



Installing the MXP_2.5G_10E_C and MXP_2.5G_10E_L Cards in the Cisco ONS 15454 SONET/SDH



Note

The terms "Unidirectional Path Switched Ring" and "UPSR" may appear in Cisco literature. These terms do not refer to using Cisco ONS 15xxx products in a unidirectional path switched ring configuration. Rather, these terms, as well as "Path Protected Mesh Network" and "PPMN," refer generally to Cisco's path protection feature, which may be used in any topological network configuration. Cisco does not recommend using its path protection feature in any particular topological network configuration.

Product Names: 15454-4x2.5G10EC MXP, 15454-4x2.5G10ELMXP

This document provides a card description, specifications, and installation procedure for the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards. These cards are compatible with the ONS 15454 SONET (ANSI) and the ONS 15454 SDH (ETSI) shelf assemblies. As appropriate, use this document in conjunction with the *Cisco ONS 15454 DWDM Procedure Guide*, the *Cisco ONS 15454 DWDM Reference Manual*, and the *Cisco ONS 15454 DWDM Troubleshooting Guide*.



Note

"MXP_2.5G_10E_C" is the card name that appears in Cisco Transport Controller (CTC); the same card is named "4x2.5G 10E MXP C" on the physical faceplate. "MXP_2.5G_10E_L" is the name that appears in CTC; the same card is named "4x2.5G 10E MXP L" on the physical faceplate.

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MXP_2.5G_10E_C and MXP_2.5G_10E_L Description

The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards are DWDM muxponders for the ONS 15454 platform that support full optical transparency on the client side. The cards multiplex four 2.5-Gbps client signals (4 x OC48/STM-16 SFP) into a single 10-Gbps DWDM optical signal on the trunk side. The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards provide wavelength transmission service for the four incoming 2.5 Gbps client interfaces. You can install MXP_2.5G_10E_C and MXP_2.5G_10E_L cards in Slots 1 to 6 and 12 to 17.



Note

The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards are not compatible with the MXP_2.5G_10G card, which does not support full optical transparency.

Feature Summary

For detailed information about card features refer to the *Cisco ONS 15454 DWDM Reference Manual*.

The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards have the following high level features:

- **Client interface:** The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards provide four intermediate- or short-range 2.5Gbps, OC-48/STM-16 ports per card on the client side. Both SR-1 and IR-1 optics can be supported and the ports use SFP connectors. The client interfaces use four wavelengths in the 1310-nm, ITU 100-GHz-spaced, channel grid.
- **DWDM interface:** The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards serve as OTN multiplexers, transparently mapping four OC-48 channels asynchronously to ODU1 into one 10-Gbps trunk. For the MXP_2.5G_10E_C card, the DWDM trunk is tunable for transmission over the entire C band and for the MXP_2.5G_10E_L card, the DWDM trunk is tunable for transmission over the entire L band. Channels are spaced at 50-GHz on the ITU grid.
- **Multiplexing function:** The muxponder is an integral part of the optically transparent ROADM network in which data payload channels and wavelengths are processed exclusively at the optical level without electrical to optical (E-O) conversion. The key function of the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards is to multiplex 4 OC-48/STM16 signals onto one ITU-T G.709 OTU2 optical signal (DWDM transmission). The multiplexing mechanism allows the signal to be terminated at a far-end node by another similar card.
- **Digital wrapper:** The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up generic communication channels (GCCs) for data communications, enable forward error correction (FEC), or facilitate performance monitoring (PM). The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards work with OTN devices defined in ITU-T G.709. The cards support ODU1 to OTU2 multiplexing, an industry standard method for asynchronously mapping a SONET/SDH payload into a digitally wrapped envelope.
- **Onboard E-FEC processor:** The processor supports both standard RS (specified in ITU-T G.709) and E-FEC, which allows an improved gain on trunk interfaces with a resultant extension of the transmission range on these interfaces. The E-FEC functionality increases the correction capability of the transponder to improve performance, allowing operation at a lower OSNR compared to the standard RS (237,255) correction algorithm. A new BCH algorithm implemented in E-FEC allows recovery of an input BER up to 1E-3.
- **Pluggable client interface optic modules:** The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards have modular interfaces. Two types of small form-factor pluggables (SFPs) can be plugged into the card. These include an OC-48/STM 16 SR-1 interface with a 7-km (4.3-mile) nominal range (for

short range and intra-office applications) and an IR-1 interface with a range up to 40 km (24.9 miles). SR-1 is defined in Telcordia GR-253-CORE and in I-16 (ITU-T G.957). IR-1 is defined in Telcordia GR-253-CORE and in S-16-1 (ITU-T G.957).

- High level provisioning support: The cards are initially provisioned using Cisco MetroPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- Link monitoring and management: The cards use standard OC-48 OH (overhead) bytes to monitor and manage incoming interfaces. The cards pass the incoming SDH/SONET data stream and its overhead bytes transparently.
- Control of layered SONET/SDH transport overhead: The cards are provisionable to terminate regenerator section overhead. This is used to eliminate forwarding of unneeded layer overhead. It can help reduce the number of alarms and help isolate faults in the network.
- Automatic timing source synchronization: The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards normally synchronize from the TCC2/TCC2P card. If for some reason, such as maintenance or upgrade activity, the TCC2/TCC2P is not available, the cards automatically synchronize to one of the input client interface clocks.
- Configurable squelching policy: The cards can be configured to squelch the client interface output if there is LOS at the DWDM receiver or if there is a remote fault. In the event of a remote fault, the card manages MS-AIS insertion.
- Y-cable protection: This protection mechanism provides redundant bidirectional paths. Two cards can be joined in a Y-cable protection group with one card assigned as the working card and the other defined as the protection card. The Y-protection mechanism is provisionable and can be set ON or OFF (OFF is the default mode). When a signal fault is detected, the protection mechanism software automatically switches between paths.
- Automatic laser shutdown: A safety mechanism used in the event of a fiber cut. The ALS procedure is supported on both client and trunk interfaces. On the client interface, ALS is compliant with ITU-T G.664 (6/99). On the data application and trunk interface, the switch on and off pulse duration is greater than 60 seconds. The on and off pulse duration is user-configurable.
- Jitter: For SONET and SDH signals, the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards comply with Telcordia GR-253-CORE, ITU-T G.825, and ITU-T G.873 for jitter generation, jitter tolerance, and jitter transfer.
- SONET/SDH configurations: You can provision a card in a linear configuration, as a BLSR/MS-SPRing, a path protection/SNCP, or a regenerator. The cards can be used in the middle of BLSR/MS-SPRing or 1+1 spans when the cards are configured for transparent termination mode.
- Onboard traffic generation: The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards provide internal traffic generation for testing purposes according to PRBS, SONET/SDH, or ITU-T G.709.

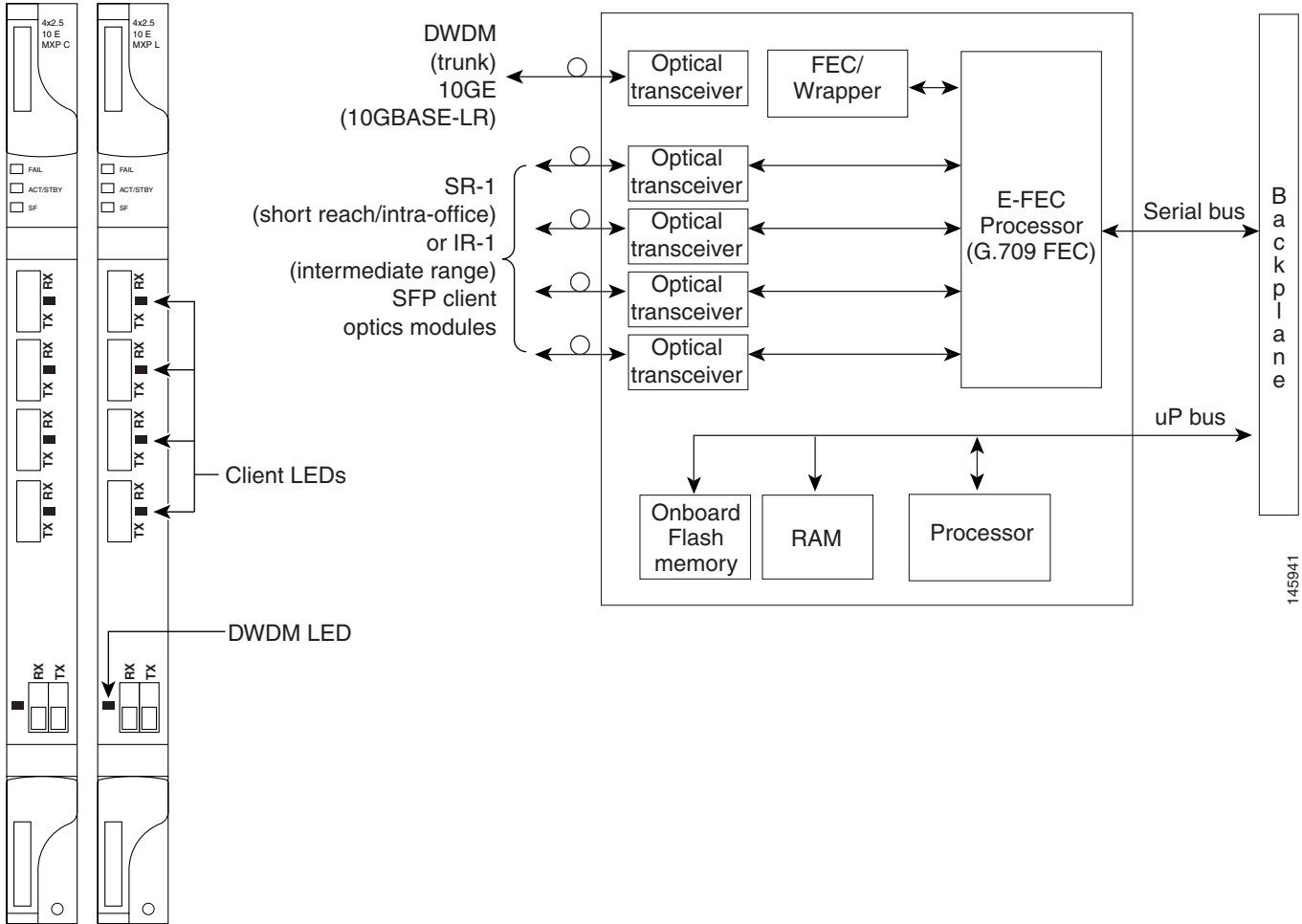
Client and Trunk Ports

The MXP_2.5G_10E_C card features a tunable 1550-nm C-band laser on the trunk port. The laser is tunable across 82 wavelengths on the ITU grid with 50-GHz spacing between wavelengths. The MXP_2.5G_10E_L features a tunable 1580-nm L-band laser on the trunk port. The laser is tunable across 80 wavelengths on the ITU grid, also with 50-GHz spacing. Each card features four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The cards use dual LC connectors on the trunk side and SFP modules on the client side for optical cable termination.

Faceplates

Figure 1 shows the MXP_2.5G_10E_C and MXP_2.5G_10E_L faceplates and block diagram.

Figure 1 MXP_2.5G_10E_C and MXP_2.5G_10E_L Faceplates and Block Diagram



Client Interface Monitoring

The following parameters are monitored on the MXP_2.5G_10E_C and MXP_MP_10E_L cards:

- Laser bias current is measured as a PM parameter.
- LOS is detected and signaled.
- Rx and Tx power are monitored.

The following parameters are monitored in real time mode (one second):

- Optical power transmitted (client)
- Optical power received (client)

In case of LOC at the DWDM receiver or far-end LOS, the client interface behavior is configurable. AIS can be invoked or the client signal can be squelched.

Wavelength Identification

The card uses trunk lasers that are wavelocked, which allows the trunk transmitter to operate on the ITU grid effectively. Both the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards implement the UT2 module. The MXP_2.5G_10E_C card uses a C-band version of the UT2 and the MXP_2.5G_10E_L card uses an L-band version.

Table 1 describes the required trunk transmit laser wavelengths for the MXP_2.5G_10E_C card. The laser is tunable over 82 wavelengths in the C band at 50-GHz spacing on the ITU grid.

Table 1 MXP_2.5G_10E_C 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

Table 1 *MXP_2.5G_10E_C Trunk Wavelengths (Continued)*

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

Table 2 describes the required trunk transmit laser wavelengths for the MXP_2.5G_10E_L card. The laser is fully tunable over 80 wavelengths in the L band at 50-GHz spacing on the ITU grid.

Table 2 *MXP_2.5G_10E_L 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

Table 2 MXP_2.5G_10E_L Trunk Wavelengths (Continued)

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
14	190.2	1576.20	54	188.2	1592.95
15	190.15	1576.61	55	188.15	1593.37
16	190.1	1577.03	56	188.1	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	189.1	1585.36	76	187.1	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

Card-Level Indicators

Table 3 describes the three card-level LEDs on the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards.

Table 3 MXP_2.5G_10E_C and MXP_2.5G_10E_L Card-Level Indicators

Card-Level LED	Description
Red FAIL LED	The red FAIL LED indicates that the card’s processor is not ready. This LED is on during reset. The FAIL LED flashes during the boot process. Replace the card if the red FAIL LED persists.
ACT/STBY LED Green (Active) Amber (Standby)	If the ACT/STBY LED is green, the card is operational (one or more ports active) and ready to carry traffic. If the ACT/STBY LED is amber, the card is operational and in standby (protect) mode.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as LOS, LOF, or high BERs on one or more of the card’s ports. The amber SF LED is also on if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the light turns off.

Port-Level Indicators

Table 4 lists the two port-level LEDs on the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards.

Table 4 MXP_2.5G_10E_C and MXP_2.5G_10E_L Port-Level Indicators

Port-Level LED	Description
Green Client LED (four LEDs)	A green Client LED indicates that the client port is in service and that it is receiving a recognized signal. The card has four client ports, and so has four Client LEDs.
Green DWDM LED	The green DWDM LED indicates that the DWDM port is in service and that it is receiving a recognized signal.

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

- 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 frequency plan, with channels on the ITU 50-GHz grid, as shown in [Table 1](#).
- 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)
 - Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957
- Transmitter (client side): Depends on the SFP that is used.
- Receiver (client side): Depends on the SFP that is used.
- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 50.00 W (maximum), 1.11 A at -48 V, 136.6 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)

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
- Compliance: ITU-T G.707, ITU-T G.709, ITU-T G.957, and Telcordia GR-253-CORE
- 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 [Table 2](#).
- 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)
 - Compliance: Telcordia GR-253-CORE, ITU-T G.707, ITU-T G.957
- Transmitter (client side): Depends on the SFP that is used.
- Receiver (client side): Depends on the SFP that is used.
- Environmental
 - Operating temperature: -5 to +55 degrees Celsius (+23 to +113 degrees Fahrenheit)
 - Operating humidity: 5 to 95 percent, noncondensing
 - Power consumption: 50.00 W (maximum), 1.11 A at -48 V, 136.6 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)

Install the MXP_2.5G_10E_C and MXP_2.5G_10E_L Card



During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself. Statement 94



Class I (CDRH) and Class 1M (IEC) laser products. Statement 1055



Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 272



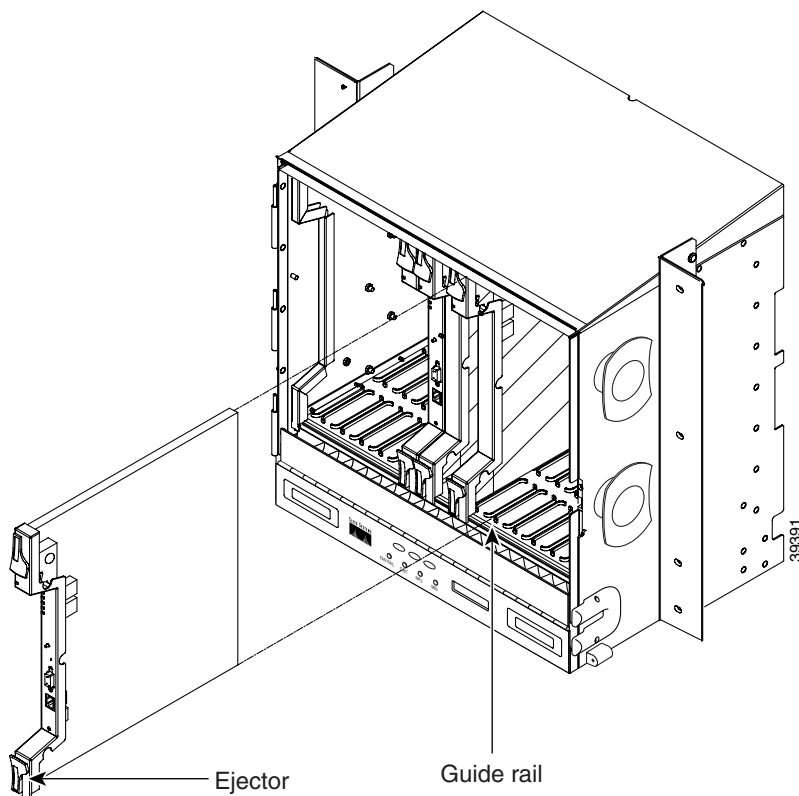
If protective clips are installed on the card connectors, remove the clips before installing the cards.



If you install a card incorrectly, the FAIL LED flashes continuously.

[Figure 2](#) shows general card installation.

Figure 2 Installing a Card in the Cisco ONS 15454 SONET (ANSI) Shelf Assembly



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- Step 1** Display the card installation plan for the node using one of the following sources:
- The Cisco MetroPlanner Site Dialog window for the node you are provisioning.
 - CTC node view with slots preprovisioned based on the Cisco MetroPlanner Site Dialog window.
 - Written slot plan. The plan must be based on the Cisco MetroPlanner Site Dialog window for your installation.
- Step 2** Remove the card from its packaging, then remove the protective clips from the card's connectors.
- Step 3** Open the card latches/ejectors.
- Step 4** Use the latches/ejectors to firmly slide the card along the guide rails until the card plugs into the receptacle at the back of the slot.
- Step 5** Verify that the card is inserted correctly and close the latches/ejectors on the card.



Note It is possible to close the latches and ejectors when the card is not completely plugged into the chassis. Ensure that you cannot insert the card any further.

- Step 6** Verify the LED activity:
- The red FAIL LED turns on for 20 to 30 seconds.
 - The red FAIL LED blinks for 35 to 45 seconds.
 - All LEDs blink once and turn off for 5 to 10 seconds.

- The ACT or ACT/STBY LED turns on. The SF LED can persist until all card ports connect to their far-end counterparts and a signal is present.

Step 7 If the card does not boot up properly, or the LED activity does not occur as described in [Step 6](#), check the following:

- When a physical card type does not match the type of card provisioned for that slot in CTC, the card might not boot. If a card does not boot, open CTC and ensure that the slot is not provisioned for a different card type before assuming that the card is faulty.
- If the red FAIL LED does not turn on, check the power.
- If you insert a card into a slot provisioned for a different card, all LEDs turn off.
- If the red FAIL LED is on continuously or the LEDs behave erratically, the card is not installed properly. Remove the card and repeat Steps [3](#) to [6](#).

Stop. You have completed this procedure.

Related Documentation

- *Cisco ONS 15454 DWDM Reference Manual*
- *Cisco ONS 15454 DWDM Procedure Guide*
- *Cisco ONS 15454 DWDM Troubleshooting Guide*
- *Cisco MetroPlanner DWDM Operations Guide*

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

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