Product Specification

R9100PR UltraSpan™ Counter Propagating Raman 450mW

PN: FOA-R9100PR-RBW2C-AA003

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Customer: General

Product Features

- Fully controlled counter propagating Raman – AGC, max power modes
- Accurate Raman gain measurement
- Up to 10 dB average gain for G.652 fiber
- Pump power up to 450 mW
- Optimized gain flattening for all fiber types
- Remote software maintenance and upgrade
- SNMP v2 or v3 and Web-based GUI
- Class 1M* laser safety classification
- 1RU rack-mountable packaging

Applications

- Long repeaterless links or spans
- Island hopping, desert ranges and oil rigs
- Storage area networks (SANs), remote locations, disaster recovery
- 100 Gb/s and 40 Gb/s transmission and/or increasing channel count to 80+ WDM channels

The UltraSpan™ Counter Propagating Raman contains an FPGA and micro processor-controlled Raman pump for C-band or L-band distributed Raman amplification. The unit includes two pump laser diodes at different wavelengths and/or polarizations, and features multiple independent automatic power reduction (APR) laser safety mechanisms. This allows both the Raman amplifier 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 same mechanisms are also used for alerting system management upon line deterioration and reduction in the Raman distributed gain.

In addition to the pump module the Raman includes redundant user replaceable 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.

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Optical Specification

Specification		Unit	Min.	Typ.	Max.	Notes
Signal Wavelength range		nm	1528		1567	
Composite pump power		mW	450	470	490	
Expected Gain	SMF	dB		10		
	Leaf	dB		13		
	TerraLight	dB		14		
	True Wave	dB		15		
Effective NF for G.652		dB		-1		
OSC wavelength range		nm	1500	1510	1520	
OSC gain, G.652		dB		>5		
Number Of Channels			1		88	
Signal Input Power Range Pump Off (composite)		dBm	-45		-10	
Gain Flatness versus Wavelength, G.652		dB			1	
Signal insertion loss		dB		1.45	1.6	
OSC insertion loss		dB			2.5	
PDL		dB			0.15	
PDG		dB			0.6	
PMD		ps			0.2	
Return loss		dB	40			

Optical Connections

The Raman is equipped with 5 Optical ports, as described in the table below (Optical connectors: E2000 for Line port and MU for other ports):

Port	Description
Line	E2000/LC. Pump power launched though this connector into the optical transmission line. In Counter propagating configuration the signal enters the Raman amplifier from the transmission line through this port. In Co-propagating configuration the signal exits the Raman amplifier though this port into the transmission line.
Output	MU/LC Connector. In Counter-Propagating configuration the signal exits the Raman amplifier through this port, which is typically connected to an EDFA. In Co-Propagating configuration, the signal enters the Raman amplifier from the preceding EDFA through this port
Supervisory Input	MU/LC connector
Supervisory Output	MU/LC connector

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Port	Description
Monitor	MU/LC connector. Used only in Counter propagating configuration to monitor the signal exiting from the output port (1% tap)

Electrical Specification

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

The APR Detection Mechanisms

There are 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 criteria can also be used to detect and alert system management with regard to deterioration of the transmission line, and/or situation which could lead to reduction in the Raman gain.

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. **Optical Supervisory Channel (OSC)**: This mechanism continuously monitors the presence of the OSC signal. Absence of the signal indicates an open connector or fiber break. If modulated OSC signal (1500-1520nm) power is < -28dBm the amplifier shuts down.
3. **Amplified Spontaneous Emission (ASE) in the short band**: This mechanism continuously monitors the ASE in the short band (1500-1520nm in case of a C-Band amplifier) entering the Raman from the line port. Changes in ASE indicate an open or degraded line (high loss points). If optical power in OSC band (1500-1520nm) is 2dB lower than value anticipated for the given fiber type, the amplifier shuts down.

Automatic Return from Shut Down Caused by APR

Two possible scenarios can automatically restart the Raman:

1. When Raman detects CW power in OSC band > -46dBm. Once pumps are turned on, OSC is amplified via the Raman process to >-36dBm, then APR criteria depends on the OSC modulated power (<-27.5dBm). SD/RS hysteresis in this case is >2dB.
2. When C-band power is > -46dBm.

In both cases if Raman turns “ON” and one of the reasons for APR still exists, Raman will shut down within 150msec.

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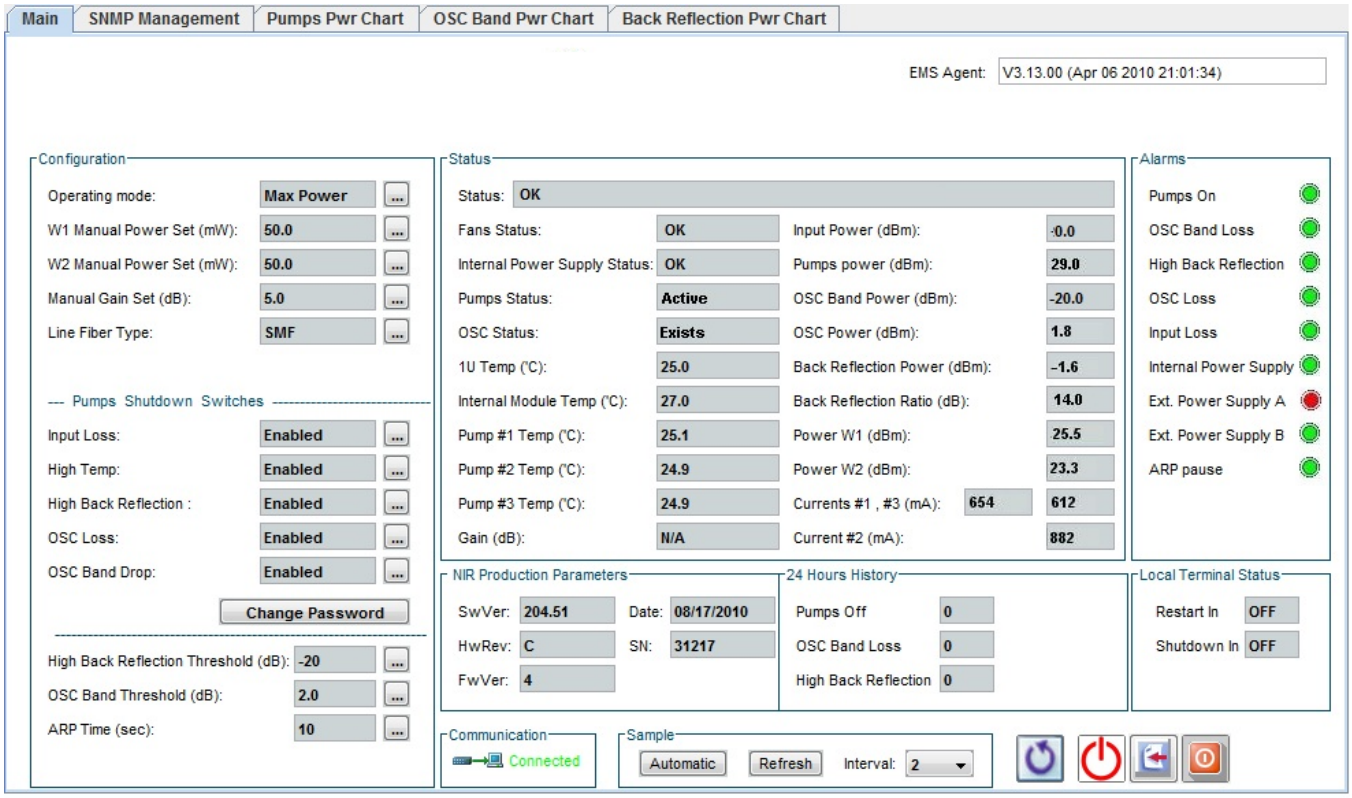
Example GUI

A typical Raman GUI snapshot can be seen in the figure below. The easy to use GUI is web-based and can be accessed using internet explorer by simply entering the IP address of the Raman unit.



Modes of Operation and Pump Monitoring Information

The pumps operating mode is set using the parameter “Operating mode” in the GUI. The possible values for this parameter are “Max pump power mode”, “Manual pump power set” or “Gain Setting”. When the pumps operating mode is set to “Gain setting”, the required gain is set using the parameter “Manual Gain Set” in the GUI. When the pumps operating mode is set to “Manual power set”, the pump power can be set using the parameters “W1 Power” and “W2 Power”, where the former controls the power of the higher wavelength pump and the latter controls the power of the lower wavelength pump.

Various pump's monitoring information (status, output power, temperature and current) can be viewed in the “Status” window on the GUI.

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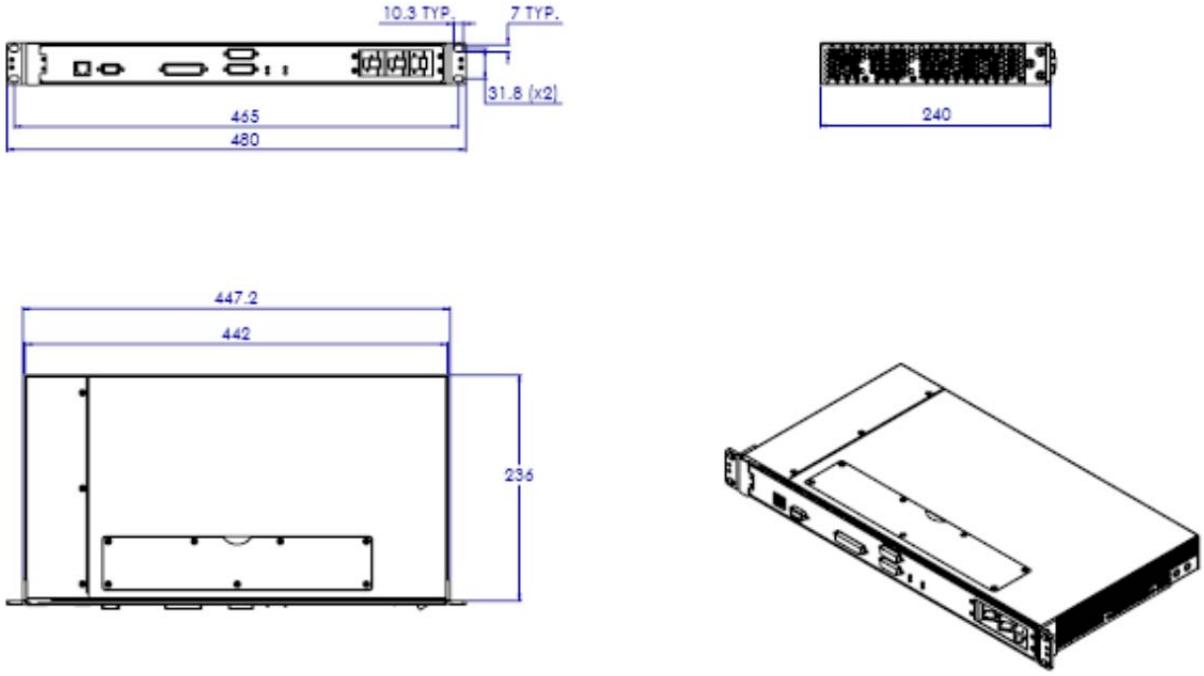
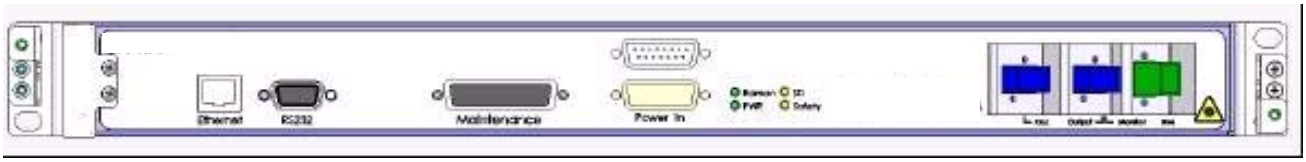
Mechanical Specifications (19”)

The following drawing shows the Raman’s width, height and length dimensions.



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:

XSoptix

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