Cisco Prisma II High Density Dual Reverse Optical Receivers

The Cisco® Prisma® II optical network is an advanced transmission system designed to optimize network architectures and increase reliability, scalability, and cost-effectiveness. The Prisma II High Density Dual Reverse Optical Receiver (HD-RXR) modules are available in the half-height High Density form factor.

The HD-RXR modules contain two independent reverse optical receivers and two RF output ports. A single HD-RXR module occupies one slot in a Prisma II XD chassis. Two such modules can be vertically stacked in an associated Prisma II Host Module that occupies a single-wide slot in the Prisma II standard chassis. Up to 26 HD-RXR modules can operate in a standard 6RU chassis,* while up to 16 HD-RXR modules can operate in the Prisma II XD chassis.

The ability to mix high density receivers with other Prisma II modules in the same chassis greatly enhances the flexibility of the platform. HD-RXR modules are available in three versions: Standard Gain, High Gain, and Low Noise.

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

Figure 1. Cisco Prisma II High Density Dual Reverse Receiver (Left) and Populated Host Module (Right)

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
- 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

Calculating Reverse Receiver RF Output Level

Use the appropriate full link gain formula below together with the following procedures to determine receiver (Rx) RF output level for design purposes.

Receiver Type	Full Link Gain Formula
High Density Dual Low Noise Reverse Optical Receiver	84 - mpeak + (2 x Pin)
HD-RXR - High Gain or Low Noise	84 - mpeak + (2 x Pin)

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

   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.
      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:
      Usable Link Gain = Full Link Gain - Rx Attenuation
      If it does not exceed the maximum, then the full link gain is equal to the usable link gain (no Rx attenuation required).
3. Calculate the **receiver RF output level** as follows:
   - Rx RF Output Level = 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	HD-RXR Standard Gain and High Gain	HD-RXR Low Noise	Notes
Input Power	dBm	-17 to -8 (High Gain) -17 to 0 (Standard Gain)	-25 to -10	
Wavelength	nm	1290 to 1620	1290 to 1620	
Optical Return Loss	dB	> 30	> 30	
Optical Interface: SC/APC		Standard	Standard	

Table 2. Electrical Specifications

Feature	Units	HD-RXR Standard Gain and High Gain	HD-RXR Low Noise	Notes
RF Bandwidth	MHz	5 to 90	5 to 90	
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)	58 (Composite)	1
RF Attenuation Range	dB	0 to 26 in 0.75 dB steps	0 to 26 in 0.75 dB steps	2
Optical AGC Range	dB	13	13	3
Module Responsivity	A/W dB	≥ 299 (High Gain) ≥ 49.5	≥ 299 ≥ 49.5	4
	A/W dB	≥ 67 (Standard Gain) ≥ 36.5		
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	+0.5 to -0.5	
Noise Equivalent Power	pA √ Hz	< 8 (High Gain) < 10 (Standard Gain)	< 2	
Power Consumption	W DC	< 5	< 5	

Notes:

1. Reverse receiver (Rx) maximum output level is determined using 5 to 42 MHz noise loading while ensuring that the link Noise Power Ratio (NPR) dynamic range is not Rx limited. Rx RF attenuation may be needed to avoid exceeding maximum Rx output level in operation. See ***Calculating Reverse Receiver RF Output Level*** on page 2.
2. RF Attenuation control: software control is via LCI, ICIM, or ROSA / TNCS.
3. Optical AGC range above and below nominal optical input power is determined by the initial RF attenuation setting. See ***Understanding Optical AGC Range*** on page 3.
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 standard or Prisma II XD chassis. Specifications are based on measurements made according to SCTE/ANSI standards (where applicable), using standard frequency assignments.

Product Specifications, cont'd.

Table 3. Environmental Specifications

Feature	Units	HD-RXR Standard Gain and High Gain	HD-RXR Low Noise	Notes
Temperature Range, Full Specs & Operational	°C °F	0 to +50 +32 to +122	0 to +50 +32 to +122	
Humidity Range	%	0 to 95	0 to 95	*

** Recommended for use only in non-condensing environments.*

Table 4. Mechanical Specifications

Feature	Units	HD-RXR Standard Gain and High Gain	HD-RXR Low Noise	Notes
Depth	in. cm	8.8 22.4	8.8 22.4	
Width	in. cm	1.03 2.6	1.03 2.6	
Height	in. cm	3.5 8.8	3.5 8.8	
Weight	lbs kg	0.9 0.4	0.9 0.4	
Module Width	slots	1	1	

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

Ordering Information

Product Ordering Matrix

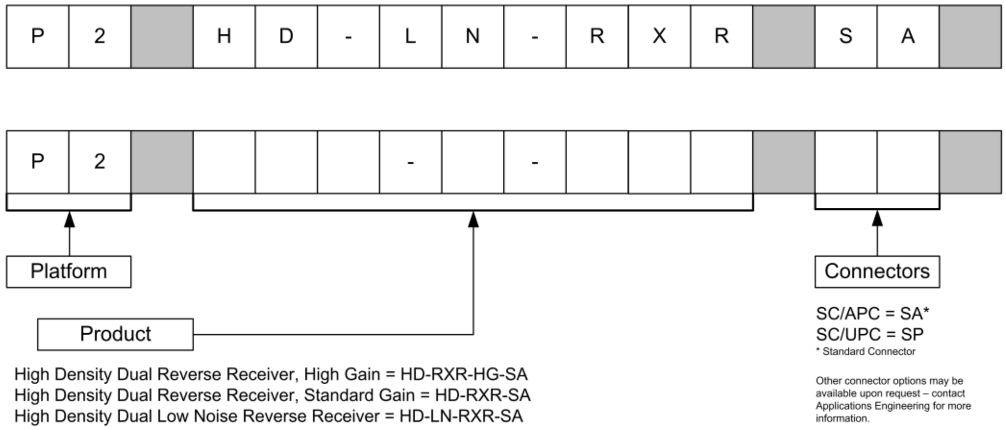

Table 5. Ordering Information

Description	SC/APC
P2-HD-RXR-HG-SA	4012717
P2-HD-RXR-SA	4012718
P2-HD-LN-RXR-SA	4040565

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.

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

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For More Information

To learn more about this product, contact your local account representative.

To subscribe to receive end-of-life/end-of-sale information, go to http://www.cisco.com/cisco/support/notifications.html.

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