PREVAIL

Product manual

Outdoor Optical Amplifier

Table of Contents

1. Overview

1.1 About This Manual

This instruction manual is a complete guide for installing and operating the outdoor optical amplifier Outdoor. Please read the entire manual before you begin with the installation.
This manual applies to optical amplifier model Outdoor.

• Chapter 1 gives general information about the Outdoor.
• Chapter 2 describes the internal panel interface.
• Chapter 3 describes the installation procedure.
• Chapter 4 tells you how to connect to a network management system.
• Chapter 5 describes maintenance and what to do in the event of problems.
• Appendix A provides complete technical specifications.

1.2 Product Description

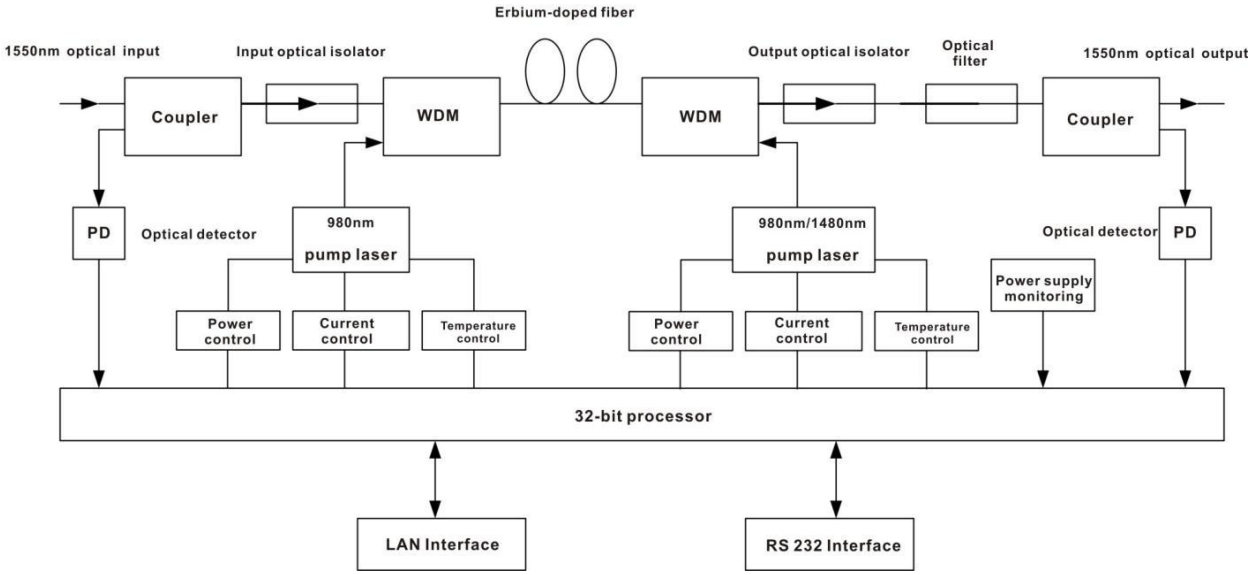
The Outdoor Optical Amplifiers are erbium-doped fiber amplifier (EDFA) modules. They deliver:

- Long time continuous work under outdoor and bad environmental condition, because of the large aluminum waterproof housing.
- High reliability switching power supply.
- Embedded SNMP agent (v1, v2c,).

1.3 Product Applications

Outdoor series of optical amplifiers is part of braun teleCom's product line. This product line is designed to meet the economic and technical requirements of broadband service providers.
Typical applications include:
• Medium-haul and long-haul applications beyond the reach of 1310 nm transmitters
• Fiber dense architectures
• Redundant rings
• Broadcast layer transmission
• Hub interconnects

1.4 Block Diagram



2. Internal Structure

This chapter describes the Outdoor internal structure. You can use the internal panel to monitor and control the operation of the Outdoor.

The internal panel of braun teleCom products allows you to:
• Enter numeric variables directly
• Scroll through and toggle variables
• Perform critical functions with a single keystroke
• View alarm and status information

2.1 Internal Structure Features

Figure 2-1 shows the Outdoor internal structure.

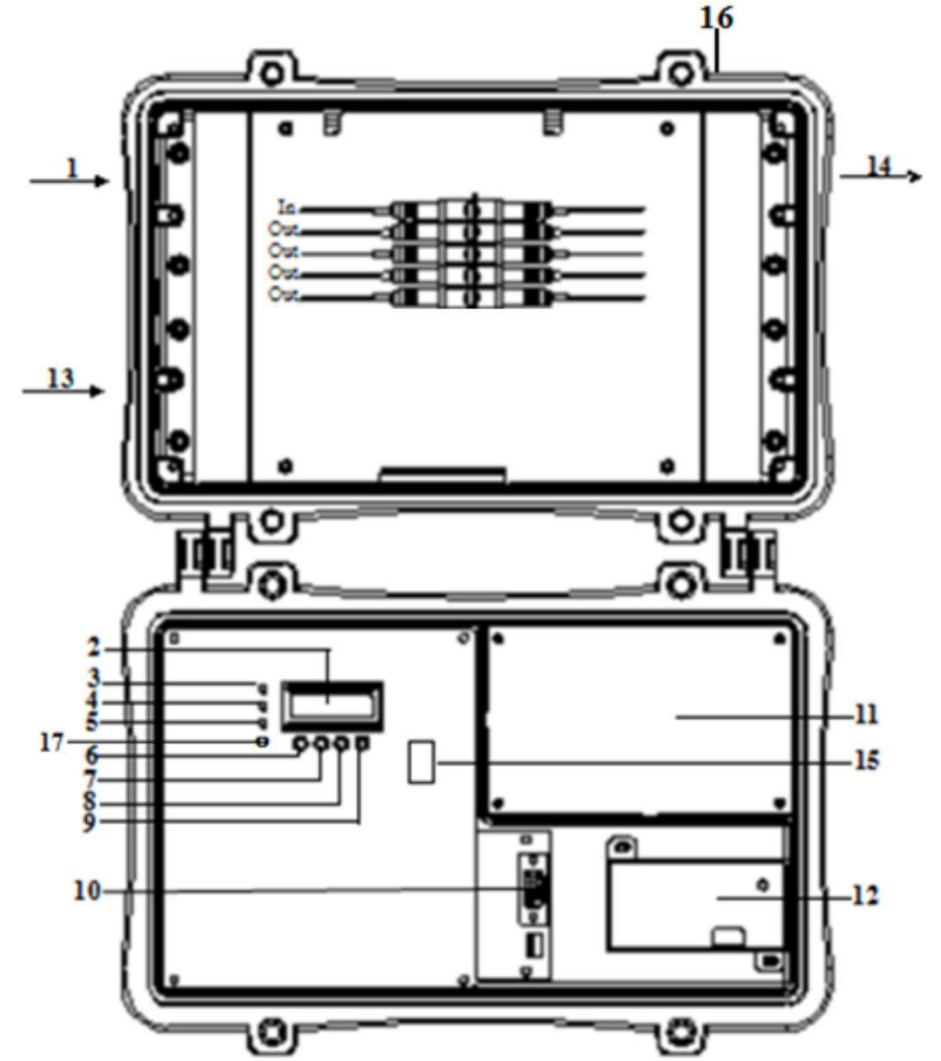


Figure 2-1 Outdoor internal structure.

1. Optical fiber input	2. Display screen	3. Power indicator	4. Input indicator
5. Output indicator	6. ESC button	7. Page down button	8. Page up button
9. Enter button	10. RS232 interface	11. Power supply	12. Transponder（optional）
13. Ethernet input	14. Optical fiber output	15. Access port of the optional transponder	16. Ground stud
17. Pump working indicator			

2.1.1 Panel LEDs

There are four LEDs on the internal panel:

1) Power indicator: Solid green indicates normal working, off indicates alarm.

2) Optical input power indicator: Green in the threshold range, otherwise red.

3) Optical output power indicator: Off when there is no optical input signal. Green when the input optical signal is normal and the optical output power is larger than +10dBm. Otherwise red.

4) Pump working status indicator: Off in case of optical input signal alarm. Green when the optical input signal and the pump laser temperature are in normal state. Otherwise red.

2.1.2 Function Keys

The function keys let you perform the following:

1) Exit or cancel key of the setup menu.

2) Up or increase key of the setup menu.

3) Down or decrease key of the setup menu.

4) Enter key of the setup menu.

2.2 The Menu System

Outdoor menu system has three choices at the top level:

• Display Parameters

• Set Parameters

• Alarms Status

The Display Parameters and Alarms Status menus provide read-only information. You make adjustments to the Outdoor through the Set Parameters menu. The Figure 2-3 shows the first menu level.

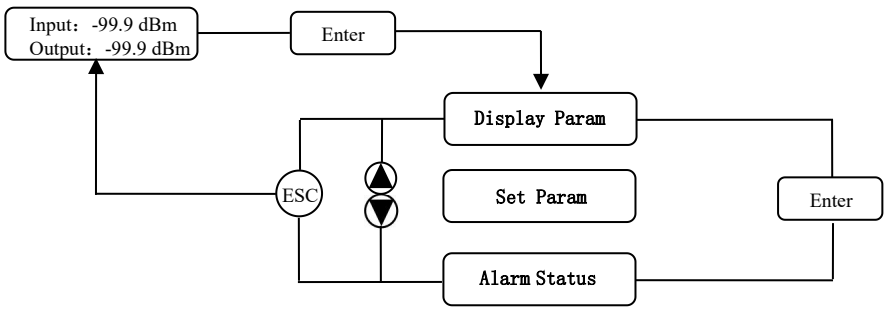


Figure 2-3. Outdoor first menu level

2.2.1 Display Parameters Menu

The Status menu provides basic information about the Outdoor. Figure 2-4 shows the information presented from the Display Parameters menu.

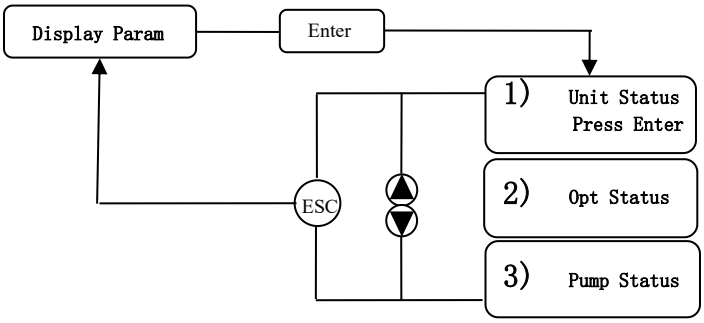


Figure 2-4. Outdoor Display Parameters menu

2.2.2 Set Parameters Menu

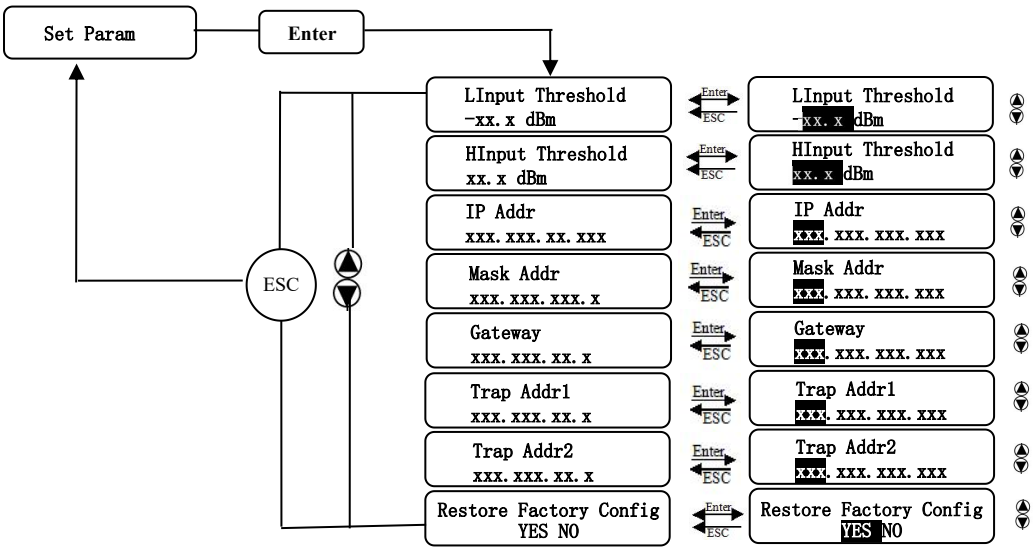


Figure 2-5. Outdoor Set Parameters menu

2.2.3 Set Parameters Options

Table 2-1 describes the adjustment options for the Outdoor.

Table 2-1: Outdoor Adjustment Options

Option	Description
Set LInput Threshold	Set optical input power low alarm threshold
Set HInput Threshold	Set optical input power high alarm threshold
Set IP Addr	Set local IP address
Set Mask Addr	Set subnet mask
Set Gateway	Set gateway
Set Trap Addr1	Set trap address 1
Set Trap Addr2	Set trap address 2
Restore Factory Config	Restore factory configuration

2.2.4 Alarm Status Menu

The Status LED indicates when the Outdoor has active alarms. You can check the alarms through the Outdoor Alarms menu. Figure 2-6 shows all the possible alarms.

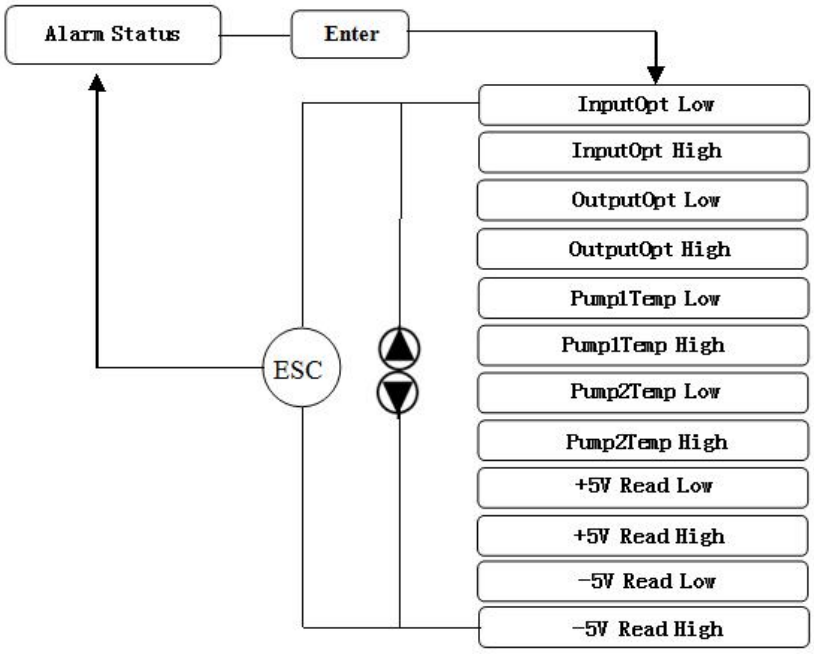


Figure 2-6. Outdoor Alarms menu

Option	Description
InputOpt Low	Optical input power low
InputOpt High	Optical input power high
OutputOpt Low	Optical output power low
OutputOpt High	Optical output power high
Pump1Temp Low	Pump 1 temperature low

Pump1Temp High	Pump 1 temperature high
Pump2Temp Low	Pump 2 temperature low
Pump2Temp High	Pump 2 temperature high
+5V Read Low	+5V read low
+5V Read High	+5V read high
-5V Read Low	-5V read low
-5V Read High	-5V read high

3. Installing the Outdoor

This chapter provides information on installing and setting up the Outdoor Optical Amplifier. Please read all the instructions before beginning installation.

This chapter describes:

• How to receive and inspect the Outdoor
• Cable requirements
• Cable connections
• Precautions
• How to mount and power the unit
• How to connect the optical fiber cables
• How to assign IP addresses

3.1 Receiving and Inspecting

As you unpack your unit, inspect the shipping container and equipment for damage. Save the shipping material for future use. If the container or the equipment is damaged, notify both the freight carrier and braun teleCom.

CAUTION: To protect yourself from potential injury and to protect the equipment from further damage, do not perform any operational tests if the equipment appears to be damaged.

3.2 Cable Requirements

Depending on your configuration of the amplifier, you may need the following cables to install the Outdoor:
• One shielded Category 5 Ethernet cable to connect to a TCP/IP network
• RS232 data configuration interface

3.3 Precautions

Heed the following precautions when working with the Outdoor.

 Warning	Read the installation instructions before connecting the system to the power source.
Attention	Avant de brancher le système sur la source d'alimentation, consulter les directives d'installation.
Warnung	Vor dem Anschließen des Systems an die Stromquelle die Installationsanweisungen lesen.

 Warning	The plug-socket combination must be accessible at all times, because it serves as the main disconnecting device.
Attention	La combinaison de prise de courant doit être accessible à tout moment parce qu'elle fait office de système principal de déconnexion.
Warnung	Der Netzkabelanschluß am Gerät muss jederzeit zugänglich sein, weil er als primäre Ausschaltvorrichtung dient.

3.4 Mounting the Outdoor

The Outdoor can be mounted outdoor. Tighten the screws; take some waterproofing measures and reliable grounding to achieve the best results.
Visually inspect each key (button) on the panel to ensure that it is not trapped under the edge of its hole. If a key is trapped, tap the key to enable it to move freely.

3.5 Connecting Power

The Outdoor is available with an AC power model. Follow the power connection procedure below for the model that you are installing.

3.5.1 Connecting AC Power

The AC-powered Outdoor requires input voltage 110-265 VAC, 50-60 Hz.
To connect AC power:
1. Connect the ground contact to ground. This is important for your safety. The ground contact is located on the hanging feet (on the opening place).
2. Connect the power cord to a 110 VAC or 230 VAC (50/60 Hz) electrical socket.
The Outdoor boots up. It takes about 30 seconds for all systems to operate.

CAUTION: To avoid personal injury and damage to the equipment, use a power outlet with a protective ground (third wire) contact.

3.6 Connecting the Optical Fiber Cables

The Outdoor has five optical connectors, one input and four outputs.

DANGER: The fiber carries invisible laser radiation. **AVOID DIRECT EXPOSURE TO BEAM**. Never operate the unit with a broken fiber or with a fiber connector disconnected.

1. Verify that the type of connector on the fiber cable matches that of the Outdoor: SC/APC.
2. Verify that the fiber cable connector has been cleaned properly. If the fiber cable connector needs to be cleaned, follow the cleaning procedure outlined in Section *5.1.1 Cleaning Patch Cord or Pigtail Fiber Optical Connectors*.
3. Verify that the Outdoor optical connector has not been exposed to any contamination. If you suspect that the connector may have been exposed to contamination (by a dirty fiber cable connector, for example), follow the cleaning procedure outlined in Section *5.1.2 Cleaning Amplifier Optical Connectors*.

NOTE: Any contamination of either the fiber cable or the Outdoor optical connector can significantly degrade optical link performance. This degradation will most likely manifest itself as poor signal-to-noise (SNR) performance.

4. Note the key characteristics of the mating connectors and align them accordingly. Gently insert the fiber cable connector into the optical connector of the Outdoor until the fiber cable connector clicks into place.

3.7 Connecting the Ethernet Cable

This function is only available with the optional transponder. You can connect the Outdoor to your TCP/IP network in order to monitor and control the amplifier remotely. After you complete the installation procedures described in this chapter, you can use a network management system (NMS) to monitor and control the Outdoor.

To connect the Outdoor, you must use a shielded and grounded Category 5 Ethernet cable.

To connect the Ethernet cable:

1. Connect an Ethernet cable to the amplifier's RJ-45 Ethernet port and to your TCP/IP network. The Ethernet port is on the optional built-in transponder of the amplifier.
2. Verify that the green Link LED is illuminated, indicating that there is a connection.

3.8 Assigning IP Addresses

This function is only available with the optional transponder. You must assign IP addresses to the Outdoor amplifier so that NMSs can communicate with it. Use the menu to assign the IP address, subnet mask, and default gateway.

NOTE: IP addresses are unique. If you do not know the IP addresses of the Outdoor, contact your system administrator.

To assign an IP address:

1. Press ENT key then press ▼ , the Display reads **Set Param** (Set Parameters) ， then press **ENT key** to enter the **Set Param** menu (Set Parameters menu).

2. Press ▼ until the Display reads **IP Addr** (**Set Local IP Address**) ， then press **ENT**.

3.Use the ▲▼ to type the IP address of the Outdoor, and then press **ENT**.

4.Press ▼ once. The Display reads **Mask Addr xxx.xxx.xxx.xxx** (set subnet mask), and then press **ENT**.

5.Use the ▲▼ to type the subnet mask of the Outdoor, and then press **ENT**.

6.Press ▼ once. The Display reads **Gateway xxx.xxx.xxx.xxx** (set gateway), and then press **ENT**.

7. Use the ▲▼ to type the default gateway of the Outdoor, and then press **ENT**

4. Using the Outdoor with an NMS

Once the Outdoor is operating, you can use a network management system (NMS) to monitor and control it. This chapter describes:

• How to connect the Outdoor to an NMS

• SNMP default access rights Amplifiers have an embedded SNMP agent that enables communication between the Outdoor and any devices that support SNMP versions 1. For instructions on installing, configuring, and operating an NMS, please refer to the documentation for the NMS.

4.1 Connecting the Outdoor to an NMS

Amplifiers have an embedded SNMP agent that enables communication between the Outdoor and any devices that support SNMP versions 1.

Before you can connect the Outdoor to an NMS:
• The Outdoor must be connected to your IP network as described in Section ***3.7 Connecting the Ethernet Cable***.
• IP addresses must have been assigned to the Outdoor as described in Section ***3.8 Assigning IP Addresses***.

To connect the Outdoor to an NMS:
1. Complete the installation procedures described in Chapter 3, **Installing the Outdoor Optical Amplifier.**
2. Determine the IP address of the Outdoor.
3. Determine your default access rights for different versions of the SNMP protocol. The default access rights for SNMP versions 1.

5. Maintenance and Troubleshooting

This chapter describes:
• How to clean fiber optic connectors
• Alarms for the Outdoor
• How to troubleshoot the Outdoor
• Manufacturer disclaimer

NOTE: The Outdoor does not include any customer serviceable components inside.

5.1 Cleaning Fiber Optic Connectors

DANGER: The fiber cable carries invisible laser radiation. **AVOID EXPOSURE TO THE BEAM.** Never operate a unit that has a broken fiber or a disconnected fiber connector.

Dirty optical connectors are the leading source of poor performance in a broadband optical fiber network. Dirty optical connectors lead to optical signal loss and reflections, which in turn can seriously degrade signal-to-noise (SNR) performance and, in some cases, distortion performance. braun teleCom recommends that you clean all mating fiber connectors before connecting them to an optical amplifier.

In addition, if you suspect that the optical connector of an Outdoor may have been exposed to contamination (by a dirty fiber cable connector, for example), you should properly clean the Outdoor optical connector before connecting the optical fiber.

CAUTION: Improper cleaning of an optical connector can do more harm than good. Never spray a clean-air product onto the surface of an optical connector. Spraying air onto an optical connector can cause condensation on the connector surface, leaving water spots and trapping dust. Failing to wipe a connector on dry lens paper immediately after wiping on paper wet with isopropyl alcohol can also lead to condensation on the connector. Using low-grade cleaning paper or other cloth to wipe an optical connector can leave microscopic fibers on the optical connector Surface.

5.1.1 Cleaning Patch Cord or Pigtail Fiber Optical Connectors

To clean optical connectors, braun teleCom recommends using a fiber optic connector cleaning cartridge (such as NTT Cletop). If a cleaning cartridge is not available, follow these steps.

To clean the optical connector of a patch cord or pigtail:

1. Fold a piece of unused dry lens cleaning paper twice, for a four-ply thickness.
2. Use a drop of high-grade isopropyl alcohol to wet part of the paper.
3. Lay the connector on the lens cleaning paper with the tip touching the paper.
4. In one continuous motion, pull the connector from the wet part of the paper to the dry part.

5.1.2 Cleaning Amplifier Optical Connectors

To clean the optical connector of an amplifier:

1. Extend the fiber connector from the unit carefully.

CAUTION: When the fiber connector is extended from the unit, take care to avoid twisting or rotating the connector in order to prevent possible fiber damage.

2. Fold a piece of unused dry lens cleaning paper twice, for a four-ply thickness.
3. Use a drop of high-grade isopropyl alcohol to wet part of the paper.
4. Lay the connector on the lens cleaning paper with the tip touching the paper.
5. In one continuous motion, pull the connector from the wet part of the paper to the dry part.
6. Once the cleaning is complete, re-insert the internal fiber connector into the bulkhead adaptor and press the two parts together carefully.

5.2 Alarms

Table 5-1 describes the alarms for the Outdoor Optical Amplifier.
Alarms are reported via the display screen, via SNMP, and via the web interface. In addition, any alarm triggers the alarm relay, and the Status LED illuminates red. For information on accessing the alarm Displays, see Section *2.2 The Menu System*.

Table 5-1: Outdoor Amplifier Alarms

Alarm	Description
InputOpt Low	Optical input power is lower than the set threshold value
InputOpt High	Optical input power is higher than the set threshold value
OutputOpt Low	Optical output power is lower than the set value (lower more than 2dB)
OutputOpt High	Optical output power is higher than the set value (higher more than 2dB)
Pump1Temp Low	Pump 1 temperature is lower than 25°C (lower more than 3°C)
Pump1Temp High	Pump 1 temperature is higher than 25°C (higher more than 3°C)
Pump2Temp Low	Pump 2 temperature is lower than 25°C (lower more than 3°C)
Pump2Temp High	Pump 2 temperature is higher than 25°C (higher more than 3°C)
+5V Read Low	+5V read is lower than the set value (lower more than 1V)
+5V Read High	+5V read is higher than the set value (higher more than 1V)
-5V Read Low	-5V read is lower than the set value (lower more than 1V)
-5V Read High	-5V read is higher than the set value (higher more than 1V)

5.3 Troubleshooting

Should a problem occur, see if the symptoms are listed in Table 5-2.

Table 5-2: Troubleshooting Solutions

Symptom	Solution
Amplifier output disabled	Check for other alarms.
Laser temperature alarm	Verify that the unit is operating within the proper temperature range (-20° to +55° C). If that does not correct the problem, contact Customer Service.
Low optical input power	**Verify that the unit is operating within the set threshold value range.** If that does not correct the problem, contact Customer Service.
Loss of optical output power	Check the fiber drawer. Follow the connector cleaning procedure (see Section 5.1). If that does not correct the problem, contact Customer Service.

Appendix A

Technical Specifications

A.1 Optical Output

Table A-1: Technical Parameters

Item		Unit	Technical Parameter	Comment
wavelength		nm	1545 ~ 1565	
Optical input power range		dBm	-3 ~ +10	
Optical output power		dBm	13~24	
The number of output ports			4	
Output power stability		dB	±0.5	
Noise figure		dB	≤ 5.0	Optical input power 0dBm
Return loss	Input	dB	≥ 45	
	Output	dB	≥ 45	
Pump leak power	Input	dBm	≤ -30	
	Output	dBm	≤ -30	
C/N		dB	≥50 / ≥52,5	*1 / *2
CTB		dBc	≥65 / ≥65	*1 / *2
CSO		dBc	≥65 / ≥64	*1 / *2
Optical Connector Type			SC/APC	
Power Voltage		V	110 – 265VAC	
Power consumption		W	≤ 30	
Operating Temperature range		°C	-15 ~ +55	
MAX Operating Relative Humidity		%	Max 85% non-condensing	
Storage Temperature		°C	-30 ~ +70	
MAX Stock Relative Humidity		%	Max 85% non-condensing	

***1** Test Configurations:

1550nm Transmitter BKTEL, AGC, 80dBµV RFin, **84 PAL-D channels**

Receiver: 20 km fiber length, 0 dBm Input level, 100 dBµV RFout, current density IEQ = 8 pA/√Hz

***2** Test Configurations:

1550nm Transmitter BKTEL, AGC, 80dBµV RFin, **42 CENELEC channels**

Receiver: 20 km fiber length, 0 dBm Input level, 100 dBµV RFout, current density IEQ = 8 pA/√Hz

A.2 User Interface

Panel
LCD
Keyboard
RS232 interface
*RJ-45 connector for network management

A.3 Electrical

Power requirements:
• AC power supply: 110/230 V, 50/60 Hz
Power consumption: 30 W maximum

A.4 Environmental

Operating temperature range: -15° to +55° C
Storage temperature range: -30° to +70° C
Relative humidity: 85% maximum, non-condensing

A.5 Physical

Dimensions: 340mm W x 130mm H x 240mm D
Weight: 3.9kg

A.6 Laser Radiation Warning

Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (July 26, 2001) as applicable to Class 1M Laser Products.

This light emission device is classified to IEC 60825-1:1993 + A1 + A2

CAUTION: INVISIBLE LASER RADIATION. DO NOT VIEW DIRECTLY WITH MAGNIFIERS. CLASS 1M LASER PRODUCT. Viewing the laser output with optical instruments (e.g. magnifier, microscopes) within a distance of 100mm may pose an eye hazard.
WARNUNG: UNSICHTBARE LASERSTRAHLUNG. NICHT DIREKT MIT LUPE BETRACHTEN. KLASSE 1M LASER PRODUKT.
ATTENTION: RADIATION LASER INVISIBLE. NE PAS OBSERVER À LA LOUPE DIRECTEMENT. PRODUIT LASER CLASSE 1M.