# EDFA3220
# V100R018C10

# Product Description 01

| | |
|---|---|
| **Issue** | 04 |
| **Date** | 2019-03-15 |

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# Huawei Technologies Co., Ltd.

Address:     Huawei Industrial Base
             Bantian, Longgang
             Shenzhen 518129
             People's Republic of China

Website:     http://www.huawei.com

Email:       support@huawei.com

# About This Document

## Version

The following table lists the product version related to this document.

| Product Name | Version |
|---|---|
| EDFA3220(EDFA for short) | V100R018C10 |
| iManager U2000(U2000 for short) | V200R017C60 |

The EDFA can be classified into EDFA3220-D and EDFA3220-D2 based on the input PON signals. Their differences are as follows:

| Level-1 Name | Level-2 Name | Difference |
|---|---|---|
| EDFA3220 | EDFA3220-D | • Supports GPON signal input |
| | EDFA3220-D2 | • Supports GPON/ XGPON/ 10KM GE/ 10KM 10GE signal input |

**□ NOTE**

Unless otherwise specified, the EDFA described in this document indicates both EDFA3220-D and EDFA3220-D2.

## Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

| Issue | Date | Description |
|---|---|---|
| 04 | 2019-03-15 | Optimized some figures. |
| 03 | 2018-12-03 | The power type is added to the **Table 4-1**. |

| Issue | Date | Description |
|-------|------|-------------|
| 02 | 2018-07-02 | A NOTE which suggesting to use an external modulation optical transmitter is added in **Application Scenario**. |
| 01 | 2017-09-30 | This issue is the first official release. |

# Contents

# 1 Product Overview

## 1.1 Product Positioning

The EDFA is designed for multiple system operators (MSOs). It is an amplifying and multiplexing product that supports both the cable TV (CATV) and broadband services. Specifically, it amplifies a channel of CATV signals, divides the signals into 32 channels, multiplexes the 32 channels of CATV signals with 32 channels of PON signals, and transmits the multiplexed signals over the optical distribution network (ODN) to users' homes. The EDFA also supports line protection. It selects a better CATV input from 2 using the 1:2 optical switch.

### Application Scenario

The EDFA is applicable in the CATV+PON fiber to the building (FTTB) and fiber to the home (FTTH) scenarios. **Figure 1-1** shows the networking for CATV+PON FTTB and FTTH.

**Figure 1-1** Networking for CATV+PON FTTB and FTTH
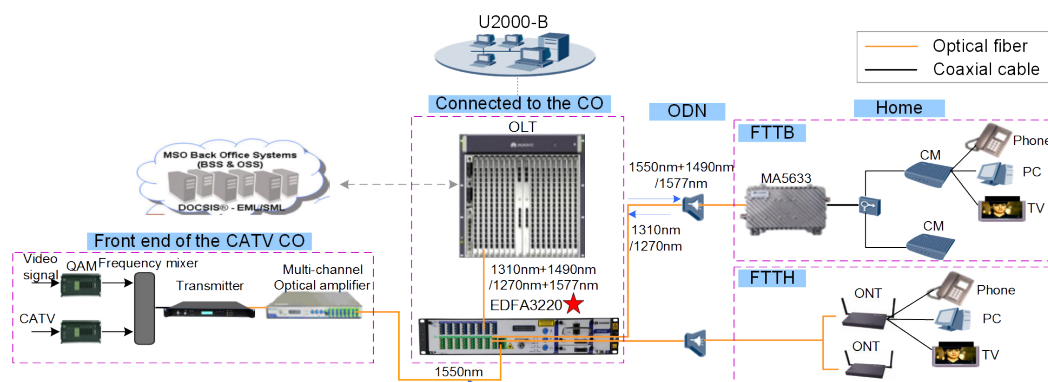


The CATV+PON FTTB and FTTH networking has the following advantages:

● Flexible provisioning of multiple services, including voice, IPTV, and private line services

● 100 M/1000 M to the desktop

● Single ONT supporting multiple services by employing the single-fiber triple-wavelength technology, minimizing investments

- Unified management for devices deployed networkwide

**NOTE**

The EDFA device is a high-power amplifier product. It has high requirements on the suppression capability of the Stimulated Brillouin Scattering (SBS) of the front-end optical transmitter (the SBS threshold cannot be less than 16 dBm). It is recommended that an external modulation optical transmitter with better SBS suppression capability be used.

# 1.2 Product Highlights

## Good adaptability

- Supports the installation in an indoor 19- or 21-inch cabinet (for example, Huawei N66B), or an outdoor cabinet with a heat exchanger (for example, Huawei S200).
- Supports remote management and control.

## Proper structure

- Modular design, front-access operation, convenient maintenance.
- High integration requiring minimum external fiber routing and low installation cost.

## High reliability

- With a carrier-class EDFA module, supporting a high operating temperature of 65°C.
- Good heat dissipation with air ventilated from the left to the right side of the device.

## High security

- Adapters slanted 60° on the left for eye protection.
- Dual power modules that support hot backup to ensure line security.

## Environment-friendly

- Complies with the European Union (EU) RoHS standards.

# 2 Functions and Features

This topic describes the main functions, function implementation, and some other features for the device. The features include the communication interfaces, configuration and management, alarm and event management.

## Main Functions and Function Implementation

1. Main functions:

   – Amplifies a channel of CATV signals, divides the signals into 32 channels, and multiplexes the 32 channels of CATV signals with 32 channels of PON signals. (Constant output power of CATV signals ≥ 19.5 dBm/1550 nm; default setting output power of CATV signals: 20.0 dBm/1550 nm; typical output power of CATV signals: 20.5 dBm/1550 nm; output power uniformity: -0.5 dB to 1 dB).

   – Supports line protection by selecting a better CATV input from 2 using the 1:2 optical switch.

2. Function implementation: (**Figure 2-1** and **Figure 2-2** respectively show the implementation principles of the EDFA3220-D and EDFA3220-D2.)

   – A single module is used to implement the functions of the 1:2 optical switch, amplifier, optical splitter, and optical multiplexer.

   – The 1:2 optical switch implements line protection at the input end as follows:

     ■ When the power of the active input port drops below the preset threshold, the 1:2 optical switch selects the standby input port.

     ■ When the power of the active input port rises above the preset threshold, the 1:2 optical switch selects the active input port.

     ■ When the power of both the active and standby input ports is below the preset threshold, the 1:2 optical switch selects the port with higher power.

     ■ When the 1:2 optical switch is faulty, CATV signals can pass through without bypassing the multiplexer.

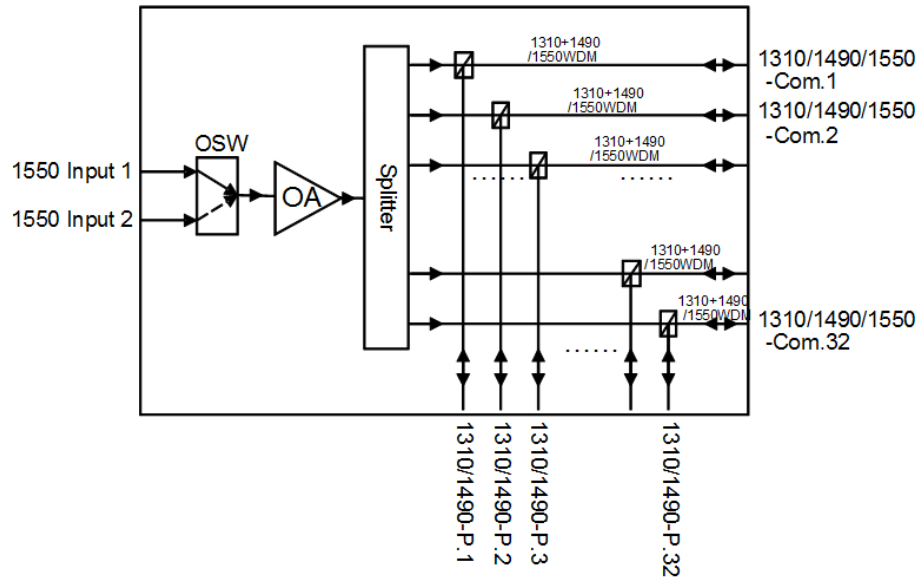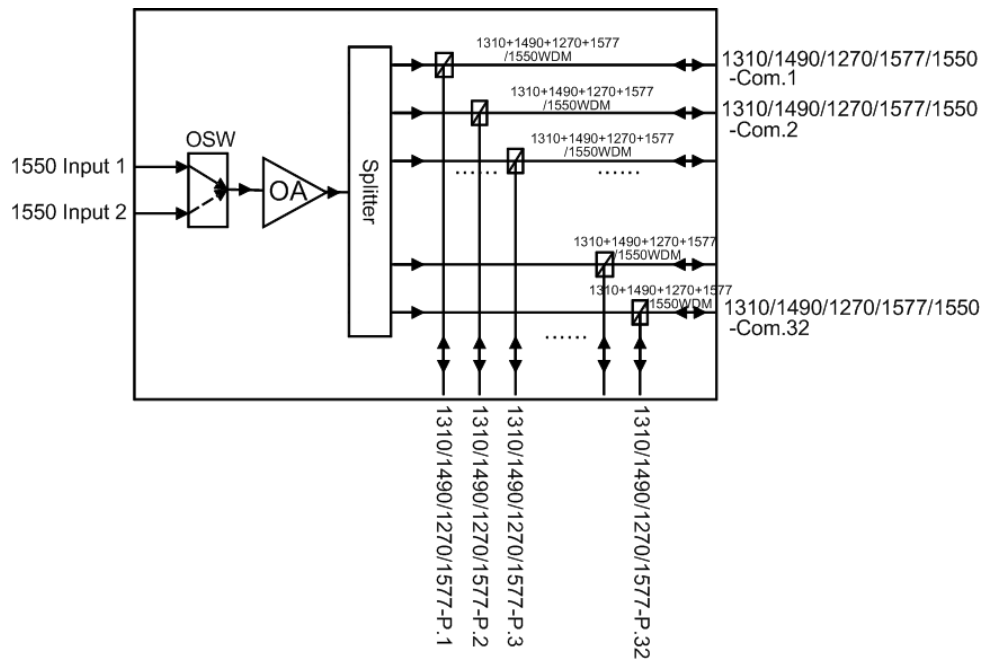**Figure 2-1** EDFA3220-D implementation principle



**Figure 2-2** EDFA3220-D2 implementation principle



## Communication Port

The device provides the COM serial port and Ethernet port, which are described in **Table 2-1**.

**Table 2-1** Description of communication ports

| Port Type | Description |
|---|---|
| COM serial port | <ul><li>The port is configured with a 9600 bps communication rate (default setting), 8 data bits, 1 stop bit, and 0 parity bit.</li><li>The port type is RJ-45.</li></ul> |
| Ethernet port | <ul><li>An Ethernet electrical port that supports 10M/100M autonegotiation is provided.</li><li>The port type is RJ-45, and each port has an indicator.</li><li>The port supports TCP/IP and SNMP.</li><li>All communication ports support basic authentication to prevent unauthorized connections.</li><li>An SNMP connection can be established between the port and the U2000 for device access.</li><li>A connection can be established between the port and the U2000 client for information obtaining and device control.</li><li>Telnet management is supported (disabled by default).</li></ul> |

## Configuration and Management

The optical line protection (OLP), EDFA input and output parameters, and PUMP parameters can be configured through the U2000 or CLI. The following table lists the configurable parameters.

**Table 2-2** List of configuration parameters

| Configurable Parameter | | Description |
|---|---|---|
| OLP Parameters | OLP Working Mode | Indicates the OLP working mode. **1** indicates **auto return**, **2** indicates **auto no return**, and **3** indicates **manual**. |
| | OLP Working Line | If the OLP working mode is **manual**, the OLP working line can be manually switched between IN1 and IN2 channels. |
| | Auto Return Time | Indicates the automatic OLP switchover time (the time required for the switching from IN2 channel to IN1 channel after the optical power of IN1 channel is recovered). |
| | R1 Power Threshold | Indicates the low input optical power alarm threshold for the CATV IN1 channel. When the input optical power of the CATV IN1 channel (active optical path) is lower than this threshold, this alarm is reported. |

| Configurable Parameter | | Description |
|---|---|---|
| | R2 Power Threshold | Indicates the low input optical power alarm threshold for the CATV IN2 channel. When the input optical power of the CATV IN2 channel (standby optical path) is lower than this threshold, this alarm is reported. |
| | R1 Power Switch Threshold | Indicates the input optical power OLP switchover threshold of the CATV IN1 channel. When the input optical power of the CATV IN1 channel is lower than this threshold, the system performs an automatic OLP switchover and switches to the CATV IN2 channel. |
| | R2 Power Switch Threshold | Indicates the input optical power OLP switchover threshold of the CATV IN2 channel. When the input optical power of the CATV IN2 channel is lower than this threshold, the system performs an automatic OLP switchover and switches to the CATV IN1 channel. |
| EDFA Parameters | APC Power | Indicates the output optical power of the EDFA. This parameter can be used to adjust the output optical power of the EDFA. |
| | Output Power Threshold | Indicates the low output optical power alarm threshold for the EDFA. When the output optical power of the EDFA is lower than this threshold, an **EDFA Output Power** alarm is reported. |
| | Input Power Threshold | Indicates the low input optical power alarm threshold for the EDFA. When the input optical power of the EDFA is lower than this threshold, an **EDFA Input Power** alarm is reported. |
| | InLos Power Threshold | Indicates the low input optical power PUMP shutdown threshold of the EDFA. When the input optical power of the EDFA is lower than this threshold, an **EDFA Input Los** alarm is reported. |
| PUMP Parameters | Pump01 Current Threshold | Indicates the operating current alarm threshold for PUMP01. When the operating current of PUMP01 is higher than this threshold, an **EDFA Pump1** alarm is reported. |
| | Pump01 Temperature Threshold | Indicates the operating temperature alarm threshold for PUMP01. When the operating temperature of PUMP01 is higher than this threshold, an **EDFA Pump1** alarm is reported. |
| | Pump02 Current Threshold | Indicates the operating current alarm threshold for PUMP02. When the operating current of PUMP02 is higher than this threshold, an **EDFA Pump2** alarm is reported. |

| Configurable Parameter | | Description |
|---|---|---|
| | Pump02 Temperature Threshold | Indicates the operating temperature alarm threshold for PUMP02. When the operating temperature of PUMP02 is higher than this threshold, an **EDFA Pump2** alarm is reported. |
| | Pump03 Current Threshold | Indicates the operating current alarm threshold for PUMP03. When the operating current of PUMP03 is higher than this threshold, an **EDFA Pump3** alarm is reported. |
| | Pump03 Temperature Threshold | Indicates the operating temperature alarm threshold for PUMP03. When the operating temperature of PUMP03 is higher than this threshold, an **EDFA Pump3** alarm is reported. |

## Alarm and Event Management

1. The device provides an alarm management application programming interface (API) to monitor the device status.

2. The device supports proactive alarm reporting.

3. The device supports the following alarms and events:

   a. Power failure

   b. Fan failure

   c. Abnormal hardware status

   d. Software exception

   e. Failure that affects tests

# 3 Product Structure

## 3.1 Overview

The EDFA includes 4 modules: control module, fan module, power module, and service module, **Figure 3-1** and **Figure 3-2** respectively show the structures of EDFA3220-D and EDFA3220-D2.
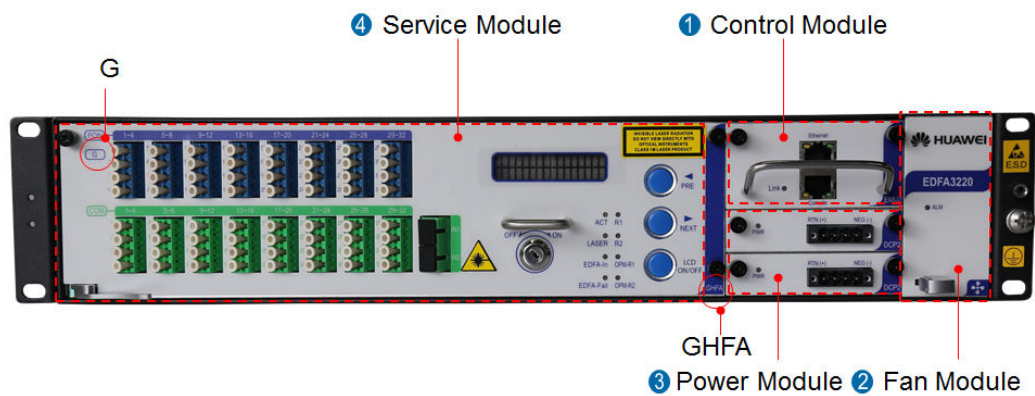
**Figure 3-1** EDFA3220-D structure



**Figure 3-2** EDFA3220-D2 structure

# 3.2 Control Module

The control module manages all the internal communications of the device, detects the availability status of the sub-modules, and obtains the operating status of the entire device. iManager U2000 can send configuration commands through the control module to the sub-modules for remote management.
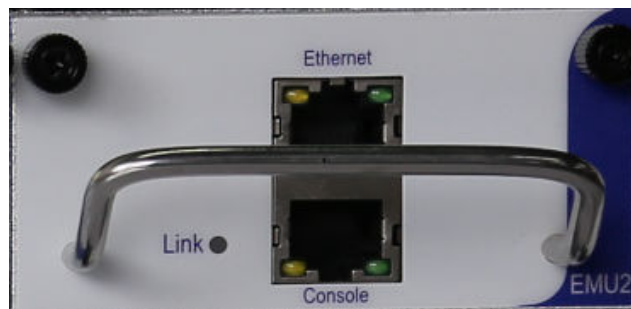
**Figure 3-3** Control Module



**Table 3-1** describe the control module ports.

**Table 3-1** Description of the RJ-45 ports

| Port | Description |
|------|-------------|
| Ethernet | It is a 10 M/100 M autonegotiation Ethernet interface used for remote device management. |
| Console | It is a serial port. |

The **Link** indicator (control module indicator) is used to indicate whether a service module works properly. If a service module is inserted into the EDFA, the **Link** indicator indicates whether this service module is available and normally communicates with the control module. **Table 3-2** introduces the working states of the **Link** indicator.
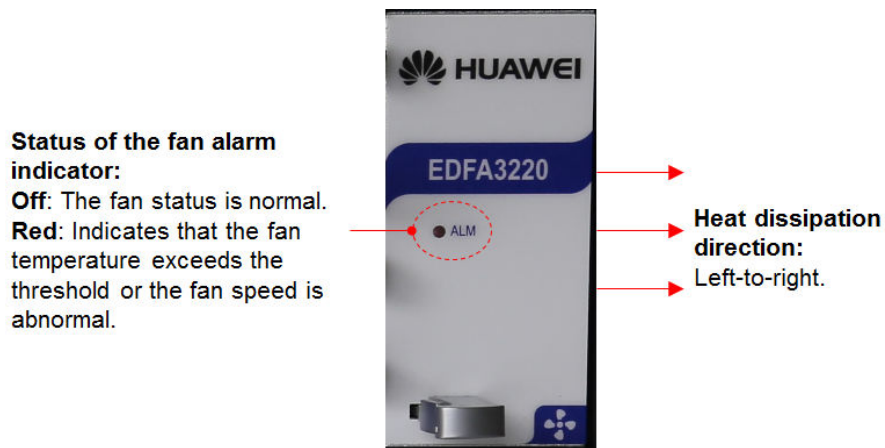
**Table 3-2 Link** indicator states and descriptions

| Status | Description |
|--------|-------------|
| Steady on | A service module is properly inserted. |
| Off | No service module is inserted. |

# 3.3 Fan Module

**Figure 3-4** shows the fan module.

**Figure 3-4** Fan module



## 3.4 Power Module

The device supports two independent -48 V DC power modules that can run in hot standby mode. Each power module supports a maximum load of 240 W.
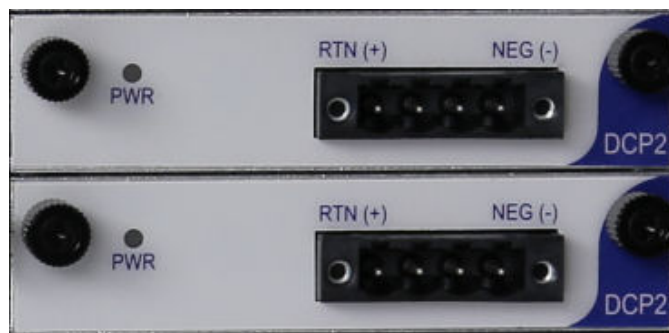
**Figure 3-5** Power Module



Table 3-3 describes the components of the power module.

**Table 3-3** Components of the power module

| Component | Description |
|---|---|
| Power port | The leftmost pin of the power port connects to voltage 0 V, the rightmost pin connects to voltage -48 V, and the two pins in the middle are suspended. |
| PWR indicator | The indicator status is defined as follows:<br>● Steady green: The power module works normally.<br>● Off: The power module is not turned on or is faulty. |

# 3.5 Service Module

The service module includes optical ports, indicators, buttons, and a screen, which are described in the following figures and tables.
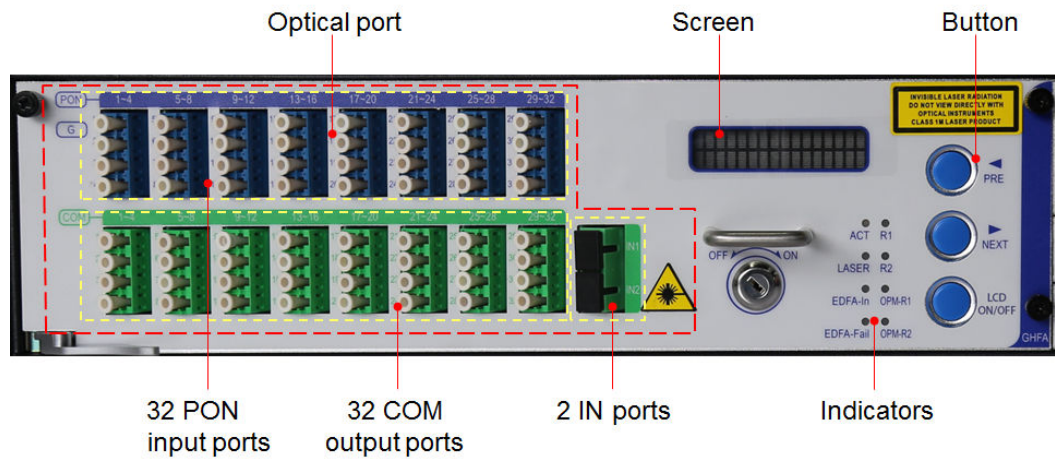
**Figure 3-6** Service module
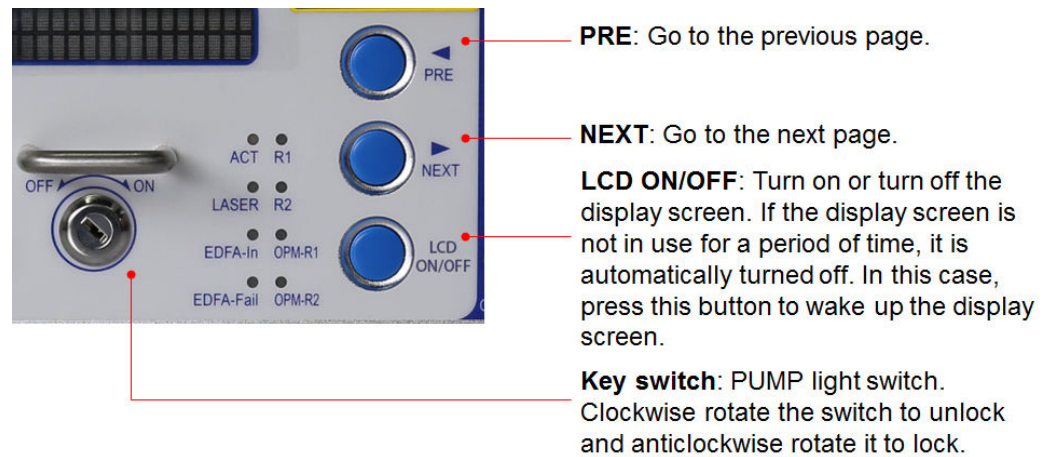


**Table 3-4** Description of optical ports

| Port | Description | Connector Type |
|------|-------------|----------------|
| PON | It leads in PON signals. | LC/UPC |
| COM | It leads out optical signals. | LC/APC |
| IN1/IN2 | It leads in CATV signals. | SC/APC |

**Table 3-5** Description of indicator status

| Indicator | Description |
|-----------|-------------|
| ACT | ● Blinking green: The device runs normally.<br>● Other status: The device is not properly powered on or the hardware is faulty. |
| LASER | ● Green: The PUMP of the EDFA module is turned on.<br>● Off: The PUMP of the EDFA module is turned off or the hardware is faulty. |
| R1 | ● Green: While the optical switch is turned to the channel IN1, R1 shows green.<br>● Off: Channel IN1 is not turned on. |

| Indicator | Description |
|-----------|-------------|
| R2 | ● Green: While the optical switch is turned to the channel IN2, R2 shows green.<br>● Off: Channel IN2 is not turned on. |
| OPM-R1 | ● Off: Optical power of channel 1 more than set threshold.<br>● Red: The device receives no CATV signals; the input optical power of the IN1 channel of the EDFA is lower than the OLP input optical power threshold; the fiber patch cord is not correctly connected to the IN1 port of the EDFA; the optical signal wavelength is beyond the operating wavelength range of the device; the fiber patch cord connector or the input port of the EDFA is not clean; hardware is faulty. |
| OPM-R2 | ● Off: Optical power of channel 2 more than set threshold.<br>● Red: The device receives no CATV signals; the input optical power of the IN2 channel of the EDFA is lower than the OLP input optical power threshold; the fiber patch cord is not correctly connected to the IN2 port of the EDFA; the optical signal wavelength is beyond the operating wavelength range of the device; the fiber patch cord connector or the input port of the EDFA is not clean; hardware is faulty. |
| EDFA-In | ● Off: External input optical power more than threshold.<br>● Red: The device receives no CATV signals; the input optical power of the EDFA is lower than the OLP input optical power threshold; the fiber patch cord is not correctly connected to the EDFA; the optical signal wavelength is beyond the operating wavelength range of the device; the fiber patch cord connector or the input port of the EDFA is not clean; hardware is faulty. |
| EDFA-Fail | ● Off: EDFA module is normal.<br>● Red: The output optical power of the EDFA is lower than the threshold for the output optical power; the temperature of the EDFA exceeds the upper limit; the PUMP current of the EDFA exceeds the upper limit; hardware is faulty. |

**Figure 3-7** Description of buttons



PRE: Go to the previous page.

NEXT: Go to the next page.

LCD ON/OFF: Turn on or turn off the display screen. If the display screen is not in use for a period of time, it is automatically turned off. In this case, press this button to wake up the display screen.

Key switch: PUMP light switch. Clockwise rotate the switch to unlock and anticlockwise rotate it to lock.
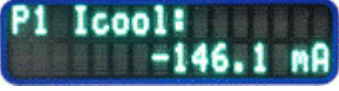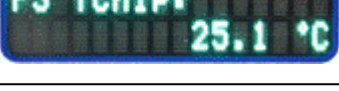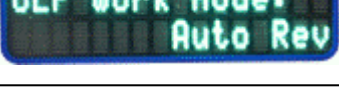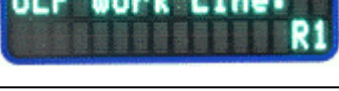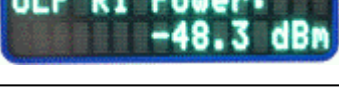
⚠ CAUTION

When you turn on the PUMP laser lock, do not look into the COM ports without eye protection. Otherwise, the laser will injure your eyes.

**Table 3-6** Description of screen displays

| No. | Display | Description | Display Picture |
|---|---|---|---|
| 1 | Device Type | Device type | Device Type: EDFA3220-D2 |
| 2 | SN | Product serial number | SN: 2150 1902673KH8000012 |
| 3 | Case Temp | EDFA case temperature | Case Temp: 27.7 °C |
| 4 | Work Mode | EDFA work mode | Work Mode: APC |
| 5 | Input Power | The current input power of EDFA. | Input Power: -28.3 dBm |
| 6 | Input LowTh | The input optical power alarm threshold for EDFA | Input LowTh: -5.0 dBm |
| 7 | Input LosTh | The output optical power alarm threshold for EDFA | Input LosTh: -10.0 dBm |

| No. | Display | Description | Display Picture |
|---|---|---|---|
| 8 | Output Power | The current output optical power of EDFA. | Output Power: -70.0 dBm |
| 9 | Output Th | The output optical power alarm threshold for the EDFA | Output Th: 19.0 dBm |
| 10 | APC Power | You can set the output optical power of EDFA through the APC Power. | APC Power: 20.0 dBm |
| 11 | P1 Iop | Operating current of PUMP 1 | P1 Iop: 0 mA |
| 12 | P1 Icool | Cooling current of PUMP 1 | P1 Icool: -146.1 mA |
| 13 | P1 TChip | Temperature of PUMP 1 | P1 TChip: 25.3 °C |
| 14 | P2 Iop | Operating current of PUMP 1 | P2 Iop: 0 mA |
| 15 | P2 TChip | Temperature of PUMP 2 | P2 TChip: 25.9 °C |
| 16 | P3 Iop | Operating current of PUMP 3 | P3 Iop: 0 mA |
| 17 | P3 TChip | Temperature of PUMP 3 | P3 TChip: 25.1 °C |
| 18 | OLP Work Mode | Optical switch work mode | OLP Work Mode: Auto Rev |
| 19 | OLP Work Line | Optical switch work line | OLP Work Line: R1 |
| 20 | OLP R1 Power | IN1 input power | OLP R1 Power: -48.3 dBm |
| 21 | OLP R1 PowerTh | Low IN1 input power alarming threshold | OLP R1 PowerTh: -3.0 dBm |

| No. | Display | Description | Display Picture |
|---|---|---|---|
| 22 | OLP R1 SwitchTh | Low IN1 input power switch threshold | OLP R1 SwitchTh: -5.0 dBm |
| 23 | OLP R2 Power | IN2 input power | OLP R2 Power: -49.1 dBm |
| 24 | OLP R2 PowerTh | Low IN2 input power alarming threshold | OLP R2 PowerTh: -3.0 dBm |
| 25 | OLP R2 SwitchTh | Low IN2 input power switch threshold | OLP R2 SwitchTh: -5.0 dBm |
| 26 | OLP Return Time | Time required for the switching from IN2 channel to IN1 channel after the optical power of IN1 channel is recovered. | OLP Return Time: 10 s |
| 27 | IP Address | IP Address | Ip Address: 192.168.3.100 |
| 28 | Netmask | Netmask | Netmask: 255.255.0.0 |
| 29 | Gateway | Gateway | Gateway: 192.168.3.1 |

# 4 Technical Specifications

This topic describes the device specifications, environmental specifications, performance specifications, safety standards compliance, and electromagnetic compatibility (EMC) standards compliance of the EDFA.

## Device Specifications

Table 4-1 Device specifications

| Item | Specification |
|------|---------------|
| Dimensions (H x W x D; unit: mm) | 88.1 x 442 x 240 |
| Weight | 8 kg |
| Number of signal input ports | CATV: 2<br>PON: 32 |
| Number of signal output ports | 32 |
| Port connector type | IN1/IN2: SC/APC<br>PON: LC/UPC<br>COM: LC/APC |
| DC power voltage | Dual -48 V DC power supplies;<br>Voltage range: -38.4 V to -72 V DC |
| Rated input current | < 5 A |
| Maximum power consumption | 120 W |
| Flame-retardant rating | UL94V-0 |
| RoHS | Compliant with European Union (EU) RoHS standards |

## Performance Specifications

**Table 4-2** Performance specifications

| Specifications | | Value |
|---|---|---|
| Entire equipment | Wavelength of CATV | 1540 nm to 1565 nm |
| | Input power cover range of CATV | -10 dBm@1550 nm to +10 dBm@1550 nm |
| | Constant output power control with output powers of CATV | ≥ 19.5 dBm@1550 nm (typical output power: 20.5 dBm@1550 nm) |
| | Wavelength of PON | 1. EDFA3220-D: GPON(1290nm to 1330nm& 1480nm to 1500nm)<br>2. EDFA3220-D2:<br>GPON (1290nm to 1330nm& 1480nm to 1500nm);<br>XG(S)-PON(1260nm to 1280nm& 1575nm to 1581nm);<br>10KM GE(1260nm to 1360nm& 1480nm to 1500nm);<br>10KM 10GE(1320nm to 1340nm& 1260nm to 1280nm) |
| | Insertion loss | PON to COM: ≤ 1.0 dB |
| | Return loss | PON ports: ≥45dB<br>CATV/COM ports: ≥50dB |
| | Output power uniformity (among output ports) | -0.5 dB to 1 dB |
| | Polarization-dependent gain | ≤ 0.5 dB |
| | Noise figure | ≤ 6 dB@1 dBm (CATV input) |
| | Output stability | ≤ 1 dB |
| | Life time | ≥ 10 years |
| Optical switch | Insertion loss | ≤1dB |
| | Switching time | 0.5 second |
| Signal multiplexing specifications | Pass band | 1550 & 1577 nm |
| | Reflection band | 1310 &1490 nm |
| | Insertion loss | Pass band : 0.9 dB<br>Reflection band : 0.6 dB |
| | Polarization dependent loss | ≤0.20 dB |
| | Polarization mode dispersion | ≤0.20 ps |

| Specifications | | Value |
|---|---|---|
| | Isolation Pass | Pass band @1540 nm to 1565 nm: ≥ 30dB |
| | | Reflection band @1260 nm to 1360 nm & 1480 nm to 1500 nm & 1575 nm to 1581 nm: ≥ 15dB |

## Environmental Specifications

**Table 4-3** Environmental Specifications

| Item | | Storage Environment | Operating Environment |
|---|---|---|---|
| Standards compliance | | ETSI EN 300 019-2-1 | ETSI EN 300 019-2-4 |
| Climate | Atmospheric pressure | 70 kPa to 106 kPa | - |
| | Temperature | -40°C to +70°C | -5°C to +65°C |
| | Temperature change rate | ≤1 °C/min | ≤0.5°C/min |
| | Relative humidity | 5%RH to 95%RH | 5%RH to 95%RH |
| | Solar radiation | ≤ 1120 W/m² | - |
| | Heat radiation | ≤600 W/m² | - |
| | Altitude | - | ≤ 4000 m |
| | Wind speed | - | ≤ 5 m/s |
| **NOTE** | | | |
| ● The temperature and humidity are measured 1.5 m above the floor and 0.4 m from the front of the device. <br> ● This product's operating temperature is -5°C to 65°C. The outdoor installation needs to use the heat exchanger cabinets, such as Huawei S200. <br> ● The air density varies with the altitude, which affects the heat dissipation capability of devices. Therefore, the operating temperature of the device changes with the altitude. | | | |

| Item | Storage Environment | Operating Environment |
|---|---|---|
| Water resistance requirements | ● When the device is stored on a customer site, it is stored indoors whenever possible.<br>● No water remains on the floor or wets the device package.<br>● The device is away from places where water leakage is possible, such as the places near the automatic fire-fighting facilities and heating facilities.<br>● If the device has to be stored outdoors, ensure that the following conditions are satisfied:<br>  – The package is intact.<br>  – Required rainproof measures are provided to prevent water from entering the package.<br>  – No water remains on the storage ground or wets the device package.<br>  – The package is not exposed to sunlight. | - |
| Biological environment requirements | ● No fungus or mildew grows in the operating environment.<br>● The operating environment is free from rodents, such as mice. | |
| Air cleanness requirements | ● The air is free of explosive, conductive, magnetic conductive, or corrosive dust.<br>● The density of mechanically active substances in the air complies with the requirements defined in **Table 4-4**<br>The density of chemically active materials in the air complies with the requirements defined in **Table 4-5**. | |
| Mechanical stress requirements | The mechanical stress complies with the requirements defined in **Table 4-6**. | The mechanical stress complies with the requirements defined in **Table 4-7**. |

**Table 4-4** Requirements on density of mechanically active substances in the air

| Mechanically Active Substance | Required Density in the Storage Environment | Required Density in the Operating Environment |
|---|---|---|
| Suspended dust | ≤ 5.00 mg/m$^3$ | ≤ 0.40 mg/m$^3$ |

| Mechanically Active Substance | Required Density in the Storage Environment | Required Density in the Operating Environment |
|---|---|---|
| Deposited dust | $\leq 20.0$ mg/(m$^2$ h) | $\leq 15.0$ mg/(m$^2$ h) |
| Sand | $\leq 300$ mg/m$^3$ | $\leq 300$ mg/m$^3$ |

**Table 4-5** Requirements on density of chemically active substances in the air

| Chemically Active Substance | Required Density in the Storage/ Operating Environment |
|---|---|
| $SO_2$ | $\leq 0.30$ mg/m$^3$ |
| $H_2S$ | $\leq 0.10$ mg/m$^3$ |
| $NO_2$ | $\leq 0.50$ mg/m$^3$ |
| $NH_3$ | $\leq 1.00$ mg/m$^3$ |
| $Cl_2$ | $\leq 0.10$ mg/m$^3$ |
| HCl | $\leq 0.10$ mg/m$^3$ |
| HF | $\leq 0.01$ mg/m$^3$ |
| $O_3$ | $\leq 0.05$ mg/m$^3$ |

**Table 4-6** Mechanical stress requirements in the storage environment

| Item | Subitem | Specifications (ETSI EN 300 019-1-1) | | |
|---|---|---|---|---|
| Random vibration | Frequency range | 5 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz |
| | Acceleration spectral density (ASD) | - | 0.02 m$^2$/s$^3$ | - |
| | dB/oct | +12 | - | -12 |

**Table 4-7** Mechanical stress requirements in the operating environment

| Item | Subitem | Specifications (ETSI EN 300 019-1-1) | | |
|---|---|---|---|---|
| Random vibration | Frequency range | 5 Hz to 10 Hz | 10 Hz to 50 Hz | 50 Hz to 100 Hz |
| | ASD | - | 0.02 m$^2$/s$^3$ | - |
| | dB/oct | +5 | - | -5 |

| Item | Subitem | Specifications (ETSI EN 300 019-1-1) |
|---|---|---|
| Shock test | Shock response spectrum II | Half sine wave 150 m/s$^2$ when an 11-ms shock test that includes 18 shocks and covers 6 directions (3 shocks per direction) |

## Safety Standards Compliance

This product complies with IEC/EN60950-1 and IEC/EN60825-1.

## EMC Standards

Table 4-8 Mechanical stress requirements in the storage environment

| Item | Standards Compliance |
|---|---|
| Overall radiated emission (RE) | EN55032/EN50083-2 |
| Port electrostatic discharge (ESD) | IEC61000-4-2/EN50083-2 |
| ESD of the signal port | IEC61000-4-2 |
| Overall radiated susceptibility (RS) | IEC61000-4-3/EN50083-2 |
| Conducted emission (CE) of the DC power port | EN55032 |
| Electrical fast transient/burst (EFT/B) of the DC power port | IEC61000-4-4 |
| Surge of the DC power port | IEC61000-4-5 |
| Conducted susceptibility (CS) of the DC power port | IEC61000-4-6 |
| DIP of the DC power port | IEC61000-4-29 |
| DC power port | ETSI EN300 132-2 |
| EFT/B of the signal port | IEC61000-4-4 |
| Surge of the signal port | IEC61000-4-5 |
| CS of the signal port | IEC61000-4-6 |

# 5 iManager U2000

This section describes the software that manages the EDFA, iManager U2000 network management system (NMS) (U2000 for short).

The U2000 provides powerful management functions at the NE layer and network layer. It is the major network management product and solution of Huawei.

The EDFA can be managed and configured through the U2000. It supports alarm query and other functions, as shown in the following figure. For detailed functions, see *EDFA3220 V100R018C10 Software Operation and Configuration Guide 02*.
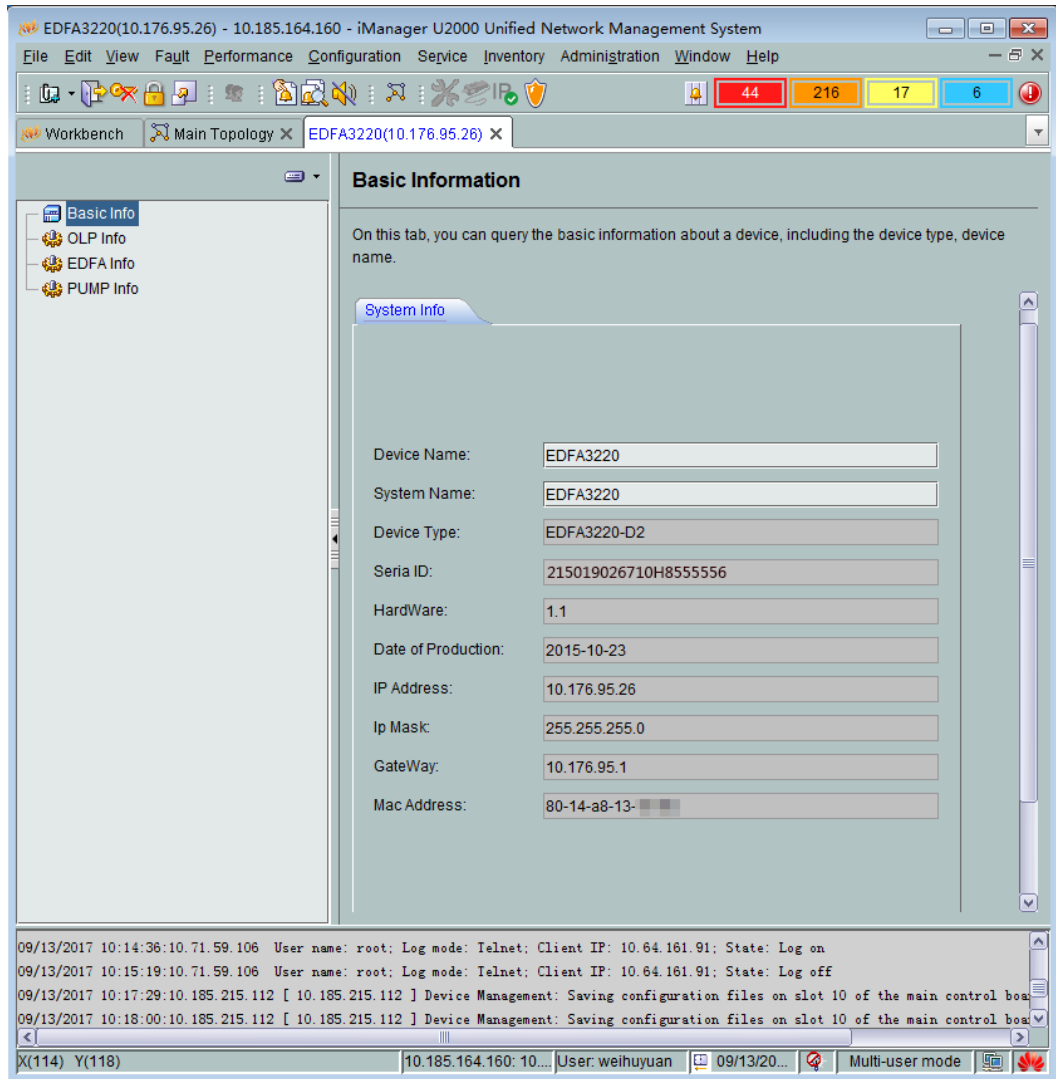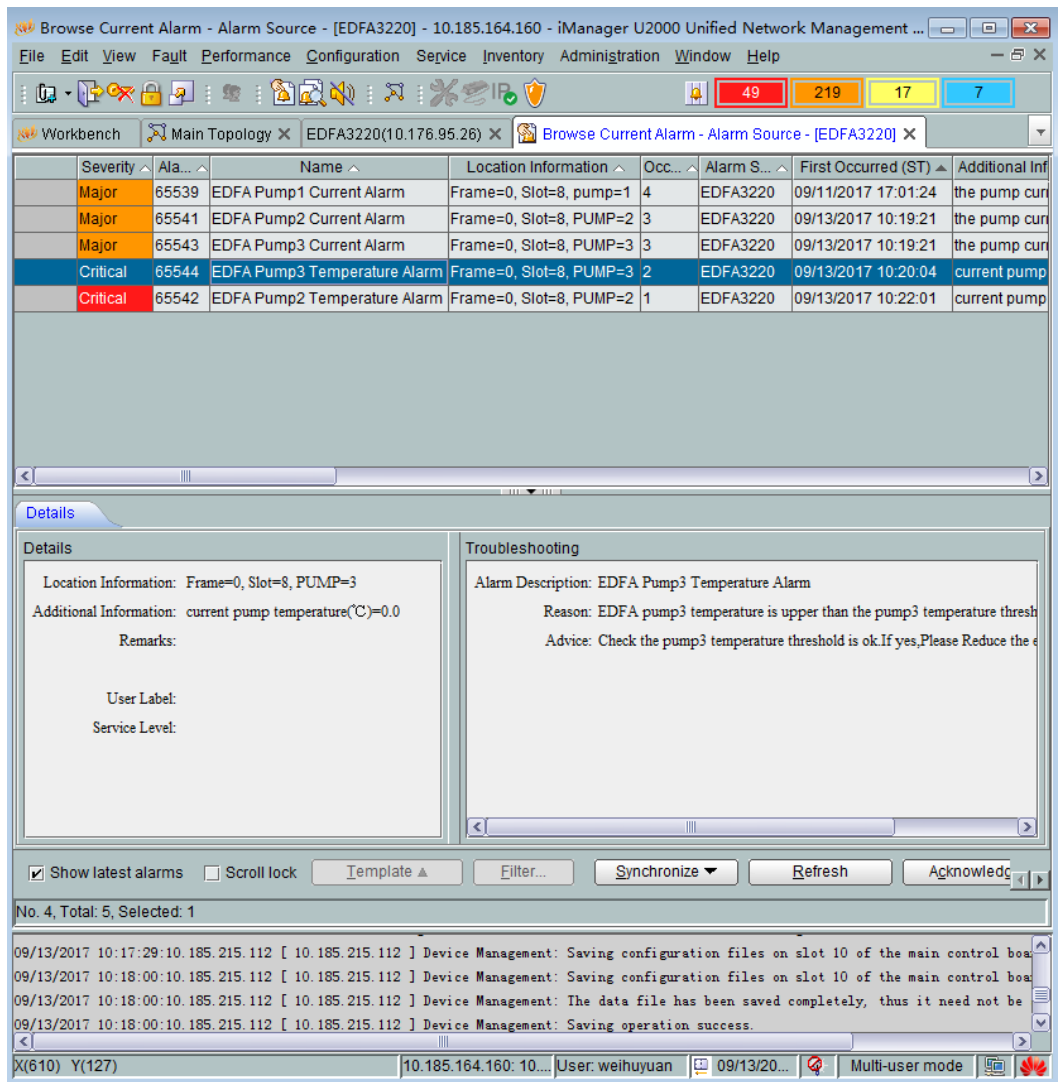
**Figure 5-1** Device management interface
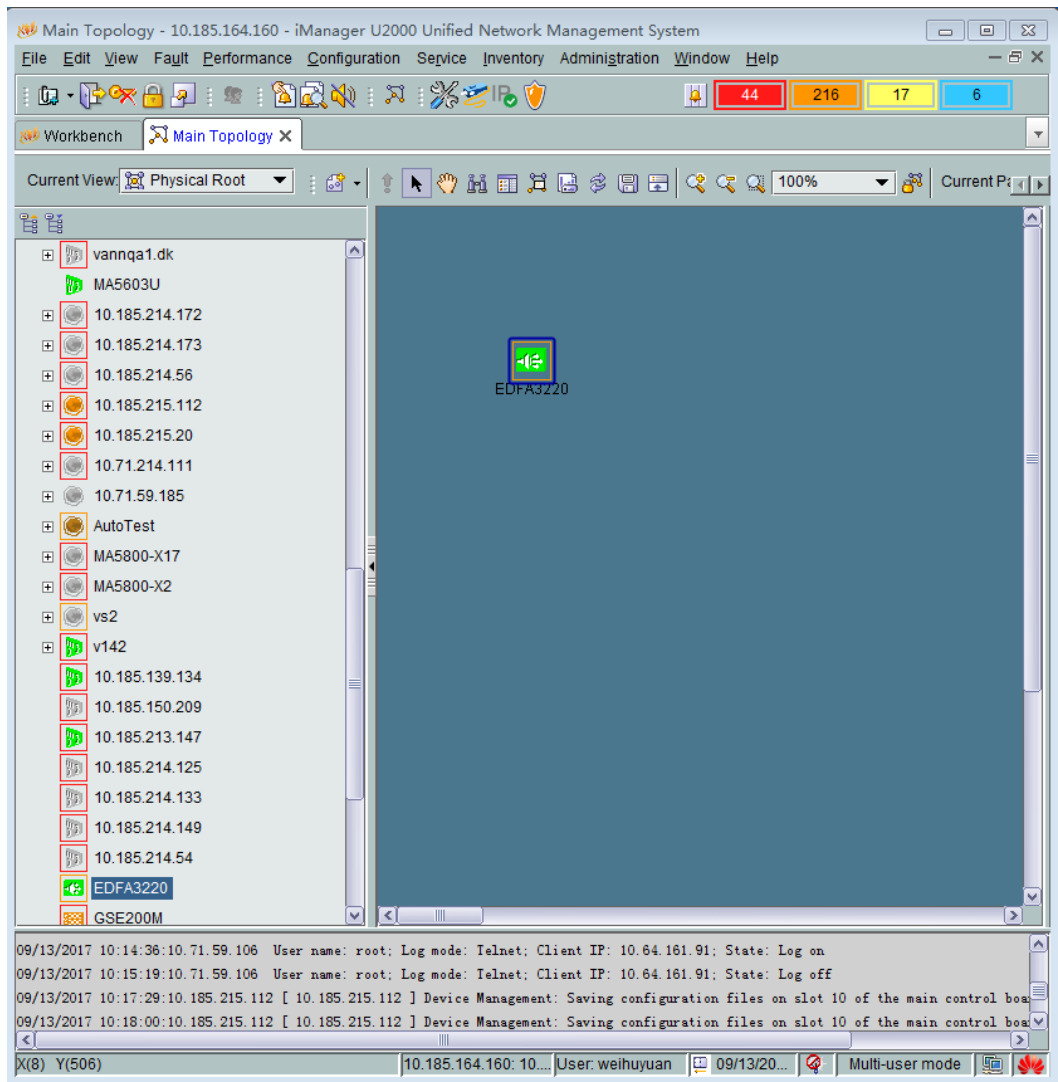
**Figure 5-2** Alarm query interface

# A Acronyms and Abbreviations

This topic describes acronyms or abbreviations and their full names.

| Acronym / Abbreviation | Full Name |
|---|---|
| API | Application Programming Interface |
| CATV | Cable TeleVision |
| CM | Cable Modem |
| CO | Central Office |
| DC | Direct Current |
| EDFA | Erbium-doped Optical Fiber Amplifier |
| EMC | ElectroMagnetic Compatibility |
| EMU | Environment Monitoring Unit |
| FTTB | Fiber To The Building |
| FTTH | Fiber To The Home |
| GPON | Gigabit-capable Passive Optical Network |
| IPTV | Internet Protocol TeleVision |
| MSO | Multiple System Operator |
| OA | Optical Amplifier |
| ODN | Optical Distribution Network |
| ONT | Optical Network Terminal |
| OSW | Optical Switch |
| PON | Passive Optical Network |
| PWR | Power Cable |
| QAM | Quadrature Amplitude Modulation |

| Acronym / Abbreviation | Full Name |
|---|---|
| SNMP | Simple Network Management Protocol |
| TCP/IP | Transmission Control Protocol/Internet Protocol |
| WDM | Wavelength Division Multiplexing |