MT9085 Series
ACCESS Master
Operation Manual

Fourth Edition

For safety and warning information, please read this manual before attempting to use the equipment.
Keep this manual with the equipment.

ANRITSU CORPORATION

Document No.: M-W3971AE-4.0

Safety Symbols

To prevent the risk of personal injury or loss related to equipment malfunction, Anritsu Corporation uses the following safety symbols to indicate safety-related information. Ensure that you clearly understand the meanings of the symbols BEFORE using the equipment. Some or all of the following symbols may be used on all Anritsu equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.

Symbols used in manual

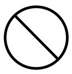
⚠ DANGER This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.

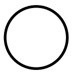
⚠ WARNING This indicates a hazardous procedure that could result in serious injury or death if not performed properly.

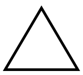
⚠ CAUTION This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

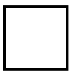
Safety Symbols Used on Equipment and in Manual

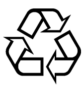
The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE using the equipment.


This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.


This indicates an obligatory safety precaution. The obligatory operation is indicated symbolically in or near the circle.


This indicates a warning or caution. The contents are indicated symbolically in or near the triangle.


This indicates a note. The contents are described in the box.



These indicate that the marked part should be recycled.

MT9085 Series
ACCESS Master
Operation Manual

4 September 2018 (First Edition)
21 May 2019 (Fourth Edition)

For Safety

⚠ DANGER

Replacing Battery

- When replacing the battery, use the specified battery and insert it with the correct polarity. If the wrong battery is used, or if the battery is inserted with reversed polarity, there is a risk of explosion causing severe injury or death.

Battery Disposal

- DO NOT expose batteries to heat or fire. This is dangerous and can result in explosions or fire. Heating batteries may cause them to leak or explode.

⚠ WARNING

- ALWAYS refer to the operation manual when working near locations at which the alert mark shown on the left is attached. If the advice in the operation manual is not followed, there is a risk of personal injury or reduced equipment performance. The alert mark shown on the left may also be used with other marks and descriptions to indicate other dangers.

- Overvoltage Category
  This equipment complies with overvoltage category II defined in IEC 61010. DO NOT connect this equipment to the power supply of overvoltage category III or IV.

⚠ WARNING

- Laser radiation warning
  - NEVER look directly into the cable connector on the equipment nor into the end of a cable connected to the equipment. There is a risk of injury if laser radiation enters the eye.
  - The Laser Safety label is attached to the equipment for safety use as indicated in "Laser Safety" later in this section.

Repair

- Only qualified service personnel with a knowledge of electrical fire and shock hazards should service this equipment. This equipment cannot be repaired by the operator. DO NOT attempt to remove the equipment covers or unit covers or to disassemble internal components. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision components.

Calibration

- The performance-guarantee seal verifies the integrity of the equipment. To ensure the continued integrity of the equipment, only Anritsu service personnel, or service personnel of an Anritsu sales representative, should break this seal to repair or calibrate the equipment. Be careful not to break the seal by opening the equipment or unit covers. If the performance-guarantee seal is broken by you or a third party, the performance of the equipment cannot be guaranteed.

For Safety

⚠ WARNING

Battery Fluid

- DO NOT short the battery terminals and never attempt to disassemble the battery or dispose of it in a fire. If the battery is damaged by any of these actions, the battery fluid may leak. This fluid is poisonous.
  DO NOT touch the battery fluid, ingest it, or get in your eyes. If it is accidentally ingested, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly with clean water.

LCD

- This equipment uses a Liquid Crystal Display (LCD). DO NOT subject the equipment to excessive force or drop it. If the LCD is subjected to strong mechanical shock, it may break and liquid may leak.
  This liquid is very caustic and poisonous.
  DO NOT touch it, ingest it, or get in your eyes. If it is ingested accidentally, spit it out immediately, rinse your mouth with water and seek medical help. If it enters your eyes accidentally, do not rub your eyes, rinse them with clean running water and seek medical help. If the liquid gets on your skin or clothes, wash it off carefully and thoroughly with soap and water.

For Safety

Laser Safety

Class 1, 1M, and 3R indicate the danger degree of the laser radiation specified below according to IEC 60825-1:2007.

Class 1: Lasers that are safe under reasonably foreseeable conditions of operation, including the use of optical instruments for intrabeam viewing.

Class 1M: Lasers emitting in the wavelength range from 302.5 to 4000 nm that are safe under reasonably foreseeable conditions of operation, but may be hazardous if the user employs optics within the beam. Two conditions apply:

(a) for diverging beams, if the user views the laser output with certain optical instruments (for example, eye loupes, magnifiers and microscopes) within a distance of 100 mm; or

(b) for collimated beams, if the user views the laser output with certain optical instruments (for example, telescopes and binoculars).

Class 3R: Lasers that emit in the wavelength range from 302.5 to 10^6 nm where direct intrabeam viewing is potentially hazardous but the risk is lower than for Class 3B lasers.

⚠ CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

For Safety

⚠ WARNING

Laser Safety

Before using this instrument, always ensure that the warning light is lit when the optical output switch is turned on.

If this warning light does not turn on, the equipment may be faulty and for safety reasons should be returned to an Anritsu service center or representative for repair.

The laser in this equipment is classified as Class 1, 1M, or 3R according to the IEC 60825-1:2007 standard.

Never use optical instruments to directly view Class 1M laser products. Doing so may result in serious damage to the eyes.

Table 1 Laser Safety Classifications Based on IEC 60825-1:2007

Model Name	Class	Max. Optical Output Power (W)*	Pulse Width (s)/ Repetition Rate	Emitted Wavelength (nm)	Beam Divergence (deg)	Incorporated Laser Specification (refer to Table 2)	Laser Aperture
MT9085A-053 MT9085B-053 MT9085C-053	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]
MT9085B-055	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1650	11.5	e)	Figure 1, [2]
MT9085B-056	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1490	11.5	b)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]

Table 1 Laser Safety Classifications Based on IEC 60825-1:2007 (Cont'd)

Model Name	Class	Max. Optical Output Power (W)*	Pulse Width (s)/ Repetition Rate	Emitted Wavelength (nm)	Beam Divergence (deg)	Incorporated Laser Specification (refer to Table 2)	Laser Aperture
MT9085A-057	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
MT9085B-057	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]
MT9085C-057	1	0.15	0.5×10^{-6} /0.039	1625	11.5	d)	Figure 1, [1]
MT9085B-058	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1490	11.5	b)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1625	11.5	d)	Figure 1, [1]
MT9085A-063 MT9085B-063	1M	0.15	20×10^{-6} /0.038	1310	11.5	a)	Figure 1, [1]
	1	0.15	0.5×10^{-6} /0.039	1550	11.5	c)	Figure 1, [1]
	1M	0.15	0.5×10^{-6} /0.039	850	36.9	f)	Figure 1, [2]
	1	0.15	4×10^{-6} /0.037	1300	36.9	g)	Figure 1, [2]
MT9085A-002 MT9085B-002 MT9085C-002	3R	0.003	CW	650	11.5	h)	Figure 1, [3]

*: Indicates the possible optical output power when each and every reasonably foreseeable single-fault condition is included.

Table 2 Incorporated Laser Specification

Incorporated Laser	Max. Optical Output Power (W)*	Pulse Width (s)/ Repetition Rate	Emitted Wavelength (nm)	Beam Divergence (deg)
a)	< 0.3	20×10^{-6}/0.038	1310	11.5
b)	< 0.3	0.5×10^{-6}/0.039	1490	11.5
c)	< 0.3	0.5×10^{-6}/0.039	1550	11.5
d)	< 0.3	0.5×10^{-6}/0.039	1625	11.5
e)	< 0.3	0.5×10^{-6}/0.039	1650	11.5
f)	< 0.3	0.5×10^{-6}/0.039	850	36.9
g)	< 0.3	4×10^{-6}/0.037	1300	36.9
h)	< 0.003	CW	650	11.5

*: Maximum output power is the estimated value when something breaks down.

For Safety

Table 3 Labels on Product

	Type	Label	Affixed to:	Model Name
1	Explanation	IEC 60825-1:2007 CLASS 1 LASER PRODUCT	Figure 2, A	All models
2	Explanation	IEC 60825-1:2007 INVISIBLE LASER RADIATION DO NOT VIEW DIRECTORY WITH OPTICAL INSTRUMENTS (MAX OUTPUT POWER) (PULSE DURATION) (WAVELENGTH) 4mW CW 850nm 150mW ≦500ns 850nm 150mW ≦20μs 1300 to 1400nm CLASS 1M LASER PRODUCT	Figure 2, B	All models
3	Explanation	IEC 60825-1:2007 VISIBLE LASER RADIATION AVOID DIRECT EYE EXPOSURE (MAX OUTPUT POWER) (PULSE DURATION) (WAVELENGTH) 5mW CW 650nm CLASS 3R LASER PRODUCT	Figure 2, C	MT9085A-002 MT9085B-002 MT9085C-002
4	Certification	THIS PRODUCT COMPLIES WITH 21 CFR 1040.10 AND 1040.11 EXCEPT FOR DEVIATIONS PURSUANT TO LASER NOTICE. NO.50, DATED JUNE 24, 2007.	Figure 2, D	All models
5	Identification	ACCESS Master ANRITSU COPR. 5-1-1, ONNA, ATSUGI-SHI KANAGAWA 243-8555, JAPAN MANUFACTURED BY: ATP 20	Figure 2, E	All models
6	Warning		Figure 2, F	MT9085A-002 MT9085B-002 MT9085C-002
7	Aperture	Laser aperture	Figure 3, G	MT9085A-002 MT9085B-002 MT9085C-002

Laser Radiation Markings

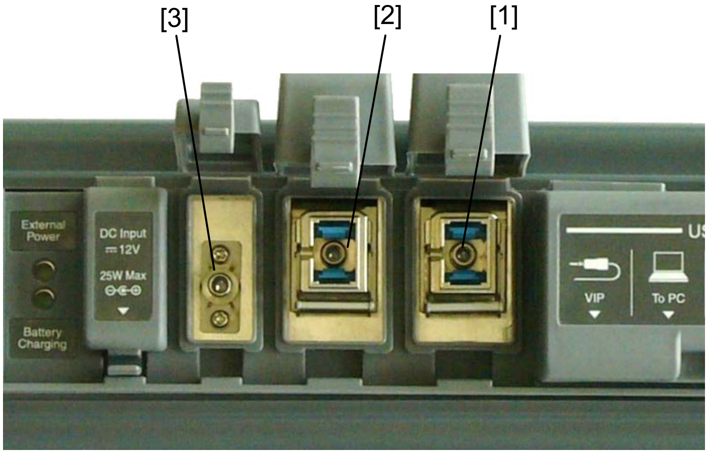


Figure 1 Locations of Laser Beam Apertures

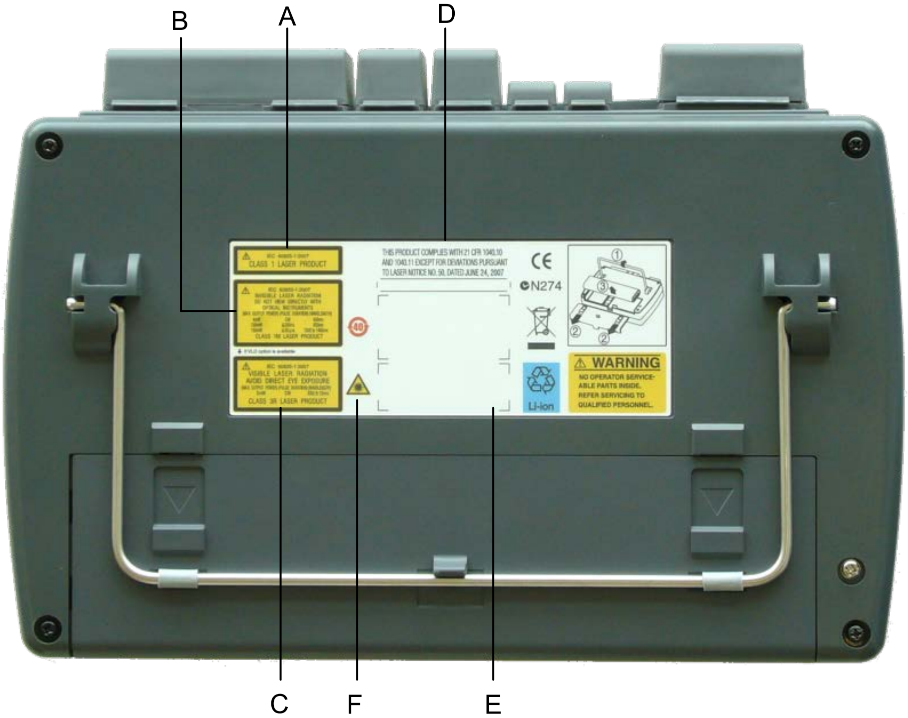


Figure 2 Locations of Affixed Labels

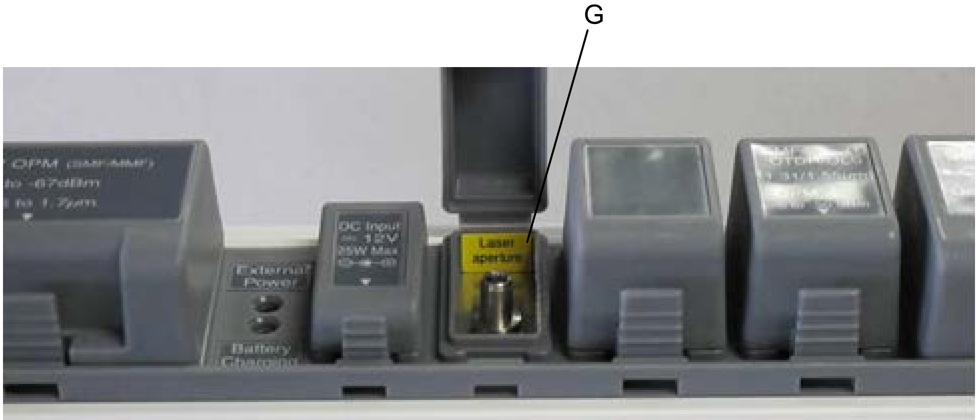


Figure 3 Locations of Affixed Labels

FOR U.S. CUSTOMERS

Please Recycle.

Li-ion

The product that you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste stream. Check with your local solid waste officials for details in your area for recycling options or proper disposal.

Before disposing of this product, discharge the battery and mail it to your Anritsu Service or Sales office.

1. Attach the battery pack to the product.
2. Disconnect the AC adapter, if used.
3. Turn the power switch to on.
4. Leave the product on until the power indicator goes off; the battery is now discharged.
5. Remove the battery.
6. Insulate the battery terminals with adhesive tape.
7. Mail it to your Anritsu Service or Sales office, or to the following address.

ANRITSU COMPANY
490 Jarvis Drive, Morgan Hill, CA 95037-2809, USA

FOR EU & EFTA CUSTOMERS

Please Recycle.

Li-ion

Read the following when using products to which the mark shown on the above is attached.

The product that you have purchased contains a rechargeable battery. The battery is recyclable. At the end of its useful life, under various state and local laws, it may be illegal to dispose of this battery into the municipal waste. Check with your local solid-waste disposal officials for details of recycling options or proper disposal in your area.

Before disposing of this product, discharge the battery and mail it to your Anritsu Service or Sales office.

1. Disconnect the AC adapter, if used.
2. Turn the power switch to on.
3. Leave the product on until the power indicator goes off; the battery is now discharged.
4. Remove the battery.
5. Insulate the battery terminals with adhesive tape.
6. Please recycle in accordance with your national or regional legislation.

Nach Gebrauch der Ver Kaufsstelle Zurückgeben.

Après usage à rapporter au point de vente.

For Safety

⚠ CAUTION

Replacing Memory Back-up Battery

This equipment uses a Poly-carbomonofluoride lithium battery to backup the memory. This battery must be replaced by service personnel when it has reached the end of its useful life; contact the Anritsu sales section or your nearest representative.

Note: The battery used in this equipment has a maximum useful life of 7 years. It should be replaced before this period has elapsed.

The life of the battery will vary depending on the length of equipment usage and the operating environment.
The following conditions may be observed if the battery has expired.

- When power to the equipment is supplied, the time display may no longer match the actual time.
- Parameter and data settings may not be retained when the power to the equipment is cut.

Use in a Residential Environment

This equipment is designed for an industrial environment.
In a residential environment, this equipment may cause radio interference in which case the user may be required to take adequate measures.

Use in Corrosive Atmospheres

Exposure to corrosive gases such as hydrogen sulfide, sulfurous acid, and hydrogen chloride will cause faults and failures.
Note that some organic solvents release corrosive gases.

Equipment Certificate

Anritsu Corporation certifies that this equipment was tested before shipment using calibrated measuring instruments with direct traceability to public testing organizations recognized by national research laboratories, including the National Institute of Advanced Industrial Science and Technology, and the National Institute of Information and Communications Technology, and was found to meet the published specifications.

Anritsu Warranty

Anritsu Corporation will repair this equipment free-of-charge if a malfunction occurs within one year after shipment due to a manufacturing fault.
However, software fixes will be made in accordance with the separate Software End-User License Agreement. Moreover, Anritsu Corporation will deem this warranty void when:

- The fault is outside the scope of the warranty conditions separately described in the operation manual.
- The fault is due to mishandling, misuse, or unauthorized modification or repair of the equipment by the customer.
- The fault is due to severe usage clearly exceeding normal usage.
- The fault is due to improper or insufficient maintenance by the customer.
- The fault is due to natural disaster, including fire, wind, flooding, earthquake, lightning strike, or volcanic ash, etc.
- The fault is due to damage caused by acts of destruction, including civil disturbance, riot, or war, etc.
- The fault is due to explosion, accident, or breakdown of any other machinery, facility, or plant, etc.
- The fault is due to use of non-specified peripheral or applied equipment or parts, or consumables, etc.
- The fault is due to use of a non-specified power supply or in a non-specified installation location.
- The fault is due to use in unusual environments[Note].
- The fault is due to activities or ingress of living organisms, such as insects, spiders, fungus, pollen, or seeds.

In addition, this warranty is valid only for the original equipment purchaser. It is not transferable if the equipment is resold.

Anritsu Corporation shall assume no liability for injury or financial loss of the customer due to the use of or a failure to be able to use this equipment.

Note:
For the purpose of this Warranty, "unusual environments" means use:

- In places of direct sunlight
- In dusty places
- In liquids, such as water, oil, or organic solvents, and medical fluids, or places where these liquids may adhere
- In salty air or in place chemically active gases (sulfur dioxide, hydrogen sulfide, chlorine, ammonia, nitrogen dioxide, or hydrogen chloride etc.) are present
- In places where high-intensity static electric charges or electromagnetic fields are present
- In places where abnormal power voltages (high or low) or instantaneous power failures occur
- In places where condensation occurs
- In the presence of lubricating oil mists
- In places at an altitude of more than 2,000 m
- In the presence of frequent vibration or mechanical shock, such as in cars, ships, or airplanes

Anritsu Corporation Contact

In the event of this equipment malfunctions, contact an Anritsu Service and Sales office. Contact information can be found on the last page of the printed version of this manual, and is available in a separate file on the PDF version.

Notes On Export Management

This product and its manuals may require an Export License/Approval by the Government of the product's country of origin for re-export from your country.

Before re-exporting the product or manuals, please contact us to confirm whether they are export-controlled items or not.

When you dispose of export-controlled items, the products/manuals need to be broken/shredded so as not to be unlawfully used for military purpose.

Caution for Transportation

This equipment uses the lithium-ion battery (100 Wh or less per battery).

When transporting this equipment by air (in a plane), follow the IATA Dangerous Goods Regulations (IATA DGR) established by the International Air Transport Association (IATA) and instructions from each airline company.

When transporting this equipment by sea (in a ship), follow the International Maritime Dangerous Goods Code (IMDG CODE) established by the International Maritime Organization (IMO).

Reuse parts

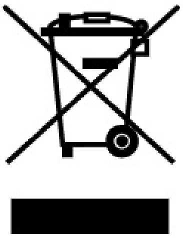
Anritsu group promotes recycling activities in order to reuse available resources and save energy. This product may use recycled parts (mechanical components) that conform to Anritsu’s quality standards.

Lifetime of Parts

The life span of certain parts used in this instrument is determined by the operating time or the power-on time. Due consideration should be given to the life spans of these parts when performing continuous operation over an extended period. These parts must be replaced at the customer's expense even if within the guaranteed period described in Warranty at the beginning of this manual.

Crossed-out Wheeled Bin Symbol

Equipment marked with the Crossed-out Wheeled Bin Symbol complies with council directive 2012/19/EU (the “WEEE Directive”) in European Union.



For Products placed on the EU market after August 13, 2005, please contact your local Anritsu representative at the end of the product's useful life to arrange disposal in accordance with your initial contract and the local law.

Software End-User License Agreement (EULA)

Please read this Software End-User License Agreement (hereafter this EULA) carefully before using (includes executing, copying, registering, etc.) this software (includes programs, databases, scenarios, etc., used to operate, set, etc., Anritsu electronic equipment). By reading this EULA and using this software, you are agreeing to be bound by the terms of its contents and Anritsu Corporation (hereafter Anritsu) hereby grants you the right to use this Software with the Anritsu-specified equipment (hereafter Equipment) for the purposes set out in this EULA.

1. Grant of License and Limitations

1. Regardless of whether this Software was purchased from or provided free-of-charge by Anritsu, you agree not to rent, lease, lend, or otherwise distribute this Software to third parties and further agree not to disassemble, recompile, reverse engineer, modify, or create derivative works of this Software.
2. You may make one copy of this Software for backup purposes only.
3. You are not permitted to reverse engineer this software.
4. This EULA allows you to install one copy of this Software on one piece of Equipment.

2. Disclaimers

To the extent not prohibited by law, in no event shall Anritsu be liable for personal injury, or any incidental, special, indirect or consequential damages whatsoever, including, without limitation, damages for loss of profits, loss of data, business interruption or any other commercial damages or losses, arising out of or related to your use or inability to use this Software.

3. Limitation of Liability

a. If a fault (bug) is discovered in this Software, preventing operation as described in the operation manual or specifications whether or not the customer uses this software as described in the manual, Anritsu shall at its own discretion, fix the bug, or exchange the software, or suggest a workaround, free-of-charge. However, notwithstanding the above, the following items shall be excluded from repair and warranty.
   i) If this Software is deemed to be used for purposes not described in the operation manual or specifications.
   ii) If this Software is used in conjunction with other non-Anritsu-approved software.
   iii) Recovery of lost or damaged data.
   iv) If this Software or the Equipment has been modified, repaired, or otherwise altered without Anritsu's prior approval.
   v) For any other reasons out of Anritsu's direct control and responsibility, such as but not limited to, natural disasters, software virus infections, etc.

b. Expenses incurred for transport, hotel, daily allowance, etc., for on-site repairs by Anritsu engineers necessitated by the above faults shall be borne by you.

c. The warranty period for faults listed in article 3a above covered by this EULA shall be either 6 months from the date of purchase of this Software or 30 days after the date of repair, whichever is longer.

4. Export Restrictions

You may not use or otherwise export or re-export directly or indirectly this Software except as authorized by Japanese and United States law. In particular, this software may not be exported or re-exported (a) into any Japanese or US embargoed countries or (b) to anyone on the Japanese or US Treasury Department's list of Specially Designated Nationals or the US Department of Commerce Denied Persons List or Entity List. By using this Software, you warrant that you are not located in any such country or on any such list. You also agree that you will not use this Software for any purposes prohibited by Japanese and US law, including, without limitation, the development, design and manufacture or production of missiles or nuclear, chemical or biological weapons of mass destruction.

5. Termination

Anritsu shall deem this EULA terminated if you violate any conditions described herein. This EULA shall also be terminated if the conditions herein cannot be continued for any good reason, such as violation of copyrights, patents, or other laws and ordinances.

6. Reparations

If Anritsu suffers any loss, financial or otherwise, due to your violation of the terms of this EULA, Anritsu shall have the right to seek proportional damages from you.

7. Responsibility after Termination

Upon termination of this EULA in accordance with item 5, you shall cease all use of this Software immediately and shall as directed by Anritsu either destroy or return this Software and any backup copies, full or partial, to Anritsu.

8. Dispute Resolution

If matters of dispute or items not covered by this EULA arise, they shall be resolved by negotiations in good faith between you and Anritsu.

9. Court of Jurisdiction

This EULA shall be interpreted in accordance with Japanese law and any disputes that cannot be resolved by negotiation described in Article 8 shall be settled by the Japanese courts.

Cautions Against Computer Virus Infection

- Copying files and data
  Only files that have been provided directly from Anritsu or generated using Anritsu equipment should be copied to the instrument.
  All other required files should be transferred by means of USB or CompactFlash media after undergoing a thorough virus check.
- Adding software
  Do not download or install software that has not been specifically recommended or licensed by Anritsu.
- Network connections
  Ensure that the network has sufficient anti-virus security protection in place.

CE Conformity Marking

Anritsu affixes the CE conformity marking on the following product(s) in accordance with the Decision 768/2008/EC to indicate that they conform to the EMC, LVD, and RoHS directive of the European Union (EU).

CE marking

1. Product Model

Model:	MT9085A	ACCESS Master Standard Dynamic Range
	MT9085B	ACCESS Master Enhanced Dynamic Range
	MT9085C	ACCESS Master High Performance Dynamic Range

2. Applied Directive

EMC:	Directive 2014/30/EU
LVD:	Directive 2014/35/EU
RoHS:	Directive 2011/65/EU

3. Applied Standards

- EMC: Emission: EN 61326-1: 2013 (Class A)
  Immunity: EN 61326-1: 2013 (Table 2)

	Performance Criteria*
IEC 61000-4-2 (ESD)	B
IEC 61000-4-3 (EMF)	A
IEC 61000-4-4 (Burst)	B
IEC 61000-4-5 (Surge)	B
IEC 61000-4-6 (CRF)	A
IEC 61000-4-8 (RPFMF)	A
IEC 61000-4-11 (V dip/short)	B, C

*: Performance Criteria

A: The equipment shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended.
The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

B: The equipment shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the equipment is used as intended.
The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

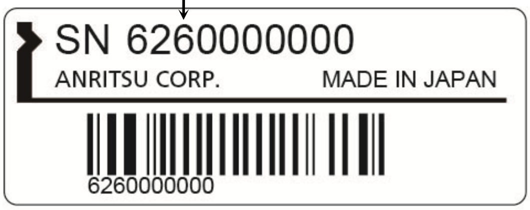
C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

Harmonic current emissions:
EN 61000-3-2: 2014 (Class A equipment)
No limits apply to this equipment with an active input power under 75 W.

- LVD: EN 61010-1: 2010 (Pollution Degree 2)
- RoHS: EN 50581: 2012 (Category 9)

If the third digit of the serial number is "7", the product complies with Directive 2011/65/EU as amended by (EU) 2015/863.
(Pb,Cd,Cr6+,Hg,PBB,PBDE,DEHP,BBP,DBP,DIBP)
If the third digit of the serial number is "6", the product complies with Directive 2011/65/EU.
(Pb,Cd,Cr6+,Hg,PBB,PBDE)

Third digit



Serial number

4. Authorized representative

Name:	Anritsu GmbH
Address, city:	Nemetschek Haus, Konrad-Zuse-Platz 1 81829 München,
Country:	Germany
Name:	ANRITSU EMEA Ltd.
Address, city:	200 Capability Green, Luton Bedfordshire, LU1 3LU
Country:	United Kingdom

RCM Conformity Marking

Anritsu affixes the RCM mark on the following product(s) in accordance with the regulation to indicate that they conform to the EMC framework of Australia/New Zealand.

RCM marking

1. Product Model

Model:	MT9085A	ACCESS Master Standard Dynamic Range
	MT9085B	ACCESS Master Enhanced Dynamic Range
	MT9085C	ACCESS Master High Performance Dynamic Range

2. Applied Standards

EMC:	Emission:	EN 61326-1: 2013 (Class A equipment)

About This Manual

The operation manuals for the MT9085 Series ACCESS Master consist of separate documents for the main unit, remote control, and quick guide. This document explains how to operate the MT9085 Series ACCESS Master (hereinafter, ACCESS Master).

Table of Contents

Chapter 6 OTDR (Construction)............. 6-1

Chapter 7 OTDR Measurement............... 7-1

Chapter 8 Loss Test Set.......................... 8-1

Chapter 9 Power Meter and Optical Light Source 9-1

Chapter 1 Quick Start

This chapter explains remote control of the ACCESS Master.

1.1 Introduction

The ACCESS Master reduces the measurement time to install or maintain optical fiber by high performance hardware and easy-to-use software.

Figure 1.1-1 ACCESS Master

1.1.1 Function

The ACCESS Master provides functions that are necessary to diagnose optical fiber failures. The ACCESS Master includes the optical power meter (OPM) and optical light source (OLS) functions for optical measurement tests in addition to the optical time domain reflectometer (OTDR) (Standard) function. The visual fault locator (VFL) can be installed as an option. The VFL visually displays the locations of bending or folded parts of the fiber in dead band of optical pulse tests.

To remotely control the ACCESS Master, connect a USB Wi-Fi dongle or a USB-Ethernet converte.
To load measurement result files to Windows PCs, Android and other devices, via Bluetooth, connect a USB Bluetooth dongle to the ACCESS Master.

1.1.2 Configuration

The following table lists the standard configuration of the ACCESS Master.

Table 1.1.2-1 Standard Configuration

Item	Model or Ordering No.	Name	Q'ty
Main frame	MT9085A	ACCESS Master Standard Dynamic Range	1
	MT9085B	ACCESS Master Enhanced Dynamic Range	
	MT9085C	ACCESS Master High Performance Dynamic Range	
Accessories		Power Cord	1
	Z0921A	Battery Pack	1
	Z1625A	AC Adapter	1
	Z1991A	ACCESS Master Operation Manual CD	1
	W3974AE	MT9085 Series Quick Guide	1
		Replaceable Connector	*

*: The quantity varies depending on the option configuration.

1.1.3 Options

Option name format

The option number is indicated by three digits.

MT9085A- x x x

Number indicating function.

Anritsu management code.

0: Installed at time of shipping

1: Retro-fitted option.
Must be returned to Anritsu (Japan) when installing.

2: Retro-fitted option.
Must be returned to an Anritsu Service and Sales office when installing.

3: User-installable option.

The numbers of the options added are indicated on the label on the back panel.

Table 1.1.3-1 Wavelength Options

Main Frame	Option	Name
MT9085A	053	SMF 1.31/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR
	063	MMF 0.85/1.3μm & SMF 1.31/1.55μm OTDR
MT9085B	053	SMF 1.31/1.55μm OTDR
	055	SMF 1.31/1.55/1.65μm OTDR
	056	SMF 1.31/1.49/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR
	058	SMF 1.31/1.49/1.55/1.625μm OTDR
	063	MMF 0.85/1.3μm & SMF 1.31/1.55μm OTDR
MT9085C	053	SMF 1.31/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR

Table 1.1.3-2 Optical Connector Options*1, *2

Main Frame	Option	Name
MT9085A MT9085B MT9085C	025	FC-APC Connector key width 2.0mm
	026	SC-APC Connector
	037	FC Connector
	038	ST Connector
	039	DIN 47256 Connector
	040	SC Connector

*1: One of them must be selected.

*2: Two identical connectors are installed for a wavelength option with two ports. However, if Option 025 or 026 is selected with Option 063, the same connector as Option 037 or 040 is installed to the MMF port.

Table 1.1.3-3 Additional Options

Main Frame	Option	Name
MT9085A MT9085B MT9085C	002	Visual Fault Locator
	004	SMF Optical Power Meter
	005	SMF High Power Optical Power Meter
	007	SMF/MMF Optical Power Meter
	010	Protector*
	110	Protector retrofit*

*: Including a protective cover and shoulder belt.

1.1.4 Optional Accessories

Table 1.1.4-1 Optional Accessories

Model	Name
B0582A	Soft carrying case
B0583A	Hard transit case
B0549	Hard transit case
G0306B	Video Inspection Probe
J0057	Optical Adapter FC Type
J0617B	Replaceable optical connector(FC-PC)
J0618D	Replaceable optical connector(ST)
J0618E	Replaceable optical connector(DIN)
J0618F	Replaceable optical connector(HMS-10/A)
J0619B	Replaceable optical connector(SC)
J0635□	Optical fiber cable for SM fiber with FC-PC connectors on both ends Specify A or B or C to select the length of optical fiber cable. (SM, FC-PC connectors on both ends)(A: 1 m, B: 2 m, C: 3 m)
J1295	Car Plug Cord
J1530A	SC Plug In Converter (UPC(P)-APC(J))
J1531A	SC Plug In Converter (APC(P)-UPC(J))
J1532A	FC Plug In Converter (UPC(P)-APC(J))
J1533A	FC Plug In Converter (APC(P)-UPC(J))
J1534A	LC-SC Plug-in Converter (for SM, SC(P)-LC(J))
J1535A	LC-SC Plug-in Converter (for MM, SC(P)-LC(J))
Z0914A	Ferrule cleaner
Z0915A	Replacement reel for ferrule cleaner (6 pcs)
Z0921A	Battery Pack
Z1625A	AC adapter (100 to 240Vac, 50/60Hz, 12Vdc, 5A, with ferrite core)
Z1632A	Battery Charger

1.2 Power Up the Unit

The ACCESS Master can be powered externally by using the AC adapter (refer to 2.3.1 "AC Adaptor" for details), or internally by using the rechargeable lithium-ion battery pack (refer to 2.2.1 "Installing a Battery Pack" for details).

Note:

Use the AC adapter supplied by Anritsu with the ACCESS Master. Use of another charger/adapter may result in damage to the ACCESS Master and/or the battery pack.

1.2.1 Start Up Sequence

1. Press Power key. The unit performs a self-test during which the Anritsu splash screen appears briefly.
2. When the self-test is complete, the unit proceeds to the Top Menu screen.
3. Touch the desired test application button.

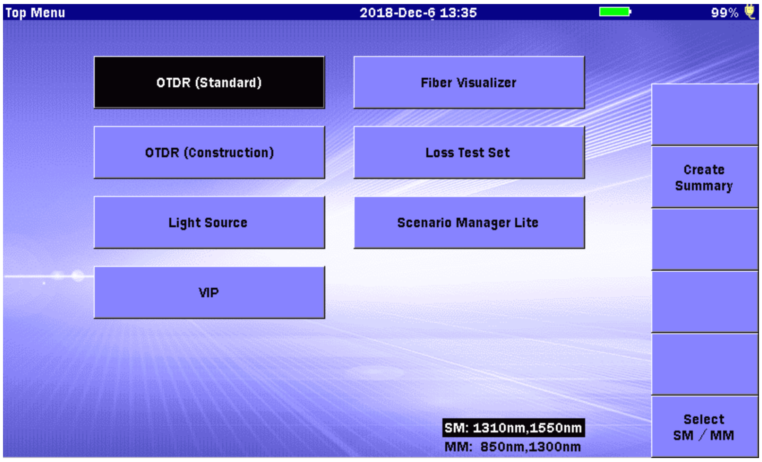


Figure 1.2.1-1 Top Menu Screen

Note:

The selections available on the Top Menu will vary with the option configuration of the given ACCESS Master.

1.2.2 OTDR (Standard)

The Optical Time Domain Reflectometer (hereafter, OTDR) function provides the capability for measuring connection loss, fiber loss, and distance of an optical fiber. You can locate defects and faults, and determine the amount of signal loss at any point in an optical fiber. The Analysis function automatically detects event positions such as splice points with loss exceeding the preset threshold or return loss, and lists the data in an event table.

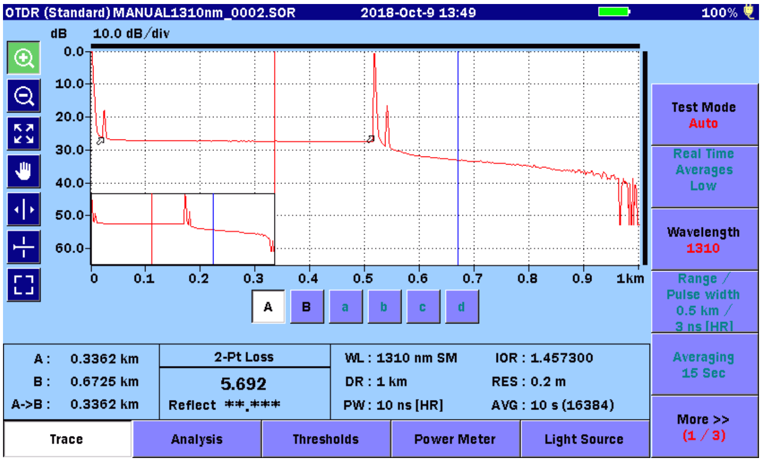


Figure 1.2.2-1 OTDR (Standard) Trace Screen

For further details on the OTDR (Standard), refer to Chapter 4 “OTDR (Standard)”.

Remote-controlled measurement is possible in the OTDR (Standard) mode.
For details of remote control operations, refer to the *MT9085 Series ACCESS Master SCPI Remote Control Operation Manual*.

1.2.3 Fiber Visualizer

Fiber Visualizer provides an easy method to determine the end/fault location of a fiber.

Press the Start to start a test. The test proceeds through the following steps:

- Performs a connection check
- Runs the test
- Reports the test results

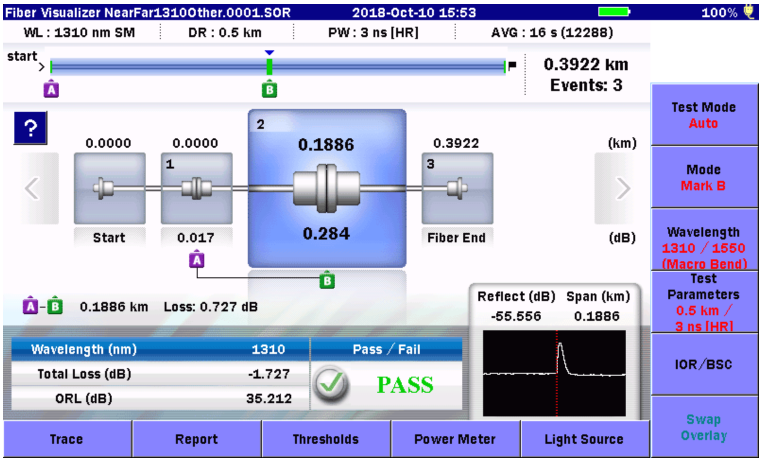


Figure 1.2.3-1 Fiber Visualizer Screen

For further details on the Fiber Visualizer, refer to Chapter 5 "Fiber Visualizer".

1.2.4 OTDR (Construction)

OTDR (Construction) simplifies and automates the testing required when installing fiber. OTDR (Construction) is used when many fibers in a cable need to be tested and documented before deployment.

Depending on the setup selections made for Construction mode testing, you can:

- Step through the test process and save the results without reviewing the trace data.

Or

- Setup the application so that it displays a Summary screen allowing review of the test data before proceeding to the next test.

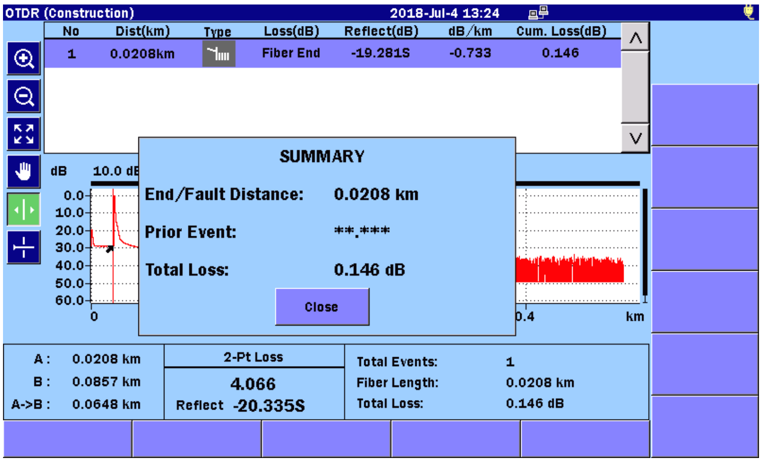


Figure 1.2.4-1 OTDR (Construction) Analysis Screen

For further details on the OTDR (Construction), refer to Chapter 6 "OTDR (Construction)".

1.2.5 Loss Test Set

Loss Test Set mode is made available by equipping an ACCESS Master with one of the optional Power Meters (Option 004, 005, or 007). Then combining a power meter and a light source allows fiber loss measurement.

The optical power measurement range varies depending on the specific optional power meter with which the ACCESS Master is equipped

Table 1.2.5-1 Optical Power Measurement Range

Option	Measurement Range
004	–50 to +23 dBm (CW light, 1550 nm) –53 to +20 dBm (Modulated light, 1550 nm)
005	–43 to +30 dBm (CW light, 1550 nm) –46 to +27 dBm (Modulated light, 1550 nm)
007	–67 to +6 dBm (CW light, 1310 nm) –70 to +3 dBm (Modulated light, 1310 nm) –67 to +6 dBm (CW light, 850 nm) –70 to +3 dBm (Modulated light, 850 nm)

An ACCESS Master without Power Meter options does not display optical loss measurement buttons on the top menu screen.

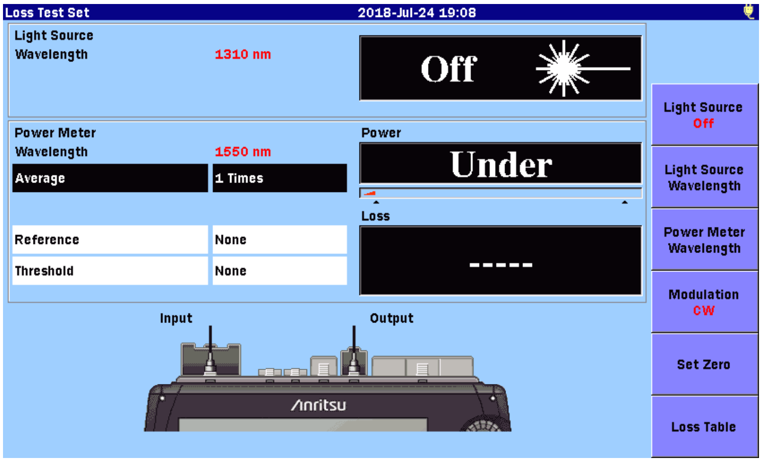


Figure 1.2.5-1 Loss Test Set Screen

For further details on the Loss Test Set, refer to Chapter 8 "Loss Test Set".

1.2.6 Power Meter

The Power Meter function provides the capability for measuring optical power levels. By measuring the power level on the fiber under test, you can easily decide whether the fault point is on the fiber or on the network.

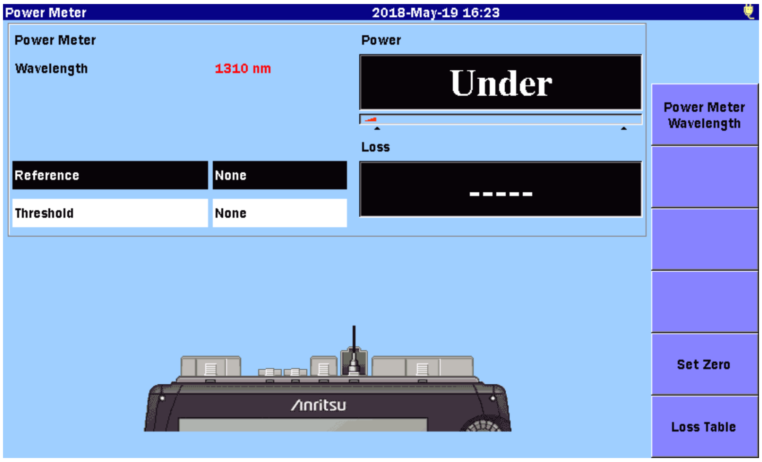


Figure 1.2.6-1 Power Meter Screen

For further details on the Power Meter, refer to Chapter 9 "Power Meter and Optical Light Source".

1.2.7 Light Source

The Light Source function provides a light source for use with fiber identification equipment (fiber identifiers). The light source can be set to output at the following modulation rates: CW (continuous wave) 270 Hz, 1 kHz, or 2 kHz.

Figure 1.2.7-1 Light Source

For further details on the Light Source refer to 9.6 “Light Source”.

1.2.8 VFL

The Visual Fault Locate (hereafter, VFL) option provides a visual method of fiber and fault identification. The VFL works by means of a red laser diode which is visible to the human eye. Bends and/or breaks in the fiber under test are identified by the visible red glow at the event. This provides a method of locating faults within the short-distance zone (dead zone) that the OTDR cannot inspect, as well as a means of fiber identification.

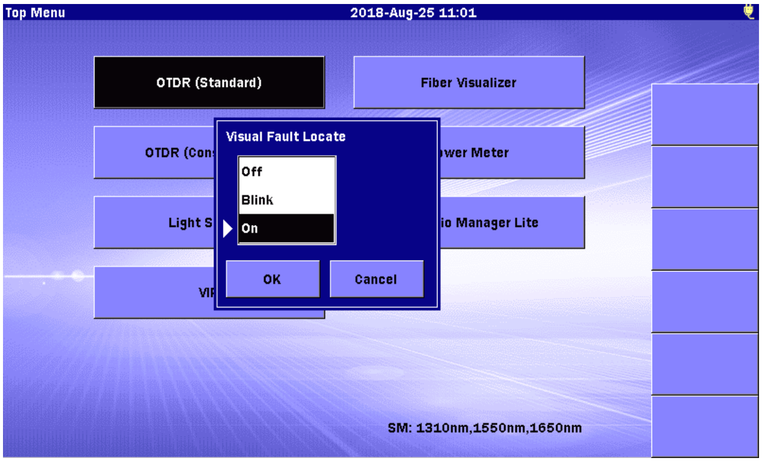


Figure 1.2.8-1 Visual Fault Locate Dialog Box

For further details on the VFL, refer to 9.7 “VFL”.

1.2.9 VIP

The Video Inspection Probe (VIP) is used to inspect fiber optic terminations. Replacing ferule adapters enables inspecting fiber optic terminations inside the receptacle, which eliminates the need to disassemble hardware devices prior to inspection.
The VIP option consists of the following:

- Video Inspection Probe (VIP)
- Ferule adapter
- Software CD

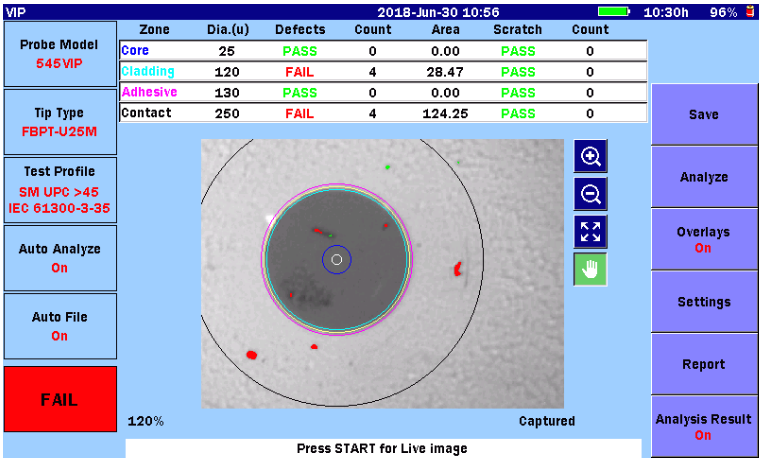


Figure 1.2.9-1 VIP Screen

Images captured with the VIP can be saved as PNG or VIPI files which can be recalled for viewing on the ACCESS Master. Also captured images can be analyzed on ACCESS Master or using the VIP Analysis software on a PC.

Note:

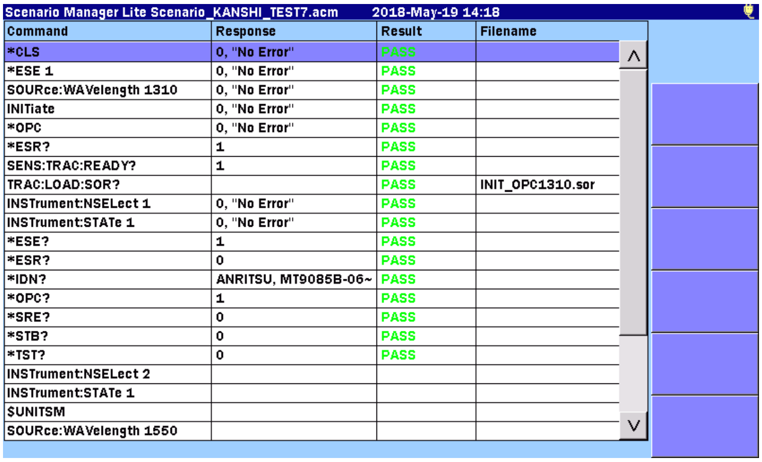
The Software CD contains the VIP Analysis software which is for PC use only. See the software's help set for details on its use.

For further details on the VIP, refer to Chapter 10 “VIP”.

1.2.10 Scenario Manager Lite

The Scenario Manager Lite is an application to execute previously defined programs.

A scenario file can be edited by the text editor (such as Memo pad of Windows). It can be also edited by the MX100003A MT1000A/MT1100A Scenario Edit Environment Kit (version 2.0.0.1or later).


Scenario Manager Lite Scenario_KANSHI_TEST7.acm 2018-May-19 14:18

Command	Response	Result	Filename
*CLS	0, "No Error"	PASS	
*ESE 1	0, "No Error"	PASS	
SOURce:WAVelength 1310	0, "No Error"	PASS	
INITiate	0, "No Error"	PASS	
*OPC	0, "No Error"	PASS	
*ESR?	1	PASS	
SENS:TRAC:READY?	1	PASS	
TRAC:LOAD:SOR?		PASS	INIT_OPC1310.sor
INSTrument:NSELect 1	0, "No Error"	PASS	
INSTrument:STATe 1	0, "No Error"	PASS	
*ESE?	1	PASS	
*ESR?	0	PASS	
*IDN?	ANRITSU, MT9085B-06~	PASS	
*OPC?	1	PASS	
*SRE?	0	PASS	
*STB?	0	PASS	
*TST?	0	PASS	
INSTrument:NSELect 2			
INSTrument:STATe 1			
$UNITSM			
SOURce:WAVelength 1550			

Figure 1.2.10-1 Example of Scenario Execution

By executing a scenario in which test procedure is written, even users who are not familiar with the devices can avoid operation mistakes and perform tests easily.

For details of the Scenario Manager Lite, refer to Chapter 13 “Scenario Manager Lite”.

Chapter 2 Before Use

This chapter explains the panels of the ACCESS Master and the preparations before use.

2.1 Front Panel

The front panel contains the touch panel, power key, and ACCESS Master control keys.

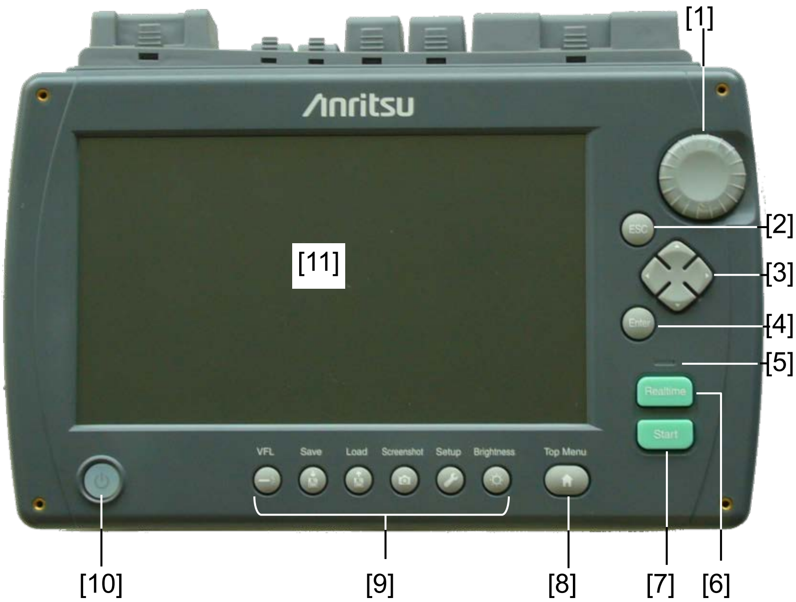


Figure 2.1-1 Front Panel

[1] Rotary knob

Turning the rotary knob has the same effect as pressing ∧ ∨ or < >. (The effect depends on the displayed screen.)
Pressing the rotary knob has the same effect as Enter.

[2] ESC key

This key is used for the followings:
- Close a currently open setup menu.
- Cancel the input.

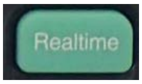
[3] Arrow key set

The arrow key set consists of the up, down, left, and right keys. This document uses ∧ ∨ as the up and down keys and < > as the left and right keys.

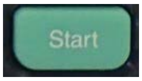
[4] Enter key

This key is used for the followings:
- Open the setting screen.
- Save the input.

[5] LED indicator
This LED blinks when the ACCESS Master is emitting laser light.



[6] [Realtime] key
Starts a Real Time measurement.



[7] [Start] key
Starts an Average measurement.

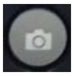
[8] Top Menu key
Opens the Top Menu (Figure 3.1.3-1). For details, refer to 3.1.3 “Top Menu”.

[9] Shortcut keys
Some keys may not work depending on the displayed screen.

VFL: This key is used to operate the Visual Fault Locator, and available when the Visual Fault Locate (VFL) option is installed. Refer to 9.7 “VFL”.

Save: Opens the Save screen.
Refer to 3.5.7 “Saving File”.

Load: Opens the Load screen.
Refer to 3.5.1 “Loading File”.



Screenshot: Saves the screenshot to a file.
Refer to 3.4 “Saving a Screen Image to a File”.

Setup: Opens the General screen.
Refer to 3.3 “System Setups”.

Brightness: Back light
Adjusts the brightness of the screen backlight. For details, refer to 3.2 “Adjusting the Backlight”.

[10] Power key
Powers on and off the ACCESS Master and indicates the ACCESS Master states by the color and status of its lamp.

 Off: Power off

 Green: Power on (Active)

 Orange flash: Charging

 Orange: Standby

[11] Touch panel

2.2 Back Panel

The back panel of the ACCESS Master contains the tilt bail, battery compartment, and compliance and warning labels. The model name and serial number labels are also located on the back panel.

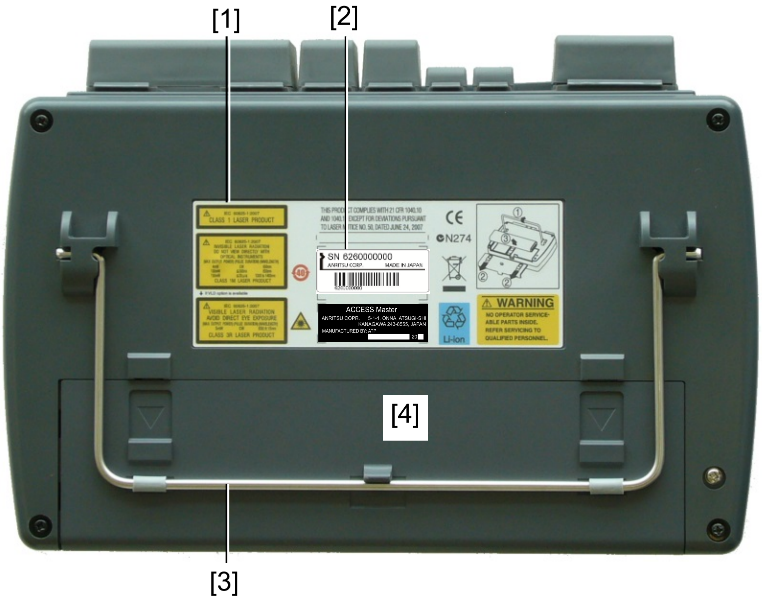


Figure 2.2-1 Back Panel

[1]	Compliance and Warning labels	[3]	Tilt bail
[2]	Model name and Serial number labels	[4]	Battery compartment

2.2.1 Installing a Battery Pack

This section explains how to install the battery pack to the ACCESS Master and remove it.

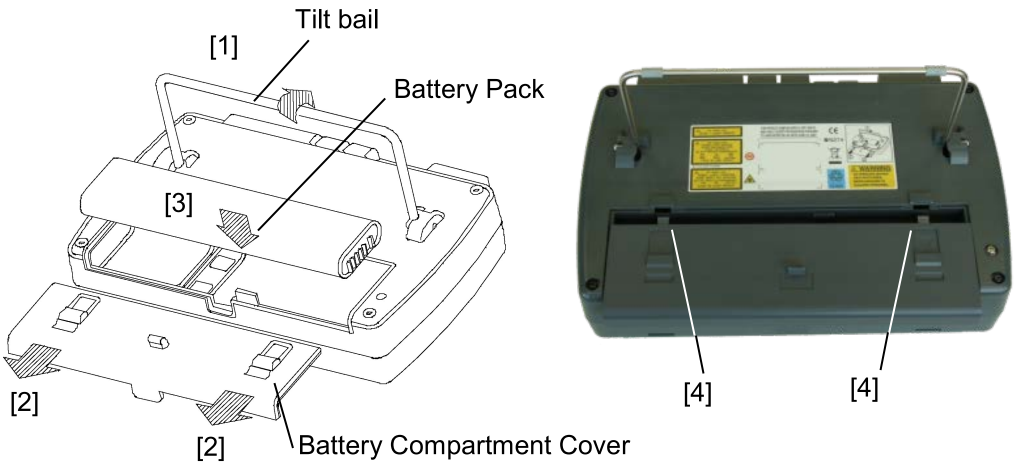


Figure 2.2.1-1 Installing the Battery Pack

<Installing the battery pack>

[1] Lift the tilt bail.

[2] Detach the battery compartment cover.

[3] Insert the battery pack into the ACCESS Master with the indicator facing out.

[4] Reattach the battery compartment cover. Fit the tabs into the slots shown in Figure 2.2.1-1 (picture), and then insert the battery compartment cover.

⚠ CAUTION

Securely attach and close the battery compartment cover. Otherwise, the battery pack may fall out, resulting in injury to the user and/or damage to the battery pack.

<Removing the battery pack>

1. Detach the battery compartment cover.
2. Remove the battery pack.

CAUTION

Always power down the ACCESS Master before removing the battery pack. Failure to do so can cause damage to the battery pack and ACCESS Master.

2.2.2 Important Information about the Battery Pack

- If you use a battery pack that has not been charged a sufficient number of times, the charging rate may not reach 100% even after completion of charging.
- The battery pack must not be charged for more than 24 hours. Overcharging the battery pack may shorten its life. (The AC charger/adapter must not be left connected for a long time with the battery pack plugged into the ACCESS Master.)
- The battery pack is a consumable item, although it can be charged/discharged about 300 to 500 times. If the actual available time shortens suddenly even after the battery pack has been charged, the battery pack's life may have expired. Replace it with a new one in this case.
- It is advisable to discharge the battery pack on occasion in order to enhance its performance and extend its life.
- If the battery pack is stored at an excessively high (40°C or higher) or low (0°C or lower) temperature, its performance and life will degrade. When the ambient temperature rises, battery pack discharge speeds up.
- A fully charged battery pack will be completely discharged in several months if left as is.
- If the battery pack has been discharged fully, its smart memory capabilities will be lost. In this case, the remaining battery indication and other information may be displayed inaccurately, or the pack may be unable to be charged normally.
- If not using for a long period of time, remove the battery pack from the ACCESS Master.

CAUTION

- Charge the battery pack only with the AC charger/adapter furnished by Anritsu for the ACCESS Master. If using a different AC charger/adapter, the battery pack may malfunction or cause a fire.
- Do not short-circuit the terminals of the battery pack. If you do so, the battery pack may malfunction or cause a fire.
- Do not drop or attempt to disassemble the battery pack. If you do so, the battery pack may malfunction or cause a fire.
- Do not use the battery pack for other than the intended purpose. If you do so, the battery pack may malfunction or cause a fire.
- Be sure to recycle or dispose of the battery pack correctly. Do not discard the battery pack in the garbage or burn it. If you do so, fire or explosion may occur.

2.2.3 Checking the Remaining Battery

The remaining battery can be checked from either the indicator on the battery pack or by checking the on-screen Battery Status area on the ACCESS Master.

Checking the LED indicator on the battery pack

Press the TEST button shown in Figure 2.2.3-1, and you can check the remaining battery by the number of illuminated LEDs.

Battery pack

Charge indicator

Figure 2.2.3-1 Remaining Battery

Table 2.2.3-1 LED State and Remaining Battery

LED state	Remaining battery (guide)
	0 to 5%
	5 to 25% (The LED flashes at 5 to 10%)
	25 to 50%
	50 to 75%
	75 to 100%

Checking the on-screen battery status area

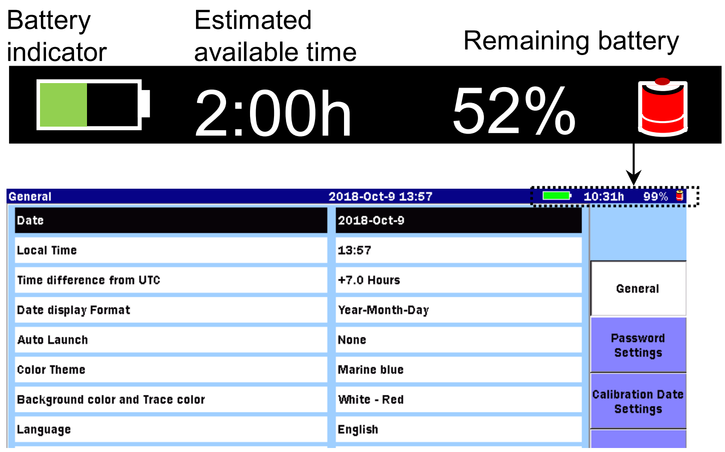


Figure 2.2.3-2 Checking the Remaining Battery

You can also check the remaining battery by viewing the battery indicator located in the upper right of the screen. If the entire battery indicator is colored green, the battery has been fully charged (100%). As the battery is discharged, the green field lessens.

Remaining battery

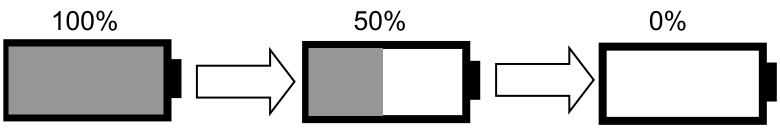


Figure 2.2.3-3 Battery Indicator Display Examples

The remaining battery is expressed numerically to the right of the battery indicator. This field displays the remaining battery in percent (%) and the estimated available time (h) forecast from the average power consumption over the previous 1 minute period. It is recommended to charge the battery when the remaining battery falls below 30%.

Notes:

- Battery indicator:
  The remaining battery and estimated available time values cannot be guaranteed. The estimated available time may differ from the actual available time, depending on the battery pack or the condition of the

ACCESS Master. Remember that these values should be considered as guidelines only. Even if the remaining battery is 1% or more, the ACCESS Master may power off.

- When the remaining battery falls below 10%:
  the battery indicator flashes.
  If you attempt to perform the following three operations in this state, the following message appears: “Battery is running low. Please connect the AC adapter.”
  - Recovery of internal memory
  - Format of internal memory
  - Update of firmware

  In this case, use the AC adapter according to the message. Charging of the battery pack starts when the AC adapter is plugged in. Charging takes longer time if the ACCESS Master remains powered on. Charging ends in about 6 hours with the ACCESS Master powered off.

- When the remaining battery falls below 3%:
  the warning buzzer sounds and the following message appears: “Battery running low. Please connect the AC adapter.”

  Touching the screen or pressing any key causes the buzzer to stop. To close the message, touch **OK** or press [Enter] or [ESC]. Also, if multiple files are being copied or deleted, the processing is interrupted halfway.

- When the remaining battery falls below 1%:
  the following message appears: “Battery is empty.”
  Then, the ACCESS Master automatically powers off. In this case, in-process measurement is canceled.

- When a battery pack temperature failure warning occurs:
  The battery pack provides an abnormal temperature detection function. If an abnormal temperature is detected when the battery pack is in use or charging, the following message appears:

  When battery charging was interrupted:
  “Battery charge was terminated since the temperature

exceeded the limit (0 to 40 °C)."
When the above message is displayed, the charging is interrupted. Charging will resume automatically when the battery pack temperature returns to the normal temperature.

When the battery pack is in use and not charging:
"Battery temperature exceeded the discharging temperature limit. The instrument will automatically turn off after a minute."

2.3 Top Panel

The top panel of the ACCESS Master contains the measurement ports to connect optical fibers and the USB ports to connect peripherals. On the top panel, the DC power connector and External Power and Battery Charging indicators are also located.

Figure 2.3-1 shows an example of a typical top panel.

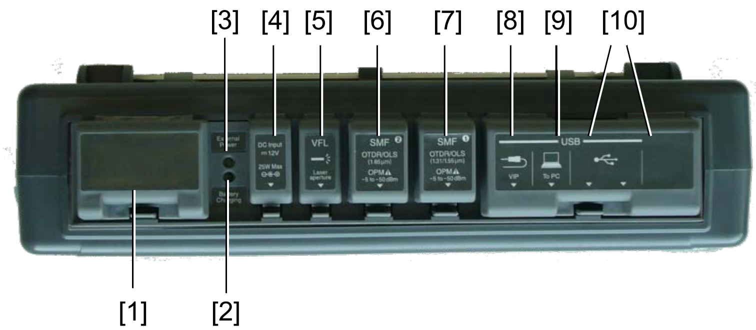


Figure 2.3-1 Top Panel

Table 2.3-1 Explanation of Top Panel

No.	Label	Explanation
[1]	Opt *1 OPM	Optical Power Meter (option)
[2]	Battery Charging	Battery Charging indicator
[3]	External Power	External Power indicator
[4]	DC Input	External power - DC Power Connection
[5]	VFL	VFL port (option)
[6]	OTDR/OLS ②	Measurement port *2
[7]	OTDR/OLS ①	Measurement port 1
[8]	USB VIP	USB port (for VIP)
[9]	USB To PC	USB port (for PC)
[10]	USB	USB port (General)

*1: Option number is printed here.

*2: Option 055 and 063 only

2.3.1 AC Adaptor

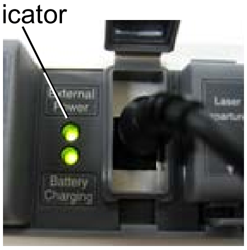
<Charging the battery pack>

1. Power off the ACCESS Master.

2. Attach the jack from the AC adapter to the DC input located on the top panel of the ACCESS Master.

3. Insert the plug from the AC line cord into an AC outlet; high-speed changing starts. The External Power indicator illuminates.
   The Battery Charging indicator illuminates green while charging.

External Power indicator



4. Leave the AC adapter connected until the battery is fully charged. Charging ends in about 6 hours and the Battery Charging lamp goes off. The battery is, however charged 90% or more after 5 hours.

5. Disconnect the AC adapter from the ACCESS Master and power outlet.

Notes on charging with the AC adapter/charger

- To charge the battery pack fully, keep the ACCESS Master at an ambient temperature of 5 to 30°C and keep the power off during the charging process. Although the battery pack can even be charged leaving powered on, it may not be charged fully. Also when charging is attempted at an ambient temperature higher than the specified value, it may stop before the pack is fully charged. This is because the temperature in the battery pack may rise above the upper limit during high-speed charging.
- If the battery pack has been over-discharged, high-speed charging may not start until trickle charging has occurred for several hours. If the Battery Charging lamp does not light up

even if you connect the AC adapter, leave it as is for several hours and remove the AC adapter once before reconnecting it.

- The charging rate may not reach 100% even if the battery pack is fully charged. However, the battery is charged completely if the charging rate reaches 90%.

CAUTION

The battery pack must not be charged for more than 24 hours. Over-charging the battery pack may shorten its life.

2.4 Connecting Fiber to a Measurement Port

Measurement Ports

On the ACCESS Master, open the connector cover(s) of the measurement port(s), and then connect the optical fiber(s) to be measured. The measurement port to which a fiber is connected depends on the test application and the wavelength to be measured.

Table 2.4-1 ACCESS Master Models and Measurement Ports

Model	Measurement Port		
	OTDR/OPM/OLS		VFL Option
	Port 1	Port 2	Port 3
MT9085A-053	1.31/1.55 μm	–	0.65 μm
MT9085A-057	1.31/1.55/1.625 μm	–	
MT9085A-063	1.31/1.55 μm	0.85/1.3 μm*	
MT9085B-053	1.31/1.55 μm	–	
MT9085B-055	1.31/1.55 μm	1.65 μm	
MT9085B-056	1.31/1.49/1.55 μm	–	
MT9085B-057	1.31/1.55/1.625 μm	–	
MT9085B-058	1.31/1.49/1.55/1.625 μm	–	
MT9085B-063	1.31/1.55 μm	0.85/1.3 μm*	
MT9085C-053	1.31/1.55 μm	–	
MT9085C-057	1.31/1.55/1.625 μm	–	

*: No Optical Power Meter function provided.

2

Before Use

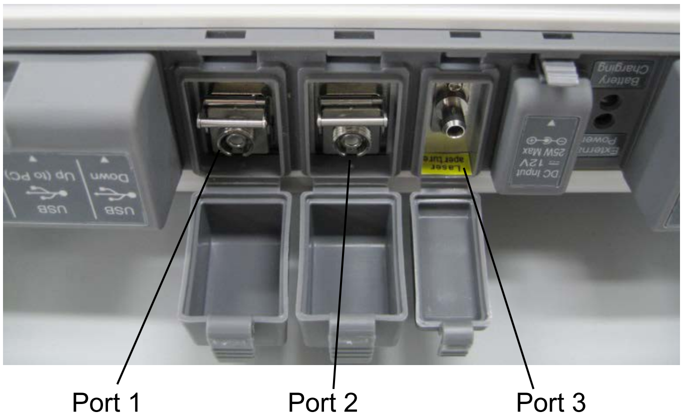


Figure 2.4-1 Connecting the Optical Fibers

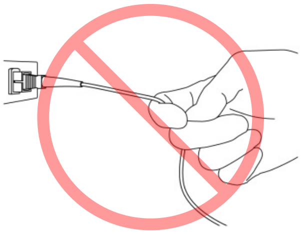
Make sure to clean the connector ferrule end surface before connecting the optical fiber.

For how to clean the connector ferrule end surface, refer to 15.1, “Optical Connector/Optical Adapter Cleaning”.

2.5 Cautions on Handling Optical Fiber Cables

Optical fiber cables may degrade in performance or be damaged if handled improperly.

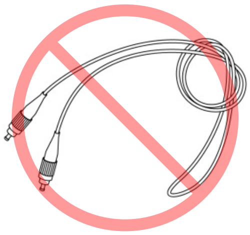
Note the following points when handling them.

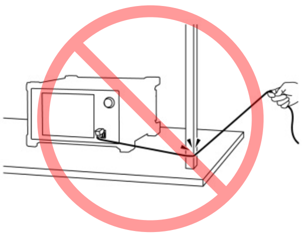


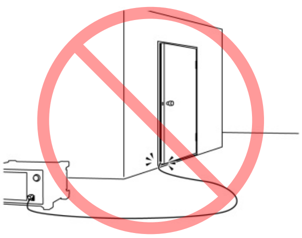
⚠ CAUTION

Do not pull the cable when removing the connector.

Doing so may break the optical fiber inside the cable, or remove the cable sheath from the optical connector.







⚠ CAUTION

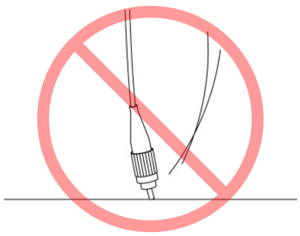
Do not excessively bend, fold, or pinch an optical fiber cable.

Doing so may break the optical fiber inside the cable. Keep the bend radius of an optical fiber cable at 30 mm or more. If the radius is less, optical fiber cable loss will increase.

⚠ CAUTION

Do not excessively pull on or twist an optical fiber cable.

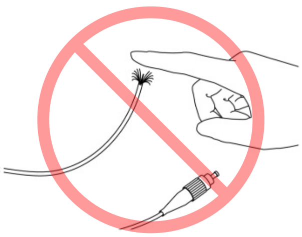
Also, do not hang anything by using a cable. Doing so may break the optical fiber inside the cable.



⚠ CAUTION

Be careful not to hit the end of an optical connector against anything hard such as the floor or a desk by dropping the optical fiber cable.

Doing so may damage the connector end and increase connection loss.



⚠ WARNING

Do not touch the end of a broken optical fiber cable.

The broken optical fiber may pierce the skin, causing injury.

⚠ CAUTION

Do not disassemble optical connectors.

Doing so may cause part to break or the performance to degrade.

2.6 Changing the Optical Adapter

2.6.1 Measurement Ports and Optical Power Meter Option 004

To change the optical connector, raise the lever to unlatch, then pull out the optical connector.

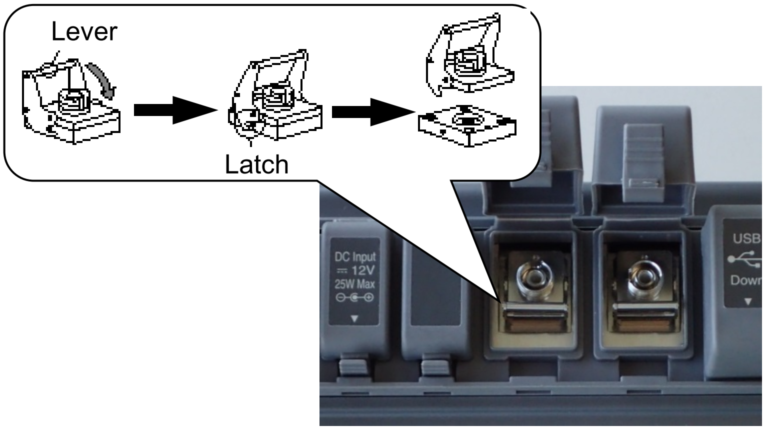


Figure 2.6.1-1 Replacable Connector

The connector types are shown below for reference.

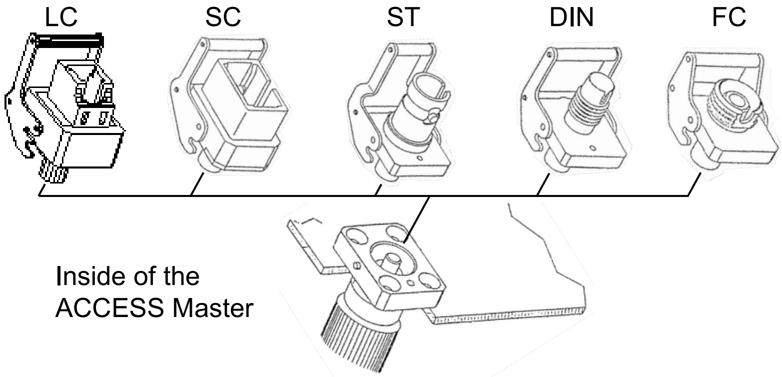


Figure 2.6.1-2 Connector Types

⚠ WARNING

Never look directly into the cable connectors on the ACCESS Master or into the end face of the optical fiber cable connected to the ACCESS Master. Exposure to laser radiation can cause damage to your eyes.

⚠ CAUTION

Take care not to scratch the optical connectors or their mating surfaces when replacing the optical connectors.

2.6.2 Optical Power Meter Option 005 and 007

To replace the optical connectors, rotate the connector adaptor counterclockwise and detach.

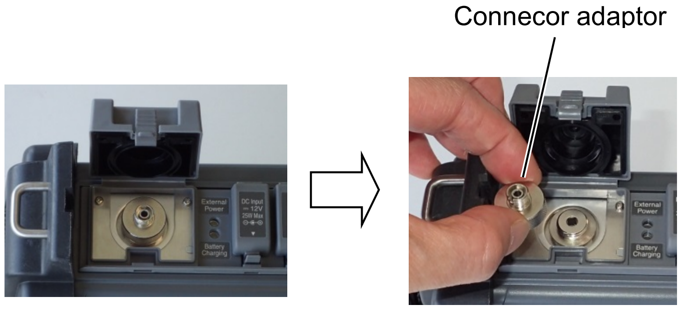


Figure 2.6.2-1 Optical Connector Part

The connector types are shown below for reference.

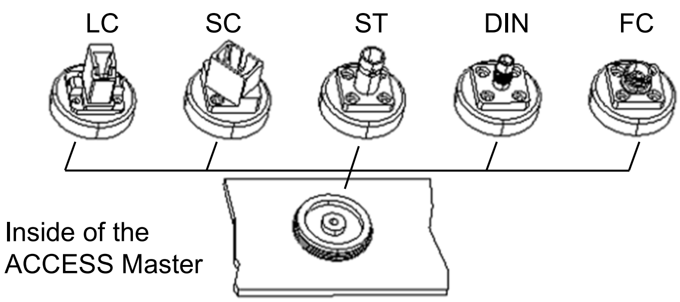


Figure 2.6.2-2 Connector Types

⚠ CAUTION

Take care not to scratch the optical connector or its mating surface when replacing the optical connector.

2.7 Connecting Peripheral Devices

The standard configuration of the ACCESS Master includes four USB ports, which allows a USB memory stick, Ethernet converter, and VIP to be connected.

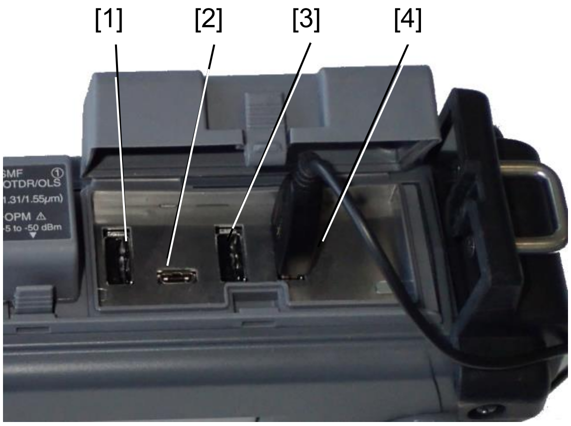


Figure 2.7-1 USB Ports

[1] USB port (VIP)

[2] USB port (PC)

[3] USB port (General)

[4] USB port (General)

Note:

A USB hub cannot be used

2.7.1 USB Port (PC)

By connecting the USB To PC port of the ACCESS Master to a PC with a USB cable, you can access the internal memory of the ACCESS Master directly from the PC. While the PC and the ACCESS Master are connected to with each other, the ACCESS Master cannot access the internal memory.
This port conforms to the USB 1.1 standard.

⚠ CAUTION

Before disconnecting the USB cable between the ACCESS Master and the PC, be sure to prepare the computer so that the hardware can be removed. Otherwise, the internal memory may be damaged.

2.7.2 USB Port (General)

This port is used to connect a USB memory stick.
This port conforms to the USB 1.1 and USB 2.0 standards.

USB memory stick

Use a USB memory stick conforming to the USB 1.1 or USB 2.0 standard. Note that not all commercially available USB memory sticks always work with this port due to compatibility issues. USB memory sticks with security measures such as encryption do not work with this port.

⚠ CAUTION

A mark during access is displayed on screen when recalling, saving, copying, or deleting folders and/or files. Do not remove USB memory stick while accessing it. USB memory stick or files may be damaged.

USB keyboard

Use a USB memory keyboard conforming to the USB 1.1 or USB 2.0 standard. Note that not all commercially available USB keyboards always work with this port due to compatibility issues.

Table 2.7.2-1 Mapping Between Panel Keys and USB Keyboard Keys

Front panel keys	USB keyboard keys
Enter	Enter
ESC	Esc
Arrow keys	Arrow keys
Start	Space
Realtime	F7
Top Menu	Home

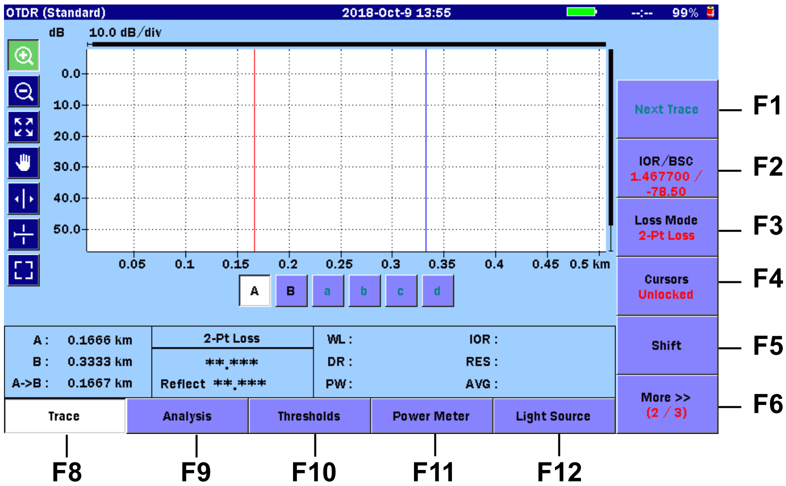


Figure 2.7.2-1 Mapping Between Softkeys and USB Keyboard Keys

USB Ethernet Converter
USB Wi-Fi Dongle
USB Bluetooth Dongle

Note:

Due to compatibility issues, not all commercially available USB converters, USB Wi-Fi dongles, and USB Bluetooth dongles always work with this port.

Table 2.7.2-2 and Table 2.7.2-3 show the dongles verified to work with this port.

Table 2.7.2-2 Verified Dongles (Wi-Fi)

Vendor	Model
Buffalo	WLI-UC-GNM2S
Buffalo	WI-U2-433DMS
IO DATA	WN-AC433UM
IO DATA	WN-G150UM
IO DATA	WHG-AC433UM
ELECOM	WDC-433SU2M2BK
Logitec	LAN-W150NU2A
Planex	GW-450S
Planex	GW-USNANO2A
EDIMAX	EW-7811Un
NETGEAR	A6100
belkin	N300 micro
HAWKING	HW7ACU
Dlink	DWA-171
NETGEAR	WNA3100M

Table 2.7.2-3 Verified Dongles (Bluetooth)

Vendor	Model
IO DATA	USB-BT40LE
ELECOM	LBT-UAN05C2/N
ELECOM	LBT-UAN05C1
Planex	BT-Micro4
Buffalo	BSBT4D205BK
Buffalo	BSBT4D105BK
Plugable	USB-BT4LE
IO GEAR	GBU521
PRiNCETON	PTM-UBT7
Cable Matters	604002-BLK

2.7.3 USB Port (VIP)

This port is used to connect the visual inspection probe that inspects end faces of optical fibers. Refer to Chapter 10 “VIP” for details.

2.8 Basic Notes on Use

⚠ CAUTION

- Connector cover
  A connector cover is installed on each of the connectors to prevent dust. Do not remove these connector covers except when connecting a cable to the connectors.
- Condensation
  Condensation may occur on the inside surface of the ACCESS Master when the ACCESS Master is carried into a room (high temperature) from an outdoor location (low temperature), etc. If this occurs, dry the ACCESS Master thoroughly before turning on the power.
- Temperature range
  Use the ACCESS Master within the operating temperature range (0 to +45°C) and storage temperature range (–20 to +60°C). If the ACCESS Master is placed in a car or other enclosed space for a long time, the ambient temperature may exceed the specified range, resulting in malfunction of the ACCESS Master.
- Safety
  Do not use any AC adapter or battery pack other than the one supplied. Otherwise, the ACCESS Master may be damaged due to nonconformity with the specifications.

⚠ CAUTION

- Laser
  Never look directly into the cable connector on the equipment nor into the end of a cable connected to the equipment. If laser radiation enters the eye, there is a risk of injury.
  In addition, the ACCESS Master outputs high-power optical pulses. To prevent damage to the photoreceiving circuit of the communication device connected to the optical fiber to be measured, remove the communication device from the optical fiber before measurement. Anritsu will take no responsibility for damage to the communication or any other device.

- Maintenance
  We recommend you to have your ACCESS Master inspected once a year at the Anritsu (a fee will be charged).

- Humid or dusty place
  Avoid installing ACCESS Master in a humid or dusty place. Drops of water or accumulated dust may constitute a short circuit, thus causing a fire accident, electric shock and/or failure.

- Place where it is exposed to active gas
  Avoid installing ACCESS Master in a place that may be ex-posed to active gas. Otherwise ACCESS Master may be damaged, thus causing a fire accident and/or failure.

Chapter 3 General Operation and System Setups

This chapter describes general operations and system setups for the ACCESS Master.

3.1 General Operation

This section assumes that the battery pack is already charged or that the AC adapter is connected to the ACCESS Master.
Refer to the following sections for details on charging the battery pack or connecting the AC charger/adapter:
2.2.1 “Installing a Battery Pack”
2.3.1 “AC Adaptor”

Press the **Power** key to start the ACCESS Master, and the Top Menu is displayed.

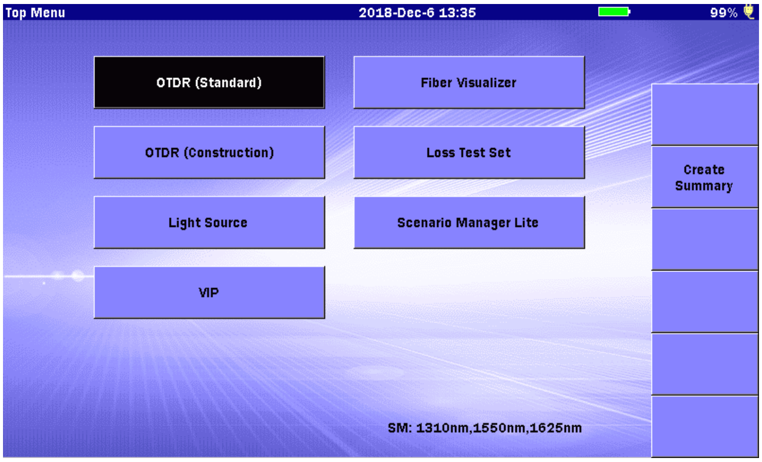


Figure 3.1-1 Initial Screen – Top Menu

Note:

If the screen shown in Figure 3.1-1 does not appear after powering up, the ACCESS Master may have failed. Run the unit through a power cycle (power down / power up). If the problem persists, contact the Anritsu or your local Anritsu representative.

3.1.1 Power On/Power Off

To Power On the ACCESS Master:

Press the **Power** key. The ACCESS Master performs a self–test and the Anritsu splash screen appears briefly. After the self–test is complete successfully, the Top Menu or one of the test application screens is displayed (refer to Figure 3.1-1).

To Power Off the ACCESS Master:

Press the **Power** key, and the following message appears.

Are you sure you want to power off?

Touch **Yes** to power off the ACCESS Master.

Note:

You can force a Power Off at any time by holding down the Power key for approximately 10 seconds.

3.1.2 Screen Elements

This subsection describes screen elements and how to operate panel keys.

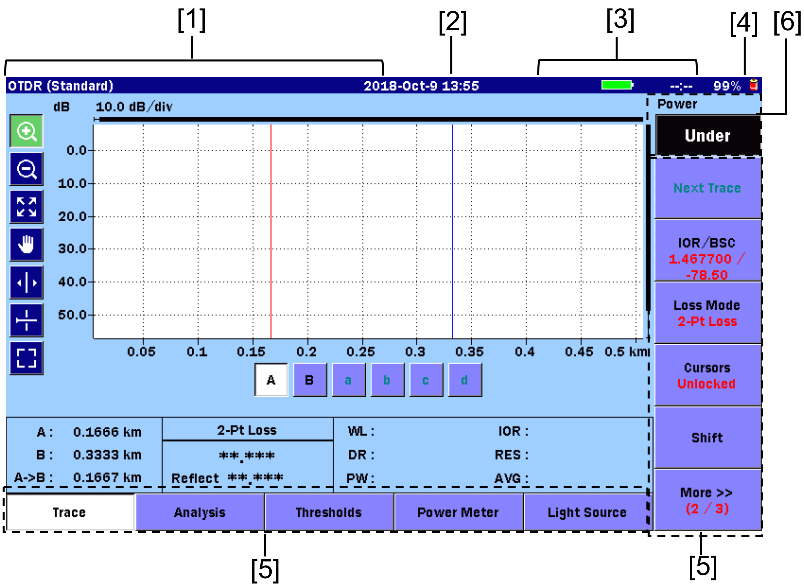


Figure 3.1.2-1 Screen Elements

[1] Screen Title area:
Displays the title of the screen currently displayed and the name of the loaded file. For details on the settings, refer to 3.3.1 “General Settings”.

[2] Date/Time area:
Displays the current date and time.
The display format (yy–mm–dd, mm–dd–yy, dd–mm–yy) follows the system settings. For details on the settings, refer to 3.3.1 “General Settings”.

[3] Status area:
Displays the battery indicator, remaining battery, and the status icon of the ACCESS Master. The remaining battery is expressed in percent (%) (100% on a full charge), and the estimated available time (h) that is forecasted based on the average power consumption over the previous one minute period.
It is recommended to charge the battery when the remaining battery falls below 30%.

- Battery indicator:
- Remaining battery (h): 11:24h
  (Estimated available time: 11 hours and 24 minutes)
- Remaining battery (%): 95%
- Connected in a network:
- Laser light is being emitted.: (in yellow)
- File is being accessed:
- VFL light is being emitted.: (in red)

[4] Driving power indicator :

- Powered by external power supply:
- Powered by battery pack:

[5] Softkeys display area:
Displays softkeys to which functions corresponding to the current screen or required for the current operation are assigned. Softkeys are used to select a function or for confirmation.

[6] Power Meter area :
For OTDR or Fiber Visualizer, the power measurement value is displayed when a power meter is used.

3.1.3 Top Menu

This subsection describes how to select a function from the Top Menu.

Starting the ACCESS Master displays the Top Menu. However, if **Auto Launch** is enabled or **Auto Power Off** is enabled, a screen other than the Top Menu may be displayed. For details, refer to 3.3.1 “General Settings”.

Applications can be started in the following operations.

- Touch an application button.
- Select an application button using ∧ ∨ or < >, and then press Enter.

The screen shown below is displayed when pressing **Top Menu** key except for the following cases.

- When the backlight is turned off according to the Auto Backlight Off setting.
- When a warning or caution message is displayed.

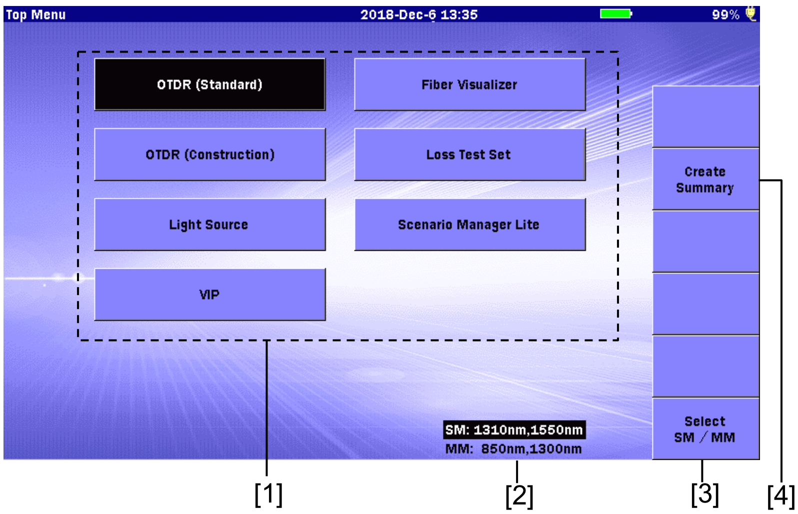


Figure 3.1.3-1 Top Menu Screen

[1] Application buttons:
Displays the available applications. The available applications depend on the options installed.

[2] Source Wavelength list:
Displays the available light source wavelengths that can be emitted.
The displayed wavelengths depend on the options installed.

[3] **Select SM/MM** softkey:
This softkey is displayed only for Option 063. Touching **Select SM / MM** highlights the wavelength of the selected port.

[4] **Create Summary** softkey:
Saves a summary of multiple waveform files (extension SOR) in a text file. Refer to 3.5.9 "Creating summary of waveform file".

3.1.4 How to Configure Settings

This subsection describes how to change settings.

- Selecting a setting item:

  Touch the item to be set.

  Or highlight the item using [∧] [∨], and then press [Enter].

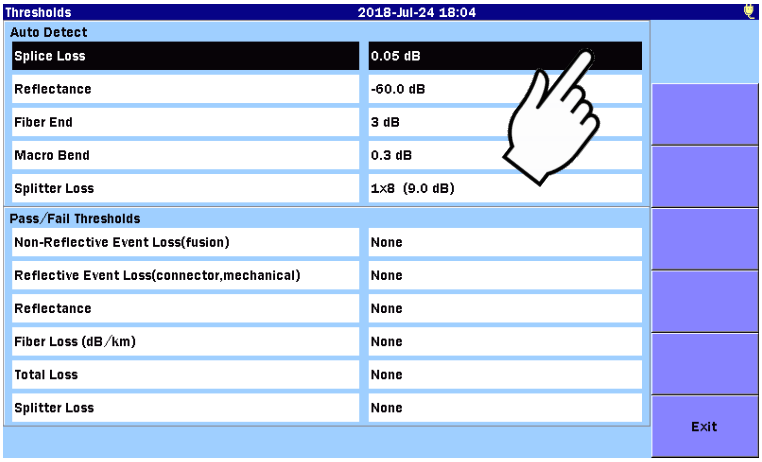


Figure 3.1.4-1 Selecting Setting Item

- Inputting a numeric value:

  The dialog box for the selected setting item appears. Touch the on–screen numeric keypad to input the value to be set.

  Also, pressing [∧] [∨] or turning the **Rotary knob** allows the value to be changed.

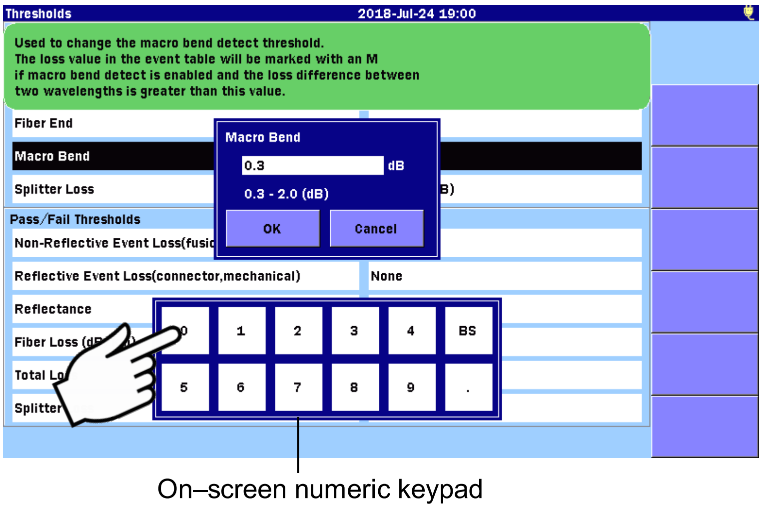


Figure 3.1.4-2 Inputting Numeric Value

Touch **OK** or press [Enter] to change the setting value.
Touch **Cancel** or press [ESC] to cancel the input value, and the setting value is not changed.

- Selecting a setting value:
  The dialog box for the selected setting item appears. Select a setting value from the list by touching the value.
  Also, pressing [∧] [∨] or turning the Rotary knob allows the value to be selected.

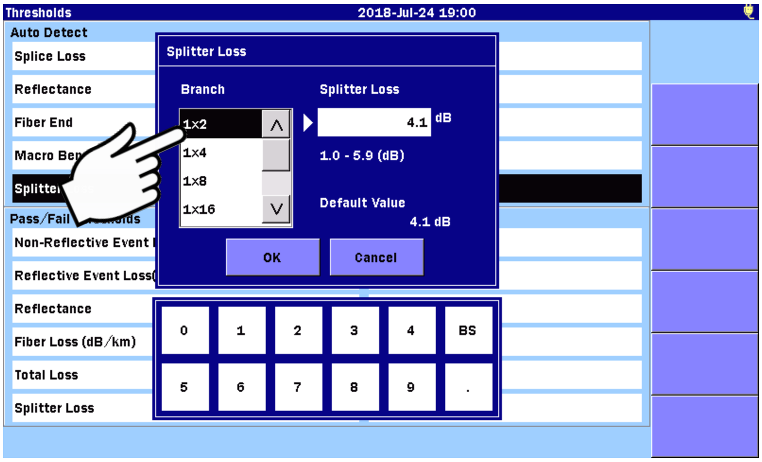


Figure 3.1.4-3 Selecting Setting Value

Touch **OK** or press [Enter] to change the setting value.
Touch **Cancel** or press [ESC] to cancel the input value, and the setting value is not changed.

- Inputting a value or specifying the setting with the button:
  The dialog box for the selected setting item appears. Touch the on–screen numeric keypad to input the value or touch **None** to specify “None”.

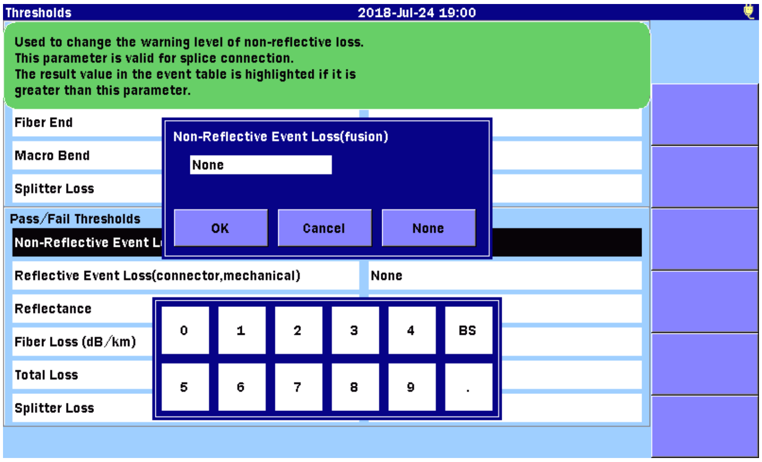


Figure 3.1.4-4 Setting Non-Reflective Event Loss

Touching **None** allows you to specify “None”.
“None” cannot be set using the on–screen numeric keypad.
Touch **OK** or press Enter to change the setting value.
Touch **Cancel** or press ESC to cancel the input value, and the setting value is not changed.

3.1.5 How to Enter Characters

For some setting items, you can enter characters such as alphanumeric characters. If such setting items are selected, a dialog box to enter characters as shown in Figure 3.1.5.1-1 appears.

If a USB keyboard is connected to the ACCESS Master, you can enter characters with the keyboard.

3.1.5.1 Entering Alphanumeric Characters

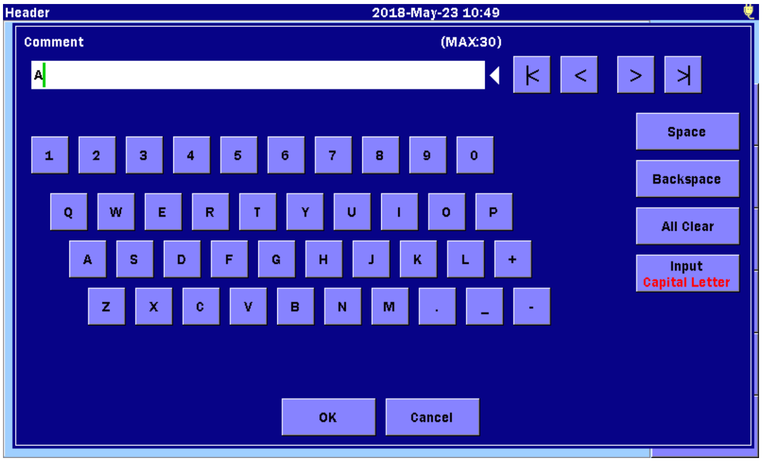


Figure 3.1.5.1-1 Dialog Box to Enter Character

- Moving the cursor to where you want to enter characters:
  If any characters are already entered, move the cursor to where you want to enter characters using < or >.

- Deleting the entered characters:
  To delete the entered characters, move the cursor to the right side of the character to be deleted and touch **Backspace**.

- Selecting an input mode (character type):
  Touch **Input** to switch the input modes: Capital Letter, Small Letter, Symbols.

3.1.5.2 Entering Number for Auto Increment Function

If **Enabled** on the **AutoSave** screen described in 4.2.4 “AutoSave" or 5.2.4 “AutoSave” is set to **On**, the number specified at the end of the comments or wavelengths will be automatically incremented every time a file is saved. The number can be up to four digits.

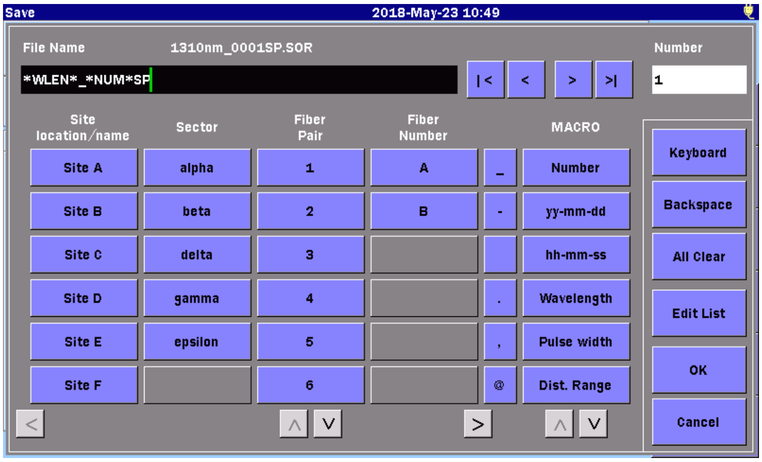


Figure 3.1.5.2-1 Base Filename Dialog Box

3.2 Adjusting the Backlight

Pressing the **Brightness** switches the brightness of the backlight in the following order:

High → Middle → Low → Off → High → Middle...

Note:

You cannot adjust the backlight in the following cases:

- The internal memory or a USB memory stick is being accessed.
- A warning or caution message is displayed.

When the backlight is turned off according to the **Auto Backlight Off** setting in 3.3.1 "General Settings", touch the screen or press any key to put the backlight on.

3.3 System Setups

Press the **Setup** to display the General screen which provides access to the general systems settings.

3.3.1 General Settings

The General screen enables you to configure system settings such as date/time, color theme, and languages. When displaying the Top Menu, pressing **Setup** displays the softkeys of **General**, **Password Settings**, **Calibration Date Settings**, and **About** on the General screen.

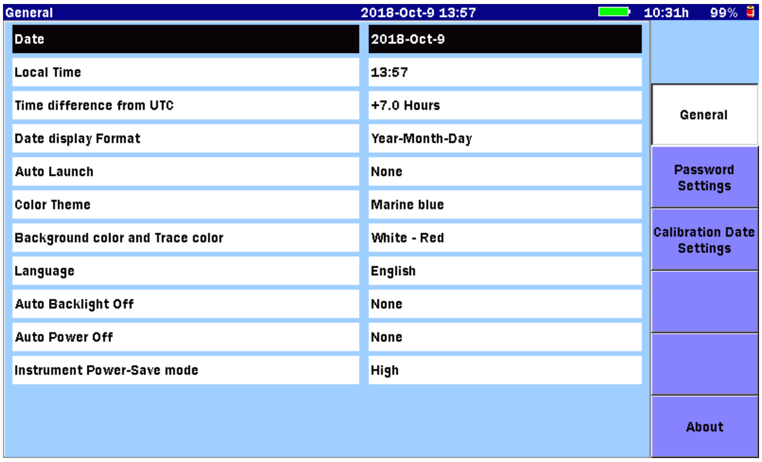


Figure 3.3.1-1 General Screen

Table 3.3.1-1 General Screen

Name	Explanation
Date	Set the date.
Local Time	Set the time.
Time difference from UTC	Set the difference between local time and UTC (Coordinated Universal Time). In Japan, set it to 9.0.
Date display Format	Set the display format for the date displayed in the title bar.
Auto Launch	Auto Launch allows you to select a test application which will be automatically launched after starting up. If **None** is selected, the **Top Menu** will be displayed after starting up.
Color Theme	Select a color theme from the following choices. Marin blue, Grassy pane, Sunshine, Grayscale, Nightblack, Outdoor white
Background Color and Trace Color	Select a color combination of background and trace for graphs.
Language	Select a language.
Auto Backlight Off	The Auto Backlight Off setting turns off the backlight when a set period of time passes without any panel operations. If None is selected, the backlight will not be turned off.

Table 3.3.1-1 General Screen (Cont'd)

Name	Explanation
Auto Power Off	The Auto Power Off setting shuts down the ACCESS Master when a set period of time passes without any panel operations. If **None** is selected, the ACCESS Master will not be shut down. In the following cases, the **Auto Backlight Off** function is disabled, and the timer of the **Auto Power Off** function is restarted at the end of the current operation: ● An OTDR test is in progress. ● The Auto Detect function is being performed. ● Optical power level measurement is in progress. ● The light source is on. ● The Visual Fault Locator is on or flashing. ● The Loss Test Set is being performed. ● File access (save, read, copy, delete, etc.) is in progress. ● The internal memory is being restored or formatted. ● The firmware is being updated. ● Currently connected to a personal computer by using a USB cable. ● Currently connected to a personal computer via Wi-Fi, Ethernet, or Bluetooth.
Instrument Power-Save mode	When an OTDR measurement is completed and a successive measurement is not performed within a set period of time, the ACCESS Master enters a standby status when an Instrument Power–Save mode is active. Select a mode from the following choices. High: Activates the standby mode when successive OTDR measurements are not performed within approximately 10 seconds after the current measurement has completed. Low: Activates the standby mode when successive OTDR measurements are not performed within approximately 180 seconds after the current measurement has completed. Off: Does not activate the standby mode after the completion of an OTDR measurement.

3.3.2 Password Settings

The **Password Settings** softkey is displayed only by pressing **Setup** when the Top Menu is displayed.

Models in the ACCESS Master can be set to allow use only at specific user authorization levels (i.e., set to block access at the Administrator level). There are two authorization levels; Administrator and User. The following table shows access rights assigned to each authorization level.

√: Allowed

Blank: Not allowed

Table 3.3.2-1 Access Rights Corresponding to Operations

Item	Administrator	User
Change the Date and the Local Time	√	
Password Protect	√	
Administrator Setting	√	
Setting the User Password	√	
Password Lifespan	√	
Password expiration date	√	
Viewing the log file	√*1	
Update the firmware	√	
Perform a Restore Default	√	
Format Internal Memory	√	√
Erase Internal Memory	√	
Touch Panel Calibration	√	
Measure OTDR, Power Meter, OLTS	√	√
Use remote GUI	√	√
Configure to accept SCPI commands	√*2,*3	√*2,*3

*1: With Password Protect On

*2: The ACCESS Master cannot accept SCPI commands unless you log in.

*3: SCPI commands are described in *MT9085 Series ACCESS Master SCPI Remote Control Operation Manual.*

3

General Operation and System Setups

Touch the **Password Settings** softkey, and the **Password Settings** screen is displayed.

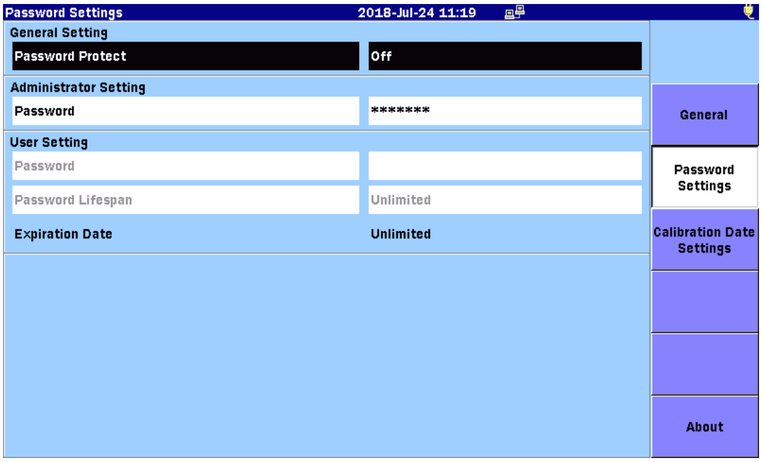


Figure 3.3.2-1 Password Settings Screen

Table 3.3.2-2 Password Settings Screen

Name	Explanation
Password Protect	On: Enables the Password Protect function. Off: Disables the Password Protect function.
Administrator Setting	
Password	A password can be set from 1 to 16 characters long using alphanumeric characters and symbols.
User Setting	This can be set when **Password Protect** is set to **On**.
Password	A password can be set up to 16 characters long using alphanumeric characters and symbols. You can leave it blank.
Password Lifespan	**Unlimited** (with no expiration date) or the number of days to expire (1 to 200) can be set.
Expiration Date	The password expiration date calculated based on the days specified for **Password Lifespan** is displayed.

Password Protect

If **Password Protect** is set to **On**, the Login screen will appear after the startup.

Additionally, when **Password Protect** is set to **On**, if the following operations are performed by users, these will be all recorded to a log file.

- Power-on (Login)
- Starting OTDR measurement
- Power-off

Note:

Do not forget your administrator password.

If you forget the password, you will not be able to use the ACCESS Master.

Administrator Setting

1. Set the administrator password from 1 to 16 characters long using alphanumeric characters and symbols.

   If you execute **Restore Defaults**, the default administrator password will be restored. The default password for the current version is "MT9085ANRITSU".

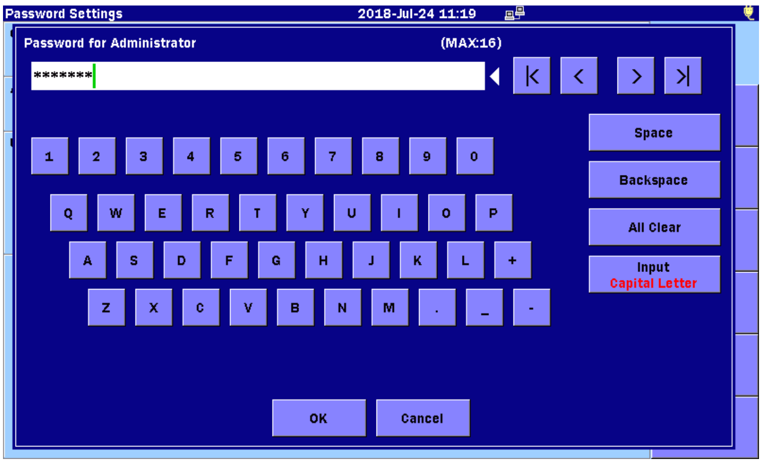


Figure 3.3.2-2 Administrator Password Dialog Box

2. Touch **OK** or press Enter.

3. Enter the password again to confirm it.

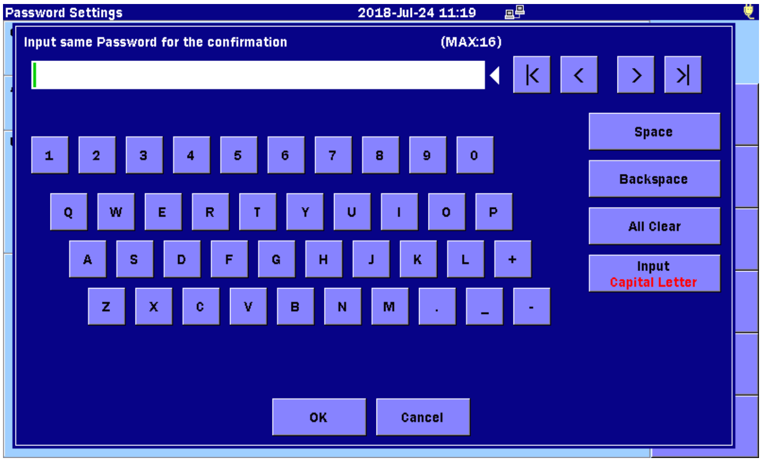


Figure 3.3.2-3 Administrator Password Confirmation Dialog Box

4. Touch **OK** or press Enter.

Setting the User Password

Set up to 16 characters long using alphanumeric characters and symbols.

If you execute **Restore Default** on the **About** screen described in 3.3.4 “About”, the password in the input box will be cleared. In this case, the Users do not need to enter the password to log into the ACCESS Master.

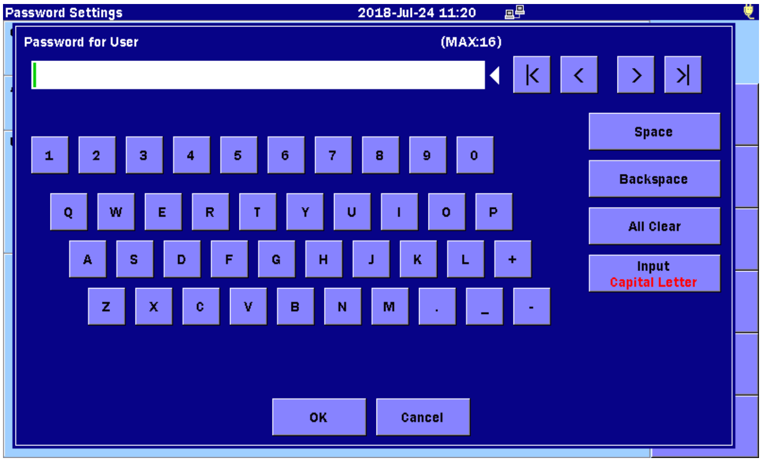


Figure 3.3.2-4 User Password Dialog Box

Password Lifespan

You can set the password expiration period. If the password has expired, the Users will not be able to log into the ACCESS Master.

Note:

The ACCESS Master will shut down automatically if running at the time the Duration of use (Password Lifespan) expires. Regardless of when you set the Password Lifespan, the day count is updated at 0:00 of each day.

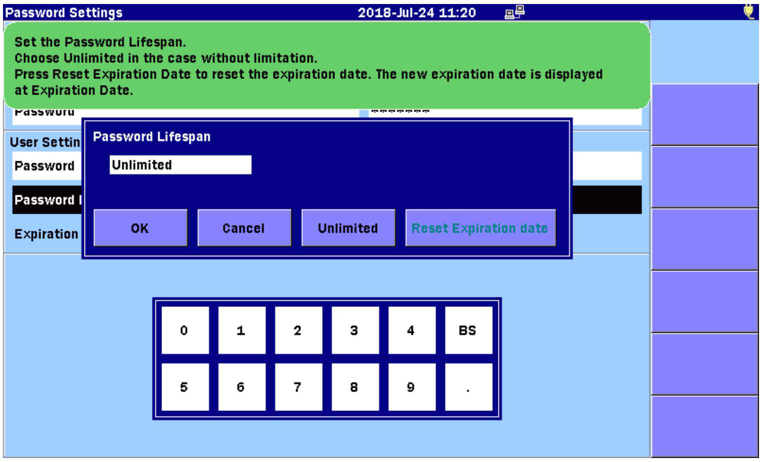


Figure 3.3.2-5 Password LifeSpan Dialog Box

Unlimited:

Use it when you do not want to set Password Lifespan.

Reset Expiration Date:

Recalculates the expiration date based on the date of reset and the days specified for **Password Lifespan**. The new expiration date is displayed at **Expiration Date**.

Viewing the log file

An access log file is created automatically if **Password Protect** is **On**.

The log format is as follows:

```
18-Jun-2018 11:00:25 POWER ON (User)
18-Jun-2018 11:05:16 OTDR TEST
18-Jun-2018 11:22:50 OTDR TEST
18-Jun-2018 11:32:44 OTDR TEST
18-Jun-2018 11:47:01 OTDR TEST
18-Jun-2018 11:56:33 POWER OFF
```

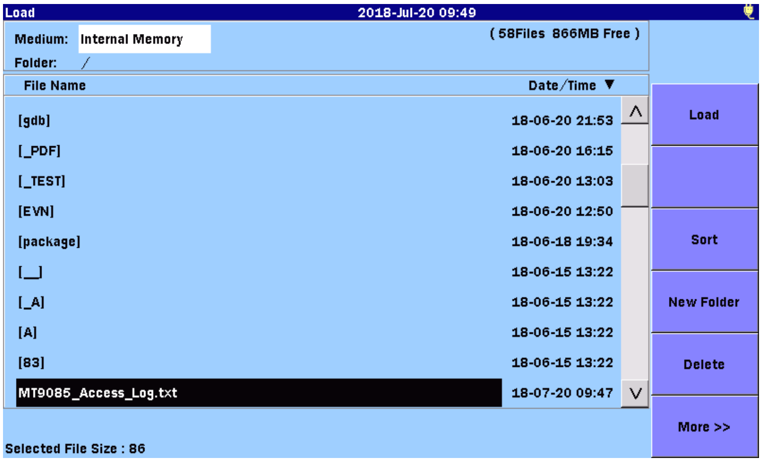
Figure 3.3.2-6 Access Log Entry Formats

Note:

The system capacity is 1,000 log entries. Once this limit is reached, newer entries will overwrite entries, starting with the oldest.

Access logs can be copied according to the following procedure.

1. Log into the ACCESS Master using the administrator password.
2. Press **Load** when the **Top Menu** is displayed.
3. Set **Medium** to **Internal Memory**.
4. Touch **MT9085_Access_Log.txt**.



5. Touch the **Copy** softkey.
6. Connect a USB memory stick to the ACCESS Master.
7. Set **Medium** to **USB Memory**.
8. Touch the copy destination folder to highlight.
9. Touch the **Paste** softkey.

3.3.3 Calibration Date Settings

The **Calibration Date Settings** softkey is displayed only by pressing **Setup** when the Top Menu is displayed.

The calibrated date and calibration period can be set on the **Calibration Date Settings** screen.

The date to calibrate the ACCESS Master next time is displayed as **Calibration Due Date**.

These information can be provided in the PDF report.

Touch the **Calibration Date Settings** softkey, and the **Calibration Date Settings** screen is displayed.

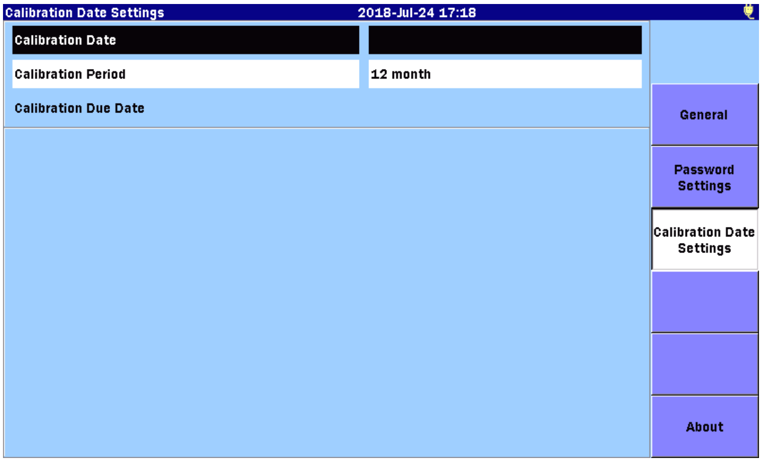


Figure 3.3.3-1 Calibration Date Settings Screen

Table 3.3.3-1 Calibration Date Settings

Name	Explanation
Calibration Date	The date on which the calibration was performed last time can be set.
Calibration Period	The calibration period can be set in the range from 0 to 120 months.
Calibration Due Date	The date to perform calibration next time is displayed.

3.3.4 About

Touch the **About** softkey, and the **About** screen is displayed.

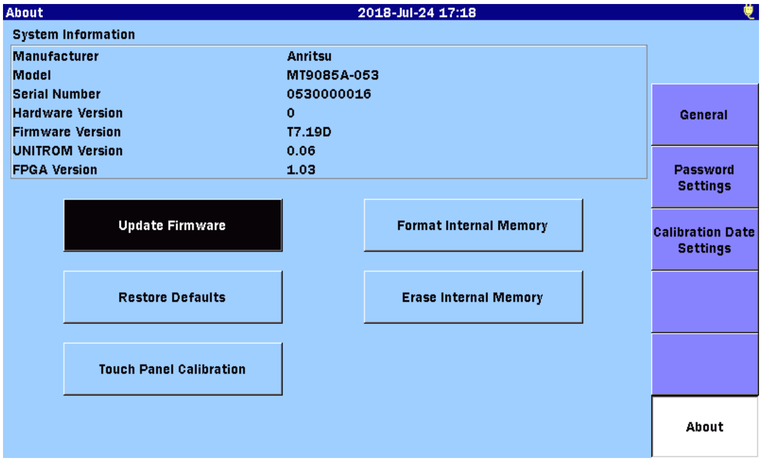


Figure 3.3.4-1 About Screen

Table 3.3.4-1 About Screen

Name	Explanation
System Information	The information about the ACCESS Master is displayed.
Update Firmware	Allows you to update the firmware by loading the installer file.
Restore Defaults	Resets the settings of the ACCESS Master to factory defaults.
Touch Panel Calibration	Calibrates the touch panel.
Format Internal Memory	Formats the internal memory. All the files stored in the internal memory are deleted.
Erase Internal Memory	Erases the data stored in the internal memory so that it cannot be restored. It takes more than 30 minutes to completely erase the stored data in the memory.

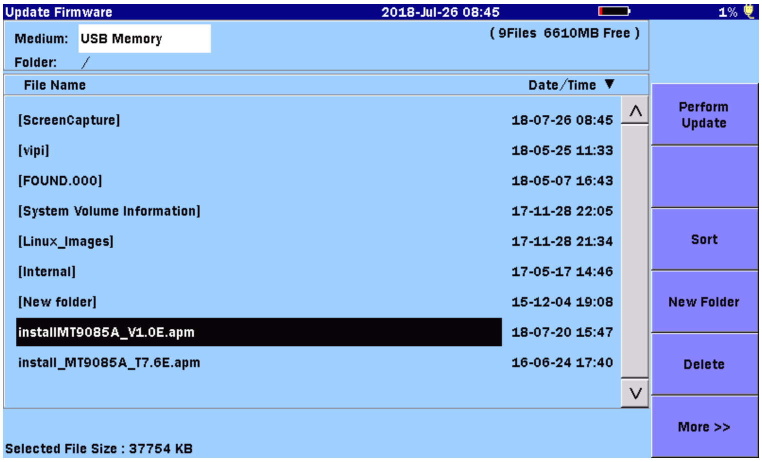
Update Firmware

The firmware can be updated by loading the update installer file released by Anritsu.

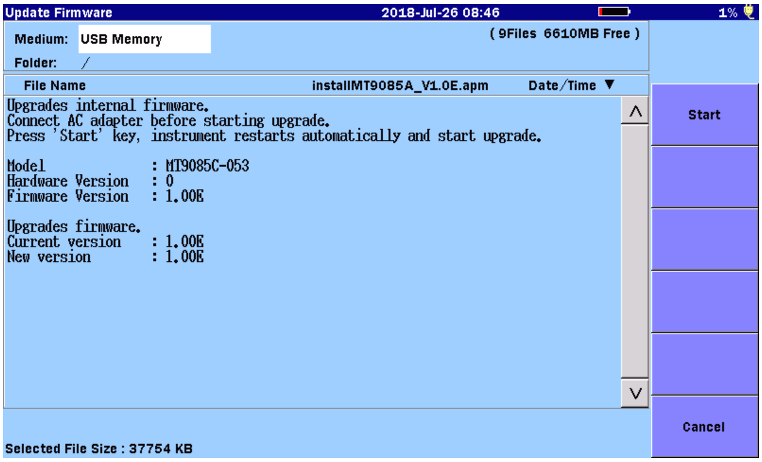
CAUTION

Always use the AC Adapter to power the ACCESS Master when performing a firmware update.

1. Copy the installer file to a USB memory stick.
2. Connect the USB memory stick to the ACCESS Master.
3. Touch **Update Firmware**.
4. Touch the **Medium** field to select **USB Memory**.
5. Touch the installer file displayed.



6. Touch the **Perform Update** softkey.
7. Touch **Start**. It takes for a while to complete the firmware update.



After the update is complete successfully, the ACCESS Master restarts automatically. Make sure that the firmware has been updated on the **About** screen described in Figure 3.3.4-1 “About Screen”.

To prevent from running out the battery in the middle of the firmware update, the update becomes unavailable when the remaining battery is 10% or less.

Touch Panel Calibration

Touch **Touch Panel Calibration**, and the confirmation dialog box is displayed.

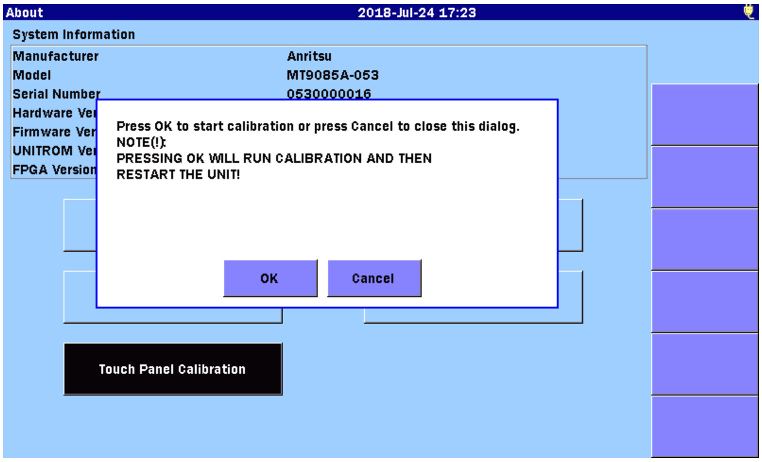


Figure 3.3.4-2 Confirmation Dialog Box for Touch Panel Calibration

Touch **OK**, and  appears on the screen. Touch the center of the appeared mark with a pointed object such as a pen (the mark appears at five places in sequence).

Figure 3.3.4-3 Touch Panel Calibration Screen

Restore Defaults

Touching **Restore Defaults** resets the settings on the following screens to factory defaults and deletes the access log file.

- Test Parameters
- Thresholds
- AutoSave

Note:

The settings described in 3.3.1 “General Settings” are not reset.

The settings described in 3.3.2 “Password Settings” and 3.3.3 “Calibration Date Settings” are reset to factory defaults.

Format Internal Memory

Formats the internal memory.

All the files stored in the internal memory are deleted.

The formatting will be complete in a few minutes.

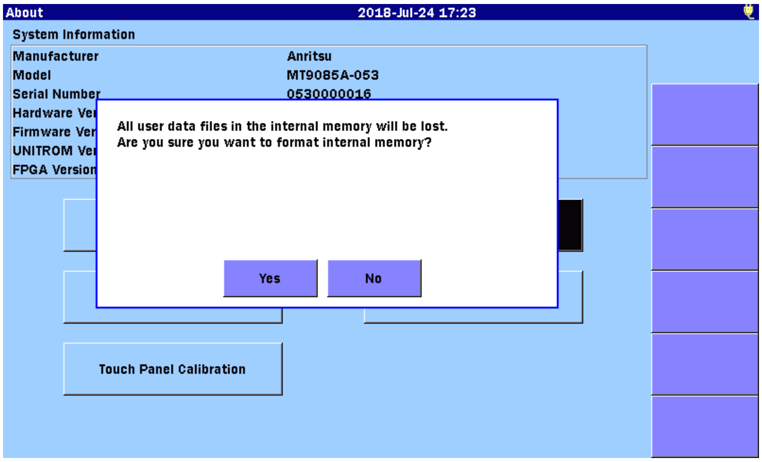


Figure 3.3.4-4 Confirmation Dialog Box for Format Internal Memory

Erase Internal Memory

Erases the data stored in the internal memory so that it cannot be restored.

The confirmation dialog box is displayed as the **Format Internal Memory** function does.

If it is required to prevent data stored in the internal memory from being leaked, execute **Erase Internal Memory**.

CAUTION

Always use the AC adapter to power the ACCESS Master when performing an internal memory format.

As it takes about 30 minutes to finish formatting the internal memory, aborted formatting caused by battery failure may damage the internal memory.

3.4 Saving a Screen Image to a File

Pressing **Screenshot**  saves a screenshot to a file. The dialog box appears and displays the destination where the file has been saved and the file name. To close the dialog box, touch **OK**.

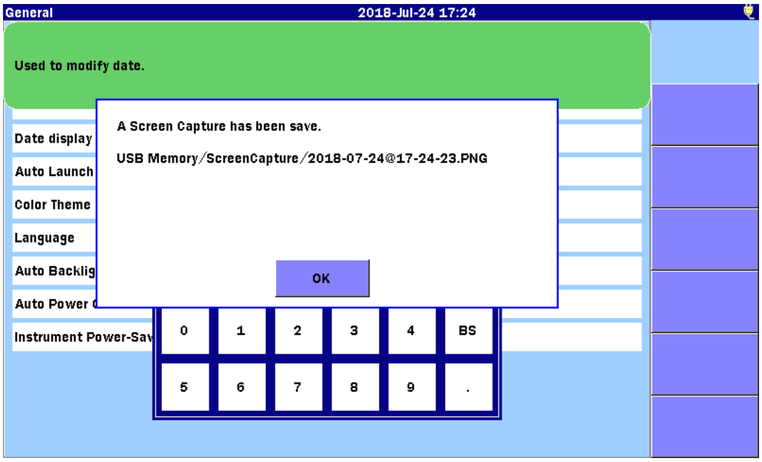


Figure 3.4-1 Screen Capture Dialog Box

3

General Operation and System Setups

3.5 File Operation

The following file operations can be performed on the ACCESS Master.

- Loading a measurement results file
- Copying files
- Deleting files
- Saving measurement results to a file

The internal memory and USB memory sticks are available for file operations on the ACCESS Master. For details on the use of USB memory sticks, refer to 2.7.2 "USB Port (General)".
For OTDR (Standard) and Fiber Visualizer, the following files can be loaded to the ACCESS Master.

SOR files (.sor): Waveform data in standard format*1 and standard V2 format*2

*1: The standard format complies with Bellcore GR-196-CORE (Issue 1, Revision 1, December 1997).

*2: The standard V2 format complies with Telecordia (formerly known as Bellcore) SR-4731 (Issue 1, February 2000). The standards number differs from GR-196-CORE, however, this standard is equivalent to GR-196-CORE Issue 2.

⚠ CAUTION

- The deleted folders and files cannot be recovered. Make sure that you really want to delete the folders and the files before deleting them.
- While loading, saving, copying or deleting folders and files, the mark indicating that they are being accessed is displayed on the screen. Do not remove the USB memory stick while it is being accessed. The USB memory stick or files being operated may be damaged.
- If a folder contains more than 1,500 subfolders or files, some subfolders or files will not be displayed. Be sure that total number of subfolders and files do not exceed 1,500 in the folder.

3.5.1 Loading File

Loading Waveform File

1. Press **Load** to display the Load screen.

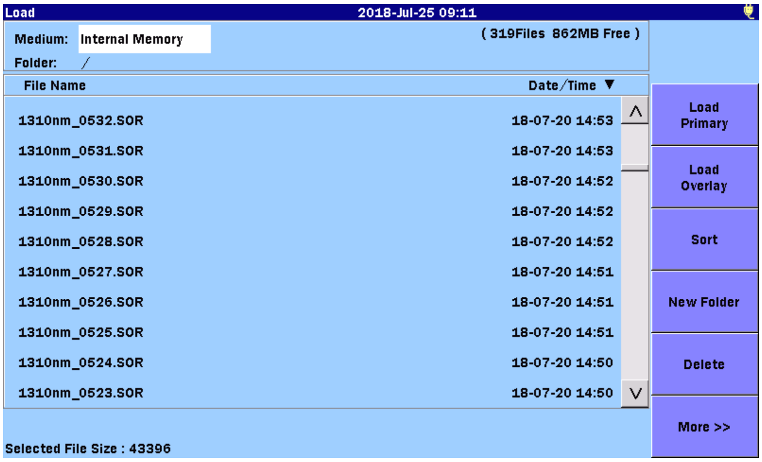


Figure 3.5.1-1 Load Screen

2. Touch the **Medium** field to select a media type.
3. Touch the file name to select it.
4. To display the file as primary trace, touch **Load Primary**. To display the file as overlay, touch **Load Overlay**. **Load Overlay** is displayed for OTDR (Standard).
5. A dialog box is displayed. Touch the loading method to be selected, and then touch **OK**.

Figure 3.5.1-2 Load Dialog Box

Without Setups
Only waveform data is loaded.

With Setups
The waveform data and setups when the waveform has been measured are loaded, and setups on the ACCESS Master are changed. The following setups are loaded.

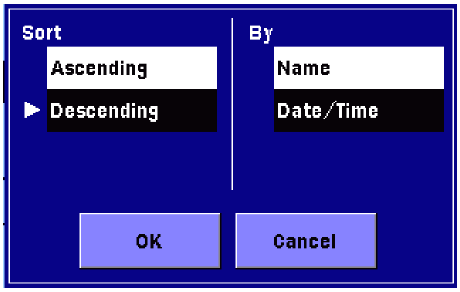
- Distance Range
- Pulse Width
- Auto Detect Thresholds
- Pass/Fail Thresholds
- Header
- IOR/BSC
- Horizontal and vertical shift of waveforms

Note:

If overlays are loaded when a primary trace does not exist, overlay traces will not be changed even if they are enlarged or reduced.

3.5.2 Sorting Files

The **Sort** softkey rearranges the display order of the files on the screen by file name or by date.



3.5.3 New Folder

Touch **New Folder**, and the on–screen keyboard appears. A folder can be created by specifying the folder name and then touching **OK**.

3.5.4 Selecting Multiple Files

Touch **Multi–Select** to display **On**.

Touch the file name to be selected, and "•" is displayed on the left of the touched file names.

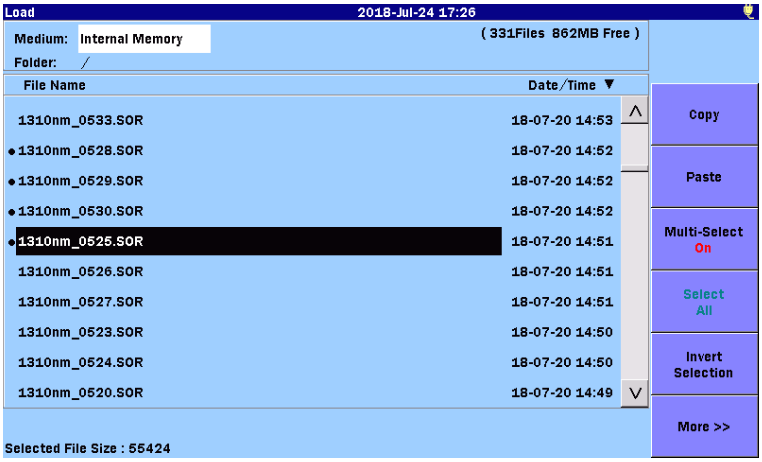
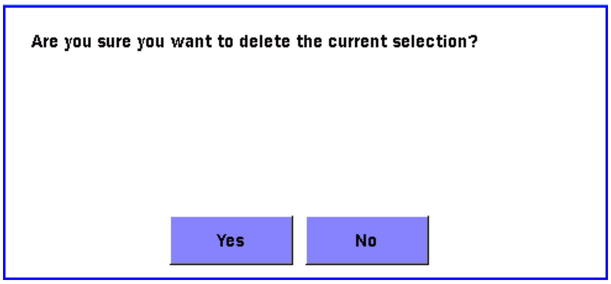


Figure 3.5.4-1 Selecting Multiple Files

Touching **Invert Selection** clears "•" from the selected file names and puts "•" on the left of the file names that were not selected.

3.5.5 Deleting Files or Folders

1. Select files or folders and then touch **Delete**, the following dialog box appears.



2. Touch **Yes** to delete the selected files or folders.

If multiple files are selected, all the selected files will be deleted.

3.5.6 Copying Files

1. Touch **More** to display **Copy**.
   Refer to Figure 3.5.4-1 “Selecting Multiple Files”.
2. Touch the file name or the folder name to select it.
3. Touch **Copy**.
4. Select a storage medium or a folder to which files are copied.
5. Touch **Paste**.

If multiple files are selected, all the selected files will be copied.

3.5.7 Saving Files

Press **Save** , and the **Save** screen is displayed.

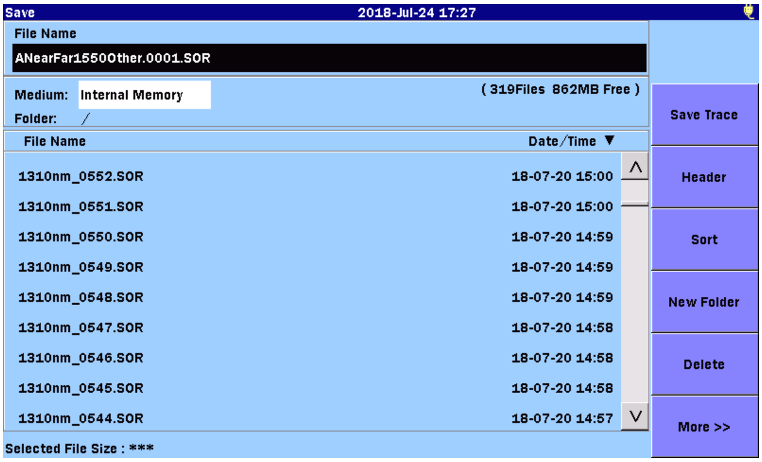


Figure 3.5.7-1 Save Screen

1. Touch the **File Name** field to enter or edit the file name.
2. Select a storage medium or a folder to which the file is saved.
3. Touch **Save Trace**. After the file is saved, the saved file name is displayed on the list.

3.5.8 Header

On the **Save** screen, touching **Header** allows you to edit the items of the file header contained in the measurement results file (sor).

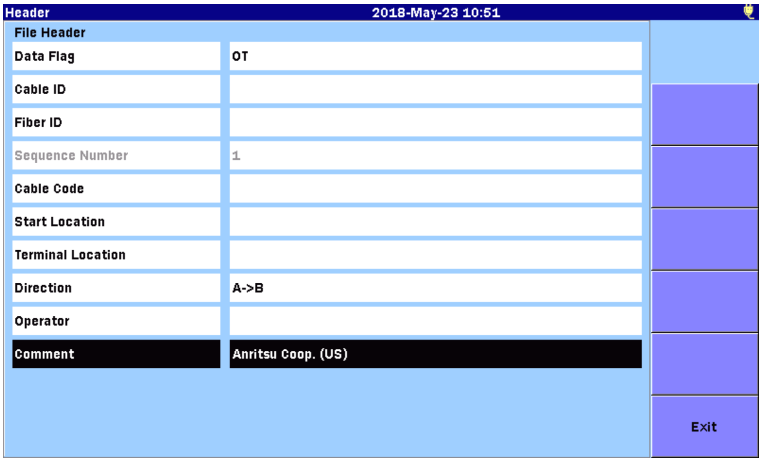


Figure 3.5.8-1 Header Screen

The items of the file header are output to the report except for sequence numbers.

Data Flag

Select data flag of waveforms.
[BC(built)]: Waveforms measured when laying a cable
[RC(repair)]: Waveforms measured when repairing a cable
[OT(other)]: Waveforms other than above

Cable ID

Enter the identification number or name of the measured cable.

Fiber ID

Enter the identification number or name of the measured fiber.

Sequence Number

Enter a start number of the sequence number to be added to the header.

Note:

If **Enabled** on the **AutoSave** screen described in 4.2.4 “AutoSave" or 5.2.4 “AutoSave” is set to **On**, **Fiber ID** and **Sequence Number** are automatically set to the number that is added to the filename when the file is automatically saved.

Cable Code

Enter the cable code of the measured fiber.

Start Location

Enter the name of the location where the measurement started.

Terminal Location

Enter the name of the location where the measurement ended.

Direction

Select the measurement direction from the following.

A->B or **B->A**

Operator

Enter the information about the operator who performed the measurement.

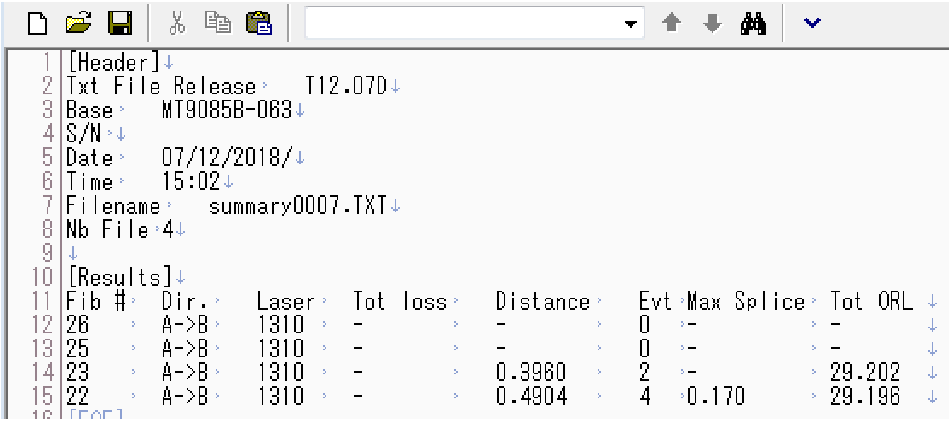
Comment

Enter comments regarding the measured fiber.

3.5.9 Creating summary of waveform file

The summary of waveform file (extension SOR) of the following measurements can be saved in a text file.

- OTDR (Standard)
- Fiber Visualizer
- OTDR (Construction)



```
[Header]
Txt File Release    T12.07D
Base    MT9085B-063
S/N
Date    07/12/2018/
Time    15:02
Filename    summary0007.TXT
Nb File 4

[Results]
Fib #   Dir.    Laser   Tot loss    Distance    Evt Max Splice  Tot ORL
26      A->B    1310    -           -           0   -           -
25      A->B    1310    -           -           0   -           -
23      A->B    1310    -           0.3960      2   -           29.202
22      A->B    1310    -           0.4904      4   0.170       29.196
[EOF]
```

Figure 3.5.9-1 Example of Summary File

1. Press **Top Menu** .
2. Touch **Create Summary**.
3. Select the storage medium.
4. Touch the file name to select it.

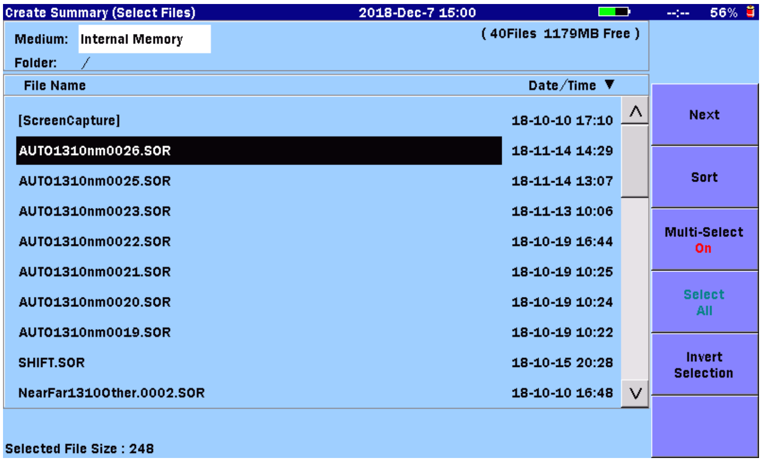


Figure 3.5.9-2 Create Summary (Select Files) Screen

7. Touch **Next**, and you will see the Create Summary (Save) screen.
   Press ESC to go back to the Create Summary (Select Files) screen.

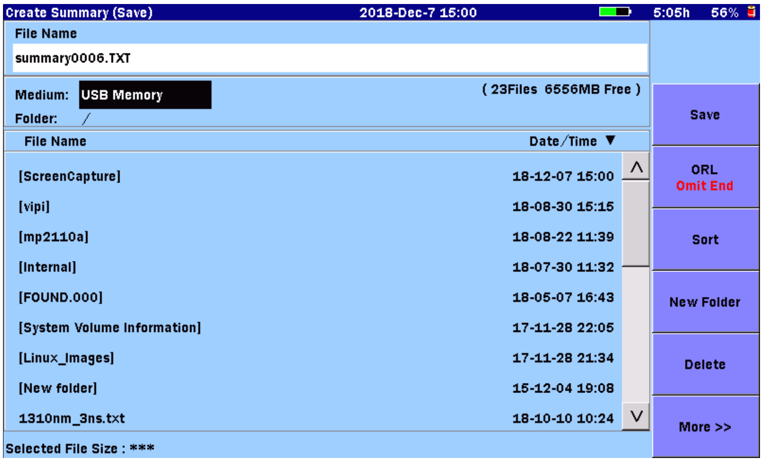


Figure 3.5.9-3 Create Summary (Save) Screen

8. Select the storage medium.
9. Touch the file name and edit it.
10. Touch **ORL**.
    Select whether to include reflection from the far end event in the calculation of ORL.
11. Touch **Save**.

Note:

When pressing the **Power** key or **Top Menu** , the output of summary file is aborted.

If failed to save a waveform file(s), a message is displayed after the summary file has been saved.

The following table shows the contents of a summary file.

Table 3.5.9-1 Contents of Summary File

Name	Description
[Header]	
Txt File Release	Software version of the Access Master that created the summary file
Base	Model name of the Access Master that created the summary file
S/N	Serial number of the Access Master that created the summary file
Date	Date when the summary file was created
Time	Time when the creation of summary file started
Filename	Summary file name
Nb File	Number of waveform files included in the summary file
[Results]	Summary of waveform file is output in one line
Fib #	Sequence number of waveform file header
Dir.	Header direction of waveform file
Laser	Wavelength
Tot Loss	Total Loss " - " is displayed when the event does not exist or the calculation result is ***.
Distance	Fiber Length " - " is displayed when the event does not exist.
Evt	Total Events " - " is displayed when the event does not exist.
Max Splice	Maximum value of event loss " - " is displayed when the event does not exist or the loss of all events is ***.
Tot ORL	ORL " - " is displayed when the event does not exist or the calculation result is ***.

Chapter 4 OTDR (Standard)

This chapter explains the OTDR (Standard) mode testing.

4.1 Getting Started with OTDR (Standard) Mode

In OTDR (Standard) mode, the ACCESS Master can perform standard OTDR testing.
The measured results are displayed as a trace as loss with respect to distance.
The ACCESS Master performs trace analysis to detect events and list them in an event table.

Pressing [Start] displays the trace that is averaged for the number of times (or period) you set.
Pressing [Realtime] updates the trace every time and allows you to observe the change of loss with respect to time.

Follow the steps below to start OTDR (Standard) mode testing.

1. Press **Top Menu** (⌂).
2. Touch **OTDR (Standard)**.

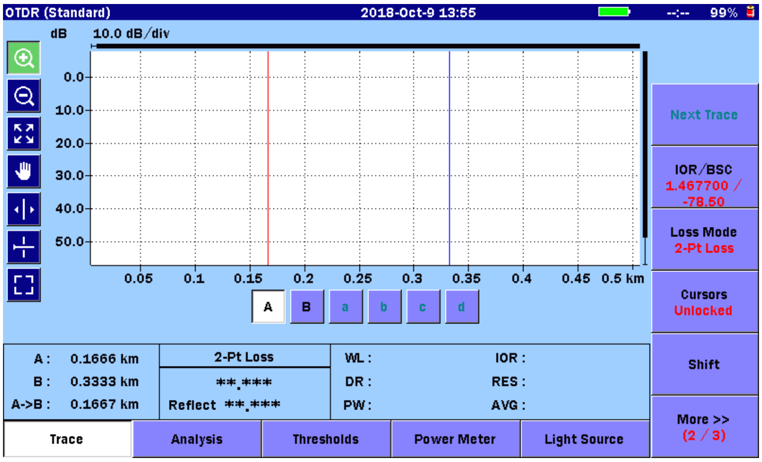


Figure 4.1-1 Initial OTDR (Standard) Screen

4

OTDR (Standard)

3. Touch **Analysis**, and you will see the following screen.

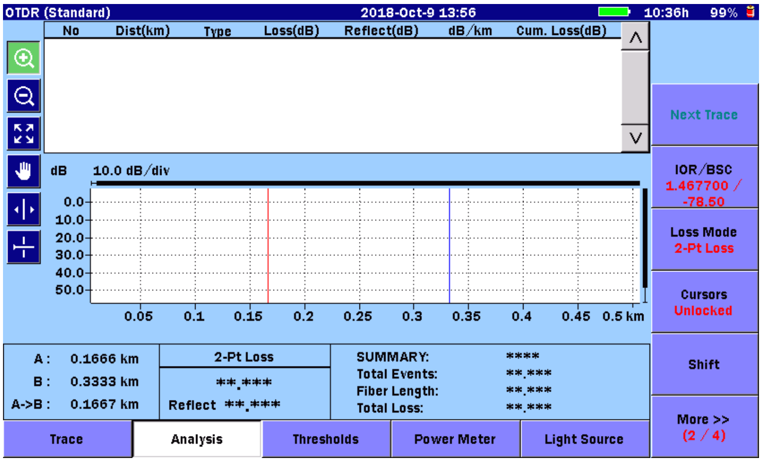


Figure 4.1-2 OTDR (Standard) Mode—Analysis Screen

4.2 Configuring OTDR (Standard) Mode Settings

To configure settings for the measurement preferences and auto save feature of OTDR (Standard) mode, press the **Setup** key .

4.2.1 General Settings

Touch **General**, and you will see the General screen.
For detailed information on the General screen, refer to Section 3.3.1 "General Settings".

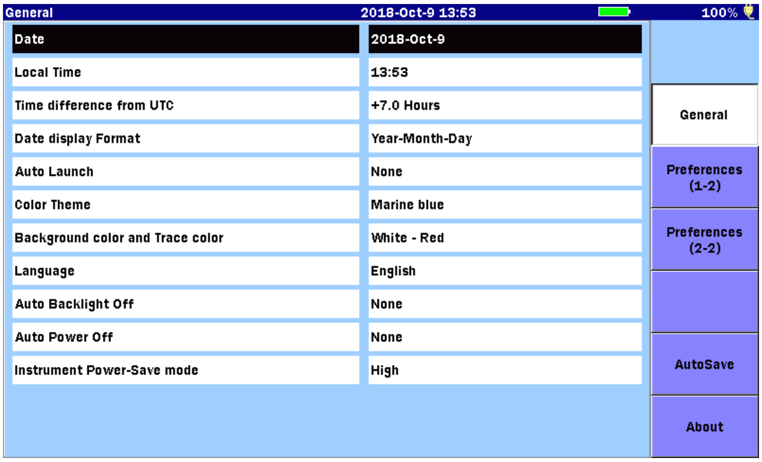


Figure 4.2.1-1 General Screen

4.2.2 Preferences (1-2)

Touch **Preferences (1-2)**, and you will see the following screen.

Figure 4.2.2-1 Preferences (1-2) Screen

Distance display Units

Select the unit of measurement used to display distance on the horizontal axis of the Trace graph. This affects Range and Resolution readings and analysis events incorporating distance.

Connection Check

The Connection Check function confirms whether or not the fiber is connected correctly to the OTDR measurement port. When set to **On**, this function is activated.

Active Fiber Check

The Active Fiber Check performs a “live fiber” check on the currently attached fiber under test to detect whether the fiber is carrying traffic before firing any OTDR laser sources.
If no traffic is detected the test proceeds normally.
If traffic is detected a warning message appears on the screen and the test is aborted.

Auto Scale

When set to **On**, the horizontal scale is set automatically so that  can display a trace from which the noise portion is removed.

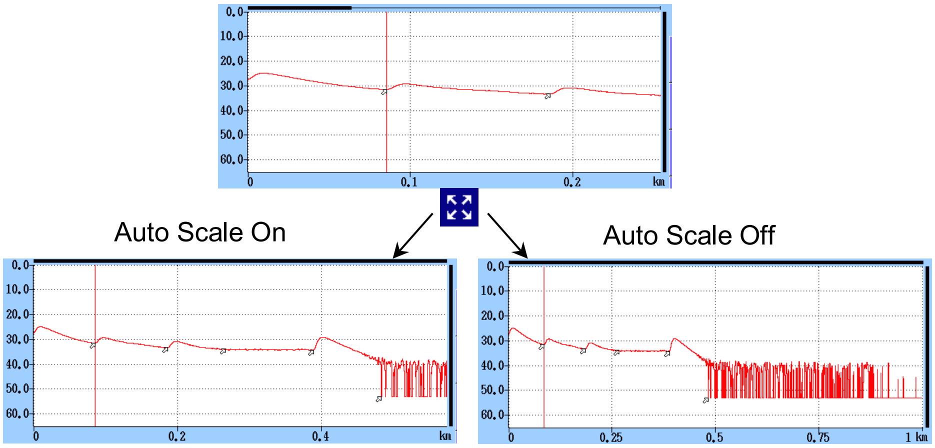


Figure 4.2.2-2 Auto Scale function

Event Summary

When set to **On** with **Marker Mode** set to **Movement**, the analysis results summary is displayed for displaying analysis.

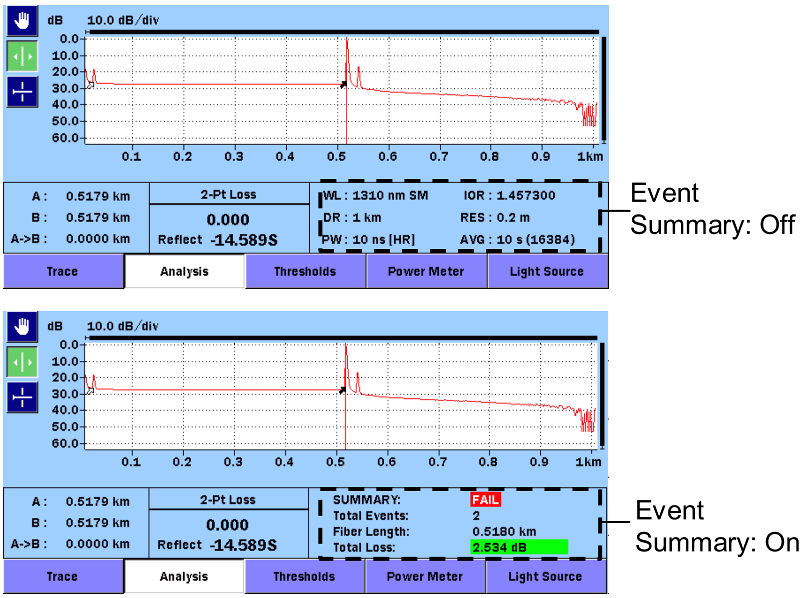


Figure 4.2.2-3 Summary Display

Trace Overview

When set to **Lower Left** or **Upper Right**, a small overview of the trace is displayed at the selected position on the Trace graph.

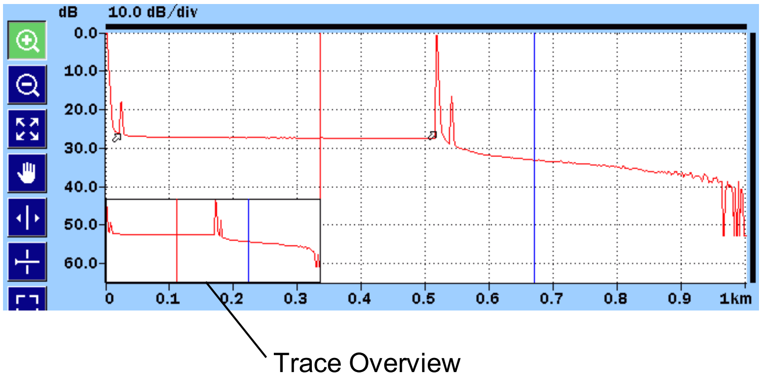


Figure 4.2.2-4 Trace Overview (Lower Left)

Show Internal Launch Fiber

When set to **On**, the internal launch fiber is displayed.

Unit of averaging

Set the unit of averaging (the number of times or second).

Real Time Attenuation

The ACCESS Master adjusts the attenuation at the light-receiver according to the level of the light returned back from the optical fiber under test. Set the attenuation adjusting method.

- **Auto Attenuation**
  Real Time attenuation is automatically selected.
- **Around selected cursor**
  Attenuation is optimized in real-time to show the backscatter around the selected (active) cursor.
- **Fresnel Measure**
  Attenuation varies according to received power level. This setting is suitable to measure reflections in long distance range however it takes longer time to measure than other options.

Display Mode After Analysis

Set the trace display mode for detected events.

- **End/Break**
  The display mode focuses on the end/break event.
- **Full Trace**
  The full trace is displayed in Display from Origin mode.
- **Current**
  The display mode and cursor positions remain unchanged.

Sound of test completion

Set the period of time to cause the buzzer to sound upon test completion. When set to **Disabled,** the buzzer does not sound upon test completion.

Touching the screen or pressing any key causes the buzzer to stop.

4.2.3　Preferences (2-2)

Touch **Preferences (2-2)**, and you will see the following screen.

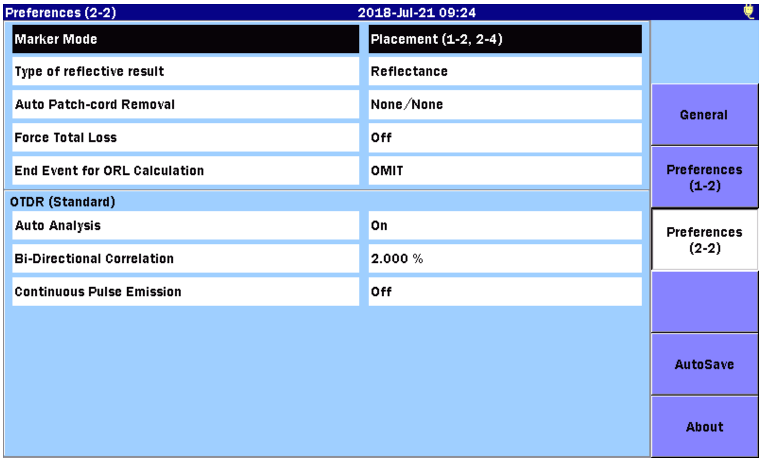


Figure 4.2.3-1　Preferences (2-2) Screen

Marker Mode

Set the mode of operating the markers for detailed measurement of splice and transmission loss of an optical fiber.

- Movement

  Cursors A and B are always displayed. Makers a to d are displayed depending on the setting for Loss Mode.

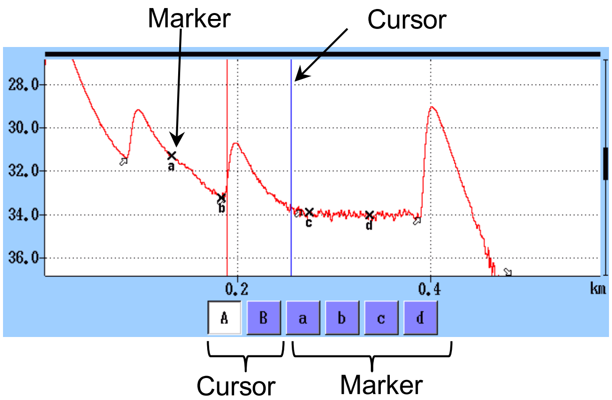


Figure 4.2.3-2　Cursors and Markers for Movement

- Placement (1-2, 2-4)

  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.

Placement (1-2, 2-4) is suitable to measure fiber loss and distance and can measure reflection, total return loss, and splice loss.

- Placement (1-2, 3-4)
  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.
  Placement (1-2, 3-4) is suitable to measure distance and loss between two markers. It can measure reflection and total return loss but cannot measure splice loss.

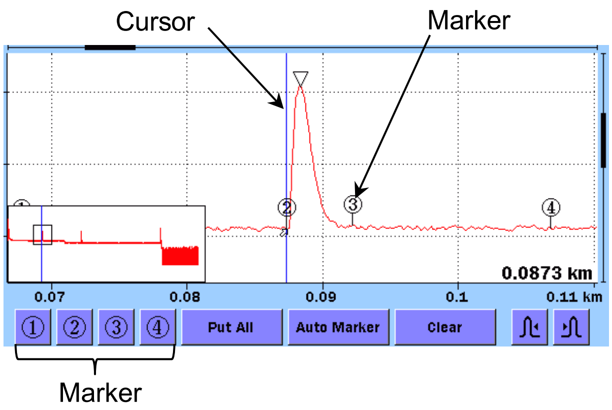


Figure 4.2.3-3 Cursor and Markers for Placement

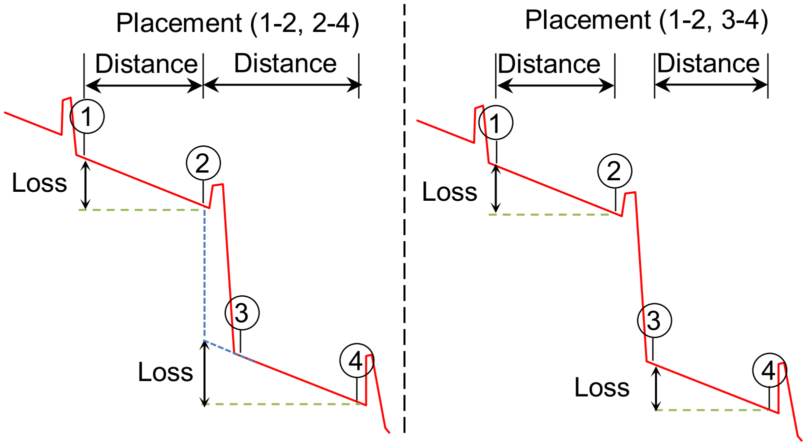


Figure 4.2.3-4 Display of Distance and Loss Between Markers

Reflectance Calculation

This is available when Marker Mode is set to **Movement**. Set the reflectance calculation method.

- **Off**
  Reflectance will not be calculated.
- **Auto**
  The reflectance of any event is reported based on the position of cursor A. The Auto setting is most useful for reflective events that are not close together or close-in to the OTDR. Refer to 7.1.3.1, "Auto Reflectance Calculation".
- Manual
  When set to Manual, the reported reflectance is based on the positions of both cursors (A and B). Refer to 7.1.3.2, "Manual Reflectance Calculation".

ORL Calculation

This is available when Marker Mode is set to **Movement**.

- **A Cursor**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the cursor A position.
- **Origin**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the origin
- **Full Trace**
  The ORL measurement is calculated from the Origin to the last data point, and the Incident Power is attained from the origin.

Type of reflective result

This is available when Marker Mode is set to **Placement**.
Select one you want to display as a result of reflection measurement from the following:

- Reflectance
  Ratio of reflected power to incident power at reflection point
- Reflection
  Difference between peak level at reflection point and backscattered light level immediately before it (height on trace)

Auto Patch-cord Removal

Set the points of events to treat as patch cords. The set number of events are recognized as patch cords and are automatically deleted from the event table.

In an example shown in the following figure, set start point to 1 and end point to 1.

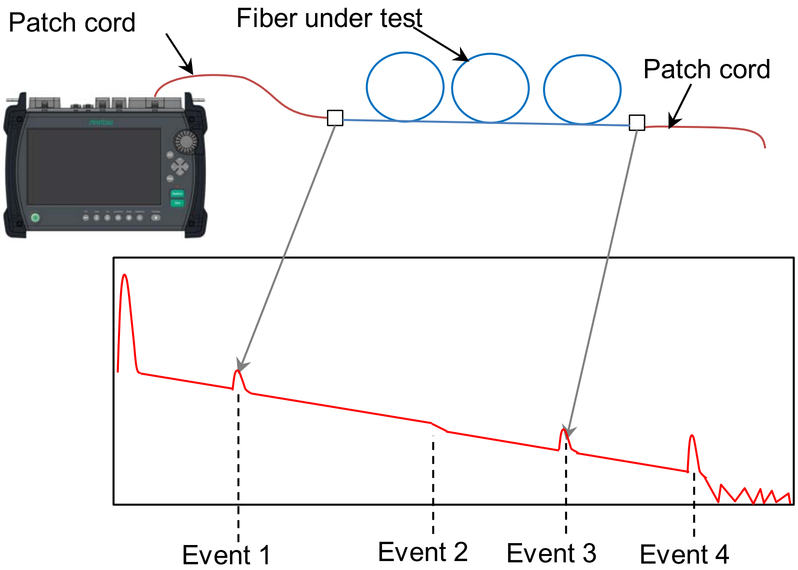


Figure 4.2.3-5 Auto Patch-cord Removal Example

When not using patch cords, set to **None**/**None**.

Note:

The Auto Patch-cord Removal settings are reflected to the measured trace. To make the settings reflected to the trace loaded from a file, touch in **Analyze** in the Analysis screen.

Force Total Loss

When set to **On**, the total loss of the fiber under test is always displayed.

When set to **Off**, *** is displayed if the total loss cannot be calculated.

End Event for ORL Calculation

Set whether to include reflection in Far-End events or not when calculating the ORL.

When **OMIT** is selected, pass/fail evaluation is not performed on the far-end reflection.

Auto Analysis

When set to **On**, OTDR trace analysis is automatically performed at the completion of data collection for the current fiber under test.

Bi-Directional Correlation

Enter the value to define the range for detecting the same event on Overlay trace in reversed direction. The detection range is obtained using the following formula:

$$\mathrm{R}_S = D_E \times \frac{R_A}{100}$$

R_S: Range for detecting the same event
D_E: Fiber End event distance of Primary trace
R_A: Bi-Directional Correlation

Example:

Fiber End event distance of Primary trace:	50 km
Bi-Directional Correction:	4%
Distance of the event on Primary trace:	12.5 km

The distance range detecting the event on Overlay trace: 11.5 to 13.5 km

Continuous Pulse Emission

This is a function to continuously emit a pulsed signal. This function is intended for using in performance test, not for optical fiber measurement.

To emit a continuous pulsed signal, set Test Mode to **Manual** , and then press Start. During continuous pulse emission, you will see the Cal value to set to the power meter.

Note:

In the following cases, continuous pulsed signal emission is not performed:

- Multiple wavelengths are selected.
- Test Mode is set to **Auto**.

4.2.4 AutoSave

Touch **AutoSave** , and you will see the following screen.
AutoSave is a function to automatically save the measurement results upon completion of measurement.
In the AutoSave screen, you can set the directory to save files and the base filename for auto filename generation.

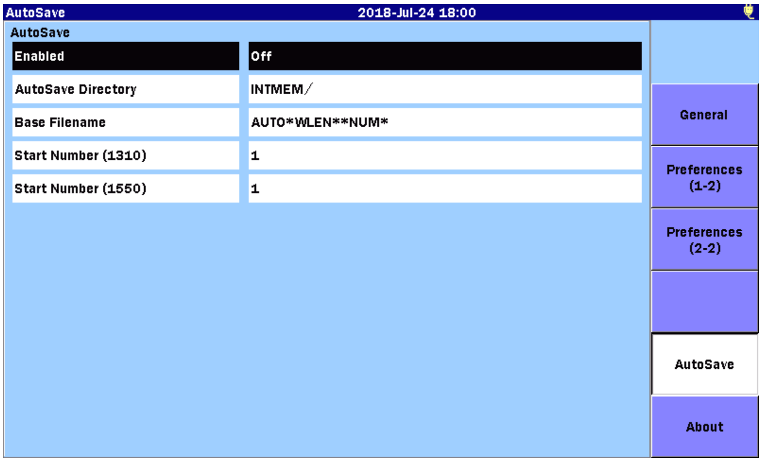


Figure 4.2.4-1 AutoSave Screen

Enabled

- **Off**
  No AutoSave is performed after the measurement is complete.
- **On**
  AutoSave is performed after the measurement is complete.
- **Verify**
  The Save screen appears after the measurement is complete so you can verify the Auto Filename.

AutoSave Directory

The AutoSave Directory field allows you to select the directory into which AutoSave will save files.

Base Filename

The Base Filename field provides a template for use when generating an auto filename. For how to set this parameter, refer to 4.2.5, “AutoSave Filename Parameters”.

Start Number (1310)
Set a start number if you want to add serial numbers when saving results of 1310-nm wavelength measurement to files.

Start Number (1550)
Set a start number if you want to add serial numbers when saving results of 1550 nm wavelength measurement to files.

Some options allows you to set start numbers for other wavelengths.

4.2.5 AutoSave Filename Parameters

In the Base Filename field of the Figure 4.2.4-1 “AutoSave Screen”, set a string used as a base filename when generating filenames with serial numbers.
In the AutoSave Screen, touch **Base Filename**, and you will see the following dialog box.

If a USB keyboard is connected, you can modify the name directly from the keyboard.

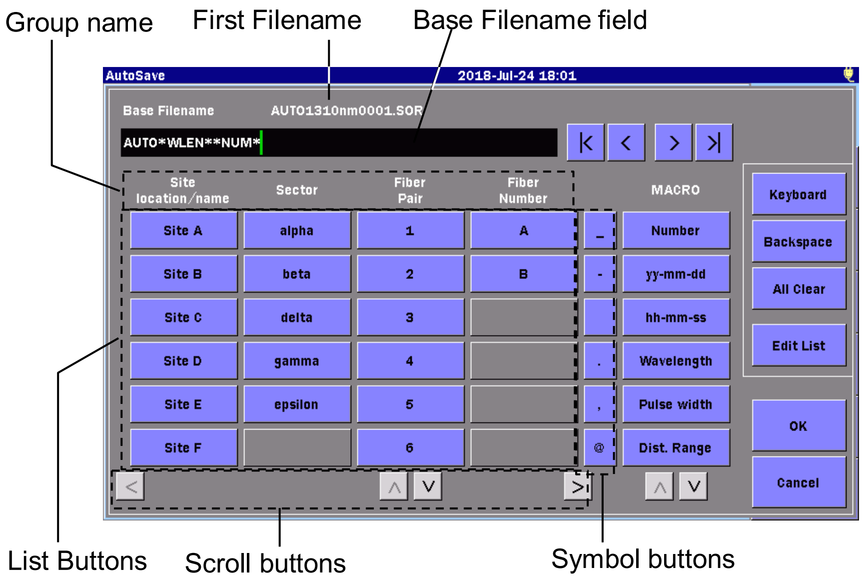


Figure 4.2.5-1 Base Filename dialog box

Base Filename field

The base filename is displayed.
Touch the field, and you can open the Keyboard screen where you can edit the base filename.

First Filename

The actual filename to be automatically generated first is displayed with the MACRO text replaced by actual value(s).

Group Name

The group names of the list buttons are displayed. Touching **Edit List** opens the screen, where you can edit the text.
Group names can be displayed up to two rows. Insert $$ in the location where you want the line to break.

List buttons

Touching the button inserts its name into the filename. Touching **Edit List** opens the screen, where you can edit the text.

Scroll buttons

If some buttons are not visible, scroll the list button view.

Symbol buttons

Insert a symbol(s) in the filename.

MACRO

To insert serial numbers, date and time of measurement, and measurement conditions to filenames, touch the corresponding buttons.

Table 4.2.5-1 MACRO Buttons

Name	Character strings to insert
Number	4 digit-serial number starting with the number in the AutoSave Screen
yy-mm-dd	Digits to represent Year-Month-Day
hh-mm-ss	Digits to represent Hour-Minute-Second
Wavelength	Wavelength used for the measurement
Pulse width	Pulse Width used for the measurement
Dist. Range	Distance Range used for the measurement
Start Loc.	String set for **Start Location** in 3.5.8 “Header”.
Terminal Loc.	String set for **Terminal Location** in 3.5.8 “Header”.

Edit List

Touching **Edit List** opens the following dialog box.

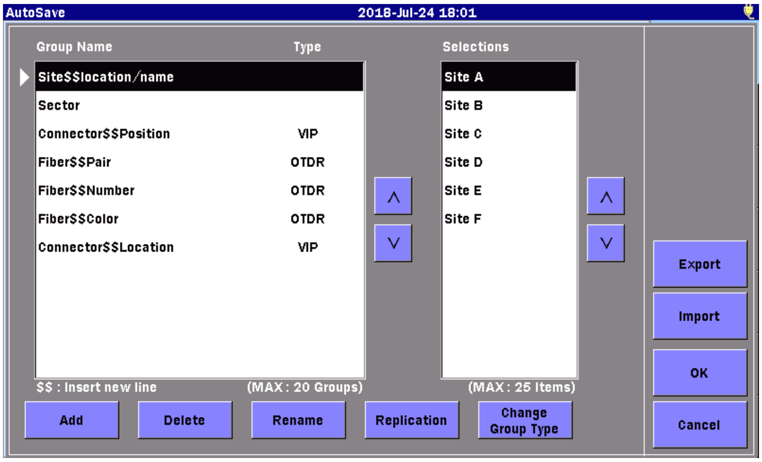


Figure 4.2.5-2 Edit List dialog box

In the **Group Name** or **Selections** box, touch and select an item you want to edit.

Add Adds a new item.

Delete Deletes the selected item.

Rename Edits the selected text.

Replication Replicates the selected item.

Change Group Type

Changes the type of the selected group name. Every time you touch this button, the type of the group name is switched in the order of OTDR, VIP, and (blank). The names of the group list buttons are changed according to the selected application. If you leave the type blank, the list buttons are displayed for all applications.

Table 4.2.5-2 List Edit Dialog box

Type	Displayed Applications
(blank)	All
OTDR	OTDR (Standard) Fiber Visualizer OTDR (Construction)
VIP	VIP

Saving and loading the edited list

Touch **Export**, and you will see the **Export** dialog box.
Select the storage media, and then touch **OK**.
In the root directory of the media, the export file is saved as "ListItem.txt".
Touch **Import**, and you will see the Select List file screen.
Select the file, and then touch **OK**.

4.2.6 About

Refer to 3.3.4 "About".

4.2.7 Thresholds

In the lower part of the OTDR (Standard) screen, touch **Thresholds**, and you will see the following screen. In this screen, set the thresholds used for auto detection of events and those used as criteria for pass/fail evaluation.

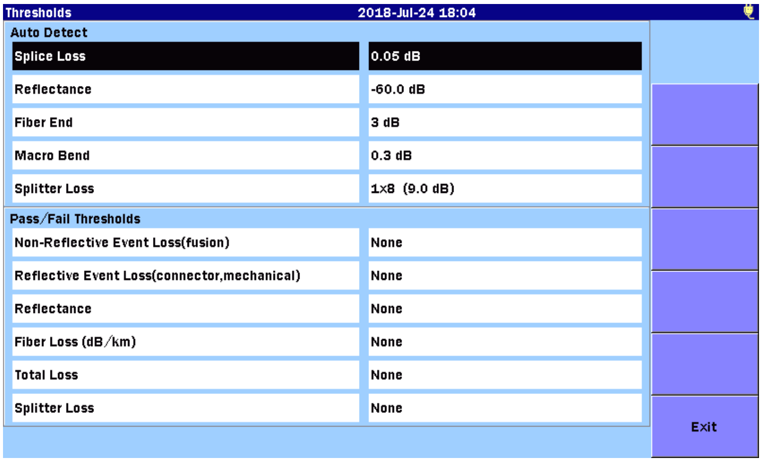


Figure 4.2.7-1 Thresholds Screen

4.2.7.1 Auto Detect

The Auto Detect parameters are thresholds for detecting events.

Splice Loss

Set the minimum splice loss to display in the event table.

Reflectance

Set the minimum reflectance. The event analysis table displays all events with reflectance of this value or less.

Fiber End

Set the minimum loss of the far end event.

Macro Bend

Set the threshold for detecting an event as a macro bend. For macro bend, refer to 4.10, “Wavelength All Mode”.

Splitter Loss

Set the splitter loss to display as a splitter event in the event table.

4.2.7.2 Pass/Fail Thresholds

Pass/Fail Thresholds items are thresholds for pass/fail evaluation of measured values. When set to **None**, pass/fail evaluation is not performed.

Non-Reflective Event Loss(fusion)

If the loss of a non-reflective event (for example, fusion splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflective Event Loss(connector, mechanical)

If the loss of a reflective event (for example, connector and mechanical splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflectance

If the reflectance of an event is less than the threshold, the **Reflect** column of the event table is displayed in red.
When **Type of reflective result** is set to **Reflection** in the Preferences (2-2) screen, if the level difference between events exceeds the threshold, the **Reflect** column of the event table is displayed in red.

Fiber Loss (dB/km)

If the fiber loss of an event exceeds the threshold, the **dB/km** column of the event table is displayed in red.

Total Loss

If the total loss of the far-end event exceeds the threshold, the **Cum. Loss** column of the event table is displayed in red. If the event summary is displayed, the total loss of the event summary is also displayed in red.
If the total loss is less than the threshold, the **Cum. Loss** column of the far-end event in the event table and the total loss of the event summary are displayed in green.

Splitter Loss

The **Loss** column of the event table is displayed in red if the splitter loss exceeds the sum of the following:

- **Splitter Loss** for **Auto Detect**
- **Splitter Loss** for **Pass/Fail Thresholds**

For example, if **Splitter Loss (1×2)** for **Auto Detect** is 4.1 dB and Splitter Loss for Pass/Fail Thresholds is 1.0 dB, the loss of 1×2 splitter event exceeding 5.1 dB is evaluated as “fail”.

4.3 Performing Measurement

The ACCESS Master performs measurement using the settings configured in 4.2 “Configuring OTDR (Standard) Mode Settings”. This section assumes that you have already configured the settings.

First of all, connect the optical fiber under test to the ACCESS Master. For how to connect the optical fiber, refer to 2.4 “Connecting Fiber to a Measurement Port”.

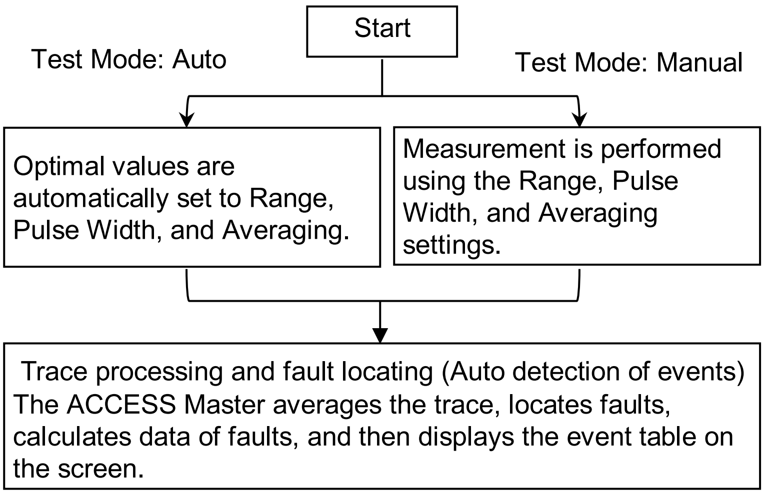
CAUTION

Disconnect any devices (for example, communication devices) connected to the optical fiber under test before measurement.

The ACCESS Master outputs high-power optical pulses that can damage the photoreceiving elements.

4.3.1 Averaging Measurement

Press Start. Then, the ACCESS Master performs the following operations and displays the event table on the screen.



4.3.2 Realtime Measurement

Press Realtime. The ACCESS Master sets values of range, pulse width, and averaging based on the test mode in the same way as averaging measurement, and then starts realtime measurement.

Realtime measurement continues unless ESC or Realtime is pressed. The ACCESS Master does not perform auto detection of events nor auto save.

When you press Start during realtime measurement, the ACCESS Master ends realtime measurement and starts average measurement.

4.4 Ending In-Progress Measurement

When measurement is started by pressing Start, the ACCESS Master displays the screen as shown in Figure 4.4-1 and performs averaging. This section explains how to end the measurement in progress.

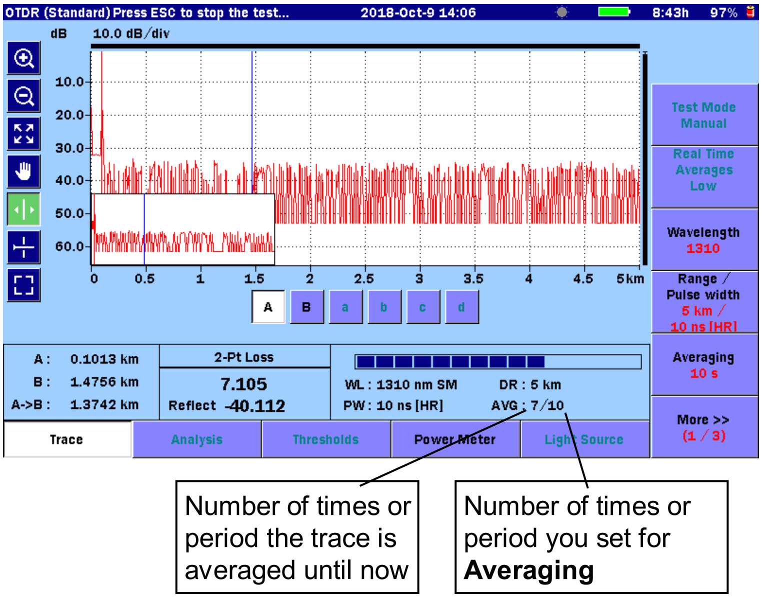


Figure 4.4-1 OTDR (Standard) Mode Screen—Measurement In Progress

You can see the number of times (or period) set for **Averaging** and the number of times (or period) the trace is averaged in the current measurement.

If you want to abort the measurement before the number of times (or period) the trace is averaged reaches the value set for **Averaging**, press ESC or Start. Even if the measurement is aborted, the ACCESS Master performs auto detection of events.

4.5 Trace Screen

The Trace screen appears when you start OTDR (Standard).

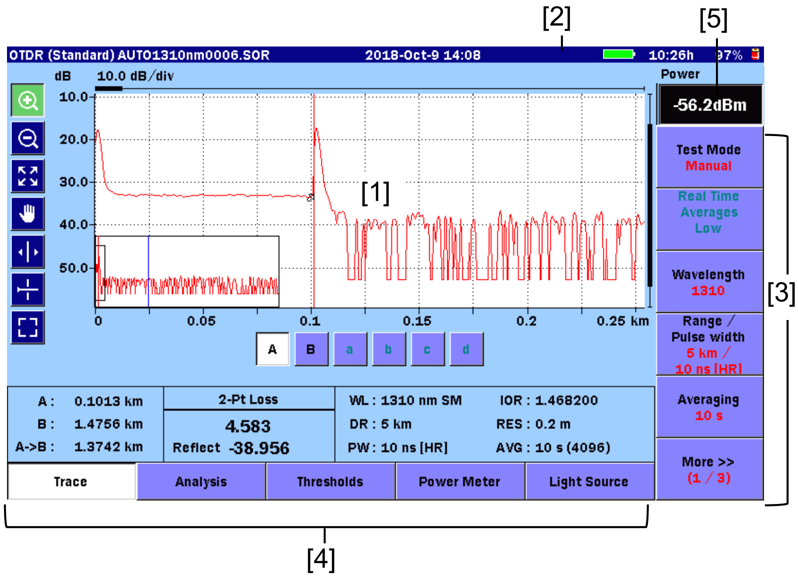


Figure 4.5-1 OTDR (Standard) Trace Screen

[1] Trace Graph
Refer to 4.5.1 “Trace Graph”.

[2] Laser On Icon
This icon flashes whenever a laser is firing.

[3] Softkeys
Refer to 4.8.1 “Softkey Displays”.

[4] Extended softkeys
Refer to 4.8.4 “Extended Softkeys”.

[5] Power, Loss display
Refer to 4.12 “Power Meter”.

4.5.1 Trace Graph

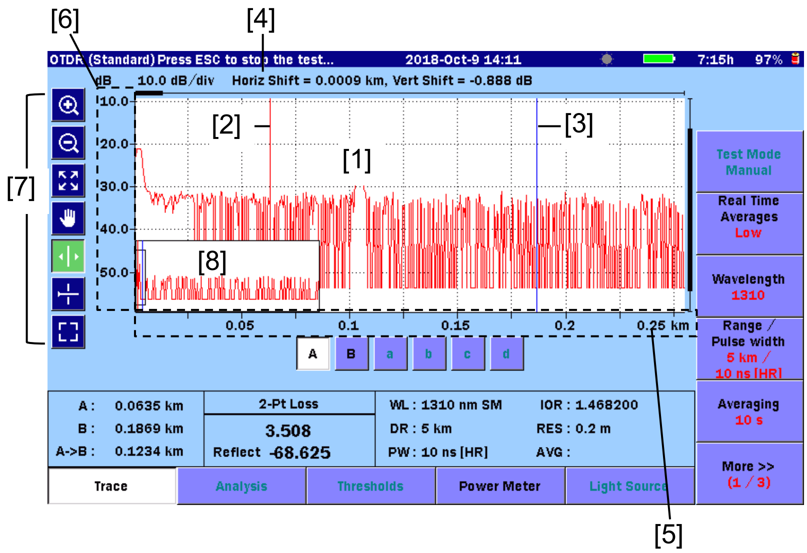


Figure 4.5.1-1 Names of Trace Graph Items

[1]	Trace Waveform(s)	[5]	Horizontal Axis scale
[2]	Cursor A	[6]	Vertical Axis scale
[3]	Cursor B	[7]	Graph control icons
[4]	Horizontal/Vertical offset	[8]	Trace Overview window

Trace Waveform

The Trace Waveform (or Trace) is the downward sloping line going from left to right that connects the data points collected during a test.

Up to four traces can be displayed simultaneously: a primary trace and up to three overlay traces.

This graph area contains bold lines at the top and on the right that indicate which part of the entire trace is displayed now.

Cursor

When **Marker Mode** is **Movement**, the cursors are the two vertical lines in the graph area. The cursors allow you to extract power and distance information from the trace graph.

The active cursor is displayed in red and the inactive cursor is displayed in blue.

When **Marker Mode** is **Placement (1-2,2-4)** or **Placement (1-2,3-4)**, only one cursor is displayed.

Horizontal/Vertical offset

The primary trace data can be shifted horizontally or vertically by using the Shift Mode softkeys and the Rotary knob.
The distance offset (horizontal) and decibel offset (vertical) are displayed above the trace graph.

Scale

The vertical axis scale is located on the left side of the trace graph and is expressed in dBs, while the horizontal axis scale is located at the bottom of the trace graph.
You can change the unit for the vertical axis at **Distance display Units** shown in 4.2.2 “Preferences (1-2)”.

Graph control icons

You can control the graph using the icons. Selected icons are displayed in green.

Table 4.5.1-1 Graph Control Icons

Icon	Explanation
	Expands the area selected by dragging.
	Contracts the view with the touched point displayed in the center.
	Displays the entire trace.
	Moves the trace by dragging.
	Moves the active cursor or marker to the touched position. The rotary knob can also move the cursor.
	Displays a horizontal line at the level of the active cursor. When **Marker Mode** is **Movement**, it switches display modes of the cursor in the following order: Hide level cursor → Show level cursor → Hide cursors
	Enlarges the graph. This icon does not appear in the Analysis Screen.

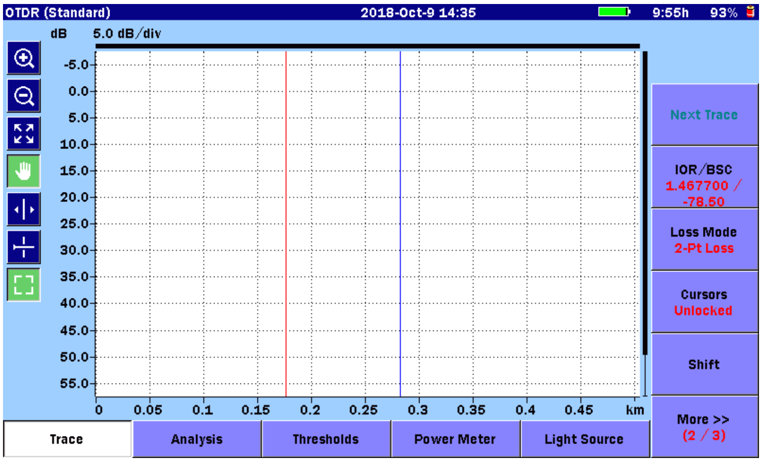


Figure 4.5.1-2 Enlarged View

Trace Overview window

When, in 4.2.2 "Preferences (1-2)", **Trace Overview** is set to **On**, the current trace is displayed entirely. This is helpful in determining the location of an expanded section on the main view.

4.5.2 Expanding and Contracting the Trace Display

Expand and contract the trace display when:

- Precisely positioning the cursor(s)
- Adjusting the LSA intervals

To expand an area:

1. Touch .
2. Drag a desired area in the trace graph to expand the view. You can also expand and contract the view by pressing the arrow keys.

   [>]: Horizontally expands the view with the active cursor or marker as the center.

   [<]: Horizontally contracts the view with the active cursor or marker as the center.

   [∧]: Vertically expands the view.

   [∨]: Vertically contracts the view.

To contract an area:

1. Touch .
2. Touch a point in the trace graph area, and you can contract the view, which displays the point in the center.
   You can also expand and contract the view by pressing the arrow keys.

To display the entire trace, touch or press ESC.

Note:

If ESC is pressed during measurement, the measurement ends.

4.5.3 Selecting and Positioning Cursors

Setting the Active Cursor

When **Marker Mode** is **Movement**, touch **A** and **B**.
You can also switch the cursors by using the rotary knob or by pressing Enter.

To precisely position the cursor

1. Touch .
2. Drag a desired area in the trace graph to expand the view.
   You can also expand the view by pressing the arrow keys.
3. Turn the rotary knob to move the cursor to the desired position.
   When **Marker Mode** is **Placement**, you can switch the cursor movement speed by pressing the rotary knob. By touching ① to ④, markers are displayed at the cursor positions.

4.5.4 Marker Mode: Movement

Cursors and markers displayed in the Trace screen vary depending on what is set for **Marker Mode** in 4.2.3, "Preferences (2-2)".

When set to **Movement**, Cursor A, Cursor B and Markers a to d are displayed.

When set to **Movement**, you can move the selected active cursor or marker by turning the rotary knob or by touching .

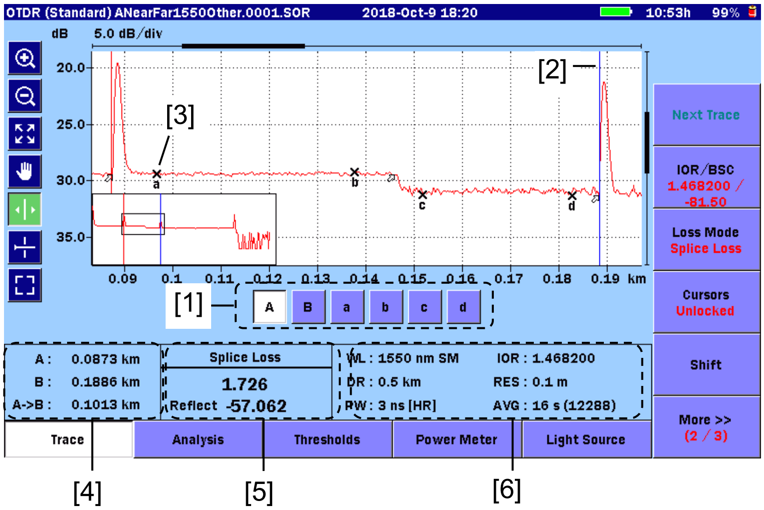


Figure 4.5.4-1 Cursors and Markers for Movement

[1] Cursor and Marker buttons

A, B: Selects an active cursor.
a to d: Selects an active marker.
These are available if Loss Mode is set to **Splice Loss**, **2-Pt LSA** or **dB/km LSA**.

You can also toggle the active cursor and marker by pressing Enter.

[2] Cursor

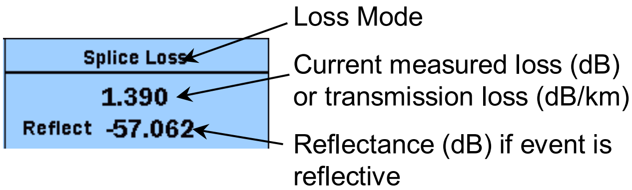
[3] Marker

[4] Cursor distance information

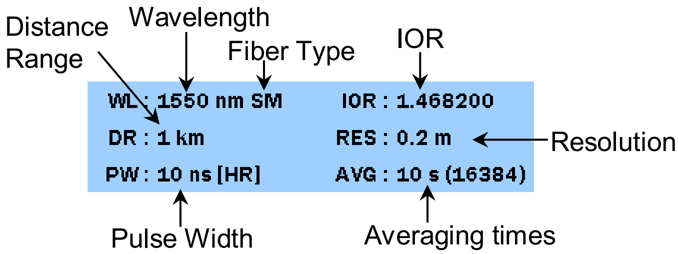
A: Distance from the origin of the trace to Cursor A
B: Distance from the origin of the trace to Cursor B
A->B: Distance between Cursor A and Cursor B

As you move the cursors, the cursor distance information updates simultaneously.

[5] Loss mode, Measurement, and Reflectance



[6] Test Parameters
Test parameters used for test are displayed.
A progress bar is displayed during measurement.



WL:	Wavelength, Fiber Type	IOR:	IOR
DR:	Distance Range	RES:	Resolution
PW:	Pulse Width	AVG:	Averaging times (Number of accumulations by hardware)

Test parameters for the primary trace are displayed for a trace recalled from a file.
The Pulse width value is followed by the Dead-zone mode.

- **ER**: Enhanced Range
- **HR**: Standard

4.5.5 Marker Mode: Placement

A cursor and Markers ① to ④ are displayed in the Trace screen when **Marker Mode** is set to **Placement (1-2,2-4)** or **Placement (1-2,3-4)** in 4.2.3, "Preferences (2-2)".

When set to **Placement**, you can move the cursor by turning the rotary knob or by touching . The marker positions cannot be changed.

Move the cursor to the precise position and touch ① to ④, and you can position the markers.

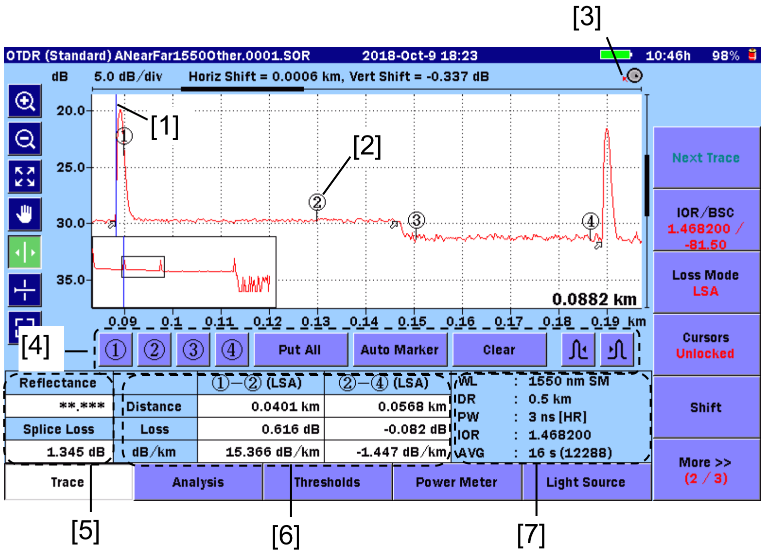


Figure 4.5.5-1 Cursor and Markers for Placement

[1] Cursor

[2] Markers

[3] Rotary Knob icon

[4] Marker buttons

[5] Reflectance, Splice Loss, ORL

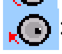
[6] Distance, Loss, dB/km

[7] Test parameters

Rotary knob icon

This icon shows the speed at which the cursor moves when turning the rotary knob. The cursor movement speed is toggled by pressing the rotary knob.

: The cursor moves quickly.

: The cursor moves slowly.

Distance, Loss, dB/km

When set to **Placement (1-2,3-4)**, the distance, loss and dB/km between Markers ①-② and ③-④, respectively.

When set to **Placement (1-2,2-4)**, the distance, loss and dB/km between Markers ①-② and ②-④, respectively.

(2PA): The loss is obtained from the level difference between the two markers.

(LSA): The loss is obtained by linear approximation of the trace between the two markers, using least squares method.

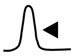
Marker buttons

① to ④: Places the marker of its number at the cursor position.

Put All: Places the markers as follows:
Marker ①—On the left side of ②
Marker ②—Cursor position
Marker ③—Falling point
Marker ④—On the right side of ③

Auto Marker: Locates the point of change near the cursor in the displayed trace and automatically places Markers ①, ②, ③ and ④. If a peak is detected between ② and ③, a triangle marker ▽ is placed at the peak. If there is no point of change, a marker is placed near the center of the graph area.

Clear: Clears all markers.

 : Moves the marker to the point of change in the leftward of the cursor.

 : Moves the marker to the point of change in the rightward of the cursor.

Note:

If the cursor is hidden by touching , ① to ④, **Put All**, and **Auto Marker** are not available.

Reflectance, Splice Loss, ORL

Reflectance

Displays the obtained reflectance or reflection amount (level difference). The displayed value will be followed by **(S)** if the measurement is not performed accurately due to saturation.

There are three reflectance measurement methods. Refer to 7.2.3 “Reflectance Measurements” for details.

Splice Loss

Displays the splice loss at the position of Marker ② obtained by linear approximation between Markers ① and ② and between Markers ③ and ④. When set to **Placement (1-2, 2-4)**, the obtained splice loss is displayed.

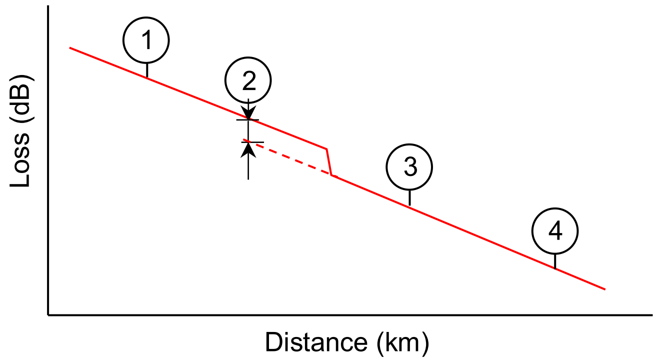


Figure 4.5.5-2 Splice Loss

ORL

Displays the ORL value obtained from the integral between Markers ① and ②. This is displayed when only Markers ① and ② are placed.

The displayed value will be followed by **(S)** if the measurement is not performed accurately due to saturation. Refer to 7.2.4 “ORL Measurements” for details.

Test Parameters

Test parameters used for test are displayed. Test parameters for the primary trace are displayed for a trace recalled from a file. The Pulse width value is followed by the Dead-zone mode.

- **ER**: Enhanced Range
- **HR**: Standard

4.5.6 Connection Check

When, in 4.2.2 “Preferences (1-2)”, **Connection Check** is set to **On**, the ACCESS Master checks whether the optical fiber is correctly connected before starting measurement.

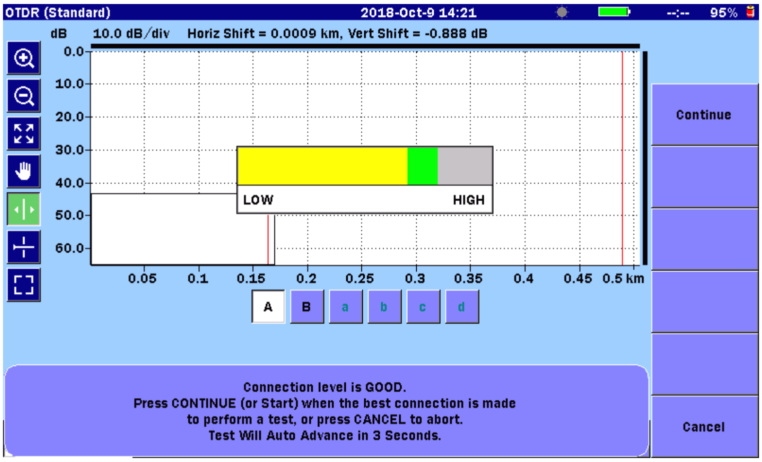


Figure 4.5.6-1 Connection Check Screen

GOOD connection

The gauge is green when connection is good. The closer the bar in the connection gauge extends to “HIGH” end, the better the connection is.

To run the test, touch **Continue** or press Start.

BAD connection

The gauge is displayed in red in case of poor connection and displayed in yellow if the connection is not so good. To run the test, touch **Continue** or press Start.

If the gauge is displayed in red or yellow, the fiber needs cleaning. If the connection state is not improved even if the fiber is cleaned, the fiber needs to be replaced.

Note:

Fibers shorter than approximately 50 meters (160 ft.) will generally result in a low connection.

Use up to 5-m long patch cords. If the patch cord is longer than 5 m, the gauge may be displayed in red.

4

OTDR (Standard)

4.6 Analysis Screen

In the Trace screen, touch **Analysis**, and you will see the Analysis screen.

The Analysis screen displays the event table and the trace, which shows markers at event locations.

- Marker for event not selected in event table
- Marker for event selected in event table

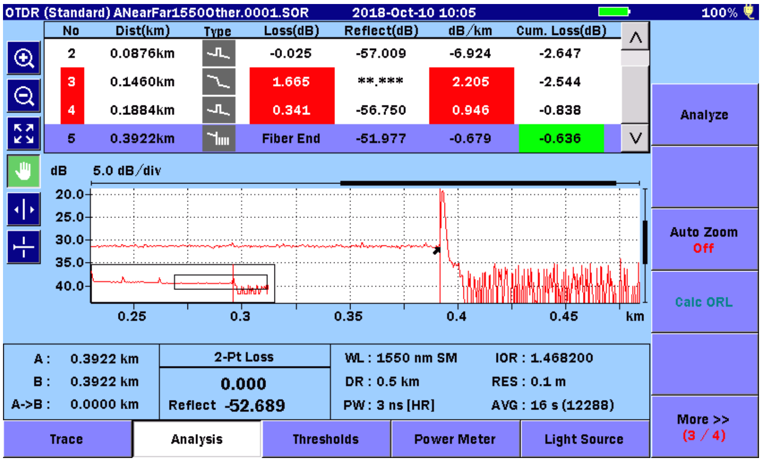


Figure 4.6-1 OTDR (Standard) Analysis Screen

Analysis can be executed in one of two ways.

Auto Analysis

Set **Auto Analysis** to **On** in the 4.2.3 "Preferences (2-2)" to automatically display the Analysis screen at the completion of each test.

Manual analysis

To perform trace analysis, touch **Analyze**.

Analyze is displayed by touching **More**.

Note:

If the Auto Detect thresholds in 4.2.7, "Thresholds" are changed, touch **Analyze**.

4.6.1 Event Table

In fiber analysis, an “event” is considered to be a distinct deviation from normal fiber attenuation:

- a lossy connection (microbend, connector, or splice)
- a reflective connection (connector or fiber break)
- the end of fiber

The event table displays the events that meet at least one of the Auto Detect thresholds set in 4.2.7, “Thresholds”. As a result of comparison with the Pass/Fail Thresholds, the values evaluated as FAIL are highlighted in red.

If values are not obtained by analysis, “**.***” is displayed instead.

No	Dist(km)	Type	Loss(dB)	Reflect(dB)	dB/km	Cum. Loss(dB)
2	0.0910km		-0.134	-57.027	**.***	-2.655
3	0.1495km		1.285	**.***	4.196	-2.544
4	0.1918km		0.361	-56.868	8.089	-0.916
5	0.3957km		Fiber End	-51.977	-0.396	-0.636

Figure 4.6.1-1 Event Table

No

Event number for the faults in the graph area (1 to 99, counted from the left)

Dist

Displays the distance from the ACCESS Master to the event. Set the unit for distance measurement at **Distance display Units** in 4.2.2, “Preferences (1-2)”.

When the start point is set at **Auto Patch-cord Removal** in 4.2.3, “Preferences (2-2)”, the distance from the start point event is displayed. When the shift amount is set in 4.8.3, “Shifting Trace Data”, the displayed distance includes the shift amount

Type

Displays the icons, which represent the types of events.

Table 4.6.1-1 Icons for Types

Icon	Explanation
	Reflective Event Reflection from an splice such as a Fresnel reflection.
	Non-Reflective Event Non-reflective events include such low loss events as fusion splices.
	Grouped Event Events spaced too close to each other for Analysis to distinguish them as separate events are reported as Grouped events. In the event table, the result of the entire group is displayed at the first event of the group.
	Far End Event Far end of the optical fiber under test.
	Questionable End Event Events out of dynamic range or out of distance range. ● Out of Range The trace reaches the noise level before a far end or break of the optical fiber cable is detected. ● Out of Distance The trace reaches the end point set for **Dist. Range** before a far end or break of the optical fiber cable is detected.
	Splitter Event Loss due to fiber splitter.

Loss

Displays the event loss.

Reflect

Displays the reflectance or level difference of the reflective event. You can change this item at **Type of reflective result** shown in 4.2.3, “Preferences (2-2)”.“***” is displayed for non-reflective events. The value is followed by S if it is not measured properly.

dB/km

Displays the value obtained by dividing “Loss between events” by “Distance between events”.

Cum.Loss

Displays the value obtained by dividing “Loss from the connection point of the ACCESS Master” by “Distance between events”.

4.7 Editing Events

This section explains how to edit events when:

- Saving an event table, including splices not located by auto detection.
- Deleting events falsely detected as faults due to noise. .

Touch **More** until the following screen is displayed.

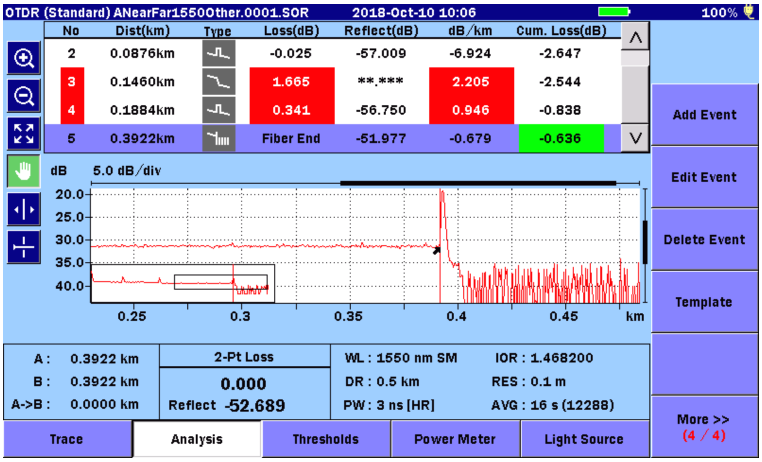


Figure 4.7-1 Analysis Screen Softkeys (4/4)

The following editing softkeys are only available when an Event Table is displayed:

Add Event
Edit Event
Delete Event
Template

When **Marker Mode** is **Placement (1-2,3-4)**, only **Delete Event** and **Template** are available.

4.7.1 Adding an Event

4.7.1.1 Marker Mode: Movement

Note:

Add Event is available when **Loss Mode** is **Splice Loss**.
When you touch **Add Event** with **Loss Mode** set to any other mode, you will see the following message.

> Cannot add event.
> Loss mode must be set to splice loss.

1. Touch **Trace** to display the Trace screen.
2. Move Cursor A to the position to add a new event.
3. Move Markers a, b, c and d to the positions ahead and behind the event to check the splice loss. For details on marker positions, refer to 7.1.2.2, “Splice Loss”.
   When **Reflectance Calculation** is **Manual**, move Cursor B to the peak of the reflectance.
4. Touch **Edit Event**.
5. Touch **Add Event**, and you will see the following dialog box.

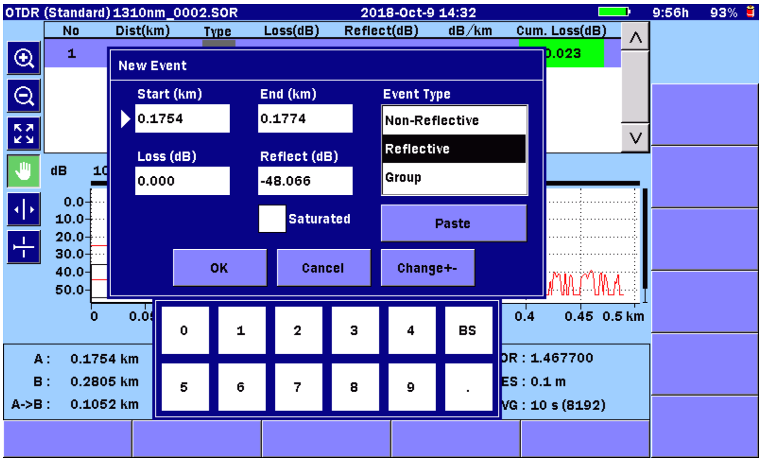


Figure 4.7.1.1-1 New Event Dialog Box

The **Loss** and **Reflect** fields display the splice loss and reflectance calculated from the cursor level and marker level.

6. Touch the field to edit the value.
   To revert the changes, touch **Paste**.

Note:

When **Event Type** is set to **Non-Reflective** , the value for **Reflect** cannot be set.

The **Saturated** check box is not available.

7. To add the event, click **OK**.
   In the event table, an asterisk (*) is displayed at the beginning of the row for the event added to the trace.

Note:

Even after an event is added, you can restore the previous trace and event table. Touch **More**, and then touch **Analyze.**

4.7.1.2 Marker Mode: Placement (1-2,2-4)

1. Touch **Trace** to display the Trace screen.
2. Move Markers ① to ④ to the positions ahead and behind the event to check the splice loss. Place them as follows.
   Distance from event to marker: ①<②<③<④
   For details on marker positions, refer to 7.2.2, "Splice Loss Measurements".

Note:

You can add an event by placing Markers ① and ② only. In this case, the ACCESS Master calculates the loss between the two points.

3. Touch Edit Event.
4. Touch **Add Event**, and you will see a dialog box.
5. Touch the field to edit the value.

Note:

When **Event Type** is set to **Non-Reflective** , the value for **Reflect** cannot be set.

The **Saturated** check box is not available.

6. To add the event, click **OK**.
   In the event table, an asterisk (*) is displayed at the beginning of the row for the event added to the trace.

Note:

Even after an event is added, you can restore the previous trace and event table. Touch **More**, and then touch **Analyze**.

4.7.2 Editing an Event

When enlarging an event that is obtained by auto detection upon completion of measurement, you may find the marker placed at the event (for example, rising point) is out of the event position due to noise. **Edit Event** is used to modify the information on the event position to the accurate one.

4.7.2.1 Marker Mode: Movement

Note:

Edit Event is available when **Loss Mode** is **Splice Loss.** When you touch **Edit Event** with **Loss Mode** set to any other mode, you will see the following message.

Cannot edit event. Loss mode must be set to splice loss.

1. Display the event table for the current trace.
2. In the event table, touch the row for the event you want to edit. If the following steps are already complete, you can set the calculated results and start position value by touching **Paste** in the Edit Event dialog box.

   a Move Cursor A to the accurate position of the event.

   b Move Markers a, b, c and d to the positions ahead and behind the event to check the splice loss. For details on marker positions, refer to 7.1.2.2, "Splice Loss".
   When **Reflectance Calculation** is **Manual**, move Cursor B to the peak of the reflectance.

3. Touch **Edit Event**, and you will see the following dialog box.

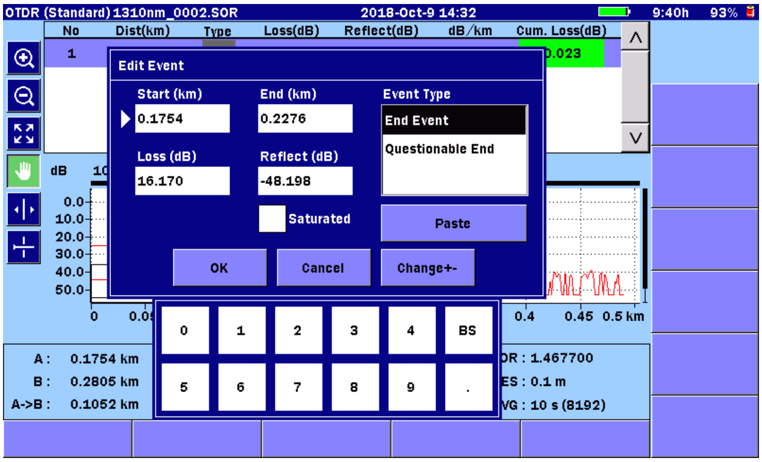


Figure 4.7.2.1-1 Edit Event Dialog Box

4. Touch the field to edit the value.

Note:

When **Event Type** is set to **Non-Reflective**, the value for **Reflect** cannot be set.

The **Saturated** check box is not available.

5. Touch **OK** to save the changes and close the dialog box.
In the event table, an asterisk (*) is displayed at the beginning of the row for the edited event.

Note:

Even after the event is edited, you can restore the previous trace and event table. Touch **More**, and then touch **Analyze**.

4.7.2.2 Marker Mode: Placement (1-2,2-4)

1. Touch **Trace** to display the Trace screen.

2. Move Markers ① to ④ to the positions ahead and behind the event to check the splice loss. Place them as follows.
Distance from event to marker: ①<②<③<④
For details on marker positions, refer to 7.2.2, “Splice Loss Measurements”.

3. Touch **Edit Event**, and you will see the dialog box.

4. Touch the field to edit the value.

Note:

When **Event Type** is set to **Non-Reflective**, the value for **Reflect** cannot be set.

The **Saturated** check box is not available.

5. Touch **OK** to save the changes and close the dialog box. In the event table, an asterisk (*) is displayed at the beginning of the row for the edited event.

Note:

Even after the event is edited, you can restore the previous trace and event table. Touch **More**, and then touch **Analyze**.

4.7.3 Deleting an Event

1. Display the event table for the current trace.
2. In the event table, touch the row for the event you want to delete.
3. Touch **Delete Event**, and you will see the following message.

Do you want to delete the event at distance.*****km ?

Note:

Far-end event and uncertain far-end event cannot be deleted. Then, you will the following message.

Cannot delete the end event.

4. Touch **OK** to delete the event.

Note:

Even after the event is edited, you can restore the previous trace and event table. Touch **More**, and then touch **Analyze**.

4.8 Softkeys

This section explains the softkeys displayed for OTDR (Standard) mode.

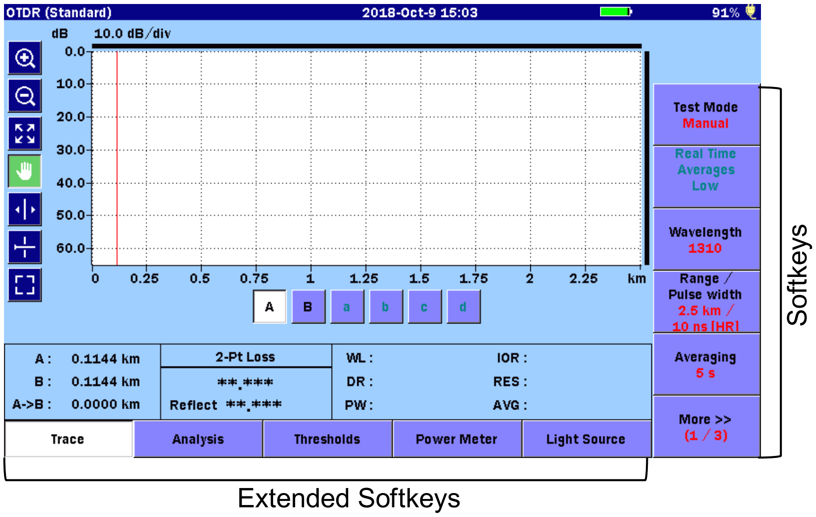
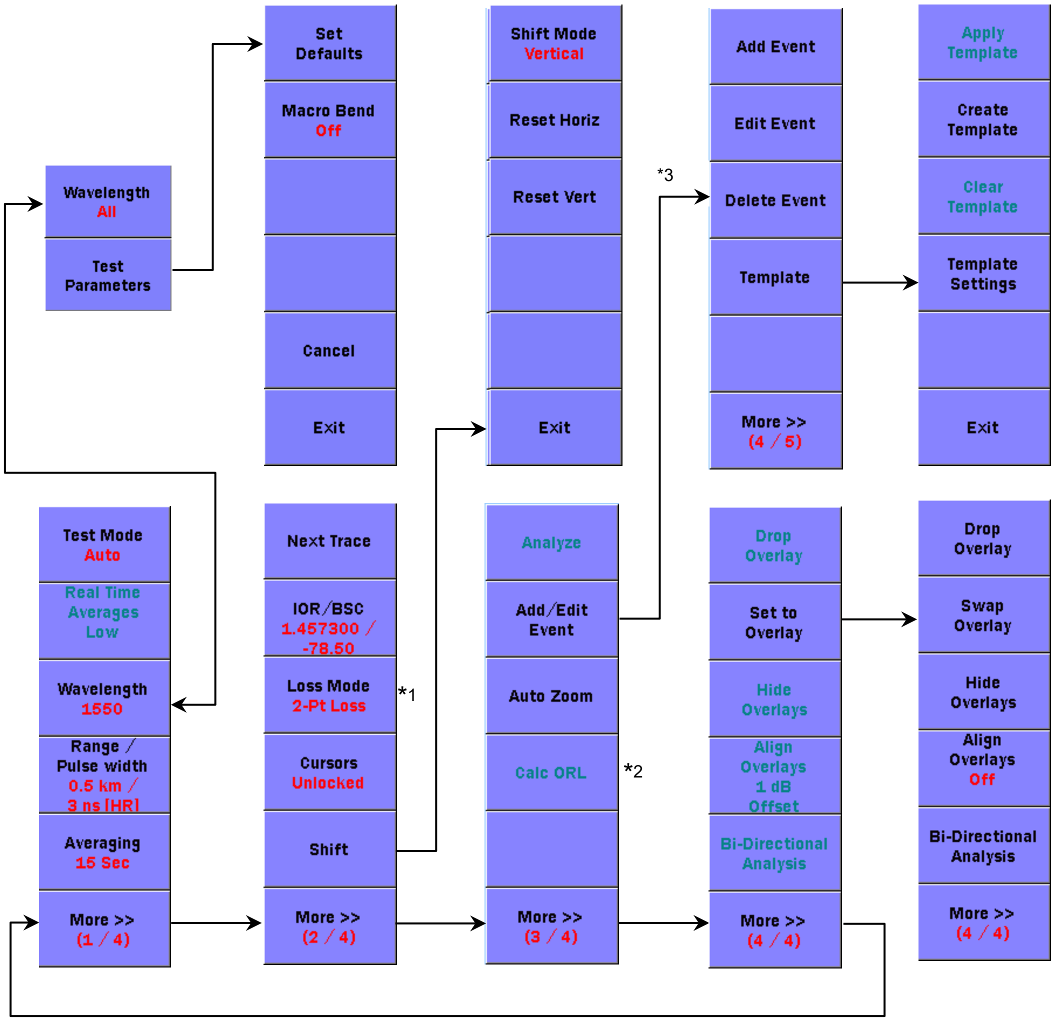


Figure 4.8-1 Softkeys for OTDR (Standard) Mode

4.8.1 Softkey Displays

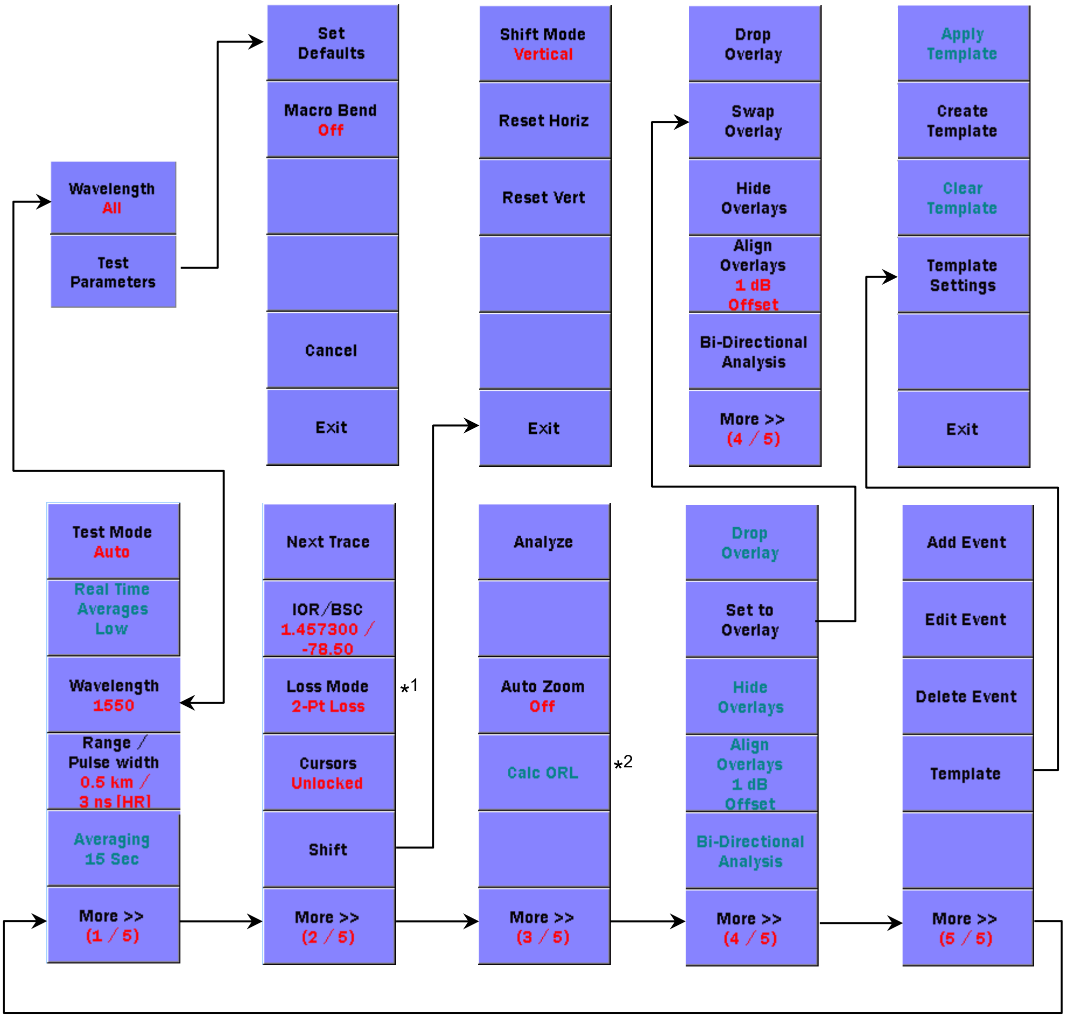
To switch the softkey displays, touch **More**.

Overlay-related softkeys (4/4 in Figure 4.8.1-1and 5/5 in Figure 4.8.1-2) are displayed only when at least one overlay trace is loaded.



*1: Options are deferent between **Movement** and **Placement**.
*2: This is displayed for **Movement**.
*3: The Analysis screen is displayed.

Figure 4.8.1-1 Trace Screen Softkeys



*1: Options are deferent between **Movement** and **Placement**.
*2: This is displayed for **Movement**.

Figure 4.8.1-2 Analysis Screen Softkeys

4.8.2 Measurement Parameters

Test Mode

Auto:

Performs measurement using optimal values automatically detected for the range, pulse width and averaging.

Manual:

Performs measurement using the values preset for the range, pulse width and averaging.

Real Time Averages

This is available for realtime measurement.

High:

High sweep speed suitable for monitoring fluctuations in a trace.

Low:

Longer sweep time, which, however, can minimize noise.

Wavelength

Switches the wavelength used for measurement. Wavelength can be changed even during measurement. In this case, the measurement restarts with the new wavelength setting.
When set to **All**, the measurement is continued while switching the wavelength for an identical measurement port.

Range/Pulse Width

Sets the distance range, resolution, pulse width and dead-zone. (This is displayed when **Wavelength** is other than **All**.)

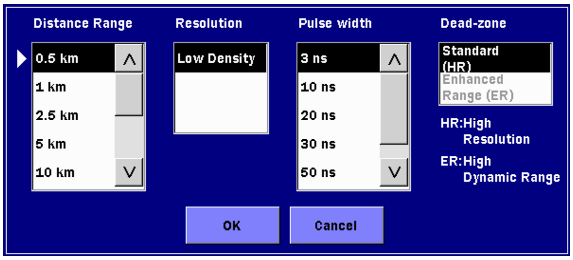


Figure 4.8.2-1 Range/Pulse Width Dialog Box

Two dead-zone modes are available.

Standard (HR)

Performs short dead-zone measurement.

Enhanced Range (ER)

Allows high dynamic range measurement.
This is used to measure a furcated optical fiber that is a splitter included in the PON system.

Touch **OK** to save the specified parameters, and the saved parameters are used for next measurement. Press Start or Realtime to start measurement using the specified parameters.

Note:

If **Pulse Width** is set to the value out of the range from 50 to 2000 ns, this is set to **Standard (HR)**.
Enhanced Range (ER) can be set for the SM port.

Test Parameters

This is displayed when **Wavelength** is **All**. Refer to 4.10, "Wavelength All Mode".

Averaging

Sets the number of times or period for averaging.
Select the unit (**Times** or **Sec**) at **Unit of averaging** in 4.2.2, "Preferences (1-2)".
Touch **OK** to save the specified parameters, and the saved parameters are used for next measurement. Press Start to start measurement using the specified parameters.
If this is changed during averaging measurement, the measurement restarts from the beginning using the new setting.
Even if this is changed during realtime measurement, average measurement does not start.

Next Trace

This is available only when at least one overlay trace is displayed. Touching this softkey changes the display of the following. This is not available during measurement.

- Display order of traces (color)
- Event Table
- Test Parameters

- Measurement results using markers
- Event Summary

IOR/BSC

Sets the IOR (Index of Refraction) and BSC (Backscatter Coefficient).

Select the fiber type, and you will see IOR and BSC suitable for the fiber.

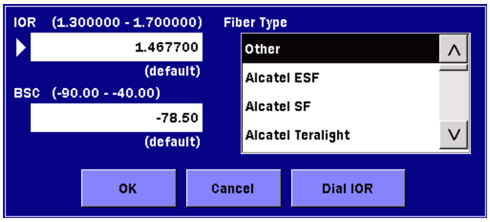


Figure 4.8.2-2 IOR/BSC Dialog Box

Dial IOR:

Allows you to change the IOR in response to the distance to the event or cursor position while checking the trace.

Touch **OK** to save the specified parameters, and the saved parameters are used for next measurement. Press Start or Realtime to start measurement using the specified parameters.

Note:

When **Wavelength** is **All**, **IOR** and **BSC** cannot be changed.

Loss Mode

Sets the Loss Mode (loss calculation mode).

When **Marker Mode** is **Movement**, you will see the following dialog box.

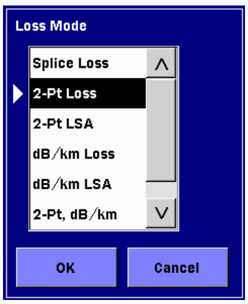


Figure 4.8.2-3 Loss Mode Dialog Box

When **Marker Mode** is **Placement**, switch between **2PA** and **LSA** by touching this softkey.
If this is changed during measurement, the measurement continues using the new setting.

For details on loss calculation methods, refer to 7.1.2 "Loss Measurements".

Cursors

When **Marker Mode** is **Movement**:

Lock: Cursor A moves interlocking with Cursor B.
Unlocked: Cursors A and B can be moved separately.

When **Marker Mode** is **Placement**:

Lock: Markers ① to ④ move interlocking with the cursor.
Unlocked: Markers ① to ④ do not move even if the cursor is moved.

Shift

Shifts the vertical and horizontal axes of the graph. Refer to 4.8.3 "Shifting Trace Data".

Analyze

Performs trace analysis.

Add/Edit Event (Trace screen)

Displays the Analysis screen, which contains the following softkeys: **Add Event**, **Edit Event**, **Delete Event** and **Template**

Auto Zoom

For the Trace screen

Enlarges the event closest to Cursor A.

For the Analysis screen

When set to **On**, the selected event is displayed in enlarged view.

Calc ORL

Displays the calculated ORL value.
This softkey is displayed when **Marker Mode** is set to **Movement** in 4.2.3, "Preferences (2-2)". Also, this is available when **Loss Mode** is **ORL**.

Add Event

Refer to 4.7.1 “Adding an Event”.

Edit Event

Refer to 4.7.2 “Editing an Event”.

Delete Event

Refer to 4.7.3 “Deleting an Event”.

Template

Refer to 4.9 “Template Mode”.

Drop Overlay
Swap Overlay
Hide Overlays
Align Overlays
Bi-Directional Analysis

Refer to 4.11 “Trace Overlay Management”.

4.8.3 Shifting Trace Data

The primary trace data can be horizontally or vertically shifted to adjust the view and event locations. The distance offset (horizontal) and decibel offset (vertical) are displayed above the trace graph.

Touch **Shift**, and you can change the softkey displays.

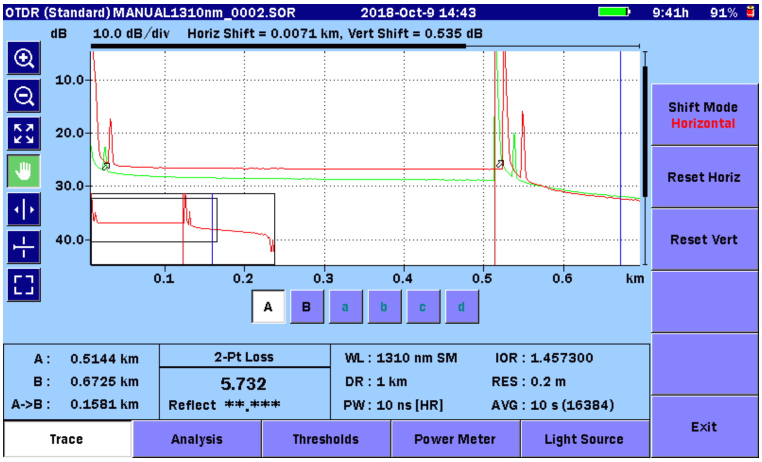


Figure 4.8.3-1 Shift-Related Softkeys

Shift Mode

Switches **Shift Mode** between **Horizontal** and **Vertical**. To set the shift amount, turn the rotary knob.

Reset Horiz

Resets the horizontal shift to 0 (zero).

Reset Vert

Resets the vertical shift to 0 (zero).

4.8.4 Extended Softkeys

Figure 4.8.4-1 Extended Softkeys

Trace

Displays the OTDR (Standard) Trace Screen shown in Figure 4.5-1.

Analysis

Displays the OTDR (Standard) Analysis Screen shown in Figure 4.6-1.

Thresholds

Displays the Thresholds screen. Refer to 4.2.7 “Thresholds”.

Power Meter

Displays the Power Meter screen. Refer to 4.12 “Power Meter”.

Light Source

Displays the Light Source screen. Refer to 4.13 “Light Source”.

4.9 Template Mode

Optical fibers in an identical cable are connected or bent at the same distance; therefore, reflection and loss are considered to occur at the same distance in each trace. Because of this, use the predefined trace (template) to perform event analysis at the same distance in each trace.

In the trace graph, a template trace is displayed in pink.

4.9.1 Softkeys

1. Touch **Analyze** to display the event table of the current trace.
2. Touch **Template**, and you will see the following softkeys:

Apply Template:
: Applies the event table for the created template trace to the primary trace.
This is not available if there is no template trace.

Create Template:
: Creates a template trace from the primary trace.

Clear Template:
: Clears the template trace.

Template Settings:
: Displays the Template Settings screen.

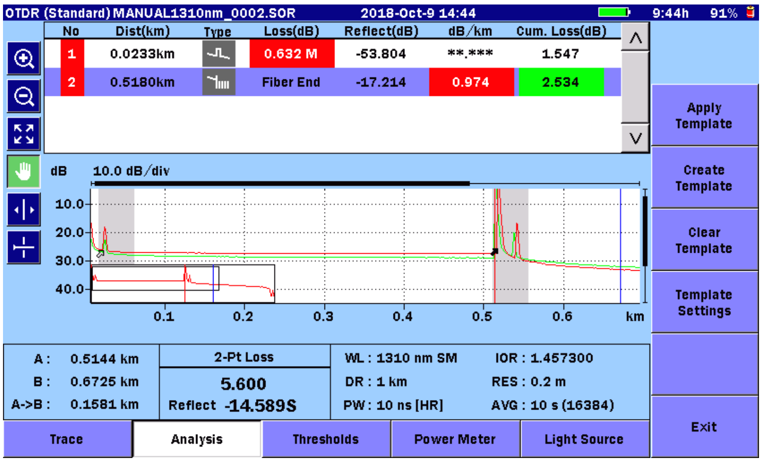


Figure 4.9.1-1 Template Softkeys

4.9.2 Template Settings

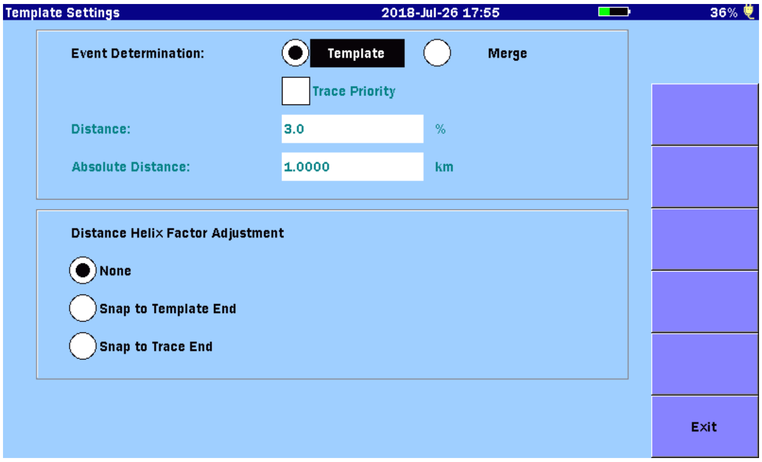


Figure 4.9.2-1 Template Settings Screen

In the Template Settings screen, set the following parameters:

Event Determination

Select how to apply the template trace events to the target trace.

Template:

Copies all events from the template trace to the obtained trace. Analysis is always performed at the event distance in the template.

Merge:

Merges the events in both template trace and obtained trace. Event analysis is performed on both detected events and template events.

Trace Priority:

To give priority to the event distance of the target trace correlated with the template trace events, select this check box. (This check box is available when **Merge** is selected.)

If the check box is not selected, events are processed as follows:

- non-correlated template events are inserted into the target trace.
- correlated template events replace the correlating target trace events.
- all other target trace events are left unchanged.

Distance

Set the distance difference (correlation window), in percentage, that determines the template event is correlated with the measured trace event.

Absolute Distance

Set the distance difference (correlation window), in units set at **Distance display Units** in 4.2.2 "Preferences (1-2)", that determines the template event is correlated with the measured trace event.
The smaller value of Absolute Distance and Distance is applied to the correlation window.

Example:

When the relative distance is 3% and the absolute distance is 1 km

Event Distance	Relative Distance	Absolute Distance	Correlation Window
10 km	0.3 km	1 km	0.3 km
50 km	1.5 km	1 km	1 km

Distance Helix Factor Adjustment

Events in the template trace and the target trace may not align perfectly due to the differences in length of the fibers within a single cable. Distance Helix Factor Adjust options compensate for the difference in length and also obtain improved splice location and loss estimation.

None:

The template and target trace event locations will be used as is, without Distance Helix Factor Adjustment.

Snap to Template End:

Converts all event distances in the measured trace using the following formula so that the distance of the trace end becomes equal to the template end.

$$E'_{Mes}(i) = E_{Mes}(i) \times \frac{D_{Temp}}{D_{Mes}}$$

$E_{Mes}(i)$: Distance of i^{th} event in trace

$E'_{Mes}(i)$: Distance of i^{th} event after conversion

D_{Temp}: Distance of template end

D_{Mes}: Distance of trace end

Snap to Trace End:

Converts all event distances in the template using the following formula so that the distance of the template end becomes equal to the distance of the trace end.

$$E'_{Temp}(i) = E_{Temp}(i) \times \frac{D_{Mes}}{D_{Temp}}$$

$E_{Temp}(i)$: Distance of i^{th} event in template

$E'_{Temp}(i)$: Distance of i^{th} event after conversion

D_{Temp}: Distance of template end

D_{Mes}: Distance of trace end

Table 4.9.2-1 shows the distance of events to be set under the following conditions.

Conditions:

Distance of template events:	10, 20, 40
Distance of trace events:	20.1, 30.1, 40.1
Distance:	3%
Absolute Distance:	1.000 km

Table 4.9.2-1 Template Settings and Event Analysis Distance

Template	Event Determination	Distance Helix Factor Adjustment	Trace Priority	Event Analysis Distance (km)
Not apply	—	—	—	20.1, 30.1, 40.1
Apply	Template	None	—	10, 20, 40
		Snap to Template End	—	10, 20, 40
		Snap to Trace End	—	10.025, 20.05, 40.1
	Merge	None	Off	10, 20, 30.1, 40
		Snap to Template End		10, 20, 30.025, 40
		Snap to Trace End		10.025, 20.05, 30.1, 40.1
		None	On	10, 20, 30.1, 40
		Snap to Template End		10, 20.05, 30.025, 40
		Snap to Trace End		10.025, 20.1, 30.1, 40.1

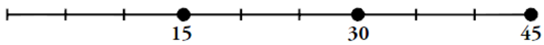
4.9.3 Detailed explanation of the Distance Helix Factor Adjustment function

The following explanation assumes the Template Settings screen settings other than the **Distance Helix Factor Adjustment** options are as follows.

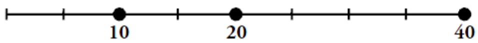
Event Determination:	Merge
Trace Priority:	Off
Distance:	30%
Absolute Distance:	1 km

Next, assuming the Template trace and Target trace event locations are as follows:

Target trace event locations



Template trace event locations

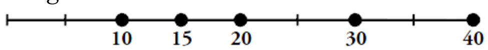


The following describes the corrections performed when each option is selected for the example shown above.

If **None** is selected

The event locations for the Target trace and Template trace events remain unchanged and correlation is performed without using the Distance Helix Factor Adjustment function.

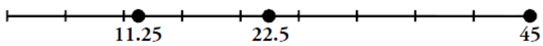
Target trace event locations after correlation



If **Snap to Template End** is selected

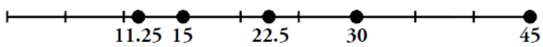
1. Each Template trace event is converted proportionately relative to the Target trace end event location.

   Adjusted Template trace event locations after conversion

2. Correlation is performed using the Target trace events and converted temporary Template trace events.

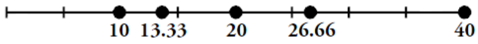
   Event locations converted in 1 and Target trace event locations

3. Event locations correlated in 2 are converted to the locations

in the template, keeping the distance ratio to the trace end.

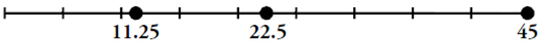
Final Target trace event locations



If **Snap to Trace End** is selected

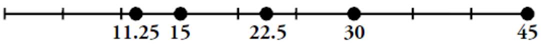
1. Each Template trace event is converted proportionately relative to the Target trace end event location.

   Adjusted Template trace event locations after conversion



2. Correlation is performed using the Target trace events and converted temporary Template trace events.

   Event locations converted in 1 and Target trace event locations



The following table shows examples of resultant event locations for the three **Distance Helix Factor Adjustment** options.

Table 4.9.3-1 Event Distance After Applying Template

Template Trace Event Location	Target Trace Event Location	Distance Helix Factor Adjustment		
		None	Snap to Template End	Snap to Trace End
10	15	10, 15	10, 13.33	11.25, 15
20	30	20, 30	20, 26.66	22.5, 30
40	45	40	40.0	45

4.10 Wavelength All Mode

Wavelength All mode provides multiple wavelength testing with trace overlay and macrobend detect features.

Note:

All wavelength testing cannot be performed by combination of wavelengths of different measurement ports.

Example: 1650 nm for Option 055

4.10.1 Wavelength All Test Parameters

1. To select all wavelengths, touch **Wavelength** to set to **All**. The **Test Parameters** softkey is displayed.
2. Touch **Test Parameters**, you will see the following items for each wavelength.
   - Range/PW Distance Range, Resolution, Pulse Width, Dead-zone
   - Num Avgs Number of times or period for averaging
   - Apply to All Wavelengths
     When selected, the settings are copied to the other wavelength.
   - IOR/BSC Index of Refraction, Backscatter Coefficient
3. Touch the field to set the value. Refer to 4.8.1 “Softkey Displays” for details.

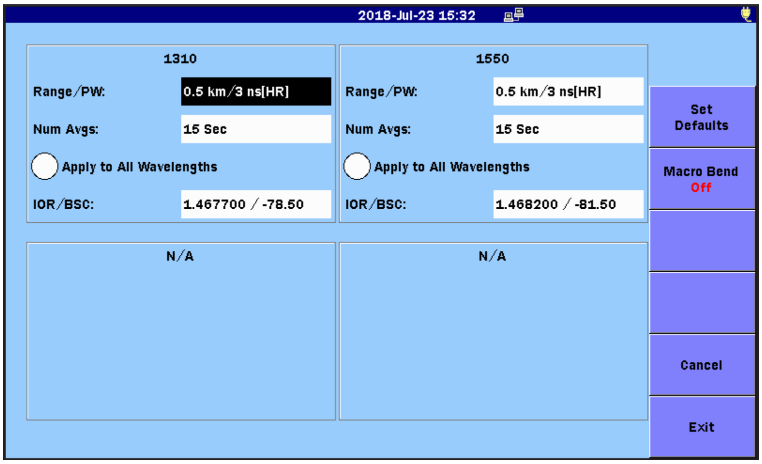


Figure 4.10.1-1 Test Parameters Screen

Set Defaults

Restores the test parameters to the factory default settings.

Macro Bend

Macro bend is loss caused by bending a single-mode fiber. Macro bend is detected by the loss difference between the measured multiple wavelengths.

To detect macro bend, touch **Macro Bend** to set to **On**. Set the level difference for macro bend detection at **Macro Bend** shown in 4.2.7, "Thresholds".

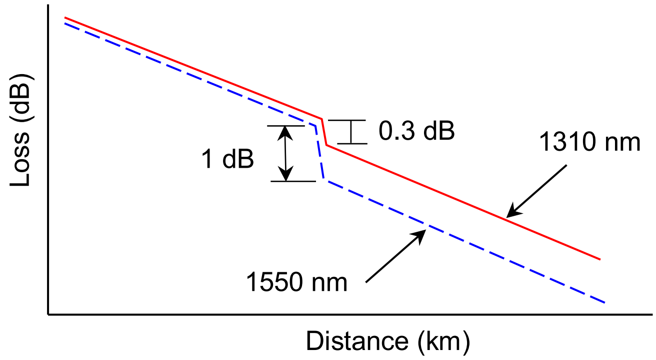


Figure 4.10.1-2 Example of Macro bend Detection

The loss value of the event exceeding the **Macro Bend** threshold is followed by "M".

Note:

Macro bend detection is performed by measuring two wavelengths. Macro bend is not detected even if the loaded trace is analyzed.

Cancel

Discards the changes and closes the Test Parameters screen.

Exit

Saves the changes and closes the Test Parameters screen. The saved parameters are used for next measurement.

Press Start or Realtime to start measurement using the specified parameters.

4.10.2 Wavelength All Testing

The following procedure outlines the steps used to perform a Wavelength All test.

1. To select all wavelengths, touch **Wavelength** to set to **All**.
2. To automatically set the test parameters when performing measurement, touch **Test Mode** to set to **Auto**.

   To manually set the test parameters when performing measurement, touch **Test Mode** to set to **Manual**. Touch **Test Parameters**, and you can set the test parameters.
3. Touch **Loss Mode** to set the calculation mode.
4. Enable **Auto Analysis**, if desired. Refer to 4.2.3 “Preferences (2-2)”.
5. If necessary, set **Enabled** to **On** shown in 4.2.4, “AutoSave”.
6. After setting the test parameters, press Start.
   Measurement starts from the shortest wavelength.
   When the test completes, Event analysis is run (if Auto Analysis is enabled), and the trace is saved (if AutoSave is enabled). The trace is placed into an Overlay position, and the next wavelength starts and updates the Primary trace position. This process continues until all traces have be collected.

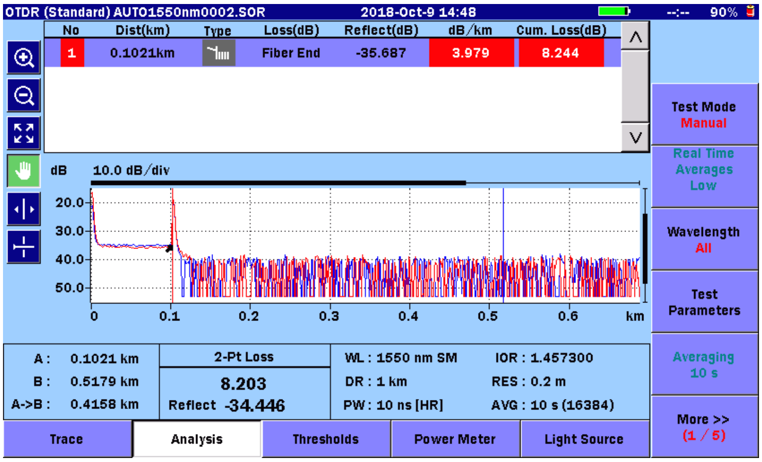


Figure 4.10.2-1 Analysis Screen for All Wavelengths

4.11 Trace Overlay Management

The ACCESS Master can display up to four traces in the Trace grid, one primary trace and up to three overlay traces.

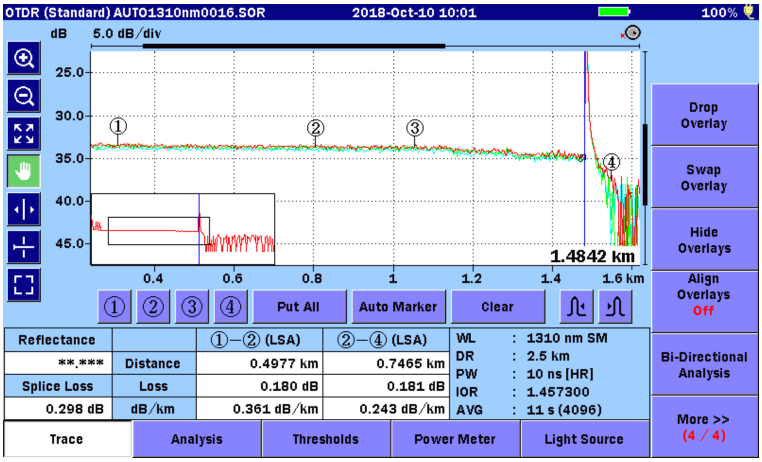


Figure 4.11-1 Trace Screen with Trace Overlay Softkeys

4.11.1 Displaying Overlay Traces

To display the overlay traces, follow the steps below.

Register the trace displayed as overlay.

When an overlay trace is not loaded, **Set to Overlay** is displayed on a softkey.

When touching **Set to Overlay**, the primary trace is changed to overlay.

Load a waveform from a file as overlay.

1. Press the **Load** key .
2. Select the storage media.
3. Touch the file name to select it.
4. Touch **Load Overlay**, and you will see the following dialog box.

Without Setups
Loads the trace data only.

With Setups
Loads the range and pulse width that were used for measurement together with the trace data and changes the ACCESS Master settings.

Note:

The wavelength data is not loaded by **With Setups**.
Touch **Wavelength**, and set the same wavelength as the loaded trace file or set the wavelength you want to apply the settings. The minimum wavelength setting is changed when displaying overlay traces under the following conditions:
- **Wavelength** is **All**.
- **Load Overlay** is **With Setups**.

When performing measurement with **Wavelength** set to **All**, the measured trace is displayed as an overlay trace.

4.11.2 Trace Overlay Functions

The Trace Overlay functions include:

- Drop Overlay
- Set to Overlay
- Swap Overlay
- Hide Overlays
- Show Overlays
- Align Overlays
- Bi-Directional Analysis

Drop Overlay

Drops a currently displayed overlay trace. In the dialog box, select the file of the trace you want to delete, and then touch **OK**.

Set to Overlay

Changes the primary trace to overlay. When the primary trace has been changed to overlay, the softkey is changed from **Set to Overlay** to **Swap Overlay**.

Swap Overlay

Displayed when an overlay is loaded.
In the dialog box, select the file of the trace you want to swap with

the primary trace, and then touch **OK**.

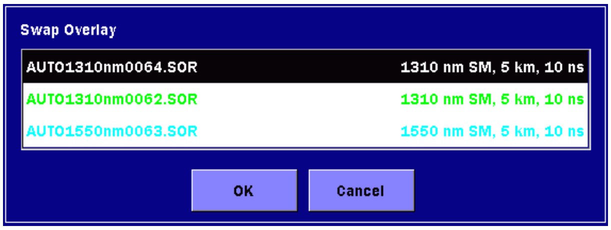


Figure 4.11.2-1 Swap Overlay dialog box

Hide Overlays

This softkey is displayed when the Trace screen displays the overlay trace(s). To hide all overlay traces and display the primary trace only, touch this softkey.

Show Overlays

This softkey is displayed when the overlay traces are hidden. To show all overlay traces, touch this softkey.

Align Overlays

On: all currently displayed Overlay traces are aligned to the same point on the screen as that of the intersection of the Primary trace and the cursor.

Off: the currently displayed Overlay traces are not aligned.

1dB Offset:

the traces are aligned as in Align Overlays On, but each overlay is offset from the common intersection point by 1 dB.

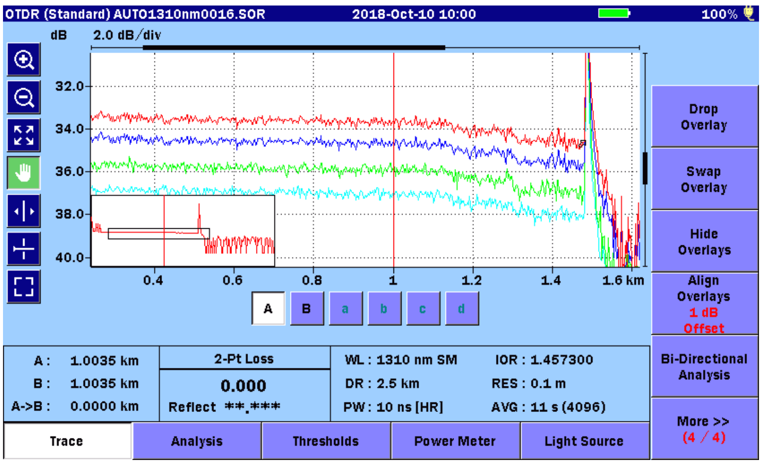


Figure 4.11.2-2 Align Overlays 1 dB Offset

Bi-Directional Analysis

In the dialog box, select the file of the trace you want to reverse the direction, and then touch **OK**.

4.11.3 Bi-Directional Analysis

The Bi-directional analysis is available by using the following two traces.

- Overlay trace measured from the opposite end of the fiber
- Primary trace measuring the same fiber

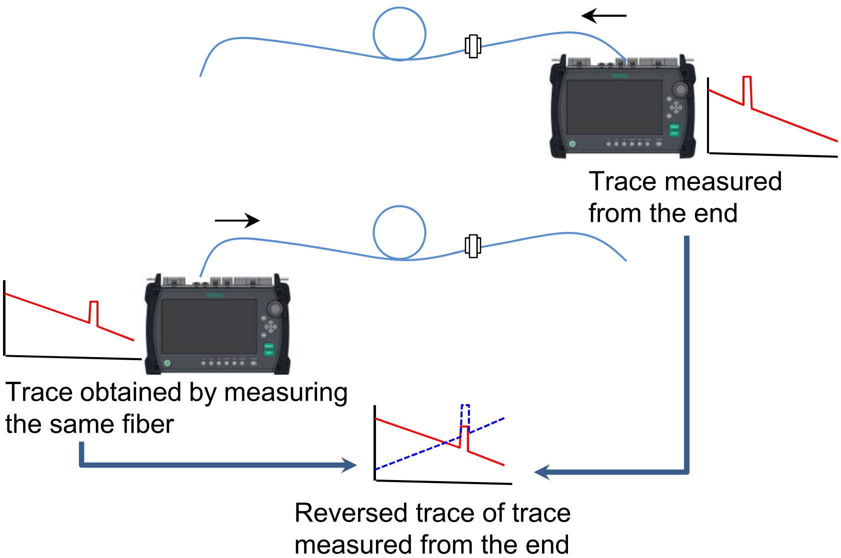


Figure 4.11.3-1 Bi-Directional Analysis

In the “Trace Screen with Trace Overlay Softkeys” shown in Figure 4.11-1, touch **Bi-Directional Analysis** to select a trace, and you will see the following values calculated from the selected trace and primary trace reflected to the event analysis results.

- Total Loss
- Loss (dB)
- dB/km
- Cum.Loss (dB)

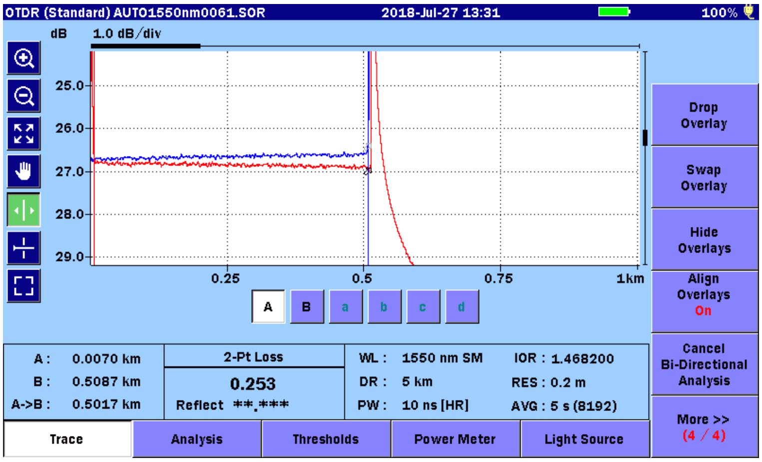


Figure 4.11.3-2 Example of Bi-Directional Analysis Results

To define the range to detect the same event on the overlay trace as the event on the primary trace, set the value at **Bi-Directional Correction** shown in 4.2.3, "Preferences (2-2)".

Cancel Bi-Directional Analysis

When bi-directional analysis is started, the **Cancel Bi-Directional Analysis** softkey is displayed. Touching the softkey ends the reverse display of the overlay trace and restores the event table to the previous state.

Saving bi-directional analysis results

1. Press the **Save** key during bi-directional analysis.

2. Select the type of the file to save.
   Bi-directional analysis results (CSV)
   SR4731 (SOR)

3. In the Save screen, set a file name and medium, and then touch **Save Trace**.

4.12 Power Meter

In the OTDR screen, you can measure optical power levels.
You can increase the working efficiency by using an optional optical power meter (if you have), which can measure the optical power level of a different fiber even during measurement.
If you don't have it, you can measure the optical power level only when measurement is not being performed.

When measurement is not in progress, touching **Power Meter** displays the dialog box, shown in Figure 4.12-1, where you can measure the optical power level.

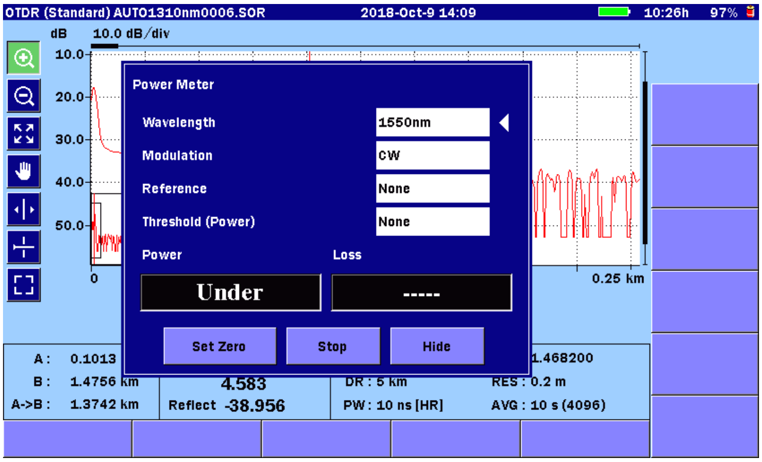


Figure 4.12-1 Power Meter Dialog Box

Wavelength
Switches the wavelength for the power meter.

Modulation
Switches the modulation frequency of the optical signal under test. If the optical signal is unmodulated, set to **CW**. (This is displayed if an optical power meter (Option 004, 005 or 007) is added.)

Reference
Sets the reference value for loss calculation, for each wavelength separately.

Threshold (Power)

Sets the threshold for pass/fail evaluation of the power level, for each wavelength separately. The power is evaluated as “PASS” if the Power value is equal to or more than this value. (This is displayed when **Reference** is set to **None**.)

Threshold (Loss)

Sets the threshold for pass/fail evaluation of the loss, for each wavelength separately. The loss is evaluated as “PASS” if the Loss value is equal to or less than this value. (This is displayed when **Reference** is set to **None**.)

Power

Displays the measured power meter value in dBm units.
The value can be converted into mW (mili-watt) units by the following formula:

$$P_W = 10^{\frac{P_D}{10}}$$

P_W: Power (mW unit)
P_D: Power (dBm unit)

“Under” is displayed if the power is less than the minimum level of the measurement range.
“Over” is displayed if the power is more than the maximum level of the measurement range.
The background color turns red if the displayed value is less than the threshold or “Under” is displayed.

Loss

Displays the difference between the values in Reference and Power as the loss.
This is not displayed if the Reference value is not set.
The background color turns red if the displayed value is more than the threshold.

Set Zero

Adjusts the power meter offset.

Note:

Close the connector cover before starting the power meter offset to avoid any light from entering the measurement port.

Stop

Ends the power meter measurement.

Hide

Closes the Power Meter dialog box and displays the power or loss in the OTDR screen. The ESC key has the same function.

When **Reference** is **None** | When any value is set for **Reference** | When evaluated as “FAIL”

Figure 4.12-2 Display of Measured Power

When you press the **Top Menu** key to return to the top menu (Figure 3.1.3-1), the power level measurement ends.

4.13 Light Source

In the OTDR screen, you can turn on the light source.

When OTDR testing or power meter measurement is not being performed, touching **Light Source** displays the screen, shown in Figure 4.11.3-1, where you can turn on the light source. When the light source is turned on, the OTDR testing cannot be performed.

Figure 4.11.3-1 Light Source Screen

[1] Light Source On/Off indicator

[2] Port connection indicator

[3] Softkeys

Light Source On/Off indicator

Displays the current status of the light source laser.
When the laser light is on, the front panel lamp ([5] in Figure 2.1-1) blinks.

CAUTION

Disconnect the target measurement optical fiber from the operating line.

The output from Optical Light Source may interrupt communications if the target measurement optical fiber is connected to the optical fiber currently operating.

Disconnect communications devices, etc. from the target measurement optical fiber during measurement to prevent the optical sensors from being damaged.

Port connection indicator

Indicates the measurement port that varies according to the wavelength setting. Connect the optical fiber under test to the indicated port.

Softkeys

Light source

Switches on and off the laser light output.

Wavelength

Switches the wavelength for the laser light.

Modulation

Switches the modulation frequency of the laser light. When set to **CW**, the laser light is not modulated.

Exit

Turns off the laser light output and returns to the OTDR screen.

4.14 Working with OTDR (Standard) Trace Files

4.14.1 Displaying Trace Files

You can display up to four traces, at a time. Traces can either be displayed while testing or be loaded from files.

1. Press the **Load** key , and you will see the Load screen.

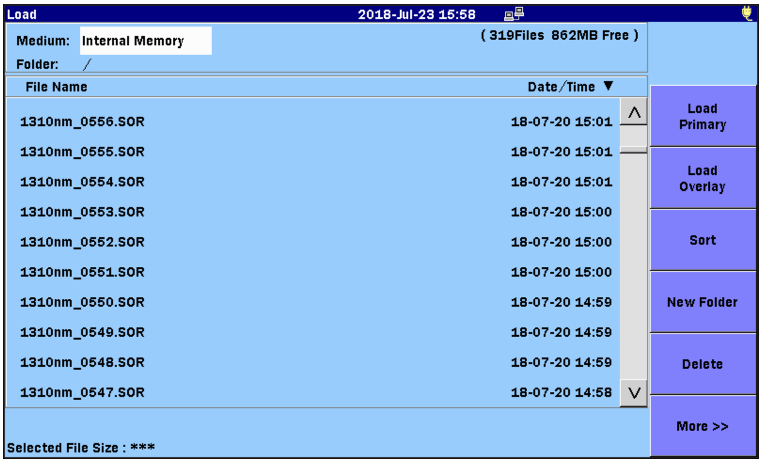


Figure 4.14.1-1 Load Screen

2. Select the storage medium.
3. Touch the folder to select it.
4. Touch the file name to select it.
5. To display as the primary trace, touch **Load Primary**.
   To display as the overlay trace, touch **Load Overlay**.
6. In the following dialog box, touch a load mode to select it, and then touch **OK**.

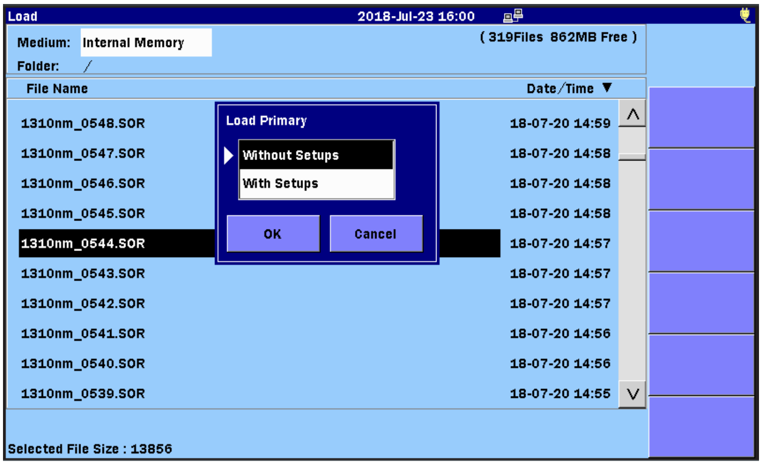


Figure 4.14.1-2 Load Primary Dialog Box

Without Setups
Loads the trace data only.

With Setups
Loads the settings used for measurement together with the trace data and changes the ACCESS Master settings. The settings to be loaded are:

- Distance Range
- Pulse Width
- Auto Detect Thresholds
- Pass/Fail Thresholds
- Header
- IOR/BSC
- Horizontal shift and vertical shift of trace

If you touch the highlighted file name in step 4, the file is loaded **Without Setups**.

For details on other file operation methods, refer to 3.5, “File Operation”.

4.14.2 Saving Files with AutoSave

AutoSave is a function that automatically saves the measured results upon completion of measurement.
For auto filename generation and folders to save files, refer to 4.2.4, "AutoSave".

1. Press the **Setup** key .
2. Touch **AutoSave**.
3. Set **Enabled** to **On**.
4. Press the **Setup** key .

4.14.3 Saving Files Manually

Press the **Save** key .

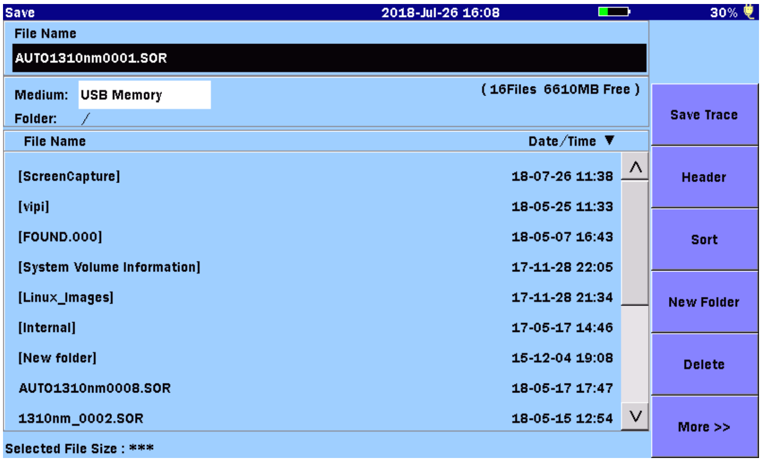


Figure 4.14.3-1 Save Screen

For how to save a file, refer to 3.5.7, "Saving File".

4.14.4 Saving a Trace File as an Image File

To save the screenshot to a file, press the **Screenshot** key .Check the save destination folder and filename, and then touch **OK** to close the dialog box.

Chapter 5 Fiber Visualizer

This chapter explains the Fiber Visualizer mode.

5.1 Starting Fiber Visualizer

Fiber Visualizer mode provides easy-to understand icons for measurement results and allows you to perform pass/fail evaluation of them easily. Since a report can be created by panel operation of the ACCESS Master, you can increase the working efficiency.

Follow the steps below to start the Fiber Visualizer mode.

1. Press the **Top Menu** key.
2. Touch **Fiber Visualizer**.

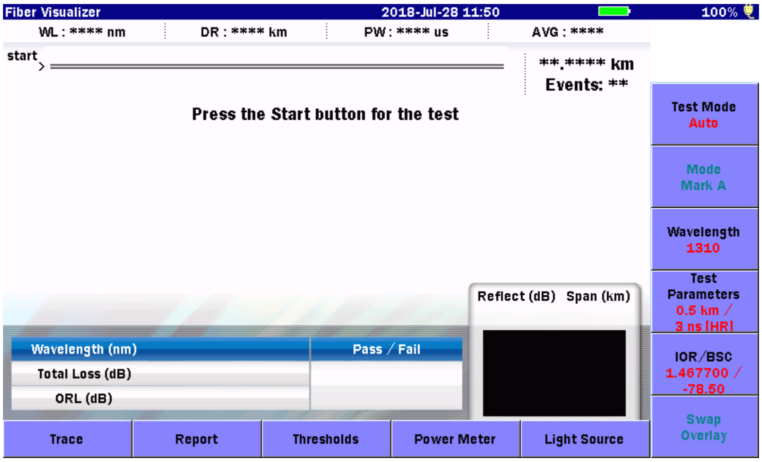


Figure 5.1-1 Initial Fiber Visualizer Screen

In the Fiber Visualizer mode, the distance and loss between events can be measured easily by using Markers A and B.

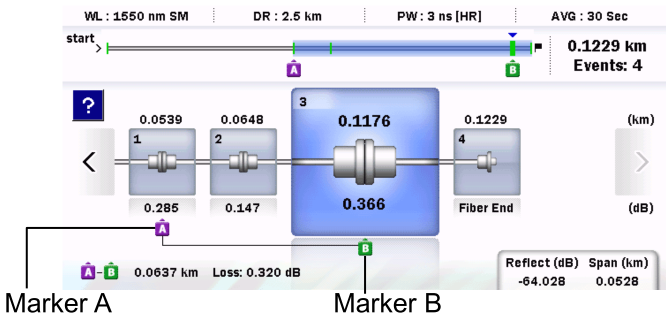


Figure 5.1-2 Marker Display

Preset the branches in the PON system, and you can select appropriate test parameters. In “Preferences (2-2)” in 5.2.3, set **Auto Test Mode** to **Advanced**, and you can use multiple pulse widths in measurement, which can detect events more accurately.

5.2 Configuring Fiber Visualizer Mode Settings

To configure the test parameters for the Fiber Visualizer, press the **Setup** key .

5.2.1 General Settings

Touch **General**, and you will see the General screen.
For detailed information on the General screen, refer to Section 3.3.1 "General Settings".

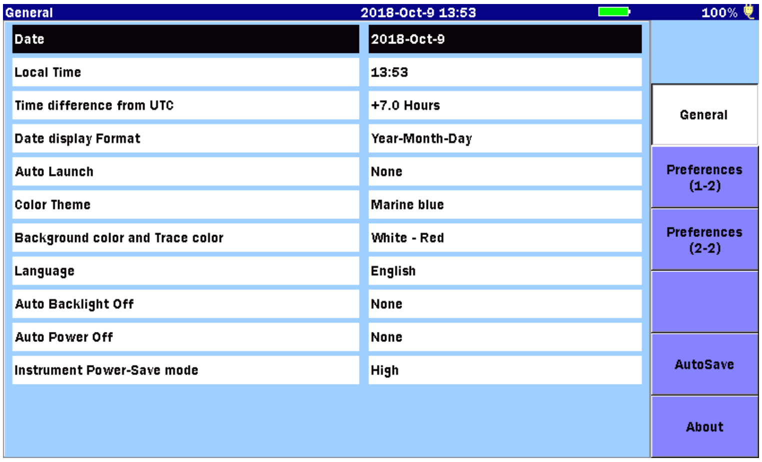


Figure 5.2.1-1 General Screen

5.2.2 Preferences (1-2)

Touch **Preferences (1-2)**, and you will see the following screen.

Figure 5.2.2-1 Preferences (1-2) Screen

Distance display Units

Select the unit of measurement used to display distance on the horizontal axis of the Trace graph. This affects Range and Resolution readings and analysis events incorporating distance.

Connection Check

The Connection Check function confirms whether or not the fiber is connected correctly to the OTDR measurement port. When set to **On**, this function is activated.

Active Fiber Check

The Active Fiber Check performs a “live fiber” check on the currently attached fiber under test to detect whether the fiber is carrying traffic before firing any OTDR laser sources.
If no traffic is detected the test proceeds normally.
If traffic is detected a warning message appears on the screen and the test is aborted.

Auto Scale

When set to **On**, the horizontal scale is set automatically so that  can display a trace from which the noise portion is removed.

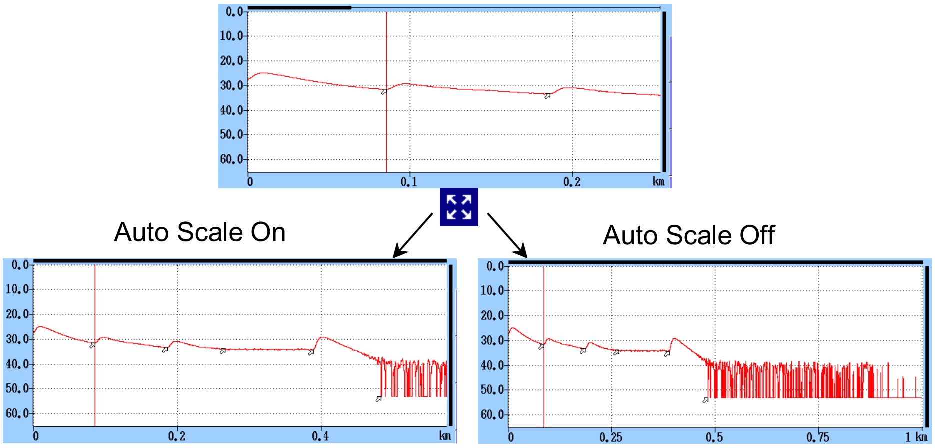


Figure 5.2.2-2 Auto Scale function

Event Summary

This setting is effective only when **Marker Mode** is **Movement**. When set to **On**, the analysis results summary is displayed when displaying the event table.

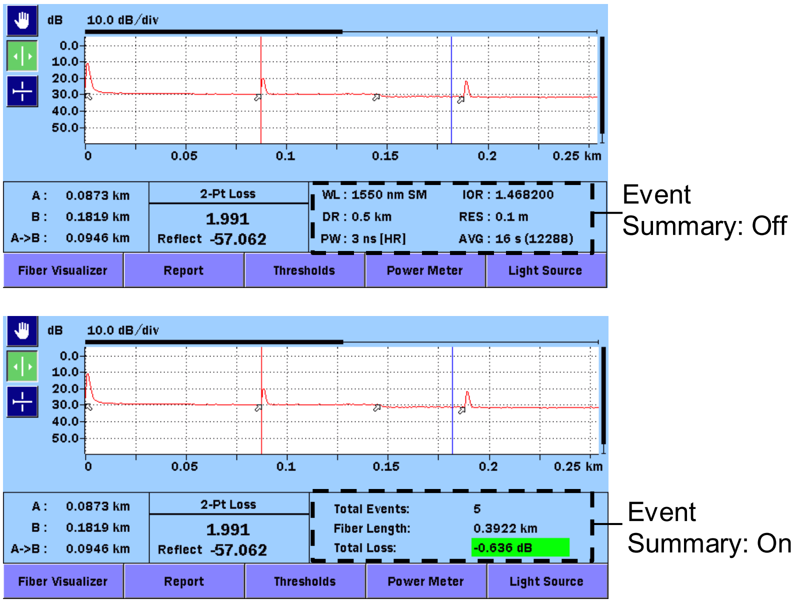


Figure 5.2.2-3 Summary Display

Trace Overview

When set to **Lower Left** or **Upper Right**, a small overview of the trace is displayed at the selected position on the Trace graph.

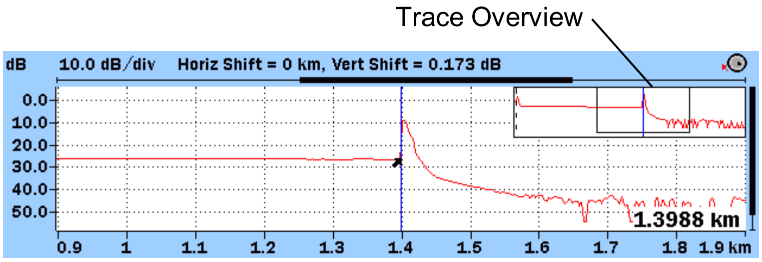


Figure 5.2.2-4 Trace Overview (Upper Right)

Show Internal Launch Fiber

When set to **On**, the internal launch fiber is displayed.

Unit of averaging

Set the unit of averaging (the number of times or second).

Real Time Attenuation

The ACCESS Master adjusts the attenuation at the light-receiver according to the level of the light returned back from the optical fiber under test. Set the attenuation adjusting method.

- **Auto Attenuation**
  Real Time attenuation is automatically selected.
- **Around selected cursor**
  Attenuation is optimized in real-time to show the backscatter around the selected (active) cursor.
- **Fresnel Measure**
  Attenuation varies according to received power level. This setting is suitable to measure reflections in long distance range however it takes longer time to measure than other options.

Display Mode After Analysis

Set the trace display mode for detected events.

- **End/Break**
  The display mode focuses on the end/break event.
- **Full Trace**
  The full trace is displayed in Display from Origin mode.
- **Current**
  The display mode and cursor positions remain unchanged.

Sound of test completion

Set the period of time to cause the buzzer to sound upon test completion. When set to **Disabled,** the buzzer does not sound upon test completion.

Touching the screen or pressing any key causes the buzzer to stop.

5.2.3 Preferences (2-2)

Touch **Preferences (2-2)**, and you will see the following screen.

Figure 5.2.3-1 Preferences (2-2) Screen

Marker Mode

Set the mode of operating the markers for detailed measurement of splice and transmission loss of an optical fiber.

- Movement

  Cursors A and B are always displayed. Makers a to d are displayed depending on the setting for Loss Mode.

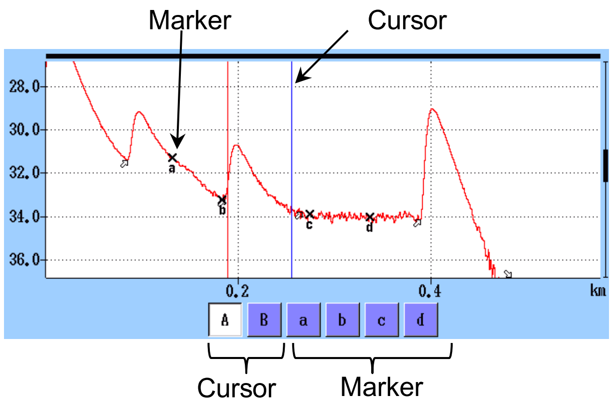


Figure 5.2.3-2 Cursors and Markers for Movement

- Placement (1-2, 2-4)
  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.
  Placement (1-2, 2-4) is suitable to measure fiber loss and distance and can measure reflection, total return loss, and splice loss.
- Placement (1-2, 3-4)
  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.
  Placement (1-2, 3-4) is suitable to measure distance and loss between two markers. It can measure reflection and total return loss but cannot measure splice loss.

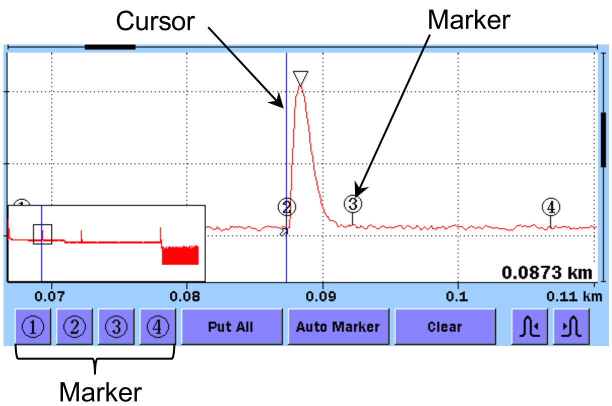


Figure 5.2.3-3 Cursor and Markers for Placement

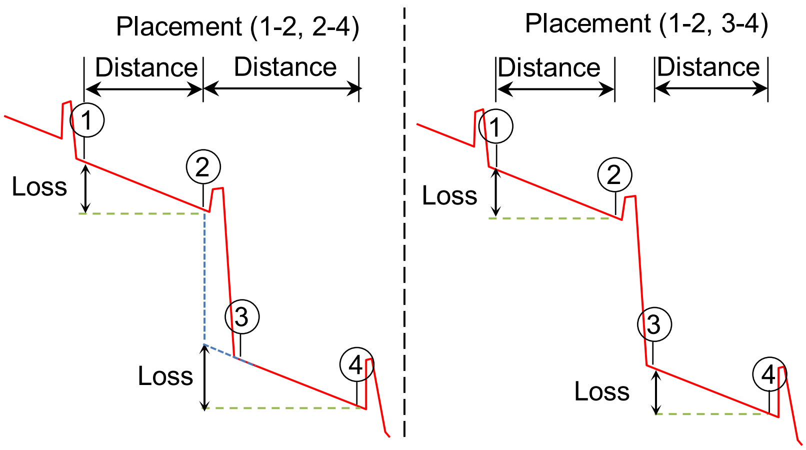


Figure 5.2.3-4 Display of Distance and Loss Between Markers

Reflectance Calculation

This is available when Marker Mode is set to **Movement**. Set the reflectance calculation method.

- **Off**
  Reflectance will not be calculated.
- **Auto**
  The reflectance of any event is reported based on the position of cursor A. The Auto setting is most useful for reflective events that are not close together or close-in to the OTDR. Refer to 7.1.3.1 "Auto Reflectance Calculation".
- **Manual**
  When set to Manual, the reported reflectance is based on the positions of both cursors (A and B). Refer to 7.1.3.2 "Manual Reflectance Calculation".

ORL Calculation

This is available when Marker Mode is set to **Movement**.

- **A Cursor**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the cursor A position.
- **Origin**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the origin
- **Full Trace**
  The ORL measurement is calculated from the Origin to the last data point, and the Incident Power is attained from the origin

Type of reflective result

This is available when Marker Mode is set to **Placement**.
Select one you want to display as a result of reflection measurement from the following:

- Reflectance
  Ratio of reflected power to incident power at reflection point
- Reflection
  Difference between peak level at reflection point and backscattered light level immediately before it (height on trace)

Auto Patch-cord Removal

Set the points of events to treat as patch cords. The set number of

events are recognized as patch cords and are automatically deleted from the event table.
In an example shown in the following figure, set start point to 1 and end point to 1.

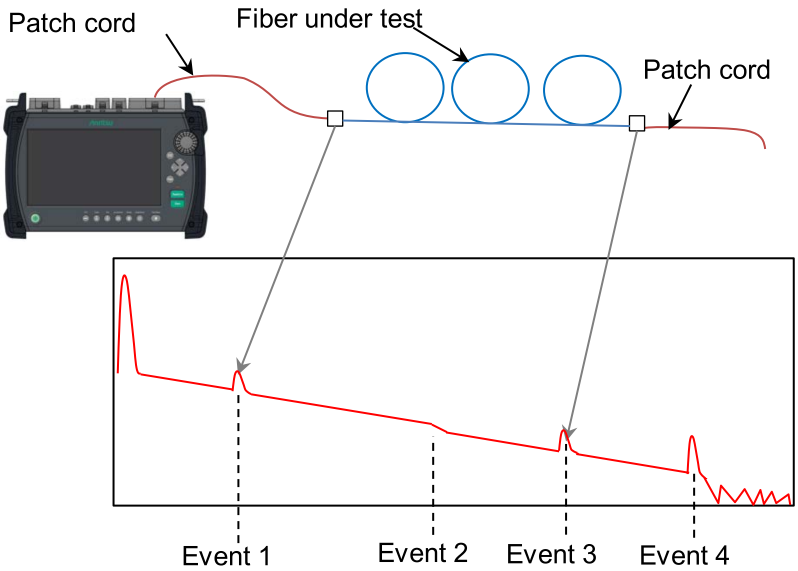


Figure 5.2.3-5 Auto Patch-cord Removal Example

When not using patch cords, set to **None/None**.

Note:

The Auto Patch-cord Removal settings are reflected to the measured trace. To make the settings reflected to the trace loaded from a file, touch in **Analyze** in the Analysis screen.

Force Total Loss

When set to **On**, the total loss of the fiber under test is always displayed.
When set to **Off**, *** is displayed if the total loss cannot be calculated.

End Event for ORL Calculation

Set whether to include reflection in Far-End events or not when calculating the ORL.
When **OMIT** is selected, pass/fail evaluation is not performed on the far-end reflection.

Event Icon Movement

Set the direction of the event to be selected by turning the rotary knob or touching the arrow switches < and > on the left and right of the trace event.

Event Table Span Calculation

Selects whether to display the span length or transmission loss (dB/km) for the results.

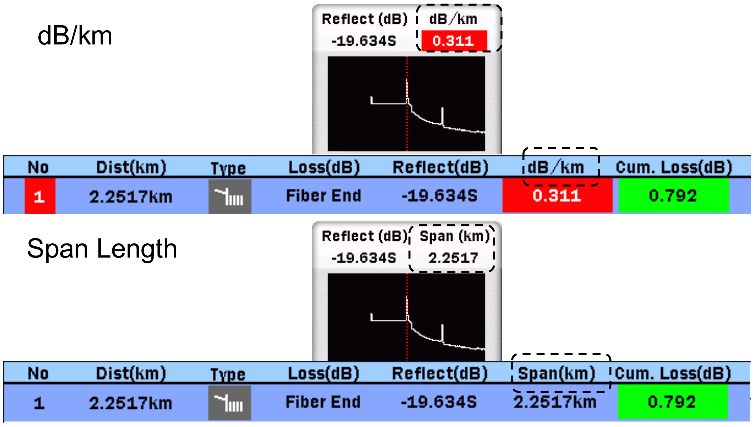


Figure 5.2.3-6 Display of Event Table Span Calculation

A-B Span Analysis

- On

  Calculates the cumulative loss and ORL between Markers A and B.

  Events outside the interval between Markers A and B are not evaluated on a pass/fail basis.
- Off

  Calculates the cumulative loss and ORL from the entire trace.

Auto Test Mode

Sets whether to change pulse width automatically when Test Mode to **Auto**.

- Standard

  Performs measurement with the pulse width set by auto test. The measurement takes a shorter time than Advanced mode.
- Advanced

  Performs measurement with multiple pulse widths and synthesizes the results measured by each pulse width. Even when a long-distance fiber is measured, an event located in a short distance from the ACCESS Master can be detected. This is also effective at measuring the optical fiber that branches at the splitter included in the PON system.

5.2.4 AutoSave

Touch **AutoSave** , and you will see the following screen.
AutoSave is a function to automatically save the measurement results upon completion of measurement.
In the AutoSave screen, you can set the directory to save files and the base filename for auto filename generation.

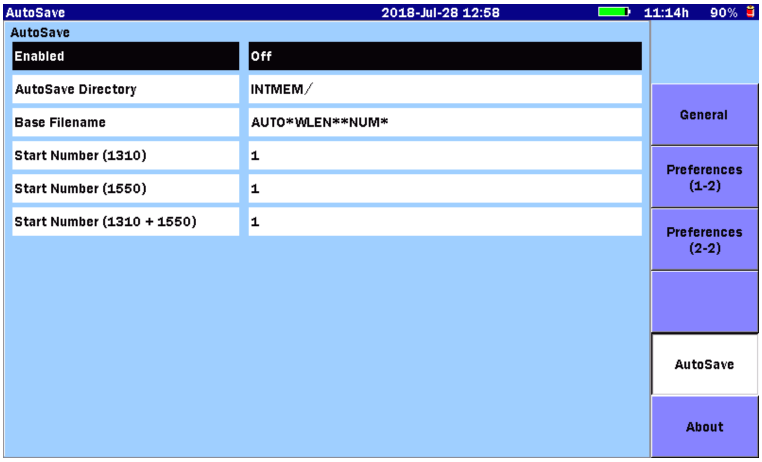


Figure 5.2.4-1 AutoSave Screen

Enabled

- **Off**
  No AutoSave is performed after the measurement is complete.
- **On**
  AutoSave is performed after the measurement is complete.
- **Verify**
  The Save screen appears after the measurement is complete so you can verify the Auto Filename.

AutoSave Directory

The AutoSave Directory field allows you to select the directory into which AutoSave will save files.

Base Filename

The Base Filename field provides a template for use when generating an autofilename. For how to set this parameter, refer to 4.2.5, “AutoSave Filename Parameters”.

Start Number (1310)

Set a start number if you want to add serial numbers when saving results of 1310-nm wavelength measurement to files.

Start Number (1550)

Set a start number if you want to add serial numbers when saving results of 1550 nm wavelength measurement to files.

Start Number (1310+1550)

Set a start number if you want to add serial numbers with the same start number when saving results of 1310 nm wavelength measurement and 1550 nm wavelength measurement to files. This setting is applied when **Wavelength** is set to **1310 / 1550 (Macro Bend)**.

If Option 057 or 058 is added, **(1310+1625)** is displayed instead of **(1310+1550)**.

5.2.5 About

Refer to 3.3.4 “About”.

5.2.6 Thresholds

In the lower part of the screen shown in Figure 5.1-1, touch **Thresholds**, and you will see the Thresholds screen.
To switch the screen display, touch the **Thresholds** softkey.

5.2.6.1 Auto Detect

When **Auto Detect** is displayed on the **Threshold** softkey, set the thresholds for event detection.

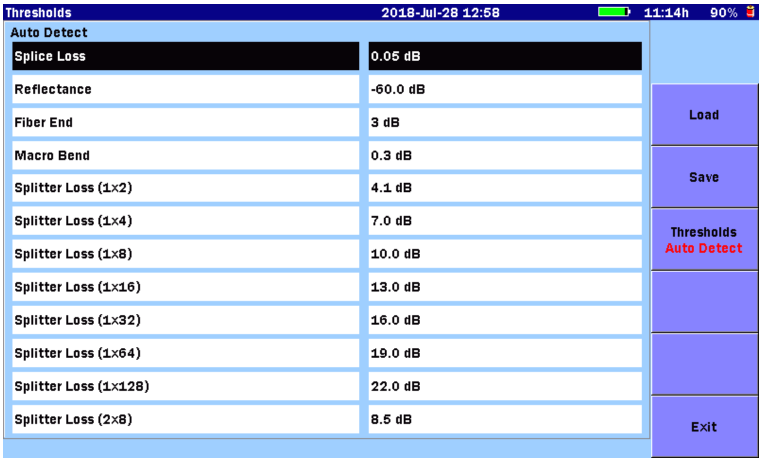


Figure 5.2.6.1-1 Thresholds Screen (Auto Detect)

The Auto Detect parameters are thresholds for detecting events.

Splice Loss
Set the minimum splice loss to display in the event table.

Reflectance
Set the minimum reflectance. The event analysis table displays all events with reflectance of this value or less.

Fiber End
Set the minimum loss of the far end event.

Macro Bend
Set the threshold for detecting an event as a macrobend. For macrobend, refer to 4.10, “Wavelength All Mode”.

Splitter Loss
Set the splitter loss for each number of branches to display as a splitter event in the event table.

5.2.6.2 Pass/Fail Thresholds

When **Pass/Fail** is displayed on the **Thresholds** softkey, set the thresholds for bases for pass/fail evaluation.

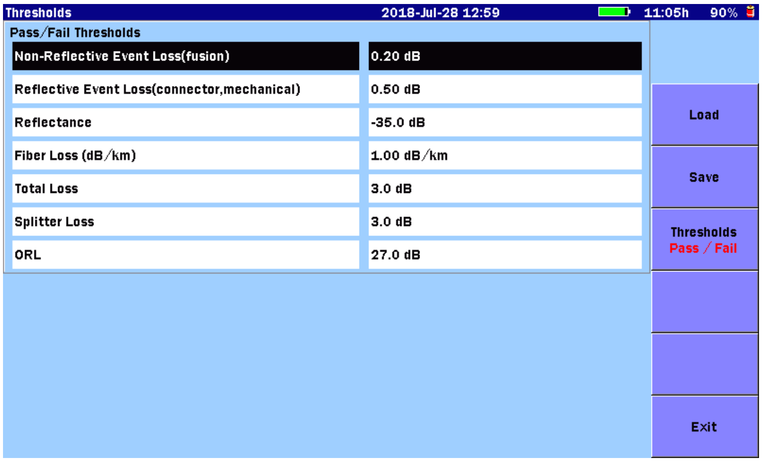


Figure 5.2.6.2-1 Thresholds Screen (Pass/Fail Thresholds)

Non-Reflective Event Loss(fusion)

If the loss of a non-reflective event (for example, fusion splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflective Event Loss(connector, mechanical)

If the loss of a reflective event (for example, connector and mechanical splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflectance

If the reflectance of an event is less than the threshold, the **Reflect** column of the event table is displayed in red.
When **Type of reflective result** is set to **Reflection** in the Preferences (2-2) screen, if the level difference between events exceeds the threshold, the **Reflect** column of the event table is displayed in red.

Fiber Loss (dB/km)

If the fiber loss of an event exceeds the threshold, the **dB/km** column of the event table is displayed in red.

Total Loss

If the total loss of the far-end event exceeds the threshold, the **Cum. Loss** column of the event table is displayed in red. If the event summary is displayed, the total loss of the event summary is also displayed in red.
The **Total Loss** value of Fiber Visualizer is displayed in red.
If the total loss is less than the threshold, the **Cum. Loss** column of the far-end event in the event table and the total loss of the event summary and Fiber Visualizer are displayed in green.

Splitter Loss

The **Loss** column of the event table is displayed in red if the splitter loss exceeds the sum of the following:

- **Splitter Loss** in Figure 5.2.6.1-1 “Thresholds Screen (Auto Detect)”
- **Splitter Loss** in Figure 5.2.6.2-1 “Thresholds Screen (Pass/Fail Thresholds)”

For example, if **Splitter Loss (1×2)** for **Auto Detect** is 4.1 dB and Splitter Loss for Pass/Fail Thresholds is 1.0 dB, the loss of 1×2 splitter event exceeding 5.1 dB is evaluated as “fail”.

ORL

If the ORL exceeds the set value, the **ORL** column of the event table is displayed in red.

5.2.7 Loading and Saving Thresholds

The thresholds for Fiber Visualizer can be saved to or loaded from a file.

Touching **Load** on Figure 5.2.6.1-1 opens the Load Threshold screen.
Touching **Save** on Figure 5.2.6.1-1 opens the Save Threshold screen.

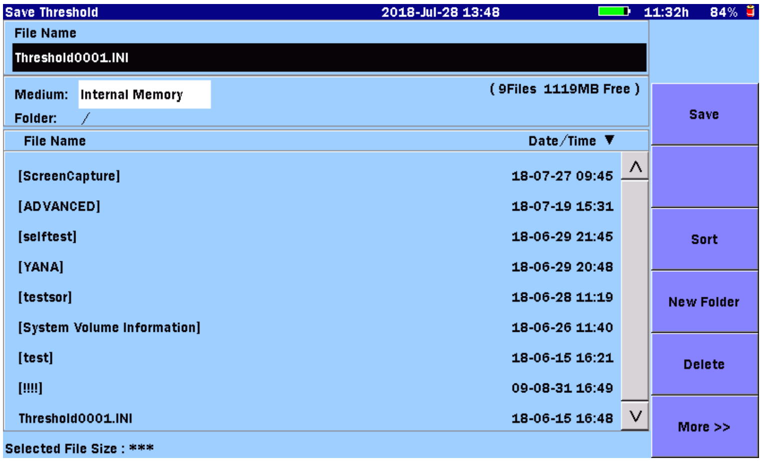


Figure 5.2.7-1 Save Threshold Screen

For details on file operations, refer to 3.5, “File Operation”.

5.3 Fiber Visualizer Screen

When the measurement completes, the fault points are indicated by icons as the figure below.

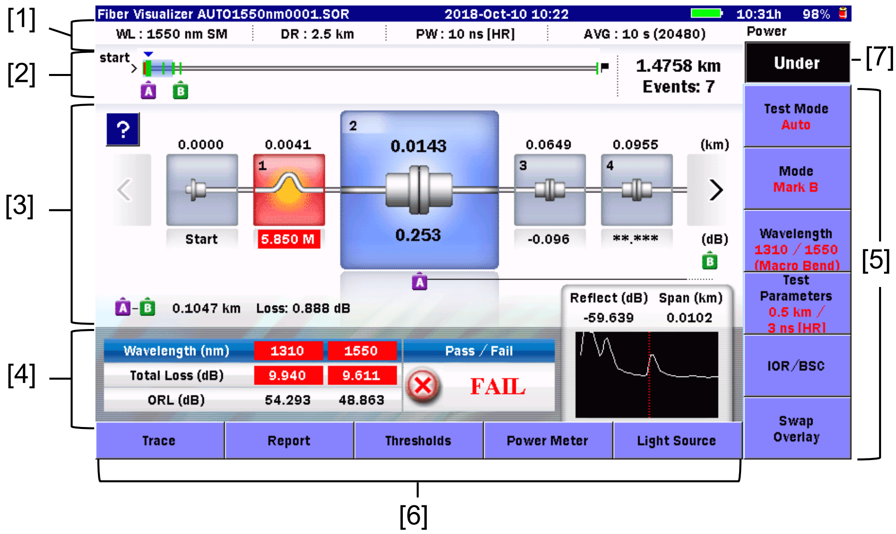


Figure 5.3-1 Fiber Visualizer Screen

[1] Test parameters

[2] Fiber Schematic

[3] Trace events

[4] Test results

[5] Softkeys
Refer to 5.5 “Softkeys”.

[6] Extended Softkeys
Refer to 5.5.3 Extended Softkeys”.

[7] Power, Loss display

5.3.1 Fiber Schematic

Figure 5.3.1-1 shows event positions or event icon positions on display. The events that exceed the PASS/FAIL thresholds are displayed in red.
The range where event icons are displayed is indicated by light blue bar.

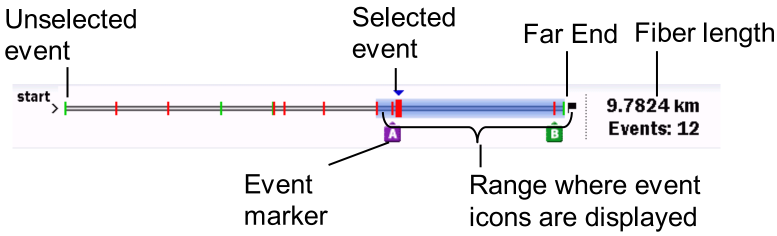
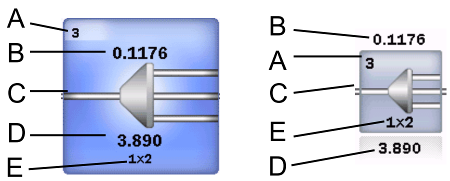


Figure 5.3.1-1 Fiber Schematic

5.3.2 Trace Events

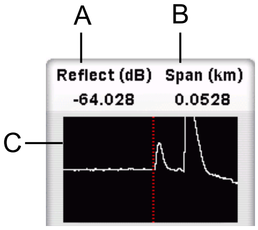
The automatically detected points such as connection point, splice points or splitter are indicated by the icons. The icon in red indicates the loss exceeds the threshold level.



A. Event number:
Number assigned sequentially from the ACCESS Master side
B. Distance: Distance from the ACCESS Master side
C. Icon of the event type
D. Splice loss at the event: (dB)
E. Number of branches (only for splitter)

Figure 5.3.2-1 Event Icon

The trace near the selected event is displayed in the lower right.



A. Reflection at event point
"S" appears if the reflection level is saturated.

B. Information between events:
Span: distance from the previous event
dB/km: Average loss from the previous event

C. Trace display around the event

Figure 5.3.2-2 Display of Trace Near Event

To see the description on the event icon, touch ?. If the event exceeds the threshold for pass/fail evaluation, a possible cause is displayed.

Touch again, and you can close the description on the possible cause.

You can select an event by one of the following methods:

- Touching the event icon.
- Touching < and >.
- Turning the rotary knob.
- Pressing the arrow keys < and >.

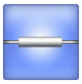
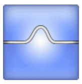
5.3.3 Test Results

The total loss, ORL, the reflection of the selected event and the trace are displayed at each wavelength.
Pass/fail of the selected event is displayed.

5.3.4 Event Icons

The following table shows an overview of event icon types.

Table 5.3.4-1 Event Icons

Icon	Explanation
	Start of the fiber Location at distance of 0 km.
	Reflective Event Reflection from a splice, for example, Fresnel reflection.
	Non-Reflective Event Non-reflective events include such low loss events as fusion splices.
	Grouped Event Events spaced too close to each other for Analysis to distinguish them as separate events are reported as Grouped events.
	Far End Event Far end of the optical fiber under test.
	Questionable End Event Events out of dynamic range or out of distance range. ● Out of Range The trace reaches the noise level before a far end or break of the optical fiber cable is detected. ● Out of Distance The trace reaches the end point set for **Dist. Range** before a far end or break of the optical fiber cable is detected.
	Splitter Event Loss due to fiber splitter.
	Macro Bend Event Event that causes loss difference when measuring multiple waveforms. This can occur when excessively bending the fiber.

5.4 Trace Screen

Touch **Trace** shown in Figure 5.3-1, and you will see the Trace screen.

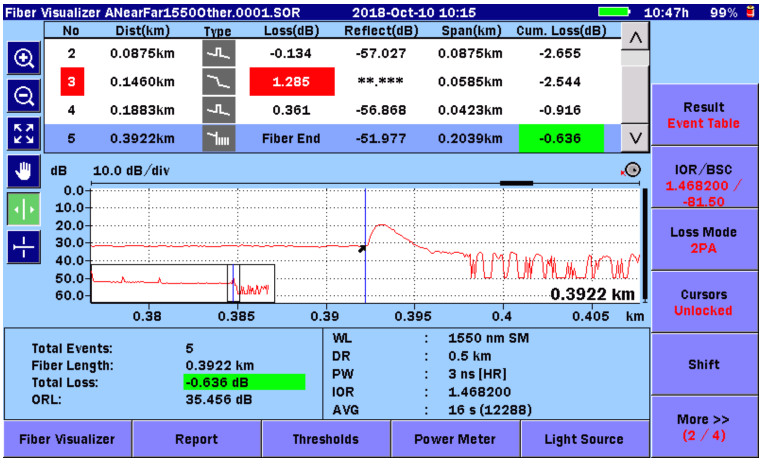


Figure 5.4-1 Fiber Visualizer Trace Screen (Event Table)

Touch the **Result** softkey (on softkey page 2/4) and display **Manual** on it, and you can see the enlarged view of the trace graph.

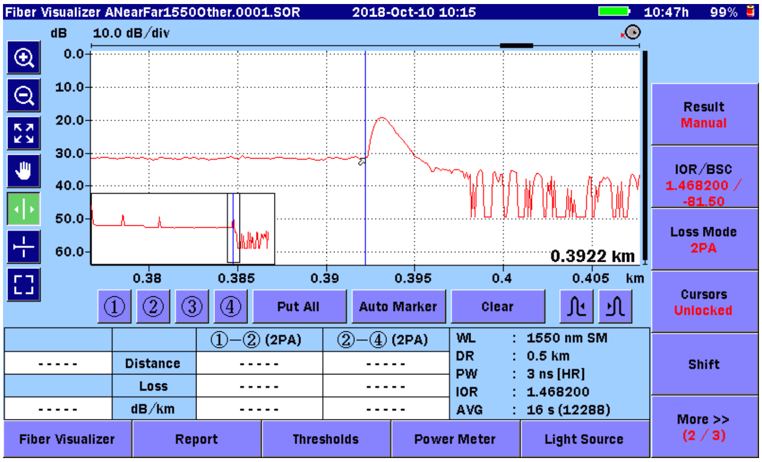


Figure 5.4-2 Fiber Visualize Trace Screen (Manual)

For details on Trace screen operations, refer to:

4.5 “Trace Screen”

4.6 “Analysis Screen”

4.8.3 “Shifting Trace Data”

5.4.1 Connection Check

When, in 5.2.2 "Preferences (1-2)", **Connection Check** is set to **On**, the ACCESS Master checks whether the optical fiber is correctly connected before starting measurement.

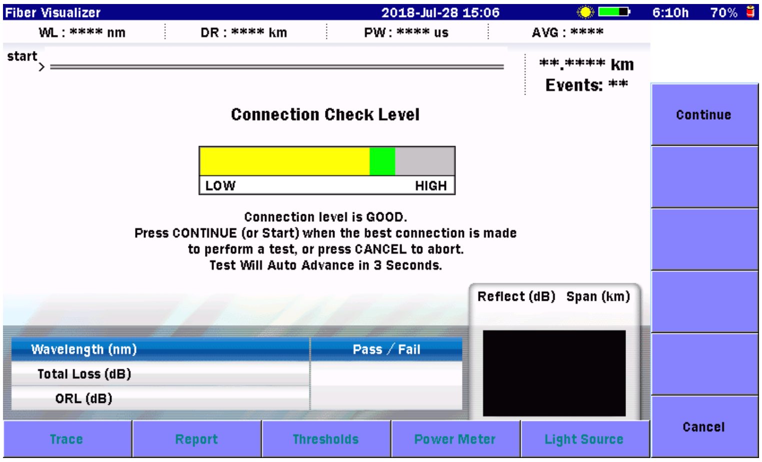


Figure 5.4.1-1 Connection Check Screen

GOOD connection

The gauge is green when connection is good. The closer the bar in the connection gauge extends to "HIGH" end, the better the connection is.

To run the test, touch **Continue** or press Start.

BAD connection

The gauge is displayed in red in case of poor connection and displayed in yellow if the connection is not so good. To run the test, touch **Continue** or press Start.

If the gauge is displayed in red or yellow, the fiber needs cleaning. If the connection state is not improved even if the fiber is cleaned, the fiber needs to be replaced.

Note:

Fibers shorter than approximately 50 meters (160 ft.) will generally result in a low connection.

Use up to 5-m long patch cords. If the patch cord is longer than 5 m, the gauge may be displayed in red.

5

Fiber Visualizer

5.5 Softkeys

This section explains the softkeys displayed for Fiber Visualizer mode.

5.5.1 Fiber Visualizer Softkeys

Figure 5.5.1-1 Fiber Visualizer Softkeys

Test Mode

Auto:

Automatically sets the test parameters.

FTTA:

Automatically sets the test parameters optimized for short-distance fibers, for example, fibers in a base station. FTTA stands for Fiber to the Antenna.

Manual:

Manually sets the test parameters.

Mode

Sets the action to take when touching the selected marker.

Mark A, Mark B:

Sets Marker A or B to the selected event when you touch the selected icon.
To clear the marker, touch the selected icon again.

Set the range of **A-B Span Analysis** in 5.2.3, “Preferences (2-2)”.

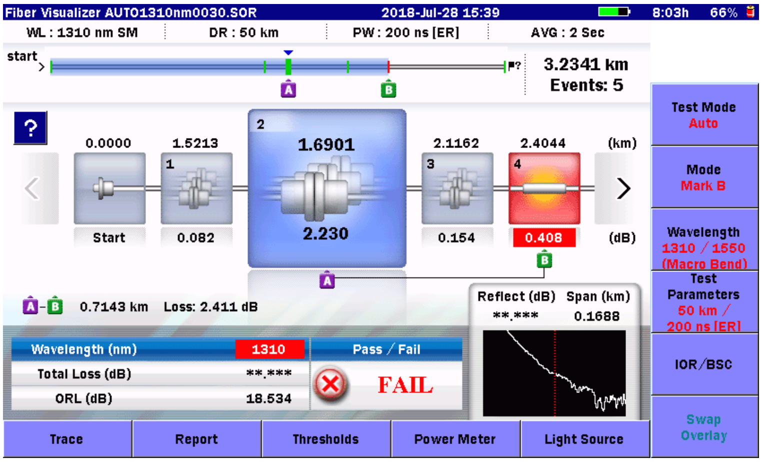


Figure 5.5.1-2 Event Marker Display

Event Edit:

Touch the enlarged icon, and you will see the Edit Event dialog box.

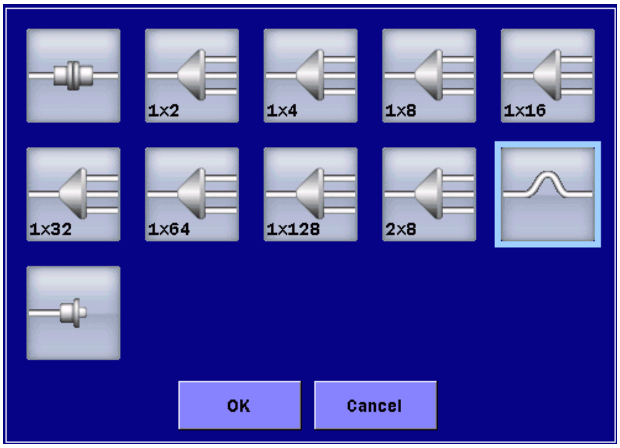


Figure 5.5.1-3 Edit Event Dialog Box

Wavelength

Switches the wavelength used for measurement. The wavelength cannot be changed during measurement.

Test Parameters

This is not available when **Test Mode** is **FTTA**.

Touch this softkey, and you will see the dialog box, where you can set the distance range, resolution, pulse width, dead-zone, averaging and splitter setup.

Even when **Test Mode** is **Auto**, be sure to set the splitter setup items when measuring the PON system.

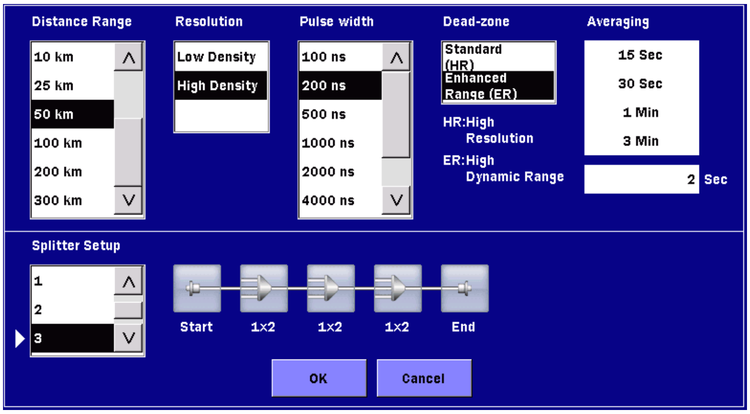


Figure 5.5.1-4 Test Parameters Dialog Box

Two dead-zone modes are available.

Standard (HR)

Performs short dead-zone measurement.

Enhanced Range (ER)

Allows high dynamic range measurement.
This is used to measure a furcated optical fiber that is a splitter included in the PON system.

Touch **OK** to save the specified parameters, and the saved parameters are used for next measurement. Press Start or Realtime to start measurement using the specified parameters.

Note:

If **Pulse Width** is set to the value out of the range from 50 to 2000 ns, this is set to **Standard (HR)**.
Enhanced Range (ER) can be set for the SM port.

Averaging

Sets the number of times or period for averaging.
Select the unit (**Times** or **Sec**) at **Unit of averaging** in 5.2.2, “Preferences (1-2)”.
Touch **OK** to save the specified parameters, and the saved parameters are used for next measurement. Press Start to start measurement using the specified parameters.

If this is changed during averaging measurement, the measurement restarts from the beginning using the new setting.

Splitter Setup

Set the number of splitters in the fiber under test and the number of branches in each splitter.

To automatically detect the number of splitters after measurement, select **Detect**.

Touch the splitter icon, and you will see the dialog box, where you can set the number of branches.

Note:

> **Test** Mode is **Auto**, the more appropriate test parameters are selected by setting the splitter setup items.

IOR/BSC

Sets the IOR (Index of Refraction) and BSC (Backscatter Coefficient).

Select the fiber type, and you will see IOR and BSC suitable for the fiber.

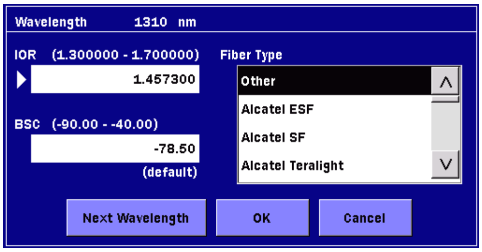


Figure 5.5.1-5 IOR/BSC Dialog Box

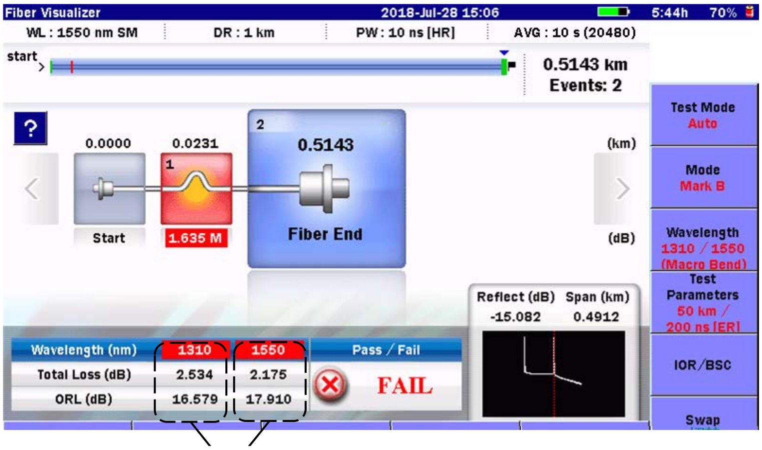
Next Wavelength:

> Sets IOR and BSC for each wavelength. Touch this button to switch the wavelength.

Swap Overlay

This is available when measuring with multiple wavelengths. When you touch **Swap Overlay**, the overlay trace and the primary trace are swapped.

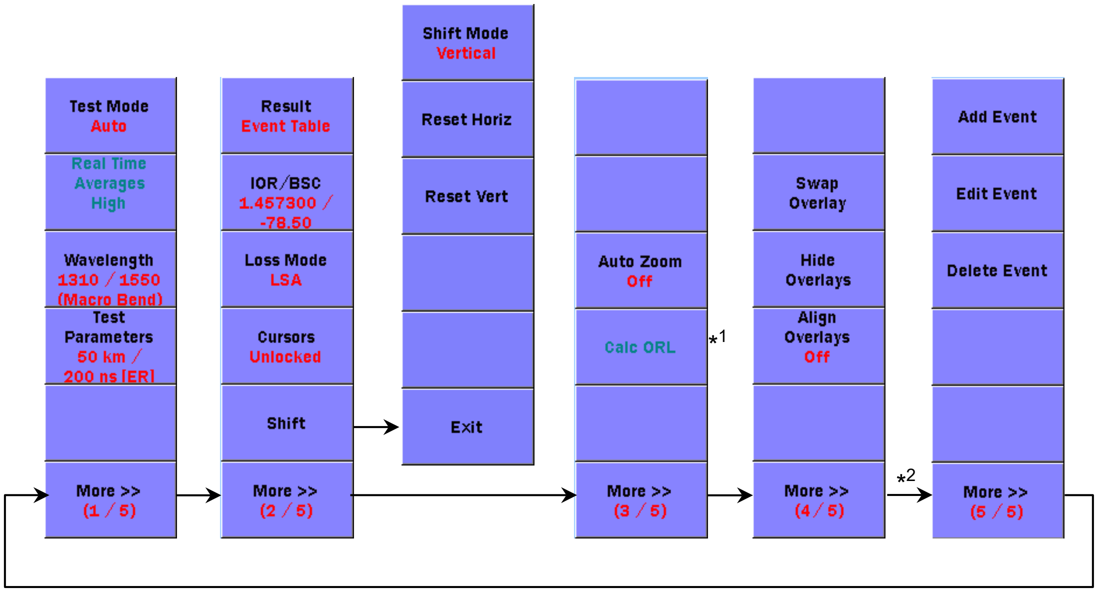
Also, overlay swapping can be performed by touching the wavelength in the test result columns.



Overlay swapping can be performed also by touching these areas.

Figure 5.5.1-6 Results of Measurement with Multiple Wavelengths

5.5.2 Trace Screen Softkeys



*1: This is displayed for **Movement**.
*2: This is displayed only when **Result** is set to **Event Table**.

Figure 5.5.2-1 Trace Screen Softkeys

Refer to 5.5.1, "Fiber Visualizer Softkeys " for details on the following softkeys:
Test Mode, Wavelength, Test Parameters, IOR/BSC

Real Time Averages

This is available for realtime measurement.

High:

High sweep speed suitable for monitoring fluctuations in a trace.

Low:

Longer sweep time, which, however, can minimize noise.

Result

Event Table:

Displays the event table.

Manual:

Does not display the event table. Cursor and marker operations are available.

Loss Mode

Sets the Loss Mode (loss calculation mode).
When **Marker Mode** is **Movement**, you will see the following dialog box.

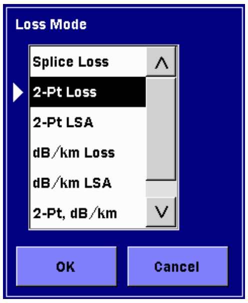


Figure 5.5.2-2 Loss Mode Dialog Box

When **Marker Mode** is **Placement**, switch between **2PA** and **LSA** by touching this softkey. If this is changed during measurement, the measurement continues using the new setting.
For details on loss calculation methods, refer to 7.1.2 "Loss Measurements".

Cursors

When **Marker Mode** is **Movement**:

- Lock: Cursor A moves interlocking with Cursor B.
- Unlocked: Cursors A and B can be moved separately.

When **Marker Mode** is **Placement**:

- Lock: Markers 1 to 4 move interlocking with the cursor.
- Unlocked: Markers 1 to 4 do not move even if the cursor is moved.

Shift

Shifts the vertical and horizontal axes of the graph. Refer to 4.8.3 "Shifting Trace Data".

Auto Zoom

When set to **On**, the selected event is displayed in enlarged view.

Swap Overlay, Hide Overlays, Align Overlays

Refer to 4.11.2 "Trace Overlay Functions". **Drop Overlay** and **Set to Overlay** are not displayed on the Fiber Visualizer screen.

Add Event

Refer to 4.7.1 “Add Event”. When **Result** on page 2/5 is **Event Table**, page 5/5 and its softkeys are available.

Edit Event

Refer to 4.7.2 “Edit Event”.

Delete Event

Refer to 4.7.3 “Delete Event”.

5.5.3 Extended Softkeys

(Fiber Visualizer)

(Trace screen)

Figure 5.5.3-1 Extended Softkeys

Trace

Displays the Fiber Visualize shown in Figure 5.4-2.

Fiber Visualizer

Displays the Fiber Visualizer shown in Figure 5.3-1.

Report

Displays the OTDR Report Settings (General) Screen shown in Figure 5.8-1. Refer to 5.8 “Creating Report Files”.

Thresholds

Displays the Thresholds screen. Refer to 5.2.6 “Thresholds”.

Power Meter

Displays the Power Meter dialog box. You can measure the optical power level without leaving the Fiber Visualizer screen. Refer to 4.12 “Power Meter”.

Light Source

Displays Light Source screen. Refer to 4.13 “Light Source”.

5.6 Measurement Procedures

This section explains how to perform measurement, display measurement results and edit events in the Fiber Visualizer screen.

5.6.1 Starting Fiber Visualizer

1. Press the **Top Menu** key .
2. Touch **Fiber Visualizer**.

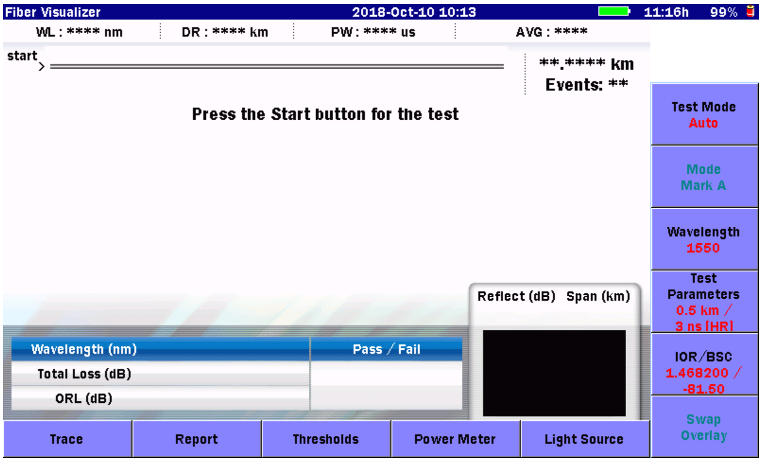


Figure 5.6.1-1 Initial Fiber Visualizer Screen

3. Connect the fiber under test to the ACCESS Master. For the port to which the fiber is connected, refer to 2.4, “Connecting Fiber to a Measurement Port”.
4. Press Start.When **Connection Check** is set to **On** in the Preferences (1-2) screen, the connection check starts. Wait until the connection reaches the best state, and then touch **Continue**.
5. Upon completion of the measurement, you will see the icons of the detected events in the Fiber Visualizer screen.

   To select an event, touch its icon.
   Also, pressing the arrow keys < and > or turning the rotary knob allows the event to be selected.

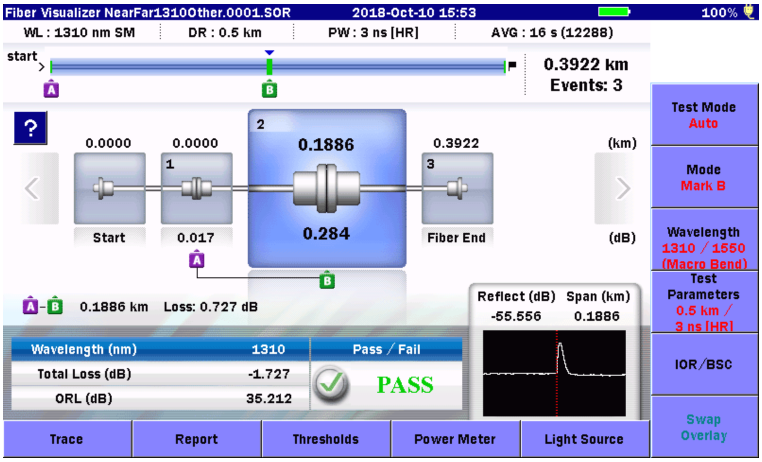


Figure 5.6.1-2 Fiber Visualizer Screen

6. Touch ?, you can see the event information.
7. To use an event marker, touch **Mode** to display **Mark A**.
8. Touch the enlarged event icon, and you will see the event marker icon A. Touch the event icon again, and you can clear the event marker.
9. Touch **Mode** to display **Mark B**.
10. Touch another event icon to select it. Touch the selected event icon, and you will see the marker icon B, and the distance and loss between events A and B.
11. To check the trace, touch **Trace** in the lower left of the screen shown in Figure 5.6.1-2.

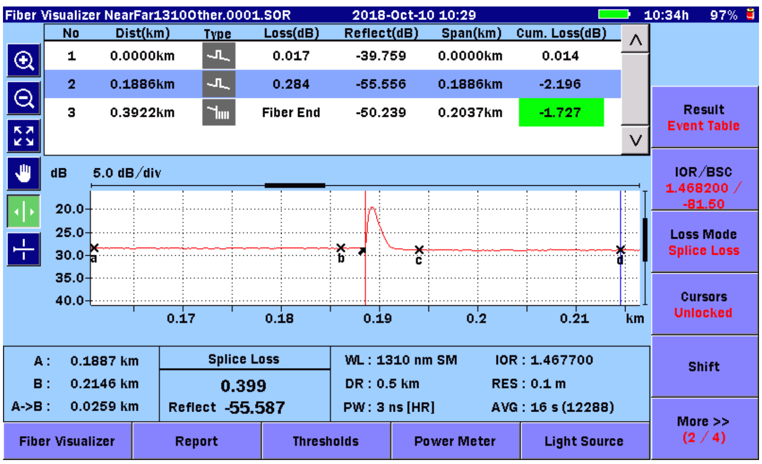


Figure 5.6.1-3 Fiber Visualizer Trace Screen

12. Touch **More** to display **Result**.

13. Touch **Result** to display **Manual** on it, and you will see the enlarged trace graph.

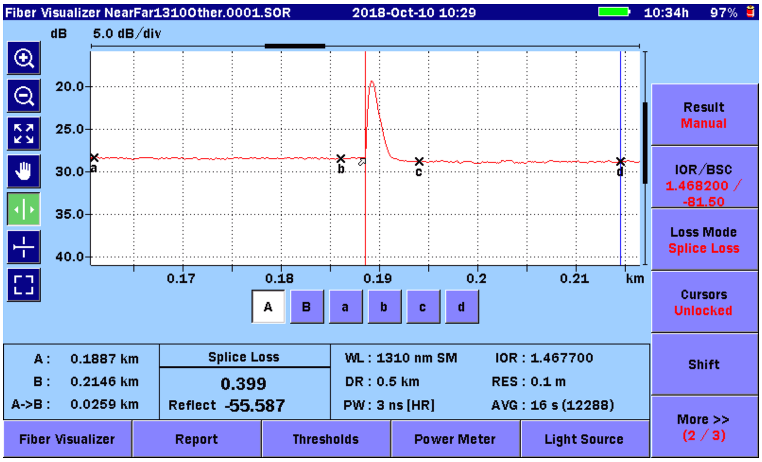


Figure 5.6.1-4 Fiber Visualizer Trace Screen (Manual)

5.6.2 Expanding and Contracting the Trace Display

Expand and contract the trace display when:

- Precisely positioning the cursor(s)
- Adjusting the LSA intervals

To expand an area:

1. Touch .

2. Drag a desired area in the trace graph to expand the view. You can also expand and contract the view by pressing the arrow keys.

[>]:	Horizontally expands the view with the active cursor or marker as the center.
[<]:	Horizontally contracts the view with the active cursor or marker as the center.
[∧]:	Vertically expands the view.
[∨]:	Vertically contracts the view.

To contract an area:

1. Touch .
2. Touch a point in the trace graph area, and you can contract the view, which displays the point in the center.
   You can also expand and contract the view by pressing the arrow keys.

To display the entire trace, touch  or press ESC.

Note:

If ESC is pressed during measurement, the measurement ends.

5.6.3 Selecting and Positioning Cursors

Setting the Active Cursor

When **Marker Mode** is **Movement**, touch **A** and **B**.
You can also switch the cursors by using the rotary knob or by pressing Enter.

To precisely position the cursor

1. Touch .
2. Drag a desired area in the trace graph to expand the view.
   You can also expand the view by pressing the arrow keys.
3. Turn the rotary knob to move the cursor to the desired position.
   When **Marker Mode** is **Placement**, you can switch the cursor movement speed by pressing the rotary knob. By touching ① to ④, markers are displayed at the cursor positions.

5.6.4 Event Editing

After Fault Locate Test has finished, Events icons appear on the screen. If detected event type is not appropriate, the event icon can be changed.

1. If a trace is displayed, touch **Fiber Visualizer** in the lower left.
2. Touch **Mode** to display **Event Edit**.

5

Fiber Visualizer

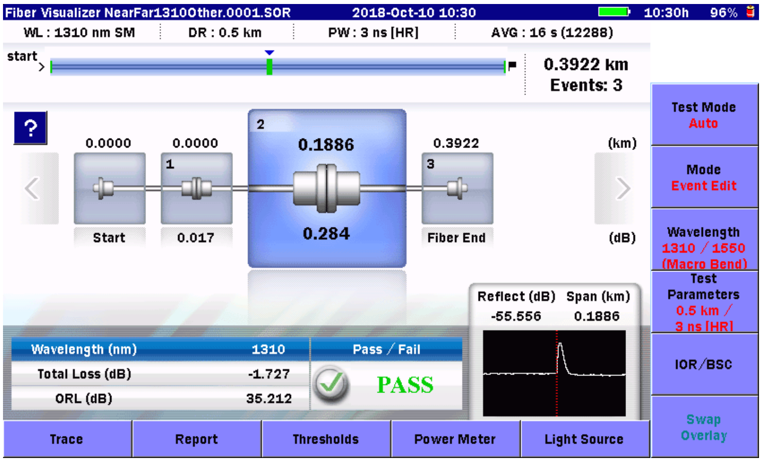


Figure 5.6.4-1 Editing Events in the Fiber Visualize Screen

3. Select an event by pressing the arrow keys [<] and [>] or turning the rotary knob.
4. Touch the enlarged event icon, and you will see the Edit Event Dialog Box shown in Figure 5.5.1-3.
5. Touch the event icon and touch **OK**.

The following table lists the events that can be edited.

Table 5.6.4-1 Type of Events Changeable icons

Current Event	Available Event
Non-Reflective	Splitter, Far End
Reflective	Splitter, Far End*1
Grouped	Splitter, Far End*1
Splitter	Non-Reflective*2, Reflective*2, Far End*1
Questionable	Far End*1

*1: Changeable if loss is larger than Far End threshold or reflection is lower than –20.0 dB.

*2: Changeable if the current event was changed from Non-Reflective or Reflective to Splitter.

5.6.5 Real Time Measurement

Realtime measurement provides a quick "realtime" view of the trace before starting Fiber Visualizer.
During realtime measurement, the trace is displayed in the screen, which does not include event icons.

To start a Real Time test:
Press [Realtime].

To stop a Real Time test:
Press [Realtime] or [ESC].

5.7 Working with Fiber Visualizer Files

Results of Fiber Visualizer measurement are saved as SOR files. For how to work with files, refer to 4.14, “Working with OTDR (Standard) Trace Files”.
However, no overlay traces cannot be loaded when working with Fiber Visualizer files.

5.8 Creating Report Files

Analysis results can be output in a report format and saved to a PDF file, which you can view on the PC.

Touch **Report**, and you will see the screen shown in Figure 5.8-1.

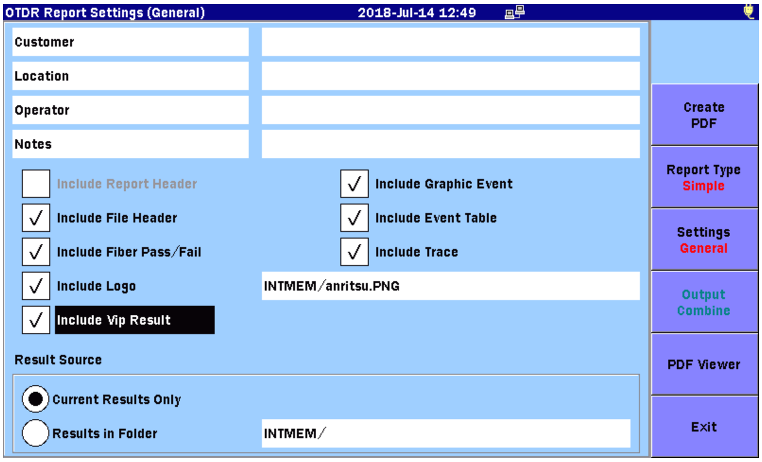


Figure 5.8-1 OTDR Report Settings (General) Screen

Create PDF

Creates a report file.

Report Type

Sets the report type.

Full Creates a multi-page report, which can include up to six VIP images.

Simple Reduces the size of the trace and creates a single-page report, which can include up to two VIP images.

Settings

Switches the OTDR Report Settings screen mode.

General displays Figure 5.8-1.

VIP Result displays Figure 5.8.3-1 or Figure 5.8.3-3.

Output

This is available when **Results in Folder** is selected for **Result Source**.

Combine Outputs measurement results of multiple tests to a report.

Separate Outputs measurement results of a test to a report.

PDF Viewer

Displays a PDF file. Refer to 5.8.5 “Viewing a Report”.

5.8.1 Report Header

Enter the information to output as a report header.

The header consists of the following fields:

- Customer: Customer name
- Location: Location, for example, address or name of city
- Operator: Operator information
- Notes: Notes regarding the fiber under test and measurement results, if necessary

Touch the header field, and you will see the dialog box, where you can enter characters. For how to enter characters, refer to 3.1.5 “How to Enter Characters”.

5.8.2 Selecting Data to Output

Select the check boxes for the items to output to a report.

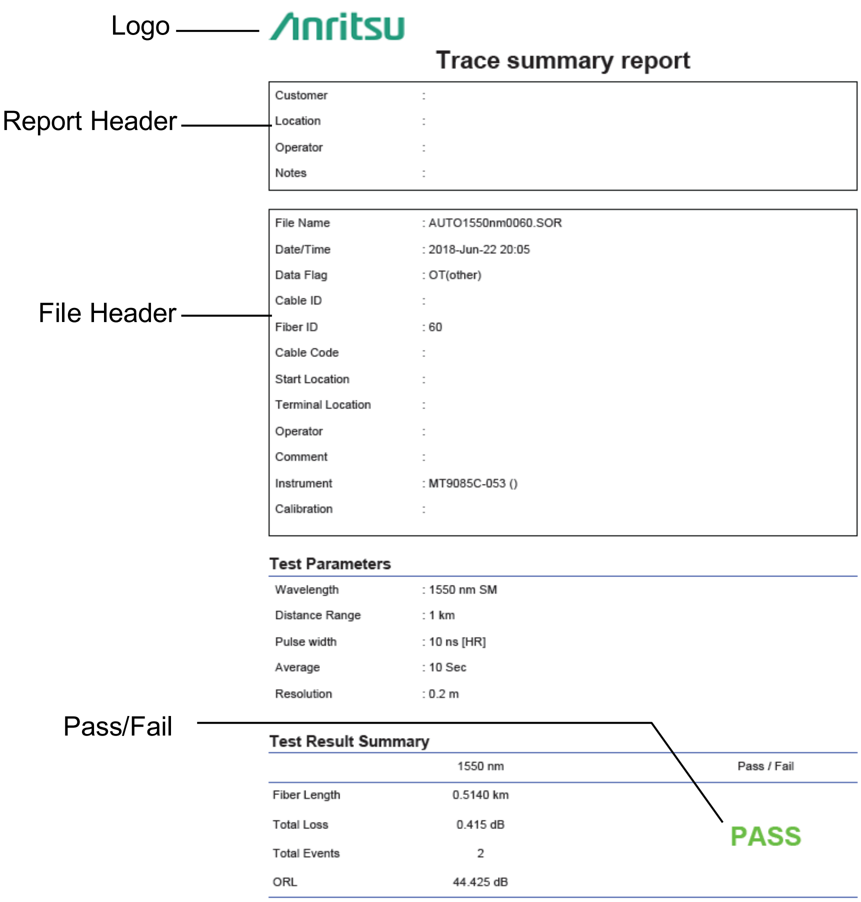
- Include Report Header
  Includes the information explained in 5.8.1, “Report Header” in a report.
  This check box is available when **Report Type** is **Full**.
- Include File Header
  Includes the information explained in 3.5.8, “Header” in a report.
- Include Fiber Pass/Loss
  Includes an evaluation result (Pass/Fail) in a report.
- Include Logo
  Includes a specified logo in a report.
  Touch the field, and select a logo file.
- Include VIP Result
  Includes VIP images and analysis results in a report.
  This check box is available when **Result Source** is **Current Results Only**.
- Include Graphic Event
  Includes event icons in a report.
- Include Event Table
  Includes the event table in a report.

- Include Trace
  Includes the trace in a report.

Result Source

Select measurement results to output to a report.

Current Results Only:
Outputs the measurement results displayed in the Fiber Visualizer screen to a report.
Results in Folder:
Outputs all SOR files in the selected folder to separate reports. To combine multiple files into a single PDF file, touch **Output** to set to **Combine**.



Trace summary report

Customer	:
Location	:
Operator	:
Notes	:

File Name	: AUTO1550nm0060.SOR
Date/Time	: 2018-Jun-22 20:05
Data Flag	: OT(other)
Cable ID	:
Fiber ID	: 60
Cable Code	:
Start Location	:
Terminal Location	:
Operator	:
Comment	:
Instrument	: MT9085C-053 ()
Calibration	:

Test Parameters

Wavelength	: 1550 nm SM
Distance Range	: 1 km
Pulse width	: 10 ns [HR]
Average	: 10 Sec
Resolution	: 0.2 m

Test Result Summary

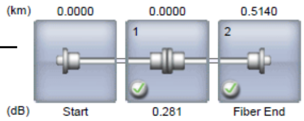
	1550 nm	Pass / Fail
Fiber Length	0.5140 km	PASS
Total Loss	0.415 dB	
Total Events	2	
ORL	44.425 dB	

Figure 5.8.2-1 Example of Output Report (Report Type: Full) (1/4)

Graphical Events

Total Events: 2

Graphic Event



Event Table

Event Table

No	Dist (km)	Type	Loss (dB)	Reflect (dB)	Span (km)	Cum. Loss (dB)
1	0.0000		0.281	-56.336	0.0000	0.000
2	0.5140		Fiber End	-19.202S	0.5140	0.415

Pass/Fail Thresholds

Pass/Fail Thresholds

Non-Reflective Event Loss(fusion)	: 0.20 dB
Reflective Event Loss(connector,mechanical)	: 0.50 dB
Reflectance	: -35.0 dB
Fiber Loss (dB/km)	: 1.00 dB/km
Total Loss	: 3.0 dB
Splitter Loss	: 3.0 dB
ORL	: 27.0 dB

Figure 5.8.2-2 Example of Output Report (Report Type: Full) (2/4)

OTDR Trace

Trace

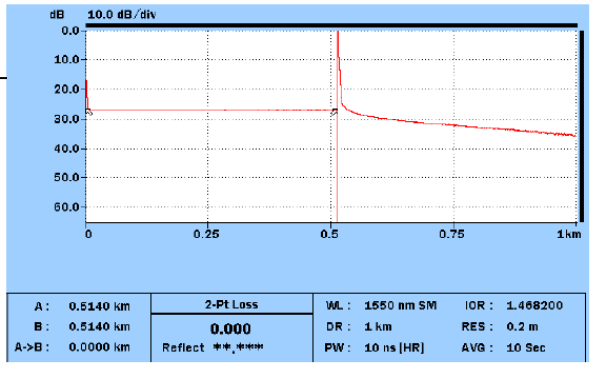


Figure 5.8.2-3 Example of Output Report (Report Type: Full) (3/4)

VIP Result

VIP Test Result

VIP Test Information	
File Name	**vip0001.VIPI**
Probe Model	G0306A
Tip Type	2.5PC-M
Test Profile	SM UPC >45 (IEC 61300-3-35 ed2.0)
Capture Time	2018-07-13 19:35:25

Analysis Result
FAIL

Analysis Details						
Zone Name	Diameter	Defects	Count	Area	Scratches	Count
Core	25	PASS	0	0.00	PASS	0
Cladding	115	FAIL	9	67.53	PASS	0
Adhesive	135	PASS	18	428.14	PASS	1
Contact	250	FAIL	40	914.56	PASS	1

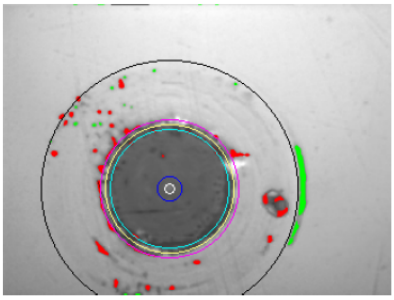
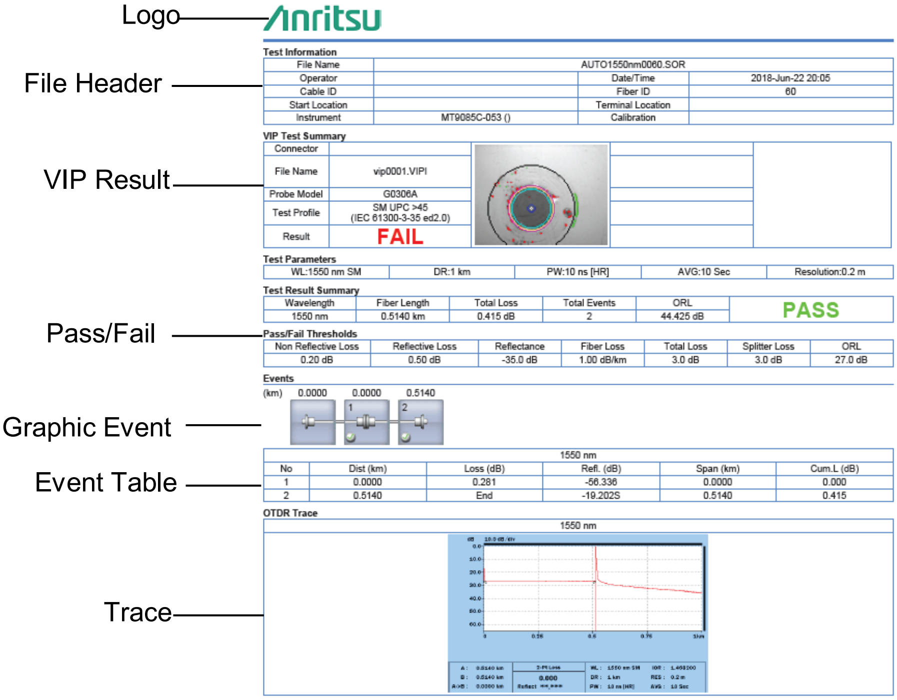


Figure 5.8.2-4 Example of Output Report (Report Type: Full) (4/4)



Test Information

File Name	AUTO1550nm0060.SOR		
Operator		Date/Time	2018-Jun-22 20:05
Cable ID		Fiber ID	60
Start Location		Terminal Location	
Instrument	MT9085C-053 ()	Calibration	

VIP Test Summary

Connector	
File Name	vip0001.VIPI
Probe Model	G0306A
Test Profile	SM UPC >45 (IEC 61300-3-35 ed2.0)
Result	FAIL

Test Parameters

WL:1550 nm SM	DR:1 km	PW:10 ns [HR]	AVG:10 Sec	Resolution:0.2 m

Test Result Summary

Wavelength	Fiber Length	Total Loss	Total Events	ORL	
1550 nm	0.5140 km	0.415 dB	2	44.425 dB	PASS

Pass/Fail Thresholds

Non Reflective Loss	Reflective Loss	Reflectance	Fiber Loss	Total Loss	Splitter Loss	ORL
0.20 dB	0.50 dB	-35.0 dB	1.00 dB/km	3.0 dB	3.0 dB	27.0 dB

Events

(km) 0.0000 0.0000 0.5140

1 2

1550 nm

No	Dist (km)	Loss (dB)	Refl. (dB)	Span (km)	Cum.L (dB)
1	0.0000	0.281	-56.336	0.0000	0.000
2	0.5140	End	-19.202S	0.5140	0.415

OTDR Trace

1550 nm

Figure 5.8.2-5 Example of Output Report (Report Type: Simple)

5.8.3 Configuring VIP File Settings

To output VIP results to a report, configure VIP file settings.

When **Report Type** is **Full**

1. Touch **Settings** to set to **VIP Results**, and you will see the following screen.

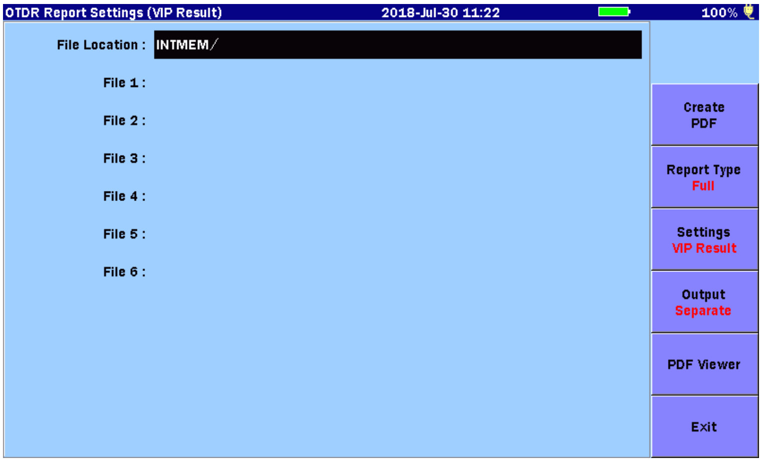


Figure 5.8.3-1 OTDR Report Settings (VIP Result) Screen Report Type: Full

2. Touch a folder, and you will see the Select Vip Result File screen.

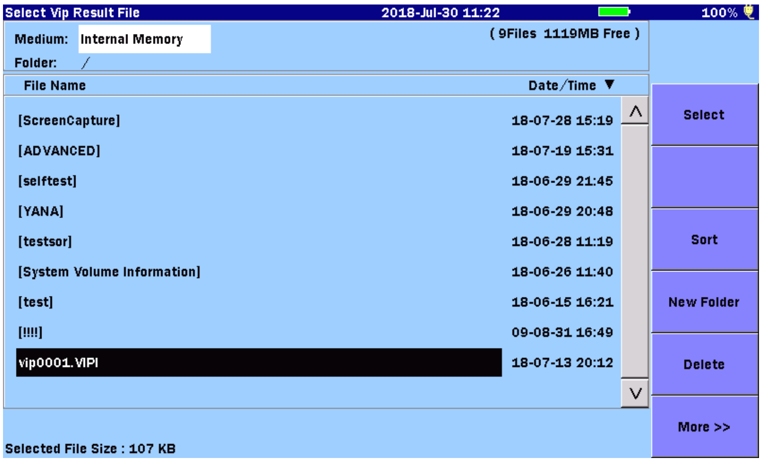


Figure 5.8.3-2 Select Vip Result File Screen

3. Touch the file name(s), and press Enter to select the file(s).When the **Multi-Select** soft key is set to **On**, a circle (●) is displayed at the beginning of the row for the selected file.

5

Fiber Visualizer

4. Press ESC, and you will see the OTDR Report Settings (VIP Result) screen, which displays the name(s) of the selected file(s).

When **Report Type** is **Simple**

1. Touch **Settings** to set to **VIP Results**, and you will see the following screen.

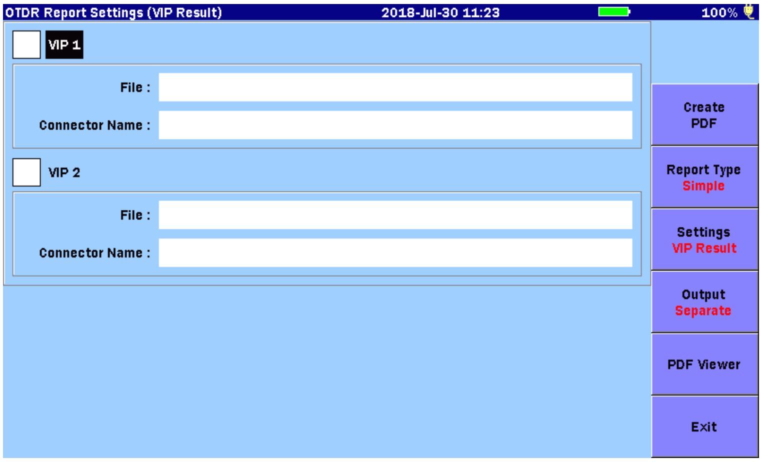


Figure 5.8.3-3 OTDR Report Settings (VIP Result) Screen Report Type: Simple

2. Select the **VIP 1** or **VIP 2** check box.

3. Touch the **File** field, and you will see the Select Vip Result File screen.

4. Touch the file name, and press Enter to select the file. When the **Multi-Select** softkey is set to **On**, a circle (●) is displayed at the beginning of the row for the selected file.

5. Press ESC, and you will see the OTDR Report Settings (VIP Result) screen, which displays the name of the selected file.

6. To enter the connector name, touch the **Connector Name** field, and you will see the dialog box, where you can enter characters.

7. When you finish entering the connector name, touch **OK**. The entered connector name is displayed in the **Connector Name** field.

5.8.4 Creating PDF File

Touch **Create PDF**, and you will see the Save PDF screen.

Set a file name and medium, and then touch **Save**.

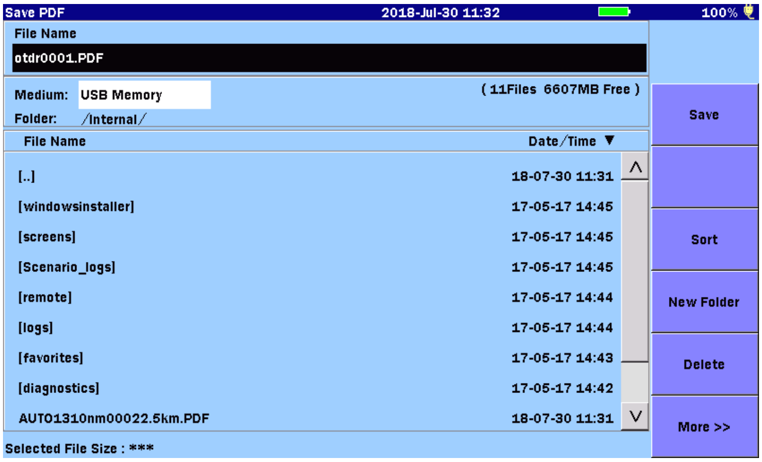


Figure 5.8.4-1 Save PDF Screen

If the file with the same name already exists in the save destination, you will be asked if you want to overwrite it.

Touch **Yes** to overwrite it, or **No** to not overwrite it.

5.8.5 Viewing a Report

You can check the contents of the created report files on the ACCESS Master.

1. Touch **PDF Viewer**.

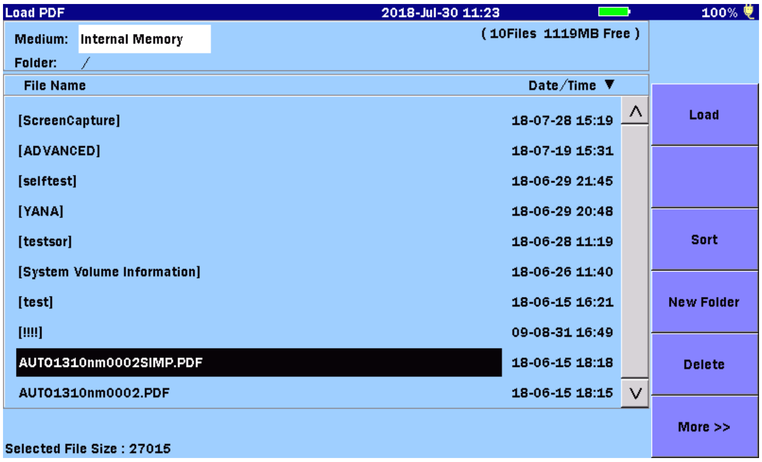


Figure 5.8.5-1 Load PDF Screen

2. Touch the file name and touch **Load**.

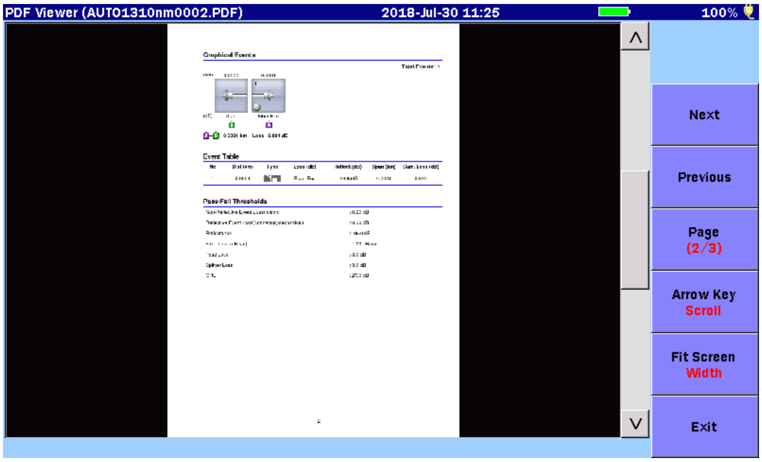


Figure 5.8.5-2 PDF Viewer Screen

3. You can change the view as you like by touching the softkeys.

Next	Displays the next page.
Previous	Displays the previous page.
Page	Displays the specified page.

Arrow Key	Sets the operation mode of the arrow keys.
Scroll	Scrolls the displayed report up and down.
Zoom	Enlarges or reduces the displayed report. [∧]: Enlarges the view. [∨]: Reduces the view.
Fit Screen	Sets the page-fit mode.
Width	Fits to the page width.
Height	Fits to the page height.

5-52.

Chapter 6 OTDR (Construction)

This chapter explains the OTDR (Construction) mode testing.

6.1 Starting OTDR (Construction)

The OTDR (Construction) is a function that automatically performs necessary tests when optical cables are installed. This function is useful when you need to test many optical fibers inside the cables and save the test results.

Follow the steps below to start OTDR (Construction) mode testing.

1. Press **Top Menu** .
2. Touch **OTDR (Construction)**. You will see the following screen.

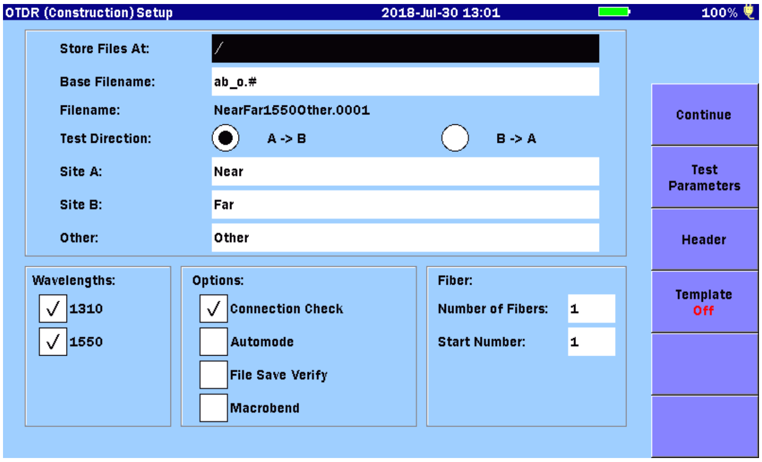


Figure 6.1-1 OTDR (Construction) Setup Screen

6.2 OTDR (Construction) Setup

To set up measurement conditions for OTDR (Construction), press **Setup** .

6.2.1 General Settings

Touch **General**, and you will see the General screen.
For detailed information on the General screen, refer to Section 3.3.1 "General Settings".

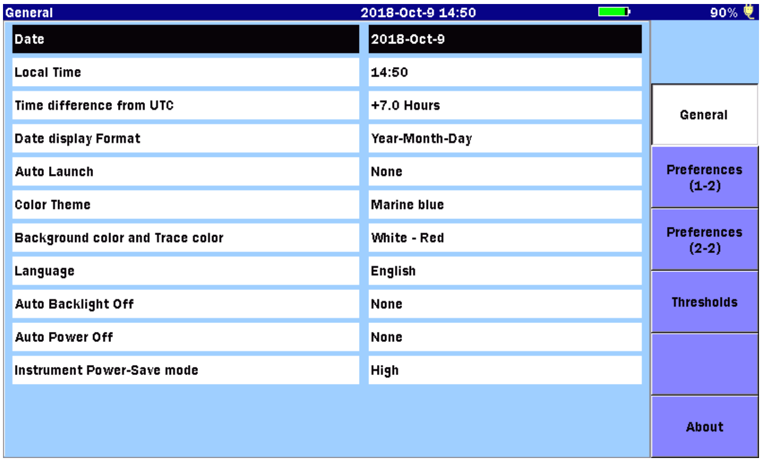


Figure 6.2.1-1 General Screen

6.2.2 Preferences (1-2)

Touch **Preferences (1-2)**, and you will see the following screen.

Figure 6.2.2-1 Preferences (1-2) Screen

Distance display Units

Select the unit of measurement used to display distance on the horizontal axis of the Trace graph. This affects Range and Resolution readings and analysis events incorporating distance.

Connection Check

The Connection Check function confirms whether or not the fiber is connected correctly to the OTDR measurement port. When set to **On**, this function is activated.

Active Fiber Check

The Active Fiber Check performs a “live fiber” check on the currently attached fiber under test to detect whether the fiber is carrying traffic before firing any OTDR laser sources.
If no traffic is detected the test proceeds normally.
If traffic is detected a warning message appears on the screen and the test is aborted.

Auto Scale

When set to **On**, the horizontal scale is set automatically so that  can display a trace from which the noise portion is removed.

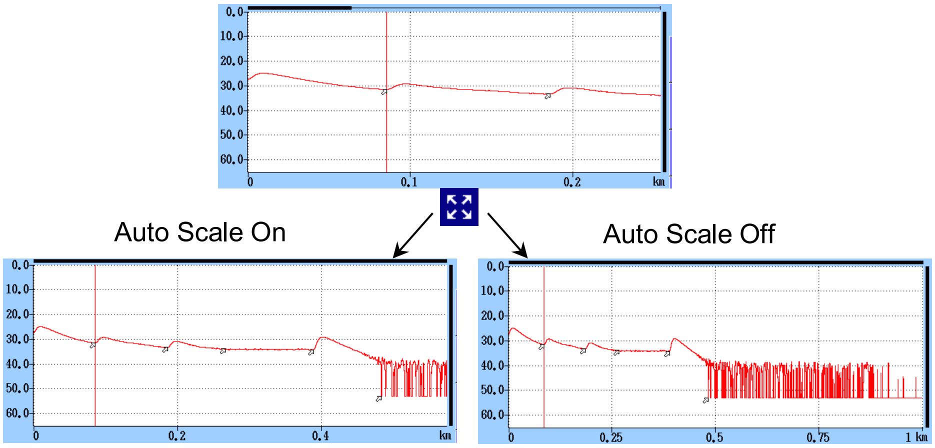


Figure 6.2.2-2 Auto Scale function

Event Summary

When set to **On** with Preferences (2-2) set to **Movement**, the analysis results summary is displayed for displaying analysis.

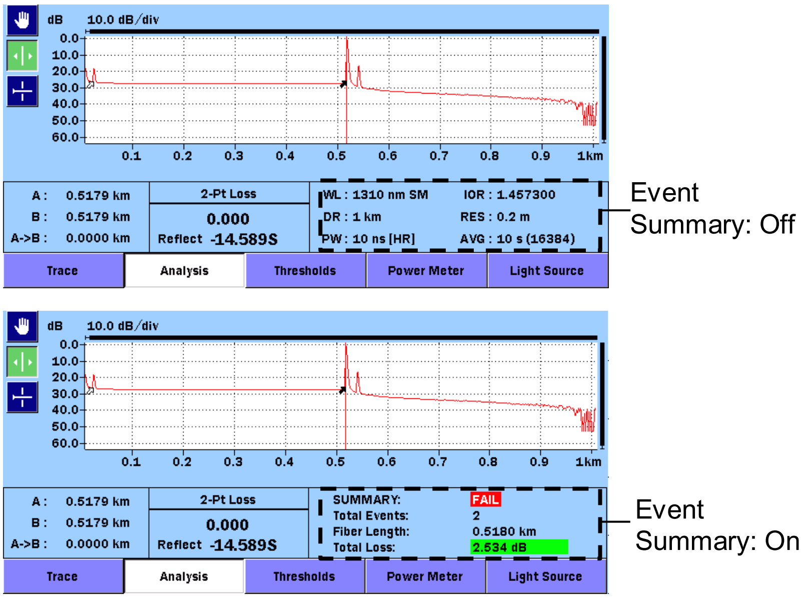


Figure 6.2.2-3 Summary Display

Trace Overview

When set to **Lower Left** or **Upper Right**, a small overview of the trace is displayed at the selected position on the Trace graph.

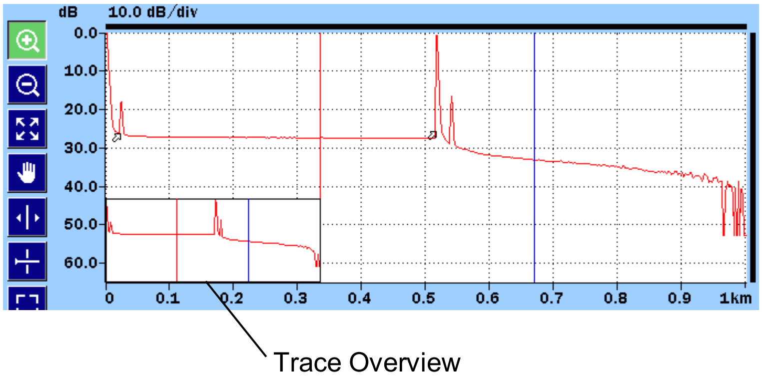


Figure 6.2.2-4 Trace Overview (Lower Left)

Show Internal Launch Fiber

When set to **On**, the internal launch fiber is displayed.

Unit of averaging

Set the unit of averaging (the number of times or second).

Real Time Attenuation

The ACCESS Master adjusts the attenuation at the light-receiver according to the level of the light returned back from the optical fiber under test. Set the attenuation adjusting method.

- **Auto Attenuation**
  Real Time attenuation is automatically selected.
- **Around selected cursor**
  Attenuation is optimized in real-time to show the backscatter around the selected (active) cursor.
- **Fresnel Measure**
  Attenuation varies according to received power level. This setting is suitable to measure reflections in long distance range however it takes longer time to measure than other options.

Note:

Real-time measurement is unavailable for the OTDR (Construction) tests.

Display Mode After Analysis

Set the trace display mode for detected events.

- **End/Break**
  The display mode focuses on the end/break event.
- **Full Trace**
  The full trace is displayed in Display from Origin mode.
- **Current**
  The display mode and cursor positions remain unchanged.

Sound of test completion

Set the period of time to cause the buzzer to sound upon test completion. When set to **Disabled,** the buzzer does not sound upon test completion.

Touching the screen or pressing any key causes the buzzer to stop.

6.2.3 Preferences (2-2)

Touch **Preferences (2-2)**, and you will see the following screen.

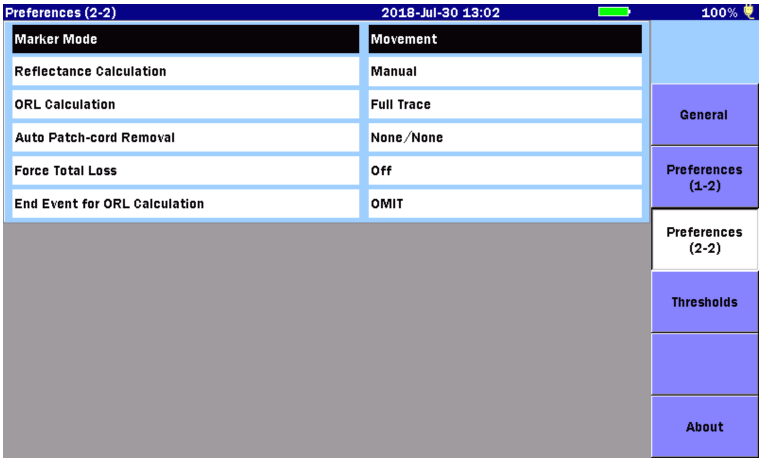


Figure 6.2.3-1 Preferences (2-2) Screen

Marker Mode

Set the mode of operating the markers for detailed measurement of splice and transmission loss of an optical fiber.

- Movement

  Cursors A and B are always displayed. Makers a to d are displayed depending on the setting for Loss Mode.

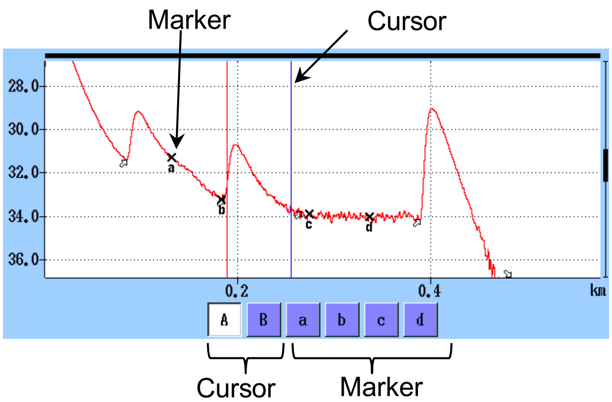


Figure 6.2.3-2 Cursors and Markers for Movement

- Placement (1-2, 2-4)

  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.

Placement (1-2, 2-4) is suitable to measure fiber loss and distance and can measure reflection, total return loss, and splice loss.

- Placement (1-2, 3-4)
  Place the markers by moving the cursor. All markers can also be cleared. As each cursor is independent of markers, you can also zoom any portion not specified by markers.
  Placement (1-2, 3-4) is suitable to measure distance and loss between two markers. It can measure reflection and total return loss but cannot measure splice loss.

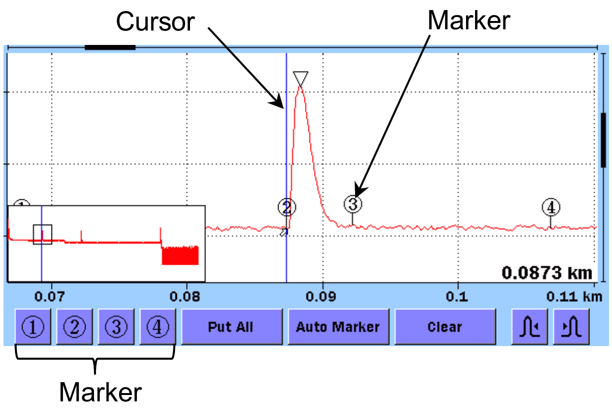


Figure 6.2.3-3 Cursor and Markers for Placement

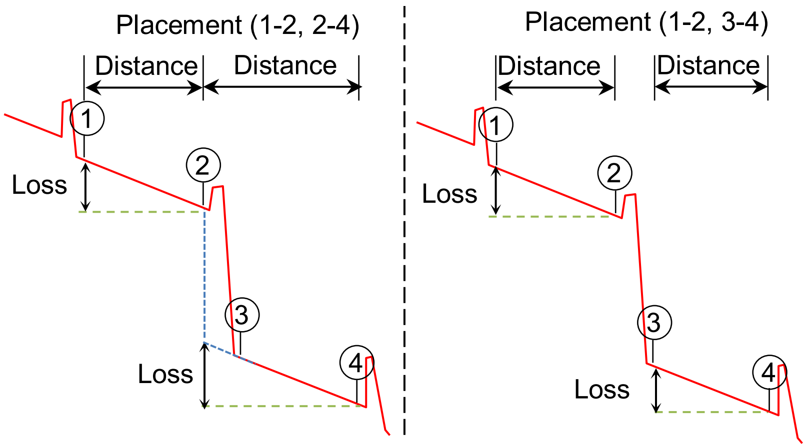


Figure 6.2.3-4 Display of Distance and Loss Between Markers

Reflectance Calculation

This is available when Marker Mode is set to **Movement**. Set the reflectance calculation method.

- **Off**
  Reflectance will not be calculated.
- **Auto**
  The reflectance of any event is reported based on the position of cursor A. The Auto setting is most useful for reflective events that are not close together or close-in to the OTDR. Refer to 7.1.3.1, “Auto Reflectance Calculation”.
- **Manual**
  When set to Manual, the reported reflectance is based on the positions of both cursors (A and B). Refer to 7.1.3.2, “Manual Reflectance Calculation”.

ORL Calculation

This is available when Marker Mode is set to **Movement**.

- **A Cursor**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the cursor A position.
- **Origin**
  The ORL measurement is calculated from the cursor A to the cursor B, but the Incident Power is attained from the origin.
- **Full Trace**
  The ORL measurement is calculated from the Origin to the last data point, and the Incident Power is attained from the origin.

Type of reflective result

This is available when Marker Mode is set to **Placement**.
Select one you want to display as a result of reflection measurement from the following:

- Reflectance
  Ratio of reflected power to incident power at reflection point
- Reflection
  Difference between peak level at reflection point and backscattered light level immediately before it (height on trace)

Auto Patch-cord Removal

Set the points of events to treat as patch cords. The set number of events are recognized as patch cords and are automatically deleted from the event table.
In an example shown in the following figure, set start point to 1

and end point to 1.

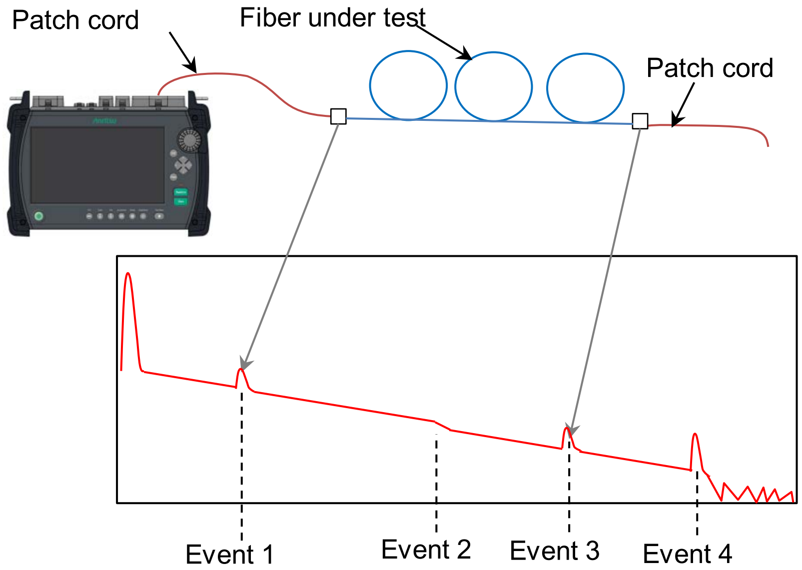


Figure 6.2.3-5 Auto Patch-cord Removal Example

When not using patch cords, set to **None/None**.

Note:

The Auto Patch-cord Removal settings are reflected to the measured trace. To make the settings reflected to the trace loaded from a file, touch in **Analyze** in the Analysis screen.

Force Total Loss

When set to **On**, the total loss of the fiber under test is always displayed.

When set to **Off**, *** is displayed if the total loss cannot be calculated.

Note:

*** is displayed for Questionable End Event even if Force Total Loss is On.

End Event for ORL Calculation

Set whether to include reflection in Far-End events or not when calculating the ORL.

When **OMIT** is selected, the pass/fail evaluation is not performed on the far-end reflection.

6.2.4 Thresholds

Touch **Thresholds** softkey, and you will see the following screen.

Figure 6.2.4-1 Thresholds Screen

6.2.4.1 Auto Detect

The Auto Detect parameters are thresholds for detecting events.

Splice Loss

Set the minimum splice loss to display in the event table.

Reflectance

Set the minimum reflectance. The event analysis table displays all events with reflectance of this value or less.

Fiber End

Set the minimum loss of the far end event.

Macro Bend

Set the threshold for detecting an event as a macrobend. For macrobend, refer to 4.10, “Wavelength All Mode”.

Splitter Loss

Set the splitter loss to display as a splitter event in the event table.

6.2.4.2 Pass/Fail Thresholds

Pass/Fail Thresholds items are thresholds for pass/fail evaluation of measured values. When set to **None**, pass/fail evaluation is not performed.

Non-Reflective Event Loss(fusion)

If the loss of a non-reflective event (for example, fusion splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflective Event Loss(connector, mechanical)

If the loss of a reflective event (for example, connector and mechanical splice) exceeds the threshold, the **Loss** column of the event table is displayed in red.

Reflectance

If the reflectance of an event is less than the threshold, the **Reflect** column of the event table is displayed in red.
When **Type of reflective result** is set to **Reflection** in the Preferences (2-2) screen, if the level difference between events exceeds the threshold, the **Reflect** column of the event table is displayed in red.

Fiber Loss (dB/km)

If the fiber loss of an event exceeds the threshold, the **dB/km** column of the event table is displayed in red.

Total Loss

If the total loss of the far-end event exceeds the threshold, the **Cum. Loss** column of the event table is displayed in red. If the event summary is displayed, the total loss of the event summary is also displayed in red.
If the total loss is less than the threshold, the **Cum. Loss** column of the far-end event in the event table and the total loss of the event summary are displayed in green.

Splitter Loss

The **Loss** column of the event table is displayed in red if the splitter loss exceeds the sum of the following:

- **Splitter Loss** for **Auto Detect**
- **Splitter Loss** for **Pass/Fail Thresholds**

For example, if Splitter Loss (1×2) for Auto Detect is 4.1 dB and Splitter Loss for Pass/Fail Thresholds is 1.0 dB, the loss of 1×2 splitter event exceeding 5.1 dB is evaluated as “fail”.

6.2.5 About

Refer to 3.3.4 “About”.

6.3 OTDR (Construction) Setup Screen

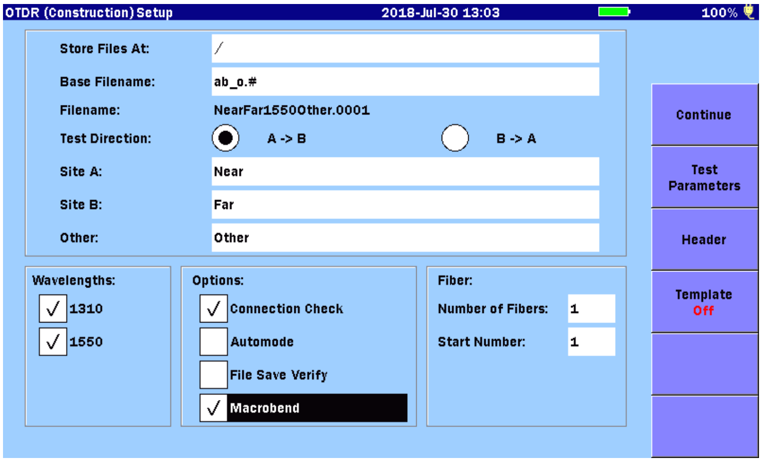


Figure 6.3-1 OTDR (Construction) Setup Screen

Store Files At

Specify a destination folder to store trace files.

Base Filename

Touching the text box allows editing the filename.

The default settings are as below.

When Test Direction is A->B :	ab_o.#
When Test Direction is B->A :	ba_o.#

- a It is replaced by characters input in the Site A field.
- b It is replaced by characters input in the Site B field.
- _ It is replaced by numeric characters representing wavelength.
- o It is replaced by other characters.
- # It is replaced by fiber number.

Note:

Do not delete the default characters. Otherwise, the base filename elements may not be displayed correctly.

Filename

The first file to be saved is displayed.

If the filename is longer than 30 characters, it is displayed in red and the **Continue** key is disabled.

Test Direction

A->B: Direction from ACCESS Master located at Site A to the far end located at Site B.

B->A: Direction from ACCESS Master located at Site B to the far end located at Site A.

Base Filename Elements

Specify characters to be used as the base filename.

Site A: Normally, input the location where ACCESS Master has performed measurement.

Site B: Normally, input the far end name of the fiber under test.

Other: Input a common element to be added to the base filename such as cable ID.

Wavelengths

Select the wavelength for testing.

Options

- Connection Check
  Select the checkbox to perform a connection check on the connected fiber before the measurement starts.
- Automode
  Select the checkbox to automatically set the measurement parameters such as distance range, resolution, and pulse width according to the fiber under test.
- File Save Verify
  Select the checkbox to display the Save screen before the trace waveforms of each fiber are saved. This allow you to check the filename and save location before saving.
- Macrobend
  Select the checkbox to measure macrobend.
  For the details of macrobend, refer to 4.10.1 “Wavelength All Test Parameters”.
  Macrobend is displayed with M added to the event table loss value.

Note:

To detect macrobend, it is necessary to test the single mode fiber with the same parameter setup in the wavelength including 1310 nm and 1550 nm or 1625 nm. Select **Apply to All Wavelength** on the Test Parameters screen (Section 6.3.2).

Macrobend is not displayed when wavelength of 1310 nm and 1550 nm or 1625 nm are not selected.

Fiber

- Number of Fibers
  Enter the maximum number of fibers for the current test in this field.
- Start Number
  Enter the number of the first fiber to be tested in the Start Number field.
  A four-digit number is given to a filename. Set the start number so that the total of the start number and the number of fibers is 9999 or under.

6.3.1 Softkeys

Continue

Starts the test according to the setup performed on the OTDR (Construction) Setup Screen. Pressing Start can also start the test.

Test Parameters

Refer to 6.3.2 “Test Parameters Setup”.

Header

Refer to 3.5.8 “Header”.

Template

Refer to 6.3.3 “Template Settings”.

6.3.2 Test Parameters Setup

Test Parameters

The following items are displayed per wavelength.

- Range/PW distance Range, Pulse Width, Resolution, Dead-zone
- Num Avgs Averaging duration or a number of averaging times
- Apply to All Wavelength
  When selected, the settings are copied to the other wavelength.
- IOR/BSC Index of reflection, Backscatter coefficient

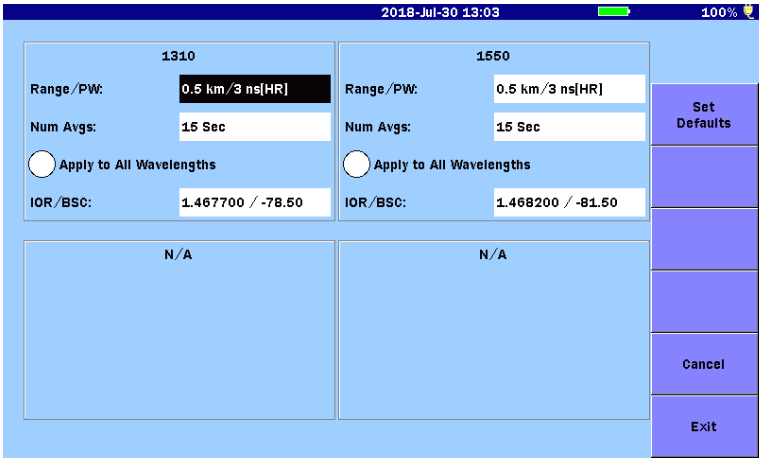


Figure 6.3.2-1 Test Parameters screen

Touch the field to set the value. Refer to 4.8.2 "Measurement Parameters" for details.

Set Defaults

Restores the test parameters to the factory default settings.

Cancel

Discards the changes and closes the Test Parameters screen.

Exit

Saves the changes and closes the Test Parameters screen.

6.3.3 Template Settings

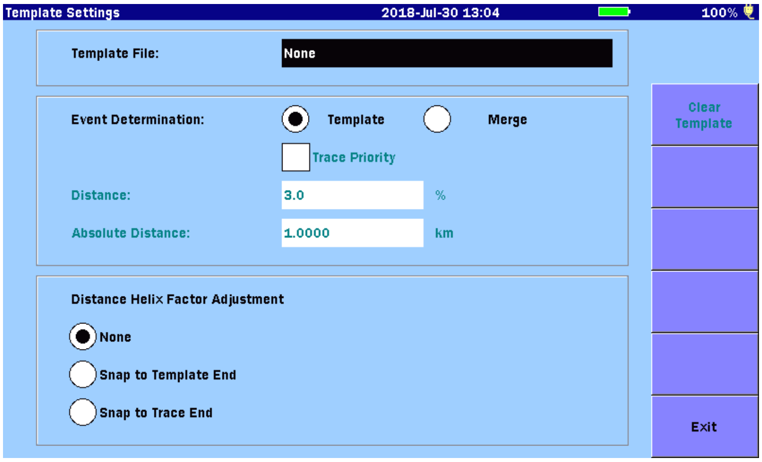


Figure 6.3.3-1 Template Settings Screen

For the details of template, refer to 4.9 "Template Mode".

Template File

Selects a template.

1. Touch the Template File field to display the Load screen.
2. Touch a SOR file to be used as a template.
3. Touch **Load**.

When touching **Clear Template** of soft key, the file is cleared and None is displayed.
The template trace is displayed in pink in the trace graph.
For details of other settings, refer to 4.9.2 "Template Settings".

6.4 Connect Fiber Screen

Two boxes are displayed on the Connect Fiber screen.

- Fiber number to connect
- Filename to be saved after measurement

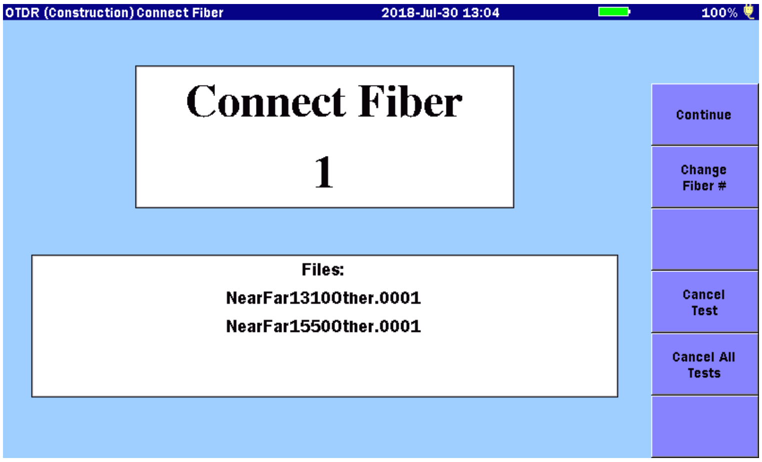


Figure 6.4-1 Connect Fiber Screen

6.4.1 Connect Fiber Screen Softkeys

Continue

Starts measurement.
Touch this key after a fiber is connected to the ACCESS Master.
If Connection Check is selected on the OTDR (Construction) Setup Screen (Figure 6.3-1), the Connection Check screen appears.
You can start the test also by pressing the button.

Change Fiber

Changes the fiber number.
Edit the fiber number when you re-test the same fiber or skip a test of specific fiber.

Cancel Test

Cancels the measurement of displayed number and start testing fiber of next number.

Cancel All Tests

Cancels the measurement of the displayed number and after, and returns to the OTDR (Construction) Setup Screen (Figure 6.3-1).

6.5 Test In Progress Screen

The ACCESS Master starts testing the fiber when touching **Continue** on the Connect Fiber Screen (Figure 6.4-1).
When **Connection Check** is selected on the OTDR (Construction) Setup Screen (Figure 6.3-1), the Connection Check screen is displayed..

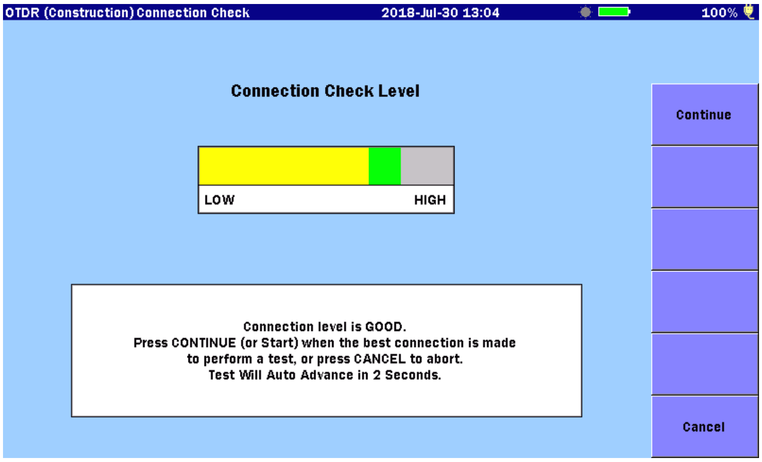


Figure 6.5-1 Connection Check Screen

For details of Connection Check, refer to 4.5.6 “Connection Check”.

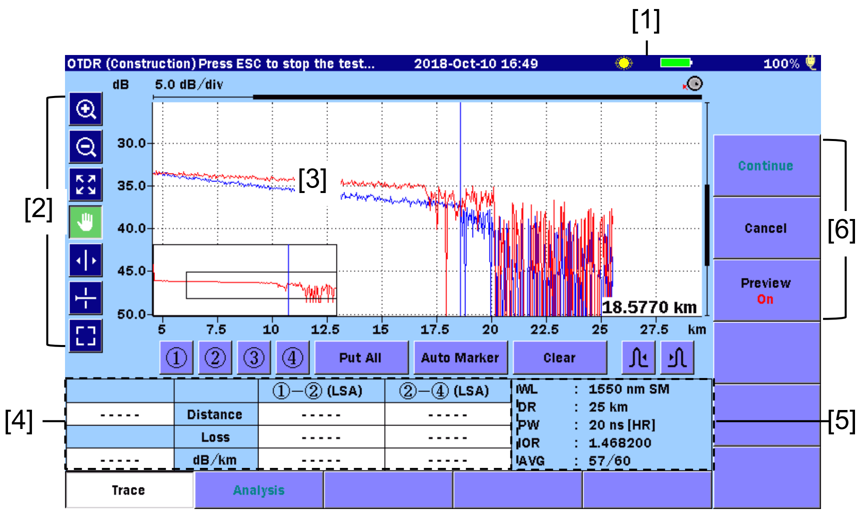


Figure 6.5-2 Test In Progress Screen

[1]	Laser On Icon	[4]	Test results
[2]	Graph control icons	[5]	Test parameters
[3]	Trace graph	[6]	Softkeys

Laser On Icon

This icon flashes whenever a laser is firing.

Graph control icons

For the details of the icons, refer to 4.5.1 "Trace Graph".

6.5.1 Softkeys When Test In Progress

Cancel

If touching **Cancel**, the running measurement is cancelled and the connected fiber number and file name number increase by one respectively.

To interrupt the running measurement, press ESC.

Preview

On When the fiber measurement ends, the summary appears on the analysis screen. See Figure 6.7.1-1.

Off When the fiber measurement ends, the results are saved to a file automatically and the measurement screen for the next fiber is displayed.
When the measurements of the specified number of fibers end, the screen goes back to the OTDR (Construction) Setup Screen (Figure 6.3-1).

6.5.2 Trace Screen Operation

For details of waveform screen operations, refer to 4.5 "Trace Screen".

6.6 Test Results Screen – OTDR (Construction)

When Preview is set to On on the Test In Progress screen (Figure 6.5-2), the results of OTDR (Construction) measurement are displayed.

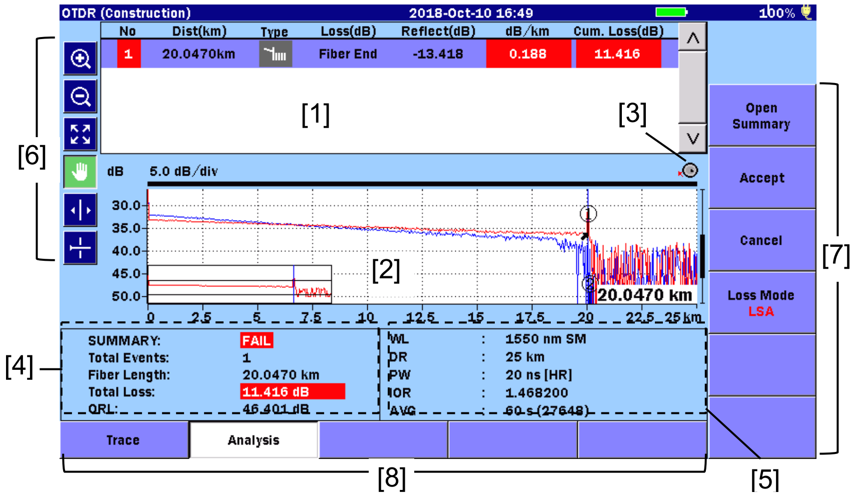


Figure 6.6-1 Test Results screen with Summary Closed

[1]	Event table	[5]	Test parameters
[2]	Trace graph	[6]	Graph control icons
[3]	Rotary konb icon	[7]	Softkeys
[4]	Analysis resuls	[8]	Extended Softkeys

Event Table

The events detected by active trace are displayed. For the details of the displayed items, refer to 4.6.1 "Event Table".

Graph control icons

For the details of the icons, refer to 4.5.1 "Trace Graph".

6.6.1 Softkeys on Test Results Screen

Open Summary

Displays the Summary dialog box.

Accept

Touch **Accept** when the test results have no problem. The test results are saved to a file, and the fiber connection screen of the next number is displayed.

Cancel

To discard the test results, touch **Cancel**. The test results are not saved to a file. Proceed to the fiber connection screen of the next number.

Loss Mode

Sets the Loss Mode (loss calculation mode). Available calculation methods differ depending on **Marker Mode** of Preferences (2-2) (Section 6.2.3).

When **Marker Mode** is **Movement**, you will see the following dialog box.

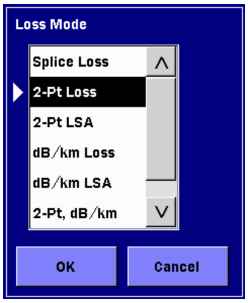


Figure 6.6.1-1 Loss Mode Dialog Box

When **Marker Mode** is **Placement**, switch between **2PA** and **LSA** by touching this softkey.

6.7 OTDR (Construction) Testing

This section explains how to execute the OTDR (Construction) tests.

6.7.1 Running an OTDR (Construction) Test

To run an OTDR (Construction) Test :

1. Power up the ACCESS Master.
2. Touch **OTDR (Construction)** on the Top Menu.
3. Refer to 6.3 "OTDR (Construction) Setup", and perform necessary settings on the OTDR (Construction) Setup screen.
4. Input the header information as needed. Touch **Header** of softkey. Refer to 3.5.8 "Header" for details.
5. To set template, touch **Template** of softkey. Refer to 6.3.3 "Template Settings" for details.
6. Touch **Continue**. The Connect Fiber Screen (Figure 6.4-1) is displayed.
7. Connect the fiber under test to the ACCESS Master. For details of ports to connect, refer to 2.4 "Connecting Fiber to a Measurement Port".

Note:

Two measurement ports may be required depending on the option configuration of the ACCESS Master. However, two different wavelengths cannot be set for measurement. Only the wavelength of Port 1 can be set for SM fiber, and only the wavelength of Port 2 for MM fiber.

8. Touch **Continue**. Different screens are displayed depending on the Connection Check setting of Preference (1-2).
   - When Connection Check is On, the Connection Check Screen is displayed (Figure 6.5-1). Touch **Continue** after making sure that the connection state is optimal.
   - When Connection Check is Off, the Test In Progress Screen is displayed (Figure 6.5-2).
9. To check the fiber waveform and event table of the measured

fiber, touch **Preview** to turn it On.

When **Preview** is Off, the measurement results are saved automatically. Proceed to Step 12.

10. When the analysis after measurement is completed, the Summary dialog box is displayed. Touch **Close** to check waveform.

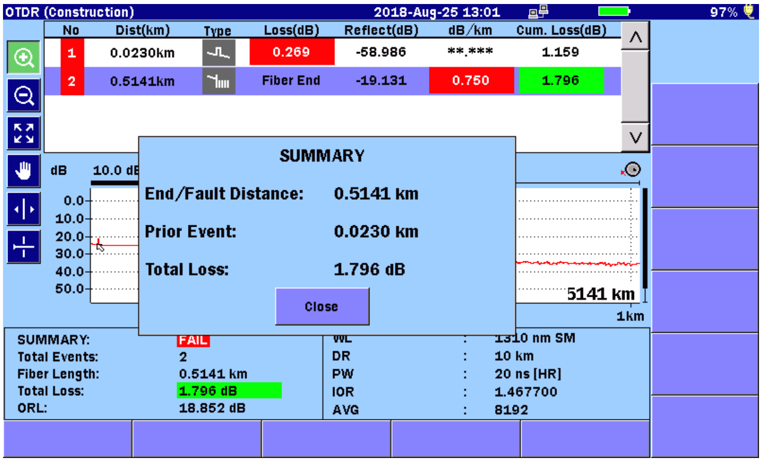


Figure 6.7.1-1 Summary Dialog Box

11. Touch **Accept**. Trace is saved, then you can proceed to the test of next wavelength.

12. When **File Save Verify** is selected on the OTDR (Construction) Setup Screen (Figure 6.3-1), the Save screen is displayed.
    Check the filename and edit it if necessary. Touch **Save Trace** after the editing.
    When pressing ESC, saving a file is interrupted and the next fiber connection screen is displayed.

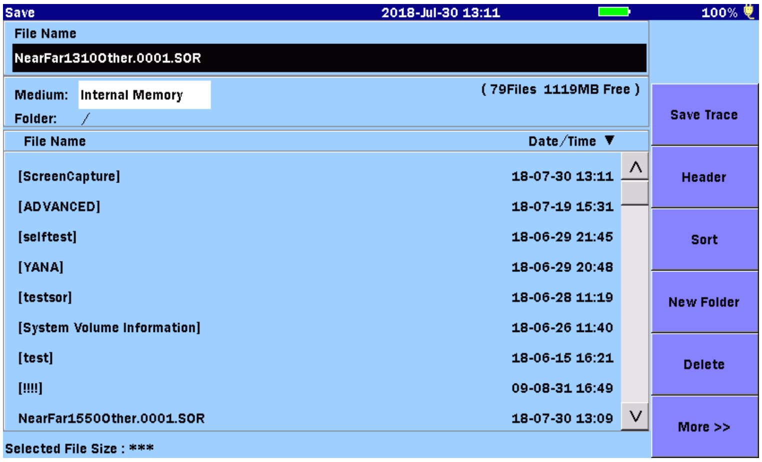


Figure 6.7.1-2 Save Screen

13. When the test has been performed for all wavelengths selected on the OTDR (Construction) Setup Screen, the next fiber's connection screen is displayed.

14. Connect the next fiber under test.

15. Perform Step 7 through 14 for all the fiber numbers set on the OTDR (Construction) Setup Screen (Figure 6.3-1).
When the tests of all the fibers finish, the screen goes back to the OTDR (Construction) Setup Screen (Figure 6.3-1).

6.7.2 Expanding and Contracting the Trace Display

Use the Horizontal/Vertical expand to expand a section of the trace when:

- Positioning the cursors for a test
- Adjusting the LSA intervals

To expand an area:

1. Touch .

2. Drag a desired area in the trace graph to expand the view.
You can also expand and contract the view by pressing the arrow keys.

   [>]: Horizontally expands the view with the active cursor or marker as the center.

   [<]: Horizontally contracts the view with the active cursor or marker as the center.

[∧]: Vertically expands the view.

[∨]: Vertically contracts the view.

To contract an area:

1. Touch .
2. Touch a point in the trace graph area, and you can contract the view, which displays the point in the center.
   You can also expand and contract the view by pressing the arrow keys.

To display the entire trace, touch or press [ESC].

Note:

If [ESC] is pressed during measurement, the measurement ends.

6.7.3 Selecting and Positioning Cursors

Setting the Active Cursor

When **Marker Mode** is **Movement**, touch **A** and **B**.
You can also switch the cursors by using the rotary knob or by pressing [Enter].

To precisely position the cursor

1. Touch .
2. Drag a desired area in the trace graph to expand the view.
   You can also expand the view by pressing the arrow keys.
3. Turn the rotary knob to move the cursor to the desired position.
   When **Marker Mode** is **Placement**, you can switch the cursor movement speed by pressing the rotary knob. By touching ① to ④, markers are displayed at the cursor positions.

6.7.4 Setting Loss Mode

You can change the Loss Mode in the OTDR (Construction) application at the end of a test, providing the **Preview** is set to **On** on the Test in Progress screen.

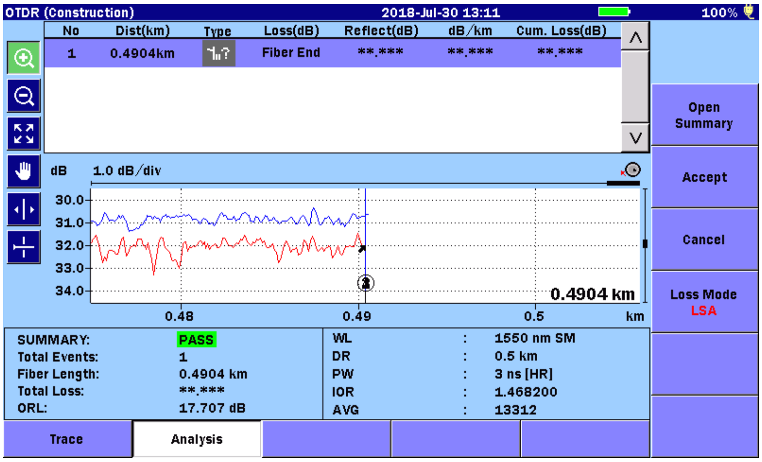


Figure 6.7.4-1 Test Result Screen

1. Touch **Loss Mode** to select a loss mode.
   When **Marker Mode** is **Movement**, you will see the following dialog box.

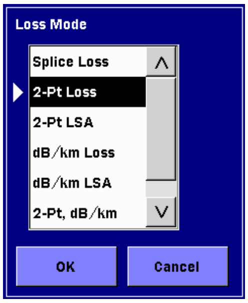


Figure 6.7.4-2 Loss Mode Dialog Box

   When **Marker Mode** is **Placement**, switch between **2PA** and **LSA** by touching this softkey.

2. Touch **OK**.

6

OTDR (Construction)

6.8 Working with OTDR Trace Files

If File Save Verify is selected on the OTDR (Construction) Setup Screen (Figure 6.3-1), the Save screen is displayed when the fiber test ends.

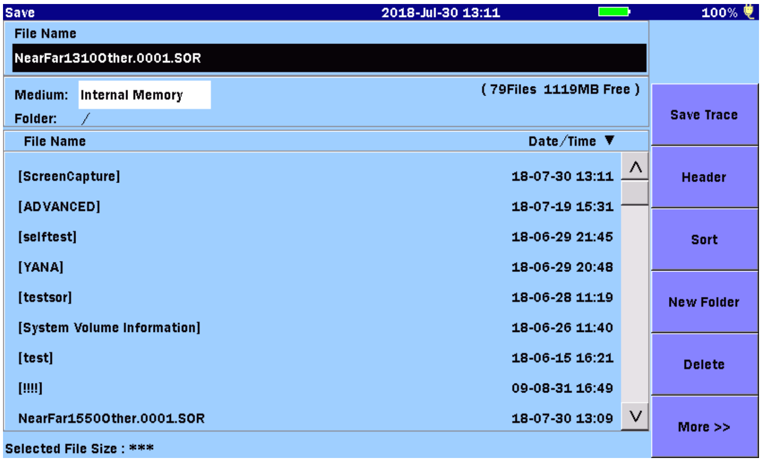


Figure 6.8-1 Save Screen

For how to save a file, refer to 3.5.7, “Saving File”.

To proceed to the measurement of the next fiber without saving the waveform file, press ESC.

For how to create a summary of a waveform file, refer to 3.5.9 “Creating summary of waveform file”.

Chapter 7 OTDR Measurement

This chapter explains the OTDR measurement methods.

7.1 Marker Mode - Movement

This section explains the measurement methods when **Marker Mode** of **Preference** (2-2) is set to **Movement** by the following procedure.

1. Press **Setup**.
2. Touch **Preference (2-2)**.
3. Touch **Marker Mode**.
4. Touch **Movement**, and **OK**.

5. Press **Setup**.

7.1.1 Distance Measurement

When **Marker Mode** is **Movement** and the waveform is displayed, the distance from the origin to Cursor A and B and the distance between Cursor A and B are displayed.

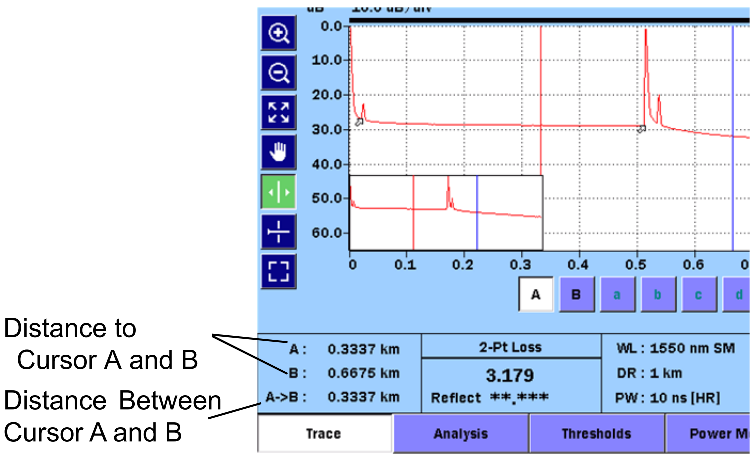


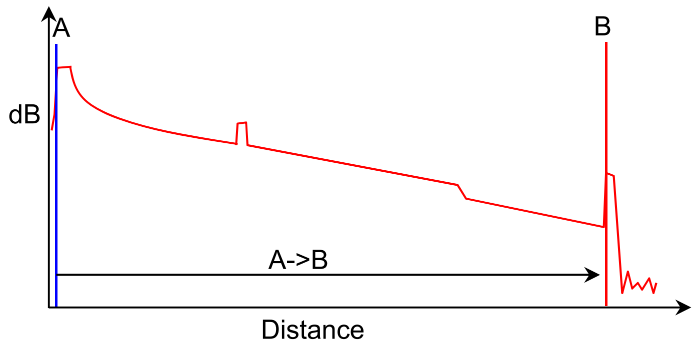
Figure 7.1.1-1 Cursor Distance Displayed

Set a correct value for IOR (Index of Refraction). If the IOR is incorrect, the cursor distances are displayed also incorrectly.

Two of the most common distance measurements are:

- Fiber Length (the total distance of a fiber)
- Distance to a Break (the distance from a known point to a break in the fiber)

7.1.1.1 Fiber Length Measurement



1. Touch **Trace**.
2. Move Cursor A to the event position at 0 km by touching the panel or turning the rotary knob.
3. Move Cursor B to the far end event position by touching the panel or turning the rotary knob. Place the cursor at the position of backscatter level just before the event. See the following figure.

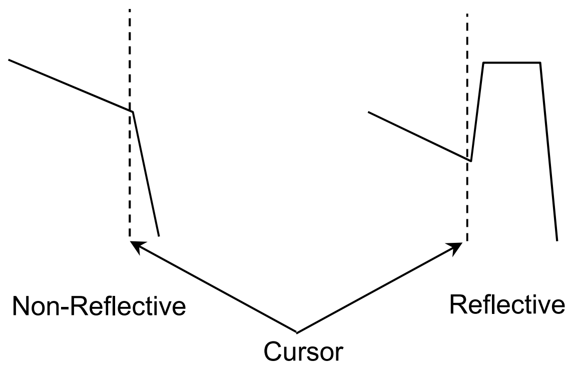


Figure 7.1.1.1-1 Location of Cursor

4. Check the A->B distance. This shows the fiber length.

7.1.1.2 Distance to a Break Measurement

The following procedure demonstrates a method of locating a break relative to a known point on the fiber.

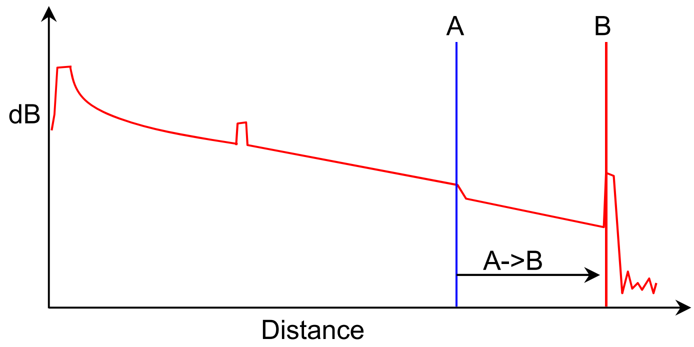


Figure 7.1.1.2-1 Location of Cursors for Distance Measurement

1. Touch **Trace**.
2. Move Cursor B to a fault point by touching the panel or turning the rotary knob.
3. Enlarge the event area and place Cursor B to the position of backscatter level just before the event. See Figure 7.1.1.1-1.
4. Move Cursor A to a known point by touching the panel or turning the rotary knob.
5. Enlarge the event area.
6. Place Cursor A to the position of backscatter level just before the event by touching **A**. See Figure 7.1.1.2-1.
7. The measured result is displayed as the A->B distance.

7.1.2 Loss Measurements

7.1.2.1 Event Examples

Figure 7.1.2.1-1 shows the event examples that are used for explaining loss calculation methods in the following sections.

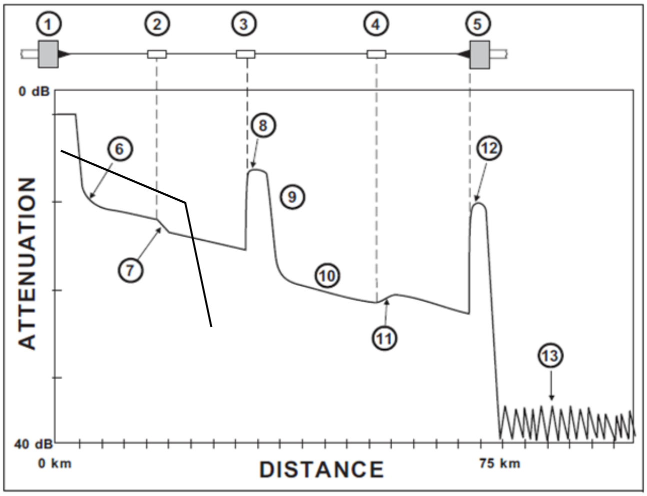


Figure 7.1.2.1-1 Event Examples

1. ACCESS Master input
2. Fusion splice
3. Mechanical splice connector
4. Fusion splice
5. End of fiber
6. Diffusion tail
7. Non-reflective loser
8. Reflective splice connector
9. Fresnel reflection
10. Rayleigh backscatter
11. Non-reflective gainer
12. Reflective end
13. Noise floor

7

OTDR Measurement

7.1.2.2 Splice Loss

Use Splice Loss mode to measure the optical power loss caused by connectors, splices, and couplers on a fiber optic cable.
Use the following figure in conjunction with the splice loss procedure to measure splice loss:

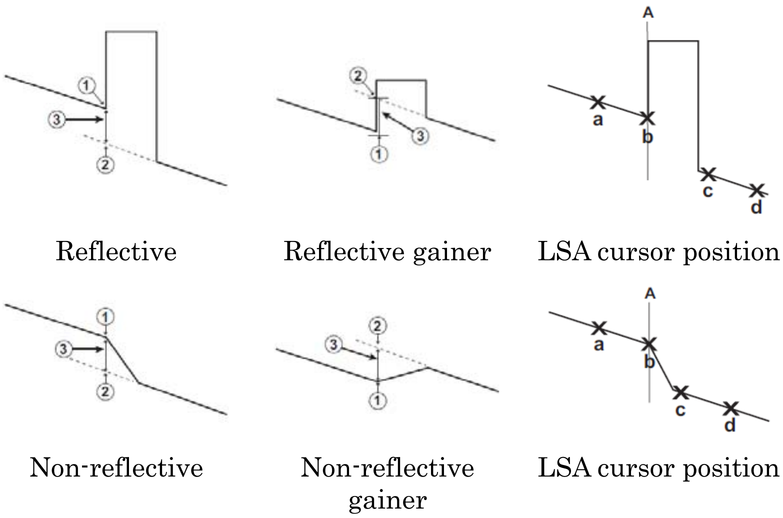


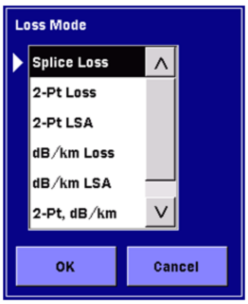
Figure 7.1.2.2-1 Points to Measure Splice Loss

① Start of splice

② Y-Intercept

③ Splice Loss (The Splice Loss is equal to the Y-axis position at ① less the Y-axis position at ②.)

1. Touch **Trace**.
2. Touch **Loss Mode** on the second page of the softkeys.
3. Select **Splice Loss**.



4. Place Cursor A to the start of splice.
5. Referring to Figure 7.1.2.2-1, move Marker a and b to the end position of backscatter light.
6. Referring to Figure 7.1.2.2-1, move Marker c and d to the start position of backscatter light.
7. The loss is displayed in the splice loss field under the graph.

Y-Axis position (①) of the connection start is determined by the least square approximation using Marker a and b on the left of Cursor A. Y-Axis position (②) at the connection start is determined by the least squares approximation using Marker c and d on the right of Cursor A.

7.1.2.3 2-Pt Loss

The 2-Point Loss Measurement uses a data point at Cursor A and a data point at Cursor B to calculate the change in dB between the two points. Normally the Cursor A (Y-Axis) data is greater than the Cursor B (Y-Axis) data and a positive loss measurement is displayed. Otherwise, the loss value is reported as a negative quantity called a “gainer.”

1. Touch **Trace**.
2. Touch **Loss Mode** on the second page of the softkeys.
3. Select **2-Pt Loss**.
4. Move Cursor B to a far end point by touching the panel or turning the rotary knob.
5. Enlarge the event area and place Cursor B to the position of backscatter level just before the event. See Figure 7.1.1.1-1.
6. Enlarge the event area and place Cursor A to the position after the diffusion tail.
7. The loss is displayed in the 2-Pt Loss field under the graph.

7.1.2.4 2-Pt LSA

The 2-Pt LSA Measurement uses the least squares approximation to figure out the optimal Y intercept from the current cursor positions.
Intervals directly to the right of Cursor A and left of Cursor B will be used to calculate the intercept values.

Before starting measurement, move Marker a and b to the right of Cursor A and move Marker c and d to the left of Cursor B.

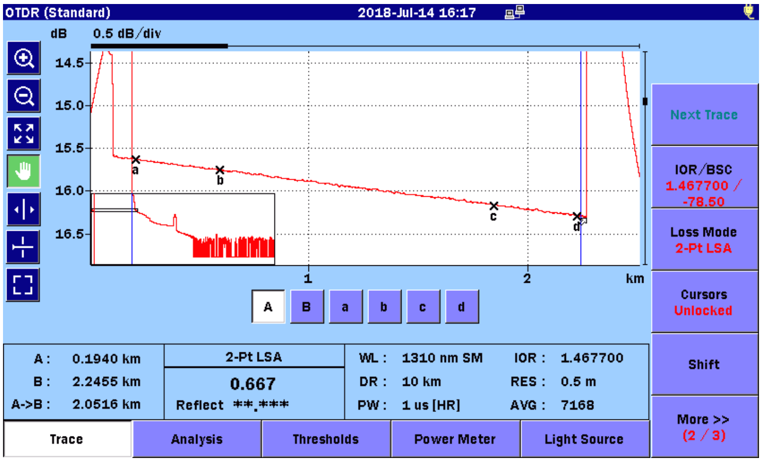


Figure 7.1.2.4-1 2-Pt LSA Measurement Screen

The 2-Pt LSA is the change in dB (Y-Axis) calculated between the two points. When the Cursor A, Y-Axis position is greater than the Cursor B, Y-Axis position, a positive loss measurement is displayed.

Marker a and b interlock with Cursor A and Marker c and d interlock with Cursor B. Marker a is on the right of Cursor A and Marker d is on the left of Cursor B.

1. Place the cursors referring to 7.1.2.3 “2-Pt Loss”.
2. Touch **Loss Mode** on the second page of the softkeys.
3. Select 2-Pt LSA.
4. Move Cursor A to a more accurate position.
5. Make sure Marker a and b and Marker c and d are in the range of backscatter light.

6. Adjust the Marker positons if necessary. Select Markers by touching **a**, **b**, **c**, or **d**. Markers can be selected by pressing Enter. Turn the rotary knob to move the marker.

7. The loss is displayed in the 2-Pt LSA field under the graph.

Note:

In a case where a trace has a lot of noise or adjacent events, the LSA interval needs to be adjusted to improve accuracy of measurements.

7.1.2.5 dB/km Loss

The dB/km Loss measurement uses a data point at Cursor A and a data point at Cursor B to calculate the change in dB (Y-Axis) between the two points. This is divided by the distance between the two Cursors to calculate the Loss/Distance measurement. When Cursor A (Y-Axis) data is greater than Cursor B (Y-Axis) data, a positive loss measurement is displayed.

$$\mathrm{dB/km} = \frac{L_A - L_B}{D_B - D_A}$$

D_A: Distance of Cursor A
D_B: Distance of Cursor B
L_A: Level of Cursor A
L_B: Level of Cursor B

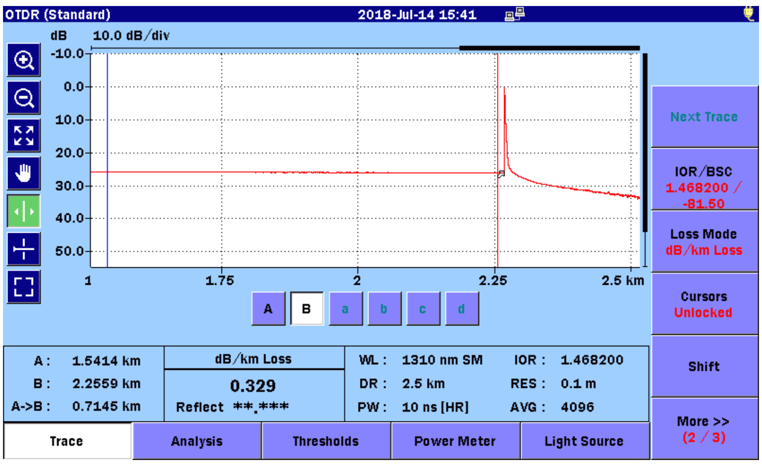


Figure 7.1.2.5-1 dB/km Loss Measurement Screen

1. Touch **Trace**.

2. Touch **Loss Mode** on the second page of the softkeys.
3. Select **dB/km Loss**.
4. Move Cursor B to a far end point by touching the panel or turning the rotary knob.
5. Place Cursor B at the position of backscatter level just before the event. See Figure 7.1.1.1-1.
6. Move Cursor A to the position of ACCESS Master input by touching the panel or turning the rotary knob.
7. Enlarge the event area and place Cursor A to the position after the diffusion tail.
8. The loss is displayed in the dB/km Loss field under the graph.

7.1.2.6 dB/km LSA

dB/km LSA is calculated by dividing the loss measured in the 2-Pt LSA Measurement (see Section 7.1.2.4) by the distance between the two cursors.

$$\mathrm{dB/km} = \frac{L_{2pt\ LSA}}{D_B - D_A}$$

D_A: Distance of Cursor A

D_B: Distance of Cursor B

$L_{2pt\ LSA}$: 2-Pt LSA loss

Before starting measurement, move Marker a and b to the right of the cursor and move Marker c and d to the left of the cursor.

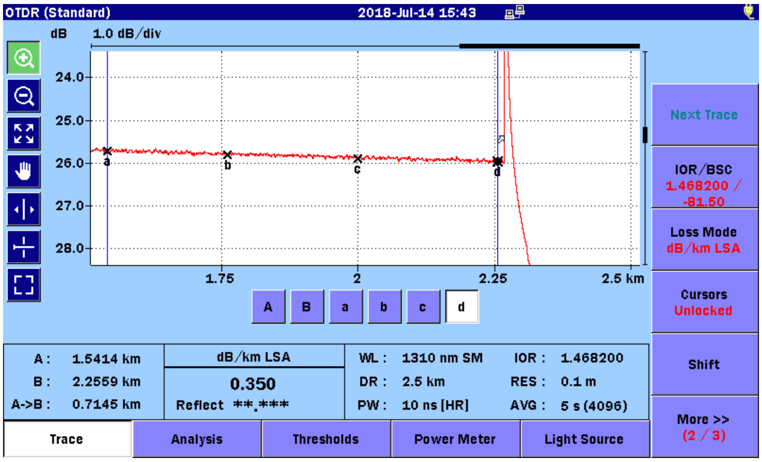


Figure 7.1.2.6-1 dB/km LSA Measurement

1. Place the cursor referring to 7.1.2.5 “dB/km Loss”.
2. Touch **Loss Mode** on the second page of the softkeys.
3. Select **dB/km LSA**.
4. Move Cursor A to a more accurate position.
5. Make sure Marker a and b and Marker c and d are in the range of backscatter light.
6. Adjust the Marker positons if necessary. Select Markers by touching **a**, **b**, **c**, or **d**. Markers can be selected by pressing Enter. Turn the rotary knob to move the marker.
7. The loss is displayed in the dB/km LSA field under the

graph.

7.1.2.7 2-Pt, dB/km

2-Pt, dB/km displays the 2-Pt Loss (Section 7.1.2.3) and dB/km Loss (Section 7.1.2.5) together.

1. Place the cursors according to the procedure described in 7.1.2.3 “2-Pt Loss”.
2. Touch **Loss Mode** on the second page of the softkeys.
3. Select **2-Pt, dB/km**.
4. The loss is displayed in the 2-Pt, dB/km field under the graph.

7.1.2.8 ORL (Optical Return Loss)

ORL is the ratio of the power reflected back up the fiber to the source power input into the optical fiber.
ORL can be calculated for a section of the fiber optic link or for the entire link.

1. Press **Setup** .
2. Touch **Preference (2-2)**.
3. Set **ORL** to one of the following.
   - Cursor A
     The ORL is calculated from the reflected power at Cursor A position.
   - Origin
     The ORL is calculated from the reflected power at the connection point of ACCESS Master.
   - Full Trace
     The ORL is calculated from the reflected power calculated from the entire waveform.
4. Set **End Event for ORL Calculation** to either of the following.
   - Include
     Includes the reflection in Far-End events when calculating the ORL.
   - OMIT
     Not Includes the reflection in Far-End events when calculating the ORL.
5. Press **Setup** .
6. Touch **Trace**.
7. Touch **Loss Mode** on the second page of the softkeys.
8. Set ORL.
   Proceed to Step 14 when **Full Trace** is set in Step 3.
9. Place Cursor B to the noise level position at the end of trace.
10. Move Cursor A to the position of measurement (backscatter level after the entrance reflection) by touching the panel or turning the rotary knob.
11. Touch **Calc ORL** on the third page of the softkey.

The result is displayed in the ORL field under the graph as shown in the following figure.

An alphabet is displayed at the end of the value based on the ORL setting in Step 3.

A: Cursor A

O: Origin

No alphabet is displayed when **ORL** is set to **Full Trace**.

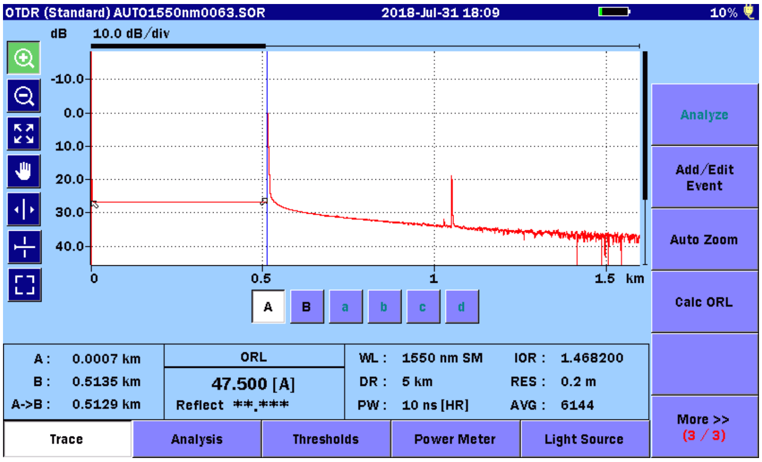


Figure 7.1.2.8-1 ORL Measurement Screen

If “S” is displayed after the ORL value, it indicates there is saturation in the calculation range of the trace. The ORL value displayed may be smaller than its real value.

7.1.3 Reflectance Measurements

Overview

Reflectance is the ratio of reflected power to incident power displayed in dB. A reflectance measurement is affected by the Pulsewidth and the Backscatter Coefficient.

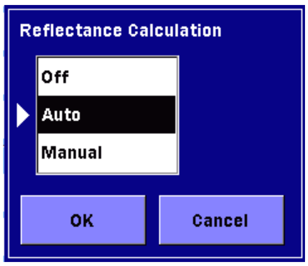
A reflectance value for reflective events is displayed in the lower section of the Loss Mode, Measurement, and Reflectance area when either **Auto** or **Manual** is selected on the Preferences (2-2) screen in Setups. “S” may be added to the reflectance value. According to the reflectance calculation mode setting, the reflectance is measured in relation to the next cursor.

- **Auto**: Cursor A
- **Manual**: Cursor A and Cursor B

7.1.3.1 Auto Reflectance Calculation

When Reflectance Calculation is set to **Auto**, the reflectance is measured only by placing Cursor A.

1. Press **Setup** .
2. Touch **Preference (2-2)**.
3. Touch **Reflectance Calculation**.
4. Touch **Auto**, **OK**.



5. Press **Setup** .
6. Touch **Trace**.
7. Move Cursor A to the backscatter level before the reflective event by touching the panel or turning the rotary knob.

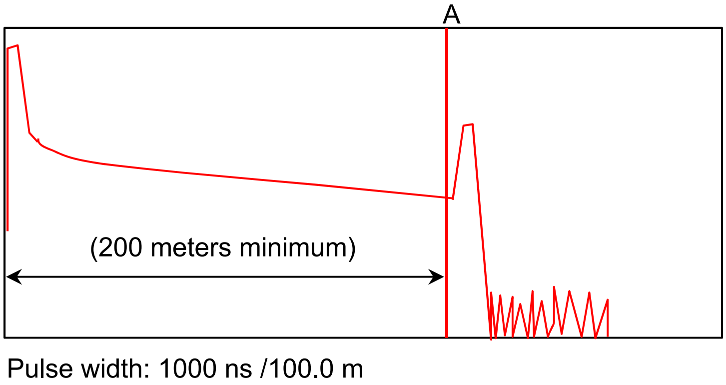


Figure 7.1.3.1-1 Location of Cursor A

8. Enlarge the event area and place Cursor A as close as possible to the rising position.

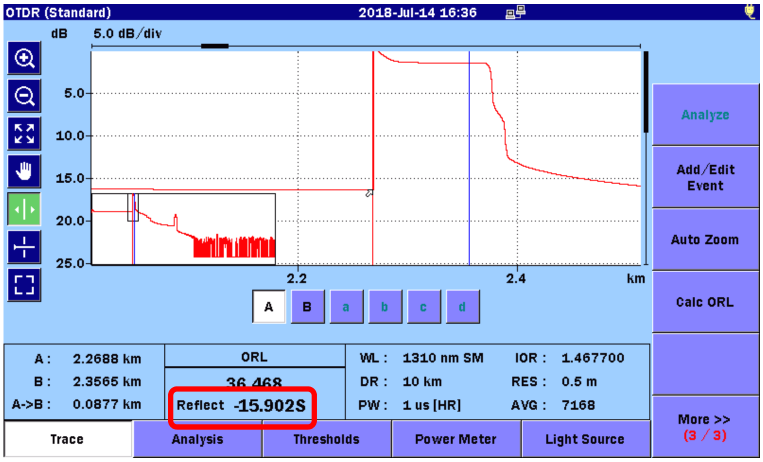


Figure 7.1.3.1-2 Auto Reflectance Measurement Screen

Place Cursor A on the straight line of backscatter light. Do not place it at the rising of reflectance.
In the figure of Step 8, the distance of 200m or longer is taken between the ACCESS Master connection part and Cursor A with pulse width of 1000 ns.

7.1.3.2 Manual Reflectance Calculation

When **Reflectance Calculation** is set to **Manual**, the reflectance is calculated using both Cursor A and Cursor B.

Note:

The following procedure applies to the OTDR (Standard) and Fiber Visualizer applications only.

1. Press **Setup** .
2. Touch **Preference (2-2)**.
3. Touch **Reflectance Calculation**.
4. Touch **Manual**, **OK**.
5. Press **Setup** .
6. Touch **Trace**.
7. Move Cursor A to the backscatter level before the reflective event by touching the panel or turning the rotary knob.
8. Enlarge the event area and place Cursor A as close as possible to the rising position.
   Place Cursor A on the straight line of backscatter light. Do not place it at the rising of reflectance.

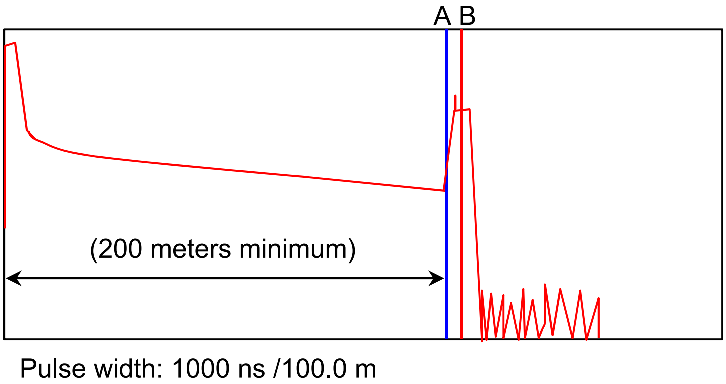


Figure 7.1.3.2-1 Location of Cursors

9. Move Cursor B to the center of reflective event by touching the panel or turning the rotary knob.

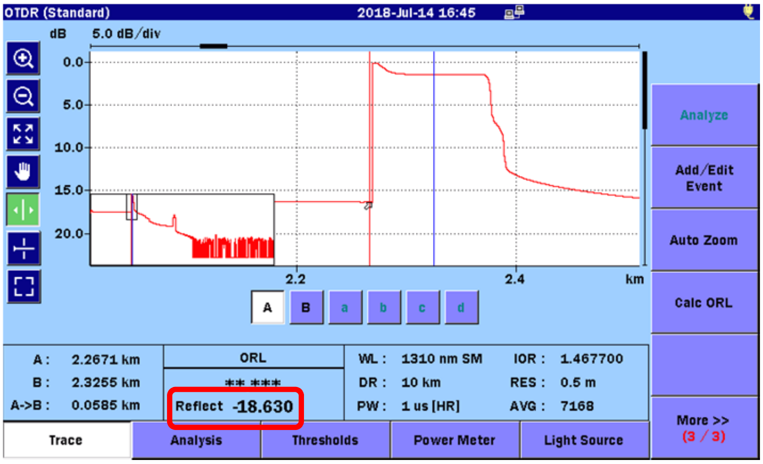


Figure 7.1.3.2-2 Manual Reflectance Calculation Screen

Note:

Occasionally a small, narrow peak may be present (as shown in the Figure 7.1.3.2-1). Do not place Cursor B on top of the first narrow peak, if a narrow peak is present, as this will result in an inaccurate reflectancenarrow measurement.

7.2 Marker Mode - Placement

This chapter explains the measurement methods when **Marker Mode** of measurement functions (2-2) is set to **Placement** as in the following procedure.

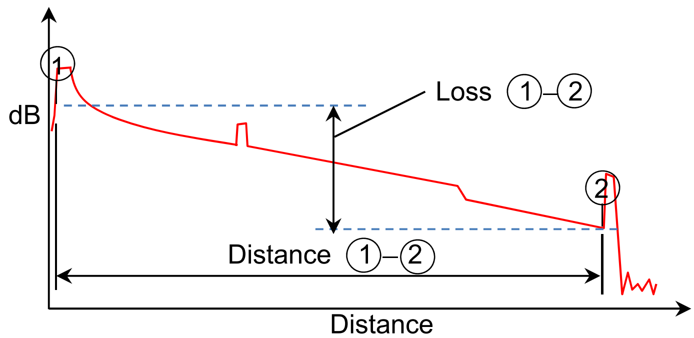
1. Press **Setup** .
2. Touch **Preference (2-2)**.
3. Touch **Marker Mode**.
4. Touch **Placement (1-2,2-4)** or **Placement (1-2,3-4)**.
   To measure splice loss, touch **Placement (1-2,2-4)**.
5. Touch **OK**.
6. Press **Setup** .

Touching **Loss Mode** on the second page of softkey allows editing LSA and 2PA.

LSA: Displays the loss of approximate line generated by the least square method.
For the calculation by the least square method, refer to Appendix B “Measurement Principle”.

2PA: Displays the level difference of marker position as a loss.

7.2.1 Distance and Loss Measurement between Two Points



1. Touch **Trace**.
2. Move the cursor to the event position by touching the panel or turning the rotary knob. Place the cursor at the position of backscatter level just before the event. See the following figure.

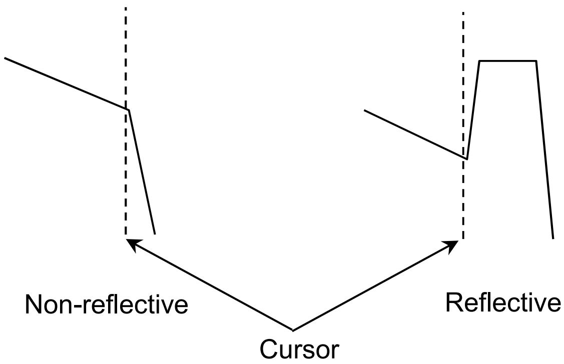


Figure 7.2.1-1 Location of Cursor

3. Touch ①.
4. Move the cursor to an event located on the right of the marker by touching the panel or turning the rotary knob.
5. Touch ②.
6. ① - ② field displays the distance, loss, and dB/km between the two points.

7.2.2 Splice Loss Measurements

This measures the splice loss of event position. Splice loss can be measured when Markers ② to ④ are displayed.

1. Touch **Trace**.
2. Move the cursor to the left of the event.
3. Touch ①.
4. Move the cursor to the event.
5. Touch ②.
6. Move the cursor to the right of the event.
7. Touch ③.
8. Move the cursor to the right of Marker ③.
9. Touch ④.

The distance, loss, and transmission loss between ① and ② and between ② and ④ can be measured simultaneously. When the event is reflective, placing ② at the rising point enables detecting the peak point between ② and ③.

automatically and measuring ORL or reflectance (level difference) simultaneously. Marker ▽ is displayed at the peak point.

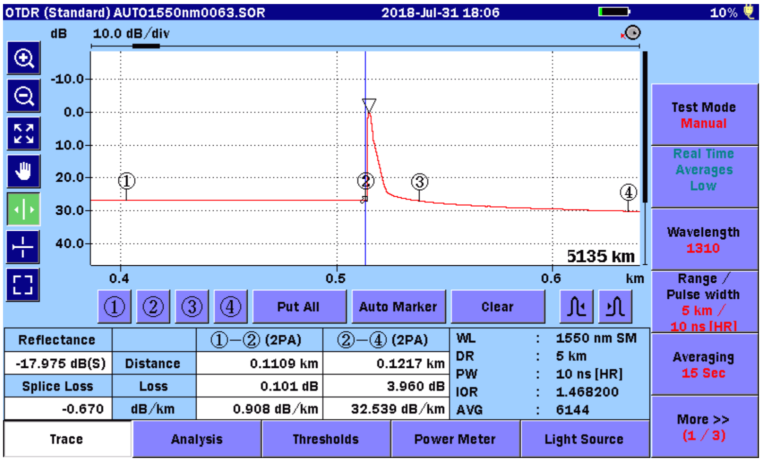


Figure 7.2.2-1 Splice Loss Measurements

7.2.3 Reflectance Measurements

There are three methods for measuring ORL or reflectance (level difference).

- Measuring only at the rising point.
- Measuring at the rising point and peak point.
- Measuring splice loss and reflectance simultaneously. (Available only when the calculation result displays ② to ④.)

(1) Measuring only at the rising point.

1. Touch **Trace**.
2. Place a cursor at the rising point.
3. Touch ①.

   The peak point is detected automatically and Marker ▽ is displayed.

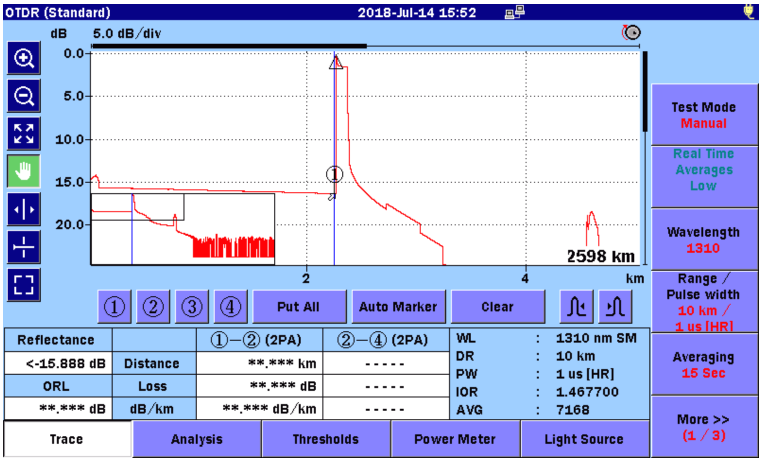


Figure 7.2.3-1 Reflectance Measurements (Rising Point Only)

Notes:

- If the automatically detected peak point is incorrect, placing Marker ② on the peak point enables measuring reflection in a more accurate position.
- When it exceeds 75 dB, Marker ▽ is not displayed.

(2) Measuring at the rising point and peak point.

1. Touch **Trace**.
2. Move the cursor at the rising point.
3. Touch ①.
4. Move the cursor at the peak point.
5. Touch ②.

The distance, loss, and transmission loss between ① and ② can be measured simultaneously.

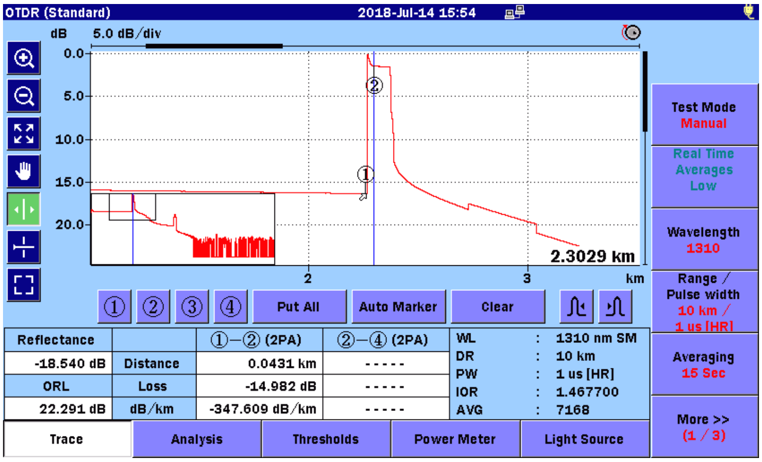


Figure 7.2.3-2 Reflectance Measurements (Rising Point and Peak Point)

(3) Measuring splice loss and reflectance simultaneously.

1. Touch **Trace**.
2. Move the cursor to the left of the event.
3. Touch ①.
4. Move the cursor to the event.
5. Touch ②.
6. Move the cursor to the right of the event.
7. Touch ③.
8. Move the cursor to the right of Marker ③.
9. Touch ④.

The peak point is automatically detected between ② and ③. and Marker ▽ is displayed.
The distance, loss, and transmission loss between the markers can be measured simultaneously.

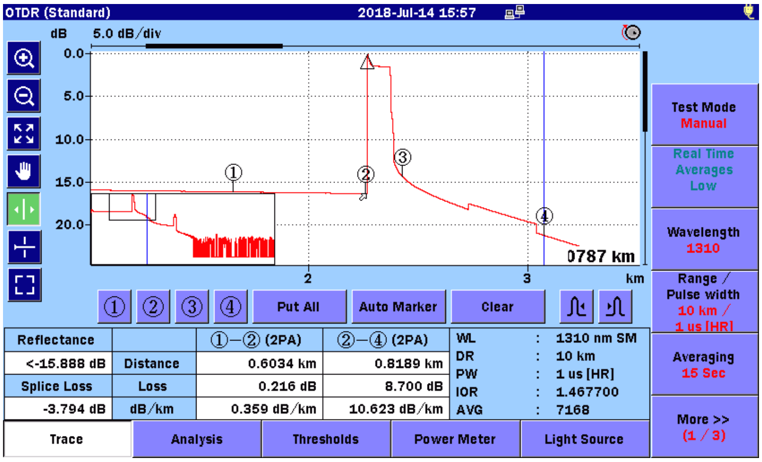


Figure 7.2.3-3 Reflectance Measurements (Points Before and After Reflectance)

7.2.4 ORL Measurements

This measures ORL within a specified range.

1. Touch **Trace**.
2. Move the cursor to the start point of a specified range you want to measure.
3. Touch ①.
4. Move the cursor to the end point.
5. Touch ②.

The distance, loss, and transmission loss between ① and ② can be measured simultaneously.

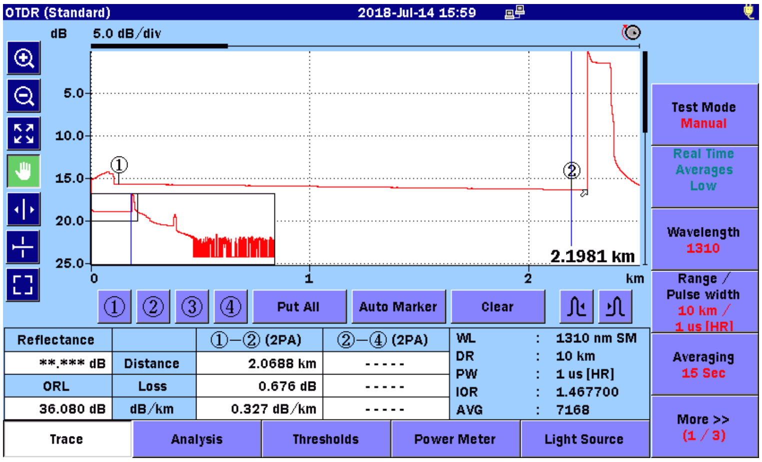


Figure 7.2.4-1 ORL Measurements

7.3 Real Time Measurement

The Real Time measurement displays the trace information in real time. In this mode, the trace data is not averaged, but the trace graph is updated every time.

In the Real Time measurement, a change in connector connections is displayed immediately, which is helpful for adjusting fiber connector connections.

To start the Real Time measurement, press Realtime.

To stop the Real Time measurement, press Realtime or ESC.

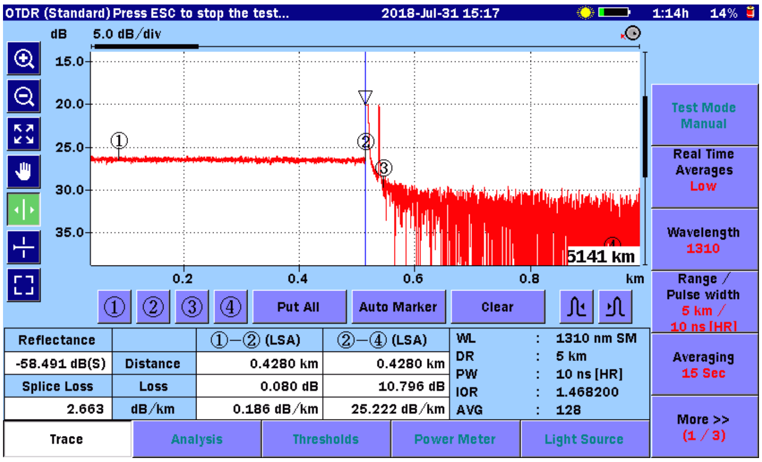


Figure 7.3-1 Real Time Screen

Real Time Averages can be operated during the Real Time measurement.

- Low Trace is updated for a shorter time.
- High Noise level can be controlled.

Chapter 8 Loss Test Set

This chapter describes Loss Test Set for the ACCESS Master.

8

Loss Test Set

8.1 Overview

When an optical power meter (Option 004, 005, or 007) is installed to the ACCESS Master, Loss Test Set is made available instead of Power Meter. The qualities of optical fibers can be judged by measuring their loss values using a built-in light source and an optical power meter.
The optical power meter (Option 004, 005, or 007) allows for measuring modulated lights.
However, if the modulation frequency setting on the optical power meter is not the same frequency of the modulated lights to be measured, the optical power meter cannot measure modulated lights correctly. Be sure to correctly set the modulation frequency on the optical power meter at the measurement.
When the optical power meter (Option 004, 005, or 007) is installed to the ACCESS Master, Loss Test Set is displayed on the Top Menu.

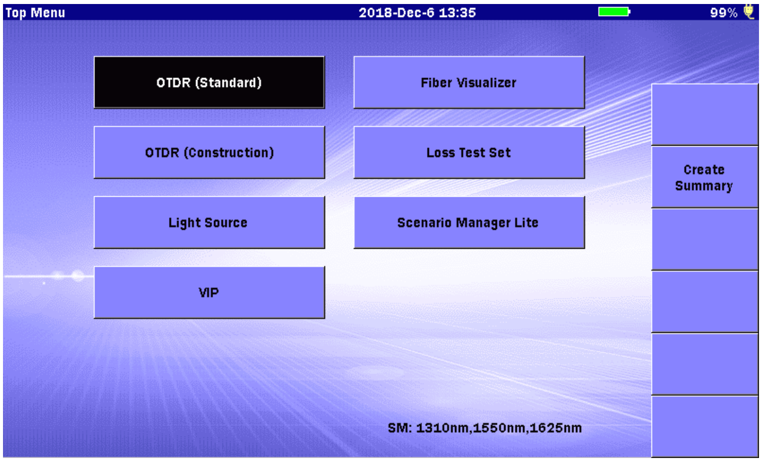


Figure 8.1-1 Top Menu (with Optical Power Meter Option)

The following table shows the measurement range of optical power levels. For the specifications, refer to “Appendix A Specifications”.

Table 8.1-1 Optical Power Measurement Range

Modulation	Option		
	004	**005**	**007**
CW	–50 to +23 dBm (1550 nm)	–43 to +30 dBm (1550 nm)	–67 to +6 dBm (1310 nm) –60 to +3 dBm (850 nm)
270Hz 1kHz 2kHz	–53 to +20 dBm (1550 nm)	–46 to +27 dBm (1550 nm)	–70 to +3 dBm (1310 nm) –63 to 0 dBm (850 nm)

8.2 Starting Loss Test Set

1. Press **Top Menu**  .

2. Touch **Loss Test Set**. The initial Loss Test Set screen is displayed.

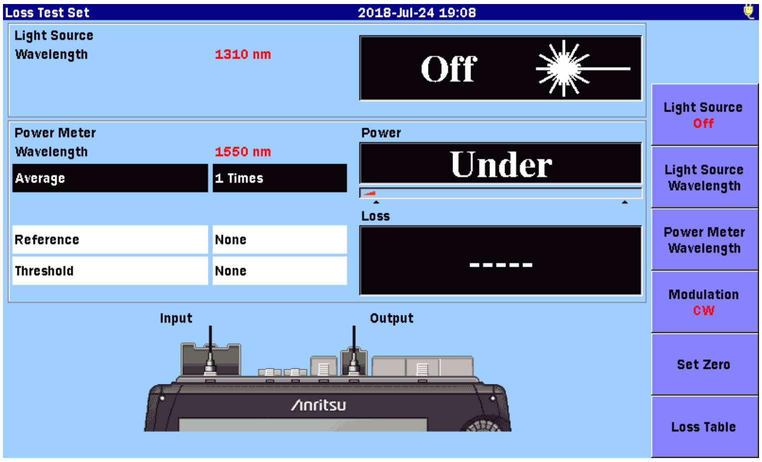


Figure 8.2-1 Initial Loss Test Set Screen

CAUTION

Do not input optical power beyond the level indicated on the optional optical power meter port.

Otherwise, the light receiver may be damaged.

8.3 Setups – Loss Test Set

Press **Setup** while the Loss Test Set screen is displayed, the General screen which enables you to configure the general systems settings is displayed.

8.3.1 General Settings

For the general settings, refer to 3.3.1 “General Settings”.

8.3.2 About

For the About screen, refer to 3.3.4 “About”.

8.4 Loss Test Set Screen

This section describes the elements of the Loss Test Set screen. Figure 8.4-1 below shows the Loss Test Set screen.

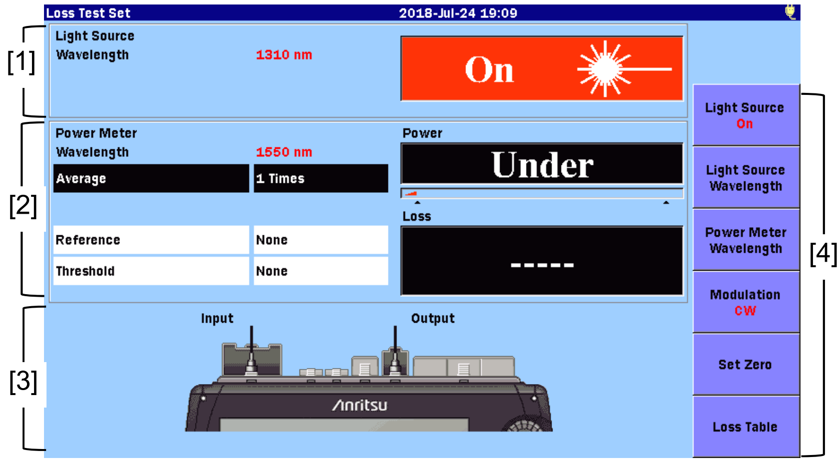


Figure 8.4-1 Loss Test Set Screen

[1] Light Source Area

[2] Power Meter Area

[3] Port Connection Indicator

[4] Softkeys

8.4.1 Light Source Area

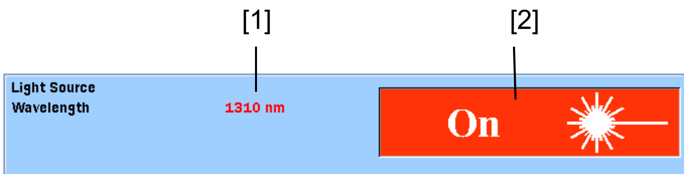


Figure 8.4.1-1 Light Source Area

[1] Light Source Wavelength indicator
Displays the wavelength set via **Light Source Wavelength**.

[2] Light Source On/Off indicator
Displays the status of the light source.

8.4.2 Power Meter Area

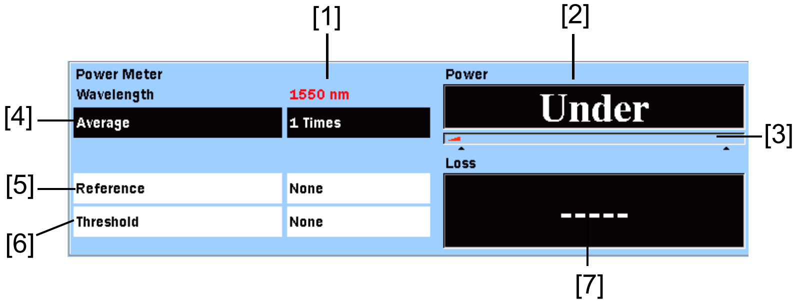


Figure 8.4.2-1 Power Meter Area

[1] Power Meter Wavelength indicator
Displays the wavelength set via **Power Meter Wavelength**.

[2] Absolute Power reading
Displays the measured power meter value in dBm units.
The value can be converted into mW (mili-watt) units by the following formula:

$$P_W = 10^{\frac{P_D}{10}}$$

P_W: Power (mW unit)

P_D: Power (dBm unit)

"Under" is displayed if the power is less than the minimum level of the measurement range.
"Over" is displayed if the power is more than the maximum level of the measurement range.
When the reference value in [5] is set to **None**, pass/fail status determined according to the threshold value in [6] is indicated. If it is determined as fail according to the threshold, the background color will get red.

[3] Range indicator
Displays the power level to be measured. The Range indicator increases with an increase in power level.

[4] Average
Displays the number of times that the current test data is averaged before the Power reading is refreshed. The higher the number of averages, the more stable the Power reading. Touching the field allows you to change the value.

[5] Reference

Displays the power level that is basis of loss calculation.

Touching the field allows you to change the value.

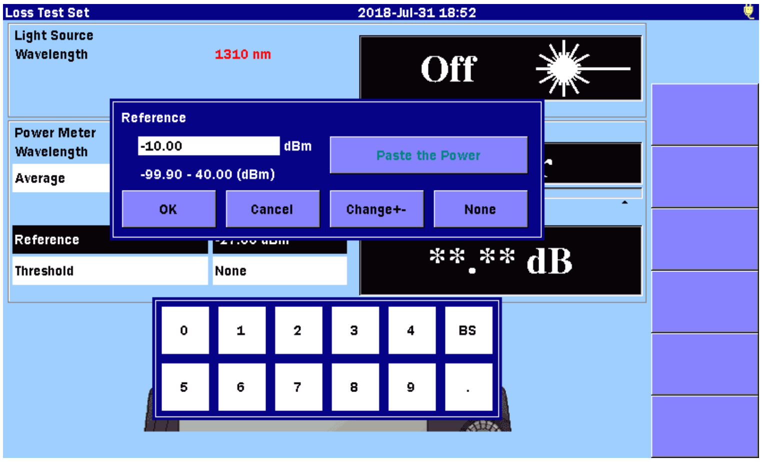


Figure 8.4.2-2 Entering Reference

Change +–	Toggles the reference value from positive to negative or negative to positive.
None	Sets the reference value to “None”.
Paste the Power	Copies current power to the Reference field.

[6] Threshold

Displays the value to determine pass/fail status of power or loss. Threshold must be set for each wavelength.

- Threshold for power when the reference is set to **None**
- Threshold for loss when the reference is set to **None**

Touching the field allows you to change the value.

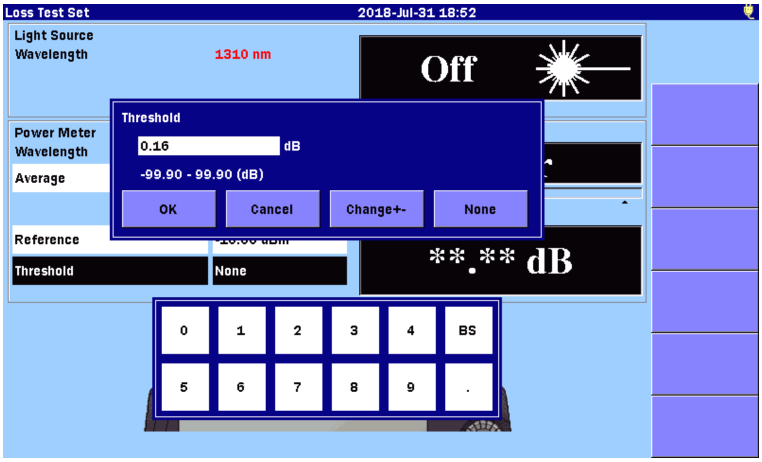


Figure 8.4.2-3 Entering Threshold

Change +–	Toggles the threshold value from positive to negative or negative to positive.
None	Sets the threshold value to “None”.

[7] Loss

Displays the power loss. When the reference value is set to **None**, “––––––” is displayed.

The optical power loss is obtained as follows:

Loss = Reference – power measurement (dB)

When the reference value in [5] is not set to **None**, pass/fail status determined according to the threshold value in [6] is indicated. If it is determined as fail according to the threshold, the background color will get red.

8.4.3 Port Connection Indicator

The ports used to measure loss are displayed. The output shown in the figure is the port used as a light source. The input shown in the figure is the port used as a power meter.
The light source port varies depending on the wavelength.

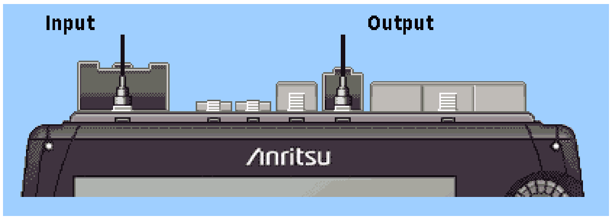


Figure 8.4.3-1 Port Connection Indicator (Loss Test Set)

8.4.4 Softkeys

Light Source
Switches on and off the laser light output.

Light Source Wavelength
Switches the wavelength for the laser light. Also, the wavelength for the power meter is switched together with it.

Power Meter Wavelength
Switches the wavelength for the power meter.

Modulation
Switches the modulation frequency of the light used for Loss Test Set.
The following modulation frequencies can be switched.

- CW (Continuous Wave)
- 270Hz
- 1kHz
- 2kHz

Set Zero
Adjusts the power meter offset. Refer to 8.4.5 “Optical Power Meter Zero Offset”.

Loss Table
Displays the Loss Table screen. Refer to 8.5 “Loss Table Screen (Loss Test Set)”.

8.4.5 Optical Power Meter Zero Offset

Perform the following steps to zero the power meter.

1. Disconnect the fiber from the Power Meter (Input) port, if connected, and close the protective cover to shield the port from incident light.
2. Touch **Set Zero** on the Loss Test Set screen (refer to Figure 8.4-1 “Loss Test Set Screen”). The following dialog box appears.

Figure 8.4.5-1 Confirmation Dialog Box

3. Touch **Start**. The message “Zeroing power meter...” appears briefly and the unit returns to the Loss Test Set screen with a Power reading of “Under”.

Note:

The following message may be displayed when executing zero offset without light shielding.

Zero set failed, please check protective cover is fully closed and try again.

Touch OK or press ESC to clear the message from the screen. Make sure that the measurement port is fully covered with the protective cover, and then execute zero offset again.

8 Loss Test Set

8.5 Loss Table Screen (Loss Test Set)

The Loss Table screen displays the measured results in the table format. The Loss Table can be saved as a text file (in csv format). Touching **Loss Table** displays the following screen.

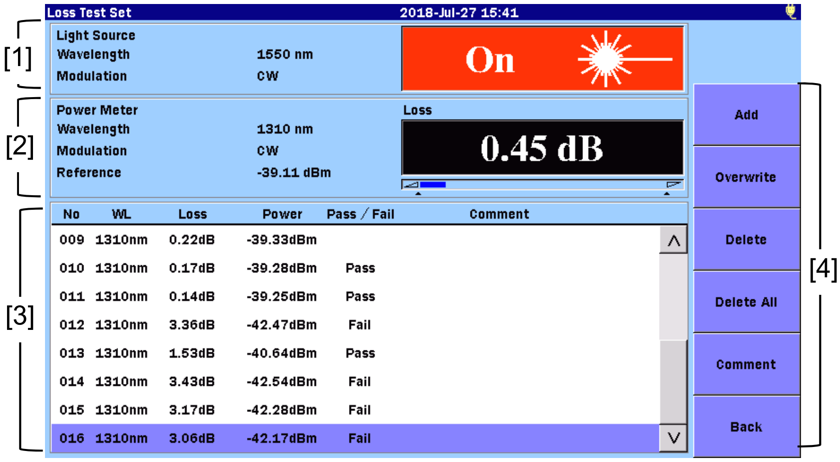


Figure 8.5-1 Loss Table Screen (Loss Test Set)

[1] Light Source Settings Area
Displays the wavelength and modulation of the light source, and the current status (On/Off) of the light source.
Refer to 8.4.1 “Light Source Area”.

[2] Power Meter Settings Area
Displays the wavelength, modulation, reference value, and power level or loss of the power meter.
If **Reference** is set to **None**, the power level currently measured is displayed. If any value is specified for **Reference**, power loss is displayed.
Refer to 8.4.2 “Power Meter Area”.

[3] Loss Table
Displays a list of the measured results. Touching a row allows you to select it. The table can be scrolled using the rotary knob or the arrow key set.
A Loss Table can contain up to 999 rows and presents the following details:

Table 8.5-1 Details of Loss Table

Name	Explanation
No	Number of the fiber tested
WL	Wavelength set for the Power Meter
Loss	Difference between the reference and power
Power	Current power measurement value
Pass/Fail	Pass/Fail status as determined by the current Threshold value
Comment	Comments entered by the operator

[4] Sofkeys
Refer to 8.5.1 "Loss Table Softkeys".

8.5.1 Loss Table Softkeys

Add

Adds the current test results to the Loss Table.

Overwrite

Overwrites the highlighted row in the Loss Table with the results from the current test.

Delete

Deletes the bottom row when it is selected.

Delete All

Deletes all test results from the Loss Table.

Comment

Allows you to enter a comment. For detail on how to enter characters, refer to 3.1.5 "How to Enter Characters".

Back

Touching this softkey goes back to the Loss Test Set Screen (Figure 8.4-1 "Loss Test Set Screen").

8.5.2 Editing the Loss Table

8.5.2.1 Adding Test Data to an Existing Loss Table

Touch **Add**.

The current test data will be added at the end of the Loss Table.

Note:

The light source output must be turned on.

When the light source output is turned off, the “Under” is displayed in the Power column and “**.***” is displayed in the Loss column. When the threshold is set, “Fail” is displayed.

8.5.2.2 Overwriting Test Data in an Existing Loss Table

1. Touch the desired row on the Loss Table to select it.
2. Touch **Overwrite**. The new test data information appears in the highlighted row.

Note:

The light source output must be turned on.

When the light source output is turned off, the “Under” is displayed in the Power column and “**.***” is displayed in the Loss column. When the threshold is set, “Fail” is displayed.

8.5.2.3 Deleting Test Data from a Loss Table

Touch **Delete**, and the bottom row is deleted.

Note:

The **Delete** softkey is only available when the bottom row in a Loss Table is selected.

8.5.2.4 Deleting All Test Data from a Loss Table

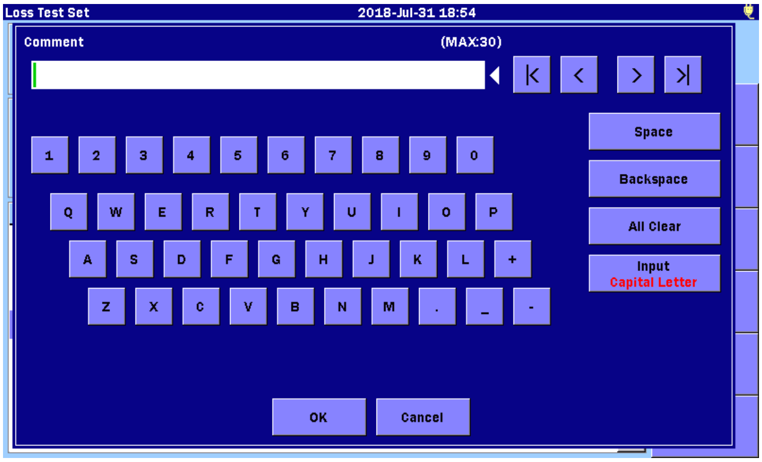
When you start a new Loss Test Set, the Loss Table is populated with the data from the previous test or the data loaded from the file.

In this case, touch **Delete All** to clear all the test results in the table.

1. Touch **Delete All**.
2. As a confirmation dialog box appears, touch **Yes** to delete.

8.5.2.5 Adding Comments to a Loss Table

1. Touch the desired row on the Loss Table to select it.
2. Touch **Comment**.
3. Enter a comment on the displayed dialog box.



For details on how to enter characters, refer to 3.1.5 "How to Enter Characters".

4. Touch **OK**.

8

Loss Test Set

8.6 Loss Test Set Measurement Procedures

There are four methods for Loss Test Set when an optical power meter (Option 004, 005, or 007) is installed to the ACCESS Master.

8.6.1 Verifying Patch Cords

Verify all reference patch cords, in both directions, before performing any tests.

1. Prepare a short fiber (patch cord) which is same type and has same connectors as the system to be tested.
2. Connect the input and the output ports of the ACCESS Master using the patch cord.

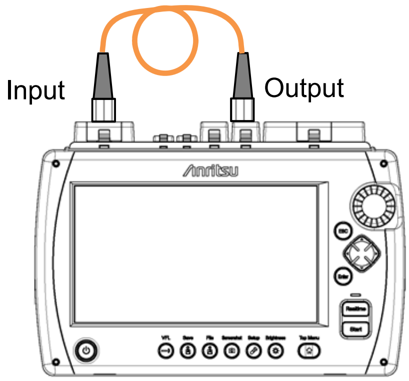


Figure 8.6.1-1 Connection to Verify Patch Code

3. Touch **Loss Test Set** on the Top Menu of the ACCESS Master.
4. If any value is specified for Reference, touch the field to set it to None.
5. Touch **Light Source** to display **On**.
6. Touch **Light Source Wavelength** to set the wavelength.
7. Touch **Power Meter Wavelength** to set the same wavelength as Light source.
8. Touch **Reference** and touch **Paste the Power** on the dialog box. The Reference field displays the current power.
9. Touch **Light Source** to display **Off**.
10. Reverse the patch code connection between the ports.

11. Touch **Light Source** to display **On**.

    - If the Loss reading displayed is less than 0.5 dB, the patch cord is good and will provide a valid test.
    - If the Loss reading is 0.5 dB or greater, clean the optical connecters and repeat steps 9 and 11.
      If the Loss reading is still 0.5 dB or greater, after cleaning the connectors, replace the patch cord and repeat steps 4 through 11.

12. Repeat steps 4 through 11 for all wavelengths to be tested as required.

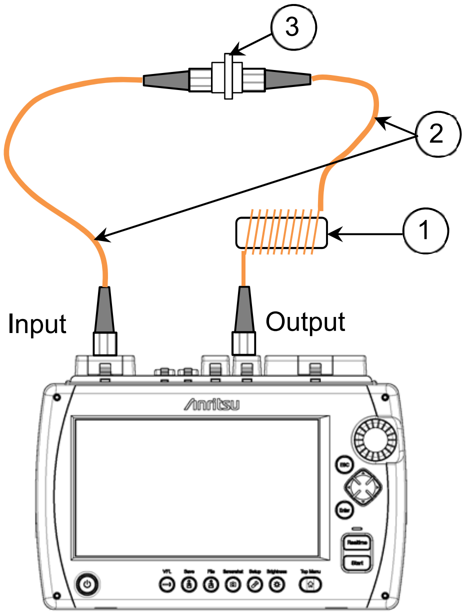
8.6.2 Single ACCESS Master Method

The following describes how to use a single ACCESS Master to which an optional power meter is installed for Loss Test Set.

This procedure requires that the start and end of the fiber to be tested are at the same location.

Measuring a reference

1. Touch **Loss Test Set** on the Top Menu of the ACCESS Master.
2. Connect the input and the output ports using either of the following.
   - A single patch cord
   - Two patch cord and an inline connector



(1) Mode conditioner (for multi-mode fiber)

(2) Patch code

(3) In-line connector

Figure 8.6.2-1 Connection to Measure a Reference

Note:

A mode conditioner is required to perform tests recommended by TIA. It is recommended to use the mode conditioner that complies with IEC61280-4-1.

A mode conditioner is not provided with the ACCESS

Master.

3. Touch **Light Source Wavelength** to set the wavelength.

4. Touch **Power Meter Wavelength** to set the same wavelength as Light source.

5. Touch **Modulation** to set **CW**.

6. Touch **Light Source** to display **On**.

7. Touch **Reference** and touch **Paste the Power** on the dialog box. The Loss reading indicates 0.00 dB and the Reference field displays the current power.

8. Repeat steps 3 through 7 for all wavelengths to be tested as required.

Note:

The Reference value(s) just stored are retained on power down of the ACCESS Master.

Testing

1. Touch **Threshold**.

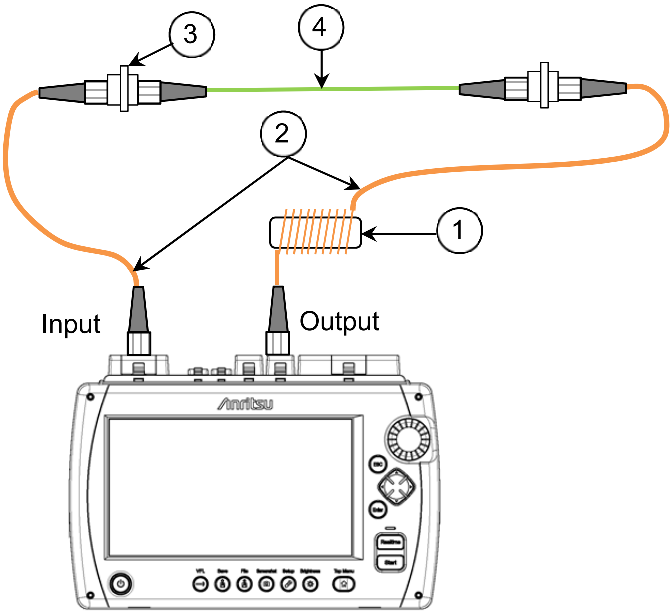
2. Enter a pass/fail threshold for the wavelength to be measured and then touch **OK**.

3. If using the two patch cord method, disconnect the patch cords at the inline connector in Figure 8.6.2-1.
   If using the one patch cord method, disconnect the patch cord from the input port.

Note:

Regardless of the method used (one or two patch cord) do not disconnect the patch cord from the output port. The coupled level of the light source may change when the patch cord is reconnected.

4. Attach the free end of the patch cord connected to the output port to one end of the device to be tested.



① Mode conditioner (for multi-mode fiber)

② Patch codes

③ In-line connector

④ Device under test (fiber, coupler, etc.)

Figure 8.6.2-2 Connecting DUT(s)

5. Touch **Light Source Wavelength** to set the wavelength.
6. Touch **Power Meter Wavelength** to set the same wavelength as Light source.
7. Touch **Light Source** to display **On**.
8. Touch **Loss Table**.
9. Touch **Add** to add the current test data to the Loss Table.
10. Repeat steps 4 through 9 until all devices for the current Loss Table are tested.

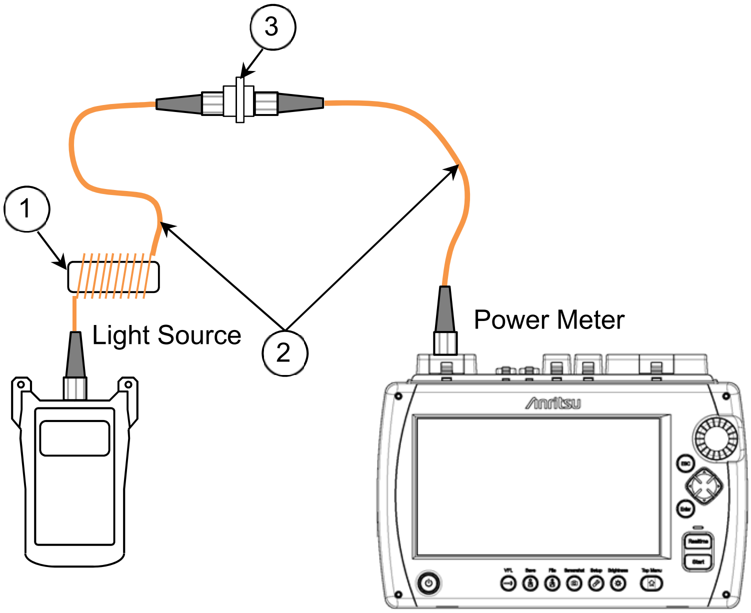
It is a good practice to save the Loss Table periodically (for example, every ten fibers) as you store the loss readings to prevent loss of data in the event of a power failure.

8.6.3 Single ACCESS Master Method with an External Light Source

This method is used when the start and end of the fiber to be tested are at two different locations.

Measuring a reference

1. Touch **Loss Test Set** on the Top Menu of the ACCESS Master.
2. Connect between an external light source and the power meter on the ACCESS Master using either of the following.
   - A single patch cord
   - Two patch cord and an inline connector



(1) Mode conditioner (for multi-mode fiber)

(2) Patch codes

(3) In-line connector

Figure 8.6.3-1 Connection to Measure a Reference

Note:

A mode conditioner is required to perform tests recommended by TIA. It is recommended to use the mode conditioner that complies with IEC61280-4-1.

A mode conditioner is not provided with the ACCESS Master.

3. Make sure that the optional Power Meter and the external light source are set to the same wavelength.

   - Power up the external light source.
     Follow the instructions for the given external light source to set it to the desired wavelength.
     Allow five minutes for the light source to stabilize.
   - Touch **Power Meter Wavelength** on ACCESS Master until the desired wavelength is displayed.

4. Make sure that the modulation mode for the ACCESS Master optional Power Meter and the external light source are set to **CW**.

   - On the ACCESS Master, touch **Modulation** to display **CW**.
   - Follow the instructions for the given external light source to set it to CW (Continuous Wave) mode.

5. Turn on the optical output of the external light source.

6. Touch **Reference** and touch **Paste the Power** on the dialog box. The Loss reading indicates 0.00 dB and the Reference field displays the current power.

7. Repeat steps 3 through 6 for all wavelengths to be tested as required.

Note:

The Reference value(s) just stored are retained on power down of the ACCESS Master.

Testing

1. Touch **Threshold** on the ACCESS Master panel.

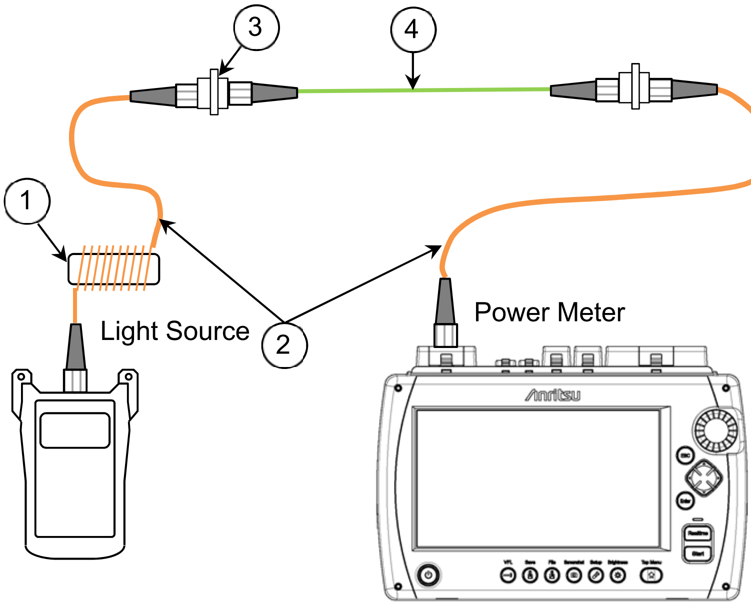
2. Enter a pass/fail threshold for the wavelength to be measured and then touch **OK**.

3. If using the two patch cord method, disconnect the patch cords at the inline connector.
   If using the one patch cord method, disconnect the patch cord from the input port.

Note:

Regardless of the method used (one or two patch cord) do not disconnect the patch cord from the external light source. The coupled level of the light source may change when the patch cord is reconnected.

4. Attach the free end of the patch cord connected to the external light source to one end of the fiber to be tested. Using a second patch cord, connect the ACCESS Master optional Power Meter to the other end of the fiber to be tested.



① Mode conditioner (for multi-mode fiber)

② Patch codes

③ In-line connector

④ Device under test (fiber, coupler, etc.)

Figure 8.6.3-2 Connecting DUT(s)

5. Make sure that the Power Meter and external light source are set to the same wavelength.
6. Turn on the optical output of the external light source.
7. Touch **Loss Table** on the ACCESS Master panel.
8. Touch **Add** to add the current test data to the Loss Table.
9. Repeat steps 4 through 8 until all devices for the current Loss Table are tested.

It is a good practice to save the Loss Table periodically (for example, every ten fibers) as you store the loss readings to prevent loss of data in the event of a power failure.

8.6.4 Dual ACCESS Masters Method

This procedure details how to operate the Loss Test Set mode for two ACCESS Masters (designated ACCESS Master-A and ACCESS Master-B) that have not been physically connected together to establish their Reference settings.

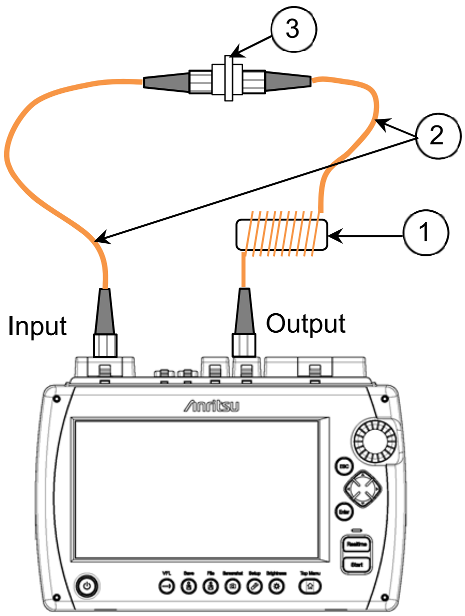
This method can also be used when there is a long distance between the start and end of the fiber to be tested.

This method has three phases.

Measuring a reference

Perform the following steps on both ACCESS Master-A and ACCESS Master-B.

1. Power on the ACCESS Master.
2. Touch **Loss Test Set** on the Top Menu of the ACCESS Master.
3. Connect the input and the output ports using an in-line connector and two patch codes.



① Mode conditioner (for multi-mode fiber)

② Patch codes

③ In-line connector

Figure 8.6.4-1 Connection to Measure a Reference

Note:

A mode conditioner is required to perform tests recommended by TIA. It is recommended to use the mode conditioner that complies with IEC61280-4-1.

A mode conditioner is not provided with the ACCESS Master.

4. Touch **Light Source Wavelength** to set the wavelength.
5. Touch **Power Meter Wavelength** to set the same wavelength as Light source.
6. Touch **Modulation** to set **CW**.
7. Touch **Light Source** to display **On**.
8. Touch **Reference** and touch **Paste the Power** on the dialog box. The Loss reading indicates 0.00 dB and the Reference field displays the current power.
9. Touch **Loss Table** and then touch **Add**.
   The reference values are displayed in Power column on the Los Table.
10. Repeat steps 4 through 9 for all wavelengths to be tested as required.

Note:

The Reference value(s) just stored are retained on power down of the ACCESS Master.

Modifying the stored reference

The stored reference values in ACCESS Master-A need to be input into ACCESS Master-B and the stored reference values in ACCESS Master-B need to be input into ACCESS Master-A.

1. On ACCESS Master-A, touch **Light Source Wavelength** to set the wavelength to be modified.
2. Touch **Reference** and then enter a reference value of ACCESS Master-B.
3. Repeat steps 1 and 2 to set the reference values for other wavelengths as required.
4. On ACCESS Master-B, repeat steps 1 through 3 to set the reference values to the values in the Power columns in the LOSS Table of ACCESS Master-A .

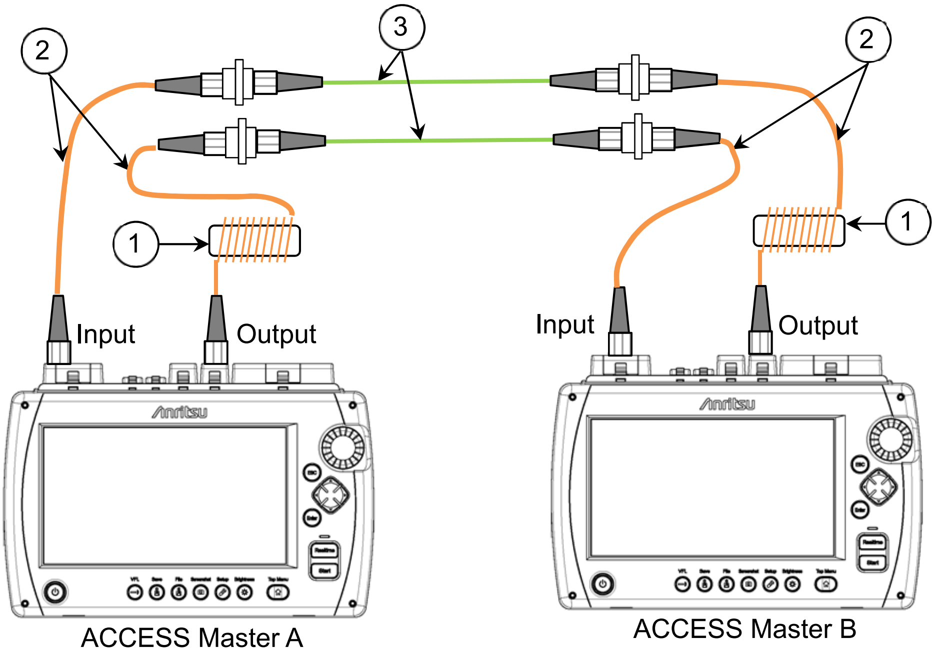
Testing

1. Touch **Threshold** on the ACCESS Master panel.
2. Enter a pass/fail threshold for the wavelength to be measured and then touch **OK**.
3. Disconnect the patch cords at the inline connector.

Note:

Do not disconnect the patch cord from the output port of ACCESS Master. The coupled level of the light source may change when the patch cord is reconnected.

4. As shown the figure below, attach the free end of the patch cord connected to the output port on ACCESS Master-A to the end of one fiber to be tested and attach the free end of the patch cord connected to the input port on ACCESS Master-B to the opposite end of the fiber. Attach the free end of the patch cord connected to the input port on ACCESS Master-A to the end of another fiber to be tested and attach the free end of the patch cord connected to the output port on ACCESS Master-B to the opposite end of the fiber.



① Mode conditioners (for multi-mode fiber)

② Patch codes

③ In-line connectors

Figure 8.6.4-2 Connecting DUT(s)

5. Make sure that the Power Meter and the light source are set to the same wavelength.
6. Touch **Light Source** to display **On**.
7. Touch **Loss Table** on the panel of ACCESS Master.
8. Touch **Add** to add the current test data to the Loss Table.
9. Repeat steps 4 through 8 until all devices for the current Loss Table are tested.

It is a good practice to save the Loss Table periodically (for example, every ten fibers) as you store the loss readings to prevent loss of data in the event of a power failure.

8.7 Working with Loss Test Set Files

8.7.1 Saving Loss Table

Press **Save** while the Loss Table screen is displayed, the Save screen is displayed.

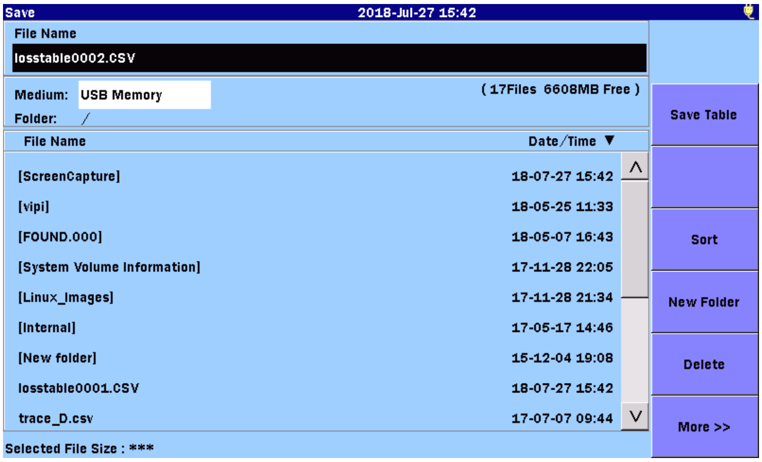


Figure 8.7.1-1 Save Screen

For details on how to save files, refer to 3.5.7 “Saving File”.

Note:

If the Loss Table to be saved is loaded from the file, be sure to change the filename and save it. Otherwise the file is overwritten and the previous test results contained in the file are lost.

8.7.2 Loading a Loss Table

1. Press **Load** while the Loss Table screen is displayed, the Load screen is displayed.

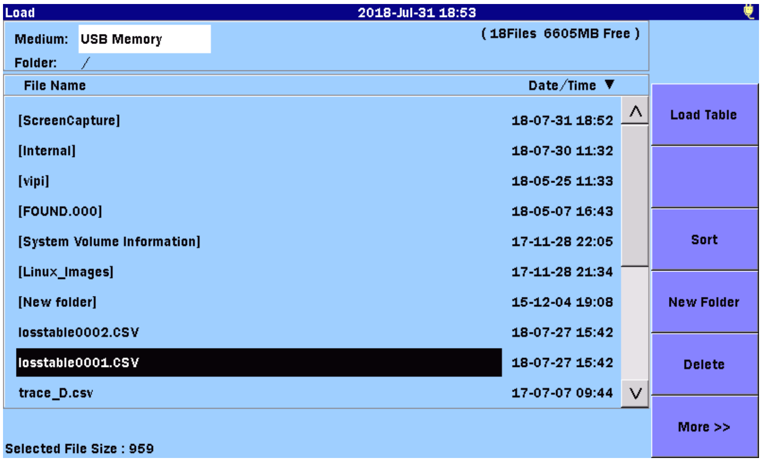


Figure 8.7.2-1 Load Screen

2. Select a storage medium.
3. Touch the file name to select it.
4. Touch **Load Table**.

For other file operations, refer to 3.5 “File Operation”.

Chapter 9 Power Meter and Optical Light Source

This chapter describes the power meter, light source, and optional VFL for the ACCESS Master.

9.1 Power Meter Overview

The optical communications power level can be measured using the power meter. Breakage, loss increases, and other optical fiber conditions can be checked by measuring the optical communications power level.

9.1.1 Accessing Power Meter

1. Press **Top Menu** .
2. Touch **Power Meter**.

Note:

When an optical power meter (Option 004, 005, or 007) is installed to the ACCESS Master, **Loss Test Set** is made available instead of **Power Meter**. For details on Loss Test Set, refer to Chapter 8 “Loss Test Set”.

CAUTION

Do not input optical power beyond the level indicated on the measurement port.

Otherwise, the light receiver may be damaged.

9.1.2 Power Meter Screen

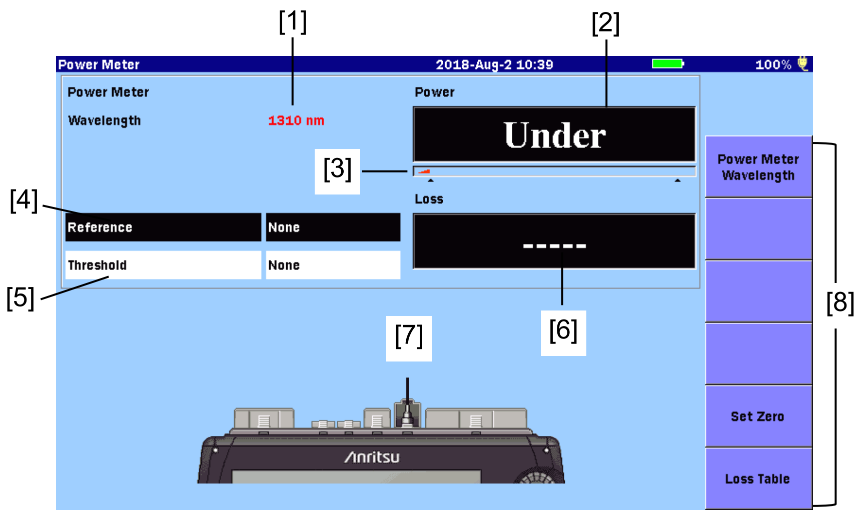


Figure 9.1.2-1 Power Meter Screen

[1] Power Meter Wavelength indicator
Displays the wavelength set via **Power Meter Wavelength**.

[2] Absolute Power reading
Displays the measured power meter value in dBm units.
The value can be converted into mW (mili-watt) units by the following formula:

$$P_W = 10^{\frac{P_D}{10}}$$

PW: Power (mW unit)

PD: Power (dBm unit)

“Under” is displayed if the power is less than the minimum level of the measurement range.

“Over” is displayed if the power is more than the maximum level of the measurement range.

When the reference value in [4] is set to **None**, pass/fail status determined according to the threshold value in [5] is indicated. If it is determined as fail according to the threshold, the background color will get red.

[3] Range indicator
Displays the power level to be measured. The Range indicator increases with an increase in power level.

[4] Reference
Displays the power level that is basis of loss calculation. Touching the field allows you to change the value.

[5] Threshold
Displays the value to determine pass/fail status of power or loss. Threshold must be set for each wavelength.

- Threshold for power when the reference is set to **None**
- Threshold for loss when the reference is set to **None**

Touching the field allows you to change the value.

[6] Loss
Displays the power loss. When the reference value is set to **None**, “––––––” is displayed.
The power loss is obtained as follows:

Loss = Reference – power measurement (dB)

When the reference value in [4] is not set to **None**, pass/fail status determined according to the threshold value in [5] is indicated. If it is determined as fail according to the threshold, the background color will get red.

[7] Port connection indicator
Indicates the measurement port that varies according to the wavelength setting. Connect the optical fiber to the indicated port.

9.1.3 Softkeys

Power Meter Wavelength

Switches the wavelength for the power meter.

Set Zero

Adjusts the power meter offset. Refer to 9.1.4 “Power Meter Zero Offset”.

Loss Table

Displays the Loss Table screen. Refer to 9.2 “Loss Table Screen (Power Meter)”.

9.1.4 Power Meter Zero Offset

Perform the following steps to zero the power meter.

1. Disconnect the fiber from the Power Meter (Input) port, if connected, and close the protective cover to shield the port from incident light.

2. Touch **Set Zero** on the Power Meter screen (Figure 9.1.2-1 “Power Meter Screen”). The following dialog box appears.

Figure 9.1.4-1 Confirmation Dialog Box

3. Touch **Start**. The message "Zeroing power meter..." appears briefly and the unit returns to the Loss Test Set screen with a Power reading of "Under".

Note:

The following message may be displayed when executing zero offset without light shielding.

Zero Set is failed. Please make sure the protective cover is fully closed and try again.

Touch **OK** or press ESC to clear the message from the screen. Make sure that the measurement port is fully covered with the protective cover, and then execute zero offset again.

9.2 Loss Table Screen (Power Meter)

The Loss Table screen displays the measured losses in the table format. The Loss Table can be saved as a text file (in csv format). Touching **Loss Table** displays the following screen.

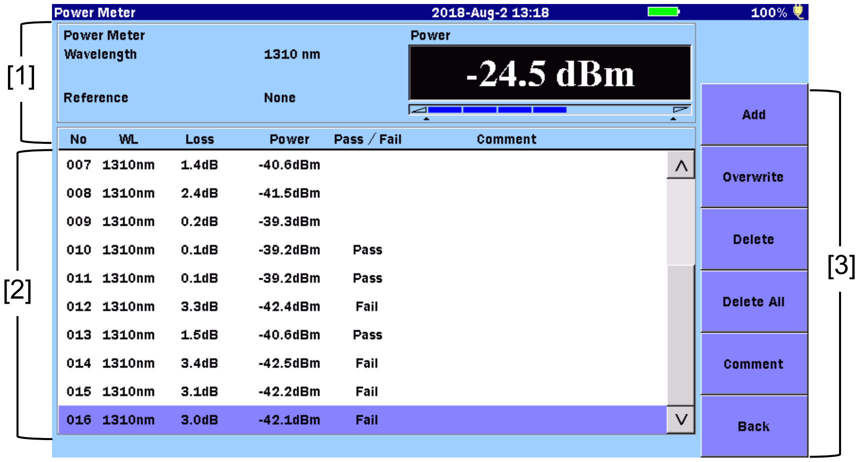


Figure 9.2-1 Loss Table Screen (Power Meter)

[1] Power Meter Settings Area

Displays the wavelength, modulation, reference value, and power level or loss set on the Power Meter Screen (Figure 9.1.2-1).

If **Reference** is set to **None**, the power level currently measured is displayed. If any value is specified for **Reference**, power loss is displayed.

[2] Loss Table

Displays a list of the measured results. Touching a row allows you to select it. The table can be scrolled using the rotary knob or the arrow key set.

A Loss Table can contain up to 999 rows and presents the following details:

Table 9.2-1 Details of Loss Table

Name	Explanation
No	Number of the fiber tested
WL	Wavelength set for the Power Meter
Loss	Difference between the reference and power
Power	Current power measurement value
Pass/Fail	Pass/Fail status as determined by the current Threshold value
Comment	Comments entered by the operator

[3] Sofkeys
Refer to 9.2.1 “Loss Table Softkeys”.

9.2.1 Loss Table Softkeys

Add
Adds the current test results to the Loss Table.

Overwrite
Overwrites the highlighted row in the Loss Table with the results from the current test.

Delete
Deletes the bottom row when it is selected.

Delete All
Deletes all test results from the Loss Table.

Comment
Allows you to enter a comment. For detail on how to enter characters, refer to 3.1.5 “How to Enter Characters”.

Back
Touching this softkey goes back to the Power Meter screen (Figure 9.1.2-1 “Power Meter Screen”).

9.2.2 Editing the Loss Table

9.2.2.1 Adding Test Data to an Existing Loss Table

Touch **Add**.
The current test data will be added at the end of the Loss Table.

Note:

The light source output must be turned on.

When the light source output is turned off, the “Under” is displayed in the Power column and “**.***” is displayed in the Loss column. When the threshold is set, “Fail” is displayed.

9.2.2.2 Overwriting Test Data in an Existing Loss Table

1. Touch the desired row on the Loss Table to select it.
2. Touch **Overwrite**. The new test data information appears in the highlighted row.

Note:

The light source output must be turned on.

When the light source output is turned off, the “Under” is displayed in the Power column and “**.***” is displayed in the Loss column. When the threshold is set, “Fail” is displayed.

9.2.2.3 Deleting Test Data from a Loss Table

Touch **Delete**, and the bottom row is deleted.

Note:

The **Delete** softkey is only available when the bottom row in a Loss Table is selected.

9.2.2.4 Deleting All Test Data from a Loss Table

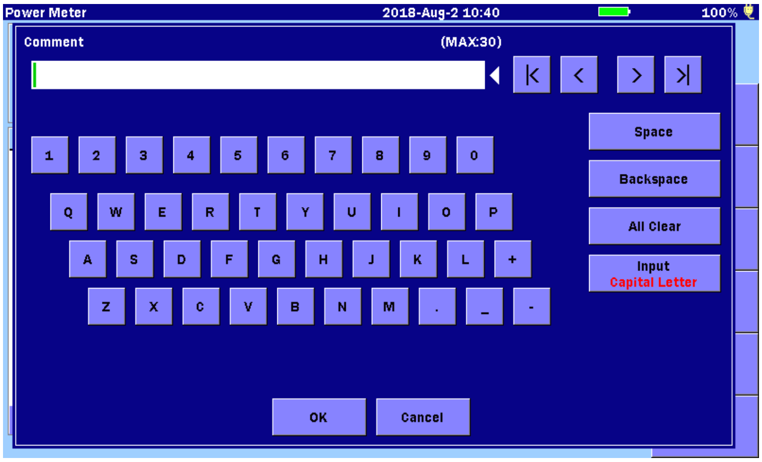
When you start a new Loss Test Set, the Loss Table is populated with the data from the previous test or the data loaded from the file.

In this case, touch **Delete All** to clear all the test results in the table.

1. Touch **Delete All**.
2. As a confirmation dialog box appears, touch **Yes** to delete.

9.2.2.5 Adding Comments to a Loss Table

1. Touch the desired row on the Loss Table to select it.
2. Touch **Comment**.
3. Enter a comment on the displayed dialog box.



For details on how to enter characters, refer to 3.1.5 “How to Enter Characters”.

4. Touch **OK**.

9.3 Power Meter Setup

9.3.1 Wavelength

Touch the **Power Meter Wavelength** to switch the wavelength.

9.3.2 Reference

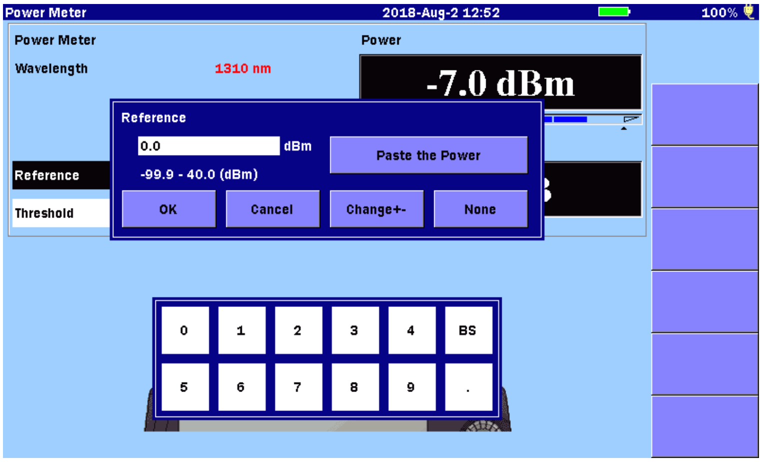


Figure 9.3.2-1 Entering Reference

Change +–	Toggles the reference value from positive to negative or negative to positive.
None	Sets the reference value to “None”.
Paste the Power	Copies current power to the Reference field.

9.3.3 Threshold

Displays the value to determine pass/fail status of power or loss. Threshold must be set for each wavelength.

- Threshold for power when the reference is set to **None**
- Threshold for loss when the reference is set to **None**

Touching the field allows you to change the value.

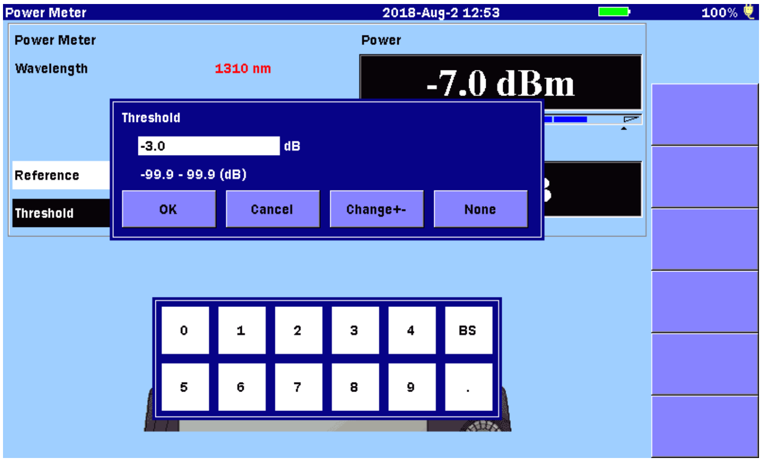


Figure 9.3.3-1 Entering Threshold

Change +–	Toggles the threshold value from positive to negative or negative to positive.
None	Sets the threshold value to “None”.

9.4 Power Meter Measurements

9.4.1 Power Level Measurement

Note:

Correct measurement may not be obtained until zero offset is executed.
Be sure to perform light shielding and execute zero offset before measurement.

1. Press **Top Menu** .
2. Touch **Power Meter**.
3. Close the power meter port connector cover.
4. Touch **Set Zero** to start zero offset, and wait until the process is complete.
5. Touch **Power Meter Wavelength** to set the wavelength.
6. Connect the fiber under test to the measurement port on the ACCESS Master.
   The power level of the fiber under test is displayed in the Power reading area.

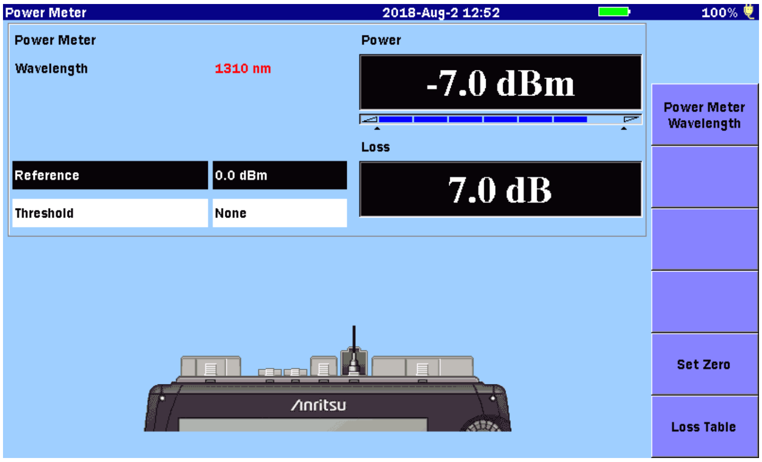
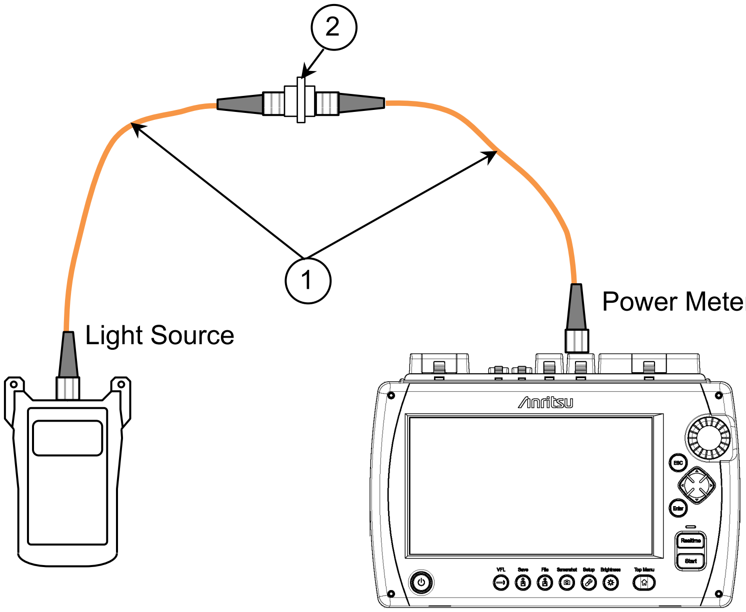


Figure 9.4.1-1 Power Display

9.4.2 Power Loss Measurements

Reference Procedure

1. Press **Top Menu** .
2. Touch **Power Meter**.
3. Connect between an external light source and the power meter on the ACCESS Master using either of the following.
   - A single patch cord
   - Two patch cord and an inline connector



① Patch code

② In-line connector

Figure 9.4.2-1 Connection to Measure a Reference

4. Make sure that the optional Power Meter and the external light source are set to the same wavelength.
   - Power up the external light source.
     Follow the instructions for the given external light source to set it to the desired wavelength.
     Allow five minutes for the light source to stabilize.
   - Touch **Power Meter Wavelength** on ACCESS Master until the desired wavelength is displayed.
5. Turn on the optical output of the external light source.

6. Touch **Reference** and touch **Paste the Power** on the dialog box. The Loss reading indicates 0.00 dB and the Reference field displays the current power.
7. Repeat steps 3 through 6 for all wavelengths to be tested as required.

Note:

The Reference value(s) just stored are retained on power down of the ACCESS Master.

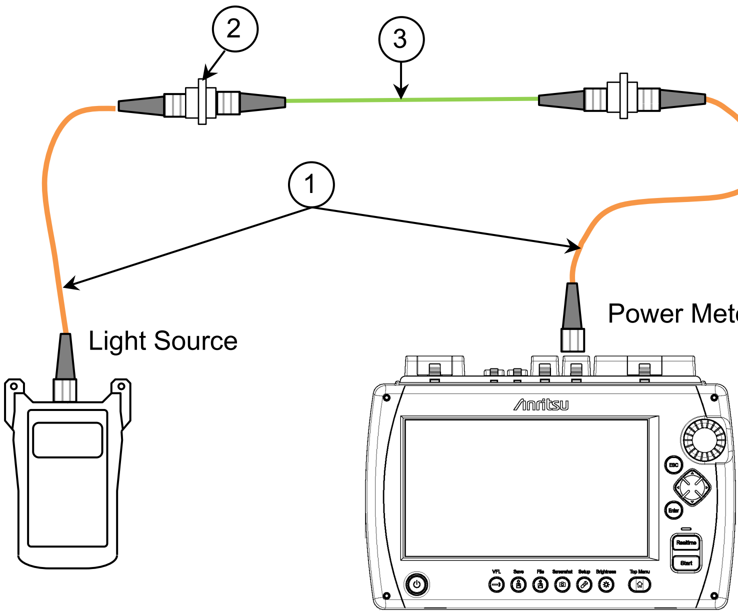
Testing

1. Touch **Threshold** on the ACCESS Master panel.
2. Enter a pass/fail threshold for the wavelength to be measured and then touch **OK**.
3. If using the two patch cord method, disconnect the patch cords at the inline connector.
   If using the one patch cord method, disconnect the patch cord from the input port.

Note:

Regardless of the method used (one or two patch cord) do not disconnect the patch cord from the external light source. The coupled level of the light source may change when the patch cord is reconnected.

4. Attach the free end of the patch cord connected to the external light source to one end of the fiber to be tested. Using a second patch cord, connect the ACCESS Master optional Power Meter to the other end of the fiber to be tested.



(1) Patch codes

(2) In-line connector

(3) Device under test (fiber, coupler, etc.)

Figure 9.4.2-2 Connecting DUT(s)

5. Make sure that the Power Meter and external light source are set to the same wavelength.

6. Turn on the optical output of the external light source.

7. Touch **Loss Table** on the ACCESS Master panel.

8. Touch **Add** to add the current test data to the Loss Table.

9. Repeat steps 4 through 8 until all devices for the current Loss Table are tested.

It is a good practice to save the Loss Table periodically (for example, every ten fibers) as you store the loss readings to prevent loss of data in the event of a power failure.

9.5 Working with Loss Test Set Files

9.5.1 Saving Loss Table

Press **Save** while the Loss Table screen is displayed, the Save screen is displayed.

Figure 9.5.1-1 Save Screen

For details on how to save files, refer to 3.5.7 “Saving File”.

Note:

If the Loss Table to be saved is loaded from the file, be sure to change the filename and save it. Otherwise the file is overwritten and the previous test results contained in the file are lost.

9.5.2 Loading a Loss Table

1. Press **Load** while the Loss Table screen is displayed, the Load screen is displayed.

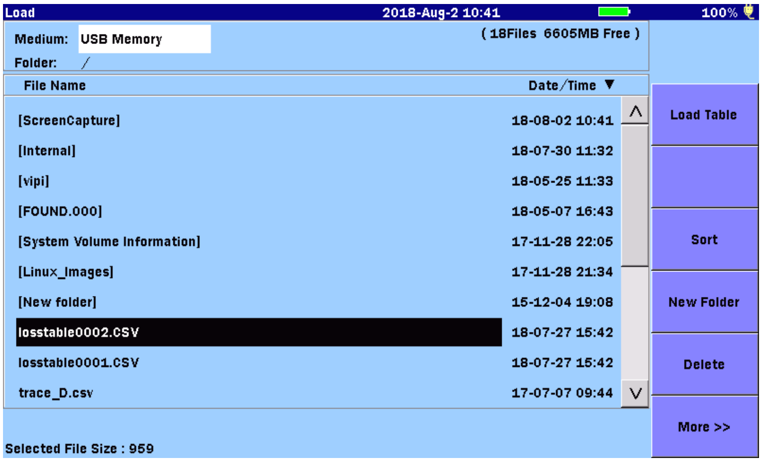


Figure 9.5.2-1 Load Screen

2. Select a storage medium.
3. Touch the file name to select it.
4. Touch **Load Table**.

For other file operations, refer to 3.5 “File Operation”.

9.6 Light Source

Light Source is a function to output continuous lights or modulated lights.

9.6.1 Accessing Optical Light Source

1. Press **Top Menu** .
2. Touch **Light Source**.

9.6.2 Light Source Screen

Figure 9.6.2-1 Light Source Screen

[1] Light Source On/Off indicator

[2] Port connection indicator

[3] Softkeys

Light Source On/Off indicator

Displays the current status of the Optical Light Source laser. When the laser light is on, the front panel lamp ([8] in Figure 2.1-1) blinks.

CAUTION

Disconnect the target measurement optical fiber from the operating line.

The output from Optical Light Source may interrupt communications if the target measurement optical fiber is connected to the optical fiber currently operating.

Disconnect communications devices, etc. from the target measurement optical fiber during measurement to prevent the optical sensors from being damaged.

Port connection indicator

Indicates the measurement port that varies according to the wavelength setting. Connect the optical fiber under test to the indicated port.

9.6.3 Softkeys

Light Source

Switches on and off the laser light output.

Wavelength

Switches the wavelength for the laser light.

Modulation

Switches the modulation frequency of the laser light. When set to **CW**, the laser light is not modulated.

9.7 VFL

The VFL is an option available for the ACCESS Master, and is a light source to emit a visible red light into a fiber. Since the light from this light source is visible, it is useful for locating fault points in the dead zone by visually checking the diffusing light. It is also useful for fiber identification of a multi-core optical fiber.

When visible light is injected into a non-coated optical fiber, diffused light can be visually checked by manually bending the fiber. It is possible to determine whether there is a break point on the optical fiber by checking the diffusing light.
The VFL can be turned on any time if panel operations are available.

The VFL enables checking for break points when no fiber identification device (ID tester) is available. Note that the further the distance from the light source, the harder it is to check the visible light.

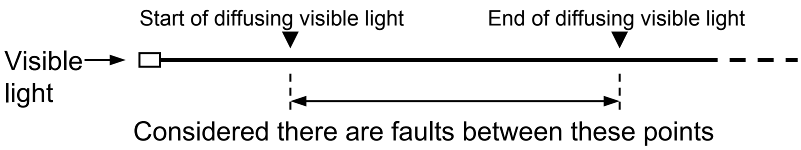


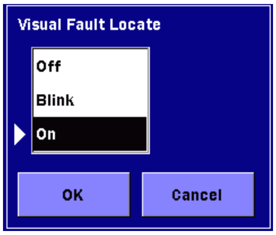
Figure 9.7-1 Injecting Visible Light into Fiber

Note:

Take care not to press too hard when inserting the APC connector as this may scratch the edge face of the ferrule.

9.7.1 Turning on, off, or Blinking VFL

1. Press **VFL** . The following dialog box appears.



2. Touch **Off**, **Blink**, or **On**.
3. Touch **OK**.

   When **On** is selected, the VFL icon is displayed in red.

   When **Blink** is selected, the VFL icon blinks.

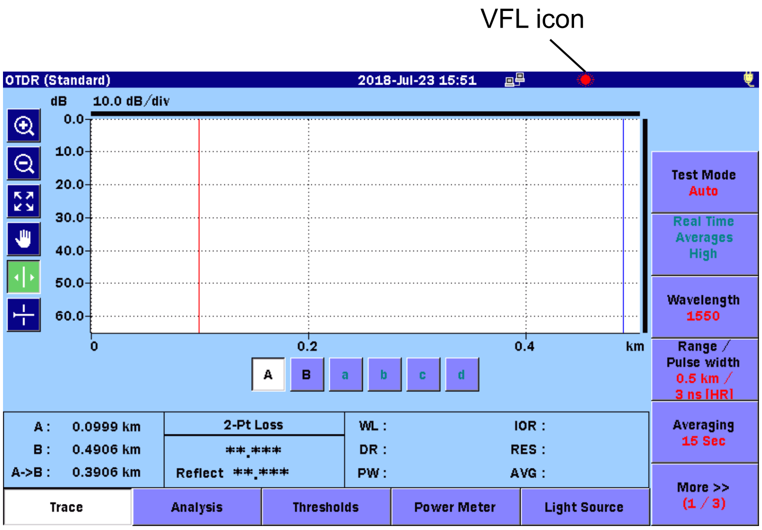


Figure 9.7.1-1 VFL Icon

9.7.2 Example of Visually Checking Faults

The following is an example of how to visually check faults on optical fibers using the VFL.

Procedure

1. Connect the optical fiber to be measured to the VFL port.
2. Turn on or blink the VFL.
3. Visually check the diffused light by bending the optical fiber to be measured.
4. Turn off the VFL after the check.

Note:

Loss measurement and event-point detection cannot be performed using the VFL.

Chapter 10 VIP

This chapter explains how to use the VIPs. The VIPs are sold separately from the ACCESS Master.

10.1 VIP

The Video Inspection Probe (VIP) option is used to inspect fiber optic terminations.

The following VIP models are available for the ACCESS Master.

Figure 10.1-1 External View of VIPs

For how to use a VIP, refer to the operation manual coming with the VIP.

Note:

545VIP, G0293A, and G0306A are discontinued models.

Connect a VIP to the USB port (VIP) on the ACCESS Master top panel.

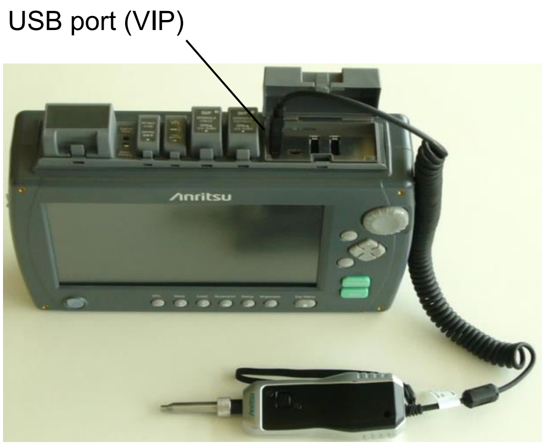


Figure 10.1-2 Connecting VIP

10.2 Using VIP on ACCESS Master

10.2.1 VIP Operation

When a VIP is connected to the ACCESS Master, touching **VIP** on Top Menu displays the VIP screen.

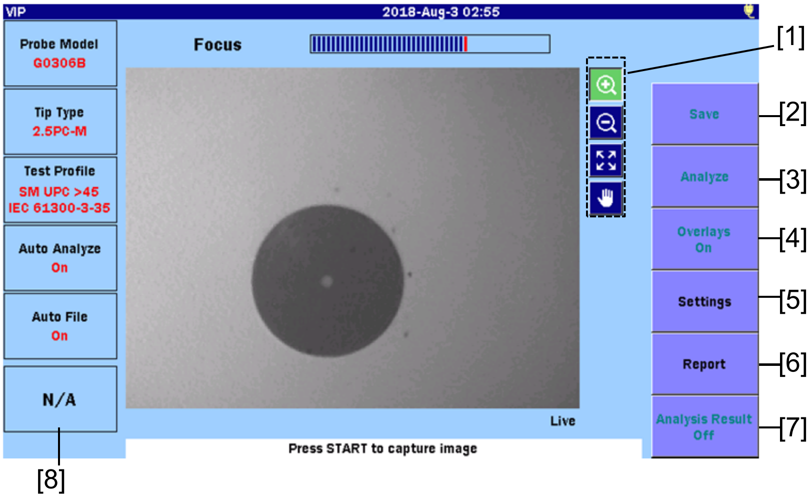


Figure 10.2.1-1 VIP Screen

The **Focus** bar indicates the degree of the focus adjustment.
Press Start to capture an image of the fiber endface.
If an image of the fiber endface has been captured, the following operations are available.

[1] Zoom, Shift

Touch , , or to zoom or shift the image by touching it or dragging it.

The image can be expanded up to 200% The zoomed-in image can be moved by pressing the arrow keys.

Rotating the Rotary knob zooms in or out of the image.

Table 10.2.1-1 Tool Icons

Icon	Explanation
	Zooms in the image centering the touched point.
	Zooms out of the image centering the touched point.
	Displays the whole image.
	Moves the image by dragging.

[2] Save
Saves the captured endface image and the analysis results to a file in VIPI format. Or saves only the endface image in PNG format.
Refer to 10.3.1 "Saving VIP Files".

[3] Analyze
Performs pass/fail judgement for the captured image.
Touch **Analysis** to display details of the analysis results.

[4] Overlays
Displays border lines of Core, Cladding, Adhesive, Contact.

[5] Settings
Displays VIP Test Set Screen and VIP Auto File Settings Screen.

[6] Report
Displays VIP Report Settings Screen (refer to Figure 10.4-1).

[7] Analysis Result
Displays the table of analysis result (refer to Figure 10.2.5-2).

[8] Pass/Fail Result
Displays the result judged from the number of defects and scratches which are discovered from analyzing the image.

10.2.2 VIP Test Settings

Images captured by the VIP can be analyzed on the ACCESS Master.
Set Probe Model, Tip Type, and Test Profile to analyze correctly.

Touching **Settings** on the VIP Screen (Figure 10.2.1-1) displays the following screen.

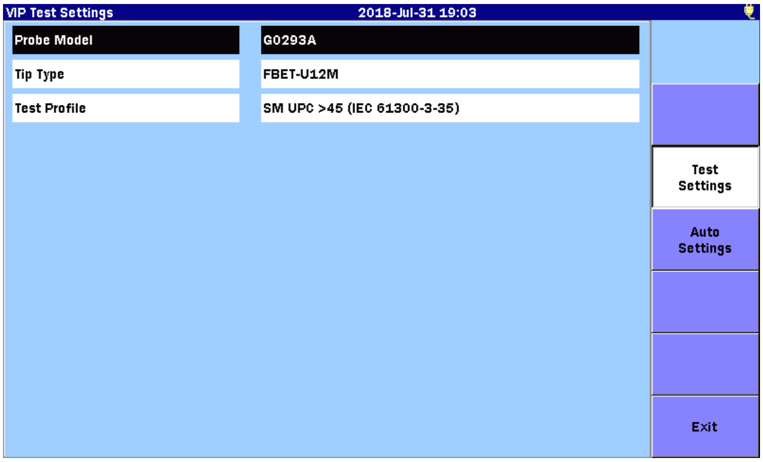


Figure 10.2.2-1 VIP Test Settings Screen

Probe Model
Select a probe to be used.

Tip Type
Select a tip attached to the probe. Tips displayed on the list vary depending on the probe model.

Test Profile

Select the observing fiber type. Limits which will be judged as "Pass" are shown in tables.

In the following tables, "None" means that the fiber has no scratches or defects. "No limit" means that there is no limit to the number of scratches or defects.

For example, "None >3 µm" the fiber has no scratches or defects which is larger than 3 µm.

Table 10.2.2-1 SM UPC>45 (IEC 61300-3-35 ed.2)

Zone	Defects	Scratch
Core	None	None
Cladding	No limit < 2 µm 5 2 to 5 µm None > 5 µm	No limit ≤ 3 µm None > 3 µm
Adhesive	No limit	No limit
Contact	None ≥ 10 µm	No limit

Single Mode Fiber, Physical Contact, Return Loss is 45 dB or greater.

Table 10.2.2-2 SM APC (IEC 61300-3-35 ed.2)

Zone	Defects	Scratch
Core	None	4 < 3 µm
Cladding	No limit < 2 µm 5 2 to 5 µm None > 5 µm	No limit
Adhesive	No limit	No limit
Contact	None ≥ 10 µm	No limit

Single Mode Fiber, Angled Physical Contact

Table 10.2.2-3 SM PC>26 (IEC 61300-3-35 ed.2)

Zone	Defects		Scratch	
Core	2 None	≤ 3 µm > 3 µm	2 None	≤ 3 µm > 3 µm
Cladding	No limit 5 None	< 2 µm 2 to 5 µm > 5 µm	No limit 3	≤ 3 µm > 3 µm
Adhesive	No limit		No limit	
Contact	No limit 5 None	< 20 µm 20 to 30 µm > 30 µm	No limit	

Single Mode Fiber, Physical Contact, Return Loss is more than 26 dB or greater.

Table 10.2.2-4 MM PC 62.5 (IEC 61300-3-35 ed.2)

Zone	Defects		Scratch	
Core	4 None	≤ 5 µm > 5 µm	No limit 0	≤ 3 µm > 5 µm
Cladding	No limit 5 None	< 5 µm 5 to 10 µm > 10 µm	No limit 0	≤ 5 µm > 5 µm
Adhesive	No limit		No limit	
Contact	No limit 5 None	< 20 µm 20 to 30 µm > 30 µm	No limit	

Multi-Mode Fiber, Physical Contact, Core diameter 62.5 µm

Table 10.2.2-5 MM PC 50.0 (IEC 61300-3-35 ed.1)

Zone	Defects		Scratch	
Core	4 None	≤ 5 µm > 5 µm	No limit 0	≤ 3 µm > 5 µm
Cladding	No limit 5 None	< 2 µm 2 to 5 µm > 5 µm	No limit 0	≤ 5 µm > 5 µm
Adhesive	No limit		No limit	
Contact	None	≥ 10 µm	No limit	

Multi-Mode Fiber, Physical Contact, Core diameter 50 µm

10.2.3 VIP Auto File Settings

Touch **Settings** on the VIP Screen (Figure 10.2.1-1) and touch **Auto Settings** to display the following screen. It allows settings for file saving or auto analysis of the captured image.

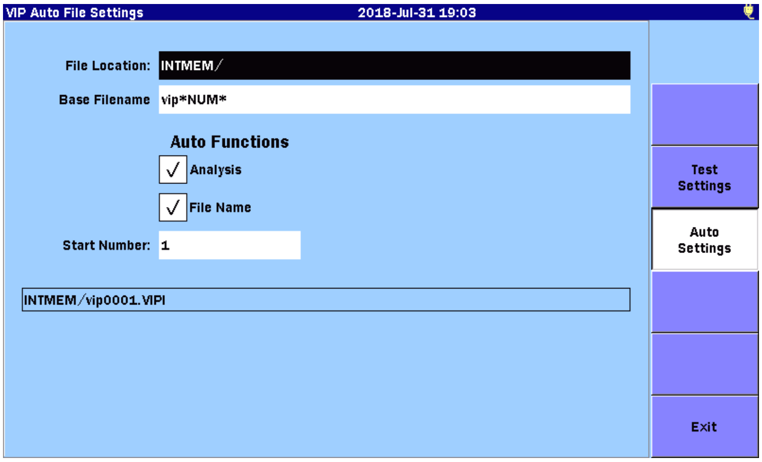


Figure 10.2.3-1 VIP Auto File Settings Screen

File Location

Set a destination folder to save an analysis result file.

Base Filename

Set a name used for a file created at AutoSave.

Analysis

If selecting the checkbox, the endface image is automatically analyzed after it was captured.

File Name

If selecting the checkbox, a filename is automatically created when saving a file.

Start Number

If a sequential number is to be appended to a filename, set its start number.

A filename which will be saved for the first time is displayed inside the black frame under Start Number.

Note:

When the checkbox of File Name is not selected, **Start Number** is not displayed and cannot be set.

10.2.4 Capturing a VIP Image

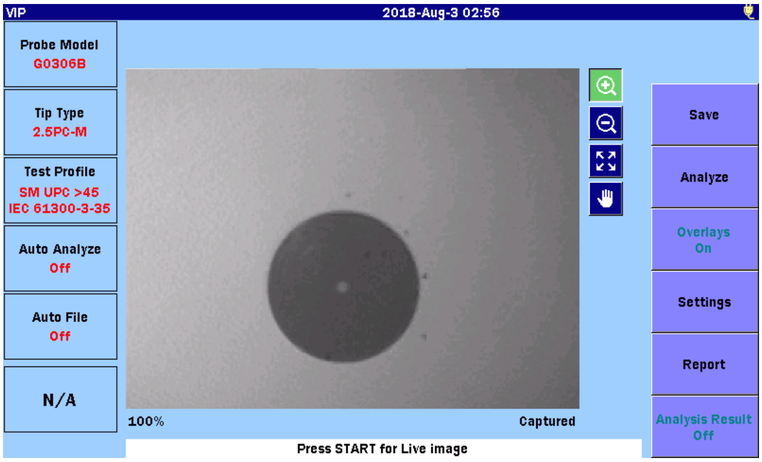


Figure 10.2.4-1 Capture a VIP Image

To capture image:

1. Press **Top Menu**  and touch **VIP**.
2. Touch **Settings** on the VIP screen to display the VIP Test Settings screen.
3. Edit the VIP Test Settings, and then press Start.
4. Touch  and touch the image to zoom in.
   The range of magnification percentage is from 100% to 200% and is displayed in the lower left of the image area.
   If press ESC then the magnification percentage will become 100%.
5. Touch . Drag the image to move it.

Note:

If the magnification percentage is 100%, the captured image cannot be moved.

10.2.5 Analyzing a VIP image

Images captured by the VIP can be analyzed on the ACCESS Master.

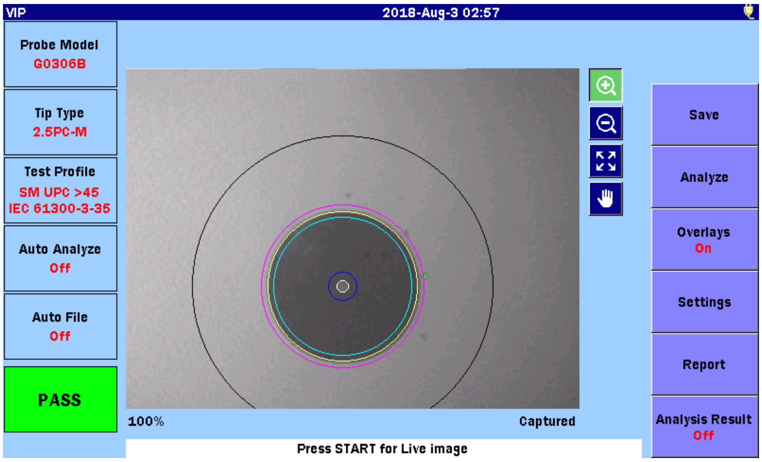


Figure 10.2.5-1 Analyze a VIP image

To analyze the image:

1. Capture the image or load VIP image from a file.
2. If you would like to change the VIP Test Settings, touch **Settings** and change the settings.
3. Touch **Analyze** to start analysis of the VIP image. The progress bar is displayed during analysis.
4. Circle of analysis range on VIP image, and PASS/FAIL indicator are displayed if analysis is normally completed.
5. Touch **Analysis Result** to show the table of analysis details.

Note:

The circles of analysis range are not displayed if **Overlays** is set to **Off.**

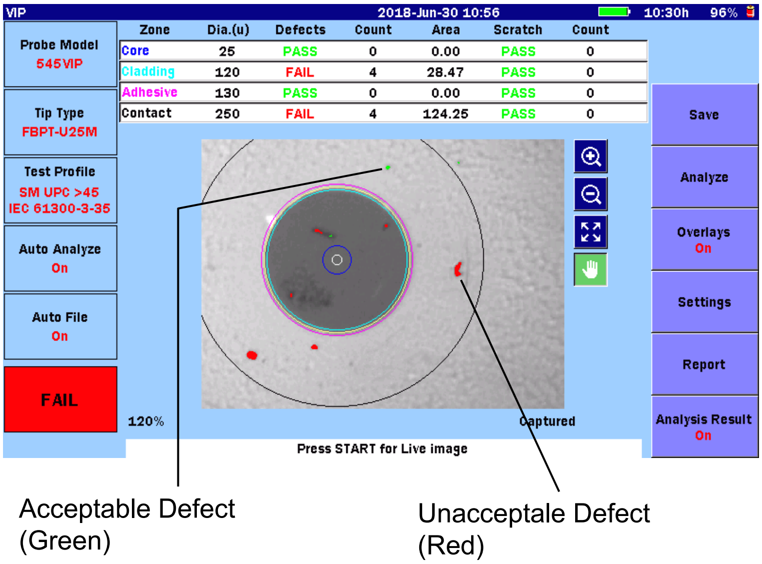


Figure 10.2.5-2 Analysis Result Display

Defects include scratches and contaminants. If the size of a defect found on the fiber endface is acceptable, the defect is highlighted in green. If the size of a defect found on the fiber endface is unacceptable, the defect is highlighted in red.
The following items appear in the analysis result table.

Table 10.2.5-1 Items in Analysis Result

Item	Explanation
Zone	Name of the analysis area
Dia.(u)	Measurement result of the diameter (μm)
Defects	Pass/Fail result of defects
Count	Number of measured defects
Area	Total area of the detected defects (μm^2)
Scratch	Pass/Fail result of scratches
Count	Number of measured scratches

10.2.6 Exiting VIP

Press **Top Menu** (home key) to close the VIP screen and the top menu appears.

10.3 Working with VIP Files

10.3.1 Saving VIP Files

The captured image of the fiber endface and the analysis result can be saved to a file. The saved file can be viewed on the ACCESS Master or the PC.

By using the application software coming with the ACCESS Master, the saved file can be analyzed on the PC. For details, refer to the help of the application software.

1. Press Start to capture an image.

2. When the checkbox of **File Name** is selected on the VIP Auto File Settings screen (Section 10.2.3), touching **Save** or pressing **Save** saves the image and analysis result to a file in VIPI format.

   When the checkbox of **File Name** is not selected or **Save** is touched again, the Save VIP screen appears.

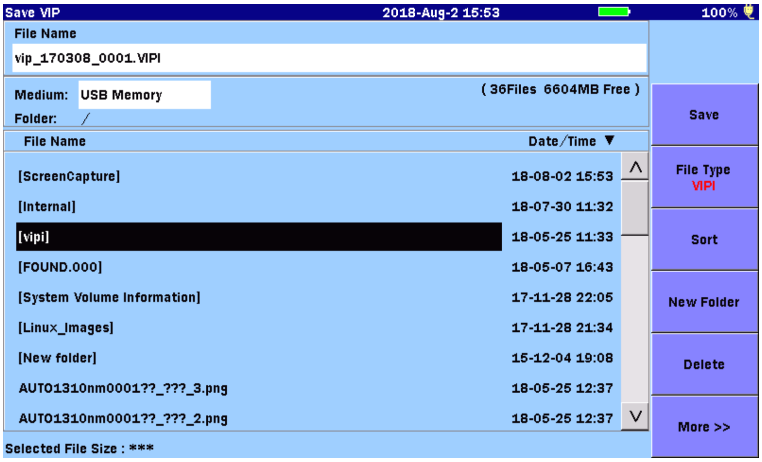


Figure 10.3.1-1 Save VIP Screen

Save

Touching **Save** saves the image of the fiber endface or both the image and analysis result to a file with the specified filename.
If the file with the same name exists in the destination folder, the overwrite confirmation message appears.
Touch **Yes** to overwrite and **No** to cancel.

File Type

Touching **File Type** switches between VIPI format and PNG format.

VIPI:

Saves both the image and analysis result.

PNG:

Saves the image of the fiber endface only.

For how to save a file, refer to 3.5.7 “Saving File”.

10.3.2 Loading VIP file

1. Press **Load** to display the VIP Load screen.
2. Select a storage medium.
3. Touch a file name to select it.
4. Touch **Load**.

For other file operations, refer to 3.5 “File Operation”

10.4 Creating Reports

The analyzed result can be output in a report. Report is saved in PDF format which is able to be viewed on PC.

1. Press Start to capture an image.
2. If the Analysis checkbox on VIP Auto File Settings is not selected, touch **Analyze** to start analyzing an image of the fiber endface.
3. Touch **Report** to display VIP Report Settings Screen.

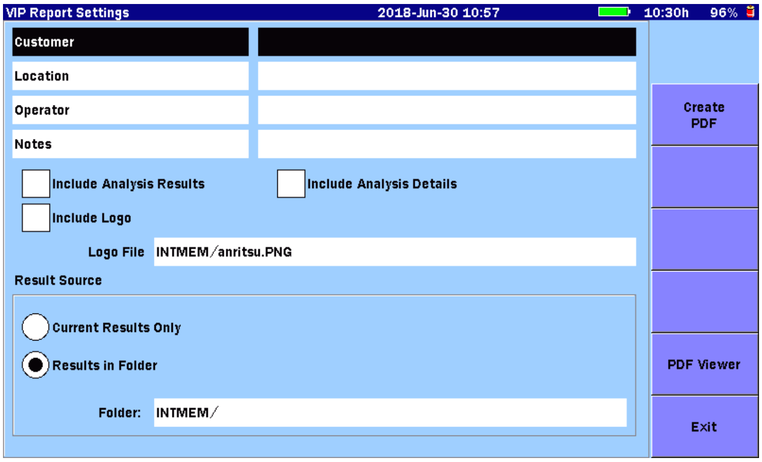


Figure 10.4-1 VIP Report Settings Screen

Create PDF

Creates a report file.

PDF Viewer

Launches PDF viewer. For the operation, refer to 5.8.5 "Viewing a Report".

10.4.1 Header

Enter the information to output as a report header.

The header consists of the following fields:

- Customer: Customer name
- Location: Location, for example, address or name of city
- Operator: Operator information
- Notes: Notes regarding the fiber under test and measurement results, if necessary

Touch the header field, and you will see the dialog box, where you can enter characters. For how to enter characters, refer to 3.1.5 "How to Enter Characters".

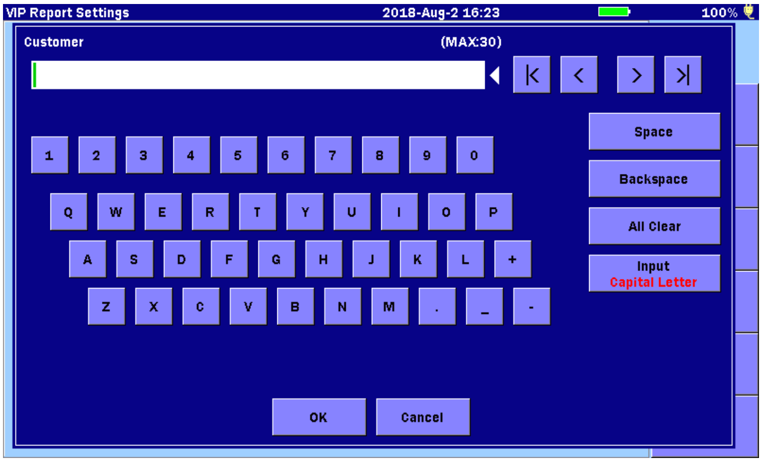


Figure 10.4.1-1 Character Entry

10

VIP

10.4.2 Save Settings

In addition to the header, test settting, and image of the fiber endface, the following information can be output separately.

Include Analysis Results

Outputs PASS or FAIL.

Include Analysis Details

Outputs analysis result details as a table.

Include Logo

Outputs a logo at left-top of the report.
Specify an image file of the logo to output.

Result Source

Set file(s) to output in reports.

Current Results Only:
Outputs the image and analysis result displayed on the VIP screen to a report.

Results in Folder:
Outputs all VIPI files from the selected folder to a report. The file list is printed on the first page of the report.

10.4.3 Creating PDF

Touching **Create PDF** on the VIP Report Settings screen displays the screen to save a report.

Set **File Name** and **Medium** and touch **Save.**

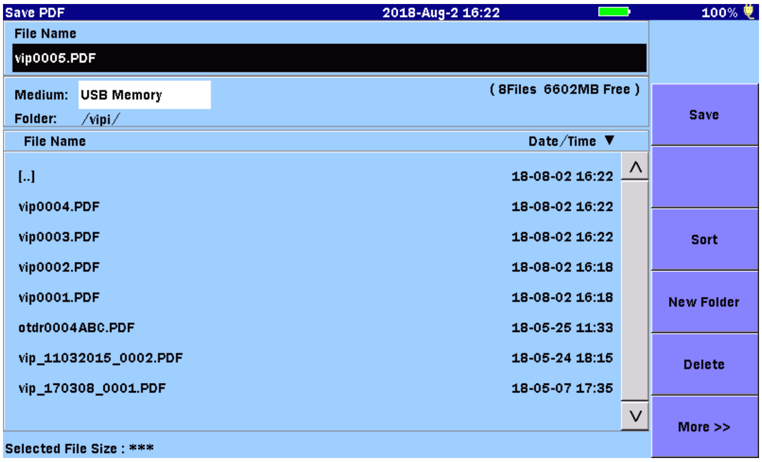


Figure 10.4.3-1 Save PDF Screen

If the file with the same name exists in the destination folder, the overwrite confirmation message appears.
Touch **Yes** to overwrite and **No** to cancel.

10

VIP

Logo — Anritsu

2018-08-02 16:22:32

VIP Report

Report Header

Report Comments	
Customer	
Location	TOKYO
Operator	
Notes	

File list

Report Contents	
Files	vip_11032015_0001.vipi vip_11032015_0002.vipi vip_11032015_0003.vipi vip_170308_0001.vipi

Figure 10.4.3-2 VIP Report Example (File list)

Logo — Anritsu

2018-08-02 16:22:32

VIP Test Result

VIPTest Setup

VIP Test Information	
File Name	**vip_11032015_0003.vipi**
Probe Model	G0306A
Tip Type	LC-PC-F
Test Profile	SM UPC >45 (IEC 61300-3-35 ed1.0)
Capture Time	2015-03-11 15:17:33

Analysis Result

Analysis Result
PASS

Analysis Details

Zone Name	Diameter	Defects	Count	Area	Scratches	Count
Core	25	PASS	0	0.00	PASS	0
Cladding	120	PASS	0	0.00	PASS	0
Adhesive	130	PASS	0	0.00	PASS	0
Contact	250	PASS	0	0.00	PASS	0

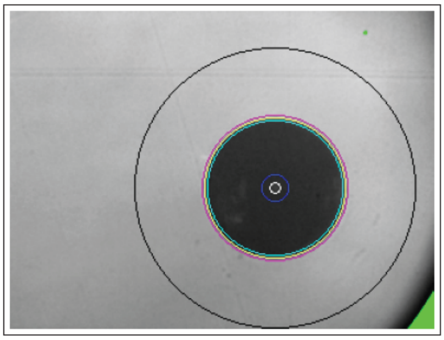


Figure 10.4.3-3 VIP Report Example

Chapter 11 Remote GUI

This chapter provides explanations on the Remote GUI function of the ACCESS Master.

11.1 Overview

The Remote GUI function allows you to control the ACCESS Master via your PC.

On your PC, you will see the operation panel and can operate the touch panel, power key, and control keys with a mouse.
It is also possible to transfer and save the files stored in the ACCESS Master to your PC.

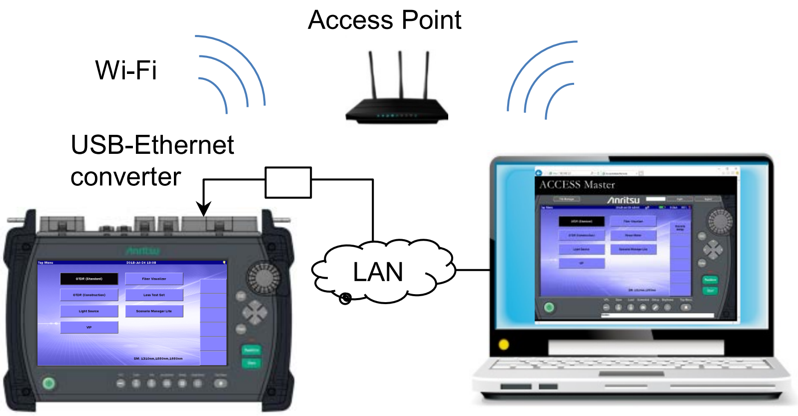


Figure 11.1-1 Remote GUI Overview

When this function is used, the ACCESS Master works as a web server. Therefore, the PC side is not required to have dedicated software. It is also possible to control the ACCESS Master via network.

Note:

Only a single web browser can access the Remote GUI function.

The following is required to use the Remote GUI function.

Table 11.1-1 Required Equipment and Software

Equipment	Required Performance
PC	Memory: 1 GB or more Free hard disk space: 5 GB or more Ethernet: 10/100BASE-T Display: 1280×1024 or more
Browser	Microsoft Internet Explorer 11 or later, Google Chrome 66 or later, Mozilla Firefox 59 or later, Safari 11 or later
USB-Ethernet converter*	USB1.1/2.0 supported, 10/100 BASE-T
Wi-Fi dongle*	USB1.1/2.0 supported, IEEE 802.11b/g/n

*: One of them. Do not simultaneously connect a USB-Ethernet converter and Wi-Fi dongle to the ACCESS Master.

Note:

Not all USB-Ethernet converters and Wi-Fi dongles are guaranteed to work with the ACCESS Master.
Use the recommended USB-Ethernet converter or Wi-Fi dongle.

11.2 Preparation

11.2.1 Ethernet Cable Connection

Connect the Ethernet cable to the USB port (General) of the ACCESS Master, via USB-Ethernet converter.

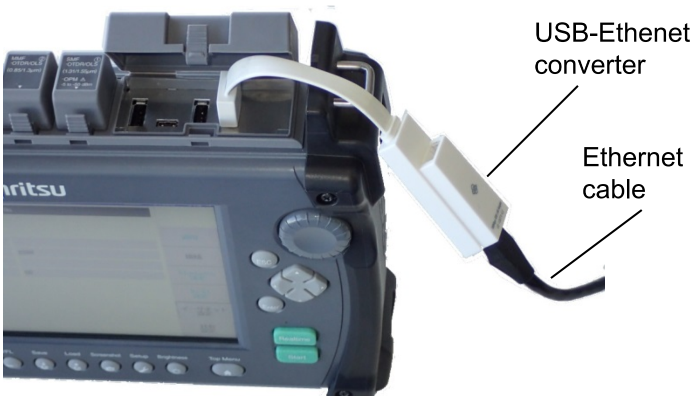


Figure 11.2.1-1 **Ethernet Cable Connection**

When connecting the USB-Ethernet converter to the powered-on ACCESS Master:

This interrupts the measurement and displays the Ethernet Settings screen. Configure the IP address and other settings according to 11.2.3, "Network Settings of ACCESS Master".

When connecting the USB-Ethernet converter to the powered-off ACCESS Master:

Power on the ACCESS Master, and then touch **Remote Setup** in the Top Menu. The ACCESS Master always holds the latest settings made to the network settings.

11.2.2 Dongle Connection

Connect the Wi-Fi dongle to the USB port (General) of the ACCESS Master.

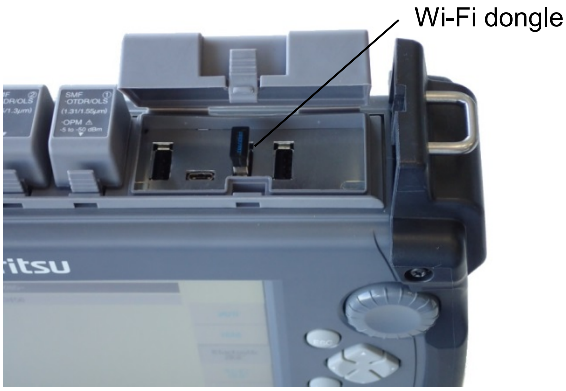


Figure 11.2.2-1 Dongle Connection

11.2.3 Network Settings of ACCESS Master

Follow the steps below to configure Ethernet settings.

1. In the Top Menu, touch **Remote Setup**.
2. Touch **Ethernet Settings**.
3. In the Ethernet Settings screen, touch the item you want to edit. Then, a dialog box appears, allowing you to edit the selected item.

   Remote GUI password:

   This password will be required to gain access to the ACCESS Master from the PC. Up to 12 characters in length is acceptable.

Note:

No password has been set at the factory.

4. When you finish editing the selected item, touch **Apply**.

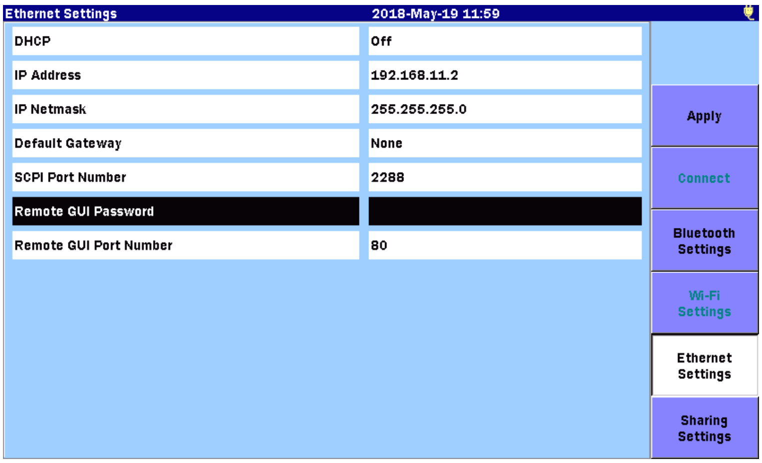
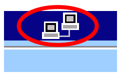


Figure 11.2.3-1 Ethernet Settings Screen

5. Touch **Connect**.
6. Check that the following icon appears on the ACCESS Master screen. This means the ACCESS Master has successfully connected to the network.



11.2.4 Wi-Fi Settings of ACCESS Master

Follow the steps below to configure Wi-Fi settings.

1. In the Top Menu, touch **Remote Setup**.
2. Touch **Wi-Fi Settings**.

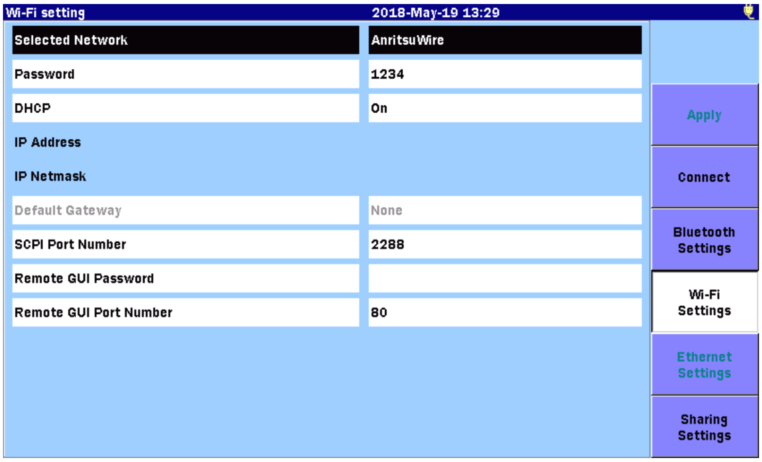


Figure 11.2.4-1 Wi-Fi Setting Screen

3. In the Wi-Fi setting screen, touch **Selected Network**.
4. In the SSID list, touch a network to connect, and then touch **Select**.

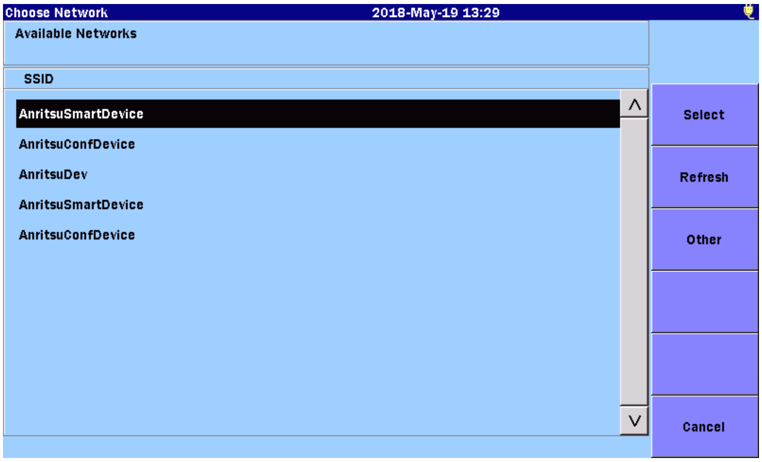


Figure 11.2.4-2 Choose Network Screen

5. In the Wi-Fi setting screen, touch the item you want to edit. Then, a dialog box appears, allowing you to edit the selected item.

Remote GUI password:

This password will be required to gain access to the ACCESS Master from the PC. Up to 12 characters in length is acceptable.

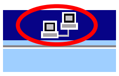
Note:

No password has been set at the factory.

6. When you finish editing the selected item, touch **Apply**.

7. Touch **Connect**.

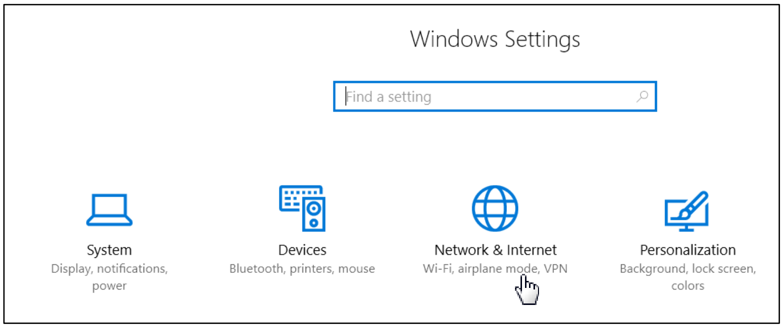
8. Check that the following icon appears on the ACCESS Master screen. This means the ACCESS Master has successfully connected to the network.



11.2.5 Network Setup on PC

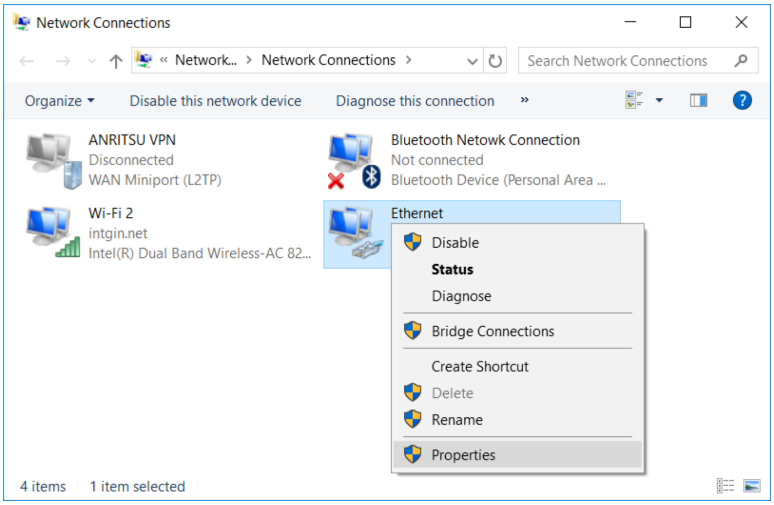
Follow the steps below to connect the ACCESS Master and PC via LAN. The example uses the Window 10 screens.

1. Go to **Start**, click **Settings**, and then click **Network & Internet**.

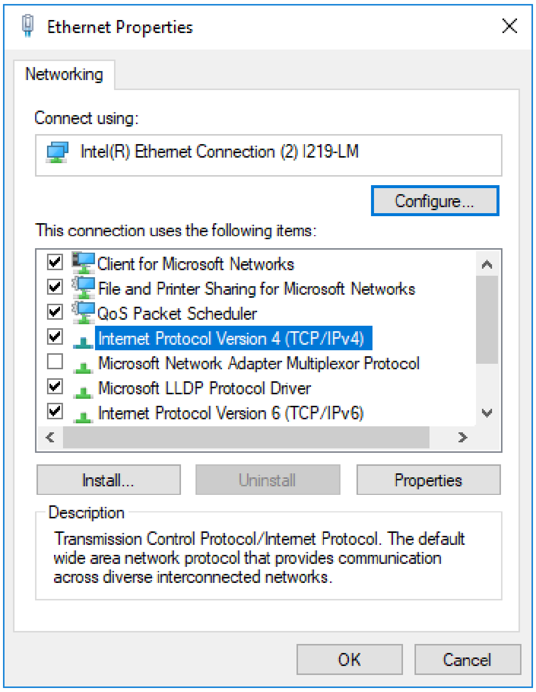


2. Click **Change adapter options**.

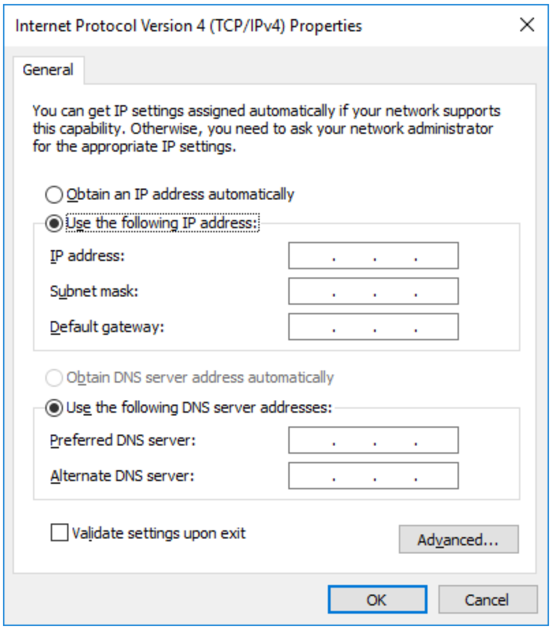
3. To use the USB-Ethernet converter, right-click **Ethernet**, and then click **Properties**.



4. In the **Ethernet Properties** dialog box, click **Internet Protocol Version 4 (TCP/IPv4)**, and then click **Properties**.

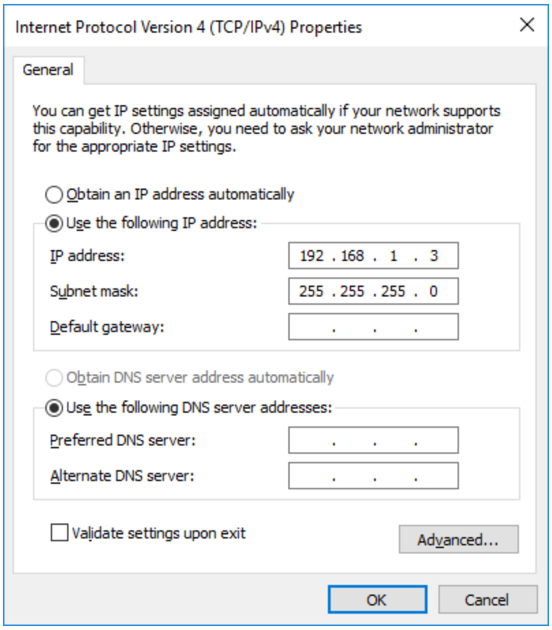


5. In the **Internet Protocol Version 4 (TCP/IP) Properties** dialog box, click **Use the following IP address**.



6. Assign an IP address that is different from the one set for the ACCESS Master. Here, configure as follows and click **OK**:

IP address:	192.168.1.3
Subnet mask:	255.255.255.0

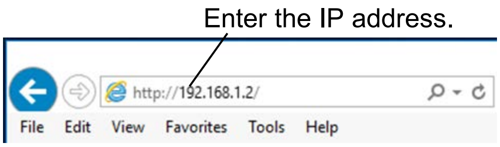


7. In the **Ethernet Properties** dialog box, click **OK**.

11.3 Connection

1. On the PC, start a web browser.

2. In the address bar, enter the IP address you set for the ACCESS Master. In this example, enter "http://192.168.1.2".



3. The following screen appears when the PC is successfully connected to the ACCESS Master. When you see an error message that tells you the specified network is not found, check for any problems with cable connection, network settings for PC and ACCESS Master.

Figure 11.3-1 Remote GUI

4. Enter the password set in 11.2.3, "Network Settings of ACCESS Master", click **login**, and then you will see the ACCESS Master screen.

To quit operating the ACCESS Master, click **logout**.

11.4 Operation

11.4.1 Panel operation

Just as you use the panel buttons on the ACCESS Master, you can click the buttons of Remote GUI.
Available keys for Remote GUI mode turns red when you move the cursor over it.

Figure 11.4.1-1 Available Hard Key Display

A click on the rotary knob moves the marker or cursor. The speed with which the cursor and marker moves is determined by the size of the red circle, as shown.

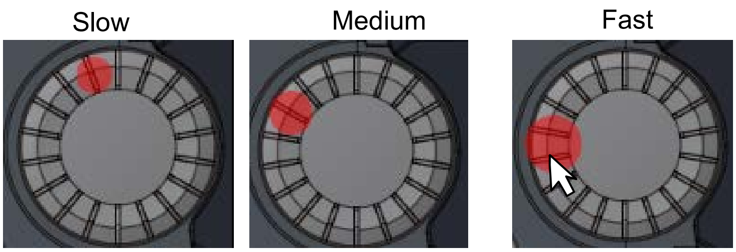


Figure 11.4.1-2 Rotary Knob Speed Display

You cannot rotate the rotary knob on the Remote GUI.
Also, you cannot move any by keep pressing the rotary knob on the Remote GUI.

⚠ CAUTION

If you change the remote control configuration (such as IP address) on the Remote GUI, you can no longer control the main unit.

11.4.2 File operation

On the Remote GUI, click **File Manager** to open the file operation window.

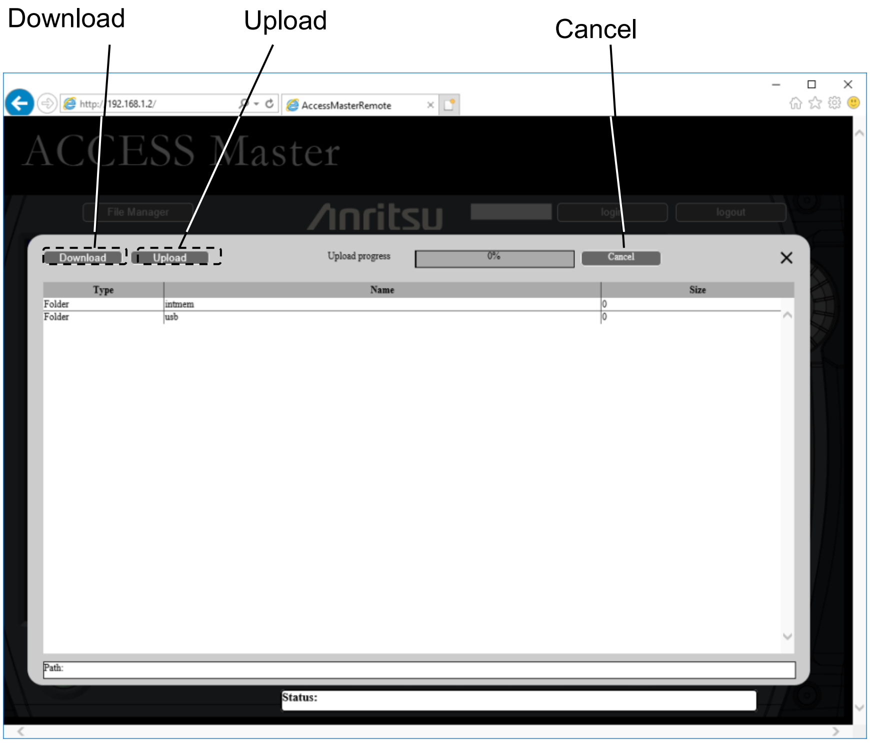


Figure 11.4.2-1 File Operation Window

Click the first or second row, and you can change the save destination.

intmem:	Internal memory
usb:	USB

If no USB memory stick is connected, no file name will be displayed even by clicking **usb**.

File transfer from the ACCESS Master to PC

1. Click to select the file(s) you want to transfer.
   When multiple files are selected, they are saved in a zip file.
2. Click **Download** in the upper left, and you can start a file download operation.
3. Select a save destination folder as required, and then click **OK**.

Note:

If the total size of files selected to transfer to the PC exceeds 5 MB, an error message appears. In this case, the selected files will not be archived.

File transfer from PC to the ACCESS Master

1. In the upper left of the screen, click **Upload**.
2. In the **Open** dialog box, select a file you want to transfer.
3. Click **Open** to transfer the selected file. The file will not be transferred if the space of the destination is insufficient.

Exiting the file operation window

Click ✕ in the upper-right corner of the file operation window.

Chapter 12 Folder Sharing

This chapter explains how to share the folder of the internal memory of ACCESS Master.

12.1 Overview

By connecting via Ethernet, Wi-Fi or Bluetooth, folders on the ACCESS Master can be shared with a Windows PC or an Android device.

Figure 12.1-1 Folder Sharing Overview

This function allows you to operate the ACCESS Master as a network PC, where you find the shared internal memory as a shared PC in File Explorer when accessing from a Windows PC.

One of the following interfaces is available for PC connection.

- Ethernet cable
- Wi-Fi
- Bluetooth

Bluetooth or Wi-Fi allows shared access to the folders from an Android smartphone and other devices. The following is required to use the Folder Sharing function

Table 12.1-1 Required Equipment

Equipment	Required Performance
PC	OS: Windows 7 Professional SP1 or later Interface: Ethernet (10/100BASE-T), Wi-Fi, or Bluetooth
Android smartphone	OS: Android 9 or later Interface: Wi-Fi or Bluetooth
USB Ethernet converter	USB1.1/2.0 support, 10/100 BASE-T
Wi-Fi dongle	USB1.1/2.0 support, IEEE 802.11b/g/n
Bluetooth dongle	USB1.1/2.0 support

Note:

The operation is not guaranteed for all USB Ethernet converters, Wi-Fi dongles, and Bluetooth dongles.

12.2 Preparation

12.2.1 Ethernet cable or Wi-Fi Setup

Refer to 11.2 "Preparation" for connection to USB ports and IP address settings.

12.2.2 Bluetooth Setup

When using Bluetooth for PC connection, once the unit is powered on and the Top Menu is displayed, perform the following steps if changing the settings:

1. Connect the Bluetooth dongle to the USB port of the ACCESS Master. The Bluetooth settings screen appears.

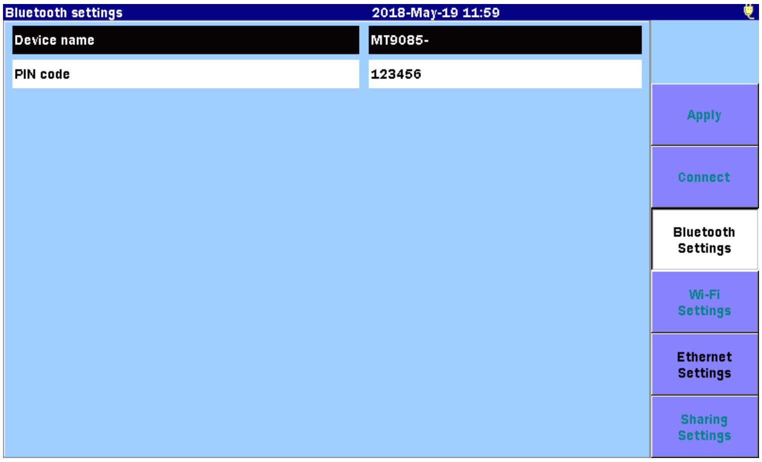


Figure 12.2.2-1 Bluetooth Settings Screen

2. Touch Device name.
3. Edit the device name and touch **OK**. The default is MT9085-(serial number).
4. Touch PIN code.
5. Edit PIN code on the dialog box, and touch **OK**. The default PIN code is "123456".
6. Press **Top Menu** .

To display the Bluetooth Settings screen, touch **Remote Setup** on the Top Menu screen.

Note:

If the Bluetooth dongle is plugged and de-plugged too frequently, USB port may stop working. If this is the case, turn off the power of ACCESS Master once and turn back on.

12.2.3 Sharing Setup

To establish a connection via Ethernet or Wi-Fi, perform the setting for sharing the internal memory.

Note:

Sharing Settings can be set while network connection is disconnected.

1. Press **Top Menu** .
2. Touch **Remote Setup**.
3. Touch **Sharing Settings**.

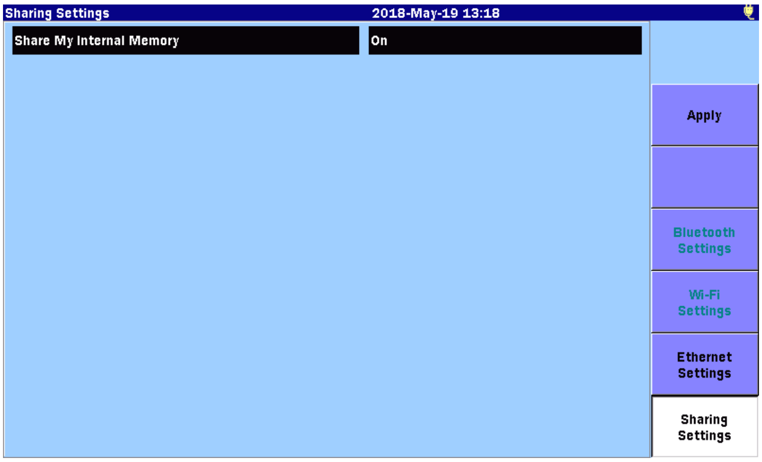


Figure 12.2.3-1 Sharing Setup Screen

4. Touch **Share My Internal Memory**.
5. Touch **On** and then touch **OK** on the dialog box.
6. Touch **Apply**.

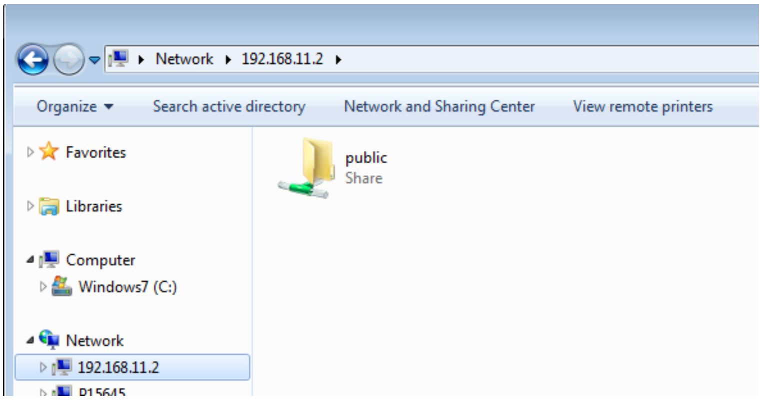
12.3 Connection

12.3.1 Setup on PC

1. Start Explorer on your PC.

2. Enter the IP address of ACCESS Master into the address bar. For example, enter \\192.168.11.2. The shared folder appears.
   IP address of ACCESS Master can be set on the Ethernet Settings Screen (Figure 11.2.3-1) or the Wi-Fi Setting Screen (Figure 11.2.4-1).

   The public folder of the ACCESS Master is displayed in a few seconds.



12.3.2 When connecting via Bluetooth

For how to establish a Bluetooth connection, refer to the instruction manual for your utility software. On the PC, use FTP-compliant software such as a Bluetooth stack on your Bluetooth dongle.

Chapter 13 Scenario Manager Lite

This chapter details the Scenario Manager Lite.

13.1 Overview

Scenario Manager Lite is the application that runs the predefined program (scenario).

The test procedure and the test parameters are described in the scenario using remote control commands. Scenario Manager Lite allows you to perform the test automatically, without using the remote control PC.

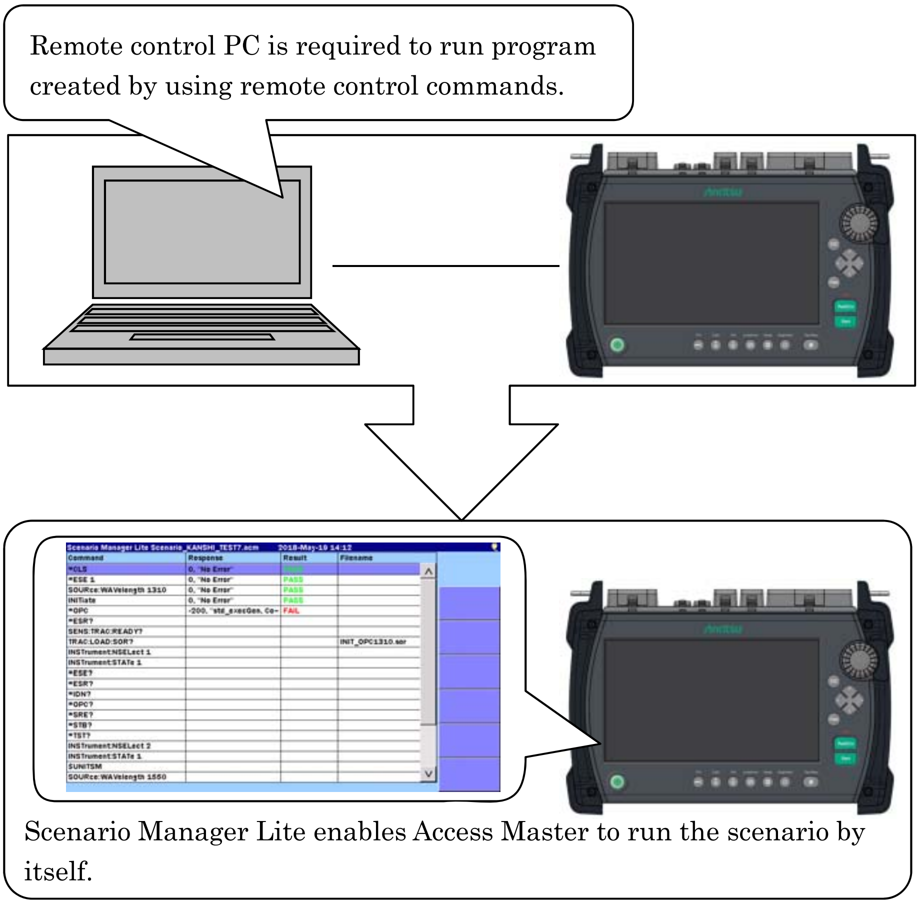


Figure 13.1-1 Scenario Manager Lite Overview

13.2 Procedure

1. Press **Top Menu** .

2. Touch Scenario Manager Lite.

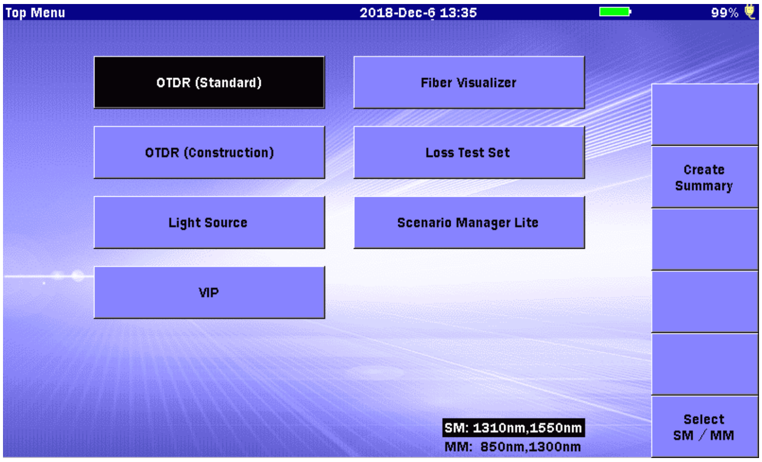


Figure 13.2-1 Top Menu Screen

3 Scenario Manager Lite screen appears. Press **Load** .

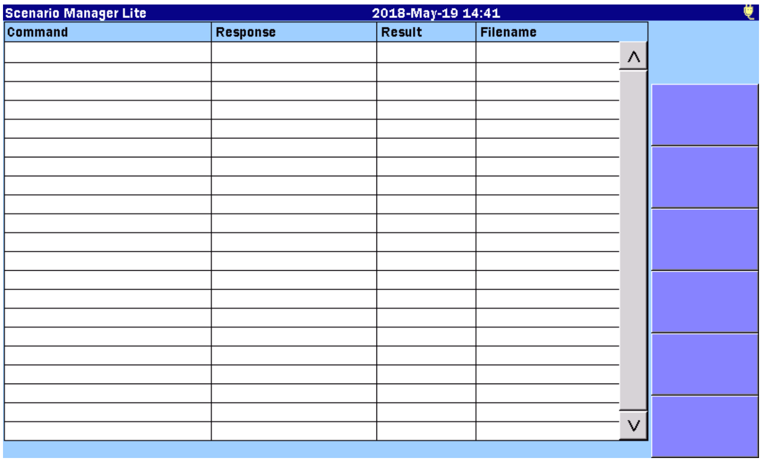


Figure 13.2-2 Scenario Manager Lite Screen

4. Touch the name of a scenario file you want to load on the Load screen. The selected file is highlighted as Figure 13.2-3.

5. Touch **Load Scenario**. For the operations of other keys, refer to 3.5 "File Operation".

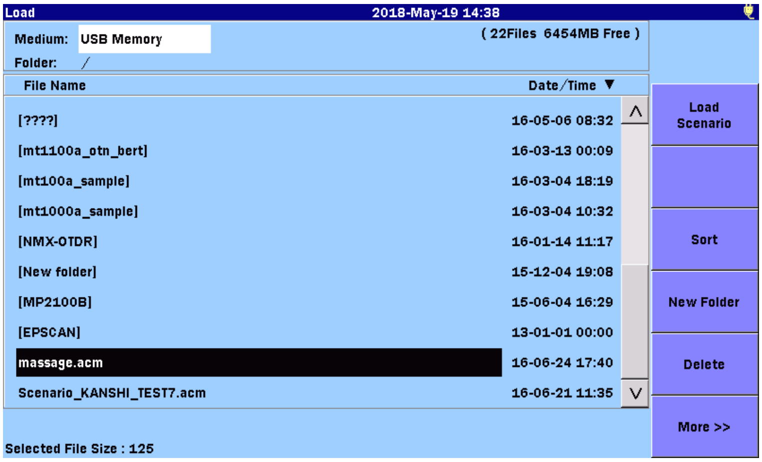


Figure 13.2-3 Load Screen

6. After loading the file, commands described in the scenario are displayed in the table. Press Start to run the scenario.

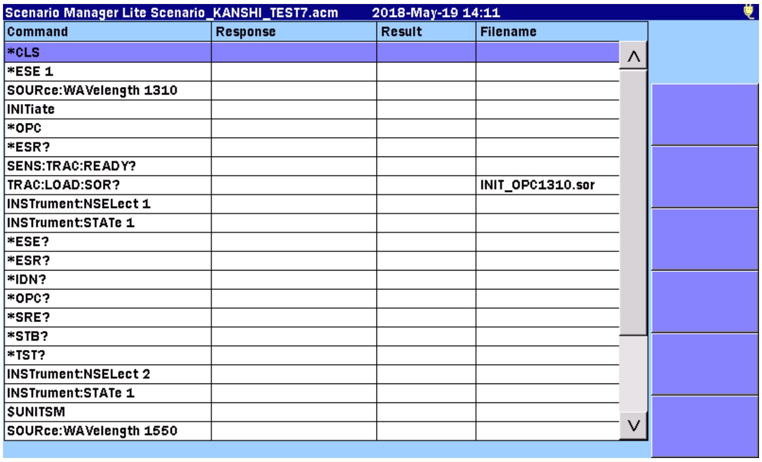


Figure 13.2-4 Scenario Example

The box of command currently running is displayed on the screen.

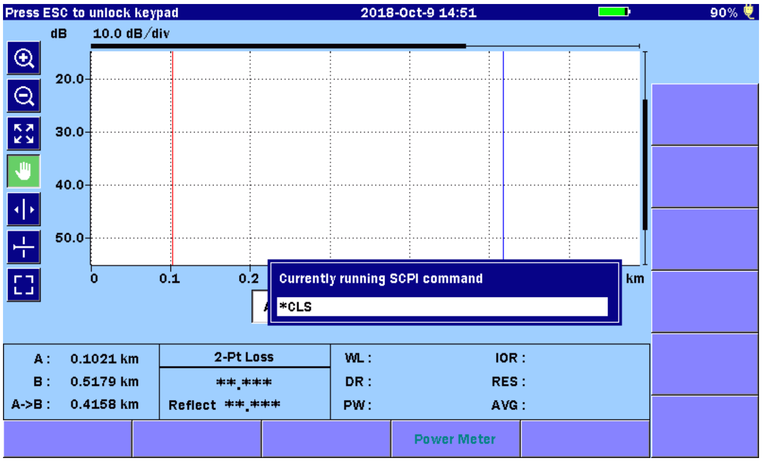
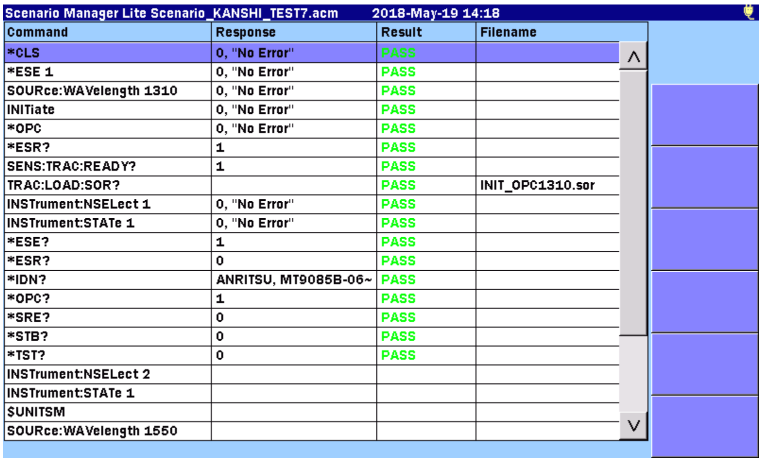


Figure 13.2-5 Screen When Scenario is Running

The operation of any keys other than ESC is locked while the scenario is running.
If you want to abort the scenario running, press ESC.

7. When the scenario is completed, PASS or FAIL is displayed in the Result column.



Command	Response	Result	Filename
*CLS	0, "No Error"	PASS	
*ESE 1	0, "No Error"	PASS	
SOURce:WAVelength 1310	0, "No Error"	PASS	
INITiate	0, "No Error"	PASS	
*OPC	0, "No Error"	PASS	
*ESR?	1	PASS	
SENS:TRAC:READY?	1	PASS	
TRAC:LOAD:SOR?		PASS	INIT_OPC1310.sor
INSTrument:NSELect 1	0, "No Error"	PASS	
INSTrument:STATe 1	0, "No Error"	PASS	
*ESE?	1	PASS	
*ESR?	0	PASS	
*IDN?	ANRITSU, MT9085B-06~	PASS	
*OPC?	1	PASS	
*SRE?	0	PASS	
*STB?	0	PASS	
*TST?	0	PASS	
INSTrument:NSELect 2			
INSTrument:STATe 1			
$UNITSM			
SOURce:WAVelength 1550			

Figure 13.2-6 Screen after Scenario Has Been Executed

13

Scenario Manager Lite

To edit the scenario settings:

1. Press **Setup** .
2. Touch **Settings**.
3. Touch the item you want to edit on the Scenario Manager Lite Settings screen.

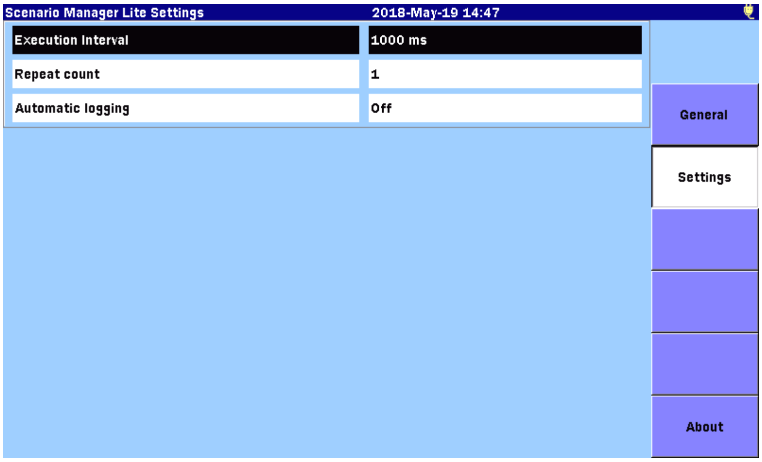


Figure 13.2-7 Scenario Manager Lite Settings Screen

4. Input a value in the Input dialog box.
5. Touch **OK**. The dialog box is closed.
6. Press **Setup** .

Table 13.2-1 Scenario Manager Lite Settings

Name	Explanation	Range	Default
Execution Interval	Intervals to send the commands.	0 to 9999 ms	1000 ms
Repeat Count	Number of times to repeatedly run the scenario. **None** is regarded as zero.	None, 1 to 9999	1
Automatic logging	Outputs the command execution results into the file.	On, Off	Off

13.3 Automatic Logging

When **Automatic logging** in Scenario Manager Lite Settings Screen is set to **On**, the log file is saved in the folder under the following directory:

/mnt/intmem/SCENARIO_LOG/

The log file name is "Scenario_Log.txt". Up to 10000 lines of sent commands and responses will be logged in the file.

In case of the following, Automatic Logging fails even if the scenario starts running.

- Free disk space is not enough.
- The destination folder or file is set to read only.

Note:

Automatic logging does not support any binary data received.

13.4 Scenario File

A scenario file can be edited by the text editor (such as Memo pad of Windows). It can be also edited by the MX100003A MT1000A/MT1100A Scenario Edit Environment Kit (version 2.0.0.1 or later).
The scenario file extension is .acm.

13.4.1 Syntax

Scenario file consists of the following elements:

- State 0: Executes the commands.
  1: Repeats the command execution until the response matches the expected value.
- Command SCPI commands or the scenario commands.
- Type 0: Response data format is ASCII code.
  1: Response data format is binary.
- Response Expected value against the response data.
  When State is set to 1, you need to set the Response value.
- File Name Full file path of destination folder.
- Comment Comment of the command

You can write the comment line by putting semicolon at the beginning of a line.
Each line should contain the six elements, which are written in the order above and separated by tabs.
The line is terminated by Carriage Return and Line Feed.
State, Command and Type are mandatary.

Example

```
;State  Command             Type  Response  File Name  Comment
0       $LOOP=10            0
0       INITiate            0
1       INITiate?           0     0
1       SENS:TRAC:READY?    0     1
0       TRAC:LOAD:SOR?      1
        SCENARIO_TRACE/INIT_
        OPC1510_?.sor
0       $LOOPEND            0
```

13.4.2 Scenario Commands

The following commands are provided for the scenario operation.

- $WAIT: Specifies the waiting time with 1 ms resolution.
- $LOOP=xx, $LOOPEND:
  Repeatedly executes the script between $LOOP and $LOOPEND, xx times.
- $MESSAGE=yy:
  Shows the dialog box with the OK button which contains the message "yy". "yy" is the characters of up to 100.
- $UNITSM: Changes the optical connector to SM port.
- $UNITMM: Changes the optical connector to MM port.

For ACCESS Master SCPI command details, refer to "*MT9085 Series ACCESS Master SCPI Remote Control Operation Manual*".

$WAIT

Function

Waits the specified time in ms. Subsequent command will be processed after the specified time has elapsed.
Pressing ESC during the wait time aborts the scenario immediately.

Example

```
;State   Command         Type Response  FileName  Comment
0        $WAIT3000       0                        Wait 3000ms
```

$LOOP, $LOOPEND

Function

Repeatedly executes the script between $LOOP and $LOOPEND. After "$LOOP=", set the number of times to repeat the script. When the file saving command is in the loop, you can use “?” in the filename so that the part of the filename can be replaced to the loop count.

Example

```
;State   Command        Type Response  FileName  Comment
0        $LOOP=10       0                        Start loop
0        INITiate       0                        Measure start
1        INITiate?      0    0                   Wait measure start
0        TRAC:LOAD:SOR? 1              Trace?sor Save sor
0        $LOOPEND       0                        End loop
```

Note:

$LOOP and $LOOPEND should be used in a pair.

$LOOP and $LOOPEND pair cannot written between another $LOOP and $LOOPEND pair.

$LOOPEND should be written after $LOOP.

The loop count should be 0 or greater. When the loop count is 0, commands between $LOOP and $LOOPEND are not executed.

$MESSAGE

Function

Displays the dialog box with the specified message. The message can contain up to 100 characters. The scenario process pauses until OK is touched.

Example

;State	Command	Type	Response	File Name	Comment
0	NSTrument:NSELect 1	0			Select top menu
0	INSTrument:STATe	0			Show top menu
0	$MESSAGE=Connect next fiber	0			Output message
0	INSTrument:NSELect 2	0			Select OTDR Standard
0	INSTrument:STATe 1	0			Show top OTDR Standard
0	$MESSAGE=Connect next fiber	0			Output message

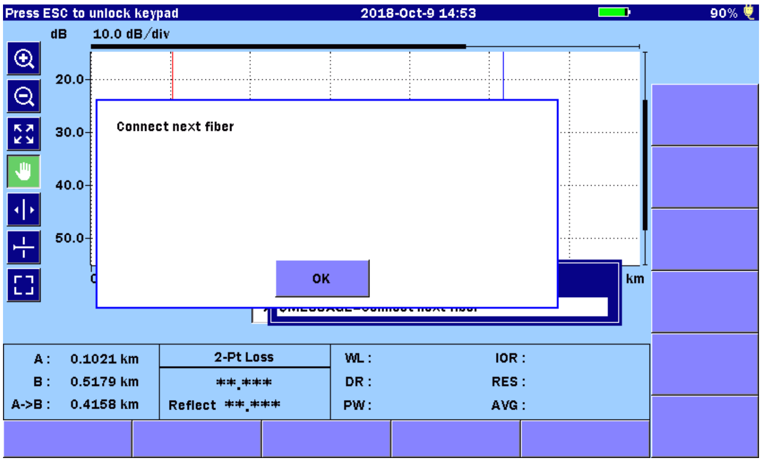


Figure 13.4.2-1 Message Dialog Box Example

$UNITSM, $UNITMM

Function

Changes to SM port or MM port. These commands perform the same operations as Select SM/MM on Top Menu Screen".

Example

```
;State  Command                Type  Response  File Name  Comment
0       $UNITSM                0                          Change to SM
0       $UNITMM                0                          Change to MM
```

Chapter 14 Performance Test

This chapter explains how to execute the performance test of the ACCESS Master.

14.1 Performance Test

The following nine items are tested to check the performance of the ACCESS Master.

- Wavelength of the OTDR
- Pulse width
- Dynamic range (One-way back-scattered light dynamic range test)
- Distance measurement accuracy
- Loss measurement accuracy (linearity)
- Dead zone
- Optical output and wavelength of the visible light source (VLD) (Option 002)
- Optical output and wavelength of the optical light source
- Measurement accuracy of the optical power meter

Clean the optical connector before testing. Test steps in this chapter are described based on conditions where the power is On and the ACCESS Master is activated.

Rated values for test items

Refer to Appendix A.

14.2 Required instruments for performance test

The following tables show the instruments required for the performance test according to test items.

Table 14.2-1 Measuring instrument (recommended) and optical fiber required for performance test (for SMF unit)

Test Item / Measuring instrument and cable	OTDR						OLS	
	Wavelength of OTDR	Pulse Width	Dynamic Range	Distance Measurement Accuracy	Measurement Accuracy	Dead Zone	Optical Output	Wavelength
Optical Spectrum Analyzer MS9740A Wavelength: 0.6 to 1.65 μm Level: –65 to +20 dBm Wavelength accuracy: ±0.3 nm	✓							✓
Variable Optical Attenuator 81578A#062 + 8163B (Keysight Technologies) Wavelength: 0.7 to 1.4 μm Attenuation: 0 to 60 dB	✓	✓	✓			✓		
Waveform Monitor P6703B (Tektronix) Wavelength: 1.1 to 1.65 μm Rising/Falling: 500 ps max.		✓						
Oscilloscope DC to 1 GHz		✓						
SM Optical fiber (60 km)			✓		✓			
SM Optical fiber (20 km)			✓					
SM Optical fiber (2 km)				✓				
SM Optical fiber (2 m)	✓	✓	✓				✓	✓
SM Optical fiber (500 to 800 m)						✓		
Optical Power Meter 81635A + 8163B (Keysight Technologies) Wavelength: 0.80 to 1.65 μm Level: –80 to +10 dBm Accuracy: ±3.5 % (0.80 to 1.2 μm)							✓	
Reference Light Source 81654A + 8163B (Keysight Technologies) Wavelength: 1.31/1.55 μm Output: 0 dBm or more			✓					

Table 14.2-2 Measuring instrument (recommended) and optical fiber required for performance test (for MMF unit)

Test Item / Measuring instrument and cable	OTDR						OLS	
	Wavelength of OTDR	Pulse Width	Dynamic Range	Distance Measurement Accuracy	Measurement Accuracy	Dead Zone	Optical Output	Wavelength
Optical Spectrum Analyzer MS9740A Wavelength: 0.6 to 1.65 μm Level: –65 to +20 dBm Wavelength accuracy: ±0.3 nm	✓							✓
Variable Optical Attenuator 81578A#062 + 8163B (Keysight Technologies) Wavelength: 0.7 to 1.4 μm Attenuation: 0 to 60 dB	✓	✓	✓			✓		
Waveform Monitor P6701B (Tektronix) Wavelength: 0.5 to 0.95 μm P6703B (Tektronix) Wavelength: 1.1 to 1.65 μm Rising/Falling: 500 ps max.		✓						
Oscilloscope DC to 1 GHz		✓						
GI Optical fiber* (8 km)			✓		✓			
GI Optical fiber* (2 km)			✓	✓				
GI Optical fiber* (2 m)	✓							
GI Optical fiber* (500 to 800 m)						✓		
Optical Power Meter 81635A + 8163B (Keysight Technologies) Wavelength: 0.80 to 1.65 μm Level: –80 to +10 dBm Accuracy: ±3.5 % (0.80 to 1.2 μm)							✓	

*: 62.5/125 μm

Table 14.2-3 Measuring instrument (recommended) and optical fiber required for performance test (for VFL option 002)

Test Item / Measuring instrument and cable	VLD	
	Output Power	Wavelength
Optical Spectrum Analyzer MS9740A Wavelength: 0.6 to 1.65 μm Level: –65 to +20 dBm Wavelength accuracy: ±0.3 nm		✓
SM Optical fiber (2 m)	✓	✓
Optical Power Meter OPM37LAN (Sanwa Electric Instrument co., ltd.) Wavelength: 0.65 μm Level: –65 to +10 dBm Accuracy: ±0.3 dB	✓	

Table 14.2-4 Measuring instrument (recommended) and optical fiber required for performance test (for Optical Power Meter option 004, 005, 007)

Test Item / Measuring instrument and cable	Measurement accuracy	
	1310/1550nm	**850nm**
Optical Power Meter 8163B + 81630B (Keysight Technologies) Wavelength: 0.97 to 1.65 μm Level: –70 to +28 dBm Accuracy: ±3.0% (1255 to 1630nm)	✓	
Reference Light Source 81657A + 8163B (Keysight Technologies) Wavelength: 1.31/1.55 μm Output: +13 dBm or more	✓	
Variable Optical Attenuator 8163B + 81570A (Keysight Technologies) Wavelength: 1.2 to 1.65 μm Attenuation: 0 to 30 dB Insertion loss: 3 dB max. Resolution: 0.1 dB max.	✓	
SM Optical fiber (2 m)	✓	
Optical Power Meter 81635A + 8163B (Keysight Technologies) Wavelength: 0.80 to 1.65 μm Level: –80 to +10 dBm Accuracy: ±3.5% (0.80 to 1.2 μm)		✓
Reference Light Source MPS-8033/06 (ILX Lightwave) Wavelength: 0.85 μm Output: 0 dBm (CW)		✓
Variable Optical Attenuator 81578A#062 + 8163B (Keysight Technologies) Wavelength: 0.7 to 1.4 μm Attenuation: 0 to 60 dB		✓
GI Optical fiber (62.5/125 μm) (2 m)		✓

14.3 Test Procedures

14.3.1 Wavelength of OTDR

Checks if the center wavelength at the peak level of the OTDR measurement pulse meets the specification.

Connection Diagram

Connect the devices as in Figure 14.3.1-1.

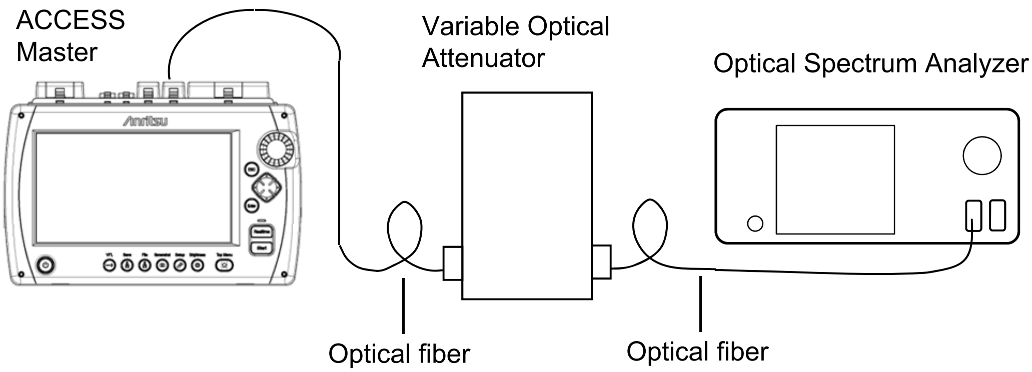
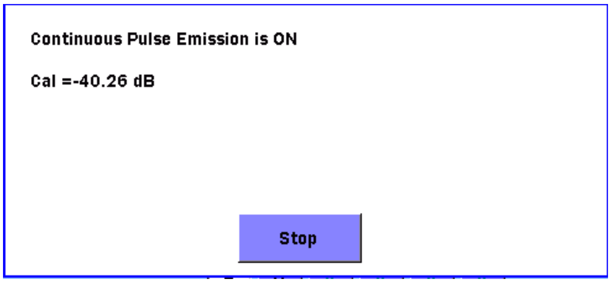


Figure 14.3.1-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Touch **Preference (2-2)**.
7. Touch **Continuous Pulse Emission** to set to **On**.
8. Press **Setup** .
9. Touch **Test Mode** to set to **Manual**.
10. Touch **Wavelength** to set a wavelength.
    Do not select **All**.
11. Touch **Range/Pulse Width**.
12. For SM port, set the pulse width to **1 µs**.
    For MM port, set the pulse width to **100 ns**.

13. Press Start to emit optical pulse continuously. The following dialog box is displayed during the continuous pulse emission. The displayed number can be changed.



14. Input the laser to the Optical Spectrum Analyzer and adjust the attenuation of the optical attenuator so that the waveform will not be saturated.

15. Adjust the scale and wavelength resolution of the Spectrum Analyzer. The measurement methods of the Spectrum Analyzer differ according to wavelength.

    RMS method

    850±30 nm, 1300±30 nm, 1310±25 nm, 1490±25 nm, 1550±25 nm, 1625±25 nm

    Threshold method

    1645-1655 nm

16. Check that the measurement result satisfies the specification.

17. Touch **Stop** to stop the continuous emission of optical pulse.

18. To continue testing for another wavelength, repeat Steps 10 through 17.

19. Press **Setup** .

20. Touch **Preference (2-2)**.

21. Touch **Continuous Pulse Emission** to set to **Off**.

22. Press **Setup** .

14.3.2 Pulse Width

Check that the pulse width of the output light of the OTDR satisfies the specifications. This test is performed for each wavelength.

Connection Diagram

Connect the devices as in Figure 14.3.2-1.

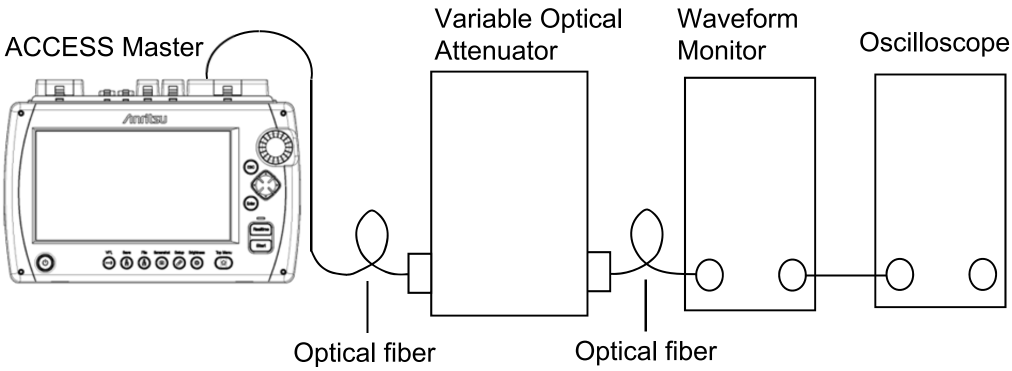


Figure 14.3.2-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Press **Setup** .
7. Touch **Test Mode** to set to **Manual**.
8. Touch **Wavelength** to set a wavelength.
   Do not select **All**.
9. Touch **Range/Pulse Width**.
10. Set Pulse Width to **3 ns**.
11. Press [Realtime].
12. Adjust the oscilloscope amplitude and time base scale to display the waveform in the oscilloscope. Adjust the optical

variable attenuator to prevent the waveform monitor from being saturated at this time.

13. Observe the oscilloscope waveform and measure the peak level half amplitude as shown in the following figure then check that measured results are with the specifications.

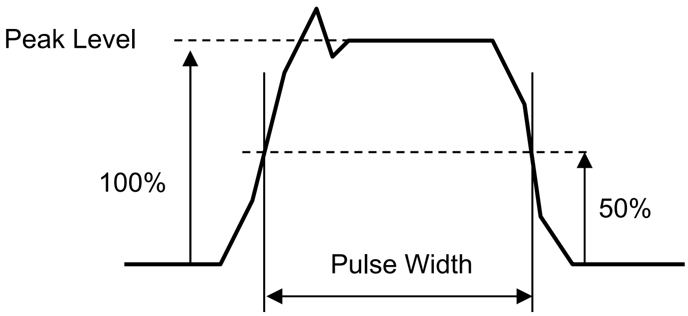


Figure 14.3.2-2 Pulse Width Measurement

14. Press [Realtime] to finish the Realtime measurement.

15. To continue testing for another wavelength, edit the pulse width in Step 9 and repeat Steps 9 through 14.

For pulse width settings, refer to the tables in 14.5.2 “Pulse Width”.

14.3.3 Dynamic Range

Check that the dynamic range satisfies the specifications. This test is performed for each wavelength and pulse width. When the wavelength is 1650 nm and the pulse width is 20 μs, the background light (–19 dBm, 1550 nm) should be injected for this measurement. Background light is generated using the reference light source and optical variable attenuator.

Connection Diagram

Connect the devices as in Figure 14.3.3-1.

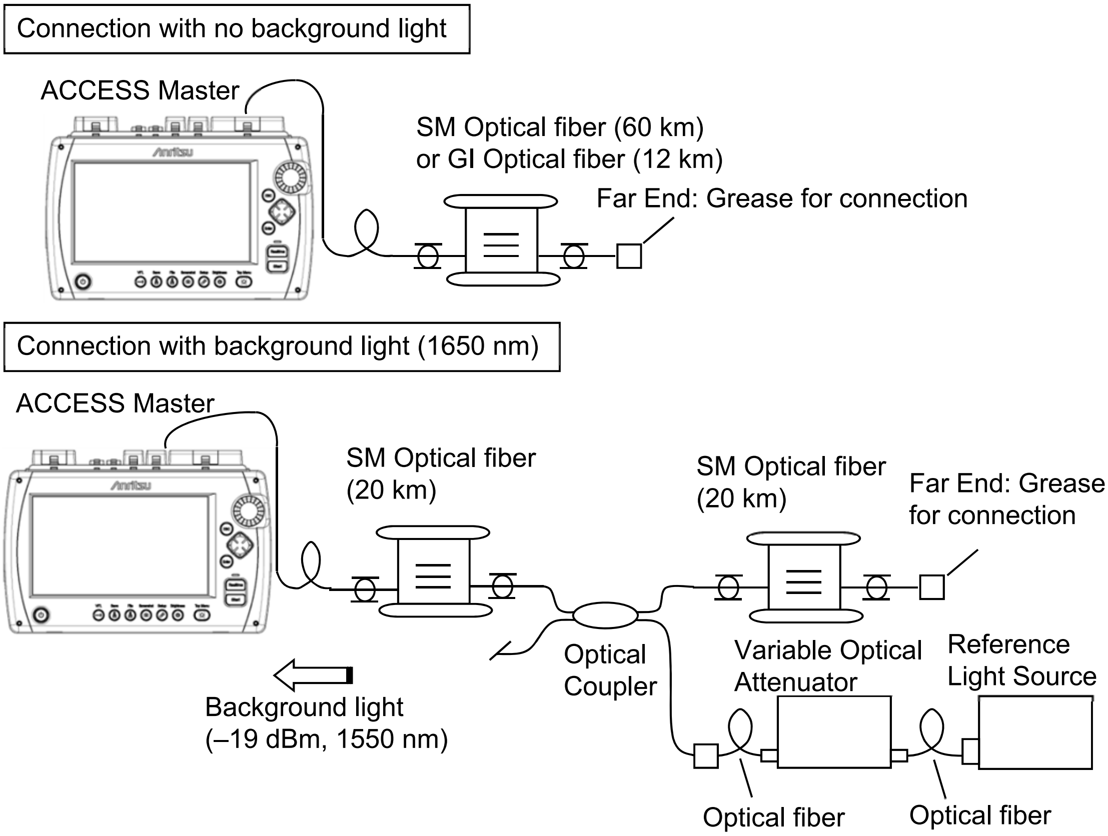


Figure 14.3.3-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch OTDR (Standard).
3. Press **Setup** .

4. Touch **Preference** (1-2).
5. Touch **Connection Check** to set to **Off**.
6. Touch **Unit of averaging** to set to **Sec**.
7. Touch **Preference** (2-2).
8. Touch **Marker Mode** to set to **Placement** [(1-2,2-4)].
9. Press **Setup** .
10. Touch **Test Mode** to set to **Manual**.
11. Touch **Wavelength** to set a wavelength.
    Do not select **All**.
12. Touch **Range/Pulse Width**.
13. Set Distance Range, Resolution, and Pulse Width according to wavelength.

Table 14.3.3-1 Test Parameters

Wavelength	Distance Range	Resolution	Pulse Width
1310 nm	100 km	Low Density	20 μs
1490 nm	100 km	Low Density	20 μs
1550 nm	100 km	Low Density	20 μs
1625 nm	100 km	Low Density	20 μs
1650 nm	100 km	Low Density	20 μs
850 nm	25 km	Low Density	500 ns
1300 nm	25 km	Low Density	4 μs

14. Touch **Averaging**.
15. Set Averaging to **3 Min**.
16. Touch **Loss Mode** on the second page of softkeys.
17. Set to **2PA**.
18. Press Start.
19. When the measurement is complete, touch **Trace**.
20. Place the markers on the positions shown in Figure 14.3.3-2.
    2 Extreme left of the trace graph
    3 Optical connector of the ACCESS Master

④ Noise peak

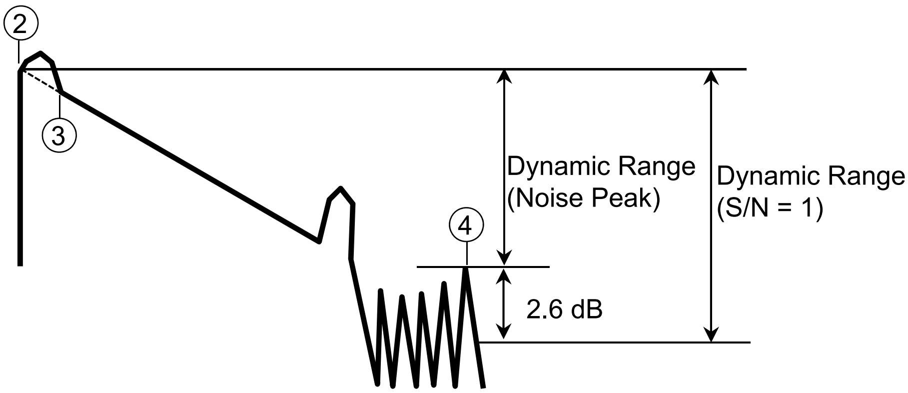


Figure 14.3.3-2 How to Measure Dynamic Range

21. Check that the dynamic range value satisfies the specification defined for each wavelength.

22. Edit the wavelength in Step 11 and repeat Steps 12 through 21.

14.3.4 Distance Measurement Accuracy

Measure the optical fiber whose length and refraction index are known, then perform a horizontal axis (i.e., measurement distance) accuracy test. This is not required for other ranges when this test is performed at a certain distance range.

Connection Diagram

Connect the devices as in Figure 14.3.4-1.

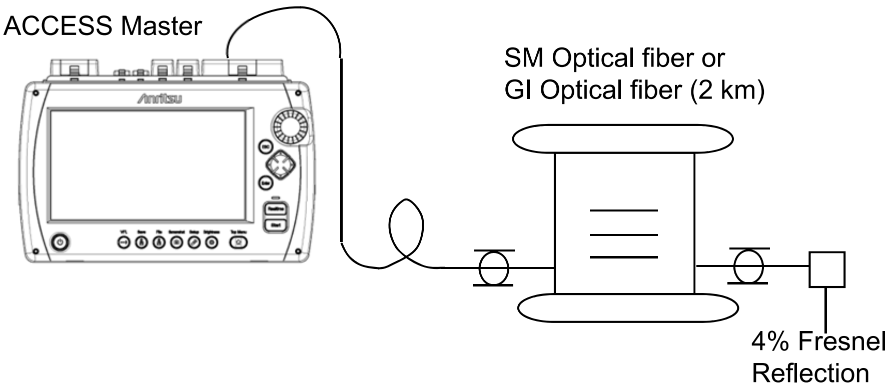


Figure 14.3.4-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Touch **Unit of averaging** to set to **Sec**.
7. Press **Setup** .
8. Touch **Test Mode** to set to **Manual**.
9. Touch **Wavelength** to set a wavelength.
   Do not select **All**.
10. Touch **Range/Pulse Width**.
11. Perform the following setting.
    Distance Range 5 km
    Resolution High Density

Pulse Width 10 ns

12. Touch **Averaging**.

13. Set Averaging to **15 Sec**.

14. Touch **IOR/BSC** on the second page of softkeys.

15. Set IOR to 1.500000.

16. Touch **Shift**.

17. Touch **Rest Horiz**.

18. Touch **Exit**.

19. Press Start.

20. Align the active cursor with the rising point of the fiber far-end Fresnel return.

21. Enlarge the scale horizontally to see the cursor position more clearly. The scale can be changed by pressing < or >.

22. Accurately align the active cursor with the Fresnel return rising point. The cursor can be moved by turning rotary knob.

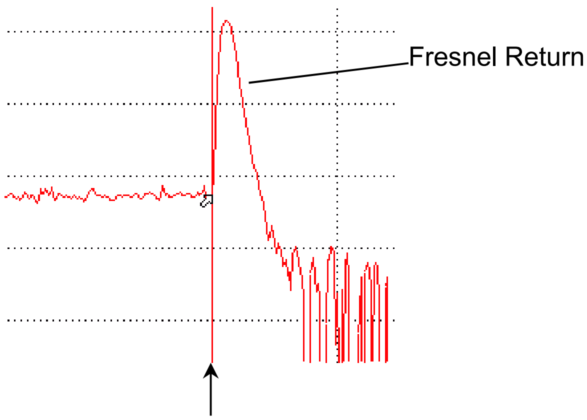


Figure 14.3.4-2 Cursor Placement for Distance Measurement Accuracy Test

23. Read the absolute distance. The cursor positions are displayed at different locations on the screen according to the **Marker Mode** setting of **Preference** (2-2).

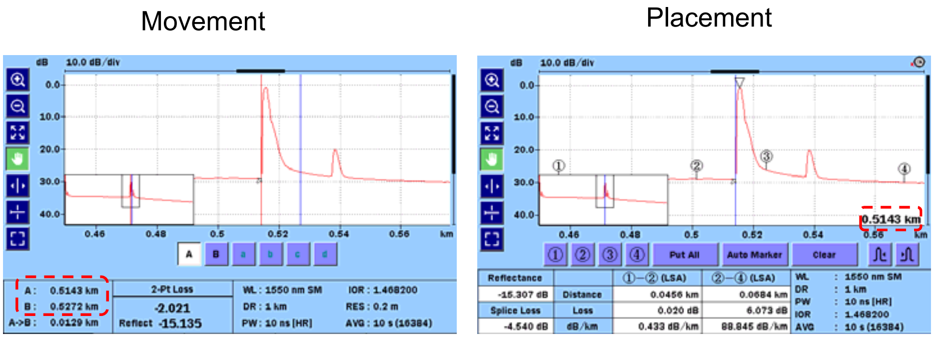


Figure 14.3.4-3 Cursor Positions Display

24. Calculate the difference between the absolute distance and the actual fiber length. Check that the value meets the specification.

Note:

The read absolute distance is a measured value of IOR = 1.5. The measured value of absolute distance is changed if IOR is edited.

14.3.5 Loss Measurement Accuracy (Linearity)

Perform a vertical axis (i.e., level measurement) accuracy test.

Connection Diagram

Connect the devices as in Figure 14.3.5-1.

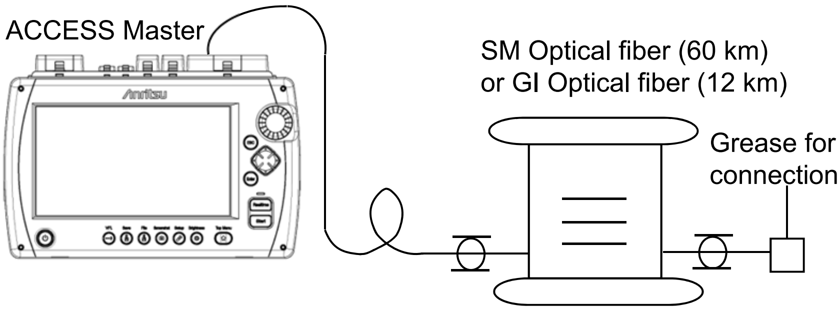


Figure 14.3.5-1 Connection Diagram

Only one wavelength is tested even if the ACCESS Master has multiple wavelengths. This section shows the measurement procedure at 1310 nm.

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Touch **Unit of averaging** to set to **Sec**.
7. Press **Setup** .
8. Touch **Test Mode** to set to **Manual**.
9. Touch **Wavelength** to set to **1310 nm**.
   Do not select **All**.
10. Touch **Range/Pulse Width**.
11. For SM Optical fiber, set the distance range to **100 km**.
    For GI Optical fiber, set the distance range to **25 km**.
12. Set the pulse width to **100 ns**.
13. Touch **Averaging**.
14. Set Averaging to **3 Min**.
15. Touch **Loss Mode** on the second page of softkeys.
16. Set to **LSA**.
17. Press Start.
18. Place Marker 1 at 0 km and Marker 2 at 3 km.
19. Record dB/km between 1 and 2. This is L_1 in Figure 14.3.5-2.
20. Move Marker 1 to 1.5 km and Marker 2 to 4.5 km by turning the rotary knob.
21. Record dB/km between 1 and 2. This is L_2 in Figure 14.3.5-2.
22. Measure the loss (L_x) every 3 km up to about 30 km.
23. Calculate the average (L_{ave}_m) of all loss values (L_x). If some fibers are connected, calculate per fiber.
24. Calculate the difference (L_{diff_n}) between loss (L_x) and

average loss (L_{ave_m}).

25. Check that the difference (L_{diff_n}) is less than ±0.1 dB.

For a multi-mode fiber, measure the loss (L_x) every 2 km up to about 6 km, and calculate the difference as in Steps 24 and 25.

Example When a Fiber (20 km × 2) is connected

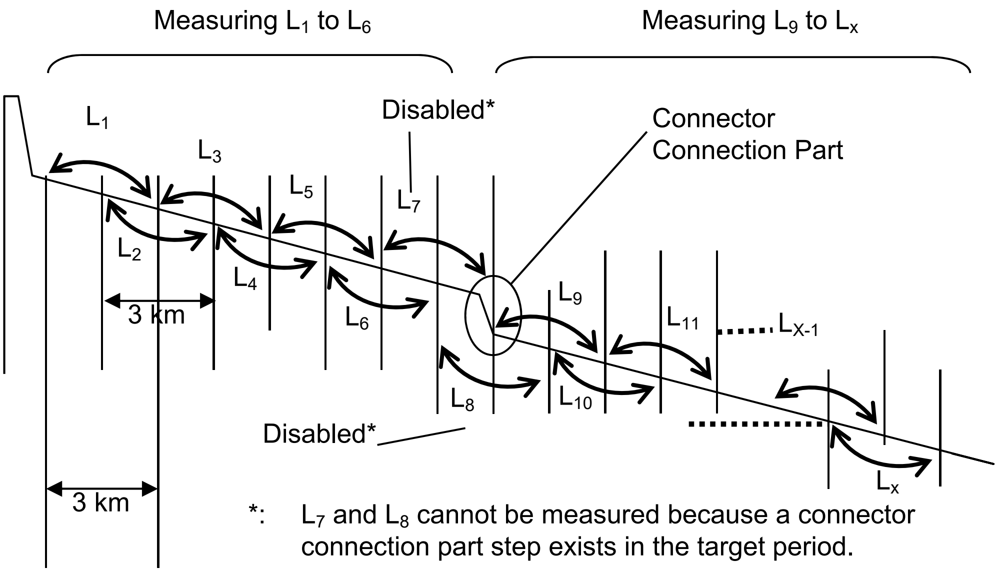


Figure 14.3.5-2 How to Measure Linearity

Measuring L_1 to L_6

$$L_{ave\_1} = \frac{L_1 + L_2 + L_3 + L_4 + L_5 + L_6}{6}$$

$$L_{diff\_1} = (L_1 - L_{ave_1}),$$

$$L_{diff\_2} = (L_2 - L_{ave_1}),$$

.....

$$L_{diff\_6} = (L_6 - L_{ave_1})$$

Measuring L_9 to L_x

$$L_{ave\_2} = \frac{L_9 + L_{10} + L_{11} + \cdots + L_{6Z}}{(x - 9 + 1)}$$

$$L_{diff\_9} = (L_9 - L_{ave_2}),$$

$$L_{diff\_10} = (L_{10} - L_{ave_2}),$$

.....

$$L_{diff\_X} = (L_X - L_{ave_2})$$

Check that the L_{diff_n} {L_{diff_1}, L_{diff_2},......L_{diff_6}, L_{diff_9},.....L_{diff_X}} is ±0.1 or less.

14.3.6 Dead Zone

Connection Diagram

Connect the devices as in Figure 14.3.6-1.

To check the dead zone of 850 nm or 1300 nm, replace the SM optical fibers and the optical coupler in the connection diagram with GI optical fibers. Also, use a variable optical attenuator for GI optical fibers.

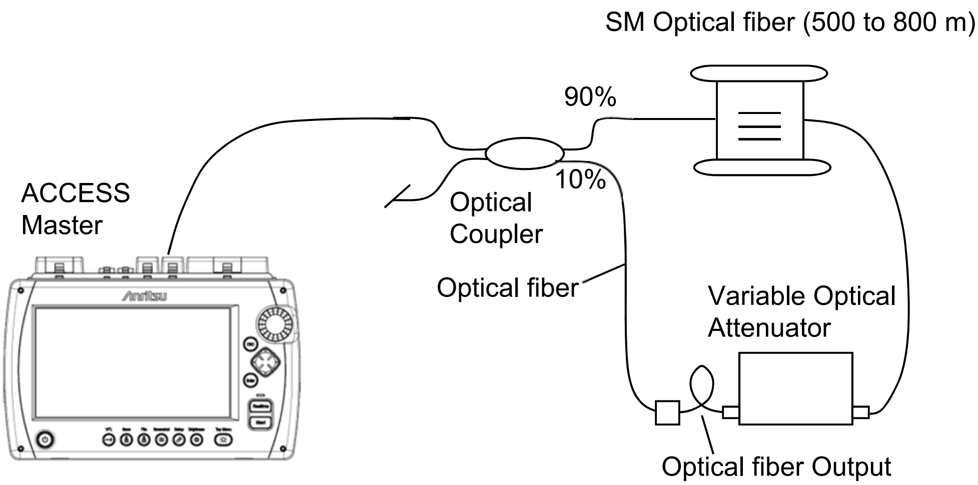


Figure 14.3.6-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Touch **Unit of averaging** to set to **Sec**.
7. Press **Setup** .
8. Touch **Test Mode** to set to **Manual**.
9. Touch **Range/Pulse Width**.
10. Perform the following setting.
    Distance Range 1 km

Resolution	High Density
Pulse Width	3 ns

11. Touch **Averaging**.
12. Set Averaging to **10 Sec**.
13. Touch **Wavelength** to set a wavelength.
    Do not select **All**.
14. Touch **IOR/BSC** on the second page of softkeys.
15. Set IOR to 1.500000.
16. Press Start.
17. Confirm the Fresnel reflection return loss at the 300 to 400 m point in the event table.
    Adjust the attenuation of the variable optical attenuator so the return loss becomes 40 ±0.2 dB.
18. Repeat steps 17 to 18 until the return loss in the event table becomes 40 ±0.2 dB.
19. Touch **Loss Mode**.
20. When **Marker Mode** is **Movement**, select **2-Pt Loss**.
    When Marker Mode is Placement, select **2PA**.
21. Press Start.
22. Move cursor A or marker 1 to the position before the Fresnel reflection where the level is 1.5 dB lower than Fresnel reflection peak.
23. Move cursor B or marker 2 to the position after the Fresnel reflection where the level is 1.5 dB lower than the Fresnel reflection peak.

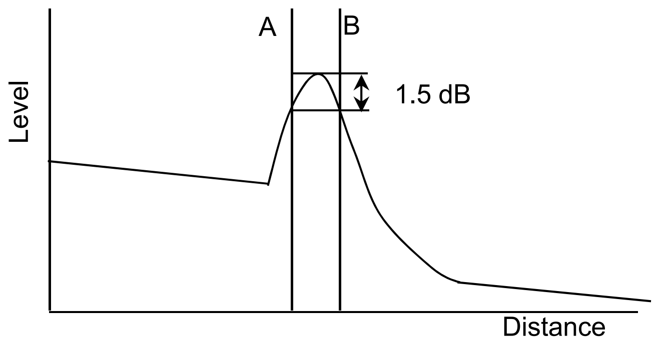


Figure 14.3.6-2 Cursor Position to Measure Fresnel Dead Zone

24. In case of **Movement**, record the **A->B** value.

    In case of **Placement**, record the difference of ①–②.

25. For SM Optical fiber, touch **Range/Pulse Width**.
    For GI Optical fiber, proceed to step 28.

26. Set pulse width to **10 ns**.

27. Press Start.

28. Move cursor A or marker ① to the rising position of the Fresnel reflection.

29. Move cursor B or marker ② to a position 0.5 dB higher than the BSC level past the Fresnel reflection.

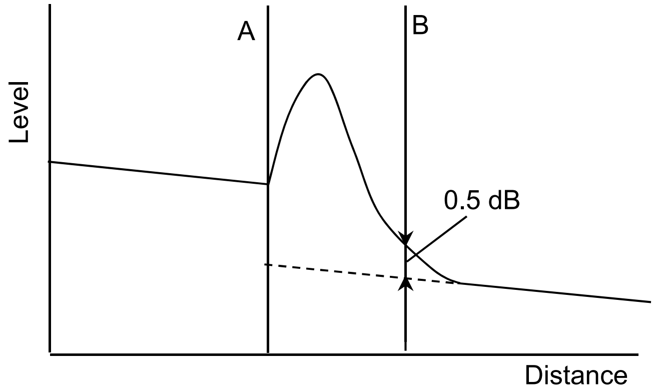


Figure 14.3.6-3 Cursor Position to Measure Backscatter coefficient Dead Zone

30. In case of **Movement**, record the **A->B** value.
    In case of **Placement**, record the difference of ①–②.

31. Edit the wavelength in Step 13 and repeat Steps 16 through 30.

14.3.7 Optical Output Level and Wavelength of VFL (Option 002)

This test is performed on ACCESS Master equipped with the optional VFL.
Check that the output power level and center wavelength.

Connection Diagram

Connect the devices as in Figure 14.3.7-1.

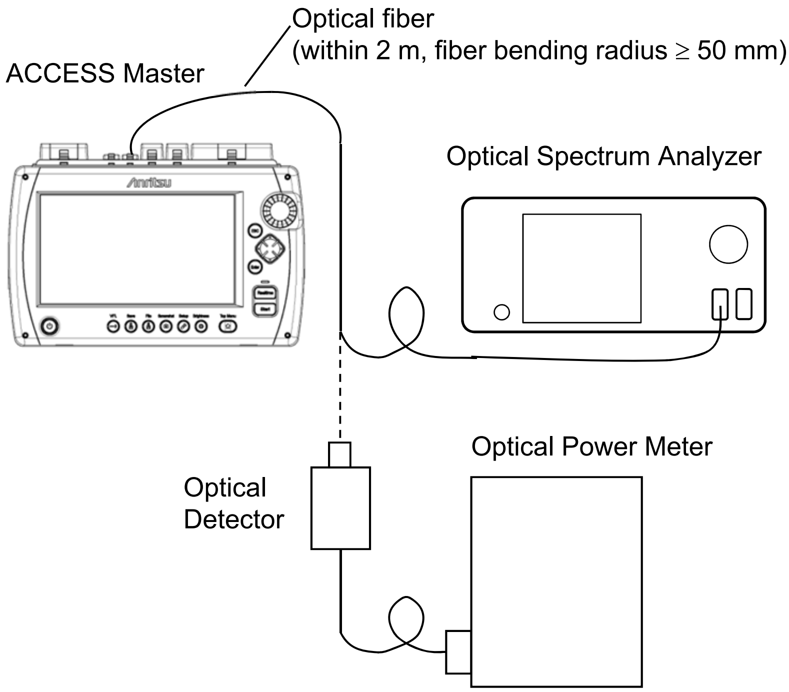


Figure 14.3.7-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Press **VFL** .
3. Touch **On**.
4. Connect the VFL port to the optical spectrum analyzer to measure the center wavelength.
5. Connect the VFL port to the optical power meter to measure the optical output level.

Note:

The wavelength and optical output performance test is performed with the Visual Fault Locator set to **On**.
Do not set Visual Fault Locator to **Blink** when testing performance.

14.3.8 Optical Output and Wavelength of Light Source

Check the optical output and center wavelength of the optical light source.

Connection Diagram

Connect the devices as in Figure 14.3.8-1.

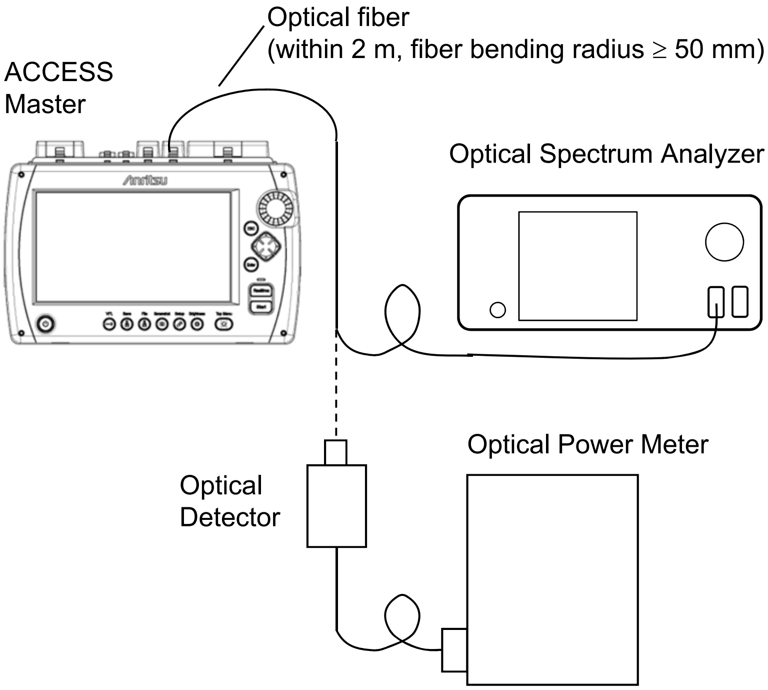


Figure 14.3.8-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** (home key).
2. Touch **Light Source**.
3. Touch **Modulation** to set to **CW**.
4. Touch **Wavelength** to set a wavelength.
5. Touch **Light Source** to set to **On**.

6. Connect the measurement port to the optical spectrum analyzer to measure the center wavelength.
7. Connect the measurement port to the optical power meter to measure the optical output level.
8. When the measurement finished, touch **Light Source** to turn it Off.
9. To continue testing for another wavelength, repeat Steps 4 through 8.

14.3.9 Optical Power Meter

Check that the measurement accuracy of the optical power meter satisfies the specifications.
Be sure to execute zero offset for the optical power meter before starting measurement.

Connection Diagram

Connect the devices as in Figure 14.3.9-1.

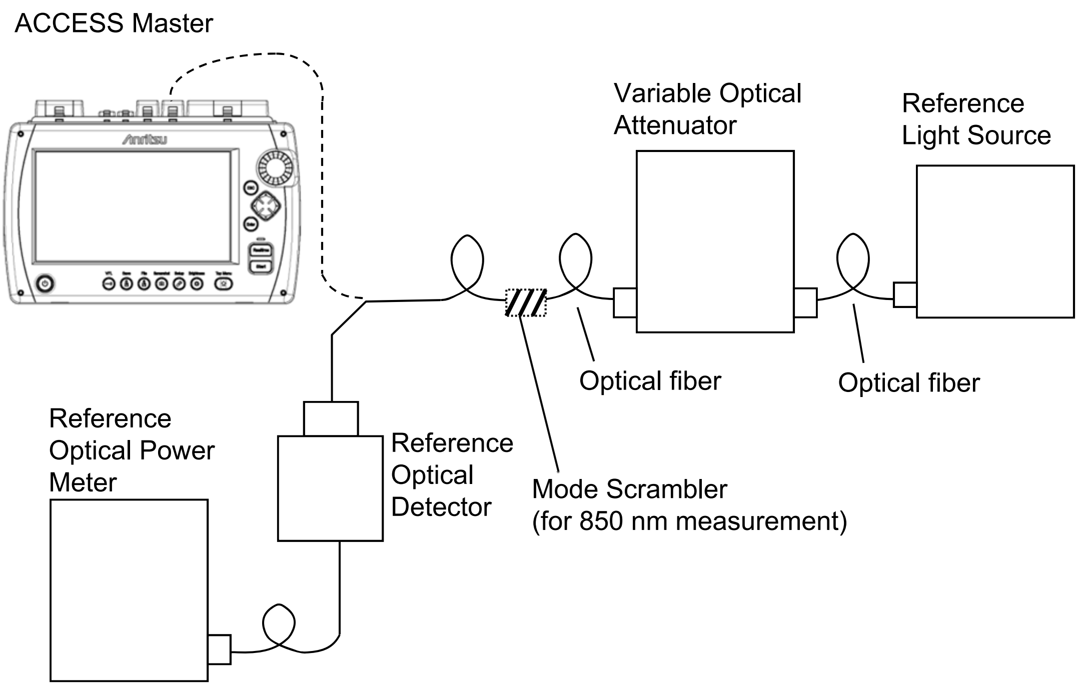


Figure 14.3.9-1 Connection Diagram

When an optical power meter option is not installed, measure the measurement accuracy for input level –20 dBm and measurement wavelength of 1550 nm.
When Option 007 is installed, the measurement is performed for input level –10 dBm and measurement wavelength of 850, 1310, and 1550 nm.
When Option 004 or 005 is installed, the measurement is performed for input level 0 dBm and measurement wavelength of 1310 and 1550 nm.

Note:

For the wavelength of 1310 and 1550 nm, use a SM optical fiber (ITU-T G.652) and master FC connector.

Test Procedure:

1. Connect the reference optical power meter to the optical variable attenuator.

2. Adjust the optical variable attenuator so that the indication value of the reference optical power meter is within the level shown in the table below.

Table 14.3.9-1 Indication value of the reference optical power

Option	Level
None	–20.00±0.10 dBm
004	0.00±0.10 dBm
005	0.00±0.10 dBm
007	–10.00±0.10 dBm

3. Connect the ACCESS Master to the optical variable attenuator.

4. Press **Top Menu** .

5. If an optical power meter option is not installed, touch **Power Meter**.
   If an optical power meter option is installed, touch **Loss Test Set**.

6. Touch **Power Meter Wavelength** and set the same wavelength as the reference light source.

7. Record the power displayed on the ACCESS Master.

8. Calculate the difference between the value of the reference optical power meter (Step 2) and the value of the ACCESS Master (Step 7).

9. To continue testing for another wavelength, edit the wavelength of the reference light source and repeat Steps 1 through 8.

14.4 Calibration

The parameters that can be calibrated with the ACCESS Master are the Backscatter coefficient (BSC) level and the Optical Power Meter measurement accuracy.

14.4.1 Backscatter Coefficient Level Calibration

Connection Diagram

Prepare the optical connector where the return loss (R_0 dB) is known then connect the devices as shown in the Figure 14.4.1-1.

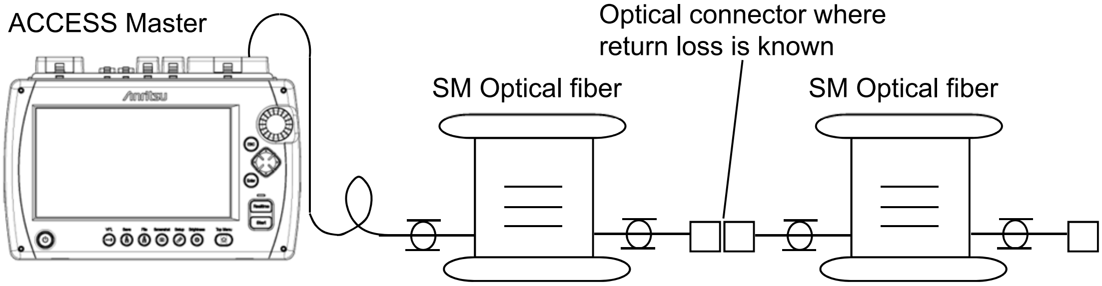


Figure 14.4.1-1 Connection Diagram

Test Procedure:

1. Press **Top Menu** .
2. Touch **OTDR (Standard)**.
3. Press **Setup** .
4. Touch **Preference (1-2)**.
5. Touch **Connection Check** to set to **Off**.
6. Touch **Preference (2-2)**.
7. Touch **Reflectance Calculation** to set to **Auto**.
8. Press **Setup** .
9. Touch **Test Range/Pulse Width**.
10. Perform the following setting.
    Distance Range 10 km
    Resolution Low Density
    Pulse Width 100 ns
11. Touch **Averaging**.

12. Set Averaging to **3 Min**.
13. Touch **Loss Mode** on the second page of softkeys.
14. When **Marker Mode** is **Movement**, select **2-Pt Loss**.
    When Marker Mode is Placement, select **2PA**.
15. Touch **Wavelength** to set a wavelength.
    Do not select **All**.
16. Touch **IOR/BSC**.
17. Set the **BSC** to –80.00.
18. Press Start.
19. Set cursor A or marker ① just prior to know reflective event.

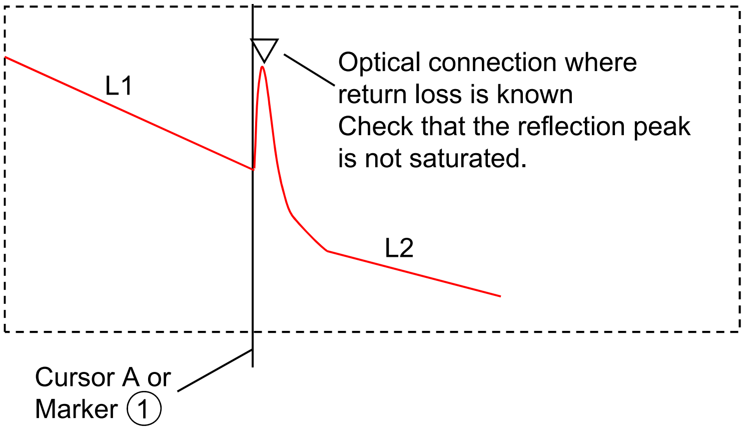


Figure 14.4.1-2 Cursor Set Position

Auto reflectance calculation will display the measured value.
Check that the return peak is not saturated.

Movement Placement

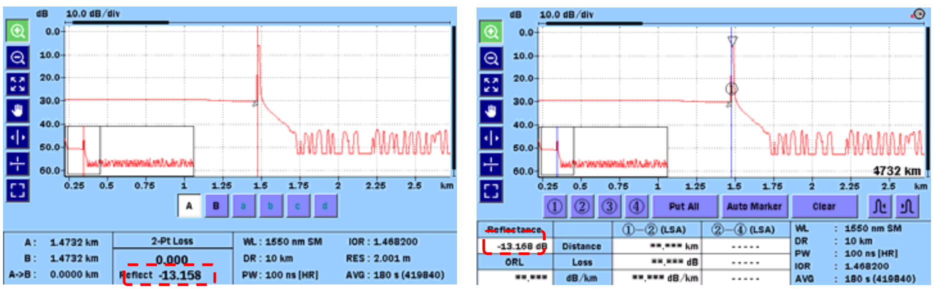


Figure 14.4.1-3 Reflectance Location on the Screen

20. Reflectance is displayed at the bottom of screen. This value is R_1 dB.

21. Calculate the difference between R1 dB and R0 dB (optical connector return loss) (R_1–R_0).

22. Touch **IOR/BSC**.

23. Add the difference (R_1-R_0) to -80.00 and set the value.

24. Touch OK and check the reflectance displayed.

25. Repeat Steps 18 through 24. If the reflectance becomes equal to R_0, the calibration is completed.

14.4.2 Optical Power Meter Measurement Accuracy Calibration

Please contact Anritsu for calibration to maintain the optical power meter measurement accuracy.

We recommend that calibration be performed once a year.

14.5 Performance Test Result Sheet

Test site: ______________________________

____

Report No: ______________________________

Date: ______________________________

Test supervisor: ______________________________

Equipment name: ______________________________

Serial No: ______________________________

Ambient temperature: ______________ ºC

Relative humidity: ______________ %

Note: ______________________________

____

____

____

14.5.1 Wavelength of OTDR

Table 14.5.1-1 Wavelength

Wavelength Settings	Minimum Value	Measured Value	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	1285 nm	nm	1335 nm	±1.83 nm	Pass / Fail
1490 nm	1465 nm	nm	1515 nm	±1.83 nm	Pass / Fail
1550 nm	1525 nm	nm	1575 nm	±1.83 nm	Pass / Fail
1625 nm	1610 nm	nm	1640 nm	±1.83 nm	Pass / Fail
1650 nm	1635 nm	nm	1665 nm	±1.83 nm	Pass / Fail
850 nm	820 nm	nm	880 nm	±1.86 nm	Pass / Fail
1300 nm	1270 nm	nm	1330 nm	±1.86 nm	Pass / Fail

14.5.2 Pulse Width

Table 14.5.2-1 Pulse Width (Wavelength 1310 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 μs	0.93 μs	μs	1.07 μs	±2.31%	Pass / Fail
2 μs	1.86 μs	μs	2.14 μs	±2.31%	Pass / Fail
4 μs	3.72 μs	μs	4.28 μs	±2.31%	Pass / Fail
10 μs	9.3 μs	μs	10.7 μs	±2.31%	Pass / Fail
20 μs	18.6 μs	μs	21.4 μs	±2.31%	Pass / Fail

Table 14.5.2-2 Pulse Width (Wavelength 1490 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 μs	0.93 μs	μs	1.07 μs	±2.31%	Pass / Fail
2 μs	1.86 μs	μs	2.14 μs	±2.31%	Pass / Fail
4 μs	3.72 μs	μs	4.28 μs	±2.31%	Pass / Fail
10 μs	9.3 μs	μs	10.7 μs	±2.31%	Pass / Fail
20 μs	18.6 μs	μs	21.4 μs	±2.31%	Pass / Fail

Table 14.5.2-3 Pulse Width (Wavelength 1550 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 µs	0.93 µs	µs	1.07 µs	±2.31%	Pass / Fail
2 µs	1.86 µs	µs	2.14 µs	±2.31%	Pass / Fail
4 µs	3.72 µs	µs	4.28 µs	±2.31%	Pass / Fail
10 µs	9.3 µs	µs	10.7 µs	±2.31%	Pass / Fail
20 µs	18.6 µs	µs	21.4 µs	±2.31%	Pass / Fail

Table 14.5.2-4 Pulse Width (Wavelength 1625 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 µs	0.93 µs	µs	1.07 µs	±2.31%	Pass / Fail
2 µs	1.86 µs	µs	2.14 µs	±2.31%	Pass / Fail
4 µs	3.72 µs	µs	4.28 µs	±2.31%	Pass / Fail
10 µs	9.3 µs	µs	10.7 µs	±2.31%	Pass / Fail
20 µs	18.6 µs	µs	21.4 µs	±2.31%	Pass / Fail

Table 14.5.2-5 Pulse Width (Wavelength 1650 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 μs	0.93 μs	μs	1.07 μs	±2.31%	Pass / Fail
2 μs	1.86 μs	μs	2.14 μs	±2.31%	Pass / Fail
4 μs	3.72 μs	μs	4.28 μs	±2.31%	Pass / Fail
10 μs	9.3 μs	μs	10.7 μs	±2.31%	Pass / Fail
20 μs	18.6 μs	μs	21.4 μs	±2.31%	Pass / Fail

Table 14.5.2-6 Pulse Width (Wavelength 850 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail

Table 14.5.2-7 Pulse Width (Wavelength 1300 nm)

Pulse width Settings	Minimum Value (Informative)	Measured Value	Maximum Value (Informative)	Measurement Uncertainty when using recommended instrument	Pass/Fail
3 ns		ns			
10 ns	7 ns	ns	13 ns	±2.31%	Pass / Fail
20 ns	14 ns	ns	26 ns	±2.31%	Pass / Fail
30 ns	22 ns	ns	38 ns	±2.31%	Pass / Fail
50 ns	39 ns	ns	61 ns	±2.31%	Pass / Fail
100 ns	85 ns	ns	115 ns	±2.31%	Pass / Fail
200 ns	180 ns	ns	220 ns	±2.31%	Pass / Fail
500 ns	465 ns	ns	535 ns	±2.31%	Pass / Fail
1 μs	0.93 μs	μs	1.07 μs	±2.31%	Pass / Fail
2 μs	1.86 μs	μs	2.14 μs	±2.31%	Pass / Fail
4 μs	3.72 μs	μs	4.28 μs	±2.31%	Pass / Fail

14.5.3 Dynamic Range

Table 14.5.3-1 Dynamic Range MT9085A-053

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	38.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	36.5 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-2 Dynamic Range MT9085A-057

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	36.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	34.5 dB	dB	±0.39 dB	Pass / Fail
1625 nm	31.5 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-3 Dynamic Range MT9085A-063

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	38.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	36.5 dB	dB	±0.39 dB	Pass / Fail
850 nm	28.0 dB	dB	±0.39 dB	Pass / Fail
1300 nm	27.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-4 Dynamic Range MT9085B-053

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	41.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	40.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-5 Dynamic Range MT9085B-055

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	41.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	40.0 dB	dB	±0.39 dB	Pass / Fail
1650 nm	34.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-6 Dynamic Range MT9085B-056

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	41.0 dB	dB	±0.39 dB	Pass / Fail
1490 nm	40.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	40.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-7 Dynamic Range MT9085B-057

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	39.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	38.0 dB	dB	±0.39 dB	Pass / Fail
1625 nm	37.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-8 Dynamic Range MT9085B-058

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	41.0 dB	dB	±0.39 dB	Pass / Fail
1490 nm	40.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	40.0 dB	dB	±0.39 dB	Pass / Fail
1625 nm	40.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-9 Dynamic Range MT9085B-063

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	41.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	40.5 dB	dB	±0.39 dB	Pass / Fail
850 nm	28.0 dB	dB	±0.39 dB	Pass / Fail
1300 nm	27.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-10 Dynamic Range MT9085C-053

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	45.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	45.0 dB	dB	±0.39 dB	Pass / Fail

Table 14.5.3-11 Dynamic Range MT9085C-057

Wavelength	Minimum Value	Measured Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
1310 nm	44.0 dB	dB	±0.39 dB	Pass / Fail
1550 nm	44.0 dB	dB	±0.39 dB	Pass / Fail
1625 nm	42.0 dB	dB	±0.39 dB	Pass / Fail

14.5.4 Distance Measurement Accuracy

Table 14.5.4-1 Distance Measurement Accuracy

Length of Optical Fiber (km)	Measured Value (km)	Minimum Value (m)	Difference (m)	Maximum Value (m)	Pass/Fail
		–1.35		1.35	Pass / Fail

Specification:
±1 m±(3 × distance range × 10^{-5})±marker resolution

When Range is 5 km and the horizontal scale is 0.005 km/div, the measurement range is 5000 m and the cursor resolution is 0.2 m.

14.5.5 Loss Measurement Accuracy (Linearity)

Table 14.5.5-1 Linearity (Wavelength 850 nm)

Location of Cursor A (km)	Location of Cursor B (km)	Loss (dB/km)	Minimum Value (dB)	Difference from Mean Loss (dB)	Maximum Value (dB)	Pass/Fail
0	2		–0.1		0.1	Pass / Fail
1	3		–0.1		0.1	Pass / Fail
2	4		–0.1		0.1	Pass / Fail
3	5		–0.1		0.1	Pass / Fail
4	6		–0.1		0.1	Pass / Fail

Mean of Loss 1 ____________ (dB/km)

Mean of Loss 2 ____________ (dB/km)

Table 14.5.5-2 Linearity (Wavelength 1310 nm)

Location of Cursor A (km)	Location of Cursor B (km)	Loss (dB/km)	Minimum Value (dB)	Difference from Mean Loss (dB)	Maximum Value (dB)	Pass/Fail
0	3		–0.1		0.1	Pass / Fail
1.5	4.5		–0.1		0.1	Pass / Fail
3	6		–0.1		0.1	Pass / Fail
4.5	7.5		–0.1		0.1	Pass / Fail
6	9		–0.1		0.1	Pass / Fail
7.5	10.5		–0.1		0.1	Pass / Fail
9	12		–0.1		0.1	Pass / Fail
10.5	13.5		–0.1		0.1	Pass / Fail
12	15		–0.1		0.1	Pass / Fail
13.5	16.5		–0.1		0.1	Pass / Fail
15	18		–0.1		0.1	Pass / Fail
16.5	19.5		–0.1		0.1	Pass / Fail
18	21		–0.1		0.1	Pass / Fail
19.5	22.5		–0.1		0.1	Pass / Fail
21	24		–0.1		0.1	Pass / Fail
22.5	25.5		–0.1		0.1	Pass / Fail
24	27		–0.1		0.1	Pass / Fail
25.5	28.5		–0.1		0.1	Pass / Fail
27	30		–0.1		0.1	Pass / Fail

Mean of Loss 1 ________________ (dB/km)

Mean of Loss 2 ________________ (dB/km)

14.5.6 Dead Zone

Table 14.5.6-1 Fresnel Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		1.0	Pass / Fail
1490 nm		1.0	Pass / Fail
1550 nm		1.0	Pass / Fail
1625 nm		1.0	Pass / Fail
1650 nm		1.0	Pass / Fail
850 nm		1.0	Pass / Fail
1300 nm		1.0	Pass / Fail

Table 14.5.6-2 MT9085A-053 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		5.0	Pass / Fail
1550 nm		5.5	Pass / Fail

Table 14.5.6-3 MT9085A-057 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		6.0	Pass / Fail
1550 nm		6.5	Pass / Fail
1625 nm		7.5	Pass / Fail

Table 14.5.6-4 MT9085A-063 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		5.0	Pass / Fail
1550 nm		5.5	Pass / Fail
850 nm		4.0	Pass / Fail
1300 nm		5.0	Pass / Fail

Table 14.5.6-5 MT9085B-053 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		5.0	Pass / Fail
1550 nm		5.5	Pass / Fail

Table 14.5.6-6 MT9085B-055 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		6.0	Pass / Fail
1490 nm		6.5	Pass / Fail
1550 nm		11.0	Pass / Fail

Table 14.5.6-7 MT9085B-056 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		6.0	Pass / Fail
1550 nm		6.5	Pass / Fail
1625 nm		6.5	Pass / Fail

Table 14.5.6-8 MT9085B-057 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		6.0	Pass / Fail
1550 nm		6.5	Pass / Fail
1625 nm		7.5	Pass / Fail

Table 14.5.6-9 MT9085B-058 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		6.0	Pass / Fail
1490 nm		6.5	Pass / Fail
1550 nm		6.5	Pass / Fail
1625 nm		8.5	Pass / Fail

Table 14.5.6-10 MT9085B-063 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		5.0	Pass / Fail
1550 nm		5.5	Pass / Fail
850 nm		4.0	Pass / Fail
1300 nm		5.0	Pass / Fail

Table 14.5.6-11 MT9085C-053 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		3.8	Pass / Fail
1550 nm		4.3	Pass / Fail

Table 14.5.6-12 MT9085C-057 Backscatter Dead Zone

Wavelength	Measured Value (m)	Maximum Value (m)	Pass/Fail
1310 nm		3.8	Pass / Fail
1550 nm		4.3	Pass / Fail
1625 nm		4.8	Pass / Fail

14.5.7 Optical Output Level and Wavelength of VFL (Option 002)

Table 14.5.7-1 VFL

Item	Minimum Value	Measured Value	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
Wavelength	635 nm	nm	665 nm		Pass / Fail
Level	–2.5 dBm	dBm	2.5 dBm		Pass / Fail

14.5.8 Optical Power Meter

Table 14.5.8-1 Optical Power Meter (No option)

Item	Wavelength	Minimum Value	Difference to Reference Optical Power Meter	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
Measurement Accuracy	1310 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1490 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1550 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1625 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1650 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail

Wavelength	Optical Power Meter reading	ACCESS Master reading	Level difference
1310 nm	dBm	dBm	dB
1490 nm	dBm	dBm	dB
1550 nm	dBm	dBm	dB
1625 nm	dBm	dBm	dB
1650 nm	dBm	dBm	dB

Table 14.5.8-2 Optical Power Meter (Option 004, 005)

Item	Wavelength	Minimum Value	Difference to Reference Optical Power Meter	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
Measurement Accuracy	1310 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1550 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail

Wavelength	Optical Power Meter reading	ACCESS Master reading	Level difference
1310 nm	dBm	dBm	dB
1550 nm	dBm	dBm	dB

Table 14.5.8-3 Optical Power Meter (Option 007)

Item	Wavelength	Minimum Value	Difference to Reference Optical Power Meter	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
Measurement Accuracy	1310 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	1490 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail
	850 nm	–0.5 dB	dB	0.5 dB	±1.87%	Pass / Fail

Wavelength	Optical Power Meter reading	ACCESS Master reading	Level difference
1310 nm	dBm	dBm	dB
1490 nm	dBm	dBm	dB
850 nm	dBm	dBm	dB

14.5.9 Optical Output and Wavelength of Light Source

Table 14.5.9-1 Light Source

Item	Wavelength	Minimum Value	Measured Value	Maximum Value	Measurement Uncertainty when using recommended instrument	Pass/Fail
Wavelength	1310 nm	1285 nm	nm	1335 nm	±1.83 nm	Pass / Fail
	1490 nm	1465 nm	nm	1515 nm	±1.83 nm	Pass / Fail
	1550 nm	1525 nm	nm	1575 nm	±1.83 nm	Pass / Fail
	1625 nm	1600 nm	nm	1650 nm	±1.83 nm	Pass / Fail
	1650 nm	1625 nm	nm	1675 nm	±1.83 nm	Pass / Fail
	850 nm	820 nm	nm	880 nm	±1.86 nm	Pass / Fail
	1300 nm	1270 nm	nm	1330 nm	±1.83 nm	Pass / Fail
Level	1310 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	1490 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	1550 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	1625 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	1650 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	850 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail
	1300 nm	–6.5 dBm	dBm	–3.5 dBm	±0.23 dB	Pass / Fail

Chapter 15 Maintenance

This chapter explains how to execute cleaning to maintain the ACCESS Master performance and the handling precautions.

15.1 Optical Connector/Optical Adapter Cleaning

Cleaning the Optical Connector Ferrule End Surface

Use an approved adapter cleaner to clean the ferrule inside the ACCESS Master measurement port(s). The ferrule should be cleaned periodically. The following shows how to clean an optical adapter, using an FC adapter as an example. Clean other types of optical adapters in the same manner.

1. Remove the currently connected adapter by raising the adapter lever (you will hear a “click” when the latch disengages) and then gently pull the adapter straight towards you.

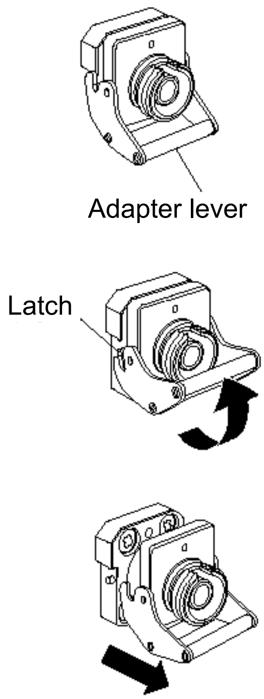


Figure 15.1-1 Removing the Optical Adapter

2. Moisten an adapter cleaner with isopropyl alcohol and then use it to clean the end surface and sides of the ferrule.

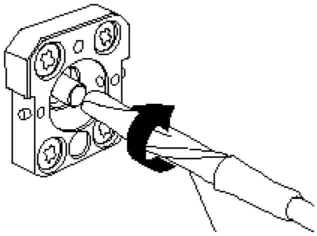


Figure 15.1-2 Cleaning the Ferrule End Surface

3. Press the tip of a new (dry) adapter cleaner into the ferrule end surface and then wipe in one direction 2 or 3 times to dry the surface. Dust and other contaminates in the isopropyl alcohol may remain on the ferrule end surface if cleaning is not properly finished.

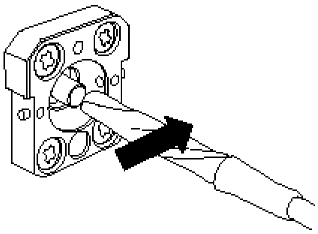


Figure 15.1-3 Cleaning the Ferrule End Surface

4. Clean the replaceable optical connector interior with adapter cleaner. (see “Cleaning the Optical Adapter” below)
5. Attach the adapter in the reverse order described in step 1. Be careful not to scratch the ferrule end surface.

Cleaning the Optical Adapter

Use an approved adapter cleaner to clean the optical adapter for connecting optical fiber cables. The following shows how to clean an optical adapter, using an FC adapter as an example. Clean other types of optical adapters in the same manner. The following method should also be used for cleaning the adapter, which is removed before cleaning the end surface of the ferrule inside the ACCESS Master.

Insert adapter cleaner into the split sleeve of the optical adapter.

Rotate the adapter cleaner in one direction while moving it back and forth.

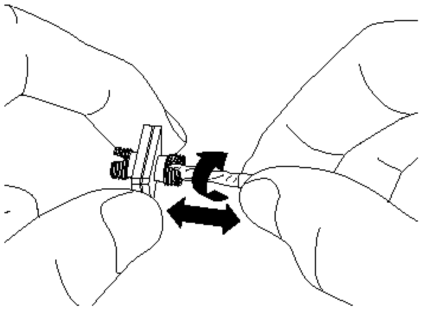


Figure 15.1-4 Cleaning an Optical Adapter

Note:

Check the ferrule diameter and use a cleaner only for the ϕ1.25 mm or ϕ2.5mm adapter.

Cleaning the Optical Fiber Cable Ferrule End Surface

Use an approved ferrule cleaner to clean the optical fiber cable ferrule of the end surface. The following shows how to clean the ferrule end surface, using an FC connector as an example. Clean other types of optical connectors in the same manner.

1. Pull the ferrule cleaner lever to expose the cleaning surface.

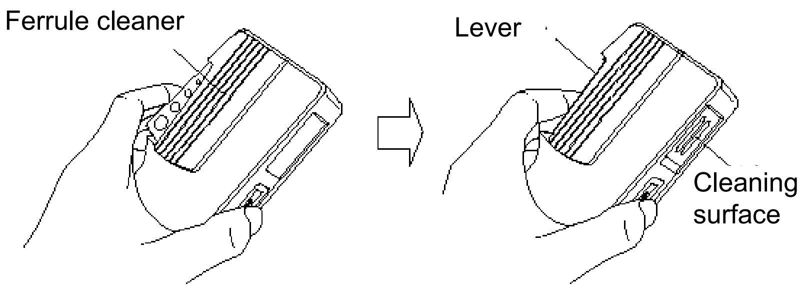


Figure 15.1-5 Ferrule Cleaner

2. Hold the lever in the opened position, press the optical connector ferrule end into the cleaning surface, and then rub in one direction as shown in the following figure.

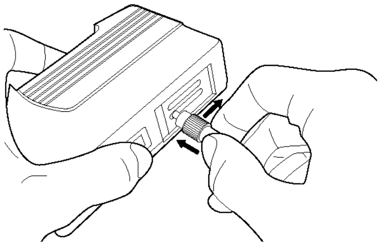


Figure 15.1-6 Cleaning the Optical Fiber Ferrule End Surface

General Notes on Cleaning

- Do not clean with a used ferrule cleaner.
- Do not finish cleaning with a swab as the swab fibers may adhere.
- Cap the cleaned connector.

⚠ WARNING

Check that no light is being emitted when cleaning and checking the ferrule end surface.

⚠ CAUTION

The ACCESS Master may not satisfy performance when used with dirt or dust adhering to the ferrule end surface. In addition, the connected fiber and/or the ACCESS Master ferrule end surface may be burned if high output light is emitted in this state. Fully clean the fiber to be connected and the ACCESS Master ferrule end surface before measurement.

15.2 Notes On Storage

Note the following when storing for long periods.

- Remove any dust or dirt adhering to the ACCESS Master before storage.
- Avoid storing in locations with high temperatures above 60°C, low temperatures below –20°C, or in humidity above 80%.
- Avoid storing in locations where there is direct sunlight or in dusty locations.
- Avoid storing in locations where water droplets are adhering or where exposed to active gases.
- Avoid storing in locations that may oxidize the ACCESS Master or in locations with severe vibrations.
- Remove the battery pack from the ACCESS Master and store separately.

Recommended Storage Conditions

It is recommended to store the ACCESS Master in the following conditions, as well as to satisfy the general notes described above.

- Temperature: 5 to 30°C
- Humidity: 40 to 75%
- Locations where there is little daily temperature or humidity changes.

15.3 Transporting

To transport the ACCESS Master, repack it using the original packing materials that were used when it was delivered. If the packing materials have not been kept, repack it following the procedure below.

1. Clean the ACCESS Master panel using a dry cloth.
2. Check that the screws are tight.
3. Cover the projections and portions which can be easily deformed, and wrap the ACCESS Master in a polyester sheet.
4. Place the wrapped ACCESS Master into a corrugated paper box and seal the box with an adhesive tape. Then, insert this into a wooden box suitable for long-distance transportation.

15.4 Disposal

Follow the instructions of your local waste disposal office when finally disposing of the ACCESS Master.
To prevent leakage of information stored in the internal memory of the ACCESS Master, physically destroy the ACCESS Master before disposing.

Appendix A Specifications

A.1 Configuration

A.1.1 Standard Configuration

Table A.1.1-1 Standard Configuration

Model	Specifications	Q'ty
MT9085A	ACCESS Master Standard Dynamic Range	
MT9085B	ACCESS Master Enhanced Dynamic Range	1
MT9085C	ACCESS Master High Performance Dynamic Range	
	Replaceable Connector *1	
	Power Cord	1
W3974AE	MT9085 Series Quick Gide	1
Z0921A	Battery Pack	1
Z1625A	AC Adapter	1
Z1991A	Access Master Operation Manual CD*2	1

*1: Select one from the optical connector options.

*2: The CD stores the following:
MT9085 Series ACCESS Master Operation Manual
MT9085 Series ACCESS Master SCPI Remote Control Operation Manual
MT9085 Series ACCESS Master Quick Guide

A.1.2 Options

Table A.1.2-1 Wavelength Options

Main Frame	Option	Name
MT9085A	053	SMF 1.31/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR
	063	MMF 0.85/1.3μm & SMF 1.31/1.55μm OTDR
MT9085B	053	SMF 1.31/1.55μm OTDR
	055	SMF 1.31/1.55/1.65μm OTDR
	056	SMF 1.31/1.49/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR
	058	SMF 1.31/1.49/1.55/1.625μm OTDR
	063	MMF 0.85/1.3μm & SMF 1.31/1.55μm OTDR
MT9085C	053	SMF 1.31/1.55μm OTDR
	057	SMF 1.31/1.55/1.625μm OTDR

Table A.1.2-2 Optical Connector Options*1, *2

Main Frame	Option	Name
MT9085A	025	FC-APC Connector key width 2.0mm
MT9085B	026	SC-APC Connector
MT9085C	037	FC Connector
	038	ST Connector
	039	DIN 47256 Connector
	040	SC Connector

*1: One of them must be selected.

*2: Two identical connectors are installed for a wavelength option with two ports. However, if Option 025 or 026 is selected with Option 063, the same connector as Option 037 or 040 is installed to the MMF port.

Table A.1.2-3 Additional Options

Main Frame	Option	Name	Remarks
MT9085A MT9085B MT9085C	002	Visual Fault Locator	
	004	SMF Optical Power Meter	
	005	SMF High Power Optical Power Meter	
	007	SMF/MMF Optical Power Meter	
	010	Protector	Including a protective cover and shoulder belt.
	110	Protector retrofit	Including a protective cover and shoulder belt.

A.2 Performance

A.2.1 OTDR Performance

Table A.2.1-1 OTDR Performance

Item	Specifications
Fiber under test	10/125 μm single mode fiber (ITU-T G.652, except for Option 063 MMF) 62.5/125 μm GI fiber (Option 063 MMF)
Wavelength	1310±25 nm (Option 053, 055, 056, 057, 058, 063) 1490±25 nm (Option 056, 058) 1550±25 nm (Option 053, 055, 056, 057, 058, 063) 1645-1655 nm (Option 055)*1 1625±25 nm (Option 057, 058) 850±30 nm (Option 063) 1300±30 nm (Option 063) Temperature 25°C Pulse width Option 053, 055, 056, 057, 058, 063 SMF: 1 μs Option 063 MMF: 100 ns
Pulse width	Option 053, 055, 056, 057, 058, 063 SMF 3, 10, 20, 30, 50, 100, 200, 500 ns, 1, 2, 4, 10, 20 μs Option 063 MMF 3, 10, 20, 30, 50, 100, 200, 500 ns, 1, 2, 4 μs*2

*1: Wavelength range of less than 20 dB from peak value. Peak value (optical output): +15 dBm max.

*2: Only 1300 nm can be selected for 1 μs or above.

Table A.2.1-1 OTDR Performance (Cont'd)

Item	Specifications	
Dynamic range		
(S/N=1)	Option 053	(1310/1550 nm)
	MT9085A-053:	39.0/37.5 dB (Typical)*3, *4, *5
	MT9085B-053:	42.0/41.0 dB (Typical)*3, *4, *5
	MT9085C-053:	46.0/46.0 dB (Typical)*3, *4, *5
		25.0/25.0 dB (Typical)*3, *4, *6
	Option 055	(1310/1550/1650 nm)
	MT9085B-055:	42.0/41.0/35.0 dB (Typical)*3, *4, *5, *7
	Option 056	(1310/1490/1550 nm)
	MT9085B-056:	42.0/41.0/41.0 dB (Typical)*3, *4, *5
	Option 057	(1310/1550/1625 nm)
	MT9085A-057:	37.0/35.5/32.5 dB (Typical)*3, *4, *5
	MT9085B-057:	40.0/39.0/38.0 dB (Typical)*3, *4, *5
	MT9085C-057:	46.0/46.0/44.0 dB (Typical)*3, *4, *5
		25.0/25.0/23.0 dB (Typical)*3, *4, *6
	Option 058	(1310/1490/1550/1625 nm)
	MT9085B-058:	42/41/41/41 dB (Typical)*3, *4
	Option 063	(1310/1550/850/1300 nm)
	MT9085A-063:	39.0/37.5/29.0/28.0 dB (Typical)*3, *8, *9
	MT9085B-063:	42.0/41.0/29.0/28.0 dB (Typical)*3, *8, *9

*3: The guaranteed values are values in the table from which 1 dB is subtracted.

*4: The measurement conditions are as below.
SNR=1
Temperature: 25°C
Distance range: 100 km
Averaging time: 180 seconds
Resolution: Low Density
Except while charging battery

*5: Pulse width: 20 µs

*6: Pulse width: 100 ns (High dynamic ragne mode)

*7: For 1650 nm, the measurement conditions are as below:

With background light, 1310/1550 nm, –19 dBm CW light

*8: The measurement conditions are as below.

SNR=1
Temperature: 25°C
Distance range: 100 km (1310/1550 nm)
25 km (850/1300 nm)
Pulse width : 20 μs (1310/1550 nm)
500 ns (850 nm)
4 μs (1300 nm)
Averaging time: 180 seconds
Resolution: Low Density
Except while charging battery

*9: When the 50/125 μm optical fiber is used as option for MMF, the dynamic range is about 3 dB lower.

Table A.2.1-1 OTDR Performance (Cont'd)

Item	Specifications
Dead zone (Backscattered light)	Deviation: ±0.5 dB, 25°C Return loss: 55 dB Option 053 MT9085A-053: 1310 nm: ≤ 5.0 m*10 1550 nm: ≤ 5.5 m*10 MT9085B-053: 1310 nm: ≤ 5.0 m*10 1550 nm: ≤ 5.5 m*10 MT9085C-053: 1310 nm: ≤ 3.8 m*10 1550 nm: ≤ 4.3 m*10 Option 055 MT9085B-055: 1310 nm: ≤ 5.0 m*10 1550 nm: ≤ 5.5 m*10 1650 nm: ≤ 6.5 m*10 Option 056 MT9085B-056: 1310 nm: ≤ 6.0 m*10 1490 nm: ≤ 6.5 m*10 1550 nm: ≤ 6.5 m*10

*10: Pulse width 10 ns

Table A.2.1-1 OTDR Performance (Cont'd)

Item	Specifications		
Dead zone (Backscattered light) (continued)	Option 057		
		MT9085A-057:	1310 nm: ≤ 6.0 m*10
			1550 nm: ≤ 6.5 m*10
			1625 nm: ≤ 7.5 m*10
		MT9085B-057:	1310 nm: ≤ 6.0 m*10
			1550 nm: ≤ 6.5 m*10
			1625 nm: ≤ 7.5 m*10
		MT9085C-057:	1310 nm: ≤ 3.8 m*10
			1550 nm: ≤ 4.3 m*10
			1625 nm: ≤ 4.8 m*10
	Option 058		
		MT9085B-058:	1310 nm: ≤ 7.0 m*10
			1490 nm: ≤ 7.5 m*10
			1550 nm: ≤ 7.5 m*10
			1625 nm: ≤ 8.5 m*10
	Option 063		
		MT9085A-063:	1310 nm: ≤ 5.0 m*10
			1550 nm: ≤ 5.5 m*10
			850 nm: ≤ 4.0 m (3.0 m Typical)*11
			1300 nm: ≤ 5.0 m (4.0 m Typical)*11
		MT9085B-063:	1310 nm: ≤ 5.0 m*10
			1550 nm: ≤ 5.5 m*10
			850 nm: ≤ 4.0 m (3.0 m Typical) *11
			1300 nm: ≤ 5.0 m (4.0 m Typical) *11

*11: Return loss 40 dB, Pulse width 3 ns

Table A.2.1-1 OTDR Performance (Cont'd)

Item	Specifications
Dead zone (Fresnel reflection)	≤1.0 m, typical 0.8 m Width at 1.5 dB below reflection peak level Pulse width 3 ns, Return loss 40 dB, Values measured at 25°C
Loss Measurement Accuracy (Linearity)	±0.05 dB/dB or ±0.1 dB, whichever greater
Return Loss Measurement Accuracy	Option 053, 055, 056, 057, 058, 063 SMF ±2 dB*12 Option 063 MMF ±4 dB*13
Distance Measurement Accuracy (Design assurance)	±1 m ±3×distance range×10^{-5} ±marker resolution However, excludes uncertainty due to IOR
Distance Range	0.5/1/2.5/5/10/25/50/100/200/300 km 850 and 1300 nm of Option 063 are up to 50 km.
Sampling Resolution (IOR=1.500000)	0.05 to 60 m
Number of Sampling Points	150,001pt max.

*12: When measuring the non-connected end of an approximately 25 km length fiber with the following settings.
Distance range: 50 km
Pulse width: 2 μs

*13: When measuring the non-connected end of an approximately 4.5 km length fiber with the following settings.
Distance range: 10 km
Pulse width: 100 ns

A.2.2 Light Source

Table A.2.2-1 Light Source

Item	Specifications
Supported Fiber	10/125 μm single mode fiber (ITU-T G.652) 62.5/125 μm GI fiber
Measurement port	Shared with OTDR port
Central wavelength	1310±30 nm*1 (Option 053, 055, 056, 057, 058, 063) 1490±30 nm*1 (Option 056, 058) 1550±30 nm*1 (Option 053, 055, 056, 057, 058, 063) 1625±30 nm*1 (Option 057, 058) 1650± 5 nm*1 (Option 055) 850±30 nm*1 (Option 063) 1300±30 nm*1 (Option 063)
Spectrum width	1310 nm: 5 nm or less*1 1490 nm: 10 nm or less*1 1550 nm: 10 nm or less*1 1625 nm: 10 nm or less*1 1650 nm: 3 nm or less*1 850 nm: 10 nm or less*1 1300 nm: 10 nm or less*1
Optical output power	–5±1.5 dBm*1, *2
Optical output power instant stability	≤ 0.1 dB*3, *4, *5 MMF: No specification
Modulation	CW, 270 Hz, 1 kHz, 2 kHz (Modulated light is square pulse)
Warm-up time	10 minutes (after optical output is turned ON)

*1: CW, 25°C

*2: SM or GI fiber 2 m

*3: CW, ±1°C at one point within –10 to +50°C, difference between the maximum value and minimum value for one minute, single mode fiber 2 m

*4: When the optical power meter with return loss of 40 dB or more is used (SM)

*5: After the warm-up time passes

A.2.3 Optical Power Meter

Table A.2.3-1 Optical Power Meter *1

Item	Specifications	
Supported fiber	SM fiber (ITU-T G652)	
Wavelength settings	Option 053, 057, 063	1310, 1550, 1625, 1650 nm
	Option 055	1310, 1550, 1625 nm*2 1650 nm*3
	Option 056, 058	1310, 1490, 1550, 1625 nm
Optical connector	Shared with OTDR port	
Optical power measurement range	–50 to –5 dBm (peak power)	
	Wavelength:	1550 nm
	Absolute max. input power:	+10 dBm
Measurement accuracy	±6.5%*4	

*1: Excluding 850 and 1300 nm of Option 063, or when Option 004, 005, or 007 is installed.

*2: OTDR1 port, wavelength range 1280 to 1625 nm

*3: OTDR2 port, 1650±5 nm

*4: –20 dBm, CW, 25°C, after executing zero offset, wavelength 1550 nm, SM (ITU-T G652) when the master FC connector is used.

A.2.4 General

Table A.2.4-1 General

Item	Specifications
Display	8-inch TFT color LCD with a touch panel
External interface	USB A port (USB2.0 High Speed supported) ×3*1 USB MicroB port (USB1.1 Full Speed supported) ×1*1
Wireless interface	WLAN/Bluetooth*2
Power supply	DC: Rated12 V AC: Rated 100 to 240 V, 50/60 Hz (when using the dedicated AC adapter) Battery:Dedicated lithium-ion battery
Power consumption	20 W max. (when charged) Standard 4 W (with backlight set to low, sweeping halted)
Battery operating time	Continuous operating time: 12.0 hours (typical) Telcordia GR-196-CORE Issue 2, September 2010 Power saving settings: Backlight…Low Auto Backlight Off…one minute, Auto Power Off…None Instrument Power-Save mode…High (recommended) 25°C, Design assurance
Battery charging time	5 hours maximum (with power off)*3

*1: USB power supply is 500 mA

*2: Connect a USB adapter to a USB port.

*3: Time required for charging until the charging rate reaches 90%, temperature range: 5 to 30°C, 80%RH, design assurance

A.2.5 Mechanical Specifications

Table A.2.5-1 Mechanical Specifications

Item	Specifications
Dimensions (excluding protrusions)	165 mm (H) × 270 mm (W) × 61 mm (D) When protector mounted: 200 mm (H) × 284 mm (W) × 77 mm (D)
Mass	1.6 kg max. (Main frame, when option 053 is installed) 1.9 kg max. (Main frame, battery pack, when option 053 is installed) 2.6 kg max. (Main frame, battery pack, when option 010 Protector and option 053 are installed)

A.3 Environment Conditions

Table A.3-1 Environment Conditions

Item	Specifications
Operating temperature, humidity	–10 to +50°C, ≤ 80% (no condensation)
Storage temperature, humidity	–20 to +60°C, ≤ 80%
Vibration	MIL-T-28800E Class3
Shock	MIL-T-28800E
Drop	MIL-T-28800E Style A (46 cm height, 8 corners, 6 faces; 14 drops in total, power off)
Bump	IEC 60068-2-27, JIS C60068-2-27
Shock-on-desk	MIL-T-28800E (45° angle or 100 mm lifted edge, 4 drops in total, power on)
EMC	EN61326-1 (Class A, Table 2) EN61000-3-2 (Class A)
Dust proof	MIL-T-28800E (Dust Exposure) Class2
Splash proof	JIS C 0920 TYPE I complied, IP51 (IEC60529)
Laser Safety	IEC Pub 60825-1:2007 Class 1M 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50 (dated June 24, 2007)

A.4 VFL (Option 002)

Table A.4-1 VFL

Item	Specifications
Use	Locating faults in the OTDR dead zone
Central wavelength	650 ±15 nm (25°C)
Optical output power	0 ±3 dBm (CW)
Optical output fiber	10/125 μm single mode fiber (ITU-T G.652)
Output function	Off, Blink, On
Optical connector	Direct insertion of ø 2.5 mm ferrule
Laser safety	IEC Pub 60825-1:2007 Class 3R 21CFR1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50 (dated June 24, 2007)
Operating temperature, humidity	0 to +50°C, ≤ 80% (no condensation)

A.5 Optical Power Meter (Option 004, 005, 007)

A.5.1 Configuration

Q’ty

Power Meter 1

Replacable connector 1

(You must select one from FC, SC, DIN, and ST.)

A.5.2 Optical Performance

The following performance is guaranteed when the options are combined with MT9085x.

Table A.5.2-1 Optical Performance

Item	Specifications
Supported fiber	Option 004, 005 10/125 μm single mode fiber (ITU-T G.652) Option 007 10/125 μm single mode fiber (ITU-T G.652) and 62.5/125 μm GI fiber
Wavelength setting range	Option 004, 005 1200 to 1700 nm Option 007 800 to 1700 nm
Wavelength settings	Option 004, 005 1310, 1383, 1490, 1550, 1625, 1650 nm Option 007 850, 1300, 1310, 1383, 1490, 1550, 1625, 1650 nm
Modulation	270/1k/2kHz

Table A.5.2-1 Optical Performance (Cont'd)

Item	Specifications
Optical power measurement range	Option 004 –50 to +23 dBm (CW light, 1550 nm) –53 to +20 dBm (Modulated light, 1550 nm) Option 005 –43 to +30 dBm (CW light, 1550 nm) –46 to +27 dBm (Modulated light, 1550 nm) Option 007 –67 to +6 dBm (CW light, 1310 nm, –60 to +3 dBm for 850 nm) –70 to +3 dBm (Modulated light, 1310 nm, –63 to 0 dBm for 850 nm)
Measurement accuracy	After executing zero offset, when the fiber with master FC connector is used. Option 004 ±5%*1 Option 005 ±5%*1, *2 Option 007 ±5%*3, ±0.5 dB*4
Return loss (Option 004)	–36 dB or less (1550 ±20 nm)*5
Operating temperature, humidity	0 to +50°C, ≤ 80% (no condensation)

*1: 0 dBm, 1310/1550 nm, CW

*2: 25°C

*3: –10 dBm, 1310/1550 nm, CW

*4: –10 dBm, 850 nm, CW, 25°C

*5: Using SM fiber (ITU-T G.652) , Return loss of 45 dB or above.

A.6 AC Adapter

Table A.6-1 AC Adapter (Z1625A)

Item	Specifications
Input	AC Rating: 100 to 240 Vac Acceptable range: 90 to 264 Vac Frequency: 50 to 60 Hz
DC Rating	12 Vdc, 5 A
Environmental conditions	Operation: 0 to +45°C, 20 to 80%RH Storage: –20 to +70°C, 10 to 90%RH

A.7 Battery Pack

Table A.7-1 Battery Pack (Z0921A)

Item	Specifications
Battery type	Lithium-ion rechargeable battery
Voltage	11.1 V
Dimensions, mass	19 mm (H) × 53 mm (W) × 215 mm (D), 330 g typ.
Environmental conditions	Charging: 0 to +40°C Discharging: –20 to +60°C, ≤ 80%RH Storage: –20 to +50°C, ≤ 80%RH

Appendix B Measurement Principle

This appendix explains the measurement principle of the ACCESS Master.

B.1 Linear Approximation by Least Squares Method

To obtain the splice loss, suppose two lines L1 and L2 from the measurement data as shown in the figure below.

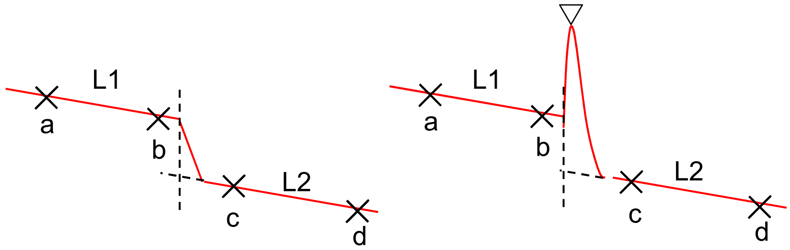


Figure B.1-1 Method to Obtain Splice Loss (Marker Mode = Movement)

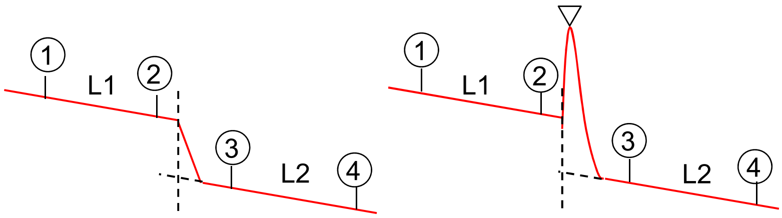


Figure B.1-2 Method to Obtain Splice Loss (Marker Mode = Placement)

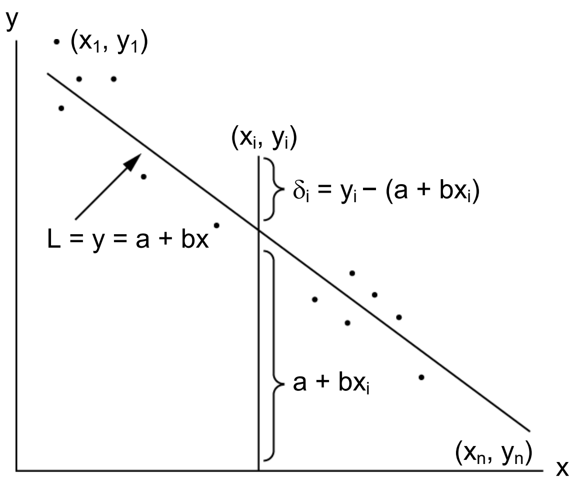


Figure B.1-3 Approximate Straight Line by Least Squares Method

Line L is y = a + bx, when the variation of the distances from n points (x_1, y_1), (x_2, y_2), …, (x_n, y_n) is the minimum as shown in the figure above. Obtain gaps δ_1, δ_2, δ_3, … from each point to Line L including variables a and b, and obtain variables a and b so that E, the sum of the square of δ_i (gap of each point), becomes the minimum to determine Line L.

$$\delta_i = y_i - (a + b_{xi})$$

$$\begin{aligned} \mathrm{E} &= \sum_{i=1}^{n} \delta_{i^2} \\ &= (y_1 - a - bx_1)^2 + (y_2 - a - bx_2)^2 + \cdots + (y_n - a - bx_n)^2 \end{aligned}$$

The necessary and sufficient conditions for minimizing E with this formula are: $\frac{\partial E}{\partial a} = 0, \frac{\partial E}{\partial b} = 0.$

When these formulas are solved, variables a and b can be obtained as follows:

$$a = \frac{\overline{y}\sum_{i=1}^{n}(x_i)^2 - \overline{x}\sum_{i=1}^{n}(x_i y_i)}{\sum_{i=1}^{n}(x_i)^2 - n(\overline{x})^2}$$

$$b = \frac{\sum_{i=1}^{n}(x_i y_i) \quad - n\overline{xy}}{\sum_{i=1}^{n}(x_i)^2 - n(\overline{x})^2}$$

Where, $\overline{x} = \frac{1}{n}\sum_{i=1}^{n}(x_i)$, $\overline{y} = \frac{1}{n}\sum_{i=1}^{n}(y_i)$

Appendix

Appendix B

B.2 Splice Loss

Splices in a trace pattern are displayed as shown by a solid line in the figure below. Actual splices should look like the one shown by the dashed line. Segment L is generated because the ACCESS Master circuit cannot accurately respond to the input pattern that shows a sharp falling at the splice. The larger the pulse width becomes, the longer Segment L becomes.

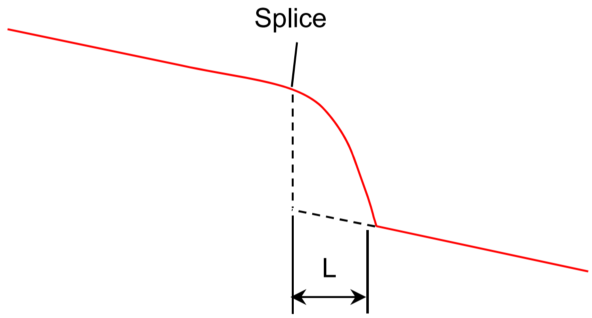


Figure B.2-1 Splice Loss

Because of this, the splice loss cannot be measured correctly in Loss mode. In LSA mode, the ACCESS Master sets two markers each before and after a splice and calculates the splice loss as explained below.

The two lines L1 and L2 are drawn as shown in the figure below. Line L2 is extended to the splice. Then, the splice loss is obtained from the intersection points between the two lines and vertical line drawn at the splice.

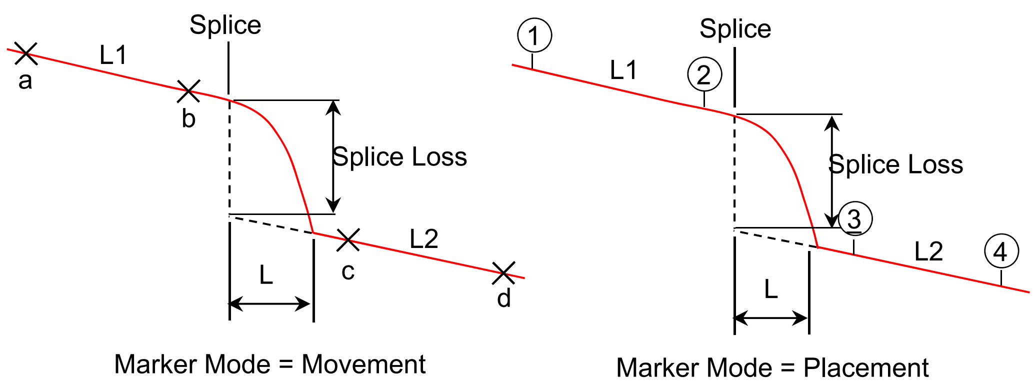


Figure B.2-2 Measurement Principle of Splice Loss

B.3 Reflectance

R, reflectance value, is obtained using the following formulas:

$$R = -\left(10\log_{10} bsl + 10\log_{10}\left(10^{\frac{L}{5}} - 1\right)\right)$$

$$bsl = S \cdot \alpha_R \cdot V \cdot \frac{W}{2}$$

$$S = K \cdot \frac{N1^2 - N2^2}{N1^2}$$

$$V = \frac{C}{N_e}$$

W (s) :	Current pulse width setting
L:	Marker Mode = Movement: Level difference between Cursors A and B Marker Mode = Placement: Level difference between one marker and peak level
$BSL = 10\log_{10}(bsl)$:	Backscattered light level
S:	Backscatter coefficient
α_R:	Rayleigh scattering loss $(Np/m) = 0.23026 \times 10^3 \times RSL$
RSL:	Rayleigh scattering loss (dB/km)
V:	Group velocity in optical fiber
K:	Constant determined by optical fiber
N1:	IOR of optical fiber core
N2:	IOR of optical fiber clad
Ne:	Effective group IOR of optical fiber
C (m/s):	Light velocity (3×10^8)

Appendix

Appendix B

B.4 ORL

ORL (dB), optical return loss value, is obtained using the following formula:

$$\begin{aligned}\mathrm{ORL} &= -10\log_{10}\frac{ER}{Ein} \\ &= -10\log_{10}\frac{\int_0^\infty P(t)dt}{P_0 W} \\ &= -10\log_{10}\frac{bsl\int_0^\infty P'(t)dt}{W} \\ &= -10\log_{10} bsl + \log_{10} W - \log_{10}\int_0^\infty P(t)dt\, sl\end{aligned}$$

Where, $\mathrm{P}'(\mathrm{t}) = \dfrac{P(t)}{P_0 bsl}$

ER: Energy of reflected light

Ein: Energy of incident light

P(t): Power measured by OTDR

P_0: Peak power of incident light pulse for t = 0

W: Pulse width of incident light

$10\log_{10}$bsl: Backscattered light level

$\int_0^\infty P'(t)dt$: Integral of measured trace normalized using backscattered light intensity (input end)s

<For reference>

bsl is a value determined by fiber, wavelength, and pulse width.

Typical values for 1.3-µm single-mode optical fibers are shown below.

Table B.4-1 Relationship Between Pulse Width and Backscattered Light Level

Pulse width	Backscattered Light Level (dB)		
	λ = 1.31 µm	λ = 1.55 µm	λ = 1.65 µm
100 ns	–58.5	–61.5	–62.5
1 µs	–48.5	–51.5	–52.5
10 µs	–38.5	–41.5	–42.5

Appendix C Settings when shipping from factory

This document explains the items that are initialized by executing **Restore Defaults** on the **About** screen (Figure 3.3.4-1). Some items are initialized also by executing the remote command (INI command).

The items that are not listed in the tables are not initialized by **Restore Defaults**.

Table C-1 Password

Item	Setting Value
Password Protect	Off
Administrator Setting Password	MT9085ANRITSU
User Setting Password	(no value)

Table C-2 Calibration Date Settings

Item	Setting Value
Calibration Date	(no value)
Calibration period	12 month

Table C-3 Preferences

Item	Setting Value
Distance display Units*	km
Connection Check*	On
Active Fiber Check*	On
Auto Scale*	Off
Event Summary*	On
Trace Overview*	Off
Show Internal Launch Fiber*	Off
Unit of averaging*	Sec
Real Time Attenuation*	Auto Attenuation
Display Mode After Analysis*	End / Break
Sound of test completion*	Disabled
Marker Mode*	Movement
Type of reflective result*	Refelectance
Auto Patch-cord Removal*	None / None
Force Total Loss*	Off
End Event for ORL Calculation*	OMIT
Auto Analysis*	On
Bi-Directional Correction*	2%
Continuous Pulse Emission	Off
Event Icon Movement	Left to right
Event Table Span Calculation	Distance between events
A-B Span Analysis	Off
Auto Test Mode	Advanced

*: Restored to factory settings by executing the INI command.

Table C-4 AutoSave

Item	Setting Value
Enabled	On
AutoSave Directory	INTMEN/
Base Filename	AUTO*WLEN**NUM*
Start Number	1

Table C-5 Thresholds - OTDR (Standard)

Item	Setting Value
Auto Detect	
Splice Loss*	0.05 dB
Reflectance*	60.0 dB
Fiber End*	3 dB
Macro Bend*	0.3 dB
Splitter Loss*	1 × 8 (10.0 dB)
Pass/Fail Thresholds	
Non-Reflective Event Loss (fusion)*	None
Reflective Event Loss (connector,mechanical)*	None
Reflectance*	None
Fiber Loss (dB/km)*	None
Total Loss*	None

*: Restored to factory settings by executing the INI command.

Table C-6 Thresholds - Fiber Visualizer

Item	Setting Value
Auto Detect	
Splice Loss	0.05 dB
Reflectance	60.0 dB
Fiber End	3 dB
Macro Bend	0.3 dB
Splitter Loss (1 × 2)	4.1 dB
Splitter Loss (1 × 4)	7.0 dB
Splitter Loss (1 × 8)	10.0 dB
Splitter Loss (1 ×16)	13.0 dB
Splitter Loss (1 × 32)	16.0 dB
Splitter Loss (1 × 64)	19.0 dB
Splitter Loss (1 × 128)	22.0 dB
Splitter Loss (2 × 8)	8.5 dB
Pass/Fail Thresholds	
Non-Reflective Event Loss (fusion)	0.2 dB
Reflective Event Loss (connector,mechanical)	0.5 dB
Reflectance	35.0 dB
Fiber Loss (dB/km)	1.0 dB/km
Total Loss	3.0 dB
Splitter Loss	3.0 dB
ORL	27.0 dB

Table C-7 OTDR Measurement Conditions

<table>
<tr><th>Item</th><th>Setting Value</th></tr>
<tr><td>Test Mode*</td><td>Auto</td></tr>
<tr><td>Distance Range*</td><td>0.5 km</td></tr>
<tr><td>Pulse width*</td><td>3 ns</td></tr>
<tr><td>Averaging*</td><td>15 Sec</td></tr>
<tr><td>IOR/BSC*</td><td>
<table>
<tr><th>Wavelength (nm)</th><th>IOR</th><th>BSC</th></tr>
<tr><td>850</td><td>1.496</td><td>–62</td></tr>
<tr><td>1300</td><td>1.491</td><td>–69</td></tr>
<tr><td>1310</td><td>1.4677</td><td>–78.5</td></tr>
<tr><td>1490</td><td>1.4682</td><td>–80.5</td></tr>
<tr><td>1550</td><td>1.4682</td><td>–81.5</td></tr>
<tr><td>1625</td><td>1.4685</td><td>–82.5</td></tr>
<tr><td>1650</td><td>1.4685</td><td>–82.5</td></tr>
</table>
</td></tr>
<tr><td>Loss Mode*</td><td>2-PtLoss</td></tr>
<tr><td>Coursors*</td><td>Unlocked</td></tr>
<tr><td>Horiz Shift*</td><td>(no value)</td></tr>
</table>

*: Restored to factory settings by executing the INI command.

Table C-8 Template Settings

Item	Setting Value
Event Determination	Template
Distance	3%
Absolute Distance	1 km
Distance Helix Factor Adjustment	None

Table C-9 Scenario Manager Lite

Item	Setting Value
Execution Interval	1000 ms
Repeat Count	1
Automatic logging	Off

Table C-10 VIP

Item	Setting Value
Probe Model	G0293A
Tip Type	FBET-U12M
Test Profile	SM UPC >45 (IEC 61300-3-35)
File Location	INTMEM/
Base Filename	vip*NUM*
Analysis	On
File Name	On
Start Number	1

Table C-11 Fiber Visualizer Report Setting

Item	Setting Value
Customer	(no value)
Location	(no value)
Operator	(no value)
Notes	(no value)
Include Report Header	On
Include Graphic Event	On
Include File Header	On
Include Event Table	On
Include Fiber Pass/Fail	On
Include Trace	On
Include Logo	On
Logo File	INTMEM/anritsu.PNG
Include VIP Result	Off
Result Source	Results in Folder
Report Type	Full
Settings	General
Output	Separate

Table C-12 VIP Report Setting

Item	Setting Value
Customer	(no value)
Location	(no value)
Operator	(no value)
Notes	(no value)
Include Analysis Results	Off
Include Analysis Details	Off
Include Logo	On
Logo File	INTMEM/anritsu.PNG
Result Source	Results in Folder

Table C-13 Remote Settings

Item	Setting Value
Ethernet Settings	
DHCP	Off
IP Address	192.168.1.2
IP Netmask	255.255.255.0
Default Gateway	None
SCPI Port Number	2288
Remote GUI Password	(no value)
Remote GUI Port Number	80
Wi-Fi settings	
Password	(no value)
DHCP	On
Bluetooth settings	
PIN code	123456

Appendix D Software License

The ACCESS Master contains the software shown in the table below.
Refer to our website for more information on the ACCESS Master.
Anritsu Corporation Website: https://www.anritsu.com

The package software on the table below is not covered in the Software License Agreement of Anritsu Corporation.

Table D-1 Software License List

Packeage	License	Remarks
BlueZ	GPL (*1)	
busybox	GPL (*1)	
dbus	GPL (*1)	
dosfstools-3.0.12	GPL (*1)	
e2fsprogs-1.42	GPL (*1)	
encoding-japanese v1.0.29	MIT (*14)	
expat	MIT (*7)	
flnx-0.18	LGPL+ exceptions (*4)	[program/widget] is based in part on the work of the FLTK project (http://www.fltk.org).
fontconfig	Permissive free software license (*9)	
freetype-2.5.5	GPL (*1)	
Freewnn-Server-1.10	GPL (*1)	
fuse	GPL (*1)	
gerodic-1.00	Others (*12)	
glibc	LGPL (*2)	
inetutils 1.5	GPL (*1)	
jpeg-8d	Others	This software is based in part on the work of the Independent JPEG Group.
jQuery	MIT (*8)	
libharu	ZLIB/LIBPNG License	
libpng-1.2.48	libpng license (*10)	

Appendix

Table D-1 Software License List (Cont'd)

Packeage	License	Remarks
libstdc++	LGPL (*2)	
linux-3.18.96	GPL (*1)	
microwindows-0.90	MPL (*3)	
mtd-utils	GPL (*1)	
obexfs		
obexftp		
openobex		
openssl	Apache License 1.0 (*5)	
poppler	GPL (*1)	
samba	GPL (*1)	
sys5utils	GPL (*1)	
tslub	LGPL (*2)	
U-Boot-1.1.4	GPL (*1)	
util-linux-ng-2.16	GPL (*1)	
webfs	Apache License 2.0 (*6)	
wireless_tools	GPL (*1)	
wpa_supplicant	BSD (*11)	
xpdf	GPL (*1)	
zlib-1.2.6	Other (*13)	

(*1) GPL:

GNU GENERAL PUBLIC LICENSE
Version 2, June 1991

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

GNU GENERAL PUBLIC LICENSE
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.

b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:

a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,

c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the

preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.

6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies

directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the program's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

Gnomovision version 69, Copyright (C) year name of author Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.
This is free software, and you are welcome to redistribute it under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program `Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

(*2) LGPL:

GNU LESSER GENERAL PUBLIC LICENSE
Version 2.1, February 1999

[This is the first released version of the Lesser GPL. It also counts as the successor of the GNU Library Public License, version 2, hence the version number 2.1.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Lesser General Public License, applies to some specially designated software packages--typically libraries--of the Free Software Foundation and other authors who decide to use it. You can use it too, but we suggest you first think carefully about whether this license or the ordinary General Public License is the better strategy to use in any particular case, based on the explanations below.

When we speak of free software, we are referring to freedom of use, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish); that you receive source code or can get it if you want it; that you can change the software and use pieces of it in new free programs; and that you are informed that you can do these things.

To protect your rights, we need to make restrictions that forbid distributors to deny you these rights or to ask you to surrender these rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link other code with the library, you must provide complete object files to the recipients, so that they can relink them with the library after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

We protect your rights with a two-step method: (1) we copyright the library, and (2) we offer you this license, which gives you legal permission to copy, distribute and/or modify the library.

To protect each distributor, we want to make it very clear that there is no warranty for the free library. Also, if the library is modified by someone else and passed on, the recipients should know that what they have is not the original version, so that the original author's reputation will not be affected by problems that might be introduced by others.

Finally, software patents pose a constant threat to the existence of any free program. We wish to make sure that a company cannot effectively restrict the users of a free program by obtaining a restrictive license from a patent holder. Therefore, we insist that any patent license obtained for a version of the library must be consistent with the full freedom of use specified in this license.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License. This license, the GNU Lesser General Public License, applies to certain designated libraries, and is quite different from the ordinary General Public License. We use this license for certain libraries in order to permit linking those libraries into non-free programs.

When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

GNU LESSER GENERAL PUBLIC LICENSE
TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library or other program which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Lesser General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). Whether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

a) The modified work must itself be a software library.

b) You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

c) You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

d) If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful.

(For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works.

But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices.

Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also combine or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

a) Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

b) Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that (1) uses at run time a copy of the library already present on the user's computer system, rather than copying library functions into the executable, and (2) will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.

c) Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.

d) If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

e) Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the materials to be distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

a) Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

b) Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties with this License.

11. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Lesser General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO

YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

How to Apply These Terms to Your New Libraries

If you develop a new library, and you want it to be of the greatest possible use to the public, we recommend making it free software that everyone can redistribute and change. You can do so by permitting redistribution under these terms (or, alternatively, under the terms of the ordinary General Public License).

To apply these terms, attach the following notices to the library. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

<one line to give the library's name and a brief idea of what it does.>
Copyright (C) <year> <name of author>

This library is free software; you can redistribute it and/or modify it under the terms of the GNU Lesser General Public License as published by the Free Software Foundation; either version 2.1 of the License, or (at your option) any later version.

This library is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU Lesser General Public License for more details.

You should have received a copy of the GNU Lesser General Public License along with this library; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the library, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the library `Frob' (a library for tweaking knobs) written by James Random Hacker.

<signature of Ty Coon>, 1 April 1990
Ty Coon, President of Vice

That's all there is to it!

(*3) MPL:

MOZILLA PUBLIC LICENSE
Version 1.1

----

1. Definitions.

1.0.1. "Commercial Use" means distribution or otherwise making the Covered Code available to a third party.

1.1. "Contributor" means each entity that creates or contributes to the creation of Modifications.

1.2. "Contributor Version" means the combination of the Original Code, prior Modifications used by a Contributor, and the Modifications made by that particular Contributor.

1.3. "Covered Code" means the Original Code or Modifications or the combination of the Original Code and Modifications, in each case including portions thereof.

1.4. "Electronic Distribution Mechanism" means a mechanism generally accepted in the software development community for the electronic transfer of data.

1.5. "Executable" means Covered Code in any form other than Source Code.

1.6. "Initial Developer" means the individual or entity identified as the Initial Developer in the Source Code notice required by Exhibit A.

1.7. "Larger Work" means a work which combines Covered Code or portions thereof with code not governed by the terms of this License.

1.8. "License" means this document.

1.8.1. "Licensable" means having the right to grant, to the maximum extent possible, whether at the time of the initial grant or subsequently acquired, any and all of the rights conveyed herein.

1.9. "Modifications" means any addition to or deletion from the substance or structure of either the Original Code or any previous Modifications. When Covered Code is released as a series of files, a Modification is:

A. Any addition to or deletion from the contents of a file containing Original Code or previous Modifications.

B. Any new file that contains any part of the Original Code or previous Modifications.

1.10. "Original Code" means Source Code of computer software code which is described in the Source Code notice required by Exhibit A as Original Code, and which, at the time of its release under this License is not already Covered Code governed by this License.

1.10.1. "Patent Claims" means any patent claim(s), now owned or hereafter acquired, including without limitation, method, process, and apparatus claims, in any patent Licensable by grantor.

1.11. "Source Code" means the preferred form of the Covered Code for making modifications to it, including all modules it contains, plus any associated interface definition files, scripts used to control compilation and installation of an Executable, or source code differential comparisons against either the Original Code or another well known, available Covered Code of the Contributor's choice. The Source Code can be in a compressed or archival form, provided the appropriate decompression or de-archiving software is widely available for no charge.

1.12. "You" (or "Your") means an individual or a legal entity exercising rights under, and complying with all of the terms of, this License or a future version of this License issued under Section 6.1. For legal entities, "You" includes any entity which controls, is controlled by, or is under common control with You. For purposes of this definition, "control" means (a) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (b) ownership of more than fifty percent (50%) of the outstanding shares or beneficial ownership of such entity.

2. Source Code License.

2.1. The Initial Developer Grant.
The Initial Developer hereby grants You a world-wide, royalty-free, non-exclusive license, subject to third party intellectual property claims:

(a) under intellectual property rights (other than patent or trademark) Licensable by Initial Developer to use, reproduce, modify, display, perform, sublicense and distribute the Original Code (or portions thereof) with or without Modifications, and/or as part of a Larger Work; and

(b) under Patents Claims infringed by the making, using or selling of Original Code, to make, have made, use, practice, sell, and offer for sale, and/or otherwise dispose of the Original Code (or portions thereof).

(c) the licenses granted in this Section 2.1(a) and (b) are effective on the date Initial Developer first distributes Original Code under the terms of this License.

(d) Notwithstanding Section 2.1(b) above, no patent license is granted: 1) for code that You delete from the Original Code; 2) separate from the Original Code; or 3) for infringements caused by: i) the modification of the Original Code or ii) the combination of the Original Code with other software or devices.

2.2. Contributor Grant.
Subject to third party intellectual property claims, each Contributor hereby grants You a world-wide, royalty-free, non-exclusive license

(a) under intellectual property rights (other than patent or trademark) Licensable by Contributor, to use, reproduce, modify, display, perform, sublicense and distribute the Modifications created by such Contributor (or portions thereof) either on an unmodified basis, with other Modifications, as Covered Code and/or as part of a Larger Work; and

(b) under Patent Claims infringed by the making, using, or selling of Modifications made by that Contributor either alone and/or in combination with its Contributor Version (or portions of such combination), to make, use, sell, offer for sale, have made, and/or otherwise dispose of: 1) Modifications made by that Contributor (or portions thereof); and 2) the combination of Modifications made by that Contributor with its Contributor Version (or portions of such combination).

(c) the licenses granted in Sections 2.2(a) and 2.2(b) are effective on the date Contributor first makes Commercial Use of the Covered

Code.

(d) Notwithstanding Section 2.2(b) above, no patent license is granted: 1) for any code that Contributor has deleted from the Contributor Version; 2) separate from the Contributor Version; 3) for infringements caused by: i) third party modifications of Contributor Version or ii) the combination of Modifications made by that Contributor with other software (except as part of the Contributor Version) or other devices; or 4) under Patent Claims infringed by Covered Code in the absence of Modifications made by that Contributor.

3. Distribution Obligations.

3.1. Application of License.
The Modifications which You create or to which You contribute are governed by the terms of this License, including without limitation Section 2.2. The Source Code version of Covered Code may be distributed only under the terms of this License or a future version of this License released under Section 6.1, and You must include a copy of this License with every copy of the Source Code You distribute. You may not offer or impose any terms on any Source Code version that alters or restricts the applicable version of this License or the recipients' rights hereunder. However, You may include an additional document offering the additional rights described in Section 3.5.

3.2. Availability of Source Code.
Any Modification which You create or to which You contribute must be made available in Source Code form under the terms of this License either on the same media as an Executable version or via an accepted Electronic Distribution Mechanism to anyone to whom you made an Executable version available; and if made available via Electronic Distribution Mechanism, must remain available for at least twelve (12) months after the date it initially became available, or at least six (6) months after a subsequent version of that particular Modification has been made available to such recipients. You are responsible for ensuring that the Source Code version remains available even if the Electronic Distribution Mechanism is maintained by a third party.

3.3. Description of Modifications.
You must cause all Covered Code to which You contribute to contain a file documenting the changes You made to create that Covered Code and the date of any change. You must include a prominent statement that the Modification is derived, directly or indirectly, from Original Code provided by the Initial Developer and including the name of the Initial Developer in (a) the Source Code, and (b) in any notice in an Executable version or related documentation in which You describe the origin or ownership of the Covered Code.

3.4. Intellectual Property Matters
(a) Third Party Claims.
If Contributor has knowledge that a license under a third party's intellectual property rights is required to exercise the rights granted by such Contributor under Sections 2.1 or 2.2, Contributor must include a text file with the Source Code distribution titled "LEGAL" which describes the claim and the party making the claim in sufficient detail that a recipient will know whom to contact. If Contributor obtains such knowledge after the Modification is made available as described in Section 3.2, Contributor shall promptly modify the LEGAL file in all copies Contributor makes available thereafter and shall take

other steps (such as notifying appropriate mailing lists or newsgroups) reasonably calculated to inform those who received the Covered Code that new knowledge has been obtained.

(b) Contributor APIs.
If Contributor's Modifications include an application programming interface and Contributor has knowledge of patent licenses which are reasonably necessary to implement that API, Contributor must also include this information in the LEGAL file.

(c) Representations.
Contributor represents that, except as disclosed pursuant to Section 3.4(a) above, Contributor believes that Contributor's Modifications are Contributor's original creation(s) and/or Contributor has sufficient rights to grant the rights conveyed by this License.

3.5. Required Notices.
You must duplicate the notice in Exhibit A in each file of the Source Code. If it is not possible to put such notice in a particular Source Code file due to its structure, then You must include such notice in a location (such as a relevant directory) where a user would be likely to look for such a notice. If You created one or more Modification(s) You may add your name as a Contributor to the notice described in Exhibit A. You must also duplicate this License in any documentation for the Source Code where You describe recipients' rights or ownership rights relating to Covered Code. You may choose to offer, and to charge a fee for, warranty, support, indemnity or liability obligations to one or more recipients of Covered Code. However, You may do so only on Your own behalf, and not on behalf of the Initial Developer or any Contributor. You must make it absolutely clear than any such warranty, support, indemnity or liability obligation is offered by You alone, and You hereby agree to indemnify the Initial Developer and every Contributor for any liability incurred by the Initial Developer or such Contributor as a result of warranty, support, indemnity or liability terms You offer.

3.6. Distribution of Executable Versions.
You may distribute Covered Code in Executable form only if the requirements of Section 3.1-3.5 have been met for that Covered Code, and if You include a notice stating that the Source Code version of the Covered Code is available under the terms of this License, including a description of how and where You have fulfilled the obligations of Section 3.2. The notice must be conspicuously included in any notice in an Executable version, related documentation or collateral in which You describe recipients' rights relating to the Covered Code. You may distribute the Executable version of Covered Code or ownership rights under a license of Your choice, which may contain terms different from this License, provided that You are in compliance with the terms of this License and that the license for the Executable version does not attempt to limit or alter the recipient's rights in the Source Code version from the rights set forth in this License. If You distribute the Executable version under a different license You must make it absolutely clear that any terms which differ from this License are offered by You alone, not by the Initial Developer or any Contributor. You hereby agree to indemnify the Initial Developer and every Contributor for any liability incurred by the Initial Developer or such Contributor as a result of any such terms You offer.

3.7. Larger Works.
You may create a Larger Work by combining Covered Code with other code not governed by the terms of this License and distribute the Larger Work as a single product. In such a case, You must make sure the requirements of this License are fulfilled for the Covered Code.

4. Inability to Comply Due to Statute or Regulation.

If it is impossible for You to comply with any of the terms of this License with respect to some or all of the Covered Code due to statute, judicial order, or regulation then You must: (a) comply with the terms of this License to the maximum extent possible; and (b) describe the limitations and the code they affect. Such description must be included in the LEGAL file described in Section 3.4 and must be included with all distributions of the Source Code. Except to the extent prohibited by statute or regulation, such description must be sufficiently detailed for a recipient of ordinary skill to be able to understand it.

5. Application of this License.

This License applies to code to which the Initial Developer has attached the notice in Exhibit A and to related Covered Code.

6. Versions of the License.

6.1. New Versions.
Netscape Communications Corporation ("Netscape") may publish revised and/or new versions of the License from time to time. Each version will be given a distinguishing version number.

6.2. Effect of New Versions.
Once Covered Code has been published under a particular version of the License, You may always continue to use it under the terms of that version. You may also choose to use such Covered Code under the terms of any subsequent version of the License published by Netscape. No one other than Netscape has the right to modify the terms applicable to Covered Code created under this License.

6.3. Derivative Works.
If You create or use a modified version of this License (which you may only do in order to apply it to code which is not already Covered Code governed by this License), You must (a) rename Your license so that the phrases "Mozilla", "MOZILLAPL", "MOZPL", "Netscape", "MPL", "NPL" or any confusingly similar phrase do not appear in your license (except to note that your license differs from this License) and (b) otherwise make it clear that Your version of the license contains terms which differ from the Mozilla Public License and Netscape Public License. (Filling in the name of the Initial Developer, Original Code or Contributor in the notice described in Exhibit A shall not of themselves be deemed to be modifications of this License.)

7. DISCLAIMER OF WARRANTY.

COVERED CODE IS PROVIDED UNDER THIS LICENSE ON AN "AS IS" BASIS, WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES THAT THE COVERED CODE IS FREE OF DEFECTS, MERCHANTABLE, FIT FOR A PARTICULAR PURPOSE OR NON-INFRINGING. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE COVERED CODE IS WITH YOU. SHOULD ANY COVERED CODE PROVE

DEFECTIVE IN ANY RESPECT, YOU (NOT THE INITIAL DEVELOPER OR ANY OTHER CONTRIBUTOR) ASSUME THE COST OF ANY NECESSARY SERVICING, REPAIR OR CORRECTION. THIS DISCLAIMER OF WARRANTY CONSTITUTES AN ESSENTIAL PART OF THIS LICENSE. NO USE OF ANY COVERED CODE IS AUTHORIZED HEREUNDER EXCEPT UNDER THIS DISCLAIMER.

8. TERMINATION.

8.1. This License and the rights granted hereunder will terminate automatically if You fail to comply with terms herein and fail to cure such breach within 30 days of becoming aware of the breach. All sublicenses to the Covered Code which are properly granted shall survive any termination of this License. Provisions which, by their nature, must remain in effect beyond the termination of this License shall survive.

8.2. If You initiate litigation by asserting a patent infringement claim (excluding declatory judgment actions) against Initial Developer or a Contributor (the Initial Developer or Contributor against whom You file such action is referred to as "Participant") alleging that:

(a) such Participant's Contributor Version directly or indirectly infringes any patent, then any and all rights granted by such Participant to You under Sections 2.1 and/or 2.2 of this License shall, upon 60 days notice from Participant terminate prospectively, unless if within 60 days after receipt of notice You either: (i) agree in writing to pay Participant a mutually agreeable reasonable royalty for Your past and future use of Modifications made by such Participant, or (ii) withdraw Your litigation claim with respect to the Contributor Version against such Participant. If within 60 days of notice, a reasonable royalty and payment arrangement are not mutually agreed upon in writing by the parties or the litigation claim is not withdrawn, the rights granted by Participant to You under Sections 2.1 and/or 2.2 automatically terminate at the expiration of the 60 day notice period specified above.

(b) any software, hardware, or device, other than such Participant's Contributor Version, directly or indirectly infringes any patent, then any rights granted to You by such Participant under Sections 2.1(b) and 2.2(b) are revoked effective as of the date You first made, used, sold, distributed, or had made, Modifications made by that Participant.

8.3. If You assert a patent infringement claim against Participant alleging that such Participant's Contributor Version directly or indirectly infringes any patent where such claim is resolved (such as by license or settlement) prior to the initiation of patent infringement litigation, then the reasonable value of the licenses granted by such Participant under Sections 2.1 or 2.2 shall be taken into account in determining the amount or value of any payment or license.

8.4. In the event of termination under Sections 8.1 or 8.2 above, all end user license agreements (excluding distributors and resellers) which have been validly granted by You or any distributor hereunder prior to termination shall survive termination.

9. LIMITATION OF LIABILITY.

UNDER NO CIRCUMSTANCES AND

UNDER NO LEGAL THEORY, WHETHER TORT (INCLUDING NEGLIGENCE), CONTRACT, OR OTHERWISE, SHALL YOU, THE INITIAL DEVELOPER, ANY OTHER CONTRIBUTOR, OR ANY DISTRIBUTOR OF COVERED CODE, OR ANY SUPPLIER OF ANY OF SUCH PARTIES, BE LIABLE TO ANY PERSON FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY CHARACTER INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF GOODWILL, WORK STOPPAGE, COMPUTER FAILURE OR MALFUNCTION, OR ANY AND ALL OTHER COMMERCIAL DAMAGES OR LOSSES, EVEN IF SUCH PARTY SHALL HAVE BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. THIS LIMITATION OF LIABILITY SHALL NOT APPLY TO LIABILITY FOR DEATH OR PERSONAL INJURY RESULTING FROM SUCH PARTY'S NEGLIGENCE TO THE EXTENT APPLICABLE LAW PROHIBITS SUCH LIMITATION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THIS EXCLUSION AND LIMITATION MAY NOT APPLY TO YOU.

10. U.S. GOVERNMENT END USERS.

The Covered Code is a "commercial item," as that term is defined in 48 C.F.R. 2.101 (Oct. 1995), consisting of "commercial computer software" and "commercial computer software documentation," as such terms are used in 48 C.F.R. 12.212 (Sept. 1995). Consistent with 48 C.F.R. 12.212 and 48 C.F.R. 227.7202-1 through 227.7202-4 (June 1995), all U.S. Government End Users acquire Covered Code with only those rights set forth herein.

11. MISCELLANEOUS.

This License represents the complete agreement concerning subject matter hereof. If any provision of this License is held to be unenforceable, such provision shall be reformed only to the extent necessary to make it enforceable. This License shall be governed by California law provisions (except to the extent applicable law, if any, provides otherwise), excluding its conflict-of-law provisions. With respect to disputes in which at least one party is a citizen of, or an entity chartered or registered to do business in the United States of America, any litigation relating to this License shall be subject to the jurisdiction of the Federal Courts of the Northern District of California, with venue lying in Santa Clara County, California, with the losing party responsible for costs, including without limitation, court costs and reasonable attorneys' fees and expenses. The application of the United Nations Convention on Contracts for the International Sale of Goods is expressly excluded. Any law or regulation which provides that the language of a contract shall be construed against the drafter shall not apply to this License.

12. RESPONSIBILITY FOR CLAIMS.

As between Initial Developer and the Contributors, each party is responsible for claims and damages arising, directly or indirectly, out of its utilization of rights under this License and You agree to work with Initial Developer and Contributors to distribute such responsibility on an equitable basis. Nothing herein is intended or shall be deemed to constitute any admission of liability.

13. MULTIPLE-LICENSED CODE.

Initial Developer may designate portions of the Covered Code as "Multiple-Licensed". "Multiple-Licensed" means that the Initial Developer permits you to utilize portions of the Covered Code under Your choice of the NPL or the alternative licenses, if any, specified by the Initial Developer in the file described in Exhibit A.

EXHIBIT A -Mozilla Public License.

``The contents of this file are subject to the Mozilla Public License Version 1.1 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at http://www.mozilla.org/MPL/

Software distributed under the License is distributed on an "AS IS" basis, WITHOUT WARRANTY OF ANY KIND, either express or implied. See the License for the specific language governing rights and limitations under the License.

The Original Code is ______________________________________.

The Initial Developer of the Original Code is ________________________.
Portions created by ______________________ are Copyright (C) ______ _______________________. All Rights Reserved.

Contributor(s): ______________________________________.

Alternatively, the contents of this file may be used under the terms of the _____ license (the "[___] License"), in which case the provisions of [______] License are applicable instead of those above. If you wish to allow use of your version of this file only under the terms of the [____] License and not to allow others to use your version of this file under the MPL, indicate your decision by deleting the provisions above and replace them with the notice and other provisions required by the [___] License. If you do not delete the provisions above, a recipient may use your version of this file under either the MPL or the [___] License."

[NOTE: The text of this Exhibit A may differ slightly from the text of the notices in the Source Code files of the Original Code. You should use the text of this Exhibit A rather than the text found in the Original Code Source Code for Your Modifications.]

(*4) LGPL+ exceptions:

FLTK License Agreement - The Fast Light Toolkit Home Page[Home | Documentation | FAQ | Links/Bazaar | News | Newsgroups | Polls | Software | Support]

FLTK License Agreement

December 11, 2001

The FLTK library and included programs are provided under the terms of the GNU Library General Public License (LGPL) with the following exceptions:

Modifications to the FLTK configure script, config header file, and makefiles by themselves to support a specific platform do not constitute a modified or derivative work.

The authors do request that such modifications be contributed to the FLTK project - send all contributions to "fltk-bugs@fltk.org".

Widgets that are subclassed from FLTK widgets do not constitute a derivative work.

Static linking of applications and widgets to the FLTK library does not constitute a derivative work and does not require the author to provide source code for the application or widget, use the shared FLTK libraries, or link their applications or widgets against a user-supplied version of FLTK.

If you link the application or widget to a modified version of FLTK, then the changes to FLTK must be provided under the terms of the LGPL in sections 1, 2, and 4.

You do not have to provide a copy of the FLTK license with programs that are linked to the FLTK library, nor do you have to identify the FLTK license in your program or documentation as required by section 6 of the LGPL.

However, programs must still identify their use of FLTK. The following example statement can be included in user documentation to satisfy this requirement:

[program/widget] is based in part on the work of the FLTK project (http://www.fltk.org).

GNU LIBRARY GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1991 Free Software Foundation, Inc.

59 Temple Place - Suite 330, Boston, MA 02111-1307, USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

[This is the first released version of the library GPL. It is numbered 2 because it goes with version 2 of the ordinary GPL.]

Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public Licenses are intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users.

This license, the Library General Public License, applies to some specially designated Free Software Foundation software, and to any other libraries whose authors decide to use it. You can use it for your libraries, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the library, or if you modify it.

For example, if you distribute copies of the library, whether gratis or for a fee, you must give the recipients all the rights that we gave you. You must make sure that they, too, receive or can get the source code. If you link a program with the library, you must provide complete object files to the recipients so that they can relink them with the library, after making changes to the library and recompiling it. And you must show them these terms so they know their rights.

Our method of protecting your rights has two steps: (1) copyright the library, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the library.

Also, for each distributor's protection, we want to make certain that everyone understands that there is no warranty for this free library. If the library is modified by someone else and passed on, we want its recipients to know that what they have is not the original version, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that companies distributing free software will individually obtain patent licenses, thus in effect transforming the program into proprietary software. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

Most GNU software, including some libraries, is covered by the ordinary GNU General Public License, which was designed for utility programs. This license, the GNU Library General Public License, applies to certain designated libraries. This license is quite different from the ordinary one; be sure to read it in full, and don't assume that anything in it is the same as in the ordinary license.

The reason we have a separate public license for some libraries is that they blur the distinction we usually make between modifying or adding to a program and simply using it. Linking a program with a library, without changing the library, is in some sense simply using the library, and is analogous to running a utility program or application program. However, in a textual and legal sense, the linked executable is a combined work, a derivative of the original library, and the ordinary General Public License treats it as such.

Because of this blurred distinction, using the ordinary General Public License for libraries did not effectively promote software sharing, because most developers did not use the libraries. We concluded that weaker conditions might promote sharing better.

However, unrestricted linking of non-free programs would deprive the users of those programs of all benefit from the free status of the libraries themselves. This Library General

Public License is intended to permit developers of non-free programs to use free libraries, while preserving your freedom as a user of such programs to change the free libraries that are incorporated in them. (We have not seen how to achieve this as regards changes in header files, but we have achieved it as regards changes in the actual functions of the Library.) The hope is that this will lead to faster development of free libraries.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, while the latter only works together with the library.

Note that it is possible for a library to be covered by the ordinary General Public License rather than by this special one.

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License Agreement applies to any software library which contains a notice placed by the copyright holder or other authorized party saying it may be distributed under the terms of this Library General Public License (also called "this License"). Each licensee is addressed as "you".

A "library" means a collection of software functions and/or data prepared so as to be conveniently linked with application programs (which use some of those functions and data) to form executables.

The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running a program using the Library is not restricted, and output from such a program is covered only if its contents constitute a work based on the Library (independent of the use of the Library in a tool for writing it). hether that is true depends on what the Library does and what the program that uses the Library does.

1. You may copy and distribute verbatim copies of the Library's complete source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and distribute a copy of this License along with the Library.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Library or any portion of it, thus forming a work based on the Library, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:

The modified work must itself be a software library.

You must cause the files modified to carry prominent notices stating that you changed the files and the date of any change.

You must cause the whole of the work to be licensed at no charge to all third parties under the terms of this License.

If a facility in the modified Library refers to a function or a table of data to be supplied by an application program that uses the facility, other than as an argument passed when the facility is invoked, then you must make a good faith effort to ensure that, in the event an application does not supply such function or table, the facility still operates, and performs whatever part of its purpose remains meaningful. (For example, a function in a library to compute square roots has a purpose that is entirely well-defined independent of the application. Therefore, Subsection 2d requires that any application-supplied function or table used by this function must be optional: if the application does not supply it, the square root function must still compute square roots.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Library, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Library, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Library.

In addition, mere aggregation of another work not based on the Library with the Library (or with a work based on the Library) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may opt to apply the terms of the ordinary GNU General Public License instead of this License to a given copy of the Library. To do this, you must alter all the notices that refer to this License, so that they refer to the ordinary GNU General Public License, version 2, instead of to this License. (If a newer version than version 2 of the ordinary GNU General Public License has appeared, then you can specify that version instead if you wish.) Do not make any other change in these notices. Once this change is made in a given copy, it is irreversible for that copy, so the ordinary GNU General Public License applies to all subsequent copies and derivative works made from that copy.

This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

4. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made

by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

5. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a "work that uses the Library" uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

6. As an exception to the Sections above, you may also compile or link a "work that uses the Library" with the Library to produce a work containing portions of the Library, and distribute that work under terms of your choice, provided that the terms permit modification of the work for the customer's own use and reverse engineering for debugging such modifications.

You must give prominent notice with each copy of the work that the Library is used in it and that the Library and its use are covered by this License. You must supply a copy of this License. If the work during execution displays copyright notices, you must include the copyright notice for the Library among them, as well as a reference directing the user to the copy of this License. Also, you must do one of these things:

Accompany the work with the complete corresponding machine-readable source code for the Library including whatever changes were used in the work (which must be distributed under Sections 1 and 2 above); and, if the work is an executable linked with the Library, with the complete machine-readable "work that uses the Library", as object code and/or source code, so that the user can modify the Library and then relink to produce a modified executable containing the modified Library. (It is understood that the user who changes the contents of definitions files in the Library will not necessarily be able to recompile the application to use the modified definitions.)

Accompany the work with a written

offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution. If distribution of the work is made by offering access to copy from a designated place, offer equivalent access to copy the above specified materials from the same place.

Verify that the user has already received a copy of these materials or that you have already sent this user a copy.

For an executable, the required form of the "work that uses the Library" must include any data and utility programs needed for reproducing the executable from it. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

It may happen that this requirement contradicts the license restrictions of other proprietary libraries that do not normally accompany the operating system. Such a contradiction means you cannot use both them and the Library together in an executable that you distribute.

7. You may place library facilities that are a work based on the Library side-by-side in a single library together with other library facilities not covered by this License, and distribute such a combined library, provided that the separate distribution of the work based on the Library and of the other library facilities is otherwise permitted, and provided that you do these two things:

Accompany the combined library with a copy of the same work based on the Library, uncombined with any other library facilities. This must be distributed under the terms of the Sections above.

Give prominent notice with the combined library of the fact that part of it is a work based on the Library, and explaining where to find the accompanying uncombined form of the same work.

8. You may not copy, modify, sublicense, link with, or distribute the Library except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, link with, or distribute the Library is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.

9. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Library or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Library (or any work based on the Library), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Library or works based on it.

10. Each time you redistribute the Library (or any work based on the Library), the recipient automatically receives a license from the original licensor to copy, distribute, link with or modify the Library subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.

11. If, as a consequence of a court judgment or allegation of patent

infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Library at all. For example, if a patent license would not permit royalty-free redistribution of the Library by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Library.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply, and the section as a whole is intended to apply in other circumstances. It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

12. If the distribution and/or use of the Library is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Library under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.

13. The Free Software Foundation may publish revised and/or new versions of the Library General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Library specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Library does not specify a license version number, you may choose any version ever published by the Free Software Foundation.

14. If you wish to incorporate parts of the Library into other free programs whose distribution conditions are incompatible with these, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

15. BECAUSE THE LIBRARY IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR

THE LIBRARY, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE LIBRARY "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE LIBRARY IS WITH YOU. SHOULD THE LIBRARY PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.

16. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE LIBRARY AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE LIBRARY (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE LIBRARY TO OPERATE WITH ANY OTHER SOFTWARE), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS

All source and documentation © 1998-2003 Bill Spitzak and others. Send questions and comments concerning this site to "webmaster at fltk dot org". This library is free software; you can redistribute it and/or modify it under the terms of the FLTK License Agreement.

(*5) Apache License 1.0

LICENSE ISSUES
==============

The OpenSSL toolkit stays under a double license, i.e. both the conditions of the OpenSSL License and the original SSLeay license apply to the toolkit. See below for the actual license texts.

OpenSSL License
----

* EXPRESSED OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE
* IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
* PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE OpenSSL PROJECT OR
* ITS CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL,
* SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT
* NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;
* LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)
* HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT,
* STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE)
* ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED
* OF THE POSSIBILITY OF SUCH DAMAGE.
*
==
*
* This product includes cryptographic software written by Eric Young
* (eay@cryptsoft.com). This product includes software written by Tim
* Hudson (tjh@cryptsoft.com).
*
*/

Original SSLeay License

/* Copyright (C) 1995-1998 Eric Young (eay@cryptsoft.com)
* All rights reserved.
*
* This package is an SSL implementation written
* by Eric Young (eay@cryptsoft.com).
* The implementation was written so as to conform with Netscapes SSL.
*
* This library is free for commercial and non-commercial use as long as
* the following conditions are aheared to. The following conditions
* apply to all code found in this distribution, be it the RC4, RSA,
* lhash, DES, etc., code; not just the SSL code. The SSL documentation
* included with this distribution is covered by the same copyright terms
* except that the holder is Tim Hudson (tjh@cryptsoft.com).
*
* Copyright remains Eric Young's, and as such any Copyright notices in
* the code are not to be removed.
* If this package is used in a product, Eric Young should be given attribution
* as the author of the parts of the library used.
* This can be in the form of a textual message at program startup or
* in documentation (online or textual) provided with the package.
*
* Redistribution and use in source and binary forms, with or without
* modification, are permitted provided that the following conditions
* are met:

```
 * 1. Redistributions of source code must retain the copyright
 *      notice, this list of conditions and the following disclaimer.
 * 2. Redistributions in binary form must reproduce the above copyright
 *      notice, this list of conditions and the following disclaimer in the
 *      documentation and/or other materials provided with the distribution.
 * 3. All advertising materials mentioning features or use of this software
 *      must display the following acknowledgement:
 *      "This product includes cryptographic software written by
 *        Eric Young (eay@cryptsoft.com)"
 *      The word 'cryptographic' can be left out if the rouines from the library
 *      being used are not cryptographic related :-).
 * 4. If you include any Windows specific code (or a derivative thereof) from
 *      the apps directory (application code) you must include an acknowledgement:
 *      "This product includes software written by Tim Hudson (tjh@cryptsoft.com)"
 *
 * THIS SOFTWARE IS PROVIDED BY ERIC YOUNG ``AS IS'' AND
 * ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO,
THE
 * IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A
PARTICULAR PURPOSE
 * ARE DISCLAIMED.   IN NO EVENT SHALL THE AUTHOR OR CONTRIBUTORS BE
LIABLE
 * FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR
CONSEQUENTIAL
 * DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF
SUBSTITUTE GOODS
 * OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS
INTERRUPTION)
 * HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN
CONTRACT, STRICT
 * LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN
ANY WAY
 * OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY
OF
 * SUCH DAMAGE.
 *
 * The licence and distribution terms for any publically available version or
 * derivative of this code cannot be changed.   i.e. this code cannot simply be
 * copied and put under another distribution licence
 * [including the GNU Public Licence.]
 */
```

(*6) Apache License 2.0

Apache License
Version 2.0, January 2004
http://www.apache.org/licenses/

TERMS AND CONDITIONS FOR USE, REPRODUCTION, AND DISTRIBUTION

1. Definitions.

"License" shall mean the terms and conditions for use, reproduction, and distribution as defined by Sections 1 through 9 of this document.

"Licensor" shall mean the copyright owner or entity authorized by the copyright owner that is granting the License.

"Legal Entity" shall mean the union of the acting entity and all other entities that control, are controlled by, or are under common control with that entity. For the purposes of this definition, "control" means (i) the power, direct or indirect, to cause the direction or management of such entity, whether by contract or otherwise, or (ii) ownership of fifty percent (50%) or more of the outstanding shares, or (iii) beneficial ownership of such entity.

"You" (or "Your") shall mean an individual or Legal Entity exercising permissions granted by this License.

"Source" form shall mean the preferred form for making modifications, including but not limited to software source code, documentation source, and configuration files.

"Object" form shall mean any form resulting from mechanical transformation or translation of a Source form, including but not limited to compiled object code, generated documentation, and conversions to other media types.

"Work" shall mean the work of authorship, whether in Source or Object form, made available under the License, as indicated by a copyright notice that is included in or attached to the work (an example is provided in the Appendix below).

"Derivative Works" shall mean any work, whether in Source or Object form, that is based on (or derived from) the Work and for which the editorial revisions, annotations, elaborations, or other modifications
represent, as a whole, an original work of authorship. For the purposes of this License, Derivative Works shall not include works that remain separable from, or merely link (or bind by name) to the interfaces of, the Work and Derivative Works thereof.

"Contribution" shall mean any work of authorship, including the original version of the Work and any modifications or additions to that Work or Derivative Works thereof, that is intentionally submitted to Licensor for inclusion in the Work by the copyright owner or by an individual or Legal Entity authorized to submit on behalf of the copyright owner. For the purposes of this definition, "submitted" means any form of electronic, verbal, or written communication sent to the Licensor or its representatives, including but not limited to communication on electronic mailing lists, source code control systems, and issue tracking systems that are managed by, or on behalf of, the Licensor for the purpose of discussing and improving the Work, but excluding communication that is conspicuously marked or otherwise designated in writing by the copyright owner as "Not a Contribution."

"Contributor" shall mean Licensor and any individual or Legal Entity on behalf of whom a Contribution has been received by Licensor and subsequently incorporated within the Work.

2. Grant of Copyright License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable copyright license to reproduce, prepare Derivative Works of, publicly display, publicly perform, sublicense, and distribute the Work and such Derivative Works in Source or Object form.

3. Grant of Patent License. Subject to the terms and conditions of this License, each Contributor hereby grants to You a perpetual, worldwide, non-exclusive, no-charge, royalty-free, irrevocable (except as stated in this section) patent license to make, have made, use, offer to sell, sell, import, and otherwise transfer the Work, where such license applies only to those patent claims licensable by such Contributor that are necessarily infringed by their Contribution(s) alone or by combination of their Contribution(s) with the Work to which such Contribution(s) was submitted. If You institute patent litigation against any entity (including a cross-claim or counterclaim in a lawsuit) alleging that the Work or a Contribution incorporated within the Work constitutes direct or contributory patent infringement, then any patent licenses granted to You under this License for that Work shall terminate as of the date such litigation is filed.

4. Redistribution. You may reproduce and distribute copies of the Work or Derivative Works thereof in any medium, with or without modifications, and in Source or Object form, provided that You meet the following conditions:

(a) You must give any other recipients of the Work or Derivative Works a copy of this License; and

(b) You must cause any modified files to carry prominent notices stating that You changed the files; and

(c) You must retain, in the Source form of any Derivative Works that You distribute, all copyright, patent, trademark, and attribution notices from the Source form of the Work, excluding those notices that do not pertain to any part of the Derivative Works; and

(d) If the Work includes a "NOTICE" text file as part of its distribution, then any Derivative Works that You distribute must include a readable copy of the attribution notices contained within such NOTICE file, excluding those notices that do not pertain to any part of the Derivative Works, in at least one of the following places: within a NOTICE text file distributed as part of the Derivative Works; within the Source form or documentation, if provided along with the Derivative Works; or, within a display generated by the Derivative Works, if and wherever such third-party notices normally appear. The contents of the NOTICE file are for informational purposes only and do not modify the License. You may add Your own attribution notices within Derivative Works that You distribute, alongside or as an addendum to the NOTICE text from the Work, provided that such additional attribution notices cannot be construed as modifying the License.

You may add Your own copyright statement to Your modifications and may provide additional or different license terms and conditions for use, reproduction, or distribution of Your modifications, or for any such Derivative Works as a whole, provided Your use, reproduction, and distribution of the Work otherwise complies with the conditions stated in this License.

5. Submission of Contributions. Unless You explicitly state otherwise, any Contribution intentionally submitted for inclusion in the Work by You to the Licensor shall be under the terms and conditions of this License, without any additional terms or conditions. Notwithstanding the above, nothing herein shall supersede or modify the terms of any separate license agreement you may have executed with Licensor regarding such Contributions.

6. Trademarks. This License does not grant permission to use the trade names, trademarks, service marks, or product names of the Licensor, except as required for reasonable and customary use in describing the origin of the Work and reproducing the content of the NOTICE file.

7. Disclaimer of Warranty. Unless required by applicable law or agreed to in writing, Licensor provides the Work (and each Contributor provides its Contributions) on an "AS IS" BASIS, WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or

implied, including, without limitation, any warranties or conditions of TITLE, NON-INFRINGEMENT, MERCHANTABILITY, or FITNESS FOR A PARTICULAR PURPOSE. You are solely responsible for determining the appropriateness of using or redistributing the Work and assume any risks associated with Your exercise of permissions under this License.

8. Limitation of Liability. In no event and under no legal theory, whether in tort (including negligence), contract, or otherwise, unless required by applicable law (such as deliberate and grossly negligent acts) or agreed to in writing, shall any Contributor be liable to You for damages, including any direct, indirect, special, incidental, or consequential damages of any character arising as a result of this License or out of the use or inability to use the Work (including but not limited to damages for loss of goodwill, work stoppage, computer failure or malfunction, or any and all other commercial damages or losses), even if such Contributor has been advised of the possibility of such damages.

9. Accepting Warranty or Additional Liability. While redistributing the Work or Derivative Works thereof, You may choose to offer, and charge a fee for, acceptance of support, warranty, indemnity, or other liability obligations and/or rights consistent with this License. However, in accepting such obligations, You may act only on Your own behalf and on Your sole responsibility, not on behalf of any other Contributor, and only if You agree to indemnify, defend, and hold each Contributor harmless for any liability incurred by, or claims asserted against, such Contributor by reason of your accepting any such warranty or additional liability.

END OF TERMS AND CONDITIONS

APPENDIX: How to apply the Apache License to your work.

To apply the Apache License to your work, attach the following boilerplate notice, with the fields enclosed by brackets "{}" replaced with your own identifying information. (Don't include the brackets!) The text should be enclosed in the appropriate comment syntax for the file format. We also recommend that a file or class name and description of purpose be included on the same "printed page" as the copyright notice for easier identification within third-party archives.

Copyright 2015 Lorenzo Fontana

Licensed under the Apache License, Version 2.0 (the "License"); you may not use this file except in compliance with the License. You may obtain a copy of the License at

http://www.apache.org/licenses/LICENSE-2.0

(*8) MIT (JQuery):

(*9) Permissive free software license:

fontconfig/COPYING

(*10) libpng:

This copy of the libpng notices is provided for your convenience. In case of any discrepancy between this copy and the notices in the file png.h that is included in the libpng distribution, the latter shall prevail.

TRADEMARK:

The name "libpng" has not been registered by the Copyright owner as a trademark in any jurisdiction. However, because libpng has been distributed and maintained world-wide, continually since 1995, the Copyright owner claims "common-law trademark protection" in any jurisdiction where common-law trademark is recognized.

OSI CERTIFICATION:

Libpng is OSI Certified Open Source Software. OSI Certified Open Source is a certification mark of the Open Source Initiative. OSI has not addressed the additional disclaimers inserted at version 1.0.7.

EXPORT CONTROL:

The Copyright owner believes that the Export Control Classification Number (ECCN) for libpng is EAR99, which means not subject to export controls or International Traffic in Arms Regulations (ITAR) because it is open source, publicly available software, that does not contain any encryption software. See the EAR, paragraphs 734.3(b)(3) and 734.7(b).

Glenn Randers-Pehrson
glennrp at users.sourceforge.net
1-Apr-17

(*11) wpa_supplicant:

WPA Supplicant
==============

This program is licensed under the BSD license (the one with
advertisement clause removed).

If you are submitting changes to the project, please see CONTRIBUTIONS
file for more instructions.

License

This software may be distributed, used, and modified under the terms of
BSD license:

Redistribution and use in source and binary forms, with or without
modification, are permitted provided that the following conditions are
met:

1. Redistributions of source code must retain the above copyright
   notice, this list of conditions and the following disclaimer.

2. Redistributions in binary form must reproduce the above copyright
   notice, this list of conditions and the following disclaimer in the
   documentation and/or other materials provided with the distribution.

3. Neither the name(s) of the above-listed copyright holder(s) nor the
   names of its contributors may be used to endorse or promote products
   derived from this software without specific prior written permission.

THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND
CONTRIBUTORS
"AS IS" AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT
LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS
FOR
A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL THE
COPYRIGHT
OWNER OR CONTRIBUTORS BE LIABLE FOR ANY DIRECT, INDIRECT,
INCIDENTAL,
SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT
LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF
USE,

DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY
THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT
(INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE
OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

(*12) Other:

(*13) Other:

(*14) MIT:

References are to page numbers.

U

V

W

Index