



OTEB-CO-P PRE-AMP EDFA INSTRUCTION MANUAL



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SAFETY WARNINGS

LASER RADIATION



The OTEA-CO-P EDFA emits invisible radiation that can cause permanent eye damage. **AVOID DIRECT EXPOSURE TO BEAM.** Operate the EDFA only with the proper optical fiber installed in the optical connector. Power to the OTEA-CO-B EDFA should be turned off or preferably, disconnected whenever the optical connector cover is opened and there is no installed fiber (as when the fiber connector is being installed or removed from the optical connector). When the amplifier is working in normal state, the output power of light with wavelengths in the invisible range (infrared light) may exceed +26dBm (400mW). Therefore, to avoid damaging your eyes, do not look into the output port of the EDFA directly.

NEVER look at the end of the fiber to see if light is coming out. **NEVER!** Most fiber optic laser wavelengths (1310nm and 1550nm) are totally invisible to the unaided eye and will cause permanent damage. Always use instruments, such as an optical power meter, to verify light output. Use extreme care with magnifying glasses, microscopes, etc.

NEVER look into the output of the EDFA or a fiber connected to an EDFA.

NEVER clean an optical connector with optical power present.

NEVER look into or use any optical instrument to view the distant end of a fiber that may be connected directly or via an optical splitter, to a transmitter or EDFA that may be operating. This specifically applies to fibers that are to be connected to receivers (such as the OTPN-2000C) or other devices at any distance from the laser transmitter or EDFA.

ALWAYS read the product data sheet and the laser safety label before powering the product. Note the operation wavelength, optical output power and safety classifications. If safety goggles or other eye protection are used, be certain that the protection is effective at the wavelength emitted by the device under test **BEFORE** applying power.

ALWAYS connect a fiber to the output of the device **BEFORE** power is applied. Power should never be applied without an attached fiber. If the device has a connector output, a connector should be attached that is connected to a fiber. This will ensure that all light is confined within the fiber waveguide, virtually eliminating all potential hazard.

HIGH VOLTAGE

The OTEA-CO-P EDFA contains no user serviceable parts. There is exposed high voltage inside this unit. Only authorized factory service technicians should open the unit with power applied.

SHOCK HAZARD

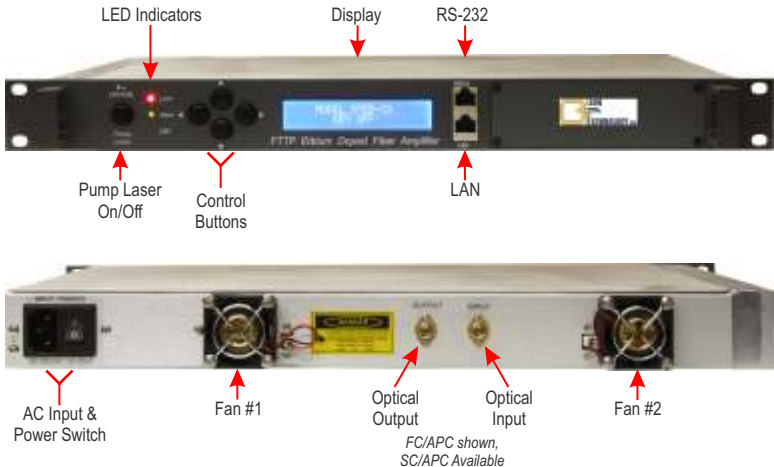
The OTEA-CO-P EDFA is designed for indoor use only. Direct exposure to moisture must be avoided. If you have questions about laser safety procedures, please call Olson Technology before powering your product. The fiber amplifier is sensitive equipment. Do not open the case of the amplifier to avoid damaging the internal component devices. Opening the case of the amplifier without the written permission of Olson Technology, Inc., will void the warranty.

INTRODUCTION

Olson Technology, Inc. provides a wide range of Erbium Doped Fiber Amplifiers (EDFA's), for 1550nm HFC networks that feature low noise figure, stable output power and excellent environmental stability. EDFA's are comprised of two main parts: the gain module and the external control system. The gain module amplifies the optical signal in 1550nm wavelength band (1540-1560nm typically). The external control system allows the operator to ensure that the gain module is working optimally. Controlled by microprocessor, it monitors the states of the gain module and adjusts all the parameters to ensure a stabilized output power of the gain module. This system also provides warnings via the front panel indicator LED and a digital display. The LCD on the front panel shows the detailed working parameters of the EDFA. This information can also be accessed via the standard RS-232 interface via an external computer.

The OTEB-CO-P is a preamplifier EDFA that is intended for use with very small optical input signals. It also provides extraordinarily high optical gain and low noise figure.

OPERATION PANEL DESCRIPTION



Menu #5 - OUTPUT - Optical Output Power (dBm)

Menu #6 - PUMP BIAS1 - Pump Laser Drive current (mA) - Typically $\leq 1,000$ ma

Menu #7 - TEC1 - Laser Cooling Current (Amps)

Menu #8 - PUMP TEMP1 - Laser temperature ($^{\circ}$ C)

Menu # 9 - Internal **+5V** Power Supply - Power supply voltage indication. If it varies more than ± 0.5 Volts from +5 Volts, an alarm will be shown.

Menu # 10 - Internal **-5V** Power Supply - Power supply voltage indication. If it varies more than ± 0.5 Volts from -5 Volts, an alarm will be shown.

Menu # 11 - IP - IP Address Setting Menu

Menu # 12 - UNIT TEMP - Case temperature. Must not be below 0° C or above $+55^{\circ}$ C.

Menu # 13 - SUB - Sub-Mask Setting Menu

Menu # 14 - GW - GW Address Setting Menu

Menu # 15 - TR1 = Trap Address Setting Menu

Menu # 16 - TR2 - Trap Address Setting Menu

INITIAL POWER-UP

- 1) Unpack and inspect the unit for any shipping damage.
- 2) Remove the covers on the **Optical Input** and **Optical Output** on the rear panel. Connect the fibers in your system to these connectors. NEVER power up the unit without fibers connected to these connectors.
- 3) Be sure the optical input signal is present on the input fiber.
- 4) Connect the power cord to the rear of the unit and plug in the AC power cord.
- 5) Turn on the AC Power using the switch on the rear panel.
- 6) The **Laser** LED on the front panel should now be **RED**. This indicates that the pump laser is off.
- 7) If the system you are connected to is ready to receive the EDFA output, then press the **Pump Laser** button. The **Laser** LED should now be **GREEN**. The EDFA is now operating and the optical output is now active.
- 8) If the EDFA needs to be temporarily disabled, press the **Pump Laser** button so the **Laser** LED turns **RED**. If fibers are going to be disconnected, always remove the AC power cord.

STATUS DISPLAY PANEL OPERATION

The microprocessor software monitors the function and allows the control of a number of system parameters. Press the ◀ and ▶ buttons to scroll through the eighteen(18) menu items listed below. Press the ▼ and ▲ buttons to modify key working parameters.

Menu# 0 - Descriptor - Equipment Description (Default display)

Menu# 1 - Descriptor - Show Parameters

Menu# 2 - S/N - Product Serial Number

Menu# 3 - INPUT - Optical Input Power (dBm)

Menu# 4 - Minimum Input Level - The Lowest Optical Input Power (dBm) that will turn on the EDFA. Can be set as low as -50dBm.

OTHER MENU COMMENTS

1. When the optical input drops below the programmed minimum (See Menu # 4 above), the pump laser power turns off and the EDFA will have no output.
2. Laser temperature (**TEMP1**): ($^{\circ}\text{C}$). The laser temperatures setting is usually in the range of $+20^{\circ}\text{C}$ to $+30^{\circ}\text{C}$.
3. Bias current (**BIAS**). This is the most important EDFA operating parameter. When it climbs too high, it will prompt a warning, and automatically shut off the laser power supply to protect the laser from damage.
4. $+5\text{V}$ voltage (**+5V**) $> \pm 0.5\text{V}$ will prompt a warning.
 -5V voltage (**-5V**) $> \pm 0.5\text{V}$ will prompt a warning.

OTHER NOTES ON OPERATION

- The EDFA should have good AC grounding. Always use an approved three-wire AC plug.
- If the units fails or if the fuse blows, contact Olson for service.
- Optical reflection loss must be $< -55\text{dB}$. To achieve this the EDFA uses APC optical connectors. Other connector types, such as PC or UPC, cannot be used with the EDFA. Keep the connector clean when installing the optical cables. Clean it with lint-free tissue with anhydrous alcohol after several rounds of connection and disconnection from the unit.
- **NEVER clean the optical connectors with the unit powered!**
- **NEVER power up the unit without terminated fibers connected.**

PERFORMANCE SPECIFICATIONS
Optical Characteristics (with SM 9/125 μ m Fiber)

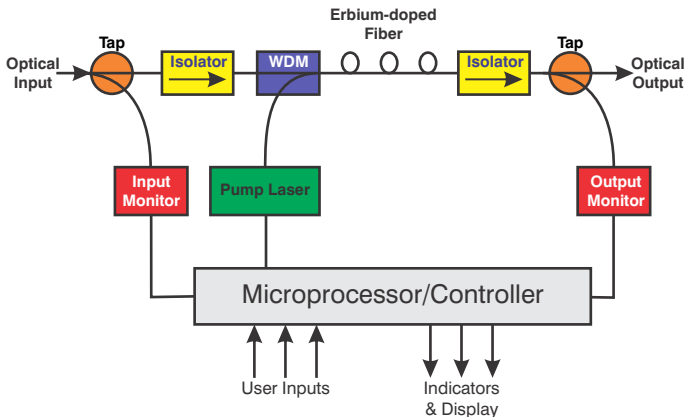
Parameter	Min	Typ	Max	Units
Operating Wavelength	1540		1560	nm
Input Power Range	-10		+10	dBm
Noise Figure (-30dBm In)		3.5		dB
Noise Figure (-10dBm In)		4.0		dB
35dB Gain Unit				
Optical Gain (-30dBm In)		35		dB
Optical Output (-30dBm In)		+5		dBm
45dB Gain Unit				
Optical Gain (-30dBm In)		45		dB
Optical Output (-30dBm In)		+15		dBm
Polarization Dependent Loss			0.3	dB
PMD Gain			0.5	ps
Reflection Loss	-55			dB
Input/Output Isolation	30			dB
Pump Power Leakage			-30	
Optical Connector	SC/APC or FC/APC			
Network Interface	RS-232/RJ45			

Electrical, Physical & Environmental Characteristics

Parameter	Min	Typ	Max	Units
Operating Temp. Range	-5		+65	°C
Storage Temp. Range	-40		+80	°C
Relative Humidity ₁	10		90	%
AC Power Supply Voltage	+90		+265	V _{AC}
DC Power Supply Voltage	-72	-48	-30	V _{DC}
Power Consumption		15	25	W
Size (W) x (D) x (H)	19	14.5	1.75	Inches

NOTES: 1) Non-condensing.

OTEB-CO-P EDFA BLOCK DIAGRAM



Ordering Information

Model OTEB-CO-P-35-yy-pp-z/S Pre-Amp EDFA, 1 Out, 35dB Gain at -30dBm In

Model OTEB-CO-P-40-yy-pp-z/S Pre-Amp EDFA, 1 Out, 40dB Gain at -30dBm In

Model OTEB-CO-P-45-yy-pp-z/S Pre-Amp EDFA, 1 Out, 45dB Gain at -30dBm In

Where

yy Optical connector type; SA = SC/APC, FA = FC/APC

pp Power; AC = AC power (Universal AC), DC = DC power (48V_{DC})

z Optical Connector Position (Omit = Back, F = Front)

/S Designates unit with SNMP. Omit for no SNMP