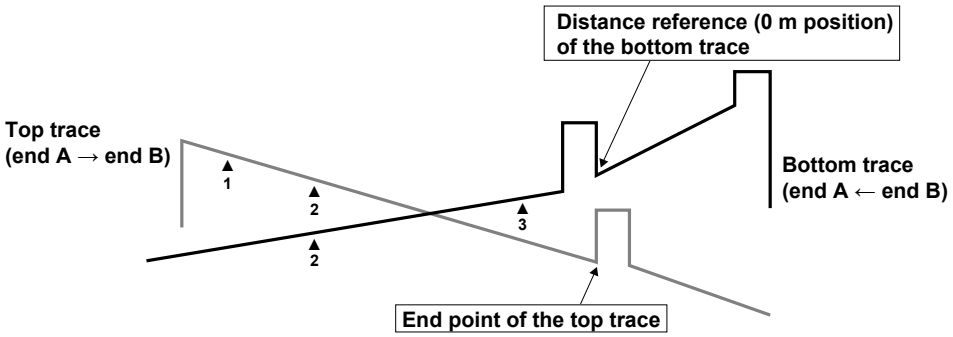
Event Analysis or MARKER analysis mode is not possible.

Two Way Analysis

The event list of waveform files measured from both directions is averaged, and a more accurate splice loss is measured.
If the splice loss of an optical fiber is measured with an OTDR, different splice loss values will be obtained depending on the measured end of the optical fiber. This is a physical phenomenon that occurs because the characteristics of each fiber cable is slightly different. To resolve this problem, the optical fiber needs to be measured from both ends, and the measurement results need to be averaged. The two way analysis feature is available for this purpose.

2way Analysis

For the two waveforms obtained by measuring from each end of the optical fiber, point S, point E, and events at the same positions are combined and displayed.
The horizontal axes of the combined traces are aligned so that the end point of the top trace (end A → end B) match the 0 m position (distance reference) of the bottom trace (end A ← end B).



As shown in the above figure, markers are added only to the trace in which events are found. Event numbers are the same as the event list numbers after the combining of the traces.

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.

Operating conditions

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.

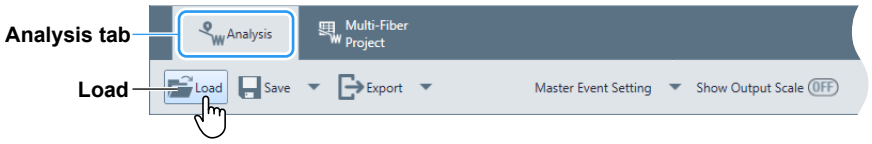
6.1 Displaying the Composite Waveform of SMP Files

This section explains the waveform display on the Trace view when SMP files are loaded. Settings and operations on the displayed waveforms are the same as those for normal analysis (One Way). However, event markers and markers are not displayed.
► chapter 4

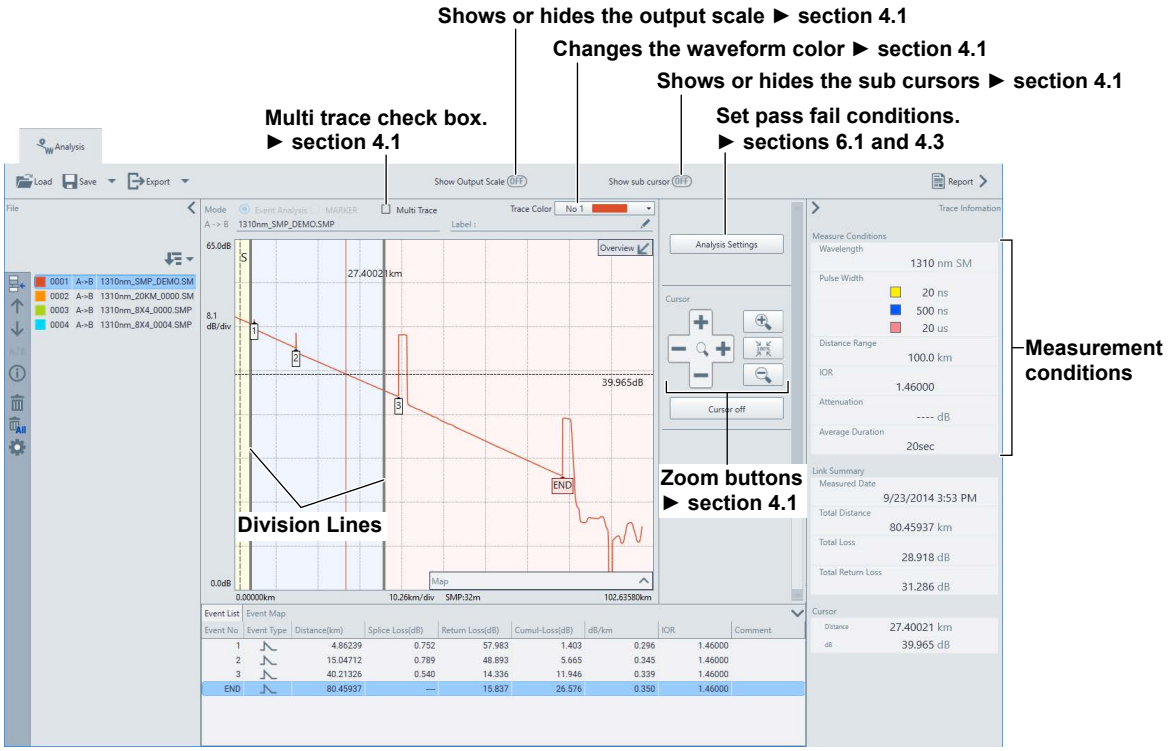
Procedure

Loading Files

1. On the menu bar, click the **Analysis** tab.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 3.1 and 3.2.



The loaded files are added to the file list, and the current waveform information is displayed in the Trace view, Information view, and Event view.



Waveforms obtained by combining multiple waveforms with the same wavelength but different pulse widths are displayed with a different color for each pulse width.

Division Lines

You can move division lines by dragging them. ► section 6.2

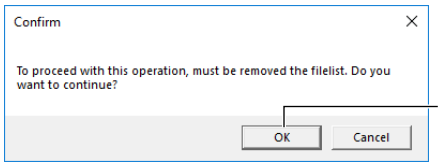
Explanation

Loading Files in Controlling the File List

- Loaded files are displayed to the file list. Up to 10 files can be loaded.
- Settings and operations on the file list are the same as those for normal analysis (One Way). However, you cannot show and hide waveforms. ► section 3.2

Note

If you try to load SMP files when SOR files are already loaded in the file list, the following confirmation message appears.



Clicking **OK** clears all SOR files in the file list and loads the SMP file.

Trace View

When waveform data in SMP format is loaded, a composite waveform is automatically displayed. The target section of each combined waveform is displayed using division lines and a color corresponding to each pulse width.
The waveforms of the loaded files are displayed in the Trace view. Up to 10 waveforms can be displayed simultaneously and compared.

Composite Waveforms

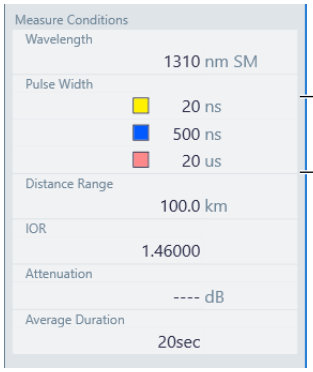
In an optical fiber cable measurement, reducing the pulse width of optical pulse measurement increases the measurement resolution of the waveform in the near-end section but causes the optical pulse to attenuate in the far-end section, preventing correct measurement. Conversely, increasing the pulse 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 Smart Mapper's 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 number measurements and pulse widths when waveforms are combined vary depending on the OTDR model that measured the waveforms and the distance range and wavelength used during measurement. For details, see the OTDR user's manual.

Division Lines

Division lines indicate the target section of the waveform of each pulse width. You can edit the composite waveform by moving the division lines. ► section 6.2

Measure Conditions

The pulse width of each measurement and the color indicating the target section of the waveform of each pulse width on the Trace view are displayed.



Pulse width of the composite waveform

6.2 SMP File Analysis

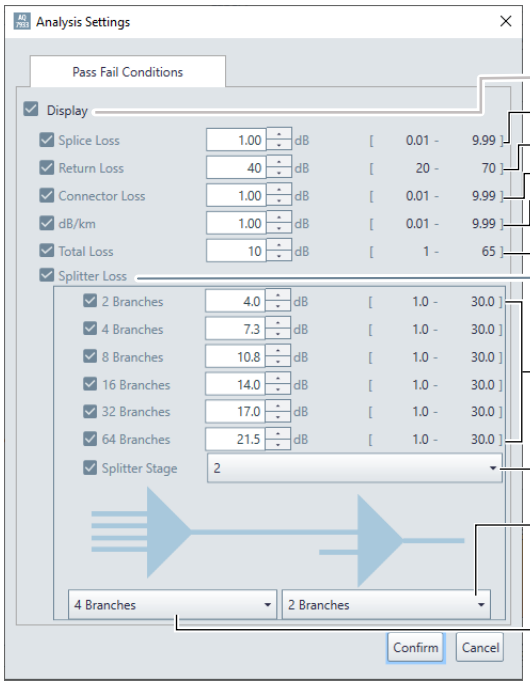
Procedure

Displaying Waveform Data

1. On the menu bar, click the **Analysis** tab.
2. On the toolbar, click **Load**. Or, drag and drop files to load them. ► sections 6.1, 3.1, and 3.2.
   A composite waveform is displayed.

Setting Pass Fail Conditions

3. On the Control view, click **Analysis Settings**. The following window appears.



Showing or hiding pass/fail judgment results

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

Showing or hiding splitter loss

Enable or disable each split, and set the splitter loss threshold.

- **2 Branches**
- **4 Branches**
- **8 Branches**
- **16 Branches**
- **32 Branches**
- **64 Branches**

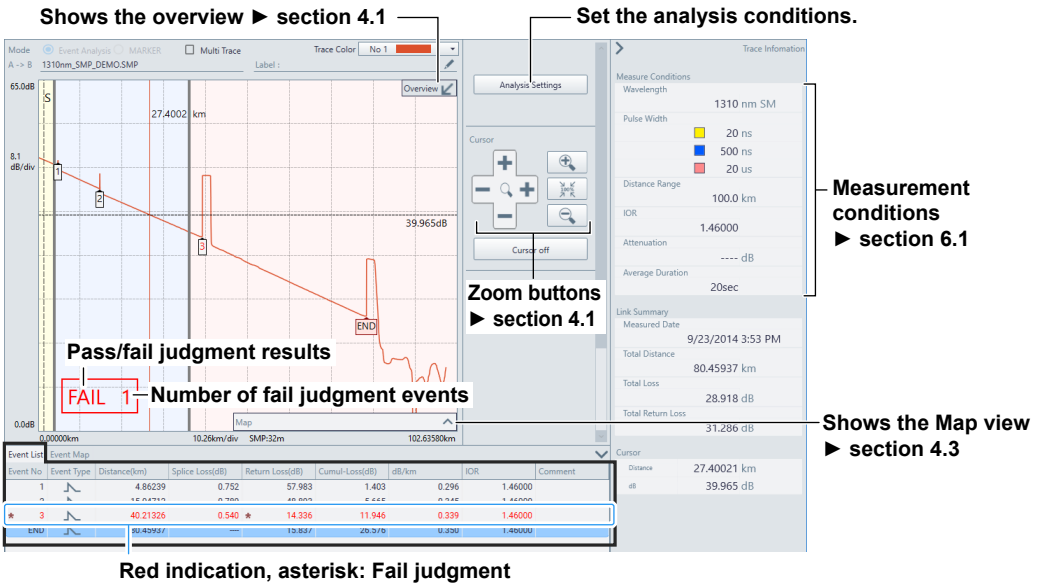
Set the number of splitter stages (None, 1, 2).

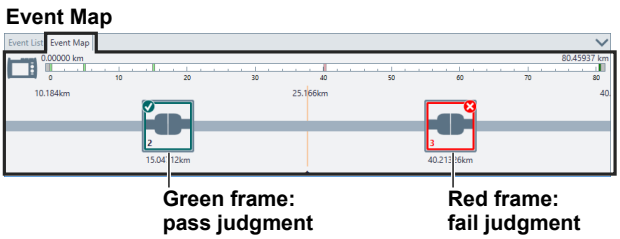
When the number of stages is set to 1 or 2

- **Set the number of splits of stage 1 (Unknown, 2 Branches, 4 Branches, 8 Branches, 16 Branches, 32 Branches, 64 Branches)**
- **Set the number of splits of stage 2 (range: see stage 1).**

For the settings of these items, see section 4.3.

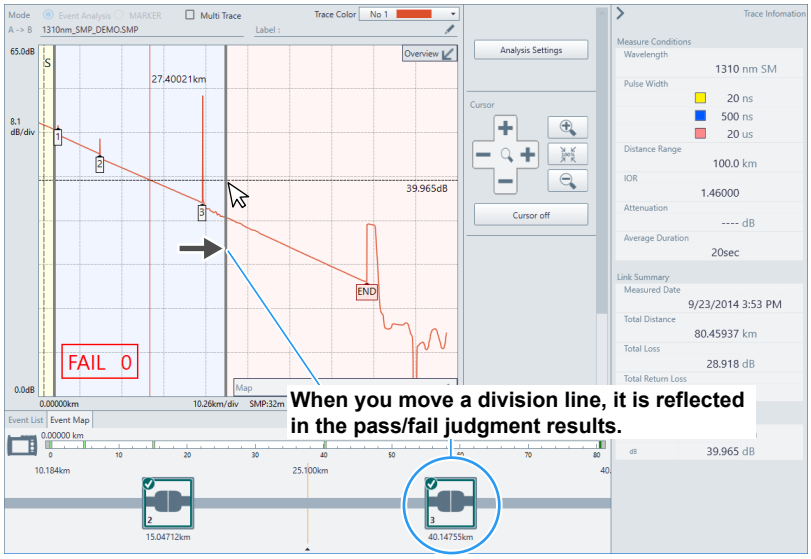
4. Click **Confirm**. The pass/fail judgment results are displayed on the Trace view, event list, and event map. ► section 4.3





Editing Waveforms

5. Move the division lines indicating the target section to change the distance section.

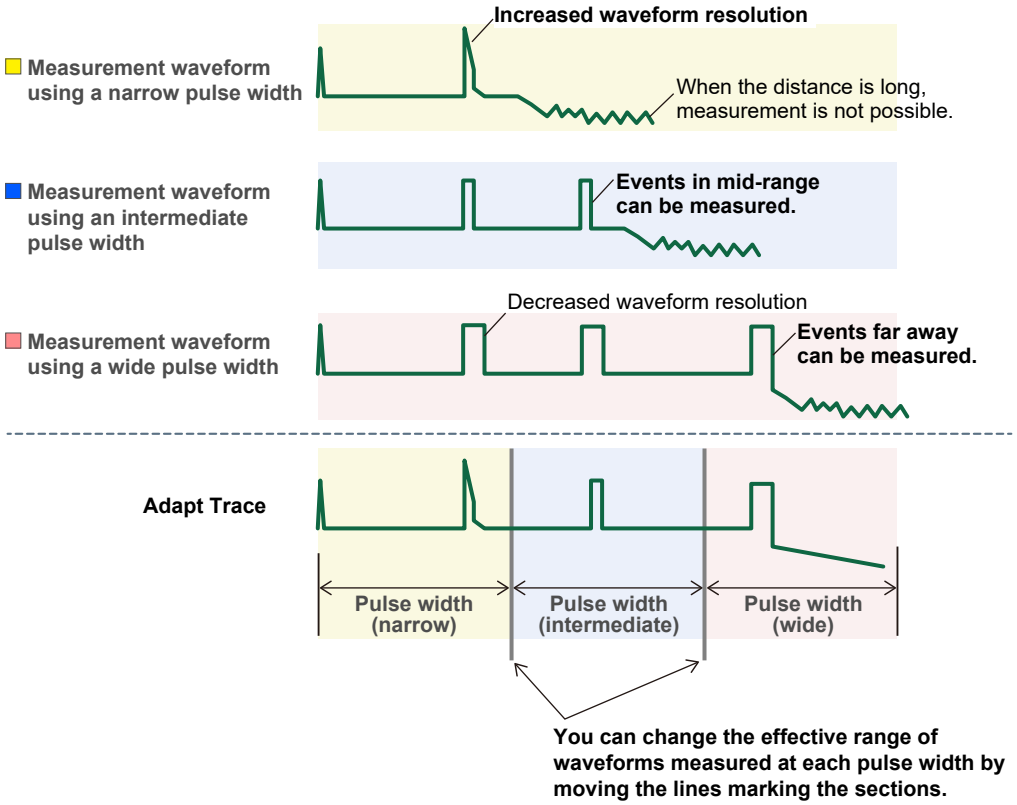


Explanation

Editing Waveforms

You can move the division lines of a composite waveform to edit the distance section of each pulse width.

Example: SMP files measured on the OTDR AQ7280



7.1 Overview of Creating Reports

You can export the loaded waveform's optical pulse measurement and analysis conditions, waveforms, and events as a report on a single sheet. You can select the items to include in the report.
You can also load multiple files and create multiple reports with the same layout.

Steps to Create Reports

- Creating a report layout Section 7.2
- Editing the report layout Section 7.3
- Editing the content of the report Section 7.4
- Exporting the report (printer, Excel, PDF) Section 7.5

Procedure

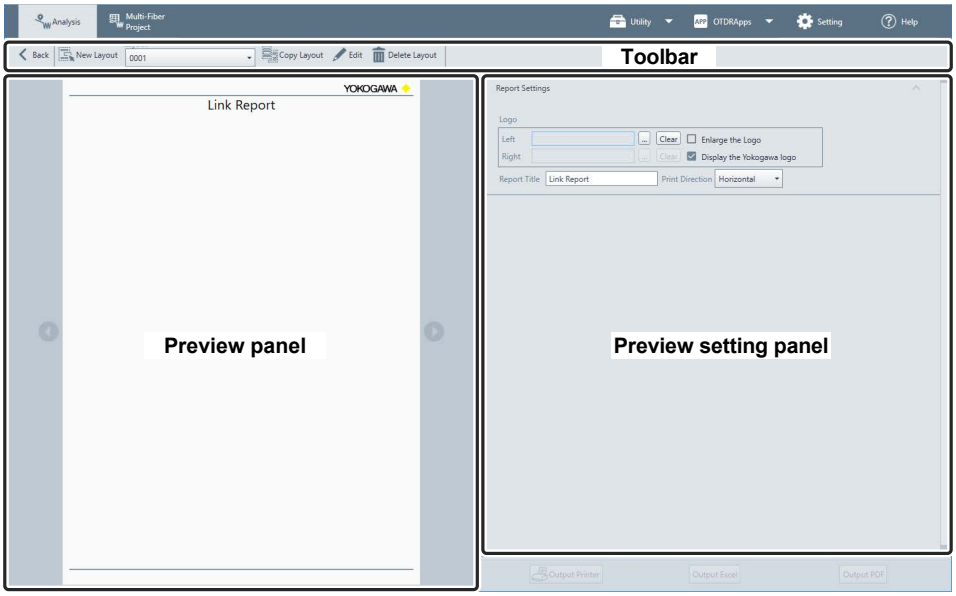
Loading and Analyzing Files

1. On the menu bar, click the **Analysis** tab.
2. On the toolbar, click **Load**. Or, drag and drop files to load them.
   For details on loading SOR files for One Way, see sections 3.1 and 3.2, and for Two Way, see sections 5.1 and 5.2.
   For details on loading SMP files, see section 6.1.
3. Analyze the waveforms.
   For details on analyzing SOR files for One Way, see chapter 4, and for Two Way, see chapter 5.
   For details on analyzing SMP files, see chapter 6.

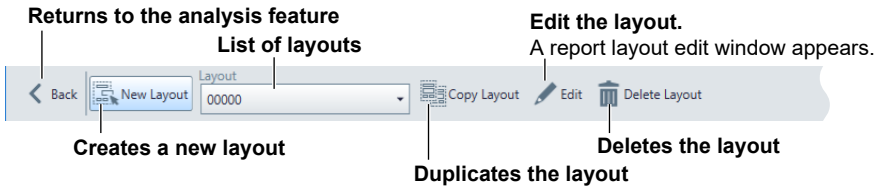
Creating a Report

4. On the toolbar of the analysis window, click **Report >**. A report preview window and toolbar appear.

Report Preview Window



Toolbar (Report Preview)



Explanation

Preview Panel

An image of the report that will be exported is displayed.

Depending on the content of the file, if the report does not fit on one page, page breaks are automatically inserted. Click the ◀ and ▶ buttons (on the sides) to move between pages.

Preview Setting Panel

Set the content to export to reports.

7.2 Creating a Report Layout

This section explains how to create a report layout.

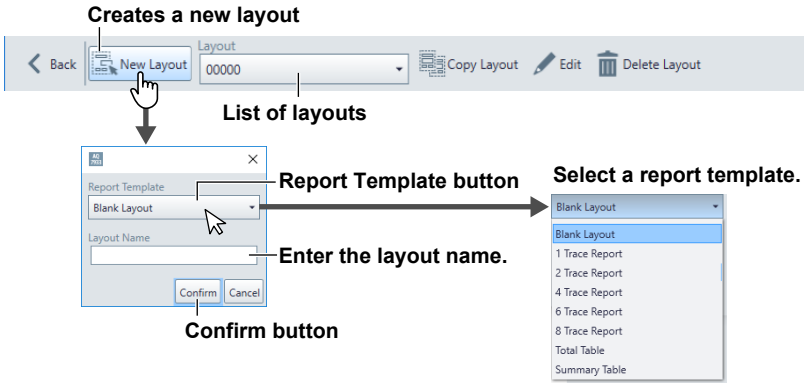
- Creating a new layout
- Selecting an existing layout
- Duplicating an existing layout

Procedure

1. On the toolbar of the analysis window, click **Report >**. A report preview window and toolbar appear.

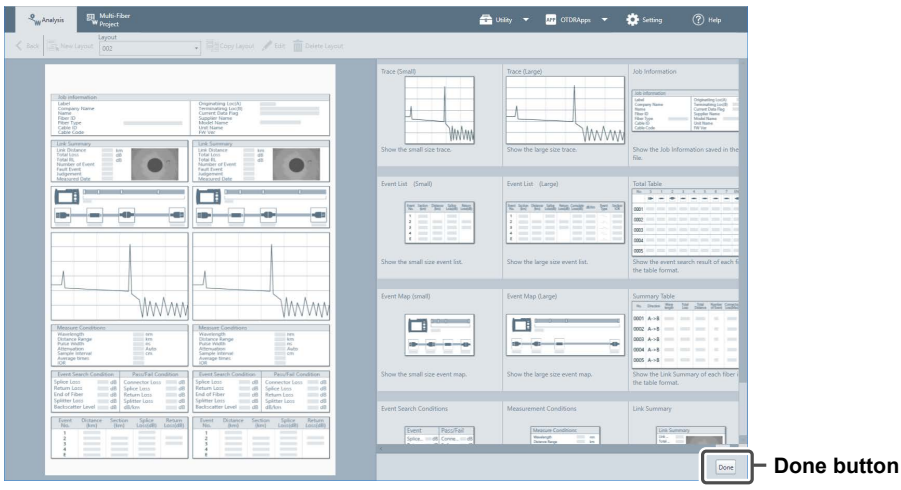
Creating a New Layout

2. On the toolbar of the report preview window, click **New Layout**. The following window appears.
3. Click **Report Template**, and from the drop-down menu, select a template.
   You can select from seven types of templates (Blank Layout, 1 Trace Report, 2 Trace Report, 4 Trace Report, 6 Trace Report, 8 Trace Report, Total Table, Summary Table).
4. Enter the layout name. The name will appear in the layout list.



5. Click **Confirm**. A report layout edit window appears, and the layout of the selected template is displayed.

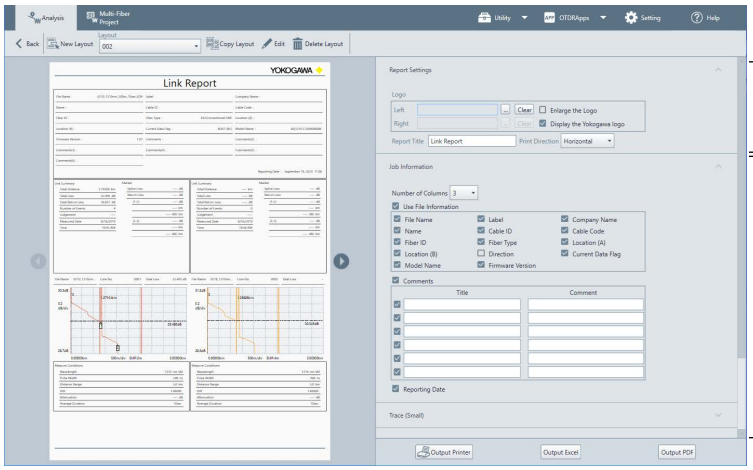
Report Layout Edit Window



To edit the layout, see section 7.3.

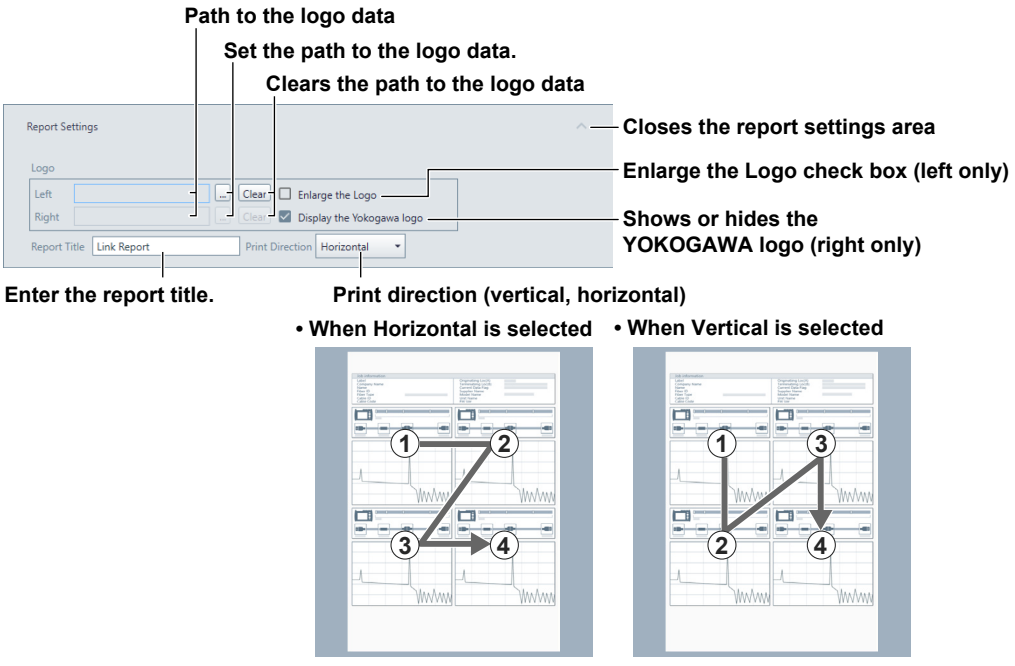
6. Click **Done**. A report preview is created using the selected report layout, and the report preview window reappears. The content of the files loaded in the analysis window is displayed in the preview window.

Report Preview Window

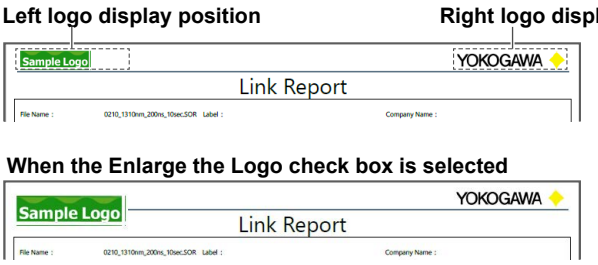


Report Settings

7. Under Report Settings, set the logo, report title, and print direction.



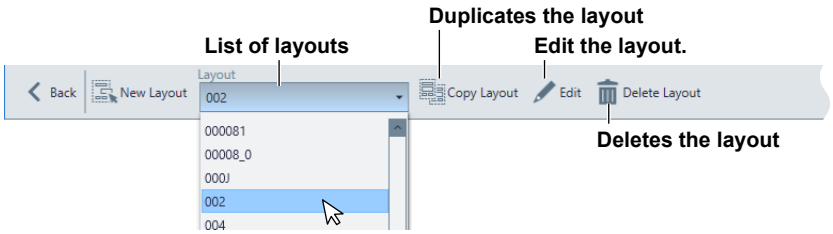
Example When a Logo Is Set



8. Set the displayed content of various parts. ► section 7.4

Selecting the Layout

2. Click **Layout** on the toolbar, and from the drop-down menu, select a layout.

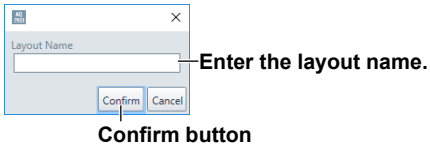


A report preview is created with the selected layout, and the content of the files loaded in the analysis window is displayed in the report preview window.

3. To edit the layout, click **Edit** on the toolbar. A report layout edit window appears.
   Edit the layout. ► section 7.3
4. If necessary, edit the report settings (► previous section) and the displayed content of various parts. ► section 7.4

Duplicating a Layout

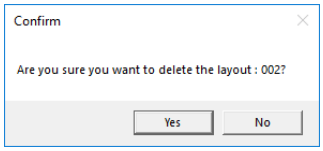
2. Click **Layout** on the toolbar, and from the drop-down menu, select a layout you want to duplicate.
3. On the toolbar, click **Copy Layout**. The following window appears.
4. Enter the layout name, and click **Confirm**. The layout is duplicated, and the layout name appears in the layout list.



5. To edit the layout, click **Edit** on the toolbar. A report layout edit window appears.
   Edit the layout. ► section 7.3
6. If necessary, edit the report settings (► previous section) and the displayed content of various parts. ► section 7.4

Deleting a Layout

2. Click **Layout** on the toolbar, and from the drop-down menu, select a layout you want to delete.
3. On the toolbar, click **Delete Layout**. The following confirmation message appears.



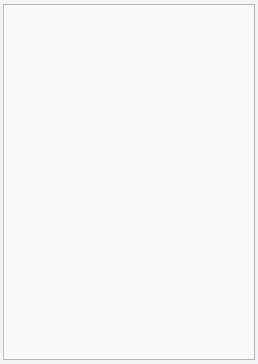
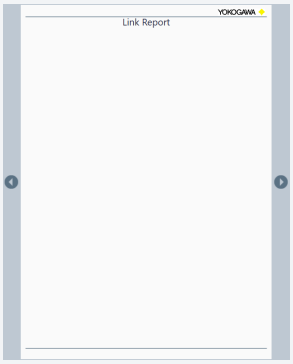
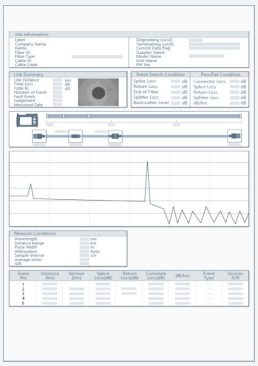
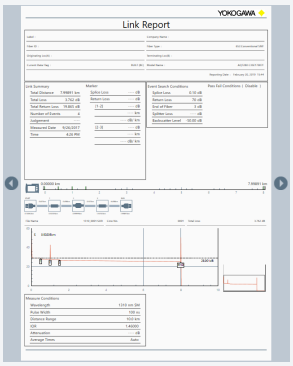
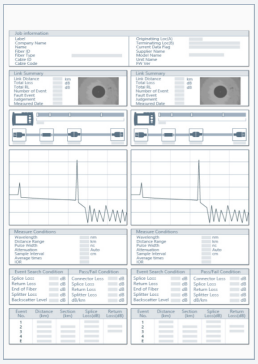
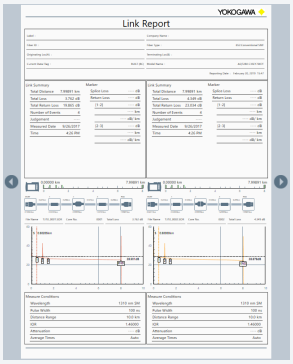
4. Click **Yes**. The selected layout is deleted from the layout list.

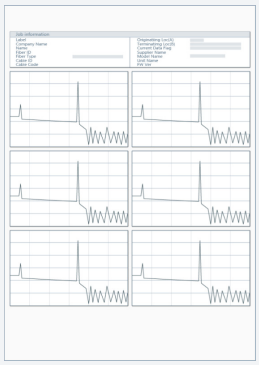
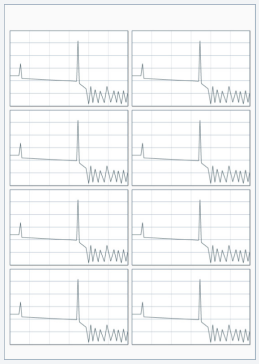
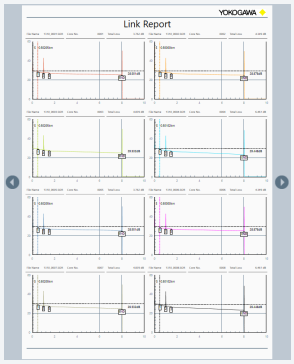
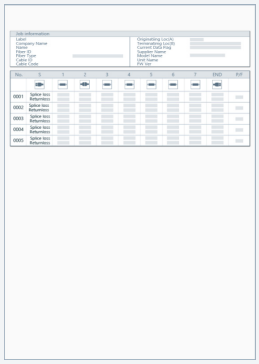
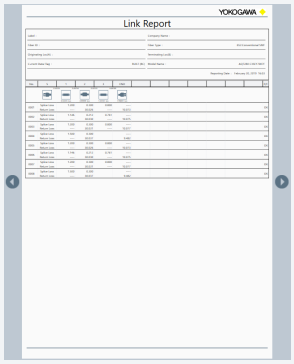
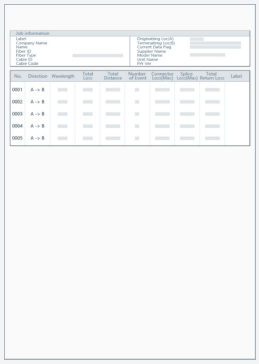
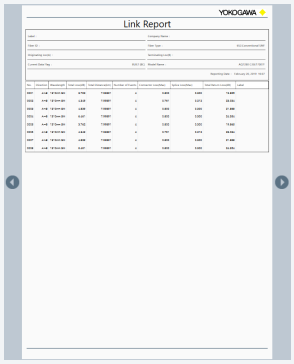
Explanation

If you edit the layout or the displayed content of various parts, they are saved in the selected layout.
► sections 7.3 and 7.4

Report Template

You can select a report layout from the following templates and edit it.

Template name	Appearance of the report layout edit window	Example of a report preview window
Blank Layout		
1 Trace Report		
2 Trace Report		
4 Trace Report		

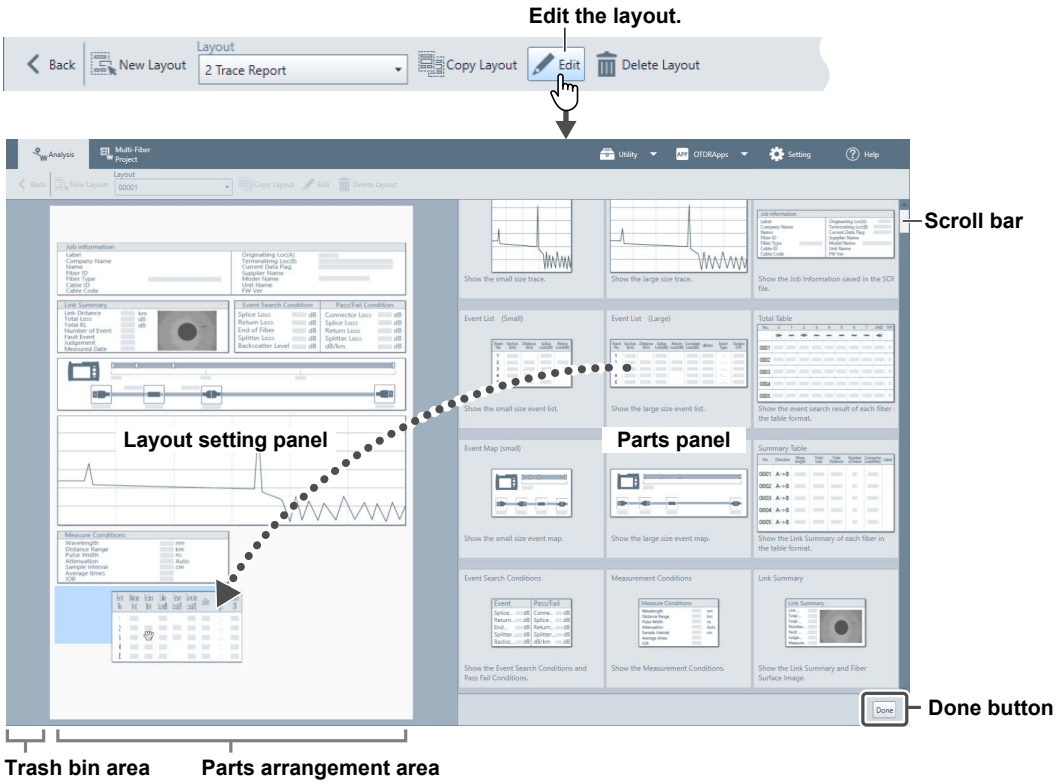
Template name	Appearance of the report layout edit window	Example of a report preview window
6 Trace Report		
8 Trace Report		
Total Table	The event search results (splice loss, return loss) of each core are exported in tabular form.	
		
Summary Table	The measurement results (judgement, direction, wavelength, total loss, total distance, number of events, connector loss (max.), splice loss (max.), return loss (max.), total return loss, label) of each core are exported in tabular form. It is also possible to display aggregate data consisting of maximum and minimum values for each wavelength based on the data in the summary table.	
		

7.3 Editing the Report Layout

Procedure

Displaying the Report Layout Edit Window

1. Select the report layout by referring to section 7.2.
2. Click **Edit** on the toolbar. A report layout edit window appears.



Arranging Parts

3. You can arrange parts using one of the following two methods.

- **Double-click**

  When you double-click a part on the parts panel, the part is automatically placed in the first available area from the top left of the report. The part cannot be placed if there is no available area.

- **Drag and Drop**

  Drag a part from the parts panel, and drop it in the layout setting panel on the left to place the part in the report.

Moving a Part

3. You can move a part by dragging an already placed part and dropping it in an available area within the parts arrangement area.

Deleting a Part

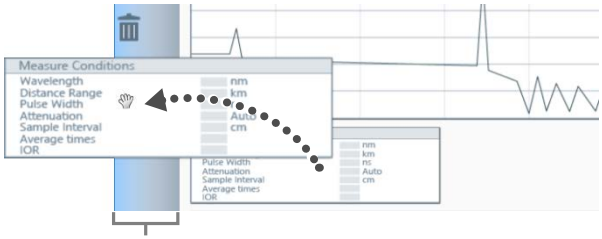
3. You can delete parts using one of the following two methods.

- **Double-click**

  When you double-click a part already placed in the report, the part is deleted.

- **Drag and Drop**

  When you drag a part already placed in the report to the left side, a trash bin mark appears at the left edge of the window. When you drop the part on the trash bin area, the part is deleted.



Trash bin area

Note

No confirmation message is displayed when a part is deleted.

Finishing the Layout Editing

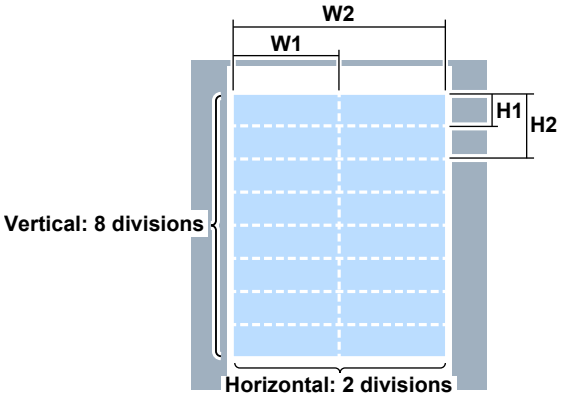
4. Click **Done**. A report preview window appears.

Set the displayed content of various parts. ► section 7.4

Explanation

Parts Arrangement Area

The parts arrangement area is divided as follows:



Part size

W1, H1

W1, H2

W2, H1

W2, H2

If the selected part does not fit in the parts arrangement area, a message appears in the bottom area of the window.

Report Parts

You can select the following parts on the parts panel.

Part name	Size*	Description
Trace (Small)	W1, H2	A small waveform is displayed.
Trace (Large)	W2, H2	A large waveform is displayed.
Job Information	W2, H1	The job information is displayed in the report.
Event List (Small)	W1, H1	A small event list is displayed.
Event List (Large)	W2, H1	A large event list is displayed.
Total Table	W2, H2	Event search results of each core are displayed in tabular form.
Event Map (small)	W1, H1	A small event map is displayed.
Event Map (Large)	W2, H1	A large event map is displayed.
Summary Table	W2, H2	Measurement results of each core are displayed in tabular form.
Event Search Conditions	W1, H1	Event search conditions and pass fail conditions are displayed.
Measure Conditions	W1, H1	Measurement conditions are displayed.
Link Summary	W1, H1	Measurement results and fiber surface image are displayed.
Fiber Surface Image	W1, H1	The fiber surface image is displayed.

* See the figure above for the parts sizes.

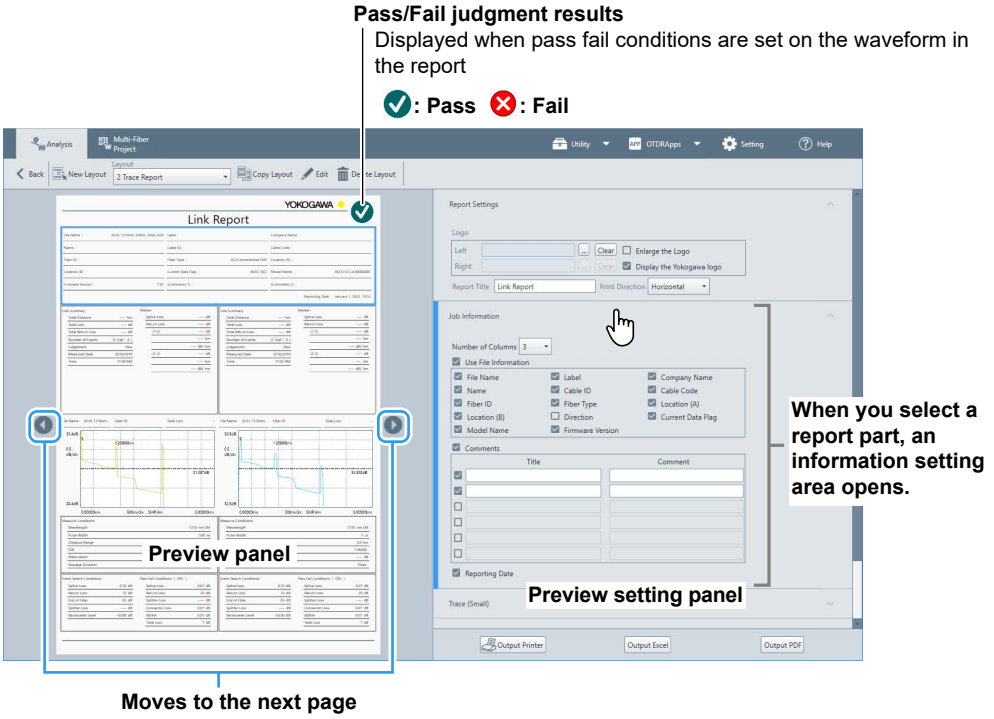
7.4 Editing the Content of the Report

Procedure

Displaying the Report Preview Window

1. Select a report layout. ► section 7.2
2. If necessary, edit the report layout. ► section 7.3
3. Click **Done**. ► sections 7.2 and 7.3

   A report preview window appears. The content of the files loaded in the analysis window is displayed in the preview window.



Selecting the Part to Edit

4. Select the part to edit using one of the following methods.

- **Click the Part to Edit on the Preview Panel**

  Only the information setting area of the corresponding part opens on the preview setting panel.

- **Click the Part to Edit on the Preview Setting Panel**

  When the part information setting area is closed, clicking it opens it. When the part information setting area is open, clicking it closes it.

  The corresponding part is enclosed in a blue frame on the preview panel.

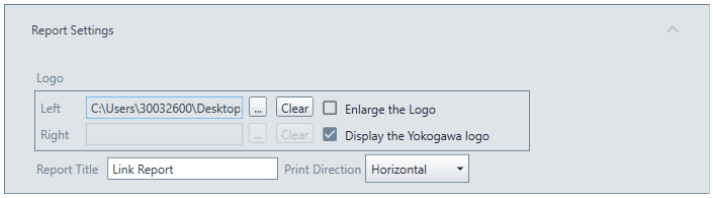
5. Set the items of the report part.

   The set items are reflected in the preview panel display.

Explanation

Setting Report Parts

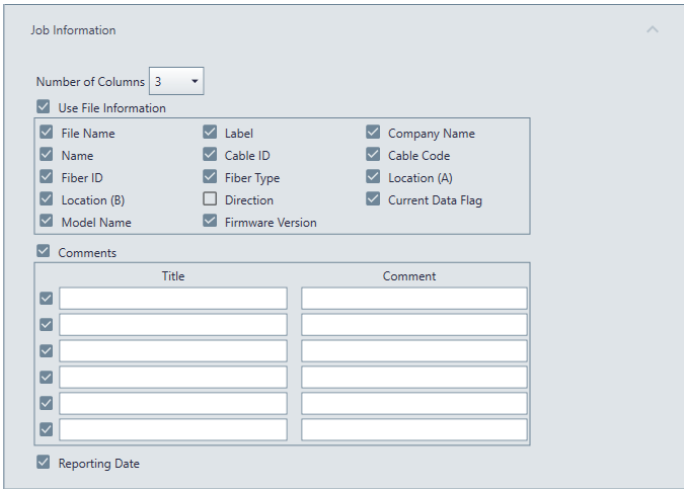
Report Settings



Item	Description
Logo setting (common to right and left)	A logo can be displayed in the upper left or upper right of the report.
Path to the logo data	Displays the path to the logo data
[...]	Specify the logo image data. Selectable file formats: png, jpg, bmp, gif
Clear	Clears the path to the selected logo data
Enlarge the Logo (left only)	This is valid when the left logo image data is specified. OFF: A logo is displayed in the upper left of the report. ON: A slightly enlarged logo is displayed in the upper left of the report.
Display the Yokogawa logo (right only)	ON: The YOKOGAWA logo is displayed in the upper right. OFF: The YOKOGAWA logo is cleared from the screen, and you will be able to specify the image data of the logo you want to display in the upper right.
Report Title	Enter the report title using up to 16 characters.
Print Direction	Horizontal: Files are arranged in order horizontally. Vertical: Files are arranged in order vertically.

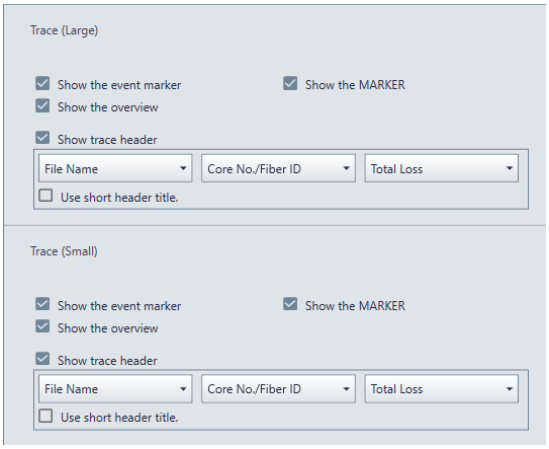
* For details on the logo display location and print direction, see page 7-4.

Job Information



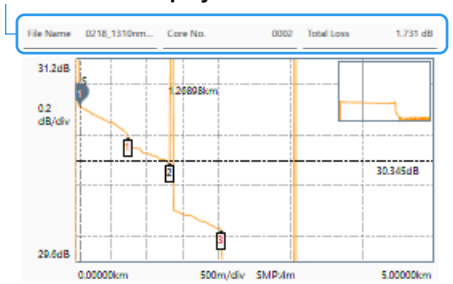
Item	Description
Number of Columns	The label display can be changed to one column, two columns, or three columns.
Use File Information	OFF: File information is not used. ON: File information is used. Select the following items to display in the report: • File Name • Label • Company Name • Name • Cable ID • Cable Code • Fiber ID • Fiber Type • Location (A) • Location (B) • Direction • Current Data Flag • Model Name • Firmware Version
Comments	OFF: Do not set user-defined export items. ON: Set user-defined export items. You can set up to six entries. You can select or unselect the check box at the left of each entry to show or hide the comments individually. • Title: up to 15 characters • Comment: up to 256 characters
Reporting Date	The reporting date is included in the label information.

Trace (Small/Large)



Preview example of trace (small)

Trace header display



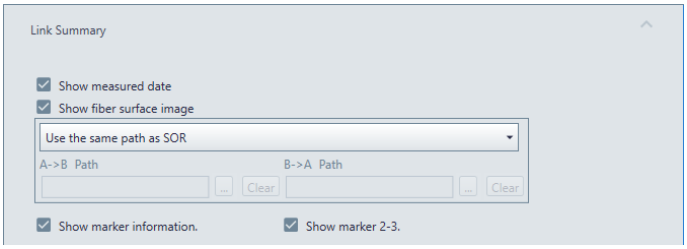
To set the display scale and display position of the waveform, use **Show Output Scale** on the toolbar of the Analysis window. ► section 4.1

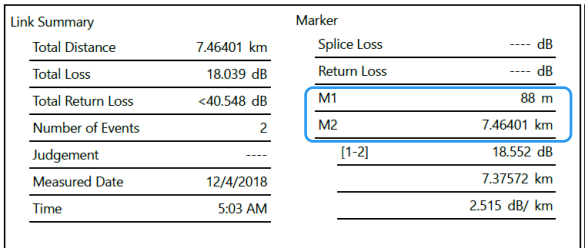
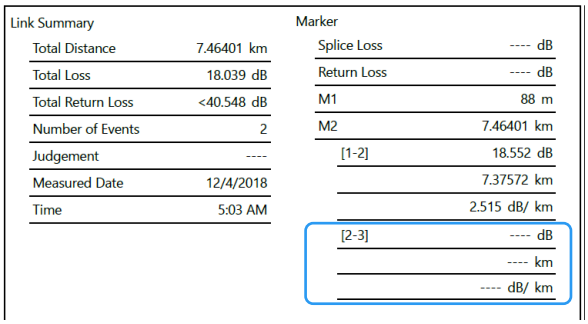
Item	Description
Show the event markers	Select whether to show event markers on the waveforms.
Show the MARKER	Select whether to show markers on the waveforms.
Show the overview	Select whether to show the overview with the waveform. For Trace (Large), the overview is displayed next to the waveform. For Trace (Small), the overview is displayed to the upper right of the waveform.
Show trace header	When the trace header display is enabled, you can select the following items using the combo boxes. • No Item. • Core No./Fiber ID • Total Return Loss • Direction • Measured Date • File Name • Total Loss • Total Distance • Label
Use short header title.	When there is not enough width, you can select whether to omit the title.

Measure Conditions

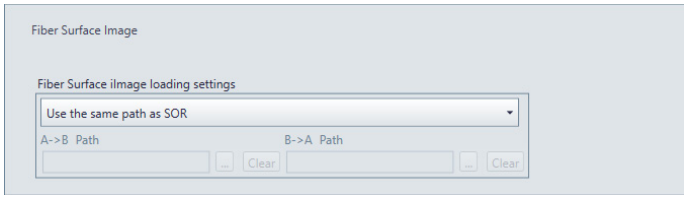
There are no items that need to be set.

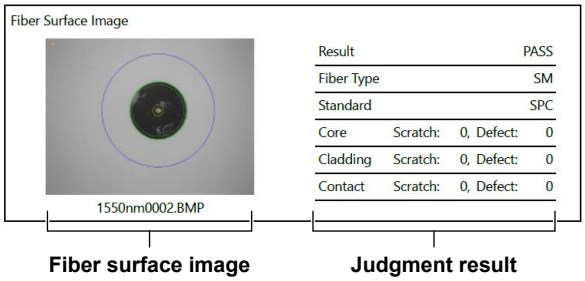
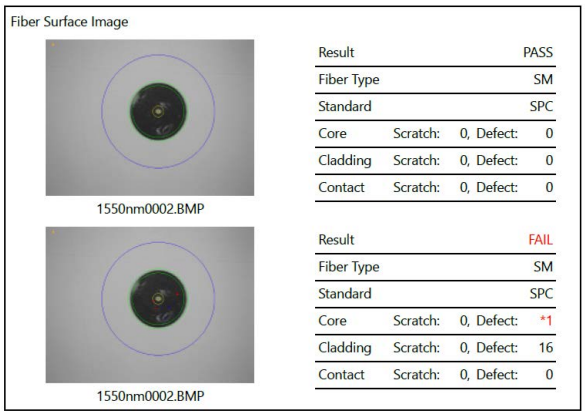
Link Summary



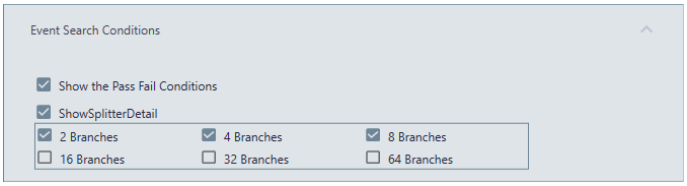
Item	Description
Show measured date	Select whether or not to show the measured date.
Show fiber surface image	OFF: The fiber surface image is not displayed. ON: The fiber surface image is displayed. Select the path to the fiber surface image from the following: • Use the same path as SOR • Specify the path: Specify the A->B path and B-A path. • Use analysis settings: The same path as the pass of the fiber surface image in the fiber settings (page 3-5)) is used. If the fiber surface image is not at the specified path, a blank will be displayed.
Show marker information.	OFF: Marker information is not displayed. ON: Marker information is displayed. The following items can be shown or hidden. • Show M1, M2 marker distance. **Preview example**  • Show marker 2-3. **Preview example** 

Fiber Surface Image



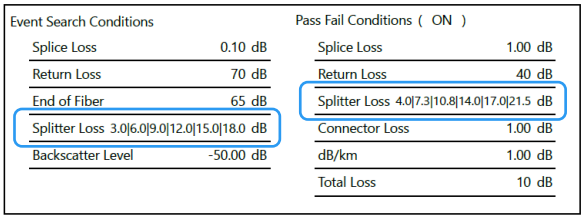
Item	Description
Fiber Surface Image loading settings	The fiber surface image is displayed. Select the path to the fiber surface image from the following: • Use the same path as SOR • Specify the path: Specify the A->B path and B-A path. • Use analysis settings: The same path as the pass of the fiber surface image in the fiber settings (page 3-5) is used. If the fiber surface image is not at the specified path, a blank will be displayed. **Preview example** **When the analysis method is One Way**  **When two-way trace analysis is running**  **Judgment result** If the path specified in “Fiber Surface Image loading settings” contains analysis result data (CSV format) with the same file name as the fiber surface image (BMP format), the CSV file will also be loaded, and the judgment result will be displayed. If a CSV file does not exist in the specified path, the judgment result will be blank.

Event Search Conditions



Item	Description
Show the Pass Fail Conditions	Select whether to show pass fail conditions. If the SOR pass fail conditions are invalid, invalid values will be displayed.
Show Splitter Detail	OFF: The splitter details are not shown. The value for each number of splits is shown in the splitter loss line.

Preview example

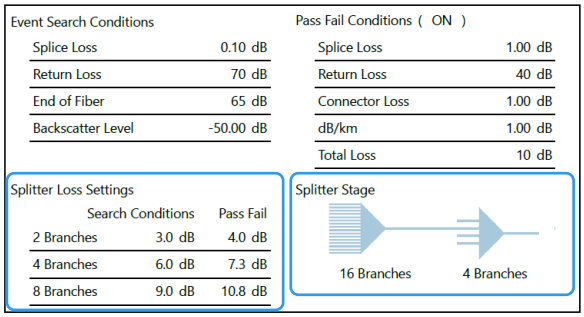


ON: The splitter details are shown. You can select the number of splits to display from the following:

- 2 Branches
- 4 Branches
- 8 Branches
- 16 Branches
- 32 Branches
- 64 Branches

The detection conditions of the selected number of splits, the pass/fail judgment conditions, and the network configuration diagram are shown.

Preview example



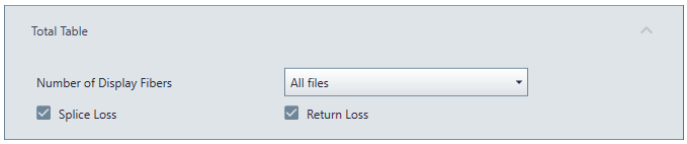
Event Map (Small/Large)

There are no items that need to be set.

Event List (Small/Large)

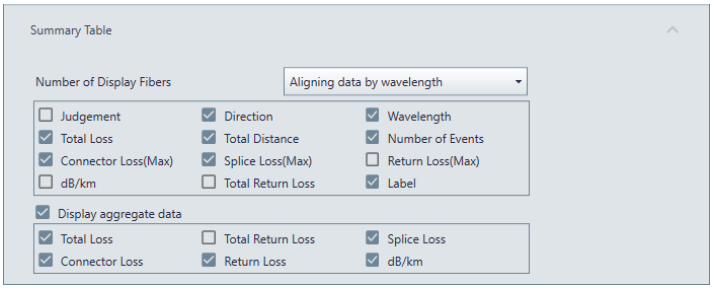
Item	Description
Event list display items	Select the items to show in the event list. * You can select only one of the following: return loss, reflection level, or reflectance. • Total Distance • Splice Loss • Reflection level* • Cumul-Loss • Event Type • Comment • Section Distance • Return Loss* • Reflectance* • dB/distance • IOR

Total Table



Item	Description
Number of Display Fibers	Set the SOR files to display in the total table. • All files All the loaded waveforms on the analysis window are included in the total table. • Combine with others Only the waveforms used in a single layout are included in the total table.
Display items	Select the items to show in the total table. • Splice Loss • Return Loss

Summary Table

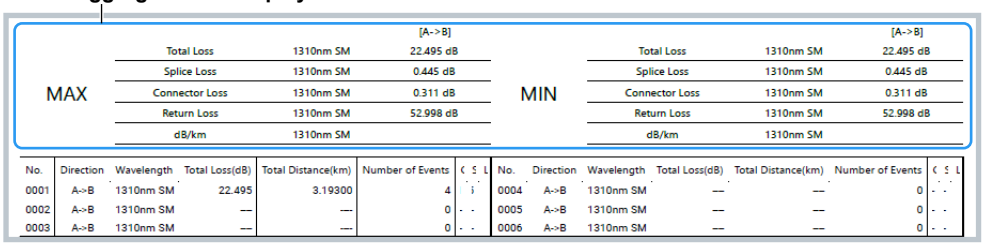


Item	Description
Number of Display Fibers	Set the SOR files to display in the summary table. • All files All the loaded waveforms on the analysis window are included in the summary table. • Combine with others Only the waveforms used in a single layout are included in the summary table. • Aligning data by wavelength The loaded SOR files are shown in columns by wavelength. When there is only one wavelength in the loaded file, the number of rows in the left and right columns of the table is adjusted evenly.
Display items	Select the items to show in the summary table. • Judgement • Direction • Wavelength • Total Loss • Total Distance • Number of Events • Connector Loss (Max) • Splice Loss (Max) • Return Loss (Max) • Total Return Loss • Label
Display aggregate data	OFF: Aggregate data is not shown. ON: Aggregate data is shown. The maximum and minimum values for each wavelength are tabulated and shown based on the data in the summary table. Select the items to tabulate from the following: • Total Loss • Connector Loss • Total Return Loss • Return Loss • Splice Loss • dB/km

Preview example

When there is only one waveform wavelength in the file, Number of Display Fibers is set to Aligning data by wavelength, and Display aggregate data is set to ON.

Aggregate data display



7.5 Exporting Reports

This section explains how to export reports.

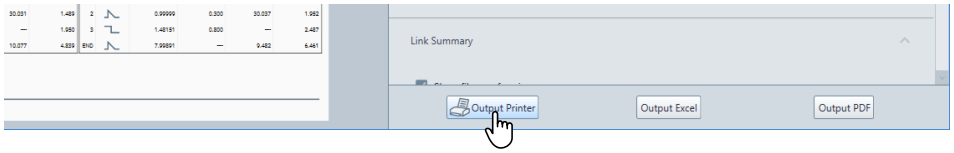
Procedure

Displaying the Report Preview Window

1. Select a report layout. ► section 7.2
2. If necessary, edit the report layout. ► section 7.3
3. Click **Done**. ► sections 7.2 and 7.3
   A report preview window appears.

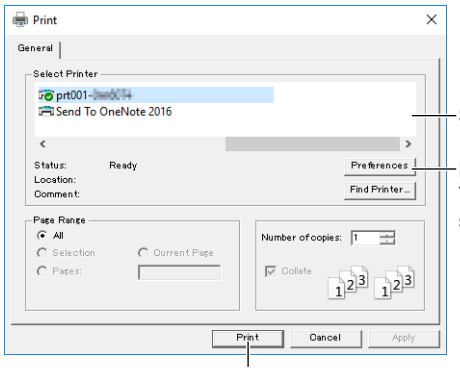
Selecting the Output Format

4. Click **Output Printer**, **Output PDF**, or **Output Excel** at the bottom area of the preview setting panel.



Output Printer

A Print dialog box appears.



Select a printer.

Detail settings
The preferences dialog box for the selected printer opens.

Print button

5. Select a printer, and click **Preferences**.
   The preferences dialog box for the selected printer opens.
6. Select the paper, print orientation, and the like, and click **OK**. The dialog box closes.
7. Click **Print** in the print dialog box.

   The report is printed with the same image as the preview window.

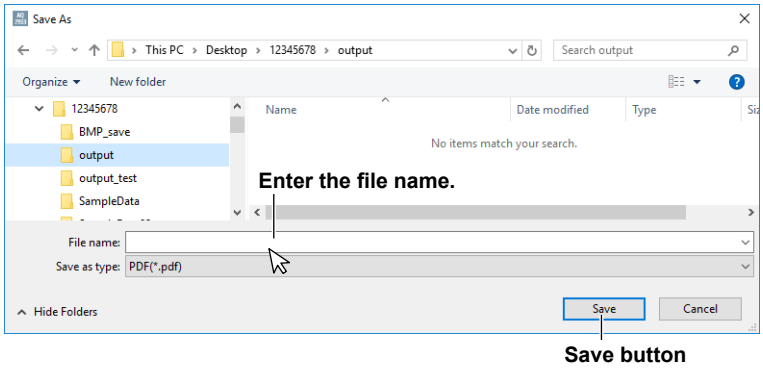
Note

Set the printer settings properly according to your system environment.

Output PDF, Output Excel

A Save As dialog box appears.

5. Set the file output destination and file name, and then click **Save**.



The report file is saved with the same image as the preview window.

Note

When you print the PDF file on a printer, the layout may become distorted. If this happens, select the Print As Image check box in the printer setup dialog box for your printer, and then print.

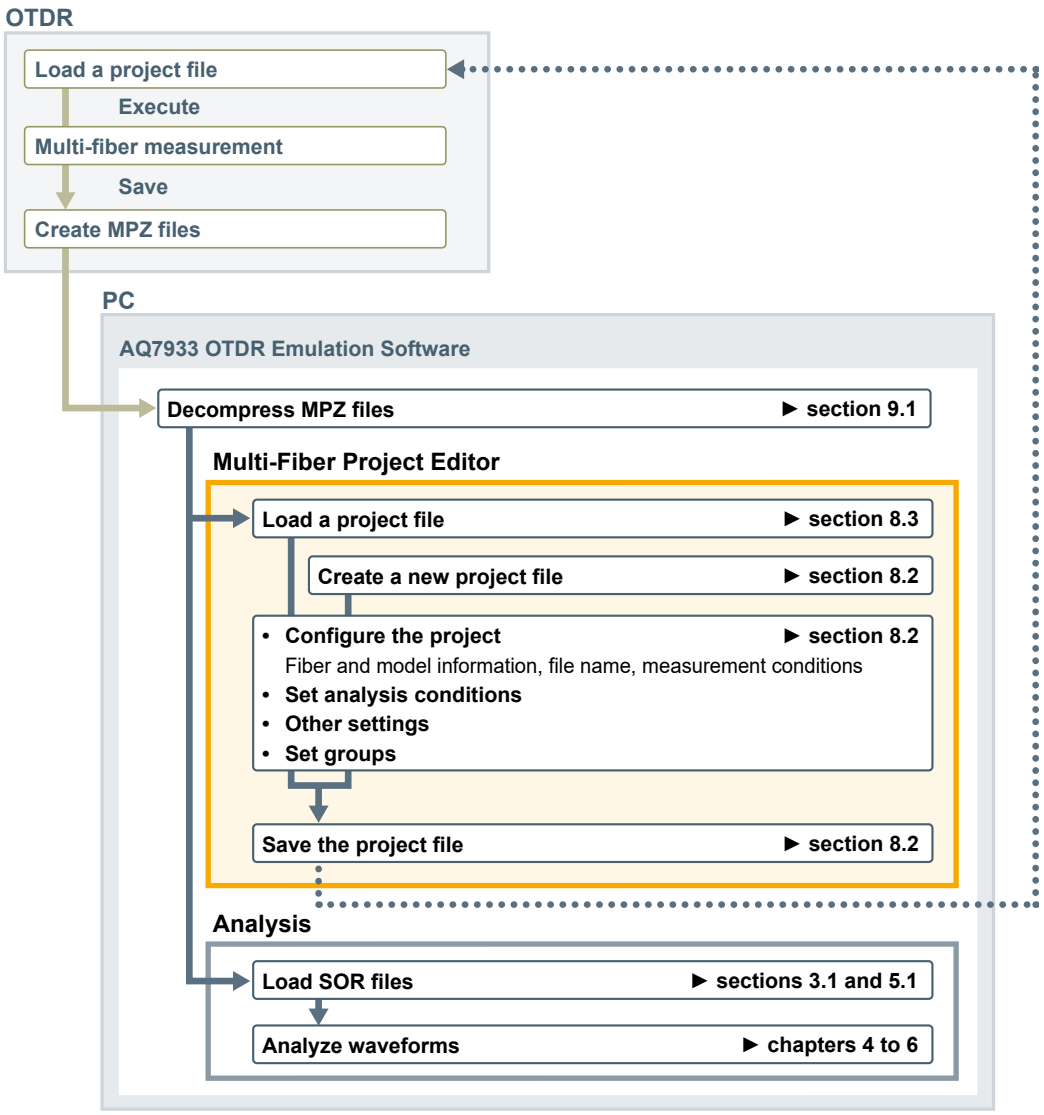
8.1 Overview of the Multi-Fiber Project Editor

The Multi-Fiber Project Editor is used to create setup files (MPJ files) that are used by the OTDR's multi-fiber measurement feature.

You can use the editor to do the following:

- Create a new project
- Load and save project files
- Set core numbers
- Set model information
- Set the name configuration
- Set analysis conditions
- Set initial conditions
- Set groups
- Set measurement conditions

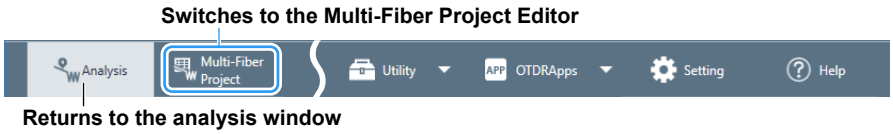
Workflow



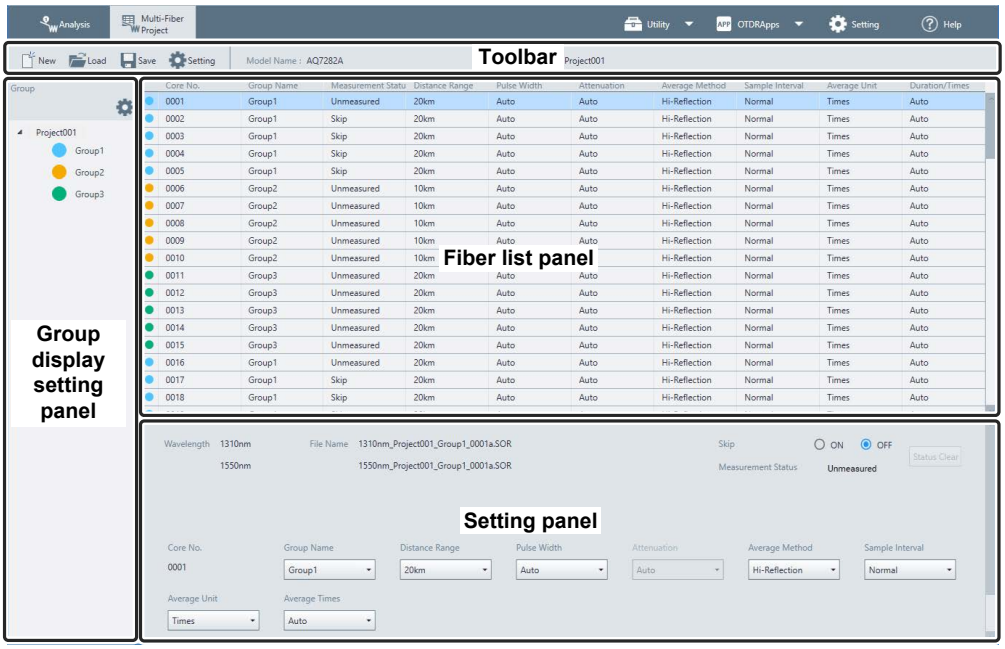
Procedure

Switching to the Multi-Fiber Project Editor

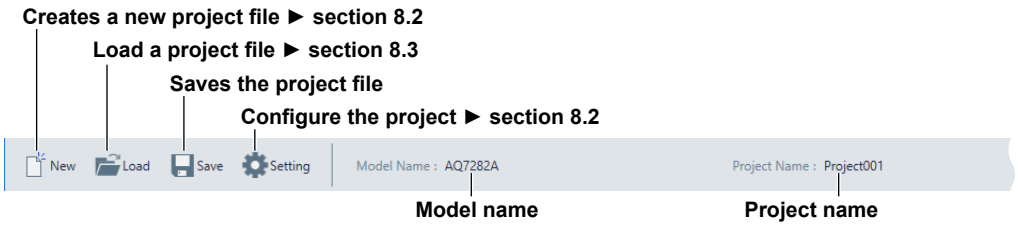
1. On the menu bar, click the **Multi-Fiber Project** tab. The following window appears.



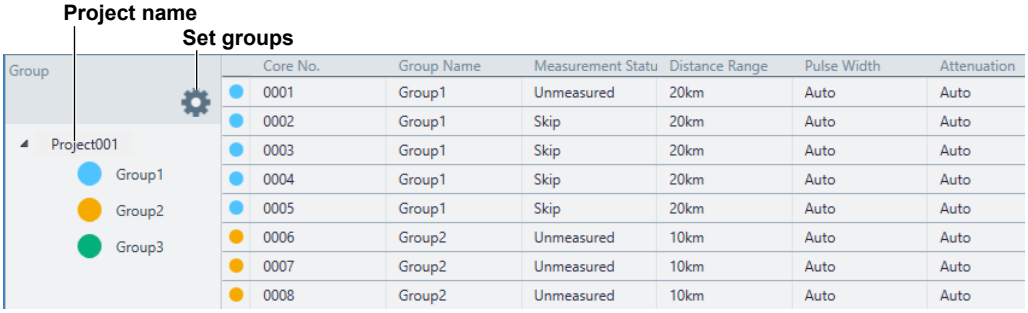
Project setting window



Toolbar

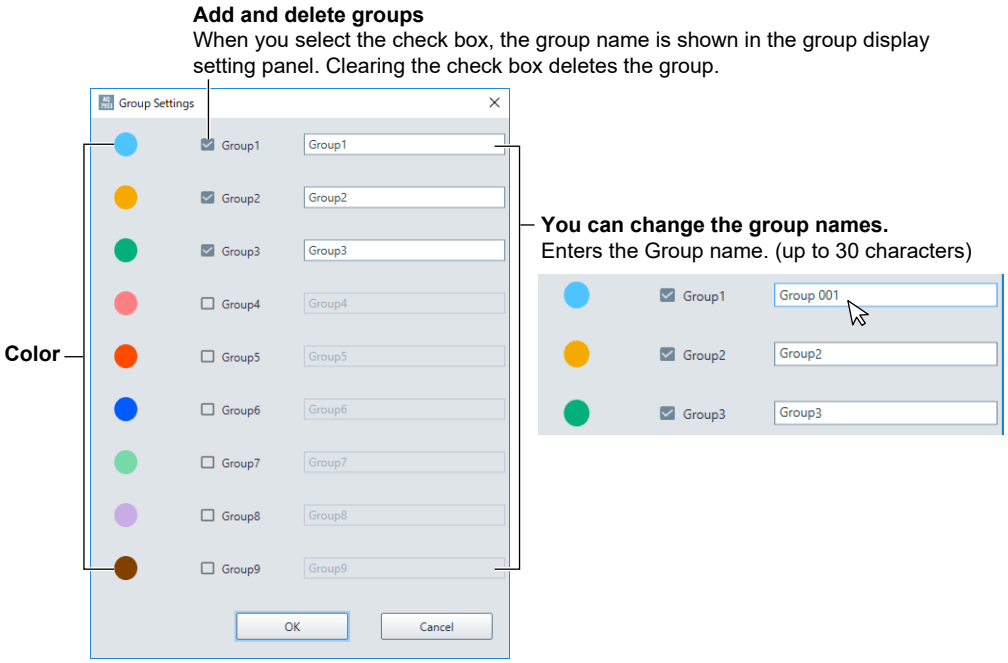


Group Display Setting Panel



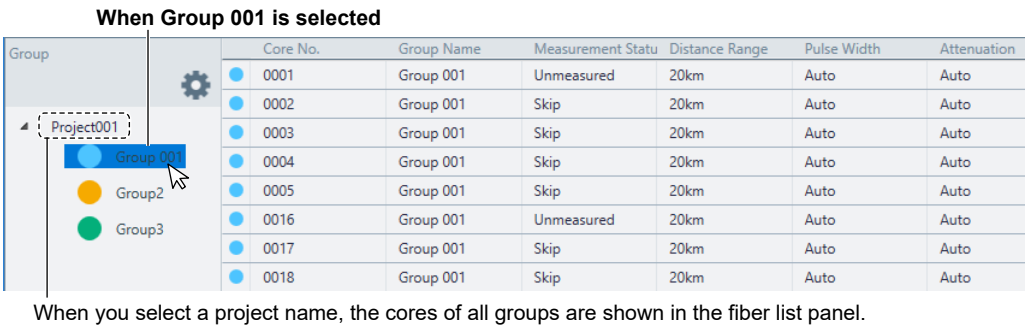
Group Settings

1. Click  . The following window appears.



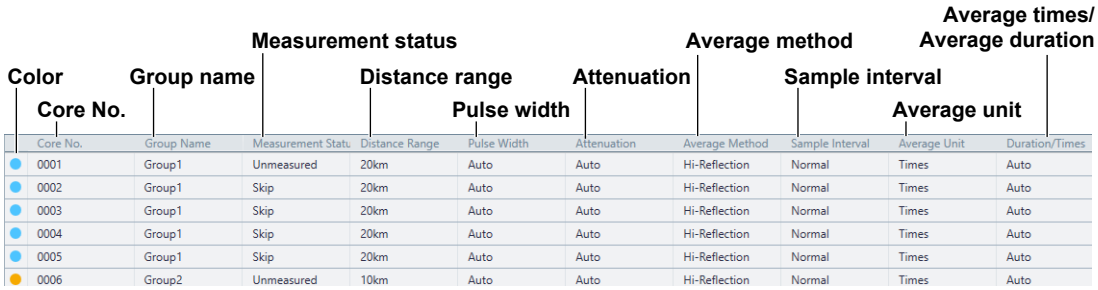
2. Click **OK**.

When you select a group on the display setting panel, only the cores in that group are shown in the fiber list panel.



Fiber List Panel

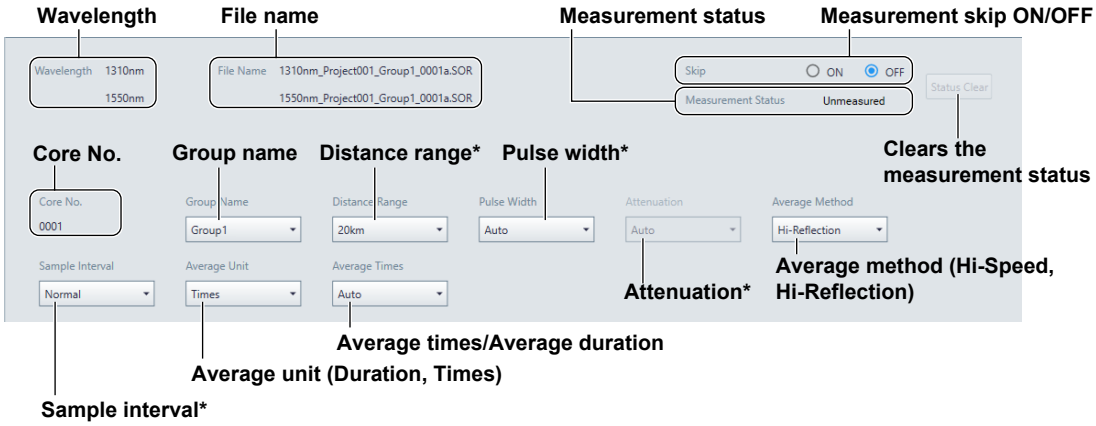
The measurement conditions set on each core are listed.



Core No.	Group Name	Measurement Statu	Distance Range	Pulse Width	Attenuation	Average Method	Sample Interval	Average Unit	Duration/Times
0001	Group1	Unmeasured	20km	Auto	Auto	Hi-Reflection	Normal	Times	Auto
0002	Group1	Skip	20km	Auto	Auto	Hi-Reflection	Normal	Times	Auto
0003	Group1	Skip	20km	Auto	Auto	Hi-Reflection	Normal	Times	Auto
0004	Group1	Skip	20km	Auto	Auto	Hi-Reflection	Normal	Times	Auto
0005	Group1	Skip	20km	Auto	Auto	Hi-Reflection	Normal	Times	Auto
0006	Group2	Unmeasured	10km	Auto	Auto	Hi-Reflection	Normal	Times	Auto

Setting Panel

You can set the measurement conditions of the core selected in the fiber list panel.



* The selectable setting ranges change depending on the model name selected in the hardware information settings. ► section 8.2

Wavelength

The selected wavelength is displayed. If multiple wavelengths are selected, list columns are added.

File Name

The file name of the selected core is displayed.

Measurement Status

The measurement status is displayed.

- Unmeasured: None of the selected wavelengths have been measured.
- Done: All of the selected wavelengths have been measured.
- Partially Done: A portion of the selected wavelengths have been measured.
- Skip: Measurement skip state.

Measurement Skip ON/OFF

You can set whether to skip the measurement of each core.

ON: Measurement is skipped.

OFF: Measurement is performed as usual.

Status Clear

It is valid only when the measurement status is Done or Partially Done.

When you click **Status Clear**, waveform files are deleted, and the measurement status is changed to Unmeasured.

Core No.

The core number is displayed.

Group Name

You can select the group name.

Pulse Width

Set the pulse width. The selectable range varies depending on the distance range.
This is fixed to Auto when Distance Range is set to Auto.

Attenuation

Set the attenuation. The selectable range varies depending on the distance range and pulse width.
This is fixed to Auto when Pulse Width is set to Auto and Average Method is set to Hi-Reflection.

Sample Interval

Set the sampling interval. The selectable range varies depending on the distance range.
When the OTDR model is AQ7280 series or AQ1210 series, you can select Normal or High Resolution.

Note

The distance range, pulse width, attenuation, and sample interval may automatically be changed within the setting range depending on the set values.

Explanation

Loading a Project File

Click **Load** to load an MPJ file.
Compatible OTDR models ► section 1.1
Information on the loaded project (measurement conditions, analysis conditions, information on the core to be measured, etc.) is displayed in the project setting window.
► section 8.3

Saving a Project File

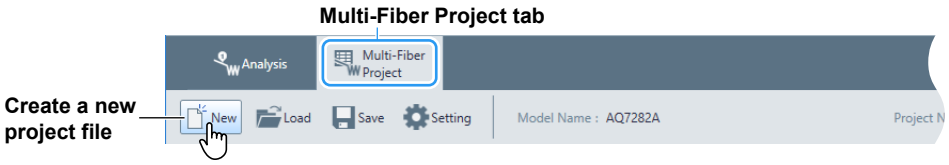
Click **Save** to save the settings you created or edited to an MPJ file.

8.2 Creating a New Project

This section explains how to create a new multi-core fiber setting file (MPJ file).

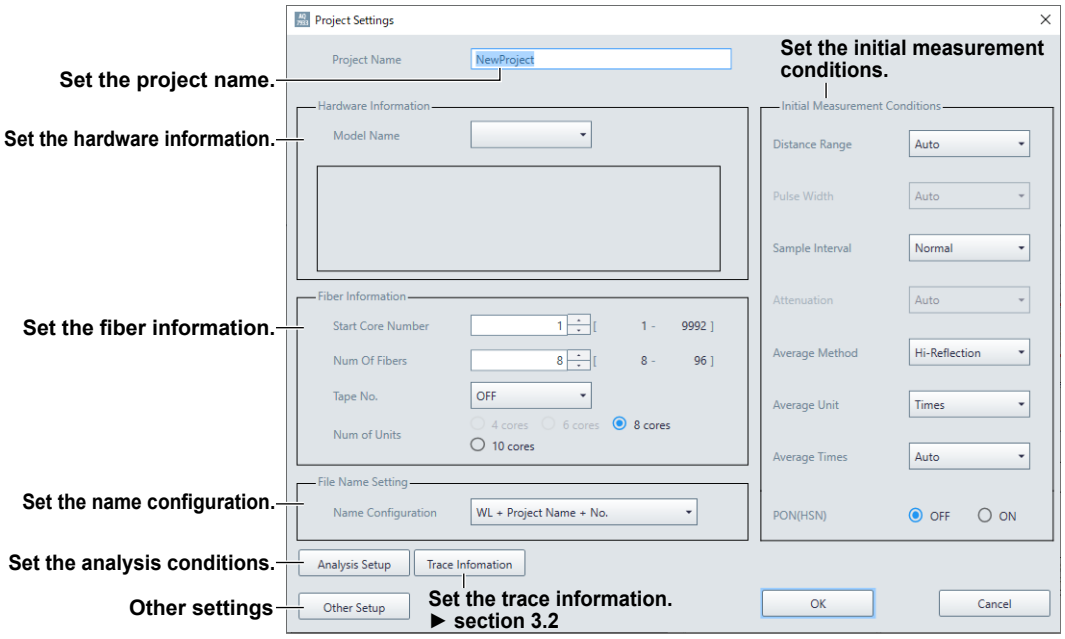
Procedure

1. On the menu bar, click the **Multi-Fiber Project** tab, and click **New** on the toolbar. The following dialog box appears.



New Project Settings Dialog Box

2. Set each item.

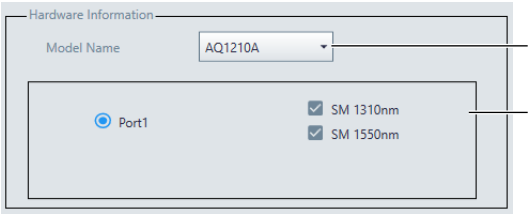


Setting the Project Name

Enter the project name (up to 19 characters).

Setting the Hardware Information

Set the hardware information of the OTDR to be used in the project.



Select the model name.

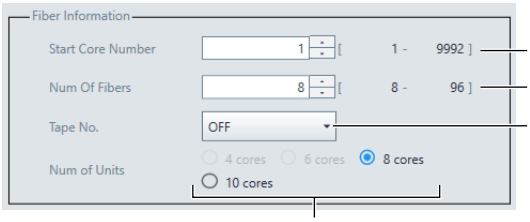
Set the wavelength.
The selectable ports and wavelengths switch automatically depending on the set model name.

Note

If the model name selected here is different from the OTDR model name, the file cannot be loaded in the OTDR. You can view the model name (MS code) by selecting MENU > OTDR > Next page > System > Hardware Information on the OTDR.

Setting the Fiber Information

Set the core number information.



Set the starting core number.

Set the number of cores or tapes.

Set the tape No.
(OFF, a-b (2), a-c (3), a-d (4), a-e (5), a-f (6), a-g (7), a-h (8))

Set the number of cores in each division (4 cores, 6 cores, 8 cores, 10 cores).
You can set this when the tape number is set to OFF.

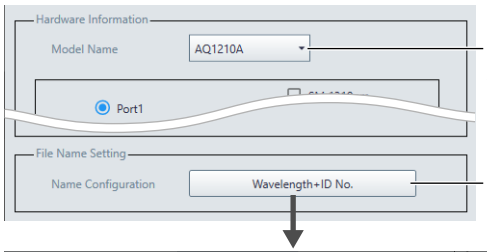
Setting the Name Configuration

The File Name Setting drop-down list appears. Select from the following options.

- WL + Project Name + No.
- Project Name + WL + No.
- No. + Project Name + WL
- No. + Project Name
- Project Name + No.

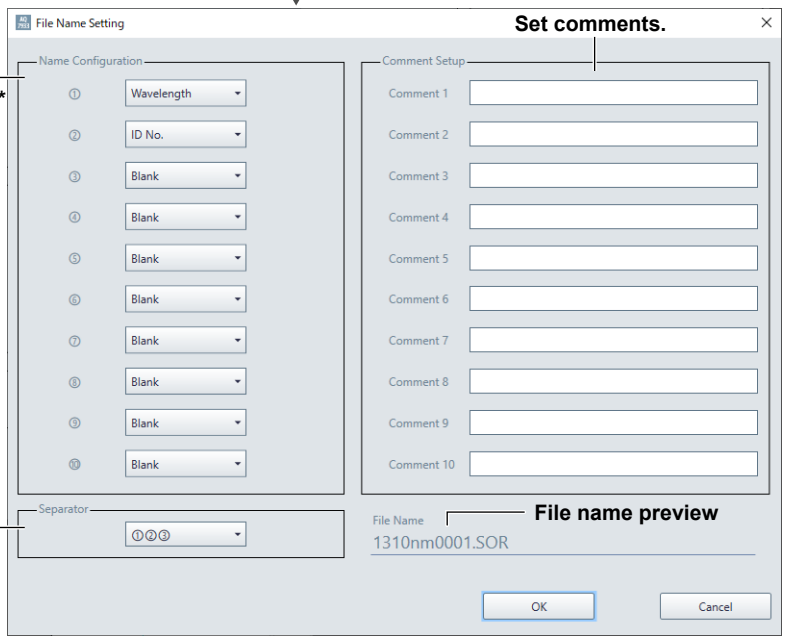
When the Model Name Is an AQ1210 Series Model

A detail setting button appears for the file name. The file name settings are displayed on the button. Click this button to display a dialog box for setting the details of the file name.



When AQ1210A, AQ1215A, AQ1210D, AQ1210E, AQ1215E, or AQ1215F is selected

Detail setting button



Set comments.

Name Configuration*
- **Project Name**
- **ID No.**
- **Wavelength**
- **Distance Range**
- **Pulse Width**
- **Average Duration/ Times**
- **Comment 1 to 10**
- **Company Name**
- **Name**
- **Cable ID**
- **Fiber ID**
- **Cable Code**
- **Location(A)**
- **Location(B)**

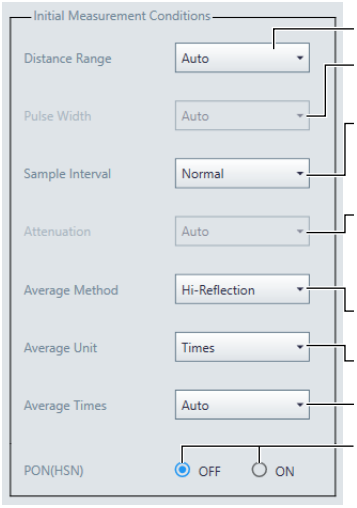
Separator
- ①②③
- ①_②_③
- ①~②~③
- ①^②^③

File name preview

*** An error occurs if the file name setting does not include "ID No." or "Wavelength."**

Setting Initial Measurement Conditions

On the Project Settings dialog box, set the initial measurement conditions. The measurement conditions of all cores are initialized to these settings.



Distance range*

Pulse width*
This is fixed to Auto when Distance Range is set to Auto.

Sample interval*
When the OTDR model is AQ7280 series or AQ1210 series, you can select Normal or High Resolution.

Attenuation*
This is fixed to Auto when Pulse Width is set to Auto and Average Method is set to Hi-Reflection.

Average method (Hi-Speed, Hi-Reflection)

Average unit (Duration, Times)

Average times/average duration

Turns PON measurement on or off

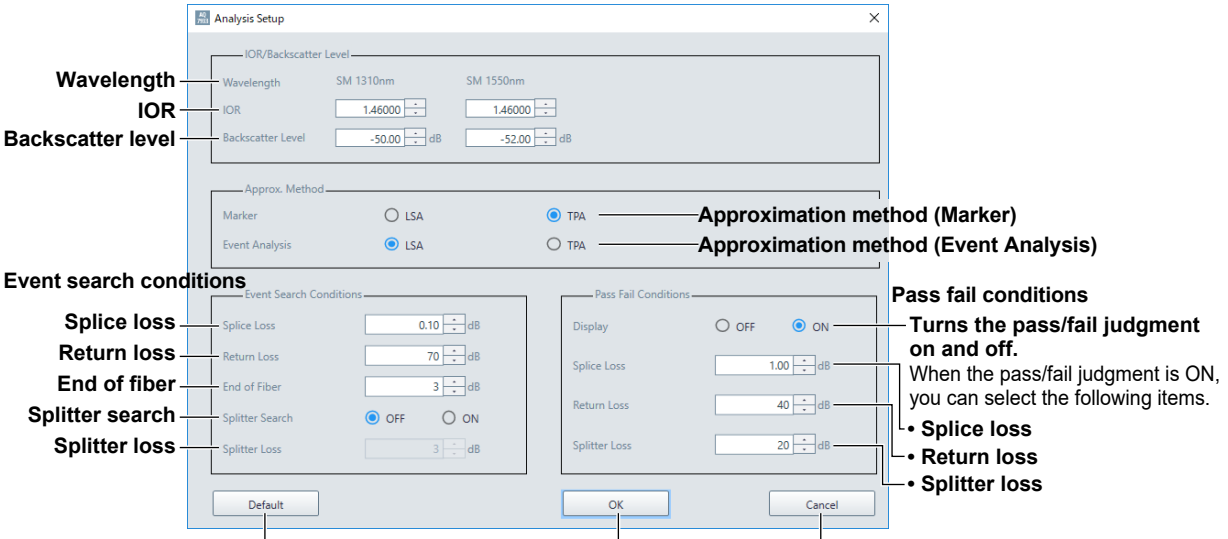
* The selectable setting ranges change depending on the model name selected in the hardware information settings.

Average Times/Average Duration

- **When Average Unit Is Set to Times**
  Set the number of times to average from the following:
  Auto, 5sec, 10sec, 20sec, 30sec, 1min, 3min, 5min, 10min, 20min, 30min
- **When Average Unit Is Set to Duration**
  Set the average duration from the following:
  Auto, 2^10, 2^11, 2^12, 2^13, 2^14, 2^15, 2^16, 2^17, 2^18, 2^19, 2^20

Setting Analysis Conditions

3. Click **Analysis Setup**. The following window appears. Set each item.
If the model name is an AQ1210 or AQ7280 series model, detailed splitter settings are displayed.
► Next page



Wavelength

IOR

Backscatter level

Approximation method (Marker)

Approximation method (Event Analysis)

Event search conditions

Splice loss

Return loss

End of fiber

Splitter search

Splitter loss

Pass fail conditions

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

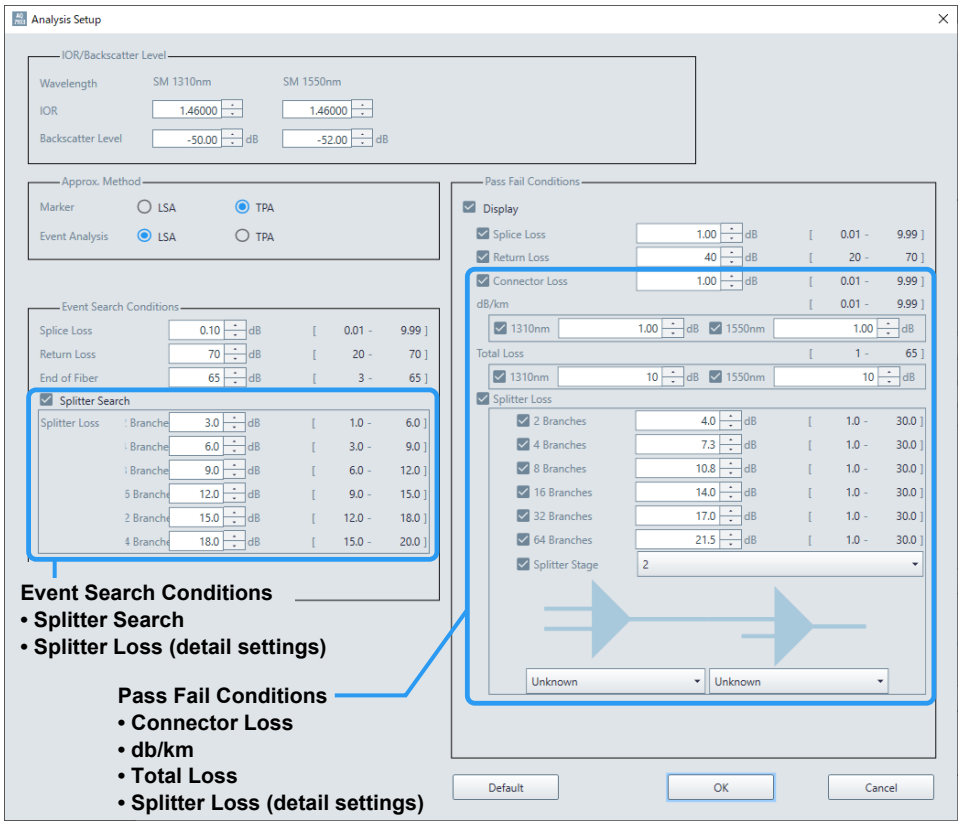
- **Splice loss**
- **Return loss**
- **Splitter loss**

Initialization

Applies the current settings

Cancels the operation

When the Model Name Is an AQ1210 or AQ7280 Series Model



Setting the Trace Information

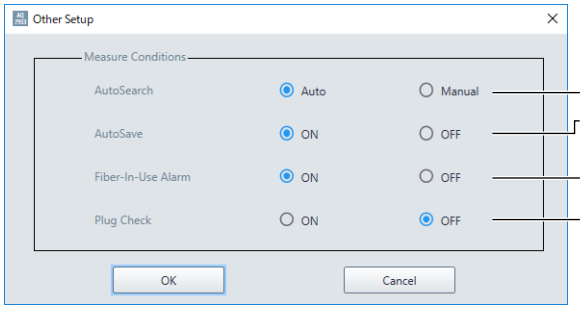
4. Click the **Trace Information**. A trace information setting window appears.

The settings are the same as those of the Trace Information window of the file list view on the Analysis tab. ► section 3.2

Other Settings

4. Click **Other Setup**. The following window appears.

Set the instrument operation during OTDR measurement.



- **Auto event search**

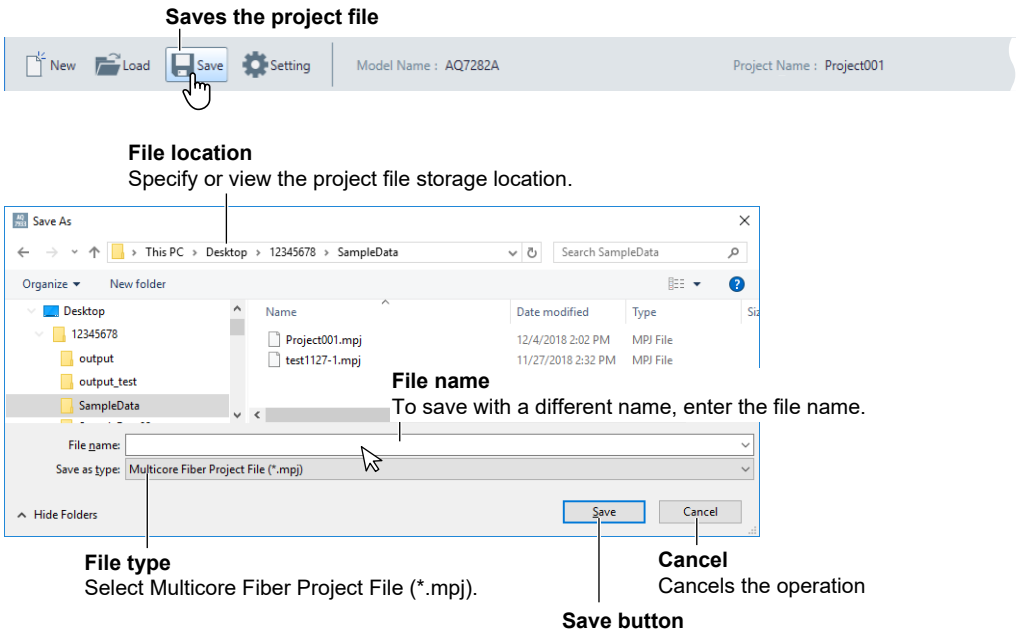
  You can set whether to automatically search for events when a measurement is completed.
- **Setting automatic saving of the measured results to on or off**

  You can set whether to automatically save SOR files when a measurement is completed.

- **Turning the fiber-in-use alarm on or off**
  You can set whether to check the usage condition of the cores to be measured before starting measurements.
- **Turning connection check on or off**
  You can set whether to check for errors (stained fiber, connection failure) in the connection between the OTDR and the target core plugs.

Saving a Project File

5. On the toolbar, click **Save**. The following window appears.



6. Click **Save** to save the project file as an MPJ file. Groups set in the project are also saved to the file.

Explanation

Hardware Information Setting Feature

On the Project Settings window, you can set the hardware information of the OTDR to be used in the project. The setting ranges of measurement conditions vary depending on the hardware information set here.

Setting the Hardware Information

- **Model Name**
  You can select the names of models supporting the MPJ file format. ► section 1.1

Setting the Wavelength

You can set the wavelength to use in the multi-fiber measurement. The selectable ports and wavelengths are filtered using the hardware information and displayed.

- **Setting the Port**
  When there are multiple ports, you can select a single port.
- **Setting the Wavelength**
  You can select the wavelength of your choice within the specified port. (You can also select multiple wavelengths.)
  An error will occur if no wavelength is selected.

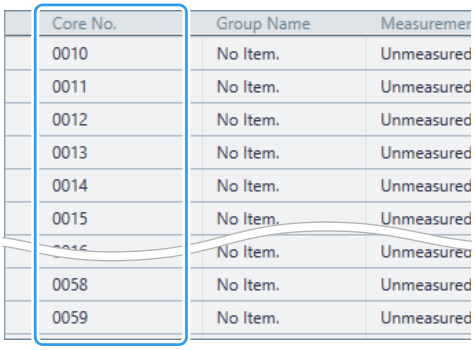
Setting the Fiber Information

- **Tape No.**
  Set the tape number to use to OFF or a value in the range of a-b (2) to a-h (8).
- **Num of Units**
  When the tape No. is set to OFF, you can set the number of core divisions.
  The number of divisions that you can set varies depending on the model name setting of the hardware information (see the previous page).
- **Start Core Number**
  You can set the start core number.
- **Num of Fibers**
  You can set the total number of fibers. The number of fibers that you can set varies depending on the tape number setting and the number of core divisions.
  - **When the tape No. is not set to OFF**
    You can set any value as long as the product of the number of tape ID alphabet letters and the number of fibers does not exceed 100.

    Example: If the tape No. is a-c (3), the number of fibers can be set up to 33 (3×33=99). Core Information Display
  - **When the tape No. is set to OFF**
    You can set the total number of fibers. The numbers of fibers you can set vary depending on the number of core divisions as follows:
    4 cores: 6, 8, 12, 16, … , 96
    6 cores: 6, 12, 24, 30, … , 72
    8 cores: 8, 16, 24, 32, … , 96
    10 cores: 10, 20, 30, 40, … , 100

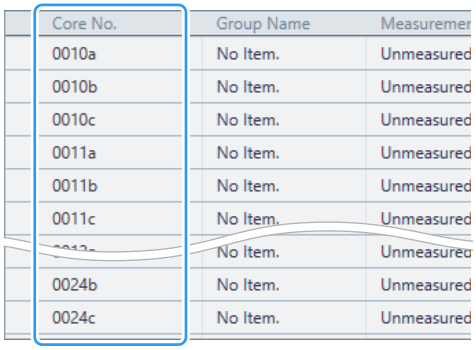
Core numbers are displayed in the fiber list panel according to the fiber information settings.

- **Example of a normal core cable**
  Start core No.: 10, tape No.: OFF,
  number of core divisions: 10, number of cores: 50



Core No.	Group Name	Measuremer
0010	No Item.	Unmeasured
0011	No Item.	Unmeasured
0012	No Item.	Unmeasured
0013	No Item.	Unmeasured
0014	No Item.	Unmeasured
0015	No Item.	Unmeasured
	No Item.	Unmeasured
0058	No Item.	Unmeasured
0059	No Item.	Unmeasured

- **Example of a ribbon slotted core cable**
  Start core No.: 10, tape No.: a-c (3),
  number of cores: 15



Core No.	Group Name	Measuremer
0010a	No Item.	Unmeasured
0010b	No Item.	Unmeasured
0010c	No Item.	Unmeasured
0011a	No Item.	Unmeasured
0011b	No Item.	Unmeasured
0011c	No Item.	Unmeasured
	No Item.	Unmeasured
0024b	No Item.	Unmeasured
0024c	No Item.	Unmeasured

Setting the Name Configuration

On the Project Settings window, you can set the format of the measurement file names of the project. The selectable name configurations and their examples are shown below.

Example: When the project name is ABC, the measure wavelength is 1310 nm, and the core number is 0010

- WL + Project Name + No. **1310nm_ABC_0010.SOR**
- Project Name + WL + No. **ABC_1310nm_0010.SOR**
- No. + Project Name + WL **0010_ABC_1310nm.SOR**
- No. + Project Name **0010_ABC.SOR**
- Project Name + No. **ABC_0010.SOR**

File Name When a Group Name Is Specified

If a group name is assigned to a core, the file name is “project name_group name.”

Example: If the name configuration is No. + Project Name + WL, the group name is Group1, and the project name is ABC

0001_ABC_Group1_1310nm.SOR

When the Model Name Is an AQ1210 Series Model

Like the OTDR mainframe, you can set the file name format by combining the following information and separators (_, ~, ^).

- Project Name
- ID No.*
- Wavelength*
- Distance Range
- Pulse Width
- Average Duration//Times
- Comment 1 to 10
- Company Name
- Name
- Cable ID
- Fiber ID
- Cable Code
- Location (A)
- Location (B)

* ID No. and Wavelength are mandatory file name settings.

Setting Analysis Conditions

IOR/Backscatter Level

- **IOR**
  You can set the IOR to use in the analysis for each wavelength.
  Selectable range: 1.30000 to 1.79999
  Interval: 0.00001
- **Backscatter Level**
  You can set the backscatter level to use in the analysis for each wavelength.
  Selectable range: -64.99 dB to -10.00 dB
  Interval: 0.01 dB

Approximation Method

- **Approximation Method (Marker)**
  You can set the approximation method to use in the free marker analysis.
  LSA: Uses the least squares method to approximate the loss between two points.
  TPA: Defines the loss between two points using the level difference between two specified points.
- **Approximation method (Event Analysis)**
  You can set the approximation method to use in the event analysis.
  ► Approximation Method (Marker)

Event Search Conditions

- **Splice Loss**
  You can set the splice loss threshold for event searches.
  Selectable range: 0.01 dB to 9.99 dB
  Interval: 0.01 dB
- **Return Loss**
  You can set and view the return loss threshold for event searches.
  Selectable range: 20 dB to 70 dB
  Interval: 1 dB
- **End of Fiber**
  You can set and view the end-of-fiber threshold for event searches.
  Selectable range: 3 dB to 65 dB
  Interval: 1 dB
- **Turning Splitter Search On or Off**
  ON: Splitter search is performed.
  OFF: Splitter search is not performed.
- **Splitter Loss**
  You can set the threshold for searching splitters.
  Selectable range: 1 dB to 20 dB
  Interval: 1 dB

If the model name is an AQ1210 or AQ7280 series model, the following items are displayed.

- **Splitter Search**
- **Splitter Loss (detail settings)**
  The settings are the same as those for auto splitter search and splitter loss. ►page 4-30

Pass Fail Conditions

- **Displaying Pass/Fail Judgment Results**
  You can show or hide pass/fail judgment results.
  ON: Show
  OFF: Hide
- **Splice Loss**
  You can set and view the splice loss threshold for past/fail judgments.
  Selectable range: 0.01 dB to 9.99 dB
  Interval: 0.01 dB
- **Return Loss**
  You can set and view the return loss threshold for past/fail judgments.
  Selectable range: 20 dB to 70 dB
  Interval: 1 dB

If the model name is an AQ1210 or AQ7280 series model, the following items are displayed.

- **Connector Loss**
- **dB/km**
- **Total Loss**
- **Splitter Loss (detail settings)**

The settings are the same as the connector loss, dB/km, total loss, and splitter loss of the normal pass/fail judgment conditions. ► page 4-34

Initialization

You can initialize the settings.

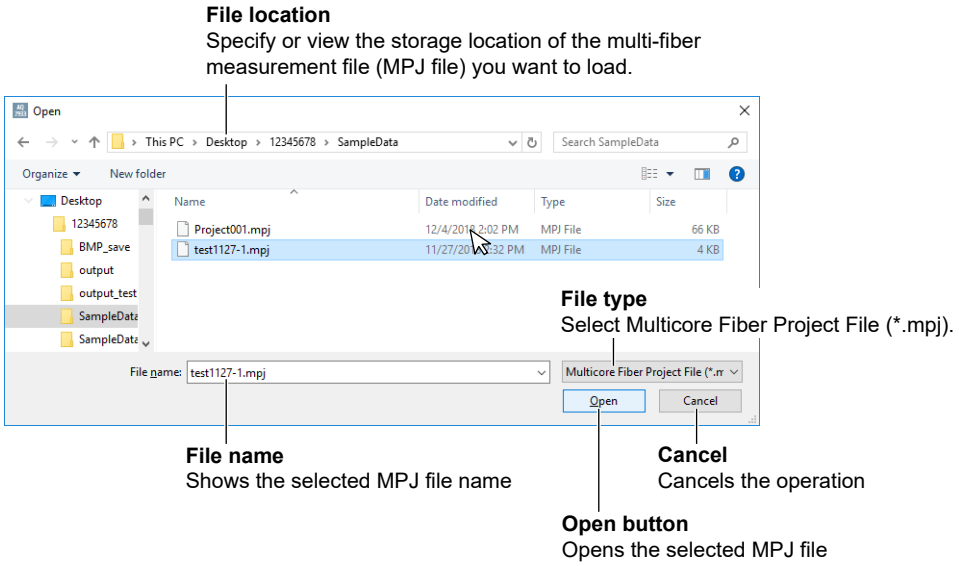
8.3 Loading a Project File

This section explains how to load a project file.

Procedure

1. On the menu bar, click the **Multi-Fiber Project** tab, and click **Load** on the toolbar. The following window appears.

2. Set the file type to **Multicore Fiber Project File (*.mpj)**, and click **Open**.



   The project file is loaded. The groups stored in the MPJ file are loaded, and the group IDs are displayed.

3. To configure the project, click Setting on the toolbar. The Project Setting dialog box appears.

   Refer to section 8.2, and set the necessary items. However, in the project settings of a loaded project file, you cannot change the initial measurement conditions.

Explanation

Loading an MPJ File

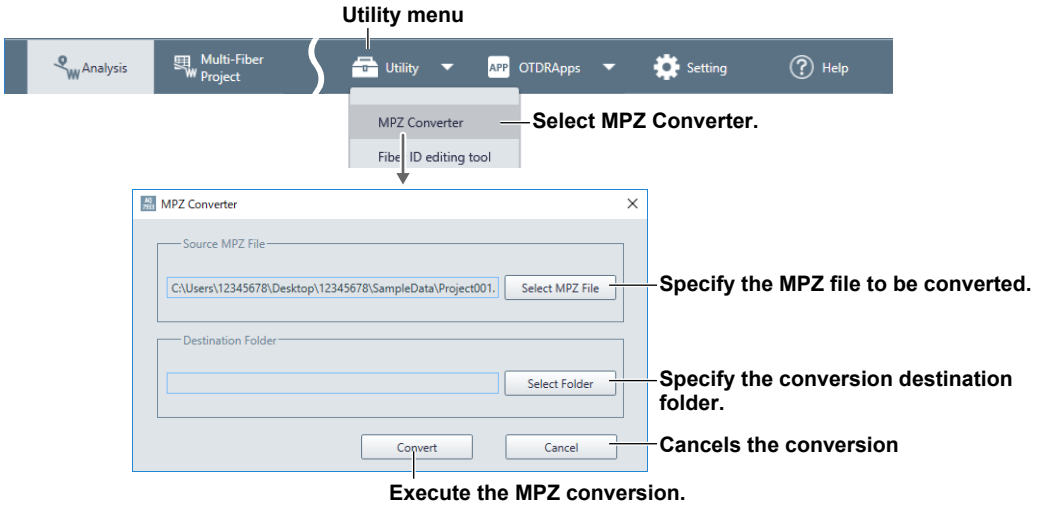
The files that can be loaded are limited to those saved using this software or an OTDR. Multiple files cannot be opened at once.

9.1 Decompressing an MPZ File

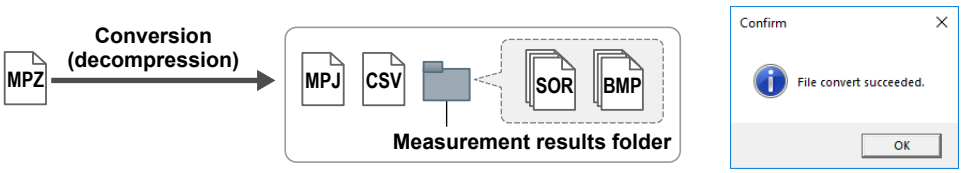
This section explains how to decompress an MPZ file.

Procedure

1. On the menu bar, click **Utility** and then **MPZ Converter**. The following window appears.



2. Specify the MPZ file to be converted and the conversion destination folder.
3. Click **Convert**. The MPZ file is converted into an MPJ file, SOR files, and the like. If the conversion is successful, the following confirmation message appears.



4. Click **OK**. The save destination folder opens, and the converted files and folders are displayed.

Explanation

MPZ Converter

This feature decompresses a measurement result file (MPZ file) of a multi-fiber project saved on an OTDR into an MPJ file, several SOR files, and the like that this software can load.

File Type	Description
MPZ file	This compressed file contains a project file and the measurement result files of each core. It contains SOR files, MPJ file, and BMP files compressed in MPZ format. It is used as a storage file.
MPJ file	This is the project file. A project file containing items for measuring and analyzing multi-core optical fiber cables on the OTDR.
CSV file	This file contains the measurement results of each core.
Measurement results folder	This folder contains SOR files, fiber surface images (BMP files), and measurement result of the power meter.

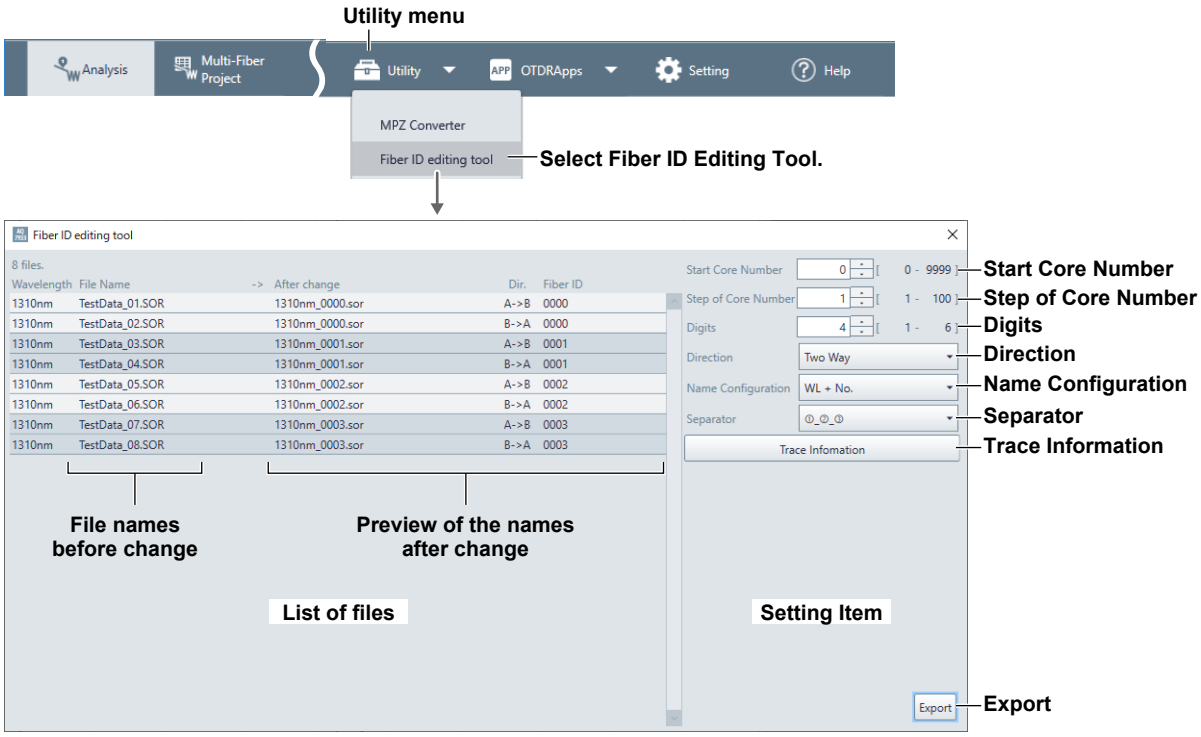
9.2 Collectively Editing the Fiber ID, File Name, and Waveform Information

Procedure

Running the Fiber ID Editing Tool

1. Refer to sections 3.1 and 3.2, and collectively load the files (SOR format) you want to edit.
2. On the menu bar, click **Utility** and then **Fiber ID Editing Tool**. The following window appears.

   Files loaded into the trace table are listed.



Editing the Fiber ID, File Name, and Waveform Information

2. On the right side of the window, edit the settings.

   You can see how the file names will be changed in the list of files.

Exporting the Results of the Edit

3. Click **Export**. A window appears for setting the save destination of the edited results.
4. Select the save destination folder, and click **Select Folder.**

   AtoB, BtoA, or both folders are created in the specified folder according to the direction set in step 2.

   Files that have been edited collectively are exported in the corresponding folder or folders.

Explanation

Editable Items

Start Core Number

Set the start core number.
Selectable range: 1 to 9999

Step of Core Number

Set the core number interval.
Selectable range: 1 to 100

Digits

Select the number of digits in the core numbers (fiber IDs).
Selectable range: 1 to 6

Direction

Select the measurement direction from the following:
Two Way, A->B, B->A

Name Configration

Select the name configuration from the following:
WL + No., No. + WL

Separator

Select the file name separator from the following:
①②③, ①_②_③, ①~②~③, ①^②^③

Trace Information

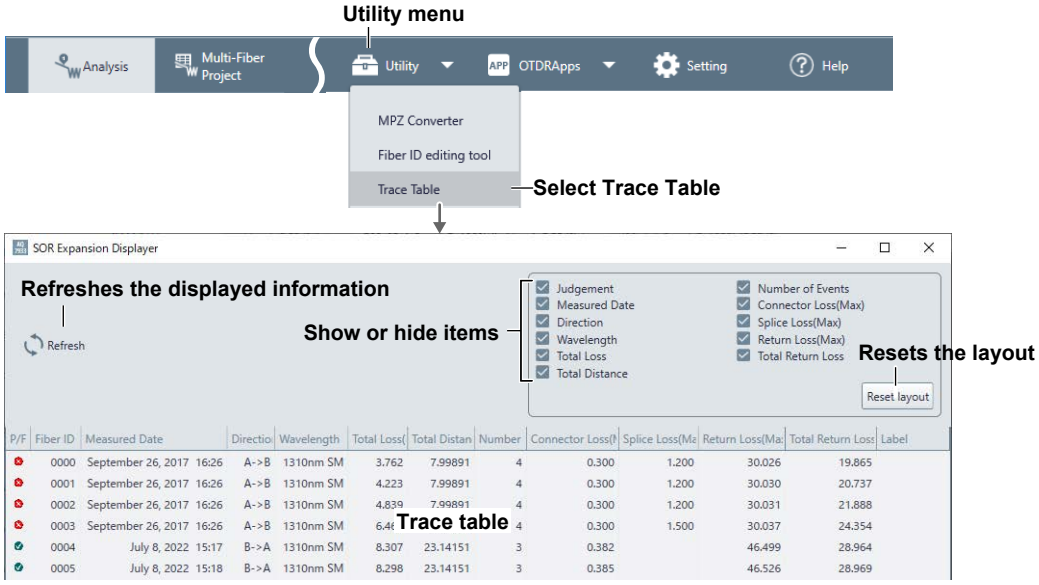
Description of the settings ►page 3-8

9.3 Displaying the Trace Table

Procedure

Trace Table

1. On the menu bar, click **Utility** and then **Trace Table**. The following menu items appear.



Refreshing the Displayed Information

Click **Refresh** to refresh the displayed information.

Showing and Hiding Items

The items in the trace table are shown below. Select the check boxes of the items you want to show. If you clear the check box, that item will not be shown in the trace table. The core number or fiber ID and label are always shown.

- Judgement (P/F)
- Measured Date
- Total Loss
- Connector Loss(Max)
- Total Return Loss
- No. (core number)/Fiber ID (fiber ID)
- Direction
- Total Distance
- Splice Loss(Max)
- Label
- Wavelength
- Number of Events
- Return Loss(Max)

Changing the Layout

If necessary, you can change the layout of the table.

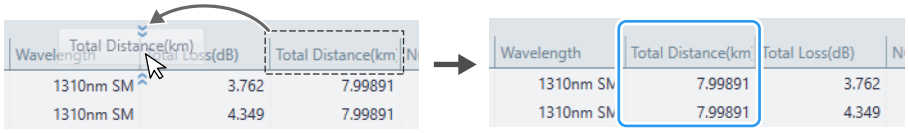
Sorting the Rows

Click the item name to sort by to change the order of the rows in ascending or descending order by the clicked item values.

Changing the Displayed Positions of Items

You can change the displayed positions of items by dragging and dropping item names on the boundary lines of columns or on the top or bottom boundary lines of the title line.

Rearranges the items (columns)



Arranges the items vertically

Resetting the Layout to Its Original State

Click **Reset layout** to reset the changed layout to its original state.

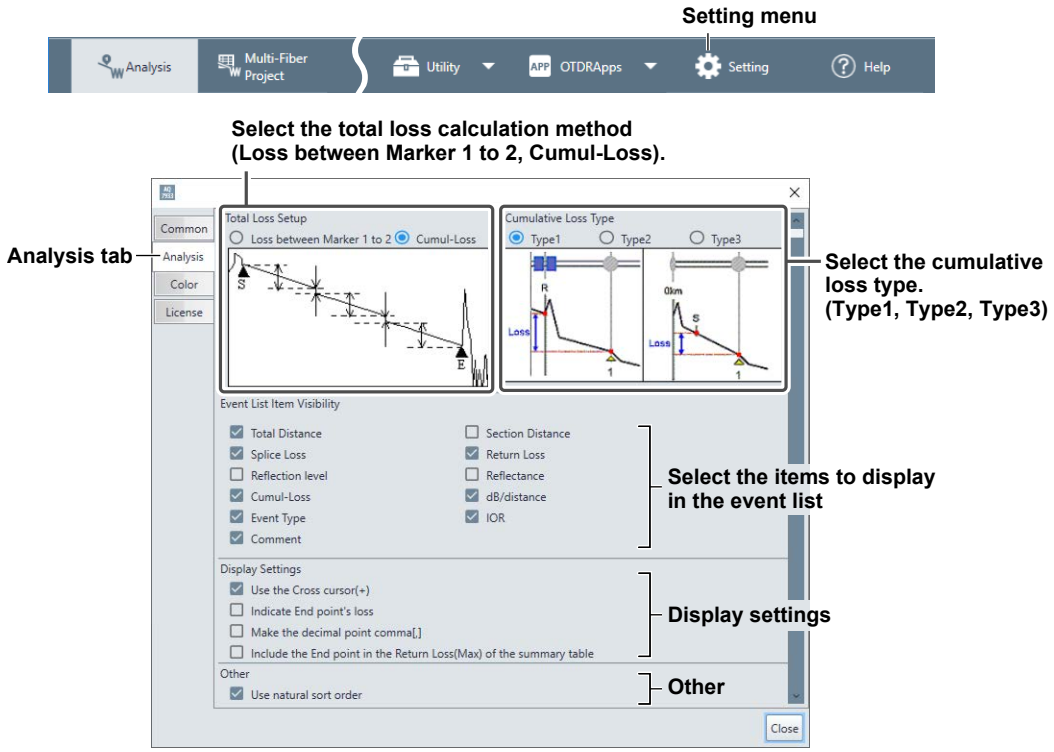
Explanation

The measurement result information of each core is shown in a table. You can view all the cores collectively.

9.4 Configuring Analysis Settings

Procedure

1. On the menu bar, click **Setting** and then the **Analysis** tab. The following window appears.



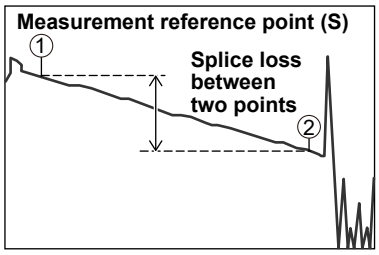
2. Select the total loss calculation method and cumulative loss type.
3. If necessary, select the Event List Item Visibility, Display Settings, and Other check boxes.
4. Click **Close**.

Explanation

Calculation Method for Total Loss

Loss between Marker 1 to 2

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

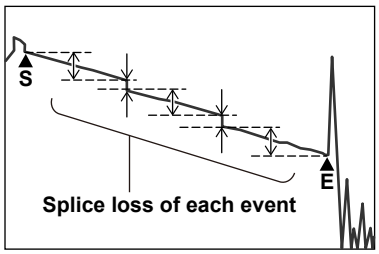


Note

If Loss between Marker 1 to 2 is selected, markers M1 and M2 are placed automatically at the measurement reference point (S) and the END point (E) when an event analysis is executed.

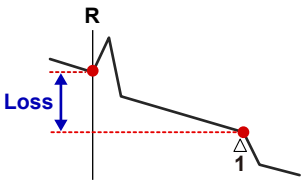
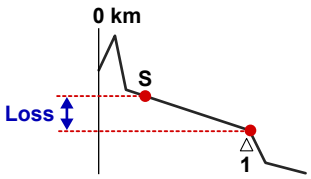
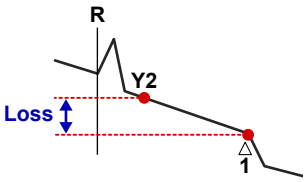
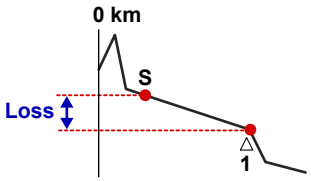
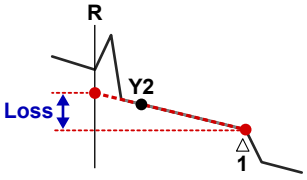
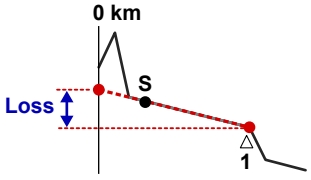
Cumul-Loss

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



Cumulative Loss Type

You can select the cumulative loss type from the following three types.

Type 1	**When distance reference is specified**	**When distance reference is not specified**
	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.	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 2	**When distance reference is specified**	**When distance reference is not specified**
	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.	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 3	**When distance reference is specified**	**When distance reference is not specified**
	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	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.
		

Displayed Items in the Event List

You can specify the following items.

- Total Distance
- Return Loss*
- Cumul-Loss
- IOR
- Section Distance
- Reflection level*
- dB/distance
- Comment
- Splice Loss
- Reflectance*
- Event Type

* You can set only one of the following: return loss, reflection level, or reflectance.

Display Settings

Use the Cross cursor(+)

ON: A vertical cursor and cursor distance as well as a horizontal cursor and the dB value at the cursor are displayed on the Trace view.

OFF: A vertical cursor and cursor distance are displayed on the Trace view. A horizontal cursor and the dB value at the cursor are not displayed.

Indicate End point's loss

ON: The splice loss at point E is shown in the event list and on the Map view.

OFF: The numerical portion of the splice loss at point E is shown as "-----" in the event list and on the Map view.

Make the decimal point comma[,]

ON: The decimal point is set to a comma.

OFF: The decimal point is set to a period.

Include the End point in the Return Loss(Max) of the summary table

ON: Point E is included in the tabulation of the maximum value.

OFF: Point E is not included in the tabulation of the maximum value.

Other

Use natural sort order

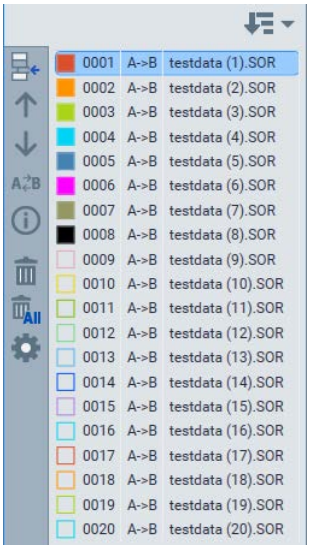
ON: Sorting is performed by identifying the numbers included in file names as numbers.

* Sorting is performed using the same rule as the file list of Windows Explorer.

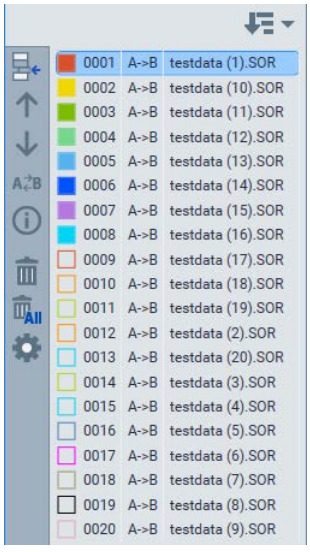
OFF: Sorting is performed according to the character code of each character even for numbers included in file names.

Example of Sorting in Ascending Order by File Name

• When ON Is Selected



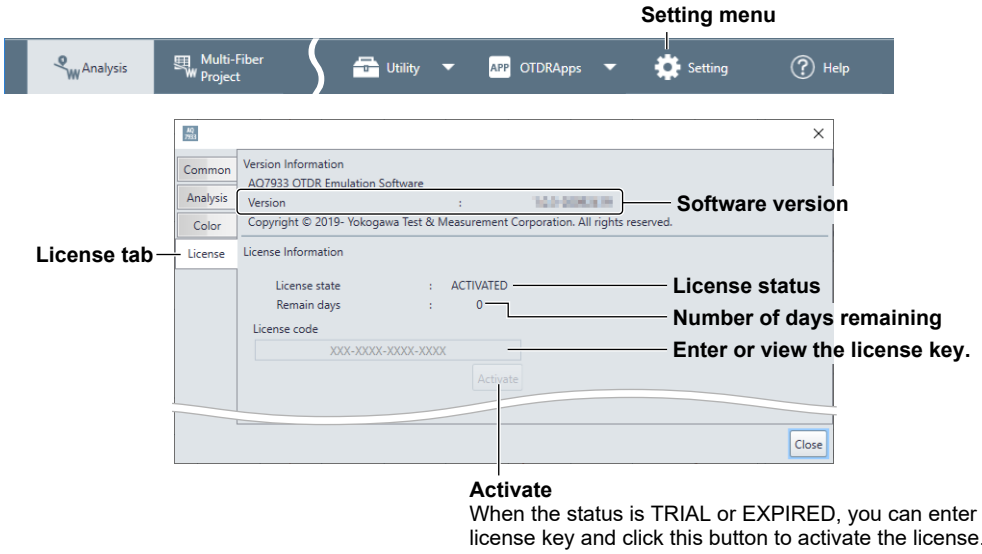
• When OFF Is Selected



9.5 Viewing the Version Information and License Information

Procedure

1. On the menu bar, click **Setting** and then the **License** tab. The following window appears.



Explanation

License Information

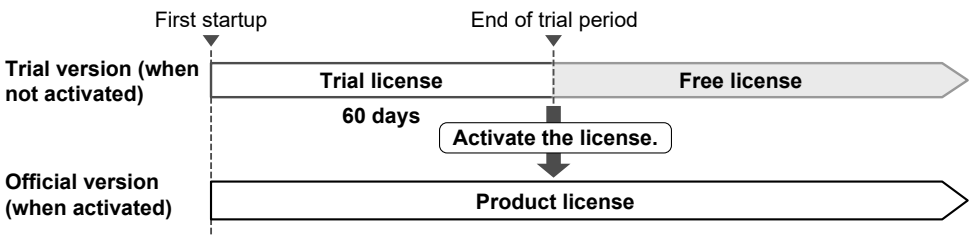
License status

Status	Indication	Description
Product license	ACTIVATED	Activation is completed. All the features of the AQ7933 can be used.
Trial license	TRIAL	The trial version is in use, or the activation is not complete. The trial license is used the first time the software is started. All the features of the AQ7933 can be used for 60 days. After 60 days, the license changes to a free license.
Free license	EXPIRED	The trial version is in use, or the activation is not complete. Restrictions are placed on using the AQ7933 features. Only the basic analysis and report features can be used.

When Using the Trial Version of the Software

The license status is determined every time the software is started. You can switch to the product license by entering a license key and activating the license in the license information window that appears when you start the software or in the above window.

The following figure shows how the license status changes from the first time the software started.



9.6 Using YOKOGAWA Applications

You can run YOKOGAWA OTDR applications from the software menu.

Yokogawa OTDR Remote Controller

You can connect an OTDR to a PC through an Ethernet or USB interface and remotely control the OTDR from the PC.
This section describes the following tools.

Command Checker

This tools allows you to check communication commands by sending them to the OTDR.

Schedule Analyzer

This tool allows you to create a table of losses over a specified section in an SOR file saved with the OTDR's schedule measurement feature.

Schedule Analyzer2

This tool allows you to analyze the fluctuation in the losses over specified sections in an SOR file saved with the OTDR's schedule measurement feature.

Schedule Finder

This tool allows you to analyze defective areas (periods) in an SOR file saved with the OTDR's schedule measurement feature.
It compares the waveforms in the file against the reference waveform and detects those whose fluctuation is greater than or equal to a specified value.

File Transfer

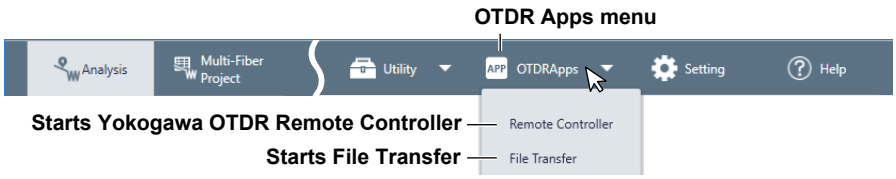
You can connect an OTDR to a PC through an Ethernet or USB interface and exchange waveform data files.

Note

For the operating procedure of each application, see the application's help.

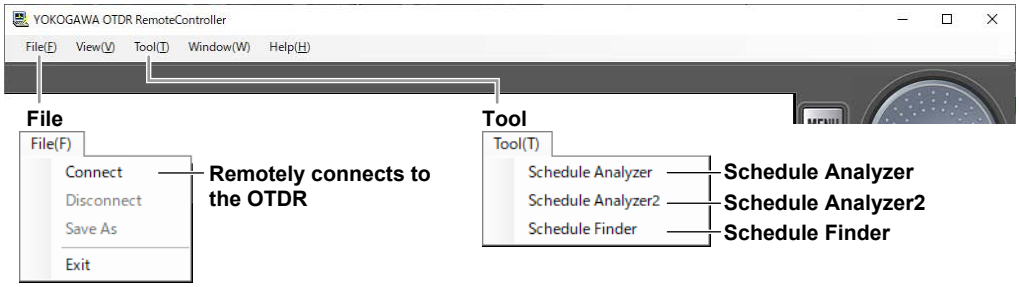
Procedure

1. On the menu bar, click **OTDRApps**. The following menu items appear.



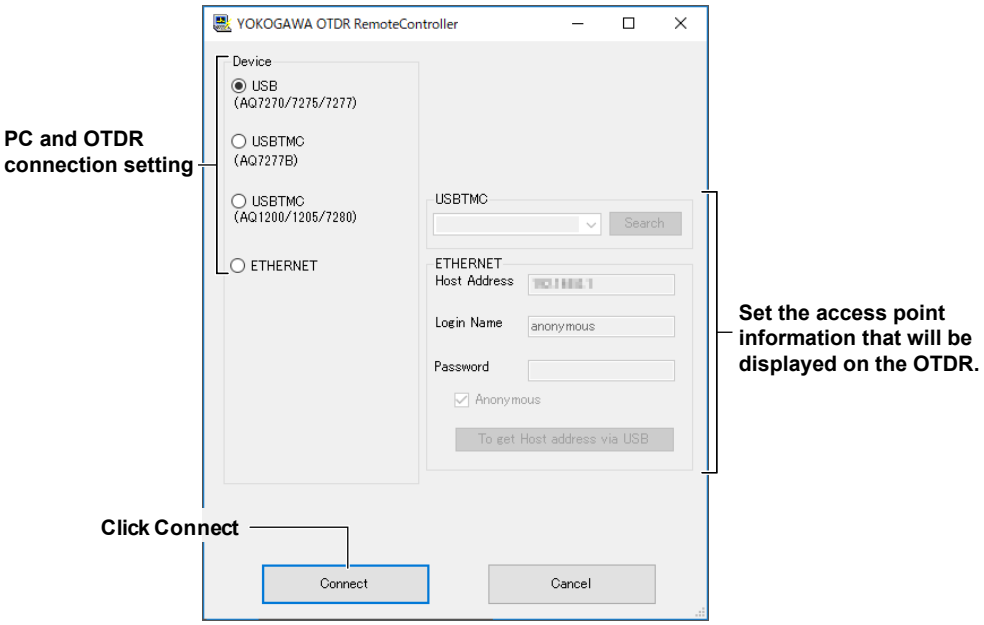
Starts Yokogawa OTDR Remote Controller

2. Click **Remote Controller**. Yokogawa OTDR Remote Controller starts.



Remotely connects to the OTDR

3. On the **File** menu, click **Connect**. The connection setup window appear.

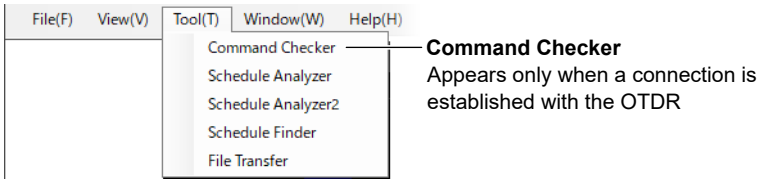


4. Click **Connect** on the connection setup window to display the OTDR control window.

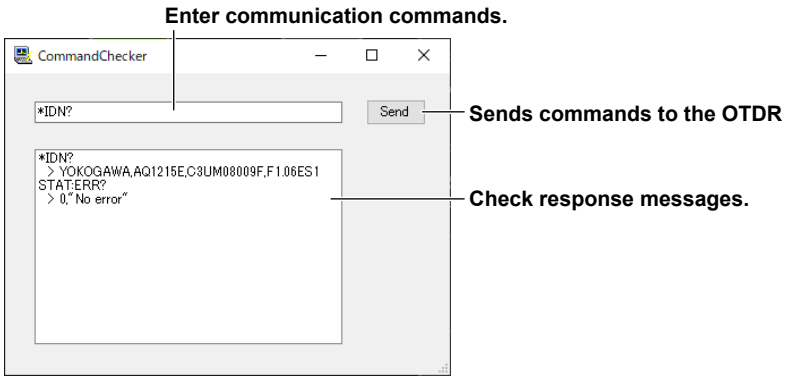
Command Checker

This tool can be used only when a remote connection is established with the OTDR.

5. On the **Tool** menu, click **Command Checker**.



The following window appears.



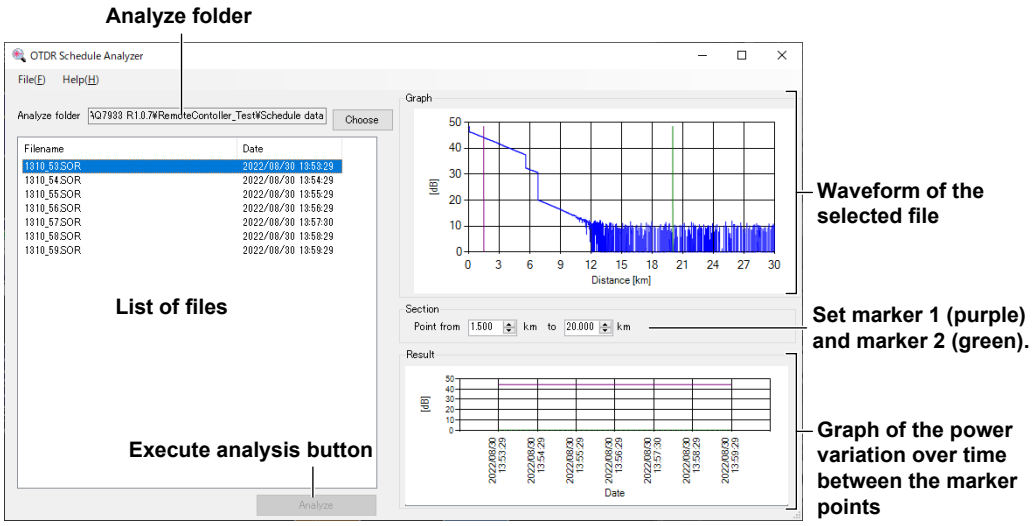
Schedule Analyzer

This tool can be used even when a remote connection is not established with the OTDR.

3. On the **Tool** menu, click **Schedule Analyzer**. A folder browsing dialog box appears.
4. Specify the location where data measured with the OTDR's schedule measurement feature is stored, and click **OK**.

   The OTDR Schedule Analyzer window appears. Measurement data in the stored location is displayed in a list at the left side of the window.
5. Click **Analyze** to display the analysis results at the lower right of the window.

   When you select a measurement data file in the list, the waveform of the file appears in the upper right of the window.



Saving the Analysis Results

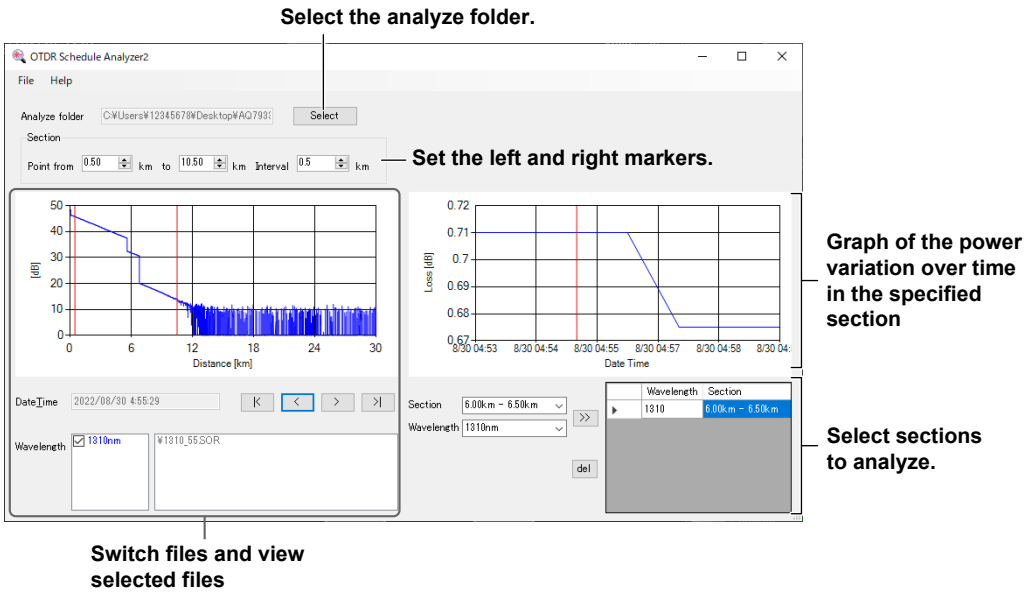
6. On the **File** menu, click **Save As Result**. A Save As dialog box appears.
7. Set the save destination and file name, and click **Save**. The analysis results are saved in CSV format.

Schedule Analyzer2

This tool can be used even when a remote connection is not established with the OTDR.

3. On the **Tool** menu, click **Schedule Analyzer2**. The Schedule Analyzer2 window appears.
4. Click **Select**. A folder browsing dialog box appears.
5. Specify the location where data measured with the OTDR's schedule measurement feature is stored, and click **OK**.

   Measurement data in the stored location is displayed at the left side of the window.



Saving the Analysis Result

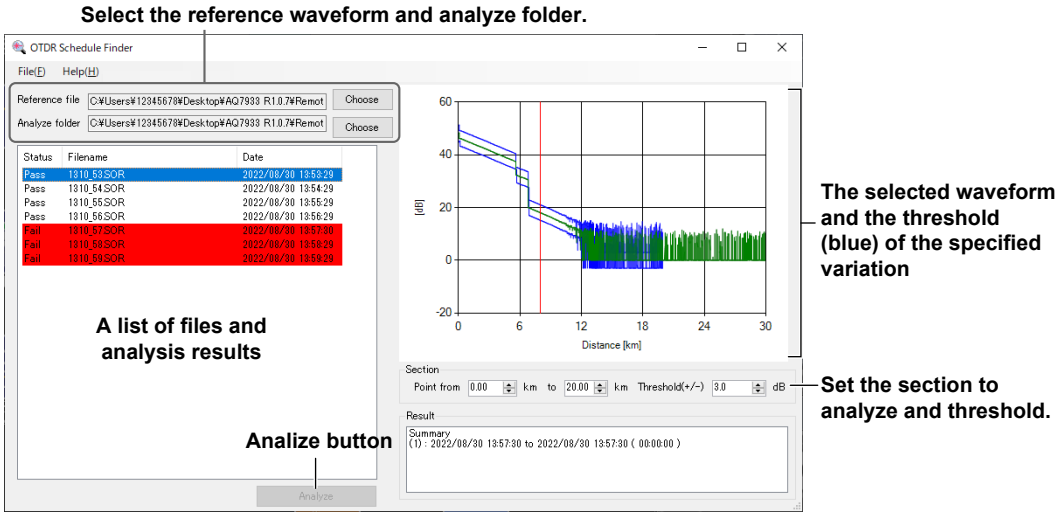
6. On the **File** menu, click **Save CSV file**. A Save As dialog box appears.
7. Set the save destination and file name, and click **Save**. The analysis results are saved in CSV format.

Schedule Finder

This tool can be used even when a remote connection is not established with the OTDR.

3. On the **Tool** menu, click **Schedule Finder**. The OTDR Schedule Finder window appears.
4. Click **Choose**. A folder browsing dialog box appears
5. Specify the location where data measured with the OTDR's schedule measurement feature is stored, and click **OK**.

   Measurement data in the stored location is displayed in a list at the left side of the window.

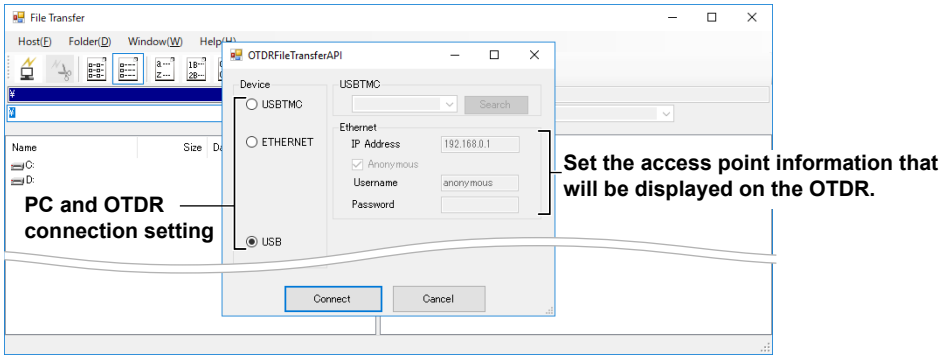


Saving the Analysis Results

This is the same as with the Schedule Analyzer. ► page 9-12

File Transfer

2. Click **File Transfer**. The File Transfer start window appears.
3. On the **Host** menu, click **Connect**. The following window appears.



10.1 Troubleshooting

If the software 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.

Waveform Analysis Problems

Description	Probable Cause and Corrective Action	Reference
A cursor cannot be placed properly at an event on the Trace view.	Click the event number in the event list. The cursor will be aligned with the event on the Trace view.	Sections 4.1 and 4.3
A displayed event cannot be dragged.	Click the event number, and drag the icon of marker M2. The marker M2 icon turns light blue while it is being moved and turns back to gray when movement is complete.	Section 4.3
A marker could only be dragged partway.	Event markers have a range that they can move in. A marker can moved within the range that satisfies the following relationship: marker M1 < M2 < Y2 < M3.	Section 4.3
When multi trace in use, the waveforms overlap and are difficult to see.	Select the ON check box next to Trace Shift of the Control view, and enter an offset value or click the up and down buttons. The display position of the current waveform will move vertically.	Section 4.1

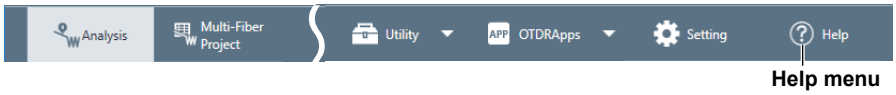
Multi-Fiber Project Editor Problems

Description	Probable Cause and Corrective Action	Reference
A project file created with this software cannot be loaded into the OTDR.	• Check that the hardware information setting of the project file created with this software is the same as the model name of the OTDR.	Section 8.2
	• Check the OTDR version. Multi-fiber measurement is not supported on versions earlier than the firmware versions listed in the compatible models list. Update the OTDR firmware.	Page v
A project file created on the OTDR cannot be loaded into this software.	The project file may have been saved on a new model (OTDR) released after the release of this software. Check that the OTDR model is included in the list of compatible models of this software. If it is not, please wait for an updated version of the software to be released.	Page v
Saving failed.	Check that there are no problems at the file save destination. When overwriting a file, check that the file attribute is not set to read-only.	Section 8.2

10.2 View help

Procedure

1. On the toolbar, click **Help**. The PDF file of this software's user's manual (this manual) will open.



Help menu

Note

To view the PDF data, you need Adobe Acrobat Reader or a software application that can open PDF data.

Index

Numerics

Page

2 Point Markers 4-11, 4-16
2way Analysis 5-9, 5-11
2way Analysis (Two Way) 1-4
4 Point Markers 4-12, 4-16
6 Point Markers 4-12, 4-16

A

Page

analysis conditions 4-26
analysis method 3-4, 3-7, 4-1, 5-1, 5-4, 5-7, 5-9
analysis mode 4-8, 5-11
analysis settings 4-26, 4-33, 8-8
approximation method 4-10, 8-13
auto generation 4-40
auto search 4-25, 4-30
Auto Search 1-3
AutoSearch (collective processing) 1-3, 4-43

B

Page

backscatter level 8-13
batch processing 4-38
Batch Processing 1-3
batch processing items 4-38
blank line 3-6
BMP 1-2, 3-9

C

Page

color pattern 2-5, 2-6
common settings 2-4
composite waveform 6-2
composite waveform, pulse width 6-2
Control view 1-12
copy source data 4-38
Core No. 8-7, 8-11
CSV 1-2, 3-15, 9-1
current event 4-19
current waveform 1-14, 3-6, 5-5
cursor 4-2
cursor link 4-9

D

Page

dB Decimal 2-4
display color 2-5
Distance Decimal 2-4
distance measurement 4-11, 4-16
distance reference 4-10, 4-24
division lines 6-2, 6-4

E

Page

event analysis 1-3, 4-18
event analysis, editing 4-20, 4-27
event analysis results 4-28
event list 4-20, 4-28
event map 4-21
event marker 4-24
event search conditions 4-25, 4-43, 8-13
events, editing 4-22, 4-27
Event view 1-13, 4-20
Export all traces
  CSV 3-14, 3-17
  Image 3-14, 3-17

F

Page

fail judgment event 4-35
Fiber Information 8-11
fiber list panel 8-4
fiber settings 3-5, 3-9
fiber surface image 3-9, 7-15
file list operations 3-6, 6-2
File List view 1-11
  Two Way 5-4
files, loading 6-2
File Transfer 9-14
file type 1-2, 3-3
forward-direction file list 5-1, 5-4, 5-7, 5-9
Fresnel reflection 4-30

G

Page

generation condition 4-48
generation method 4-48
ghost cursor 4-7
group 8-3
group name 8-5

H

Page

hardware information 8-6

I

Page

icon display, how to view 4-29
Information view 1-13
initialization 8-14
initial measurement conditions 8-8
IOR 4-27, 8-13

L

Page

language 2-4
launch fiber 4-31
  analysis settings 4-26, 4-34
  auto search 4-25
license activation 2-1
logo 7-4
loop analysis 1-3, 4-45, 4-49
loopback measurements 4-49
loss and distance between two points 4-11, 4-16
LSA 4-15

M

Page

map view 4-21
marker analysis 1-3
marker, deleting 4-10
marker operation 4-9
master event 4-40
Master Event Setting 1-3
master file 4-42, 4-49
measurement direction 3-6, 3-9
measurement results folder 9-1
menu bar 1-11, 2-3
model information 8-10
MPJ 1-2, 9-1
MPZ 1-2, 9-1
MPZ Converter 9-1
Multi-Fiber Project Editor 1-6

multi trace 4-2, 4-6
multi trace processing 1-3

N

Page

name configuration 8-7, 8-12
normal analysis (One Way) 1-3, 4-1

O

Page

output format 7-20
outputs scale 4-5, 4-6

P

Page

parts arrangement area 7-10
pass fail conditions 4-26, 4-34, 5-10, 6-3, 8-14
pass/fail judgment result 4-35, 6-3
print direction 7-4
project name 8-6
Project Settings window 8-2

R

Page

REF 4-10, 4-24
report, creating 7-1
report feature 1-4
report layout edit window 7-3, 7-8
report parts 7-10, 7-12
event list (small/large) 7-18
event map (small/large) 7-17
event search conditions 7-17
job information 7-13
measured results 7-15
measurement conditions 7-14
summary table 7-19
total table 7-18
trace (small/large) 7-14
report preview window 7-1, 7-4
report settings 7-4
report template 7-6
return loss 4-13, 4-17
reverse-direction file list 5-1, 5-4, 5-7, 5-9

S

Page

sample interval 4-6
scale display 4-6
screen state preservation 1-14
section analysis 4-13, 4-17
setting menu 1-6
setting panel 8-4
SMP 1-2, 3-3, 3-12
SMP file analysis 1-4
SOR 1-2, 3-3, 3-12
SOZ 3-3
splice loss 4-12, 4-16
splitter loss 4-30, 4-34
splitter splits 4-34
sub cursor 4-5, 4-7
summary data 3-17

T

Page

TPA 4-15
trace information 3-5, 3-8, 4-6
Trace Information (collective processing) 4-44
trace shift 4-4
trace table 9-4
Trace view 1-12, 6-2
two way 5-1
two way analysis 5-11

U

Page

Utility menu 1-6

V

Page

view size, changing 1-14

W

Page

waveform, editing 6-5
wavelength 8-10
window size and layout, resetting 2-4
workflow 1-8