User's Manual

AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Field Tester Getting Started Guide

YOKOGAWA
Yokogawa Test & Measurement Corporation

IM AQ1210-02EN
1st Edition

Thank you for purchasing the AQ1210A, AQ1215A, AQ1215E, AQ1215F, AQ1216F OTDR (Optical Time Domain Reflectometer) Multi Field Tester. This Getting Started Guide focuses on the handling precautions, basic operations, and specifications of this instrument. To ensure correct use, please read this manual thoroughly before operation. Keep this manual in a safe place for quick reference. The following manuals, including this one, are provided as manuals for this instrument.

Please read all manuals.

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

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

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

Document No.	Description
PIM113-01Z2	List of worldwide contacts

1st Edition: January 2019 (YMI)

Notes

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

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Revisions

April 2019 1st Edition

Product Registration

Thank you for purchasing YOKOGAWA products.

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

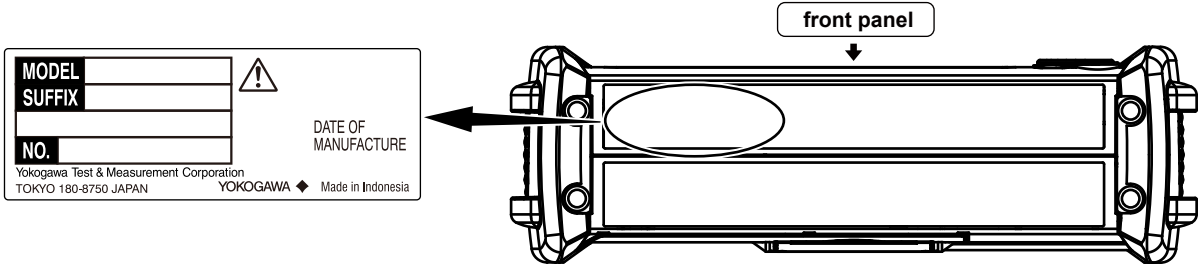
http://tmi.yokogawa.com/

Checking the Contents of the Package

Unpack the box, and check the contents before operating the instrument. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F

Check that the product that you have received is the same product that you ordered. For reference, the model name, suffix code, and specifications of the products are listed below.



MODEL	Suffix Code[1]	Specifications
AQ1210A		2 wavelengths 1310/1550 nm, DR 37/35 dB
AQ1215A		2 wavelengths 1310/1550 nm, DR 42/40 dB
AQ1210E		3 wavelengths 1310/1550 nm, 1625 nm, DR 37/35 dB, 35 dB
AQ1215E		3 wavelengths 1310/1550 nm, 1625 nm, DR 42/40 dB, 39 dB
AQ1215F		3 wavelengths 1310/1550 nm, 1650 nm, DR 42/40 dB, 37 dB
AQ1216F		3 wavelengths 1310/1550 nm, 1650 nm, DR 42/40 dB, 40 dB
Language	-HJ	Japanese/English
	-HE	English
	-HC	Chinese/English
	-HM	Chinese
	-HK	Korean/English
	-HR	Russian/English

MODEL	Suffix Code[1]		Specifications
Optical connector[2]	-USC		Universal adapter (SC)
	-UFC		Universal adapter (FC)
	-ULC		Universal adapter (LC)[3]
	-ASC		SC/APC connector (SC angled physical contact)[4]
Options		/PC	Power checker (OTDR port)
		/SPM	Standard optical power meter, auto loss test included
		/HPM	High power optical power meter, auto loss test included
		/PPM	PON power meter
		/VLS	Visible light source (2.5ϕ ferrule connector)
		/FST	Fiber Surface Test function
		/SB	Shoulder belt

1 For products whose suffix code contains "Z," an exclusive manual may be included. Please read it along with the standard manual.
2 The optical connector that you selected is attached to the OTDR ports and the OPM port prior to shipping.
3 1.25 mm diameter ferrule type for the optical power meter.
4 SC type for the optical power meter

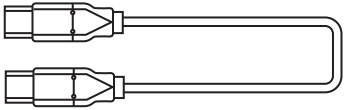
No. (Instrument number)

When contacting the dealer from which you purchased the instrument, please give them the instrument number.

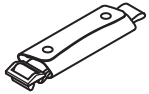
Standard Accessories

The following accessories are included. Make sure that all accessories are present and undamaged.

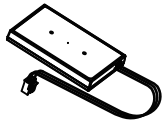
USB typeC cable
A1681WL



Hand strap
B8070CX

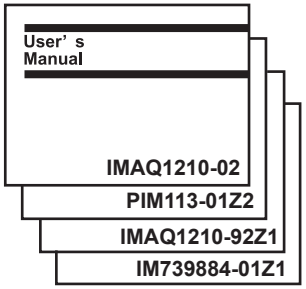


Battery pack
(lithium-ion)
739884



Manuals*

- **IM AQ1210-02EN** (this manual)
- **PIM113-01Z2** (List of contacts)
- **IM AQ1210-92Z1** (for Chaina)
- **IM 739884-01Z1** (Battery pack)



* IM AQ1210-01EN and IM AQ1210-17EN are contained in a PDF file in this instrument internal memory. A printed manual can also be purchased separately. Contact your nearest YOKOGAWA dealer to purchase a copy.

Optional Accessories

The following optional accessories are available for purchase separately. For information about ordering accessories, contact your nearest YOKOGAWA dealer.

Item	Model/Part No.	Note
Soft carrying case	SU2006A	—
Shoulder strap	B8070CY	—
USB Cable (TypeC to TypeC)	A1681WL	—
Battery pack	739884	—
Universal adapter (SC)	735482-SCC	For the OTDR port (SC type), fixing screws (2 pcs.) For the PON optical power measurement port (/PPM option), fixing screws (2 pcs.)
Universal adapter (FC)	735482-FCC	For the OTDR port (FC type), fixing screws (2 pcs.) For the PON optical power measurement port (/PPM option), fixing screws (2 pcs.)
Universal adapter (LC)	735482-LCC	For the OTDR port (LC type), fixing screws (2 pcs.) For the PON optical power measurement port (/PPM option), fixing screws (2 pcs.)
Universal adapter (SC Angled-PC)	735482-ASC	For the OTDR port, fixing screws (2 pcs.) For the PON optical power measurement port (/PPM option), fixing screws (2 pcs.)
Connector adapter (SC)	735480-SCC	For optical power measurement (OPM) ports with an SC connector. For products with the /SPM or /HPM option.
Connector adapter (FC)	735480-FCC	For optical power measurement (OPM) ports with an FC connector. For products with the /SPM or /HPM option.
Ferrule adapter (ϕ1.25)	735481-LMC	For optical power measurement (OPM) ports. For products with the /SPM or /HPM option.
Ferrule adapter (ϕ2.5)	735481-SFC	For optical power measurement (OPM) ports. For products with the /SPM or /HPM option.
Additional Option License for AQ1210	735051-FST	Fiber surface test function
Emulation software	AQ7933	Software for PC. Analysis of trace data function, report creation wizard function.

Accessories (sold separately) are not covered by warranty.

Conventions Used in This Guide

Notes

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

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

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

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

French

Une manipulation ou une utilisation incorrectes risquent de blesser l'utilisateur ou d'endommager l'instrument. Ce symbole apparaît sur l'instrument pour indiquer à l'utilisateur qu'il doit se reporter au manuel de l'utilisateur afin d'y lire les instructions spécifiques correspondantes. Ce même symbole apparaît à la section correspondante du manuel de l'utilisateur pour signaler lesdites instructions. Dans le manuel de l'utilisateur, ce symbole est accompagné des termes AVERTISSEMENT et ATTENTION.

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

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

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

Safety Precautions

This product is designed to be used by a person with specialized knowledge. The general safety precautions described herein must be observed during all phases of operation. If the product is used in a manner not specified in this manual, the protection provided by the product may be impaired. This manual is part of the product and contains important information. Store this manual in a safe place close to the instrument so that you can refer to it immediately. Keep this manual until you dispose of the instrument.
YOKOGAWA assumes no liability for the customer's failure to comply with these requirements.

The following symbols are used on this instrument.

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

Hazard, radiation of laser apparatus

Direct current

Stand-by

French

Avertissement : À manipuler délicatement. Toujours se reporter aux manuels d'utilisation et d'entretien. Ce symbole a été apposé aux endroits dangereux de l'instrument pour lesquels des consignes spéciales d'utilisation ou de manipulation ont été émises. Le même symbole apparaît à l'endroit correspondant du manuel pour identifier les consignes qui s'y rapportent

Danger : Appareil laser à rayonnement.

Courant direct

Veille

Failure to comply with the precautions below could lead to injury or death or damage to the instrument.

WARNING

Use the Instrument Only for Its Intended Purpose

This optical measuring instrument is designed to measure the optical characteristics of light sources and evaluate their performance. Do not use this instrument for anything other than as an optical measuring instrument.

Check the Physical Appearance

Do not use the instrument if there is a problem with its physical appearance.

Battery

- This instrument contains a battery (lithium-ion cell). The battery cannot be removed. For information on replacing the battery, contact your nearest YOKOGAWA dealer.
- Use only the supplied USB cable to charge the instrument.
- With the instrument turned off, when the battery pack is charged using the USB-AC adapter that YOKOGAWA recommends , if the battery pack is still charging after 8 hours, stop charging it immediately.
- Do not charge the instrument under direct sunlight (such as on the car dashboard or by a window), inside a vehicle under the blazing sun, near a stove or other heat source, or other hot locations.
- Your clothing may be damaged or you may be injured if you come in contact with the electrolyte in the battery due to fluid leakage or the battery exploding. Because the electrolyte may cause loss of eyesight, if it comes in contact with your eyes, immediately wash the affected area with clean water, and consult a doctor as soon as possible.
- Do not throw the instrument into fire or heat it. Such actions are dangerous as they may cause the battery to explode or the electrolyte to be sprayed about.
- For information on transporting lithium-ion batteries by air, see the requirement for each packing instruction (lithium battering instruction Section II) in the latest IATA Dangerous Goods Regulations.

Laser Beam

Do not look directly or indirectly into the laser beam or at a specular reflection of the beam without protective equipment. Do not aim the laser beam at the eye. Doing so may cause blindness or damage to your eyes. Attach the cover to the optical connector when it is not in use. Be sure to turn off this instrument before you clean it.

Connecting Optical Fiber Cables
Use optical fiber cables that are compatible with the universal adapter (the universal adapter is specified with a suffix code).

TypeA USB port
Only use the USB memory device or USB dongle that YOKOGAWA recommends. YOKOGAWA provides no guarantee if you use the device that YOKOGAWA do not recommend. This instrument may be powered off without alarm forcibly if you use the device that YOKOGAWA do not recommend.

Applying Light to the Optical Connector
Do not apply light that is –5 dBm or greater to the optical connector of the OTDR port. Doing so can damage the instrument. Do not apply light that is +10 dBm or greater to the OPM port/PON-OPM port (1310 nm/1490 nm). Do not apply light that is +27 dBm or greater to the high power OPM port/PON-OPM port (1550 nm). Doing so may damage the OPM port.

Do Not Operate in an Explosive Atmosphere
Do not use this instrument in the presence of flammable gases or vapors. Doing so is extremely dangerous.

Do Not Remove Covers or Disassemble or Alter the Instrument
Only qualified YOKOGAWA personnel may remove the covers and disassemble or alter the instrument.

Installation Location
Using a stand in an unstable location is extremely dangerous. If you are installing the instrument using a stand, install in a stable location.

CAUTION

Operating Environment Limitations
This product is a Class A (for industrial environments) product. Operation of this product in a residential area may cause radio interference in which case the user will be required to correct the interference.

AVERTISSEMENT

Utiliser l’instrument aux seules fins prévues

Cet instrument de mesure optique est prévu pour mesurer les caractéristiques optiques des sources lumineuses et évaluer leur performance. Ne pas utiliser cet instrument à d’autres fins que celles de mesure optique.

Inspecter l’apparence physique

Ne pas utiliser l’instrument si son intégrité physique semble être compromise.

Batterie

- Cet instrument contient une batterie (cellule au lithium-ion). La batterie ne peut être retirée. Pour plus d'informations sur le remplacement de la batterie, contacter votre fournisseur YOKOGAWA le plus proche.
- Utiliser uniquement le câble USB fourni pour charger l'instrument.
- Avec l'instrument hors tension, lorsque le pack de batteries est chargé à l'aide de l'adaptateur USB-CA recommandé par YOKOGAWA, si le pack de batteries est encore en charge après 8 heures, arrêter le chargement immédiatement.
- Ne pas charger l'instrument en plein soleil (par exemple sur le tableau de bord de la voiture ou sur le rebord d'une fenêtre), dans un véhicule stationné sous un soleil de plomb, à proximité d'une gazinière ou de toute autre source de chaleur ou dans tout autre endroit chaud.
- Tout contact avec l'électrolyte échappé en raison d'une fuite ou d'une explosion du pack de batteries peut endommager les vêtements ou causer des blessures. L'électrolyte peut entraîner la cécité, par conséquent, en cas de contact avec les yeux, rincer immédiatement à l'eau et consulter un médecin dans les plus brefs délais.
- Tenir le pack de batteries éloigné de toute source de chaleur et des flammes pour éviter le risque d'explosion du pack de batteries ou de déversement d'électrolyte.
- Pour toute information sur le transport aérien des batteries au lithium-ion, consulter les exigences énoncées dans le Règlement de l'IATA sur le transport des marchandises dangereuses (instruction sur les batteries au lithium).

Faisceau laser

Ne pas fixer directement ou indirectement le faisceau laser, ni la réflexion spéculaire du faisceau en l’absence d’équipement de protection. Ne pas orienter le faisceau laser en direction des yeux. Le faisceau laser peut entraîner la cécité ou causer des lésions oculaires. Recouvrir le connecteur optique à l’aide du cache pendant les périodes de non-utilisation. Mettre cet instrument HORS tension pendant son nettoyage.

Connexion des câbles à fibre optique

Utiliser des connecteurs de câbles à fibre optique conformes à l'adaptateur universel fourni (adaptateur universel indiqué par le suffixe).

Envoyer un signal au connecteur optique

Ne pas appliquer un signal de -5 dBm ou plus au connecteur optique du port OTDR. Cela pourrait endommager l'instrument. Ne pas appliquer de signal de +10 dBm ou plus au port OPM/PON-OPM (1310 nm/1490 nm). Ne pas appliquer de signal de +27 dBm ou plus au port OPM/PON-OPM (1550 nm) haute puissance. Cela pourrait endommager le port OPM.

Ne pas utiliser dans un environnement explosif

Ne pas utiliser l'instrument en présence de gaz ou de vapeurs inflammables. Cela pourrait être extrêmement dangereux.

Ne pas retirer le capot, ni démonter ou modifier l'instrument

Seul le personnel YOKOGAWA qualifié est habilité à retirer le capot et à démonter ou modifier l'instrument. Certains composants à l'intérieur de l'instrument sont à haute tension et par conséquent, représentent un danger.

Position d'installation

Lorsque vous manipulez les pieds ou le support escamotable, soutenez toujours l'instrument fermement. Prendre les précautions suivantes.

ATTENTION

Limitations relatives à l'environnement opérationnel

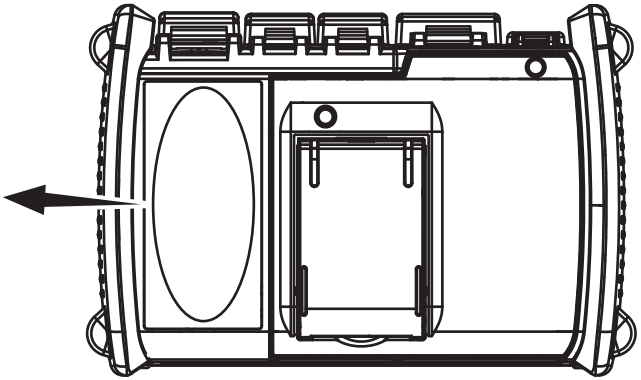
Ce produit est un produit de classe A (pour environnements industriels). L'utilisation de ce produit dans un zone résidentielle peut entraîner une interférence radio que l'utilisateur sera tenu de rectifier.

Safety Precautions for Laser Products

This instrument uses a laser light source. This instrument is a Class 1M laser product and Class 3R laser product as defined by IEC60825-1:2007 Safety of Laser Products-Part 1: Equipment classification and requirements. In addition, this instrument complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Laser Class 1 Label
Avoid direct eye exposure.

Laser Class 1M Label
Using an optical instrument, such as a loupe, magnifying glass, or microscope, when observing the laser beam from a distance of less than 100 mm may cause eye injury.



Laser Class 3R Label
Avoid direct eye exposure.

OTDR Port

Model	Class[1]	Center Wavelength	Maximum Output Power [2]	Mode Field Diameter	Beam Divergence Angle
AQ1210A					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°
AQ1215A					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°
AQ1210E					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
OTDR port (PORT2)	1M or 1	1625 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°
AQ1215E					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
OTDR port (PORT2)	1M or 1	1625 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°
AQ1215F					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
OTDR port (PORT2)	1M or 1	1650 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°

Model	Class[1]	Center Wavelength	Maximum Output Power [2]	Mode Field Diameter	Beam Divergence Angle
AQ1216F					
OTDR port (PORT1)	1M or 1	1310 nm/1550 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
OTDR port (PORT2)	1M or 1	1650 nm	CW: 50 mW, Pulse: 200 mW, Pulse width: 20 µs, Duty: ≤ 3.0%	9 µm	11.5°
VLS port [3]	3R	650 nm	CW: 5 mW	9 µm	11.5°

1 Class 1M: IEC 60825-1:2007, GB 7247.1-2012,
Class 1: EN 60825-1:2014

2 Under single fault conditions.

3 Applicable to models with the /VLS option.

Regulations and Sales in Each Country or Region

Waste Electrical and Electronic Equipment

(This directive is valid only in the EU.)
This product complies with the WEEE Directive marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category
With reference to the equipment types in the WEEE directive, this product is classified as a “Monitoring and control instruments ” product. When disposing of products in the EU, contact your local Yokogawa Europe B.V. office.
Do not dispose in domestic household waste.

EU Battery Directive

(This directive is valid only in the EU.)
Batteries are included in this product. This marking indicates they shall be sorted out and collected as ordained in the EU battery directive.

Battery type:

1. Lithium battery
   You cannot replace batteries by yourself. When you need to replace batteries, contact your local Yokogawa Europe B.V. office.
2. Lithium-ion battery
   When you remove batteries from this product and dispose them, discard them in accordance with domestic law concerning disposal. Take a right action on waste batteries, because the collection system in the EU on waste batteries are regulated. For instructions on how to remove the battery pack, see page 64.

Recycle Mark

Do not dispose together with normal garbage. To protect the environment, please dispose according to the recycling ordinances in your area.

Authorized Representative in the EEA

Yokogawa Europe B.V. is the authorized representative of Yokogawa Meters & Instruments Corporation for this product in the EEA. To contact Yokogawa Europe B.V., see the separate list of worldwide contacts, PIM 113-01Z2.

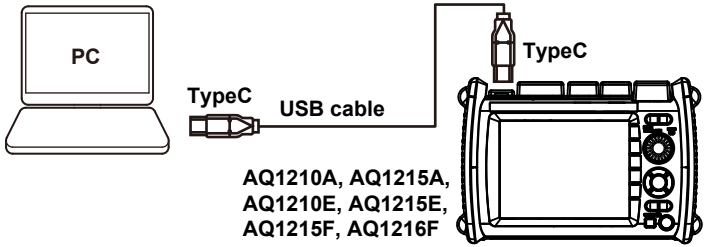
How to View the User's Manual

The following PDF file is stored in the USERS_MANUAL folder in this instruments internal memory.

File Name	Manual Title	Manual No.
Features & Operation Manual_*.pdf "*" is used to indicate the revision number.	AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Feild Tester User's Manual	IM AQ1210-01EN
Communication Interface_*.pdf "*" is used to indicate the revision number.	AQ1210A, AQ1215A, AQ1210E, AQ1215E, AQ1215F, AQ1216F OTDR Multi Feild Tester Communication Interface User's Manual	IM AQ1210-17EN

To view the PDF file above, you need Adobe Reader 5.0 or later. Follow the procedure below to open the PDF file.

1. Turn on the instrument.
2. Connect the type B (editionMicro-B) USB port on the top panel of the instrument to the type A USB port of the PC with the supplied USB cable. For a description of the top panel, see "Component Names and Functions." If the instrument is connected to the PC for the first time as a mass storage device, a USB driver is automatically installed in the PC.



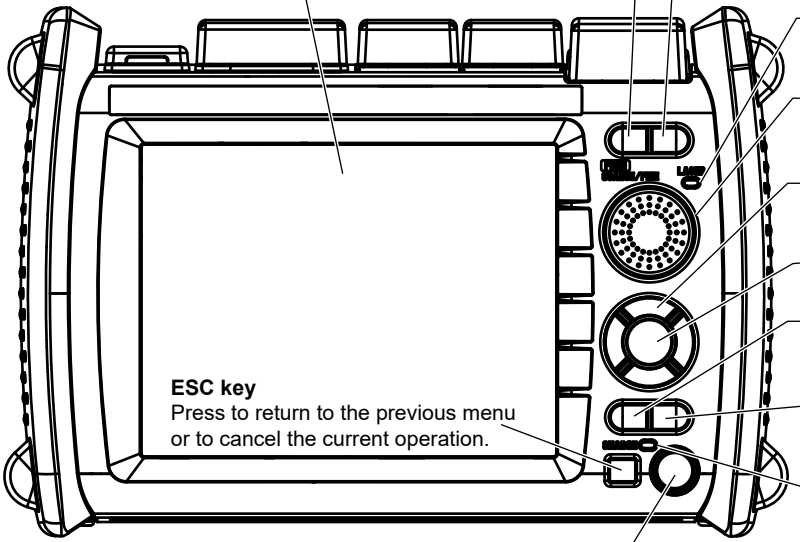
The ends of the USB cable supplied with the product are both Type-C. If the USB port on your PC is of a different type, prepare your own USB cable.

3. On your PC, start Explorer or other browser. The folder in the instruments internal memory will be displayed.
4. Open the /USER/DATA/USERS_MANUAL folder. The following PDF file will be displayed.
5. Open the PDF file. The user's manual appears on the computer screen.

Contents

Component Names and Functions

Front Panel



LCD
Used to perform touch panel operations.

REAL TIME key
Press to start or stop the real-time measurement of optical pulses.

AVG Key
Press to start or stop the averaged measurement of optical pulses.

LASER LED
Illuminates in red when the light is being emitted from the light source port.

Rotary knob
Turn to select features, change settings, and move the cursor.

Arrow keys
Press to change values, move between digits, move cursors, and zoom waveforms.

ENTER key
Press to confirm procedures and settings.

MENU key
Press to select the features (OTDR, Smart Mapper or like) used this istrument.

SETUP key
Press to display the measurement conditions, system setup, and file operation menus.

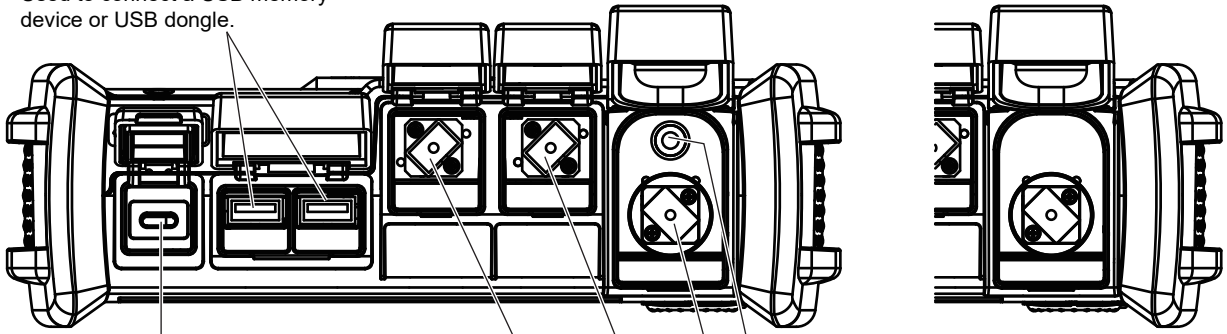
CHARGE LED
Illuminates in red when the battery is being charged. It turns off when charging is complete.

ESC key
Press to return to the previous menu or to cancel the current operation.

Power switch (POWER LED)
Press to turn the instrument on and off. Illuminates in green when the instrument is running. Illuminates in red when the battery is low. The LED illuminates in red for an instant during startup, but this does not indicate the battery level.

Top Panel

without /VLS option



Type A USB port
Used to connect a USB memory device or USB dongle.

Type C USB port
Used to charge the instrument with the USB-AC adapter and to access the instrument internal memory (USB mass storage) from a PC. Note that the charging function and USB mass storage function cannot be used simultaneously.

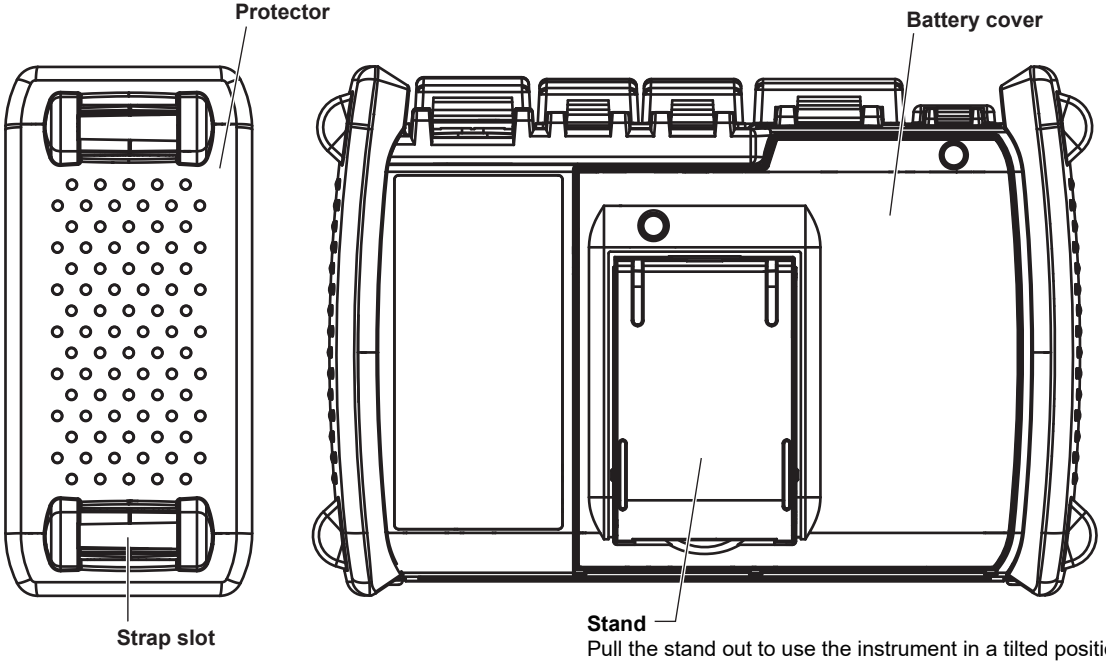
VLS port (/VLS option)
Used for VLS output.

OPM port (/SPM, /HPM, or /PPM option)
Used for OPM input.

OTDR port (PORT1)
Used for OTDR measurement (1310 nm/1550 nm), power checker measurement (/PC option), and light source output.

OTDR port (PORT2)
Used for OTDR measurement (1625 nm/1650 nm).

Rear and Side Panels



Stand
Pull the stand out to use the instrument in a tilted position.

Making Preparations for Measurements

Handling Precautions

Safety Precautions

If you are using this instrument for the first time, make sure to thoroughly read “Safety Precautions,” on pages 7 to 14.

Do Not Remove the Case

Do not remove the case from the instrument. Doing so is extremely dangerous. For internal inspection, adjustment and battery replacement, contact your nearest YOKOGAWA dealer.

Unplug If Abnormal Behavior Occurs

If you notice smoke or unusual odors coming from the instrument, immediately turn off the power, unplug the USB-AC adapter, remove the battery pack and contact your nearest YOKOGAWA dealer.

Handle the USB-AC Adapter and USB Cable Properly

Do not place objects on top of the USB-AC adapter or USB cable, and keep them away from heat sources.

General Handling Precautions

Do Not Place Objects on Top of the Instrument

Never place objects such as other instruments or objects that contain water on top of the instrument. Doing so may damage the instrument.

Do Not Subject the OTDR Port or VLS Port to Mechanical Shock

If the optical connectors or universal adapters are subjected to mechanical shock, they may be damaged. The instrument may not perform measurements correctly due to damage or deformation that is not visible to the naked eye.

Do Not Scratch the LCD

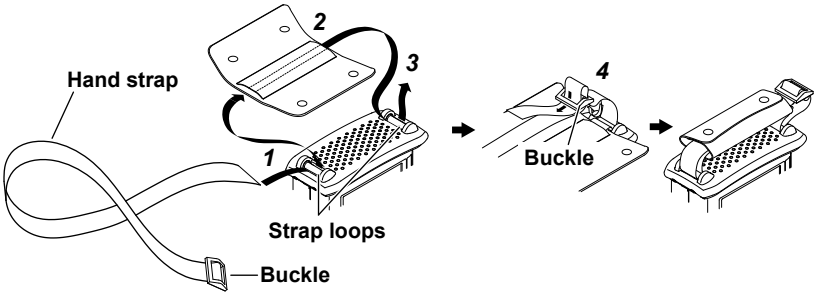
Because the LCD can be easily scratched, do not allow any sharp objects near it. Also, do not apply vibration or shock to it. Do not apply strong shock to the LCD or place objects on top of it.

When Carrying the Instrument

First, remove all cables including the USB cable and optical fiber cable. When carrying the instrument, grasp the protector or the attached strap firmly.

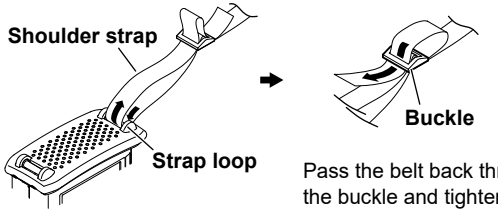
Attaching the Strap

Attaching the Hand Strap



1. Pass the hand strap through the loop on the lower-left side of the instrument.
2. Pass the hand strap through the hand strap cover.
3. Pass the hand strap through the loop on the upper-left side of the instrument.
4. Pass the strap through the buckle, and use the buttons to close the hand strap cover.

Attaching the Shoulder Strap



Pass the belt back through the buckle and tighten it.

Attach the strap to the loops on both the upper-left and upper-right sides of the instrument. These loops are also used when attaching the hand strap, but you cannot attach both the shoulder strap and the hand strap at the same time.
Pass the shoulder strap through the loops and then the buckle as shown in the figure. In the same manner, attach the strap to the other side of the instrument.

Attaching the Battery Pack

WARNING

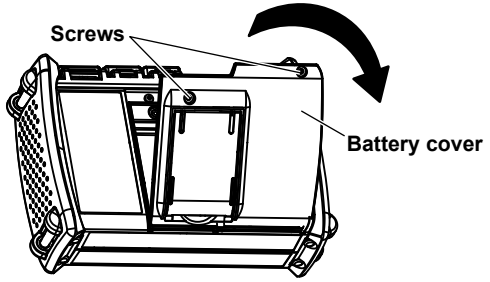
- Do not connect or disconnect the battery pack while electricity is being supplied by the AC adapter.
- To prevent problems before they occur, periodically inspect the battery pack exterior to confirm that there is no damage such as cracks or deformations and to confirm that there is no fluid leakage.
- Use the instrument to charge the battery pack. Maintain the correct environmental conditions when the battery pack is charging. Failure to do so can cause fluid leakage, heating, smoke, explosions, or fire.
- Follow the handling precautions that are included in the battery pack's user's manual.

French

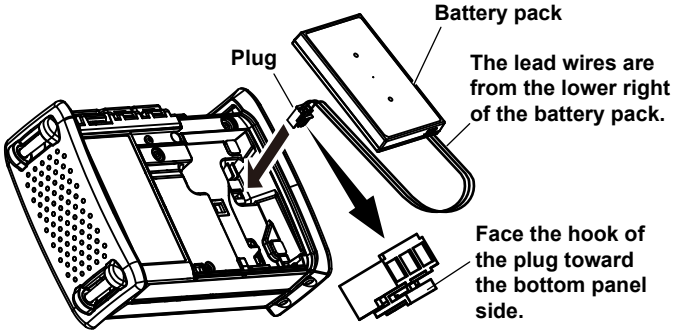
AVERTISSEMENT

- Ne pas installer, ni déposer le pack de batteries lorsque l'électricité est alimentée par l'adaptateur USB-CA.
- À titre préventif, inspecter régulièrement le boîtier extérieur du pack de batteries afin de déceler tout signe d'endommagement, comme l'apparition de fissures ou de déformations, et vérifier qu'il n'y a aucune fuite.
- Recharger le pack de batteries à l'aide de cet instrument. Respecter les consignes environnementales prescrites pour la recharge du pack de batteries, afin d'éviter les risques de fuite, de surchauffe, de fumée, d'explosion ou d'incendie.
- Respecter les consignes de manipulation indiquées dans le manuel d'utilisation du pack de batteries.

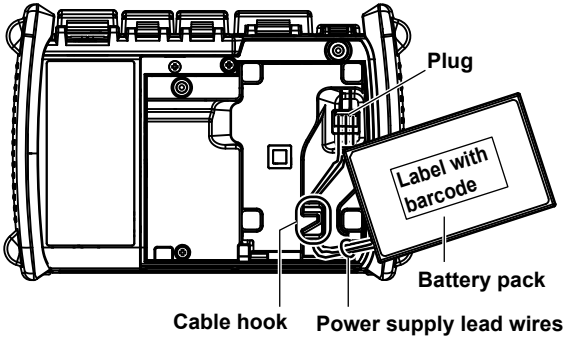
1. Loosen the battery cover screws with a Phillips screwdriver until the screw head moves up and down.
2. Pull the battery cover toward you, lift, and remove.



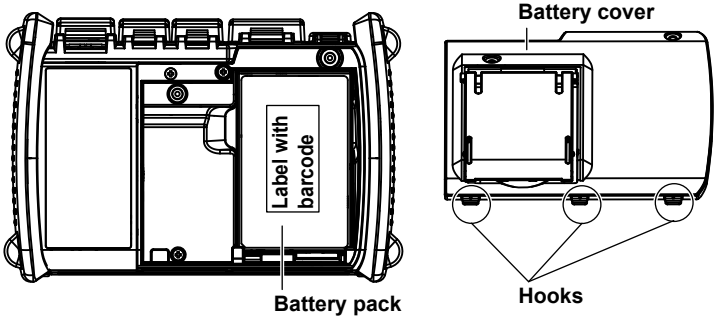
3. Connect the battery pack' s power supply lead wire plug to the instrument' s battery connector.



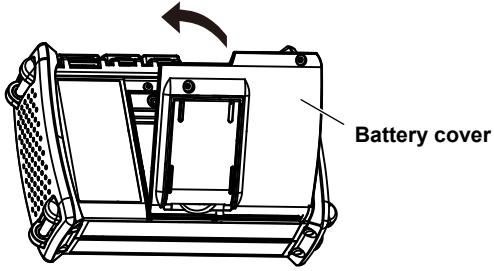
4. Secure the power supply lead wires on the instrument' s cable hook.



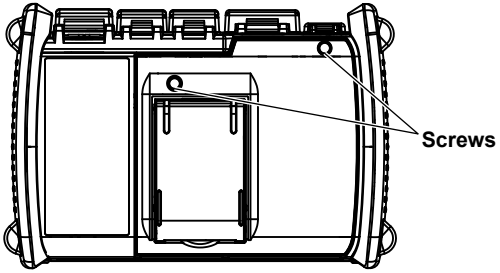
5. Insert the battery pack so that the power supply lead wires are facing the bottom panel side from the lower right of the battery pack. Make sure that the power supply lead wires do not protrude from the battery case. Check that the entire battery pack is completely inside the case.



6. Attach the battery cover from the bottom panel side, making sure that the hooks on the battery cover enter into their holes on the case.



7. Check that the battery cover is not loose, and then fasten the attachment screws with a Phillips screwdriver.
Tightening torque: Approx. 0.4 N.m



Connecting the USB-AC Adapter and Charging the Instrument

WARNING

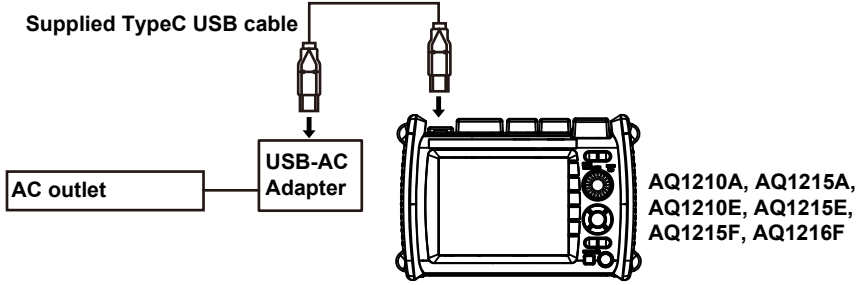
- Only use the USB-AC adapter that YOKOGAWA recommends.
- Use the USB-AC adapter after confirming that the rated supply voltage matches the voltage of the power supply.
- Use only the supplied USB cable.

French

AVERTISSEMENT

- Utiliser l’adaptateur USB-CA recommandé par YOKOGAWA.
- Utiliser l’adaptateur USB-CA après confirmation que la tension d’alimentation nominal correspond à la tension d’alimentation.
- Utiliser uniquement le câble USB fourni.

1. Connect one end of the supplied USB cable to the type C USB port of the instrument.
2. Connect the other end of the cable to the type A USB port of the USB-AC adapter.
3. Connect the USB-AC adapter's power plug to an outlet. The instrument's CHARGE indicator turns on red.

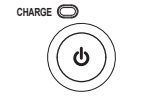


Note

- If the instrument's connector cover comes off, bend the cover axle and reattach it.
- For details on the USB-AC adapter, contact your nearest YOKOGAWA dealer.
- The battery cannot be charged by connecting to a PC (YOKOGAWA provides no guarantee). Be sure to connect the USB-AC adapter to charge the battery.
- Power supply icon blinks if the USB-AC adapter has insufficient power supply ability. Change to the USB-AC adapter recommended by YOKOGAWA.

Charging the Instrument

- When the instrument's battery is low, a warning message will appear.
- When the battery is low, connect the USB-AC adapter to an electrical outlet, and charge the instrument. For the estimated battery level, check the battery level indicator at the top of the screen.



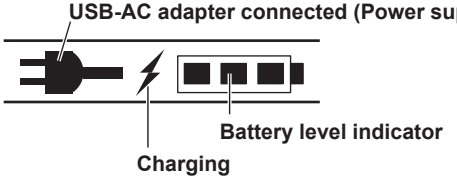
Power switch

Power switch (POWER LED)
Green: Running
Red: Battery low

CHARGE LED (red)
Solid: Charging
Off: Charging complete
Blinking: Charging suspended

- The battery pack may be too cold or too hot.
- The battery pack disconnected

Power supply status display



Battery power level

Sufficiently full

Half full

Almost empty
The power switch (POWER LED) lights in red, a warning message appears on the screen.

- Charging takes about 5 hours with the power turned off. If the instrument is charged with the power turned on, it may take longer than 15 hours, but charging will be suspended after about 15 hours by the protection circuit. If battery charging does not complete within 8 hours with the power turned off, stop immediately. The battery in the instrument may be malfunctioning. Contact your nearest YOKOGAWA dealer.
- **Power supply icon**
  Power supply icon blinks if the USB-AC adapter has insufficient power supply ability. In this case, the battery pack charging may not be completed because the battery pack becomes discharge. In addition, the battery pack may be dead if you continue use this USB-AC adapter.

Note

Over Discharge and Long Periods of Storage

- If you do not use the instrument for an extended period of time with the battery pack connected to it, the battery pack may become over discharged. This shortens the service life of the battery pack. To avoid over discharging, if you will not use the instrument for one week or longer, charge the battery pack, remove it from the instrument, and store the battery pack away from direct sunlight in a location that has an ambient temperature of 10°C to 30°C.
- When you store the battery pack for six months or longer, to replace the power that has been lost through self discharge, recharge the battery using the instrument once every six months.
- Avoid storing the battery pack for an extended period of time when it is fully charged (after it has just been charged) or when it has no power left (when the instrument will not turn on). Storing the battery pack under these conditions will degrade its performance and reduce its longevity. It is better to store the battery pack when it is 40% to 50% charged. This is equivalent to the state the battery is in after you turn off the instrument and charge an empty battery for an hour at room temperature.
- Use the instrument to charge the battery pack prior to its first use or if it has not been used for an extended period of time.

Connecting Optical Fiber Cables

WARNING

- When the instrument generates light, light is emitted from the light source ports. Do not disconnect the connected optical fiber cables. Visual impairment may occur if the light enters the eye.
- Close the covers of any light source ports that do not have optical fiber cables connected to them. On models with two or more light source ports, visual impairment may occur if light that is mistakenly emitted from the wrong port enters the eye.

CAUTION

- Insert the optical fiber cable connectors slowly and straight into the optical ports. If you shake the connector to the left and right or force it into the port, the optical connector or optical port may be damaged.
- If you use optical connectors that do not meet the specifications, the instrument optical ports may be damaged. Use optical connectors that are approved or used by national or local telecom carriers and providers in your area.
- Use optical fiber cable connectors that conform to the included universal adapter and connector adapter (the universal adapter specified by the suffix code).

Using SC Angled Physical Contact Connectors (Suffix code -ASC)

- The SC angled physical contact connector's ferrule tip is angle-polished. Use optical fiber cables whose connectors are of the same type. Using a different type of connector may damage the connector end face.
- Only use SC-type (735482-SCC) universal adapters on -ASC OTDR ports. Otherwise, the instrument optical ports or the optical fiber cable connectors may be damaged.

French

AVERTISSEMENT

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

ATTENTION

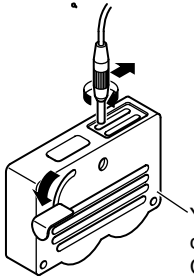
- Insérer les connecteurs de câbles à fibre optique délicatement et sans les incliner dans les ports optiques. Éviter de faire pression sur le connecteur ou de forcer pour l'insérer dans le port, car cela pourrait endommager le connecteur optique ou le port optique.
- Toujours utiliser des connecteurs optiques conformes aux spécifications, à défaut de quoi les ports optiques de cet instrument pourraient être endommagés. Utiliser des connecteurs optiques homologués ou utilisés par les entreprises et les fournisseurs de services de télécommunications de votre région.
- Utiliser des connecteurs de câbles à fibre optique conformes à l'adaptateur universel et l'adaptateur de connecteur fournis (adaptateur universel indiqué par le suffixe).

Utilisation de connecteurs de contact physique incliné SC (suffixe - ASC de l'unité OTDR)

- L'embout à ferrule du connecteur de contact physique incliné SC est poli. Utiliser des câbles à fibre optique dont les connecteurs sont de même type. L'utilisation d'un autre type de connecteur peut endommager l'extrémité du connecteur.
- Utiliser exclusivement des adaptateurs universels de type SC (735482-SCC) sur les ports ASC OTDR, pour éviter d'endommager les ports optiques ou les connecteurs à fibre optique de cet instrument.

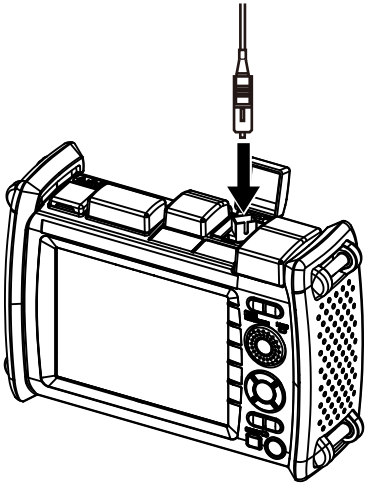
Clean the connector end face of the optical fiber cable before connecting it to the instrument. If dust is adhered to the connector end face, it may damage the instrument's optical port. If this happens, the instrument will not be able to make correct measurements.

1. Firmly press the connector end face of the optical fiber cable against the cleaning surface of the cleaner.
2. While pressing the end face against the cleaner, turn the cable once.
3. While pressing the end face against the cleaner, move the cable.
4. Repeat steps 1 to 3.



You can purchase an optical fiber connector cleaner from NTT-AT Corporation.

1. Open the optical port cover on the instruments top panel.
2. Properly align the optical fiber cable's connector with the optical port, and insert the connector.



Note

- The optical port that you have to connect to varies depending on how you intend to use the instrument. Confirm which port light will be transmitted from before you connect the optical fiber cable.
- On the AQ1210E, AQ1215E, AQ1215F and AQ1216F, light with a 1310 nm or 1550 nm wavelength is transmitted from OTDR port (PORT1), and light with a 1625 nm or 1650 nm wavelength is transmitted from OTDR (PORT2).

Turning the Power On

Hold down the power switch on the instrument's front panel for at least 2 seconds. When the instrument starts normally, the power switch (POWER LED) lights, and the start screen appears.

When the Power-on Operation Does Not Finish Normally

Turn off the power switch, and check the following items.

- Is the USB-AC adapter connected correctly? See page 27.
- Are you holding down the power switch for at least 2 seconds?

If the instrument still does not work properly after checking these items, contact your nearest YOKOGAWA dealer for repairs.

Warm Up

To enable more accurate measurements, allow the instrument to warm up for at least 5 minutes after it is turned on.

Power-off and Sleep State

When the instrument is running normally with the power switch turned on, you can temporarily turn the power off to a sleep state. The operation varies depending on how long you hold down the power switch.

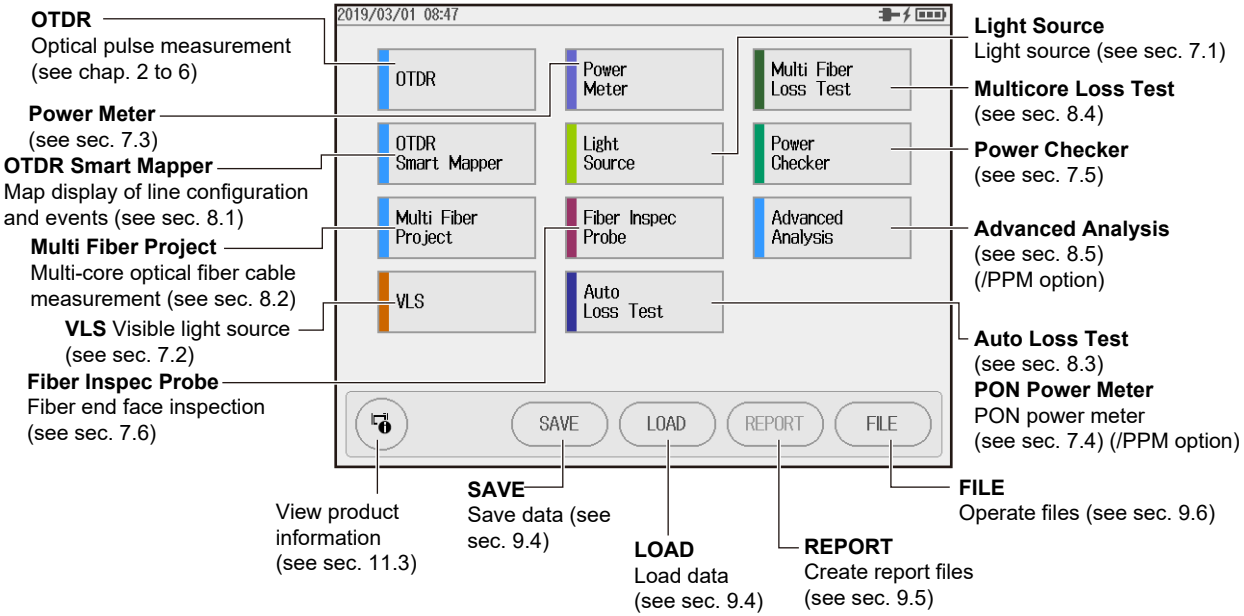
- Turning the Power Off
  If you hold down the power switch for 3 seconds or longer, a shutdown message appears on the screen, the power is turned off completely, and the power switch (POWER LED) turns off.
- Sleep State
  If you hold down the power switch for less than 3 seconds and release it, the screen turns off, and the instrument enters the sleep state. In this case, the power switch (POWER LED) remains on. To release the sleep state, hold down the power switch. In the sleep state, the instrument consumes the minimum amount of power. In the sleep state, the setup screen that you were using, the character input screen, or the like is retained. When you turn on the power switch again, the original screen is restored. If the sleep state continues for 2 hours, the power is turned off automatically.

Screen Operations

MENU Screen

When you turn on the instrument or press **MENU**, the menu screen appears. You can change the screen that appears when you start the instrument to the OTDR screen. For the setup procedure, see section 10.6 in the User's Manual, IMAQ1210-01EN.

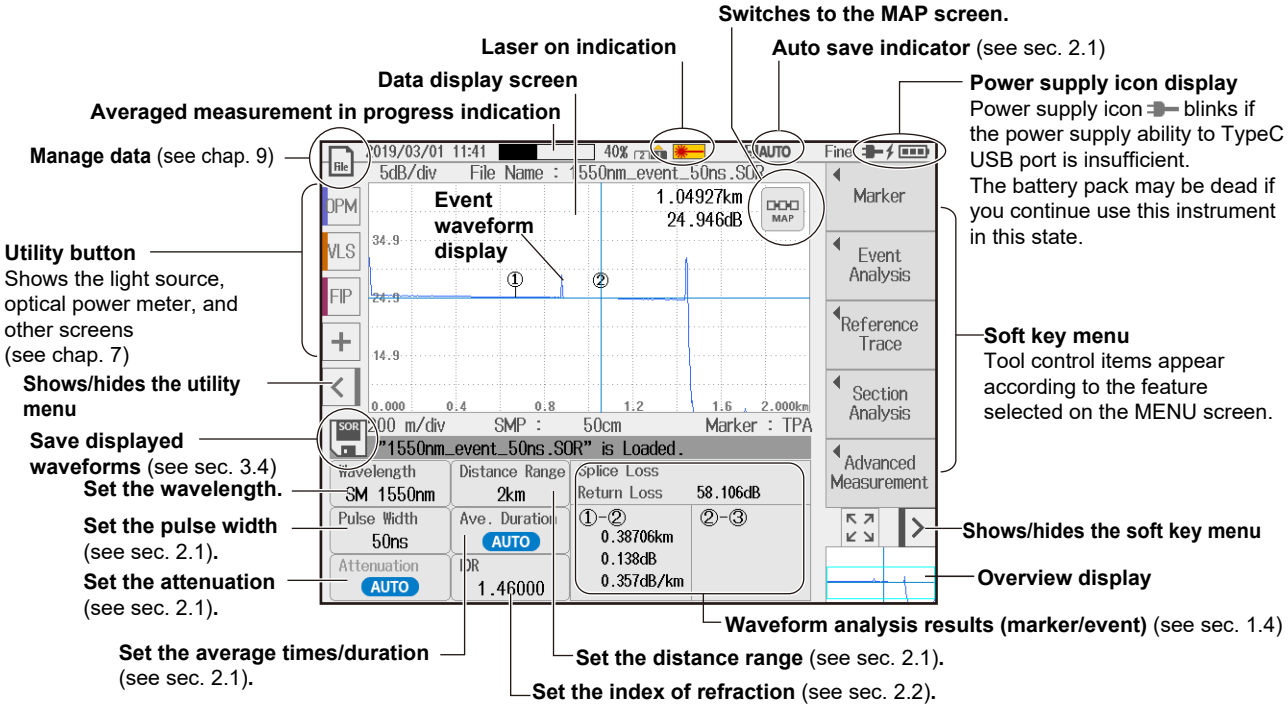
The references are chapters and sections in the User's Manual, IMAQ1210-01EN.



OTDR Measurement Screen

TRACE Screen

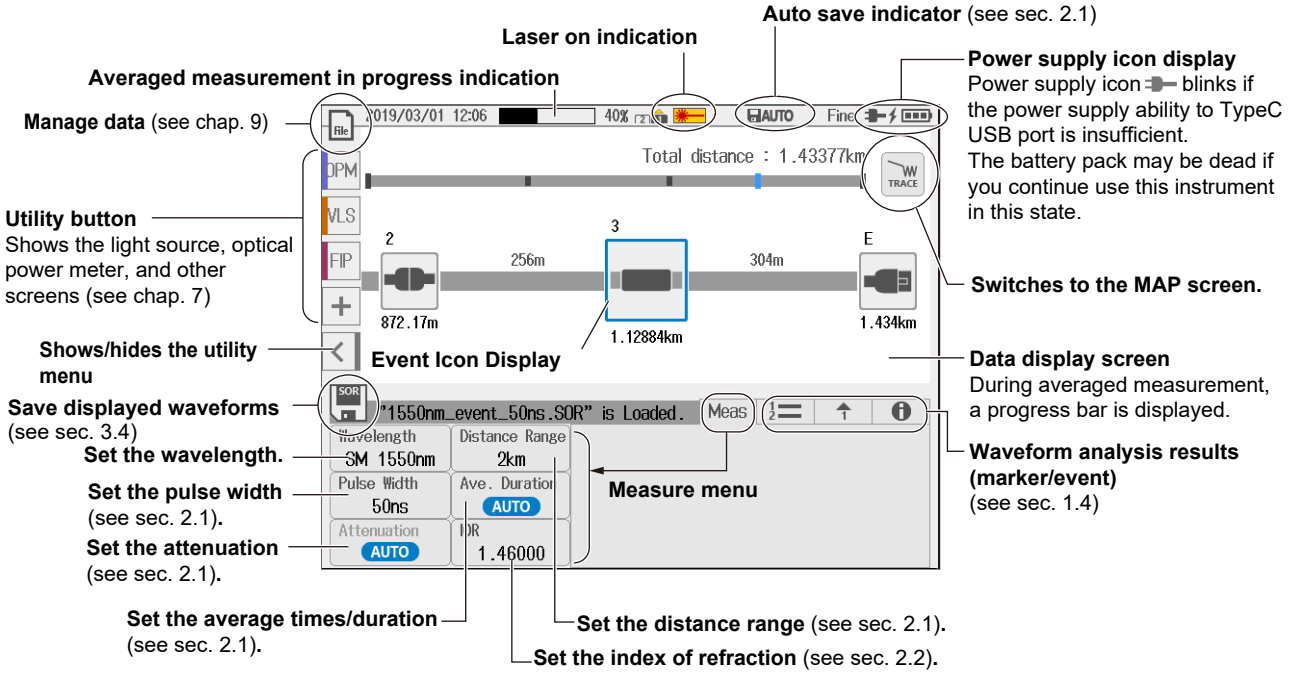
1. Tap **OTDR** on the MENU screen. The OTDR measurement results are displayed as waveforms on the data display screen.
The references are chapters and sections in the User's Manual, IMAQ1210-01EN.



MAP Screen

1. Tap **OTDR** on the MENU screen. The OTDR measurement results are displayed as icons on the data display screen.

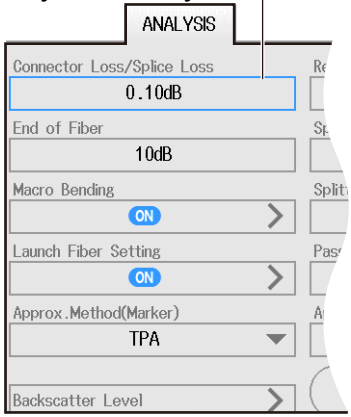
The references are chapters and sections in the User's Manual, IMAQ1210-01EN.



Using the Rotary Knob and Arrow Keys

This section explains how to use the rotary knob and arrow keys using the ANALYSIS screen (partial extraction) of the SETUP item as an example.

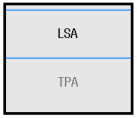
Move the cursor to the item that you want to set using the arrow keys or the rotary knob.



The following setup operation patterns are available depending on the display button shape.

Press Enter to display following setup item.

Items set from a list of options



- **Move the cursor to the item that you want to select using the arrow keys or the rotary knob.**
- **Press ENTER to confirm the selected item.**

Items that require a value to be entered

70dB

A numeric keypad appears.
Press ENTER to confirm the entered value.

OFF

Items toggle between on and off
Each time you press the key, the setting toggles between ON and OFF.

Press Enter to display the detailed setup screen.

Press Enter to confirm the selected item or execute its corresponding action.

Using the Touch Panel

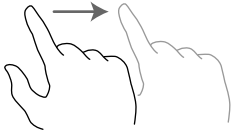
The basic touch panel operations are described below.

Tap

Tap refers to the act of gently hitting the screen with your finger.
Tapping is used on the instrument screen to select areas with a ▶ mark, close a setup menu, and so on.

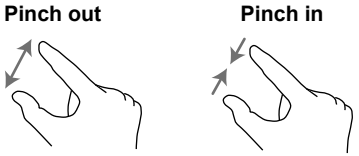
Drag

Drag refers to the act of pressing your finger against the screen and sliding your finger.



Pinch Out and Pinch In

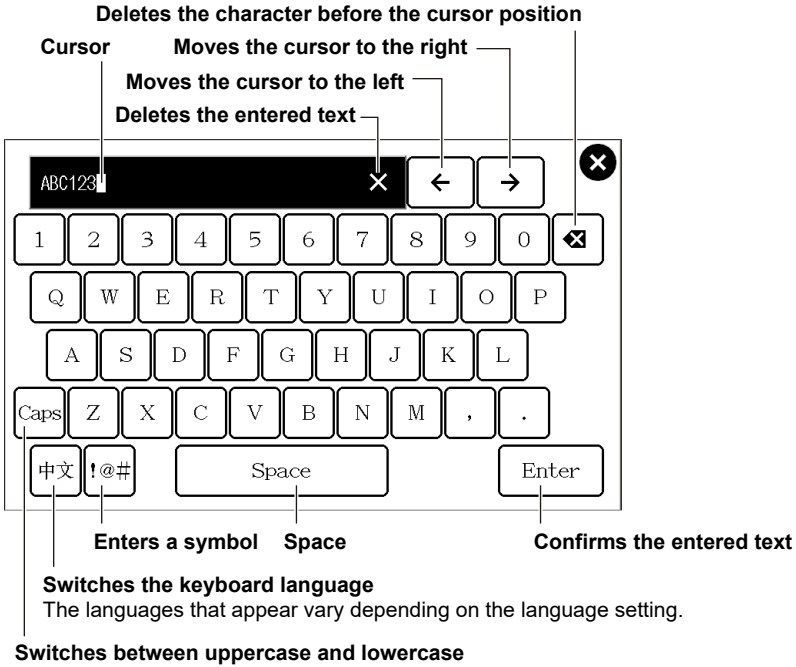
Pinch out refers to the act of pressing two fingers against the screen and spreading them apart. Pinch in refers to the act of pressing two fingers against the screen and drawing them together.
On a screen displaying waveforms, you can pinch out to zoom in and pinch in to zoom out.



Entering Text

When you select a setting, a character input dialog box appears if necessary. This section explains the operation after a character input dialog box is displayed.

Entering Alphanumeric Characters

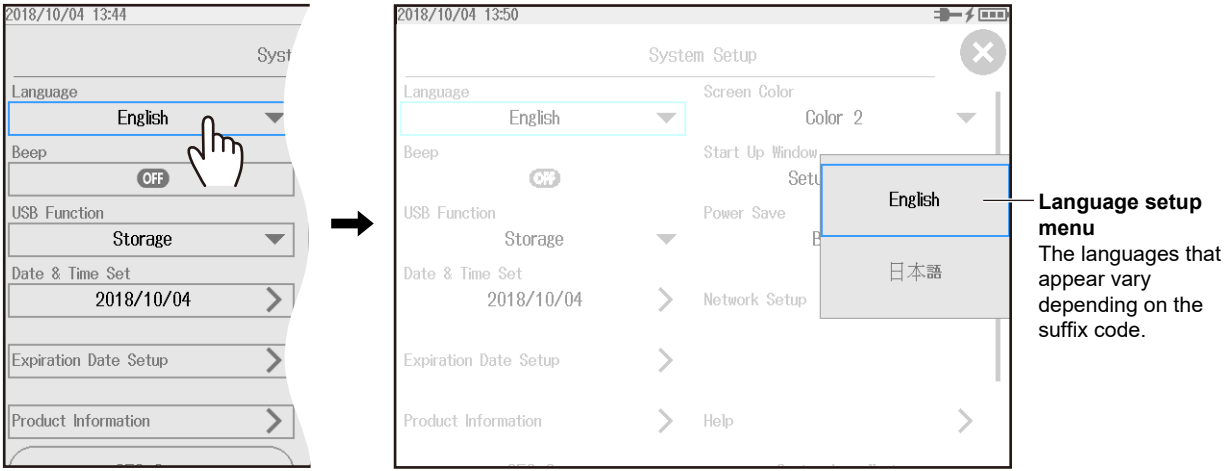


Setting the Language and Date and Time

Selecting the Language to Display

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the System Setup screen.
3. Tap the **Language** button to display the language setup menu.

System Setup Screen

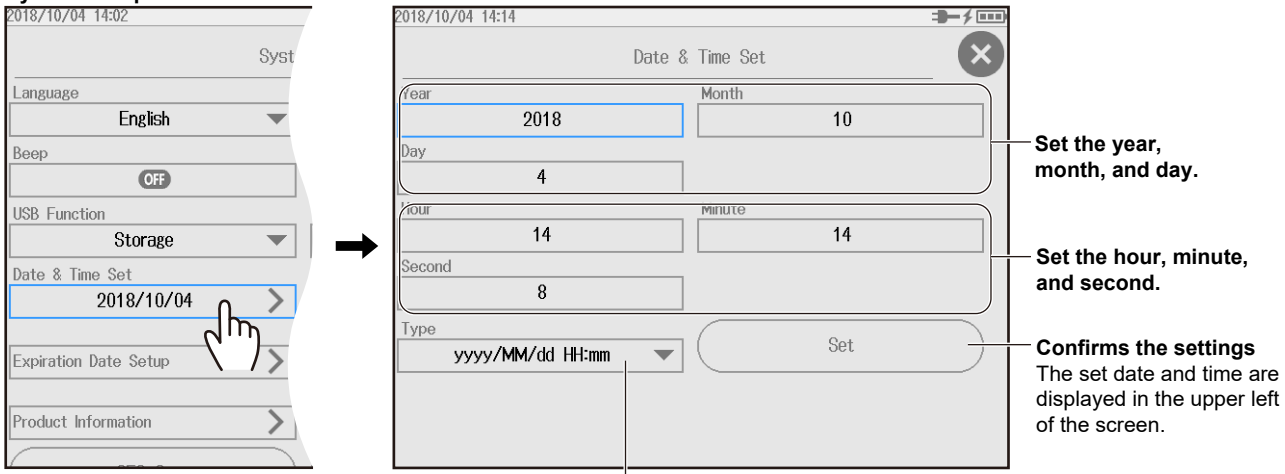


Language setup menu
The languages that appear vary depending on the suffix code.

Selecting the Date and Time to Display

1. Press **MENU** to display the MENU screen.
2. Press **SETUP** to display the System Setup screen.
3. Tap the **Date & Time Set** button to display the following screen.

System Setup Screen



Year, Month, and Date

The year is displayed according to the Gregorian calendar. The instrument supports leap years.

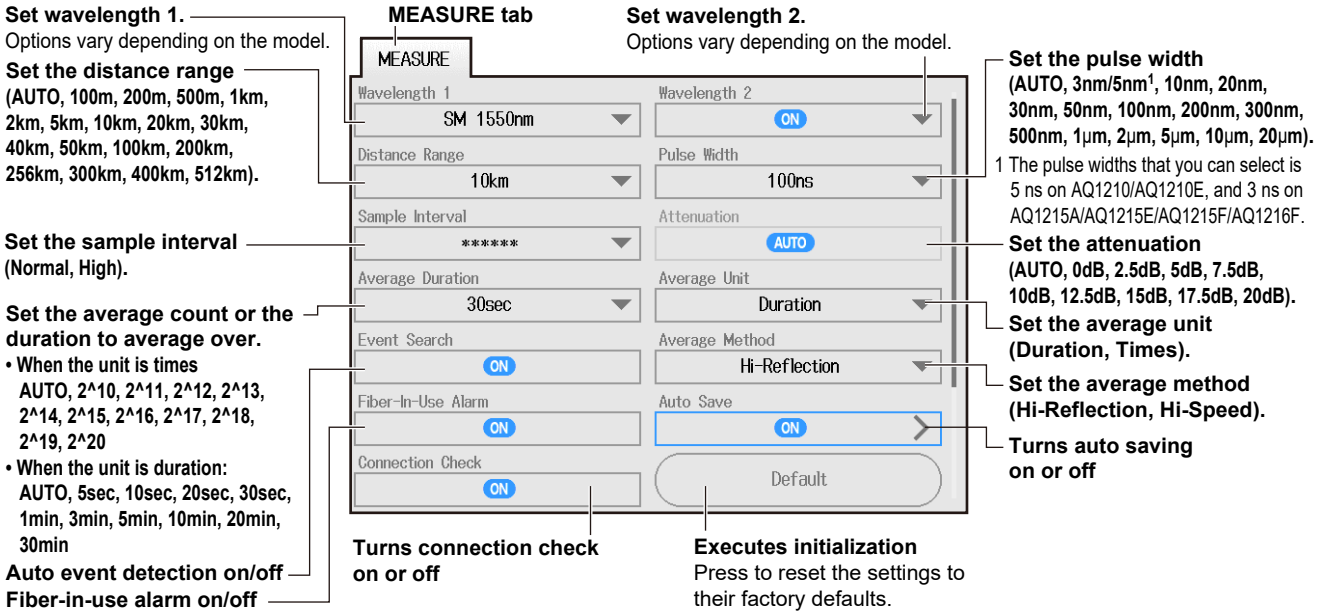
Hour, Minute, and Second

The hour can be set to a value from 0 to 23.

Setting Measurement Conditions (Measure)

2.1, “Measurement (Measure) Conditions” in the User’s Manual

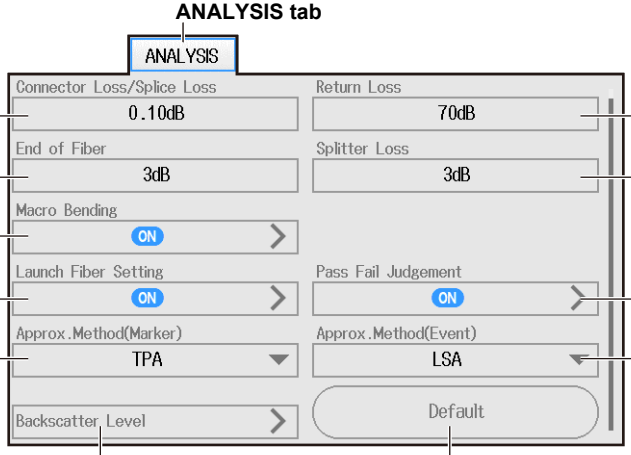
1. Tap **OTDR** on the MENU screen.
2. Press **SETUP** to display the setup screen.
3. Tap the **MEASURE** tab to display the following screen.



Setting the Analysis Conditions (Analysis)

2.2, “Analysis (Analysis) Conditions” in the User’s Manual

1. Tap **OTDR** on the MENU screen.
2. Press **SETUP** to display the setup screen.
3. Tap the **ANALYSIS** tab to display the following screen.



ANALYSIS tab

Splice loss threshold (0.01dB to 9.99dB)
An event is detected when this value is exceeded.

End of fiber threshold (3dB to 65dB)
An event E is detected when this value is exceeded.

Bending loss threshold (0.001dB to 99.999dB)
An event (bending) is detected when this value is exceeded.

Setting a Launch Fiber
Set the conditions for when a launch fiber is attached to the start or end face.

Set the approximation method (TPA, LSA).

Return loss threshold (20dB to 70dB).
An event is detected when this value is exceeded.

Splitter detection threshold (1dB to 20dB)
An event (splitter) is detected when this value is exceeded.

Configure the pass/fail judgment.
Set a pass/fail judgment threshold on each measurement item.

Set the event search approximation method (TPA, LSA).

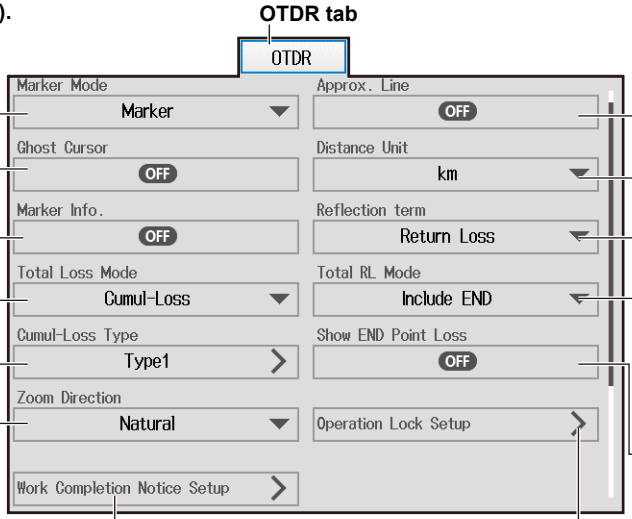
Set the backscatter level.

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

Setting Display Conditions (OTDR)

2.3, “Display (OTDR) Conditions” in the User’s Manual

1. Tap **OTDR** on the MENU screen.
2. Press **SETUP** to display the setup screen.
3. Tap the **OTDR** tab to display the following screen.



Set the marker type (Marker, Line).
Marker: ① ② **Y2** ③
Line: **n N E F f**

Ghost cursor display on/off
Checks secondary reflections

Marker information display (OFF, ON)
Display the loss and the distance from the measurement reference point to each marker on the waveform display area.

Set the calculation method for total loss (Cumulate loss, Loss between S and E).
Cumulate: Integrated value of events
Between two points: Loss between S and E

Select the cumulate loss type (Type1, Type2, Type3)
Select the calculation method for cumulate loss.

Set the zoom method.
Select the zoom behavior of the waveform display that is controlled with the arrow keys.

OTDR tab

Turns approximated line display on or off
Displays an approximated line for waveform events.

Select the measurement distance unit
This menu is not available on -HJ suffix code.

Select the reflection term (Return Loss, Reflection level)
This menu is available on -HJ suffix code.

Calculation method for total return loss (Include END, Exclude END).

END point loss display (ON, OFF)

Configure the work completion notification.
Configure settings that indicate that the optical fiber cable being installed has reached the destination with an alarm or the like.

Locks screen operations
Screen operations can be locked after a given time elapses.

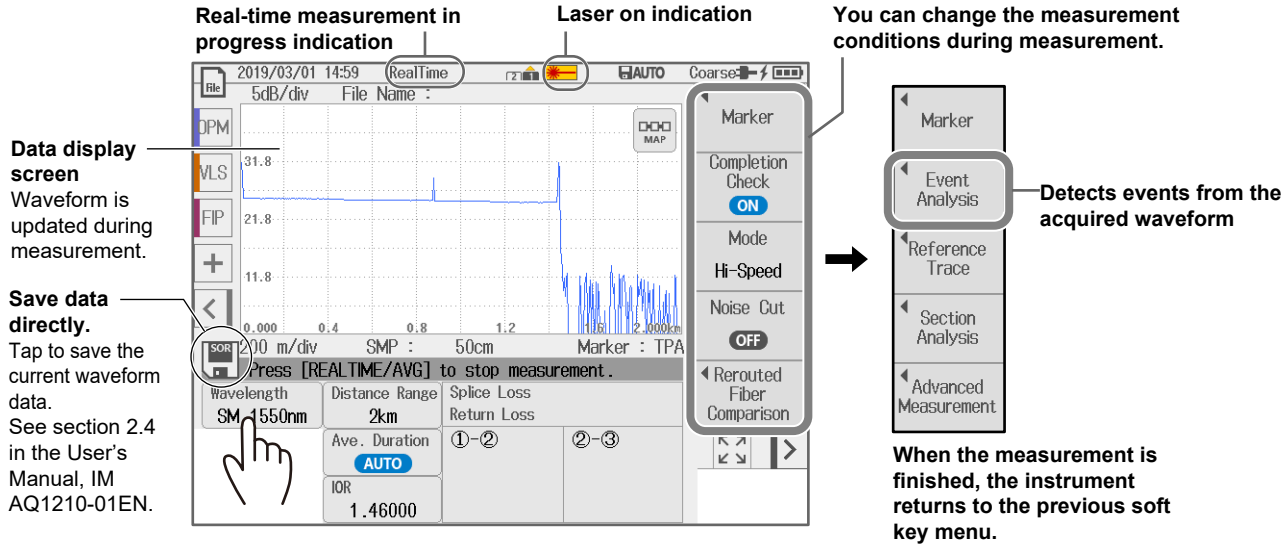
Waveform Measurement

Performing Real-time Measurement

3.1, “Performing Real-time Measurement” in the User’s Manual

In real-time measurement, the waveform display is updated in real time. This feature is used to monitor the waveforms.

1. Tap **OTDR** on the MENU screen.
2. Tap **Wavelength** to select the wavelength to be measured.
3. Press **REALTIME** to start a measurement. Pressing it again stops the measurement.



Performing High-Precision Waveform Monitoring in Real-time

3.1, “Performing Real-time Measurement” in the User’s Manual

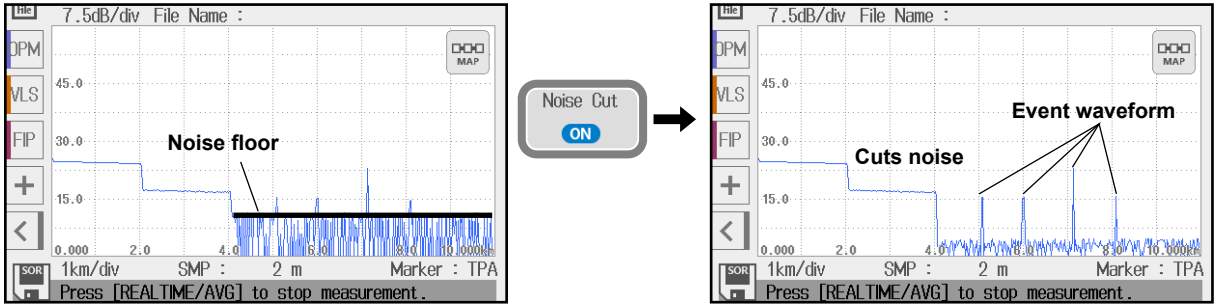
The real-time measurement waveform display updates the displayed waveform each time an optical fiber cable is measured. This update rate can be changed according to your application. Before configuring this feature, start real-time measurement according to the steps on the previous page.

4. Move the marker to the position where you want to monitor the waveform in detail.
5. Tap the **Refresh Rate** soft key. The soft key display changes to “Hi-Precision,” and high-precision measurement is enabled.

Cutting the Waveform Display Noise

This feature removes noise at the far-end point.

6. Tap **Noise Cut**. The soft key display changes to “ON,” and the waveform noise is cut.



Performing Averaged Measurements

4.1, “Performing Averaged Measurements in TRACE Mode” in the User’s Manual

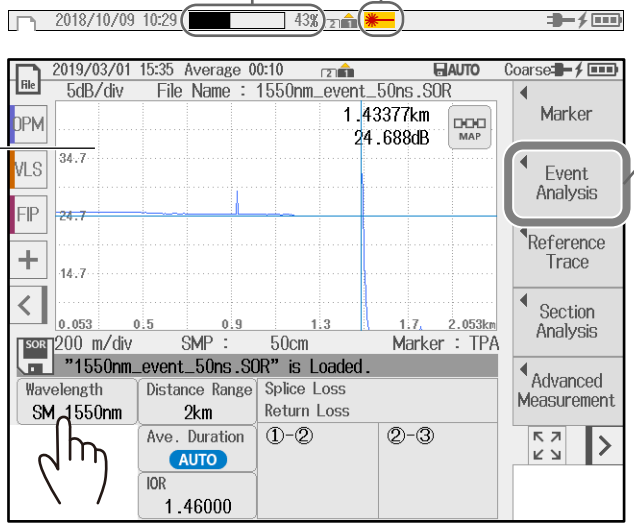
In averaged measurements, the data that is acquired from each pulse is averaged and displayed.

1. Tap **OTDR** on the MENU screen.
2. Tap **Wavelength** to select the wavelength to be measured.
3. Press **AVG** to start a measurement. If you press AVG again before measurement completion, the measurement stops at that point.

Averaged measurement in progress indication
Measurement ends when 100% is reached.

Laser on indication

Data display screen
Displays the averaged waveform



Detects events from the acquired waveform

You cannot set the wavelength during measurement.

You can only control the markers and edit labels during measurement. When the measurement is finished, the instrument returns to the previous soft key display.

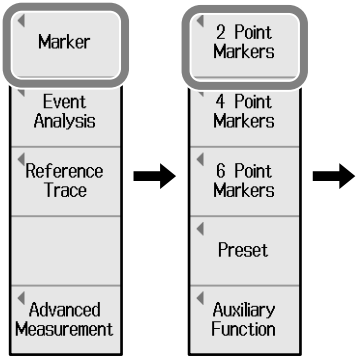
Analyzing Waveforms and Events

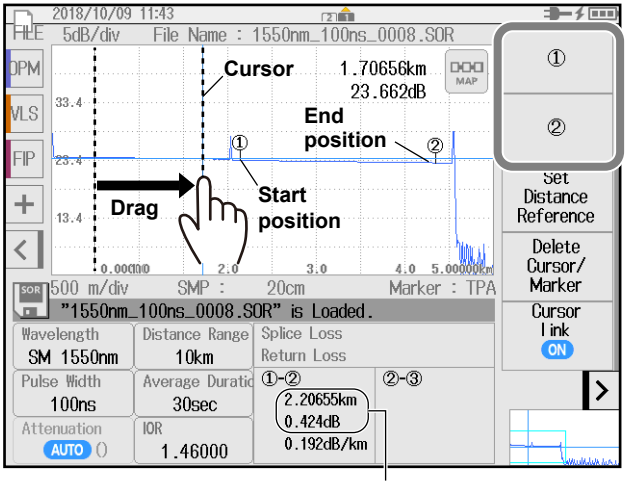
Measuring the Distance and Loss between Two Points

1.4, “Analyzing Measured Data” in the User’s Manual

You can place two markers on the waveform on the data display screen and measure the distance and loss between the markers.

1. Tap **OTDR** on the MENU screen.
2. Tap the **Marker** soft key and then the **2 Point Markers** soft key.
3. **Tap the screen near the location where you want to display a cursor.**
4. **Drag to adjust the position of the cursor on the screen. You can also use the rotary knob.**





5. **Tap a soft key.**

   A marker is placed at the cursor position.

   ① : Distance measurement start position

   ② : Distance measurement end position

When measuring the loss, if there are events (connections) between the markers, use TPA for the marker approximation method (see page 45).

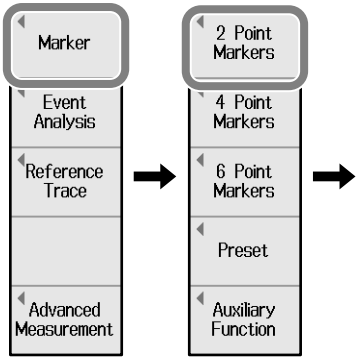
Displays the measured results of the distance and loss between the markers (distance at the top and loss at the bottom within the frame)

Measuring the Return Loss

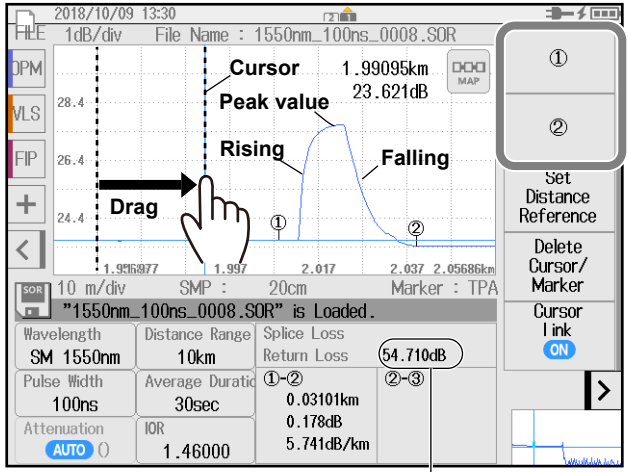
1.4, “Analyzing Measured Data” in the User’s Manual

You can place two markers on the waveform on the data display screen and measure the return loss between the markers.

1. Tap **OTDR** on the MENU screen.
2. Tap the **Marker** soft key and then the **2 Point Markers** soft key.



3. **Tap the screen near the location where you want to display a cursor.**
4. **Drag to adjust the position of the cursor on the screen. You can also use the rotary knob.**



5. **Tap a soft key.**

   A marker is placed at the cursor position.

   ① : Event’s rising position

   ② : Event’s falling position

Place marker ② on the right side of the waveform peak value.

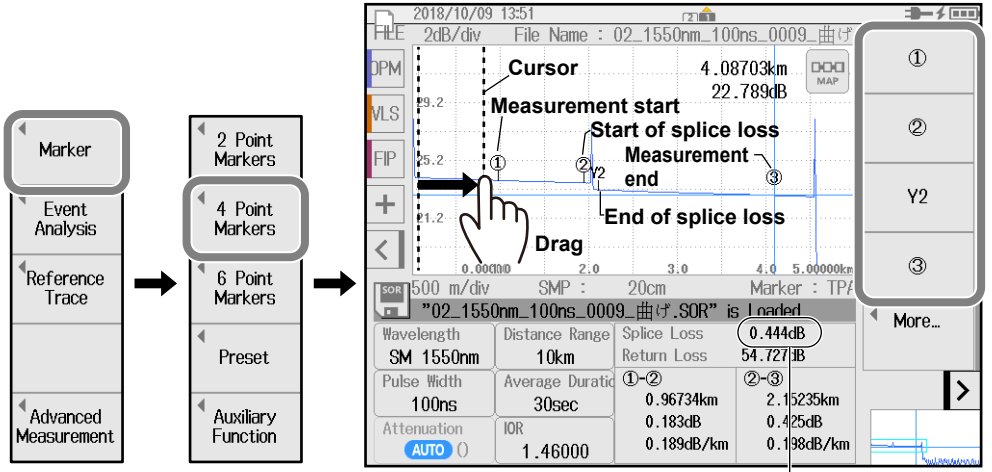
Displays the measured results of return loss between the markers.

Measuring the Splice Loss

1.4, “Analyzing Measured Data” in the User’s Manual

You can place four markers on the waveform on the data display screen and measure the splice loss between the markers.

1. Tap **OTDR** on the MENU screen.
2. Tap the **Marker** soft key and then the **4 Point Markers** soft key.
3. **Tap the screen near the location where you want to display a cursor.**
4. **Drag to adjust the position of the cursor on the screen. You can also use the rotary knob.**



5. **Tap a soft key.**

   A marker is placed at the cursor position.

   ① : Measurement start position

   ② : Position where splice loss starts

   Y2 : Position where splice loss ends

   ③ : Measurement end position

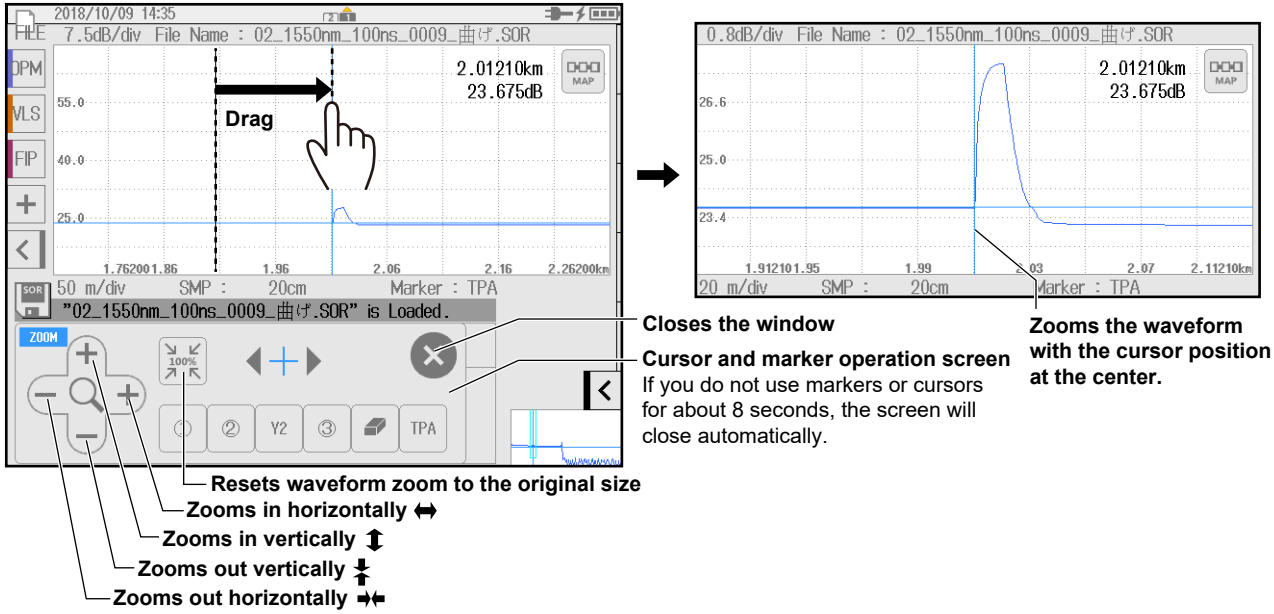
Displays the splice loss value calculated from the measured results of each marker.

Zooming In on or Out of Waveforms

6.2, “Zooming Waveforms” in the User’s Manual

You can zoom the waveform at the specified position on the data display screen.

1. Tap **OTDR** on the MENU screen.
2. Display a waveform on the screen.
3. Tap the screen near the location where you want to display a cursor. A cursor appears.
4. Drag to adjust the position of the cursor on the screen. You can also use the rotary knob.



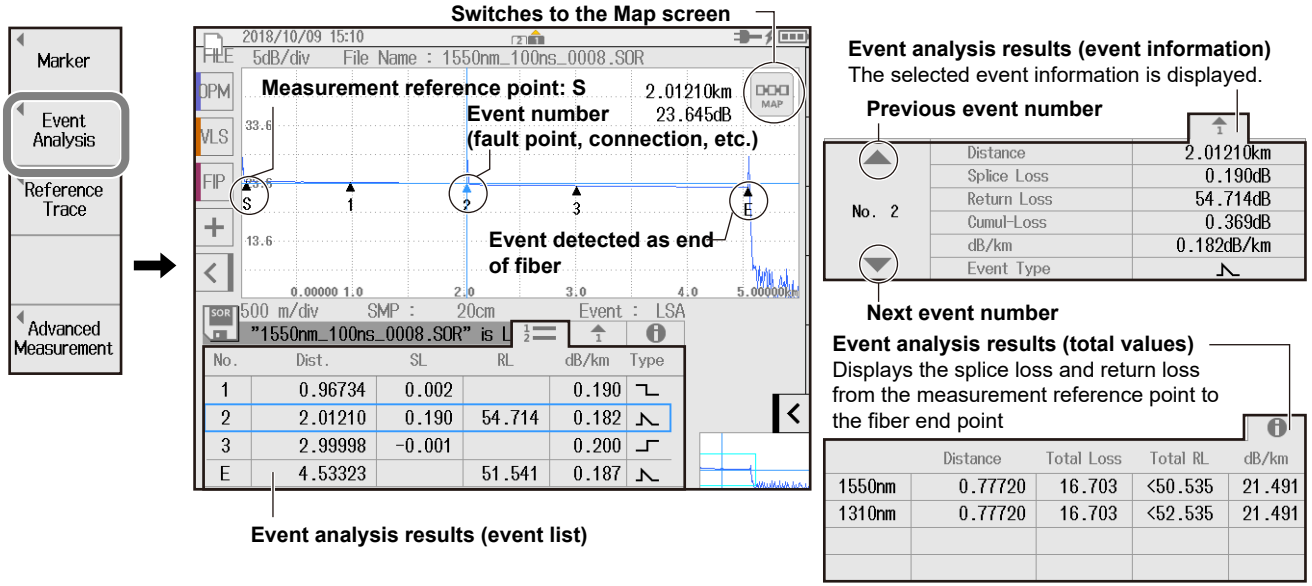
Analyzing Events

TRACE Screen

5.1, “Analyzing in TRACE Mode” in the User’s Manual

The numbers of detected events are displayed on the measured waveform.

1. Tap **OTDR** on the MENU screen.
2. Display a waveform on the screen.
3. Tap the **Event Analysis** soft key to execute an event analysis.



No.	Dist.	SL	RL	dB/km	Type
1	0.96734	0.002		0.190	
2	2.01210	0.190	54.714	0.182	
3	2.99998	-0.001		0.200	
E	4.53323		51.541	0.187	

No. 2	
Distance	2.01210km
Splice Loss	0.190dB
Return Loss	54.714dB
Cumul-Loss	0.369dB
dB/km	0.182dB/km
Event Type	

	Distance	Total Loss	Total RL	dB/km
1550nm	0.77720	16.703	<50.535	21.491
1310nm	0.77720	16.703	<52.535	21.491

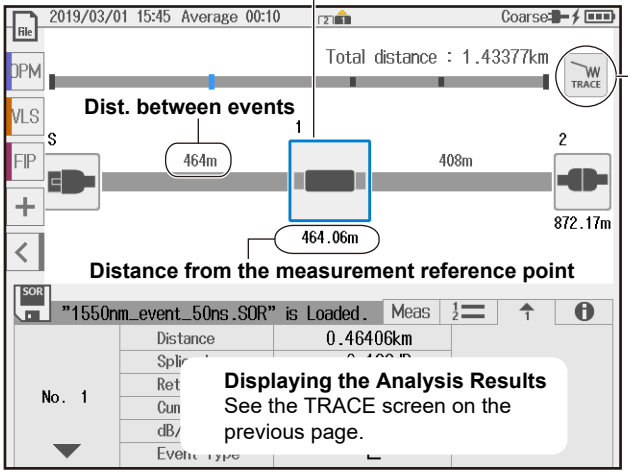
MAP Screen

5.2, “Analyzing in MAP Mode” in the User’s Manual

The event analyzed in TRACE mode on the previous page is displayed as an icon on the MAP screen.

4. Tap **MAP** to change to the MAP screen. When the MAP screen is displayed, the MAP button changes to a TRACE button.

If you execute an averaged measurement after displaying the MAP screen, the event is displayed as an icon automatically when the measurement is completed.



Switches to the waveform view.

Change the event type.

: Reflection

: Positive splice loss

: Negative splice loss

: Bending loss (macro bending)

: Splitter insertion loss

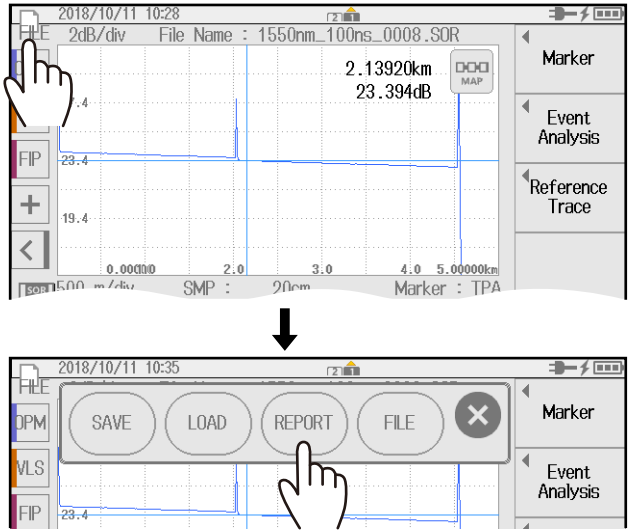
Tapping the icon of another event on the screen will show that event at the center. You can move the icon horizontally by dragging the icon.
You can change the event type by tapping the icon shown at the center.

Creating Reports

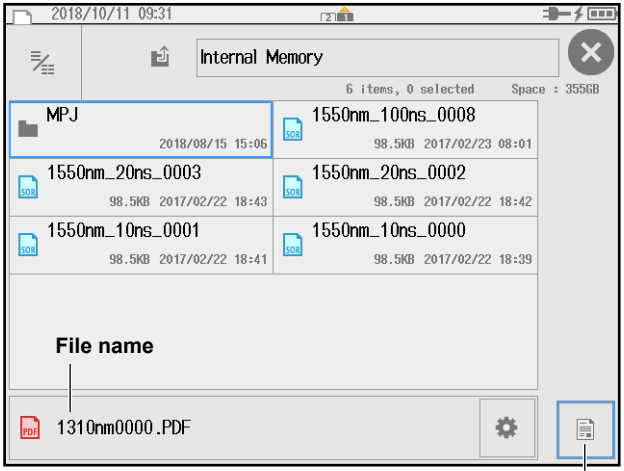
Exporting the Waveforms on the Screen to Report Files

9.5, “Creating Report Files” in the User’s Manual

1. Tap **OTDR** on the MENU screen.
2. Display a waveform on the screen.
3. Tap the **FILE** icon and then **REPORT** to display the file list screen.



File list screen

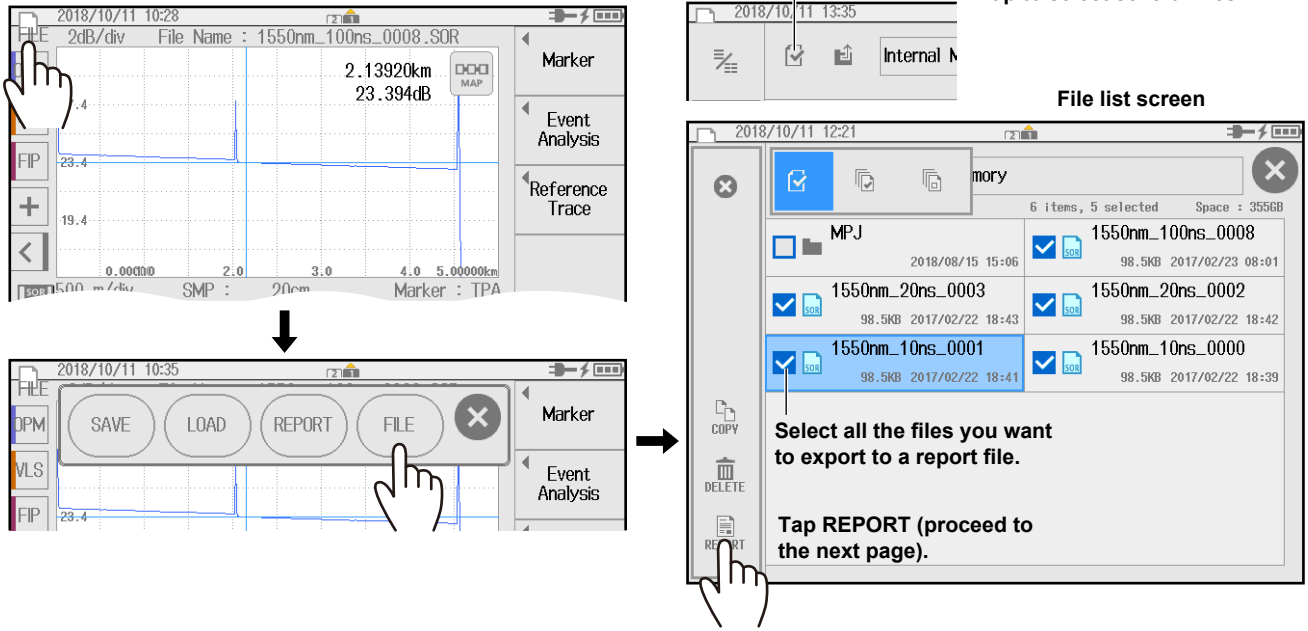


The waveform shown on the data display screen is exported to a PDF report file. To select a waveform data file in the file list and export a report file, see “Exporting File List Data to Report Files” on the next page.

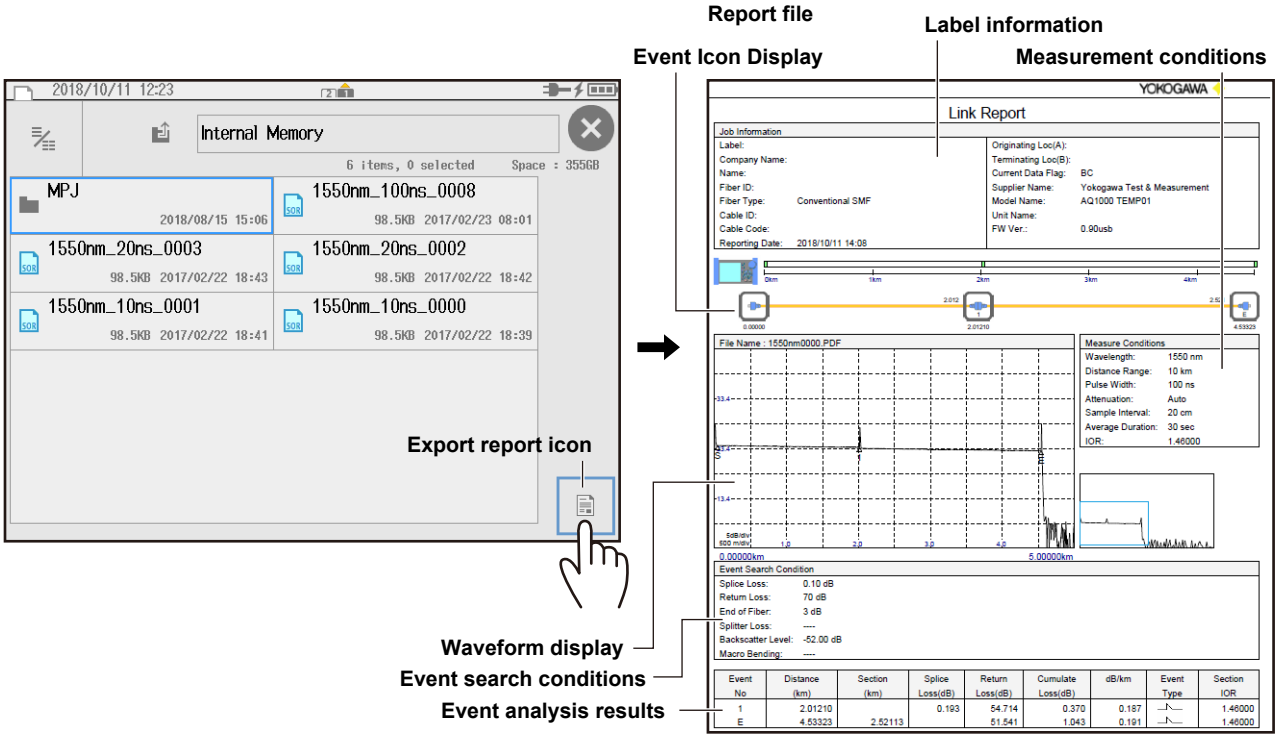
Exporting File List Data to Report Files

9.5, “Creating Report Files” in the User’s Manual

1. Tap **OTDR** on the MENU screen.
2. Tap the **FILE** icon and then **FILE** to display the file list screen.
3. Select the waveform data file to export to a report file.
   For the procedure to select multiple files, see section 9.6 in the User’s Manual IM AQ1210-02EN.



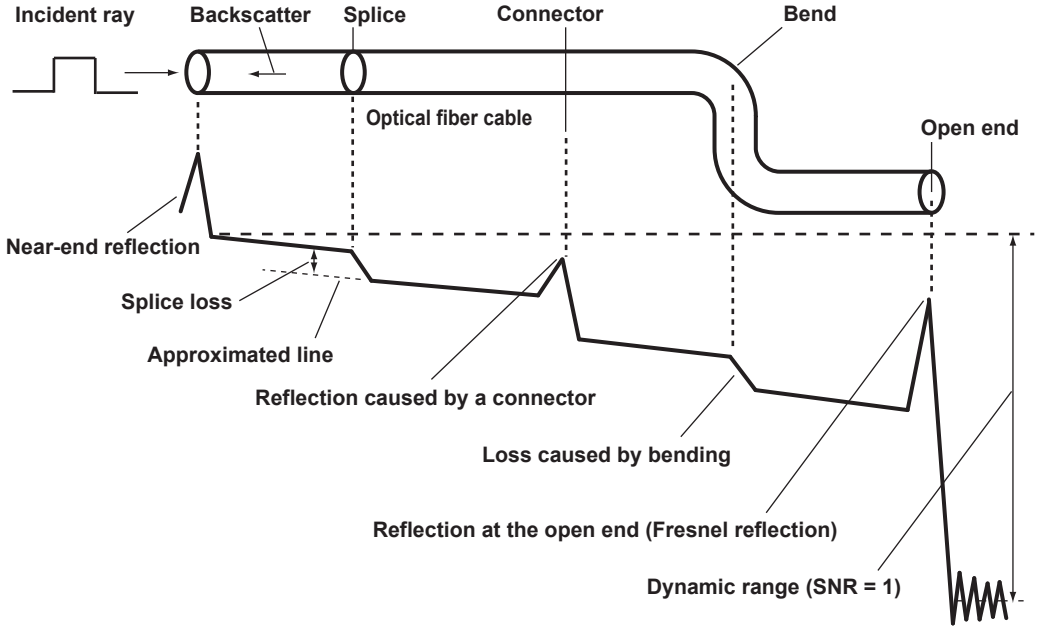
4. Tap the export report icon.
A report file will be created in the same folder as selected file.



Background Information on Measurements

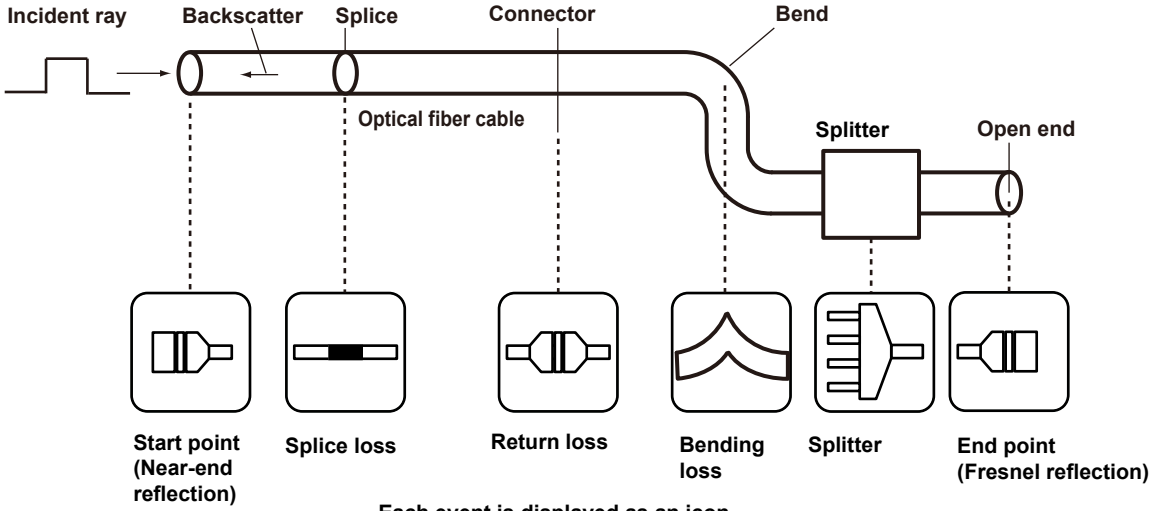
How to View Optical Pulse Measurement Waveforms (TRACE screen)

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



How to View the Icon Display (MAP Screen)

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.



Each event is displayed as an icon.

Terminology

Near-end reflection
Reflection occurs at the gap in the connector connecting the instrument and optical fiber cable. In the section where this reflection is detected, loss and reflections that occur at connections cannot be detected. This section is called a dead zone.

Backscatter
When light travels through an optical fiber cable, Rayleigh scattering occurs due to inconsistencies in the density and composition of materials that are smaller than the unit of wavelength. The portion of the scattered light that travels in the direction opposite to the direction of propagation is known as backscatter.

Splice loss
Splice loss occurs in spliced sections mainly due to the offset axis and angle.

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

Fresnel reflection at the far-end of the optical fiber
When light is applied to an optical fiber cable, Fresnel reflection occurs at locations where the cable is broken and at locations where the index of refraction changes such as at the end of the cable (the interface between glass and air). When the optical fiber cable end face is vertical, approximately 3.4% of the incident optical power (–14.7 dB) is reflected.

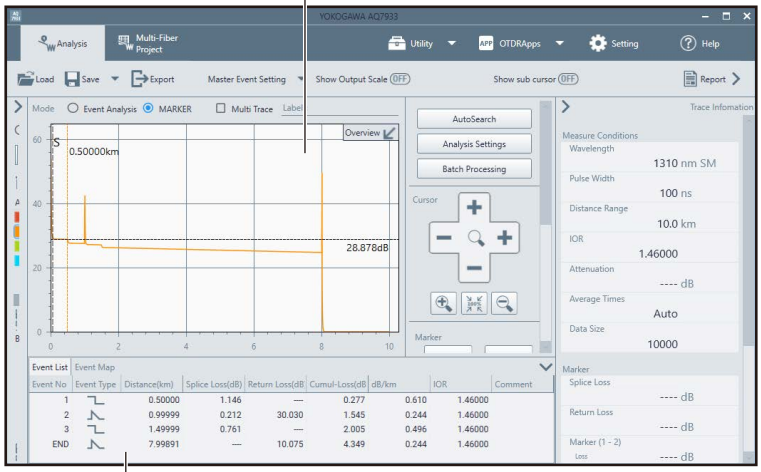
Dynamic range
Dynamic range refers to the difference between the backscatter level at the near-end side and the noise (RMS = 1).

Dead zone
Dead zone refers to areas where measurement is not possible because of the influence from Fresnel reflection, connection points, or the like.

Analysis using the Emulation Software

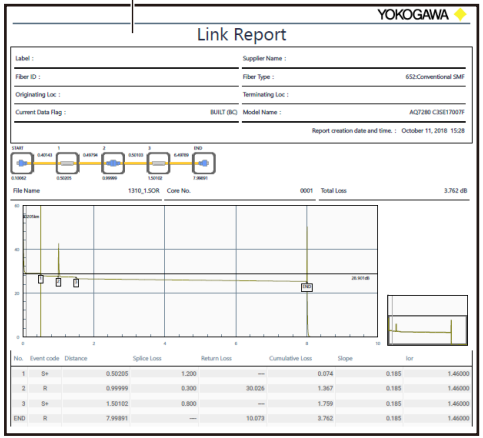
Waveform data measured with the instrument can be analyzed on a PC by using the AQ7933 OTDR Emulation Software. This software also has a PDF report creation feature, which is convenient for creating construction reports.

Waveform data saved in SOR format using the instrument can be displayed on the PC using the emulation software.



Analysis results (displays at list of events)

Create a PDF construction report using the report creation feature of the emulation software.



Replacing the Optical Adapter

WARNING

When replacing the optical adapter, turn off the instrument to prevent the light from accidentally being emitted from the light source port. Replacing the optical adapter with the instrument turned on may cause the emitted light to accidentally enter the eye. This can cause eye damage or vision impairment.

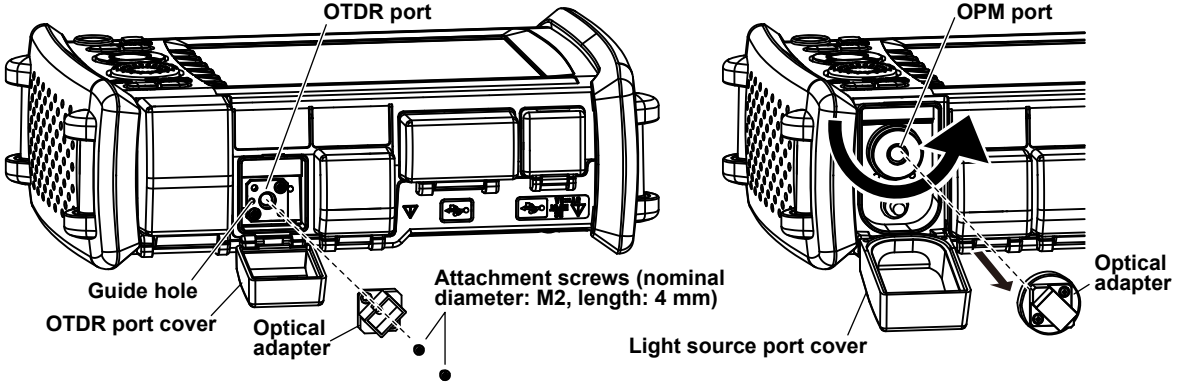
French

AVERTISSEMENT

Lors du nettoyage de l’émetteur de lumière, mettre l’instrument hors tension pour empêcher l’émission accidentelle de lumière provenant du port de la source lumineuse. Le nettoyage de l’émetteur de lumière avec l’instrument sous tension peut permettre à la lumière émise de pénétrer accidentellement dans les yeux. Ceci peut provoquer des lésions oculaires ou une déficience visuelle.

Removal

1. Check that the instrument is turned off.
2. Open the OTDR ports or the OPM port (/SPM, /HPM or /PPM option) cover.
3. Remove the optical adapter attachment screws (nominal diameter: M2, length: 4 mm) with a Phillips screwdriver.
   If the OPM port (when /SPM or /HPM option) turn the knob to the left to loosen.
4. Pull out the optical adapter.



Installation

1. Check that the instrument is turned off.
2. Open the OTDR ports or the OPM port (/SPM, /HPM or /PPM option) cover.
3. Insert the optical adapter straight so that the guide protrusion part engages the guide hole of the OTDR ports or the OPM port (when /PPM option).
4. Tighten the attachment screws (nominal diameter: M2, length: 4 mm) with a Phillips screwdriver. The proper tightening torque is about 0.12 N-m. If the OPM port (when /SPM or /HPM option) turn the knob to the right to tighten.

Removing the Battery Pack

WARNING

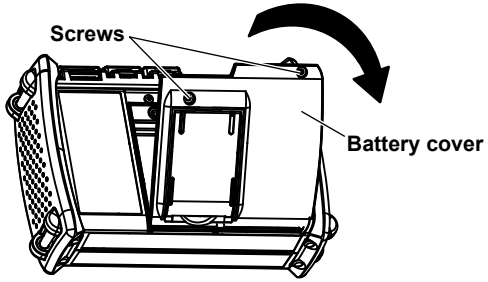
- Do not connect or disconnect the battery pack while electricity is being supplied by the USB-AC adapter.
- To prevent problems before they occur, periodically inspect the battery pack exterior to confirm that there is no damage such as cracks or deformations and to confirm that there is no fluid leakage.
- Use the instrument to charge the battery pack. Maintain the correct environmental conditions when the battery pack is charging. Failure to do so can cause fluid leakage, heating, smoke, explosions, or fire.
- Follow the handling precautions that are included in the battery pack's user's manual.

French

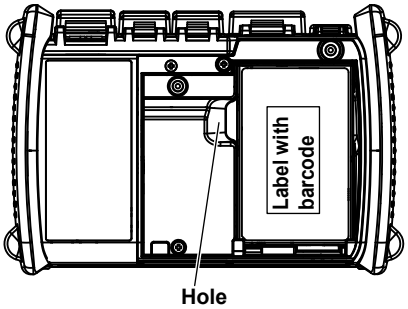
AVERTISSEMENT

- Ne pas installer, ni déposer le pack de batteries lorsque l'électricité est alimentée par l'adaptateur USB-CA.
- À titre préventif, inspecter régulièrement le boîtier extérieur du pack de batteries afin de déceler tout signe d'endommagement, comme l'apparition de fissures ou de déformations, et vérifier qu'il n'y a aucune fuite.
- Recharger le pack de batteries à l'aide de cet instrument. Respecter les consignes environnementales prescrites pour la recharge du pack de batteries, afin d'éviter les risques de fuite, de surchauffe, de fumée, d'explosion ou d'incendie.
- Respecter les consignes de manipulation indiquées dans le manuel d'utilisation du pack de batteries.

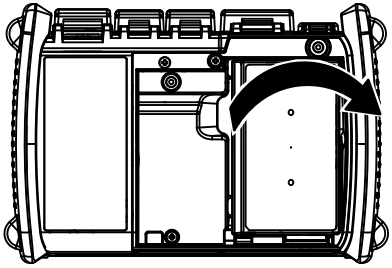
1. Loosen the battery cover screws with a Phillips screwdriver until the screw head moves up and down.
2. Pull the battery cover toward you, lift, and remove.



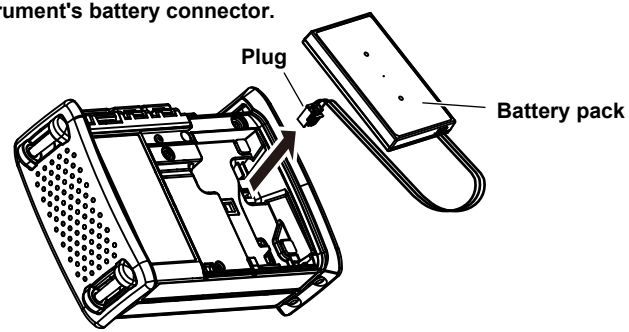
3. Insert your finger into the hole so that the battery pack can be removed.



4. Lift the battery pack with your finger.



5. Disconnect the battery pack's power supply lead wire plug from the instrument's battery connector.



Recommended Part Replacement

The following parts are wearable. It is recommended to replace them after the time period indicated below. For replacement of parts, please contact your nearest Yokogawa representative.

Parts with Limited Service Life

Part Name	Service Life	Notes
Battery pack (Lithium-ion battery)	Approx. 500 charges	The actual service life varies depending on the operating environment.

Consumables

We recommend that you replace the following parts at the intervals listed below.

Part Name	Service Life	Notes
Backup battery (lithium battery)	5 years	Send to factory to replace.
LCD	Approx. 50,000 hours	Send to factory to replace.
Measurement connector ferrule	One year	Send to factory to replace.
Universal and connector adapters	One year	Purchase and replace.
USB connector	1500 times	Send to factory to replace.

The recommended replacement interval can vary greatly depending on the operating environment and the frequency of use.
The above intervals are estimates.

Disposing of the Instrument

When disposing of YOKOGWA products, follow the laws and ordinances of the country or region where the product will be disposed of.

Specifications

Optical Pulse Measurement (OTDR)

AQ1210A, AQ1215A, AQ1210E, AQ1215E

Item	Specifications			
	AQ1210A	**AQ1215A**	**AQ1210E**	**AQ1215E**
Center wavelength	1310 nm ± 25 nm 1550 nm ± 25 nm	1310 nm ± 25 nm 1550 nm ± 25 nm	1310 nm ± 25 nm 1550 nm ± 25 nm 1625 nm ± 10 nm	1310 nm ± 25 nm 1550 nm ± 25 nm 1625 nm ± 25 nm
Event dead zone[1]	1.0 m (1310 nm) 1.0 m (1550 nm)	0.7 m (1310 nm) 0.7 m (1550 nm)	1.0 m (1310 nm) 1.0 m (1550 nm) 1.0 m (1625 nm)	0.7 m (1310 nm) 0.7 m (1550 nm) 0.7 m (1625 nm)
Attenuation dead zone[2]	4 m (typical value)[3]	2.5 m (typical value)[3]	4 m (typical value)[3]	2.5 m (typical value)[3]
Dynamic range	35 dB (1310 nm) 33 dB (1550 nm)	40 dB (1310 nm) 38 dB (1550 nm)	35 dB (1310 nm) 33 dB (1550 nm) 33 dB (1625 nm)	40 dB (1310 nm) 38 dB (1550 nm) 36 dB (1625 nm)
Loss measurement accuracy	±0.05 dB/dB	±0.03 dB/dB	±0.05 dB/dB	±0.03 dB/dB
Sampling resolution	5 cm (min.)	2 cm (min.)	5 cm (min.)	2 cm (min.)
Number of sampling points	256000 (max.)	256000 (max.)	256000 (max.)	256000 (max.)
Distance range	0.1 km to 256 km	0.1 km to 512 km	0.1 km to 256 km	0.1 km to 512 km
Pulse width	5 ns to 200 µs	3 ns to 200 µs	5 ns to 200 µs	3 ns to 20 µs
Return loss measurement accuracy	±2 dB	±2 dB	±2 dB	±2 dB
Distance measurement accuracy	± (1 m + measured distance × 2 × 10^{-5} ± 1 sampling resolution)			
Compliant fiber	SM (ITU-T G.652)	SM (ITU-T G.652)	SM (ITU-T G.652)	SM (ITU-T G.652)

1 3 ns pulse width (when AQ1215A and AQ1215E), 5 ns pulse width (when AQ1210A and AQ1210E), 55 dB or more return loss, at a point at 1.5 dB or less from the peak value under unsaturated conditions

2 10 ns pulse width, 55 dB or more return loss, point where the backscattering light level is attenuated to a value within the regular value ± 0.5 dB

3 Typical values (typ.) are typical or mean values. They are not strictly warranted.

AQ1215F, AQ1216F

Item	Specifications	
	AQ1215F	AQ1216F
Center wavelength	1310 nm ± 25 nm 1550 nm ± 25 nm 1650 nm ± 5 nm	1310 nm ± 25 nm 1550 nm ± 25 nm 1650 nm ± 25 nm
Event dead zone[1]	0.7 m (1310 nm) 0.7 m (1550 nm) 0.7 m (1650 nm)	0.7 m (1310 nm) 0.7 m (1550 nm) 0.7 m (1650 nm)
Attenuation dead zone[2]	2.5 m (typical value)[3]	2.5 m (typical value)[3]
Dynamic range	40 dB (1310 nm) 38 dB (1550 nm) 35 dB (1650 nm)	40 dB (1310 nm) 38 dB (1550 nm) 38 dB (1650 nm)
Loss measurement accuracy	±0.03 dB/dB	±0.03 dB/dB
Sampling resolution	2 cm (min.)	2 cm (min.)
Number of sampling points	256000 (max.)	256000 (max.)
Distance range	0.1 km to 512 km	0.1 km to 512 km
Pulse width	3 ns to 200 µs	3 ns to 20 µs
Return loss measurement accuracy	±2 dB	±2 dB
Distance measurement accuracy	± (1 m + measured distance × 2 × 10^{-5} ± 1 sampling resolution)	
Compliant fiber	SM (ITU-T G.652)	SM (ITU-T G.652)

1 3 ns pulse width, 55 dB or more return loss, at a point at 1.5 dB or less from the peak value under unsaturated conditions
2 10 ns pulse width, 55 dB or more return loss, point where the backscattering light level is attenuated to a value within the regular value ± 0.5 dB
3 Typical values (typ.) are typical or mean values. They are not strictly warranted.

Power Checker (/PC option)

Item	Specification
Wavelength setting	1310 nm, 1490 nm, 1550 nm, 1625 nm, 1650 nm
Power range	–50 dBm to –5 dBm
Measurement accuracy (dB)[1]	±0.5 dB
Optical input port	OTDR port (PORT1)

1 Ambient temperature: 23°C±2°C, CW light, wavelength: 1310 nm, light source spectral width: 10 nm or less, power level: 100 µW (–10 dBm), optical fiber: SM (ITU-T G.652), changes to the measuring instrument due to the passage of time are not included.

Optical Power Meter (Option)

Item	Specification		
	/SPM Option	/HPM Option	/PPM Option
Wavelength	800 nm to 1700 nm	800 nm to 1700 nm	1310 nm, 1490 nm, 1550 nm
Modulation mode	CW, CHOP (270 Hz, 1kHz, 2 kHz)	CW, CHOP (270 Hz, 1kHz, 2 kHz)	CW
Power range (CW)	–70 dBm to +10 dBm	–50 dBm to +27 dBm	–70 dBm to +10 dBm (1310 nm/1490 nm) –50 dBm to +27 dBm (1550 nm)
Noise level	0.5 nW (1310 nm)	50 nW (1310 nm)	—
Uncertainty at reference conditions[1]	≤ ± 5%	≤ ± 5%	≤ ± 0.5 dB

1 CW, 1310 ±2 nm (Standard, High Power, PON at 1310 nm), 1550 ±2 nm (PON at 1550 nm), spectral width: 10 nm or less, input power: 100 µW (−10 dBm), SM (ITU-T G.652), FC/PC connector, wavelength setting: measured wavelength ±0.5 nm, excluding a secular change of equipment (add 1% a year after calibration)

Light Source

Item	Specification
Wavelength	Same as the specifications for optical pulse measurement (OTDR)
Optical output level	–3 dBm ± 1 dB
Level stability[1]	±0.05 dB (1310 nm, 1550 nm), ±0.15 dB (1625 nm, 1650 nm)
Modulation mode	CW, CHOP (270 Hz, 1kHz, 2 kHz)
Optical output port	OTDR port

1 The level is stable for 5 minutes when the ambient temperature is kept at a constant temperature within 23°C ± 2°C.

Visible Light Source (/VLS option)

Item	Specification
Wavelength	650 nm ± 20 nm
Optical output level	–3 dBm or more (Peak)
Modulation mode	CW, CHOP (2 Hz)
Optical output port	VLS port

The ambient temperature is 23°C ± 2°C unless otherwise stated.

Functions

Item		Specification
Measurement		Distance, Loss, Return loss, Section Return loss, dB/km
Analysis		Multi trace, Two wavelength combine, Differential trace, Section analysis, Pass/Fail judgment, Automatic event detection, Fiber Surface Test
Reading resolution		Horizontal axis: Minimum 1 cm Vertical axis: Minimum 0.001 dB
Advanced functions		Multi-Core Fiber Measurement, Installation Completion Notification, Smart Mapper, Auto Loss Test, Report Creation
Display section	Display	5.7 (inch size) color TFT LDC[1] , Display pixels: 640 (horizontal) × 480 (vertical)
	LED	POWER (power supply on/off display), CHARGE (charge condition), LASER (Laser on indication)
Input section	Input keys	Arrow keys, MENU key, REAL TIME key, AVG key, ENTER key, power switch
	Touchscreen	Multi-touch capacitive
External interface	USB port	USB2.0 TypeA (Host): USB memory, Fiber scope, USB dongle (LAN, WLAN) Type C: USB mass storage device, DC power supply

1 The LCD may include a few defective pixels.
There may be some pixels on the LCD that never light or are always lit (0.002% or less of the total number of display pixels including RGB).
These pixels are not defects.

General Specifications

Item		Specifications
Operating environment	Ambient temperature	–10°C to 50°C, (10°C to 35°C during battery charge[1])
	Ambient humidity	5 to 90%RH (no condensation)
	Altitude	4000 m or less
Storage environment	Ambient temperature	–20°C to 60°C
	Ambient humidity	0 to 90%RH (no condensation)
Power supply	Rated supply voltage	5 VDC ± 5%, 3 A max., supplied through the type C USB port
Battery	Type	Lithium-ion polymer
	Operation time	10 hours or more (Telcordia GR-196-CORE Issue 2, September 2010)
	Charge time	5 hours (power-off state)
Warm-up time		At least 5 minutes
Recommended calibration period		1 year
Installation position		Hand-held, horizontally or vertically oriented, and oriented on a slant with a stand.
External dimensions		Approx. 210 mm (W) × 148 mm (H) × 69 mm (D), excluding protrusions
Weight		Approx. 1 kg, including the battery pack
Safety standards		Compliant standard: EN 61010-1, IEC 61010-1, EN 60825-1:2014 (laser safety), IEC 60825-1:2007 (laser safety), FDA 21 CFR 1040.10 and 1040.11 (laser safety), GB7247.1-2012 (laser safety)
Emissions		Compliant standards: EN 61326-1 Class A, EN 55011 Class A Group1 EMC standards of Australia and New Zealand EN55011 Class A, Group 1 Korea Electromagnetic Conformity Standard (한국 전자파적합성기준) This is a Class A product. Operation of this product in a residential area may cause electromagnetic interference in which case the user will be required to correct the interference.
Immunity		Compliant standard: EN 61326-1 Table2 (for use in industrial locations)
Environmental standard		Compliant standard: EN 50581 Monitoring and control instruments

1 The ambient temperature value during battery charge varies depending on the specifications of the USB-AC adapter in use.

Typical values (typ.) are typical or mean values. They are not strictly warranted.

External Dimensions

Unit : mm
(approx. inch)

If not specified, the tolerance is ±3%. However, in cases of less than 10 mm, the tolerance is ±0.3 mm.