

PRODUCT INTRODUCTION

MW9077A/A1/A2/B

OTDR Module

ANRITSU CORPORATION

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Product Introduction MW9077A/A1/A2/B OTDR Module

February 7th 2006

IP Network Division
Product Marketing dept.

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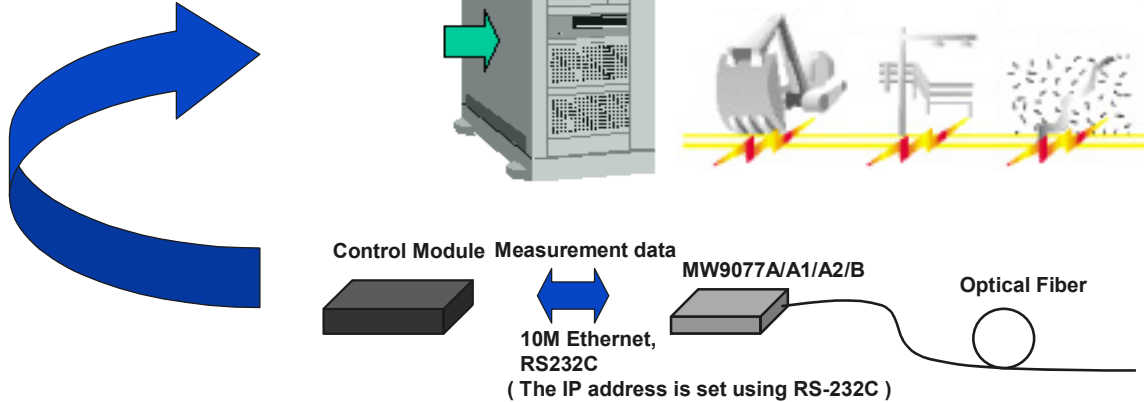
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This time, we have developed the Anritsu MW9077A/A1/A2/B OTDR module. This document describes the MW9077A/A1/A2/B OTDR module.

Product Outline

**High-performance,
Compact unit,
Mountable type
OTDR !**

**For optical fiber
monitoring !**



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I will first provide an outline of the MW9077A/A1/A2/B OTDR module.

The MW9077A/A1/A2/B OTDR module is a mountable type OTDR module in a high-performance, compact unit designed for optical fiber monitoring. The OTDR module has been developed as an OTDR to support measurement operations. This is done by connecting to the customer's interface board (control module) and sending various types of remote commands.

The MW9077A/A1/A2/B OTDR module is designed for use in an optical fiber monitoring system. The OTDR module can measure the total loss of the fiber, interval loss between connectors, and optical fiber length.

Because of its compact design, the MW9077A/A1/A2/B is ideal for use in the maintenance of optical fiber.

Moreover, the MW9077A/A1 provides RS-232C and 10M Ethernet interfaces as standard. (The IP address is set using RS-232C.) Measurements can be performed by selecting the interface that matches the customer's environment.

MW9077A/A1/A2/B Modules Outline



- **MW9077A OTDR Module**
Wavelength 1310nm (1310nm±25nm)
- **MW9077A1 OTDR Module**
Wavelength 1550nm (1550nm±25nm)
- **MW9077A2 OTDR Module**
Wavelength 1625nm (1620nm±25nm)
- **MW9077B OTDR Module**
Wavelength 1310/1550nm(1310/1550nm±25nm)

- **Module miniaturization**

Less than A5 size (200mm × 130mm × 25mm)

- **Usable over a wide temperature range**

Performance from -5°C to +55°C (MW9077A/A1/B)

- **High performance utilizing MW9076 OTDR technology**

Wide Dynamic Range (41dB(25°C), 39dB(-5°C to +55°C),(MW9077A))

Short dead zone (5m(Fresnel reflection, Typ.2m),
20m(Backscattered light))

- **Enable measurements that meet the monitor conditions and enable high-speed data transfer**

10M Ethernet and RS-232C interfaces
(The IP address is set using RS-232C)

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In the following sections, I will describe the configuration of the MW9077A/A1/A2/B OTDR module.

Four types of modules are provided: the MW9077A for handling wavelengths of 1310 nm, the MW9077A1 for handling wavelengths of 1550nm, the MW9077A2 for handling wavelengths of 1625nm and the MW9077B for handling wavelengths of 1310/1550 nm.

The MW9077A/A1/A2/B OTDR module comes as a compact unit measuring less than A5 size. The module also provides for standardized performance over a wide temperature range from -5 to +55°C. (MW9077A2/B is stable to +25°C) Moreover, the module utilizes the technology of the MW9076 series, which has been widely used as field measuring instruments. The module offers dynamic ranges of 41 dB (25°C) and 39 dB (-5 to +55°C)(MW9077A), which are essential measurement parameters. In addition, the module has short dead zones of 5 m (Fresnel reflection) and 20 m (backscattered light). (For details about the MW9076 series, please refer to the product introductions and catalogs of the MW9076 series products.)

In addition, the 10M Ethernet interface mounted in the module enable measurements that meet the monitor conditions and enable high-speed data transfer.

Product concept (1/3)

- **Module miniaturization**
 - Less than A5 size(200mm x 130mm x 25mm)
- Usable over a wide temperature range
 - Performance from -5°C to +55°C (MW9077A/A1/B)
- High performance utilizing MW9076 OTDR technology
 - Dynamic Range(41dB(25°C), 39dB(-5°C to +55°C), MW9077A)
 - Dead zone (5m(Fresnel reflection, Typ.2m), 20m(Backscattered light))
- Measurements that match the monitor conditions and high-speed data transfer
 - Sweep waveforms at approximately one-second intervals
- Detailed operation enabled from the control unit
 - 10M Ethernet interface
(The IP address is set using RS-232C)
 - For setting the measurement conditions, transferring the waveform data to the control unit, and transferring files

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- Module miniaturization

When designing a monitor system, one important point that must be taken into consideration is the space factor. The system conditions must be met within the prescribed space. Therefore, using a compact module is an effective step toward achieving the system design requirements. Using a compact module also enables the overall monitor system to be reduced in size, which will also lead to reduced cost of the entire system.

The MW9077A/A1/A2/B OTDR module comes as a compact unit measuring less than A5 size (200 mm x 130 mm x 25 mm). Even for strict system conditions, for example, 1U size, there will still be sufficient space to install the module.

Product concept (2/3)

- Module miniaturization
 - Less than A5 size(200mm x 130mm x 25mm)
- Usable over a wide temperature range
 - Performance from -5°C to +55°C (MW9077A/A1/B)
- High performance utilizing MW9076 OTDR technology
 - Dynamic Range(41dB(25°C), 39dB(-5°C to +55°C), MW9077A)
 - Dead zone (5m(Fresnel reflection, Typ.2m), 20m(Backscattered light))
- Measurements that match the monitor conditions and high-speed data transfer
 - Sweep waveforms at approximately one-second intervals
- Detailed operation enabled from the control unit
 - 10M Ethernet interface
(The IP address is set using RS-232C)
 - For setting the measurement conditions, transferring the waveform data to the control unit, and transferring files

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- Usable over a wide temperature range

The ambient temperature during system operation greatly depends on the environmental conditions such as the installation site and the objects being monitored. Even under such temperature changes during operation, it is essential that the functions and performance of the installed module and the reliability of the monitor system be maintained. The MW9077A/A1/A2/B OTDR module has a standardized dynamic range performance from -5 to +55°C (MW9077A/A1), which enables the design of a monitor system that is both safe and secure. In addition, the module provides stable performance even under severe ambient temperatures during system operation.

- High performance utilizing MW9076 OTDR technology

The MW9077A/A1/A2/B OTDR module has been designed utilizing the technology of the MW9076 series modules, which have established reputations as proven field measuring instruments. The dead zones of the module are 5 m (event) and 20 m (back scattering). The dynamic ranges are 41 dB (1310 nm) and 40 dB (1550 nm)(MW9077A). In addition, the sampling resolution is a minimum of 5 cm. The MW9077A/A1 OTDR module offers both compactness and sufficient high performance for monitoring optical fibers.

Product concept (3/3)

- Module miniaturization
 - Less than A5 size(200mm x 130mm x 25mm)
- Usable over a wide temperature range
 - Performance from -5°C to +55°C (MW9077A/A1/B)
- High performance utilizing MW9076 OTDR technology
 - Dynamic Range(41dB(25°C), 39dB(-5°C to +55°C), MW9077A)
 - Dead zone (5m(Fresnel reflection, Typ.2m), 20m(Backscattered light))
- Measurements that match the monitor conditions and high-speed data transfer
 - Sweep waveforms at approximately one-second intervals
- Detailed operation enabled from the control unit
 - 10M Ethernet interface
(The IP address is set using RS-232C)
 - For setting the measurement conditions, transferring the waveform data to the control unit, and transferring files

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- Measurements that match the monitor conditions and high-speed data transfer

The conditions for measuring optical fiber are varied. In some cases, fluctuations over a long period are monitored. For example, an OTDR may be used to measure the optical fiber only once every several hours. In other cases, an OTDR may be used to quickly identify problems when an error occurs in a communications network. An OTDR may also be used to constantly monitor an optical fiber to quickly detect changes that occur in it.

The MW9077A/A1/A2/B OTDR module, which is fully capable of averaging measured waveforms to obtain a waveform with little noise, can also sweep waveforms at approximately one-second intervals. Because the MW9077A/A1/A2/B provides a 10M Ethernet interface, it can transfer the measured waveform data from the MW9077A/A1/A2/B OTDR module to the control unit at high speed. This can be done without any stress to the monitoring of the optical fiber.

- Detailed operation enabled from the control unit

The MW9077A OTDR module has two types of interfaces: 10BaseT Ethernet and RS-232C. (The IP address is set using RS-232C.) These two interfaces are installed from the control unit. Either of these interfaces can be used from the control unit to control the MW9077A/A1/A2/B OTDR module.

The commands provided for controlling the MW9077A/A1/A2/B OTDR module include various functions, for example, for setting the measurement conditions, transferring the waveform data to the control unit, and transferring files. These commands therefore enable detailed settings to be made based on the optical fiber to be monitored.

Differences from MW9076 and MT9080 Series

	MW9077x	MW9076 Series	MT9080 Series
Display unit	None	VGA (640x480, 16 colors)	6.4 type color TFT-LCD (MT9081x)
Input unit	None	Keyboard, Keypad, Rotary encoder,	Keypad
Input Port	10M Ethernet RS-232C (The IP address is set using RS-232C)	RS-232C	None
Main frame	Optical Unit only	Display Unit Optical Unit	1 Unit (Display, Optical)
Measurement functions	OTDR	OTDR OLTS (LD, Power meter, (option))	OTDR LD (Standard) Power Meter (Standard)
Appearance			
	Mountable type	Maintenance, construction (Long distance)	Maintenance, construction (Long, short distance)

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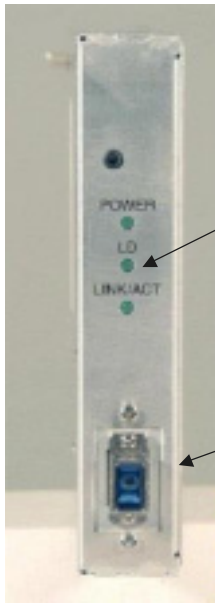
Here, I would like to introduce the main differences from the MW9076 and MT9080 series offered so far by Anritsu to enable the customer to use the MW9077A/A1/A2/B OTDR module.

The MW9076 and MT9080 series that have so far been offered by Anritsu have been used in various fields, including optical fiber manufacturers, construction/building companies, and maintenance-related fields. In particular, many of our customers have used the OTDR integrated with an efficient display for on-site work.

As previously stated, the MW9077A/A1/A2/B module utilizes the technology of the high-performance MW9076 OTDR. This OTDR module has been designed particularly for installation in systems developed for the maintenance of optical fiber. Compared to the MW0976 and MT9080 series, the MW9077A/A1/A2/B OTDR module is of course smaller. It has a compact design for use as a mountable type OTDR.

As described above, the MW9077A/A1/A2/B OTDR module is designed to be integrated into the customer's system to provide the essential functions and operations as a system mountable module.

MW9077A/A1/A2/B Modules (1/2)



Status display LED

Power It illuminates when power is supplied to the OTDR module.

LD It illuminates when LD is emitting radiation.

LINK/ACT It illuminates when the OTDR module is operated by remote control.

Optical connector

OTDR input/output optical connector.
(SC connector fixed, LC connector (option))

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This slide shows the front of the MW9077A/A1/A2/B OTDR module.

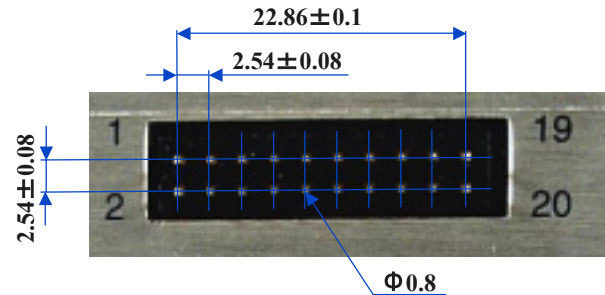
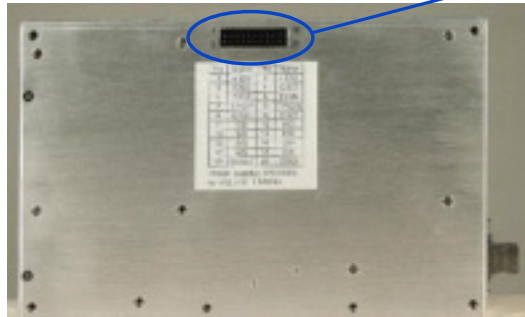
Status display LED

- Power: This LED goes on when power is supplied to the OTDR module.
- LD: This LED goes on when LD is output.
- LINK/ACT: This LED goes on when the OTDR module is controlled using the Ethernet.

Optical connector

OTDR input/output is performed via the optical connector.
An SC connector is used for the optical connector. However, an LC connector can be selected as an option.

MW9077A/A1/A2/B Modules (2/2)



Interface connector

The OTDR has an interface (RS-232C and 10M Ethernet) to read the measurement. (The IP address is set using RS-232C) Commands can be input externally to do the following

- Set up the measurement conditions
- Transfer the waveform data to the control unit
- Read and write to files

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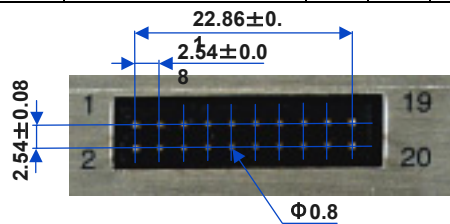
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The MW9077A/A1/A2/B has the interface connector shown in the figure. All commands used for setting up the measurement conditions, starting and stopping measurement, and so on are executed through these interfaces. Both the 10M Ethernet and RS-232C interfaces can be used. (The IP address is set using RS-232C.) Commands can be input externally to do the following:

- Set up the measurement conditions.
- Transfer the waveform data to the control unit.
- Read and write to files.

Arrangement of the connector pins

	I/O	signal	description	pin	I/O	signal	description
1	I	+12V	1.5A tolerance± 1V	2	I	+12V	1.5A tolerance± 1V
3		GND	Chassis and four mounting holes are connected to GND.	4		GND	
5	I	TPIP	Ethernet	6	I	TPIN	Ethernet
7	O	TPOP		8	O	TPON	
9		GND	RS232C	10		GND	RS232C
11		CD		12		RD	
13		SD		14		ER	
15		SG		16		DR	
17		RS		18		CS	
19	I	RESET		TTL level. Active "L" Assert Pin19 for more than 10ms for RESET.	20		



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Ordering Information

- Main frame**

- MW9077A OTDR module :Wavelength 1.31 μ m SC connector (Fixed)"
- MW9077A1 OTDR module "Wavelength 1.55 μ m SC connector (Fixed)"
- MW9077A2 OTDR module "Wavelength 1.625 μ m SC connector (Fixed)"
- MW9077B OTDR module
"Wavelength 1.31/1.55 μ m SC connector (Fixed)"

- Standard accessories**

- W2254AE MW9077A/A1 Operation Manual*1
- *1 A new table is attached at purchase of the MW9077A2/B

- Options**

- MW9077A-01 1550nm filter : Factory option. 1550nm cut filter
- MW9077A-33 LC connector : OTDR +LC connector (Fixed type)
- MW9077A1-33 LC connector : OTDR +LC connector (Fixed type)

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Specifications

	MW9077A	MW9077A1
Central wavelength	1310±25 nm	1550±25 nm
Dynamic range (SNR=1)	41 dB (at 25°C) 39 dB (at -5°C~+55°C)	40 dB (at 25°C) 38 dB (at -5°C~+55°C)
Pulse width	10ns, 30ns, 100ns, 300ns, 1us, 3us, 10us, 20us	
Event deadzone	5 m (Reflectance≤-35 dB, using 10 ns pulse width, Typ.2m)	
Attenuation deadzone	20 m (using 10 ns pulse width)	
Linearity	±0.05 dB/dB or ±0.1dB (whichever is greater)	
Readout resolution (Attenuation)	0.001 dB	
Reflectance measurements accuracy	±2.0 dB	
Distance accuracy	±1m ± 3×10 ⁻⁵ ×distance ± Sampling Spacing	
Group refractive index setting	1.400000~1.699999	
Optical connectors	SC/PC, LC/PC	
Temperature	Operating	-5°C to +55°C
	Storage	-40°C to +70°C
Humidity	≤ 95 % (non-condensing)	
Dimensions and mass	200×130×25 mm、 ≤ 0.6 kg	

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Specifications

	MW9077A2	MW9077B
Central wavelength	1625±25 nm	1310/1550±25 nm
Dynamic range (SNR=1)	37 dB (at 25°C)	39 dB (1.31um,at 25°C)
Pulse width	10ns, 30ns, 100ns, 300ns, 1us, 3us, 10us, 20us	
Event deadzone	5 m (Reflectance≤-35 dB (MW9077A2), Reflectance≤-40 dB (MW9077B), using 10 ns pulse width, Typ. 2m)	
Attenuation deadzone	20 m (using 10 ns pulse width)	
Linearity	±0.05 dB/dB or ±0.1dB (whichever is greater)	
Readout resolution (Attenuation)	0.001 dB	
Reflectance measurements accuracy	±2.0 dB	
Distance accuracy	±1m ± 3×10 ⁻⁵ ×distance ± Sampling Spacing	
Group refractive index setting	1.400000~1.699999	
Optical connectors	SC/PC	
Temperature	Operating	-5°C to +55°C (MW9077B), -5°C to +55°C (MW9077A2)
	Storage	-40°C to +70°C
Humidity	≤ 85 % (non-condensing) (MW9077A2)	
	≤ 95 % (non-condensing) (MW9077B)	
Dimensions and mass	200×130×25 mm、 ≤ 0.6 kg	

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Measurement Applications

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OTDR function

- Loss Measurement
- Splice & Return Loss Measurement
- Total Return Loss Measurement

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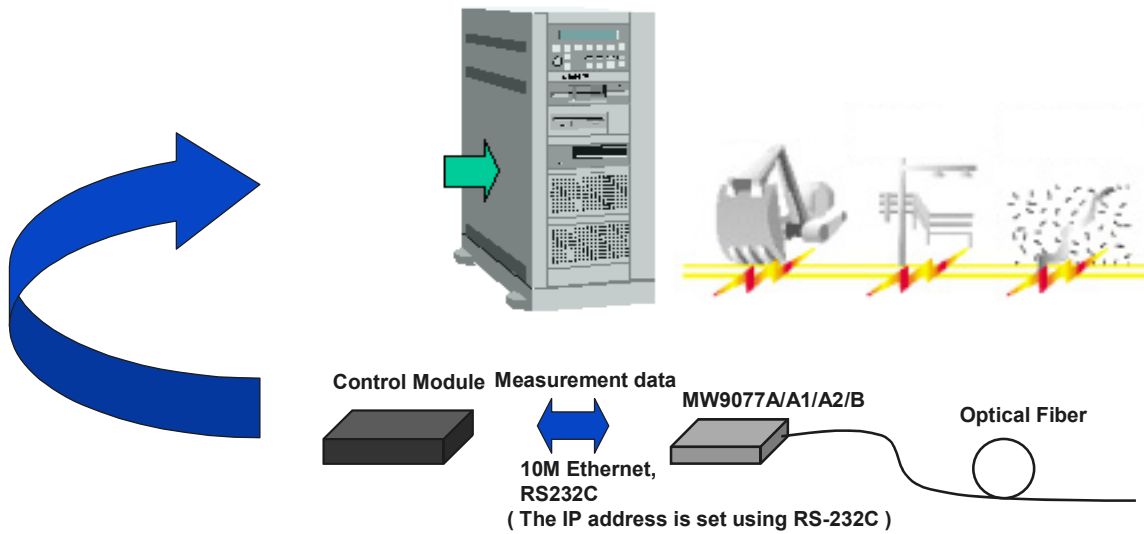
I would now like to introduce the measurement applications.

The measurement applications of the OTDR functions of the MW9077A/A1/A2/B module are introduced here.

The MW9077A/A1/A2/B module has the following OTDR functions called event measurements:

- Loss measurement
- Connection loss and reflection attenuation measurement
- Total reflection attenuation amount (total return loss measurement)

Measurement Application (2/3)



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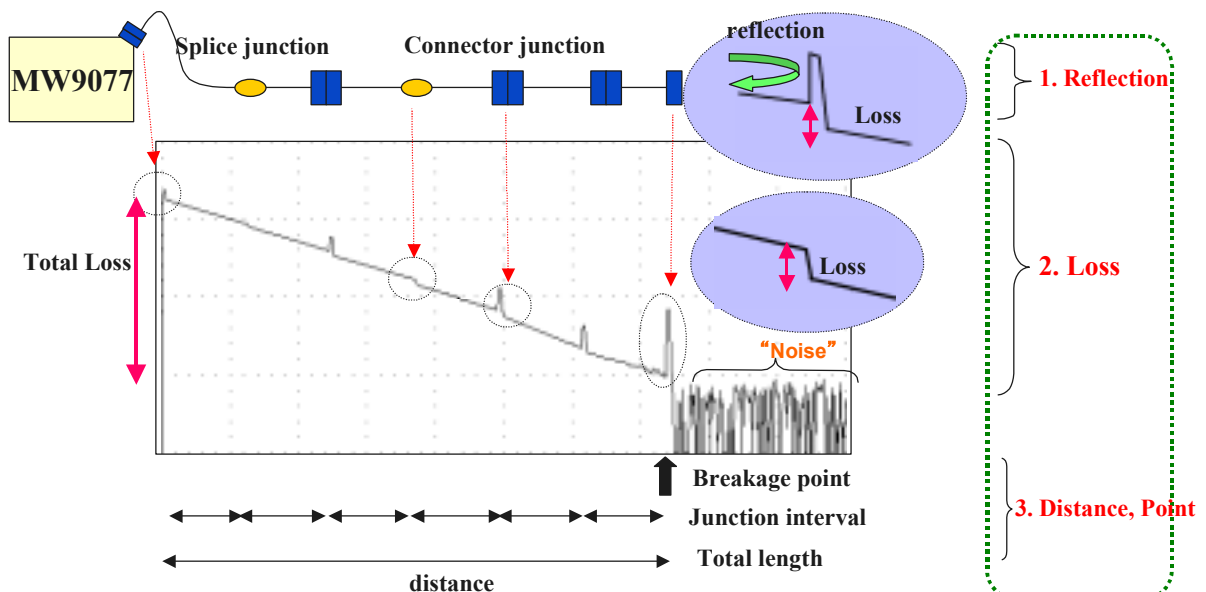
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This slide shows an example of an OTDR measurement environment.

The MW9077A/A1/A2/B OTDR module is connected to the optical fiber to be measured. Long-term monitoring of the optical fiber can be performed, for example, by installing the MW9077A/A1/A2/B OTDR module into a customer's RFTS. The compact MW9077A/A1/A2/B OTDR module, which is capable of operating over a wide temperature range, can provide satisfactory applications that are fully integrated into the customer's system.

The commands required for the desired measurement operation are entered through the control module and passed to the MW9077A/A1/A2/B OTDR module via the interface. After the measurement operation is completed, the measured data is passed to the control module via the interface.

Measurement Application (3/3)



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The MW9077A/A1/A2/B OTDR module measures events automatically (locations of connection points, connection loss, reflection amount, and total fiber connection loss). (Regarding automatic detection, please note that, depending on the measurement environment, not all of the points may be accurately detectable.)

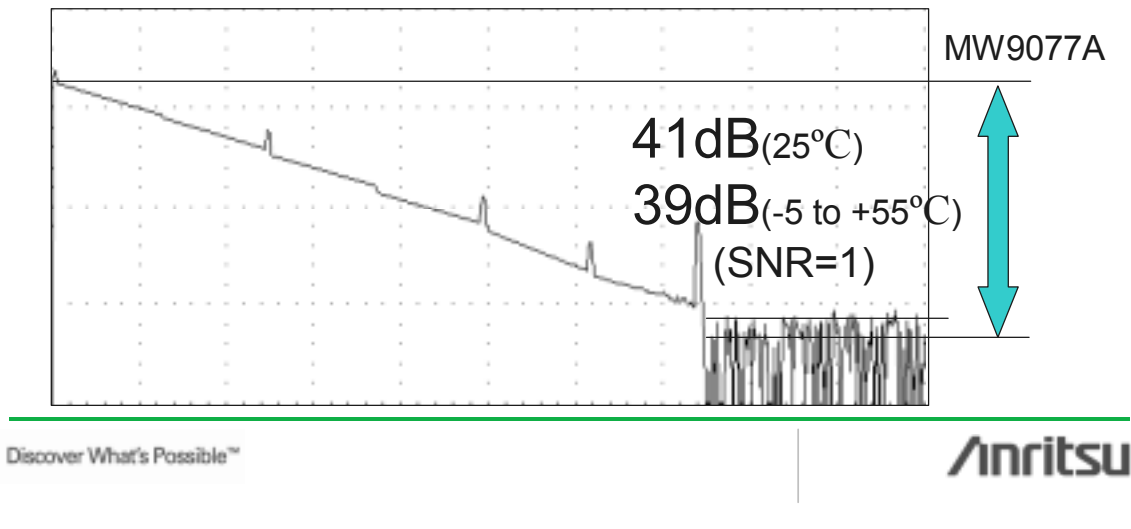
For example, the data obtained from the ODTR module via the interface is processed from an Excel file and graphed. As shown in the slide, various points such as the fusion points, connection points due to differences in levels, and peak waveforms due to connector connections are displayed so that each of the conditions can be checked. The cable length can be measured, including the final optical fiber breakage point. Various measurement results such as the loss between cables and the total loss from the light source up to the breakage point can also be obtained.

- No display unit or emulation software is provided with the MW9077A/A1/A2/B OTDR module.

Wide Dynamic Range

Features :

1. Long-distance fibers can be handled.
 2. The measurement time has been shortened.
- Waveforms having good S/N can be measured quickly.

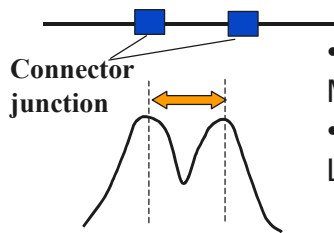


One of the essential parameters when performing OTDR measurements is the dynamic range.

The MW9077A/A1/A2/B OTDR module utilizes the technology inherited from the MW9076 series to provide a wide dynamic range.

The wide dynamic range enables long-distance optical cables to be measured. In addition, waveforms having a good S/N can be measured with reduced measurement time.

Short dead zone

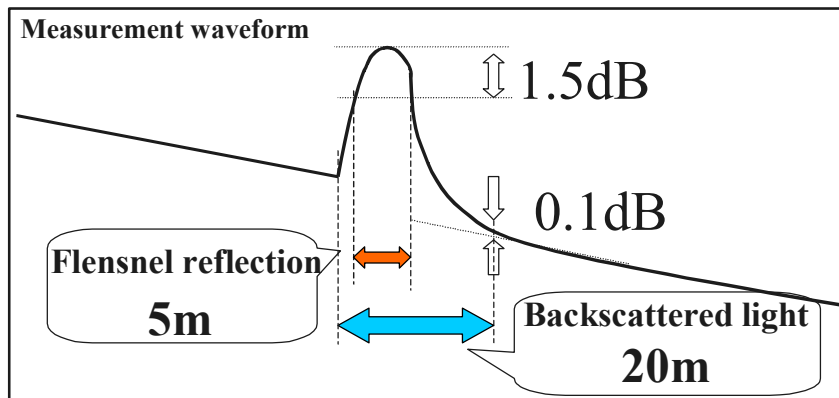


- **Fresnel dead zone**

Minimum distance where two connectors can be identified.

- **Backscattered dead zone**

Loss measurement can be performed after this dead zone.



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The dead zone values of the MW9077 series are 5 m (Fresnel reflection) and 20 m (backscattered light).

From the relationship between the dead zones and dynamic range, minimum-distance optical fibers can be measured for a short pulse width. For a long pulse width, maximum-distance optical fibers can be measured.



Specifications are subject to change without notice.

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