

High-Power 1550nm Erbium Doped Fiber Amplifier OTEB-CL-B Series

OPERATION MANUAL



1RU Model - Combined Output Power up to 1,000mW (+30dBm)



2RU Model - Combined Output Power up to 5,000mW (+37dBm)

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1.0 PRODUCT SUMMARY

The OTEB-CL-B series high-power, single-mode EDFA is characterized by low noise and high linearity. It offers a flexible, low-cost solution for large area distribution. The OTEB-CL-B series incorporates advanced design techniques for heat dissipation, which assures reliability and stable operation of the PUMP laser(s). RS-232 and RJ-45 on the front panel offer serial communication and SNMP network interface. The LCD displays all the parameters of the unit and alarms. The laser will be automatically switched off if the optical input power is too low.

Total Output Power Capability (1RU & 2RU Models)

OTEB-CL-B: 1RU chassis, total output power >1000mW, offers up to 16 optical outputs.

OTEB-CL-B: 2RU chassis, total output power >5000mW, offers up to 64 optical outputs.

2.0 INSTALLATION

2.1 Unpacking

- Inspect the shipping boxes for any obvious damage.
- Unpack the unit.
- Inspect the appearance of the unit for any shipping damage.
- Document and inform the shipping company, if any damage is found.
- Save the shipping boxes and their inserts for future shipment in case the product needs repair.

NOTE: When shipping the EDFA back to the manufacturer, the manufacturer does not accept responsibility for the damage caused by non-use the original packaging.

2.2 EDFA Mounting and Power Connection

1. Place the unit into a 19-inch wide rack or cabinet. Make sure to leave a 1.75-inch (1RU) space above and below the unit for cooling.
2. The OTEB-CL-B series 1550nm EDFA operates at temperatures between 0°C to +50°C (+32°F to +122°F). We recommend +25°C (+77°F) environment temperature. Humidity is 95% maximum (non-condensing conditions). We recommend operating in a dust-free environment.
3. The equipment can be powered by AC or DC. Power supply requirements:

AC input	94-245V _{AC} , 50-60Hz
DC input	36-60V _{DC} , floating
Power consumption (Max)	50W (1RU), 150W (2RU)

The EDFA must have good grounding with grounding resistance <4Ω.

2.3 Optical Connection

Clean all fiber patch cords before connecting to the EDFA. Optical Input is nominally -7dBm to +7dBm. In some cases it is usable from -10dBm to +10dBm, but an alarm may be indicated.

ALWAYS be SURE that all power is removed from the EDFA before optical connectors are mated or unmated. Eye damage and EDFA damage may result if the EDFA is powered while connectors are cleaned or mated/unmated.

Cleaning Guidelines:

Fiber Patch cord connectors

- Remove the dust cap of the fiber connectors and clean the fiber connector tip with a high-quality fiber cleaner such as the Senko Fiber Optic Cleaner (shown below). Check if there are scratches or debris on the connector surface by using a microscope (400X magnification recommended).

Fiber Optic Cleaner



- If no scratches or debris is found, the connector is ready for connection. If scratches or debris is found, repeat the fiber patch cord connector cleaning. Severe scratches may require replacing the connector.

Fiber Bulkhead Connectors

- Compressed air may be used to clean fiber bulkhead connectors. Use compressed air according to the following minimum specifications:
 - Non-residue, inert gas for precision dust removal
 - Ultra-filtered to < 0.2 microns
 - Recommended for optical systems
- Using compressed air as listed above, remove the bulkhead dust cover and hold the can of compressed air about 6 inches away from the connector. After spraying a few short bursts into the bulkhead, the connector is clean and ready for connection.
- If compressed air is not available, the transmitter fiber bulkhead connector may be cleaned by 2.5 mm alcohol-saturated sponge.

CAUTION: Use caution when handling fibers.

Do not exceed fiber manufacturer's pulling tension or bend radius specifications when removing fiber bulkhead connector plate.

2. Make sure the laser key switch on the front panel of the transmitter is in the OFF position.
3. Connect a fiber to the EDFA input. Attach the other end of that fiber to a 1550nm transmitter with optical output in the +3dBm range. Power up that transmitter once the fiber connections to the EDFA input are secure.
4. Connect a fiber patch cord from the output of the transmitter to the optical power meter. Be sure the optical power meter is rated for the optical power level expected at the EDFA output.
5. Turn the transmitter laser key switch to the ON position.
6. **NEVER disconnect any fiber connections to the EDFA while it is powered.**
7. Use the optical power meter to verify that the transmitter optical power meets the specification.
8. Turn the transmitter laser key switch to the OFF position.

3.0 EDFA CONTROLS, INDICATORS, AND ALARMS

This section of the manual will give an overview of the available menus in the OTEB-CL-B series EDFA and their descriptions. The user can scroll through the EDFA menus by using the push buttons that are on the front panel and are located beside the LCD screen.

OTEB-CL-B (1RU Style)



3.1 The Operation of the Panel

3.1.1 Starting Menu

- A. Plug in the power supply and connect all fibers.
- B. Turn on power switch in the back panel, Front panel display "KEY OFF"

Laser	Status LED	Red
Alarm	Status LED	Green
Link	Status LED	Off / Green
- C. Apply optical input power, then press laser start-up key switch. Front panel shows "KEY ON", Laser status lamp turns green from red.

3.1.2 Start-up Main Menu

Press ▲/▼ button and the following menu will be displayed in sequence.

- | | |
|-------------------------|--|
| Menu #1 - Model | Displays the model of this equipment |
| Menu #2 - S/N | Displays the serial number of this equipment |
| Menu #3 - INPUT | Displays the input optical power in dBm. |
| Menu #4 - OUTPUT | Displays the output optical power in dBm. |
| Menu #5 - BIAS1 | Displays the current of PUMP1 |
| Menu #6 - BIAS2 | Displays the current of PUMP2 |
| Menu #7 - BIAS3 | Displays the current of PUMP3 |
| Menu #8 - BIAS4 | Displays the current of PUMP4 |
| Menu #9 - BIAS5 | Displays the current of PUMP5 |
| Menu #10 - BIAS6 | Displays the current of PUMP6 |
| Menu #11 - BIAS7 | Displays the current of PUMP7 |
| Menu #12 - BIAS8 | Displays the current of PUMP8 |
| Menu #13 - BIAS9 | Displays the current of PUMP9 |
| Menu #14 - TEC1 | Displays the TEC current of PUMP1 |

Menu #15 - TEC2	Displays the TEC current of PUMP2
Menu #16 - TEC3	Displays the TEC current of PUMP3
Menu #17 - TEC4	Displays the TEC current of PUMP4
Menu #18 - TEC5	Displays the TEC current of PUMP5
Menu #19 - TEC6	Displays the TEC current of PUMP6
Menu #20 - TEC7	Displays the TEC of PUMP7
Menu #21 - TEC8	Displays the TEC current of PUMP8
Menu #22 - TEC9	Displays the TEC current of PUMP9
Menu #23 - TEMP1	Displays the laser temperature of PUMP1
Menu #24 - TEMP2	Displays the laser temperature of PUMP2
Menu #25 - TEMP3	Displays the laser temperature of PUMP3
Menu #26 - TEMP4	Displays the laser temperature of PUMP4
Menu #27 - TEMP5	Displays the laser temperature of PUMP5
Menu #28 - TEMP6	Displays the laser temperature of PUMP6
Menu #29 - TEMP7	Displays the laser temperature of PUMP7
Menu #30 - TEMP8	Displays the laser temperature of PUMP8
Menu #31 - TEMP9	Displays the laser temperature of PUMP9
Menu #32 - +5V Monitor	Displays the voltage
Menu #33 - -5V Monitor	Displays the voltage
Menu #34 - UNIT TEMP	Displays the unit's case temperature
Menu #35 - IP	Displays the IP address (Adjustable)
Menu #36 - SUBNET	Display the address of net mask (Adjustable)
Menu #37 - GATEWAY	Displays the gateway address (Adjustable)
Menu #38 - TRAP ADDR1	Displays the TRAP1 address (Adjustable)
Menu #39 - TRAP ADDR2	Displays the TRAP2 address (Adjustable)

2.1.1 Changing Parameters

Press the ▼ key to select the address menu to be updated. Press the ◀ key to choose the change place. Push the ▶ key to increment the value by one. Press the ▼ key to the exit the address and save it.

For example, update the IP setup menu, IP: 192.168.000.015; to change 5 to 6, use the ◀ key to choose the number 5, then press the ▶ key to change 5 to 6. Finally, press the ▼ key to save updated IP: 192.168.000.016

4.0 PORT AND CABLE ASSIGNMENTS

OTEB-CL-B series provide the following management ports:

RS-232 port: Suitable for examining OTEB-CL-B parameters and some system configuration.

SNMP: Simple network management protocol.

Before connecting to one of the OTEB-CL-B series ports, please read the following instructions and port connectivity requirements.

4.1 Management Port (RJ-45)

4.1.1 Port Description

The OTEB-CL-B series management port connector type is RJ-45.

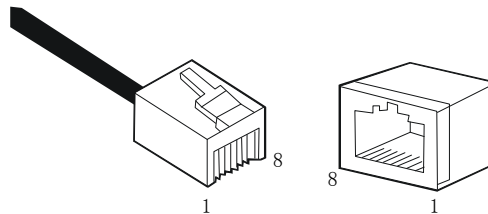


Figure 4.1.1 RJ-45 Connector Plug and Socket

The Management port (RJ-45) can be connected to any device that uses a standard network interface (e.g., a workstation, server, bridge or router). The RJ-45 connector can be connected with similar network equipment (i.e. a network Hub). Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-Ohm Category 3, 4 or 5 cable for 10 Mbps connections or 100-Ohm Category 5 cable for 100 Mbps connections. The maximum allowable cable length is 100 meters.

4.1.2 Pin assignment

When the network management cable (RJ-45 connector in each side) connects NMS PC and OTEB-CL-B series directly, use a straight cable. See Figure 4.1.2.

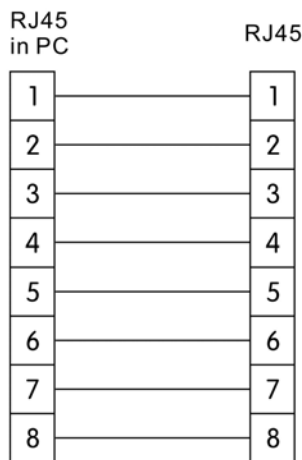


Figure 4.1.2 RJ-45 Connector Straight-Through Connection

PIN	Workstation port	MDI
1	Input receive data+	Output transmit data+
2	Input receive data-	Output transmit data-
3	Output transmit data+	Input receive data+
6	Output transmit data-	Input receive data-
4, 5, 7, 8	Unused	Unused

Table 4-1 RJ-45 Pin Assignment

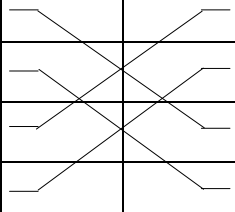
Straight				Cross			
(OTEB-CL-B)		(Adapter)		(OTEB-CL-B)		(HUB/ OTEB-CL-B)	
1 IRD+	_____	_____	1 OTD+	1 IRD+		1 IRD+	
2 IRD-	_____	_____	2 OTD-	2 IRD-		2 IRD-	
3 OTD+	_____	_____	3 IRD+	3 OTD+		3 OTD+	
6 OTD-	_____	_____	6 IRD-	6 OTD-		6 OTD-	

Table 4-2 Straight and Cross-Cable Connection

4.1.3 Port Connection

OTEB-CL-B series automatically detects the Ethernet cable type (Straight-through or Crossover), so either type can be used. An Ethernet twisted pair cable should be connected between the RJ-45 connector of the OTEB-CL-B series and any device with a standard network interface (such as a work station or server), or to a network interconnection device (such as a bridge or router).

- 1) Ensure that the device to be connected has a 10BASE-T or 100BASE-TX network interface card (NIC).
- 2) Prepare a twisted pair Ethernet cable with RJ-45 plugs on each end. Use Cat 3, 4 or 5 cable for standard 10Mbps Ethernet connections, or Cat-5 cable for 100Mbps Fast Ethernet connections.
- 3) Plug one end of the cable into the computer's NIC and plug the other end into any RJ-45 port of the OTEB-CL-B series. The OTEB-CL-B RJ-45 port supports both 10Mbps and 100Mbps Ethernet connections. Ensure that the plug's locking tab clicks into proper position.

Caution: Do not plug a phone jack connector into the RJ-45 port. This may damage the EDFA. Instead, use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

Note:

- 1) Connect other compatible OTEB-CL-B series or network hub, use direct or cross-connect cable to connect to the RJ-45 port in other device.
- 2) Ensure that the twisted pair cable length does not exceed 100 meters.
- 3) Cat-5 cable is recommended for all network connections to avoid confusion or inconvenience, when upgrading to Fast Ethernet devices in the future.
- 4) Cascade length provision: IEEE 802.3 standard prescribes that at most four hubs (such as repeaters) can be cascaded.

4.1.4 Connection Management (Out-Band)

Remote management can be performed through the dedicated Management port (10/100BASE-TX port) on the front of the OTEB-CL-B or any 10/100BASE port of OTEB-CL-B.

Before the Management port is accessed through the LAN port, please configure the IP address and subnet mask by serial port according to the network configuration requirements.

4.2 RS-232 Console port (DB9)

4.2.1 Port Description

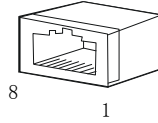


Figure 4-2.1 DB9 interface

DB9 interface is a standard connectors used in RS-232 in series communication connects. OLT adopts 9-pin standard connector which is same as the connector of PC COM interface.

4.2.2 Pin Assignment

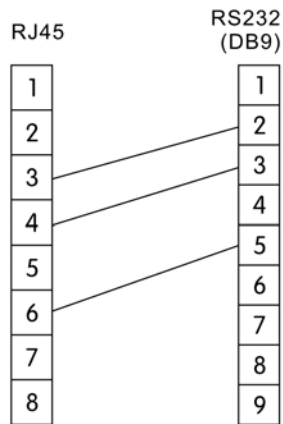


Figure 4-2.2 DB9/RS-232 pin assignment

Pin	Distribution
2	RXD: accepting of data
3	TXD: transmitter data
5	SG: signal

Table 4-3 RS-232 Pin information

4.3 Power Connection

4.3.1 Connection Description

The power module provides stable operating power for the system. The input voltage is 90-265V_{AC} or optional -30 V_{DC} to -72V_{DC}. The Power module provides output various DC voltages to meet the power all the components in the system.

5.0 FAULTS

The OTEB-CL-B series EDFA monitors system operation and offers warning of potential problems. It can correct the majority of problems of the equipment, such as: Equipment tolerance, laser aging, and changing temperature. The PUMP laser will usually go on working when an alarm is present. The alarm will disappear if the system parameter recovers into normal range. Some serious warnings can be eliminated by restarting the power supply of the equipment.

Most warnings will be sent out when the a system parameter is close to or exceeds the permitted range. In most cases, users cannot modify these status conditions. Status condition limits require special programming equipment, so the modification can only be made in the factory.

5.1 Warning Status

When the pump laser is in warning status, the status LED will turn red and note of the status will be briefly displayed on the screen. The warning will not necessarily make the EDFA stop running. If the warning is removed, it shows that the offending parameter has returned into normal limits. The screen & LCD will return to their normal status and there is no need for intervention. However, the problem that caused the alarm should not be ignored, because there may be some serious system faults.

Unit status	Status display	LED color	Explanation
Laser is off	Key Off	Red	The EDFA isn't operating. It is shut down.
Case temperature	-	Red	Warning when the temp $\geq 60^{\circ}\text{C}$.
Input	Input Low	Red	Optical output power is low.
Output	Output Low	Red	Optical output power is low.

Table 5-1 Warning Status

5.2 Alarm Status

When the pump laser sends out a warning, it may stop working to prevent damage. The alarm is because some parameter has exceeded its safe working limits or some situation that may cause damage to the laser. The alarm can usually be eliminated by restarting the power supply or resetting the key switch. If the user cannot eliminate the alarm, please contact Olson Technology, Inc.

5.3 Fault Prevention

Please read the below information to prevent some potential problems.

1. Please place the EDFA in a temperature environment of 0°C to +50°C. We suggest placing the EDFA in low dust environment.
2. Leave a 1RU (1.75") gap above and below the unit to allow adequate cooling.
3. Ensure the rear panel fan & front panel sockets are clean for air flow to let the rear panel fans to cool the unit.
4. Check the power supply. Verify that all the connections are sound.
5. Keep the optic fiber connectors and bulkhead connectors clean. Prevent output optic power decreasing caused by optic leakage.

NOTE: ONCE CONNECTED, THERE IS NO NEED TO ROUTINELY DISCONNECT THE FIBER OPTIC CONNECTORS TO CLEAN THEM. AS LONG AS THEY ARE CONTINUOUSLY CONNECTED, NO DIRT WILL GET IN THE CONNECTIONS.