

Cisco NCS 2000 Series Line Card Configuration Guide, Release 11.x.x

First Published: 2019-03-08

Last Modified: 2025-11-12

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Preface

This section explains the objectives, intended audience, and organization of this publication and describes the conventions that convey instructions and other information.

Note Cisco ONS 15454 M2 chassis has reached its end-of-life status. For more information, see the Retirement Notification page.

This section provides the following information:

- Revision History, on page xxv
- Document Objectives, on page xxv
- Audience, on page xxvi
- Document Organization, on page xxvi
- Document Conventions, on page xxvii
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Revision History

Date	Notes
May 2020	Updated for R11.1.1.2
October 2019	Updated for R11.1
March 2019	This is the first release of this publication.

Document Objectives

This document provides background and reference material for Cisco NCSsystems.

Audience

To use this publication, you should be familiar with Cisco or equivalent optical transmission hardware and cabling, telecommunications hardware and cabling, electronic circuitry and wiring practices, and preferably have experience as a telecommunications technician.

Document Organization

This document is organized into the following chapters:

Chapter	Description
Setting Up Optical Service Channel Cards	Includes descriptions of OSCM and OSC-CSM cards. Also provides references to related procedures.
Provisioning Optical Amplifier Cards	Includes descriptions of the optical amplifier cards. Also provides references to related procedures.
Provisioning Multiplexer and Demultiplexer Cards	Includes descriptions of the 4MD-xx.x cards. Also provides references to related procedures.
Setting Up Tunable Dispersion Compensating Units	Explains the Tunable Dispersion Compensating Units (T-DCU) used in DWDM networks. Also provides references to related procedures.
Provisioning Protection Switching Module	Includes descriptions of the Protection Switching Module (PSM) card used in DWDM networks. Also provides references to related procedures.
Provisioning Reconfigurable Optical Add/Drop Cards	Includes descriptions of the ROADM cards. Also provides references to related procedures.
Provisioning Transponder and Muxponder Cards	Includes descriptions of transponder (TXP), muxponder (MXP), Xponder (GE_XP, 10GE_XP, GE_XPE and 10GE_XPE), and ADM-10G cards. Also provides references to related procedures.
Configuring GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards Using PCLI	Describes how to provision GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards using Pseudo Command Line Interface (PCLI).
Pseudo Command Line Interface Reference	Describes Pseudo-IOS command line interface (PCLI) for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Card Features	Describes the card features.
Card Specifications	Contains hardware specifications for the shelf assemblies and cards.

Chapter	Description
Administrative and Service States	Describes the administrative and service states for line cards, optical payload ports, out-of-band optical service channel (OSC) ports, optical channel network connections (OCHNCs), and transponder/muxponder cards and ports.
SNMP	Explains Simple Network Management Protocol (SNMP) as implemented by the Cisco NCS.
CTC Enhancements, Operations, and Shortcuts	Describes the Cisco Transport Controller (CTC) views, menus options, tool options, shortcuts, and table display options.
Network Element Defaults	Describes the defaults for the network element settings for Cisco NCS 2000 Series shelf assemblies.

Document Conventions

This document uses the following conventions:

Convention	Description
^ or Ctrl	Both the ^ symbol and Ctrl represent the Control (Ctrl) key on a keyboard. For example, the key combination **^D** or **Ctrl-D** means that you hold down the Control key while you press the D key. (Keys are indicated in capital letters but are not case sensitive.)
bold font	Commands and keywords and user-entered text appear in **bold** font.
Italic font	Document titles, new or emphasized terms, and arguments for which you supply values are in *italic* font.
`Courier font`	Terminal sessions and information the system displays appear in `courier` font.
`Bold Courier font`	Bold Courier font indicates text that the user must enter.
[x]	Elements in square brackets are optional.
...	An ellipsis (three consecutive nonbolded periods without spaces) after a syntax element indicates that the element can be repeated.
|	A vertical line, called a pipe, indicates a choice within a set of keywords or arguments.
[x | y]	Optional alternative keywords are grouped in brackets and separated by vertical bars.
{x | y}	Required alternative keywords are grouped in braces and separated by vertical bars.

Convention	Description
[x {y | z}]	Nested set of square brackets or braces indicate optional or required choices within optional or required elements. Braces and a vertical bar within square brackets indicate a required choice within an optional element.
string	A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks.
< >	Nonprinting characters such as passwords are in angle brackets.
[ ]	Default responses to system prompts are in square brackets.
!, #	An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line.

Reader Alert Conventions

This document uses the following conventions for reader alerts:



Note Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the manual.



Tip Means *the following information will help you solve a problem.*



Caution Means *reader be careful*. In this situation, you might do something that could result in equipment damage or loss of data.



Timesaver Means *the described action saves time.* You can save time by performing the action described in the paragraph.



Warning **Means *reader be warned.* In this situation, you might perform an action that could result in bodily injury.**

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

SAVE THESE INSTRUCTIONS

Waarschuwing

BELANGRIJKE VEILIGHEIDSINSTRUCTIES

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

BEWAAR DEZE INSTRUCTIES

Varoitus

TÄRKEITÄ TURVALLISUUSOHJEITA

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

SÄILYTÄ NÄMÄ OHJEET

Attention

IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d'avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung **WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza **IMPORTANTI ISTRUZIONI SULLA SICUREZZA**

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel **VIKTIGE SIKKERHETSINSTRUKSJONER**

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyret, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutten av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarslene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! **INSTRUCCIONES IMPORTANTES DE SEGURIDAD**

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

Varning!

VIKTIGA SÄKERHETSANVISNINGAR

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezeto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezte, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplo figyelmeztetések fordítása a készülékhez mellékelt biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján keresheto meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение

ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ

警告

重要的安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此设备的安全性警告说明的翻译文本。

请保存这些安全性说明

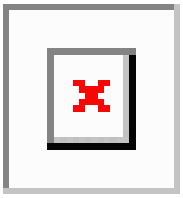
警告

安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記述されています。装置の取り扱い作業を行うときは、電気回路の危険性に注意し、一般的な事故防止策に留意してください。警告の各国語版は、各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管しておいてください。

주의



Aviso **INSTRUÇÕES IMPORTANTES DE SEGURANÇA**

Este símbolo de aviso significa perigo. Você se encontra em uma situação em que há risco de lesões corporais. Antes de trabalhar com qualquer equipamento, esteja ciente dos riscos que envolvem os circuitos elétricos e familiarize-se com as práticas padrão de prevenção de acidentes. Use o número da declaração fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham o dispositivo.

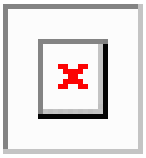
GUARDE ESTAS INSTRUÇÕES

Advarsel **VIGTIGE SIKKERHEDSANVISNINGER**

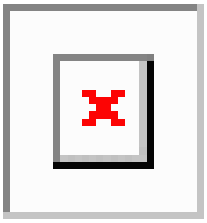
Dette advarselssymbol betyder fare. Du befinder dig i en situation med risiko for legemesbeskadigelse. Før du begynder arbejde på udstyr, skal du være opmærksom på de involverede risici, der er ved elektriske kredsløb, og du skal sætte dig ind i standardprocedurer til undgåelse af ulykker. Brug erklæringsnummeret efter hver advarsel for at finde oversættelsen i de oversatte advarsler, der fulgte med denne enhed.

GEM DISSE ANVISNINGER

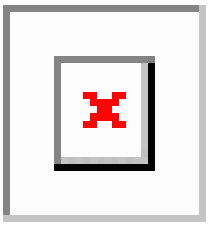
تحذير

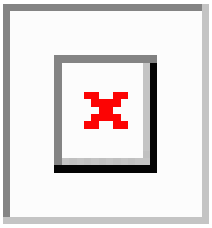


Upozorenje

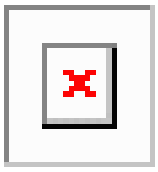


Upozornění

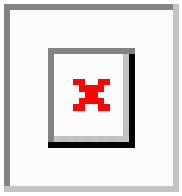




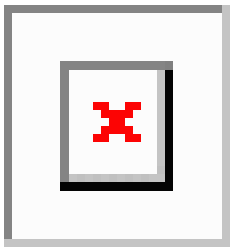
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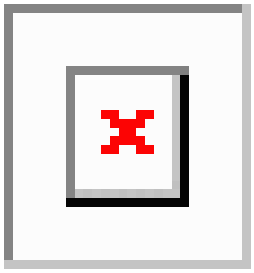
Opomena



Ostrzeżenie



Upozornenie



Related Documentation

Use this guide in conjunction with the following referenced release publications:

- *Release Notes for Cisco NCS 2000 Series*
- *Cisco NCS 2000 Series Control Card and Node Configuration Guide*
- *Cisco NCS 2000 Series Network Configuration Guide*
- *Cisco NCS 2000 Series Licensing Configuration Guide*
- *Cisco NCS 2000 Series Hardware Installation Guide*
- *Cisco NCS 2000 Series Troubleshooting Guide*
- *Cisco NCS 2000 Series TL1 Command Guide*
- *Regulatory Compliance and Safety Information for Cisco NCS 2000 Series*
- *Electrostatic Discharge and Grounding Guide for Cisco NCS 2000 Series*
- *Installing the GBIC, SFP, SFP+, XFP, CXP, and CFP Optical Modules in Cisco NCS Platforms*
- I*nstalling the Cisco NCS 2000 Series Passive Optical Modules*

For an update on End-of-Life and End-of-Sale notices, refer to

http://www.cisco.com/en/US/products/hw/optical/ps2006/prod_eol_notices_list.html

Obtaining Optical Networking Information

This section contains information that is specific to optical networking products. For information that pertains to all of Cisco, refer to the Obtaining Documentation and Submitting a Service Request section.

Where to Find Safety and Warning Information

For safety and warning information, refer to the Regulatory Compliance and Safety Information document that accompanied the product. This publication describes the international agency compliance and safety information. It also includes translations of the safety warnings.

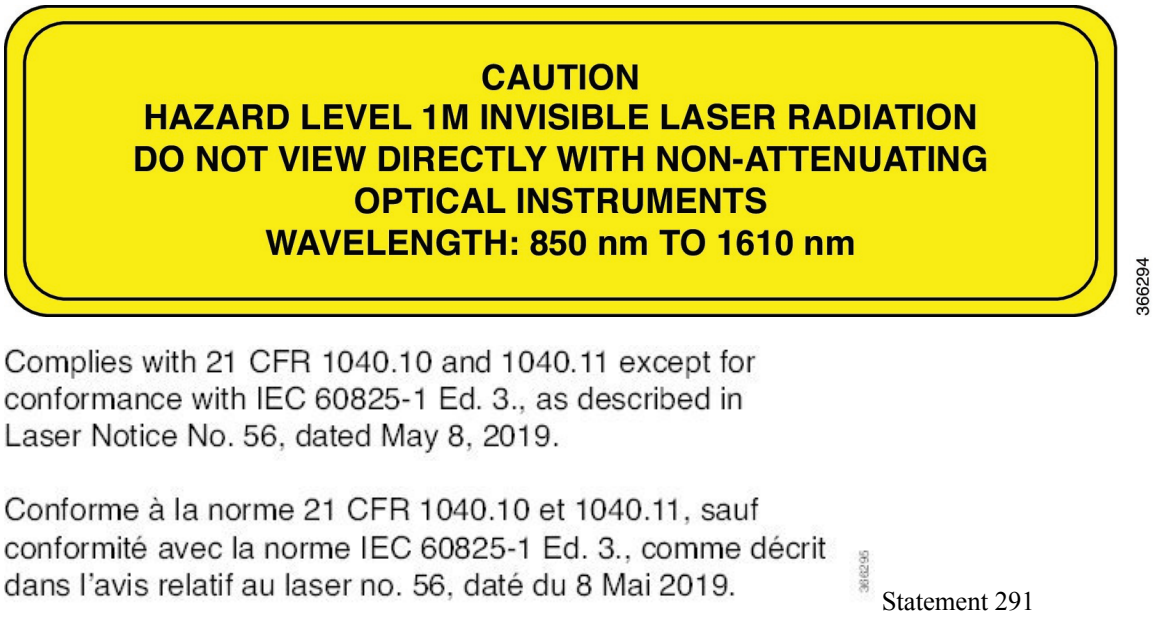
Safety Labels

Cisco NCS 2000 Series cards are classified as Laser Class 1 or 1M as per IEC 60825-1 and Hazard Level 1M as per IEC 60825-2.

Figure 1: Class 1M Laser Product Label



Figure 2: Class 1M Laser Product Label



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- To obtain general networking, training, and certification titles, visit Cisco Press.
- To find warranty information for a specific product or product family, access Cisco Warranty Finder.

Cisco Bug Search Tool

Cisco Bug Search Tool (BST) is a web-based tool that acts as a gateway to the Cisco bug tracking system that maintains a comprehensive list of defects and vulnerabilities in Cisco products and software. BST provides you with detailed defect information about your products and software.



Cisco NCS Documentation Roadmap

To quickly access publications of Cisco NCS Release 11.x.x, see the Documentation Roadmap.

Cisco NCS Documentation Roadmap



New and Changed Information

This table summarizes the new and changed information for Release 11.12, and tells you where the features are documented.

Table 1: New and Changed Features - R11.12

Feature	Description	Where Documented
Secure Unique Device Identification (SUDI) SUDI 2099 Certificates for WSE, MR-MXP, and 400G XP Cards	This enhancement allows you to extend the usage of WSE, MR-MXP and 400G-XP-LC cards with encryption functionality beyond year 2029. This extended validity helps to avoid encryption and card upgrade failures.	*Cisco NCS 2000 Series Line Card Configuration Guide* SUDI 2099 Certificate for WSE, MR-MXP, and 400G-XP-LC Cards
MCH Custom Alien Wavelength and MEDIA CHANNEL OCH NC circuit management through CTC	The feature allows you to create an MCH custom alien wavelength and the associated MEDIA CHANNEL OCH NC circuit specifying the following parameters through CTC: • Signal width • Modulation guard band • Filtering guard band This functionality enables you to create a medial channel of any spectrum size, for example, signal width of 34.20 GHz, modulation GB of 1.71 GHz, and filtering GB of 4.92 GHz.	*Cisco NCS 2000 Series Network Configuration Guide, Release 11.x.x* MCH Custom Alien Bandwidth Parameters
GMPLS Hybrid circuit between NCS 4000 and 400G-XP-LC-CFP2	This enhancement allows you to create a GMPLS Hybrid circuit connection between NCS 4000 and NCS 2000 with 400G-XP-LC-CFP2 transponder.	*Cisco NCS 2000 Series Network Configuration Guide* DLP-G800 Create an Link Management Protocol (LMP) Link Using CTC

Feature	Description	Where Documented
Dynamic Power Allocation on 200G-CK-LC and 400G-XP-LC Cards	This feature allows you to dynamically allocate power based on the line card operating mode. This maximises the usage of the NCS 2015 chassis slots in a 2+2 PSU configuration.This feature is supported on the 200G-CK-LC and 400G-XP-LC cards.	*Cisco NCS 2000 Series Line Card Configuration Guide* 200G-CK-LC Card 400G-XP-LC Card
Fiber Shuffle Upgrade	This feature allows you to upgrade the Boot ROM version, OS Kernel, and Uboot version of the fiber shuffle through CTC.	*Cisco NCS 2000 Series Control Card and Node Configuration Guide* DLP-G793 Performing Upgrade on Fiber Shuffle
Pluggables Support	• QSFP-100G-FR-S pluggable is supported on 400G-XP-LC card. • CPAK-100G-FR pluggable is supported on 200G-CK-LC and MR-MXP cards	*Installing the GBIC, SFP, SFP+, QSFP, XFP, CXP, CFP and CPAK Optical Modules in Cisco NCS Platforms* Compatibility by Card QSFP Specifications CPAK Description and Specifications

This table summarizes the new and changed information for Release 11.1.1.2, and tells you where the features are documented.

Table 2: New and Changed Features - R11.1.1.2

Feature	Description	Where Documented
OTDR Enhancements	Optical Time Domain Reflectometer (OTDR) supports the Refractive Index (RI) and Backscatter Coefficient (BS) parameters for OTDR scan.	*Manage the Node* DLP-G786 Perform OTDR Scan
GCC0 Transparency in REGEN Mode	The GCC0 enable in REGEN mode is supported on the 400G-XP-LC card.	*Cisco NCS 2000 Series Line Card Configuration Guide* 400G-XP-LC Card

This table summarizes the new and changed information for Release 11.1, and tells you where the features are documented.

Table 3: New and Changed Features - R11.1

Feature	Description	Where Documented
Submarine Line Terminal Equipment (SLTE)	In Submarine Line Terminal Equipment (SLTE) topology, the channel SMR (CH SMR) card of NCS 2000 node aggregates channels from transponders, say NCS 1004. If there is more than one channel SMR card, they are connected by the 1*6 AD-CFS passive module. The aggregated channels from this passive module are transmitted to the fan-out module that covers signals from other geographical locations and SMR card. The channels are then transmitted to the SLTE SMR card that faces the submarine system.	*Cisco NCS 2000 Series Network Configuration Guide* Understanding SLTE
400G-XP-LC Enhancements	The OPM_PEER_ODU2 and OPM_PEER_ODU2e slice modes are available on Slice 2 when the 400G-XP-LC card is configured in the MXP mode for any trunk configuration. These slice modes support interoperability with a peer 10x10G-LC card. The peer 10x10G-LC card can only be installed in an even slot of the Cisco NCS 2006 or Cisco NCS 2015 chassis. The payloads supported on the 10x10G-LC card are OTU2, OTU2e, OC192/STM64, and 10GE.	*Cisco NCS 2000 Series Line Card Configuration Guide* 400G-XP-LC Card
GMPLS Enhancements	• Restoration is supported on Regen NCS 1004. • Manages greater than 50dB high span loss from validation. • Supports 200G QPSK from NCS 1004.	*Cisco NCS 2000 Series Network Configuration Guide* DLP-G800 Create an LMP Link Using CTC
LOGO Expert Mode	When the Expert mode is configured for an optical side, spectral parameters such as Linear XT avg, Linear XT Stdev, Non-linear XT avg and Non-linear XT Stdev are used by the control plane for optical validation. These parameter values are obtained from the XML file. These spectral values must not be modified, unless instructed by the Cisco TAC representative.	*Cisco NCS 2000 Series Network Configuration Guide* *LOGO Expert Mode*

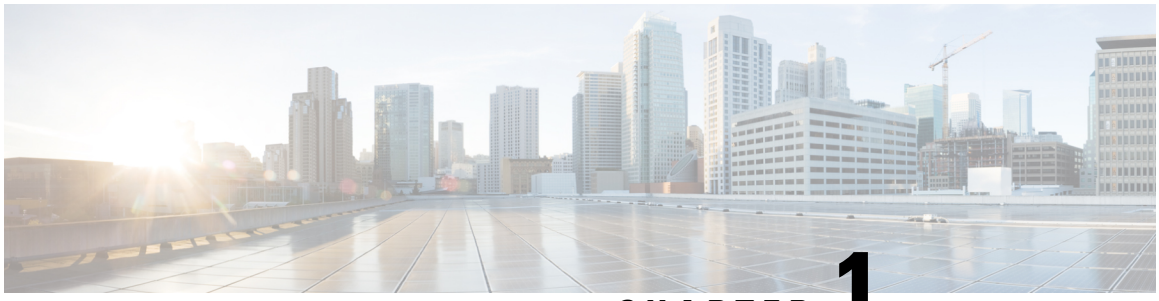
This table summarizes the new and changed information for Release 11.0, and tells you where the features are documented.

Table 4: New and Changed Features - R11.0

Feature	Description	Where Documented
OTNXC encryption	The OTNXC operating mode on the 400G-XP-LC card supports encryption.	*Cisco NCS 2000 Series Line Card Configuration Guide* NTP-G367 Provisioning Encryption on 400G-XP-LC Card
Third party certificates for encryption	The 400G-XP-LC card supports the generation of a Certificate Signing Request (CSR) and the installation of Locally Significant Certificates (LSCs) that can be used to authenticate the peer card connection. Third party certificates also referred to as Locally Significant Certificates (LSCs) are certificates that are signed by a Certification Authority (CA) other than Cisco Certificate Authority. LSCs allow customers to have their own Public Key Infrastructure (PKI) to provide better security, to have control of their own CA, and to define policies, restrictions, and usages on the generated certificates.	*Cisco NCS 2000 Series Line Card Configuration Guide* NTP-G363 Provisioning LSC on Cards
ANS APC Skipping	The upgraded NE update XML file imported on the CTC for the respective node will import the new ANS parameters and settings for the new degree or modules. The existing ANS parameters or module settings are not affected. This prevents unintended changes to the APC corrections to the existing degree and its associations.	*Cisco NCS 2000 Series Network Configuration Guide* Automatic Node Setup
TNCS-2 and TNCS-2-O Control Cards	The TNCS-2 and TNCS-2O are new control cards compatible with all chassis types such as, Cisco NCS 2002, Cisco NCS 2006, and Cisco NCS 2015.	*Cisco NCS 2000 Series Control Card and Node Configuration Guide* TNCS 2 and TNCS 2O Cards
TNCS-O Card Support	The TNCS-O card is supported on the NCS 2002.	*Cisco NCS 2000 Series Control Card and Node Configuration Guide* TNCS-O Card

Feature	Description	Where Documented
400G-XP-LC enhancements	• The new payloads supported for the MXP operating mode are FC-10G, FC-8G, and 40G. • The OPM_2x40G_2x10G slice mode can be configured in the MXP operating mode for 40GE payloads. • LLDP support—The source MAC address of 10 or 100GE ports can be retrieved after an LLDP packet is received on the client port. LLDP filtering is enabled or disabled on the 10GE or 100GE ports using the Provisioning > Line > Ethernet tab in CTC.	*Cisco NCS 2000 Series Line Card Configuration Guide* 400G-XP-LC Card
NCS 1004 Alien	Two variants of 300G , such as 300G_3bps and 300G_3.4375bps are added in the wavelength drop-down list.	*Cisco NCS 2000 Series Network Configuration Guide* DLP-G800 Create an LMP Link Using CTC
8QAM Support on non-SSON	In non-SSON, the user can force the wavelength by checking the wavelength configuration check box and choosing the wavelength from the drop-down list.	*Cisco NCS 2000 Series Network Configuration Guide* Provision GMPLS Optical Channel Network Connections Using Non-SSON
OTDR Support for TNCS-2O Cards	A TNCS-2O card has an optical module that provides Optical Time Domain Reflectometer (OTDR) measurement, ORL measurement, and standard Optical Service Channel (OSC) capability on two ports. These capabilities are available for upto four ports for each shelf; one shelf can have two TNCS-2O cards.	*Cisco NCS 2000 Series Network Configuration Guide* • Provisioning OTDR *Manage the Node* • NTP-G357 Perform OTDR Scan and OTDR Event Scan
Regenerator Constraints Support	For using a regenerator, the optical path needs to be validated. If the optical validation fails, then, the regenerator cannot be used, and the circuit creation fails. If validation is not supported, pre-validated paths are calculated offline and provided as a constraint to the control plane, while setting up the main and restored paths.	*Cisco NCS 2000 Series Network Configuration Guide*

New and Changed Information



CHAPTER 1

Setting Up Optical Service Channel Cards

This chapter describes the optical service channel (OSC) cards for Cisco NCS networks. For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document.

Note OSCM cards are not supported on the Cisco NCS platform.

An optical service channel (OSC) is a bidirectional channel connecting two adjacent nodes in a DWDM ring. For every DWDM node (except terminal nodes), two different OSC terminations are present, one for the west side and another for the east side. The channel transports OSC overhead that is used to manage DWDM networks. An OSC signal uses the 1510-nm wavelength and does not affect client traffic. The primary purpose of this channel is to carry clock synchronization and orderwire channel communications for the DWDM network. It also provides transparent links between each node in the network. The OSC is an OC-3/STM-1 formatted signal.

There are two versions of the OSC modules: the OSCM, and the OSC-CSM, which contains the OSC wavelength combiner and separator component in addition to the OSC module.

The Mesh/Multiring Upgrade (MMU) card is used to optically bypass a given wavelength from one section of the network or ring to another one without requiring 3R regeneration.

Note OSC can be created on the OC3 port (SFP-0) of the TNC, TNCE, and TNCS cards.

The TNC, TNCE, and TNCS cards support two optical service channels (OSC): primary OSC and secondary OSC.

The primary optical service channel (SFP-0) supports the following interfaces:

- OC-3/STM-1
- Fast Ethernet (FE)
- Gigabit Ethernet (GE).

The secondary optical service channel (SFP-1) supports the following interfaces:

- Fast Ethernet (FE)

- Gigabit Ethernet (GE).

- Card Compatibility, on page 2
- Class 1 Laser Safety Labels, on page 2
- OSC-CSM Card, on page 2

Card Compatibility

Table 5: Software Release Compatibility for Optical Service Channel Cards in Cisco NCS

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5/10.6/10.6.2/10.7/10.8/10.9	R11.x.x
OSC-CSM	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Class 1 Laser Safety Labels

For information about safety labels, see the "Safety Labels" section.

OSC-CSM Card

The OSC-CSM card has reached end of support.

Note For OSC-CSM card specifications, see the OSC-CSM Card Specifications document.

The OSC-CSM card is used in unamplified nodes. This means that the booster amplifier with the OSC wavelength combiner and separator is not required for OSC-CSM operation. The OSC-CSM can be installed in Slots 1 to 6 and 12 to 17. To operate in hybrid mode, the OSC-CSM cards must be accompanied by cross-connect cards. The cross-connect cards enable functionality on the OC-N/STM-N cards and electrical cards.

The OSC-CSM supports the following features:

- Optical combiner and separator module for multiplexing and demultiplexing the optical service channel to or from the wavelength division multiplexing (WDM) signal
- OC-3/STM-1 formatted OSC
- SDC forwarded to the TCC2/TCC2P/TCC3 cards for processing
- Distribution of the synchronous clock to all nodes in the ring
- 100BaseT FE UC
- Monitoring functions such as orderwire support

- Optical safety: Signal loss detection and alarming, fast transmitted power shut down by means of an optical 1x1 switch
- Optical safety remote interlock (OSRI), a feature capable of shutting down the optical output power
- Automatic laser shutdown (ALS), a safety mechanism used in the event of a fiber cut. For details on ALS provisioning for the card, see the . For information on using the card to implement ALS in a network, see the .

The WDM signal coming from the line is passed through the OSC combiner and separator, where the OSC signal is extracted from the WDM signal. The WDM signal is sent along with the remaining channels to the COM port (label on the front panel) for routing to the OADM or amplifier units, while the OSC signal is sent to an optical transceiver.

The OSC is an OC-3/STM-1 formatted signal. The OC-3/STM-1 SDCC or RS-DCC overhead bytes are used for network communications. An optical transceiver terminates the OC-3/STM-1, and then it is regenerated and converted into an electrical signal. The SDCC or RS-DCC bytes are forwarded to the active and standby TCC2/TCC2P/TCC3 cards for processing via the SCL bus on the backplane. Orderwire bytes (E1, E2, F1) are also forwarded via the SCL bus to the TCC2/TCC2P/TCC3 for forwarding to the AIC-I card.

The payload portion of the OC-3/STM-1 is used to carry the fast Ethernet UC. The frame is sent to a POS processing block that extracts the Ethernet packets and makes them available at the RJ-45 front panel connector.

The OSC-CSM distributes the reference clock information by removing it from the incoming OC-3/STM-1 signal and then sending it to the active and standby TCC2/TCC2P/TCC3 cards. The clock distribution is different from the OSCM card because the OSC-CSM does not use Slot 8 or 10 (cross-connect card slots).

Note Due to memory limitations, TCC2/TCC2P cards are not supported from Release 10.5.2 onwards. As a result, in a multishelf configuration, the TCC2/TCC2P card cannot be a node controller or a shelf controller. Upgrade the TCC2/TCC2P card to a TCC3 card

Note S1 and S2 (Figure 4-5 on page 4-10) are optical splitters with a splitter ratio of 2:98. The result is that the power at the MON TX port is about 17 dB lower than the relevant power at the COM RX port, and the power at the MON RX port is about 20 dB lower than the power at the COM TX port. The difference is due to the presence of a tap coupler for the P1 photodiode.

For more information about the OSCM card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet09186a00801a1641.html.

OSC-CSM Card Functions

The functions of the OSC-CSM card are:

- OSC-CSM Card Power Monitoring
- See "Alarms and thresholds"
- See "Card level indicators"
- See "Port-Level Indicators"

OSC-CSM Card Power Monitoring

Physical photodiodes P1, P2, P3, and P5 monitor the power for the OSC-CSM card. Their function is as follows:

- P1: The returned power value is calibrated to the LINE RX port, including the insertion loss of the previous filter (the reading of this power dynamic range has been brought backward towards the LINE RX output).
- P2: The returned value is calibrated to the LINE RX port.
- P3: The returned value is calibrated to the COM RX port.
- P5: The returned value is calibrated to the OSC TX port, including the insertion loss of the subsequent filter.

The returned power level values are calibrated to the ports as shown in the following table.

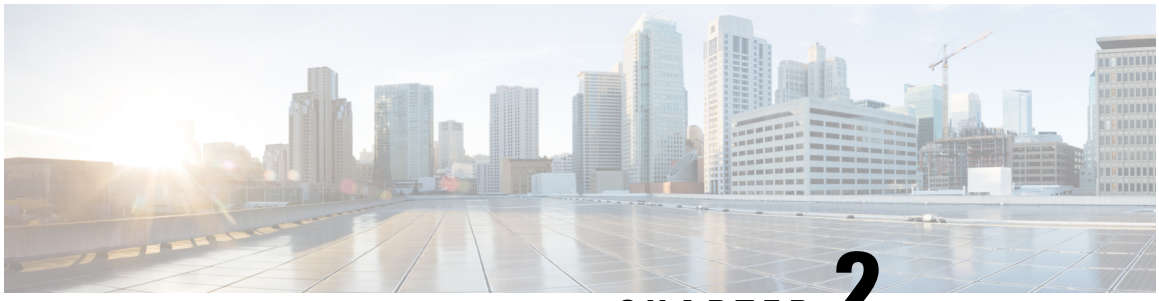
Table 6: OSC-CSM Port Calibration

Photodiode	CTC Type Name	Calibrated to Port	Power	PM Parameters
P1	Input Line	LINE RX	Channel Power	Supported
			OSC Power	
P2	Input Line	LINE RX	OSC Power	Supported
P3	Input Com	COM RX	Channel Power	Supported
P5	Output OSC	OSC TX	OSC Power	Supported

The OSC power on the LINE TX is the same as the power reported from P5.

The PM parameters for the power values are listed at Optics and 8b10b PM Parameter Definitions.

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in Cisco ONS SONET TL1 Command Guide.



CHAPTER 2

Provisioning Optical Amplifier Cards

This chapter describes the optical amplifier cards used in Cisco NCS networks and related procedures.

For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document.

Optical amplifier card architecture includes an optical plug-in module with a controller that manages optical power, laser current, and temperature control loops. An amplifier also manages communication with the control card and operation, administration, maintenance, and provisioning (OAM&P) functions such as provisioning, controls, and alarms.

- Applications of Amplifiers, on page 5
- Card Compatibility, on page 6
- OPT-PRE Amplifier Card, on page 8
- OPT-BST and OPT-BST-E Amplifier Card, on page 10
- OPT-AMP-17-C Card, on page 11
- OPT-AMP-C Card, on page 12
- OPT-RAMP-C and OPT-RAMP-CE Cards, on page 14
- RAMAN-CTP and RAMAN-COP Cards, on page 16
- OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 Cards, on page 19
- EDRA-1-xx and EDRA-2-xx Cards, on page 22

Applications of Amplifiers

The following amplifiers can be configured as booster or preamplifiers:

- OPT-AMP-C
- OPT-AMP-17C
- OPT-AMP-L
- OPT-BST-E
- OPT-BST
- OPT-EDFA-17
- OPT-EDFA-24

The amplifier functions as a booster amplifier by default. The amplifier role is automatically configured when the CTP NE update configuration file is loaded in CTC. The amplifier role can also be manually modified.

Note The OPT-BST and OPT-BST-E amplifiers are supported as preamplifiers in sites that are equipped with the OPT-RAMP-C card. In any other configuration, the OPT-BST and OPT-BST-E cards must be configured as a booster amplifier.

For more information about the supported configurations and network topologies, see and

Card Compatibility

The following table lists the Cisco Transport Controller (CTC) software compatibility for each optical amplifier card.

Table 7: Software Release Compatibility for Optical Amplifier Cards

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2/10.6.1 /10.6.2	R10.7/10.8/10.9	R11.x.x
OPT-PRE	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-BST	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-BST-E	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-AMP-17-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2/10.6.1 /10.6.2	R10.7/10.8/10.9	R11.x.x
OPT-AMPC	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-RAMPC	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
OPT-RAMP-CE	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006 (From R10.8) NCS 2015	NCS 2006 (From R10.8) NCS 2015
RAMAN-CTP	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
RAMAN-COP	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-EDFA-17	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
OPT-EDFA-24	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2/10.6.1 /10.6.2	R10.7/10.8/10.9	R11.x.x
OPT-EDFA-35	No	No	No	No	No	From R10.8, NCS 2002, NCS 2006, NCS 2015	From R10.8, NCS 2002, NCS 2006, NCS 2015
EDRA-1-26	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015
EDRA-1-35	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015
EDRA-2-26	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015
EDRA-2-35	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015

OPT-PRE Amplifier Card

The OPT-PRE card has reached end of support.

Note For OPT-PRE card safety labels, see Class 1M Laser Product Cards.

The OPT-PRE is a C-band, DWDM, two-stage erbium-doped fiber amplifier (EDFA) with midamplifier loss (MAL) that can be connected to a dispersion compensating unit (DCU). The OPT-PRE is equipped with a built-in variable optical attenuator (VOA) that controls the gain tilt and can also be used to pad the DCU to a reference value. The card is designed to support up to 80 channels at 50-GHz channel spacing. The OPT-PRE card features include:

- Fixed gain mode with programmable tilt
- True variable gain
- Fast transient suppression

- Nondistorting low-frequency transfer function
- Settable maximum output power
- Fixed output power mode (mode used during provisioning)
- MAL for fiber-based DCU
- Amplified spontaneous emissions (ASE) compensation in fixed gain mode
- Full monitoring and alarm handling with settable thresholds
- Four signal photodiodes to monitor the input and output optical power of the two amplifier stages through CTC
- An optical output port for external monitoring



Note The optical splitter has a ratio of 1:99, resulting in about 20 dB-lower power at the MON port than at the COM TX port.

You can install the OPT-PRE card in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 16 in NCS 2015.

For more information about the OPT-PRE Amplifier card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd800e4d24.html and Card Features, on page 691.

Related Procedures for OPT-PRE Card

The following is the list of procedures and tasks related to the configuration of the OPT-PRE card:

- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control

OPT-BST and OPT-BST-E Amplifier Card

The OPT-BST card has reached end of support.

Note For OPT-BST and OPT-BST-E cards safety labels, see "Class 1M Laser Product Cards". .

The OPT-BST is designed to ultimately support up to 80 channels at 50-GHz channel spacing. The OPT-BST-E amplifier card is a gain-enhanced version of the OPT-BST card. It is designed to support up to 80 channels at 50-GHz channel spacing. Both the cards are C-band, DWDM EDFA with optical service channel (OSC) add-and-drop capability. When an OPT-BST or an OPT-BST-E is installed, an OSCM card is also needed to process the OSC. The OPT-BST cards features include:

- Fixed gain mode (with programmable tilt)
- Gain range of 5 to 20 dB in constant gain mode and output power mode for an OPT-BST card
- Gain range of 8 to 23 dBm with the tilt managed at 0 dBm in constant gain mode and output power mode for an OPT-BST-E card
- Enhanced gain range of 23 to 26 dBm with unmanaged tilt with OPT-BST-E card
- True variable gain
- Built-in VOA to control gain tilt
- Fast transient suppression
- Nondistorting low-frequency transfer function
- Settable maximum output power
- Fixed output power mode (mode used during provisioning)
- ASE compensation in fixed gain mode
- Full monitoring and alarm handling with settable thresholds
- Optical Safety Remote Interlock (OSRI), a CTC software feature capable of shutting down optical output power or reducing the power to a safe level (automatic power reduction)
- Automatic laser shutdown (ALS), a safety mechanism used in the event of a fiber cut. For information about using the card to implement ALS in a network, see "Network Optical Safety". .

Note The optical splitters each have a ratio of 1:99. The result is that MON TX and MON RX port power is about 20 dB lower than COM TX and COM RX port power.

You can install the OPT-BST and OPT-BST-E cards in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006

- Slots 2 to 16 in NCS 2015.

For more information about the OPT-BST and OPT-BST-E Amplifier cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd802be30a.html and Card Features, on page 691.

Related Procedures for OPT-BST and OPT-BST-E Cards

The following is the list of procedures and tasks related to the configuration of the OPT-BST and OPT-BST-E cards:

- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control

OPT-AMP-17-C Card



Note For OPT-AMP-17-C safety labels, see "Class 1M Laser Product Cards"..

The OPT-AMP-17-C is a 17-dB gain, C-band, DWDM EDFA amplifier/preamplifier with OSC add-and-drop capability. It supports 80 channels at 50-GHz channel spacing in the C-band (that is, the 1529 nm to 1562.5 nm wavelength range). When the system has an OPT-AMP-17-C installed, an OSCM card is needed to process the OSC.

The card features include:

- Fixed gain mode (no programmable tilt)
- Standard gain range of 14 to 20 dB at startup when configured as a preamplifier
- Standard gain range of 20 to 23 dB in the transient mode when configured as a preamplifier
- Gain range of 14 to 23 dB (with no transient gain range) when configured as a booster amplifier
- True variable gain
- Fast transient suppression
- Nondistorting low-frequency transfer function

- Settable maximum output power
- Fixed output power mode (mode used during provisioning)
- ASE compensation in fixed gain mode
- Full monitoring and alarm handling with settable thresholds
- OSRI
- ALS

You can install the OPT-AMP-17-C card in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 16 in NCS 2015.

For more information about the OPT-AMP-17-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd800e4d24.html and Card Features, on page 691.

Related Procedures for OPT-AMP-17-C Card

The following is the list of procedures and tasks related to the configuration of the OPT-AMP-17-C card:

- NTP-G143 Import the Cisco Transport Planner NE Update Configuration File
- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control
- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, and OPT-EDFA-24 Card Line Settings and PM Thresholds

OPT-AMP-C Card

The OPT-AMP-C card is a 20-dB output power, C-band, DWDM EDFA amplifier or preamplifier. It contains midstage access loss for a Dispersion Compensation Unit (DCU). A Variable Optical Attenuator (VOA) is

used to control gain tilt. The VOA can also be used to attenuate the signal of the DCU to a reference value. The amplifier module also includes the OSC add (TX direction) and drop (RX direction) optical filters.

The features of the card include:

- Fast transient suppression
- Nondistorting low-frequency transfer function
- Mid-stage access for DCU
- Constant pump current mode (test mode)
- Fixed output power mode
- Constant gain mode
- Amplified spontaneous emissions (ASE) compensation in Constant Gain and Constant Output Power modes
- Programmable tilt
- Full monitoring and alarm handling capability
- Gain range with gain tilt control of 12–24 dB
- Extended gain range (with uncontrolled tilt) of 24–35 dB
- Full monitoring and alarm handling with settable thresholds
- Optical Safety Remote Interlock (OSRI)—Shuts down optical output power or reduces the power to a safe level
- Automatic laser shutdown (ALS)—Safety mechanism used in case of fiber cut

You can install the OPT-AMP-C card in the following slots:

- Slots 2 and 3 in NCS 2002
- Slots 2–7 in NCS 2006
- Slots 2–16 in NCS 2015

For more information about the OPT-AMP-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/prod_data_sheet0900aecd8072b322.html. and Card Features.

Related Procedures for OPT-AMP-C Card

The following is the list of procedures and tasks related to the configuration of the OPT-AMP-C card:

- NTP-G143 Import the Cisco Transport Planner NE Update Configuration File
- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup

- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control
- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, and OPT-EDFA-24 Card Line Settings and PM Thresholds

OPT-RAMP-C and OPT-RAMP-CE Cards

Note For OPT-RAMP-C or OPT-RAMP-CE card safety labels, see "Class 1M Laser Product Cards".

The OPT-RAMP-C card is a double-slot card that improves unregenerated sections in long spans using the span fiber to amplify the optical signal. Different wavelengths in C-band receive different gain values. To achieve Raman amplification, two Raman signals (that do not carry any payload or overhead) are required to be transmitted on the optical fiber because the gain generated by one signal is not flat. The energy of these Raman signals transfer to the higher region of the spectrum thereby amplifying the signals transmitted at higher wavelengths. The Raman effect reduces span loss but does not compensate it completely.

When the Raman optical powers are set correctly, a gain profile with limited ripple is achieved. The wavelengths of the Raman signals are not in the C-band of the spectrum (used by MSTP for payload signals). The two Raman wavelengths are fixed and always the same. Due to a limited Raman gain, an EDFA amplifier is embedded into the card to generate a higher total gain. An embedded EDFA gain block provides a first amplification stage, while the mid stage access (MSA) is used for DCU loss compensation.

The OPT-RAMP-CE card is a 20 dBm output power, gain-enhanced version of the OPT-RAMP-C card and is optimized for short spans. The OPT-RAMP-C and OPT-RAMP-CE cards can support up to 80 optical transmission channels at 50-GHz channel spacing over the C-band of the optical spectrum (wavelengths from 1529 nm to 1562.5 nm). To provide a counter-propagating Raman pump into the transmission fiber, the Raman amplifier provides up to 500 mW at the LINE-RX connector. The OPT-RAMP-C or OPT-RAMP-CE card can be installed in Slots 1 to 5 and 12 to 16, and supports all network configurations. However, the OPT-RAMP-C or OPT-RAMP-CE card must be equipped on both endpoints of a span.

The Raman total power and Raman ratio can be configured using CTC. The Raman configuration can be viewed on the Maintenance > Installation tab.

The features of the OPT-RAMP-C and OPT-RAMP-CE card include:

- Raman pump with embedded EDFA gain block
- Raman section: 500 mW total pump power for two pump wavelengths
- EDFA section:
  - OPT-RAMP-C: 16 dB gain and 17 dB output power
  - OPT-RAMP-CE: 11 dB gain and 20 dB output power

- Gain Flattening Filter (GFF) for Raman plus EDFA ripple compensation
- MSA for DC units
- VOA for DC input power control
- Full monitoring of pump, OSC, and signal power
- Fast gain control for transient suppression
- Low-FIT (hardware-managed) optical laser safety
- Hardware output signals for LOS monitoring at input photodiodes
- Optical service channel add and drop filters
- Raman pump back-reflection detector

You can install the OPT-RAMP-C and OPT-RAMP-CE cards in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 7 in Cisco 2015 chassis. These cards upgrade to a new bootcode automatically when they are installed between slots 2 and 7.

  After the bootcode upgrade, the cards can be installed in Slots from 2 to 16 in Cisco NCS 2015 chassis.

For more information about the OPT-RAMP-C and OPT-RAMP-CE cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-500925.html. and Card Features, on page 691.

Related Procedures for OPT-RAMP-C and OPT-RAMP-CE Cards

The following is the list of procedures and tasks related to the configuration of the OPT-RAMP-C and OPT-RAMP-CE cards:

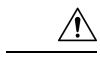
- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G201 Configure the Raman Pump on an MSTP Link
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control

- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, and OPT-EDFA-24 Card Line Settings and PM Thresholds

RAMAN-CTP and RAMAN-COP Cards



Note The RAMAN-CTP and RAMAN-COP cards are supported in R9.3.02 and later.



Caution LASER ENERGY - EXPOSURE NEAR APERTURE MAY CAUSE BURNS

The single-slot RAMAN-CTP and RAMAN-COP cards support counter and co-propagating Raman amplification on very long unregenerated spans.

The cards manage up to 96 ITU-T 50-GHz spaced channels over the C-band of the optical spectrum (wavelengths from 1528.77 nm to 1566.72 nm). The counter-propagating RAMAN-CTP card is the primary unit. The co-propagating RAMAN-COP card is the secondary unit and can be used only when the counter-propagating unit is present. The RAMAN-CTP card and the RAMAN-COP card must be installed in adjacent slots for Cisco NCS 2000 Series chassis. For example, you can install in Slots 2 and 3, 4 and 5, or 6 and 7 in NCS 2006 . However, these adjacent slots must not be used to install two RAMAN-CTP or two RAMAN-COP cards.

The RAMAN-CTP card can be calibrated either manually or using the Automatic Raman Pump Amplification (ARPC) procedure from the Card tab in the Provisioning panel in CTC. When the RAMAN-COP card is used, the RAMAN-CTP card can be calibrated only using the manual option. ARPC is supported only in the NCS Flex package.

The features of the RAMAN-CTP and RAMAN-COP cards include:

- Raman section: 1000 mW total pump power for four pumps and two wavelengths
- Embedded distributed feedback (DFB) laser at 1568.77 nm to be used for optical safety and link continuity (in RAMAN-CTP card only)
- Photodiodes to enable monitoring of Raman pump power
- Photodiodes to enable monitoring of the DFB laser and signal power (in RAMAN-CTP card only)
- Hardware managed automatic laser shutdown (ALS) for optical laser safety
- Hardware output signals for loss of signal (LOS) monitoring at input photodiodes
- Raman pump back reflection detector to check for excessive back reflection

You can install the RAMAN-CTP and RAMAN-COP cards in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 16 in NCS 2015.

Important Notes Regarding Patchcord Installation

Warning Avoid eye or skin exposure to direct or scattered radiation.

- Two E-2000 PS PC to F-3000s SM PC patchcords are shipped with the RAMAN-CTP card.
- One E-2000 PS PC to E-2000 PS PC patchcord is shipped with the RAMAN-COP card.
- Connect the F-3000s SM PC connector to the RAMAN-CTP card before connecting the E2000 PS PC high optical power connector to the card.
- The F-3000s SM PC connector is mechanically and optically compatible with the LC PC connectors and the LC PC mating adapters. If the connectors are clean, the standard connectors and the F-3000s SM PC connectors can be used for optical power of 250 mW and higher.

RAMAN-CTP and RAMAN-COP Cards Power Monitoring

Physical photodiodes P1 through P10 monitor the power for the RAMAN-CTP card.

Table 8: RAMAN-CTP Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1	DFB in-fiber Output Power	LINE-TX
P2	DWDM RX Input Power	LINE-RX
P3	Pump 1 in-fiber Output Power	LINE-RX
P4	Pump 2 in-fiber Output Power	LINE-RX
P5	Total Pump in-fiber Output Power	LINE-RX
P6	Back-Reflected Pump Power	LINE-RX
P7	DWDM TX Input Power	COM-RX
P8	Total Co-Pump in-fiber Output Power	LINE-TX
P9	DFB Input Power	LINE-RX
P10	ASE Input Power	LINE-RX

Physical photodiodes P3 through P6 monitor the power for the RAMAN-COP card.

Table 9: RAMAN-CTP Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P3	Pump 1 in-fiber Output Power	RAMAN-TX
P4	Pump 2 in-fiber Output Power	RAMAN-TX
P5	Total Pump in-fiber Output Power	RAMAN-TX

Photodiode	CTC Type Name	Calibrated to Port
P6	Back-Reflected Pump Power	RAMAN-TX

The PM parameters for the power values are listed at Optics and 8b10b PM Parameter Definitions.

For information on the associated TL1 AIDs for the optical power monitoring points, see the "CTC Port Numbers and TL1 Aids" section in Cisco ONS SONET TL1 Command Guide, Release 9.8.

For more information about the RAMAN-CTP and RAMAN-COP cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-658538.html and Card Features, on page 691.

Related Procedures for RAMAN-CTP and RAMAN-COP Cards

Caution During a software upgrade, do not unplug the RAMAN-CTP or RAMAN-COP card fibers or connectors. The ends of unterminated fibers or connectors emit invisible laser radiation.

The following is the list of procedures and tasks related to the configuration of the RAMAN-CTP and RAMAN-COP cards:

- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G201 Configure the Raman Pump on an MSTP Link
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control
- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, and OPT-EDFA-24 Card Line Settings and PM Thresholds
- NTP-G184 Create a Provisionable Patchcord
- DLP-G690 Configure the Raman Pump Using Manual Day-0 Installation

OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 Cards

Note For OPT-EDFA-17, OPT-EDFA-35, or OPT-EDFA-24 card safety labels, see "Class 1M Laser Product Cards."

Note OPT-EDFA-35 card is supported only in NCS Flex and NCS SSON packages.

The OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 cards are C-band DWDM EDFA amplifiers and preamplifiers. The cards are true variable gain amplifiers, offering an optimal equalization of the transmitted optical channels over a wide gain range. They support 96 channels at 50-GHz channel spacing in the C-band (that is, 1528.77 to 1566.72-nm wavelength range). The OPT-EDFA-17 and OPT-EDFA-24 cards deliver 20-dBm output powers and the OPT-EDFA-35 card delivers +23-dBm output power. These cards do not contain mid-stage access loss for a Dispersion Compensation Unit (DCU). The cards provide a noise-figure optimized version of the EDFA amplifiers to cope with new modulation formats like PM-DQPSK, which do not need dispersion compensation. To control gain tilt, a VOA is used. The amplifier module also includes the OSC add (TX direction) and drop (RX direction) optical filters.

The OPT-EDFA-17, and OPT-EDFA-24 cards share the same hardware platform and firmware architecture, but they differ in their operative optical gain range, which is 17 and 24 dB respectively.

The OPT-EDFA-35 card includes two identical amplification sections to serve two fiber directions simultaneously. Each section has a switchable gain range that allows its usage over a wide gain range. The OPT-EDFA-35 card is bidirectional. The card acts on both pairs of fibers entering and exiting from the node.

The OPT-EDFA-35 card has two possible gain ranges: gain range 1 from 12–24, gain range 2 from 20–35. The card also has extended gain range up to 40 dB without tilt control.

The OPT-EDFA-35 card is managed in a similar way as the OPT-EDFA-17 and OPT-EDFA-24 cards. For each EDFA unit inside the OPT-EDFA-35 card, the following settings are allowed:

- Configuration of PRE or BST role
- Configuration of Constant Gain working mode
- Configuration of Gain Range

The main functionalities of the OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 cards are:

- (OPT-EDFA-17 and OPT-EDFA-24) Amplification of the input signal at the COM-RX port toward the LINE-TX port through a true-variable gain EDFA block.

  (OPT-EDFA-35) Two EDFA amplifier units embedded into the card, amplification of the input signal at the LINE-1-RX port toward the LINE-2-TX port through a true-variable gain EDFA-2 block, and amplification of the input signal at the LINE-2-RX port toward the LINE-1-TX port through a true-variable gain EDFA-1 block.
- Multiplexing the OSC to the LINE-TX port
- Demultiplexing the OSC from the LINE-RX port

- Monitoring of the LINE input or output signal with 1% TAP splitters

The features of the OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 cards are:

- Embedded Gain Flattening Filter
- Constant pump current mode (test mode)
- Constant output power mode
- Constant gain mode
- Nondistorting low-frequency transfer function
- ASE compensation in Constant Gain and Constant Output Power modes
- Fast transient suppression
- Programmable tilt
- Full monitoring and alarm handling capability
- Gain range with gain tilt control of 5–17 dB (for OPT-EDFA-17 card) , 12 to 24 dB and 20 to 35 dB (for OPT-EDFA-35 card), and 12–24 dB (for OPT-EDFA-24 card).
- Extended gain range (with uncontrolled tilt) of 17–20 dB (for OPT-EDFA-17 card) , (for OPT-EDFA-35 card) of upto 27dB (for Gain Range1) and 40dB (for Gain Range2), and 24–27 dB (for OPT-EDFA-24 card).
- Optical Safety Remote Interlock (OSRI)
- Automatic Laser Shutdown (ALS)

You can install the OPT-EDFA-17 and OPT-EDFA-24 cards in slots 1–6 and 12–17 in ONS 15454 M12.

You can install the OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 cards in the following slots:

- Slots 2 and 3 in NCS 2002
- Slots 2–7 in NCS 2006
- Slots 2–16 in NCS 2015

Power Monitoring of OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 Cards

Physical photodiodes PD1 through PD6 monitor the power for the OPT-EDFA-17 and OPT-EDFA-24 cards.

Table 10: Port Calibration of OPT-EDFA-17 and OPT-EDFA-24 Cards

Photodiode	Calibrated to Port
PD1	COM-RX
PD2	LINE-TX
PD3	LINE-TX
PD4	OSC-RX

Photodiode	Calibrated to Port
PD5	LINE-RX
PD6	LINE-RX

Physical photodiodes PD1 through PD8 monitor the power for the OPT-EDFA-35 card.

Table 11: Port Calibration of OPT-EDFA-35 Card

Photodiode	Calibrated to Port
PD1	LINE-2-RX
PD2	LINE-1-TX
PD3	LINE-1-RX
PD4	LINE-2-TX
PD5	OSC-2-RX
PD6	OSC-2-TX
PD7	OSC-1-TX
PD8	OSC-1-RX

Related Procedures for OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 Cards

The list of procedures and tasks related to the configuration of the OPT-EDFA-17, OPT-EDFA-24, and OPT-EFDA-35 cards are:

- NTP-G143 Import the Cisco Transport Planner NE Update Configuration File
- NTP-G30 Install the DWDM Cards
- NTP-G31 Install the DWDM Dispersion Compensating Units
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control

- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, OPT-EDFA-24, and OPT-EDFA-35 Card Line Settings and PM Thresholds
- NTP-G107 Remove Permanently or Remove and Replace DWDM Cards

EDRA-1-xx and EDRA-2-xx Cards

(Cisco NCS 2006 and Cisco NCS 2015)



Note For EDRA-1-xx and EDRA-2-xx card safety labels, see the section, Class 1M Laser Product Cards.

The double-slot EDRA-1-xx and EDRA-2-xx cards are erbium-doped Raman amplifiers that support Raman amplification on long unregenerated spans.

The cards manage up to 96 ITU-T 50 GHz spaced channels over the C-band of the optical spectrum (wavelengths from 1528.77 nm to 1566.72 nm). You can install the EDRA-1-xx and EDRA-2-xx cards in the lowest slots to allow high output power. The power output is limited to 21dBm when the cards are inserted in any slot. The OSC pluggable used with the cards is ONS-SC-OSC-18.0=.

The cards can be used in point-to-point, ring, multi-ring, or mesh topologies and are supported on flexible nodes in these node configurations:

- Optical line amplifier nodes
- Terminal nodes
- Dynamic gain equaliser nodes

Apart from these node configurations having only EDRA cards as amplifiers, the system also supports hybrid configurations with OPT-EDFA-17, OPT-EDFA-24, RAMAN-CTP, and RAMAN-COP cards. These cards support span loss and gain values that are not supported in EDRA cards.

- For gain less than 15dB, OPT-EDFA-17 or OPT-EDFA-24 must be used.
- For gain greater than 35dB, RAMAN-CTP, RAMAN-COP, OPT-EDFA-17 or OPT-EDFA-24 must be used.

You can install the EDRA-1-xx and EDRA-2-xx cards in the following slots.

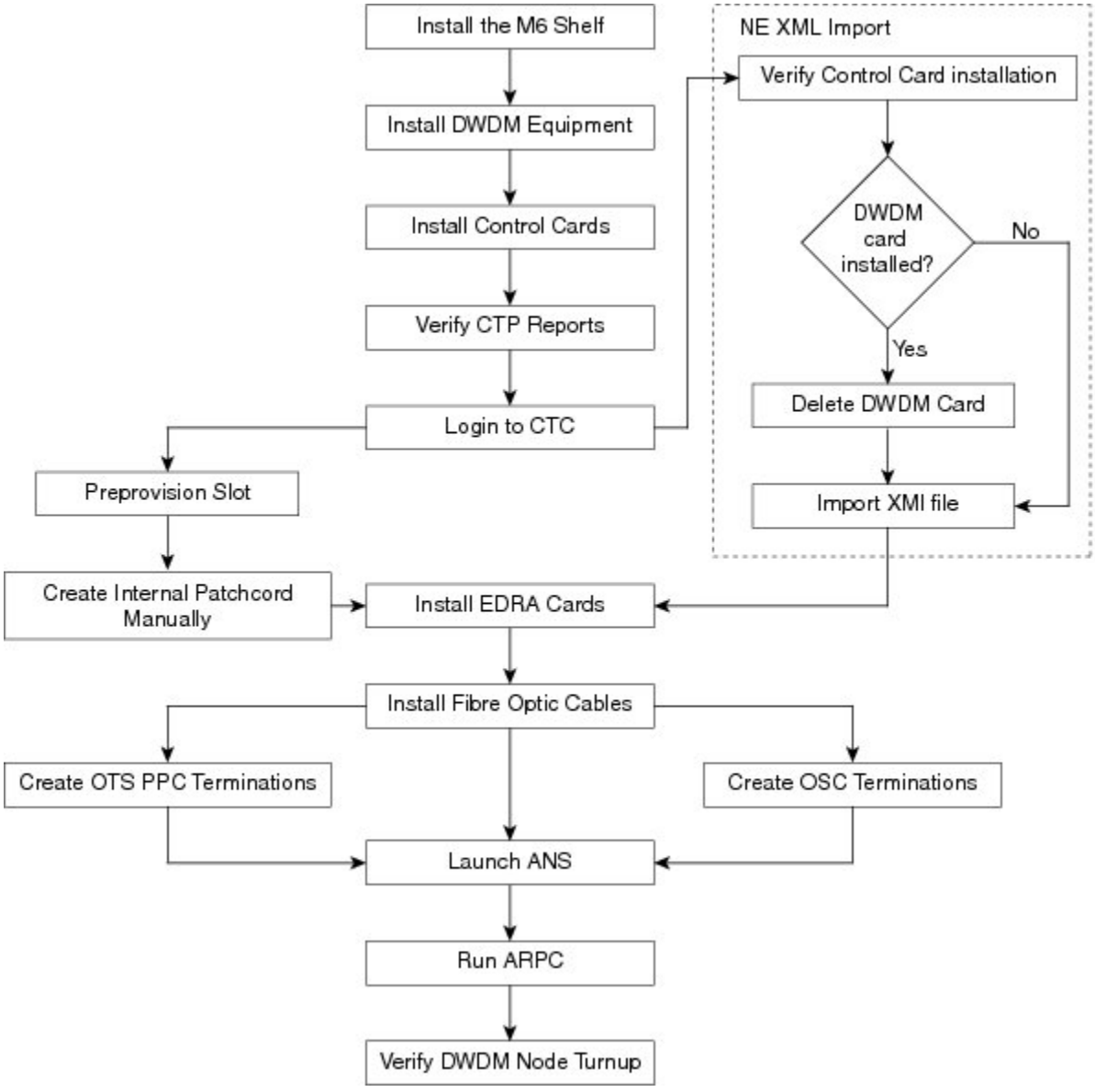
- Slots 2 to 7 in NCS 2006
- Slots 2 to 16 in NCS 2015.

For more information about the EDRA-1-xx and EDRA-2-xx cards, see http://www.cisco.com/en/US/solutions/collateral/ns340/ns394/ns398/ns406/data_sheet_c78-729313.html.

EDRA Workflow Diagram

This figure shows the workflow diagram of the EDRA card. The diagram depicts the tasks required to configure the EDRA card.

Figure 3: EDRA Card Workflow Diagram



EDRA-1-xx and EDRA-2-xx Cards Power Monitoring

The following table lists the physical photodiodes that monitor the power for the EDRA-1-xx and EDRA-2-xx cards.

Table 12: EDRA-1-xx and EDRA-2-xx Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
PD1	Remnant Pump Input power	LINE-TX

Photodiode	CTC Type Name	Calibrated to Port
PD2	OSC Add Input Power	OSC-RX
PD3	EDFA1 Input Power	LINE-RX
PD4	EDFA1 Output Power	COM-TX
PD5	EDFA2 Input Power	COM-RX
PD6	EDFA2/LINE-TX Output Power	LINE-TX
PD7	OSC Drop Output Power	LINE-TX
PD11	Pump λ1 in-fibre Output Power	LINE-RX
PD12	Pump λ2 in-fibre Output Power	LINE-RX
PD13	Pump λ3 in-fibre Output Power	LINE-RX
PD14	Pump λ4 in-fibre Output Power	LINE-RX
PD15	Total Pump in-fibre Output Power	LINE-RX
PD16	Back-Reflected Pump Power	LINE-RX
PD17	OTDR2-L Input Power	OTDR2-L-RX

The PM parameters for the power values are listed at Optics and 8b10b PM Parameter Definitions.

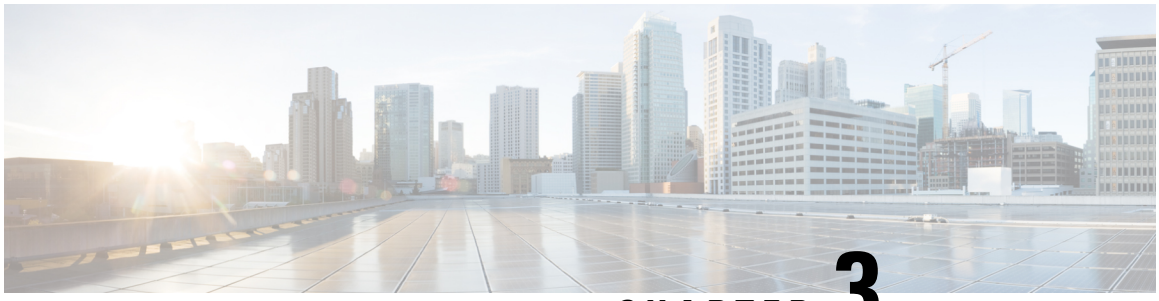
For information on the associated TL1 AIDs for the optical power monitoring points, see the “CTC Port Numbers and TL1 Aids” section in *Cisco NCS 2000 Series TL1 Command Guide*.

Related Procedures for EDRA-1-xx and EDRA-2-xx Cards

The list of procedures and tasks related to the configuration of the EDRA-1-xx and EDRA-2-xx cards are:

- NTP-G30 Install the DWDM Cards
- NTP-G34 Install Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G38 Provision OSC Terminations
- NTP-G37 Run Automatic Node Setup
- NTP-G51 Verify DWDM Node Turn Up
- NTP-G76 Verify Optical Span Loss Using CTC
- NTP-G74 Monitor DWDM Card Performance
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, and 40-SMR2-C Cards
- NTP-G77 Manage Automatic Power Control

- NTP-G160 Modify OPT-AMP-L, OPT-AMP-17-C, OPT-AMP-C, OPT-RAMP-C, OPT-RAMP-CE, 15454-M-RAMAN-CTP, 15454-M-RAMAN-COP, OPT-EDFA-17, and OPT-EDFA-24 Card Line Settings and PM Thresholds
- NTP-G184 Create a Provisionable Patchcord



CHAPTER 3

Provisioning Multiplexer and Demultiplexer Cards

This chapter describes legacy multiplexer and demultiplexer cards used in Cisco ONS 15454 dense wavelength division multiplexing (DWDM) networks and related procedures.

For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document.

- Card Compatibility, on page 27
- Optical Performance Parameters, on page 27
- DWDM Channel Allocation Plan, on page 31
- 4MD-xx.x Card, on page 34
- 12-AD-FS Card, on page 37
- 16-AD-CCOFS Card, on page 37
- Related Procedures for the 12-AD-FS and 16-AD-FS Cards, on page 38

Card Compatibility

The table below lists the software compatibility for the respective cards.

Table 13: Software Compatibility for Multiplexer and Demultiplexer Cards in Cisco NCS

Card Name	R10.0	R10.1	R10.3	R10.5.2	R10.6.1/10.6.2	R10.7/10.8/10.9	R11.x.x
12-AD-FS, 16-AD-FS	No	No	No	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015

Optical Performance Parameters

The following table lists the optical performance parameters for 40-Gbps cards that provide signal input to multiplexer and demultiplexer cards.

Table 14: 40-Gbps Interface Optical Performance

Parameter	Class A		Class B		Class I	
Type	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**
Maximum bit rate	40 Gbps		40 Gbps		40 Gbps	
Regeneration	3R		3R		3R	
FEC	Yes		No		Yes (E-FEC)	
Threshold	Optimum		Average		Optimum	
Maximum BER	10–15		10–12		10–15	
OSNR sensitivity	23 dB	9 dB	23 dB	19 dB	20 dB	8 dB
Power sensitivity	–24 dBm	–18 dBm	–21 dBm	–20 dBm	–26 dBm	–18 dBm
Power overload	–8 dBm		–8 dBm		–8 dBm	
Transmitted Power Range						
40-Gbps multirate transponder/40-Gbps EC transponder (40E-TXP-C and 40ME-TXP-C)	+2.5 to 3.5 dBm		+2.5 to 3.5 dBm		—	
OC-192 LR ITU	—		—		—	
Dispersion compensation tolerance	+/–800 ps/nm		+/–1,000 ps/nm		+/–800 ps/nm	

Note

- OSNR = optical signal-to-noise ratio
- BER = bit error rate
- Transmitted Power Range values decreased by patchcord and connector losses, are also the input power values for the OADM cards.

The following table lists the optical performance parameters that provide signal input for the 40-Gbps multiplexer and demultiplexer cards.

Table 15: 10-Gbps Interface Optical Performance Parameters

Parameter	Class A		Class B		Class C	Class I	
Type	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**
Maximum bit rate	10 Gbps		10 Gbps		10 Gbps	10 Gbps	
Regeneration	3R		3R		3R	3R	
FEC	Yes		No		No	Yes (E-FEC)	
Threshold	Optimum		Average		Average	Optimum	
Maximum BER	10–15		10–12		10–12	10–15	
OSNR sensitivity	23 dB	9 dB	23 dB	19 dB	19 dB	20 dB	8 dB
Power sensitivity	–24 dBm	–18 dBm	–21 dBm	–20 dBm	–22 dBm	–26 dBm	–18 dBm
Power overload	–8 dBm		–8 dBm		–9 dBm	–8 dBm	
Transmitted Power Range							
10-Gbps multirate transponder/10-Gbps FEC transponder (TXP_MR_10G)	+2.5 to 3.5 dBm		+2.5 to 3.5 dBm		—	—	
OC-192 LR ITU	—		—		+3.0 to 6.0 dBm	—	
10-Gbps multirate transponder/10-Gbps FEC transponder (TXP_MR_10E)	+3.0 to 6.0 dBm		+3.0 to 6.0 dBm		—	+3.0 to 6.0 dBm	
Dispersion compensation tolerance	+/–800 ps/nm		+/–1,000 ps/nm		+/–1,000 ps/nm	+/–800 ps/nm	

Note

- OSNR = optical signal-to-noise ratio
- BER = bit error rate
- Transmitted Power Range values decreased by patchcord and connector losses, are also the input power values for the OADM cards.

The following table lists the optical interface performance parameters for 2.5-Gbps cards that provide signal input to multiplexer and demultiplexer cards.

Table 16: 2.5-Gbps Interface Optical Performance

Parameter	Class D		Class E		Class F	Class G		Class H	
Type	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**
Maximum bit rate	2.5 Gbps		2.5 Gbps		2.5 Gbps	2.5 Gbps		1.25 Gbps	
Regeneration	3R		3R		2R	3R		3R	
FEC	Yes		No		No	No		No	
Threshold	Average		Average		Average	Average		Average	
Maximum BER	10–15		10–12		10–12	10–12		10–12	
OSNR sensitivity	14 dB	6 dB	14 dB	10 dB	15 dB	14 dB	11 dB	13 dB	8 dB
Power sensitivity	–31 dBm	–25 dBm	–30 dBm	–23 dBm	–24 dBm	–27 dBm	–33 dBm	–28 dBm	–18 dBm
Power overload	–9 dBm		–9 dBm		–9 dBm	–9 dBm		–7 dBm	
Transmitted Power Range									
TXP_MR_2.5G	–1.0 to 1.0 dBm		–1.0 to 1.0 dBm		–1.0 to 1.0 dBm	–2.0 to 0 dBm			
TXPP_MR_2.5G	–4.5 to –2.5 dBm		–4.5 to –2.5 dBm		–4.5 to –2.5 dBm				
MXP_MR_2.5G	—		+2.0 to +4.0 dBm		—				
MXPP_MR_2.5G	—		–1.5 to +0.5 dBm		—				
2/4 port GbE Transponder (GBIC WDM 100GHz)								+2.5 to 3.5 dBm	
Dispersion compensation tolerance	–1200 to +5400 ps/nm		–1200 to +5400 ps/nm		–1200 to +3300 ps/nm	–1200 to +3300 ps/nm		–1000 to +3600 ps/nm	

Note Transmitted Power Range values decreased by patchcord and connector losses, are also the input power values for the OADM cards.

DWDM Channel Allocation Plan

ONS 15454 DWDM multiplexer and demultiplexer cards are designed for use with specific channels in the C band and L band. In most cases, the channels for these cards are either numbered (for example, 1 to 32 or 1 to 40) or delimited (odd or even). Client interfaces must comply with these channel assignments to be compatible with the ONS 15454 system.

Table 6-4 lists the channel IDs and wavelengths assigned to the C-band DWDM channels.

Note In some cases, a card uses only one of the bands (C band or L band) and some or all of the channels listed in a band. Also, some cards use channels on the 100-GHz ITU grid while others use channels on the 50-GHz ITU grid. See the specific card description or the "Hardware Specifications" document for more details.

Table 17: DWDM Channel Allocation Plan (C Band)

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

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

The following table lists the channel IDs and wavelengths assigned to the L-band channels.

Table 18: DWDM Channel Allocation Plan (L Band)

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
1	190.85	1570.83	41	188.85	1587.46
2	190.8	1571.24	42	188.8	1587.88
3	190.75	1571.65	43	188.75	1588.30
4	190.7	1572.06	44	188.7	1588.73
5	190.65	1572.48	45	188.65	1589.15
6	190.6	1572.89	46	188.6	1589.57
7	190.55	1573.30	47	188.55	1589.99
8	190.5	1573.71	48	188.5	1590.41
9	190.45	1574.13	49	188.45	1590.83
10	190.4	1574.54	50	188.4	1591.26
11	190.35	1574.95	51	188.35	1591.68
12	190.3	1575.37	52	188.3	1592.10
13	190.25	1575.78	53	188.25	1592.52
14	190.2	1576.20	54	188.2	1592.95
15	190.15	1576.61	55	188.15	1593.37
16	190.1	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

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

4MD-xx.x Card

The 4MD-xx.x card has reached end of support.



Note For 4MD-xx.x card specifications, see the section "4MD-xx.x Card Specifications" section in the Hardware Specifications document.

The 4-Channel Multiplexer/Demultiplexer (4MD-xx.x) card multiplexes and demultiplexes four 100-GHz-spaced channels identified in the channel plan.

The card is bidirectional. The demultiplexer and multiplexer functions are implemented in two different sections of the same card. In this way, the same card can manage signals flowing in opposite directions.

There are eight versions of this card that correspond with the eight sub-bands specified in Table 6-9 on page 6-13. The 4MD-xx.x can be installed in Slots 1 to 6 and 12 to 17.

4MD-xx.x Card Functions

The 4MD-xx.x has the following functions implemented inside a plug-in optical module:

- Passive cascade of interferential filters perform the channel multiplex/demultiplex function.
- Software-controlled VOAs at every port of the multiplex section regulate the optical power of each multiplexed channel.
- Software-monitored photodiodes at the input and output multiplexer and demultiplexer ports for power control and safety purposes.
- Software-monitored virtual photodiodes at the common DWDM output and input ports. A virtual photodiode is a firmware calculation of the optical power at that port. This calculation is based on the single channel photodiode reading and insertion losses of the appropriated paths.

Port-Level Indicators for the 4MD-xx.x Cards

The 4MD-xx.x card has five sets of ports located on the faceplate. COM RX is the line input. COM TX is the line output. The 15xx.x TX ports represent demultiplexed channel outputs 1 to 4. The 15xx.x RX ports represent multiplexed channel inputs 1 to 4.

Wavelength Pairs

The following table shows the band IDs and the add/drop channel IDs for the 4MD-xx.x card.

Table 19: 4MD-xx.x Channel Sets

Band ID	Add/Drop Channel IDs
Band 30.3 (A)	30.3, 31.2, 31.9, 32.6
Band 34.2 (B)	34.2, 35.0, 35.8, 36.6
Band 38.1 (C)	38.1, 38.9, 39.7, 40.5
Band 42.1 (D)	42.1, 42.9, 43.7, 44.5
Band 46.1 (E)	46.1, 46.9, 47.7, 48.5
Band 50.1 (F)	50.1, 50.9, 51.7, 52.5
Band 54.1 (G)	54.1, 54.9, 55.7, 56.5
Band 58.1 (H)	58.1, 58.9, 59.7, 60.6

Power Monitoring

Physical photodiodes P1 through P8 and virtual photodiodes V1 and V2 monitor the power for the 4MD-xx.x card. The returned power level values are calibrated to the ports as shown in the following table.

Table 20: 4MD-xx.x Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1–P4	ADD	COM TX

Photodiode	CTC Type Name	Calibrated to Port
P5–P8	DROP	DROP TX
V1	OUT COM	COM TX
V2	IN COM	COM RX

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in *Cisco ONS SONET TL1 Command Guide, Release 9.2.1*.

Related Procedures for the 4MD-xx.x Card

The following is the list of procedures and tasks related to the configuration of the 4MD-xx.x card:

- DLP-G353 Preprovisioning a Slot
- NTP-G30 Installing the DWDM Cards
- NTP-G143 Importing the Cisco Transport Planner NE Update Configuration File
- NTP-G49 Performing the Active OADM Node Acceptance Test on a Symmetric Node with OSC-CSM Cards
- DLP-G94 Verifying Add and Drop Connections on an OADM Node with OSC-CSM Cards
- NTP-G34 Installing Fiber-Optic Cables on DWDM Cards and DCUs
- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- DLP-G315 Installing Fiber-Optic Cables From the 32WSS/32DMX Cards to the Standard Patch Panel Tray
- DLP-G356 Installing Fiber-Optic Cables from the 32WSS/32DMX and 32MUX-O/32DMX-O Cards to the Deep Patch Panel Tray
- NTP-G44 Performing the Anti-ASE Hub Node Acceptance Test
- DLP-G141 View Optical Power Statistics for 32MUX-O, 32WSS, 32WSS-L, 32DMX-O, 32DMX, 32DMX-L, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G175 Modifying Line Card Settings and PM Thresholds for Multiplexer and Demultiplexer Cards
- DLP-G414 Changing Optical Line Settings for Multiplexer and Demultiplexer Cards
- DLP-G415 Changing Optical Line Threshold Settings for Multiplexer and Demultiplexer Cards
- DLP-G416 Changing Optical Channel Settings for Multiplexer and Demultiplexer Cards
- DLP-G417 Changing Optical Channel Threshold Settings for Multiplexer and Demultiplexer Cards

12-AD-FS Card

The 12-AD-FS card is a single slot add/drop card that provides colorless, contentionless, omnidirectional, and flex spectrum capability on 12 channels over 4 ROADM directions. The card receives the same wavelength from transponder cards and forwards it to different ROADM nodes without collision. This capability is achieved using multicast switches.

Each add/drop port pair in the card is:

- Colorless - forwards any wavelength on a specific port
- Contentionless - adds/drops the same wavelength from the same add/drop section to different directions
- Omnidirectional - connects to both the add and drop directions

The 12-AD-FS card can be installed in any service slots in the Cisco NCS 2006 and NCS 2015 chassis. The 12-AD-FS card works only in the Cisco NCS Flex node.

Key Features

- Integrates three independent add/drop sections that individually support add/drop of up to four channels over four ROADM directions. The channels can be forwarded to a direction only within the same section.
- Provides add/drop sections, each of which has a 4 channel multiplexer and a 4 channel demultiplexer.
- Monitors optical power on the input ports through optical photo diodes and raises alarms when the threshold is exceeded.
- Supports tone detection on the input ports in the add direction.
- Provides a multicast switch that does not block any wavelength and that does not have any optical filtering element.

For more information about the 12-AD-FS card, such as the block diagram and card specifications, see the data sheet.

16-AD-CCOFS Card

In this chapter, "16-AD-CCOFS" refers to the NCS2K-16-AD-CCOFS card.

The 16-AD-CCOFS card is a single slot add or drop card that provides colorless, contentionless, omnidirectional, and flex spectrum capability on 16 channels over 4 ROADM directions. The card receives the same wavelength from 16 transponder cards and forwards it to different ROADM nodes without collision. This capability is achieved using multicast switches. 2 or 3 16-AD-CCOFS cards can be connected using upgrade ports to provide the add/drop capability on 16 channels over 8 or 12 ROADM directions respectively.

Each add/drop port pair in the card is:

- Colorless - forwards any wavelength on a specific port
- Contentionless - adds/drops the same wavelength from the same add/drop section to different directions
- Omnidirectional - connects to both the add and drop directions

The 16-AD-CCOFS card can be installed in any service slots in the Cisco NCS 2006 and NCS 2015 chassis. The 16-AD-CCOFS card works only in the Cisco NCS Flex node.

Key Features

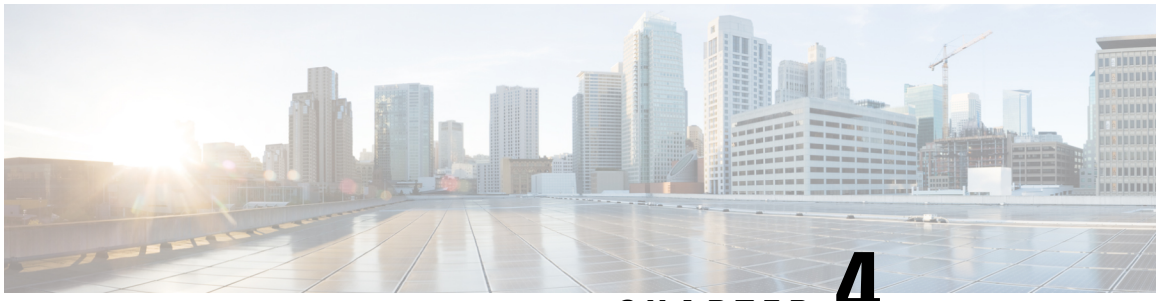
- Has a 16x4 multiplexer and a 4x16 demultiplexer.
- Monitors optical power on the input ports through optical photo diodes and raises alarms when the threshold is exceeded.
- Supports tone detection on the input ports in the add direction.
- Provides a multicast switch that does not block any wavelength and does not have any optical filtering element.
- Has fixed gain EDFA amplifiers in the add or drop directions to compensate for high optical insertion loss. The gain is -1 dB in the drop direction and -2 dB in the add direction.

For more information about the 16-AD-CCOFS card, such as the block diagram and card specifications, see the data sheet.

Related Procedures for the 12-AD-FS and 16-AD-FS Cards

The following is the list of procedures and tasks related to the configuration of the 12-AD-FS and 16-AD-FS cards:

- DLP-G414 Changing Optical Line Settings for Multiplexer and Demultiplexer Cards
- DLP-G415 Changing Optical Line Threshold Settings for Multiplexer and Demultiplexer Cards
- DLP-G781 Switching the Channels for 12-AD-FS and 16-AD-FS Cards
- DLP-G479 View Optical Power Statistics for the PSM, 12-AD-FS, and 16-AD-FS Cards



CHAPTER 4

Setting Up Tunable Dispersion Compensating Units

This chapter explains the Tunable Dispersion Compensating Units (T-DCU) used in Cisco ONS 15454 dense wavelength division multiplexing (DWDM) networks.

For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document.

The T-DCU unit compensates for chromatic dispersion (CD) of the transmission fiber. The T-DCU provides two line cards with varied set of tunable wavelengths to compensate for CD.

The T-DCU card provides a selectable set of discrete negative chromatic dispersion values to compensate for chromatic dispersion of the transmission line. The card operates over the entire C-band (in the range of 1529.0 nm to 1562.5 nm) and monitors the optical power at the input and the output ports. The two types of T-DCU line cards are:

- TDC-CC (Coarse T-DCU)
- TDC-FC (Fine T-DCU)

Note Each T-DCU card is marked with a symbol that corresponds to a slot (or slots) on the NCS shelf assembly. Cards should be installed in slots that have the same symbols. .

- Safety Labels, on page 39
- TDC-CC and TDC-FC Cards, on page 40
- Optical Performance, on page 41

Safety Labels

For information about safety labels, see the “G.1.2 Class 1M Laser Product Cards” section on page G-4.

TDC-CC and TDC-FC Cards

The TDC-CC card provides 16 values of CD ranging from 0 to -1650 ps/nm with a granularity of 110 ps/nm in the C-band spectrum.

The TDC-FC card provides 16 values of CD ranging from 0 to -675 ps/nm with a granularity of 45 ps/nm in the C-band spectrum.

You can configure the TDC-CC and TDC-FC cards for the CD value listed in the following table.

Table 21: TDC-CC and TDC-FC Tunable CD Value

Unit Configuration	TDC-CC [ps/nm]	TDC-FC [ps/nm]
0	0	0
1	-110	-45
2	-220	-90
3	-330	-135
4	-440	-180
5	-550	-225
6	-660	-270
7	-770	-315
8	-880	-360
9	-990	-405
10	-1100	-450
11	-1210	-495
12	-1320	-540
13	-1430	-585
14	-1540	-630
15	-1650	-675



Note The default TDC-CC CD value for Coarse Unit is 0. The default TDC-FC value for Fine Unit is 0.

Key Features

The TDC-CC and TDC-FC cards provide these features:

- Single slot card with three LEDs on the front panel.
- Two LC-PC-II optical connectors on the front panel.
- Operates in slots from slot 1 to 6 and 12 to 17.
- Operates over the C-band (wavelengths from 1529 nm to 1562.5 nm) of the optical spectrum.
- Allows upto 16 provisionable CD values for chromatic dispersion compensation.
- Connects to OPT-PRE, OPT-AMP-C, OPT-RAMP-C, and OPT-RAMP-CE amplifiers and 40-SMR-1 and 40-SMR-2 cards.
- Supports performance monitoring and alarm handling for selectable thresholds.
- Allows monitoring and provisioning using CTC, SNMP, or TL1.

For more information about the TDC-CC and TDC-FC cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-581114.html

Optical Ports

The T-DCU unit contains the DC-RX (input) and DC-TX (output) ports. The optical signal enters the DC-RX port, compensates the chromatic dispersion and then exits from the DC-TX port.

TDC-CC and TDC-FC Card Functions

The functions of the TDC-CC and TDC-FC cards are:

- G.15 Lamp Test, page G-22
- Card level indicators— Table G-1 on page G-8

Optical Performance

The TDC-CC and TDC-FC cards monitor the optical input power and optical output power of the fiber. It monitors the insertion loss from the input (DC-RX) to the output (DC-TX) port, with the help of the two photodiodes PD1 and PD2. The TDC-CC and TDC-FC cards report the minimum, average, and maximum power statistics of each of the monitored ports or channels in the specific card. To view the optical power statistics of the TDC-CC and TDC-FC cards, refer to the Monitor Performance document. The performance data is recorded at 15 minutes and 24 hours intervals.

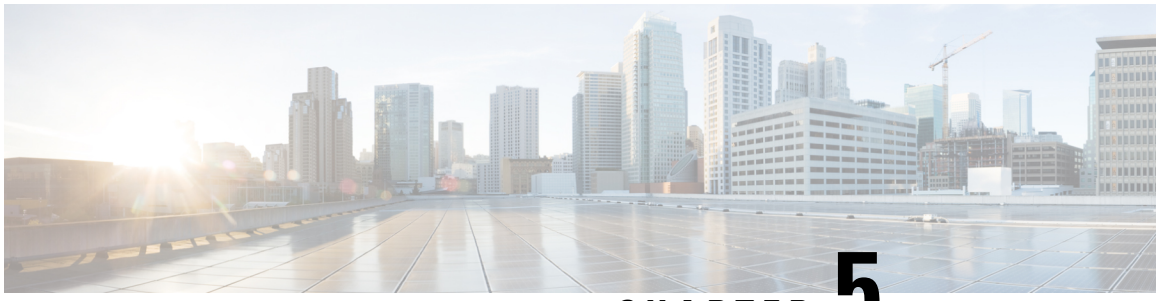
Note You can view the performance monitoring (PM) data of the card using CTC, SNMP, and TL1 interfaces.

Note The PM data is stored on a wrap-around basis at 32 x 15 min. and 2 x 24 hour intervals.

Related Procedures for TDC-CC and TDC-FC Cards

The following section lists procedures and tasks related to the configuration of the TDC-CC and TDC-FC cards:

- NTP-G30 Installing the DWDM Cards
- DLP-G525 View Optical Power Statistics for TDC-CC and TDC-FC cards
- NTP-G240 Modifying Line Settings and PM Thresholds for the TDC-CC and TDC-FC Cards
- NTP-G242 Modify the CD setting of TDC-CC and TDC-FC Cards



CHAPTER 5

Provisioning Protection Switching Module

This chapter describes the Protection Switching Module (PSM) card used in Cisco NCS networks. For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document. .

- PSM Card, on page 43

PSM Card

The PSM card performs splitter protection functions. In the transmit (TX) section of the PSM card, the signal received on the common receive port is duplicated by a hardware splitter to both the working and protect transmit ports. In the receive (RX) section of the PSM card, a switch is provided to select one of the two input signals (on working and protect receive ports) to be transmitted through the common transmit port.

The PSM card supports multiple protection configurations:

- Channel protection—The PSM COM ports are connected to the TXP/MXP trunk ports.
- Line (or path) protection—The PSM working (W) and protect (P) ports are connected directly to the external line.
- Multiplex section protection—The PSM is equipped between the MUX/DMX stage and the amplification stage.
- Standalone—The PSM can be equipped in any slot and supports all node configurations.

The PSM card is a single-slot card that can be installed in any node from Slot 1 to 6 and 12 to 17. The PSM card includes six LC-PC-II optical connectors on the front panel. In channel protection configuration, the PSM card can be installed in a different shelf from its peer TXP/MXP card.

Note It is strongly recommended that you use the default layouts designed by Cisco Transport Planner, which place the PSM card and its peer TXP/MXP card as close as possible to simplify cable management.

Key Features

The PSM card provides the following features:

- Operates over the C-band (wavelengths from 1529 nm to 1562.5 nm) and L-band (wavelengths from 1570.5 nm to 1604 nm) of the optical spectrum.
- Implements bidirectional non-revertive protection scheme. For more details on bidirectional switching, see the "PSM Bidirectional Switching" section on page 8-2.
- Release 10.5.2 implements bidirectional revertive protection scheme. For more details on bidirectional switching, see the "PSM Bidirectional Switching" section on page 8-2.

Note PSM reversion is supported only for Optical Channel (OCH) protection and not supported for Optical Multiplex Section (OMS) and OTS protection.

- Release 10.5.2 supports automatic Optical Multiplex Section (OMS) protection when PSM cards are provisioned with Multiplexers and De-multiplexer cards.
- Supports automatic creation of splitter protection group when the PSM card is provisioned.
- Supports switching priorities based on ITU-T G.873.1.
- Supports performance monitoring and alarm handling with settable thresholds.
- Supports automatic laser shutdown (ALS), a safety mechanism used in the event of a fiber cut. ALS is applicable only in line protection configuration. For information about using the card to implement ALS in a network, see the .

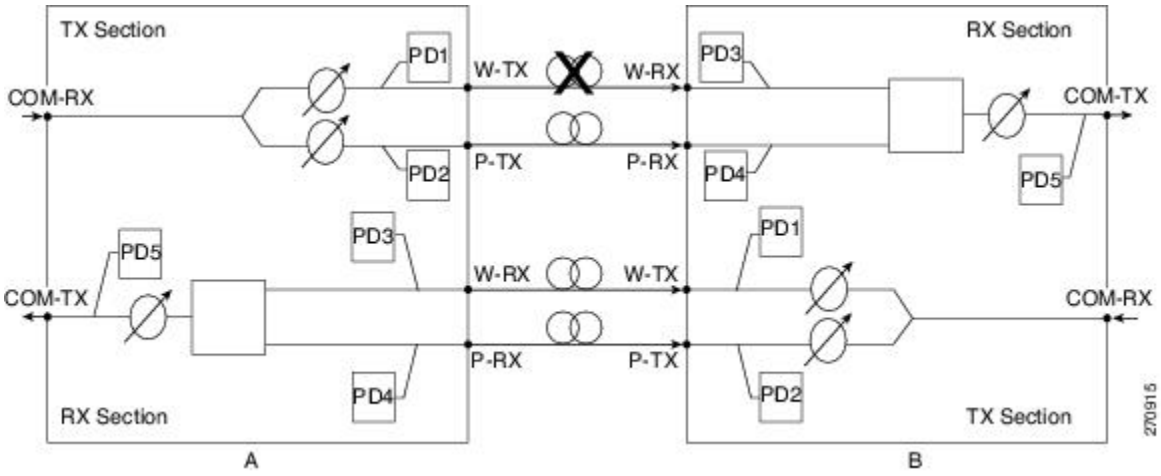
PSM Card-Level Indicators

Table G-1 "Card-level indicators" describes the card-level indicators on the card.

PSM Bidirectional Switching

A VOA is equipped after the hardware splitter within the PSM card. The VOA implements bidirectional switching when there is a single fiber cut in a protection configuration involving two peer PSM cards. The following figure shows a sample configuration that explains the bidirectional switching capability of the PSM card.

Figure 4: PSM Bidirectional Switching



In this example, there is a fiber cut in the working path from Station A to Station B. As a result of the fiber cut, an LOS alarm is raised on the W-RX port of Station B and it immediately switches traffic on to its P-RX port. Station B simultaneously also stops transmission (for approximately 25 milliseconds) on its W-TX port, which raises an LOS alarm on the W-RX port of Station A. This causes Station A to also switch traffic to its P-RX port. In this way, PSM implements bidirectional switching without any data exchange between the two stations.

Because the two stations do not communicate using signaling protocols (overhead bytes), a Manual or Force protection switch on the PSM card is implemented by creating a traffic hit. For example, consider that you perform a Manual or Force protection switch on Station A. The TX VOA on the active path is set to automatic VOA shutdown (AVS) state for 25 milliseconds. This causes Station B to switch traffic to the other path because it cannot differentiate between a maintenance operation and a real fail. After 25 milliseconds, the VOA in Station A is automatically reset. Now Station B does not revert back by itself if the non-revertive switching protection scheme is used in the PSM card. However, if the automatic reversion feature on the PSM card is enabled, Station B reverts back to the working path once Wait To Restore (WTR) timer is over. For more details on the automatic reversion feature, see the Automatic PSM Reversion section.

To effectively implement switching, the Lockout and Force commands must be performed on both the stations. If these commands are not performed on both the stations, the far-end and near-end PSMs can be misaligned. In case of misalignment, when a path recovers, traffic might not recover automatically. You might have to perform a Force protection switch to recover traffic.

Note The order in which you repair the paths is important in the event of a double failure (both the working and protect paths are down due to a fiber cut) on the PSM card in line protection configuration when the active path is the working path. If you repair the working path first, traffic is automatically restored. However, if you repair the protect path first, traffic is not automatically restored. You must perform a Force protection switch to restore traffic on the protect path.

Automatic PSM Reversion

From Release 10.5.2, the PSM cards support automatic bidirectional switching. When the fault on the working path clears, traffic automatically switches from the protection path to the working path. The reversion takes place after the Wait To Restore (WTR) timer is over. The key features of automatic PSM reversion are:

- Only normal and standalone modes of PSM card support automatic reversion.
- Protection cannot be provisioned as revertive if automatic laser shutdown (ALS) is enabled in standalone mode, and vice versa.
- Revertive feature is supported for only OCH protection.
- By default, the protection in PSM is non-revertive. To enable the revertive feature, perform step 4 of DLP-G176 Modify a Splitter Protection Group.



Note PSM revertive mode does not support user switching requests from working(W) to protect(P) path. In order to perform maintenance on the working path, the user must disable revertive mode and then perform W to P path switching.

- Reversion parameters that include revertive/non-revertive protection, WTR, pulse width, and interval can be configured only when the working path is active.
- WTR time can be set to a duration between 30 seconds to 12 minutes and is configurable only if the protection is revertive. By default, the timer is set to five minutes.
- Reversion Pulse Width is between 10 to 200 seconds and is configurable only if the protection is revertive. By default, the duration is set to 60 seconds. This parameter value can be calculated using the following formula:

  Minimum reversion pulse width = ROADM delay + 10 seconds

  ROADM delay = N x 5 x 2

  N=number of filter cards in the network between the source and destination PSM nodes on the working path.

  5 = maximum startup delay in seconds

  2=bidirectional communication

  For example, if a network has four ROADM nodes with the end nodes having PSM cards on the working path as depicted below:

  [PSM - Node 1 - FILTER 1] ==== [FILTER 2 - Node 2 - FILTER 3] ==== [FILTER 4 - Node 3 - FILTER 5] ==== [FILTER 6 - Node 4 - PSM]

  then N = 6

  ROADM delay = 6 x 5 x 2= 60

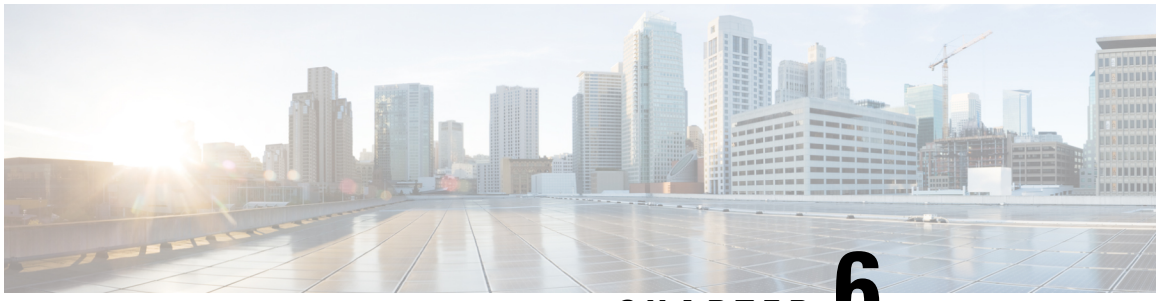
  Minimum reversion pulse width = 60 + 10 = 70 seconds

- Recovery Pulse Interval for reversion is auto-calculated and the user cannot configure the thresholds.

Related Procedures for PSM Card

The following is the list of procedures and tasks related to the configuration of the PSM card:

- NTP-G202 Modify PSM Card Line Settings and PM Thresholds
- NTP-G242 Create an Internal Patchcord Manually
- DLP-G493 Provision Protected Optical Channel Network Connections
- DLP-G479 View Optical Power Statistics for the PSM Card
- DLP-G176 Modify a Splitter Protection Group
- DLP-G459 Delete a Splitter Protection Group
- NTP-G30 Installing the DWDM Cards



CHAPTER 6

Provisioning Reconfigurable Optical Add/Drop Cards

This chapter describes the line cards deployed in reconfigurable optical add/drop (ROADM) networks. These cards perform mesh topology functions.

For card safety and compliance information, refer to the Regulatory Compliance and Safety Information for Cisco NCS Platforms document.

- Card Compatibility, on page 49
- Channel Allocation Plans, on page 50
- Safety Labels, on page 52
- 40-DMX-C and 40-DMX-CE Card, on page 53
- 40-MUX-C Card, on page 58
- 40-WSS-C and 40-WSS-CE Card, on page 60
- 40-WXC-C Card, on page 63
- 80-WXC-C Card, on page 66
- 16-WXC-FS Card, on page 73
- Single Module ROADM (SMR-C) Cards, on page 78

Card Compatibility

The following table lists the Cisco Transport Controller (CTC) software compatibility for the ROADM cards.

Table 22: Software Release Compatibility for ROADM Cards

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1	R10.6.2	R10.7	R10.9	R11.x.x
40-WSS-C	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006
40-WSS-CE	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006
40-DMX-C	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1	R10.6.2	R10.7	R10.9	R11.x.x
40-DMX-CE	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006
40-MUX-C	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006
40-WXC-C	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006
80-WXC-C	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015
16-WXC-FS	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015
40-SMR1-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
40-SMR2-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, SMR20 FS CV	No	No	No	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Channel Allocation Plans

ROADM cards are designed for use with specific channels in the C band and L band. In most cases, the channels for these cards are either numbered (for example, 1 to 32 or 1 to 40) or delimited (odd or even). Client interfaces must comply with these channel assignments to be compatible with the NCS system.

The following cards operate in the C-band:

- 40-MUX-C

- 40-WXC-C
- 80-WXC-C
- 40-SMR1-C
- 40-SMR2-C
- MMU

Table 23: DWDM L-band Channel Allocation Plan at 50 GHz Spacing, on page 51 lists the L-band channel IDs and wavelengths at ITU-T 50-GHz intervals. This is a comprehensive L-band channel table that encompasses present and future card capabilities.

Table 23: DWDM L-band Channel Allocation Plan at 50 GHz Spacing

Channel Number[1]	Frequency (THz)	Wavelength (nm)		Channel Number	Frequency (THz)	Wavelength (nm)
1	190.85	1570.83		41	188.85	1587.46
2	190.8	1571.24		42	188.8	1587.88
3	190.75	1571.65		43	188.75	1588.30
4	190.7	1572.06		44	188.7	1588.73
5	190.65	1572.48		45	188.65	1589.15
6	190.6	1572.89		46	188.6	1589.57
7	190.55	1573.30		47	188.55	1589.99
8	190.5	1573.71		48	188.5	1590.41
9	190.45	1574.13		49	188.45	1590.83
10	190.4	1574.54		50	188.4	1591.26
11	190.35	1574.95		51	188.35	1591.68
12	190.3	1575.37		52	188.3	1592.10
13	190.25	1575.78		53	188.25	1592.52
14	190.2	1576.20		54	188.2	1592.95
15	190.15	1576.61		55	188.15	1593.37
16	190.1	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

Channel Number[1]	Frequency (THz)	Wavelength (nm)		Channel Number	Frequency (THz)	Wavelength (nm)
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

[1] Channels on the L-band are contiguous, starting at 1577.86 nm. The channels listed in this table begin with 1570.83 nm for backward compatibility with other ONS products.

Safety Labels

For information about safety labels, see the section, Class 1M Laser Product Cards.

40-DMX-C and 40-DMX-CE Card

The single-slot 40-channel demultiplexer C-band (40-DMX-C) or single-slot 40-channel demultiplexer C-band, even channels (40-DMX-CE) card demultiplexes 40 100-GHz-spaced channels identified in the channel plan (Table 26: Channel Allocation Plan, on page 56), and sends them to dedicated output ports. The overall optical power can be adjusted using a single VOA that is common to all channels. The 40-DMX-C card is unidirectional, optically passive, and can be installed in Slots 1 to 6 and 12 to 17.

The 40-DMX-C or 40-DMX-CE has two types of ports:

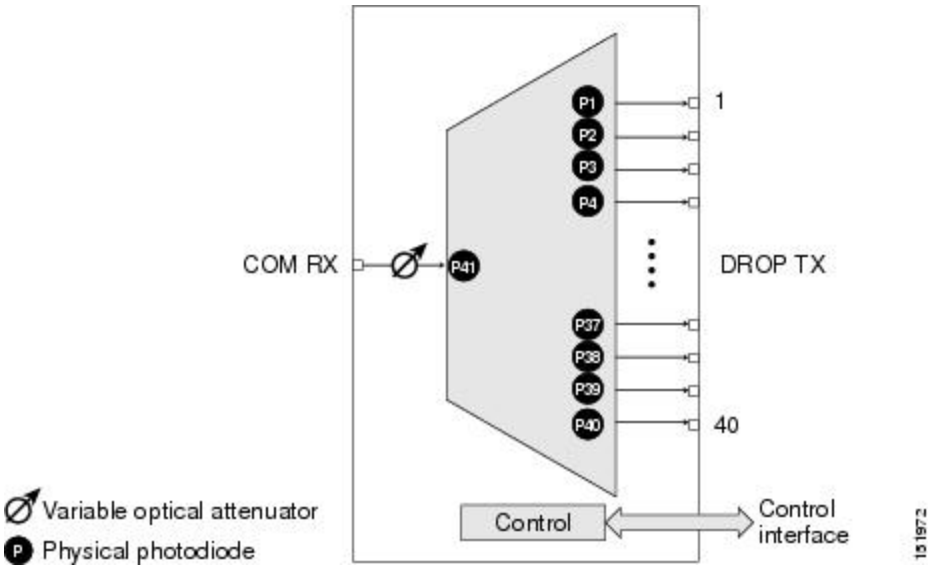
- COM RX port: COM RX is the line input port for the aggregate optical signal being demultiplexed. This port is supported by a VOA for optical power regulation and a photodiode for per channel optical power monitoring.

Note By default, the VOA is set to its maximum attenuation for safety purposes (for example, electrical power failure). A manual VOA setting is also available.

- DROP TX ports (1 to 40): On its output, the 40-DMX-C or 40-DMX-CE card provides 40 drop ports that are typically used for dropping channels within the ROADM node. These ports are connected using five physical connectors on the front panel that accept MPO client input cables. (MPO cables break out into eight separate cables.) The 40-DMX-C card also has one LC-PC-II optical connector for the main input.

The following figure shows the 40-DMX-C or 40-DMX-CE optical module functional block diagram.

Figure 5: 40-DMX-C or 40-DMX-CE Optical Module Functional Block Diagram



For more information about the 40-DMX-C or 40-DMX-CE card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ebf1d.html.

40-DMX-C and 40-DMX-CE ROADM Functionality

The 40-DMX-C (or 40-DMX-CE) card works in combination with the 40-WSS-C (or 40-WSS-CE) card to implement ROADM functionality. As a ROADM node, the node can be configured at the optical channel level using CTC, Cisco Transport Planner, and CTM. ROADM functionality using the 40-DMX-C (or 40-DMX-CE) card requires two single-slot 40-DMX-C (or 40-DMX-CE) cards and two 40-WSS-C (or 40-WSS-CE) double-slot cards (for a total of six slots in the chassis).

For other cards' ROADM functionality, see that card's description in this chapter. For a diagram of a typical ROADM configuration, see the section, ROADM Node in the *Cisco NCS 2000 Series Network Configuration Guide*.

40-DMX-C and 40-DMX-CE Power Monitoring

Physical photodiodes P1 through P40 monitor the power at the outputs of the 40-DMX-C or 40-DMX-CE card. P41 monitors the total multiplexed power at the input, calibrated to the COM-RX port. The following table shows the returned power level values calibrated to each port.

Table 24: 40-DMX-C or 40-DMX-CE Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1–P40	DROP	DROP TX
P41	INPUT COM	COM RX

For information on the associated TL1 AIDs for the optical power monitoring points, refer the "CTC Port Numbers and TL1 Aids" section in *Cisco NCS 2000 Series TL1 Command Guide*.

40-DMX-C and 40-DMX-CE Channel Plan

This table shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are demultiplexed by the 40-DMX-C card.

Table 25: Channel Allocation Plan

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
Ch. 0[2]	29.5	196	1529.55
B30.3	30.3	195.9	1530.33
	31.1	195.8	1531.12
	31.9	195.7	1531.90
	32.6	195.6	1532.68
	33.4	195.5	1533.47

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
B34.2	34.2	195.4	1534.25
	35.0	195.3	1535.04
	35.8	195.2	1535.82
	36.6	195.1	1536.61
	37.4	195	1537.40
B38.1	38.1	194.9	1538.19
	38.9	194.8	1538.98
	39.7	194.7	1539.77
	40.5	194.6	1540.56
	41.3	194.5	1541.35
B42.1	42.1	194.4	1542.14
	42.9	194.3	1542.94
	43.7	194.2	1543.73
	44.5	194.1	1544.53
	45.3	194	1545.32
B46.1	46.1	193.9	1546.12
	46.9	193.8	1546.92
	47.7	193.7	1547.72
	48.5	193.6	1548.51
	49.3	193.5	1549.32
B50.1	50.1	193.4	1550.12
	50.9	193.3	1550.92
	51.7	193.2	1551.72
	52.5	193.1	1552.52
	53.3	193	1553.33

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
B54.1	54.1	192.9	1554.13
	54.9	192.8	1554.94
	55.7	192.7	1555.75
	56.5	192.6	1556.55
	57.3	192.5	1557.36
B58.1	58.1	192.4	1558.17
	58.9	192.3	1558.98
	59.7	192.2	1559.79
	60.6	192.1	1560.61
	61.4	192	1561.42

[2] This channel is unused by the 40-WXC-C

This table shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are demultiplexed by the 40-DMX-CE card.

Table 26: Channel Allocation Plan

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
B30.7	30.7	195.85	1530.72
	31.5	195.75	1531.51
	32.3	195.65	1532.29
	33.1	195.55	1533.07
	33.9	195.45	1533.86
B34.6	34.6	195.35	1534.64
	35.4	195.25	1535.43
	36.2	195.15	1536.22
	37.0	195.05	1537.00
	37.8	194.95	1537.79

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
B38.6	38.6	194.85	1538.58
	39.4	194.75	1539.37
	40.1	194.65	1540.16
	40.9	194.55	1540.95
	41.8	194.45	1541.75
B42.5	42.5	194.35	1542.54
	43.3	194.25	1543.33
	44.1	194.15	1544.13
	44.9	194.05	1544.92
	45.7	193.95	1545.72
B46.5	46.5	193.85	1546.52
	47.3	193.75	1547.32
	48.1	193.65	1548.11
	48.9	193.55	1548.91
	49.7	193.45	1549.72
B50.5	50.5	193.35	1550.52
	51.3	193.25	1551.32
	52.1	193.15	1552.12
	52.9	193.05	1552.93
	53.7	192.95	1553.73
B54.4	54.4	192.85	1554.54
	55.3	192.75	1555.34
	56.1	192.65	1556.15
	56.9	192.55	1556.96
	57.8	192.45	1557.77

Band ID	Channel Label	Frequency (GHz)	Wavelength (nm)
B58.6	58.6	192.35	1558.58
	59.4	192.25	1559.39
	60.2	192.15	1560.20
	61.0	192.05	1561.01
	61.8	191.95	1561.83

Related Procedures for 40-DMX-C and 40-DMX-CE Cards

The following section lists procedures and tasks related to the configuration of the 40-DMX-C or 40-DMX-CE card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G175 Modifying Line Card Settings and PM Thresholds for Multiplexer and Demultiplexer Cards

40-MUX-C Card

The single-slot 40-Channel Multiplexer C-band (40-MUX-C) card multiplexes forty ITU-T 100-GHz-spaced channels identified in the channel plan in Table 25: Channel Allocation Plan, on page 54. The 40-MUX-C card can be installed in Slots 1 to 6 and 12 to 17. The 40-MUX-C card is typically used in hub nodes.

The 40-MUX-C card has two types of ports:

- COM TX port: COM TX is the line output port for the aggregate optical signal being multiplexed. This port is supported by both a VOA for optical power regulation and a photodiode for per channel optical power monitoring.

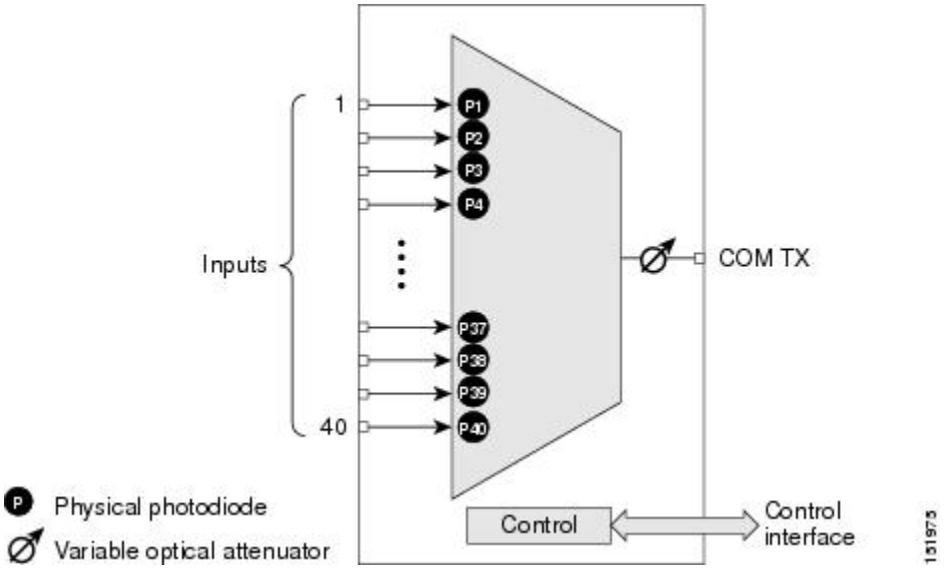
Note By default, the VOA is set to its maximum attenuation for safety purposes (for example, electrical power failure). A manual VOA setting is also available.

- DROP RX ports (1 to 40): The 40-MUX-C card provides 40 input optical channels. These ports are connected using five physical receive connectors on the card's front panel that accept MPO cables for the client input interfaces. MPO cables break out into eight separate cables. The 40-DMX-C card also

has one LC-PC-II optical connector for the main output. For the wavelength range, see Table 25: Channel Allocation Plan, on page 54.

The following figure shows the 40-MUX-C optical module functional block diagram.

Figure 6: 40-MUX-C Optical Module Functional Block Diagram



For more information about the 40-MUX-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ebf1d.html.

40-MUX-C Card Power Monitoring

Physical photodiodes P1 through P40 monitor the power of the individual input ports to the 40-MUX-C card. P41 monitors the total multiplexed output power, calibrated to the COM-TX port. The following table shows the returned power level values calibrated to each port.

Table 27: 40-MUX-C Port Calibration

Photodiode	CTC Type Name	Calibrated to Port
P1–P40	ADD	ADD RX
P41	OUTPUT COM	COM-TX

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in *Cisco NCS 2000 Series TL1 Command Guide*.

40-MUX-C Card Channel Plan

Table 25: Channel Allocation Plan, on page 54 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are multiplexed by the 40-MUX-C card.

Related Procedures for 40-MUX-C Card

The following section lists procedures and tasks related to the configuration of the 40-MUX-C card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G175 Modifying Line Card Settings and PM Thresholds for Multiplexer and Demultiplexer Cards

40-WSS-C and 40-WSS-CE Card

The double-slot 40-channel wavelength selective switch C-band (40-WSS-C) or the double-slot 40-channel wavelength selective switch even-channel C-band (40-WSS-CE) card switches 40 ITU-T 100-GHz-spaced channels identified in the channel plan (Table 25: Channel Allocation Plan, on page 54 or Table 26: Channel Allocation Plan, on page 56) and sends them to dedicated output ports. The 40-WSS-C or 40-WSS-CE card is bidirectional and optically passive. The card can be installed in Slots 1 to 6 and 12 to 17

The 40-WSS-C or 40-WSS-CE features include:

- Receipt of an aggregate DWDM signal into 40 output optical channels from the Line receive port (EXP RX) in one direction and from the COM-RX port in the other direction.
- Per-channel optical power monitoring using photodiodes.
- Signal splitting in a 70%-to-30% ratio, sent to the 40-DMX-C (or 40-DMX-CE) for dropping signals, then to the other 40-WSS-C (or 40-WSS-CE) card.
- Aggregate DWDM signal monitoring and control through a variable optical attenuator (VOA). In the case of electrical power failure, the VOA is set to its maximum attenuation for safety purposes. A manual VOA setting is also available.

Within the 40-WSS-C or 40-WSS-CE card, the first AWG opens the spectrum and each wavelength is directed to one of the ports of a 1x2 optical switch. The same wavelength can be passed through or stopped. If the pass-through wavelength is stopped, a new channel can be added at the ADD port. The card's second AWG multiplexes all of the wavelengths, and the aggregate signal is output through the COM-TX port.

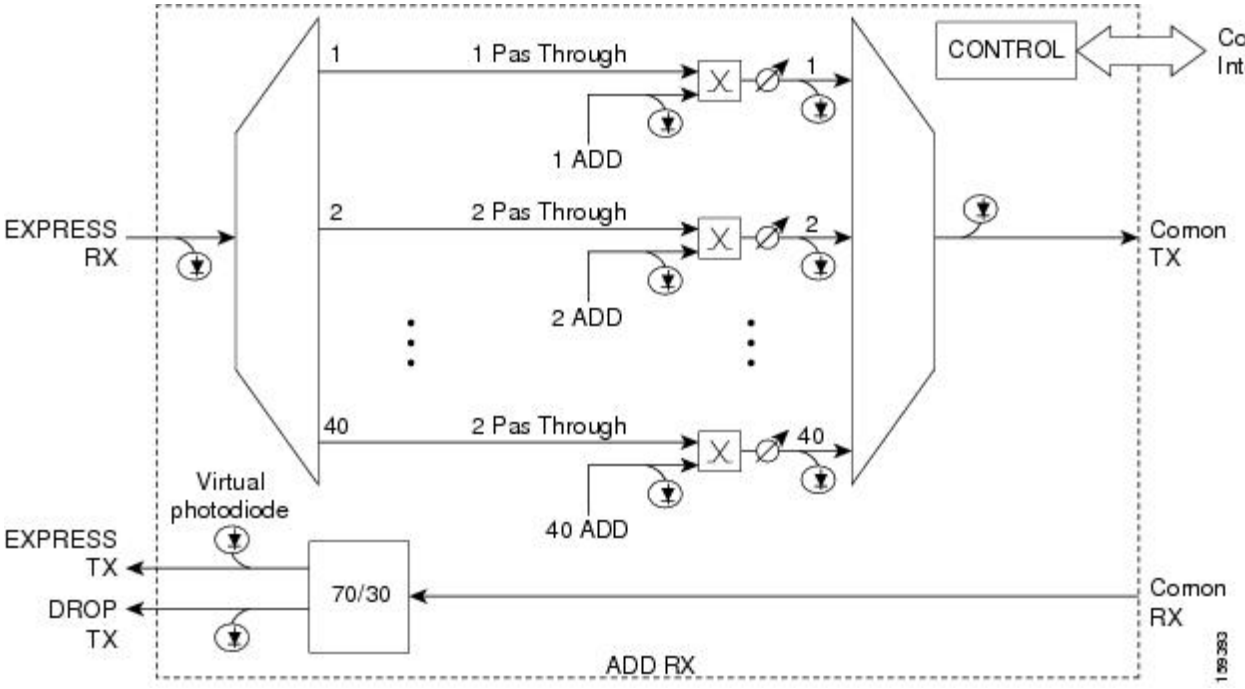
The 40-WSS-C or 40-WSS-CE has eight types of ports:

- ADD RX ports (1 to 40): These ports are used for adding channels. Each add channel is associated with an individual switch element that selects whether an individual channel is added. Each add port has optical power regulation provided by a VOA. The five connectors on the card faceplate accept MPO cables for the client input interfaces. MPO cables break out into eight separate cables. The 40-WSS-C or 40-WSS-CE card also has one LC-PC-II optical connector for the main input.

- COM RX: The COM RX port receives the optical signal from a preamplifier (such as the OPT-PRE) and sends it to the optical splitter.
- COM TX: The COM TX port sends an aggregate optical signal to a booster amplifier card (for example, the OPT-BST card) for transmission outside of the NE.
- EXP RX port: The EXP RX port receives an optical signal from another 40-WSS-C or 40-WSS-CE card in the same NE.
- EXP TX: The EXP TX port sends an optical signal to the other 40-WSS-C or 40-WSS-CE card within the NE.
- DROP TX port: The DROP TX port sends the split off optical signal that contains drop channels to the 40-DMX-C(or 40-DMX-CE) card, where the channels are further processed and dropped.

The following figure shows a functional block diagram of the 40-WSS-C or 40-WSS-CE card.

Figure 7: 40-WSS-C or 40-WSS-CE Block Diagram



For more information about the 40-WSS-C or 40-WSS-CE card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ebf1d.html.

40-WSS-C and 40-WSS-CE ROADM Functionality

The 40-WSS-C (or 40-WSS-CE) card works in combination with the 40-DMX-C (or 40-DMX-CE) card to implement ROADM functionality. As a ROADM node, the node can be configured at the optical channel level using CTC, Cisco Transport Planner, and CTM. ROADM functionality using the 40-WSS-C (or 40-WSS-CE) card requires two 40-WSS-C (or 40-WSS-CE) double-slot cards and two 40-DMX-C (or 40-DMX-CE) single-slot cards (for a total of six slots in the chassis).

For information about ROADM functionality for other cards, see that card's description in this chapter. For a diagram of a typical ROADM configuration, see the section, ROADM Node in the *Cisco NCS 2000 Series Network Configuration Guide* .

40-WSS-C and 40-WSS-CE Power Monitoring

The 40-WSS-C (or 40-WSS-CE) has physical diodes that monitor power at various locations on the card. The following table lists the physical diode descriptions.

Table 28: 40-WSS-C or 40-WSS-CE Physical Photodiode Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
P1	DROP	DROP TX
P2	EXP	EXP RX
PDi3[3]	RX	Add i RX ports (that is, channel input Add i RX power), up to 40 ports and therefore 40 PDs
PDi4[1]	TX	COM TX port (that is, per channel output COM TX power) up to 40 channels and therefore 40 PDs
PD5	COM	COM TX port (that is, total output COM TX power)

[3] i indicates any channel from 01 through 40.

For information on the associated TL1 AIDs for the optical power monitoring points, refer the "CTC Port Numbers and TL1 Aids" section in *Cisco NCS 2000 Series TL1 Command Guide*.

Additionally, the 40-WSS-C (or 40-WSS-CE) has two virtual diodes. Virtual diodes are monitor points for each physical photodiode; they are identified with a physical diode relative to the way that the physical diode is identified with one of the two interlink (ILK) ports. The following table lists the virtual diodes.

Table 29: 40-WSS-C or 40-WSS-CE Virtual Photodiode Port Calibration

Virtual Photodiode	CTC Type Name	Calibrated to Port(s)
VPD1	COM	COM RX port (total input COM RX power)
VPD2	EXP	EXP TX port (total output EXP TX power)

40-WSS-C and 40-WSS-CE Channel Plan

Table 25: Channel Allocation Plan, on page 54 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are switched by the 40-WSS-C card.

Table 26: Channel Allocation Plan, on page 56 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are switched by the 40-WSS-CE card.

Related Procedures for 40-WSS-C and 40-WSS-CECards

The following section lists procedures and tasks related to the configuration of the 40-WSS-C or 40-WSS-CE card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G93 Modifying the WSS Card Line Settings and PM Thresholds

40-WXC-C Card

The double-slot 40-channel wavelength cross-connect C-band (40-WXC-C) card selectively sends any wavelength combination coming from nine input ports to a common output port. The device can manage up to 41 channels spaced at 100GHz on each port according to the channel grid in Table 25: Channel Allocation Plan, on page 54. Each channel can be selected from any input. The card is optically passive and provides bidirectional capability. It can be installed in Slots 1 to 6 and 12 to 17.

.The 40-WXC-C card provides the following features:

- Demultiplexing, selection, and multiplexing of DWDM aggregate signal from input ports to common output port.
- Aggregate DWDM signal monitoring and control through a VOA.
- VOAs are deployed in every channel path in order to regulate the channel's optical power. In the case of an electrical power failure, VOAs are set to their maximum attenuation value, or to a fixed and configurable one. The VOA can also be set manually.
- Per-channel optical power monitoring using photodiodes.

The 40-WXC-C card acts as a selector element with the following characteristics:

- It is able to select a wavelength from one input port and pass the wavelength through to the common out port. Simultaneously, the card can block the same wavelength coming from the other eight input ports.
- It is able to stop wavelengths from all nine inputs.
- It is able to monitor optical power and control path attenuation using per channel VOA independently of the wavelength input-to-out port connection.

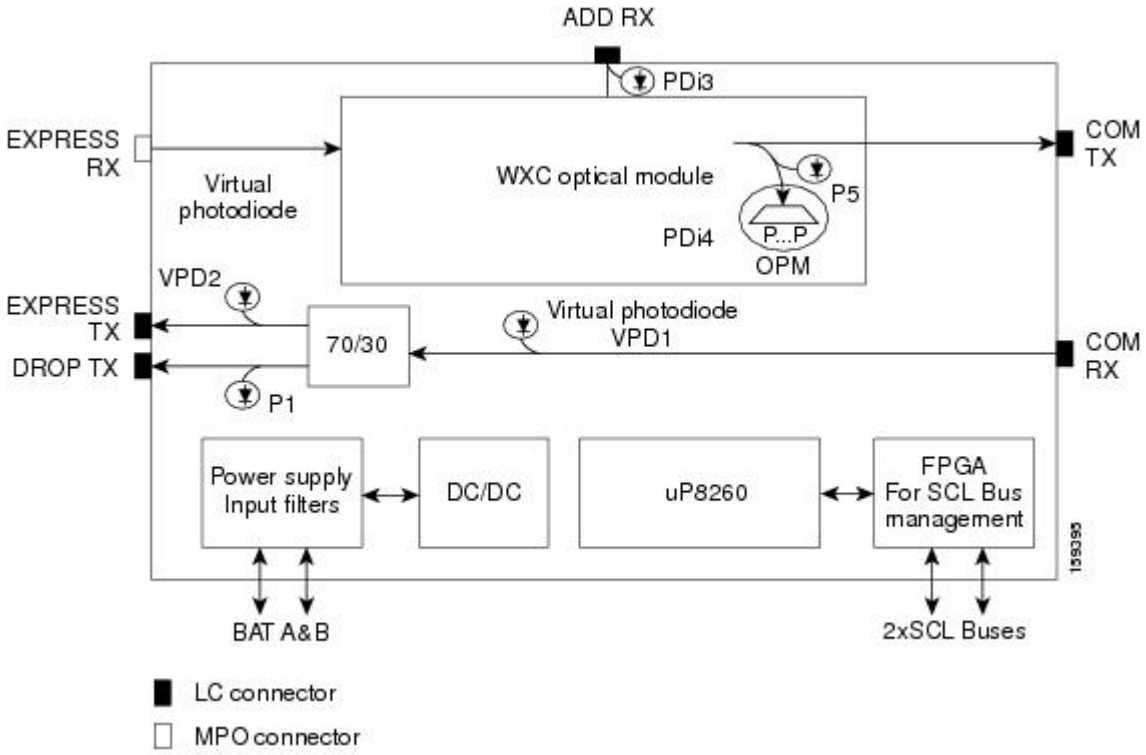
The 40-WXC-C card has six types of ports:

- COM RX: The COM RX port receives the optical signal from a preamplifier (such as the OPT-PRE) and sends it to the optical splitter.

- COM TX: The COM TX port sends an aggregate optical signal to a booster amplifier card (for example, the OPT-BST card) for transmission outside of the NE.
- EXP TX: The EXP TX port sends an optical signal to the other 40-WXC-C card within the NE.
- MON TX: The optical service channel (OSC) monitor.
- ADD/DROP RX: The 40-WXC-C card provides 40 input optical channels. For the wavelength range, see Table 25: Channel Allocation Plan, on page 54.
- ADD/DROP TX: The DROP TX port sends the split off optical signal that contains drop channels to the 40-WXC-C card, where the channels are further processed and dropped.

The following figure shows the 40-WXC-C optical module functional block diagram.

Figure 8: 40-WXC-C Optical Module Functional Block Diagram



For more information about the 40-WXC-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ebf1d.html.

40-WXC-C Power Monitoring

The 40-WXC-C has 83 physical diodes (P1 through P40) that monitor power at the outputs of the card. The following table describes the physical diodes.

Table 30: 40-WXC-C Physical Photodiode Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
P1	DROP	DROP TX
P2	EXP	EXP RX
PDi3[4]	RX	Add i RX ports (that is, channel input Add i RX power), up to 40 ports and therefore 40 PDs
PDi4[1]	TX	COM TX port (that is, per channel output COM TX power) up to 40 channels and therefore 40 PDs
PD5	COM	COM TX port (that is, total output COM TX power)

[4] i indicates any channel from 01 through 40.

For information on the associated TL1 AIDs for the optical power monitoring points, refer the “CTC Port Numbers and TL1 Aids” section in *Cisco NCS 2000 Series TL1 Command Guide*.

Additionally, the 40-WXC-C has two virtual diodes. Virtual diodes are monitor points for each physical photodiode; they are identified with a physical diode relative to the way that the physical diode is identified with one of the two interlink (ILK) ports. The following table lists the virtual diodes.

Table 31: 40-WXC-C Virtual Photodiode Port Calibration

Virtual Photodiode	CTC Type Name	Calibrated to Port(s)
VPD1	COM	COM RX port (total input COM RX power)
VPD2	EXP	EXP TX port (total output EXP TX power)

The usage of WXC and mesh PP power readings to troubleshoot a LOS-P in WXC COM TX port in Side A is described in the following example. The example is explained assuming a single wavelength 1558.17 in the setup that comes from Side H to Side A. If there is more than one wavelength, then there is a risk of dropping traffic when pulling common fibers. The example is explained below:

When the wavelength from side H is 1558.17, you can check the power reading at WXC EXP TX port of the WXC card and verify the consistency with side H pre output power and WXC COMRX-EXPTX port loss. You can also check with a power meter connected to the 8th fiber (since it is from side H) of an MPO-FC (or LC) cable connected to the TAP-TX port of the MESH-PP. This value should be consistent with the previous reading, less than the insertion loss of the installed PP-MESH. If it is consistent, the issue is with the MPO between side A WXC and PP-MESH. If it is not consistent, the issue is with the PP-MESH or the LC-LC from side H. With only the PP-MESH already tested during installation, the only issue can be with the patch cord b.

You can check if the 1558.17 wavelength from side H is unequalized (that is, if the channel is not aligned with the linear fit of the power values of the other channels) by keeping the DMX COM-RX port of side H in maintenance, and checking both the signal and ASE levels of CHAN-TX ports of the DMX card. If the channel is equalized (that is, if the channel is aligned with the linear fit of the power values of the other channels), then the issue is in the WXC side A that cannot properly regulate the VOA for such channel. If the channel is unequalized, then the issue is on a remote node.

Note With an OSA or a spare 40 DMX, you can see the light coming from all the sides from TAP-TX of the PP-MESH.

40-WXC-C Channel Plan

Table 25: Channel Allocation Plan, on page 54 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) that are cross connected by the 40-WXC-C card.

Related Procedures for 40-WXC-C Card

The following section lists procedures and tasks related to the configuration of the 40-WXC-C card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G185 Installing Fiber-Optic Cables between Mesh Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G174 Modifying Line Settings and PM Thresholds for 40-WXC-C, 80-WXC-C, or 16-WXC-FS Cards

80-WXC-C Card

The double-slot 80-channel Wavelength Cross-Connect C-band (80-WXC-C) card manages up to 80 ITU-T 50 GHz-spaced channels identified in the channel plan and sends them to dedicated output ports. Each channel can be selected from any input port to any output port. The card is optically passive, and provides bidirectional capability. It can be installed in Slots 2 to 6 in the Cisco NCS 2006 and Slots 2 to 17 in the NCS 2015 chassis.

The 80-WXC-C card provides the following functionalities:

- When used in the multiplexer or bidirectional mode, the 80-WXC-C card allows selection of a single wavelength or any combination of wavelengths from any of the nine input ports to the common output port.

- When used in the bidirectional mode, the output wavelength from the COM-RX port is split to manage the express and drop wavelengths.
- When used in the demultiplexer mode, the 80-WXC-C card, allows selection of a single wavelength or a combination of wavelengths from the common input port to any of the nine output ports.
- Automatic VOA shutdown (AVS) blocking state on each wavelength and port.
- Per-channel (closed loop) power regulation on the output port based on OCM block feedback.
- Per-channel (open loop) attenuation regulation on the output port which is not based on the OCM feedback.

The OCM unit provides per-channel optical power monitoring on the following ports:

- COM port in output direction
- COM port in input direction
- DROP-TX port in output direction
- Eight Express/Add/Drop (EAD) ports and one Add/Drop (AD) port in both input and output directions

The 80-WXC-C card has 14 types of ports:

- MON: The MON port monitors power on the COM T/R port.
- COM RX: The COM RX port receives the optical signal from a preamplifier (such as the OPT-PRE) and sends it to the optical splitter.
- DROP TX: In the bidirectional mode, the DROP TX port sends the optical signal to the demultiplexer.
- EXP TX: The EXP TX port sends the split off optical signal that contains pass-through channels to the other side of the NE.
- COM T/R: The COM port is bidirectional. It functions as a COM TX port in the multiplexer mode and as a COM RX port in the demultiplexer mode.
- AD T/R: The AD port functions as ADD RX port in bidirectional and multiplexer modes and as a DROP port in the demultiplexer mode.
- EAD T/R *i* (where i = 1 to 8): The EAD ports function as EXP ports in the bidirectional mode, as ADD ports in the multiplexer mode, and as DROP ports in the demultiplexer mode.

The different units of the 80-WXC-C card are:

- 40/60 splitter with VOA on drop path—The preamplifier output signal from the preamplifier is split in a 40%-to-60% ratio; 40% is sent on the drop path (DROP-TX port) and 60% is sent on the pass-through path (EXP-TX port). The VOA equipped on the drop path is used to match the power range of the receiver photodiode without the need for bulk attenuation. If a channel is expected to be dropped in the 80-WXC-C card, the pass-through channel is stopped after the EXP-TX port either by a 40-WSS-C or a 40-WXC-C card.
- 50 Ghz 10 port WXC—The WXC block is optically passive and has bidirectional capability. The WXC block can selectively send any wavelength combination coming from the eight input EAD ports and one AD port to a common (COM) output port, when used as a multiplexer, whereas it can selectively send any wavelength combination coming from its common (COM) input port to any of the eight output EAD ports and one AD port, when used as a demultiplexer. The WXC block can manage (on each port) up to

80 channels according to the channel grid reported in Table 34: 80-WXC-C Channel Plan, on page 69. Each channel can be selected from any input and routed to any output.

- 50 Ghz Optical Channel Monitor (OCM)—The OCM provides per channel power monitoring on the COM T/R, DROP-TX, AD, and EAD*i* (*i*=1 to 8) ports. The power value for each wavelength is refreshed after a variable timer depending on the port and card activity.

For instructions on proper handling of the 80-WXC-C card, see 80-WXC-C Card Handling.

For more information about the 80-WXC-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/datasheet_c78-598521.html.

80-WXC-C Power Monitoring

The 80-WXC-C has two physical photodiodes and an OCM unit that monitors power at the different ports of the card. The following table describes the physical photodiodes.

Table 32: 80-WXC-C Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
PD1	COM Total Power	COM
PD2	EXP-TX Total Power	EXP-TX
OCM1	EAD 1 Per-Channel and Total Power	EAD-1
OCM2	EAD 2 Per-Channel and Total Power	EAD-2
OCM3	EAD 3 Per-Channel and Total Power	EAD-3
OCM4	EAD 4 Per-Channel and Total Power	EAD-4
OCM5	EAD 5 Per-Channel and Total Power	EAD-5
OCM6	EAD 6 Per-Channel and Total Power	EAD-6
OCM7	EAD 7 Per-Channel and Total Power	EAD-7
OCM8	EAD 8 Per-Channel and Total Power	EAD-8
OCM9	AD Per-Channel and Total Power	AD
OCM10	Output Per-Channel and Total Power	COM
OCM11	Input Per-Channel and Total Power	COM
OCM12	Drop Per-Channel and Total Power	DROP-TX

For information on the associated TL1 AIDs for the optical power monitoring points, see the “CTC Port Numbers and TL1 Aids” section in the *Cisco NCS 2000 Series TL1 Command Guide*.

Additionally, the 80-WXC-C has two virtual photodiodes. The following table lists the virtual photodiodes.

Table 33: 80-WXC-C Virtual Photodiode Port Calibration

Virtual Photodiode	CTC Type Name	Calibrated to Port(s)
VPD3	DROP-TX Total Power	DROP-TX
VPD4	COM-RX Total Power	COM-RX

80-WXC-C Channel Plan

The following table shows the 80 ITU-T 50-GHz-spaced, C-band channels (wavelengths) that are cross connected by the 80-WXC-C card.

Table 34: 80-WXC-C Channel Plan

Band ID	Channel Label	Frequency (THz)	Wavelength (nm)
Ch. 0[5]	-	196	1529.55
30.3	30.3	195.9	1530.33
	30.7	195.85	1530.72
	31.1	195.8	1531.12
	31.5	195.75	1531.51
	31.9	195.7	1531.90
	32.3	195.65	1532.29
	32.7	195.6	1532.68
	33.1	195.55	1533.07
	33.5	195.5	1533.47
	33.9	195.45	1533.86

Band ID	Channel Label	Frequency (THz)	Wavelength (nm)
34.3	34.3	195.4	1534.25
	34.6	195.35	1534.64
	35.0	195.3	1535.04
	35.4	195.25	1535.43
	35.8	195.2	1535.82
	36.2	195.15	1536.22
	36.6	195.1	1536.61
	37.0	195.05	1537
	37.4	195	1537.40
	37.8	194.95	1537.79
38.2	38.2	194.9	1538.19
	38.6	194.85	1538.58
	39.0	194.8	1538.98
	39.4	194.75	1539.37
	39.8	194.7	1539.77
	40.2	194.65	1540.16
	40.6	194.6	1540.56
	41.0	194.55	1540.95
	41.3	194.5	1541.35
	41.7	194.45	1541.75

Band ID	Channel Label	Frequency (THz)	Wavelength (nm)
42.1	42.1	194.4	1542.14
	42.5	194.35	1542.94
	42.9	194.3	1542.94
	43.3	194.25	1543.33
	43.7	194.2	1543.73
	44.1	194.15	1544.13
	44.5	194.1	1544.53
	44.9	194.05	1544.92
	45.3	194	1545.32
	45.7	193.95	1545.72
46.1	46.1	193.9	1546.12
	46.5	193.85	1546.52
	46.9	193.8	1546.92
	47.3	193.75	1547.32
	47.7	193.7	1547.72
	48.1	193.65	1548.11
	48.5	193.6	1548.51
	48.9	193.55	1548.91
	49.3	193.5	1549.32
	49.7	193.45	1549.72

Band ID	Channel Label	Frequency (THz)	Wavelength (nm)
50.1	50.1	193.4	1550.12
	50.5	193.35	1550.52
	50.9	193.3	1550.92
	51.3	193.25	1551.32
	51.7	193.2	1551.72
	52.1	193.15	1552.12
	52.5	193.1	1552.52
	52.9	193.05	1552.93
	53.3	193	1553.33
	53.7	192.95	1553.73
54.1	54.1	192.9	1554.13
	54.5	192.85	1554.54
	54.9	192.8	1554.94
	55.3	192.75	1555.34
	55.7	192.7	1555.75
	56.2	192.65	1556.15
	56.6	192.6	1556.55
	57.0	192.55	1556.96
	57.4	192.5	1557.36
	57.8	192.45	1557.77

Band ID	Channel Label	Frequency (THz)	Wavelength (nm)
58.2	58.2	192.4	1558.17
	58.6	192.35	1558.58
	59.0	192.3	1558.98
	59.4	192.25	1559.39
	59.8	192.2	1559.79
	60.2	192.15	1560.20
	60.6	192.1	1560.61
	61.0	192.05	1561.01
	61.4	192	1561.42
	61.8	191.95	1561.83

[5] This channel is unused by the 80-WXC-C

Related Procedures for 80-WXC-C Card

The following section lists procedures and tasks related to the configuration of the 80-WXC-C card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G185 Installing Fiber-Optic Cables between Mesh Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G174 Modifying Line Settings and PM Thresholds for 40-WXC-C, 80-WXC-C, or 16-WXC-FS Cards

16-WXC-FS Card

The 16-WXC-FS card is a double-slot cross connect card, tunable over 96 channels in the C-band, at 50-GHz spacing on the ITU-T grid. The card provides the flex spectrum capability, which allows the user the flexibility to allocate the channel bandwidth, to increase the network scalability. The channel bandwidth is not fixed, but can be defined arbitrarily, with a given granularity and within a given range. Attenuation and power values

are defined for each sub-range. The central frequency ranges from 191'350 Ghz (1566 .72 nm) to 196'100 Ghz (1528 .77 nm).

The 16-WXC-FS card can be used in point-to-point, ring, multi-ring, or mesh topologies. The 16-WXC-FS card supports up to 16 directions for each ROADM node. The card is optically passive and provides bidirectional capability. It can be installed in slots 2, 4, or 6 in the Cisco NCS 2006 chassis. It is recommended that you use the 16-WXC-FS card in slot 4 when used with EDRA amplifiers to comply with optical safety. It is recommended that you use the 16-WXC-FS card and the EDRA-2-xx card in slots 2 and 4, 5 and 7, 8 and 10, 11 and 13 of the Cisco NCS 2015 chassis.



Important In the Cisco NCS 2006 chassis, the 16-WXC-FS card front panel has two compression latch devices. These latches enforce the position of the unit in the chassis. To insert or remove a card from the Cisco NCS 2006 chassis, rotate the compression latches fully in the anti-clockwise direction. After the card is inserted or removed, close the unit and rotate the compression latches fully in the clockwise direction.

For more information about the 16-WXC-FS card, see Cisco NCS 2000 16-port Flex Spectrum ROADM Line Card Data Sheet

16-WXC-FS Ports

The 16-WXC-FS card has these ports:

- EXP-TX*i* (where *i* = 1 to 16)—The EXP TX port sends the split-off optical signal that contains pass-through channels to the other side of the NE. For example, in four degrees setup, the EXP ports can be used as drop Tx ports, EXP-Tx(1 to 4) are used as express channel from one side to other side. The 5th to 16th EXP-Tx ports are used to transmit the power to passive units.
- EXP-RX*i* (where *i* = 1 to 16)—The EXP RX port receives the optical signal from the pass-through channels. For example, in four degrees setup, the EXP ports can be used as drop Rx ports, EXP-Rx(1 to 4) are used to receive power from the express channel from one side to other. The 5th to 16th EXP-Rx ports are used to receive the power from the passive units.
- COM-TX—The COM TX port transmits the combined power from all directions or add drop ports towards the amplifier card.
- COM-RX—The COM RX port receives the optical signal from a preamplifier card and sends it to the optical cross connect.
- UPG-TX—The UPG TX port can be used to drop channels and transmits power to the preamplifier card. This port can also be used to increase the number of ports by connecting to another 16-WXC-FS card.
- UPG-RX-The UPG RX port can be used to add channels and receives power from the preamamplifer card. This port can also be used to increase the number of ports by connecting to another 16-WXC-FS card.

Two LC-duplex adapters are required to connect COM and UPG ports, and four MPO connectors to connect add/drop ports of the 16-WXC card. All the 16 I/O ports of the 16-WXC-FS card can be used either for node interconnection or for add/drop.

Key Features

The 16-WXC-FS card provides these features when used in multiplexer mode:

- The card allows you to select a single 50-GHz spaced channel or any combination of the aggregated 96 channels grid on the COM-TX port.
- The combination of input signals from the 16 EXP-RX ports and the UPG-RX port into COM-TX port.
- The selection of an arbitrary wavelength range or different wavelength ranges, with a common insertion loss value on the COM-TX port.
- Automatic VOA shutdown (AVS) blocking state on each wavelength on the COM-TX port.
- Per-channel (closed loop) power regulation on the COM-TX output port based on OCM block feedback.
- Per-channel (open loop) attenuation regulation on the EXP-TX output port, which is not based on the OCM feedback.

The 16-WXC-FS card provides these features when used in de-multiplexer mode:

- The card allows you to select a single 50-GHz spaced channel or any combination of the aggregated 96 channels grid on any of the 16 EXP-TX port.
- Splitting of the input signal from COM-RX port into a total of 16 EXP-TX ports and 1 UPG-TX port.
- AVS blocking state on each wavelength on any of the 16 EXP-TX ports.
- Per-channel (closed loop) power regulation on the EXP-TX output port based on OCM block feedback.
- Per-channel (open loop) attenuation regulation on the EXP-TX output port which is not based on the OCM feedback.
- Selection of an arbitrary wavelength range or of different wavelength ranges, with a common insertion loss value on any of the 16 EXP-TX ports.
- DWDM Optical amplifier(s) partially compensates the loss of couplers or splitters and wavelength blockers.

16-WXC-FS Power Monitoring

The 16-WXC-FS card has two physical photodiodes and an OCM unit that monitors power at the different ports of the card.

Table 35: 16-WXC-FS Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
PD1	COM-RX Total Input Power	COM-RX
PD2	COM-TX Total Output Power	COM-TX
OCM1	COM-RX Per-Channel and Input Power	COM-RX
OCM2	COM-TX Per-Channel and Output Power	COM-TX

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
OCM3 to OCM18	De-MUX Output Ports	EXP-TX
OCM19 to OCM34	MUX Input Ports	EXP-RX
OCM35	De-MUX Output Ports	UPG-TX
OCM36	MUX Input Ports	UPG-RX

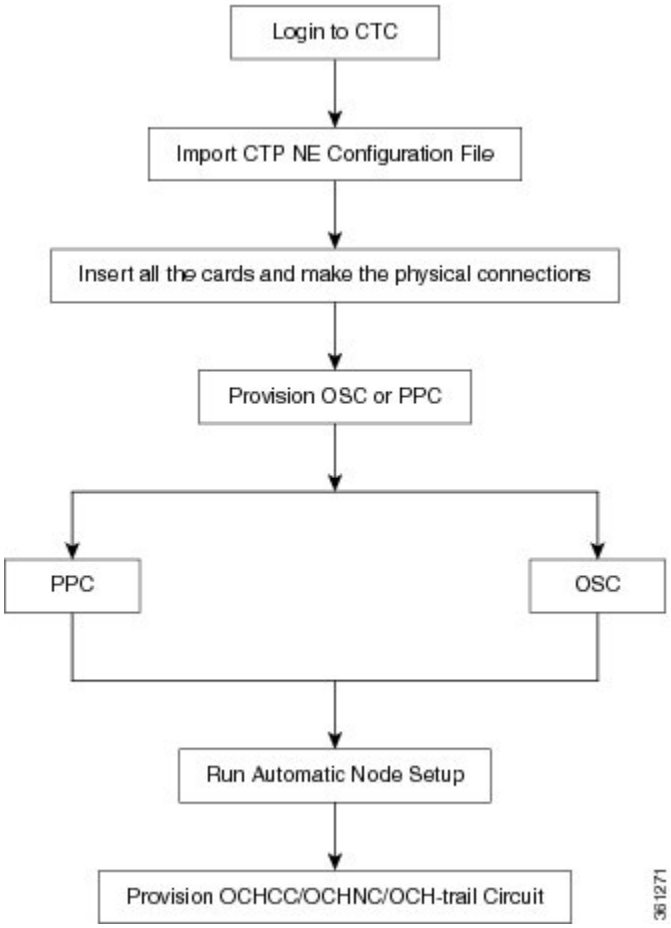
For information on associated TL1 AIDs for the optical power monitoring points, see the "CTC Port Numbers and TL1 Aids" section in the *Cisco NCS 2000 Series TL1 Command Guide*.

The OCM unit provides per-channel optical power monitoring on these ports:

- COM-TX and COM-RX ports
- UPG-TX and UPG-RX ports
- EXP-TX*i* (where *i* = 1 to 16) ports in output direction
- EXP-RX*i* (where *i* = 1 to 16) ports in input direction

Task Flow Diagram of 16-WXC-FS Card

Figure 9: Task Flow Diagram of 16-WXC-FS Card



Related Procedures for 16-WXC-FS Card

The following section lists procedures and tasks related to the configuration of the 16-WXC-FS card:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G185 Installing Fiber-Optic Cables between Mesh Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards

- NTP-G174 Modifying Line Settings and PM Thresholds for 40-WXC-C, 80-WXC-C, or 16-WXC-FS Cards

Single Module ROADM (SMR-C) Cards

Note For 40-SMR1-C and 40-SMR2-C safety label information, see the "Safety Labels" section on page 10-4.

The single-slot 40-channel single module ROADM (SMR-C) cards integrate the following functional blocks onto a single line card:

- Optical preamplifier
- Optical booster amplifier
- Optical service channel (OSC) filter
- 2x1 wavelength cross-connect (WXC) or a 4x1 WXC
- Optical channel monitor (OCM)

The SMR-C cards are available in two versions:

- 40-SMR1-C Card
- 40-SMR2-C Card

The SMR-C cards can manage up to 40 channels spaced at 100GHz on each port according to the channel grid in Table 10-10. The cards can be installed in Slots 1 to 6 and 12 to 17.

For more information about the 40-SMR1-C or 40-SMR2-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-578552.html.

SMR-C Card Key Features

The optical amplifier units in the SMR-C cards provide the following features:

- Embedded gain flattening filter
- Mid-stage access for dispersion compensation unit (only applicable for preamplifier erbium-doped fiber amplifier [EDFA])
- Fixed output power mode
- Fixed gain mode
- Nondistorting low-frequency transfer function
- Amplified spontaneous emissions (ASE) compensation in fixed gain and fixed output power mode
- Fast transient suppression
- Programmable tilt (only applicable for preamplifier EDFA)

- Full monitoring and alarm handling capability
- Optical safety support through signal loss detection and alarm at any input port, fast power down control, and reduced maximum output power in safe power mode.
- EDFA section calculates the signal power, by taking into account the expected ASE power contribution to the total output power. The signal output power or the signal gain can be used as feedback signals for the EDFA pump power control loop.

The 1x2 WXC unit (40-SMR1-C card) provides the following features:

- Selection of individual wavelength of the aggregated 100GHz signal from either the EXP-RX or ADD-RX ports
- Automatic VOA shutdown (AVS) blocking state on each wavelength and port
- Per-channel power regulation based on external OCM unit
- Open loop path attenuation control for each wavelength and port

The 1x4 WXC unit (40-SMR2-C card) provides the following features:

- Selection of individual wavelength of the aggregated 100GHz signal from either the EXP*i*-RX (where *i* = 1, 2, 3) or ADD-RX ports
- Automatic VOA shutdown (AVS) blocking state on each wavelength and port
- Per-channel power regulation based on external OCM unit
- Open loop path attenuation control for each wavelength and port

The OCM unit provides per channel optical power monitoring at EXP-RX, ADD-RX, DROP-TX, and LINE-TX ports.

40-SMR1-C Card

The 40-SMR1-C card includes a 100Ghz 1x2 WXC unit with integrated preamplifier unit (single EDFA).

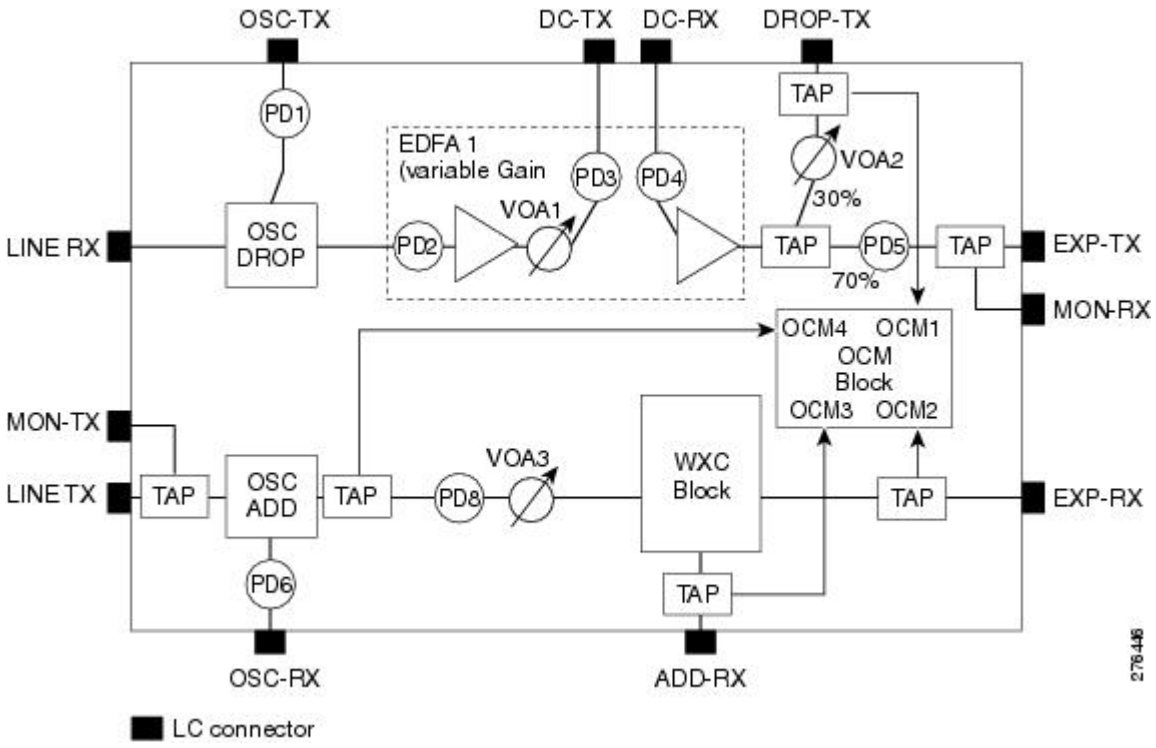
The 40-SMR1-C card has the following types of ports:

- MON RX: The MON RX port monitors power on the EXP-TX output port.
- MON TX: The MON TX port monitors power on the LINE-TX output port.
- DC RX: The DC RX port receives the optical signal from the dispersion compensating unit (DCU) and sends it to the second stage preamplifier input.
- DC TX: The DC TX port sends the optical signal from the first stage preamplifier output to the DCU.
- OSC RX: The OSC RX port is the OSC add input port.
- OSC TX: The OSC TX port is the OSC drop output port.
- ADD/DROP RX: The ADD RX port receives the optical signal from the multiplexer section of the NE and sends it to the 1x2 WXC unit.
- ADD/DROP TX: The DROP TX port sends the split off optical signal to the demultiplexer section of the NE.

- LINE RX: The LINE RX port is the input signal port.
- LINE TX: The LINE TX port is the output signal port.
- EXP RX: The EXP RX port receives the optical signal from the other side of the NE and sends it to the 1x2 WXC unit.
- EXP TX: The EXP TX port sends the split off optical signal that contains pass-through channels to the other side of the NE.

The following figure shows a block diagram of the 40-SMR1-C card.

Figure 10: 40-SMR1-C Block Diagram



The different units of the 40-SMR1-C card are:

- OSC filter—The OSC filter allows to add an OSC channel to the C-band in the transmission path and to drop an OSC channel on the receiving path. The OSCM card that is connected to the OSC-TX and OSC-RX ports generates the OSC channel.
- Double-stage variable gain EDFA preamplifier—The double-stage preamplifier allows the insertion of a DCU between the DC-TX and DC-RX ports to compensate for chromatic dispersion. It is also equipped with built-in variable optical attenuator (VOA) and gain flattening filter (GFF) that provides tilt compensation and enables the use of this device over an extended range of span losses (5 dB to 35 dB).
- 70/30 splitter and VOA—The output signal from the preamplifier is split in a 70%-to-30% ratio, 70% is sent on the pass-through path (EXP-TX port) and 30% is sent on the drop path (DROP-TX port). The VOA equipped on the drop path is used to match the power range of the receiver photo diode without the need for bulk attenuation. If a channel is expected to be dropped in the 40-SMR1-C card, the pass-through channel is stopped after the EXP-TX port either by a 40-WSS-C, 40-SMR1-C, or 40-SMR2-C card.

- 1x2 WXC—The 1x2 WXC aggregates on its output port a 100-GHz-spaced optical channel received from either its ADD-RX or EXP-RX port. In addition to the switching function, the 1x2 WXC allows to set a different per channel power for each of the managed wavelengths and also monitor the optical power.
- OCM—The OCM provides per channel power monitoring on the DROP-RX, EXP-RX, ADD-RX, and LINE-TX ports. The power value for each wavelength is refreshed after a variable timer depending on the port and card activity.

You can install the 40-SMR1-C card in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 7 in NCS 2015.

40-SMR1-C Power Monitoring

The 40-SMR1-C card has seven physical diodes (PD1 through PD6 and PD8) and an OCM unit that monitors power at the input and output ports of the card (see the following table).

Table 36: 40-SMR1-C Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
PD1	LINE	LINE-RX
PD2	LINE	LINE-RX
PD3	DC	DC-TX
PD4	DC	DC-RX
PD5	EXP	EXP-TX
PD6	OSC	OSC-RX
PD8	LINE	LINE-TX
OCM1	LINE OCH	DROP-TX
OCM2	DROP OCH	EXP-RX
OCM3	ADD OCH	ADD-RX
OCM4	EXP OCH	LINE-TX

40-SMR1-C Channel Plan

Table 25: Channel Allocation Plan, on page 54 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) supported by the 40-SMR1-C card.

40-SMR2-C Card

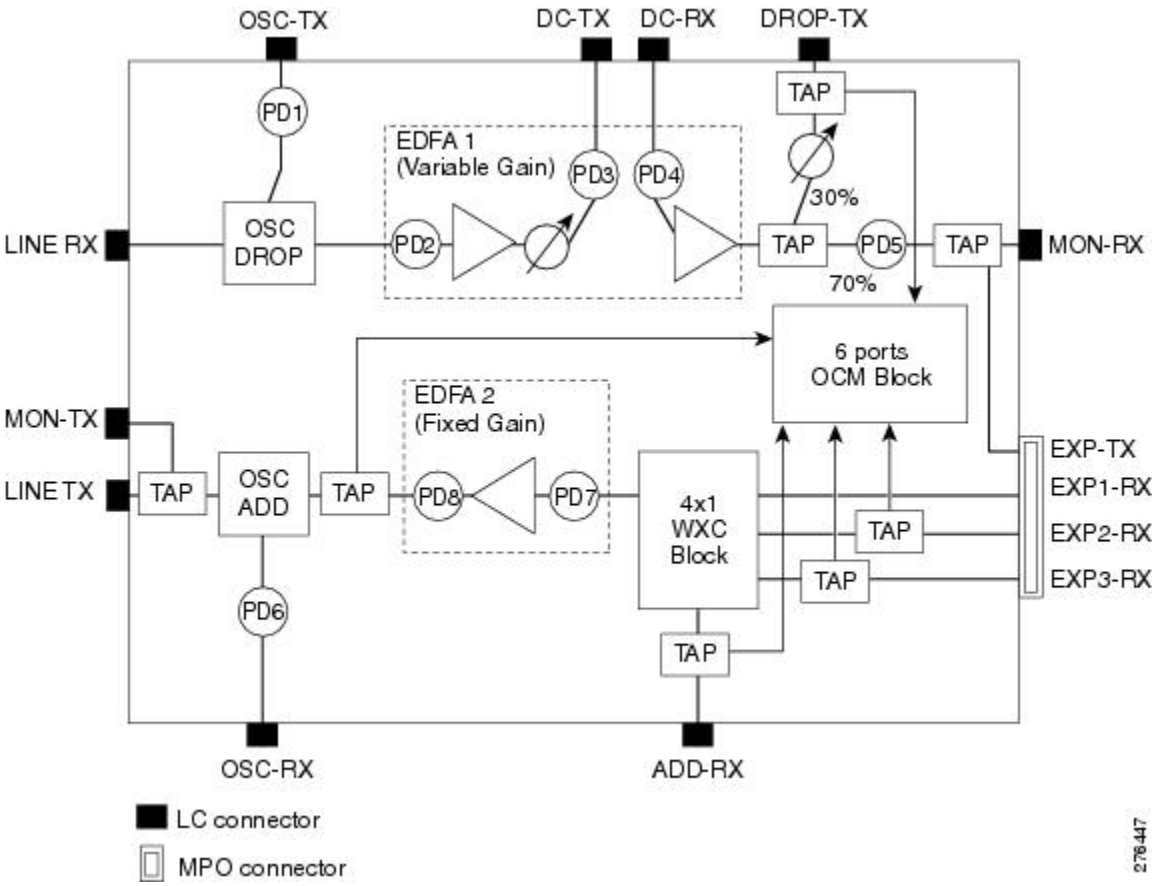
The 40-SMR2-C card includes a 100Ghz 1x4 WXC unit with integrated preamplifier and booster amplifier units (double EDFA).

The 40-SMR2-C card has the following types of ports:

- MON RX: The MON RX port monitors power on the EXP-TX output port.
- MON TX: The MON TX port monitors power on the LINE-TX output port.
- DC RX: The DC RX port receives the optical signal from the dispersion compensating unit (DCU) and sends it to the second stage preamplifier input.
- DC TX: The DC TX port sends the optical signal from the first stage preamplifier output to the DCU.
- OSC RX: The OSC RX port is the OSC add input port.
- OSC TX: The OSC TX port is the OSC drop output port.
- ADD/DROP RX: The ADD RX port receives the optical signal from the multiplexer section of the NE and sends it to the 1x4 WXC unit.
- ADD/DROP TX: The DROP TX port sends the split off optical signal to the demultiplexer section of the NE.
- LINE RX: The LINE RX port is the input signal port.
- LINE TX: The LINE TX port is the output signal port.
- EXP TX: The EXP TX port sends the split off optical signal that contains pass-through channels to the other side of the NE.
- EXP*i*-RX (where *i* = 1, 2, 3): The EXP*i*-RX port receives the optical signal from the other side of the NE and sends it to the 1x4 WXC unit.

The following figure shows a block diagram of the 40-SMR2-C card.

Figure 11: 40-SMR2-C Block Diagram



The different units of the 40-SMR2-C card are:

- OSC filter—The OSC filter allows to add an OSC channel to the C-band in the transmission path and to drop an OSC channel on the receiving path. The OSCM card that is connected to the OSC-TX and OSC-RX ports generates the OSC channel.
- Double-stage variable gain EDFA preamplifier—The double-stage preamplifier allows the insertion of a DCU between the DC-TX and DC-RX ports to compensate for chromatic dispersion. It is also equipped with built-in variable optical attenuator (VOA) and gain flattening filter (GFF) that provides tilt compensation and enables the use of this device over an extended range of span losses (5 dB to 35 dB).
- 70/30 splitter and VOA—The output signal from the preamplifier is split in a 70%-to-30% ratio, 70% is sent on the pass-through path (EXP-TX port) and 30% is sent on the drop path (DROP-TX port). The VOA equipped on the drop path is used to match the power range of the receiver photo diode without the need for bulk attenuation. If a channel is expected to be dropped in the 40-SMR2-C card, the pass-through channel is stopped after the EXP-TX port by a 40-WSS-C, 40-SMR1-C, or 40-SMR2-C card.
- 1x4 WXC—The 1x4 WXC aggregates on its output port a 100-GHz-spaced optical channel received from either its ADD-RX or EXP*i*-RX (where *i* = 1, 2, 3) port. In addition to the switching function, the 1x4 WXC allows to set a different per channel power for each of the managed wavelengths and also monitor the optical power.

- Single-stage fixed gain EDFA booster amplifier—The booster amplifier amplifies the output signal from the 1x4 WXC unit before transmitting it into the fiber. Since it is a fixed gain (17 dB) amplifier, it does not allow gain tilt control.
- OCM—The OCM provides per channel power monitoring on the DROP-RX, EXP*i*-RX (where *i* = 1, 2, 3), ADD-RX, and LINE-TX ports. The power value for each wavelength is refreshed after a variable timer depending on the port and card activity.

You can install the 40-SMR2-C card in the following slots.

- Slots 2 and 3 in NCS 2002
- Slots 2 to 7 in NCS 2006
- Slots 2 to 7 in NCS 2015.

40-SMR2-C Power Monitoring

The 40-SMR2-C card has eight physical diodes (PD1 through PD8) and an OCM unit that monitors power at the input and output ports of the card (see the following table).

Table 37: 40-SMR2-C Port Calibration

Physical Photodiode	CTC Type Name	Calibrated to Port(s)
PD1	LINE	LINE-RX
PD2	LINE	LINE-RX
PD3	DC	DC-TX
PD4	DC	DC-RX
PD5	EXP	EXP-TX
PD6	OSC	OSC-RX
PD7	Not reported on CTC	Internal port
PD8	LINE	LINE-TX
OCM1	LINE OCH	LINE-TX
OCM2	DROP OCH	DROP-TX
OCM3	ADD OCH	ADD-RX
OCM4	EXP-1 OCH	EXP1-RX
OCM5	EXP-2 OCH	EXP2-RX
OCM6	EXP-3 OCH	EXP3-RX

40-SMR2-C Channel Plan

Table 25: Channel Allocation Plan, on page 54 shows the 40 ITU-T 100-GHz-spaced, C-band channels (wavelengths) supported by the 40-SMR2-C card.

Related Procedures for 40-SMR1-C and 40-SMR2-C Card

The following section lists procedures and tasks related to the configuration of the 40-SMR-1C and 40-SMR-2C cards:

- NTP-G140 Installing Fiber-Optic Cables Between Terminal, Hub, or ROADM Nodes
- NTP-G185 Installing Fiber-Optic Cables between Mesh Nodes
- NTP-G152 Creating and Verifying Internal Patchcords
- NTP-G37 Running Automatic Node Setup
- NTP-G243 Performing the Two-Degree ROADM Node with 40-SMR-1-C and OPT-AMP-17-C Cards Acceptance Test
- NTP-G244 Performing the Four Degree ROADM Node with 40-SMR-2-C Cards Acceptance Test
- NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections
- NTP-G51 Verify DWDM Node Turn Up
- DLP-G141 View Optical Power Statistics for 32WSS, 32WSS-L, 32DMX, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards
- NTP-G241 Modifying the Line Settings and PM Thresholds for 40-SMR1-C and 40-SMR2-C Cards

17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV Cards

The 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards are tunable over 96 channels in the C-band, at 50-GHz spacing on the ITU-T grid. The cards provide the flex spectrum capability, which give the flexibility to allocate channel bandwidth, to increase the network scalability. The channel bandwidth is not fixed, but can be defined arbitrarily, with a specified granularity and within a given range. For each sub-range, attenuation and power values are defined. The central frequency ranges from 191350 Ghz (1566 .72 nm) to 196100 Ghz (1528 .77 nm).

The 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards are single-slot cards that integrate two cross-connect blocks (multiplexer and demultiplexer), a variable gain EDFA pre-amplifier, and a variable gain EDFA booster amplifier. In addition, the SMR20 FS CV card has a dedicated laser source at the demultiplexer section, and a photodiode at the multiplexer section; these support the connection verification capability. The 17 SMR9 FS, 24 SMR9 FS, and 34 SMR9 FS cards support up to 9 directions for each ROADM node. The SMR20 FS/SMR20 FS CV card support up to 20 directions for each ROADM node. The cards can be installed in any service slot in the Cisco NCS 2000 Series chassis. The cards can be used in point-to-point, ring, multi-ring, or mesh topologies.

The SMR20 FS CV cards provide the connection verification capability using a connectivity check signal. The correctness and the quality of the interconnections (determined by measuring the insertion loss of the external passive path) can be validated with the connection verification feature in the cards . For more information about the connection verification, see *Connection Verification* section.

The EDFA pre-amplifier in SMR20 FS/SMR20 FS CV cards have switchable gain ranges. The following table describes the gain ranges and extended gain ranges of a EDFA pre-amplifier in the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards.

Table 38: Gain Ranges and Extended Gain Ranges of EDFA Pre-Amplifier

Card	Gain Range	Extended Gain Range
17 SMR9 FS	0 - 17 dB with controlled tilt	20 dB with uncontrolled tilt
24 SMR9 FS	12 - 24 dB with controlled tilt	27 dB with uncontrolled tilt
34 SMR9 FS	20 - 34 dB with controlled tilt	40 dB with uncontrolled tilt
SMR20 FS/SMR20 FS CV	Gain Range 1: 0 - 17 dB with controlled tilt	20 dB with uncontrolled tilt
	Gain Range 2: 12 - 24 dB with controlled tilt	35 dB with uncontrolled tilt

For more information, such as the block diagrams and the card specifications of the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards, see the data sheet.

SMR9 FS Ports

The SMR9 FS card has these ports:

- EXP-TX*i* (where *i* = 1 to 9)—The EXP TX port sends the split-off optical signal that contains pass-through channels to the other side of the NE. For example, in four degrees setup, the EXP ports can be used as drop Tx ports, EXP-Tx(1 to 4) are used as express channels from one side to other side. The 5th to 9th EXP-Tx ports are used to transmit power to passive units.
- EXP-RX*i* (where *i* = 1 to 9)—The EXP RX port receives the optical signal from the pass-through channels. For example, in the four degrees setup, the EXP ports can be used as drop Rx ports, EXP-Rx(1 to 4) are used to receive power from the express channel, from one side to other. The 5th to 9th EXP-Rx ports are used to receive power from passive units.
- OSC-TX— The OSC-TX port transmits the Service Channel signal received from the LINE-RX port signal, separating it from the C-Band signals.
- OSC-RX— The OSC-RX port receives signal from the Service Channel module and transmits it to the LINE-TX port.
- COM-TX—The COM TX port transmits the combined power from all the directions or add drop ports towards the amplifier.
- COM-RX— The COM RX port receives the optical signal from the pre-amplifier and sends it to the optical cross connect.

Note The COM-TX and COM-RX ports are not physical ports on the faceplate. These ports are represented in CTC.

- LINE-TX— The booster amplifier amplifies the composite signal coming from WXC-MUX towards the LINE-TX port.
- LINE-RX— The pre amplifier amplifies the composite signal coming from the LINE-RX port towards the WXC-DMX input.

20-SMRFS and 20-SMRFS-CV Ports

The 20-SMRFS and 20-SMRFS-CV cards have these ports:

- EXP-TX*i* (where *i* = 1–20)—The EXP Tx port sends the split-off optical signal that contains pass-through channels to the other side of the NE. For example, in the four degrees setup, the EXP ports can be used as drop Tx ports; EXP-Tx (1–4) ports are used as an express channel from one side to other side. The 5th to 20th EXP-Tx ports are used to transmit power to passive units.
- EXP-RX*i* (where *i* = 1–20)—The EXP RX port receives the optical signal from the pass-through channels. For example, in the four degrees setup, the EXP ports can be used as add Rx ports, EXP-Rx (1–4) are used to receive power from the express channels from one side to other. The 5th to 20th EXP-Rx ports are used to receive power from passive units.
- OSC-TX—The OSC-TX port transmits the Optical Service Channel signal that is received from the LINE-RX port signal to the controller card, separating it from the C-Band signals.
- OSC-RX—The OSC-RX port receives Optical Service Channel signal from the Controller Card and transmits it to the LINE-TX port.
- COM-TX—The COM TX port transmits the combined power from all directions or add or drop ports toward the booster amplifier.
- COM-RX—The COM RX port receives the optical signal from the pre-amplifier and sends it to the optical cross connect.



Note The COM-TX and COM-RX ports are not physical ports on the faceplate.

- LINE-TX—This port sends the optical signal from the local node to the far end node.
- LINE-RX—This port receives the optical signal from the far end node.

Key Features

The multiplexer section of the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards provide the following features:

- Selection of any arbitrary wavelength range from any EXP-RX*i* ports and routing to the MUX output port.
- Automatic VOA shutdown (AVS) blocking state on each wavelength on the MUX output port.
- Per-channel (closed loop) power regulation on the MUX output port based on OCM block feedback.
- Per-channel (open loop) attenuation regulation on the MUX output port, which is not based on the OCM feedback.

- Amplification of the aggregated C-Band signal toward the LINE-TX port by the variable gain booster EDFA amplifier.
- Combination of C-Band signals with 1510 nm by OSC MUX filter.
- Detection of the connectivity check signal, of wavelength 97 nm, by an embedded photodiode.

The demultiplexer section of the 9-SMR17FS, 9-SMR24FS, 9-SMR34FS, 20-SMRFS, and 20-SMRFS-CV cards provide the following features:

- Selection of any arbitrary wavelength range and routing to any EXP-TX*i* port.
- AVS blocking state on each wavelength, on any of the EXP-TX*i* ports.
- Per-channel (closed loop) power regulation on the EXP-TX*i* output port based on OCM block feedback.
- Per-channel (open loop) attenuation regulation on the EXP-TX*i* output port, which is not based on the OCM feedback.
- Amplification of the C-Band signals entering the LINE-RX port by the pre-amplifier.
- Separation of C-Band signals from 1510 nm by OSC De-MUX filter.
- Generation and transmission of the connectivity check signal into the DE-MUX input port.

The 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS cards also support count-based licensing. For more information on licensing, see the *Cisco NCS 2000 Series Licensing Configuration Guide*.

Connection Verification

The SMR20 FS CV cards provide the connection verification feature. This feature measures power levels and verifies the optical cables and patchcords in a node for:

- Connectivity: Checks whether the cable is connected.
- Insertion Loss: Checks whether the cable loss is within expected value.

A 1567 nm connectivity check signal is generated and transmitted into the DE-MUX input port by a dedicated laser source. This signal, in turn, is detected by an embedded photo diode to complete the verification. The highlights of this feature are:

- It validates the SMR20 FS CV card connection with other nodes or local Add/Drop elements.
- It detects any incorrect cabling of the ROADM network element.
- It collects insertion losses of every possible optical path inside the network element, in order to predict any possible failure.
- It verifies the connection every six hours, by default. Refer to http://www.cisco.com/c/en/us/td/docs/optical/15000r10_0/ncs/network_config/guide/b_ncs_network_configuration/b_ncs_network_configuration_chapter_010000.html#task_8B1E0075021B4A7EBCAC85FD09C02AC8 for manual validation of the SMR20 FS CV interconnections.

Note In releases earlier to Release 10.8, the Connection Verification (CV) procedure terminates when the CV and circuit creation procedures that use the same wavelength, run concurrently on CV enabled cards. The wavelength that was used for CV is then auto-provisioned due to which the circuit creation uses a different wavelength.

Connection Verification Prerequisites

The connection verification works only if the following conditions are fulfilled:

- Flex nodes must be present for the connection verification to work.
- Loopback caps must be installed on all the unused ports of the passive modules.
- At least one SMR20 FS CV card must be present in the node.
- All sides of the node must have a SMR20 FS CV card to test all cables and patchcords.
- All passive modules must be connected with an USB cable and associated, so that power readings can be calculated.

Supported Cards

The cards that supports connection verification are as follow:

- 16-AD-FS
- SMR20 FS CV
- MF-DEG-5 and MF-DEG-5-CV
- MF-MPO-16LC and MF-MPO-16LC-CV
- MF-PPMESH8-5AD
- MF-UPG-4 and MF-UPG-4-CV
- 100GC-CK-LC and 200G-CK-LC

Note

- Other MXP and TXP cards support CV partially; these cards support the CV for the patch cords belonging to paths going from TXP card trunk port to SMR20-FS-CV EXP-RX ports and not for the patch cords belonging to path in the opposite direction.
- MF-DEG-5, MF-DEG-5-CV, MF-MPO-16LC, MF-MPO-16LC-CV, MF-PPMESH8-5AD, MF-UPG-4, and MF-UPG-4-CV cards require loopback caps on unused ports. The (-CV) version is shipped with the loopback pre-installed.

Running the Connection Verification

The connection verification runs:

- Automatically at these time intervals and events:
  - 20 minutes after first shelf controller boot or reboot
  - One minute after enabling the connection verification
  - Ten minutes after new patch-cord creation or deletion (*)
  - Ten minutes after new circuit creation or deletion (*)
  - Every six hours
- For manual execution of connection verification, refer to http://www.cisco.com/c/en/us/td/docs/optical/15000r10_0/ncs/network_config/guide/b_ncs_network_configuration/b_ncs_network_configuration_chapter_010000.html#task_8B1E0075021B4A7EBCAC85FD09C02AC8.

(*) indicates that this condition occurs only after an automatic run is interrupted by the creation or deletion of a circuit or a patch cord.

PIDs of 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV Cards

The following table lists the PIDs and descriptions of the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards.

PID	Description
NCS2K-9-SMR17FS=	9 port Single Module ROADM - 0-17 dB Gain - Flex Spectrum
NCS2K-9-SMR24FS=	9 port Single Module ROADM - 12-24 dB Gain - Flex Spectrum
NCS2K-9-SMR34FS=	9 port Single Module ROADM - 20-34 dB Gain - Flex Spectrum
NCS2K-20-SMRFS=	20 port Single Module ROADM - Switchable Gain - Flex Spectrum
NCS2K-20-SMRFS-CV=	20 port Single Module ROADM - Switchable Gain Flex Spectrum with Connection Verification
NCS2K-9-SMR17FS-L=	9 port Single Module ROADM - 0-17 dB Gain - Licensed
NCS2K-9-SMR24FS-L=	9 port Single Module ROADM - 12-24 dB Gain - Licensed
NCS2K-9-SMR34FS-L=	9 port Single Module ROADM - 20-34 dB Gain - Licensed
NCS2K-20-SMRFS-L=	20 port Single Module ROADM - Switchable Gain - Flex Spectrum - Licensed
L-NCS2K-SMR-FS=	License PID to enable Flex Spectrum capability for the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS cards. NCS Flex package is required to use this license.
L-NCS2K-SMR-2P=	License PID to enable two EXP-TX/EXP-RX ports on the 17 SMR9 FS, 24 SMR9 FS, or 34 SMR9 FS cards.
L-NCS2K-SMR-4P=	License PID to enable four EXP-TX/EXP-RX ports on the SMR20 FS card.

Manual Firmware Upgrade on SMR20 FS and SMR20 FS CV Cards

Table 39: Feature History

Feature Name	Release Information	Feature Description
On-demand Firmware Upgrade of SMR20 FS and SMR20 FS CV Cards	Cisco NCS 2000 Release 11.13	It is necessary to perform a firmware upgrade to clear the TRAF-AFFECT-RESET-REQUIRED (Traffic Affecting Reset Required) alarm on the SMR 20 and SMR 20 FS CV cards. The **FIRMWARE Upgrade** button has been introduced in the **Maintenance** > **Firmware** tabs to initiate the upgrade operation on demand. This button performs an instantaneous firmware upgrade to the latest version.

Note Manual firmware upgrades are allowed only when there is a TRAF_AFFECT_RESET_REQUIRED alarm generated from the SMR20 FS or SMR 20 FS CV card.

Caution Since this procedure is traffic-affecting, the Firmware Upgrade must be done during a Maintenance window.

Procedure

Step 1 In the node view (single shelf mode) or shelf view (multishelf view), double click the SMR20 FS or SMR 20 FS CV card.

Step 2 Click the **Maintenance**> **Firmware** tabs.

Step 3 Click **FIRMWARE Upgrade**.

A warning message is displayed.

Step 4 Click **Yes**.

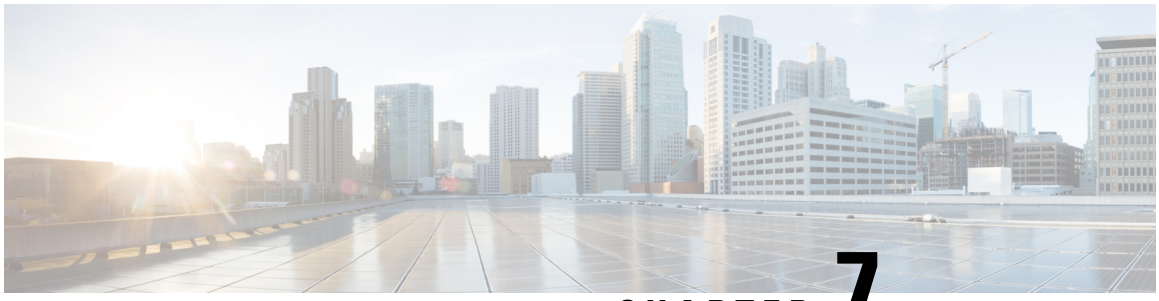
The card starts firmware upgrade. This operation is completed when the TRAF_AFFECT_RESET_REQUIRED alarm is cleared.

The procedure is complete.

Related Procedures for 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV Cards

The following section lists procedures and tasks related to the configuration of the 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS/SMR20 FS CV cards:

- DLP-G325 Changing Optical Amplifier Line Settings
- DLP-G326 Changing Optical Amplifier Threshold Settings
- DLP-G406 Changing Card Optical Channel Parameters for 40-WXC-C, 80-WXC-C, 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Cards
- DLP-G407 Changing the Optical Channel Thresholds for 40-WXC-C, 80-WXC-C, 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Cards
- DLP-G408 Changing Optical Line Parameters for 40-WXC-C, 80-WXC-C, 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Cards
- DLP-G409 Changing the Optical Line Thresholds for 40-WXC-C, 80-WXC-C, 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Cards
- DLP-G772 Viewing Wavelength Power for 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Card
- DLP-G773 Creating a Flex Spectrum or ITU Circuit for 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, or SMR20 FS CV Card
- DLP-G140 View Power Statistics for Optical Amplifier, 40-SMR1-C, 40-SMR2-C, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, and SMR20 FS CV Cards
- DLP-G141 View Optical Power Statistics for 32MUX-O, 32WSS, 32WSS-L, 32DMX-O,32DMX, 32DMX-L, 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, 16-WXC-FS, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, SMR20 FS, SMR20 FS CV, 40-MUX-C, 40-DMX-C, and 40-DMX-CE Cards



CHAPTER 7

Provisioning Transponder and Muxponder Cards

This chapter describes transponder (TXP), muxponder (MXP), GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, ADM-10G, OTU2_XP, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C,100ME-CKC, 100GS-CK-LC, 400G-XP-LC, WSE, AR_MXP, AR_XP, and AR_XPE cards, as well as their associated plug-in modules (Small Form-factor Pluggables [SFP, SFP+, XFP, CXP, or CFP module]). For card safety and compliance information, see the Regulatory Compliance and Safety Information for Cisco NCS Platform document.

Note The cards and procedures described in this chapter are supported on the Cisco NCS 2002 and Cisco NCS 2006 platforms, unless noted otherwise.

Note Cisco NCS supports IBM's 5G DDR (Double Data Rate) InfiniBand interfaces.

5G DDR InfiniBand is referred to as IB_5G.

Note When newly installed NCS 2000 cards are provisioned, they initially start in the Standby state. Ensure to provision the card's operating modes, trunk ports, and client ports as required. Change the administrative state of trunk or client ports to "IS," "OOS,MT," or "IS,AINS." Then, the card state will transition from Standby to Active state.

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Card Overview

The card overview section lists the cards described in this chapter and provides compatibility information.

The purpose of a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, ADM-10G, OTU2_XP, AR_MXP, AR_XP, or AR_XPE card is to convert the “gray” optical client interface signals into trunk signals that operate in the “colored” dense wavelength division multiplexing (DWDM) wavelength range. Client-facing gray optical signals generally operate at shorter wavelengths, whereas DWDM colored optical signals are in the longer wavelength range (for example, 1490 nm = violet; 1510 nm = blue; 1530 nm = green; 1550 nm = yellow; 1570 nm = orange; 1590 nm = red; 1610 nm = brown). Some of the newer client-facing PPMs, however, operate in the colored region. Transponding or muxponding is the process of converting the signals between the client and trunk wavelengths.

An MXP generally handles several client signals. It aggregates, or multiplexes, lower rate client signals together and sends them out over a higher rate trunk port. Likewise, it demultiplexes optical signals coming in on a trunk and sends them out to individual client ports. A TXP converts a single client signal to a single trunk signal and converts a single incoming trunk signal to a single client signal. GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards can be provisioned as TXPs, as MXPs, or as Layer 2 switches.

All of the TXP and MXP cards perform optical to electrical to optical (OEO) conversion. As a result, they are not optically transparent cards. The reason for this is that the cards must operate on the signals passing through them, so it is necessary to do an OEO conversion.

On the other hand, the termination mode for all of the TXPs and MXPs, which is done at the electrical level, can be configured to be transparent. In this case, neither the Line nor the Section overhead is terminated. The cards can also be configured so that either Line or Section overhead can be terminated, or both can be terminated.

Note The MXP_2.5G_10G card, by design, when configured in the transparent termination mode, actually does terminate some of the bytes. See "Termination Modes" section for details.

Card Compatibility

Table 40: Platform and Software Release Compatibility for Transponder and Muxponder Cards

Card Name	R9.2	R9.2.1	R9.3	R9.4	R9.6.x	R9.8
TXP_MR_10G	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
TXP_MR_10E	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
TXP_MR_10E_C	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
TXP_MR_10E_L	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM

TXP_MR_2.5G and TXPP_MR_2.5G	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
MXP_2.5G_10G	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
MXP_2.5G_10E	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
MXP_2.5G_10E_C	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
MXP_2.5G_10E_L	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
MXP_MR_2.5G and MXPP_MR_2.5G	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
MXP_MR_10DME_C	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
MXP_MR_10DME_L	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM	15454 - DWDM
GE_XP and 10GE_XP	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
GE_XPE and 10GE_XPE	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
ADM - 10G	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM

OTU2_XP	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
TXP_MR_10EX_C, MXP_2.5G_10EX_C, and MXP_MR_10DMEX_C	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
40E - TXP - C, 40ME - TXP - C, 40E - MXP - C, and 40ME - MXP - C	No	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
40E - MXP - C	No	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
40G - MXP - C	15454-M2, 15454-M6, 15454-DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
AR_XP	No	No	No	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
AR_MXP and AR_XPE	No	No	No	No	15454 - M2, 15454 - M6, 15454 - DWDM	15454 - M2, 15454 - M6, 15454 - DWDM
100G - LC - C, 100G - ME-C, and 10x10G-LC	No	No	No	No	15454 - M2, 15454 - M6	15454 - M2, 15454 - M6
CFP-LC	No	No	No	No	15454 - M6	15454 - M6
WSE	No	No	No	No	No	15454 - M2, 15454 - M6
100GS-CK-LC	No	No	No	No	No	No
200G-CK-LC	No	No	No	No	No	No
MR-MXP	No	No	No	No	No	No

100ME-CKC	No	No	No	No	No	No
100G-CK-C	No	No	No	No	No	No
400G-XP-LC	No	No	No	No	No	No

Table 41: Platform and Software Release Compatibility for Transponder and Muxponder Cards

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1/10.6.2	R10.7 - R10.9	R11.x.x
TXP_MR_10E_C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
TXP_MR_10E_L	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
TXP_MR_10E	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
TXP_MR_2.5G, TXPP_MR_2.5G	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
MXP_2.5G_10G	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
MXP_2.5G_10E_C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
MXP_2.5G_ 10E_L	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
MXP_MR_2.5G, MXPP_ MR_2.5G	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1/10.6.2	R10.7 - R10.9	R11.x.x
MXP_MR_10DME_C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006 (From R10.8) NCS 2015	NCS 2002, NCS 2006 (From R10.8) NCS 2015
MXP_MR_10DME_L	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
GE_XP and 10GE_XP	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006 (From R10.8) NCS 2015	NCS 2002, NCS 2006 (From R10.8) NCS 2015
GE_XPE and 10GE_XPE	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006 (From R10.8) NCS 2015	NCS 2002, NCS 2006 (From R10.8) NCS 2015
ADM-10G	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
OTU2_XP	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1/10.6.2	R10.7 - R10.9	R11.x.x
TXP_MR_10EX_C, MXP_2.5G_ 10EX_C, MXP_MR_ 10DMEX_C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
40E-TXP-C, 40ME-TXP-C, 40ME-MXP-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
40E-MXP-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
40G-MXP-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
AR_XP	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
AR_MXP, AR_XPE	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
100G-LC-C, 100G-ME-C, 10x10G-LC	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
CFP-LC	NCS 2006	NCS 2006	NCS 2006	NCS 2006	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015	NCS 2006, NCS 2015

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1/10.6.2	R10.7 - R10.9	R11.x.x
WSE	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
100G-CK-LC, 100ME-CK-LC	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006
100GS-CK-LC	No	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
200G-CK-LC	No	No	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
MR-MXP	No	No	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
100ME-CKC	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015
100G-CK-C	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Card Name	R10.0	R10.1	R10.3	R10.5	R10.5.2	R10.6.1/10.6.2	R10.7 - R10.9	R11.x.x
400G-XP-LC	No	No	No	No	No	NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015	NCS 2002, NCS 2006, NCS 2015

Version Number Compatibility for Transponder and Muxponder Cards

Older versions of the TXP_MR_10E_C, TXP_MR_2.5G, TXPP_MR_2.5G, and MXP_2.5G_10E_C cards cannot be installed in the Cisco NCS 2002 and Cisco NCS 2006 shelves because of an incompatible backplane connector.

The following table describes the version numbers of the cards that are compatible with the Cisco NCS 2002 and Cisco NCS 2006 shelves. The version numbers can be viewed from the HW Rev field in the Inventory tab.

Table 42: Version Number Compatibility

Card	Version Number
TXP_MR_2.5G	Version 06 or later of the different unit part number
TXPP_MR_2.5G	Version 06 or later of the different unit part number
MXP_2.5G_10E_C	Version 04 or later of the 800-26774 part number
TXP_MR_10E_C	Version 04 or later of the 800-26772 part number

Safety Labels

For information about safety labels, see the "Safety Labels" section.

Interface Classes

The input interface cards have been grouped in classes listed in the following table. The subsequent tables list the optical performance and output power of each interface class.

Table 43: Card Interfaces Assigned to Input Power Classes

Input Power Class	Card
A	10-Gbps multirate transponder cards (TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, and TXP_MR_10E_L) with forward error correction (FEC) enabled, 10-Gbps muxponder cards (MXP_2.5G_10G, MXP_2.5G_10E, MXP_MR_10DME_C, MXP_MR_10DME_L, MXP_2.5G_10E_C, and MXP_2.5G_10E_L) with FEC enabled, 40-Gbps transponder cards (40E-TXP-C, and 40ME-TXP-C), and 40-Gbps muxponder cards (40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C)

Input Power Class	Card
B	10-Gbps multirate transponder card (TXP_MR_10G) without FEC and the 10-Gbps muxponder card (MXP_2.5G_10G, MXP_MR_10DME_C, MXP_MR_10DME_L), 40-Gbps transponder cards (40E-TXP-C, and 40ME-TXP-C), and 40-Gbps muxponder cards (40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C), and ADM-10G cards with FEC disabled
C	OC-192 LR ITU cards without FEC, 10-Gbps multirate transponder (TXP_MR_10E, TXP_MR_10E_C, and TXP_MR_10E_L) and muxponder (MXP_2.5G_10E, MXP_2.5G_10E_L, and MXP_MR_10DME_L) cards with FEC disabled
D	2.5-Gbps multirate transponder card (TXP_MR_2.5G), both protected and unprotected, with FEC enabled
E	OC-48 100-GHz dense wavelength division multiplexing (DWDM) muxponder card (MXP_MR_2.5G) and 2.5-Gbps multirate transponder card (TXP_MR_2.5G), protected or unprotected; FEC disabled; and retime, reshape, and regenerate (3R) mode enabled
F	2.5-Gbps multirate transponder card (TXP_MR_2.5G), protected or unprotected, in regenerate and reshape (2R) mode
G	OC-48 ELR 100 GHz card
H	2/4 port GbE transponder (GBIC WDM 100GHz)
I	10-Gbps multirate transponder cards (TXP_MR_10E, TXP_MR_10E_C, and TXP_MR_10E_L) and 10-Gbps muxponder cards (MXP_2.5G_10E, MXP_2.5G_10E_L, and MXP_MR_10DME_L) with enhanced FEC (E-FEC) enabled, 40-Gbps transponder cards (40E-TXP-C, and 40ME-TXP-C), and 40-Gbps muxponder cards (40G-MXP-C, 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C) with E-FEC enabled
K	OC-192/STM-64 LR ITU cards without FEC, 100GHz 10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with FEC disabled
L	40Gbps Duobinary CRS-1 DWDM ITU-T line card
M	2.5 Gbps DWDM ITU-T SPF
N	10Gbps enhanced full tunable transponder (TXP_MR_10E_C) and muxponder (MXP_2.5G_10E_C, MXP_MR_10DME_C) with E-FEC enabled
O	10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), 10Gbps Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with FEC enabled
P	10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), 10Gbps Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with E-FEC enabled
T	40Gbps DPSK CRS-1 DWDM ITU-T line card

Input Power Class	Card
V	OC-192/STM-64 LR ITU cards without FEC, full tunable 10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with FEC disabled, full tunable
W	10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with FEC enabled, full tunable
X	10Gbps Ethernet Xponder (GE_XP, GE_XPE, 10GE_XP, 10GE_XPE), Sonet/SDH add/drop (ADM_10G), OTU2 Xponder (OTU2_XP), with E-FEC enabled, full tunable
Y	10Gbps enhanced full tunable transponder (TXP_MR_10EX_C) and muxponder (MXP_2.5G_10EX_C, MXP_MR_10DMEX_C), with FEC enabled and maximum likelihood sequence estimator (MLSE) correction
Z	10Gbps enhanced full tunable transponder (TXP_MR_10EX_C) and muxponder (MXP_2.5G_10EX_C, MXP_MR_10DMEX_C), with E-FEC enabled and MLSE correction

Table 44: 40-Gbps Interface Optical Performance

Parameter	Class A		Class B		Class I	
Type	Power Limited	OSNR Limited (if appl.) OSNR = optical signal-to-noise ratio	Power Limited	OSNR Limited (if appl.)	Power Limited	OSNR Limited (if appl.)
Maximum bit rate	40 Gbps		40 Gbps		40 Gbps	
Regeneration	3R		3R		3R	
FEC	Yes		No		Yes (E-FEC)	
Threshold	Optimum		Average		Optimum	
Maximum BER BER = bit error rate	10–15		10–12		10–15	
OSNR sensitivity OSNR = optical signal-to-noise ratio	23 dB	9 dB	23 dB	19 dB	20 dB	8 dB
Power sensitivity	–24 dBm	–18 dBm	–21 dBm	–20 dBm	–26 dBm	–18 dBm
Power overload	–8 dBm		–8 dBm		–8 dBm	

Parameter	Class A		Class B		Class I	
Type	Power Limited	OSNR Limited (if appl.) OSNR = optical signal-to-noise ratio	Power Limited	OSNR Limited (if appl.)	Power Limited	OSNR Limited (if appl.)
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power values for the OADM cards.						
40-Gbps multirate transponder/40-Gbps FEC transponder (40E-TXP-C, and 40ME-TXP-C)	+2.5 to 3.5 dBm		+2.5 to 3.5 dBm		—	
OC-192 LR ITU	—		—		—	
Dispersion compensation tolerance	+/–800 ps/nm		+/–1,000 ps/nm		+/–800 ps/nm	

Table 45: 10-Gbps Interface Optical Performance (Class A, B, C, I, and K)

Parameter	Class A		Class B		Class C		Class I		Class K	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited
Maximum bit rate	10 Gbps		10 Gbps		10 Gbps		10 Gbps		10 Gbps	
Regeneration	3R		3R		3R		3R		3R	
FEC	Yes		No		No		Yes (E-FEC)		No	
Threshold	Optimum		Average		Average		Optimum		Average	
Maximum BER	10–15		10–12		10–12		10–15		10–12	

Parameter	Class A		Class B		Class C		Class I		Class K	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limit
OSNR sensitivity	23 dB	8.5 dB	23 dB	19 dB	19 dB	19 dB	20 dB 6 dB		23 dB This value is for Xen Pak XFP used with Catalyst card.	16 dB3
									23 dB This value is for XFP used with Catalyst, Xponder, and ADM-10G cards.	17 dB4
									23 dB This value is for X2 XFP used with Catalyst card.	17 dB5
Power sensitivity	–24 dBm	–18 dBm	–21 dBm	–20 dBm	–22 dBm	–22 dBm	–26 dBm	–18 dBm	–24 dBm3	–17 dBm3
									–23 dBm4	–18 dBm4
									–23 dBm5	–17 dBm5
Power overload	–8 dBm		–8 dBm		–9 dBm		–8 dBm		–7 dBm	
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power val optical add drop multiplexer (OADM) cards.										
10-Gbps multirate transponder /10-Gbps FEC transponder	+2.5 to 3.5 dBm (for TXP_MR_10G) +3.0 to 6.0 dBm (for TXP_MR_10E)		+2.5 to 3.5 dBm		+3.0 to 6.0 dBm		+3.0 to 6.0 dBm		—	

Parameter	Class A		Class B		Class C		Class I		Class K	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited
OC-192 LR ITU	—		—		+3.0 to 6.0 dBm		—		–1.0 to +3.0 dBm	
10-Gbps Ethernet Xponder, Sonet/SDH Add/Drop, OTU2 Xponder	—		—		—		—		–1.0 to +3.0 dBm	
Dispersion compensation tolerance	+/–800 ps/nm		+/–1,000 ps/nm		+/–1,000 ps/nm		+/–800 ps/nm		–400 to +800 ps/nm	

Table 46: 10-Gbps Interface Optical Performance (Class N, O, P, and V)

Parameter	Class N		Class O		Class P		Class V	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited
Maximum bit rate	10 Gbps		10 Gbps		10 Gbps		10 Gbps	
Regeneration	3R		3R		3R		3R	
FEC	Yes (E-FEC)		Yes		Yes (E-FEC)		No	
Threshold	Optimum		Optimum		Optimum		Average	
Maximum BER	10–15		10–15		10–15		10–12	
OSNR sensitivity	19 dB	5 dB	11 dB	11 dB	23 dB	8 dB	23 dB	16 dB
Power sensitivity	–27 dBm	–20 dBm	–18 dBm	–18 dBm	–27 dBm	–18 dBm	–24 dBm	–18 dBm
Power overload	–8 dBm		–7 dBm		–7 dBm		–7 dBm	
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power values for the optical add drop multiplexer (OADM) cards.								
10-Gbps multirate transponder/10-Gbps FEC transponder	+3.0 to 6.0 dBm		—		—		—	
OC-192 LR ITU	—		—		—		0 to +3.0 dBm	

Parameter	Class N		Class O		Class P		Class V	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited
10-Gbps Ethernet Xponder, Sonet/SDH Add/Drop, OTU2 Xponder	—		–1.0 to +3.0 dBm		–1.0 to +3.0 dBm		0 to +3.0 dBm	
Dispersion compensation tolerance	+/–800 ps/nm		–500 to +1100 ps/nm		–500 to +1100 ps/nm		–500 to +1600 ps/nm	

Table 47: 10-Gbps Interface Optical Performance (Class W, X, Y, and Z)

Parameter	Class W		Class X		Class Y		Class Z	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	
Maximum bit rate	10 Gbps		10 Gbps		10 Gbps		10 Gbps	
Regeneration	3R		3R		3R		3R	
FEC	Yes		Yes (E-FEC)		Yes		Yes (E-FEC)	
Threshold	Optimum		Optimum		Optimum		Optimum	
Maximum BER	10–15		10–15		10–15		10–15	
OSNR sensitivity	8.5 dB	8.5 dB	19 dB	5 dB	23 dB	8 dB	19 dB	
Power sensitivity	–18 dBm	–18 dBm	–27 dBm	–20 dBm	–24 dBm	–20 dBm	–27 dBm	
Power overload	–7 dBm		–7 dBm		–8 dBm		–8 dBm	
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power val the optical add drop multiplexer (OADM) cards.								
10-Gbps multirate transponder/10-Gbps FEC transponder	—		—		+3.0 to 6.0 dBm		+3.0 to 6.0 dBm	
OC-192 LR ITU	—		—		—		—	
10-Gbps Ethernet Xponder, Sonet/SDH Add/Drop, OTU2 Xponder	0 to +3.0 dBm		0 to +3.0 dBm		—		—	
Dispersion compensation tolerance	–500 to +1100 ps/nm		–500 to +1300 ps/nm		–800 to +1600 ps/nm		–2200 to +3700	

Table 48: 2.5-Gbps Interface Optical Performance (Class D, E, and F)

Parameter	Class D		Class E		Class F	
Type	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**
Maximum bit rate	2.5 Gbps		2.5 Gbps		2.5 Gbps	
Regeneration	3R		3R		2R	
FEC	Yes		No		No	
Threshold	Average		Average		Average	
Maximum BER	10–15		10–12		10–12	
OSNR sensitivity	14 dB	5 dB	14 dB	10 dB	15 dB	15 dB
Power sensitivity	–31 dBm	–25 dBm	–30 dBm	–23 dBm	–24 dBm	–24 dBm
Power overload	–9 dBm		–9 dBm		–9 dBm	
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power values for the optical add drop multiplexer (OADM) cards.						
TXP_MR_2.5G and TXPP_MR_2.5G	–1.0 to 1.0 dBm		–1.0 to 1.0 dBm		–1.0 to 1.0 dBm	
MXP_MR_2.5G and MXPP_MR_2.5G	—		+2.0 to +4.0 dBm		—	
OC-48 ELR 100 GHz	—		—		—	
2/4 port GbE Transponder (GBIC WDM 100GHz)	—		—		—	
2.5 Gbps DWDM ITU-T SPF	—		—		—	
Dispersion compensation tolerance	–1200 to +5400 ps/nm		–1200 to +5400 ps/nm		–1200 to +3300 ps/nm	

Table 49: 2.5-Gbps Interface Optical Performance (Class G, H, and M)

Parameter	Class G		Class H		Class M	
Type	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**	**Power Limited**	**OSNR Limited**
Maximum bit rate	2.5 Gbps		1.25 Gbps		2.5 Gbps	
Regeneration	3R		3R		3R	
FEC	No		No		No	

Parameter	Class G		Class H		Class M	
Type	Power Limited	OSNR Limited	Power Limited	OSNR Limited	Power Limited	OSNR Limited
Threshold	Average		Average		Average	
Maximum BER	10–12		10–12		10–12	
OSNR sensitivity	14 dB	11 dB	13 dB	8 dB	14 dB	9 dB
Power sensitivity	–27 dBm	–23 dBm	–28 dBm	–18 dBm	–28 dBm	–22 dBm
Power overload	–9 dBm		–7 dBm		–9 dBm	
Transmitted Power Range—These values, decreased by patchcord and connector losses, are also the input power values for the optical add drop multiplexer (OADM) cards.						
TXP_MR_2.5G	—		—		—	
TXPP_MR_2.5G	—					
MXP_MR_2.5G	–2.0 to 0 dBm					
MXPP_MR_2.5G	—					
OC-48 ELR 100 GHz	—		—		—	
2/4 port GbE Transponder (GBIC WDM 100GHz)	–1200 to +3300 ps/nm		0 to +3 dBm		—	
2.5 Gbps DWDM ITU-T SPF			—		0 to +4 dBm	
Dispersion compensation tolerance			–1000 to +3600 ps/nm		–800 to +2400 ps/nm	

TXP_MR_10E Card

The card is fully backward compatible with the TXP_MR_10G card. It processes one 10-Gbps signal (client side) into one 10-Gbps, 100-GHz DWDM signal (trunk side) that is tunable over four wavelength channels (spaced at 100 GHz on the ITU grid) in the C band and tunable over eight wavelength channels (spaced at 50 GHz on the ITU grid) in the L band. There are eight versions of the C-band card, with each version covering four wavelengths, for a total coverage of 32 wavelengths. There are five versions of the L-band card, with each version covering eight wavelengths, for a total coverage of 40 wavelengths.

You can install TXP_MR_10E cards in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006, Slots 2 to 16 in Cisco NCS 2015 chassis and provision the cards in a linear configuration, BLSR/MS-SPRing, path protection/SNCP, or a regenerator. The card can be used in the middle of BLSR/MS-SPRing or 1+1 spans when the card is configured for transparent termination mode.

The TXP_MR_10E card features a 1550-nm tunable laser (C band) or a 1580-nm tunable laser (L band) for the trunk port and ONS-XC-10G-S1 1310-nm or ONS-XC-10G-L2 1550-nm laser XFP module for the client port that can be ordered separately.

When TNCS-2 and TNCS-2O cards are present as control cards, LDCC is not supported for the TXP_MR_10E card.



Note When the ONS-XC-10G-L2 XFP is installed, the TXP_MR_10E card must be installed in Slots 6, 7, 12, or 13 in the .

On its faceplate, the TXP_MR_10E card contains two transmit and receive connector pairs, one for the trunk port and one for the client port. Each connector pair is labeled.

Key Features

The key features of the TXP_MR_10E card are:

- A tri-rate client interface (available through the ONS-XC-10G-S1 XFP, ordered separately)
  - OC-192 (SR1)
  - 10GE (10GBASE-LR)
  - 10G-FC (1200-SM-LL-L)
  - IB_5G
- OC-192 to ITU-T G.709 OTU2 provisionable synchronous and asynchronous mapping
- The MTU setting is used to display the OverSizePkts counters on the receiving Gigabit Ethernet client port interfaces. Traffic of frame sizes up to 65535 bytes pass without any packet drops, from the client port to the trunk port irrespective of the MTU setting.

TXP_MR_10E Functions

The following functions of the TXP_MR_10E card are explained in "Card Features" chapter:

- Client Interface
- DWDM Trunk Interface
- FEC
- Client-to-Trunk Mapping

For more information about the TXP_MR_10E card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/ps5320/product_data_sheet0900aecd803fc3e8_ps13234_Products_Data_Sheet.html.

Related Procedures for TXP_MR_10E Card

The following is the list of procedures and tasks related to the configuration of the TXP_MR_10E card:

- NTP-G96 Provisioning the 10G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds, on page 344

- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

TXP_MR_10E_C and TXP_MR_10E_L Cards

The TXP_MR_10E_C and TXP_MR_10E_L cards are fully backward compatible with the TXP_MR_10G and TXP_MR_10E cards. They processes one 10-Gbps signal (client side) into one 10-Gbps, 100-GHz DWDM signal (trunk side). The TXP_MR_10E_C is tunable over the entire set of C-band wavelength channels (82 channels spaced at 50 GHz on the ITU grid). The TXP_MR_10E_L is tunable over the entire set of L-band wavelength channels (80 channels spaced at 50 GHz on the ITU grid) and is particularly well suited for use in networks that employ DS fiber or SMF-28 single-mode fiber.

The advantage of these cards over previous versions (TXP_MR_10G and TXP_MR_10E) is that there is only one version of each card (one C-band version and one L-band version) instead of several versions needed to cover each band.

You can install TXP_MR_10E_C and TXP_MR_10E_L cards in , Slot 2 in Cisco NCS 2002 chassis, Slots 2 to 6 in Cisco NCS 2006 and provision the cards in a linear configuration, BLSR/MS-SPRing, 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.

The TXP_MR_10E_C and TXP_MR_10E_L cards feature a universal transponder 2 (UT2) 1550-nm tunable laser (C band) or a UT2 1580-nm tunable laser (L band) for the trunk port and a separately orderable ONS-XC-10G-S1 1310-nm or ONS-XC-10G-L2 1550-nm laser XFP module for the client port.

On its faceplate, the TXP_MR_10E_C and TXP_MR_10E_L cards contain two transmit and receive connector pairs, one for the trunk port and one for the client port. Each connector pair is labeled.

Key Features

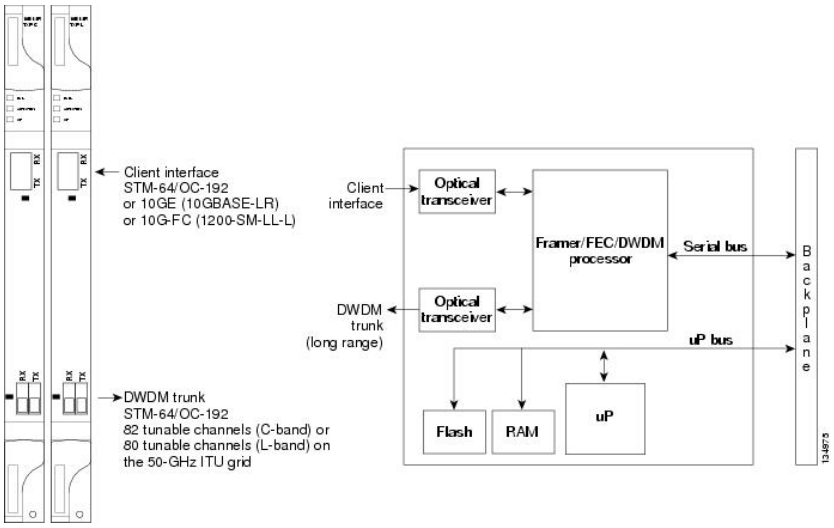
The key features of the TXP_MR_10E_C and TXP_MR_10E_L cards are:

- A tri-rate client interface (available through the ONS-XC-10G-S1 XFP, ordered separately):
  - OC-192 (SR1)
  - 10GE (10GBASE-LR)
  - 10G-FC (1200-SM-LL-L)
- A UT2 module tunable through the entire C band (TXP_MR_10E_C card) or L band (TXP_MR_10E_L card). The channels are spaced at 50 GHz on the ITU grid.
- OC-192 to ITU-T G.709 OTU2 provisionable synchronous and asynchronous mapping.
- The MTU setting is used to display the OverSizePkts counters on the receiving Gigabit Ethernet client port interfaces. Traffic of frame sizes up to 65535 bytes pass without any packet drops, from the client port to the trunk port irrespective of the MTU setting.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Faceplates and Block Diagram

Figure 12: TXP_MR_10E_C and TXP_MR_10E_L Faceplates and Block Diagram



For information about safety labels for the cards, see the "Class 1M Laser Product Cards" section.

Caution You must use a 15-dB fiber attenuator (10 to 20 dB) when working with the TXP_MR_10E_C or TXP_MR_10E_L card in a loopback on the trunk port. Do not use direct fiber loopbacks with the cards. Using direct fiber loopbacks causes irreparable damage to the cards.

TXP_MR_10E_C and TXP_MR_10E_L Functions

The following functions of the TXP_MR_10E_C and TXP_MR_10E_L cards are explained in "Card Features" chapter:

- Automatic Laser Shutdown
- Card level indicators
- Port level indicators
- Client Interface
- DWDM Trunk Interface
- FEC
- Client-to-Trunk Mapping

Related Procedures for TXP_MR_10E_C and TXP_MR_10E_L Cards

The following is the list of procedures and tasks related to the configuration for both TXP_MR_10E_C and TXP_MR_10E_L:

- NTP-G96 Provisioning the 10G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds, on page 344
- NTP-G75 Monitor Transponder and Muxponder Performance

TXP_MR_2.5G and TXPP_MR_2.5G Cards

The TXP_MR_2.5G card processes one 8-Mbps to 2.488-Gbps signal (client side) into one 8-Mbps to 2.5-Gbps, 100-GHz DWDM signal (trunk side). It provides one long-reach STM-16/OC-48 port per card, compliant with ITU-T G.707, ITU-T G.709, ITU-T G.957, and Telcordia GR-253-CORE.

The TXPP_MR_2.5G card processes one 8-Mbps to 2.488-Gbps signal (client side) into two 8-Mbps to 2.5-Gbps, 100-GHz DWDM signals (trunk side). It provides two long-reach STM-16/OC-48 ports per card, compliant with ITU-T G.707, ITU-T G.957, and Telcordia GR-253-CORE.

The TXP_MR_2.5G and TXPP_MR_2.5G cards are tunable over four wavelengths in the 1550-nm, ITU 100-GHz range. They are available in eight versions, each of which covers four wavelengths, for a total coverage of 32 different wavelengths in the 1550-nm range.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Note ITU-T G.709 specifies a form of FEC that uses a "wrapper" approach. The digital wrapper lets you transparently take in a signal on the client side, wrap a frame around it, and restore it to its original form. FEC enables longer fiber links because errors caused by the optical signal degrading with distance are corrected.

The trunk/line port operates at up to 2.488 Gbps (or up to 2.66 Gbps with ITU-T G.709 Digital Wrapper/FEC) over unamplified distances up to 360 km (223.7 miles) with different types of fiber such as C-SMF or higher if dispersion compensation is used.

Caution Because the transponder has no capability to look into the payload and detect circuits, a TXP_MR_2.5G or TXPP_MR_2.5G card does not display circuits under card view.

The TXP_MR_2.5G and TXPP_MR_2.5G cards support 2R (retime, regenerate) and 3R (retime, reshape, and regenerate) modes of operation where the client signal is mapped into a ITU-T G.709 frame. The mapping function is simply done by placing a digital wrapper around the client signal. Only OC-48/STM-16 client signals are fully ITU-T G.709 compliant, and the output bit rate depends on the input client signal. The following table shows the possible combinations of client interfaces, input bit rates, 2R and 3R modes, and ITU-T G.709 monitoring.

Table 50: 2R and 3R Mode and ITU-T G.709 Compliance by Client Interface

Client Interface	Input Bit Rate	3R vs. 2R	ITU-T G.709
OC-48/STM-16	2.488 Gbps	3R	On or Off
DV-6000	2.38 Gbps	2R	—

Client Interface	Input Bit Rate	3R vs. 2R	ITU-T G.709
2 Gigabit Fibre Channel (2G-FC)/fiber connectivity (FICON)	2.125 Gbps	3R No monitoring	On or Off
High-Definition Television (HDTV)	1.48 Gbps	2R	—
Gigabit Ethernet (GE)	1.25 Gbps	3R	On or Off
1 Gigabit Fibre Channel (1G-FC)/FICON	1.06 Gbps	3R	On or Off
OC-12/STM-4	622 Mbps	3R	On or Off
OC-3/STM-1	155 Mbps	3R	On or Off
Enterprise System Connection (ESCON)	200 Mbps	2R	—
SDI/D1/DVB-ASI video	270 Mbps	2R	—
ISC-1 Compat	1.06 Gbps	2R	Off
ISC-3	1.06 or 2.125 Gbps	2R	—
ETR_CLO	16 Mbps	2R	—

Note ITU-T G.709 and FEC support is disabled for all the 2R payload types in the TXP_MR_2.5G and TXPP_MR_2.5G cards.

The output bit rate is calculated for the trunk bit rate by using the 255/238 ratio as specified in ITU-T G.709 for OTU1. The following table lists the calculated trunk bit rates for the client interfaces with ITU-T G.709 enabled.

Table 51: Trunk Bit Rates With ITU-T G.709 Enabled

Client Interface	ITU-T G.709 Disabled	ITU-T G.709 Enabled
OC-48/STM-16	2.488 Gbps	2.66 Gbps
2G-FC	2.125 Gbps	2.27 Gbps
GE	1.25 Gbps	1.34 Gbps
1G-FC	1.06 Gbps	1.14 Gbps
OC-12/STM-3	622 Mbps	666.43 Mbps
OC-3/STM-1	155 Mbps	166.07 Mbps

For 2R operation mode, the TXP_MR_2.5G and TXPP_MR_2.5G cards have the ability to pass data through transparently from client side interfaces to a trunk side interface, which resides on an ITU grid. The data might vary at any bit rate from 200-Mbps up to 2.38-Gbps, including ESCON, DVB-ASI, ISC-1, and video signals.

In this pass-through mode, no performance monitoring (PM) or digital wrapping of the incoming signal is provided, except for the usual PM outputs from the SFPs. Similarly, this card has the ability to pass data through transparently from the trunk side interfaces to the client side interfaces with bit rates varying from 200-Mbps up to 2.38-Gbps. Again, no PM or digital wrapping of received signals is available in this pass-through mode.

For 3R operation mode, the TXP_MR_2.5G and TXPP_MR_2.5G cards apply a digital wrapper to the incoming client interface signals (OC-N/STM-N, 1G-FC, 2G-FC, GE). PM is available on all of these signals except for 2G-FC, and varies depending upon the type of signal. For client inputs other than OC-48/STM-16, a digital wrapper might be applied but the resulting signal is not ITU-T G.709 compliant. The card applies a digital wrapper that is scaled to the frequency of the input signal.

The TXP_MR_2.5G and TXPP_MR_2.5G cards have the ability to take digitally wrapped signals in from the trunk interface, remove the digital wrapper, and send the unwrapped data through to the client interface. PM of the ITU-T G.709 OH and SONET/SDH OH is implemented.

You can install TXP_MR_2.5G and TXPP_MR_2.5G cards in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006. You can provision this card in a linear configuration. TXP_MR_10G and TXPP_MR_2.5G cards cannot be provisioned as a BLSR/MS-SPRing, a path protection/SNCP, or a regenerator. They can be used in the middle of BLSR/MS-SPRing or 1+1 spans only when the card is configured for transparent termination mode.

The TXP_MR_2.5G card features a 1550-nm laser for the trunk/line port and a 1310-nm laser for the client port. It contains two transmit and receive connector pairs (labeled) on the card faceplate. The card uses dual LC connectors for optical cable termination.

The TXPP_MR_2.5G card features a 1550-nm laser for the trunk/line port and a 1310-nm or 850-nm laser (depending on the SFP) for the client port and contains three transmit and receive connector pairs (labeled) on the card faceplate. The card uses dual LC connectors for optical cable termination.

Related Procedures for TXP_MR_2.5G and TXPP_MR_2.5G Cards

The following is the list of procedures and tasks related to the configuration for both TXP_MR_2.5G and TXPP_MR_2.5G:

- NTP-G98 Provisioning the 2.5G Multirate Transponder Card Line Settings and PM Parameter Thresholds, on page 320
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

40E-TXP-C and 40ME-TXP-C Cards

The 40E-TXP-C and 40ME-TXP-C cards process a single 40-Gbps signal (client side) into a single 40-Gbps, 50-GHz DWDM signal (trunk side). It provides one 40-Gbps port per card that can be provisioned for an OC-768/STM-256 very short reach (1550-nm) signal compliant with ITU-T G.707, ITU-T G.691, and Telcordia GR-253-CORE, 40G Ethernet LAN signal compliant with IEEE 802.3ba, or OTU3 signal compliant with ITU-T G.709.

You can install and provision the 40E-TXP-C and 40ME-TXP-C cards in a linear configuration in:

- Slot 2 in Cisco NCS 2002 chassis

- Slots 2 to 6 in Cisco NCS 2006 chassis

When a protection switch occurs on the 40E-TXP-C, and 40ME-TXP-C cards, the recovery from PSM protection switch takes about 3 to 4 minutes.

For more information about the 40E-TXP-C and 40ME-TXP-C cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-643796.html.

Related Procedures for 40E-TXP-C and 40ME-TXP-C Cards

The following is the list of procedures and tasks related to the configuration of 40E-TXP-C and 40ME-TXP-C:

- NTP-G292 Provisioning the 40G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds, on page 361
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_2.5G_10G Card

The MXP_2.5G_10G card has reached end of support.

The MXP_2.5G_10G card multiplexes/demultiplexes four 2.5-Gbps signals (client side) into one 10-Gbps, 100-GHz DWDM signal (trunk side). It provides one extended long-range STM-64/OC-192 port per card on the trunk side (compliant with ITU-T G.707, ITU-T G.709, ITU-T G.957, and Telcordia GR-253-CORE) and four intermediate- or short-range OC-48/STM-16 ports per card on the client side. The port operates at 9.95328 Gbps over unamplified distances up to 80 km (50 miles) with different types of fiber such as C-SMF or dispersion compensated fiber limited by loss and/or dispersion.

Client ports on the MXP_2.5G_10G card are also interoperable with SONET OC48.

The MXP_2.5G_10G card is tunable over two neighboring wavelengths in the 1550-nm, ITU 100-GHz range. It is available in 16 different versions, each of which covers two wavelengths, for a total coverage of 32 different wavelengths in the 1550-nm range.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Note ITU-T G.709 specifies a form of FEC that uses a “wrapper” approach. The digital wrapper lets you transparently take in a signal on the client side, wrap a frame around it and restore it to its original form. FEC enables longer fiber links because errors caused by the optical signal degrading with distance are corrected.

The port can also operate at 10.70923 Gbps in ITU-T G.709 Digital Wrapper/FEC mode.

Caution Because the transponder has no capability to look into the payload and detect circuits, an MXP_2.5G_10G card does not display circuits under card view.

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

You can install MXP_2.5G_10G cards in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006.

Caution Do not install an MXP_2.5G_10G card in Slot 3 if you have installed a DS3/EC1-48 card in Slots 1or 2. Likewise, do not install an MXP_2.5G_10G card in Slot 17 if you have installed a DS3/EC1-48 card in Slots 15 or 16. If you do, the cards will interact and cause DS-3 bit errors.

You can provision this card in a linear configuration. MXP_2.5G_10G cards cannot be provisioned as a BLSR/MS-SPRing, a path protection/SNCP, or a regenerator. They can be used in the middle of BLSR/MS-SPRing or 1+1 spans only when the card is configured for transparent termination mode.

The MXP_2.5G_10G port features a 1550-nm laser on the trunk port and four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The card uses a dual LC connector on the trunk side and SFP connectors on the client side for optical cable termination.

Note When you create a 4xOC-48 OCHCC circuit, you need to select the G.709 and Synchronous options. A 4xOC-48 OCHCC circuit is supported by G.709 and synchronous mode. This is necessary to provision a 4xOC-48 OCHCC circuit.

For more information about the MXP_2.5G_10G card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/ps5320/product_data_sheet0900aecd80121bee_ps13234_Products_Data_Sheet.html.

Related Procedures for MXP_2.5G_10G Card

The following is the list of procedures and tasks related to the configuration of MXP_2.5G_10G:

- NTP-G97 Modifying the 4x2.5G Muxponder Card Line Settings and PM Parameter Thresholds, on page 401
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_2.5G_10E Card

The MXP_2.5G_10E card has reached end of support.

The faceplate designation of the card is “4x2.5G 10E MXP.” The MXP_2.5G_10E card is a DWDM muxponder that supports full transparent termination the client side. The card multiplexes 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

provides wavelength transmission service for the four incoming 2.5 Gbps client interfaces. The MXP_2.5G_10E muxponder passes all SONET/SDH overhead bytes transparently.

The MXP_2.5G_10E card is not compatible with the MXP_2.5G_10G card, which does not support full transparent termination. You can install MXP_2.5G_10E cards in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006. You can provision this card in a linear configuration, as a BLSR/MS-SPRing, a path protection/SNCP, or a regenerator. The card can be used in the middle of BLSR/MS-SPRing or 1+1 spans when the card is configured for transparent termination mode.

The MXP_2.5G_10E features a 1550-nm laser on the trunk port and four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The card uses a dual LC connector on the trunk side and uses SFP modules on the client side for optical cable termination. The SFP pluggable modules are short reach (SR) or intermediate reach (IR) and support an LC fiber connector.

Note When you create a 4xOC-48 OCHCC circuit, you need to select the G.709 and Synchronous options. A 4xOC-48 OCHCC circuit is supported by G.709 and synchronous mode. This is necessary to provision a 4xOC-48 OCHCC circuit.

Key Features

The MXP_2.5G_10E card has the following high level features:

- Four 2.5 Gbps client interfaces (OC-48/STM-16) and one 10 Gbps trunk. The four OC-48 signals are mapped into a ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing.
- Onboard E-FEC processor: The processor supports both standard Reed-Solomon (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 (255,239) correction algorithm. A new block code (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 card has modular interfaces. Two types of optics modules 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 MXP_2.5G_10E card is initially provisioned using CiscoTransport Planner software. Subsequently, the card can be monitored and provisioned using CTC software.
- Link monitoring and management: The MXP_2.5G_10E card uses standard OC-48 OH (overhead) bytes to monitor and manage incoming interfaces. The card passes the incoming SDH/SONET data stream and its overhead bytes transparently.
- Control of layered SONET/SDH transport overhead: The card is 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 normally synchronizes from the control card. If for some reason, such as maintenance or upgrade activity, the control card is not available, the MXP_2.5G_10E automatically synchronizes to one of the input client interface clocks.

- Configurable squelching policy: The card 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 multiplex section alarm indication signal (MS-AIS) insertion.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

MXP_2.5G_10E Functions

The following functions of the MXP_2.5G_10E card are explained in "Card Features" chapter:

- Client Interface
- DWDM Interface
- Multiplexing Function
- Timing Synchronization
- FEC
- SONET/SDH Overhead Byte Processing
- Card-Level Indicators
- Client Interface Monitoring
- Jitter
- Lamp Test
- Onboard Traffic Generation

Wavelength Identification

The card uses trunk lasers that are wave-locked, which allows the trunk transmitter to operate on the ITU grid effectively. The laser is tunable over eight wavelengths at 50-GHz spacing or four at 100-GHz spacing.

Table 52: MXP_2.5G_10E Trunk Wavelengths

Band	Wavelength (nm)	Band	Wavelength (nm)
30.3	1530.33	46.1	1546.12
30.3	1531.12	46.1	1546.92
30.3	1531.90	46.1	1547.72
30.3	1532.68	46.1	1548.51
34.2	1534.25	50.1	1550.12
34.2	1535.04	50.1	1550.92
34.2	1535.82	50.1	1551.72

Band	Wavelength (nm)	Band	Wavelength (nm)
34.2	1536.61	50.1	1552.52
38.1	1538.19	54.1	1554.13
38.1	1538.98	54.1	1554.94
38.1	1539.77	54.1	1555.75
38.1	1540.56	54.1	1556.55
42.1	1542.14	58.1	1558.17
42.1	1542.94	58.1	1558.98
42.1	1543.73	58.1	1559.79
42.1	1544.53	58.1	1560.61

For more information about the MXP_2.5G_10E card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/ps5320/product_data_sheet0900aecd801018ac.html.

Related Procedures for MXP_2.5G_10E Card

The following is the list of procedures and tasks related to the configuration of MXP_2.5G_10E Card:

- NTP-G97 Modifying the 4x2.5G Muxponder Card Line Settings and PM Parameter Thresholds, on page 401
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_2.5G_10E_C and MXP_2.5G_10E_L Cards

The MXP_2.5G_10E_C and MXP_2.5G_10E_L cards are DWDM muxponders that support transparent termination mode on the client side. The faceplate designation of the cards is “4x2.5G 10E MXP C” for the MXP_2.5G_10E_C card and “4x2.5G 10E MXP L” for the MXP_2.5G_10E_L card. 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. The MXP_2.5G_10E_C and MXP_2.5G_10E_L muxponders pass all SONET/SDH overhead bytes transparently.

The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up GCCs for data communications, enable FEC, or facilitate 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. See the "Multiplexing Function" section.

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 transparent termination mode.

You can install MXP_2.5G_10E_C and MXP_2.5G_10E_L cards in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006. 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.

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 uses dual LC connectors on the trunk side and use SFP modules on the client side for optical cable termination. The SFP pluggable modules are SR or IR and support an LC fiber connector.



Note When you create a 4xOC-48 OCHCC circuit, you need to select the G.709 and Synchronous options. A 4xOC-48 OCHCC circuit is supported by G.709 and synchronous mode. This is necessary to provision a 4xOC-48 OCHCC circuit.

Key Features

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

- Four 2.5 Gbps client interfaces (OC-48/STM-16) and one 10 Gbps trunk. The four OC-48 signals are mapped into a ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing.
- 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 (255,239) 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 optics modules 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 TransportPlanner 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 control card. If for some reason, such as maintenance or upgrade activity, the control card 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.
- The cards are tunable across the full C band (MXP_2.5G_10E_C) or full L band (MXP_2.5G_10E_L), thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.

For information about safety labels for the cards, see the "Class 1 Laser Product Cards" section.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

MXP_2.5G_10E_C and MXP_2.5G_10E_L Functions

The following functions of the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards are explained in the"Card Features" chapter:

- Client Interface
- DWDM Interface
- Multiplexing Function
- Timing Synchronization
- FEC
- SONET/SDH Overhead Byte Processing
- Client Interface Monitoring
- Automatic Laser Shutdown
- Jitter
- Lamp Test
- Onboard Traffic Generation
- Card level indicators
- Port level indicators

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. For 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 53: 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
26	194.75	1539.371	67	192.70	1555.747

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

For 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 54: 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

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
9	190.45	1574.13	49	188.45	1590.83
10	190.4	1574.54	50	188.4	1591.26
11	190.35	1574.95	51	188.35	1591.68
12	190.3	1575.37	52	188.3	1592.10
13	190.25	1575.78	53	188.25	1592.52
14	190.2	1576.20	54	188.2	1592.95
15	190.15	1576.61	55	188.15	1593.37
16	190.1	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

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

Related Procedures for MXP_2.5G_10E_C and MXP_2.5G_10E_L Cards

The following is the list of procedures and tasks related to the configuration of MXP_2.5G_10E_C and MXP_2.5G_10E_L cards:

- NTP-G97 Modifying the 4x2.5G Muxponder Card Line Settings and PM Parameter Thresholds
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_MR_2.5G and MXPP_MR_2.5G Cards

The MXP_MR_2.5G card aggregates a mix and match of client Storage Area Network (SAN) service client inputs (GE, FICON, Fibre Channel, and ESCON) into one 2.5 Gbps STM-16/OC-48 DWDM signal on the trunk side. It provides one long-reach STM-16/OC-48 port per card and is compliant with Telcordia GR-253-CORE.

Note In Software Release 7.0 and later, two additional operating modes have been made available to the user: pure ESCON (all 8 ports running ESCON), and mixed mode (Port 1 running FC/GE/FICON, and Ports 5 through 8 running ESCON). When the card is part of a system running Software Release 6.0 or below, only one operating mode, (FC/GE) is available for use.

The 2.5-Gbps Multirate Muxponder–Protected–100 GHz–Tunable 15xx.xx-15yy.yy (MXPP_MR_2.5G) card aggregates various client SAN service client inputs (GE, FICON, Fibre Channel, and ESCON) into one 2.5 Gbps STM-16/OC-48 DWDM signal on the trunk side. It provides two long-reach STM-16/OC-48 ports per card and is compliant with ITU-T G.957 and Telcordia GR-253-CORE.

Because the cards are tunable to one of four adjacent grid channels on a 100-GHz spacing, each card is available in eight versions, with 15xx.xx representing the first wavelength and 15yy.yy representing the last wavelength of the four available on the card. In total, 32 DWDM wavelengths are covered in accordance with the ITU-T 100-GHz grid standard, G.692, and Telcordia GR-2918-CORE, Issue 2.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Table 55: Card Versions

Card Version	Frequency Channels at 100 GHz (0.8 nm) Spacing			
1530.33–1532.68	**1530.33 nm**	**1531.12 nm**	**1531.90 nm**	**1532.68 nm**
1534.25–1536.61	1534.25 nm	1535.04 nm	1535.82 nm	1536.61 nm
1538.19–1540.56	1538.19 nm	1538.98 nm	1539.77 nm	1540.56 nm
1542.14–1544.53	1542.14 nm	1542.94 nm	1543.73 nm	1544.53 nm
1546.12–1548.51	1546.12 nm	1546.92 nm	1547.72 nm	1548.51 nm
1550.12–1552.52	1550.12 nm	1550.92 nm	1551.72 nm	1552.52 nm
1554.13–1556.55	1554.13 nm	1554.94 nm	1555.75 nm	1556.55 nm
1558.17–1560.61	1558.17 nm	1558.98 nm	1559.79 nm	1560.61 nm

The muxponders are intended to be used in applications with long DWDM metro or regional unregenerated spans. Long transmission distances are achieved through the use of flat gain optical amplifiers.

The client interface supports the following payload types:

- 2G FC
- 1G FC
- 2G FICON
- 1G FICON
- GE
- ESCON

Note Because the client payload cannot oversubscribe the trunk, a mix of client signals can be accepted, up to a maximum limit of 2.5 Gbps.

The current version of the ITU-T Transparent Generic Framing Procedure (GFP-T) G.7041 supports transparent mapping of 8B/10B block-coded protocols, including Gigabit Ethernet, Fibre Channel, and FICON.

In addition to the GFP mapping, 1-Gbps traffic on Port 1 or 2 of the high-speed serializer/deserializer (SERDES) is mapped to an STS-24c channel. If two 1-Gbps client signals are present at Port 1 and Port 2 of the SERDES, the Port 1 signal is mapped into the first STS-24c channel and the Port 2 signal into the second STS-24c channel. The two channels are then mapped into an OC-48 trunk channel.

Table 56: MXP_MR_2.5G and MXPP_MR_2.5G Client Interface Data Rates and Encapsulation

Client Interface	Input Data Rate	ITU-T GFP-T G.7041 Encapsulation
2G FC	2.125 Gbps	Yes
1G FC	1.06 Gbps	Yes

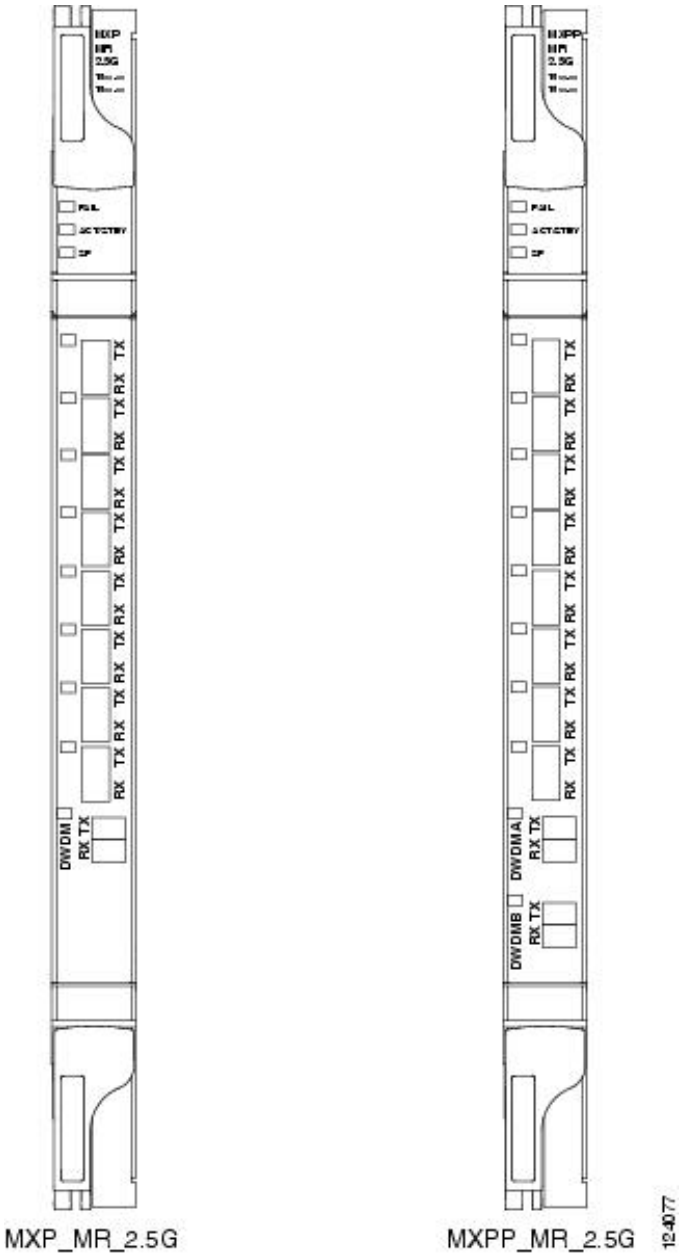
Client Interface	Input Data Rate	ITU-T GFP-T G.7041 Encapsulation
2G FICON	2.125 Gbps	Yes
1G FICON	1.06 Gbps	Yes
GE	1.25 Gbps	Yes
ESCON	0.2 Gbps	Yes

Table 57: Client Data Rates and Ports

Mode	Port(s)	Aggregate Data Rate
2G FC	1	2.125 Gbps
1G FC	1, 2	2.125 Gbps
2G FICON	1	2.125 Gbps
1G FICON	1, 2	2.125 Gbps
GE	1, 2	2.5 Gbps
1G FC -ESCON (mixed mode)	1 ,5, 6, 7, 8	1.06 Gbps 0.8 Gbps 1.86 Gbps total
1G FICON -ESCON (mixed mode)	1 ,5, 6, 7, 8	1.06 Gbps 0.8 Gbps 1.86 Gbps total
GE -ESCON (mixed mode)	1 ,5, 6, 7, 8	1.25 Gbps 0.8 Gbps Total 2.05 Gbps
ESCON	1, 2, 3, 4, 5, 6, 7, 8	1.6 Gbps

Faceplates and Block Diagram

Figure 13: MXP_MR_2.5G and MXPP_MR_2.5G Faceplates



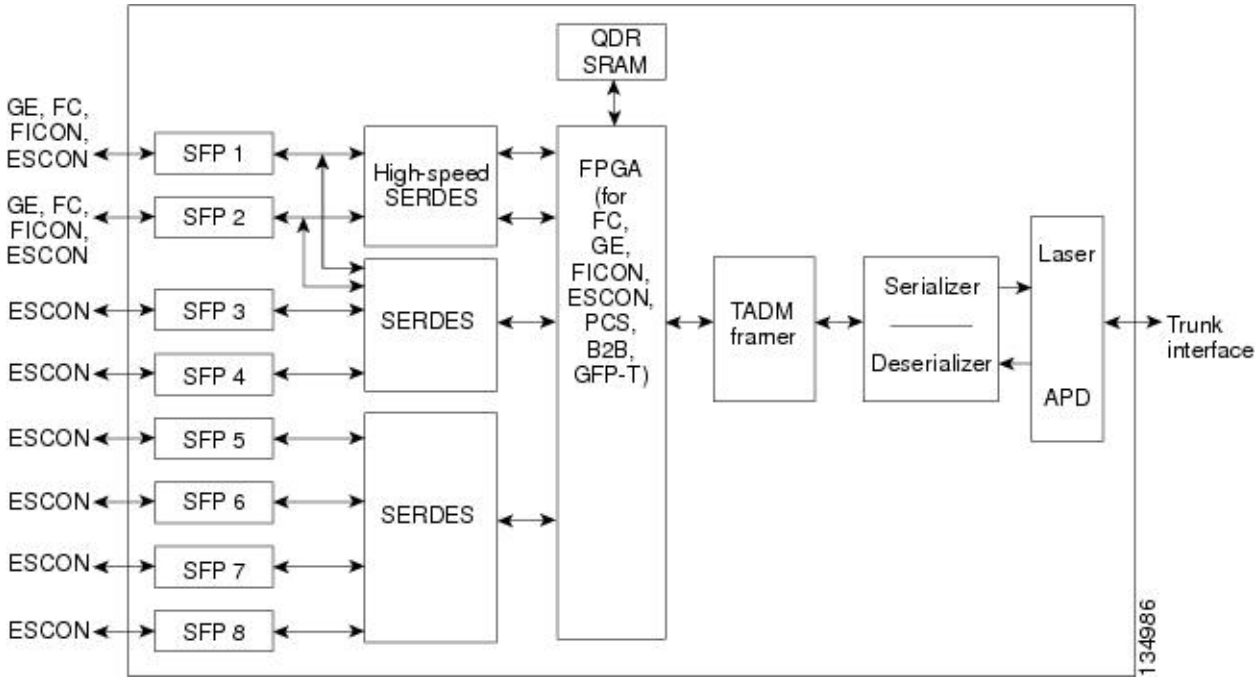
For information about safety labels for the cards, see the "Class 1M Laser Product Cards" section.

The card has eight SFP client interfaces. Ports 1 and 2 can be used for GE, FC, FICON, or ESCON. Ports 3 through 8 are used for ESCON client interfaces. There are two SERDES blocks dedicated to the high-speed interfaces (GE, FC, FICON, and ESCON) and two SERDES blocks for the ESCON interfaces. A FPGA is provided to support different configurations for different modes of operation. This FPGA has a Universal Test and Operations Physical Interface for ATM (UTOPIA) interface. A transceiver add/drop multiplexer (TADM) chip supports framing. Finally, the output signal is serialized and connected to the trunk front end

with a direct modulation laser. The trunk receive signal is converted into an electrical signal with an avalanche photodiode (APD), is deserialized, and is then sent to the TADM framer and FPGA.

The MXPP_MR_2.5G is the same, except a 50/50 splitter divides the power at the trunk interface. In the receive direction, there are two APDs, two SERDES blocks, and two TADM framers. This is necessary to monitor both the working and protect paths. A switch selects one of the two paths to connect to the client interface.

Figure 14: MXP_MR_2.5G and MXPP_MR_2.5G Block Diagram



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

MXP_MR_2.5G and MXPP_MR_2.5G Functions

The following functions of the MXP_MR_2.5G and MXPP_MR_2.5G cards are explained in the "Card Features" chapter:

- Performance Monitoring
- Distance Extension
- Slot Compatibility
- Interoperability with Cisco MDS Switches
- Client and Trunk Ports

- Automatic Laser Shutdown
- Card level indicators
- Port level indicator

Related Procedures for MXP_MR_2.5G and MXPP_MR_2.5G Cards

The following is the list of procedures and tasks related to the configuration of MXP_MR_2.5G and MXPP_MR_2.5G cards:

- NTP-G99 Modifying the 2.5G Data Muxponder Card Line Settings and PM Parameter Thresholds, on page 423
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_MR_10DME_C and MXP_MR_10DME_L Cards

The MXP_MR_10DME_C and MXP_MR_10DME_L cards aggregate a mix of client SAN service client inputs (GE, FICON, and Fibre Channel) into one 10.0 Gbps STM-64/OC-192 DWDM signal on the trunk side. It provides one long-reach STM-64/OC-192 port per card and is compliant with Telcordia GR-253-CORE and ITU-T G.957.

The cards support aggregation of the following signal types:

- 1-Gigabit Fibre Channel
- 2-Gigabit Fibre Channel
- 4-Gigabit Fibre Channel
- 1-Gigabit Ethernet
- 1-Gigabit ISC-Compatible (ISC-1)
- 2-Gigabit ISC-Peer (ISC-3)

Note On the card faceplates, the MXP_MR_10DME_C and MXP_MR_10DME_L cards are displayed as 10DME_C and 10DME_L, respectively.

Caution The card can be damaged by dropping it. Handle it safely.

Note Because the client payload cannot oversubscribe the trunk, a mix of client signals can be accepted, up to a maximum limit of 10 Gbps.

The MXP_MR_10DME_C card can be installed in Slots 2 to 7 in Cisco NCS 2015 chassis. This card upgrades to a new bootcode automatically when it is installed between slots 2 and 7. After the bootcode upgrade, the card can be installed in Slots 2 to 16 of the Cisco NCS 2015 chassis.



Note The MXP_MR_10DME_C and MXP_MR_10DME_L cards are not compatible with the MXP_2.5G_10G card, which does not support transparent termination mode.

The MXP_MR_10DME_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_MR_10DME_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 supports eight SFP based client ports and one trunk port. The cards uses dual LC connectors on the trunk side and use SFP modules on the client side for optical cable termination. The SFP pluggable modules are SR or IR and support an LC fiber connector.

The current version of the GFP-T G.7041 supports transparent mapping of 8B/10B block-coded protocols, including Gigabit Ethernet, Fibre Channel, ISC, and FICON.

Table 58: MXP_MR_10DME_C and MXP_MR_10DME_L Client Interface Data Rates and Encapsulation

Client Interface	Input Data Rate	GFP-T G.7041 Encapsulation
2G FC	2.125 Gbps	Yes
1G FC	1.06 Gbps	Yes
2G FICON/2G ISC-Compatible (ISC-1)/ 2G ISC-Peer (ISC-3)	2.125 Gbps	Yes
1G FICON/1G ISC-Compatible (ISC-1)/ 1G ISC-Peer (ISC-3)	1.06 Gbps	Yes
Gigabit Ethernet	1.25 Gbps	Yes

There are two FPGAs on each MXP_MR_10DME_C and MXP_MR_10DME_L, and a group of four ports is mapped to each FPGA. Group 1 consists of Ports 1 through 4, and Group 2 consists of Ports 5 through 8. The following table shows some of the mix and match possibilities on the various client data rates for Ports 1 through 4, and Ports 5 through 8. An X indicates that the data rate is supported in that port.

Table 59: Supported Client Data Rates for Ports 1 through 4 and Ports 5 through 8

Port (Group 1)	Port (Group 2)	Gigabit Ethernet	1G FC	2G FC	4G FC
1	5	X	X	X	X
2	6	X	X	—	—
3	7	X	X	X	—
4	8	X	X	—	—

GFP-T PM is available through RMON and trunk PM is managed according to Telcordia GR-253-CORE and ITU G.783/826. Client PM is achieved through RMON for FC and GE.

A buffer-to-buffer credit management scheme provides FC flow control. With this feature enabled, a port indicates the number of frames that can be sent to it (its buffer credit), before the sender is required to stop transmitting and wait for the receipt of a “ready” indication The MXP_MR_10DME_C and MXP_MR_10DME_L cards support FC credit-based flow control with a buffer-to-buffer credit extension of up to 1600 km (994.1 miles) for 1G FC, up to 800 km (497.1 miles) for 2G FC, or up to 400 km (248.5 miles) for 4G FC. The feature can be enabled or disabled.

The MXP_MR_10DME_C and MXP_MR_10DME_L cards feature a 1550-nm laser for the trunk/line port and a 1310-nm or 850-nm laser (depending on the SFP) for the client ports. The cards contains eight 12.5 degree downward tilt SFP modules for the client interfaces. For optical termination, each SFP uses two LC connectors, which are labeled TX and RX on the faceplate. The trunk port is a dual-LC connector with a 45 degree downward angle.

The throughput of the MXP_MR_10DME_C and MXP_MR_10DME_L cards is affected by the following parameters:

- Distance extension—If distance extension is enabled on the card, it provides more throughput but more latency. If distance extension is disabled on the card, the buffer to buffer credits on the storage switch affects the throughput; higher the buffer to buffer credits higher is the throughput.

Note For each link to operate at the maximum throughput, it requires a minimum number of buffer credits to be available on the devices which the link connects to. The number of buffer credits required is a function of the distance between the storage switch extension ports and the link bandwidth, that is, 1G, 2G, or 4G. These buffer credits are provided by either the storage switch (if distance extension is disabled) or by both the storage switch and the card (if distance extension is enabled).

- Forward Error Correction (FEC)—If Enhanced FEC (E-FEC) is enabled on the trunk port of the card, the throughout is significantly reduced in comparison to standard FEC being set on the trunk port.

Note If distance extension is enabled on the card, the FEC status does not usually affect the throughput of the card.

- Payload size—The throughput of the card decreases with decrease in payload size.

The resultant throughput of the card is usually the combined effect of the above parameters.

Key Features

The MXP_MR_10DME_C and MXP_MR_10DME_L cards have the following high-level features:

- 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 (255,239)

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_MR_10DME_C and MXP_MR_10DME_L cards have modular interfaces. Two types of optics modules 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).
- Y-cable protection: Supports Y-cable protection between the same card type only, on ports with the same port number and signal rate. See the "Y-Cable Protection Availability on TXP, MXP, and Xponder Cards" section for more detailed information.
- High level provisioning support: The cards are initially provisioned using Cisco TransportPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- ALS: A safety mechanism used in the event of a fiber cut. For details regarding ALS provisioning for the MXP_MR_10DME_C and MXP_MR_10DME_L cards, see the "NTP-G162 Change the ALS Maintenance Settings" section.
- Link monitoring and management: The cards use standard OC-48 OH bytes to monitor and manage incoming interfaces. The cards pass the incoming SDH/SONET data stream and its OH 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_MR_10DME_C and MXP_MR_10DME_L cards normally synchronize from the control card. If for some reason, such as maintenance or upgrade activity, the control card is not available, the cards automatically synchronize to one of the input client interface clocks.



Note MXP_MR_10DME_C and MXP_MR_10DME_L cards cannot be used for line timing.

- 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.
- The cards are tunable across the full C band (MXP_MR_10DME_C) or full L band (MXP_MR_10DME_L), thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.
- You can provision a string (port name) for each fiber channel/FICON interface on the MXP_MR_10DME_C and MXP_MR_10DME_L cards, which allows the MDS Fabric Manager to create a link association between that SAN port and a SAN port on a Cisco MDS 9000 switch.
- From Software Release 9.0, the fast switch feature of MXP_MR_10DME_C and MXP_MR_10DME_L cards along with the buffer-to-buffer credit recovery feature of MDS switches, prevents reinitialization of ISL links during Y-cable switchovers.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

MXP_MR_10DME_C and MXP_MR_10DME_L Functions

The following functions of the MXP_MR_10DME_C and MXP_MR_10DME_L cards are explained in the "Card Features" chapter:

- Card level indicators
- Port level indicators

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_MR_10DME_C and MXP_MR_10DME_L cards implement the UT2 module. The MXP_MR_10DME_C card uses a C-band version of the UT2 and the MXP_MR_10DME_L card uses an L-band version.

The MXP_MR_10DME_C card is tunable over 82 wavelengths in the C band at 50-GHz spacing on the ITU grid.

Table 60: MXP_MR_10DME_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

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
16	195.25	1535.429	57	193.20	1551.721
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

The MXP_MR_10DME_L card is fully tunable over 80 wavelengths in the L band at 50-GHz spacing on the ITU grid.

Table 61: MXP_MR_10DME_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
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

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

For more information about the MXP_MR_10DME_C and MXP_MR_10DME_L cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/ps5320/product_data_sheet0900aecd803fc51a.html.

Related Procedures for MXP_MR_10DME_C and MXP_MR_10DME_L Cards

The following is the list of procedures and tasks related to the configuration of MXP_MR_10DME_C and MXP_MR_10DME_L cards:

- NTP-G148 Modifying the 10G Data Muxponder Card Line Settings and PM Parameter Thresholds, on page 445
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards aggregate a variety of client service inputs (Gigabit Ethernet, Fibre Channel, OTU2, OTU2e, and OC-192) into a single 40-Gbps OTU3/OTU3e signal on the trunk side.

Note In CTC, the 40E-MXP-C and 40ME-MXP-C card is displayed with the same card name, 40E-MXP-C.

The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards support aggregation of the following signals:

- With overclock enabled on the trunk port:
  - OC-192/STM-64 (only on 40E-MXP-C and 40ME-MXP-C cards)
  - 10 Gigabit Fibre Channel
  - OTU2e
  - 10 Gigabit Ethernet LAN-Phy (CBR mapping) (only on 40E-MXP-C and 40ME-MXP-C cards)
- With overclock disabled on the trunk port:
  - 8 Gigabit Fibre Channel
  - 10 GigabitEthernet LAN-Phy (GFP framing)
  - 10 GigabitEthernet LAN-Phy (WIS framing)
  - OC-192/STM-64
  - OTU2

Caution Handle the card with care. Dropping or misuse of the card could result in permanent damage.

You can install and provision the 40G-MXP-C, cards in a linear configuration in:

- Slot 2 in Cisco NCS 2002 chassis
- Slots 2 to 15 in Cisco NCS 2015 chassis (for 40E-MXP-C card)

The client ports of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards interoperates with all the existing TXP/MXP (OTU2 trunk) cards.

The auto negotiation is not supported on the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards in 8G FC client mode. Hence, during interoperation, the auto negotiation of the 8G-FC client port of the other device connected to 8G-FC client port on 40G-MXP-C, 40E-MXP-C, or 40ME-MXP-C card must be set to Fixed/Disabled.

The client port of 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards do not interoperate with OTU2_XP card when the signal rate is OTU1e (11.049 Gbps) and the “No Fixed Stuff” option is enabled on the trunk port of OTU2_XP card.

For OTU2 and OTU2e client protocols, Enhanced FEC (EFEC) is not supported on Port 1 of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.

Table 62: Client Interface Data Rates for 40G-MXP-C, 40E-MXP-C and 40ME-MXP-C Cards

40G-MXP-C, 40E-MXP-C and 40ME-MXP-C Client Port	FEC Configuration Supported on OTU2/OTU2e Client Protocol
Port 1	Only Standard FEC
Port 2	Standard and Enhanced FEC
Port 3	Standard and Enhanced FEC
Port 4	Standard and Enhanced FEC

When setting up the card for the first time, or when the card comes up after clearing the LOS-P condition due to fiber cut, the trunk port of the 40G-MXP-C card takes about 6 minutes to lock a signal. The trunk port of the 40G-MXP-C card raises an OTUK-LOF alarm when the card is comes up. The alarm clears when the trunk port locks the signal.

When a protection switch occurs on the 40E-MXP-C and 40ME-MXP-C cards, the recovery from PSM protection switch takes about 3 to 4 minutes.

Key Features

The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards provides the following key features:

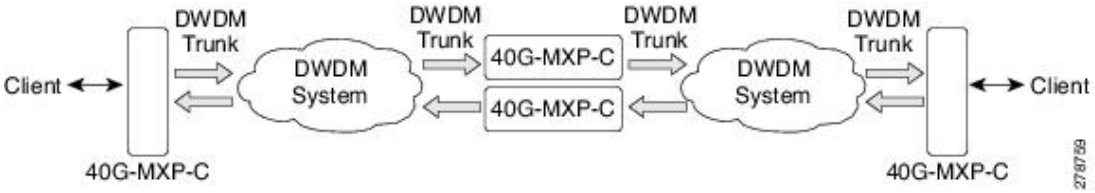
- The 40G-MXP-C card uses the RZ-DQPSK 40G modulation format.
- The 40E-MXP-C and 40ME-MXP-C cards uses the CP-DQPSK modulation format.
- Onboard E-FEC processor—The E-FEC functionality improves the correction capability of the transponder to improve performance, allowing operation at a lower OSNR compared to the standard RS (239,255) correction algorithm. A new BCH algorithm implemented (according to G.975.1 I.7) in E-FEC allows recovery of an input BER up to 1E-3. The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards support both the standard RS (specified in ITU-T G.709) and E-FEC standard, which allows an improved gain on trunk interfaces with a resultant extension of the transmission range on these interfaces.
- Y-cable protection—Supports Y-cable protection only between the same card type on ports with the same port number and signal rate. For more information on Y-cable protection, see the "Y-Cable Protection Availability on TXP, MXP, and Xponder Cards" section.

Note Y-cable cannot be created on a 10 GE port when WIS framing is enabled on the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.

- Unidirectional regeneration—The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards supports unidirectional regeneration configuration. Each 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C card in the configuration regenerates the signal received from another 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C card in one direction.

Note When you configure the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards in the Unidirectional Regen mode, ensure that the payload is not configured on the pluggable port modules of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C card.

Figure 15: 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards in Unidirectional Regeneration Configuration



- High level provisioning support—The cards are initially provisioned using Cisco Transport Planner software. Subsequently, the card can be monitored and provisioned using CTC software.
- Automatic Laser Shutdown (ALS)—A safety mechanism, Automatic Laser Shutdown (ALS), is used in the event of a fiber cut. The Auto Restart ALS option is supported only for OC-192/STM-64 and OTU2 payloads. The Manual Restart ALS option is supported for all payloads. For more information on provisioning ALS for the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards, see the "NTP-G162 Change the ALS Maintenance Settings" section.
- 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 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards synchronize to the card cards. Because of a maintenance or upgrade activity, if the control cards are not available, the cards automatically synchronize to one of the input client interface clocks.
- Squelching policy—The cards are set 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.
- The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards are tunable across the full C-band wavelength.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Wavelength Identification

The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards use trunk lasers that are wavelocked, which allows the trunk transmitter to operate on the ITU grid effectively. These cards implement the UT2 module; they use a C-band version of the UT2. The laser is tunable over 82 wavelengths in the C-band at 50-GHz spacing on the ITU grid.

Table 63: 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-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
26	194.75	1539.371	67	192.70	1555.747

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

For more information on 40G-MXP-C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/datasheet_c78-598898.html.

For more information on 40E-MXP-C and 40ME-MXP-C cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-606950.html.

Related Procedures for 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

The following is the list of procedures and tasks related to the configuration of 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards:

- NTP-G293 Modifying the 40G Muxponder Card Line Settings and PM Parameter Thresholds, on page 455
- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G75 Monitor Transponder and Muxponder Performance

GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards

Note GE_XPE card is the enhanced version of the GE_XP card and 10GE_XPE card is the enhanced version of the 10GE_XP card.

The cards aggregate Ethernet packets received on the client ports for transport on C-band trunk ports that operate on a 100-GHz grid. The trunk ports operate with ITU-T G.709 framing and either FEC or E-FEC. The GE_XP and 10GE_XP cards are designed for bulk point-to-point transport over 10GE LAN PHY wavelengths for Video-on-Demand (VOD), or broadcast video across protected 10GE LAN PHY wavelengths. The GE_XPE and 10GE_XPE cards are designed for bulk GE_XPE or 10GE_XPE point-to-point, point-to-multipoint, multipoint-to-multipoint transport over 10GE LAN PHY wavelengths for Video-on-Demand (VOD), or broadcast video across protected 10GE LAN PHY wavelengths.

Note When all the cards in the chassis are simultaneously reset by the user, the GE_XP and 10GE_XP cards undergo a hard reset instead of a soft reset. This causes traffic loss for traffic going through these cards.

You can install and provision the GE_XP, and GE_XPE cards in a linear configuration in:

- Slot 2 in Cisco NCS 2002 chassis
- Slots 2 to 6 in Cisco NCS 2006 chassis
- Slots 2 to 7 in Cisco NCS 2015 chassis. These cards upgrade to a new bootcode automatically when they are installed between slots 2 and 7.

  After the bootcode upgrade, the cards can be installed in Slots from 2 to 16 in Cisco NCS 2015 chassis.

The RAD pluggables (ONS-SC-E3-T3-PW= and ONS-SC-E1-T1-PW=) do not support:

- No loopbacks (Terminal or Facility)
- RAI (Remote Alarm Indication) alarm
- AIS and LOS alarm

Caution

GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards can be provisioned to perform different Gigabit Ethernet transport roles. All the cards can work as Layer 2 switches. However, the 10GE_XP and 10GE_XPE cards can also perform as a 10 Gigabit Ethernet transponders (10GE TXP mode), and the GE_XP and GE_XPE can perform as a 10 Gigabit Ethernet or 20 Gigabit Ethernet muxponders (10GE MXP or 20GE MXP mode).

Note Changing the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card mode requires the ports to be in a OOS-DSBL (ANSI) or Locked, disabled (ETSI) service state. In addition, no circuits can be provisioned on the cards when the mode is being changed.

Table 64: GE_XP, 10GE_XP, GE_XPE, and 10GE_XPECard Modes

Card Mode	Cards	Description
Layer 2 Ethernet switch	GE_XP 10GE_XP GE_XPE 10GE_XPE	Provides capability to switch between any two ports irrespective of client or trunk port. Supported Ethernet protocols and services include 1+1 protection, QoS (Quality of Service), CoS (Class of Service), QinQ, MAC learning, MAC address retrieval, service provider VLANs (SVLANs), IGMP snooping and Multicast VLAN Registration (MVR), link integrity, and other Ethernet switch services.
10GE TXP	10GE_XP 10GE_XPE	Provides a point-to-point application in which each 10 Gigabit Ethernet client port is mapped to a 10 Gigabit Ethernet trunk port.
10GE MXP 20GE MXP	GE_XP GE_XPE	Provides the ability to multiplex the twenty Gigabit Ethernet client ports on the card to one or both of its 10 Gigabit Ethernet trunk ports. The card can be provisioned as a single MXP with twenty Gigabit Ethernet client ports mapped to one trunk port (Port 21) or as two MXPs with ten Gigabit Ethernet client ports mapped to a trunk port (Ports 1 to 10 mapped to Port 21, and Ports 11-20 mapped to Port 22).

Key Features

The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards have the following high-level features:

- Link Aggregation Control Protocol (LACP) that allows you to bundle several physical ports together to form a single logical channel.
- Ethernet Connectivity Fault Management (CFM) protocol that facilitates proactive connectivity monitoring, fault verification, and fault isolation.
- Ethernet Operations, Administration, and Maintenance (OAM) protocol that facilitates link monitoring, remote failure indication, and remote loopback.
- Resilient Ethernet Protocol (REP) that controls network loops, handles link failures, and improves convergence time.
- Configurable service VLANs (SVLANs) and customer VLANs (CVLANs).
- Ingress rate limiting that can be applied on both SVLANs and CVLANs. You can create SVLAN and CVLAN profiles and can associate a SVLAN profile to both UNI and NNI ports; however, you can associate a CVLAN profile only to UNI ports.
- CVLAN rate limiting that is supported for QinQ service in selective add mode.
- Differentiated Services Code Point (DSCP) to class of service (CoS) mapping that you can configure for each port. You can configure the CoS of the outer VLAN based on the incoming DSCP bits. This feature is supported only on GE_XPE and 10GE_XPE cards.
- Ports, in Layer 2 switch mode, can be provisioned as network-to-network interfaces (NNIs) or user-network interfaces (UNIs) to facilitate service provider to customer traffic management.
- Broadcast drop-and-continue capability for VOD and broadcast video applications.
- Gigabit Ethernet MXP, TXP, and Layer 2 switch capability.

- For more information on FELC, see the"Far-End Laser Control" section.
- Layer 2 switch mode that provides VLAN translation, QinQ, ingress CoS, egress QoS, Fast Ethernet protection switching, and other Layer 2 Ethernet services.
- Interoperable with TXP_MR_10E and TXP_MR_10E_C cards. Also interoperable with Cisco Catalyst 6500 and Cisco 7600 series Gigabit Ethernet, 10 GE interfaces and CRS-1 10GE interfaces.
- The GE_XP and GE_XPE cards have twenty Gigabit Ethernet client ports and two 10 Gigabit Ethernet trunk ports. The 10GE_XP and 10GE_XPE cards have two 10 Gigabit Ethernet client ports and two 10 Gigabit Ethernet trunk ports. The client Gigabit Ethernet signals are mapped into an ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing when configured in one of the MXP modes (10GE MXP or 20GE MXP).
- ITU-T G.709 framing with standard Reed-SoloMon (RS) (255,239) FEC. Performance monitoring and ITU-T G.709 Optical Data Unit (ODU) synchronous and asynchronous mapping. E-FEC with ITU-T G.709 ODU and 2.7 Gbps with greater than 8 dB coding gain.
- IEEE 802.3 frame format that is supported for 10 Gigabit Ethernet interfaces. The minimum frame size is 64 bytes. The maximum frame size is user-provisionable.
- MAC learning capability in Layer 2 switch mode.
- MAC address retrieval in cards provisioned in the L2-over-DWDM mode.
- When a port is in UNI mode, tagging can be configured as transparent or selective. In transparent mode, only SVLANs in the VLAN database of the node can be configured. In selective mode, a CVLAN-to-SVLAN relationship can be defined.
- Layer 2 VLAN port mapping that allows the cards to be configured as multiple Gigabit Ethernet TXPs and MXPs.
- Y-cable protection is configurable in TXP and MXP modes.
- Two protection schemes are available in Layer 2 mode. They are:
  - 1+1 protection—Protection scheme to address card, port, or shelf failures for client ports.
  - Fast Automatic Protection—Protection scheme to address card, port, or shelf failures for trunk ports.
- End-to-end Ethernet link integrity.
- Pluggable client interface optic modules (SFPs and XFPs)—Client ports support tri-rate SX, LX, and ZX SFPs, and 10-Gbps SR1 XFPs.
- Pluggable trunk interface optic modules; trunk ports support the DWDM XFP.
- Internet Group Management Protocol (IGMP) snooping that restricts the flooding of multicast traffic by forwarding multicast traffic to those interfaces where a multicast device is present.
- Multicast VLAN Registration (MVR) for applications using wide-scale deployment of multicast traffic across an Ethernet ring-based service provider network.
- Ingress CoS that assigns a CoS value to the port from 0 (highest) to 7 (lowest) and accepts CoS of incoming frames.
- Egress QoS that defines the QoS capabilities for the egress port.
- MAC address learning that facilitates switch processing.

- Storm Control that limits the number of packets passing through a port. You can define the maximum number of packets allowed per second for the following types of traffic: Broadcast, Multicast, and Unicast. The threshold for each type of traffic is independent and the maximum number of packets allowed per second for each type of traffic is 16777215.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Protocol Compatibility list

Table 65: Protocol Compatibility List for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards

Protocol	LI	1+1	FAPS	IGMP	REP	LACP	CFM	EFM
LI		No	Yes	Yes	No	No	Yes	No
1+1	No		Yes	Yes	No	No	Yes	No
FAPS	Yes	Yes		Yes	No	No	Yes	No
IGMP	Yes	Yes	Yes		Yes	No	Yes	No
REP	No	No	No	Yes		No	Yes	No
LACP	No	No	No	No	No		No	No
CFM	Yes	Yes	Yes	Yes	Yes	No		No
EFM	No	No	No	No	No	No	No	

The 10GE_XP and 10GE_XPE card trunk ports are displayed as follows:

- Trunk 1 and Trunk 2 on the faceplate
- 3-1 and 4-1 on CTC
- 3 (Trunk) and 4 (Trunk) on the Optics Thresholds table

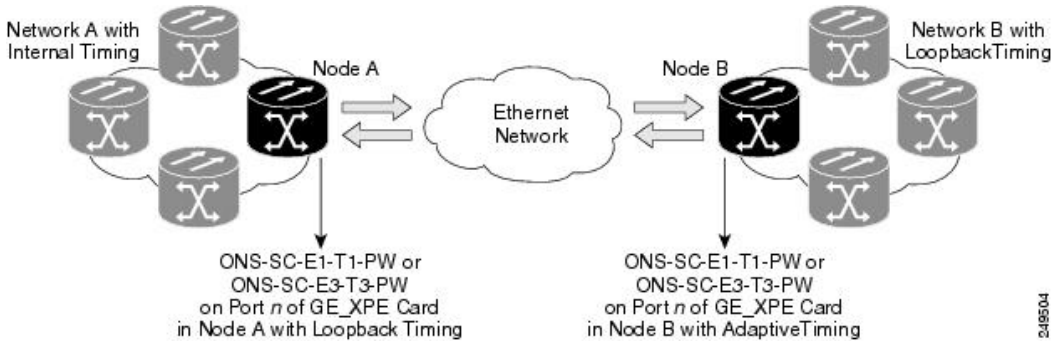
Client Interface

The client interface is implemented with separately orderable SFP or XFP modules. The client interfaces support the following tri-rate SFPs and XFPs using dual LC connectors and multimode fiber:

- SFP - GE/1G-FC/2G-FC - 850 nm - MM - LC (PID ONS-SE-G2F-SX)
- SFP - GE/1G-FC/2G-FC 1300 nm - SM - LC (PID ONS-SE-G2F-LX)
- SFP - GE/1G-FC/2G-FC 1300 nm - SM - LC (PID ONS-SE-G2F-ZX)
- SFP - 10/100/1000Base-T - Copper (PID ONS-SE-ZE-EL) Intra office up to 100; Cable: RJ45 STP CAT5, CAT5E, and CAT6
- SFP - 1000Base BX D/Gigabit Ethernet 1550 nm - SM - LC (PID ONS-SE-GE-BXD)
- SFP - 1000Base BX U/Gigabit Ethernet 1550 nm - SM - LC (PID ONS-SE-GE-BXU)

- SFP - Fast Ethernet 1310 nm - SM - LC (PID ONS-SI-100-LX10)
- SFP - Fast Ethernet 1310 nm - MM - LC (PID ONS-SI-100-FX)
- SFP - Fast Ethernet over DS1/E1 - SM - LC (PID ONS-SC-EOP1)
- SFP - Fast Ethernet over DS3/E3 - SM - LC (PID ONS-SC-EOP3)
- SFP - E1/DS1 over Fast Ethernet - SM - LC (PID ONS-SC-E1-T1-PW)
- SFP - E3/DS3 PDH over Fast Ethernet - SM - LC (PID ONS-SC-E3-T3-PW)

Figure 16: Recommended Topology for Using ONS-SC-E1-T1-PW and ONS -SC-E3-T3-PW SFPs



The client interfaces support the following dual-rate XFP using dual LC connectors and single-mode fiber:

- XFP - OC-192/STM-64/10GE/10-FC/OTU2 - 1310 SR - SM LC (PID: ONS-XC-10G-S1)
- XFP - 10GE - 1550 nm - SM - LC (PID ONS-XC-10G-L2)
- XFP - 10GE - 1550 nm - SM - LC (PID ONS-XC-10G-C)

Note If ONS-XC-10G-C XFP is used on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards on client port 1, the maximum temperature at which the system qualifies is +45 degree Celsius.

The client interfaces support the following multimode XFP using dual LC connectors and multi-mode fiber:

- XFP - OC-192/10GFC/10GE - 850 nm MM LC (PID ONS-XC-10G-SR-MM)

DWDM Trunk Interface

The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards have two 10 Gigabit Ethernet trunk ports operating at 10 Gigabit Ethernet (10.3125 Gbps) or 10 Gigabit Ethernet into OTU2 (nonstandard 11.0957 Gbps). The ports are compliant with ITU-T G.707, ITU-T G.709, and Telcordia GR-253-CORE standards. The ports are capable of carrying C-band and L-band wavelengths through insertion of DWDM XFPs. Forty channels are available in the 1550-nm C band 100-GHz ITU grid, and forty channels are available in the L band.

The maximum system reach in filterless applications without the use of optical amplification or regenerators is nominally rated at 23 dB over C-SMF and NZ-DS SMF fibers. This rating is not a product specification, but is given for informational purposes. It is subject to change.

Configuration Management

The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards support the following configuration management parameters:

- Port name—User-assigned text string.
- Admin State/Service State—Administrative and service states to manage and view port status.
- MTU—Provisionable maximum transfer unit (MTU) to set the maximum number of bytes per frames accepted on the port.
- Mode—Provisional port mode, either Autonegotiation or the port speed.
- Flow Control—Flow control according to IEEE 802.1x pause frame specification can be enabled or disabled for TX and RX ports.
- Bandwidth—Provisionable maximum bandwidth allowed for the port.
- Ingress CoS—Assigns a CoS value to the port from 0 (highest) to 7 (lowest) and accepts CoS of incoming frames.
- Egress QoS—Defines the QoS capabilities at the egress port.
- NIM—Defines the port network interface management type based on Metro Ethernet Forum specifications. Ports can be defined as UNI or NNI.
- MAC Learning—MAC address learning to facilitate switch processing.
- VLAN tagging provided according to the IEEE 802.1Q standard.



Note When the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards are provisioned in a MXP or TXP mode, only the following parameters are available: Port Name, State, MTU, Mode, Flow control, and Bandwidth.

Security

GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card ports can be provisioned to block traffic from a user-defined set of MAC addresses. The remaining traffic is normally switched. You can manually specify the set of blocked MAC addresses for each port. Each port of the card can receive traffic from a limited predefined set of MAC addresses. The remaining traffic will be dropped. This capability is a subset of the Cisco IOS “Port Security” feature.

Card Protection

The following card protection schemes are available for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

- Y-Cable protection
- 1+1 protection
- L2 over DWDM protection- Fast Automatic Protection Switch (FAPS)

Related Procedures for Card Protection

The following are the related procedures for creating card protection on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards:

- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G198 Creating 1+1 Protection for Cards, on page 318
- DLP-G381 Provisioning Layer 2 Protection Settings, on page 532

IGMP Snooping

As networks increase in size, multicast routing becomes critically important as a means to determine which segments require multicast traffic and which do not. IP multicasting allows IP traffic to be propagated from one source to a number of destinations, or from many sources to many destinations. Rather than sending one packet to each destination, one packet is sent to the multicast group identified by a single IP destination group address. GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards can learn up to a maximum of 1024 multicast groups. This includes groups on all the VLANs.

Internet Group Management Protocol (IGMP) snooping restricts the flooding of multicast traffic by forwarding multicast traffic to those interfaces where a multicast device is present.

When the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card receives an IGMP leave group message from a host, it removes the host port from the multicast forwarding table after generating group specific queries to ensure that no other hosts interested in traffic for the particular group are present on that port. Even in the absence of any “leave” message, the cards have a timeout mechanism to update the group table with the latest information. After a card relays IGMP queries from the multicast router, it deletes entries periodically if it does not receive any IGMP membership reports from the multicast clients.

In a multicast router, general queries are sent on a VLAN when Protocol Independent Multicast (PIM) is enabled on the VLAN. The GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card forwards queries to all ports belonging to the VLAN. All hosts interested in this multicast traffic send Join requests and are added to the forwarding table entry. The Join requests are forwarded only to router ports. By default, these router ports are learned dynamically. However, they can also be statically configured at the port level in which case the static configuration overrides dynamic learning.

For information about interaction of IGMP with other protocols, see the “Protocol Compatibility list” section on page 11-50.

IGMP Snooping Guidelines and Restrictions

The following guidelines and restrictions apply to IGMP snooping on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards:

- IGMP snooping V2 is supported as specified in RFC 4541.
- IGMP snooping V3 is not supported and the packets are flooded in the SVLAN.
- Layer 2 multicast groups learned through IGMP snooping are dynamic.
- GE_XP and 10GE_XP cards support IGMP snooping on 128 stacked VLANs and GE_XPE and 10GE_XPE cards support up to 256 stacked VLANs that are enabled.
- IGMP snooping can be configured per SVLAN or CVLAN. By default, IGMP snooping is disabled on all SVLANs and CVLANs.

- IGMP snooping on CVLAN is enabled only when:
  - MVR is enabled.
  - UNI ports are in selective add and selective translate modes. For each UNI port, a CVLAN must be specified for which IGMP snooping is to be enabled.
- IGMP snooping can be enabled only on one CVLAN per port. If you enable IGMP snooping on CVLAN, you cannot enable IGMP snooping on the associated SVLAN and vice versa. The number of VLANs that can be enabled for IGMP snooping cannot exceed 128.
- When IGMP snooping is enabled on double-tagged packets, CVLAN has to be the same on all ports attached to the same SVLAN.
- When IGMP snooping is working with the Fast Automatic Protection Switch (FAPS) in a ring-based setup, it is advisable to configure all NNI ports as static router ports. This minimizes the multicast traffic hit when a FAPS switchover occurs.

The following conditions are raised from IGMP snooping at the card:

- MCAST-MAC-TABLE-FULL—This condition is raised when the multicast table is full and a new join request is received. This table is cleared when at least one entry gets cleared from the multicast table after the alarm is raised.
- MCAST-MAC-ALIASING—This condition is raised when there are multiple L3 addresses that map to the same L2 address in a VLAN. This is a transient condition.

For more information on severity level of these conditions and procedure to clear these alarms, refer to the *Cisco NCS 2000 Series Troubleshooting Guide*.

Fast-Leave Processing



Note Fast-Leave processing is also known as Immediate-Leave.

IGMP snooping Fast-Leave processing allows the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE to remove an interface that sends a leave message from the forwarding table without first sending group specific queries to the interface. When you enable IGMP Fast-Leave processing, the card immediately removes a port from the IP multicast group when it detects an IGMP, version 2 (IGMPv2) leave message on that port.

Static Router Port Configuration

Multicast-capable ports are added to the forwarding table for every IP multicast entry. The card learns of such ports through the PIM method.

Report Suppression

Report suppression is used to avoid a storm of responses to an IGMP query. When this feature is enabled, a single IGMP report is sent to each multicast group in response to a single query. Whenever an IGMP snooping report is received, report suppression happens if the report suppression timer is running. The Report suppression timer is started when the first report is received for a general query. Then this time is set to the response time specified in general query.

IGMP Statistics and Counters

An entry in a counter contains multicasting statistical information for the IGMP snooping capable GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card. It provides statistical information about IGMP messages that have been transmitted and received. IGMP statistics and counters can be viewed via CTC from the Performance > Ether Ports > Statistics tab.

This information can be stored in the following counters:

- cisTxGeneralQueries—Number of general queries transmitted through an interface.
- cisTxGroupSpecificQueries—Total group specific queries transmitted through an interface.
- cisTxReports—Total membership reports transmitted through an interface.
- cisTxLeaves—Total Leave messages transmitted through an interface.
- cisRxGeneralQueries—Total general queries received at an interface.
- cisRxGroupSpecificQueries—Total Group Specific Queries received at an interface.
- cisRxReports—Total Membership Reports received at an interface.
- cisRxLeaves—Total Leave messages received at an interface.
- cisRxValidPackets—Total valid IGMP packets received at an interface.
- cisRxInvalidPackets—Total number of packets that are not valid IGMP messages received at an interface.

Related Procedure for Enabling IGMP Snooping

To enable IGMP snooping on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G204 Enabling IGMP Snooping on a Card, on page 551.

Multicast VLAN Registration

Multicast VLAN Registration (MVR) is designed for applications using wide-scale deployment of multicast traffic across an Ethernet-ring-based service provider network (for example, the broadcast of multiple television channels over a service-provider network). MVR allows a subscriber on a port to subscribe and unsubscribe to a multicast stream on the network-wide multicast VLAN. It allows the single multicast VLAN to be shared in the network while subscribers remain in separate VLANs. MVR provides the ability to continuously send multicast streams in the multicast VLAN, but to isolate the streams from the subscriber VLANs for bandwidth and security reasons.

MVR assumes that subscriber ports subscribe and unsubscribe (“Join” and “Leave”) these multicast streams by sending out IGMP Join and Leave messages. These messages can originate from an IGMP version-2-compatible host with an Ethernet connection. MVR operates on the underlying mechanism of IGMP snooping. MVR works only when IGMP snooping is enabled.

The card identifies the MVR IP multicast streams and their associated MAC addresses in the card forwarding table, intercepts the IGMP messages, and modifies the forwarding table to include or remove the subscriber as a receiver of the multicast stream, even though the receivers is in a different VLAN than the source. This forwarding behavior selectively allows traffic to cross between different VLANs.

Note When MVR is configured, the port facing the router must be configured as NNI in order to allow the router to generate or send multicast stream to the host with the SVLAN. If router port is configured as UNI, the MVR will not work properly.

Related Procedure for Enabling MVR

To enable MVR on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G206 Enabling MVR on a Card, on page 553.

MAC Address Learning

The GE_XPE and 10 GE_XPE cards support 32K MAC addresses. MAC address learning can be enabled or disabled per SVLAN on GE_XPE and 10 GE_XPE cards. The cards learn the MAC address of packets they receive on each port and add the MAC address and its associated port number to the MAC address learning table. As stations are added or removed from the network, the GE_XPE and 10 GE_XPE cards update the MAC address learning table, adding new dynamic addresses and aging out those that are currently not in use.

MAC address learning can be enabled or disabled per SVLAN. When the configuration is changed from enable to disable, all the related MAC addresses are cleared. The following conditions apply:

- If MAC address learning is enabled on per port basis, the MAC address learning is not enabled on all VLANs, but only on VLANs that have MAC address learning enabled.
- If per port MAC address learning is disabled then the MAC address learning is disabled on all VLANs, even if it is enabled on some of the VLAN supported by the port.
- If the per port MAC address learning is configured on GE-XP and 10 GE-XP cards, before upgrading to GE-XPE or 10 GE-XPE cards, enable MAC address learning per SVLAN. Failing to do so disables MAC address learning.

Related Procedure for MAC Address Learning

To enable MAC address learning on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the DLP-G221 Enabling MAC Address Learning on SVLANs, on page 540.

MAC Address Retrieval

MAC addresses learned can be retrieved or cleared on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards provisioned in L2-over-DWDM mode. The MAC addresses can be retrieved using the CTC or TL1 interface.

GE_XPE and 10GE_XPE cards support 32K MAC addresses and GE_XP and 10GE_XP cards support 16K MAC addresses. To avoid delay in processing requests, the learned MAC addresses are retrieved using an SVLAN range. The valid SVLAN range is from 1 to 4093.

The MAC addresses of the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards can also be retrieved. The card MAC addresses are static and are used for troubleshooting activities. One MAC address is assigned to each client, trunk, and CPU ports of the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card. These internal MAC addresses can be used to determine if the packets received on the far-end node are generated by GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

For MAC address retrieval, the following conditions apply:

- The cards must be provisioned in L2-over-DWDM mode.
- MAC address learning must be enabled per SVLAN on GE_XPE or 10 GE_XPE cards.
- MAC address learning must be enabled per port on GE_XP or 10 GE_XP cards.

Related Procedure for MAC Address Retrieving

To retrieve and clear MAC addresses on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G237 Retrieving and Clearing MAC Addresses on SVLANs, on page 543.

Link Integrity

The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card support end-to-end Ethernet link integrity. This capability is integral to providing an Ethernet private line service and correct operation of Layer 2 and Layer 3 protocols on the attached Ethernet devices.

The link integrity feature propagates a trunk fault on all the affected SVLAN circuits in order to squelch the far end client interface. Ethernet-Advanced IP Services (E-AIS) packets are generated on a per-port/SVLAN basis. An E-AIS format is compliant with ITU Y.1731.

Note E-AIS packets are marked with a CoS value of 7 (also called .1p bits). Ensure that the network is not overloaded and there is sufficient bandwidth for this queue in order to avoid packet drops.

When link integrity is enabled on a per-port SVLAN basis, E-AIS packets are generated when the following alarms are raised;

- LOS-P
- OTUKLOF/LOM
- SIGLOSS
- SYNCHLOSS
- OOS
- PPM not present

When link integrity is enabled, GE_XP and 10 GE_XP card supports up to128 SVLANs and GE_XPE, 10 GE_XPE can support up to 256 SVLANs.

Related Procedure for Enabling Link Integrity

To enable link integrity on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G205 Enabling Link Integrity on a Card, on page 546.

Ingress CoS

Ingress CoS functionality enables differentiated services across the GE_XPE and 10GE_XPE cards. A wide range of networking requirements can be provisioned by specifying the class of service applicable to each transmitted traffic.

When a CVLAN is configured as ingress CoS, the per-port settings are not considered. A maximum of 128 CVLAN and CoS relationships can be configured.

Related Procedure for Enabling Ingress CoS

To enable Ingress CoS on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the:

- DLP-G380 Provisioning Ethernet Settings, on page 519
- DLP-G612 Modifying the Parameters of the Channel Group Using CTC, on page 484

CVLAN Rate Limiting

CVLAN rate limiting is supported on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards. CVLAN rate limiting is supported for QinQ service in selective add mode. The following limitations and restrictions apply to CVLAN rate limiting:

- CVLAN rate limiting is not supported for the following service types:
  - Selective translate mode
  - Transparent mode
  - Selective double add mode
  - Selective translate add mode
  - Untagged packets
  - CVLAN range
  - Services associated with the channel group
- CVLAN rate limiting and SVLAN rate limiting cannot be applied to the same service instance.
- Pseudo-IOS command line interface (PCLI) is not supported for CVLAN rate limiting.
- A VLAN profile with Link Integrity option enabled cannot be used to perform CVLAN rate limiting.
- On GE_XP and 10 GE_XP cards, CVLAN rate limiting can be applied to up to 128 services. However, the number of provisionable CVLAN rate limiting service instances is equal to 192 minus the number of SVLAN rate limiting service instances present on the card (subject to a minimum of 64 CVLAN rate limiting service instances).
- On GE_XPE and 10 GE_XPE cards, CVLAN rate limiting can be applied to up to 256 services. However, the number of provisionable CVLAN rate limiting service instances is equal to 384 minus the number of SVLAN rate limiting service instances present on the card (subject to a minimum of 128 CVLAN rate limiting service instances).

Related Procedure for Provisioning CVLAN Rate

To provision CVLAN rate on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the DLP-G289 Provisioning CVLAN Rate Limiting on a Card, on page 548.

DSCP to CoS Mapping

DSCP to CoS mapping can be configured for each port. You can configure the CoS of the outer VLAN based on the incoming DSCP bits. This feature is supported only on GE_XPE and 10GE_XPE cards. PCLI is not supported for DSCP to CoS mapping.

DSCP to CoS mapping is supported for the following service types:

- Selective add mode
- Selective translate mode
- Transparent mode
- Selective double add mode
- Selective translate add mode
- Untagged packets
- CVLAN range
- Services associated with the channel group

Related Procedure for Provisioning CoS Based on DSCP

To provision CoS based on DSCP on the GE_XPE and 10GE_XPE cards, see the DLP-G384 Provisioning the QinQ Settings, on page 538.

Link Aggregation Control Protocol

Link Aggregation Control Protocol (LACP) is part of the IEEE802.3ad standard that allows you to bundle several physical ports together to form a single logical channel. LACP allows a network device such as a switch to negotiate an automatic bundling of links by sending LACP packets to the peer device.

LACP allows you to form a single Layer 2 link automatically from two or more Ethernet links. This protocol ensures that both ends of the Ethernet link are functional and agree to be members of the aggregation group before the link is added to the group. LACP must be enabled at both ends of the link to be operational.

For more information on LACP, refer to the IEEE802.3ad standard. For information about interaction of LACP with other protocols, see the "Protocol Compatibility list" section on page 11-50.

Advantages of LACP

LACP provides the following advantages:

- High-speed network that transfers more data than any single port or device.
- High reliability and redundancy. If a port fails, traffic continues on the remaining ports.
- Hashing algorithm that allows to apply load balancing policies on the bundled ports.

Functions of LACP

LACP performs the following functions in the system:

- Maintains configuration information to control aggregation.
- Exchanges configuration information with other peer devices.
- Attaches or detaches ports from the link aggregation group based on the exchanged configuration information.
- Enables data flow when both sides of the aggregation group are synchronized.

Modes of LACP

LACP can be configured in the following modes:

- On — Default. In this mode, the ports do not exchange LACP packets with the partner ports.
- Active — In this mode, the ports send LACP packets at regular intervals to the partner ports.
- Passive — In this mode, the ports do not send LACP packets until the partner sends LACP packets. After receiving the LACP packets from the partner ports, the ports send LACP packets.

Parameters of LACP

LACP uses the following parameters to control aggregation:

- System Identifier—A unique identification assigned to each system. It is the concatenation of the system priority and a globally administered individual MAC address.
- Port Identification—A unique identifier for each physical port in the system. It is the concatenation of the port priority and the port number.
- Port Capability Identification—An integer, called a key, that identifies the capability of one port to aggregate with another port. There are two types of keys:
  - Administrative key—The network administrator configures this key.
  - Operational key—The LACP assigns this key to a port, based on its aggregation capability.
- Aggregation Identifier—A unique integer that is assigned to each aggregator and is used for identification within the system.

Unicast Hashing Schemes

LACP supports the following unicast hashing schemes:

- Ucast SA VLAN Incoming Port
- Ucast DA VLAN Incoming Port
- Ucast SA DA VLAN Incoming port
- Ucast Src IP TCP UDP
- Ucast Dst IP TCP UDP

- Ucast Src Dst IP TCP UDP

Note Unicast hashing schemes apply to unicast traffic streams only when the destination MAC address is already learned by the card. Hence, MAC learning must be enabled to support load balancing as per the configured hashing scheme. If the destination MAC address is not learned, the hashing scheme is Ucast Src Dst IP TCP UDP.

LACP Limitations and Restrictions

The LACP on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards has the following limitations and restrictions:

- Hot standby link state is not supported on the channel group.
- Marker protocol generator is not supported.
- ALS cannot be configured on the channel group.
- Loopback configuration cannot be applied on the channel group.

Related Procedure for LACP

To provision Channel Group using LACP, see the NTP-G281 Managing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Channel Group Settings, on page 482.

Ethernet Connectivity Fault Management

Ethernet Connectivity Fault Management (CFM) is part of the IEEE 802.1ag standard. The Ethernet CFM is an end-to-end per service instance that supports the Ethernet layer Operations, Administration, and Management (OAM) protocol. It includes proactive connectivity monitoring, link trace on a per service basis, fault verification, and fault isolation for large Ethernet metropolitan-area networks (MANs) and WANs.

CFM is disabled on the card by default. CFM is enabled on all the ports by default.

For more information on CFM, refer to the IEEE 802.1ag standard. For information about interaction of CFM with other protocols, see the "Protocol Compatibility list" section on page 11-50. The following sections contain conceptual information about Ethernet CFM.

Maintenance Domain

A maintenance domain is an administrative domain that manages and administers a network. You can assign a unique maintenance level (from 0 to 7) to define the hierarchical relationship between domains. The larger the domain, the higher the maintenance level for that domain. For example, a service provider domain would be larger than an operator domain and might have a maintenance level of 6, while the operator domain maintenance level would be 3 or 4.

Maintenance domains cannot intersect or overlap because that would require more than one entity to manage it, which is not allowed. Domains can touch or nest if the outer domain has a higher maintenance level than the nested domain. Maintenance levels of nesting domains must be communicated among the administrating

organizations. For example, one approach would be to have the service provider assign maintenance levels to operators.

The CFM protocol supports up to eight maintenance domains on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

Maintenance Association

A maintenance association identifies a service within the maintenance domain. You can have any number of maintenance associations within each maintenance domain. The CFM protocol supports up to 1500 maintenance associations on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.



Note Each maintenance association is mapped to a maintenance domain. This mapping is done to configure a Maintenance End Point (MEP). The CFM protocol supports up to 1000 mappings on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

Maintenance End Points

Maintenance End Points (MEPs) reside at the edge of the maintenance domain and are active elements of the Ethernet CFM. MEPs transmit Continuity Check messages at periodic intervals and receive similar messages from other MEPs within a domain. MEPs also transmit Loopback and Traceroute messages at the request of the administrator. MEPs confine CFM messages within the boundary of a maintenance domain through the maintenance level. There are two types of MEPs:

- Up (Inwards, towards the bridge)
- Down (Outwards, towards the wire).

You can create up to 255 MEPs and MIPs together on GE_XP and 10GE_XP cards. You can create up to 500 MEPs and MIPs together on GE_XPE and 10GE_XPE cards.

The MEP continuity check database (CCDB) stores information that is received from other MEPs in the maintenance domain. The card can store up to 4000 MEP CCDB entries.

Maintenance Intermediate Points

Maintenance Intermediate Points (MIPs) are internal to the maintenance domain and are passive elements of the Ethernet CFM. They store information received from MEPs and respond to Linktrace and Loopback CFM messages. MIPs forward CFM frames received from MEPs and other MIPs, drop all CFM frames at a lower level, and forward all CFM frames at a higher level.

You can create up to 255 MEPs and MIPs together on GE_XP and 10GE_XP cards. You can create up to 500 MEPs and MIPs together on GE_XPE and 10GE_XPE cards.

The MIP CCDB maintains the information received for all MEPs in the maintenance domain. The card can store up to 4000 MIP CCDB entries.

CFM Messages

The Ethernet CFM on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards supports the following messages:

- Continuity Check—These messages are exchanged periodically among MEPs. They allow MEPs to discover other MEPs within a domain and allow MIPs to discover MEPs. These messages are confined to a domain.
- Loopback—These messages are unicast messages that a MEP transmits, at the request of an administrator, to verify connectivity to a specific maintenance point. A reply to a loopback message indicates whether a destination is reachable.
- Traceroute—These messages are multicast messages that a MEP transmits, at the request of an administrator, to track the path to a destination MEP.

CFM Limitations and Restrictions

The CFM on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards has the following limitations and restrictions:

- CFM is not supported on channel groups.
- CFM is not enabled on protected ports running REP, FAPS, and 1+1.
- Y.1731 enhancements including AIS, LCK, and performance monitoring messages along with CFM are not supported.
- IEEE CFM MIB is not supported.
- L1 and CFM are mutually exclusive on a SVLAN because LI and CFM use the same MAC address.
- MAC security and CFM are mutually exclusive on the card due to hardware resource constraints.

Related Procedure for Ethernet CFM

For information about the supported Ethernet CFM features on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G283 Managing the Card CFM Settings, on page 493.

Ethernet OAM

The Ethernet OAM protocol is part of the IEEE 802.3ah standard and is used for installing, monitoring, and troubleshooting Ethernet MANs and Ethernet WANs. This protocol relies on an optional sublayer in the data link layer of the OSI model. The Ethernet OAM protocol was developed for Ethernet in the First Mile (EFM) applications. The terms Ethernet OAM and EFM are interchangeably used and both mean the same.

Normal link operation does not require Ethernet OAM. You can implement Ethernet OAM on any full-duplex point-to-point or emulated point-to-point Ethernet link for a network or part of a network (specified interfaces). OAM frames, called OAM Protocol Data Units (OAM PDUs), use the slow protocol destination MAC address 0180.c200.0002. OAM PDUs are intercepted by the MAC sublayer and cannot propagate beyond a single hop within an Ethernet network.

Ethernet OAM is disabled on all interfaces by default. When Ethernet OAM is enabled on an interface, link monitoring is automatically turned on.

For more information on Ethernet OAM protocol, refer to IEEE 802.3ah standard. For information about interaction of Ethernet OAM with other protocols, see the "Protocol Compatibility list" section on page 11-50.

Components of the Ethernet OAM

Ethernet OAM consists of two major components, the OAM Client and the OAM Sublayer.

OAM Client

The OAM client establishes and manages the Ethernet OAM on a link. The OAM client also enables and configures the OAM sublayer. During the OAM discovery phase, the OAM client monitors the OAM PDUs received from the remote peer and enables OAM functionality. After the discovery phase, the OAM client manages the rules of response to OAM PDUs and the OAM remote loopback mode.

OAM Sublayer

The OAM sublayer presents two standard IEEE 802.3 MAC service interfaces:

- One interface facing toward the superior sub-layers, which include the MAC client (or link aggregation).
- Other interface facing toward the subordinate MAC control sublayer.

The OAM sublayer provides a dedicated interface for passing OAM control information and OAM PDUs to and from the client.

Benefits of the Ethernet OAM

Ethernet OAM provides the following benefits:

- Competitive advantage for service providers
- Standardized mechanism to monitor the health of a link and perform diagnostics

Features of the Ethernet OAM

The Ethernet OAM protocol has the following OAM features:

- Discovery—Identifies devices in the network and their OAM capabilities. The Discovery feature uses periodic OAM PDUs to advertise the OAM mode, configuration, and capabilities. An optional phase allows the local station to accept or reject the configuration of the peer OAM entity.
- Link Monitoring—Detects and indicates link faults under a variety of conditions. It uses the event notification OAM PDU to notify the remote OAM device when it detects problems on the link.
- Remote Failure Indication—Allows an OAM entity to convey the failure conditions to its peer through specific flags in the OAM PDU.
- Remote Loopback—Ensures link quality with a remote peer during installation or troubleshooting.

Ethernet OAM Limitations and Restrictions

The Ethernet OAM on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards has the following limitations and restrictions:

- CFM, REP, link integrity, LACP, FAPS, IGMP on SVLAN and L2 1+1 protection are not supported with EFM.
- IEEE EFM MIB is not supported.
- EFM cannot be enabled or disabled at the card level.

- Unidirectional functionality is not supported.
- Errored Symbol Period, Rx CRC errors, Tx CRC errors are not supported.
- OAM PDUs are limited to 1 frame per second.
- Dying Gasp and critical events are not supported.

Note Dying Gasp RFI is not generated on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards. However, if the peer device sends a dying gasp RFI, the card detects it and raises an alarm.

Related Procedure for Ethernet OAM

For information about the supported Ethernet OAM features on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G285 Managing the Card EFM Settings, on page 506.

Resilient Ethernet Protocol

The Resilient Ethernet Protocol (REP) is a protocol used to control network loops, handle link failures, and improve convergence time.

REP performs the following tasks:

- Controls a group of ports connected in a segment.
- Ensures that the segment does not create any bridging loops.
- Responds to link failures within the segment.
- Supports VLAN load balancing.

For information about interaction of REP with other protocols, see the "Protocol Compatibility list" section on page 11-50.

REP Segments

A REP segment is a chain of ports connected to each other and configured with a segment ID. Each segment consists of regular segment ports and two edge ports. A GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card can have up to 2 ports that belong to the same segment, and each segment port can have only one external neighbor port.

A segment protects only against a single link failure. Any more failures within the segment result in loss of connectivity.

Characteristics of REP Segments

REP segments have the following characteristics:

- If all the ports in the segment are operational, one port blocks traffic for each VLAN. If VLAN load balancing is configured, two ports in the segment control the blocked state of VLANs.

- If any port in the segment is not operational, all the other operational ports forward traffic on all VLANs to ensure connectivity.
- In case of a link failure, the alternate ports are immediately unblocked. When the failed link comes up, a logically blocked port per VLAN is selected with minimal disruption to the network.

REP Port States

Ports in REP segments take one of three roles or states: Failed, Open, or Alternate.

- A port configured as a regular segment port starts as a failed port.
- When the neighbor adjacencies are determined, the port transitions to the alternate port state, blocking all the VLANs on the interface. Blocked port negotiations occur and when the segment settles, one blocked port remains in the alternate role and all the other ports become open ports.
- When a failure occurs in a link, all the ports move to the failed state. When the alternate port receives the failure notification, it changes to the open state, forwarding all VLANs.

Link Adjacency

Each segment port creates an adjacency with its immediate neighbor. Link failures are detected and acted upon locally. If a port detects a problem with its neighbor, the port declares itself non-operational and REP converges to a new topology.

REP Link Status Layer (LSL) detects its neighbor port and establishes connectivity within the segment. All VLANs are blocked on an interface until the neighbor port is identified. After the neighbor port is identified, REP determines the neighbor port that must be the alternate port and the ports that must forward traffic.

Each port in a segment has a unique port ID. When a segment port starts, the LSL layer sends packets that include the segment ID and the port ID.

A segment port does not become operational if the following conditions are satisfied:

- No neighbor port has the same segment ID or more than one neighbor port has the same segment ID.
- The neighbor port does not acknowledge the local port as a peer.

Fast Reconvergence

REP runs on a physical link and not on per VLAN. Only one hello message is required for all VLANs that reduces the load on the protocol.

REP Hardware Flood Layer (HFL) is a transmission mechanism that floods packets in hardware on an admin VLAN. HFL avoids the delay that is caused by relaying messages in software. HFL is used for fast reconvergence in the order of 50 to 200 milliseconds.

VLAN Load Balancing

You must configure two edge ports in the segment for VLAN load balancing. One edge port in the REP segment acts as the primary edge port; the other edge port as the secondary edge port. The primary edge port always participates in VLAN load balancing in the segment. VLAN load balancing is achieved by blocking certain VLANs at a configured alternate port and all the other VLANs at the primary edge port.

REP Configuration Sequence

You must perform the following tasks in sequence to configure REP:

- Configure the REP administrative VLAN or use the default VLAN 1. The range of REP admin VLAN is 1 to 4093. VLAN 4094 is not allowed.
- Add ports to the segment in interface configuration mode.
- Enable REP on ports and assign a segment ID to it. REP is disabled on all ports by default. The range of segment ID is 1 to 1024.
- Configure two edge ports in the segment; one port as the primary edge port and the other as the secondary edge port.
- If you configure two ports in a segment as the primary edge port, for example, ports on different switches, REP selects one of the ports to serve as the primary edge port based on port priority. The Primary option is enabled only on edge ports.
- Configure the primary edge port to send segment topology change notifications (STCNs) and VLAN load balancing to another port or to other segments. STCNs and VLAN load balancing configurations are enabled only for edge ports.

Note A port can belong to only one segment. Only two ports can belong to the same segment. Both the ports must be either regular ports or edge ports. However, if the No-neighbor port is configured, one port can be an edge port and another port can be a regular port.

REP Supported Interfaces

REP supports the following interfaces:

- REP is supported on client (UNI) and trunk (NNI) ports.
- Enabling REP on client ports allows protection at the access or aggregation layer when the cards are connected to the L2 network.
- Enabling REP on trunk ports allows protection at the edge layer when the cards are connected in a ring.

REP Limitations and Restrictions

The REP on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards has the following limitations and restrictions:

- Fast re-convergence and VLAN load balancing are not supported on UNI ports in transparent mode.
- Native VLAN is not supported.
- CFM, EFM, link integrity, LACP, FAPS, and L2 1+1 protection are not supported on ports that are configured as part of REP segment and vice versa.
- When a node installed with GE_XP, GE_XPE, 10GE_XP, or 10GE_XPE cards configured with REP or LACP is upgraded, traffic loss may occur. This traffic loss is due to reconvergence when the cards soft reset during the upgrade process.

- NNI ports cannot be configured as the primary edge port or blocking port at the access or aggregation layer.
- Only three REP segments can be configured on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
- Consider the following configuration:

  More than one REP closed segment is configured on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards and the same HFL admin VLAN is enabled on the switches.

  If two different segments are configured on more than one common switch, the following consequences happen.

  - Layer 1 loop
  - Flooding of HFL packets across segments if one REP segment fails
  - Segment goes down due to LSL time out even if the segment does not have faults

    Hence, it is recommended not to configure two different segments on more than one common switch.

- Consider the following configuration:
  - VLAN Load Balancing is configured on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards by specifying the VLB preempt delay.
  - Primary and secondary edge ports are configured on the same switch.
  - HFL or LSL is activated.

    This configuration leads to high convergence time during manual premption, VLB activation, and deactivation (400 to 700 milliseconds).

Related Procedure for Managing the REP Settings

To manage the REP settings on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see the NTP-G287 Managing the Card REP Settings, on page 511.

For more information about the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, see:

- http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ebef7.html
- http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/product_data_sheet0900aecd805ec093.html

Related Procedures for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards

The following is the list of procedures and tasks related to the configuration of the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards:

- NTP-G165 Modifying the Ethernet, Line and PM Thresholds, on page 518
- NTP-G311 Provisioning the Storm Control Settings, on page 545
- NTP-G208 Provisioning SVLAN Rate Limiting on a Card, on page 548
- NTP-G314 Adding a Card on FAPS Ring, on page 565
- NTP-G75 Monitor Transponder and Muxponder Performance

ADM-10G Card

The ADM-10G card operates on Cisco NCS 2002 and Cisco NCS 2006 networks to carry optical signals and Gigabit Ethernet signals over DWDM wavelengths for transport. The card aggregates lower bit-rate client SONET or SDH signals (OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, or Gigabit Ethernet) onto a C-band tunable DWDM trunk operating at a higher OC-192/STM-64 rate. In a DWDM network, the ADM-10G card transports traffic over DWDM by mapping Gigabit Ethernet and SONET or SDH circuits onto the same wavelength with multiple protection options.

You can install and provision the ADM-10G card in a linear configuration in:

- Slot 2 in Cisco NCS 2002
- Slots 2 to 6 in Cisco NCS 2006

The card is compliant with ITU-T G.825 and ITU-T G.783 for SDH signals. It supports concatenated and non-concatenated AU-4 mapped STM-1, STM-4, and STM-16 signals as specified in ITU-T G.707. The card also complies with Section 5.6 of Telcordia GR-253-CORE and supports synchronous transport signal (STS) mapped OC-3, OC-12, and OC-48 signals as specified in the standard.

The client SFP and trunk XFP are compliant with interface requirements in Telcordia GR-253-CORE, ITU-T G.957 and/or ITU-T G.959.1, and IEEE 802.3.

Key Features

The ADM-10G card has the following high-level features:

- Operates with the control card.
- Interoperable with TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10EX_C, and OTU2_XP cards.
- Has built-in OC-192/STM-64 add/drop multiplexing function including client, trunk, and STS cross-connect.
- Supports both single-card and double-card (ADM-10G peer group) configuration.
- Supports path protection/SNCP on client and trunk ports for both single-card and double-card configuration. The card does not support path protection/SNCP between a client port and a trunk port. Path protection/SNCP is supported only between two client ports or two trunk ports.
- Supports 1+1 protection on client ports for double-card configuration only.
- Supports SONET, SDH, and Gigabit Ethernet protocols on client SFPs.
- Supports XFP DWDM trunk interface single wavelengths.
- Returns zero bit errors when a control card switches from active to standby or when manual or forced protection switches occur.
- Has 16 SFP-based client interfaces (gray, colored, coarse wavelength division multiplexing (CWDM), and DWDM optics available).
- Supports STM1, STM4, STM16, and Gigabit Ethernet client signals (8 Gigabit Ethernet maximum).
- Has one XFP-based trunk interface supporting E-FEC/FEC and ITU-T G.709 for double-card configuration.

- Has two XFP-based trunk interface supporting E-FEC/FEC and ITU-T G.709 for single-card configuration.
- Has two SR XFP interlink interfaces supporting redundancy connection with protection board and pass-through traffic for double-card configuration.
- Supports frame-mapped generic framing procedure (GFP-F) and LEX mapping for Ethernet over SONET or SDH.
- Can be installed or pulled from operation, in any slot, without impacting other service cards in the shelf.
- Supports client to client hairpinning, that is, creation of circuits between two client ports for both single-card and double-card configuration. See the "Circuit Provisioning" section on page 11-76 for more detailed information.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

ADM-10G POS Encapsulation, Framing, and CRC

The ADM-10G card supports Cisco EoS LEX (LEX) and generic framing procedure framing (GFP-F) encapsulation on 8 POS ports corresponding to 8 GigE ports (Port 1 to Port 8) in both single-card and double-card (ADM-10G peer group) configuration.

You can provision framing on the ADM-10G card as either the default GFP-F or LEX framing. With GFP-F framing, you can configure a 32-bit cyclic redundancy check (CRC) or none (no CRC) (the default). LEX framing supports 16-bit or 32-bit CRC configuration. The framing type cannot be changed when there is a circuit on the port.

On the CTC, navigate to card view and click the Provisioning > Line> Ethernet Tab. Parameters such as, admin state, service state, framing type, CRC, MTU and soak time for a port can be configured.

It is possible to create an end-to-end circuit between equipment supporting different kinds of encapsulation (for example, LEX on one side and GFP-F on other side). But, under such circumstances, traffic does not pass through, and an alarm is raised if there is a mismatch.

POS Overview

Ethernet data packets need to be framed and encapsulated into a SONET/SDH frame for transport across the SONET/SDH network. This framing and encapsulation process is known as packet over SONET/SDH (POS).

The Ethernet frame comes into the ADM-10G card on a standard Gigabit Ethernet port and is processed through the card's framing mechanism and encapsulated into a POS frame. When the POS frame exits, the ADM-10G card is in a POS circuit, and this circuit is treated as any other SONET circuit (STS) or SDH circuit (VC) in the node. It is cross-connected and rides the SONET/SDH signal out the port of an optical card and across the SONET/SDH network.

The destination of the POS circuit is a card or a device that supports the POS interface. Data packets in the destination card frames are removed and processed into ethernet frames. The Ethernet frames are then sent to a standard Ethernet port of the card and transmitted onto an Ethernet network.

POS Framing Modes

A POS framing mode is the type of framing mechanism employed by the ADM-10G card to frame and encapsulate data packets into a POS signal. These data packets were originally encapsulated in Ethernet frames that entered the standard Gigabit Ethernet interface of the ADM-10G card.

GFP-F Framing

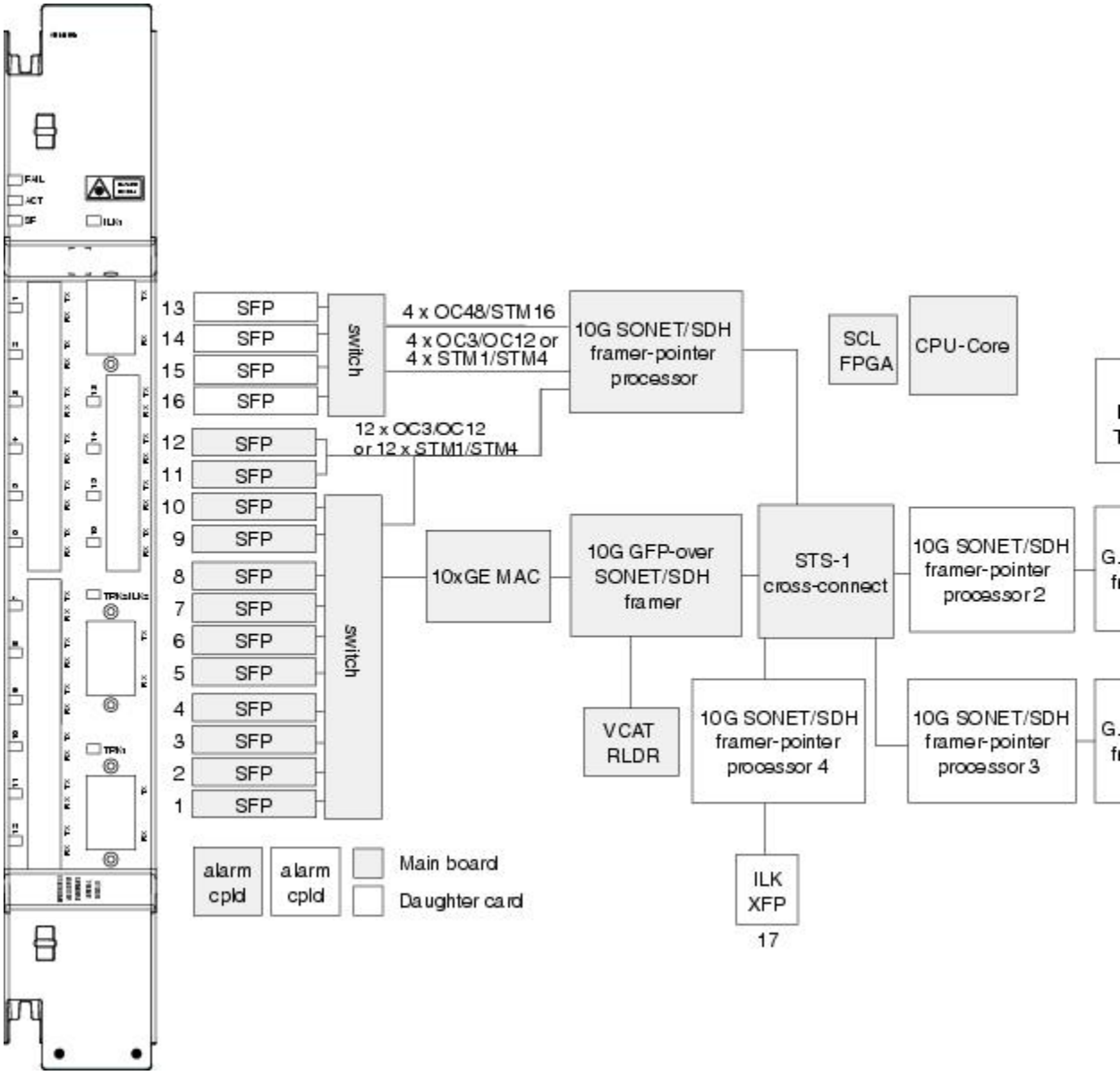
The GFP-F framing represent standard mapped Ethernet over GFP-F according to ITU-T G.7041. GFP-F defines a standard-based mapping of different types of services onto SONET/SDH. GFP-F maps one variable length data packet onto one GFP packet. GFP-F comprises of common functions and payload specific functions. Common functions are those shared by all payloads. Payload-specific functions are different depending on the payload type. GFP-F is detailed in the ITU recommendation G.7041.

LEX Framing

LEX encapsulation is a HDLC frame based Cisco Proprietary protocol, where the field is set to values specified in Internet Engineering Task Force (IETF) RFC 1841. HDLC is one of the most popular Layer 2 protocols. The HDLC frame uses the zero insertion/deletion process (commonly known as bit stuffing) to ensure that the bit pattern of the delimiter flag does not occur in the fields between flags. The HDLC frame is synchronous and therefore relies on the physical layer to provide a method of clocking and synchronizing the transmission and reception of frames. The HDLC framing mechanism is detailed in the IETF's RFC 1662, "PPP in HDLC-like Framing."

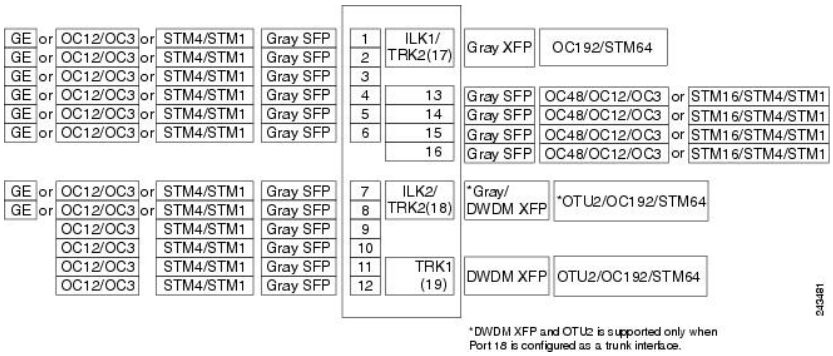
Faceplate and Block Diagram

Figure 17: ADM-10G Card Faceplate and Block Diagram



Port Configuration Rules

Figure 18: ADM-10G Card Port Capacities



Port 17 acts as trunk2 or ILK1 interface based on single-card or double-card configuration.

Client Interfaces

The ADM-10G card uses LC optical port connectors supports up to 16 SFPs that can be utilized for OC-N/STM-N traffic. Eight of the SFPs can be used for Gigabit Ethernet. The interfaces can support any mix of OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, or Gigabit Ethernet of any reach, such as SX, LX, ZX, SR, IR, or LR. The interfaces support a capacity of:

- 4 x OC-48/STM-16
- 16 x OC-12/STM-4
- 16 x OC-3/STM-1
- 8 x GE

The supported client SFPs and XFPs are:

- Gray SFPs
  - 1000Base-SX SFP 850 nm (ONS-SE-G2F-SX=)
  - 1000Base-LX SFP 1310 nm (ONS-SE-G2F-LX=)
  - OC48/STM16 IR1, OC12/STM4 SR1, OC3/STM1 SR1, GE-LX multirate SFP 1310 nm (ONS-SE-Z1=)
  - OC3/STM1 IR1, OC12/STM4 IR1 multirate SFP 1310 nm (ONS-SI-622-I1=)
  - OC48/STM16 SR1 SFP 1310 nm (ONS-SI-2G-S1=)
  - OC48/STM16 IR1 SFP 1310 nm (ONS-SI-2G-I1=)
  - OC48/STM16, 1550 LR2, SM LC (ONS-SE-2G-L2=)
- Colored DWDM SFPs
  - 1000Base-ZX SFP 1550 nm (ONS-SI-GE-ZX=)
  - OC3/STM1 LR2 SFP 1550 nm (ONS-SI-155-L2=)

- OC48/STM16 LR2 SFP 1550 nm (ONS-SI-2G-L2=)
- OC48/STM16 SFP (ONS-SC-2G-xx.x)



Note xx.x = 28.7 to 60.6. ONS-SC-2G-28.7, ONS-SC-2G-33.4, ONS-SC-2G-41.3, ONS-SC-2G-49.3, and ONS-SC-2G-57.3 are supported from Release 8.5 and later.

- CWDM SFPs
  - OC48/STM16/GE CWDM SFP (ONS-SC-Z3-xxxx)
- XFPs
  - OC-192/STM-64/10GE XFP 1550 nm (ONS-XC-10G-I2)

Interlink Interfaces

Two 2R interlink interfaces, called ILK1 (Port 17) and ILK2 (Port 18), are provided for creation of ADM-10G peer groups in double-card configurations. In a single-card configuration, Port 17 (OC-192/STM-64) and Port 18 (OC-192/STM-64 or OTU2 payload) must be configured as trunk interfaces. In a double-card configuration (ADM-10G peer group), Ports 17 and 18 must be configured as ILK1 and ILK2 interfaces, respectively. Physically cabling these ports between two ADM-10G cards, located on the same shelf, allows you to configure them as an ADM-10G peer group.The ILK ports carry 10 Gb of traffic each.

The interlink interfaces support STM64 SR1 (ONS-XC-10G-S1=) XFP and 10GE BASE SR (ONS-XC-10G-SR-MM=) XFPs.

DWDM Trunk Interface

The ADM-10G card supports OC-192/STM-64 signal transport and ITU-T G.709 digital wrapping according to the ITU-T G.709 standard.The ADM-10G card supports three trunk XFPs:

- Two DWDM trunks, and one trunk interface in a single-card configuration.
- One DWDM trunk XFP in a double-card configuration.

The supported DWDM trunk XFPs are:

- 10G DWDM (ONS-XC-10G-xx.x=) (colored XFP)
- STM64 SR1 (ONS-XC-10G-S1=) (gray XFP)

Configuration Management

When using OC-48/STM-16 traffic, some contiguous port configurations are unavailable due to hardware limitations. This limitation does not impact the Gigabit Ethernet payload.

Note The ADM-10G card cannot be used in the same shelf with SONET or SDH cross-connect cards.

Table 66: OC-48/STM-16 Configuration Limitations

OC-48/STM-16 Port Number	Ports Restricted from Optical Traffic
OC-48/STM-16 on Port 13	No OC-N/STM-N on Port 1 through Port 3
OC-48/STM-16 on Port 14	No OC-N/STM-N on Port 4 through Port 6
OC-48/STM-16 on Port 15	No OC-N/STM-N on Port 7 through Port 9
OC-48/STM-16 on Port 16	No OC-N/STM-N on Port 10 through Port 12

Note The total traffic rate for each trunk cannot exceed OC-192/STM-64 on each ADM-10G card, or for each ADM-10G peer group.

Note Gigabit Ethernet is supported on Ports 1 through 8. Ports 9 through Port 12 support only OC-3/STM-1 or OC-12/STM-4.

Additionally, the following guidelines apply to the ADM-10G card:

- Trunk Port 17 supports OC-192/STM-64.
- Trunk Ports 18 and 19 support OC-192/STM-64 and OTU2.
- The interlink port supports OC-192/STM-64.
- Up to six ADM-10G cards can be installed in one shelf.
- Up to 24 ADM-10G cards can be installed per network element (NE) regardless of whether the card is installed in one shelf or in multiple shelves.
-
- A lamp test function can be activated from CTC to ensure that all LEDs are functional.
- The card can operate as a working protected or working non-protected card.
- In a redundant configuration, an active card hardware or software failure triggers a switch to the standby card. This switch is detected within 10 ms and is completed within 50 ms.
- ADM-10G cards support jumbo frames with MTU sizes of 64 to 9,216 bytes; the maximum is 9,216.
- After receiving a link or path failure, the ADM-10G card can shut down only the downstream Gigabit Ethernet port.

Note In ADM-10G cards, the Gigabit Ethernet port does not support flow control.

Security

The ADM-10G card that an SFP or XFP is plugged into implements the Cisco Standard Security Code Check Algorithm that keys on the vendor ID and serial number.

If a pluggable port module (PPM) is plugged into a port on the card but fails the security code check because it is not a Cisco PPM, a minor NON-CISCO-PPM alarm is raised.

If a PPM with an unqualified product ID is plugged into a port on this card—that is, the PPM passes the security code as a Cisco PPM but it has not been qualified for use on the ADM-10G card— a minor UNQUAL-PPM alarm is raised.

Protection

The ADM-10G card supports 1+1 and SONET path protection and SDH SNCP protection architectures in compliance with Telcordia GR-253-CORE, Telcordia GR-1400-CORE, and ITU-T G.841 specifications.

Circuit Protection Schemes

The ADM-10G card supports path protection/SNCP circuits at the STS/VC4 (high order) level and can be configured to switch based on signal degrade calculations. The card supports path protection/SNCP on client and trunk ports for both single-card and double-card configuration.

Note The ADM-10G card supports path protection/SNCP between client ports and trunk port 17. The card does not support path protection/SNCP between client ports and trunk ports 18 or 19. The card does not support path protection/SNCP between port 17 and trunk ports 18 and 19.

The card allows open-ended path protection/SNCP configurations incorporating other vendor equipment. In an open-ended path protection/SNCP, you can specify one source point and two possible endpoints (or two possible source points and one endpoint) and the legs can include other vendor equipment. The source and endpoints are part of the network discovered by CTC.

Port Protection Schemes

The ADM-10G card supports unidirectional and bidirectional 1+1 APS protection schemes on client ports for double-card configuration (ADM-10G peer group) only. 1+1 APS protection scheme is not supported in single-card configuration. For 1+1 optical client port protection, you can configure the system to use any pair of like facility interfaces that are on different cards of the ADM-10G peer group.

Circuit Provisioning

The ADM-10G card supports STS circuit provisioning both in single-card and double-card (ADM-10G peer group) configuration. The card allows you to create STS circuits between:

- Client and trunk ports
- Two trunk ports
- Two client ports (client-to-client hairpinning)

Note Circuits between two trunk ports are called pass-through circuits.

For an ADM-10G card in single-card configuration, if you are creating STS circuits between two client ports, the following limitation must be considered:

- Gigabit Ethernet to Gigabit Ethernet connections are not supported.

For an ADM-10G card that is part of an ADM-10G peer group, if you are creating STS circuits between two client ports or between client and trunk ports, the following limitations must be considered:

- Gigabit Ethernet to Gigabit Ethernet connections are not supported.
- Optical channel (OC) to OC, OC to Gigabit Ethernet, and Gigabit Ethernet to OC connections between two peer group cards are supported. Peer group connections use interlink port bandwidth, hence, depending on the availability/fragmentation of the interlink port bandwidth, it may not be possible to create an STS circuit from the Gigabit Ethernet/OC client port to the peer card trunk port. This is because, contiguous STSs (that is, STS-3c, STS-12c, STS-24c, and so on) must be available on the interlink port for circuit creation.

  An alarm is raised on the port having the STS circuit created on the port of the ADM-10G card. Right click the alarm and choose Select Affected Circuits to view the circuits affected by this alarm. CTC informs that no STS circuits are affected by the alarm instead of highlighting the circuit passing over that port in Circuits pane.

Note There are no limitations to create an STS circuit between two trunk ports.

The two ADM-10G cards used in a paired mode use interlink ports ILK1 (Port 17) and ILK2 (Port 18). A CCAT or VCAT circuit created between the peer ADM-10G cards uses the ILK1 port if the source or destination is Port 19. The circuits created with a single ADM-10G card uses the ILK2 port.

If the circuit is of type STS-*n*c (where *n* is an integer and can take values 3,6,9,12,18,24,36,48,96) and uses the ILK2 port, then the starting timeslot needs to use specific timeslots for traffic to flow. The timeslots can be 12*m*+1 for STS-12c circuits and 48*m*+1 (where *m* is an integer and can take values 0,1,2,3...) for STS-48c circuits. The timeslots can be 3*m*+1 for the other STS-*n*c circuits.

The following example illustrates how to use the correct timeslot for an ILK2 port:

If there is no circuit on the ILK2 port and a STS-3c circuit is created, the circuit uses timeslots 1 to 3. An STS-12c circuit must be created on the ILK2 port later. The STS-12c circuit must have used timeslots 4 to 15. However, the STS-12c circuit uses timeslots starting from 12m+1 (1, 13, 25, and so on) as defined in the above rule. Therefore, before creating the STS-12c circuit, dummy circuits must be created in CTC that consumes STS-9 bandwidth.

ADM-10G CCAT and VCAT Characteristics

The ADM-10G card supports high-order (HO) contiguous concatenation (CCAT) and HO virtual concatenation (VCAT) circuits on 8 GigE ports (Port 1 to Port 8) in both single-card and double-card (ADM-10G peer group) configuration.

To enable end-to-end connectivity in a VCAT circuit that traverses through a third-party network, you can use Open-Ended VCAT circuit creation.

The ADM-10G card supports flexible non-LCAS VCAT groups (VCGs). With flexible VCGs, the ADM-10G can perform the following operations:

- Add or remove members from groups
- Put members into or out of service, which also adds/removes them from the group
- Add or remove cross-connect circuits from VCGs

Any operation on the VCG member is service effecting (for instance, adding or removing members from the VCG). Adding or removing cross-connect circuits is not service-affecting, if the associated members are not in the group

The ADM-10G card allows independent routing and protection preferences for each member of a VCAT circuit. You can also control the amount of VCAT circuit capacity that is fully protected, unprotected, or uses Protection Channel Access (PCA) (when PCA is available). Alarms are supported on a per-member as well as per virtual concatenation group (VCG) basis.

The ADM-10G card supports both automatic and manual routing for VCAT circuit, that is, all members are manually or automatically routed. Bidirectional VCAT circuits are symmetric, which means that the same number of members travel in each direction. With automatic routing, you can specify the constraints for individual members; with manual routing, you can select different spans for different members. Two types of automatic and manual routing are available for VCAT members: common fiber routing and split routing.

The ADM-10G card supports VCAT common fiber routing and VCAT split fiber (diverse) routing. With VCAT split fiber routing, each member can be routed independently through the SONET or SDH or DWDM network instead of having to follow the same path as required by CCAT and VCAT common fiber routing. This allows a more efficient use of network bandwidth, but the different path lengths and different delays encountered may cause slightly different arrival times for the individual members of the VCG. The VCAT differential delay is this relative arrival time measurement between members of a VCG. The maximum tolerable VCAT split fiber routing differential delay for the ADM-10G card is approximately 55 milliseconds. A loss of alignment alarm is generated if the maximum differential delay supported is exceeded.

The differential delay compensation function is automatically enabled when you choose split fiber routing during the CTC circuit configuration process. CCAT and VCAT common fiber routing do not enable or need differential delay support.



Caution Protection switches with switching time of less than 60 milliseconds are not guaranteed with the differential delay compensation function enabled. The compensation time is added to the switching time.



Note For TL1, EXPBUFFERS parameter must be set to ON in the ENT-VCG command to enable support for split fiber routing.

Available Circuit Sizes

Table 67: Supported SONET Circuit Sizes of ADM-10G card

CCAT	VCAT High Order
STS-1	STS-1-1*n*V (*n*= 1 to 21)
STS-3c	STS-3c-*m*v (*m*= 1 to 7)
STS-6c	
STS-9c	
STS-12c	
STS-24c	

Table 68: Supported SDH Circuit Sizes of ADM-10G card

CCAT	VCAT High Order
VC-4	VC-4-*m*v (*m*= 1 to 7)
VC-4-2c	
VC-4-3c	
VC-4-4c	
VC-4-8c	

Note In ADM-10G cards, the Gigabit Ethernet port does not support flow control. When less than seven VC-4s are configured for the port, with the client traffic expected to be below the line rate, a burst in traffic beyond the supposed bandwidth leads to packet loss. It is, therefore, recommended to use an external flow control mechanism with less than seven VC-4s configured. Connecting a GE-XP or GE-XPE card between the client traffic and the ADM-10G Gigabit Ethernet interface enables such flow control.

Related Procedure for VCAT Circuit

The following is the list of procedures related to creating VCAT circuits:

- NTP-G245 Creating an Automatically Routed VCAT Circuit
- NTP-G246 Creating a Manually Routed VCAT Circuit

Intermediate Path Performance Monitoring

Intermediate path performance monitoring (IPPM) allows a node to monitor the constituent channel of an incoming transmission signal. You can enable IPPM for STS/VC-4s payload on OCn and Trunk ports of ADM-10G card. The IPPM is complaint with GR253/G.826.

Software Release 9.2 and higher enables the ADM-10G card to monitor the near-end and far-end PM data on individual STS/VC-4 payloads by enabling IPPM. After provisioning IPPM on the card, service providers can monitor large amounts of STS/VC-4 traffic through intermediate nodes, thus making troubleshooting and maintenance activities more efficient. IPPM occurs only on STS/VC-4 paths that have IPPM enabled, and TCAs are raised only for PM parameters on the selected IPPM paths.

For a CCAT circuit, you can enable IPPM only on the first STS/VC-4 of the concatenation group. For a VCAT circuit, you can enable IPPM independently on each member STS/VC-4 of the concatenation group.

Related Procedure for IPPM

To enable IPPM on the ADM-10G card, see:

- NTP-G247 Enabling or Disabling Path Performance Monitoring on Intermediate Nodes

Pointer Justification Count Performance Monitoring

Pointers are used to compensate for frequency and phase variations. Pointer justification counts indicate timing errors on SONET networks. When a network is out of synchronization, jitter and wander occur on the transported signal. Excessive wander can cause terminating equipment to slip.

Slips cause different effects in service. Voice service has intermittent audible clicks. Compressed voice technology has short transmission errors or dropped calls. Fax machines lose scanned lines or experience dropped calls. Digital video transmission has distorted pictures or frozen frames. Encryption service loses the encryption key, causing data to be transmitted again.

Pointers provide a way to align the phase variations in STS and VC4 payloads. The STS payload pointer is located in the H1 and H2 bytes of the line overhead. Clocking differences are measured by the offset in bytes from the pointer to the first byte of the STS synchronous payload envelope (SPE) called the J1 byte. Clocking differences that exceed the normal range of 0 to 782 can cause data loss.

There are positive (PPJC) and negative (NPJC) pointer justification count parameters. PPJC is a count of path-detected (PPJC-PDET-P) or path-generated (PPJC-PGEN-P) positive pointer justifications. NPJC is a count of path-detected (NPJC-PDET-P) or path-generated (NPJC-PGEN-P) negative pointer justifications depending on the specific PM name. PJCDIFF is the absolute value of the difference between the total number of detected pointer justification counts and the total number of generated pointer justification counts. PJCS-PDET-P is a count of the one-second intervals containing one or more PPJC-PDET or NPJC-PDET. PJCS-PGEN-P is a count of the one-second intervals containing one or more PPJC-PGEN or NPJC-PGEN.

A consistent pointer justification count indicates clock synchronization problems between nodes. A difference between the counts means that the node transmitting the original pointer justification has timing variations with the node detecting and transmitting this count. Positive pointer adjustments occur when the frame rate of the SPE is too slow in relation to the rate of the STS-1.

You must enable PPJC and NPJC performance monitoring parameters for ADM-10Gcard. In CTC, the count fields for PPJC and NPJC PMs appear white and blank unless they are enabled on the card view Provisioning tab.

Performance Monitoring Parameter Definitions

This section describes the STS and VC-4 path performance monitoring parameters that ADM-10G card support.

Table 69: STS Near-end Path Performance Monitoring Parameters

Parameter	Definition
CV-P	Near-End STS Path Coding Violations (CV-P) is a count of BIP errors detected at the STS path layer (that is, using the B3 byte). Up to eight BIP errors can be detected per frame; each error increments the current CV-P second register.
ES-P	Near-End STS Path Errored Seconds (ES-P) is a count of the seconds when at least one STS path BIP error was detected. An AIS Path (AIS-P) defect (or a lower-layer, traffic-related, near-end defect) or a Loss of Pointer Path (LOP-P) defect can also cause an ES-P.
SES-P	Near-End STS Path Severely Errored Seconds (SES-P) is a count of the seconds when K (2400) or more STS path BIP errors were detected. An AIS-P defect (or a lower-layer, traffic-related, near-end defect) or an LOP-P defect can also cause an SES-P.
UAS-P	Near-End STS Path Unavailable Seconds (UAS-P) is a count of the seconds when the STS path was unavailable. An STS path becomes unavailable when ten consecutive seconds occur that qualify as SES-Ps, and continues to be unavailable until ten consecutive seconds occur that do not qualify as SES-Ps.
FC-P	Near-End STS Path Failure Counts (FC-P) is a count of the number of near-end STS path failure events. A failure event begins when an AIS-P failure, an LOP-P failure, a UNEQ-P failure, or a Section Trace Identifier Mismatch Path (TIM-P) failure is declared. A failure event also begins if the STS PTE that is monitoring the path supports Three-Bit (Enhanced) Remote Failure Indication Path Connectivity (ERFI-P-CONN) for that path. The failure event ends when these failures are cleared.
PPJC-PDET-P	Positive Pointer Justification Count, STS Path Detected (PPJC-PDET-P) is a count of the positive pointer justifications detected on a particular path in an incoming SONET signal.
PPJC-PGEN-P	Positive Pointer Justification Count, STS Path Generated (PPJC-PGEN-P) is a count of the positive pointer justifications generated for a particular path to reconcile the frequency of the SPE with the local clock.
NPJC-PDET-P	Negative Pointer Justification Count, STS Path Detected (NPJC-PDET-P) is a count of the negative pointer justifications detected on a particular path in an incoming SONET signal.
NPJC-PGEN-P	Negative Pointer Justification Count, STS Path Generated (NPJC-PGEN-P) is a count of the negative pointer justifications generated for a particular path to reconcile the frequency of the SPE with the local clock.

Parameter	Definition
PJCDIFF-P	Pointer Justification Count Difference, STS Path (PJCDIFF-P) is the absolute value of the difference between the total number of detected pointer justification counts and the total number of generated pointer justification counts. That is, PJCDiff-P is equal to (PPJC-PGEN-P - NPJC-PGEN-P) - (PPJC-PDET-P - NPJC-PDET-P).
PJCS-PDET-P	Pointer Justification Count Seconds, STS Path Detect (NPJCS-PDET-P) is a count of the one-second intervals containing one or more PPJC-PDET or NPJC-PDET.
PJCS-PGEN-P	Pointer Justification Count Seconds, STS Path Generate (PJCS-PGEN-P) is a count of the one-second intervals containing one or more PPJC-PGEN or NPJC-PGEN.

Table 70: VC-4 Near-end Path Performance Monitoring Parameters

Parameter	Definition
HP-EB	High-Order Path Errored Block (HP-EB) indicates that one or more bits are in error within a block.
HP-BBE	High-Order Path Background Block Error (HP-BBE) is an errored block not occurring as part of an SES.
HP-ES	High-Order Path Errored Second (HP-ES) is a one-second period with one or more errored blocks or at least one defect.
HP-SES	High-Order Path Severely Errored Seconds (HP-SES) is a one-second period containing 30 percent or more errored blocks or at least one defect. SES is a subset of ES.
HP-UAS	High-Order Path Unavailable Seconds (HP-UAS) is a count of the seconds when the VC path was unavailable. A high-order path becomes unavailable when ten consecutive seconds occur that qualify as HP-SESs, and it continues to be unavailable until ten consecutive seconds occur that do not qualify as HP-SESs.
HP-BBER	High-Order Path Background Block Error Ratio (HP-BBER) is the ratio of BBE to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during SESs.
HP-ESR	High-Order Path Errored Second Ratio (HP-ESR) is the ratio of errored seconds to total seconds in available time during a fixed measurement interval.
HP-SESR	High-Order Path Severely Errored Second Ratio (HP-SESR) is the ratio of SES to total seconds in available time during a fixed measurement interval.
HP-PPJC-PDET	High-Order, Positive Pointer Justification Count, Path Detected (HP-PPJC-Pdet) is a count of the positive pointer justifications detected on a particular path on an incoming SDH signal.

Parameter	Definition
HP-NPJC-PDET	High-Order, Negative Pointer Justification Count, Path Detected (HP-NPJC-Pdet) is a count of the negative pointer justifications detected on a particular path on an incoming SDH signal.
HP-PPJC-PGEN	High-Order, Positive Pointer Justification Count, Path Generated (HP-PPJC-Pgen) is a count of the positive pointer justifications generated for a particular path.
HP-NPJC-PGEN	High-Order, Negative Pointer Justification Count, Path Generated (HP-NPJC-Pgen) is a count of the negative pointer justifications generated for a particular path.
HP-PJCDIFF	High-Order Path Pointer Justification Count Difference (HP-PJCDiff) is the absolute value of the difference between the total number of detected pointer justification counts and the total number of generated pointer justification counts. That is, HP-PJCDiff is equal to (HP-PPJC-PGen - HP-NPJC-PGen) - (HP-PPJC-PDet - HP-NPJC-PDet).
HP-PJCS-PDET	High-Order Path Pointer Justification Count Seconds (HP-PJCS-PDet) is a count of the one-second intervals containing one or more HP-PPJC-PDet or HP-NPJC-PDet.
HP-PJCS-PGEN	High-Order Path Pointer Justification Count Seconds (HP-PJCS-PGen) is a count of the one-second intervals containing one or more HP-PPJC-PGen or HP-NPJC-PGen.

ADM-10G Functions

The following functions of the ADM-10G card are explained in the "Card Features" chapter:

- Automatic Laser Shutdown
- Card level indicators
- Port level indicators

Related Procedures for ADM-10G Card

The following is the list of procedures and tasks related to the configuration of the ADM-10G card:

- NTP-G170 Provisioning the ADM-10G Card Peer Group, Ethernet Settings, Line Settings, PM Parameters, and Thresholds, on page 376
- NTP-G200 Creating, Deleting, and Managing STS or VC Circuits for the ADM-10G Card
- NTP-G75 Monitor Transponder and Muxponder Performance
- NTP-G333 Adding an ADM-10G Card to an Existing Topology, on page 400

DLP-G775 Displaying the Bandwidth Usage of the STS Timeslots

Purpose	This task displays the bandwidth usage of the STS timeslots on the interlink interfaces, ILK1 (Port 17) and ILK2 (Port 18), in ADM-10G double-card configuration.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G403 Creating the ADM-10G Peer Group, on page 377
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to display the bandwidth usage of the STS timeslots on the interlink interfaces.

Step 2 Click the **Maintenance** > **ILK Utilization** tabs.

Step 3 In the Interlink Ports drop-down list, choose the interlink port for which you want to display the bandwidth usage and click **Refresh**.

The bandwidth usage of STS 1 to 192 timeslots are displayed in the Free/Occupied column. The bandwidth usage values are updated only after clicking the Refresh button.

Step 4 Return to your originating procedure (NTP).

OTU2_XP Card

The OTU2_XP card is a single-slot card with four ports with XFP-based multirate (OC-192/STM-64, 10GE, 10G FC, IB_5G) Xponder. The OTU2_XP card supports multiple configurations.

Table 71: OTU2_XP Card Configurations and Ports

Configuration	Port 1	Port 2	Port 3	Port 4
2 x 10G transponder	Client port 1	Client port 2	Trunk port 1	Trunk port 2
2 x 10G standard regenerator (with enhanced FEC (E-FEC) only on one port)	Trunk port 1	Trunk port 2	Trunk port 1	Trunk port 2

Configuration	Port 1	Port 2	Port 3	Port 4
10 GE LAN Phy to WAN Phy	Client port	Client port in transponder or trunk port in regenerator configuration	Trunk port	Trunk port in transponder or regenerator configuration
1 x 10G E-FEC regenerator (with E-FEC on two ports)	Not used	Not used	Trunk port	Trunk port
1 x 10G splitter protected transponder	Client port	Not used	Trunk port (working)	Trunk port (protect)

All the four ports are ITU-T G.709 compliant and support 40 channels (wavelengths) at 100-GHz channel spacing in the C-band (that is, the 1530.33 nm to 1561.42 nm wavelength range).

The OTU2_XP card can be installed in , Slots 2 and 3 in Cisco NCS 2002, Slots 2 to 7 in Cisco NCS 2006, Slots 2 to 16 in Cisco NCS 2015 chassis. The OTU2_XP card supports SONET SR1, IR2, and LR2 XFPs, 10GE BASE SR, SW, LR, LW, ER, EW, and ZR XFPs, and 10G FC MX-SN-I and SM-LL-L XFPs.

When TNCS-2 and TNCS-2O cards are present as control cards, LDCC is not supported for the OTU2_XP card.

Key Features

The OTU2_XP card has the following high-level features:

- 10G transponder, regenerator, and splitter protection capability.
- Interoperable with TXP_MR_10E and TXP_MR_10E_C cards.
- Four port, multirate (OC-192/STM-64, 10G Ethernet WAN Phy, 10G Ethernet LAN Phy, 10G Fibre Channel, IB_5G) client interface. The client signals are mapped into an ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing.
- ITU-T G.709 framing with standard Reed-SoloMon (RS) (255,239) FEC. Performance monitoring and ITU-T G.709 Optical Data Unit (ODU) synchronous mapping. Enhanced FEC (E-FEC) with ITU-T G.709 ODU with greater than 8 dB coding gain.
- The trunk rate remains the same irrespective of the FEC configuration. The error coding performance can be provisioned as follows:
  - FEC—Standard ITU-T G.709.
  - E-FEC—Standard ITU-T G.975.1 (subclause I.7)
- IEEE 802.3 frame format supported for 10 Gigabit Ethernet interfaces. The minimum frame size is 64 bytes. The maximum frame size is user-provisionable.
- Supports fixed/no fixed stuff mapping (insertion of stuffing bytes) for 10G Ethernet LAN Phy signals (only in transponder configuration).
- Supports 10G Ethernet LAN Phy to 10G Ethernet WAN Phy conversion on Ports 1 (client port) and 3 (trunk port).

- Supports 10G Ethernet LAN Phy to WAN Phy conversion using CTC and TL1. When enabled on the OTU2_XP card, the first Channel (Ports 1 and 3) supports LAN to WAN conversion. The second channel carries normal 10GE, 10G FC, and OC192/STM64 traffic.
- The LAN Phy to WAN Phy conversion functions in accordance to WAN Interface Sublayer (WIS) mechanism as defined by IEEE802.3ae (IEEE Std 802.3ae-2002, Amendment to CSMA/CD).
- Default configuration is transponder, with trunk ports configured as ITU-T G.709 standard FEC.
- In transponder or regenerator configuration, if one of the ports is configured the corresponding port is automatically created.
- In regenerator configuration, only Ports 3 and 4 can be configured as E-FEC. Ports 1 and 2 can be configured only with standard FEC.
- When port pair 1-3 or 2-4 is configured as regenerator (that is, card mode is standard regenerator), the default configuration on Ports 3 and 4 is automatically set to standard FEC.
- When Ports 3 and 4 are configured as regenerator (that is, card mode is E-FEC regenerator), the default configuration on both these ports is automatically set to E-FEC.
- In a splitter-protected transponder configuration, the trunk ports (Port 3 and Port 4) are configured as ITU-T G.709 standard FEC or E-FEC. OCHCC circuits with different trunk wavelengths can be configured for the working and protect paths. The process of setting the trunk wavelengths is similar to the "DLP-G367 Change the 2.5G Multirate Transponder Trunk Wavelength Settings" task on page 11-175. OCHCC circuits having different trunk wavelengths on the working and protect paths can be upgraded to GMPLS circuits.
- Supports protection through Y-cable protection scheme.



Note When enabled, the 10G Ethernet LAN Phy to WAN Phy conversion feature does not support Y-cable protection on the LAN to WAN interface (ports 1 and 3).

- Client ports support SONET SR1, IR2, and LR2 XFPs, 10GE BASE SR, SW, LR, LW, ER, EW, and ZR XFPs, and 10G FC MX-SN-I and SM-LL-L XFPs.
- Following are the OTU2 link rates that are supported on the OTU2_XP trunk port:
  - Standard G.709 (10.70923 Gbps) when the client is provisioned as "SONET" (including 10G Ethernet WAN PHY) (9.95328 Gbps).
  - G.709 overclocked to transport 10GE as defined by ITU-T G. Sup43 Clause 7.2 (11.0491 Gbps) when the client is provisioned as "10G Ethernet LAN Phy" (10.3125 Gbps) with "No Fixed Stuff" enabled.
  - G.709 overclocked to transport 10GE as defined by ITU-T G. Sup43 Clause 7.1 (11.0957 Gbps) when the client is provisioned as "10G Ethernet LAN Phy" (10.3125 Gbps) with "No Fixed Stuff" disabled.
  - G.709 proprietary overclocking mode to transport 10G FC (11.3168 Gbps) when the client is provisioned as "10G Fiber Channel" (10.518 Gbps).
  - Proprietary rate at the trunk when the client is provisioned as IB_5G.

- The MTU setting is used to display the OverSizePkts counters on the receiving Gigabit Ethernet client port interfaces. Traffic of frame sizes up to 65535 bytes pass without any packet drops, from the client port to the trunk port irrespective of the MTU setting.
- The OTU2_XP card configured in the Transponder or Mixed mode does not support egress Ethernet variables such as ifOutOctets, ifOutDiscards, ifOutMulticastPkts, and ifOutBroadcastPkts.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

OTU2_XP Card Interface

The OTU2_XP card is a multi-functional card that operates in different configurations, such as transponder, standard regenerator, E-FEC regenerator, and 10G Ethernet LAN Phy to WAN Phy conversion mode. The OTU2_XP card acts as a protected transponder, when the 10G Ethernet LAN Phy to WAN Phy is in splitter protected transponder configuration mode.

Depending on the configuration of the OTU2_XP card, the ports act as client or trunk ports (see "OTU2_XP Card Configurations and Ports" table). The following section describes the client and trunk rates supported on the OTU2_XP card for different card configurations:

Client Interface

In transponder and 10G Ethernet LAN Phy to WAN Phy card configurations, Ports 1 and 2 act as client ports and in splitter protected transponder configuration, Port 1 acts as a client port. For these card configurations, the client rates supported are:

- OC-192/STM-64
- 10G Ethernet WAN Phy
- 10G Ethernet LAN Phy
- 10G Fibre Channel
- IB_5G

Trunk Interface

In transponder, 10G Ethernet LAN Phy to WAN Phy, and splitter protected transponder card configurations, Ports 3 and 4 act as trunk ports. For these card configurations, the trunk rates supported are:

- OC-192/STM-64
- 10G Ethernet WAN Phy
- 10G Ethernet LAN Phy
- 10G Fibre Channel
- OTU2 with ITU-T G.709 for OC-192 client interface
- OTU2e with ITU-T G.709 for 10G Ethernet LAN Phy client interface
- Proprietary rate at the trunk when the client is provisioned as IB_5G

In standard regenerator card configuration, all four ports act as trunk ports and in E-FEC regenerator configuration, Ports 3 and 4 act as the trunk ports. For these card configurations, the trunk rate supported is OTU2 G.709

Note The above mentioned OTU2 signal must be an OC-192/STM-64, 10G Ethernet WAN Phy, 10G Ethernet LAN Phy, or 10G Fibre Channel signal packaged into an OTU2 G.709 frame. Additionally, the standard regenerator and E-FEC regenerator configuration supports an OTU2 signal that is OTU2 has been generated by multiplexing four ODU1 signals.

Configuration Management

The OTU2_XP card supports the following configuration management parameters:

- Card Configuration—Provisionable card configuration: Transponder, Standard Regen, Enhanced FEC, or Mixed, or 10G Ethernet LAN Phy to WAN Phy.
- Port Mode—Provisionable port mode when the card configuration is set as Mixed. The port mode can be chosen as either Transponder or Standard Regen for each port pair (1-3 and 2-4). For card configurations other than Mixed, CTC automatically sets the port mode depending on the selected card configuration. For 10G Ethernet LAN Phy to WAN Phy mode, CTC automatically selects the port pair (1-3) as 10G Ethernet LAN Phy to WAN Phy. Port pair (2-4) in 10G Ethernet LAN Phy to WAN Phy mode is selected as Transponder or Standard Regen.
- Termination Mode—Provisionable termination mode when the card configuration is set as either Transponder or Mixed. The termination mode can be chosen as Transparent, Section, or Line. For Standard Regen and Enhanced FEC card configurations, CTC automatically sets the termination mode as Transparent. For 10G Ethernet LAN Phy to WAN Phy mode, CTC automatically selects the Termination Mode of port pair (1-3) as Line. You cannot provision the Termination Mode parameter.
- Fault Signalling—Provisionable Fault Signaling mode configuration when the card configuration is set as either Transponder, Mixed, or Standard Regen. The Fault Signaling mode configuration can be chosen as AIS/Send Local Fault or Squelch/Laser-Off. For Enhanced FEC card configuration, CTC automatically sets the AIS/Send Local Fault or Squelch/Laser-Off mode configuration as AIS/Send Local Fault. For 10G Ethernet LAN Phy to WAN Phy mode, the CTC automatically selects the AIS/Send Local Fault or Squelch/Laser-Off of port pair (1-3) as Squelch/Laser-Off. You cannot provision the AIS/Send Local Fault or Squelch/Laser-Off parameter.

Note When Fault Signaling is enabled in Standard Regen configuration with port pairs (1-3) and (2-4), Squelch/Laser-Off is supported on ports 1 and 2 and AIS/Send Local Fault on ports 3 and 4.

Note When you choose the 10G Ethernet LAN Phy to WAN Phy conversion, the Termination mode is automatically set to LINE. The AIS/Squelch is set to Squelch/Laser-Off and ODU Transparency is set to Cisco Extended Use for Ports 1 and 3.

- Regen Line Name—User-assigned text string for regeneration line name.
- ODU Transparency—Provisionable ODU overhead byte configuration, either Transparent Standard Use or Cisco Extended Use. See the "ODU Transparency" section on page 11-89 for more detailed information. For 10G Ethernet LAN Phy to WAN Phy mode, CTC automatically selects the ODU Transparency as Cisco Extended Use. You cannot provision the ODU Transparency parameter.
- Port name—User-assigned text string.
- Admin State/Service State—Administrative and service states to manage and view port status.
- ALS Mode—Provisionable ALS function.
- Reach—Provisionable optical reach distance of the port.
- Wavelength—Provisionable wavelength of the port.
- AINS Soak—Provisionable automatic in-service soak period.

OTU2_XP Card Configuration Rules

The following rules apply to OTU2_XP card configurations:

- When you preprovision the card, port pairs 1-3 and 2-4 come up in the default Transponder configuration.
- The port pairs 1-3 and 2-4 can be configured in different modes only when the card configuration is Mixed. If the card configuration is Mixed, you must choose different modes on port pairs 1-3 and 2-4 (that is, one port pair in Transponder mode and the other port pair in Standard Regen mode).
- If the card is in Transponder configuration, you can change the configuration to Standard Regen or Enhanced FEC.
- If the card is in Standard Regen configuration and you have configured only one port pair, then configuring payload rates for the other port pair automatically changes the card configuration to Mixed, with the new port pair in Transponder mode.
- If the card is in Standard Regen configuration, you cannot directly change the configuration to Enhanced FEC. You have to change to Transponder configuration and then configure the card as Enhanced FEC.
- If the card is in Enhanced FEC configuration, Ports 1 and 2 are disabled. Hence, you cannot directly change the configuration to Standard Regen or Mixed. You must remove the Enhanced FEC group by moving the card to Transponder configuration, provision PPM on Ports 1 and 2, and then change the card configuration to Standard Regen or Mixed.
- If the card is in Standard Regen or Enhanced FEC configuration, you cannot change the payload rate of the port pairs. You have to change the configuration to Transponder, change the payload rate, and then move the card configuration back to Standard Regen or Enhanced FEC.
- If any of the affected ports are in IS (ANSI) or Unlocked-enabled (ETSI) state, you cannot change the card configuration.
- If IB_5G payload has to be provisioned, the NE Default should match the values. For more information on editing the NE Default values, see the "NTP-G135 Edit Network Element Defaults" task.

Table 72: OTU2_XP Card Configuration for IB_5G Payload Provisioning

Parameter	NE Default Name	Value
FEC	OTU2-XP.otn.otnLines.FEC	Standard
ITU-T G.709 OTN	OTU2-XP.otn.otnLines.G709OTN	Enable
Termination Mode	OTU2-XP.config.port.TerminationMode	Transparent
ODU Transparency	OTU2-XP.config.port.OduTransparency	Cisco Extended Use
AIS/Squelch	OTU2-XP.config.port.AisSquelchMode	Squelch

- If the card is changed to 10G Ethernet LAN Phy to WAN Phy, the first PPM port is deleted and replaced by a 10G Ethernet port; the third PPM port is deleted and automatically replaced with OC192/STM64 (SONET/SDH) port. The third PPM port is automatically deleted and the third PPM port is replaced with OC192/STM64 (SONET/SDH).

Table 73: Card Configuration Transition Summary

Card Configuration	Transition To				
	Transponder	Standard Regen	Enhanced FEC	Mixed	10G Ethernet LAN Phy to WAN Phy
Transponder	—	Yes	Yes	Yes	Yes
Standard Regen	Yes	—	No	Yes	Yes
Enhanced FEC	Yes	No	—	No	No
Mixed	Yes	Yes	No	—	Yes
10G Ethernet LAN Phy to WAN Phy	Yes	Yes	No	The 10G Ethernet LAN Phy to WAN Phy to Mixed is supported if the Port pair 1-3 is chosen as Transponder. The 10G Ethernet LAN Phy to WAN Phy to Mixed is not supported if the Port pair 1-3 is chosen as Standard Regen.	—

Security

The OTU2_XP card, when an XFP is plugged into it, implements the Cisco Standard Security Code Check Algorithm that keys on vendor ID and serial number.

If a PPM is plugged into a port on the card but fails the security code check because it is not a Cisco PPM, a NON-CISCO-PPM Not Reported (NR) condition occurs.

If a PPM with a non-qualified product ID is plugged into a port on this card, that is, the PPM passes the security code as a Cisco PPM but it has not been qualified for use on the OTU2_XP card, a UNQUAL-PPM NR condition occurs.

ODU Transparency

A key feature of the OTU2_XP card is the ability to configure the ODU overhead bytes (EXP bytes and RES bytes 1 and 2) using the ODU Transparency parameter. The two options available for this parameter are:

- Transparent Standard Use—ODU overhead bytes are transparently passed through the card. This option allows the OTU2_XP card to act transparently between two trunk ports (when the card is configured in Standard Regen or Enhanced FEC).
- Cisco Extended Use—ODU overhead bytes are terminated and regenerated on both ports of the regenerator group.

The ODU Transparency parameter is configurable only for Standard Regen and Enhanced FEC card configuration. For Transponder card configuration, this parameter defaults to Cisco Extended Use and cannot be changed.

Note The Forward Error Correction (FEC) Mismatch (FEC-MISM) alarm will not be raised on OTU2_XP card when you choose Transparent Standard Use.

For more information about the OTU2_XPcard, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-500937.html

Related Procedures for OTU2_XP Card

The following is the list of procedures and tasks related to the configuration of the OTU2_XP card:

- NTP-G33 Creating a Y-Cable Protection Group, on page 310
- NTP-G199 Creating a Splitter Protection Group, on page 316
- NTP-G75 Monitor Transponder and Muxponder Performance

TXP_MR_10EX_C Card

The TXP_MR_10EX_C card is a multirate transponder card. The card is fully backward compatible with TXP_MR_10E_C cards (only when the error decorrelator is disabled in the CTC on the TXP_MR_10EX_C card). It processes one 10-Gbps signal (client side) into one 10-Gbps, 100-GHz DWDM signal (trunk side).

The TXP_MR_10EX_C card is tunable over the 82 channels of C-band (82 channels spaced at 50 GHz on the ITU grid).

You can install TXP_MR_10EX_C card in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006. The card can be provisioned in linear, BLSR/MS-SPRing, path protection/SNCP configurations or as a regenerator. The card can be used in the middle of BLSR/MS-SPRing or 1+1 spans when the card is configured for transparent termination mode. The TXP_MR_10EX_C card features an MLSE-based Universal Transponder 1550-nm tunable laser and a separately orderable ONS-XC-10G-S1 1310-nm or ONS-XC-10G-L2 1550-nm laser XFP module for the client port.

Note The PRE FEC BER performance of the TXP_MR_10EX_C card may be significantly low when compared to the TXP_MR_10E card. However, this does not affect the Post FEC BER performance, but could possibly affect any specific monitoring application that relies on the PRE FEC BER value (for example, protection switching). In this case, the replacement of TXP_MR_10E card with the TXP_MR_10EX_C may not work properly.

Key Features

The key features of the TXP_MR_10EX_C card are:

- A multi-rate client interface (available through the ONS-XC-10G-S1 XFP, ordered separately):
  - OC-192 (SR1)
  - 10GE (10GBASE-LR)
  - 10G-FC (1200-SM-LL-L)
  - (ONS-XC-10G-S1 version 3 only) IB_5G
- An MLSE-based UT module tunable through 82 channels of C-band. The channels are spaced at 50 GHz on the ITU grid.
- OC-192 to ITU-T G.709 OTU2 provisionable synchronous and asynchronous mapping.
- Proprietary rate at the trunk when the client is provisioned as IB_5G.
- The MTU setting is used to display the OverSizePkts counters on the receiving Gigabit Ethernet client port interfaces. Traffic of frame sizes up to 65535 bytes pass without any packet drops, from the client port to the trunk port irrespective of the MTU setting.

For information about safety labels for the card, see the "Class 1M Laser Product Cards" section.

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

For more information about the TXP_MR_10EX_C card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-580763.html

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Related Procedures for TXP_MR_10EX_C Card

The following is the list of procedures and tasks related to the configuration of the TXP_MR_10EX_C card:

- NTP-G96 Provisioning the 10G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds, on page 344
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_2.5G_10EX_C card

The MXP_2.5G_10EX_C card is a DWDM muxponder supports transparent termination mode on the client side. The faceplate designation of the card is “4x2.5G 10EX MXP.” The card multiplexes four 2.5-Gbps client signals (4xOC48/STM-16 SFP) into a single 10-Gbps DWDM optical signal on the trunk side. The card provides wavelength transmission service for the four incoming 2.5-Gbps client interfaces. The MXP_2.5G_10EX_C muxponder passes all SONET/SDH overhead bytes transparently.

The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up GCCs for data communications, enable FEC, or facilitate PM.

The MXP_2.5G_10EX_C card works with OTN devices defined in ITU-T G.709. The card supports ODU1 to OTU2 multiplexing, an industry standard method for asynchronously mapping a SONET/SDH payload into a digitally wrapped envelope. See the "Multiplexing Function" section.

The MXP_2.5G_10EX_C card is not compatible with the MXP_2.5G_10G card, which does not support transparent termination mode.

You can install the MXP_2.5G_10EX_C card in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006. You can provision a card in a linear configuration, a BLSR/MS-SPRing, a path protection/SNCP, or a regenerator. The card can be used in the middle of BLSR/MS-SPRing or 1+1 spans when the card is configured for transparent termination mode.

The MXP_2.5G_10EX_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 card features four 1310-nm lasers on the client ports and contains five transmit and receive connector pairs (labeled) on the card faceplate. The card uses dual LC connectors on the trunk side and SFP modules on the client side for optical cable termination. The SFP pluggable modules are SR or IR and support an LC fiber connector.



Note When you create a 4xOC-48 OCHCC circuit, you need to select the G.709 and Synchronous options. A 4xOC-48 OCHCC circuit is supported by G.709 and synchronous mode, which are necessary to provision the 4xOC-48 OCHCC circuit.

Key Features

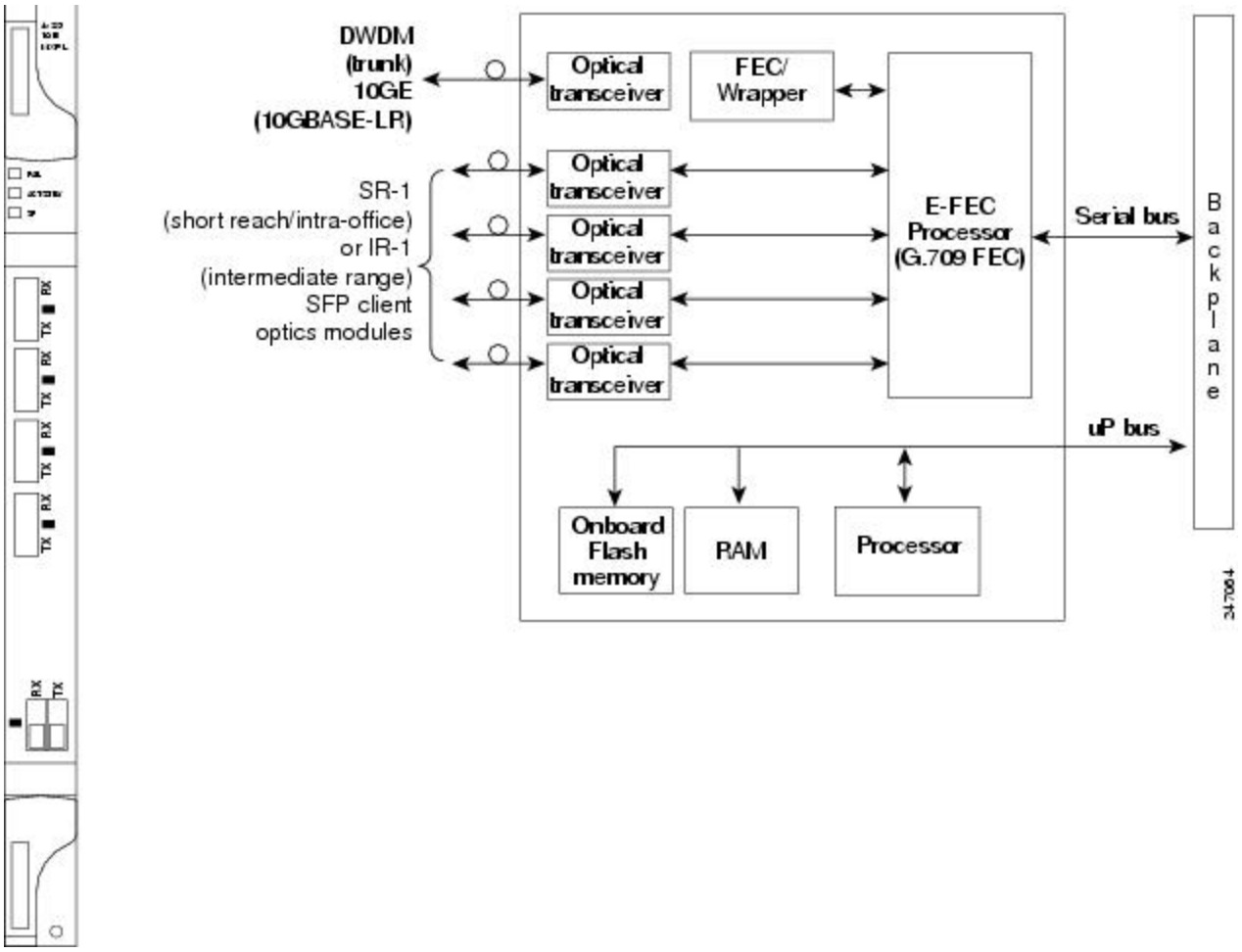
The MXP_2.5G_10EX_C card has the following high-level features:

- Four 2.5-Gbps client interfaces (OC-48/STM-16) and one 10-Gbps trunk. The four OC-48 signals are mapped into an ITU-T G.709 OTU2 signal using standard ITU-T G.709 multiplexing.
- 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 (255,239) correction algorithm.
- Pluggable client-interface optic modules: The MXP_2.5G_10EX_C card has modular interfaces. Two types of optic modules can be plugged into the card. These modules 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 of 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 card is initially provisioned using Cisco TransportPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- Link monitoring and management: The card uses standard OC-48 OH (overhead) bytes to monitor and manage incoming interfaces. The card passes the incoming SDH/SONET data stream and its overhead bytes transparently.
- Control of layered SONET/SDH transport overhead: The card is provisionable to terminate regenerator section overhead, which eliminates 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_10EX_C card normally synchronizes from the control card. If for some reason, such as maintenance or upgrade activity, the control card is not available, the card automatically synchronize to one of the input client-interface clocks.
- Configurable squelching policy: The card can be configured to squelch the client interface output if LOS occurs at the DWDM receiver or if a remote fault occurs. In the event of a remote fault, the card manages MS-AIS insertion.
- The card is tunable across the full C-band, thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Faceplate and Block Diagram

Figure 19: MXP_2.5G_10EX_C Faceplate and Block Diagram



For information about safety labels for the card, see the "Class 1 Laser Product Cards" section.

MXP_2.5G_10EX_C Functions

The following functions of the MXP_2.5G_10EX_C card are explained in the "Card Features" chapter:

- Client Interface
- DWDM Interface
- FEC
- Multiplexing Function
- Timing Synchronization
- SONET/SDH Overhead Byte Processing
- Client Interface Monitoring

- Automatic Laser Shutdown
- Jitter
- Lamp Test
- Onboard Traffic Generation
- Card level indicators
- Port level indicators

Wavelength Identification

The card uses trunk lasers that are wavelocked, which allows the trunk transmitter to operate on the ITU grid effectively. The MXP_2.5G_10EX_C card implements the MLSE-based UT module. The MXP_2.5G_10EX_C card uses a C-band version of the UT2.

The MXP_2.5G_10EX_C card is tunable over 82 wavelengths in the C-band at 50-GHz spacing on the ITU grid.

Table 74: MXP_2.5G_10EX_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

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42
41	194.00	1545.32	82	191.95	1561.83

Related Procedures for MXP_2.5G_10EX_C Card

The following is the list of procedures and tasks related to the configuration of the MXP_2.5G_10EX_C card:

- NTP-G97 Modifying the 4x2.5G Muxponder Card Line Settings and PM Parameter Thresholds, on page 401
- NTP-G75 Monitor Transponder and Muxponder Performance

MXP_MR_10DMEX_C Card

The MXP_MR_10DMEX_C card aggregates a mix of client SAN service-client inputs (GE, FICON, and Fibre Channel) into one 10-Gbps STM-64/OC-192 DWDM signal on the trunk side. It provides one long-reach STM-64/OC-192 port per card and is compliant with Telcordia GR-253-CORE and ITU-T G.957.

The card supports aggregation of the following signal types:

- 1-Gigabit Fibre Channel
- 2-Gigabit Fibre Channel
- 4-Gigabit Fibre Channel
- 1-Gigabit Ethernet
- 1-Gigabit ISC-Compatible (ISC-1)
- 2-Gigabit ISC-Peer (ISC-3)

Caution The card can be damaged by dropping it. Handle it carefully.

The MXP_MR_10DMEX_C muxponder passes all SONET/SDH overhead bytes transparently.

The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up GCCs for data communications, enable FEC, or facilitate PM. The MXP_MR_10DMEX_C card works with the OTN devices defined in ITU-T G.709. The card supports ODU1 to OTU2 multiplexing, an industry standard method for asynchronously mapping a SONET/SDH payload into a digitally wrapped envelope. See the "Multiplexing Function" section.

Note You cannot disable ITU-T G.709 on the trunk side. If ITU-T G.709 is enabled, then FEC cannot be disabled.

Note Because the client payload cannot oversubscribe the trunk, a mix of client signals can be accepted, up to a maximum limit of 10 Gbps.

You can install the MXP_MR_10DMEX_C card in , Slots 2 and 3 in Cisco NCS 2002 chassis, Slots 2 to 7 in Cisco NCS 2006.

Note The MXP_MR_10DMEX_C card is not compatible with the MXP_2.5G_10G card, which does not support transparent termination mode.

The MXP_MR_10DMEX_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. 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 card uses dual LC connectors on the trunk side and SFP modules on the client side for optical cable termination. The SFP pluggable modules are SR or IR and support an LC fiber connector.

The current version of the GFP-T G.7041 supports transparent mapping of 8B/10B block-coded protocols, including Gigabit Ethernet, Fibre Channel, ISC, and FICON.

In addition to the GFP mapping, 1-Gbps traffic on Port 1 or 2 of the high-speed SERDES is mapped to an STS-24c channel. If two 1-Gbps client signals are present at Port 1 and Port 2 of the high-speed SERDES, the Port 1 signal is mapped into the first STS-24c channel and the Port 2 signal into the second STS-24c channel. The two channels are then mapped into an OC-48 trunk channel.

Table 75: MXP_MR_10DMEX_C Client Interface Data Rates and Encapsulation

Client Interface	Input Data Rate	GFP-T G.7041 Encapsulation
2G FC	2.125 Gbps	Yes
1G FC	1.06 Gbps	Yes
2G FICON/2G ISC-Compatible (ISC-1)/ 2G ISC-Peer (ISC-3)	2.125 Gbps	Yes
1G FICON/1G ISC-Compatible (ISC-1)/ 1G ISC-Peer (ISC-3)	1.06 Gbps	Yes
Gigabit Ethernet	1.25 Gbps	Yes

The MXP_MR_10DMEX_C card includes two FPGAs, and a group of four ports is mapped to each FPGA. Group 1 consists of Ports 1 through 4, and Group 2 consists of Ports 5 through 8. The following table shows some of the mix and match possibilities on the various client data rates for Ports 1 through 4, and Ports 5 through 8. An X indicates that the data rate is supported in that port.

Table 76: Supported Client Data Rates for Ports 1 through 4 and Ports 5 through 8

Port (Group 1)	Port (Group 2)	Gigabit Ethernet	1G FC	2G FC	4G FC
1	5	X	X	X	X
2	6	X	X	—	—
3	7	X	X	X	—
4	8	X	X	—	—

GFP-T PM is available through RMON and trunk PM is managed according to Telcordia GR-253-CORE and ITU G.783/826. Client PM is achieved through RMON for FC and GE.

A buffer-to-buffer credit management scheme provides FC flow control. With this feature enabled, a port indicates the number of frames that can be sent to it (its buffer credit), before the sender is required to stop transmitting and wait for the receipt of a “ready” indication. The MXP_MR_10DMEX_C card supports FC credit-based flow control with a buffer-to-buffer credit extension of up to 1600 km (994.1 miles) for 1G FC, up to 800 km (497.1 miles) for 2G FC, or up to 400 km (248.5 miles) for 4G FC. The feature can be enabled or disabled.

The MXP_MR_10DMEX_C card features a 1550-nm laser for the trunk/line port and a 1310-nm or 850-nm laser (depending on the SFP) for the client ports. The card contains eight 12.5-degree downward-tilt SFP modules for the client interfaces. For optical termination, each SFP uses two LC connectors, which are labeled TX and RX on the faceplate. The trunk port is a dual-LC connector with a 45-degree downward angle.

Key Features

The MXP_MR_10DMEX_C card has the following high-level features:

- 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 (255,239) correction algorithm.
- Pluggable client-interface optic modules: The MXP_MR_10DMEX_C card has modular interfaces. Two types of optics modules can be plugged into the card. These modules 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 of 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).
- Y-cable protection: The card supports Y-cable protection between the same card type only, on ports with the same port number and signal rate. See the "Y-Cable Protection Availability on TXP, MXP, and Xponder Cards" section for more detailed information.
- High-level provisioning support: The card is initially provisioned using Cisco TransportPlanner software. Subsequently, the card can be monitored and provisioned using CTC software.
- ALS: This safety mechanism is used in the event of a fiber cut. For details regarding ALS provisioning for the MXP_MR_10DMEX_C card, see the “NTP-G162 Change the ALS Maintenance Settings” section.
- Link monitoring and management: The card uses standard OC-48 OH (overhead) bytes to monitor and manage incoming interfaces. The card passes the incoming SDH/SONET data stream and its OH (overhead) bytes transparently.
- Control of layered SONET/SDH transport overhead: The card is provisionable to terminate regenerator section overhead, which eliminates 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_MR_10DMEX_C card normally synchronizes from the control card. If for some reason, such as maintenance or upgrade activity, the control card is not available, the card automatically synchronizes to one of the input client-interface clocks.



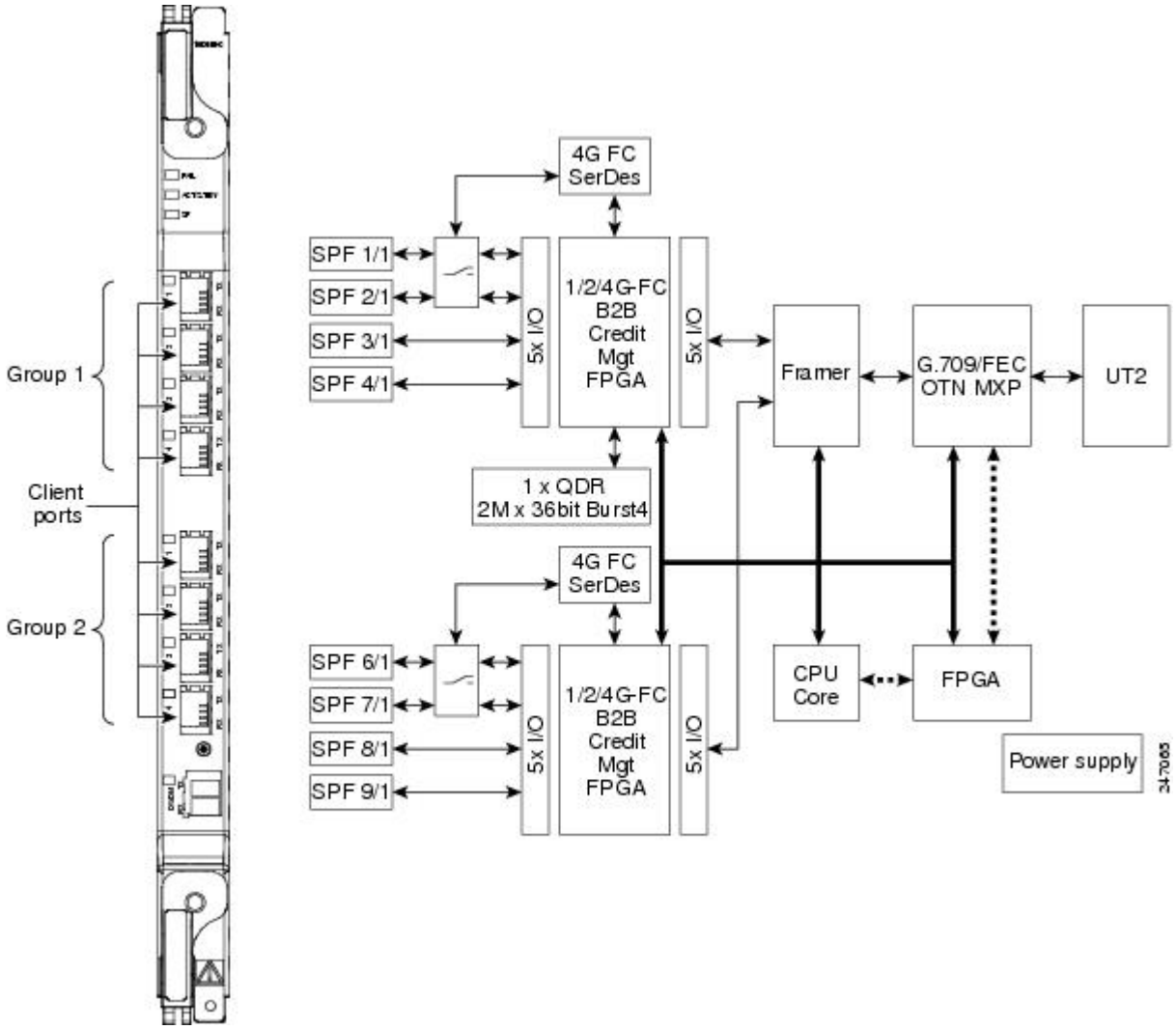
Note MXP_MR_10DMEX_C card cannot be used for line timing.

- Configurable squelching policy: The card can be configured to squelch the client-interface output if LOS occurs at the DWDM receiver or if a remote fault occurs. In the event of a remote fault, the card manages MS-AIS insertion.
- The card is tunable across the full C-band, thus eliminating the need to use different versions of each card to provide tunability across specific wavelengths in a band.
- You can provision a string (port name) for each fiber channel/FICON interface on the MXP_MR_10DMEX_C card, which allows the MDS Fabric Manager to create a link association between that SAN port and a SAN port on a Cisco MDS 9000 switch.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Faceplate and Block Diagram

Figure 20: MXP_MR_10DMEX_C Faceplate and Block Diagram



For information about safety labels for the card, see the "Class 1M Laser Product Cards" section.

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

MXP_MR_10DMEX_C Functions

The following functions of the MXP_MR_10DMEX_C card are explained in the "Card Features" chapter:

- Card level indicators
- Port level indicators

Wavelength Identification

The card uses trunk lasers that are wavelocked, which allows the trunk transmitter to operate on the ITU grid effectively. The MXP_MR_10DMEX_C card uses a C-band version of the MLSE-based UT module.

The MXP_MR_10DMEX_C card is tunable over 82 wavelengths in the C-band at 50-GHz spacing on the ITU grid.

Table 77: MXP_MR_10DMEX_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

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
14	195.35	1534.643	55	193.30	1550.918
15	195.30	1535.036	56	193.25	1551.319
16	195.25	1535.429	57	193.20	1551.721
17	195.20	1535.822	58	193.15	1552.122
18	195.15	1536.216	59	193.10	1552.524
19	195.10	1536.609	60	193.05	1552.926
20	195.05	1537.003	61	193.00	1553.33
21	195.00	1537.40	62	192.95	1553.73
22	194.95	1537.79	63	192.90	1554.134
23	194.90	1538.186	64	192.85	1554.537
24	194.85	1538.581	65	192.80	1554.940
25	194.80	1538.976	66	192.75	1555.343
26	194.75	1539.371	67	192.70	1555.747
27	194.70	1539.766	68	192.65	1556.151
28	194.65	1540.162	69	192.60	1556.555
29	194.60	1540.557	70	192.55	1556.959
30	194.55	1540.953	71	192.50	1557.36
31	194.50	1541.35	72	192.45	1557.77
32	194.45	1541.75	73	192.40	1558.173
33	194.40	1542.142	74	192.35	1558.578
34	194.35	1542.539	75	192.30	1558.983
35	194.30	1542.936	76	192.25	1559.389
36	194.25	1543.333	77	192.20	1559.794
37	194.20	1543.730	78	192.15	1560.200
38	194.15	1544.128	79	192.10	1560.606
39	194.10	1544.526	80	192.05	1561.013
40	194.05	1544.924	81	192.00	1561.42

Channel Number	Frequency (THz)	Wavelength (nm)	Channel Number	Frequency (THz)	Wavelength (nm)
41	194.00	1545.32	82	191.95	1561.83

Related Procedures for MXP_MR_10DMEX_C Card

The following is the list of procedures and tasks related to the configuration of the MXP_MR_10DMEX_C card:

- NTP-G148 Modifying the 10G Data Muxponder Card Line Settings and PM Parameter Thresholds, on page 445
- NTP-G75 Monitor Transponder and Muxponder Performance

AR_MXP, AR_XP, and AR_XPE Cards

The AR_MXP (Any-Rate Muxponder), AR_XP (Any-Rate Xponder), and AR_XPE (Any-Rate Enhanced Xponder) cards are supported on Cisco NCS 2000 Series platform. The AR_MXP card supports a trunk bandwidth of up to 10 Gbps. The AR_XP and AR_XPE cards support a trunk bandwidth of up to 20 Gbps. The AR_MXP, AR_XP, and AR_XPE cards aggregate a mix of client SAN services (FC or FICON 1G/2G/4G/8G, ESCON and ISC3-STP 1G/2G), Ethernet (FE, GE, 10GE LAN), OCn (OC3/STM-1, OC12/STM-4, and OC48/STM-16), OTU (OTU1, OTU2e/1e), and Video (SD-SDI, HD-SDI, and 3G-SDI) into one 10 Gbps signal on the trunk side.

Note

- When all the cards in the chassis are simultaneously reset by the user, the AR_XP card undergoes a hard reset instead of a soft reset. This causes traffic loss for traffic going through these cards.
- The AR-XP card can only create four HD_SDI circuits at any given time. If you attempt to create more than four HD_SDI circuits, when the protection is enabled on the trunk ports, it will lead to errors and the circuit creation fails.

Table 78: AR_MXP, AR_XP, and AR_XPE Client Interface Data Rates and Encapsulation

Client Interface	Input Data Rate	GFP Encapsulation
OC3/ STM1	155.52 Mbps	—
OC12/STM4	622.08 Mbps	—
OC48/STM16	2.488 Gbps	—
FE	100 Mbps	GFP-F
GE	1.125 Gbps	GFP-F GFP-T (as per G.709 mentioned in 17.7.1.1 1000BASE-X transcoding) for AR_XPE card

Client Interface	Input Data Rate	GFP Encapsulation
10GE LAN	10.31 Gbps	—
1GFC	1.06 Gbps	GFP-T
2GFC	2.125 Gbps	GFP-T
4GFC	4.25 Gbps	GFP-T
8GFC	8.5 Gbps	GFP-T for AR_MXP and AR_XP cards GMP for AR_XPE card
OTU1	2.66 Gbps	—
OTU2	10.7 Gbps	—
ESCON	200 Mbps	GFP-T
1G ISC3-STP	1.06 Gbps	GFP-T
2G ISC3-STP	2.125 Gbps	GFP-T
HD-SDI	1.485 Gbps	GFP-F
SD-SDI	270 Mbps	GFP-F
3G-SDI	2.970 Gbps	GFP-F

Key Features

The AR_MXP, AR_XP, and AR_XPE cards support the following key features:

- Multiple Operating Modes—The AR_MXP, AR_XP, or AR_XPE card can be configured into multiple operating modes. The cards are equipped with pluggables for client and trunk options, and offer a large variety of configurations. For more information about multiple operating modes, see 11.0.3 Multiple Operating Modes, page 11-105.
- Operating Mode to Client Payload Mapping—Each operating mode supports a specific set of client payloads.

Table 79: AR_MXP, AR_XP, and AR_XPE Card Supported Client-Payload Mapping—SONET/SDH, Ethernet, OTU1, and FC

Card Mode	Rate	SONET/SDH			Ethernet			OTU		FC			
		OC3/STM1	OC12/STM4	OC48/STM16	FE	GE	10GE	OTU1	OTU2e	FICON 1G/FC 1G	FICON 2G/FC 2G	FICON 4G/FC 4G	F
TXP_MR	LOW	Yes	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes	N
	HIGH	No	No	No	No	No	Yes	No	Yes	No	No	No	Y
TXPP_MR	LOW	Yes	Yes	Yes	Yes	Yes	N/A	No	No	Yes	Yes	Yes	N
	HIGH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N

Card Mode	Rate	SONET/SDH			Ethernet			OTU		FC		
		OC3/STM1	OC12/STM4	OC48/STM16	FE	GE	10GE	OTU1	OTU2e	FICON1G/FC1G	FICON2G/FC2G	FICON4G/FC4
MXP_DME	HIGH	No	No	No	No	Yes	N/A	No	No	Yes	Yes	Yes
MXPP_DME	HIGH	No	No	No	No	Yes	N/A	No	No	Yes	Yes	Yes
MXP_MR	LOW	Yes	Yes	No	Yes	Yes	N/A	No	No	Yes	No	No
	HIGH	Yes	Yes	Yes	Yes	Yes	N/A	Yes	No	Yes	Yes	Yes
MXPP_MR	LOW	Yes	Yes	No	Yes	Yes	N/A	No	No	Yes	No	No
	HIGH	Yes	Yes	Yes	Yes	Yes	N/A	Yes	No	Yes	Yes	Yes
MXP-4x2.5-10G	HIGH	No	No	Yes	No	No	N/A	Yes	No	No	No	No
MXPP-4x2.5-10G	HIGH	No	No	Yes	No	No	N/A	Yes	No	No	No	No
MXP-VD-10G	HIGH	No	No	No	No	No	N/A	No	No	No	No	No
RGN	HIGH	No	No	No	No	No	N/A	No	Yes	No	No	No
	LOW	No	No	No	No	No	N/A	Yes	No	No	No	No

Table 80: AR_MXP, AR_XP, and AR_XPE Card Supported Client-Payload Mapping—ISC and Video

		ISC			Video		
Card Mode	Rate	ISC-1	ISC3SP_1G	ISC3SP_2G	SD-SDI	HD-SDI	3G-SDI
TXP_MR	LOW	No	Yes	Yes	No	No	No
	HIGH	No	No	No	No	No	No
TXPP_MR	LOW	No	No	N/A	No	No	No
	HIGH	N/A	N/A	N/A	N/A	N/A	N/A
MXP_DME	HIGH	No	No	No	No	No	No
MXPP_DME	HIGH	No	No	No	No	No	No
MXP_MR	LOW	No	No	No	No	No	No
	HIGH	No	No	No	Yes	Yes	No
MXPP_MR	LOW	No	No	No	No	No	No
	HIGH	No	No	No	Yes	Yes	No
MXP-4x2.5-10G	HIGH	No	No	No	No	No	No
MXPP-4x2.5-10G	HIGH	No	No	No	No	No	No

		ISC			Video		
Card Mode	**Rate**	**ISC-1**	**ISC3_SP_1G**	**ISC3_SP_2G**	**SD-SDI**	**HD-SDI**	**3G-SDI**
MXP-VD-10G	HIGH	No	No	No	No	No	Yes
RGN	HIGH	No	No	No	No	No	No
	LOW	No	No	No	No	No	No

- Auto Sensing—The AR_MXP, AR_XP, and AR_XPE cards support auto sensing of client payloads. The line card analyzes the received client signal and configures the payload on the client port automatically without user intervention.

  Auto sensing feature is supported on the Gigabit Ethernet, OC-3/STM-1, OC-12/STM-4, and OC-48/STM-16 payloads. Following operating card modes support the autosensing feature:

  - TXP (low rate)
  - TXPP (low rate)
  - MXP_MR (low and high Rate)
  - MXPP_MR (low and high rate)

    CTC supports the configuration of all the provisioning parameters supported by the autosensed payload. However, creation and deletion of the

    circuits are the only configurations supported on the “AUTO” payload.

- Video Multiplexing—The AR_XP and AR_XPE cards support the capability to multiplex SD-SDI, HD-SDI, and 3G-SDI signals over the OTU2 trunk interface allowing to maximize the wavelength bandwidth, maintain full transparency for uncompressed signals, and reduce latency. The video multiplexing of 3G-SDI signal is not supported on the AR_MXP card.
- Regenerator Mode—This mode regenerates the OTU2e or OTU1 signals with ODU transparent or CISCO Extended Use options. For OTU2e, FEC can be Disabled, Standard G.975, EFEC I.4 or EFEC I.7, and for OTU1, FEC can be Standard G.975 or Disabled.
- High Speed GCCs—The AR_MXP, AR_XP, and AR_XPE cards support the provisioning of GCC channel on OTN (OTU1/OTU2) enabled client and trunk ports. A maximum of ten GCC channels on Cisco NCS 2002 or Cisco NCS 2006 shelf can be created. The high speed GCC enables you to create the GCC when both the NE and FE line cards are in Cisco NCS 2002 or Cisco NCS 2006 shelf.
- Y-cable protection—Y-cable protection between the same card type is supported only on ports with the same port number and signal rate. Switching time is high between two AR_XPE cards when auto negotiation is enabled. Hence, if Y-cable protection is configured on AR_XPE cards, auto-negotiation must be disabled on the client ports so that the switching time is less than 50 ms. For more detailed information, see "Y-Cable Protection Availability on TXP, MXP, and Xponder Cards" section.
- Splitter protection—For splitter protection, OCHCC circuits with different trunk wavelengths for the working and protect paths can be configured. The process of setting the trunk wavelengths is similar to the “DLP-G367 Change the 2.5G Multirate Transponder Trunk Wavelength Settings” task on page 11-175. OCHCC circuits having different trunk wavelengths on the working and protect paths can be upgraded to GMPLS circuits.

- SyncE Support—Customers using a packet network find it difficult to provide timing to multiple remote network elements (NEs) through an external time division multiplexed (TDM) circuit. The SyncE feature helps to overcome this problem by providing effective timing to the remote NEs through a packet network. SyncE leverages the physical layer of the Ethernet to transmit frequency to the remote sites. SyncE's functionality and accuracy resemble the SONET/SDH network because of its physical layer characteristic. The SyncE feature provides the required synchronization at the physical level. Operation messages maintain SyncE links and ensure that a node always derives timing from the most reliable source. SyncE uses the Ethernet Synchronization Message Channel (ESMC) to enable traceability of the best clock source to correctly define the timing source and prevent a timing loop. SyncE is not supported on the AR_XPE card.
- Licensing—The AR_MXP and AR_XP cards offer you an unprecedented flexibility. The cards support a wide range of different applications and configurations. To help you take advantage of such flexibility to lower capital expenditures (CapEx) on your network, Cisco provides a licensing model for AR_MXP and AR_XP cards. Licensing is not supported on the AR_XPE card. For more information on licensing, see the Licensing Configuration Guide.
- GFP-T Mapping— The GFP-T framing mode can be provisioned on the AR_XP and AR_MXP cards in the CTC card view > Provisioning > Line tab. The AR_XP and AR_MXP cards must be configured in the high-rate MXP_DME mode. When GFP-T framing mode is provisioned, autonegotiation is enabled but does not impact traffic.

When the software version of the node is changed from Release 10.6.2 to releases prior to 10.6.1, the AR_XP card undergoes a hard reset. This is applicable for the NCS 2002 and the NCS 2006 chassis.

The AR_MXP, AR_XP, and AR_XPE cards can be installed in any service slots in the chassis. The AR_MXP, AR_XP, and AR_XPE cards do not interoperate with all the existing TXP or MXP cards. The AR_MXP card allows you to configure only one high rate XFP port. This can be a muxponder mode where N [N= 1 to 8] client ports goes out via 1 trunk XFP port or in a transponder mode where client and trunk are XFP ports. There is no limitation in the AR_XP and AR_XPE cards, where you can use both high rate trunk ports simultaneously.

The AR_XPE card does not interoperate with AR_MXP and AR_XP cards.

The GE client interfaces on the AR-XPE card interoperate with NCS 4000 platform, when ODU2 is multiplexed on a 100G trunk interface, with both 100GS-CK-LC and 200G-CK-LC cards, in MXP-10X10G operating mode. The GE client mapping on AR-XPE cards must be performed directly on ODU0, and then on ODU2 not passing through the ODU1 container.

Multiple Operating Modes

A single AR_MXP, AR_XP, or AR_XPE card can be configured into multiple operating modes. Criteria for selecting a particular operational mode are defined by the network level design. CTP helps you to choose the appropriate operational mode. Each operating mode is divided into two categories based on the trunk rate:

- Low rate (trunk rate < 5G)
- High rate (trunk rate > 5G)

The AR_XP or AR_XPE card allows you to configure two high rate operational modes, where as you can configure only one high rate operational mode on the AR_MXP card.

When you configure the AR_MXP, AR_XP, or AR_XPE card in to multiple operational modes, make sure that the following tasks are completed:

- In order to make the ports operational and to correctly report alarms, OCHCC circuit must be created for the following operating modes::
  - Low-rate MXP_MR
  - High-rate MXP_MR
  - Low-rate MXPP_MR
  - High-rate MXPP_MR
- Same operational mode is configured at both ends and ensure the port numbers are same on both ends.
- The OCHCC circuit should be created between the same client port numbers at the near and far end.
- Ensure ODU1 and timeslots are matching at both ends.
- For AR_XPE card that is configured with 1GE or 1GFC payload, ensure that ODU0 and ODU1 are matching at both ends.
- For auto sensing payloads created on auto ports, you should check the Auto Sensing checkbox in the provisioning pane.
- GMPLS circuits can be created on AR_MXP, AR_XP, and AR_XPE cards.
- PPMs must be provisioned on all ports before configuring the operational mode.
- The following conditions determine the maximum bandwidth at the client side when a 4GFC payload is configured in the TXP_MR or TXPP_MR mode:
  - The maximum client bandwidth should not exceed 28G when TXP_MR or TXPP_MR operating mode is configured on the AR_MXP, AR_XP, or AR_XPE card and other operating modes, like low-rate or high-rate TXP_MR,TXPP_MR, MXP_DME, MXPP_DME, MXP_MR, MXPP_MR, MXP-4X2.5G-10G, MXPP-4X2.5G-10G, and MXP-VDC-10G, are configured on the same card.
  - The maximum client bandwidth should not exceed 20G when a TXP_MR or TXPP_MR operating mode is configured on the AR_MXP, AR_XP, or AR_XPE card and if more than two or more combinations of Low-rate or high-rate TXP_MR,TXPP_MR, MXP_DME, MXPP_DME, MXP_MR, MXPP_MR, MXP-4X2.5G-10G, MXPP-4X2.5G-10G, and MXP-VDC-10G, operating modes are configured on the same card.
  - The utilized client bandwidth is 8G when the TXP_MR operating mode is configured with a 4GFC as payload.
  - The utilized client bandwidth is 12G when the TXPP_MR operating mode is configured with a 4GFC as payload.
  - There is no restriction on the bandwidth if only TXP_MR or TXPP_MR operating mode with 4GFC payload is configured on the card. For example, four instances of TXP_MR mode with 4GFC payload on one AR_MPX, AR_XP, or AR_XPE card.
  - The low-rate or high-rate RGN operating mode does not add to the client side bandwidth. For example, four instances of TXP_MR mode with 4GFC and one instance of high-rate RGN mode on same card.

    For all the other payloads and operating modes, the client bandwidth utilized is the client payload data rate.

- If you revert to a release earlier than Release 9.80, ensure that you delete the following card modes:
  - Low-rate TXPP_MR if the client payload is 4GFC.
  - High-rate TXP_MR if the client payload is 10 GE.

The AR_MXP, AR_XP, and AR_XPE cards support the following operating modes:

- TXP_MR (Unprotected Transponder), page 11-107
- TXPP_MR (Protected Transponder), page 11-108
- MXP_DME (Unprotected Data Muxponder), page 11-109
- MXPP_DME (Protected Data Muxponder), page 11-110
- MXP_MR (Unprotected Multirate Muxponder), page 11-111
- MXPP_MR (Protected Multirate Muxponder), page 11-113
- MXP-4x2.5-10G (OC48/OTU1 Unprotected Muxponder), page 11-115
- MXPP-4x2.5-10G (OC48/OTU1 Protected Muxponder), page 11-116
- RGN (OTU1/OTU2 Regenerator), page 11-116
- MXP-VD-10G (Video Muxponder), page 11-118

TXP_MR (Unprotected Transponder)

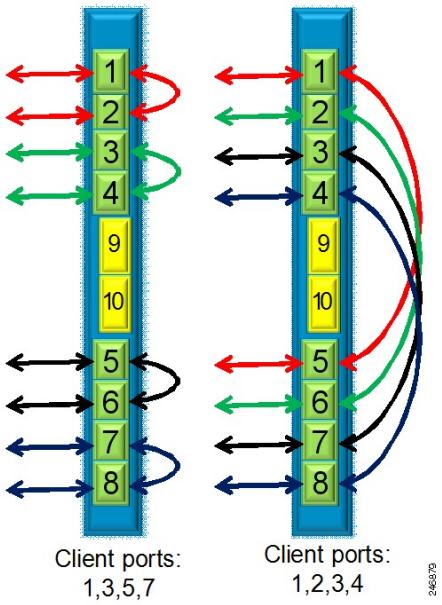
The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate or a high-rate TXP_MR card mode.

Note OTN cannot be enabled for 4GFC trunk ports.

- Low Rate—A maximum of four TXP_MR configurations can be provisioned on a single AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate TXP_MR card by adhering to the following provisioning rules:
  1. Two SFP ports must be grouped. The allowed port pairs are 1-2, 3-4, 5-6, 7-8, 1-5, 2-6, 3-7, and/or 4-8.
  2. Ports 2, 4, 5, 6, 7, or 8 can be configured as trunk ports.
  3. Ports 1, 2, 3, 4, 5 or 7 can be configured as client ports.

Note The trunk port is not created when the low-rate TXP_MR card operating mode is configured. It is created after the client payload is created.

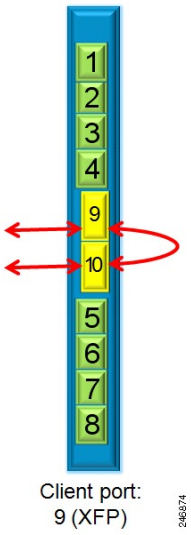
Figure 21: Low-Rate TXP_MR Card Operating Mode Configuration



- High Rate—Only one TXP_MR configuration can be provisioned on a single AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a high-rate TXP_MR card by adhering to the following provisioning rules:

  1. XFP ports 9 and 10 must be grouped.
  2. Port 10 must be configured as a trunk port.
  3. Port 9 must be configured as a client port.

Figure 22: High-Rate TXP_MR Card Operating Mode Configuration



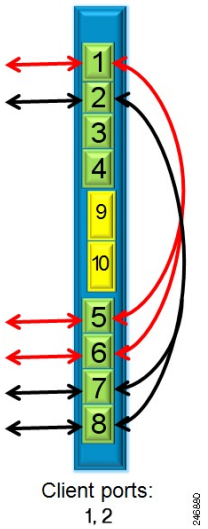
TXPP_MR (Protected Transponder)

The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate TXPP_MR card mode. A maximum of two TXPP_MR configurations can be provisioned on a single AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate TXPP_MR card by adhering to the following provisioning rules:

1. Three SFP ports must be grouped. The allowed port pairs are 1-5-6 or 2-7-8, or both.
2. Ports 5 and 6, and 7 and 8 must be configured as trunk ports, where 6 and 8 are the protect trunk ports for 5 and 6 respectively.
3. Ports 1 and 2 must be configured as client ports.

Splitter protection is automatically created between ports 5-6 and 7-8.

Figure 23: Low-Rate TXPP_MR Card Operating Mode Configuration



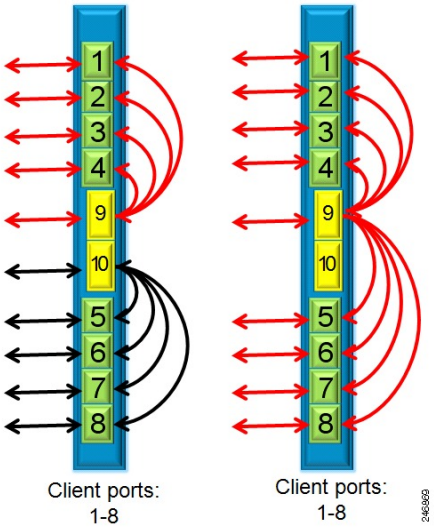
MXP_DME (Unprotected Data Muxponder)

The AR_XP or AR_XPE card can be configured as a high-rate 4:1 or 8:1 MXP_DME card mode. The AR_MXP card can be configured as a high rate 8:1 MXP_DME card mode.

- 4:1 MXP_DME mode—A maximum of two MXP_DME configurations can be provisioned on a single AR_XP or AR_XPE card. The AR_XP or AR_XPE card can be configured as a high-rate 4:1 MXP_DME card by adhering to the following provisioning rules:
  1. Four SFP ports and one XFP port must be grouped. The allowed port pairs are 1-2-3-4-9 or 5-6-7-8-10, or both.
  2. Port 9 or 10 must be configured as a trunk port.
  3. Ports 1, 2, 3, and 4, or 5, 6, 7, and 8 must be configured as client ports.
- 8:1 MXP_DME mode—Only one MXP_DME configuration can be provisioned on a single AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, AR_XPE card can be configured as a high-rate 8:1 MXP_DME card by adhering to the following provisioning rules:

1. Eight SFP ports and one XFP port must be grouped. The allowed port pairs are 1-2-3-4-5-6-7-8-9.
2. Port 9 must be configured as a trunk port.
3. Ports 1 to 8 must be configured as client ports.

Figure 24: High-Rate MXP_DME Card Operating Mode Configuration



MXPP_DME (Protected Data Muxponder)

The AR_XP or AR_XPE card can be configured as a high-rate 4:2 or 8:2 MXPP_DME card mode.

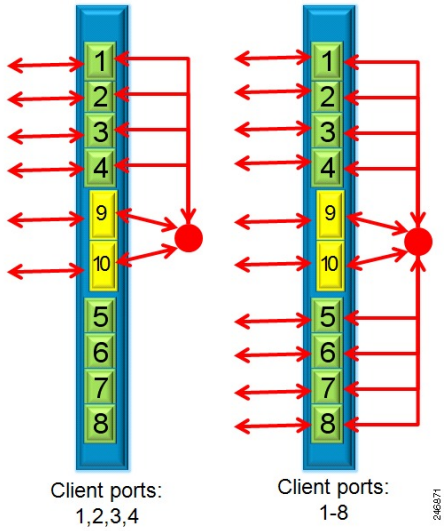
- 4:2 MXP_DME mode—Only one MXPP_DME configuration can be provisioned on a single AR_XP or AR_XPE card. The AR_XP or AR_XPE card can be configured as a high-rate 4:2 MXPP_DME card by adhering to the following provisioning rules:
  1. Four SFP ports and two XFP ports must be grouped. The allowed port pairs are 1-2-3-4-9-10 or 5-6-7-8-9-10.
  2. Ports 9 and 10 must be configured as trunk ports.
  3. Ports 1, 2, 3, and 4, or 5, 6, 7, and 8 must be configured as client ports.

Splitter protection is automatically created between ports 9 and 10. Port 10 will be the protected trunk port for port 9.

- 8:2 MXPP_DME mode—Only one MXPP_DME configuration can be provisioned on a single AR_XP or AR_XPE card. The AR_XP or AR_XPE card can be configured as a high-rate 8:2 MXPP_DME card by adhering to the following provisioning rules:
  1. Eight SFP ports and two XFP ports must be grouped. The allowed port pairs are 1-2-3-4-5-6-7-8-9-10.
  2. Ports 9 and 10 must be configured as trunk ports.
  3. Ports 1 to 8 must be configured as client ports.

Splitter protection is automatically created between ports 9 and 10. Port 10 will be the protected trunk port for port 9.

Figure 25: High-Rate MXPP_DME Card Operating Mode Configuration



MXP_MR (Unprotected Multirate Muxponder)

The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate or a high-rate MXP_MR card mode.

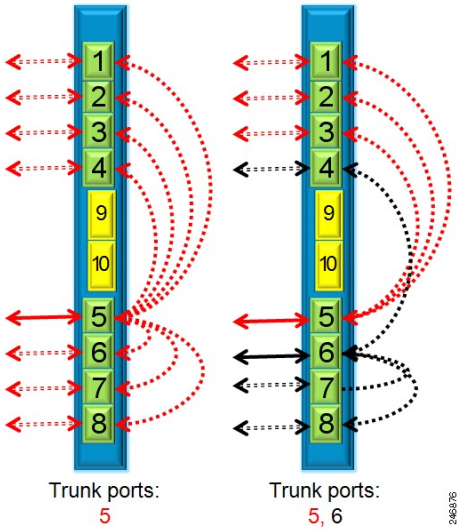
- Low Rate—A maximum of two MXP_MR configurations can be provisioned depending on the availability of client ports. The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate MXP_MR card by adhering to the following provisioning rules:

  1. N:1 muxponder must be created, where N varies from client ports 2 to 7.
  2. Only ports 5, 6, 7, or 8 can be configured as trunk ports.
  3. Ports 1 to 8 can be configured as client ports, if they are not configured as trunk ports.

Any client port can be added or deleted, if the trunk bandwidth supports the new payload without impacting the traffic on the existing services. Minimum of two client ports should be part of the operational mode group.

On the AR_XPE card, 1GE or 1G FC payload cannot be configured with other payloads. When a 1GE or 1GFC payload is configured on a port of MXP_MR (low rate) mode, then only 1GE or 1GFC payload can be configured on the other ports.

Figure 26: Low-Rate MXP_MR Card Operating Mode Configuration



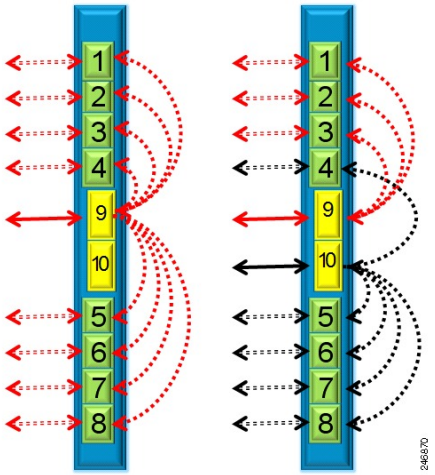
- High Rate—A maximum of two MXP_MR configurations can be provisioned on a AR_XP or AR_XPE card and only one such configuration can be provisioned on an AR_MXP card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a high-rate MXP_MR card by adhering to the following provisioning rules:

  1. N:1 muxponder must be created, where N varies from client ports 2 to 8.
  2. Only ports 9 and 10 can be configured as trunk ports.
  3. Ports 1 to 8 can be configured as client ports.

Any client payload can be added or deleted, if the trunk bandwidth supports the new payload without impacting the traffic on the existing services.

On the AR_XPE card, when you create a OCHCC circuit using 1GE or 1GFC payload, only ODU0 mapping is supported and timeslot mapping is not supported. When a OCHCC circuit is created on a particular ODU1 timeslot with payloads using timeslot mapping, OCHCC circuits cannot be created on payloads using ODU0 mapping, but can be created on the other ODU1 timeslot. In MXP_MR (high-rate) mode, while creating a OCHCC circuits on the GE or 1GFC client payload, you can select the ODU1 and ODU0 timeslots instead of ODU1 and timeslot selection.

Figure 27: High-Rate MXP_MR Card Operating Mode Configuration



MXPP_MR (Protected Multirate Muxponder)

The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate or a high-rate MXPP_MR card mode.

- Low Rate—A maximum of two MXPP_MR configurations can be provisioned depending on the availability of client ports. Any client payload can be added or deleted, if the trunk bandwidth supports the new payload without impacting the traffic on the existing services.

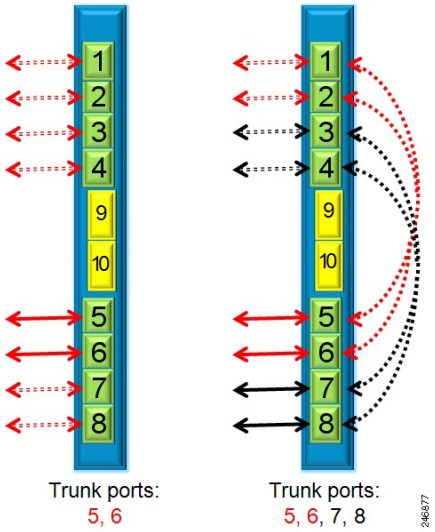
The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate MXPP_MR card by adhering to the following provisioning rules:

1. N:2 muxponder must be created, where N varies from client ports 2 to 6.
2. Only ports 5 and 6 or 7 and 8, or both can be configured as trunk port.
3. Ports 1 to 8 can be configured as client ports, if ports are not configured as a trunk ports and are not part of another muxponder.

Splitter protection is automatically created between ports 5 and 6 or 7 and 8.

On the AR_XPE card, 1GE or 1G FC payload cannot be configured with other payloads. When a 1GE or 1GFC payload is configured on a port of MXPP_MR (low rate) mode, then only 1GE or 1GFC payload can be configured on the other ports.

Figure 28: Low-Rate MXPP_MR Card Operating Mode Configuration



- High Rate—A maximum of one MXPP_MR configuration can be provisioned on a AR_XP or AR_XPE card. Any client payload can be added or deleted, if the trunk bandwidth supports the new payload without impacting the traffic on the existing services.

The AR_XP or AR_XPE card can be configured as a high-rate MXPP_MR card by adhering to the following provisioning rules:

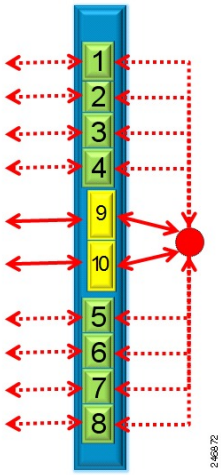
1. N:2 muxponder must be created, where N varies from client ports 2 to 8.
2. Only ports 9 and 10 can be configured as trunk ports.
3. Ports 1 to 8 can be configured as client ports.

Splitter protection is automatically created between ports 9 and 10. Port 10 will be the protected trunk port for port 9.

On the AR_XPE card, when you create a OCHCC circuit using 1GE or 1GFC payload, only ODU0 mapping is supported and timeslot mapping is not supported. When a OCHCC circuit is created on a particular ODU1 timeslot with payloads using timeslot mapping, OCHCC circuits cannot be created on payloads using ODU0 mapping, but can be created on the other ODU1 timeslot.

When you create a OCHCC circuit between two nodes, with a Provisional Patch Cord (PPC) between the trunks in splitter protection mode, then, while editing the OCHCC circuit, check the far-end and near-end details. The near-end and far-end should either be the client and the trunk port respectively or vice-versa. The client port cannot exist with the trunk port . In some cases, the client and the trunk ports are displayed together, which is incorrect.

Figure 29: High-Rate MXPP_MR Card Operating Mode Configuration



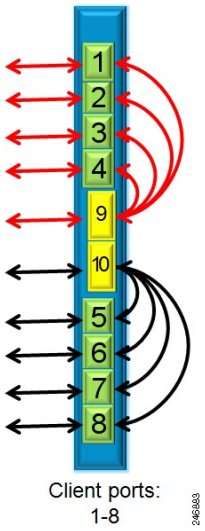
MXP-4x2.5-10G (OC48/OTU1 Unprotected Muxponder)

The AR_MXP, AR_XP, or AR_XPE card can be configured as a high-rate MXP-4x2.5-10G card mode. Only one MXP-4x2.5-10G configuration can be provisioned on an AR_MXP card and a maximum of two on a AR_XP or AR_XPE card.

The AR_MXP, AR_XP, or AR_XPE card can be provisioned as MXP-4x2.5-10G card by adhering to the following provisioning rules:

1. The allowed port pairs are 1-2-3-4-9 or 5-6-7-8-10, or both.
2. Ports 9 and 10 can be configured as trunk ports.
3. Ports 1-2-3-4 or 5-6-7-8 can be configured as client ports.

Figure 30: High-Rate MXP-4x2.5-10G Card Operating Mode Configuration



MXPP-4x2.5-10G (OC48/OTU1 Protected Muxponder)

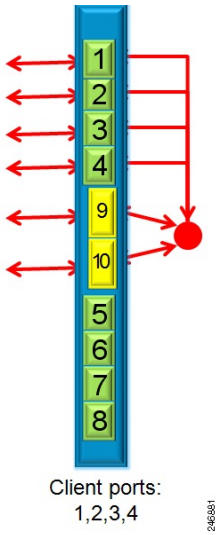
The AR_XP or AR_XPE card can be configured as a high-rate MXPP-4x2.5-10G card mode. Only one MXPP-4x2.5-10G configuration can be provisioned on a AR_XP or AR_XPE card.

The AR_XP or AR_XPE card can be configured as MXPP-4x2.5-10G card by adhering to the following provisioning rules:

1. Four SFP ports and two XFP ports must be configured. The allowed port pair is 1-2-3-4-9-10 or 5-6-7-8-9-10, or both.
2. Only ports 9 and 10 can be configured as trunk ports.
3. Ports 1-2-3-4 or 5-6-7-8 can be configured as client ports.

Splitter protection is automatically created between ports 9 and 10. Port 10 will be the protected trunk port for port 9.

Figure 31: High-Rate MXPP-4x2.5-10G Card Operating Mode Configuration



MXP_MR_S (Unprotected Multirate Muxponder-Static) and MXPP_MR_S (Protected Multirate Muxponder-Static)

The MXP_MR_S and MXPP_MR_S operating modes are similar to the existing MXP_MR and MXPP_MR operating modes except for static timeslot and ODU allocation. A specific set of client payloads or a mix of client playloads can be used only if the trunk bandwidth and timeslot are available as per the static allocation mapping.

For example, the MXP_MR_S and MXPP_MR_S modes can be used to provision a dual 4xOC-48 or a mix of 2-OC-48 + 2-GE or 1-OC-48 + 6-GE into one OTU2 muxponder.

This works similar to traditional transponders/muxponders where operators can choose to use OCH-CC or just provision OCH-Trail/OCH-NC for creating the circuits.

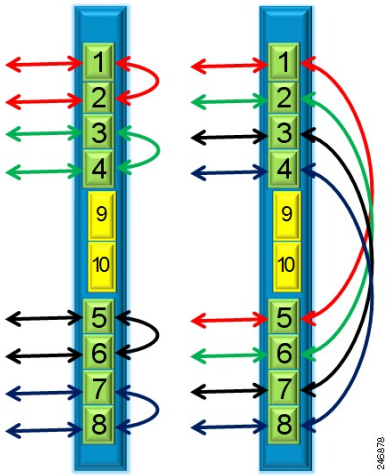
RGN (OTU1/OTU2 Regenerator)

The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate or high-rate RGN card mode.

- Low Rate—A maximum of four RGN configurations can be provisioned on a single AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a low-rate RGN card by adhering to the following provisioning rules:

  The allowed port pairs are 1-2, 3-4, 5-6, 7-8 or 1-5, 2-6, 3-7, 4-8.

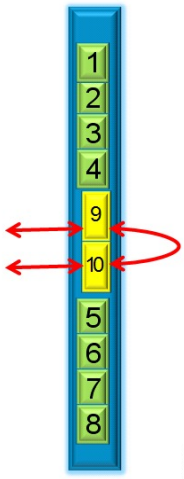
Figure 32: Low-Rate RGN Card Operating Mode Configuration



- High Rate—Only one RGN configuration can be provisioned on a AR_MXP, AR_XP, or AR_XPE card. The AR_MXP, AR_XP, or AR_XPE card can be configured as a high rate RGN card by adhering to the following provisioning rules:

  The allowed port pairs are 9-10.

Figure 33: High-Rate RGN Card Operating Mode Configuration



The 10 GE over OTU2e/OTU1e signal with disabled FEC, standard FEC, I.4 or I.7 EFEC mode can be regenerated. The ODU transparency can either be Transparent Standard Use or Cisco Extended Use.

Note Payload PMs are not supported in this operating mode.

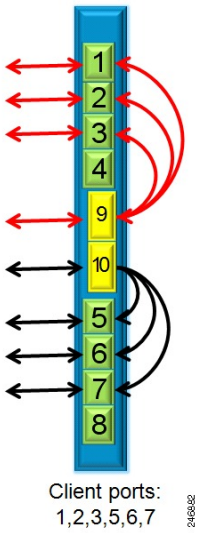
MXP-VD-10G (Video Muxponder)

The AR_XP or AR_XPE card can be configured as a high-rate MXP-VD-10G card mode. A maximum of two MXP-VD-10G configurations can be provisioned on a AR_XP or AR_XPE card.

The AR_XP or AR_XPE card can be configured as MXP-VD-10G card by adhering to the following provisioning rules:

1. The allowed port pairs are 1-2-3-9 or 5-6-7-10.
2. Only ports 9 and 10 can be configured as trunk ports.
3. Ports 1-2-3 and 5-6-7 can be configured as client ports.

Figure 34: High-Rate MXP-VD-10G Card Operating Mode Configuration



Scenarios of Different Operational mode Configurations on a AR_XP, or AR_XPE Card

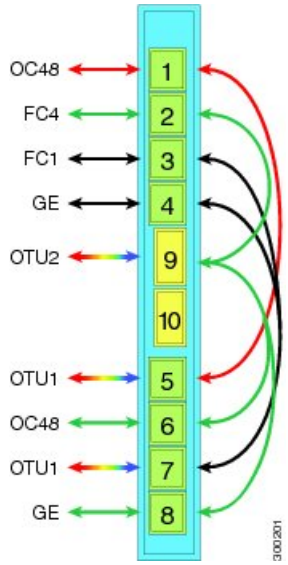
The following section provides a few sample scenarios of different operational modes that can be configured on an AR_XP or AR_XPE card:

Scenario 1

In this example, the following three operational modes are configured on the AR_XP or AR_XPE card:

- Low-rate TXP_MR (Cl=1;Tr=5)
- Low-rate MXP_MR (Cl=3,4;Tr=7)
- High-rate 3:1 MXP_MR (Cl=2,6,8;Tr=9)

Figure 35: Scenario 1

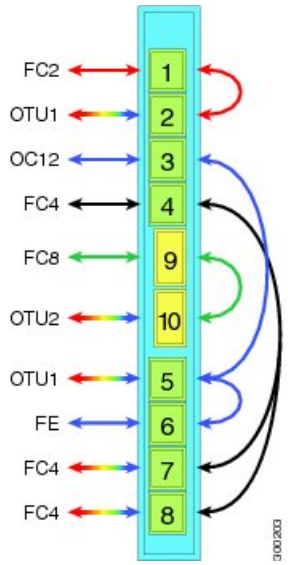


Scenario 2

In this example, the following four operational modes are configured on the AR_XP or AR_XPE card:

- Low-rate TXP_MR (Cl=1;Tr=2)
- 8G FC TXP (Cl=9;Tr=10)
- Low-rate MR_MXP (Cl=4;TR=7,8)
- Low-rate MR_MXP (Cl=3,6;TR=5)

Figure 36: Scenario 2

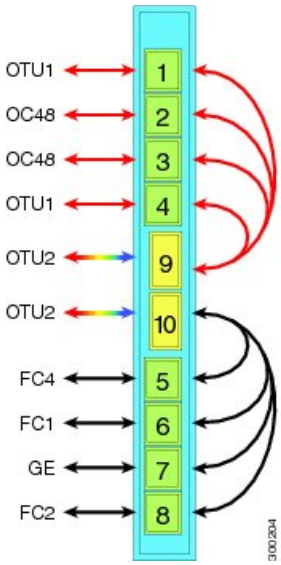


Scenario 3

In this example, the following two operational modes are configured on the AR_XP card:

- High-rate MXP-4x2.5-10G (Cl=1,2,3,4;Tr=9)
- High-rate 4:1 MXP_DME (Cl=5,6,7,8;Tr=10)

Figure 37: Scenario 3

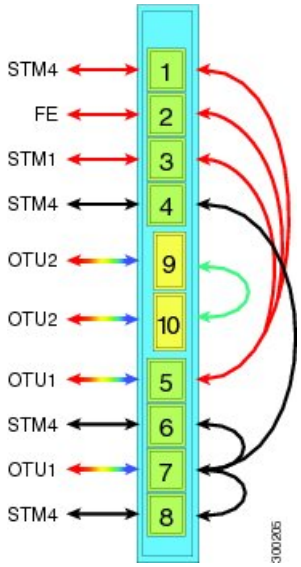


Scenario 4

In this example, the following three operational modes are configured on the AR_XP or AR_XPE card:

- Low-rate MXP_MR (Cl=1,2,3;Tr=5)
- Low-rate MXP_MR (Cl=4,6,8; Tr=7)
- RGN(Cl=9;Tr=10)

Figure 38: Scenario 4

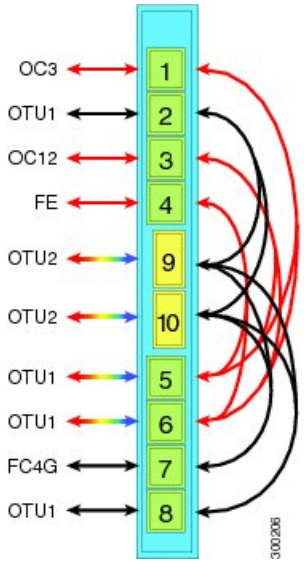


Scenario 5

In this example, the following two operational modes are configured on the AR_XP or AR_XPE card:

- Low-rate MXPP_MR (Cl=1,3,4;Tr=5,6)
- High-rate MXPP_MR (Cl=2,7,8;Tr=9,10)

Figure 39: Scenario 5



AR_MXP, AR_XP, and AR_XPE Functions and Features

The AR_MXP, AR_XP, and AR_XPE cards have the following functions and features are explained in the "Card Features" chapter:

- Client Interface
- DWDM Interfac
- DWDM Trunk Interface
- Enhanced FEC (E-FEC) Feature
- Timing Synchronization
- Y-Cable Protection
- Jitter Consideration

For more information about the AR_MXP and AR_XPE cards, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-682432.html

For more information about the AR_XPE card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/datasheet_c78-726878.html

Related Procedures for AR_MXP, AR_XP, and AR_XPE Cards

The following is the list of procedures and tasks related to the configuration of the AR_MXP, AR_XP, and AR_XPE cards:

- NTP-G321 Provisioning Multiple Operating Modes, on page 577
- NTP-G322 Modifying the Card Line Settings and PM Parameter Thresholds, on page 578
- NTP-G75 Monitor Transponder and Muxponder Performance

100G-LC-C, 100G-ME-C, 100G-CK-C, 100GS-CK-LC, 100ME-CKC, and 200G-CK-LC Cards

The 100G-LC-C, 100G-ME-C, 100G-CK-C, and 100ME-CKC cards are tunable DWDM trunk cards, which simplifies the integration and transport of 100 Gigabit Ethernet interfaces and services into enterprises or service provider optical networks. The 100GS-CK-LC and 200G-CK-LC cards simplify the integration and transport of 100 and 200 Gigabit Ethernet interfaces and services into enterprises or service provider optical networks. These cards are supported on Cisco NCS 2000 Series platforms.

The cards interoperate with 10x10G-LC and CFP-LC cards through a chassis backplane.

Note The 100GS-CK-LC and 200G-CK-LC cards do not operate with the CFP-LC card.

The cards provide the following benefits:

- Provides 100 Gbps wavelengths transport over fully uncompensated networks, with more than 2,500 km of unregenerated optical links.
- Enables 100-Gbps transport over very high Polarization Mode Dispersion (PMD).
- Improves overall system density of up to 100 Gbps per slot, which is five times greater than what can be achieved with 40 Gbps units.

Up to six cards can be installed per Cisco NCS 2006 shelf, supporting up to 42 100-Gbps interfaces per 42-rack units (RU) bay frame. It is possible to place up to two 100G TXPs, one 100 G Regen, or one 100 G MXP in an Cisco NCS 2006 shelf.



Note The fan-tray assembly NCS2006-FTA= (for the NCS 2006 chassis), NCS2002-FTA= (for the NCS 2002 chassis) must be installed in the shelf where the cards are installed. When an ONS-SC+-10G-C pluggable is used along with the 10x10G-LC card, the maximum operating temperature of the shelf must not exceed 50 degrees Celsius.

100G-LC-C, 100G-CK-C, 100ME-CKC, and 100G-ME-C Cards

The 100G-CK-C card works similar to the 100G-LC-C card. The 100G-CK-C card has the new CPAK client interface replacing the CXP client interface of the 100G-LC-C card. The CPAK client interface enables different payload combinations such that this card can be used instead of the 100G-LC-C and CFP-LC cards.

The 100G-ME-C and 100ME-CKC cards are metro edge versions of 100G-LC-C and 100G-CK-C respectively. The metro edge cards have chromatic dispersion of +/-5000 ps/nm and does not support 20% FEC.

The 100G-CK-C and 100ME-CKC cards support the following pluggables:

- CPAK-100G-SR10 pluggable with 100GE/OTU4 and 40GE payloads
- CPAK-100G-LR4 pluggable with 100GE/OTU4 payloads
- CPAK-100G-SR4 pluggable with 100GE payloads

The 100G-LC-C and 100G-ME-C cards support these client signal types:

- 100GE/OTU4
- OTU4 from BP OTL4.10 (interconnect with CFP client)
- 100GE from BP CAUI (interconnect with CFP client)
- 3 x OTU3e(255/227) from BP OTL3.4 (interconnect with 10 x10G client)
- 2 x OTU3 from BP OTL3.4 (interconnect with CFP client)
- 2 x 40 GE from BP XLAUI (interconnect with CFP client)

In addition to the above, the 100G-CK-C and 100ME-CKC cards support these client signal types:

- 100GE/OTU4 for the CPAK-100G-SR10/CPAK-100G-LR4 client interface
- 40GE for the CPAK-100G-SR10 client interface

- The 100G-LC-C card and 100G-CK-C cards provide a 100 G DWDM trunk interface that supports up to 70000 ps/nm of CD robustness.
- The 100G-LC-C card and 100G-CK-C cards enables configuration of the CD dispersion tolerance to 50000 ps/nm and 30000 ps/nm to reduce power consumption.

100GS-CK-LC and 200G-CK-LC Cards

The 100GS-CK-LC and 200G-CK-LC cards are tunable DWDM trunk cards, which simplify the integration and transport of 100 and 200 Gigabit Ethernet interfaces and services into enterprises or service provider optical networks. The 200G-CK-LC card is an enhancement of the 100GS-CK-LC card.

The 100GS-CK-LC and 200G-CK-LC cards provide the following benefits:

- Allow choosing 16 QAM and QPSK as the modulation formats at the line side.
- Provide Standard G-FEC (Reed-Solomon), Soft Decision FEC (SD-FEC) encoding with 20% overhead, and Hard Decision FEC (HD-FEC) encoding with 7% overhead.
- Provide Nyquist filtering for best performance and optimal band usage.
- Support gridless tunability.
- Allow client access either through the local 100G CPAK interface or through backplane lines.
- In MXP-10X10G operating mode, allow 10GE and OC-192 clients (multiplexed on 100G trunk) to interoperate with NCS 4000 platform. The NCS 2000 line cards must fill the PT and MSI bytes to interoperate with the supported NCS 4000 10G client. The interoperability applies for Hard Decision FEC (HD-FEC) encoding with 7% overhead and GFEC trunk modes.

The 200G-CK-LC card also supports feature-based licensing. The 200G-CK-LIC is the licensed card version of the 200G-CK-LC card. The licensed card version has only some basic functionality enabled while other features can be enabled separately with specific licenses.

The 200G-CK-LC card has the following limitation:

- Terminal loopback on the client port is not supported for the CPAK-FRS pluggable.
- When the line card is under a warm reboot and is still not operational, and if traffic goes down in the system, then the traffic is not recovered. This issue is seen when the client port is connected to the QSFP28-100G-FR-S or CPAK-FRS pluggable.

Key Features

The card key features are listed in the "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129.

The cards are single-slot cards and can be installed in Slot 2 to Slot 7 in the Slot 2 to Slot 7 in the Cisco NCS 2006 chassis and Slot 2 and Slot 3 in the Cisco NCS 2002 chassis. The 100G-LC-C and 100G-ME-C cards have one DWDM port and one CXP port. The 100G-CK-C and 100ME-CK-C cards have one DWDM port and one CPAK port.

Operating Modes for 100G-LC-C, 100G-ME-C, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, and 100ME-CKC Cards

Each operating mode can be configured using the specific set of cards and client payloads. Key Features of 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, and MR-MXP Cards, on page 239 describes how each mode can be configured, the supported payloads, and the valid port pair for a specific operating mode.

100G Operating Modes

The 100G-LC-C, 100G-ME-C, 100G-CK-C, 100GS-CK-LC, 100ME-CKC, and 200G-CK-LC cards support the following 100G operating modes. The operating mode configuration for the 100G operating modes is performed on the client card.

- TXP-100G (Standalone 100GE Transponder)
- RGN-100G (100G Regenerator)

TXP-100G (Standalone 100GE Transponder)

The cards can be configured as a standalone 100 Gigabit Ethernet transponder. The 100 Gigabit Ethernet traffic is supported on the CXP/CPAK and coherent optical trunk. The 100 Gigabit Ethernet or OTU4 payload traffic is routed from the CXP/CPAK to the optical trunk, passing through the T100 framer and vice versa. The supported client signals in this mode are 100 Gigabit Ethernet LAN-PHY or OTU4 data rates.

RGN-100G (100G Regenerator)

The cards can be configured as a regenerator. Two cards can be connected to work in a back-to-back mode connecting through the chassis backplane in the same shelf. The allowed slot pairs are 2-3, 4-5, 6-7, 8-9, 10-11, 12-13, or 14-15.

The client signals supported are 100 Gigabit Ethernet or OTU4. Regeneration is performed leveraging on the OTU4 backplane interconnection. OTU4 overhead is terminated, allowing ODU4 to transparently pass through. GCC0 is terminated, while GCC1 and GCC2 are allowed to pass through.

The CXP client is not required because communication between the two cards acting as a regeneration group is supported through the chassis backplane.

MXP-2x40G

The 100G-CK-C and 100ME-CKC cards support the MXP-2x40G operating mode. The 100G-CK-C and 100ME-CKC cards can be configured as a 2-port 40 GE muxponder. Two 40 GE flows through the CPAK client interface and are multiplexed in the 100G trunk interface. The traffic on the second client interface can be configured only after the traffic is provisioned on the first client interface. This operating mode is not supported on the 100GS-CK-LC card.

Note The synchronization for the 100G-CK-LC card is derived only from port 1. Hence, the traffic on port 2 must originate from the same synchronization source as port 1. The two ports must carry traffic from the same synchronization source.

Note GCC Rate in the Edit GCC Termination Window is shown as 192K instead of the supported 1200K. This is a known behavior.

If ONS 15454 with the MXP-2x40G operating mode is connected to a NCS 6000 router, ensure that both the 40G ports are connected to the same group of six ports on the NCS 6000 router. The 40G ports 1 and 2 need to connect to 1-6, 7-12, 13-18 ports on the NCS 6000 router.

200G Operating Modes

The 100GS-CK-LC and 200G-CK-LC cards also support the 200G operating modes. The operating mode configuration for these modes is performed on the trunk card.

- MXP_200G
- MXP_10x10G_100G
- MXP_CK_100G

MXP_200G

Three cards, trunk card, peer card, and skip card are required to configure this operating mode. The skip card is adjacent to the peer card.

The trunk card is 100GS-CK-LC or 200G-CK-LC card; the peer card and skip cards are MR-MXP. The first 10x10G is taken from the two SFP and two QFSP+ ports of the peer MR-MXP card and the second 10x10G is taken from the two SFP and two QFSP+ ports of the skip MR-MXP card.

200G-CK-LC card supports another configuration in the MXP_200G operating mode. In this configuration, 2x40GE clients on QSFP+ ports and 2x10GE clients on SFP+ ports of both the peer MR-MXP and skip MR-MXP cards are multiplexed into 200G traffic on the trunk 200G-CK-LC card.

The operating mode can be provisioned on the following slots:

- NCS 2006: 100GS-CK-LC or 200G-CK-LC card in slots 2 or 7, peer and skip MR-MXP cards in adjacent slots 3, 4 or 5, 6
- NCS 2015: 100GS-CK-LC or 200G-CK-LC card in slots 2, 7, 8, 13, or 14, peer and skip MR-MXP cards in adjacent slots.

MXP_10x10G_100G

Three cards, trunk card, peer card, and skip card are required to configure this operating mode.

The trunk card is 100GS-CK-LC or 200G-CK-LC card; the peer card is 10x10G-LC and the skip card is MR-MXP . The first 10x10G is taken from the ten SFP ports of the peer 10x10G-LC card and the second 10x10G is taken from the two SFP and two QFSP+ ports of the skip MR-MXP card.

The operating mode can be provisioned on the following slots:

- NCS 2006: 100GS-CK-LC or 200G-CK-LC card in slots 2 or 7, peer and skip MR-MXP cards in adjacent slots 3, 4 or 5, 6
- NCS 2015: 100GS-CK-LC or 200G-CK-LC card in slots 2, 7, 8, 13, or 14, peer and skip MR-MXP cards in adjacent slots.

MXP_CK_100G

Two cards, trunk and peer cards are required to configure this operating mode. The trunk card is 100GS-CK-LC or 200G-CK-LC; the peer card is MR-MXP . The first 100G is taken from the CPAK client port of the trunk 100GS-CK-LC or 200G-CK-LC card and the second 100G is taken from the CPAK client port of the MR-MXP card.

200G-CK-LC card supports another configuration in the MXP_CK_100G operating mode. In this configuration, 10x10GE clients on QSFP+ or SFP+ ports of the peer MR-MXP card and 100GE client on the CPAK port of the 200G-CK-LC card are multiplexed into a 200G configuration on the trunk 200G-CK-LC card.

The operating mode can be provisioned on the following slots:

- NCS 2006: 100GS-CK-LC or 200G-CK-LC card and the peer MR-MXP card need to be in adjacent slots 2-3, 4-5, 6-7
- NCS 2015: 100GS-CK-LC or 200G-CK-LC card and the peer MR-MXP card need to be in adjacent slots 2-3, 4-5, 6-7, 8-9, 10-11, 12-13, 14-15

For more information about the cards, see:

- http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-713298.html
- http://www.cisco.com/en/US/solutions/collateral/ns340/ns394/ns398/ns406/data_sheet_c78-729401.html
- http://www.cisco.com/c/en/us/products/collateral/optical-networking/network-convergence-system-2000-series/datasheet-c78-733529.html
- http://www.cisco.com/c/en/us/products/collateral/optical-networking/network-convergence-system-2000-series/datasheet-c78-733699.html

10x10G-LC Card

In this chapter, "10x10G-LC" refers to the 15454-M-10x10G-LC card.

The 10x10G-LC card is a DWDM client card, which simplifies the integration and transport of 10 Gigabit Ethernet interfaces and services to enterprises or service provider optical networks. The 10x10G-LC card is supported on Cisco NCS 2000 Series platforms.

The 10x10G-LC card is a single-slot card and can be installed in any service slot of the chassis. The 10x10G-LC card consists of a 10-port SFP+ based (with gray-colored, coarse wavelength division multiplexing ([CWDM] and DWDM optics available) and one 100 G CXP-based port.

The 10x10G-LC card interoperates with 100G-LC -C, 100G-CK-C, 100GS-CK-C, and 200G-CK-C cards through a chassis backplane.

The 10x10G-LC card supports the following signal types:

- OC-192/STM-64 (9.95328 Gbps)
- 10 Gigabit Ethernet LAN PHY (10.3125 Gbps)
- 10 G FC (10.518 Gbps)
- 8 G FC
- OTU-2

- G.709 overclocked to transport 10 Gigabit Ethernet as defined by ITU-T G. Sup43 Clause 7.1 (11.0957 Gbps)
- IB_5G (supported only in TXP-10G operating mode)

Note You may observe traffic glitches on the receiving direction of client ports 7, 8, 9, and 10 on the 400G-XP-LC card that you connect to CXP port of a 10x10G-LC card in fanout mode. To bringup traffic in such cases, change the admin state of the CXP port from **OOS-DSBLD** state to **IS-NR** state. Repeat the same action if you continue to observe glitches.

The key features of 10x10G-LC card are listed in "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129.

Operating Modes for 10x10G-LC Card

The 10x10G-LC card supports the following operating modes:

- MXP-10x10G (10x10G Muxponder)
- RGN-10G (5x10G Regenerator)/TXP-10G (5x10G Transponder)
- Low Latency
- Fanout-10X10G
- TXPP-10G

Each operating mode can be configured using specific set of cards and client payloads. "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129 lists the valid port pair for a specific operating mode and the supported payloads, and describes how each mode can be configured.

MXP-10x10G (10x10G Muxponder)

The 10x10G-LC card can be configured as a 10x10G muxponder. It can be connected with a 100G-LC-C, 100G-ME-C, 100G-CK-LC, 100GS-CK-LC or 100ME-CKC card to support 10-port 10 G muxponder capabilities. The 100G-LC-C, 100G-ME-C, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, or 100ME-CKC card can be connected through the chassis backplane (no client CXP/CPAK is required) with the 10x10G-LC card to provide OTN multiplexing of the 10 G data streams into a single 100 G DWDM OTU4 wavelength. When 10x10G-LC card is configured with the 100GS-CK-LC card, OC-192/STM-64, and 10 Gigabit Ethernet LAN PHY payloads are supported. The allowed slot pairs are 2-3, 4-5, 6-7, 8-9, 10-11, 12-13, or 14-15.

The 10x10G muxponder mode supports client signals that are a combination of any 10 Gigabit Ethernet LAN-PHY, OC-192, STM-64, 10 G FC/FICON, 8 G FC/FICON, or OTU2 data rates.

RGN-10G (5x10G Regenerator)/TXP-10G (5x10G Transponder)

The 10x10G-LC card works as a standalone card, supporting the multitransponder functionality. The 10 Gbps SFP+ ports should be paired to provide the 10 G transponder functionality for each port of the port pair. By using the grey optics SFP+ to provide the client equipment connectivity and DWDM SFP+ on the WDM side, up to five 10 G transponders are supported by a single 10x10G-LC card. Up to six 10x10G-LC cards are supported on the Cisco NCS 2006 chassis allowing for 30 10 Gbps transponders in a single shelf.

All ports can be equipped with or without the G.709 Digital Wrapper function that provides wide flexibility in terms of the supported services.

As the client and trunk ports are completely independent, it is also possible to equip both SFP+ of the same pair of ports with the DWDM SFP+, thereby allowing them to function as a WDM regenerator. The CXP pluggable is unused in this configuration.

Each of the SFP+ ports can be provisioned as a client or trunk. When one port is selected as a trunk, the other port of the pair is automatically selected as the client port. The allowed port pairs are 1-2, 3-4, 5-6, 7-8, or 9-10.

For RGN-10G mode, both ports are trunk ports.

It is not a constraint to provision five pairs of TXP-10G mode or five pairs of RGN-10G mode. A mix of TXP-10G and RGN-10G modes can be configured. For example, pairs 1-2 and 5-6 can be configured as TXP-10G mode and the remaining pairs as RGN-10G mode.

Table 81: Supported Payload Mapping Between Two SFP+ Ports

SFP+ Payload (Peer-1)	SFP+ Payload (Peer -2)
10GE-LAN (CBR Mapped)	OTU2e or 10GE-LAN (CBR Mapped)
OTU2	OC192 or OTU2

Low Latency

The 10x10G-LC card can be configured in low latency mode. This configuration minimizes the time spent by the signal to cross the card during the regeneration process. Athough each SFP port functions as a unidirectional regenerator, adjacent SFP ports must be selected while provisioning this mode. Both ports are trunk ports. The allowed ports are 1-2, 3-4, 5-6, 7-8, or 9-10. A mix of TXP-10G, RGN-10G, and low latency modes can be configured.

The low latency mode supports 10GE and 10G FC data rates. The same payload must be provisioned on both SFP ports involved in this operating mode. GCC cannot be provisioned on the ports used in low latency mode. The low latency mode does not support terminal and facility loopback.

Fanout-10X10G

The 10x10G-LC card can be configured in the fanout-10x10G mode. The fanout configuration configures the CXP side as the client and SFP side as the trunk. This configuration functions as ten independent transponders. The CXP lanes are managed independently and the payload for each CXP-lane-SPF+ pair is independent of the other pairs.

The fanout configuration provides the following mapping for the port pairs:

- CXP lane 2-SFP1
- CXP lane 3-SFP2
- CXP lane 4-SFP3
- CXP lane 5-SFP4
- CXP lane 6-SFP5
- CXP lane 7-SFP6
- CXP lane 8-SFP7
- CXP lane 9-SFP8

- CXP lane 10-SFP9
- CXP lane 11-SFP10

Note CXP lane 1 and CXP lane 12 are not supported in this configuration.

The fanout configuration supports the following payload types and mapping modes:

- 10GE (CXP line), transparent (no mapping), 10GE (SFP)
- 10GE (CXP line), GFP mapping, OTU2 (SFP)
- 10GE (CXP line), CBR mapping, OTU2e (SFP)

TXPP-10G

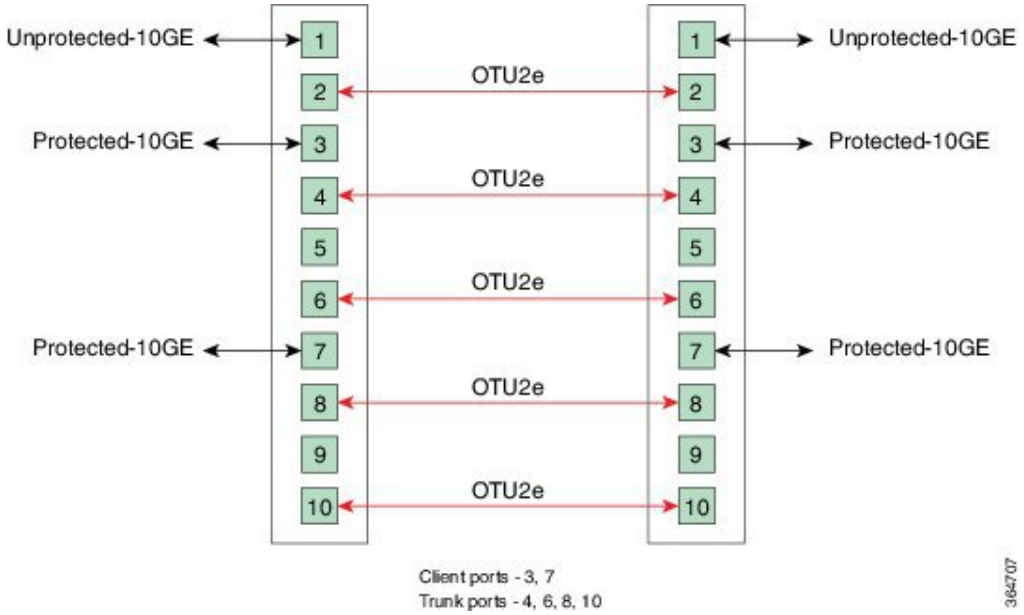
Splitter protection can be implemented on the 10x10G-LC card in TXPP-10G mode. The 10x10G-LC card supports up to two splitter protection groups with one client and two trunk ports. The client and trunk ports on the two groups are:

- Port 3 (client), port 4, and port 6 (trunks) on the first protection group
- Port 7 (client), port 8, and port 10 (trunks) on the second protection group

Port 1 and port 2 are available for unprotected transponders and can be configured in the standard TXP-10G mode, with the first port selected as the trunk and the other port selected as the client. Two ports, port 5 and port 9, are left unused. A Y-Cable protection group cannot be defined on the same 10x10G-LC card when it is provisioned in the TXPP-10G mode. The splitter protection is supported only for 10GE traffic, with trunk ports set to disabled FEC, standard FEC, or enhanced FEC (E-FEC) mode.

The following figure shows the 10x10G-LC card configured for splitter protection.

Figure 40: Splitter Protection on the 10x10G-LC card



Note If the card is configured only once in the TXPP-10G mode, with port 3 or port 7 as the client port, the rest of the ports are available for configuration in the standard TXP-10G mode (except port 5 and port 9, which are left unused). The TXPP-10G mode configuration is successful only when three licenses for the three ports (one client and two trunk ports) involved in splitter protection are available for the card. No new licensing is required for the splitter protection operating mode.

For more information about the 10x10G-LC card, see http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-713296.html.

CFP-LC Card

In this chapter, "CFP-LC" refers to the _15454-M-CFP-LC card.

The CFP-LC card is a client card, which simplifies the integration and transport of 40 GE and 100 GE interfaces and services to enterprises or service provider optical networks. The CFP-LC card is supported on the Cisco NCS 2006 and NCS 2015 platform. The CFP-LC card provides 100 Gbps services to support 100 G DWDM wavelengths generated by the 100G-LC-C card. The traffic coming from CFP interfaces is switched to the trunk port through a cross-switch.

The CFP-LC card supports the following signal types:

- 100 Gigabit Ethernet
- 40 Gigabit Ethernet
- OTU-3
- OTU-4

Client ports can be equipped with a large variety of CFP pluggables.

Key Features

The key features of CFP-LC card are listed in "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129.

The CFP-LC card is a double-slot card and can be installed in Slot 3 or Slot 5 in the Cisco NCS 2006 chassis, and the 100G-LC-C peers cards must be placed in the adjacent slots (2 and 5 or 4 and 7). If the card is plugged in one of the unsupported slots or in a Cisco NCS 2002 chassis, the system raises an EQPT::MEA (Mismatch of Equipment Alarm) notification. Up to two CFP-LC cards per Cisco NCS 2006 shelf assembly can be installed, supporting up to 28x 40-Gbps or 14x 100 Gbps interfaces per 42-rack units (RU) bay frame.

The CFP-LC card is equipped with two 100 G CFP pluggable modules and a cross-bar embedded switch module. The CFP-LC card provides two backplane interfaces (working both at 100 Gb or 40 Gb) that are suitable for the cross-switch application on the incoming CFP signals. The CFP-LC card can be configured to send all client CFP services towards the backplane to be connected with up to two 100G-LC-C cards placed in the two adjacent slots (upper and lower) of the Cisco NCS 2006 chassis in order to provide two 100 G transponders configurations.

Operating Modes for CFP-LC Card

The CFP-LC card supports the following operating modes:

- 2x40G Muxponder
- CFP-TXP (100G Transponder)

Each operating mode can be configured using the specific set of cards and client payloads. "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129 lists the valid port pair for a specific operating mode and the supported payloads, and describes how each mode can be configured.

2x40G Muxponder

The CFP-LC card can be configured as a 2-port 40 G muxponder. It can be connected with the 100G-LC-C, 100G-ME-C, 100G-CK-C, or 100ME-CKC card to support 2-port 40 G muxponder capabilities. The 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC card can be connected through the Cisco NCS 2006 backplane (no client CXP/CPAK required) with the CFP-LC card to provide OTN multiplexing of the 40 G data streams into a single 100 G WDM OTU4 wavelength. The 2x40G muxponder mode supports client signals that are a mix and combination of any 40 Gigabit Ethernet LAN-PHY or OTU3 data rates.

CFP-TXP (100G Transponder)

The CFP-LC card can be configured as a 100G transponder. It can be connected with the 100G-LC-C, 100G-ME-C, 100G-CK-C, or 100ME-CKC card to support the client interface for the 100-Gbps transponder capabilities. The 100G CXP pluggable available on the 100G-LC or 100G-ME-C card supports only 100GE-BASE-SR10 client interface, while the 100GE-BASE-LR4 is supported using a CFP form factor only. The 100G CPAK pluggable available on the 100G-CK-C or 100ME-CKC card supports the CPAK-100G-SR10 and CPAK-100G-LR4 client interfaces.

The CFP-LC card can be connected through the Cisco NCS 2006 backplane with up to two 100G-LC cards placed in the upper or lower slot of the same shelf to provide the equivalent functionalities of two 100 G LR4 transponders, leveraging on CFP pluggables as the client interface.

For more information about the CFP-LC card, see
http://www.cisco.com/en/US/prod/collateral/optical/ps5724/ps2006/data_sheet_c78-713295.html

MR-MXP Card

In this chapter, "MR-MXP" refers to the NCS2K-MR-MXP card.

The MR-MXP card is a mixed rate 10G and 40G client muxponder that is supported on Cisco NCS 2000 Series platforms. The card is equipped with one CPAK port, two SFP ports, and two QSFP+ ports. The card can interoperate with 100GS-CK-LC, 200G-CK-LC, and 10x10G-LC cards through a chassis backplane.

Note The FPGA and firmware upgrade (via CTC) for MR-MXP cards should be done one by one. Wait till the card completely comes up, to active or standby (based on configuration) before upgrading the next card in the chassis. If this is not followed, the load on the TNC card increases causing longer booting time for the line cards in the chassis and in a few cases, the line cards might not boot up.

When the node is upgraded to R10.5.2.4 or R10.6.x from a previous release, traffic loss on the MR-MXP card might occur for few seconds. When the node is reverted from R10.6.x to R10.5.x, cold reboot is required.

The TRAF-AFFECT-RESET-REQUIRED (Traffic Affecting Reset Required) alarm is raised on the MR-MXP card in CTC after the node is upgraded to R10.5.2.4 or R10.6. Hence, it is recommended to reboot the card.

1. In the Card view, go to **Provisioning** > **Card**.
2. Click **FPGA/FIRMWARE Upgrade/Traffic Affecting Reset** to reboot the card.



Note Firmware upgrade is allowed only when the ports are in OOS (out-of-service) or Maintenance service state

When the node is upgraded to R10.8 followed by reset of the active control card, FPGA upgrade of the MR-MXP card fails.

Perform the following steps to upgrade FPGA successfully.

- Soft reset the MR-MXP card.
- In the Card view, go to **Provisioning** > **Card**.
- Click **FPGA/FIRMWARE Upgrade/Traffic Affecting Reset** to upgrade FPGA.

Encryption as an Appliance

The MR-MXP-K9 and MR-MXP-K9= PIDs of MR-MXP card are referred as Encryption as an appliance PIDs. The card authentication and payload encryption are enabled by default and cannot be disabled for these PIDs.

The MR-MXP-K9 and MR-MXP-K9= PIDs of MR-MXP card do not interoperate with other PIDs of the MR-MXP card. In MXP-200G operating mode, the two MR-MXP cards must have the same PIDs.

Key Features

The card key features are listed in the "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129.

The MR-MXP card provides the following features:

- Termination point for a 100G client payload on the CPAK port. The aggregated payloads are forwarded to a 200G companion trunk card.
- Provides encryption capability on the virtual port or OTU4 backplane port. This card provides confidentiality of the data, which is sent over a fiber optic communication channel, using Next Generation Cryptography. The encryption works only after provisioning the high speed or low speed encryption license. To provision encryption on the MR-MXP card, see NTP-G340 Provisioning Encryption on the WSE and MR-MXP Cards, on page 664.
- Supports feature-based licensing. The base functionality is enabled in the licensed card version. Additional features such as encryption are provided through specific feature licenses. The MR-MXP-LIC is the licensed card version of the MR-MXP card. For more information on licensing, see the *Licensing Configuration Guide*.
- Third Party Certificates-From Release 10.7, the MR-MXP card supports the generation of a Certificate Signing Request (CSR) and the installation of Locally Significant Certificates (LSCs) that can be used to authenticate the peer card connection. Third party certificates also referred to as Locally Significant

Certificates (LSCs) are certificates that are signed by a Certification Authority (CA) other than Cisco Certificate Authority. LSCs allow customers to have their own Public Key Infrastructure (PKI) to provide better security, to have control of their own CA, and to define policies, restrictions, and usages on the generated certificates.

A public-private key is generated inside the target system and then the generated public key along with other product or customer specific information (collectively called as a Certificate Signing Request) is then sent to be signed by a CA (customer owned or a third party) after which, the signed certificates are imported or installed via a trusted and secure channel or method into the target system. After the signed certificates are installed, it can be used in conjunction with the private key to authenticate any remote connection before exchanging sensitive information with the same.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Operating Modes for MR-MXP Card

The MR-MXP card supports the following 200G operating modes:

- MXP-200G
- MXP-10x10G-100G
- MXP-CK-100G

Each operating mode can be configured using specific set of cards and client payloads. The operating mode is configured on the companion trunk card (100GS-CK-LC or 200G-CK-LC). For more information about these operating modes, see "Key Features of 100G-LC-C, 10x10G-LC, and CFP-LC Cards" section on page 11-129.

The MR-MXP card supports the following 100G operating modes:

- MXP-100G
- TXP-100G
- 100G-B2B

Note All 100G and 200G operating modes support the encryption feature except for the MXP-CK-100G mode.

MXP-100G

The MXP-100G operating mode is provisioned with MR-MXP card on the client side and the adjacent 200G-CK-LC card or 100GS-CK-LC card on the trunk side. The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. This mode supports 10GE as the payload. This mode uses the SFP+ and QSFP+ ports on MR-MXP client card and the DWDM port on the 200G-CK-LC card or 100GS-CK-LC card. The aggregate signal from the client is sent to trunk through the backplane.

The MXP-100G operating mode is also provisioned with MR-MXP card on the client side and the adjacent 200G-CK-LC card on the trunk side. The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. This mode supports 2X10GE+2X40GE as the payload. This

mode uses the SFP+ and QSFP+ ports on MR-MXP client card and the DWDM port on the 200G-CK-LC card. The aggregate signal from the client is sent to trunk through the backplane.

The operating mode can be provisioned on the following slots:

- NCS 2002: Slots 2 and 3
- NCS 2006: Slots 2 and 3, 4 and 5, 6 and 7
- NCS 2015: Slots 2 and 3, 4 and 5, 6 and 7, 8 and 9, 10 and 11, 12 and 13, 14 and 15

TXP-100G

TXP-100G operating mode is provisioned with MR-MXP card on the client side and the adjacent 200G-CK-LC card or 100GS-CK-LC card on the trunk side. The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. This mode supports 100GE as the payload. This mode uses the CPAK port on MR-MXP client card and the DWDM port on the 200G-CK-LC card or 100GS-CK-LC card. The aggregate signal from client is sent to trunk through the backplane.

The operating mode can be provisioned on the following slots:

- NCS 2002: Slots 2 and 3
- NCS 2006: Slots 2 and 3, 4 and 5, 6 and 7
- NCS 2015: Slots 2 and 3, 4 and 5, 6 and 7, 8 and 9, 10 and 11, 12 and 13, 14 and 15

100G-B2B

The 100G-B2B operating mode can be provisioned with MR-MXP card on the client side and the adjacent MR-MXP card card on the trunk side. The operating mode performs encryption of an 100GE client signal taken from the CPAK interface or 10x10GE client signal taken from the two QSFP and SFP interfaces of the client MR-MXP card and maps it to an OTU4 signal with encryption. The OTU4 signal is passed to the trunk MR-MXP card in the peer slot through the back plane. The trunk MR-MXP card converts the OTU4 signal to grey wavelength with either an SR-10 or an LR-4 through the CPAK interface of the trunk card. The 100GE client payload can be divided into either four or 10 sub-lanes.

The CPAK port or two QSFP and 2 SFP+ ports can be selected on the client card during the provisioning. The operating mode can be provisioned from any MR-MXP card in the peer slot pair. When the operating mode is created, the card that the user selects to create operating mode acts as the client card and the peer card for that card acts as the trunk card. When payloads are created on both the client and trunk cards, CTC provides the option to select the number of lanes as required for LR4/SR10 based payload.

The operating mode can be provisioned on the following slots:

- NCS 2002: Slots 2 and 3
- NCS 2006: Slots 2 and 3, 4 and 5, 6 and 7
- NCS 2015: Slots 2 and 3, 4 and 5, 6 and 7, 8 and 9, 10 and 11, 12 and 13, 14 and 15

The provisioning operations like payload/operating mode creation and FEC settings in 100G-B2B operating mode of MR-MXP card takes longer when compared to other operating modes.

Sub Operating Modes

The sub OpMode in MR-MXP cards determines the operating mode on the card client ports. For example, the QSFP+ port can be provisioned either as a 40GE port or can be divided into four 10G ports. This

provisioning is controlled by the sub OpMode. The sub OpMode is created by default when the operating mode is configured on the card.

- OPM_10x10G—This is the default sub OpMode for the MXP-100G, MXP-200G, and MXP-10x10G-100G operating modes. In this sub OpMode, the SFP and QSFP+ ports are divided in such a way that 10 10GE payloads can be provisioned. When a PPM is provisioned on a QSFP+ port, four internal ports are created. A 10 GE payload can be provisioned on each of these ports. The OPM-10x10G operating mode is provisioned with MR-MXP card on the client side and the adjacent MR-MXP card on the trunk side. The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. The aggregate signal from client is sent to trunk through the backplane.
- OPM_100G—This is the default sub OpMode for the MXP-CK-100G operating mode where the CPAK port can be provisioned with a 100GE or OTU4 payload. The 100GE payload can be divided into either four or ten sub-lanes. For 100GE payload, the OPM-100G operating mode is provisioned with MR-MXP card on the client side and the adjacent MR-MXP card on the trunk side. For OTU4 payload, the OPM-100G operating mode is provisioned with MR-MXP card on the client side and the adjacent 200G-CK-LC card on the trunk side.The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. The aggregate signal from client is sent to trunk through the backplane.
- OPM_2x40G_2x10G—This sub OpMode is provisioned for the MXP-100G operating mode to support the 2X10GE+2X40GE payload. This operating mode is provisioned with MR-MXP card on the client side and the adjacent 200G-CK-LC card on the trunk side. The operating mode can be provisioned only from the client side but can be deleted from both client and trunk sides. The aggregate signal from client is sent to trunk through the backplane.

  This sub OpMode is also provisioned for the MXP-200G operating mode to support the following sub OpMode combinations on both peer and skip MR-MXP cards.

  - OPM_10x10G and OPM_10x10G
  - OPM_2x40G_2x10G and OPM_2x40G_2x10G
  - OPM_2x40G_2x10G and OPM_10x10G
  - OPM_10x10G and OPM_2x40G_2x10G

Limitations for MR-MXP Card

- Line timing is not supported.
- DCC communication channel is not supported for OC192/STM64.
- GCC0 communication channel is not supported.
- Trace is not supported for OC192/STM64.
- Overclocking of OTU2 payload is not supported.
- Y cable protection is not supported.
- Only G-FEC is supported on OTN payloads.
- The lanes in a QSFP+ port support only homogeneous payloads.
- Terminal loopback on the client port is not supported for the CPAK-FRS pluggable.

- When the line card is under a warm reboot and is still not operational, and if traffic goes down in the system, then the traffic is not recovered. This issue is seen when the client port is connected to the QSFP28-100G-FR-S or CPAK-FRS pluggable.

Key Features of 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, and MR-MXP Cards

Table 82: Feature History

Feature Name	Release Information	Feature Description
Dynamic Power Allocation on 200G-CK-LC and 400G-XP-LC Cards	Cisco NCS 2000 Release 11.12	This feature allows you to dynamically allocate power based on the line card operating mode. This maximises the usage of the NCS 2015 chassis slots in a 2+2 PSU configuration.This feature is supported on the 200G-CK-LC and 400G-XP-LC cards.

The 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, and MR-MXP cards support the following key features:

- Operating Modes—The cards can be configured into multiple operating modes. The cards can be equipped with pluggables for client and trunk options, and offer a large variety of configurations. When you configure the card into multiple operational modes, make sure that the following tasks are completed:
  - The card must be preprovisioned and the modes must be configured. None of the modes are provisioned on the card by default. All operating modes are created on the card level. These are card-specific provisioning, which decides the behavior of a particular card.
  - Depending on the card mode selected, the supported payload for that particular card mode must be provisioned on the PPMs.
  - The payloads can be provisioned after configuring the operational mode on the card.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

Each operating mode can be configured using the specific set of cards and client payloads.

Table 83: Operating Modes and Supported Payloads for 100G-LC-C, 100G-ME-C, 100G-CK-C, 200G-CK-LC, 100ME-CKC, 10x10G-LC, CFP-LC, and MR-MXP Cards

Card (provisioning executed on this card)	Operational Mode	Peer Card (connected through backplane)	Supported Client Payloads
100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC	TXP-100G (Standalone 100G Transponder)	—	100GE, OTU4
	RGN-100G (100G Regenerator)	100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC	Regeneration of any 100 G configuration
	MXP-2x40G (for 100G-CK-C, 100ME-CKC)	—	40GE, OTU3

Card (provisioning executed on this card)	Operational Mode	Peer Card (connected through backplane)	Supported Client Payloads
100GS-CK-LC and 200G-CK-LC	TXP-100G (Standalone 100G Transponder)	—	100GE and OTU4 OTU4 is supported only for the 200G-CK-LC card.
	RGN-100G (100G Regenerator)	100GS-CK-LC or 200G-CK-LC	Regeneration of any 100 G configuration
	MXP-200G	MR-MXP Skip card is MR-MXP OC192/SMT64, and OTU2 payloads are supported in MLR QSFP+	10GE, OC192/STM64, and OTU2 OC192/STM64, and OTU2 payloads are supported only when the sub OpMode in MR-MXP is OPM_10x10G.
	MXP-10x10G-100G	10x10G-LC Skip card is MR-MXP	10GE, OC192/STM64, and OTU2 OC192/STM64, and OTU2 payloads are supported only when the sub OpMode in MR-MXP is OPM_10x10G.
	MXP-CK-100G	MR-MXP	10GE, 100GE, OC192/STM64, and OTU2 10GE, OC192/STM64, and OTU2 payloads are supported only when the sub OpMode in MR-MXP is OPM_10x10G. OTU4 (only with 200G-CK-LC card) 100GE and OTU4 payloads are supported only when the sub OpMode in MR-MXP is OPM_100G.

Card (provisioning executed on this card)	Operational Mode	Peer Card (connected through backplane)	Supported Client Payloads
10x10G-LC	MXP-10x10G (10x10G Muxponder)	100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, , 100GS-CK-LC 200G-CK-LC	OC192/STM-64, 10GE-LAN Phy, 10GE-WAN Phy (using OC192), OTU2, OTU2e, 8G FC, 10G FC, FICON Only OC192/STM64 and 10GE are supported when the 10x10G-LC card is connected with the 100GS-CK-LC card. Only OC192/STM64, 10GE, and OTU2 are supported when the 10x10G-LC card is connected with the 200G-CK-LC card.
	RGN-10G (5x10G Regenerator)	—	10GE-LAN Phy, OTU2
	TXP-10G (5x10G Transponder)	—	10GE-LAN Phy, OTU2e, OTU2, OC192/STM-64, 8G FC, 10G FC, IB_5G
	Low Latency	—	10GE, 10G FC
	Fanout-10X10G	—	10GE
	TXPP-10G	—	10GE
CFP-LC	2x40G Muxponder	100G-LC-C or 100G-CK-C card	OTU3/40GE-LAN Phy
	CFP-TXP (100G Transponder)—One port	100G-LC-C or 100G-CK-C card	OTU4, 100GE
	CFP-TXP (100G Transponder)—Two ports	Two 100G-LC-C or 100G-CK-C cards	OTU4, 100GE

Card (provisioning executed on this card)	Operational Mode	Peer Card (connected through backplane)	Supported Client Payloads
MR-MXP	MXP-100G	200G-CK-LC card or 100GS-CK-LC card	10GE, OC192/STM64, and OTU2 OC192/STM64, and OTU2 payloads are supported only when the sub OpMode in MR-MXP is OPM_10x10G.
	MXP-100G	200G-CK-LC card	2X10GE+2X40GE This payload is supported only when the sub OpMode in MR-MXP is OPM_2x40G_2x10G
	TXP-100G	200G-CK-LC card or 100GS-CK-LC card	100GE
	100G-B2B	MR-MXP	100GE, 10x10GE
	MXP-200G	200G-CK-LC card or 100GS-CK-LC card Skip card is MR-MXP	10GE, OC192/STM64, 40G, and OTU2
	MXP-CK-100G	200G-CK-LC card or 100GS-CK-LC card	100GE,10GE,OC192/STM64, and OTU2
	MXP-CK-100G	200G-CK-LC	OTU4 This payload is supported only when the sub OpMode in MR-MXP is OPM_100G
	MXP-10X10G-100G	200G-CK-LC card or 100GS-CK-LC card	10GE,OC192/STM64, and OTU2

For operating modes of the respective cards, see the "Operating Modes for 100G-LC-C Card" section on page 11-124, "Operating Modes for 10x10G-LC Card" section on page 11-125, "Operating Modes for CFP-LC Card" section on page 11-128, and Operating Modes for MR-MXP Card, on page 236.

- Protocol Transparency—The 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 100GS-CK-LC, and 200G-CK-LC cards deliver any 100 Gbps services for cost-effective, point-to-point networking. The 10x10G-LC card delivers any 10 Gbps services for cost-effective, point-to-point networking. In case of 100 G muxponder clients that are mapped into OTU4 DWDM wavelength.

Table 84: Transponder Client Configurations and Mapping for 100G-LC-C and 100G-CK-C Cards

Client			Trunk	
Format	**Rate (Gbps)**	**Mapping**	**Format**	**Rate with 7% GFEC, 20% GFEC, or EFEC OH (Gbps)**
100GE LAN-PHY	101.125	Bit transparent through standard G.709v3 mapping	OTU4	111.809
OTU4	111.809	Transparent G.709 standard		

Table 85: Transponder Client Configurations and Mapping for 10x10G-LC Card

Client		Mapping
Format	**Rate (Gbps)**	
10GE LAN-PHY (MXP-10x10G mode)	10.3125	CBR-BMP clause 17.2.4 (ex G sup43 7.1) + GMP ODU2e to OPU3e4
10GE LAN-PHY (MXP-10x10G mode)	10.3125	GFP-F clause 17.4.1 (ex G sup43 7.3) + GMP ODU2 to OPU3e4
10GE LAN-PHY (TXP-10G mode)	10.3125	CBR-BMP clause 17.2.4 (ex G sup43 7.1)
10GE LAN-PHY (TXP-10G mode)	10.3125	GFP-F clause 17.4.1 (ex G sup43 7.3)
OC-192/STM-64	9.953	CBR-BMP clause 17.2.2 (Sync) + GMP ODU2 to OPU3e4
10G FC	10.518	513b Transc + AMP GFP-F clause 17.8.2 + GMP ODU2e to OPU3e4
8G FC	8.500	CBR-BMP clause 17.9 (OduFlex) + GMP ODU2 to OPU3e4 (8 timeslot mapping)
8G FC	8.500	GMP ODU2 to OPU3e4
OTU2	10.709	ODU transparent + GMP ODU2 to OPU3e4
OTU2e	11.095	ODU transparent + GMP ODU2e to OPU3e4
IB-5G	5.0000	GMP ODU2e to OPU3e4

Table 86: Client Configurations and Mapping for CFP-LC Card

Client			Trunk	
Format	**Rate (Gbps)**	**Mapping**	**Format**	**Rate with 7% GFEC or EFEC OH (Gbps)**
100GE LAN-PHY	101.125	Bit transparent through standard G.709v3 mapping	OTU4	111.809
OTU4	111.809	Transparent G.709 standard		
40GE LAN-PHY	41.250	1024b/1027b transc + OPU4 GMP G709 Appendix VIII		
OTU3	43.018	Transparent G.709 standard		

- Flow-Through Timing—The cards allow the timing to flow through from client to line optical interface. The received timing from client interface is used to time the line transmitter interface. This flow-through timing allows multiple cards to be placed in the same shelf but be fully independently timed, independent of the NE timing.
- Far-End Laser Control (FELC)—FELC is supported on the cards. For more information on FELC, see "Far-End Laser Control" section.
- Performance Monitoring—The 100-Gbps DWDM trunk provides support for both transparent and non-transparent signal transport performance monitoring. The Digital Wrapper channel is monitored according to G.709 (OTN) and G.8021 standards. Performance Monitoring of optical parameters on the client and DWDM line interface include Loss Of Signal (LOS), Laser Bias Current, Transmit Optical Power, and Receive Optical Power. Calculation and accumulation of the performance monitoring data are supported in 15-minute and 24-hour intervals as per G.7710. Physical system parameter measured at the wavelength level like Mean PMD, accumulated Chromatic Dispersion, or Received OSNR are also included in the set of performance monitoring parameters. These can greatly simplify troubleshooting operations and enhance the set of data which can be collected directly from the equipment. The performance monitoring for the CFP-LC card takes into account that the two CFP-LC cards are an host board supporting CFP client equipment, while the digital monitoring if the incoming client is implemented on the 100G cards. There is a virtual port connection that displays the Digital Wrapper monitoring according to G.709 (OTN) as well as the RMON for Ethernet signals, while the optical performance monitoring is directly available on the two CFP-LC cards. Calculation and accumulation of the performance monitoring data are supported in 15-minute and 24-hour intervals as per G.7710.
- Loopback—The terminal, facility, or backplane loopback can be provisioned on all the ports of the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, and 200G-CK-LC cards configured in any operating mode except for the low latency mode. The backplane facility loopback cannot be configured on the 10x10G -LC card configured in the MXP-10x10G mode. The loopback can be provisioned only when the port is in OOS-MT state. A new port cannot be provisioned when the backplane loopback is configured on the 10x10G-LC card. For the CFP-LC card configured in the

CFP-TXP or CFP-MXP mode, the facility or terminal loopback can be configured on the backplane of the peer 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 100GS-CK-LC, and 200G-CK-LC cards. Terminal and facility loopback can be provisioned on MR-MXP cards configured in any operating mode.

In Release 10.0.2, the facility loopback and drop feature can be provisioned on the client, trunk, and backplane interfaces of the 100G-LC-C, 10x10G-LC, CFP-LC, and 100G-CK-C cards as follows:

- Trunk facility loopback (drop) and client facility loopback (drop) is supported on:
  - 100G-LC-C cards configured in the TXP mode (with CXP client pluggable) for OTU4 and 100GE client payloads.
  - 100G-CK-LC configured in the TXP mode (with CPAK client pluggable) for OTU4 and 100GE client payloads.

  When facility loopback (drop) is provisioned on the trunk interface, the trunk RX signal is sent back to the trunk TX port and an ODUk-AIS (for OTU4 payloads) or an LF (for 100GE payloads) signal is fowarded to the client port in the downstream direction for any of the squelch settings. When facility loopback (drop) is provisioned on the client interface, the client RX signal is sent back to the client TX port and an ODUk-AIS signal is forwarded to the trunk port in the downstream direction for any of the squelch settings.
- Backplane facility loopback (drop) is supported on:
  - 100G-LC-C and CFP-LC configured in the TXP mode (with CFP client pluggable) for OTU4 and 100GE client payloads.
  - 100G-CK-C and CFP-LC configured in the TXP mode (with CFP client pluggable) for OTU4 and 100GE client payloads.

  When facility loopback (drop) is provisioned on the backplane interface, the client RX signal is sent back to the client TX port and an ODUk-AIS signal is forwarded to the trunk port in the downstream direction for any of the squelch settings.

- Fault propagation on 10GE, 40GE, and 100GE clients— In R 10.3, a new squelch option named LF is supported for GigE payloads. A local fault (LF) indication is fowarded to the client port in the downstream direction when a failure on the trunk port occurs. The LF option is supported for :
  - 10GE payloads on 10x10G-LC cards configured in the:
    - RGN-10G or TXP-10G mode
    - MXP-10x10G mode (paired with 100G-LC-C, 100G-CK-C, or 100GS-CK-LC card)
    - MXP-10x10G-100G mode (paired with a 100GS-CK-LC or 200G-CK-LC card)
  - 100GE payloads on:
    - 100G-LC-C, 100G-CK-LC, 100GS-CK-LC, or 200G-CK-LC cards configured in the TXP-100G mode
    - CFP-LC cards configured in the CFP-TXP mode (paired with 100G-LC-C or 100G-CK-C card)
  - 40GE payloads on:

- CFP-LC card configured in the 2x40G Muxponder mode (paired with a 100G-LC-C or 100G-CK-C card)
- 100G-CK-C card configured in the MXP-2x40G mode

- Trail Trace Identifier—In R 10.3, the Trail Trace Identifier (TTI) in the path monitoring overhead is supported in OTU, and ODU OTN frames. It is possible to to individually manage the Source Access Point Identifer (SAPI), Destination Access Point Identifer (DAPI), and User Operator Data fields on VTXP. This feature is also supported on these cards.
  - 10x10G-LC— OTU4 and ODU4 payloads
  - CFP-LC— OTU4, ODU4, OTU3, and ODU3 payloads
  - 100G-LC-C, 100G-CK-LC, 100GS-CK-LC, 200G-CK-LC— OTU4 and ODU4 payloads

  The Trail Trace Identifier Mismatch (TTIM) alarm is raised after comparing only the SAPI bytes.

  TTI monitoring is not supported between two nodes (node 1, node 2) in the following conditions:
  - Node 1 and node 2 are installed with a release earlier to R10.3. Node 2 is upgraded to R 10.3. New TTI strings provisioned at either node1 or node 2 raises the TTIM alarm.
  - Node 1 is installed with the R 10.3 software. Node 2 is installed with a release earlier to R10.3. New TTI strings provisioned at either node1 or node 2 raises the TTIM alarm.
  - Node 1 is installed with R 10.3 software and TTI settings are configured. Node 2 is installed with the R10.3 software but the database is loaded from a release earlier to R10.3.

- Generalized Multiprotocol Label Switching — The Generalized Multiprotocol Label Switching (GMPLS) circuit can be created on the 100G-LC-C, 100G-CK-C, 10 x10G-LC, 100GS-CK-LC, and 200G-CK-LC cards. However, this circuit cannot be created when the card is in 100G regenerator mode. When the card is configured in MXP-10 x10G card mode, only GMPLS Optical Channel Network Connections (OCHNCs) can be created.
- Automatic Laser Shutdown (ALS) can be configured on all the ports. ALS is supported only on the ports that are configured with OC192/STM64, OTU2, and OTU4 payloads.
- GCC channels—can be provisioned on the OTU2 client and trunk ports of the 10 x10G-LC card, OTU3 port (virtual port on the peer 100G-LC-C or 100G-CK-C card) of the CFP-LC card, and the OTU4 client and trunk ports of the 100G-LC-C or 100G-CK-C card.
- 50 ms switching with PSM—A protection switch time of less than 50 ms can be achieved with two CFP-LC cards on their 100GE client ports using a PSM card that is configured in the standalone mode. The client ports of the CFP-LC cards are connected to the working and protect ports of the PSM card. An OCHCC circuit must be created between the two client ports. PSM is also supported on 100GS-CK-LC or 200G-CK-LC cards on their trunk ports where the protection switch time of 50 ms is achieved in the TXP-100G configuration with 20%SD FEC.
- The optical TX power can be set to a value from -10.0 to +0.25 dBm on the trunk port of the 100G-LC-C, 100G-CK-C card, or 200G-CK-LC card -10.0 to -0.5 dBm for 100GS-CK-LC card; to enable it to interoperate with ASR 9000 series routers and Cisco CRS-3 routers. The TX shutdown feature allows you to turn off the TX power on the 100G-LC-C, 100G-CK-C, or 200G-CK-LC cards when the trunk port in out of service or in maintenance. The 100G-LC-C, 100G-CK-C, and 200G-CK-LC cards have the ability to receive optical signals even when the TX power is turned off.

- Pseudo Random Binary Sequence (PRBS)—For 100G-CK-C and 100G-LC-C cards, the trunk ports can generate PRBS_31 pattern and detect PRBS_11, PRBS_23, and PRBS_31 patterns. Only PRBS_31 is supported on the 100GS-CK-LC card. The detection is always on and does not need to be enabled. The generation can be enabled that prompts the card to fulfill the OPU with PRBS_31 pattern.
- Licensing—The 100G-LC-C card adds the capability to cost-effectively transport the 10G service offering as a Pay-As-You-Grow licensing model for the 10 x 10G muxponder. A licensed card works in conjunction with a licensed 10 x10G line card. The two cards that can only work in this configuration and in combination of the other licensed pair card offers a price-sensitive solution with the ability to equip one 10G service.

  The 200G-CK-LC card also supports licensing. The 200G-CK-LIC is the licensed card version of the 200G-CK-LC card. The licensed card version has only some basic functionality enabled while other features can be enabled separately with specific licenses. For more information on licensing, see the Licensing Configuration Guide.

Note Licensing is not supported on the CFP-LC, 100G-CK-C and 100GS-CK-LC cards.

- Multivendor Interoperability - From Release 10.6.2, the 200G-CK linecard can be configured to inter-operate with other vendor interfaces. A new option called, Interop Mode is available to disable/enable interoperability. This option is available, when, the:
  - Modulation format is 100G-QPSK
  - FEC is set to 7% High Gain FEC
  - Admin state of the trunk port is set to OOS-DSBLD (Out of service and disabled).
  - License L-NCS2K-DQPSK-LH= is active.

  The Interop Mode is available on the full PID (NCS2K-200G-CK) and on the licensed PID version, 200G-CK-LIC, when license L-NCS2K-DQPSK-LH= is active.

  The behavior and performance of the card configured with HG-FEC Multivendor FEC, is the same as the old HG-FEC mode (no optical performance variation). The only difference is that the DGD data retrieved form the CTC PM tab has a reduced accuracy.
- 200G-CK-LC and 10x10G-LC cards—Supports protection through Y-cable protection scheme.

  Y-cable protection is supported when the 200G-CK-LC card is configured in TXP-100G operating mode and the 100G client CPAK ports are provisioned with 100GE payload. This configuration uses the CPAK-100G-LR4 pluggable.

  Y-cable protection is supported when the 10x10G-LC card is configured in MXP-10x10G operating mode with 200G-CK-LC card and the 10x10G-LC card is provisioned with 10GE, OC-192/STM-64 payloads. This configuration uses the ONS-SC+-10G-LR and ONS-SC+-10G-SR pluggables.
- Dynamic allocation of power—The maximum power allocated to the 200G-CK-LC card in a NCS 2015 chassis is based on the configured operating mode. The following table displays the power allocation for each of the supported operating modes.

Operating Mode	Typical Power (W)	Maximum Power (W)
TXP-100G	146	155

Operating Mode	Typical Power (W)	Maximum Power (W)
RGN-100G	146	155
MXP_200G	166	178
MXP_CK_100G	166	178
MXP_10x10G_100G	166	178

Functions and Features

The cards have the following functions and features, explained in the Card Features, on page 691 chapter:

- Enhanced FEC (E-FEC) Feature
- Timing Synchronization
- Jitter Considerations
- Card level indicators
- Port level indicators

Related Procedures for 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 10x10G-LC, CFP-LC, 100GS-CK-LC, 200G-CK-LC, and MR-MXP Cards

- NTP-G235 Provisioning an Operating Mode, on page 599
- NTP-G236 Modifying the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, , 200G-CK-LC, CFP-LC, WSE, MR-MXP, or 400G-XP-LC Card Line Settings and PM Parameter Thresholds, on page 610
- NTP-G75 Monitor Transponder and Muxponder Performance

DLP-L71 Provisioning the Frequency on the 100GS-CK-LC, 200G-CK-LC, and 400G-XP-LC Cards

Purpose	This task provisions the frequency on the 100GS-CK-LC, 200G-CK-LC, and 400G-XP-LC cards with 0.1 GHz granularity. This feature is available only in NCS flex package.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view or shelf view, double-click the 100GS-CK-LC, 200G-CK-LC, or 400G-XP-LC card where you want to provision the frequency on the trunk port.

Step 2 Click the **Provisioning** > **Line** > **Flex** tabs.

Step 3 Check the **Gridless** check box to enable gridless tunability on the trunk port of the card.

Step 4 Enter the Frequency on the trunk port of the card with 0.1 GHz granularity in the Frequency field.

When the **Gridless** check box is checked, the user cannot create internal patchcords, provisionable patchcords, and circuits on the cards. In gridless mode, the wavelength cannot be specified. If the non ITU frequency is specified, the wavelength in **Provisioning** > **Line** > **Ports** pane is set to **First Tunable Wavelength** for the trunk port. If the ITU frequency is specified, the wavelength value is set to **Auto Provision** for the trunk port.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

400G-XP-LC Card

The 400G-XP-LC card is a tunable DWDM trunk card that simplifies the integration and transport of 10 Gigabit and 100 Gigabit Ethernet interfaces and services to enterprises and service provider optical networks. The card is a double-slot unit that provides 400 Gbps of client and 400 Gbps of trunk capacity. The card supports six QSFP+ based client ports that can be equipped with 4x 10 Gbps optics and four QSFP28 or QSFP+ based client ports that can be equipped with 100 Gbps QSFP28 and 4x 10 Gbps QSFP+ optics. The card is capable of aggregating client traffic to either of the two 200 Gbps coherent CFP2 trunk ports. The CFP2 - 11 trunk port of the 400G-XP-LC card can interoperate with the 10x10G-LC card through the chassis backplane. To enable this interoperability between the 400G-XP-LC and 10x10G-LC cards, the OPM_PEER_ODU2 and OPM_PEER_ODU2e slice modes are supported on Slice 2 when the 400G-XP-LC card is configured in the MXP mode.

The table below details the layout constraints when the 400G-XP-LC card is paired with the 10x10G-LC card in the Cisco NCS 2006 and Cisco NCS 2015 chassis.

Table 87: Slot Constraints for the 400G-XP-LC and 10x10G-LC Cards

Chassis	Slot (10x10G-LC)	Slot (400G-XP)	Notes
Cisco NCS 2006	2	3-4	Only one of these two combinations can be deployed at a time.
	4	5-6	

Chassis	Slot (10x10G-LC)	Slot (400G-XP)	Notes
NCS 2015	2	3-4	A maximum of four of these combinations can be deployed at a time.
	4	5-6	
	6	7-8	
	8	9-10	
	10	11-12	
	12	13-14	
	14	15-16	

The 400G-XP-LC card supports the following client signals:

- 10 GE: The payload can be provisioned for the OPM_10x10G, OPM_PEER_ODU2, or OPM_PEER_ODU2e slice mode for any trunk configuration. 10GE is provisioned for the OPM_PEER_ODU2 and OPM_PEER_ODU2e slice modes in the GFP and CBR mapping modes respectively. The cross-connect circuit bandwidth is ODU2e.
- 100 GE: The payload can be provisioned for the OPM_100G slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU4.
- OTU2: This payload is supported only on the QSFP-4X10G-MLR pluggable. The payload can be provisioned for the OPM_10x10G or OPM_PEER_ODU2 slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU2.
- OTU2e: This payload is supported only on the QSFP-4X10G-MLR pluggable. The payload can be provisioned for the OPM_10x10G or OPM_PEER_ODU2e slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU2e.
- FC-10G: This payload is supported only on the ONS-QSFP-4X10-MLR pluggable for 400G-XP-LC cards configured in the MXP mode. The payload can be provisioned for the OPM_10x10G slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU2. The default fault signalling mode is local fault.
- FC-8G: This payload is supported only on the ONS-QC16FC-LW pluggable for 400G-XP-LC cards configured in the MXP mode. The payload can be provisioned for the OPM_10x10G slice mode for any trunk configuration with the exception of CDR ports (7,8,9, and 10). You can configure a mix of FC-8G and 16G FC payloads on the same PPM for the common ports of OPM_6x16G_FC and OPM_10x10G slice modes. The cross-connect circuit bandwidth is ODU2. The default fault signalling mode is NOS.
- OC192/STM64: This payload is supported only on the QSFP-4X10G-MLR pluggable. The payload can be provisioned for the OPM_10x10G or OPM_PEER_ODU2 slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU2.
- OTU4: This payload is supported only on the ONS-QSFP28-LR4 pluggable. The payload can be provisioned for the OPM_100G slice mode for any trunk configuration. The cross-connect circuit bandwidth is ODU4.
- 16G FC: This payload is supported only on the ONS-QC+-4X16FC-MM pluggable. A new operating mode, OPM_6x16G_FC is introduced to support this payload on ports 1, 2, 3, 4, 5, and 6. This operating mode can be provisioned on any slice, with trunk configuration set to M_100G and M_200G.

- 40GE: This payload is supported in the MXP operating mode. This payload can be provisioned for the OPM_2x40G_2x10G slice mode for any trunk configuration. The pluggables supported are QSFP-40G-SR4, QSFP-40G-LR4, and QSFP-40-SR-BD. 40GE cannot be provisioned on the shared ports 2 and 5. These shared ports can be provisioned only with 10GE payloads. 10G supported QSFP+ pluggables can be used on the shared ports for 10GE provisioning. The default fault signalling mode is squelch.



Note For any card mode except REGEN with slide mode as OPM-10x10G, you can configure a mix of 10G payloads (OC192/STM64, OTU2, 10GE, FC-10G) on the same slice or client port with the exception of CDR ports (7, 8, 9, and 10). On CDR ports, the first configured 10G lane would determine the configurable payloads for the other three port lanes.



Note If a slice is configured using the OPM_10x10G slice mode, it can be used only for 10G circuit creation whereas if a slice is configured using the OPM_100G slice mode, it can be used only for 100G circuit creation.



Note Until R11.1, ODU alarms and PMs on cross-connected trunks ODUs are raised under the OTU4C2 trunk port of the 400G-XP-LC card for both near-end and far-end directions. From R11.1, ODU alarms and PMs are raised under the specific cross-connected trunks ODUs for both near-end and far-end directions for OTU4 client payload. OTN alarms and PMs are raised under the OTU4C2 trunk port of the 400G-XP-LC card for both near-end and far-end directions.



Note GCC Rate in the Edit GCC Termination Window is shown as 192K instead of the supported 1200K. This is a known behavior.

The 400G-XP-LC card is supported on Cisco NCS 2002, Cisco NCS 2006, and Cisco NCS 2015 platforms.

One 400G-XP-LC card can be installed in the Cisco NCS 2002 DC chassis that is powered by NCS2002-DC or NCS2002-DC-E. Three 400G-XP-LC cards can be installed in the Cisco NCS 2006 chassis that is powered by NCS2006-DC, NCS2006-DC40, or NCS2006-AC (180V AC to 264V AC). Seven 400G-XP-LC cards can be installed in the Cisco NCS 2015 chassis that is powered by DC 2 + 2, DC 3 + 1, or AC 2 + 2 PSU.

The 400G-XP-LC supports PSM. The switch time for all 10G payloads is less than 50 ms. The switch time for 100G trunk rate is higher than the 200G.

Limitations

- To achieve a switch time of less than 50 ms, the squelch mode should either be LF or AIS.
- Switch time of less than 50 ms is not supported on client ports 7, 8, 9, and 10.
- PSM in standalone mode is supported.
- Terminal loopback on the client port is not supported for the QSFP28-FRS pluggable.

- Terminal loopback is not supported on the client port having non-FRS pluggable at the near-end node when the peer client port at the far-end node has QSFP28-FRS pluggable or vice versa.
- Encrypted traffic is not supported on the client port with a QSFP28-FRS pluggable.
- When the line card is under a warm reboot and is still not operational, and if traffic goes down in the system , then the traffic is not recovered. This issue is seen when the client port is connected to the QSFP28-100G-FR-S or CPAK-FRS pluggable.

Note The maximum short term operating temperature of the Cisco NCS 2002 shelf must not exceed 50 degrees when the 400G-XP-LC card is installed.

Note It is recommended to wait for two seconds after performing every TL1 operation.

Note You may observe traffic glitches on the receiving direction of client ports 7, 8, 9, and 10 on the 400G-XP-LC card that you connect to CXP port of a 10x10G-LC card in fanout mode. To bringup traffic in such cases, change the admin state of the CXP port from **OOS-DSBLD** state to **IS-NR** state. Repeat the same action if you continue to observe glitches.

For more information about the 400G-XP-LC card, see http://www.cisco.com/c/en/us/products/collateral/optical-networking/network-convergence-system-2000-series/datasheet-c78-736916.html.

Key Features

The 400G-XP-LC card supports the following key feature:

- • Operating Modes—The card can be configured in various operating modes. The cards can be equipped with pluggables for client and trunk ports, and offer a large variety of configurations. When you configure the card, make sure that the following tasks are completed:
  - The trunk port PPMs must be preprovisioned before configuring the card operating mode. When the 400G-XP-LC card is paired with the 10x10G-LC card, all the operating mode provisioning must performed on the 400G-XP-LC card. The client payloads can be provisioned after configuring the operational mode on the card.

  The table below details the configurations supported on the 400G-XP-LC card for the supported card modes.

Table 88: Configuration Options for the 400G-XP-LC Card Modes

Configuration	Options			
Card configuration	MXP	OTNXC	REGEN	MXP_2x150G (8QAM)

Configuration	Options			
Trunk configuration (per trunk)	None	None	None	M_150G
	M_100G	M_100G	M_100G	
	M_200G	M_200G	M_200G	
Slice configuration	None	None	Slice configuration is not supported	None
	OPM_2x40G_2x10G	OPM_100G		OPM_100G
	OPM_100G	OPM_10x10G		OPM_10x10G
	OPM_10x10G			OPM_6x16G_FC
	OPM_6x16G_FC			
	OPM_PEER_ODU2 (Available only for Slice 2 when 400G-XP-LC is paired with 10x10G-LC)			
	OPM_PEER_ODU2e (Available only for Slice 2 when 400G-XP-LC is paired with 10x10G-LC)			

For more information about the trunk and slice configuration, see Slice Definition and Line Card Configuration for 400G-XP-LC Card, on page 262.

- Each trunk port functions as a muxponder instance has the following features:
  - The trunk port supports Analog Coherent Optical (ACO) CFP2 coherent pluggable.

Note Before removing the CFP2 pluggable from any of two trunk ports, ensure that the relevant trunk port is set to the OOS (Out-of-service) state. Wait until the trunk port LED turns off. Wait for a further 120 seconds before extracting the CFP2 pluggable.

  - Configurable trunk capacity:
    - 100 Gbps coherent DWDM transmission with quadrature phase shift keying (QPSK)modulation.
    - 200 Gbps coherent DWDM transmission with 16-state quadrature amplitude modulation (16-QAM) modulation.
  - Configurable trunk FEC: SD-FEC with 15% or 25% overhead.

- Configurable differential/non-differential line encoding.
- Nyquist shaping if channels at trunk TX.
- Flex spectrum tunability over the full extended C-Band.
- 100 Gbps through 100 Gbps QSFP28 client ports.
- 10 Gbps through 4x 10 Gbps QSFP+ client ports.
- 16 Gbps through 4 x 16 Gbps QSFP+ client ports.

- The supported CD ranges are detailed in the table below:

Table 89: CD Range for 400G-XP-LC Card

	200G 16-QAM		100G QPSK	
	Low	High	Low	High
Default Working CD Range	-10000	50000	-20000	90000
Default CD Thresholds	-9000	45000	-18000	72000
Allowed CD Range (Working and Thresholds)	-60000	60000	-280000	280000

- Loopback—The following loopback types are supported:
  - Client ports - Terminal (Inward), Facility (Line)
  - Trunk ports - Terminal (Inward)
  - Iports - Facility (Line), Terminal loopback (Drop)



Note Before you provision loopback on the iports, place the relevant trunk ports in the OOS-MT state. This causes the iports to move to the OOS-MT state.

- Automatic Laser Shutdown (ALS) can be configured on all the ports.
- Provides encryption capability on the OTU4 (IPort) ports. This card provides confidentiality of the data, which is sent over a fiber optic communication channel, using Next Generation Cryptography. To provision encryption on the 400G-XP-LC card, see "NTP-G367 Provisioning Encryption on 400G-XP-LC Card". The MXP operating mode supports the encryption feature. The 400G-XP-LC card does not support Encryption as an Appliance.
- 100GE ethernet client ports can be provisioned with or without IEEE 802.3 bj FEC. The options are Auto, Force-Fec-On, Force-Fec-Off.

- Trail Trace Identifier (TTI)—TTI in the section monitoring overhead is supported . Source Access Point Identifer (SAPI), Destination Access Point Identifer (DAPI), and User Operator Data fields are supported in Release 10.6.2 and later releases.
- Trunk Port Interworking—The two CFP2 trunk ports can interoperate with each other when the source and destination 400G-XP-LC cards have the same trunk mode and slice mode configuration. For more information, see Trunk Port Interworking in 400G-XP-LC Cards, on page 266.
- PRBS Support—The ODU4 internal ports can support configuration of PRBS with all operating modes when the source and destination 400G-XP-LC cards have the same trunk mode. For more information, see Enable PRBS Support on the 400G-XP-LC Card, on page 270.
- GCC0 Support—The 400G-XP-LC card supports provision of GCC0 channel on the trunk port. For more information, see GCC0 Support on the 400G-XP-LC Card, on page 272.
- OTN cross-connection support—For more information, see OTN Cross-connect Capability on 400G-XP-LC Cards, on page 258.
- Licensing—The licenses for the 400G-XP card are installed by default.
- Third Party Certificates-From Release 11.0, the 400G-XP-LC card supports the generation of a Certificate Signing Request (CSR) and the installation of Locally Significant Certificates (LSCs) that can be used to authenticate the peer card connection. Third party certificates also referred to as Locally Significant Certificates (LSCs) are certificates that are signed by a Certification Authority (CA) other than Cisco Certificate Authority. LSCs allow customers to have their own Public Key Infrastructure (PKI) to provide better security, to have control of their own CA, and to define policies, restrictions, and usages on the generated certificates.

  A public-private key is generated inside the target system and then the generated public key along with other product or customer specific information (collectively called as a Certificate Signing Request) is then sent to be signed by a CA (customer owned or a third party) after which, the signed certificates are imported or installed via a trusted and secure channel or method into the target system. After the signed certificates are installed, it can be used in conjunction with the private key to authenticate any remote connection before exchanging sensitive information with the same.
- LLDP support—The source MAC address of 10 or 100GE ports can be retrieved after an LLDP packet is received on the client port. LLDP filtering is enabled or disabled on the 10GE or 100GE ports using the Provisioning > Line > Ethernet tab in CTC.



Note There may be a traffic hit on LLDP enabled ports during a soft boot or while LLDP packet monitoring is being enabled using CTC or TL1, if the LLDP bandwidth on the port is greater than one Mbps.

- Interoperability—The 400G-XP-LC card is interoperable with the NC55-6X200-DWDM-S card supported on NCS 5500 and the NCS4K-4H-OPW-QC2 Card supported on NCS 4000.

  The following table describes the configurations, payload types, and pluggables supported for interoperability between the 400G-XP-LC card and the NCS4K-4H-OPW-QC2 card.

Table 90: 400G-XP-LC Interoperability with the NCS4K-4H-OPW-QC2 card.

Payload type	Trunk configuration	Pluggables for trunk ports on 400G-XP-LC	Pluggables for client ports on 400G-XP-LC	Pluggables for trunk ports on 4H-OPW-QC2	Pluggables for client ports on 4H-OPW-QC2
100GE	OTU4	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
100GE	OTU4C2	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
OTU2	OTU4	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP28-LR4
OTU2	OTU4C2	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP28-LR4
10GE	OTU4	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP-4X10 MLR
10GE	OTU4C2	CFP2	ONS-QSFP-4X10 MLR	CFP2	ONS-QSFP-4X10 MLR

The following table describes the configurations, payload types, and pluggables supported for interoperability between the 400G-XP-LC card and the NC55-6X200-DWDM-S card.

Table 91: 400G-XP-LC Interoperability with the NC55-6X200-DWDM-S card.

Payload type	Trunk configuration	Pluggables for trunk ports on 400G-XP-LC	Pluggables for client ports on 400G-XP-LC	Pluggables for trunk ports on 6X200-DWDM-S	Pluggables for client ports on 6X200-DWDM-S
100GE	OTU4	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S
100GE	OTU4C2	CFP2	QSFP-100G-SR4-S	CFP2	QSFP-100G-SR4-S

- Dynamic allocation of power—The maximum power allocated to the 400G-XP-LC card in a NCS 2015 chassis is based on the configured operating mode. The following table displays the power allocation for each of the supported operating modes.

Operating Mode	Typical Power (W)	Maximum Power (W)
MXP	330	380
OTNXC	300	345
REGEN	280	320
MXP_2x150G	330	345

For a detailed list of the supported pluggables, see http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html .

OTN Cross-connect Capability on 400G-XP-LC Cards

The 400G-XP-LC card supports a new OTN cross-connect (OTNXC) operating mode. You cannot edit the trunk and slice mode after the 400G-XP-LC card is configured in OTNXC mode. This mode allows ODU2e switching between client to trunk ports or trunk to trunk ports within a single 400G-XP-LC card for 100G and 200G trunk rates. Both trunk ports are configured with the same rate (100G or 200G).

Only 10GE client payloads are supported in Release 10.x.x. From Release 11.0 onwards, OTU2, OTU2, OTU2e, OC192/STM64, 100GE, and OTU4 are also supported as client payloads. Each 10GE is mapped to an ODU or ODU2e channel. Each 10G client port of the 400G-XP-LC card consists of only one ODU or ODU2e and each OTU4C2 (200G) trunk port of the 400G-XP-LC card consists of 20 ODUs or ODU2es.

You can create 20xODU or 20xODU2e trunk-to-trunk cross-connections or up to 40x10GE client-to-trunk cross-connections. Client-to-trunk cross-connections can be protected or unprotected. The card supports up to 20x10GE circuits with SNC-N 1+1 bidirectional protection.

The OTNXC card mode requires a new trunk FPGA image. The 400G-XP LC card should be running on firmware (SCP) version 5.24 or above. A Condition message warns the user about availability of a new image. To upgrade the FPGA image, see NTP-G362 Manual FPGA Upgrade on the 400G-XP-LC Card, on page 603.

You can create single card cross-connects or end-to-end cross-connects in an OTN ring. Before you create an end-to-end ODU circuit, WSON OCH trails or SSON trails must be configured between the nodes that help discover the topology.

OTNXC Constraints

The following constraints apply to ODU circuit creation between 400G-XP-LC cards configured in the OTNXC mode.

- Both trunk ports of the 400G-XP-LC card are configured with the same rate (100G or 200G)
- An ODU circuit cannot be created between two client ports of the 400G-XP-LC card.
- Each client port belongs to one of the four card slices. Slice 1 and Slice 2 are linked to the first trunk port and Slice 3 and Slice 4 are linked to the second trunk port. Cross-connecting between slices of the same trunk is not allowed. The possible cross-connections that can be created are within the same client slice or between the client slice and any of the other trunk slices.
- There is a bandwidth limitation between the two internal ASICs of the 400G-XP-LC card due to which a maximum of 20x10G interlink connections can be defined. These resources are consumed by either trunk-to-trunk cross-connects or client-to-trunk cross-connects when the client does not belong to the trunk slice.
- Protected cross-connects are restricted to client ports 1, 2, 3, 7, and 8 belonging to slices 1and 2.
- Do not provision more than one path for nonprotected circuits.
- The NE defaults thresholds for ODU interfaces cannot be set for cross-connected ODUs.
- With 100GE payload on QSFP-100G-FR-S on 400G-XP-LC card with OTNXC mode, protection switching time is high during Manual/Force switching (varies between 2.5 to 3.5 seconds); however auto switching time is less than 50 ms.

ODU Utilization Panes

There are three utilization panes that display the ODU utilization for the 400G-XP-LC card at the card level, network level, and cross-connect level. To view the ODU utilization, see NTP-G366 Viewing the ODU Utilization for ODU Circuits, on page 604.

OTNXC Exceptions

The following exceptions apply to ODU circuits between 400G-XP-LC cards configured in the OTNXC mode:

- WSON OCH trail creation is allowed between the trunks ports of 400G-XP-LC cards configured in different operating modes (MXP and OTNXC)
- Downgrading WSON OCH trails to non-WSON OCH trails is allowed even though OTN circuits exist.
- OCH trail deletion is allowed if though the trunk port has an ODU cross-connect passing through it.
- Restoration and revert operations are allowed on an OCH trail when the 400G-XP-LC card is configured in OTNXC mode.
- If the circuit protection type is SNC-N, the circuit service state is OOS-PARTIAL (Locked-partial) if the source or destination nodes have a fault on both the trunk ports causing the port service state to change to OOS-AU,FLT (ANSI) or Unlocked-disabled,failed (ETSI)) or if three or more intermediate nodes have the service state as FLT.

  If the circuit protection type is None, the circuit service state is OOS-PARTIAL (Locked-partial) if the source or intermediate nodes have the service state as FLT.
- When the traffic is manually switched to the protect path in a protected revertive ODU circuit, the WKSWPR alarm is raised on the node. The alarm may not persist after a control card reset.
- Performing a database restore operation, may not clear the WKSWPR alarm.
- Single card cross-connects may persist in CTC for some time even after the node is disconnected.
- When the user enables PRBS on the trunk port and attempts to create second SNC, the "unsupported operation" error message appears.

Interoperability

The 400G-XP-LC card has two trunk ports, each supporting up to 20 ODU2es. These ODU2es are numbered from 1 through 20. ODU2es 1 through 10 belong to the first ODU4 slice and ODU2es 11 through 20 belong to the second ODU4 slice. Each ODU number has a pre-defined group of timeslots as seen in the following table.

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
Trunk 1 (FAC 10)	Slice 1	1	96	1	1 11 21 31 41 51 61 71

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
		2	97	2	2 12 22 32 42 52 62 72
		3	98	3	3 13 23 33 43 53 63 73
		4	99	4	4 14 24 34 44 54 64 74
		5	100	5	5 15 25 35 45 55 65 75
		6	101	6	6 16 26 36 46 56 66 76
		7	102	7	7 17 27 37 47 57 67 77
		8	103	8	8 18 28 38 48 58 68 78
		9	104	9	9 19 29 39 49 59 69 79
		10	105	10	10 20 30 40 50 60 70 80
	Slice 2	11	106	1	1 11 21 31 41 51 61 71
		12	107	2	2 12 22 32 42 52 62 72
		13	108	3	3 13 23 33 43 53 63 73
		14	109	4	4 14 24 34 44 54 64 74
		15	110	5	5 15 25 35 45 55 65 75
		16	111	6	6 16 26 36 46 56 66 76
		17	112	7	7 17 27 37 47 57 67 77
		18	113	8	8 18 28 38 48 58 68 78

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
		19	114	9	9 19 29 39 49 59 69 79
		20	115	10	10 20 30 40 50 60 70 80
Trunk 2 (FAC 11)	Slice 1	1	116	1	1 11 21 31 41 51 61 71
		2	117	2	2 12 22 32 42 52 62 72
		3	118	3	3 13 23 33 43 53 63 73
		4	119	4	4 14 24 34 44 54 64 74
		5	120	5	5 15 25 35 45 55 65 75
		6	121	6	6 16 26 36 46 56 66 76
		7	122	7	7 17 27 37 47 57 67 77
		8	123	8	8 18 28 38 48 58 68 78
		9	124	9	9 19 29 39 49 59 69 79
		10	125	10	10 20 30 40 50 60 70 80
	Slice 2	11	126	1	1 11 21 31 41 51 61 71
		12	127	2	2 12 22 32 42 52 62 72
		13	128	3	3 13 23 33 43 53 63 73
		14	129	4	4 14 24 34 44 54 64 74
		15	130	5	5 15 25 35 45 55 65 75

Trunk Port	ODU4 Slice	ODU Trunk Number	ODU Trunk FAC	Tributary Port Number	Timeslots
		16	131	6	6 16 26 36 46 56 66 76
		17	132	7	7 17 27 37 47 57 67 77
		18	133	8	8 18 28 38 48 58 68 78
		19	134	9	9 19 29 39 49 59 69 79
		20	135	10	10 20 30 40 50 60 70 80

When the 400G-XP-LC card interoperates with the NCS4K-4H-OPW-QC2 card, the first ODU4 slice of the 400G-XP-LC trunk is connected to the second ODU4 slice of the same NCS4K-4H-OPW-QC2 trunk.

Note The ODU circuit between the 400G-XP-LC and NCS4K-4H-OPW-QC2 cards is created even when the ODU number is incorrect. Please ensure that the correct source and destination ODU numbers are selected.

Regeneration Mode for 400G-XP-LC

From Release 10.8.0, the 400G-XP-LC can be configured as a regenerator. The regeneration functionality is available only on the trunk ports. A new card operating mode, REGEN, is available. No client ports are involved. The two trunk ports must have the same rate to achieve regeneration (wavelengths and FEC of the trunks can vary).

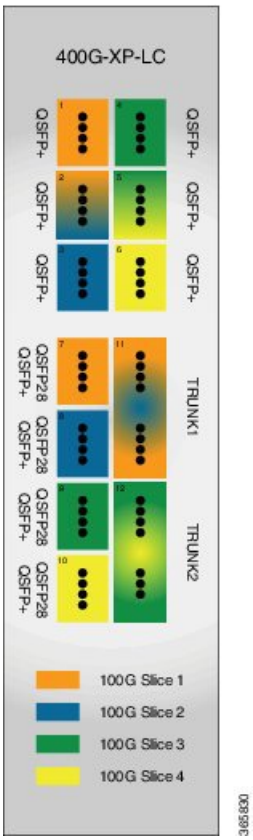
Note For traffic to flow in the REGEN mode, it is mandatory that the 400G-XP-LC should be running on firmware (SCP) version 5.24 or later.

We recommend that you use the REGEN mode only with the MXP operating mode (the output from the MXP trunk of a 400G-XP-LC can be connected to trunk ports in REGEN mode).

Slice Definition and Line Card Configuration for 400G-XP-LC Card

The image below displays the client and trunk ports of the 400G-XP-LC card.

Figure 41: 400G-XP-LC Card



The client to trunk port mapping is fixed in the 400G-XP-LC card as detailed in this table:

Table 92: Trunk -Client Port Mapping on the 400G-XP-LC Card

Trunk	Client Port	Pluggable Type
Trunk 1 (CFP2-11)- Slice 1 and Slice 2	Ports 1, 2, 3	QSFP+
	Ports 7, 8	QSFP+ or QSFP28 [6]
Trunk 2 (CFP2-12) - Slice 3 and Slice 4	Ports 4, 5, 6	QSFP+
	Ports 9, 10	QSFP+ or QSFP28

[6] QSFP+ and QSFP28 share the same form factor.

The trunk ports can be configured with either 100G or 200G rates. The client ports are grouped into four slices. The slice mode defines the aggregation capacity and can be configured independently.

The configuration of each of the two trunk ports is independent of the configuration of the other and is done using either one of the two trunk operating modes.

Trunk Operating Modes (trunk capacity)

- M-100G: 100G QPSK. One slice is enabled on the trunk. Slice 2 is enabled for Trunk 1 and Slice 4 is enabled on Trunk 2.

- M-200G: 200G 16 QAM. Two slices are enabled on the trunk.

From Release 10.6.2, the NCS2K-400G-XP linecard supports the 16G fiber channel payload. This new payload is supported only on the ONS-QC-16GFC-SW= pluggable. The supported payload mapping is CBR, with encoding 64b or 66b.



Note The maximum transmit launch power (per lane) of the ONS-QC-16GFC-SW= pluggable is +1dBm (the lowest transmit launch power is -7.6dBm).

To support the 16G FC payload, a new operating mode, OPM_6x16G_FC is introduced. This operating mode can be provisioned on any MXP card configuration slice, with M_100G and M_200G trunk ports. The OPM_6x16G_FC can also be provisioned with any other another slice opmode in the card.

The OPM_6X16G_FC shall enable 16G-FC clients on ports 1, 2, 3, 4, 5 and 6. The client ports 2 and 5 (shared between 2 slices) cannot support different payload bit-rates. This means that in case of contextual provisioning of OPM_6x16G_FC and OPM_10x10G on slices 1 and 2 or slices 3 and 4 , the available options are:

- provision a ONS-QC-16GFC-SW= pluggable on the shared ports and have 6x 16G-FC payloads and 8x 10G payloads (10GE or OTU2)
- provision a QSFP-4X10G-MLR (or ONS-QSFP-4X10G-LR-S) pluggable on the shared ports and have 4x 16G-FC + 10x 10G payloads (10GE and/or OTU2)

Slice Mode:

- OPM-100G: Enables 100G client on the QSFP 28 port.
- OPM-10x10G: Enables 10G client over a set of QSFP+ ports.
- OPM-6x16G_FC: Enables 16G client over a set of QSFP+ ports.
- OPM_2x40G_2x10G: Enables 40G client over a set of QSFP+ ports.

Traffic from the client ports are aggregated on the 100G or 200G trunk at the intermediate ports. There are four intermediate ports (iports), two per trunk. The iports are automatically configured when the slices are configured.

The relation between the two trunk ports (Ports 11 and 12), client ports (Ports 1 through 10) and the four slices are represented in the tables below.

The OPM-6x16G_FC mode is referred to as 6x16G_FC and OPM_2x40G_2x10G mode is referred to as 2x40G_2x10G in this table.

Table 93: Trunk, Slice, and Port Configuration for Trunk 1 of the 400G-XP-LC Card

Trunk 1			Client Ports				
Trunk Mode	Slice Operation Mode		1	2 [7]	3	7	8
	Slice 1	Slice 2	Port Lanes				

M-200G	OPM-100G	OPM-100G	-	-	-	4x [8]	4x
	OPM-100G	OPM-10x10G	-	3,4	1 to 4	4x	1 to 4
	OPM-10x10G	OPM-100G	1 to 4	1, 2	-	1 to 4	4x
	OPM-10x10G	OPM-10x10G	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4
	6x16G_FC	OPM-100G	1 to 4	1,2			4x
	6x16G_FC	OPM-10x10G	1 to 4	1,2 or 3,4 [9]	1 to 4		1 to 4
	OPM-100G	6x16G_FC	-	3,4	1 to 4	4x	
	OPM-10x10G	OPM-6x16G	1 to 4	1,2 or 3,4 [10]	1 to 4	1 to 4	
	OPM-6x16G	6x16G_FC	1 to 4	1,2 and 3,4	1 to 4		
	2x40G_2x10G	2x40G_2x10G	40G	1,2 + 3,4	40G	40G	40G
	2x40G_2x10G	OPM-10x10G	40G	1,2 + 3,4	1 to 4	40G	1 to 4
	2x40G_2x10G	OPM_100G	40G	1,2	-	40G	4x
	OPM-10x10G	2x40G_2x10G	1 to 4	1,2 + 3,4	40G	1 to 4	40G
	OPM_100G	2x40G_2x10G	-	3,4	40G	4x	40G
M-100G	NA	OPM-100G		-	-		4x
		OPM-10x10G		3,4	1 to 4		1 to 4
		6x16G_FC		3,4	1 to 4		
		2x40G_2x10G	-	3,4	40G	-	40G

[7] Port 2 is shared between Slice 1 and Slice 2.
[8] 4x refers to all four lanes of the QSFP28 pluggable.
[9] Depending on the PPM provisioned, ports 1 and 2 can be 16G FC or ports 3 and 4 can be 10GE/OTU2.
[10] Depending on the PPM provisioned, ports 3 and 4 can be 16G FC or ports 1 and 2 can be 10GE/OTU2.

The OPM-6x16G_FC mode is referred to as 6x16G_FC and OPM_2x40G_2x10G mode is referred to as 2x40G_2x10G in this table.

Table 94: Trunk, Slice, and Port Configuration for Trunk 2 of the 400G-XP-LC Card

Trunk 2			Client Ports				
Trunk Mode	Slice Operation Mode		4	5 [11]	6	9	10
	Slice 3	Slice 4	Port Lanes				

M-200G	OPM-100G	OPM-100G	-	-	-	4x	4x
	OPM-100G	OPM-10x10G	-	3,4	1 to 4	4x	1 to 4
	OPM-10x10G	OPM-100G	1 to 4	1, 2	-	1 to 4	4x
	OPM-10x10G	OPM-10x10G	1 to 4	1 to 4	1 to 4	1 to 4	1 to 4
	6x16G_FC	OPM-100G	1 to 4	1,2	-	-	4x
	6x16G_FC	OPM-10x10G	1 to 4	1,2 or 3,4 [12]	1 to 4	-	1 to 4
	OPM-100G	6x16G_FC	-	3,4	1 to 4	4x	-
	OPM-10x10G	6x16G_FC	1 to 4	1,2 or 3,4 [13]	1 to 4	1 to 4	-
	6x16G_FC	6x16G_FC	1 to 4	1,2 and 3,4	1 to 4	1 to 4	-
	2x40G_2x10G	2x40G_2x10G	40G	1,2 + 3,4	40G	40G	40G
	2x40G_2x10G	OPM-10x10G	40G	1,2 + 3,4	1 to 4	40G	1 to 4
	2x40G_2x10G	OPM_100G	40G	1,2	-	40G	4x
	OPM-10x10G	2x40G_2x10G	1 to 4	1,2 + 3,4	40G	1 to 4	40G
	OPM_100G	2x40G_2x10G	-	3,4	40G	4x	40G
M-100G	NA	OPM-100G	-	-	-	-	1 to 4
		OPM-10x10G		3,4	1 to 4		1 to 4
				3,4	1 to 4		
		2x40G_2x10G	-	3,4	40G	-	40G

[11] Port 5 is shared between Slice 3 and Slice 4.
[12] Depending on the PPM provisioned, ports 1 and 2 can be 16G FC or ports 3 and 4 can be 10GE/OTU2.
[13] Depending on the PPM provisioned, ports 3 and 4 can be 16G FC or ports 1 and 2 can be 10GE/OTU2.

Trunk Port Interworking in 400G-XP-LC Cards

To provide greater flexibility on the network design and deployment, the two CFP2 trunk ports of the 400G-XP-LC card can interoperate with each other when the same trunk operating mode and slice configurations exist on both source and destination cards.

OCHCC circuits can be created between compatible client ports as detailed in the tables below.

Table 95: Compatible Client Ports for M-100G Trunk Port Configuration

Trunk 1 - CFP2 Port 11		Source/Destination Client Ports	Source/Destination Client Ports	Trunk 2 - CFP2 Port 12	
Slice configuration 1	Slice 2: OPM_100G	8	10	Slice 4: OPM_100G	Slice configuration 1
Slice configuration 2	Slice 2: OPM_10x10G	2-3	5-3	Slice 4: OPM_10x10G	Slice configuration 2
		2-4	5-4		
		3-1	6-1		
		3-2	6-2		
		3-3	6-3		
		3-4	6-4		
		8-1	10-1		
		8-2	10-2		
		8-3	10-3		
		8-4	10-4		
Slice configuration 2	Slice 2: OPM_6x16G_FC	2-3	5-3	Slice 4: OPM_6x16G_FC	Slice configuration 2
		2-4	5-4		
		3-1	6-1		
		3-2	6-2		
		3-3	6-3		
		3-4	6-4		

Table 96: Compatible Client Ports for M-200G Trunk Port Configuration

Trunk 1 - CFP2 Port 11		Source/Destination Client Ports	Source/Destination Client Ports	Trunk 2 - CFP2 Port 12	
Slice configuration 1	Slice1: OPM_100G	7	9	Slice 3: OPM_100G	Slice configuration 1
	Slice 2: OPM_10x10G	2-3	5-3	Slice 4: OPM_10x10G	
	Slice 1: OPM_100G	7	9	Slice 3: OPM_100G	

Trunk 1 - CFP2 Port 11		Source/Destination Client Ports	Source/Destination Client Ports	Trunk 2 - CFP2 Port 12	
Slice configuration 2	Slice 2: OPM_10x10G	2-3	5-3	Slice 4: OPM_10x10G	Slice configuration 2
		2-4	5-4		
		3-1	6-1		
		3-2	6-2		
		3-3	6-3		
		3-4	6-4		
		8-1	10-1		
		8-2	10-2		
		8-3	10-3		
		8-4	10-4		
Slice configuration 3	Slice 1: OPM_10x10G	1-1	4-1	Slice 3: OPM_10x10G	Slice configuration 3
		1-2	4-2		
		1-3	4-3		
		1-4	4-4		
		2-1	5-1		
		2-2	5-2		
		7-1	9-1		
		7-2	9-2		
		7-3	9-3		
		7-4	9-4		
	Slice 2: OPM_100G	8	10	Slice 4: OPM_100G	

Trunk 1 - CFP2 Port 11		Source/Destination Client Ports	Source/Destination Client Ports	Trunk 2 - CFP2 Port 12	
Slice configuration 4	Slice 1: OPM_10x10G	1-1	4-1	Slice 3: OPM_10x10G	Slice configuration 4
		1-2	4-2		
		1-3	4-3		
		1-4	4-4		
		2-1	5-1		
		2-2	5-2		
		7-1	9-1		
		7-2	9-2		
		7-3	9-3		
		7-4	9-4		
	Slice 2: OPM_10x10G	2-3	5-3	Slice 4: OPM_10x10G	
		2-4	5-4		
		3-1	6-1		
		3-2	6-2		
		3-3	6-3		
		3-4	6-4		
		8-1	10-1		
		8-2	10-2		
		8-3	10-3		
		8-4	10-4		
Slice configuration 1	Slice 1:OPM_6x16G_FC	1-1	4-1	Slice 3: OPM_6x16G_FC	Slice configuration 3
		1-2	4-2		
		1-3	4-3		
		1-4	4-4		
		2-1	5-1		
		2-2	5-2		

Trunk 1 - CFP2 Port 11		Source/Destination Client Ports	Source/Destination Client Ports	Trunk 2 - CFP2 Port 12	
Slice configuration 2	Slice 2: OPM_6x16G_FC	2-3	5-3	Slice 4: OPM_6x16G_FC	Slice configuration 4
		2-4	5-4		
		3-1	6-1		
		3-2	6-2		
		3-3	6-3		
		3-4	6-4		

Enable PRBS Support on the 400G-XP-LC Card

The ODU4 internal ports on the 400G-XP-LC card support configuration of PRBS with all operating modes.

Table 97: Feature History

Feature Name	Release Information	Feature Description
New PRBS pattern support for 400G-XP-LC card	Cisco NCS 2000 Release 11.13	CTC now supports **INVERTEDPRBS_31** as one of the PRBS patterns that are used to perform data integrity checks on the encapsulated packet data payloads. When a network comprises of both NCS 2000 and NCS 1004 nodes, this enhancement facilitates interoperability between the 400G-XP-LC card and NCS1K4-OTN-XP cards, as the latter only supports INVERTEDPRBS_31 pattern.

Before you begin

Pseudo Random Binary Sequence (PRBS) feature allows users to perform data integrity checks on their encapsulated packet data payloads using a pseudo-random bit stream pattern. PRBS generates a bit pattern and sends it to the peer router that uses this feature to detect if the sent bit pattern is intact or not.

Procedure

Step 1 In the node view, double-click the card where you want to provision PRBS. The card view appears.

Step 2 Set the admin state to OOS, MT for the source and destination trunk ports. Which in turn puts corresponding IPorts in OOS, MT state.

Note

The PRBS configuration supports the 400G-XP-LC card only when the port is in **Maintenance** State. In case the port is in **In-Service** or **Out-of-Service**, PRBS is disabled.

Step 3 Click the **Maintenance** > **PRBS Configuration** tabs.

Step 4 From the **Generator Pattern** drop-down list, choose a pattern.The supported patterns are None, PRBS_11, PRBS_31, and INVERTEDPRBS_31.

From Release 11.13, INVERTEDPRBS_31 is included as one of the patterns to support interoperability between the NCS1K4-OTN-XP card and the 400G-XP-LC card.

Note
You must apply the same pattern in both source and destination Internal Ports (IPorts).

Step 5 Click **Apply**.

The 400G-XP-LC card provides a PRBS sync status with the following values:

- PATTERN_OK: When the IPort is receiving one of the recognized patterns.
- PATTERN_ERROR: When the IPort is receiving a recognized pattern but the pattern contains errors. This also occurs when there is a pattern mismatch.
- PATTERN_NONE: When the IPort is not receiving a recognized PRBS pattern.

In case of pattern errors, the card provides a PRBS error counter. The counter zeroes itself when the PRBS is disabled.

Step 6 Click **Refresh** in the PRBS window under **Maintenance** to check the pattern sync status on the IPorts.

Note
If cross-connections or clients are not created, the pattern shows **PATTERN_OK** with mismatch configurations.

The mismatch configurations are:

- PRBS is enabled on one end and disabled on the other end.
- One pattern is enabled on one end and other pattern is enabled on the other end (Pattern Mismatch).

Limitations of PRBS Support on 400G-XP-LC card

- PRBS cannot be enabled on IPorts if corresponding client payloads are not provisioned.
- Client payloads cannot be provisioned if PRBS is enabled on the corresponding IPorts.
- CPRBS pattern shows **OK** even with mismatch configuration if no cross connections or clients are created.
- PRBS is supported when the source and destination 400G-XP-LC cards are configured with the same operating mode.
- PRBS for OTU4 clients is not available on 400G-XP-LC card in Release 11.0 or earlier releases.
- PRBS shall be supported when two IPorts carry similar client rates.

- When you restore the database that was deleted after the backup, the PRBS pattern does not sync up. Hence we recommend you to reconfigure the PRBS through CTC. See Enable PRBS Support on the 400G-XP-LC Card, on page 270.

GCC0 Support on the 400G-XP-LC Card

- The 400G-XP-LC card supports provision of one GCC0 channel for each of the trunk ports on the operating modes-OTNXC, MXP, and MXP-2x150G(8QAM).
- In case of the OTU4C3 (8QAM) payload, only one GCC0 channel is configurable on the first trunk port (Port-11). The configuration on the second trunk port (Port-12) is automatically blocked.
- In case of the MXP-2x150G(8QAM) payload, the GCC0 channel is configurable only on the second trunk port (Port-12); no GCC0 channel configuration is supported on the first trunk port (Port-11).
- The OTU4 and OTU2 client ports do not support GCC0 channels on the card.
- The 400G-XP-LC card supports a maximum of two GCC0 channels on each trunk port.
- The OTU4C2 trunk port supports the Low Speed GCC 196K and High Speed GCC 1200K. The 400G-XP-LC card supports only the High Speed GCC rate, 1200K. So, GCC0 channels provisioning on 400G-XP-LC cards, which are part of 15454-M12 as Node Controller (NC) configurations, is not supported.
- The OTNXC or OCHTRAIL circuits are not supported over the direct GCC0 link on the 400G-XP-LC card.
- The GCC0 channel provisioning is not supported on REGEN card mode on the 400G-XP-LC card. However, GCC0 tunneling is enabled.
- From R11.1.1.2, the GCC0 channel provisioning is supported on the REGEN card mode on the 400G-XP-LC card. If the GCC0 provisioning is not provisioned, it acts transparent for GCC0 channel.



Note CTC session may hang when you create GCC0 channels on the regeneration node. We recommend you to relaunch the session for these nodes.

- The Field-Programmable Gate Array (FPGA) should be upgraded to the latest version before creating a GCC0 circuit on the 400G-XP-LC card trunk ports. The CTC throws an error message during the circuit creation if FPGA version is outdated.
- GCC0 channels provisioning is supported with hardware FPGA image version > 0.28. GCC provisioning will fail with a deny error message if FPGA version is = < 0.28.

  Hardware FPGA image version information is available under **CTC > Card View > Maintenance > Info Tab > FPGA_HW_VERSION.**
- Hardware FPGA image version information will be available under **CTC > Card view > Maintenance > Info tab > PGA_HW_VERSION.**
- FPGA image upgrade is traffic impacting and, should be done in a maintenance window.
- To Upgrade FPGA Image, go to **CTC > Card View > Provisioning > Card** tab and, click on the **FPGA** or **FIRMWARE UPGRADE** button and follow the auto generated instruction.

Note Firmware upgrade is allowed only when the ports are in OOS (out-of-service) or Maintenance service state

- In presence of the TIM-SM alarm, GCC0 link remains down.

2x150G Support on the 400G-XP-LC Card

From Release 10.9, the 400G-XP-LC card supports the configuration of 2x150G mode in 8QAM modulation format. It is configurable on the trunk ports of the card by selecting M_150G as the Trunk Operating mode.

The M_150G mode does not support muxponder, cross connection, and regeneration configurations.

The M_150G trunk mode configuration supports client slices 1, 3 and 4. The available ports 1[1:4], 2[1:2], 4[1:4], 5[1:4], 6[1:4], 7[1:4], 9[1:4], 10[1:4]. When the M_150G trunk mode in configured, the slices 1, 3 and 4 are independently configurable as OPM_100G, OPM_10x10G or OPM_6x16G-FC. It is possible to change a slice mode without it being traffic affecting on the other provisioned slices. The admin state of both trunk ports are aligned.

On a M_150G configured trunk mode, all client payloads or options are the same as the standard M_200G MXP mode.

The M_150G trunk mode is applicable to both trunk ports. This is required because this mode splits the ODU4line frames into two interleaved 150G signals transported separately by the two trunk ports.

The trunk ports configured as M_150G support the same optical and FEC alarms or monitors provided by the M_200G mode. An LOS-P or LOF alarm on any of the two trunk ports of M_150G correlates all the OTU4C3 container OTN alarms.

The Line OTN Alarms and Performance Monitors of the 2x150G mode container frame (OTU4C3) is evaluated as the summarization of the Alarms or PMs related to the 3 embedded ODU4 internal ports 1, 3, and 4. The resulting values are available at the OTN layer of Trunk12.

Limitations of 2x150G Support on the 400G-XP-LC Card

- The trunk ports are put in the Out-of-Service state before unplugging any CFP2 trunk. Extracting an In-Service CFP2 trunk results in shutting down of the other trunk.
- The loopback setting of both M_150G trunks are aligned. However, the internal loopback ports are configurable independently with the same limitations as that of M_100G and the M_200G modes.
- The TTI-SM of the OTU4C3 container is configurable and is monitored only on Trunk 12.
- The GCC0 provisioning is supported only for Trunk-12.
- The FEC setting of both M_150G trunks are aligned.

Related Procedures for 400G-XP-LC Cards

- NTP-G361 Provisioning an Operating Mode on the 400G-XP-LC Card, on page 600

- NTP-G236 Modifying the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, , 200G-CK-LC, CFP-LC, WSE, MR-MXP, or 400G-XP-LC Card Line Settings and PM Parameter Thresholds, on page 610
- NTP-G362 Manual FPGA Upgrade on the 400G-XP-LC Card, on page 603
- NTP-G75 Monitor Transponder and Muxponder Performance
- Enable PRBS Support on the 400G-XP-LC Card, on page 270

Supported MSM Configurations

The following configurations are supported :

Configuration	Card Configuration	Payload	Total Client Interfaces
1	40 400G-XP-LC cards	10 GE	1600
2	20 400G-XP-LC cards 36 200G-CK-LC cards 72 MR-MXP cards	10 GE	1520
3	70 400G-XP-LC cards	100 GE	280
4	20 400G-XP-LC cards	100 GE	800
	36 200G-CK-LC cards 72 MR-MXP cards	10 GE	

Recommendations

Ensure you follow the recommendations stated below for optimum system performance.

- Five CTC sessions can run concurrently.
- Only one TL1 session can run at a time when TL1 scripts are run continuously for monitoring on a node.
- Only one OTDR scan can be run at a time.
- Only one EPNM session can run at a time.
- Two SNMP traps can be configured.
- Performing software downloads, database backup, and database restore operations must not be performed when the system is synchronizing with EPNM or when TL1 sessions are running.
- Software upgrade must not be run with the recommended environment (five CTC sessions, one OTDR scan, one TL1 session, one EPNM session, and two SNMP traps) enabled as it impacts the upgrade operation.
- The following operations may cause degradation of system performance:
  - Retrieving performance monitoring values using HTTP in a browser.
  - Performing a full SNMP walk.

- Running parallel sessions of EPNM and TL1.

WSE Card

The Wire Speed Encryption (WSE) card is an optical line card that provides encryption capability, at the OTN layer, to the Cisco NCS 2000 Series and platforms. This card provides confidentiality of the data, which is sent over a fiber optic communication channel, using Next Generation Cryptography. In addition to providing encryption, this card also provides integrated transponder functionality.

The WSE card supports these client signals:

- 10GE LAN PHY mapped to OTU2e
- OTU2
- OTU2e
- OTU1e
- OC-192/STM-64
- 10GE WAN
- 10GE LAN mapped to OTU2
- 8G FC/10G FC

The WSE card does not support auto negotiation for SAN protocols (10GFC/8GFC). The WSE card supports only speed lock for SAN protocols.

The WSE card is tunable on 96 wavelength channels, spaced at 50-GHz over the entire C-band. The digital wrapper function (ITU-T G.709 compliant) formats the DWDM wavelength so that it can be used to set up GCCs for data communications, enable FEC, or facilitate PM. The WSE card works with the OTN devices defined in ITU-T G.709. The OTN client can be FEC, standard G.975 FEC, or disabled FEC.

For information on safety labels for the cards, see the "Class 1M Laser Product Cards" section.



Caution A 15 to 20 dB fiber attenuator must be used when working with the cards in a loopback on the trunk port. Do not use direct fiber loopbacks with the cards. Using direct fiber loopbacks causes irreparable damage to the DWDM/CWDM XFP/SFPs plugged in WSE card.

The WSE card is a single-slot card and can be installed in any service slots in the chassis. The card has 10 SFP+ ports. The trunk and client ports are fixed. The trunk ports are 2, 4, 6, 8, and 10; the client ports are 1, 3, 5, 7, and 9. The trunk SFP+ can be grey or DWDM. The trunks include FEC and EFEC for longer reach. Depending on the traffic pattern, the WSE card provides per port flexibility.

Up to six WSE cards can be installed per Cisco NCS 2006 shelf assembly, supporting up to 30 encrypted streams in a 2-rack unit (RU) bay frame. Up to two WSE cards can be installed per Cisco NCS 2002 shelf assembly, supporting up to 10 encrypted streams in a 6-rack unit (RU) bay frame. It is possible to aggregate the wavelength required with 40G and 100G cards in the same chassis. Up to 15 WSE cards can be installed per Cisco NCS 2015 shelf assembly.

When the software version of the node is changed from Release 10.6.2 to releases prior to 10.6.1, the WSE card undergoes a hard reset. This is applicable for the NCS 2002 and the NCS 2006 chassis.

When the node is upgraded followed by reset of the active control card, FPGA upgrade of the WSE card fails.

Perform the following steps to upgrade FPGA successfully.

- Soft reset the WSE card.
- In the Card view, go to **Provisioning** > **Card**.
- Click **FPGA/FIRMWARE Upgrade/Traffic Affecting Reset** to upgrade FPGA.

Note Firmware upgrade is allowed only when the ports are in OOS (out-of-service) or Maintenance service state.

Note In R11.12, the WSE card is shipped with new CPU and pre-programmed with FPGA version 0x36. When the WSE card is downgraded to release earlier than R11.12, the TRAF-AFFECT-RESET-REQUIRED alarm is raised; however, FPGA is not downgraded. FPGA downgrade from 0x36 version to 0x34 version or lower is not supported on the WSE card that is shipped with R11.12.

Key Features

The WSE card supports these key features:

- Operating Modes—The WSE card can be configured into multiple operating modes. The card can be equipped with pluggables for client and trunk options, and offers a large variety of configurations. For more information about multiple operating modes, see Multiple Operating Modes, page 11-137.
- Security Features
  - Secure Boot—This feature does a boot verification in hardware. It ensures that only authentic Cisco software boots up on the Cisco platform, and provides tamper and cloning resistance.
  - Digital Image Signing—After the secure boot, the Digital Image Signing ensures that the software that runs on Cisco devices is authentic. This maintains the integrity of the image that is loaded on the WSE card.
  - Key Exchange—Key exchange between authenticated peer cards happens over the GCC2 channel that is secured using Transport Layer Security (TLS). The Elliptic Curve Diffie Hellman Ephemeral (ECDHE) algorithm is used for key exchange.
  - Confidentiality of Data—The WSE card protects against ciphertext manipulation and cut-and-paste attempts. AES algorithm in XTS mode of operation.
  - Role Based Access Control—Access control is enforced to ensure that there is complete separation in managing the transport (provisioning) and the security functionalities. As a result, depending on the role assigned to a user, only certain operations can be performed by that user.

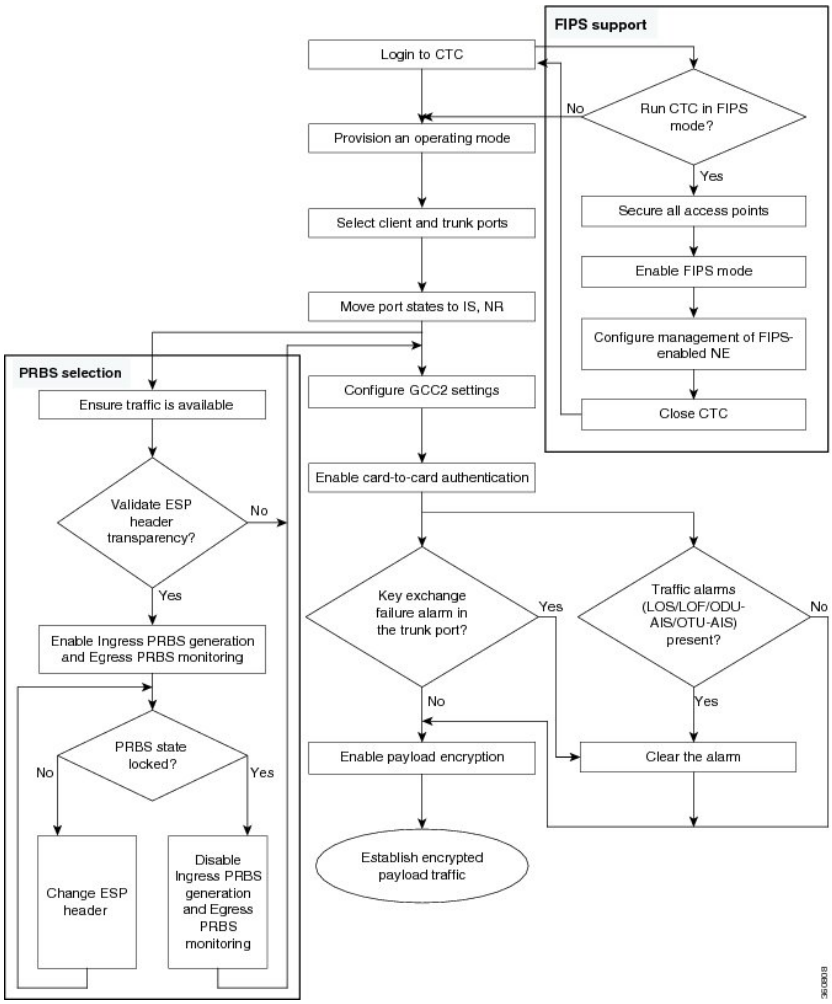
- Card Authentication—The Secure Unique Device Identification (SUDI) certificate that is formatted as an X.509 certificate and conforms to the IEEE 802.1 AR standard. It is signed using Cisco's Root Certificate Authority. This certificate carries a unique identifier used to authenticate the peer card as being a WSE card before the data is exchanged. Information cannot be exchanged with a card that is not authenticated.
- High Speed GCCs—The WSE card supports the provisioning of GCC channel on OTN (OTU2/OTU2e) enabled client and trunk ports. A maximum of ten GCC0 channels can be created per WSE card, on Cisco NCS 2002, Cisco NCS 2006, or Cisco NCS 2015 shelf, and a maximum of five GCC2 channels can be created per WSE card, on Cisco NCS 2002, Cisco NCS 2006, or Cisco NCS 2015 shelf.
- OCH-trail Protection—Provides protection for the DWDM signals through external optical switch units (Protection Switch Module [PSM]).
- Licensing—A licensed version of the card provides a cost-effective solution for customers who do not need to encrypt data on all five streams from day one itself. The licensed WSE card provides single stream encryption as a base functionality. When an additional encrypted stream is required, you need to purchase a software ugrade license. Licensing is required for only security features. A WSE card without a license acts as for transponder. For more information on licensing, see the Licensing Configuration Guide.
- Third Party Certificates—The WSE card supports the generation of a Certificate Signing Request (CSR) and installation of Locally Significant Certificates (LSCs) that can be used to authenticate the peer card connection.

For information on safety labels for the cards, see the "Class 1M Laser Product Cards" section.

For a detailed list of the supported pluggables, see, http://www.cisco.com/c/en/us/td/docs/optical/spares/gbic/guides/b_ncs_pluggables.html

WSE Workflow Diagram

The following figure shows the workflow diagram of the WSE card. The diagram provides information on the tasks required to configure the WSE card.



Multiple Operating Modes

A single WSE card can be configured into multiple operating modes. The criteria for selecting a particular operating mode are defined by the network level design. CTP helps you to choose the appropriate operating mode. When you configure the WSE card into multiple operating modes, make sure that these tasks are completed:

- The PPMs must be configured on the card, and then the operating modes. None of the modes are provisioned on the card by default. All operating modes are created on a per port basis. This is card-specific provisioning, which decides the behavior of a particular card.
- Depending on the card mode selected, the supported payload for that particular card mode must be provisioned on the PPMs.

The WSE card supports these operating modes:

- TXP-10G
- RGN-10G

A mix of TXP-10G and RGN-10G modes can be configured on the WSE card.

TXP-10G

A maximum of five TXP-10G configurations can be provisioned on a single WSE card. When the card is configured in this mode, these features are supported:

- Enable or disable card authentication
- Enable or disable payload encryption

OTN cannot be disabled on the trunk port.

Table 98: Supported Payload Mapping in TXP-10G Mode

Client Payload	Trunk Mapping
10GE LAN PHY-CBR	OTU2e
OTU2	OTU2
OTU2e	OTU2e
8G FC	OTU2
10G FC	OTU2
10GE LAN PHY-GFP	OTU2
OTU1e	OTU1e

RGN-10G

In the RGN-10G mode, the card behaves as a standard regenerator with DWDM SFP+ on both the client and trunk ports. The card supports OTU1e, OTU2, and OTU2e regeneration on all the client and trunk pairs. When the WSE card is configured in this mode, card authentication and payload encryption features are not supported.

The OTN cannot be disabled when the card is configured in RGN-10G mode.

Card Authentication

The WSE cards provide TLS 1.2 based card-to-card authentication per port. An authentication failure on one trunk port does not affect the traffic on any other trunk port. The card authentication must be enabled to configure encryption on the card.

Cisco Signed certificates are installed on the WSE card by default. These certificates are exchanged between the cards during card authentication.

All ports are re-authenticated upon a soft-reset of the card.

In case of TLS or SSL authentication failure, the KEY_EX_FAIL alarm is raised on the particular trunk port.

Key Management

A single key, called a primary key, is exchanged for each TLS session. It is exchanged using an asymmetric key algorithm (Elliptic Curve Diffie Hellman). The primary key is used to derive a set of symmetric keys for payload encryption.

The user can change the primary key at anytime from CTC, which initiates another DH exchange between the sender and the receiver. The user can also specify the time when the primary key is periodically reset.

The keys used for encryption of data are never stored in plaintext on the card. All keys are deleted when the card reboots or is removed from the chassis. The key changes do not affect the traffic.

Important Notes on KEY-EX-FAIL Alarm

- After an upgrade of a software version, KEY-EX-FAIL alarm may be raised due to soft reset of the card. However, the traffic is not impacted, and the alarm will be cleared in the next exchange interval of the primary key
- When the MANRESET alarm (Manual System Reset alarm) is cleared on a client WSE card, the KEY-EX-FAIL alarm might be raised due to soft reset of the card. The alarm is raised when the server exits the existing connection and establishes a new connection during this period. However, the traffic is not impacted.

Payload Encryption

The payload on each port can be encrypted independent of the other streams. NIST approved Advanced Encryption Standard (AES) AES-256, a symmetric key cryptographic algorithm in XTS mode of operation, is used to encrypt the OTN payload. The payload encryption needs to be enabled at both source and destination trunk ports; otheriwse, it is traffic affecting.

AES Secure Packet

The concept of a packet does not exist within OTN; however, packet-based traffic is necessary for encryption using XTS-AES algorithm. A single OTN frame cannot be tagged with the necessary Encapsulating Security Payload (ESP) header, which carry the information necessary for encryption and decryption of payloads. The ESP header and trailer require a total of 32 bytes within the OTN overhead.

The AES secure packet for each port can be made up of four or eight OTN frames. In CTC, the user can choose from these two options for transporting the ESP header and trailer:

- Four OTN frame based AES secure packet—The four OTN frame-based AES secure packet transports four ESP header and four ESP trailer bytes within each OTN frame. In the four OTN frame-based AES secure packet, eight overhead bytes are utilized in each OTN frame in order to transport all 32 bytes of ESP header and trailer within a single AES secure packet. Each location is four bytes wide, therefore two locations from each OTN frame are utilized, one for the ESP header and one for the ESP trailer.
- Eight OTN frame based AES secure packet— The eight OTN frame-based AES secure packet transports two ESP header and two ESP trailer bytes within each OTN frame. In the eight OTN frame-based AES secure packet, four overhead bytes are utilized in each OTN frame in order to transport all 32 bytes of ESP header and trailer within a single AES secure packet. Each location is four bytes wide; therefore, only one location from each OTN is utilized. Within the selected location, two bytes are used for the ESP header, and two bytes for the ESP trailer.

Pseudo Random Binary Sequence (PRBS) testing is used to ensure that the selected overhead bytes can be used to transport the ESP header and trailer safely. Both the transmitting node and receiving node must be aware that PRBS testing is taking place. Each node must also know which bytes are to be tested.

Functions and Features

The cards have the following functions and features, explained in the "Card Features" chapter:

- Enhanced FEC (E-FEC) Feature
- Timing Synchronization
- Card level indicators
- Port level indicators

Scenarios that Affect Traffic

Scenario 1: Traffic in a Stacked Topology

Consider an example where the WSE cards are connected in a stacked topology:

```
Client:WSE1:Trunk===Trunk:WSE2:Client===Client:WSE3:Trunk===Trunk:WSE4:Client
```

where WSE:Trunk represents OTU2e payload and WSE:Client represents 10GE signal.

In this scenario, card-to-card authentication and payload encryption are enabled on all the trunk ports, and loopback is not configured. In this stacked topology, the WSE2 and WSE3 client will report a synchronization loss since the keys are different, and an ODUk-AIS is raised on the trunk ports. The key is not exchanged between WSE1 and WSE2 cards, and WSE 3 and WSE4 cards. This creates a deadlock and the traffic does not recover.

Scenario 2: Traffic in a Far-end and Near-end Client Loopback

Consider an example where loopback is configured on the WSE cards:

```
TS(10GE): near-end WSE1(client):(trunk)=== far-end WSE2(trunk):(client loopback)
```

where the trunk represents OTU2e payload and client represents 10GE signal.

In WSE card, do not enable encryption with far-end or near-end client loopback as this results in synchronization loss at the client, and an ODUk-AIS is raised on the trunk port. The key is exchanged only after the ODUk-AIS on the trunk is cleared. This forms a deadlock and the traffic does not recover.

Scenario 3: Traffic After Enabling PRBS Ingress and Egress

In a scenario when WSE cards are connected in a point-to-point setup:

```
10GE(client)===OTU2e(trunk)----OTU2e(trunk)===10GE(client-loopback)
```

When PRBS Ingress and Egress are enabled at both ends of the setup, the traffic will go down. When PRBS Ingress and Egress are enabled at both ends of the setup, the traffic will go down.

Note When software version is downgraded to a previous version, the traffic may be affected with frame loss and BIP errors.

Related Procedures for WSE Card

- NTP-G338 Provisioning an Operating Mode on the WSE Card, on page 648
- NTP-G339 Modifying the WSE Card Line Settings and PM Parameter Thresholds, on page 649
- NTP-G340 Provisioning Encryption on the WSE and MR-MXP Cards, on page 664
- NTP-G342 Provisioning FIPS and CC Mode, on page 672
- DLP-G803 Installing Locally Significant Certificates on Cards, on page 676

MLSE UT

The maximum likelihood sequence estimation (MLSE) based universal transponder (UT) modules are added to the TXP_MR_10EX_C, MXP_2.5G_10EX_C, and MXP_MR_10DMEX_C cards to support the error decorrelator functionality to enhance system performance.

Error Decorrelator

The MLSE feature uses the error decorrelator functionality to reduce the chromatic dispersion (CD) and polarization mode dispersion (PMD), thereby extending the transmission range on the trunk interface. You can enable or disable the error decorrelator functionality using CTC or TL1. The dispersion compensation unit (DCU) is also used to reduce CD and PMD. The MLSE-based UT module helps to reduce CD and PMD without the use of a DCU.

SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules

Small Form-factor Pluggable (SFP), Enhanced Small-Form-factor Pluggable (SFP+), Quad Small-Form-factor Pluggable Plus (QSFP+), 10-Gbps SFP (XFP), CXP, and C Form-factor pluggable (CFP and CPAK) modules are integrated fiber optic transceivers that provide high-speed serial links from a port or slot to the network. For more information on SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK modules and for a list of SFP, SFP+, XFP, CXP, CFP, CFP2 and CPAK modules supported by the transponder and muxponder cards, see the Installing the GBIC, SFP, SFP+, XFP, CXP, CFP and CFP2 Optical Modules in Cisco NCS Platforms.

In CTC, SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK modules are called pluggable port modules (PPMs). To provision SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 or CPAK module and change the line rate for multirate PPMs, see the DLP-G725 Preprovisioning PPM Slot task.

NTP-G128 Managing Pluggable Port Modules

Purpose	Complete this procedure to provision a multirate PPM, provision the optical line rate of a multirate PPM, or delete a single-rate or multirate PPM.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G723 Install PPM on a Line Card • DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note If a single-rate PPM is installed, the PPM screen will autoprovision and no further steps are necessary.

Note When you autoprovision a PPM, initial alarm and TCA defaults are supplied by Cisco Transport Controller (CTC) depending on your port and rate selections and the type of PPM. These default values can be changed after you install the PPM.

Note The hardware device that plugs into a TXP, MXP, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, 200G-CK-LC, 400G-XP-LC, 100ME-CKC, WSE, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, ADM-10G, or OTU2_XP card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP, SFP+, XFP, or CXP) or C Form-factor pluggable (CFP, CFP2). In CTC, SFPs, XFPs, CXPs, and CFPs are called pluggable port modules (PPMs). SFPs/XFPs/CXPs/CFPs/CFP2s are hot-swappable I/O devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Procedure

Step 1 Click the **Alarms** tab:

a) Verify that the alarm filter is not turned on. See the "DLP-G128 Disable Alarm Filtering" as necessary.

b) Verify that no unexplained conditions appear. If unexplained conditions appear, resolve them before continuing. Refer to the Troubleshooting Guide.

Step 2 If you are provisioning a MXP_MR_2.5G or MXPP_MR_2.5G card, complete the "DLP-G235 Change the 2.5G Data Muxponder Card Mode" task on page 11-145. If not, continue with Step 3

Step 3 If you are provisioning a MXP_MR_10DME_C, MXP_MR_10DME_L, or MXP_MR_10DMEX_C card, complete the "DLP-G332 Change the 10G Data Muxponder Port Mode" task on page 11-146. If not, continue with Step 4.

Step 4 If you are provisioning a GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card, complete the "DLP-G379 Change the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode" task on page 11-148. If not, continue with Step 5.

Step 5 If you are provisioning a OTU2_XP card, complete the "DLP-G452 Change the OTU2_XP Card Mode" task on page 11-150. If not, continue with Step 6.

Step 6 If you are provisioning a PPM on an ADM-10G card, complete the "DLP-G411 Provision an ADM-10G PPM and Port" task on page 11-149. If not, continue with Step 10.

Step 7 If you are provisioning a PPM on an AR_MXP, AR_XP, or AR_XPE card, complete the NTP-G321 Provisioning Multiple Operating Modes, on page 577. If not, continue with Step 10.

Step 8 If you are provisioning a PPM on an 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, or 100ME-CKC card, complete the NTP-G235 Provisioning an Operating Mode, on page 599. If not, continue with Step 10.

Step 9 If you are provisioning a PPM on an 400G-XP-LC card, complete the NTP-G361 Provisioning an Operating Mode on the 400G-XP-LC Card, on page 600. If not, continued with Step 10.

Step 10 If you are provisioning a PPM on a WSE card, complete the NTP-G338 Provisioning an Operating Mode on the WSE Card, on page 648. If not, continue with Step 10.

Step 11 Complete the DLP-G725 Preprovisioning PPM Slot task for TXP, MXP, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, , 200G-CK-LC, 100ME-CKC, 400G-XP-LC, WSE, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or OTU2_XP ports with multirate PPMs. If you already preprovisioned the multirate PPM, skip this step and continue with Step 11.

Step 12 If you are provisioning an IBM ETR_CLO (External Time Reference – Control Link Oscillator) or InterSystem Coupling Link (ISC) service on the PPM, complete "DLP-G274 Verify Topologies for ETR_CLO and ISC Services" task on page 11-151. Otherwise, continue with Step 12.

Step 13 Complete the "DLP-G278 Provision the Optical Line Rate" task on page 11-153 to assign a line rate to a TXP, MXP, AR_MXP, AR_XP, AR_XPE, WSE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, 200G-CK-LC, 100ME-CKC, 400G-XP-LC, or OTU2_XP port after the PPM is provisioned. (This task is not performed for GE_XP, 10GE_XP, GE_XPE, and 10GE _XPE cards.)

Step 14 If you need to delete a PPM at any point in this procedure, complete the DLP-G727 Delete PPM Provisioning task.

Stop. You have completed this procedure.

DLP-G235 Changing the 2.5G Data Muxponder Card Mode

Purpose	This task changes the card mode for MXP_MR_2.5G and MXPP_MR_2.5G muxponder cards. The card mode determines which PPMs can be provisioned for the card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_2.5G or MXPP_MR_2.5G card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** (ANSI) or **SDH** (ETSI) tabs.

Step 3 Locate the Trunk port table row and verify that the Service State column value is OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI). If the service state is correct, continue with Step 6. If not, complete the following steps:

a) Click the **Admin State** table cell and choose **OOS,DSBLD** (ANSI) or **Locked,Maintenance** (ETSI).
b) Click **Apply**, then **Yes**.

Step 4 Click the **Provisioning** > **Line** > **Client** tabs.

Step 5 Locate the Trunk port table row and verify that the Service State column value is OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI). If the service state is correct, continue with Step 6. If not, complete the following steps:

a) Click the **Admin State** table cell and choose **OOS,DSBLD** (ANSI) or **Locked,Maintenance** (ETSI).
b) Click **Apply**, then **Yes**.

Step 6 Click the **Provisioning** > **Card** tabs.

Step 7 Change the Card Mode as needed:

- FC-GE—Choose this option if you will provision any of the following PPM port rates: FC1G (Ports 1-1 and 2-1 only), FC2G (Port 1-1 only), FICON1G (Ports 1-1 and 2-1 only), FICON2G (Port 1-1 only), and ONE_GE (Ports 1-1 through 8-1).
- Mixed—Choose this option if you will provision any of the following PPM port rates: FC1G and ONE_GE (Port 1–1 only), ESCON (Ports 5–1 through 8-1 only)
- ESCON—Choose this option if you will provision the ESCON PPM on Ports 1-1 through 8-1.

Note
The Provisioning > Card tab also has the display-only Tunable Wavelengths field. This field shows the supported wavelengths of the trunk port after the card is installed in the format: *first wavelength-last wavelength-frequency spacing-number of supported wavelengths*. For example, 1529.55nm-1561.83nm-50gHz-82.

Step 8 Click **Apply**.

Step 9 Return to your originating procedure (NTP).

DLP-G332 Changing the 10G Data Muxponder Port Mode

Purpose	This task changes the port mode for the MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C muxponder cards. The port mode determines which PPMs can be provisioned on the ports.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C cards have two port mode groups, one for Ports 1 through 4, and the second for Ports 5 through 8. To change the port mode, all ports within the selected port group must be in OOS (out-of-service) service state. Ports in the second port group do not need to be in OOS service state if you are not changing the port mode for the second port group. Before you change the port mode, you must also ensure that any PPM port rate provisioned for the selected port group is deleted (see the DLP-G727 Delete PPM Provisioning).

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_10DME_C, MXP_MR_10DME_L, or MXP_MR_10DMEX_C card where you want to change the port mode.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Change the port mode as described in Table 11-47.

Note
The PPM port rates are provisioned in the DLP-G725 Preprovisioning PPM Slot task.

Table 99: 10G Data Muxponder Card Port Modes

Parameter	Description	Options
Port 1-4 Mode	Sets the mode of operation for Ports 1-1 through 4-1.	Chose one of the following: • FC-GE_ISC—Choose this option if you will provision any of the following PPM port rates: FC1G (Ports 1-1 through 4-1), FC2G (Ports 1-1 and 3-1 only), FICON1G (Ports 1-1 through 4-1), FICON2G (Ports 1-1 and 3-1 only), ONE_GE (Ports 1-1 through 4-1), ISC3 COMPAT (Ports 1-1 through 4-1), ISC3 PEER 1G (Ports 1-1 through 4-1), and ISC3 PEER 2G (Ports 1-1 and 3-1 only). • FC4G—Choose this option if you will provision an FC4G or FICON4G PPM (Port 1-1 only).
Port 5-8 Mode	Sets the mode of operation for Ports 5-1 through 8-1.	Chose one of the following: • FC-GE_ISC—choose this option if you will provision any of the following PPM port rates: FC1G (Ports 5-1 through 8-1), FC2G (Ports 5-1 and 7-1 only), FICON1G (Ports 5-1 through 8-1), FICON2G (Ports 5-1 and 7-1 only), ONE_GE (Ports 5-1 through 8-1), ISC3 COMPAT (Ports 5-1 through 8-1), ISC3 PEER 1G (Ports 5-1 through 8-1), and ISC3 PEER 2G (Ports 5-1 and 7-1 only). • FC4G—choose this option if you will provision an FC4G or FICON4G PPM port rate (Port 5-1 only).

Note
The Provisioning > Cards tab also has a display-only Tunable Wavelengths field which shows the wavelengths supported by the card. If a MXP_MR_10DME_C card is installed, the 32 C-band wavelengths appear. If the MXP_MR_10DME_L card is installed, the 32 L-band wavelengths appear. If the MXP_MR_10DMEX_C card is installed, the 82 C-band wavelengths appear.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

Note
Loopbacks on MXP-MR-10DME are not applicable when Fiber Channel switches are present.

Note
If the Fiber Channel switch version is not present then the Distance Extension settings are not supported.

DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode

Purpose	This task changes the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card mode. 10GE_XP and 10GE_XPE cards can be provisioned as a Layer 2 Ethernet switch or a 10G Ethernet TXP. GE_XP and GE_XPE cards can be provisioned as a Layer 2 Ethernet switch, 10G Ethernet MXP, or 20G Ethernet MXP.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the card mode.

Step 2 In card view, click **Provisioning** > **Ether Ports** > **Ports**.

Step 3 Verify that any provisioned client or trunk ports have an **OOS-MA,DSBLD** (ANSI) or **Locked-enabled,disabled**(ETSI) service state in the Service State column. If so, continue with Step 4. If not, complete the following substeps.

a) For the first port that is not out of service, in the Admin State column, choose **OOS-MA,DSBLD** (ANSI) or **Locked-enabled,disabled** (ETSI).

b) Repeat Step a for each port that is not out of service.

c) Click **Apply**.

Step 4 Click the **Provisioning** > **Card** tabs.

Step 5 Choose one of the following card modes:

Table 100: GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Modes

Mode	Cards	Description
L2 over DWDM	GE_XP 10GE_XP GE_XPE 10GE_XPE	Provisions the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE as a Layer 2 switch.
10GE TXP	10GE_XP 10GE_XPE	Provisions the 10GE_XP or 10GE_XPE as a 10 Gigabit Ethernet transponder. Traffic received on the 10GE client Port 1-1 is sent to 10 Gigabit Ethernet trunk Port 3-1, and traffic received on 10 Gigabit Ethernet client Port 2-1 is sent to 10 Gigabit Ethernet trunk Port 4-1.

Mode	Cards	Description
10GE MXP	GE_XP GE_XPE	Provisions the GE_XP or GE_XPE as a 10 Gigabit Ethernet muxponder. Traffic received on Gigabit Ethernet client Ports 1-1 through 10-1 is multiplexed and sent to 10 Gigabit Ethernet trunk Port 21-1, and traffic received on Gigabit Ethernet client Ports 11-1 through 20-1 is multiplexed and sent to 10 Gigabit Ethernet trunk Port 22-1.
20GE MXP	GE_XP GE_XPE	Provisions the GE_XP or GE_XPE as a 20 Gigabit Ethernet muxponder. Traffic received on Gigabit Ethernet client Ports 1-1 through 20-1 is multiplexed and sent to 10 Gigabit Ethernet trunk Port 21-1. Trunk port 22-1 is not used.

The GE-XP and GE-XPE cards operating in 10GE MXP mode and configured for 100% traffic flow, do not drop frames when up to nine ports are in use. However, when all the ten ports are in use, some frames are dropped. When the tenth port is to be used, configure the Committed Info Rate (CIR) at 55% on any one of the ports. For more information about configuring the CIR, see DLP-G380 Provisioning Ethernet Settings.

Step 6 Click **Apply**, then click **Yes** in the confirmation dialog box.

Step 7 Return to your originating procedure (NTP).

DLP-G411 Provisioning an ADM-10G PPM and Port

Purpose	This task provisions a fixed-rate PPM and port on an ADM-10G PPM card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to provision PPM settings.

Step 2 Click the **Provisioning** > **Pluggable Port Modules** tabs.

Step 3 In the Pluggable Port Modules area, click **Create**. The Create PPM dialog box appears.

Step 4 In the Create PPM dialog box, complete the following:

- PPM—Choose the SFP you want to install from the drop-down list.
- PPM Type—Choose the number of ports supported by your SFP from the drop-down list. If only one port is supported,**PPM (1 port)** is the only option.

Step 5 Click **OK**. The newly created PPM appears in the Pluggable Port Modules area. The row in the Pluggable Port Modules area turns white and the Actual Equipment Type column lists the equipment name.

Step 6 In the Pluggable Ports area, click **Create**. The Create Ports dialog box appears.

Step 7 In the Create Ports dialog box, complete the following:

- Port—Choose the port you want to configure from the drop-down list.
- Port Type—Choose the port type, such as OC-3, OC-12, OC-48, or ONE-GE from the drop-down list.
  - Ports 1 - 8 can only be OC-3, OC-12, or ONE_GE
  - Ports 9 - 12 can on be OC-3 or OC-12
  - Ports 13 - 16 can only be OC-3, OC-12, or OC-48

Step 8 Click **OK**. The newly created port appears in the Pluggable Ports area. The port type you provisioned is listed in the Rate column.

Step 9 If you want to provision a PPM or another port, repeat Steps 4 through 8.

Step 10 Return to your originating procedure (NTP).

DLP-G452 Changing the OTU2_XP Card Mode

Purpose	This task changes the OTU2_XP card mode. The card mode determines which PPMs can be provisioned for the card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Caution Changing the card configuration to 10G Ethernet LAN Phy to WAN Phy automatically replaces the current port configurations (Ports 1 and 3) to 10G Ethernet and OC192. This resets and reboots the OTU2_XP card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the OTU2_XP card where you want to change the card mode.

Step 2 In card view, click the **Provisioning** > **Line** > **Ports** tabs.

Step 3 Verify that all provisioned client or trunk ports have an OOS-MA, DSBLD (ANSI) or Locked-enabled, disabled (ETSI) service state in the Service State column. If so, continue with Step 4. If not, complete the following substeps.

a) For the first port that is not out of service, in the Admin State column, choose **OOS, DSBLD** > **Locked, disabled** (ANSI) or (ETSI).

b) Repeat Step a for each port that is not out of service.

c) Click **Apply**.

Step 4 Click the **Provisioning** > **Card** tabs.

Step 5 Change the Card Configuration as needed:

- **Transponder**—Choose this option to provision the OTU2_XP card as a transponder. Port pairs 1-3 and 2-4 are both configured as transponders. This is the default card configuration.
- **Standard Regen**—Choose this option to provision the OTU2_XP card as a standard regenerator (with E-FEC only on one port). Port pairs 1-3 and 2-4 are both configured as regenerators.
- **Enhanced FEC**—Choose this option to provision the OTU2_XP card as an E-FEC regenerator (with E-FEC on two ports). Port pair 3-4 is configured as enhanced regenerator. Ports 1 and 2 are not used.
- **Mixed**—Choose this option to provision the OTU2_XP card as a transponder and a standard regenerator (mixed configuration). One of the port pair (1-3 or 2-4) is configured as a transponder and the other port pair as a standard regenerator.
- **10G Ethernet LAN Phy to WAN Phy**—Choose this option to provision the OTU2_XP card to enable the 10G Ethernet LAN Phy to WAN Phy conversion. Port pair 1-3 supports LAN Phy to WAN Phy conversion. Port pair 2-4 can be configured either as a transponder or a standard regenerator.

Note
If you revert to the previous release (release earlier than 9.10), be sure to disable the 10G Ethernet LAN Phy to WAN Phy conversion feature. If you do not disable the 10G Ethernet LAN Phy to WAN Phy feature, an error message stating that the user needs to disable 10G Ethernet LAN Phy to WAN Phy feature before reverting to the previous release is displayed.

Note
Table 11-188 on page 11-439 lists the Ethernet variables supported on Ports 1 and 3 of the OTU2_XP card that has the 10G Ethernet LAN Phy to WAN Phy enabled. When the card is in the 10G Ethernet LAN Phy to WAN Phy mode, no 10G FC RMONS are supported on Ports 2 and 4.

For more information on OTU2_XP card configuration rules, see the "OTU2_XP Card Configuration Rules" section.

Step 6 Click **Apply**. Then click **Yes** in the confirmation dialog box.

Step 7 Return to your originating procedure (NTP).

DLP-G274 Verifying Topologies for ETR_CLO and ISC Services

Purpose	This task verifies that the DWDM network topology can support the IBM ETR_CLO and ISC services.
Tools/Equipment	Cisco TransportPlanner site plan

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

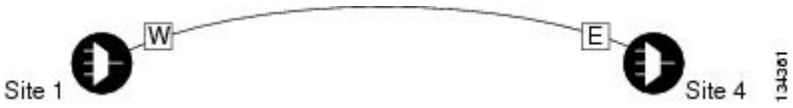
Procedure

Step 1 Display your site plan in Cisco TransportPlanner.

Step 2 Verify that the topology where you plan to run the ETR_CLO or ISC service can support the service. The following topologies support ETR_CLO or ISC:

- Single span—Two terminal sites with no intermediate sites in between and one of the following sets of cards installed:
  - 32WSS and 32DMX cards
  - 32WSS and 32-DMX-O cards
  - 40-MUX-C and 40-DMX-C/40-DMX-CE cards
  - 40-WSS-C/40-WSS-CE and 40-DMX-C/40-DMX-CE cards

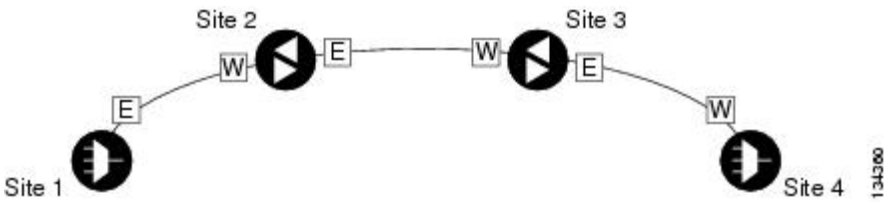
  Figure 42: Single-Span Topology

- Point-to-Point—Two terminal sites with one of the following sets of cards installed:
  - 32WSS and 32DMX cards
  - 32WSS and 32-DMX-O cards
  - 40-MUX-C and 40-DMX-C/40-DMX-CE cards
  - 40-WSS-C/40-WSS-CE and 40-DMX-C/40-DMX-CE cards

  Line amplifiers can be installed between the terminal sites, but intermediate (traffic terminating) sites cannot be installed.

  Figure 43: Point-to-Point Topology

- Two hubs—Two hub nodes in a ring with one of the following sets of cards installed:

- 32MUX-O and 32DMX-O cards
- 32WSS and 32DMX cards
- 32WSS and 32-DMX-O cards
- 40-MUX-C and 40-DMX-C/40-DMX-CE cards
- 40-WSS-C/40-WSS-CE and 40-DMX-C/40-DMX-CE cards

Line amplifiers can be installed between the hubs.

Figure 44: Hubs with No Line Amplifiers

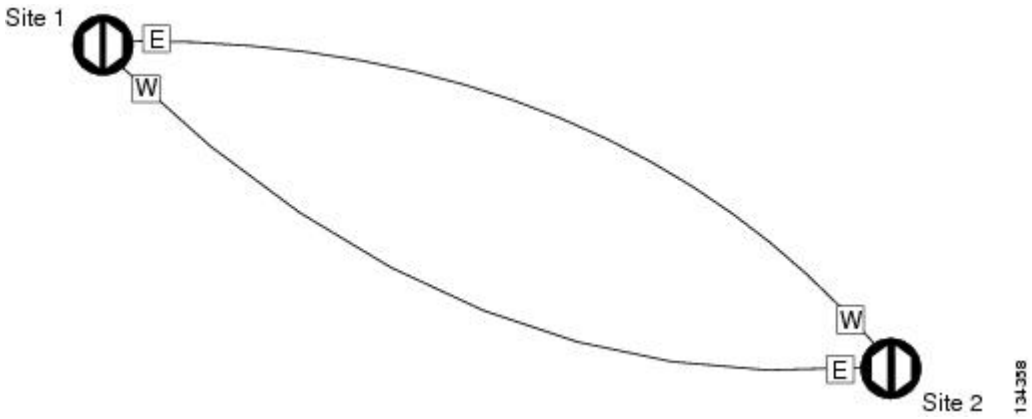
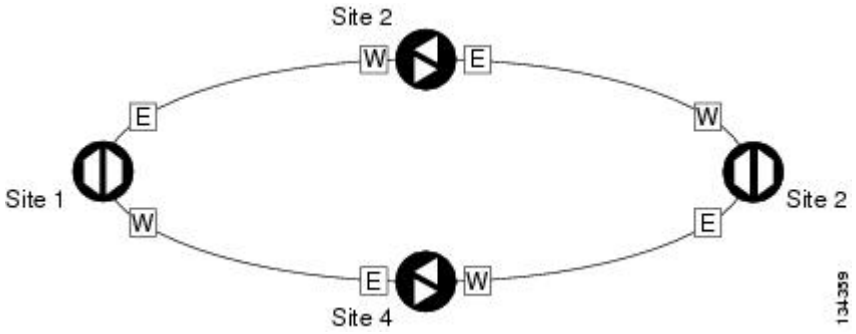


Figure 45: Hubs with Line Amplifiers



Step 3 Return to your originating procedure (NTP).

DLP-G278 Provisioning the Optical Line Rate

Purpose	This task provisions the line rate for TXP, MXP, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, 100ME-CKC, 100GS-CK-LC, 200G-CK-LC, WSE, 400G-XP-LC, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, ADM-10G, and OTU2_XP cards.
Tools/Equipment	None

Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G725 Preprovisioning PPM Slot • DLP-G274 Verifying Topologies for ETR_CLO and ISC Services, on page 291
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The optical line rate for cards with single-rate PPMs is provisioned automatically when you complete the "DLP-G726 Preprovisioning a Multirate PPM" task if the trunk port is out of service. If the optical line rate was provisioned automatically, you do not need to complete this task for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, MXP_2.5G_10EX_C, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or OTU2_XP card. If the trunk port was in-service when you provisioned the PPM, complete this task to provision the optical line rate manually for those cards.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to provision PPM ports. If the data rate that you are provisioning is DV-6000, HDTV, ESCON, SDI/D1 Video, ISC1, ISC3 (for TXP_MR_2.5G and TXPP_MR_2.5G cards), or ETR_CLO, complete the following steps. Otherwise, continue with Step 4.

a) Click the **Provisioning** > **OTN** > **OTN Lines** tabs.
b) In the ITU-T G.709 OTN field for the respective PPM, choose **Disable**.
c) In the FEC field for the respective PPM, choose **Disable**.
d) Click **Apply**.

Step 2 For the TXP_MR-10G card, click the **Provisioning** > **Data Rate Selection** tabs. For all other cards, go to Step 4.

Step 3 In the Data Rate Selection area, click **Create** and choose the type of port from the drop-down list. The supported port types are SONET (including 10G Ethernet WAN Phy) and 10G Ethernet LAN Phy.

Step 4 Click the **Provisioning** > **Pluggable Port Modules** tabs.

Step 5 In the Pluggable Ports area, click **Create**. The Create Port dialog box appears.

Step 6 In the Create Port dialog box, complete the following:

- Port—Choose the port and port number from the drop-down list. The first number indicates the PPM in the Pluggable Port Modules area, and the second number indicates the port number on the PPM. For example, the first PPM with one port appears as 1-1 and the second PPM with one port appears as 2-1. The PPM number can be 1 to 4, but the port number is always 1.
- Port Type—Choose the type of port from the drop-down list. The port type list displays the supported port rates on your PPM. See table "PPM Port Types" for definitions of the supported rates.

Step 7 Click **OK**. The row in the Pluggable Ports area turns white if the physical SFP is installed and light blue if the SFP is not installed. If the optical parameter values differ from the NE Default settings, change the port state to In-Service (for ANSI) or Unlocked (for ETSI) to synchronize the values with the NE Default settings.

Step 8 Repeat Step 5 through Step 7 to configure the rest of the port rates as needed.

Table 101: PPM Port Types

Card	Port Type
TXP_MR_2.5G TXPP_MR_2.5G	• OC-3/STM1—155 Mbps • OC-12/STM4—622 Mbps • OC-48/STM16—2.48 Gbps • ONE_GE—One Gigabit Ethernet 1.125 Gbps • ESCON—Enterprise System Connection 200 Mbps (IBM signal) • DV6000—Proprietary signal from video vendor • SDI_D1_VIDEO—Serial Digital Interface and Digital Video signal type 1 • HDTV—High Definition Television • PASS-THRU—Not specified • FC1G—Fibre Channel 1.06 Gbps • FC2G—Fibre Channel 2.125 Gbps • FICON1G—Fiber connectivity1.06 Gbps (IBM signal) • FICON2G—Fiber connectivity 2.125 Gbps (IBM signal) • ETR_CLO—External Time Reference–Control Link Oscillator • ISC compat—InterSystem Coupling Link 1 (ISC1) • ISC peer—InterSystem Coupling Link 3 (ISC3) • DVB-ASI — Proprietary signal from video vendor. Digital Video Broadcast - Asynchronous Serial Interface • ISC1— InterSystem Channel 1 Gbps (IBM signal)
MXP_2.5G_10G MXP_2.5G_10E MXP_2.5G_10E_C MXP_2.5G_10E_L MXP_2.5G_10EX_C	• OC-48/STM16—2.48 Gbps Automatically provisioned when the PPM is created if the trunk port is out of service.

Card	Port Type
TXP_MR_10G Provisioned on the Data Rate Selection tab.	• SONET (OC-192)/SDH (STM-64) including 10G Ethernet WAN Phy • 10G Ethernet LAN Phy
TXP_MR_10E TXP_MR_10E_C TXP_MR_10E_L TXP_MR_10EX_C	• SONET (OC-192)/SDH (STM-64) including 10G Ethernet WAN Phy—10 Gbps • 10G Ethernet LAN Phy—10 Gbps Ethernet • 10G Fibre Channel—10 Gbps Fibre Channel • (TXP_MR_10EX_C only) IB_5G
40E-TXP-C 40ME-TXP-C	• SONET (OC-768)/SDH (STM-256) • 40G Ethernet LAN Phy • OTU3
MXP_MR_2.5G MXPP_MR_2.5G	If the card mode is FC_GE: • FC1G ISL—Fibre Channel 1.06 Gbps (Ports 1-1 and 2-1) • FC2G ISL—Fibre Channel 2.125 Gbps (Port 1-1 only) • FICON1G ISL—Fiber connectivity 1.06 Gbps (IBM signal) (Ports 1-1 and 2-1) • FICON2G ISL—Fiber connectivity 2.125 Gbps (IBM signal) (Port 1-1 only) • ONE_GE—One Gigabit Ethernet 1.125 Gbps (Ports 1-1 and 2-1 only) If the card mode is Mixed: • FC1G ISL—Fibre Channel 1.06 Gbps (Port 1-1 only) • FICON1G ISL—Fiber connectivity 1.06 Gbps (IBM signal) (Port1-1 only) • ONE_GE—One Gigabit Ethernet 1.125 Gbps (Port 1-1 only) • ESCON—Enterprise System Connection 200 Mbps (IBM signal) (Ports 5-1 through 8-1) If the card mode is ESCON: • ESCON—Enterprise System Connection 200 Mbps (IBM signal) (Ports 1-1 through 8-1)

Card	Port Type
MXP_MR_10DME_C MXP_MR_10DME_L MXP_MR_10DMEX_C	If the port mode is FC_GE_ISC: • FC1G—Fibre Channel 1.06 Gbps (Ports 1-1 through 8-1) • FC2G—Fibre Channel 2.125 Gbps (Ports 1-1, 3-1, 5-1, and 7-1 only; ports are not available if the port that follows—2-1, 4-1, 6-1, or 8-1—has a PPM provisioned.) • FICON1G—Fiber connectivity 1.06 Gbps (IBM signal) FICON2G—Fiber connectivity 2.125 Gbps (IBM signal) (Ports 1-1, 3-1, 5-1, and 7-1 only; ports are not available if the port that follows—2-1, 4-1, 6-1, or 8-1—has a PPM provisioned.) • ONE_GE—One Gigabit Ethernet 1.125 Gbps (Ports 1-1 through 8-1) • ISC COMPAT (Ports 1-1 through 8-1) • ISC3 PEER 1G (Ports 1-1 through 8-1) • ISC3 PEER 2G (Ports 1-1, 3-1, 5-1, and 7-1 only; ports are not available if the port that follows—2-1, 4-1, 6-1, or 8-1—has a PPM provisioned.) If the port mode is FC4G: • FC4G—Fibre Channel 4.25 Gbps (Ports 1-1 or 5-1 only; ports are not available if any of the three ports that follow has a PPM provisioned.) • FICON4G—Fiber connectivity 4.25 Gbps (IBM signal) (Ports 1-1 or 5-1 only; ports are not available if any of the three ports that follow has a PPM provisioned.)
40G-MXP-C 40E-MXP-C 40ME-MXP-C	• SONET (OC-192)/SDH (STM-64) • FC8G • FC10G • TEN_GE • OTU2
GE_XP 10GE_XP GE_XPE 10GE_XPE	• GE_XP and GE_XPE client ports1 • 10GE_XP and 10GE_XPE client and trunk ports; GE_XP and GE_XPE trunk ports1

Card	Port Type
OTU2_XP	• SONET (including 10G Ethernet WAN Phy)—10 Gbps • 10G Ethernet LAN Phy—10 Gbps Ethernet • 10G Fiber Channel—10 Gbps Fibre Channel • IB_5G—InfiniBand 5 Gbps **Note** If you have an OTU2 signal in which the OPU2 has been generated by multiplexing four ODU1 signals, choose SONET as the port rate. This allows the OTU2 signal to be transported transparently in standard or E-FEC regenerator configuration.
AR_MXP AR_XP AR_XPE	• OC-3/STM1—155 Mbps • OC-12/STM4—622 Mbps • OC-48/STM16—2.48 Gbps • Gigabit Ethernet—1.125 Gbps • Fast Ethernet—100 Mbps • ESCON-Enterprise System Connection 200 Mbps (IBM signal) • FC1G—Fibre Channel 1.06 Gbps • FC2G—Fibre Channel 2.125 Gbps • FC4G—Fibre Channel 4.25 Gbps • FC8G—Fibre Channel 8.5 Gbps • FICON1G—Fiber connectivity1.06 Gbps (IBM signal) • FICON2G—Fiber connectivity 2.125 Gbps (IBM signal) • FICON4G—Fiber connectivity 4.25 (IBM signal) • FICON8G—Fiber connectivity 8.5 Gbps (IBM signal) • SD-SDI—270 Mbps • HD-SDI—1.485 Gbps • Third-generation SDI (3G-SDI)—2.970 Gbps • OTU2E —11.09 Gbps • OTU1—2.66 Gbps

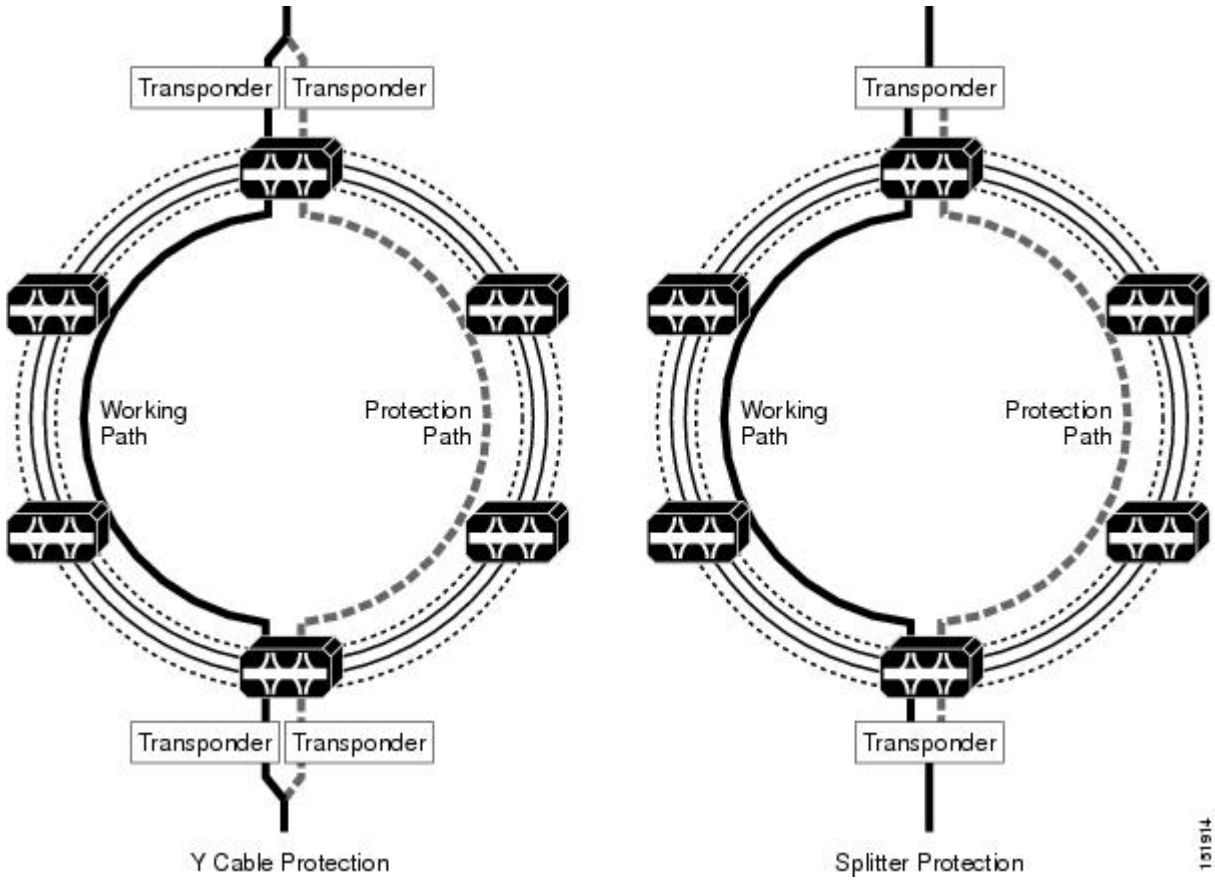
Card	Port Type
100G-LC-C 10x10G-LC CFP-LC 100G-CK-C 100G-ME-C 100ME-CKC 400G-XP-LC	• SONET (OC-192)/SDH (STM-64) • 10G Ethernet LAN Phy • 40G Ethernet LAN Phy • 100 GE • FC 8G • FC 10G • OTU2 • OTU3 • OTU4 • IB_5G
WSE	• 10GE LAN PHY • 8G FC • 10G FC • SONET (OC-192)/SDH (STM-64) • OTU2 • OTU2e

Step 9 Return to your originating procedure (NTP).

Transponder and Muxponder Protection Topologies

The ONS 15454 supports Y-cable and splitter protection for transponder (TXP) and muxponder (MXP) cards. The following figure shows Y-cable and splitter protection.

Figure 46: Y-Cable and Splitter Protection



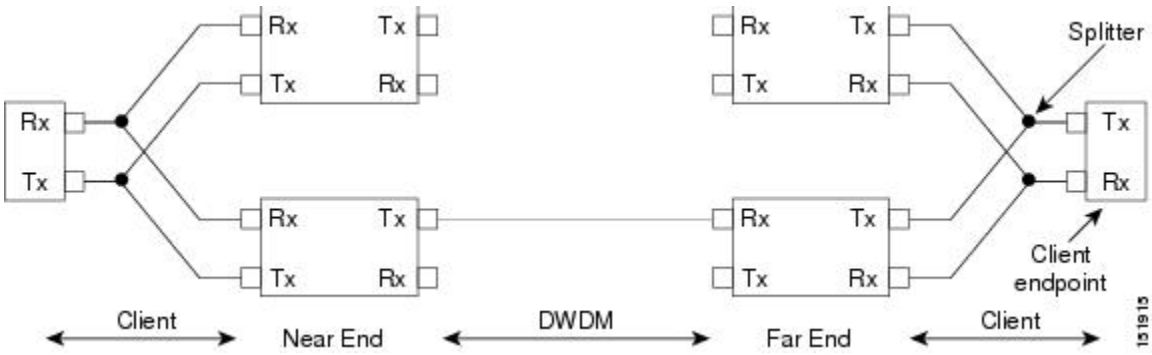
Y-Cable Protection

The Y-cable protection scheme employs two Y cables, which are hardware combiner/splitters. A signal injected into the stem of the Y is duplicated into both arms of the Y with 50 percent attenuation in each arm. Signals injected into the arms of the Y are summed into the stem of the Y.

A Y-cable protection group requires two DWDM cards with the arms of the Y-cables connected to the client ports on the DWDM cards, and the stems of the Y-cables connected to the client source, such as an OC-N card. When a TXP Y-cable protection group is required, the two TXP cards must be installed in the same shelf assembly in adjacent slots.

The following figure shows a functional block diagram of Y-cable protection.

Figure 47: Y-Cable Protection

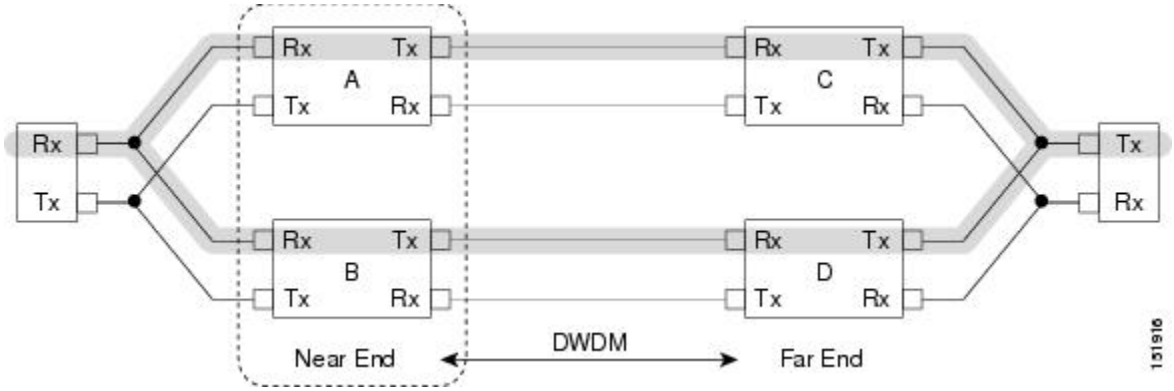


A Y-cable protection group has two paths:

- Transmit (TX) path, defined as the client RX and the trunk TX
- Receive (RX) path, defined as the trunk RX and the client TX

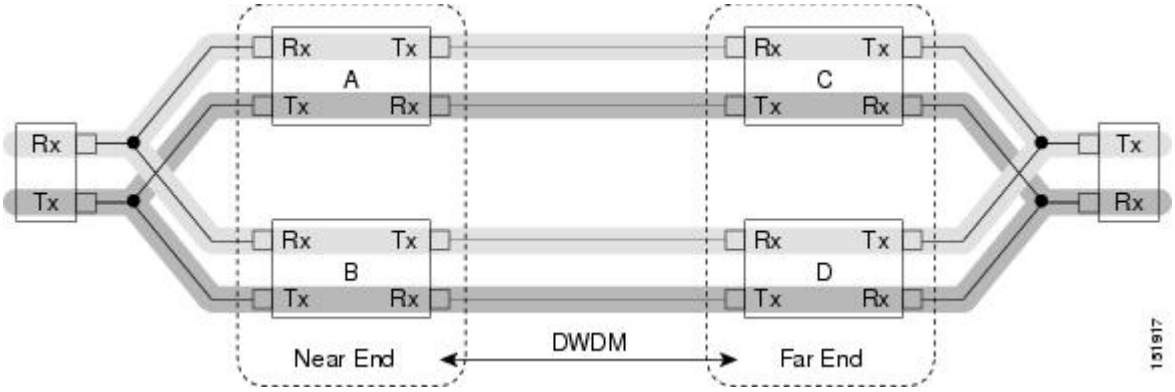
The basic behavior of the Y-cable group is that an incoming client signal is bridged to the two TX paths, and one RX path is selected for the outgoing client signal. Thus, a Y-cable protection group only protects against defects in the RX path. The following figure shows the RX path for the near-end Y-cable protection group.

Figure 48: Rx Path for Near-End Y-Cable Protection



To protect against all defects, a pair of Y-cable protection groups is required. Each protects against defects in its own RX path. The following figure shows how the near-end and the far-end jointly protect against defects.

Figure 49: Near-End and Far-End Y-Cable Protection



A Y-cable protection group is defined by two client ports on two different cards. One client port is designated as working and the other is designated as protect. Some of the rules in a Y-cable protection are as follows:

- The cards must have the same equipment type.
- The cards must have the same payload data type.
- The cards must have the same termination mode.
- The client ports must have the same payload type.
- The client ports must have the same facility number.
- The cards must have the same operating mode.

For example, a Y-cable protection group can include MXP Client 2 on the working and protect cards, but cannot include Client 2 on the working card if Client 3 is on the protect card. TXP cards have a single client (facility 1), so this requirement is satisfied by default.

Zero, one, two, or all of the client ports on an MXP card can be in Y-cable protection groups. Some clients can be in a protection group while others are unprotected.

The client ports on a card that are in Y-cable protection groups are either all working or all protect. You cannot mix working and protect client ports on the same card. For convenience, the trunk ports adopt the designation (working or protect) of the client ports.

The Y-cable protection groups on an MXP card switch independently. A Y-cable protection group performs protection switching by disabling the transmitter on the standby client port and enabling the active client port.

The protection group does not enable the active transmitter, because the active transmitter may have been disabled for other reasons. The port is disabled if it has an OOS-DBLD service state, is squelched, or is shutdown by automatic laser shutdown (ALS). The protection group releases a signal that the active transmitter is disabled. This activity changes the RX path but not the TX path. A Y-cable protection group can only protect its RX path.

A Y-cable protection group enables its client receivers unless the client facilities have an OOS-DSBLD service state. This means that client receivers (and trunk transmitters) are operational regardless of the active/standby status of the card. Traffic might not be lost if both client lasers in a Y-cable protection group are enabled. If the output powers of the two lasers are not identical, then the receiver at the stem of the Y-cable can opt for the stronger client laser and ignore the weaker signal.

Splitter Protection

The protection group is defined by the two trunk ports on the splitter card. One trunk port is designated working and the other is designated as protect. A splitter card has a single trunk laser and a hardware splitter that duplicates the trunk signal out of the card's two trunk ports. The switch in the card receives one of the two trunk input signals and the received signal is connected to the client ports.

A splitter protection group has two TX paths and two RX paths on the same card; the paths share client ports. The TX path is defined as the client RX and the trunk TX, and the RX path is defined as the trunk RX and the client TX. In a splitter group, an incoming client signal is bridged to the TX paths, and one RX path is selected for the outgoing client signal.

A splitter protection group performs switching by enabling the receiver of the active trunk port and then routing the active trunk traffic to the client ports. The protection group does not disable the transmitter on the standby trunk port.

Splitter protection is supported in AR_MXP, AR_XP, AR_XPE, and 10x10G-LC cards by configuring the operating mode.

When any client port of the 10x10G-LC card is involved in Y-cable protection group, then splitter protection must not be allowed in that card.

Switch Criteria

Cisco Transport Controller (CTC), the ONS 15454 software interface, performs protection switches based on priority, trunk and client line conditions, switch commands, unidirectional/bidirectional switching, and other criteria.

Switch Priority

Switch priorities are defined in the following table.

Table 102: Switch Priorities

Request/State	Abbreviation	Priority
Lockout of Protection	LO	8 (highest)
Forced Switch	FS	7
Signal Fail	SF	6
Signal Degrade	SD	5
Manual Switch	MS	4
Wait to Restore	WTR	3
Do Not Revert	DNR	2
No Request	NR	1 (lowest)

All switch criteria are assigned a numerical priority, which is reversed from ITU-T G.873.1 to avoid confusion when comparing priorities. In this document, a higher priority is numerically greater than a lower priority.

If the protection channel and the working channel have conditions with the same priority, and the priority is greater than Do Not Revert (DNR), then the condition on the protection channel takes precedence.

In practice, only two priorities can exist independently and simultaneously on the working and protection channels: signal fail (SF) and signal degrade (SD). This requirement means that if both channels have, for example, an SF condition without any higher conditions present, then the protection group chooses the working channel. Traffic switches away from the highest-priority condition.

Line Conditions on the Trunk

The following line conditions on the trunk generate the priorities given:

- OTUn-LOS on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- OTUn-LOF on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- OTUn-LOM on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- OTUn-AIS on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- ODUn-AIS on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- OTU BER SF on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- OTU BER SD on a trunk, if ITU-T G.709 is enabled, has an SD priority.
- TIM on OTU SM TTI on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- TIM on ODU PM TTI on a trunk, if ITU-T G.709 is enabled, has an SF priority.
- S-LOF on a trunk, if ITU-T G.709 is disabled and the trunk is OCn, has an SF priority.
- S-LOS on a trunk, if ITU-T G.709 is disabled and the trunk is OCn, has an SF priority.
- SF on a trunk, if ITU-T G.709 is disabled and the trunk is OCn, has an SF priority.
- SD on a trunk, if ITU-T G.709 is disabled and the trunk is OCn, has an SD priority.
- AIS-L on a trunk, if ITU-T G.709 is disabled and the trunk is OCn, has an SF priority.
- RS-LOF on a trunk, if ITU-T G.709 is disabled and the trunk is STMn, has an SF priority.
- RS-LOS on a trunk, if ITU-T G.709 is disabled and the trunk is STMn, has an SF priority.
- SF on a trunk, if ITU-T G.709 is disabled and the trunk is STMn, has an SF priority.
- SD on a trunk, if ITU-T G.709 is disabled and the trunk is STMn, has an SD priority
- MS-AIS on a trunk, if ITU-T G.709 is disabled and the trunk is STMn, has an SF priority.
- TIMS-S on J0 on a trunk, if ITU-T G.709 is disabled and TIM is enabled, has an SF priority.
- RS-TIM-S on J0 on a trunk, if ITU-T G.709 is disabled and TIM is enabled, has an SF priority.
- CARLOSS on a trunk, if ITU-T G.709 is disabled and the payload is GigE, has an SF priority.
- SIGLOSS on a trunk, if ITU-T G.709 is disabled and the payload is Fibre Channel (any speed), has an SF priority.
- GE-OOSYNC on a trunk, if ITU-T G.709 is disabled and the payload is 10GigE, has an SF priority.
- OOS on a trunk, if ITU-T G.709 is disabled and the payload is GigE, has an SF priority.
- OOS on a trunk, if ITU-T G.709 is disabled and the payload is Fibre Channel, has an SF priority.
- SYNCLOS on a trunk, if ITU-T G.709 is disabled and the payload is Fibre Channel, has an SF priority.

Line Conditions on the Client

Most of the defects on client ports are corrected by switching at the far-end protection group.

In a Y-cable protection group, a line alarm indication signal (AIS-L) on the client signal has an SF priority if generic framing procedure (GFP) is not used and the client framing is SONET.

Switch Commands

Switch commands have the following priorities:

- A Lockout of Protect (Lockon Working) switch command has an LO priority on the protect port.
- A Force From Working (Force to Protect) switch command has an FS priority on the working port.
- A Force From Protect (Force To Working) switch command has an FS priority on the protect port.
- A Manual From Working (Manual To Protect) switch command has an MS priority on the working port.
- A Manual From Protect (Manual To Working) switch command has an MS priority on the protect port.
- A Clear command cancels (unlocks) any switch command.

Unidirectional and Bidirectional Switching

Y-cable and splitter protection support unidirectional switching. In unidirectional switching, the near-end protection group switches without regard for the status of the far-end protection group.

Therefore, the near-end working facilities can be active at the same time the far-end protection facilities are in standby. This does not mean that a defect at the far end will not cause a near-end switch. A defect at the far end might result in a condition at the near end, which then causes a switch, but the switch is caused by the near-end condition.

Bidirectional protection cannot be provisioned unless the near end and far end have the same hardware and data modes and the trunks are connected as working-to-working and protect-to-protect.

Any other configuration results in an undefined behavior. Y-cable and splitter protection groups are not required to detect misconfigured bidirectional protection.

A Y-cable or splitter protection group switches unidirectionally unless at least one trunk signal is intact and there is an operational card terminating the trunk signal at the far end.

Other Switch Criteria

This section details switch criteria other than line conditions. A card is said to become operational after it has received and processed the first provisioning message after a warm or cold boot. A card ceases to be operational when it is reset, either with a soft reset request or a hardware reset.

A soft reset of a card does not cause a protection switch or a traffic disruption greater than the disruption induced by the soft reset of an unprotected card. If one or both cards are not operational, then any disruption of traffic on the active card will cause traffic loss until both cards have become operational again.

Switch conditions with a priority lower than FS are ignored by a Y-cable protection group unless both cards are operational. Switch conditions cannot be used to restore traffic while one member of the protection group is reset. For instance, if the working/active card is soft reset and a Forced Switch to the protect card is issued, the protect client laser will turn on but the working client laser will not turn off. Traffic will be lost until the working card becomes operational and can process the Forced Switch request.

The LO and FS switch conditions are accepted by the shelf regardless of the operational status of the cards in a Y-cable protection group or a splitter protection group. A nonoperational card cannot process the switch condition; the provisioning has been accepted by the shelf controller and will be issued to the cards when it becomes operational.

The LO and FS switch conditions are implemented immediately by the operational cards in a Y-cable protection group even if one card is nonoperational. This might cause traffic loss.

Y-cable protection switching is inhibited during a shelf controller reset. Protection switching does not resume until the cards receive their first provisioning message from the active shelf controller.

Each card in a Y-cable protection group begins its provisioning hold-off timer after processing the first provisioning message. For proper behavior, both cards should be provisioned within the provisioning hold-off timer interval. A card missing condition has an SF+ priority. This gives the card missing condition a higher priority than any span alarm.

- A card MEA condition has an SF priority.
- An SFP failure condition has an SF priority.
- An SFP mismatch (failure to support the data rate or mode) condition has an SF priority.
- An SFP missing condition has an SF priority.
- A wavelength mismatch condition has an SF priority.
- A port that is OOS-DSBLD has an SF+ priority.
- The OOS-DSBLD condition has a higher priority than any span alarm.
- A port that is shutdown by ALS has an SF priority.

The hold-off timer interval is not applicable for WSE, 10x10G-LC, 100G-LC-C, 100G-CK-C, 100GS-CK-LC, and 200G-CK-LC cards.

Switch Stability

Y-cable and splitter protection groups use a variety of timers to prevent oscillation, as detailed in the following requirements. No timer is provisionable.

The protection groups implement soak-to-clear timers. A soak-to-clear timer starts when a switch condition clears. While the timer is running, the protection group behaves as though the switch condition is still present. If the switch condition recurs before the timer has expired, the timer is canceled. When the switch condition clears, the timer is restarted.

The durations of soak-to-clear timers are not user-provisionable and are unrelated to the soak times for alarms and conditions. A soak-to-clear timer is not started when a switch condition clears if the switch condition has a lower priority than the currently active switch condition For example, an SD BER soak-to-clear timer will not start if SD BER clears while AIS is present, since AIS has a higher priority than SD BER. All line defects with an SF priority, except for SF BER, share a single one-second soak-to-clear timer. SF BER and SD BER line conditions have a 10-second soak-to-clear timer.

The protection group does not switch sooner than 1.5 seconds after the last switch (the switch hold-off timer). This timer prevents rapid oscillation of the protection group.

A Y-cable protection group does not switch for the first 5 seconds after it is created unless both cards in the protection group become active before 5 seconds elapses.This delay allows both cards in the protection group to be provisioned before any switching decisions are made.

A Y-cable protection group does not switch sooner than 0.5 seconds after a client or trunk facility moves from the OOS-SDBLD state. This hold-off timer allows the cards to ignore transients caused by a port going in-service. The ALS condition has a 3 second soak-to-clear timer.

Revertive and Nonrevertive Attributes

Both revertive and nonrevertive switching is supported; the default switch mode is nonrevertive.

Network element (NE) defaults contain a revertive attribute for Y-cable and splitter protection. When applicable in revertive mode, the revert delay timer, also called the Wait-To-Restore (WTR) timer, is software provisionable for Y-cable and splitter protection. The WTR timer is provisionable between 0.5 and 12 minutes, in 0.5 minute increments, and it has a default value of 5 minutes.

When applicable, the NE defaults contain a WTR attribute for Y-cable and splitter protection. When a Y-cable protection group is deleted, a dialog box will appear warning of possible traffic loss.

Communications Channels

In a Y-cable protection group, only the working client cam be provisioned with a section data communications channel (SDCC) or line data communications channel (LDCC), and only the working client port can be provisioned as a timing reference (as permitted by payload). The working and protect trunks can be provisioned separately with communication channels (SDCC, LDCC, or generic communications channel [GCC], as permitted by payload type). The communication channels are not protected.

Inherited Port Properties

Selected port properties of the protection port are inherited from the working port. In this section, the word port refers to a Y-cable client port or a splitter trunk port:

- The maximum Ethernet Frame Size of the protect port is inherited from the working port.
- The Port Type (SONET or SDH) of the protect port is inherited from the working port.
- The Termination Mode of the protect port is inherited from the working port.
- The SF BER threshold of the protect port is inherited from the working port.
- The SD BER threshold of the protect port is inherited from the working port.
- The SyncMsgIn and SendDoNotUse attributes of the protect port are inherited from the working port.
- Section trace provisioning of the protect port is inherited from the working port.
- The line thresholds of the protect port are inherited from the working port.
- The SDCC/LDCC/GCC provisioning of the protect port is inherited from the working port.
- The ALS provisioning of the protect port is inherited from the working port.

ALS is not permitted on the client ports of Y-cable protection groups. This requirement applies only to splitter protection groups.

Switch Status Reporting

Y-cable and splitter protection groups indicate to management software the active/standby status of facilities and cards involved in the protection group. A facility has an active/standby status within the protection group and it has a status that is reported to the management software. These two do not always coincide. Internally, the protection group always has one active facility and one standby facility. In some circumstances, the protection group reports both facilities as standby.

The reported status of any port on a nonoperational card is undefined. While a card is reset, its status might or might not be reported properly. Because the card does not report any status, the report to the user is a function of the management software, not the protection group.

A Y-cable protection group reports a separate status for the TX path and the RX path, for every facility. The active/standby status of the protection group is reported as the status of the RX path. If the status of the far-end protection group is known, then the status of the far-end protection group is reported as the status of the near-end TX path.

The ability of a protection group to know the status of the far-end protection group is a function of the equipment type and the trunk type. If the status of the far-end protection group is not known, the status of the near-end protection group shall be reported as the status of the TX path.

A Y-cable protection group has at most one active client port. A port in a Y-cable or splitter protection group is reported as standby if it has an OOS-DSBLD service state, regardless of its status within the protection group. A port in a Y-cable or splitter protection group is reported as active if it does not have an OOS-DSBLD

state and if it carries overhead traffic (GCC, SDCC, LDCC, or E1 bytes), regardless of its status within the protection group.

A client port in a Y-cable protection group is reported as active if it does not have an OOS-DSBLD service state and if it is active within the protection group. A trunk port in a Y-cable protection group is reported as active if it does not have an OOS-DSBLD service state and if any client port on the same card is active.

Transponders have exactly one client port, and the relationship of client to trunk is clear. Muxponder cards have multiple client ports, which means that multiple protection groups are present. If any client port on a muxponder is active, and if the trunk is in-service, the trunk is also reported as active.

Client ports and trunk ports on unprotected cards (cards not part of any protection group) are reported as active if they do not have an OOS-DSBLD service state.

Switch Conditions

Protection groups generate conditions and transient conditions to provide a status to the node management software. Common conditions include:

- The protection group raises a MAN-REQ condition against the working facility while a Manual Switch to Protection switch command is in effect.
- The protection group raises a MAN-REQ condition against the protection facility while a Manual Switch to Working switch command is in effect.
- The protection group raises a FORCED-REQ condition against the working facility while a Forced Switch to Protection switch command is in effect.
- The protection group raises a FORCED-REQ condition against the protection facility while a Forced Switch to Working switch command is in effect.
- The protection group raises a LOCKOUT-REQ condition against the protection facility while a Lockout of Protection switch command is in effect.
- The protection group signals an APS-CLEAR condition when a switch command is preempted by a higher-priority switch condition.
- The protection group signals a FAILTOSW condition while a switch command is inhibiting a protection switch due to a lower-priority line condition.
- The protection group raises a WTR condition against the working facility while the Wait To Restore timer is running.
- The protection group, if it is in revertive mode, raises a WKSWPR condition against the working facility while the protection facility is active.
- The protection group, if it is in nonrevertive mode, signals a WKSWPR condition against the working facility when the protection facility becomes active.
- The protection group, if it is nonrevertive, signals a WKSWBK condition against the working facility when the working facility becomes active.

Protection Switching Performance Requirements

Protection switching is executed within 50 ms of a defect appearing at the near end. Loss of light on the client outputs of a Y-cable protection group does not exceed 20 ms during a switch.

During a protection switch, the standby client transmitter turns off, and the active client transmitter turns on. If the standby transmitter turns off before the active transmitter is fully on, a loss of light occurs at the stem of the Y-cable. This loss of light does not last longer than 20 ms. If a payload cannot tolerate a loss of light less than 20 ms, then that payload cannot be used with Y-cable protection.

Usability Requirements

The following section discusses regeneration groups, automatic laser shutdown, and client signal failures.

Regeneration Groups

A regeneration group boosts the power and improves the signal-to-noise (S/N) ratio in a DWDM signal. The purpose is to extend the reach of a DWDM signal between two termination points. In an ideal condition, regeneration is totally transparent to the endpoints. However, some regeneration techniques fall short of this ideal condition and might modify, delay, or even drop overhead signals (ITU-T G.709, GFP, or other section-level signaling protocols).

The behavior of Y-cable and splitter protection groups is unchanged by the presence of a single peer-to-peer regeneration group in one or both of the DWDM spans. This requirement cannot be met if the regeneration corrupts the overhead bytes that are necessary for protection switching.

Automatic Laser Shutdown

ALS disables the transmitter of a facility if the receiver of the same facility detects a loss of light. ALS exists as a human-safety standard. After ALS shuts down the transmitter, it is not restarted until the loss of light condition clears. To facilitate restarting lasers when both ends of a span are shut down by ALS, the facility can be provisioned to send short test pulses of light. ALS is not permitted on the client ports of a Y-cable protection group.

Client Signal Failures

Y-cable protection groups can protect against failures of the client RX signal at the end. The far-end client RX failure can be in the fiber (in an “arm” of the Y), in the equipment (for example, the SFP), or in the provisioning (client OOS-DSBLD). These failure types require special handling because they are out-of-band with respect to the normal client payload. The term used for these failures is client signal fail (CSF). This has the same meaning as GFP-CSF, but does not imply that GFP-CSF is used for the signaling. Client signal failures include:

- An S-LOF on a client port, if the client is OC-N, is signaled to the downstream client port as a CSF.
- An S-LOS on a client port, if the client is OC-N, is signaled to the downstream client port as a CSF.
- An RS-LOF on a client port, if the client is STM-N, is signaled to the downstream client port as a CSF.
- An RS-LOS on a client port, if the client is STM-N, is signaled to the downstream client port as a CSF.
- A GE-OOSYNC on a client port, if the client is GigE or 10GigE, is signaled to the downstream client port as a CSF.
- An SFP missing condition on a client port is signaled to the downstream silent port as a CSF.
- An SFP mismatch (failure to support client data rate) condition on a client port is signaled to the downstream client port as a CSF.
- An SFP failure condition on a client port is signaled to the downstream client port as a CSF.
- An OOS-DSBLD condition on a client port is signaled to the downstream client port as a CSF.

In-service Upgrade

A Y-cable group switches normally during a software activation or software revert if both cards in the Y-cable group are running the same software release.

This behavior is different from that of OC-N 1+1 protection groups, which will not switch until the software activation is complete. The Y-cable group is able to switch before either card has booted to the new release

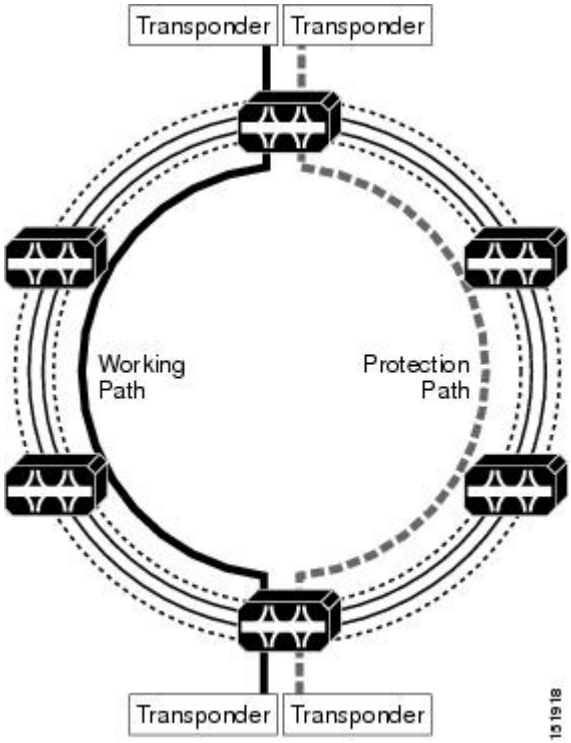
and after both cards have booted to the new release. This requirement does not preempt the other requirements that both cards be operational and that an active TCC2/TCC2P be installed.

Path Diversion Support for Client Protection

The ONS 15454 DWDM system provides the capability to provision unprotected wavelengths on a per-wavelength basis and supports the reuse of unprotected wavelengths on adjacent spans.

The following figure provides examples of unprotected wavelengths.

Figure 50: Example of Unprotected Wavelengths



NTP-G33 Creating a Y-Cable Protection Group

Purpose	This procedure creates a Y-cable protection group between the client ports of two TXP, MXP, AR_XP, AR_MXP, AR_XPE, 10x10G-LC, CFP-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or OTU2_XP cards when the cards are provisioned in the TXP or MXP mode.
Tools/Equipment	• Installed TXP, MXP, AR_MXP, AR_XP, AR_XPE, 10x10G-LC, CFP-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or OTU2_XP card. • Cisco TransportPlanner Traffic Matrix

Prerequisite Procedures	• NTP-G313 Installing and Configuring the TNC, TNCE, TSC, or TSCE Card • NTP-L41 Unpacking and Inspecting the Shelf • DLP-G46 Log into CTC • NTP-G139 Verifying Cisco Transport Planner Reports and Files
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Y-cable protection is available for the 100GS-CK-LC and 200G-CK-LC cards only in the MXP-10x10G operating modes

Note In the MXP-10x10G opmode, for the 200G-CK-LC and 10x10G-LC cards, Y-cable creation for OTU2 client payload of 10x10G-LC is not supported in R10.70.

Note In the MXP-10x10G-100G opmode, Y-cable creation for client ports of 10x10G-LC, for the combination of 200G-CK-LC and 100GS-CK-LC trunk cards is not supported in R10.70.

Note Y-cable protection is available for the 10x10G-LC card when it is provisioned in one of the following modes:

- TXP-10G mode—The client ports are provisioned with 10G Ethernet LAN Phy, 8G FC, 10G FC, OTU2, and OC192/STM-64 payloads.
- MXP-10G mode—The client ports are provisioned with 10GE, 8G FC, 10G FC, OTU2, and OC192/STM-64 payloads.

Note Y-cable protection is available for the 100G-CK-C card for the CPAK-100G-LR4 pluggable with 100GE/OTU4 payloads.

Note Y-cable protection is available for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards when they are provisioned in the 10GE MXP, 20GE MXP, or 10GE TXP mode. If you are provisioning Y-cable protection for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards, the Ethernet mode must be set to 1000 and 10000 Mbps respectively. To provision the Ethernet mode, see the DLP-G380 Provisioning Ethernet Settings, on page 519. Y-cable protection cannot be provisioned for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards when they are provisioned in L2-over-DWDM mode.

Note Y-cable protection is available for the OTU2_XP card when it is provisioned in the TXP card mode. The OTU2-XP and 40E-MXP-C card cannot implement Y-cable protection for the client ports in 10 GE LAN PHY mode. Hence, a pair of OTU2_XP cards is used at each end in pass-through mode (Transponder mode with G.709 disabled) to implement Y-cable protection. The 40E-MXP-CE card can implement Y-cable protection without the OTU2-XP card for the client ports in LAN PHY GFP mode. However, the 40E-MXP-CE card cannot implement Y-cable protection without the OTU2-XP card for the client ports in LAN PHY WIS mode.

Note For SONET or SDH payloads, Loss of Pointer Path (LOP-P) alarms can occur on a split signal if the ports are not in a Y-cable protection group.

Procedure

Step 1 View the Cisco Transport Planner Traffic Matrix (see the Cisco Transport Planner Node Setup Information and Files table) for your site. Verify the cards that need Y-cable protection groups. (Cards requiring Y-cable protection are indicated with "Y-Cable" in the Traffic Matrix table Protection Type column.)

Step 2 Verify that the cards are installed according to the requirements specified in Cable Connections for Y-Cable Protection of One Client Signal. Protection Types, on page 314 lists the protection types available for DWDM client cards.

Step 3 Verify that pluggable ports are provisioned for the same payload and payload rate on the cards where you want to create the Y-cable protection group:

a) Display the card in card view.
b) Click the **Provisioning** > **Pluggable Port Module** tab.
c) Verify that a pluggable port is provisioned in the Pluggable Port Module area, and the payload type and rate is provisioned for it in the Pluggable Ports area. If they are not the same, for example, if the pluggable port and rate are not the same, you must either delete the provisioned rate and create a new rate to match using the DLP-G725 Preprovisioning PPM Slot task or replace the pluggable port (SFP or XFP) using the DLP-G728 Remove PPM from the Line Card task.

Step 4 In node view (single-shelf mode) or shelf view (multishelf mode), click the **Provisioning** > **Protection** tabs.

Step 5 In the Protection Groups area, click **Create**.

Step 6 In the Create Protection Group dialog box, enter the following:

- Name—Type a name for the protection group. The name can have up to 32 alphanumeric (a-z, A-Z, 0-9) characters. Special characters are permitted. For TL1 compatibility, do not use question mark (?), backslash (\), or double quote (“) characters.
- Type—Choose **Y Cable** from the drop-down list.
- Protect Port—From the drop-down list, choose the port that will be the standby or protection port to the active port. The list displays the available transponder or muxponder ports. If transponder or muxponder cards are not installed, no ports appear in the drop-down list.

After you choose the protect port, a list of available working ports appear in the Available Ports list. If no cards are available, no ports appear. If this occurs, you can not complete this task until you install the physical cards or preprovision the slots.

Step 7 From the Available Ports list, select the port that will be protected by the port you selected in Protect Ports. Click the top arrow button to move the port to the Working Ports list.

Step 8 Complete the remaining fields:

- Revertive—Check this check box if you want traffic to revert to the working port after failure conditions remain corrected for the amount of time entered in the Reversion Time field.
- Reversion time—If Revertive is checked, select a reversion time from the drop-down list. The range is 0.5 to 12.0 minutes. The default is 5.0 minutes. Reversion time is the amount of time that will elapse before the traffic reverts to the working card. The reversion timer starts after conditions causing the switch are cleared.

Note
The bidirectional switching option is available for Y-cable protection groups only in the following cases:

- On the MXP_MR_10DME card when ISC3_PEER_1G/ISC3_PEER_2G is the client payload.
- On the MXP_MR_10DME and MXP_MR_2.5G cards when Fibre Channel is the client payload. In this case bidirectional switching is:
  - Automatically enabled when Distance Extension is enabled.
  - Automatically disabled when Distance Extension is disabled.

The bidirectional switching option is available for all SONET and SDH 1+1 protection groups.

Step 9 Click **OK**.

Step 10 Repeat this procedure for every Y-cable protection group indicated in the Cisco TransportPlanner Traffic Matrix.

Stop. You have completed this procedure.

Protection Types

Table 103: Protection Types

Protection Type	Cards	Description and Installation Requirements
Y-cable		Pairs a working transponder or muxponder card or port with a pro transponder or muxponder card or port. The protect port must be on card than the working port and it must be the same card type as th port. The working and protect port numbers must be the same, tha 1 can only protect Port 1, Port 2 can only protect Port 2, and so or **Note** The working and protect card must be in the same shelf for a mul node.

Protection Type	Cards	Description and Installation Requirements
	MXP_2.5_10G MXP_2.5_10E MXP_2.5_10E_C MXP_2.5_10E_L TXP_MR_10EX_C TXP_MR_10G TXP_MR_10E TXP_MR_10E_C TXP_MR_10E_L TXP_MR_2.5G 40E-TXP-C 40ME-TXP-C MXP_MR_2.5G MXP_MR_10DME_C MXP_MR_10DME_L MXP_MR_10DMEX_C 40G-MXP-C 40E-MXP-C 40ME-MXP-C GE_XP (when provisioned in 10GE MXP or 20GE MXP card mode) 10GE_XP (when provisioned in 10GE TXP card mode) GE_XPE 10GE_XPE OTU2_XP AR_MXP AR_XP AR_XPE 10x10G-LC CFP-LC 100G-CK-C	

Protection Type	Cards	Description and Installation Requirements
Splitter	TXPP_MR_2.5G MXPP_MR_2.5G AR_MXP AR_XP AR_XPE 10x10G-LC	A splitter protection group is automatically created when a TXPP_ MXPP_MR_2.5G, AR_MXP, AR_XP, AR_XPE, or 10x10G-LC installed. You can edit the splitter protection group name.
	OTU2_XP	A splitter protection group is configurable for the OTU2_XP card create a splitter protection group on ports 3 and 4 of the OTU2_XP the NTP-G199 Creating a Splitter Protection Group, on page 316
1+1	GE_XP 10GE_XP GE_XPE 10GE_XPE	In the Layer 2 (L2) card mode 1+1 protection is provided to prote against client port and card failure.

NTP-G199 Creating a Splitter Protection Group

Purpose	This procedure creates a splitter protection group between the trunk ports of an OTU2_XP card. For additional information about splitter protection, see the "Splitter Protection" section.
Tools/Equipment	Installed OTU2_XP card Cisco TransportPlanner Traffic Matrix
Prerequisite Procedures	In the Hardware Installation Guide: • NTP-G15 Install the Common Control Cards • NTP-G14 Install DWDM Equipment • DLP-G46 Log into CTC • NTP-G139 Verifying Cisco Transport Planner Reports and Files
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note A splitter protection group is automatically created when a TXPP_MR_2.5G, MXPP_MR_2.5G, or PSM card is installed. You can edit the splitter protection group name for these cards. The splitter protection group is deleted when you delete the TXPP_MR_2.5G, MXPP_MR_2.5G, or PSM card.

Note Splitter protection is available for the OTU2_XP card when it is provisioned in Transponder configuration only. In a splitter-protected Transponder configuration, Port 1 is the client port, Port 3 is the working trunk port, and Port 4 is the standby trunk port.

Note For SONET or SDH payloads, Loss of Pointer Path (LOP-P) alarms can occur on a split signal if the ports are not in a splitter protection group.

Procedure

Step 1 View the Cisco TransportPlanner Traffic Matrix (see the Cisco Transport Planner Node Setup Information and Files table) for your site. Verify which OTU2_XP card needs a splitter protection group. (Cards requiring splitter protection are indicated with "Splitter" in the Traffic Matrix table Protection Type column. Refer to the *Cisco Transport Planner DWDM Operations Guide* for more information.)

Step 2 Verify that the OTU2_XP card is installed according to the requirements specified in Cable Connections for Y-Cable Protection of One Client Signal

Step 3 Verify that the pluggable port (SFP or XFP) slot is provisioned for the same payload rate as the pluggable port on the OTU2_XP card where you will create the splitter protection group:

a) Display the OTU2_XP card in card view.
b) Click the **Provisioning** > **Pluggable Port Module** tabs.
c) Verify that a pluggable port (SFP or XFP) slot is provisioned in the Pluggable Port Module area, and that the payload rate of the pluggable port (SFP or XFP) slot is same as the payload rate of the pluggable port on the OTU2_XP card provisioned in the Pluggable Ports area. If they are not the same, you must either delete the provisioned rate and create a new rate to match using the DLP-G725 Preprovisioning PPM Slot task or replace the pluggable port (SFP or XFP) using the DLP-G728 Remove PPM from the Line Card task.

Step 4 In node view (single-shelf mode) or shelf view (multishelf view), click the **Provisioning** > **Protection** tabs.

Step 5 In the Protection Groups area, click **Create**.

Step 6 In the Create Protection Group dialog box, enter the following:

- Name—Type a name for the protection group. The name can have up to 32 alphanumeric (a-z, A-Z, 0-9) characters. Special characters are permitted. For TL1 compatibility, do not use question mark (?), backslash (\), or double quote (") characters.
- Type—Choose **Splitter** from the drop-down list.
- Protect Card—From the drop-down list, choose the port that will be the standby or protection port to the active port. The list displays the available OTU2_XP ports. If transponder or muxponder cards are not

installed or if the trunk ports of the card are part of a regenerator group, no ports appear in the drop-down list.

After you choose the protect port, a list of available working ports appear in the Available Cards list. If no cards are available, no ports appear. If this occurs, you cannot complete this task until you install the physical cards or preprovision the slots using the DLP-G353 Preprovisioning a Slot.

Step 7 From the Available Cards list, select the port that will be protected by the port you selected in Protect Cards. Click the top arrow button to move the port to the Working Cards list.

Step 8 Complete the remaining fields:

- Revertive—Check this check box if you want traffic to revert to the working port after failure conditions remain corrected for the amount of time entered in the Reversion Time field.
- Reversion time—If Revertive is checked, select a reversion time from the drop-down list. The range is 0.5 to 12.0 minutes. The default is 5.0 minutes. Reversion time is the amount of time that will elapse before the traffic reverts to the working card. The reversion timer starts after conditions causing the switch are cleared.

Note
The Bidirectional Switching option is not applicable for splitter protection groups.

Step 9 Click **OK**.

Step 10 Repeat this procedure for every splitter protection group indicated in the Cisco TransportPlanner Traffic Matrix.

Stop. You have completed this procedure.

NTP-G198 Creating 1+1 Protection for Cards

Purpose	This procedure creates a 1+1 protection group to protect against client port and card failure of GE_XP, 10GE_XP, GE_XPE, 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	In the Hardware Installation Guide: • DLP-G46 Log into CTC • NTP-G139 Verifying Cisco Transport Planner Reports and Files
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed according to the requirements specified in Cable Connections for Y-Cable Protection of One Client Signal

Step 2 Complete the NTP-G242 Creating an Internal Patchcord Manually by selecting the Trunk to Trunk (L2) option, at the trunk port where you want to create 1+1 protection.

Step 3 Complete the DLP-G461 Creating a 1+1 Protection Group for Cards, on page 319 to create a protection group.

Step 4 Configure the standby port behavior, by setting the Protection Action to **None** or **Squelch**. For detailed information on how to configure the standby port behavior, see the DLP-G380 Provisioning Ethernet Settings, on page 519 task.

Note
Do not enable squelch in a 1 + 1 protection group, if the 100FX, 100LX SFP, and ONS-SE-ZE-EL SFP is used in the protection group and is connected to the peer via the parallel cable (not Y-cable)

Note
When you configure L2 1 + 1 protection on 10GE_XP and 10GE_XPE cards, set the Protection Action to None on the client ports. Setting the Protection Action as **Squelch results in unexpected switching behavior**.

Step 5 Configure the standby and active port speed, by setting the mode parameter to Auto or 1000 or any other values. For detailed information on how to configure the standby port behavior, see the DLP-G380 Provisioning Ethernet Settings, on page 519 task.

Stop. You have completed this procedure.

DLP-G461 Creating a 1+1 Protection Group for Cards

Purpose	This procedure creates a 1+1 protection group for GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE slots where internal patchcords were created.
Tools/Equipment	None
Prerequisite Procedures	DLP-G344 Verifying Provisionable and Internal Patchcords
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or multishelf view (multishelf mode), click the **Provisioning** > **Protection** tabs.

Step 2 In the Protection Groups area, click **Create**.

Step 3 In the Create Protection Group dialog box, enter the following:

- Name—Type a name for the protection group. The name can have up to 32 alphanumeric (a-z, A-Z, 0-9) characters. Special characters are permitted. For TL1 compatibility, do not use question mark (?), backslash (\), or double quote (“) characters.
- Type—Choose **L2 1+1 (port)** from the drop-down list.
- Protect Port—From the drop-down list, choose the port that will be the standby or protection port for the active port. The list displays the available transponder or muxponder ports. If transponder or muxponder cards are not installed, no ports appear in the drop-down list.

After you choose the protect port, a list of available working ports appear in the Available Ports list. If no cards are available, no ports appear. If this occurs, you cannot complete this task until you install the physical cards or preprovision the slots using the DLP-G353 Preprovisioning a Slot task.

Step 4 From the Available Ports list, select the port that will be protected by the port you selected in the Protected Port drop-down list. Click the top arrow button to move the port to the Working Ports list.

Step 5 Complete the remaining fields:

- Revertive—Check this check box if you want traffic to revert to the working port after failure conditions remain corrected for the amount of time entered in the Reversion Time field.
- Reversion time—If Revertive is checked, select a reversion time from the drop-down list. The range is 0.5 to 12.0 minutes. The default is 5.0 minutes. Reversion time is the amount of time that will elapse before the traffic reverts to the working card. The reversion timer starts after conditions causing the switch are cleared.

The bidirectional switching option is available for SONET and SDH 1+1 protection groups.

Step 6 Click **OK**.

Step 7 Repeat this procedure for every 1+1 protection group indicated in the Cisco TransportPlanner Traffic Matrix.

Step 8 Return to your originating procedure (NTP).

NTP-G98 Provisioning the 2.5G Multirate Transponder Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and threshold settings for TXP_MR_2.5G and TXPP_MR_2.5G transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G723 Install PPM on a Line Card DLP-G726 Preprovisioning a Multirate PPM (if necessary) DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G229 Changing the 2.5G or 10G Transponder Card Settings, on page 321
- DLP-G230 Changing the 2.5G Multirate Transponder Line Settings, on page 324
- DLP-G231 Changing the 2.5G Multirate Transponder Line Section Trace Settings, on page 326
- DLP-G232 Changing the Multirate Transponder SONET or SDH Line Threshold Settings, on page 329
- DLP-G320 Changing the 2.5G Multirate Transponder Line RMON Thresholds, on page 332
- DLP-G305 Provisioning the 2.5G Multirate Transponder Trunk Port Alarm and TCA Thresholds, on page 334
- DLP-G306 Provisioning the 2.5G Multirate Transponder Client Port Alarm and TCA Thresholds, on page 336
- DLP-G234 Changing the Multirate Transponder OTN Settings, on page 340
- DLP-G367 Changing the Multirate Transponder Trunk Wavelength Settings, on page 328

Stop. You have completed this procedure.

DLP-G229 Changing the 2.5G or 10G Transponder Card Settings

Purpose	This task changes the card settings for TXP_MR_2.5G and TXPP_MR_2.5G, TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Modify any of the settings described in the following table.

Note
The Card subtab Framing Type and Tunable Wavelengths fields are display-only. Framing Type shows the card framing type, either SONET or SDH, depending on whether the card is installed in an ANSI or ETSI chassis. The Tunable Wavelengths field shows the tunable wavelengths for the physical TXP_MR_2.5G or TXPP_MR_2.5G that is installed.

Table 104: 2.5G or 10G Transponder Card Settings

Parameter	Description	Options
Termination Mode	Sets the mode of operation (option only supported for SONET/SDH payloads).	• Transparent • Section (ANSI) or Regeneration Section (ETSI) - Only for TXP_MR_2.5G, TXPP_MR_2.5G, and TXP_MR_10E. • Line (ANSI) or Multiplex Section (ETSI)
AIS/Squelch Configuration	(TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C only) Sets the transparent termination mode configuration.	• Squelch • AIS

Parameter	Description	Options
Regeneration Peer Slot	Sets the slot containing another multirate card to create a regeneration peer group. A regeneration peer group facilitates the management of two multirate cards that are needed to perform a complete signal regeneration. The regeneration peer group synchronizes provisioning of the two cards. Payload type and ITU-T G.709 optical transport network (OTN) changes made on one multirate card are reflected on the peer multirate card. **Note** Y-cable protection groups cannot be created on TXP cards that are in a regeneration peer group.	• None • 1 • 2 • 3 • 4 • 5 • 6 • 12 • 13 • 14 • 15 • 16 • 17
Regeneration Group Name	Sets the regeneration peer group name.	User defined
Tunable Wavelengths	(Only for 10G multirate transponder cards) Shows the supported wavelengths of the trunk port after the card is installed. For the TXP_MR_10E_C, or TXP_MR_10E_L cards, the first and last supported wavelength, frequency spacing, and number of supported wavelengths are shown in the format: *first wavelength-last wavelength-frequency spacing-number of supported wavelengths*. For example, the TXP_MR_10E_C card would show: 1529.55nm-1561.83nm-50gHz-82. The TXP_MR_10E show the four wavelengths supported by the card that is installed. The TXP_MR_10G show the two wavelengths supported by the card that is installed.	—

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G230 Changing the 2.5G Multirate Transponder Line Settings

Purpose	This task changes the line settings for the client port of the TXP_MR_2.5G and TXPP_MR_2.5G transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_2.5G or TXPP_MR_2.5G card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** tabs.

Step 3 Modify any of the settings described in the following table.

Note
The 2.5G multirate transponder trunk settings are provisioned in the DLP-G305 Provisioning the 2.5G Multirate Transponder Trunk Port Alarm and TCA Thresholds, on page 334.

Table 105: TXP_MR_2.5G and TXPP_MR_2.5G Transponder Card Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	• 1 • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G card only)
Port Name	The user can assign a logical name for each of the ports shown by filling in this field.	User-defined. Name can be up to 80 alphanun special characters. Blank by default.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS,AINS (ANSI) or Unlocked,automatic (ETSI) • OOS,DSBLD (ANSI) or Locked,disable • OOS,MT (ANSI) or Locked,maintenanc

Parameter	Description	Options
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled • OOS-AU,AINS (ANSI) or Unlocked automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,maintenance (ETSI)
SF BER	(OC-N and STM-N payloads only) Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5
SD BER	(OC-N and STM-N payloads only) Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
ALS Mode	Sets the automatic laser shutdown (ALS) function.	• Disabled (default) • Auto Restart • Manual Restart • Manual Restart for Test
Reach	Displays the optical reach distance of the client port.	Options: ANSI/ETSI • Autoprovision/Autoprovision (defaul • SR • SR 1/I-1—Short reach up to 2-km dis • IR 1/S1—Intermediate reach, up to 15 • IR 2/S2—Intermediate reach up to 40 • LR 1/L1—long reach, up to 40-km d • LR 2/L2—long reach, up to 80-km d • LR 3/L3—long reach, up to 80-km d

Parameter	Description	Options
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: 1310 nm through 156 100-GHz ITU spacing; coarse wavelength multiplexing (CWDM) spacing Note: supported wavelengths are marked by a (**)
AINS Soak	(OC-N and STM-N payloads only) Sets the automatic in-service soak period.	• Duration of valid input signal, in hh.mm after which the card becomes in service (automatically • 0 to 48 hours, 15-minute increments
Type	(OC-N and STM-N payloads only) The optical transport type.	• SONET • SDH

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G231 Changing the 2.5G Multirate Transponder Line Section Trace Settings

Purpose	This task changes the section trace settings for TXP_MR_2.5G and TXPP_MR_2.5G transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note This task only applies to SONET services.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_2.5G or TXPP_MR_2.5G card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs.

Step 3 Modify any of the settings described in the following table.

Table 106: TXP_MR_2.5G and TXPP_MR_2.5G Transponder Card Section Trace Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 1 • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G only)
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	If an TIM on Section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-S is disabled) • Unchecked (AIS/RDI on TIM-S is not disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this display updated automatically.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G367 Changing the Multirate Transponder Trunk Wavelength Settings

Purpose	This task changes the trunk wavelength settings for the TXP_MR_2.5G and TXPP_MR_2.5G, TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Before modifying the wavelength settings, change the port state to OOS,DSBLD (for ANSI) or Locked,disabled (for ETSI) and delete the circuit and patchcord provisioning present on the port. Payload or communication channel provisioning can be retained.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the multirate card where you want to change the trunk wavelength settings.

Step 2 Click the **Provisioning** > **Line** > **Wavelength Trunk Settings** tabs.

Step 3 Modify any of the settings as described in the following table.

Table 107: Multirate Transponder Card Wavelength Trunk Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	• 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G only)
Band	Indicates the wavelength band that can be provisioned. If the physical TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C is installed, this field is display-only.	• C—The C-band wavelengths are available in the Wavelength field. • L—The L-band wavelengths are available in the Wavelength field.

Parameter	Description	Options
Even/Odd	Sets the wavelengths available for provisioning for TXP_MR_10E_C, and TXP_MR_10E_L cards.	• Even—Displays even C-band or L-band wavelengths in the Wavelength field. • Odd—Displays odd C-band or L-band wavelengths in the Wavelength field.
Wavelength	The wavelength provisioned for the trunk.	• First Tunable Wavelength • Further wavelengths in 100-GHz ITU-T C-band or L-band spacing, depending on the card that is installed. For TXP_MR_10G and TXP_MR_10E cards, the wavelengths carried by the card are identified with two asterisks. The wavelengths supported by the SFPs/XFPs plugged to the card are identified with two asterisks. Other wavelengths have a dark grey background. If the card is not installed, all wavelengths appear with a dark grey background.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G232 Changing the Multirate Transponder SONET or SDH Line Threshold Settings

Purpose	This task changes the line threshold settings for TXP_MR_2.5G and TXPP_MR_2.5G transponder cards carrying OC-3/STM-1, OC-12/STM-4, and OC-48/STM-16 payloads. You can also use this task to change the line threshold settings for TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C transponder cards carrying SONET or SDH payloads, including the physical 10G Ethernet WAN Phy payload.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the multirate transponder card where you want to change the line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** tabs.

Note
You must modify Near End and Far End independently; 15 Min and 1 Day independently; and Line and Section independently. To do so, choose the appropriate radio button and click **Refresh**.

Step 3 Modify any of the settings in the following table.

Note
Some parameters and options in the following table do not apply to all the multirate cards. If a parameter or option does not apply, that parameter or option does not appear in CTC.

Table 108: Multirate Transponder Card Line Thresholds Settings

Parameter	Description	Options - ANSI	Options - ETSI
Port	(Display only) Port number	• 1 • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G only)	• 1 • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G
EB	Path Errored Block indicates that one or more bits are in error within a block	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near e Choose an option in each category **Refresh**.
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—

Parameter	Description	Options - ANSI	Options - ETSI
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.
FC	(Line or Multiplex Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
SEFS	(Near End Section or Regeneration Section only) Severely errored framing seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—

Parameter	Description	Options - ANSI	Options - ETSI
UAS	Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) for 2.5G cards and Line or Section (near end only) for 10G cards. Choose an option in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—SM (OTUk) or PM (for 2.5G cards and Multiplex or Regeneration Section (near for 10G cards. Choose an option in each category **Refresh**.
BBE	Background block errors	—	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—SM (OTUk) or PM (for 2.5G cards and Multiplex or Regeneration Section (near for 10G cards Choose an option in each category **Refresh**.
OFS	(Near End Section or Regeneration Section only) Out of frame seconds	—	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Line or Section (near Choose an option in each category **Refresh**.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G320 Changing the 2.5G Multirate Transponder Line RMON Thresholds

Purpose	This task changes the line remote monitoring (RMON) threshold settings for TXP_MR_2.5G and TXPP_MR_2.5G transponder cards carrying the 1G Ethernet or 1G FC/FICON payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In card view, display the TXP_MR_2.5G or TXPP_MR_2.5G card where you want to change the line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the applicable port.

Step 5 From the Variable drop-down list, choose an Ethernet variable. See the following table for a list of available Ethernet variables.

Table 109: TXP_MR_2.5G and TXPP_MR_2.5G Card 1G Ethernet and 1G FC/FICONThresholds

Variable	Description
ifInErrors	Number of inbound packets that contained errors preventing them from being delivered to a higher-layer protocol.
rxTotalPkts	Total number of received packets.
8b10bStatsEncodingDispErrors	Number of IETF 8b10b disparity violations on the Fibre Channel line side.
8b10bIdleOrderedSets	Number of received packets containing idle ordered sets.
8b10bNonIdleOrderedSets	Number of received packets containing non-idle ordered sets.
8b10bDataOrderedSets	Number of received packets containing data ordered sets.

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Enter the appropriate number of seconds for the Sample Period.

Step 9 Enter the appropriate number of occurrences for the Rising Threshold.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Step 12 Return to your originating procedure (NTP).

DLP-G305 Provisioning the 2.5G Multirate Transponder Trunk Port Alarm and TCA Thresholds

Purpose	This task changes the TXP_MR_2.5G and TXPP_MR_2.5G trunk port alarm and threshold crossing alert (TCA) thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note In this task, trunk port refers to Port 2 for TXP_MR_2.5G cards, and to Ports 2 and 3 for TXPP_MR_2.5G cards.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_2.5G or TXPP_MR_2.5G card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Pluggable Port Modules** tab. Under Pluggable Ports, record the Rate that is provisioned.

Step 3 Look up the rate in the following table and note whether it is 2R or 3R.

Table 110: 2R and 3R Mode and ITU-T G.709 Compliance by Client Interface

Client Interface	Input Bit Rate	3R vs. 2R	ITU-T G.709
OC-48/STM-16	2.488 Gbps	3R	On or Off
DV-6000	2.38 Gbps	2R	—

Client Interface	Input Bit Rate	3R vs. 2R	ITU-T G.709
2 Gigabit Fibre Channel (2G-FC)/fiber connectivity (FICON)	2.125 Gbps	3R (no monitoring)	On or Off
High-Definition Television (HDTV)	1.48 Gbps	2R	—
Gigabit Ethernet (GE)	1.25 Gbps	3R	On or Off
1 Gigabit Fibre Channel (1G-FC)/FICON	1.06 Gbps	3R	On or Off
OC-12/STM-4	622 Mbps	3R	On or Off
OC-3/STM-1	155 Mbps	3R	On or Off
Enterprise System Connection (ESCON)	200 Mbps	2R	—
SDI/D1 video	270 Mbps	2R	—
ISC-1 Compact	1.06 Gbps	3R	Off
ISC-3	1.06 or 2.125 Gbps	2R	—
ETR_CLO	16 Mbps	2R	—

Step 4 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 5 Under **Types**, verify that the TCA radio button is checked. If not, check it and click **Refresh**.

Step 6 Referring to the following table, verify the trunk port TCA thresholds for RX Power High and RX Power Low depending on whether the rate is 2R or 3R. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 111: TXP_MR_2.5G and TXPP_MR_2.5G Trunk Port TCA Thresholds

Signal	TCA RX Power Low	TCA RX Power High
3R	–23 dBm	–9 dBm
2R	–24 dBm	–9 dBm

Step 7 Click **Apply**.

Step 8 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 9 Verify the trunk port Alarm thresholds for RX Power High is –7 dBm, and for RX Power Low is –26 dBm. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Step 10 Click **Apply**.

Step 11 Return to your originating procedure (NTP).

DLP-G306 Provisioning the 2.5G Multirate Transponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the TXP_MR_2.5G and TXPP_MR_2.5G cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_2.5G or TXPP_MR_2.5G card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Referring to the following table, verify the Port 1 (client) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Table 112: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface TCA Thresholds

Port Type (by CTC)	Pluggable Port Module (SFP)	TCA RX Power Low	TCA RX Power High	TCA TX Power Low	TCA TX Power High
OC-3	15454-SFP3-1-IR	–23	–8	–21	–2
STM-1	15454E-SFP-L.1.1	–24	–10	–21	–2
OC-12	15454-SFP12-4-IR	–28	–7	–21	–2
STM-4	15454E-SFP-L.4.1	–28	–8	–21	–2
OC-48	ONS-SE-2G-S1	–18	–3	–16	3
	15454-SFP-OC48-IR	–18	0	–11	6
STM-16	ONS-SE-2G-S1 15454E-SFP-L.16.1	–18	–3	–16	3
ONE_GE	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
ESCON	15454-SFP-200 15454E-SFP-200 ONS-SE-200-MM	–21	–14	–35	–8
DV6000	15454-SFP-OC48-IR	–18	0	–11	6
	15454E-SFP-L.16.1	–18	–3	–16	3
SDI_D1_VIDEO	15454-SFP12-4-IR	–28	–7	–21	–2
	15454E-SFP-L.4.1	–28	–8	–21	–2
HDTV	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
PASS-THRU	2R MODE (not specified)	—	—	—	—
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3

Port Type (by CTC)	Pluggable Port Module (SFP)	TCA RX Power Low	TCA RX Power High	TCA TX Power Low	TCA TX Power High
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–15	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–15	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
ETR_CLO	15454-SFP-200 15454E-SFP-200 ONS-SE-200-MM	–17	0	–16	3
ISC compat	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
ISC peer	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3

Step 4 Click **Apply**.

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 6 Referring to the following table, verify the Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Table 113: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface Alarm Thresholds

Port Type (by CTC)	Pluggable Port Module (SFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
OC-3	15454-SFP3-1-IR	–26	–5	–17	–6
STM-1	15454E-SFP-L.1.1	–27	–7	–17	–6

Port Type (by CTC)	Pluggable Port Module (SFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
OC-12	15454-SFP12-4-IR	–31	–4	–17	–6
STM-4	15454E-SFP-L.4.1	–31	–5	–17	–6
OC-48	ONS-SE-2G-S1	–21	0	–12	–1
	15454-SFP-OC48-IR	–21	3	–7	2
STM-16	ONS-SE-2G-S1 15454E-SFP-L.16.1	–21	0	–12	–1
ONE_GE	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–12	–2
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
ESCON	15454-SFP-200 15454E-SFP-200 ONS-SE-200-MM	–24	–11	–31	–12
DV6000	15454-SFP-OC48-IR	–21	3	–7	2
	15454E-SFP-L.16.1	–21	0	–12	–5
SDI_D1_VIDEO	15454-SFP12-4-IR	–31	–4	–17	–6
	15454E-SFP-L.4.1	–31	–5	–17	–6
HDTV	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
PASS-THRU	2R MODE (not specified)	—	—	—	—
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–12	–2
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1

Port Type (by CTC)	Pluggable Port Module (SFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–18	3	–12	–2
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–12	–2
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–18	3	–12	–2
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
ETR_CLO	15454-SFP-200 15454E-SFP-200 ONS-SE-200-MM	–20	3	–12	–2
ISC compat	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1
ISC peer	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–12	–1

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G234 Changing the Multirate Transponder OTN Settings

Purpose	This task changes the OTN settings for the TXP_MR_2.5G, TXPP_MR_2.5G, TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, TXP_MR_10EX_C, 40E-TXP-C, and 40ME-TXP-C transponder cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: **OTN Lines**, **G.709 Thresholds**, **FEC Thresholds**, or **Trail Trace Identifier**.

Step 3 Modify any of the settings described in the following tables.

Note
You must modify Near End and Far End; 15 Min and 1 Day; and SM and PM settings independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 114: Multirate Transponder Card OTN Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	• 1 (only when data rate is set to OTU3) • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G)
G.709 OTN	Sets the OTN lines according to ITU-T G.709. For TXP-MR-10EX_C cards, the G.709 OTN should be enabled.	• Enable • Disable
FEC	Sets the OTN lines to forward error correction (FEC). FEC mode can be Disabled, Enabled, or, Enhanced FEC mode can be enabled to provide greater range and lower bit error rate. For TXP_MR_10E, 40E-TXP-C, and 40ME-TXP-C cards, Standard is the same as enabling FEC. For TXP-MR-10EX_C cards, the FEC should be enabled.	• Enable—FEC is on. • Disable—FEC is off. • Standard—(TXP_MR_10E, 40E-TXP-C, and 40ME-TXP-C only) Standard FEC is on. • Enhanced—(TXP_MR_10E, 40E-TXP-C, and 40ME-TXP-C only) Enhanced FEC is on.
SF BER	(Display only) The signal fail bit error rate.	• 1E-5

Parameter	Description	Options
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Asynch/Synch Mapping	(TXP_MR_10E only) Sets how the ODUk (client payload) is mapped to the optical channel (OTUk).	• Asynch mapping • Synch mapping

Table 115: Multirate Transponder Card ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G)
ES	Errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**. **Note** SM (OTUk) is the ITU-T G.709 optical channel transport unit order of k overhead frame used for management and performance monitoring. PM (ODUk) is the ITU-T G.709 optical channel data unit order of k overhead frame unit used for path performance monitoring.
SES	Severely errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
UAS	Unavailable seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
BBE	Background block errors	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
FC	Failure counter	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.

Note

Latency for a 1G-FC payload without ITU-T G.709 is 4 microseconds, and with ITU-T G.709 is 40 microseconds. Latency for a 2G-FC payload without ITU-T G.709 is 2 microseconds, and with ITU-T G.709 is 20 microseconds. Consider these values when planning a FC network that is sensitive to latency.

Table 116: Multirate Transponder Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G)
Bit Errors Corrected	Sets the value for bit errors corrected during the selected time period.	Numeric. Can be set for 15-minute or one-day intervals.
Uncorrectable Words	Sets the value for uncorrectable words during the selected time period.	Numeric. Can be set for 15-minute or one-day intervals.

Table 117: MultirateTransponder Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 1 (OTU3) for 40E-TXP-C and 40ME-TXP-C cards • 2 (Trunk) • 3 (Trunk) (TXPP_MR_2.5G)
Level	Sets the level.	• Section • Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	If a TIM on Section overhead alarm is raised because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-S is disabled) • Unchecked (AIS/RDI on TIM-S is enabled)
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).	String of trace string size; trail trace identifier is 64 bytes in length.

Parameter	Description	Options
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 minutes.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G96 Provisioning the 10G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds

Purpose	This procedure changes the line and threshold settings for 10G multirate transponder cards including the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The TXP_MR_10G card does not support PPMs.

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database to preserve the existing transmission settings.

Step 2 If you are provisioning a TXP_MR_10G card, complete the DLP-G365 Provisioning the TXP_MR_10G Data Rate, on page 345, and if you are provisioning a TXP_MR_10E or TXP_MR_10EX_C card, complete the DLP-G712 Provisioning the TXP_MR_10E or TXP_MR_10EX_C Data Rate, on page 346. If not, continue with the next step.

Step 3 Perform any of the following tasks as needed:

- DLP-G229 Changing the 2.5G or 10G Transponder Card Settings, on page 321
- DLP-G217 Changing the 10G Multirate Transponder Line Settings, on page 347
- DLP-G218 Changing the 10G or 40G Multirate Transponder Line Section Trace Settings, on page 351
- DLP-G232 Changing the Multirate Transponder SONET or SDH Line Threshold Settings, on page 329
- DLP-G319 Changing the 10G Multirate Transponder Line RMON Thresholds for 10G Ethernet LAN Phy Payloads, on page 353
- DLP-G301 Provisioning the 10G Multirate Transponder Trunk Port Alarm and TCA Thresholds, on page 357
- DLP-G302 Provisioning the 10G Multirate Transponder Client Port Alarm and TCA Thresholds, on page 358
- DLP-G234 Changing the Multirate Transponder OTN Settings, on page 340
- DLP-G367 Changing the Multirate Transponder Trunk Wavelength Settings, on page 328

Stop. You have completed this procedure.

DLP-G365 Provisioning the TXP_MR_10G Data Rate

Purpose	This task changes the TXP_MR_10G card data rate.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10G card where you want to change the card data rate settings.

Step 2 Click the **Provisioning** > **Data Rate Selection** tabs.

Step 3 Click **Create**.

Step 4 In the Create Port dialog box, choose one of the following data rates:

- SONET (ANSI) or SDH (ETSI) (including 10G Ethernet WAN Phy)
- 10G Ethernet LAN Phy

Step 5 Click **Ok**.

Step 6 Return to your originating procedure (NTP).

DLP-G712 Provisioning the TXP_MR_10E or TXP_MR_10EX_C Data Rate

Purpose	This task changes the TXP_MR_10E or TXP_MR_10EX_C card data rate.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10E or TXP_MR_10EX_C card where you want to change the card data rate settings.

Step 2 Click the **Provisioning** > **Pluggable Port Modules** tabs.

Step 3 In the Pluggable Port Modules area, click **Create**. The Create PPM dialog box appears.

Step 4 In the Create PPM dialog box, complete the following:

- PPM—Choose the SFP you want to install from the drop-down list.
- PPM Type—Choose the number of ports supported by your SFP from the drop-down list. If only one port is supported, PPM (1 port) is the only option.

Step 5 Click **OK**. The newly created PPM appears in the Pluggable Port Modules area. The row in the Pluggable Port Modules area turns white and the Actual Equipment Type column lists the equipment name.

Step 6 In the Pluggable Ports area, click **Create**. The Create Ports dialog box appears.

Step 7 In the Create Port dialog box, choose one of the following data rates:

- SONET (ANSI) or SDH (ETSI) (including 10G Ethernet WAN Phy)
- 10G Ethernet LAN Phy
- 10G FIBER Channel
- (TXP-MR-10EX_C card only) IB_5G

Step 8 Click **OK**.

Step 9 Return to your originating procedure (NTP).

DLP-G217 Changing the 10G Multirate Transponder Line Settings

Purpose	This task changes the line settings for TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **SONET/SDH/Ethernet** tabs. SONET is the option for ANSI shelves when 10G Ethernet WAN phy is the Pluggable Port Rate, SDH is the option for ETSI shelves when 10G Ethernet WAN phy is the Pluggable Port Rate, and Ethernet is the option for ANSI or ETSI shelves when 10GE LAN Phy is the Pluggable Port Rate.

Step 3 Modify any of the settings described in the following table.

Note
In the following table, some parameter tabs do not always apply to all 10G multirate transponder cards. If a tab does not apply, it will not appear in CTC.

Table 118: TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C Line Settings

Parameter	Description	ONS 15454 (ANSI) Options	ONS 15454 SDH (ETSI) Options
Port	(Display only) Displays the port number.	• 1 (OC192) (10G Ethernet WAN Phy) (if TXP_MR_10G) • 1 (TEN_GE) (if Ethernet LAN is provisioned on the TXP_MR_10G card) • 1-1 (OC192) (10G Ethernet WAN Phy on the TXP_MR_10E card) • 1-1 (TEN_GE) (if Ethernet LAN is provisioned on the TXP_MR_10E card) • 1-1 (FC10G) (if 10G fiber channel is provisioned on the TXP_MR_10E card) • 2 (Trunk) • (TXP_MR_10EX_C only) IB_5G	• 1 (STM-64) (10G Ethernet WA (if TXP_MR_10G) • 1 (TEN_GE) (if Ethernet LAN provisioned on the TXP_MR_ card) • 1-1 (STM-64) (10G Ethernet V Phy on the TXP_MR_10E car • 1-1 (TEN_GE) (if Ethernet LA provisioned on the TXP_MR_ card) • 1-1 (FC10G) (if 10G fiber cha provisioned on the TXP_MR_ card) • 2 (Trunk) • (TXP_MR_10EX_C only) IB_
Port Name	Provides the ability to assign the specified port a name.	User-defined. Name can be up to 80 alphanumeric/special characters. Blank by default.	User-defined. Name can be up to 80 alphanumeric/special characters. by default.
Admin State	Sets the port service state. For more information about administrative states, see the Administrative and Service States document.	• IS • IS,AINS • OOS,DSBLD • OOS,MT	• Unlocked • Unlocked,automaticInService • Locked,disabled • Locked,maintenance
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR • OOS-AU,AINS • OOS-MA,DSBLD • OOS-MA,MT	• Unlocked-enabled • Unlocked-disabled, automaticIn • Locked-enabled,disabled • Locked-enabled,maintenance

Parameter	Description	ONS 15454 (ANSI) Options	ONS 15454 SDH (ETSI) Options
SF BER	(SONET [ANSI] or SDH [ETSI] including 10G Ethernet WAN Phy only) Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5	• 1E-3 • 1E-4 • 1E-5
SD BER	(SONET [ANSI] or SDH [ETSI] including 10G Ethernet WAN Phy only) Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Type	(SONET [ANSI] or SDH [ETSI] including 10G Ethernet WAN Phy only) The optical transport type.	• SONET • SDH	• SONET • SDH
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled, or it can be set for one of three mode options.	• Disabled (default): ALS is off; the laser is not automatically shut down when traffic outages (LOS) occur. • Auto Restart: ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. It automatically restarts when the conditions that caused the outage are resolved. • Manual Restart: ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test: Manually restarts the laser for testing.	• Disabled (default): ALS is laser is not automatically s when traffic outages (LOS • Auto Restart: ALS is on; th automatically shuts down w outages (LOS) occur. It aut restarts when the condition caused the outage are resol • Manual Restart: ALS is on automatically shuts down w outages (LOS) occur. How laser must be manually rest conditions that caused the resolved. • Manual Restart for Test: M restarts the laser for testing

Parameter	Description	ONS 15454 (ANSI) Options	ONS 15454 SDH (ETSI) Options
AINS Soak	(SONET [ANSI] or SDH [ETSI] including 10G Ethernet WAN Phy only) Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, after which the card becomes in service (IS) automatically • 0 to 48 hours, 15-minute increments	• Duration of valid input signal, hh.mm format, after which the becomes in service (IS) autom • 0 to 48 hours, 15-minute incre
ProvidesSync	(TXP_MR_10E, OC192 only) Sets the ProvidesSync card parameter. If checked, the card is provisioned as a network element (NE) timing reference.	Checked or unchecked	Checked or unchecked
SyncMsgIn	(TXP_MR_10E, OC192 only) Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked	Checked or unchecked
Max Size	(TXP_MR_10E, TXP_MR_10G LAN Phy only) Sets the maximum Ethernet packet size.	• 1548 bytes • Jumbo (1518 to 9216 bytes)	• 1548 bytes • Jumbo (1518 to 9216 bytes)
Incoming MAC Address	(TXP_MR_10E, TXP_MR_10G LAN Phy only) Sets the incoming MAC address.	Value of MAC address. Six bytes in hexadecimal format.	Value of MAC address. Six bytes in hexadecimal format.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: 1310 nm through 1560.61 nm, 100-GHz ITU spacing; coarse wavelength division multiplexing (CWDM) spacing Note: supported wavelengths are marked by asterisks (**)	• First Tunable Wavelength • Further wavelengths: 1310 nm t 1560.61 nm, 100-GHz ITU spa coarse wavelength division multiplexing (CWDM) spacing Note: supported wavelengths are m by asterisks (**)

Parameter	Description	ONS 15454 (ANSI) Options	ONS 15454 SDH (ETSI) Options
Reach	Displays the optical reach distance of the client port.	The Reach options depend on the traffic type that has been selected.	The Reach options depend on th type that has been selected.
Squelch Hold Off Timer	(Only for TXP_MR_10E card) Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period. The user can configure the squelch hold off timer in CTC only under the following conditions: • The card must be configured in TXP or MXP operating modes. • The client payload must be 10GE or 100GE. • The Squelch drop-down in CTC must be set to Squelch.	• Disable (0 ms) - Default value • 50 ms • 100 ms • 250 ms • 500 ms	• Disable (0 ms) - Default va • 50 ms • 100 ms • 250 ms • 500 ms

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G218 Changing the 10G or 40G Multirate Transponder Line Section Trace Settings

Purpose	This task changes the line section trace settings for the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, TXP_MR_10EX_C, 40E-TXP-C, and 40ME-TXP-C transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs.

Note
The Section Trace tab is available for the 10G Multirate Transponder cards only if no PPMs are provisioned, or the OC192 PPM is provisioned. The tab is not available if a 10G Ethernet LAN Phy or 10G Fibre Channel PPM is provisioned.

Step 3 Modify any of the settings described in the following table.

Table 119: 10G or 40G Card Section Trace Settings

Parameter	Description	SONET Options	SDH Options
Port	Sets the port number.	• 1-1 (OC192) and 2—Trunk for 10G cards • 1 (OC-768) and 2 (OC-768) for 40G cards	• 1-1 (STM64) and 2—Trunk for 10 • 1 (STM-256) and (STM-256) for 4
Received Trace Mode	Sets the trace mode.	• Off/None • Manual	• Off/None • Manual
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte	• 1 byte • 16 byte
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Transmit String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).The supported range for 1 bit Hex TX trace is 20 to 7E. If TX trace is provisioned outside this range, client transmits 00.	String of trace string size	String of trace string s

Parameter	Description	SONET Options	SDH Options
Disable AIS/RDI on TIM-S	If an TIM on Section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-S is disabled) • Unchecked (AIS/RDI on TIM-S is not disabled)	• Checked (AIS TIM-S is disa • Unchecked (A TIM-S is not
Expected	Displays the current expected string; sets a new expected string. You can click thebutton on the right to change the display. Its title changes, based on the current display mode. In Expected String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).	String of trace string size	String of trace strin
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size	String of trace strin
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked/unchecked (default)	Checked/unchecke

Step 4 Click **Apply**.

Step 5 Click **Default** to restore default values.

Step 6 Return to your originating procedure (NTP).

DLP-G319 Changing the 10G Multirate Transponder Line RMON Thresholds for 10G Ethernet LAN Phy Payloads

Purpose	This task changes the line threshold settings for TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C transponder cards carrying the physical 10G Ethernet LAN payload.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Display the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C card where you want to change the line threshold settings in card view.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the applicable port.

Step 5 From the Variable drop-down list, choose an Ethernet variable. See the following table for a list of available Ethernet variables.

Table 120: TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C Card GE LAN Phy Variables

Variable	Description
ifInOctets	Total number of octets received on the interface, including framing characters.
rxTotalPkts	Total number of received packets.
ifInMulticastPkts	Number of multicast frames received error free.
ifInBroadcastPkts	Number of packets, delivered by a sublayer to an higher sublayer, that were addressed to a broadcast address at this sublayer.
ifInErrors	Number of inbound packets that contained errors preventing them from being delivered to a higher-layer protocol.
ifInErrorBytePkts (TXP_MR_10G only)	Number of receive error bytes.
ifInFramingErrorPkts (TXP_MR_10G only)	Number of receive framing error counters.
ifInJunkInterPkts (TXP_MR_10G only)	Number of receive interpacket junk counters.
ifOutOctets (TXP_MR_10G only)	Total number of octets transmitted out of the interface, including framing characters.
txTotalPkts (TXP_MR_10G only)	Total number of transmit packets.
ifOutMulticastPkts (TXP_MR_10G only)	Number of multicast frames transmitted error free.
ifOutBroadcastPkts (TXP_MR_10G only)	Total number of packets that higher-level protocols requested be transmitted, and that were addressed to a broadcast address at this sublayer, including those that were discarded or not sent.
dot3StatsFCSErrors	Number of frames with frame check errors, that is, there is an integral number of octets, but an incorrect Frame Check Sequence (FCS).

dot3StatsFrameTooLong (TXP_MR_10G only)	Number of received frames that were larger than the maximum size permitted.
etherStatsUndersizePkts	Total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsFragments	Total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). Note that it is entirely normal for etherStatsFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits.
etherStatsPkts64Octets	Total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts128to255Octets	The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts256to511Octets	Total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts512to1023Octets	Total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts1024to1518Octets	Total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsBroadcastPkts	Total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.
etherStatsMulticastPkts	Total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.
etherStatsOversizePkts	The total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsJabbers	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a nonintegral number of octets (Alignment Error).

etherStatsOctets	Total number of octets of data (including those in bad packets) received on the network (excluding framing bits but including FCS octets).
etherStatsCRCAlignErrors (TXP_MR_10G only)	Total number of packets received that had a length (excluding framing bits, but including FCS octets) of between 64 and 1518 octets, inclusive, but had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
rxPauseFrames (TXP_MR_10G only)	Number of received IETF 802.x pause frames.
rxControlFrames	Number of MAC control frames passed by the MAC sublayer to the MAC control sublayer.
rxUnknownOpcodeFrames (TXP_MR_10G only)	Number of MAC control frames received that contain an opcode that is not supported by the device.

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Type in an appropriate number of seconds for the Sample Period.

Step 9 Type in the appropriate number of occurrences for the Rising Threshold.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Note
To view all RMON thresholds, click **Show All RMON thresholds**.

Step 12 Return to your originating procedure (NTP).

DLP-G301 Provisioning the 10G Multirate Transponder Trunk Port Alarm and TCA Thresholds

Purpose	This task provisions the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C trunk port alarm and threshold cross alert (TCA) thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 Under Types, verify that the TCA radio button is checked. If not, check it, then click **Refresh**.

Step 4 Referring to the following table, verify the trunk port (Port 2) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Hit **Enter**, then click **Apply**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Table 121: 10G Multirate Transponder Trunk Port TCA Thresholds

Card	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
TXP_MR_10G	–8 dBm	–18 dBm	7 dBm	–1 dBm
TXP_MR_10E TXP_MR_10E_C TXP_MR_10E_L TXP_MR_10EX_C	–9 dBm	–18 dBm	9 dBm	0 dBm

Step 5 Click **Apply**.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the trunk port (Port 2) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Hit **Enter**, then click **Apply**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 122: 10G Multirate Transponder Trunk Port Alarm Thresholds

Card	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
TXP_MR_10G	–8 dBm	–20 dBm	4 dBm	2 dBm
TXP_MR_10E TXP_MR_10E_C TXP_MR_10E_L TXP_MR_10EX_C	–8 dBm	–20 dBm	7 dBm	3 dBm

Step 8 Click **Apply**.

Step 9 Return to your originating procedure (NTP).

DLP-G302 Provisioning the 10G Multirate Transponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Under Types, verify that the TCA radio button is checked. If not, check it, then click **Refresh**.

Step 4 Referring to the following table, verify the Port 1 (Client) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Hit Enter, then click **Apply**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Table 123: TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C Card Client Interface TCA Thresholds

Pluggable Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
SONET (or SDH)	TXP_MR_10E uses ONS-XC-10G-S1 TXP_MR_10G (XFP not present)	–1	–11	–1	–6
10G Ethernet LAN Phy	TXP_MR_10E uses ONS-XC-10G-S1 TXP_MR_10G (XFP not present)	0.5	–14.4	–1	–6
10G Fibre Channel	TXP_MR_10E uses ONS-XC-10G-S1	0.5	–14.4	–1	–6

Pluggable Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
IB_5G (Only the TXP_MR_10EX_C card supports IB_5G)	TXP_MR_10EX_C uses ONS-XC-10G-S1 Version 3	1.0	–14.0	5.0	12.0

Step 5 Click **Apply**.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, provision the Port 1 (Client) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 124: TXP_MR_10G, TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, or TXP_MR_10EX_C Card Client Interface Alarm Thresholds

Pluggable Port Rate	Pluggable Port Module (XFP)	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
SONET (or SDH)	TXP_MR_10E uses ONS-XC-10G-S1 TXP_MR_10G (XFP not present)	3	–16	1	–8
10G Ethernet LAN Phy	TXP_MR_10E uses ONS-XC-10G-S1 TXP_MR_10G (XFP not present)	3	–16	1	–8
10G Fibre Channel	TXP_MR_10E uses ONS-XC-10G-S1	3	–16	1	–8
IB_5G (Only the TXP_MR_10EX_C card supports IB_5G)	TXP_MR_10EX_C uses ONS-XC-10G-S1 Version 3	3.0	–16	1.0	–8

Step 8 Click **Apply**.

Step 9 Return to your originating procedure (NTP).

NTP-G292 Provisioning the 40G Multirate Transponder Card Line Settings, PM Parameters, and Thresholds

Purpose	This procedure changes the line settings, PM parameters, and threshold settings for 40G multirate transponder cards (40E-TXP-C, 40ME-TXP-C).
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The 40E-TXP-C and 40ME-TXP-C cards do not support PPMs.

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 If you are provisioning a 40E-TXP-C or 40ME-TXP-C card, complete the DLP-G656 Provisioning the 40E-TXP-C and 40ME-TXP-C Data Rate, on page 362 task. If not, continue with the next step.

Step 3 Perform any of the following tasks as needed:

- DLP-G657 Changing the 40G Multirate Transponder Card Settings, on page 362
- DLP-G658 Changing the 40G Multirate Transponder Line Settings, on page 364
- DLP-G659 Changing the 40G Multirate Transponder SONET, SDH, or Ethernet Line Settings, on page 366
- DLP-G218 Changing the 10G or 40G Multirate Transponder Line Section Trace Settings, on page 351
- DLP-G661 Changing the 40G Multirate Transponder Line Thresholds for SONET or SDH Payloads, on page 371

- DLP-G663 Provisioning the 40G Multirate Transponder Trunk Port Alarm and TCA Thresholds, on page 373
- DLP-G664 Provisioning the 40G Multirate Transponder Client Port Alarm and TCA Thresholds, on page 375
- DLP-G234 Changing the Multirate Transponder OTN Settings, on page 340

Stop. You have completed this procedure.

DLP-G656 Provisioning the 40E-TXP-C and 40ME-TXP-C Data Rate

Purpose	This task changes the 40E-TXP-C and 40ME-TXP-C card data rate.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the card data rate settings.

Step 2 Click the **Provisioning** > **Data Rate Selection** tabs.

Step 3 Click **Create**.

Step 4 In the Create Port dialog box, choose one of the following data rates:

- SONET (ANSI) OC-768 or SDH (ETSI) STM-256
- 40G Ethernet LAN Phy (only when overclock mode is ON)
- OTU3

Step 5 Click **OK**.

Step 6 Return to your originating procedure (NTP).

DLP-G657 Changing the 40G Multirate Transponder Card Settings

Purpose	This task changes the card settings of the 40E-TXP-C and 40ME-TXP-C cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Modify any of the settings described in the following table.

Table 125: 40E-TXP-C and 40ME-TXP-C Card Settings

Parameter	Description	ANSI Options	ETSI Options
Regeneration Peer Slot	Sets the slot containing another 40E-TXP-C or 40ME-TXP-C card to create a regeneration peer group. A regeneration peer group facilitates the management of two 40E-TXP-C or 40ME-TXP-C cards that are needed to perform a complete signal regeneration. The regeneration peer group synchronizes provisioning of the two cards. Payload type and ITU-T G.709 optical transport network (OTN) changes made on one 40E-TXP-C or 40ME-TXP-C card is reflected on the peer 40E-TXP-C or 40ME-TXP-C card. **Note** Y-cable protection groups cannot be created on TXP cards that are in a regeneration peer group.	• None • 1 • 2 • 3 • 4 • 5 • 12 • 13 • 14 • 15 • 16	• None • 1 • 2 • 3 • 4 • 5 • 12 • 13 • 14 • 15 • 16
Regeneration Group Name	(Display only) The regeneration peer group name.	—	—
Trunk Wavelengths	(Display only) Shows the supported wavelengths of the trunk port after the card is installed. The 40E-TXP-C, or 40ME-TXP-C that is installed shows the C-band wavelengths that it supports.	—	—

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G658 Changing the 40G Multirate Transponder Line Settings

Purpose	This task changes the line settings of the 40E-TXP-C and 40ME-TXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs.

Step 3 Modify any of the settings for the Client tab as described in the following table.

Table 126: Line Settings of the 40E-TXP-C, and 40ME-TXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number.	1 and 2
Port Name	Assigns a logical name for each of the ports shown by filling in this field.	User-defined. The port name can be up to 80 alphanum special characters, or both. The port name is blank by c
Admin State	Sets the port service state unless network conditions prevent the change. For more information about service states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI) • IS,AINS (ANSI) or Unlocked,automaticInService
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disab • OOS-MA,MT (ANSI) or Locked-enabled,maintenar

Parameter	Description	Options
ALS Mode	(Client port only) Sets the ALS function mode.	• Disabled (default)—ALS is off; the laser is not shut down when traffic outage or loss of signal • Auto Restart: (OC-768/STM-256/OTU-3 only the laser automatically shuts down when traffic occur. It automatically restarts when the conditio the outage are resolved. • Manual Restart—ALS is on; the laser automat down when traffic outage or LOS occurs. How must be manually restarted when conditions th outage are resolved. • Manual Restart for Test—Manually restarts th testing.
Reach	(Display only) Displays the optical reach distance of the port.	• Autoprovision—(trunk port only) The system provisions the reach. • VSR—(client port only) The system provision reach (VSR) for the port.
Wavelength	Provisions the wavelength for the port.	• First Tunable Wavelength • Further wavelengths: Further wavelengths in 10 C-band spacing. The wavelengths carried by t identified with two asterisks. If the card is not wavelengths appear with a dark grey backgrou
Fault Signalling	(Display only) Applicable only to client port 1. When the termination mode is set to transparent, Squelch/Laser-Off is enabled. For section/line termination mode, AIS/Send Local Fault is enabled. For trunk port, Squelch/Laser-Off is disabled.	• Squelch/Laser-Off • AIS/Send Local Fault • Disable/Transparent **Note** Both Squelch/Laser-Off and AIS/Send Local F are supported when the selected Termination M Transparent. If the Termination Mode selected Line, then only AIS/Send Local Fault is suppo applicable for OC-192/STM-64 and OC-768/S OTN payloads, both Squelch/Laser-Off and AI Fault options are supported.
Overclock	Enables or disables overclock mode on trunk port.	• OFF (default) • ON

Parameter	Description	Options
Rx Wavelength	Provisions the wavelength of the trunk port.	• First Tunable Wavelength • Further wavelengths: Further wavelengths in 100-G C-band spacing. The wavelengths carried by the c identified with two asterisks. If the card is not inst wavelengths appear with a dark grey background.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G659 Changing the 40G Multirate Transponder SONET, SDH, or Ethernet Line Settings

Purpose	This task changes the SONET, SDH, or Ethernet line settings for 40E-TXP-C and 40ME-TXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the SONET, SDH, or Ethernet line settings.

Step 2 Click the **Provisioning** > **Line** > **SONET/SDH/Ethernet** tabs.

Step 3 Modify any of the settings described in the following table.

Note
In the following table, some parameter tabs do not always apply to all 40G multirate transponder cards. If a tab does not apply, it will not appear in CTC.

Table 127: SONET, SDH Line Settings of the 40E-TXP-C and 40ME-TXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the port number.	• 1 (OC-768) • 1 (40G Ethernet LAN Phy) • 1 (OTU3)	• 1 (STM-256) • 1 (40G Ethernet Phy) • 1 (OTU3)
SF BER	(SONET [ANSI] or SDH [ETSI] only) Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5	• 1E-3 • 1E-4 • 1E-5
SD BER	(SONET [ANSI] or SDH [ETSI] only) Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
ProvidesSync	(OC-768/STM-256 only) Sets the ProvidesSync card parameter. If checked, the card is provisioned as a network element (NE) timing reference.	Checked or unchecked	Checked or unchecke
SyncMsgIn	(OC-768/STM-256 only) Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked	Checked or unchecke
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• PRS—Primary Reference Source (Stratum 1) • STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing synchronization • RES—Reserved; quality level set by user	• G811—Primary refe clock • STU—Sync traceab unknown • G812T—Transit noc traceable • G812L—Local node traceable • SETS—Synchronou equipment • DUS—Do not use fo synchronization

Parameter	Description	ANSI Options	ETSI Options
Send DoNotUse	(OC-768/STM-256 only) Sets the Send DoNotUse card state. When checked, sends a do not use (DUS) message on the S1 byte.	Checked or unchecked	Checked or unchecked
Type	(SONET [ANSI] or SDH [ETSI] only) Indicates the optical transport type.	• SONET • SDH	• SONET • SDH
Termination Mode	(OC-768/STM-256 only) Sets the mode of operation. **Note** This option is only available for SONET/SDH payloads.	• Transparent • Section • Line	• Transparent • Regeneration Section • Multiplex Section (M

Table 128: Ethernet Line Settings of the 40E-TXP-C and 40ME-TXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the port number.	• 1-1 to 1-16 (OC3/OC12/OC48/GE) • 17-1 (Trunk/Interlink) • 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 17 and Port 18 are trunk ports that support OC192 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).	• 1-1 to 1-16 (STM1/STM4/STM1 • 17-1 (Trunk/Interlink • 18-1 (Trunk/Interlink • 19-1 (Trunk) **Note** Port 17 and Port 18 a trunk ports that suppo STM64 payload in a single-card configura These ports are interl ports in a double-carc configuration (ADM- peer group).
Port Name	Provides the ability to assign the specified port a name.	User-defined. Name can be up to 80 alphanumeric/special characters. Blank by default.	User-defined. Name can be 80 alphanumeric/special characters. Blank by defau
Admin State	Sets the port service state. For more information about administrative states, see the Administrative and Service States document.	• IS • IS,AINS • OOS,DSBLD • OOS,MT	• Unlocked • Unlocked,automaticInS • Locked,disabled • Locked,maintenance

Parameter	Description	ANSI Options	ETSI Options
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR • OOS-AU,AINS • OOS-MA,DSBLD • OOS-MA,MT	• Unlocked-enablec • Unlocked-disable automaticInServic • Locked-enabled,d • Locked-enabled,ma
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled, or it can be set for one of three mode options.	• Disabled (default): ALS is off; the laser is not automatically shut down when traffic outages (LOS) occur. • Manual Restart: ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test: Manually restarts the laser for testing.	• Disabled (default) off; the laser is no automatically shu when traffic outag occur. • Manual Restart: A the laser automatic down when traffic (LOS) occur. How laser must be man restarted when co that caused the ou resolved. • Manual Restart fo Manually restarts for testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, after which the card becomes in service (IS) automatically • 0 to 48 hours, 15-minute increments **Note** The AINS service state is not supported on interlink ports.	• Duration of valid signal, in hh.mm after which the ca becomes in servic automatically • 0 to 48 hours, 15- increments **Note** The AINS service not supported on ports.
Reach	Displays the optical reach distance of the client port.	The Reach options depend on the traffic type that has been selected.	The Reach options depe traffic type that has beer

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G692 Changing the 40G Multirate Transponder OTU Settings

Purpose	This task changes the OTU settings of the 40E-TXP-C, and 40ME-TXP-C transponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C or 40ME-TXP-C card where you want to change the OTU settings.

Step 2 Click the **Provisioning** > **Line** > **OTU** tabs.

Step 3 Modify any of the settings described in the following table.

Table 129: OTU Settings of the 40E-TXP-C, and 40ME-TXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the port number that is applicable only for OC-192/STM-64 payloads.	• 1-1 • 2-1 • 3-1 • 4-1	• 1-1 • 2-1 • 3-1 • 4-1
SyncMsgIn	(Display only) (OC-768/STM-256 only) Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked	Checked or unchecked

Parameter	Description	ANSI Options	ETSI Options
Admin SSM	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• PRS—Primary Reference Source (Stratum 1) • STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing synchronization • RES—Reserved; quality level set by user	• G811—Primary referenc • STU—Sync traceability unknown • G812T—Transit node cl traceable • G812L—Local node clo traceable • SETS—Synchronous equ • DUS—Do not use for tin synchronization
ProvidesSync	(Display only) (OC-768/STM-256 only) Sets the ProvidesSync card parameter. If checked, the card is provisioned as a network element (NE) timing reference.	Checked or unchecked	Checked or unchecked

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G661 Changing the 40G Multirate Transponder Line Thresholds for SONET or SDH Payloads

Purpose	This task changes the line threshold settings of 40E-TXP-C and 40ME-TXP-C transponder cards carrying SONET or SDH payloads, including the physical 40G Ethernet WAN Phy payload.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the line threshold settings.

Step 2 Click the **Provisioning > Line Thresholds** > **SONET Thresholds** (ANSI) or **SDH Thresholds** (ETSI) tabs.

Step 3 Modify any of the settings described in the following table.

Table 130: Line Threshold Settings for the 40E-TXP-C, and 40ME-TXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Port number	• 1 (OC-768) • 2 (OC-768)	• 1 (STM-256) • 2 (STM-256)
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display optior • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**.
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**. Click **Reset to Default** to restore default values.	Numeric. Threshold display optior • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**. Click **Reset to Default** to restore d values.

Parameter	Description	ANSI Options	ETSI Options
FC	(Line or Multiplex Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**. Click **Reset to Default** to restore default values.	—
UAS	(Line or Multiplex Section only) Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**. Click **Reset to Default** to restore default values.	Numeric. Threshold display op • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**. Click **Reset to Default** to resto values.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G663 Provisioning the 40G Multirate Transponder Trunk Port Alarm and TCA Thresholds

Purpose	This task provisions the 40E-TXP-C, and 40ME-TXP-C trunk port alarm and threshold cross alert (TCA) thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 Under Types area, verify that the TCA radio button is selected. If not, click it, then click **Refresh**.

Step 4 Referring to the following table, verify the trunk port (Port 2) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Press **Enter**, then click **Apply**.

Step 5 Under Intervals area, select 15 Min or 1 Day, then click Refresh.

Note
Do not modify the Laser Bias parameters.

Table 131: Trunk Port TCA Thresholds of the 40E-TXP-C, and 40ME-TXP-C Cards

Card	TCA RX Power High (dbm)	TCA RX Power Low (dbm)	TCA TX Power High (dbm)	TCA TX Power Low (dbm)
40E-TXP-C 40ME-TXP-C	–9.0	–22.0	9.0	0.0

Step 6 Click **Apply**.

Step 7 Under Types area, click the **Alarm** radio button and click **Refresh**.

Step 8 Referring to the following table, verify the trunk port (Port 2) alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Press **Enter**, then click **Apply**.

Step 9 Under Intervals area, select 15 Min or 1 Day, then click Refresh.

Table 132: Trunk Port Alarm Thresholds of the 40E-TXP-C, and 40ME-TXP-C Cards

Card	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
40E-TXP-C 40ME-TXP-C	–9.0	–22.0	9.0	0.0

Step 10 Click **Apply**.

Step 11 Click **Default** to restore default values.

Step 12 Return to your originating procedure (NTP).

DLP-G664 Provisioning the 40G Multirate Transponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the 40E-TXP-C, and 40ME-TXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40E-TXP-C card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Under Types area, verify that the TCA radio button is selected. If not, click it, then click **Refresh**.

Step 4 Referring to the following table, verify the client port (Port 1) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting the existing value, and entering the new value. Press Enter, then click **Apply**.

Step 5 Under Intervals area, select 15 Min or 1 Day, then click Refresh.

Note
Do not modify the Laser Bias parameters.

Table 133: Client Interface TCA Thresholds of the 40E-TXP-C, and 40ME-TXP-C Cards

Pluggable Port Rate	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
40G Ethernet LAN Phy	3.0	–6.0	6.0	–3.0
OC-768/STM-256	3.0	–6.0	6.0	–3.0
OTU3	3.0	–6.0	6.0	–3.0

Step 6 Click **Apply**.

Step 7 Under Types area, click the **Alarm** radio button and click **Refresh**.

Step 8 Referring to the following table, provision the client port (Port 1) alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned.

Step 9 Under Intervals area, select 15 Min or 1 Day, then click Refresh.

Table 134: Card Client Interface Alarm Thresholds of the 40E-TXP-C, and 40ME-TXP-C Cards

Pluggable Port Rate	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
40G Ethernet LAN Phy	5.0	–8.0	4.0	–1.0
OC-768/STM-256	5.0	–8.0	4.0	–1.0
OTU3	5.0	–8.0	4.0	–1.0

Step 10 Click **Apply**.

Step 11 Return to your originating procedure (NTP).

NTP-G170 Provisioning the ADM-10G Card Peer Group, Ethernet Settings, Line Settings, PM Parameters, and Thresholds

Purpose	This procedure creates an ADM-10G peer group and changes line settings, PM parameters, and threshold settings for ADM-10G cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC DLP-G723 Install PPM on a Line Card DLP-G411 Provisioning an ADM-10G PPM and Port, on page 289 DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 To provision a peer group, complete the DLP-G403 Creating the ADM-10G Peer Group, on page 377.

Step 3 To display the bandwidth usage of the STS timeslots, complete the DLP-G775 Displaying the Bandwidth Usage of the STS Timeslots, on page 183.

Step 4 To provision Ethernet settings, complete the DLP-G469 Provisioning the ADM-10G Card Ethernet Settings, on page 378.

Step 5 To change line settings, complete the following tasks as needed:

- DLP-G397 Changing the ADM-10G Line Settings, on page 379
- DLP-G398 Changing the ADM-10G Line Section Trace Settings, on page 383
- DLP-G399 Changing the ADM-10G Line Thresholds for SONET and SDH Payloads, on page 385
- DLP-G412 Changing the ADM-10G Line RMON Thresholds for the 1G Ethernet Payload, on page 389

Step 6 To change thresholds, complete the following tasks as needed:

- DLP-G400 Provisioning the ADM-10G Interlink or Trunk Port Alarm and TCA Thresholds, on page 392
- DLP-G401 Provisioning the ADM-10G Client Port Alarm and TCA Thresholds, on page 394
- DLP-G402 Changing the ADM-10G OTN Settings, on page 395

Stop. You have completed this procedure.

DLP-G403 Creating the ADM-10G Peer Group

Purpose	This task creates peer group protection for two ADM-10G cards within the same node, located on the same shelf. Perform this task on only one of the two peer cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 In the ADM Group Peer drop-down list, choose the slot number where the companion ADM-10G card is located.

Step 4 In the ADM Peer Group field, enter a group name.

Step 5 Click **Apply**.

Note
The Card Parameters Tunable Wavelengths area is read-only and does not contain any wavelengths until circuits are separately provisioned for the card.

Step 6 Return to your originating procedure (NTP).

DLP-G469 Provisioning the ADM-10G Card Ethernet Settings

Purpose	This task changes the Ethernet settings for the ADM-10G card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the Ethernet settings. The card view appears.

Step 2 Click the **Provisioning** > **Line** > **Ethernet** tabs.

Step 3 Modify any of the settings for the Ethernet tab as described in the following table. The parameters that appear depend on the card mode.

Table 135: ADM-10G Card Ethernet Settings

Parameter	Description	Options
Port	(Display only) The Port number (*n*-*n*) and rate.	—
MTU	The maximum size of the Ethernet frames accepted by the port.	Jumbo. Default: 64 to 9216 Numeric: 1548
Mode	Sets the Ethernet mode.	• 1000 Mbps
Framing	Sets the framing type.	• GFP-F • HDLC

Parameter	Description	Options
CRC Encap	Sets the CRC encap values for the framing type.	CRC encap value for GFP-F: • None (default) • 32-Bit CRC encap value for HDLC: • 16-Bit • 32-Bit (default)
AINS Soak	Automatic in-service soak time. The duration of time that must pass with an uninterrupted signal before the traffic/termination transitions to the IS-NR (ANSI) or unlocked-enabled (ETSI) service state.	• Duration of valid input signal, in hh.mm forma the card becomes in service (IS) automatically • 0 to 48 hours, 15-minute increments

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G397 Changing the ADM-10G Line Settings

Purpose	This task changes the line settings for the ADM-10G card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs.

Step 3 Modify any of the settings described in the following table as needed.

Note
In the following table, some parameter tabs do not always apply to all ADM-10G cards. If a tab does not apply, it will not appear in CTC.

Table 136: ADM-10G Line Port Tab Settings

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the port number.	• 1-1 to 1-16 (OC3/OC12/OC48/GE) • 17-1 (Trunk/Interlink) • 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 17 and Port 18 are trunk ports that support OC192 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).	• 1-1 to 1-16 (STM1/STM4/STM16/GE) • 17-1 (Trunk/Interlink) • 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 17 and Port 18 are trunk ports that support STM64 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).
Port Name	Provides the ability to assign the specified port a name.	User-defined. Name can be up to 80 alphanumeric/special characters. Blank by default.	User-defined. Name can be up to 80 alphanumeric/special characters. Blank by default.
Admin State	Sets the port service state. For more information about administrative states, see the Administrative and Service States document.	• IS • IS,AINS • OOS,DSBLD • OOS,MT	• Unlocked • Unlocked,automaticInService • Locked,disabled • Locked,maintenance
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR • OOS-AU,AINS • OOS-MA,DSBLD • OOS-MA,MT	• Unlocked-enabled • Unlocked-disabled, automaticInService • Locked-enabled,disabled • Locked-enabled,maintenance

Parameter	Description	ANSI Options	ETSI Options
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled, or it can be set for one of three mode options.	• Disabled (default): ALS is off; the laser is not automatically shut down when traffic outages (LOS) occur. • Auto Restart: (Not applicable for Gigabit Ethernet client interfaces) ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. It automatically restarts when the conditions that caused the outage are resolved. • Manual Restart: ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test: Manually restarts the laser for testing.	• Disabled (default): ALS is off; the laser is not automatically shut down when traffic outages (LOS) occur. • Auto Restart: (Not applicable for Gigabit Ethernet client interfaces) ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. It automatically restarts when the conditions that caused the outage are resolved. • Manual Restart: ALS is on; the laser automatically shuts down when traffic outages (LOS) occur. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test: Manually restarts the laser for testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, after which the card becomes in service (IS) automatically • 0 to 48 hours, 15-minute increments **Note** The AINS service state is not supported on interlink ports.	• Duration of valid input signal, in hh.mm format, after which the card becomes in service (IS) automatically • 0 to 48 hours, 15-minute increments **Note** The AINS service state is not supported on interlink ports.
Reach	Displays the optical reach distance of the client port.	The Reach options depend on the traffic type that has been selected.	The Reach options depend on the traffic type that has been selected.

Parameter	Description	ANSI Options	ETSI Options
Wavelength	Tunable wavelength.	Shows the supported wavelengths of the trunk port after the card is installed in the format: *first wavelength-last wavelength-frequency spacing-number of supported wavelengths*. For example, 1529.55nm-1561.83nm-50gHz-8 are supported wavelengths. You can also view the bandwidth of the wavelength information in THz.	Shows the supported wavelengths of the trunk port after the card is installed in the format: *first wavelength-last wavelength-frequency spacing-number of supported wavelengths*. For example, 1529.55nm-1561.83nm-50gHz-8 are supported wavelengths. You can also view the bandwidth of the wavelength information in THz.

Step 4 Click **Apply**.

Step 5 Click the **Provisioning** > **Line** >**SONET** or **SDH** tabs.

Step 6 Modify any of the settings described in the following table as needed.

Table 137: ADM-10G Line SONET or SDH Tab Settings

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the client and trunk port number.	• 1-1 to 1-16 (OC3/OC12/OC48/GE) • 17-1 (OC192) • 18-1 (OC192/Interlink) • 19-1 (OC192) **Note** Port 17 and Port 18 are trunk ports that support OC192 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).	• 1-1 to 1-16 (STM1/STM4/STM16/GE) • 17-1(STM64) • 18-1 (STM64/Interlink) • 19-1 (STM64) **Note** Port 17 and Port 18 are trunk ports that support STM64 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).
ProvidesSync	When checked, the card is provisioned as an NE timing reference.	Checked or unchecked	Checked or unchecked
SyncMsgIn	Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked	Checked or unchecked

Parameter	Description	ANSI Options	ETSI Options
SF BER	Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5	• 1E-3 • 1E-4 • 1E-5
Send DoNotUse	When checked, sends a DUS message on the S1 byte.	Checked or unchecked	Checked or unchecked
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Type	(Display only) Type of node.	• SONET • SDH	• SDH
Admin SSM In	Overrides the synchronization status message (SSM) synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• PRS—Primary Reference Source (Stratum 1) • ST2—Stratum 2 • TNC—Transit node clock • ST3E—Stratum 3E • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing synchronization • RES—Reserved; quality level set by user	• G811—Primary reference clock • STU—Sync traceability unknown • G812T—Transit node clock traceable • G812L—Local node clock traceable • SETS—Synchronous equipment • DUS—Do not use for timing synchronization

Step 7 Return to your originating procedure (NTP).

DLP-G398 Changing the ADM-10G Line Section Trace Settings

Purpose	This task changes the line section trace settings for the ADM-10G cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The **Section Trace** tab is available for ports configured as OC-N (Ports 1 through 16, Ports 17 and 18 [only in a single-card configuration] and Port 19). Section trace is not available on interlink ports.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the section trace settings. The card view appears.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs.

Step 3 Modify any of the settings described in the following table.

Table 138: ADM-10G Section Trace Settings

Parameter	Description	ANSI Options	ETSI Options
Port	Sets the port number.	• 1-1 to 1-16 (OC3/OC12/OC48/GE) • 17-1 (OC 192) • 18-1 (OC192) • 19-1 (OC192) **Note** Port 17 and Port 18 are trunk ports that support OC192 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).	• 1-1 to 1-16 (STM1/STM4/STM16/GE) • 17-1 (STM64) • 18-1 (STM64) • 19-1 (STM64) **Note** Port 17 and Port 18 are trunk ports that support STM64 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).
Received Trace Mode	Sets the trace mode.	• Off/None • Manual	• Off/None • Manual

Parameter	Description	ANSI Options	ETSI Options
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte • 64 byte	• 1 byte • 16 byte • 64 byte
Current	Current Transmit String displays the current transmit string; New Transmit String sets a new transmit string. Current String Type allows you to choose between ASCII or Hexadecimal format. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size	String of trace string size
Received	(Display only) Current Received String displays the current received string. You can click **Refresh** to manually refresh this display, or check the **Auto-refresh every 5 sec** check box to keep this panel updated.	String of trace string size	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked/unchecked (default)	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G399 Changing the ADM-10G Line Thresholds for SONET and SDH Payloads

Purpose	This task changes the line threshold settings for ADM-10G cards carrying SONET payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the line threshold settings. The card view appears.

Step 2 Click the **Provisioning** > **Line Thresholds** > **SONET Thresholds** or **SDH Thresholds** tabs.

Step 3 Modify any of the settings described in the following table.

Table 139: ADM-10G Card Line Threshold Settings

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Port number	• 1-1 to 1-16 (OC3/OC12/OC48/GE) • 17-1 (OC 192) • 18-1 (OC192) • 19-1 (OC192) **Note** Port 17 and Port 18 are trunk ports that support OC192 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).	• 1-1 to 1-16 (STM1/STM4/STM16/GE) • 17-1 (STM 64) • 18-1 (STM64) • 19-1 (STM64) **Note** Port 17 and Port 18 are trunk ports that support STM64 payload in a single-card configuration. These ports are interlink ports in a double-card configuration (ADM-10G peer group).
EB	Path Errored Block indicates that one or more bits are in error within a block	—	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Multiplex Section or Regeneration Section (near end only) Choose an option in each category and click **Refresh**.

Parameter	Description	ANSI Options	ETSI Options
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.

Parameter	Description	ANSI Options	ETSI Options
BBE	Background block errors	—	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Multiplex Section or Regeneration Section (near end only) Choose an option in each category and click **Refresh**.
FC	(Line Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
PSC	Protection Switching Count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day Choose an option in each category and click **Refresh**.	—
PSD	Protection Switching Duration	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day Choose an option in each category and click **Refresh**.	—

Parameter	Description	ANSI Options	ETSI Options
UAS	(Line Section only) Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G412 Changing the ADM-10G Line RMON Thresholds for the 1G Ethernet Payload

Purpose	This task changes the line RMON threshold settings for an ADM-10G card carrying the 1G Ethernet payload.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC DLP-G411 Provisioning an ADM-10G PPM and Port, on page 289
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note This task can only be performed if the ADM-10G card has at least one PPM port provisioned for Gigabit Ethernet.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the line RMON thresholds. The card view appears.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the applicable port.

Step 5 From the Variable drop-down list, choose the applicable Ethernet variable. See the following table for a list of available Ethernet variables.

Table 140: ADM-10G Gigabit Ethernet Thresholds

Variable	Description
ifInOctets	Total number of octets received on the interface, including framing characters.
ifInErrors	Number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
ifInMulticastPkts	Number of multicast frames received error-free.
ifInBroadcastPkts	Number of packets, delivered by a sublayer to a higher layer or sublayer, that were addressed to a broadcast address at this sublayer.
ifInErrorBytePkts	Number of receive error bytes.
dot3StatsFCSErrors	Number of frames with frame check errors; that is, there is an integral number of octets, but there is also an incorrect frame check sequence (FCS).
dot3StatsFrameTooLong	Number of received frames that were larger than the permitted maximum size.
dot3ControlInUnknownOpcodes	A count of MAC control frames received on this interface that contain an opcode not supported by this device.
dot3InPauseFrames	A count of MAC control frames received on this interface with an opcode indicating the PAUSE operation.
dot3OutPauseFrames	A count of MAC control frames transmitted on this interface with an opcode indicating the PAUSE operation.
etherStatsUndersizePkts	Total number of packets received that were well-formed and less than 64 octets long (excluding framing bits and including FCS octets).
etherStatsFragments	Total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error). **Note** It is normal for etherStatsFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits.

etherStatsPkts64Octets	Total number of packets (including bad packets) transmitted and received by the interface that were 64 octets in length (excluding framing bits and including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including bad packets) transmitted and received by the interface that were between 65 and 127 octets in length, inclusive.
etherStatsPkts128to255Octets	The total number of packets (including bad packets) transmitted and received by the interface that were between 128 and 255 octets in length, inclusive, excluding framing bits and including FCS octets.
etherStatsPkts256to511Octets	Total number of packets (including bad packets) transmitted and received by the interface that were between 256 and 511 octets in length, inclusive.
etherStatsPkts512to1023Octets	Total number of packets (including bad packets) transmitted and received by the interface that were between 512 and 1023 octets in length, inclusive, excluding framing bits and including FCS octets.
etherStatsPkts1024to1518Octets	Total number of packets (including bad packets) transmitted and received by the interface that were between 1024 and 1518 octets in length, inclusive, excluding framing bits and including FCS octets.
etherStatsBroadcastPkts	Total number of good packets transmitted and received by the interface that were directed to the broadcast address. **Note** Multicast packets are not included.
etherStatsMulticastPkts	Total number of good packets transmitted and received by the interface that were directed to a multicast address. **Note** This number does not include packets directed to the broadcast address.
etherStatsOversizePkts	Total number of packets transmitted and received by the interface that were well-formed and longer than 1518 octets, excluding framing bits and including FCS octets.
etherStatsJabbers	Total number of packets received that were longer than 1518 octets (excluding framing bits and including FCS octets), and had a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).
rxTotalPkts	Total number of received packets.
txTotalPkts	Total number of transmit packets.

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**.

Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Type an appropriate number of seconds for the Sample Period.

Step 9 Type the appropriate number of occurrences for the Rising Threshold.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Step 12 Return to your originating procedure (NTP).

DLP-G400 Provisioning the ADM-10G Interlink or Trunk Port Alarm and TCA Thresholds

Purpose	This task provisions the ADM-10G interlink or trunk port alarm and threshold crossing alert (TCA) thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the interlink or trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 Under Types, verify that the TCA radio button is checked. If not, check it, then click **Refresh**.

Step 4 Referring to the following table, verify the interlink or trunk port TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Table 141: ADM-10G Interlink and Trunk Port TCA Thresholds

Port	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
17-1 and 18-1 (Trunk/Interlink) **Note** Port 17 and Port 18 are trunk ports in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).	–7.0 dBm	–27.0 dBm	6.0 dBm	–4.0 dBm
19-1 (Trunk)	–7.0 dBm	–27.0 dBm	6.0 dBm	–4.0 dBm

Step 5 Click **Apply**.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the interlink or trunk port alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low.

Step 8 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 142: ADM-10G Interlink and Trunk Port Alarm Thresholds

Port	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
17-1 (Trunk/Interlink) **Note** Port 17 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).	1.0 dBm	–13.0 dBm	1.0 dBm	–8.0 dBm

Port	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
18-1 (Trunk/Interlink) **Note** Port 18 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).	–5.0 dBm	–30.0 dBm	5.0 dBm	–3.0 dBm
19-1 (Trunk)	–5.0 dBm	–30.0 dBm	5.0 dBm	–3.0 dBm

Step 9 Click **Apply**.

Step 10 Return to your originating procedure (NTP).

DLP-G401 Provisioning the ADM-10G Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the ADM-10G card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 Under Types, verify that the **TCA** radio button is checked. If not, check it, then click **Refresh**.

Step 4 Referring to Table 112: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface TCA Thresholds, on page 337 and Table 113: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface Alarm Thresholds, on page 338, verify the Port 1 to 16 (Client) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned.

Step 5 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note

You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Step 6 Click **Apply**.

Step 7 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 8 Referring to Table 112: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface TCA Thresholds, on page 337 and Table 113: TXP_MR_2.5G and TXPP_MR_2.5G Card Client Interface Alarm Thresholds, on page 338, verify the interlink ports 17-1 and 18-1 for RX Power High, RX Power Low, TX Power High, and TX Power Low settings.

Step 9 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Step 10 Click **Apply**.

Step 11 Return to your originating procedure (NTP).

DLP-G402 Changing the ADM-10G OTN Settings

Purpose	This task changes the line OTN settings for the ADM-10G card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the ADM-10G card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then click one of the following subtabs: **OTN Lines**, ITU-T **G.709 Thresholds**, **FEC Thresholds**, or **Trail Trace Identifier**.

Step 3 Modify any of the settings described in the following tables.

Note
You must modify Near End and Far End independently; 15 Min and 1 Day independently; and SM and PM independently. To do so, choose the appropriate radio buttons and click **Refresh**.

Table 143: ADM-10G Card OTN Lines Settings

Parameter	Description	Options
Port	(Display only) Displays the port number and optional name.	• 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 18 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).
ITU-TG.709 OTN	Sets the OTN lines according to ITU-T G.709.	• Enable • Disable
FEC	Sets the OTN lines FEC mode. FEC mode can be Disabled, Enabled, or, for the TXP_MR_10E, Enhanced FEC mode can be enabled to provide greater range and lower bit error rate. For TXP_MR_10E cards, Standard is the same as enabling FEC.	• Disable—FEC is off. • Standard—Standard FEC is on. • Enhanced—Enhanced FEC is on.
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
SF BER	(Display only) Indicates the signal fail bit error rate.	• 1E-5
Synch Mapping	Sets how the ODUk (client payload) is mapped to the optical channel (OTUk).	Synch mapping

Table 144: ADM-10G Card ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number and optional name.	• 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 18 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).

Parameter	Description	Options
ES	Errored seconds. Selecting the SM (OTUk) radio button selects FEC, overhead management, and PM using OTUk. Selecting the PM radio button selects path PM using ODUk.	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**. **Note** SM (OTUk) is the ITU-T G.709 optical channel transport unit order of k overhead frame used for management and performance monitoring. PM (ODUk) is the ITU-T G.709 optical channel data unit order of k overhead frame unit used for path performance monitoring.
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.
UAS	Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.
BBE	Background block errors	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.

Parameter	Description	Options
FC	Failure counter	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.

Table 145: ADM-10G Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number and optional name.	• 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 18 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).
Bit Errors Corrected	Displays the number of bit errors corrected during the selected time period.	Numeric display. Can be set for 15-minute or 1 day intervals.
Uncorrectable Words	Displays the number of uncorrectable words in the selected time period.	Numeric display. Can be set for 15-minute or 1 day intervals.

Table 146: ADM-10GTrail Trace Identifier Settings

Parameter	Description	Options
Port	Sets the port number.	• 18-1 (Trunk/Interlink) • 19-1 (Trunk) **Note** Port 18 is a trunk port in single-card configuration and an interlink port in double-card configuration (ADM-10G peer group).
Level	Sets the level.	• Section • Path

Parameter	Description	Options
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable FDI on TTIM	If a Trace Identifier Mismatch on Section/Path overhead alarm arises because of a J0/J1 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)
Transmit	Current Transmit String displays the current transmit string; New sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Transmit String Type, click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size; trail trace identifier is 64 bytes in length.
Expected	Current Expected String displays the current expected string; New sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Expected String Type, click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Current Received String displays the current received string. You can click **Refresh** to manually refresh this display, or check the **Auto-refresh every 5 sec** check box to keep this panel updated.	String of trace string size
Auto-refresh (every 5 sec)	If checked, automatically refreshes the display every 5 seconds.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G333 Adding an ADM-10G Card to an Existing Topology

Purpose	This procedure adds an ADM-10G card to an existing topology. Perform the steps in this procedure when OCHNC and DCC are present in the network. In case of OCH trails, delete all the circuits in Step 3 that traverses the port before deleting the OCH-trail.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC. • Complete the turn up procedures in the "Turning Up a Node" chapter for the node to be added. • An updated Cisco Transport Planner network plan recalculated with the new node.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 If path protected circuits exist between Node A and Node B, complete the DLP-A197 Initiate a Path Protection Force Switch task. This task applies a force switch on the path between Node A and Node B.

Step 2 Complete the NTP-G129 Add a DWDM Node task to add Node C.

Step 3 Complete the DLP-G106 Deleting Optical Channel Network Connections task to delete OCHNC circuit between Node A and Node B.

Step 4 Complete the NTP-G59 Creating, Deleting, and Managing Optical Channel Network Connections task to create OCHNC circuit between Node A-->Node C and Node C-->Node B for wavelength connectivity.

Note
The ports on the card in Node C must be tuned to the same wavelength as Node A and Node B.

Step 5 Create DCC terminations on Node C. See the DLP-A377 Provision Section DCC Terminations task.

Alternatively, if additional bandwidth is needed for CTC management, complete the DLP-A378 Provision Line DCC Terminations task.

TNC reloads when SDCC and LDCC co-exist on the same card. This behavior is observed in the following cards:

- TXP-MR-10G
- TXP-MR-2.5G
- TXPP-MR-2.5G
- TXP-MR-10E

- MXP-MR-2.5G
- MXPP-MR-2.5G
- MXP-MR-10DME
- MXP-MR-10DMEX
- ADM-10G
- TXP-MR-10EX
- TXPP-MR-10EX
- OTU2-XP

Step 6 Ensure that the DCCs are functional between Node A-->Node C and Node C-->Node B. See the "DLP-G76 Provision DCC/GCC Terminations" task.

Step 7 Complete the following task to create pass-through STS or VC circuits in Node C.

- NTP-G200 Creating, Deleting, and Managing STS or VC Circuits for the ADM-10G Card

Step 8 Complete the NTP-A301 Merge Circuits task for each circuit created.

Step 9 If path protected circuits exist between Node A and Node B, complete the DLP-A198 Clear a Path Protection Force Switch task. This task clears a force switch on the path between Node A and Node B.

Stop. You have completed this procedure.

NTP-G97 Modifying the 4x2.5G Muxponder Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and threshold settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G222 Changing the 4x2.5G Muxponder Card Settings, on page 402
- DLP-G223 Changing the 4x2.5G Muxponder Line Settings, on page 404
- DLP-G224 Changing the 4x2.5G Muxponder Section Trace Settings, on page 407
- DLP-G225 Changing the 4x2.5G Muxponder Trunk Settings, on page 409
- DLP-G226 Changing the 4x2.5G Muxponder SONET/SDH Line Thresholds Settings, on page 413
- DLP-G303 Provisioning the 4x2.5G Muxponder Trunk Port Alarm and TCA Thresholds, on page 415
- DLP-G304 Provisioning the 4x2.5G Muxponder Client Port Alarm and TCA Thresholds, on page 417
- DLP-G228 Changing the 4x2.5G Muxponder Line OTN Settings, on page 419
- DLP-G369 Changing the 4x2.5G Muxponder Trunk Wavelength Settings, on page 411

Step 3 As needed, complete the NTP-G103 Backing Up the Database task.

Stop. You have completed this procedure.

DLP-G222 Changing the 4x2.5G Muxponder Card Settings

Purpose	This task changes the card settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards, including payload type, termination mode, and wavelength.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Modify any of the settings described in the following table. The Parameters shown in the following table do not apply to all 4x2.5G muxponder cards. If the parameter or option does not apply, it is not shown in CTC.

Table 147: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Settings

Parameter	Description	Options
Termination Mode	Sets the mode of operation. Options that do not apply to a card do not display. The MXP_2.5G_10G card is based on SONET/SDH multiplexing. The transparent mode terminates and rebuilds the B1 byte (as well as other bytes) of the incoming OC-48/STM-16 signal. The B2 byte is not touched. The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards are fully transparent in transparent mode based on the OTN/ITU-T G.709 multiplexing scheme. It does not terminate the B1 byte or other bytes. It encapsulates OC-48/STM-16 bytes into ODU1 first, then multiplexes them into an OTU2.	For ANSI platforms: • Transparent • Section (MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C only) • Line (MXP_2.5G_10G only) For ETSI platforms: • Transparent • Multiplex Section (MXP_2.5G_10G, only) • Regeneration Section (MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C only)
AIS/Squelch	(MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C only) Sets the transparent termination mode configuration.	• Ais • Squelch

Parameter	Description	Options
Tunable Wavelengths	(Display only) Shows the supported wavelengths of the trunk port after the card is installed. For the MXP_2.5G_10E_C, or MXP_2.5G_10E_L cards, the first and last supported wavelength, frequency spacing, and number of supported wavelengths are shown in the format: *first wavelength-last wavelength-frequency spacing-number of supported wavelengths*. For example, the MXP_2.5G_10E_C card would show: 1529.55nm-1561.83nm-50gHz-82. The MXP_2.5G_10G and MXP_2.5G_10E show the four wavelengths supported by the card that is installed. You can also view the bandwidth of the wavelength information in THz.	—

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G223 Changing the 4x2.5G Muxponder Line Settings

Purpose	This task changes the line settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** (ANSI) or **SDH** (ETSI) tabs.

Note
The SONET tab appears only if you have created a PPM for a given port.

Step 3 Modify any of the settings described in the following table.

Note
You must modify Near End and Far End independently; 15 Min and 1 Day independently; and Line and Section independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 148: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Line Settings

Parameter	Description	Options
Port	(Display only) Port number. Ports 1 to 4 are client ports (OC-48/STM-16). Port 5 is the DWDM trunk (OC-192/STM-64) that provides wavelength services. Client ports will not appear of the pluggable port module is not provisioned for it.	• 1 • 2 • 3 • 4 • 5 (Trunk) (MXP_2.5G_10G only)
Port Name	Provides the ability to assign the specified port a logical name.	User-defined. Name can be up to 80 alphanu characters. Blank by default.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS,AINS (ANSI) or Unlocked,automat (ETSI) • OOS,DSBLD (ANSI) or Locked,disab • OOS,MT (ANSI) or Locked,maintena
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (• OOS-AU,AINS (ANSI) or Unlocked-d automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,maintenance (ETSI)
SF BER	Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5

Parameter	Description	Options
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled or can be set for one of three mode options.	• Disable (default): ALS is off; the laser is r automatically shut down when traffic outag occur. • Auto Restart: ALS is on; the laser automati down when traffic outages (LOS) occur. It automatically restarts when the conditions t the outage are resolved. • Manual Restart: ALS is on; the laser autor shuts down when traffic outages (LOS) oc However, the laser must be manually resta conditions that caused the outage are resol • Manual Restart for Test: Manually restarts for testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm fo which the card becomes in service (IS) auto • 0 to 48 hours, 15-minute increments
Type	Sets the optical transport type.	• SONET • SDH
SyncMsgIn	Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source. (This parameter does not appear for the MXP_2.5G_10E trunk port.)	Checked or unchecked
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as an NE timing reference. (This parameter does not appear for the MXP_2.5G_10E trunk port.)	Checked or unchecked

Parameter	Description	Options
Reach	Displays the optical reach distance of the client port.	Options: ANSI/ETSI • Autoprovision/Autoprovision (default) • SR • SR 1/I-1—Short reach up to 2-km dist • IR 1/S1—Intermediate reach, up to 15 • IR 2/S2—Intermediate reach up to 40- • LR 1/L1—long reach, up to 40-km dis • LR 2/L2—long reach, up to 80-km dis • LR 3/L3—long reach, up to 80-km dis
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: 850 nm through 100-GHz ITU spacing CWDM spacing also view the bandwidth of the wavele information in THz.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G224 Changing the 4x2.5G Muxponder Section Trace Settings

Purpose	This task changes the section trace settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The Section Trace tab appears only if you have created a PPM for the card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs.

Step 3 Modify any of the settings described in the following table.

Table 149: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Section Trace Settings

Parameter	Description	Options
Port	Sets the port number.	• 1 • 2 • 3 • 4 • 5 (Trunk; MXP_2.5G_10G only)
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	If an TIM on Section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-S is disabled) • Unchecked (AIS/RDI on TIM-S is not disabled)
Transmit Section Trace String Size	Sets the trace string size. Select either radio button.	• 1 byte • 16 byte
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size

Parameter	Description	Options
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 minutes.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G225 Changing the 4x2.5G Muxponder Trunk Settings

Purpose	This task provisions the trunk settings for the MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note This task does not apply to the MXP_2.5G_10G card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the trunk settings.

Step 2 Click the **Provisioning** > **Line** > **Trunk** tabs.

Step 3 Modify any of the settings described in the following table.

Table 150: MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Trunk Settings

Parameter	Description	Options
Port	(Display only) Displays the port number. Port 5 is the DWDM trunk (OC-192/STM-64) that provides wavelength services.	5 (Trunk)
Port Name	Provides the ability to assign the specified port a logical name.	User-defined. Name can be up to 80 alphanun special characters. Blank by default.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS,AINS (ANSI) or Unlocked,automatic (ETSI) • OOS,DSBLD (ANSI) or Locked,disable • OOS,MT (ANSI) or Locked,maintenanc
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ET • OOS-AU,AINS (ANSI) or Unlocked-dis automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,maintenance (ETSI)

Parameter	Description	Options
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled or can be set for one of three mode options.	• Disabled (default): ALS is off; the las automatically shut down when traffic (LOS) occur. • Auto Restart: ALS is on; the laser au shuts down when traffic outages (LO automatically restarts when the condi caused the outage are resolved. • Manual Restart: ALS is on; the laser a shuts down when traffic outages (LO However, the laser must be manually when conditions that caused the outa resolved. • Manual Restart for Test: Manually res for testing.
AINS Soak	(OC-N and STM-N payloads only) Sets the automatic in-service soak period.	• Duration of valid input signal, in hh.r after which the card becomes in servi automatically • 0 to 48 hours, 15-minute increments

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G369 Changing the 4x2.5G Muxponder Trunk Wavelength Settings

Purpose	This task changes the trunk wavelength settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C card where you want to change the trunk wavelength settings.

Step 2 Click the **Provisioning** > **Line** > **Wavelength Trunk Settings** tabs.

Step 3 Modify any of the settings described in the following table.

Table 151: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C Card Wavelength Trunk Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	5 (Trunk)
Band	(Display only) Indicates the wavelength band available from the card that is installed. If the card is preprovisioned, the field can be provisioned to the band of the card that will be installed.	• C—The C-band wavelengths are available in the Wavelength field. • L—The L-band wavelengths are available in the Wavelength field.
Even/Odd	Sets the wavelengths available for provisioning for MXP_2.5G_10E_C and MXP_2.5G_10E_L cards. (This field does not apply to MXP_2.5G_10G or MXP_2.5G_10E cards.)	• Even—Displays even C-band or L-band wavelengths in the Wavelength field. • Odd—Displays odd C-band or L-band wavelengths in the Wavelength field.
Wavelength	The wavelength provisioned for the trunk.	• First Tunable Wavelength • Further wavelengths in 100-GHz ITU-T C-band or L-band spacing, depending on the card that is installed. For MXP_2.5G_10G and MXP_2.5G_10E cards, the wavelengths carried by the card are identified with two asterisks. If the card is not installed, all wavelengths appear with a dark grey background.You can view the bandwidth of wavelength information in THz.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G226 Changing the 4x2.5G Muxponder SONET/SDH Line Thresholds Settings

Purpose	This task changes the SONET (ANSI) or SDH (ETSI) line threshold settings for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** tabs.

Step 3 Modify any of the settings described in the following table. Some parameter tabs or selections do not always apply to all 4x2.5G muxponder cards. If the tabs or selections do not apply, they do not appear in CTC.

Table 152: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Line Threshold Settings

Parameter	Description	SONET Options	SDH Options
Port	(Display only) Port number	• 1 • 2 • 3 • 4 • 5 (MXP_2.5G_10G only)	• 1 • 2 • 3 • 4 • 5 (MXP_2.5G_10G only)
EB	Path Errored Block indicates that one or more bits are in error within a block	—	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.

Parameter	Description	SONET Options	SDH Options
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**.
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**.
SEFS	(Near End Section or Regeneration Section only) Severely errored framing seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—

Parameter	Description	SONET Options	SDH Options
BBE	Background block errors	—	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.
FC	(Line or Multiplex Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
UAS	(Line or Multiplex Section only) Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G303 Provisioning the 4x2.5G Muxponder Trunk Port Alarm and TCA Thresholds

Purpose	This task changes the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C trunk port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 Select **TCA** (if not already selected), a 15 Min or 1 Day PM interval radio button and then click **Refresh**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Step 4 Referring to the following table, verify the trunk port (Port 5) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low.

Step 5 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
Do not modify the Laser Bias parameters.

Table 153: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Trunk Port TCA Thresholds

Card	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
MXP_2.5G_10G	–8 dBm	–18 dBm	7 dBm	–1 dBm
MXP_2.5G_10E	–9 dBm	–18 dBm	9 dBm	0 dBm
MXP_2.5G_10E_C	–9 dBm	–18 dBm	9 dBm	0 dBm
MXP_2.5G_10E_L	–9 dBm	–18 dBm	9 dBm	0 dBm
MXP_2.5G_10EX_C	–9 dBm	–18 dBm	9 dBm	0 dBm

Step 6 Click **Apply**.

Step 7 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 8 Referring to the following table, verify the trunk port (Port 5) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low.

Step 9 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
Do not modify the Laser Bias parameters.

Table 154: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Trunk Port Alarm Thresholds

Card	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
MXP_2.5G_10G	–8 dBm	–20 dBm	4 dBm	2 dBm
MXP_2.5G_10E	–8 dBm	–20 dBm	7 dBm	3 dBm
MXP_2.5G_10E_C	–8 dBm	–20 dBm	7 dBm	3 dBm
MXP_2.5G_10E_L	–8 dBm	–20 dBm	7 dBm	3 dBm
MXP_2.5G_10EX_C	–8 dBm	–20 dBm	7 dBm	3 dBm

Step 10 Click **Apply**.

Step 11 Return to your originating procedure (NTP).

DLP-G304 Provisioning the 4x2.5G Muxponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Referring to the following table, verify the client Port *N* (where *N* = 1 through 4) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end.

Step 4 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282

Table 155: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Client Interfaces TCA Thresholds

Port Type (by CTC)	Pluggable Port Module (SFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
OC-48	ONS-SE-2G-S1	–3	–18	3	–16
	15454-SFP-OC48-IR	0	–18	6	–11
STM-16	ONS-SE-2G-S1	–3	–18	3	–16
	15454E-SFP-L.16.1	0	–18	6	–11

Step 5 Provision each additional client port.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the client Port *N* (where *N* = 1 through 4) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned.

Step 8 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Note
Do not modify the Laser Bias parameters.

Table 156: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, or MXP_2.5G_10E_L Card Client Interfaces Alarm Thresholds

Port Type (by CTC)	Pluggable Port Module (SFP)	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
OC-48	ONS-SE-2G-S1	0	–21	0	–13
	15454-SFP-OC48-IR	3	–21	3	–8

Port Type (by CTC)	Pluggable Port Module (SFP)	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
STM-16	ONS-SE-2G-S1	0	–21	0	–13
	15454E-SFP-L.16.1	3	–21	3	–8

Step 9 Click **Apply**.

Step 10 Return to your originating procedure (NTP).

DLP-G228 Changing the 4x2.5G Muxponder Line OTN Settings

Purpose	This task changes the line OTN settings for MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C card where you want to change the line OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: **OTN Lines**, **OTN G.709 Thresholds**, **FEC Thresholds**, or **Trail Trace Identifier**.

Step 3 Modify any of the settings as described in the following tables.

Note
You must modify Near End and Far End independently, 15 Min and 1 Day independently, and SM and PM independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
In the following table, some parameter tabs or values do not always apply to all MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, or MXP_2.5G_10E_L cards. If the tabs or values do not apply, they do not appear in CTC.

Table 157: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Card Line OTN Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	5 (Trunk)
G.709 OTN	Sets the OTN lines according to ITU-T G.709.	• Enable • Disable
FEC	Sets the OTN line FEC mode. FEC mode can be Disabled or Enabled. With the MXP_2.5G_10E card, Enhanced FEC (E-FEC) mode can be enabled to provide greater range and lower bit error rate. E-FEC applies only to the MXP_2.5G_10E card.	• Enable—(MXP_2.5G_10G only) FEC is on. • Disable—FEC is off. • Standard—(MXP_2.5G_10E only) FEC is on. • Enhanced—(MXP_2.5G_10E only) Enhanced FEC is on.
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
SF BER	(Display only) Sets the signal fail bit error rate.	• 1E-5
Asynch/Synch Mapping	(MXP_2.5G_10E only) The MXP_2.5G_10E can perform standard ODU multiplexing according to ITU-T G.709. The card uses this to aggregate the four OC-48 client signals.	• ODU Multiplex

Table 158: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number	5 (Trunk)

Parameter	Description	Options
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**. **Note** SM (OTUk) is the ITU-T G.709 optical channel transport unit order of k overhead frame used for management and performance monitoring. PM (ODUk) is the ITU-T G.709 optical channel data unit order of k overhead frame unit used for path performance monitoring.
SES	Severely errored seconds. Two types of thresholds can be asserted. Selecting the SM (OTUk) radio button selects FEC, overhead management, and PM using OTUk. Selecting the PM radio button selects path PM using ODUk.	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.
UAS	Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.
BBE	Background block errors	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.

Parameter	Description	Options
FC	Failure counter	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—SM (OTUk) or PM (ODUk) Choose an option in each category and click **Refresh**.

Table 159: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	5 (Trunk)
Bit Errors Corrected	Displays the number of bit errors corrected during the interval selected. The interval can be set for 15 minutes or one day.	Numeric
Uncorrectable Words	Displays the number of uncorrectable words during the interval selected. The interval can be set for 15 minutes or one day.	Numeric

Table 160: MXP_2.5G_10G, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, or MXP_2.5G_10EX_C Trail Trace Identifier Settings

Parameter	Description	Options
Port	Sets the port number. The trail trace identifier is applicable only to the trunk interface, which handles ITU-T G.709 frames.	5 (Trunk)
Level	Sets the level.	• Section • Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable FDI on TTIM	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)

Parameter	Description	Options
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size; trail trace identifier is 64 bytes in length.
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 minutes.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G99 Modifying the 2.5G Data Muxponder Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and threshold settings for the MXP_MR_2.5G and MXPP_MR_2.5G muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G236 Change the 2.5G or 10G Data Muxponder Client Line Settings
- DLP-G237 Change the 2.5G Data Muxponder Distance Extension Settings
- DLP-G238 Change the 2.5G or 10G Data Muxponder SONET/SDH Settings
- DLP-G239 Change the 2.5G or 10G Data Muxponder Section Trace Settings
- DLP-G240 Change the 2.5G or 10G Data Muxponder SONET or SDH Line Thresholds
- DLP-G321 Change the 2.5G or 10G Data Muxponder Line RMON Thresholds
- DLP-G307 Provision the 2.5G Data Muxponder Trunk Port Alarm and TCA Thresholds
- DLP-G308 Provision the 2.5G Data Muxponder Client Port Alarm and TCA Thresholds
- DLP-G370 Change the 2.5G or 10G Data Muxponder Trunk Wavelength Settings

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G236 Changing the 2.5G or 10G Data Muxponder Client Line Settings

Purpose	This task changes the client line settings for MXP_MR_2.5G, MXPP_MR_2.5G, MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Client** tabs. Tabs and parameter selections vary according to PPM provisioning.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Step 3 Modify any of the settings for the Client tab as described in the following table.

Table 161: 2.5G or 10G Data Muxponder Card Client Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 1 and 2 for 2.5G data muxponder cards • 1 through 8 for 10G data muxponder cards
Port Name	The user can assign a logical name for each of the ports shown by filling in this field.	User-defined. Name can be up to 80 alphanumeric/speci Blank by default. **Note** You can provision a string (port name) for each fiber cha interface on the cards, which allows the MDS Fabric Mana a link association between that SAN port and a SAN por Cisco MDS 9000 switch.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI)
Service State	Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabled, autom (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disal • OOS-MA,MT (ANSI) or Locked-enabled,maintena

Parameter	Description	Options
ALS Mode	Sets the ALS function mode.	• Disabled (default): ALS is off; the laser is not automati down when traffic outages (LOS) occur. • Auto Restart: (MXP_MR_2.5G only) ALS is on; the la automatically shuts down when traffic outages (LOS) o automatically restarts when the conditions that caused t are resolved. • Manual Restart: ALS is on; the laser automatically shu when traffic outages (LOS) occur. However, the laser r manually restarted when conditions that caused the out resolved. • Manual Restart for Test: Manually restarts the laser for
Reach	Displays the optical reach distance of the client port.	The reach distances that appear in the drop-down list depen card: • Autoprovision—The system to automatically provision from the pluggable port module (PPM) reach value on hardware. • SX—Short laser wavelength on multimode fiber optic a maximum length of 550 meters. The operating wavelen is 770-860 nm. • LX—Long wavelength for a long haul fiber optic cable maximum length of 10 km. The operating wavelength 1270-1355 nm. • CX—Two pairs of 150-ohm shielded twisted pair cable maximum length of 25 meters. • T—Four pairs of Category 5 Unshielded Twisted Pair a maximum length of 100 meters. • DX—Single mode up to 40 km. The operating wavelen is 1430-1580 nm. • HX—Single mode up to 40 km. The operating wavelen is 1280-1335 nm. • ZX—Extended wavelength single-mode optical fiber f 100 km. The operating wavelength range is 1500-1580 • VX—Single mode up to 100 km. The operating wavelen is 1500-1580 nm.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths:850 nm through 1560.61 nm; 100- spacing; CWDM spacing

Parameter	Description	Options
Squelch	Shuts down the far-end laser in response to certain defects. (Squelch does not apply to ISC COMPACT payloads.)	• Squelch • Disable

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G237 Changing the 2.5G Data Muxponder Distance Extension Settings

Purpose	This task changes the distance extension settings for MXP_MR_2.5G and MXPP_MR_2.5G muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Distance extension settings can be changed only if the facilities are out of service (OOS,DSBLD).

Note The distance extension parameters only apply to client ports (Ports 1 to 8) and not to the trunk ports (Port 9 for MXP_MR_2.5G card or Ports 9 and 10 for the MXPP_MR_2.5G card).

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_2.5G or MXPP_MR_2.5G card where you want to change the distance extension settings.

Step 2 Click the **Provisioning** > **Line** > *Client* tabs. A client port must be provisioned for the tab to be present.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Step 3 Locate the Client port table row and verify that the Service State column value is OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI). If yes, continue with Step 4. If not, complete the following substeps:

a) Click the **Admin State** table cell and choose **OOS,DSBLD** (ANSI) or **Locked,Maintenance** (ETSI).

b) Click **Apply**, then **Yes**.

Step 4 Click the **Provisioning** > **Line** > **Distance Extension** tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 5 Modify any of the settings for the Distance Extension tab as described in the following table.

Table 162: MXP_MR_2.5G or MXPP_MR_2.5G Card Line Distance Extension Settings

Parameter	Description	Options
Port	(Display only) Port number	• 1 • 2
Enable Distance Extension	Allows end-to-end distances of up to 1600 km for FC1G and up to 800 km for FC2G. If Distance Extension is enabled, set the connected Fibre Channel switches to Interop or Open Fabric mode, depending on the Fibre Channel switch. By default, the MXP_MR_2.5G and MXPP_MR_2.5G card will interoperate with the Cisco Multilayer Director Switch (MDS) storage products.	Checked or unchecked
Auto Detect Credits	Allows automatic detection of buffer credits for Fibre Channel flow control.	Checked or unchecked
Credits Available	(Display only) Displays the number of buffer credits available.	Numeric (range depends on the client equipment attached to the card)
Autoadjust GFP Buffer Threshold	Allows the threshold of the generic framing procedure (GFP) buffer between two MXP_MR_2.5G or two MXPP_MR_2.5G cards to be automatically adjusted.	Checked or unchecked
GFP Buffers Available	Displays the number of GFP buffers available between two MXP_MR_2.5G or two MXPP_MR_2.5G cards.	Numeric

Step 6 Click **Apply**.

Step 7 Return to your originating procedure (NTP).

DLP-G238 Changing the 2.5G or 10G Data Muxponder SONET/SDH Settings

Purpose	This task changes the OC-48 (ANSI) or STM-16 (ETSI) settings for MXP_MR_2.5G and MXPP_MR_2.5G muxponder cards. This task also changes the OC-192 (ANSI) or STM-64 (ETSI) settings for the MXP_MR_10DME_C and MXP_MR_10DME_L muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note SONET (OC-48)/SDH (STM-16) settings apply only to the trunk ports (Port 9 for the MXP_MR_2.5G card and Ports 9 and 10 for the MXPP_MR_2.5G card.)

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the OC-48/STM-64 settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** (ANSI) or **SDH** (ETSI). Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the settings for the SONET or SDH tab as described in the following table.

Table 163: MXP_MR_2.5G or MXPP_MR_2.5G Card Line SONET or SDH Settings

Parameter	Description	Options
Port	(Display only) Port number.	9 (trunk for MXP_MR_2.5G, MXP_MR_10D MXP_MR_10DME_L) or 9 and 10 (trunks fo MXPP_MR_2.5G)
Port Name	Provides the ability to assign the specified port a name.	User-defined. Name can be up to 80 alphanun characters. Blank by default.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS,AINS (ANSI) or Unlocked,automatic (ETSI) • OOS,DSBLD (ANSI) or Locked,disable • OOS,MT (ANSI) or Locked,maintenanc

Parameter	Description	Options
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabl automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enable (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,ma (ETSI)
SF BER	Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
ALS Mode	Sets the ALS function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled or can be set for one of three mode options.	• Disable (default): ALS is off; the laser is not automatically shut down when traffic outage occur. • Auto Restart: ALS is on; the laser automatic down when traffic outages (LOS) occur. It aut restarts when the conditions that caused the resolved. • Manual Restart: ALS is on; the laser automati down when traffic outages (LOS) occur. Ho laser must be manually restarted when condi caused the outage are resolved. • Manual Restart for Test: Manually restarts th testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm for which the card becomes in service (IS) auto • 0 to 48 hours, 15-minute increments
Type	The optical transport type.	• SONET (ANSI) • SDH (ETSI)

Parameter	Description	Options
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked
Send DoNotUse	Sets the Send DoNotUse card state. When checked, sends a DUS message on the S1 byte.	Checked or unchecked
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as an NE timing reference.	Checked or unchecked

SF BER and SD BER thresholds apply only to trunk ports (Port 9 for MXP_MR_2.5G and Ports 9 and 10 for MXPP_MR_2.5G).

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G239 Changing the 2.5G or 10G Data Muxponder Section Trace Settings

Purpose	This task changes the section trace settings for the MXP_MR_2.5G, MXPP_MR_2.5G, MXP_MR_10DME_C and MXP_MR_10DME_L muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs. Tabs and parameter selections vary according to PPM provisioning.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Step 3 Modify any of the settings in the Section Trace tab as described in the following table.

Table 164: 2.5G or 10G Data Muxponder Card Line Section Trace Settings

Parameter	Description	Options
Port	(Display only) Port number.	• 9 (trunk port for MXP_MR_2 MXP_MR_10DME_C, and MXP_MR_10DME_L) • 9 and 10 (trunk ports for MXPP_MR_2.5G)
Received Trace Mode	Sets the received trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	If an TIM on Section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-S disabled) • Unchecked (AIS/RDI on TIM disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked/unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G370 Changing the 2.5G or 10G Data Muxponder Trunk Wavelength Settings

Purpose	This task changes the trunk wavelength settings for the MXP_MR_2.5G, MXPP_MR_2.5G, MXP_MR_10DME_C, and MXP_MR_10DME_L cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the trunk wavelength settings.

Step 2 Click the **Provisioning** > **Line** > **Wavelength Trunk Settings** tabs.

Step 3 Modify any of the settings as described in the following table.

Table 165: 2.5G or 10G Data Muxponder Card Wavelength Trunk Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	9 (Trunk) 10 (Trunk) (MXPP_MR_2.5G only)
Band	(Display only) Indicates the wavelength band that can be provisioned. The field is display-only when a physical MXP_MR_10DME_C or MXP_MR_10DME_L is installed. If the card is provisioned in CTC only, you can provision the band for the card that will be installed.	• C—The C band wavelengths are available in the Wavelength field. • (MXP_MR_10DME_C, and MXP_MR_10DME_L only) L—The L-band wavelengths are available in the Wavelength field.
Even/Odd	Sets the wavelengths available for provisioning. This field does not apply to MXP_MR_2.5G or MXPP_MR_2.5G cards	• Even—Displays even C-band or L-band wavelengths in the Wavelength field. • Odd—Displays odd C-band or L-band wavelengths in the Wavelength field.

Parameter	Description	Options
Wavelength	The wavelength provisioned for the trunk.	• First Tunable Wavelength • Further wavelengths in 100-GHz ITU-T, C-band spacing. If the card is installed, the wavelengths it carries are identified with two asterisks. Other wavelengths have a dark grey background. If the card is not installed, all wavelengths appear with a dark grey background.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G240 Changing the 2.5G or 10G Data Muxponder SONET or SDH Line Thresholds

Purpose	This task changes the SONET or SDH line threshold settings for MXP_MR_2.5G, MXPP_MR_2.5G, MXP_MR_10DME_C, and MXP_MR_10DME_L muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** > **SONET Thresholds** (ANSI) or **SDH Thresholds** (ETSI) tabs.

Step 3 Modify any of the settings as shown in the following table.

Note
You must modify Near End and Far End independently, 15 Min and 1 Day independently, and Line and Section independently. To do so, choose the appropriate radio button and click **Refresh**.

Note

In the following table, some parameters or options do not apply to all the cards. If the parameters or options do not apply, they do not appear in CTC.

Table 166: 2.5G or10G Data Muxponder Card Line Threshold Settings

Field	Description	ONS 15454 Options	ONS 15454 SDH Options
Port	(Display only) Port number	• 9 (MXP_MR_2.5G) • 9 and 10 (MXPP_MR_2.5G) • 9 (Trunk) for MXP_MR_10DME_C and MXP_MR_10DME_L	• 9 (MXP_MR_2.5G) • 9 and 10 (MXPP_MR_2.5G) • 9 (Trunk) for MXP_MR_10DM MXP_MR_10DME_L
EB	Path Errored Block indicates that one or more bits are in error within a block	—	Numeric. Threshold display options • Direction—Near End or Far En • Interval—15 Min (minutes) or • Types—Multiplex Section or R Section (near end only) Choose an option in each category a **Refresh**.
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display options • Direction—Near End or Far En • Interval—15 Min (minutes) or • Types—Multiplex Section or R Section (near end only) Choose an option in each category a **Refresh**.

Field	Description	ONS 15454 Options	ONS 15454 SDH Options
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display options inc • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 d • Types—Multiplex Section or Rege Section (near end only) Choose an option in each category and **Refresh**.
BBE	Background block errors	—	Numeric. Threshold display options inc • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 d • Types—SM (OTUk) or PM (ODU Choose an option in each category and **Refresh**.
SEFS	(Section or Regeneration Section only) Severely errored framing seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Section only Choose an option in each category and click **Refresh**.	—
FC	(Line or Multiplex Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Section only Choose an option in each category and click **Refresh**.	—
UAS	(Line or Multiplex Section only) Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Section only Choose an option in each category and click **Refresh**.	Numeric. Threshold display options inc • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 d • Types—Regeneration Section (onl Choose an option in each category and **Refresh**.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G321 Changing the 2.5G or 10G Data Muxponder Line RMON Thresholds

Purpose	This task changes the line threshold settings for MXP_MR_10G and MXPP_MR_2.5G transponder cards carrying the 1G Ethernet or 1G FC/FICON payloads. This task changes the line threshold settings for MXP_MR_10DME_C and MXP_MR_10DME_L cards carrying Ethernet, FC/FICON, or ISC/ISC3 payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), display the card where you want to change the line RMON threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the applicable port, either the payload port, for example “1-1 (ONE_GE)”, or the equivalent ITU-T G.7041 GFP (Generic Frame Procedure) port.

Step 5 From the Variable drop-down list, choose an Ethernet, FC, FICON, or ISC variable.

Table 167: MXP_MR_2.5G and MXPP_MR 2.5G Card 1G Ethernet or 1G, 2G FC/FICON Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of receive packets.
ifInDiscards	Number of inbound packets that were chosen to be discarded even though no errors had been detected to prevent their being deliverable to a higher-layer protocol.
ifInErrors	Total number of receive errors.
ifOutOctets	The total number of octets transmitted out of the interface, including framing characters.

txTotalPkts	Total number of transmitted packets.
ifOutDiscards	Number of outbound packets that were chosen to be discarded even though no errors had been detected to prevent their being transmitted.
mediaIndStatsRxFramesTruncated	Total number of frames received that are less than 5 bytes. This value is a part of high-level data link control (HDLC) and GFP port statistics.
mediaIndStatsRxFramesTooLong	Number of received frames that exceed the maximum transmission unit (MTU). This value is part of HDLC and GFP port statistics.
mediaIndStatsRxFramesBadCRC	Number of receive data frames with payload cyclic redundancy check (CRC) errors when HDLC framing is used.
mediaIndStatsTxFramesBadCRC	Number of transmitted data frames with payload CRC errors when HDLC framing is used.
8b10bInvalidOrderedSets	Number of 8b10b disparity violations on the Fibre Channel line side.
8b10bStatsEncodingDispErrors	Number of 8b10b disparity violations on the Fibre Channel line side.

Table 168: MXP_MR_10DME_C or MXP_MR_10DME_L Ethernet Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of receive packets.
ifInErrors	Total number of receive errors.
ifOutOctets	The total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
mediaIndStatsRxFramesTruncated	Total number of frames received that are less than 5 bytes. This value is a part of HDLC and GFP port statistics.
mediaIndStatsRxFramesTooLong	Number of received frames that exceed the MTU. This value is part of HDLC and GFP port statistics.
mediaIndStatsRxFramesBadCRC	Number of receive data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsTxFramesBadCRC	Number of transmitted data frames with payload CRC errors when HDLC framing is used.
8b10bInvalidOrderedSetsDispErrorsSum	Number of code violations/running disparity errors in the 8b/10b encoded characters received.

Table 169: MXP_MR_10DME_C or MXP_MR_10DME_L FC/FICON Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of receive packets.
ifInErrors	Total number of receive errors.
ifOutOctets	The total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
ifOutOversizePkts	Total number of oversized packets output from the interface.
mediaIndStatsRxFramesTruncated	Total number of frames received that are less than 5 bytes. This value is a part of HDLC and GFP port statistics.
mediaIndStatsRxFramesTooLong	Number of received frames that exceed the MTU. This value is part of HDLC and GFP port statistics.
mediaIndStatsRxFramesBadCRC	Number of receive data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsTxFramesBadCRC	Number of transmitted data frames with payload CRC errors when HDLC framing is used.
fcStatsZeroTxCredits	This is a count that increments when the FC/FICON Tx credits go from a non-zero value to zero.
fcStatsRxRecvrReady	Number of received RDY (Receive Ready) order set.
fcStatsTxRecvrReady	Number of transmitted RDY (Receive Ready) order set.
8b10bInvalidOrderedSetsDispErrorsSum	Number of Code Violations/Running Disparity errors in the 8b/10b encoded characters received.

Table 170: MXP_MR_10DME_C or MXP_MR_10DME_L ISC and ISC3Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of receive packets.
ifOutOctets	The total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
8b10bInvalidOrderedSetsDispErrorsSum	Number of Code Violations/Running Disparity errors in the 8b/10b encoded characters received.

Table 171: MXP_MR_10DME_C or MXP_MR_10DME_L GFP RMON Variables

Variable	Description
gfpStatsRxSBitErrors	Received generic framing protocol (GFP) frames with single bit errors in the core header (these errors are correctable).
gfpStatsRxTypeInvalid	Received GFP frames with invalid type (these are discarded). For example, receiving GFP frames that contain Ethernet data when we expect Fibre Channel data.
gfpStatsRxSblkCRCErrors	Total number of superblock CRC errors with the receive transparent GFP frame. A transparent GFP frame has multiple superblocks which each contain Fibre Channel data.
gfpStatsCSFRaised	Number of Rx client management frames with Client Signal Fail indication.
gfpStatsLFDRaised	The number of Core HEC CRC Multiple Bit Errors. **Note** This count is only for cHEC multiple bit error when in frame. It is a count of when the state machine goes out of frame.

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Type in an appropriate number of seconds for the Sample Period.

Step 9 Type in the appropriate number of occurrences for the Rising Threshold.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Note
To view all RMON thresholds, click **Show All RMON thresholds**.

Step 12 Return to your originating procedure (NTP).

DLP-G307 Provisioning the 2.5G Data Muxponder Trunk Port Alarm and TCA Thresholds

Purpose	This task changes the MXP_MR_2.5G and MXPP_MR_2.5G trunk port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Throughout this task, trunk port refers to Port 9 (MXP_MR_2.5G and MXPP_MR_2.5G) and Port 10 (MXPP_MR_2.5G only).

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_2.5G or MXPP_MR_2.5G card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Step 3 Verify the trunk port TCA thresholds for RX Power High is –9 dBm and for RX Power Low is –23 dBm.

Step 4 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 6 Verify the trunk port Alarm thresholds for RX Power High is –7 dBm and for RX Power Low is –26 dBm.

Step 7 Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Step 8 Click **Apply**.

Step 9 Return to your originating procedure (NTP).

DLP-G308 Provisioning the 2.5G Data Muxponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the MXP_MR_2.5G and MXPP_MR_2.5G cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_2.5G or MXPP_MR_2.5G card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Referring to the following table, verify the client port (Ports 1 through 8) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Table 172: MXP_MR_2.5G and MXPP_MR_2.5G Card Client Interface TCA Thresholds

Port Type (by CTC)	Pluggable Port Module (XFP)	TCA RX Power Low	TCA RX Power High	TCA TX Power Low	TCA TX Power High
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–15	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
ONE_GE	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–17	0	–16	3
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–20	–3	–16	3
ESCON	ONS-SE-200-MM	–21	–14	–32	–11

Step 4 Click **Apply**.

Step 5 Repeat Steps 3 and 4 to provision each additional client port.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the client port (Ports 1 through 8) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned.

Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Table 173: MXP_MR_2.5G and MXPP_MR_2.5G Card Client Interface Alarm Thresholds

Port Type (by CTC)	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–18	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
ONE_GE	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
ESCON	ONS-SE-200-MM	–24	–11	–35	–8

Step 8 Click **Apply**.

Step 9 Repeat Steps 7 and 8 to provision each additional client port.

Step 10 Return to your originating procedure (NTP).

NTP-G148 Modifying the 10G Data Muxponder Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and threshold settings for the MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G236 Change the 2.5G or 10G Data Muxponder Client Line Settings
- DLP-G334 Change the 10G Data Muxponder Distance Extension Settings
- DLP-G370 Change the 2.5G or 10G Data Muxponder Trunk Wavelength Settings
- DLP-G238 Change the 2.5G or 10G Data Muxponder SONET/SDH Settings
- DLP-G239 Change the 2.5G or 10G Data Muxponder Section Trace Settings
- DLP-G240 Change the 2.5G or 10G Data Muxponder SONET or SDH Line Thresholds
- DLP-G321 Change the 2.5G or 10G Data Muxponder Line RMON Thresholds
- DLP-G338 Provision the 10G Data Muxponder Trunk Port Alarm and TCA Thresholds
- DLP-G339 Provision the 10G Data Muxponder Client Port Alarm and TCA Thresholds

- DLP-G366 Change the 10G Data Muxponder OTN Settings

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G334 Changing the 10G Data Muxponder Distance Extension Settings

Purpose	This task changes the distance extension settings for the MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C muxponder card ports provisioned for Fibre Channel or FICON payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_10DME_C, MXP_MR_10DME_L, or MXP_MR_10DMEX_C card where you want to change the distance extension settings.

Step 2 Click the **Provisioning** > **Line** > **Distance Extension** tabs.

Note
The distance extension parameters only apply to client ports (Ports 1 to 8) and not to the trunk port (Port 9).

Note
The client port must be in the OOS,DSBLD (ANSI) or Locked,disabled (ETSI) state in order to change the distance extension settings. If a Y-cable is provisioned on the client port, both the working and protect client ports must be in OOS,DSBLD (ANSI) or Locked,disabled (ETSI) state before you change the distance extension settings.

Step 3 Modify any of the settings as described in the following table.

Table 174: MXP_MR_10DME_C, MXP_MR_10DME_L, or MXP_MR_10DMEX_C Card Line Distance Extension Settings

Parameter	Description	Options
Port	(Display only) Port number. Up to eight ports might appear based on the number of pluggable port modules that are provisioned.	—
Enable Distance Extension	Allows end-to-end distances of up to 1600 km for FC1G and up to 800 km for FC2G. If Distance Extension is enabled, set the connected Fibre Channel switches to Interop or Open Fabric mode, depending on the Fibre Channel switch. By default, the MXP_MR_10DME_C and MXP_MR_10DME_L card will interoperate with the Cisco MDS storage products.	Checked or unchecked
Fast Switch	If unchecked, the end-to-end fiber channel link is reinitialized every time a Y-cable protection switch occurs. If checked, reinitialization of the link is avoided when a Y-cable protection switch occurs, thus reducing the traffic hit considerably. This feature is supported for FC1G, FC2G, FC4G, FICON1G, FICON2G, and FICON4G trunk failures as well as user-initiated Y-cable protection switch such as, Manual, Force, or Lockout. It is recommended that you do not enable the Fast Switch option as the link may not come up after a Y-cable protection switch in certain cases. **Note** This option can be used only if you have unchecked Enable Distance Extension option.	Checked or unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G338 Provisioning the 10G Data Muxponder Trunk Port Alarm and TCA Thresholds

Purpose	This task changes the MXP_MR_10DME_C and MXP_MR_10DME_L trunk port alarm and TCA thresholds.

Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_10DME_C or MXP_MR_10DME_L card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 3 If TCA is not selected, click **TCA** and then click Refresh.

Step 4 Verify the trunk port (Port 9) TCA thresholds are set at the values shown as follows. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and press **Enter**.

- RX Power High: –9 dBm
- RX Power Low: –18 dBm
- TX Power High: 9 dBm
- TX Power Low: 0 dBm

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 6 Verify the trunk port (Port 9) Alarm thresholds are set at the values shown as follows. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and press **Enter**.

- RX Power High: –8 dBm
- RX Power Low: –20 dBm
- TX Power High: 7 dBm
- TX Power Low: 3 dBm

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G339 Provisioning the 10G Data Muxponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the MXP_MR_10DME_C and MXP_MR_10DME_L cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provisioning the Optical Line Rate, on page 293 DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_10DME_C and MXP_MR_10DME_L card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Referring to the following table, verify the client ports (Ports 1 through 8) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the DLP-G278 Provisioning the Optical Line Rate, on page 293.

Table 175: MXP_MR_10DME_C and MXP_MR_10DME_L Card Client Interfaces TCA Thresholds

PPM Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	0	–17	3	–16
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–3	–20	3	–16
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	0	–15	3	–16
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–3	–20	3	–16
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	0	–17	3	–16
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–3	–20	3	–16
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	0	–17	3	–16
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–3	–20	3	–16
ISC3 PEER 1G ISC3 PEER 2G	ONS-SE-G2F-SX	0	–17	3	–16
	ONS-SE-G2F-LX	0	–20	3	–16
FC4G	ONS-SE-4G-MM	0	–12	4	–15
	ONS-SE-4G-SM	–1	–15	4	–15
FICON4G	ONS-SE-4G-MM	0	–12	4	–15
	ONS-SE-4G-SM	–1	–15	4	–15

Step 4 Click **Apply**.

Step 5 Repeat Steps 3 and 4 to provision each additional client port.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the client port (Ports 1 through 8) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Table 176: MXP_MR_10DME_C and MXP_MR_10DME_L Card Client Interface Alarm Thresholds

PPM Port Rate	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FC2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–18	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FICON1G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
FICON2G	15454-SFP-GEFC-SX 15454E-SFP-GEFC-S ONS-SE-G2F-SX	–20	3	–13	–1
	15454-SFP-GE+-LX 15454E-SFP-GE+-LX ONS-SE-G2F-LX	–23	0	–13	0
ISC3 PEER 1G ISC3 PEER 2G	ONS-SE-G2F-SX	–20	3	–13	–1
	ONS-SE-G2F-LX	–23	0	–13	0
FC4G	ONS-SE-4G-MM	–15	3	–11	–1
	ONS-SE-4G-SM	–18	2	–11	0
FICON4G	ONS-SE-4G-MM	–15	3	–11	–1
	ONS-SE-4G-SM	–18	2	–11	0

Step 8 Click **Apply**.

Step 9 Repeat Steps 7 and 8 to provision each additional client port.

Step 10 Return to your originating procedure (NTP).

DLP-G366 Changing the 10G Data Muxponder OTN Settings

Purpose	This task changes the OTN settings for the MXP_MR_10DME_C and MXP_MR_10DME_L cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the MXP_MR_10DME_C and MXP_MR_10DME_L card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: **OTN Lines**, **G.709 Thresholds**, **FEC Thresholds**, or **Trail Trace Identifier**.

Step 3 Modify any of the settings described in the following tables.

Note
You must modify Near End and Far End; 15 Min and 1 Day; and SM and PM independently. To do so, choose the appropriate radio button and click **Refresh**.

Table 177: MXP_MR_10DME_C and MXP_MR_10DME_L Card OTN Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	9 (Trunk)
G.709 OTN	Sets the OTN lines according to ITU-T G.709.	• Enable • Disable
FEC	Sets the OTN lines to forward error correction (FEC).	• Standard • Enhanced
SF BER	(Display only) Sets the signal fail bit error rate.	• 1E-5

Parameter	Description	Options
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Asynch/Synch Mapping	Sets how the ODUk (client payload) is mapped to the optical channel (OTUk).	• Asynch mapping • Synch mapping

Table 178: MXP_MR_10DME_C and MXP_MR_10DME_L Card ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number.	9 (Trunk)
ES	Errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
SES	Severely errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
UAS	Unavailable seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
BBE	Background block errors	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
FC	Failure counter	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.

Latency for a 1G-FC payload without ITU-T G.709 is 4 microseconds, and with ITU-T G.709 is 40 microseconds. Latency for a 2G-FC payload without ITU-T G.709 is 2 microseconds, and with ITU-T G.709 is 20 microseconds. Consider these values when planning a FC network that is sensitive to latency.

Table 179: MXP_MR_10DME_C and MXP_MR_10DME_L Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number.	2
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minute or one-day intervals.

Parameter	Description	Options
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minute or one-day intervals.

Table 180: MXP_MR_10DME_C and MXP_MR_10DME_L Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	(Display only) Port number.	2
Level	Sets the level.	• Section • Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Disable FDI on TTIM	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G293 Modifying the 40G Muxponder Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and parameter threshold settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Complete the NTP-G103 Backing Up the Database task to save the existing settings before modifying.

Step 2 Perform any of the following tasks as needed:

- DLP-G662 Change the 40G Multirate Muxponder Card Settings
- DLP-G666 Change the 40G Muxponder Line Settings
- DLP-G735 Provision the 40G Muxponder Ethernet Settings
- DLP-G667 Change the 40G Muxponder SONET (OC-192)/SDH (STM-64) Settings
- DLP-G668 Change the 40G Muxponder Section Trace Settings
- DLP-G669 Change the 40G Muxponder SONET or SDH Line Thresholds
- DLP-G670 Change the 40G Muxponder Line RMON Thresholds for Ethernet, 8G FC, or 10G FC Payloads
- DLP-G671 Provision the 40G Muxponder Trunk Port Alarm and TCA Thresholds
- DLP-G672 Provision the 40G Muxponder Client Port Alarm and TCA Thresholds
- DLP-G673 Change the 40G Muxponder OTN Settings

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G662 Changing the 40G Multirate Muxponder Card Settings

Purpose	This task changes the card settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the card settings.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Modify either of the settings described in the following table.

Table 181: 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Card Settings

Parameter	Description	ANSI Options	ETSI Options

Card Mode	Sets the card mode.	• Muxponder
		• Unidirectional Regen Set the mode to Unidirectional Regen under the following conditions:
		  • Trunk port is in OOS,DSBLD state.
		  • Pluggable port modules of the card must not be configured for payload.
		  • Regeneration peer slot must be set to None.
			• Muxponder
			• Unidirection the mode to Regen under conditions:
			  • Trunk locked,
			  • Pluggal module must n configu payloa
			  • Regene slot mu None.

Timing Source	Sets the clock selection. The line card sets the clock switch based on the provisioning of the card. The clock can be set in two ways: Internal Clock and TNC Clock. • Internal Clock: This is the default value for normal operations; to avoid the traffic hits in case of missing TNC. • TNC Clock: This is the default value to avoid traffic hit during maintenance activities like software download. After the maintenance activity is complete, the clock must be set to use the internal clock. **Note** A warning message is displayed when the provisioning is set because this activity affects traffic.	—	—
Trunk Wavelengths	(Display only) Shows supported wavelengths of the trunk port after the card is installed. The 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C card that is installed shows the C-band wavelengths that it supports.	—	—

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G666 Changing the 40G Muxponder Line Settings

Purpose	This task changes the line settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C or 40E-MXP-C card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs. Tabs and parameters vary according to the PPM provisioning.

Step 3 Modify any of the settings as described in the following table.

Table 182: Line Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number.	• 1 through 4 (client) • 5 (trunk)
Port Name	Assigns a logical name for each of the port.	User-defined. This can be up to 80 alphanumeric or sp characters, or both. The port name is blank by default. **Note** You can assign a port name for each fiber channel/FIC interface on the 40G-MXP-C, 40E-MXP-C, and 40ME card, enabling the MDS Fabric Manager to associate th port and a SAN port on the Cisco MDS 9000 switch.
Admin State	Sets the port service state unless network conditions prevent the change. For more information, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI) • IS,AINS (ANSI) or Unlocked,automaticInService

Parameter	Description	Options
Service State	(Display only) Shows the general condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabled automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,d • OOS-MA,MT (ANSI) or Locked-enabled,maint
ALS Mode	(Client ports only) Activates the ALS mode.	• Disabled (default)—ALS is off; the laser is not shut down when traffic outage or loss of signal • Auto Restart—(OC-192/STM-64 only) ALS is automatically shuts down during LOS. It automa when the conditions that caused the outage are • Manual Restart—ALS is on; the laser automat down when traffic outage or LOS occurs. How must be manually restarted when conditions th outage are resolved. • Manual Restart for Test—Manually restarts th testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to the change settings.	• Duration of valid input signal, in hh.mm forma the card status changes to in service (IS) auton • 0 to 48 hours, 15-minute increments

Parameter	Description	Options
Reach	Sets the optical reach distance of the client port.	• Autoprovision—The system automatically provis reach from the pluggable port module (PPM) reac the hardware. • EW • LW • SW • LRM • ER • LR • SR • ZR • IR 2 • LR 2 • DWDM • CWDM40km
Wavelength	Provisions the port wavelength.	• First Tunable Wavelength • Further wavelengths: Further wavelengths in the ITU-T C-band spacing. The card wavelengths are asterisks. If the card is not installed, all wavelengt with a dark grey background.
Fault Signalling	Shuts down the far-end laser in response to certain defects.	• Squelch/Laser-Off **Note** Squelch does not apply to ISC COMPACT payloa • Disable/Transparent **Note** Both Squelch/Laser-Off and AIS/Send Local Faul are supported when the selected Termination Mod Disable/Transparent. If the Termination Mode sel Section or Line, then only AIS is supported. This applicable for OC-192/STM-64 and OC-768/STM OTN payloads, both Squelch/Laser-Off and AIS/S Fault options are supported.

Parameter	Description	Options
Overclock	(Trunk port only) Enables or disables overclock mode on the trunk port.	• OFF (default) • ON **Note** Before the overclock is changed, delete any ex Ethernet LAN-Phy payload that is present on t 40E-MXP-C and 40ME-MXP-C cards.
Rx Wavelength	(Trunk port only) Provisions the trunk port wavelength.	• First Tunable Wavelength • Further wavelengths: Further wavelengths in t ITU-T C-band spacing. The card wavelengths a asterisks. If the card is not installed, all wavele with a dark grey background.
Squelch Hold Off Timer	(Only for 40E-MXP-C card) Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period. The user can configure the squelch hold off timer in CTC only under the following conditions: • The card must be configured in TXP or MXP operating modes. • The client payload must be 10GE or 100GE. • The Squelch drop-down in CTC must be set to Squelch.	• Disable (0 ms) - Default value • 50 ms • 100 ms • 250 ms • 500 ms

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G735 Provisioning the 40G Muxponder Ethernet Settings

Purpose	This task changes the Ethernet settings for the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G Muxponder card (40G-MXP-C, 40E-MXP-C, or 40ME-MXP-C card) where you want to change the Ethernet settings. The card view appears.

Step 2 Click the **Provisioning** > **Line** > **Ethernet** tabs. The Ethernet tab is available once the 10G Ethernet LAN Phy payload is selected as the port rate for the pluggable port module.

Step 3 Modify any of the settings for the Ethernet tab as described in the following table.

Table 183: 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Card Ethernet Settings

Parameter	Description	Options
Port	(Display only) The Port number (*n*-*n*) and rate.	—
Port Name	Allows you to enter a port name.	—
MTU	(Display only) The maximum size of the Ethernet frames accepted by the port.	Jumbo: 64 to 9216 bytes (Default)
Mapping Mode	Sets the Ethernet mapping mode.	• GFP • WIS • CBR (only for 40E-MXP-C and 40ME-MXP-C) **Note** CBR is automatically mapped when a 10G Ethernet payload is configured with overclock on the trunk p ON. This mapping cannot be changed.
Enable Flow Control	Activates flow control when the check box is selected.	—

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G667 Changing the 40G Muxponder SONET (OC-192)/SDH (STM-64) Settings

Purpose	This task changes the SONET OC-192 or SDH STM-64 settings for the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the SONET (OC-192) or SDH (STM-64) settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** (ANSI) or **SDH** (ETSI). Tabs and parameters vary according to the PPM provisioning.

Step 3 Modify any of the settings described in the following table.

Table 184: Line SONET or SDH Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number.	5 (Trunk)
Port Name	Assigns a logical name assigned to a port. This field is blank by default.	User-defined. This can be up to 80 alphanume characters, or both. The port name is blank by
SF BER	Sets the signal fail bit error rate.	• 1E-3 • 1E-4 • 1E-5
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
ProvidesSync	(Display only) Displays the ProvidesSync card parameter state.	Checked or unchecked
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked

Parameter	Description	Options
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU. **Note** If SyncMsgIn check box is checked in 40E-MXP-C card, the Admin SSM In value does not change from STU.	• STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing synchronizatio • RES—Reserved; quality level set by user
Send DoNotUse	Sets the Send DoNotUse card state. When checked, sends a DUS (do not use) message on the S1 byte.	Checked or unchecked
Type	Indicates the optical transport type.	• SONET (ANSI) • SDH (ETSI)
Termination Mode	(Display-only for Standard Regeneration and Enhanced FEC card configurations) Sets the mode of operation.	• Transparent • Section (ANSI) or Regeneration Section (RS • Line (ANSI) or Multiplex Section (MS) (ET

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G668 Changing the 40G Muxponder Section Trace Settings

Purpose	This task changes the section trace settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs. Tabs and parameter selections vary according to the PPM provisioning.

Step 3 Modify any of the settings described in the following table.

Table 185: Line Section Trace Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number that is applicable only for OC-192/STM-64 payloads.	• 1-1 • 2-1 • 3-1 • 4-1
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	Disables the alarm indication signal.	• Checked (AIS/RDI on T disabled) • Unchecked (AIS/RDI or disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte
Transmit	Displays and sets the current transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Transmit String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode). The supported range for 1 bit Hex TX trace is 20 to 7E. If TX trace is provisioned outside this range, client transmits 00.	Transmit string size
Expected	Displays and sets the current expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Expected String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode). The supported range for 1 bit Hex TX trace is 20 to 7E. If TX trace is provisioned outside this range, client transmits 00.	Expected string size

Parameter	Description	Options
Received	(Display only) Displays the current received string. Click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	Received string size
Auto-refresh	Automatically refreshes the display every 5 seconds.	• Checked • Unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G691 Changing the 40G Muxponder OTU Settings

Purpose	This task changes the OTU settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the OTU settings.

Step 2 Click the **Provisioning** > **Line** > **OTU** tabs. Tabs and parameter selections vary according to the PPM provisioning.

Step 3 Modify any of the settings described in the following table.

Table 186: OTU Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Displays the port number that is applicable only for OC-192/STM-64 payloads.	• 1-1 • 2-1 • 3-1 • 4-1	• 1-1 • 2-1 • 3-1 • 4-1

Parameter	Description	ANSI Options	ETSI Options
SyncMsgIn	(Display only) (OC-768/STM-256 only) Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked	Checked or unchecked
Admin SSM	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• PRS—Primary Reference Source (Stratum 1) • STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing synchronization • RES—Reserved; quality level set by user	• G811—Primary referenc • STU—Sync traceability unknown • G812T—Transit node clo traceable • G812L—Local node cloc traceable • SETS—Synchronous equ • DUS—Do not use for tin synchronization
ProvidesSync	(Display only) (OC-768/STM-256 only) Sets the ProvidesSync card parameter. If checked, the card is provisioned as a network element (NE) timing reference.	Checked or unchecked	Checked or unchecked

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G669 Changing the 40G Muxponder SONET or SDH Line Thresholds

Purpose	This task changes the SONET or SDH line threshold settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C muxponder cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** > **SONET Thresholds** (ANSI) or **SDH Thresholds** (ETSI) tabs.

Step 3 Modify any of the settings shown in the following table. Some parameters and options do not apply to all 40-G-MXP-C cards. If the parameter or options do not apply, they do not appear in CTC.

Table 187: Line Threshold Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	ANSI Options	ETSI Options
Port	(Display only) Port number. Applicable for only OC-192/STM-64 payloads.	• 1-1 • 2-1 • 3-1 • 4-1	• 1-1 • 2-1 • 3-1 • 4-1
CV	Coding violations	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option individually in each category and click **Refresh**.	—
ES	Errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option individually in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option individually in e category and click **Refresh**.

Parameter	Description	ANSI Options	ETSI Options
SES	Severely errored seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option individually in each category and click **Refresh**. Click **Reset to Default** to restore default values.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option individually category and click **Refresh**. Click **Reset to Default** to resto values.
FC	(Line or Multiplex Section only) Failure count	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option individually in each category and click **Refresh**. Click **Reset to Default** to restore default values.	—
UAS	(Line or Multiplex Section only) Unavailable seconds	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option individually in each category and click **Refresh**. Click **Reset to Default** to restore default values.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option individually category and click **Refresh**. Click **Reset to Default** to resto values.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G670 Changing the 40G Muxponder Line RMON Thresholds for Ethernet, 8G FC, or 10G FC Payloads

Purpose	This task changes the line threshold settings of 40G-MXP-C, or 40E-MXP-C card carrying Ethernet, 8G FC, or 10G FC payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), display the 40G-MXP-C, or 40E-MXP-C card where you want to change the line threshold settings in the card view.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the payload port— for example "1-1 (TEN_GE)", or the equivalent ITU-T G.7041 GFP (Generic Frame Procedure) port.

Step 5 From the Variable drop-down list, choose an Ethernet or FC variable.

Table 188: Ethernet Variables of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of received packets.
ifInUcastPkts	Number of packets, delivered by this sub-layer to a higher sub-layer, which were not addressed to a multicast or broadcast address at this sub-layer.
inInMulticastPkts	Number of packets, delivered by this sub-layer to a higher sub-layer, which were addressed to a multicast address at this sub-layer. For a MAC layer protocol, this includes both Group and Functional addresses.
ifInBroadcastPkts	Number of packets, delivered by this sub-layer to a higher sub-layer, which were addressed to a broadcast address at this sub-layer.
ifInErrors	Total number of received errors.

Variable	Description
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
dot3StatsFCSErrors	Count of frames received on a particular interface that are an integral number of octets in length but do not pass the Frame Check Sequence (FCS) check.
dot3StatsFrameTooLong	Count of frames received on a particular interface that exceed the maximum permitted frame size.
dot3StatsInPauseFrames	Count of frames received on this interface with an opcode indicating the PAUSE operation.
dot3StatsOutPauseFrames	Count of MAC control frames transmitted on this interface with an opcode indicating the PAUSE operation.
etherStatsUndersizePkts	Total number of packets transmitted and received by the interface that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsFragments	Total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad Frame Check Sequence (FCS) with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets.
etherStatsPkts	Total number of packets (including bad packets, broadcast packets, and multicast packets) transmitted and received by the interface.
etherStatsPkts64Octets	Total number of packets (including bad packets) transmitted and received by the interface that were 64 octets in length (excluding framing bits but including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including error packets) transmitted and received by the interface that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts128to255Octets	Total number of packets (including error packets) transmitted and received by the interface that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts256to511Octets	Total number of packets (including error packets) transmitted and received by the interface that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts512to1023Octets	Total number of packets (including error packets) transmitted and received by the interface that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).

Variable	Description
etherStatsPkts1024to1518Octets	Total number of packets (including error packets) transmitted and received by the interface that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsBroadcastPkts	Total number of good packets transmitted and received by the interface that were directed to the broadcast address.
etherStatsMulticastPkts	Total number of good packets transmitted and received by the interface that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.
etherStatsOversizePkts	Total number of packets transmitted and received by the interface that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsJabbers	Total number of packets transmitted and received by the interface that were longer than 1518 octets (excluding framing bits, but including FCS octets), and were not an integral number of octets in length or had a bad FCS.
etherStatsOctets	Total number of octets of data (including those in bad packets) transmitted and received by the interface on the network (excluding framing bits but including FCS octets).

Table 189: FC Variables of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of received packets.
ifInErrors	Total number of received errors.
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
ifOutErrors	Number of outbound packets or transmission units that could not be transmitted because of errors.
mediaIndStatsRxFramesTruncated	Total number of frames received that are less than 5 bytes. This value is a part of HDLC and GFP port statistics.
mediaIndStatsRxFramesTooLong	Number of received frames that exceed the MTU. This value is part of HDLC and GFP port statistics.
mediaIndStatsRxFramesBadCRC	Number of receive data frames with payload CRC errors when HDLC framing is used.

Variable	Description
mediaIndStatsTxFramesBadCRC	Number of transmitted data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsTxFramesTooLong	Total number of transmitted data frames that are less than 5 bytes. This value is a part of HDLC and GFP port statistics.
mediaIndStatsTxFramesTruncated	Number of transmitted data frames that exceed the MTU. This value is part of HDLC and GFP port statistics.

Table 190: GFP RMON Variables of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Variable	Description
gfpStatsRxFrame	Total number of received data frames.
gfpStatsTxFrame	Total number of transmitted data frames.
gfpStatsRxSblkCRCErrors	Total number of superblock CRC errors with the receive transparent GFP frame. A transparent GFP frame has multiple superblocks where each contains Fibre Channel data.
gfpStatsRxOctets	Total number of GFP data octets received.
gfpStatsTxOctets	Total number of GFP data octets transmitted.
gfpStatsRxSBitErrors	Received GFP frames with single bit errors in the core header (these errors can be corrected).
gfpStatsRxMBitErrors	Received GFP frames with multiple bit errors in the core header (these errors cannot be corrected).
gfpStatsRxTypeInvalid	Received GFP frames with invalid type (these are discarded). For example, receiving GFP frames that contain Ethernet data when we expect Fibre Channel data.
gfpStatsLFDRaised	Count of core HEC CRC multiple bit errors. **Note** This count is only of eHec multiple bit errors when in frame. This can be looked at as a count of when the state machine goes out of frame.
gfpRxCmfFrame	—
gfpTxCmfFrame	—

Step 6 From the Alarm Type drop-down list, choose an alarm type. The alarm type indicates whether or not an event is triggered by the type of threshold.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Enter the number of Sample Period occurrences.

Step 9 Enter the number of Rising Threshold occurrences.

To trigger the alarm, the measured value of a threshold must always move from below the falling threshold to above the rising threshold. For example, if a network moves from below a rising threshold of 1000 collisions every 15 seconds to 1001 collisions.

Step 10 Enter the appropriate number of occurrences for the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the exact opposite of a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded.

Step 11 Click **OK**.

Step 12 Return to your originating procedure (NTP).

DLP-G671 Provisioning the 40G Muxponder Trunk Port Alarm and TCA Thresholds

Purpose	This task changes the trunk port alarm and TCA thresholds of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note
You must modify 15 Min and 1 Day independently. To do so, select the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 3 If TCA is not selected, click **TCA** and then click Refresh. If it is selected, continue with Step 4.

Step 4 Verify the trunk port (Port 5) TCA thresholds are set at the values shown as follows:

- Laser Bias High (%): 95.0
- RX Power High (dBm): –9.0
- RX Power Low (dBm): –22.0
- TX Power High (dBm): 9.0
- TX Power Low (dBm): 0.0

Provision new thresholds as needed by replacing the old values with new ones.

Step 5 Under Types area, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 6 Verify the trunk port (Port 5) alarm thresholds are set at the values shown as follows:

- Laser Bias High (%): 98.0
- RX Power High (dBm): –8.0
- RX Power Low (dBm): –24.0
- TX Power High (dBm): 7.0
- TX Power Low (dBm): 3.0

Provision new thresholds as needed replacing the old values with new ones.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G672 Provisioning the 40G Muxponder Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Step 3 If TCA is not selected, click **TCA** and then click Refresh. If it is selected, continue with Step 4.

Step 4 Referring to the following table, verify the client ports (Ports 1 through 4) TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by replacing the old values with new ones.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, select the appropriate radio button and click **Refresh**.

Table 191: Client Interfaces TCA Thresholds of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

PPM Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
FC8G	ONS-XC-8G-FC-SM	–9	–22	9.0	0.0
FC10G	ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-C ONS-XC-10G-S1	–9	–22	9.0	0.0
	ONS-XC-10G-I2	2.0	–15.8	8.0	–7.0
	ONS-XC-10G-L2	1.0	–14.0	5.0	–12.0
	ONS-XC-10G-SR-MM	0.0	0.0	6.0	–6.0
10GE	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-SR-M ONS-XC-10G-S1	–9	–22	9.0	0.0
	ONS-XC-10G-I2	2.0	–15.8	8.0	–7.0
	ONS-XC-10G-L2	–7.0	–24.0	6.5	–2.5

PPM Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
OC-192	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-I2 ONS-XC-10G-SR-MM	–9	–22	9.0	0.0
	ONS-XC-10G-L2	–9.0	–26.0	8.0	–8.0
	ONS-XC-10G-S1	–1.0	–11.0	5.0	–12.0
OTU2	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-I2 ONS-XC-10G-L2 ONS-XC-10G-SR-MM ONS-XC-10G-S1	–9	–22	9.0	0.0

Step 5 Click **Apply**.

Step 6 Repeat Steps 3 and 4 to provision the additional client ports.

Step 7 Under Types area, click the **Alarm** radio button and click **Refresh**.

Step 8 Referring to the following table, verify the client port (Ports 1 through 8) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned. Provision new thresholds as needed replacing the old values with new ones.

Table 192: Client Interface Alarm Thresholds of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

PPM Port Rate	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC8G	ONS-XC-8G-FC-SM ONS-XC-10G-S1	–9	–22	9.0	0.0
FC10G	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-S1	–9	–22	9.0	0.0
	ONS-XC-10G-I2	4.5	–18.3	4.5	–3.5
	ONS-XC-10G-L2	–4.5	–26.5	6.5	–2.5
	ONS-XC-10G-SR-MM	2.0	–2.0	2.0	–2.0

PPM Port Rate	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
10GE	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-S1 ONS-XC-10G-SR-MM	–9	–22	9.0	0.0
	ONS-XC-10G-I2	4.5	–18.3	4.5	–3.5
	ONS-XC-10G-L2	–4.5	–26.5	6.5	–2.5
OC-192	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-I2 ONS-XC-8G-FC-SM ONS-XC-10G-SR-MM	–9	–22	9.0	0.0
	ONS-XC-10G-L2	–7.0	–28.0	4.0	–4.0
	ONS-XC-10G-S1	–1.0	–13.0	1.0	–8.0
OTU2	ONS-XC-10G-30.3 through ONS-XC-10G-61.4 ONS-XC-10G-C ONS-XC-10G-1470 through ONS-XC-10G-1610 ONS-XC-10G-S1 ONS-XC-10G-I2 ONS-XC-10G-L2 ONS-XC-8G-FC-SM ONS-XC-10G-SR-MM	–9	–22	9.0	0.0

Step 9 Click **Apply**.

Step 10 Repeat Steps 7 and 8 to provision additional client ports.

Step 11 Return to your originating procedure (NTP).

DLP-G673 Changing the 40G Muxponder OTN Settings

Purpose	This task changes the OTN settings for the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 40G-MXP-C, or 40E-MXP-C card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: **OTN Lines**, **ITU-T G.709 Thresholds**, **FEC Thresholds**, or **Trail Trace Identifier**.

Step 3 Modify any of the settings described in the following tables.

Note
You must modify Near End and Far End, 15 Min and 1 Day, and SM and PM independently. To do so, select the appropriate radio button and click **Refresh**.

Table 193: OTN Line Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number. Applicable for trunk ports and ports with OTU2 payload.	• 1-1 • 2-1 • 3-1 • 4-1 • 5 (Trunk)
ITU-T G.709 Thresholds	Sets the OTN lines according to ITU-T G.709.	• Enable • Disable
FEC	Sets the OTN lines to forward error correction (FEC).	• Standard • Enhanced
SF BER	(Display only) Sets the signal fail bit error rate.	• 1E-5
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9

Table 194: ITU-T G.709 Threshold Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number. Applicable for trunk ports and ports with OTU2 payload.	• 1-1 • 2-1 • 3-1 • 4-1 • 5 (Trunk)
ES	Errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select the radio button individually and click **Refresh**. Click **Reset to Default** to restore default values.
SES	Severely errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select the radio button individually and click **Refresh**.
UAS	Unavailable seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select the radio button individually and click **Refresh**.
BBE	Background block errors	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select the radio button individually and click **Refresh**.
FC	Failure counter	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select radio button individually and click **Refresh**.

Table 195: FEC Threshold Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number. Applicable for trunk ports and ports with OTU2 payload.	• 1-1 • 2-1 • 3-1 • 4-1 • 5 (Trunk)

Parameter	Description	Options
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minute or one-day intervals.
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minute or one-day intervals.

Table 196: Trail Trace Identifier Settings of the 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C Cards

Parameter	Description	Options
Port	(Display only) Displays the port number. Applicable for trunk ports and ports with OTU2 payload.	• 1-1 • 2-1 • 3-1 • 4-1 • 5 (Trunk)
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	Disables alarm indication signal.	• Checked (AIS/RDI on TIM-S is disabled) • Unchecked (AIS/RDI on TIM-S is not disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte
Transmit	Displays and sets the current transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Transmit String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).	Transmit string size
Expected	Displays and sets the current expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. In Expected String Type, click **Hex Mode** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex Mode).	Expected string size

Parameter	Description	Options
Received	(Display only) Displays the current received string. Click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	Received string size
Auto-refresh	Refreshes the display automatically every 5 seconds.	• Checked • Unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G281 Managing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Channel Group Settings

Purpose	This procedure changes the channel group settings for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G46 Log into CTC • DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • DLP-G726 Preprovisioning a Multirate PPM (if necessary)
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Perform any of the following tasks as needed:

- DLP-G611 Create a Channel Group Using CTC
- DLP-G612 Modify the Parameters of the Channel Group Using CTC
- DLP-G613 Managing Ports in a Channel Group, on page 489

- DLP-G614 Deleting a Channel Group, on page 489
- DLP-G615 Retrieving Information on Channel Group, REP, CFM, and EFM, on page 490
- DLP-G616 Viewing PM Parameters of a Channel Group, on page 491
- DLP-G617 Viewing Utilization PM Parameters of a Channel Group, on page 492
- DLP-G618 Viewing History PM Parameters of a Channel Group, on page 492
- DLP-G619 Create a Channel Group on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G620 Add Ports to a Channel Group on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G611 Creating a Channel Group Using CTC

Purpose	This task creates a channel group on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note You can create up to 11 channel groups on the GE_XP and GE_XPE cards and up to 2 channel groups on the 10GE_XP and 10GE_XPE cards. You can create a channel group with ports only when the ports do not have any UNI QinQ settings or NNI SVLAN settings. Otherwise, the channel group will be created with empty ports.

For information about interaction of LACP with other protocols, see the Protocol Compatibility list, on page 149.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed according to the requirements specified in Cable Connections for Y-Cable Protection of One Client Signal table.

Step 2 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 3 In card view, click the **Provisioning** > **Channel Groups** tabs.

Step 4 Click **Create**. The Channel Group Creation dialog box appears.

Step 5 Enter the name of the channel group in the Name field.

Step 6 From the Stand Alone list, choose the ports that will belong to this channel group and click the right arrow button to move the selected ports to the Bundled list.

Step 7 From the LACP Mode drop-down list, choose the LACP mode as needed:

- On—Default mode. In this mode, the ports will not exchange LACP packets with the partner ports.
- Active—In this mode, the ports will send LACP packets at regular intervals to the partner ports.
- Passive—In this mode, the ports will not send LACP packets until the partner ports send LACP packets. After receiving the LACP packets from the partner ports, the ports will send LACP packets.

Step 8 From the LACP Hashing drop-down list, select the LACP hashing algorithm that the protocol uses to perform the load balancing task between the bundled ports.

The following hashing algorithms are supported:

- Ucast SA VLAN Incoming Port
- Ucast DA VLAN Incoming Port
- Ucast SA DA VLAN Incoming port
- Ucast Src IP TCP UDP
- Ucast Dst IP TCP UDP
- Ucast Src Dst IP TCP UDP

Step 9 Click **Create**.

A new row is added in the LACP table and all the other parameters in the channel group are set to default values. The default values of these parameters are taken from the first port that is attached to the channel group.

Step 10 Return to your originating procedure (NTP).

DLP-G612 Modifying the Parameters of the Channel Group Using CTC

Purpose	This task modifies the parameters of the channel group.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Ports cannot be added or removed using this procedure. For adding or removing the ports, see the DLP-G613 Managing Ports in a Channel Group, on page 489.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to modify the parameters of the channel group.

Step 2 In card view, click the **Provisioning** > **Channel Groups** tabs.

Step 3 Choose a channel group from the existing channel groups.

Step 4 Modify the channel group settings as described in the following table.

Table 197: Channel Group Settings

Parameter	Description	Options
Channel Group	(Display only) ID and name of the channel group.	N.A.
Name	Sets the name of the channel group.	—
Ports	(Display only) Port number (*n*-*n*) and rate (GE or TEN_GE of the channel group).	N.A.
LACP Mode	Sets the LACP mode. The channel group must be in OOS-DSBLD admin state.	• On • Active • Passive
Hashing	Sets the LACP hashing algorithm. The channel group must be in OOS-DSBLD admin state.	• Ucast SA VLAN Incoming Port • Ucast DA VLAN Incoming Port • Ucast SA DA VLAN Incoming port • Ucast Src IP TCP UDP • Ucast Dst IP TCP UDP • Ucast Src Dst IP TCP UDP
Admin State	Sets the administrative state on the channel group.	• IS • OOS, DSBLD

Parameter	Description	Options
Service State	(Display only) Sets the service state that indicates the operational state of the channel group.	• IS-NR • OOS-MA, DSBLD
MTU	Sets the maximum transfer unit (MTU), which sets the maximum number of bytes per frame accepted on the port. The member ports must be in OOS-DSBLD admin state. The default MTU value in the channel group is taken from the default settings in the node.	Numeric. Default: 9700 Range: 64 to 9700
Mode	Sets the provisional port mode. If the port mode is Auto, the Expected Speed field determines which ports can belong to the bundle. The member ports must be in OOS-DSBLD admin state.	• Auto • 1000 Mbps
Expected Speed	Sets the expected speed of ports of the channel group. The channel group must be in OOS-DSBLD admin state.	• 10 Mbps • 100 Mbps • 1000 Mbps
Duplex	(Display only) Expected duplex capability of ports of the channel group.	• Full
Committed Info Rate	Sets the guaranteed information rate based on the service-level agreement of the service provider. The channel group must be in OOS-DSBLD admin state.	Numeric. Default: 100% Range: 0 to 100% Granularity: 0.1%
Committed Burst Size	Sets the maximum number of bits transferred per second. The channel group must be in OOS-DSBLD admin state.	• 4k (default) • 8k • 16k • 32k • 64k • 128k • 256k • 512k • 1M • 2M • 4M • 8M • 16M

Parameter	Description	Options
Excess Burst Size	Sets the maximum number of bits credited for later transfer if the committed burst rate cannot be transmitted. The channel group must be in OOS-DSBLD admin state.	• 4k (default) • 8k • 16k • 32k • 64k • 128k • 256k • 512k • 1M • 2M • 4M • 8M • 16M
NIM	Sets the network interface mode (NIM) for the channel group. The member ports must be in OOS-DSBLD admin state. The channel group NIM is set to UNI or NNI based on the mode of the first port that is added to the channel group.	• UNI Mode (Default)—provisions the port as a User-Network Interface (UNI). This is the interface that faces the subscriber. • NNI Mode—provisions the port as a Network-to-Network Interface (NNI). This is the interface that faces the service provider network.

Parameter	Description	Options
Ingress CoS	Provisions the IEEE 802.1p ingress class of service (CoS). Ingress CoS is used to set the priority of the Ethernet frame in the service provider network. The member ports must be in OOS-DSBLD admin state.	• 0 • 1 • 2 • 3 • 4 • 5 • 6 • 7 • Trust • CVLAN • DSCP
Inner Ethertype (Hex)	Defines the inner Ethertype field. The Ethertype field indicates which protocol is being transported in an Ethernet frame. The member ports must be in OOS-DSBLD admin state to modify the Inner Ethertype value to a non-default value.	Numeric. Default: 8100 (IEEE Std 802.1Q customer VLAN tag type) Range: 0x600 to 0xffff.
Outer Ethertype (Hex)	Defines the outer Ethertype field. The Ethertype field identifies which protocol is being transported in an Ethernet frame. The member ports must be in OOS-DSBLD admin state.	Numeric. Default: 8100 (IEEE standard 802.1Q service provider VLAN tag type) Range: 0x600 to 0xffff
MAC Learning	Enables or disables MAC learning for the port on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards. MAC learning is used by Layer 2 switches to learn the MAC addresses of network nodes so that the Layer 2 switches send traffic to the right location. In GE_XPE or 10GE_XPE cards, enable MAC address learning per SVLAN.	• Checked—MAC learning is enabled for this port. • Unchecked—(Default) MAC learning is disabled for this port.

Note
When you set the Committed Info Rate above 40% on 10GE_XP and 10GE_XPE cards, the Committed Burst Size and Excess Burst Size must be set to at least 32K. The Committed Burst Size and Excess Burst Size can be increased based on the packet size and Committed Info Rate value.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G613 Managing Ports in a Channel Group

Purpose	This task adds or removes ports to or from an existing channel group.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note

- You can assign up to eight ports to a channel group on GE_XP and GE_XPE cards and up to three ports on the 10GE_XP and 10GE_XPE cards.
- You can assign the ports to a channel group only if the ports are in OOS-DSBLD admin state. The ports must not have any UNI QinQ rule or NNI SVLAN configuration.
- If the channel group is configured in UNI mode, only the UNI ports can be added to the channel group. If the channel group is configured in NNI mode, only the NNI ports can be added to the channel group.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to add ports to an existing channel group.

Step 2 In card view, click the **Provisioning** > **Channel Groups** tabs.

Step 3 Choose a channel group from the existing channel groups.

Step 4 Click **Add/Remove Ports**.

Step 5 To add ports to an existing channel group, from the Stand Alone list, choose the required ports and click the right arrow button to move the selected ports to the Bundled list.

Step 6 To remove ports from an existing channel group, complete the following: from the Bundled list, choose the required ports and click the left arrow button to move the selected ports to the Stand Alone list.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G614 Deleting a Channel Group

Purpose	This task deletes a channel group.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XP card where you want to delete the channel group.

Step 2 In card view, click the **Provisioning** > **Channel Groups** tabs.

Step 3 Choose a channel group that you want to delete.

Step 4 Click **Delete**.

Step 5 Return to your originating procedure (NTP).

DLP-G615 Retrieving Information on Channel Group, REP, CFM, and EFM

Purpose	This task enables you to view and retrieve information on the channel group, Resilient Ethernet Protocol (REP), Connectivity Fault Management (CFM), and Ethernet in the First Mile (EFM) on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288

Step 2 In card view, click the **Maintenance** > **Show Commands** tabs.

Step 3 From the Command drop-down list, choose a command.

The following commands are supported:

- ETH LACP—Displays detailed LACP information from the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.

- REP TOPO—Displays the topology information for a specific REP segment.
- REP TOPO ARCHIVE—Displays the previous topology information for a specific REP segment.
- REP INTERFACE—Displays information on the REP interface status and configuration. You can retrieve detailed information for each segment by selecting Detailed from the Level drop-down list and providing the segment ID.
- OAM DISCOVERY—Displays discovery information for all the EFM interfaces or for a specific EFM interface.
- OAM SUMMARY—Displays the active EFM sessions on a device.
- OAM STATISTICS—Displays detailed information about the EFM packets.
- OAM STATUS—Displays information about the EFM configurations for all the EFM interfaces or for a specific interface.

For more information, see the Pseudo Command Line Interface Reference document.

Step 4 From the Level drop-down list, choose Normal or Detailed.

Step 5 Click Show. Depending on the command, the appropriate output appears in the text area.

Step 6 Return to your originating procedure (NTP).

DLP-G616 Viewing PM Parameters of a Channel Group

Purpose	This task enables you to view current statistical performance monitoring (PM) counts on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards and channel groups to detect possible performance problems.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to view the channel group statistics. The card view appears.

Step 2 Click the **Performance** > **Channel Groups** > **Statistics** tabs.

Step 3 Click **Refresh**. Performance monitoring statistics for each channel group on the card appear in the Statistics tab.

View the PM parameter names in the Param column. The current PM parameter values appear in the Port # (CHGRP) column. For PM parameter definitions, see the Monitor Performance document.

Note
To refresh, reset, or clear PM counts, see the "NTP-G73 Change the PM Display" procedure.

Step 4 Return to your originating procedure (NTP).

DLP-G617 Viewing Utilization PM Parameters of a Channel Group

Purpose	This task enables you to view line utilization PM counts on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards and channel groups to detect possible performance problems.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 In node view, double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to view the channel group utilization. The card view appears.

Step 2 Click the **Performance** > **Channel Groups** > **Utilization** tabs.

Step 3 Click **Refresh**. The utilization percentages for each channel group on the card appear in the Utilization tab.

View the Port # column to find the channel group you want to monitor.

The transmit (Tx) and receive (Rx) bandwidth utilization values, for the previous time intervals, appear in the Prev-*n* columns. For PM parameter definitions, see the Monitor Performance document.

Note
To refresh, reset, or clear PM counts, see the "NTP-G73 Change the PM Display" procedure.

Step 4 Return to your originating procedure (NTP).

DLP-G618 Viewing History PM Parameters of a Channel Group

Purpose	This task enables you to view historical PM counts at selected time intervals on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards and channel groups to detect possible performance problems.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card where you want to view the channel group history PM data. The card view appears.

Step 2 Click the **Performance** > **Channel Groups** > **History** tabs.

Step 3 From the Port field, choose a channel group.

Step 4 Click **Refresh**. Performance monitoring statistics for each channel group on the card appear in the History tab.

View the PM parameter names that appear in the Param column. The PM parameter values appear in the Prev-*n* columns. For PM parameter definitions, see the Monitor Performance document.

Note
To refresh, reset, or clear PM counts, see the "NTP-G73 Change the PM Display" procedure.

Step 5 Return to your originating procedure (NTP).

NTP-G283 Managing the Card CFM Settings

Purpose	This procedure changes the CFM settings for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • DLP-G726 Preprovisioning a Multirate PPM (if necessary)
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Perform any of the following tasks as needed:

- DLP-G621 Enabling CFM on a card
- DLP-G622 Enabling CFM for a port
- DLP-G623 Creating a maintenance domain profile
- DLP-G624 Deleting a maintenance domain profile
- DLP-G625 Creating a maintenance association profile
- DLP-G626 Modifying a maintenance association profile
- DLP-G627 Deleting a maintenance association profile
- DLP-G628 Mapping profiles
- DLP-G629 Creating a MEP
- DLP-G630 Deleting a MEP
- DLP-G631 Creating a MIP
- DLP-G632 Deleting a MIP
- DLP-G633 Pinging a MEP
- DLP-G634 Displaying output of a traceroute MEP
- DLP-G635 Enable CFM on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G615 Retrievig information on channel group, REP, CFM, and EFM
- DLP-G636 Create a Maintenance Domain on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G637 Create a Maintenance Intermediate Point on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G638 Create a Maintenance End Point on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G621 Enabling CFM on a Card

Purpose	This task allows you to enable or disable CFM on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note CFM is disabled on the card by default. CFM must be enabled at both card and port levels for the CFM service to work.

For information about interaction of CFM with other protocols, see the “Protocol Compatibility list” section.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **Security** tab.

Step 3 Uncheck the **MAC security** check box to disable MAC security.

Step 4 In card view, click the **Provisioning** > **CFM** > **Configuration** > **Global Settings** tabs.

Step 5 Check the **Enable CFM** check box that is present at the bottom of the screen.

Step 6 Choose the value for CC Timer field. The value can be 1 second, 10 seconds, or 1 minute.

Note
Continuity Check (CC) messages are periodically exchanged between maintenance end points (MEPs). The CC Timer field is used to set the time frequency for transmission of CC messages.

Step 7 Click **Apply** to enable CFM on the card.

Note
Uncheck the **Enable CFM** check box to disable CFM on the card.

Step 8 Return to your originating procedure (NTP).

DLP-G622 Enabling CFM for a Port

Purpose	This task allows you to enable or disable CFM for each port on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288

Note
CFM must be enabled at both card and port levels for the CFM service to work. However, CFM is enabled on all the ports by default.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **Global Settings** tabs.

Step 3 If you want to enable CFM on a specific port, check the **Enable CFM** check box against that port.

Step 4 Choose the value for CC Timer field. The value can be 1 second, 10 seconds, or 1 minute.

Note
Continuity Check (CC) messages are periodically exchanged between MEPs. The CC Timer field is used to set the time frequency for transmission of CC messages.

Step 5 Click **Apply** to enable CFM on the port.

Note
Uncheck the **Enable CFM** check box against the port to disable CFM on the port.

Step 6 Return to your originating procedure (NTP).

DLP-G623 Creating a Maintenance Domain Profile

Purpose	This task allows you to create a maintenance domain profile on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

You can create up to eight maintenance domain profiles on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards. The maximum number of characters for the maintenance domain profile and the maintenance association profile must not exceed 43 characters.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **Domain Profiles** tabs or in node/network view, click the **Provisioning** > **CFM Profiles** > **Domain Profiles** tabs.

Note
Use the network view to store the domain profile on multiple nodes.

Step 3 Click **Add row(s)**.

Step 4 Enter the name of the domain in the Domain Name field.

Step 5 Enter the level of the domain profile in the Level field. The range of the domain profile level is from 0 to 7.

Step 6 Click **Store**.

Step 7 Choose the card slot where you want to store this domain profile and click **OK**.

Step 8 Return to your originating procedure (NTP).

DLP-G624 Deleting a Maintenance Domain Profile

Purpose	This task allows you to delete a maintenance domain profile on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **Domain Profiles** tabs or in node/network view, click the **Provisioning** > **CFM Profiles** > **Domain Profiles** tabs.

Step 3 Select the domain profiles that you want to delete.

Step 4 Check the **on Node** check box.

Step 5 Click **Delete Sel. row(s)**.

Step 6 Choose the card slot where you want to delete this profile and click **OK**.

Step 7 In the **Deleting Profile** dialog box, click **Yes**.

Step 8 Return to your originating procedure (NTP).

DLP-G625 Creating a Maintenance Association Profile

Purpose	This task allows you to create a maintenance association profile on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note You can create up to 1500 maintenance association profiles on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See theDLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MA Profiles** tabs or in node/network view, click the **Provisioning** > **CFM Profiles** > **MA Profiles** tabs.

Note
Use the network view to store the maintenance association profile on multiple nodes.

Step 3 Click **Add row(s)**.

Step 4 Enter the name of the maintenance association in the Maintenance Profile Name field.

Step 5 Enter the VLAN ID in the VLAN ID field. The range of the VLAN ID is from 1 to 4093.

Step 6 Check the **CC Enable** check box to receive Continuity Check messages.

Step 7 Click **Store**.

Step 8 Choose the card slot where you want to store this maintenance association profile and click **OK**.

Step 9 Return to your originating procedure (NTP).

DLP-G626 Modifying a Maintenance Association Profile

Purpose	This task allows you to modify a maintenance association profile on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note Ensure that the maintenance association profile you want to modify is not associated with a maintenance domain profile.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MA Profiles** tabs or in node/network view, click the **Provisioning** > **CFM Profiles** > **MA Profiles** tabs.

Step 3 Select the maintenance association profiles that you want to modify.

Step 4 Click **Modify Selected Profile(s)**.

Step 5 Modify the values as required and click **OK**.

Step 6 Return to your originating procedure (NTP).

DLP-G627 Deleting a Maintenance Association Profile

Purpose	This task allows you to delete a maintenance association profile on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note Ensure that the maintenance association profile you want to delete is not associated with a maintenance domain profile.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MA Profiles** tabs or in node/network view, click the **Provisioning** > **CFM Profiles** > **MA Profiles** tabs.

Step 3 Select the maintenance association profiles that you want to delete.

Step 4 Check the **on Node** check box.

Step 5 Click **Delete Sel. row(s)**.

Step 6 Choose the card slot where you want to delete this profile and click **OK**.

Step 7 In the Deleting Profile dialog box, click **Yes**.

Step 8 Return to your originating procedure (NTP).

DLP-G628 Mapping Profiles

Purpose	This task allows you to map a maintenance association profile to a maintenance domain profile on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note Ensure that you have already created maintenance domain profiles and maintenance association profiles.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MA-Domain Mapping** tabs.

Step 3 From the main drop-down list, choose a maintenance domain profile.

Step 4 Click **Link MA Profiles**.

Step 5 From the Available Profiles list, choose the required MA profiles and click the right arrow button to move the MA profiles to the Linked Profiles list and click **OK**.

Note
The maintenance association profiles that are mapped with a specific maintenance domain profile must have a unique SVLAN ID.

Step 6 Return to your originating procedure (NTP).

DLP-G629 Creating a MEP

Purpose	This task allows you to create a Maintenance End Point (MEP) for a given VLAN range on a specific maintenance domain.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note You can create up to 255 MEPs and MIPs on the GE_XP and 10GE_XP cards. You can create up to 500 MEPs and MIPs on the GE_XPE and 10GE_XPE cards.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MEP** tabs.

Step 3 Click **Create**.

Step 4 From the Port drop-down list, choose a port where you want to create the MEP.

Note
CFM must be enabled on the port to create a MEP. The port must not belong to a channel group.

Step 5 From the Domain drop-down list, choose a maintenance domain.

Step 6 Enter the SVLAN ID in the Vlan Id field.

Note

The specified VLAN must be configured on the selected port. The specified VLAN must also appear in the MA-Domain Mapping table.

Step 7 Enter the MP ID (identifier of the maintenance end point) in the MPID field and click **OK**. The range of the MP ID is from 1 to 8191.

The MP ID must not be the same between the maintenance end points.

Step 8 Return to your originating procedure (NTP).

DLP-G630 Deleting a MEP

Purpose	This task allows you to delete a MEP on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MEP** tabs.

Step 3 Select the MEPs that you want to delete.

Step 4 Click **Delete**.

Step 5 Return to your originating procedure (NTP).

DLP-G631 Creating a MIP

Purpose	This task allows you to create a Maintenance Intermediate Point (MIP) for a given VLAN range with a specific maintenance level.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed

Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note You can create up to 255 MEPs and MIPs on the GE_XP and 10GE_XP cards. You can create up to 500 MEPs and MIPs on the GE_XPE and 10GE_XPE cards.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MIP** tabs.

Step 3 Click **Create**.

Step 4 From the Port drop-down list, choose a port where you want to create the MIP.

Note
The port must not belong to a channel group.

Step 5 From the Level drop-down list, choose a maintenance level. The range of the maintenance level is from 0 to 7.

Step 6 Enter the SVLAN range in the Vlan range field. The range of the SVLAN is from 1 to 4093.

Note
The specified SVLAN must be configured on the selected port.

Step 7 Click **OK**.

Step 8 Return to your originating procedure (NTP).

DLP-G632 Deleting a MIP

Purpose	This task allows you to delete a MIP on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **CFM** > **Configuration** > **MIP** tabs.

Step 3 Select the MIPs that you want to delete.

Step 4 Click **Delete**.

Step 5 Return to your originating procedure (NTP).

DLP-G633 Pinging a MEP

Purpose	This task allows you to display the output of the ping command on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 task.

Step 2 In card view, click the **Provisioning** > **CFM** > **Ping** tabs.

Step 3 Enter the MP ID value in the MPID field. The range of the MP ID is from 1 to 8191.

Note
Remote MP ID user cannot ping local MP ID.

Step 4 (Optional) Enter the MAC address of the remote maintenance point in the Mac Addr field. The format of MAC address is *abcd.abcd.abcd*.

Step 5 Enter the SVLAN ID in the VLAN ID field. The range of the SVLAN ID is from 1 to 4093.

Step 6 Enter the domain name in the Domain Name field.

Step 7 Enter the size of the ping packet in the DataGram Size field. The default value is 100.

Step 8 Enter the number of ping packets in the No of Requests field. The default value is 5.

Step 9 Click **Ping**. The output of the ping command appears in the Ping Response area.

Step 10 Return to your originating procedure (NTP).

DLP-G634 Displaying Output of a Traceroute MEP

Purpose	This task allows you to display the output of the traceroute command on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288

Step 2 In card view, click the **Provisioning** > **CFM** > **Traceroute** tabs.

Step 3 Enter the remote MP ID value in the MPID field. The range of the MP ID is from 1 to 8191.

Step 4 (Optional) Enter the MAC address of the remote maintenance point in the Mac Addr field. The format of MAC address is abcd.abcd.abcd.

Step 5 Enter the SVLAN ID in the VLAN ID field. The range of the SVLAN ID is from 1 to 4093.

Step 6 Enter the domain name in the Domain Name field.

Step 7 Click **TraceRoute Response**.

The output of the traceroute command appears in the TraceRoute Response area.

- Verify the RlyHit message is shown in the traceroute display and LTM reaches a maintenance point whose MAC address matches the target MAC address.
- Verify the RlyFDB message is shown in the traceroute display when the next hop address is found in the forwarding database.
- Verify the RlyMPDB message is shown in the traceroute display when the next hop address is found in the CCDN.

Step 8 Return to your originating procedure (NTP).

NTP-G285 Managing the Card EFM Settings

Purpose	This procedure changes the EFM settings of the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • DLP-G726 Preprovisioning a Multirate PPM (if necessary)
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Perform any of the following tasks as needed:

- DLP-G639 Enabling EFM for a port,
- DLP-G640 Configuring EFM parameters
- DLP-G641 Configuring EFM link monitoring parameters
- DLP-G642 Enabling remote loopback for a port
- DLP-G615 Retrievig information on channel group, REP, CFM, and EFM
- DLP-G643 Enable EFM on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G644 Configure the EFM Mode on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G639 Enabling EFM for a Port

Purpose	This task allows you to enable or disable EFM for each port on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note You can enable EFM on both UNI and NNI ports. You cannot enable or disable EFM for ports that belong to a channel group. For information about interaction of EFM with other protocols, see the "11.14.2 Protocol Compatibility list" section on page 11-62.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **EFM** > **Configuration** tabs. The EFM details appear for each port.

Step 3 From the EFM State drop-down list, choose **Enabled**.

Step 4 Click **Apply** to enable EFM for that port.

Note
From the EFM State drop-down list, choose Disabled to disable EFM for that port.

Step 5 Return to your originating procedure (NTP).

DLP-G640 Configuring EFM Parameters

Purpose	This task allows you to configure EFM parameters on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **EFM** > **Configuration** tabs.

Step 3 Modify the EFM parameter settings as described in the table.

Table 198: EFM Parameter Settings

Parameter	Description	Options
Port	(Display only) Port number (*n*-*n*) and rate (GE or TEN_GE).	—
EFM State	Sets the state of the EFM protocol for each port.	• Enabled • Disabled
Mode	Sets the operating mode of the port. If the mode is Active, the port sends OAM Protocol Data Units (OAMPDUs) at regular intervals to the partner ports. If the mode is Passive, the port will not send OAMPDUs until the partner ports send OAMPDUs.	• Active • Passive
Link Fault	Sets the Remote Failure Indication (RFI) action. If the link is down on a port, the link fault RFI is sent to the partner port through OAMPDU. An alarm indicating the remote failure indication link fault (RFI-LF) is raised. The alarm is cleared after you clear the link fault condition. You can specify the following actions for link fault RFI: • Error Block—The interface is placed in the error-block state and the RFI-LF alarm is raised. • None—Only the RFI-LF alarm is raised. **Note** Dying Gasp and critical events are not supported.	• Error Block • None
Session Timer	Sets the duration up to when the EFM session is retained with the partner port without receiving OAMPDUs.	Default: 5 seconds Range: 2 to 30 seconds

Step 4 Click **Apply** to save the changes.

Step 5 Return to your originating procedure (NTP).

DLP-G641 Configuring EFM Link Monitoring Parameters

Purpose	This task allows you to configure EFM link monitoring parameters for each port on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288

Step 2 In card view, click the **Provisioning** > **EFM** > **Link Monitoring** tabs.

Step 3 Modify the EFM link monitoring parameter settings as described in the table.

Table 199: EFM Link Monitoring Parameter Settings

Parameter	Description	Options
Port	(Display only) Port number (*n*-*n*) and rate (GE or TEN_GE).	—
EF Max	Sets the threshold value for the maximum number of errored frames to detect during a specific period.	Range: 1 to 65535
EF Min	Sets the threshold value for the minimum number of errored frames to detect during a specific period.	Range: 0 to 65535
EF Action	Specifies that when the parameter value exceeds the maximum threshold value, the applicable action is None. When the parameter value falls below the minimum threshold value, a threshold crossing alert (transient condition) is generated.	• None • Squelch
EF Window	Period in which the errored frame parameters are monitored.	Range: 10 to 600
EFP Max	Sets the threshold value for the maximum number of errored frames within the last n frames.	Range: 1 to 65535
EFP Min	Sets the threshold value for the minimum number of errored frames within the last n frames.	Range: 0 to 65535

Parameter	Description	Options
EFP Action	Specifies that when the parameter value exceeds the maximum threshold value, the applicable action is None. When the parameter value falls below the minimum threshold value, a threshold crossing alert (transient condition) is generated.	• None • Squelch
EFP Window	Period in which the EFP parameters are monitored.	Range: 1 to 65535
EFSS Max	Sets the threshold value for the maximum number of errored seconds within the last m seconds.	Range: 1 to 900
EFSS Min	Sets the threshold value for the minimum number of errored seconds within the last m seconds.	Range: 0 to 900
EFSS Action	Specifies that when the parameter value exceeds the maximum threshold value, the applicable action is None. When the parameter value falls below the minimum threshold value, a threshold crossing alert (transient condition) is generated.	• None • Squelch
EFSS Window	Specifies the period when the EFSS parameters are monitored.	Range: 100 to 9000

Step 4 Click **Apply** to save the changes.

Step 5 Return to your originating procedure (NTP).

DLP-G642 Enabling Remote Loopback for a Port

Purpose	This task allows you to enable remote loopback for each port on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **EFM** > **Loopback** tabs.

The remote loopback type details appear for each port.

Step 3 From the Remote Loopback Type drop-down list, choose **Remote Loopback**.

Step 4 Click **Apply** to save the changes.

Step 5 Return to your originating procedure (NTP).

NTP-G287 Managing the Card REP Settings

Purpose	This procedure changes the REP settings for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • DLP-G726 Preprovisioning a Multirate PPM (if necessary)
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Perform any of the following tasks as needed:

- DLP-G713 Provisioning administrative VLAN for ports in a REP segment
- DLP-G645 Creatig a segment
- DLP-G646 Editing a segment
- DLP-G647 Activating VLAN load balancing
- DLP-G648 Deactivating VLAN load balancing
- DLP-G615 Retrievig information on channel group, REP, CFM, and EFM

- DLP-G649 Create a Segment on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G650 Configure STCN on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- DLP-G651 Configure Preemption Delay on the Primary Edge Port Using PCLI
- DLP-G652 Configure VLAN Load Balancing on the Primary Edge Port Using PCL

Stop. You have completed this procedure.

DLP-G713 Provisioning Administrative VLAN for Ports in a REP Segment

Purpose	This task allows you to provision administrative VLAN for NNI and UNI ports in a REP segment on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note One administrative CVLAN and one administrative SVLAN can be provisioned for each card. The REP segments using NNI ports send Hardware Flood Layer (HFL) messages using the administrative SVLAN. The REP segments using UNI ports send HFL messages using the administrative CVLAN. The two VLANs need not be the same.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **REP** > **Admin VLAN Configuration** tabs.

Step 3 To provision administrative VLAN for NNI ports in a REP segment, perform the following steps:

a) From the SVLAN drop-down list, choose a SVLAN. The following table describes the REP convergence time for SVLANs.

Table 200: REP Convergence Time for SVLANs

SVLAN	Administrative VLAN	REP Convergence Time
0 (default)	Not configured	4 to 5 seconds

SVLAN	Administrative VLAN	REP Convergence Time
1 to 4093	Configured	Less than 200 milliseconds

b) Click **Apply**

c) To associate the chosen SVLAN with the NNI ports, see "DLP-G382 Adding SVLANS to NNI ports" task.

Step 4 To provision administrative VLAN for UNI ports in a REP segment, perform the following steps:

a) Enter the CVLAN in the CVLAN field.

b) Click **Apply**.

c) To associate the CVLAN with the UNI ports, see "DLP-G384 Provisioning the QinQ settings" task.

Step 5 Return to your originating procedure (NTP).

DLP-G645 Creating a Segment

Purpose	This task allows you to create a segment on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note

- You can create up to three segments on a card. Each segment can have up to two ports on the same switch.
- You must configure the REP administrative VLAN to activate the Hardware Flood Layer (HFL).
- Before creating REP segments, you must configure the administrative VLAN or use the default VLAN 1 and add the ports to the segment. Only one SVLAN can be configured per card for all the three segments. REP uses the administrative VLAN to flood its own control traffic.
- The administrative CVLAN is required if a REP port is configured as a UNI port. However, the REP ports are configured as NNI ports in many configurations, and hence the administrative CVLAN is not required in these configurations. The option to configure the administrative CVLAN is present in CTC.
- You must configure two edge ports in the segment. A segment has only one primary edge port. If you configure two ports in a segment as the primary edge port, for example, ports on different switches, REP selects one of the ports to serve as the primary edge port based on port priority.
- If REP is enabled on two ports on a switch, both the ports must be either regular ports or edge ports. However, if the No-neighbor port is configured, one port can be an edge port and another port can be a regular port.
- You can also optionally configure where to send segment topology change notifications (STCNs) and VLAN load balancing (VLB). STCNs are enabled only for primary edge ports. VLB configurations are enabled on any edge ports. For information about interaction of REP with other protocols, see the “11.14.2 Protocol Compatibility list” section on page 11-62

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. SeeDLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **REP** > **Segment tabs**.

Step 3 Click **Create**.

Step 4 Enter the segment ID in the Segment field. The range of the segment ID is from 1 to 1024.

Step 5 From the Port drop-drown list, choose a REP port that must belong to this segment.

Note
A REP port can belong to only one segment.

Step 6 From the Port Role area, choose whether you want to configure the port as an edge port or a regular port. The options are:

a) Edge—The port is configured as an edge port.

- Check the **Primary** check box to configure the edge port as a primary edge port. A segment can have only one primary edge port.

Note
If an edge port is configured as primary edge port, the other edge port in the ring automatically becomes secondary edge port. If neither edge port is configured as primary edge port, one edge port is automatically selected as primary edge port, and the other edge port is secondary edge port.

Configuring an edge port as a primary edge port is not mandatory. However, it is recommended since VLAN load balancing must be configured on the node with the primary edge port.

- Uncheck the **Primary** check box to configure the edge port as a secondary edge port.
- (Optional) Check the **Preferred** check box to configure the regular or edge port as a preferred alternate port (alternate to primary edge port). This port blocks a range of SVLANs for VLAN load balancing. There is no limit on the number of preferred ports in a REP ring. The preferred port, if configured, is relevant even without VLAN load balancing, as it takes priority over non-preferred ports for alternate port election.

  Note
  Configuring a port as preferred does not ensure that it becomes the alternate port; it only gets preference over the other ports that are not configured as preferred when an alternate port is elected.

- Check the **NoNeighbor** check box if the edge port must not have a neighbor port. REP does not check for neighbor adjacency.

  Note
  When the **NoNeighbor** check box is checked, ensure that only one segment is created.

b) None—The port is configured as a regular port. If you choose this option, Segment Topology Change Notifications (STCN) and VLAN Load Balancing (VLB) configurations are disabled.

Check the **Preferred** check box to configure the regular port as a preferred alternate port.

Step 7 From the STCN area, configure the destination of STCN messages:

a) Check the **Enable** check box to enable sending STCN messages.
b) From the Port drop-down list, choose the STCN port to send STCN messages or enter the segment ID in the Segment field to send STCN messages. The STCN port and REP port must be unique.

Step 8 From the VLAN Load Balancing area, configure VLAN Load Balancing on the primary edge port:

a) Check the **Enable** check box to enable VLB.
b) Enter a single SVLAN or range of SVLANs in the SVLAN field. These SVLANs are blocked at the alternate ports. The primary edge port blocks the remaining VLANs.
c) Enter the Rep PortId in the Rep PortId field to identify the VLAN blocking alternate port. This unique port ID is automatically generated when REP is enabled.
d) Check the **Preferred** check box to select the segment port previously identified as the preferred alternate port for VLAN load balancing.

When you check **Preferred** under VLAN Load Balancing area, you configure VLAN load balancing to use one of the previously configured preferred ports (under the Port Role area) to be the load balancing port. This restricts the load balancing port to be one among the preferred ports, but you cannot select a specific preferred port.

Step 9 From the VLB Preempt Delay area, enter the trigger delay for automatic VLB activation. The range is 15 to 300 seconds.

Step 10 Click **Next**.

Step 11 Enter the details of the second port to add it to the segment.

Step 12 Repeat step6 to step 10 when the first port is configured as a regular port and the second port is configured as a primary edge port. Repeat step 6 to step 7 when the first port is configured as a primary edge port and the second port is configured as a regular port.

Step 13 Click **Finish**.

Step 14 Return to your originating procedure (NTP).

DLP-G646 Editing a Segment

Purpose	This task allows you to edit a segment on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Note You can edit only the STCN and VLB entries for a segment.

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **REP** > **Segment** tabs. The list of segments appear.

Step 3 Choose a segment from the list of segments.

Step 4 Click **Edit**.

Step 5 Modify the values as required and click **Finish**.

Step 6 Return to your originating procedure (NTP).

DLP-G647 Activating VLAN Load Balancing

Purpose	This task allows you to activate VLAN load balancing on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **REP** > **Segment** tabs.

Step 3 Choose a segment from the list of segments.

Step 4 Click **Activate VLB**.

Note
When VLAN load balancing is activated, the default configuration is manual preemption with the delay timer disabled.

Step 5 Return to your originating procedure (NTP).

DLP-G648 Deactivating VLAN Load Balancing

Purpose	This task allows you to deactivate VLAN load balancing on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 Verify that the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card is installed in L2-over-DWDM mode. See DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 2 In card view, click the **Provisioning** > **REP** > **Segment** tabs.

Step 3 Choose a segment from the list of segments.

Step 4 Click **Deactivate VLB**.

Step 5 Return to your originating procedure (NTP).

NTP-G165 Modifying the Ethernet, Line and PM Thresholds

Purpose	This procedure changes Ethernet, line, and PM threshold settings for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G723 Install PPM on a Line Card
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database procedure, to preserve the existing transmission settings.

Step 2 Verify the card mode:

a) Display the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card in card view.

b) Click the **Provisioning** > **Card** tabs.

c) Verify that the card mode is set to the mode designated by your site plan:

- L2-over-DWDM (GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE)
- 10GE TXP (10GE_XP or 10 GE_XPE)
- 10GE MXP (GE_XP or GE_XPE)
- 20GE MXP (GE_XP or GE_XPE)

If the card mode is set correctly, continue with step 4. If not, complete the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 task.

Step 3 Complete the "DLP-G380 Provisioning ethernet settings" task.

Step 4 If the ONS-SC-E1-T1-PW or ONS-SC-E3-T3-PW SFP is inserted in the GE_XPE card, complete the following tasks, as needed.

- DLP-G684 Provisioning the PDH ethernet settings
- DLP-G685 Provisioning the electrical lines

Step 5 If the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card mode is L2-over-DWDM, complete the following tasks, as needed. If the card mode is not L2-over-DWDM, continue with step 7.

- DLP-G381 Provisioning layer 2 protection settings

- DLP-G382 Adding SVLANS to NNI ports
- DLP-G383 Provisioning the quality of service settings
- DLP-G384 Provisioning the QinQ settings
- NTP-G205 Enabling link integrity on a card
- DLP-G385 Provisioning the MAC filter settings
- NTP-G204 Enabling IGMP snooping on a card or NTP-G220 Enable IGMP Snooping on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI.
- NTP-G206 Enabling MVR on a card, or NTP-G224 Enable MVR on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI.
- DLP-G460 Enabling MAC address learning on SVLANs for GE_XPE or 10GE_XPE cards or NTP-G226 Enable MAC Address Learning on SVLANs for GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI.

Step 6 Complete the following tasks, as needed:

- DLP-G386 Provisioning the trunk port alarm and TCA threshold
- DLP-G387 Provisioning the client port alarm and TCA thresholds
- DLP-G388 Changing the RMON Threshold
- DLP-G389 Changing OTN settings

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G380 Provisioning Ethernet Settings

Purpose	This task changes the Ethernet settings for the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the Ethernet settings. The card view appears.

Step 2 Click the **Provisioning** > **Ether Ports** > **Ethernet** tabs.

Step 3 Modify any of the settings for the Ethernet tab as described in the table. The parameters that appear depend on the card mode.

Table 201: GE_XP, 10GE_XP, GE_XPE, and 10GE_XPEEthernet Settings

Parameter	Description	Card Mode
Port	(Display only) The Port number (*n*-*n*) and rate (GE or TEN_GE).	• L2-over-DWDM • 10GE TXP • 10GE MXP • 20GE MXP
MTU	The maximum size of the Ethernet frames accepted by the port. The port must be in OOS/locked state.	• L2-over-DWDM • 10GE TXP • 10GE MXP • 20GE MXP

Parameter	Description	Card Mode
Mode	Sets the Ethernet mode. The port must be in OOS/locked state before setting the card mode. **Note** For GE_XP and GE_XPE cards that are in Y-cable protection groups, Mode must be set to 1000 Mbps for those client ports that are configured in Y-cable. For 10GE_XP and 10GE_XPE cards that are in Y-cable protection groups, Mode must be set to 10000 Mbps.	• L2-over-DWDM • 10GE TXP • 10GE MXP • 20GE MXP
Flow Control	Enables/disables flow control messaging with its peer port. When enabled, the port can send and receive PAUSE frames when buffer congestion occurs. When disabled, no PAUSE frames are transmitted and the PAUSE frames received are discarded. **Note** Flow control messaging is symmetric and not negotiated. When flow control is enabled on one port, the other end of the link (peer port) is not considered. That is, even if flow control is disabled on the peer port, the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card will send PAUSE frames.	• L2-over-DWDM • 10GE MXP • 10GE TXP • 20GE MXP

Parameter	Description	Card Mode
Media Type	**Note** PROV-MISMATCH alarm is raised if the Media Type is not set to Ethernet Over DS1 (ANSI) or Ethernet Over E1 (ETSI) for ONS-SC-EOP1,Ethernet Over DS3 (ANSI) or Ethernet Over E3 (ETSI) for ONS-SC-EOP3, or DS1 Over Ethernet (ANSI) or E1 Over Ethernet (ETSI) for ONS-SC-E1-T1-PW or DS3 Over Ethernet (ANSI) or E3 Over Ethernet (ETSI) ONS-SC-E3-T3-PW. Set the correct Media Type to clear the PROV-MISMATCH alarm.	• L2-over-DWDM • 10GE MXP • 20GE MXP
Committed Info Rate	Sets the guaranteed information rate based on the service-level agreement of the service provider. The port must be in OOS/locked state.	• L2-over-DWDM • 10GE MXP • 20GE MXP
Committed Burst Size	Sets the maximum number of bits that will be transferred per second. The port must be in OOS/locked state before the Committed Burst Size is provisioned.	• L2-over-DWDM • 10GE MXP • 20GE MXP

Parameter	Description	Card Mode
Excess Burst Size	The maximum number of bits that are credited for later transfer in the event the committed burst rate cannot be transmitted. The port must be in OOS/locked state before the Excess Burst Size is provisioned.	• L2-over-DWDM • 10GE MXP • 20GE MXP
NIM	Sets the port network interface mode (NIM). This parameter classifies port types designed for the Metro Ethernet market to simplify deployment, management, and troubleshooting. The port must be in OOS/locked state before the NIM is provisioned.	L2-over-DWDM
Egress QoS	Enables Quality of Service (QoS) on the port's egress or output queues. The port must be in OOS/locked state before the Egress QoS is provisioned.	L2-over-DWDM

Parameter	Description	Card Mode
MAC Learning	Enables or disables MAC learning for the port on GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards. MAC learning is used by Layer 2 switches to learn the MAC addresses of network nodes so the Layer 2 switches send traffic to the right location. Layer 2 switches, including the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards in L2-over-DWDM mode with MAC Learning configured, maintain a MAC learning table that associates the MAC addresses and VLANs with a given port. **Note** MAC addresses on SVLANs attached to the port must also be enabled to provision MAC address learning on GE_XPE and 10GE_XPE cards. **Note** MAC address table aging is 300 seconds. It cannot be changed.	L2-over-DWDM

Parameter	Description	Card Mode
Ingress CoS	Provisions the IEEE 802.1p ingress Class of Service (CoS). The CoS .1p bits set the Ethernet frame priority. The port must be in OOS/locked state before the Ingress CoS is provisioned. Ingress CoS is used to set the priority of the Ethernet frame in the service provider network, This parameter is used to set the CoS.1p bits in the SVLAN tag. Ingress CoS applies only to ports provisioned as UNI mode. It does not apply to ports provisioned as NNI mode.	L2-over-DWDM

Parameter	Description	Card Mode
Inner Ethertype (Hex)	Defines the inner Ethertype field. The Ethertype field indicates which protocol is being transported in an Ethernet frame. The inner Ethertype applies to ports provisioned in UNI mode only. It does not apply to ports provisioned as NNI mode. The ports must be OOS/locked before the inner Ethertype is provisioned.	L2-over-DWDM
Outer Ethertype (Hex)	Defines the outer Ethertype field. The Ethertype field identifies which protocol is being transported in an Ethernet frame. The ports must be OOS/locked before the Outer Ethertype is provisioned. **Note** The PROV-MISMATCH alarm is raised on GE_XPE and 10GE_XPE cards if more than four different Outer Ethertype options are configured per card.	L2-over-DWDM
IGMP Static Router Port	Adds multicast-capable ports to the forwarding table for every IP multicast.	L2-over-DWDM
AIS Action	Defines the AIS action type provisioned on the port.	L2-over-DWDM

Parameter	Description	Card Mode
Protection Action	Configures the standby port behavior. Set Protection Action to None if Media Type is set to Ethernet Over DS1 (ANSI) or Ethernet Over E1 (ETSI) for ONS-SC-EOP1, Ethernet Over DS3 (ANSI) or Ethernet Over E3 (ETSI) for ONS-SC-EOP3, or DS1 Over Ethernet (ANSI) or E1 Over Ethernet (ETSI) for ONS-SC-E1-T1-PW or DS3 Over Ethernet (ANSI) or E3 Over Ethernet (ETSI) for ONS-SC-E3-T3-PW.	L2-over-DWDM

The table shows the inner and outer Ethertype behavior based on the NIM setting (either NNI mode or UNI mode). When the NIM is set to UNI, and the QinQ mode is set to Selective, the Ethertype behavior depends on the SVLAN/CVLAN operation that is provisioned, either Add or Translate. (QinQ parameters are provisioned in the "DLP-G384 Provisioning the QinQ settings" task.)

Note
A packet can exit out of any UNI/NNI port if the outermost tag in the packet matches with the SVLAN provisioned on that port. In other words, in the egress path, the inner tags (even if present) of the packet are not matched with the inner SVLAN or CVLAN provisioned on the port.

Note
The Committed Burst Size and Excess Burst Size must be configured based on the expected packet size to ensure that no packets are dropped when Flow Control is enabled. For example, if the CIR is 40% and packet size is 1 KB, the Committed Burst Size and Excess Burst Size should be set to 1 MB.

Note
When you set the Committed Info Rate above 40% on 10GE_XP and 10GE_XPE cards, the Committed Burst Size and Excess Burst Size must be set to at least 32K. The Committed Burst Size and Excess Burst Size can be increased based on the packet size and Committed Info Rate value.

Table 202: Ethertype Behavior

Port Type/ Ethertype	NNI Mode	UNI Mode		
		Transparent	Selective Operation: Add	Selective Operat
Inner Ethertype	Not applicable: the outer Ethertype value is used.	Not applicable: all packets are mapped over the SVLAN.	Working (card-based)	Working (card-b
Outer Ethertype	Working (per port)	Not applicable: the outer Ethertype is contained in the inner VLAN (same as UNI Selective mode).	Not applicable: the outer Ethertype is the one contained in the inner VLAN.	This cannot be se by card. The oute automatically set Ethertype.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G684 Provisioning the PDH Ethernet Settings

Purpose	This task changes the PDH Ethernet settings for the GE_XPE card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • Set the Media Type as DS1 Over Ethernet in Provisioning > Ether Ports > Ethernet tab in DLP-G380 Provisioning ethernet settings, page 11-29
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XPE card where you want to change the PDH Ethernet settings. The card view appears.

Step 2 Click the **Provisioning** > **Ether Ports** > **PDH Ethernet Parameters** tabs. The PDH Ethernet Parameters tab appear only when the . The PDH Ethernet Parameters tab is available in GE_XPE card view only, provided the PPM for GE_XPE port is created in FE mode.

Step 3 Modify any of the settings for the PDH Ethernet Parameters tab as described in table.

Table 203: GE_XPE Card PDH Ethernet Settings

Parameter	Description	Card Mode	Options
Port	(Display only) The Port number (*n-n*) and rate.	• L2-over-DWDM • 10GE MXP • 20GE MXP	—
Port Name	(Display only) The port name.	• L2-over-DWDM • 10GE MXP • 20GE MXP	—
	Sets the MPLS Inner Label value.	• L2-over-DWDM • 10GE MXP • 20GE MXP	

Parameter	Description	Card Mode	Option
	Sets the MPLS Outer Label value.	• L2-over-DWDM • 10GE MXP • 20GE MXP	
	Sets the jitter buffer value.	• L2-over-DWDM • 10GE MXP • 20GE MXP	Table for dif **Note** The tr set to set to ONS- Ethern
	(ONS-SC-E1-T1-PW only) Sets the RX sensitivity value.	• L2-over-DWDM • 10GE MXP • 20GE MXP	
	Only Unicast IP addresses are accepted.	• L2-over-DWDM • 10GE MXP • 20GE MXP	—
	Only Unicast IP addresses are accepted.	• L2-over-DWDM • 10GE MXP • 20GE MXP	—

Table 204: Jitter Buffer Values for Various Payload Types

Payload Type	Jitter Buffer Value	
	Lower Limit	Upper Limit
T1 (DS1)	1500	20000
T3 (DS3)	400	4500
E1	1500	200000
E3	400	60000

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G685 Provisioning the Electrical Lines

Purpose	This task changes the Electrical Lines settings for the GE_XPE card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • Set the Media Type as DS1 Over Ethernet in Provisioning > Ether Ports > Ethernet tab in DLP-G380 Provisioning ethernet settings
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XPE card where you want to change the Electrical Lines settings. The card view appears.

Step 2 Click the **Provisioning** > **Ether Ports** > **Electrical Lines** tabs. The Electrical Lines tab appear only when the ONS-SC-E1-T1-PW or ONS-SC-E3-T3-PW SFP is inserted. The Electrical Lines tab is available in GE_XPE card view only, provided the PPM for GE_XPE port is created in FE mode.

Step 3 Modify any of the settings for the Electrical Lines > DS1 or Electrical Lines > DS3 tab as described in table.

Table 205: GE_XPE Card Electrical Lines Settings

Parameter	Description	Card Mode	Opt
Port	(Display only) The Port number (*n-n*) and rate	• L2-over-DWDM • 10GE MXP • 20GE MXP	—
Port Name	(Display only) The port name.	• L2-over-DWDM • 10GE MXP • 20GE MXP	—

Parameter	Description	Card Mode
Clock Source	Sets the Clock Source	• L2-over-DWDM • 10GE MXP • 20GE MXP
		• L2-over-DWDM • 10GE MXP • 20GE MXP
		• L2-over-DWDM • 10GE MXP • 20GE MXP
		• L2-over-DWDM • 10GE MXP • 20GE MXP

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G381 Provisioning Layer 2 Protection Settings

Purpose	This task provisions the Layer 2 protection settings for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards when the cards are provisioned in L2-over-DWDM mode.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Layer 2 protection settings must be planned for the entire VLAN ring. One card in the ring is provisioned as the primary card and one of its port is set to Blocking. The primary card coordinates the protection switching for the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE in a VLAN ring.

Up to 1024 SVLANs can be protected. This protection is used in FAPS ring. When a fault occurs on the working path of FAPs ring, all the SVLANs whose protection is set, are moved to the protection path of the FAPS ring. All the SVLANs can be protected or a range of SVLANs can be protected.

Note To perform this task, the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card must be in L2-over-DWDM mode. To change the card mode, complete the DLP-G379 Change the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode task.

Note You can choose to enable another card in the ring to be the primary card. However, only one card in the ring can be provisioned as primary card. Make sure that the provisioning settings on the card that was previously configured as the primary are disabled as soon as another card is enabled as the primary card. To perform this task complete the DLP-G507 Enabling a Different GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Card as Primary Card, on page 534 task.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the protection settings. The card view appears.

Step 2 Click the **Provisioning** > **Protection** tabs.

Step 3 In the Status column, modify the port protection status by clicking the appropriate table cell and choosing one of the following from the drop-down list:

- Forwarding—Forwards the Ethernet packets that are received by the port.
- Blocking—Blocks the Ethernet packets that are received by the port.

Note
One port of the primary card within a VLAN ring must be set to Blocking. All other ports must be set to Forwarding.

Step 4 Check the **Master** check box if you want the card to serve as the protection coordinator for the VLAN ring. If not, continue with step 5.

Step 5 From the Protection drop-down list, choose one of the following:

- Enabled—Enables protection.
- Disabled—Disables protection.
- Forced—Converts all the SVLANs to protected SVLANs irrespective of the SVLAN protection configuration in the SVLAN database. This is applicable to a point-to-point linear topology. The SVLAN protection must be forced to move all SVLANs, including protected and unprotected SVLANs, to the protect path irrespective of provisioned SVLAN attributes.

Step 6 From the Hold Off Time drop-down list, choose one of the following:

- Disabled (default)—A FAPS switchover occurs immediately.
- 50 msec, 100 msec, 200 msec, 500 msec, 1 sec, 2 sec, or 5 sec—Holds off FAPS protection for the selected duration.

Note
To get consistent results ensure Hold Off Time values are the same throughout the ring.

Note
FAPS is an Layer 2 protection enabled on a VLAN. When a fiber fault occurs, Layer 1 protection is triggered immediately to restore the traffic. Setting the Hold Off Time option prevents Layer 2 FAPS protection from triggering at the same time as Layer 1 protection thereby avoiding traffic hits.

Step 7 Click **Refresh** to refresh the FAPS Layer 2 protection settings.

Step 8 Click **Protect SVLAN's** to protect the SVLANs.

The Protect All SVLAN's dialog appears.

a) Choose the **Select All** option to protect all the SVLANs.
b) Choose the **Range** option to provide the range of SVLANs to protect.

Upto 1024 SVLANs can be protected. SVLANs that are in use are excluded.

c) Click **OK**.

Step 9 Set the following parameters for FAPS switching with CRC errors:

a) Switch with CRC Alarm—Check this check box to enable FAPS switching with CRC errors.
b) CRC Threshold—Threshold for CRC error count. The default CRC threshold value is 10(-e)2. The available options are 10(-e)2, 10(-e)3, and 10(-e)4.
c) CRC Soak Count—Number of times the CRC error rate exceeds the CRC threshold value before raising the DATA-CRC alarm. The default CRC Soak Count is 10. The valid range is from 3 to 10.
d) CRC Poll Interval—Time interval (in seconds) between the successive polls. The default CRC Poll Interval is 60 seconds.

For example, if the CRC Threshold value = 10(-e)2, CRC Soak Count = 10, and CRC Poll Interval = 60 seconds, then FAPS occurs when the incoming CRC error rate is more than 10(-e)2 continuously across 10 poll intervals (10*60 = 600 seconds).

e) Clear/Suppress CRC Alarm—Uncheck the **Clear/Suppress CRC Alarm** check box for FAPS to occur. If you check this check box, the DATA-CRC alarm gets cleared and FAPS does not occur.

Note
As along as the **Clear/Suppress CRC Alarm** checkbox is checked, the DATA-CRC alarm is not raised on that port and FAPS does not occur.

Note
For consistent result, ensure that all the values that are set in Step 7 are same throughout the ring.

Step 10 Click **Apply**.

Step 11 Return to your originating procedure (NTP).

DLP-G507 Enabling a Different GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Card as Primary Card

Purpose	This task provisions another GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card on a stable VLAN ring, to be the primary card when the cards are provisioned in L2-over-DWDM mode. Layer 2 protection must be enabled for the entire VLAN ring. One card in the ring is provisioned as the primary card and one of its port is set to Blocking. The primary card coordinates the protection switching for the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards in a VLAN ring.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC DLP-G381 Provisioning layer 2 protection settings, page 11-41 To perform this task, the card must be in L2-over-DWDM mode. To change the card mode, complete the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 .
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

You can choose to enable another card in the ring to be the primary card. However, only one card in the ring can be provisioned as primary card. Make sure that the provisioning settings on the card that was previously configured as the primary are disabled as soon as another card is enabled as the primary card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card in a VLAN ring where you want to enable primary card provisioning.

Step 2 Perform the following steps:

a) Click the **Provisioning** > **Protection** tabs.
b) From the Status drop-down list, choose **Blocking** for a trunk port.

Note
One port of the primary card within a VLAN ring must be set to Blocking. All other ports must be set to Forwarding.

c) Check the **Master** check box for the card that serves as the protection coordinator for the VLAN ring.
d) From the Protection drop-down list, choose **Enabled**.
e) Click **Apply**.

Step 3 The primary card provisioning on the other card must be disabled. Perform the following steps:

a) Click the **Provisioning** > **Protection** tabs.
b) Uncheck the **Master** check box for the card where Primary node provisioning must be disabled.
c) Click **Apply**.
d) From the Protection drop-down list, choose **Disabled**.
e) Click **Apply**.

Step 4 The protection on the card that was disabled in step 2 must be enabled again. Perform the following steps:

a) Click the **Provisioning** > **Protection** tabs.
b) From the Protection drop-down list, choose **Enabled**.
c) Click **Apply**.
d) From the Status drop-down list, choose **Forwarding**on both ports.
e) Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G382 Adding SVLANS to NNI Ports

Purpose	This task adds or removes service provider VLAN (SVLAN) provisioning to/from GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE ports. This task only applies to GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards in L2-over-DWDM mode.
Tools/Equipment	None

Prerequisite Procedures	• DLP-G46 Log into CTC • To perform this task, the card must be in L2-over-DWDM mode. To change the card mode, complete the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • This task can only be performed on ports provisioned as NNI. See the "DLP-G380 Provisioning ethernet settings" task.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the SVLAN port settings. The card view appears.

Step 2 Click the **Provisioning** > **SVLAN** tabs.

Step 3 For each SVLAN shown in the table, click the check box under the Port [*port name*] table cell to include the SVLAN in that port. If you do not want the SVLAN included, uncheck the check box.

Note
If no SVLANs appear in the SVLAN tab, complete the DLP-G421 Creating and Storing an SVLAN Database.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G383 Provisioning the Quality of Service Settings

Purpose	This task provisions the Weighted Round Robin (WRR) value and bandwidth for QoS Class of Service (CoS) egress queues on a GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card port.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • To perform this task, the card must be in L2-over-DWDM mode and the port must have QoS enabled. Refer to the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 and the "DLP-G380 Provisioning ethernet settings", if needed.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the QoS settings.

Step 2 Click the **Provisioning** > **QoS** tabs.

Step 3 In the Port field at the bottom of the window, choose the port where you want to provision the QoS settings.

Step 4 For each CoS egress queue, 0 through 7, define the following:

- WRR weight—sets the Weighted Round Robin (WRR) level for the CoS egress queue. The default is 1. The range is 0 to 15, where 0 is Strict Priority.)

  Note
  The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE define a set of eight queues, one queue for each CoS. Only one of the queues can be assigned the 0 WRR weight (Strict Priority).

- Bandwidth—sets the bandwidth allocated for the CoS egress queue, 100 is the default. This bandwidth value is the percentage (%) of bandwidth with respect to the SFP, XFP, or port speed (100 Mbps for FE, 1 Gbps for GE, and 10 Gbps for 10GE) of the interface.

Step 5 Click **Apply**. Click **Yes** in the confirmation dialog box.

Step 6 Return to your originating procedure (NTP).

DLP-G470 Provisioning the CoS Settings

Purpose	This task provisions Class of Service (CoS) settings on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • To perform this task, the card must be in L2-over-DWDM mode and the port must be in OOS state.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the CoS settings.

Step 2 Complete Ingress CoS section in the "DLP-G380 Provisioning ethernet settings" task.

Step 3 Return to your originating procedure (NTP).

DLP-G384 Provisioning the QinQ Settings

Purpose	This task provisions the IEEE 802.1QinQ VLAN tags on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card UNI ports. QinQ tags expand the VLAN capability by tagging the tagged packets to produce a "double-tagged" Ethernet frame. For service providers the expanded VLAN allows specific services to be provided on specific VLANs for specific customers, while other types of services can be provided to other customers on other VLANs.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G421 Creating and Storing an SVLAN Database To perform this task, the must be in L2-over-DWDM mode. To change the card mode, complete the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288. • This task can only be performed on the cards UNI ports. (To provision the port Ethernet parameters, see the "DLP-G380 Provisioning ethernet settings" task.)
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the QinQ settings.

Step 2 Click the **Provisioning** > **QinQ** tabs.

Step 3 Click the **Port** field and choose the port where you want to provision QinQ. Channel groups configured in UNI mode appear in the Port field along with the physical ports.

Step 4 Click the **Mode** field and choose one of the following modes from the drop-down list:

- Selective—The incoming Ethernet packet is checked against the CVLAN and SVLAN table. If the CVLAN is not found, the packet is dropped. If you choose Selective, add an entry in the QinQ tab to map the administrative CVLAN to the SVLAN (if it is not same as the one used for data).
- Transparent—All incoming packets are transported with the additional VLAN chosen in the SVLAN field. If you choose transparent, the traffic on administrative CVLAN will pass through.

Step 5 Click the **BPDU** field and choose one of the following bridge protocol data unit (BPDU) modes from the drop-down list:

- Drop (default)—If checked, drops incoming packets with any of the following destination MAC addresses. The BPDU default can be applied for any UNI port.
  - 01-80-c2-00-00-00—IEEE 802.1D
  - 01-80-c2-00-00-02—Link Aggregation Control Protocol (LACP)
  - 01-80-0c-cc-cc-cc—VLAN Spanning Tree Plus (PVST+)
  - 01-00-c-cc-cc-cc—Cisco Discovery Protocol (CDP) type 0x2000, VLAN Trunk Protocol (VTP) type 0x2003, Port Aggregation Protocol (PAgP), type 0x0104, Uni-Directional Link Detection (UDLD) type 0x111, Dynamic Trunking Protocol (DTP) type 0x2004
- Tunnel—If checked, transparently sends any of the destination MAC addresses listed above.

Step 6 If the Mode was set to Selective, complete the following steps. If not, continue with step 7.

a) To add a row, click **Add**.

b) Click the **CVLAN** table and type in the CVLAN range. You can enter a single value or a range using "–" between the two ends of the range.

Note
If you are using Software Release 8.5 or earlier, it is recommended that you do not specify a CVLAN range due to certain limitations in the feature.

c) Click the **SVLAN** table cell and choose an SVLAN from the drop-down list.

d) Click the **Operation** table cell and choose an operation:

- Add (default)—Adds the SVLAN on top of the CVLAN. The operation default can be applied for any UNI port.
- Translate—CVLAN is translated with the SVLAN value.
- Double Add—(GE_XPE and 10GE_XPE cards only) Adds an inner and an outer SVLAN to double tagged packets only. CVLAN settings are not required. If this double tagged selective operation is present on a port, no other selective operation can be present.
- Translate Add—(GE_XPE and 10GE_XPE cards only) CVLAN gets translated to inner SVLAN and the SVLAN is added.

Note
If Double Add and Translate Add are configured on a GE_XP or a 10GE_XP card, a PROV-MISMATCH alarm is raised. Until this alarm is cleared, provisioning on the card is not possible.

Note

A CVLAN with a value of 0 means “untagged packet”.

Note
Two or more CVLANs cannot be translated over the same SVLAN.

e) (GE_XPE and 10GE_XPE cards only) Click the **COS** table cell and choose a value from the drop down list.
f) Click **Apply**.
g) Continue with step 9.

Step 7 If the Mode was set to Transparent, in the SVLAN field, choose the SVLAN to be added to incoming packets.

Step 8 Click DSCP-Cos mapping Table to provision CoS based on DSCP for each port.

Step 9 For each DSCP, choose a CoS value from 0 to 7 and click **OK**.

Step 10 Return to your originating procedure (NTP).

DLP-G221 Enabling MAC Address Learning on SVLANs

Purpose	This task enables MAC address learning on SVLANS for GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC VLANs must already be created on the selected card.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Complete the following tasks, as needed:

- DLP-G460 Enabling MAC address learning on SVLANs for GE_XPE or 10GE_XPE cards
- NTP-G226 Enable MAC Address Learning on SVLANs for GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Step 2 Return to your originating procedure (NTP).

DLP-G460 Enabling MAC Address Learning on SVLANs for GE_XPE or 10GE_XPE Cards

Purpose	This task enables MAC address learning on SVLANs attached to the port of a GE_XPE or 10GE_XPE card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • To perform this task, the card must be in L2-over-DWDM mode. Refer to the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note MAC address learning is applicable only for GE_XPE and 10GE_XPE cards. If MAC address learning is configured on a GE_XP or a 10GE_XP card, a PROV-MISMATCH alarm is raised. Until this alarm is cleared, provisioning on the card is not possible.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XPE or 10GE_XPE card where you want to enable MAC address learning.

Step 2 Enable MAC address learning on the port. Perform the following steps:

a) Click **Provisioning** > **Ethernet**.

b) Check the **MAC Learning** check box.

Note
If the per port MAC address learning is configured on a GE_XP or 10 GE_XP cards, before upgrading to a GE_XPE or 10 GE_XPE card, enable MAC address learning per SVLAN. Not doing so disables MAC address learning.

Step 3 Enable MAC address learning on the SVLAN attached to the port. Perform the following steps:

a) Click **SVLAN** > **SVLAN DB** tabs.

b) Click **Load**. This loads an SVLAN database from a network node or local file and replaces any SVLANs that are in the network view VLAN DB table.

c) Check the **MAC Learning** check box related to the SVLAN (one or more than one SVLAN) to be configured with MAC address learning.

d) Click **Store**. This records and enables the new configuration.

Step 4 Return to your originating procedure (NTP).

DLP-G385 Provisioning the MAC Filter Settings

Purpose	This task provisions the MAC address filter for the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards when the cards are provisioned in L2-over-DWDM mode. The MAC address filter is a list of MAC addresses whose packets should be accepted or dropped.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G379 Change the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the MAC filter settings.

Step 2 Click the **Provisioning** > **Security** > **MAC Filter** tabs.

Step 3 Click the port for which you want to create a MAC filter.

Step 4 Click **Edit**.

Step 5 In the Edit MAC Address dialog box, click **Add**. A new table entry appears with the MAC address 00-00-00-00-00-00.

Step 6 In the MAC Address Port field, type in the MAC address you want to filter over the default 00-00-00-00-00-00 address.

Step 7 If you want to add more MAC addresses, repeat step 5 and step 6. (Up to eight MAC addresses can be added for each port.) If not, click **OK**.

Step 8 On the MAC Filter table, provision the Allowed check box:

- Checked—All MAC addresses different from the address(es) entered in the table will be dropped.
- Unchecked—All MAC addresses matching the address(es) entered in the table will be dropped.

Step 9 Click **Apply**.

Step 10 Repeat step 3 to step 9 for each port of the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card that you want to set up.

Step 11 Return to your originating procedure (NTP).

NTP-G237 Retrieving and Clearing MAC Addresses on SVLANs

Purpose	This procedure retrieves and clears MAC addresses learned on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 • DLP-G221 Enabling MAC address learning on SVLANs
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Caution Retrieving and clearing learned MAC addresses are CPU intensive and traffic affecting. You must clear the MAC addresses only during a scheduled maintenance window.

Note It is not possible to simultaneously retrieve learned MAC addresses from both CTC and TL1 interfaces.

Procedure

Step 1 In the node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to retrieve the MAC addresses.

Step 2 To retrieve the MAC addresses learned, perform the following steps:

a) Click **Maintenance** > **MAC Addresses** > **Learned**.

b) In the SVLAN field, type a valid SVLAN range. The SVLAN range is from 1 to 4093.

c) Click **Refresh**.

The table displays the following fields:

- MAC Address—Displays the MAC address for the port.
- VLAN—Displays the VLAN identifier for the port.
- Port—Displays the port number.

d) Right-click the column heading to display the following options:

- Row Count—Displays the number of learned MAC addresses retrieved.

- Sort Column—Sorts the table by the column's values.
- Hide Column—Hides the column from view.
- Reorder Columns Visibility—Displays all hidden columns.

Step 3 Click **Refresh** to refresh the list of MAC addresses learned.

Step 4 Click **Clear** to clear the MAC addresses learned on all the SVLANS of the card.

Note
It is not possible to delete the MAC addresses learned on a per SVLAN basis.

Step 5 To view card MAC addresses, complete the "DLP-G546 Viewing MAC Addresses on a card" task.

Stop. You have completed this procedure.

DLP-G546 Viewing MAC Addresses on a Card

Purpose	This task allows you to view the MAC addresses for each client and trunk port and the CPU port of the card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 To view the card MAC addresses, click **Maintenance** > **MAC Addresses** > **Card**. The MAC addresses for each client and trunk port and the CPU port are displayed.

The table displays these fields:

- Port—Displays the port number.
- MAC Address—Displays the MAC address for the port.

Step 2 Return to your originating procedure (NTP).

NTP-G311 Provisioning the Storm Control Settings

Purpose	This task provisions the storm control settings for the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards when the cards are provisioned in L2-over-DWDM mode.
Tools/Equipment	None
Prerequisite Procedures	To perform this task, the card must be in L2-over-DWDM mode. To change the card mode, complete the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288 .
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the storm control settings.

Step 2 Click the **Provisioning** > **Security** > **Storm Control** tabs.

Step 3 Modify any of the settings as described in table.

Table 206: Storm Control Settings

Parameter	Description	Options
Port	(Display only) The Port number (*n*-*n*) and rate (GE or TEN_GE).	
DLF Storm Control	Enables or disables DLF storm control on the card.	• Checked—DLF storm control is enabled. • Unchecked—DLF storm control is disabled.
DLF Storm Control Threshold (pps)	Threshold value to set the number of unknown unicast packets per second.	Range: 0 to 16777215 packets per second
Mcast Storm Control	Enables or disables Multicast storm control on the card.	• Checked—Multicast storm control is enabled. • Unchecked—Multicast storm control is disabled.

Parameter	Description	Options
Mcast Storm Control Threshold (pps)	Threshold value to set the number of multicast packets per second.	Range: 0 to 16777215 packets per second
Bcast Storm Control	Enables or disables Broadcast storm control on the card.	• Checked—Broadcast storm control is enabled. • Unchecked—Broadcast storm control is disabled.
Bcast Storm Control Threshold (pps)	Threshold value to set the number of broadcast packets per second.	Range: 0 to 16777215 packets per second

Step 4 Click **Apply**.

Stop. You have completed this procedure.

NTP-G205 Enabling Link Integrity on a Card

Purpose	This task enables link integrity on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Complete these tasks, as needed:

- DLP-G509 Enabling link integrity using CTC, page 11-54
- NTP-G216 Enable Link Integrity on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G509 Enabling Link Integrity Using CTC

Purpose	This task enables link integrity on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 From the View menu, choose **Go to Network View**.

Step 2 Create or load an SVLAN profile. To create a SVLAN profile see the DLP-G471 Creating SVLAN or CVLAN Profile task.

Note
Make sure the **Link Integrity** check box is selected to enable link integrity for a profile and save it to the node.

Step 3 Associate the SVLAN profile (with Link Integrity enabled) to a SVLAN on a port. To do this perform these steps:

a) In node view (single-shelf mode), or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card. The card view appears.

b) Click the **Provisioning** > **Profiles Mapping** > **SVLAN** tabs.

c) Enter the SVLANs or SVLAN range in the **SVLAN to View** text box.

A table appears that displays SVLANs and available ports. The SVLAN profiles that was created must be applied to a SVLAN and a port. However, make sure the SVLAN has already been associated with the port via the QinQ tab (For information on how to associate a SVLAN to a port, see the "DLP-G384 Provisioning the QinQ settings" task).

d) Select the SVLAN for a port and choose the available SVLAN profile from the drop-box.

e) Click **Apply**.

Step 4 AIS action must be set on a per-UNI port basis. Select **None** or **Squelch** from the AIS action drop-down list. For detailed instructions, see the "DLP-G380 Provisioning ethernet settings" task.

Step 5 Return to your originating procedure (NTP).

DLP-G289 Provisioning CVLAN Rate Limiting on a Card

Purpose	This task provisions CVLAN rate limiting on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 From the View menu, choose **Go to Network View**.

Step 2 Create or load a CVLAN profile by setting Committed Info Rate, Committed Burst, Excess Info, Excess Burst. To create a CVLAN Profile see the "DLP-G471 Creating SVLAN or CVLAN Profile" task on page 11-57.

Note
You cannot provision CVLAN rate limiting on channel groups.

Step 3 Associate the CVLAN profile to a CVLAN on a UNI port. To do this perform theae steps:

a) In node view (single-shelf mode), or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card. The card view appears.

b) Click the **Provisioning** > **Profiles Mapping** > **CVLAN** tabs.

c) Enter the CVLANs or CVLAN range in the **CVLANS to View** text box.

A table appears that displays CVLANs and available ports. The CVLAN profiles that were created must be applied to a CVLAN and port. However, make sure the CVLAN has already been associated with the port via the QinQ tab (For information on how to associate a CVLAN profile to a UNI port, see the "DLP-G384 Provisioning the QinQ settings" task on page 11-46).

d) Select the CVLAN for a given port and choose the available CVLAN profile from the drop-down list.

e) Click **Apply**.

Step 4 Return to your originating procedure (NTP).

NTP-G208 Provisioning SVLAN Rate Limiting on a Card

Purpose	This task provisions SVLAN rate limiting on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Complete the following tasks, as needed:

- DLP-G515 Provisioning SVLAN rate limiting using CTC
- NTP-G225 Provision SVLAN Rate Limiting on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Card Using PCLI

Stop. You have completed this procedure.

DLP-G515 Provisioning SVLAN Rate Limiting Using CTC

Purpose	This task provisions SVLAN rate limiting on the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 From the View menu, choose **Go to Network View**.

Step 2 Create or load a SVLAN profile by setting Committed Info Rate, Committed Burst, Excess Info, Excess Burst. To create a SVLAN Profile see the DLP-G471 Creating SVLAN or CVLAN Profile task.

Step 3 Associate the SVLAN profile to a SVLAN on a port. To do this, perform the following steps:

a) In node view (single-shelf mode), or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE card. The card view appears.

b) Click the **Provisioning** > **Profiles Mapping** > **SVLAN** tabs.

c) Enter the SVLANs or SVLAN range in the **SVLAN to View** text box.

A table appears that displays SVLANs and available ports. The SVLAN profiles that were created must be applied to a SVLAN and port. However, make sure the SVLAN has already been associated with the port via the QinQ tab (For information on how to associate a SVLAN profile to a UNI port, see the DLP-G384 Provisioning the QinQ settings task and to a NNI port see the DLP-G382 Adding SVLANS to NNI ports task).

d) Select the SVLAN for a given port and choose the available SVLAN profile from the drop-down list.
e) Click **Apply**.

Step 4 Return to your originating procedure (NTP).

DLP-G471 Creating SVLAN or CVLAN Profile

Purpose	This task creates an SVLAN profile.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note You cannot associate SVLAN or CVLAN profiles to channel groups. You can associate a CVLAN profile only to a UNI port.

Procedure

Step 1 From the View menu, choose **Go to Network View**.

Step 2 Click the **Provisioning** > **SVLAN** > **Profiles** tabs.

Step 3 Click **Add** and a profile is added to the Profiles tab. Modify any of these settings:

- Name—The profile name can be up to 32 alphanumeric/special characters.
- Committed Info Rate—Sets the guaranteed information rate based on the service-level agreement of the service provider. The valid value ranges from 0 to 100% with 0.1% granularity. The default value is 100%.
- Committed Burst—Sets the maximum number of bits that will be transferred per second.
- Peak Info rate—Sets the maximum access rate based on the service-level agreement of the service provider. The valid value ranges from 0 to 100% with 0.1% granularity. The default value is 100%. However, the value must be greater than or equal to the Committed Info Rate.

- Peak Burst Size—The maximum number of bits that are credited for later transfer in the event the committed burst rate cannot be transmitted.
- Link Integrity—Enables link integrity for the SVLAN profile. Do not check this check box if you are creating a CVLAN profile.

Note
When you set the Committed Info Rate above 40% on 10GE_XP and 10GE_XPE cards, the Committed Burst Size and Excess Burst Size must be set to at least 32K. The Committed Burst Size and Excess Burst Size can be increased based on the packet size and Committed Info Rate value.

Step 4 Click **Store**.

In the Store Profile(s) dialog box, choose one of the following:

- To Node(s)—Stores the SVLAN profile at one or more network nodes. Choose the network nodes where you want to store the SVLAN profile. To choose more than one node, press the Shift key, or click Select All.
- To File—Stores the SVLAN profile in a file. Enter a file name, then click Browse to navigate to a local or network drive where you want to store the file.

Step 5 Click **OK**.

Step 6 Return to your originating procedure (NTP).

NTP-G204 Enabling IGMP Snooping on a Card

Purpose	This procedure enables Internet Group Management Protocol (IGMP) snooping on a per-SVLAN basis on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Complete the following tasks, as needed:

- DLP-G511 Enabling IGMP snooping, fast leave and report suppression
- NTP-G220 Enable IGMP Snooping on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

- NTP-G217 Enable IGMP Fast-Leave Processing on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI
- NTP-G219 Enable IGMP Report Suppression on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G511 Enabling IGMP Snooping, Fast Leave, Report Suppression, and Protection

Purpose	This procedure explains how to enable IGMP snooping, IGMP fast leave and IGMP report suppression on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards using CTC.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 From the View menu, choose **Go to Network View**.

Step 2 Click the **Provisioning** > **SVLAN** > **SVLAN DB** tabs. Click **Load** to load the SVLANs on the card where IGMP must be enabled.

Step 3 For each SVLAN shown in the table, select the following:

- Protection—Check the **Protection** check box to protect the SVLAN.

  Check the **Protect All SVLANS** check box to protect all the SVLANs. Up to 1024 SVLANs can be protected.

- MAC Learning—(GE_XP card only) Check the **MAC Learning** check box to enable or disable MAC learning for the port.
- IGMP—Check the **IGMP** check box to enable IGMP for the selected SVLAN.
- IGMP Fast Leave—Checking the **IGMP Fast Leave** check box causes the switch to immediately remove a port from the IP multicast group when it detects an IGMP, version 2 (IGMPv2) leave message on that port.
- IGMP Suppression—Check the **IGMP Suppression** check box to enable a single IGMP report to be sent to each multicast group in response to a single query.

Step 4 Click **Store SVLAN DB**.

If card protection is enabled and one or more SVLANs are not protected, CTC informs the user that protection check box is disabled on one or more SVLANs. This allows the user to check the Protection check box for SVLANs if required.

In the Store SVLAN DB dialog box, choose one of the following:

- To Node/Shelf/Card—Select the node and shelf. All the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards in L2 over DWDM mode are displayed. Select the card where you want to store the SVLAN DB.
- Stores the SVLAN database at one or more network nodes. Choose the network nodes where you want to store the SVLAN database. To choose more than one node, press the Shift key, or click **Select All**.
- To File—Stores the SVLAN database in a file. Enter a file name, then click **Browse** to navigate to a local or network drive where you want to store the file.
- Select the card on which you want to save the changes made in step 3.

Step 5 Click **OK**.

Note
If you want to add the multicast-capable ports to the forwarding table for every IP multicast, select the IGMP Static Router Port check box as described in the DLP-G380 Provisioning ethernet settings task.

Step 6 Return to your originating procedure (NTP).

NTP-G206 Enabling MVR on a Card

Purpose	This procedure enables Multicast VLAN Registration (MVR) on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Complete the following tasks, as needed:

- DLP-G513 Enabling MVR using CTC
- NTP-G224 Enable MVR on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE Cards Using PCLI

Stop. You have completed this procedure.

DLP-G513 Enabling MVR Using CTC

Purpose	This procedure enables Multicast VLAN Registration (MVR) on GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE cards using CTC.
Tools/Equipment	None
Prerequisite Procedures	DLP-G382 Adding SVLANS to NNI ports
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode), or shelf view (multishelf mode), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to enable MVR. The card view appears.

Note
At least one SVLAN must be configured on the card.

Step 2 Click the **Provisioning** > **MVR** tabs.

Step 3 Check the **Enabled** check box and enter the following information:

- IGMP CVLAN—Check box to enable IGMP snooping on CVLAN. This check box is enabled only when MVR is enabled through the Enabled check box.
- Multicast SVLAN—Select the MVR SVLAN ID. The default value is the SVLAN with the lowest ID configured on the card. The drop box lists all the SVLANs on the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card.

  Note
  SVLAN selected here can not be used for UNI port, make sure that the corresponding SVLAN on the NNI port is checked.

- Multicast Address—Sets the specified multicast group address as the MVR multicast group. The default address is 239.255.255.255 and the range is 224.0.0.0 to 239.255.255.255. Except the subrange [224-239].[0/128].0.x.
- Count—Sets the range of any additional multicast group addresses. The default is 1, and range is 1 to 256.

Step 4 Click **Apply**

Step 5 Return to your originating procedure (NTP).

DLP-G386 Provisioning the Trunk Port Alarm and TCA Threshold

Purpose	This task changes the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card trunk port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards have two trunk ports. The GE_XP and GE_XPE trunk ports are 21-1 and 22-1 on the card graphic and 21 (Trunk) and 22 (Trunk) on the Optics Thresholds table. The 10GE_XP and 10GE_XPE card trunk ports are 3-1 and 4-1 on the card graphic and 3 (Trunk) and 4 (Trunk) on the Optics Thresholds table.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the trunk port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Note
The hardware device that plugs into a TXP, MXP, GE_XP, 10GE_XP, GE_XPE, 10GE_XPE or ADM-10G card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the “11.26 SFP, SFP+, XFP, CXP, and CFP Modules” section.

Step 3 If TCA is not selected, click **TCA** and then click **Refresh**. When TCA is selected, continue with step 4.

Step 4 Verify the trunk port TCA thresholds are provisioned as shown in table. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting Enter.

Table 207: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard Trunk Interface TCA Thresholds

Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
XFP WDM no FEC	–7	–23	6	–4
XFP WDM standard FEC	–7	–27	6	–4
XFP WDM Enhanced FEC	–7	–27	6	–4

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 6 Verify the trunk port alarm thresholds are provisioned as shown in table. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting Enter.

Table 208: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard Trunk Interface Alarm Thresholds

Pluggable Port Module (XFP)	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
XFP WDM no FEC	–5	–26	5	–3
XFP WDM standard FEC	–5	–30	5	–3
XFP WDM Enhanced FEC	–5	–30	5	–3

Step 7 Click **Apply**.

Step 8 Repeat step 3 to step 7 to provision the second trunk port.

Step 9 Return to your originating procedure (NTP).

DLP-G387 Provisioning the Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G726 Preprovisioning a Multirate PPM DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The GE_XP card has 20 client ports. The ports are 1-1 through 20-1 on the card graphic and 1 (Client) through 20 (Client) on the Optics Thresholds table. The 10GE_XP card has 2 client ports. The ports are 1-1 and 2-1 on the card graphic and 1 (Client) and 2 (Client) on the Optics Thresholds table.

The hardware device that plugs into the card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable input/output devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see the SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282 section.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the client port alarm and TCA settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

a) If TCA is not selected, click **TCA** and then click **Refresh**. When TCA is selected, continue with step 4.

b) Verify the client port TCA thresholds are provisioned as shown in table. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Table 209: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard Client Interface TCA Thresholds

Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
10GE LAN PHY 10GBASE-LR	1	–14	5	–12
1000Base-SX (1Gbps)[14]	0	–17	3	–16
1000Base-LX [1]	–3	–20	3	–16

[14] Gigabit Ethernet client

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Step 3 Under Types, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 4 Verify the client port Alarm thresholds are provisioned as shown in table. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting Enter.

Table 210: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPEcard Client Interface Alarm Thresholds

Pluggable Port Module (XFP)	Alarm RX Power High	Alarm RX Power Low	Alarm TX Power High	Alarm TX Power Low
10GE LAN PHY 10GBASE-LR	3	–16	1	–8
1000Base-SX (1Gbps)[15]	3	–20	–2	–12
1000Base-SX (2Gbps)[1]	3	–18	–2	–12
1000Base-LX [1]	0	–23	–1	–12

[15] Gigabit Ethernet client

Step 5 Click **Apply**.

Step 6 Repeat step 3 to step 5 to provision each additional client port.

Step 7 Return to your originating procedure (NTP).

DLP-G388 Changing the RMON Threshold

Purpose	This task changes the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card RMON threshold settings.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), display the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the RMON thresholds.

Step 2 Click the **Provisioning** > **RMON Thresholds** tabs.

Step 3 Click **Create**. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose an individual port, or choose **All** to provision RMON thresholds for all ports.

Step 5 From the Variable drop-down list, choose an Ethernet variable. See the table for a list of available Ethernet RMON variables.

Note
Variable descriptions were obtained from the following Internet Engineering Task Force (IETF) Requests for Comment (RFCs): RFC 3635, RFC 2233, and RFC 1757. Refer to the RFCs for additional information.

Table 211: Gigabit Ethernet RMON Variables

Variable	Description
rxTotalPkts	Total number of receive packets.
ifInUcastPkts	The number of packets, delivered by this sub-layer to a higher (sub-)layer, whi addressed to a multicast or broadcast address at this sub-layer.
ifInMulticastPkts	The number of packets, delivered by this sub-layer to a higher (sub-)layer, whi addressed to a multicast address at this sub-layer. For a MAC layer protocol, th both Group and Functional addresses.
ifInBroadcastPkts	The number of packets, delivered by this sub-layer to a higher (sub-)layer, whi addressed to a broadcast address at this sub-layer.
ifInDiscards	The number of inbound packets which were chosen to be discarded even thoug had been detected to prevent their being deliverable to a higher-layer protocol. reason for discarding such a packet could be to free up buffer space.
ifInOctets	Total number of octets received on the interface, including framing characters.
ifOutOctets	Total number of octets transmitted out of the interface, including framing char
txTotalPkts	Total number of transmitted packets.
ifOutMulticastPkts	The total number of packets that higher-level protocols requested be transmitte were addressed to a multicast address at this sub-layer, including those that we or not sent. For a MAC layer protocol, this includes both group and functional
ifOutBroadcastPkts	The total number of packets that higher-level protocols requested be transmitte were addressed to a broadcast address at this sub-layer, including those that we or not sent.
ifOutDiscards	The number of outbound packets which were chosen to be discarded even thou had been detected to prevent their being transmitted. One possible reason for di a packet could be to free up buffer space.
IfOutErrors	Number of outbound packets or transmission units that could not be transmitte errors.
dot3StatsFCSErrors	A count of frames received on a particular interface that are an integral numbe length but do not pass the FCS check.
dot3StatsFrameTooLong	A count of frames received on a particular interface that exceed the maximum frame size.
dot3ControlInUnknownOpCode	A count of MAC control frames received on this interface that contain an opco supported by this device.
dot3InPauseFrames	A count of MAC control frames received on this interface with an opcode indi PAUSE operation.
dot33StatsFCSErrors	A count of frames received on a particular interface that are an integral numbe length but do not pass the FCS check.

Variable	Description
dot3StatsFrameTooLong	A count of frames received on a particular interface that exceed the maximum per frame size.
dot3ControlInUnknownOpCode	A count of MAC control frames received on this interface that contain an opcode supported by this device.
dot3InPauseFrames	A count of MAC control frames received on this interface with an opcode indicati PAUSE operation.
dot3OutPauseFrames	A count of MAC Control frames transmitted on this interface with an opcode indi PAUSE operation.
etherStatsCRCAlignErrors	Total number of packets received that had a length (excluding framing bits, but in FCS octets) of between 64 and 1518 octets, inclusive, but had either a bad FCS with a number of octets (FCS Error) or a bad FCS with a non-integral number of octets (A Error).
etherStatsUndersizePkts	The total number of packets received that were less than 64 octets long (excluding bits, but including FCS octets) and were otherwise well formed.
etherStatsFragments	The total number of packets received that were less than 64 octets in length (excludin bits but including FCS octets) and had either a bad Frame Check Sequence (FCS) integral number of octets (FCS Error) or a bad FCS with a non-integral.
etherStatsPkts	The total number of packets (including bad packets, broadcast packets, and multicas received.
etherStatsPkts64Octets	The total number of packets (including bad packets) received that were 64 octets i (excluding framing bits but including FCS octets).
etherStatsPkts65to127Octets	The total number of packets (including error packets) received that were between 6 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts128to255Octets	The total number of packets (including error packets) received that were between 255 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts256to511Octets	The total number of packets (including error packets) received that were between 511 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts512to1023Octets	The total number of packets (including error packets) received that were between 1023 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts1024to1518Octets	The total number of packets (including error packets) received that were between 1518 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts1519to1522Octets	The total number of packets (including error packets) received that were between 1522 octets in length inclusive (excluding framing bits but including FCS octets). **Note** This variable is supported only on client ports.
etherStatsBroadcastPkts	The total number of good packets received that were directed to the broadcast add

Variable	Description
etherStatsMulticastPkts	The total number of good packets received that were directed to a multicast ad that this number does not include packets directed to the broadcast address.
etherStatsOversizePkts	The total number of packets received that were longer than 1518 octets (for unta or 1522 octets (for tagged packets) (excluding framing bits, but including FCS were otherwise well formed.
etherStatsJabbers	The total number of packets received that were longer than 1518 octets (for unta or 1522 octets (for tagged packets) (excluding framing bits, but including FCS were not an integral number of octets in length or had a bad FCS.
etherStatsOctets	The total number of octets of data (including those in bad packets) received on (excluding framing bits but including FCS octets).

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Type in an appropriate number of seconds for the Sample Period.

Step 9 Type in the appropriate number of occurrences for the Rising Threshold.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Step 12 To view all RMON thresholds, click **Show All RMON thresholds**.

Step 13 Return to your originating procedure (NTP).

DLP-G389 Changing OTN Settings

Purpose	This task changes the optical transport network (OTN) settings for the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the GE_XP, 10GE_XP, GE_XPE, or 10GE_XPE card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: OTN Lines, G.709 Thresholds, FEC Thresholds, or Trail Trace Identifier.

Step 3 Modify any of the settings described in the tables.

Note
You must modify Near End and Far End; 15 Min and 1 Day; and SM and PM independently. To do so, choose the appropriate radio button and click **Refresh**.

The table describes the values on the Provisioning > OTN > OTN Lines tab.

Table 212: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard OTN Line Settings

Parameter	Description	Options
Port	(Display only) Port number and description:	3 (Trunk) and 4 (Trunk). 10GE_XP and 10GE_XPE cards 21 (Trunk) and 22 (Trunk). GE_XP and GE_XPE cards
ITU-T G.709 OTN	Sets the OTN lines according to ITU-T G.709.	• Enable • Disable
FEC	Sets the OTN lines to forward error correction (FEC).	• Standard • Enhanced
SF BER	(Display only) Sets the signal fail bit error rate.	• 1E-5
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9

The table describes the values on the Provisioning > OTN > ITU-T G.709 Thresholds tab.

Table 213: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number and description:	3 (Trunk) and 4 (Trunk). 10GE_XP and 10GE_XPE cards 21 (Trunk) and 22 (Trunk). GE_XP and GE_XPE cards
ES	Errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
SES	Severely errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
UAS	Unavailable seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
BBE	Background block errors	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.
FC	Failure counter	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select a bullet and click **Refresh**.

The table describes the values on the Provisioning > OTN > FEC Threshold tab.

Table 214: GE_XP, 10GE_XP, GE_XPE, or 10GE_XPECard FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Port number and description:	3 (Trunk) and 4 (Trunk). 10GE_XP and 10GE_XPE cards 21 (Trunk) and 22 (Trunk). GE_XP and GE_XPE cards
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minute or one-day intervals.
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minute or one-day intervals.

The table describes the values on the Provisioning > OTN > Trail Trace Identifier tab.

Table 215: GE_XP, 10GE_XP, GE_XPE, and 10GE_XPECard Trail Trace Identifier Settings

Parameter	Description	Options
Port	(Display only) Port number.	2
Level	Sets the level.	• Section • Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Transmit	Displays the current transmit string; sets a new transmit string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Disable FDI on TTIM	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)
Expected	Displays the current expected string; sets a new expected string. You can click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G314 Adding a Card on FAPS Ring

Purpose	This procedure adds a GE_XP or 10GE_XP card on a FAPS ring.
Tools/Equipment	Installed GE_XP or 10GE_XP cards.
Prerequisite Procedures	DLP-G46 Log into CTC Complete the "NTP-G179 Install the Transponder and Muxponder Cards" procedure in "Turn up a node" chapter. DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Perform any of the following tasks as needed:

- DLP-G687 Adding a Card Facing the Primary Card on FAPS Ring, on page 565
- DLP-G688 Adding a Card Between Secondary Cards on FAPS Ring, on page 566

Stop. You have completed this procedure.

DLP-G687 Adding a Card Facing the Primary Card on FAPS Ring

Purpose	This procedure adds a GE_XP or 10GE_XP card that faces the primary card on a FAPS ring.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Verify that the GE_XP or 10GE_XP card is installed according to the requirements specified in table in DLP-G375 Installing Fiber-Optic Cables on the Y-Cable Modules in the FlexLayer Shelf task.

Step 2 Insert the new GE-XP card with XFP on the slot.

Step 3 Change the GE_XP card mode to L2-over-DWDM. See DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 4 Create and store an SVLAN database on the new GE_XP card. See the DLP-G421 Creating and Storing an SVLAN Database task.

Step 5 Enable FAPS protection on the new card.

Step 6 Attach SVLAN to the trunk ports of the new card.

Step 7 Choose OOS,DSBLD from the Admin State column for port 22 on the primary card that is facing toward the new card. This action places port 22 in the blocking state and port 21 in the forwarding state.

Note
FAPS configuration mismatch alarm is raised on the primary card.

Step 8 Switch the traffic to the protect path.

Step 9 Choose OOS,DSBLD from the Admin State column for port 21 on the secondary card that is facing toward the new card.

Step 10 Connect the fiber from the secondary card (that is facing toward the new card) to the new card in segment B.

Step 11 Connect the fiber from the primary card to the new card in segment A.

Step 12 Choose IS from the Admin State column for port 21 on the secondary card that is facing toward the new card.

Step 13 Choose IS from the Admin State column for port 22 on the new card to bring up segment B.

Step 14 Choose IS from the Admin State column for port 21 on the new card.

Note
The FAPS state of the new card will be in the forwarding state for both the ports and port 21 of the secondary card will be in the blocking state.

Step 15 Choose IS from the Admin State column for port 22 on the primary card to bring up segment A.

Note
The FAPS state of port 21 on the primary card will be in the blocking state and port 22 will be in the forwarding state. The trunk ports of the remaining GE_XP cards will be in the forwarding state. The port 21 of the secondary card (that is facing toward the new card) will change to the forwarding state.

Step 16 Return to your originating procedure (NTP).

DLP-G688 Adding a Card Between Secondary Cards on FAPS Ring

Purpose	This procedure adds a GE_XP or 10GE_XP card between the two secondary cards on a FAPS ring.

Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Verify that the GE_XP or 10GE_XP card is installed according to the requirements specified in table in the DLP-G375 Installing Fiber-Optic Cables on the Y-Cable Modules in the FlexLayer Shelf task.

Step 2 Insert the new GE-XP card with XFP on the slot.

Step 3 Change the GE_XP card mode to L2-over-DWDM. See the DLP-G379 Changing the GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Card Mode, on page 288.

Step 4 Create and store an SVLAN database on the new GE_XP card. See the DLP-G421 Creating and Storing an SVLAN Database task.

Step 5 Attach SVLAN to the trunk ports of the new card.

Step 6 Choose OOS, DSBLD from the Admin State column for port 22 on secondary card 1, and port 21 on secondary card 2 that are facing toward the new card.

Step 7 Connect the fiber from the secondary card 1 to the new card in segment A.

Step 8 Connect the fiber from the secondary card 2 to the new card in segment B.

Step 9 Choose IS from the Admin State column for port 22 on the secondary card 1.

Step 10 Choose IS from the Admin State column for port 21 on the new card to bring up segment A.

Step 11 Choose IS from the Admin State column for port 22 on the new card.

Step 12 Choose IS from the Admin State column for port 21 on the secondary card 2 to bring up segment B.

Step 13 Return to your originating procedure (NTP).

NTP-G162 Changing the ALS Maintenance Settings

Purpose	This procedure changes the ALS maintenance settings for the cards. The automatic laser shutdown (ALS) function is normally disabled. Enable ALS only when the cards are directly connected to each other.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Note ALS is applicable only for OCn and OTN payloads.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the card where you want to change the ALS maintenance settings.

Step 2 Click the **Maintenance** > **ALS** tabs.

Step 3 Modify any of the settings described in table. The provisionable parameters are listed in the Options column in the table.

Table 216: ALS Settings

Parameter	Description	Options
Port	(Display only) Displays the port name.	—
ALS Mode	Automatic laser shutdown. ALS provides the ability to shut down the laser when the card detects an LOS or LOS-P.	From the drop-down list, choose one of the following: • Disable—Deactivates ALS. • Auto Restart—(Default) ALS is active. The power is automatically shut down when needed and automatically tries to restart using a probe pulse until the cause of the failure is repaired. • Manual Restart • Manual Restart for Test
OSRI	Optical safety remote interlock. When set to On, the OSC TX output power is shut down.	From the drop-down list, choose one of the following: • On • Off
Recovery Pulse Duration	(Display only for Manual Restart ALS mode) Displays the duration of the optical power pulse that begins when the card restarts. The Recovery Pulse Duration value in Manual Restart ALS mode is always 2.5 seconds. From R10.9, this value cannot be changed by CTC.	—

Parameter	Description	Options
Currently Shutdown	(Display only) Displays the current status of the laser.	—
Request Laser Restart	If checked, allows you to restart the laser for maintenance.	Checked or unchecked
Recovery Pulse Interval	(Display only) Displays the interval between optical power pulses.	—

Step 4 Click **Apply**. If the change affects traffic, a warning message displays. Click **Yes** to complete the change.

Stop. You have completed this procedure.

NTP-G302 Configuring Loopback on a Card

Purpose	This procedure configures or clears terminal or facility loopback on the 100G-LC-C, 10x10G-LC, CFP-LC, MR-MXP, 100G-CK-C, 100G-ME-C, 100ME-CKC, 100GS-CK-LC, 200G-CK-LC, 400G-XP-LC, and WSE cards. The loopback on the CFP-LC card can be configured on the backplane of the peer 100G-LC-C card. The facility loopback (drop) can be configured on the 100G-LC-C, CFP-LC, and 100G-CK-C cards. **Note** In WSE card, do not enable encryption with far-end client loop back. Enabling encryption with far-ed client loopback will result in sync loss until the key is exchanged. The key is exchanged only after the ODUk-AIS on the trunk is cleared.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Caution This procedure is traffic-affecting.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the card where you want to change the loopback settings.

Step 2 Click **Maintenance** > **Loopback** tab.

Note
In WSE card, do not enable encryption with far-end client loopback. This affects the traffic.

Step 3 Modify any of the settings described in table. The provisionable parameters are listed in the Options column of the table.

Note
Before you configure a loopback, the port admin state must be set to OOS,MT(ANSI) or Locked,maintenance (ETSI).

Table 217: Loopback Settings

Parameter	Description	Options
Port	(Display only) Name of the port.	—
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • IS,AINS (ANSI) or Unlocked,AutomaticInService (ETSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,maintenance (ETSI)

Parameter	Description	Options
Loopback	Configures or clears a port for a terminal (inward), facility (line), facility loopback (drop), or terminal loopback (drop) on the required port.	• None—Clears loopback • Terminal (Inward) • Facility (Line) • Facility Loopback (Drop) • Terminal Loopback (Drop)

Step 4 Click **Apply**.

Stop. You have completed this procedure.

NTP-G299 Configuring Backplane Loopback on a Card

Purpose	This procedure configures or clears the backplane terminal or facility loopback on the 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100G-ME-C, 100ME-CKC, and 100GS-CK-LC cards. The backplane facility (drop) loopback can be configured on the 100G-LC-C, CFP-LC, and 100G-CK-C cards. **Note** The loopback on the CFP-LC card can be configured on the backplane of the peer 100G-LC-C card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Caution This procedure is traffic-affecting.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the card where you want to change the backplane loopback settings. The card view appears.

Step 2 Click **Maintenance** > **Card** tabs.

Step 3 Modify any of the settings described in the table. The provisionable parameters are listed in the Options column in the table.

Note
Before you configure a backplane loopback, the port admin state must be set to OOS,MT(ANSI) or Locked,maintenance (ETSI).

Table 218: Backplane Loopback Settings

Parameter	Description	Options
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-MA,MT (ANSI) or Locked-enabled,maintenance (ETSI)
Loopback	Configures or clears backplane terminal (Inward), facility (Line),or facility (Drop) loopback on the card. You can configure the backplane loopback only if the card is removed from service.	• None • Backplane Facility • Backplane Terminal • Backplane Facility (Drop)

Step 4 Click **Apply**.

Stop. You have completed this procedure.

NTP-G192 Forcing FPGA Update

Purpose	This procedure forces an upgrade of the FPGA image on the MXP_MR_10DME_C and MXP_MR_10DME_L cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 Perform step 1 only if you are updating the node software, else proceed to step 2.

a) Close the CTC window, if open.
b) Delete the CTC Cache from the CTC Launcher browser window.
c) Close the CTC Launcher browser window.
d) Relaunch the CTC Launcher browser window.

Step 2 In node view (single-shelf mode) or shelf view (multishelf mode), double-click the MXP_MR_10DME_C or MXP_MR_10DME_L card to be upgraded.

Step 3 For all ports being provisioned on the card, click the **Provisioning** > **Line** tabs.

a) Click the **Admin State** table cell and choose **OOS,DSBLD** (ANSI) or **Locked,Disabled** (ETSI).
b) Click **Apply**, then **Yes**.

Step 4 Click the **Provisioning** > **Card** tabs.

Step 5 Change the Card Mode as needed:

- FC-GE_ISC—Choose this option if you will provision any of the following PPM port rates: FC1G (Ports 1-1 through 4-1), FC2G (Ports 1-1 and 3-1 only), FICON1G (Ports 1-1 through 4-1), FICON2G (Ports 1-1 and 3-1 only), ONE_GE (Ports 1-1 through 4-1), ISC3 COMPAT (Ports 1-1 through 4-1), ISC3 PEER 1G (Ports 1-1 through 4-1), and ISC3 PEER 2G (Ports 1-1 and 3-1 only).
- FC4G—Choose this option if you will provision an FC4G or FICON4G PPM (Port 1-1 only).

Step 6 Click the **Force FPGA Update** button. This upgrades the FPGA image in the MXP_MR_10DME_C or MXP_MR_10DME_L card, as appropriate. The MXP_MR_10DME_C or MXP_MR_10DME_L card reboots and the FPGA now contains the updated image.

Step 7 For all ports being provisioned on the card, click the **Provisioning** > **Line** tabs.

a. Click the **Admin State** table cell and choose **IS** (ANSI) or **Unlocked** (ETSI).

b. Click **Apply**, then **Yes**.

Stop. You have completed this procedure.

NTP-G196 Forcing FPGA Update on a Card in Protection Group

Purpose	This procedure forces an upgrade of the FPGA image on the MXP_MR_10DME_C and MXP_MR_10DME_L cards when the card is part of a protection group. This procedure applies to a near-end node that has two MXP_MR_10DME_C or MXP_MR_10DME_L cards, one card acting as the working card and the other as the protect card. The far-end node has a similar configuration. The near-end working card trunk port is connected to the far-end working card trunk port. The near-end protect card trunk port is connected to the far-end protect card trunk port.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 Perform step 1 only if you are updating the node software. Else, proceed to step 2.
a) Close the CTC window, if open.
b) Delete the CTC Cache from the CTC Launcher browser window.
c) Close the CTC Launcher browser window.
d) Relaunch the CTC Launcher browser window.

Step 2 Ensure traffic is running on the near-end and far-end working cards for each protection group on the MXP_MR_10DME_C or MXP_MR_10DME_L card.

Step 3 In node view (single-node mode) or multishelf view (multishelf mode), click the **Provisioning** > **Protection** tab.

Step 4 For each protection group, verify that the working card client port is reported as working/active and the protect card client port is reported as protect/standby.

Step 5 Repeat step 6 and step 7 for the far-end node.

Step 6 For each protection group on the near-end and far-end nodes, complete the DLP-G182 Apply a Lockout task to prevent traffic from switching to the protect card.

Step 7 At the near-end and far-end nodes, complete the NTP-G192 Forcing FPGA update task to force an upgrade of the FPGA image on the protect card.

Step 8 For each protection group on the near-end and far-end nodes, complete the DLP-G183 Clear a Lock-On or Lockout task to remove a lockout and return a protection group to its usual switching method.

Step 9 For each protection group on the near-end and far-end nodes, complete the DLP-G179 Apply a Force Y-Cable or Splitter Protection Switch task to move traffic from the working to the protect card.

Step 10 At the near-end and far-end nodes, complete the NTP-G192 Forcing FPGA update task to force an upgrade of the FPGA image on the working card.

Step 11 For each protection group on the near-end and far-end nodes, complete the DLP-G180 Clear a Manual or Force Y-Cable or Splitter Protection Switch task to clear a Force protection switch on the working card. If the protection group is revertive, this operation causes the traffic to revert to the working card. If the protection group is non-revertive, this operation causes the traffic to remain on the protect card.

Stop. You have completed this procedure.

NTP-G232 Enabling Error Decorrelator

Purpose	This task enables error decorrelator on a TXP_MR_10EX_C, MXP_2.5G_10EX_C, or MXP_MR_10DMEX_C card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the TXP_MR_10EX_C, MXP_2.5G_10EX_C, or MXP_MR_10DMEX_C card where you want to enable error decorrelator.

Step 2 Click the **Provisioning** > **Line** > **Error Decorrelator Settings** tabs.

Step 3 In the Error Decorrelator Settings area, select **Enable**.

Note
To inter-operate with other cards, disable the error decorrelator. Click the **Provisioning** > **Line** > **Error Decorrelator Settings** tabs and then select **Disable**.

Stop. You have completed this procedure.

NTP-G315 Enabling the Wavelength Drifted Channel Automatic Shutdown Feature

Purpose	This procedure allows you to enable or disable the wavelength drifted channel automatic shutdown feature for 40-SMR1-C, 40-SMR2-C, 80-WXC-C, 40-WXC-C, and 40-WSS-C cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In the node view (single-shelf mode) or multishelf view (multishelf mode), click the **Provisioning** > **Defaults** tabs. The Node Defaults page opens.

Step 2 Select the card from the Defaults Selector pane where you want to enable or disable the wavelength drifted channel automatic shutdown feature.

Step 3 Select the <*card name*>.config.card.WavelengthDrift from the Default Name column. Choose Disable or Enable from the Default Value drop-down list for the selected card.

For example, if you select 40-SMR2-C card from the Defaults Selector folder, the Default Name column reads "40-SMR2-C.config.card.WavelengthDrift".

Step 4 Click **Apply** to save changes.

Stop. You have completed this procedure.

NTP-G316 Enabling REP and FAPS on the Same Port

Purpose	This task allows you enable REP and FAPS on the same port for the GE_XP and 10GE_XP cards. You can configure REP and FAPS on port 22 and 21 for GE_XP cards, and port 4 and 3 for 10GE_XP cards. The FAPS primary node on the edge ring should never be the node that has a common FAPS and REP port.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 To enable REP, complete the following procedures:
a) DLP-G645 Creatig a segment
b) DLP-G647 Activating VLAN load balancing

Step 2 To enable FAPS, complete the DLP-G381 Provisioning layer 2 protection settings

Stop. You have completed this procedure.

NTP-G321 Provisioning Multiple Operating Modes

Purpose	This procedure enables you to provision multiple operating modes on the AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • DLP-G726 Preprovisioning a Multirate PPM • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to provision an operating mode. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 In the Card tab, click **Create**.

Step 4 From the Card Config Rate Selection section, select **Low Rate Mode** or **High Rate Mode**.

Step 5 In the Card Config Selection section:
a) Choose the Operating Mode from the drop-down list.

The Operating Mode options vary depending on the Card Type (AR_MXP, AR_XP, or AR_XPE) and Card Config Rate Selection.

b) For MXP_DME and MXPP_DME card modes, choose the Client Trunk Mapping from the drop-down list. For other card modes, CTC automatically selects the client trunk mapping.

Step 6 Click **Next**.

Step 7 Select the appropriate trunk port that is available and click **Next**.

Step 8 Select the appropriate client port that is available and click **Finish**.

The selected operating mode is provisioned on the AR_MXP, AR_XP, or AR_XPE card.

Note
When you want to upgrade the FPGA image on the AR_MXP, AR_XP, or AR_XPE card, click the **FPGA/FIRMWARE Upgrade** button. This upgrades the FPGA image on the AR_MXP, AR_XP, or AR_XPE card as appropriate, without the need of upgrading the whole network.

Firmware upgrade is allowed only when the ports are in OOS (out-of-service) or Maintenance service state.

Stop. You have completed this procedure.

NTP-G322 Modifying the Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and PM parameter threshold settings of the AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	• NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task, to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G695 Changing the card line settings
- DLP-G698 Changing the AR_MXP, AR_XP, or AR_XPE card section trace settings
- DLP-G699 Enabling auto-sensing for AR_MXP, AR_XP, or AR_XPE cards
- DLP-G701 Changing the AR_MXP, AR_XP, or AR_XPE card line RMON thresholds
- DLP-G702 Provisioning the AR_MXP, AR_XP, or AR_XPE card with trunk port alarm and TCA thresholds
- DLP-G703 Provisioning the AR_MXP, AR_XP, or AR_XPE card client port alarm and TCA thresholds
- DLP-G704 Changing the AR_MXP, AR_XP, or AR_XPE card OTN settings
- DLP-G734 Viewing the mapping of ODU object with client port

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G695 Changing the Card Line Settings

Purpose	This task changes the line settings of the AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the line settings in the Ports tab as described in table.

Table 219: AR_MXP, AR_XP, or AR_XPE Card Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	1 through 10
Port Name	Assigns a logical name for the specified port.	User-defined. Name can be up to 80 alphanumeric or sp characters, or both. Blank by default. See, DLP-G104 Assigning a Name to a Port **Note** You can provision a string (port name) for each fiber channel/FICON interface on the AR_MXP, AR_XP, or A card, which allows the MDS Fabric Manager to create a association between that SAN port and a SAN port on a Cisco MDS 9000 switch.
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI) • IS,AINS (ANSI) or Unlocked,AutomaticInService
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU,AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA,DSBLD (ANSI) or Locked-enabled,disable • OOS-MA,MT (ANSI) or Locked-enabled,maintenanc
ALS Mode	Sets the ALS function mode.	• Disabled (default)— ALS is off; the laser is not auto shut down when traffic outage or loss of signal (LOS • Manual Restart— ALS is on; the laser automaticall down when traffic outage or loss of signal (LOS) o However, the laser must be manually restarted whe conditions that caused the outage are resolved. • Manual Restart for Test— Manually restarts the las testing.
AINS Soak	Sets the automatic in-service soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, aft the card state changes to in service (IS) automatical • 0 to 48 hours, 15-minute increments.

Parameter	Description	Options
Reach	Sets the optical reach distance of the client port.	The reach distances that appear in the drop-down list the card: • Autoprovision—The system automatically prov reach from the pluggable port module (PPM) re the hardware. • I1—Intermediate reach • S1—Short reach, up to 15-km distance • S2—Short reach up to 40-km distance • L1—long reach, up to 40-km distance • L2—long reach, up to 80-km distance • L3—long reach, up to 80-km distance • CWDM— CWDM Reach • MM— • ULH—Ultra long-haul (ULH) • DWDM—DWDM Reach
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: • 850 nm through 1561.83 nm • 100-GHz ITU spacing • CWDM spacing
Fault Signalling	Shuts down the far-end laser in response to certain defects. (Squelch does not apply to ISC COMPACT payloads.)	• G AIS/Send Local Fault • Squelch/Laser-Off • NOS • None
Termination Mode	Sets the mode of operation. (This option is only available for SONET/SDH payloads).	• Transparent

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G698 Changing the AR_MXP, AR_XP, or AR_XPE Card Section Trace Settings

Purpose	This task changes the section trace settings of the AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the settings in the Section Trace tab as described in the table.

Table 220: AR_MXP, AR_XP, or AR_XPE Card Line Section Trace Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	• Client Ports (1-8)
Received Trace Mode	Sets the received trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S	If a TIM on section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal is sent to downstream nodes if this box is checked.	• Checked (AIS/RDI on TIM-disabled) • Unchecked (AIS/RDI on TI disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte

Parameter	Description	Options
Transmit	Displays the current transmit string or sets a new transmit string. Click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex). **Note** For OCn and OTU traces, the junk squares appear in the New Transmit String field when you click the default button. Ignore the junk squares that appear in the New Transmit String field.	String of trace string size
Expected	Displays the current expected string or sets a new expected string. Click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex). **Note** For OCn and OTU traces, the junk squares appear in the New Expected String field when you click the default button. Ignore the junk squares that appear in the New Expected String field.	String of trace string size
Received	(Display only) Displays the current received string. Click **Refresh** to manually refresh this display, or select the **Auto-refresh every 5 sec** check box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked or unchecked (defau

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G699 Enabling Auto-sensing for AR_MXP, AR_XP, or AR_XPE Cards

Purpose	This task enables the auto sensing for AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to enable auto sensing.

Step 2 Click the **Provisioning** > **Line** > **Auto Ports** tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the settings in the Auto Ports tab as described in table.

Table 221: AR_MXP, AR_XP, or AR_XPE Auto Sensing Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	Client Ports (1-8)
Auto Sensing	If checked, enables auto sensing.	Checked or Unchecked
Actual Port Type	Displays the auto-sensed signal type.	—

Step 4 Return to your originating procedure (NTP).

DLP-G701 Changing the AR_MXP, AR_XP, or AR_XPE Card Line RMON Thresholds

Purpose	This task changes the line threshold settings for AR_MXP, AR_XP, or AR_XPE cards carrying Ethernet, FC/FICON, or ISC/ISC3 payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to change the line RMON threshold settings in card view.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**.

Step 4 From the Port drop-down list, choose the applicable port, either the payload port, for example "1-1 (ONE_GE)", or the equivalent ITU-T G.7041 GFP (Generic Frame Procedure) port.

Step 5 From the Variable drop-down list, choose an Ethernet, FC, FICON, or ISC variable. To change the values of the variables, see the following tables.

Table 222: AR_MXP, AR_XP, or AR_XPE Card Ethernet Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of received packets.
ifInUcastPkts	Number of packets delivered by this sublayer to a higher sublayer that are not addressed to a multicast or broadcast address.
ifInMulticastPkts	Number of packets delivered by this sublayer to a higher sublayer that are addressed to a multicast address. For a MAC layer protocol, this includes both group and functional addresses.
ifInBroadcastPkts	Number of packets delivered by this sublayer to a higher sublayer that are addressed to a broadcast address.
ifInErrors	Total number of received errors.
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
IfOutUcastPkts	Total count of good frames transmitted to a unicast group destination address.
ifOutMulticastPkts	Total number of packets that higher-level protocols requested to be transmitted, which were addressed to a multicast address at this sublayer. These include packets that were discarded or not sent. For a MAC layer protocol, this includes both group and functional addresses.
ifOutBroadcastPkts	Total number of packets that higher-level protocols requested to be transmitted, which were addressed to a broadcast address at this sublayer. These include packets that were discarded or not sent.
dot3StatsFCSErrors	Number of frames received on a particular interface that are an integral number of octets in length but do not pass the FCS check.
dot3StatsAlignmentErrors	Total number of frames received on a particular interface that are not an integral number of octets in length and do not pass the FCS check. This counter is only valid for FE modes of operation.

Variable	Description
dot3StatsFrameTooLong	Number of frames received on a particular interface that exceed the maximum permitted frame size.
dot3StatsSymbolErrors	Number of frames received on an associated RX_ER assertion during a data reception error event (MII) or data reception error event, or carrier extension error (GMII) from the PCS.
dot3StatsLayer1Errors	Number of Layer 1 errors as defined within the following conditions: • During Packet Reception—Layer 1 errors are only counted one time per packet. The Layer 1 error is indicated as a direct result of a line side protocol violation in which RX_DV is asserted. This is an uncommon event from which may be the reason why the device loses synchronization. • During Interpacket Reception—The Layer 1 error is indicated as a direct result of a line side protocol violation in which RX_DV is de-asserted. This is an uncommon event. The Layer 1 error is also asserted on detection of a False Carrier indication and is asserted on detection of Erred byte (interpacket) signal encoding. When the Layer 1 error is asserted during inter-packet reception, it is only statistically asserted in the vector.
dot3StatsLCVErrors	Number of received line code violations at the PCS layer.
etherStatsUndersizePkts	Total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsFragments	Total number of packets received that were less than 64 octets in length (excluding framing bits but including FCS octets) and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error). Note that it is entirely normal for etherStatsFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits.
etherStatsPkts64Octets	Total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).

Variable	Description
etherStatsPkts128to255Octets	Total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts256to511Octets	Total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts512to1023Octets	Total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts1024to1518Octets	Total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
etherStatsPkts1519toMaxSizeOctets	Total number of packets (including bad packets) received that were between 1519 and the maximum frame size as programmed within the RMAC Max Frame Length Configuration Register in length inclusive (excluding framing bits but including FCS octets).
etherStatsBroadcastPkts	Total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.
etherStatsMulticastPkts	Total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.
etherStatsOversizePkts	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well-formed.
etherStatsOversizePkts	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
etherStatsJabbers	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad FCS with an integral number of octets (FCS Error) or a bad FCS with a non-integral number of octets (Alignment Error).
etherStatsOctets	Total number of octets of data (including those in bad packets) received on the network (excluding framing bits, but including FCS octets).
etherStatsPkts1519tomaxOctets	Total number of packets (including bad packets) received that were 1591 octets in length (excluding framing bits, but including FCS octets).

Variable	Description
mediaIndStatsTXShortPkts	Number of transmitted frames containing less than the minimum permitted frame size as programmed with the transmit MAC Min Frame Length Configuration Register.

Table 223: AR_MXP, AR_XP, or AR_XPE FC/FICON Variables

Variable	Description
rxTotalPkts	Total number of received packets.
txTotalPkts	Total number of transmitted packets.
mediaIndStatsRxFramesBadCRC	Number of received data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsTxFramesBadCRC	Number of transmitted data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsRxLcvErrors	Number of L1 line code violations received for lower rate FC, which equate to invalid 8b10b ordered sets.
mediaIndStatsTxLcvErrors	Number of L1 line code violations transmitted for lower rate FC, which equate to invalid 8b10b ordered sets.
rx8b10bWords	Number of 8B/10B words received.
tx8b10bWords	Number of 8B/10B words transmitted.

Table 224: AR_MXP, AR_XP, and AR_XPE ISC Variables

Variable	Description
mediaIndStatsRxLcvErrors	Number of L1 line code violations received for constant bit rate protocols, which equate to invalid 8b10b ordered sets.
mediaIndStatsTxLcvErrors	Number of L1 line code violations transmitted for constant bit rate protocols, which equate to invalid 8b10b ordered sets.

Table 225: AR_MXP, AR_XP, and AR_XPE GFP RMON Variables

Variable	Description
gfpStatsRxCRCErrors	Total number of CRC errors with the receive transparent GFP frame.
gfpStatsRxSblkCRCErrors	Total number of superblock CRC errors with the receive transparent GFP frame. A transparent GFP frame has multiple superblocks which each contain fiber channel data.
gfpStatsCSFRaised	Number of Rx client management frames with Client Signal Fail indication.

Variable	Description
gfpStatsLFDRaised	Number of Core HEC CRC Multiple Bit Errors. **Note** This count is only for cHEC multiple bit error when in frame. It is a count of when the state machine goes out of frame.
gfpStatscHecRxMBitErrors	Number of received GFP frames with single bit errors in the core header (these errors are uncorrectable).
gfpStatstHecRxMBitErrors	Number of received GFP frames with single bit errors in the tHec (these errors are uncorrectable).

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, the falling threshold, or both the rising and falling thresholds.

The available options are Rising Threshold, Falling Threshold, and Both Rising and Falling Threshold.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**.

Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Enter the appropriate number of seconds in the Sample Period field.

Step 9 Enter the appropriate number of occurrences in the Rising Threshold field.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Note
To view all RMON thresholds, click **Show All RMON thresholds**.

Step 12 Return to your originating procedure (NTP).

DLP-G702 Provisioning the AR_MXP, AR_XP, or AR_XPE Card with Trunk Port Alarm and TCA Thresholds

Purpose	This task provisions the AR_MXP, AR_XP, or AR_XPE card with trunk port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to provision the trunk port alarm and TCA threshold settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note Do not modify the Laser Bias parameters.

Step 3 If TCA is not checked, check the **TCA** check box and then click **Refresh**. If it is checked, continue with step 4.

Step 4 Verify if the trunk port (Port 9) TCA thresholds are set. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Note Do not modify the Laser Bias parameters.

Step 6 Verify if the trunk port (Port 9) Alarm thresholds are set. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G703 Provisioning the AR_MXP, AR_XP, or AR_XPE Card Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the AR_MXP, AR_XP, and AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G278 Provision the Optical Line Rate DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to change the client port alarm and TCA threshold settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Referring to the following table, verify the TCA thresholds for client ports (ports 1 through 8) for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
The hardware device that plugs into a AR_MXP, AR_XP, or AR_XPE card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP or XFP). In CTC, SFPs and XFPs are called pluggable port modules (PPMs). SFPs/XFPs are hot-swappable I/O devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information about SFPs and XFPs, see SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Table 226: AR_MXP, AR_XP, and AR_XPE Card Client Interfaces TCA Thresholds

PPM Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
FC1G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16
FC2G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–15	3	–16
FICON1G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16
FICON2G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16
FC4G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–12	4	–15
FICON4G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–12	4	–15
FC8G	ONS-XC-8G-MM ONS-XC-8G-SM	0	–12	4	–15
FICON8G	ONS-XC-8G-MM ONS-XC-8G-SM	0	–12	4	–15
1GE	ONS-SI-GE-SX ONS-SI-GE-LX ONS-SI-GE-ZX ONS-SE-ZE-EL				
FE	ONS-SE-GE-BXU ONS-SE-GE-BXD				
ESCON	ONS-SE-200-MM				
OC3/STM1	ONS-SC-155-EL ONS-SI-155-SR-MM ONS-SI-155-I1 ONS-SI-155-L1 ONS-SI-155-L2				
OC12	ONS-SI-622-SR-MM				

PPM Port Rate	Pluggable Port Module (XFP)	TCA RX Power High	TCA RX Power Low	TCA TX Power High	TCA TX Power Low
OC12/STM4	ONS-SI-622-I1 ONS-SI-622-L1 ONS-SI-622-L2				
OC48/STM16	ONS-SI-2G-S1 ONS-SI-2G-L1 ONS-SI-2G-L2				
OTU1	ONS-SI-2G-S1 ONS-SE-Z1 ONS-SI-2G-L2 ONS-SC-2G-xxxx				
OTU2	ONS-XC-10G-96C				
3G-SDI, HD-SDI, SD-SDI	ONS-SC-HD3GV-RX=				

Step 4 Click **Apply**.

Step 5 Repeat step 3 and step 4 to provision each additional client port.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Referring to the following table, verify the client port (Ports 1 through 8) Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low based on the client interface that is provisioned. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Table 227: AR_MXP, AR_XP, and AR_XPE Card Client Interface Alarm Thresholds

PPM Port Rate	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC1G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16
FC2G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–15	3	–16
FICON1G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16
FICON2G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–17	3	–16

PPM Port Rate	Pluggable Port Module (XFP)	Alarm RX Power Low	Alarm RX Power High	Alarm TX Power Low	Alarm TX Power High
FC4G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–12	4	–15
FICON4G	ONS-SE-4G-SM ONS-SC-2G-XX.X ONS-SC-4G-XX.X	0	–12	4	–15
FC8G	ONS-XC-8G-MM ONS-XC-8G-SM	0	–12	4	–15
FICON8G	ONS-XC-8G-MM ONS-XC-8G-SM	0	–12	4	–15
1GE	ONS-SI-GE-SX ONS-SI-GE-LX ONS-SI-GE-ZX ONS-SE-ZE-EL				
FE	ONS-SE-GE-BXU ONS-SE-GE-BXD				
ESCON	ONS-SE-200-MM				
OC3/STM1	ONS-SC-155-EL ONS-SI-155-SR-MM ONS-SI-155-I1 ONS-SI-155-L1 ONS-SI-155-L2				
OC12	ONS-SI-622-SR-MM				
OC12/STM4	ONS-SI-622-I1 ONS-SI-622-L1 ONS-SI-622-L2				
OC48/STM16	ONS-SI-2G-S1 ONS-SI-2G-L1 ONS-SI-2G-L2				
OTU1	ONS-SI-2G-S1 ONS-SE-Z1 ONS-SI-2G-L2 ONS-SC-2G-xxxx				
3G-SDI, HD-SDI, SD-SDI	ONS-SC-HD3GV-RX=				

Step 8 Click **Apply**.

Step 9 Repeat step 7 and step 8 to provision each additional client port.

Step 10 Return to your originating procedure (NTP).

DLP-G704 Changing the AR_MXP, AR_XP, or AR_XPE Card OTN Settings

Purpose	This task changes the OTN settings for the AR_MXP, AR_XP, or AR_XPE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_MXP, AR_XP, or AR_XPE card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: OTN Lines, G.709 Thresholds, FEC Thresholds, Trail Trace Identifier, or Proactive Protection Regen.

Step 3 Modify any of the settings described in the following tables.

Note
You must modify Near End and Far End; 15 Min and 1 Day; and SM and PM independently. To do so, choose the appropriate radio button and click **Refresh**.

The following table describes the values on the Provisioning > OTN > OTN Lines tab.

Table 228: AR_MXP, AR_XP, and AR_XPE Card OTN Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
G.709 OTN	Sets the OTN lines according to ITU-T G.709.	Enabled by default
FEC	Sets the OTN lines to forward error correction (FEC).	• Disable • Standard • Enhanced-I.4 • Enhanced-I.7

Parameter	Description	Options
SF BER	(Display only) Displays the signal fail bit error rate.	• 1E-5
SD BER	Sets the signal degrade bit error rate.	• 1E-5 • 1E-6 • 1E-7 • 1E-8 • 1E-9
Asynch/Synch Mapping	Sets how the ODUk (client payload) is mapped to the optical channel (OTUk).	• Asynch mapping • Synch mapping
OTU Mapping	Sets the client payload mapping to the trunk	• ODU1e • ODU2e • CBR10G • ODU1Mux • ODU1
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as a NE timing reference.	Checked or unchecked
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	Checked or unchecked
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	STU
Send DoNotUse	If checked, sends a DUS message on the S1 byte.	Checked or unchecked
ODU Transparency	Sets the ODU overhead byte configuration.	• Transparent Standard Use • Cisco Extended Use
Proactive Protection Regen	Enables or disables the proactive protection regen mode.	• Enable • Disable

The following table describes the values on the Provisioning > OTN > G.709 Thresholds tab.

Table 229: AR_MXP, AR_XP, and AR_XPE ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port [16]	(Display only) Displays the port number.	9 (Trunk)
ES	Errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
SES	Severely errored seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
UAS	Unavailable seconds	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
BBE	Background block errors	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
FC	Failure counter	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.

[16] Latency for a 1G-FC payload without ITU-T G.709 is 4 microseconds, and with ITU-T G.709 is 40 microseconds. Latency for a 2G-FC payload without ITU-T G.709 is 2 microseconds, and with ITU-T G.709 is 20 microseconds. Consider these values when planning a FC network that is sensitive to latency.

The following table describes the values on the Provisioning > OTN > FEC Threshold tab.

Table 230: AR_MXP, AR_XP, and AR_XPE Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	2
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minute or one-day intervals.
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minute or one-day intervals.

The following table describes the values on the Provisioning > OTN > Trail Trace Identifier tab.

Table 231: AR_MXP, AR_XP, and AR_XPE Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	2

Parameter	Description	Options
Level	Sets the level.	• Section • Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Transmit	Displays the current transmit string or sets a new transmit string. Click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Disable FDI on TTIM	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)
Expected	Displays the current expected string or sets a new expected string. Click the button on the right to change the display. Its title changes, based on the current display mode. Click **Hex** to change the display to hexadecimal (button changes to ASCII); click **ASCII** to change the display to ASCII (button changes to Hex).	String of trace string size
Received	(Display only) Displays the current received string. You can click Refresh to manually refresh this display, or check the Auto-refresh every 5 sec check box to keep this panel updated.	String of trace string size
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	Checked Unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G734 Viewing the Mapping of ODU Object with Client Port

Purpose	This procedure allows you to view the mapping of ODU object with the corresponding client port for the AR_XPE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the AR_XPE card to view the ODU object mapping with the corresponding client port. The card view appears.

Step 2 Click the **Provisioning** > **Card** ODU Interfaces tabs. Displays the parameters as described in the table.

Table 232: ODU Object and Client Port Mapping

Parameter	Description
ODU Object	Displays the ODUk(k=0) AID that is used to raise the ODU0 level alarms.
Trunk Port Number	Displays the physical trunk port details that map to the virtual ODUk(k=0) port or object.
ODU1	Displays the ODU1 frame number within the ODU-2 frame, which has the corresponding ODUk(frame.
ODU0	Displays the ODU0 frame number within a ODU1 frame.
Client Port Number	Displays the physical client port number that maps to the virtual ODUk(k=0) port or object.

Step 3 Return to your originating procedure (NTP).

NTP-G235 Provisioning an Operating Mode

Purpose	This procedure enables you to provision an operating mode on the 100G-LC-C, 100G-CK-C, 100GS-CK-LC, , 200G-CK-LC,100G-ME-C, 100ME-CKC, 10x10G-LC, CFP-LC, or MR-MXP card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC

Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to provision an operating mode. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 In the Card tab, click **Create**. The Operating Mode Configuration Creation window appears.

Step 4 From the Card Configuration drop-down list, choose the configuration. The card configuration options vary depending on the card. If the TXP-10G, TXPP-10G, RGN-10G, or LOW LATENCY mode is selected on the 10x10G-LC card, go to Step 7. If the FANOUT-10x10G mode is selected in the 10x10G-LC card, go to Step 8.

For more information about the card configurations, see Key Features of 100G-LC-C, 100G-ME-C, 100G-CK-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, and MR-MXP Cards, on page 239.

Step 5 Choose the slot number from the Peer Card drop-down list. This field is enabled only if a peer card is required for the configuration.

Step 6 Choose the slot number from the Skip Peer card drop-down list. This field is enabled only for MXP_200G and MXP_10x10G_100G operating modes.

Step 7 Select the port pair in the Card Configuration Dialog area.

The 10x10G-LC card supports a maximum of five TXP-10G modes, two TXPP-10G modes, five RGN-10G modes, five LOW LATENCY modes, or a combination of five TXP-10G, RGN-10G, and LOW LATENCY modes. For the TXPP-10G mode configuration, client ports can be port 3, port 7, or both. Port 4 and port 6 are selected as trunk ports when port 3 is selected as the client port. Port 8 and port 10 are selected as trunk ports when port 7 is selected as the client port. For MXP_200G, MXP_10x10G_100G, and MXP_CK_100G operating modes, the required ports are selected by default.

Step 8 Click **Finish**. The selected operating mode is provisioned on the card.

Step 9 Complete the DLP-G726 Preprovisioning a Multirate PPM task.

Step 10 Complete the DLP-G278 Provisioning the Optical Line Rate, on page 293 task.

Stop. You have completed this procedure.

NTP-G361 Provisioning an Operating Mode on the 400G-XP-LC Card

Purpose	This procedure enables you to provision an operating mode on the 400G-XP-LC card.

Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note Provision the PPM on the trunk ports (Port 11 and 12) of the 400G-XP-LC card before you provision the operating mode.

From Release 10.9, MXP 2x150G Operating modes are supported on the 400G-XP-LC card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 400G-XP-LC card where you want to provision an operating mode. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 In the Card tab, click **Create**. The Operating Mode Configuration Creation window appears.

Step 4 From the Card Configuration drop-down list, choose the operating mode.

For the OTNXC and the REGEN card modes, both trunk ports are configured with the same rate (100G or 200G). The trunk port configuration that is created for CFP2-11 is copied to CFP2-12. For the MXP 2x150G card mode, both the trunk ports are configured at 150G.

Step 5 To configure the trunk port (CFP2 - 11, CFP2 - 12, or both trunk ports), perform the following steps:

a) Choose the operating mode from the Trunk Operating Mode drop-down list. If the mode selected is M_100G, the Slice 1 or Slice 3 fields are disabled. If the mode selected is MXP_2x150G, the Slice 2 field is disabled.

b) Choose the slice mode from the Slice drop-down list. The 10x10G-LC card is supported on Slice 2 only. The configuration can be done only from the 400G-XP-LC card.

For more information about the trunk, slice, and port configuration, see Slice Definition and Line Card Configuration for 400G-XP-LC Card.

Slice configuration is not applicable for the REGEN mode.

Step 6 Click **Finish**.

The operating mode is provisioned on the card.

Step 7 Complete the DLP-G726 Preprovisioning a Multirate PPM task.

Step 8 Complete the DLP-G278 Provisioning the Optical Line Rate, on page 293 task.

To edit an operating mode:

Table 233: Rules for Editing an Operating Mode on the 400G-XP-LC Card

Editing an Op Mode	Trunk Port	Client Port	Restrictions/Information
Modifying a slice mode within a trunk	Allowed with trunk in IS	Blocked if client payloads are provisioned on the slice being edited.	
Adding a trunk	-	-	Related trunk PPM must be provisioned.
Deleting a trunk	Blocked if trunk is in IS or if trunk is associated with internal patch cords (IPCs) or provisional patch cords (PPCs).	Blocked if client payloads are provisioned for the trunk being deleted	Blocked, if the trunk to be deleted is the only provisioned trunk on the card.
Modifying the trunk operating mode	Blocked if trunk is in IS or if trunk is associated IPCs or PPCs.	Blocked if client payloads are provisioned for the trunk being modified	The existing OTU4 or OTU4C2 trunk port is deleted and recreated.

Step 9 In the Card tab, choose the configured operating mode and click **Edit**. The Operating Mode Configuration window appears.

The OTNXC and the REGEN card mode cannot be edited after it is configured. To modify the card mode configuration, you need to delete the existing configuration and create a new one.

Step 10 Choose the trunk port to be edited from the Edit Trunk Configuration drop-down list.

Note
Only one trunk port configuration can be edited at a time. The table above details the rules for editing an operating mode.

The Trunk Operating Mode cannot be edited for REGEN mode.

Step 11 Modify the Trunk Operating Mode and the Slice modes as needed.

Step 12 Click **Finish**.

The operating mode is updated with the new configuration on the card.

Step 13 Complete the DLP-G726 Preprovisioning a Multirate PPM task.

Step 14 Complete the DLP-G278 Provisioning the Optical Line Rate, on page 293 task.

Step 15 To delete an operating mode, in the Card tab, choose the configured operating mode and click **Delete**.

The operating mode is deleted. A card operating mode can be deleted only if client payloads are not provisioned and the trunk ports in the out-of-service (OOS) state with no IPCs or PPCs associated.

Stop. You have completed this procedure.

NTP-G362 Manual FPGA Upgrade on the 400G-XP-LC Card

Purpose	This procedure manually upgrades the FPGA/ firmware images in the 400G-XP-LC card.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Note The manual FPGA / firmware upgrade is allowed only when there is a version mismatch. A **Different FPGA/ firmware image available** condition is raised to notify the user of the availability of a new firmware image.

It is recommnded to upgrade the FPGA / firmware on the cards, at both ends of the circuit.

Note Firmware upgrade is allowed only when the ports are in OOS (out-of-service) or Maintenance service state.

Caution This procedure is traffic-affecting.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 400G-XP-LC card where you want to provision an operating mode. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Click the **FPGA/FIRMWARE Upgrade** button.

A warning message is displayed.

Step 4 Click **Yes**.

The card undergoes a cold reset and the FPGA now contains the updated images. To view the FPGA and firmware versions, click the Card view > Maintenance > Info tabs.

Stop. You have completed this procedure.

NTP-G366 Viewing the ODU Utilization for ODU Circuits

Purpose	This procedure allows you to view the ODU utilization per 400G-XP-LC card, OTN span, and ILK consumption for each ODU circuit.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 400G-XP-LC card. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Step 3 Click **ODU Utilization**.

An ODU utilization window for the 400G-XP-LC card is displayed where you can get information about the availability of each port for ODU circuit creation.

All ODU ports are displayed according to the slice configuration that was configured. Each row represents 100G or ODU4 bandwidth. The client ports are listed first followed by the trunk ports. The ports that are already used by the ODU circuit are displayed in green, the ports that are available for circuit creation are displayed in orange and the ports that are not applicable nor configured are displayed in gray.

If a slice is configured with the OPM_100G option, the ODU usage is reserved for ODU4 circuits. If a slice is configured with the OPM_10x10G option, the ODU usage is reserved for ODU2 circuits.

Step 4 Click the **Maintenance** > **ODU** > **ODU** tabs. The pane displays the ILK consumption for each ODU circuit as described in the table.

Table 234: ILK Consumption

Parameter	Description
Circuit	Displays the circuit name.
Source Port	Displays the source port number.
Source ODU #	Displays the source ODU number in use
Destination Port	Displays the destination port number.
Destination ODU #	Displays the destination ODU number in use.

Parameter	Description
ILK Usage	Displays the ILK usage for the circuit. All protected circuits depicted by a tree hierarchy cons one ILK bandwidth.
Bandwidth	Displays the bandwidth for the circuit.

Note
The ILK, client, and trunk ODU2e usage per 400G-XP-LC card is also displayed in terms of a percentage below the table.

Step 5 To view the number of available link ODUs on the source and destination nodes, right-click the OTN span in the network map in the network view and select the Span Utilization option.

In the case of OTU4 trunk, the first 10 ODUs are not available and are depicted with "-". If the ODU is in use, it is depicted with an "x" and if the ODU is available, it is depicted with an tick mark. For the link ODU to be available, both the source and destination ODU must be available. The ODU utilization is also displayed as a percentage.

Stop. You have completed this procedure.

NTP-G367 Provisioning Encryption on 400G-XP-LC Card

Purpose	This procedure allows you to provision encryption on the 400G-XP-LC card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • NTP-G361 Provisioning an Operating Mode on the 400G-XP-LC Card, on page 600
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Security user or security super user

The encryption feature (Enable/Disable) requires a new hardware FPGA image. The 400G-XP LC card must be running with FPGA version 1.02 or higher. The FPGA version information can be checked using **Card view** > **Maintenance** > **Info** > **FPGA_HW_VERSION** in CTC. A Condition message warns the user about availability of a new image. To upgrade the FPGA image, see NTP-G362 Manual FPGA Upgrade on the 400G-XP-LC Card, on page 603.

The encrypted traffic on 400G-XP-LC card goes down if the Key Exchange Fail (KEY-EX-FAIL) alarm remains for more than 40 hours.

Procedure

Perform any of the following tasks as needed:

- DLP-G817 Configuring GCC2 Settings on 400G-XP-LC Card, on page 606
- DLP-G818 Enabling or Disabling Card Authentication and Payload Encryption on 400G-XP-LC Card, on page 607
- DLP-G819 Resetting the Primary Key on 400G-XP-LC Card, on page 608
- DLP-G820 Changing the Primary Key Reset Interval on 400G-XP-LC Card, on page 608

Stop. You have completed this procedure.

DLP-G817 Configuring GCC2 Settings on 400G-XP-LC Card

Purpose	This task configures a GCC2 channel on OTN enabled trunk ports to establish a connection between two 400G-XP-LC cards by configuring the IP address and ports of the source and destination cards.
Tools/Equipment	None
Prerequisite Procedures	Disable Card Authentication on 400G-XP-LC Card
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Note Each card on a node must have unique GCC2 source IP address. This IP address must not match with the source or destination IP address of other cards on the same node.

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the 400G-XP-LC card for which you want to configure the GCC settings.

Step 2 Go to **Provisioning** > **Encryption** > **GCC2 Settings**.

Step 3 In the Card IP Address field, specify the IP address of the source 400G-XP-LC card.

Step 4 Click on the Destination Card IP entry. Specify the IP address of the destination card.

The range of source and destination IP address is 172.16.0.1 to 172.16.0.255. The destination IP address must be same for IPort1 and IPort2. The destination IP address must be same for IPort3 and IPort4.

There can be only two destination card IP addresses and destination ports for the 400G-XP-LC card.

Step 5 Click on the Destination Port entry. Specify the port number of the destination card.

The values of Destination Port must be 1 or 3 for IPort1, 2 or 4 for IPort2, 3 or 1 for IPort3, 4 or 2 for IPort4 depending on the trunk port of the peer card this card is connected.

Step 6 Click **Apply**.

Step 7 Return to your originating procedure (NTP).

DLP-G818 Enabling or Disabling Card Authentication and Payload Encryption on 400G-XP-LC Card

Purpose	This task initiates the authentication of a destination 400G-XP-LC card with a source 400G-XP-LC card. This ensures that the source card communicates only with the destination card. This task also enables payload encryption on 400G-XP-LC card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G817 Configuring GCC2 Settings on 400G-XP-LC Card, on page 606
Required/As Needed	Required
Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the 400G-XP-LC card for which you need to enable or disable card authentication and payload encyption.

Step 2 Go to **Provisioning** > **Encryption** > **Security**.

Step 3 From the Port list, choose the port on which card authentication is to be enabled or disabled.

Step 4 Check the **Card Authentication** checkbox to enable card authentication.

Uncheck the **Card Authentication** checkbox to disable card authentication.

Note
When the **Card Authentication** check box is checked, the **Payload Encryption** check box is automatically checked and vice versa.

The primary key for encryption is exchanged between the source and destination 400G-XP-LC cards and OTN frames are encrypted.

Step 5 Click **Apply**.

Step 6 Repeat step 3 to step 5 for each port that carries the encrypted payload, as the card authentication takes place independently on each port of the source 400G-XP-LC card.

Step 7 Return to your originating procedure (NTP).

DLP-G819 Resetting the Primary Key on 400G-XP-LC Card

Purpose	This task allows to reset the primary key for each encrypted stream of the source 400G-XP-LC card. For more information, see Key Management, on page 280.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G818 Enabling or Disabling Card Authentication and Payload Encryption on 400G-XP-LC Card, on page 607
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the 400G-XP-LC card for which you want to reset the primary key.

Step 2 Go to **Provisioning** > **Encryption** > **Key Management**.

Step 3 Click the **Reset Master Key** button for a port to reset the primary key used for the payload encryption on that port.

By resetting the primary key, a key exchange is enforced by overriding the existing primary key reset interval, and a new interval is calculated from the time the key is reset.

Resetting the primary key does not affect traffic.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G820 Changing the Primary Key Reset Interval on 400G-XP-LC Card

Purpose	This task allows to change the primary key reset interval between two consecutive resets of the primary key that is used for payload encryption.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G818 Enabling or Disabling Card Authentication and Payload Encryption on 400G-XP-LC Card, on page 607
Required/As Needed	As Needed

Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the 400G-XP-LC card for which you want to change the primary key reset interval.

Step 2 Go to **Provisioning** > **Encryption** > **Key Management**.

Step 3 Click on the **Master Key Change Interval** entry for each port. Two spin boxes appear in place of the entry.

The box on the left registers the time in hours; the box on the right, the time in minutes.

The primary key interval can be set in multiples of 15 minutes between 15 minutes to 24 hours. The default interval value is 15 minutes.

Step 4 Set the desired values in the boxes.

When the time interval elapses, a new primary key is exchanged between the source and destination 400G-XP-LC cards.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

Limitations of Encryption on 400G-XP-LC Card

- AES frame size and location for Encryption overhead cannot be changed.
- OTN overhead settings such as AES security setting, ESP header and trailer locations, and Ingress/Egress PRBS generation are not supported.
- Advanced settings such as Ingress/Egress BIP8 bypass is not supported.
- Payload authentication is not supported.
- Encryption PMs such as Sequence Mismatch parameter is not supported.
- When encryption is enabled, the operating mode cannot be disabled.
- Each card on a node must have unique GCC2 source IP address. This IP address must not match with the source or destination IP address of other cards on the same node.
- The client/trunk/Iport loopbacks are not supported if encryption is enabled on the corresponding Iport and vice versa for MXP operating mode.
- The trunk and Iport loopbacks are not supported if encryption is enabled on the corresponding Iport and vice versa for OTNXC operating mode.
- The trunk mode or slice modes cannot be edited if encryption is enabled on the corresponding Iports.

NTP-G236 Modifying the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, , 200G-CK-LC, CFP-LC, WSE, MR-MXP, or 400G-XP-LC Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and PM parameter threshold settings of the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, CFP-LC, 100GS-CK-LC, 200G-CK-LC, WSE, MR-MXP, or 400G-XP-LC cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task, to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G714 Changing the 100G-LC-C, 10x10G-LC, CFP-LC, or WSE card line settings
- DLP-G715 Changing the 100G-LC-C, 10x10G-LC, CFP-LC, or WSE card ethernet settings
- DLP-G716 Changing the 10x10G-LC and WSE card SONET/SDH settings
- DLP-G717 Changing the 10x10G-LC and WSE card section trace settings
- DLP-G718 Changing the 10x10G-LC and WSE card SONET/SDH line thresholds
- DLP-G719 Changing the 100G-LC-C, 10x10G-LC, CFP-LC, or WSE card line RMON thresholds
- DLP-G720 Provisioning the 100G-LC-C card with trunk port alarm and TCA thresholds
- DLP-G721 Provisioning the 100G-LC-C, 10x10G-LC, or CFP-LC client port alarm and TCA thresholds

- DLP-G722 Changing the 100G-LC-C card OTN settings
- DLP-G815 Changing the 400G-XP-LC Card ODU Settings, on page 643
- DLP-G770 Enabling PRBS Settings, on page 646

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G714 Changing the Card Line Settings

Purpose	This task changes the line settings of the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, MR-MXP, MR-MXP-LIC, WSE, or 400G-XP-LC cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs. Tabs and parameter selections vary according to pluggable port modules (PPM) provisioning.

Step 3 Modify any of the line settings in the Ports tab as described in the following table.

Table 235: Card Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	1–12
Port Name	Assigns a logical name for the specified port.	User-defined. Name can be up to 80 alphanumeric or characters, or both. Blank by default. See the"NTP-G104 Assign a Name to a Port" task in the Node" chapter.

Parameter	Description	Options
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS, DSBLD (ANSI) or Locked, disabled (ETSI) • OOS, MT (ANSI) or Locked, maintenance (ETSI) • IS, AINS (ANSI) or Unlocked, AutomaticInServic
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU, AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA, DSBLD (ANSI) or Locked-enabled, dis (ETSI) • OOS-MA, MT (ANSI) or Locked-enabled, mainter (ETSI) • OOS-MA, LPBK&MT (ANSI) or Locked-enabled, & maintenance (ETSI)
ALS Mode	Sets the automatic laser shutdown (ALS) function mode.	• Disabled (default)—ALS is off; the laser is not auto shut down when traffic outage or loss of signal (LOS • Auto Restart-ALS is on; the laser automatically shu when traffic outage or LOS occurs. It automatically when the conditions that caused the outage are reso • Manual Restart—ALS is on; the laser automatically down when traffic outage or LOS occurs. However, must be manually restarted when conditions that ca outage are resolved. • Manual Restart for Test—Manually restarts the lase testing.
AINS Soak	Sets the automatic in-service (AINS) soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, aft the card state changes to in-service (IS) automatica • 0–48 hours, 15-minutes increments.

Parameter	Description	Options
Reach	Sets the optical reach distance of the client port.	• Autoprovision—The system automatically prov reach from the pluggable port module (PPM) re the hardware. **Note** The reach distances that appear in the drop-down list the card. **Note** On the 400G-XP-LC card, certain processes may fai unsupported PPMs are plugged into the card.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength **Note** In the dual node setup that includes the 400G-X upgrade is completed in one node and the other in the older package. In this scenario, when the activation is triggered, wavelength may not mat we recommend you choose a proper value for the instead of the **First Tunable Wavelength**. • Further wavelengths: • 850–1610 nm **Note** On 100G, 200G, and 400G LC cards, the wavelengt nm is displayed twice.
OverClock	Enables or disables overclock mode.	• OFF • ON **Note** When an OTU2 payload is provisioned on the 1 card in the TXP-10G or RGN-10G operating m overclock parameter is automatically set to ON.
Cd (Working Range) Low	Sets the threshold for minimum chromatic dispersion.	—

Parameter	Description	Options
Cd (Working Range) High	Sets the threshold for maximum chromatic dispersion. In 200G-CK-LC card, the CD (Working Range) High and CD (Working Range) Low thresholds value in Provisioning > Line > Ports tab in CTC do not change automatically after installing the 100G_SD_FEC_OR_CD_RANGE license. Hence, it is required to manually change the threshold values in CTC. Otherwise, the Chromatic Dispersion (CD) alarm is raised.	—
TX SHUTDOWN	If checked, the Tx optical power is turned off. This can be done when the port is out of service or in maintenance.	—
TX Power	Sets the Tx power to a specific value.	The range is from –10.0 to 0.25 dBm. 400G-XP-LC: The range for 100G is from –0.5 to –11.5 The range for 200G is from –1.5 to –11.5 dBm.

Parameter	Description	Options
Fault Signalling	Shuts down the far-end laser in response to certain defects. (Squelch does not apply to ISC COMPACT payloads.)	• AIS/Send Local Fault **Note** AIS/Send Local Fault is not supported on all the However, this option is present in the drop-down to allow a proper software upgrade from the previ • Squelch/Laser-Off **Note** When the 100G-LC-C, 100G-CK-C, 100G-ME- 100ME-CKC, 100GS-CK-LC, , 100GS-CK-LC 200G-CK-LC cards are used in the standalone m the CFP-LC card configured in the CFP-TXP m value can be set to Squelch/Laser-Off or AIS/Se Fault on the trunk port of the 100G-LC-C, 100G 100G-ME-C, 100GS-CK-LC, , 200G-CK-LC ca the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100G 100ME-CKC, and card is used with the CFP-LC configured CFP-MXP mode, the value can be se the trunk port of the 100G-LC-C, 100G-CK-C, 10 100GS-CK-LC, 200G-CK-LC, and 100ME-CK • LF/Local Fault—Supported for 10GE, 40GE, 1 100GE payloads. **Note** For 16GFC, this is the default mode; the user ca this to squelch, if necessary. • Disable/Transparent—Supported for any data tr 10GE, 8G FC, 10G FC, 40GE, 100GE.
Mapping Mode (10x10G-LC and WSE)	Sets the mapping mode.	• CBR **Note** CBR mapping mode supports Sync-E transpare • GFP **Note** The mapping mode can be configured to GFP fo payloads. The GFP port is placed in service whe client and trunk ports of the 10x10G-LC card are **Note** When the mapping mode is set to CBR on the 1 card, the overclock parameter is set to On. When the mapping mode is set to GFP on the 1 card, the overclock parameter is set to Off.

Parameter	Description	Options
Termination Mode	Sets the termination mode.	• Transparent
Squelch Hold Off Timer	(Only for 100G-LC-C, 100G-CK-C, 100ME-CK-C, CFP-LC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, and MR-MXP cards) Sets the period in milliseconds that the client interface waits for resolution of issues on the trunk side. The client squelching starts after this period. The user can configure the squelch hold off timer in CTC only under the following conditions: • The card must be configured in TXP or MXP operating modes. • The client payload must be 10GE or 100GE. • The Squelch drop-down in CTC must be set to Squelch. **Note** • The squelch hold off timer value can be changed without changing the port admin state. • When the squelch holdoff timer is set to a value other than 0 ms, Y-Cable cannot be provisioned. • When the Squelch drop-down is changed from non-squelch to squelch, the squelch holdoff timer is set to 0 ms. • When the node is upgraded to R10.5.2, the squelch hold-off timer is set to 0 ms. • When the squelch timer value is changed, the changed value will be applicable in the next squelch interval. • When squelch hold off timer is active, the OTU2_XP, TXP_MR_10E, and 40E-MXP-C cards send junk frames; the 100G-LC-C, 100G-CK-C, 100ME-CK-C, CFP-LC, 10x10G-LC, MR-MXP cards send Local Fault (LF).	• Disable (0 ms) - Default value • 50 ms • 100 ms • 250 ms • 500 ms

Table 236: Reach Distances for 10x10G-LC, 100G-LC-C, 100G-CK-C, CFP-LC, MR-MXP, 100GS-CK-LC, 200G-CK-LC, 400G-XP-LC, and WSE Cards

Card	Payload	Reach
10x10G-LC	OTU2	SR-MM
		P1I1-2D1
		P1S1-2D2b
		P1L1-2D2
		DWDM
	OC192	SR-MM
		SR-1
		IR-2
		LR-2
		DWDM
	10G FC	10GFC-SW
		10GFC-LW
		10GFC-EW
		10GFC-ZW
		DWDM
	8G FC	8GFC-SW
		8GFC-LW
	10 GE	TEN_GE_SR
		TEN_GE_LR
		TEN_GE_ER
		TEN_GE_ZR
		DWDM
	IB-5G	LX and SR-MM
100G-CK-C	100 GE	100GBASE-SR10 and 100GBASE-I
	OTU4	4I1-9D1F
	40 GE	40GBASE-SR4

Card	Payload	Reach
100G-LC-C	100 GE	100GBASE-SR10
100GS-CK-LC	100 GE	100GBASE-SR10 and 100GBASE-LR4
200G-CK-LC	100 GE	100GBASE-SR10 and 100GBASE-LR4
CFP-LC	40 GE	40GBASE-FR
		40GBASE-LR4
	100 GE	100GBASE-LR4
	OTU3	VSR2000-3R2
		C4S1-2D1
	OTU4	4I1-9D1F
MR-MXP	10 GE	SR
		TEN_GE_SR
		MR-MXP
		TEN_GE_ER
		TEN_GE_ZR
		DWDM
		CX1
		CWDM40km
	100 GE	100GBASE-SR10
		100GBASE-LR4
	OTU2	MLR-QSFP+
		TEN_GE_LR
		TEN_GE_EP
	40GE	QSFP-SR4
		QSFP-LR4
	OC192/STM64	MLR-QSFP+
		TEN_GE_LR
		TEN_GE_EP

Card	Payload	Reach
400G-XP-LC	Trunk ports	
	OTU4	DWDM
	OTU4C2	
	Client ports	
	100 GE	100GBASE-LR4
		100GBASE-SR4
	OTU4	4I1-9D1F
	10 GE	TEN_GE_LR
	OTU2	P1I1 2D1
	16GFC	16GFC-SW

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G715 Changing the Card Ethernet Settings

Purpose	This task changes the Ethernet settings of the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, CFP-LC, 100GS-CK-LC, 200G-CK-LC, MR-MXP, WSE, or 400G-XP-LC cards. **Note** The ethernet settings of the CFP-LC card can be changed on the virtual port of the peer 100G-LC-C, 100G-CK-C, 100G-ME-C, or 100ME-CKC card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the Ethernet settings. The card view appears.

Step 2 Click the **Provisioning** > **Line** > **Ethernet** tabs.

Step 3 Modify any of the Ethernet settings in the Ethernet tab. The parameters that appear depend on the card mode.

Table 237: Card Ethernet Settings

Parameter	Description	Options
Port	(Display only) Displays the port number *n* (-*n*) and rate.	—
Port Name	(Display only) Displays the port name.	—
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS, DSBLD (ANSI) or Locked,dis (ETSI) • OOS, MT (ANSI) or Locked,mainte (ETSI) • IS, AINS (ANSI) or Unlocked,AutomaticInService (ETS
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled • OOS-AU, AINS (ANSI) or Unlocked automaticInService (ETSI) • OOS-MA, DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA, MT (ANSI) or Locked-enabled,maintenance (ETSI) • OOS-MA, LPBK&MT (ANSI) or Locked-enabled,loopback & mainter (ETSI)
ALS Mode	Sets the automatic laser shutdown (ALS) function mode.	• Disabled (default)— ALS is off; the l automatically shut down when traffic loss of signal (LOS) occurs. • Manual Restart— ALS is on; the las automatically shuts down when traff or LOS occurs. However, the laser m manually restarted when conditions th the outage are resolved. • Manual Restart for Test— Manually the laser for testing.
AINS Soak	Sets the automatic in-service (AINS) soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.m after which the card state changes to (IS) automatically. • 0 to 48 hours, 15-minutes increments

Parameter	Description	Options
Reach	Sets the optical reach distance of the client port.	• Autoprovision—The system auto provisions the reach from the plu module (PPM) reach value on the **Note** The reach distances that appear i drop-down list depend on the car
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: • 850 nm through 1610 nm
MTU	Sets the maximum size of the Ethernet frames accepted by the port. The port must be in OOS/locked state.	Numeric. Default: 1548 Range 64 to 9700
Incoming MAC address (100G-LC-C and 10x10G-LC)	Sets the MAC address of the incoming Ethernet signal.	Value of the MAC address. Six bytes in format.
Mapping Mode (10x10G-LC)	Sets the mapping mode.	• CBR • GFP
Termination Mode	(Display-only) Sets the mode of operation.	• Transparent
Video Type (100G-LC-C and 10x10G-LC)	Video	—
BJ Fec (400G-XP-LC)	Enables or disables BJ Fec on 100G ethernet client interfaces based on the QSP28 pluggables used	• Auto (default) **Note** When the auto mode is used, BJ Off for QSFP28-LR4 and set to O QSFP28-SR4. • Force-Fec-On • Force-Fec-Off

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G716 Changing the 10x10G-LC and WSE Card SONET/SDH Settings

Purpose	This task changes the SONET (OC-192)/SDH (STM-64) settings of the 10x10G-LC and WSE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the SONET (OC-192)/SDH (STM-64) settings.

Step 2 Click the **Provisioning** > **Line** > **SONET** (ANSI) or **SDH** (ETSI) tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the settings as described in the table.

Table 238: 10x10G-LC and WSE Card SONET/SDH Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
Port Name	Assign a name for the specified port.	User-defined. Name can be up to 80 alphanumeric characters, or both. Blank by default. DLP-G104 Assigning a Name to a Port
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS, AINS (ANSI) or Unlocked,automaticInS (ETSI) • OOS, DSBLD (ANSI) or Locked,disabled (• OOS, MT (ANSI) or Locked,maintenance (I
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU, AINS (ANSI) or Unlocked-disabl automaticInService (ETSI) • OOS-MA, DSBLD (ANSI) or Locked-enable (ETSI) • OOS-MA, MT (ANSI) or Locked-enabled,ma (ETSI)

Parameter	Description	Options
SF BER	Sets the signal fail (SF) bit error rate (BER).	• 1E-3 • 1E-4 (default) • 1E-5
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 (default) • 1E-8 • 1E-9
Type	Sets the optical transport type.	• SONET (ANSI) • SDH (ETSI)
ALS Mode	Sets the automatic laser shutdown (ALS) function mode. The DWDM transmitter supports ALS according to ITU-T G.644 (06/99). ALS can be disabled or enabled for one of the three mode options.	• Disabled (default)—ALS is off; the laser automatically shut down when traffic out signal (LOS) occurs. • Auto Restart—ALS is on; the laser autom down when traffic outage or LOS occurs automatically restarts when the condition the outage are resolved. • Manual Restart—ALS is on; the laser au shuts down when traffic outage or LOS o However, the laser must be manually res conditions that caused the outage are res • Manual Restart for Test—Manually resta for testing.
AINS Soak	Sets the automatic in-service (AINS) soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm which the card state changes to in-servic automatically. • 0 to 48 hours, 15-minutes increments.
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as a NE timing reference.	• Checked • Unchecked
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	• Checked • Unchecked

Parameter	Description	Options
Send DoNotUse (WSE)	Sets the Send DoNotUse card state. When checked, sends a do not use (DUS) message on the S1 byte.	• Checked • Unchecked
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	STU
Reach	Sets the optical reach distance of the client port.	• Autoprovision—The system to automatically the reach from the pluggable port module (PI value on the hardware. **Note** The reach distances that appear in the drop-d depend on the card.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G717 Changing the 10x10G-LC and WSE Card Section Trace Settings

Purpose	This task changes the section trace settings of the 10x10G-LC and WSE cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the section trace settings.

Step 2 Click the **Provisioning** > **Line** > **Section Trace** tabs. Tabs and parameter selections vary according to PPM provisioning.

Step 3 Modify any of the settings in the Section Trace tab as described in the table.

Table 239: 10x10G-LC and WSE Card Line Section Trace Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
Received Trace Mode	Sets the received trace mode.	• Off/None • Manual
Disable AIS/RDI on TIM-S?	If a trace identifier mismatch (TIM) on a section overhead alarm arises because of a J0 overhead string mismatch, no alarm indication signal (AIS) is sent to the downstream nodes if this box is checked. If the Received Trace Mode field is set to Manual, the Disable AIS/RDI on TIM-S? checkbox is automatically checked.	• Checked (AIS/RDI on T disabled) • Unchecked (AIS/RDI or disabled)
Transmit Section Trace String Size	Sets the trace string size.	• 1 byte • 16 byte
Transmit	Displays the current transmit string or sets a new transmit string. **Note** The transmit string cannot be configured when the termination mode is transparent.	• **Hex Mode**— Click to cl display to hexadecimal (b to ASCII Mode). • **ASCII Mode**— Click to display to ASCII (buttor Hex Mode). **Note** The button title changes current display mode.
Expected	Displays the current expected string or sets a new expected string.	• **Hex Mode**— Click to cl display to hexadecimal (b to ASCII Mode). • **ASCII Mode**— Click to display to ASCII (buttor Hex Mode). **Note** The button title changes current display mode.

Parameter	Description	Options
Received	(Display only) Displays the current received string.	• **Hex Mode**— Click to chang display to hexadecimal (butto to ASCII Mode). • **ASCII Mode**— Click to ch display to ASCII (button ch Hex Mode). **Note** The button title changes bas current display mode.
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	• Checked • Unchecked (default)

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G718 Changing the 10x10G-LC and WSE Card SONET/SDH Line Thresholds

Purpose	This task changes the SONET/SDH line threshold settings of the 10x10G-LC card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 10x10G-LC card where you want to change the SONET/SDH line threshold settings.

Step 2 Click the **Provisioning** > **Line Thresholds** > **SONET Thresholds** (ANSI) or **SDH Thresholds** (ETSI) tabs.

Step 3 Modify any of the settings as shown in the table.

Note You must modify each of these options independently: Near End and Far End, 15 Min and 1 Day, and Line and Section. To do so, choose the appropriate radio button and click **Refresh**.

Table 240: 10x10G-LC and WSE Card SONET/SDH Line Threshold Settings

Parameter	Description	SONET Options	SDH Options
Port	(Display only) Displays the port number.	• Client Ports	• Client Ports
CV	Coding violations (CV)	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
EB	Errored Block (EB)	—	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.
ES	Errored seconds (ES)	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.
SES	Severely errored seconds (SES)	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display opt • Direction—Near End or F • Interval—15 Min (minute • Types—Multiplex Section Regeneration Section (nea Choose an option in each categ **Refresh**.

Parameter	Description	SONET Options	SDH Options
FC	(Line or Multiplex Section only) Failure count (FC)	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	—
BBE	Background block error (BBE)	—	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**.
UAS	(Line or Multiplex Section only) Unavailable seconds (UAS)	Numeric. Threshold display options include: • Direction—Near End or Far End • Interval—15 Min (minutes) or 1 day • Types—Line or Section (near end only) Choose an option in each category and click **Refresh**.	Numeric. Threshold display option • Direction—Near End or Far E • Interval—15 Min (minutes) o • Types—Multiplex Section or Regeneration Section (near en Choose an option in each category **Refresh**.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G719 Changing the Card Line RMON Thresholds

Purpose	This task changes the line RMON threshold settings for 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, CFP-LC, 100GS-CK-LC, 200G-CK-LC, MR-MXP, WSE, or 400G-XP-LC cards carrying Ethernet or FC payloads. **Note** The RMON threshold settings for the CFP-LC card can be changed on the virtual port of the peer 100G-LC-C, 100G-CK-C, 100G-ME-C, or 100ME-CKC card.
Tools/Equipment	None

Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the line RMON threshold settings in the card view.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click **Create**.

Step 4 From the Port drop-down list, choose the applicable port, either the payload port, for example "1-1 (ONEHUNDRED_GE)" port.

Step 5 From the Variable drop-down list, choose an Ethernet, FC, FICON, or GFP variable. See the following tables for the list of the available variables.

Table 241: Card Ethernet Variables

Variable	Description
ifInOctets	Number of bytes received since the last counter reset.
rxTotalPkts	Total number of received packets.
ifInUcastPkts [17]	Total number of packets delivered by this sublayer to a higher sublayer that are not addressed to a multicast or broadcast address.
ifInMulticastPkts [1]	Total number of packets delivered by this sublayer to a higher sublayer that are addressed to a multicast address. For a MAC layer protocol, this includes both group and functional addresses.
ifInBroadcastPkts [1]	Total number of packets delivered by this sublayer to a higher sublayer that are addressed to a broadcast address.
ifInErrors	Total number of received errors.
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
txTotalPkts	Total number of transmitted packets.
IfOutUcastPkts	Total count of packets transmitted to a unicast group destination address.

ifOutMulticastPkts	Total number of packets that higher-level protocols requested to be transmitted, which were addressed to a multicast address at this sublayer. These include packets that were discarded or not sent. For a MAC layer protocol, this includes both group and functional addresses.
ifOutBroadcastPkts	Total number of packets that higher-level protocols requested to be transmitted, which were addressed to a broadcast address at this sublayer. These include packets that were discarded or not sent.
dot3StatsAlignmentErrors	Total number of frames received on a particular interface that are not an integral number of octets in length and do not pass the FCS check. This counter is only valid for FE modes of operation.
dot3StatsFCSErrors	Total number of frames received on a particular interface that are an integral number of octets in length but do not pass the FCS check.
dot3StatsFrameTooLong	Total number of frames received on a particular interface that exceed the maximum permitted frame size.
etherStatsUndersizePkts	Total number of packets received that were less than 64 octets long (excluding framing bits, but including FCS octets) and were otherwise well-formed.
etherStatsFragments	Total number of packets received that were less than 64 octets in length (excluding framing bits, but including FCS octets) and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error). Note that it is entirely normal for etherStatsFragments to increment. This is because it counts both runts (which are normal occurrences due to collisions) and noise hits.
etherStatsPkts	Total number of frames received on an interface in both Rx and Tx directions.
etherStatsPkts64Octets	Total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits, but including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits, but including FCS octets).
etherStatsPkts128to255Octets	Total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits, but including FCS octets).

etherStatsPkts256to511Octets	Total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits, but including FCS octets).
etherStatsPkts512to1023Octets	Total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits, but including FCS octets).
etherStatsPkts1024to1518Octets	Total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits, but including FCS octets).
etherStatsBroadcastPkts	Total number of good packets received that were directed to the broadcast address. Note that this number does not include multicast packets.
etherStatsMulticastPkts	Total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address.
etherStatsOversizePkts	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well-formed.
etherStatsJabbers	Total number of packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets), and had either a bad FCS with an integral number of octets (FCS error) or a bad FCS with a non-integral number of octets (alignment error).
etherStatsOctets	Total number of octets of data (including those in bad packets) received on the network (excluding framing bits, but including FCS octets).
etherStatsPkts1519tomaxOctets	Total number of packets (including bad packets) received that were 1591 octets in length (excluding framing bits, but including FCS octets).
pcs49RxErrBer	—
pcs49RxErrDec	—

[17] The counter does not increment for traffic with incorrect Ethertype and packet size of more than 64 bytes on the 10x10G-LC and 100G-LC-C cards.

Table 242: 10x10G-LC and WSE FC/FICON Variables

Variable	Description
rxTotalPkts	Total number of received packets.
txTotalPkts	Total number of transmitted packets.

Variable	Description
mediaIndStatsRxFramesBadCRC	Total number of received data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsTxFramesBadCRC	Total number of transmitted data frames with payload CRC errors when HDLC framing is used.
mediaIndStatsRxFramesTruncated	Total number of frames received that are less than 5 bytes. This value is a part of the high-level data link control (HDLC) and GFP port statistics.
mediaIndStatsTxFramesTruncated	Total number of transmitted data frames that exceed the MTU. This value is a part of the HDLC and GFP port statistics.
mediaIndStatsRxFramesTooLong	Total number of received frames that exceed the maximum transmission unit (MTU). This value is a part of the HDLC and GFP port statistics.
mediaIndStatsTxFramesTooLong	Total number of transmitted data frames that are less than 5 bytes. This value is a part of the HDLC and GFP port statistics.
ifInOctets	Total number of octets received on the interface, including the framing octet.
ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.
ifInErrors	Total number of inbound packets that contained errors preventing them from being delivered to a higher-layer protocol.
ifOutErrors	Total number of outbound packets or transmission units that could not be transmitted because of errors.
pcs49RxErrBer	—
pcs49RxErrDec	—

Table 243: 10x10G-LC and WSE GFP RMON Variables

Variable	Description
gfpStatsRxFrame	Total number of received data frames.
gfpStatsTxFrame	Total number of transmitted data frames.
gfpStatsRxCRCErrors	Total number of CRC errors with the receive transparent GFP frame.
gfpStatsRxOctets	Total number of GFP data octets received.
gfpStatsTxOctets	Total number of GFP data octets transmitted.

gfpStatsRxSBitErrors	Received GFP frames with single bit errors in the core header (these errors can be corrected).
gfpStatsRxMBitErrors	Received GFP frames with multiple bit errors in the core header (these errors cannot be corrected).
gfpStatsRxTypeInvalid	Received GFP frames with invalid type (these are discarded). For example, receiving GFP frames that contain Ethernet data when we expect Fibre Channel data.
gfpRxCmfFrame	—
gfpRxCmfFrame	—

Step 6 From the Alarm Type drop-down list, indicate whether the event will be triggered by the rising threshold, falling threshold, or both the rising and falling thresholds.

The available options are Rising Threshold, Falling Threshold, and Rising and Falling Threshold.

Step 7 From the Sample Type drop-down list, choose either **Relative** or **Absolute**. Relative restricts the threshold to use the number of occurrences in the user-set sample period. Absolute sets the threshold to use the total number of occurrences, regardless of time period.

Step 8 Enter the appropriate number of seconds in the Sample Period field.

Step 9 Enter the appropriate number of occurrences in the Rising Threshold field.

For a rising type of alarm, the measured value must move from below the falling threshold to above the rising threshold. For example, if a network is running below a rising threshold of 1000 collisions every 15 seconds and a problem causes 1001 collisions in 15 seconds, the excess occurrences trigger an alarm.

Step 10 Enter the appropriate number of occurrences in the Falling Threshold field. In most cases a falling threshold is set lower than the rising threshold.

A falling threshold is the counterpart to a rising threshold. When the number of occurrences is above the rising threshold and then drops below a falling threshold, it resets the rising threshold. For example, when the network problem that caused 1001 collisions in 15 seconds subsides and creates only 799 collisions in 15 seconds, occurrences fall below a falling threshold of 800 collisions. This resets the rising threshold so that if network collisions again spike over a 1000 per 15-second period, an event again triggers when the rising threshold is crossed. An event is triggered only the first time a rising threshold is exceeded (otherwise, a single network problem might cause a rising threshold to be exceeded multiple times and cause a flood of events).

Step 11 Click **OK**.

Note
To view all RMON thresholds, check the **Show All RMON thresholds** checkbox.

Step 12 Return to your originating procedure (NTP).

DLP-G720 Provisioning the Card with Trunk Port Alarm and TCA Thresholds

Purpose	This task provisions the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, 200G-CK-LC, 100ME-CKC, or 400G-XP-LC cards with trunk port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, 200G-CK-LC, 100ME-CKC, or 400G-XP-LC card where you want to provision the trunk port alarm and TCA threshold settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Note
The **Optics Thresholds** tab incorrectly lists the 100GE aggregate port on the CPAK-FR-S pluggable for the 200G-CK-LC card and on the 100G-QSFP-FR-S pluggable for the 400G-XP-LC card.

Step 3 If TCA is not selected, click the **TCA** radio button and then click **Refresh**. If it is checked, continue with step 4.

Step 4 Verify if the port TCA thresholds are set. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing **Enter**.

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 6 Verify if the port Alarm thresholds are set. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G721 Provisioning the Client Port Alarm and TCA Thresholds

Purpose	This task provisions the client port alarm and TCA thresholds for the 100G-LC-C, 10x10G-LC, CFP-LC, MR-MXP, 100G-CK-C, 100G-ME-C, 100GS-CK-LC, , 200G-CK-LC, 100ME-CKC, and 400G-XP-LC cards. **Note** The client port alarm and TCA thresholds cannot be provisioned on the QSFP+ ports of the MR-MXP cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G278 Provisioning the Optical Line Rate, on page 293 • DLP-G46 Log into CTC
Required/As Needed	Required
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the client port alarm and TCA threshold settings.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Step 3 Verify if the TCA thresholds for client ports for RX Power High, RX Power Low, TX Power High, and TX Power Low parameters are set based on the client interface at the other end. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Note
Do not modify the Laser Bias parameters.

Note
You must modify 15 Min and 1 Day independently. To do so, choose the appropriate radio button and click **Refresh**.

Note
The hardware device that plugs into a card faceplate to provide a fiber interface to the card is called a Small Form-factor Pluggable (SFP, QSFP+, XFP, or CXP) or a C Form-factor Pluggable (CFP, CFP2, or CPAK). In CTC, SFPs, QSFPs+, XFPs, CXPs, CFPs, and CPAKs are called pluggable port modules (PPMs). SFPs/QSFPs+/XFPs/CXPs/CFPs/CPAKs are hot-swappable I/O devices that plug into a port to link the port with the fiber-optic network. Multirate PPMs have provisionable port rates and payloads. For more information, see SFP, SFP+, QSFP+, XFP, CXP, CFP, CFP2 and CPAK Modules, on page 282.

Note
For multi-lane pluggables (CXP, CFP, CPAK), the thresholds are set on the first lane and copied on the remaining lanes. You can edit only the first lane.

Step 4 Click **Apply**.

Step 5 Repeat step 3 and step 4 to provision each additional client port.

Step 6 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 7 Verify if the client port Alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low parameters are set based on the client interface that is provisioned. Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and hitting **Enter**.

Step 8 Click **Apply**.

Step 9 Repeat step 7 and step 8 to provision each additional client port.

Step 10 Return to your originating procedure (NTP).

DLP-G722 Changing the Card OTN Settings

Purpose	This task changes the OTN settings for the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 10x10G-LC, 100GS-CK-LC, 200G-CK-LC, CFP-LC, or 400G-XP-LC cards. **Note** The OTN settings cannot be provisioned on the virtual port of the MR-MXP card.
Tools/Equipment	None
Prerequisite Procedures	Login to CTC.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs, then choose one of the following subtabs: OTN Lines, ITU-T G.709 Thresholds, FEC Thresholds, Trail Trace Identifier, or Proactive Protection Regen.

Step 3 Modify any of the settings described in the following tables.

Note You must modify each of these options independently: Near End and Far End, 15 Min and 1 Day, and SM and PM. To do so, choose the appropriate radio button and click **Refresh**.

The following table describes the values on the Provisioning > OTN > OTN Lines tab.

Table 244: Card OTN Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
ITU-T G.709 OTN	Sets the OTN lines according to ITU-T G.709.	Enabled by default
FEC	Sets the OTN lines to forward error correction (FEC).	See .
SF BER	(Display only) Displays the signal fail (SF) bit error rate (BER).	• 1E-5
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 (Default) • 1E-8 • 1E-9
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as a NE timing reference.	• Checked • Unchecked
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	• Checked • Unchecked
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing • RES—Reserved; quality level set
Interop Mode	Enables interoperability between 200G-CK linecards and other vendor interfaces.	• None (default value) • Enable

The following table describes the values on the Provisioning > OTN > ITU-T G.709 Thresholds tab.

Table 245: ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
ES	Errored seconds (ES)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
SES	Severely errored seconds (SES)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
UAS	Unavailable seconds (UAS)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
BBE	Background block errors (BBE)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
FC	Failure counter (FC)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.

The following table describes the values on the Provisioning > OTN > FEC Thresholds tab.

Table 246: Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	—
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minute or one-day intervals.
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minute or one-day intervals.

The following table describes the values on the Provisioning > OTN > Trail Trace Identifier tab.

Table 247: Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	Displays the port number.	—
Level	Sets the level.	• Section • Path

Parameter	Description	Options
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable FDI on TTIM?	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked. This field is enabled only if the Received Trace Mode is set to Manual.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled) **Note** FDI is not supported for TTI-PM but is applicable for TTI-SM.
Transmit (Release 10.1 and earlier releases) Supported in 400G-XP-LC card	Displays the current transmit string or sets a new transmit string.	• **Hex Mode**—Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** Transmit is not supported for TTI-PM but is applicable for TTI-SM. **Note** The button title changes based on the current display mode.
Expected (Release 10.1 and earlier releases) Supported in 400G-XP-LC card	Displays the current expected string or sets a new expected string.	• **Hex Mode**—Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** The button title changes based on the current display mode.

Parameter	Description	Options
Received (Release 10.1 and earlier releases) Supported in 400G-XP-LC card	(Display only) Displays the current received string.	• **Hex Mode**—Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** The button title changes based on the current display mode.
In Release 10.3 and later releases: Transmit Area—The Edit Transmit Area allows you to enter a new transmit string. The Current Transmit Area displays the current transmit string. Expected Area—The Edit Expected Area allows you to enter a new expected string. The Current Expected Area displays the current expected string. Received Area—The Current Received Area displays the current received string.		
SAPI	Source Access Point Identifier (SAPI) of the TTI.	—
DAPI	Destination Access Point Identifier (DAPI) of the TTI.	—
User Operator Data	User operator data of the TTI.	—
Edit Mode	Sets the transmit or expected string type to ASCII or Hex.	—
Fill from Current	Uses the values of the current or expected transmit string for the SAPI, DAPI, and User Operator Data fields.	—
Hex Mode	When the button label displays “Hex Mode”, the strings in the SAPI, DAPI and User Operator fields are in ASCII format. Click the **Hex Mode** button to display the string in hexadecimal format. The button name also changes to “ASCII Mode”. Click **ASCII Mode** to return the strings to ASCII format.	—
Auto-refresh	If checked, automatically refreshes the display every five seconds. **Note** Do not check the auto-refresh checkbox while configuring the TTI strings.	• Checked • Unchecked (default)

From Release 10.6.2, the 400G-XP line cards support SAPI/ DAPI (and not TTI).

The received trace value in the Provisioning -> OTN -> Trail Trace Identifier tab might be empty (even when TTI is not OFF and is receiving information) upon the following conditions, for these cards - 100GS-CK-LC, 200G-CK-LC, 400G-CK-L, MR-MXP :

a. The user has logged into the node for the first time.

b. The user has upgraded the node.

c. The user has reset the card.

Click **Refresh** or **Reset** to view the received trace value immediately or click **Auto-refresh** to view the received trace value after five seconds.

Table 248: Support for Proactive Protection Regeneration

Card	Operating Mode	Supported Payloads
100G-LC-C and 100G-ME-C	TXP-100G or RGN-100G	100GE, OTU4
100G-CK-C and 100ME-CKC	TXP-100G or RGN-100G	• CPAK-100G-LR4 with 100GE,OTU4 • CPAK-100G-SR10 with 100GE,OTU4
10x10G-LC	MXP-10x10G	OTU2
CFP-LC	CFP-TXP	100GE, OTU4

Note
The 100GS-CK-LC and 200G-CK-LC cards do not support proactive protection.

The following table describes the values on the Provisioning > OTN > Proactive Protection Regen tabs.

Table 249: Card Proactive Protection Regen Settings

Parameter	Description	Options
Port	(Display only) Displays the port number and name (optional).	—
Trigger Threshold	Sets the maximum BER threshold to trigger proactive protection.	• 1E-3 • 9E-4 to 1E-4 • 9E-5 to 1E-5 • 9E-6 to 1E-6 • 9E-7 to 1E-7

Parameter	Description	Options
Trigger Window (ms)	Sets the duration when BER is monitored before triggering the proactive protection. The trigger window value must be a multiple of: • 10 ms for trigger thresholds between 1E-3 and 6E-6 • 100 ms for trigger threshold between 5E-6 to 1E-7 Trigger window must be less than or equal to 500 ms for trigger thresholds between 1E-3 and 6E-6. The trigger window must be less than or equal to 3900 ms for trigger thresholds between 5E-6 to 1E-7.	Time in milliseconds.
Revert Threshold	Sets the revert threshold value of BER. **Note** The revert threshold settings must be less than the trigger threshold values.	• 1E-4 • 9E-5 to 1E-5 • 9E-6 to 1E-6 • 9E-7 to 1E-7 • 9E-8 to 5E-8
Revert Window (ms)	Sets the duration when BER is monitored for settings that are less than the revert threshold value before which proactive protection provided to the router is removed. The revert window value must be at least 2000 ms and a multiple of: • 10 ms for a revert threshold of 1E-4 to 6E-7 • 100 ms for a revert threshold of 5E-7 to 5E-8. The revert window must be less than or equal to 3900 ms.	Time in milliseconds.

Parameter	Description	Options
Enable Proactive Protection	Enables proactive protection.	The available options for TXP-100G operating mode on the 100G-LC or 100G-CK card are: • Disabled—Proactive protection is not enabled. • FRR Proactive Protection—Supported on all the pluggables except on ONS-CC-100G-LR4= and CPAK-100G-LR4 when the client payload is 100GE-LAN. • Pre-FEC PSM Proactive Protection—This option is supported on the trunk port only when the client has ONS-CC-100G-LR4= and CPAK-100G-LR4. Also, this option is applicable only when the card is configured in TXP-100G and CFP-TXP operating modes using 100GE or OTU4 payload. The available options for MXP-10x10G operating mode are: • Enabled • Disabled The available options for 10x10G-LC card are: • Egress Proactive Protection Enabled • Egress Proactive Protection Disabled

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G815 Changing the 400G-XP-LC Card ODU Settings

Purpose	This task changes the ODU settings for the 400G-XP-LC cards configured in the OTNXC mode. **Note** The ODU parameters on the protected trunk-ODUs cannot be edited independently. The ports inherit the values of the working trunk-ODUs. **Note** The ODU line and ODU threshold settings are not applicable for ODU4 interfaces. The TCAs and conditions are directly raised on the trunk port.

Tools/Equipment	None
Prerequisite Procedures	Login to CTC.
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the 400G-XP-LC card where you want to change the ODU settings.

Step 2 Click the **Provisioning** > **ODU** tabs, then choose one of the following subtabs: ODU Lines, ODU Thresholds, or ODU TTI.

Step 3 In the Port drop-down list, choose a port.

Step 4 Modify any of the settings described in the following tables.

Note
You must modify each of these options independently: Near End and Far End, 15 Min and 1 Day, and SM and PM. To do so, choose the appropriate radio button and click **Refresh**.

The following table describes the values on the Provisioning > ODU > ODU Lines tab.

Table 250: Card ODU Line Settings

Parameter	Description	Options
ODU	(Display only) Displays the port number.	trunk ports
SF BER	(Display only) Displays the signal fail (SF) bit error rate (BER).	• 1E-5
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 (Default) • 1E-8 • 1E-9

The following table describes the values on the Provisioning > ODU > ODU Thresholds tab.

Table 251: ODU Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	trunk ports

Parameter	Description	Options
ES	Errored seconds (ES)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals. Select an option and click **Apply**.
SES	Severely errored seconds (SES)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals. Select an option and click **Apply**.
UAS	Unavailable seconds (UAS)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals. Select an option and click **Apply**.
BBE	Background block errors (BBE)	Numeric. Can be set for Near End or Far End, for 15-minute or one-day intervals. Select an option and click **Apply**.
FC	Failure counter (FC)	Numeric. Can be set for Near End or Far End. Select an option and click **Apply**.

Note
To restore the default values, select a row from the table and click Reset to Default.

The following table describes the values on the Provisioning > ODU > TTI tab.

Table 252: Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	Displays the port number.	client ports
Level	Sets the level.	• Path
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable FDI on TTIM?	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked. This field is enabled only if the Received Trace Mode is set to Manual.	• Checked (FDI on TTIM is disabled) • Unchecked (FDI on TTIM is not disabled)
Transmit Area—The Edit Transmit Area allows you to enter a new transmit string. The Current Transmit Area displays the current transmit string. Expected Area—The Edit Expected Area allows you to enter a new expected string. The Current Expected Area displays the current expected string. Received Area—The Current Received Area displays the current received string.		

Parameter	Description	Options
SAPI	Source Access Point Identifier (SAPI) of the TTI.	—
DAPI	Destination Access Point Identifier (DAPI) of the TTI.	—
User Operator Data	User operator data of the TTI.	—
Edit Mode	Sets the transmit or expected string type to ASCII or Hex.	—
Edit Current Values	Uses the values of the current or expected transmit string for the SAPI, DAPI, and User Operator Data fields.	—
Hex Mode	When the button label displays "Hex Mode", the strings in the SAPI, DAPI and User Operator fields are in ASCII format. Click the **Hex Mode** button to display the string in hexadecimal format. The button name also changes to "ASCII Mode". Click **ASCII Mode** to return the strings to ASCII format.	—
Auto-refresh	If checked, automatically refreshes the display every five seconds. **Note** Do not check the auto-refresh checkbox while configuring the TTI strings.	• Checked • Unchecked (default)

Click **Refresh** or **Reset** to view the received trace value immediately or click **Auto-refresh** to view the received trace value after five seconds.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G770 Enabling PRBS Settings

Purpose	This task enables PRBS settings for the 100G-LC-C, 100G-CK-C, 100G-ME-C, 100ME-CKC, 100GS-CK-LC, and 200G-CK-LC cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote

Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to enable the PRBS settings.

Step 2 Click the **Maintenance** > **PRBS** tabs.

Step 3 Modify any of the settings as described in the following table.

Table 253: Card PRBS Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	Trunk ports
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • IS,AINS (ANSI) or Unlocked,automaticInService (ETSI) • OOS,DSBLD (ANSI) or Locked,disabled (ETSI) • OOS,MT (ANSI) or Locked,maintenance (ETSI)
Generator Pattern	Displays the pattern generated by the line card.	PRBS_31
Detected Pattern	Displays the pattern detected by the line card.	• PRBS_11 • PRBS_23 • PRBS_31 Only PRBS_31 is supported on the 100GS-CK-LC and 200G-CK-LC cards.
Pattern Sync Status	Displays the pattern sync status.	• PATTERN_NONE • PATTERN_OK • PATTERN_ERROR

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G351 Retrieving MAC Addresses on Cards

Purpose	This procedure enables you to retrieve the MAC address of the host connected to the MR-MXP ports for 10 GE clients or 400G-XP-LC ports for 10GE or 100GE ports using the Link Layer Discovery Protocol (LLDP).
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Retrieve or higher

Procedure

Step 1 In the node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to retrieve the source MAC addresses.

Step 2 Click the **Maintenance** > **LLDP** tabs.

Step 3 Click **Retrieve**.

The table displays the following fields:

- Port-Displays the port number.
- Source MAC Address-Displays the MAC address of the node to which the port is connected.

Stop. You have completed this procedure.

NTP-G338 Provisioning an Operating Mode on the WSE Card

Purpose	This procedure enables you to provision an operating mode on the WSE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Super user

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to provision an operating mode. The card view appears.

Step 2 Click the **Provisioning** > **Card** tabs.

Note
You cannot edit an existing operating mode on the WSE card.

Step 3 In the Operating Modes tab, click **Create**.

Step 4 Choose the configuration from the Card Configuration drop-down list. The card configuration options are TXP-10G and RGN-10G modes.

Step 5 Select the defined port pair in the Card Configuration Dialog area. The WSE card supports a maximum of five TXP-10G modes, five RGN-10G modes, or a combination of five TXP-10G, and RGN-10G modes.

Step 6 Click **Finish**. The selected operating mode is provisioned on the WSE card.

Step 7 Complete the DLP-G726 Preprovisioning a Multirate PPM task.

Step 8 Complete the DLP-G278 Provisioning the Optical Line Rate, on page 293 task.

Stop. You have completed this procedure.

NTP-G339 Modifying the WSE Card Line Settings and PM Parameter Thresholds

Purpose	This procedure changes the line and PM parameter threshold settings of the WSE card.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • NTP-G179 Installing the Transponder and Muxponder Cards • DLP-G723 Install PPM on a Line Card • DLP-G726 Preprovisioning a Multirate PPM (if necessary) • DLP-G278 Provisioning the Optical Line Rate, on page 293
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 As needed, complete the NTP-G103 Backing Up the Database task, to preserve the existing transmission settings.

Step 2 Perform any of the following tasks as needed:

- DLP-G744 Changing the WSE card security thresholds
- DLP-G740 Changing the WSE Card Ethernet Settings
- DLP-G745 Changing the WSE card line RMON thresholds
- DLP-G746 Provisioning the WSE card with port alarm and TCA thresholds
- DLP-G747 Changing the WSE card OTN settings

Note
To use the Alarm Profiles tab, including creating alarm profiles and suppressing alarms, see the Alarm and TCA Monitoring and Management document.

Stop. You have completed this procedure.

DLP-G739 Changing the WSE Card Line Settings

Purpose	This task changes the line settings of the WSE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to change the line settings.

Step 2 Click the **Provisioning** > **Line** > **Ports** tabs.

Tabs and parameter selections vary according to pluggable port modules (PPM) provisioning.

Step 3 Modify any of the line settings in the Ports tab as described in the following table.

Table 254: WSE Card Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	1 through 10
Port Name	Assigns a logical name for the specified port.	User-defined. Name can be up to 80 alphanumeric or special characters, or both. Blank by default. DLP-G104 Assigning a Name to a Port
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS, DSBLD (ANSI) or Locked,disabled (ETSI) • OOS, MT (ANSI) or Locked,maintenance (ETSI) • IS, AINS (ANSI) or Unlocked,AutomaticInService (ETSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU, AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA, DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA, MT (ANSI) or Locked-enabled,maintenance (ETSI) • OOS-MA, LPBK&MT (ANSI) or Locked-enabled,loopback & maintenance (ETSI)
ALS Mode	Sets the automatic laser shutdown (ALS) function mode.	• Disabled (default)— ALS is off; the laser is not automatically shut down when traffic outage or loss of signal (LOS) occurs. • Auto Restart—ALS is on; the laser automatically shuts down when traffic outage or LOS occurs. It automatically restarts when the conditions that caused the outage are resolved. • Manual Restart— ALS is on; the laser automatically shuts down when traffic outage or LOS occurs. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test— Manually restarts the laser for testing.

Parameter	Description	Options
AINS Soak	Sets the automatic in-service (AINS) soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, after which the card state changes to in-service (IS) automatically. • 0 to 48 hours, 15-minute increments.
Reach	Sets the optical reach distance of the client port.	Autoprovision—The system automatically provisions the reach from the pluggable port module (PPM) reach value on the hardware.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: • – 850 nm through 1610 nm
OverClock	Enables or disables overclock mode.	• OFF • ON **Note** When an OTU2 payload is provisioned on the WSE card in the TXP-10G or RGN-10G operating mode, the overclock parameter is automatically set to ON.
Fault Signalling	Shuts down the far-end laser in response to certain defects.	• AIS/Send Local Fault • Squelch/Laser-Off
Mapping Mode	Sets the mapping mode. In a WSE card with a 10-GE payload, when a network fault or failure occurs, and the user sets squelch to the Disable state, the faults propagated downstream are different in GFP and CBR mapping. In GFP mapping, the device connected to the client reports a momentary local fault, but in CBR mapping, the local fault is reported for the entire duration of the fault.	• CBR • GFP
Termination Mode	Sets the termination mode.	Transparent

Table 255: Reach Distances for WSE Card

Card	Payload	Reach
WSE	OTU2	SR-MM P1I1-2D1 P1S1-2D2b P1L1-2D2 DWDM
	OTU2e	TEN_GE_SR TEN_GE_LR TEN_GE_ER TEN_GE_ZR DWDM

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G740 Changing the WSE Card Ethernet Settings

Purpose	This task changes the ethernet settings of the WSE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to change the ethernet settings.

Step 2 Click the **Provisioning** > **Line** > **Ethernet** tabs.

Tabs and parameter selections vary according to pluggable port modules (PPM) provisioning.

Step 3 Modify any of the line settings in the Ethernet tab as described in the table.

Table 256: WSE Card Ethernet Settings

Parameter	Description	Options
Port	(Display only) Displays the port number *n-n* and rate.	--
Port Name	(Display only) Displays the port name.	--
Admin State	Sets the port service state unless network conditions prevent the change. For more information about administrative states, see the Administrative and Service States document.	• IS (ANSI) or Unlocked (ETSI) • OOS, DSBLD (ANSI) or Locked,disabled (ETSI) • OOS, MT (ANSI) or Locked,maintenance (ETSI) • IS, AINS (ANSI) or Unlocked,AutomaticInService (ETSI)
Service State	(Display only) Identifies the autonomously generated state that gives the overall condition of the port. Service states appear in the format: Primary State-Primary State Qualifier, Secondary State. For more information about service states, see the Administrative and Service States document.	• IS-NR (ANSI) or Unlocked-enabled (ETSI) • OOS-AU, AINS (ANSI) or Unlocked-disabled, automaticInService (ETSI) • OOS-MA, DSBLD (ANSI) or Locked-enabled,disabled (ETSI) • OOS-MA, MT (ANSI) or Locked-enabled,maintenance (ETSI) • OOS-MA, LPBK&MT (ANSI) or Locked-enabled,loopback & maintenance (ETSI)
ALS Mode	Sets the automatic laser shutdown (ALS) function mode.	• Disabled (default)— ALS is off; the laser is not automatically shut down when traffic outage or loss of signal (LOS) occurs. • Manual Restart— ALS is on; the laser automatically shuts down when traffic outage or LOS occurs. However, the laser must be manually restarted when conditions that caused the outage are resolved. • Manual Restart for Test— Manually restarts the laser for testing.
AINS Soak	Sets the automatic in-service (AINS) soak period. Double-click the time and use the up and down arrows to change settings.	• Duration of valid input signal, in hh.mm format, after which the card state changes to in-service (IS) automatically. • 0 to 48 hours, 15-minute increments.

Parameter	Description	Options
Reach	Sets the optical reach distance of the client port.	Autoprovision—The system automatically provisions the reach from the pluggable port module (PPM) reach value on the hardware.
Wavelength	Displays the wavelength of the client port.	• First Tunable Wavelength • Further wavelengths: • – 850 nm through 1610 nm
MTU	Sets the maximum size of the Ethernet frames accepted by the port. The port must be in OOS/locked state.	Numeric. Default: 1548 Range 64 to 9700
Termination Mode	(Display-only) Sets the mode of operation.	Transparent

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G744 Changing the WSE Card Security Thresholds and Setting Authentication Error Thresholds

Purpose	This task changes the security threshold settings of the WSE card. This task also sets the payload authentication error thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to change the security threshold settings.

Step 2 Click the **Provisioning** > **Security Thresholds** tabs.

Step 3 Modify any of the settings as described in the table.

Note

You must modify each of these options independently: TCA and Alarm, and 15 Min and 1 Day. To do so, choose the appropriate radio button and click **Refresh**.

Table 257: WSE Card Security Threshold Settings

Parameter	Description
Port	Selects the port number.
Sequence Mismatch	Shows the number of times the Sequence Number (SEQ) for an AES packet has differed at the encryption and decryption ends.

Step 4 Click **Apply**.

Step 5 To set the payload authentication error thresholds, go to **Provisioning** > **Security Thresholds** tab and click the **Alarm** radio button.

Step 6 Enter the authentication error threshold value in the Payload Authentication Error field.

The default value is 1. The range is 1 to 500.

The Payload Authentication Alarm is raised when the payload authentication error PM counter for 10 seconds in the Encryption PM tab exceeds the payload authentication error value set in the Security Thresholds tab. The Payload Authentication Alarm is not raised if payload authentication is enabled only on the near end or far end.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G745 Changing the WSE Card Line RMON Thresholds

Purpose	This task changes the line RMON threshold settings for WSE cards carrying Ethernet or FC payloads.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to change the RMON threshold settings in the card view.

Step 2 Click the **Provisioning** > **Line Thresholds** > **RMON Thresholds** tabs.

Step 3 Click Create. The Create Threshold dialog box appears.

Step 4 From the Port drop-down list, choose the applicable port, either the payload port, for example "1-1 (TEN_GE)" port.

Step 5 From the Variable drop-down list, choose an Ethernet variable. See Table 11-230 for a list of available Ethernet variables.

Table 258: WSE Card Ethernet Variables

Variable	Description
rxTotalPkts	Total number of received packets.
etherStatsPkts	Total number of frames received on an interface in both Rx and T
etherStatsOctets	Total number of octets of data (including those in bad packets) re (excluding framing bits, but including FCS octets).
etherStatsOversizePkts	Total number of packets received that were longer than 1518 octe bits, but including FCS octets) and were otherwise well-formed.
dot3StatsFCSErrors	Total number of frames received on a particular interface that are octets in length but do not pass the FCS check.
dot3StatsAlignmentErrors	Total number of frames received on a particular interface that are of octets in length and do not pass the FCS check. This counter is o of operation.
dot3StatsSymbolErrors	Contains a count of received frames that have an associated RX_ data reception error event (MII) or data reception error event or c (GMII) from the PCS.
dot3StatsFrameTooLong	Total number of frames received on a particular interface that exc permitted frame size.
dot3StatsLCVErrors/mediaIndStatsRxLcvErrors	Number of received line code violations at the PCS layer.
dot3StatsLayer1Errors	Number of Layer 1 errors as defined within the following conditi • During Packet Reception—Layer 1 errors are only counted The Layer 1 error is indicated as a direct result of a line side which RX_DV is asserted. This is an uncommon event from reason why the device loses synchronization. • During Interpacket Reception—The Layer 1 error is indicate a line side protocol violation in which RX_DV is de-asserted event. The Layer 1 error is also asserted on detection of a Fa and is asserted on detection of Erred byte (interpacket) signa Layer 1 error is asserted during inter-packet reception, it is on in the vector.
etherStatsJabbers	Total number of packets received that were longer than 1518 octe bits, but including FCS octets), and had either a bad FCS with an octets (FCS error) or a bad FCS with a non-integral number of oc

Variable	Description
etherStatsUndersizePkts	Total number of packets received that were less than 64 octets long (bits, but including FCS octets) and were otherwise well-formed.
etherStatsFragments	Total number of packets received that were less than 64 octets in leng framing bits, but including FCS octets) and had either a bad FCS with of octets (FCS error) or a bad FCS with a non-integral number of octet Note that it is entirely normal for etherStatsFragments to increment. itcounts both runts (which are normal occurrences due to collisions)
etherStatsPkts64Octets	Total number of packets (including bad packets) received that were 6 (excluding framing bits, but including FCS octets).
etherStatsPkts65to127Octets	Total number of packets (including bad packets) received that were b octets in length inclusive (excluding framing bits, but including FCS
etherStatsPkts128to255Octets	Total number of packets (including bad packets) received that were be octets in length inclusive (excluding framing bits, but including FCS
etherStatsPkts256to511Octets	Total number of packets (including bad packets) received that were be octets in length inclusive (excluding framing bits, but including FCS
etherStatsPkts512to1023Octets	Total number of packets (including bad packets) received that were b 1023 octets in length inclusive (excluding framing bits, but including
etherStatsPkts1024to1518Octets	Total number of packets (including bad packets) received that were b 1518 octets in length inclusive (excluding framing bits, but including
etherStatsMulticastPkts	Total number of good packets received that were directed to a multic that this number does not include packets directed to the broadcast ad
etherStatsBroadcastPkts	Total number of good packets received that were directed to the broad that this number does not include multicast packets.
etherStatsPkts1519tomaxOctets	Total number of packets (including bad packets) received that were 15 (excluding framing bits, but including FCS octets).
ifInUcastPkts (The counter does not increment for traffic with incorrect Ethertype and packet size of more than 64 bytes on the WSE card.)	Total number of packets delivered by this sublayer to a higher sublay addressed to a multicast or broadcast address.
ifInMulticastPkts (The counter does not increment for traffic with incorrect Ethertype and packet size of more than 64 bytes on the WSE card.)	Total number of packets delivered by this sublayer to a higher sublaye to a multicast address. For a MAC layer protocol, this includes both gr addresses.
ifInBroadcastPkts (The counter does not increment for traffic with incorrect Ethertype and packet size of more than 64 bytes on the WSE card.)	Total number of packets delivered by this sublayer to a higher sublaye to a broadcast address.

Variable	Description
ifInErrors	Total number of received errors.
IfOutUcastPkts	Total count of packets transmitted to a unicast group destination a
ifOutMulticastPkts	Total number of packets that higher-level protocols requested to b were addressed to a multicast address at this sublayer. These inclu discarded or not sent. For a MAC layer protocol, this includes both addresses.
ifOutBroadcastPkts	Total number of packets that higher-level protocols requested to b were addressed to a broadcast address at this sublayer. These incl discarded or not sent.
ifOutOctets	Total number of octets transmitted out of the interface, including
mediaIndStatsTXFramesBadCRC	Total number of transmitted data frames with payload CRC errors is used.
mediaIndStatsTXShortPkts	Number of transmitted frames containing less than the minimum as programmed with the transmit MAC Min Frame Length Confi
txTotalPkts	Total number of transmitted packets.

Step 6 Click **Apply**.

Step 7 Return to your originating procedure (NTP).

DLP-G746 Provisioning the WSE Card with Port Alarm and TCA Thresholds

Purpose	This task provisions the WSE card with port alarm and TCA thresholds.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to provision the alarm and TCA threshold settings for the port.

Step 2 Click the **Provisioning** > **Optics Thresholds** tabs. The TCA thresholds are shown by default.

Note

You must modify 15 Min and 1 Day independently. Choose the appropriate radio button and click **Refresh**.

Note
Do not modify the Laser Bias parameters.

Step 3 If TCA is not selected, select the TCA option and then click Refresh. If it is checked, continue with Step 4.

Step 4 Verify whether the port TCA thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low are set.

Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Step 5 Under Types, click the **Alarm** radio button and click **Refresh**.

Step 6 Verify whether the port alarm thresholds for RX Power High, RX Power Low, TX Power High, and TX Power Low are set.

Provision new thresholds as needed by double-clicking the threshold value you want to change, deleting it, entering a new value, and pressing Enter.

Step 7 Click **Apply**.

Step 8 Return to your originating procedure (NTP).

DLP-G747 Change the WSE Card OTN Settings

Purpose	This task changes the OTN settings for the WSE card.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Provisioning or higher

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the WSE card where you want to change the OTN settings.

Step 2 Click the **Provisioning** > **OTN** tabs. Choose one of these subtabs: OTN Lines, ITU-T G.709 Thresholds, FEC Thresholds, or Trail Trace Identifier.

Step 3 Modify any of the settings described in the tables.

Note
You must modify each of these options independently: Near End and Far End, 15 Min and 1 Day, and SM and PM. Choose the appropriate radio button and click **Refresh**.

The table describes the values on the Provisioning > OTN > OTN Lines tab.

Table 259: WSE Card OTN Line Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
ITU-T G.709 OTN	Sets the OTN lines according to ITU-T G.709.	Enabled by default
FEC	Sets the OTN lines to forward error correction (FEC). When an OTN cloud is present between two WSE cards used in stacked card scenario, it is recommended to keep the same FEC setting on both ends of the OTN cloud to avoid FEC-MISM alarm on the WSE cards.	• Disable • Standard • Enhanced
SF BER	(Display only) Displays the signal fail (SF) bit error rate (BER).	1E-5
SD BER	Sets the signal degrade (SD) bit error rate (BER).	• 1E-5 • 1E-6 • 1E-7 (Default) • 1E-8 • 1E-9
ProvidesSync	Sets the ProvidesSync card parameter. If checked, the card is provisioned as a NE timing reference.	• Checked • Unchecked
SyncMsgIn	Sets the EnableSync card parameter. Enables synchronization status messages (S1 byte), which allow the node to choose the best timing source.	• Checked • Unchecked
Admin SSM In	Overrides the synchronization status message (SSM) and the synchronization traceability unknown (STU) value. If the node does not receive an SSM signal, it defaults to STU.	• PRS—Primary Reference Source • STU—Sync traceability unknown • ST2—Stratum 2 • ST3—Stratum 3 • SMC—SONET minimum clock • ST4—Stratum 4 • DUS—Do not use for timing • RES—Reserved; quality level set

The following table describes the values on the Provisioning > OTN > ITU-T G.709 Thresholds tab.

Table 260: WSE ITU-T G.709 Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
ES	Errored seconds (ES)	Numeric. Can be set for Near End or Far End, for 15-minutes or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
SES	Severely errored seconds (SES)	Numeric. Can be set for Near End or Far End, for 15-minutes or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
UAS	Unavailable seconds (UAS)	Numeric. Can be set for Near End or Far End, for 15-minutes or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
BBE	Background block errors (BBE)	Numeric. Can be set for Near End or Far End, for 15-minutes or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.
FC	Failure counter (FC)	Numeric. Can be set for Near End or Far End, for 15-minutes or one-day intervals, or for SM (OTUk) or PM (ODUk). Select an option and click **Refresh**.

The following table describes the values on the Provisioning > OTN > FEC Thresholds tab.

Table 261: WSE Card FEC Threshold Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
Bit Errors Corrected	Sets the value for bit errors corrected.	Numeric. Can be set for 15-minutes or one-day intervals. Select an option and click **Refresh**.
Uncorrectable Words	Sets the value for uncorrectable words.	Numeric. Can be set for 15-minutes or one-day intervals. Select an option and click **Refresh**.

The following table describes the values on the Provisioning > OTN > Trail Trace Identifier tab.

Table 262: WSE Card Trail Trace Identifier Settings

Parameter	Description	Options
Port	(Display only) Displays the port number.	All client and trunk ports
Level	Sets the level.	• Section • Path

Parameter	Description	Options
Received Trace Mode	Sets the trace mode.	• Off/None • Manual
Disable FDI on TTIM?	If a Trace Identifier Mismatch on Section overhead alarm arises because of a J0 overhead string mismatch, no Forward Defect Indication (FDI) signal is sent to the downstream nodes if this box is checked. This field is enabled only if the Received Trace Mode is set to Manual.	• Checked (FDI on TTIM is disabled) • Manual Unchecked (FDI on TTIM is not disabled)
Transmit	Displays the current transmit string or sets a new transmit string.	• **Hex Mode**— Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** The button title changes based on the current display mode.
Expected	Displays the current expected string or sets a new expected string.	• **Hex Mode**— Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** The button title changes based on the current display mode.
Received	(Display only) Displays the current received string.	• **Hex Mode**— Click to change the display to hexadecimal (button changes to ASCII Mode). • **ASCII Mode**—Click to change the display to ASCII (button changes to Hex Mode). **Note** The button title changes based on the current display mode.
Auto-refresh	If checked, automatically refreshes the display every 5 seconds.	• Checked • Unchecked

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

NTP-G340 Provisioning Encryption on the WSE and MR-MXP Cards

Purpose	This procedure enables you to provision encryption on the WSE and MR-MXP cards.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC • NTP-G338 Provisioning an operating mode on the WSE card • NTP-G235 Provisioning an Operating Mode, on page 599
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Security super user

The card authentication and payload encryption must be enabled to check Bit Interleaved Parity-8 (BIP-8) functionality on encrypted traffic.

Note When BIP-8 functionality is enabled on the MR-MXP card of the source node, the MR-MXP card of the destination node raises only the ODUk-SD alarm instead of ODUk-SD and ODUk-SF alarms.The WSE card raises both the ODUk-SD and ODUk-SF alarms for the same scenario.

Procedure

Perform any of the following tasks as needed:

- DLP-G759 Configuring GCC2 settings
- DLP-G748 Enabling or Disabling Card Authentication, on page 666
- DLP-G749 Enabling payload encryption
- DLP-G Enabling Payload Authentication, on page 667
- DLP-G751 Resetting the Primary Key, on page 668
- DLP-G752 Changing the Primary Key Reset Interval, on page 669

- DLP-G753 Setting AES secure packet configuration
- DLP-G754 Specifying ESP header and trailer locations
- DLP-G755 Enabling ingress PRBS generation and egress PRBS monitoring

Stop. You have completed this procedure.

DLP-G759 Configuring GCC2 Settings

Purpose	This task configures a GCC2 channel on OTN enabled trunk ports to establish a connection between two WSE or two MR-MXP cards by configuring the IP address and ports of the source and destination cards.
Tools/Equipment	None
Prerequisite Procedures	Disable Card Authentication for MR-MXP or WSE Card The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-XMP card for which you want to configure the GCC settings.

Step 2 Go to **Provisioning** > **Encryption** > **GCC2 Settings**.

Step 3 In the Card IP Address field, provide the IP address of the source WSE or MR-MXP card.

Step 4 Click on the Destination Card IP entry. Specify the IP address of the destination card.

Step 5 Click on the Destination Port entry. Specify the port number of the destination card.

There can be multiple destination card IPs and destination ports for WSE card and only a single destination card IP and destination port for MR-MXP card.

Step 6 Click **Apply**.

To change the MR-MXP or WSE card role from primary to secondary and vice versa:

a. Remove only the card IP address or only the destination card IP address or both.

b. Modify or configure the required IP address in the Card IP Address or Destination Card IP field.

Step 7 Return to your originating procedure (NTP).

DLP-G748 Enabling or Disabling Card Authentication

Purpose	This task initiates the authentication of a destination WSE or MR-MXP card with a source WSE or MR-MXP card. This ensures that the source card communicates only with the destination card. The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	Required
Onsite/Remote	Onsite or Remote
Security Level	Security Super User

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you need to enable or disable card authentication.

Step 2 Go to **Provisioning** > **Encryption** > **Security**.

Step 3 (Only for WSE card) From the Port list, choose the port on which card authentication is to be enabled or disabled.

Step 4 Check the **Card Authentication** checkbox to enable card authentication.

Uncheck the **Card Authentication** checkbox to disable card authentication.

The primary key for encryption is exchanged between the source and destination WSE or MR-MXP cards.

Step 5 Click **Apply**.

Step 6 (Only for WSE card) Repeat step 3 to step 5 for every port that carries the encrypted payload, as the card authentication takes place independently on each port of the source WSE card.

Step 7 Return to your originating procedure (NTP).

DLP-G749 Enabling Payload Encryption

Purpose	This task enables encryption of OTN frames emerging from a port of the source WSE or MR-MXP card.
Tools/Equipment	None

Prerequisite Procedures	• DLP-G759 Configuring GCC2 Settings, on page 665 • DLP-G748 Enabling or Disabling Card Authentication, on page 666 The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Required/As Needed	Required
Onsite/Remote	Onsite or Remote
Security Level	Security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to enable payload encryption.

Step 2 Go to **Provisioning** > **Encryption** > **Security**.

Step 3 Check the Payload Encryption check box to enable encryption of the OTN frames.

In WSE card, do not enable encryption with far-end client loopback. This affects the traffic. In MR-MXP card, the client loopback is disabled when encryption is enabled.

When encryption is enabled in the near end and disabled in the far end, the client port of MR-MXP card raises Local Fault (LF) and the client port of WSE card raises SYNCLOSS alarm.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G Enabling Payload Authentication

Purpose	This task enables payload authentication on the MR-MXP card to validate the integrity of the received payloads. The payload authentication is enabled by default and can be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs of MR-MXP card.
Tools/Equipment	None
Prerequisite Procedures	• Enable Card Authentication • Enable Payload Encryption
Required/As Needed	Required
Onsite/Remote	Onsite or Remote
Security Level	Super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the MR-MXP card for which you want to enable payload authentication.

Step 2 Go to **Provisioning** > **Encryption** > **Security** tab.

Step 3 Check the **Payload Authentication** check box to enable payload authentication and click **Apply**.

Step 4 Return to your originating procedure (NTP).

DLP-G751 Resetting the Primary Key

Purpose	This task lets you reset the primary key for each encrypted stream of the source WSE or MR-MXP card. For more information, see Key Management, on page 280.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G748 Enabling or Disabling Card Authentication, on page 666 • DLP-G749 Enabling Payload Encryption, on page 666
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to reset the primary key.

Step 2 Go to **Provisioning** > **Encryption** > **Key Management**.

Step 3 (For WSE card) Click the **Reset Master Key** button for a port to reset the primary key used for the payload encryption on that port.

(For MR-MXP card) Click the **Reset Master Key** button to reset the primary key used for the payload encryption on the card.

By resetting the primary key, a key exchange is enforced by overriding the existing primary key reset interval, and a new interval is calculated from the time the key is reset.

Step 4 Check the **TCA on Key Reset check** box to raise TCA notification indicating MASTERKEY-SUCCESS transient condition of the payload on a port listed in the Port column.

When this check box is checked on both the near end and far end, the Alarms and History tabs are updated with TCA notifications on both the near end and far end in the specified key change interval. Two key resets occur in every key reset interval.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G752 Changing the Primary Key Reset Interval

Purpose	This task lets you change the primary key reset interval between two consecutive resets of the primary key that is used for payload encryption.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G748 Enabling or Disabling Card Authentication, on page 666 • DLP-G749 Enabling Payload Encryption, on page 666
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security user or security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to change the primary key reset interval.

Step 2 Go to **Provisioning** > **Encryption** > **Key Management**.

Step 3 Click on the **Master Key Change Interval** entry. For WSE card, two spin boxes appear in place of the entry and for MR-MXP card, four spin boxes appear.

For WSE card, the box on the left registers the time in hours; the box on the right, the time in minutes. For MR-MXP card, four boxes register the time in days, hours, minutes, and seconds.

For WSE card, the primary key interval can be set in multiples of 15 minutes between 15 minutes to 48 hours. For MR-MXP card, the primary key interval can be set between 50 seconds and 48 hours.

Step 4 Set the desired values in the boxes.

When the time interval elapses, a new primary key is exchanged between the source and destination WSE or MR-MXP cards.

Step 5 Check the **TCA on Key Reset check** box to raise TCA notification indicating MASTERKEY-SUCCESS transient condition of the payload on a port listed in the Port column.

When this check box is checked on both the near end and far end, the Alarms and History tabs are updated with TCA notifications on both the near end and far end in the specified key change interval. Two key resets occur in every key reset interval.

Step 6 Click **Apply**.

Step 7 Return to your originating procedure (NTP).

DLP-G753 Setting AES Secure Packet Configuration

Purpose	This task configures the number of OTN frames per AES secure packet. The AES secure packet for each port can be made up of 4 or 8 OTN frames. For more information, see AES Secure Packet, on page 280
Tools/Equipment	None
Prerequisite Procedures	• DLP-G759 Configuring GCC2 Settings, on page 665 • Disable Card Authentication for MR-MXP Card The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to set the AES secure packet configuration.

Step 2 Go to **Provisioning** > **Encryption** > **OTN Overhead for Packet traffic**.

Step 3 Click on the AES Secure Packet entry corresponding to the port where the AES secure packet must be configured. A dropdown list appears.

Step 4 From the drop-down list, choose either **4 OTN Frame Based** or **8 OTN Frame Based**.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G754 Specifying ESP Header and Trailer Locations

Purpose	This task specifies the location of the ESP (Encapsulating Security Payload) Header and Trailer in each OTN frame of the AES secure packet.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G759 Configuring GCC2 Settings, on page 665 • Disable Card Authentication for MR-MXP Card The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Required/As Needed	As Needed

Onsite/Remote	Onsite or Remote
Security Level	Security super user

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to specify the ESP header and trailer locations.

Step 2 Go to **Provisioning** > **Encryption** > **OTN Overhead for Packet traffic**.

Step 3 Click on the ESP Header Location entry corresponding to a port.

The locations available are A, B, C, D, E and F. The default values of ESP Header Location and ESP Trailer Location are location A. The ESP header and trailer require a total of 32 bytes within the OTN overhead.

Step 4 Choose the ESP header location from the predefined values in the list.

The ESP Trailer Location is updated to match the location of the ESP header.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G755 Enabling PRBS Generation and Monitoring

Purpose	This task lets you enable PRBS generation at the ingress, and PRBS monitoring at the egress of each port for the source and destination WSE or MR-MXP cards. For MR-MXP card, PRBS Generation and Monitoring is possible only when card authentication and payload encryption are disabled.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G759 Configuring GCC2 Settings, on page 665 • Disable Card Authentication and Payload Encryption for MR-MXP Card The card authentication and payload encryption are enabled by default and cannot be disabled for MR-MXP-K9 and MR-MXP-K9= PIDs.
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security super user

Note PRBS does not work for WSE card when client loopback is enabled.

Procedure

Step 1 In node view (single shelf mode), or shelf view (multi-shelf mode), double-click the WSE or MR-MXP card for which you want to enable PRBS generation and PRBS monitoring.

Step 2 Go to **Provisioning** > **Encryption** > **OTN Overhead for Packet traffic**.

Step 3 Check the **Ingress PRBS Generator** check box for a port to enable PRBS generation at the ingress of that port. The ingress of a port is the data path in the encryption block.

Step 4 Check the **Egress PRBS Monitor** check box for a port to enable PRBS monitoring at the egress of that port. The egress of a port is the data path in the decryption block.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

NTP-G342 Provisioning FIPS and CC Mode

Purpose	This procedure lets you enable the FIPS and CC mode on the node.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Security super user

Note Provisioning a FIPS and CC mode is not supported in Macintosh computers.

Procedure

Perform any of the following tasks as needed:

- DLP-G761 Enabling FIPS and CC Mode, on page 673

Stop. You have completed this procedure.

DLP-G761 Enabling FIPS and CC Mode

Purpose	This task lets you enable the Federal Information Processing Standard (FIPS) mode and Common Criteria (CC) for the node. The CTC can be run in FIPS and CC mode. It supports FIPS 140-2 level 2 standards of encryption and cryptographic services. The CC certification ensures that the node is accessed, managed, monitored and provisioned in a highly secure manner. In the FIPS and CC mode, only the algorithms that are approved by FIPS and CC can be run. When the FIPS and CC mode is selected, the node reboots and performs a self-test at startup. **Note** Use this procedure with caution. Running FIPS and CC mode in a multi-shelf node with the WSE card in the primary shelf, might lead to loss of control with the secondary shelfs if a problem occurs.
Tools/Equipment	None
Prerequisite Procedures	• DLP-G46 Log into CTC
Required/As Needed	As Needed
Onsite/Remote	Onsite or Remote
Security Level	Security super user



Note When FIPS mode is enabled during CTC startup, CTC cache directory path must not contain any space in the Settings > Cache tab. Otherwise, CTC cannot be launched successfully.

Procedure

Step 1 Select the node for which you want to enable FIPS and CC mode.

Step 2 Secure all the access points:

a) In the node view, click **Provisioning** > **Security** > **Access**.

b) Change the Access State of Pseudo IOS Access, Shell Access, EMS Access, TL1 Access , and SNMP Access to Secure state.

c) Click **Apply**.

Step 3 Click the **FIPS and CC** tab.

Step 4 Select the **FIPS and CC Mode** check box to enable FIPS and CC mode for that node.

Caution
In a situation that warrants a breach into the system, the system can be protected by erasing the private keys. To erase all the private keys in the WSE, MR-MXP, and TNC cards, click **Zeroise Key**. A warning message is displayed with details about the consequence of zeroizing the keys. This will rewrite all the private keys with zeros. This implementation for the private keys is a requirement as per the FIPS 140-2 compliance.

Step 5 Click **Apply**.

Step 6 Return to your originating procedure (NTP).

DLP-G760 Configuring Management of FIPS and CC Mode Enabled NE

Purpose	This task configures the requirements to manage the Federal Information Processing Standard (FIPS) and Common Criteria (CC) mode enabled network element. This procedure also applies to EMS and Shell Secure mode.
Tools/Equipment	None
Prerequisite Procedures	None
Required/As Needed	Required to use the FIPS and CC mode
Onsite/Remote	Onsite or Remote
Security Level	None

Procedure

Step 1 Install JRE version 7.0.

a) Uninstall previous versions of JREs from the control panel.
b) Restart the computer.
c) Download and install the latest JRE version 7.0. for Windows x64.

Step 2 Go to Java Control Panel and click the **Advanced** tab. Expand **Security** > **General settings**. Perform these actions:

a) Uncheck the **Use SSL 3.0** check box.
b) Check the **Use TLS 1.0** check box.

Step 3 In the Java Control Panel, click the **General** tab. Click **Settings** and perform these actions to clear the JNLP cache:

a) Clear the **Keep temporary files on my computer** check box.
b) Click **Delete Files**.
c) Select the files to delete and click **OK**.
d) Click **OK** and exit the Java Control Panel.

Step 4 Install Java Cryptography Extension (JCE)version 7.0.

a) Download the JCE.
b) Extract the contents of the downloaded policy file.
c) Copy and overwrite the security policy file to C:\Program Files\Java\jre7\lib\security\.

<*java-home*>/lib/security [Unix]

<*java-home*>\lib\security [Win32]

where <java-home> is the location where the Jave SE Runtime Environmen (JRE) is installed.

Step 5 Configure the browser settings:

- Chrome browser settings:
  a. Go to **Chrome** > **Settings**.
  b. Click the **Open Proxy settings** and click the **Advanced** tab.
  c. Uncheck the **Use SSL 3.0** check box.
  d. Check the **Use TLS 1.0** check box and click **OK**.
- Firefox browser settings:
  a. Go to **Mozilla Firefox**.
  b. Type **about:config** in the Address bar.
  c. Type **TLS** in the Search box.
  d. Enter the value for **security.tls.version.max** as 0, 1, 2, 3, where 0 refers to SSL 3.0, 1 refers to TLS 1.0, 2 refers to TLS 1.1, 3 refers to TLS 1.2, and so on.
  e. Enter the value for **security.tls.version.min** as 0, 1, 2,3, where 0 refers to SSL 3.0, 1 refers to TLS 1.0, 2 refers to TLS 1.1, 3 refers to TLS 1.2, and so on.

  Click **OK** twice.

Step 6 Return to your originating procedure (NTP).

NTP-G363 Provisioning LSC on Cards

Purpose	This procedure provisions Locally Significant Certificates (LSCs) on the WSE, MR-MXP, and 400G-XP-LC cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Remote
Security Level	Security super user

Note You cannot provision LSCs on MR-MXP trunk cards configured in the 100G-B2B mode.

Procedure

Step 1 Complete DLP-G803 Installing Locally Significant Certificates on Cards, on page 676, as needed.

Step 2 Complete DLP-G804 Switching Between LSC and MIC on Cards, on page 678, as needed.

Step 3 Complete DLP-G805 Viewing Certificates , on page 679, as needed.

Stop. You have completed this procedure.

DLP-G803 Installing Locally Significant Certificates on Cards

Purpose	This task provisions the generation of a CSR and installation of Locally Significant Certificates (LSCs) on the WSE, MR-MXP, and 400G-XP-LC cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC Secure the Shell Access and EMS Access. **1.** In the node view, click Provisioning > Security > Access. **2.** Change the Access State of Shell Access, and EMS Access to Secure State. **3.** Click Apply.
Required/As Needed	As needed
Onsite/Remote	Remote
Security Level	Security super user

Note LSCs installed on the 400G-XP-LC card in R11.0 are deleted upon revert to R10.9.

Note Ensure the size of each certificate (SUDI, MID, and ROOT) does not exceed 2000 bytes on WSE, MR-MXP, and 400G-XP-LC cards.

Procedure

Step 1 In the node view (single-shelf mode) or shelf view (multishelf view), click **Provisioning** > **Certificate** > **Certificate** tabs.

Step 2 To generate the CSR file, perform the following steps:

a) Click **Generate**.

The Generate Certificate dialog box appears.

b) Select the **Shelf ID**, **Slot ID**, **Encryption Algorithm**, and **Hashing** from the drop-down lists.
c) Enter the name in the **Common Name** text box.

This name must be the same on both the near-end and far-end cards.

d) (Optional) Click **Additional Details**.
e) Enter the **Country Name**, **State Name**, **Locality Name**, **Organization Name**, **Organization Unit Name**, and **Mail ID** in the corresponding text box.
f) Click **Ok**.

Note
When the user changes the Shelf ID of SSC through the LCD, the shelf and slot numbers for all the LSC entries of cards in a shelf might not be updated. The shelf and slot numbers might report as Not Applicable (N/A). It is recommended to reset the card or to delete the LSC entry and create it again.

After the CSR file is generated, you can view the certificate details by right-clicking on it and selecting View Details.

If the CSR generation fails, the Comments/Errors field is updated.

Step 3 To export the CSR file, perform the following steps:

a) Select the certificate and click **Export**.

The Certificate Export dialog box appears.

b) Click Browse to navigate to a local or network drive where you want to save the file.
c) Select the **File Type** from the drop-down list.
d) Click **Ok**.

The exported certificate is sent to the Certification Authority (CA) for generation of the LSC.

Step 4 To make CA sign the CSR request, you must enter the following X509v3 extension information in the certificate:

Table 263: X509v3 Extension Information in Certificate

Open SSL Config File Field	X509v3 Extension Field in the Certificate	Description	Example
basicConstraints	X509v3 Basic Constraints	Specifies to avoid interpreting an end user certificate as a CA certificate.	basicConstraints=CA:FALSE
nsComment	Netscape Comment	Displays the Netscape comment	nsComment=”open ssl generated certificate”
subjectKeyIdentifier	X509v3 Subject Key Identifier	Specifies the key hash of the certificate	subjectKeyIdentifier= hash
authorityKeyIdentifier	X509v3 Authority Key Identifier	Specifies the key hash of the issuer certificate	authorityKeyIdentifier= keyid,issuer

Open SSL Config File Field	X509v3 Extension Field in the Certificate	Description	Example
keyUsage	X509v3 Key Usage	Specifies the key usage for a client certificate	keyUsage = critical,nonRepudiation, digitalSignature, keyEncipherment
nsCertType	X509v3 Extended Key Usage	Specifies to include client and server If this field is not populated, then the certificate can be used for anything other than object signing	nsCertType = client,server,email

This enables CA sign the CSR request in the certificate.

Step 5 To import the locally signed certificates from local or network drive into the system, perform the following steps:

a) Select the certificate and click **Import**.

The Certificate Import dialog box appears.

b) Select the **Certificate Format** and **No. of Files** from the drop-down lists.

c) Browse and select the files.

Import the signed files in this sequence: SUDI, MID, and ROOT files.

d) Click **Ok**.

If the certificate import fails, the Comments/Errors field is updated.

Step 6 To install and switch to the locally signed certificates in the line card, perform the following steps:

a) Select the certificate and click **Install & Switch**.

The Certificate Install & Switch warning message is displayed.

b) Check the **Auto delete after Install** check box to auto-delete the entries after installation.

c) Click **Ok**.

The certificate undergoes a verification phase where the expired certificates are not installed. If the verification is successful, the certificate is installed in the line card. After installation, it switches from the MIC certificate to the LSC certificate.

Step 7 Return to your originating procedure (NTP).

DLP-G804 Switching Between LSC and MIC on Cards

Purpose	To switch between the Manufacturing Installed Certificate (MIC) and Locally Significant Certificate (LSC) on the WSE, MR-MXP, and 400G-XP-LC cards.

Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC DLP-G803 Installing Locally Significant Certificates on Cards, on page 676
Required/As Needed	As needed
Onsite/Remote	Remote
Security Level	Security super user

Note When the certificate option is switched from MIC to LSC on the client or server MR-MXP card, there is a peer certification mismatch between the client and server MR-MXP cards. This causes the PEER-CERT-VERIFICATION-FAILED alarm to be raised on the client MR-MXP card.

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card where you want to change the certificate being used. The card view appears.

Step 2 In the card view, click **Provisioning** > **Certificate** > **Maintenance** tabs.

Step 3 In the Certificate Options area:

- Click the **Use LSC (Locally Significant Certificate)** radio button to switch to LSC for the card.

  Note
  The LSC-NOT-PRESENT-MIC-IN-USE alarm is raised when the LSC is not installed on the card and this option is selected in CTC. To generate and install the LSC, see DLP-G803 Installing Locally Significant Certificates on Cards, on page 676.

- Click the **Use MIC (Manufacturing Installed Certificate)** radio button to switch to MIC for the card.

Step 4 Click **Apply**.

Step 5 Return to your originating procedure (NTP).

DLP-G805 Viewing Certificates

Purpose	This task enables you to view the details of the Manufacturing Installed Certificate (MIC) or Locally Significant Certificate (LSC) that is in use on the WSE, MR-MXP, and 400G-XP-LC cards.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC #unique_602

Required/As Needed	As needed
Onsite/Remote	Remote
Security Level	Security super user

Procedure

Step 1 In node view (single-shelf mode) or shelf view (multishelf view), double-click the card. The card view appears.

Step 2 In the card view, click **Provisioning** > **Certificate** > **Details** tabs.

The **Certificate List Details** area displays the certificate type (MIC/LSC) that is in use. You can choose a level and view the certificate (in X.509 format) for that level.

Note
Currently, Cisco NCS 2000 supports only ECDSA-p521, RSA-2048, and RSA-3072 key lengths to generate the CSR. Therefore, CTC shows "Invalid" in the **Certificates List Details** area when the key length exceeds. However, this limitation does not apply to the CA certificates used for signing the CSR. Hence, you can use a certificate with a key length higher than 3072 and sign the CSR as long as the size of each CA (Root or MID) certificate does not exceed the 2000 byte limit. In this case, the installation of the certificate chain goes through successfully, and traffic comes up without issues.

From R11.13 onwards, support is enabled for RSA-4096 key length to generate the CSR.

- The RSA-4096 key length prevents invalid values from appearing in the **Certificates List Details**. It also helps in increasing the size of the certificate for proper display.
- RSA-4096 is supported on three line cards: 400G-XP-LC, WSE and MR-MXP.
- The maximum number of files selected to import the signed certificates is reduced from five to three.
- The storage for each certificate in the ACT2LITE device is increased to 3000 bytes, in the existing software.

Step 3 Return to your originating procedure (NTP).

SUDI 2099 Certificate for WSE, MR-MXP, and 400G-XP-LC Cards

Table 264: Feature History

Feature Name	Release Information	Feature Description
Secure Unique Device Identification (SUDI) SUDI 2099 Certificate for WSE, MR-MXP, and 400G-XP-LC Cards	Cisco NCS 2000 Release 11.12	This feature enhances the encryption capability of WSE, MR-MXP, and 400G-XP-LC cards by extending their encryption functionality beyond the year 2029 and/or 10 years from the date of manufacture, whichever occurs first. This extended validity addresses issues related to encryption and card upgrade failures caused by expired certificates.

Table 265: Feature History

Feature Name	Release Information	Feature Description
WSE and 400G-XP-LC Encryption for Incorrect SUDI Certificates	Cisco NCS 2000 Release 11.13	With this enhancement, the system now selects the correct Secure Unique Device Identification (SUDI) certificate combination on 400G-XP-LC and WSE cards, during encryption negotiations. This feature ensures that users can configure encryption without any errors or failures. The enhancement is applicable to both 10-Year and 99-Year certificate validity types.

Secure Unique Device Identification (SUDI) certificate is formatted as an X.509 certificate and conforms to the IEEE 802.1 AR standard. It is signed using Cisco's Root Certificate Authority. This certificate carries a unique identifier that is used to authenticate the peer card before the data is exchanged. Information cannot be exchanged with a card that is not authenticated.



Note SUDI certificates can only be programmed by the Cisco manufacturing team that manufactures the device and cannot be programmed using any other method.

The WSE, MR-MXP, and 400G-XP-LC cards use Software SUDI certificates for encryption. The Manufacturing Installed Certificates (MIC) are valid for 10 years from the date of manufacture or until the year 2029, whichever date comes first. All these cards that have already been shipped have 2029 SUDI certificates programmed. Once the expiration date of the certificates has passed, the following events take place:

- The Transport Layer Security (TLS) session used for encryption goes down.
- Encrypted traffic on WSE and MR-MXP cards will continue to flow using the last successfully negotiated encryption key until a service-impacting event occurs. After such an event, the encryption key will become invalid and traffic stops.
- Encrypted traffic on 400G-XP-LC cards will continue to flow using the last successfully negotiated encryption key for up to 44 hours, or until a service-impacting event occurs during the 44-hour window, following which, the traffic stops..

To prevent SUDI certificate expiration scenarios, upgrade the target node software to R11.1.2 or higher which supports a SUDI 2099 certificate with a validity date until the year 2099. The software utilizes SUDI 2099 certificates for cards that have already been shipped with SUDI 2099 certificates, per the rules outlined in Table 227. Users can check the currently used certificate in CTC by navigating to the target *WSE Card View* in the *Encryption* tab.

When migrating to R11.1.2 or a higher version, it is necessary to upgrade both endpoints of a link. If one endpoint is running on a previous release while the other endpoint is running on R11.1.2, a master key exchange failure may occur. This can happen due to incorrect SUDI Certificate negotiation. If the line card is programmed with both the SUDI 2029 and 2099 certificates, the software will automatically select the latest certificate based on the status of the peer card.

For more details, refer to the Field Notice 72217.

With R11.1.2 or higher, the following events occur when the SUDI certificate expires:

- The software reports a standing condition “MIC cert is expired switch to LSC.”
- When the certificate expiry date is passed, the software ignores the error if a Cisco certificate is installed and the certificate expires between the year 2023–2029.



Note To establish a TLS session in the WSE, MR-MXP, and 400G-XP-LC cards, either SUDI 2029 or SUDI 2099 certificates can be used at the same time. If a KEY-EX-FAIL alarm occurs between two cards with SUDI 2029 and SUDI 2099 certificates, perform a soft reset of the card with SUDI 2099 certificate allowing both the cards to be configured with the 2029 certificates.

We recommend upgrading to R11.12 or newer software before the SUDI certificate expires.

Table 266: SUDI Behavior of WSE, MR-MXP, and 400G-XP-LC Cards

Setup Combinations	Condition
Both the near-end and far-end cards have 2029 certificates	Both the cards boot with 2029 certificate.

Setup Combinations	Condition
Both the near-end and far-end cards have 2099 certificates	1. Both the cards boot with 2099 certificate . 2. If the user replaces the line card having a 2099 certificate with the line card having a 2029 certificate on one end, the Key Exchange Fail (KEY-EX-FAIL) alarm is raised. To clear this alarm, perform a soft reset on the line card which has the 2099 certificate to load the 2029 certificate.
One end has 2029 certificate, and another end has 2099 certificate	Both the cards initially boot with the 2029 certificate.

Setup Combinations	Condition
In this scenario, there are three line cards: LC1, LC2, and LC3. LC1 has a 2029 certificate programmed on it while LC2 and LC3 have 2029 and 2099 certificates programmed respectively. Test Case 1 (TC1) indicates encryption between LC1 and LC2 and Test Case 2 (TC2) indicates encryption between LC2 and LC3.	

Setup Combinations	Condition
	1. If encryption for TC1 is enabled first, LC1 and LC2 are configured with the 2029 certificates. However, encryption for TC2 is enabled later, LC2 and LC3 are also configured with the 2029 certificate, even though they already have both the 2029 and 2099 certificates programmed. This is because a line card with multiple SUDI certificates can only be configured with one certificate at a time. In this case, LC2 already has the 2029 certificate programmed on it, which is also available on all the other line cards. Hence, LC2 and LC3 are also configured with the 2029 certificate. 2. If encryption for TC2 is enabled first, LC2 and LC3 are configured with the 2099 certificates as the cards are programmed with both 2029 and 2099 certificates. However, if encryption for TC1 is enabled later, the KEY-EX-FAIL alarm is raised for TC1 since LC1 only has 2029 programmed on it. To clear the alarm, a soft reset of LC2 and LC3 is required to reconfigure the certificates, allowing all three cards to be configured with the 2029 certificates. 3. If a soft or hard reset is performed on LC1, followed by LC2 and LC3, all the cards are loaded with the 2029 certificates, even if LC2 and LC3 already have the 2029 and 2099 certificates programmed. This happens because a line card programmed with multiple SUDI certificates can only be configured with one certificate at a time. In this case, LC2 and LC3 already have the 2029 certificate programmed, which is also present on LC1. Therefore, all line cards are configured with the 2029 certificate. 4. If you perform a soft or hard reset on LC3 first and then on LC2, both cards are configured with the latest certificate (2099) programmed on them. However, if LC1 is soft or hard reset later, certificate verification and key exchange between LC2 and LC1 fails as LC1 only has 2029 programmed on it. To resolve this issue, perform a soft reset on LC2 and LC3 to load the 2029 certificate on the cards. **Note** We recommend enabling encryption or performing a soft or hard for the cards with older certificates first, followed by those with the latest certificate.

Improved CSR encryption using RSA-4096

Table 267: Feature History

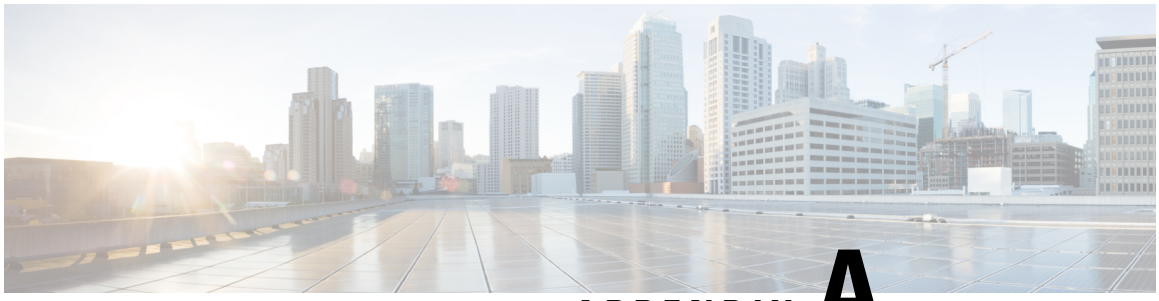
Feature Name	Release Information	Feature Description
Improved CSR encryption using RSA-4096	Cisco NCS 2000 Release 11.13	The 400G-XP-LC, WSE, and MR-MXP cards now support RSA-4096 for Certificate Signing Request (CSR) encryption. As the RSA-4096 uses a longer encryption key compared to previously supported RSA-2048 and RSA-3072, it improves the security level of the signed certificate.

From R11.13 onwards, support for RSA-4096 key length based certificates is enabled for generating CSR for the encryption module. This support is provided in addition to the currently supported key lengths ECDSA-p521, RSA-2048 and RSA-3072. You can now sign the CSR using a certificate with a key length upto 4096. The CSR with RSA-4096 key length is supported on the WSE, MR-MXP and 400G-XP-LC cards. Up to three signed certificates can be selected in CTC during import at a time.

From R11.13 onwards, 3000 bytes of storage is assigned to each certificate in the ACT2LITE device. This helps to generate the CSR with RSA-4096 key length and also to resolve the invalid certificate issue in CTC.



Note For RSA-4096 CSR, the user must wait for 40 minutes after the card turns to the active or standby mode, before attempting any CSR generate operation. The user must additionally wait for 40 minutes after the CSR generation operation before attempting another CSR generation operation on the same line card. Due to which the CSR generation now takes more time to complete.

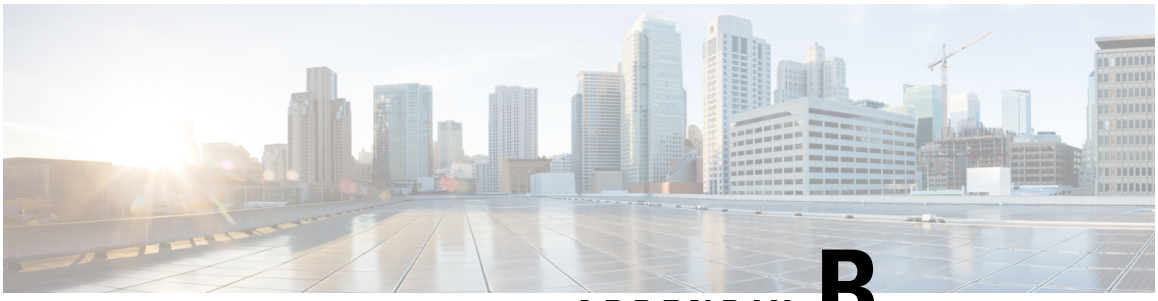


APPENDIX A

Configuring GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards Using PCLI

The information in this chapter is in a new location. See Configure GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards Using PCLI for information on how to provision GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards using Pseudo Command Line Interface (PCLI).

Configuring GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE Cards Using PCLI

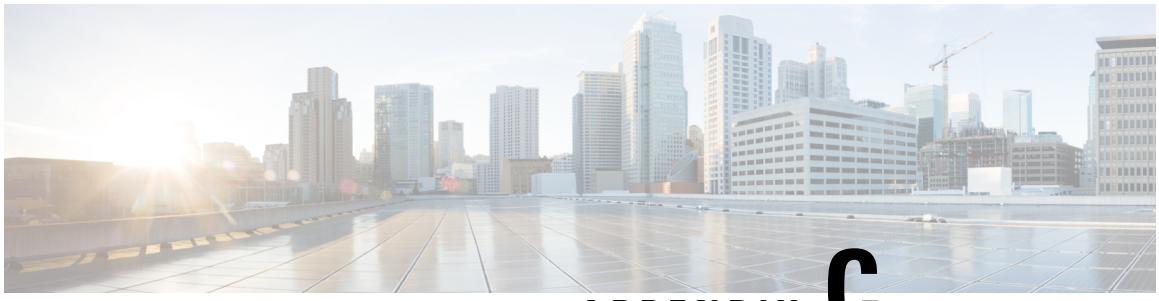


APPENDIX B

Pseudo Command Line Interface Reference

The information in this chapter is in a new location. See Pseudo Command Line Interface Reference for information related to Pseudo-IOS command line interface (PCLI) for GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards.

Pseudo Command Line Interface Reference



APPENDIX C

Card Features

This chapter describes features common to the Cisco NCS suite of cards.

Note The cards described in this chapter are supported on the Cisco NCS 2002 and Cisco NCS 2006 platforms, unless noted otherwise.

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

Note In this chapter, “100G-LC-C card” refers to the 15454-M-100G-LC-C card. “10x10G-LC” refers to the 15454-M-10x10G-LC card. “CFP-LC” refers to the 15454-M-CFP-LC card.

- Automatic Laser Shutdown, on page 692
- Card-Level Indicators, on page 692
- Port-Level Indicators, on page 694
- Client Interface, on page 700
- DWDM Interface, on page 700
- DWDM Trunk Interface, on page 701
- FEC, on page 702
- Timing Synchronization, on page 704
- Multiplexing Function, on page 706
- SONET/SDH Overhead Byte Processing, on page 706
- Client Interface Monitoring, on page 706
- Jitter, on page 707
- Lamp Test, on page 707
- NTP-G335 Performing Lamp Test, on page 707
- Onboard Traffic Generation, on page 708
- Performance Monitoring, on page 708
- Distance Extension, on page 708
- Interoperability with Cisco MDS Switches, on page 708

• Client and Trunk Ports, on page 708
• Automatic Power Control, on page 709
• Alarms and Thresholds, on page 709
• Card Protection, on page 709
• Far-End Laser Control, on page 715
• Jitter Considerations, on page 716
• Termination Modes, on page 716

Automatic Laser Shutdown

The Automatic Laser Shutdown (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 and is user-configurable.

For information on ALS provisioning, refer the following procedures, as necessary:

- NTP-G162 Changing the ALS Maintenance Settings
- DLP-G203 Changing the ALS Maintenance Settings for OSCM and OSC-CSM Cards
- DLP-G322 Changing the ALS Maintenance Settings for OPT-BST Card

Card-Level Indicators

Multiple colored LEDs indicate the status of the card.

Card-level LEDs for Transponder, Muxponder and Control Cards

The following table lists the three card-level LEDs on the following cards:

- TNC/TNCE/TSC/TSCE/TNCS
- TXP_MR_10G and TXP_MR_10E
- TXP_MR_10E_C and TXP_MR_10E_L
- TXP_MR_2.5G and TXPP_MR_2.5G
- 40E-TXP-C and 40ME-TXP-C
- MXP_2.5G_10G and MXP_2.5G_10E
- MXP_2.5G_10E_C and MXP_2.5G_10E_L
- MXP_MR_2.5G and MXPP_MR_2.5G
- MXP_MR_10DME_C and MXP_MR_10DME_L
- 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C
- GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE
- ADM-10G

- OTU2_XP
- TXP_MR_10EX_C
- MXP_2.5G_10EX_C
- MXP_MR_10DMEX_C
- PSM
- TDC-CC and TDC-FC
- AR_MXP, AR_XP, and AR_XPE
- 100G-LC-C, 10x10G-LC, CFP-LC, 100G-ME-C, 100G-CK-C, 100GS-CK-LC, , 200G-CK-LC, 100ME-CKC, 400G-XP-LC

Table 268: Card-Level Indicators

Card-Level LED	Description
FAIL LED (Red)	Red 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)	Green indicates that the card is operational (one or both ports active) and ready to carry traffic. Amber indicates that the card is operational and in standby (protect) mode.
SF LED (Amber)	Amber indicates a signal failure or condition such as loss of signal (LOS), loss of frame (LOF), or high bit error rates (BERs) on one or more of the card's ports. The amber SF LED is also illuminated if the transmit and receive fibers are incorrectly connected. If the fibers are properly connected and the link is working, the LED turns off.

Card-level LEDs on the Multiplexer, Demultiplexer and Optical Amplifier Cards

The following table lists the card-level LEDs on the following cards:

- 4MD-xx.x
- OPT-PRE, OPT-BST, OPT-BST-E
- OPT-AMP-17-C, and OPT-AMP-C
- OPT-RAMP-C and OPT-RAMP-CE
- 32WSS
- 32DMX, 40-DMX-C, 40-DMX-CE, and 40-MUX-C
- 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, and 16-WXC-FS
- 40-SMR1-C, 40-SMR2-C, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS
- OPT-EDFA-17 and OPT-EDFA-24

- EDRA-1-26, EDRA-1-35, EDRA-2-26, and EDRA-2-35

Table 269: Card-Level Indicators

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that there is an internal hardware failure. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the card is carrying traffic or is traffic-ready.
Amber SF LED	The amber SF LED indicates a signal failure on one or more of the card's ports. The amber SF LED also illuminates when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the light turns off.

Card-level LEDs on OSCM and OSC-CSM Cards

Table 270: Card-Level Indicators on the OSCM and OSC-CSM Cards

Card-Level Indicators	Description
Red FAIL LED	The red FAIL LED indicates that the card's processor is not ready or that there is an internal hardware failure. Replace the card if the red FAIL LED persists.
Green ACT LED	The green ACT LED indicates that the OSCM or OSC-CSM is carrying traffic or is traffic-ready.
Amber SF LED	The amber SF LED indicates a signal failure or condition such as loss of signal (LOS), loss of frame alignment (LOF), line alarm indication signal (AIS-L), or high BER on one or more of the card's ports. The amber signal fail (SF) LED also illuminates when the transmit and receive fibers are incorrectly connected. When the fibers are properly connected, the light turns off.

Port-Level Indicators

Port-level LEDs

For the following cards, the status of the card ports is indicated on the LCD screen of the ONS 15454 fan-tray assembly that displays the number and severity of alarms for a given port or slot.

- OPT-PRE, OPT-BST, OPT-BST-E
- OPT-AMP-17-C, and OPT-AMP-C
- OPT-RAMP-C and OPT-RAMP-CE
- RAMAN-CTP and RAMAN-COP
- EDRA-1-26, EDRA-1-35, EDRA-2-26, and EDRA-2-35

- OSCM and OSC-CSM
- 4MD-xx.x
- 32WSS
- 32DMX40-DMX-C, 40-DMX-CE, and 40-MUX-C
- 40-WSS-C, 40-WSS-CE, 40-WXC-C, 80-WXC-C, and 16-WXC-FS
- 40-SMR1-C, 40-SMR2-C, 17 SMR9 FS, 24 SMR9 FS, 34 SMR9 FS, and SMR20 FS
- OPT-EDFA-17 and OPT-EDFA-24

In some cards, multiple colored LEDs indicate the status of the port.

Port-Level LEDs for AR_MXP, AR_XP, and AR_XPE cards depend on the configured card mode.

The following table lists the port-level LEDs on the following cards:

- TXP_MR_10E, TXP_MR_10E_C, and TXP_MR_10E_L
- TXP_MR_2.5G and TXP_MR_10EX_C
- 40E-TXP-C and 40ME-TXP-C
- MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C

Table 271: Port-Level Indicators

Port-Level LED	Description
Green Client LED	The green Client LED indicates that the client port is in service and that it is receiving a recognized signal. The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards have four client ports, and so have 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.

Port-level LEDs on the TXP_MR_10G and MXP_2.5G_10G Cards

Table 272: Port-Level Indicators on the TXP_MR_10G and MXP_2.5G_10Gcards

Port-Level LED	Description
Green Client LED	The green Client LED indicates that the client port is in service and that it is receiving a recognized signal. The MXP_2.5G_10G 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.
Green Wavelength 1 LED	Each port supports two wavelengths on the DWDM side. Each wavelength LED matches one of the wavelengths. This LED indicates that the card is configured for Wavelength 1.

Port-Level LED	Description
Green Wavelength 2 LED	Each port supports two wavelengths on the DWDM side. Each wavelength LED matches one of the wavelengths. This LED indicates that the card is configured for Wavelength 2.

Port-level LEDs on the TXPP_MR_2.5G Card

Table 273: Port-Level Indicators on the TXPP_MR_2.5G card

Port-Level LED	Description
Green Client LED	The green Client LED indicates that the client port is in service and that it is receiving a recognized signal.
Green DWDM A LED	The green DWDM A LED indicates that the DWDM A port is in service and that it is receiving a recognized signal.
Green DWDM B LED	The green DWDM B LED indicates that the DWDM B port is in service and that it is receiving a recognized signal.

Port-level LEDs on the GE_XP, 10DME and 40G Cards

The following table lists the port-level LEDs on the following cards:

- GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE
- MXP_MR_10DME_C, MXP_MR_10DME_L, and MXP_MR_10DMEX_C
- 40G-MXP-C, 40E-MXP-C, and 40ME-MXP-C

Table 274: Port-Level Indicators

Port-Level LED	Description
Port LEDs (eight LEDs, four for each group, one for each SFP/XFP) Green/Red/Amber/Off	Green—The client port is either in service and receiving a recognized signal (that is, no signal fail), or Out of Service and Maintenance (OOS,MT or locked, maintenance) in which case the signal fail and alarms will be ignored. Red—The client port is in service but is receiving a signal fail (LOS). Amber—The port is provisioned and in a standby state. Off—The SFP is either not provisioned, out of service, not properly inserted, or the SFP hardware has failed.
Green DWDM LED	The green DWDM LED indicates that the DWDM port is in service and that it is receiving a recognized signal.

Port-level LEDs on the MXP_MR_2.5G and MXPP_MR_2.5G Cards

Table 275: Port-Level Indicators on the MXP_MR_2.5G and MXPP_MR_2.5G cards

Port-Level LED	Description
Client LEDs (eight LEDs)	Green indicates that the port is carrying traffic (active) on the interface. Amber indicates that the port is carrying protect traffic (MXPP_MR_2.5G). Red indicates that the port has detected a loss of signal.
DWDM LED (MXP_MR_2.5G) Green (Active) Red (LOS)	Green indicates that the card is carrying traffic (active) on the interface. A red LED indicates that the interface has detected an LOS or LOC.
DWDMA and DWDMB LEDs (MXPP_MR_2.5G) Green (Active) Amber (Protect Traffic) Red (LOS)	Green indicates that the card is carrying traffic (active) on the interface. When the LED is amber, it indicates that the interface is carrying protect traffic in a splitter protection card (MXPP_MR_2.5G). A red LED indicates that the interface has detected an LOS or LOC.

Port-level LEDs on the ADM-10G and OTU2_XP Cards

Note Client or trunk ports can each be in active or standby mode as defined in the related section for each specific protection type. For example, fiber-switched protection has active or standby trunk ports; 1+1 APS protection has active or standby client ports, and client 1+1 protection does not utilize active or standby ports.

Table 276: Port-Level Indicators on the ADM-10G and OTU2_XP cards (client and trunk ports)

Port-Level Status	Tri-color LED Description
The port-level LED is active and unprotected.	• If a port is in OOS/locked state for any reason, the LED is turned off. • If a port is in IS/unlocked state and the PPM is preprovisioned or is physically equipped with no alarms, the LED is green. • If a port is in IS state and the PPM is physically equipped but does have alarms, the LED is red.
The port-level LED is in standby.	• If a port is in OOS/locked state for any reason, the LED is turned off. • If a port is in the IS/unlocked state and the PPM is preprovisioned or is physically equipped with no alarms, the LED is amber. • If a port is in IS state and physically equipped but does have alarms, the LED is red.

Port-level LEDs on the 100G-LC-C, 10x10G-LC, CFP-LC, 100GS-CK-LC, 200G-CK-LC, 100G-CK-C, 100G-ME-C, 100ME-CKC, and 400G-XP-LC Cards

Table 277: Port-Level Indicators

Port-Level LED	Description
Port LEDs (Green/Red/Amber/Off	Green—The client port is either in service and receiving a recognized signal (that is, no signal fail), or Out of Service and Maintenance (OOS,MT or locked, maintenance) in which case the signal fail and alarms will be ignored. Red—The client port is in service but is receiving a signal fail (LOS). Amber—The port is provisioned and in a standby state. Off—The pluggable is either not provisioned, out of service, not properly inserted, or the pluggable hardware has failed.
DWDM LED Green (Active) Amber (Protect Traffic) Red (LOS)	Green indicates that the card is carrying traffic (active) on the interface. When the LED is amber, it indicates that the interface is carrying protect traffic in a splitter protection card. A red LED indicates that the interface has detected an LOS or LOF.

Power-level LEDs on the Control Cards

Table 278: Power-Level Indicators on the Control Cards

Power-Level LEDs	Definition
Green/Amber/Red PWR A LED	The PWR A LED is green when the voltage on supply input A is between the low battery voltage (LWBATVG) and high battery voltage (HIBATVG) thresholds. The LED is amber when the voltage on supply input A is between the high battery voltage and extremely high battery voltage (EHIBATVG) thresholds or between the low battery voltage and extremely low battery voltage (ELWBATVG) thresholds. The LED is red when the voltage on supply input A is above extremely high battery voltage or below extremely low battery voltage thresholds.
Green/Amber/Red PWR B LED	The PWR B LED is green when the voltage on supply input B is between the low battery voltage and high battery voltage thresholds. The LED is amber when the voltage on supply input B is between the high battery voltage and extremely high battery voltage thresholds or between the low battery voltage and extremely low battery voltage thresholds. The LED is red when the voltage on supply input B is above extremely high battery voltage or below extremely low battery voltage thresholds.

Note The power-level LEDs are either green or red. The LED is green when the voltage on supply inputs is between the extremely low battery voltage and extremely high battery voltage thresholds. The LED is red when the voltage on supply inputs is above extremely high battery voltage or below extremely low battery voltage thresholds.

Network-level LEDs on the Control Cards

Table 279: Network-Level Indicators on the Control Cards

System-Level LEDs	Definition
Red CRIT LED	Indicates critical alarms in the network at the local terminal.
Red MAJ LED	Indicates major alarms in the network at the local terminal.
Yellow MIN LED	Indicates minor alarms in the network at the local terminal.
Red REM LED	Provides first-level alarm isolation. The remote (REM) LED turns red when an alarm is present in one or more of the remote terminals.
Green SYNC LED	Indicates that node timing is synchronized to an external reference.
Green ACO LED	After pressing the alarm cutoff (ACO) button, the ACO LED turns green. The ACO button opens the audible alarm closure on the backplane. ACO is stopped if a new alarm occurs. After the originating alarm is cleared, the ACO LED and audible alarm control are reset.

Ethernet Port-level LEDs on the Control Cards

Table 280: Ethernet Port-Level Indicators on the TNC/TNCE/TSC/TSCE/TNCS Cards

Port-Level LEDs	Definition
Green LINK LED	Indicates the connectivity status.
Amber ACT LED	Indicates data reception.

SFP LEDs on TNC, TNCE, and TNCS Cards

Table 281: TNC, TNCE, and TNCS SFP Indicators

Port Type	Link LED	Activity LED
OC3	• RED - No link • GREEN - Link	—

Port Type	Link LED	Activity LED
FE	• RED - No link • GREEN - Link	Blinks on packet flow
GE	• RED - No link • GREEN - Link	Blinks on packet flow

Client Interface

The client interface in TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards is implemented with a separately orderable XFP module. The module is a tri-rate transceiver, providing a single port that can be configured in the field to support an OC-192 SR-1 (Telcordia GR-253-CORE) or STM-64 I-64.1 (ITU-T G.691) optical interface, as well as 10GE LAN PHY (10GBASE-LR), 10GE WAN PHY (10GBASE-LW), 10G FC signals or IB_5G signals (TXP_MR_10EX_C only).

The client side XFP pluggable module supports LC connectors and is equipped with a 1310-nm laser.

The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards provide four intermediate- or short-range OC-48/STM-16 ports per card on the client side. Both SR-1 or IR-1 optics can be supported and the ports use SFP connectors. The client interfaces use four lasers of 1310-nm wavelength.

The client interface in AR_MXP, AR_XP, and AR_XPE cards are implemented with a separately orderable XFP/SFP module. The module can be single-rate or tri-rate transceiver, providing a single port that can be configured in the field to support available payloads. For the list of supported payloads, see the section.

DWDM Interface

The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards serve as an OTN multiplexer, transparently mapping four OC-48 channels asynchronously to ODU1 into one 10-Gbps trunk. The tunable wavelengths for the DWDM trunk is as follows:

- MXP_2.5G_10E—Tunable for transmission over four wavelengths in the 1550-nm, ITU 100-GHz spaced channel grid.
- MXP_2.5G_10E_C and MXP_2.5G_10EX_C—Tunable for transmission over the entire C-band and the channels are spaced at 50-GHz on the ITU grid.
- MXP_2.5G_10E_L—Tunable for transmission over the entire L-band and the channels are spaced at 50-GHz on the ITU grid.
- AR_MXP, AR_XP, and AR_XPE—The wavelengths for the DWDM trunk is based on the pluggable.
  - 100G-LC-C, 10X10G-LC, CFP-LC, 100G-ME-C, 100GS-CK-LC, 200G-CK-LC, 100G-CK-C, and 100ME-CKC—Tunable on 96 wavelength channels spaced at 50-GHz on the ITU grid over the entire C band.

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

Note On the MXP_2.5G_10EX_C card, you cannot disable ITU-T G.709 on the trunk side. If ITU-T G.709 is enabled, then FEC cannot be disabled.

DWDM Trunk Interface

On the trunk side, the TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, and TXP_MR_10EX_C cards provide a 10-Gbps STM-64/OC-192 interface. There are four tunable channels available in the 1550-nm band or eight tunable channels available in the 1580-nm band on the 50-GHz ITU grid for the DWDM interface. The card provides 3R (retime, reshape, and regenerate) transponder functionality for this 10-Gbps trunk interface. Therefore, the card is suited for use in long-range amplified systems. The DWDM interface is complaint with ITU-T G.707, ITU-T G.709, and Telcordia GR-253-CORE standards.

The DWDM trunk port operates at a rate that is dependent on the input signal and the presence or absence of the ITU-T G.709 Digital Wrapper/FEC. The possible trunk rates are:

- OC192 (9.95328 Gbps)
- OTU2 (10.70923 Gbps)
- 10GE (10.3125 Gbps) or 10GE into OTU2 (ITU G.sup43 11.0957 Gbps)
- 10G FC (10.51875 Gbps) or 10G FC into OTU2 (nonstandard 11.31764 Gbps)
- (TXP_MR_10EX_C only) Proprietary rate at the trunk when the client is provisioned as IB_5G.

The maximum system reach in filterless applications without the use of optical amplification or regenerators is nominally rated at 23 dB over C-SMF fiber. This rating is not a product specification, but is given for informational purposes. It is subject to change.

On the trunk side, the AR_MXP, AR_XP, and AR_XPE cards provide a 10-Gbps OTU2 or 2.5-Gbps OTU1 or 4-Gbps FC interfaces. The trunk wavelength can be tuned to any C-band wavelength, based on the pluggable inserted. The card provides 3R (retime, reshape, and regenerate) transponder functionality for this 10-Gbps trunk interface. Therefore, the card is suited for use in the long-range amplified systems. The DWDM interface is complaint with ITU-T G.707, ITU-T G.709, and Telcordia GR-253-CORE standards. The DWDM trunk port operates at a rate that is dependent on the input signal and the presence or absence of the ITU-T G.709 Digital Wrapper/FEC.

The maximum system reach in filterless applications without the use of optical amplification or regenerators is nominally rated at 23 dB over C-SMF fiber. This rating is not a product specification, but is given for informational purposes. It is subject to change.

FEC

Forward error correction (FEC) is a feature used for controlling errors during data transmission. This feature works by adding data redundancy to the transmitted message using an algorithm. This redundancy allows the receiver to detect and correct a limited number of errors occurring anywhere in the message, instead of having to ask the transmitter to resend the message.

FEC Modes for the TXP_MR_10E and MXP_2.5G_10E Cards

For the TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, TXP_MR_10EX_C, or MXP_2.5G_10EX_C card, you can configure the forward error correction in three modes: NO FEC, FEC, and E-FEC modes.

The E-FEC mode has a higher level of error detection and correction than the FEC mode. As a result, using the E-FEC mode allows higher sensitivity (that is, a lower optical signal-to-noise ratio [OSNR]) with a lower bit error rate than what the FEC mode allows. The E-FEC mode also enables longer distance trunk-side transmission than what the FEC enables.

The output bit rate is always 10.7092 Gbps as defined in the ITU-T G.709 standard, but the error coding performance can be provisioned in this way:

- NO FEC—No forward error correction
- FEC—Standard ITU-T G.975 Reed-Solomon algorithm
- E-FEC—Standard ITU-T G.975.1 I.7, two orthogonally concatenated BCH super FEC code. This FEC scheme contains three parameterizations of a single scheme of two orthogonally interleaved BCH. The constructed code is decoded iteratively to achieve the expected performance.

FEC Modes for the AR_MXP, AR_XP and AR_XPE Cards

For the AR_MXP, AR_XP, and AR_XPE cards you can configure forward error correction on 10 Gbps trunk XFP ports in four modes: NO FEC, FEC, I.4 E-FEC, and I.7 E-FEC. The 2.5Gbps SFP OTN ports have only two modes of operation: NO FEC and FEC. The output bit rate varies depending on the provisioned payload and the configured FEC. The details of the error-coding performance that can be provisioned are:

- NO FEC—No forward error correction
- FEC—Standard ITU-T G.975 Reed-Solomon algorithm
- I.4 E-FEC—Standard G.975.1 I.4 two interleaved codes (RS and BCH) super FEC codes
- I.7 E-FEC— Standard G.975.1 I.7 two orthogonally concatenated block (BCH) super FEC codes; this FEC scheme contains three parameterizations of a single scheme of two BCH codes, with the constructed code decoded iteratively to achieve expected performance.



Note G.709 OTN is enabled by default for all trunk ports, except for a 4GFC transponder.

FEC Modes for 100G-LC-C, CFP-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, and 400G-XP-LC Cards

The cards support multiple FEC modes on its trunk and client interfaces.

- FEC—Standard ITU-T G.975 Reed-Solomon algorithm with 7% overhead.
- I.7 FEC—Standard G.975.1 I.7 two orthogonally concatenated block (BCH) super FEC codes; this FEC scheme contains three parameterizations of a single scheme of two BCH codes, with the constructed code decoded iteratively to achieve expected performance.
- Soft Decision FEC—Employs an advanced differential encoding and cycle slip-aware algorithm offering excellent performance and robustness against high cycle slip rates. The SD-FEC is suitable for applications where maintaining sufficient signal to noise ratio is important. Examples include long haul and ultra-long haul 100G transmission, and wavelengths employing high order modulation schemes such as 16QAM.
- High Gain FEC—High Gain FEC with 7% or 20% overhead provides better performance than the standard G.975.1. The HG-FEC is suitable for all applications where 100G wavelengths are passing through a high number of ROADM nodes, with limited pass-band performance.



Note G.709 OTN is enabled by default for OTU payloads.

- Hard Decision FEC—The HD-FEC with 7% overhead can be provisioned on the 100GS-CK-LC and 200G-CK-LC cards to allow trunk interoperability with the 100G-LC-C and 100G-CK-LC (older Line Cards). The 100GS-CK-LC and 200G-CK-LC cards provisioned with 7% HD-FEC has 0.5dB better B2B OSNR sensitivity than the 100G-LC-C and 100G-CK-LC cards. This FEC mode is available for all 100G operating modes.

Table 282: Supported FEC Modes for 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, and 400G-XP-LC Cards

Card	Supported FEC Modes
100G-LC-C	• Standard • 7% High Gain • 20% High Gain
CFP-LC	• GFEC
100G-CK-C	• Standard • 7% High Gain • 20% High Gain
100GS-CK-LC	• Standard • 7% Hard Decision • 20% Soft Decision

Card	Supported FEC Modes
200G-CK-LC	• Standard • 7% Hard Decision • 20% Soft Decision
400G-XP-LC	• 15% Soft Decision Differential Encoding (DE) OFF • 25% Soft Decision Differential Encoding (DE) OFF • 15% Soft Decision Differential Encoding (DE) ON • 25% Soft Decision Differential Encoding (DE) ON

Client-to-Trunk Mapping

The TXP_MR_10E, TXP_MR_10E_C, TXP_MR_10E_L, TXP_MR_10EX_C, AR_MXP, AR_XP, and AR_XPE cards can perform ODU2-to-OCh mapping, which allows operators to provision data payloads in a standard way across 10-Gbps optical links. Additionally, the AR_MXP, AR_XP, and AR_XPE cards can perform ODU1-to-OCh mapping across 2.5 Gbps optical links.

Digital wrappers that define client side interfaces are called Optical Data Channel Unit 2 (ODU2) entities in ITU-T G.709. Digital wrappers that define trunk side interfaces are called Optical Channels (OCh) in ITU-T G.709. ODU2 digital wrappers can include Generalized Multiprotocol Label Switching (G-MPLS) signaling extensions to ITU-T G.709 (such as Least Significant Part [LSP] and Generalized Payload Identifier [G-PID] values) to define client interfaces and payload protocols.

Timing Synchronization

The TNC/TNCE/TSC/TSCE/TNCS card performs all the system-timing functions for the NCS 2000 Series shelves.

Note Due to memory limitations, TCC2/TCC2P cards are not supported from Release 10.5.2 onwards. As a result, in a multishelf configuration, the TCC2/TCC2P card cannot be a node controller or a shelf controller. Upgrade the TCC2/TCC2P card to a TCC3 card.

The control card monitors the recovered clocks from each traffic card and two BITS ports for frequency accuracy. The control card selects a recovered clock, a BITS, or an internal Stratum 3 reference as the system-timing reference. You can provision any of the clock inputs as primary or secondary timing sources. A slow-reference tracking loop allows the control card to synchronize with the recovered clock, which provides holdover if the reference is lost. The control card supports 64/8K composite clock and 6.312 MHz timing output.

Note The TNC/TNCE/TSC/TSCE/TNCS card supports the BITS-1 and BITS-2 external timing interfaces on the NCS 2006 and NCS 2015 shelves. The card supports the BITS-1 interface on the NCS 2002 shelf.

The TNC/TNCE/TSC/TSCE/TNCS card supports SNTP operation that allows the nodes to synchronize the system clock automatically with a reference SNTP server following system reboots, card resets, and software upgrades.

For more information on the timing function, see Timing Reference document.

The MXP_2.5G_10G card is synchronized to the the control card clock during normal conditions and transmits the ITU-T G.709 frame using this clock. The control card can operate from an external building integrated timing supply (BITS) clock, an internal Stratum 3 clock, or from clock recovered from one of the four valid client clocks. If clocks from both the control cards are not available, the MXP_2.5G_10G card switches automatically (with errors, not hitless) to an internal 19.44 MHz clock that does not meet SONET clock requirements. This will result in a clock alarm.

The MXP_2.5G_10E and MXP_2.5G_10EX_C cards are synchronized to the control clock and the MXP_2.5G_10E_C and MXP_2.5G_10E_L cards are synchronized to the control card clock during normal conditions and transmits the ITU-T G.709 frame using this clock. No holdover function is implemented. If neither control clock is available, the cards switch automatically (hitless) to the first of the four valid client clocks with no time restriction as to how long it can run on this clock. The cards continue to monitor the control card. If a control card is restored to working order, the cards revert to the normal working mode of running from the control-card clock. If no valid control-card clock is available and all of the client channels become invalid, the cards wait (no valid frames processed) until the control card supplies a valid clock. In addition, the cards can select the recovered clock from one active and valid client channel and supply that clock to the control card card.

The AR_MXP, AR_XP, and AR_XPE cards are able to transparently transport synchronization and timing information for payload enveloped within ODU-1 and ODU-2. The AR_MXP and AR_XP cards are synchronized to the control card clock during normal conditions and transmit the ITU-T G.709 frame using this clock. The AR_XPE card is synchronized to the control card clock during normal conditions and transmit the ITU-T G.709 frame using this clock. The AR_MXP, AR_XP, and AR_XPE cards select its synchronization source between an optical line, an external synchronization input, and the internal source. The optical line can be either OCN, OTN or Ethernet based. The AR_MXP and AR_XP cards transmit the SyncE information from an incoming SyncEthernet (ITU-T G.8262 and G.8264 ESMC) signal to the node controller (TNC).

The 100G-LC-C, 10x10G-LC, CFP-LC, 100G-ME-C, 100G-CK-C, and 100ME-CKC cards are synchronized to TNC/TSC/TNCE/TSCE/TNCS clock during normal conditions and transmits the ITU-T G.709 frame using this clock.

The 100GS-CK-LC and 200G-CK-LC cards cannot be used as a timing reference source.

Note Only one port per card can be selected as a timing reference. The OTN ports configured as clients shall not be provisionable as timing source.

Multiplexing Function

The muxponder is an integral part of the reconfigurable optical add/drop multiplexer (ROADM) network. The key function of the MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, MXP_2.5G_10EX_C, AR_MXP, AR_XP, and AR_XPE 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.

Termination mode transparency on the muxponder is configured using OTUx and ODUx OH bytes. The ITU-T G.709 specification defines OH byte formats that are used to configure, set, and monitor frame alignment, FEC mode, section monitoring, tandem connection monitoring, and termination mode transparency.

The card performs ODU to OTU multiplexing as defined in ITU-T G.709. The ODU is the framing structure and byte definition (ITU-T G.709 digital wrapper) used to define the data payload coming into one of the SONET/SDH client interfaces on the card. The term ODU1 refers to an ODU that operates at 2.5-Gbps line rate. On the card, four client interfaces can be defined using ODU1 framing structure and format by asserting an ITU-T G.709 digital wrapper.

The output of the muxponder is a single 10-Gbps DWDM trunk interface defined using OTU2. It is within the OTU2 framing structure that FEC or E-FEC information is appended to enable error checking and correction.

SONET/SDH Overhead Byte Processing

The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, MXP_2.5G_10EX_C, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, 100G-ME-C, and 100ME-CKC cards pass the incoming SONET/SDH data stream and its overhead bytes for the client signal transparently. The card can be provisioned 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.

Client Interface Monitoring

The following parameters are monitored on the MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, MXP_2.5G_10EX_C, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 100GS-CK-LC, , 200G-CK-LC, 100G-ME-C, and 100ME-CKC cards:

- Laser bias current is measured as a PM parameter
- LOS is detected and signaled
- Transmit (TX) and receive (RX) 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 loss of communication (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.

Jitter

For SONET and SDH signals, the MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, MXP_2.5G_10EX_C, AR_MXP, AR_XP, AR_XPE cards comply with Telcordia GR-253-CORE, ITU-T G.825, and ITU-T G.873 for jitter generation, jitter tolerance, and jitter transfer. For more information, see the Jitter Considerations, on page 716.

Lamp Test

The MXP_2.5G_10E, MXP_2.5G_10E_C and MXP_2.5G_10E_L, MXP_2.5G_10EX_C, AR_MXP, AR_XP, AR_XPE, TDC-CC, TDC-FC, TNC, TNCE, TSC, TSCE, TNCS, RAMAN-CTP, and RAMAN-COP cards support lamp test function activated from the shelf front panel or through CTC to ensure that all LEDs are functional.

The Lamp Test is run during the initial node turn-up, periodic maintenance routine, identification of specific cards, or LED testing.

NTP-G335 Performing Lamp Test

Purpose	This procedure performs lamp test at the shelf and card levels.
Tools/Equipment	None
Prerequisite Procedures	DLP-G46 Log into CTC
Required/As Needed	As needed
Onsite/Remote	Onsite or remote
Security Level	Superuser only

Procedure

Step 1 In node view (single-shelf mode) or multishelf view (multishelf mode), click the **Maintenance**> **Diagnostic** tab.

Step 2 Click the **Lamp Test** button. The **Lamp Test** dialog box appears.

Step 3 Perform lamp test at the shelf level.

- Select the **All** option.
- Click **Lamp Test**.

Step 4 Perform lamp test at the card level.

- Select the **Lamp Test For Slot** option
- Choose the required Slot ID or card from the drop-down list.

- Click **Slot Lamp Test**.

Note
Cards in pre-provisioned or improper removal state are not listed in the drop-down list.

Stop. You have completed this procedure.

Onboard Traffic Generation

The MXP_2.5G_10E, MXP_2.5G_10E_C, MXP_2.5G_10E_L, and MXP_2.5G_10EX_C cards provide internal traffic generation for testing purposes according to pseudo-random bit sequence (PRBS), SONET/SDH, or ITU-T G.709.

Performance Monitoring

GFP-T performance monitoring (GFP-T PM) in MXP_MR_2.5G, MXPP_MR_2.5G, AR_MXP, AR_XP, AR_XPE, 100G-LC-C, 10x10G-LC, 100G-CK-C, 100GS-CK-LC, 200G-CK-LC, 100G-ME-C, and 100ME-CKC cards are available via remote monitoring (RMON), and trunk PM is managed according to Telcordia GR-253-CORE and ITU G.783/826. Client PM is achieved through RMON for FC and GE.

Distance Extension

In MXP_MR_2.5G and MXPP_MR_2.5G cards, buffer-to-buffer credit management scheme provides FC flow control. When this feature is enabled, a port indicates the number of frames that can be sent to it (its buffer credit), before the sender is required to stop transmitting and wait for the receipt of a “ready” indication The MXP_MR_2.5G and MXPP_MR_2.5 cards support FC credit-based flow control with a buffer-to-buffer credit extension of up to 1600 km (994.2 miles) for 1G FC and up to 800 km (497.1 miles) for 2G FC. The feature can be enabled or disabled, as necessary.

Interoperability with Cisco MDS Switches

You can provision a string (port name) for each fiber channel/FICON interface on the MXP_MR_2.5G and MXPP_MR_2.5G cards, which allows the MDS Fabric Manager to create a link association between that SAN port and a SAN port on a Cisco MDS 9000 switch.

Client and Trunk Ports

The MXP_MR_2.5G card features a 1550-nm laser for the trunk/line port and a 1310-nm or 850-nm laser (depending on the SFP) for the client ports. The card contains eight 12.5 degree downward tilt SFP modules for the client interfaces. For optical termination, each SFP uses two LC connectors, which are labeled TX and RX on the faceplate. In a MXP_MR_2.5G card, the trunk port is a dual-LC connector with a 45 degree

downward angle. In a MXPP_MR_2.5G card, there are two trunk port connectors (one for working and one for protect), each a dual-LC connector with a 45-degree downward angle.

Automatic Power Control

A transient gain range of 20 to 23 dB is available to APC in order to permit other amplifiers to reach their expected set points. However, operation in this range is not continuous. At startup, the OPT-AMP-17-C card caps the gain at a maximum of 20 dB.

Note When the OPT-AMP-17-C operates as a booster amplifier, APC does not control its gain.

Alarms and Thresholds

The following table lists the alarms and its related thresholds for the OSC-CSM card.

Table 283: Alarms and Thresholds

Port	Alarms	Thresholds
LINE RX	LOS	None
	LOS-P	LOS-P Fail Low
	LOS-O	LOS-O Fail Low
LINE TX	None	None
OSC TX	OPWR-DEG-HIGH	OPWR-DEG-HIGH Th
	OPWR-DEG-LOW	OPWR-DEG-LOW Th
	OPWR-FAIL-LOW	OPWR-FAIL-LOW Th
OSC RX	None	None
COM TX	None	None
COM RX	LOS-P	LOS-P Fail Low

Card Protection

Y-Cable and Splitter Protection

Y-cable and splitter protection are two main forms of card protection that are available for TXP, MXP, AR_MXP, AR_XP, AR_XPE, and Xponder (GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, and OTU2_XP)

cards when they are provisioned in TXP or MXP mode. Y-cable protection is provided at the client port level. Splitter protection is provided at the trunk port level.

Note GE_XP, 10GE_XP, GE_XPE, and 10GE_XPE cards use VLAN protection when they are provisioned in L2-over-DWDM mode. For more information, see the Layer 2 Over DWDM Protection, on page 715. The ADM-10G card uses path protection and 1+1 protection. For more information, see the Protection section.

Y-Cable Protection Availability on TXP, MXP, and Xponder Cards

Y-cable protection is available for the following ONS 15454 TXP, MXP, and Xponder cards:

- TXP_MR_10G
- TXP_MR_10E
- TXP_MR_2.5G
- 40E-TXP-C
- 40ME-TXP-C
- MXP_2.5G_10G
- MXP_2.5G_10E
- MXP_2.5G_10E_C
- MXP_2.5G_10E_L
- MXP_MR_2.5G
- MXP_MR_10DME_C
- MXP_MR_10DME_L
- 40G-MXP-C
- 40E-MXP-C
- 40ME-MXP-C
- GE_XP and GE_XPE (when in 10GE or 20GE MXP card mode)
- 10GE_XP and 10GE_XPE (when in 10GE TXP card mode)
- OTU2_XP (when in Transponder card configuration)
- AR_MXP
- AR_XP
- AR_XPE
- 10x10G-LC (when in TXP-10G or MXP-10G mode)—The client ports of the 10x10G-LC cards are provisioned with OC192/STM-64, 10GE-LAN, OTU2, OTU2e, 8G FC, and 10G FC payloads.

Y-cable protection is supported when the 10x10G-LC card is configured in MXP-10x10G operating mode with 200G-CK-LC card and the 10x10G-LC card is provisioned with 10GE, OC-192/STM-64 payloads. This configuration uses the ONS-SC+-10G-LR and ONS-SC+-10G-SR pluggables.



Note A hardware reset or a hardware failure of the active 10x10G-LC card configured in the TXP-10G or MXP-10G mode in a Y-cable configuration causes a protection switchover that may result in a traffic hit of more than 50 msec.

- CFP-LC (when in CFP-TXP mode)—The client ports of the CFP-LC cards are provisioned with 100GE payloads. This configuration uses only the CFP LR4 pluggable.
- CFP-LC (when in CFP-MXP mode)—The client ports of the CFP-LC cards are provisioned with 40GE payloads. This configuration uses only the CFP LR4 pluggable.
- 200G-CK-LC (when in TXP-100G mode)—Y-cable protection is supported when the 200G-CK-LC card is configured in TXP-100G operating mode and the 100G client CPAK ports are provisioned with 100GE payload. This configuration uses the CPAK-100G-LR4 pluggable.
- 100G-CK-C—The client ports of the 100G-CK-C cards are provisioned with 100GE/OTU4 payloads. This configuration uses only the CPAK-100G-LR4 pluggable.
- 100GS-CK-LC and 200G-CK-LC—Y-cable protection is supported in MXP-10x10G operating mode.

Setting-up Y-Cable Protection

To set up Y-cable protection, create a Y-cable protection group for two TXP, MXP, or Xponder cards using Cisco Transport Controller (CTC). Next, connect the client ports of the two cards physically with a Y-cable. The single client signal is sent into the RX Y-cable and is split between the two TXP, MXP, or Xponder cards. The two TX signals from the client side of the TXP, MXP, or Xponder cards are combined in the TX Y-cable into a single client signal. Only the active card signal passes through as the single TX client signal. CTC automatically turns off the laser on the protect card to avoid signal interference where the Y-cable joins.

On the GE_XP, 10GE_XP, GE_XPE, 10GE_XPE, and OTU2_XP cards, the Y-cable 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. Y-cable protection also supports revertive and nonrevertive mode.

When an MXP_MR_2.5G, MXP_MR_10DME_C, MXP_MR_10DME_L, AR_MXP, AR_XP, or AR_XPE card that is provisioned with Y-cable protection is used on a storage ISL link (ESCON, FC1G, FC2G, FC4G, FICON1G, FICON2G, FICON4G, or ISC-3 1/2G), a protection switchover resets the standby port to active. This reset reinitialises the end-to-end link to avoid any link degradation caused due to loss of buffer credits during switchover and results in an end-to-end traffic hit of 15 to 20 seconds.

When using the MXP_MR_10DME_C or MXP_MR_10DME_L card, enable the fast switch feature and use it with a Cisco MDS storage switch to avoid this 15 to 20 second traffic hit. When enabling fast switch on the MXP_MR_10DME_C or MXP_MR_10DME_L card, ensure that the attached MDS switches have the buffer-to-buffer credit recovery feature enabled.

You can also use the TXP_MR_2.5G card to avoid this 15 to 20 second traffic hit. When a Y-cable protection switchover occurs, the storage ISL link does not reinitialize and results in an end-to-end traffic hit of less than 50 ms.

AR_MXP, AR_XP, and AR_XPE cards support Y-cable protection on the client ports, which are part of an unprotected card mode. The Y-cable protection is not supported for video and auto payloads.

When using the AR_MXP, AR_XP, or AR_XPE card on storage ISL link, use it with a Cisco MDS storage switch to avoid this 15 to 20 second traffic hit.

When the active AR_MXP, AR_XP, AR_XPE card is removed from the shelf, there is a traffic hit of 60 to 100 ms.

Note Y-cable connectors will not work with electrical SFPs because Y-cables are made up of optical connectors and it is not possible to physically connect them to an electrical SFP. Y-cable protection is not supported on IB_5G.

Note There is a traffic hit of up to a of couple hundred milliseconds on the MXP_MR_2.5G and MXP_MR_10DME cards in Y-cable configuration when a fiber cut or SFP failure occurs on one of the client ports.

Note If you create a GCC on either card of the protect group, the trunk port stays permanently active, regardless of the switch state. When you provision a GCC, you are provisioning unprotected overhead bytes. The GCC is not protected by the protect group.

Note Loss of Signal–Payload (LOS-P) alarms, also called Incoming Payload Signal Absent alarms, can occur on a split signal if the ports are not in a Y-cable protection group.

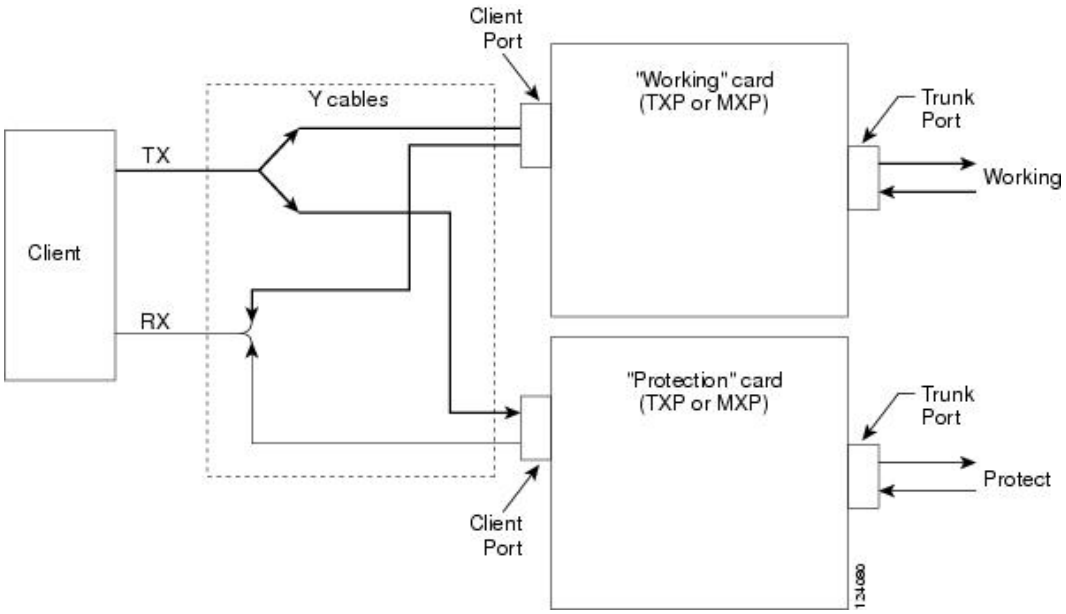
Note Removing an SFP from the client ports of a card in a Y-cable protection group card causes an IMPROPRMVL (PPM) alarm. The working and protected port raises the IMPROPRMVL alarm. The severity on the client ports is changed according to the protection switch state.

Note On the OTU2_XP card, when the 10G Ethernet LAN Phy to WAN Phy conversion feature is enabled, Y-cable protection is not supported on the LAN to WAN interface (ports 1 and 3).

Note When using fixed DWDM or tunable XFPs for Y-cable protection, the protection switch time may exceed 50 ms.

The following figure shows the Y-cable signal flow.

Figure 51: Y-Cable Protection



Splitter Protection

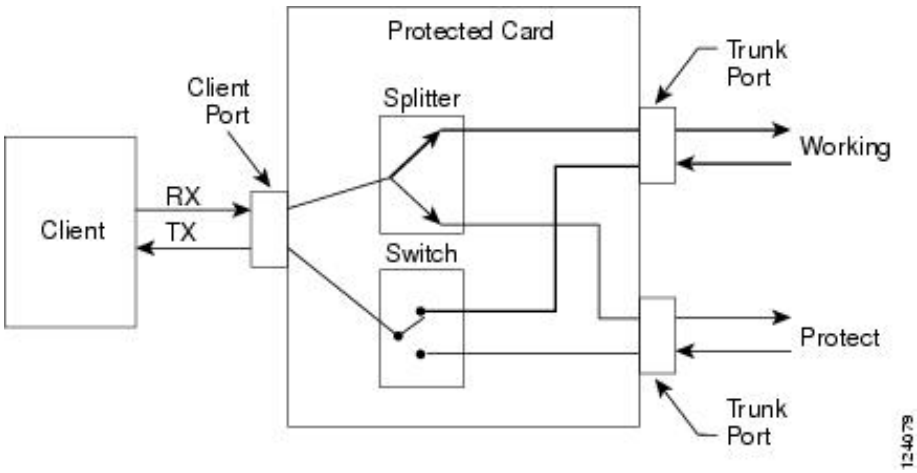
Splitter protection, shown in the following figure, is provided with TXPP cards, MXPP cards, and OTU2_XP cards (on trunk ports that are not part of a regenerator group). You can create and delete splitter protection groups in OTU2_XP card.

To implement splitter protection, a client injects a single signal into the client RX port. An optical splitter internal to the card then splits the signal into two separate signals and routes them to the two trunk TX ports. The two signals are transmitted over diverse optical paths. The far-end MXPP or TXPP card uses an optical switch to choose one of the two trunk RX port signals and injects it into the TX client port. When using splitter protection with two MXPP or TXPP cards, there are two different optical signals that flow over diverse paths in each direction. In case of failure, the far-end switch must choose the appropriate signal using its built-in optical switch. The triggers for a protection switch are LOS, LOF, SF, or SD.

In the splitter protected 10G Ethernet LAN Phy to WAN Phy mode, AIS-P and LOP-P acts as trigger (when G.709 is enabled) for the Protection Switch, in addition to the existing switching criteria.

In the OTU2_XP card, the STS parameters such as, SF /SD thresholds, Path PM thresholds, and Path Trace is set for the working path (Port 3). The same parameters are also applicable for the protected path (Port 4).

Figure 52: Splitter Protection



1+1 Protection

The 1+1 protection is available for the GE_XP, GE_XPE, 10GE_XP, and 10GE_XPE cards:

The 1+1 protection is provided in the Layer 2 (L2) card mode to protect against client port and card failure. 1+1 protection is supported in both single shelf and multishelf setup. This means that the working card can be in one shelf and the protect card can be in another shelf of a multishelf setup. Communication between the two cards is across 10 Gigabit Ethernet interconnection interface using Ethernet packets. The Inter link (ILK) trunk or internal pathcord must be provisioned on both the cards. This link is used to transmit protection switching messages and data.

Note With 1+1 protection mechanisms, the switch time of a copper SFP is 1 second.

With 1+1 protection, ports on the protect card can be assigned to protect the corresponding ports on the working card. A working card must be paired with a protect card of the same type and number of ports. The protection takes place on the port level, and any number of ports on the protect card can be assigned to protect the corresponding ports on the working card.

To make the 1+1 protection scheme fully redundant, enable L2 protection for the entire VLAN ring. This enables Fast Automatic Protection Switch (FAPS). The VLAN configured on the 1+1 port must be configured as protected SVLAN.

1+1 protection can be either revertive or nonrevertive. With nonrevertive 1+1 protection, when a failure occurs and the signal switches from the working card to the protect card, the signal remains on the protect card until it is manually changed. Revertive 1+1 protection automatically switches the signal back to the working card when the working card comes back online. 1+1 protection uses trunk ports to send control traffic between working and protect cards. This trunk port connection is known as ILK trunk ports and can be provisioned via CTC.

The standby port can be configured to turn ON or OFF but the traffic coming to and from the standby port will be down. If the laser is ON at the standby port, the other end port (where traffic originates) will not be down in a parallel connection. Traffic is blocked on the standby port.

1+1 protection is bidirectional and nonrevertive by default; revertive switching can be provisioned using CTC.

Layer 2 Over DWDM Protection

The Layer 2 Over DWDM protection is available for the following cards:

- GE_XP and GE_XPE
- 10GE_XP and 10GE_XPE

When the card is in L2-over-DWDM card mode, protection is handled by the hardware at the Layer 1 and Layer 2 levels. Fault detection and failure propagation is communicated through the ITU-T G.709 frame overhead bytes. For protected VLANs, traffic is flooded around the 10 Gigabit Ethernet DWDM ring. To set up the Layer 2 protection, you identify a node and the card port that is to serve as the primary node and port for the VLAN ring on the card view Provisioning > Protection tab. If a failure occurs, the node and port are responsible for opening and closing VLAN loops.



Note The Forced option in the Protection drop-down list converts all the SVLANs to protected SVLANs irrespective of the SVLAN protection configuration in the SVLAN database. This is applicable to a point-to-point linear topology. The SVLAN protection must be forced to move all SVLANs, including protected and unprotected SVLANs, to the protect path irrespective of provisioned SVLAN attributes.

A FAPS switchover happens in the following failure scenarios:

- DWDM line failures caused by a fiber cut
- Unidirectional failure in the DWDM network caused by a fiber cut
- Fiber pull on the primary card trunk port followed by a hard reset on the primary card
- Hard reset on the primary card
- Hard reset on the secondary card
- An OTN failure is detected (LOS, OTUK-LOF, OTUK-LOM, OTUK-LOM, OTUK-SF, or OTUK-BDI on the DWDM receiver port in the case of ITU-T G.709 mode)
- Trunk ports are moved to OOS,DSBLD (Locked,disabled) state
- Improper removal of XFPs

A FAPS switchover does not happen in the following scenarios:

- Secondary card trunk port in OOS,DSBLD (Locked,disabled) state followed by a hard reset of the secondary card
- OTN alarms raised on the secondary card trunk port followed by a hard reset of the secondary card

Far-End Laser Control

The cards provide a transparent mode that accurately conveys the client input signal to the far-end client output signal. The client signal is normally carried as payload over the DWDM signals. Certain client signals, however, cannot be conveyed as payload. In particular, client LOS or LOF cannot be carried. Far-end laser control (FELC) is the ability to convey an LOS or LOF from the near-end client input to the far-end client output.

If an LOS is detected on the near-end client input, the near-end trunk sets the appropriate bytes in the OTN overhead of the DWDM line. These bytes are received by the far-end trunk, and cause the far-end client laser to be turned off. When the laser is turned off, it is said to be squelched. If the near-end LOS clears, the near-end trunk clears the appropriate bytes in the OTN overhead, the far-end detects the changed bytes, and the far-end client squelch is removed.

FELC also covers the situation in which the trunk port detects that it has an invalid signal; the client is squelched so as not to propagate the invalid signal.

Payload types with the 2R mode preclude the use of OTN overhead bytes. In 2R mode, an LOS on the client port causes the trunk laser to turn off. The far end detects the LOS on its trunk receiver and squelches the client.

FELC is not provisionable. It is always enabled when the DWDM card is in transparent termination mode. However, FELC signaling to the far-end is only possible when ITU-T G.709 is enabled on both ends of the trunk span.

Jitter Considerations

Jitter introduced by the SFPs used in the transponders and muxponders must be considered when cascading several cards. With TXP_MR_2.5G, TXPP_MR_2.5G, MXP_MR_2.5G, MXPP_MR_2.5G, TXP_MR_10E, 100G-LC-C, 10x10G-LC, CFP-LC, 100G-CK-C, 200G-CK-LC, 100GS-CK-LC, 100G-ME-C, 100ME-CKC, AR_MXP, AR_XP, AR_XPE cards several transponders can be cascaded before the cumulative jitter violates the jitter specification. The recommended limit is 20 cards. With TXP_MR_10G cards, you can also cascade several cards, although the recommended limit is 12 cards. With MXP_2.5G_10G and MXP_2.5G_10E cards, any number of cards can be cascaded as long as the maximum reach between any two is not exceeded. This is because any time the signal is demultiplexed, the jitter is eliminated as a limiting factor.

The maximum reach between one transponder and the other must be halved if a Y cable is used. For more information on Y-cable operation, see the "Y-Cable and Splitter Protection" section on page G-24.

Termination Modes

Transponder and Muxponder cards have various SONET and SDH termination modes that can be configured using CTC. The termination modes are summarized in the following table.

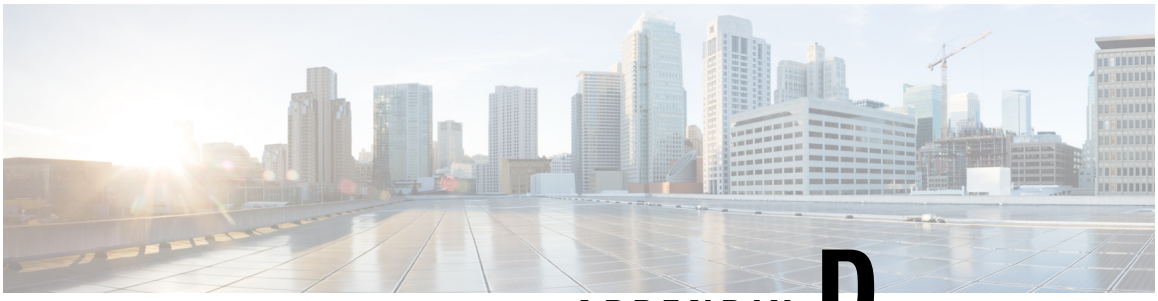
Table 284: Termination Modes

Cards	Termination Mode	Description
All TXP, MXP, and OTU2_XP cards, with the exception of the MXP_2.5G_10G card (see next row)	Transparent Termination	All the bytes of the payload pass transparently through the car
	Section Termination	In line termination mode, the section and line overhead bytes fo and the overhead bytes for the SDH multiplex and regenerator are terminated. None of the overhead bytes are passed through all regenerated, including the SONET SDCC and line DCC (LD and the SDH RS-DCC and multiplexer section DCC (MS-DC

Cards	Termination Mode	Description
MXP_2.5G_10G (Clients operating at the OC48/STM16 rate are multiplexed into an OC192/STM64 frame before going to OTN or DWDM.)	Transparent Termination	All client bytes pass transparently except the following: B1 is rewritten, A1 to A2 are regenerated, and H1 to H3 are re
	Section Termination	The SONET TOH section bytes and the SDH regenerator sec bytes are terminated. None of these section overhead bytes through. They are all regenerated, including the SONET T DCC bytes and the SDH RS-DCC bytes. In the section term the SONET TOH line and SDH multiplex section overhead passed transparently.
	Line Termination	In the line termination mode, the section and line overhead SONET and the overhead bytes for the SDH multiplex and sections are terminated. None of the overhead bytes are pa They are all regenerated, including the SONET SDCC and and the SDH RS-DCC and MS-DCC bytes.

For TXP and MXP cards, adhere to the following conditions while DCC termination provisioning:

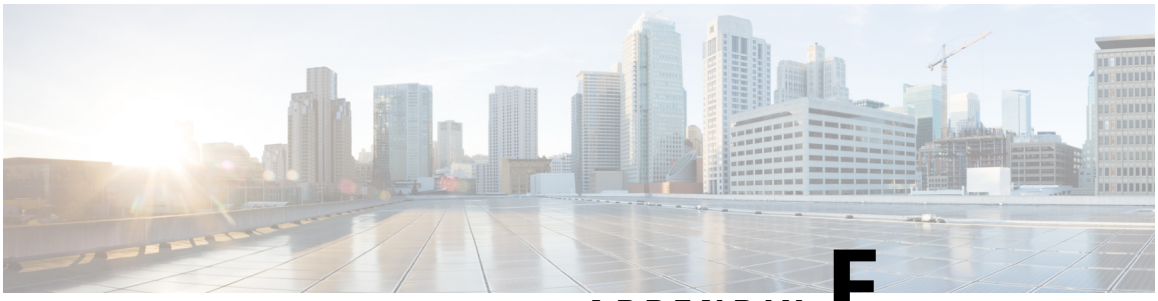
- For SDCC/RS-DCC provisioning, the card should be in the Section/RS-DCC or Line/MS-DCC termination mode.
- For LDCC/MS-DCC provisioning, the card should be in the Line/MS-DCC termination mode.



APPENDIX D

Card Specifications

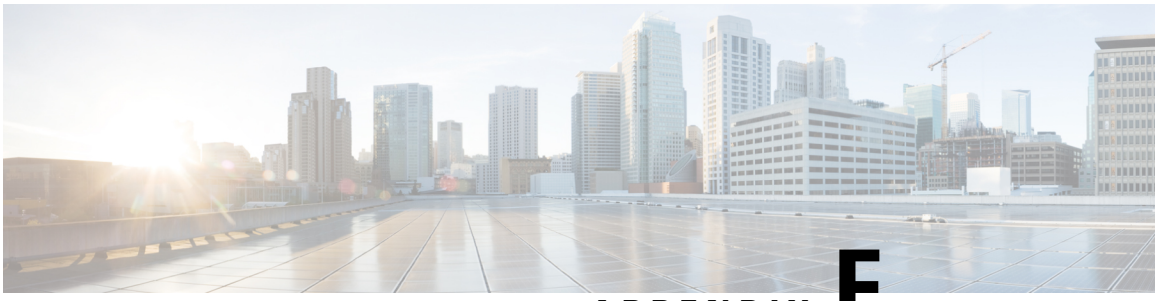
The information in this chapter is in a new location. See Hardware Specifications for information related to hardware and software specifications for the cards.



APPENDIX E

Administrative and Service States

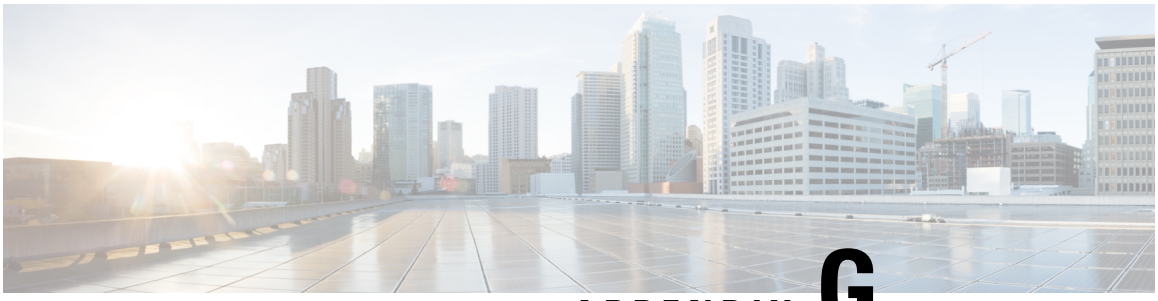
The information in this chapter is in a new location. See Administrative and Service States for an understanding of administrative and service states for DWDM cards, optical payload ports, out-of-band optical service channel (OSC) ports, optical channel network connections (OCHNCs), and transponder/muxponder cards and ports.



APPENDIX F

SNMP

The information in this chapter is in a new location. See SNMP for information related to Simple Network Management Protocol (SNMP).

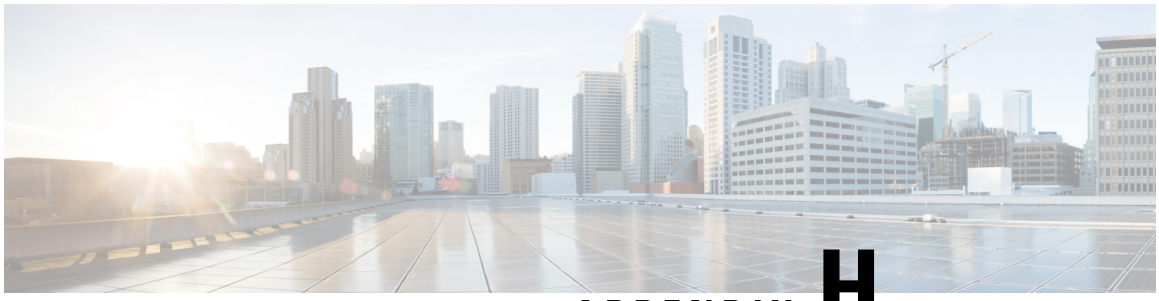


APPENDIX G

CTC Enhancements, Operations, and Shortcuts

The information in this chapter is in a new location. See CTC Enhancements, Operations, and Shortcuts for information on Cisco Transport Controller (CTC) views, menus options, tool options, shortcuts, table display options, and shelf inventory data presented in CTC.

CTC Enhancements, Operations, and Shortcuts



APPENDIX H

Network Element Defaults

The information in this chapter is in a new location. See Network Element Defaults for information related to factory-configured (default) network element (NE) settings.

Network Element Defaults



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