
OMP2000/3000/4000

**Automatic Optical Cable Monitoring
and Switching Protection System**

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1 INTRODUCTION

1.1 Preface

With the rapid growth of data traffic, the optical fiber cable, as the transmission medium of the information highway, becomes more and more important. However, the problem of maintenance and troubleshooting is also becoming increasingly prominent with the expansions and aging of the optical cables. Since the traditional maintenance mode has many problems, such as the difficulty of fault location, the longer troubleshooting time, the failure of the early warning, and so on, the economic expenses caused by the optical cable failure is very huge every year. Therefore, the effective monitoring and management, timely detection and prediction of risk nodes and shortening the fault duration of optical cable are particularly important.

1.2 System Introduction.

Gained through years' experience and profound understanding of optical fiber cable management and monitoring, we have designed and developed an innovative **Automatic Optical Cable Monitoring and Switching Protection System**.

Based on the GIS platform and powerful resource management function, this system combines the monitoring, alarm, fault analysis, fault location, fiber maintenance and management and other functions together, to provide security for the safe and efficient operation of the optical cables, thus realizing the monitoring, marketing, maintenance and management the optical network.

2 HARDWARE SYSTEM

2.1 Functions

2.1.1 Remote Maintenance

- Remote query of all modules status and other information by NMS.
- Alarmed when cards fails or be pulled out.

2.1.2 Module Maintenance

- Modular design, all cards support hot-plugging, easy for installation and maintenance.
- Power supply: DC and/or AC. Dual power supplies are supported for redundancy.
- Replaceable fuse for over current protection.

2.1.3 Alarm

The system has acousto-optic alarm function. When the equipment is failure, the ALM light turns red and the buzzer gives out alarm sound.

2.2 Equipment Configuration

- 1U chassis is composed of 4×Universal slots, 1×PS slot, 1×NMU slot, 1×FAN slot.
- 2U chassis is composed of 8×Universal slots, 2×PS slot, 1×NMU slot, 1×FAN slot.
- 4U chassis is composed of 16×Universal slots, 2×PS slots, 1×NMU slot, 1×FAN slot.
- Automatic OTDR testing function.
- Up to 32ch optical switching in 1U card.
- Up to 16ch Optical Power Monitoring on dark fiber in 0.5U card.
- Up to 6ch WDM in 0.5U card.
- Up to 10ch Filter in 0.5U card.
- Up to 16ch Optical Source output in 0.5U card.
- Up to 2ch Optical Line Protection function in 0.5U card.
- Embedded Network Management System.
- Acousto-Optic alarm function.
- Dual power supplies are supported for redundancy.

2.3 Hardware Technical Specifications

The hardware is composed of modules including NMU, OTDR, OPM, OSW, PWU, OLP, WDM and Filter.

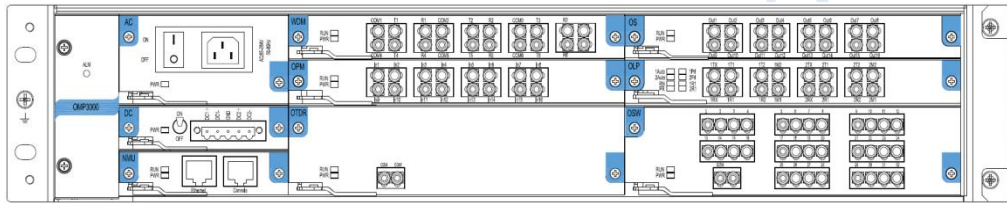
Equipment Outline

OMP2000: 1U height



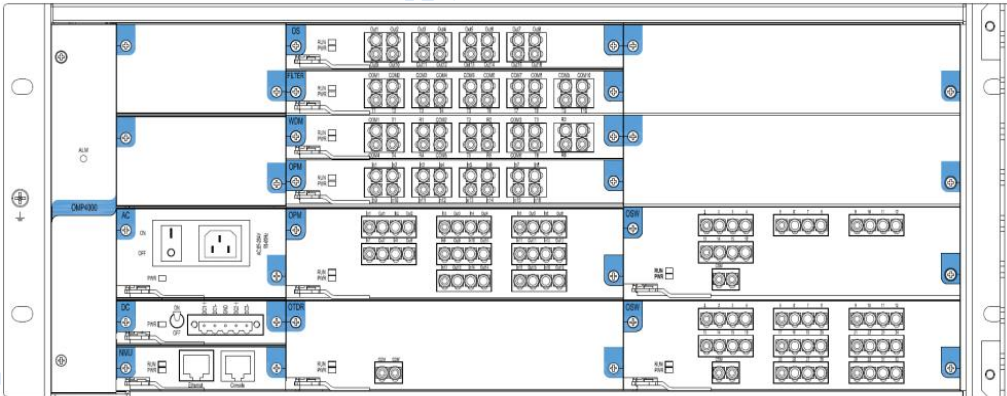
Size: 483mm (W) × 240mm (D) × 44mm (H)

OMP3000: 2U height



Size: 483mm (W) × 240mm (D) × 89mm (H)

OMP4000: 4U height



Size: 483mm (W) × 240mm (D) × 176mm (H)

1) Environmental Condition

- Temperature: -5°C to +55°C
- Humidity: ≤85% (@ 25°C)
- Pressure: 86 kpa to 106 kpa.

2) Power Supply

- Power supply: $-48\text{V}/\text{DC} \pm 20\%$ (85-264)V/AC
- Power consumption: less than 50W in full configuration.

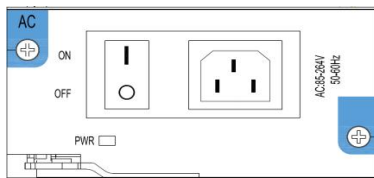
3) Grounding

Communication Station: earthing resistance $\leq 1\text{ohm}$

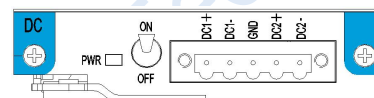
Access station: earthing resistance $\leq 4\text{ohm}$

2.3.1 Power Unit (PWU)

Outline:



AC Card (1U height)



DC Card (0.5U height)

Function Description:

Advanced technique, such as overload protection, short circuit protection, power supply stability and others, are integrated into the PWU card design to improve the reliability and stability. And, in order to protect the equipment against the accidental damage due to the poor power supply, we specially designed the protection circuit and replaceable fuse.

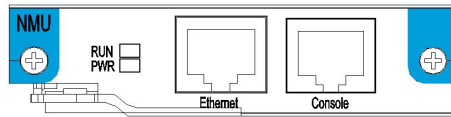
Dual power supplies are supported for redundancy.

Specifications:

Power supply	:	$-48\text{V}/\text{DC} \pm 20\%$	(85-264)V/AC
Operating Temperature	:	-10°C to $+60^{\circ}\text{C}$	
Storage Temperature	:	-40°C to $+70^{\circ}\text{C}$	
Humidity	:	$\leq 95\%$	

2.3.2 Network Management Unit (NMU)

Outline:



Function Description:

The NMU card is used to manage all the modules inside the equipment, and communicate with the server. It collects and reports the status of the monitoring station to the center, or executes the instructions from the center.

The card uses the embedded control system, which has the characteristics of flexible communication and easy maintenance.

Specifications:

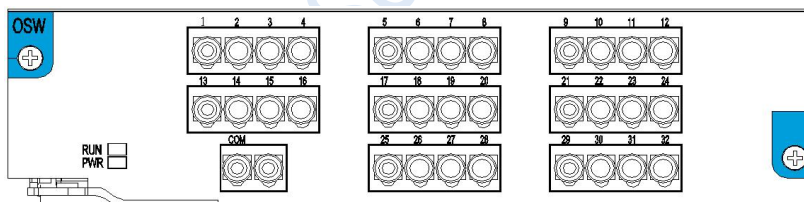
Ethernet port:

- Type: 10/100Base-T(X)
- Connector: RJ-45

Console port: for debugging only.

2.3.3 Optical Switching Card (OSW)

Outline:



Function description:

A microprocessor is installed inside the OSW card to control the optical switching and to monitor the switching status.

The OSW card use backboard-bus to communicate with CPU Module.

The card supports hot-plugging. Multiple cards can be cascaded, which simplifies the interface circuit and makes the system more modular.

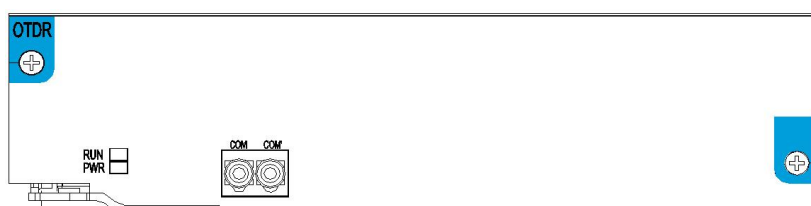
Specifications:

Working Wavelength : $1625 \pm 20\text{nm}$

Switching time	:	$\leq 10\text{ms}$ (between adjacent channels)
Lifetime	:	$\geq 10^8$ times
Isolation	:	$\geq 55\text{dB}$
Return loss	:	$\geq 50\text{dB}$
Insertion loss	:	$\leq 1.2\text{dB}$
Connector	:	LC/PC
Port numbers	:	up to 32 ports

2.3.4 OTDR Card

Outline:



Function Description:

The optical time-domain reflectometer (OTDR) is an optoelectronic instrument used to characterize an optical fiber. It injects a series of optical pulses into the fiber under test and extracts, from the same end of the fiber, light that is scattered (Rayleigh backscatter) or reflected back from points along the fiber. The scattered or reflected light that is gathered back is used to characterize the optical fiber. The strength of the return pulses is measured and integrated as a function of time, and plotted as a function of fiber length.

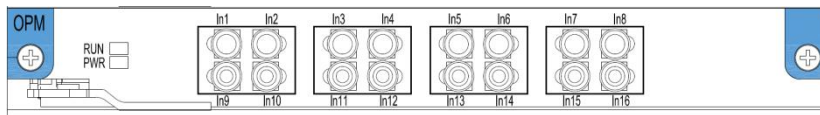
Specifications:

Wavelength	:	1625nm
Dynamic range	:	40dB, 38dB, 36dB, 34dB, 30dB
Pulse Width	:	5ns, 10ns, 20ns, 40ns, 80ns, 160ns, 320ns, 640ns 1.28us, 2.56us, 5.12us, 10.24us, 20.48us
Event dead zone	:	2m (when pulse width = 10ns)
Attenuation dead zone	:	12m (when pulse width = 10ns, unsaturation)
Sampling interval	:	Min. 0.125m
Sampling points	:	Max. 32K
Ranging precision	:	$\pm (1\text{m} + 5 \times 10^{-5} \times \text{distance} + \text{Sampling interval})$
Optical connector	:	LC/PC

Ports:

COM port: OTDR output port

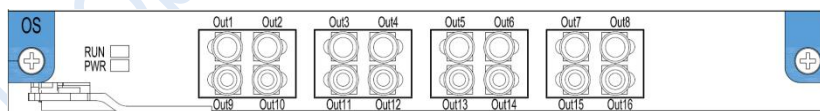
COM' port: Not use.

2.3.5 Optical Power Monitoring Card (OPM)**Outline:****Function Description:**

The real-time fault alarm testing can be achieved by monitoring the optical power through this card.

Specifications:

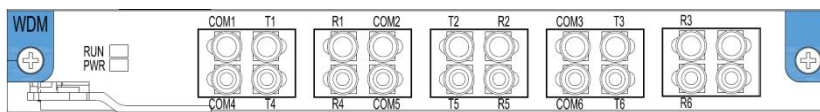
Calibrated wavelength	: 1310/1550nm
Input Optical Power	: -50dBm to +23dBm
Resolution	: 0.01dB
Stability	: ± 0.2 dB
Optical connector	: LC/PC
Monitoring Channels	: up to 16 channels (for dark fiber) up to 8 channels (for lit fiber)

2.3.6 Optical Source Card (OS)**Outline:****Function Description:**

Besides the on-line real time test, the optical source can also be provided by our own system to meet the safety and low cost requirement. We can install the OS at one end of the fiber under test, and monitor the power by OPM card at the other end. The test result will be statistics. When the optical power is degraded to the threshold we predefined, the OTDR test will be activated.

Specifications:

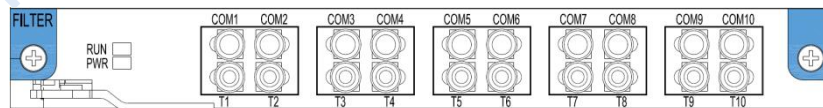
Wavelength	:	1550nm \pm 20nm
Output Optical Power	:	+3dBm to -13dBm
Stability	:	\pm 0.2dB/15min for short-term \pm 0.15dB/6h for long-term
Optical Connector	:	LC/PC
OS Channels	:	up to 16 channels

2.3.7 Wavelength-Division Multiplexing Card (WDM)**Outline:****Function Description:**

The WDM card is used for multiplexing and de-multiplexing the different wavelength between the traffic optical pulse and OTDR detective optical pulse.

Specifications:

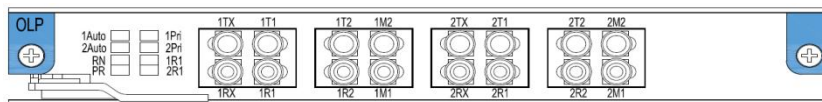
Wavelength	:	1600-1670nm at T port 1260-1580nm at R port
Insertion loss	:	\leq 0.8dB
Transmission isolation	:	\geq 40dB
Reflection isolation	:	\geq 15dB
Optical Channels	:	up to 6 channels

2.3.8 Filter**Outline:****Function description:**

The Filter card is used for wavelength filtering for the different wavelength between the traffic optical pulse and OTDR detective optical pulse.

Specifications:

Wavelength	:	1530-1570nm
Insertion loss	:	$\leq 0.8\text{dB}$
Isolation	:	$\geq 40\text{dB}$
Optical Channels	:	up to 10 channels

2.3.9 Optical Line Protection Card (OLP)**Outline:****Function Description:**

The OLP card will monitoring the optical power of primary and secondary fiber in real-time. When the primary optical fiber of the optical transmission line is accidentally broken or the performance is degraded, the OLP card can automatically switch the working channel from the Primary line to the Secondary line to realize the protection of optical transmission line.

Specifications:

Wavelength	:	1310nm, 1550nm
Insertion loss	:	$\leq 1.2\text{dB}$
Return loss	:	$\geq 45\text{dB}$
Crosstalk	:	$\geq 55\text{dB}$
Optical Power Monitoring Range	:	-50 to +23dBm
Switching time	:	$\leq 50\text{ms}$
Protection line numbers	:	up to 2 channels