

Product Specification

R9400PR UltraSpan™ Remote Optically Pumped Amplifier (ROPA) 820 mW

PN: FOA-R9400PR-RPA3C-AA001

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Customer: General

Product Features

- Fully Controlled ROPA pump unit
- Pump power up to 820mW delivered using two wavelengths and second order pumping of 1480nm
- Remote software maintenance and upgrade
- SNMP v2 or v3 and Web-based GUI
- Class 1M* laser safety classification
- 1RU rack-mountable packaging
- Class 1M* laser Safety classification



Applications

- Long repeaterless links or spans up to 78dB total loss (390km)
- Island hopping, desert ranges and oil rigs
- Storage area networks (SANs), remote locations, disaster recovery

The R9400PR UltraSpan™ Remote Optically Pumped Amplifier (ROPA) contains an FPGA and micro processor-controlled pump module which includes three pump laser diodes at wavelengths 1425nm and 1475nm and features multiple independent automatic power reduction (APR) laser safety mechanisms. This allows both the ROPA itself and the network within which it is installed to be classified as Class 1M* with respect to laser safety (according to IEC 60825, and CDRH 21 CFR §1040.10), and also protects optical and electronic gear deployed along the lines.

The ROPA is designed to pump a remote Erbium Doped Fiber (EDF) about 70-100km down the link, thereby allowing for ultra-long spans in optical networks up to 390km. The unit supports both single-channel and WDM links (span length is dependent on the number of channels).

In addition to the pump module the unit includes redundant 48V DC power supplies and cooling fans, as well as a communication module supporting SNMP and a web based GUI through a standard Ethernet RJ45 connector.

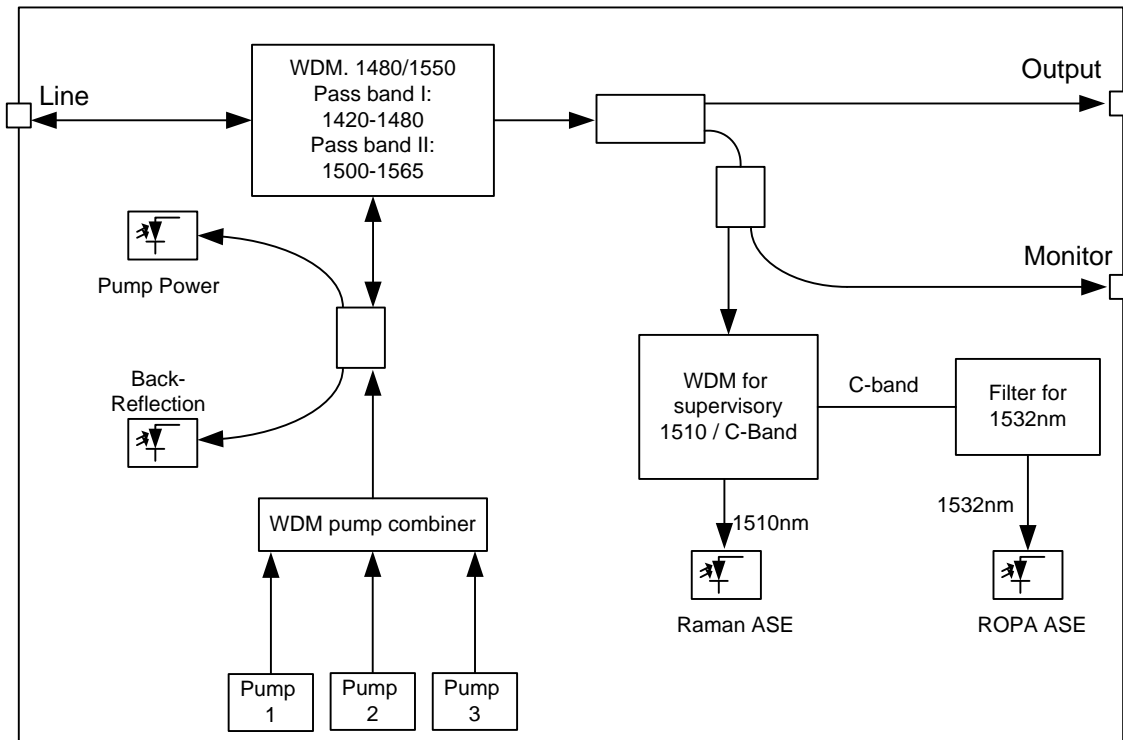
Optical Specification

Specification	Unit	Min.	Typ.	Max.	Notes
Signal Wavelength range	nm	1533		1565	Optimal performance with respect to EDF gain is obtain in the WL range of 1545-1565nm
Composite pump power	mW	800	820	840	
Pump Power	1425nm			300	
	1475nm			540	
Signal insertion loss (C-band)	dB		1.2	1.6	
Detection range of ASE in 1532nm	dBm	-45		-15	ASE generated by EDF
Detection range of ASE in S-band	dBm	-45		-15	ASE generated by Raman
Maximum Input power Without Damage	dBm			22	
Output monitor insertion loss	dB	23		28	
PDL	dB			0.15	
Raman generated PDG	dB			0.4	
PMD	ps			0.2	
Gain variation over time	dBpp			0.5	
RIN	dB/Hz			-110	
Return loss	dB	40			

Electrical Specification

Parameter	Unit	Min.	Typ.	Max.
Supply Voltage	V	-76		-36
Power Consumption	W			55
Supply Current @48V Supply	A			1.5

Block Diagram



Optical Connections

The ROPA is equipped with 3 optical ports, as described in the table below. (Optical connectors: E2000 for Line port and LC/UPC for other ports):

Port	Description
Line	This port has an E2000 high power connector. Pump power is launched through this connector into the optical transmission line. The signal enters the amplifier from the transmission line through this port.
Output	The signal exits the amplifier through this port, which is typically connected to an EDFA.
Monitor	Used to monitor the signal exiting from the output port (1% tap)

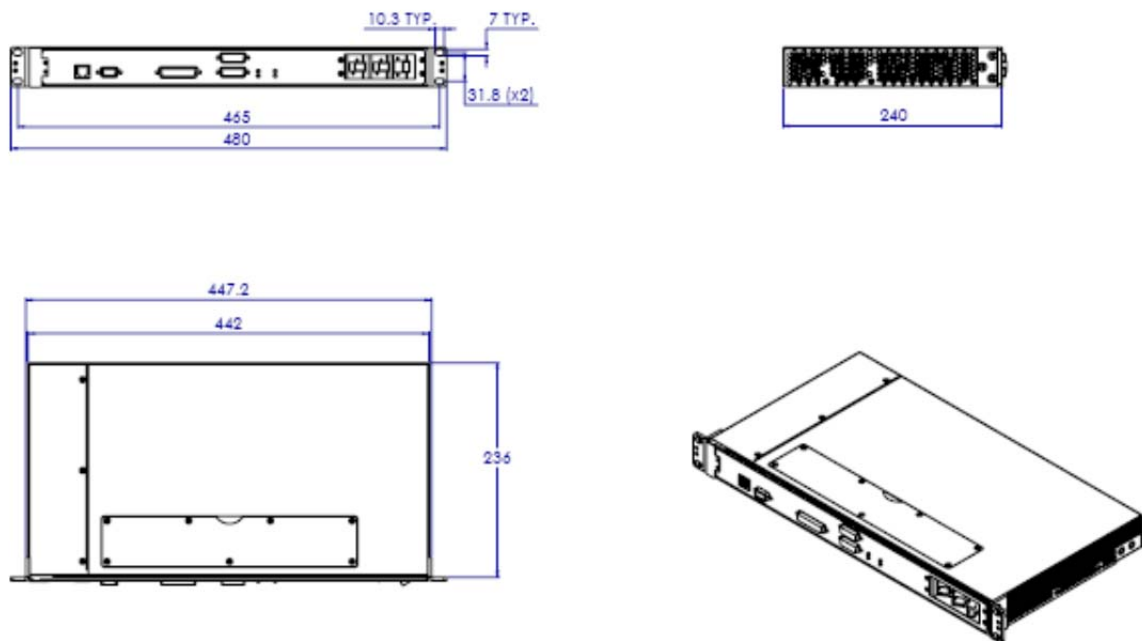
The APR Detection Mechanisms

There are up to three different APR detection criteria. These criteria are used either independently or collectively to detect various scenarios, which indicate a potential safety hazard and consequently result in APR activation. The APR criteria are:

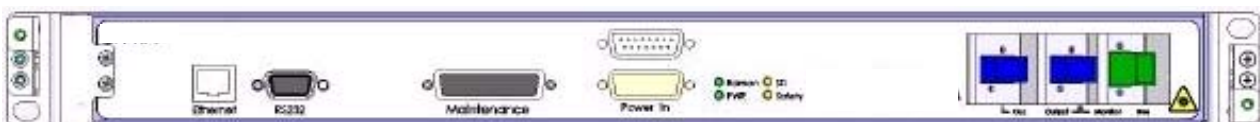
1. **Pump power back-reflection:** The pump back reflection entering the Raman from the line port is continuously monitored and compared to the output pump power. Changes in the back-reflection level indicate an open connector in the system and can trigger an APR event. Shut down threshold default value is 22dB and can be configured between -22dB and -28dB.
2. **Raman generated ASE in the short band:** This mechanism continuously monitors the Raman generated ASE in the short band (1500-1520nm) entering the Raman from the line port. A drop in ASE indicates an open or degraded line (high loss points) and causes the amplifier to shut down.
3. **Detection of ASE generated by the EDF in 1532nm band:** The EDF generated ASE in 1532nm is continuously monitored to detect fiber continuity on the fiber between the remote EDF and the pump unit. A drop in ASE at 1532nm will cause the amplifier to shut down.

Mechanical Specifications (19")

The following drawing shows the ROPA's width, height and length dimensions.



The ROPA's front panel connectors are shown in the drawing below:



Environmental and Qualification

Parameter	Value/Range
Operating Temperature	-5°C to +55 °C
Operating Humidity	5 to 85%
Storage Temperature	-40°C to +85°C
Storage Humidity	5 to 95%
Qualification	ETSI, NEBS Level 3
Laser Safety	Class 1M*

* Class 1M products are not hazardous under normal circumstances, but may pose an eye hazard when the laser output is viewed with certain optical instruments (for example eye loupes, magnifiers and microscopes) within a distance of 100 mm

Ordering Information:



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