Hardware Specifications for Cisco ONS 15454 DWDM

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Hardware Specifications

This document contains hardware and software specifications for the ANSI and ETSI shelf assemblies and cards.

Note In this chapter, "RAMAN-CTP" refers to the 15454-M-RAMAN-CTP card. "RAMAN-COP" refers to the 15454-M-RAMAN-COP card.

Note In this document, “100G-LC-C card” refers to the 15454-M-100G-LC-C card.

The following sections are included:

Revision History

Shelf Specifications

For information on shelf bandwidth, list of topologies, Cisco Transport Controller (CTC) specifications, the LAN, Transaction Language One (TL1), modem, and alarm specifications, timing, power, environment, and shelf dimensions, see the "Hardware Specifications" appendix in the

General Card Specifications

This section provides power specifications and temperature ranges for all cards.

Power

The following table provides power consumption information for the cards and ancillary units.

Table 1: Power Requirements

Card type	Card Name	Maximum Power in Watts	Typical Power in Watts	Amperes at -48 V	BTU/Hr.
Common Control Cards	TNC	62	52	0.94	177.43
	TNC-E	59	54	1.1	184.26
	TSC	55	46	0.79	155.96
	TSC-E	52	48	0.96	163.78
	TNCS	65	55	1.15	187.67
	TNCS-O	70	-	-	-
	TNCS-2	52	49	-	-
	TNCS-2O	60	58	-	-
Optical Service Channel Cards	OSCM	26	23	0.48	78.48
	OSC-CSM	27	24	0.5	81.89
Optical Amplifier Cards	OPT-PRE	39	30	0.63	102.36
	OPT-BST	39	30	0.63	102.36
	OPT-BST-E	39	30	0.63	102.36
	OPT-AMP-17-C	23	19	0.83	64.83
	OPT-AMP-C	32	26	0.83	88.72
	OPT-RAMP-C	55	44	1.04	150.13
	OPT-RAMP-CE	58	46	0.83	156.96
	RAMAN-CTP	90	50	1.04	170.61
	RAMAN-COP	90	50	1.04	170.61
	OPT-EDFA-17	25	18	0.52	61.42
	OPT-EDFA-24	25	18	0.52	61.42
	EDRA-1-xx	65	45	1.35	153.55
	EDRA-2-xx	65	45	1.35	153.55
PSM Card	PSM	12	9	0.41	30.71

Multiplexer and Demultiplexer Cards	4MD-xx.x	25	17	0.35	58.01
	12-AD-FS	32	30	0.67	102.36
	16-AD-FS	65	58	1.35	197.90
ROADM Cards	32DMX	25	15	0.31	51.18
	32WSS	65	50	1.04	170.61
	40-MUX-C	39	35	0.73	119.42
	40-DMX-C	39	35	0.73	119.42
	40-DMX-CE	39	35	0.73	119.42
	40-WSS-C	79	63	1.53	214.96
	40-WSS-CE	79	63	1.53	214.96
	40-WXC-C	33	30	0.63	102.36
	80-WXC-C	40	22	0.42	75.07
	16-WXC-FS	39	38	0.82	129.66
	40-SMR1-C	60	30	0.73	102.36
	40-SMR2-C	70	35	0.83	119.42
	17 SMR9 FS	82	60	1.71	204.73
	24 SMR9 FS	82	60	1.71	204.73
	34 SMR9 FS	82	60	1.71	204.73
	SMR20 FS	110	58	1.75	197.90

Transponder and Muxponder Cards	TXP_MR_10G	50	32.5	0.73	110.89
	TXP_MR_10E	50	32.5	1.05	110.89
	TXP_MR_10E-C	50	31.8	1.05	108.51
	TXP_MR_10E_L	50	31.8	1.05	108.51
	TXP_MR_10EX_C	53	34.4	0.88	117.38
	TXP_MR_2.5G	31	24.3	0.73	82.92
	TXPP_MR_2.5G	35	27.3	1.05	93.15
	MXP_2.5G_10G	53	33	1.05	112.60
	MXP_2.5G_10E	50	37.2	1.05	126.93
	MXP_2.5G_10E_C	50	30.4	1.05	103.72
	MXP_2.5G_10E_L	50	30.4	1.05	103.72
	MXP_2.5G_10EX_C	53	33	1.05	112.60
	MXP_MR_2.5G	60	43.6	1.05	171
	MXPP_MR_2.5G	60	43.6	1.05	171
	MXP_MR_10DME_C	71	53.4	1.25	182.21
	MXP_MR_10DME_L	71	53.4	1.25	182.21
	MXP_MR_10DMEX_C	74	56	1.25	191.08
	40G-MXP-C	112	90	2.34	307.09
	40E-MXP-C	143	99	2.34	337.80
	40ME-MXP-C	143	99	2.34	337.80
	40E-TXP-C	130	105	0.73	358.27
	40ME-TXP-C	130	105	0.73	358.27
	ADM-10G	160	135	2.81	460.64
	OTU2_XP	60	53	1.48	180.84
	AR_MXP	74	50	1.09	170.61
	AR_XP	68	57	1.09	194.49
	AR_XPE	68	57	1.09	194.49
	100G-LC-C	150	125	2.6	426.52
	CFP-LC	95	60	1.25	204.73

	100ME-CKC	150	130	2.7	443.58
	100G-CK-C	150	130	2.7	443.58
	100GS-CK-LC	143	127	2.65	433.34
	200G-CK-LC	170	170	3.54	515.23
	100G-ME-C	150	125	2.6	426.52
	WSE	155	120		409.46
	MR-MXP	140	120		409.46
	10x10G-LC	148	134	2.79	457.23
	400G-XP-LC	380	330	6.9	1297 (Max) 1126 (typical)
TDCU Cards	TDC-CC	12	11	0.17	37.53
	TDC-FC	12	11	0.17	37.53
Ancillary Units	15454-M6-FTA	120	-	-	-
	15454-M6-FTA2	140	-	-	-
	NCS2006-FTA	140	-	-	-
	15454-M6-ECU	40	-	-	-
	15454-M6-ECU-60	12	-	-	-
	NCS2006-ECU	47	-	-	-
	NCS2006-ECU-S	97	-	-	-
	NCS2006-ECU60-S	67	-	-	-
	NCS2015-FTA	560	-	-	-
	NCS2015-ECU	147	-	-	-

Temperature

- Operating temperature:
  - Long term: 0 to 40 degrees Celsius (32 to 104 degrees Fahrenheit)
  - Short term: Functionality is guaranteed at -5 to 55 degrees Celsius (23 to 131 degrees Fahrenheit), according to GR-63 Issue 3

The indicated temperatures are the ambient ones in which the shelf can be placed.

Physical Dimensions

The physical dimensions of single slot and double slot cards are shown in the following table.

Table 2: Card Physical Dimensions

	English Measure				Metric Measure			
	Height (Value)	**Width (Value)**	**Depth (Value)**	**Unit of Measure**	**Height (Value)**	**Width (Value)**	**Depth (Value)**	**Unit of Measure**
Single slot cards	13.11	0.921	9.84	inches	333	23.4	250	mm
Double slot cards	13.11	1.866	9.84	inches	333	47.4	250	mm

Note The dimension of the finger gasket is not included in the width.

Common Control Card Specifications

This section provides specifications for the TNC, TNCE, TSC, TSCE, AIC, cards, the alarm expansion panel (AEP), the MIC-A/P and MIC-C/T/P FMECs, and the card.

For compliance information, refer to the Cisco Optical Transport Products Safety and Compliance Information document.

TNCS-O, TNCS-2, and TNCS-2O Card Specifications

For information on card specifications, see data sheet.

TNC, TNCE, and TNCS Card Specifications

The TNC, TNCE, and TNCS cards have the following specifications:

- CTC software
  - Interface: EIA/TIA-232 (local craft access, on TNC and TNCE faceplate)
  - Interface: 10BaseT LAN (on TNC and TNCE faceplate)
  - Interface: 10BaseT LAN (through the external connection unit for EMS, CT, MSM, VoIP, UDC and Line Cards)
  - Two SFP interfaces to support Optical Service Channels (OC-3/STM-1 or FE/GE)
- Synchronization
  - Stratum 3, per Telcordia GR-253-CORE
  - Free running access: Accuracy +/- 4.6 ppm

- Holdover stability: 3.7 * 10 exp -7 per day including temperature (<255 slips in first 24 hours)
- Reference: External BITS, line, internal

- Supply voltage monitoring
  - Both the input supply voltages are monitored.
  - Normal operation: -40.5 to -56.7 V (in -48 VDC systems)
  - AC input voltage range: Undervoltage TH 90V hysteresis 5V; Overvoltage TH 254V hysteresis 10V
  - Undervoltage: Major alarm
  - Overvoltage: Major alarm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 1.6 lb (0.8 kg)

TSC and TSCE Card Specifications

The TSC and TSCE card has the following specifications:

- CTC software
  - Interface: EIA/TIA-232 (local craft access, on TSC and TSCE faceplates)
  - Interface: 10BaseT LAN (on TSC and TSCE faceplates)
  - Interface: 10BaseT LAN (through the external connection unit for EMS, CT, MSM, VoIP, UDC, and Line Cards)

- Synchronization
  - Stratum 3, per Telcordia GR-253-CORE
  - Free running access: Accuracy +/- 4.6 ppm
  - Holdover stability: 3.7 * 10 exp - 7 per day including temperature (<255 slips in first 24 hours)
  - Reference: External BITS, line, internal

- Supply voltage monitoring
  - Both the input supply voltages are monitored.
  - Normal operation: -40.5 to -56.7 V (in 48 VDC systems)
  - AC input voltage range: Undervoltage TH 90V hysteresis 5V; Overvoltage TH 254 hysteresis 10 V
  - Undervoltage: Major alarm
  - Overvoltage: Major alarm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 1.6 lb (0.8 kg)

AEP Specifications (ANSI only)

The AEP has the following specifications:

- Alarm inputs
  - Number of inputs: 32
  - Optocoupler isolated
  - Label customer provisionable
  - Severity customer provisionable
  - Common 32 V output for all alarm inputs
  - Each input limited to 2 mA
  - Termination: 50-pin AMP champ connector
- Alarm outputs
  - Number of outputs: 16
  - Switched by opto MOS
  - Triggered by definable alarm condition
  - Maximum allowed open circuit voltage: 60 VDC
  - Maximum allowed closed circuit current: 100 mA
  - Termination: 50-pin AMP champ connector
- Environmental
  - Overvoltage protection: as in ITU-T G.703 Annex B
- Dimensions of AEP board
  - Height: 20 mm (0.79 in.)
  - Width: 330 mm (13.0 in.)
  - Depth: 89 mm (3.5 in.)
  - Weight: 0.18 kg (0.4 lb)

MIC-A/P FMEC Specifications (ETSI only)

The MIC-A/P FMEC card has the following specifications:

- Power supply input BATTERY B
  - System supply voltage: ominal -48 VDC

    Tolerance limits: -40.5 to -57.0 VDC
  - Connector: 3WK3 Combo-D power cable connector
- Alarm outputs
  - Voltage (open contact): Maximum 60 VDC
  - Current (closed contact): Maximum 2 mA
  - Connector: 62-pin DB connector (common for inputs/outputs)
- Alarm inputs
  - Voltage (open contact): Maximum 60 VDC
  - Current (closed contact): Maximum 2 mA
  - Connector: 62-pin DB connector (common for inputs/outputs)
- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 31.88 mm (1.255 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.2 kg (0.5 lb)

MIC-C/T/P FMEC Specifications (ETSI only)

The MIC-C/T/P FMEC card has the following specifications:

- Power supply input BATTERY A
  - System supply voltage: Nominal -48 VDC

    Tolerance limits: -40.5 to -57.0 VDC
  - Connector: 3WK3 Combo-D power cable connector
- Timing connector
  - Frequency: 2.048 MHz +/-10 ppm
  - Signal level: 0.75 to 1.5 V
  - Impedance: 75 ohms +/-5 percent (switchable by jumper to high impedance > 3 kohms)

Note 120 ohms balanced impedance is possible with external matching cable.

- Cable attenuation: Up to 6 dB at 2 MHz
- Connectors: 1.0/2.3 miniature coax connector

- System management serial port:
  - System management serial port craft interface
  - Modem port (for future use)
  - Connectors: 8-pin RJ-45

- System management LAN port connectors:
  - Signal: IEEE 802.3 10BaseT
  - Connectors: 8-pin RJ-45

- Dimensions
  - Height: 182 mm (7.165 in.)
  - Width: 31.88 mm (1.255 in.)
  - Depth: 92 mm (3.62 in.)
  - Depth with backplane connector: 98 mm (3.87 in.)
  - Weight not including clam shell: 0.2 kg (0.5 lb)

Optical Service Channel Cards

This section provides specifications for the OSCM and OSC-CSM cards.

OSCM Card Specifications

The OSCM card has the following specifications:

- Line
  - Bit rate: 155 Mbps
  - Code: Scrambled non-return to zero (NRZ)
  - Loopback modes: None
  - Connector: Duplex LC

- Transmitter optical service channel (OSC) signal
  - Maximum transmitter output power: -1 dBm

- Minimum transmitter output power: -5 dBm
- Nominal wavelength: 1510-nm +/-10 nm
- Variable optical attenuator (VOA) necessary in the transmit path to adjust the in-fiber optical power level

- Receiver OSC signal
  - Maximum receiver level: -8 dBm at 10^{-10} bit error rate (BER)
  - Minimum receiver level: -40 dBm at 10^{-10} BER
  - Span budget: 40-dB span budget (about 150 km assuming fiber path loss equals 0.25 dB/km)
  - Jitter tolerance: Telcordia GR-253/G.823 compliant

OSC-CSM Card Specifications

The OSC-CSM card has the following specifications:

- Line
  - Bit rate: 155 Mbps
  - Code: Scrambled NRZ
  - Loopback modes: None
  - Connector: Duplex LC

- Transmitter OSC signal
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -24 dBm
  - Nominal wavelength: 1510-nm +/-10 nm
  - VOA is necessary in the transmit path to adjust the in-fiber optical power level

- Receiver OSC signal
  - Maximum receiver level: -8 dBm at 10^{-10} BER
  - Minimum receiver level: -40 dBm at 10^{-10} BER
  - Span loss budget: 35-dB span budget (approximately 140 km assuming that the fiber path loss is equal to 0.25 dB/km)
  - Jitter tolerance: Telcordia GR-253/G.823 compliant

Optical Amplifier Cards

This sections provides specifications for the OPT-PRE amplifier, OPT-BST amplifier, OPT-BST-E amplifier, OPT-AMP-C amplifier (configurable as a preamplifier or booster amplifier), OPT-AMP-17-C, OPT-RAMP-C, OPT-RAMP-CE, RAMAN-CTP, and RAMAN-COP amplifier cards.

OPT-PRE Amplifier Card Specifications

The OPT-PRE amplifier card has the following specifications:

- Optical characteristics:
  - Total operating wavelength range: 1530 to 1561.3 nm
  - Gain ripple (peak to valley): 1.5 dB
  - Mid-access loss (MAL) range (for dispersion compensation unit [DCU]): 3 to 9 dB
  - Gain range: 5 to 38.5 dBm in constant power mode, 5 to 28 dBm in constant gain mode
  - Minimum gain (standard range): 5.0 dBm
  - Maximum gain (standard range with programmable gain tilt): 21 dBm
  - Maximum gain (extended range with uncontrolled gain tilt): 38.5 dBm
  - Gain and power regulation over/undershoot: 0.5 dB
  - Limited maximum output power: 17.5 dBm
  - Maximum output power (with full channel load): 17 dB
  - Minimum output power (with one channel): -2 dBm
  - Input power (Pin) range at full channel load: -21.5 to 12 dBm
  - Input power (Pin) range at single channel load: -39.5 to -6 dBm
  - Noise figure at G^3 21 dB = 6.5 dB
  - OSC filter drop (channels) insertion loss maximum: 1 dB
  - OSC filter drop (OSC) insertion loss maximum: 1.8 dB
  - OSC filter add (OSC) insertion loss maximum: 1.3 dB
  - Optical connectors: LC-UPC/2

OPT-BST Amplifier Card Specifications

The OPT-BST amplifier card has the following specifications:

- Optical characteristics:
  - Total operating wavelength range: 1530 to 1561.3 nm
  - Gain ripple (peak to valley): 1.5 dB

- Gain range: 5 to 20 dBm with programmable gain tilt
- Gain and power regulation over/undershoot: 0.5 dB
- Limited maximum output power: 17.5 dBm
- Maximum output power (with full channel load): 17 dB
- Minimum output power (with one channel): -2 dBm
- Input power (Pin) range at full channel load: -3 to 12 dBm
- Input power (Pin) range at single channel load: -21 to -6 dBm
- Noise figure at G^3 20 dB = 6 dB
- OSC filter drop (channels) insertion loss maximum: 1 dB
- OSC filter drop (OSC) insertion loss maximum: 1.8 dB
- OSC filter add (OSC) insertion loss maximum: 1.3 dB
- Optical connectors: LC-UPC/2

OPT-BST-E Amplifier Card Specifications

The OPT-BST-E amplifier card has the following specifications:

- Optical characteristics
  - Total operating wavelength range: 1530 to 1561.3 nm
  - Gain ripple (peak to valley): 1.8 dB
  - Gain range: 8 to 23 dB with programmable gain tilt
  - Extended gain range: 23 to 26 dB with gain tilt uncontrolled
  - Gain and power regulation over/undershoot: 0.5 dB
  - Limited maximum output power: 20.5 dBm
  - Maximum output power (with full channel load): 20 dB
  - Minimum output power (with one channel): -0 dBm
  - Input power (Pin) range at full channel load: -6 to 12 dBm
  - Input power (Pin) range at single channel load: -26 to -8 dBm
  - Noise figure at G^3 23 dB = 6 dB
  - OSC filter drop (channels) insertion loss maximum: 1 dB
  - OSC filter drop (OSC) insertion loss maximum: 1.8 dB
  - OSC filter add (OSC) insertion loss maximum: 1.3 dB
  - Optical connectors: LC-UPC/2

OPT-AMP-17-C Amplifier Card Specifications

The OPT-AMP-17-C card has the following specifications:

- Optical characteristics:
  - DWDM channel wavelength plan: 80 channels at 50 GHz spacing, 1530.33 nm to 1561.83 nm
  - Channel spacing: 50 GHz
  - Total operating wavelength range 1529.0 to 1562.5 nm
  - Gain ripple (peak to valley): 1.5 dB
  - Gain range: 14 to 23 dB
  - Optimal gain (gain tilt = 0): 17 dB
  - Gain and power regulation over/undershoot: 0.5 dB
  - Minimum output power (with one channel): -2 dBm
  - Maximum power output (standard or extended gain range): 17.5 dBm
  - Input power range (full channel load): -6 to 3 dBm
  - Input power range (single channel load): -28 to -19 dBm
  - Noise figure at G=17dB = 6 dB maximum
  - Insertion loss (Line RX to OSC TX): 0.3 to 1.8 dB
  - Insertion loss (Line RX to COM TX): 0.3 to 1.0 dB
  - Insertion loss (OSC RX to LINE TX): 0.3 to 1.3 dB
  - Optical connectors: LC-UPC/2

OPT-AMP-C Amplifier Card Specifications

The OPT-AMP-C amplifier card has the following specifications:

- Optical characteristics:
  - Total operating wavelength range: 1529.0 to 1562.5 nm
  - Gain ripple (peak to valley): 1.2 dB
  - Gain range: 12 to 24 dB with programmable gain tilt
  - Extended gain range: 24 to 35 dB with gain tilt uncontrolled
  - Gain and power regulation over/undershoot: 0.5 dB
  - Limited maximum output power: 20.5 dBm
  - Maximum output power (with full channel load): 20 dBm
  - Minimum output power (with one channel): -2 dBm
  - Input power (Pin) at full channel load: -15 dBm minimum

- Input power (Pin) range at single channel load: -40 to -17 dBm
- Noise figure at G3 20 dB: 7.6 dB
- Insertion loss (Line RX to OSC TX): 0.3 to 1.8 dB
- Insertion loss (Line RX to COM TX): 0.3 to 1.0 dB
- Insertion loss (OSC RX to LINE TX): 0.3 to 1.3 dB
- Optical connectors: LC-UPC/2

OPT-RAMP-C Amplifier Card Specifications

The OPT-RAMP-C amplifier card has the following specifications:

- Raman pump
  - Raman pump 1 wavelength: 1425 nm
  - Raman pump 2 wavelength: 1452 nm
  - Total Raman Pump power - Line-RX port: 500 mW
  - Operating range Raman Pump power - Line-RX port: min 100 mW, max 450[2] mW
  - Raman pump laser class: 3B
- Embedded EDFA
  - Total operating signal wavelength range: 1529 to 1529.5 nm
  - EDFA nominal gain value (Line RX to DC-TX): 14 dB
  - EDFA gain settable range: 8 to 20 dB
  - EDFA Output Power range - DC-TX (Full Channel load): 17.5[3] dBm
  - VOA attenuation range: 0 to 25 dB
  - Gain and power regulation over/undershoot: 0.5 dB
  - EDFA laser class: 1M
  - Maximum EDFA output power: 17.5 dBm
  - Minimum output power (with one channel): -10 dBm
  - Input power (Pin) at full channel load: -3 dBm to +9 dBm
  - Input power (Pin) range at single channel load: -24 dBm to -10 dBm
  - Noise figure at G 14 dB: 7.5 dB
  - Insertion loss (Line TX to OSC TX): 0.3 to 2.0 dB
  - Insertion loss (Line RX to COM TX): 0.3 to 1.0 dB
  - Insertion loss (OSC RX to LINE RX): 0.3 to 1.8 dB
  - Optical connectors: LC-UPC/2

OPT-RAMP-CE Amplifier Card Specifications

The OPT-RAMP-CE amplifier card has the following specifications:

- Raman pump
  - Raman pump 1 wavelength: 1425 nm
  - Raman pump 2 wavelength: 1452 nm
  - Total Raman pump power - LINE-RX port: 500 mW
  - Operating range Raman pump power - LINE-RX port: min 100 mW, max 450 mW
  - Raman pump laser class: 3B
- Embedded EDFA
  - Total operating signal wavelength range: 1529 to 1562.9 nm
  - EDFA nominal gain value (LINE-RX to DC-TX): 11dB
  - EDFA gain settable range: 5 to 17 dB
  - EDFA Output power range - DC-TX (Full Channel load): 20.2 dBm
  - VOA attenuation range: 0 to 25 dB
  - Gain and power regulation over/undershoot: 0.5 dB
  - EDFA laser class: 1M
  - Maximum EDFA output power: 20.5 dBm
  - Minimum output power (with one channel): -10 dBm
  - Input power (Pin) at full channel load: 15 dBm (maximum)
  - Input power (Pin) range at single channel load: -27 dBm (minimum)
  - Noise figure at G 11 dB: 7 dB
  - Insertion loss (LINE-RX to MON-RX): 22 to 26 dB
  - Insertion loss (LINE-TX to OSC-TX): 1.5 dB
  - Insertion loss (OSC-RX to LINE-RX): 0.7 to 1.7 dB
  - Insertion loss (LINE-TX to COM-RX): 0.6 to 1.0 dB
  - Insertion loss (LINE-TX to PD12): 1.7 dB
  - Insertion loss (OSC-RX to LINE-RX): 0.7 to 1.7 dB
  - Optical connectors: LC-UPC/2

RAMAN-CTP and RAMAN-COP Card Specifications

The RAMAN-CTP and RAMAN-COP are supported from Release 9.3 onwards and have the following specifications:

- Raman pump
  - Raman pump 1 wavelength: 1428 nm
  - Raman pump 2 wavelength: 1457 nm
  - Total Raman pump power-LINE-RX port: 1000 mW
  - Operating range Raman pump power-LINE-RX port: min 100 mW, max 1000 mW
  - Raman pump laser class: 1M (internal pump module laser class: 4)
- DFB laser (present in RAMAN-CTP only)
  - DFB wavelength: 1568.77 nm
  - Operating range DFB power-LINE-TX port: 14.3 dBm, max 5.7 dBm
  - DFB section class: 1
  - Max DFB laser power: 10 mW
- Optical Connectors:
  - RAMAN-CTP card:
    - Three E-2000 PS PC connectors (LINE-TX, LINE-RX, and RAMAN-COP-RX ports)
    - Three LC-UPC-II connectors (COM-TX, COM-RX, and MON-TX ports)
  - RAMAN-COP card:
    - One E-2000 PS PC connector (RAMAN-TX port)

OPT-EDFA-17 Amplifier Card Specifications

The OPT-EDFA-17 amplifier card has the following specifications:

- Optical characteristics:
  - Total operating wavelength range: 1528.77 to 1566.72 nm
  - Gain ripple (peak to valley): 1.2 dB
  - Gain range with gain tilt control of 5 to 17 dB
  - Extended gain range (with uncontrolled tilt) of 17 to 20 dB
  - Gain and power regulation over/undershoot: 0.5 dB
  - Limited maximum output power: 20 dBm
  - Maximum output power (with full channel load): 20 dBm
  - Minimum output power (with one channel): 5 dBm
  - Input power (Pin) at full channel load: 0 dBm minimum to 15 dBm maximum
  - Input power (Pin) range at single channel load: -25 to 10 dBm

- Noise figure at G^3 17 dB: 5.5 dB
- Insertion loss (LINE RX to OSC TX): 0.3 to 1.8 dB
- Insertion loss (LINE RX to COM TX): 0.3 to 1.0 dB
- Insertion loss (OSC RX to LINE TX): 0.3 to 1.3 dB
- Optical connectors: LC-UPC/2

OPT-EDFA-24 Amplifier Card Specifications

The OPT-EDFA-24 Amplifier Card Specifications

- Optical characteristics:
  - Total operating wavelength range: 1528.77 to 1566.72 nm
  - Gain ripple (peak to valley): 1.2 dB
  - Gain range with gain tilt control of 12 to 24 dB
  - Extended gain range (with uncontrolled tilt) of 24 t o 27 dB
  - Gain and power regulation over/undershoot: 0.5 dB
  - Limited maximum output power: 20 dBm
  - Maximum output power (with full channel load): 20 dBm
  - Minimum output power (with one channel): -5 dBm
  - Input power (Pin) at full channel load: -7 dBm minimum to 8 dBm maximum
  - Input power (Pin) range at single channel load: -32 to -17 dBm
  - Noise figure at G^3 24 dB: 5.5 dB
  - Insertion loss (LINE RX to OSC TX): 0.3 to 1.8 dB
  - Insertion loss (LINE RX to COM TX): 0.3 to 1.0 dB
  - Insertion loss (OSC RX to LINE TX): 0.3 to 1.3 dB
  - Optical connectors: LC-UPC/2

EDRA-1-xx and EDRA-2-xx Card Specifications

For information on card specifications, see the data sheet .

PSM (Protection Switching Module) Card Specifications

The PSM card has the following specifications:

- Wavelength:
  - Total operating wavelength range (C-band range): 1529.0 - 1562.5 nm

- OSC wavelength range: 1500 - 1520 nm
- L-band range: 1570 - 1605 nm

- Optical
  - Insertion loss:
    - COM-RX to W-TX and P-TX; 4.6 dB
    - W-RX to P-RX to COM-TX: 2.3 dB
  - Insertion loss ripple: 0.2 dB
  - Maximum optical input power: 300 mW
  - Polarization dependent loss: 0.2 dB
  - Optical switches state setting time: 5 ms
  - VOA attenuation setting time in open loop: 20 ms
  - VOA attenuation setting time in closed loop: 500 ms (applicable to VOA in RX only)
  - VOA attenuation range: 0 - 15 dB

Multiplexer and Demultiplexer Cards

This section provides specifications for the 4MD-xx.x cards.

12-AD-FS and 16-AD-FS Card Specifications

For more information on the card specifications, see the data sheet.

Reconfigurable Optical Add/Drop Cards

This section provides specifications for the 32DMX, 32WSS, 40-MUX-C, 40-DMX-C, 40-DMX-CE, 40-WSS-C. 40-WSS-CE, 40-WXC-C, 80-WXC-C, SMR1-C, 40-SMR2-C cards.

16-WXC-FS Card Specifications

For information on card specifications, see the data sheet.

17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, and SMR20 FS CV Card Specifications

For information on card specifications, see the data sheet.

Transponder and Muxponder Card Specifications

This section provides specifications for the 40E-TXP-C, 40ME-TXP-C,40E-TXP-C, 40ME-TXP-C, 40E-TXP-C, 40ME-TXP-C, TXP_MR_10G, MXP_2.5G_10G, TXP_MR_2.5G, TXPP_MR_2.5G, MXP_MR_2.5G, MXPP_MR_2.5G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10EX_C, MXP_2.5G_10E, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, TXP_MR_10EX_C, MXP_MR_10DME_C, MXP_MR_10DME_L, MXP_MR_10DMEX_C, 40G-MXP-C, 40E-MXP-C, 40ME-MXP-C, 100G-LC-C, 100G-CK-C, ADM-10G, and OTU2_XP cards.

For compliance information, refer to the Cisco Optical Transport Products Safety and Compliance Information document .

40E-TXP-C, and 40ME-TXP-C Card Specifications

The 40E-TXP-C, and 40ME-TXP-C cards have the following specifications:

- Line (Trunk-side)
  - Bit rate:

    43.018 Gbps for OTU3

    44.57 Gbps for OTU3e
  - Code: NRZ 40G
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance for 40E-TXP-C: +/- 29000 ps/nm
  - Maximum chromatic dispersion allowance for 40ME-TXP-C: +/- 3000 ps/nm
  - Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the 40E-TXP-C, and 40ME-TXP-C cards in a loopback on the trunk port. Do not use direct fiber loopbacks with the 40E-TXP-C, and 40ME-TXP-C cards. Using direct fiber loopbacks causes irreparable damage to the 40E-TXP-C, and 40ME-TXP-C cards.

  - Connectors: LC
  - Compliance Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.691

- Transmitter (Trunk-side)
  - Maximum transmitter output power: +3.0 dBm
  - Minimum transmitter output power: +1 dBm
  - Transmitter: Lithium Niobate (LN) external modulator transmitter
  - Wavelength stability (Drift): +/- 25 picometers

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Receiver (Trunk-side):
  - Receiver input power (no FEC, unamplified, 23 dB optical signal-to-noise ratio [OSNR], BER 1 * 10 exp - 12): -8 to -21 dBm
  - Receiver input power (no FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12): -8 to -19 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, BER 1 * 10 exp - 12): -8 to -20 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12): -8 to -18 dBm
  - Receiver input power (FEC, unamplified, 23 dB OSNR, BER 8 * 10 exp - 5): -8 to -24 dBm
  - Receiver input power (FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm, BER 8 * 10 exp - 5): -8 to -22 dBm
  - Receiver input power (FEC, amplified, 9 dB OSNR, BER 8 * 10 exp - 5): -8 to -18 dBm
  - Receiver input power (FEC, unamplified, 11 dB OSNR, at +/- 800 ps/nm, BER 8 * 10 exp - 5): -8 to -18 dBm
- Line (Client-side)
  - Bit rate:

    39.8131 Gbps for OC-768/STM-256/40GE WAN PHY

    41.250 Gbps for 40GE LAN PHY

    43.0184 Gbps for OTU3 (OC-768/STM-256/40GE WAN PHY)
  - Code: NRZ 40G
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: 40 ps/nm
  - Loopback modes: Terminal and facility
- Transmitter (Client-side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1530 to 1565 nm
  - Nominal wavelength: 1550 nm
  - Transmitter: Distributed feedback (DFB) laser
- Receiver (Client-side)

- Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
- Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
- Receiver: Avalanche photodiode (APD)
- Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
- Receiver input wavelength range: 1290 to 1605 nm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 7.7 lb (3.5 kg)

TXP_MR_10G Card Specifications

The TXP_MR_10G card has the following specifications:

- Line (trunk side)
  - Bit rate:

    9.95328 Gbps for OC-192/STM-64

    10.70923 Gbps with ITU-T G.709 Digital Wrapper/forward error correction (FEC)

    10.3125 Gbps for 10 Gigabit Ethernet (GE)

    11.095 Gbps with ITU-T G.709 Digital Wrapper/FEC over 10 GE
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: 1000 ps/nm
  - Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10G card in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_10G card. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_10G card.

  - Connectors: LC
  - Compliance Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.691

- Transmitter (trunk side)
  - Maximum transmitter output power: +3.5 dBm
  - Minimum transmitter output power: +2.5 dBm

- Transmitter: Lithium Niobate (LN) external modulator transmitter
- Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of TXP_MR_10G (16 card versions, each covering two wavelengths):
  - 1530.33 to 1531.12 nm (two wavelengths)
  - 1531.90 to 1532.68 nm (two wavelengths)
  - 1534.25 to 1535.04 nm (two wavelengths)
  - 1535.82 to 1536.61 nm (two wavelengths)
  - 1538.19 to 1538.98 nm (two wavelengths)
  - 1539.77 to 1540.56 nm (two wavelengths)
  - 1542.14 to 1542.94 nm (two wavelengths)
  - 1543.73 to 1544.53 nm (two wavelengths)
  - 1546.12 to 1546.92 nm (two wavelengths)
  - 1547.72 to 1548.51 nm (two wavelengths)
  - 1550.12 to 1550.92 nm (two wavelengths)
  - 1551.72 to 1552.52 nm (two wavelengths)
  - 1554.13 to 1554.94 nm (two wavelengths)
  - 1555.75 to 1556.55 nm (two wavelengths)
  - 1558.17 to 1558.98 nm (two wavelengths)
  - 1559.79 to 1560.61 nm (two wavelengths)
- Receiver (trunk side):
  - Receiver input power (no FEC, unamplified, 23 dB optical signal-to-noise ratio [OSNR], BER 1 * 10 exp - 12): -8 to -21 dBm
  - Receiver input power (no FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12): -8 to -19 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, BER 1 * 10 exp - 12): -8 to -20 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12):-8 to -18 dBm
  - Receiver input power (FEC, unamplified, 23 dB OSNR, BER 8 * 10 exp - 5): -8 to -24 dBm

- Receiver input power (FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm, BER 8 * 10 exp - 5): -8 to -22 dBm
- Receiver input power (FEC, amplified, 9 dB OSNR, BER 8 * 10 exp - 5): -8 to -18 dBm
- Receiver input power (FEC, unamplified, 11 dB OSNR, at +/- 800 ps/nm, BER 8 * 10 exp - 5): -8 to -18 dBm

- Line (client side)
  - Bit rate: 9.95328 Gbps or 10.3125 Gbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: Compliant with SR-1 specification for OC-192. In the case of 10 GE, the allowance is up to 10 km of single-mode fiber (SMF) dispersion.
  - Loopback modes: Terminal and facility
  - Connectors: LC
- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: Distributed feedback (DFB) laser
- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: avalanche photodiode (APD)
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_2.5G_10G Card Specifications

The MXP_2.5G_10G card has the following specifications:

- Line (trunk side)

- Bit rate:

  9.95328 Gbps for OC-192/STM-64

  10.70923 Gbps with ITU-T G.709 Digital Wrapper/FEC

- Code: Scrambled NRZ
- Fiber: 1550-nm single-mode
- Maximum chromatic dispersion allowance: 1000 ps/nm
- Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_2.5G_10G card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_2.5G_10G card. Using direct fiber loopbacks causes irreparable damage to the MXP_2.5G_10G card.

- Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +3.5 dBm
  - Minimum transmitter output power: +2.5 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm

- Currently available wavelengths and versions of MXP_2.5G_10G (16 card versions, each covering two wavelengths):
  - 1530.33 to 1531.12 nm (two wavelengths)
  - 1531.90 to 1532.68 nm (two wavelengths)
  - 1534.25 to 1535.04 nm (two wavelengths)
  - 1535.82 to 1536.61 nm (two wavelengths)
  - 1538.19 to 1538.98 nm (two wavelengths)
  - 1539.77 to 1540.56 nm (two wavelengths)
  - 1542.14 to 1542.94 nm (two wavelengths)
  - 1543.73 to 1544.53 nm (two wavelengths)
  - 1546.12 to 1546.92 nm (two wavelengths)

- 1547.72 to 1548.51 nm (two wavelengths)
- 1550.12 to 1550.92 nm (two wavelengths)
- 1551.72 to 1552.52 nm (two wavelengths)
- 1554.13 to 1554.94 nm (two wavelengths)
- 1555.75 to 1556.55 nm (two wavelengths)
- 1558.17 to 1558.98 nm (two wavelengths)
- 1559.79 to 1560.61 nm (two wavelengths)

- Receiver (trunk side)
  - Receiver input power (no FEC, unamplified, 23 dB OSNR, BER 1 * 10 exp - 12): -8 to -21 dBm
  - Receiver input power (no FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12): -8 to -19 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, BER 1 * 10 exp - 12): -8 to -20 dBm
  - Receiver input power (no FEC, amplified, 19 dB OSNR, at +/- 1000 ps/nm BER 1 * 10 exp - 12): -8 to -18 dBm
  - Receiver input power (FEC, unamplified, 23 dB OSNR, BER 8 * 10 exp - 5): -8 to -24 dBm
  - Receiver input power (FEC, unamplified, 23 dB OSNR, at +/- 1000 ps/nm, BER 8 * 10 exp - 5): -8 to -22 dBm
  - Receiver input power (FEC, amplified, 9 dB OSNR, BER 8 * 10 exp - 5): -8 to -18 dBm
  - Receiver input power (FEC, unamplified, 11 dB OSNR, at +/- 800 ps/nm, BER 8 * 10 exp - 5): -8 to -18 dBm

- Line (client side)
  - Bit rate: 2.48832 Gbps
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: Compliant with SR-1 specification for OC-192. In the case of 10 GE, allowance is up to 10 km of SMF fiber of dispersion.
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side): Depends on the Small Form-factor Pluggable (SFP) that is used.
- Receiver (client side): Depends on the SFP that is used.
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

TXP_MR_2.5G and TXPP_MR_2.5G Card Specifications

The TXP_MR_2.5G and TXPP_MR_2.5G cards have the following specifications:

- Line (trunk side)
  - Bit rate:

    2.488 Gbps for OC-48/STM-16

    2.66 Gbps with ITU-T G.709 Digital Wrapper/FEC
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: 5400 ps/nm
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the TXP_MR_2.5G and TXPP_MR_2.5G cards in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_2.5G and TXPP_MR_2.5G cards. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_2.5G and TXPP_MR_2.5G cards.

  - Connectors: LC
- Transmitter (trunk side)
  - Maximum transmitter output power: +1 dBm
  - Minimum transmitter output power: -4.5 dBm
  - Transmitter: Direct modulated laser
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths of TXP_MR_2.5G and TXPP_MR_2.5G (eight card versions):

  ITU grid blue band: 1530.334 to 1544.526 nm (four card versions covering four wavelengths each)

  ITU grid red band: 1546.119 to 1560.606 nm (four card versions covering four wavelengths each)
- Receiver (trunk side, see the following table).

Table 3: TXP_MR_2.5G/TXPP_MR_2.5G Card Receiver Trunk Side Specifications

OSNR [1]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	Chormatic Dispersion Tolerance
22 dB	Off - 2R	< 10 exp - 12	N/A	- 9 to - 24 dBm	—
22 dB	Off - 2R	< 10 exp - 12	N/A	- 9 to - 21 dBm	+/- 3300ps/nm
21 dB	Off - 3R	< 10 exp - 12	N/A	- 9 to - 30 dBm	—
22 dB	Off - 3R	< 10 exp - 12	N/A	- 9 to - 30 dBm	+/- 1800ps/nm
23 dB	Off - 3R	< 10 exp - 12	N/A	- 9 to - 30 dBm	+/- 5400ps/nm
12 dB	Standard - 3R	< 10 exp - 5	< 10 exp - 15	- 9 to - 25 dBm	—
12 dB	Standard - 3R	< 10 exp - 5	< 10 exp - 15	- 9 to - 24 dBm	+/- 1800ps/nm
12 dB	Standard - 3R	< 10 exp - 5	< 10 exp - 15	- 9 to - 23 dBm	+/- 5400ps/nm
21 dB	Standard - 3R	< 10 exp - 5	< 10 exp - 15	- 9 to - 31 dBm	—

[1] OSNR defined with 0.1 nm resolution bandwidth (RBW)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion

- Line (client side)
  - Bit rate: 8 Mbps to 2.488 Gbps
  - Code: Scrambled NRZ
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Maximum chromatic dispersion allowance: Based on SFP
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: Based on SFP
  - Nominal wavelength: Based on SFP
  - Transmitter: Based on SFP

- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 850nm to 1605 nm
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_MR_2.5G and MXPP_MR_2.5G Card Specifications

The MXP_MR_2.5G and MXPP_MR_2.5G cards have the following specifications:

- Payload configuration
  - FC1G-Fibre Channel 1.06 Gbps
  - FC2G-Fibre Channel 2.125 Gbps
  - FICON1G-Fiber connectivity 1.06 Gbps (IBM signal)
  - FICON2G-Fiber connectivity 2.125 Gbps (IBM signal)
  - ESCON-Enterprise System Connection 200 Mbps
  - ONE_GE-One Gigabit Ethernet 1.125 Gbps
  - Mixed configurations up to maximum line rate of 2.5 Gbps (for example, if you have a port configured for FC2G, you cannot use another port at the same time). See the "MXP_MR_2.5G and MXPP_MR_2.5G Cards" section, chapter "Provision Transponder and Muxponder Cards" in the Cisco ONS 15454 DWDM Configuration Guide for more information on mixed-mode operation.
- Client ports: 8x SFP
- Performance monitoring (PM) for all interfaces
- Buffer-to-buffer credit management for distance extension
- Line (trunk side)
  - Bit rate: 2.488 Gbps for OC-48/STM-16
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: 6000 ps/nm
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_MR_2.5G and MXPP_MR_2.5G cards in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_MR_2.5G and MXPP_MR_2.5G cards. Using direct fiber loopbacks causes irreparable damage to the MXP_MR_2.5G and MXPP_MR_2.5G cards.

- Connectors: LC

- Transmitter (trunk side)
  - Transmit power: +3 +/- 1 dBm with MXP_MR_2.5G card, and +/- 1 dBm with MXPP_MR_2.5G card
  - 50-GHz DWDM migration ready (the wavelength deviation is less than +/- 0.040 nm through wavelocker deployment)
  - Four-channel wavelength tunability at 100-GHz spacing
  - Transmitter maximum return reflectance: -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB
  - Transmitter is a direct modulated laser
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths of the TXP_MR_2.5G and TXPP_MR_2.5G cards (eight card versions):
  - ITU grid blue band: 1530.334 to 1544.526 nm (four card versions, four wavelengths each)
  - ITU grid red band: 1546.119 to 1560.606 nm (four card versions, four wavelengths each)

- Receiver (trunk side, see the following table).

Table 4: MXP_MR_2.5G/MXPP_MR_2.5G Card Receiver Trunk Side Specifications

OSNR [2]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [3]	Chromatic Dispersion Tolerance
17 dB	N/A	< 10 exp - 12	N/A	-9 to -23 dBm	—
17 dB	N/A	< 10 exp - 12	N/A	-9 to -22 dBm	+/- 1800 ps/nm
17 dB	N/A	< 10 exp - 12	N/A	-9 to -21 dBm	+/- 5400 ps/nm

18 dB	N/A	< 10 exp - 12	N/A	-9 to -23 dBm	+/- 1800 ps/nm
19 dB	N/A	< 10 exp - 12	N/A	-9 to -23 dBm	+/- 5400 ps/nm
21 dB	N/A	< 10 exp - 12	N/A	-9 to -30 dBm	—
21 dB	N/A	< 10 exp - 12	N/A	-9 to -29 dBm	+/- 1800 ps/nm
21 dB	N/A	< 10 exp - 12	N/A	-9 to -28 dBm	+/- 5400 ps/nm
22 dB	N/A	< 10 exp - 12	N/A	-9 to -30 dBm	+/- 1800 ps/nm
23 dB	N/A	< 10 exp - 12	N/A	-9 to -30 dBm	+/- 5400 ps/nm

[2] OSNR defined with 0.1 nm RBW
[3] Receiver filter bandwidth 32.5GHz (at - 3 dB)

- Receiver sensitivity -28 dBm, BER 1 * 10 exp - 12
- Receiver overload is equal to or exceeds -8 dBm
- Receiver maximum reflectance of -27 dB

- Line (client side)
  - Bit rate: 200Mbps or 1.06 Gbps to 2.125 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: Based on SFP
  - Nominal wavelength: Based on SFP
  - Transmitter: Based on SFP

- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm or 850nm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

MXP_2.5G_10E Card Specifications

The MXP_2.5G_10E card has the following specifications:

- Line (trunk side)
  - Bit rate: 10.70923 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_2.5G_10E card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_2.5G_10E card. Using direct fiber loopbacks causes irreparable damage to the MXP_2.5G_10E card.

  - Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of MXP_2.5G_10E (eight card versions):

  ITU grid blue band:
  - 1530.33 to 1533.07 nm (four channels)
  - 1534.25 to 1537.00 nm (four channels)
  - 1538.19 to 1540.95 nm (four channels)
  - 1542.14 to 1544.92 nm (four channels)

ITU grid red band:

- 1546.12 to 1548.92 nm (four channels)
- 1550.12 to 1552.93 nm (four channels)
- 1554.13 to 1556.96 nm (four channels)
- 1558.17 to 1561.01 nm (four channels)

- Receiver (trunk side, see Table 5: MXP_2.5G_10E Card Receiver Trunk Side Specifications, on page 33)
  - Receiver: APD
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion

Table 5: MXP_2.5G_10E Card Receiver Trunk Side Specifications

OSNR [4]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [5]	Chormatic Dispersion Tolerance
30 dB	Off	< 10 exp - 12	N/A	- 8 to - 20 dBm	+/- 1200 ps/nm
26 dB	Off	< 10 exp - 12	N/A	- 8 to - 20 dBm	+/- 1000 ps/nm
26 dB	Off	< 10 exp - 12	N/A	- 8 to - 22 dBm	—
17 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 18 dBm	+/- 800ps/nm
15 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 18 dBm	—
15 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 18 dBm	+/- 800ps/nm
14 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 18 dBm	—

[4] OSNR defined with 0.1 nm (RBW)
[5] Receiver filter bandwidth greater than or equal to 180 pm (at - 3 dBm)

- Line (client side)
  - Bit rate: 2.5 Gbps per port (OC-48/STM-16)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 12 ps/nm (SR SFP version)
  - Loopback modes: Terminal and facility
  - Connectors: LC (optical)

- Transmitter (client side): Depends on the SFP that is used.
- Receiver (client side): Depends on the SFP that is used.

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_2.5G_10E_C Card Specifications

The MXP_2.5G_10E_C card has the following specifications:

- Line (trunk side)
  - Bit rate: 10.70923 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_2.5G_10E_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_2.5G_10E_C card. Using direct fiber loopbacks causes irreparable damage to the card.

  - Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of MXP_2.5G_10E_C card:

  There is a single version of the MXP_2.5G_10E_C card. It is tunable across 82 wavelengths in the C-band requency plan, with channels on the ITU 50-GHz grid, as shown in the following table.

Table 6: MXP_2.5G_10E_C Card Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength(nm)

1	196.00	1529.55	42	193.95	1545.72
2	195.95	1529.94	43	193.90	1546.119
3	195.90	1530.334	44	193.85	1546.518
4	195.85	1530.725	45	193.80	1546.917
5	195.80	1531.116	46	193.75	1547.316
6	195.75	1531.507	47	193.70	1547.715
7	195.70	1531.898	48	193.65	1548.115
8	195.65	1532.290	49	193.60	1548.515
9	195.60	1532.681	50	193.55	1548.915
10	195.55	1533.073	51	193.50	1549.32
11	195.50	1533.47	52	193.45	1549.71
12	195.45	1533.86	53	193.40	1550.116
13	195.40	1534.250	54	193.35	1550.517
14	195.35	1534.643	55	193.30	1550.918
15	195.30	1535.036	56	193.25	1551.319
16	195.25	1535.429	57	193.20	1551.721
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959

30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

- Receiver (trunk side, see the following table).

Table 7: MXP_2.5G_10E_C Card Receiver Trunk Side Specifications

OSNR [6]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [7]	Chromatic Dispersion Tolerance
30 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	+/- 1200 ps/nm
26 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	+/- 1000 ps/nm
26 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	—
17 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm
15.5 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 18 dBm	—
14 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm
12 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	8 to - 18 dBm	—

[6] OSNR defined with 0.1 nm (RBW)
[7] Receiver filter bandwidth 32.5GHz (at - 3 dB)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1529 to 1562 nm

- Line (client side)
  - Bit rate: 2.5 Gbps per port (OC-48/STM-16)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 12 ps/nm (SR SFP version)
  - Loopback modes: Terminal and facility
  - Connectors: LC (optical)
- Transmitter (client side): Depends on the SFP that is used.
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_2.5G_10E_L Card Specifications

The MXP_2.5G_10E_L card has the following specifications:

- Line (trunk side)
  - Bit rate: 10.70923 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_2.5G_10E_L card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_2.5G_10E_L card. Using direct fiber loopbacks causes irreparable damage to the card.

  - Connectors: LC
- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of MXP_2.5G_10E_L card:

  There is a single version of the MXP_2.5G_10E_L card. It is tunable across 80 wavelengths in the L band frequency plan, with channels on the ITU 50-GHz grid, as shown in the following table.

Table 8: MXP_2.5G_10E_L Card Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength(nm)
1	190.85	1570.83	41	188.85	1587.46
2	190.8	1571.24	42	188.8	1587.88
3	190.75	1571.65	43	188.75	1588.30
4	190.7	1572.06	44	188.7	1588.73
5	190.65	1572.48	45	188.65	1589.15
6	190.6	1572.89	46	188.6	1589.57
7	190.55	1573.30	47	188.55	1589.99
8	190.5	1573.71	48	188.5	1590.41
9	190.45	1574.13	49	188.45	1590.83
10	190.4	1574.54	50	188.4	1591.26
11	190.35	1574.95	51	188.35	1591.68
12	190.3	1575.37	52	188.3	1592.10
13	190.25	1575.78	53	188.25	1592.52
14	190.2	1576.20	54	188.2	1592.95
15	190.15	1576.61	55	188.15	1593.37
16	190.10	1577.03	56	188.10	1593.79
17	190.05	1577.44	57	188.05	1594.22
18	190	1577.86	58	188	1594.64
19	189.95	1578.27	59	187.95	1595.06
20	189.9	1578.69	60	187.9	1595.49

21	189.85	1579.10	61	187.85	1595.91
22	189.8	1579.52	62	187.8	1596.34
23	189.75	1579.93	63	187.75	1596.76
24	189.7	1580.35	64	187.7	1597.19
25	189.65	1580.77	65	187.65	1597.62
26	189.6	1581.18	66	187.6	1598.04
27	189.55	1581.60	67	187.55	1598.47
28	189.5	1582.02	68	187.5	1598.89
29	189.45	1582.44	69	187.45	1599.32
30	189.4	1582.85	70	187.4	1599.75
31	189.35	1583.27	71	187.35	1600.17
32	189.3	1583.69	72	187.3	1600.60
33	189.25	1584.11	73	187.25	1601.03
34	189.2	1584.53	74	187.2	1601.46
35	189.15	1584.95	75	187.15	1601.88
36	189.10	1585.36	76	187.10	1602.31
37	189.05	1585.78	77	187.05	1602.74
38	189	1586.20	78	187	1603.17
39	188.95	1586.62	79	186.95	1603.60
40	188.9	1587.04	80	186.9	1604.03

- Receiver (trunk side, see the following table).

Table 9: MXP_2.5G_10E_L Card Receiver Trunk Side Specifications

OSNR [8]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [9]	Chromatic Dispersion Tolerance
30 dB	Off	< 10 exp - 12	N/A	8 to - 20 dBm	+/- 1200 ps/nm
26 dB	Off	< 10 exp - 12	N/A	8 to - 20 dBm	+/- 1000 ps/nm
26 dB	Off	< 10 exp - 12	N/A	8 to - 22 dBm	—
17 dB	Standard	< 10 exp - 5	< 10 exp - 15	8 to - 18 dBm	+/- 800 ps/nm

15.5 dB	Standard	< 10 exp - 5	< 10 exp - 15	8 to - 18 dBm	—
15 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	8 to - 18 dBm	+/- 800 ps/nm
13 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	8 to - 18 dBm	—

[8] OSNR defined with 0.1 nm (RBW)
[9] Receiver filter bandwidth greater than or equal to 180 pm (at - 3 dBm)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1570 to 1604 nm

- Line (client side)
  - Bit rate: 2.5 Gbps per port (OC-48/STM-16)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 12 ps/nm (SR SFP version)
  - Loopback modes: Terminal and facility
  - Connectors: LC (optical)
- Transmitter (client side): Depends on the SFP that is used.
- Receiver (client side): Depends on the SFP that is used.
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_2.5G_10EX_C Card Specifications

The MXP_2.5G_10EX_C card has the following specifications:

- Line (trunk side)
  - Bit rate: 10.70923 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1600 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_2.5G_10EX_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_2.5G_10EX_C card. Using direct fiber loopbacks causes irreparable damage to the card.

- Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of MXP_2.5G_10EX_C card:

  There is a single version of the MXP_2.5G_10EX_C card. It is tunable across 82 wavelengths in the C-band frequency plan, with channels on the ITU 50-GHz grid, as shown in the following table.

Table 10: MXP_2.5G_10EX_C Card Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength(nm)
1	196.00	1529.55	42	193.95	1545.72
2	195.95	1529.94	43	193.90	1546.12
3	195.90	1530.334	44	193.85	1546.52
4	195.85	1530.725	45	193.80	1546.92
5	195.80	1531.116	46	193.75	1547.32
6	195.75	1531.507	47	193.70	1547.72
7	195.70	1531.898	48	193.65	1548.11
8	195.65	1532.290	49	193.60	1548.51
9	195.60	1532.681	50	193.55	1548.91
10	195.55	1533.073	51	193.50	1549.32
11	195.50	1533.47	52	193.45	1549.72

12	195.45	1533.86	53	193.40	1550.12
13	195.40	1534.250	54	193.35	1550.52
14	195.35	1534.643	55	193.30	1550.92
15	195.30	1535.036	56	193.25	1551.32
16	195.25	1535.429	57	193.20	1551.72
17	195.20	1535.822	58	193.15	1552.12
18	195.15	1536.216	59	193.10	1552.52
19	195.10	1536.609	60	193.05	1552.93
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.13
23	194.90	1538.186	64	192.85	1554.54
24	194.85	1538.581	65	192.80	1554.94
25	194.80	1538.976	66	192.75	1555.34
26	194.75	1539.371	67	192.70	1555.75
27	194.70	1539.766	68	192.65	1556.15
28	194.65	1540.162	69	192.60	1556.55
29	194.60	1540.557	70	192.55	1556.96
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.17
33	194.40	1542.142	74	192.35	1558.58
34	194.35	1542.539	75	192.30	1558.98
35	194.30	1542.936	76	192.25	1559.39
36	194.25	1543.333	77	192.20	1559.79
37	194.20	1543.730	78	192.15	1560.20
38	194.15	1544.128	79	192.10	1560.61
39	194.10	1544.526	80	192.05	1561.01
40	194.05	1544.924	81	192.00	1561.42

41	194.00	1545.32	82	191.95	1561.83

- Receiver (trunk side, see the following table).

Table 11: MXP_2.5G_10EX_C Card Receiver Trunk Side Specifications

OSNR [10]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [11]	Chromatic Dispersion Tolerance	PMD Tolerance
16 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 20 dBm	+/- 1600 ps/nm	—
15 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 20 dBm	—	—
TBD	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 20 dBm	—	[12]
12.5 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 20 dBm	—	—
17 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 20 dBm	+/- 4000 ps/nm	—
15.2 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 20 dBm	+/- 2500 ps/nm	—
17.4 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 20 dBm		3

[10] OSNR defined with 0.1 nm (RBW)
[11] Receiver filter bandwidth 32.5GHz (at - 3 dB)
[12] PMD = 30 ps; DGD = 90 ps, hence PMD = 3000 ps^2

  - Receiver: APD
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
  - Receiver input wavelength range: 1529 to 1562 nm

- Line (client side)
  - Bit rate: 2.5 Gbps per port (OC-48/STM-16)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 12 ps/nm (SR SFP version)
  - Loopback modes: Terminal and facility
  - Connectors: LC (optical)

- Transmitter (client side): Depends on the SFP that is used.

- Receiver (client side): Depends on the SFP that is used.
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

MXP_MR_10DME_C Card Specifications

The MXP_MR_10DME_C card has the following specifications:

- Payload configuration
  - FC1G-Fibre Channel 1.06 Gbps
  - FC2G-Fibre Channel 2.125 Gbps
  - FC4G-Fibre Channel 4.25 Gbps
  - FICON1G-Fiber connectivity 1.06 Gbps (IBM signal)
  - FICON2G-Fiber connectivity 2.125 Gbps (IBM signal)
  - FICON4G-Fiber connectivity 4.25 Gbps (IBM signal)
  - ISC compatibility
  - ISC peer 1G
  - ISC peer 2G
  - ONE_GE-One Gigabit Ethernet 1.125 Gbps
  - Mixed configurations up to maximum line rate of 10.0 Gbps. See the "MXP_MR_10DME_C and MXP_MR_10DME_L Cards" section, chapter "Provision Transponder and Muxponder Cards" in the Cisco ONS 15454 DWDM Configuration Guide for more information on mixed-mode operation.
- Client ports: 8x SFP
- Line (trunk side)
  - Bit rate: 9.952 Gbps for OC-192/STM-64
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_MR_10DME_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_MR_10DME_C cards. Using direct fiber loopbacks causes irreparable damage to the MXP_MR_10DME_C cards.

- Connectors: LC

- Transmitter (trunk side)
  - Minimum output power: +3 dBm
  - Maximum output power: +6 dBm
  - Minimum Single-Mode Suppression Ratio (SMSR): 30 dB
  - Minimum optical extinction ratio: 10 dB
  - 41 wavelength tunability at 100-GHz spacing
  - Receiver maximum return reflectance (Rx return loss): -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

  - For available wavelengths for the MXP_MR_10DME_C card, see "Wavelength Identification" section, chapter "Transponder and Muxponder Cards" in the *Cisco ONS 15454 DWDM Configuration Guide*.

- For the receiver trunk side, see the following table.

Table 12: MXP_MR_10DME_C Card Receiver Trunk Side Specifications

FEC Applications	OSNR [13]	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [14]	Chromatic Dispersion Tolerance	Power Penalty	OSNR Penalty
None	23 dB	< 10 exp -12	—	-8 to - 20 dBm	+/- 1200 ps/nm	2 dBm	—
	19 dB	< 10 exp -12	—	-9 to - 22 dBm	+/- 1000 ps/nm	2 dBm	—
FEC	10 dB	< 10 exp -5	< 10 exp -15	-8 to - 18 dBm	+/- 800 ps/nm	—	1.5 dB
Enhanced FEC	19 dB	< 10 exp -4	< 10 exp -15	-8 to - 26 dBm	+/- 800 ps/nm	2 dBm	2 dB
	8 dB	< 10 exp -4	< 10 exp -15	-8 to - 18 dBm	+/- 800 ps/nm	2 dBm	1.5 dB

[13] OSNR defined with 0.1 nm (RBW)
[14] Receiver filter bandwidth 32.5GHz (at - 3 dB)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1529 to 1562 nm

- Line (client side)
  - Bit rate: 1.06 Gbps to 4.25 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Maximum chromatic dispersion allowance: Based on SFP
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: Based on SFP
  - Nominal wavelength: Based on SFP
  - Transmitter: Based on SFP

- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm or 850nm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

MXP_MR_10DME_L Card Specifications

The MXP_MR_10DME_L card has the following specifications:

- Payload configuration
  - FC1G-Fibre Channel 1.06 Gbps

- FC2G-Fibre Channel 2.125 Gbps
- FC4G-Fibre Channel 4.25 Gbps
- FICON1G-Fiber connectivity 1.06 Gbps (IBM signal)
- FICON2G-Fiber connectivity 2.125 Gbps (IBM signal)
- FICON4G-Fiber connectivity 4.25 Gbps (IBM signal)
- ISC compatibility
- ISC peer 1G
- ISC peer 2G
- ONE_GE-One Gigabit Ethernet 1.125 Gbps
- Mixed configurations up to maximum line rate of 10.0 Gbps. See the "MXP_MR_10DME_C and MXP_MR_10DME_L Cards" section, chapter "Provision Transponder and Muxponder Cards" in the Cisco ONS 15454 DWDM Configuration Guide for more information on mixed-mode operation.

- Client ports: 8x SFP
- Line (trunk side)
  - Bit rate: 9.952 Gbps for OC-192/STM-64
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_MR_10DME_L card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_MR_10DME_L cards. Using direct fiber loopbacks causes irreparable damage to the MXP_MR_10DME_L cards.

  - Connectors: LC

- Transmitter (trunk side)
  - Minimum output power: +3 dBm
  - Maximum output power: +6 dBm
  - Minimum SMSR: 30 dB
  - Minimum optical extinction ratio: 10.5 dB
  - 40 wavelength tunability at 100-GHz spacing, 80 wavelength tunability at 50-GHz spacing
  - Receiver maximum return reflectance (Rx return loss): -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB

- Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- For the currently available wavelengths for the MXP_MR_10DME_L card, see "Wavelength Identification" section, chapter "Transponder and Muxponder Cards" in the *Cisco ONS 15454 DWDM Configuration Guide*.

- The receiver trunk side specifications are shown in the following table.

Table 13: MXP_MR_10DME_L Card Receiver Trunk Side Specifications

FEC Applications	OSNR [15]	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	Chromatic Dispersion Tolerance	Power Penalty	OSNR Penalty
None	23 dB	< 10 exp - 12	—	-8 to - 19 dBm	+/- 1200 ps/nm	2 dBm	—
	19 dB	< 10 exp - 12	—	-9 to - 19 dBm	+/- 1000 ps/nm	2 dBm	—
FEC	10 dB	< 10 exp - 5	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm	—	1.5 dB
Enhanced FEC	19 dB	< 10 exp - 4	< 10 exp - 15	-8 to - 26 dBm	+/- 800 ps/nm	—	2 dB
	8 dB	< 10 exp - 4	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm	—	1.5 dB

[15] OSNR defined with 0.1 nm (RBW)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1570 to 1604 nm

- Line (client side)
  - Bit rate: 1.06 Gbps to 4.25 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Maximum chromatic dispersion allowance: Based on SFP
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: Based on SFP
  - Nominal wavelength: Based on SFP
  - Transmitter: Based on SFP
- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm or 850nm
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

MXP_MR_10MEX_C Card Specifications

The MXP_MR_10DMEX_C card has the following specifications:

- Payload configuration
  - FC1G-Fibre Channel 1.06 Gbps
  - FC2G-Fibre Channel 2.125 Gbps
  - FC4G-Fibre Channel 4.25 Gbps
  - FICON1G-Fiber connectivity 1.06 Gbps (IBM signal)
  - FICON2G-Fiber connectivity 2.125 Gbps (IBM signal)
  - FICON4G-Fiber connectivity 4.25 Gbps (IBM signal)
  - ISC compatibility
  - ISC peer 1G
  - ISC peer 2G
  - ONE_GE-One Gigabit Ethernet 1.125 Gbps
  - Mixed configurations up to maximum line rate of 10.0 Gbps.
- Client ports: 8x SFP

- Line (trunk side)
  - Bit rate: 9.952 Gbps for OC-192/STM-64
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the MXP_MR_10DMEX_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the MXP_MR_10DMEX_C cards. Using direct fiber loopbacks causes irreparable damage to the MXP_MR_10DMEX_C cards.

  - Connectors: LC

- Transmitter (trunk side)
  - Minimum output power: +3 dBm
  - Maximum output power: +7 dBm
  - Minimum Single-Mode Suppression Ratio (SMSR): 30 dB
  - Minimum optical extinction ratio: 10 dB
  - 41 wavelength tunability at 100-GHz spacing
  - Receiver maximum return reflectance (Rx return loss): -27 dB
  - Chromatic dispersion allowance: 5400 ps/nm, giving an optical power penalty < 2.0 dB
  - Minimum side mode suppression ratio: 30 dB
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

  - For available wavelengths for the MXP_MR_10DMEX_C card, see "Wavelength Identification" section, chapter "Transponder and Muxponder Cards" in the *Cisco ONS 15454 DWDM Configuration Guide*.

- For the receiver trunk side, see the following table.

Table 14: MXP_MR_10MEX_C Card Receiver Trunk Side Specifications

OSNR [16]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Sensitivity [17]	Chromatic Dispersion Tolerance	PMD Tolerance

16 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	+/- 1600ps/nm	—
15 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	—	—
TBD	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	—	[18]
12.5 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	—	—
17 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	+/- 4000ps/nm	—
15.2 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	+/- 2500ps/nm	—
17.4 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm		[3]

[16] OSNR defined with 0.1 nm RBW
[17] Receiver filter bandwidth 32.5GHz (at - 3 dBm)
[18] PMD = 30 ps; DGD = 90 ps, hence PMD = 3000 ps^ 2

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1529 to 1562 nm

- Line (client side)
  - Bit rate: 1.06 Gbps to 4.25 Gbps per client
  - Code: Scrambled NRZ
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Maximum chromatic dispersion allowance: Based on SFP
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: Based on SFP
  - Nominal wavelength: Based on SFP
  - Transmitter: Based on SFP

- Receiver (client side)

- Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
- Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
- Receiver: APD
- Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
- Receiver input wavelength range: 1290 to 1605 nm or 850nm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 2.25 lb (1.02 kg)

TXP_MR_10E Card Specifications

The TXP_MR_10E card has the following specifications:

- Line (trunk side)
  - Bit rate: OC-192/STM-64 (9.95328 Gbps), OTU2 (10.70923 Gbps), 10GE (10.3125 Gbps), 10GE into OTU2 (non-standard 11.0957 Gbps), 10G FC (10.51875 Gbps), or 10G FC into OTU2 (non-standard 11.31764 Gbps)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10E card in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_10E card. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_10E card.

  - Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm for C-band and +2 dBm for L-band
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of TXP_MR_10E:

  C-band frequency plan (eight card versions, each with four tunable channels on the ITU 100-GHz grid):

  - 1530.33 to 1533.07 nm (four channels)
  - 1534.25 to 1537.00 nm (four channels)
  - 1538.19 to 1540.95 nm (four channels)
  - 1542.14 to 1544.92 nm (four channels)
  - 1546.12 to 1548.92 nm (four channels)
  - 1550.12 to 1552.93 nm (four channels)
  - 1554.13 to 1556.96 nm (four channels)
  - 1558.17 to 1561.01 nm (four channels)

  L-band frequency plan (five card versions, each with eight tunable channels on the ITU 50-GHz grid):

  - 1577.44 to 1580.35 nm (eight channels)
  - 1580.77 to 1583.69 nm (eight channels)
  - 1584.11 to 1587.04 nm (eight channels)
  - 1587.46 to 1590.41 nm (eight channels)
  - 1590.83 to 1593.79 nm (eight channels)

- Receiver (trunk side, see the following table).

Table 15: TXP_MR_10E Card Receiver Trunk Side Specifications

OSNR [19]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Sensitivity [20]	Chromatic Dispersion Tolerance
30 dB	Off	< 10 exp - 12	N/A	- 8 to - 20 dBm	+/- 1200ps/nm
26 dB	Off	< 10 exp - 12	N/A	- 8 to - 20 dBm	+/- 1000ps/nm
26 dB	Off	< 10 exp - 12	N/A	- 8 to - 22 dBm	—
17 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 18 dBm	+/- 800 ps/nm
15 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 18 dBm	—
15 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 18 dBm	+/- 800 ps/nm
14 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 18 dBm	—

[19] OSNR defined with 0.1 nm RBW
[20] Receiver filter bandwidth 32.5GHz (at - 3 dBm)

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion

- Line (client side):
  - 10-Gigabit Small Form-factor Pluggable (XFP)-based SR
  - Bit rate: 10GE (10.3125 Gbps), 10G FC (10.51875 Gbps), or STM-64/OC-192
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 6.6 ps/nm
  - Loopback modes: Terminal and facility
  - Connectors: LC
  - Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957, ITU-T G.691
- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: DFB laser
- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

TXP_MR_10E_C Card Specifications

The TXP_MR_10E_C card has the following specifications:

- Line (trunk side)
  - Bit rate: OC-192/STM-64 (9.95328 Gbps), OTU2 (10.70923 Gbps), 10GE (10.3125 Gbps), 10GE into OTU2 (non-standard 11.0957 Gbps), 10G FC (10.51875 Gbps), or 10G FC into OTU2 (non-standard 11.31764 Gbps)
  - Code: Scrambled NRZ

- Fiber: 1550-nm single-mode
- Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
- Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10E_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_10E_C card. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_10E_C card.

- Connectors: LC
- Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957, and ITU-T G.709

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of TXP_MR_10E_C card:

  There is a single version of the TXP_MR_10E_C card. It is tunable across 82 wavelengths in the C-band frequency plan, with channels on the ITU 50-GHz grid, as shown in the following table.

Table 16: TXP_MR_10E_C Card Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
1	196.00	1529.55	42	193.95	1545.72
2	195.95	1529.94	43	193.90	1546.119
3	195.90	1530.334	44	193.85	1546.518
4	195.85	1530.725	45	193.80	1546.917
5	195.80	1531.116	46	193.75	1547.316
6	195.75	1531.507	47	193.70	1547.715
7	195.70	1531.898	48	193.65	1548.115

8	195.65	1532.290	49	193.60	1548.515
9	195.60	1532.681	50	193.55	1548.915
10	195.55	1533.073	51	193.50	1549.32
11	195.50	1533.47	52	193.45	1549.71
12	195.45	1533.86	53	193.40	1550.116
13	195.40	1534.250	54	193.35	1550.517
14	195.35	1534.643	55	193.30	1550.918
15	195.30	1535.036	56	193.25	1551.319
16	195.25	1535.429	57	193.20	1551.721
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794

37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

- Receiver (trunk side, see the following table).

Table 17: TXP_MR_10E_C Card Receiver Trunk Side Specifications

OSNR [21]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity [22]	Chromatic Dispersion Tolerance
30 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	+/- 1200 ps/nm
26 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	+/- 1000 ps/nm
26 dB	Off	< 10 exp - 12	N/A	-8 to - 18 dBm	—
17 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm
15.5 dB	Standard	< 10 exp - 5	< 10 exp - 15	-8 to - 18 dBm	—
14 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 18 dBm	+/- 800 ps/nm
12 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	-8 to - 18 dBm	—

[21] OSNR defined with 0.1 nm RBW
[22] Receiver filter bandwidth 32.5GHz (at - 3 dB)

  - Receiver: APD
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
  - Receiver input wavelength range: 1529 to 1562 nm

- Line (client side):
  - XFP-based SR
  - Bit rate: 10GE (10.3125 Gbps), 10G FC (10.51875 Gbps), or STM-64/OC-192
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 6.6 ps/nm
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm
  - Center wavelength: 1290 to 1330 nm
  - Nominal wavelength: 1310 nm
  - Transmitter: DFB laser
- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

TXP_MR_10EX_C Card Specifications

The TXP_MR_10EX_C card has the following specifications:

- Line (trunk side)
  - Bit rate: OC-192/STM-64 (9.95328 Gbps), OTU2 (10.70923 Gbps), 10GE (10.3125 Gbps), 10GE into OTU2 (non-standard 11.0957 Gbps), 10G FC (10.51875 Gbps), or 10G FC into OTU2 (non-standard 11.31764 Gbps)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1600 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10EX_C card in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_10EX_C card. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_10EX_C card.

  - Connectors: LC
  - Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957, and ITU-T G.709

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +3 dBm
  - Transmitter: LN external modulator transmitter
  - Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of TXP_MR_10EX_C card:

  There is a single version of the TXP_MR_10EX_C card. It is tunable across 82 wavelengths in the C-band frequency plan, with channels on the ITU 50-GHz grid, as shown in the following table.

Table 18: TXP_MR_10EX_C Card Trunk Wavelengths

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength(nm)
1	196.00	1529.55	42	193.95	1545.72
2	195.95	1529.94	43	193.90	1546.12
3	195.90	1530.334	44	193.85	1546.52
4	195.85	1530.725	45	193.80	1546.92
5	195.80	1531.116	46	193.75	1547.32
6	195.75	1531.507	47	193.70	1547.72
7	195.70	1531.898	48	193.65	1548.11
8	195.65	1532.290	49	193.60	1548.51
9	195.60	1532.681	50	193.55	1548.91
10	195.55	1533.073	51	193.50	1549.32
11	195.50	1533.47	52	193.45	1549.72
12	195.45	1533.86	53	193.40	1550.12
13	195.40	1534.250	54	193.35	1550.52
14	195.35	1534.643	55	193.30	1550.92
15	195.30	1535.036	56	193.25	1551.32
16	195.25	1535.429	57	193.20	1551.72

17	195.20	1535.822	58	193.15	1552.12
18	195.15	1536.216	59	193.10	1552.52
19	195.10	1536.609	60	193.05	1552.93
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.13
23	194.90	1538.186	64	192.85	1554.54
24	194.85	1538.581	65	192.80	1554.94
25	194.80	1538.976	66	192.75	1555.34
26	194.75	1539.371	67	192.70	1555.75
27	194.70	1539.766	68	192.65	1556.15
28	194.65	1540.162	69	192.60	1556.55
29	194.60	1540.557	70	192.55	1556.96
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.17
33	194.40	1542.142	74	192.35	1558.58
34	194.35	1542.539	75	192.30	1558.98
35	194.30	1542.936	76	192.25	1559.39
36	194.25	1543.333	77	192.20	1559.79
37	194.20	1543.730	78	192.15	1560.20
38	194.15	1544.128	79	192.10	1560.61
39	194.10	1544.526	80	192.05	1561.01
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

- Receiver (trunk side, see the following table).

Table 19: TXP_MR_10EX_C Card Receiver Trunk Side Specifications

OSNR [23]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Sensitivity [24]	Chromatic Dispersion Tolerance	PMD Tolerance
16 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	+/- 1600ps/nm	—
15 dB	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	—	—
TBD	Standard	< 10 exp - 5	< 10 exp - 15	- 8 to - 20 dBm	—	[25]
12.5 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	—	—
17 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	+/- 4000ps/nm	—
15.2 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm	+/- 2500ps/nm	—
17.4 dB	Enhanced	< 7 x 10 exp - 4	< 10 exp - 15	- 8 to - 20 dBm		3

[23] OSNR defined with 0.1 nm RBW
[24] Receiver filter bandwidth 32.5GHz (at - 3 dBm)
[25] PMD = 30 ps; DGD = 90 ps, hence PMD = 3000 ps^ 2

- Receiver: APD
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
- Receiver input wavelength range: 1529 to 1562 nm

- Line (client side):
  - XFP-based SR
  - Bit rate: 10GE (10.3125 Gbps), 10G FC (10.51875 Gbps), or STM-64/OC-192
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode
  - Maximum chromatic dispersion allowance: 6.6 ps/nm
  - Loopback modes: Terminal and facility
  - Connectors: LC

- Transmitter (client side)
  - Maximum transmitter output power: -1 dBm
  - Minimum transmitter output power: -6 dBm

- Center wavelength: 1290 to 1330 nm
- Nominal wavelength: 1310 nm
- Transmitter: DFB laser

- Receiver (client side)
  - Maximum receiver level: -1 dBm at BER 1 * 10 exp - 12
  - Minimum receiver level: -14 dBm at BER 1 * 10 exp - 12
  - Receiver: APD
  - Link loss budget: 8 dB minimum, at BER = 1 * 10 exp - 12
  - Receiver input wavelength range: 1290 to 1605 nm

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.1 lb (1.3 kg)

TXP_MR_10E_L Card Specifications

The TXP_MR_10E_L card has the following specifications:

- Line (trunk side)
  - Bit rate: OC-192/STM-64 (9.95328 Gbps), OTU2 (10.70923 Gbps), 10GE (10.3125 Gbps), 10GE into OTU2 (non-standard 11.0957 Gbps), 10G FC (10.51875 Gbps), or 10G FC into OTU2 (non-standard 11.31764 Gbps)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: +/- 1200 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10E_L card in a loopback on the trunk port. Do not use direct fiber loopbacks with the TXP_MR_10E_L card. Using direct fiber loopbacks causes irreparable damage to the TXP_MR_10E_L card.

  - Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +6 dBm
  - Minimum transmitter output power: +2 dBm
  - Transmitter: LN external modulator transmitter

- Wavelength stability (drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of TXP_MR_10E_L card:

  There is a single version of the TXP_MR_10E_L card. It is tunable across 80 wavelengths in the L band frequency plan, with channels on the ITU 50-GHz grid, as shown in Table 50

40G-MXP-C, 40E-MXP-C AND 40ME-MXP-C Card Specifications

The 40G-MXP-C, 40E-MXP-C and 40ME-MXP-C cards have the following specifications:

- Payload configuration
  - FC8G-Fibre Channel 8.50 Gbps
  - FC10G-Fiber Channel 10.519 Gbps
  - FICON10G-Fiber connectivity 10.519 Gbps
  - OC-192/STM-64/10GE WAN PHY-9.953 Gbps
  - 10-GE LAN PHY-10.312 Gbps
  - OTU2 (OC-192/STM-64/10GE WAN PHY)-10.709 Gbps
  - OTU2e (10GE LAN PHY)-11.096 Gbps
- Client ports: 4 x SFP
- Line (Trunk-side)
  - Bit rate: 43.018 Gbps for OTU3, 44.57 Gbps for OTU3e
  - Code: RZ-DQPSK 40G
  - Fiber: 1550-nm single-mode
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the 40G-MXP-C 40E-MXP-C, and 40ME-MXP-C cards in a loopback on the trunk port. Do not use direct fiber loopbacks with the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards. Using direct fiber loopbacks causes irreparable damage to the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.

  - Connectors: LC
- Transmitter (Trunk-side)
  - Minimum output power: -2 dBm

- Maximum output power: +2 dBm
- Minimum Single-Mode Suppression Ratio (SMSR): 35 dB
- Minimum optical extinction ratio: 25 dB
- Wavelength tunability (total 82 wavelengths) at 50-GHz spacing
- Receiver maximum return reflectance (Rx return loss): -27 dB
- Maximum chromatic dispersion allowance for 40G-MXP-C: 750 ps/nm, giving an optical OSNR penalty < 2.0 dB
- Maximum chromatic dispersion allowance for 40E-MXP-C: +/- 29000 ps/nm
- Maximum chromatic dispersion allowance for 40ME-MXP-C: +/- 3000 ps/nm
- Minimum side mode suppression ratio: 30 dB
- Wavelength stability (Drift): +/- 25 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- For wavelengths available for the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards, see "Wavelength Identification" section, chapter "Transponder and Muxponder Cards" in the *Cisco ONS 15454 DWDM Configuration Guide*.

- Receiver (Trunk-side)
  - Receiver: PIN
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion
  - Receiver input wavelength range: 1529 to 1562 nm

  The trunk side specifications for the 40G-MXP-C Card receiver are shown in the following table. The trunk side specifications for the 40E-MXP-C and 40ME-MXP-C Card receiver are shown in Table 21: 40E-MXP-C and 40-ME-MXP-C Card Receiver (Trunk-Side) Specifications, on page 65.

Table 20: 40G-MXP-C Card Receiver (Trunk-Side) Specifications

CD Tolerance	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	PMD2	OSNR (0.5nm RWB)
Any bit-rate						

0 ps/nm	STD	<10E(-5)	<10E(-15)	-8 to -20 dBm		12.5 dB
+/- 650 ps/nm						12.5 dB
+/- 650 ps/nm					5 ps	13.5 dB
+/- 650 ps/nm					8 ps	14.5 dB
+/- 750 ps/nm						13.5 dB
0 ps/nm	ENH	<1x10E(-3)	<10E(-15)	-8 to -24 dBm		23 dB
0 ps/nm				-8 to -20 dBm		8.5 dB
+/- 650 ps/nm				-8 to -20 dBm		8.5 dB
+/- 650 ps/nm				-8 to -20 dBm	5 ps	9.5 dB
+/- 650 ps/nm				-8 to -20 dBm	8 ps	9.5 dB
+/- 750 ps/nm				-8 to -20 dBm		9.5 dB
+/- 750 ps/nm				-8 to -20 dBm	5 ps	10.5 dB
+/- 750 ps/nm				-8 to -20 dBm	8 ps	11.5 dB

Table 21: 40E-MXP-C and 40-ME-MXP-C Card Receiver (Trunk-Side) Specifications

CD Tolerance	FEC Type	Pre-FEC BER	Post-FEC BER	Input Power Sensitivity	DGD	OSNR (0.5nm RWB)
Extended performance						
0 ps/nm	STD 7%	<10E(-5)	<10E(-15)	-8 to -20 dBm		10 dB
0 ps/nm					100 ps	11 dB
+/- 34,000 ps/nm					100 ps	14 dB

0 ps/nm	ENH 10%	<4.6x10E(-3)	<10E(-15)	-8 to -20 dBm		5.2 dB
0 ps/nm					100 ps	5.7 dB
+/- 29,000 ps/nm					100 ps	6.2 dB
0 ps/nm	ENH 13%	<7x10E(-3)	<10E(-15)	-8 to -20 dBm		4.7 dB
0 ps/nm					100 ps	5.1 dB
+/- 29,000 ps/nm					100 ps	5.5 dB
Metro edge performance						
0 ps/nm	STD	<10E(-5)	<10E(-5)	-8 to -20 dBm		10 dB
+/- 3000 ps/nm					10 ps	11 dB
0 ps/nm	ENH 10%	<4.6x10E(-3)	<10E(-15)	-8 to -20 dBm		5.2 dB
+/- 3000 ps/nm					10 ps	5.2 dB
0 ps/nm	ENH 13%	<7x10E(-3)	<10E(-15)	-8 to -20 dBm		4.7 dB
+/- 3000 ps/nm					10 ps	5.5 dB

- Line (Client-side)
  - Bit rate: 8.50 Gbps to 11.096 Gbps per client
  - Code: NRZ 40G
  - Fiber: Based on SFP (1310-nm single-mode or 850-nm multimode)
  - Maximum chromatic dispersion allowance: Based on XFP
  - Loopback modes: Terminal and facility
  - Connectors: LC
- Transmitter (Client-side)
  - Maximum transmitter output power: Based on XFP
  - Minimum transmitter output power: Based on XFP
  - Center wavelength: Based on XFP
  - Nominal wavelength: Based on XFP
  - Transmitter: Based on XFP

- Receiver (Client-side)
  - Maximum receiver level: Based on XFP
  - Minimum receiver level: Based on XFP
  - Receiver: Based on XFP
  - Link loss budget: Based on XFP
  - Receiver input wavelength range: Based on XFP
- Environmental Exception
  - Short term ambient temperature: Functionality is guaranteed, according to GR-63 Issue 3 for the thermal cycles except for the temperature values which are -5 to 45 degrees Celsius (23 to 113 degrees Fahrenheit) instead of -5 to 55 degrees Celsius (23 to 131 degrees Fahrenheit).
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight excluding clam shell: 7.7 lb (3.5 kg)

ADM-10G Card Specifications

The ADM-10G card has the following specifications:

- Line
  - Bit rate: OC-3/STM-1 (155.520 Mb/s); OC-12/STM-3 (622.08 Mb/s); OC-48/STM-16 (2488.32 Mb/s); OC-192/STM-64 (9.95328 Gbps)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode for ONS-XC-10GS1 XFP or 1530.33 to 1554.94-nm single-mode for ONS-XC-10G-xx.x XFP
  - Maximum chromatic dispersion allowance: up to 3600 ps/nm
  - Loopback modes: Terminal, facility, and cross-connect
  - Connectors: LC
- Transmitter (trunk side)
  - Transmitter: LN external modulator transmitter
  - Maximum transmitter output power: Depends on XFP that is used
  - Minimum transmitter output power: Depends on XFP that is used
  - Wavelength stability (drift): +/- 25 picometers (pm)
- Receiver (trunk side)
  - Receiver: APD
  - Receiver input wavelength range: Depends on XFP that is used

- Receiver sensitivity: depends on XFP that is used
- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion

- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 5.07 lb (2.3 kg)

GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Specifications

The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards have the following specifications:

- Line (trunk side)
  - Bit rate: 11.1 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode) or 10.3125 Gbps (in ITU-T G.709 Digital Wrapper/FEC mode disabled)
  - Code: Scrambled NRZ
  - Fiber: 1550-nm single-mode
  - Maximum chromatic dispersion allowance: - 500 to 1600 ps/nm (specified penalty)
  - Loopback modes: Terminal and facility

Caution You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the GE_XP and GE_XPE card in a loopback on the trunk port. Do not use direct fiber loopbacks with the GE_XP and GE_XPE card. Using direct fiber loopbacks causes irreparable damage to the GE_XP and GE_XPE card.

  - Connectors: LC

- Transmitter (trunk side)
  - Maximum transmitter output power: +3 dBm
  - Minimum transmitter output power: -1 dBm
  - Transmitter: EML laser
  - Wavelength stability (drift): +/- 100 picometers (pm)

Note An optical device on the card keeps the laser wavelength locked as closely as possible to the ITU nominal value. The allowed drift is +/- 25 pm.

- Currently available wavelengths and versions of GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE: C Band, 100 GHz spacing.

- Receiver (trunk side, see Table 22: GE_XP and GE_XPE Card Receiver Trunk Side Specifications, on page 69)
  - Receiver: APD
  - Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 * 10 exp - 12 including dispersion

Table 22: GE_XP and GE_XPE Card Receiver Trunk Side Specifications

OSNR [26]	FEC Type	Pre-FEC BER	Post-FEC BER	Input Sensitivity [27]	Chromatic Dispersion Tolerance
30 dB	Off	1.00E - 12	N/A	-7 to -23 dBm	—
30 dB	Off	1.00E - 12	N/A	-7 to -20dBm	-500 to 1600 ps/nm
24 dB	Off	1.00E - 12	N/A	-7 to -18 dBm	—
27 dB	Off	1.00E - 12	N/A	-7 to -18 dBm	-500 to 1600 ps/nm
18 dB	Standard	1.00E - 05	1.00E - 15	-7 to -18 dBm	—
19 dB	Standard	1.00E - 05	1.00E - 15	-7 to -18 dBm	-500 to 1600 ps/nm
30 dB	Enhanced	1.00E - 04	1.00E - 15	-7 to -27 dBm	—
30 dB	Enhanced	1.00E - 04	1.00E - 15	-7 to -24 dBm	-500 to 1600 ps/nm
15 dB	Enhanced	1.00E - 04	1.00E - 15	-7 to -18 dBm	—
15 dB	Enhanced	1.00E - 04	1.00E - 15	-7 to -18 dBm	-500 to 1600 ps/nm

[26] OSNR defined with 0.1 nm RBW
[27] Receiver filter bandwidth greater than or equal to 180 pm (at - 3 dBm)

- Line (client side)
  - Bit rate: 1.125Gbps (GE) or 10.3125Gbps (10GE)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode or 850-nm multimode
  - Maximum chromatic dispersion allowance: 12 ps/nm (SR SFP version)
  - Loopback modes: Terminal and facility
  - Connectors: LC (optical)
- Transmitter (client side): Depends on the SFP that is used.
- Receiver (client side): Depends on the SFP that is used.

- Environmental
  - Power consumption: 95.00 W (maximum), 2 A at -48 V for GE_XP and GE_XPE cards
  - Power consumption: 80.00 W (maximum), 1.67 A at -48 V for 10GE_XP and 10GE_XPE cards
- Dimensions
  - Weight not including clam shell: 10GE-XP and 10GE_XPE, 1.04 kg; GE-XP and GE_XPE, 1.36 kg.

OTU2_XP Card Specifications

The OTU2_XP card has the following specifications:

- Line
  - Bit rate: OC-192/STM-64 (9.95328 Gbps), 10GE (10.3125 Gbps), or 10G FC (10.51875 Gbps)
  - Code: Scrambled NRZ
  - Fiber: 1310-nm single-mode for ONS-XC-10GS1 XFP or 1530.33-nm to 1561.42-nm single-mode for ONS-XC-10G-xx.x XFP
  - Maximum chromatic dispersion allowance: Depends on the XFP that is used
  - Loopback modes: Terminal and facility
  - Connectors: LC
- Transmitter (trunk side)
  - Transmitter: EML
  - Maximum transmitter output power: Depends on the XFP that is used
  - Minimum transmitter output power: Depends on the XFP that is used
  - Wavelength stability (drift): Depends on the XFP that is used
- Receiver (trunk side)
  - Receiver: APD
  - Receiver input wavelength range: Depends on XFP that is used
  - Receiver sensitivity: Depends on XFP that is used
  - Link loss budget: Depends on XFP that is used
- Dimensions
  - Depth with backplane connector: 9.909 in. (251.7 mm)
  - Weight not including clam shell: 2.38 lb (1.08 kg)

100G-LC-C and 100G-ME-C Card Specifications

The 100G-LC-C and 100G-ME-C cards have the following specifications:

- Bit rate:
  - 27.952 Gbaud ±20 ppm (OTU4 with GFEC or HG-FEC 7% OH)
  - 31.241Gbaud ±20 ppm (OTU4 with UFEC 20% OH)
- Wavelengths: 1530 nm to 1560 nm
- Beam divergence: Alpha min
- Pulse duration: Continuous
- Maximum output power: 1.5 dBm
- Voltage: –48 VDC
- Current: 3 A
- Power: 150 W
- Connector type: LC, duplex (shuttered)
- Transmitter:
  - Type: CP-DQPSK modulation format
  - Output Power: -1 to +1.5 dBm
  - Laser Safety Class: 1M

Caution Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

- Receiver:
  - Chromatic Dispersion tolerance : +/- 70,000 ps/nm
  - Receiver reflectance (maximum): 30 dB
  - Input wavelength bandwidth: Between 1528.77 nm and 1566.72 nm (C-Band – 50 GHz)

100G-CK-C and 100ME-CKC Card Specifications

For information on card specifications, see the data sheet.

10x10G-LC Card Specifications

For information on card specifications, see the data sheet.

100GS-CK-LC and 200G-CK-LC Card Specifications

For information on card specifications, see the following data sheets.

- 100GS-CK-LC
- 200G-CK-LC

400G-XP-LC Card Specifications

For information on card specification, see the datasheet.

MR-MXP Card Specifications

For information on card specifications, see the data sheet.

AR-MXP, AR_XP, and AR_XPE Card Specifications

The AR_MXP, AR_XP, and AR_XPE card specifications are as follows:

- Payload configuration
  - FC1G—Fibre Channel 1.06 Gbps
  - FC2G—Fibre Channel 2.125 Gbps
  - FC4G—Fibre Channel 4.25 Gbps
  - FICON1G—Fiber connectivity 1.06 Gbps (IBM signal)
  - FICON2G—Fiber connectivity 2.125 Gbps (IBM signal)
  - FICON4G—Fiber connectivity 4.25 Gbps (IBM signal)
  - FICON8G—Fibre connectivity 8.50 Gbps (IBM signal)
  - ISC compatibility
  - ISC peer 1G
  - ISC peer 2G
  - ISC peer 3G
  - ONE_GE—One Gigabit Ethernet 1.125 Gbps
  - –3G-SDI—2.970 Gbps
- Client ports: 8x SFP
- Dimensions
  - Depth with backplane connector: 9.250 in. (235 mm)
  - Weight not including clam shell: 3.13 lb (1.4 kg)

TDC-CC and TDC-FC Card Specifications

The TDC-CC and TDC-FC Card Specifications

- Wavelength
  - Total operating signal wavelength range (C-band range): 1529.0 - 1562.5 nm
- Optical
  - Insertion loss - DC-RX to DC-TX: Maximum 12.5 for TDC-CC and 9.5 for TDC-FC @ 1545.32 nm at room temperature
    - Wavelength dependant loss: 0.8 dB max
  - Maximum optical input power: 200 mW
  - Polarization dependent loss: 0.2 dB max
- Dimensions
  - Depth with backplane connector: 235 mm (9.250 in)
  - Weight not including clam shell:
    - TDC-CC-1.26 Kg
    - TDC-FC-1.14 Kg
    - The TDC-CC and TDC-FC tunable CD values are shown in the following table.

Table 23: TDC-CC and TDC-FC Tunable CD Value

Unit Configuration	TDC-CC [ps/nm]	TDC-FC [ps/nm]
0	0[28]	0[29]
1	-110	-45
2	-220	-90
3	-330	-135
4	-440	-180
5	-550	-225
6	-660	-270
7	-770	-315
8	-880	-360
9	-990	-405

10	-1100	-450
11	-1210	-495
12	-1320	-540
13	-1430	-585
14	-1540	-630
15	-1650	-675

[28] The default value of the TDC-CC CD value for Coarse Unit is 0 .
[29] The default value of the TDC-FC value for Fine Unit is 0 .

Mesh Patch Panel Specifications

This section provides specifications for the PP-MESH-4, PP-MESH-8, and 15454-PP-4-SMR patch panels.

PP-MESH-4 Patch Panel Specifications

The PP-MESH-4 patch panel optical specifications are shown in the following table.

Table 24: PP-MESH-4 Patch Panel Optical Specifications

Parameter	Note	Condition	Min	Max	Unit
Wavelength	—	—	1530	1570	nm
Insertion loss [30] [31]	—	In all the wavelength ranges (local ADD or test access RX to EXP TX, COM RX to EXP TX, COM RX to test access TX)	—	7.5	dB
Insertion Loss Uniformity [1] [2]	—	In all the wavelength ranges	—	0.9	dB
Polarization dispersion loss (PDL) [1]	—	—	—	0.3	dB
Polarization mode dispersion (PMD) [1]	—	—	—	0.1	dB
Optical Return Loss [1]	—	—	50	—	dB
Directivity [1]	—	—	50	—	dB

[30] Under all SOPs and all operating environmental conditions

[31] Values are referenced with connector loss (LC=0.3 dB, MPO=0.5dB)

The PP-MESH-4 patch panel has the following additional specifications:

- Environmental
  - Operating temperature: +23 to +149 degrees Fahrenheit (-5 to +65 degrees Celsius)
  - Operating humidity: 5 to 95 percent, noncondensing

PP-MESH-8 Patch Panel Specifications

The PP-MESH-8 patch panel optical specifications are shown in the following table.

Table 25: PP-MESH-8 Patch Panel Optical Specifications

Parameter	Note	Condition	Min	Max	Unit
Wavelength range	—	—	1530	1570	nm
Insertion loss [32] [33]	—	In all the wavelength ranges (local ADD or test access RX to EXP TX, COM RX to EXP TX, COM RX to test access TX)	—	10.6	dB
Insertion loss uniformity [1] [2]	—	In all wavelength ranges	—	1.3	dB
PDL [1]	—	—	—	0.5	dB
PMD [1]	—	—	—	0.1	dB
Optical Return Loss [1]	—	—	50	—	dB
Directivity [1]	—	—	50	—	dB

[32] Under all SOPs and all operating environmental conditions
[33] Values are referenced with connector loss (LC=0.3 dB, MPO=0.5dB)

The PP-MESH-8 patch panel has the following additional specifications:

- Environmental
  - Operating temperature: +23 to +149 degrees Fahrenheit (-5 to +65 degrees Celsius)
  - Operating humidity: 5 to 95 percent, noncondensing

15454-PP-4-SMR Patch Panel Specifications

The 15454-PP-4-SMR patch panel optical specifications are shown in the following table.

Table 26: 15454-PP-4-SMR Patch Panel Optical Specifications

Parameter	Note	Condition	Min	Max	Unit
Wavelength range	All SOP within operating temperature range	—	1520	1570	nm
Insertion loss	All SOP within operating temperature range, wavelength range, from each input port of any MPO connector to any output port including two MPO connections	—	5.5	7.5	dB
Insertion Loss Uniformity[34]		—	—	0.5	dB
Insertion loss ripple		—	—	0.2	dB
Chromatic dispersion		—	—	+/- 5	ps/nm
PLD		—	—	0.1	dB
PMD		—	—	0.1	dB
Optical return loss		—	50	—	dB
Directivity		—	50.0	—	dB

[34] Defined as the difference between the insertion loss values of any of the four branches of each 1x4 coupler.

The 15454-PP-4-SMR patch panel has the following additional specifications:

- Environmental
  - Operating temperature: +23 to +149 degrees Fahrenheit (-5 to +65 degrees Celsius)

SFP and XFP Specifications

Note The CC-FTA fan tray is mandatory if CWDM SFPs and DWDM SFPs are used on MSTP units.

Note Use hardware version 2.0 DWDM SFP for MSTP units.

See the Installing the GBIC, SFP, SFP+, and XFP Optical Modules in Cisco CPT and Cisco ONS Platforms for SFP and XFP specifications.

Patch Panel Specifications

For information on 15216 40-Channel Mux/Demux Patch Panel specifications, refer to the "Patch Panel Specifications" section in the "Installing Cisco ONS 15216 40-Channel Mux/Demux Patch Panel" guide.

For information on 15454-PP-4-SMR Patch Panel specifications, refer to the "Patch Panel Specifications" section in the "Installing Cisco ONS 15454-PP-4-SMR Patch Panel" guide.

Additional References

Related Documents

Use this document in conjunction with the other release-specific documentation listed in this table:

Technical Assistance

Link	Description
http://www.cisco.com/support	The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.

Short Description

Obtaining Documentation and Submitting a Service Request

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