9000EDFA-D-AGC
Erbium Doped Fiber Amplifiers
User Manual

EVERTZ MICROSYSTEMS LTD.
5292 John Lucas Drive
Burlington, Ontario
Canada L7L 5Z9

Phone:	+1 905-335-3700	
Sales:	sales@evertz.com	Fax: +1 905-335-3573
Tech Support:	service@evertz.com	Fax: +1 905-335-7571
Web Page:	http://www.evertz.com	Twitter: @EvertzTV

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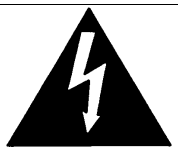
IMPORTANT SAFETY INSTRUCTIONS

	The lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated “Dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.
	The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (Servicing) instructions in the literature accompanying the product.

- Read these instructions
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturer’s instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

WARNING
TO REDUCE THE RISK OF FIRE OR ELECTRIC – SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE

WARNING
DO NOT EXPOSE THIS EQUIPMENT TO DRIPPING OR SPLASHING AND ENSURE THAT NO OBJECTS FILLED WITH LIQUIDS ARE PLACED ON THE EQUIPMENT

WARNING
TO COMPLETELY DISCONNECT THIS EQUIPMENT FROM THE AC MAINS, DISCONNECT THE POWER SUPPLY CORD PLUG FROM THE AC RECEPTACLE

WARNING
THE MAINS PLUG OF THE POWER SUPPLY CORD SHALL REMAIN READILY OPERABLE

INFORMATION TO USERS IN EUROPE

NOTE

CISPR 22 CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to the European Union EMC directive. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

CE

EN60065	Safety
EN55103-1: 1996	Emission
EN55103-2: 1996	Immunity

EN504192 2005
Waste electrical products should not be disposed of with household waste.
Contact your Local Authority for recycling advice

INFORMATION TO USERS IN THE U.S.A.

NOTE

FCC CLASS A DIGITAL DEVICE OR PERIPHERAL

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

WARNING

Changes or Modifications not expressly approved by Evertz Microsystems Ltd. could void the user's authority to operate the equipment.

Use of unshielded plugs or cables may cause radiation interference. Properly shielded interface cables with the shield connected to the chassis ground of the device must be used.

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FIGURES

REVISION HISTORY

REVISION	DESCRIPTION	DATE
1.0	First Release	May 2016

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1. INTRODUCTION

9000EDFA-D-AGC is an Erbium Doped Fiber Amplifier (EDFA) for 1529~1561nm Dense wavelength Division Multiplexing DWDM networks. It features low noise figures, high gain, adjustable gain, flattened gain, stable output power and fine environmental stability. It can realize the fiber optic communication for super span and extend relay distance. It is the ideal optical amplifier for the DWDM networks.

The DWDM EDFA consists of the amplifier module and the electrical system, see Figure 1-1.

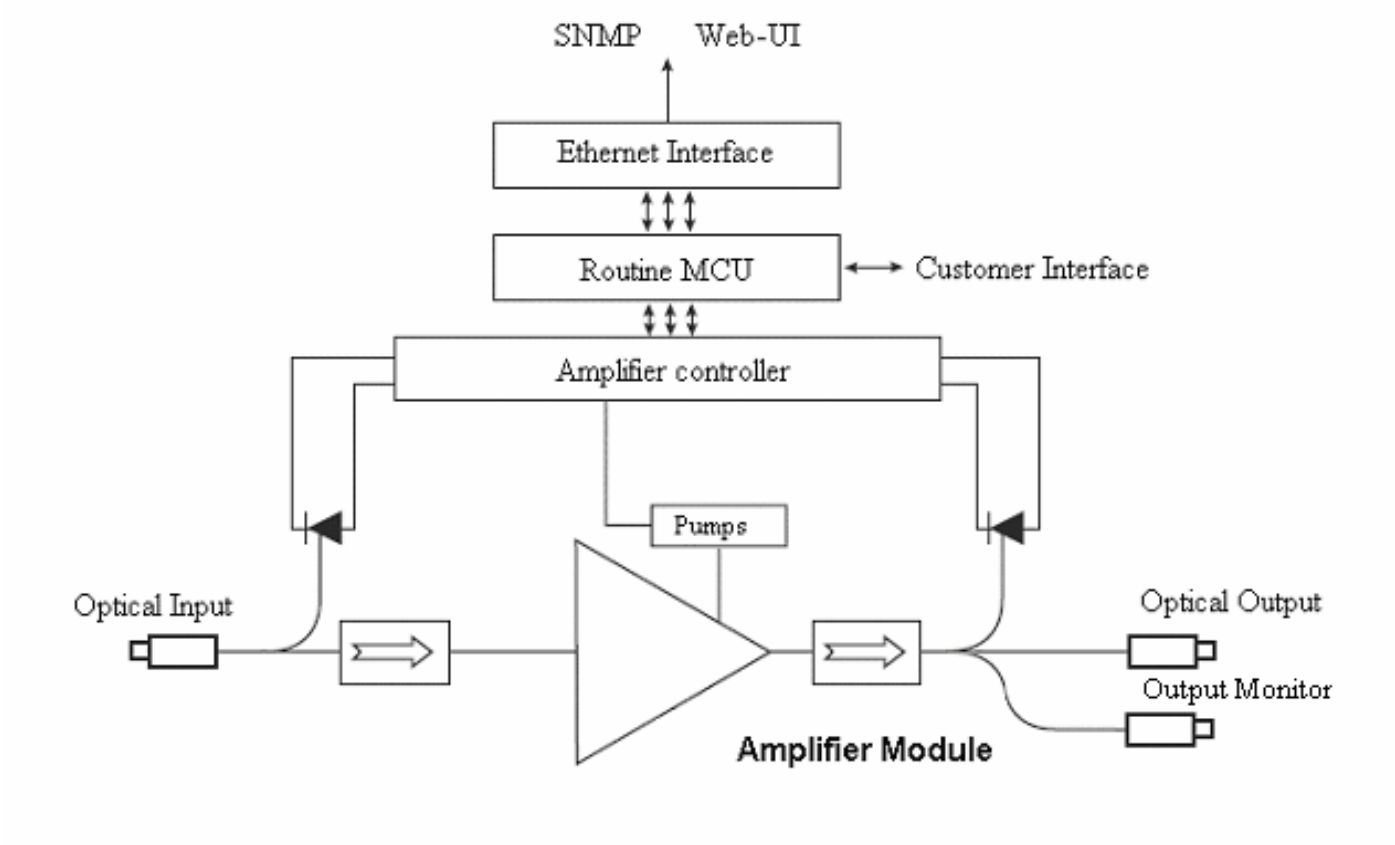


Figure 1-1: Optical & Electrical Schematic Drawing

Amplifier Module

The amplifier module incorporates a powerful, processor-controlled gain and transient control system for optimum performance. Input and output powers are instantly monitored to dynamically maintain the desired operating gain under changing input conditions. This scheme enables the module to maintain performance of the remaining channels when the numbers and the power of wavelength are added or dropped.

External Control System

The control system is indispensable to the EDFA, to ensure the amplifier module is working in the optimum state. Controlled by the micro-processor, it monitors the states of the amplifier module, such as pump power, pump temperature, pump current, input and output power, and adjusts all the

parameters to ensure a stabilized output power from the gain module, and also maintains the ideal working states. Moreover, this system provides a warning function, which can give warning signals through the LEDs on the front panel of EDFA when the working state of the amplifier is abnormal. The detailed working parameters of the EDFA are shown by the LCD on the front panel. This information can also be accessed via RJ45 interface by an external computer.

Figure 1-2 portrays the front panel of 9000EDFA-D-AGC EDFA. The key switch is to control the pump lasers; the switch button is to switch the LCD's information.

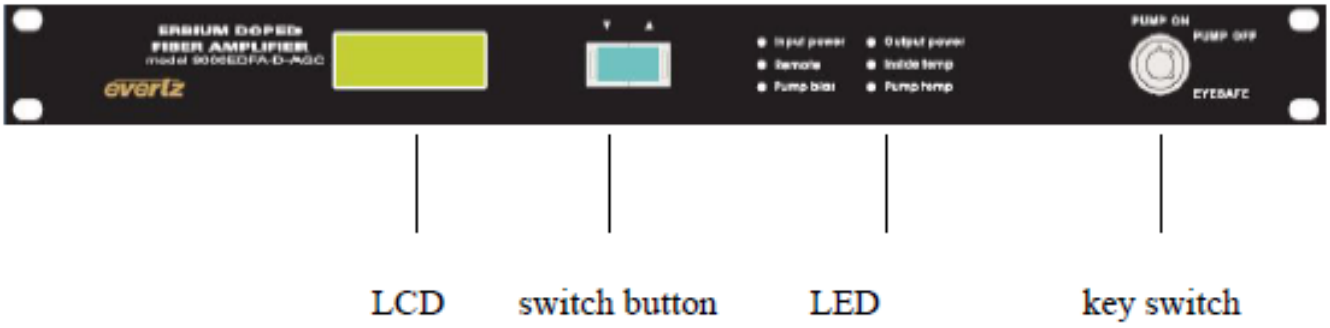


Figure 1-2: 9000EDFA-D-AGC Front Panel

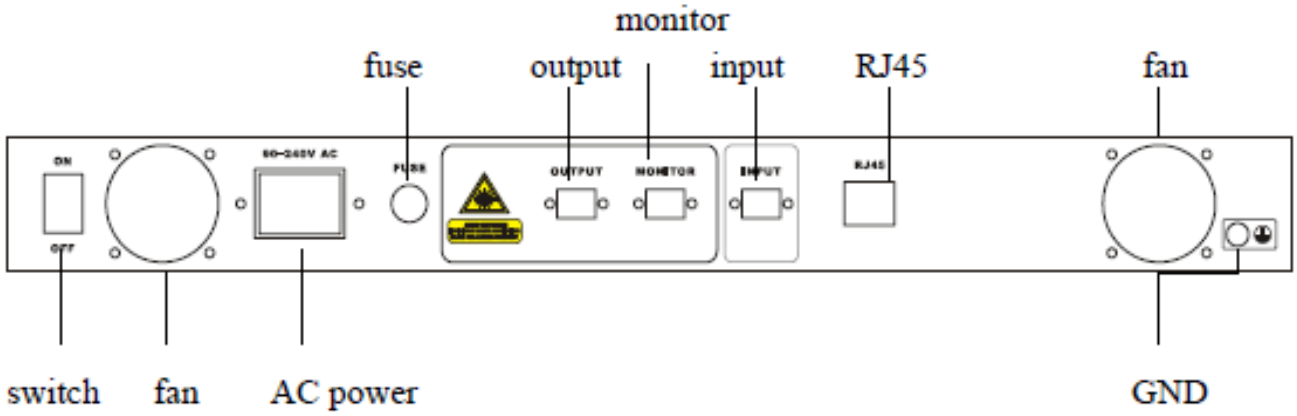


Figure 1-3: 9000EDFA-D-AGC Rear Panel

2. SPECIFICATIONS

Parameters		Min	Type	Max	Units
Operation Wavelength		1529		1561	nm
Input Power		-29		+7	dBm
Output Power				+17	dBm
Rated Gain		10		25	dB
Gain Flatness(room temperature)				1	dB
Output Power (eyesafe mode)				10	dBm
Control Mode		AGC, APC and ACC			
Noise Figure	Condition1 (Gain=25)			5.5	dB
	Condition1 (Gain=20)			6.0	dB
	Condition1 (Gain=15)			9.0	dB
	Condition1 (Gain=10)			14.5	dB
Input/Output Isolation		30			dB
Pump Leakage to Input				-40	dBm
Pump Leakage to Output				-30	dBm
Input/Output Return Loss		50			dB
Polarization Dependent Gain				0.5	dB
Polarization Mode Dispersion				0.5	ps
Transient Suppression Time (Gain=25dB)	3dB add/drop			1	ms
	6dB add/drop			1	ms
	15dB add/drop			1	ms
Transient overshoot/undershoot (Gain=25dB)	3dB add/drop		1.5	1.85	dB
	6dB add/drop		1.5	1.85	dB
	15dB add/drop		1.5	1.85	dB
Transient Offset (Gain=25dB)				1	dB
Operating Temperature		0		50	℃
Storage Temperature		-25		65	℃
Relative Humidity		5		95	%
Power Supply		90~240VAC or -36~ -60VDC			
Power dissipation				30	W
Input/Output Interface		SC/APC, FC/APC or Customer Specified			
Dimension		434(W)×260(D)×44(H)			mm
Installation		Standard 19" 1U Rack Mounted			

Figure 2-1: 9000EDFA-D-AGC Specifications

3. OPERATION

3.1. CONNECTION

- Connect the EDFA to the power supply when EDFA power switch and key lock are both off.
- Be sure that the input optical power is in the right range (-29dBm～+7dBm), and the optical interfaces of the linkers in use are in accordance with those of the EDFA.
- Connect the optical linkers to the input and output flanges of the EDFA.

3.2. TURN EDFA ON AND OFF

- First turn on the power switch (in the back panel), the LCD will work and LED will light. Then open the key switch to PUMP ON, wait for half an hour and EDFA will be in the normal working state.
- To turn off the EDFA, first close the key lock to OFF, and then turn off power switch after a few minutes.
- Three options of the key switch:
    - o PUMP ON
    - o EYESAFE (the output power is less than 10mW)
    - o PUMP OFF

3.3. LED INDICATORS

The six LEDs indicate as follows:

Input power - input power indicator
- Color of the LED based on the LOS (limit of no signal). It shows red when the input power is less than LOS.

Output power - output power indicator
- CG: the deviation of the gain from upper and lower limits exceeds 2dB, the LED shows red.
- CP: the deviation of the output power from upper and lower limits exceeds 2dB, the LED shows red.
- CC: no alarm.
- In addition, it shows red when the input power is less than LOS or no input signal.

Remote - remote connection (optional) indicator
- Remote control shows green when the SNMP work normally.

Inside temp - inside temperature indicator
- It shows red when the inside temperature higher than 65 °C, or less than -2 °C, otherwise shows green.

Pump bias - pump current indicator
- It shows green when the pumps work in their normal states, and shows red when the pump current is higher than 656mA.
- The pumps will be shut down in these cases: input power is less than LOS; pump temperature is higher than 35 °C or less than 15 °C; pump current value exceeds its limitation.

Pump temp - pump temperature indicator
- It shows green when pump temperature is below 35 °C or less than 15 °C, otherwise it shows red.

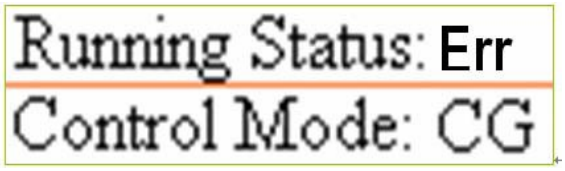
3.4. LCD DISPLAY

The LCD screen in the front panel is to display the detail information of the EDFA. Press the blue key to display these parameters circularly.

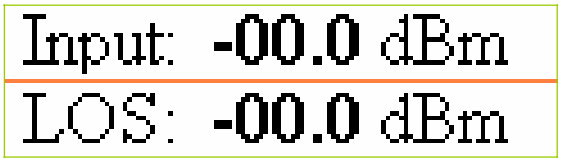
The LCD screen in the front panel is to display the detail information of the EDFA. Press the blue key to display these parameters circularly.

- LOGO and Model name

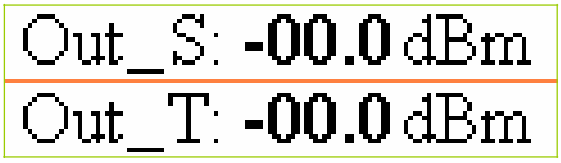
- Control mode ---- AGC, APC and ACC
- Running status ---- OK or Err



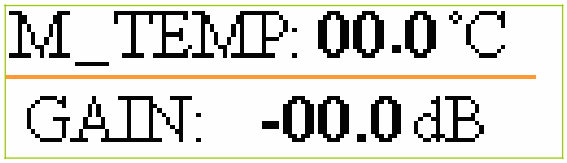
- Input power
- Limit for limit the signal



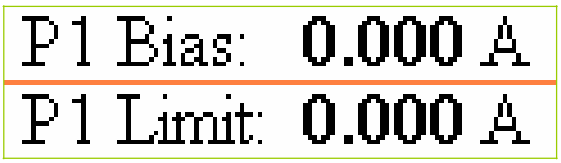
- Output signal power and total output power



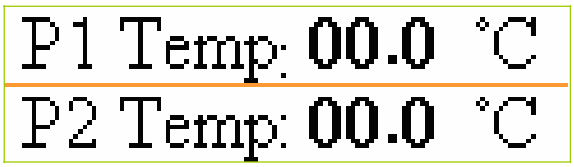
- Inside temperature and Gain
- The upper and lower limits of the Gain for alarm



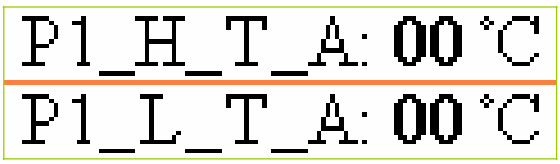
- Bias and the upper limit of the pump1 for alarm



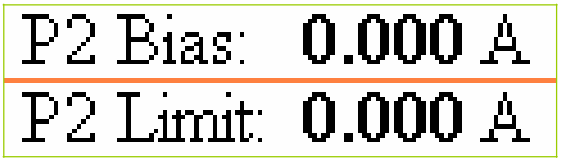
- Temperature of the pumps



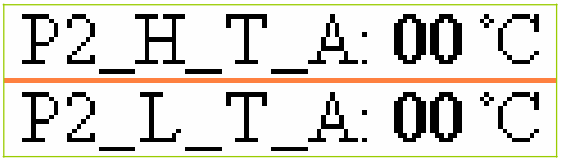
- The upper and lower temperature limits of Pump1 for alarm



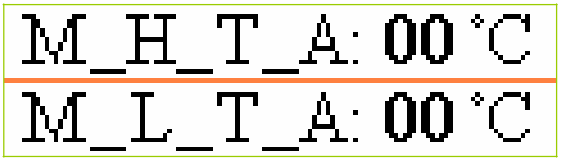
- Bias and the upper limit of the pump2 for alarm



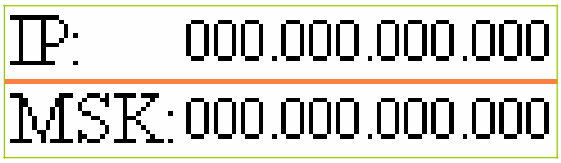
- The upper and lower limits of pump2 for alarm



- The upper and lower temperature limits inside for alarm



- IP address and netmask



4. ERROR AND MAINTENANCE

When EDFA is in its normal working state, the first five LEDs on the front panel will be green. If any of the LEDs show red, it indicates an abnormal working state of EDFA. In this case, please make sure that:

a) The key lock is on
- If the key switch is not on, the indicator of output power will show red.

b) The input power is in the correct range
- If the value of the input power is less than LOS, the input power and output power will show red. In this case the pump will turn off, and the EDFA will stop working.

c) Be sure EDFA working temperature is in its normal state
- The working temperature for EDFA is between -2 °C to 65 °C. Any temperature over the range will cause TEC current beyond its limit, and inside temp will show red to give a warning. If the temperature is higher than 35 °C, the fan will run.

d) Be sure EDFA working temperature is in its normal
- When pump temperature is between 15 °C to 35 °C, EDFA will shut off the pump automatically; the pump temp will show red.

e) The pump current is normal
- The pump bias shows red when the pump current is higher than 656mA.

f) The output power is normal
- CG: the deviation of the gain from upper and lower limits excess 2dB, the output power will show red.
- CP: the deviation of the output power from upper and lower limits excess 2dB, the output power will show red.
- In addition, CP/CG: if the difference of the two setting value is large (over 4dB), the output power will show red instantly, then it will shows green. This phenomenon is normal.

g) the setting is invalid
- CP/CG/CC: if the setting value cannot be set properly several times, try the different value.

5. SAFETY PRECAUTIONS

When the amplifier is working in the normal state, the output power of light with wavelengths in the invisible range (infrared light) may be over 17dBm (50 mW). Please do not look into the output port of the EDFA directly to avoid damaging your eyes.

Please do not clean the output connector when the pump laser is on to avoid damaging the connector and the pump.

Please cover the EDFA with the dust cap when it is not in use, this can prevent the input and the output from any pollution.

The fiber amplifier is a precision instrument. Therefore, please do not open the cover of the amplifier to avoid damaging the internal components. Opening the cover of the amplifier without the permission, the warranty of the EDFA will be void.

Please contact Evertz if the problem cannot be solved by following the aforementioned methods. Do not attempt repair.

6. SNMP NETWORK MANAGEMENT USER GUIDE

DWDM EDFA Network Management System is based on SNMP protocol to meet the user's requirement. The network management system can control and set the working station of the EDFA by PC, realize the function for the management and maintenance, and improve the service quality and satisfaction requirement.

Characteristics

- UI: provide WEB management manner.
- Logging in: accessing and exit.
- Alarm: give an alarm by trap and LED.
- Manage: adjust the output power and mode, remote switch PUMP on/off, monitor the temperature and the state of PUMP, the input and output of optical signal, and the state of power supply.
- Support remote the accessing mode based on SNMP protocol.
- Support online software upgrade.

Accessing server management

Start the web browser and enter the IP address of the device: http://xxx.xxx.xxx.xxx.
The login screen of EDFA Network Management System is shown in figure 6-1.
The default Server Management user name is "admin"; the default password is "snmpedfa", and it is necessary to log in with this name for full access to the server.

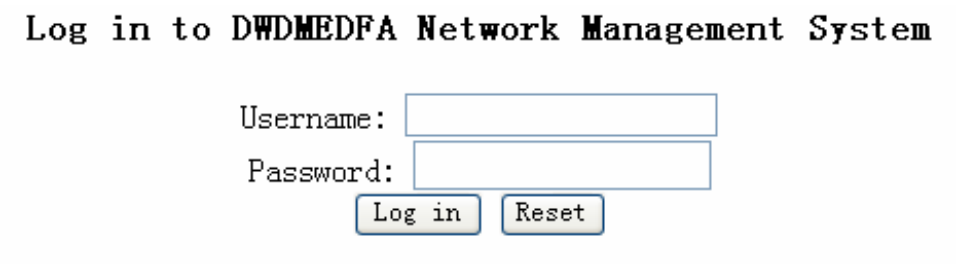


Figure 6-1: DWDMEDFA Network Management System

Management interface summary

When logging in, the web browser displays the following main interface as shown in figure 6-2

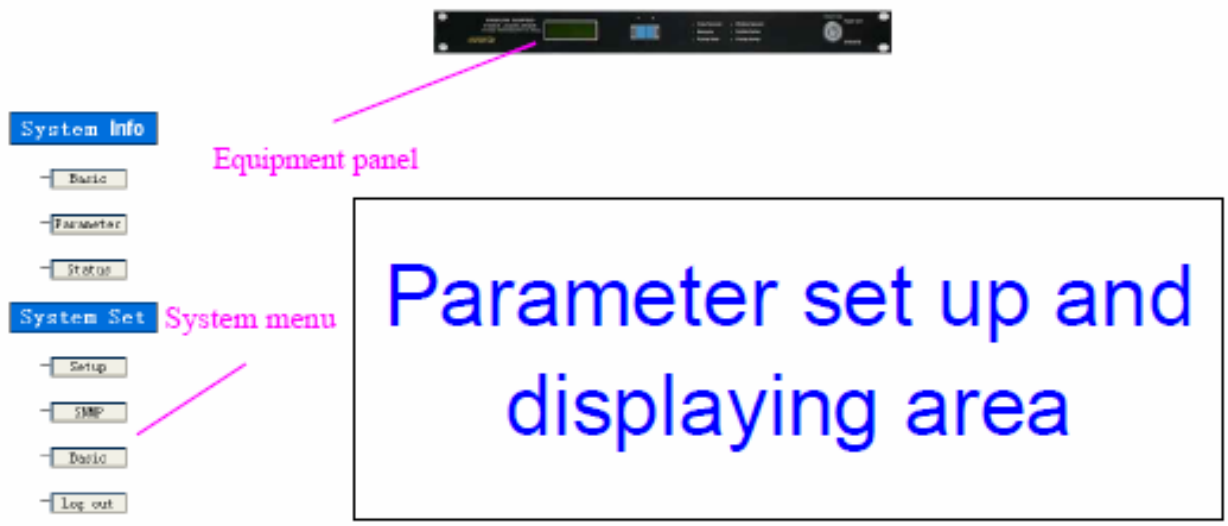


Figure 6-2: Parameter Set and Display

System Info sub menu is shown in figure 6-3.

Clicking on the different system menu will change the displayed area screen.

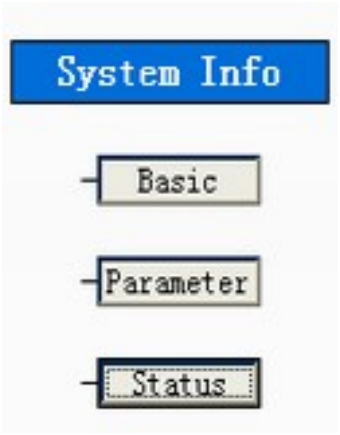


Figure 6-3: Instructions for System Info Sub Menu

Basic:

Click [Basic] to view the network basic information, the SNMP information and the user setting information for EDFA networking management system, shown in figure 6-4.

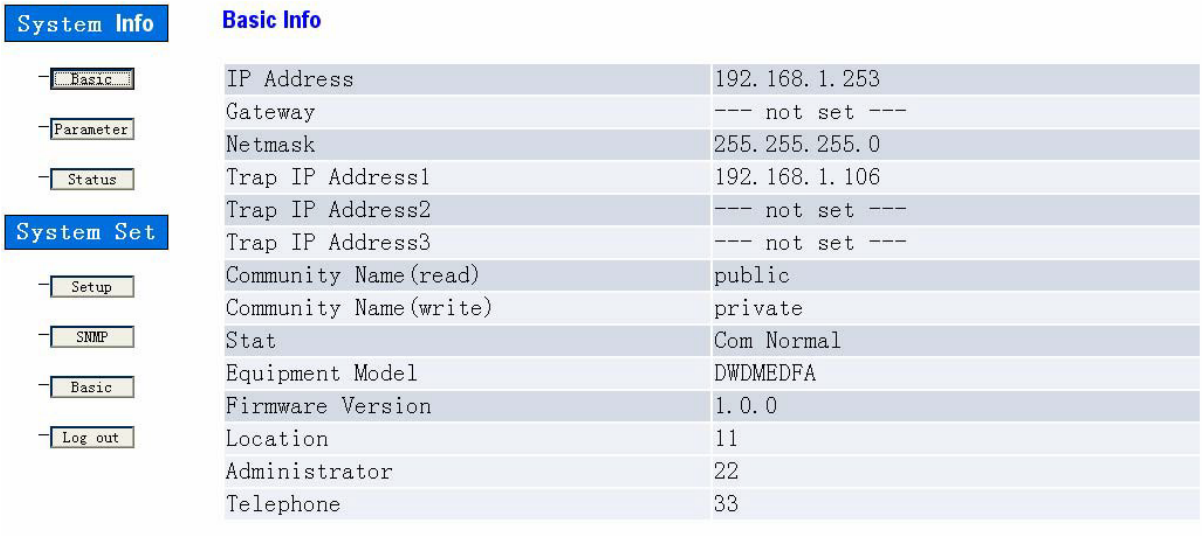


Figure 6-4: Basic Information

Basic Info explanation:

- IP Address: Unique IP address designated to this device.
- Gateway: The IP address of the default gateway (router).
- Netmask: The subnet mask of the IP address specified above.
- Trap IP Address: IP address of the trap host to which a trap is issued.
- Community Name (read): The read community to which the system belongs.
- Community Name (write): The write community to which the system belongs.
- Stat: Scan data elements status.
    - Com Abnormal expresses unreliable or useless data status.
    - Com Normal expresses reliable or useful data status.
- Firmware Version: Software version. Equipment Model: Equipment model.
- Location: Location where the system is installed (user setting).
- Administrator: Administrator for the system (user setting).
- Telephone: Contact telephone regarding the system (user setting).

Parameter:

Click [Parameter] to view EDFA running status in a table list, shown in figure 6-5.

System Info

- Basic
- Parameter
- Status

System Set

- Setup
- SNMP
- Basic
- Log out

Parameter Info

Input Power	-40.0dBm
Input Power Alarm	-35.0dBm
Output Signal Power	-40.0dBm
Output Power	-40.0dBm
Gain	0.0dB
Mode	CG
Gain High Limit	22dBm
Gain Low Limit	18dBm
Pump1 Bias	0mA
Pump1 Limit	656mA
Pump1 Temp	24℃
Pump2 Bias	0mA
Pump2 Limit	656mA
Pump2 Temp	24℃
Inside Temp	25.0℃

Figure 6-5: Parameter Information

Parameter Info explanation:

- Input Power: the input power of the optical signal.
- Input Power Alarm: the minimal input power.
- Output Signal Power: the output power of the signal.
- Output Power: the output power of the signal and the noise.
- Gain: amplifier gain.
- Mode: control mode.
- Gain High Limit: upper limit of the gain.
- Gain low Limit: lower limit of the gain.
- Pump1 Bias: the current of the Pump 1.
- Pump1 Limit: the current limit of the Pump 1.
- Pump1 Temperature: the temperature of the Pump 1.
- Pump2 Bias: the current of the Pump 2.
- Pump2 Limit: the current limit of the Pump 2.
- Pump2 Temperature: the temperature of the Pump 2.
- Inside Temp: the inside temperature of the optical module.

Status:

Show the working information of EDFA. It is equivalent to the six LEDs on the front panel of DWDM EDFA, shown in figure 6-6.

Figure 6-6: Status Information

Instruction of DWDM EDFA Status Info:

- Power: Show green when the power is on.
- Pump temperature: Show green when the pump temperature is less than 35 °C and higher than 15 °C. Show red when the pump temperature is higher than 35 °C or less than 15 °C.
- Output power: Shows green when the output power is normal. Shows red when the input power is less than LOS or no input signal. In addition, CG: the deviation of the gain from upper and lower limits excess 2dB, CP: the deviation of the output power from upper and lower limits excess 2dB, otherwise show green.
- Input power: Shows green when the input power is higher than [LOS]. Shows red when the input power is less than [LOS].
- Pump bias: Shows green when the current of the Pump is less than 656mA, and the pumps work in their normal states. Show red when the current of the Pump is higher than 656mA; input power is less than LOS; pump temperature is higher than 35 °C or less than 15 °C.
- Inside Temp: Shows green when the inside temp of the module is normal. Shows red when the inside temp of the module is higher than 65 °C, or less than -2 °C, otherwise shows green.

System Set:

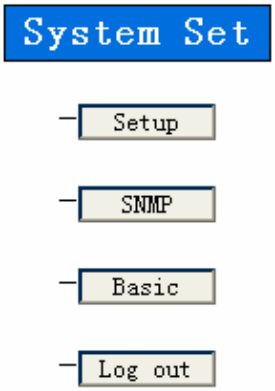


Figure 6-7: System Set

Instruction of System Set:

- Setup: set up the control mode, parameters and the status. Click [Setup] to view the mode and the LOS setting, shown in figure 6-8, and to change the working mode and status.

Instruction of setting:

- LOS: denote no input signal. Setting range: -15dBm ~ -35dBm.
- CG Mode: auto gain control. Setting range: 10dB ~ 25dB.
- CP Mode: auto power control. Setting range: -35dBm ~ 20dBm.
- CC Mode: auto current control. Setting range: 0mA ~ 576mA.
- CD Mode: turn off the control mode. Click [set] to view [SET SUCCESS].

Note: the setting parameters must be operated by a professional. At the same time, the user must observe the changes of the EDFA parameters. See [SYSTEM INFO] menu.

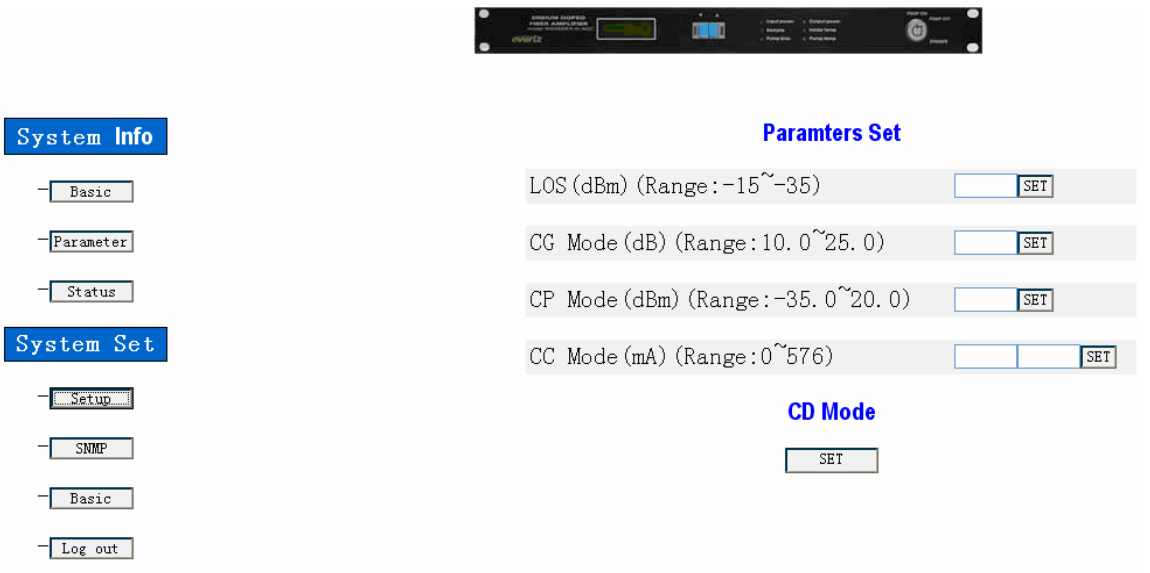


Figure 6-8: System Parameters & CD Mode

Figure 6-9: SNMP Trap Address Setting & Community Name

SNMP

Instruction of SNMP Info:

- SNMP: Click [SNMP] to view the SNMP setting. See Figure 6-9.
- SNMP Trap Address Setting: IP address of the trap host to which a trap is issued (three trap hosts are supported). The systems enter into force upon setting.
- SNMP Community Name: SNMP read/write communities to which the system belongs. The default name is public/private. When the setting has been successfully completed, restart your system.

Note: If SNMPTRAP address setting and SNMP community name options succeed to set up, "set success" will appear.

Basic

Instruction of Basic info:

- Basic: Click [Basic] to view the Network settings and the user related settings. See figure 6-10.
- Network Setting: Click [Apply] button to set IP address, netmask, gateway.
- Other Setting: Click [Apply] button to set location, administrator, telephone

Network Setting:

- IP Address: set the unique IP address designated to this device.
- Netmask: set the subnet mask of the IP address.
- Gateway: set the IP address of the default gateway (router).

Other Setting:

- Location: set the location where the system is installed.
- Administrator: set the Administrator for the system.
- Telephone: set the contact telephone regarding the system.

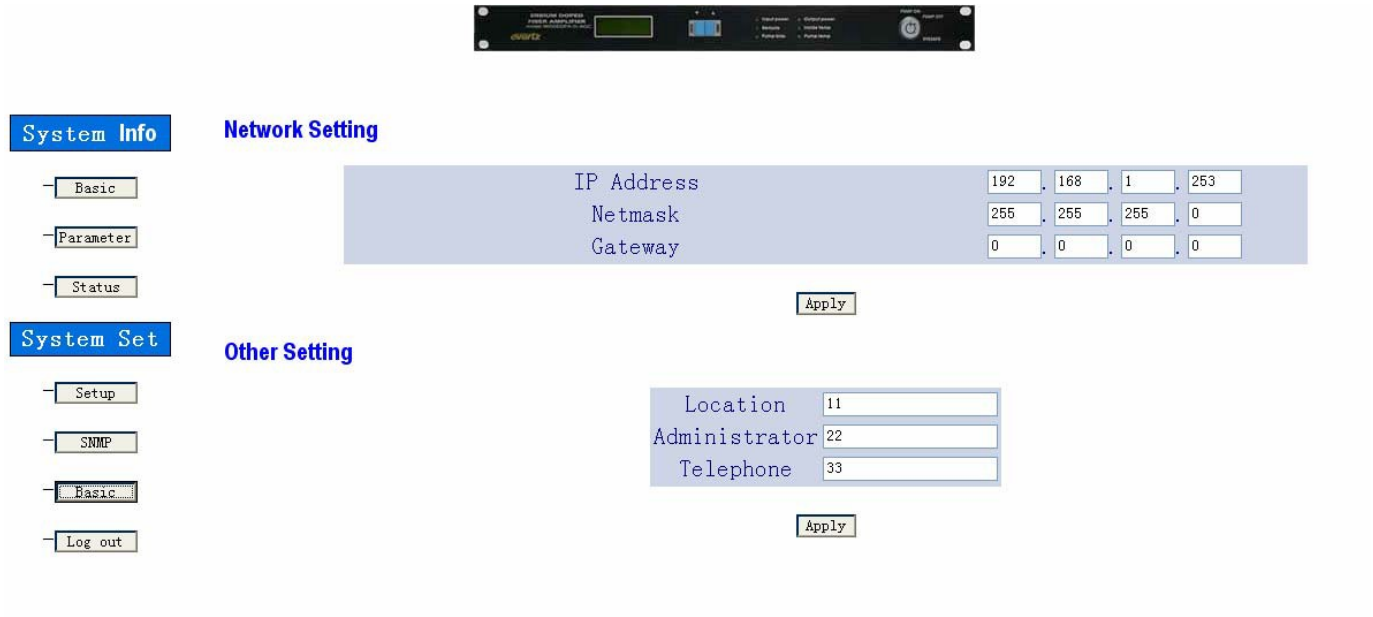


Figure 6-10: Network & Other Setting

Log out:
Click [Log out] to exit, it is necessary to log in again with the name and the password.

7. FAQ

Q: Why communication failed between management server and SNMP agent.
A: Please try the following steps first.

a) Make sure physical link is connected.

b) Test the connection to the administrative station through ping orders.

c) Check your IP setting (IP address, sub netmask and broadcasting address) make sure it is correct. If SNMP administrative station is in different networks, make sure to establish a suitable gateway IP address.

d) If SNMP can't communicate to the management server and SNMP agent, please check SNMP parameter.

e) Check read community and write community.

f) If traps are not received check whether or not the address of the administrative station is trap address, and whether the IP address and community are correct.

If the problem cannot be solved through above steps, please contact Evertz.