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Bidirectional DWDM Optical Amplifier

(1528-1568nm, 22-32dB Gain, DWDM, data-rate: 200Gb)

The BEDF Series Bidirectional DWDM Optical Amplifier provides high-performance erbium-doped fiber amplification (EDFA) across the full ITU C-band (1528–1568 nm), supporting high-capacity transmission scales from 2 to 48 channels over a single fiber. Engineered for maximum slot density, the BEDF integrates two independent amplifier stages on a single board to deliver simultaneous bidirectional amplification. Specialized internal photonic components cleanly partition the spectrum, routing downstream traffic (even DWDM channels) through a high-power booster stage, while upstream traffic (odd DWDM channels) is directed through a low-noise pre-amplifier stage. The system features an advanced, software-driven "set-and-forget" Automatic Gain Control (AGC) mode that dynamically adapts pump laser profiles in real time. This ensures absolute gain stability and eliminates the need for manual adjustment or field recalibration as channel loading fluctuates. To maintain flat spectral uniformity and minimize inter-channel tilt across the full 48-channel grid, the BEDF incorporates high-precision, customized Gain Flattening Filters (GFF).To mitigate the critical risks associated with fiber-cut scenarios, the BEDF features an advanced safety and isolation architecture. It integrates strategically positioned special 75dB fiber optic isolators working in tandem with a proprietary fast-acting pump laser control algorithm. Upon detecting a fiber break, this combined hardware and software protection instantly suppresses and clamps the resulting -14dB(4%) glass-to-air Fresnel reflections. This prevents destructive back-reflections from blinding head-end transponders, stops the formation of parasitic lasing cavities, and ensures clean Loss of Signal (LOS) alarming without polluting the transmitter spectrum. Designed for seamless network integration, the plug-in module sits within Agiltron's Rack Network Management Chassis (RNMC), enabling centralized configuration, SNMP v3 reporting, and multi-rate hybrid transmission support. For long-haul or high-speed links susceptible to pulse broadening, the BEDF is commonly paired with Agiltron's passive Dispersion Compensation Modules (DCM) to deliver an ultra-low distortion transport solution. Both components can be fully integrated within a single, standard 1U chassis footprint—maximizing system density, optimizing thermal efficiency, and ensuring a carrier-grade operational lifespan exceeding 15 years. Engineered for maximum uptime, the BEDF chassis features hardware redundancy, utilizing dual hot-swappable DC power supplies (operating from -42 VDC to -70 VDC) and dual independent Ethernet communication controllers that feature automatic failover and proactive SNMP v3 alarm reporting.

Features

- Supports Bidirectional Amplification, Boosting Signals and Improving Coverage
- Built-in VOA Module Can Fast Adjust Optical Power to Realize 22-32dB Variable Gain
- Embedded OSC for Real-time Monitoring to Ensure Normal Operation of the Network
- Embedded OPM for Detection and Reporting of Optical Power

Applications

- DWDM Communication
- Ring Networks

RoHS COMPLIANT

Rev 05/27/26

Specifications

Parameter		Min	Typical	Max	Unit
Wavelength		1530		1568	nm
Input Power		-34		2	dBm
Optical Power	Tx	0		15	dBm
	Rx	-15		1	dBm
Optical Gain		22		32	dBm
Gain Till		-2	-1	0	dB
Noise Figure		6	7	7.3	dB
Gain Flatness		1		1.5	dB
Polarization Dependent Gain				0.3	dB
Polarization Mode Dispersion			0.5		ps
Input/output Isolation		35			dB
Return Loss		40			dB
Output Stability (8hrs)			0.05	0.1	dB
Operation Mode			AGC/APC		
Fiber Type		SMF-28e 9/125um NA = 0.13			
Housing		Pluggable Module Occupies 2 vertical Slots			
Working Temperature		-5	35	65	°C
Storage Temperature		-40		85	°C
Power Consumption				95	W
Power Supply	DC	-40 ~ -70			V
	AC	100 ~ 240			V

P +1 781-935-1200 E sales@agiltron.com W www.agiltron.com

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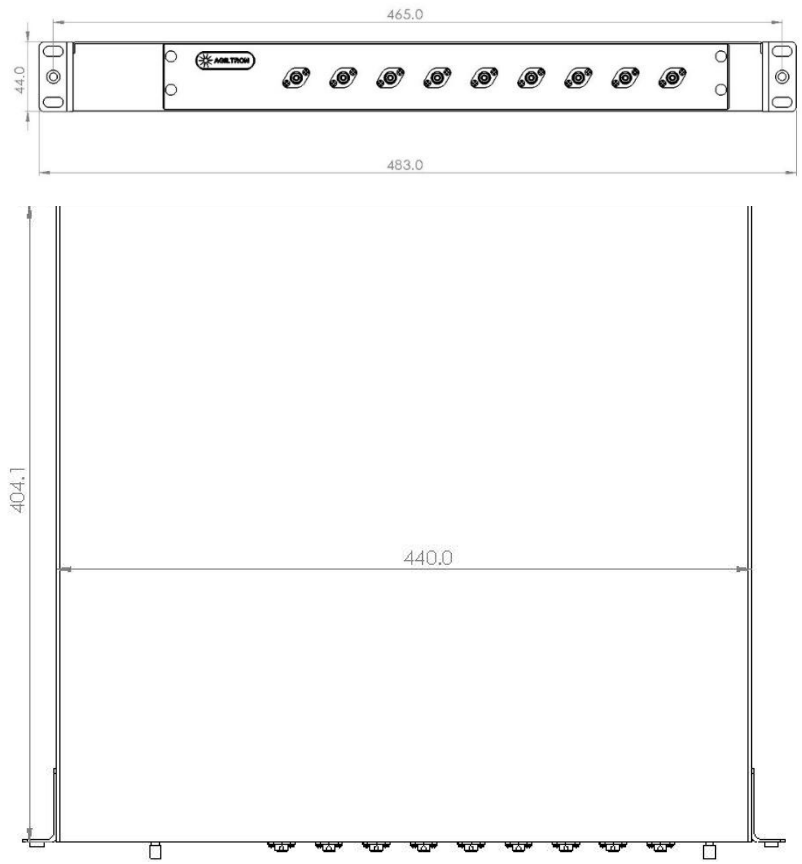
Mechanical Dimensions (mm)

1RU 19" mount rack typically. The input and output connectors and the control interface are on the front panel, while and power inputs are on the rear panel.

1U Rack Mount



Pluggable Module

*Product dimensions may change without notice. This is sometimes required for non-standard specifications.

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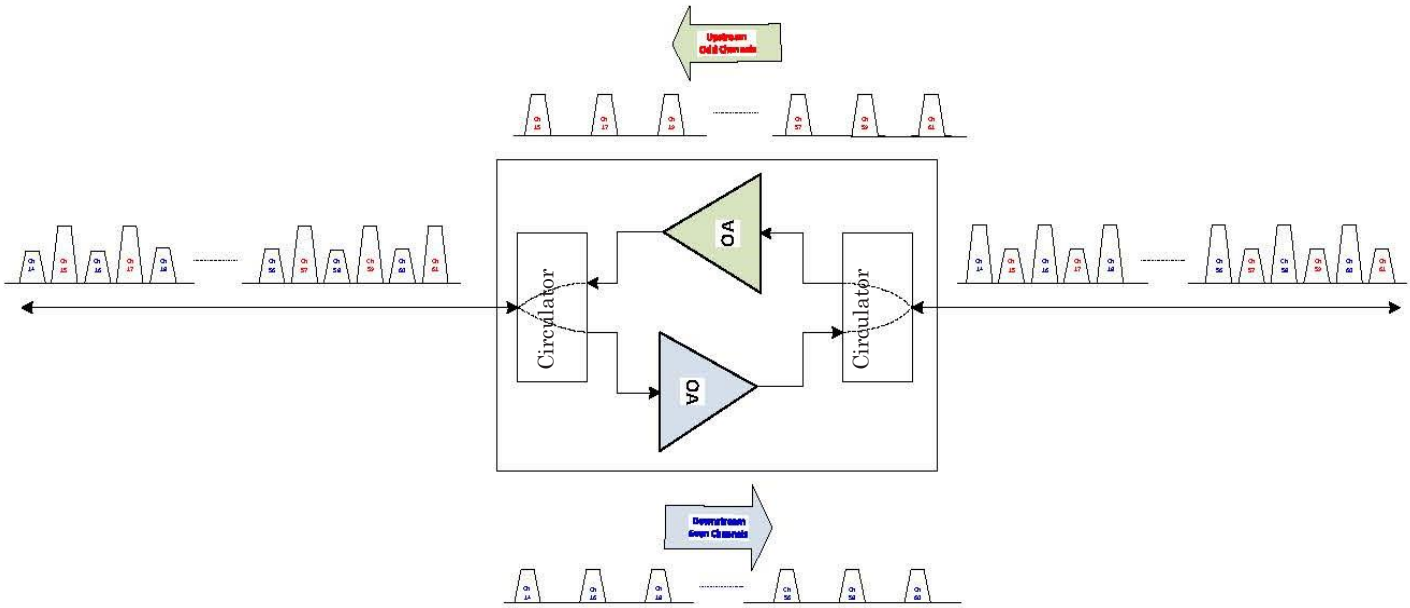
Function Diagram



Ordering Information (Part Number)

	1	1	1	1	☐	☐	☐	☐
Prefix	**Type**	**Wavelength**	**Power/Gain**		**Package**	**CDM**	**Power Supply**	**Connector [1]**
BEDF-	Standard = 1	1528-1565nm = 1	Standard = 1 High Power = 2		1U Rack = 1 Module = 2 Special =0	Non = N 20km = 2 30km = 3 40km = 4 50km = 5	DC = 1 AC =2	LC/APC = 1 FC/PC = 2 FC/APC = 3 SC/PC = 4 SC/APC = 5 LC/PC = 7 LC/UPC = U High Power FC/PC = H Special = 0

* Rack Mount Depth ~ 430mm.

[1]. The default connector configuration uses fiber with 0.9 mm buffer protection. The connector cannot be installed directly onto bare fiber because the bare fiber is prone to damage during shipping. However, the connector can be assembled on bare fiber if a 3 cm protective loose tube is added for reinforcement. The customer may remove this protective tube after testing. The optical power handling of a standard connector is less than 0.5 W for SMF-28 fiber and decreases further for smaller-core fibers.

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Q&A

Q: Is manual calibration required during the initial system turn up?
A: No. The BEDF Series EDFA is a true plug-and-play network element that requires zero manual calibration, mechanical adjustments, or field-side tuning during initial system initialization or subsequent line loading.
• Calibration Requirements and Procedure:
There are no manual optical or electrical alignment procedures required of the field technician. The initial provisioning process is entirely software-driven via Agiltron's Rack Network Management Chassis (RNMC) or a Local Craft Terminal. Technicians simply input the desired software parameters (such as target gain setpoints) via the management interface, eliminating the need to manually adjust variable optical attenuators (VOAs) or tune pump currents in the field.
• Internal Technology Used to Support This Calibration:
The autonomous turn-up is managed by an integrated, microprocessor-controlled Automatic Gain Control (AGC) loop architecture. Precision Tap Photodiodes: The module incorporates internal tap couplers and photodiodes at the input and output boundaries of both the downstream (booster) and upstream (pre-amplifier) paths. Real-Time Closed-Loop Control: The embedded microprocessor continuously senses incoming and outgoing optical power to calculate actual real-time gai. It automatically adjusts the drive currents of the internal pump lasers within microseconds to match the provisioned target, absorbing variations from fiber span losses or connector insertion losses automatically.

Q: How does the amplifier maintain gain in "set and forget" mode under different traffic loads (2–48 channels per fibre)?
A: The BEDF Series supports a true "set-and-forget" Automatic Gain Control (AGC) mode. The internal controller ensures that the optical gain per channel is locked and remains completely flat, regardless of whether the single-fiber link is populated with a minimal load of 2 channels or a full capacity of 48 channels.
• Amplifier Behavior as the Line is Loaded (2 to 48 DWDM Channels): Gain Considerations: In a standard constant-current amplifier, adding channels drops the gain per channel (gain saturation) because more signals compete for the same pool of excited erbium ions. The BEDF's high-speed AGC constantly tracks total aggregate input power. When loading scales from 2 to 48 channels (representing an input power surge of approximately 13.8 dB), the algorithm instantly ramps up the internal pump laser power in lockstep. This maintains a constant population inversion level within the erbium-doped fiber, guaranteeing that existing active channels experience zero transient gain drop or fluctuations when new channels are turned up. Wavelength Considerations: To maintain strict spectral uniformity across the full 48-channel grid, the BEDF integrates customized Gain Flattening Filters (GFF). Because erbium ions naturally exhibit a non-uniform gain spectrum (a sharp peak near 1530 nm and a plateau around 1550 nm), the passive GFF applies an exact inverse attenuation curve. As channels are loaded across the C-band (with even channels assigned to downstream traffic and odd channels assigned to upstream traffic), the integrated GFF suppresses inter-channel gain tilt, ensuring equalized optical power output across all wavelengths.

Q: Is there any mitigation for Fresnel reflection amplification during a fibre cut scenario?
A:Yes. A fiber cut creates a glass-to-air boundary that bounces approximately 4% (14dB) of the forward-propagating optical power straight back into the amplifier. The BEDF features a ruggedized architectural combination of high-isolation hardware and fast-acting software protection algorithms to neutralize these reflections.

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• Mitigation Technology & Impact on Head-End Transmitters: The BEDF integrates a 3-stage, 75 dB fiber optic isolator at strategic internal junctions. When a downstream channel encounters a fiber break and generates a high-power Fresnel reflection, this back-reflected energy hits the 3-stage isolator. The isolator provides 75 dB of optical isolation, choking the reflection path and reducing the feedback energy down to negligible levels. This completely prevents back-reflections from flooding back into the transmitter gain medium, avoiding the creation of parasitic lasing cavities and protecting head-end DWDM transmitters from catastrophic optical feedback or blinding.
• Impact on Fibre Cut Alarming: Unambiguous Fault Detection: Because the 75 dB isolator prevents the back-reflection from circulating or being re-amplified by the EDFA, the internal monitoring photodiodes cleanly register a valid, immediate drop in legitimate transponded optical power through the span.
• Automatic Pump Power Clamping: In tandem with the hardware isolation, the BEDF's advanced pump laser control algorithm actively triggers a Loss of Signal (LOS) / Loss of Power (LOP) alarm. The moment an input drop passes the threshold, the software immediately clamps or shuts down the pump lasers. This guarantees that the amplifier does not amplify ghost reflections, while simultaneously preventing hazardous open-beam laser exposure at the cut site. Clean, unambiguous fiber-cut alerts are instantly generated and sent to the centralized Element Management System (EMS) via SNMP v3 without polluting or disrupting head-end infrastructure.

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