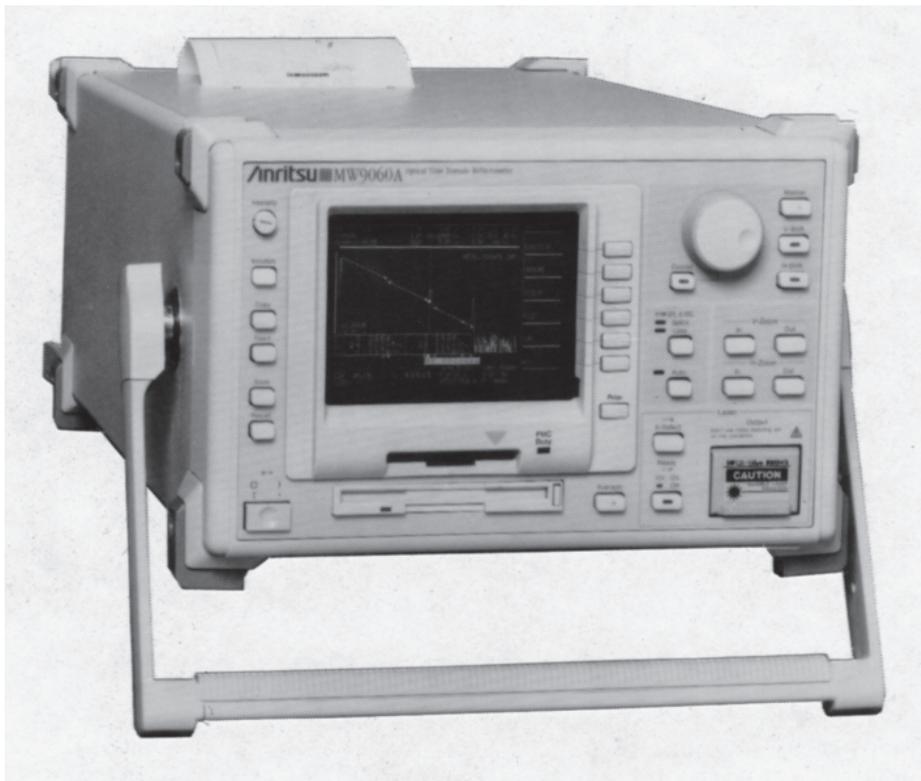


MW9060A

Optical Time Domain Reflectometer



Shortens the measurement time in optical fiber manufacturing, construction, and maintenance

Optical fiber communication networks for the advanced information communication service are being constructed at a high speed. These networks use multi-core optical fiber with up to 1000 cores. The OTDR used in the manufacturing, construction, and maintenance of these optical fibers must provide not only high performance measurement, but also other measurement efficiencies such as short measurement time.

The MW9060A OTDR contains a 3.5-inch FDD and high-speed printer, and maintains the high performance and ease of operation of the MW9040 Series. It also uses a procedure function, event registration function, and other original functions that allow more efficient measurement. Therefore, the MW9060A OTDR is perfect for measurements in the manufacturing, construction, etc. of multi-core optical fiber.

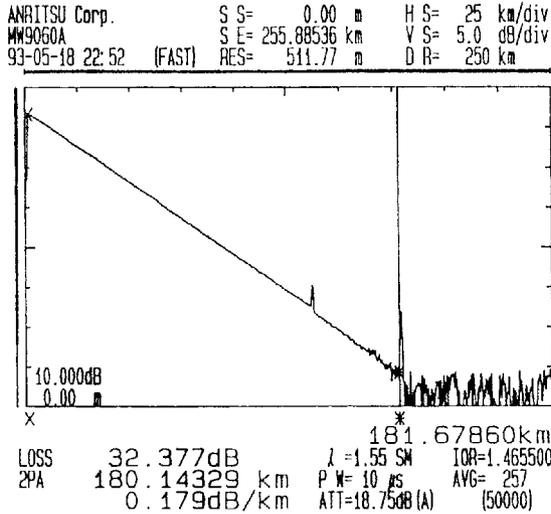
Features

- For long-haul, short-haul, and single-mode/multimode
- 0.3-second high-speed sweep (FAST mode/2PA mode)
- Procedure function and event registration function shorten the measurement time
- Built-in printer and 3.5-inch FD/PMC drive are standard.
- Built-in return loss measurement function

Excellent Basic Performance

Long-haul Optical Fiber Measurement

The MW0945B, and MW0947B plug-in unit have a wide 34/32 dB or greater (1.31/1.55 μm) dynamic range, and can measure fibers over 180 km long. An example of a long-haul fiber measurement with a transmission loss of 0.18 dB/km (1.55 μm) is shown below.

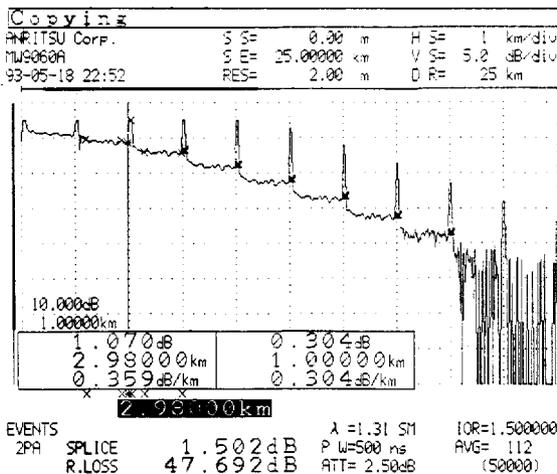


Measurement Waveform Example

Variety of Standard Inputs and Outputs

Built-in High-speed Printer

The screen displayed on the CRT is 73.1 x 57.1 mm, and can be printed out in about 7 seconds. Averaging can be continued and key operations can be performed even during printout. Therefore, there is no waiting time during printout.



Copy Example Using Event Function

High Resolution Measurement

The MW0944B plug-in unit has a spatial resolution of less than 2 m and a near-end dead zone of less than 8 m, making it useful for detecting faults in short optical fibers used in buildings, etc.

PMC and FD Drive

The PMC is a 512 Kbytes type and can store the measurement waveforms of 248 screens. The FD uses MS-DOS * format so that its contents can be read by a personal computer. One FD (2HD) can store the measurement waveforms of 700 screens, as standard. The PMC is more resistant to harsh environmental conditions than the FD. The PMC is very reliable at high temperatures and when data is stored in environments with poor ambient conditions, such as in dusty places.

* MS-DOS is a registered trademark of Microsoft Corporation.

Direct Plotting Function

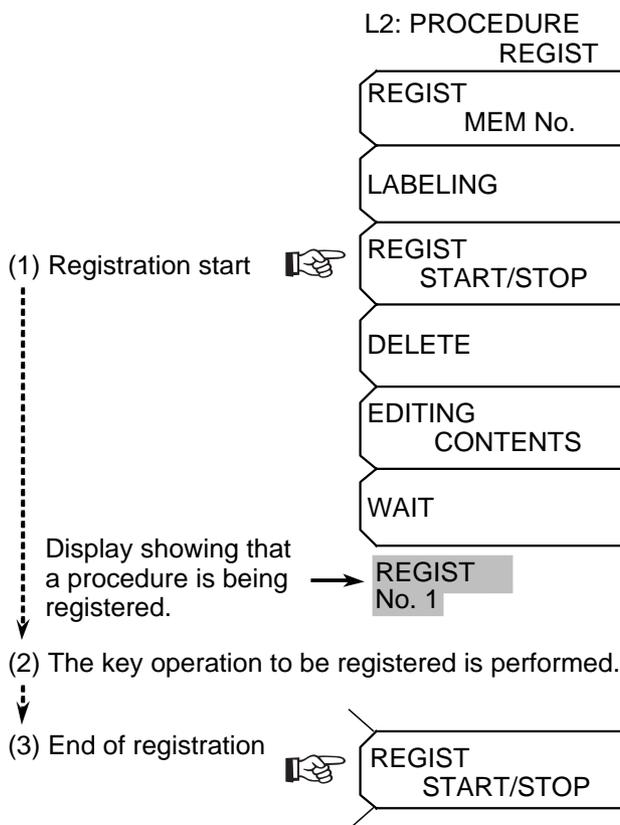
Direct printout to an external printer or plotter is possible through GPIB.

Anritsu's Original Procedure and Event Registration Functions

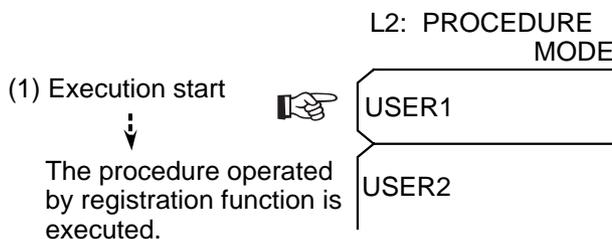
Procedure Function

The procedure registration function stores the MW9060A operating procedure in an internal memory and registers its contents at function keys. With the procedure execution function, the same processing as the procedure stored by registration function is executed by simply pressing the function key. An operation procedure example is shown below.

[Procedure registration operation]



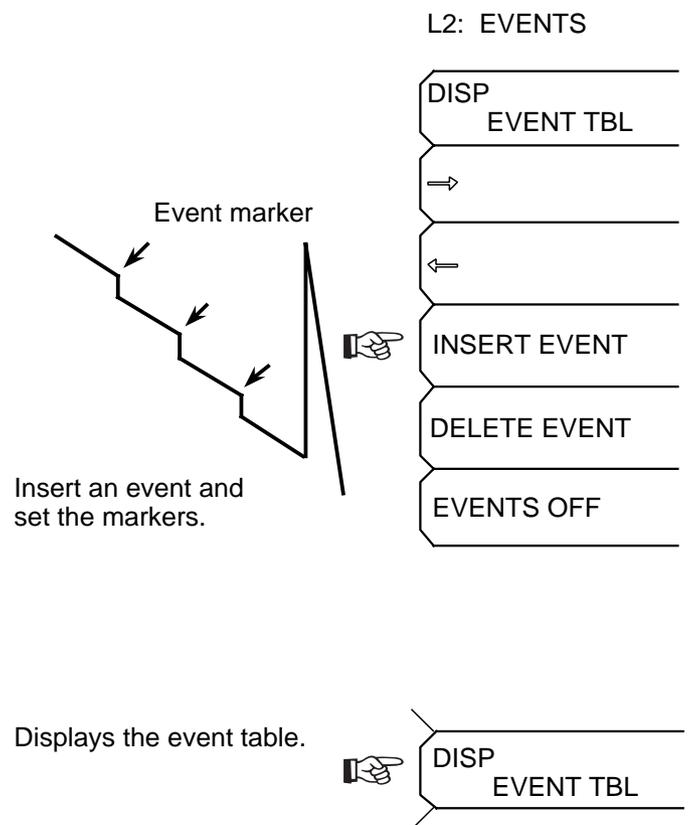
[Procedure execution operation]



Event Registration Function

When the event marker is set to the measurement point to be measured, an event table of the measured result are displayed in accordance with the set marker, simply by turning the LASER ON/OFF key on. An operating procedure example is shown below.

[Event marker registration operation]



No.	DISTANCE(km) LENGTH (km)	SPL (dB) LOSS (dB)	R.LOSS (dB) (dB/km)
1	2.98000 2.98000	1.502 ? 1.070	47.692 0.359
2	3.98000 1.00000	1.841 ? 0.435	43.930 0.430
3	4.98000 1.00000	2.120 ? 0.492	39.700 0.492
4	5.98000 1.00000	1.726 0.348	37.600 0.348
5	6.98000 1.00000	2.405 0.384	37.856 0.384
6	7.98000 0.98000	2.313 0.289	37.718 0.295
7	8.98000 1.00000	1.097 0.368	33.046 0.368

Event Table Display Screen Example

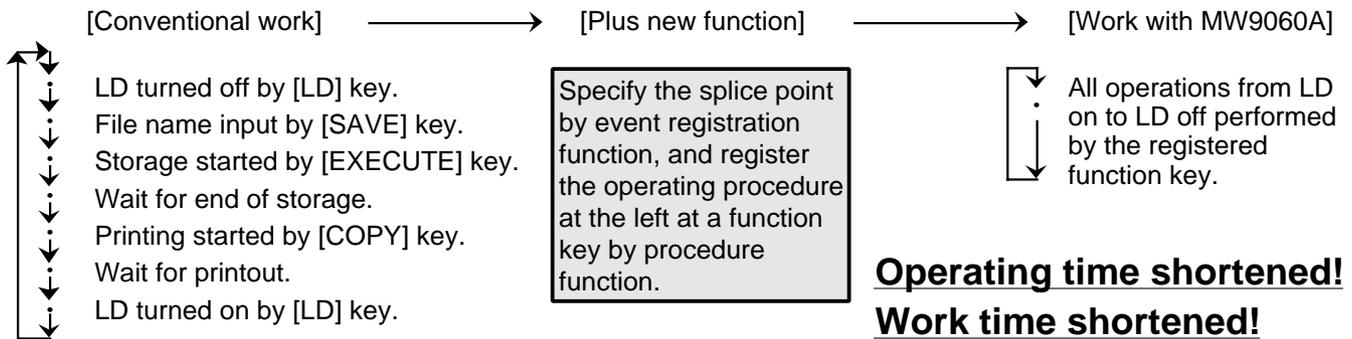
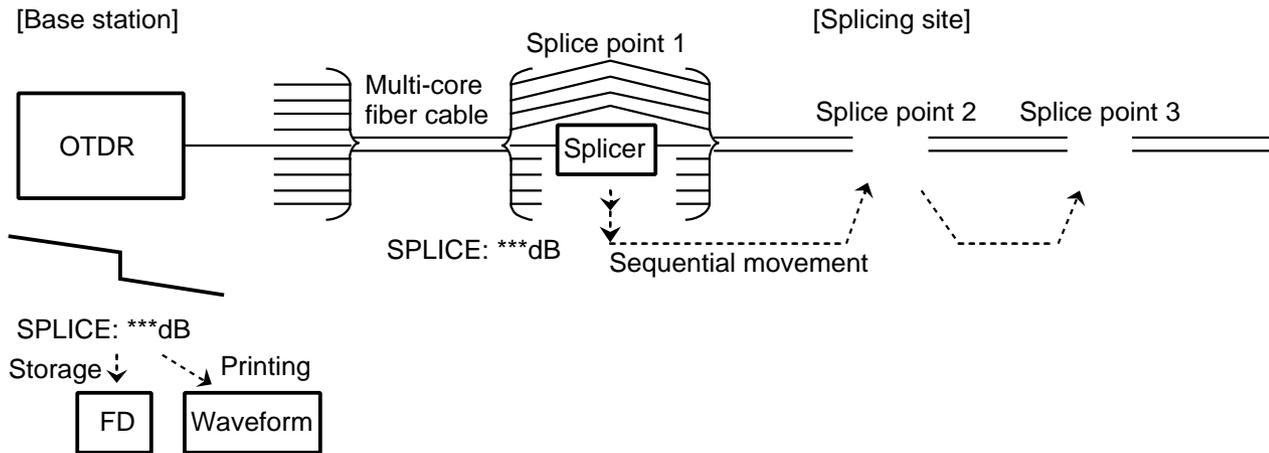
Applications

Shortens the Splicing Work Time During Fiber Construction

Generally, when a fiber is being constructed, splicing work is performed by monitoring the splicing quality from a base station with an OTDR and storing the spliced data at the end of splicing work to an FD or printing it out as shown in the figure below.

These tasks are performed at the splicing points of all the fibers and take a long time to complete. The procedure function is an original function used to shorten this work time. By using this function, conventional multiple key operations can be performed easily with one key as shown in the work flow. Since the OTDR performs the set measurements automatically, other work can be performed while the OTDR is operating.

A substantial shortening of the splicing work time during fiber construction can be expected if the procedure function is used as described above.



Anritsu's original procedure and event registration functions are designed to shorten the measurement operation time and the overall work time during splicing and final confirmation in fiber construction, routine maintenance, and inspection in fiber manufacturing.

Specifications

MW9060A (Main Frame)

Sweep speed		Min. 0.3 s/sweep (FAST mode and 2PA mode)	
Automatic search	No. of search points	Max. 5 points (at event mode off), max. 100 points (at event mode on)	
	Threshold	0.05/0.1/0.3/1.0/3.0/5.0 dB	
Optical return loss measurement		Provided	
Waveform comparison		Displays 2 waveforms simultaneously.	
Smoothing function		Improves the S/N ratio of the waveform by 6 levels from level 1 through level 6.	
Full-trace display function		Displays the full measurement trace, measured by switching each attenuator in turn.	
Relative distance measurement function		Displays distance relative to cursor setting.	
Event function		Fiber length, total loss, transmission loss, return loss for fiber on either side of splice point.	
Procedure function		Key command sequence is recorded and assigned to a single key for automatic execution.	
Built-in memory		32 waveforms (stores the setting conditions at the same time.)	
Memory card		Plug-in memory card (option: 32KB/64KB/128KB/256KB/512KB)	
Floppy disk *1		Micro floppy disk Storage capacity (MS-DOS *2 formatted) 2M/1MB (1.44M/720KB) or 1.6M/1MB(1.2M/720KB)	
Printer		Hard copy of screen display is available by line thermal printer.	
Title display		20 characters x 2 lines	
IOR		1.400000 to 1.699999 (in 0.000001 steps)	
Distance display unit		Meters/feet/miles	
CRT		6-inch, green	
Interface	GPIB	Device	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
		Controller	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C4, C7, E2
	Direct plot		Hard copy of the measurement screen to an external plotter/printer is available through GPIB.
Power supply		85 to 132 (170 to 250) Vac, 50/60 Hz±5%, ≤ 160 VA	
Temperature and humidity *3		-10°C to +55°C (+5°C to +35°C for FDD & printer), -20°C to +60°C (storage), ≤ 80%	
Dimensions/mass		284 W x 177 H x 450 Dmm, ≤ 12.5 kg (with no plug-in units)	
EMC *4		EN55011: 1991, Group 1, Class A EN50082-1: 1992	
Safety		EN61010-1: 1993 (Installation Category II, Pollution Degree II)	

*1 1.6M/1M (1.2M/720KB) capability available as option.

1.44MB/720KB: IBM-PC Series formatted (IBM is a registered trademark of International Business Machines Corporation.)

1.2MB/720KB: PC-9800 Series formatted (PC-9800 Series is a product of NEC.)

*2 MS-DOS is a registered trademark of Microsoft Corporation.

*3 When plug-in memory cards (PMC) are used, the operating temperature is:

PMC left inserted: -10°C to +55°C

Inserting/removing PMC: 0°C to +55°C

Operating temperature when floppy disk & printer are used: +5°C to +35°C

*4 EMC: Electromagnetic Compatibility

MW0944B High-Resolution Unit

Wavelength *6		1310/1550 ±15 nm				
Fiber under measurement		10/125 μm single-mode fiber *ITU-T (formerly CCITT) G.652				
Optical connector *8		FC-PC/DIAMOND-PC/ST-PC/DIN-PC/SC-PC				
Pulse width		10 ns	20 ns	100 ns	500 ns	2 μs
Dynamic range (one-way back-scattered light level) *1, *11	Effective	6.5/4.0 dB	8.0/5.5 dB	11.5/9.0 dB	15.0/12.5 dB	18.0/15.5 dB
	SNR=1	9.5/7.0 dB	11.0/8.5 dB	14.5/12.0 dB	18.0/15.5 dB	21.0/18.5 dB
Dynamic range (4% Fresnel reflection) *11	Effective	34.5/33.0 dB				
	SNR=1	37.5/36.0 dB				
Near-end dead zone (back-scattered light) *2, *3	Fresnel reflection	3 m	5 m	13 m	55 m	220 m
	Back-scattered light	8 m	10 m	20 m	65 m	240 m
Spatial resolution *2, *4	Fresnel reflection	2 m	4 m	13 m	55 m	220 m
	Back-scattered light	2 m	4 m	15 m	60 m	220 m
Mask function *2, *5	No. of masks	5 max. (optical)				
	Mask width	13 m	13 m	18 m	65 m	240 m
Variable near-end mask width function		Provided				
Variable optical output power function *5		Provided				
Distance range (km) *2		10, 25, 50, 100				
Horizontal axis *2	Scale (m/div)	2.5, 5, 10, 25, 50, 100, 250, 500, 1 km (10 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range)				
	Resolution	Sampling resolution: 5 cm to 20 m Read-out resolution: 5 cm to 200 m				
	Accuracy	±1 m ± measured value (m) × 2 × 10 ⁻⁵ (does not include uncertainty in fiber index of refraction)				
Vertical axis	Scale (dB/div)	0.1, 0.25, 0.5, 1, 2.5, 5				
	Read-out resolution	0.001 dB				
	Linearity	±0.05 dB/dB				
Ambient temperature		0° to +35°C (spec. meet), -10° to +60°C (storage)				
Mass		<2.5 kg				

MW0945B/0947B Wide Dynamic Range Unit

Model		MW0945B						MW0947B					
Wavelength *6		1310 ±15 nm						1310/1550 ±15 nm					
Fiber under measurement		10/125 μm single-mode fiber *ITU-T (formerly CCITT) G.652											
Optical connector *7		FC/DIAMOND/ST/DIN/SC											
Pulse width		20 ns	100 ns	500 ns	1 μs	4 μs	10 μs	20 ns	100 ns	500 ns	1 μs	4 μs	10 μs
Dynamic range (one-way back-scattered light level) *1, *11	Effective	15 dB	20 dB	23 dB	26 dB	31 dB	34 dB	13 dB	18 dB	21 dB	24 dB	29 dB	32 dB
	SNR=1	18 dB	23 dB	26 dB	29 dB	34 dB	37 dB	16 dB	21 dB	24 dB	27 dB	32 dB	35 dB
Dynamic range (4% Fresnel reflection) *11	Effective	35 dB	39 dB	41 dB	42 dB	44 dB	45 dB	34 dB	38 dB	40 dB	41 dB	43 dB	44 dB
	SNR=1	38 dB	42 dB	44 dB	45 dB	47 dB	48 dB	37 dB	41 dB	43 dB	44 dB	46 dB	47 dB
Near-end dead zone *2, *3	Fresnel reflection	35 m	50 m	95 m	200 m	700 m	1500 m	35 m	50 m	95 m	200 m	700 m	1500 m
	Back-scattered light	35 m	50 m	95 m	200 m	700 m	1500 m	35 m	50 m	95 m	200 m	700 m	1500 m
Spatial resolution *2, *4	Fresnel reflection	15 m	30 m	75 m	150 m	500 m	1500 m	15 m	30 m	75 m	150 m	500 m	1500 m
	Back-scattered light	30 m	50 m	90 m	200 m	700 m	1500 m	30 m	50 m	90 m	200 m	700 m	1500 m
Mask function *2, *5	No. of masks	5 max. (optical)											
	Mask width	75 m	75 m	150 m	200 m	700 m	1500 m	75 m	75 m	150 m	200 m	700 m	1500 m
Variable optical output power function *5		Provided											
Distance range (km) *2		10, 25, 50, 100, 250											
Horizontal axis *2	Scale (m/div)	5, 10, 25, 50, 100, 250, 500, 1 km (10 km range)											
		5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range)											
	Resolution	5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range)											
Vertical axis	Scale (dB/div)	5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range)											
		5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km, 25 km (250 km range)											
	Accuracy	±1 m ± measured value (m) × 2 × 10 ⁻⁵ (does not include uncertainty in fiber index of refraction)											
Vertical axis	Read-out resolution	Sampling resolution: 10 cm to 50 m, Read-out resolution: 10 cm to 500 m											
	Linearity	±0.03 dB/dB											
	Linearity	±0.03 dB/dB											
Ambient temperature		-10° to +55°C (spec. meet), -40° to +75°C (storage)											
Mass		<2.5 kg											

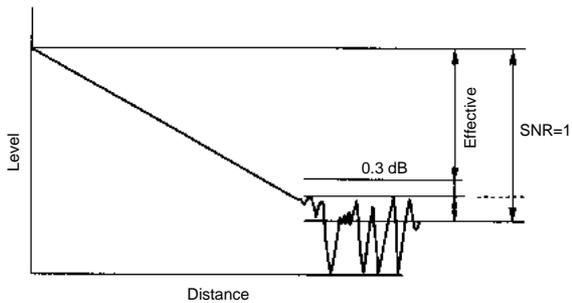
MW0967B High-Resolution Unit

Wavelength *6		850/1300 ±15 nm				
Fiber under measurement *9		50/125 μm GI multimode fiber (NA0.2) *ITU-T (formerly CCITT) G.651				
Optical connector *10		FC/DIAMOND/ST/DIN/SC				
Pulse width		5 ns	20 ns	100 ns	500 ns	2 μs
Dynamic range (one-way back-scattered light level) *1, *11	Effective	9.0/7.0 dB	12.0/10.0 dB	15.5/13.5 dB	19.0/17.0 dB	21.5/20.0 dB
	SNR=1	12.0/10.0 dB	15.0/13.0 dB	18.5/16.5 dB	22.0/20.0 dB	24.5/23.0 dB
Dynamic range (4% Fresnel reflection) *11	Effective	27/29 dB	29/31 dB			
	SNR=1	30/32 dB	32/34 dB			
Near-end dead zone *2, *3	Fresnel reflection	1.5 m	1.5 m	1.5 m	1.5 m	1.5 m
	Back-scattered light	3 m	4.5 m	15 m	60 m	220 m
Spatial resolution *2, *4	Fresnel reflection	2 m	4 m	15 m	60 m	220 m
	Back-scattered light	2 m	4 m	15 m	60 m	220 m
Mask function		Not provided				
Variable optical output power function		Provided				
Distance range (km) *2		10, 25, 50, 100				
Horizontal axis *2	Scale (m/div)	2.5, 5, 10, 25, 50, 100, 250, 500, 1 km (10 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km (25 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km (50 km range) 2.5, 5, 10, 25, 50, 100, 250, 500, 1 km, 2.5 km, 5 km, 10 km (100 km range)				
	Resolution	Sampling resolution: 5 cm to 20 m Read-out resolution: 5 cm to 200 m				
	Accuracy	±1 m ± measured value (m) × 2 × 10 ⁻⁵ (does not include uncertainty in fiber index of refraction)				
Vertical axis	Scale (dB/div)	0.1, 0.25, 0.5, 1, 2.5, 5				
	Read-out resolution	0.001 dB				
	Linearity	±0.05 dB/dB				
Ambient temperature		-10° to +55°C (spec. meet), -40° to +75°C (storage)				
Mass		<2.5 kg				

*1 Dynamic range (one-way back-scattered light)

Effective: The difference between the level of the point which is 0.3 dB higher than the peak noise level and the level of the point where near-end back-scattering occurs.

SNR=1: The level difference between the RMS noise level and the level where near-end back-scattering occurs.

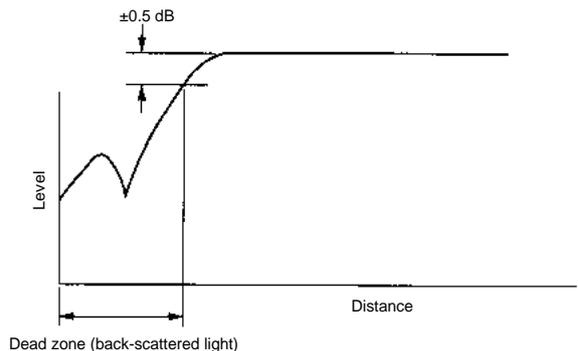


*2 When the index of refraction is set to 1.500000.

*3 Near-end dead zone

Fresnel reflection: The minimum distance at which the 4% Fresnel reflection generated by the fault can be detected. (MW0944B with built-in variable optical output power function used.)

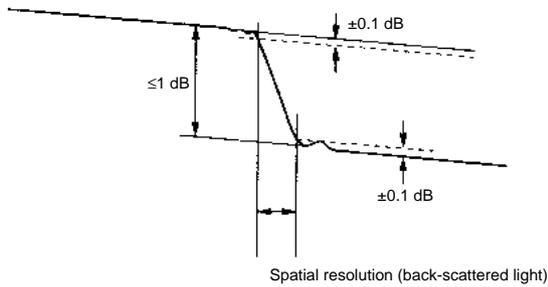
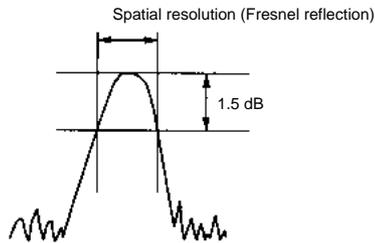
Back-scattered light: The near-end dead zone (for back-scattered light) is the distance at which the near-end back-scattered light level approaches ±0.5 dB of its final value. – For the MW0944B: This specification represents the values for the FC-PC connector (when return loss ≥25 dB). When a fiber with an FC connector (flat polished) is measured, the dead zone may be larger than the specified value. The variable near-end mask width function can be used to suppress dead zone widening to 2 to 3 m.



*4 Spatial resolution

Fresnel reflection: The width of an unsaturated Fresnel reflection pulse at the point that is 1.5 dB less than the peak value.

Back-scattered light: The distance between the points where the beginning and ending levels at a splice etc. (≤ 1 dB) are within ± 0.1 dB of their initial and final values, respectively.

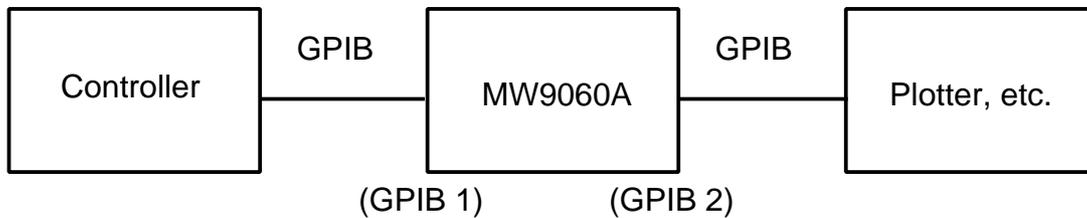


- *5 All masks including the near-end mask (except MW0945B, MW0946B and MW0947B) are OFF in the variable optical output power mode.
- *6 Not applicable in the variable optical output power mode
- *7 Please specify one connector among those shown in the specification table. Please contact us for other connectors. (However, the dynamic range is degraded by 0.5 dB for DIAMOND, D4, and AT&T Biconic connectors.)
- *8 Please specify one connector among those shown in the specification table. Please contact us for other connectors. (However, the dynamic range is degraded by 0.5 dB for DIAMOND and D4 connectors.)
- *9 The dynamic range is increased by about 1.5 dB when measuring 62.5/125 μm (NA0.29) fibers. The transmission loss measurement result may differ from that obtained with NA 0.29 by as much as 0.1 dB/km.
- *10 Please specify one connector among those shown in the specification table. Please contact us for other connectors.
- *11 Values are obtained using smoothing (level 6). With no smoothing, all values are reduced by 2 dB.

Options

GPIB interface

When another device is controlled by the MW9060A (direct plotting, etc.) while the MW9060A is being controlled by an external controller, another GPIB interface board besides the standard GPIB interface is necessary.



FD format

The built-in 3.5-inch FDD can be used for 2HD type FD in 1.44M format (IBM-PC Series *1) and 2DD type FD in 720KB format. Use of 2HD type FD in 1.2M format (NEC PC-9800 Series *2) and 2DD type FD in 720KB format is also available as an option.

*1 IBM is a registered trademark of International Business Machines Corporation.

*2 PC-9800 Series is a product of NEC.

Optional accessories

Unit adapter

When using plug-in unit used with the MW9040A/B with the MW9060A, install a plug-in adapter at the back of the plug-in unit to reduce the depth from the MW9060A. The adapter can be installed easily by simply tightening two screws.

One unit adapter is supplied as standard accessories of plug-in unit.

Protective cover

A protective cover can be installed to protect the front panel.

Ordering information

Please specify model/order number, name and quantity when ordering.

Model/Order No.	Name	Remarks
MW9060A	- Main frame - Optical Time Domain Reflectometer	
MW0944B	- Plug-in units - SMF 1.31/1.55 μm Unit	Short distance, high resolution
MW0945B	SMF 1.31 μm Unit	Long distance, wide-dynamic range measurement
MW0947B	SMF 1.31/1.55 μm Unit	Long distance, wide-dynamic range measurement
MW0967B	GIF 0.85/1.30 μm Unit	Short distance, high resolution
	- Standard accessories (main frame) -	
F0013	Power cord, 2.5 m: 1 pc	
Z0240	Fuse, 5 A: 2 pcs	
W0667AE	Thermal roll paper for MW9060A: 1 set	2 rolls/set
	MW9060A operation manual: 1 copy	
	- Standard accessories (plug-in unit) -	
B0346	Unit adapter: 1 pc/1 unit	Adapter for unit installation
	- Options (main frame) -	
MW9060A-01	GPIB interface	
MW9060A-02	1.2 Mbytes FDD	NEC PC-9800 Series* formatted
	- Options (plug-in unit) -	
MW09 -21	D4 connector	
MW09 -22	AT&T Biconic connector	Unavailable for MW0944B
MW0967B-23	Amphenol 906	
MW09 -37	FC-PC connector	Unavailable for MW0944B/0967B
	- Optional accessories -	
B0293	CRT hood	
P0005	Memory card	RAM (32 Kbyte)
P0006	Memory card	RAM (64 Kbyte)
P0007	Memory card	RAM (128 Kbyte)
P0008	Memory card	RAM (256 Kbyte)
P0009	Memory card	RAM (512 Kbyte)
J0007	GPIB cable, 1 m	408JE-101
J0008	GPIB cable, 2 m	408JE-102

* PC-9800 Series is a product of NEC.

J0057	optical Adapter	FC type
J0200	Optical fiber cable	FC-2- M-GI (for GI fiber)
J0056	Optical fiber cable	FC-2- M-SM (for SM fiber)
J0087	FC/D4 conversion cable	For GI fiber
J0210	FC/D4 conversion cable	For SM fiber
J0209	FC/AT&T Biconic conversion cable	For GI fiber
J0208	FC/AT&T Biconic conversion cable	For SM fiber
J0207	FC/DIAMOND conversion cable	For GI fiber
J0206	FC/DIAMOND conversion cable	For SM fiber
J0516	FC/DIN conversion cable	For GI fiber
J0517	FC/DIN conversion cable	For SM fiber
J0518	FC/ST conversion cable	For GI fiber
J0519	FC/ST conversion cable	For SM fiber
J0520	FC/SC conversion cable	For GI fiber
J0521	FC/SC conversion cable	For SM fiber
B0329K	Protective cover	For front panel
Z0245	Carrying case for plug-in unit	Hard type
Z0246	Carrying case for plug-in unit	Soft type
B0350	Carrying case	Hard type
	- Peripherals -	
MA9014A	Bare Fiber Connector	Common use for SM and GI fiber
MA9013A	Fiber Adapter	
FP-850	Printer	(EPSON product)
VP-870	Printer	(EPSON product)
MP5300-11	Plotter	(Graphtec product)
HP7550A	Plotter	(HP product)
	- Supplies -	
Z0168	3.5-inch floppy disk (2HD)	10 pcs/set
Z0054	3.5-inch floppy disk (2DD)	10 pcs/set

These lengths are expressed by symbols A, B and C in the order number, for example; J0200A, B or C, where A=1 m, B=2 m, C=3 m.



Specifications are subject to change without notice.

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