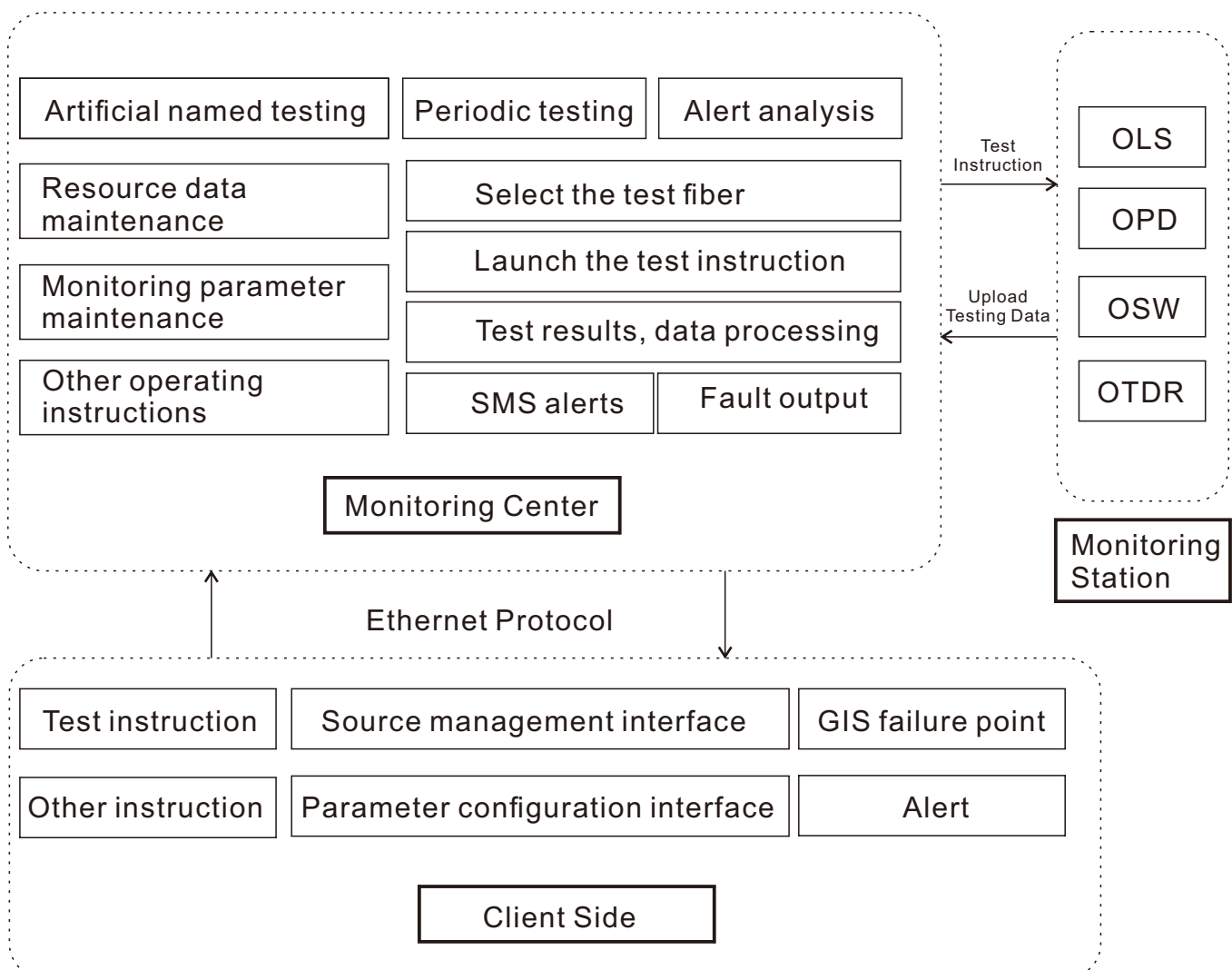## FirstFiber

Optical Cable Monitoring System

As the scale of long-distance fiber optic transmission and the local network are rapidly expanded, in order to protect communications, to improve the availability of fiber optic cables, and to compensate for the shortcoming of the relatively insufficient maintenance strength, adoption of a centralized maintenance measure is required.
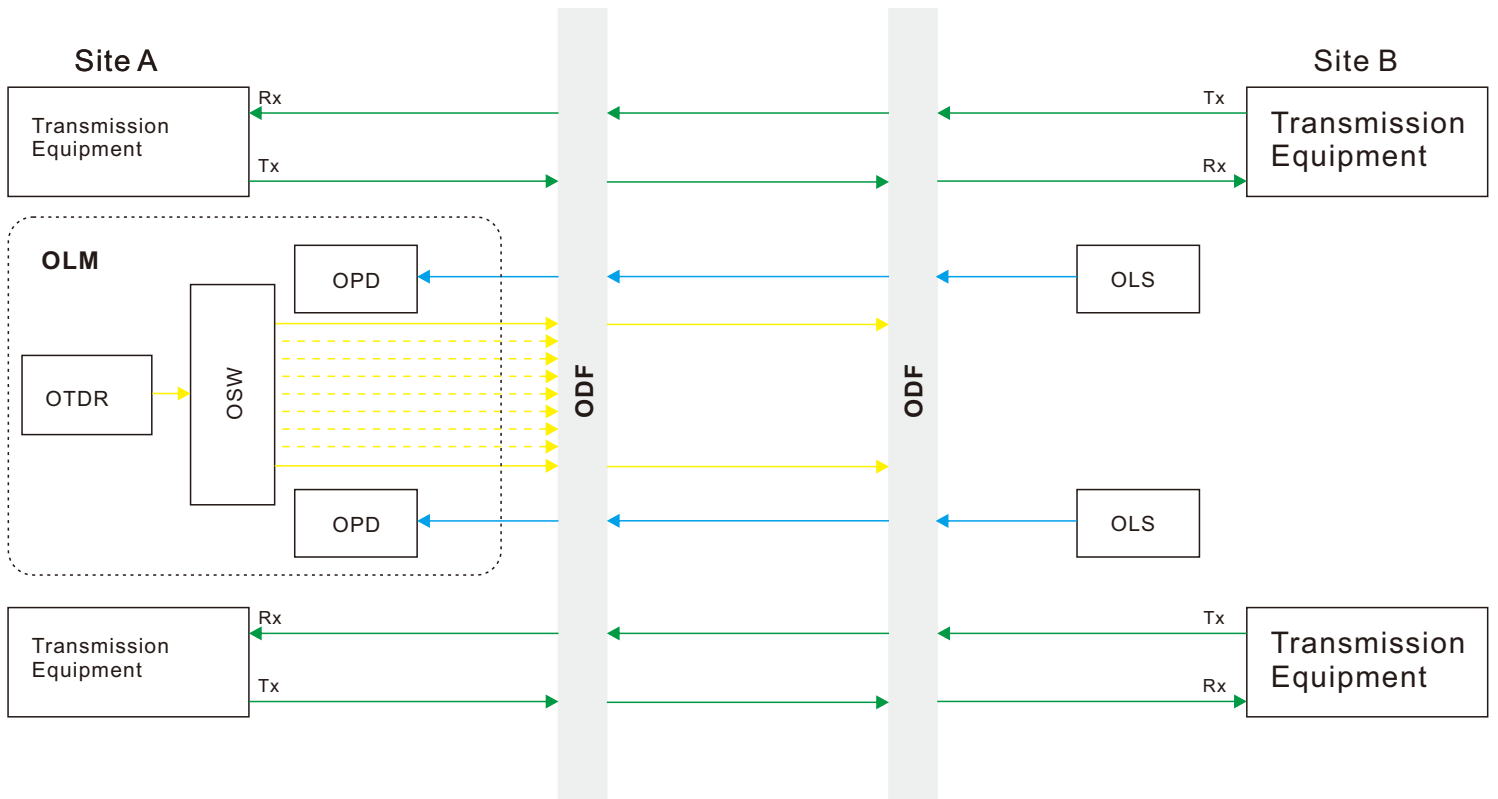
On the one hand it should inspect the operation conditions of fiber-optic network to detect degradation trends in time for prevention beforehand; on the other hand, when there is fiber broken, it can response fast and locate accurately, which can shorten the fault duration. Meanwhile, large amount information of construction, cutover, maintenance related with cable maintenance and management need electronic means for table recording, processing and querying.

OTDR is an important tool for monitoring fiber optic cable. Traditional OTDR used as test instrument is a decentralized, passive means of manual maintenance means, which is difficult to satisfy higher cable safety requirements. Therefore, the use of multiple OTDRs to achieve a set of test, analysis, warning, locating, information management, business reporting capabilities in one centralized cable network monitoring system, is a further development and innovation for traditional OTDR usage and maintenance institution, which can greatly improve the maintenance efficiency and standards.
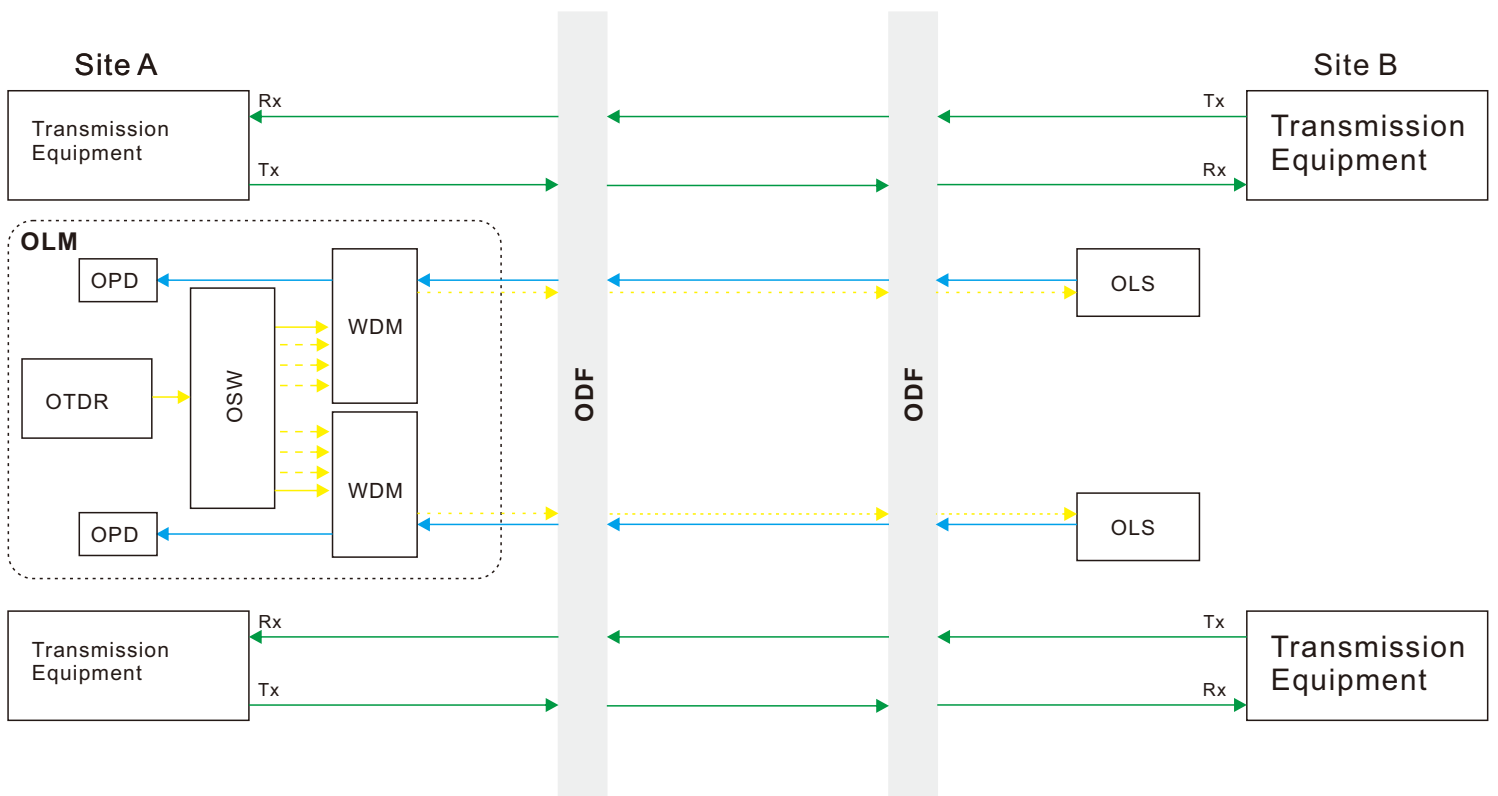
By deploying distributed clients of the system and using typical network and database technology, the operator can easily complete the operation of the system and view a variety of test results. The system automatically manage OTDR instrument, monitor cable networks, and give the real-time analysis of alarm and optical performance degradation. All the fiber test data and results are stored in the background data for easily querying and analyzing.
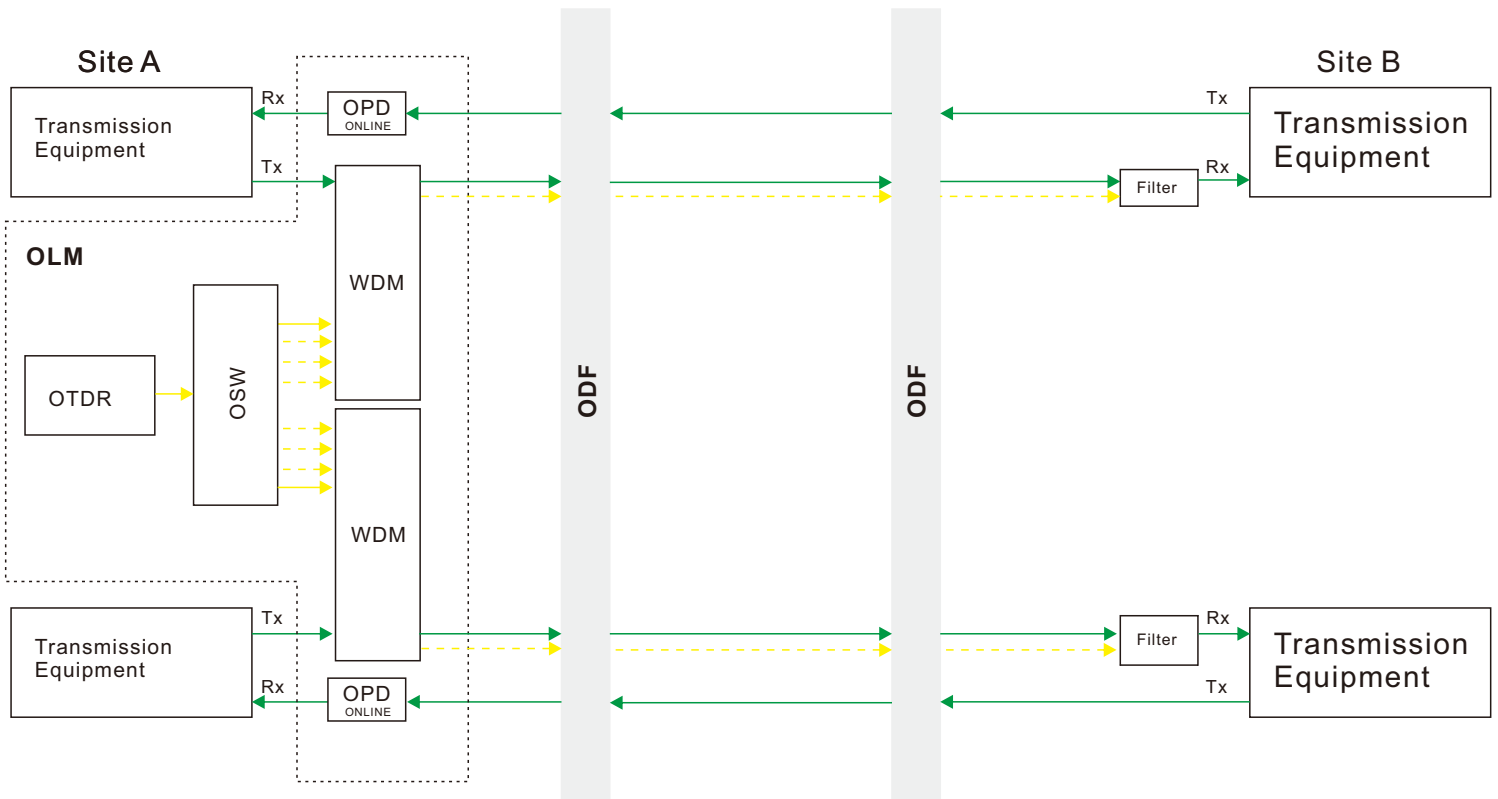
Artificial named testing	Periodic testing	Alert analysis
Resource data maintenance	Select the test fiber	
Monitoring parameter maintenance	Launch the test instruction	
Other operating instructions	Test results, data processing	
	SMS alerts	Fault output

Monitoring Center

Test Instruction →

Upload Testing Data ←

OLS

OPD

OSW

OTDR

Monitoring Station

Ethernet Protocol

Test instruction	Source management interface	GIS failure point
Other instruction	Parameter configuration interface	Alert

Client Side

Solution 1: Double-Fiber Off-line Mornitoring

Site A

Site B

Transmission Equipment — Rx / Tx

Transmission Equipment — Tx / Rx

OLM

OPD

OTDR → OSW → OPD

ODF

ODF

OLS

OLS

Transmission Equipment — Rx / Tx

Transmission Equipment — Tx / Rx

Solution 2: Singe-Fiber Off-line Mornitoring

Site A

Site B

Transmission Equipment — Rx / Tx

Transmission Equipment — Tx / Rx

OLM

OPD

OTDR → OSW → WDM

WDM → OPD

ODF

ODF

OLS

OLS

Transmission Equipment — Rx / Tx

Transmission Equipment — Tx / Rx

Solution 3: Double-Fiber On-line Mornitoring

Site A

Transmission Equipment — Rx / Tx

OPD ONLINE

OLM

OTDR → OSW → WDM / WDM

Transmission Equipment — Tx / Rx

OPD ONLINE

ODF ODF

Filter

Site B

Transmission Equipment — Tx / Rx

Transmission Equipment — Rx / Tx

Filter

Solution 4: Single-Fiber On-line Mornitoring

Site A

Transmission Equipment — Rx / Tx

OLM

OTDR → OSW → WDM / WDM

Transmission Equipment — Tx / Rx

ODF ODF

Filter

Site B

Transmission Equipment — Tx / Rx

Transmission Equipment — Rx / Tx

Filter
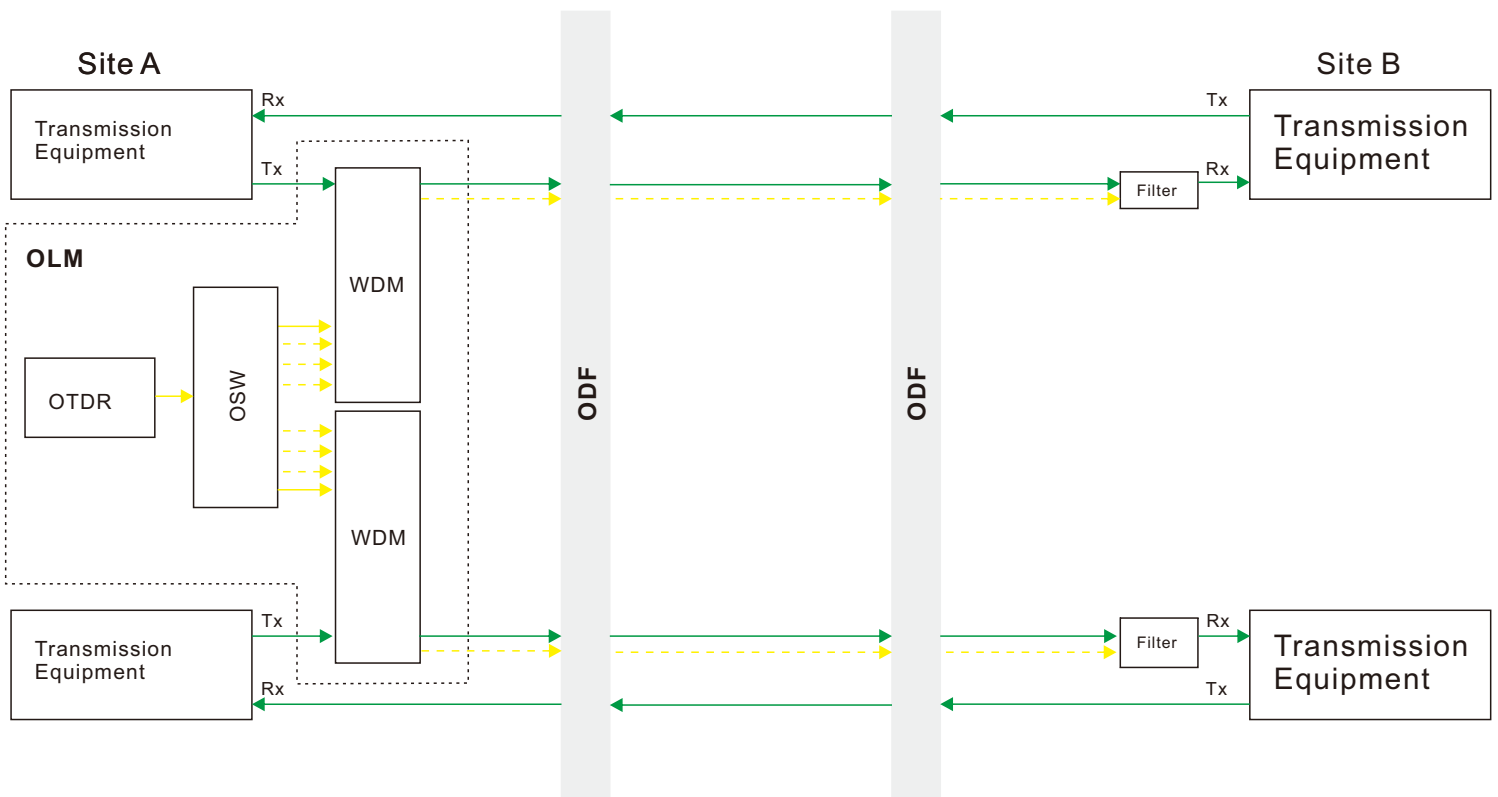
FRONT / SIDE / REAR
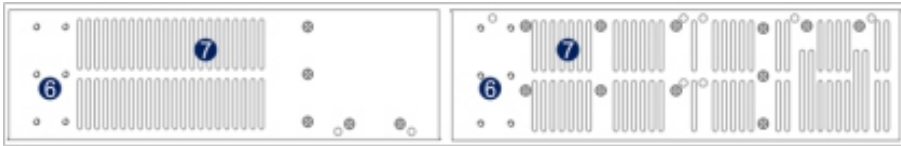
1. Main Control Card
2. Service Card, Max.4
3. Fan Card
4. Scalable Lug
5. Lug Installation Position
6. Side Vent
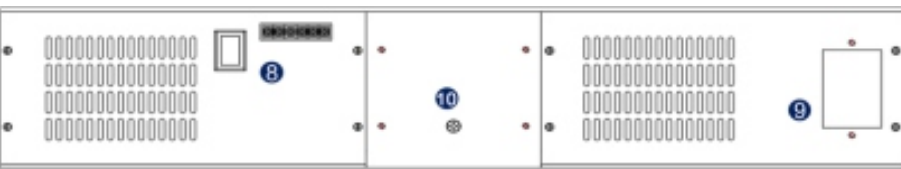7. Power Source Card 1
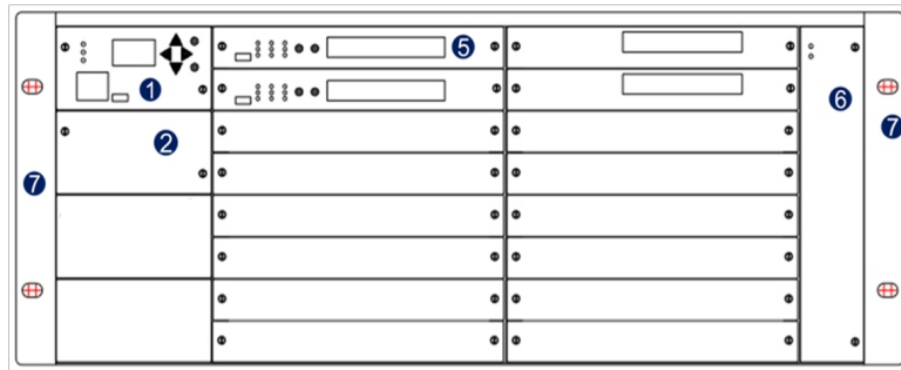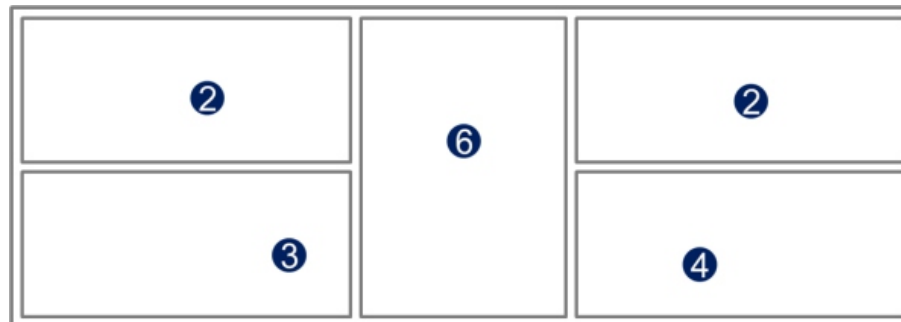8. Power Source Card 2
9. Grounding Screw

FRONT / SIDE / REAR

1. Main Control Card
2. Expansion Slot
3. Service Card, Max.8
4. Fan Card
5. Scalable Lug
6. Lug Installation Position
7. Side Vent
8. Power Source Card 1
9. Power Source Card 2
10. Grounding Screw

FRONT / REAR

1. Main Control Card
2. Expansion Slot
3. Power Source Card 1
4. Power Source Card 2
5. Service Card, Max.16
6. Fan Card
7. Scalable Lug

1U/2U/4U Frame

Cards

Frame Correlation Parameter

Working Temp.	-10 to +60°C
Storage Temp.	-20 to +70°C
Condensation	5% ~ 95% no Condensation
1U Frame Size	482.6Wx300Dx44.5H (mm)
2U Frame Size	482.6Wx300Dx86H (mm)
4U Frame Size	482.6Wx300Dx176H (mm)
Power Supply (AC)	85~264V,50~60hz
Power Supply (DC)	36~72
Consumption (1U)	Max. 50
Consumption (2U)	Max.100
Consumption (4U)	Max.200

Main Control Card

Equipment Management
- Equipment state, cards performance to be visible
- Other Card parameters can be set by buttons on the card
- Support income or outcome of band network management
- Supports SNMP, Telnet, Client
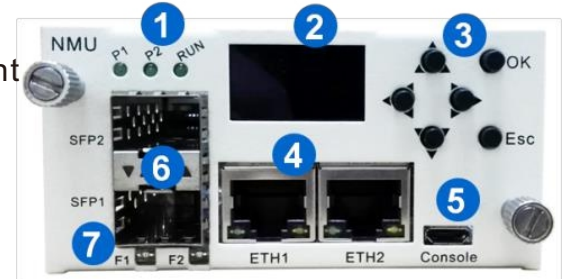
❶ Status indicator P1(Power1) P2(Power2),RUN
❷ HD dual color LCD display screen
❸ Operation keys
❹ Ethernet communication interface
❺ Micro USB equipment upgrade interface
❻ Optical transceiver slot(Support 100/1000Mbps SFP)
❼ Optical transceiver working status indicator

OTDR Card

OTDR card has an OTDR internal module, for optical parameters statistics of locating malfunction, attenuation, return loss and reflectivity on fiber.

Dynamic Range	24 to 40dB
Wavelength (Optional)	1310/1550/1625/1550nm
Output Channel (Optional)	1/2/3/4
Pulse Width	5ns,10ns,20ns,40ns,80ns,160ns,320ns,640ns,
Event Dead Zone	2m
Attenuation Dead Zone	10m
Minimum Sampling Interval	0.25m
Max. Sampling	32k
Distance Accuracy	+/-(1m+5x10^-5 x distance + Sampling interval)
Connector	SC/UPC or LC/UPC

OSW Card

Optical switch card is composed of several optical switches, it provides an input interface used for connecting with OTDR module, and selects the output routings through a variety of channels (1x8, 1x16, 1x32 routes, 1x48 routes, 1×64 routes), so as to make OTDR test signal arrive at different fibers to achieve multi-channel optical fiber detection. The switching of optical switch can be controlled by software.

Wavelength	1550±20nm/1625±20nm/1650±20nm
Insertion Loss	≤1.0dB
PDL	≤0.1dB
Return Loss	≥50dB
WDL	≤0.2dB
ISO	≥55dB
Repeatability	≤±0.01
Life cycle	≥160 millions times
Switch time	≤25+15×(N-1)(N is interval number of channels)ms
Maximum input power	≤500mW

OPD Card

OPD card (Optical Power Meter) is composed of Multi-channel detectors (4 channels, 8 channels, 16 channels) for detecting optical values of monitoring lines.

Wavelength	1200nm to 1650nm
Input optical power range	-70 to +3dBm or -50 to +26dBm
Resolution	0.01dB
Stability	±0.2dB
Electrical signal conversion time	≤25ms(between adjacent channel), ≤100ms(between any channel)
Return Loss	≥45dB
Monitoring channel number	4/8/16

OLS Card

Optical source unit is used to provide stable light source for real-time detecting of line.

Connector type	LC/UPC or SC/UPC
Wavelength	1310nm or 1550nm
Spectral length	≤4 nm
Output power	-6 to 0dBm
Short time Stability	±0.02/15min
Long time Stability	±0.15/6h

WDM & Coupler Card

The function of WDM Card is achieving coupling and isolating between transmission light signal and monitoring light signal, which ensures non-interference of the two signals. Single WDM board can be configured 1 link or 2 links, which has function of filter.

Wavelength	1310±20nm, 1550±20nm
Monitoring wavelength	1625±10nm, 1650±10nm
Insertion Loss	≤1.0 dB
Monitoring IL	≤1.0 dB
Return Loss	≥45 dB
WDL	≤0.2 dB
PDL	≤0.2 dB
Power	500 mW
Connector type	LC/UPC or SC/UPC

Coupler board monitor light power by coupled light that splitting ratio is 10% from the transmission system. Single coupler board can be integrated 2 links.

Wavelength	1310±20nm, 1550±20nm
Splitting ratio	10%
Insertion Loss	≤1.5 dB
Monitoring IL	≤11 dB
WDL	≤0.2 dB
PDL	≤0.2 dB
Return Loss	≥45 dB
Power	500 mW
Connector type	LC/UPC or SC/UPC

Management Software

The fiber cable monitoring and management system is a resources management and optical fiber cable monitoring for the integration of large-scale management software. The system integrated of the current mature GIS technology, the vivid graphical display interface, more intuitive to make fault location. The System offer the basic information management, RTU monitoring management, RTU configuration management, query statistics, report management, and other functions.