

Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module

The Cisco® CRS-1 Carrier Routing System offers continuous system operation, exceptional service flexibility, and system longevity. The Cisco CRS-1 is powered by Cisco IOS® XR Software – a unique self-healing, distributed operating system designed for always-on operation while scaling system capacity up to 92 Tbps. The innovative system architecture combines the Cisco Silicon Packet Processor, the first programmable 40-Gbps application-specific integrated circuit (ASIC), with the Cisco Service Separation Architecture for superior service flexibility and speed to service. The Cisco CRS-1 marks a new era in carrier IP Communications by powering the foundation for network and service convergence today while protecting investments for decades to come.

Product Overview

This data sheet provides detailed product specifications for an important element of the Cisco IP-over-DWDM solution, the Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module (Figure 1). This tunable DWDM interface module allows service providers to increase efficiencies, improve reliability, and reduce operational and capital costs through elimination of expensive and bulky optical transponder equipment, even as video-based applications rapidly increase traffic in their DWDM networks. The module supports both G.709 Generic Forward Error Correction (GFEC) and high-gain Enhanced Forward Error Correction (EFEC), extending reach up to 2000 kilometers (km) without requiring signal regeneration. The Cisco CRS-1 4-Port 10GE Interface Module is also completely tunable across the C band with 50-GHz spacing, and supports router-to-router SONET/SDH-like operations, administration, maintenance, and provisioning (OAM&P). For more information about the Cisco CRS-1 or about other interfaces available for the Cisco CRS-1, visit <http://www.cisco.com/go/crs>.

Figure 1. Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module



Product Specifications

Table 1 gives specifications of the Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module.

Table 1. Product Specifications

Feature	Description
Chassis Compatibility	Compatible with all current Cisco CRS-1 line-card chassis
Software Compatibility	Cisco IOS XR Software Release 3.3
Ethernet	<ul style="list-style-type: none"> • Encapsulations: ARPA, IEEE 802.2/SAP, IEEE 802.3/SNAP • IEEE 802.x flow control • 802.1q VLAN support, jumbo frames • IEEE 802.1p tagging • Source/destination MAC accounting and VLAN accounting • IEEE 802.3ae LANPHY (10GBASE-R) PCS
Port Density	<ul style="list-style-type: none"> • Four ports of 10GE WDMPHY interfaces per physical layer interface module (PLIM) • Duplex LC optical connector per port
OTN (G.709) Features	<ul style="list-style-type: none"> • OTN Disabled: no OTN (G.709) framing, line rate of 10.3125 Gbps • OTN Enabled: OTN (G.709) framing, line rate of 11.0975 Gbps • Mapping of IEEE 802.3ae 10GBASE-R signal into an overclocked OTU2 running at 11.0975 Gbps • Alarm reporting: Loss of Signal (LOF), Loss of OTN Frame (LOF), Loss of OTN Multiframe (LOM), OTU alarm indication signal (OTU-AIS), OTU backward defect indication (OTU-BDI), ODU alarm indication signal (ODU-AIS), ODU open connection indication (ODU-OCI), ODU locked (ODU-LCK), ODU backwards defect indication (ODU-BDI), ODU payload type identifier mismatch (ODU-PTIM), OTU signal fail (OTU_SF_BER), and OTU signal degrade (OTU_SD_BER) • OTU_SF_BER and OTU_SD_BER alarms are based on monitoring OTU BIP errors with a user-configurable threshold crossing • Error counts: OTU BIP, OTU BEI, ODU BIP, and ODU BEI • Threshold crossing alerts (TCAs) for OTU BIP errors (SM-TCA) and ODU BIP errors (PM-TCA) with user-configurable threshold • Local (internal) and line (network) loopback • Local (internal) or loop (recovered from network) timing • ± 100ppm local clock accuracy over operating temperature
FEC Features	<ul style="list-style-type: none"> • FEC Type: G.975.1 I.7 • NO FEC: no Forward Error Correction • GFEC: standard G.975 Reed-Salomon algorithm • EFEC: standard G.975.1 two orthogonally concatenated BCH super FEC code. This FEC scheme contains three parameterizations of the same scheme of two orthogonally interleaved block codes (BCH). The constructed code is decoded iteratively, to achieve the expected performance. FEC statistics for pre-FEC BER, corrected errors (EC), and uncorrected words (UC) • FEC statistics for pre-FEC BER, corrected errors (EC), and uncorrected words (UC)
Optical Features	<ul style="list-style-type: none"> • Line rate 10.3125 Gbps ± 100 ppm or 11.0957 Gbps ± 100 ppm • Duplex LC (shuttered) faceplate optical connector • Full C-band tunable laser with 50 GHz spacing • Tx and Rx optical power monitoring • Optical power monitoring accuracy ± 2 dB
Reliability and Availability	Online insertion and removal (OIR) without affecting system traffic
Network Management	<ul style="list-style-type: none"> • Cisco IOS XR Software command-line interface (CLI) • Simple Network Management Protocol (SNMP) • Extensible Markup Language (XML) interface • CraftWorks Interface (CWI)
Physical Dimensions	<ul style="list-style-type: none"> • Occupies one PLIM slot on a Cisco CRS-1 line card chassis • Weight: 8.6 lb (3.9 kg) • Height: 20.6 in. (52.32 cm) • Depth: 11.2 in. (28.4 cm) • Width: 1.8 in. (4.57 cm)
Power	150W

Feature	Description
Environmental Conditions	<ul style="list-style-type: none"> • Storage temperature: –40 to 70°C (–40 to 158°F) • Operating temperature: <ul style="list-style-type: none"> ◦ Normal: 5 to 40°C (41 to 104°F) ◦ Short-term: –5 to 50°C (23 to 122°F) short term • Relative humidity: <ul style="list-style-type: none"> ◦ Normal: 5 to 85% ◦ Short-term: 5 to 90% but not to exceed 0.024 kg water/kg of dry air <p>Short-term refers to a period of not more than 96 consecutive hours and a total of 360 hours but not more than 15 instances in 1 year.</p>

Approvals and Compliance

Table 2 gives standards compliance information about the Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module, and Table 3 lists optical specifications.

Table 2. Compliance and Agency Approvals

Feature	Description
Safety Standards	<ul style="list-style-type: none"> • UL/CSA/IEC/EN 60950-1 • IEC/EN 60825 Laser Safety • ACA TS001 • AS/NZS 60950 • FDA – Code of Federal Regulations Laser Safety
EMI	<ul style="list-style-type: none"> • FCC Class A • ICES 003 Class A • AS/NZS 3548 Class A • CISPR 22 (EN55022) Class A • VCCI Class A • BSMI Class A • IEC/EN 61000-3-2: Power Line Harmonics • IEC/EN 61000-3-3: Voltage Fluctuations and Flicker
Immunity (Basic Standards)	<ul style="list-style-type: none"> • IEC/EN-61000-4-2: Electrostatic Discharge Immunity (8-kV contact, 15-kV air) • IEC/EN-61000-4-3: Radiated Immunity (10V/m) • IEC/EN-61000-4-4: Electrical Fast Transient Immunity (2-kV power, 1-kV signal) • IEC/EN-61000-4-5: Surge AC Port (4-kV CM, 2-kV DM) • IEC/EN-61000-4-5: Signal Ports (1 kV) • IEC/EN-61000-4-5: Surge DC Port (1 kV) • IEC/EN-61000-4-6: Immunity to Conducted Disturbances (10 Vrms) • IEC/EN-61000-4-8: Power Frequency Magnetic Field Immunity (30A/m) • IEC/EN-61000-4-11: Voltage Dips, Short Interruptions, and Voltage Variations
ETSI and EN	<ul style="list-style-type: none"> • EN300 386: Telecommunications Network Equipment (EMC) • EN55022: Information Technology Equipment (Emissions) • EN55024: Information Technology Equipment (Immunity) • EN50082-1/EN-61000-6-1: Generic Immunity Standard
Network Equipment Building Standards (NEBS)	<p>This product is designed to meet the following requirements (qualification in progress):</p> <ul style="list-style-type: none"> • SR-3580: NEBS Criteria Levels (Level 3) • GR-1089-CORE: NEBS EMC and Safety • GR-63-CORE: NEBS Physical Protection

Additional Specifications

Table 3. Optical Specifications

Specification	DWDM Line Interface
DWDM Line Interface	
Bit rate	10.3125 ±100 ppm 11.0957 ±100 ppm
Nominal wavelengths (λ_{Tnom})	C-band 50GHz unit: full tunable from 1529.55 to 1561.84
Spectral width at 20dB ($\lambda_{\Delta 20}$)	≤25 GHz
Optical Transmitter	
Type	Lithium niobate external modulator
Output power (P_{Tmin} to P_{Tmax})	+3 dBm, +6 dBm
Required optical return loss, minimum (ORL_{min})	27 dB
Extinction ratio, minimum ($reminx$)	>10.5 dB
Laser safety class	1
Optical Receiver	
Type	Avalanche photo diode (APD)
Chromatic dispersion tolerance (DLR_{max})	Up to ±1200 ps/nm (2 dB penalty)
<ul style="list-style-type: none"> Minimum BER (BER_{min}) FEC off FEC on E-FEC on 	10E-12 10E-15 10E-15
<ul style="list-style-type: none"> Reflectance between far-end Tx and near-end Rx (maximum) 	-27 dB
<ul style="list-style-type: none"> Receiver reflectance (maximum) 	-14 dB
<ul style="list-style-type: none"> Input wavelength bandwidth ($\lambda_{\Delta c_rx}$) 	1290 nm to 1605 nm
Connector type (Tx/Rx)	LC, duplex (shuttered)

Optical Performance					
OSNR	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	CD Tolerance
23 dB	OFF	<10E(-12)	–	-8 to -20dBm C-band	±1200ps/nm
19 dB	OFF	<10E(-12)	–	-8 to -20dBm C-band	±1000ps/nm
19 dB	OFF	<10E(-12)	–	-8 to -22dBm C-band	–
10 dB	GFEC	<10E(-5)	<10E(-15)	-8 to -18dBm	±800ps/nm
8.5 dB	GFEC	<10E(-5)	<10E(-15)	-8 to -18dBm	–
19 dB	EFEC	<7x10E(-4)	<10E(-15)	-8 to -26dBm	±800ps/nm
19 dB	EFEC	<7x10E(-4)	<10E(-15)	-8 to -27dBm	–
7 dB	EFEC	<7x10E(-4)	<10E(-15)	-8 to -20dBm	±800ps/nm
5 dB	EFEC	<7x10E(-4)	<10E(-15)	-8 to -20dBm	–

Ordering Information

To place an order, contact your local Cisco representative or visit the Cisco Ordering Home Page. Use the ordering information in Table 4.

Table 4. Ordering Information

Product Part Number	Product Name
4-10GE-ITU/C	Cisco CRS-1 4-Port 10 Gigabit Ethernet (C-band) DWDM PLIM

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For More Information

For more information about the Cisco CRS-1 4-Port 10GE Tunable WDMPHY Interface Module, contact your local Cisco representative or visit <http://www.cisco.com/go/crs>.



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