

SECTION 1 OVERVIEW

This section outlines the features of the MW9040B Optical Time Domain Reflectometer and the organization of this manual, as well as describes the equipment composition of the MW9040B when it is used with standard fittings, plug-in units, expansion options, optional accessories and peripheral devices, and specifications.

1.1 Product Outline

The MW9040B Optical Time Domain Reflectometer lets you automatically or manually detect fault locations in fiber-optic cables and measure cable splice loss, optical-connector connecting loss, etc. with high accuracy. With its wide dynamic range of 34 dB in wavelength 1.3 μm band or 32 dB in 1.55 μm band, it can made precise measurement with a 10 cm read-out resolution even for 250 km long-distance measurement. Using hierarchically structured soft keys (3 layers), it allows such versatile functions as CONDITION (measurement conditions), MEASURE, DISPLAY, FILE (storing waveforms in internal or external memory), HARD COPY (outputting to external printers or plotters), and SYSTEM (GP-IB) to be used with ease.

The MW9040B comes with plug-in units that you can simply fit into it after selecting the appropriate type depending on the measurement wavelength band, kind of fiber, or measurement range (distance and resolution).

The MW9040B is designed and manufactured conforming to the FDA optical safety standard 21CFR1040.10, and is classed as Class-1 Laser Equipment under the standards. In addition, it is housed in the frame that conforms to the MIL-T-28800D, Class 3, Style C environment test standards.

1.5 Specifications

Tables 1-6 and 1-7 list the Specifications for the MW9040B and the Plug-in Units.

Table 1-6 MW9040B Specifications

Model		MW9040B
Sweep time		Max. 0.3 sec. (Used in Fast Sweep Mode and 2PA Mode)
Automatic searching	No. of search points	Max. 5 points
	Threshold	0.05/0.1/0.3/1.0/3.0/5.0 dB
Optical return loss measurement		Provided
Waveform comparison		Provided
Built-in memory		32 Waveforms (with setting conditions)
Memory card		Plug-in memory card 32KB/64KB/128KB/256KB/512KB
Title display		20 Characters × 2 Lines
IOR		1.400000 to 1.699999 (0.000001 Steps)
Unit of distance display		meters/feet/miles
CRT		6 inches, green
Video output		Composite video signal: 1 Vp-p (75 Ω load), Connector: BNC-type
Interface	GP-IB Device-mode Controller-mode Conformity	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0, E2 SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C4, C7, E2 IEEE-488.1 and IEEE-488.2
	Direct-plotting output	The CRT screen can be copied to the external plotter or printer via the GP-IB connector without an external controller.
Power		AC 85 to 132 V (170 to 250 V), 50/60 Hz ± 5%, ≤ 165 VA
Environmental specifications	Ambient temperature *1	− 10° to + 55°C (spec.), − 40° to + 75°C (storage)
	Relative humidity	≤ 95%
	Physical vibration *2	Frequency: 5 to 55 Hz, Amplitude: Max. 1.5 mm (in all 3 directions) Repetition time: 15 minutes
	Physical shock *2	Max. acceleration: 30 G, Shock time: 11 m sec. Shock impact: Sine half wave, Frequency: 3 times each at all 6 faces
	Water resistance test	16.3 ± 1 liter/hour (8 minutes on, 4 minutes off with protective covers)
Dimensions and weight		177 H × 284 W × 401 D mm, < 12.5 kg (With protective covers and without plug-in unit)

*1 As long as the plug-in memory card (PMC) is always installed in the main frame.
− 10° to + 55°C (spec.), − 30° to + 75°C (storage)

When the PMC is installed in/removed from the main frame.
0° to + 55°C (spec.), − 30° to + 60°C (storage)

*2 These specifications do not apply to the MW0942A and the MW0944B.

Table 1-7 Specifications of Plug-in Units (Continued)

Model		MW0947B					
Center Wavelength *7		1310/1550 ± 15 nm					
Fiber under measurement		10/125 μm Single-mode fiber (CCITT G.652)					
Optical connector *1		FC					
Pulse width *10		20 ns	100 ns	500 ns	1 μs	4 μs	10 μs
Dynamic range (one-way back-scattered light level) *2	Effective	13/11 dB	18/16 dB	21/19 dB	24/22 dB	29/27 dB	32/30 dB
	S. N. R = 1	16/14 dB	21/19 dB	24/22 dB	27/25 dB	32/30 dB	35/33 dB
4% Fresnel reflection dynamic range	Effective	33/32 dB	37/36 dB	39/38 dB	40/39 dB	42/41 dB	43/42 dB
	S. N. R = 1	36/35 dB	40/39 dB	42/41 dB	43/42 dB	45/44 dB	46/45 dB
Near-end deadzone *3, *4	Fresnel reflection	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
Spatial resolution *3, *5	Fresnel reflection	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
Mask function *3, *6	No. of masks	Max. 5 (Optical)					
	Mask width *8	75 m	75 m	150 m	200 m	700 m	1500 m
Variable near-end mask-width function		Not provided					
Attenuation *9		AUTO/0.0 to 23.75 dB in 1.25 dB steps					
Variable optical output power function *6		Provided					
Distance range *3		10/25/50/100/250 km					
Horizontal axis *3	Scale (m/div)	5/10/25/50/100/250/500/1 k 5/10/25/50/100/250/500/1 k/2.5 k 5/10/25/50/100/250/500/1 k/2.5 k/5 k 5/10/25/50/100/250/500/1 k/2.5 k/5 k/10 k 5/10/25/50/100/250/500/1 k/2.5 k/5 k/10 k/25 k					(10 km range) (25 km range) (50 km range) (100 km range) (250 km range)
	Resolution	Sampling resolution : 10 cm to 50 m Read-out resolution : 10 cm to 500 m					
	Accuracy	± 1 m ± measured value (m) × 2 × 10 ⁻⁵ (does not include the uncertainty in the index of refraction for the fiber.)					

Table 1-7 Specifications of Plug-in Units (Continued)

Model		MW0947B
Vertical axis	Scale (dB/div)	0.1/0.25/0.5/1/2.5/5
	Read-out resolution	0.001 dB
	Linearity	± 0.03 dB/dB
Ambient temperature	Spec.	-10°C to 55°C
	Storage	-40°C to 75°C
Weight		≤ 2.5 kg

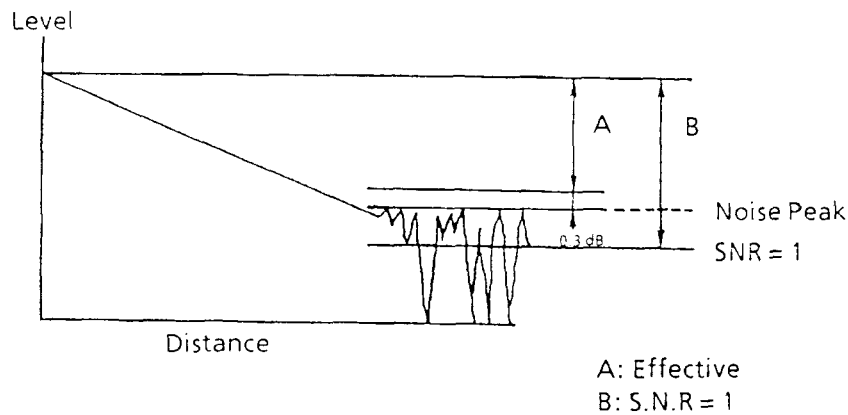
*1: The FC connector is the standard optical connector. For other optical connectors, please refer to Table 1-3.

However, the dynamic range is degraded by 0.5 dB for the DIAMOND, D4, and AT & T Biconic connectors.

*2: 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 at which near-end back-scattering occurs.

SNR = 1: Level difference between the RMS noise level and the level at which near-end back-scattering occurs.

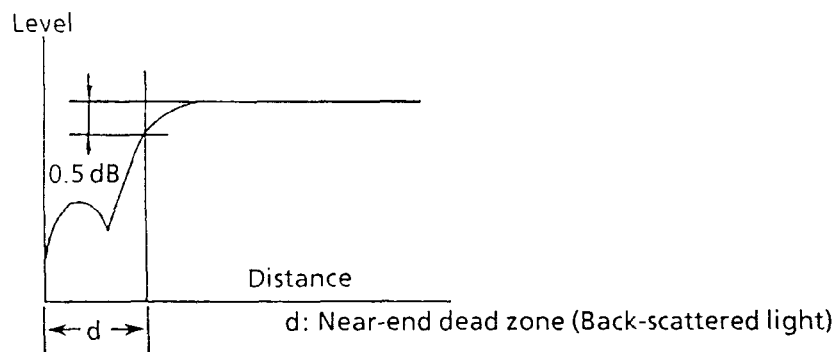


*3: When IOR is set to 1.500 000.

*4: Near-end Dead Zone

(For Fresnel Reflection): The minimum distance at which the 4% Fresnel Reflection generated by the fault point can be detected.

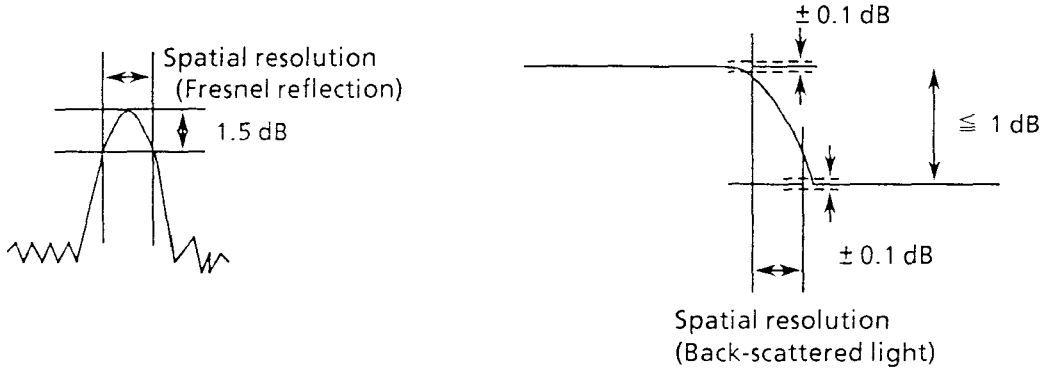
(For Back Scattered light): The near-end dead zone (for back-scattered light) is the distance at which the near-end back-scattered light level approaches to within ± 0.5 dB of its final value.



*5: Spatial resolution

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

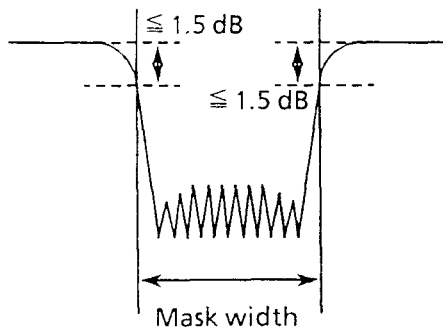
For Back-Scattering: The distance between the points at which the beginning and ending levels at a splice etc. gap (≤ 1 dB) are within ± 0.1 dB of their initial and final values respectively.



*6: All the masks except for the near-end mask are turned OFF in the variable optical output power mode.

*7: Not applicable in the variable optical output power mode.

*8: Mask width



*9: The value selected for the attenuation depends on the pulse width.

*10: Pulse widths of 4 μ s and 10 μ s cannot be selected for the 10-km, 25-km, and 50-km distance ranges. Furthermore, 1- μ s pulse width cannot be selected for the 10-km and 25-km distance range.