

MU- series

DWDM Transmission System

User Manual



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Chapter 1 Overview

1 Product Description

MU-series equipment is a new generation of high-capacity DWDM dense wavelength division transmission products developed and produced by DWDM.ME, applicable to various network levels such as national, provincial, and metro core, and meets the needs of large-capacity nodes of 32T and above. It is cost-effective in the industry. The highest transmission application platform to build large-granular WDM transmission solutions for IDC and ISP operators.

2 Product Highlights

- **Super T-bit capacity, massive IP service delivery**
 - Super T-bit capacity, fast centralized scheduling
 - Ultra-long distance 2000 kilometers without electric relay transmission capacity
 - Large particles, large service, support 10G/100G/200G/400G mixed transmission
 - Smooth network upgrade to obtain high bandwidth
- **Intelligent protection of the whole network, higher reliability**
 - The client side supports 1+1 optical port dual-transmitting and selective-receiving thermal redundancy protection
 - The wavelength side supports 1+1 optical port dual-transmitting and selective-receiving thermal redundancy protection
 - The line side supports 1+1 dual-transmit and selective-receive thermal redundancy protection
 - The power supply supports multi-channel power supply hot redundant backup
- **Modular design, flexible and convenient**
 - The power supply adopts modular design, supports hot swap, and is easy to replace
 - The fan adopts a modular design, supports hot swap, and is easy to replace
 - The transaction card adopts modular design, supports hot swap, and is easy to replace
- **Small size, high integration**
 - 1U/2U/5U compact design, small size
 - General transaction: 3/7/19 slots
 - High-density MUX board supports 48CH

- High-density OTU single board, support 8*SFP+
- **Super Intelligent Network Management Platform**
 - Support network management methods based on SNMP, CLI, WEB, TELNET, etc.
 - Support automatic discovery of the whole network topology map and automatic generation of network elements
 - Support electronic map location, fault location is fast and accurate
 - Support sound alarm, email alarm, SMS alarm
 - EMS network management platform, covering the whole process from planning to operation and maintenance
 - Support fast fault diagnosis, one-click export of resource reports
 - Support the location and diagnosis of fiber optic cable fault points, real-time detection of the quality of the fiber optic cable
 - Support OPM real-time channel scanning, OSNR real-time monitoring

Chapter 2 Transmission Platform Introduction

1 MU-380-ACDC - 5U Transmission Platform

1.1 Overview

MU-380-ACDC is DWDM.ME next-generation high-capacity transmission platform. It is suitable for national, provincial, and metro core network levels to meet TBit capacity requirements. It is the industry's most cost-effective transmission application platform. Granular WDM transmission solution.

1.2 Product Highlight

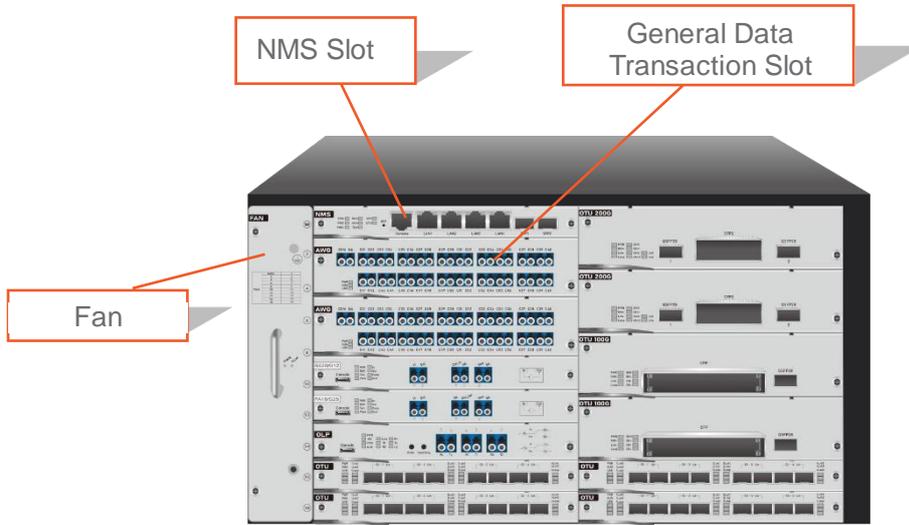
- Standard 19 inch 5U chassis
- The single sub-rack supports up to 76 channels of 10G service conversion
- The single sub-rack supports up to 19*16 wavelength multiplexing and demultiplexing
- High integration: a single rack supports 19 general service slots and 1 network management slot

- Unified platform: supports mixed insertion of various service cards and unified network management;
- High reliability: support 2xDC -48V, 2xAC 220V dual power protection;
- Good heat dissipation performance: 6 high-performance, high-speed fan design to ensure sufficient heat dissipation;

1.3 Performance Parameters

Parameter	Technical Index
Slot number	20 slots:1 NMS Slot, 19 Data Transaction Slots
Capacity	Single rack supports up to 19x16 wavelength multiplexing and demultiplexing A single rack supports up to 76x10G service forwarding A single rack supports up to 9x100G service forwarding A single rack supports up to 9x200G service forwarding A single rack supports up to 9x400G service forwarding
Power supply	Dual Power 1+1 Protection,220V AC (85V~220V) /-48V DC (-36~-72V) Optional
Power consumption	Full equipped <500W
Fan	6 pcs high-performance, high-speed Fan to ensure excellent heat dissipation performance
Operating Temperature	-10°C ~ 60°C
Storage Temperature	-40°C ~ 80°C
Relative humidity	5% ~ 95% non-condensation
Size	482.5 (W) × 222.5 (H) × 350 (D) (mm)
G.W.	20kg

1.4 Product Pictures



MU-380-ACDC - 5U 20-slots sub-rack front Panel



MU-380-ACDC - 5U 20-slots sub-rack back Panel

1.5 Indicator Light Description

Indicator Screen	Name	Description
PWR	Rack Power Indicator	On: The rack power supply is normal Off: The rack is not powered
FAN-PWR	Power Working Indicator	On: the fan power supply is normal Off: the fan power supply is not working
ALM	Fan Alarm Indicator	On: the fan is not working properly Off: the fan is working normally

2 MU-180-ACDC - 2U Transmission Platform

2.1 Overview

MU-180-ACDC is DWDM.ME's generation of large-capacity transmission platform, applicable to various network levels such as national, provincial, and metropolitan core, and meets TBit capacity requirements. It is the industry's most cost-effective transmission application platform. It builds a large Granular WDM transmission solution.

2.2 Product Highlight

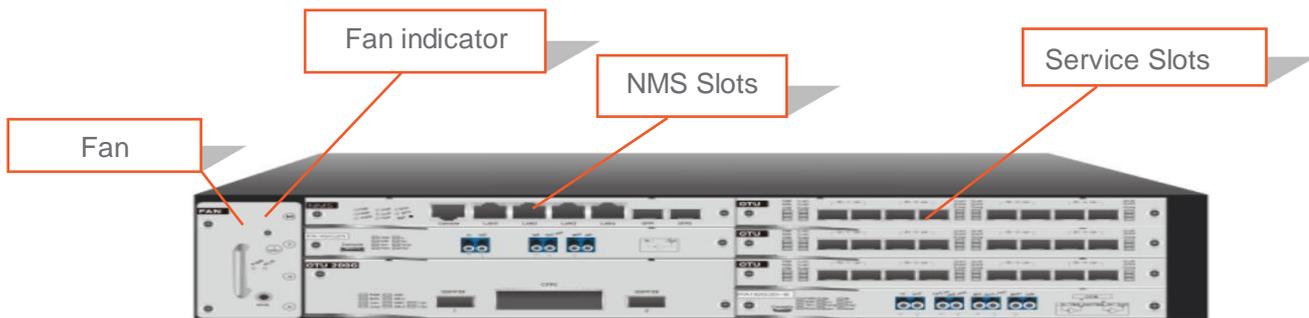
- Standard 19 inches 2U chassis
- High integration: supports 7 general service slots and 1 NMS slot
- The single sub-rack supports up to 28x10G service forwarding
- The single sub-rack supports up to 4x200G service forwarding
- The single sub-rack supports up to 4x400G service forwarding
- Single sub-rack supports up to 7*16 wavelength multiplexing and demultiplexing
- Unified platform: supports mixed insertion of various service cards and unified network management
- High reliability: modular power supply design, support for plugging and unplugging, dual power supply 1+1 protection
- Good heat dissipation performance: 4 high-performance, high-speed fan design to ensure sufficient heat dissipation

2.3 Performance Parameters

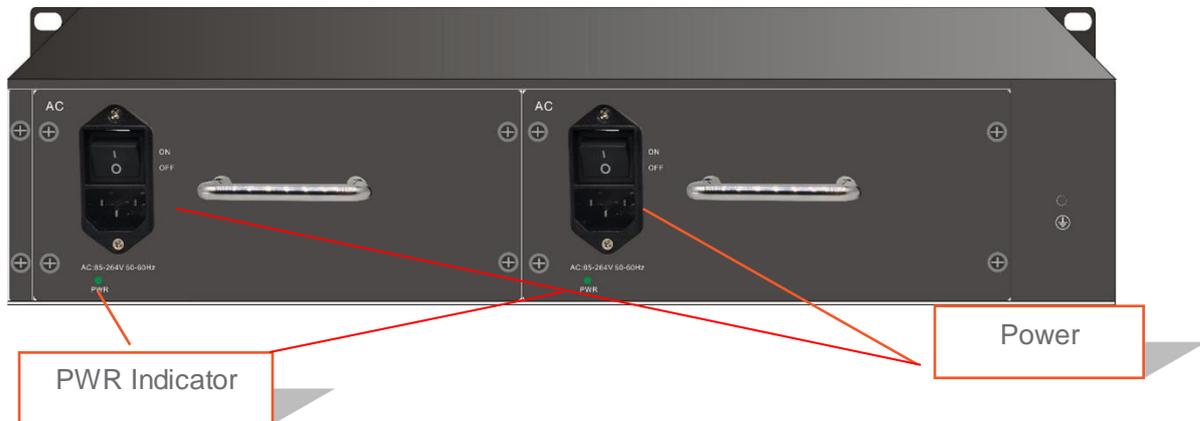
Parameters	Technical index
Size	2U 19 inches
Slot	8 slots:1 NMS slot, 7 service slots
Capacity	Single rack supports up to 7x16 wavelength multiplexing and demultiplexing A single rack supports up to 28x10G service forwarding A single rack supports up to 4x100G service forwarding A single rack supports up to 4x200G service forwarding A single rack supports up to 4x400G service forwarding
Power Supply	Dual Power 1+1 protection, AC: 220V (85V~220V) /DC: -48V (-36~-72V) Optional
Power Consumption	Full equipped < 200W
Fan	4 pcs high-performance, high-speed Fan to ensure excellent heat dissipation performance

Operating temperature	-10°C ~ 60°C
storage temperature	-40°C ~ 80°C
Relative humidity	5% ~ 95% No condensation
Size	282.5 (W) × 89 (H) ×350 (D) (mm)
Weight	10kg

2.4 Product Pictures



MU-180-ACDC - 2U 8-slots sub-rack front pane



MU-180-ACDC - 2U 8-slots sub-rack back panel

2.5 Indicator Light Description

Indicator screen	Name	Description
PWR	Rack power indicator	On: The rack power supply is normal Off: The rack is not powered
FAN-PWR	Power working indicator	On: the fan power supply is normal Off: the fan power supply is not working
ALM	Fan alarm indicator	On: the fan is not working properly Off: the fan is working normally

3 MU-70-ACDC - 1U Transmission Platform

3.1 Overview

MU-70-ACDC is DWDM.ME's generation of large-capacity transmission platform, applicable to various network levels such as national, provincial, and metropolitan core, and meets TBit capacity requirements. It is the industry's most cost-effective transmission application platform. It builds a large Granular WDM transmission solution.

3.2 Product Highlights

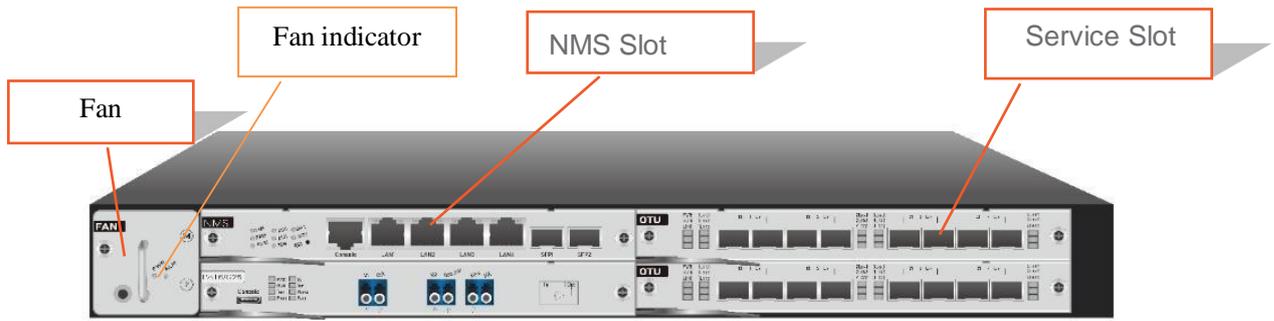
- Standard 19 inches 2U height
- High integration: single rack supports 3 general service slots, 1 network management slot
- The single sub-rack supports up to 12x10G service forwarding
- The single sub-rack supports up to 1x200G service forwarding
- The single sub-rack supports up to 1x400G service forwarding
- Single sub-rack supports up to 3*16 wavelength multiplexing and demultiplexing
- Unified platform: supports mixed insertion of various service cards and unified network management
- High reliability: modular power supply design, support for plugging and unplugging, dual power supply 1+1 protection
- Good heat dissipation performance: 4 high-performance, high-speed fan design to ensure sufficient heat dissipation

3.3 Performance Parameters

Parameters	Technical index
Size	Standard 1U 19 inches
Slot Number	Single slot
Capacity	Single rack supports up to 3x16 wavelength multiplexing and demultiplexing A single rack supports up to 12x10G service forwarding A single rack supports up to 1x100G service forwarding A single rack supports up to 1x200G service forwarding A single rack supports up to 1x400G service forwarding
Power Supply	Dual Power 1+1 Protection, AC:220V (85V~220V/DC:-48V (-36~-72V) Optional
Power Consumption	Full set < 100W
Fan	4pcs high-performance, high-speed Fan to ensure excellent heat dissipation performance

Operating Temperature	-10°C ~ 60°C
Storage Temperature	-40°C ~ 80°C
Relative humidity	5% ~ 95% non-condensation
Size	482.5 (W) ×44.5 (H) × 320 (D) (mm)

3.4 Product Pictures



MU-70-ACDC 4-slot sub-rack front panel



MU-70-ACDC 4-slot sub-rack back panel

3.5 Indicator Light Description

Indicator Screen	Name	Description
PWR	Rack power indicator	On: The rack power supply is normal Off: The rack is not powered
FAN-PWR	Power working indicator	On: the fan power supply is normal Off: the fan power supply is not working
ALM	Fan alarm indicator	On: the fan is not working properly Off: the fan is working normally

Chapter 3 Single Board Description

1 Network Management System (MS-2GEN)

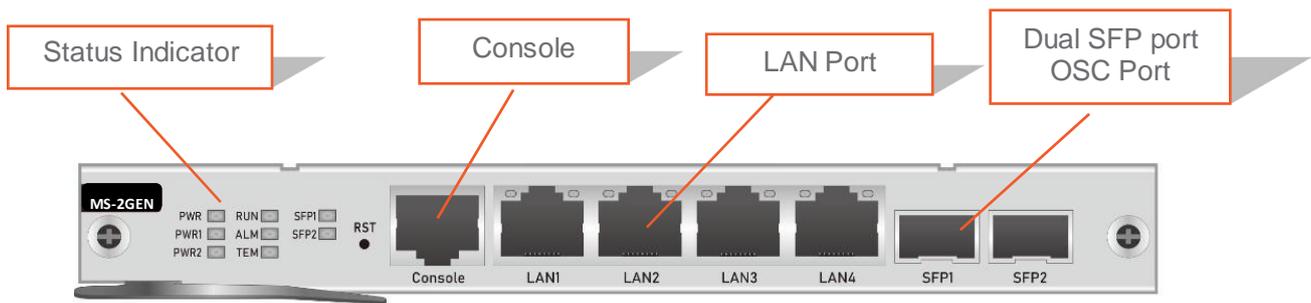
1.1 Overview

The network element management panel is an important part of the MU- series. The network element management card realizes online management and monitoring of the entire WDM system, and performs data configuration, alarm management, fault monitoring, etc. for each network element, and provides graphical information management, Topology management, electronic map positioning, friendly man-machine information, convenient for rapid service deployment, rapid fault location, and saving maintenance costs.

1.2 Product Highlights

- The optical monitoring channel does not limit the distance between 2 optical amplifiers
- Amplifier failure does not affect the performance of the optical monitoring channel
- The network management board is independent of the service board and does not affect the service
- When the service board fails, the network management information transmission can still be guaranteed
- Using 1510nm wavelength, supporting maximum 40dB span transmission
- Support RJ45, E1, SFP, the largest possible use of existing transmission resources to transmit network management information

1.3 MS-2GEN Diagram



MS-2GEN Diagram

Local management console port	Support 1 local management console port
Remote management Ethernet port	Support 4pcs RJ45 Ethernet interfaces, interface rate 10/100M adaptive

OSC Optical monitoring port	Support 2 pluggable SFP ports , LC type
Network management Type	Support CLI, Telnet, SNMP, Web and other network management Types
Exchange function	Support IP communication function between devices to realize comprehensive management of multiple devices
Maintenance function	Support local or remote software online upgrade
Reset function	Support operation button to reset local NCP board hardware
Operating temperature	-10°C~+60°C
Working humidity	5%~95%
Size	191 (W) × 20 (H) × 253 (D)
Max. power consumption	5W
MTBF	> 100,000 hours
Default IP address	192.168.1.188

1.4 Device Interface Definition

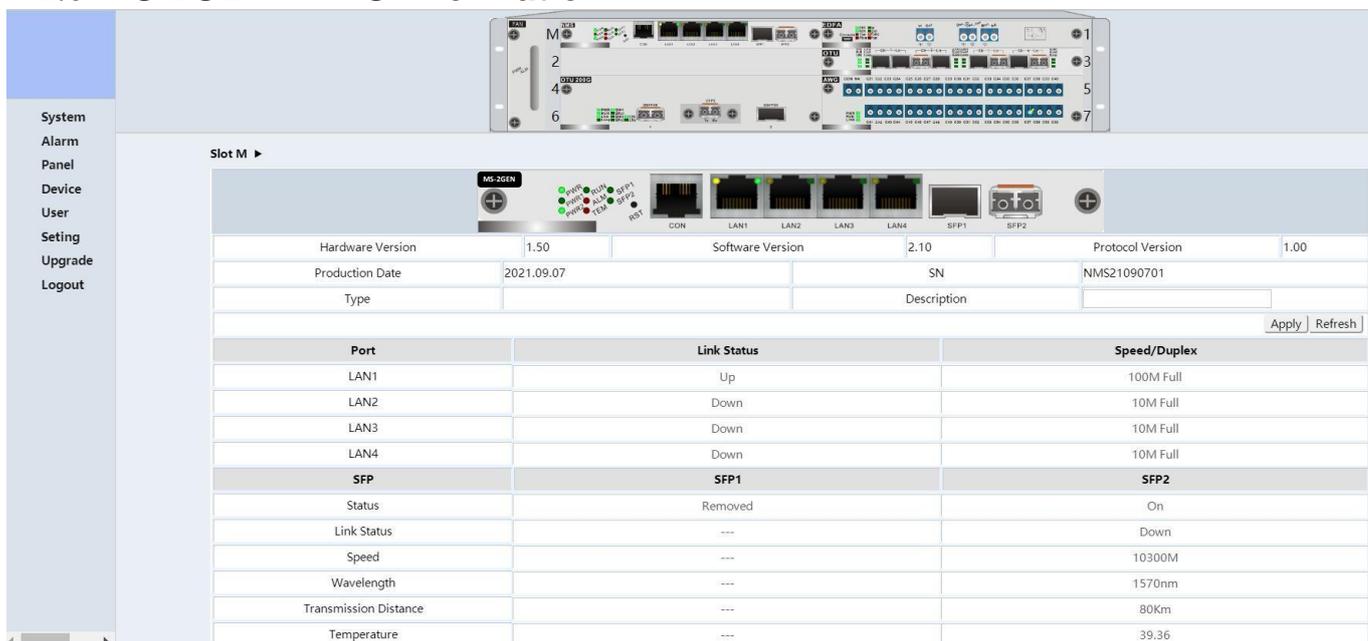
Interface	Interface Screen	Function
Ethernet port	LAN1	Connect to the network management computer through the network cable to realize the management of the MU-series by the network management system. LAN1, LAN2, LAN3, LAN4 interfaces to realize cascading management of multiple network elements. Simultaneously realize the transmission of network management information.
	LAN2	
	LAN3	
	LAN4	
SFP Port	SFP1	Access to the transmission optical cable through the OSC interface to realize the aggregation of branch node network management information to the network management center, dual optical ports to achieve two-way transmission, and 1+1 protection.
	SFP2	
Console	CON	Provide local console port network management function

1.5 Indicator Light Description

Indicator Screen	Name	Description
PWR	NMS power indicator	On: the power supply of NMS is normal Off: the power supply is faulty
PWR1	Rack power indicator 1	On: The rack power supply is normal Off: The rack is not powered
PWR2	Rack power indicator 2	
RUN	NMS indicator	On: NMS is operating normally Off: malfunctioning

ALM	Alarm indicator	Unknown rack type alarm is on Any power failure alarm is on Any fan failure alarm is on
		The temperature alarm is on The unknown card message type alarm is on
TEM	Temperature warning indicator	Alarm when the temperature is too high
SFP1	SFP 1 indicator	On: Flashing, data link is normal, Off: data connection is abnormal
SFP2	SFP 2 indicator	On: Flashing, data link is normal, Off: data connection is abnormal

1.6 MS-2GEN - NMS Information



The screenshot shows the NMS interface for an MS-2GEN device. On the left is a navigation menu with options: System, Alarm, Panel, Device, User, Setting, Upgrade, and Logout. The main area displays a top view of the device with slot M selected. Below this, a table provides system information:

Hardware Version	1.50	Software Version	2.10	Protocol Version	1.00
Production Date	2021.09.07	SN	NMS21090701		
Type	Description				

Below the system information is a table for port status:

Port	Link Status	Speed/Duplex
LAN1	Up	100M Full
LAN2	Down	10M Full
LAN3	Down	10M Full
LAN4	Down	10M Full

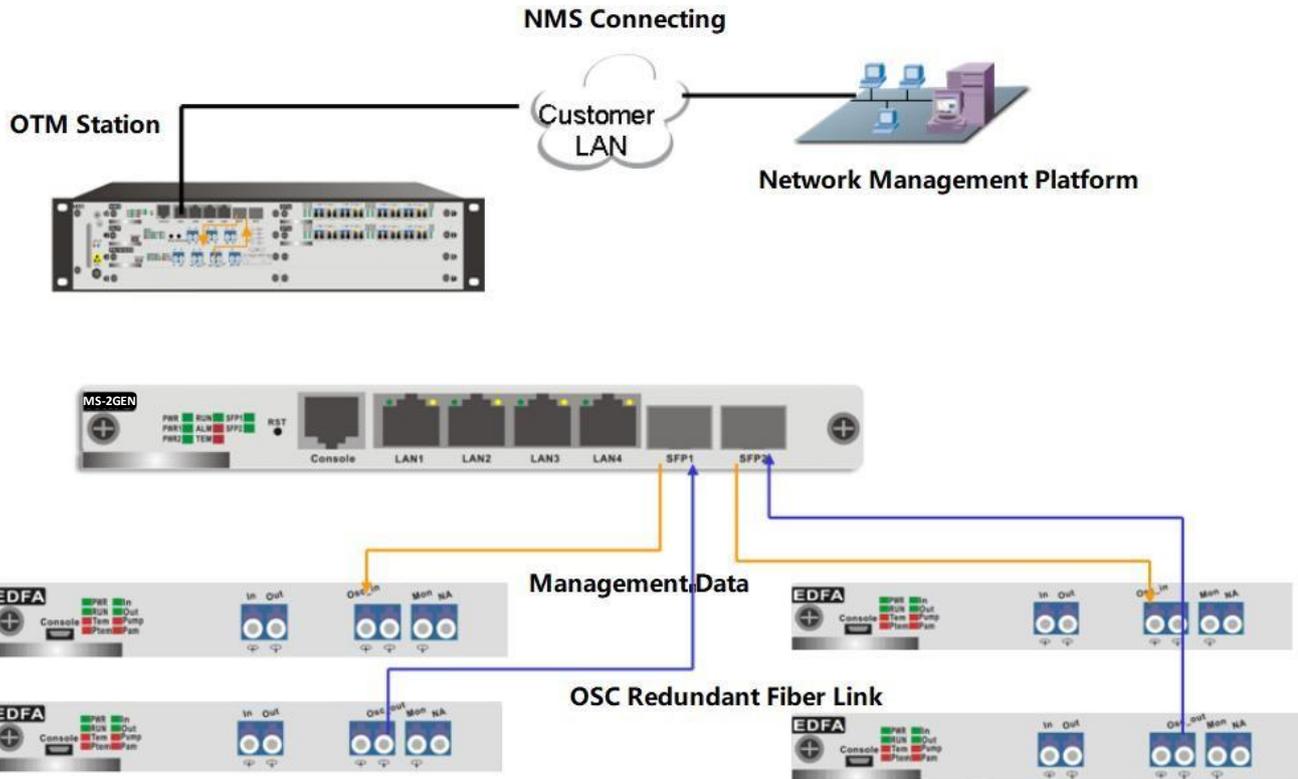
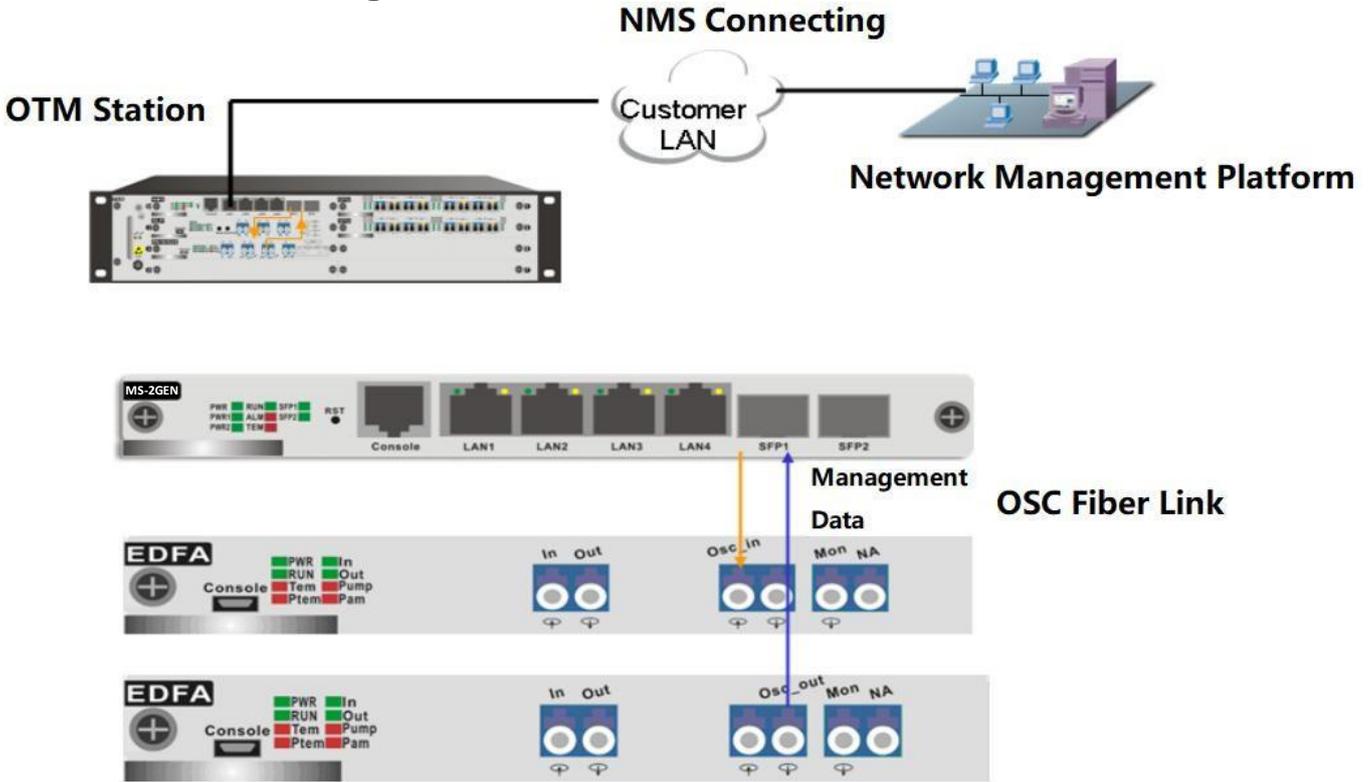
There is also a section for SFP (SFP1 and SFP2) with fields for Status, Link Status, Speed, Wavelength, Transmission Distance, and Temperature.

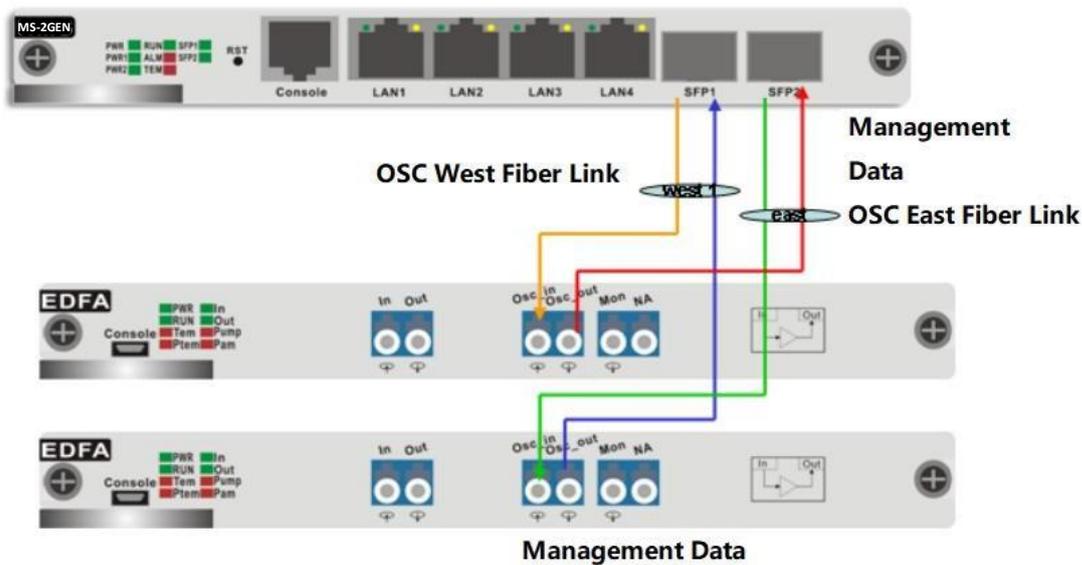
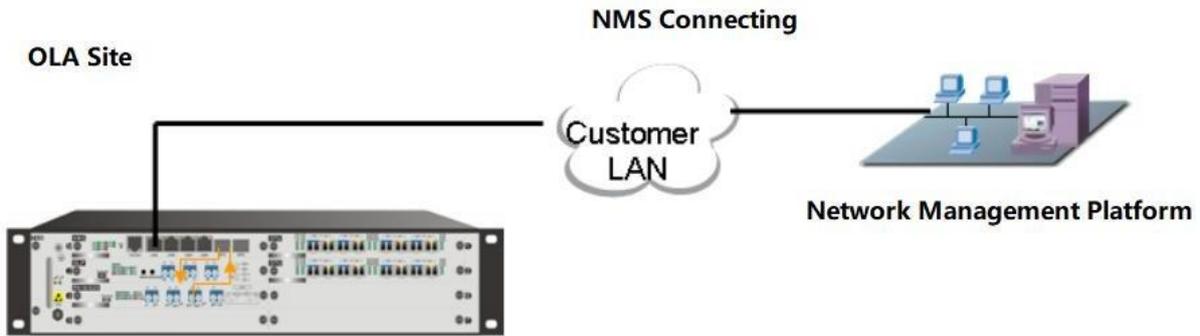
Monitoring information

- Real-time monitoring of the working status of the network management disk
- Support real-time monitoring of SFP port link status
- Support real-time reading of SFP module DDM information
- Support real-time monitoring of LAN port connection status

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1.7 Connection Diagram





Note:

1. The network management card has dual optical ports SFP1 and SFP2 with cascading, ring network, and 1+1 protection functions. SFP1 and SFP2 Tx and Rx are respectively connected to OSC-IN and OSC-OUT to realize the transmission of network management information.
2. The 4 LAN ports of the network management card have switching and cascading functions, connecting multiple PCs to realize multiple PCs to manage the DWDM system at the same time, and 4 LAN ports can be cascaded to 4 DWDM systems to realize multiple DWDM centralized network management.

2 LC-OTUQS2S - 8*SFP+ Optical Transponder (4x10G OTU)

2.1 Overview

LC-OTUQS2S optical transponder unit (Optical Transponder Unit) supports 4 channels of 10G rate data optical forwarding. Amplify and regenerate 4 channels of 10G bidirectional signals, re-timing the clock, convert them into specific wavelength signals, send them to the OMU disk, and perform DWDM transmission after multiplexing and amplification.

2.2 Product Highlights

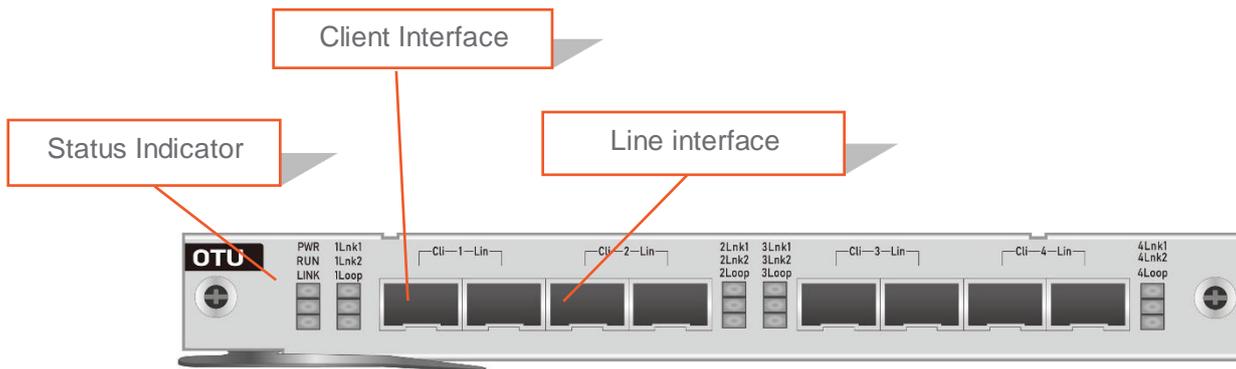
- Multi-protocol rate compatibility
 - Support 3R function
 - Signal amplification and regeneration
 - Wave shaping
 - Clock re-timing
 - Multi-protocol rate compatibility:
 - FC: 1/2/4/8/10Gbps
 - CPRI: 2/3/4/5/6/7
 - Ethernet: 1G/10G
 - SDH: STM-4/16/64
 - High port density:
 - Single board supports 4-channel 1.25G~10Gbps two-way transaction
 - Single board supports 8-channel unidirectional 1.25G~10Gbps Transaction
 - Powerful self-healing ring function:
 - Support software and hardware loopback port self-loop function
 - Support SFP+ digital diagnosis
 - Support LFP link failover function
 - Support ALS function

2.3 Product Performance

Parameter	Technical index
Wavelength range	Comply with DWDM wavelength

Service accesstype		Single channel support: IP: GE/10GE FC: 1/2/4/8/10Gbps SDH: STM-1/4/16/64 CPRI:1/2/3/4/5/6/7
Optical interface transmission mode		3R 8*SFP+ interface, 4 channels of bidirectional and 8 channels of unidirectional data
Environmental requirements	Operating temperature	-10°C ~ 70°C
	Storage temperature	-40°C ~ 80°C
	Relative humidity	5% ~ 95% non-condensation
Power consumption		≤15W
Size (mm)		191 (W) × 20 (H) ×253 (D)

2.4 10G OTU Diagram



4-channel 10G OTU Board Diagram

2.5 Device Interface Definition

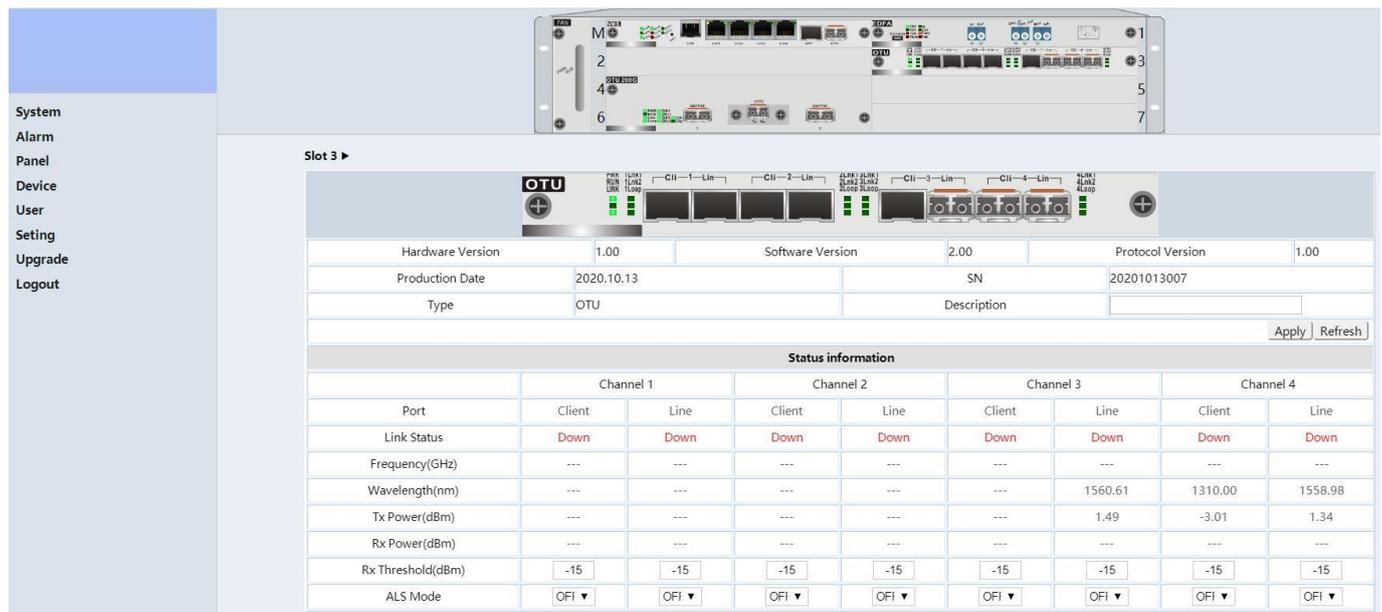
Interface screen	Name	Function/Link
Cli	Client interface	Connec tcustomer equipment, realize O/E conversion, and forward to line side port
Lin	Line side interface	Connect the OD/OM Client Interface, convert the client signal into a specific wavelength, sendittothe OM multiplexed transmission, amplify, re-timing, and regenerate the OD branch signal, and sendit to the client port;

Note: 4 groups of SFP ports

2.6 Indicator Light Description

Interface Screen	Name	Description
PWR	OTU Power Indicator	On: OTU power supply is normal, off, power supply failure
RUN	OUT System indicator	Flashing: the system is operating normally, on or off, operating failure
Lnk	OTU board on the place indicator	On: the board is in place, off, the board is not in place
Link1~Link8	OTU Module receiving light indicator	On: the board is in place, off, the board is not in place
Loop	Loopback indicator	On: the link is in the loopback enabled state, off, the link is in the loopback disabled state

2.7 10G OTU NMS Interface



Hardware Version		1.00	Software Version		2.00	Protocol Version		1.00
Production Date		2020.10.13		SN		20201013007		
Type	OTU		Description					
Status information								
	Channel 1		Channel 2		Channel 3		Channel 4	
Port	Client	Line	Client	Line	Client	Line	Client	Line
Link Status	Down	Down	Down	Down	Down	Down	Down	Down
Frequency(GHz)	---	---	---	---	---	---	---	---
Wavelength(nm)	---	---	---	---	1560.61	1310.00	1558.98	---
Tx Power(dBm)	---	---	---	---	1.49	-3.01	1.34	---
Rx Power(dBm)	---	---	---	---	---	---	---	---
Rx Threshold(dBm)	-15	-15	-15	-15	-15	-15	-15	-15
ALS Mode	OFI	OFI	OFI	OFI	OFI	OFI	OFI	OFI

Single Board Monitoring Information

- Online real-time monitoring of the working status of the service disk
- Online monitoring module link status, port link status
- Real-time monitoring module receiving and luminous power, current working rate
- Support real-time reading of DDM information of optical module
- Support reading module wavelength and channel information

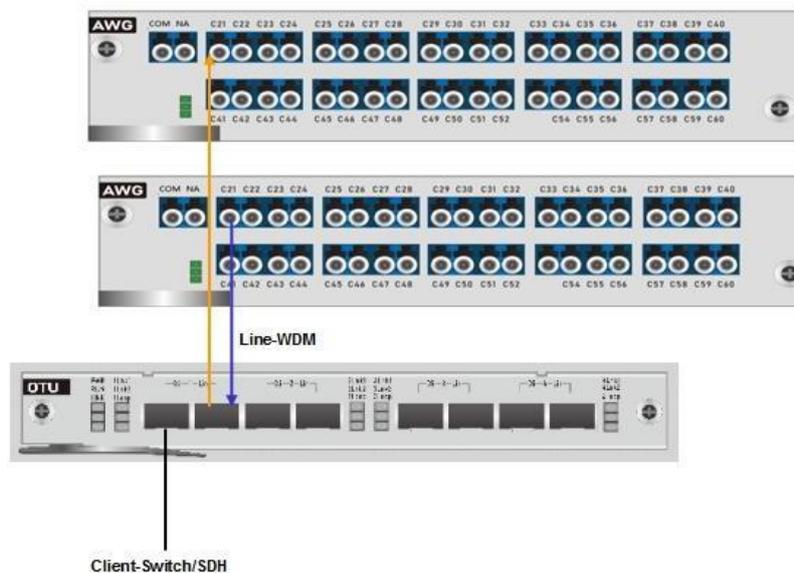
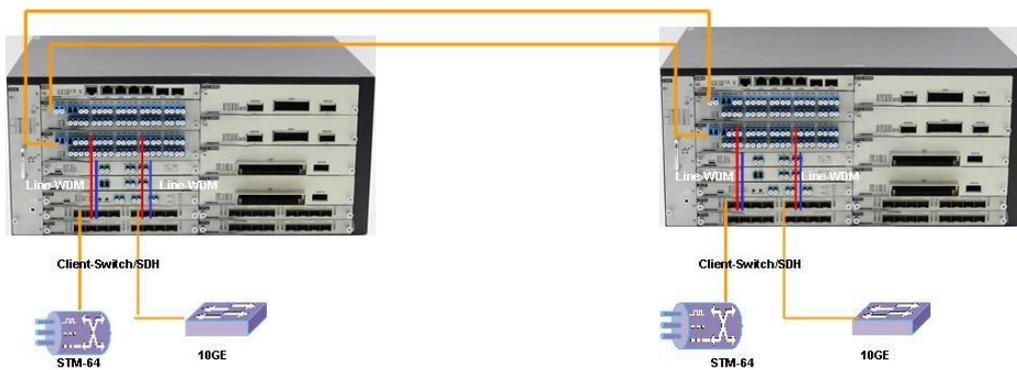
Setting

1. Receiving power alarm threshold setting The receiving power alarm threshold of the optical module can be set

through the network management. When the receiving power is lower than the threshold, the device will prompt an alarm to notify the maintenance personnel to pay attention, and the service will not be affected.

2. LFP settings: The LFP function can be set through the network management. When the LFP function is enabled, if the OTU line side does not receive light, the client side does not emit light, and when the client side does not receive light, the line side does not emit light.
3. Loopback settings: The loopback function can be set through the network management to test link failures.
4. Speed selection According to the service, you can choose the corresponding rate, 8.5G FC, 9.953~11.3 SDH/Ethernet, 11.3~11.7.

2.8 Connection Diagram



Notes: OTU branch Cli interface, connected to customer switch equipment, line interface connected to MUX/DEMUX channel interface.

3 LC-MP100-II - 100G Optical Transponder (QSFP28 to CFP-DCO)

3.1 Overview

The LC-MP100-II Optical Transponder Unit supports 1 channel of 100G rate data optical forwarding, a QSFP28 client interface and a CFP line-side interface to support single-channel 100Gbps large-granularity data transmission. Using the industry's most advanced coherent technology and DSP processing technology, it overcomes the challenges of high-speed transmission systems for OSNR requirements, CD tolerance, PMD tolerance and nonlinear transmission physical effects, and provides large capacity and ultra-large bandwidth for the transmission network 100G coherent transmission system solution.

3.2 Product Highlights

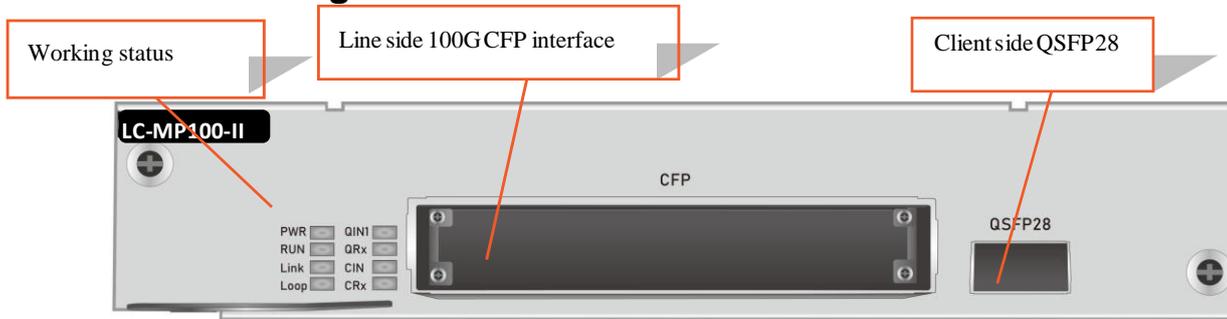
- Support single channel 100Gbps large particle transmission
- Client side supports QSFP28-LR4 module
- Line side interface: CFP interface, 100G coherent DWDM module
- Ultra-long-distance transmission: adopts FEC forward error correction coding technology to achieve 1500km long-distance transmission without electrical relay
- Large dispersion tolerance: using coherent wave technology and high-performance DSP processing technology, 1500km without dispersion compensation
- Support port software and hardware loopback test
- Support DDM digital diagnosis
- Support adjustable wavelength
- Support adjustable output power
- Support OSNR real-time monitoring
- Support real-time monitoring of bit error rate
- Support LFP function Support ALS function

Performance Parameters

Performance Parameters	Technical Index
Center Wavelength	DWDM 1528~1565nm
Rate (Gbps)	100Gbps

100G interface	Client side	100G QSFP28 Module
	Line side	CFP 100Gbps DWDM Coherence Module
FEC(Gain, delay, biterror rate threshold)	RS-FEC (G.709)	6.2dB, 1.2μs, 8.5e-2
	EFEC	9.4dB, 16μs, 3.6e-2
	SD-FEC	10.1dB, 7.9μs, 1.0e-2
Size	191 (W) × 41 (H) × 253 (D)	
environment	Working Temp.	-10°C ~ 60°C
	Storage Temp.	-40°C ~ 80°C
	Relative humidity	5% ~ 95% Non-condensing
Power consumption	≤50W	

3.3 100G OTU Diagram



3.4 Device Interface Definition

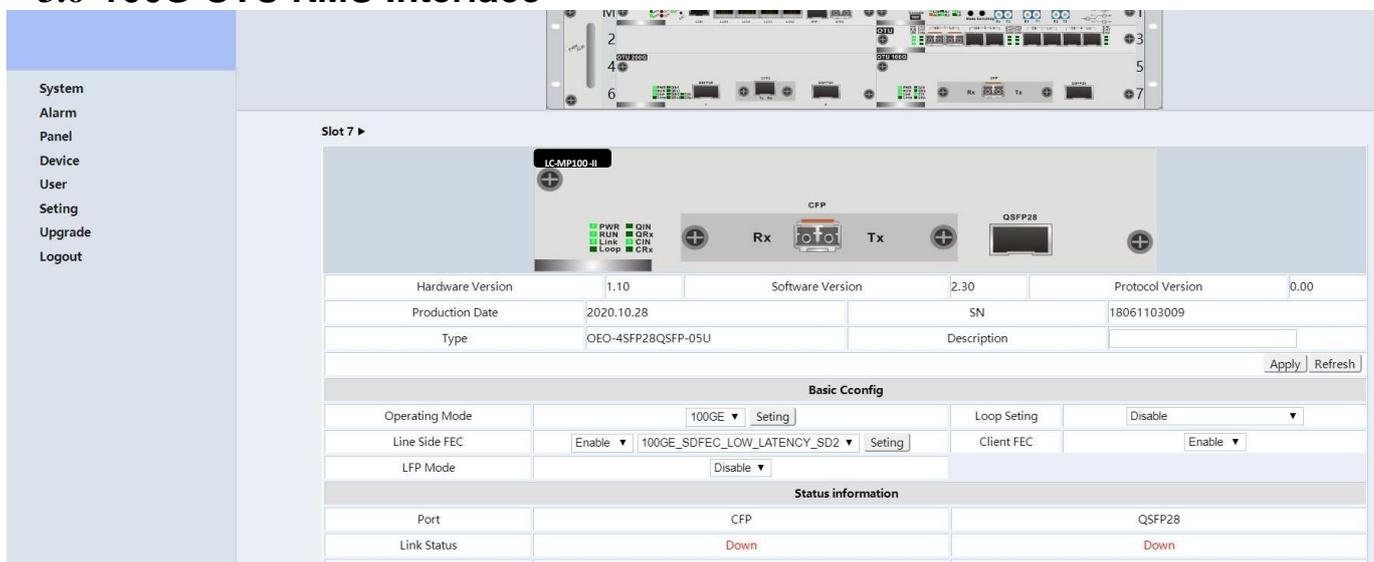
Interface Screen	Name	Function/Links
CFP	Line side interface	Insert the 100G CFP coherent module, connect to the wavelength division multiplexer
QSFP28	Client side interface	Support inserting 100G QSFP28 module to connect customer equipment

3.5 Indicator Light Description

Interface Screen	Name	Description
PWR	Power Indicator	On, TMUX power supply is normal, Off, power supply failure
RUN	System indicator	Flashing, the system is operating normally, On or Off, operating failure

Lnk	Board card in place indicator	On, the board is in place, Off, the board is not in place
Qin	Client side module presence indicator	On, the module is in place, Off, the module is not in place
QRx	Light receiving indicator on Client side module	On, light receiving is normal, Off, light receiving is abnormal
Cin	Line-side module presence indicator	On, the module is in place, Off, the module is not in place
CRx	Line side module receiving light indicator	On, light receiving is normal, Off, light receiving is abnormal
Loop	Loopback indicator	On, loopback is enabled, Off, loopback is prohibited

3.6 100G OTU NMS Interface



Monitoring Information

- Online real-time monitoring of the working status of the service disk
- Online monitoring module link status, port link status
- Real-time monitoring module receiving and luminous power, current working rate
- Support real-time reading of DDM information of optical module
- Support reading module wavelength and channel information
- Real-time monitoring of signal-to-noise ratio
- Real-time monitoring of bit error rate

Setting

1. Receiving power alarm threshold setting

The receiving power alarm threshold of the optical module can be set through the network management. When the receiving power is lower than the threshold, the device will prompt an alarm to notify the maintenance personnel to pay attention, and the service will not be affected.

2. LFP settings

The LFP function can be set through the network management. When the LFP function is enabled, if the OTU line side does not receive light, the client side does not emit light, and when the client side does not receive light, the line side does not emit light.

3. ALS settings

You can set the ALS enable through the network management. When the ALS is enabled, when the optical module of this port is not receiving light, the module laser does not emit light and emits light at intervals to determine whether the line connection is normal. The lighting interval and lighting duration can be set through the network management.

4. Loop loopback settings

The loopback function can be set through the network management to test link failures.

5. FEC level setting

The FEC level can be set through the network management interface.

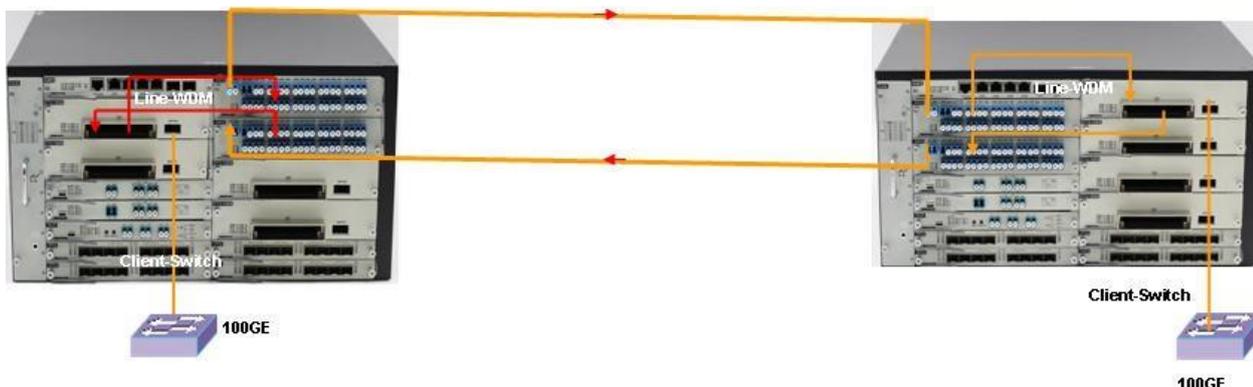
6. Wavelength setting

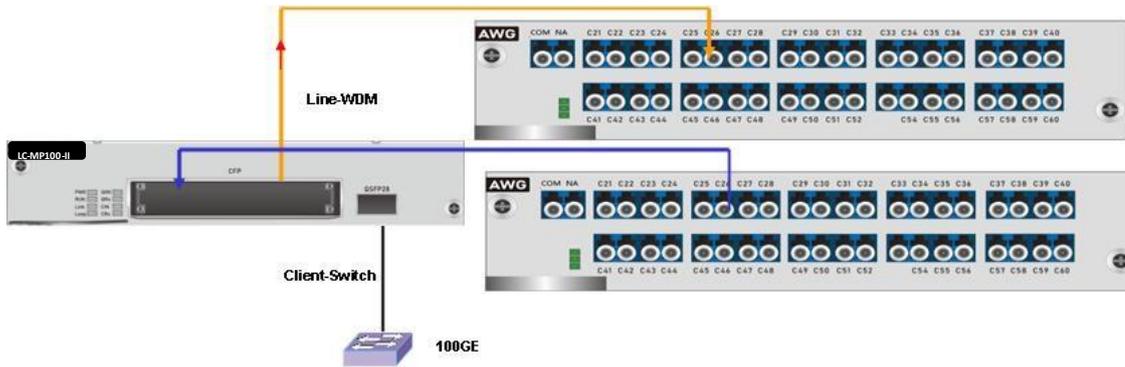
The wavelength and channel can be set through the network management interface.

7. Power setting

The luminous power can be set through the network management interface.

3.7 Connection Diagram





Note: OTU branch Cli interface, connected to customer switch equipment, line interface connected to MUX/DEMUX channel interface.

4 LC-MP200-II - 200G Muxponder(2xQSFP28 to CFP2-DCO)

4.1 Overview

The LC-MP200-II - 200G Muxponder service board supports 2x100G↔200G electrical layer multiplexing/demultiplexing, achieving 2 channels of 100G rate aggregation into a single channel 200G rate; supporting 2 QSFP28 client interfaces and a CFP2 line side interface, supporting single channel 200Gbps Granular data transmission. Using the industry's most advanced coherent technology and DSP processing technology, it overcomes the challenges of high-speed transmission systems for OSNR requirements, CD tolerance, PMD tolerance and nonlinear transmission physical effects, and provides large capacity and ultra-large bandwidth for the transmission network 200G coherent transmission system solution.

4.2 Product Highlights

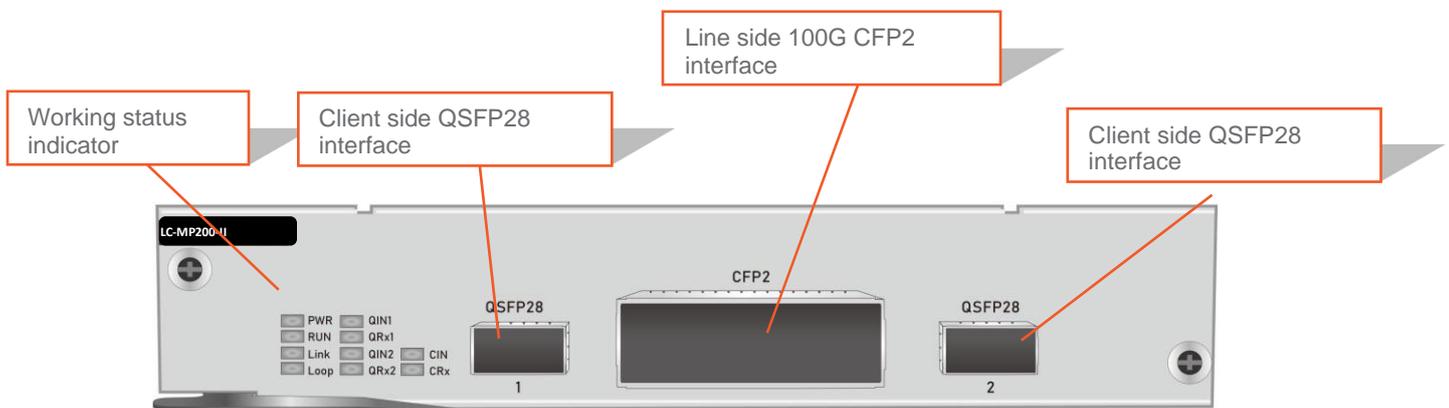
- Support single channel 200Gbps large particle transmission
- Client side supports 2xQSFP28-LR4 module
- Line side interface: CFP2 interface, 200G coherent DWDM module
- Ultra-long-distance transmission: adopts FEC forward error correction coding technology to achieve 800km long-distance transmission without electrical relay
- Large dispersion tolerance: using coherent wave technology and high-performance DSP processing technology, 1500km without dispersion compensation
- Support port software and hardware loopback test

- Support DDM digital diagnosis
- Support adjustable wavelength
- Support adjustable output power
- Support OSNR real-time monitoring
- Support real-time monitoring of bit error rate
- Support ALS function

Performance Parameter

Performance parameter		Technical Index
Center wavelength		DWDM 1528~1565nm
Rate (Gbps)		200Gbps
100G interface	Client side	2x100G QSFP28 Module
	Line side	CFP2 200Gbps DWDM Coherence Module
FEC(Gain, delay, biterror rate threshold)	RS-FEC (G.709)	6.2dB, 1.2μs, 8.5e-2
	EFECC	9.4dB, 16μs, 3.6e-2
	SD-FEC	10.1dB, 7.9μs, 1.0e-2
Size (mm)		192(W) x 41(H) x 252(D)
environment	Working Temp.	-10°C ~ 60°C
	Storage Temp.	-40°C ~ 80°C
	Relative humidity	5% ~ 95% Non-condensing
Power consumption		≤50W

4.3 200G OTU Diagram



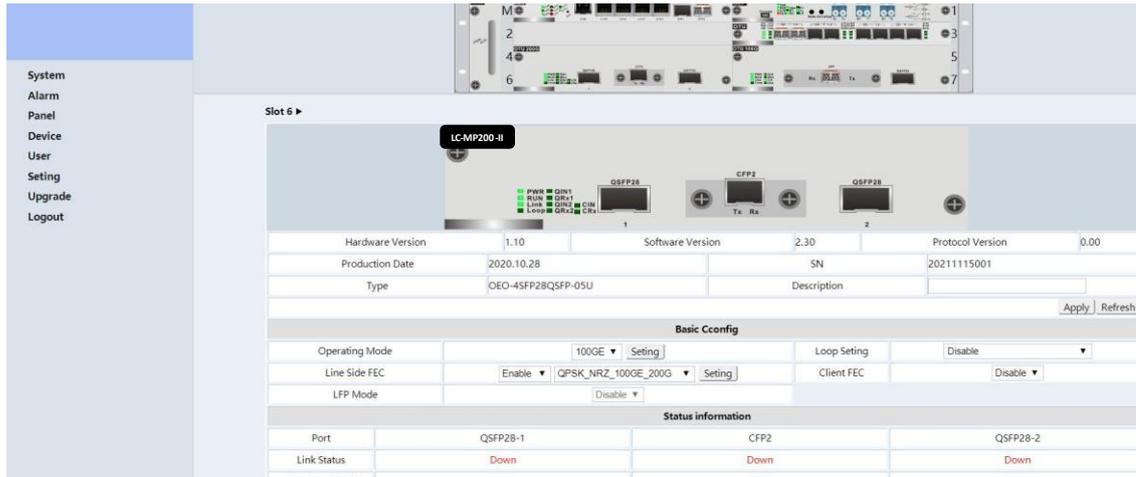
4.4 Device Interface Definition

Interface Screen	Name	Function/Links
CFP2	Line side interface	Insert the 200G CFP2 coherent module and connect to the wavelength division multiplexer
QSFP28	Client side interface	Support inserting 100G QSFP28 module to connect customer equipment

4.5 Indicator Description

Interface Screen	Name	Description
PWR	Power Indicator	On, TMUX power supply is normal, Off, power supply failure
RUN	System indicator	Flashing, the system is operating normally, On or off, operating failure
Lnk	Board card in place indicator	On, the board is in place, Off, the board is not in place
Qin1	Module presence indicator on Line side 1	On, the module is in place, Off, the module is not in place
QRx1	Light receiving indicator on the Line side 1	On, light receiving is normal, Off, light receiving is abnormal
Qin2	Client side 2 module presence indicator	On, the module is in place, Off, the module is not in place
QRx2	Light receiving indicator on the side of branch 2 module	On, light receiving is normal, Off, light receiving is abnormal
Cin	Line-side module presence indicator	On, the module is in place, Off, the module is not in place
CRx	Line side module receiving light indicator	On, light receiving is normal, Off, light receiving is abnormal
Loop	Loopback indicator	On, loopback enabled, Off, loopback disabled

4.6 200G OTU NMS Interface



Monitoring Information

- Online real-time monitoring of the working status of the service disk
- Online monitoring module link status, port link status
- Real-time monitoring module receiving and luminous power, current working rate
- Support real-time reading of DDM information of optical module
- Support reading module wavelength and channel information
- Real-time monitoring of signal-to-noise ratio
- Real-time monitoring of bit error rate

Setting

1. Receiving power alarm threshold setting

The receiving power alarm threshold of the optical module can be set through the network management. When the receiving power is lower than the threshold, the device will prompt an alarm to notify the maintenance personnel to pay attention, and the service will not be affected.

2. LFP settings

The LFP function can be set through the network management. When the LFP function is enabled, if the OTU line side does not receive light, the client side does not emit light, and when the client side does not receive light, the line side does not emit light.

3. ALS settings

You can set the ALS enable through the network management. When the ALS is enabled, when the optical module

of this port is not receiving light, the module laser does not emit light and emits light at intervals to determine whether the line connection is normal. The lighting interval and lighting duration can be set through the network management.

4. Loop loopback settings

The loopback function can be set through the network management to test link failures.

5. FEC level setting

The FEC level can be set through the network management interface.

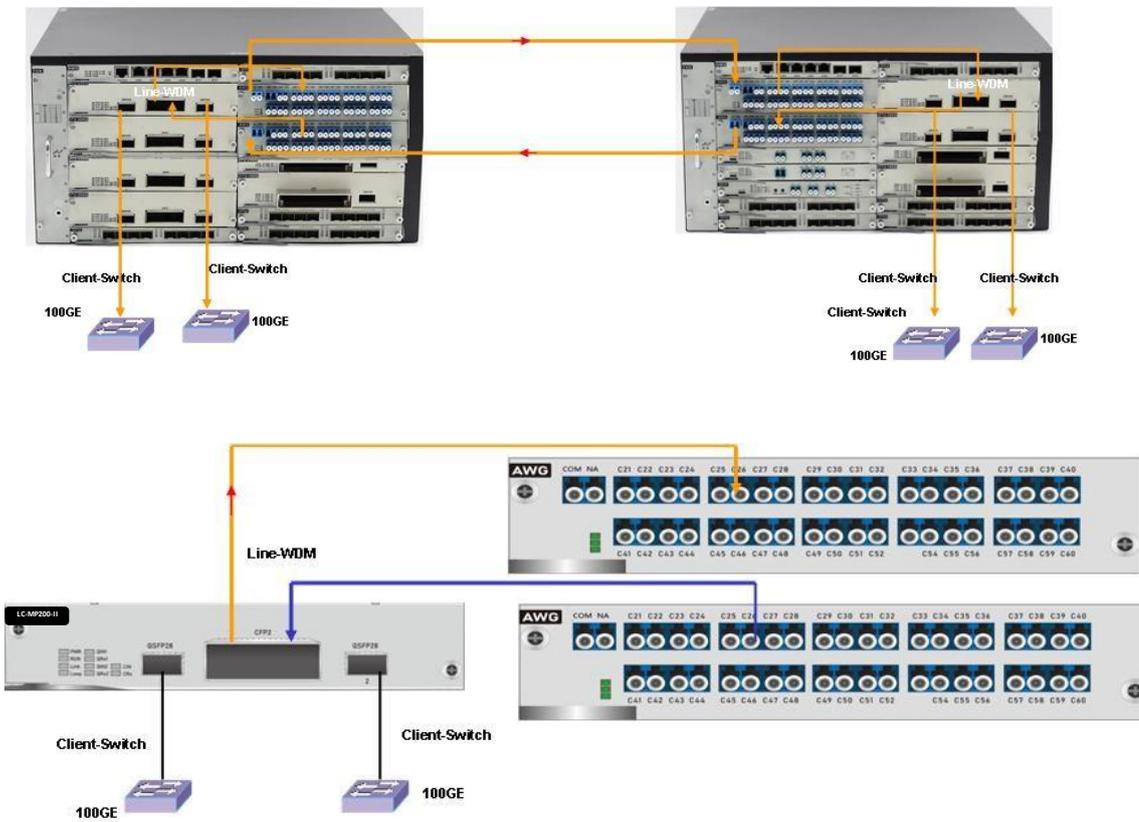
6. Wavelength setting

The wavelength and channel can be set through the network management interface.

7. Power setting

The luminous power can be set through the network management interface.

4.7 Connection Diagram



5 LC-MP400-II - 400G Muxponder 4x100G converge to 400G

5.1 Overview

LC-MP400-II - the 400G Muxponder Transmitter supports four QSFP28 client interface and one CFP2 line-side interface to support single-channel 400Gbps large-grain data transfers. The industry's most advanced coherent technology and FEC forward error correction coding technology enable high-capacity, long-distance high-performance transmission.



5.2 Product Highlights

- Media conversion
- Signal repeating
- Lambda conversion
- Support single channel 400Gbps
- Client Side: 4x QSFP28 module
- Line Side: CFP2 400Gbps coherent module
- Ultra-long-distance transmission: FEC technology can be used to achieve 1000km transmission without regeneration
- Large dispersion tolerance: 20000ps.nm
- Support port loopback test
- Support 80 channel wavelength tunable

LC-MP400-II - 400G Muxponder includes integrated OTN FEC capability on the transponder, allowing operation over longer distances or in applications requiring ultra-low bit error rates.

The 400G Muxponder from DWDM.ME offer a choice of pluggable QSFP28 Client Side Optics and CFP2 -DCO Coherent DWDM Line Side Optics based on distance and capacity requirements.

The Coherent DWDM Optics are the most technologically advanced and offer benefits on dispersion management, signal reach, and other optical properties. Coherent DWDM Optics can greatly increase the capacity and reach of an optical network, The 400G Muxponder models fits for MU- series (chassis: MU-70-ACDC - 1U, MU-180-ACDC - 2U, MU-380-ACDC - 5U).

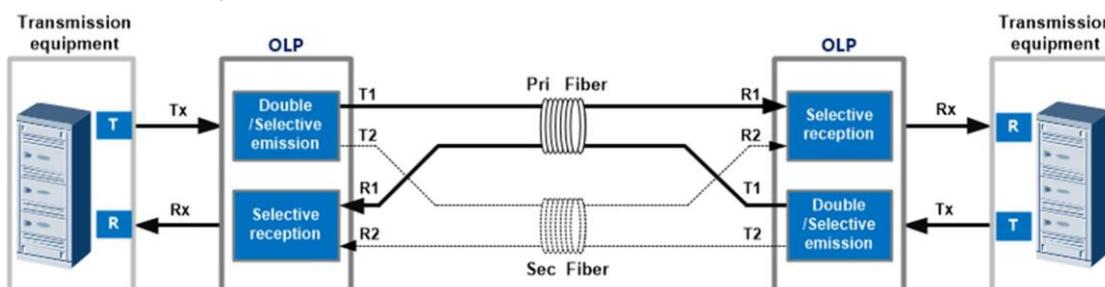
5.3 Performance Parameter

System Parameter		Technical Indicator
Center Wavelength		DWDM 1529.5~1565.50nm
Data Rate		400Gbps
400G Interface	Client Side	4xQSFP28 module
	Line Side	CFP2 400Gbps coherent module
FEC (gain, delay, BER threshold)	200G-QPSK, 20% SDFEC, 2x100G	Rx OSNR Tolerance: 13.8dB
	200G-16QAM-PS, 20% SDFEC, 2x100G	Rx OSNR Tolerance: 15.8dB
	400G-16QAM-PS, 20% SDFEC, 4x100G	Rx OSNR Tolerance: 21dB
NMS		TELNET, SNMP, WEB
Size		191 (W) x 253 (D) x 42 (H) mm
Environment	Operating Temperature	-10°C ~ 60°C
	Storage Temperature	-40°C ~ 80°C
	Relative Humidity	5% ~ 95% Non-condensing
Power Consumption		≤50W

6 Optical line protection Card (OLP)

6.1 Overview

Optical Line Protection Equipment (OLP) is a kind of equipment used in the field of optical fiber communication to switch between the main and standby optical paths. It can automatically identify the optical signal status of the main and standby optical fibers, and perform instantaneous switching of the optical paths. Prevent the normal operation of communication when the main optical cable has a full-blocking obstacle. The optical path protection equipment mainly has the functions of real-time monitoring of optical power, optical path switching, and alarms. The port that establishes the route is transparent to the speed and interface, and its switching route is established in the optical domain.



DWDM.ME

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Email: sales@dwdm.me www.dwdm.me
 Add.: Kadaka tee 113a, 12915 Tallinn, Estonia

6.2 Product Highlights

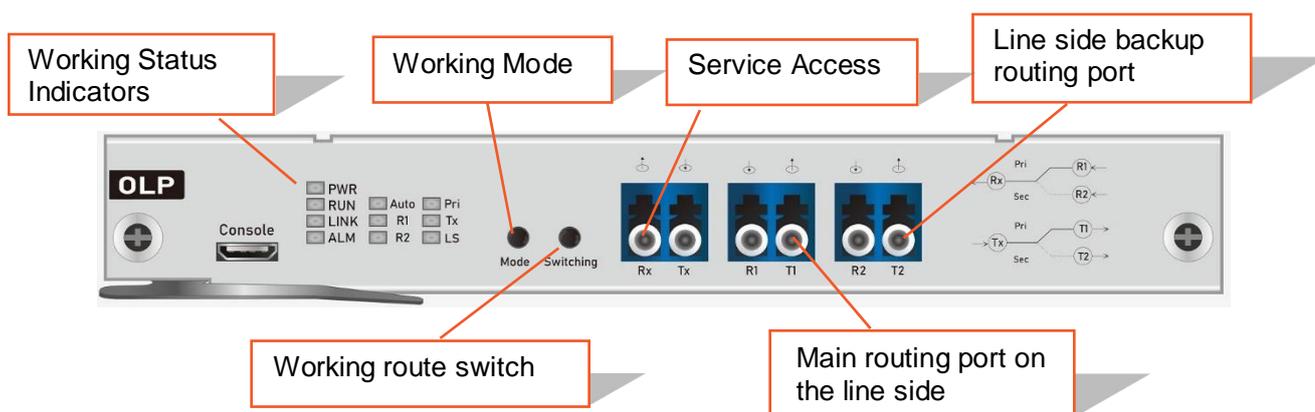
- Automatic switching protection: After the line is interrupted, the system automatically quickly switches the faulty optical fiber main route to the backup route to ensure uninterrupted services, increase the reliability of the transmission network or line quality, and improve the service quality of operators.
- Fast switching speed: switching time <30ms, shortening communication interruption time and improving maintenance efficiency.
- Fiber quality real-time monitoring: Provides real-time monitoring of the main and standby fiber cores, that is, the optical power monitoring of the main and standby fiber (transceiver) dual fibers at the same time, which can monitor the quality of the optical cable of the main and standby routes, which can effectively avoid the simultaneous blocking of the main and standby route fibers Case.
- Emergency dispatch of active and standby routes: Arbitrary dispatch of active and standby working routes under the premise of ensuring that the business is not interrupted, without the need to manually dispatch on the on-site ODF, which saves time and is safe and convenient.
- Low insertion loss: 1+1≤4dB, 1:1≤1.5dB Working mode can be set: support manual switching, automatic switching can be set
- Support switching threshold can be set: the main and standby route switching threshold can be set according to the line condition
- Manual return to automatic delay: the time for manual mode to return to automatic mode can be set according to requirements
- Support automatic switchback delay setting: the main route failure repair and automatic return to the main route delay can be set as needed

6.3 Product Performance

Performance Parameters	1:1 Protection	1+1 Protection
Working Wavelength(nm)	1310±50nm and 1550±50nm	
Monitoring optical power range (dBm)	+23~-50	
Monitoring optical power accuracy(dB)	±0.25	
Monitor optical power resolution(dB)	±0.01	

Return loss(dB)	≥55	
Polarization dependent loss(dB)	≤0.05	
Wavelength dependent loss(dB)	≤0.1	
Insertion loss(dB)	TX<1.2, RX<1.2	TX<4, RX<1.2
Switching time(ms)	<30	<15
Environment	-10~+60°C	
	-20~+75°C	
	5%~95% non-condensation	
Power (V)	220V/AC, 50Hz; -48V/DC (Optional)	
Power Consumption (W)	<5W	
Power down state	Keeping	
Size(mm)	191(W)× 20(H)× 253(D)	

6.4 OLP Diagram



Dual-fiber OLP line protection Card Diagram

6.5 Device Interface Definition

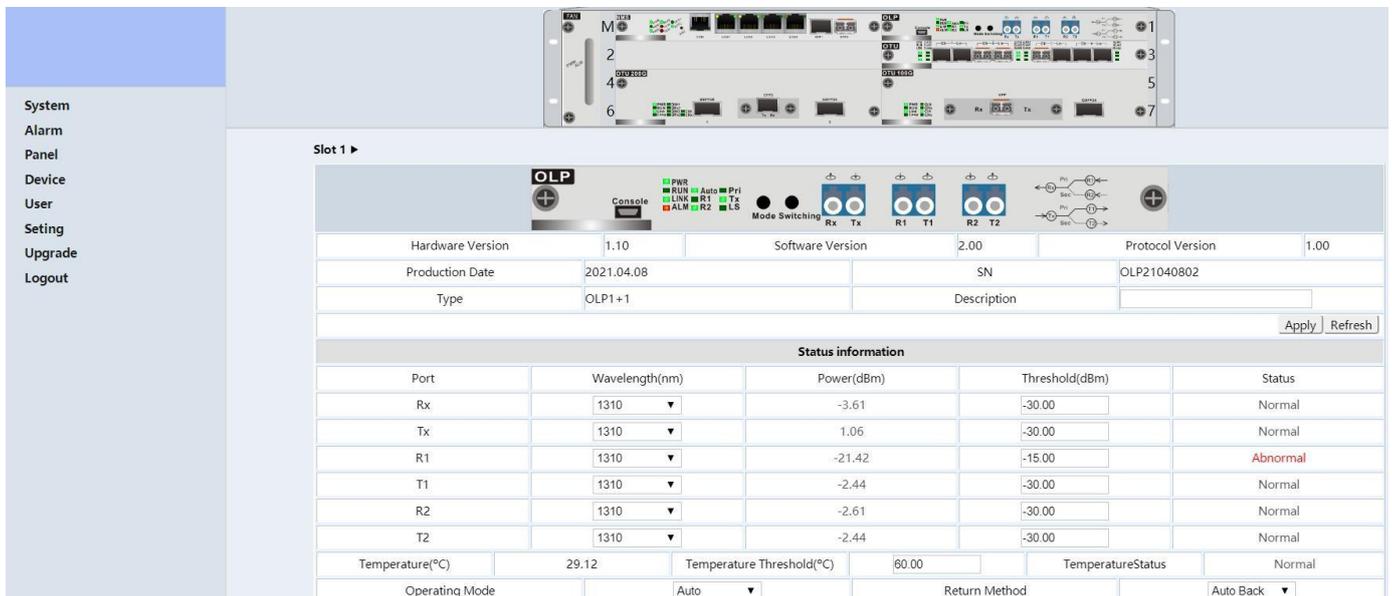
Interface Screen	Name	Function/Links
RX	OLP Local output interface	Connect to the receiving port of the local device
TX	OLP local receiving interface	Connect the local device's transmit port
R1	Main route receiving interface	Connect to the peer T1
T1	Main route output interface	Connect to the peer R1
R2	Standby route receiving interface	Connect to the peer T2
T2	Backup routing output interface	Connect to the peer R2

6.6 Indicator Light Description

Indicator Screen	Name	Description
PWR	OLP power indicator	On, OLP power supply is normal, Off, power supply failure
RUN	OLP operation indicator	Flashing, the system is operating normally, On or off, operating failure
Link	OLP board card in place indicator	On, OLP is in place, Off, OLP is not in place
Alm	Alarm indicator	
R1	OLP main route receiving indicator	On, reception is normal, Off, reception is abnormal

R2	OLP standby route receiving indicator	On, reception is normal, Off, reception is abnormal
Tx	Local receiving indicator	On, reception is normal, Off, reception is abnormal
Auto	Working mode indicator	On, working in automatic mode, Off: working in manual mode
Pri	Main route working indicator	On, working on the main route,
Sec	Standbyrouterworkingindicator	On, working in alternate route
LS	Lightsourceindicator(1:1 device effective)	

6.7 OLP Information



Hardware Version	1.10	Software Version	2.00	Protocol Version	1.00
Production Date	2021.04.08	SN	OLP21040802		
Type	OLP1+1	Description			

Status information				
Port	Wavelength(nm)	Power(dBm)	Threshold(dBm)	Status
Rx	1310	-3.61	-30.00	Normal
Tx	1310	1.06	-30.00	Normal
R1	1310	-21.42	-15.00	Abnormal
T1	1310	-2.44	-30.00	Normal
R2	1310	-2.61	-30.00	Normal
T2	1310	-2.44	-30.00	Normal

Temperature(°C)	29.12	Temperature Threshold(°C)	60.00	TemperatureStatus	Normal
Operating Mode	Auto	Return Method	Auto Back		

Monitoring Information

- Online real-time monitoring of the working status of the OLP board
- Online real-time monitoring of the current working route of OLP
- Online real-time monitoring of OLP working mode manual or automatic
- Online real-time monitoring of the receiving and luminous power of the OLP access side
- Real-time monitoring of OLP main and backup routes receiving and luminous power

Setting

1. Working mode setting

The device provides two working modes: manual mode and automatic mode. The manual mode is used for equipment commissioning and forced switching.

- 1) Select automatic and manual through the network management.
- 2) Select through the device button, press and hold the device panel button until the Auto light is off (working in manual) or on (working in automatic)

Note: The device supports manual mode to automatically return to automatic mode, and the return time is factory set to 5 minutes. After the operator completes the operation, the equipment should be placed in automatic working mode, otherwise it may cause protection failure accidents.

2. Main route settings

The device provides the main route setting. Customers can choose R1 or R2 as the main route according to their needs; the factory default R1 is the main route.

3. Work routing settings

The factory default R1 is the main working route (Pri), and R2 is the backup working route (Sec). When the device is in automatic working mode, the device will automatically select the working route according to the line conditions:

- 1) When only one route is available: working in the channel corresponding to the available route.
- 2) When both routes are available: the route corresponding to the route that works first smoothly in time (if working on the backup channel, the device will automatically switch back to the main channel to work after 5 minutes, provided that the device starts the return channel. Cut function). When selecting the route manually, set the device to manual mode, and set the working route through the panel button or the network management.

4. Switching threshold power value setting

The initial switching threshold power of the device is -30dBm, and the user can set it according to the device type and the actual situation of the other party's line. Basic principle: The switching threshold power value is slightly larger than the minimum received power value of the optical transmission equipment, and the difference is 0.5~1dB. (The minimum received power value is subject to the normal transmission of the entire system business) For 1:1 protection, since the 1:1 OLP device uses a built-in light source to perform circuit backup monitoring, it is also necessary to consider whether the power value of the built-in light source of the opposite OLP device received by the local OLP device is within the set switching threshold power value range.

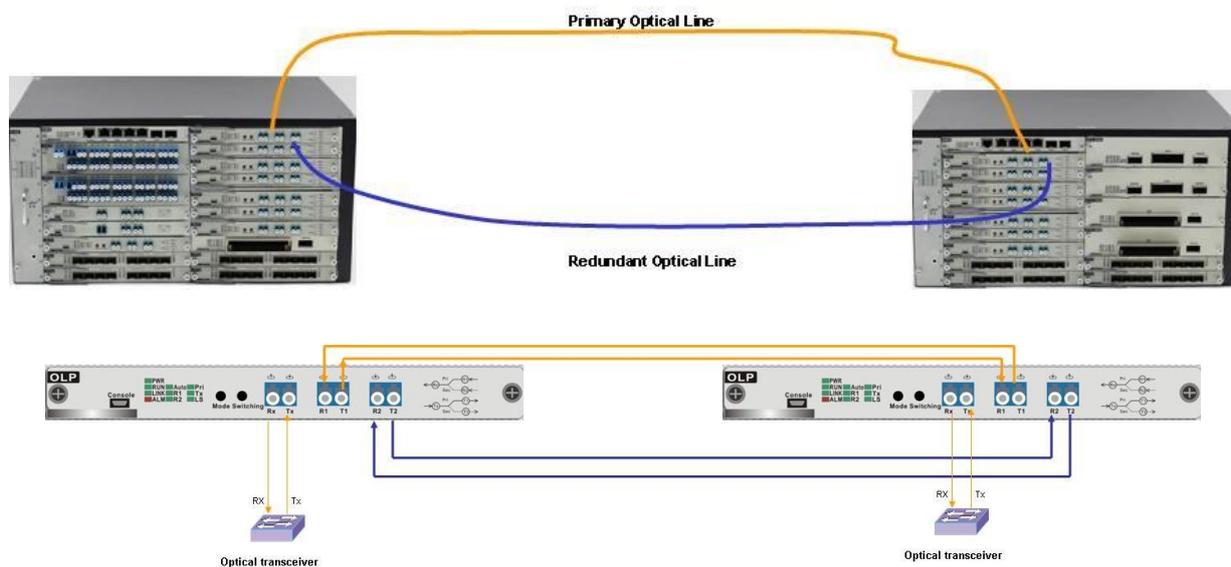
5. Return mode setting

Definition of switchback: In automatic mode, the device switches from the standby state to the main state. It can be set to "automatically switch back" or "automatically not switch back". In the "automatic non-reverting" mode, even if the revertive conditions are met (the main and standby routes are normal), it will not automatically switch from the standby path to the main path.

6. Switchback delay setting

When the device is in the "automatic switchback" mode, the optical path is in the standby state, and is working in the automatic mode, the device will perform optical detection on the main and standby paths in real time. If the optical power of the main and standby paths is detected in M time (0~999 If it has been normal within minutes), the device will automatically switch back to the main road (Pri) state.

6.8 Connection Diagram



Note: OLP TX is connected to the TX light-emitting port of the client device, RX is connected to the RX light-receiving port of the client device, R1 is connected to the opposite OLP device T1 through an optical cable, R2 is connected to the opposite OLP device T2, T1 is connected to the opposite OLP device R1, and T2 is connected to the opposite end R2 port of OLP device.

7 Single Fiber Bidirectional Optical Line Protection Board (OLP)

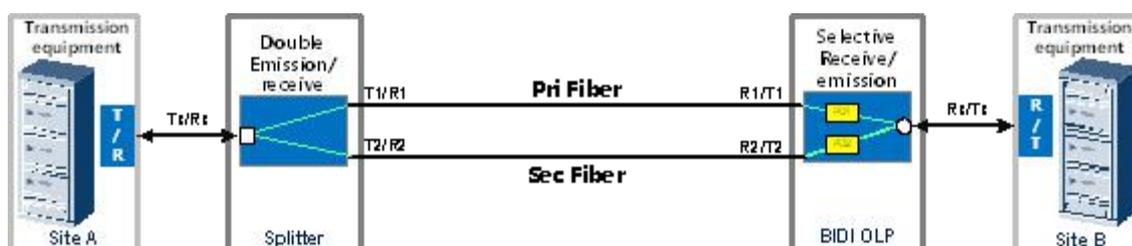
7.1 Overview

Traditional OLP protects 4-core optical fiber, but in many places, due to insufficient optical fiber resources, it is

impossible to provide excessive optical fiber resources and optical line redundancy protection. In response to the shortage of optical fiber resources and the demand for redundant protection of optical lines, our company has developed BIDI OLP equipment to solve the problem of optical line protection when optical cable resources are insufficient.

OLP-BIDI only needs two optical fibers to realize the optical line protection function. When the main circuit fiber fails, the receiving end will automatically switch to the spare fiber to receive, thus ensuring unimpeded communication and improving the stability and reliability of the communication system. This also saves fiber resources.

Application principle:



7.2 Product Highlights

- Support single-fiber bidirectional protection, and dual-route protection can be realized with only 2-core optical cable.
- Automatic switching protection: After the line is interrupted, the system automatically quickly switches the faulty optical fiber main route to the backup route to ensure uninterrupted services, increase the reliability of the transmission network or line quality, and improve the service quality of operators.
- Fast switching speed: switching time <30ms, shortening communication interruption time and improving maintenance efficiency.
- Fiber quality real-time monitoring: Provides real-time monitoring of the main and standby fiber cores, that is, the optical power monitoring of the main and standby fiber (transceiver) dual fibers at the same time, which can monitor the quality of the optical cable of the main and standby routes, which can effectively avoid the simultaneous blocking of the main and standby route fibers Case.
- Emergency dispatch of active and standby routes: Arbitrary dispatch of active and standby working routes

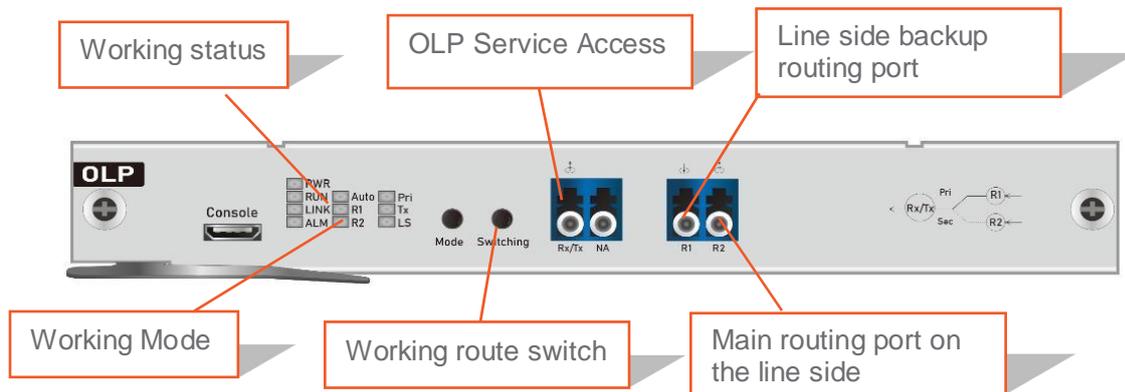
under the premise of ensuring that the business is not interrupted, without the need to manually dispatch on the on-site ODF, which saves time and is safe and convenient.

- Low insertion loss: insertion loss $\leq 1.5\text{dB}$
- Working mode can be set: support manual switching, automatic switching can be set
- Support switching threshold can be set: the main and standby route switching threshold can be set according to the line condition
- Manual return to automatic time delay: the time of manual mode return to automatic mode can be set according to requirements
- Support automatic switchback delay setting: the main route failure repair and automatic return to the main route delay can be set as needed

7.3 Product Performance

Performance Parameter		Technical index
Workign Wavelength (nm)	DWDM	Blue : 1528~1543, Red : 1547~1561
	CWDM	1270~1610
Monitoring optical power range(dBm)		+23~-50
Monitoring optical power accuracy	dB	± 0.25
Monitor optical power resolution	dB	± 0.01
Return loss dB		≥ 55
Polarization dependent loss dB		≤ 0.05
Wavelength dependent loss dB		≤ 0.1
Insertion loss dB		$< 1.5\text{dB}$
Switching time ms		< 20
Environment	Working Temp. °C	-10~+60°C
	Storage Temp. °C	-20~+75°C
	Relative Humidity	5%~95% non-condensation
Power(V)		220V/AC, 50Hz; -48V/DC(Optional)
Power Consumption (W)		$< 5\text{W}$
Power down status		Keeping
Size (mm)		191(W)× 20(H)× 253(D)

7.4 OLP Diagram



Single Fiber Bidirectional Optical Line Protection Board

7.5 Device Interface Definition

Interface Screen	Name	Function/Links
Tx/RX	OLP local output interface	Connect to the receiving port of the local device
R1	Main router receiving and sending interface	Connect to the peer R1
R2	Backup route receiving and sending interface	Connect to the peer R2

7.6 Indicator Light Description

Indicator Screen	Name	Description
PWR	OLP power indicator	On, OLP power supply is normal, Off, power supply failure
RUN	OLP operation indicator	Flashing, the system is operating normally, On or off, operating failure
Link	OLP board card in place indicator	On, OLP is in place, Off, OLP is not in place
Alm	Alarm indicator	
R1	OLP main route receiving indicator	On, reception is normal, Off, reception is abnormal
R2	OLP standby route receiving indicator	On, reception is normal, Off, reception is abnormal

Tx	Local receiving indicator	On, reception is normal, Off, reception is abnormal
Auto	Working mode indicator	On, working in automatic mode, Off: working in manual mode
Pri	Main route working indicator	On, working on the main route,
Sec	Standbyrouterworkingindicator	On, working in alternate route
LS	Lightsourceindicator(1:1device effective)	

7.7 OLP Information

Hardware Version	1.10	Software Version	2.00	Protocol Version	1.00
Production Date	2021.04.08	SN	OLP21040802		
Type	OLP1+1	Description			
Apply Refresh					
Status information					
Port	Wavelength(nm)	Power(dBm)	Threshold(dBm)	Status	
Rx	1310	-3.61	-30.00	Normal	
Tx	1310	1.06	-30.00	Normal	
R1	1310	-21.42	-15.00	Abnormal	
T1	1310	-2.44	-30.00	Normal	
R2	1310	-2.61	-30.00	Normal	
T2	1310	-2.44	-30.00	Normal	
Temperature(°C)	29.75	Temperature Threshold(°C)	60.00	TemperatureStatus	Normal
Operating Mode	Auto	Return Method	Auto Back		

Monitoring Information

- Online real-time monitoring of the working status of the OLP Board
- Online real-time monitoring of the current working route of OLP
- Online real-time monitoring of OLP working mode manual or automatic
- Online real-time monitoring of the receiving and luminous power of the OLP access side
- Real-time monitoring of OLP main and backup routes receiving and luminous power

Setting

1. Working mode setting

The device provides two working modes: manual mode and automatic mode. The manual mode is used for

equipment commissioning and forced switching.

- 1) Select automatic and manual through the network management.
- 2) Select through the device button, press and hold the device panel button until the Auto light is off (manual) or on (automatic).

Note: The device supports manual mode to automatically return to automatic mode, and the return time is factory set to 5 minutes.

After the operator completes the operation, the equipment should be placed in automatic working mode, otherwise it may cause protection failure accidents.

2. Main route settings

The device provides the main route setting. Customers can choose R1 or R2 as the main route according to their needs; the factory default R1 is the main route. 3 work routing settings The factory default R1 is the main working route (Pri), and R2 is the backup working route (Sec). When the device is in automatic working mode, the device will automatically select the working route according to the line conditions:

- 1) When only one route is available: working in the channel corresponding to the available route;
- 2) When both routes are available: the route corresponding to the route that works first smoothly in time (if working in the backup channel, the device will automatically switch back to the main channel to work after 5 minutes, provided that the device starts the return channel. Cut function); When selecting the route manually, set the device to manual mode, and set the working route through the panel button or the network management.

3. Switching threshold power value setting

The initial switching threshold power of the device is -30dBm, and the user can set it according to the device type and the actual situation of the other party's line: Basic principle: The switching threshold power value is slightly larger than the minimum received power value of the optical transmission equipment, and the difference is 0.5~1dB. (The minimum received power value is subject to the normal transmission of the entire system business)

4. Return mode setting

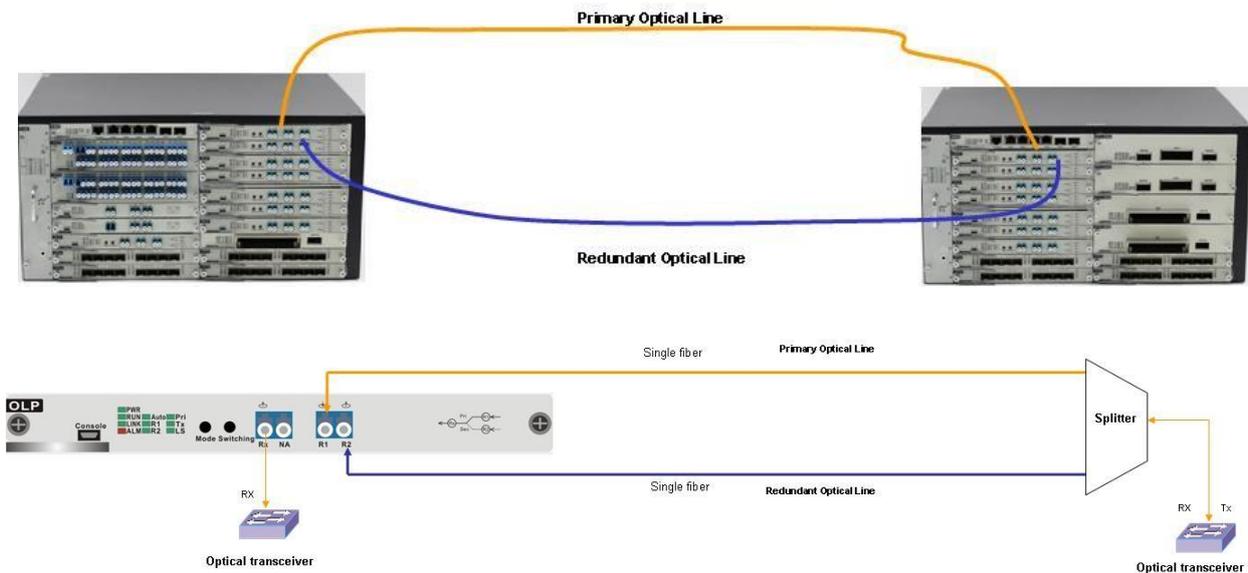
Definition of switchback: In automatic mode, the device switches from the standby state to the main state. It can be set to "automatically switch back" or "automatically not switch back". In the "automatic non-reverting" mode, even if the revertive conditions are met (the main and standby routes are normal), it will not automatically switch from the standby path to the main path.

5. Switchback delay setting

When the device is in the "automatic switchback" mode, the optical path is in the standby state, and is working in

the automatic mode, the device will perform optical detection on the main and standby paths in real time. If the optical power of the main and standby paths is detected in M time (0~999 If it has been normal within minutes), the device will automatically switch back to the main road (Pri) state.

7.8 Connection Diagram



Note: OLP TX is connected to the TX light-emitting port of the client device, RX is connected to the RX light-receiving port of the client device, R1 is connected to the opposite OLP device T1 through an optical cable, and R2 is connected to the opposite OLP device T2.

8 WDM Board (40CH AWG)

8.1 Overview

The AWG optical multiplexing de-wave disc is a part of the MU-series DWDM system. The AWG optical multiplexing de-wave disc can be assembled on the 2U and 5U management sub-frames. Its main function is to combine multiple single-channel optical input signals with specific wavelengths into one optical signal with 100GHz wavelength interval.

8.2 Product Highlights

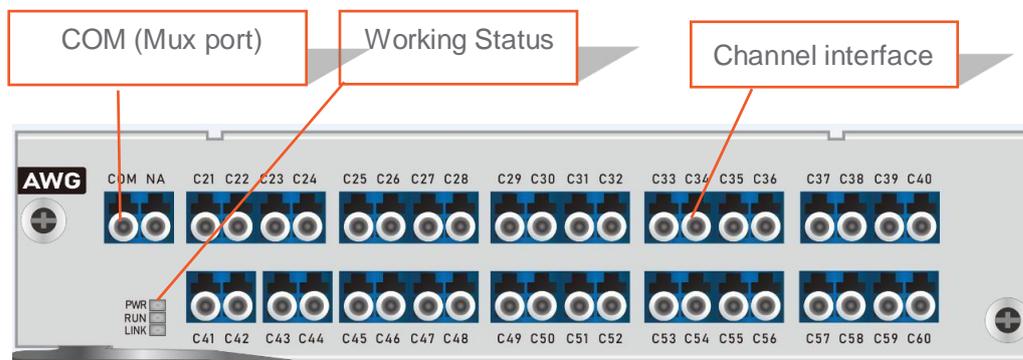
- Large capacity: single card adopts 40-wave/48-wave compatible design
- Easy to maintain and replace: the board adopts modular design and supports hot swap

- High isolation: adjacent isolation $\geq 25\text{dB}$, non-adjacent isolation $\geq 35\text{dB}$
- Ultra-low insertion loss: insertion loss $\leq 5\text{dB}$, typical value is 4.5dB
- Unified insertion loss: 48-wave AWG channel insertion loss difference $< 0.6\text{dB}$

8.3 Product Performance

Parameters	Min	Typ.	max	Unit
Center Wavelength	C -band			nm
Channel spacing	100			GHz
Number of channels	40		48	
Pass-band bandwidth		± 0.1		nm
1 dB /3dB bandwidth		0.4/0.6		nm
Insertion loss		4.5	6.0	dB
Adjacent/non-adjacent channel isolation	25/30			dB
Directionality	45			dB
Insertion loss flatness			0.5	dB
Return loss	45			dB
Polarization loss		0.3	0.5	dB
Polarization mode dispersion			0.5	ps
Maximum carrying optical power				dBm
Power consumption	$< 25\text{W}$			
Size(mm)	192(W) \times 41(H) \times 252(D)			

8.4 40CH AWG Diagram



40CH AWG Diagram

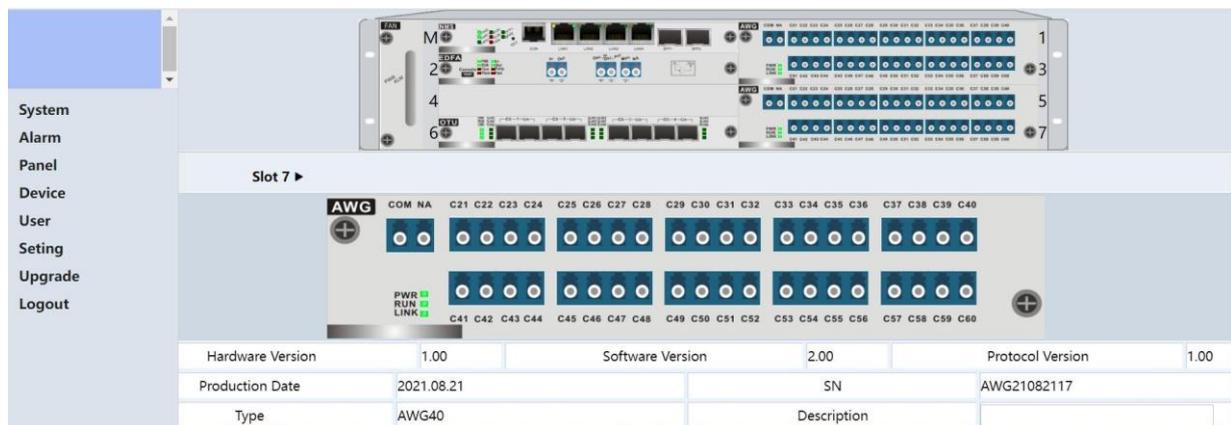
8.5 Device Interface Definition

Interface Screen	Name	Function/Links
COM	MUX Port	MUX/output, Demux/input
C21~C60	Channels	40CH input/output Ports

8.6 Indicator Light Description

Indicator Screen	Name	Description
PWR	AWG PowerIndication	On, AWG power supply is normal, off, power supply failure
RUN	AWG System operation indicator	On, the AWG system is operating normally, off, it is malfunctioning
Link	AWG Presence indicator	On, the AWG module is working normally, off, not working properly

8.7 AWG Interface



Monitoring Information

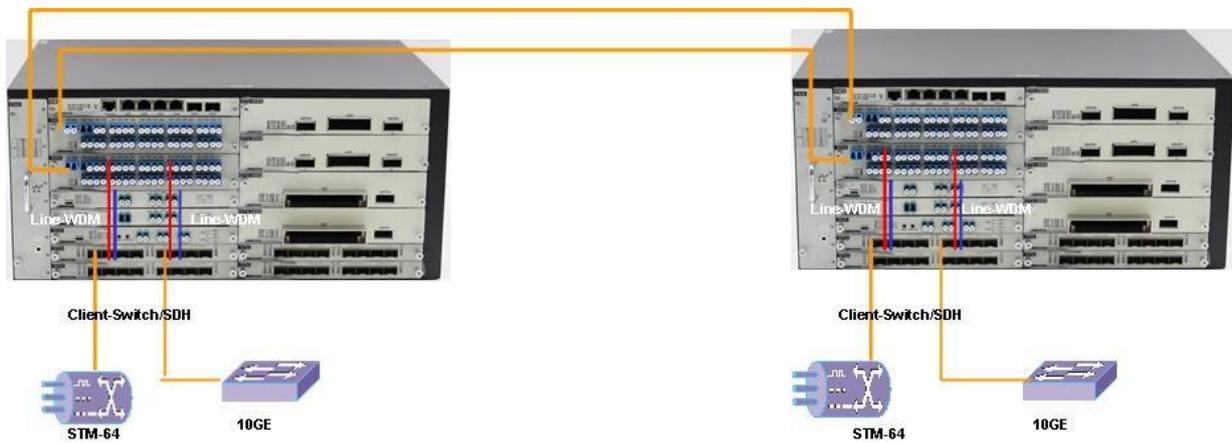
- Real-time monitoring of the working status of the AWG power supply
- Real-time monitoring of AWG working status
- Real-time monitoring of AWG chip temperature
- Check the currently used channels online

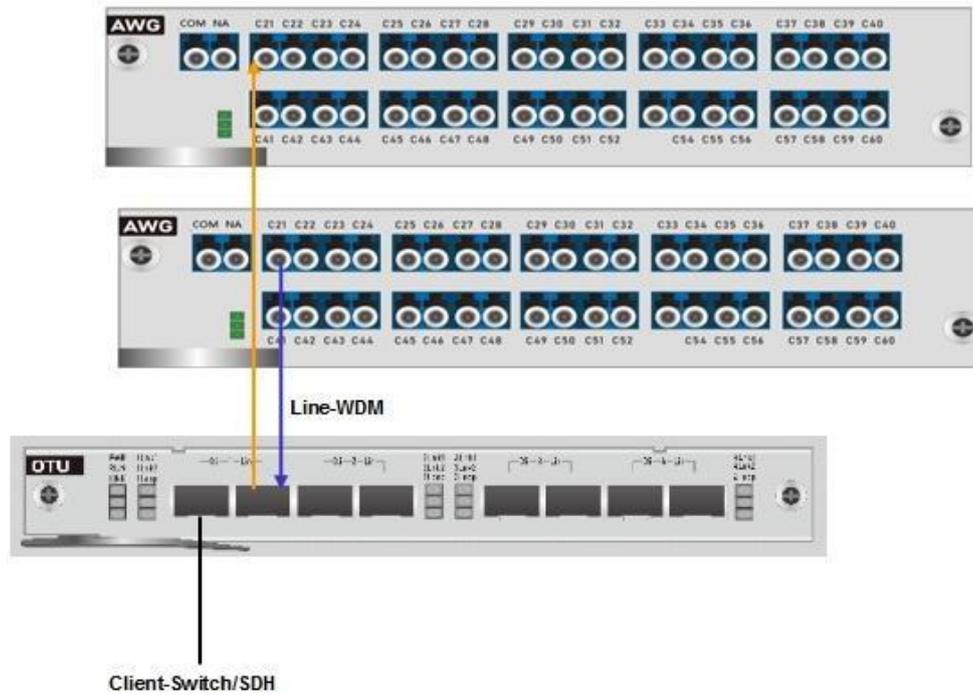
Setting

<input type="checkbox"/>	C21	<input type="checkbox"/>	C22	<input type="checkbox"/>	C23	<input type="checkbox"/>	C24	<input type="checkbox"/>	C25
<input checked="" type="checkbox"/>	C26	<input type="checkbox"/>	C27	<input type="checkbox"/>	C28	<input type="checkbox"/>	C29	<input type="checkbox"/>	C30
<input type="checkbox"/>	C31	<input type="checkbox"/>	C32	<input type="checkbox"/>	C33	<input type="checkbox"/>	C34	<input type="checkbox"/>	C35
<input checked="" type="checkbox"/>	C36	<input type="checkbox"/>	C37	<input type="checkbox"/>	C38	<input type="checkbox"/>	C39	<input type="checkbox"/>	C40
<input checked="" type="checkbox"/>	C41	<input type="checkbox"/>	C42	<input type="checkbox"/>	C43	<input type="checkbox"/>	C44	<input type="checkbox"/>	C45
<input type="checkbox"/>	C46	<input type="checkbox"/>	C47	<input type="checkbox"/>	C48	<input type="checkbox"/>	C49	<input type="checkbox"/>	C50
<input type="checkbox"/>	C51	<input type="checkbox"/>	C52	<input type="checkbox"/>	C53	<input type="checkbox"/>	C54	<input type="checkbox"/>	C55
<input type="checkbox"/>	C56	<input type="checkbox"/>	C57	<input type="checkbox"/>	C58	<input type="checkbox"/>	C59	<input type="checkbox"/>	C60

1. Current working channel setting: the branch channel currently working can be selected through the network management to facilitate expansion, maintenance and management
2. Channel description setting: the nature and purpose of the current channel can be set through the network management, which is convenient for management and maintenance

8.8 Connection Diagram





Note: OTU branch Cli interface, connected to customer switch equipment, line line interface connected to MUX/DEMUX channel interface, line side line interface TX connected to MUX multiplexer channel port, multiplexer MUX multiplex port COM port connected through long-distance optical cable The COM port of the DEMUX multiplex port of the end-decoder, and the DEMUX channel port of the decoder is connected to the line Rx receiving port of the OTU line interface;

9 Optical Add/Drop Multiplexer Board (OADM)

9.1 Overview

The main function of the optical channel add/drop multiplexing disk (OADM, Optical Add And Drop) is to add/drop multiplex the optical signal of the selected wavelength through the optical add/drop multiplexing module (OADM).

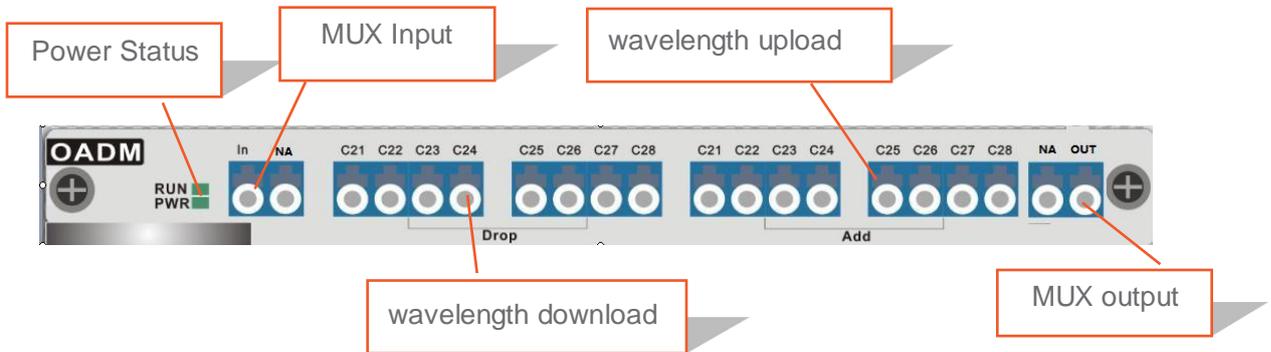
9.2 Product Highlight

- Flexible and convenient: support any combination of 1~8 waves of business up and down
- Easy to maintain and replace: the board adopts modular design and supports hot swap
- Low insertion loss: maximum loss <3.6dB
- High channel isolation: adjacent isolation ≥ 25 dB, non-adjacent isolation ≥ 35 dB

9.3 Product Performance

Parameter		Index		Unit
Center wavelength		ITU Grid		nm
Channel spacing		100Ghz		GHZ
Number of channels		4 Ch	8 Ch	
Wavelength accuracy		±0.11		nm
Channel bandwidth		>0.3		nm
Insertion Loss	In—Drop	2.0	3.2	dB
	Add---Out	2.0	3.2	dB
	In---out	2.5	3.6	dB
Channel isolation		>25		dB
Return loss		>45		dB
Maximum power		500		mW
Operating temperature		-10~+75		°C
Storage temperature		-40~+85		°C
Size		191 (W) × 20 (H) × 253 (D)		mm

9.4 OADM Diagram



OADM Diagram

9.5 Device Interface Definition

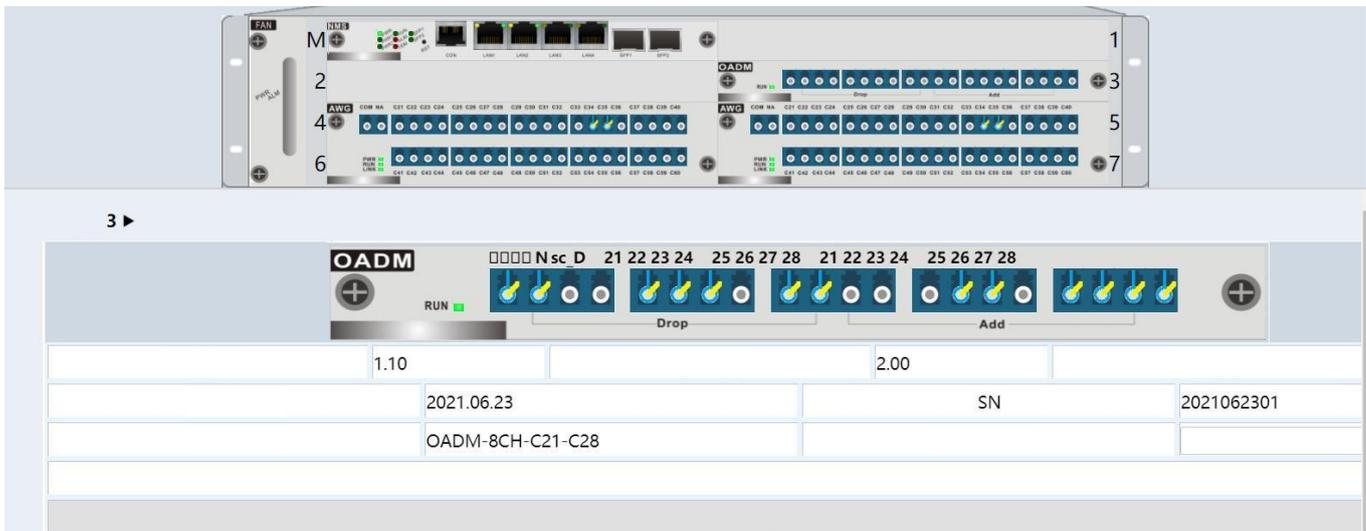
Interface Screen	Name	Function/Links
IN	Input Port	Multiwave mixed input interface
OUT	Output Port	Multiwave mixed output interface
Drop : C15~C62	wavelength download	For channel signal download

Add : C15~C62	wavelength upload	For channel signal upload
---------------	-------------------	---------------------------

9.6 Indicator Light Description

Indicator Screen	Name	Description
PWR	OADM Power Indicator	On, OADM power supply is normal, Off, power supply failure
RUN	OADM System operation indicator	Flashing, the system is operating normally, On or off, operating failure

9.7 OADM Interface



Real-time monitoring of OADM working status, and query the current working channel.

Configuration Interface

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Setting

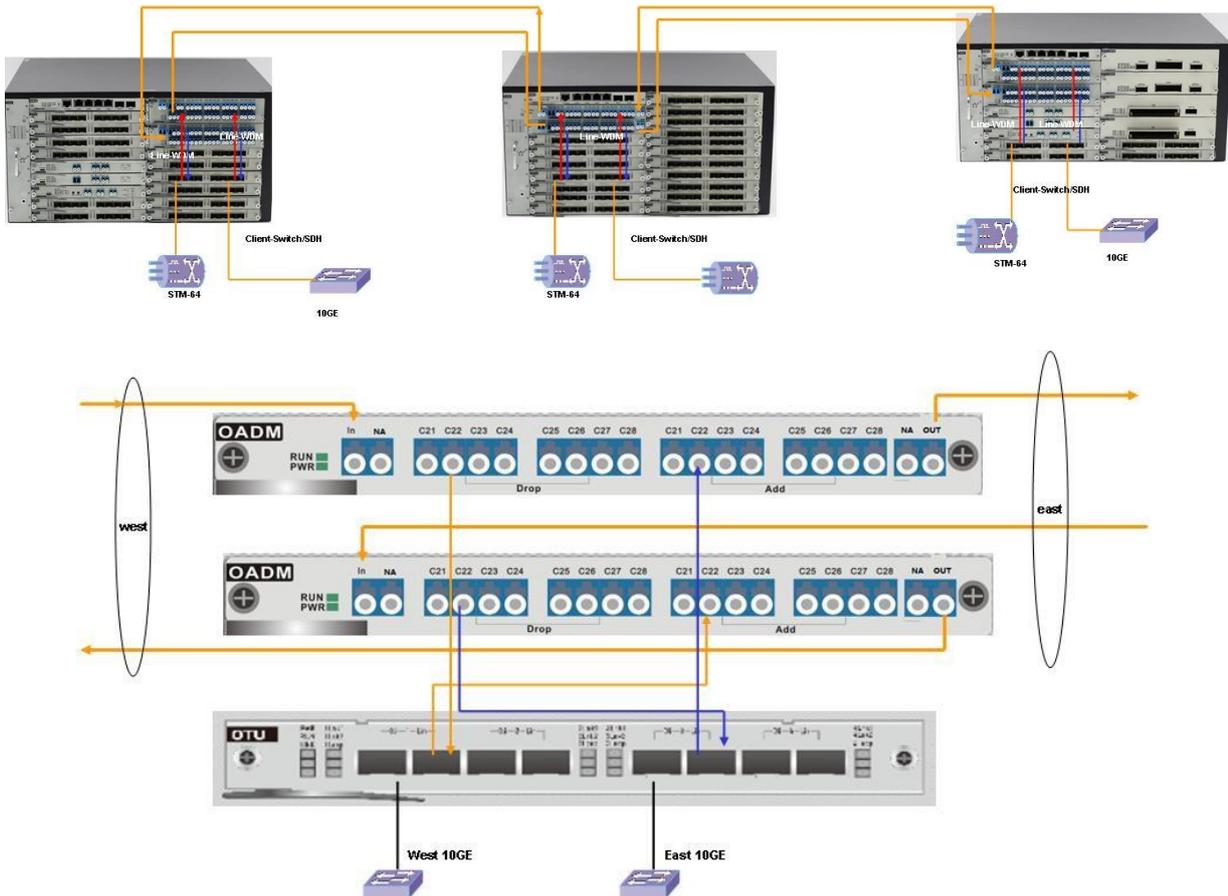
1. Current working channel setting

The branch channel currently working can be selected through the network management to facilitate expansion, maintenance and management.

2. Channel description settings

The nature and purpose of the current channel can be set through the network management, which is convenient for management and maintenance.

9.8 Connection Diagram



Note: OADM transparent transmission input interface IN link optical cable, receiving 1 site multiplex output, drop interface connected to OTU Line interface receiving, download 1 site business, add interface connected to OTU line interface Tx to upload business to 2 site.

10 EDFA Optical Amplifier Board

10.1 overview

EDFA series optical amplifiers are erbium-doped fiber amplifier products launched by our company, which can provide multi-functional, low-noise, high-gain erbium-doped fiber amplifier solutions, especially suitable for DWDM dense wavelength division multiplexing systems, and solve the problem of insufficient long-distance transmission power problem.

EDFA amplifier: it can be divided into power amplifier, line amplifier, pre-amplifier from the application position . BA Booster amplifier: It has the characteristics of high input power, high gain, high output, etc. It is mainly used at the transmitting end of the DWDM system to increase the optical power of the DWDM system.

LA line amplifier: It has the characteristics of low input power, low gain, high output, etc. It is mainly used in the middle of the two network nodes of the DWDM system to increase the transmission power of the DWDM system. PA pre-amplifier: It has the

characteristics of low input power, low input power, high gain, low output, etc. It is mainly used for DWDM system connection to increase the received optical power of DWDM system

10.2 Product Highlights

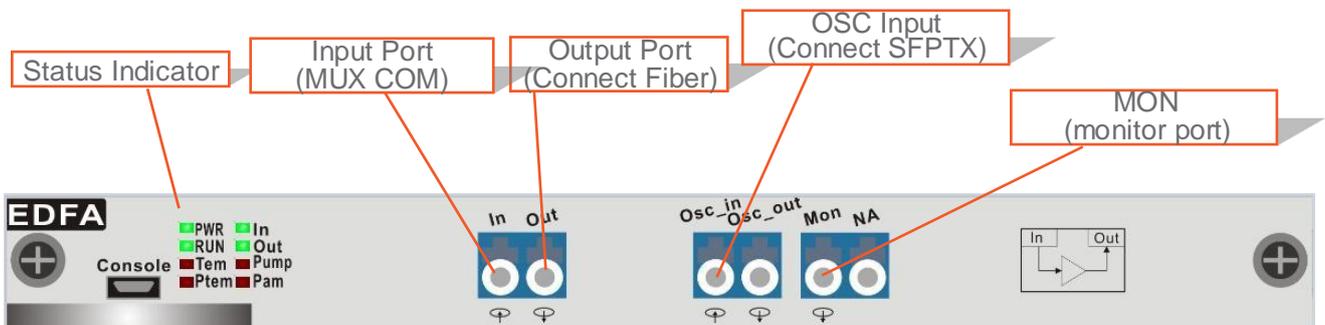
- Low noise figure: typical: 5dB
- Excellent gain flatness: DWDM 48 wave gain flatness < 1dB
- Multiple working modes: support AGC gain adjustable, APC output adjustable, ACC voltage adjustable
- Transient response control: high-performance transient response control to ensure stable power and gain without affecting existing signals
- ASE automatic correction function: automatically optimize ASE noise to ensure that the noise index is at the minimum
- Personalized customization :
 - Support a variety of personalized customization with saturated output power of 13~24dBm
 - Support a variety of gain specifications 8~35dB personalized customization
 - Support personalized customization of BA power amplification, LA line amplification, and PA pre-amplification
 - Support red and blue single fiber bidirectional EDFA (used in single fiber transmission system)
 - Support with intermediate gain

- DCM can be inserted in the middle, which can offset the insertion loss introduced by DCM;
- Support OADM insertion, which can offset the insertion loss introduced by OADM
- Increase the signal receiving optical power
- Improve the OSNR

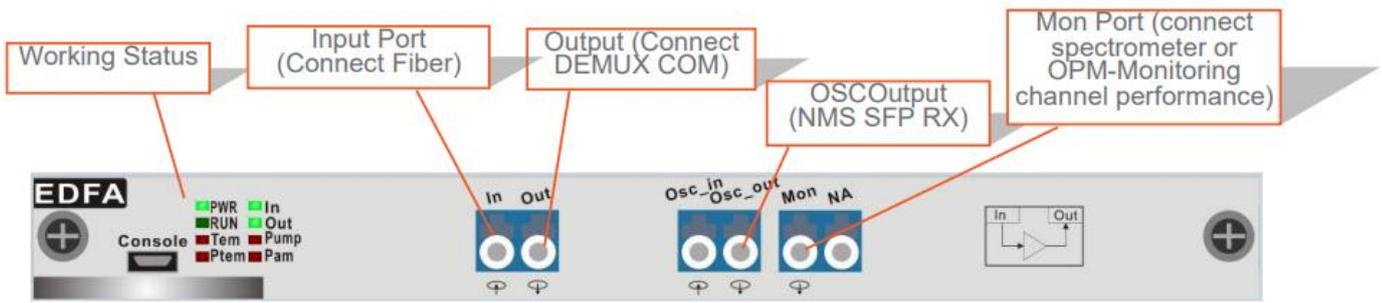
10.3 Product Performance

Parameter		Min.	Typ.	Max.	Unit
Working wavelength		1528		1565	nm
Input optical power	BA	-14		+8	dBm
	PA /LA	-28		-5	
Output optical power				23	dBm
Gain				33	dB
Noise index			5.0		dB
Gain flatness			1.0		dB
Polarization dependent loss				0.3	dB
Polarization dependent gain				0.4	dB
Return loss		45			dB
Environmental requirements	Working Temp.	-10°C ~ 70°C			
	Relative Humidity	5%~95% non-condensation			
	Storage Temp.	-40°C ~ 85°C			
Power consumption		<30			W
Size		191(W)× 20(H)× 253(D)			mm

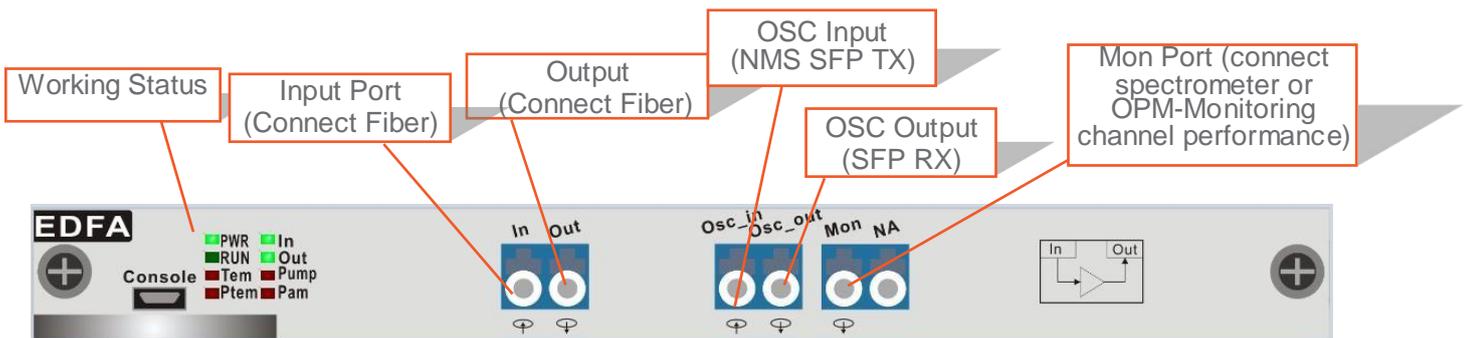
10.4 Single-stage EDFA Board Diagram



BA Board Diagram

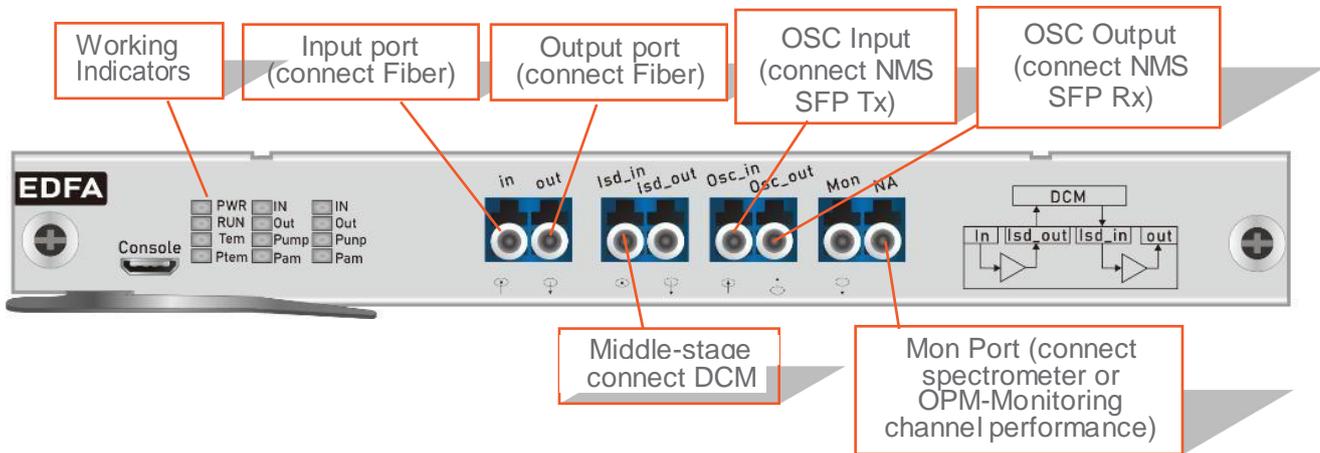


PA Board Diagram

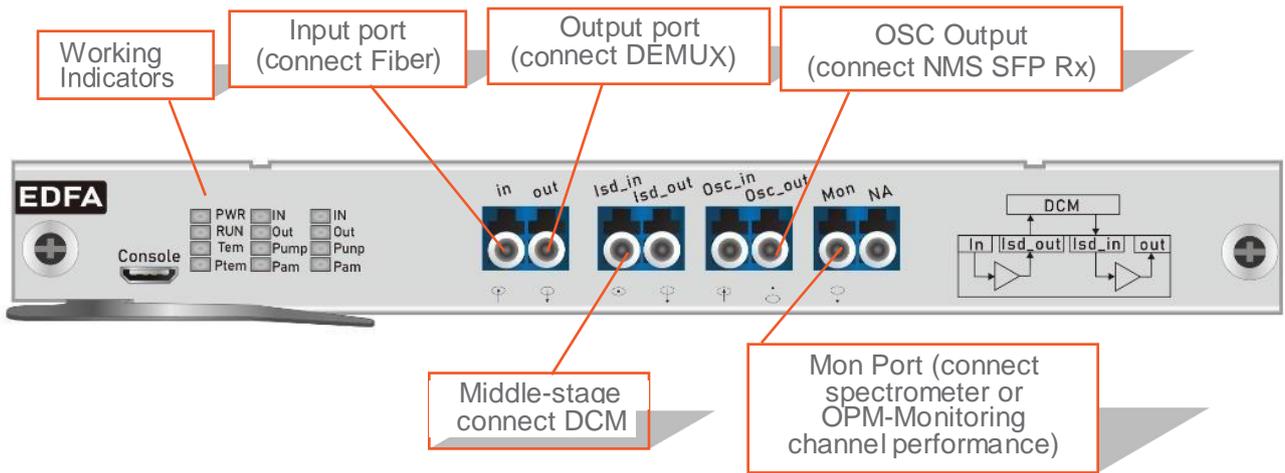


LA Board diagram

10.5 Middle-stage EDFA Board Diagram

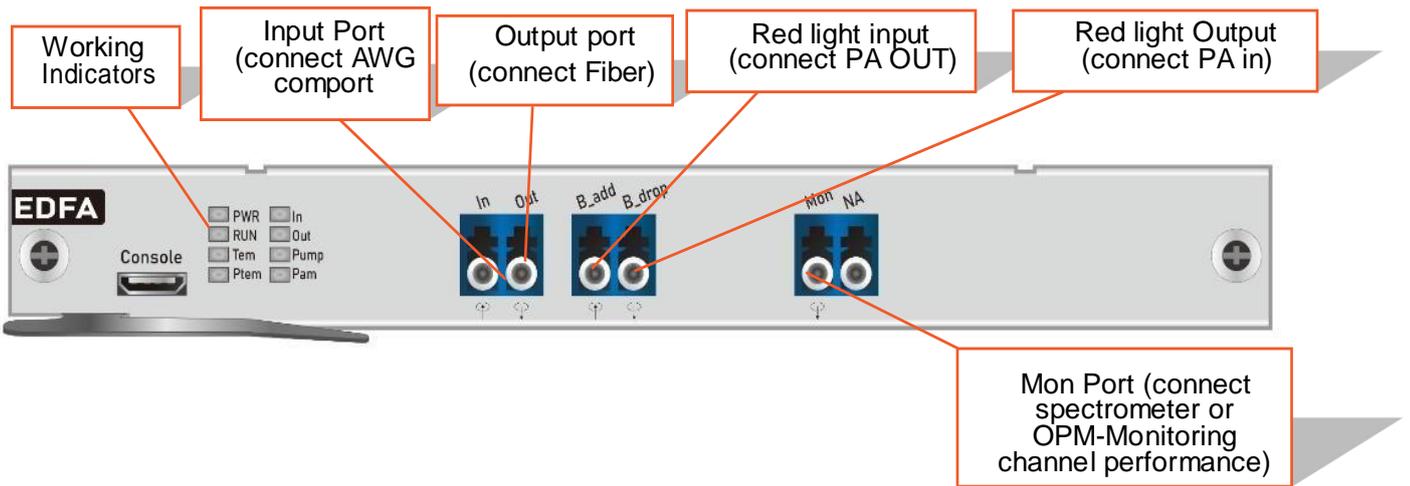


Middle type LA Board diagram

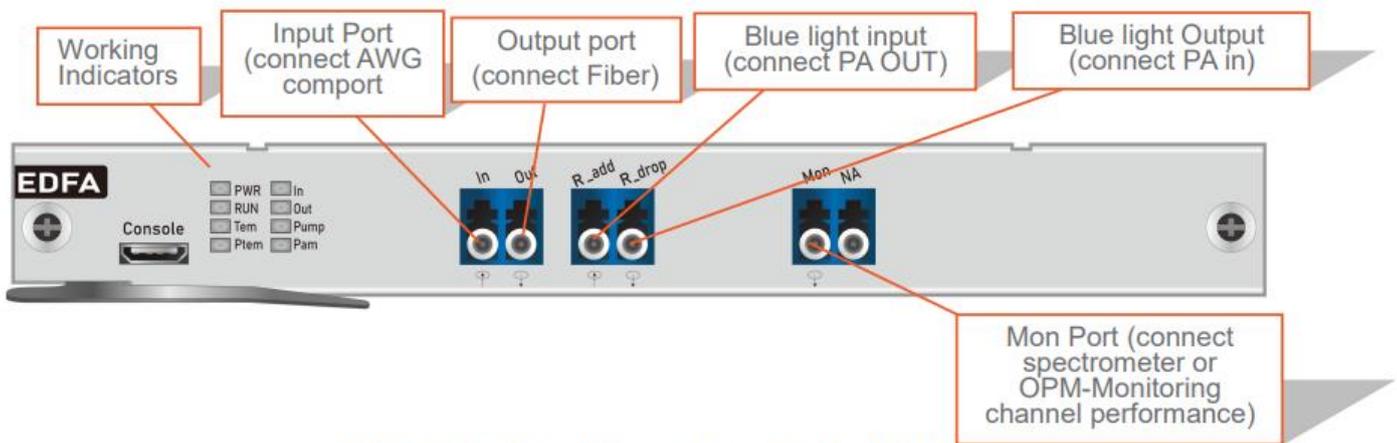


Middle PA Board Diagram

10.6 Single-fiber Bidirectional EDFA Board Diagram



BA Amplifier Board Diagram (magnify red light)



BA Amplifier Board Diagram (magnify blue light)

10.7 Device Interface Definition

Interface Screen	Name	Function/Link
In	EDFA input interface	Small signal optical power input port
Out	EDFA output interface	EDFA amplified output optical port
Isd_In	Intermediate output interface	Link to DCM IN interface
Isd_Out	Intermediate input interface	Link to DCM OUT interface
OSC_IN	Monitoring channel input	Link network management card SFP TX, transmit network management information
OSC_Out	Monitoring channel output	Link network management card SFP RX, transmit network management information
R_add/B_add	Redlight, bluelight input port	Connect EDFA OUT port
R_drop/B_drop	Redlight, bluelight output port	Connect EDFA IN port
MON	Monitoring port	EDFA performance monitoring interface, link OPM or spectrometer

10.8 Indicator light Description

Indicator Screen	Name	Description
PWR	EDFA power indicator	On, EDFA power supply is normal, off, power supply failure
RUN	EDFA running indicator	Flashing, the system is operating normally, on or off, operating failure
In	EDFA input alarm indicator	On, reception is abnormal, off, reception is normal
Out	EDFA output alarm indicator	On, the output is abnormal, off, the output is normal
mA	Pump current alarm indicator	On, pump current is abnormal, off: pump current is normal
Pump	Pump alarm indicator	On, the pump is off, off, the pump is on
Tem	EDFA module temperature alarm indicator	On, the temperature of the EDFA module is abnormal, off, the temperature of the module is normal
Ptem	Pump temperature alarm indicator	On, the pump temperature is abnormal, off, the pump temperature is normal

10.9 EDFA Information

The screenshot displays the EDFA configuration interface. On the left is a navigation menu with options: System, Alarm, Panel, Device, User, Setting, Upgrade, and Logout. The main area shows a rack of EDFA units. Below this, the 'Slot 2' configuration is detailed:

- Hardware Version: 1.30
- Software Version: 2.01
- Protocol Version: 1.00
- Production Date: 2021.08.04
- SN: 20210804007
- Type: BA20-G12

Below the configuration is a 'Status information' table:

Port	Real time optical power			Optical power jitter				Gain deviation	
	Current power value(dBm)	Low Power threshold(dBm)	Alarm Status	Refer(dBm)	Jitter Threshold(dB)	Alarm Status	Enable	Gain relative value(dB)	Alarm Status
In	-6.44	-22.0	Normal	-40.00	3.00	Normal	OFF	2.0	Normal
Out	8.57	-30.00	Normal	-40.00	3.00	Normal	OFF		

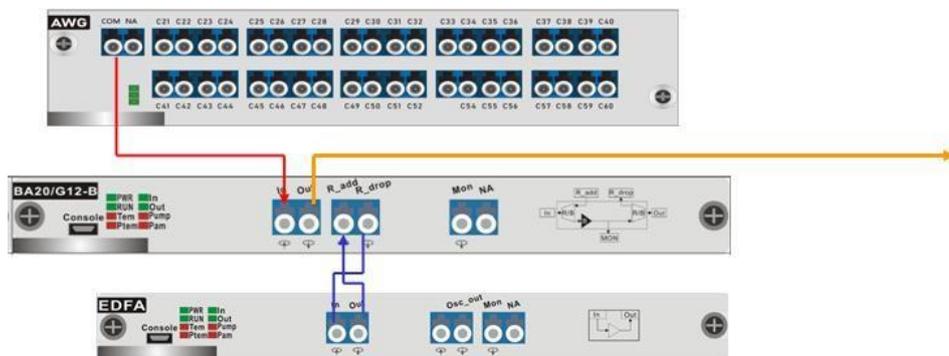
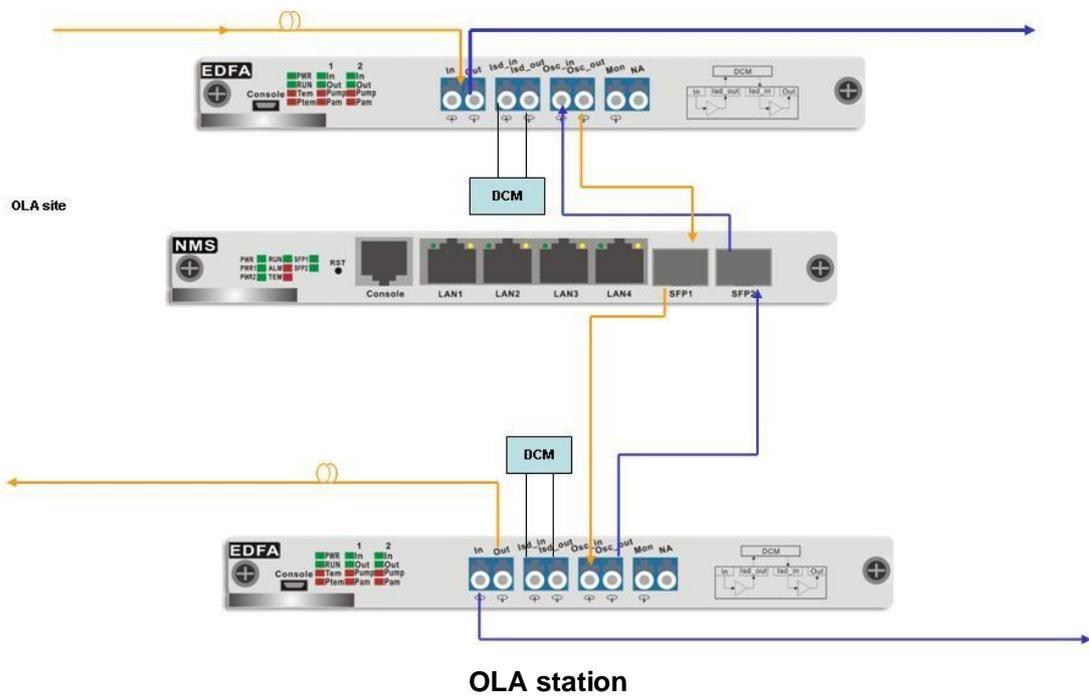
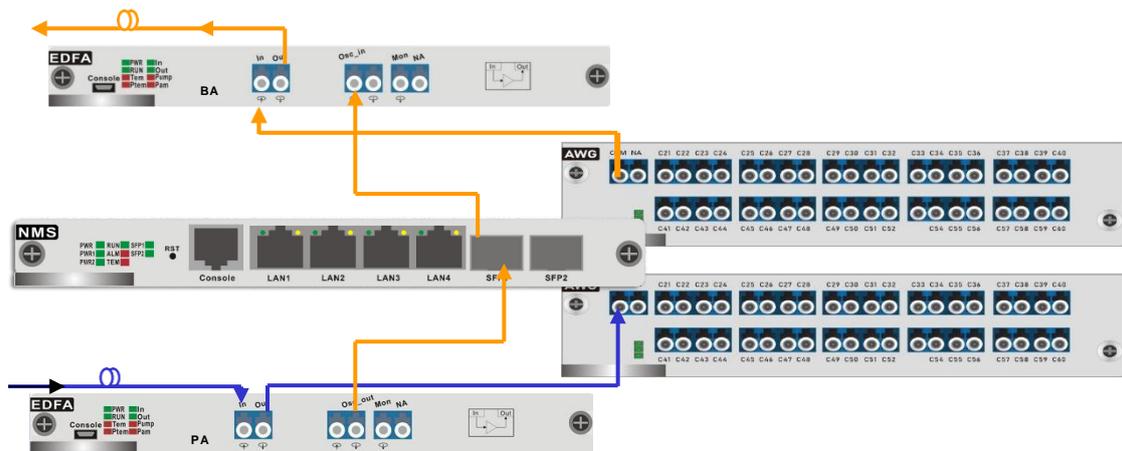
Monitor information

- Online real-time monitoring of EDFA single disk working status
- Real-time monitoring of EDFA input optical power and output optical power
- Real-time monitoring of the working status of EDFA Pump
- Real-time monitoring of EDFA working current, power consumption, die temperature, cooling current, etc.
- Set the input and output optical threshold through the network management, set the EDFA working mode, output power threshold, gain, etc.

Setting

1. Input and output power threshold setting
2. The amplifier input and output power alarm threshold can be set through the network management. When the input power is lower than the threshold, the EDFA alarms. At this time, the EDFA pump is turned off and the EDFA does not work. When the EDFA output is lower than the threshold, an alarm will be prompted.
3. Working mode setting
4. The amplifier working mode can be set through the network management: AGC constant gain mode, APC constant output mode, ACC constant current mode, the gain can be set in AGC mode, the setting range is ± 1 db, the best setting, the output power can be set in APC mode, the setting range is ± 1 dBm optimal.
5. Eye protection mode setting
6. When installing and debugging or troubleshooting, you can turn on the amplifier eye protection mode through the network management to reduce the output power of the EDFA to avoid harm to maintenance personnel.

10.10 Connection Diagram



Single fiber bidirectional EDFA

Notes:

1. MUX multiplexer The multiplexer COM port is connected to the BA input port IN, the BA output port OUT is connected to the long-distance optical cable to transmit large signal light, and the OSC-in port is connected to the network management card optical port Tx launch port.
2. The PA input port IN is connected to the long-distance optical cable to receive small signal light, the PA output port is connected to the DEMUX demux COM port, the ISD-IN, ISD-OUT intermediate interface is serially connected to DCM, and the osc-out is connected to the network management card optical port TX Receiving port.
3. The network management card SFP TX is connected to the OSC-IN interface of the BA OSC channel, and RX is connected to the OSC-OUT interface of the PA OSC channel.
4. The OSC channels OSC-IN and OSC-OUT of LA1 are respectively connected to the Rx of the optical port SFP1 of the network management card and the Tx of SFP2. The OSC channels OSC-IN and OSC-OUT of LA2 are respectively connected to the Tx and Tx of the optical port of the network management card SFP1 and SFP2. Rx, realize the two-way transmission of network management card cascade.

Chapter 4 MU-series Network Management Configuration

The MU-series network management system is a super intelligent network management platform developed by our company for the current long-distance WDM transmission system, which is difficult to locate faults and high maintenance costs. It supports Web network management, NMS network management, CLI local serial port command line, TELNET and other network management methods. It supports intelligent management such as graphical interface, electronic map positioning, alarm positioning, fiber optic cable monitoring and accurate positioning of fault breakpoints. The man-machine interface is friendly and clear at a glance, saving maintenance costs.

1.1 Web Network management configuration

1.1 Web Network Management Login

Open the web page, enter the IP address of NMS, the factory default is 192.168.1.188, and enter the following login interface.



English

username

password

Enter the user name and password and click login to enter the main page of the network management;

Default:

username: admin

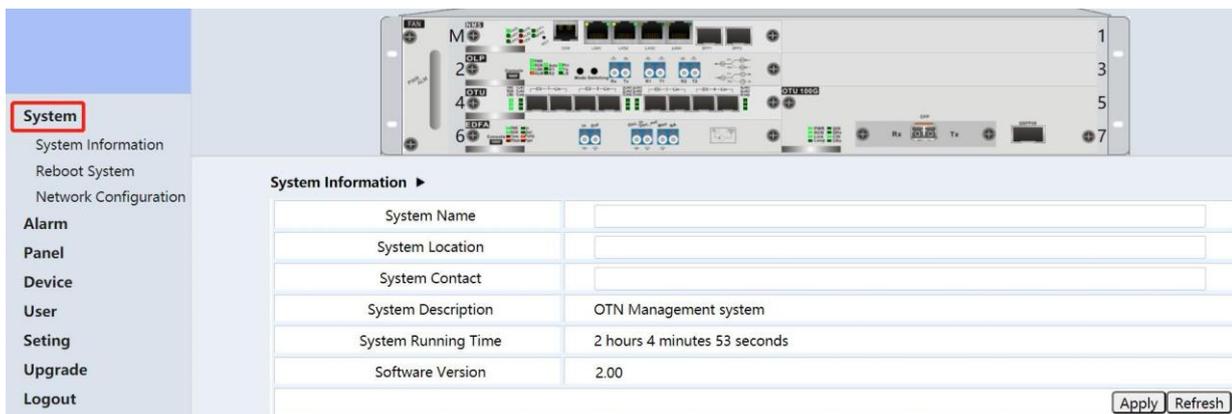
password: admin

The main page of the network management is composed of four parts:

1. The upper left is the LOGO, equipment diagram, and operation catalog. The right is the display content and the picture of the single service card;
2. The equipment diagram and the single-card picture are consistent with the physical picture. The display content, indicator light, power supply, and fan status are consistent with the physical picture;
3. The operating directory includes: system, alarm, panel, equipment, user, and other components
4. The display content on the right can view the working status and performance parameters of the equipment in real time, and do some simple parameter configuration.

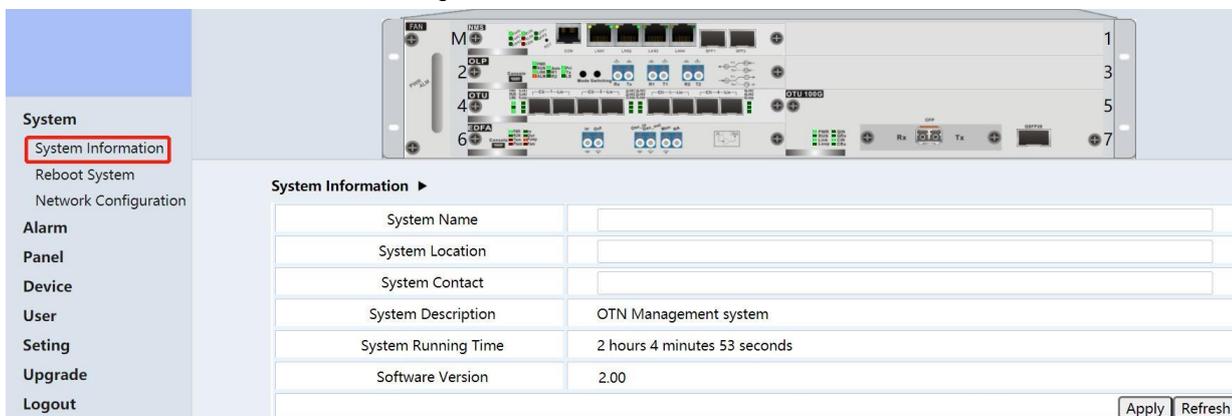
1.2 System Configuration Interface

There are System Information, Reboot System, and Network Configuration in the system directory. In this directory, you can configure and view system information, network management card IP, and restart the device.



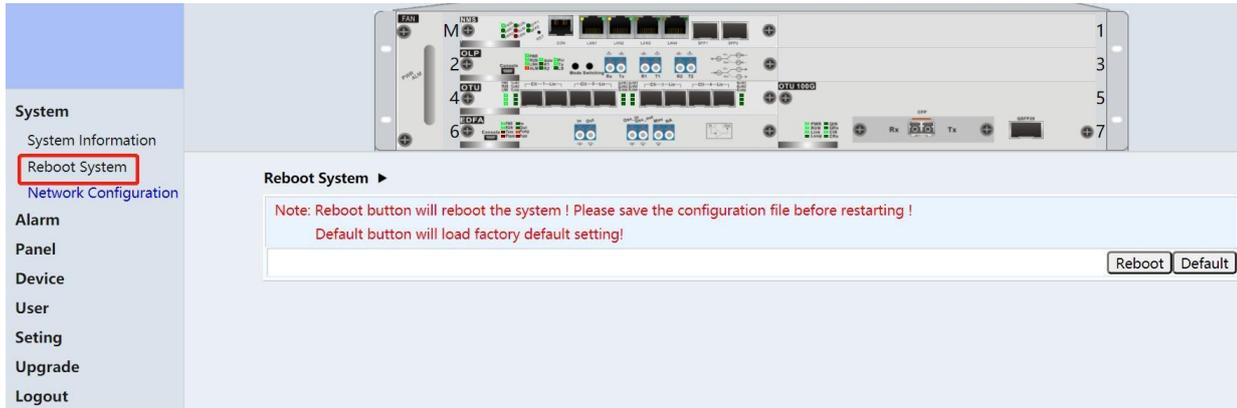
1.2.1 System Information

Click "System" on the left to enter the "system information" page, you can configure the system name, installation location, administrator information, view running time, software version information, etc.



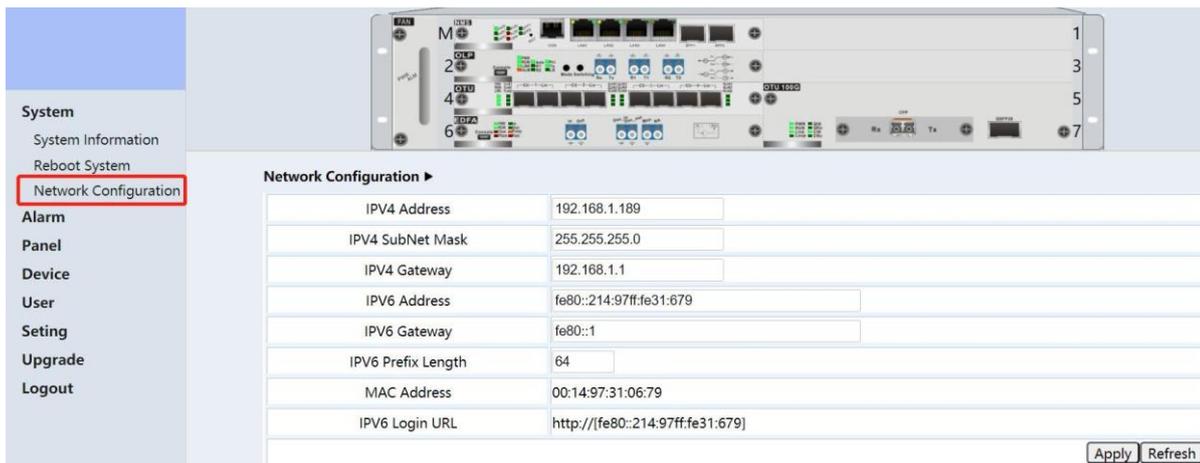
1.2.2 Reboot System

Click "System" on the left to enter the "reboot system" page, you can restart the system and restore factory settings.



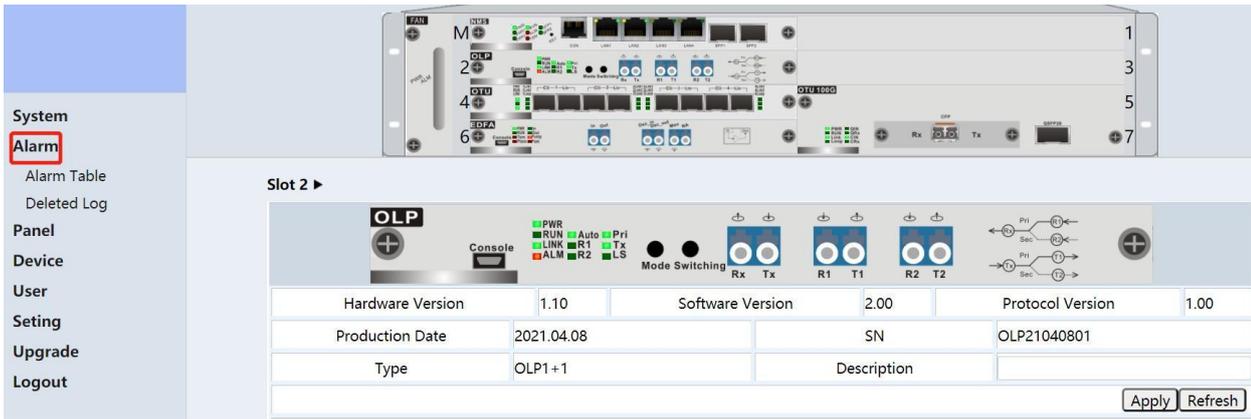
1.2.3 Network Configuration

Click "System" on the left to enter the "network configuration" page, and configure the IP address, sub-net mask, gateway, etc.



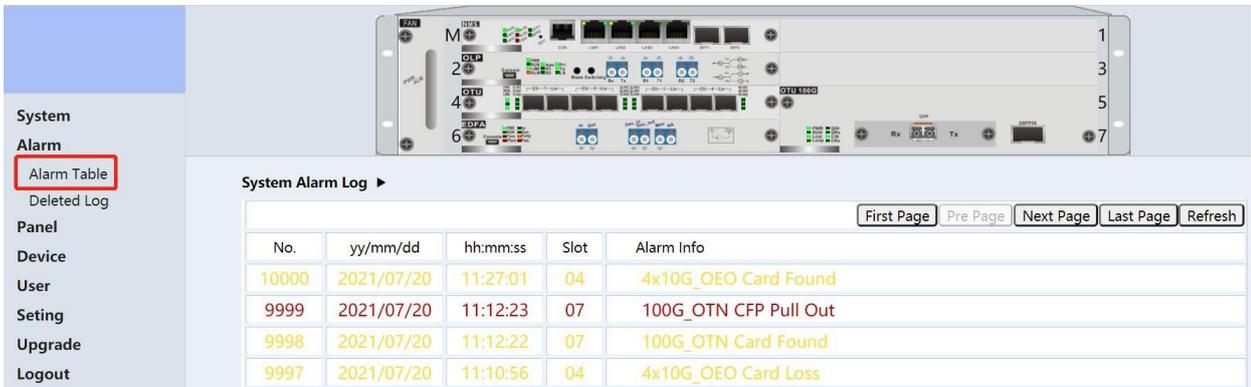
1.3 Alarm

Click "alarm" to display two function: Alarm Table and Delete Log.



1.3.1 Alarm Table

Click "Alarms" on the left to enter the "Alarm Table", you can perform alarm query and alarm clearing operations



1.3.2 Deleted Log

DeleteLog function, you can delete all alarms, the alarm will not be restored after deletion, please operate with caution



1.4 Panel

Click "panel", the entire chassis diagram appears, you can clearly see the slot and model of each card and the refresh panel

The screenshot shows a network configuration interface. On the left sidebar, the menu items are: System, Alarm, **Panel** (highlighted with a red box), Refresh Panel, Device, User, Setting, Upgrade, and Logout. The main content area displays a network configuration table with the following data:

Network Configuration ▶	
IPv4 Address	192.168.1.189
IPv4 SubNet Mask	255.255.255.0
IPv4 Gateway	192.168.1.1
IPv6 Address	fe80::214:97ff:fe31:679
IPv6 Gateway	fe80::1
IPv6 Prefix Length	64
MAC Address	00:14:97:31:06:79
IPv6 Login URL	http://[fe80::214:97ff:fe31:679]

At the bottom right of the configuration table, there are 'Apply' and 'Refresh' buttons.

1.5 Device

Click "Device" and the following sub-items will appear: Chassis Parameters, Chassis Slots and Description.

The screenshot shows the same network configuration interface, but now the 'Device' menu item is selected in the left sidebar (highlighted with a red box). The sub-items under 'Device' are: Chassis Parameters, Chassis Slot, and Description. The main content area still displays the same network configuration table as in the previous screenshot.

1.5.1 Chassis Parameters

Click "Device" on the left to enter the "Chassis Parameters", You can query chassis information, chassis temperature, chassis fan working status, and chassis power supply status.

Chassis Parameters

Parameter	Value
Description	2U Chassis; 8 Slots; Max 2 powers; 3 fans.
Temperature	30.75
Temperature Threshold(°C)	<input type="text" value="75"/>
Fan Status	
Fan A	Normal
Fan B	Normal
Fan C	Normal
Psu	
Type	Status
Psu 1	Abnormal
Psu 2	DC2216A Normal

Apply Refresh

1.5.2 Chassis Slot

Chassis Slot

Slot	Type	Software Version	IP Address	SubNet Mask	Gateway
2	OLP1+1	2.00	172.31.255.12	255.255.255.0	172.31.255.1
4		2.00	192.168.2.14	255.255.255.0	192.168.2.1
6	BA20-G12	2.01	172.31.255.16	255.255.255.0	172.31.255.1
7	OEO-4SFP28QSFP-05U	2.12	172.31.255.17	255.255.255.0	172.31.255.1

Refresh

1.5.3 Description

Click "Device" on the left to enter the "Description", you can add description information to each service card.

Card Description

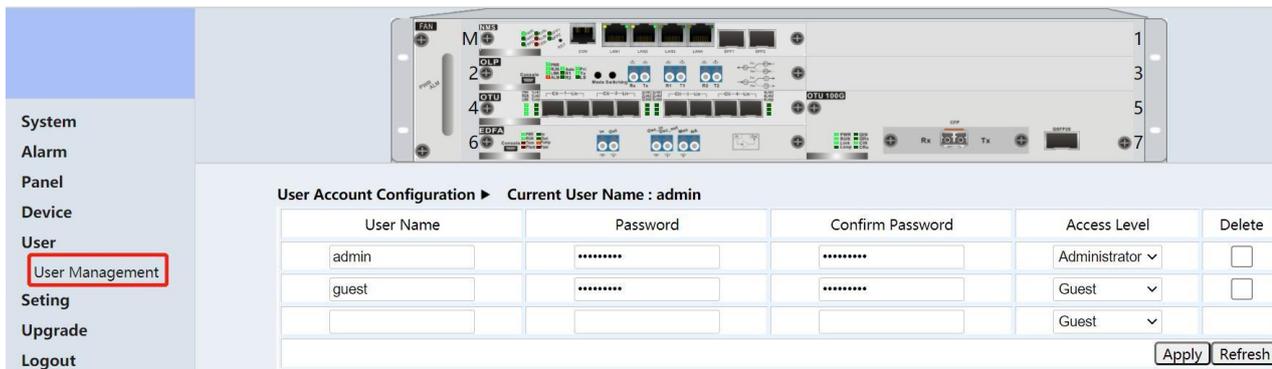
Slot	Local Card
2	<input type="text"/>
4	<input type="text"/>
6	<input type="text"/>
7	<input type="text"/>

Apply Refresh

1.6 User

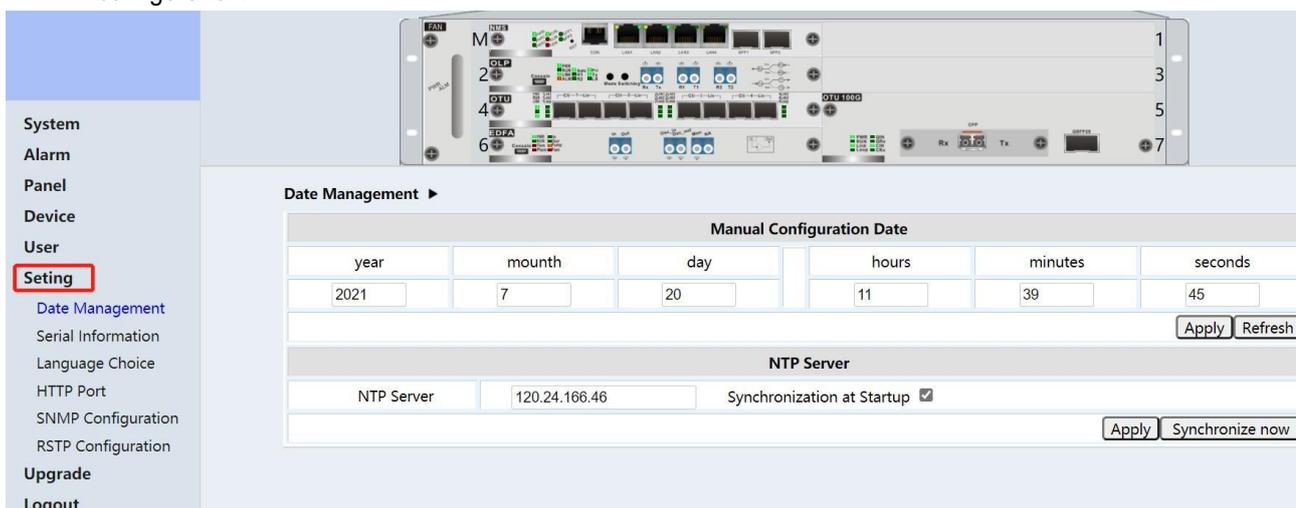
Click "User" on the left to enter the "User Management", you can change the user name and password, create a new

user name, password, and set the priority. The user levels are divided into super user, administrator, and ordinary user. Super user is the highest priority and can perform all operations including user management. Administrator It is the second priority and can perform all operations except user management. Ordinary users have the lowest priority and can only view relevant information;



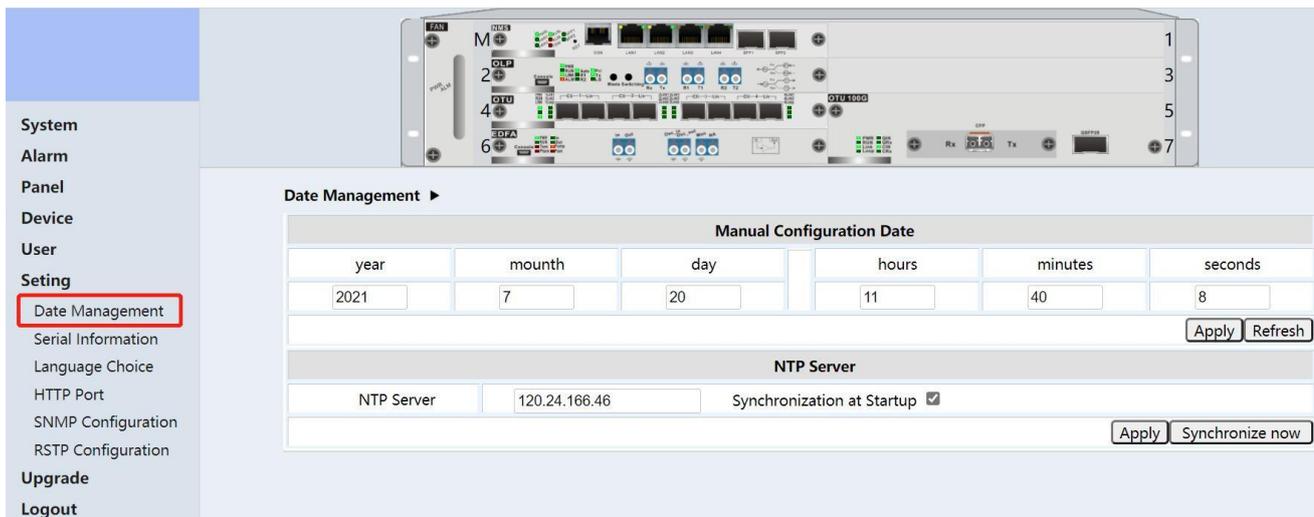
1.7 Setting

“Setting” includes Date Management, Serial Information, Language Choice, HTTP port, SNMP configuration and RSTP configuration.



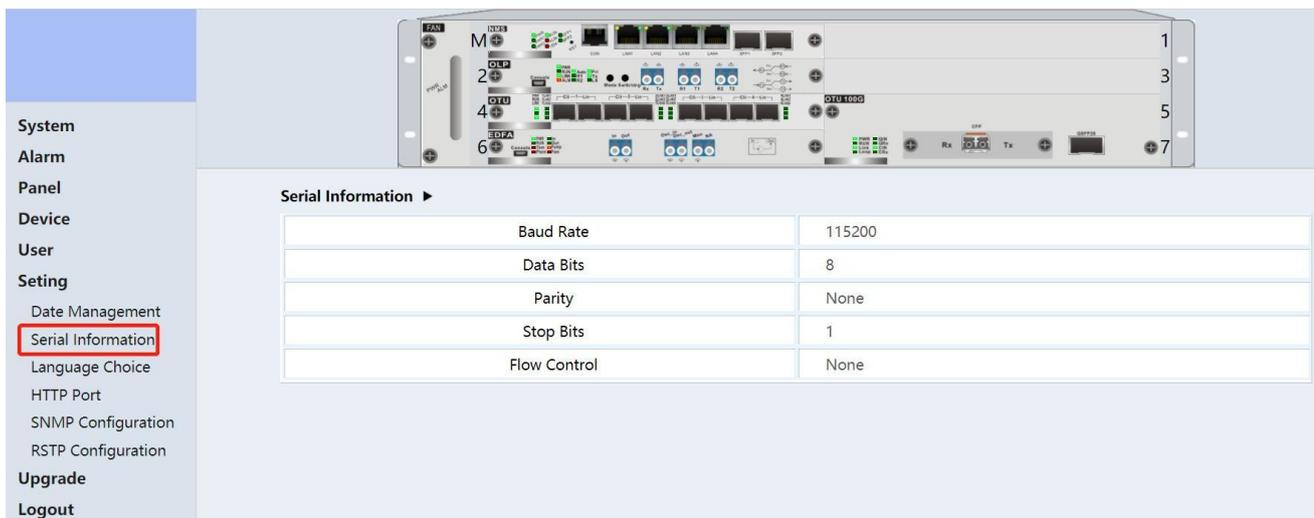
1.7.1 Date Management

Click “Setting” on the left to enter the “Date Management”, You can set the date and time to synchronize with the local time



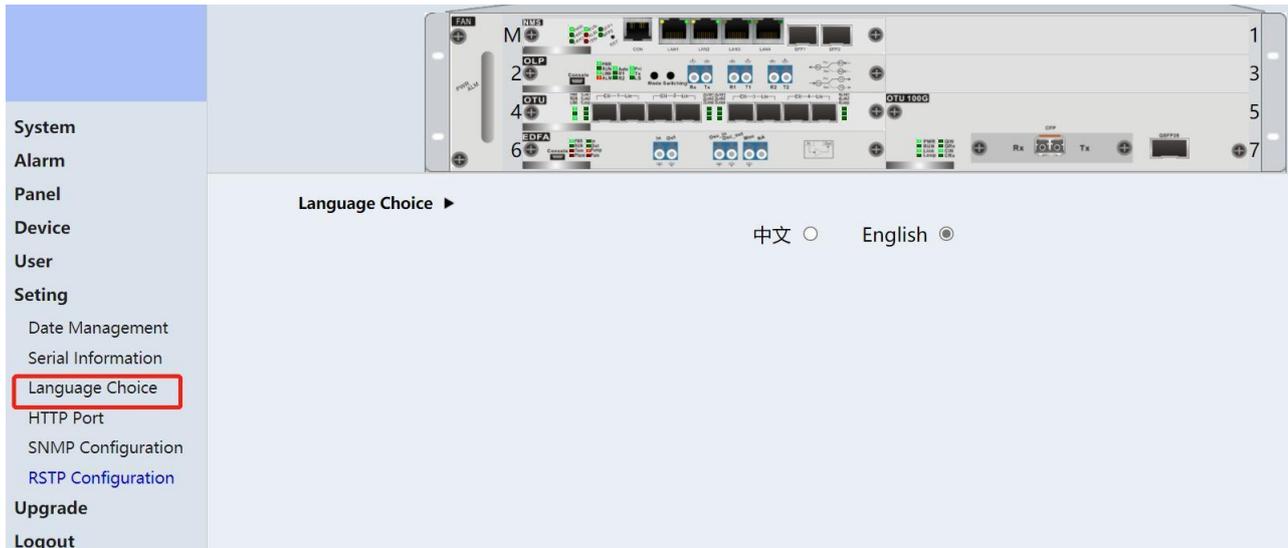
1.7.2 Serial Information

Click “Setting” on the left to enter the “Serial Information”, You can view serial information;



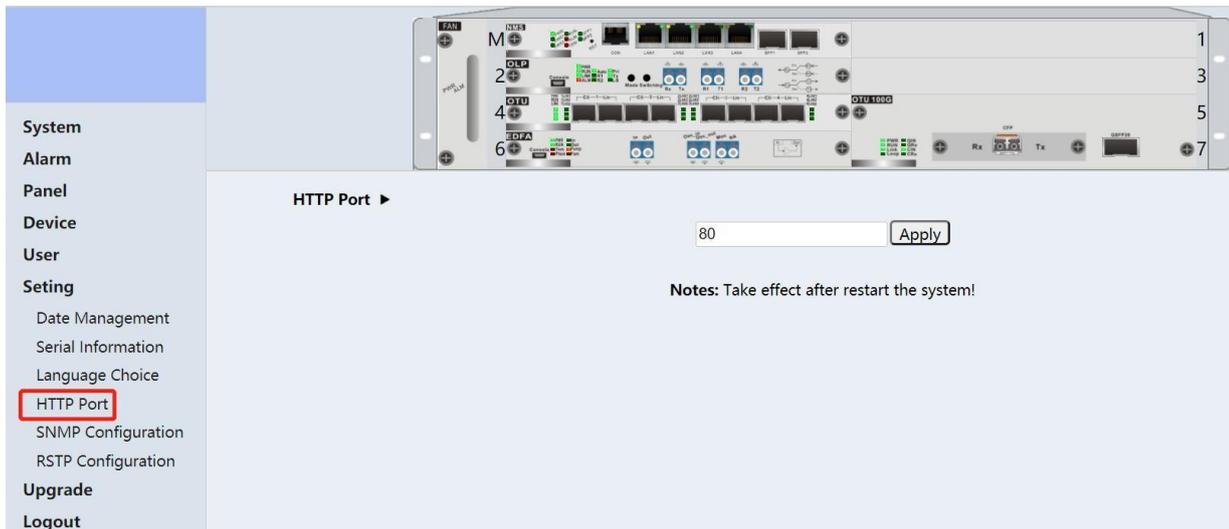
1.7.3 Language Choice

Click “Setting” on the left to enter the “Language Choice”, you can choose Chinese or English interface



1.7.4 HTTP Port

In the “HTTP port”, we can set the HTTP port.



1.7.5 SNMP Configuration

In the “SNMP configuration”, we can set the SNMP port.

The screenshot shows the configuration page for a network device. On the left is a navigation menu with 'SNMP Configuration' highlighted. The main area is divided into two sections:

SNMP Configuration

Port	161
Get Community	public
Set Community	private

Trap Configuration

ID	Status	Version	Port	Community	IPv4 Address	IPv6 Address
1	Disable	V2c	162	public	0.0.0.0	::
2	Disable	V2c	162	public	0.0.0.0	::
3	Disable	V2c	162	public	0.0.0.0	::
4	Disable	V2c	162	public	0.0.0.0	::
5	Disable	V2c	162	public	0.0.0.0	::

Buttons: Apply Refresh

1.7.6 RSTP Configuration

RSTP Configuration can realize port backup.

The screenshot shows the configuration page for a network device. On the left is a navigation menu with 'RSTP Configuration' highlighted. The main area is divided into two sections:

Bridge Config

RSTP Enable	Disable
Bridge Priority	32768
Hello Time(1~10 s)	2
Ageing Time(6~40 s)	20
Forward Delay(4~30 s)	15
Bridge Priority	32768 (0x8000)
Bridge ID	8000-0014973cc005
DesRoot Bridge ID	8000-0014973cc005

Buttons: Apply Refresh Default

Port Config

Port	Port Priority	Port Path Cost	Admin Edge	Point-to-point	Port Status	Port Role
LAN1	128	Auto	Edge	Auto	Forwarding	DesignatedPort
LAN2	128	Auto	Edge	Auto	Disabled	DisabledPort
LAN3	128	Auto	Edge	Auto	Disabled	DisabledPort
LAN4	128	Auto	Edge	Auto	Disabled	DisabledPort
SFP1	128	Auto	Edge	Auto	Disabled	DisabledPort
SFP2	128	Auto	Edge	Auto	Disabled	DisabledPort

Buttons: Apply Refresh Default

1.8 Upgrade

In the upgrade section, we can upgrade our system or services cards, as well as backup and restore.



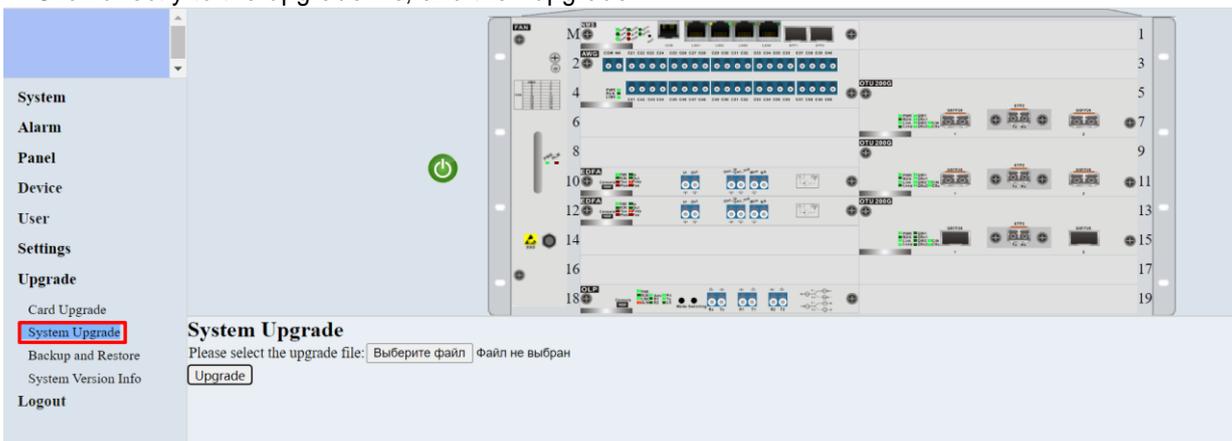
1.8.1 Upgrade

First you select the slot and the card type, and then upload the file.



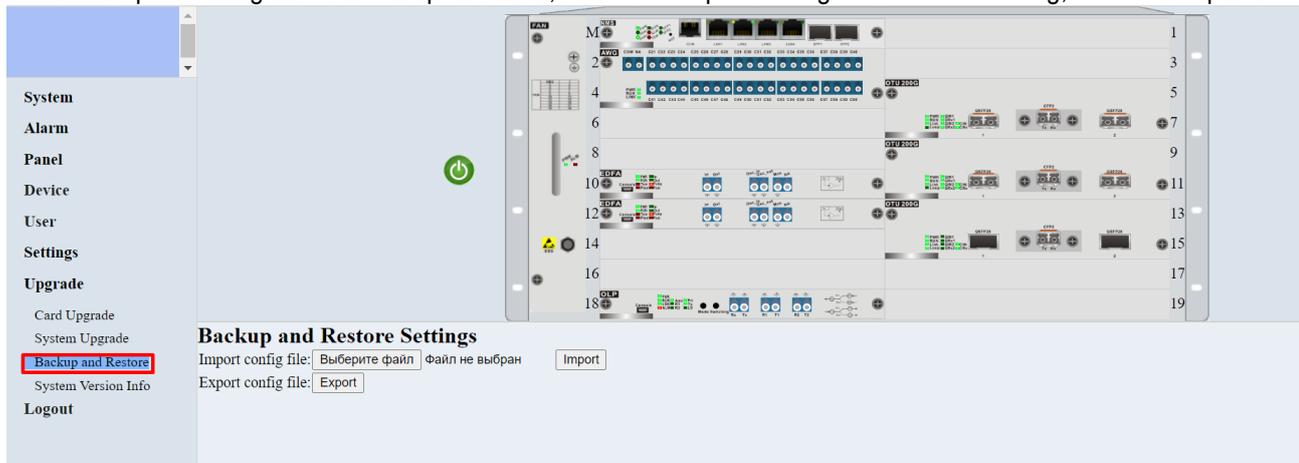
1.8.2 System Upgrade

Click directly to the upgrade file, and then upgrade.



1.8.3 Backup and Restore

Click Export config file to back up the data; select the import config file when restoring, and click Import.



1.9 Logout

After clicking logout, we return to the initial page of our login account.

