



AEDFA-M

Operation Manual

**Medium Power
Erbium Doped Fiber Amplifier**



CAUTION –

USE OF CONTROLS OR ADJUSTMENTS OR PERFORMANCE OF PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.



THE USER MUST READ THIS MANUAL BEFORE OPERATING THE PRODUCT. OPERATIONS OTHER THAN THOSE DESCRIBED IN THIS MANUAL MAY RESULT IN PERSONAL INJURY AND DAMAGE TO THE PRODUCT.



Note that any attempt to open or fix the equipment without prior approval by Amonics Limited voids the warranty.

Revision History

Revision	Date (DD-MM-YYYY)	Summary
R7.00	09-10-2014	Manual introduced.
R7.01	01-01-2015	Add section regarding to laser safety label.
R7.02	26-02-2015	Modify operation section.
R7.03	20-07-2015	Replaced the picture of nameplate.
R7.04	18-08-2015	Add warning label for Class 4 on 3.1 Front Panel

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Open Source License Acknowledgement

This product uses the following third-party open source software in addition to our proprietary software:

- FreeRTOS is an open-source project under the Modified GPL Licensing. Please visit <http://www.freertos.org> for details.
- uIP is an open-source project under the BSD-style Licensing. Please visit <http://www.sics.se/~adam/uip/index.php> for details.

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1. Precautions



CAUTION!

Read and follow this section before operation. Failing to following the instruction voids the warranty.

1.1 Operating Precautions



NEVER USE ADAPTOR OR CONNECTOR TYPE OTHER THAN SPECIFIED IN THE TEST REPORT. If measurement instruments accept different connector type, use hybrid patch-cords.



Ensure the optical input signal is within the range specified in the test report.



Avoid using any solvent or vaporizing chemical to clean the panel or case. It may result in damage to the surface and internal circuits.

1.2 Optical Emission Safety Precautions



This product emits medium power invisible laser radiation from the optical connector(s). It is classified as a **CLASS 3B** laser product according to IEC 60825-1:2007. **The optical output is hazardous to eyes. INVISIBLE LASER RADIATION - AVOID EXPOSURE TO BEAM.**

NOTE:



Classification is solely based on the Accessible Emission Limit (AEL) of the optical output power. The implementation of the engineering requirements required by IEC 60825-1 remain the responsibility of the user because this product is intended for use as a component of a larger laser system which is itself subject to IEC 60825-1.



THE OPTICAL OUTPUT MUST BE DISABLED WHEN SWAPPING PATCH-CORD CONNECTIONS.



THE USER SHOULD NEVER OPEN THE EQUIPMENT CASE; any attempt will void the warranty and impose the risk of exposure to hazardous invisible laser radiation. **If the product is suspected to be defective, DO NOT USE THE UNIT,** and contact the manufacturer for service and repair arrangement. **NO SCHEDULED MAINTENANCE IS NECESSARY TO KEEP THIS PRODUCT IN COMPLIANCE.**

1.3 Electrical Safety Precautions



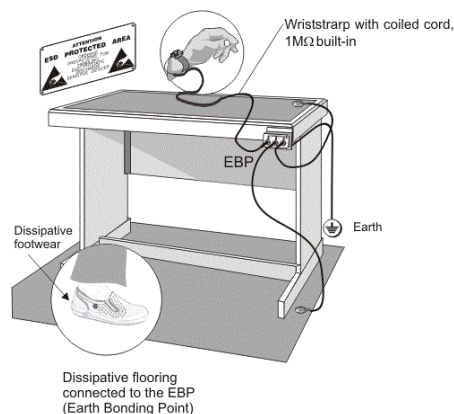
The equipment is certified for EMC requirements. **THE USER SHOULD NEVER OPEN THE EQUIPMENT CASE**; any such attempt will void the warranty and may result in electric shock and EMI attack to equipment in the vicinity.



This product can be damaged by ESD. ESD damage can range from subtle performance degradation to complete device failure. The product should be handled with appropriate precautions. Failing to observe proper handling and installation procedures can cause damage.

Protection against electrostatic discharge (ESD) is vital when connecting/disconnecting accessories (e.g. end-cap, electrical cables, etc.) to/from the unit. Static electricity can build up on human body and can easily damage sensitive internal circuit elements when discharged. Static discharges too small to be felt can cause permanent damage. To prevent damage to the unit, always ground:

- the unit by placing it on a grounded, conductive table mat.
- the personnel by wearing a grounded wrist strap that is connected to a grounded conductive table mat and have a 1 M Ω resistor in series with it, and wearing dissipative footwear (e.g. heel strap) on a grounded, conductive floor.
- the accessories before cleaning, inspecting, or making a connection/disconnection to/from the unit. For example, it can be achieved by holding the metallic parts of the accessories while wearing a grounded wrist strap.



2. General Information

2.1 Product Overview

This product is an ultra-stable high gain optical amplifier unit designed for applications requiring high efficiency optical amplification. It is a self-contained, compact module designed to supply high and stable gain across the specified range of the communication window.

2.1.1 Features

- High saturation output power
- High gain
- High stability
- Low noise

In addition, for polarization maintaining (PM) models:

- High polarization extinction ratio

2.1.2 Product Specification and Test Report



When you receive this product, please verify that a product specification and a test report are included. These documents contain important parameters regarding to the optical and electrical specifications of the product.

2.1.3 Mechanical Specifications

Dimension:	120 × 100 × 18 mm (D × W × H)
Case:	Anodized aluminum

2.2 Accessories

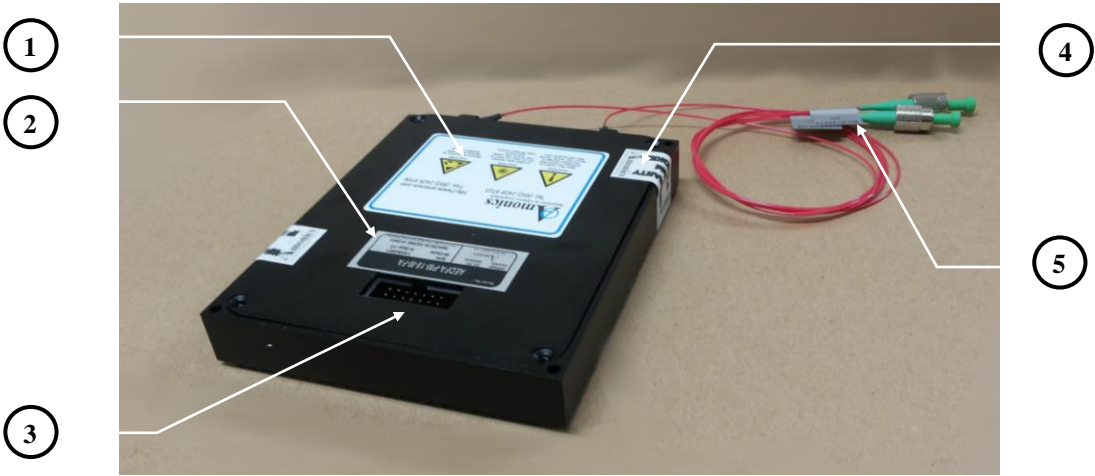


When you receive this product, please verify the accessories specified in the **product packing list** are included. If there are any discrepancies, please notify Amonics Limited promptly.

This product was carefully inspected before it was dispatched. It should be in proper working order upon receipt. You should, however, inspect the product for any damage that may have occurred in transit. If the shipping container or the packing material is damaged, keep it until the contents of the shipment have been checked to be free of mechanical and electrical damages. Notify Amonics Limited promptly if any notable damage is found.

3. Product Description

3.1 Module



Feature	Function
(1) Laser Explanatory Labels	<p>This label describes the classification and potential hazards of the optical output.</p> <div></div>
(2) Nameplate / Manufacturer ID	<p>The nameplate records the equipment's model number, serial number, manufacture date, and power supply information.</p> <div></div>
(3) Control Interface Socket	<p>This 2.54mm (2x7) 14-pin IDC connector socket provides an interface to control the unit. Please refer to the next section for pin definition.</p>

(4) Warranty Seal

The warranty seal(s) ensure us that the module has not been opened. **The warranty will be considered void if any of the seals have been tampered with or removed.**



(5) Optical Connector

The optical connector(s) for optical input/output. The fiber-optic connector type is stated in the test report:

FC/APC:	Ferrule Connector with Angled Physical Contact.
FC/UPC:	Ferrule Connector with Ultra-polish Physical Contact.
SC/APC:	Subscriber Connector with Angled Physical Contact.
SC/UPC:	Subscriber Connector with Ultra-polish Physical Contact.
LC/APC:	Lucent Connector with Angled Physical Contact.
LC/UPC:	Lucent Connector with Ultra-polish Physical Contact.



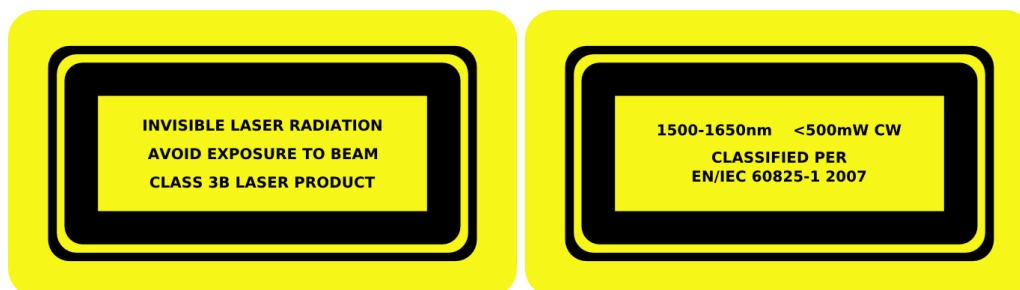
The optical output connector(s) serve as apertures that emit Invisible Laser Radiation when the optical driver(s) is enabled.



Proper cleaning and handling for the connectors are required to keep the equipment in proper performance.

3.1.1 Laser Safety Label













This module is intended to be used as a component of a larger laser system which is itself subject to the requirements of IEC 60825-1. The following laser safety labels are provided within the package. To fulfill the labeling requirement of IEC 60825-1, please affix these labels on the outside of the laser system where they are clearly visible to the users.



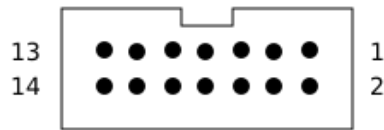
3.1.2 Optical Connectors and Receptacles



NEVER USE ADAPTOR OR CONNECTOR TYPE OTHER THAN SPECIFIED IN THE TEST REPORT. If measurement instruments accept different connector type, hybrid patch-cords are recommended.

	Angled Physical Contact (APC) [Green]		Ultra-polish Physical Contact (UPC) [Blue]	
Ferrule Connector (FC)				
Subscriber Connector (SC)				
Lucent Connector (LC)				

3.2 Pin Definition



Pin	Name	Type	Pin	Name	Type
1	Vcc ⁶	P	2	Vcc ⁶	P
3	EN1# ¹	I	4	PD1 ⁴	O
5	Internal Use	-	6	Internal Use	-
7	GND	P	8	GND	P
9	Internal Use	-	10	GND	P
11	SET1 ²	I	12	CUR1 ⁵	O
13	Vref ⁷	O	14	TEC1 ³	O
Type: P = Power I = Input O = Output					

1. ENx# is the enable pin of the pump laser x. Shorting the pin to Ground will enable the optical power; Connecting to 5 VDC (or non-connected) will disable the optical power.
2. SETx controls the current set-point of pump laser x when the ENx# is shorted to ground. Apply 0 VDC for minimum optical output, and 5 VDC for maximum optical output.
3. TECx will measure 2.5 VDC when the pump laser's temperature is at set temperature of 25°C. For every one Volt change from 2.5 VDC, the pump laser temperature is off from the set temperature for 0.9°C. **These pins should be monitored to prevent the case temperature from exceeding the maximum operating temperature. Sufficient ventilation should be provided, otherwise, damage may occur in the unit.**
4. PDx will measure the voltage proportional to the pump laser power. The maximum PD voltage is 3.0 VDC. *Please refer to test report for the coefficient.*
5. CURx will measure the voltage proportional to the pump feedback current. *Please refer to test report for the coefficient.*
6. Vcc is the input voltage. Apply 5 VDC to this pin.
7. Vref is the 2.5 VDC reference output voltage.

4. Operation



CAUTION!

Read and follow the **SAFETY PRECAUTIONS** in this manual before operation. Failing to following the instruction voids the warranty.

4.1 Installation

1. Check that the power supply is set to 5 VDC. Turn off power supply.
2. Insert the power plug from power supply to the **Power Supply Header** of the unit.
3. Connect the IDC connector between the host controller and the **Control Interface Socket** of the unit.
4. Connect optical signal for amplification via the optical input receptacle using the adapter and connectorized patch-cord specified in the test report.
5. Connect the optical output receptacle using the specified adapter and connectorized patch-cord to obtain the optical output signal.

4.2 Enable Optical Output



1. Turn on the power supply.
2. Apply 0V to **EN#** to enable the optical output. Then increase the voltage at **SET** to increase the optical output power.

4.3 Disable Optical Output and Power-down

1. Reduce the voltage at **SET** to 0V. Then apply 5 VDC (or disconnect) to **EN#** to disable the optical power.
2. Turn off the power supply.

5. Physical Dimensions



Dimensions are in millimeters unless otherwise noted.
Connectors are for illustration only. Please refer to Product Description Section for details.

File name: Mechanical_Specification_100x120x18_V6.0.dwg						
Drawn By: Kel	Unit: mm	表面处理 氧化化黑	Tolerance: +/-0.5	Material: Aluminum	DWG No.: CID 3407	Rev: 6.0

6. Maintenance and Care

6.1 Troubleshooting

Symptom	Possible Cause (C) and Solution (S)
Optical output power is not high enough.	C: Driving set-point not turned all the way up. S: Increase the driving set-points by SET pin.
	C: No optical input or optical input power is too small. S: Check whether optical input is present or check optical input power is correct according to the test report.
	C: Optical connectors are dirty. S: Disable optical output and clean optical connectors.
	C: Use of incorrect optical receptacle. S: Use only the compatible optical receptacle indicated in the test report. If measurement instruments accept different connector type, then use hybrid patch-cords.
	C: Optical output connector damaged. S: Measure optical output power with power meter and compare it with the readout from T-O/P pin . Return to Amonics Limited for repair if the difference is high and cannot be corrected by cleaning the optical connectors
Optical output power is unstable.	C: Insufficient ventilation. S: Place unit in well ventilated area or supply additional fans for ventilation.
	C: Insufficient optical output isolation. S: Connect isolator of corresponding wavelength to optical output connector.
Unit does not power up.	C: Insufficient electrical voltage. S: Check that the electrical supply is at the specified voltage on the label.

6.2 Care of Connectors and Receptacles



Clean mating between optical connectors and receptacles prevents optical performance degradation. In addition, in high-power products, any contaminant (e.g. dust, oil, film residue, etc.) that blocks the fiber core can result in burning the optical end-face when the optical power is turned on.



There are two families of cleaning techniques depending on whether isopropyl alcohol is used. Dry-cleaning (without alcohol) is preferred over Wet-cleaning (with alcohol) because if the alcohol is allowed to evaporate slowly off the ferrule, it can leave residual material on the cladding and fiber core. This is extremely difficult to clean off and usually more difficult to remove than the original contaminant. Liquid alcohol can also remain in small cavities where it can re-emerge during fiber connection.



When cleaning optical connectors, the objective is to eliminate the contaminant and to provide a clean environment for the fiber-optic connection. **Remember that inspection, cleaning and re-inspection are critical steps which must be carried out before any fiber-optic connection is made.**

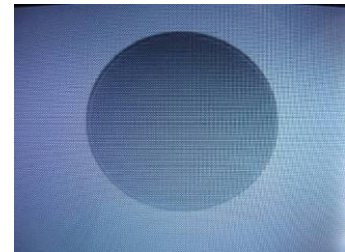
Single-mode Fiber (SMF)



Damaged: Replacement required



Dirty: Cleaning required



Clean: No cleaning required

Polarization-maintaining Fiber (PMF)



Damaged: Replacement required



Dirty: Cleaning required



Clean: No cleaning required

The use of One-Click™ Cleaners (<http://www.oneclickcleaner.com>) by Fujikura is recommended because it provides dry-cleaning for both connectors (patch-cords / pigtails) and receptacles.

In case of having difficulties in obtaining a compatible One-Click™ Cleaner, other cleaning techniques are available, such as that recommended by CISCO. The details can be downloaded directly from <http://www.cisco.com> or via this link: http://www.amonics.com/amonics/php/en/Inspection_and_Cleaning_Connections_Cisco.pdf

6.2.1 Cleaning Procedure



1. **Ensure the optical output power is turned off before the inspection commences.**
2. Remove the protective end-cap and store it in a small re-sealable container.
3. Inspect the fiber connector or receptacle with a fiberscope.
4. If the connector is dirty, clean it with a compatible One-Click™ Cleaner.
5. Inspect the fiber connector or receptacle with a fiberscope again.
6. If the contaminant cannot be removed, repeat the cleaning procedure until the end-face is clean.

Using One-Click™ Cleaner to Clean Optical Connectors	Using One-Click™ Cleaner to Clean Optical Receptacles
<p>① Open the lid of guide cap.</p> <p>② Insert the ferrule into a hole on the guide cap and push the body to the adapter until it clicks.</p>	<p>① Remove the guide cap.</p> <p>② Insert the nozzle tip into the adapter. Push the body to the adapter until it clicks.</p>

7. Support and Warranty

7.1 Support



Your product has been designed to provide years of trouble-free operation. Apart from cleaning the optical connectors and receptacles, no internal service is required provided that the equipment is properly handled, operated and kept away from contamination. **THE USER SHOULD NEVER OPEN THE EQUIPMENT CASE**; any attempt will void the warranty. If the product is suspected to be defective, please contact Amonics Limited for service and repair arrangement.

7.2 Warranty Policy

Amonics Limited warrants that each new product will be free from defective material and workmanship under normal use and service for a period of one (1) year for all products from date of shipment.

During the warranty, Amonics Limited will either repair or replace, at its discretion, any defective product (hereafter refer to as Product) within thirty (30) days after its receipt, and Amonics Limited shall return such repaired or replaced Product to the location from which it originated. Amonics Limited will be responsible for both material and labor required to effect all repairs under terms of the warranty, providing the Product is returned to Amonics Limited as specified in the warranty statement. The purchaser shall bear the freight charges incurred in returning the Product to Amonics Limited for examination, replace and / or repair of the Product.

The warranty does not apply if the Product has been modified by purchaser or subjected to misuse, neglect, or accident, or if the Product has been repaired or altered by an unauthorized service depot so that its performance or reliability has been impaired, or if the Product has had the serial number altered, effaced or removed; or if it has been damaged by accessories, peripherals, and other attachments not approved by Amonics Limited.

The warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to assume for Amonics Limited any other liability in connection with the sale of the Product.