Infinera ATN

Hardware Description Guide

Release 1.0

Version 001

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Trademarks

Infinera ATN, DTN and Infinera Optical Line Amplifier Regulatory Compliance

FCC Class A

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Modifying the equipment without Infinera's written authorization may result in the equipment no longer complying with FCC requirements for Class A digital devices. In that event, your right to use the equipment may be limited by FCC regulations, and you may be required to correct any interference to radio or television communications at your own expense.

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FDA

This product complies with the DHHS Rules 21 CFR Subchapter J, Section 1040.10, Applicable at date of manufacture.

Contents

Figures

Tables

About this Document

This chapter provides an overview of the *Infinera ATN Hardware Description Guide*. It describes the following:

Objective

This guide provides an introduction and reference to the Infinera® ATN network elements, its deployable configurations, and its hardware architecture. This guide also provides the details of the functional description, functional block diagrams, faceplate diagrams with status indicators and connectors, and the technical specification of all the components.

Audience

The primary audience for this manual includes network planners, network operations personnel, field technicians, and system administrators who are responsible for deploying and administering Infinera Digital Optical Network®. This manual assumes that the reader is familiar with the following topics and products:

- Basic internetworking terminology and concepts
- Dense Wavelength Division Multiplexing (DWDM) technology and concepts
- Coarse Wavelength Division Multiplexing (CWDM) technology and concepts

Document Organization

The following table lists the chapters and its description covered in this manual.

Chapter	Description
CHAPTER 1: "Introduction"	Provides a high level description of ATN network element features and network configurations.
CHAPTER 2: "Infinera ATN"	Provides details of the ATN hardware and the functional description of various circuit packs the ATN houses. It covers the various audible and visual alarms on the faceplates that indicate the status of the circuit packs.
CHAPTER 3: "Infinera Dispersion Management Chassis"	Provides details of the DMC hardware and its technical specifications.
Appendix A: "Acronyms"	Provides a list of acronyms and their definitions used in Infinera Technical Publications.

Documents for Release 1.0

The following documents are available for Infinera ATN:

Document Name	Document ID	Description
Infinera ATN CLI User Guide	1900-420	Describes the CLI interface supported by the Infinera ATN network elements. It includes the description of the supported CLI commands and the procedures for the commonly performed OAM&P functions.
Infinera ATN GNM User Guide	1900-421	Describes the Infinera Graphical Node Manager (GNM) user interface used to manage the Infinera ATN network elements. It also includes the procedures for the commonly performed OAM&P functions.
Infinera ATN Hardware Description Guide	1900-422	Provides the hardware description of the Infinera ATN network elements which includes the description of chassis, common modules and circuit packs. It provides hardware block diagrams, functional descriptions, mechanical and electrical specifications for each module.
Infinera ATN Maintenance and Troubleshooting Guide	1900-423	Provides the routine maintenance and alarm troubleshooting procedures for the Infinera ATN network elements. It includes the routine hardware and software maintenance procedures and various troubleshooting tools. A comprehensive list alarms and events, and alarm clearing procedures are also included.
Infinera ATN Site Preparation and Hardware Installation Guide	1900-424	Describes the procedures for initial installation of the Infinera ATN network elements at any given site. Includes procedures for site preparation and site testing, system cabling, safety procedures and hand-over to provisioning activities.
Infinera ATN SNMP Agent Reference Guide	1900-425	Describes the user interface for the Infinera ATN Simple Network Management Protocol (SNMP) Agent. It provides detailed instructions to configure and operate the Infinera ATN SNMP Agent from the Infinera network element.
Infinera ATN System Description Guide	1900-426	Provides an overview of the Infinera ATN network element. It includes a description of the Infinera IQA Network Operating System ATN (IQA NOS ATN), and a description of the Infinera Graphical Node Manager (GNM) and Infinera Digital Network Administrator (DNA) software applications that are used to manage Infinera products.
Infinera ATN Turn-up and Test Guide	1900-427	Describes procedures for turning up, commissioning and testing the installed Infinera ATN network elements. Includes the description of circuit activation and end-end system testing procedures.

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- Page number(s) in the document on which there are comments

CHAPTER 1

Introduction

This chapter provides an introduction to the Infinera Digital Optical Network, Infinera Management Suite, and Release 1.0 features in the following sections:

Infinera Digital Optical Network

Infinera delivers the Digital Optical Network solution, referred to as the Infinera Digital Optical Network®. The Infinera Digital Optical Network provides the ability to multiplex, transport, add, drop, switch and protect SONET, SDH, Ethernet and other services inexpensively, transparently, reliably, flexibly and quickly. The Infinera Digital Optical Network allows the construction of a single unified optical transport network that scales from metro to long haul applications.

Infinera offers the following Digital Optical Networking Systems which help carriers build Digital Optical Networks:

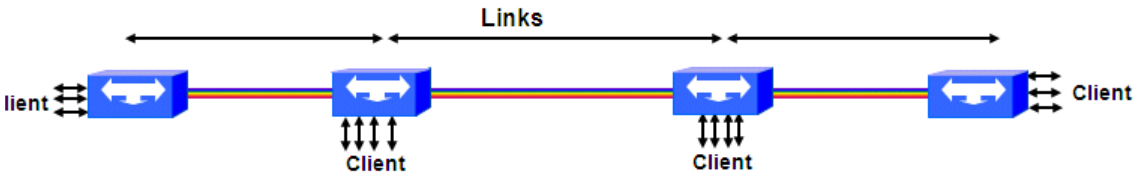
- "Infinera ATN"
- "Infinera Dispersion Management Chassis"
- "Infinera DTN"
- "Infinera Optical Line Amplifier"

Infinera ATN

The Infinera ATN® is a Coarse Wavelength Division Multiplexing (CWDM) and Dense Wavelength Division Multiplexing (DWDM) multi-service platform that provides digital add/drop and bandwidth management capabilities.

The Infinera Digital Optical Network is shown in Figure 1-1, with ATNs deployed anywhere client access is desired. The links between the ATNs isolate analog engineering and impairments within that link. Users can progressively deploy the transport network with ATNs at more points of presence, interconnected by links, when and where capacity is required, without re-engineering the network.

Figure 1-1 Infinera Digital Optical Network



The Infinera ATN has DWDM and CWDM capabilities and provides support for up to 40 DWDM channels and 8 CWDM channels. It provides the means for direct access to client data at 10Gbps, 2.7Gbps, 2.5Gbps, 2G, 1G, 1GbE, 622Mbps, 200Mbps or 155Mbps digital granularity at a site, allowing flexible selection of whether to add/drop, amplify, or optically express individual data streams.

The ATN can be equipped in a variety of network configurations using a common set of circuit packs. The detailed description of ATN hardware is provided in "Infinera ATN" on page 2-1.

Infinera Dispersion Management Chassis

The Infinera Dispersion Management Chassis, referred to as the DMC, is an optional chassis which can be mounted in the same rack as the ATC or the DTC for the purpose of dispersion compensation. A description of the DMC hardware is provided in “Infinera Dispersion Management Chassis” on page 3-1.

Infinera DTN

The Infinera DTN is a Digital Optical Networking System which provides digital add/drop and bandwidth management capabilities. The DTN provides digital bandwidth management within a Digital Optical Network. It provides the means for direct access to client data at 40Gbps, 10Gbps, 2.5Gbps, 1GbE, 622Mbps, and 155Mbps digital granularity at a site, allowing flexible selection of whether to multiplex, add/drop, amplify, groom, optically express, or switch individual data streams.

For more information on the Infinera DTN, refer to *Infinera DTN System Description Guide*.

Infinera Optical Line Amplifier

The Infinera Optical Line Amplifier is used to extend the optical reach between DTNs. The Optical Line Amplifier is deployed at locations where customer access is not anticipated.

For more information on the Optical Line Amplifier hardware, refer to *Infinera DTN System Description Guide*.

Note: The Infinera Optical Line Amplifier is used in conjunction with only the Infinera DTN and not the Infinera ATN.

Release 1.0 Feature Summary

Table 1-1 lists the features supported in ATN Release 1.0

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
Network Applications	
Network Topologies	Point-to-point, linear add/drop multiplexing (ADM), hub-and-spoke, and ring topologies.
Hardware Modules	
Infinera ATN	Digital Optical Networking System which provides add/drop capabilities.
ATC-A	The ATN Active Transport Chassis (ATC-A) is a 3RU, 11 slot service shelf that can be mounted in a 19 or 23-inch ANSI or ETSI rack. The ATC-A includes slots for the following: • One management module (AMM-A) • Two Power Conversion Modules (PCMs) • One Fan tray • Two EDFA amplifiers (AAMs) • The ATC-A also has eight flexible slots that can house up to eight Optical Filter Modules (OFMs) or eight Service Interface Modules (SIMs)
ATC-P	The ATN Passive Transport Chassis (ATC-P) is a 2RU, eight slot chassis that can be mounted in a 19 or 23-inch ANSI or ETSI rack. The ATC-P includes slots for up to eight Optical Filter Modules (OFMs). The ATC-P and its modules are not managed by any software interface.
ATN Management Module (AMM)	The AMM is the main system controller and performs management and control functions for the ATN. It supports a database branding mechanism that prevents the installation of an incorrect or outdated control module into a chassis.
ATN Amplifier Modules (AAM)	AAMs are EDFA based optical amplifier modules. An ATN may be equipped with AAMs to when optical amplification is required to extend the optical reach between the ATNs. There are two types of AAMs: • AAM-B1, which is used as a booster amplifier • AAM-P1, which is used as a pre-amplifier and in-line amplifier
Optical Filter Modules (OFM)	Performs optical multiplexing and de-multiplexing of Optical Channels to/from SIMs as well as AAMs. There are several types of DWDM and CWDM OFMs. • DWDM OFMs— The ATN supports four 10-channel OFMs and ten 4 -channel OFMs • CWDM OFMs— The ATN supports four 2-channel OFMs and one 8-channel OFM

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
Service Interface Module (SIM)	This module houses the client side and line side tributary optical modules. The Service Interface Module (SIM) maps the client optical signals into electrical signals for subsequent transmission through the line side tributary optical module. There are two types of SIMs: • SIM-T-1-10G is a one port 10G transponder that encapsulates the client signal into an OTU2/OTU2e frame • SIM-T-2-2.5GM is a two port 2.5G multi-rate transponder that performs 3R regeneration of the client signal
Tributary Optical Module (TOM)	Tributary Optical Modules (TOMs) are client-side and line-side optical interface modules (field-replaceable). A TOM converts an incoming client optical signal into a serial electrical signal for further processing in the Service Interface Modules (SIMs). The TOM also converts out-going signals from electric to optical for line-side transport. The following TOMs are supported in the ATN: **Line TOMs** • Tributary Optical Module-10G, DWDM XFP (TOM-10G-Dn-LR2) • Tributary Optical Module-2.5G Multi Rate, DWDM SFP (TOM-MR-Dn-LR2) • Tributary Optical Module-2.5G Multi Rate, CWDM SFP (TOM-MR-Cn-LR2) **Client TOMs** • Tributary Optical Module-10G-SR0 (TOM-10G-SR0) • Tributary Optical Module-10G-SR1 (TOM-10G-SR1) • Tributary Optical Module-2.5G-SR1 (TOM-2.5G-SR1) • Tributary Optical Module-2.5G-IR2 (TOM-2.5G-IR2) • Tributary Optical Module-2.5G-SR1 Multi Rate (TOM-2.5GMR-SR1) • Tributary Optical Module-2.5G-IR1 Multi Rate (TOM-2.5GMR-IR1) • Tributary Optical Module-1G-LX (TOM-1G-LX) • Tributary Optical Module-1G-SX (TOM-1G-SX) **OSC TOM** • Tributary Optical Module-100M-C45-L2 (TOM-100M-C45-L2)
Dispersion Management Chassis (DMC)	The DMC is a passive chassis and does not require management. Depending on the span characteristics, the DMC is optionally included in ATNs to house Dispersion Compensation Modules (DCMs).
Dispersion Compensation Module (DCM)	The Dispersion Compensation Module (DCM) houses the dispersion compensating fiber that can be optically connected in-line with an AAM. The DCM equalizes chromatic dispersion of different frequency components having different propagation speeds and reverses the dispersion effect of transmission fiber, to restore the optical signal.

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
System Interfaces	
Transport Interfaces	The supported client/tributary interfaces are: • SONET OC-3, OC-12, OC-48 and OC-192 signals • SDH STM-1, STM-4, STM-16, STM-64 signals • Fibre Channel 1G (1G FC), Fibre Channel 2G (2G FC) signals • Ethernet 10GbE LAN Phy, 10GbE WAN Phy, and 1GbE signals • OTU1 signals • ESCON and FICON signals The supported line interfaces are: • Up to 40 DWDM line-side channels in combination with an Optical Supervisory Channel (OSC) to provide up to 400Gbps transport and in-band communications between network elements. The line-side channels include OTU2 (10.7Gbps), OTU2e (11.1Gbps), 3R output of 2.7Gbps and lower client signals. • Up to eight CWDM line-side channels in combination with an Optical Supervisory Channel (OSC) to provide up to 20Gbps transport and in-band communications between network elements. The line-side channels include 3R output of 2.7Gbps and lower client signals
Management Connection Interfaces	The AMM includes the following RJ-45 management interfaces: • Two Nodal Control (NC) ports • One DCN port (RJ-45 interface) • One Craft Ethernet port (RJ-45 interface) • One Craft Serial DCE port (RJ-45 interface)
Alarm Interfaces	The ATC supports five external alarm inputs and ten alarm control outputs. These opto-isolator contacts enable integration with parallel telemetry systems, and provide office-level alarming. Of the five external alarm inputs, four can be configured by the user (one is dedicated for ACO). Of the ten external alarm outputs, four can be configured by the user and the remaining six are based on system alarms (three each for visual and audible).
Optical Supervisory Channel (OSC)	100M Ethernet Optical Supervisory Channel for inter-node communication.
System Architecture	
G.709 Optical Transport Units (OTU)	The ATN transports 10G client signals using ITU-T G.709 Optical Transport Units (OTU2, OTU2E). The ATN supports forty (40) DWDM wavelengths with 100GHz spacing.

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
Hardware Scalability	ATN R1.0 can support a total of four ATC-A's in a multi-node configuration. One of the ATC nodes is connected to the ATN line system using the OSC ports and the three other ATC nodes are interconnected with the NC 10/100 Ethernet stacking ports. Remote communications and management to the three stacked ATC nodes is accomplished using Layer 2 Ethernet communication across the NC ports.
Fault Management	
Alarm Surveillance	The ATN provides the following alarm surveillance functions: • Provides detection and user-customized reporting of defects in the ATN. Features alarm masking and the option to export alarm data. • The system includes an Alarm Reporting Control (ARC) feature that allows users to prevent a managed object from reporting alarms during maintenance procedures. The system can be configured to clear or to maintain all pre-existing standing alarms when ARC is enabled. • Customizable severity levels for Threshold Crossing Alerts (TCAs).
Event Log	Provides a wrap-around historical event log that tracks the reports of all changes that occur within the system. Users can retrieve event log data through the network management user interfaces.
Maintenance and Troubleshooting	For comprehensive maintenance and troubleshooting, the system supports loopbacks, PRBS generation and detection, and trace messaging.
Equipment Management	
Managed Object Model	All hardware equipment, physical ports and logical termination points are represented through the network management interfaces as managed objects, according to the Telcordia, ITU-T and TMF general information modeling standards. Users can export inventory information in Tab Separated Value (TSV) and Comma Separated Value (CSV) format.
State Modeling	Implements a standard state model, compliant with TMF814, and GR-1093, for all the managed objects.
Protection	
Digital Subnetwork Connection Protection (D-SNCP)	Enables 1+1 protection of diverse circuit paths through the Digital Optical Network for sub-50ms switching. Digital SNCP increases the overall reliability and service uptime of the optical path, and provides Fault Escalation, which enables Digital SNCP protection on services that are transported through foreign WDM or SONET/SDH networks that originate and terminate on Infinera ATNs.

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
Performance Monitoring	
Optical PM, Digital PM, SONET/SDH/Ethernet PM	Optical and digital PM data collection is supported on the ATN. SONET/SDH/Ethernet PM data collection is supported in the ATN for the tributary interfaces. Both current and historical PM reset counters are supported, as is automatic notification of user-defined-threshold crossings for early detection of problems. The ATN allows the user to customize severity levels for Threshold Crossing Alerts (TCAs). Release 1.0 adds support for collection of the following PMs: • Optical and digital PMs for both the client and line side interfaces of the SIM-T-1-10G. • Optical PMs for both the Client and Line side interfaces of the SIM-T-2-2.5GM. • Optical PMs for the OSC on the AMM • C-band power monitoring for AAM-B1 line side. • C-band power monitoring for the AAM-P1 line side. • Calibration data monitoring for the OFMs
Security and Access Management	
Standards-based Security Model with Network-wide User Administration	Based on the Telcordia GR-815-CORE standard, the security model provides support for user identification, authentication, and access control with user customized access privileges.
Security Audit Log	The ATN features a persistent circular audit log that records all system configuration activities and security related events, such as unauthorized attempts and excessive authentication attempts. The audit log provides traceability of all system-impacting changes.
Software and Database Management	
Software Management	Users can remotely download the software image from a user specified FTP server to the AMM of the ATC-A. Each network element can store three images of the software, which users may selectively activate. The system provides the option to gracefully "fall-back" or "down-grade" to a prior release in the rare event that a failure is experienced during the upgrade process. Software images can be managed across multiple network elements from a centralized location.
Database Management	Users can backup, download and restore database versions. Each network element can store three versions of a database, which users may selectively activate.
Chassis Branding	ATC-As contain database versions that are branded - or marked as belonging to a specific chassis - in order to prevent activation of the wrong or outdated controller within a given chassis.
Remote Hardware FPGA Upgrade	The ATN hardware modules that support the ability to be remotely upgraded include all types of AAMs and SIMs.

Table 1-1 New Features and Hardware for Release 1.0

Feature	Description
System Management	
ATN SNMP Agent	In Release 1.0, IQA NOS ATN provides an embedded SNMPv2c agent on Infinera network elements in order to meet the management requirements of third party EMS/NMS systems that are based on the SNMP protocol.
Network Management User Interfaces	
Infinera Graphical Node Manager (GNM) GUI	A web browser-launched Graphical User Interface (GUI) to manage a single network element. The Infinera GNM provides all of the relevant network element-level Operations, Administration, Maintenance, and Provisioning (OAM&P) functions listed above in this table.
Infinera Digital Network Administrator (DNA)	In DNA Release 5.1, a new feature called Peripheral Nodes is introduced to allow new node types that are not fully integrated into DNA to be inventoried into the DNA database. ATN nodes are recognized as peripheral nodes and the following functions are available to the ATN from the DNA. • The nodes and links between these nodes and/or other Infinera nodes, can be created or deleted in/from DNA, providing DNA users a mechanism to visualize these nodes and links in the topology map and view them accordingly in inventory managers, namely Link Manager and Node Manager. • This feature also enables DNA users to start deploying future Infinera network elements (for example, Infinera ATN) before full DNA management integration becomes available. • For these Infinera nodes, DNA will provide manual inventory and topology management and also provide a cut-through launch point to the nodal management interfaces like GNM as supported by these nodes.
CLI Interface	A command line interface (CLI) provides full Fault-management, Configuration, Accounting, Performance, and Security (FCAPS) support for ATNs

CHAPTER 2

Infinera ATN

The Infinera ATN, referred to as the ATN, provides digital bandwidth management and client access to the Coarse Wavelength Division Multiplexing (CWDM) and Dense Wavelength Division Multiplexing (DWDM) transport bandwidth.

The ATN consists of one or more Access Transport Chassis (ATC), and optionally one or more Dispersion Management Chassis (DMC) for dispersion compensation. See “Infinera Dispersion Management Chassis” on page 3-1 for more details on DMC.

This chapter provides a hardware description for the ATN including a functional description of the hardware, block diagram of the internal signal flow (where applicable), and technical specifications. This chapter includes the following sections:

For ATN installation procedures, refer to the *Infinera ATN Installation Guide.* For ATN turn-up and test procedures, refer to the *Infinera ATN Turn-up and Test Guide.*

Refer to *Infinera ATN Maintenance and Troubleshooting Guide* for a description of module Light Emitting Diode (LED) status indicators.

ATC System Specifications

This section contains system specifications for the ATC includes the following:

ATC Power Consumption

The power consumption numbers for the ATC are presented as two values:

- Typical Power Draw—characterizes average power usage under normal operating system conditions and can be used for estimating average power consumption over time (ongoing operational cost for power consumption)
- Maximum Power Draw—is worst-case power draw under severe equipment, environmental, and network conditions

Table 2-1 on page 2-2 provides typical and maximum power draw numbers for supported ATC system components.

Table 2-1 ATC Power Consumption Numbers

Configuration	Typical Power Draw (Watts)	Maximum Power Draw (Watts)
ATC	120	360
Fan Tray	34	96
AMM-A	9	12
AAM (B1 and P1 types)	6	7.5
SIM-T-1-10G	13	15
SIM-T-2-2.5GM	6	7

ATC Compliancy

The ATC complies with many industry standard specifications as described in Table 2-2.

Table 2-2 ATC Hardware Compliancy

Category	Approval Agency / Requirement
Safety Certifications	• UL 60950: Safety of Information Technology Equipment • CAN/CSA C22.2 No. 60950: Safety of Information Technology Equipment • EN 60950 (Low Voltage Directive): Safety of Information Technology Equipment including electrical business equipment • IEC 60950: Safety of Information Technology Equipment, including electrical business equipment • TS001: Safety requirements for customer equipment • AS/NZS 60950: Approval & Test specification - Safety of Information Technology Equipment including electrical business equipment
NEBS/ETSI Compliance Report	• GR-1089-CORE: Electromagnetic Compatibility and Electrical Safety - Generic requirement for Network Telecommunications Equipment • NEBS Level 3 • ETS 300 386 • GR-63-CORE: Network Equipment Building Systems - Physical Protection • ETS 300 019-2-1, 2 and 3 • ETS 300 753
EMC Emissions	• EN55022 Class A
EMC Immunity	• EN61000-4-2, 3, 4, 5 and 6
Laser Safety	• EN60825 Series: Safety of Laser Products • FDA21 CFR 1040: Performance Standard of Light Emitting Products
General Compliancy	• ETSI ETS 300 119-4 • Telecordia GR-63-CORE; GR-78-CORE; GR-253-CORE • ANSI T1.315-1994 • ANSI T1.304 1989

ATC Technical Specifications

Table 2-3 provides electrical and environmental specifications for the ATC, common components, and all supported circuit packs.

Table 2-3 ATC Technical Specifications

Type	Parameter	Specification
Electrical specifications	Input voltage range (DC)	-40V DC to -72V DC Nominal voltage range: -48V DC to -60V DC
Environmental specifications	Operating temperature range	Normal: 5deg C to 40deg C Short term: -5deg C to 55deg C
	Storage temperature range	-40deg C to 70deg C
	High relative humidity	90% non-condensing

ATC Overview

The ATN Transport Chassis (ATC) is a chassis type that can be used in a ATN. The ATC can be deployed as an Active Chassis (ATC-A), or as a Passive Chassis (ATC-P).

Table 2-4 provides a list of the common components that make up a ATC (some components are field replaceable).

Table 2-5 on page 2-5 provides a list of the supported circuit packs on a ATC (circuit packs are field replaceable)..

Table 2-4 ATC Common Components

Equipment Type	Name	Description
Common Components	Rack Mounting Ears	See page 2-16
	Power Conversion Modules (PCMs)	See page 2-16
	External Indicators and Connectors	See page 2-20
	Fan Tray	See page 2-26
	Air Filter	See page 2-27
	Fiber management guide and cable guide	See page 2-28
	Card Cage	See page 2-31

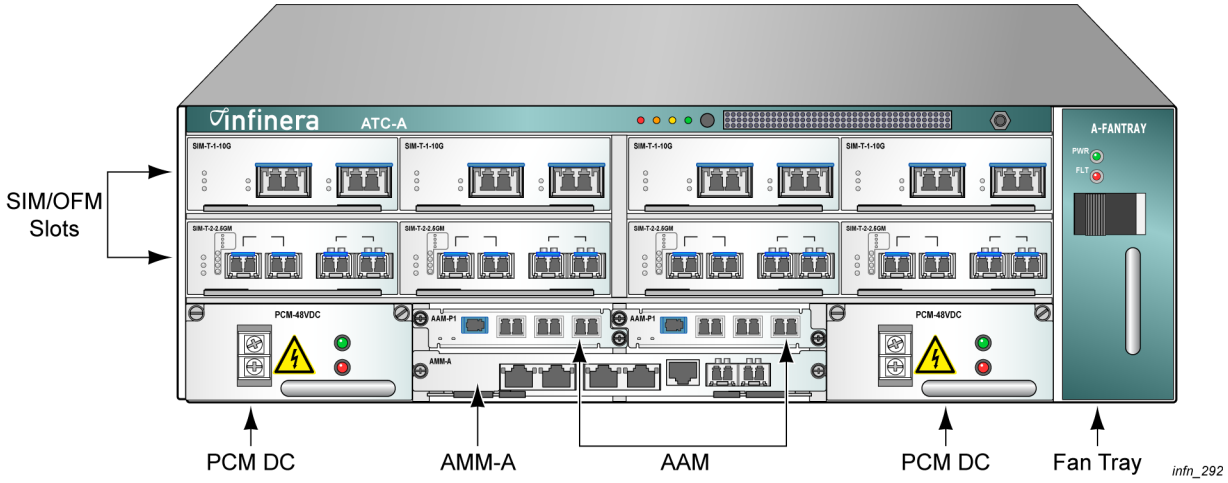
Table 2-5 ATC Supported Circuit Packs

Equipment Type	Name	Description
Circuit Packs	ATN Management Module-A (AMM-A)	See page 2-34
	ATN Amplifier Module (AAM)	See page 2-39
	Optical Filter Module (OFM)	See page 2-43
	Passive OSC Add/Drop Module	See page 2-76
	Service Interface Module (SIM)	See page 2-79
	Tributary Optical Module (TOM)	See page 2-86

Front View

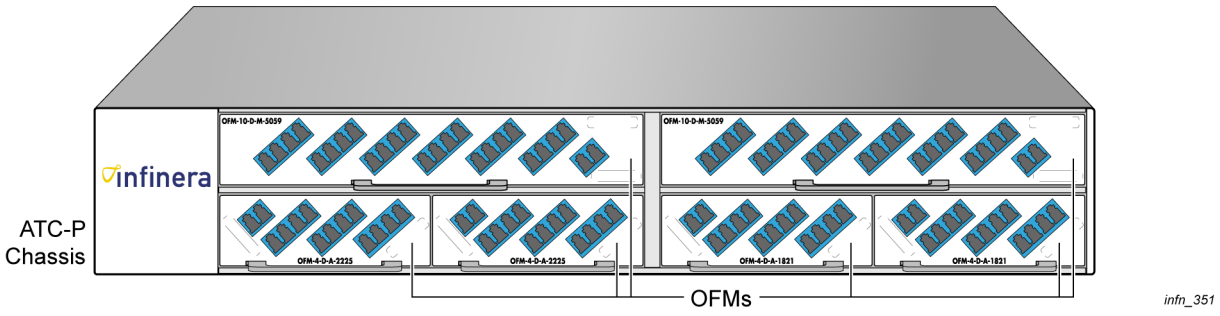
A front view of the ATC-A, with components and circuit packs, is shown in Figure 2-1.

Figure 2-1 ATC-A Front View



A front view of the ATC-P, with components and circuit packs, is shown in Figure 2-2

Figure 2-2 ATC -P Front View



ATC Thermal Loading

Table 2-6 provides typical heat release information for the ATC housed in a 19-inch frame.

Table 2-6 ATC Typical Heat Release (19-inch frame)

ATC Typical Heat Release Calculation for 19-inch (483mm) Frame									
Power Consumption (Watts)	105								
Frame Depth (feet)	1.0								
Frame Width (feet)	1.837								
Equipment Height (feet)	0.437								
Maintenance Aisle (feet)	**Wiring Aisle (feet)**								
	1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
	Heat Release (Watts/ft^2)								
1.0	65.4	58.1	52.3	47.6	43.6	40.2	37.4	34.9	32.7
1.5	58.1	52.3	47.6	43.6	40.2	37.4	34.9	32.7	30.8
2.0	52.3	47.6	43.6	40.2	37.4	34.9	32.7	30.8	29.1
2.5	47.6	43.6	40.2	37.4	34.9	32.7	30.8	29.1	27.5
3.0	43.6	40.2	37.4	34.9	32.7	30.8	29.1	27.5	26.2
3.5	40.2	37.4	34.9	32.7	30.8	29.1	27.5	26.2	24.9
4.0	37.4	34.9	32.7	30.8	29.1	27.5	26.2	24.9	23.8
4.5	34.9	32.7	30.8	29.1	27.5	26.2	24.9	23.8	22.7
5.0	32.7	30.8	29.1	27.5	26.2	24.9	23.8	22.7	21.8

In lieu of increasing the typical aisle width, an additional vertical empty space (either above or below the EUT) may be implemented as follows:

Equipment Type	Equipment Vertical Space (feet)	Reference
Natural Convection Frame Depth = 12 inches	0.404	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Natural Convection Frame Depth = 18 inches	0.110	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)

Table 2-6 ATC Typical Heat Release (19-inch frame)

ATC Typical Heat Release Calculation for 19-inch (483mm) Frame		
Natural Convection Frame Depth = 24 inches	0.110	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)
Forced-air Fans Frame Depth = 12 inches	0.193	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Forced-air Fans Frame Depth = 18 inches	-0.027	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Forced-air Fans Frame Depth = 24 inches	-0.0273	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)

Table 2-7 provides maximum heat release information for the ATC housed in a 19-inch frame.

Table 2-7 ATC Maximum Heat Release (19-inch frame)

ATC Maximum Heat Release Calculation for 19-inch (483mm) Frame									
Power Consumption (Watts)	105								
Frame Depth (feet)	1.0								
Frame Width (feet)	1.837								
Equipment Height (feet)	0.437								
Maintenance Aisle (feet)	**Wiring Aisle (feet)**								
	1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
	Heat Release (Watts/ft^2)								
1.0	224.2	199.3	179.4	163.1	149.5	138.0	128.1	119.6	112.1
1.5	199.3	179.4	163.1	149.5	138.0	128.1	119.6	112.1	105.5
2.0	179.4	163.1	149.5	138.0	128.1	119.6	112.1	105.5	99.7
2.5	163.1	149.5	138.0	128.1	119.6	112.1	105.5	99.7	94.4
3.0	149.5	138.0	128.1	119.6	112.1	105.5	99.7	94.4	89.7
3.5	138.0	128.1	119.6	112.1	105.5	99.7	94.4	89.7	85.4
4.0	128.1	119.6	112.1	105.5	99.7	94.4	89.7	85.4	81.5
4.5	119.6	112.1	105.5	99.7	94.4	89.7	85.4	81.5	78.0
5.0	112.1	105.5	99.7	94.4	89.7	85.4	81.5	78.0	74.7

Table 2-7 ATC Maximum Heat Release (19-inch frame)

ATC Maximum Heat Release Calculation for 19-inch (483mm) Frame		
In lieu of increasing the typical aisle width, an additional vertical empty space (either above or below the EUT) may be implemented as follows:		
Equipment Type	**Equipment Vertical Space (feet)**	**Reference**
Natural Convection Frame Depth = 12 inches	2.448	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Natural Convection Frame Depth = 18 inches	1.438	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Natural Convection Frame Depth = 24 inches	1.438	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)
Forced-air Fans Frame Depth = 12 inches	1.724	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Forced-air Fans Frame Depth = 18 inches	0.968	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Forced-air Fans Frame Depth = 24 inches	-0.0273	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)

Table 2-8 provides typical heat release information for the ATC housed in a 23-inch frame.

Table 2-8 ATC Typical Heat Release (23-inch frame)

ATC Typical Heat Release Calculation for 23-inch (600mm) Frame		
Power Consump-tion (Watts)	105	
Frame Depth (feet)	1.0	
Frame Width (feet)	2.167	
Equipment Height (feet)	0.437	

Table 2-8 ATC Typical Heat Release (23-inch frame)

ATC Typical Heat Release Calculation for 23-inch (600mm) Frame									
Maintenance Aisle (feet)	**Wiring Aisle (feet)**								
	1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
	Heat Release (Watts/ft^2)								
1.0	55.4	49.3	44.4	40.3	37.0	34.1	31.7	29.6	27.7
1.5	49.3	44.4	40.3	37.0	34.1	31.7	29.6	27.7	26.1
2.0	44.4	40.3	37.0	34.1	31.7	29.6	27.7	26.1	24.6
2.5	40.3	37.0	34.1	31.7	29.6	27.7	26.1	24.6	23.3
3.0	37.0	34.1	31.7	29.6	27.7	26.1	24.6	23.3	22.2
3.5	34.1	31.7	29.6	27.7	26.1	24.6	23.3	22.2	21.1
4.0	31.7	29.6	27.7	26.1	24.6	23.3	22.2	21.1	20.2
4.5	29.6	27.7	26.1	24.6	23.3	22.2	21.1	20.2	19.3
5.0	27.7	26.1	24.6	23.3	22.2	21.1	20.2	19.3	18.5

In lieu of increasing the typical aisle width, an additional vertical empty space (either above or below the EUT) may be implemented as follows:

Equipment Type	Equipment Vertical Space (feet)	Reference
Natural Convection Frame Depth = 12 inches	0.276	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Natural Convection Frame Depth = 18 inches	0.027	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Natural Convection Frame Depth = 24 inches	0.027	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)
Forced-air Fans Frame Depth = 12 inches	0.097	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)
Forced-air Fans Frame Depth = 18 inches	-0.090	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Forced-air Fans Frame Depth = 24 inches	-0.0897	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)

Table 2-9 provides maximum heat release information for the ATC housed in a 23-inch frame.

Table 2-9 ATC Maximum Heat Release (23-inch frame)

ATC Maximum Heat Release Calculation for 23-inch (600mm) Frame									
Power Consumption (Watts)	105								
Frame Depth (feet)	1.0								
Frame Width (feet)	2.167								
Equipment Height (feet)	0.437								
Maintenance Aisle (feet)	**Wiring Aisle (feet)**								
	1.0	**1.5**	**2.0**	**2.5**	**3.0**	**3.5**	**4.0**	**4.5**	**5.0**
	Heat Release (Watts/ft^2)								
1.0	291.3	244.5	210.6	185.0	164.9	148.8	135.5	124.4	115.0
1.5	244.5	210.6	185.0	164.9	148.8	135.5	124.4	115.0	106.9
2.0	210.6	185.0	164.9	148.8	135.5	124.4	115.0	106.9	99.9
2.5	185.0	164.9	148.8	135.5	124.4	115.0	106.9	99.9	93.8
3.0	164.9	148.8	135.5	124.4	115.0	106.9	99.9	93.8	88.3
3.5	148.8	135.5	124.4	115.0	106.9	99.9	93.8	88.3	83.5
4.0	135.5	124.4	115.0	106.9	99.9	93.8	88.3	83.5	79.1
4.5	124.4	115.0	106.9	99.9	93.8	88.3	83.5	79.1	75.2
5.0	115.0	106.9	99.9	93.8	88.3	83.5	79.1	75.2	71.7
In lieu of increasing the typical aisle width, an additional vertical empty space (either above or below the EUT) may be implemented as follows:									
Equipment Type	**Equipment Vertical Space (feet)**	**Reference**							
Natural Convection Frame Depth = 12 inches	2.009	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)							
Natural Convection Frame Depth = 18 inches	1.153	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)							
Natural Convection Frame Depth = 24 inches	1.153	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)							
Forced-air Fans Frame Depth = 12 inches	1.395	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-2)							

Table 2-9 ATC Maximum Heat Release (23-inch frame)

ATC Maximum Heat Release Calculation for 23-inch (600mm) Frame		
Forced-air Fans Frame Depth = 18 inches	0.754	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-3)
Forced-air Fans Frame Depth = 24 inches	0.7539	Vertical empty space calculation based on Typical Aisle Widths for a Typical 20 x 20 feet Bay (GR-63-CORE, Figure 2-6)

ATC Product Details

Table 2-10 lists the name and a brief description of each of the supported ATCs.

Table 2-10 ATC Product Details

Product Ordering Name (PON)	Description
ATC-A	ATN Transport Chassis- Active
ATC-P	ATN Transport Chassis- Passive

Functional Description

The ATC supports the following functions:

- The ATC can be deployed as an Active Chassis (ATC-A) or a Passive Chassis (ATC-P) within an ATN
- The ATC is used in ATN Terminal and ATN Add/Drop configurations
- The ATC can be installed in an 19-inch or 23-inch ANSI or ETSI rack

The ATC-A is composed of the following components that provide power, perform system supervision, and enable system-level communication. See Figure 2-1 on page 2-6 for an illustration of the ATC components.

- "Rack Mounting Ears" on page 2-16
- "Power Conversion Module (PCM)" on page 2-16
- "Alarm Panel" on page 2-20
- "Fan Tray" on page 2-26
- "Air Filter" on page 2-27
- "Fiber Management Guide and Cable Guides" on page 2-28
- "Card Cage" on page 2-31

The ATC-A contains two electrical ground locations. One set of two 1/4-20 press-nuts are located on the chassis at the rear bottom and another set of two 1/4-20 press-nuts are located on the right side toward the rear end of the chassis.

The ATC-P is a passive chassis that does not require any management or power inputs. The ATC-P includes eight chassis slots to house passive Optical Filter Modules (OFMs), and can be installed in a 19-inch or 23-inch ANSI or ETSI rack. See Figure 2-2 on page 2-6 for an illustration of the ATC components.

Mechanical Specifications

Table 2-11 provides the mechanical specifications for the ATC-A.

Table 2-11 ATC-A Mechanical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	5.22 inches / 132.5mm
	Width	17.48 inches / 444.0mm
	Depth	11.54 inches / 293.0mm (Overall Chassis depth)
	Weight - with backplane and alarm card	21lbs / 9.53kg
	Weight - fully loaded chassis	43.91lbs / 19.96kg

The ATC-A top and front dimensions of the chassis are provided in Figure 2-3.

Figure 2-3 ATC-A Dimensions

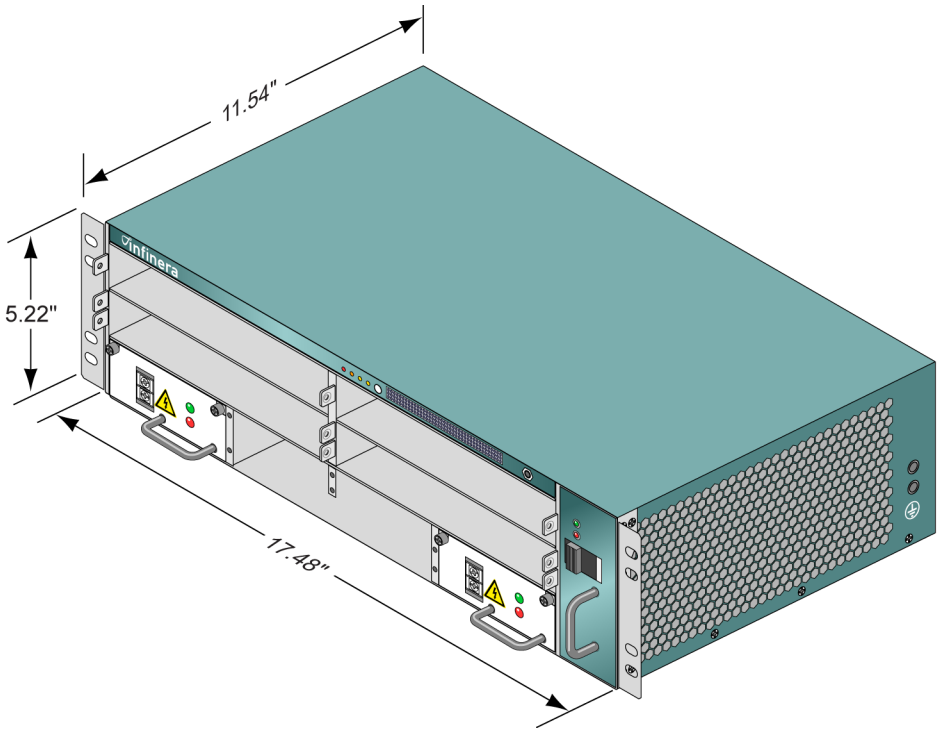


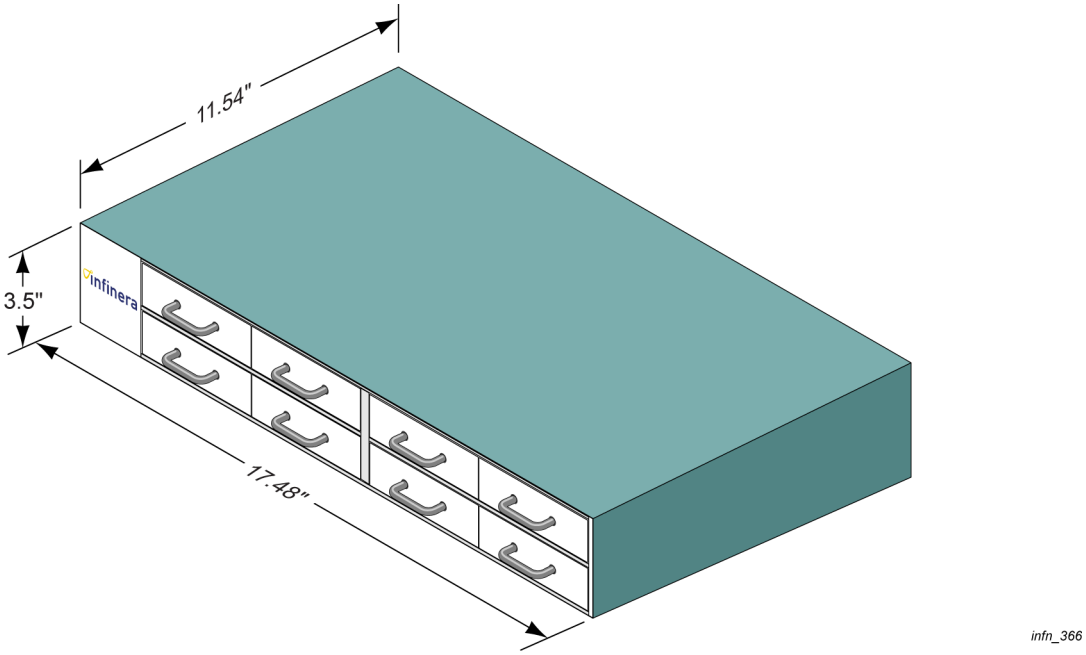
Table 2-11 provides the mechanical specifications for the ATC-P.

Table 2-12 ATC-P Mechanical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	3.5 inches
	Width	17.48 inches
	Depth	11.54 inches (Overall Chassis depth)
	Weight	14lbs / 6.35kg
	Weight - fully loaded chassis	34.23lbs / 15.56kg

The ATC-P top and front dimensions of the chassis are provided in Figure 2-3.

Figure 2-4 ATC-P Dimensions



Rack Mounting Ears

Each ATC includes six types of rack mounting ears that can be ordered by the user. The rack mounting ears are utilized to flush mount the chassis in a 19-inch or 23-inch ANSI or ETSI rack. Additionally, separate forward mount ears are utilized to allow the chassis to mount 2-inch forward from the front of the 19-inch or 23-inch ANSI or ETSI rack.

Power Conversion Module (PCM)

Table 2-13 lists the name and a brief description of the supported PCM.

Table 2-13 ATN Power Conversion Module

Product Ordering Name (PON)	Features
PCM-48VDC	Power Conversion Module- DC

The front lower corners of the ATC accommodate up to two hot-pluggable -48V DC Power Conversion Modules (PCM-48VDC). The ATC supports dual redundant DC power feeds.

DC Power Conversion Module (PCM-48VDC)

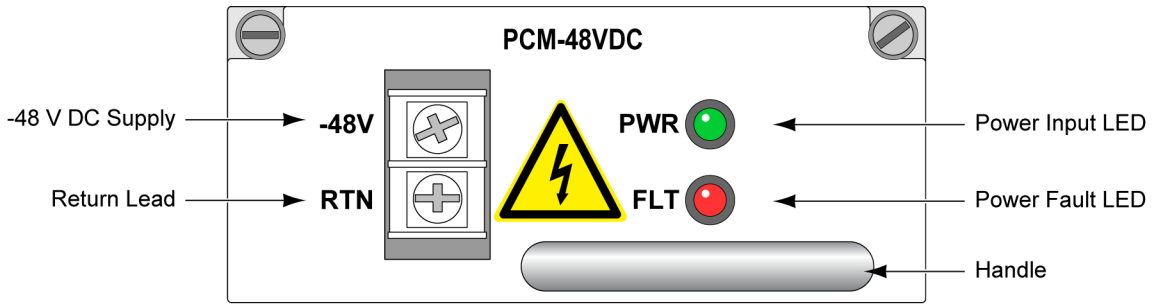
The ATN includes two redundant DC power conversion modules in each ATC-A. The DC power conversion module, PCM-48VDC receives a -48V DC input feed, converts it to +12V DC and distributes the +12V DC to all slots. It also generates +3.3VDC that is provided to passive cards and the Alarm card for light loads.

The PCM-48VDC has the following features:

- Over-voltage and under-voltage detection
- Automated power shutdown for over/under-voltage with restart of under-voltage correction
- Overcurrent protection
- Protection for reverse polarity
- In-rush control
- In-line fusing to protect other shelves from a local short circuit condition.

External Indicators

Figure 2-5 ATC PCM-48VDC Faceplate



infn_271

Power LEDs

The PCM-48VDC located in the ATC provide two status LEDs: Power Input and Power Fault. The LEDs indicate whether the power levels are within specified limits. The significance of an illuminated LED is described in Table 2-14.

Table 2-14 ATC PCM-48VDC Visual Alarm Indicators

Power Input (Green)	Power fault (Red)	Description
ON	OFF	Input lead is receiving power Power output from the Power Conversion Module as per specifications
ON	ON	Input lead is receiving power Power output from Power Conversion Module not to specifications
Blinking	OFF	Input under voltage Power output from the Power Conversion Module as per specifications
Blinking	ON	Input under voltage Power output from the Power Conversion Module not to specifications
OFF	ON	Input lead is not receiving power Power output from the Power Conversion Module not to specifications
OFF	OFF	Input lead is not receiving power No power to either Power Conversion Module

Connectors

Each PCM-48VDC is provided with a terminal block with two wire clamps. One wire clamp is for connection to -48V DC Power and the second to its Return. Power cables are connected to the PCM either by direct bare wire connection, or through the use of lugs. A plastic safety cover is provided to prevent inadvertent contact with the terminals once installed.

Technical Specifications

Table 2-15 provides the mechanical and electrical specifications for the ATC PCM-48VDC.

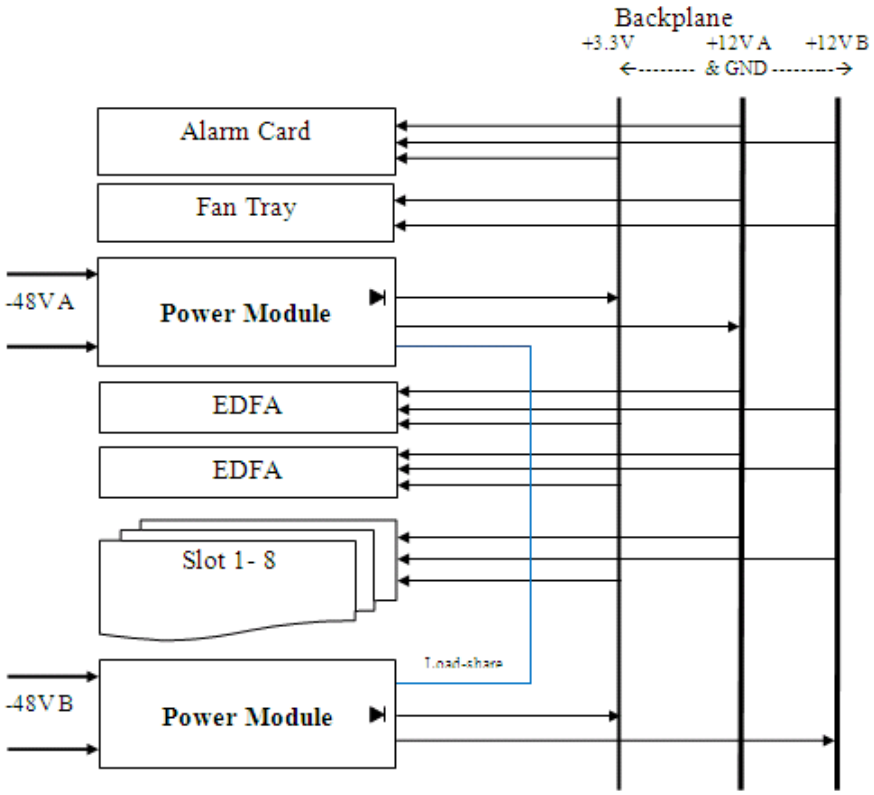
Table 2-15 ATC PCM-48VDC Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	3.6 inches / 91.5mm
	Width	1.57 inches / 40mm
	Depth	10.68 inches / 271.3mm
	Weight	2.2lbs / 0.98kg
Electrical specifications	Power consumption	See Table 2-1 on page 2-2

Power Distribution Architecture

PCM A and PCM B distribute the power supply to the power connectors on top of the backplane. The backplane feeds the power supply from each PCM to the circuit packs as shown in Figure 2-6.

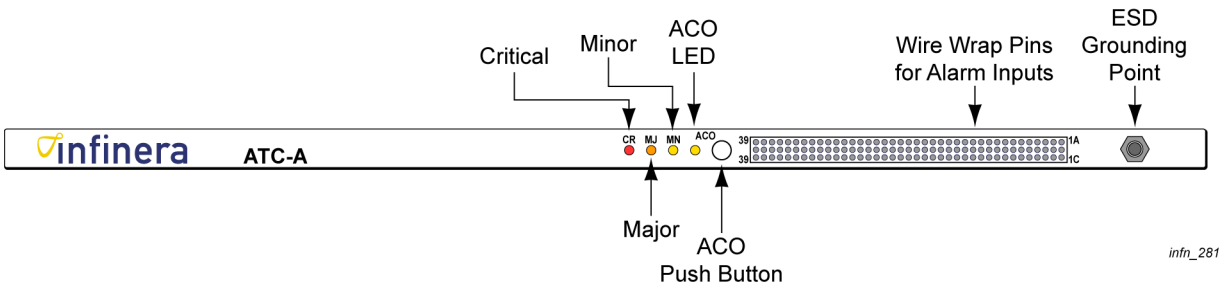
Figure 2-6 ATC Power Distribution Diagram



The ATC hardware modules combine the power feed by diode-ORing. The 12V DC inputs are individually fused on the circuit packs and fan tray to protect them from overcurrent conditions. The fuse is not field replaceable. The status of each fuse is monitored before the ORing diodes. A diode and a transient voltage suppression (TVS) diode are provided to protect against reverse polarity and transient overvoltage conditions.

Alarm Panel

Figure 2-7 ATC-A Alarm Panel Front View



Chassis-Level Alarm LEDs

The alarm panel on the ATC-A provides chassis level alarms, POWER, CRITICAL, MAJOR, and MINOR LEDs. These indicate the severities of the current outstanding alarms within that chassis. The POWER LED indicates the power-on status. Each chassis has an Alarm Cutoff (ACO) button on the alarm panel which controls the reporting of audible alarms. The significance of an illuminated LED is described in Table 2-16.

Table 2-16 ATC-A Visual Alarm Indicators - Chassis Level

LED	Color	Description
POWER	Green	Indicates the presence (lit) or absence (dimmed) of power supply within the specified operating range to the chassis
CRITICAL	Red	Indicates the presence (lit) or absence (dimmed) of Critical alarms in the chassis
MAJOR	Red	Indicates the presence (lit) or absence (dimmed) of Major alarms in the chassis
MINOR	Yellow	Indicates the presence (lit) or absence (dimmed) of Minor alarms in the chassis
ACO	Yellow	Indicates the presence (lit) or absence (dimmed) of the Alarm Cutoff function

Alarm Cutoff (ACO) Indicators

The ATC contains one ACO button and an ACO LED. The ACO feature allows muting of the external audible alarms. When the ACO button is pressed, all current critical, major, and minor audio alarms are muted and the ACO LED is lit. Table 2-17 provides a description of the alarm state and the ACO LED state.

Table 2-17 ATC-A Audio Alarm Indicators - Chassis Level

Condition	ACO LED State	Audio Alarm
There are no external alarms on the chassis	OFF	Not present
An external alarm is raised on the chassis	OFF	Present
ACO button is pressed	ON	Muted
An external alarm is cleared	OFF	Not present

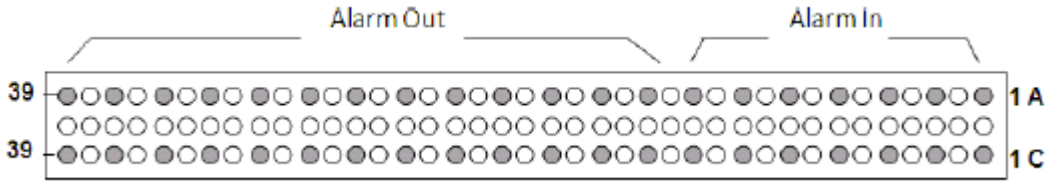
External Connectors

The ATC-A also houses alarm input and output contact sets. The ATC-A has five alarm input contact sets. Each input alarm contact set has two contacts. Four alarm input contact sets are user customizable, and the other input contact set is reserved for ACO input from an external chassis. See “ATC Alarm Input Contact Pin Assignments” on page 2-22 for the list of the alarm contacts.

The ATC-A has ten alarm output contact sets. Each output alarm contact set consists of Normally-closed, Normally-open and common contacts. Four output contacts are user customizable, while the rest are reserved for office alarms. See “ATC Alarm Output Contact Pin Assignments” on page 2-23 for the list of the alarm contacts.

The input and output dry alarm contacts of 0.025 inch square pins are accessible from the front of the ATC to facilitate easy interconnection. These contacts are used for integration with existing environmental alarm systems. The alarm pin positions are shown in Figure 2-8.

Figure 2-8 ATC Alarm Input/Output Contacts



The input and output connector details are provided in Table 2-18.

Table 2-18 ATC External Connectors

Connector	Type	Purpose
ALARM INPUTS	0.025 inch square wire wrap pins that can be attached to the alarm panel	Environmental alarm inputs and office alarm input contacts
ALARM OUTPUTS	0.025 inch square wire wrap pins that can be attached to the alarm panel	Environmental alarm output and office alarm output contacts

Technical Specifications

The environmental alarm contacts have the electrical ratings specified in Table 2-19.

Table 2-19 ATC Alarm Relay Contact Specifications

Parameter	Value
Maximum voltage	125V AC, 220V DC
Maximum current	2A
Rated load	0.5A @ 125V AC, 2A @ 30V DC
Wire size	26 AWG minimum
Maximum surge voltage between contact and coil	2,500V

Alarm Input Contact Pin Assignments

Table 2-20 lists the assignment of alarm input contact pins for the ATC. One alarm contact is pre-defined in the system and the remaining four contacts can be customized by the users to monitor environmental alarms.

Table 2-20 ATC Alarm Input Contact Pin Assignments

Pin		Description	Function
Row	Column		
C	7	Alarm Input Contact 1	User defined
A	7	Alarm Input Contact 1	User defined
C	5	Alarm Input Contact 2	User defined
A	5	Alarm Input Contact 2	User defined
C	3	Alarm Input Contact 3	User defined
A	3	Alarm Input Contact 3	User defined
C	1	Alarm Input Contact 4	User defined
A	1	Alarm Input Contact 4	User defined

Table 2-20 ATC Alarm Input Contact Pin Assignments

Pin		Description	Function
Row	Column		
C	9	Reserved for Alarm Cutoff (ACO)[a]	Predefined
A	9	Reserved for Alarm Cutoff (ACO)[a]	Predefined

a. ACO can be enabled using the input contact pins in addition to the ACO push button and the ATN GNM user interface.

Alarm Output Contact Pin Assignments

Table 2-21 lists the assignment of alarm output contact pins for the ATC. Six alarm contacts are pre-defined in the system and the remaining four contacts can be customized by the users to monitor the environmental alarms.

Table 2-21 ATC Alarm Output Contact Pin Assignments

Pin		Description	Function
Row	Column		
A	17	Alarm Output Contact 1, COMMON	User defined
A	19	Alarm Output Contact 1, NORMALLY CLOSED	User defined
A	21	Alarm Output Contact 1, NORMALLY OPEN	User defined
C	17	Alarm Output Contact 2, COMMON	User defined
C	19	Alarm Output Contact 2, NORMALLY CLOSED	User defined
C	21	Alarm Output Contact 2, NORMALLY OPEN	User defined
A	11	Alarm Output Contact 3, COMMON	User defined
A	13	Alarm Output Contact 3, NORMALLY CLOSED	User defined
A	15	Alarm Output Contact 3, NORMALLY OPEN	User defined
C	11	Alarm Output Contact 4, COMMON	User defined

Table 2-21 ATC Alarm Output Contact Pin Assignments

Pin		Description	Function
Row	Column		
C	13	Alarm Output Contact 4, NORMALLY CLOSED	User defined
C	15	Alarm Output Contact 4, NORMALLY OPEN	User defined
C	29	Minor Audio Alarm, COMMON	Predefined
C	27	Minor Audio Alarm, NORMALLY CLOSED	Predefined
C	25	Minor Audio Alarm, NORMALLY OPEN	Predefined
A	23	Minor Visual Alarm, COMMON	Predefined
A	25	Minor Visual Alarm, NORMALLY CLOSED	Predefined
A	27	Minor Visual Alarm, NORMALLY OPEN	Predefined
C	29	Major Audio Alarm, COMMON	Predefined
C	31	Major Audio Alarm, NORMALLY CLOSED	Predefined
C	33	Major Audio Alarm, NORMALLY OPEN	Predefined
A	29	Major Visual Alarm, COMMON	Predefined
A	31	Major Visual Alarm, NORMALLY CLOSED	Predefined
A	33	Major Visual Alarm, NORMALLY OPEN	Predefined
C	35	Critical Audio Alarm, COMMON	Predefined
C	37	Critical Audio Alarm, NORMALLY CLOSED	Predefined
C	39	Critical Audio Alarm, NORMALLY OPEN	Predefined

Table 2-21 ATC Alarm Output Contact Pin Assignments

Pin		Description	Function
Row	Column		
A	35	Critical Visual Alarm, COMMON	Predefined
A	37	Critical Visual Alarm, NORMALLY CLOSED	Predefined
A	39	Critical Visual Alarm, NORMALLY OPEN	Predefined

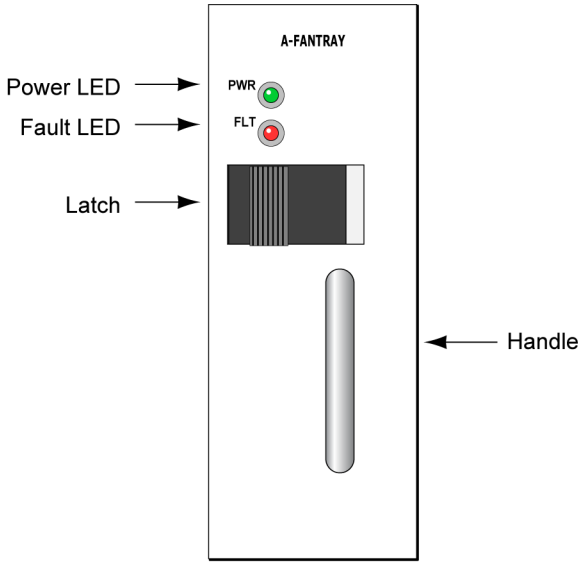
Fan Tray

The ATC contains one removable fan tray (A-Fantray) consisting of two individually controlled DC brushless fans and an embedded air filter. The thermal system employs a horizontal-push approach to move air through the system. The air flow enters from the right side, and exits from the left side.

The individual fans within a fan tray, are 1 +1 redundant with power hot-swap controllers. The fans can operate under normal conditions from 0ºC to 40ºC. If one of the two fans fail, an alarm will be generated that indicates one of the fans has failed. The ATC can operate for up to 96 hours with one fan failed, as long as the temperature is not over 40ºC. The user should change the fan tray at the earliest convenience to protect against a second fan failure.The faulted fan tray should be kept installed inside the ATC until a replacement fan tray is available.

The fan tray should never be partially removed from the system unless performing air filter maintenance (when performing air filter maintenance, the fan tray should not be removed from the system for more than five minutes).

Figure 2-9 Fan Tray



A POWER LED and a FAULT LED are provided on the fan tray. The significance of an illuminated LED is described in Table 2-22.

Table 2-22 ATC Fan Tray Visual Alarm Indicators

LED	Color	Description
POWER	Green	Indicates the presence or absence of power supply to the fan tray
FAULT	Red	Indicates the presence or absence of a fault condition with the fan tray

Technical Specifications

Table 2-23 provides the mechanical and electrical specifications for the ATC fan tray.

Table 2-23 ATC Fan Tray Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	4.99 inches / 126.5mm
	Width	1.99 inches / 50.7mm
	Depth	10.79 inches / 274.2mm
	Weight- with air filter	3lbs / 1.4kg
Electrical specifications	Power consumption	See Table 2-1 on page 2-2

Air Filter

A replaceable air filter is necessary to filter out dust particles at the air intake of the ATC. In the ATC, the air filter is embedded within the fan tray (see Figure 2-10 on page 2-28). Air is filtered at 80% dust arrestance. To ensure adequate cooling of the ATC the air filter must be inspected at regular intervals and possibly replaced. Infinera recommends inspecting the air filter once every six months.

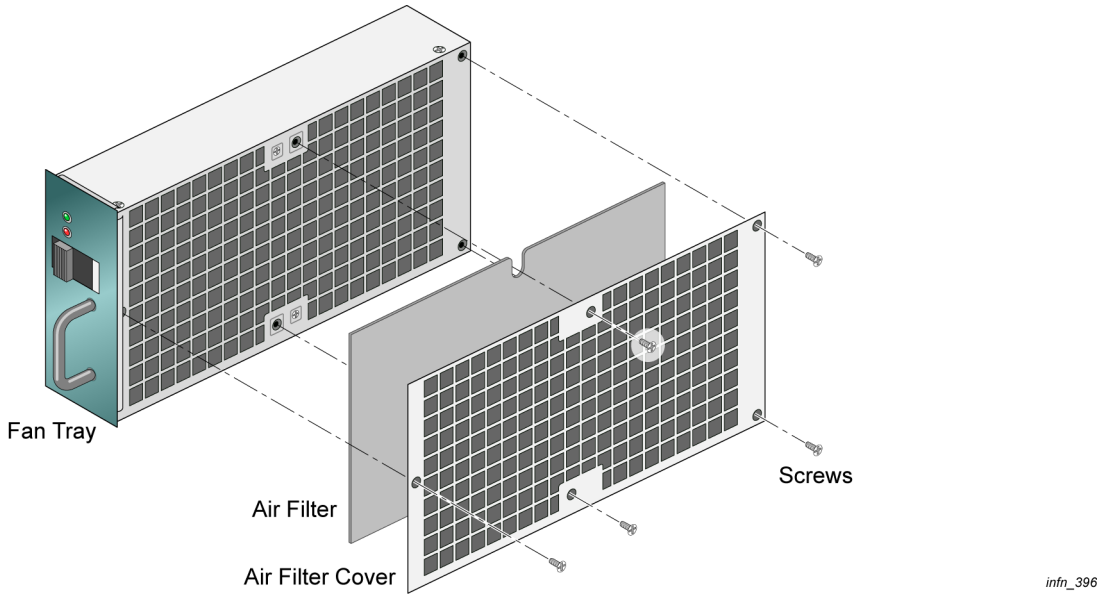
Mechanical Specifications

Table 2-24 provides the mechanical specifications for the ATC air filter.

Table 2-24 ATC Air Filter Mechanical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	5 inches/127 mm
	Width	0.25 inches/6.35 mm
	Depth	9.5 inches/241.3 mm
	Weight	NA
	Dust arrestance	80%

Figure 2-10 Fan Tray with Air Filter



Fiber Management Guide and Cable Guides

The Infinera ATN can be equipped with an optional Fiber management Guide and Cable Management Guides. For additional information refer to the following sections:

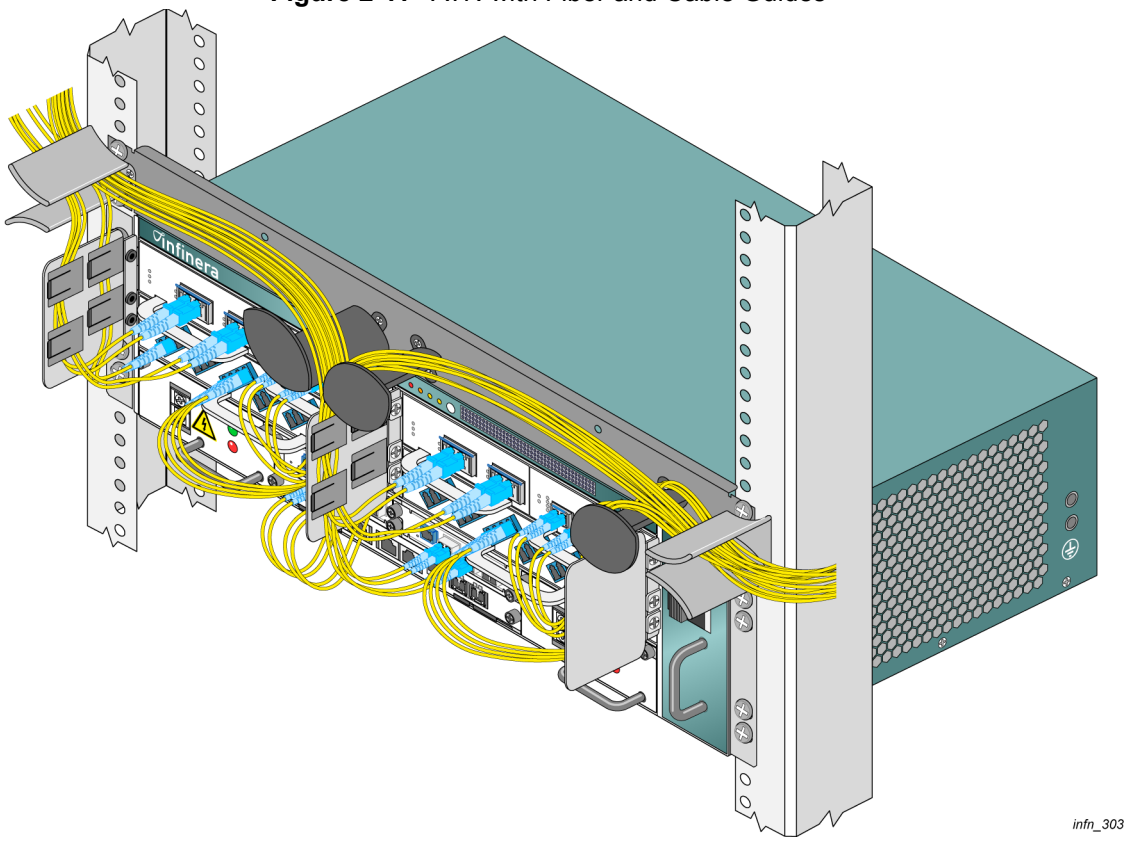
- “Fiber Management Guide” on page 2-29
- “Cable Management Guides” on page 2-30

The ATN Fiber and Cable Guide components are listed in Table 2-25.

Table 2-25 Fiber and Cable components

Name	Description	Part Number
Fiber Guide	Rack mounted 1 RU Fiber Guide	120-0191-001
Cable Guide set	Set of three cable guides	120-0194-001
Right Cable Guide	Cable Guide that mounts to the right side of the ATC	120-0189-001
Left Cable Guide	Cable Guide that mounts to the left side of the ATC	120-192-001
Middle Cable Guide	Cable Guide that mounts to the middle of the ATC	120-0188-001

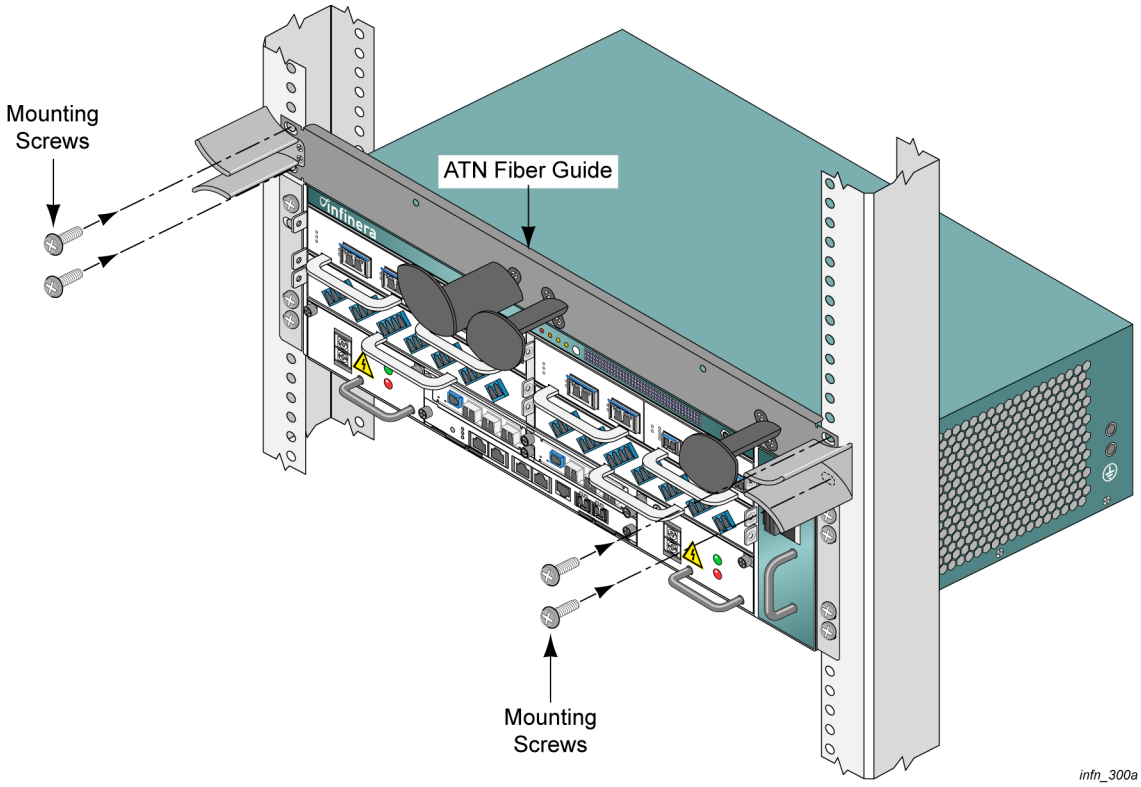
Figure 2-11 ATN with Fiber and Cable Guides



Fiber Management Guide

An optional fiber management guide can be used in conjunction with the ATC. The Fiber management guide is one rack unit high (1.75”) and is designed to be mounted to the equipment rack on top of an ATC. The fiber management guide aids in routing fiber optic cables between the ATC and the equipment rack. See Figure 2-12 on page 2-30.

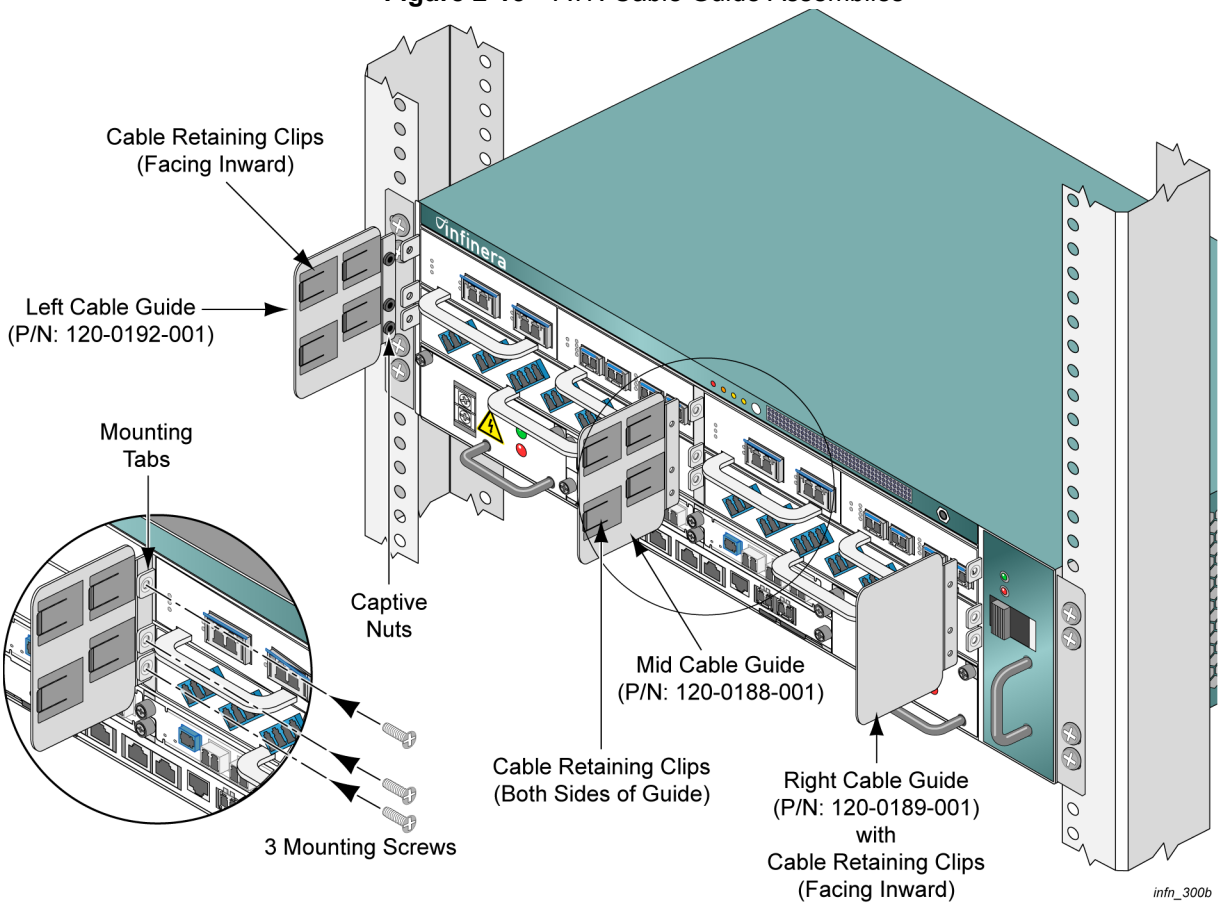
Figure 2-12 ATN Fiber Guide Assembly



Cable Management Guides

In addition to the fiber management guide, there are three cable management guides that can be mounted directly to the ATC, one each on the right and left sides of the chassis and one in the middle. Along with the fiber management guide, the cable guides maximize valuable rack space and help to eliminate the pinching of cables in addition to providing correct cable bend radius. See Figure 2-13 on page 2-31.

Figure 2-13 ATN Cable Guide Assemblies



Card Cage

The ATC-A and the ATC-P contain a single card cage to house the various circuit packs. The card cage for the ATC-A and ATC-P are described in the following topics:

- “ATC-A Card Cage” on page 2-31
- “ATC-P Card Cage” on page 2-32

ATC-A Card Cage

The ATC-A contains a single card cage consisting of eleven chassis slots which house the circuit packs that provide the optical and digital transport functions of the system as shown in Figure 2-14 on page 2-32.

Slots 1 to 8 are flexible slots and house Service Interface Modules (SIMs) and/or Optical Filter Modules (OFMs). Slots 9 and 10 are reserved for the ATN Amplification Module (AAM) or Passive OSC Add/Drop module (OFM-1-OSC) and slot 11 is reserved for the ATN Management Module (AMM). Table 2-26 on page 2-32 outlines the ATC-A slot assignments.

Figure 2-14 ATC-A Card Cage

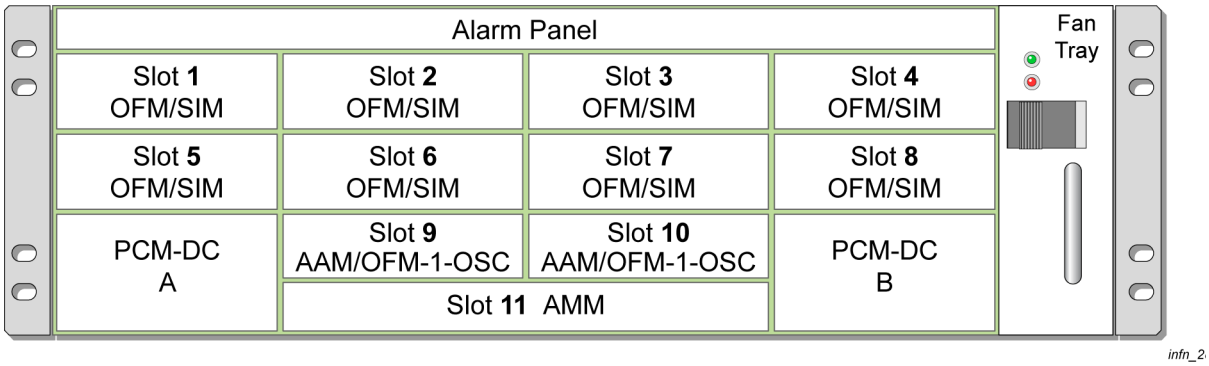


Table 2-26 ATC-A Chassis Slot Assignments

ATC Chassis Slot Number	Module Type
1	OFM/SIM
2	
3	
4	
5	
6	
7	
8	
9	AAM/OFM-1-OSC
10	AAM/OFM-1-OSC
11	AMM

ATC-P Card Cage

The ATC-P contains a single card cage consisting of eight chassis slots which house the Optical Filter Modules (OFMs) as shown in Figure 2-15.

Table 2-27 on page 2-33 outlines the ATC-A slot assignments

Figure 2-15 ATC-P Card Cage

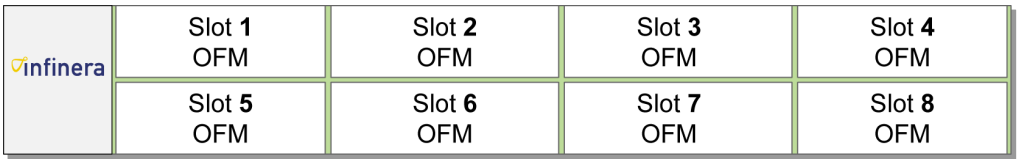


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Table 2-27 ATC-P Chassis Slot Assignments

ATC Chassis Slot Number	Module Type
1	OFM
2	
3	
4	
5	
6	
7	
8	

ATN Management Module (AMM)

Table 2-28 AMM-A Product Details

Product Ordering Name (PON)	Description
AMM-A	ATN Management Module

Functional Description

The AMM-A module occupies slot 11 of the ATC and provides shelf controller functionality for all modules resident within the chassis. Each ATC-A must be equipped with an AMM-A.

The AMM-A contains the system software and configuration database for the ATN and performs the following:

- Management gateway functions to the external Data Communications Network (DCN)
- Terminates East and West Optical Supervisory Channels (OSCs)
- Supports remote network element configuration database download.

AMM-A parameters are shown in Table 2-29.

Table 2-29 AMM-A Parameters

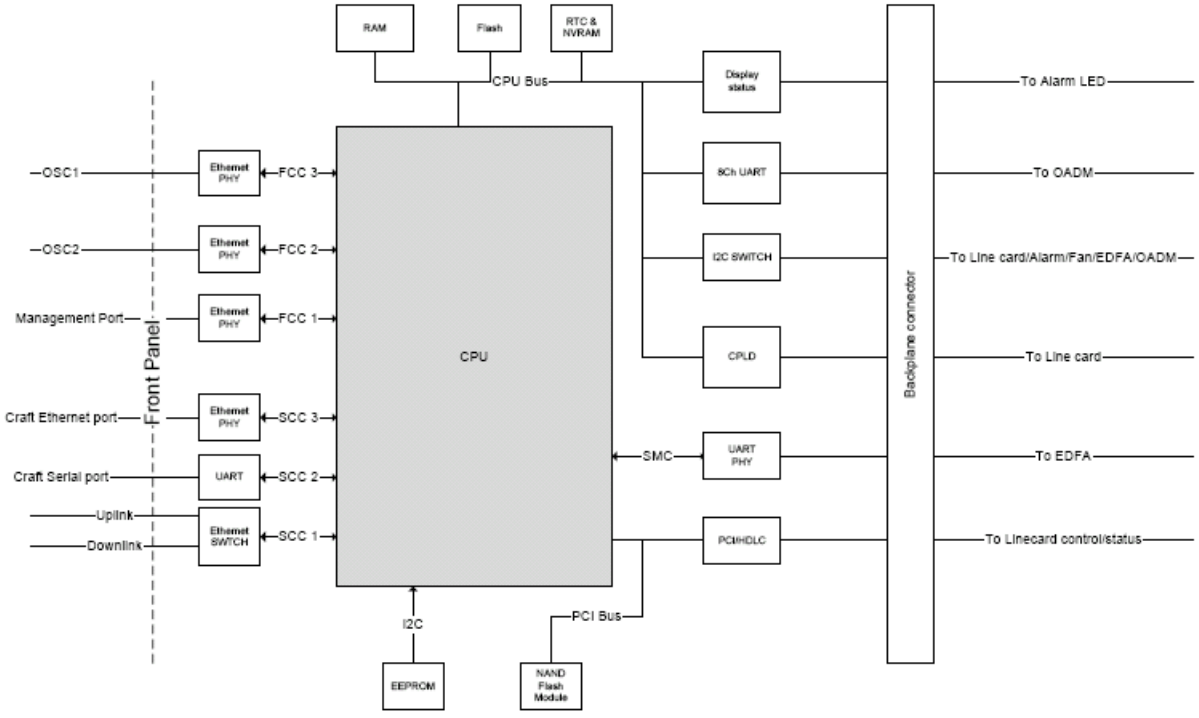
Parameter	AMM-A
CPU Frequency	450 Mhz
Persistence Storage	1 GB
Physical Memory (SDRAM)	256 MB

The AMM-A front panel also houses the LEDs, management and operations interfaces as described below:

- Three circuit pack level LEDs; PWR, FLT and NM
- Two 10/100 Base-T auto-negotiating inter-chassis interconnect RJ-45 Ethernet interfaces labeled as Nodal Control (NC1 and NC2)
- One 10/100 Base-T auto-negotiating Data Communication Network (DCN) RJ-45 Ethernet interface labeled as DCN
- One 10Base-T Craft Ethernet interface via an RJ-45 connector
- One craft RS-232 serial port (DCE) via an RJ-45 connector
- Two small-form factor pluggable (SFP) ports corresponding to West and East Optical Supervisory Channels (OSC channels) labeled as OSC-W and OSC-E. The OSC connection has 100M Ethernet over a wavelength of 1451nm through the SFP ports.

Block Diagram

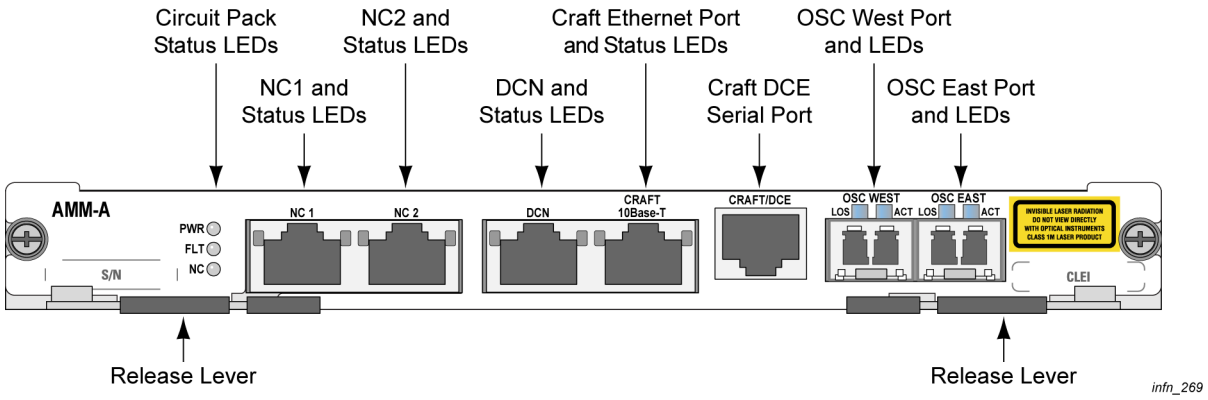
Figure 2-16 AMM-A Functional Block Diagram



External Indicators and Connectors

The AMM-A provides circuit pack status LED indicators and port connectors as shown in Figure 2-17.

Figure 2-17 AMM-A Faceplate



Circuit Pack Level LEDs

The AMM-A provides three LEDs to indicate the circuit pack status as described in Table 2-30.

Table 2-30 AMM-A Status LED Indicators

LED	Color	Description
PWR (Power)	Green	Indicates the presence (lit) or absence (dimmed) of power supply to the AMM-A
FLT (Fault)	Red	Indicates the presence (lit) or absence (off) of an alarm on the circuit pack: Critical, Major, or Minor
NC (Node Controller)	Green	Indicates the circuit pack function: Node Controller (Green) or Not a Node Controller (off)

Connectors

The AMM-A provides the ports as described in Table 2-31.

Table 2-31 AMM-A Connectors

Connector	Type	Purpose
NC1	10/100Base-Tx Auto-MDI RJ-45	Used for inter-chassis communication for uplink
NC2	10/100Base-Tx Auto-MDIX RJ-45	Used for inter-chassis communication for downlink
DCN	10/100Base-Tx Auto-MDI RJ-45	Used for remote management through DCN
CRAFT Ethernet (10Base-T)	10/100Base-Tx Auto-MDIX RJ-45	Used by maintenance personnel for managing the network element
CRAFT DCE	57600 baud RS-232 DCE via RJ-45 connector	Used by maintenance personnel for initial commissioning of a network element during turn-up and test. Also used for field debugging
OSC-W and OSC-E	SFP ports for two West/ East OSC channels (1451nm)	Used for terminating West and East OSCs

Port Indicators

Table 2-32 describes the AMM port indicator LEDs (see Figure 2-17).

Table 2-32 AMM-A Port Indicators

LED	Color	Status	Description
RJ-45 built-in LNK (Link established)	Green	ON	Link is established
		OFF	Link is not established
RJ-45 built-in ACT (Active)	Green	ON	The port is active
		OFF	The port is not active
ACT (Active)	Green	ON	The port is active
		OFF	The port is not active
LOS (Loss Of Signal)	Red	ON	Loss of signal
		OFF	No loss of signal

Technical Specifications

Table 2-33 provides the mechanical and electrical specifications for the AMM-A.

Table 2-33 AMM-A Technical specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.87 inches / 22.10mm
	Width	7.44 inches / 188.94mm
	Depth	10.73 inches / 272.50mm
	Weight	1.1lbs / 0.5kgs
Electrical specifications	Power consumption	See Table 2-1 on page 2-2

ATN Amplifier Module (AAM)

There are two types of ATN Amplifier Modules (AAMs) supported on the ATC. The AAMs are used to provide amplification in DWDM systems. The AAM occupies slot 9 and/or slot 10 of the ATC.

ATN Release 1.0 supports the following AAMs:

- AAM-B1 (ATN Amplifier Module — Boost EDFA)
- AAM-P1 (ATN Amplifier Module — Pre/line EDFA)

Table 2-34 lists the name and a brief description of the supported AAMs.

Table 2-34 AAM Product Details

Product Ordering Name (PON)	Description
AAM-B1 (Boost EDFA)	ATN Amplifier Module — Boost 13dBm Output Power
AAM-P1 (Pre/line EDFA)	ATN Amplifier Module — Pre/line 13dBm Output Power

Functional Description

The AAM performs the following functions:

- Available in two configurations that provide pre/line and boost amplification in DWDM systems
- Variable gain performance
  - 10 to 16 dB for AAM-B1 (Boost-EDFA)
  - 20 to 30 dB for AAM-P1 (Pre/Line-EDFA)
- Provides full C-Band coverage
- Extensive performance management and alarm management capabilities
  - Integrated OSA monitoring port and OSC Add/Drop ports
  - Excellent transient response and flat gain over wide dynamic range

Block Diagram

Figure 2-18 displays the functional block diagram of AAM-B1.

Figure 2-18 AAM-B1 Functional Block Diagram

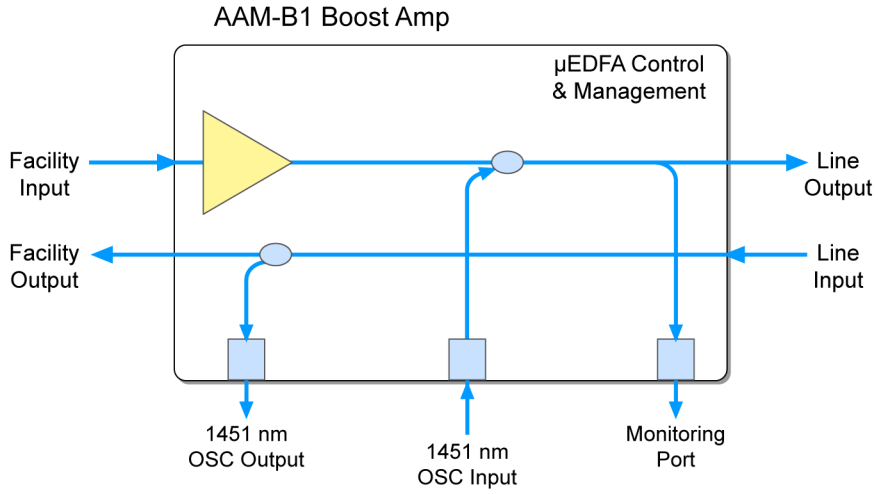
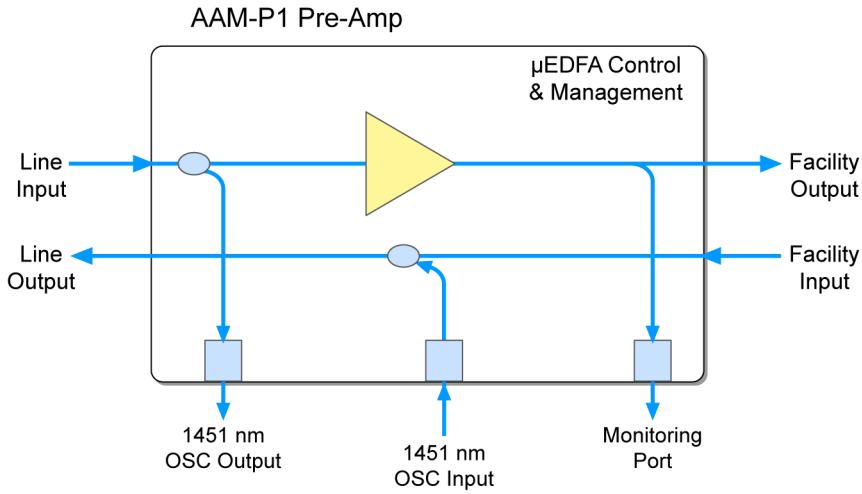


Figure 2-18 displays the functional block diagram of AAM-P1.

Figure 2-19 AAM-P1 Functional Block Diagram

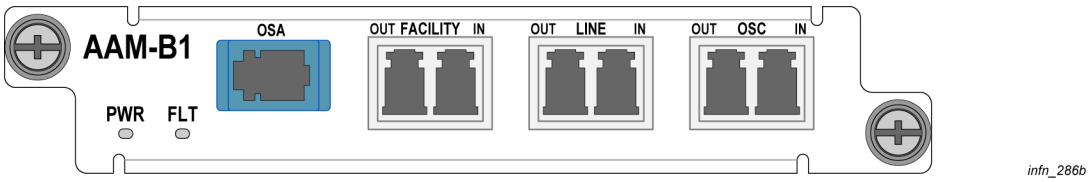


External Indicators and Connectors

The AAM provides circuit pack status LED indicators as follows:

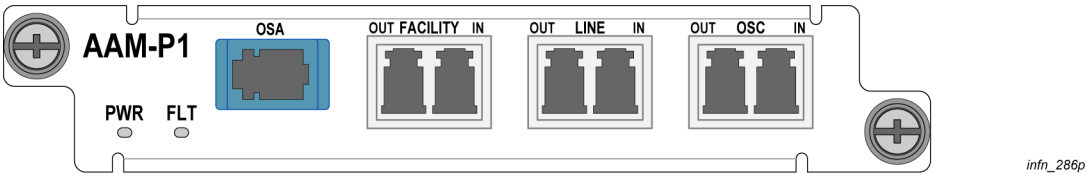
- AAM-B1 as shown in Figure 2-20 on page 2-41

Figure 2-20 AAM-B1 Faceplate



- AAM-P1 as shown in Figure 2-21 on page 2-41

Figure 2-21 AAM-P1 Faceplate



Circuit Pack Level LEDs

The AAM provides two LEDs to indicate the circuit pack status. The significance of an illuminated LED is described in Table 2-35.

Table 2-35 AAM Status LED Indicators

LED	Color	Description
PWR (Power)	Green	Indicates the presence (lit) or absence (dimmed) of power supply to the AAM
FLT (Fault)	Red	Indicates the presence (lit) or absence (dimmed) of an alarm on the circuit pack: Critical, Major, or Minor

Connectors

The AAM provides connectors for the external fiber plant, and for management and control of traffic.

Table 2-36 lists the connectors for the AAM-B1 and AAM-P1

Table 2-36 AAM-B1 and AAM-P1 Connectors

Connector	Type	Purpose
Line IN	LC, Front access	Connects from the line side fibers
Line OUT	LC, Front access	Connects to the line side fibers

Table 2-36 AAM-B1 and AAM-P1 Connectors

Connector	Type	Purpose
OSA Monitor	LC, Front access	Port to monitor the output from the EDFA
Facility IN	LC, Front access	Connects from the facility side
Facility OUT	LC, Front access	Connects to the facility side
OSC IN	LC, Front access	Connects from the AMM
OSC OUT	LC, Front access	Connects to the AMM

Technical Specifications

Table 2-37 provides the mechanical and electrical specifications for the AAM-B1 and AAM-P1.

Table 2-37 AAM-B1 and AAM-P1 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.7 inches / 17.78mm
	Width	3.6 inches / 91.44mm
	Depth	11.1 inches / 281.94mm
	Weight	0.8lbs
Electrical specifications	Power consumption	See Table 2-1 on page 2-2

Optical Specifications

The optical specification details for the AAM-B1 and AAM-P1 are listed in Table 2-38.

Table 2-38 AAM-B1 and AAM-P1 Optical Specifications

Type	Parameter	Specification
Line side optics	Wavelength spacing	100GHz
	Wavelength frequency range	1530.33-1563.05nm ITU Grid
OSC	Wavelength	1451nm
	Format	100M Ethernet

Optical Filter Modules (OFM)

The Optical Filter Modules (OFMs) multiplex and demultiplex DWDM or CWDM signals. OFMs are hard-wired to transmit and receive a designated number of channels with specific wavelengths. The OFMs are passive modules that do not require power input and can be installed in slots 1 through 8 of the ATC-A and ATC-P.

The naming convention for an OFM is OFM-*n*-*A*-*B*-*xy,* where:

n indicates the number of channels

A indicates if the signal is of DWDM (D) or CWDM (C) type

B indicates if the OFM functions as a Multiplexer/Demultiplexer (M) or an OADM (A)

x indicates the channel number corresponding to the start of the band or sub-band

y indicates the channel number corresponding to the end of the band or sub-band

For example, OFM-10-D-M-5059 indicates a 10 channel DWDM Multiplexer/Demultiplexer supporting signals within Channel 50 to Channel 59. For more information on the optical channel plan, refer to *Infinera ATN System Description Guide*.

There are twenty (20) versions of the OFMs as listed in Table 2-39.

Table 2-39 OFM Product Details

PON	Description
DWDM OFMs	
OFM-10-D-M-5059	10 Channel DWDM Multiplexer/Demultiplexer— Band 1 (Channel 50-59), with 1 Red/Blue Filter port, 1 Expansion Port
OFM-10-D-M-4049	10 Channel DWDM Multiplexer/Demultiplexer— Band 2 (Channel 40-49)
OFM-10-D-M-2837	10 Channel DWDM Multiplexer/Demultiplexer— Band 3 (Channel 28-37), 1 Expansion Port, 1 Red/Blue Filter port
OFM-10-D-M-1827	10 Channel DWDM Multiplexer/Demultiplexer— Band 4 (Channel 18-27)
OFM-4-D-A-5659	4-Channel DWDM OADM Module with Express Port— Sub-Band 1 (Channel 56-59)
OFM-4-D-A-5255	4-Channel DWDM OADM Module with Express Port— Sub-Band 2 (Channel 52-55)
OFM-4-D-A-4851	4-Channel DWDM OADM Module with Express Port— Sub-Band 3 (Channel 48-51)
OFM-4-D-A-4447	4-Channel DWDM OADM Module with Express Port— Sub-Band 4 (Channel 44-47)
OFM-4-D-A-4043	4-Channel DWDM OADM Module with Express Port— Sub-Band 5 (Channel 40-43)

Table 2-39 OFM Product Details

PON	Description
OFM-4-D-A-3437	4-Channel DWDM OADM Module with Express Port— Sub-Band 6 (Channel 34-37)
OFM-4-D-A-3033	4-Channel DWDM OADM Module with Express Port— Sub-Band 7 (Channel 30-33)
OFM-4-D-A-2629	4-Channel DWDM OADM Module with Express Port— Sub-Band 8 (Channel 26-29)
OFM-4-D-A-2225	4-Channel DWDM OADM Module with Express Port— Sub-Band 9 (Channel 22-25)
OFM-4-D-A-1821	4-Channel DWDM OADM Module with Express Port— Sub-Band 10 (Channel 18-21)
CWDM OFMs	
OFM-8-C-M-4761	8-Channel CWDM Multiplexer/Demultiplexer— Band 1 (consisting of channels with the following corresponding wavelengths): • 1471nm • 1491nm • 1511nm • 1531nm • 1551nm • 1571nm • 1591nm • 1611nm
OFM-2-C-A-4755	2-Channel CWDM OADM Module with Express Port — Sub-Band 1 (consisting of channels with the following corresponding wavelengths): • 1471nm • 1551nm
OFM-2-C-A-4957	2-Channel CWDM OADM Module with Express Port — Sub-Band 2 (consisting of channels with the following corresponding wavelengths): • 1491nm • 1571nm

Table 2-39 OFM Product Details

PON	Description
OFM-2-C-A-5159	2-Channel CWDM OADM Module with Express Port— Sub-Band 3 (consisting of channels with the following corresponding wavelengths): • 1511nm • 1591nm
OFM-2-C-A-5361	2-Channel CWDM OADM Module with Express Port— Sub-Band 4 (consisting of channels with the following corresponding wavelengths): • 1531nm • 1611nm

10-Channel DWDM OFMs

Functional Description

- **Optical Filter Module OFM-10-D-M-5059**

  The OFM-10-D-M-5059 is a ten channel DWDM Multiplexer/Demultiplexer supporting signals within Channel 50 to Channel 59 and has ten add/drop ports corresponding to the channels. It has a built-in 10-skip 0 band filter in order to cascade another ten channels. It also has a Red/Blue filter to further expand to 20 channels of Bands 3 and 4. Therefore, the OFM-10-D-M-5059 has two expansion ports, one from the Band 1 filter and another from the Red/Blue (R/B) filter. The Band 1 port can be connected to the OFM-10-D-M-4049 and the R/B port can be connected to the OFM-10-D-M-2837. This is a double-slot OFM and can be cascaded with three other ten channel OFMs to provide 40 DWDM channels.

- **Optical Filter Module OFM-10-D-M-4049**

  The OFM-10-D-M-4049 is a ten channel DWDM Multiplexer/Demultiplexer supporting signals within Channel 40 to Channel 49 and has ten add/drop ports corresponding to the channels. This is a double-slot OFM and can be cascaded with OFM-10-D-M-5059.

- **Optical Filter Module OFM-10-D-M-2837**

  The OFM-10-D-M-2837 is a ten channel DWDM Multiplexer/Demultiplexer supporting signals within Channel 28 to Channel 37 and has ten add/drop ports corresponding to the channels. The OFM-10-D-M-2837 is a double-slot OFM that has two expansion ports, one from the Band 3 filter and another from the Red/Blue (R/B) filter. The Band 3 filter can be connected to the OFM-10-D-M-1827 and the R/B port can be connected to the OFM-10-D-M-5059.

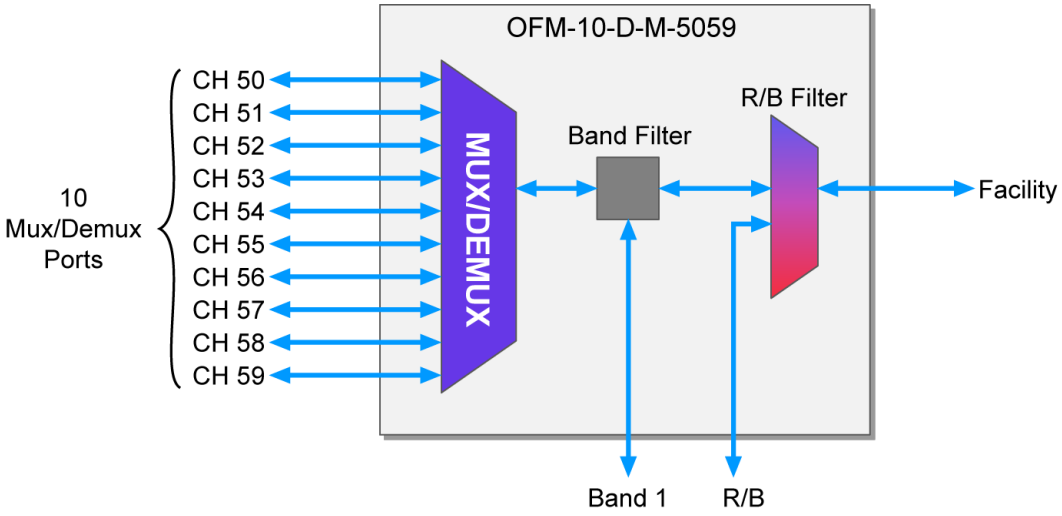
- **Optical Filter Module OFM-10-D-M-1827**

The OFM-10-D-M-1827 is a ten channel DWDM Multiplexer/Demultiplexer supporting signals within Channel 18 to Channel 27 and has ten add/drop ports corresponding to the channels. This is a double-slot OFM and can be cascaded with the OFM-10-D-M-2837.

Block Diagram

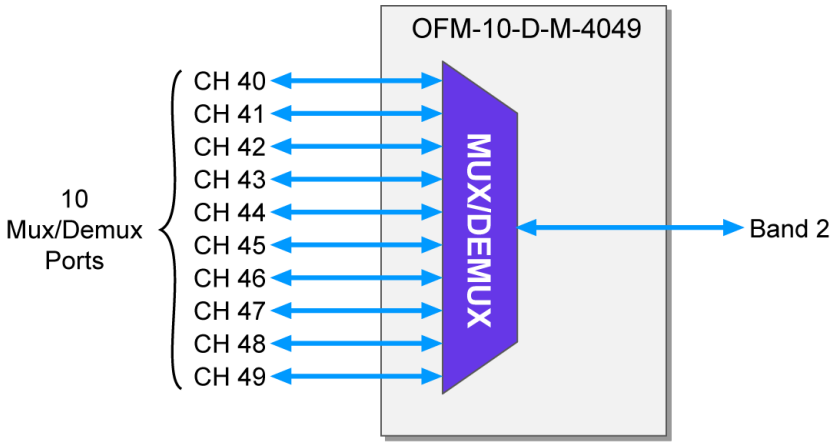
- The functional block diagram of OFM-10-D-M-5059 is shown in Figure 2-22.

Figure 2-22 OFM-10-D-M-5059 Functional Block Diagram



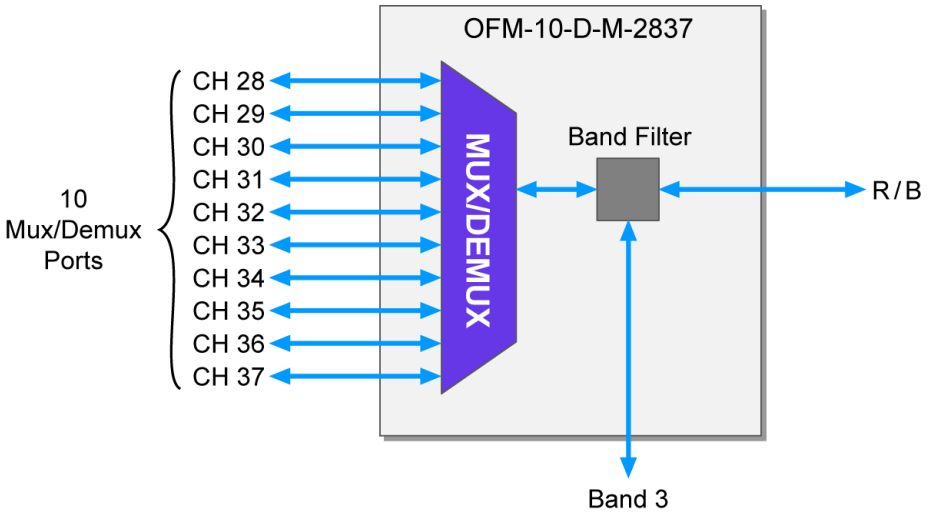
- The functional block diagram of OFM-10-D-M-4049 is shown in Figure 2-23.

Figure 2-23 OFM-10-D-M-4049 Functional Block Diagram



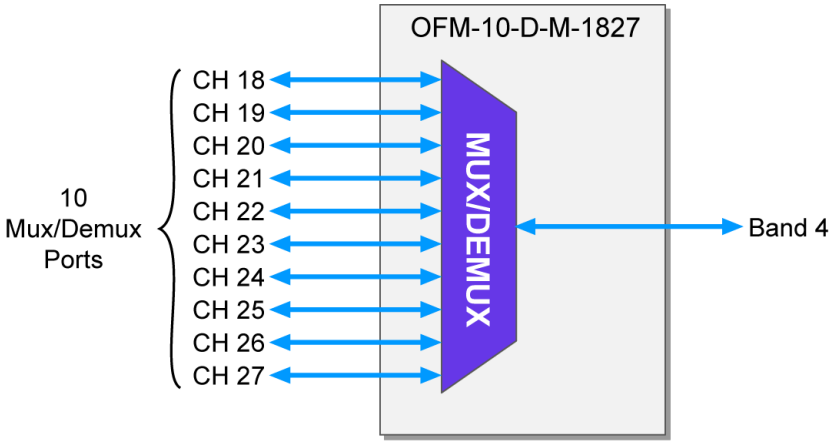
- The functional block diagram of OFM-10-D-M-2837 is shown in Figure 2-24.

Figure 2-24 OFM-10-D-M-2837 Functional Block Diagram



- The functional block diagram of OFM-10-D-M-1827 is shown in Figure 2-25.

Figure 2-25 OFM-10-D-M-1827 Functional Block Diagram



External Connectors

The OFM card does not have any visual indicators. The line/port connectors are as shown in Figure 2-26 to Figure 2-29.

Figure 2-26 OFM-10-D-M-5059 Faceplate

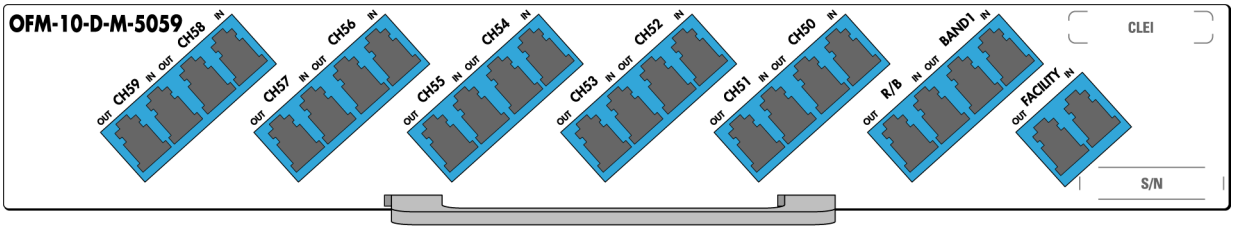


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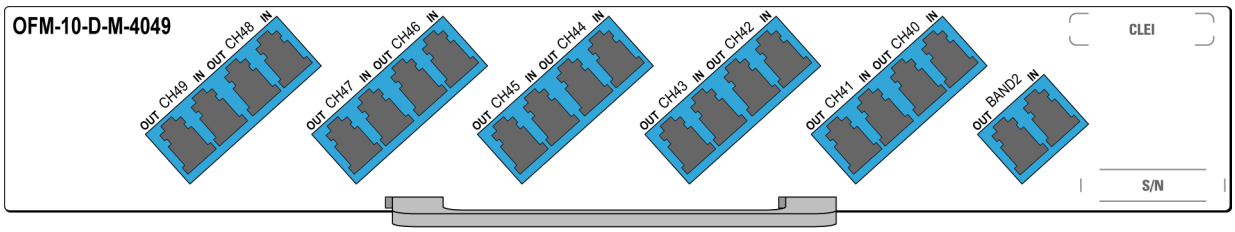
Figure 2-27 OFM-10-D-M-4049 Faceplate



infn_319

Figure 2-28 OFM-10-D-M-2837 Faceplate

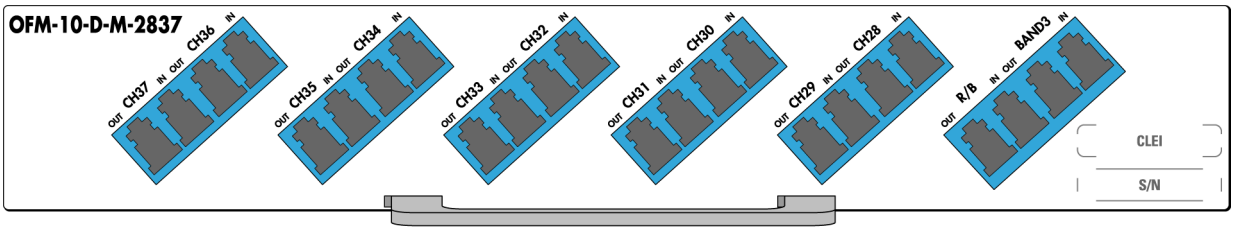
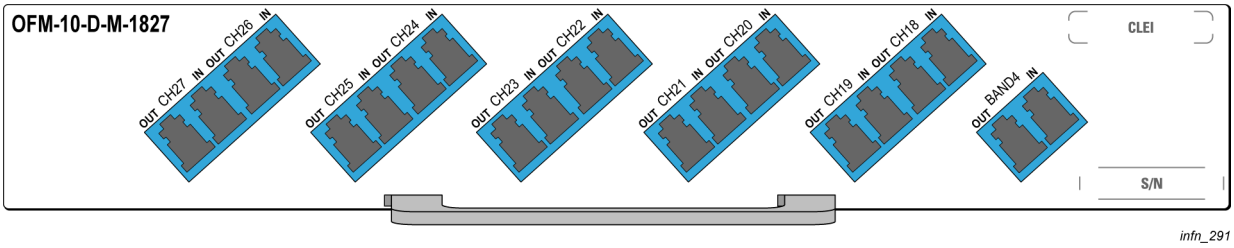


Figure 2-29 OFM-10-D-M-1827 Faceplate



Connectors

Table 2-40 lists the interfaces for the 10-channel DWDM OFM-10-D-M-5059.

Table 2-40 OFM-10-D-M-5059 Connectors

Connector	Type	Purpose
R/B IN	LC/UPC	Red/Blue Band splitter port connects from the Red/Blue Band splitter port of the OFM-10-D-M-2837
R/B OUT	LC/UPC	Red/Blue Band splitter port connects to the Red/Blue Band splitter port of the OFM-10-D-M-2837
BAND 1 IN	LC/UPC	BAND 1 port connects from the BAND 2 port of the OFM-10-D-M-4049 to allow in-service expansion
BAND 1 OUT	LC/UPC	BAND 1 port connects to the BAND 2 port of the OFM-10-D-M-4049 to allow in-service expansion
FAC IN	LC/UPC	Connects from the FACILITY port of an AAM or the OFM-1-OSC
FAC OUT	LC/UPC	Connects to the FACILITY port of an AAM or the OFM-1-OSC
Channel 59 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wave-length on the SIM
Channel 59 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wave-length on the SIM

Table 2-40 OFM-10-D-M-5059 Connectors

Connector	Type	Purpose
Channel 58 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 58 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 57 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 57 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 56 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 56 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 55 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 55 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 54 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 54 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 53 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 53 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 52 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 52 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 51 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 51 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 50 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 50 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-41 lists the interfaces for the 10-channel DWDM OFM-10-D-M-4049.

Table 2-41 OFM-10-D-M-4049 Connectors

Connector	Type	Purpose
BAND 2 IN	LC/UPC	BAND 2 port of a standalone OFM-10-D-M-4049 connects from the FACILITY port of an AAM or the OFM-1-OSC. BAND 2 port of an OFM-10-D-M-4049 being used for expansion connects from the BAND 1 port of the OFM-10-D-M-5059.
BAND 2 OUT	LC/UPC	BAND 2 port of a standalone OFM-10-D-M-4049 connects to the FACILITY port of an AAM or the OFM-1-OSC. BAND 2 port of an OFM-10-D-M-4049 being used for expansion connects to the BAND 1 port of the OFM-10-D-M-5059.
Channel 49 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 49 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 48 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 48 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 47 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 47 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 46 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 46 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 45 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 45 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 44 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 44 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 43 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 43 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 42 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-41 OFM-10-D-M-4049 Connectors

Connector	Type	Purpose
Channel 42 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 41 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 41 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 40 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 40 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-42 lists the interfaces for the 10-channel DWDM OFM-10-D-M-2837.

Table 2-42 OFM-10-D-M-2837 Connectors

Connector	Type	Purpose
R/B IN	LC/UPC	Red/Blue Band splitter port of a standalone OFM-10-D-M-2837 connects from the FACILITY port of an AAM or the OFM-1-OSC. Red/Blue Band splitter port of an OFM-10-D-M-2837 connects from the Red/Blue Band splitter port of the OFM-10-D-M-5059 for expansion.
R/B OUT	LC/UPC	Red/Blue Band splitter port of a standalone OFM-10-D-M-2837 connects to the FACILITY port of an AAM or the OFM-1-OSC. Red/Blue Band splitter port of an OFM-10-D-M-2837 connects to the Red/Blue Band splitter port of the OFM-10-D-M-5059 for expansion.
BAND 3 IN	LC/UPC	BAND 3 port of an OFM-10-D-M-2837 being used for expansion connects from the BAND 4 port of the OFM-10-D-M-1827.
BAND 3 OUT	LC/UPC	BAND 3 port of an OFM-10-D-M-2837 being used for expansion connects to the BAND 4 port of the OFM-10-D-M-1827
Channel 37 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 37 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 36 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 36 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-42 OFM-10-D-M-2837 Connectors

Connector	Type	Purpose
Channel 35 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 35 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 34 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 34 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 33 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 33 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 32 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 32 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 31 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 31 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 30 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 30 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 29 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 29 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 28 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 28 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-43 lists the interfaces for the 10-channel DWDM OFM-10-D-M-1827.

Table 2-43 OFM-10-D-M-1827 Connectors

Connector	Type	Purpose
BAND 4 IN	LC/UPC	BAND 4 port of a standalone OFM-10-D-M-1827 connects from the FACILITY port of an AAM or the OFM-1-OSC. BAND 4 port of an OFM-10-D-M-1827 being used for expansion connects from the BAND 3 port of the OFM-10-D-M-2837
BAND 4 OUT	LC/UPC	BAND 4 port of a standalone OFM-10-D-M-1827 connects to the FACILITY port of an AAM or the OFM-1-OSC. BAND 4 port of an OFM-10-D-M-1827 being used for expansion connects to the BAND 3 port of the OFM-10-D-M-2837
Channel 27 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 27 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 26 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 26 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 25 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 25 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 24 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 24 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 23 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 23 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 22 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 22 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 21 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 21 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-43 OFM-10-D-M-1827 Connectors

Connector	Type	Purpose
Channel 20 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 20 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 19 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 19 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 18 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 18 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Technical Specifications

Table 2-44 provides the mechanical and electrical specifications for the 10-channel DWDM OFMs

Table 2-44 10-channel DWDM OFM Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3 inches / 33.02 mm
	Width	7.2 inches / 182.88mm
	Depth	11.1 inches / 281.94mm
	Weight	3.3lbs

Optical Specifications

Table 2-45 provides the optical specifications for the 10-channel DWDM OFMs

Table 2-45 10-channel DWDM OFM Optical Specifications

Parameter	Channel Number	ITU DWDM Wavelength (nm)	Center Frequency (THz)
Band 1 (channel 50-59) wavelength range	• Channel 59 • Channel 58 • Channel 57 • Channel 56 • Channel 55 • Channel 54 • Channel 53 • Channel 52 • Channel 51 • Channel 50	• 1530.33 • 1531.12 • 1531.90 • 1532.68 • 1533.47 • 1534.25 • 1535.04 • 1535.82 • 1536.61 • 1537.40	• 195.9 • 195.8 • 195.7 • 195.6 • 195.5 • 195.4 • 195.3 • 195.2 • 195.1 • 195.0
Band 2 (channel 40-49) wavelength range	• Channel 49 • Channel 48 • Channel 47 • Channel 46 • Channel 45 • Channel 44 • Channel 43 • Channel 42 • Channel 41 • Channel 40	• 1538.19 • 1538.98 • 1539.77 • 1540.56 • 1541.35 • 1542.14 • 1542.94 • 1543.73 • 1544.53 • 1545.32	• 194.9 • 194.8 • 194.7 • 194.6 • 194.5 • 194.4 • 194.3 • 194.2 • 194.1 • 194.0

Table 2-45 10-channel DWDM OFM Optical Specifications

Parameter	Channel Number	ITU DWDM Wavelength (nm)	Center Frequency (THz)
Band 3 (channel 28-37) wavelength range	• Channel 37 • Channel 36 • Channel 35 • Channel 34 • Channel 33 • Channel 32 • Channel 31 • Channel 30 • Channel 29 • Channel 28	• 1547.72 • 1548.51 • 1549.32 • 1550.12 • 1550.92 • 1551.72 • 1552.52 • 1553.33 • 1554.13 • 1554.94	• 193.7 • 193.6 • 193.5 • 193.4 • 193.3 • 193.2 • 193.1 • 193.0 • 192.9 • 192.8
Band 4 (channel 18-27) wavelength range	• Channel 27 • Channel 26 • Channel 25 • Channel 24 • Channel 23 • Channel 22 • Channel 21 • Channel 20 • Channel 19 • Channel 18	• 1555.75 • 1556.55 • 1557.36 • 1558.17 • 1558.98 • 1559.79 • 1560.61 • 1561.42 • 1562.23 • 1563.05	• 192.7 • 192.6 • 192.5 • 192.4 • 192.3 • 192.2 • 192.1 • 192.0 • 191.9 • 191.8

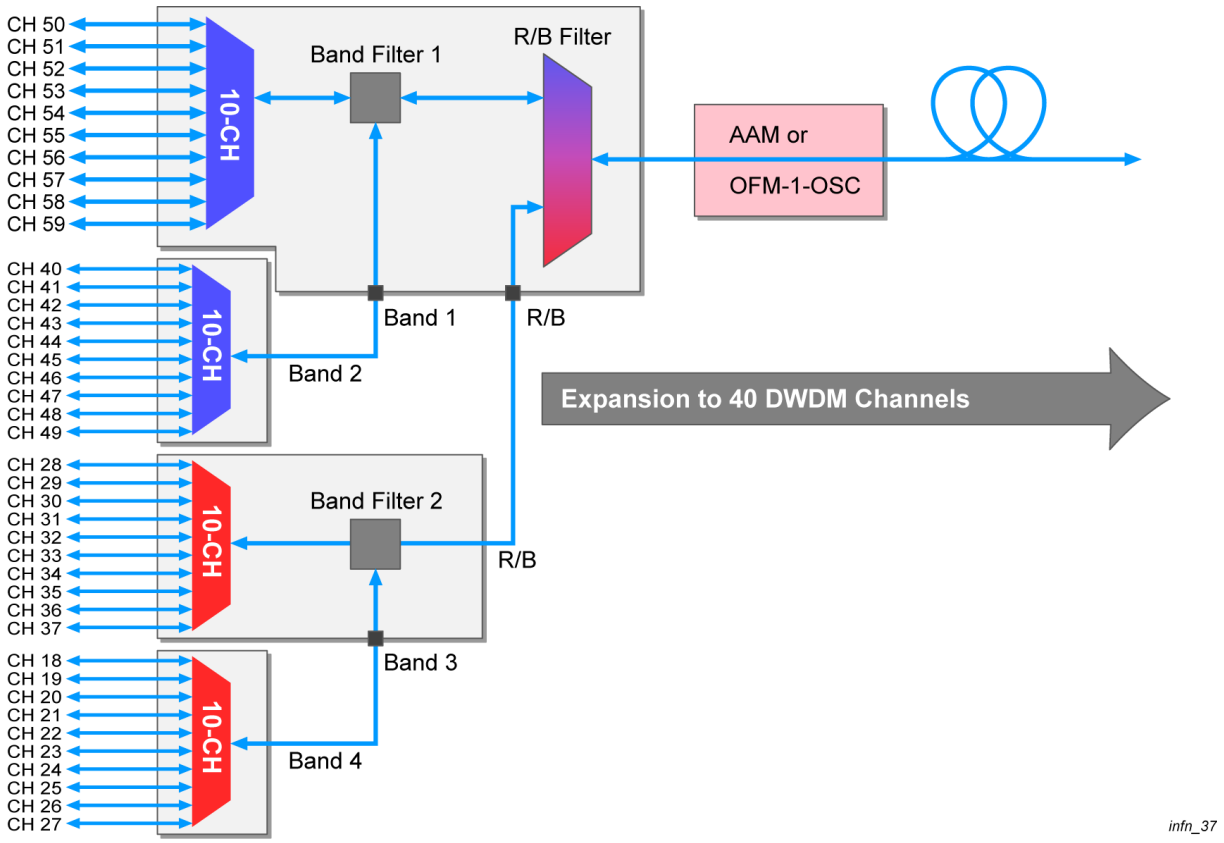
Cascaded 10-channel DWDM Optical Filter Modules

Figure 2-30 shows a block diagram of the complete scalable 40-channel DWDM Multiplexing/ De-multiplexing architecture that comprises of cascaded four 10-channel DWDM OFMs.

- The first 10-channel OFM card, OFM-10-D-M-5059 has a built-in 10-skip 0 band filter in order to cascade another 10-channel OFM (OFM-10-D-M-4049). It also has a Red/Blue filter to further expand 20 channels of Band 3 and Band 4.
- The second 10-channel DWDM OFM card, OFM-10-D-M-4049 is a pure Multiplexer/Demultiplexer card.
- The third 10-channel DWDM OFM card, OFM-10-D-M-2837 has a second 10-skip 0 band filter built-in for expansion to the fourth card (OFM-10-D-M-1827).
- The fourth 10-channel DWDM OFM card, OFM-10-D-M-1827 is a pure Multiplexer/Demultiplexer card.
- For expansion,

- Band 1 port of the OFM-10-D-M-5059 connects to Band 2 port of the OFM-10-D-M-4049.
- Band 3 port of the OFM-10-D-M-2837 connects to Band 4 port of the OFM-10-D-M-1827
- The R/B port of OFM-10-D-M-5059 connects to R/B port of OFM-10-D-M-2837

Figure 2-30 Cascaded 10-Channel DWDM OFMs



4-Channel DWDM OFMs

Functional Description

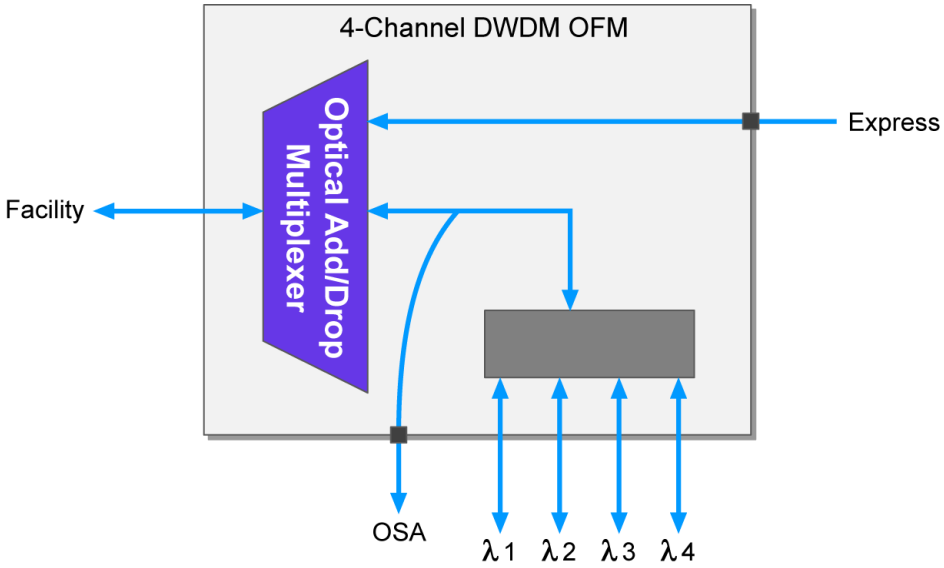
The four channel DWDM OFMs bear the naming convention OFM-4-D-A-*xy*, where, *x* indicates the channel number corresponding to the start of the band or sub-band and *y* indicates the channel number corresponding to the end of the band or sub-band.

- OFM-4-D-A-*xy* indicates a four DWDM channel flexible Optical Add/Drop Multiplexer.
- It supports add/drop of four DWDM channels
- It includes an integrated Add/Drop monitoring port and an express port that enables express connections to other appropriate OFMs
- The four channel OFMs are available in the following configurations:
  - OFM-4-D-A-5659
  - OFM-4-D-A-5255
  - OFM-4-D-A-4851
  - OFM-4-D-A-4447
  - OFM-4-D-A-4043
  - OFM-4-D-A-3437
  - OFM-4-D-A-3033
  - OFM-4-D-A-2629
  - OFM-4-D-A-2225
  - OFM-4-D-A-1821

Block Diagram

The functional block diagram of a 4-channel DWDM OFM is shown in Figure 2-31.

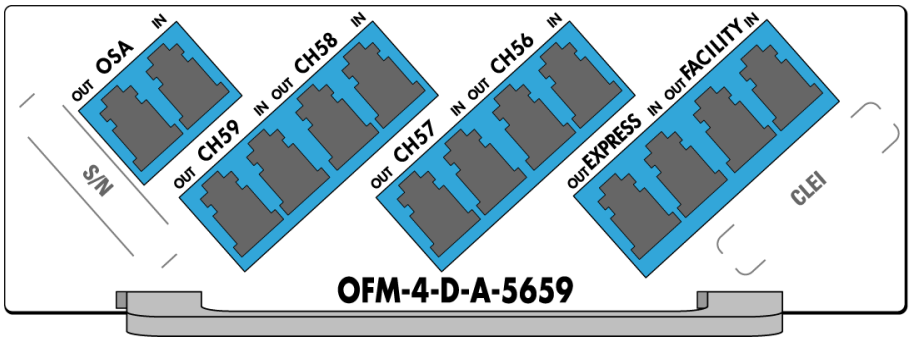
Figure 2-31 4-channel DWDM OFM Functional Block Diagram



External Connectors

The OFM card does not have any visual indicators. The line/port connectors are as shown in Figure 2-32. The other 4-channel DWDM OFMs have a similar connectors.

Figure 2-32 4-channel OFM: OFM-4-D-A-5659 Faceplate



Connectors

The interfaces provided by the 4-channel DWDM OFMs are included in Table 2-46.

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
Connectors common to all 4-channel DWDM OFMs		
EXPRESS IN	LC/UPC	Express connection from another 4-channel DWDM OFM
EXPRESS OUT	LC/UPC	Express connection to another 4-channel DWDM OFM
FAC IN	LC/UPC	Connects from the facility port of another OFM or AAM
FAC OUT	LC/UPC	Connects to the facility port of another OFM or AAM
OSA IN	LC/UPC	Monitors the added channels
OSA OUT	LC/UPC	Monitors the dropped channels
OFM-4-D-A-5659 Connectors		
Channel 59 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 59 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 58 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 58 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
Channel 57 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 57 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 56 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 56 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-5255 Connectors		
Channel 55 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 55 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 54 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 54 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 53 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 53 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 52 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 52 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-4851 Connectors		
Channel 51 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 51 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 50 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 50 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 49 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 49 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
Channel 48 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 48 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-4447 Connectors		
Channel 47 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 47 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 46 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 46 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 45 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 45 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 44 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 44 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-4043 Connectors		
Channel 43 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 43 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 42 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 42 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 41 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 41 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 40 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 40 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
OFM-4-D-A-3437 Connectors		
Channel 37 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 37 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 36 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 36 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 35 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 35 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 34 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 34 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-3033 Connectors		
Channel 33 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 33 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 32 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 32 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 31 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 31 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 30 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 30 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-2629 Connectors		
Channel 29 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
Channel 29 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 28 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 28 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 27 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 27 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 26 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 26 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-2225 Connectors		
Channel 25 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 25 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 24 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 24 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 23 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 23 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 22 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 22 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
OFM-4-D-A-1821 Connectors		
Channel 21 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 21 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 20 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM

Table 2-46 4-channel DWDM OFM Connectors

Connector	Type	Purpose
Channel 20 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 19 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 19 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 18 IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
Channel 18 OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Technical Specifications

Table 2-44 provides the mechanical specifications for the 4-channel DWDM OFMs

Table 2-47 4-channel DWDM OFM Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3 inches / 33.02 mm
	Width	3.6 inches / 91.44 mm
	Depth	11.1 inches / 281.94 mm
	Weight	1.9 lbs

Optical Specifications

Table 2-45 provides the optical specifications for the 4-channel DWDM OFMs.

Table 2-48 4-channel DWDM OFM Optical Specifications

Parameter	Channel Number	ITU DWDM Wavelength (nm)	Center Frequency (THz)
Sub-Band 1 (channel 56-59) wavelength range	• Channel 59 • Channel 58 • Channel 57 • Channel 56	• 1530.33 • 1531.12 • 1531.90 • 1532.68	• 195.9 • 195.8 • 195.7 • 195.6
Sub-Band 2 (channel 52-55) wavelength range	• Channel 55 • Channel 54 • Channel 53 • Channel 52	• 1533.47 • 1534.25 • 1535.04 • 1535.82	• 195.5 • 195.4 • 195.3 • 195.2
Sub-Band 3 (channel 48-51)	• Channel 51 • Channel 50 • Channel 49 • Channel 48	• 1536.61 • 1537.40 • 1538.19 • 1538.98	• 195.1 • 195.0 • 194.9 • 194.8
Sub-Band 4 (channel 44-47)	• Channel 47 • Channel 46 • Channel 45 • Channel 44	• 1539.77 • 1540.56 • 1541.35 • 1542.14	• 194.7 • 194.6 • 194.5 • 194.4
Sub-Band 5 (channel 40-43) wavelength range	• Channel 43 • Channel 42 • Channel 41 • Channel 40	• 1542.94 • 1543.73 • 1544.53 • 1545.32	• 194.3 • 194.2 • 194.1 • 194.0
Sub-Band 6 (channel 34-37) wavelength range	• Channel 37 • Channel 36 • Channel 35 • Channel 34	• 1547.72 • 1548.51 • 1549.32 • 1550.12	• 193.7 • 193.6 • 193.5 • 193.4
Sub-Band 7 (channel 30-33) wavelength range	• Channel 33 • Channel 32 • Channel 31 • Channel 30	• 1550.92 • 1551.72 • 1552.52 • 1553.33	• 193.3 • 193.2 • 193.1 • 193.0

Table 2-48 4-channel DWDM OFM Optical Specifications

Parameter	Channel Number	ITU DWDM Wavelength (nm)	Center Frequency (THz)
Sub-Band 8 (channel 26-29) wavelength range	• Channel 29 • Channel 28 • Channel 27 • Channel 26	• 1554.13 • 1554.94 • 1555.75 • 1556.55	• 192.9 • 192.8 • 192.7 • 192.6
Sub-Band 9 (channel 22-25) wavelength range	• Channel 25 • Channel 24 • Channel 23 • Channel 22	• 1557.36 • 1558.17 • 1558.98 • 1559.79	• 192.5 • 192.4 • 192.3 • 192.2
Sub-Band 10 (channel 18-21) wavelength range	• Channel 21 • Channel 20 • Channel 19 • Channel 18	• 1560.61 • 1561.42 • 1562.23 • 1563.05	• 192.1 • 192.0 • 191.9 • 191.8

8-channel CWDM OFM

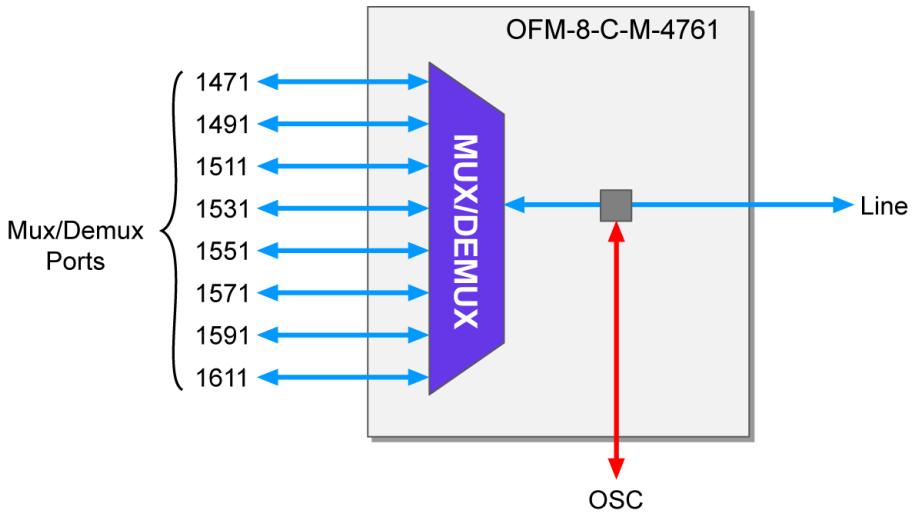
Functional Description

- The OFM-8-C-M-4761 is a double-slot CWDM OFM module
- It is a Multiplexer/Demultiplexer module that includes OSC add/drop ability.
- It supports eight CWDM channels at 20nm channel spacing.
- It supports the entire CWDM channel range for the ATN and has eight add/drop ports corresponding to the channels

Block Diagram

The functional block diagram of the OFM-C-8-M-4761 is shown in Figure 2-33.

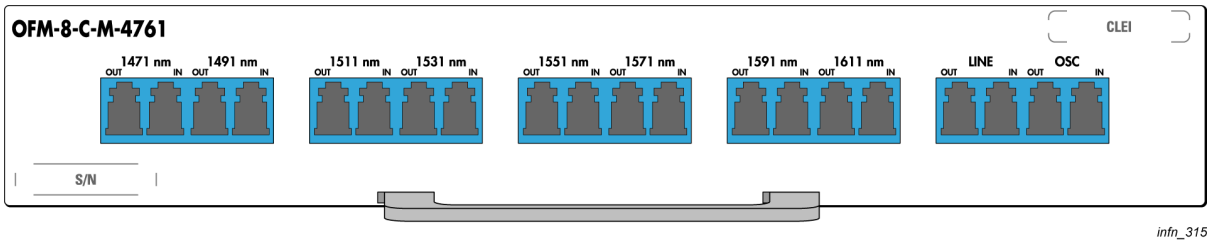
Figure 2-33 8-Channel OFM-8-C-M-4761 Functional Block Diagram



External Connectors

The OFM card does not have any visual indicators. The line/port connectors are as shown in Figure 2-34.

Figure 2-34 OFM-8-C-M-4761 Faceplate



Connectors

The interfaces provided by the OFM-8-C-M-4761 are included in Table 2-49.

Table 2-49 8-channel OFM-8-C-M-4761 Connectors

Connector	Type	Purpose
LINE IN	LC/UPC	Connects to the line fiber
LINE OUT	LC/UPC	Connects to the line fiber
OSC IN	LC/UPC	OSC port connects from the AMM OSC TOM OUT port
OSC OUT	LC/UPC	OSC port connects to the AMM OSC TOM IN port

Table 2-49 8-channel OFM-8-C-M-4761 Connectors

Connector	Type	Purpose
1471nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1471nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1491nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1491nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1511nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1511nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1531nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1531nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1551nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1551nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1571nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1571nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1591nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1591nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM
1611nm IN	LC/UPC	Connects from SFP/XFP TOM of the corresponding wavelength on the SIM
1611nm OUT	LC/UPC	Connects to the SFP/XFP TOM of the corresponding wavelength on the SIM

Technical Specifications

Table 2-50 provides the mechanical specifications for the 8-channel CWDM OFM-8-C-M-4761

Table 2-50 8-channel CWDM OFM-8-C-M-4761 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3 inches / 33.02 mm
	Width	7.2 inches / 182.88mm
	Depth	11.1 inches / 281.94mm
	Weight	3.3lbs

Optical Specifications

Table 2-51 provides the optical specifications for the 8-channel CWDM OFM.

Table 2-51 OFM-8-C-M-4761 Optical Specifications

Parameter	ITU CWDM Wavelength
Channel 1	1471 nm
Channel 2	1491 nm
Channel 3	1511 nm
Channel 4	1531 nm
Channel 5	1551 nm
Channel 6	1571 nm
Channel 7	1591 nm
Channel 8	1611 nm

Note: Only Channel 3, 4, 5 and 6 are available for 10GbE, OC-192 and STM-64 signal support in future releases.

2-channel CWDM OFMs

Functional Description

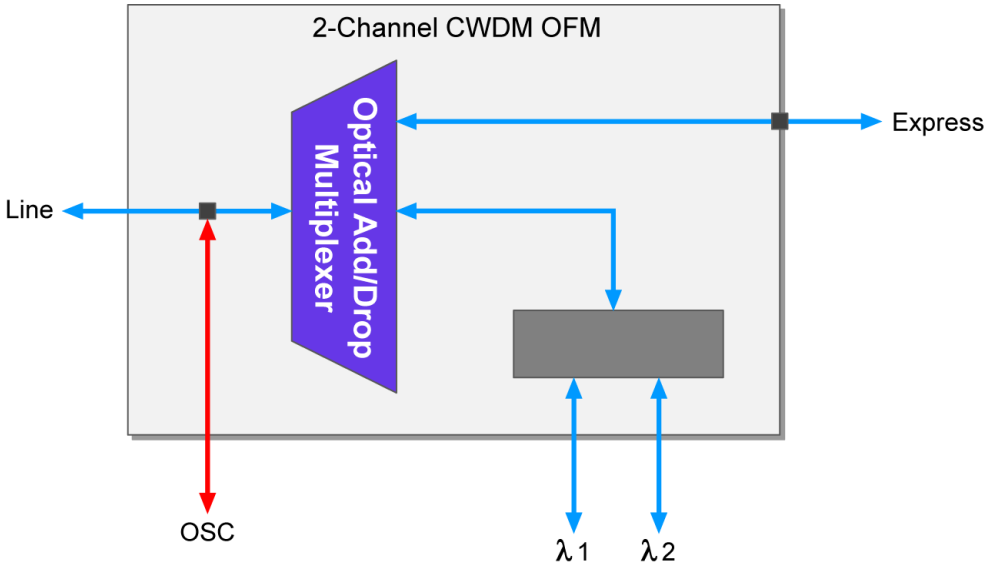
The 2-channel CWDM OFMs bear the naming convention OFM-2-C-A-*xy*, where, *x* and *y* indicate the two channel numbers included in the channel group.

- OFM-2-C-A-*xy* indicates a two CWDM channel flexible Optical Add/Drop Multiplexer
- It supports add/drop of two CWDM channels
- It includes an OSC port and an express port that enables express connections to other two channel CWDM OFMs
- The single-slot width 2-channel OFMs are available in the following configurations:
  - OFM-2-C-A-5961
  - OFM-2-C-A-5557
  - OFM-2-C-A-5153
  - OFM-2-C-A-4749

Block Diagram

The functional block diagram of the two channel CWDM OFM is shown in Figure 2-35.

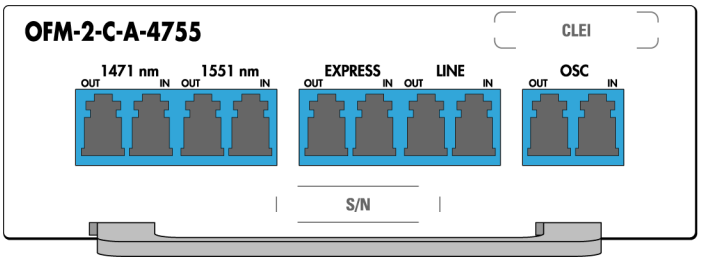
Figure 2-35 2-Channel CWDM OFM Functional Block Diagram



External Connectors

The OFM card does not have any visual indicators. The line/port connectors are similar for all the 2 channel CWDM OFMs. Figure 2-36 shows the connectors for the OFM-2-C-A-4755.

Figure 2-36 2-Channel CWDM OFM Faceplate



Connectors

The interfaces provided by the 2-channel OFMs are included in Table 2-52.

Table 2-52 2-channel CWDM OFM Connectors

Connector	Type	Purpose
Connectors common to all 2-channel CWDM OFMs		
EXPRESS IN	LC/UPC	Express connection from another 2-channel DWDM OFM
EXPRESS OUT	LC/UPC	Express connection to another 2-channel DWDM OFM
LINE IN	LC/UPC	Connects from the line side
LINE OUT	LC/UPC	Connects to the line side
OSC IN	LC/UPC	Connects from the AMM OSC TOM OUT port
OSC OUT	LC/UPC	Connects to the AMM OSC TOM IN port
OFM-2-C-A-4755 Connectors		
1471 IN	LC/UPC	Connects from a 1471 nm SFP/XFP TOM on the SIM
1471 OUT	LC/UPC	Connects to a 1471 nm SFP/XFP TOM on the SIM
1551 IN	LC/UPC	Connects from a 1551 nm SFP/XFP TOM on the SIM
1551 OUT	LC/UPC	Connects to a 1551 nm SFP/XFP TOM on the SIM
OFM-2-C-A-4957 Connectors		
1491 IN	LC/UPC	Connects from a 1491 nm SFP/XFP TOM on the SIM
1491 OUT	LC/UPC	Connects to a 1491 nm SFP/XFP TOM on the SIM
1571 IN	LC/UPC	Connects from a 1571 nm SFP/XFP TOM on the SIM

Table 2-52 2-channel CWDM OFM Connectors

Connector	Type	Purpose
1571 OUT	LC/UPC	Connects to a 1571 nm SFP/XFP TOM on the SIM
OFM-2-C-A-5159 Connectors		
1511 IN	LC/UPC	Connects from a 1511 nm SFP/XFP TOM on the SIM
1511 OUT	LC/UPC	Connects to a 1511 nm SFP/XFP TOM on the SIM
1591 IN	LC/UPC	Connects from a 1591 nm SFP/XFP TOM on the SIM
1591 OUT	LC/UPC	Connects to a 1591 nm SFP/XFP TOM on the SIM
OFM-2-C-A-5361 Connectors		
1531 IN	LC/UPC	Connects from a 1531 nm SFP/XFP TOM on the SIM
1531 OUT	LC/UPC	Connects to a 1531 nm SFP/XFP TOM on the SIM
1611 IN	LC/UPC	Connects from a 1611 nm SFP/XFP TOM on the SIM
1611 OUT	LC or UPC	Connects to a 1611 nm SFP/XFP TOM on the SIM

Technical Specifications

Table 2-53 provides the mechanical specifications for the 2-channel CWDM OFMs

Table 2-53 2-channel CWDM OFM Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3 inches / 33.02 mm
	Width	3.6 inches / 91.44 mm
	Depth	11.1 inches / 281.94 mm
	Weight	1.9 lbs

Optical Specifications

Table 2-54 provides the optical specifications for the two-channel CWDM OFMs.

Table 2-54 2-Channel CWDM OFM Optical Specifications

Parameter	ITU DWDM Wavelength
Channel 1	1471 nm
Channel 2	1491 nm
Channel 3	1511 nm
Channel 4	1531 nm
Channel 5	1551 nm
Channel 6	1571 nm
Channel 7	1591 nm
Channel 8	1611 nm

Note: Only Channel 3, 4, 5 and 6 are available for 10GbE, OC-192 and STM-64 signal support in future releases.

Passive OSC Add/Drop Module

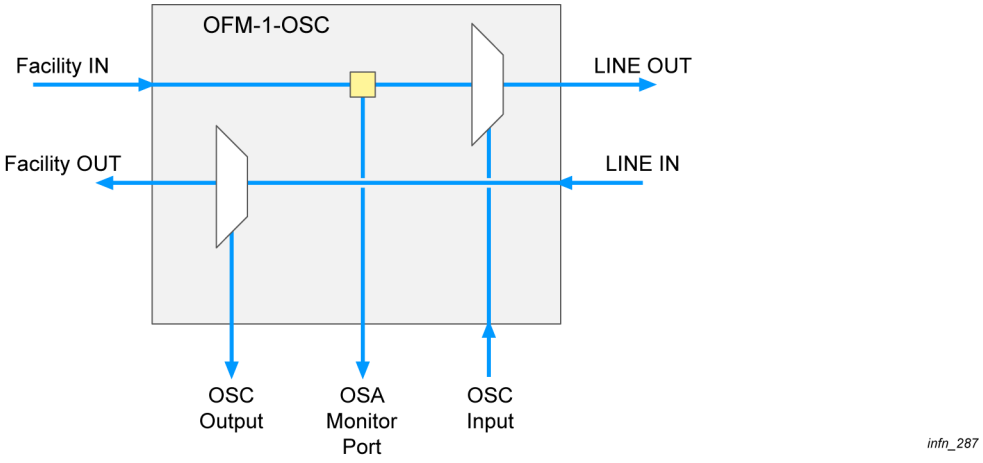
The OSC is an optical supervisory channel used for out-of-band communications between ATN network elements. The passive OSC module (OFM-1-OSC) provides add/drop capabilities for the Infinera ATNs at 1451nm OSC. For optical spans that do not require optical amplification, the passive OSC module (OFM-1-OSC) will be used in place of an AAM for line side connectivity.

The OFM-1-OSC provides the same add/drop capabilities for optical supervisory channel (OSC) as an AAM.

Block Diagram

Figure 2-37 displays the functional block diagram of OFM-1-OSC.

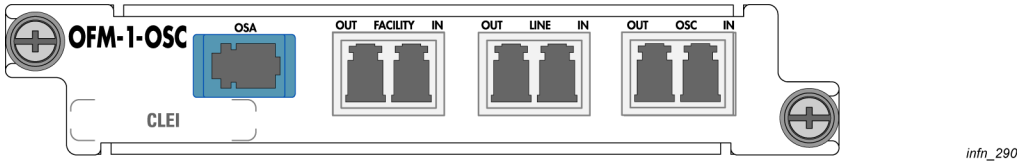
Figure 2-37 OFM-1-OSC Functional Block Diagram



External Indicators and Connectors

The OSC card does not have any visual indicators. The line/port connectors are as follows:

Figure 2-38 OFM-1-OSC Faceplate



Connectors

Table 2-55 lists the connectors for the OFM-1-OSC.

Table 2-55 OFM-1-OSC Connectors

Connector	Type	Purpose
Line IN	LC/UPC, Front access	Connects from the line side fibers
Line OUT	LC/UPC, Front access	Connects to the line side fibers
Facility IN	LC/UPC, Front access	Connects from the facility side
Facility OUT	LC/UPC, Front access	Connects to the facility side
OSC IN	LC/UPC, Front access	Connects from the AMM-A OSC TOM OUT port
OSC OUT	LC/UPC, Front access	Connects to the AMM-A OSC TOM IN port
OSA	LC/UPC, Front access	Monitors the signal from the Facility port

Technical Specifications

Table 2-56 provides the mechanical specifications for the OFM-1-OSC.

Table 2-56 OFM-1-OSC Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.7 inches / 17.78 mm
	Width	3.6 inches / 91.44 mm
	Depth	11.1 inches / 281.94 mm
	Weight	0.6lbs

Optical Specifications

The optical specification details for the OFM-1-OSC are listed in Table 2-57.

Table 2-57 OFM-1-OSC Optical Specifications

Type	Parameter	Specification
Line side optics	Wavelength spacing	100 GHz
	Wavelength frequency range	1530.33-1563.05 nm ITU Grid
OSC	Wavelength	1451 nm
	Format	100M Ethernet

Service Interface Module (SIM)

The Service Interface Module (SIM) is a transponder card that houses the client side and line side Tributary Optical Modules (TOMs). The SIM maps the client optical signals into electrical signals for subsequent transmission through the line side Tributary Optical Modules (TOMs). Table 2-58 lists the name and a brief description of each of the supported SIMs.

Table 2-58 SIM Product Details

Product Ordering Name (PON)	Description
SIM-T-1-10G	1-Port 10G SIM
SIM-T-2-2.5GM	2-Port 2.5G Multi-rate SIM

SIM Module 10G (SIM-T-1-10G)

Functional Description

The SIM-T-1-10G is a single port 10G transponder with the client and line side optical modules using pluggable XFP transceivers. Client side incoming data is wrapped into G.709 framing and FEC/EFEC encoded before sending out to line. The line received data is FEC/EFEC decoded and G.709 de-framed before sending out of to the client transmitter. The SIM-T-1-10G can occupy any of the slots between Slot 1 to Slot 8.

The SIM-T-1-10G performs client signal adaptation to OTU2 to support multi-vendor interoperability. It provides fully transparent transport for TDM, Ethernet services.

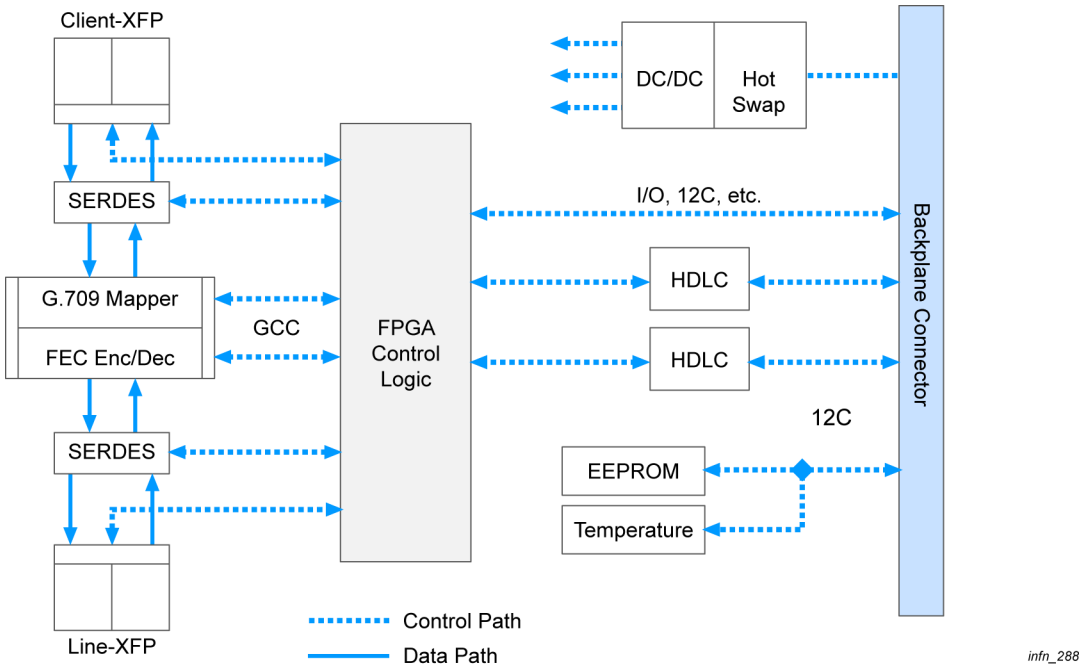
It supports multiple applications including:

- 10GbE LAN and 10GbE WAN bit transparently mapped to G.709/FEC/EFEC, or OPU2e (with fixed stuff bytes at a ratio of 255/237)
- OC-192 and STM-64 transparently mapped to G.709/FEC/EFEC

The SIM-T-1-10G provides performance monitoring for both the line and client interfaces for 10GbE and OC-192/STM-64 applications. The user can configure the EFEC mode for extra gain.

Block Diagram

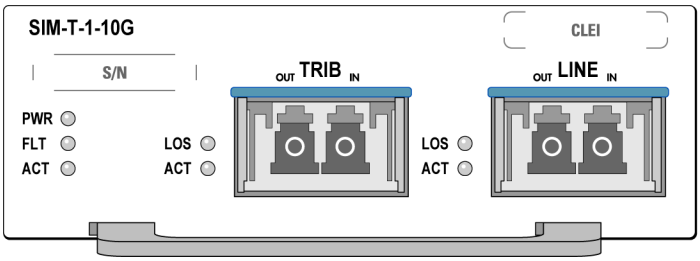
Figure 2-39 SIM-T-1-10G Functional Block Diagram



External Indicators and Connectors

The SIM-T-1-10G provides circuit pack status/TOM LED indicators and slots for pluggable TOM-10Gs as shown in Figure 2-40.

Figure 2-40 SIM-T-1-10G Faceplate



Circuit Pack Level LEDs

The SIM-T-1-10G provides three LEDs to indicate the circuit pack status. The significance of an illuminated LED is described in Table 2-59.

Table 2-59 SIM-T-1-10G Status LED Indicators

LED	Color	Description
PWR (Power)	Green	Indicates the presence (lit) or absence (dimmed) of power supply to the SIM-T-1-10G
ACT (Active)	Green / Yellow	Indicates the SIM-T-1-10G status. Solid Green indicates Active, Yellow indicates standby and flashing Yellow indicates In maintenance state
FLT (Fault)	Red	Indicates the presence (lit) or absence (off) of a Critical, Major, or Minor alarm on the SIM-T-1-10G

Port Level LEDs

In addition to SIM status indicators, the SIM-T-1-10G houses the port level LEDs in support of the XFPs. The significance of an illuminated LED is described in Table 2-60.

Table 2-60 SIM-T-1-10G Status Indicators

LED	Color	Description
ACT (Active)	Green / Yellow	Indicates active/inactive status of the port. Solid Green indicates Active), solid Yellow (Standby), flashing Yellow (In maintenance)
LOS	Red	Indicates the status of the XFP signal. During a Loss of Signal (LOS) condition, this indicator will be lit

Technical Specifications

Table 2-61 provides the mechanical and electrical specifications for the SIM-T-1-10G.

Table 2-61 SIM-T-1-10G Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3125 inches/33.375 mm
	Width	3.625 inches/92.075 mm
	Depth	11.125 inches/282.575 mm
	Weight	1.4lbs

Interface Specifications

Table 2-62 provides the interface details for the SIM-T-1-10G.

Table 2-62 SIM-T-1-10G Interface Specifications

Type	Parameter	Specification
Client protocols	• OC192 • STM-16 • 10GbE LAN • 10GbE WAN	OTU2 and OTU2e
Capacity	Maximum capacity	11.1Gbps

SIM Module 2.5G (SIM-T-2-2.5GM)

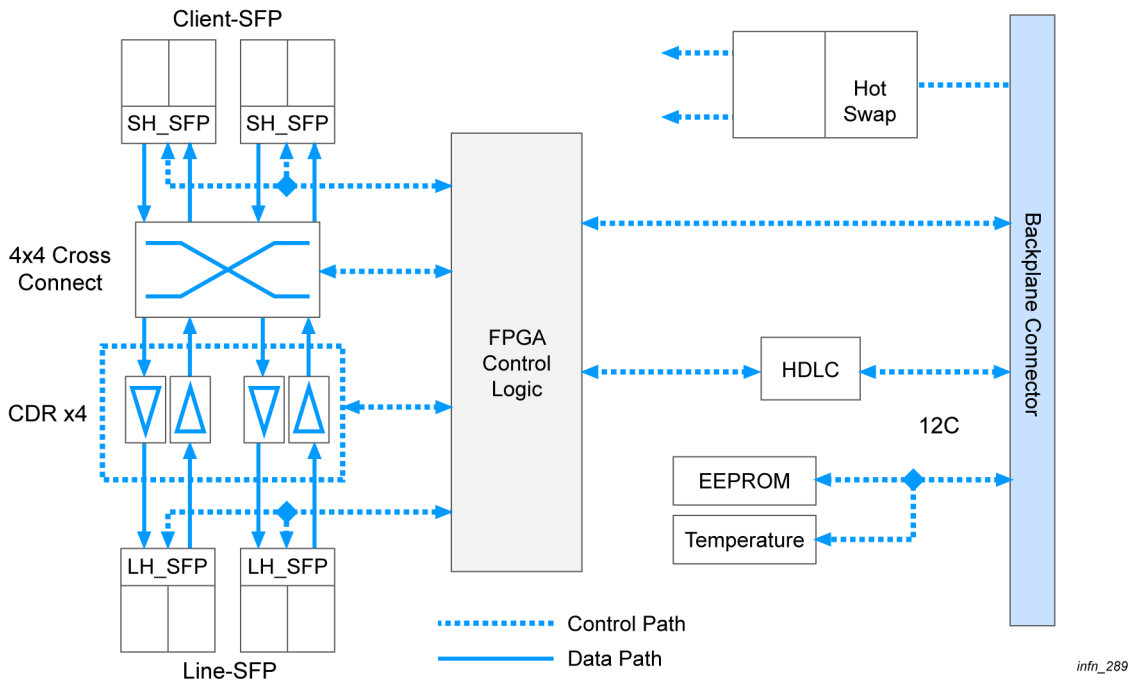
Functional Description

The Service Interface Module 2.5G, referred to as SIM-T-2-2.5GM is a two-port multi-rate transponder that supports data rates from 155M to 2.7G continuously and is a 3R regenerator of client signals. Client and Line interfaces on this card utilize Small Form-factor Pluggable (SFP) transceivers that can be plugged in to provide an optical interface for client signals, and an electrical interface to the SIM. Line side TOMs utilize DWDM or CWDM transceivers. The SIM-T-2-2.5GM can be configured to support 1-Port D-SNCP and 2-Port D-SNCP.

- Two Client-side TOMs support the OC-3, OC-12, OC-48, STM-1, STM-16, STM-64, 1GbE, 1G FC, 2G FC, ESCON, FICON and OTU1 client signals
- Two Line-side TOMS provide 3R regeneration of the client signals listed above.
- Supports clock and data recovery (CDR) only and does not map the client signal into any other format

Block Diagram

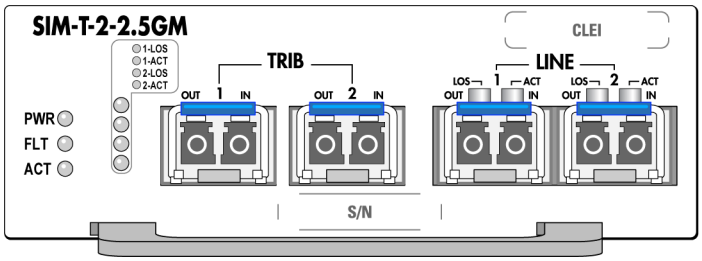
Figure 2-41 SIM-T-2-2.5GM Functional Block Diagram



External Indicators and Connectors

The SIM-T-2-2.5GM provides circuit pack status/TOM LED indicators and slots for pluggable TOM-2.5Gs as shown in Figure 2-42.

Figure 2-42 SIM-T-2-2.5GM Faceplate



Circuit Pack Level LEDs

The SIM-T-2-2.5GM provides three LEDs to indicate the circuit pack status. The significance of an illuminated LED is described in Table 2-63.

Table 2-63 SIM-T-2-2.5GM Status LED Indicators

LED	Color	Description
PWR (Power)	Green	Indicates the presence (lit) or absence (dimmed) of power supply to the SIM-T-2-2.5GM
ACT (Active)	Green / Yellow	Indicates the SIM-T-2-2.5GM status. Solid Green indicates Active, Yellow indicates standby and flashing Yellow indicates In maintenance state
FLT (Fault)	Red	Indicates the presence (lit) or absence (off) of a Critical, Major, or Minor alarm on the SIM-T-2-2.5GM

Port Level LEDs

In addition to SIM status indicators, the SIM-T-2-2.5GM houses the port level LEDs in support of the SFPs. The significance of an illuminated LED is described in Table 2-64.

Table 2-64 SIM-T-2-2.5GM Status Indicators

LED	Color	Description
ACT (Active)	Green / Yellow	Indicates active/inactive status of the port. Solid Green indicates Active), solid Yellow (Standby), flashing Yellow (In maintenance)
LOS	Red	Indicates the status of the SFP signal. During a Loss of Signal (LOS) condition, this indicator will be lit

Technical Specifications

Table 2-65 provides the mechanical and electrical specifications for the SIM-T-2-2.5GM.

Table 2-65 SIM-T-2-2.5GM Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.3 inches / 33.02 mm
	Width	3.6 inches / 91.44 mm
	Depth	11.1 inches / 281.94 mm
	Weight	1.3 lbs
Electrical specifications	Power consumption	See Table 2-1 on page 2-2

Interface Specifications

Table 2-66 provides the interface specifications for the SIM-T-2-2.5GM.

Table 2-66 SIM-T-2-2.5GM Interface Specifications

Type	Parameter	Specification
Tributary protocols	• OC-3 • OC-12 • OC-48 • STM-1 • STM-4 • STM-16 • Fibre Channel 1G • Fibre Channel 2G • ESCON • OTU1	OTU1
Capacity	2.7G	

Tributary Optical Module (TOM)

The TOM is a field-replaceable, pluggable module that converts the client optical signals to and from a serial electrical signal. The TOM is hot-pluggable into any of the corresponding SIMs, and is powered through the pluggable interface. Table 2-67 lists the name and a brief description of each of the supported TOMs

Table 2-67 TOM Product Details

Product Ordering Name	Details
Line TOMs	
TOM-10G-Dn-LR2[a]	Tributary Optical Module 10G Dense Wavelength Division Multiplexing (DWDM) Long Reach. For more information, see "Tributary Optical Module 10G-Dn-LR2 (TOM-10G-Dn-LR2)"
TOM-MR-Dn-LR2[b]	Tributary Optical Module 2.5G Multi-Rate Dense Wavelength Division Multiplexing (DWDM) Long Reach. For more information, see "Tributary Optical Module MR-Dn-LR2 (TOM-MR-Dn-LR2)"
TOM-MR-Cn-LR2[c]	Tributary Optical Module 2.5G Multi-Rate Coarse Wavelength Division Multiplexing (CWDM) Long Reach. For more information, see "Tributary Optical Module MR-Cn-LR2 (TOM-MR-Cn-LR2)"
Client TOMs	
TOM-10G-SR0	Tributary Optical Module 10G Short Reach. For more information, see "Tributary Optical Module 10G-SR0 (TOM-10G-SR0)"
TOM-10G-SR1	Tributary Optical Module 10G Short Reach. For more information, see "Tributary Optical Module 10G-SR1 (TOM-10G-SR1)"
TOM-2.5G-SR1	Tributary Optical Module 2.5G Short Reach. For more information, see "Tributary Optical Module 2.5G-SR1 (TOM-2.5G-SR1)"
TOM-2.5G-IR2	Tributary Optical Module 2.5G Intermediate Reach. For more information, see "Tributary Optical Module 2.5G-IR2 (TOM-2.5G-IR2)"
TOM-2.5GMR-SR1	Tributary Optical Module 2.5G Multi-Rate Short Reach. For more information, see "Tributary Optical Module 2.5GMR-SR1 (TOM-2.5GMR-SR1)"
TOM-2.5GMR-IR1	Tributary Optical Module 2.5G Multi-Rate Intermediate Reach. For more information, see "Tributary Optical Module 2.5GMR-IR1 (TOM-2.5GMR-IR1)"
TOM-1G-SX	Tributary Optical Module 1GbE. For more information, see "Tributary Optical Module 1G-SX (TOM-1G-SX)"
TOM-1G-LX	Tributary Optical Module 1GbE. For more information, see "Tributary Optical Module 1G-LX (TOM-1G-LX)"
OSC TOM	
TOM-100M-C45-LR2	Tributary Optical Module 100M CWDM. For more information, see "Tributary Optical Module 100M-C45-L2 (TOM-100M-C45-L2)"

a. Value (n=18 to 37 and 40 to 59) corresponds to specific operating frequencies
b. Value (n=18 to 37 and 40 to 59) corresponds to specific operating frequencies
c. Value (n=47,49,51,53,55,57,59 and 61) corresponds to specific wavelengths

Tributary Optical Module 10G-Dn-LR2 (TOM-10G-Dn-LR2)

Table 2-68 TOM-10G-Dn-LR2 Product Features

Parameter	Description
Product Ordering Name	10G Tributary Optical Module, TOM-10G-Dn-LR2 (n=18-37 and 40-59)
Reach	• GR-253 CORE OC-192 LR-2 • ITU-T G.959.1 P1L1-2D2

Parameter	Description
Operating frequency and wavelength	• TOM-10G-D18-LR2: 191.8THz, 1563.05nm • TOM-10G-D19-LR2: 191.9THz, 1562.23nm • TOM-10G-D20-LR2: 192.0THz, 1561.42nm • TOM-10G-D21-LR2: 192.1THz, 1560.61nm • TOM-10G-D22-LR2: 192.2THz, 1559.79nm • TOM-10G-D23-LR2: 192.3THz, 1558.98nm • TOM-10G-D24-LR2: 192.4THz, 1558.17nm • TOM-10G-D25-LR2: 192.5THz, 1557.36nm • TOM-10G-D26-LR2: 192.6THz, 1556.55nm • TOM-10G-D27-LR2: 192.7THz, 1555.75nm • TOM-10G-D28-LR2: 192.8THz, 1554.94nm • TOM-10G-D29-LR2: 192.9THz, 1554.13nm • TOM-10G-D30-LR2: 193.0THz, 1553.33nm • TOM-10G-D31-LR2: 193.1THz, 1552.52nm • TOM-10G-D32-LR2: 193.2THz, 1551.72nm • TOM-10G-D33-LR2: 193.3THz, 1550.92nm • TOM-10G-D34-LR2: 193.4THz, 1550.12nm • TOM-10G-D35-LR2: 193.5THz, 1549.32nm • TOM-10G-D36-LR2: 193.6THz, 1548.51nm • TOM-10G-D37-LR2: 193.7THz, 1547.72nm • TOM-10G-D40-LR2: 194.0THz, 1545.32nm • TOM-10G-D41-LR2: 194.1THz, 1544.53nm • TOM-10G-D42-LR2: 194.2THz, 1543.73nm • TOM-10G-D43-LR2: 194.3THz, 1542.94nm • TOM-10G-D44-LR2: 194.4THz, 1542.14nm • TOM-10G-D45-LR2: 194.5THz, 1541.35nm • TOM-10G-D46-LR2: 194.6THz, 1540.56nm *(continued...)*

Parameter	Description
Operating frequency and wave-length	*(continued...)* • TOM-10G-D47-LR2: 194.7THz, 1539.77nm • TOM-10G-D48-LR2: 194.8THz, 1538.98nm • TOM-10G-D49-LR2: 194.9THz, 1538.19nm • TOM-10G-D50-LR2: 195.0THz, 1537.40nm • TOM-10G-D51-LR2: 195.1THz, 1536.61nm • TOM-10G-D52-LR2: 195.2THz, 1535.82nm • TOM-10G-D53-LR2: 195.3THz, 1535.04nm • TOM-10G-D54-LR2: 195.4THz, 1534.25nm • TOM-10G-D55-LR2: 195.5THz, 1533.47nm • TOM-10G-D56-LR2: 195.6THz, 1532.68nm • TOM-10G-D57-LR2: 195.7THz, 1531.90nm • TOM-10G-D58-LR2: 195.8THz, 1531.12nm • TOM-10G-D59-LR2: 195.9THz, 1530.33nm

Functional Description

The Tributary Optical Module 10G, referred to as TOM-10-GD*n*-LR2 (*n*=18-37 and 40-59), is a field-replaceable 10G Small Form Factor Pluggable (XFP) module. It converts client or line side optical signals to and from serial electrical signals. TOM-10G-D*n*-LR2s are hot-pluggable into any of the sub-slots in the SIM (SIM-T-1-10G), and are powered through the pluggable interface.

The TOM-10G-D*n*-LR2 supports:

- SONET OC-192 signals
- SDH STM-64 signals
- 10GbE WAN Phy and 10GbE LAN Phy signals
- 10G FC
- OTU2 (OC-192/SDH-64 + FEC)
- OTU2e (10GbE + FEC)

TOM-10GD*n*-LR2 port status LEDs are located on the SIM-T-1-10G as shown in Figure 2-40 on page 2-81.

Connectors

The TOM-10GDn-LR2 provides the optical interfaces to equipment through the ports as described in Table 2-69.

Table 2-69 TOM-10G-D*n*-LR2 Connectors

Connector	Type	Purpose
Tributary port connectors		
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment
Line port connectors		
Line port IN	LC	Connects to the corresponding Optical Channel OUT port on an Optical Filter Module (OFM)
Line port OUT	LC	Connects to the corresponding Optical Channel IN port on an Optical Filter Module (OFM)

Technical Specifications

Table 2-70 lists the mechanical and electrical specifications for the TOM-10G-D*n*-LR2.

Table 2-70 TOM-10G-D*n*-LR2 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.72 inches / 18.29mm
	Width	0.34 inches / 8.64mm
	Depth	3.10 inches / 78.74mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary/line port IN are listed in Table 2-71.

Table 2-71 TOM-10G-D*n*-LR2 Tributary/Line Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-28.5dBm
Receiver overload	-7dB
Receiver wavelength	1270nm to 1600nm
Data rate	9.95Gbps to 11.3Gbps

The optical specifications for tributary port OUT are listed in Table 2-72.

Table 2-72 TOM-10G-D*n*-LR2 Tributary/Line Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	Complies with: • GR-253 CORE OC-192 LR-25 • ITU-T G.959.1 P1L1-2D2
Transmitter output power	-1dBm to +3dBm
Transmitter wavelength	1530nm to 1565nm
Data rate	9.95Gbps to 11.3Gbps

Interface Specifications

The interface details are listed in Table 2-73.

Table 2-73 TOM-10G-D*n*-LR2 Facilities

Type	Parameter	Specification
Tributary protocols	10GbE LAN PHY	Fully transparent
	10GbE WAN PHY	Fully transparent
	SONET OC-192	Fully transparent
	SDH STM-64	Fully transparent

Tributary Optical Module MR-Dn-LR2 (TOM-MR-Dn-LR2)

Table 2-74 TOM-MR-D*n*-LR2 Product Features

Parameter	Description
Product Ordering Name	2.5G Tributary Optical Module, TOM-MR-D*n*-LR2 (*n*=18 to 37 and 40 to 59)
Reach	• GR 253 CORE OC48 LR-2 • ITU-T G.957 L-16.2

Parameter	Description
Operating Frequency and Wavelength	• TOM-MR-D18-LR2: 191.8THz, 1563.05nm • TOM-MR-D19-LR2: 191.9THz, 1562.23nm • TOM-MR-D20-LR2: 192.0THz, 1561.42nm • TOM-MR-D21-LR2: 192.1THz, 1560.61nm • TOM-MR-D22-LR2: 192.2THz, 1559.79nm • TOM-MR-D23-LR2: 192.3THz, 1558.98nm • TOM-MR-D24-LR2: 192.4THz, 1558.17nm • TOM-MR-D25-LR2: 192.5THz, 1557.36nm • TOM-MR-D26-LR2: 192.6THz, 1556.55nm • TOM-MR-D27-LR2: 192.7THz, 1555.75nm • TOM-MR-D28-LR2: 192.8THz, 1554.94nm • TOM-MR-D29-LR2: 192.9THz, 1554.13nm • TOM-MR-D30-LR2: 193.0THz, 1553.33nm • TOM-MR-D31-LR2: 193.1THz, 1552.52nm • TOM-MR-D32-LR2: 193.2THz, 1551.72nm • TOM-MR-D33-LR2: 193.3THz, 1550.92nm • TOM-MR-D34-LR2: 193.4THz, 1550.12nm • TOM-MR-D35-LR2: 193.5THz, 1549.32nm • TOM-MR-D36-LR2: 193.6THz, 1548.51nm • TOM-MR-D37-LR2: 193.7THz, 1547.72nm • TOM-MR-D40-LR2: 194.0THz, 1545.32nm • TOM-MR-D41-LR2: 194.1THz, 1544.53nm • TOM-MR-D42-LR2: 194.2THz, 1543.73nm • TOM-MR-D43-LR2: 194.3THz, 1542.94nm • TOM-MR-D44-LR2: 194.4THz, 1542.14nm • TOM-MR-D45-LR2: 194.5THz, 1541.35nm • TOM-MR-D46-LR2: 194.6THz, 1540.56nm *(continued...)*

Parameter	Description
Operating Frequency and Wavelength	*(continued...)* • TOM-MR-D47-LR2: 194.7THz, 1539.77nm • TOM-MR-D48-LR2: 194.8THz, 1538.98nm • TOM-MR-D49-LR2: 194.9THz, 1538.19nm • TOM-MR-D50-LR2: 195.0THz, 1537.40nm • TOM-MR-D51-LR2: 195.1THz, 1536.61nm • TOM-MR-D52-LR2: 195.2THz, 1535.82nm • TOM-MR-D53-LR2: 195.3THz, 1535.04nm • TOM-MR-D54-LR2: 195.4THz, 1534.25nm • TOM-MR-D55-LR2: 195.5THz, 1533.47nm • TOM-MR-D56-LR2: 195.6THz, 1532.68nm • TOM-MR-D57-LR2: 195.7THz, 1531.90nm • TOM-MR-D58-LR2: 195.8THz, 1531.12nm • TOM-MR-D59-LR2: 195.9THz, 1530.33nm

Functional Description

The Tributary Optical Module 2.5G, referred to as TOM-MR-D*n*-LR2 (*n*=18 to 37 and 40 to 59), is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client side optical signals to and from serial electrical signals. TOM-MR-D*n*-LR2s are hot-pluggable into any of the sub-slots in the SIM (SIM-T-2-2.5GM), and are powered through the pluggable interface.

TOM-MR-D*n*-LR2 supports the following signals:

- SONET OC-48, OC-12 and OC-3
- SDH STM-1, STM-4 and STM-16
- 1G Fibre Channel and 2G Fibre Channel
- 1GbE
- ESCON
- FICON
- OTU-1 with digital wrapper

TOM-MR-D*n*-LR2 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Connectors

The TOM-MR-D*n*-LR2 provides the optical interfaces to equipment through the ports as described in Table 2-75.

Table 2-75 TOM-MR-D*n*-LR2 Connectors

Connector	Type	Purpose
Tributary Port Connectors		
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment
Line Port Connectors		
Line port IN	LC	Connects to the corresponding Optical Channel OUT port on an Optical Filter Module (OFM)
Line port OUT	LC	Connects to the corresponding Optical Channel IN port on an Optical Filter Module (OFM)

Technical Specifications

Table 2-76 lists the mechanical and electrical specifications for the TOM-MR-D*n*-LR2.

Table 2-76 TOM-MR-D*n*-LR2 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.72 inches / 18.29mm
	Width	0.34 inches / 8.64mm
	Depth	3.10 inches / 78.74mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary/line port IN are listed in Table 2-77.

Table 2-77 TOM-MR-D*n*-LR2 Tributary/Line Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-29.0dBm
Receiver overload	-9dB
Receiver wavelength	1520nm to 1565nm
Data rate	0.155Gbps to 2.7Gbps

The optical specifications for tributary port OUT are listed in Table 2-78.

Table 2-78 TOM-MR-D*n*-LR2 Tributary/Line Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	Complies with: • GR-253 CORE OC-48 LR-2 • ITU-T G.957 L-16.2
Transmitter output power	0dBm to +3.5dBm
Transmitter wavelength	1500nm to 1580nm
Data rate	0.155Gbps to 2.7Gbps

Interface Specifications

The interface details are listed in Table 2-79.

Table 2-79 TOM-MR-D*n*-LR2 Facilities

Type	Parameter	Specification
Tributary protocols	SONET OC-3	Fully transparent
	SONET OC-12	Fully transparent
	SONET OC-48	Fully transparent
	SDH STM-1	Fully transparent
	SDH STM-4	Fully transparent
	SDH STM-16	Fully transparent
	1 GbE	Fully transparent
	1G Fibre Channel	Fully transparent
	2G Fibre Channel	Fully transparent
	ESCON	Fully transparent
	FICON	Fully transparent

Tributary Optical Module MR-Cn-LR2 (TOM-MR-Cn-LR2)

Table 2-80 TOM-MR-C*n*-LR2 Product Features

Parameter	Description
Product Ordering Name	2.5G Tributary Optical Module, TOM-MR-C*n*-LR2 (*n*=47,49,51,53,55,57,59,61)
Reach	• CWDM 2.5Gbps SONET/SDH • CWDM 120km 2.5G Ethernet
Operating Wavelength and Wavelength	• TOM-MR-C47-LR2: 1471nm, 203.94THz • TOM-MR-C49-LR2: 1491nm, 201.21THz • TOM-MR-C51-LR2: 1511nm, 198.54THz • TOM-MR-C53-LR2: 1531nm, 195.95THz • TOM-MR-C55-LR2: 1551nm, 193.42THz • TOM-MR-C57-LR2: 1571nm, 190.96THz • TOM-MR-C59-LR2: 1591nm, 188.56THz • TOM-MR-C61-LR2: 1611nm, 186.22THz

Functional Description

The Tributary Optical Module 2.5G, referred to as TOM-MR-C*n*-LR2 (*n*=47, 49, 51, 53, 55, 57, 59, 61), is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client side optical signals to and from serial electrical signals. TOM-MR-C*n*-LR2s are hot-pluggable into any of the sub-slots in the SIM (SIM-T-2-2.5GM), and are powered through the pluggable interface.

TOM-MR-C*n*-LR2 supports the following signals

- SONET OC-48, OC-12 and OC-3
- SDH STM-1, STM-4 and STM-16
- 1G Fibre Channel and 2G Fibre Channel
- 1GbE
- ESCON
- FICON
- OTU-1 with digital wrapper

TOM-MR-C*n*-LR2 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Connectors

The TOM-MR-C*n*-LR2 provides the optical interfaces to equipment through the ports as described in Table 2-81.

Table 2-81 TOM-MR-C*n*-LR2 Connectors

Connector	Type	Purpose
Tributary Port Connectors		
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment
Line Port Connectors		
Line port IN	LC	Connects to the corresponding Optical Channel OUT port on an Optical Filter Module (OFM)
Line port OUT	LC	Connects to the corresponding Optical Channel IN port on an Optical Filter Module (OFM)

Technical Specifications

Table 2-82 lists the mechanical and electrical specifications for the TOM-MR-C*n*-LR2.

Table 2-82 TOM-MR-C*n*-LR2 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.72 inches / 18.29mm
	Width	0.34 inches / 8.64mm
	Depth	3.10 inches / 78.74mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary/line port IN are listed in Table 2-83.

Table 2-83 TOM-MR-C*n*-LR2 Tributary/Line Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-28.0dBm
Receiver overload	-9dB
Receiver wavelength	1200nm to 1625nm
Data rate	0.155Gbps to 2.7Gbps

The optical specifications for tributary port OUT are listed in Table 2-84.

Table 2-84 TOM-MR-C*n*-LR2 Tributary/Line Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	Complies with: • CWDM 2.5Gbps SONET/SDH • CWDM 120km 2.5G Ethernet
Transmitter output power	>1dBm
Transmitter wavelength	1471nm, 1491nm, 1511nm, 1531nm, 1551nm, 1571nm, 1591nm, 1611nm CWDM
Data rate	0.155Gbps to 2.7Gbps

Interface Specifications

The interface details are listed in Table 2-85.

Table 2-85 TOM-MR-C*n*-LR2 Facilities

Type	Parameter	Specification
Tributary protocols	SONET OC-3	Fully transparent
	SONET OC-12	Fully transparent
	SONET OC-48	Fully transparent
	SDH STM-1	Fully transparent
	SDH STM-4	Fully transparent
	SDH STM-16	Fully transparent
	1 GbE	Fully transparent
	1G Fibre Channel	Fully transparent
	2G Fibre Channel	Fully transparent
	ESCON	Fully transparent
	FICON	Fully transparent

Tributary Optical Module 10G-SR0 (TOM-10G-SR0)

Table 2-86 TOM-10G-SR0 Product Features

Product Ordering Name (PON)	Features
TOM-10G-SR0	10G Tributary Optical Module Reach: • 10GbE LAN: IEEE 802.3ae 10GBase-SR • 10GbE WAN: IEEE 802.3ae 10GBase-SW

Functional Description

The Tributary Optical Module 10G, referred to as TOM-10G-SR0, is a field-replaceable 10G Small Form Factor Pluggable (XFP) module. It converts client optical signals to and from serial electrical signals. TOM-10G-SR0s are hot-pluggable into the SIM-T-1-10G, and are powered through the pluggable interface.

TOM-10G-SR0 supports 10GbE LAN and 10GbE WAN client signals. The optical interface complies with ITU short reach specification 10GBase-SR for the 10GbE LAN client signal and 10GBase-SW for the 10GbE WAN client signal.

TOM-10G-SR0 port status LEDs are located on the SIM-T-1-10G as shown in Figure 2-40 on page 2-81.

Connectors

The TOM-10G-SR0 provides the optical interfaces to the client equipment through the ports as described in Table 2-87.

Table 2-87 TOM-10G-SR0 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-88 lists the mechanical and electrical specifications for the TOM-10G-SR0.

Table 2-88 TOM-10G-SR0 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.72 inches / 18.29mm
	Width	0.34 inches / 8.64mm
	Depth	3.10 inches / 78.74mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-89.

Table 2-89 TOM-10G-SR0 Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Multi-mode
Receiver sensitivity	-9.9dBm
Receiver overload	-1.0dBm
Receiver wavelength	840nm to 860nm
Data rate	9.95328Gbps to 10.3125Gbps

The optical specifications for tributary port OUT are listed in Table 2-90.

Table 2-90 TOM-10G-SR0 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Multi-mode
Link distance	Complies with 10GBase-SR and 10GBase-SW specifications
Transmitter output power	-7.3dBm to -1dBm
Transmitter wavelength	840nm to 860nm
Data rate	9.95328Gbps to 10.3125Gbps

Interface Specifications

The tributary interface details are listed in Table 2-91.

Table 2-91 TOM-10G-SR0 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	10GbE LAN PHY	Fully transparent
	10GbE WAN PHY	Fully transparent

Tributary Optical Module 10G-SR1 (TOM-10G-SR1)

Table 2-92 TOM-10G-SR1 Product Features

Product Ordering Name (PON)	Features
TOM-10G-SR1	10G Tributary Optical Module Reach: • 10GbE LAN: IEEE 802.3ae 10GBase-LR • 10GbE WAN: IEEE 802.3ae 10GBase-LW • Telcordia GR-253-CORE SR-1 • ITU-T G.693 VSR2000-2R1

Functional Description

The Tributary Optical Module 10G, referred to as TOM-10G-SR1, is a field-replaceable 10G Small Form Factor Pluggable (XFP) module. It converts client optical signals to and from serial electrical signals. TOM-10G-SR1s are hot-pluggable into any of the sub-slots in the SIM-T-1-10G, and are powered through the pluggable interface.

TOM-10G-SR1 supports the following signals:

- SONET OC-192
- SDH STM-64
- 10GbE WAN Phy
- 10GbE LAN Phy

The optical interface complies with SONET Telcordia SR-1 specification for the OC-192 client signal, ITU short reach specification for the STM-64 signal, 10GBase-LR for the 10GbE LAN client signal, and 10GBase-LW for the 10GbE WAN client signal.

TOM-10G-SR1 port status LEDs are located on the SIM-T-1-10G as shown in Figure 2-40 on page 2-81.

Connectors

The TOM-10G-SR1 provides the optical interfaces to the client equipment through the ports as shown in Table 2-93.

Table 2-93 TOM-10G-SR1 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-94 lists the mechanical and electrical specifications for the TOM-10G-SR1.

Table 2-94 TOM-10G-SR1 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.72 inches / 18.29mm
	Width	0.34 inches / 8.64mm
	Depth	3.10 inches / 78.74mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-95.

Table 2-95 TOM-10G-SR1 Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-11.0dBm
Receiver overload	+0.5dBm
Receiver wavelength	1260nm to 1580nm
Data rate	9.95Gbps to 10.3Gbps

The optical specifications for tributary port OUT are listed in Table 2-96.

Table 2-96 TOM-10G-SR1 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	• 10GbE LAN: IEEE 802.3ae 10GBase-LR • 10GbE WAN: IEEE 802.3ae 10GBase-LW • GR-253-CORE SR-1 • ITU-T G.693 VSR2000-2R1
Transmitter output power	-6dBm to -1dBm
Transmitter wavelength	1290nm to 1330nm
Data rate	9.95Gbps to 10.3Gbps

Interface Specifications

The tributary interface details are listed in Table 2-97.

Table 2-97 TOM-10G-SR1 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	10GbE LAN PHY	Fully transparent
	10GbE WAN PHY	Fully transparent
	SONET OC-192	Fully transparent
	SDH STM-64	Fully transparent

Tributary Optical Module 2.5G-SR1 (TOM-2.5G-SR1)

Table 2-98 TOM-2.5G-SR1 Product Features

Product Ordering Name (PON)	Features
TOM-2.5G-SR1	2.5G Tributary Optical Module Reach: • GR-253-CORE OC-48 SR-1 • ITU-T G.957 I-16

Functional Description

The Tributary Optical Module 2.5G, referred to as TOM-2.5G-SR1, is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-2.5G-SR1s are hot-pluggable into any of the sub-slots in the SIM-T-2-2.5GMs, and are powered through the pluggable interface.

TOM-2.5G-SR1 supports the following client signals:

- OC-48
- STM-16

The optical interface complies with GR-253-CORE SR-1 specification for the OC-48 client signal, ITU short reach specification for the STM-16 signal.

TOM-2.5G-SR1 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Connectors

The TOM-2.5G-SR1 provides the optical interfaces to the client equipment through the ports as shown in Table 2-99.

Table 2-99 TOM-2.5G-SR1 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-100 lists the mechanical and electrical specifications for the TOM-2.5G-SR1.

Table 2-100 TOM-2.5G-SR1 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches / 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2.

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-101.

Table 2-101 TOM-2.5G-SR1 Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-18.0dBm
Receiver overload	-3.0dBm
Receiver wavelength	1260nm to 1580nm
Data rate	2.488Gbps

The optical specifications for tributary port OUT are listed in Table 2-102.

Table 2-102 TOM-2.5G-SR1 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	• GR-253-CORE OC-48 SR-1 • ITU-T G.957 I-16
Transmitter output power	-10dBm to -3dBm
Transmitter wavelength	1266nm to 1360nm
Data rate	2.488Gbps

Interface Specifications

The tributary interface details are listed in Table 2-103.

Table 2-103 TOM-2.5G-SR1 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	SONET OC-48	Fully transparent
	SDH STM-16	Fully transparent

Tributary Optical Module 2.5G-IR2 (TOM-2.5G-IR2)

Table 2-104 TOM-2.5G-IR2 Product Features

Product Ordering Name (PON)	Features
TOM-2.5G-IR2	2.5G Tributary Optical Module Reach: • GR 253 CORE OC-48 IR-2 • ITU-T G.957 S-16.2

Functional Description

The Tributary Optical Module 2.5G, referred to as TOM-2.5G-IR2, is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-2.5G-IR2s are hot-pluggable into any of the sub-slots in the SIM-T-2-2.5GMs, and are powered through the pluggable interface.

TOM-2.5G-IR2 supports OC-48 and STM-16 client signals. The optical interface complies with GR 253 CORE IR2 specification for the OC-48 client signal and ITU G.957 S-16.2 for SDH STM-16 client signal.

TOM-2.5G-IR2 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Connectors

The TOM-2.5G-IR2 provides the optical interfaces to the client equipment through the ports as shown in Table 2-105.

Table 2-105 TOM-2.5G-IR2 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-106 lists the mechanical and electrical specifications for the TOM-2.5G-IR2.

Table 2-106 TOM-2.5G-IR2 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches / 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-107.

Table 2-107 TOM-2.5G-IR2 Tributary port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-18.0dBm
Receiver overload	0.0dBm
Receiver wavelength	1260nm to 1580nm
Data rate	2.5Gbps

The optical specifications for tributary port OUT are listed in Table 2-108.

Table 2-108 TOM-2.5G-IR2 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	• GR 253 CORE OC-48 IR-2 • ITU-T G.957 S-16.2
Transmitter output power	-5dBm to 0dBm
Transmitter wavelength	1430nm to 1580nm
Data rate	2.5Gbps

Interface Specifications

The tributary interface details are listed in Table 2-109.

Table 2-109 TOM-2.5G-IR2 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	SONET OC-48	Fully transparent
	SDH STM-16	Fully transparent

Tributary Optical Module 2.5GMR-SR1 (TOM-2.5GMR-SR1)

Table 2-110 TOM-2.5GMR-SR1 Product Features

Product Ordering Name (PON)	Features
TOM-2.5GMR-SR1	2.5G Tributary Optical Module Reach: • GR 253 CORE OC-48 IR-1 • ITU-T G.957 S-16.1 • ANSI T1.105

Functional Description

The Tributary Optical Module Multi-rate 2.5G, referred to as TOM-2.5GMR-SR1, is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-2.5GMR-SR1s are hot-pluggable into any of the sub-slots in the SIM-T-2-2.5GMs, and are powered through the pluggable interface.

TOM-2.5GMR-SR1 supports the following client signals

- SONET OC-48, OC-12 and OC-3
- SDH STM-16, STM-4 and STM-1
- 1GbE
- OTU1
- ESCON and FICON
- 1G Fibre Channel and 2G Fibre Channel

The optical interface complies with GR 253 CORE IR1 specification for the OC-48 client signal and ITU G.957 S-16.1 for SDH STM-16 client signal.

TOM-2.5GMR-SR1 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Note: The TOM-2.5GMR-SR1 always uses the transmission characteristics of OC-48 SR-1 or STM-16, even when set to the lower OC-3/OC-12 or STM-1/STM-4 rates. Span engineering should take this into consideration and optical attenuators should be applied, if appropriate.

Connectors

The TOM-2.5GMR-SR1 provides the optical interfaces to the client equipment through the ports as shown in Table 2-116.

Table 2-111 TOM-2.5GMR-SR1 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-117 lists the mechanical and electrical specifications for the TOM-2.5GMR-SR1.

Table 2-112 TOM-2.5GMR-SR1 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches/ 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-118.

Table 2-113 TOM-2.5GMR-SR1 Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	• 2.5G: -18.0dBm • 1G: -20.0dBm • 155M: -23.0dBm
Receiver overload	• 2.5G: -3.0dBm • 1G: -3.0dBm • 155M: -8.0dBm

Table 2-113 TOM-2.5GMR-SR1 Tributary Port IN Optical Specifications

Type	Specification
Receiver wavelength	1270nm to 1600nm
Data rate	2.5Gbps, 1Gbps, 622Mbps, 155Mbps user provisionable

The optical specifications for tributary port OUT are listed in Table 2-114.

Table 2-114 TOM-2.5GMR-SR1 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	GR 253 CORE OC-48 IR-1 ITU-T G.957 S-16.1 ANSI T1.105/GR 253 CORE
Transmitter output power	-9.5dBm to -3dBm
Transmitter wavelength	1270nm to 1360nm
Data rate	2.5Gbps, 1Gbps, 622Mbps, 155Mbps user provisionable

Tributary Optical Module 2.5GMR-IR1 (TOM-2.5GMR-IR1)

Table 2-115 TOM-2.5GMR-IR1 Product Features

Product Ordering Name (PON)	Features
TOM-2.5GMR-IR1	2.5G Tributary Optical Module Reach: • GR 253 CORE OC-48 IR-1 • ITU-T G.957 S-16.1 • ANSI T1.105

Functional Description

The Tributary Optical Module Multi-rate 2.5G, referred to as TOM-2.5GMR-IR1, is a field-replaceable 2.5G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-2.5GMR-IR1s are hot-pluggable into any of the sub-slots in the SIM-T-2-2.5GMs, and are powered through the pluggable interface.

TOM-2.5GMR-IR1 supports the following client signals

- SONET OC-48, OC-12 and OC-3
- SDH STM-16, STM-4 and STM-1

The optical interface complies with GR 253 CORE IR1 specification for the OC-48 client signal and ITU G.957 S-16.1 for SDH STM-16 client signal.

TOM-2.5GMR-IR1 port status LEDs are located on the SIM-T-2-2.5GM as shown in Figure 2-42 on page 2-84.

Note: The TOM-2.5GMR-IR1 always uses the transmission characteristics of OC-48 IR-1 or STM-16, even when set to the lower OC-3/OC-12 or STM-1/STM-4 rates. Span engineering should take this into consideration and optical attenuators should be applied, if appropriate.

Connectors

The TOM-2.5GMR-IR1 provides the optical interfaces to the client equipment through the ports as shown in Table 2-116.

Table 2-116 TOM-2.5GMR-IR1 Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-117 lists the mechanical and electrical specifications for the TOM-2.5GMR-IR1.

Table 2-117 TOM-2.5GMR-IR1 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches/ 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-118.

Table 2-118 TOM-2.5GMR-IR1 Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	• 2.5G: -18.0dBm • 622M: -23.0dBm • 155M: -23.0dBm
Receiver overload	• 2.5G: 0.0dBm • 622M: -8.0dBm • 155M: -8.0dBm

Table 2-118 TOM-2.5GMR-IR1 Tributary Port IN Optical Specifications

Type	Specification
Receiver wavelength	1260nm to 1580nm
Data rate	2.5Gbps, 622Mbps, 155Mbps user provisionable

The optical specifications for tributary port OUT are listed in Table 2-119.

Table 2-119 TOM-2.5GMR-IR1 Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	GR 253 CORE OC-48 IR-1 ITU-T G.957 S-16.1 ANSI T1.105/GR 253 CORE
Transmitter output power	-5dBm to 0dBm
Transmitter wavelength	1260nm to 1360nm
Data rate	2.5Gbps, 622Mbps, 155Mbps user provisionable

Interface Specifications

The tributary interface details are listed in Table 2-120.

Table 2-120 TOM-2.5GMR-IR1 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	SONET OC-48	Fully transparent
	SONET OC-12	Fully transparent
	SONET OC-3	Fully transparent
	SDH STM-16	Fully transparent
	SDH STM-4	Fully transparent
	SDH STM-1	Fully transparent

Tributary Optical Module 1G-SX (TOM-1G-SX)

Table 2-121 TOM-1G-SX Product Features

Product Ordering Name (PON)	Features
TOM-1G-SX	1G Tributary Optical Module Reach: • 1.25GbE: IEEE 802.3z 1000Base-SX

Functional Description

The Tributary Optical Module 1G, referred to as TOM-1G-SX, is a field-replaceable 1G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-1G-SXs are hot-pluggable into any of the sub-slots in the SIMs, and are powered through the pluggable interface.

TOM-1G-SX supports the following client signals:

- 1GbE
- FICON
- 1G Fibre Channel and 2G Fibre Channel

The optical interface complies with IEEE802.3 1000Base-SX client signals.

TOM-1G-SX port status LEDs are located on the SIMs as shown in Figure 2-40 on page 2-81 and Figure 2-42 on page 2-84.

Connectors

The TOM-1G-SX provides the optical interfaces to the client equipment through the ports as shown in Table 2-122.

Table 2-122 TOM-1G-SX Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-123 lists the mechanical and electrical specifications for the TOM-1G-SX.

Table 2-123 TOM-1G-SX Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches / 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-124.

Table 2-124 TOM-1G-SX Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Multi-mode
Receiver sensitivity	• 1G: -20.0dBm • 2.125G: -18.0dBm
Receiver overload	• 1G: 0.0dBm • 2.125G: 0.0dBm
Receiver wavelength	770nm to 860nm
Data rate	1Gbps, 2.125Gbps

The optical specifications for tributary port OUT are listed in Table 2-125.

Table 2-125 TOM-1G-SX Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Multi-mode
Link distance	IEEE 802.3z 1000Base-SX
Transmitter output power	-9.5dBm to -3dBm
Transmitter wavelength	830nm to 860nm
Data rate	1Gbps, 2.125Gbps

Interface Specifications

The tributary interface details are listed in Table 2-126.

Table 2-126 TOM-1G-SX Tributary Facilities

Type	Parameter	Specification
Tributary protocols	1GbE	Fully transparent
	FICON	Fully transparent
	1G Fibre Channel	Fully transparent
	2G Fibre Channel	Fully transparent

Tributary Optical Module 1G-LX (TOM-1G-LX)

Table 2-127 TOM-1G-LX Product Features

Product Ordering Name (PON)	Features
TOM-1G-LX	1G Tributary Optical Module Reach: • 1.25GbE: IEEE 802.3z 1000Base-LX

Functional Description

The Tributary Optical Module 1G, referred to as TOM-1G-LX, is a field-replaceable 1G Small Form Factor Pluggable (SFP) module. It converts client optical signals to and from serial electrical signals. The TOM-1G-LXs are hot-pluggable into any of the sub-slots in the SIMs, and are powered through the pluggable interface.

TOM-1G-LX supports the following client signals:

- 1GbE
- FICON
- 1G Fibre Channel and 2G Fibre Channel

The optical interface complies with IEEE802.3z 1000Base-LX client signals.

TOM-1G-LX port status LEDs are located on the SIMs as shown in Figure 2-40 on page 2-81 and Figure 2-42 on page 2-84.

Connectors

The TOM-1G-LX provides the optical interfaces to the client equipment through the ports as shown in Table 2-128.

Table 2-128 TOM-1G-LX Connectors

Connector	Type	Purpose
Tributary port IN	LC	Connects to the transmit or output port of the client equipment
Tributary port OUT	LC	Connects to receive or input port of the client equipment

Technical Specifications

Table 2-129 lists the mechanical and electrical specifications for the TOM-1G-LX.

Table 2-129 TOM-1G-LX Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches / 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary port IN are listed in Table 2-130.

Table 2-130 TOM-1G-LX Tributary Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	• 1G: -22.0dBm • 2.125G: -21.0dBm
Receiver overload	• 1G: -3.0dBm • 2.125G: -3.0dBm
Receiver wavelength	1260nm to 1580nm
Data rate	1Gbps, 2.125Gbps

The optical specifications for tributary port OUT are listed in Table 2-131.

Table 2-131 TOM-1G-LX Tributary Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	IEEE 802.3z 1000Base-LX
Transmitter output power	-9.5dBm to -3dBm
Transmitter wavelength	1270nm to 1355nm
Data rate	1Gbps, 2.125Gbps

Interface Specifications

The tributary interface details are listed in Table 2-132.

Table 2-132 TOM-1G-LX Tributary Facilities

Type	Parameter	Specification
Tributary protocols	1GbE	Fully transparent
	FICON	Fully transparent
	1G Fibre Channel	Fully transparent
	2G Fibre Channel	Fully transparent

Tributary Optical Module 100M-C45-L2 (TOM-100M-C45-L2)

Table 2-133 TOM-100M-C45-L2 Product Features

Parameter	Description
Product Ordering Name	Tributary Optical Module, TOM-100M-C45-L2
Reach	1451nm OSC wavelength, 100Mbps Ethernet
Operating Frequency	206.75THz

Functional Description

The Tributary Optical Module 100M-C45-L2, referred to as TOM-100M-C45-L2 is a field-replaceable Small Form Factor Pluggable (SFP) module. It converts client or line side optical signals to and from serial electrical signals. TOM-100M-C45-L2s are hot-pluggable into the AMM-A and are powered through the pluggable interface.

TOM-100M-C45-L2 supports 1451nm OSC wavelength, 100Mbps Ethernet signals and allows for OSC termination on the AMM-A.

Connectors

The TOM-100M-C45-L2 provides the optical interfaces to equipment through the ports as described in Table 2-134.

Table 2-134 TOM-100M-C45-L2 Connectors

Connector	Type	Purpose
IN	LC	Connects to the OSC OUT port of an AAM or OFM-1-OSC module
OUT	LC	Connects to the SC IN port of an AAM or OFM-1-OSC module

Technical Specifications

Table 2-135 lists the mechanical and electrical specifications for the TOM-100M-C45-L2.

Table 2-135 TOM-100M-C45-L2 Technical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	0.52 inches / 13.21mm
	Width	0.33 inches / 8.38mm
	Depth	2.23 inches / 56.64mm
	Weight	0.1lbs (approximately)
Electrical specifications	Power consumption	Included as part of the SIM; see Table 2-1 on page 2-2

Optical Specifications

The optical specifications for tributary/line port IN are listed in Table 2-136.

Table 2-136 TOM-100M-C45-L2 Tributary/Line Port IN Optical Specifications

Type	Specification
Incoming fiber type	Single mode
Receiver sensitivity	-40 dBm at BER of 1e-10
Receiver overload	-7dB
Receiver wavelength	1260nm to 1620nm
Data rate	100Mbps

The optical specifications for tributary port OUT are listed in Table 2-137.

Table 2-137 TOM-100M-C45-L2 Tributary/Line Port OUT Optical Specifications

Type	Specification
Outgoing fiber type	Single mode
Link distance	Complies with Telcordia GR-2918-CORE OSC2 Optical Parameters
Transmitter output power	0.5dBm to +5dBm
Transmitter wavelength	1451nm
Data rate	100Mbps

Interface Specifications

The tributary interface details are listed in Table 2-138.

Table 2-138 TOM-100M-C45-L2 Tributary Facilities

Type	Parameter	Specification
Tributary protocols	Fast Ethernet	Fully transparent

CHAPTER 3

Infinera Dispersion Management Chassis

The Infinera Dispersion Management Chassis, referred to as the DMC, is a rack mountable passive chassis. The DMC does not require power or management. DMCs are used to house Dispersion Compensation Modules (DCMs). Depending on the span characteristics, the DMC is optionally included in ATN network elements to provide dispersion compensation.

This chapter provides the DMC functional description and technical specifications in the following sections:

For DMC installation procedures, refer to the *Infinera ATN Site Preparation and Hardware Installation Guide.*

DMC Overview

The DMC includes a DMC and Dispersion Compensation Module(s) (DCM) as listed in Table 3-1.

Table 3-1 DMC Hardware Equipment

Equipment Type	Name
DMC-B	Dispersion Management Chassis
DCMs	Dispersion Compensation Modules

Views of the DMC-B with the supported DCM types are shown in Figure 3-1 on page 3-2 and Figure 3-2 on page 3-3. See "Dispersion Compensation Module (DCM)" on page 3-6 for more information.

Figure 3-1 DMC-B with Half-width DCMs

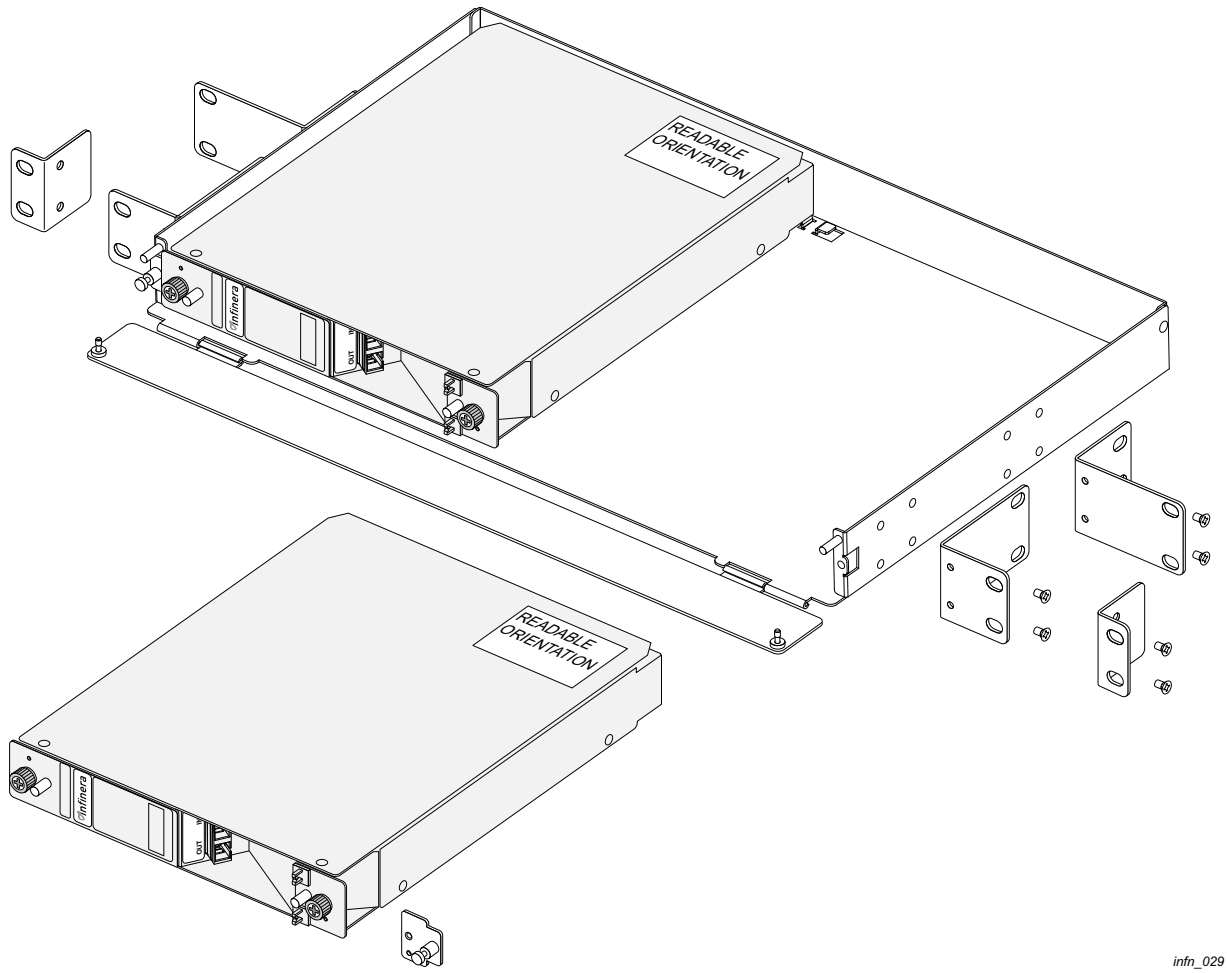
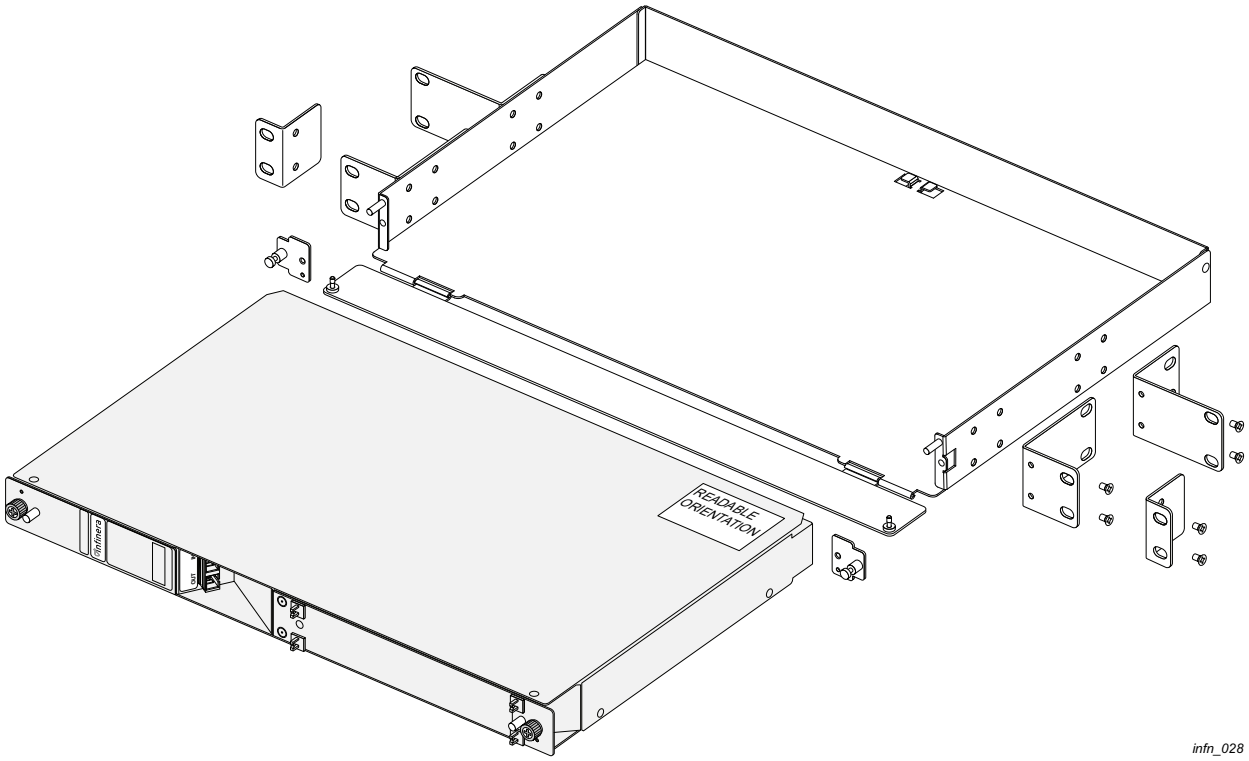


Figure 3-2 DMC-B with a Full-width DCM



DMC Product Details

Table 3-2 lists the name and a brief description of each of the supported DMCs.

Table 3-2 DMC Product Details

Product Ordering Name (PON)	Description
DMC1-B	Dispersion Management Chassis

Functional Description

The DMC supports the following functions:

- The chassis is passive and does not require electrical connections to the chassis or within the chassis
- Accommodates up to two half-width DCMs or one full-width DCM
- Can be installed in a 19-inch rack as 2-inch or 6-inch forward mount
- Can be installed in an ETSI (600mm), or 23-inch rack as flush mount and 1-inch, 2-inch, 5-inch, and 6-inch forward mount

Table 3-3 lists the mounting kits available for the DMC.

Table 3-3 DMC Mounting Kits

Part Number	Description	Rack Mounting Ears
120-0096-001	Mounting option for a DCM shelf (DMC1-B) in an ETSI (600mm) or 23-inch rack	2 each 590-0156-001
120-0096-001	Mounting option for a DCM shelf (DMC1-B) in a 19-inch rack	2 each 590-0215-001

Mechanical Specifications

Table 3-4 lists the mechanical specifications for the DMC.

Table 3-4 DMC Mechanical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.75 inches / 44.45mm
	Width	17.40 inches / 441.96mm
	Depth	11.00 inches / 279.4mm
	Weight	5.5lbs

Dispersion Compensation Module (DCM)

There are fourteen (14) DCM types that are provided to help equalize the effect of chromatic dispersion on the optical signals. DCMs are capable of reversing the dispersion effect of the transmission fiber and restoring the optical signal.

Table 3-5 lists the name and a brief description of each of the supported DCMs.

Table 3-5 DCM Product Details

Product Ordering Name (PON)	Description
DCM1H-100N-A	Half-width, -100ps/nm, Negative Dispersion
DCM1H-300N-A	Half-width, -300ps/nm, Negative Dispersion
DCM1H-500N-A	Half-width, -500ps/nm, Negative Dispersion
DCM1H-700N-A	Half-width, -700ps/nm, Negative Dispersion
DCM1H-900N-A	Half-width, -900ps/nm, Negative Dispersion
DCM1H-1100N-A	Half-width, -1100ps/nm, Negative Dispersion
DCM1H-1300N-A	Half-width, -1300ps/nm, Negative Dispersion
DCM1F-1500N-A	Full-width, -1500ps/nm, Negative Dispersion
DCM1F-1700N-LL	Full-width, -1700ps/nm, Negative Dispersion
DCM1F-1900N-LL	Full-width, -1900ps/nm, Negative Dispersion
DCM1H-100P-A	Half-width, +100ps/nm, Positive Dispersion
DCM1F-200P-A	Full-width, +200ps/nm, Positive Dispersion
DCM1F-300P-A	Full-width, +300ps/nm, Positive Dispersion
DCM1F-400L-A	Full-width, -400ps/nm, Negative Dispersion

Functional Description

The Dispersion Compensation Module, referred to as DCM, is a passive pluggable module that slides into the DMC.

The DCM supports the following functions:

- Houses dispersion compensating fiber that is optically connected to an AAM in-line access port (DCM) through a front panel, duplex optical cable
- The length of the dispersion compensation fiber depends upon the DCM module type
- Equalizes chromatic dispersion of different frequency components having different propagation speeds
- Reverses the dispersion effect of transmission fiber and restores the optical signal
- Each DCM has two ports; one labeled IN and the other labeled OUT
- Available in eleven (11) types of negative DCMs, ranging from 100 ps/nm to 1900 ps/nm in 100 ps/nm increments
- Available in three (3) types of positive DCMs, ranging from 100 ps/nm to 300 ps/nm

The half-width DCM type is shown in Figure 3-3 and the full-width DCM type is shown in Figure 3-4 on page 3-7.

Figure 3-3 Half-width DCM

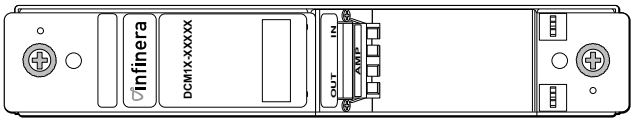


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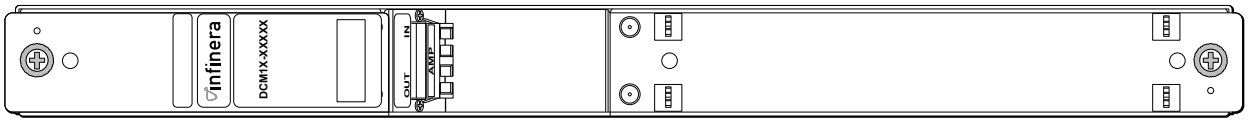
Figure 3-4 Full-width DCM



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Mechanical Specifications

Table 3-6 lists the mechanical specifications for the DCM.

Table 3-6 DCM Mechanical Specifications

Type	Parameter	Specification
Mechanical specifications	Height	1.60 inches / 40.64mm
	Width	Negative 100-1300 ps/nm: 8.64 inches / 219.46mm
		Negative 1400-4000 ps/nm: 17.28 inches / 438.91mm
		Positive 100-200 ps/nm: 8.64 inches / 219.46mm
		Positive 300 ps/nm: 17.28 inches / 438.91mm
	Depth	10.50 inches / 266.70mm
	Weight	Varies - <6lbs

Connectors

All DCMs have two SC type connectors; one labeled IN and one labeled OUT for optical interface as listed in Table 3-7.

Table 3-7 DCM Connectors

Connector	Type	Purpose
IN	SC	Optical interface connects to the Line-side fiber
OUT	SC	Optical interface connects to the Line-In port of an AAM

Appendix A

Acronyms

List of Acronyms

Acronym	Definition
A	
AAM	ATN Amplifier Module
ACO	alarm cutoff
ACT	active
ADM	add/drop multiplexer
ADPCM	adaptive differential pulse code modulation
AGC	Automated Gain Control
AID	access identifier
AINS	automatic in-service
AIS	alarm indication signal
ALS	Automatic Laser Shutdown
AMM	ATN Management Module
AMP	amplifier
ANSI	American National Standards Institute
APD	avalanche photo diode
API	application programming interface
APS	automatic protection switching
ARC	Alarm Reporting Control
ARP	address resolution protocol

Acronym	Definition
ASCII	American Standard Code for Information Interchange
ASE	amplified spontaneous emission
ASIC	Application-specific Integrated Circuit
ASPS	alarm severity profile settings
ATM	asynchronous transfer mode
AU	administrative unit
AUX	auxiliary port
AWG	american wire gauge; array waveguide gating
B	
BDFB	battery distribution fuse bay
BDI	backward defect indication
BEI	backward error indication
BER	bit error rate
BERT	bit error rate testing
BIP-8	bit interleaved parity
BITS	building-integrated timing supply
BLSR	bi-directional line switched ring
BNC	bayonet Neill-Concelman; British Naval Connector
BOL	beginning of life
BOM	bill of material
BOOTP	bootstrap protocol
bps	bits per second
BPV	bipolar violations
C	
C	Celsius
CBN	Common Bonding Network
CCITT	Consultative Committee on International Telegraph and Telephone (now known as the ITU-T)
CCLI	commissioning command line interface
CDE	chromatic dispersion equalizer
CDR	clock and data recovery
CDRH	Center for Devices and Radiological Health
CFR	code for federal regulations
CH/Ch/ch	channel

Acronym	Definition
CID	circuit identifier
CIT	craft interface terminal
CLEI	common language equipment identifier
CLI	command line interface
CO	central office
CODEC	coder and decoder
COM	communication
CORBA	Common Object Request Broker Architecture
CPC	common processor complex
CPE	customer premises equipment
CPLD	complex programmable logic device
CPU	central processing unit
CRC	cyclic redundancy check
CSPF	constraint-based shortest path first algorithm
CSV	comma separated value
CTAG	correlation tag
CTP	connection termination point, channel trail termination point, client termination point
CTS	clear to send
CV	coding violation
CV-L	coding violation-line
CV-P	coding violation-path
CV-S	coding violation-section
CWDM	coarse wavelength division multiplexing
D	
dB	decibel
DB	database
DCC	data communications channel
DCE	data communications equipment
DCF	dispersion compensation fiber
DCM	Dispersion Compensation Module
DCN	data communication network
DEMUX	de-multiplexing
DFB	distributed feedback
DFE	decision feedback equalizer
DGE	dynamic gain equalization

Acronym	Definition
DHCP	dynamic host configuration protocol
DMC	Dispersion Management Chassis
DNA	Digital Network Administrator
DSF	dispersion shifted fiber
DSP	digital signal processor
DWDM	dense wavelength division multiplexing
E	
EDFA	erbium doped fiber amplifier
EEPROM	electrically-erasable programmable read-only memory
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EML	element management layer
EMS	element management system
EOL	end of life
ESCON	Enterprise Systems Connection
ESD	electrostatic discharge; electrostatic-sensitive device
ES-L	line-errored seconds
ES-P	path-errored seconds
ES-S	section-errored seconds
ETS	IEEE European Test Symposium
ETSI	European Telecommunications Standards Institute
F	
F	Fahrenheit
FA	frame alignment
FAS	frame alignment signal
FC	Fibre Channel; failure count
FCAPS	fault management, configuration management, accounting, performance monitoring, and security administration
FCC	Federal Communications Commission (USA)
FDA	Food and Drug Administration
FDI	forward defect indication
FDR	flight data recorder
FEC	forward error correction
FICON	Fibre Connectivity

Acronym	Definition
FIFO	first-in-first-out
FIT	failure in time
FLT	fault
FPGA	field programmable gate array
FRU	field replaceable unit
FTP	file transfer protocol; floating termination point
G	
GbE	gigabit Ethernet
Gbps	gigabits per second
GCC	general communication channel
GFP	generic framing protocol
GHz	gigahertz
GMPLS	generalized multi protocol label switching
GNE	gateway network element
GNM	Graphical Node Manager
GRE	generic routing encapsulation
GUI	graphical user interface
H/I	
HDLC	high-level data link control
HTML	hypertext markup language
HTTP	hypertext transfer protocol
I2C	inter-integrated circuit
IAP	input, output, and alarm panel
ICG	invalid code group
ID	identification
IDF	invalid data flag
IEC	International Electrical Commission
IMS	Infinera Management Suite
I/O	input/output
IP	Internet protocol
IQA NOS ATN	Infinera IQA Network Operating System ATN
IR	intermediate reach
IS	in-service
ITU-T	International Telecommunications Union - Telecommunications

Acronym	Definition
J/K/L	
JDK	Java Development Kit
JRE	Java Runtime Environment
JS	jabber seconds
LAN	local area network
LBC	laser bias current
LC	fiber optic cable connector type
LCK	locked
LED	light-emitting diode
LOC	loss of communication
LOF	loss of frame
LOL	loss of light
LOP	loss of pointer
LOS	loss of signal; loss of synch
LR	long reach
LSB	least significant bit
LTE	line-terminating equipment
M	
MA	monitoring access
MAC	media access control
MAP	management application proxy
MB	megabyte
Mbps	megabits per second
MEMS	micro electro mechanical systems
MFAS	multi frame alignment signal
MIB	management information base
MMF	multimode fiber
MS	multiplex section
MSA	multi source agreement
MSB	most significant bit
MSO	multi-service operator
MSOH	multiplex section overhead
MTBF	mean time between failure
MTU	maximum transmission unit

Acronym	Definition
MUX	multiplex, multiplexer, multiplexing
N	
NA	network administrator
NAND	flash type
NC	normally closed; node controller
NC	nodal control
NDSF	non zero dispersion shifted fiber
NE	network engineer
NEBS	network equipment building standards
NEC	National Electrical Code
NECG	net electrical coding gain
NEL	network element layer
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
nm	nanometer
NML	network management layer
NMS	network management system
NNI	network-to-network interface
NO	normally open
NOC	network operations center
NPS	Network Planning System
NSA	non-service affecting
NTP	network time protocol
NVRAM	nonvolatile random access memory
O	
OAM&P	operation, administration, maintenance and provisioning
OC-12	optical carrier signal at 622.08Mbps
OC-192	optical carrier signal at 9.95328Gbps
OC-3	optical carrier signal at 155.52Mbps
OC-48	optical carrier signal at 2.48832Gbps
Och	optical channel
OCI	open connection indication
ODU	optical channel data unit
OEO	optical-electrical-optical

Acronym	Definition
OFC	open fiber control
OFM	Optical Filter Module
OH	overhead
OIF	Optical Internetworking Forum
OLOS	optical loss of signal
OMS	optical multiplex section
OOS	out-of-service
OOS-MT	out-of-service maintenance
OPR	optical power received
OPT	optical power transmitted
OPU	optical channel payload unit
ORL	optical return loss
OS	operating system
OSA	optical spectrum analyzer
OSC	Optical Supervisory Channel
OSNR	optical signal-to-noise ratio
OSPF	open shortest path first
OSS	operations support system
OTDR	optical time domain reflectometer
OTN	Optical Transport Network
OTS	optical transport section
OTU	optical transport unit
OW	orderwire
P/Q	
PC	personal computer
PCM	Power Conversion Module
PCS	physical coding sublayer
PDU	protocol data unit; power distribution unit
PG	protection group
PHY	physical
PID	protocol identifier
PIN	positive-intrinsic negative
PJO	positive justification opportunity
PLD	programmable logic device
PLL	phase locked loop

Acronym	Definition
PM	performance monitoring
PMD	polarization mode dispersion
POH	path overhead
PON	product ordering name
POP	point-of-presence
PPM	part per million
PPP	point-to-point protocol
PR	provisioning
PRBS	pseudo random binary sequence
ps	pico second (unit of measure for dispersion)
PSC	protection switch completion; protection switch count
PSD	protection switch duration
PSTN	public switched telephone network
PTP	physical termination point; point-to-point
PU	protection unit
PWR	power
QOS	quality of service
R	
RADIUS	Remote Authentication Dial-In User Service
RAM	random access memory
RDI	remote defect indication
REI-L	remote error indication-line
REI-P	remote error indication-path
RFI	remote failure indication
RMA	return material authorization
ROM	read-only memory
RS	regenerator section; Reed-Solomon
RSOH	regenerator section overhead
RSTP	rapid spanning tree protocol
RTC	real time clock
RTN	return lead
RTS	ready to send
RU	rack unit
Rx	receiver; receive
Rx Q	receiver quality

Acronym	Definition
S	
SA	service affecting; security administrator
SAPI	source access point identifier
SC	square shaped fiber optic cable connector
SD	signal degrade
SDH	synchronous digital hierarchy
SDRAM	synchronized dynamic random access memory
SEF	severely errored frame
SEFS	severely errored frame second
SELV	safety extra low voltage
SERDES	serializer and deserializer
SES	severely errored seconds
SF	signal fail
SFP	small form factor pluggable
SFTP	secure file transfer protocol
SID	source identifier; system identifier
SIM	Service Interface Module
SMF	single-mode fiber
SML	service management layer
SNC	subnetwork connection
SNCP	subnetwork connection protection
SNMP	simple network management protocol
SNR	signal-to-noise ratio
SOH	section overhead
SOL	start of life
SONET	synchronous optical network
SPE	synchronous payload envelope
SQ	signal quality
SR	short reach
SSHv2	Secure Shell version 2
SSL	secure sockets layer
STE	section terminating equipment
STM	synchronous transfer mode
STM-1	SDH signal at 155.52Mbps
STM-16	SDH signal at 2.48832Gbps

Acronym	Definition
STM-4	SDH signal at 622.08Mbps
STM-64	SDH signal at 9.95328Gbps
STM-n	synchronous transfer module of level n (for example, STM-64, STM-16)
STP	spanning tree protocol
STS	synchronous transport signal
STS-n	synchronous transport signal of level n (for example, STS-12, STS-48)
SW	software
T/U/V	
TCA	threshold crossing alert
TCC	threshold crossing condition
TCP	transmission control protocol
TE	traffic engineering
TEC	thermo-electric cooler
TERM	terminal
TFTP	trivial file transfer protocol
TID	target identifier
TIM	trace identifier mismatch
TL1	transaction language 1
TMF	TeleManagement Forum
TMN	telecommunications management network
TOM	Tributary Optical Module
TP	termination point
TR	transceiver
TT	test and turn-up
TTI	trail trace identifier
TWC	true-wave-classic
Tx	transmitter; transmit
UA	unavailable seconds
UART	universal asynchronous receiver transmitter
UAS	unavailable seconds
UAS-L	unavailable seconds, near-end line
UAS-P	unavailable seconds, near-end STS path
UDP	user datagram protocol
UNI	user-network interface
UPSR	unidirectional path switched ring

Acronym	Definition
URL	universal resource locator
UTC	Coordinated Universal Time
V	volt
VCG	virtual concatenation group
VGA	variable gain amplifier
VLAN	virtual local area network
VOA	variable optical attenuator
VPN	virtual private network
VSR	very short reach
W/X/Y/Z	
WAN	wide area network
WDM	wavelength division multiplexing
WTR	wait to restore
XC	cross-connect
XFP	10Gbps small form factor pluggable
XML	extensible markup language
MISC	
1R	re-amplification
2R	re-amplification, re-shape
3R	re-amplification, re-shape, re-time
4R	re-amplification, re-shape, re-time, re-code