

Cisco Enhanced Digital Return 85 System: Modules for Cisco Prisma II and Prisma II HD Chassis

The Cisco[®] Enhanced Digital Return (EDR) 85 System expands the functionality of our Cisco Prisma[®] II products by increasing the performance, reach, and efficiency of the reverse path transmissions.

For systems based on Prisma II, the Cisco EDR 85 System includes the EDR Transmitter module inside of a Cisco Prisma II HD EDR host module and companion Cisco Prisma high-density (HD) EDR PRX85 Transmitter modules that install in a Cisco Prisma II or Prisma II XD chassis at the headend or hub. The transmitter and receiver use Small Form Factor Pluggable (SFP) optical pluggable modules (OPMs) for enhanced flexibility. The Cisco EDR 85 System operates over the 5-85 MHz range and supports all standard reverse frequency bandwidths at 40, 42, 55, 65, and 85 MHz.

At the transmit end of the system, reverse-path RF input signals are routed to an EDR 2:1 Transmitter module. The transmitter module converts each signal to a baseband digital data stream and combines the signals into a serial data stream using time-division multiplexing (TDM). The baseband data stream is then converted to an optical signal for transmission to the headend or hub EDR Rx. The transmitter OPMs are available in either Coarse Wavelength Division Multiplexing (CWDM) 1270-1610 nm wavelengths or Dense Wavelength Division Multiplexing (DWDM) ITU channels (17-61 nm).

A single Cisco Prisma II EDR Transmitter module (Figure 1) occupies two slots in a Cisco Prisma II XD chassis. Two EDR HD transmitter modules can be vertically stacked in an associated Prisma II host module. They occupy two slots in the Prisma II standard chassis. Up to 12 HD EDR Transmitter modules can operate in a standard 6 rack unit (6RU) chassis (the 56-connector version of the chassis is required to make use of both receivers in one chassis slot). Up to 8 HD EDR Transmitter modules can operate in the Prisma II XD chassis. The ability to mix EDR Transmitter modules with other Prisma II HD modules in the same chassis greatly enhances the flexibility of the platform.

Figure 1. Cisco EDR 85 System PII EDR Transmitter



At the receive end, typically in a large hub or headend, the EDR Receiver module receives the optical signal and performs the conversion back to the baseband data stream. The resulting data streams are converted back to analog reverse path signals for routing to termination equipment. The EDR Receiver module is available in the High Density form factor. The receiver OPMs are available in Standard Range (SR) and Extended Range (XR) configurations. Both configurations feature a dual LC/PC optical input connector that feeds two independent reverse optical transmitters, each with its own RF output port.

A single EDR Receiver module (Figure 2) occupies one slot in a Cisco Prisma II XD chassis. Two EDR HD receiver 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 modules can operate in a standard 6 rack unit (6RU) chassis (the 56-connector version of the chassis is required to make use of both receivers in one chassis slot). Up to 16 HD modules can operate in the Prisma II XD chassis. The ability to mix EDR Receiver modules with other Prisma II HD modules in the same chassis greatly enhances the flexibility of the platform.

Figure 2. Cisco EDR Receiver Module



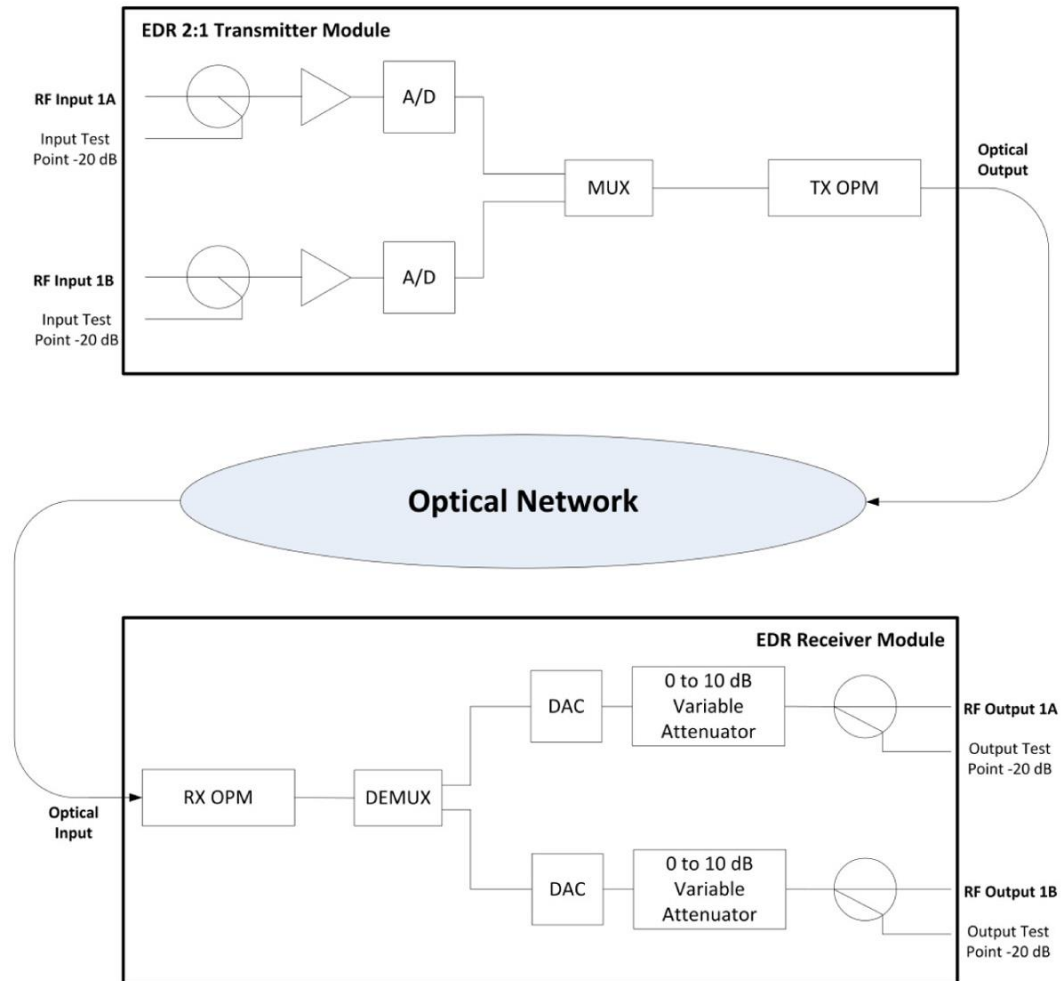
Features

- High-performance digital reverse technology:
 - 12-bit encoding that helps enable transmission of analog video in the reverse band
 - High-order digital modulation signals (for example, 16 quadrature amplitude modulation [QAM], 64 QAM, and 256 QAM)
- Multiple operating modes in the EDR transmitter that support the EDR transmitter and the older integrated 2:1 bdr node transmitter
- Optical pluggable modules that provide flexible inventory management
- Long-reach transmission capabilities that eliminate the need for optical amplifiers, reducing cost and space requirements
- Capability to send 90 individual 5-85 MHz reverse signals over a single fiber:
 - Use of 2:1 multiplexing to reduce fiber usage
 - Compatibility with Cisco's 45-wavelength DWDM system
- Support for independent balancing of reverse traffic at EDR transmitter RF ports
- Simplified setup that reduces installation time and expertise requirements
- Distance- and temperature-independent link performance that simplifies engineering and maintenance requirements
- Space-saving, high-density deployment in Prisma II or Prisma II XD chassis to increase deployment cost-efficiency
- Ability to monitor the Cisco Prisma II EDR transmitter via the Cisco Prisma II EDR receiver

Block Diagrams

Figure 3 provides a block diagram of the EDR systems for 2:1 transmission.

Figure 3. Cisco EDR 85 System with 2:1 Transmitter



Product Specifications

Table 1 lists specifications for the Cisco EDR 85 System Transmitter modules. Table 2 gives specifications for the EDR Receiver module. Table 3 lists RF link performance specifications.

Table 1. Cisco EDR 85 System Transmitter Modules

Specification	Units	Value
RF input level	dBmV/Hz	See Table 3
RF input test point	dB	-20 (\pm 1 dB)
Test point return loss (minimum)	dB	18
Power consumption (maximum)	W	< 5
Operating temperature range, chassis ambient	$^{\circ}$ C $^{\circ}$ F	-0 to + 50

Specification	Units	Value
Physical dimensions (D x W x H) Tx in EDR Host Module	in. cm	8.8 x 2.1 x 3.5 22.35 x 5.2 x 8.9
Weight	lb	1.25
	kg	0.6

Table 2. Cisco EDR 85 System PRX85 Receiver Module

Specification	Units	Value	Notes
RF output level	dBmV/Hz	See Table 3	
RF output return loss (minimum)	dB	18	
Output RF variable gain control range	dB	0 to -10 (0.5 dB increments)	
Power consumption (maximum)	W	< 9	
RF output test point	dB	-20 (\pm 1 dB)	
RF output test point return loss	dB	18	
Operating temperature range	$^{\circ}$ C $^{\circ}$ F	0 to 50 32 to 122	1
Physical dimensions (D x W x H)	in. cm	8.8 x 1.0 x 3.5 22.35 x 2.54 x 8.89	
Weight	lb	0.9	
	kg	0.4	

Note:

¹ Recommended for use only in noncondensing environments.

Table 3. RF Link Performance

General	Units	Value	Notes
Bandpass	MHz	5 - 85	
Full-scale single carrier wave (CW) carrier amplitude	dBmV	33	1, 2
Link gain	dB	15.5 (\pm 1.0 dB)	3, 4
Response flatness	dB	\pm 0.5	

Notes:

¹ With respect to the input port on the EDR Transmitter module.

² A CW carrier of this amplitude applied to the RF input will exercise the full-scale range of the A/D converter. Full scale is analogous to 100% OMI for analog lasers.

³ Add link gain (dB) to EDR Transmitter module RF input level to determine EDR Transmitter module RF output level.

⁴ At low and high temperature extremes.

Tables 4 and 5 provide group delay and optical link specifications. Figure 9 shows noise power ratio (NPR) performance.

Table 4. Group Delay, 1-MHz Bandwidth

Frequency (MHz)	Units	Value	Notes
5-10	ns	\leq 2.0	
11-85	ns	\leq 1.5	

Table 5. Optical Link Characteristics

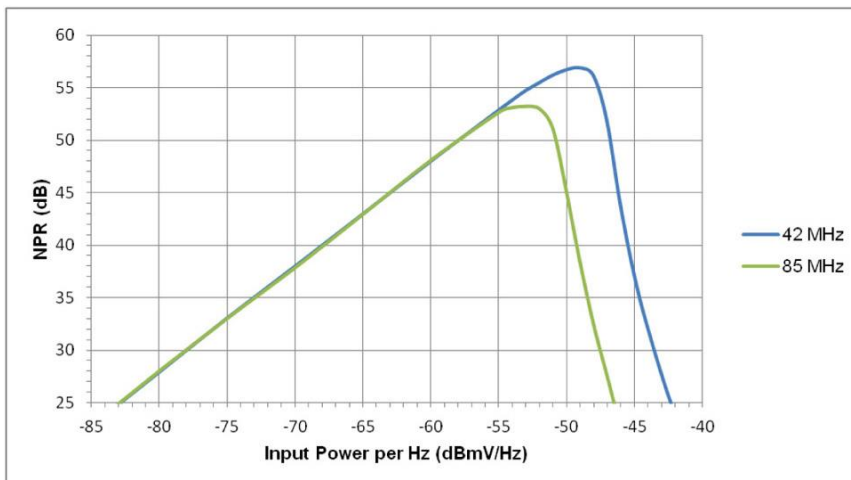
General	Units	Value	Notes
Link budget	dB	21 (SR Rx) 28 (XR Rx)	
Optical wavelength	nm	1270 - 1610 (CWDM) 1563.86 - 1528.77 (DWDM)	1
Optical output power (modulated)	dBm	5 minimum (CWDM) 5 minimum (DWDM)	1
Optical input power (SR module)	dBm	0 to -18	2
Optical Input power (XR module)	dBm	-8 to -25	2
Optical interface		LC/PC Connector	

Notes:

¹ Applies to Transmitter module only.

² Applies to Transmitter module only.

Figure 4. Cisco EDR 85 System Noise Power Ratio Performance: Input Power per Hz



Notes:

1. Input power is specified with respect to the input port of the EDR Transmitter module.
2. Unless otherwise stated, all link performance specifications shown reflect minimum performance over the specified operating temperature range of the Cisco GS7000 and relevant Cisco GainMaker Nodes. The EDR Transmitter module specifications are for the optical link only, measured from the input to the Cisco GS7000 or Cisco GainMaker Node EDR Transmitter module to the output of the transmitter module. Refer to the relevant node data sheets for other node-related specifications.

Ordering Information

Cisco Prisma II EDR Transmitters are sold as a combination. There is a comprehensive selection of DWDM and CWDM wavelength Optical Pluggable Modules (OPMs) available for the EDR Transmitter modules. See table 6 for the lists of these OPMs. OPMs are sold separately from the Tx and host module. Table 7 lists part numbers for Cisco Prisma EDR Tx and Rx equipment, additional required equipment, and accessories.

Transmitter 2:1 Optical Pluggable Module (OPM) Order Matrix

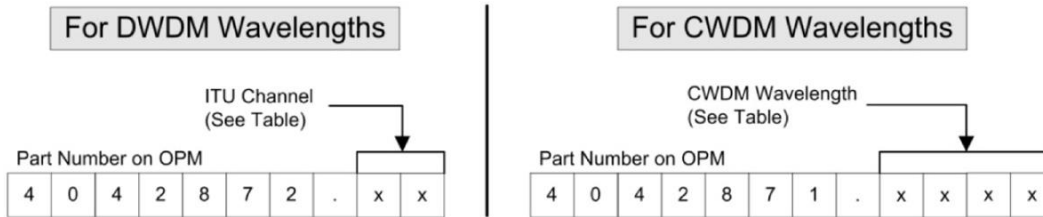


Table 6. DWDM and CWDM Wavelengths

ITU Channel	DWDM Wavelengths, nm	ITU Channel	DWDM Wavelengths, nm	CWDM Wavelengths, nm
17	1563.86	40	1545.32	1270
18	1563.05	41	1544.53	1290
19	1562.23	42	1543.73	1310
20	1561.42	43	1542.94	1330
21	1560.61	44	1542.14	1350
22	1559.79	45	1541.35	1370
23	1558.98	46	1540.56	1390
24	1558.17	47	1539.77	1410
25	1557.36	48	1538.98	1430
26	1556.55	49	1538.19	1450
27	1555.75	50	1537.40	1470
28	1554.94	51	1536.61	1490
29	1554.13	52	1535.82	1510
30	1553.33	53	1535.04	1530
31	1552.52	54	1534.25	1550
32	1551.72	55	1533.47	1570
33	1550.92	56	1532.68	1590
34	1550.12	57	1531.90	1610
35	1549.32	58	1531.12	
36	1548.51	59	1530.33	
37	1547.72	60	1529.55	
38	1546.92	61	1528.77	
39	1546.12			

Table 7. Cisco Prisma EDR Required Equipment

Description	Part Number for Ordering	Part Number on Module	Part Number on OPM
Cisco Prisma II EDR Host Module with 2:1 Tx	P2-HD-EDR-SA=	P2-HD-EDR-SA	N/A
EDR PRX85 Prisma HD Rx module	4041277	4041278	N/A
EDR PRX85 Prisma HD Rx w/SR OPM	4042748	4041278	4044008
EDR PRX85 Prisma HD Rx w/XR OPM	4042749	4041278	4044009
EDR Rx OPM SR	4042750	N/A	4044008
EDR Rx OPM XR	4042751	N/A	4044009
Test Point Adapter Cable	CAB-TSTADPT-MCX-F=	N/A	N/A

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