



FiberPrime

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User Manual

Portable C-band 26dB-gain EDFA Instrument

in compact benchtop

(EDFA-C-26G-S, version 1.0b. January 28, 2015)



Safety

The input signal and pump laser output are de-multiplexed before the output, resulting in no remnant 980 pump power exiting the unit, however, with higher input power, this unit may be capable of emitting dangerous levels of light. **Do not under any circumstances look at the output of the unit through collimating or focusing optics unless the unit is turned off!** Containing a high power pump laser, use the utmost care when changing connections, and always turn the unit completely off before inspecting or cleaning any connectors which are attached to the unit's output.



Laser Safety and Electrical Compliance

- Class 1M Laser product. Max permissible output power around 1550nm: 136mW. Max wavelength range : 1525-1565nm.
 - Complies with IEC 60825-1, 60825-2 laser safety standards.
 - Complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.
- Complies with CE and other standards for electrical safety and EMI. The external AC-DC power supply comes with safety certificate from manufacturer. The EDFA instrument only needs low voltage 12 VDC power supply.

Introduction

C-band erbium-doped fiber amplifier (EDFA) in small enclosure. Fixed about 26dB-gain at small signal input and fixed >13dBm-output at large signal input. Low-cost and compact EDFA instrument for your lab experiment and project. It is based on high-reliable JDS 27-series 974nm pump laser and telecom-grade circuitry. Low-noise and stabilized laser driving and temperature control circuitry.

It can be used as pre-amplifier, line, and booster(post) amplifier.

Operating modes: constant-gain at small signal input, constant-power at large signal input.

It cannot be used as ASE broadband source without input light. You can spend extra to buy 1.55um LED output option, then you can get 8dBm broadband source by connecting LED output to EDFA input.

Small, light, portable, and also benchtop. It can be placed on either low workbench or high shelf.

Front panel: Optical Input and Output Ports with two FC/PC, FC/APC, SC/PC, or SC/APC fiber adapters (If you really need LC interface, we can modify from SC interface by adding a label and unused adapter, then front panel does not look so good). Power-on keylock switch, EDFA-enable button switch. Power-on green LED. EDFA-enable green LED.

Note: We have changed FC/APC adapter from bronze sleeve to ceramic sleeve of Japanese Seikoh brand, square shape, with top quality for SMF, since June 10, 2013.

Rear panel: 9-18V DC input. Typical 12V 1A.

The product comes with small external wall-mount power supply, its AC plug type will fit the wall socket of AC voltage in your country. Our available AC power plug types are A, C, G, I. Type A is most popular one, used in North and Centra America, China, Japan, Taiwan, and Thailand. We will give you type A power supply by default. Shipping fee may be higher if you need all four plug types.



Enclosure overall dimension: 21x21X8 cm (excluding power supply). 32x27x14 cm packed.
Net weight: 1.62kg (including power supply).

Enclosure material: Aluminum at rear panel and side extrusions, steel at top and bottom covers, copper at front panel. So whole enclosure is EMI shielded, only with several small holes at front/rear panels.

Standard package includes:

- Enclosure with EDFA module and drive circuitry.
- One wall-mount power supply.
- One pair of FC/UPC-FC/UPC (UPC is compatible with PC) or FC/APC-FC/APC SMF 3mm cable jumpers, 2-meter or longer. (or SC type)
- One pair of FC-FC (or FC/APC-FC/APC) adapters. (or SC type)
- Small qty of swabs to clean internal fiber connectors at front panel (Wilshire PN:1002).
- Gain, noise figure, and output power test report at several few input powers (-31, -25, -19, -13, -7, -1dBm, 3dBm by default). One test data sheet.
- User manual

Inspection

Before shipment, this unit has been found to be free of defects. The instrument's model/part number, serial number, and configuration are found on a label located on the back of the unit. The instrument's history is filed at the factory by part number and serial number.

Assembling Instrument after you receive the instrument

- Connect two fiber patchcords to the adapters on front panel. (**Please Do Not screw FC connector into FC adapter very hard which may make connector dirty ! Please always keep fiber jumpers connected on front panel adapters**). Put on the two adapters at other ends on fiber jumpers.
- Plug in the wall-mount power supply.

Getting Started

- Insert the key into key-lock switch on front panel.
- Turn on the key-lock switch on front panel.
- Press "EDFA ENABLE" button on front panel.

Cleaning optical connectors

After optical connectors plug in and pull out many times on adapters, the connector may not be easily cleaned, so we highly recommend that you always keep external fiber jumpers connected on front panel, and only clean the jumper connectors of far ends. You may need clean internal connectors on front panel in future, please use Fiber Optic Cleaner Pen (designed to clean the internal connector through the adapter of equipment panels).

Warranty: one year after delivery. See <http://www.lightwavestore.com/warranty%20and%20technical%20support.htm>

Note: Never open the instrument enclosure, or warranty will be voided.



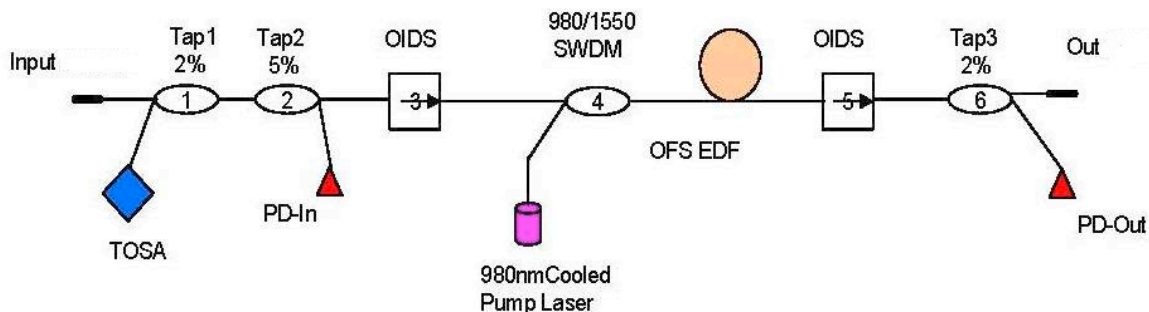
Applications:

- Instrumentation, Testing
- Metro and Long-haul communications and optical switching systems.
- LANS and MANs
- Laboratory use
- Cable television

Key optical features:

- Fixed gain at small signal: 25.5dB typical (min 24.5dB, max 26.5dB), at input signal from -19dBm to -13dBm (Gain will be reduced if input power is out of this range; Test result includes one connector loss).
- Fixed output power at >-13dBm input: 13dBm typical. Output power will be saturated and grow slower with input power after input power greater than -13dBm. Max output power at large input (-1dBm): >13dBm.
- Noise figure at input signal between -19dBm and -13dBm : 5dB typical. Noise figure is a little bit high at shorter wavelength, up to 6dB. Noise figure would be higher at <-19dBm input.
- Noise figure at large signal input: >5.5dB typical.
- Gain flatness: <1dB typically, at >-19dBm input signal power. There is small gain peak around 1532nm at small input signal, and there is small gain peak around 1558nm at large input signal.
- Dual-stage optical isolator at both input and output ports of EDFA.

Optical Block diagram



Ordering Information

Part number: EDFA-C-26G-S-FP for FC/PC adapter, EDFA-C-26G-S-FA for FC/APC adapter.
EDFA-C-26G-S-SP for SC/PC adapter, EDFA-C-26G-S-SA for SC/APC adapter.

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Specifications

Note: Optical power test is on internal fiber connectors. So gain result only includes one connector loss. The internal EDFA module was designed for 26dB gain between -19dBm and -13dBm input. Due to measurement accuracy, fiber connector loss (especially FC/APC), and possible EDFA module degradation after manufacture, our gain test results on many samples are between -24.5dB to -26.5dB in most wavelength region of C-band.

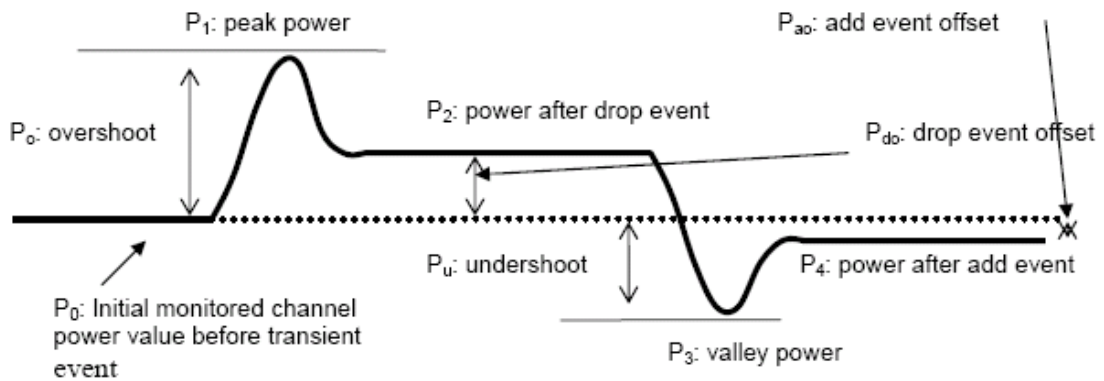
Following specifications are for fixed gain at the input signal between -19dBm and -13dBm.

Parameter	Min	Typical	Max	Unit	Note
Operation Wavelength	1529.16		1561.84	nm	(1). It can be used at wider wavelength range at lower gain and power performance
Input Power	-19.00		-13	dBm	(2). It can be used at wider range at lower gain and power performance
Gain	24.5	25.5	26.5	dB	(3). Gain near 1562nm or near 1529nm might be slightly out of specification.
Output Power	6.7		13.3	dBm	(3)
Noise Figure		5		dB	
PDG			0.3	dB	Polarization Dependent Gain
PMD			0.4	ps	Polarization Mode Dispersion
Input/Output Return Loss			35	dB	
Residual Pump Power at Output			25	dBm	
Traditional Transient Over/ Undershoot/Offset (Po) / (Pu) / (Pos)			±0.5	dB	For 6 dB add/drop within 3.2 nm band; Defined as in note (4) (7)
ON-OFF Transient Overshoot/Offset (Po) / (Pos)			±1.5	dB	From dark to -13 dBm input with rise time < 30 ns Defined as in note (5) (7)
Transient Suppression Time (Tts)		20	50	ns	Defined as in note (6) (7)
Transient Settling Time (Tst)			500	µs	Defined as in note (4) (7)
Operating temperature	10		40	°C	
Warm-Up time	5			Min	

Note:

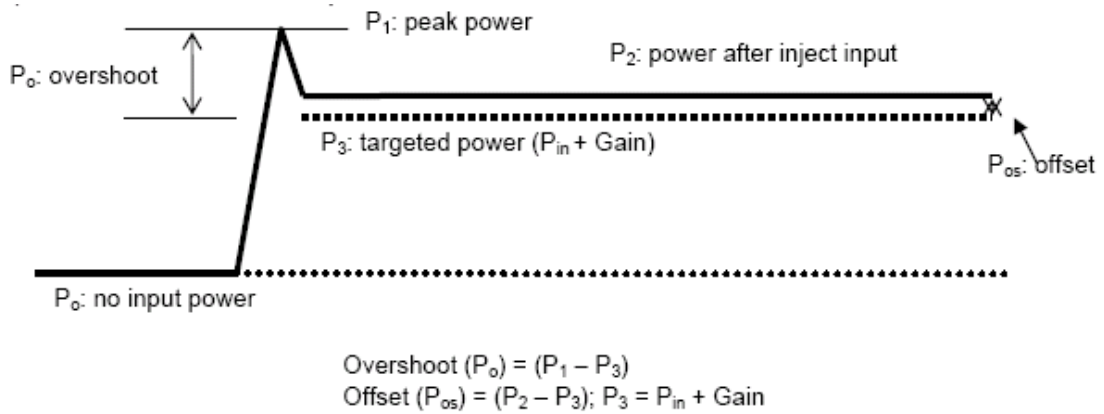
Unless otherwise specified, all values refer to EOL and over the operation temperature (0 to 70 °C). but in manufacturing, it may test at room temperature only when engineering test show the performance could be guaranteed in whole temperature range.

- (1) During operation, the input signals will be confined in one of the 3.2 nm band specified in Table 2. However, the band will be in the traditional C-band region as indicated here and the BOA should work in any one band.
- (2) -19 dBm is the minimum per channel input power. The maximum number of channel at this power level will be four. There will be only one channel at channel input power of -13 dBm.
- (3) Fixed gain operation, the output power follows the input power.
- (4) The definitions of traditional transient overshoot, undershoot and offset are as indicated in the following:



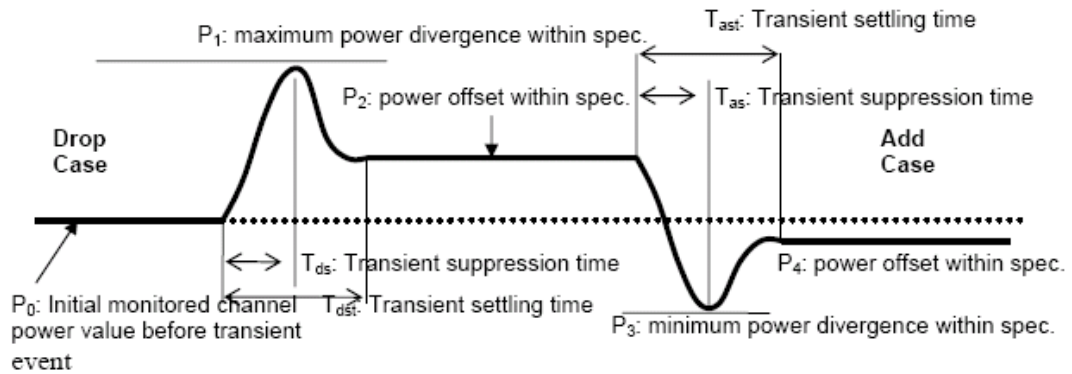
$$\begin{aligned} \text{Overshoot } (P_o) &= (P_1 - P_0) \\ \text{Undershoot } (P_u) &= (P_0 - P_3) \\ \text{Offset } (P_{os}) &= \pm \text{Max} [\text{Abs}(P_{do}), \text{Abs}(P_{ao})]; \\ (P_{do}) &= (P_2 - P_0) \\ (P_{ao}) &= (P_0 - P_4) \end{aligned}$$

(5) For a unique ON-OFF Transient test, the definition of overshoot is as the following:

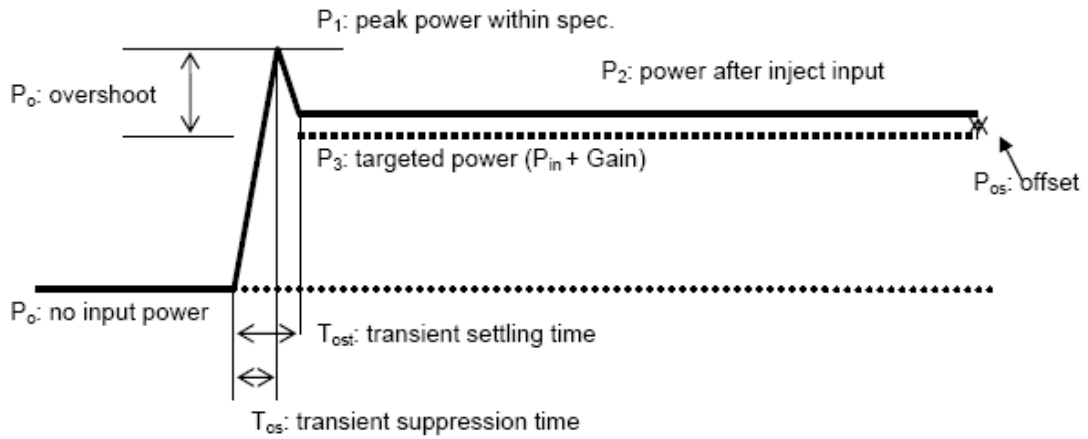


(6) The transient suppression time and transient settling time are defined as the following:

(a) For traditional transient



(b) For ON-OFF transient



$$\text{Transient suppression time } (T_{ts}) = \text{Max}[T_{ds}, T_{as}, T_{os}]$$

$$\text{Transient settling time } (T_{st}) = \text{Max}[T_{dst}, T_{ast}, T_{ost}]$$

(7) Ensured by ~ 1 's design of control circuit, Specifications are for internal control reference