



Hardware Specifications

This appendix contains hardware and software specifications for the ONS 15454 SDH, including:

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A.1 Shelf Specifications

This section provides specifications for shelf bandwidth; a list of topologies; Cisco Transport Controller (CTC) specifications; LAN, TL1, modem, alarm, and electrical interface assembly (EIA) interface specifications; database, timing, power, and environmental specifications; and shelf dimensions.

A.1.1 Bandwidth

The ONS 15454 SDH has the following bandwidth specifications:

- 60 Gbps per shelf
- Total bandwidth: 180 Gbps per rack (assuming there are 3 shelves)
- Data plane bandwidth: 120 Gbps per rack (assuming there are 3 shelves)
- SDH plane bandwidth: 60 Gbps per rack (assuming there are 3 shelves)

A.1.2 Configurations

The ONS 15454 SDH can be configured as follows:

- Digital cross-connect
- Terminal mode

- Linear add-drop multiplexer (ADM)
- Two-fiber multiplex section-shared protection ring (MS-SPRing)
- Four-fiber MS-SPRing
- Multiring interconnection
- Subnetwork connection protection (SNCP)
- Extended SNCP
- Virtual rings
- Hybrid SDH network topology
- Regenerator mode
- Wavelength multiplexer

A.1.3 Cisco Transport Controller

CTC, the ONS 15454 SDH craft interface software, has the following specifications:

- 10BaseT
- TCC2/TCC2P access: RJ-45 connector
- Front Mount Electrical Connection (FMEC) access: LAN connector on MIC-C/T/P faceplate

A.1.4 External LAN Interface

The ONS 15454 SDH external LAN interface has the following specifications:

- 10BaseT Ethernet
- FMEC access: LAN connector on MIC-C/T/P faceplate

A.1.5 Alarm Interface

The ONS 15454 SDH alarm interface has the following specifications:

- Visual: Critical, Major, Minor, Remote
- Audible: Critical, Major, Minor, Remote
- Alarm inputs: Common 32-VDC output for all alarm-inputs, closed contact limited to 2 mA
- Control outputs: Open contact maximum 60 VDC, closed contact maximum 100 mA
- FMEC access: 62-Pin DB connector on the MIC-A/P faceplate

A.1.6 Database Storage

The ONS 15454 SDH has the following database storage specifications:

- Nonvolatile memory: 128 MB, 3.0 V flash memory

A.1.7 Timing Interface

The ONS 15454 SDH timing interface has the following specifications:

- 2 coaxial inputs
- 2 coaxial outputs
- FMEC access: 1.0/2.3 miniature coax connectors on the MIC-C/T/P faceplate

A.1.8 System Timing

The ONS 15454 SDH has the following system timing specifications:

- Stratum 3E, per ITU-T G.813
- Free running accuracy: +/- 4.6 ppm
- Holdover stability: 3.7 exp -7/day, including temperature (< 255 slips in first 24 hours)
- Reference: External building integrated timing supply (BITS), line, internal

A.1.9 System Power

The ONS 15454 SDH has the following power specifications:

- Input voltage: -48 VDC
- Maximum Current Rating: 24 A (at -48 VDC)
- Power requirements:
 - Nominal: -48 VDC
 - Tolerance limits: -40.5 to -57.0 VDC
- Power terminals: 3WK3 Combo-D power cable connector (MIC-A/P and MIC-C/T/P faceplates)
- Fusing: Maximum 30 A fuse panel

A.1.10 System Environmental Specifications

The ONS 15454 SDH has the following environmental specifications:

- Operating temperature: 0 to +40 degrees Celsius (32 to 104 degrees Fahrenheit)
- Operating humidity: 5 to 95 percent, noncondensing

A.1.11 Dimensions

The ONS 15454 SDH shelf assembly has the following dimensions:

- Height: 616.5 mm (24.27 in.)
- Width: 535 mm (17 in.) without mounting ears attached
- Depth: 280 mm (11.02 in.)
- Weight: 26 kg (57.3 lb) empty

A.2 SFP and XFP Specifications

Table A-1 lists the specifications for the available Small Form-factor Pluggables (SFPs) and 10 Gbps Pluggables (XFPs). In the table, the following acronyms are used:

- ESCON = Enterprise System Connection
- FICON = fiber connectivity
- GE = Gigabit Ethernet
- FC = Fibre Channel
- HDTV = high definition television
- DWDM = dense wavelength division multiplexing
- CWDM = coarse wavelength division multiplexing

Table A-1 SFP and XFP Specifications

SFP/XFP Product ID	Interface	Transmitter Output Power Min/Max (dBm)	Receiver Input Power Min/Max (dBm)
15454-SFP-LC-SX/ 15454E-SFP-LC-SX	GE	-9.5 to -4	-17 to 0
15454-SFP-LC-LX/ 15454E-SFP-LC-LX	GE	-9.5 to -3	-19 to -3
15454-SFP3-1-IR=	OC-3	-15 to -8	-23 to -8
15454E-SFP-L.1.1=	STM-1	-15 to -8	-34 to -10
15454-SFP12-4-IR=	OC-12, D1 Video	-15 to -8	-28 to -7
15454E-SFP-L.4.1=	STM-4, D1 Video	-15 to -8	-28 to -8
15454-SFP-OC48-IR=	OC-48, DV6000 (C-Cor)	-5 to +0	-18 to +0
ONS-SE-2G-S1=	OC-48, STM-16	-10 to -3	-18 to -3
15454E-SFP-L.16.1=	STM-16, DV6000 (C-Cor)	-5 to +0	-18 to +0
15454-SFP-200/ 15454E-SFP-200	ESCON	-8 to -4	-28 to -3
15454-SFP-GEFC-SX=/ 15454E-SFP-GEFC-S=	FC (1 and 2 Gbps), FICON, GE	-10 to -3.5	-17 to 0 (1FC and 1GE) -15 to 0 (2FC)
15454-SFP-GE+-LX=/ 15454E-SFP-GE+-LX=	FC (1 and 2 Gbps), FICON, GE, HDTV	-9.5 to -3.0	-20 to -3 (1FC, 1GE, and 2FC)
ONS-SE-200-MM=	ESCON	-20.5 to -15	-14 to -29 ¹
ONS-SE-G2F-SX=	Fibre Channel (1 and 2 Gbps), GE	-9.5 to 0 (GE) -10 to -3.5 (1G and 2G FC/FICON)	-17 to 0 ² (GE) -22 (1G FC/FICON) -20 (2G FC/FICON)
ONS-SE-G2F-LX=	Fibre Channel (1 and 2 Gbps), FICON, GE, HDTV	-9.5 to -3 (GE) -10 to -3.5 (1FC, 2FC, and FICON)	-19 to -3 ³ (GE) -22 (1G FC/FICON) -21 (2G FC/FICON)
ONS-SC-GE-SX=	GE	-9.5 to 0	-17 to 0 ²

Table A-1 SFP and XFP Specifications (continued)

SFP/XFP Product ID	Interface	Transmitter Output Power Min/Max (dBm)	Receiver Input Power Min/Max (dBm)
ONS-SC-GE-LX=	GE	-9.5 to -3	-19 to -3 ³
ONS-SI-2G-S1	OC-48 SR	-10 to -3	-18 to -3
ONS-SI-2G-I1	OC-48 IR1	-5 to 0	-18 to 0
ONS-SI-2G-L1	OC-48 LR1	-2 to 3	-27 to -9
ONS-SI-2G-L2	OC-48 LR2	-2 to 3	-28 to -9
ONS-SC-2G-30.3 through ONS-SC-2G-60.6	OC-48 DWDM	0 to 4	-28 to -9
ONS-SI-622-I1	OC-3/OC-12 IR1 Dual rate	-15 to -8	-28 to -8
ONS-SI-622-L1	OC-21 LR1	-3 to 2	-28 to -8
ONS-SI-622-L2	OC-12 LR2	-3 to 2	-28 to -8
ONS-SE-622-1470 through ONS-SE-622-1610	OC-12 CWDM	0 to 5	-28 to -7
ONS-SI-155-I1	OC-3 IR1	-15 to -8	-28 to -8
ONS-SI-155-L1	OC-3 LR1	-5 to 0	-34 to -10
ONS-SI-155-L2	OC-3 LR2	-5 to 0	-34 to -10
ONS_SE-155-1470 through ONS-SE-155-1610	OC-3 CWDM	0 to 5	-34 to -7
ONS-XC-10G-S1	OC-192 SR1	-6 to -1	-11 to -1
ONS-XC-10G-I2	OC-192 IR2	-1 to +2	-14 to +2
ONS-XC-10G-L2	OC-192 LR2	0 to 4	-24 to -7
ONS-SE-100-FX	Fast Ethernet	-20 to -14	-30 to -14
ONS-SE-100-LX10	Fast Ethernet	-15 to -8	-25 to -8

1. Based on any valid 8B/10B code pattern measured at, or extrapolated to, 10E-15 BER measured at center of eye
2. Minimum Stressed Sensitivity (10-12): -12.5(62.5um) and -13.5(50um) dBm
3. Minimum Stressed Sensitivity (10^{-12}): -14.4 dBm

A.3 General Card Specifications

This section provides power consumption and temperature ranges for all ONS 15454 SDH cards.

A.3.1 Power Consumption

Table A-2 provides power consumption information for the ONS 15454 SDH cards.

Table A-2 Individual Card Power Requirements

Card Type	Card Name	Watts	Amperes	BTU/Hr
Control Cards	TCC2	18.72	0.39 (0.213 at -60 V)	63.88
	TCC2P	27.00	0.56	92.2
	XC-VXL-10G	54.24	1.13	185.07
	XC-VXL-2.5G	81.30	1.69	277.6
	XC-VXC-10G	67	1.4	228.62
	AIC-I	4.80	0.10	16.38
	Fan Tray -48 VDC	129.60	2.7	442.21
Electrical Cards	E1-N-14	13.44	0.28	45.86
	E1-42	43.2	0.90	147.40
	E3-12	38.20	0.92	130.35
	DS3i-N-12	19.0	0.80	64.83
	STM1E-12	59.40	1.24	202.8
	FMEC-E1	0.00	0.00	0.0
	FMEC-DS1/E1	0.00	0.00	0.0
Electrical Cards	FMEC E1-120NP	0.00	0.00	0.0
	FMEC E1-120PROA	-0.1	through E1-42	—
	FMEC E1-120PROB	-0.1	through E1-42	—
	E1-75/120	0.00	0.00	0.0
	FMEC-E3/DS3	0.00	0.00	0.0
	FMEC STM1E 1:1	-8.8	through STM1E-12	—
	MIC-A/P	-0.13	through TCC2/TCC2P	—
	MIC-C/T/P	-0.38	through TCC2/TCC2P	—

Table A-2 Individual Card Power Requirements (continued)

Card Type	Card Name	Watts	Amperes	BTU/Hr
Optical Cards	OC3 IR 4/STM1 SH 1310	19.20	0.40	65.6
	OC3IR/STM1SH 1310-8	23.00	0.48	78.5
	OC12 IR/STM4 SH 1310	9.28	0.19	31.7
	OC12 LR/STM4 LH 1310	9.28	0.19	31.7
	OC12 LR/STM4 LH 1550	9.28	0.19	31.7
	OC12 LR/STM4 SH 1310-4	35.60	0.74	121.6
	OC48 IR/STM16 SH AS 1310	37.20	0.78	127.0
	OC48 LR/STM16 LH AS 1550	37.20	0.78	127.0
	OC48 ELR/STM16 EH 100 GHz	31.20	0.65	106.5
	OC192 SR/STM64 IO 1310	42.00	0.88	143.4
	OC192 IR/STM64 SH 1550	44.00	0.92	150.2
	OC192 LR/STM64 LH 1550	72.20	1.50	246.5
	OC192 LR/STM64 LH ITU 15xx.xx	46.00	0.96	157.1
	15454_MRC-12	38	0.79	129.66
	OC192SR1/STM64IO Short Reach and OC192/STM64 Any Reach ¹	40	0.83	136.49
Ethernet Cards	E100T-G	60.96	1.27	208.00
	E1000-2-G	38.88 (including GBICs)	0.81	182.67
	G1K-4	55.20 (including GBICs)	1.15	215.11
	ML100T-12	53.00	1.10	181.0
	ML1000-2	44.1(including SFPs)	0.92	167.3
	ML100X-8	65	1.35	221.93
	CE-100T-8	53.14	1.10	181.3
	CE-1000-4	60	1.25	204.80
Storage Access Networking	FC_MR-4 (Fibre Channel)	60	1.25	204.80

1. These cards are referred to as OC192-XFP in CTC.

A.3.2 Temperature Ranges

Table A-3 provides temperature ranges and product names for ONS 15454 SDH cards.



Note

The I-Temp symbol is displayed on the faceplate of an I-Temp compliant card. A card without this symbol is C-Temp compliant.

Table A-3 Card Temperature Ranges and Product Names

Card Type	Card Name	C-Temp Product Name (0 to +55 degrees Celsius, 32 to 131 degrees Fahrenheit)	I-Temp Product Name (-40 to +65 degrees Celsius, -40 to 149 degrees Fahrenheit)
Control Cards	TCC2	—	15454-TCC2
	TCC2P	—	15454-TCC2P
	XC-VXL-10G	15454E-XC-VXL10G	—
	XC-VXL-2.5G	15454E-XC-VXL-2.5G	—
	XC-VXC-10G	—	15454-XC-VXC-10G-T
	AIC-I	—	15454-AIC-I
Electrical	E1-N-14	15454E-E1N-14	—
	E1-42	15454E-1-42	—
	E3-12	15454E-3-12	—
	DS3i-N-12	15454E-DS3i-N-12	—
	STM1E-12	15454E-STM1E-12	—
	FMEC-E1	15454E-FMEC-E1	—
	FMEC-DS1/E1	15454E-FMEC-DS1/E1	—
	FMEC E1-120NP	15454E-FMEC E1-120NP	—
	FMEC E1-120PROA	15454E-FMEC E1-120PROA	—
	FMEC E1-120PROB	15454E-FMEC E1-120PROB	—
	E1-75/120	15454E-E1-75/120	—
	FMEC-E3/DS3	15454E-FMEC-E3/DS3	—
	FMEC STM1E 1:1	15454E-FMEC STM1E 1:1	—
	MIC-A/P	15454E-MIC-A/P	—
	MIC-C/T/P	15454E-MIC-C/T/P	—

Table A-3 Card Temperature Ranges and Product Names (continued)

Card Type	Card Name	C-Temp Product Name (0 to +55 degrees Celsius, 32 to 131 degrees Fahrenheit)	I-Temp Product Name (-40 to +65 degrees Celsius, -40 to 149 degrees Fahrenheit)
Optical	OC3 IR/STM1 SH 1310	15454E-S1.1-4	—
	OC3 IR/STM1 SH 1310-8	15454E-S1.1-8	—
	OC12 IR/STM4 SH 1310	15454E-S4.1-1	—
	OC12 LR/STM4 LH 1310	15454E-L4.1-1	—
	OC12 LR/STM4 LH 1550	15454E-L4.2-1	—
	OC12 LR/STM4 SH 1310-4	15454E-L4.1-4	—
	OC48 IR/STM16 SH AS 1310	15454E-S16.1-1	—
	OC48 LR/STM16 LH AS 1550	15454E-S16.2-1	—
	OC48 ELR/STM16 EH 100 GHz	15454E-EL16HXXXX	—
	OC192 SR/STM64 IO 1310	15454E-I65.1	—
	OC192 IR/STM64 SH 1550	15454E-S64.2	—
	OC192 LR/STM64 LH 1550	15454E-L64.2.1	—
	OC192 LR/STM64 LH ITU 15xx.xx	15454E-64-LXX.X	—
	15454_MRC-12	—	15454-MRC-12-T
	OC192SR1/STM64IO Short Reach and OC192/STM64 Any Reach ¹	15454_OC192SR1/ STM64IO Short Reach and 15454_OC192/ STM64 Any Reach	—
Ethernet	E100T-G	15454-E100T-G	—
	E1000-2-G	15454-E1000-2-G	—
	G1K-4	15454-G1K-4	—
	ML100T-12	15454-ML100T-12	—
	ML1000-2	15454-ML1000-2	—
	ML100X-8	—	15454-ML100X-8
	CE-100T-8	15454-CE100T-8	—
	CE-1000-4	15454-CE1000-4	—
Storage Access Networking	FC_MR-4	15454-FC_MR-4	—

1. These cards are referred to as OC192-XFP in CTC.

A.4 Common Control Card Specifications

This section provides specifications for the common control cards.

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

A.4.1 TCC2 Card Specifications

The TCC2 card has the following specifications:

- CTC software
 - Interface: EIA/TIA-232 (local craft access, on TCC2 faceplate)
 - Interface: 10BaseT LAN (on TCC2 faceplate)
 - Interface: 10BaseT LAN (through backplane, access on the MIC-A/P card)
- Synchronization
 - Stratum 3, per ITU-T G.812
 - Free running access: Accuracy +/- 4.6 ppm
 - Holdover stability: $3.7 * 10 \text{ exp} - 7$ per day including temperature (< 255 slips in first 24 hours)
 - Reference: External BITS, line, internal
- Supply voltage monitoring
 - Both supply voltage inputs are monitored
 - Normal operation:
 - 40.5 to –56.7 V (in –48 VDC systems)
 - 50.0 to –72.0 V (in –60 VDC systems)
 - Undervoltage: Major alarm
 - Overvoltage: Major alarm
- Environmental
 - Operating temperature: –40 to +55 degrees Celsius (–40 to +149 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 26.00 W, 0.54 A at –48 V, 0.43 A at –60 V, 88.8 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.7 kg (1.5 lb)

A.4.2 TCC2P Card Specifications

The TCC2P card has the following specifications:

- CTC software
 - Interface: EIA/TIA-232 (local craft access, on TCC2P faceplate)
 - Interface: 10BaseT LAN (on TCC2P faceplate)
 - Interface: 10BaseT LAN (through backplane, access on the MIC-A/P card)
 - Security communication protocols such as SSH, SSL, and HTTPS are optional

- Synchronization
 - Stratum 3, per ITU-T G.812
 - 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 supply voltage inputs are monitored
 - Normal operation:
 - 40.5 to -56.7 V (in -48 VDC systems)
 - 50.0 to -72.0 V (in -60 VDC systems)
 - Undervoltage: Major alarm
 - Overvoltage: Major alarm
- Environmental
 - Operating temperature: -40 to +55 degrees Celsius (-40 to +149 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 26.00 W, 0.54 A at -48 V, 0.43 A at -60 V, 88.8 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.7 kg (1.5 lb)

A.4.3 XC-VXL-10G Card Specifications

The XC-VXL-10G card has the following specifications:

- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 85 percent, noncondensing
 - Power consumption: 81.30 W, 1.69 A at -48 V, 277.6 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.6 kg (1.5 lb)

A.4.4 XC-VXL-2.5G Card Specifications

The XC-VXL-2.5G card has the following specifications:

- Environmental
 - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 85 percent, noncondensing
 - Power consumption: 81.30 W, 1.69 A at –48 V, 277.6 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.6 kg (1.5 lb)

A.4.5 XC-XVC-10G Card Specifications

- Environmental
 - Operating temperature:
 - I-Temp (15454-XC-VXC-10G-T): –40 to 149 degrees Fahrenheit (–40 to +55 degrees Celsius)
 - Operating humidity: 5 to 85 percent, noncondensing
 - Power consumption: 67 W, 1.25 A, 204.73 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Weight (not including clam shell): 1.5 lb (0.6 kg)

A.4.6 AIC-I Specifications

The AIC-I card has the following specifications:

- Alarm inputs
 - Number of inputs: 16
 - Opto-coupler isolated
 - Label customer provisionable
 - Severity customer provisionable
 - Common 32-V output for all alarm-inputs
 - Each input limited to 2 mA
 - Termination through MIC-A/P

- Alarm outputs
 - Number of outputs: 4 (user configurable as inputs)
 - Switched by opto-MOS (metal oxide semiconductor)
 - Triggered by definable alarm condition
 - Maximum allowed open circuit voltage: 60 VDC
 - Maximum allowed closed circuit current: 100 mA
 - Termination through MIC-A/P
- EOW/LOW
 - ITU-T G.711, ITU-T G.712, Telcordia GR-253-CORE
 - A-law, mu-law



Note Due to the nature of mixed coding, in a mixed-mode configuration (A-law/mu-law) the orderwire is not ITU-T G.712 compliant.

- Orderwire party line
- Dual tone multifrequency (DTMF) signaling
- User data channel (UDC)
 - Bit rate: 64 kbps, codirectional
 - ITU-T G.703
 - Input/output impedance: 120 ohms
 - Termination: RJ-11 connectors
- Generic communications channel (GCC)
 - Bit rate: 576 kbps
 - EIA/TIA-485/V11
 - Input/output impedance: 120 ohms
 - Termination: RJ-45 connectors
- ACC connection for additional alarm interfaces
 - For future use
- Environmental
 - Operating temperature: –40 to +55 degrees Celsius (–40 to +149 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 8.00 W, 0.17 A, 27.3 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Weight (not including clam shell): 1.8 lb (0.82 kg)

A.5 Electrical Card and FMEC Specifications

This section provides specifications for the electrical and Front Mount Electrical Connection (FMEC) cards.

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

A.5.1 E1-N-14 Card Specifications

The E1-N-14 card has the following specifications:

- E1-N-14 input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Frame format: Unframed, ITU-T G.704 framed
 - Line code: HDB-3
 - Termination: Through FMEC-E1 (for 75 ohms unbalanced) or FMEC-DS1/E1 (for 120 ohms balanced)
 - Input impedance: 75 ohms unbalanced or 120 ohms balanced
 - Cable loss: 0 to 6 dB at 1024 kHz (for cable length, see the specification of the cable that you are using)
 - AIS: ITU-T G.704 compliant
- E1-N-14 output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Frame format: Unframed, ITU-T G.704 framed
 - Line code: HDB-3
 - Termination: Through FMEC-E1 (for 75 ohms unbalanced) or FMEC-DS1/E1 (for 120 ohms balanced)
 - Output impedance: 75 ohms unbalanced or 120 ohms balanced
 - Alarm indication signal (AIS): ITU-T G.704 compliant
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15
 - Pulse amplitude: 2.37 V +/- 5 percent zero-peak at 75 ohms; 3 V +/-5 percent zero-peak at 120 ohms
 - Loopback modes: Terminal and facility
- Environmental
 - Overvoltage protection: As in ITU-T G.703 Annex B
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 24.00 W, 0.50 A at -48 V, 81.9 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)

- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight (not including clam shell): 0.8 kg (1.9 lb)

A.5.2 E1-42 Card Specifications

The E1-42 card has the following specifications:

- E1-42 input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Frame format: Unframed, ITU-T G.704 framed
 - Line code: HDB-3
 - Termination: Through FMEC E1-120NP, FMEC E1-120PROA, or FMEC E1-120PROB
 - Input impedance: 120 ohms balanced (75 ohms unbalanced with additional E1-75/120)
 - Cable loss: 0 to 6 dB at 1024 kHz (for cable length, see the specification of the cable that you are using)
 - AIS: ITU-T G.704 compliant
- E1-42 output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Frame format: Unframed, ITU-T G.704 framed
 - Line code: HDB-3
 - Termination: Through FMEC E1-120NP, FMEC E1-120PROA, or FMEC E1-120PROB
 - Output impedance: 120 ohms balanced (75 ohms unbalanced with additional E1-75/120)
 - AIS: ITU-T G.704 compliant
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15
 - Pulse amplitude: 3 V +/- 5 percent zero-peak at 120 ohms; 2.37 V +/-5 percent zero-peak at 75 ohms
 - Loopback modes: Terminal and facility
- Environmental
 - Overvoltage protection: As in ITU-T G.703 Annex B
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 38.10 W, 0.79 A at -48 V, 130.1 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.8 kg (1.9 lb)

A.5.3 E3-12 Card Specifications

The E3-12 card has the following specifications:

- E3-12 input
 - Bit rate: 34.368 Mbps +/-20 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms +/-5 percent
 - Cable loss: Up to 12 dB at 17184 kHz (for cable length, see the specification of the cable that you are using)
 - AIS: ITU-T G.704 compliant
- E3-12 output
 - Bit rate: 34.368 Mbps +/- 20 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms +/-5 percent
 - AIS: ITU-T G.704 compliant
 - Power level: -1.8 to +5.7 dBm
 - Pulse shape: ITU-T G.703, Figure 17
 - Pulse amplitude: 0.36 to 0.85 V peak-to-peak
 - Loopback modes: Terminal and facility
- E3-12 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors in the FMEC-E3/DS3 card
- Environmental
 - Overvoltage protection: As in ITU-T G.703 Annex B
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 38.20 W, 0.80 A at -48 V, 130.4 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.7 kg (1.7 lb)

A.5.4 DS3i-N-12 Card Specifications

The DS3i-N-12 card has the following specifications:

- DS3i-N-12 input
 - Bit rate: 44.736 Mbps \pm 20 ppm
 - Frame format: ITU-T G.704, ITU-T G.752/DS-3 ANSI T1.107-1988
 - Line code: B3ZS
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms \pm 5 percent
 - Cable loss:
 - Maximum 137 m (450 ft): 734A, RG59, 728A
 - Maximum 24 m (79 ft): RG179
 - AIS: ITU-T G.704 compliant
- DS3i-N-12 output
 - Bit rate: 44.736 Mbps \pm 20 ppm
 - Frame format: ITU-T G.704, ITU-T G.752/DS-3 ANSI T1.107-1988
 - Line code: B3ZS
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms \pm 5 percent
 - AIS: ITU-T G.704 compliant
 - Power level: -1.8 to $+5.7$ dBm



Note The power level is for a signal of all ones and is measured at a center frequency of 22.368 MHz (3 \pm 1 kHz) bandwidth.

- Pulse shape: ITU-T G.703, Figure 14/ANSI T1.102-1988, Figure 8
- Pulse amplitude: 0.36 to 0.85 V peak-to-peak
- Loopback modes: Terminal and facility
- Line build out: 0 to 69 m (0 to 225 ft); 69 to 137 m (226 to 450 ft)
- DS3i-N-12 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors through the FMEC-E3/DS3 card
- Environmental
 - Overvoltage protection: As in ITU-T G.703 Annex B
 - Operating temperature: -5 to $+45$ degrees Celsius ($+23$ to $+113$ degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 26.80 W, 0.56 A at -48 V, 91.5 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)

- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight (not including clam shell): 0.8 kg (1.9 lb)

A.5.5 STM1E-12 Card Specifications

The STM1E-12 card has the following specifications:

- STM1E-12 input
 - Bit rate: 155.52 Mbps +/-5 ppm for STM-1 or 139.264 Mbps +/-15 ppm for E-4
 - Line code: Coded mark inversion (CMI)
 - E-4 (can be framed or unframed)
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms +/-5 percent
 - Cable loss: Up to 12.7 dB at 78 MHz (for cable length, see the specification of the cable that you are using)
 - AIS: ITU-T G.704 compliant
- STM1E-12 output
 - Bit rate: 155.52 Mbps +/-5 ppm for STM-1 or 139.264 Mbps +/-15 ppm for E-4
 - Line code: CMI
 - E-4 can be framed or unframed
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms +/-5 percent
 - AIS: ITU-T G.704 compliant
 - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
 - Pulse amplitude: 1 V +/- 0.1 V peak-to-peak
 - Loopback modes: Terminal and facility
- STM1E-12 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors in the FMEC STM1E 1:1 card
- Environmental
 - Overvoltage protection: As in ITU-T G.703 Annex B
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 59.40 W, 1.24 A at -48 V, 202.8 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)

- Depth with backplane connector: 235 mm (9.250 in.)
- Weight (not including clam shell): 0.7 kg (1.7 lb)

A.5.6 FILLER Card

The FILLER card has the following specifications:

- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: Not applicable
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Weight (not including clam shell): 0.2 kg (0.4 lb)

A.5.7 FMEC-E1 Specifications

The FMEC-E1 has the following specifications:

- FMEC-E1 input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms +/-5 percent
 - Cable loss: Up to 6 dB at 1024 kHz
- FMEC-E1 output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms +/-5 percent
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
 - Pulse amplitude: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
- FMEC-E1 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.00 W, 0.00 A at -48 V, 0.0 BTU/hr

- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.8 FMEC-DS1/E1 Specifications

The FMEC-DS1/E1 has the following specifications:

- FMEC-DS1/E1 input
 - Bit rate: 2.048 Mbps \pm 50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms \pm 5 percent
 - Cable loss: Up to 6 dB at 1024 kHz
- FMEC-DS1/E1 output
 - Bit rate: 2.048 Mbps \pm 50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Output impedance: 120 ohms \pm 5 percent
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
 - Pulse amplitude: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
- FMEC-DS1/E1 electrical interface
 - Connectors: 37-pin DB connectors
- Environmental
 - Operating temperature: -5 to $+45$ degrees Celsius ($+23$ to $+113$ degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.00 W, 0.00 A at -48 V, 0.0 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.6 lb)

A.5.9 FMEC E1-120NP Specifications

The FMEC E1-120NP has the following specifications:

- FMEC E1-120NP input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent
 - Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120NP output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
 - Pulse amplitude: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
- FMEC E1-120NP electrical interface
 - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.00 W, 0.00 A at -48 V, 0.0 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.10 FMEC E1-120PROA Specifications

The FMEC E1-120PROA has the following specifications:

- FMEC E1-120PROA input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent

- Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120PROA output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
 - Pulse amplitude: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
- FMEC E1-120PROA electrical interface
 - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.1 W (provided by the E1-42 card), 0.34 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.11 FMEC E1-120PROB Specifications

The FMEC E1-120PROB has the following specifications:

- FMEC E1-120PROB input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent
 - Cable loss: Up to 6 dB at 1024 kHz
- FMEC E1-120PROB output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
 - Termination: Balanced twisted-pair cable
 - Input impedance: 120 ohms +/-5 percent
 - Pulse shape: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7

- Pulse amplitude: conforms to ITU-T Recommendation G.703 (1991), Section 6.2, Figure 15 and Table 7
- FMEC E1-120PROB electrical interface
 - Connectors: Molex 96-pin LFH connectors (21 ports per connector)
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.1 W (provided by the E1-42 card), 0.34 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.12 E1-75/120 Impedance Conversion Panel Specifications

The FMEC E1-75/120 impedance conversion panel has the following specifications:

- E1-75/120 input
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
- E1-75/120 output
 - Bit rate: 2.048 Mbps +/-50 ppm
 - Line code: HDB-3
- E1-75/120 electrical interface
 - Connectors:
 - 1.0/2.3 miniature coax connectors on 75-ohm side
 - Molex 96-pin LFH connectors on 120-ohm side
 - Impedance tolerance: +/-5 percent
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: Not applicable; the E1-75/120 is a passive device.
- Dimensions
 - Height: 75 mm (2.95 in.)
 - Width: 535 mm (21.06 in.)
 - Depth: 221 mm (8.7 in.)
 - Weight (not including clam shell): 2.15 kg (4.74 lb)

A.5.13 FMEC-E3/DS3 Specifications

The FMEC-E3/DS3 has the following specifications:

- FMEC-E3/DS3 input (for E3 signals)
 - Bit rate: 34.368 Mbps \pm 20 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms \pm 5 percent
 - Cable loss: Up to 12 dB at 17184 kHz
- FMEC-E3/DS3 output (for E3 signals)
 - Bit rate: 34.368 Mbps \pm 20 ppm
 - Line code: HDB-3
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms \pm 5 percent
 - Pulse shape: ITU-T G.703, Figure 17
 - Pulse amplitude: ITU-T G.703, Figure 17 and Table 9
- FMEC-E3/DS3 Input (for DS3 signals)
 - Bit rate: 44.736 Mbps \pm 20 ppm
 - Line code: B3ZS
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms \pm 5 percent
 - Cable loss:
 - Maximum 137 m (450 ft): 734A, RG59, 728A
 - Max 24 m (79 ft): RG179
- FMEC-E3/DS3 output (for DS3 signals)
 - Bit rate: 44.736 Mbps \pm 20 ppm
 - Line code: B3ZS
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms \pm 5 percent
 - AIS: TR-TSY-000191 compliant
 - Power level: ITU-T G.703, Table 6; -1.8 to $+5.7$ dBm
 - Pulse shape: ITU-T G.703, Table 6 and Figure 14; ANSI T1.102-1988, Figure 8
 - Pulse amplitude: ITU-T G.703, Table 6; 0.36 to 0.85 V peak-to-peak
 - Line build out: 0 to 68.58 m (0 to 225 ft.); 68.88 to 137.16 m (226 to 450 ft.)
- FMEC-E3/DS3 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
 - Operating temperature: -5 to $+45$ degrees Celsius ($+23$ to $+113$ degrees Fahrenheit)

- Operating humidity: 5 to 95 percent, noncondensing
- Power consumption: 0.00 W, 0.00 A at -48 V, 0.0 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.14 FMEC STM1E 1:1 Specifications

The FMEC STM1E 1:1 has the following specifications:

- FMEC STM1E 1:1 input
 - Bit rate: 155.52 Mbps +/-20 ppm
 - Line code: CMI
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms +/-5 percent
 - Cable loss: Up to 12.7 dB at 78 MHz
- FMEC STM1E 1:1 E4 input
 - Bit rate: 139.264 Mbps +/-15 ppm
 - Line code: CMI
 - Termination: Unbalanced coaxial cable
 - Input impedance: 75 ohms +/-5 percent
 - Cable loss: Up to 12.7 dB at 78 MHz
- FMEC STM1E 1:1 output
 - Bit rate: 155.52 Mbps +/-20 ppm
 - Line code: CMI
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms +/-5 percent
 - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
 - Pulse amplitude: 1 V +/- 0.1 V peak-to-peak
- FMEC STM1E E4 output
 - Bit rate: 139.264 Mbps +/-20 ppm
 - Line code: CMI
 - Termination: Unbalanced coaxial cable
 - Output impedance: 75 ohms +/-5 percent
 - Pulse shape: ITU-T G.703, Figure 18 and 19 for E-4, Figure 22 and 23 for STM-1
 - Pulse amplitude: 1 V +/- 0.1 V peak-to-peak

- FMEC STM1E 1:1 electrical interface
 - Connectors: 1.0/2.3 miniature coax connectors
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 8.8 W (provided by the STM1E-12 card), 30.0 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Depth: 92 mm (3.62 in.)
 - Depth with backplane connector: 98 mm (3.87 in.)
 - Weight (not including clam shell): 0.3 kg (0.7 lb)

A.5.15 BLANK-FMEC Specifications

The BLANK-FMEC is a sheet metal plate that is used to cover up empty FMEC slots. It has the following specifications:

- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: Not applicable
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 in.)
 - Weight (not including clam shell): 0.2 kg (0.4 lb)

A.5.16 MIC-A/P Specifications

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

- Power supply input BATTERY B
 - System supply voltage:
 - Nominal –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 250 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)
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.13 W (provided by +5 V from the TCC2/TCC2P card), 0.44 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 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)

A.5.17 MIC-C/T/P Specifications

The MIC-C/T/P FMEC 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
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 0.38 W (provided by +5 V from the TCC2/TCC2P card), 1.37 BTU/hr
- Dimensions
 - Height: 182 mm (7.165 in.)
 - Width: 32 mm (1.25 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)

A.6 Optical Card Specifications

This section provides specifications for the optical cards.

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

A.6.1 OC3 IR 4/STM1 SH 1310 Card Specifications

The OC3 IR 4/STM1 SH 1310 card has the following specifications:

- Line
 - Bit rate: 155.52 Mbps
 - Code: Scrambled non-return to zero (NRZ)
 - Fiber: 1310-nm single-mode
 - Loopback modes: Terminal and facility
 - Connector: SC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: -8 dBm
 - Minimum transmitter output power: -15 dBm
 - Center wavelength: 1261 to 1360 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Fabry Perot laser
 - Extinction ratio: 8.2 dB
 - Dispersion ratio: 96 ps/nm
- Receiver
 - Maximum receiver level: -8 dBm at BER 1×10^{-12}

- Minimum receiver level: -28 dBm at BER $1 * 10 \text{ exp} - 12$
- Receiver: InGaAs/InP photodetector
- Link loss budget: 13 dB
- Receiver input wavelength range: 1261 to 1360 nm
- Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 19.20 W, 0.40 A at -48 V, 65.56 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.4 kg (1.0 lb)

A.6.2 OC3 IR/STM1 SH 1310-8 Card Specifications

The OC3IR/STM1 SH 1310-8 card has the following specifications:

- Line
 - Bit rate: 155.52 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Loopback modes: Terminal and facility
 - Connector: LC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: -8 dBm
 - Minimum transmitter output power: -15 dBm
 - Center wavelength: 1293 to 1334 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Fabry Perot laser
 - Extinction ratio: 8.2 dB
 - Dispersion tolerance: 96 ps/nm
- Receiver
 - Maximum receiver level: -8 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: -28 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: InGaAs/InP photodetector

- Link loss budget: 13 dB
- Receiver input wavelength range: 1274 to 1356 nm
- Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 23.00 W, 0.48 A at -48 V, 78.5 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.4 kg (1.0 lb)

A.6.3 OC12 IR/STM4 SH 1310 Card Specifications

The OC12 IR/STM4 SH 1310 card has the following specifications:

- Line
 - Bit rate: 622.08 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Loopback modes: Terminal and facility
 - Connectors: SC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: -8 dBm
 - Minimum transmitter output power: -15 dBm
 - Center wavelength: 1274 to 1356 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Fabry Perot laser
 - Extinction ratio: 8.2 dB
 - Dispersion tolerance: 96 ps/nm
- Receiver
 - Maximum receiver level: -8 dBm at BER $1 * 10^{-12}$
 - Minimum receiver level: -28 dBm at BER $1 * 10^{-12}$
 - Receiver: InGaAs/InP photodetector
 - Link loss budget: 13 dB
 - Receiver input wavelength range: 1274 to 1356 nm

- Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
 - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 10.90 W, 0.23 A at –48 V, 37.2 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.6 kg (1.4 lb)

A.6.4 OC12 LR/STM4 LH 1310 Card Specifications

The OC12 LR/STM4 LH 1310 card has the following specifications:

- Line
 - Bit rate: 622.08 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Loopback modes: Terminal and facility
 - Connectors: SC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: +2 dBm
 - Minimum transmitter output power: –3 dBm
 - Center wavelength: 1280 to 1335 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Distributed feedback (DFB) laser
- Receiver
 - Maximum receiver level: –8 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: –28 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: InGaAs/InP photodetector
 - Link loss budget: 25 dB
 - Receiver input wavelength range: 1280 to 1335 nm
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 9.28 W, 0.19 A at –48 V, 31.7 BTU/hr

- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.6 kg (1.4 lb)

A.6.5 OC12 LR/STM4 LH 1550 Card Specifications

The OC12 LR/STM4 LH 1550 card has the following specifications:

- Line
 - Bit rate: 622.08 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1550-nm single-mode
 - Loopback modes: Terminal and facility
 - Connectors: SC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: +2 dBm
 - Minimum transmitter output power: –3 dBm
 - Center wavelength: 1480 to 1580 nm
 - Nominal wavelength: 1550 nm
 - Transmitter: DFB laser
- Receiver
 - Maximum receiver level: –8 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: –28 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: InGaAs/InP photodetector
 - Link loss budget: 25 dB
 - Receiver input wavelength range: 1480 to 1580 nm
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 9.28 W, 0.19 A at –48 V, 31.7 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)

- Weight (not including clam shell): 0.6 kg (1.4 lb)

A.6.6 OC12 IR/STM4 SH 1310-4 Card Specifications

The OC12 IR/STM4 SH 1310-4 card has the following specifications:

- Line
 - Bit rate: 622.08 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Chromatic dispersion allowance: 74 ps/nm for the spectral range of 1274 to 1356 nm; 46 ps/nm for the spectral range of 1293 to 1334 nm
 - Loopback modes: Terminal and facility
 - Connector: SC
- Transmitter
 - Maximum transmitter output power: -8 dBm
 - Minimum transmitter output power: -15 dBm
 - Center wavelength: 1293 to 1334 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Fabry Perot laser
- Receiver
 - Maximum receiver level: -8 dBm at BER $1 * 10 \text{ exp} - 10$
 - Minimum receiver level: -30 dBm at BER $1 * 10 \text{ exp} - 10$
 - Receiver: InGaAs/InP photodetector
 - Link loss budget: 15 dB
 - Receiver input wavelength range: 1274 to 1356 nm
- Environmental
 - Operating temperature: -5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 28 W, 0.58 A at -48 V, 95.6 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.4 kg (1.0 lb)

A.6.7 OC48 IR/STM16 SH AS 1310 Card Specifications

The OC48 IR/STM16 SH AS 1310 card has the following specifications:

- Line
 - Bit rate: 2488.320 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Loopback modes: Terminal and facility
 - Connectors: SC
 - Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: 0 dBm
 - Minimum transmitter output power: –5 dBm
 - Center wavelength: 1280 to 1350 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: DFB laser
- Receiver
 - Maximum receiver level: 0 dBm at BER $1 * 10 \text{ exp} - 10$
 - Minimum receiver level: –18 dBm at BER $1 * 10 \text{ exp} - 10$
 - Receiver: InGaAs InP photodetector
 - Link loss budget: 13 dB minimum
 - Receiver input wavelength range: 1280 to 1350 nm
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 37.20 W, 0.78 A at –48 V, 127.0 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.9 kg (2.2 lb)

A.6.8 OC48 LR/STM16 LH AS 1550 Card Specifications

The OC48 LR/STM16 LH AS 1550 card has the following specifications:

- Line
 - Bit rate: 2488.320 Mbps

- Code: Scrambled NRZ
- Fiber: 1550-nm single-mode
- Loopback modes: Terminal and facility
- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: +3 dBm
 - Minimum transmitter output power: –2 dBm
 - Center wavelength: 1520 to 1580 nm
 - Nominal wavelength: 1550 nm
 - Transmitter: DFB laser
- Receiver
 - Maximum receiver level: –8 dBm at BER $1 * 10 \text{ exp} - 10$
 - Minimum receiver level: –28 dBm at BER $1 * 10 \text{ exp} - 10$
 - Receiver: InGaAs avalanche photo diode (APD) photodetector
 - Link loss budget: 26 dB minimum, with 1 dB dispersion penalty
 - Receiver input wavelength range: 1520 to 1580 nm
- Environmental
 - Eye safety compliance: Class 1 (EN60825)
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 37.20 W, 0.78 A at –48 V, 127.0 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 0.9 kg (2.2 lb)

A.6.9 OC48 ELR/STM16 EH 100 GHz Card Specifications

The OC48 ELR/STM16 EH 100 GHz cards have the following specifications:

- Line
 - Bit rate: 2488.320 Mbps
 - Code: Scrambled NRZ
 - Fiber: 1550-nm single-mode
 - Loopback modes: Terminal and facility
 - Connectors: SC

- Compliance: ITU-T G.692, ITU-T G.707, ITU-T G.957, ITU-T G.958
- Transmitter
 - Maximum transmitter output power: 0 dBm
 - Minimum transmitter output power: –2 dBm
 - Center wavelength: +/- 0.25 nm
 - Transmitter: DFB laser
- Receiver
 - Maximum receiver level: –8 dBm at BER $1 * 10 \text{ exp} - 10$
 - Minimum receiver level: –28 dBm at BER $1 * 10 \text{ exp} - 10$
 - Receiver: InGaAs APD photodetector
 - Link loss budget: 26 dB minimum, with 1 dB dispersion penalty
 - Receiver input wavelength range: 1520 to 1580 nm
- Environmental
 - Operating temperature: –5 to +45 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 31.20 W, 0.65 A at –48 V, 106.5 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 1.1 kg (2.4 lb)
- Currently available wavelengths and versions of the OC48 ELR/STM16 EH 100 GHz card:
 - ITU grid blue band (2 * 100 GHz spacing):
 - 1530.33 +/- 0.25 nm, STM-16HS-LH 1530.33 (DWDM)
 - 1531.90 +/- 0.25 nm, STM-16HS-LH 1531.90 (DWDM)
 - 1533.47 +/- 0.25 nm, STM-16HS-LH 1533.47 (DWDM)
 - 1535.04 +/- 0.25 nm, STM-16HS-LH 1535.04 (DWDM)
 - 1536.61 +/- 0.25 nm, STM-16HS-LH 1536.61 (DWDM)
 - 1538.19 +/- 0.25 nm, STM-16HS-LH 1538.19 (DWDM)
 - 1539.77 +/- 0.25 nm, STM-16HS-LH 1539.77 (DWDM)
 - 1541.35 +/- 0.25 nm, STM-16HS-LH 1541.35 (DWDM)
 - 1542.94 +/- 0.25 nm, STM-16HS-LH 1542.94 (DWDM)
 - ITU grid red band (2 * 100 GHz spacing):
 - 1547.72 +/- 0.25 nm, STM-16HS-LH 1547.72 (DWDM)
 - 1549.32 +/- 0.25 nm, STM-16HS-LH 1549.32 (DWDM)
 - 1550.92 +/- 0.25 nm, STM-16HS-LH 1550.92 (DWDM)
 - 1552.52 +/- 0.25 nm, STM-16HS-LH 1552.52 (DWDM)

- 1554.13 +/- 0.25 nm, STM-16HS-LH 1554.13 (DWDM)
- 1555.75 +/- 0.25 nm, STM-16HS-LH 1555.75 (DWDM)
- 1557.36 +/- 0.25 nm, STM-16HS-LH 1557.36 (DWDM)
- 1558.98 +/- 0.25 nm, STM-16HS-LH 1558.98 (DWDM)
- 1560.61 +/- 0.25 nm, STM-16HS-LH 1560.61 (DWDM)

A.6.10 OC192 SR/STM64 IO 1310 Card Specifications

The OC192 SR/STM64 IO 1310 card has the following specifications:

- Line
 - Bit rate: 9.95328 Gbps
 - Code: Scrambled NRZ
 - Fiber: 1310-nm single-mode
 - Maximum chromatic dispersion allowance: 6.6 ps/nm
 - Loopback modes: Terminal and facility
 - Connectors: SC
 - Compliance: ITU-T G.707, ITU-T G.957, ITU-T G.691
- Transmitter
 - Maximum transmitter output power: -1 dBm
 - Minimum transmitter output power: -6 dBm
 - Center wavelength: 1290 to 1330 nm
 - Nominal wavelength: 1310 nm
 - Transmitter: Directly modulated laser
- Receiver
 - Maximum receiver level: -1 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: -11 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: PIN diode
 - Link loss budget: 5 dB minimum, plus 1 dB dispersion penalty at BER = $1 * 10 \text{ exp} - 12$ including dispersion
 - Receiver input wavelength range: 1290 to 1330 nm
- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 47.00 W, 0.98 A at -48 V, 160.5 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)

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

A.6.11 OC192 IR/STM64 SH 1550 Card Specifications

The OC192 IR/STM64 SH 1550 card has the following specifications:

- Line
 - Bit rate: 9.95328 Gbps
 - Code: Scrambled NRZ
 - Fiber: 1550-nm single-mode
 - Maximum chromatic dispersion allowance: 800 ps/nm
 - Loopback modes: Terminal and facility



Note

You must use a 3 to 15 dB fiber attenuator (5 dB recommended) when working with the OC192 IR/STM64 SH 1550 card in a loopback. Do not use fiber loopbacks with the OC192 IR/STM64 SH 1550 card. Using fiber loopbacks can cause irreparable damage to the OC192 IR/STM64 SH 1550 card.

- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: +2 dBm
 - Minimum transmitter output power: -1 dBm
 - Center wavelength: 1530 to 1565 nm
 - Nominal wavelength: 1550 nm
 - Transmitter: Cooled European accreditation (EA) modulated laser
- Receiver
 - Maximum receiver level: -1 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: -14 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: Positive-intrinsic-negative (PIN) diode
 - Link loss budget: 13 dB minimum, plus 2 dB dispersion penalty at BER = $1 * 10 \text{ exp} - 12$ including dispersion
 - Receiver input wavelength range: 1530 to 1565 nm
- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 50.00 W, 1.04 A at -48 V, 170.7 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)

- Width: 18.2 mm (0.716 in.)
- Depth: 228.6 mm (9.000 in.)
- Depth with backplane connector: 235 mm (9.250 in.)
- Weight (not including clam shell): 1.3 kg (3.1 lb)

A.6.12 OC192 LR/STM64 LH 1550 Card Specifications

The OC192 LR/STM64 LH 1550 card has the following specifications:

- Line
 - Bit rate: 9.95328 Gbps
 - Code: Scrambled NRZ
 - Fiber: 1550-nm single-mode
 - Maximum chromatic dispersion allowance: 1360 ps/nm



Note

You must use a fiber attenuator when connecting a fiber loopback to an OC192 LR/STM64 LH 1550 card. Use a 19 to 24 dB attenuator for 15454-OC192LR1550 or a 14 to 28 dB attenuator for 15454-OC192-LR2 (20 dB is recommended). Never connect a direct fiber loopback.

- Loopback modes: Terminal and facility
- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power:
 - +10 dBm (15454-OC192LR1550);
 - +7 dBm (15454-OC192-LR2)
 - Minimum transmitter output power:
 - +7 dBm (15454-OC192LR1550);
 - +4 dBm (15454-OC192-LR2)
 - Center wavelength: 1530 to 1565 nm
 - Nominal wavelength: 1550 nm
 - Maximum chromatic dispersion allowed: 1600 ps/nm
 - Transmitter: LN (Lithium Niobate) external modulator transmitter
- Receiver
 - Maximum receiver level:
 - 10 dBm (15454-OC192LR1550);
 - 7 dBm (15454-OC192LR1550)
 - Minimum receiver level:
 - 19 dBm (15454-OC192LR1550);
 - 24 dBm from 1530 to 1565 nm
 - 20 dBm from 1290 to 1330 nm (15454-OC192-LR2)
 - Receiver: APD/TIA

- Link loss budget: 24 dB minimum, with no dispersion or 22 dB optical path loss at BER = 1 – exp (–12) including dispersion
- Receiver input wavelength range: 1530 to 1565 nm
- Jitter tolerance: Telcordia GR-253/ITU-T G.823 compliant
- Environmental
 - Operating temperature:
 - C-Temp (15454-OC192LR1550): +23 to +131 degrees Fahrenheit (–5 to +55 degrees Celsius)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 72.20 W, 1.50 A, 246.52 BTU/hr (15454-OC192LR1550); 52.00 W, 1.08 A at –48 V, 177.6 BTU/hr (15454-OC192-LR2)
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Weight not including clam shell: 3.1 lb (1.3 kg)

A.6.13 OC192 LR/STM64 LH ITU 15xx.xx Card Specifications

The OC192 LR/STM64 LH ITU 15xx.xx card has the following specifications:

- Line
 - Bit rate: 9.95328 Gbps
 - Code: Scrambled NRZ
 - Fiber: 1550-nm single-mode
 - Maximum chromatic dispersion allowance:
 - In deployments with a dispersion compensating unit (DCU): +/- 1000 ps/nm, with optical signal-to-noise ratio (OSNR) of 19 dB (0.5 nm resolution bandwidth [RBW])
 - In deployments without a DCU: +/- 1200 ps/nm, with OSNR of 23 dB (0.5 nm RBW)
 - Loopback modes: Terminal and facility



Note You must use a 20-dB fiber attenuator (15 to 25 dB) when working with the OC192 LR/STM64 LH 15xx.xx card in a loopback. Do not use fiber loopbacks with the OC192 LR/STM64 LH 15xx.xx card. Using fiber loopbacks causes irreparable damage to this card.

- Connectors: SC
- Compliance: ITU-T G.707, ITU-T G.957
- Transmitter
 - Maximum transmitter output power: +6 dBm
 - Minimum transmitter output power: +3 dBm
 - Center wavelength: See wavelength plan

- Center wavelength accuracy: +/- 0.040 nm
- Transmitter: LN external modulator transmitter
- Receiver
 - Maximum receiver level: -9 dBm at BER $1 * 10 \text{ exp} - 12$
 - Minimum receiver level: -22 dBm at BER $1 * 10 \text{ exp} - 12$
 - Receiver: APD
 - Link loss budget: 25 dB minimum, plus 2 dB dispersion penalty at BER = $1 * 10 \text{ exp} - 12$ including dispersion
 - Receiver input wavelength range: 1529 to 1565 nm
- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 52.00 W, 1.08 A at -48 V, 177.6 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 1.3 kg (3.1 lb)
- Currently available wavelengths and versions of OC192 LR/STM64 LH ITU 15xx.xx card:
 - ITU grid blue band:
 - 1534.25 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1534.25
 - 1535.04 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1535.04
 - 1535.82 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1535.82
 - 1536.61 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1536.61
 - 1538.19 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1538.19
 - 1538.98 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1538.98
 - 1539.77 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1539.77
 - 1540.56 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1540.56
 - ITU grid red band:
 - 1550.12 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1550.12
 - 1550.92 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1550.92
 - 1551.72 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1551.72
 - 1552.52 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1552.52
 - 1554.13 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1554.13
 - 1554.94 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1554.94
 - 1555.75 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1555.75
 - 1556.55 +/- 0.040 nm, OC192 LR/STM64 LH ITU 1556.55

A.6.14 15454_MRC-12 Card Specifications

The 15454_MRC-12 card has the following specifications:

- Line
 - Bit rate: up to STM-16 (2488.320 Mbps), depending on SFP



Note

Each optical interface on the card can be configured as STM-1, STM-4, or STM-16, depending on the available backplane bandwidth and existing provisioned lines. In general, the card supports all different rates on the line side as long as the accumulated bandwidth does not exceed the total backplane allowed bandwidth.

- Fiber: 1550-nm single-mode
- Connectors: LC duplex connector for each SFP
- Compliance: ITU-T G.957 and Telcordia GR-253
- Transmitter
 - Maximum transmitter output power: Depends on SFP (see [A.2 SFP and XFP Specifications, page A-4](#))
 - Minimum transmitter output power: Depends on SFP (see [A.2 SFP and XFP Specifications, page A-4](#))
 - Center wavelength: See wavelength plan
 - Center wavelength accuracy: 1 nm to 4 nm, depending on SFP
 - Transmitter: Fabry Perot and DFB laser
- Receiver
 - Maximum receiver level: Depends on SFP (see [A.2 SFP and XFP Specifications, page A-4](#))
 - Minimum receiver level: Depends on SFP (see [A.2 SFP and XFP Specifications, page A-4](#))
 - Receiver: PIN PD
 - Receiver input wavelength range: Depends on SFP
- Environmental
 - Operating temperature: –40 to +55 degrees Celsius (–40 to +149 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 38.00 W, 0.79 A at –48 V, 129.66 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Depth with backplane connector: 9.250 in. (235 mm)
 - Weight (not including clam shell): 3.1 lb (1.3 kg)
- Wavelength Plan: Currently available wavelengths and versions of the 15454_MRC-12 card:
 - For ONS-SC-2G-30.3 through ONS-SC-2G-60.0 SFPs: 1530.33 nm to 1560.61 nm (32 distinct wavelengths at 100 GHz spacing)

- For ONS-SE-622-1470 through ONS-SE-622-1610 SFPs: 1470 to 1610 nm (eight distinct wavelengths at 2500 GHz spacing)
- For ONS_SE-155-1470 through ONS-SE-155-1610 SFPs: 1470 to 1610 nm (eight distinct wavelengths at 2500 GHz spacing)

A.6.15 OC192SR1/STM64IO Short Reach Card Specifications

The OC192SR1/STM64IO Short Reach card has the following specifications:



Note

The OC192SR1/STM64IP Short Reach card is designated as OC192-XFP in CTC.

- Line
 - Bit rate: STM-64 (9.9520 Gbps)
 - Fiber: 1310-nm single-mode
 - Connectors: LC duplex connector for the XFP
 - Compliance: ITU G.957 and GR-253
- Transmitter
 - Maximum transmitter output power: –1 dBm
 - Minimum transmitter output power: –6 dBm
- Receiver
 - Maximum receiver level: –1 dBm
 - Minimum receiver level: –11 dBm
 - Receiver input wavelength range: 1260 to 1565 nm
- Environmental
 - Operating temperature: 0 to +55 degrees Celsius (32 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 40.00 W, 0.83 A at –48 V, 136.49 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Depth with backplane connector: 9.250 in. (235 mm)
 - Weight (not including clam shell): 3.1 lb (1.3 kg)

A.6.16 OC192/STM64 Any Reach Card Specifications

The OC192/STM64 Any Reach card has the following specifications:



Note

The OC192/STM64 Any Reach card is designated as OC192-XFP in CTC.

- Line
 - Bit rate: STM-64 (9.9520 Gbps)
 - Fiber: 1310-nm single-mode for ONS-XC-10G-S1 XFP, 1550-nm single mode for ONS-XC-10G-I2 and ONS-XC-10G-L2 XFPs
 - Connectors: LC duplex connector for the XFPs
 - Compliance: ITU G.957 and GR-253
- Transmitter
 - Maximum transmitter output power: Depends on SFP (see the “A.2 SFP and XFP Specifications” section on page A-4)
 - Minimum transmitter output power: Depends on SFP (see the “A.2 SFP and XFP Specifications” section on page A-4)
- Receiver
 - Maximum receiver level: Depends on SFP (see the “A.2 SFP and XFP Specifications” section on page A-4)
 - Minimum receiver level: Depends on SFP (see the “A.2 SFP and XFP Specifications” section on page A-4)
 - Receiver input wavelength range: 1260 to 1565 nm
- Environmental
 - Operating temperature: 0 to +55 degrees Celsius (32 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 40.00 W, 0.83 A at –48 V, 136.49 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.716 in. (18.2 mm)
 - Depth: 9.000 in. (228.6 mm)
 - Depth with backplane connector: 9.250 in. (235 mm)
 - Weight (not including clam shell): 3.1 lb (1.3 kg)

A.7 Ethernet Card Specifications

This section includes specifications for the Ethernet cards.

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

A.7.1 E100T-G Card Specifications

The E100T-G card has the following specifications:

- Environmental
 - Operating temperature:
 - C-Temp (15454-E100T-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)

- Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 65 W, 1.35 A, 221.93 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Weight (not including clam shell): 2.3 lb (1.0 kg)
- Compliance
 - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950

A.7.2 E1000-2-G Card Specifications

The E1000-2-G card has the following specifications:

- Environmental
 - Operating temperature:
C-Temp (15454-E1000-2-G): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 53.50 W, 1.11 A, 182.67 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Weight (not including clam shell): 2.1 lb (0.9 kg)
- Compliance
 - ONS 15454 SDH cards, when installed in a system, comply with these safety standards: UL 1950, CSA C22.2 No. 950, EN 60950, IEC 60950
 - Eye Safety Compliance: Class I (21 CFR 1040.10 and 1040.11) and Class 1M (IEC 60825-1 2001-01) laser products

A.7.3 CE-1000-4 Card Specifications

The CE-1000-4 card has the following specifications:

- Environmental
 - Operating temperature: +23 to +131 degrees Fahrenheit (-5 to +55 degrees Celsius)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 60 W, 1.25 A at -48 V, 204.8 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.310 mm)

- Width: 0.716 in. (18.2 mm)
- Depth: 9.000 in. (228.6 mm)
- Card weight: 2.1 lb (0.9 kg)

A.7.4 CE-100T-8 Card Specifications

The CE-100T-8 card has the following specifications:

- Environmental
 - Operating temperature:
C-Temp (15454-CE100T): 0 to +55 degrees Celsius (32 to 131 degrees Fahrenheit)
 - Operating humidity: 0 to 95 percent, noncondensing
 - Power consumption: 53 W, 1.1 A, 181.3 BTU/hr
- Dimensions
 - Height: 12.650 in. (321.3 mm)
 - Width: 0.913 in. (23.19 mm)
 - Depth: 9.073 in. (230.45 mm)
 - Weight (not including clam shell): 1.8 lb (0.82 kg)

A.7.5 G1K-4 Card Specifications

The G1K-4 card has the following specifications:

- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 63.00 W, 1.31 A at -48 V, 215.1 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 2.1 lb (0.9 kg)
- Compliance. ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
 - Class 1 laser product

A.7.6 ML100T-12 Card Specifications

The ML100T-12 card has the following specifications:

- Environmental
 - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 53.00 W, 1.10 A at –48 V, 181.0 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 2.3 lb (1.0 kg)
- Compliance. ONS 15454 SDH cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, and AS/NZS 3260

A.7.7 ML1000-2 Card Specifications

The ML1000-2 card has the following specifications:

- Environmental
 - Operating temperature: –5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 49.00 W, 1.02 A at –48 V, 167.3 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 2.1 lb (0.9 kg)
- Compliance: ONS 15454 SDH optical cards, when installed in a system, comply with these standards:
 - Safety: IEC 60950, EN 60950, UL 60950, CSA C22.2 No. 60950, TS 001, AS/NZS 3260, IEC 60825-1, IEC 60825-2, 21 CFR 1040-10, and 21 CFR 1040.11
 - Class 1 laser product

A.7.8 ML100X-8 Card Specifications

The ML100X-8 card has the following specifications:

- Environmental

- Operating temperature: -5 to +55 degrees Celsius (+23 to +131 degrees Fahrenheit)
- Operating humidity: 5 to 95 percent, noncondensing
- Power consumption: 65.00 W, 1.35 A at -48 V, 221.93 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Depth with backplane connector: 235 mm (9.250 in.)
 - Weight (not including clam shell): 2.1 lb (0.9 kg)

A.8 Storage Access Networking Card Specifications

This section provides specifications for the FC_MR-4 (Fibre Channel) card.

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

A.8.1 FC_MR-4 Card Specifications

- Environmental
 - Operating temperature
 - C-Temp (15454-E100T): -5 to +55 degrees Celsius (23 to 131 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 60 W, 1.35 A, 221.93 BTU/hr
- Dimensions
 - Height: 321.3 mm (12.650 in.)
 - Width: 18.2 mm (0.716 in.)
 - Depth: 228.6 mm (9.000 in.)
 - Weight (not including clam shell): 1.17 kg (2.59 lb)