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Chapter 1 Safety Information

Laser Safety Information

EDFA and OLP (1:1 type) are members of Class 3B laser products, which should not be used or installed in an optical network with emissions higher than Class 3B. Before operating the products, the individuals must be familiar with the safety symbols on the products panel and their meanings.

Please watch out invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments.

NOTE

Please strictly follow the instructions in this manual, otherwise any improper operations may unintentionally damage the product or even cause the personnel injury.

Only trained and qualified personnel should be allowed to install, maintain, or trouble-shoot the device.

Chapter 2 Overview

<table>
<thead>
<tr>
<th>About</th>
<th>This FMT (FS Multiservice Transport) series user manual cover the function, appearance, settings and installation of FMT series products.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FMT Series</td>
<td>Managed Chassis, DWDM EDFA, DCM, OEO, OLP/OBP, DWDM Red/Blue filter and VOA</td>
</tr>
<tr>
<td>Usage</td>
<td>FMT series products are card design, which can be highly integrated with the managed chassis. The scalable design enables easy installation and rapid deployment. The manual will help you install the products and how you can better use it to make your network deployment easier.</td>
</tr>
</tbody>
</table>

Table 2-1
Chapter 3  Managed Chassis

3.1 Managed Chassis Introduction

As a professional provider of OTN products, FS.COM provides 1U, 2U and 4U managed chassis to realize flexible network deployment. All FMT chassis support mixed insertion of the business cards. The figures below shows 1U chassis.

![Figure 3-1](image1)

![Figure 3-2](image2)

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Main control card</td>
<td>Fixed 1 NMU card</td>
</tr>
<tr>
<td>②</td>
<td>Business card</td>
<td>Fixed two 2-slot type or four 1-slot type FMT cards</td>
</tr>
<tr>
<td>③</td>
<td>Fan</td>
<td>Support field-replaceable and hot-swappable</td>
</tr>
<tr>
<td>④</td>
<td>Lugs</td>
<td>Used to fix the chassis to the cabinet</td>
</tr>
<tr>
<td>⑤</td>
<td>Power 1</td>
<td>AC or DC power, hot-swappable</td>
</tr>
<tr>
<td>⑥</td>
<td>Power 2</td>
<td>AC or DC power, hot-swappable</td>
</tr>
<tr>
<td>⑦</td>
<td>Grounding screw</td>
<td>Used to ground the chassis</td>
</tr>
</tbody>
</table>

Table 3-1

⚠️ NOTE: Please notice it should be grounded before starting up.
3.2 Managed Chassis Capacity Instruction

FMT managed chassises are compatible with NMU (Network Management Unit), and are available in 1RU, 2RU and 4U, which are extremely flexible and compact chassis. There are two types of cards that can be inserted into the chassises.

![Figure 3-3](image)

1. 2-Slot card type: Occupies 2 slots in the chassis.
2. 1-Slot card type: Occupies 1 slot in the chassis.

<table>
<thead>
<tr>
<th>Chassis Type</th>
<th>Chassis Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2-Slot Card Type</td>
</tr>
<tr>
<td>1U</td>
<td>2 pcs</td>
</tr>
<tr>
<td>2U</td>
<td>4 pcs</td>
</tr>
<tr>
<td>4U</td>
<td>8 pcs</td>
</tr>
</tbody>
</table>

Table 3-2
3.3 Managed Chassis Components

3.3.1 Network Management Unit

3.3.1.1 NMU Introduction

NMU (Network management unit) card masters and manages all FMT cards which can be placed in a compatible FMT series chassis. By the NMU card, you can view current state and work performance, and also set relevant functions of all cards through our remote network management system.

![NMU Card Diagram]

**Table 3-3**

<table>
<thead>
<tr>
<th>Item</th>
<th>Item Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Device status indicator</td>
<td>P1 (Power1), P2 (Power2), RUN</td>
</tr>
<tr>
<td>②</td>
<td>LCD display screen</td>
<td>Provide main and daughter cards information</td>
</tr>
<tr>
<td>③</td>
<td>Operation keys</td>
<td>Used for controlling the LCD display</td>
</tr>
<tr>
<td>④</td>
<td>Console port</td>
<td>Reserved for FS.COM future use (not available for customers)</td>
</tr>
<tr>
<td>⑤</td>
<td>RJ45 ETH port</td>
<td>Used for device management and program upgrade</td>
</tr>
<tr>
<td>⑥</td>
<td>Optical transceiver working status indicator</td>
<td>Indicating the status of optical transceiver</td>
</tr>
<tr>
<td>⑦</td>
<td>Optical transceiver slots</td>
<td>Support in-band and out-of-band OSC management</td>
</tr>
<tr>
<td>Indicator</td>
<td>Note</td>
<td>Normal State</td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>P1</td>
<td>Power 1</td>
<td>Green light</td>
</tr>
<tr>
<td>P2</td>
<td>Power 2</td>
<td>Green light</td>
</tr>
<tr>
<td>RUN</td>
<td>Board Run</td>
<td>Light flashes every second</td>
</tr>
<tr>
<td>F1</td>
<td>SFP1</td>
<td>Light flashes</td>
</tr>
<tr>
<td>F2</td>
<td>SFP2</td>
<td>Light flashes</td>
</tr>
</tbody>
</table>

Table 3-4

Communication Ports

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETH</td>
<td>Internet communication port</td>
<td>RJ-45</td>
</tr>
<tr>
<td>Console</td>
<td>Debugging &amp; upgrading port</td>
<td>Micro USB</td>
</tr>
<tr>
<td>SFP1 &amp; SFP2</td>
<td>In-band and Out-of-band OSC management port</td>
<td>SFP</td>
</tr>
</tbody>
</table>

Table 3-5

3.3.1.2 NMU Supplemental Instruction

1. Operation Keys

(1) Press “down key” ▼ to choose card which need to check or set, such as NMU information (include IP information) or business card information.

(2) If you need to check or set detailed information of business cards, please stay in the interface of the card, then enter into sub-interface by pressing “OK key” and you can view or set card information by pressing “up key” ▲ and “down key” ▼.

(3) The terms with asterisk (*) can be set. If you need to set the term, please enter into visual design set by pressing “OK key”. There are two ways as follows to set card information in visual design set page.

A. N-numeric type: You can choose the term which need to set by pressing “up key” ▲ and “down key” ▼, then press “OK key” to complete setting.

B. Numeric type: You can choose digit bit by pressing “left key” ◀ and “right key” ▶, then adjust numbers by pressing “up key” ▲ and “down key” ▼, and lastly press “OK key” to complete setting.

(4) You can return to previous interface or exit some interface by pressing “ESC key”.

Data Center, Enterprise & ISP Network Solutions

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3.3.1.3. Communication Ports

(1) Remote network management and management through RJ45 interface within 100 meters.

(2) In-band and Out-of-band OSC management through SFP port for longer transmission.

Tips:
1. 100Mbps SFP: only connection from NMU to switch or other management device.
2. 1000Mbps SFP: only connection from NMU to NMU.
3. SFP port: used for network management.
4. RJ45 Ethernet port: used for equipment upgradation to repair system bug and management.
3.3.2 Power Supply

Depending on the supply voltage that you require, FS.COM can offer you a number of power supply cards to suit your application. All the power supply cards are hot-swappable and field-replaceable.

We offer a varied range of power supply cards:

1U: 100V-240VAC (1.8A); 36V-72VDC (1.8A)
2U/4U: 100V-240VAC (1.8A); 36V-72VDC (1.8A)

Power supply for 1U chassis

Power supply for 2U/4U chassis

Figure 3-7

Figure 3-8
Chapter 4   FMT Series Cards Description

FS.COM offers a wide range of FMT (FS Multiservice Transport) series cards, including cards of DWDM EDFA, DCM, OEO, OLP, OLP/OBP, DWDM R/B Filter and VOA. They can be highly integrated with FS.COM management platform chassis to realize high-density and efficient multiservice transmission. And different cards can be chosen flexibly to match managed chassis in accordance with various projects.

4.1 DWDM Erbium Doped Fiber Amplifier

4.1.1 DWDM EDFA Introduction

Erbium-doped fiber amplifier (EDFA) is an optical repeater device that is used to boost the intensity of optical signals being carried through a fiber optic communications system. The amplifiers are designed to be operated over the DWDM C-band channels (1529–1564nm). They offer high power and low noise figure with a proven reliability and quality. Combine EDFA with other FMT series products, you can build long distance DWDM solutions.

![Figure 4-1](image)

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Note</th>
<th>Normal State</th>
<th>Alarm State</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Board Power</td>
<td>Green light</td>
<td>Light off</td>
</tr>
<tr>
<td>RUN</td>
<td>Board Run</td>
<td>Green light flashes every second</td>
<td>Light off or flashes irregularly</td>
</tr>
<tr>
<td>In</td>
<td>Input Optical Power Alarm</td>
<td>Green light flashes every second</td>
<td>Red light, lower input power</td>
</tr>
<tr>
<td>Out</td>
<td>Output Optical Power Alarm</td>
<td>Green light flashes every second</td>
<td>Red light, lower output power</td>
</tr>
<tr>
<td>MT</td>
<td>Module Temperature Alarm</td>
<td>Green light flashes every second</td>
<td>Red light, higher temperature</td>
</tr>
<tr>
<td>PT</td>
<td>PUMP Temperature Alarm</td>
<td>Green light flashes every second</td>
<td>Red light, higher temperature</td>
</tr>
</tbody>
</table>

Table 4-1
Communication Port

<table>
<thead>
<tr>
<th>Port Type</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console</td>
<td>Debugging &amp; upgrading port</td>
<td>Micro USB</td>
</tr>
</tbody>
</table>

Table 4-2

Fiber Ports

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>Optical signal input port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out</td>
<td>Optical signal output port</td>
<td>LC/UPC</td>
</tr>
</tbody>
</table>

Table 4-3

4.1.2 The Main Working Parameters

(1) Working Mode
   AGC: Automatic constant gain
   Tips: Please do not modify working mode.

(2) PUMP Switch
   DWDM EDFA does not work normally after PUMP closed, please set with caution.

(3) Input Power Alarm Threshold
   DWDM EDFA alarms with lower input power than threshold and then does not work normally.
   Please
do not set this term, lest the device come to error alarm and affect normal work.
   Tips: DWDM EDFA still can work with higher input power than saturated input power. But please
   note that in this case the performance problems are at the owner’s risk and FS.COM shall not be responsible or liable for any performance problems of input power alarm threshold adjustment.

(4) Output Power Alarm Threshold
   DWDM EDFA alarms with lower output power than threshold and then does not work normally.
   Please do not set this term, lest device come to error alarm and affect normal work.
   Tips: DWDM EDFA still can work with higher output power than saturated output power, but please
   note that in this case the performance problems are at the owner’s risk and FS.COM shall not be responsible or liable for any performance problems of output power alarm threshold adjustment.
(5) Work Gain

It is the current gain of EDFA card, which is the same as the default gain when output power is lower than or equal to saturated output power.

(6) Default Gain

It is the default gain of EDFA card, which is generally the same as work gain under normal circumstance.

Tips: Please do not modify the default gain.

(7) Module Temperature

It is the temperature inside EDFA module box.

(8) PUMP Temperature

It is temperature of pump laser.

4.2 Dispersion Compensation Module

4.2.1 DCM Introduction

FS.COM Dispersion Compensation Module (DCM) provides passive dispersion for DWDM transmission systems. Based on the mature and reliable optical fiber technology (DCF), DCM can improve the performance of the optical transmission system and increase fiber transmission distances without regenerating the signals.

![DCM Image]

Figure 4-2

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>Optical signal input port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out</td>
<td>Optical signal output port</td>
<td>LC/UPC</td>
</tr>
</tbody>
</table>

Table 4-4
4.3 OEO Optical Transponder

4.3.1 OEO Introduction

The WDM OEO converter is an Optical-Electrical-Optical (OEO) signal converter that provides several functions, including optical wavelength conversion, fiber type conversion and optical signal boosting. With transparent bi-directional forwarding capability between the 2 fiber media, the transponder brings you the best and simplest solution for WDM optical networks.

![Image of OEO Optical Transponder](image.png)

**Figure 4-3**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Note</th>
<th>Normal State</th>
<th>Alarm or Other Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Board Power</td>
<td>Green light</td>
<td>Light off</td>
</tr>
<tr>
<td>RUN</td>
<td>Board Run</td>
<td>Light flashes every second</td>
<td>Light off or flashes irregularly</td>
</tr>
<tr>
<td>A1</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>A2</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>B1</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>B2</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>C1</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>C2</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>D1</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
<tr>
<td>D2</td>
<td>Optical Transceiver</td>
<td>Light flashes every second</td>
<td>Light off, no transceiver identified</td>
</tr>
</tbody>
</table>

Table 4-5
Communication Port

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console</td>
<td>Debugging &amp; upgrading port</td>
<td>Micro USB</td>
</tr>
</tbody>
</table>

Table 4-6

Fiber Ports

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Optical transceiver signal receiving port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>T</td>
<td>Optical transceiver signal transmitting port</td>
<td>LC/UPC</td>
</tr>
</tbody>
</table>

Table 4-7

4.3.2 The Main Working Parameters

1) Working Mode

Normal Mode:

Used for conversion of fiber mode and wavelength and regeneration of optical signal.

The optical transceivers must be used in pairs under normal mode. For example, optical signal enters R of optical transceiver A1 and then comes out from T of transceiver A2; Optical signal enters R of optical transceiver A2 and then comes out from T of transceiver A1.

OEO card has A, B, C and D four groups. The working mode of each group is always the same, but the working mode of different groups can be different.

Loopback Mode:

Used for detection and troubleshooting.
The optical transceiver must be used alone under loopback mode. For example, optical signal enters R of optical transceiver A1 and comes out from T of transceiver A1.

OEO card has four groups. They are A, B, C and D. The working mode of each group is always the same. And the working mode of different groups also can be different.

(2) Optical Transceiver Transmission Control

Open: Optical transceiver always transmits signal;

Close: Optical transceiver does not transmit signal;

AUTO: Optical transceiver transmits signal when it receives fiber signal normally.

① When AUTO light control comes with general working mode, optical transceiver A2 transmits signal only when optical transceiver A1 receives signal normally and optical transceiver A1 transmits signal only when optical transceiver A2 receives signal normally.

② When AUTO light control comes with loopback working mode, optical transceiver A1 transmits signal only when optical transceiver A1 receives signal normally.
4.4 1+1 Optical Line Protection

1+1 Optical Line Protection (OLP) can realize optical power monitoring and automatic switching to protect continuous optical transmission. They are particularly well suited for protection in any type of fiber data transmission, including CWDM & DWDM links.

4.4.1 1+1 OLP Introduction

1+1 OLP (Optical Line Protection) is a device used in pairs. Optical power monitoring and automatic switching from main line to spare line can be realized.

![OLP Diagram]

**Figure 4-6**

<table>
<thead>
<tr>
<th>LED</th>
<th>Note</th>
<th>Normal State</th>
<th>Alarm or Other Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Board Power</td>
<td>Green light</td>
<td>Light off</td>
</tr>
<tr>
<td>RUN</td>
<td>Board Run (flashes every second)</td>
<td>Green light</td>
<td>Light off or flashes irregularly</td>
</tr>
<tr>
<td>ALM</td>
<td>Alarm (working normal)</td>
<td>Light off (manual mode)</td>
<td>Red light, abnormal power of R1, R2 or TX</td>
</tr>
<tr>
<td>AUTO</td>
<td>Working Mode</td>
<td>Green light (auto mode)</td>
<td>Light off (manual mode)</td>
</tr>
<tr>
<td>R1</td>
<td>Main Optical Signal</td>
<td>Green light (normal power)</td>
<td>Light off (power lower than R1 switching threshold)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Green light flashes (power lower than R1 warning threshold)</td>
</tr>
<tr>
<td>R2</td>
<td>Backup Optical Signal</td>
<td>Green light (normal power)</td>
<td>Light off (power lower than R2 switching threshold)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Green light flashes (power lower than R2 warning threshold)</td>
</tr>
<tr>
<td>Pri</td>
<td>Rx Signal Option</td>
<td>Green light (main optical signal)</td>
<td>Light off (backup optical signal)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Light off, power lower than</td>
</tr>
<tr>
<td>Tx</td>
<td>Tx Signal</td>
<td>Green light (normal power)</td>
<td>Light off (TX warning threshold)</td>
</tr>
<tr>
<td>LS</td>
<td>Internal Light Source</td>
<td>Green light (no probe signal)</td>
<td>Gray light (no probe signal)</td>
</tr>
</tbody>
</table>

Table 4-8
Panel Key Instruction

<table>
<thead>
<tr>
<th>Key Name</th>
<th>Note</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode</td>
<td>Switch Working Mode</td>
<td>Press lasting 3 seconds, auto mode switches to manual mode; Press for 1 second, manual mode switches to auto mode</td>
</tr>
<tr>
<td>Status</td>
<td>Switch Working Channel</td>
<td>Press lasting 3 seconds, channels switches</td>
</tr>
</tbody>
</table>

Table 4-9

Communication Port

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console</td>
<td>Debugging &amp; upgrading port</td>
<td>Micro USB</td>
</tr>
</tbody>
</table>

Table 4-10

Optical Fiber Ports

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Note</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX</td>
<td>User device signal receiving port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>TX</td>
<td>User device signal transmitting port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>R1</td>
<td>Main optical signal receiving port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>T1</td>
<td>Main optical signal transmitting port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>R2</td>
<td>Backup optical signal receiving port</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>T2</td>
<td>Backup optical signal transmitting port</td>
<td>LC/UPC</td>
</tr>
</tbody>
</table>

Table 4-11

4.4.2 The Main Working Parameters

(1) Working Mode
   Auto Mode: The channels are switched automatically in the system according to the switching threshold.
   Manual Mode: The channels are switched by setting channel manually.

(2) Manual Channel Option
   Pri Channel (R1): The system receives optical signal from R1 channel.
   Sec Channel (R2): The system receives optical signal from R2 channel.
(3) Working Mode Save
   Not saved after power failure: After device powers up again, working mode would always be automatic mode.
   Saved after power failure: After device powers up again, working mode is the same as that before power failure.
(4) R1 Switch Threshold
   R1 switch threshold is the judgment condition of automatic switch. When the current power of R1 is lower than the switch threshold, the working mode is automatic one and if power of R2 is normal, the system will switch automatically to R2.
(5) R2 Switch Threshold
   R2 switch threshold is the judgment condition of automatic switch. When the current power of R2 is lower than the switch threshold, the working mode is automatic one and if power of R1 is normal, the system will switch automatically to R1.
(6) R1 Alarm Threshold
   R1 Alarm threshold is the judgment condition of R1 optical power early warning.
   R1 optical power early warning is to remind users by perceiving signal degradation of R1.
(7) R2 Alarm Threshold
   R2 Alarm threshold is the judgment condition of R2 optical power early warning.
   R2 optical power early warning is to remind users by perceiving signal degradation of R2.
(8) TX Alarm Threshold
   TX alarm threshold is the judgement condition of TX optical power alarm.
   When the current power of TX is lower than the alarm threshold, the whole system will be severely affected.
(9) R1/R2/TX Channel Wavelength
   Please choose the appropriate channel wavelength according to the optical signal wavelength. If the channel wavelength is different from optical signal wavelength, the detected optical power will be incorrect.
(10) R1/R2/TX Channel Power
    R1/R2/TX channel power is the power value of the current channel received.
(11) Back Switch Mode

Automatic back switch: The system will switch back automatically from backup channel R2 to main channel R1 when main channel and backup channel receive optical signal normally in automatic working mode.

Manual back switch: The system will not switch back automatically from backup channel R2 to main channel R1 when main channel and backup channel receive optical signal normally.

(12) Delay of Back Switch

The delay of back switch is the time condition of back switch. The system switches back only when both main channel and backup channel receive optical signal normally and the main channel receive optical signal normally even within delay time of back switch. The delay time of back switch can be set within 0 – 999 minutes.

(13) Handoff Delay

The handoff delay is the time condition of automatic channel switch. The system will switch after the handoff delay when it meets auto switch conditions of some channel. It can be set within 0 – 999 seconds. When the delay time of switch is set in 0 second, it means no delay and the system switches immediately when it reaches switch condition.

Tips: 1:1 OLP does not support handoff delay.

(14) Return to Auto Delay

Return to auto delay is the time condition of working mode automatically from manual mode to auto mode. When the system works in manual mode, it will automatically turn to auto mode after return to auto delay. It can be set within 0 – 999 minutes.

When the delay time is set in 0 minute, then the system will not turn to auto mode automatically.

4.5 DWDM Red/Blue Filter

4.5.1 DWDM Red/Blue Filter Introduction

The DWDM Red/Blue Filter is mainly used to separate or combine red band wavelength signal (1548.31-1560.81nm) and blue band wavelength signals (1529.35-1541.55nm) in C-band in DWDM system and high power amplification system.
4.6 Variable Optical Attenuator

4.6.1 VOA Introduction

FS.COM’s Variable Optical Attenuators (VOA) allow the users to vary the attenuation of the signal in the fiber as it is transmitted through the device. The VOA card is used for attenuation adjustment of C-band optical signal, which can be adjusted in manual mode and auto mode.
### Table 4-13

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Note</th>
<th>Normal State</th>
<th>Alarm State</th>
</tr>
</thead>
<tbody>
<tr>
<td>PWR</td>
<td>Board power</td>
<td>Green light</td>
<td>Light off</td>
</tr>
<tr>
<td>RUN</td>
<td>Board run</td>
<td>Green light flashes every second</td>
<td>Light off or flashes irregularly</td>
</tr>
<tr>
<td>Out1</td>
<td>Line 1 output optical power monitor</td>
<td>Light green, line 1 output optical power higher than line 1 threshold</td>
<td>Light off, line 1 output optical power lower than line 1 threshold</td>
</tr>
<tr>
<td>Out2</td>
<td>Line 2 output optical power monitor</td>
<td>Light green, line 2 output optical power higher than line 2 threshold</td>
<td>Light off, line 2 output optical power lower than line 2 threshold</td>
</tr>
<tr>
<td>Out3</td>
<td>Line 3 output optical power monitor</td>
<td>Light green, line 3 output optical power higher than line 3 threshold</td>
<td>Light off, line 3 output optical power lower than line 3 threshold</td>
</tr>
<tr>
<td>Out4</td>
<td>Line 4 output optical power monitor</td>
<td>Light green, line 4 output optical power higher than line 4 threshold</td>
<td>Light off, line 4 output optical power lower than line 4 threshold</td>
</tr>
</tbody>
</table>

#### Communication Port

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console</td>
<td>Debugging &amp; upgrading port</td>
<td>Micro USB</td>
</tr>
</tbody>
</table>

#### Fiber Ports

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Note</th>
<th>Port Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>In1</td>
<td>Optical signal input port of line 1</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out1</td>
<td>Optical signal output port of line 1</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>In2</td>
<td>Optical signal input port of line 2</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out2</td>
<td>Optical signal output port of line 2</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>In3</td>
<td>Optical signal input port of line 3</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out3</td>
<td>Optical signal output port of line 3</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>In4</td>
<td>Optical signal input port of line 4</td>
<td>LC/UPC</td>
</tr>
<tr>
<td>Out4</td>
<td>Optical signal output port of line 4</td>
<td>LC/UPC</td>
</tr>
</tbody>
</table>
4.6.2 The Main Working Parameters

(1) Working Mode
   Auto mode: The attenuation is adjusted automatically based on configured output power.
   Manual mode: The attenuation is adjusted manually.

(2) Out1 Power
   Output power of line 1

(3) Out2 Power
   Output power of line 2

(4) Out3 Power
   Output power of line 3

(5) Out4 Power
   Output power of line 4
   Tips: The VOA card only monitors power of output port.

(6) VOA1 Atten
   Current attenuation of line 1, like 5dB.

(7) VOA2 Atten
   Current attenuation of line 2, like 5dB.

(8) VOA3 Atten
   Current attenuation of line 3, like 5dB.

(9) VOA4 Atten
   Current attenuation of line 4, like 5dB.

(10) Out1 Config
    Output power configuration value of line 1. The value can be only configured in auto mode
    and the attenuation is adjusted based on configured power value.

(11) Out2 Config
    Output power configuration value of line 2. The value can be only configured in auto mode
    and the attenuation is adjusted based on configured power value.

(12) Out3 Config
    Output power configuration value of line 3. The value can be only configured in auto mode
    and the attenuation is adjusted based on configured power value.
(13) Out4 Config
Output power configuration value of line 4. The value can be only configured in auto mode and the attenuation is adjusted based on configured power value.

(14) VOA1 Config
Attenuation configuration value of line 1. The value can be only configured in manual mode.

(15) VOA2 Config
Attenuation configuration value of line 2. The value can be only configured in manual mode.

(16) VOA3 Config
Attenuation configuration value of line 3. The value can be only configured in manual mode.

(17) VOA4 Config
Attenuation configuration value of line 4. The value can be only configured in manual mode.

Chapter 5 Managed Chassis and FMT Cards Installation

5.1 Managed Chassis Installation

The following three steps are required to mount 1U/2U/4U chassis to the cabinet.

Step 1: Identify the location to be installed in the equipment cabinet and fix 4 nuts on the cabinet with a straight screwdriver.

Step 2: Keep mounting holes on the chassis lugs aligned with that on the cabinet in a horizontal way.

Step 3: Screw tight slowly the nut with a cross screwdriver.

Figure 5-1
5.2 FMT Cards Installation

FMT series cards are designed as 2-slot card or 1-slot card to match FMT managed chassis. All the FMT cards are installed the same as each other.

![Image of FMT card installation](image)

Figure 5-2

Step 1: Insert it along with the guide rail into the chassis.
Step 2: Tighten the two loose screws on the card by your hands only.

5.3 Installation Notices

1. All the FMT cards can not be used alone. Please keep them used with FMT 1U/2U/4U managed chassis.
2. Installation order: Please install 1U/2U/4U managed chassis to cabinet firstly; then FMT cards to managed chassis.
3. Before installing FMT series products, please keep all fiber connectors and ports clean. When fiber connectors or ports are not in use, please capped with clean dust caps.
4. Double check if the managed chassis has been fixed tight on the cabinet in a horizontal way in case it can not work well or even falls to the ground over installation.
5. Please insert external power supply correctly according to the type of power card.
6. Note that the chassis is grounded alone.
7. Make sure both good air circulation and heat dissipation with cooling air outlets located on either side the chassis.
8. Keep the machine room clean with constant temperature.
Chapter 6 Check Parameters of FMT Series Cards

6.1 Card Positions Introduction

The cards in the chassis have up to 16 positions. Before you check the parameters of a card, you’d better get clear on the exact position of the card.

6.2 Check the Parameters

When you want to see the parameters of card 3 (EDFA) in blue wireframe as fig.5-2, you can take the following steps.

Step 1: Get position of this card on LCD screen

This card is in the 3rd slot. Please press “down key” ▼ on the right side of the screen until the LCD screen to display the interface as fig.5-3.

Step 2: View the card

Press “OK button” to enter the interface as fig.5-4 and then go on with “down key” ▼, now you can see the parameters of this card.
If you want to see other card parameters, press “ESC” to quit, and return back to the first step.

6.3 Check the Parameters through SNMPV1

You can also check the parameters through our remote network management system. For example, the EDFA card has been inserted into the 3rd slot, then you should choose the corresponding MIB document of OAP-C3-EDFA. Otherwise you can not get the information you want.

Tips:
1. You can get MIB documents from the CD attached with the products and raise any questions.
2. When the card occupies 2 slots in FMT chassis, for example, it has been inserted into the 1st and 3rd slots, then you should choose the corresponding MIB document of OAP-C3-EDFA, because the PCI slot corresponds to 3rd slot. Similarly, if it has been inserted into the 2nd and 4th slots, then you should choose the document of OAP-C4-EDFA.
## MIB Document

<table>
<thead>
<tr>
<th>Category</th>
<th>Slot</th>
<th>Housing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pluggable Module</td>
</tr>
<tr>
<td>DWDM EDFA</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>Raman-off Amplifier</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>SDH EDFA</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>CATV Amplifier</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>SOA</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>EYDFA</td>
<td>2</td>
<td>√</td>
</tr>
<tr>
<td>Mid-stage EDFA</td>
<td>2</td>
<td>√</td>
</tr>
<tr>
<td>DCM</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>OEO</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>BO Module</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>OLP</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>DWDM Red/Blue Filter</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>VOA</td>
<td>1</td>
<td>√</td>
</tr>
<tr>
<td>OPD</td>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>OTDR</td>
<td>2</td>
<td>x</td>
</tr>
<tr>
<td>OPM</td>
<td>2</td>
<td>x</td>
</tr>
</tbody>
</table>

Note: √ stands for providing MIB document; \ represents there is no such housing; x indicates the MIB document does not available.

### Chapter 7 FAQs

Q: Why it is sometimes difficult to insert the card into the chassis?

A: Please do not worry, you can insert the card flat guide slowly. In this case, it is easier to insert without damaging the card and the chassis.

Q: There are some optical fibers on the outside of the card, is it OK?

A: Sure. But please do not touch the optical fibers too hard to avoid bending excessive.

### Chapter 8 Technical Support

As a full service provider of network and connectivity products, FS.COM focuses on providing our customers the best technical support, engineering cost effective and scalable solutions. Our professional technical support team will answer questions about installation and usage details. Our services make sure that customers’ any problems can be solved quickly and efficiently. If you need more help, please contact us at Tech@fs.com.
Product Warranty Card

FS.COM ensures our customers that any damage or faulty items due to our workmanship, we will offer a free return within 30-Days from when you receive your goods. This excludes any custom made items or tailored solutions.

What this warranty covers?
This warranty is only available for the original buyer and is not transferable to a third-party.

- Within the first 30 Days of purchase, if for any reason you are not satisfied with your purchase (except custom made items or tailored solutions), simply return it for a refund or replacement.
- Within the first 1 Year of purchase, free repair or maintenance due to manufacturer’s defects (including shipping, handling and parts costs).
- Within 20 Years of purchase except for the first 1 year, repairs and maintenance will be charged.

What is NOT covered?
This warranty is non-transferable and does not cover if the product:

- Has been modified and/or altered, or an addition made thereto, except by FS.COM authorized representatives, or as approved by FS.COM in writing.
- Has been painted or physically modified in any way.
- Has been subjected to misuse, abuse, negligence, abnormal or physical stress, including accident.
- Has been damaged or impaired as a result of using third party firmware.
- Has no original FS.COM label, or miss any other original labels.

FS.COM sole and exclusive obligation and liability under the foregoing warranty shall be for FS.COM, at its discretion, to repair or replace any product that fails to conform to the above warranty during the warranty period. The expense of removal and reinstallation of any product is not included in this warranty. The warranty period of any repaired or replaced products shall not extend beyond its original warranty expiry.

Return Conditions
If you return for refund or replacement within 30 Days, please make sure that the product must be in new or like-new condition with its original trademark and SN number (the SN number is the unique identification number of every product), manual and accessories that were included when delivered to you. Return for replacement or repair is due to an error on our part (you received an incorrect or defective item, etc.), we will cover the shipping and repair cost and customs duty (for international purchase). Otherwise, you are responsible for these charges of returning or repairing items on your own.
FS.COM offers two channels to process your return request, if you purchase from FS.COM website, you may visit the website and log in to your FS “account “center to start a quick return. If you purchased by emails, you may contact your sales representative or visit our website fs.com to talk with customer service team and obtain an approved Return Materials Authorization (RMA) Number. Products returned without a RMA Number will not be processed and will be returned freight collect or subject to disposal. Information on how to start return can be found at https://www.fs.com/day_return_policy.html
Addresses, phone number and fax number also have been listed at www.fs.com. Please e-mail us at sales@fs.com or call us for assistance. All statements, technical information, and recommendations related to the products here are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. Please contact FS for more information.

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