Prisma II Reverse Optical Receivers

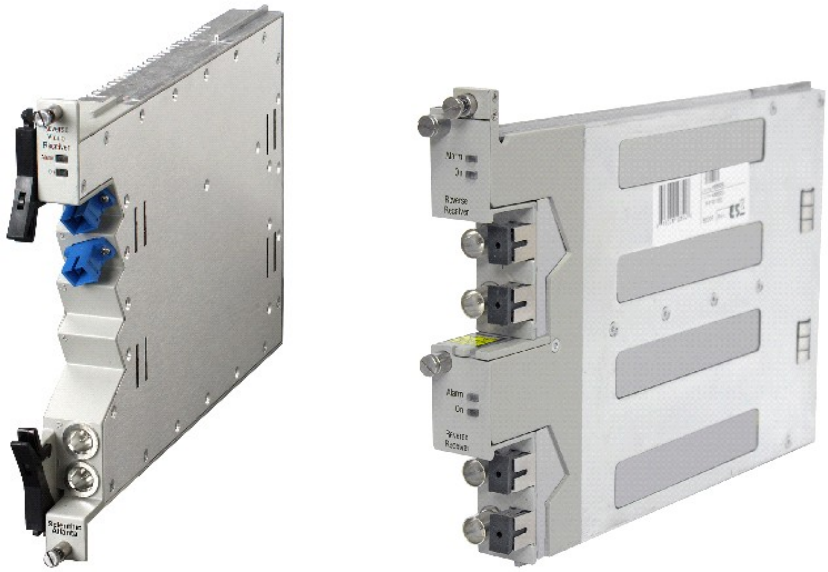
The Prisma II optical network is an advanced transmission system designed to optimize network architectures and increase reliability, scalability, and cost-effectiveness. The Prisma II Reverse Optical Receivers are available in two form-factors: the original full-height Reverse Data/Video Receiver, and the new half-height High Density Dual Reverse Receiver.

High Density Dual Reverse Receiver (HD-RXR) modules contain two independent reverse optical receivers and two RF output ports. Two HD-RXR modules can be vertically stacked in an associated Host Module that occupies a single-wide slot in the Prisma II chassis. Up to 26 HD-RXR modules can operate in a standard 6RU chassis.* The ability to mix high density receivers with other Prisma II modules in the same chassis greatly enhances the flexibility of the platform. The HD-RXR modules are available in both High Gain and Standard Gain versions.

Each Reverse Data Receiver and Reverse Video Receiver module contains two independent optical receivers and two RF output ports. Both receiver modules occupy a single-wide slot in the Prisma II chassis.

** The 56-connector version of the chassis is required to make use of all 4 receivers in one chassis slot.*

Figure 1. Full-Height (Left) and High Density (in Host Module, Right) Reverse Optical Receivers



Features

- Blind-mate (push-on) connections for RF, power, and data
- RF test points (one for each independent optical receiver)
- Adjustable RF output levels
- Optical automatic gain control (HD Dual Reverse Receivers only)
- Multiple setup and control options
- Local control via Local Craft Interface (LCI) and / or Intelligent Communications Interface Module (ICIM)
- Remote monitoring via ROSA / TNCS
- Master / Slave or Independent Mode Redundancy (HD Dual Reverse Receivers only)

Calculating Reverse Receiver RF Output Level

Use the following procedures to determine receiver (Rx) RF output level for design purposes.

1. Calculate the **full link gain** using the appropriate formula below, where:
   - **mpeak** is the reverse transmitter single CW carrier RF input (drive) level, expressed in dBmV, produces 100% peak OMI
   - **Pin** is the reverse receiver optical input power, expressed in dBm

Receiver Type	Full Link Gain Formula
Reverse Data Receiver	78 – mpeak + (2 x Pin)
Reverse Video Receiver	73 – mpeak + (2 x Pin)
High Density Dual Receiver (High Gain)	84 – mpeak + (2 x Pin)
High Density Dual Receiver (Standard Gain)	71 – mpeak + (2 x Pin)

   The resulting full link gain is the gain of the link in dB from the reverse transmitter RF input to the reverse receiver RF output, with receiver output attenuation set to minimum (0 dB).

2. Calculate the **usable link gain** as follows:
   a. Add the full link gain to the reverse transmitter maximum expected composite RF input (drive) level to determine the maximum expected Rx composite RF output level.
   b. Determine if the maximum expected reverse Rx composite RF output level exceeds the maximum RF output level specification (previous page).
      - If it exceeds the maximum, calculate the amount of Rx RF attenuation (level reduction in dB) required to prevent such occurrence. Then calculate the usable link gain using the formula provided below.
      - If it does not exceed the maximum, the full link gain is equal to the usable link gain (no Rx attenuation required).

3. Calculate the **receiver RF output level** as follows:
   - For Reverse Data / Video Receivers, add Tx design RF input level + usable link gain
   - For High Density Dual Receivers, add Tx design RF input level + usable link gain

   This formula yields the RF output level that can be used for reverse RF design in the headend or hub site where the receiver is located.

Note:

Many systems are designed for a common Rx RF output level by first calculating output level for the link(s) with greatest optical loss. For links with lower optical loss, Rx RF attenuation is then added (2 dB for each dB lower optical link loss) to achieve the common Rx RF output level.

Understanding Optical AGC Range

High Density Dual Reverse Receiver modules incorporate an optical automatic gain control (AGC) system that adjusts RF output attenuation to keep the output level constant as the optical input power level varies.

Without optical AGC, the RF output of the optical receiver changes 2 dB for every 1 dB change in optical input power. Given an RF output attenuation range of 26 dB, the optical AGC can compensate for as much as 13 dB of change in optical input power. The distribution of this range above and below the nominal optical input power level depends on the RF attenuation used to achieve the correct nominal RF output level.

Example:

A High Density Dual Reverse Receiver produces 50 dBmV RF output for a nominal optical input power of -6 dBm. The design calls for 38 dBmV nominal RF output, so 12 dB of RF attenuation is applied manually during setup to reduce the receiver RF output to 38 dBmV.

This initial attenuation setting creates a margin of 12 dB for the optical AGC when keeping the RF output stable with falling optical input power. Because the RF output level changes 2 dB for every 1 dB change in optical input power, the optical AGC in this case can correct for as much as 6 dB drop in optical input power. It follows that the optical AGC can correct for as much as (13 – 6 =) 7 dB rise in optical input power.

Product Specifications

Table 1. Optical Specifications

Feature	Units	High Density Dual Reverse Receiver	Reverse Data / Video Receiver	Notes
Input Power	dBm	-17 to -8 (High Gain) -17 to 0 (Standard Gain)	-17 to +2	
Wavelength	Nm	1290 to 1620	1290 to 1600	
Optical Return Loss	dB	>30	>30	
Optical Interface: SC/APC		Standard	Standard	

Table 2. Electrical Specifications

Feature	Units	High Density Dual Reverse Receiver	Reverse Data / Video Receiver	Notes
RF Bandwidth	MHz	5 to 90	5 to 65 (Data) 5 to 200 (Video)	
RF Output Level	dBmV	Use RF output level calculations (see previous section)	Use RF output level calculations (see previous section)	
Maximum RF Output Level	dBmV	58 (Composite)	61 (Composite)	1
RF Attenuation Range	dB	0 to 26 in 0.75 dB Steps	0 to 20 in 0.1 dB Steps	2
Optical AGC Range	dB	13 dB	n/a	3
Module Responsivity	A/W dB	≥ 299 (High Gain) ≥ 49.5	≥ 150 (Data) ≥ 43.5	4
	A/W dB	≥ 67 (Standard Gain) ≥ 36.5	≥ 82 (Video) ≥ 38.3	
RF Frequency Response	dB	±0.5	±0.5	
RF Test Point	dB	-20 (±1.0)	-20 (±1.0)	
Return Loss	dB	> 16	> 16	
Tilt	dB	+0.5 to -0.5	+0.75 to -1.25	
Noise Equivalent Power	pA √ Hz	< 8 (High Gain) < 10 (Standard)	< 8	
Power Consumption	W DC	< 5	< 13	

Note: 1. Reverse receiver (Rx) maximum output level is determined using 5 to 42 MHz noise loading while ensuring that the Noise Power Ratio (NPR) dynamic range for the link is not limited by the Rx. Rx RF attenuation may be needed to prevent the maximum Rx output level from being exceeded during operation. See *Calculating Reverse Receiver RF Output Level* above.

Note: 2. RF Attenuation control: software control is via LCI, ICIM, or ROSA / TNCS.

Note: 3. The distribution of the optical AGC range above and below nominal optical input power is determined by the initial RF attenuation setting. See *Understanding Optical AGC Range* above.

Note: 4. Module responsivity is measured at 1310 nm with 0 dB RF attenuation, and may change at other wavelengths.

Unless otherwise noted, specifications reflect typical performance and are referenced to the ambient air temperature at the inlet to the Prisma II chassis. Specifications are based on measurements made according to SCTE/ANSI standards (where applicable), using standard frequency assignments.

Table 3. Environmental Specifications

Feature	Units	High Density Dual Reverse Receiver	Reverse Data / Video Receiver	Notes
Temperature Range Full Specs & Operational	°C °F	0 to +50 +32 to +122	-40 to +65 -40 to +149	
Humidity Range	%	0 to 95	0 to 95	1

Table 4. Mechanical Specifications

Feature	Units	High Density Dual Reverse Receiver	Reverse Data / Video Receiver	Notes
Depth	in. cm	8.8 22.4	9.8 24.9	
Width	in. cm	1.03 2.6	1.03 2.6	
Height	in. cm	3.5 8.8	7.6 19.3	
Weight	lbs kg	0.9 0.4	3.0 1.4	
Module Width	slots	1	1	

Note: 1. Recommended for use only in non-condensing environments.

Unless otherwise noted, specifications reflect typical performance and are referenced to the ambient air temperature at the inlet to the Prisma II chassis. Specifications are based on measurements made according to SCTE/ANSI standards (where applicable), using standard frequency assignments.

Ordering Information

Sample

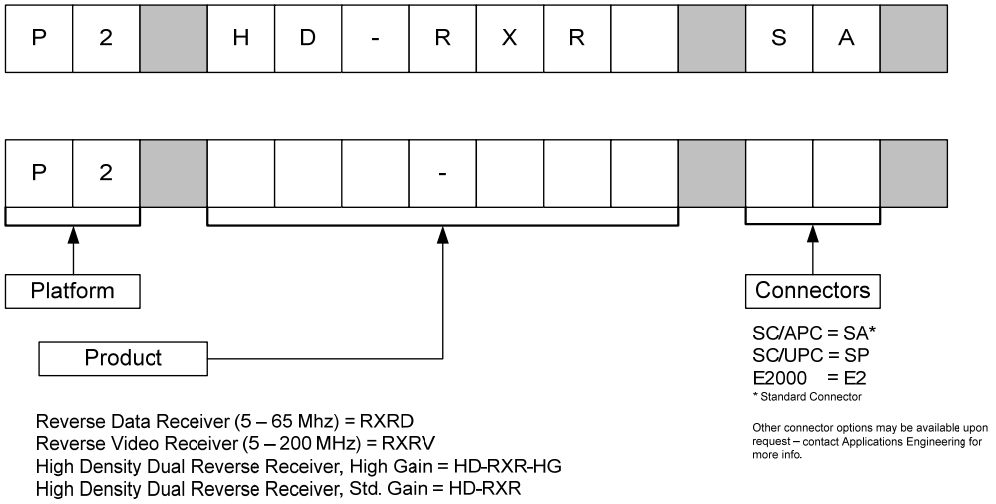


Table 5. Ordering Information

Description	SC/APC	SC/UPC	E2000
P2-RXRD	716488	734945	734947
P2-RXRV	716480	734948	734950
P2-HD-RXR-HG	4012717	n/a	n/a
P2-HD-RXR	4012718	n/a	n/a

For More Information

Prisma II products include some of the industry's most complete range of high performance optical components. For more information, please refer to the appropriate data sheet(s) listed below.

Platform	Prisma II Data Sheet Part Number 739199
1310 Transmitters	Prisma II Data Sheet Part Number 739200
Prisma II 1310 HDTx Transmitters	Prisma II Data Sheet Part Number 7006768
Prisma II Forward Optical Receivers	Prisma II Data Sheet Part Number 7011887
1550 nm Transmitters	Prisma II Data Sheet Part Number 739201
1550 nm Optical Amplifiers	Prisma II Data Sheet Part Number 739202
Ancillary Modules	Prisma II Data Sheet Part Number 739205
bdr™ Digital Reverse 2:1 Multiplexing System	Prisma II Data Sheet Part Number 744484

Cisco Systems, Inc.
1-800-722-2009 or 678-277-1120
www.cisco.com

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