

Nortel

Optical Metro 5100/5200

Hardware Description, Part 2 of 2

Standard Release 8.0 Issue 1 April 2005

What's inside...

OMX modules, OSC trays, C&L splitter/coupler, ECT, Per Band Equalizer, Ethernet hub, Cables and optical patch cords, Rectifiers, Patch panel, Transponder Protection Tray, Optical Trunk Switch, Enhanced Trunk Switch, Fiber Manager, 1310 nm splitter/coupler, Equipment Inventory Unit, Discrete VOA, DSCMs

See Part 1 for the following:

Optical Metro 5200 shelves, Optical Metro 5100 shelves, Optical Metro 5100/5200 shelf installation kit, General circuit pack information, OCI circuit packs, OCLD circuit packs, OTR circuit packs, Muxponder circuit packs, OCM circuit packs, OSC circuit packs, SP circuit packs, OFA circuit packs, APBE circuit packs, Filler cards

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About this document

This document describes the components of the Nortel Optical Metro 5100/5200 product and the functionality of each.

ATTENTION

This document is presented in two parts: Part 1 and Part 2. Each part has its own table of contents. The table of contents in Part 1 contains topics found in Part 1 only. The table of contents in Part 2 contains topics found in Part 2 only. Part 2 continues sequential chapter numbering from Part 1.

Hardware Description, Part 1, 323-1701-102, contains the following:

- Chapter 1, “Optical Metro 5200 shelves”
- Chapter 2, “Optical Metro 5100 shelves”
- Chapter 3, “Optical Metro 5100/5200 shelf installation kit”
- Chapter 4, “General circuit pack information”
- Chapter 5, “OCI circuit packs”
- Chapter 6, “OCLD circuit packs”
- Chapter 7, “OTR circuit packs”
- Chapter 8, “Muxponder circuit packs”
- Chapter 9, “OCM circuit packs”
- Chapter 10, “OSC circuit packs”
- Chapter 11, “SP circuit packs”
- Chapter 12, “OFA circuit packs”
- Chapter 13, “APBE circuit packs”
- Chapter 14, “Filler cards”

Hardware Description, Part 2, 323-1701-102, contains the following:

- Chapter 15, “OMX modules”
- Chapter 16, “OSC trays”
- Chapter 17, “C&L splitter/coupler”

- Chapter 18, “ECT”
- Chapter 19, “Per Band Equalizer”
- Chapter 20, “Ethernet hub”
- Chapter 21, “Cables and optical patch cords”
- Chapter 22, “Rectifiers”
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- Chapter 24, “Transponder Protection Tray”
- Chapter 25, “Optical Trunk Switch”
- Chapter 26, “Enhanced Trunk Switch”
- Chapter 27, “Fiber Manager”
- Chapter 28, “1310 nm splitter/coupler”
- Chapter 29, “Equipment Inventory Unit”
- Chapter 30, “Discrete VOA”
- Chapter 31, “DSCMs”

This document contains an overview of hardware components, including:

- shelves
- circuit packs
- modules
- the Ethernet hub
- connectors
- cables
- rectifiers
- patch panels

Audience for this document

This document is intended for the following audience:

- strategic and current planners
- provisioners
- installers
- transmission standards engineers
- field maintenance engineers
- system line-up and testing (SLAT) personnel
- maintenance technicians
- network administrators

Optical Metro 5100/5200 library

The Optical Metro 5100/5200 library consists of the *Nortel Optical Metro 5100/5200 Technical Publications*, NT0H65AM.

Technical Publications

The *Optical Metro 5100/5200 Nortel Technical Publications* (NTP) consist of descriptive information and procedures.

Descriptive information

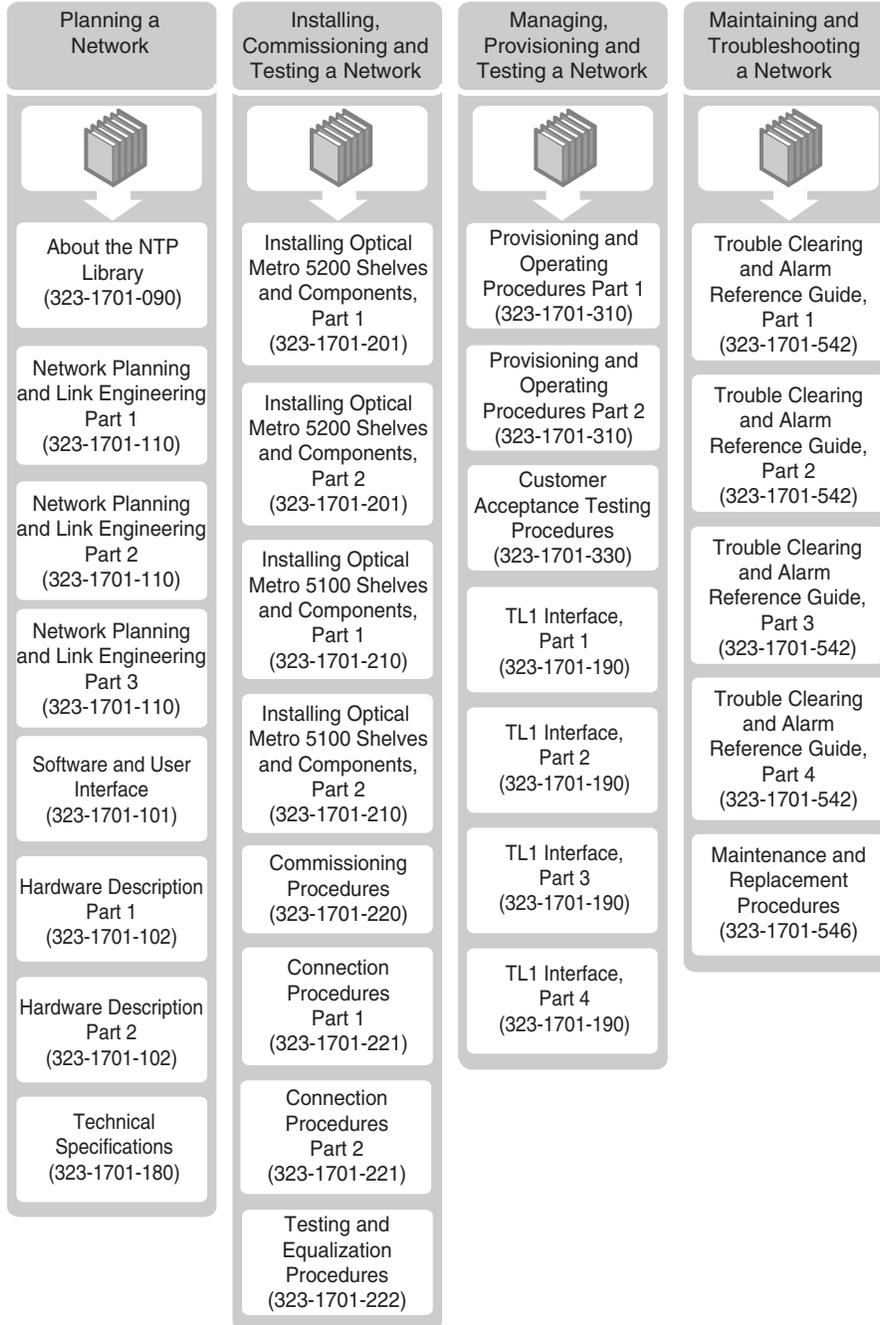
These NTPs provide detailed descriptive information about the Optical Metro 5100/5200 system, including system software and hardware descriptions, technical specifications, ordering information, and TL1 user information.

Procedures

These NTPs contain all procedures required to install, provision, and maintain the Optical Metro 5100/5200 system.

The following roadmap lists the documents in the Optical Metro 5100/5200 library.

OM2805p



Technical assistance service telephone numbers

For technical support and information from Nortel Networks, refer to the following table.

Technical Assistance Service	
<p>For service-affecting problems: For 24-hour emergency recovery or software upgrade support, that is, for:</p> <ul style="list-style-type: none"> • restoration of service for equipment that has been carrying traffic and is out of service • issues that prevent traffic protection switching • issues that prevent completion of software upgrades 	<p>North America: 1-800-4NORTEL (1-800-466-7835)</p> <p>International: 001-919-992-8300</p>
<p>For non-service-affecting problems: For 24-hour support on issues requiring immediate support or for 14-hour support (8 a.m. to 10 p.m. EST) on upgrade notification and non-urgent issues.</p>	<p>North America: 1-800-4NORTEL (1-800-466-7835)</p> <p>Note: You require an express routing code (ERC). To determine the ERC, see our corporate Web site at www.nortel.com. Click on the Express Routing Codes link.</p> <p>International: Varies according to country. For a list of telephone numbers, see our corporate Web site at www.nortel.com. Click on the Contact Us link.</p>
<p>Global software upgrade support:</p>	<p>North America: 1-800-4NORTEL (1-800-466-7835)</p> <p>International: Varies according to country. For a list of telephone numbers, see our corporate Web site at www.nortel.com. Click on the Contact Us link.</p>

OMX modules

In this chapter

This chapter includes the following sections:

- [Types of OMX on page 15-1](#)
- [DWDM OMX on page 15-6](#)
- [CWDM OMX on page 15-12](#)
- [ITU CWDM OMX on page 15-18](#)

Note: For product engineering codes for all types of optical multiplexers (OMX)f, refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

Types of OMX

The following optical multiplexers (OMXs) are available for Optical Metro 5100/5200 networks:

- OMX (Standard)
- OMX 4CH + Fiber Manager
- OMX 4CH Enhanced
- OMX 16CH DWDM
- OMX 4CH CWDM
- OMX 4CH CWDM with dual taps
- OMX 1CH CWDM
- OMX 1CH OADM ITU CWDM
- OMX 4CH ITU CWDM
- OMX 4CH OADM ITU CWDM
- OMX 8CH ITU CWDM

OMX (Standard)

The OMX (Standard) is used with Optical Metro 5200 shelves and is installed in a built-in drawer in the standard (12 U) shelf. The OMX (Standard) multiplexes and demultiplexes up to four channels in one band.

OMX 4CH + Fiber Manager

The OMX + Fiber Manager 4 CH is used with Optical Metro 5200 shelves and is a stand-alone unit that is used in conjunction with the Variant 11 U shelf. The OMX + Fiber Manager 4 CH multiplexes and demultiplexes up to four channels in one band.

OMX 4CH Enhanced

The OMX 4CH Enhanced is used with Optical Metro 5200 shelves and is a stand-alone unit that is used in conjunction with the Variant 11 U shelf. The OMX 4CH Enhanced multiplexes and demultiplexes up to four channels in one band, and supports a higher isolation and lower insertion loss than the OMX 4CH + Fiber Manager.

OMX 16CH DWDM

The OMX 16CH DWDM is a 2U unit used with the Optical Metro 5200 shelf and the Optical Metro 5100 shelf. The OMX 16CH DWDM is a stand-alone unit that multiplexes and demultiplexes up to 16 channels. Two variants are available: C-band for DWDM bands 1, 2, 3, and 4, and L-band for DWDM bands 5, 6, 7, and 8. The OMX 16CH DWDM is supported in unamplified configurations only.

OMX 4CH CWDM

The OMX 4CH CWDM is used with Optical Metro 5200 or with Optical Metro 5100 shelves and is a stand-alone unit. The OMX 4CH CWDM multiplexes and demultiplexes four CWDM bands. There are two variants of the CWDM OMX: C-band for CWDM bands 1, 2, 3, and 4 and L-band for CWDM bands 5, 6, 7, and 8.

OMX 4CH CWDM with dual taps

Like the OMX 4CH CWDM, the OMX 4CH CWDM with dual taps is used with the Optical Metro 5100 and Optical Metro 5200 shelves and is a stand-alone unit. The OMX 4CH CWDM with dual taps multiplexes and demultiplexes four CWDM bands. There are two variants of the OMX 4CH CWDM: C-band for CWDM bands 1, 2, 3, and 4 and L-band for CWDM bands 5, 6, 7, and 8.

The OMX 4CH CWDM with dual taps offers the following new functionality when compared to the OMX 4CH CWDM:

- 5% (nominal) optical tap at the OTS IN port
- 2% (nominal) optical tap at the OTS OUT port
- improved isolation specifications
- new drawer providing openings on the faceplate to access the monitor ports. The drawer does not need to be opened to access the monitor ports. The monitor ports are labeled as “OTS IN MONITOR” and “OTS OUT MONITOR”.

OMX 1CH CWDM

The OMX 1CH CWDM is used with Optical Metro 5100 shelves and is a stand-alone unit. The OMX 1CH CWDM adds or drops one CWDM band. There are eight variants of the CWDM OMX for CWDM bands 1 through 8.

OMX 1CH OADM ITU CWDM

The OMX 1CH OADM ITU CWDM assembly is used with Optical Metro 5100 and Optical Metro 5200 shelves and is a stand-alone unit. The OMX 1CH OADM ITU CWDM is used in ITU CWDM systems. The OMX 1CH OADM ITU CWDM tray is equipped with a filter module that adds and drops one specific ITU CWDM channel, and optically passes through all other ITU CWDM channels supported by Optical Metro 5100/5200. Eight variants are available, one for each of the following ITU CWDM channels: 1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm, 1551.00 nm, 1571.00 nm, 1591.00 nm, and 1611.00 nm.

OMX 4CH ITU CWDM

The 4 channel ITU CWDM OMX is used with Optical Metro 5200 or Optical Metro 5100 shelves and is a stand-alone unit. The 4-channel ITU CWDM OMX is used in ITU CWDM systems. It follows the ITU-T standard wavelength. The OMX adds and drops the following wavelengths: 1511.00 nm, 1531.00 nm, 1551.00 nm, and 1571.00 nm.

Note: You cannot combine two 4 channel ITU CWDM OMXs to add and drop all eight ITU CWDM wavelengths. You must use the 8 channel ITU CWDM OMX.

OMX 4CH OADM ITU CWDM

The OMX 4CH OADM ITU CWDM drawer is used with Optical Metro 5200 or Optical Metro 5100 shelves and is a stand-alone unit. The OMX 4CH OADM ITU CWDM is used in ITU CWDM systems. The OMX 4CH OADM ITU CWDM drawer is equipped with a filter module that adds and drops four specific ITU CWDM channels, and optically passes through all other ITU CWDM channels supported by Optical Metro 5100/5200. Two variants are available for the following sets of sequential ITU CWDM channels: 1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm and 1551.00 nm, 1571.00 nm, 1591 nm, and 1611.00 nm.

OMX 8CH ITU CWDM

The 8 channel ITU CWDM OMX is used with Optical Metro 5200 or with Optical Metro 5100 shelves and is a stand-alone unit. The 8 channel ITU CWDM OMX is used in ITU CWDM systems. It follows the ITU-T standard wavelength. The OMX adds and drops the following wavelengths: 1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm, 1551.00 nm, 1571.00 nm, 1591.00 nm, and 1611.00 nm.

OMX sharing

Table 15-1 lists the OMX sharing possibilities. An OMX can only be shared by shelves that are located at the same physical site and are provisioned with the same Site ID and hubbing group. Circuit packs sharing the OMX must be on the same ring and be provisioned with the same Optical System Identifier (OSID) values.

Note: Failed inter-site fiber detection (via the Shelf Input Failure alarm) may be inaccurately reported if an OSC circuit pack is located on a shelf that has line equipment connected to a shared OMX.

Table 15-1
OMX sharing

OMX type	Shareable
OMX (Standard)	No
OMX 4CH + Fiber Manager (see Note 1 and Note 2)	Can be shared with up to: <ul style="list-style-type: none"> • four Optical Metro 5200 shelves running Release 6.1 or higher
OMX 4CH Enhanced (see Note 1 and Note 2)	Can be shared with up to: <ul style="list-style-type: none"> • four Optical Metro 5200 shelves running Release 6.1 or higher
OMX 16CH DWDM (see Note 2 and Note 3)	Can be shared with up to <ul style="list-style-type: none"> • 16 Optical Metro 5200 shelves or Optical Metro 5100 shelves running Release 7.0 or higher
OMX 1CH CWDM	No
OMX 1CH OADM ITU CWDM	No
OMX 4CH CWDM OMX 4CH CWDM with dual taps	Can be shared with up to: <ul style="list-style-type: none"> • four Optical Metro 5200 or Optical Metro 5100 shelves running Release 6.1 or higher • two Optical Metro 5100 shelves running Release 4.1, 5.0, or 6.0
OMX 4CH OADM ITU CWDM	Can be shared with up to: <ul style="list-style-type: none"> • four Optical Metro 5200 or Optical Metro 5100 shelves running Release 6.0 or higher

Table 15-1 (continued)
OMX sharing

OMX type	Shareable
OMX 4CH ITU CWDM	Can be shared with up to: <ul style="list-style-type: none"> • four Optical Metro 5200 or Optical Metro 5100 shelves running Release 6.0 or higher
OMX 8CH ITU CWDM	Can be shared with up to: <ul style="list-style-type: none"> • eight Optical Metro 5200 or Optical Metro 5100 shelves running Release 6.0 or higher
<p>Note 1: If sharing the OMX 4CH + Fiber Manager or OMX 4CH Enhanced, the Intra-site Fault Sectionalization (IFS) feature is not supported.</p> <p>Note 2: In shared OMX 4CH + Fiber Manager, shared OMX 4CH Enhanced and shared OMX 16CH DWDM configurations, a single fiber failure can result in one or more Loss of Signal (LOS) alarms and/or Band Input Failure (BIF) alarms.</p> <p>Note 3: The Intra-site Fault Sectionalization (IFS) feature is not supported on the OMX 16CH DWDM.</p>	

DWDM OMX

The OMXs perform the channel add/drop functions for the shelf.

Types of DWDM OMX

Nortel Networks supplies four types of DWDM OMX:

- OMX (Standard)
- OMX 4CH + Fiber Manager
- OMX 4CH Enhanced
- OMX 16CH

The OMX 16CH DWDM can be used with Optical Metro 5200 and Optical Metro 5100 WDM shelves. All other DWDM OMX variants can only be used with Optical Metro 5200 WDM shelves.

These DWDM variants differ in the physical packaging. The OMX 16CH DWDM, the OMX 4CH + Fiber Manager, and the OMX 4 CH Enhanced provide more flexibility in physical placement and OCLD/OTR connectivity.

OMX (Standard)

The distinguishing features of the OMX (Standard) are as follows.

- Each OMX (Standard) is a tray that fits inside a drawer that is built into the Optical Metro 5200 Shelf Assembly (Standard 12 U).
- Each OMX (Standard) tray can only be used in the Optical Metro 5200 Shelf Assembly (Standard 12 U).
- Each OMX (Standard) tray contains 8 fiber pigtails that connect to OCLDs/OTRs.

OMX 4CH + Fiber Manager

The distinguishing features of the OMX 4CH + Fiber Manager are as follows.

- Each OMX 4CH + Fiber Manager is a 1 U high external drawer that contains optical filters, a small patch panel with bulkhead connectors, and fiber management components. The drawers can be mounted anywhere in the rack. Nortel Networks recommends that you install the trays directly beneath the shelf.
- Each OMX 4CH + Fiber Manager uses bulkhead connectors and patch cords to connect circuit packs.

OMX 4CH Enhanced

The distinguishing features of the OMX 4CH Enhanced are as follows.

- Each OMX 4CH Enhanced is a 1 U high external drawer that contains optical filters, a small patch panel with bulkhead connectors, and fiber management components. The drawers can be mounted anywhere in the rack. Nortel Networks recommends that you install the trays directly beneath the shelf.

- The OMX 4CH Enhanced supports a higher isolation and a lower insertion loss than the OMX 4CH + Fiber Manager. For details, see “[OMX specifications](#)” in *Technical Specifications*, 323-1701-180.
- Each OMX 4CH Enhanced uses bulkhead connectors and patch cords to connect circuit packs.

OMX 16CH DWDM

The distinguishing features of the OMX 16CH DWDM are as follows:

- The OMX 16CH DWDM includes a 16-channel multiplexer and demultiplexer module in a 2U high passive shelf that can be mounted anywhere in the rack. Nortel Networks recommends that you install the passive shelves directly beneath the shelf.
- The OMX 16CH DWDM module minimizes overall insertion loss for 32-wavelength DWDM applications while maximizing the reach of unamplified point-to-point systems. The OMX 16CH DWDM module also reduces footprint requirements at terminal sites.
- The physical design of the OMX 16CH DWDM minimizes the module size through the use of slider adapter on the faceplate. Each slider adapter contains either two dual LC adapters or two single SC adapters.

Note: By using the slider adapter, you can clean back-side fibers without the need for sliding drawers or fiber patch cord blocks inside the chassis. The slider adapters increase connector density on the faceplate and reduce the risk of accidental fiber pinching.

Features

The OMX (Standard), OMX 4CH + Fiber Manager, the OMX 4CH Enhanced, have the following common features.

- Each OMX multiplexes and demultiplexes four channels.
- An OMX can add and drop up to four optical channels in a band.
- An OMX cannot add or drop optical channels that are outside the band assigned to it. It also cannot bypass optical channels within the band assigned to it.
- An OMX can pass through all channels that are not in band.
- The band add-drop filters (ADF) add and drop one wavelength band and allows the other bands to pass through the filters. The channel multiplexer and demultiplexer add and drop the optical channels, respectively.

The OMX 16CH DWDM offers the following features:

- Each OMX 16CH DWDM multiplexes and demultiplexes 16 channels. Two variants of the OMX 16CH DWDM module are available: OMX 16CH DWDM C-band (NT0H32JA) and OMX 16CH DWDM L-band (NT0H32KA).

- The OMX 16CH DWDM module permits in-service channel addition and removal without the need to disable line-side traffic. If you plan to fully fill your Optical Metro 5100/5200 DWDM system with 32 channels, you must deploy the OMX 16CH DWDM C-band module prior to adding the L-band module.
- The C-band OMX 16CH DWDM has a total of 36 optical ports:
 - 16 channel add and drop ports (32 LC-LC ports)
 - OTS IN and OTS OUT ports (2 SC-SC ports)
 - L-Band OUT and L-Band IN upgrade ports (2 SC-SC ports)

Note: The L-band upgrade ports on the C-band OMX 16CH DWDM module eliminate the need for C&L splitter/coupler trays.

- The L-band OMX 16CH DWDM has a total of 34 optical ports:
 - 16 channel add and drop ports (32 LC-LC ports)
 - OTS IN and OTS OUT ports (2 SC-SC ports)

Note 1: Direct padding on the LC-LC slider adapters is supported using LC-LC attenuators. You must place LC-LC attenuators in the OMX 16CH DWDM between the slider adapters and the internal fibers. You cannot place the LC-LC attenuators between the slider adapters and the client fibers. Direct padding using SC-SC attenuators is not supported on the OMX 16CH DWDM. For details, refer to *Network Planning and Link Engineering*, 323-1701-110.

Note 2: Fiber management is not provided in the OMX 16CH DWDM chassis. The Fiber Manager tray (NT0H57BB) can be used for fiber management, if required.

Signal flow

[Figure 15-1 on page 15-9](#) shows the signal flow through the following OMX: OMX (Standard), OMX 4CH + Fiber Manager, and OMX 4CH Enhanced. Each of these DWDM OMX multiplexes and demultiplexes four channels.

Figure 15-1
OMX signal flow

OM1297p

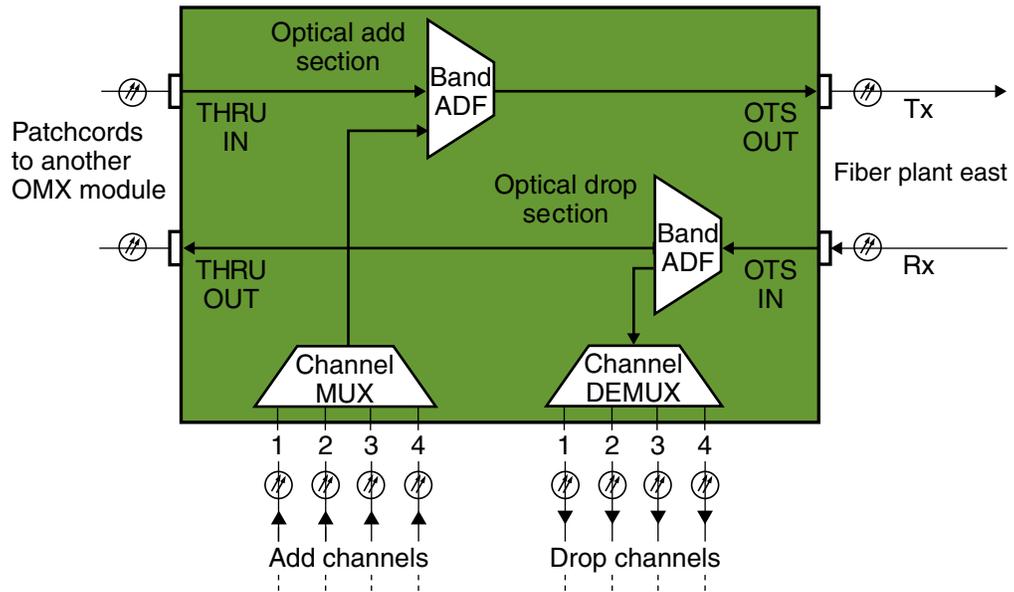
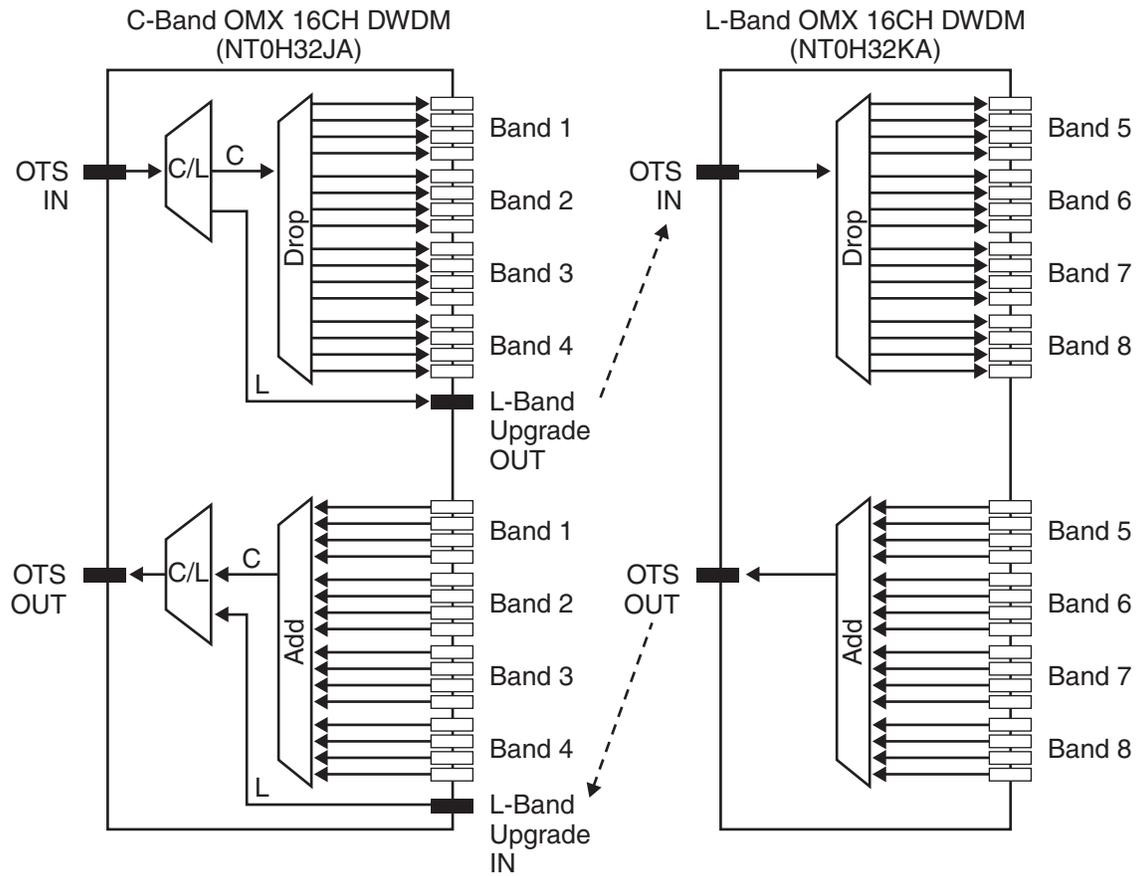


Figure 15-2 shows the optical signal flow through the OMX 16CH DWDM module that multiplexes and demultiplexes 16 channels.

Figure 15-2
OMX 16CH DWDM signal flow

OM2589p



Legend

- = SC connector
- = LC connector
- · · · · → = Connector for C & L Band

Note: The OMX 16CH DWDM module does not have an optical through path like the OMX 4CH + Fiber Manager or the OMX 4CH Enhanced.

Indicator lamps

Indicator lamps are not supported on the following DWDM OMXs: OMX (Standard), OMX 4CH + Fiber Manager, and OMX 4CH Enhanced. The indicator lamps are off at all times on these DWDM OMXs.

The OMX 16CH DWDM has a faceplate viewable LED. This LED supports the shelf locator function, so you can toggle the faceplate LED on and off through the craft interface. This test allows rapid determination of module location while also validating that the digital identification card (DID) is

correctly connected to the maintenance panel or the Equipment Inventory Unit. The DID card is used for inventory identification and can either be connected to the Optical Metro 5200 maintenance panel or the Equipment Inventory Unit.

Connectors

The OMX (Standard) tray has eight optical fiber pigtails used to connect the add/drop filters in the OMX to its four related OCLD/OTR circuit packs. Each pigtail is labeled to identify its associated OCLD/OTR.

The OMX 4CH + Fiber Manager and OMX 4CH Enhanced use SC connectors for installing fiber-optic patch cords.

The OMX 16CH DWDM has ten slider adapter on the faceplate. Each slider adapter contains either two dual LC connectors or two single SC connectors. The C-band OMX 16CH DWDM module has 16 dual LC connectors for a maximum of 32 LC-LC channel add and drop optical connections, 2 single SC-SC connectors for OTS IN and OTS OUT optical connections, and 2 single SC-SC connectors for L-Band-OUT and L-Band-IN upgrade ports optical connections. The L-band OMX 16CH DWDM module has 16 dual LC connectors for a maximum of 32 LC-LC channel add and drop optical connections and 2 single SC-SC connectors for OTS IN and OTS OUT optical connections.

Note: OTS IN and OTS OUT connectors are isolated on their own slider adapter in the middle of the OMX 16CH DWDM faceplate to reduce the risk of disrupting aggregate traffic.

There is an RJ-45 connector on each DWDM OMX, used to connect the DID card to the maintenance panel through the DWDM OMX cable. This connection provides the electrical and System Manager monitoring interfaces for the DWDM OMX.

Cables and optical patch cords

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

For slot assignments and equipping rules for the OMX, refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

CWDM OMX

The CWDM OMXs perform the add/drop functions for CWDM signals.

Types of CWDM OMX

Nortel Networks supplies three types of CWDM OMX:

- OMX 1CH CWDM
- OMX 4CH CWDM
- OMX 4CH CWDM with dual taps

OMX 1CH CWDM

The OMX 1CH CWDM assembly:

- consists of a 1 U high drawer that contains two filter modules. Each filter module adds and drops one CWDM band, and optically passes through all other traffic. Each module is field-replaceable
- has eight variants, one for each Optical Metro sub-band
- contains six SC/PC bulkhead connectors
- uses SC-FC duplex patch cords to connect OCLDs (except OCLD 2.5 Gbit/s Flex) to the CWDM OMX optical filters; uses SC-LC duplex patch cords to connect OCLD/OTR 2.5 Gbit/s Flex, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs to the CWDM OMX optical filters

OMX 4CH CWDM

The OMX 4CH CWDM assembly:

- is a 1 U high drawer that contains one C-band or L-band filter module; the drawer is field-replaceable
- adds and drops four CWDM bands at a site, and optically passes through all other traffic
- can be connected to two Optical Metro 5100 shelves
- has two variants, one for C-band and one for L-band
- contains 12 SC/PC bulkhead connectors
- uses SC-FC duplex patch cords to connect OCLDs (except OCLD 2.5 Gbit/s Flex) to the CWDM OMX optical filters; uses SC-LC duplex patch cords to connect OCLD/OTR 2.5 Gbit/s Flex, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs to the CWDM OMX optical filters

OMX 4CH CWDM with dual taps

The OMX 4CH CWDM with dual taps offers the following new functionality when compared to the OMX 4CH CWDM:

- 5% (nominal) optical tap at the OTS IN port
- 2% (nominal) optical tap at the OTS OUT port
- improved isolation specifications
- new drawer providing openings on the faceplate to access the monitor ports. The drawer does not need to be opened to access the monitor ports. The monitor ports are labeled as “OTS IN MONITOR” and “OTS OUT MONITOR”.

Use an OMX 4CH CWDM with dual taps with an Optical Metro 5100 or Optical Metro 5200 shelf for CWDM systems.

Compatibility between the OMX 4CH CWDM and OMX 4CH CWDM with dual taps

Software does not distinguish between the OMX 4CH CWDM and the OMX 4CH CWDM with dual taps OMX types. The OMX type field displays Quad Band Coarse for both. The OMX types can be distinguished by their product engineering code (PEC).

Since software does not distinguish between the OMX 4CH CWDM and the OMX 4CH CWDM with dual taps OMX types, the new OMX 4CH CWDM with dual taps is fully backward compatible and can be inventoried in all older software releases like the OMX 4CH CWDM.

The OMX 4CH CWDM with dual taps optical module is equipped in the new drawer with front apertures for the monitor ports. The new OMX 4CH CWDM with dual tap drawer provides increases functionality compared with the existing OMX 4CH CWDM. The existing OMX 4CH CWDM and the new OMX 4CH CWDM with dual tap are physically interchangeable.

Since the OMX 4CH CWDM with dual taps and the OMX 4CH CWDM have very similar loss specifications, they are optically interchangeable.

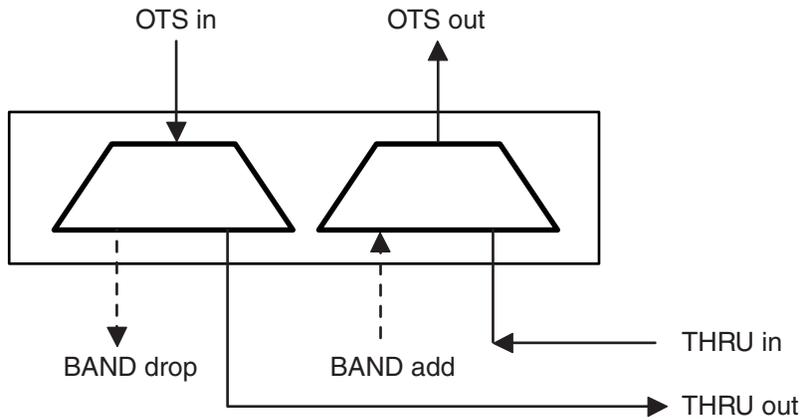
Signal flow

OMX 1CH CWDM

Figure 15-3 shows the signal flow through the filter module in an OMX 1CH CWDM.

Figure 15-3
Signal flow through an OMX 1CH CWDM

OM08951

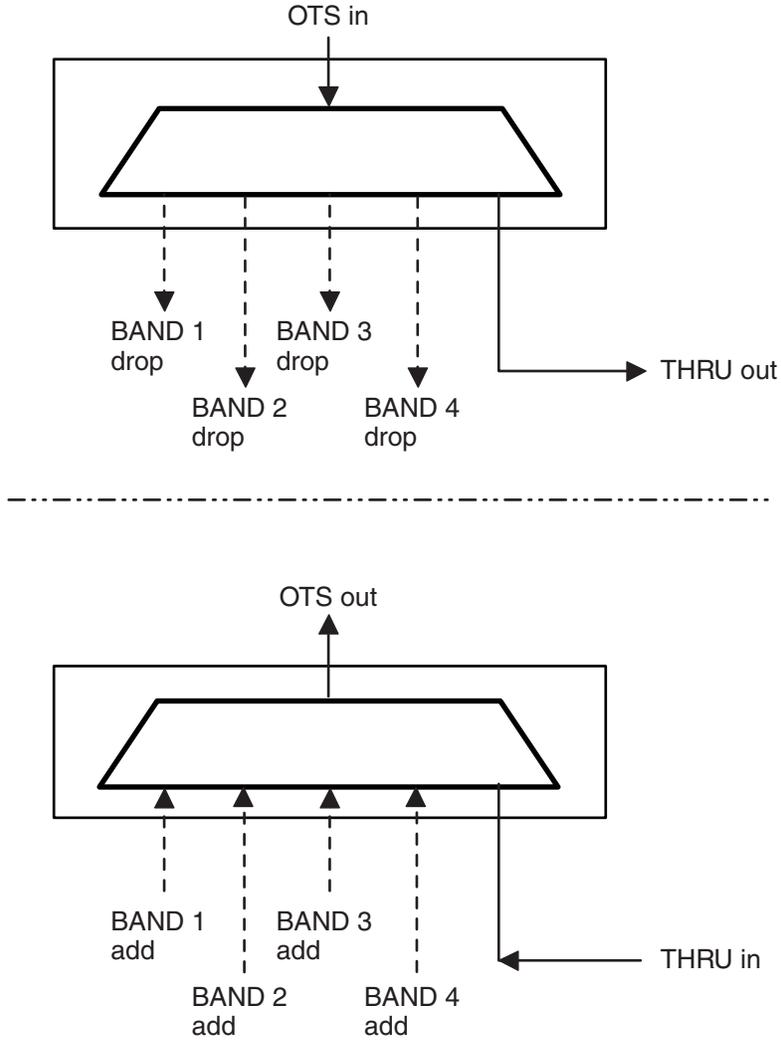


OMX 4CH CWDM

Figure 15-4 shows the signal flow through the filter module in an OMX 4CH CWDM.

Figure 15-4
Signal flow through an OMX 4CH CWDM (C-band model shown)

OM08961



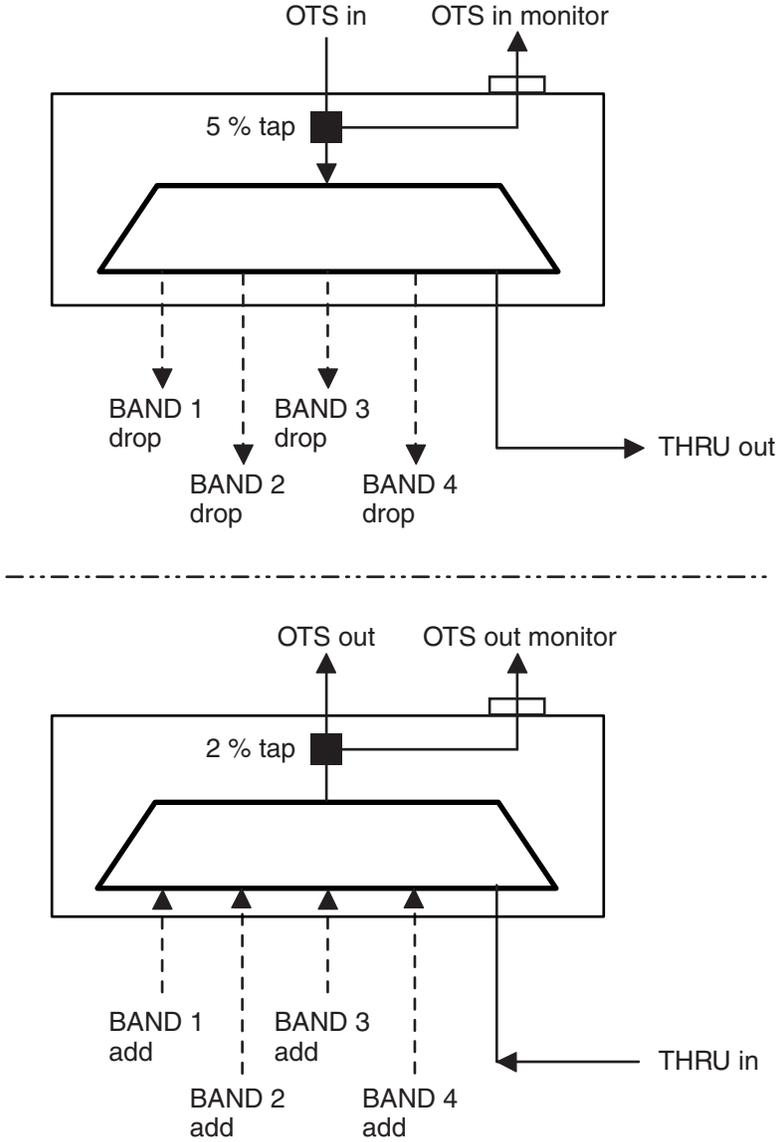
OMX 4CH CWDM with dual taps

Figure 15-5 shows the signal flow through the filter module in an OMX 4CH CWDM with dual taps.

Figure 15-5

Signal flow through an OMX 4CH CWDM with dual taps (C-band model shown)

OM2710



CWDM wavelength plan and deployment rules

Each CWDM band is one of the four channel wavelengths used in a DWDM band, as outlined in [Table 15-2](#).

Table 15-2
CWDM/DWDM band and channel comparison

C/L band	CWDM	DWDM	Wavelength (nm)
C-band	Band 1	Band 1 channel 2	1533.47
	Band 2	Band 2 channel 3	1539.77
	Band 3	Band 3 channel 4	1550.92
	Band 4	Band 4 channel 3	1558.98
L-band	Band 5	Band 5 channel 2	1575.37
	Band 6	Band 6 channel 1	1580.35
	Band 7	Band 7 channel 1	1590.41
	Band 8	Band 8 channel 4	1604.02

Note: Channel filters are not required in CWDM OMXs. A CWDM band has one channel, while DWDM bands have four channels.

CWDM OMX use the full band. You cannot deploy any other channels in the band.

Connectors

Each OMX uses SC connectors for installing fiber-optic patch cords.

Each OMX includes an RJ-45 connector, which is used to connect the OMX to the maintenance panel through the OMX cable. This connection provides the electrical and System Manager monitoring interfaces for the OMX.

Cables and optical patch cords

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

For slot assignments and equipping rules for the CWDM OMX, refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

ITU CWDM OMX

The ITU CWDM OMXs perform the add/drop functions for ITU CWDM signals.

Types of ITU CWDM OMX

Nortel Networks supplies four types of ITU CWDM OMXs:

- OMX 1CH OADM ITU CWDM
- OMX 4CH ITU CWDM
- OMX 4CH OADM ITU CWDM
- OMX 8CH ITU CWDM

Note: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized has labels with a center wavelength that differs by 1 nm with respect to the finalized ITU CWDM standard (G.695). For example, for the 1471 nm wavelength, the label shows 1470 nm. However, there is no wavelength incompatibility since the passbands are the same. For example, the pre-finalized ITU CWDM standard 1470 nm channel specified a range of -5.5 to $+7.5$ nm: a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ± 6.5 nm: the passband is still 1464.5 to 1477.5 nm. The only difference is the labeling.

OMX 1CH OADM ITU CWDM

The OMX 1CH OADM ITU CWDM assembly:

- consists of a 1U high drawer that contains two filter modules. Each filter module adds and drops one ITU CWDM channel, and optically passes through all other ITU CWDM channels supported by Optical Metro 5100/5200
- has eight variants, one to add and drop each of the following ITU CWDM channels: 1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm, 1551.00 nm, 1571.00 nm, 1591.00 nm, and 1611.00 nm
- contains six SC/PC bulkhead connectors
- is used in conjunction with the OCLD 2.5 Gbit/s Flex ITU, OTR 2.5 Gbit/s Flex ITU, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs and uses SC-LC duplex patch cords to connect these circuit packs to the OMX 1CH OADM ITU CWDM optical filters

OMX 4CH ITU CWDM

The OMX 4CH ITU CWDM assembly:

- consists of a 1U high drawer that contains one filter module. The assembly is field-replaceable
- adds and drops the following wavelengths: 1511.00 nm, 1531.00 nm, 1551.00 nm, and 1571.00 nm. There is no optical pass-through.

- is used in conjunction with the OCLD 2.5 Gbit/s Flex ITU, OTR 2.5 Gbit/s Flex ITU, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs and uses SC-LC duplex patch cords to connect these circuit packs to the OMX 4CH ITU CWDM optical filters

OMX 4CH OADM ITU CWDM

The OMX 4CH OADM ITU CWDM assembly:

- consists of a 1U high drawer equipped with one filter module. The filter module adds and drops four specific ITU CWDM channels, and optically passes through all other ITU CWDM channels supported by Optical Metro 5100/5200
- has two variants for the following sets of sequential ITU CWDM channels: (1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm) and (1551.00 nm, 1571.00 nm, 1591.00 nm, and 1611.00 nm)
- contains twelve SC/PC bulkhead connectors
- is used in conjunction with the OCLD 2.5 Gbit/s Flex ITU, OTR 2.5 Gbit/s Flex ITU, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs and uses SC-LC duplex patch cords to connect these circuit packs to the OMX 4CH OADM ITU CWDM optical filters

OMX 8CH ITU CWDM

The OMX 8CH ITU CWDM assembly:

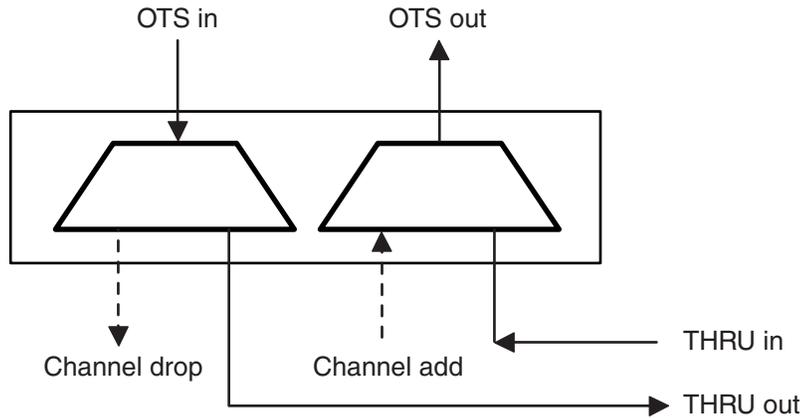
- consists of a 1U high drawer (NT0H57BA) that contains one filter module. The assembly is field-replaceable.
- adds and drops the following wavelengths: 1471.00 nm, 1491.00 nm, 1511.00 nm, 1531.00 nm, 1551.00 nm, 1571.00 nm, 1591.00 nm, and 1611.00 nm. There is no optical pass-through.
- is used in conjunction with the OCLD 2.5 Gbit/s Flex ITU, OTR 2.5 Gbit/s Flex ITU, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs and uses SC-LC duplex patch cords to connect these circuit packs to the OMX 8CH ITU CWDM optical filters

Signal flow**OMX 1CH OADM ITU CWDM**

[Figure 15-6](#) shows the signal flow through the filter module in an OMX 1CH OADM ITU CWDM.

Figure 15-6
Signal flow through an OMX 1CH OADM ITU CWDM

OM2599t

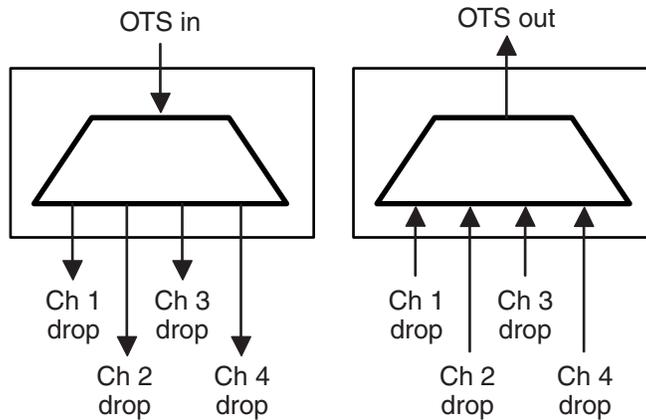


OMX 4CH ITU CWDM

Figure 15-7 shows the signal flow through the filter module in an OMX 4CH ITU CWDM.

Figure 15-7
Signal flow through an OMX 4CH ITU CWDM

OM1960pt

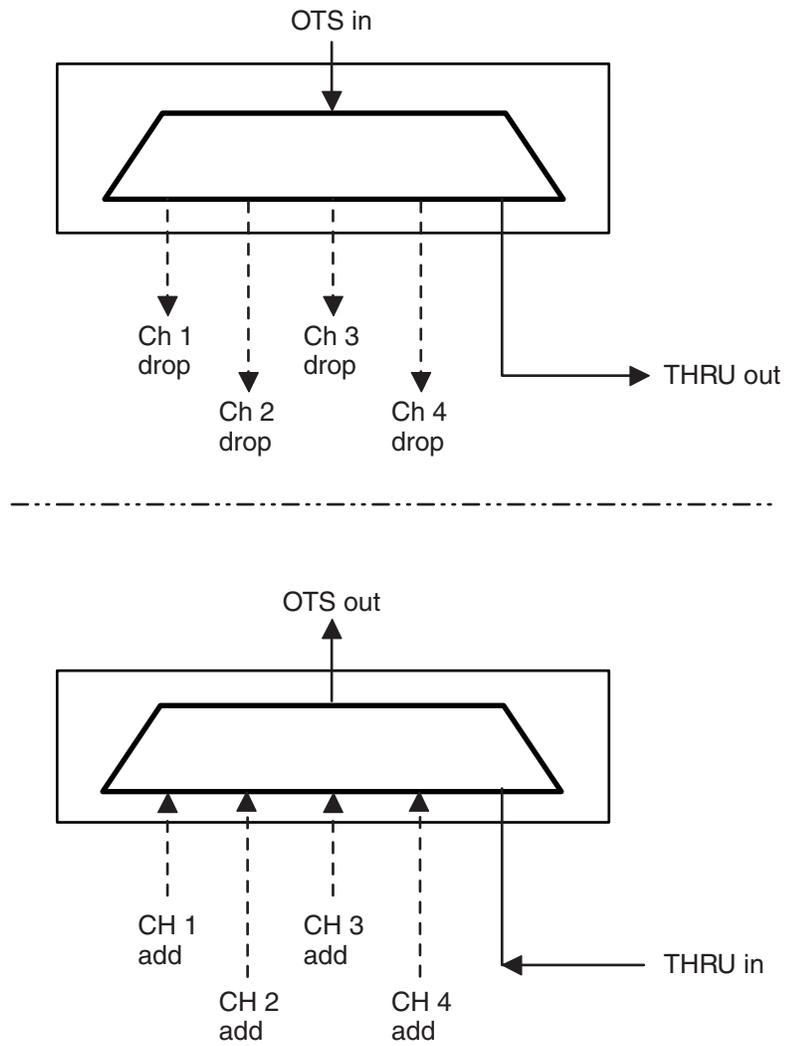


OMX 4CH OADM ITU CWDM

Figure 15-8 shows the signal flow through the filter module in an OMX 4CH OADM ITU CWDM.

Figure 15-8
Signal flow through an OMX 4CH ITU CWDM

OM2598p

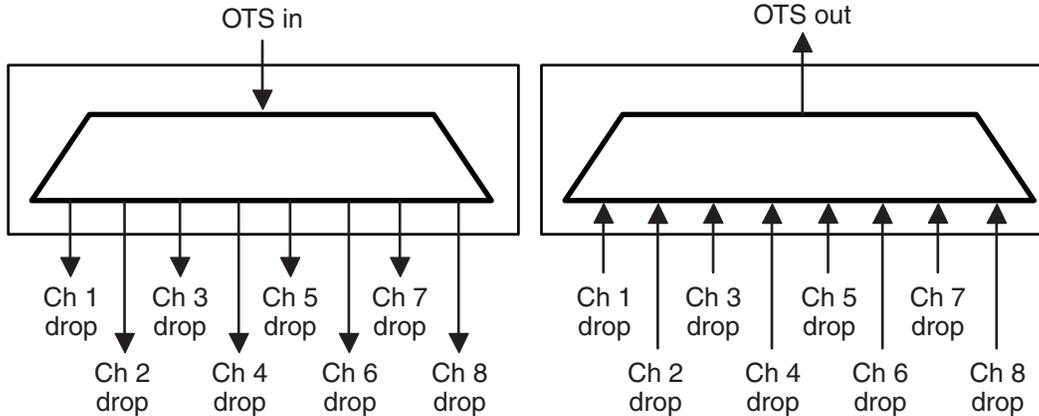


OMUX 8CH ITU CWDM

Figure 15-9 shows the signal flow through the filter module in an OMX 8CH ITU CWDM.

Figure 15-9
Signal flow through an OMX 8CH ITU CWDM

OM1961p

**Indicator lamps**

The indicator lamps are not supported on the OMX 4CH ITU CWDM and OMX 8CH ITU CWDM. The OMX indicator lamps are off at all times on these modules.

Connectors

Each OMX uses SC connectors for installing fiber-optic patch cords.

There is an RJ-45 connector on each OMX, used to connect the OMX to the maintenance panel through the OMX cable. This connection provides the electrical and System Manager monitoring interfaces for the OMX.

Cables and optical patch cords

For information on cables and optical patch cords, refer to “[Cables and optical patch cords](#)” on [page 21-1](#).

Location

For slot assignments and equipping rules for the ITU CWDM OMX, refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

OSC trays

In this chapter

This chapter includes the following sections:

- [OSC trays on page 16-1](#)
- [Types on page 16-1](#)
- [Function on page 16-1](#)
- [Features on page 16-2](#)
- [Signal flow on page 16-6](#)
- [Connectors on page 16-7](#)
- [Indicator lamps on page 16-8](#)
- [Cables and optical patch cords on page 16-8](#)
- [Location on page 16-8](#)
- [Product engineering codes on page 16-8](#)

OSC trays

The OSC tray assembly is a 1 U high drawer that contains two OSC trays (with or without one or two optical taps) each with a patch panel and fiber management components. The assembly contains one dual filter drawer and SC-LC patch cords. The OSC trays can be replaced without having to replace the drawer.

Types

Three types of OSC trays are available:

- OSC tray assembly with one optical tap
- OSC tray assembly with dual optical taps
- OSC tray assembly

Function

The OSC uses passive optical technology to add and drop the OSC channel (1510 nm) to and from an existing WDM signal. Each OSC tray receives a WDM signal containing the OSC channel (1510 nm) and separates the OSC channel from the WDM signal and sends it to the OSC circuit pack. The OSC

tray also receives the OSC channel from the OSC circuit pack and combines it with the WDM signal that is transmitted from Optical Metro 5100/5200 equipment. The OSC tray then transmits the newly combined WDM signal to the network.

The OSC contains an add/drop filter (ADF). The ADF drops specific wavelengths while allowing other wavelengths to pass through the filter.

A patch panel inside the OSC tray allows you to connect the wayside channel (WSC) from the OSC circuit pack to the client equipment. Nortel Networks recommends that you use the patch panel to connect the client equipment to the wayside channel.

OSC trays with a single optical tap can be used to monitor the power of the aggregate signal (not the OSC signal) entering the OSC tray. The tap takes a small amount of the signal (4%) entering the OSC tray, and sends it to the monitor port. By connecting an optical power meter to the monitor port, you can measure the total signal power for the optical fiber. You can also connect an optical spectrum analyzer to the tap to measure the signal power for each channel.

The OSC with dual taps provides non-intrusive access to monitor the inbound (OTS IN) and outbound (OTS OUT) optical signals. The monitor ports (OTS IN MONITOR and OTS OUT MONITOR) are located directly on the faceplate of the drawer for easy access without opening the drawer and disturbing the high-speed fibers. The OSC with dual taps includes a 4% tap on the OTS IN signal, and a 2% tap on the OTS OUT signal.

Features

The OSC Splitter/Coupler drawer with dual taps (NT0H57GB/GC) is similar to the existing OSC Splitter/Coupler assembly (NT0H57DA) and OSC Splitter/Coupler assembly with optical tap (NT0H57FA).

The distinguishing features of the OSC Splitter/Coupler tray with dual taps are as follows:

- includes an optical tap on both the OTS input signal (4%) and the OTS output signal (2%)
- supports optical monitoring ports accessible from the front of the OSC Splitter/Coupler tray assembly without having to open the drawer or disturb traffic-carrying fibers

Note: The monitor ports (OTS IN MONITOR and OTS OUT MONITOR) are located directly on the faceplate of the drawer for easy access.

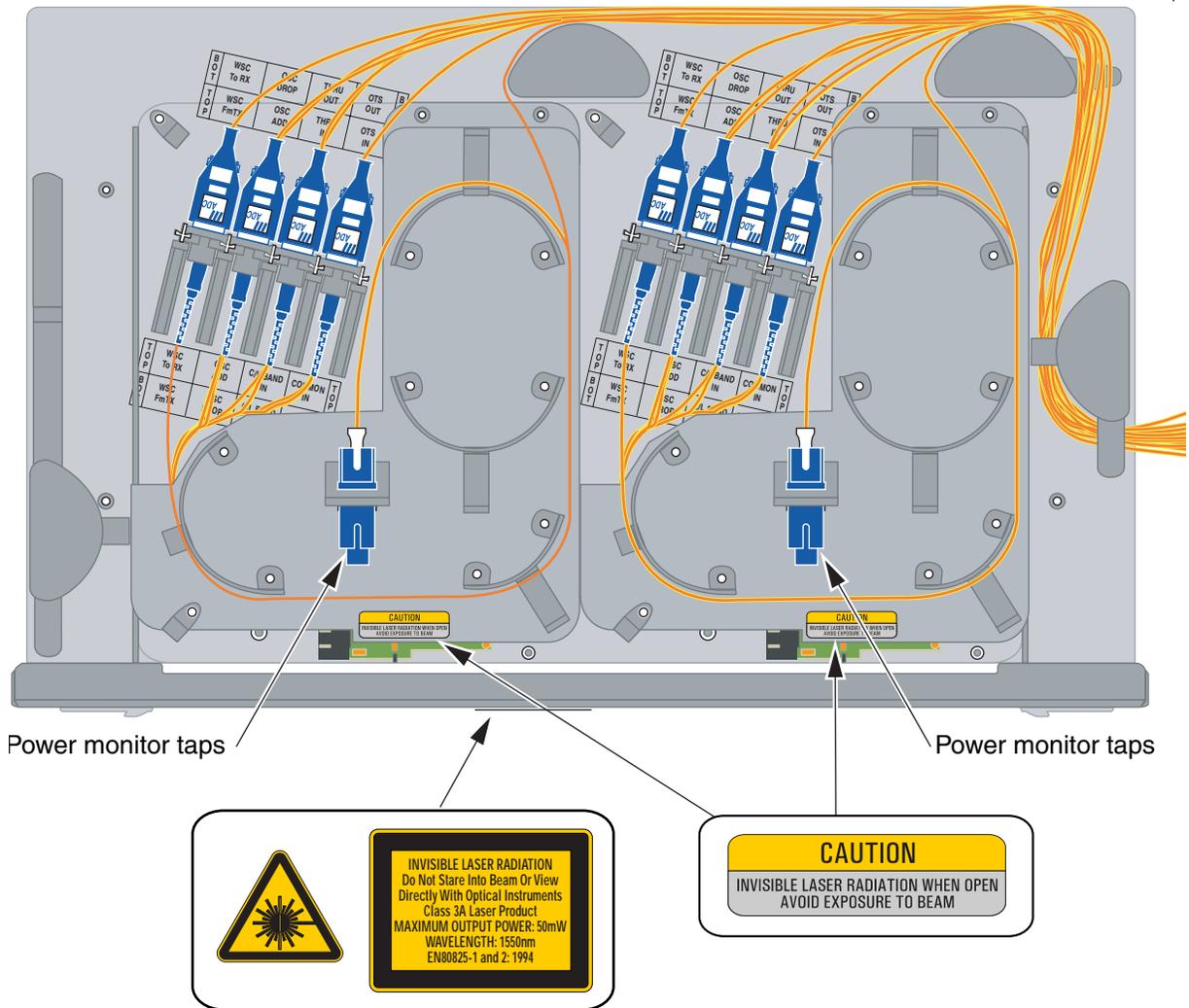
- provides better isolation to prevent OSC bleed-through

- backside fiber cleaning is possible for all connections in the OSC Splitter/Coupler tray with dual taps. The monitor ports can be cleaned through the SC-SC adapters on the faceplate using a swab. For backside cleaning of the monitor ports and all other internal connectors, the drawer must be opened.

Figure 16-1 shows an OSC tray assembly with an optical tap. Figure 16-2 on page 16-4 shows an OSC tray assembly with dual optical taps. Figure 16-3 on page 16-5 shows an OSC tray assembly without an optical tap.

Figure 16-1
OSC tray with one optical tap

OM0726p.



16-4 OSC trays

Figure 16-2
OSC tray with dual optical taps

OM2671p.jpg

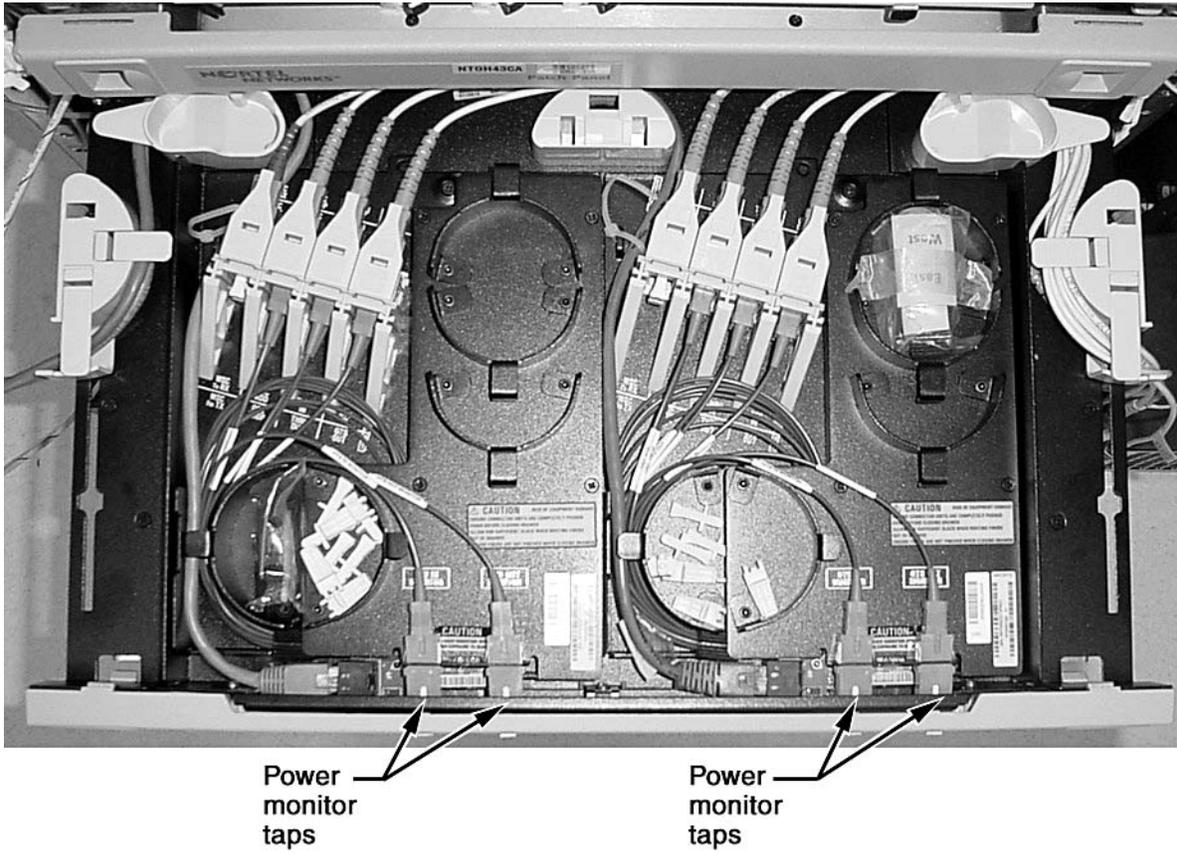
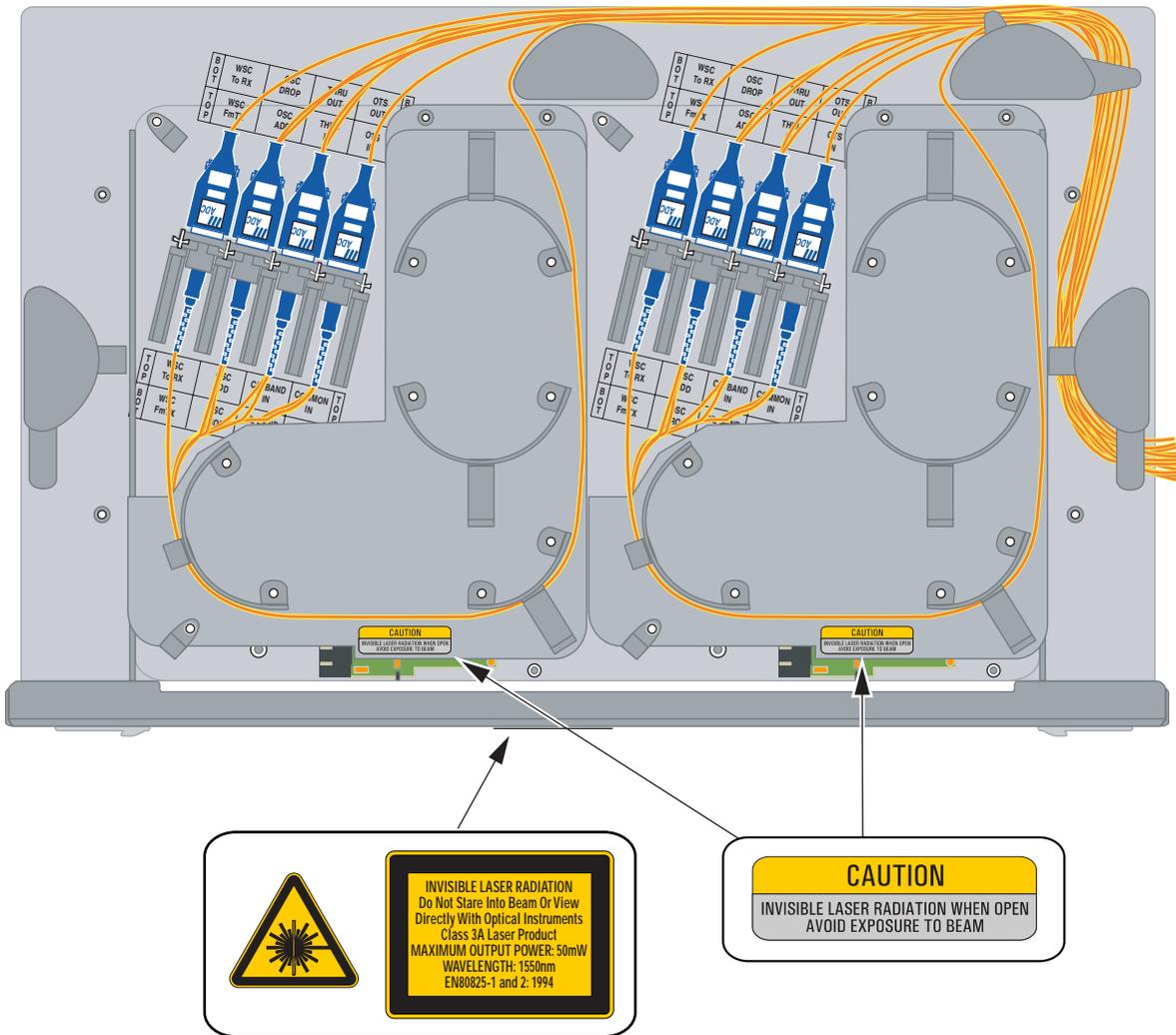


Figure 16-3
OSC tray without an optical tap

OM0727p

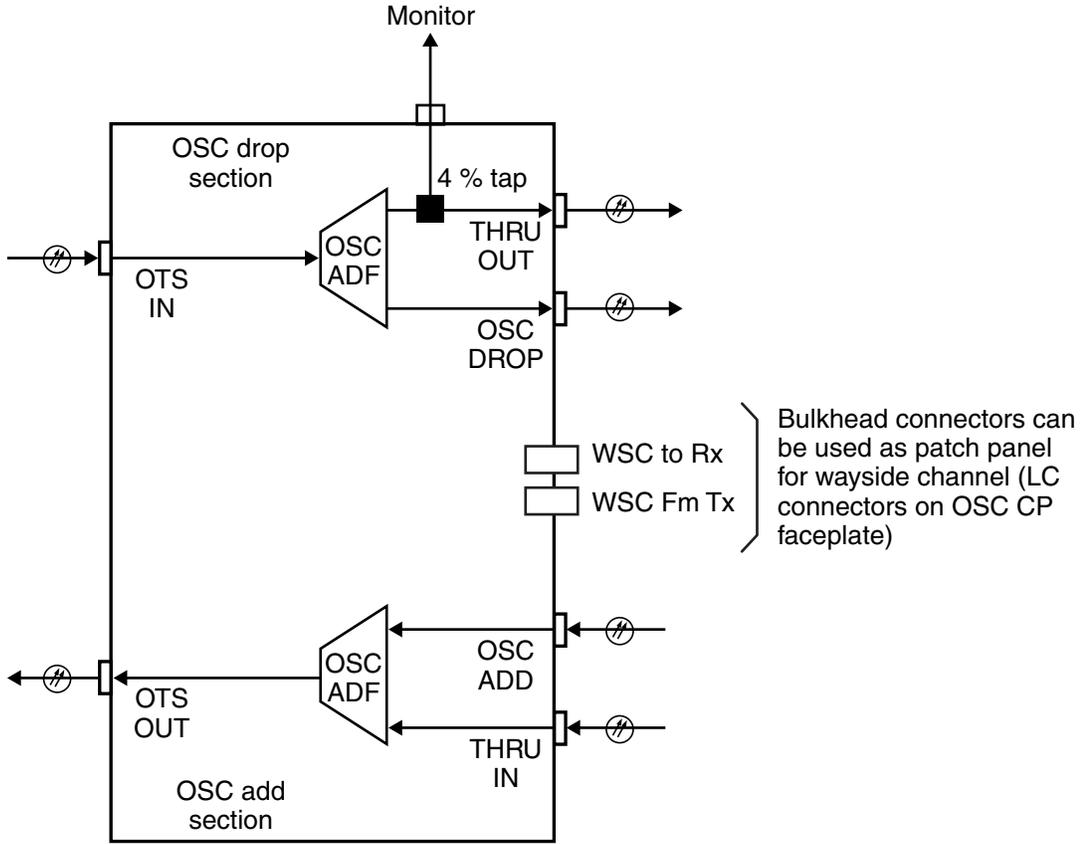


Signal flow

Figure 16-4 on page 16-6 shows the signal flow through the OSC Splitter/Coupler tray with a single optical tap.

Figure 16-4
OSC signal flow (for OSC with single optical tap)

OM1034t

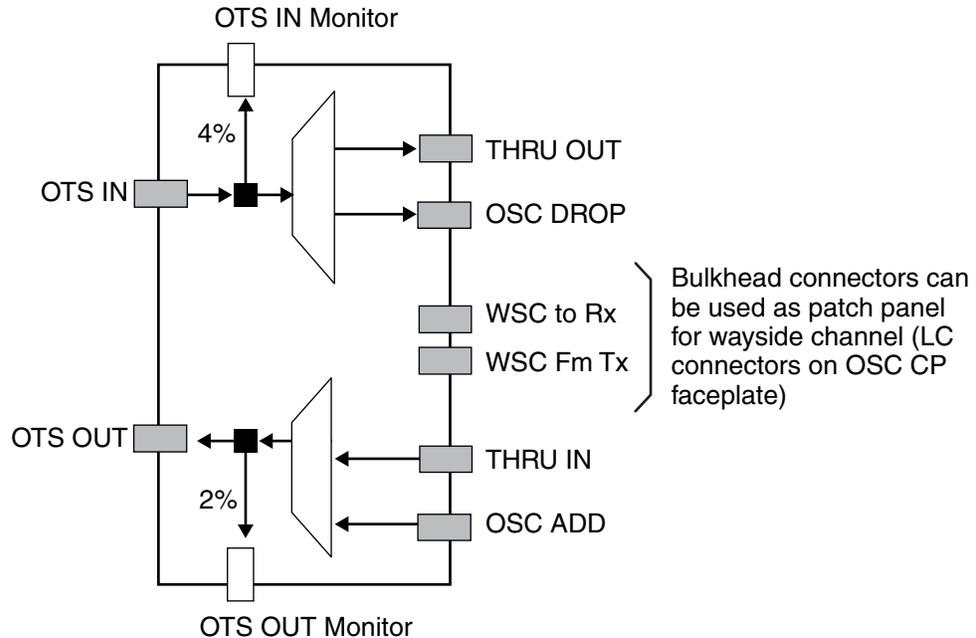


Note: The signal flow through the OSC tray without optical tap is the same as the signal flow for the OSC tray with a single optical tap except for the 4% tap on the THRU OUT port, which is not present.

Figure 16-5 on page 16-7 shows the signal flow through the the OSC Splitter/Coupler tray with dual optical taps.

Figure 16-5
OSC signal flow (for OSC with dual optical taps)

OM2565p



Legend

- SC internal connectors (bulkhead lift-up)
- SC connector accessible on drawer face plate

Connectors

Each OSC tray has a patch panel with eight SC-SC connectors that are used to make fiber connections between the tray and the OSC circuit pack, the optical devices, and the Optical Metro 5100/5200 network. The OSC tray with a single optical tap has an additional SC connector for monitoring optical power and wavelengths. The OSC tray with dual optical taps has two additional SC connectors for monitoring optical power and wavelengths. You can access these monitoring ports from the front of the faceplate without opening the OSC tray and disturbing fibers.

Each OSC tray has an RJ-45 connector on the digital identification (DID) card for connection to the shelf maintenance panel or the Equipment Inventory Unit (EIU).

Indicator lamps

Each OSC Splitter/Coupler tray supports a faceplate viewable LED. This LED supports the lamp test feature, whereby users can toggle the faceplate LED on and off through the craft interface. This feature allows rapid determination of module location while also validating that the tray is connected to the maintenance panel or the Equipment Inventory Unit correctly.

Cables and optical patch cords

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

Refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

C&L splitter/coupler

In this chapter

This chapter includes the following sections:

- [C&L splitter/coupler on page 17-1](#)
- [Signal flow on page 17-3](#)
- [Connectors on page 17-3](#)
- [Cables and optical patch cords on page 17-3](#)
- [Location on page 17-3](#)
- [Product engineering codes on page 17-4](#)

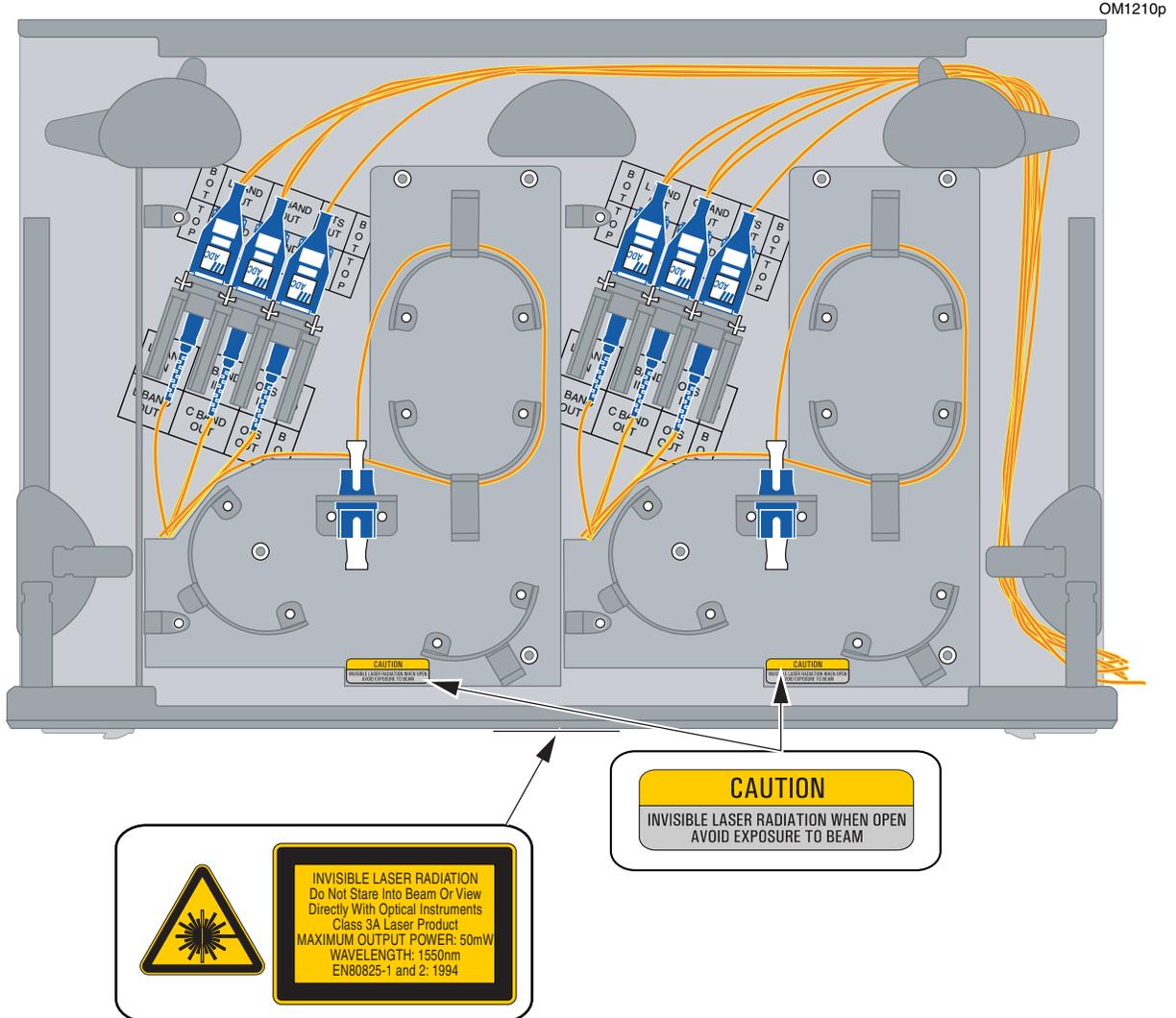
C&L splitter/coupler

The C&L splitter/coupler tray assembly consists of two C&L splitter/coupler trays in a 1 U high drawer. Each tray contains one C-band and L-band splitter/coupler, a patch panel with SC-SC connectors, and a digital identification (DID) card for inventory purposes. Each tray is individually replaceable without having to replace the drawer. The drawer manages the fiber slack necessary for opening and closing the drawer but does not provide slack storage for the incoming fibers.

The C&L splitter/coupler tray contains optical filters that split the wavelengths in the conventional band (C-band) from the wavelength in the long band (L-band), and recombines the bands into one signal. The C&L splitter/coupler can be deployed anywhere in the network (OADM, terminal, or OFA sites) where you need to separate the C-band from the L-band.

[Figure 17-1 on page 17-2](#) shows the interior view of the C&L splitter/coupler tray assembly.

Figure 17-1
Interior view of the C&L splitter/coupler tray assembly



For more information about

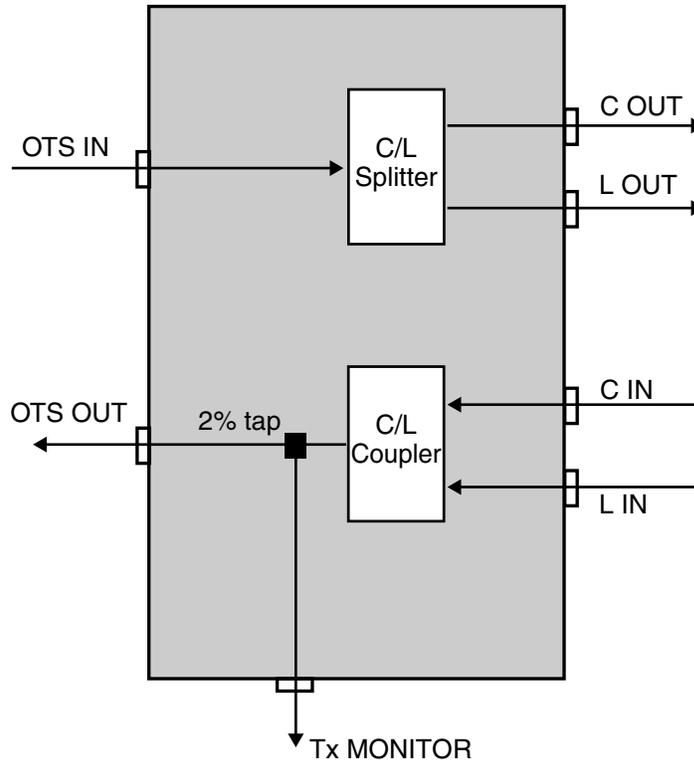
- Equalizer Coupler Trays, refer to the “[ECT](#)” chapter of this book
- Per Band Equalizers, refer to the “[Per Band Equalizer](#)” chapter of this book
- APBE circuit packs, refer to the “[General circuit pack information](#)” chapter of this book
- OFA circuit packs, refer to the “[General circuit pack information](#)” chapter of this book

Signal flow

Figure 17-2 on page 17-3 shows the signal flow through the C&L splitter/coupler.

Figure 17-2
Site signal flow through C&L splitter/coupler tray with a tap

OM0734p



Connectors

Each C&L splitter/coupler tray has a patch panel with six SC-SC connectors. These connectors are used to connect the C&L splitter/coupler tray to other Optical Metro 5100/5200 equipment, and to the network. There is a seventh connector for an optical tap.

Cables and optical patch cords

For information on cables and optical patch cords, refer to “[Cables and optical patch cords](#)” on [page 21-1](#).

Location

Refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

ECT

In this chapter

This chapter includes the following section: [Equalizer coupler tray on page 18-1](#).

Equalizer coupler tray

The Equalizer Coupler Tray (ECT) is used with an Optical Metro 5200 OFA shelf to separate, equalize, and combine conventional (C-band) and long band (L-band) traffic.

The ECT can be connected to the maintenance panel in an OFA shelf using the ECT cable assembly. This cable provides the data communication link between the ECT and shelf processor (SP) circuit pack, that is needed to inventory and monitor the ECT.

If the Optical Metro 5200 is transmitting C-band and L-band traffic on the same optical fiber, the ECT can separate the bands. The ECT then transmits the bands to the OFA circuit packs for amplification, equalizes the bands, and combines them again. When the ECT transmits the combined bands to OADM nodes, each band is within the required power level. The coupler/splitter is designed to have low loss and high isolation so that it reduces multipath interference (MPI).

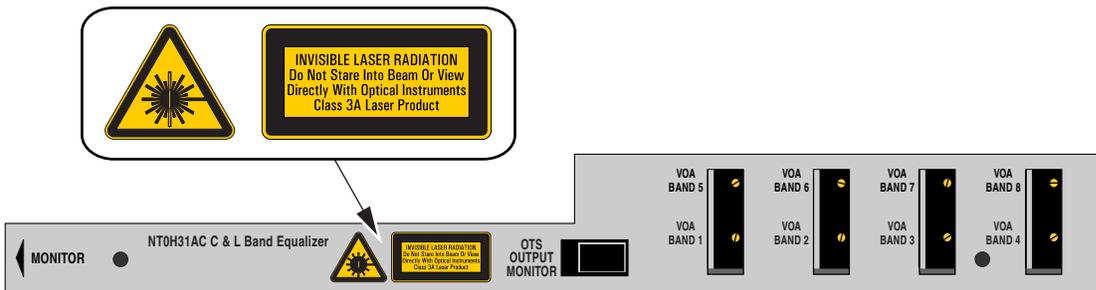
The equalizer removes power differences in the bands before transmitting traffic to the amplifier.

Each ECT has an OTS OUTPUT MONITOR port located on the front of the ECT. The optical tap in the ECT takes a small amount of the aggregate signal (C-band and L-band) exiting the ECT (approximately 1.8%) and sends it to the monitor port. You can connect a power meter to the monitor port to measure the total power on the optical fiber. You can also connect an optical spectrum analyzer to the port to examine the power level of each channel in all bands.

[Figure 18-1 on page 18-2](#) shows the faceplate of the ECT.

Figure 18-1
ECT faceplate

OM0164p



Four types of ECT are available. Each type includes variable optical attenuators (VOA) so that you can manually attenuate the power level for each band. All ECT types are inventoried by System Manager. [Table 18-1](#) lists descriptions for each type of ECT.

Table 18-1
Types of ECT

Description	Number of VOAs	Number of PBEs	Equalized wavelength (nm)	Use
C-band equalizer with coupler/splitter (NT0H31AA)	4	1	1528.77—1562.23	<ul style="list-style-type: none"> • splits/couples C-band and L-band signals • attenuates and equalizes individual bands in C-band spectrum
L-band equalizer with coupler/splitter (NT0H31AB)	4	1	1570.42—1605.73	<ul style="list-style-type: none"> • splits/couples C-band and L-band signals • attenuates and equalizes individual bands in L-band spectrum
C-band and L-band equalizer with coupler/splitter (NT0H31AC)	8	2	1528.77—1562.23 1570.42—1605.73	<ul style="list-style-type: none"> • splits/couples C-band and L-band signals • attenuates and equalizes individual bands in C-band and L-band spectrum
C-band and L-band coupler/splitter with VOAs (NT0H31AD)	2	0	none	<ul style="list-style-type: none"> • splits/couples C-band and L-band signals • attenuates all bands in C-band and L-band spectrum • no equalization

Signal flow

Figure 18-2 shows the signal flow through an ECT with a C-band equalizer and a coupler/splitter.

Figure 18-2
Signal flow through a C-band equalizer with coupler/splitter

OM0380t

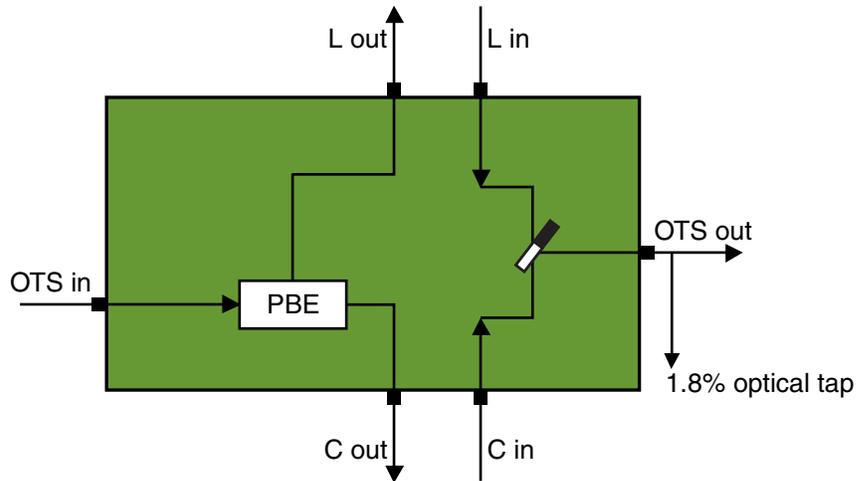


Figure 18-3 shows the signal flow through an ECT equipped with an L-band equalizer and a coupler/splitter.

Figure 18-3
Signal flow through an L-band equalizer with coupler/splitter

OM0378t

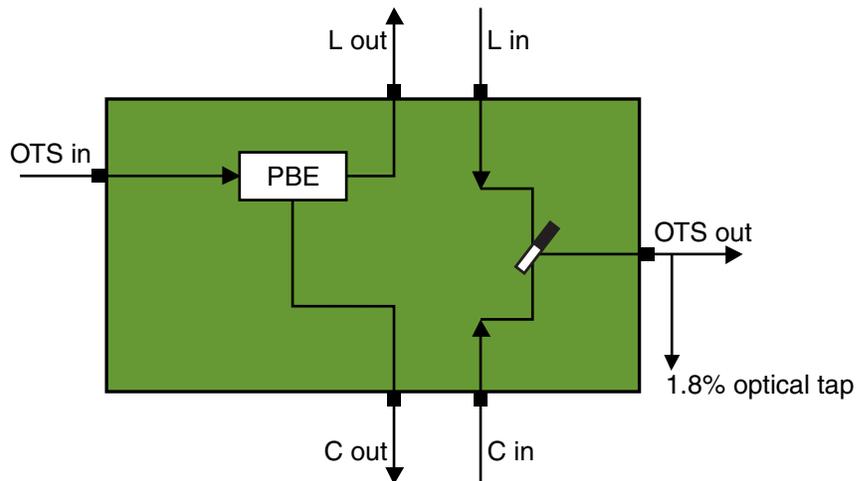


Figure 18-4 shows the signal flow through an ECT equipped with a C-band and L-band equalizer and a coupler/splitter.

Figure 18-4
Signal flow through a C-band and L-band equalizer with coupler/splitter

OM0379t

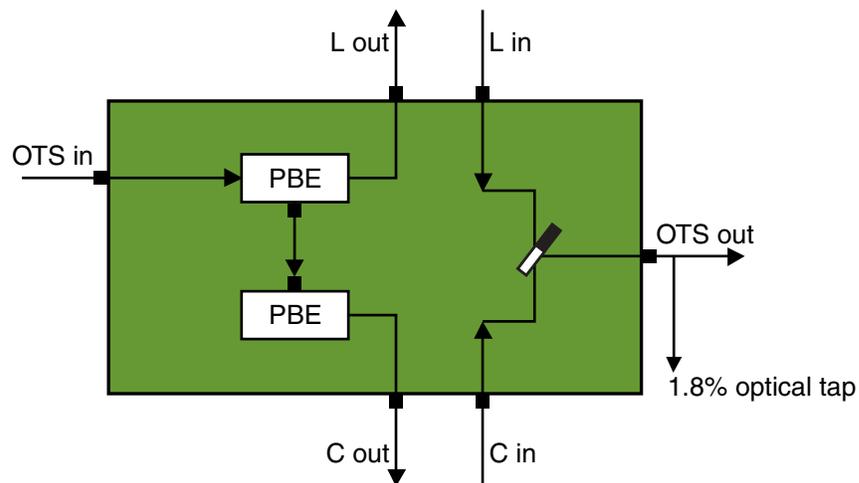
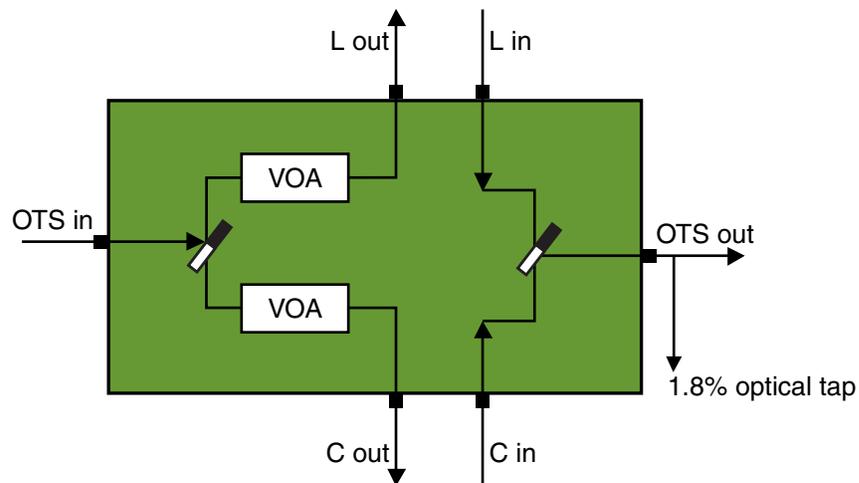


Figure 18-5 shows the signal flow through an ECT equipped with a C-band and an L-band coupler/splitter with VOAs.

Figure 18-5
Signal flow through a C-band and L-band coupler/splitter with VOAs

OM0381t



Connectors

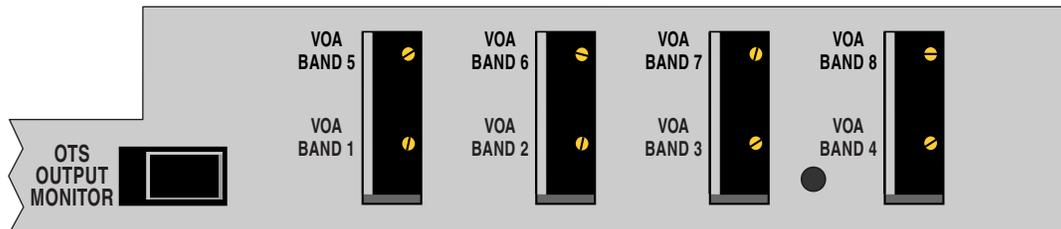
Inside the ECT, there are two inputs and two outputs for connections to the OFA C-band and OFA L-band circuit packs, as well as connections for OTS in and OTS out. You can access these inputs and outputs by lifting a door located on the top left of the ECT tray.

The ECT has a maximum of eight VOAs on the front panel, depending on the model. You use the VOAs to manually adjust the optical power level for each band.

Figure 18-6 shows the VOAs on an ECT.

Figure 18-6
VOAs on an ECT

OM0165p



Cables and optical patch cords

For information on cables and optical patch cords, refer to “[Cables and optical patch cords](#)” on [page 21-1](#).

Location

An ECT tray is installed in a drawer that is built into the OFA shelf. You can install a second drawer below the shelf to hold another ECT. You need the OFA installation kit (NT0H44AB) in order to install the second drawer.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

Per Band Equalizer

In this chapter

This chapter includes the following section: [Per Band Equalizer on page 19-1](#).

Per Band Equalizer

The Per Band Equalizer (PBE) is a 1 U high rack-mounted drawer that contains filters, variable optical attenuators (VOAs), and fiber management components. The PBE allows you to manually adjust the optical power of each band within the C-band, or L-band, to provide centralized equalization in amplified Optical Metro 5200 networks.

Types

The Per Band Equalizer is available in three types

- C-band only
- L-band only
- C-band and L-band

All PBE types are inventoried by System Manager.

Function

Filters in the PBE demultiplex the C-band or L-band signal into four bands, so that each band can be passed to its own VOA for attenuation. A small screw on top of the VOA allows you to attenuate the signal power of the band. After passing through the VOAs, the bands are sent to another set of filters where they are multiplexed. After multiplexing, the aggregate signal is transmitted to the OFA circuit pack for amplification. The PBE does not contain a C/L splitter/coupler. If your network is carrying C-band and L-band traffic on the same fiber, you must install a C/L splitter/coupler upstream of the PBE, to separate the C-band from the L-band before the signal reaches the PBE.

Features

The C-band and L-band PBEs each contain

- two sets of filters—one set demultiplexes the C-band (or L-band) signal into four bands for attenuation, and one set multiplexes the equalized bands into an aggregate signal before the signal is transmitted to the OFA circuit pack
- four VOAs
- a patch panel with 3 pairs of SC-SC connectors
- one fiber-optic terminator
- an ID card

The C&L-band PBE contains

- two sets of filters — one set to demultiplex the C-band and L-band into eight bands, and one set to multiplex the equalized bands into one band before the signal is transmitted to the OFA circuit pack
- eight VOAs
- a patch panel with 3 pairs of SC-SC connectors
- two fiber-optic terminators
- an ID card

The ID card has an RJ45 port that allows you to connect a cable from the PBE to the maintenance panel of an Optical Metro 5200 OFA shelf. The cable provides the data communications between the PBE and the shelf that the System Manager needs to inventory and monitor the PBE.

[Figure 19-1 on page 19-3](#) shows the interior of a C-band PBE, [Figure 19-2](#) shows the interior of the L-band PBE, and [Figure 19-3 on page 19-4](#), shows the interior of the C&L-band PBE.

Figure 19-1
Interior view of a C-band PBE

OM0908p

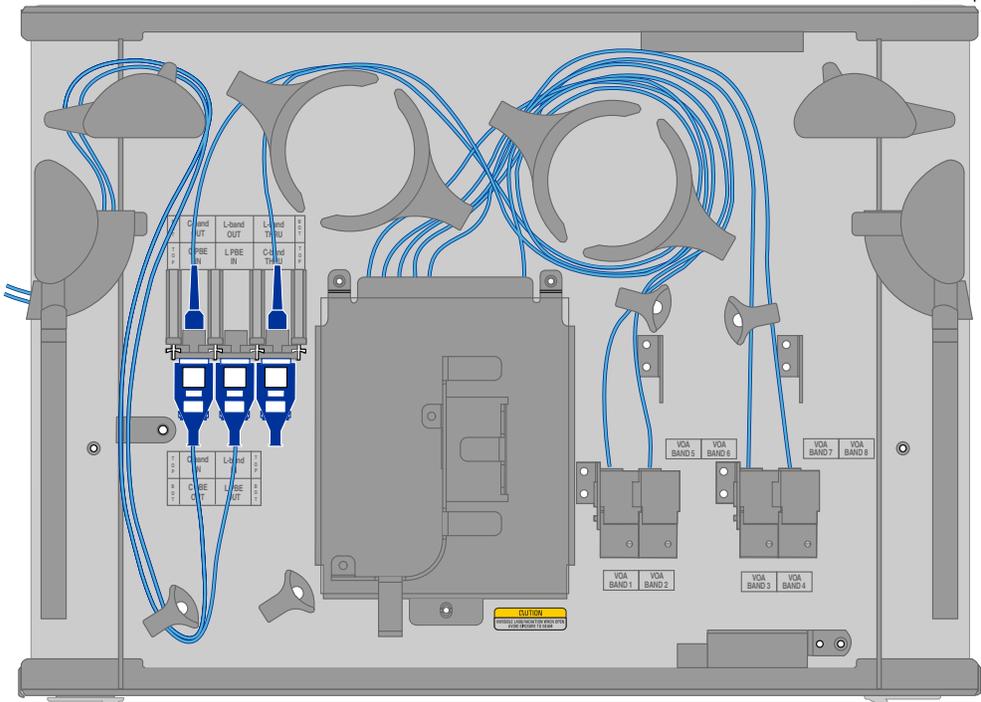


Figure 19-2
Interior view of an L-band PBE

OM0933p

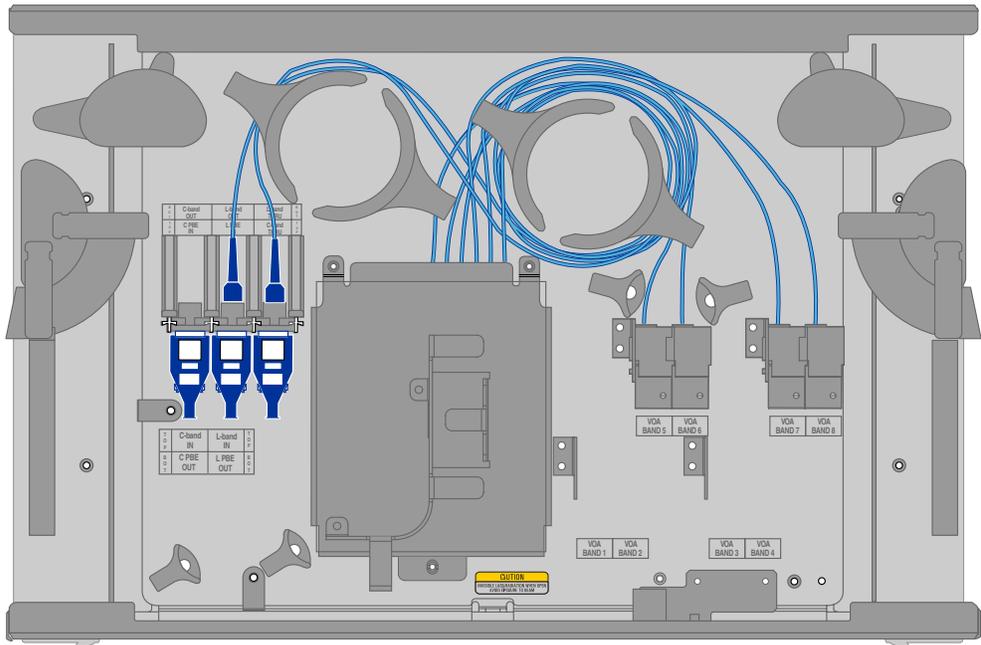
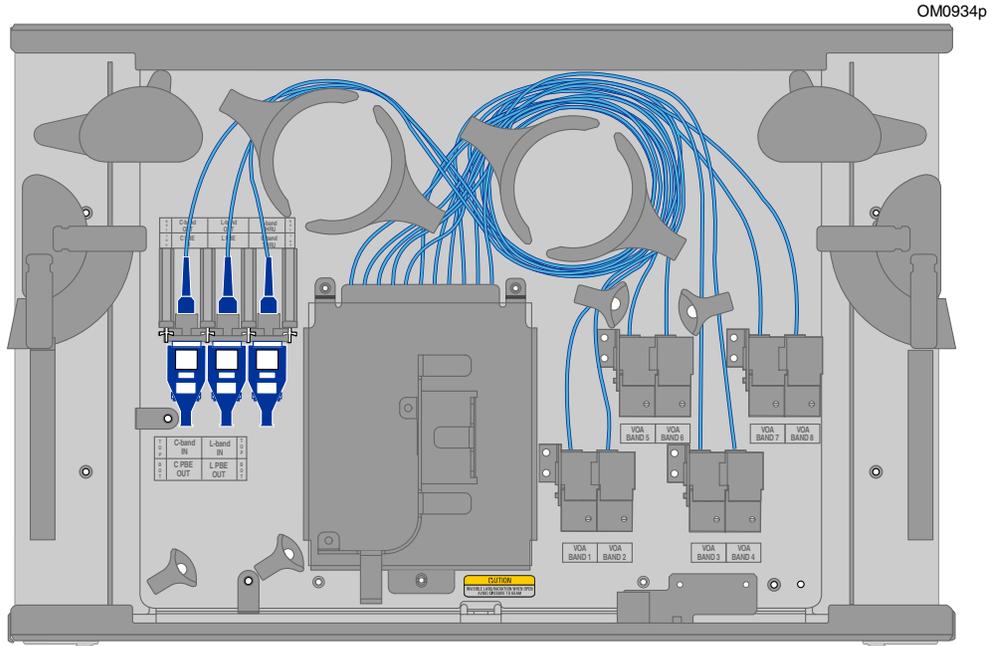


Figure 19-3
Interior view of a C&L-band PBE



Signal flow

Figure 19-4 shows the signal flow through the C-band PBE, and Figure 19-5 shows the signal flow through the L-band PBE.

Figure 19-4
C-band PBE signal flow

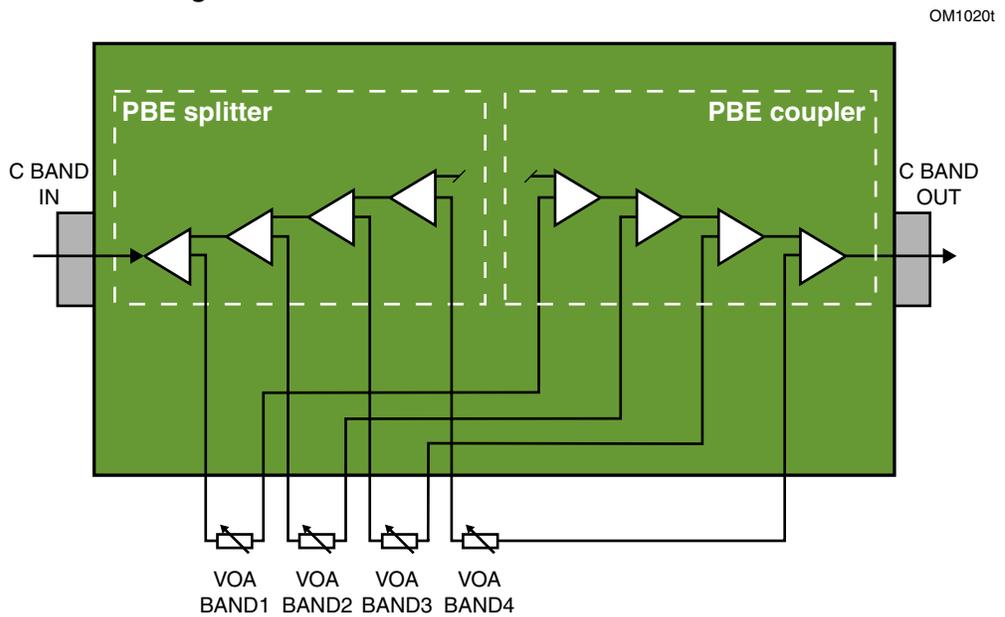
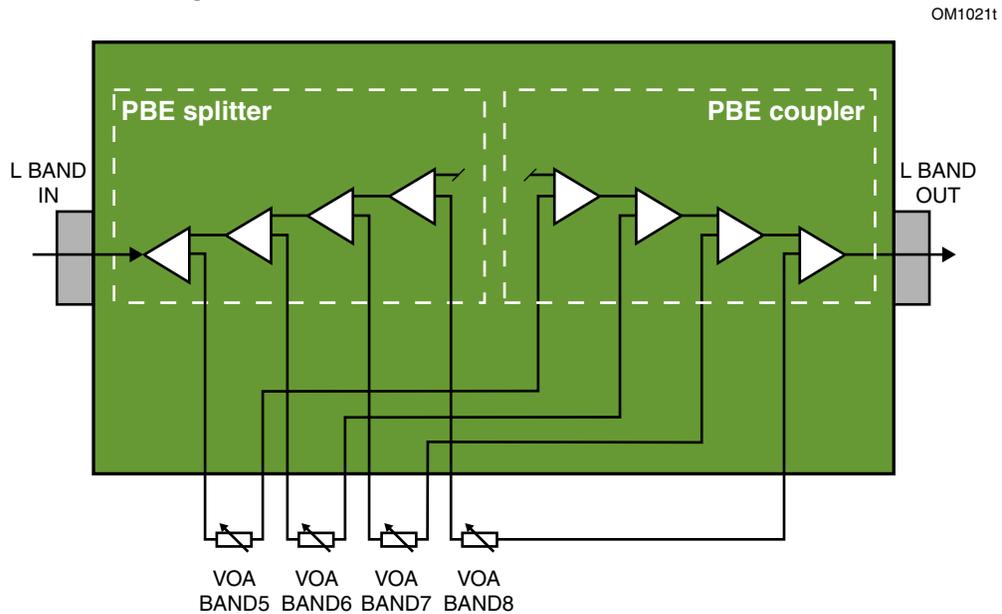


Figure 19-5
L-band PBE signal flow



In the C&L-band PBE, the signal flow of the bands is identical to that shown in [Figure 19-4](#) and [Figure 19-5](#).

Connectors

The Per Band Equalizer contains a patch panel with 3 pairs of SC-SC connectors. Use the connectors to make fiber connections between other Optical Metro 5100/5200 equipment and the PBE, and between the PBE and the OFA circuit pack.

Cables and optical patch cords

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

For site requirements and equipping rules for the PBE, refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Ethernet hub

In this chapter

This chapter includes the following section: [Ethernet hubs on page 20-1](#).

Ethernet hubs

Every site with more than two shelves requires an Ethernet hub for intershelf messaging. Intershelf messaging is achieved by connecting the 10BaseT 2X Ethernet port on the maintenance panel of each shelf to the Ethernet hub using shielded cross-over cable.

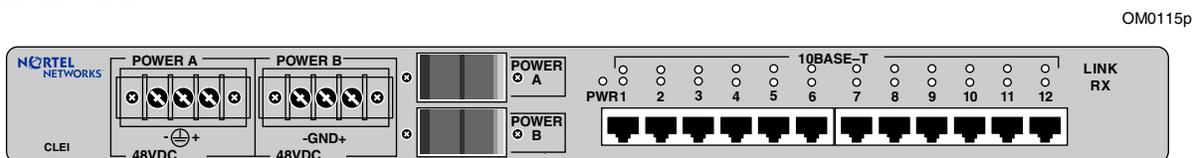
Power requirements

The Ethernet hub runs on –48 V dc power. If you do not have direct current power available at the site, you must install a rectifier to convert alternating current power to direct current power.

Connectors

There are 12 ports on the front of the Ethernet hub for making intershelf connections. [Figure 20-1](#) shows the Ethernet hub.

Figure 20-1
Ethernet hub



The power connection terminals on the front of the Ethernet hub accept a dual feed power source for redundancy. Terminals A+ and A- are the primary input terminals. Terminals B+ and B- are the secondary input terminals.

Diodes in the two input terminals protect the Ethernet hub from incorrect power input connections. For example, these diodes ensure that only power of the correct polarity flows into the Ethernet hub. The Ethernet hub can receive

power from either input terminal, if at least one terminal is receiving the correct polarity. An incorrect polarity connection does not affect the hub, its internal power supply, or blow the fuse of the internal power supply.

Indicator lamps

The Ethernet hub has three types of indicator lamps

- PWR
- LINK
- RX

The PWR lamp indicates the status of the electrical power to the hub. The LINK and RX lamps indicate the status of the data communication link between the hub and the shelf. There is one LINK and one RX lamp associated with each port on the hub.

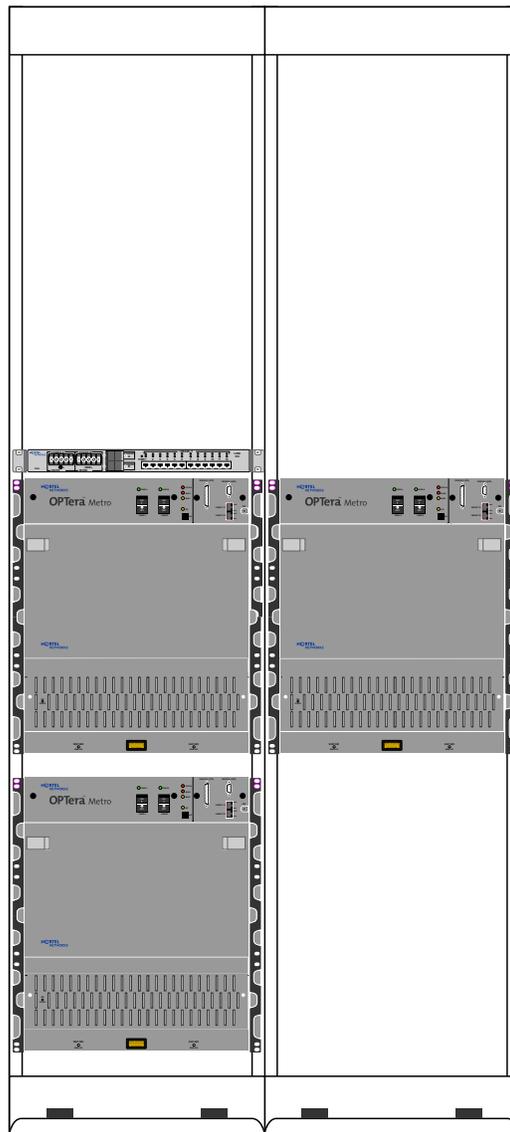
Location

For site requirements and equipping rules for the Ethernet hub, refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

[Figure 20-2](#) shows an Ethernet hub installed in a multishelf terminal site with standard 12 U shelves.

Figure 20-2
Ethernet hub installed at a three-shelf terminal site

OM0105t



Product engineering code

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Cables and optical patch cords

In this chapter

- [Interconnect cables on page 21-1](#)
- [Ethernet cables on page 21-2](#)
- [Fiber-optic patch cords on page 21-2](#)
- [Data communications cables on page 21-37](#)

Interconnect cables

You require different types of optical patch cords and data communications cables for:

- intershelf messaging and local connection to a System Manager computer
- interconnecting Optical Metro 5100/5200 components to each other
- connecting Optical Metro 5100/5200 components to circuit packs

The types of cables and optical patch cords you require are

- Ethernet cables
- fiber-optic patch cords
- data communication cables

You can order these cables from Nortel Networks. The number of each type of patch cord and cable that you need is determined by

- the number of Optical Metro 5100/5200 shelves in your network
- the number of OMXs you have for each shelf, and the wiring method used to connect them to the shelf and each other
- the number of additional external components you have

For information on converting American Wire Gauge (AWG) sizes to their metric (ETSI) equivalent, refer to [“Cable pinouts and specifications” on page 1-11](#) in *Technical specifications*, 323-1701-180.

Ethernet cables

Use shielded Ethernet cables for intershelf messaging between Optical Metro 5100/5200 shelves located at the same site.

Two types of 10Base-T shielded Ethernet cables are available from Nortel Networks

- straight-through cables—used to connect an Optical Metro 5100/5200 shelf to the System Manager computer
- cross-over cables—used for intershelf messaging

[Table 21-1](#) lists the product engineering codes (PECs) for the types and lengths of Ethernet cables.

Table 21-1
Product engineering codes for Ethernet cables

PEC	Type	Length	Used to connect
NT0H4342	straight-through cable	2.75 m (108 in.)	an Optical Metro 5100/5200 shelf to the System Manager computer
NT0H4340	cross-over cable	2.15 m (84 in.)	an Optical Metro 5100/5200 shelf to an Ethernet hub (same rack), or two Optical Metro 5100/5200 shelves in the same rack
NT0H4341	cross-over cable	4.5 m (177 in.)	an Optical Metro 5100/5200 shelf to an Ethernet hub (adjacent rack)

Fiber-optic patch cords

Use fiber-optic patch cords to

- make connections between shelves so that signals can flow through the backbone of the network
- make connections between external components
- make connections between components and circuit packs

Three patch cord assemblies (NT0H4330, NT0H4331, and NT0H4332) have two different colored boots on the fibers: gray and black. The boots have different colors to help you differentiate between the fibers when you are making connections between two shelves.

For help in determining which patch cords you need to make the appropriate connections, refer to the description of the component or circuit pack in *Hardware Description*, 323-1701-102, and to the “[Connecting components](#)” chapter in *Connection Procedures*, 323-1701-221. Also, refer to the tables listed in [Table 21-2](#) for specifications on the fiber-optic patch cords:

Table 21-2
List of patch cords

PEC	See
NT0H39AA	Table 21-3 on page 21-5
NT0H39AB	Table 21-4 on page 21-6
NT0H4319	Table 21-5 on page 21-7
NT0H4320	Table 21-6 on page 21-8
NT0H4321	Table 21-7 on page 21-9
NT0H4325	Table 21-8 on page 21-10
NT0H4326	Table 21-9 on page 21-11
NT0H4327	Table 21-10 on page 21-11
NT0H4328	Table 21-11 on page 21-12
NT0H4330	Table 21-12 on page 21-13
NT0H4331	Table 21-13 on page 21-14
NT0H4332	Table 21-14 on page 21-15
NT0H4333	Table 21-15 on page 21-16
NT0H4343	Table 21-16 on page 21-17
NT0H4344	Table 21-17 on page 21-18
NT0H4346	Table 21-18 on page 21-19
NT0H4347	Table 21-19 on page 21-20
NT0H4348	Table 21-20 on page 21-20
NT0H4349	Table 21-21 on page 21-21
NT0H4381	Table 21-22 on page 21-22
NT0H4382	Table 21-23 on page 21-24
NT0H4383	Table 21-24 on page 21-26
NT0H4384	Table 21-25 on page 21-27
NT0H4385	Table 21-26 on page 21-28
NT0H4386	Table 21-27 on page 21-29
NT0H4387	Table 21-28 on page 21-29
NT0H4388	Table 21-29 on page 21-30
NT0H4389	Table 21-30 on page 21-30

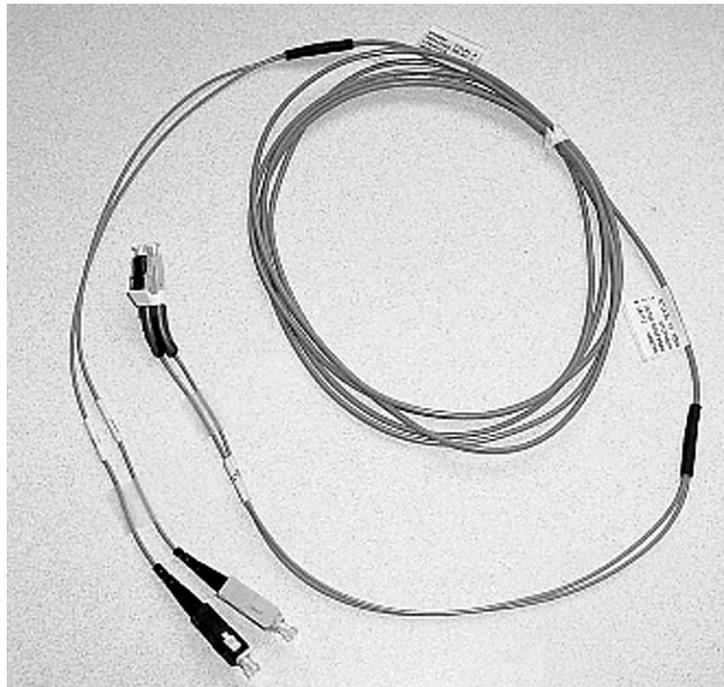
Table 21-2 (continued)
List of patch cords

PEC	See
NT0H4390	Table 21-31 on page 21-31
NT0H4391	Table 21-32 on page 21-31
NT0H4391	Table 21-32 on page 21-31
NT0H4392	Table 21-33 on page 21-32
NT0H4393	Table 21-34 on page 21-32
NT0H4396	Table 21-35 on page 21-33
NT0H4398	Table 21-36 on page 21-34
NT0H43JC	Table 21-37 on page 21-35
NTTC53AT to NTTC53AY	Table 21-38 on page 21-36

Table 21-3 lists the specifications for NT0H39AA.

Table 21-3
Patch cord description - NT0H39AA

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H39AA	1.6 mm	MMF 62.5 μm/MMF 50μm	duplex	2.4 m (96 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector



Used to connect:

Client-side connector from 850 nm SFP on Muxponder circuit pack to subtending equipment or to patch panel (see [Note 1](#), [Note 2](#), and [Note 3](#))

Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.

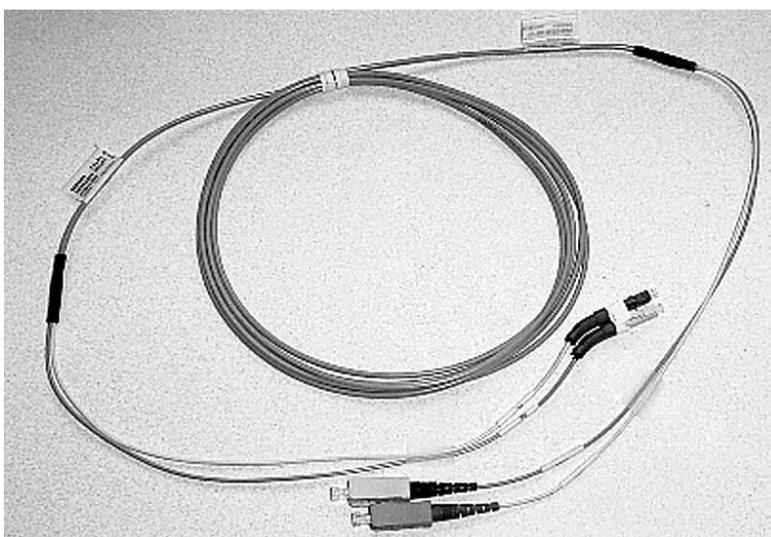
Note 2: This patch cord can also be used to connect the Muxponder SFP modules to the Optical Metro 5100/5200 patch panel (NT0H43CA/CB). One NT0H43CA patch panel can accommodate up to eight client-side ports on the Muxponder 10 Gbit/s GbE/FC circuit pack. One NT0H43CB patch panel can accommodate up to 10 client-side ports on the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack.

Note 3: This patch cord has a 1.6 mm diameter to avoid over-filling the exit openings at the shelf base below the Muxponder circuit pack when all client-side ports are used.

Table 21-4 lists the specifications for NT0H39AB.

Table 21-4
Patch cord description - NT0H39AB

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H39AB	1.6 mm	MMF 62.5 μ m on RX side and SMF on TX side	duplex	2.4 m (96 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector



Used to connect:

Client-side connector from 1310 nm SFP on Muxponder circuit pack to subtending equipment or to patch panel (see [Note 1](#), [Note 2](#), and [Note 3](#))

Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.

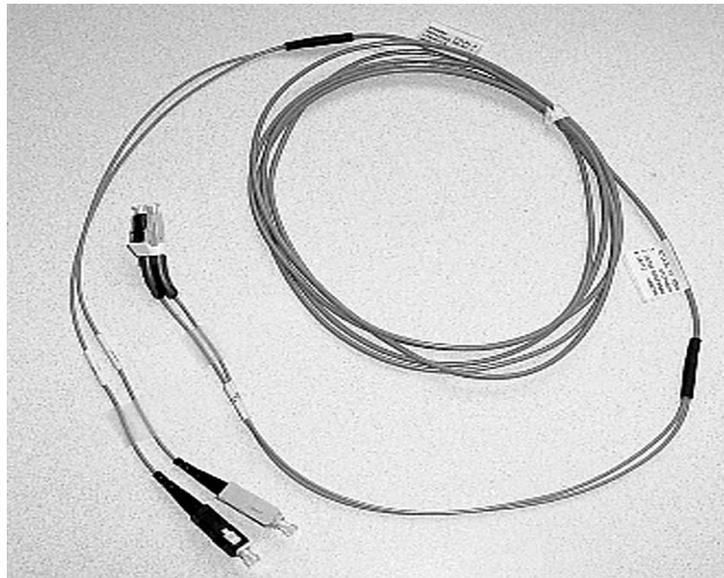
Note 2: This patch cord can also be used to connect the Muxponder SFP modules to the Optical Metro 5100/5200 patch panel (NT0H43CA/CB). One NT0H43CA patch panel can accommodate up to eight client-side ports on the Muxponder 10 Gbit/s GbE/FC circuit pack. One NT0H43CB patch panel can accommodate up to 10 client-side ports on the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack. For Gigabit Ethernet, the fiber between the patch panel and the subtending equipment can be single mode or multi-mode. When the fiber is multi-mode, a mode-conditioning patch cord or plug is required to guarantee error-free performance if the subtending equipment is not colocated with the Optical Metro 5100/5200. Colocated means less than 30 m (100 ft.) away. For FC-100, FC-200, FICON or FICON Express the fiber between the patch panel and the subtending equipment must be single mode.

Note 3: This patch cord has a 1.6 mm diameter to avoid over-filling the exit openings at the shelf base below the Muxponder circuit pack when all client-side ports are used.

Table 21-5 lists the specifications for NT0H4319.

Table 21-5
Patch cord description - NT0H4319

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4319	1.6 mm	MMF 62.5 μm/MMF 50μm	duplex	3.1 m (122 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector



Used to connect:

Client-side connector from 850 nm SFP on Muxponder 10 Gbit/s GbE/FC circuit pack to subtending equipment or to patch panel (see [Note 1](#), [Note 2](#), [Note 3](#), and [Note 4](#))

Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors.

Note 2: This patch cord can also be used to connect the Muxponder 10 Gbit/s GbE/FC SFP modules to the Optical Metro 5100/5200 patch panel (NT0H43CA/CB). One NT0H43CA/CB patch panel can accommodate up to eight client-side ports on the Muxponder 10 Gbit/s GbE/FC circuit pack.

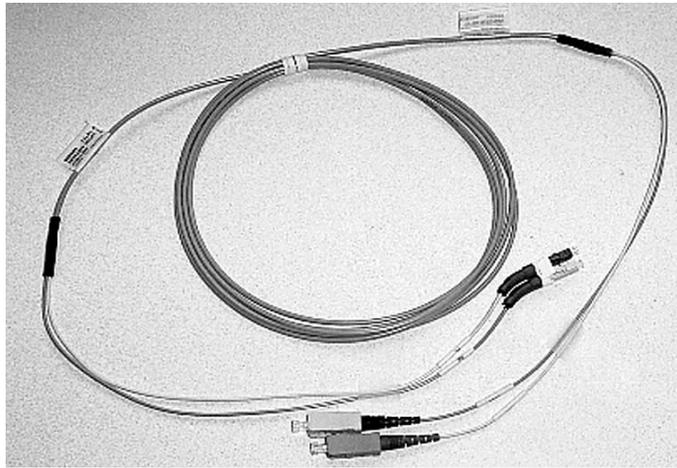
Note 3: This patch cord has a 1.6 mm diameter to avoid over-filling the exit openings at the shelf base below the Muxponder 10 Gbit/s GbE/FC circuit pack when all client-side ports are used.

Note 4: Do not use this patch cord with the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack, instead use the NT0H39AA patch cord.

Table 21-6 lists the specifications for NT0H4320.

Table 21-6
Patch cord description - NT0H4320

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4320	1.6 mm	MMF 62.5 μ m on RX side and SMF on TX side	duplex	3.1 m (122 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector



Used to connect:

Client-side connector from 1310 nm SFP on Muxponder 10 Gbit/s GbE/FC circuit pack to subtending equipment or to patch panel (see [Note 1](#), [Note 2](#), [Note 3](#), and [Note 4](#))

Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors.

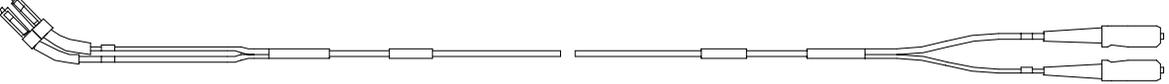
Note 2: This patch cord can also be used to connect the Muxponder 10 Gbit/s GbE/FC SFP modules to the Optical Metro 5100/5200 patch panel (NT0H43CA/CB). One NT0H43CA/CB patch panel can accommodate up to eight client-side ports on the Muxponder 10 Gbit/s GbE/FC circuit pack. For Gigabit Ethernet, the fiber between the patch panel and the subtending equipment can be single mode or multi-mode. When the fiber is multi-mode, a mode-conditioning patch cord or plug is required to guarantee error-free performance if the subtending equipment is not colocated with the Optical Metro 5100/5200. Colocated means less than 30 m (100 ft.) away. For FC-100, FC-200, FICON or FICON Express the fiber between the patch panel and the subtending equipment must be single mode. This patch cord has a 1.6 mm diameter to avoid over-filling the exit openings at the shelf base below the Muxponder 10 Gbit/s GbE/FC SFP circuit pack when all client-side ports are used.

Note 3: This patch cord has a 1.6 mm diameter to avoid over-filling the exit openings at the shelf base below the Muxponder 10 Gbit/s GbE/FC circuit pack when all client-side ports are used.

Note 4: Do not use this patch cord with the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack, instead use the NT0H39AB patch cord.

Table 21-7 lists the specifications for NT0H4321.

Table 21-7
Patch cord description - NT0H4321

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4321	3 mm	SMF	duplex	1.57 m (62 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • Transponder Protection Tray (two-channel version only) to client-side connector on OTR 2.5 Gbit/s 1310 nm circuit pack for protected applications • Client-side connector on OTR 2.5 Gbit/s 1310 nm, OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit pack to subtending equipment for unprotected applications (see Note 1) • OCI SRM GbE/FC 1310 nm, OCI SRM GbE/FC Enhanced 1310 nm or OCI SRM GbE 1310 nm to subtending equipment (see Note 1) • Line-side connector on OCLD 2.5 Gbit/s Flex, OCLD 2.5 Gbit/s Universal, OTR, or Muxponder circuit pack to: <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM — patch panel (see Note 2) • LC filler card to: <ul style="list-style-type: none"> — OMX 4CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM 							

21-10 Cables and optical patch cords

Table 21-7 (continued)
Patch cord description - NT0H4321

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
<p>Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.</p> <p>Note 2: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-8 lists the specifications for NT0H4325.

Table 21-8
Patch cord description - NT0H4325

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4325	3 mm	SMF	simplex	10.0 m (394 in.)	single	SC/PC-LC/PC	Straight boot for both SC and LC connectors
							
<p>Used to connect: APBE circuit pack to OFA (see Note)</p>							
<p>Note: The NT0H57BB Fiber Manager is required for this application.</p>							

Table 21-9 lists the specifications for NT0H4326.

Table 21-9
Patch cord description - NT0H4326

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4326	3 mm	SMF	simplex	6.0 m (236 in.)	single	SC/PC-LC/PC	Straight boot for both SC and LC connectors
							
Used to connect: APBE circuit pack to OFA (see Note)							
Note: The NT0H57BB Fiber Manager is required for this application.							

Table 21-10 lists the specifications for NT0H4327.

Table 21-10
Patch cord description - NT0H4327

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4327	3 mm	SMF	simplex	0.39 m (15.5 in.)	single	SC/PC-LC/PC	Straight boot for both SC and LC connectors
							
Used to connect: APBE circuit pack to OFA (see Note)							
Note: This patch cord can only be used when the APBE circuit pack is equipped immediately to the right of the OFA circuit pack. For example, if the OFA circuit pack is in slots 1 to 4, then the APBE circuit pack must be equipped in slots 5 and 6. Also, if the OFA circuit pack is in slots 11 to 14, then the APBE circuit pack must be equipped in slots 15 and 16.							

Table 21-11 lists the specifications for NT0H4328.

Table 21-11
Patch cord description - NT0H4328

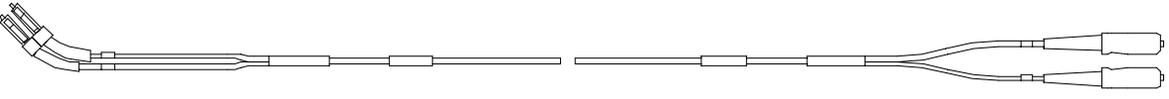
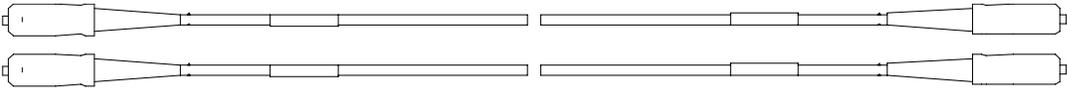
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4328	3 mm	MMF 62.5 μm MMF 50 μm	duplex	1.27 m (50 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • Transponder Protection Tray (two-channel version only) to client-side connector on OTR 2.5 Gbit/s 850 nm circuit pack for protected applications • Client-side connector on OTR 2.5 Gbit/s 850 nm circuit pack to subtending equipment for unprotected applications (see Note) • OCI SRM GbE/FC 850 nm, OCI SRM GbE/FC Enhanced 850 nm or OCI SRM GbE 850 nm to subtending equipment (see Note) 							
<p>Note: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors.</p>							

Table 21-12 lists the specifications for NT0H4330.

Table 21-12
Patch cord description - NT0H4330

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4330	3 mm	SMF	2 x simplex (two separate cables)	1.86 m (73 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
<p>Used to connect: see Note</p>							
<p>Note: The NT0H4330, NT0H4331, NT0H4332 SC/PC-SC/PC patch cords are used to make SC to SC connections for the following components (as appropriate): OSC, ECT, C&L Splitter/Coupler, OMX, PBE, OFA, DSCM, OTS, and ETS. For help to determine the appropriate patch cord, refer to the <i>Hardware Description</i>, 323-1701-102, and the “Connecting components” chapter in <i>Connection Procedures</i>, 323-1701-221.</p>							

21-14 Cables and optical patch cords

Table 21-13 lists the specifications for NT0H4331.

Table 21-13
Patch cord description - NT0H4331

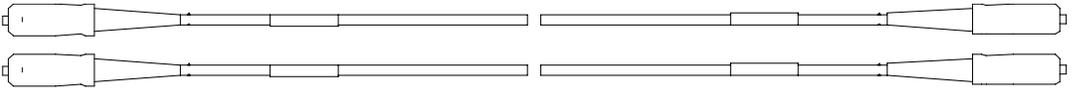
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4331	3 mm	SMF	2 x simplex (two separate cables)	2.29 m (90 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
<p>Used to connect: see Note</p>							
<p>Note: The NT0H4330, NT0H4331, NT0H4332 SC/PC-SC/PC patch cords are used to make SC to SC connections for the following components (as appropriate): OSC, ECT, C&L Splitter/Coupler, OMX, PBE, OFA, DSCM, OTS, and ETS. For help to determine the appropriate patch cord, refer to the <i>Hardware Description</i>, 323-1701-102, and the “Connecting components” chapter in <i>Connection Procedures</i>, 323-1701-221.</p>							

Table 21-14 lists the specifications for NT0H4332.

Table 21-14
Patch cord description - NT0H4332

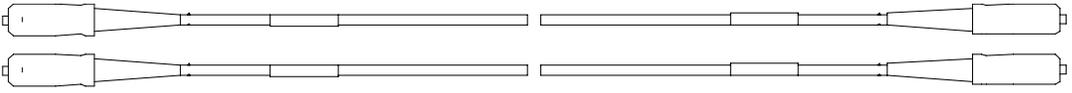
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4332	3 mm	SMF	2 x simplex (two separate cables)	7.92 m (312 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
<p>Used to connect: see Note</p>							
<p>Note: The NT0H4330, NT0H4331, NT0H4332 SC/PC-SC/PC patch cords are used to make SC to SC connections for the following components (as appropriate): OSC, ECT, C&L Splitter/Coupler, OMX, PBE, OFA, DSCM, OTS, and ETS. For help to determine the appropriate patch cord, refer to the <i>Hardware Description</i>, 323-1701-102, and the “Connecting components” chapter in <i>Connection Procedures</i>, 323-1701-221.</p>							

Table 21-15 lists the specifications for NT0H4333.

Table 21-15
Patch cord description - NT0H4333

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4333	3 mm	MMF/SMF	duplex	2.29 m (90 in.)	zipped	MTRJ-SC/PC	Straight boot for SC connector and 90° boot for MTRJ connector
<p>Used to connect:</p> <ul style="list-style-type: none"> • OCI SRM 1310 nm circuit pack to patch panel (see Note) • OCI SONET/SDH SRM circuit pack to patch panel (see Note) 							
<p>Note: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-16 lists the specifications for NT0H4343.

Table 21-16
Patch cord description - NT0H4343

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4343	3 mm	SMF	simplex	1.57 m (62 in.)	single	SC/PC-FC/PC	Straight boot for both SC and FC connectors
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack to <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — Patch panel (see Note) • OCLD filler card to <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM 							
<p>Note: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-17 lists the specifications for NT0H4344.

Table 21-17
Patch cord description - NT0H4344

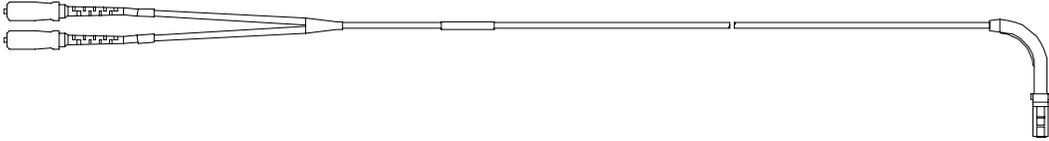
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4344	3 mm	MMF/ SMF	duplex	3.44 m (135 in.)	zipped	MTRJ-SC/PC	Straight boot for SC connector and 90° boot for MTRJ connector
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • OCI SRM 1310 nm circuit pack to patch panel (see Note) • OCI SRM SONET/SDH circuit pack to patch panel (see Note) 							
<p>Note: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-18 lists the specifications for NT0H4346.

Table 21-18
Patch cord description - NT0H4346

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4346	5 mm x 1.5 mm	SMF	duplex	1.57 m (62 in.)	zipped	FC/PC-SC/PC	Straight boot for both SC and FC connectors
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack to <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — Patch panel (see Note) • OCLD filler card to <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM 							
<p>Note: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-19 lists the specifications for NT0H4347.

Table 21-19
Patch cord description - NT0H4347

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4347	3 mm	SMF	duplex	3.18 m (125 in.)	zipped	FC/PC-LC/PC (with FC-FC adaptors)	Straight boot for both FC and LC connectors
							
Used to connect: OMX (Standard) to line-side connector on OCLD 2.5 Gbit/s Flex, OCLD 2.5 Gbit/s Universal, OTR, or Muxponder circuit pack (see Note)							
Note: The NT0H57BB Fiber Manager is required for this application.							

Table 21-20 lists the specifications for NT0H4348.

Table 21-20
Patch cord description - NT0H4348

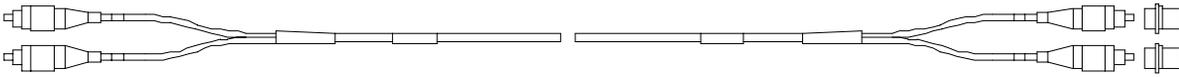
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4348	3 mm	SMF	duplex	3.18 m (125 in.)	zipped	FC/PC-FC/PC (with FC-FC adaptors)	Straight boot for both connectors
							
Used to connect: OMX (Standard) to OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack in slots 5 to 8, and slots 11 to 14. (see Note)							
Note: The NT0H57BB Fiber Manager is required for this application.							

Table 21-21 lists the specifications for NT0H4349.

Table 21-21
Patch cord description - NT0H4349

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4349	3 mm	SMF	simplex	3.0 m (118 in.)	single	SC/PC-LC/PC	Straight boot for both SC and LC connectors
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • APBE circuit pack to <ul style="list-style-type: none"> — OFA (see Note 1) — OSC — OMX — C&L Splitter/Coupler • Client-side connector on OTR 10 Gbit/s circuit pack to client-side connector on OTR 10 Gbit/s circuit pack for 10 Gbit/s regenerator applications (see Note 2) • Client-side connector on OTR 10 Gbit/s Enhanced circuit pack to client-side connector on OTR 10 Gbit/s Enhanced circuit pack for 10 Gbit/s regenerator applications (see Note 2) 							
<p>Note 1: The NT0H57BB Fiber Manager is required for this application.</p> <p>Note 2: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-22 lists the specifications for NT0H4381.

Table 21-22
Patch cord description - NT0H4381

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4381	3 mm	SMF	duplex	1.27 m (50 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector

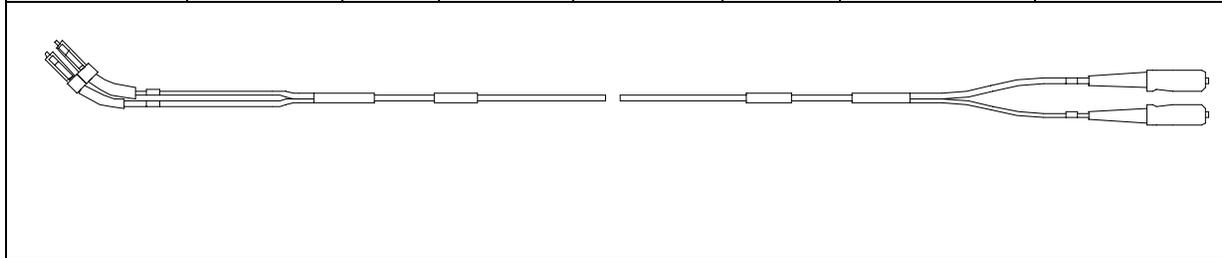


Table 21-22 (continued)
Patch cord description - NT0H4381

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
<p>Used to connect:</p> <ul style="list-style-type: none"> • OSC tray to OSC ports on the OSC circuit pack (see Note 1) • Transponder Protection Tray (two-channel version only) to client-side connector on OTR 2.5 Gbit/s 1310 nm, OTR 10 Gbit/s, or OTR 10 Gbit/s Enhanced circuit pack for protected applications • Client-side connector on OTR 2.5 Gbit/s 1310 nm, OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit pack to subtending equipment for unprotected applications (see Note 2) • OCI SRM GbE/FC 1310 nm, OCI SRM GbE/FC Enhanced 1310 nm or OCI SRM GbE 1310 nm to subtending equipment (see Note 2) • Line-side connector on the OCLD 2.5 Gbit/s Flex, OCLD 2.5 Gbit/s Universal, OTR, or Muxponder circuit pack to (see Note 2): <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM — patch panel (see Note 3) • LC filler card to (see Note 2): <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM 							
<p>Note 1: This patch cord (quantity 2) is included with the OSC kits (NT0H57DA and NT0H57FA).</p> <p>Note 2: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.</p> <p>Note 3: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-23 lists the specifications for NT0H4382.

Table 21-23
Patch cord description - NT0H4382

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4382	3 mm	SMF	duplex	3.12 m (123 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector



Table 21-23 (continued)
Patch cord description - NT0H4382

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
<p>Used to connect:</p> <ul style="list-style-type: none"> • OSC tray to OSC ports on the OSC circuit pack • Transponder Protection Tray (two-channel or four-channel version) to client-side connector on OTR 2.5 Gbit/s 1310 nm, OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit pack for protected applications (see Note 1) • Client-side connector on OTR 2.5 Gbit/s 1310 nm, OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit pack to subtending equipment for unprotected applications (see Note 2) • OCI SRM GbE/FC 1310 nm, OCI SRM GbE/FC Enhanced 1310 nm or OCI SRM GbE 1310 nm to subtending equipment (see Note 2) • Line-side connector on OCLD 2.5 Gbit/s Flex, OCLD 2.5 Gbit/s Universal, OTR, or Muxponder circuit pack to (see Note 2): <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM — patch panel (see Note 3) • LC filler card to (see Note 2): <ul style="list-style-type: none"> — OMX 4 CH Enhanced — OMX + Fiber Manager 4CH DWDM — OMX 1 CH CWDM — OMX 4 CH CWDM — OMX (4CH or 8CH) ITU CWDM — OMX (1CH or 4CH) OADM ITU CWDM 							
<p>Note 1: The NT0H57BB Fiber Manager is required for this application when using the four-channel version Transponder Protection Trays (NT0H59AA or NT0H59BA).</p> <p>Note 2: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.</p> <p>Note 3: The NT0H43CA/CB patch panel is required for this application.</p>							

Table 21-24 lists the specifications for NT0H4383.

Table 21-24
Patch cord description - NT0H4383

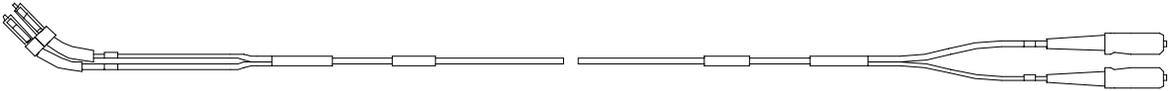
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4383	3 mm	MMF	duplex	1.27 m (50 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect: OSC tray to Wayside channel ports on OSC circuit pack (see Note)</p>							
<p>Note: This patch cord (quantity 2) is included with the OSC kits (NT0H57DA and NT0H57FA).</p>							

Table 21-25 lists the specifications for NT0H4384.

Table 21-25
Patch cord description - NT0H4384

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4384	3 mm	MMF 62.5 µm MMF 50 µm	duplex	3.12 m (123 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect:</p> <ul style="list-style-type: none"> • Transponder Protection Tray (two-channel or four-channel version) to client-side connector on OTR 2.5 Gbit/s 850 nm circuit pack for protected applications (see Note 1) • Client-side connector on OTR 2.5 Gbit/s 850 nm circuit pack to subtending equipment for unprotected applications (see Note 2) • OCI SRM GbE/FC 850 nm, OCI SRM GbE/FC Enhanced 850 nm or OCI SRM GbE 850 nm to subtending equipment (see Note 2) 							
<p>Note 1: The NT0H57BB Fiber Manager is required for this application when using the four-channel version Transponder Protection Trays (NT0H59AA or NT0H59BA).</p> <p>Note 2: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application.</p>							

Table 21-26 lists the specifications for NT0H4385.

Table 21-26

Patch cord description - NT0H4385

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4385	3 mm	MMF 62.5 μm on Rx side and SMF on Tx side	duplex	3.12 m (123 in.)	zipped	SC/PC-LC/ PC	straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect: OCI SRM 1310 nm LC or OCI SRM SONET/SDH LTE to subtending equipment (see Note 1) or to patch panel</p>							
<p>Note 1: This patch cord can be used to connect directly to the subtending equipment if the subtending equipment and the Optical Metro 5100/5200 shelf are co-located and the subtending equipment uses SC connectors. Contact Nortel Networks if longer length patch cords are required for your application</p> <p>Note 2: This patch cord is required for all applications of the OCI SRM 1310 nm LC circuit pack:</p> <ul style="list-style-type: none"> • can be used directly for the SM/SM application • can be used directly for the SM (Tx)/MM (Rx) application • can be used for the MM/MM application with a mode-conditioning device <p>Note 3: When multi-mode fiber is used, a mode-conditioning patch cord or mode-conditioning plug is required to guarantee error-free performance if the subtending equipment is not collocated (less than 30 m [100 ft.] away) with the Optical Metro 5100/5200.</p>							

Table 21-27 lists the specifications for NT0H4386.

Table 21-27
Patch cord description - NT0H4386

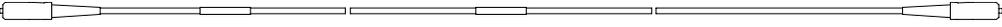
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4386	3 mm	SMF	simplex	0.86 m (34 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 1 to ECT (OUT) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-28 lists the specifications for NT0H4387.

Table 21-28
Patch cord description - NT0H4387

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4387	3 mm	SMF	simplex	0.93 m (37 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 5 to ECT (OUT) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-29 lists the specifications for NT0H4388.

Table 21-29
Patch cord description - NT0H4388

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4388	3 mm	SMF	simplex	1.07 m (42 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 11 to ECT (OUT) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-30 lists the specifications for NT0H4389.

Table 21-30
Patch cord description - NT0H4389

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4389	3 mm	SMF	simplex	1.17 m (46 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 15 to ECT (OUT) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-31 lists the specifications for NT0H4390.

Table 21-31
Patch cord description - NT0H4390

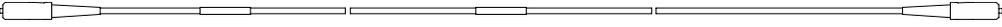
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4390	3 mm	SMF	simplex	0.86 m (34 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 1 to ECT (IN) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-32 lists the specifications for NT0H4391.

Table 21-32
Patch cord description - NT0H4391

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4391	3 mm	SMF	simplex	0.93 m (37 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 5 to ECT (IN) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-33 lists the specifications for NT0H4392.

Table 21-33
Patch cord description - NT0H4392

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4392	3 mm	SMF	simplex	1.07 m (42 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 11 to ECT (IN) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-34 lists the specifications for NT0H4393.

Table 21-34
Patch cord description - NT0H4393

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4393	3 mm	SMF	simplex	1.17 m (46 in.)	single	SC/PC-SC/PC	Straight boot for both connectors
							
Used to connect: OFA circuit pack Slot 15 to ECT (IN) (see Note)							
Note: This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB).							

Table 21-35 lists the specifications for NT0H4396.

Table 21-35
Patch cord description - NT0H4396

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4396	3 mm	MMF	duplex	3.12 m (123 in.)	zipped	SC/PC-LC/PC	Straight boot for SC connector and 45° boot for LC connector
							
<p>Used to connect: OSC tray to Wayside channel ports on OSC circuit pack</p>							

Table 21-36 lists the specifications for NT0H4398.

Table 21-36
Patch cord description - NT0H4398

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H4398	3 mm at MPO end 1.8 mm at breakout points	MMF	8	3.2 m (126 in.)	single	MPO-8xSC	Straight boot for all connectors
<p>Used to connect: OCI SRM ESCON circuit pack to patch panel (see Note 1 and Note 2)</p>							
<p>Note 1: The NT0H43CA/CB patch panel is required for this application. Note 2: Two NT0H4398 patch cords are required for each OCI SRM ESCON circuit pack.</p>							

Table 21-37 lists the specifications for NT0H43JC.

Table 21-37
Patch cord description - NT0H43JC

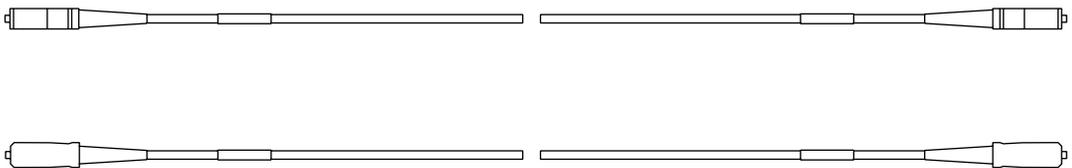
PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type	Connector description
NT0H43JC	3 mm	SMF	simplex	0.39 m (15.5 in.)	single	SC/PC-SC/ PC	Straight boot for both connectors
							
Used to connect:							
OFA VGA circuit pack to OFA VGA circuit pack in the same shelf							

Table 21-38 lists the specifications for NTTC53AT to NTTC53AY.

Table 21-38
Patch cord description - NTTC53AT to NTTC53AY

PEC	Diameter	Fiber type	Number of fibers	Length	Jacket type	Connector type
NTTC53AT	2 mm (twin jacket)	SMF	duplex	1 m (39 in.)	zipped	LC/PC-LC/PC
NTTC53AU				2 m (79 in.)		
NTTC53AV				3 m (118 in.)		
NTTC53AW				5 m (16.4 ft.)		
NTTC53AX				7 m (23 ft.)		
NTTC53AY				10 m (32.8 ft.)		



Used to connect:

Line-side connector on OCLD 2.5 Gbit/s Flex, OCLD 2.5 Gbit/s Universal, OTR circuit packs, Muxponder 10 Gbit/s GbE/FC circuit pack or LC filler card to:

- OMX 16 CH DWDM
- Common Photonic Layer CMD

Table 21-39 lists the OCI SRM ESCON cable breakout color code.

Table 21-39
OCI SRM ESCON cable breakout color code

Fiber number	Break-out color	Tx MPO	Rx MPO
1	Blue	Port 1 Transmit	Port 1 Receive
2	Orange	Port 2 Transmit	Port 2 Receive
3	Green	Port 3 Transmit	Port 3 Receive
4	Brown	Port 4 Transmit	Port 4 Receive
5	Grey	Port 5 Transmit	Port 5 Receive
6	White	Port 6 Transmit	Port 6 Receive
7	Red	Port 7 Transmit	Port 7 Receive
8	Black	Port 8 Transmit	Port 8 Receive

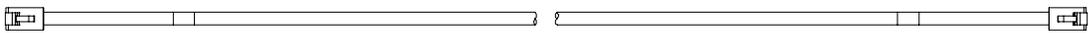
Data communications cables

Optical Metro 5100/5200 shelves support data communication between a shelf and passive optical components, that are associated with the shelf.

Inside the maintenance panel of each shelf are two OMX interface (OMXI) cards that allow the System Manager to inventory and monitor the equipment. Each passive optical component contains an identity card that carries information about that component. Data communication cables are used to connect an passive optical component to an OMXI port or the Equipment Inventory Unit.

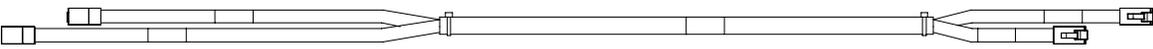
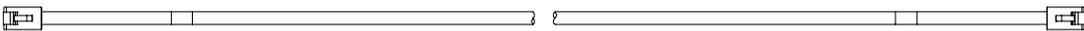
Table 21-40 lists the specifications for each cable.

Table 21-40
Data communication cables

PEC	Type and Length	Use
NT0H5731	Duplex RJ45-RJ45 1.15 m (45 in.)	Connect two OMX (Standard) trays to the maintenance panel.
NT0H4345	Simplex RJ45-RJ45 1.5 m (60 in.)	<ul style="list-style-type: none"> • Connect passive optical components to the maintenance panel or Equipment Inventory Unit (EIU). • Connect the maintenance panel to the EIU.
		

21-38 Cables and optical patch cords

Table 21-40 (continued)
Data communication cables

PEC	Type and Length	Use
NT0H4403	Duplex RJ45-RJ45 0.77 m (30 in.)	Connect two ECT trays to the maintenance panel.
		
NT0H4322	Simplex RJ45-RJ45 2.98 m (117 in.)	<ul style="list-style-type: none"> • Connect passive optical components to the maintenance panel or Equipment Inventory Unit (EIU). • Connect the maintenance panel to the EIU.
		

Rectifiers

In this chapter

- [Rectifiers on page 22-1](#)
- [3U APRS on page 22-2](#)
- [1U APRS on page 22-8](#)

Note: For a list of the product engineering codes (PEC) for all rectifiers, refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

Rectifiers

Optical Metro 5100/5200 shelves require direct current (dc) power. If your site does not have access to a –48 V dc power source, you must install rectifiers to convert the alternating current (ac) power to dc in order to power your shelves.

See *Technical Specifications*, 323-1701-180, for information about the power requirements of the

- Optical Metro 5200 shelf, refer to [Table 1-2 on page 1-3](#)
- Optical Metro 5100 shelf, refer to [Table 1-3 on page 1-5](#)
- Enhanced Trunk Switch (ETS) shelf, refer to [Table 1-34 on page 1-35](#)
- Optical Trunk Switch (OTS), refer to [Table 1-33 on page 1-34](#)

Two rectifiers are available through Nortel Networks: the 3U AC Power Rectifier Shelf (3U APRS), and the 1U AC Power Rectifier Shelf (1U APRS). The 3U APRS can provide power to and Optical Metro 5200 shelf, an Optical Metro 5100 shelf, an ETS shelf and an OTS. The 1U APRS can provide power for Optical Metro 5100 shelves only.

A Breaker Interface Panel or Fuse Panel must be used between a 3U APRS rectifier and Optical Metro 5100 shelves.

3U APRS

The 3U APRS is a 3 U high rack-mounted chassis that can hold a maximum of two rectifier modules. To provide a redundant input power supply, one rectifier module is required for each of the two input feeds on an Optical Metro 5100/5200 shelf, and ETS shelf or an OTS. See [Figure 22-1](#).

Power requirements

The 3U APRS can operate with 110/120 V ac or a 208/220/240 V ac input feed.

If the input feed is 208/220/240 V ac, a single chassis equipped with two rectifier modules can provide redundant power for two Optical Metro 5200 shelves, or two Optical Metro 5100 shelves, one Optical Metro 5100 shelf with one ETS shelf or one OTS, or a combination of two ETS shelves or two OTS. In addition to the 208/220/240 V ac input feed you need

- two dedicated 208/220/240 V ac circuits, each with 20 A circuit breaker protection
- two 20 A receptacles (per circuit and country specific)

If the input feed is 110/120 V ac, a single chassis equipped with two rectifier modules can provide redundant power to one Optical Metro 5200 shelf, or two Optical Metro 5100 shelves, one Optical Metro 5100 shelf with one ETS shelf or one OTS, or a combination of two ETS shelves or two OTS. In addition to the 110/120 V ac input feed you need

- two dedicated 120 V ac circuits, each with 20 A circuit breaker protection
- two NEMA 5-20R receptacles (one per circuit) available within the cabinet or frame

An Ethernet hub can be powered by the same rectifier that is used to power shelves in either mode (110/120 V ac or 208/220/240 V ac). An Ethernet hub consumes approximately 20 Watts of power, an Optical Metro 5200 shelf consumes approximately 675 Watts, and an Optical Metro 5100 shelf consumes even less. For information on the ETS and OTS power consumption, refer to the “[Hardware specifications](#)” chapter in *Technical Specifications*, 323-1701-180.

A rectifier connected to a 120 V power source may supply 1100 Watts, and a 240 V power source may supply 1680 Watts, so there is an adequate supply of power for shelves plus the Ethernet hub. For more information on power consumption, see the “[Hardware specifications](#)” chapter in *Technical Specifications*, 323-1701-180.

[Figure 22-1](#) shows the front of the 3U APRS chassis with two modules installed. [Figure 22-2](#) shows the back of the rectifier chassis.

**DANGER****Risk of electrical shock**

The ac rectifiers require that the ac main receptacles provide a ground/protective earth connection. The ground/protective earth conductor of the ac power cords must be connected to this ground/protective earth connection by way of a suitable plug in accordance with local and national electrical codes.

ATTENTION

For redundant power supply, Nortel Networks recommends that both ac circuits be derived from the same ac phase. Consult your local and national safety codes if you are considering powering each rectifier from different ac phases.

Figure 22-1
Front view of a 3U APRS chassis with two rectifier modules installed

OM0242p

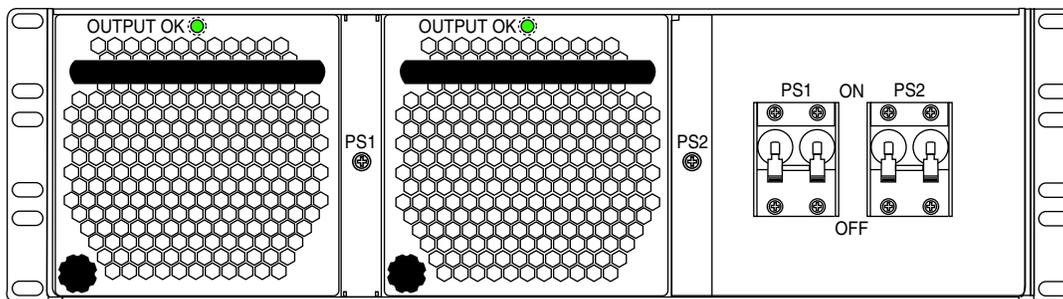
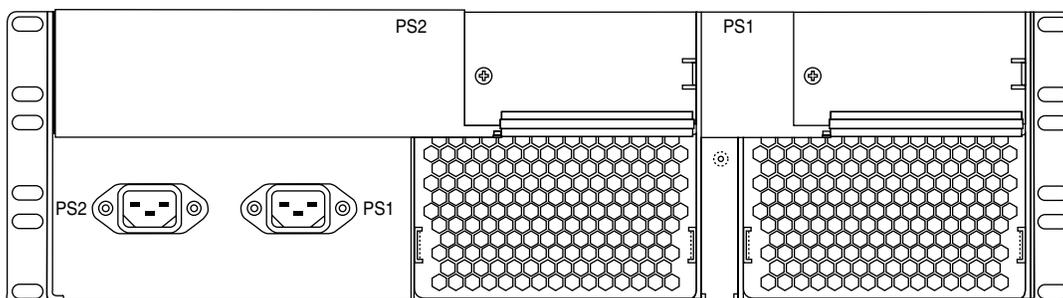


Figure 22-2
Rear view of a 3U APRS chassis with two rectifier modules installed

OM0100p

**Connectors**

The 3U APRS chassis has two IEC-320-C20 connectors on the back, that are used to connect the ac power supply to each rectifier unit. You need a C19 plug on each ac power cord in order to connect the power supply to the rectifier unit.

Screw terminals on the back of the chassis provide the connection points for wiring the direct current outputs (–48V dc and return) to the shelf. To the left of the BUS bar is a two-terminal alarm connector that indicates “power fail” before a loss of dc output regulation occurs. The alarm terminal is an open collector signal, capable of sinking up to 40mA at 40V. The alarm return terminal is the logic return connection.

Location

The recommended location for the 3U APRS is in the lowest position in the equipment rack. For more information about positioning equipment in a rack, refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110.

Mounting options

Refer to *Installing Optical Metro 5200 Shelves and Components*, 323-1701-201, and *Installing Optical Metro 5100 Shelves and Components*, 323-1701-210 for mounting options.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

[Figure 22-3](#) shows the rectifier chassis.

Figure 22-3
Rectifier chassis - NT0H4312

OM0453.jpg



Figure 22-4 shows the rectifier unit.

Figure 22-4
Rectifier unit - NT0H4311

OM0446.jpg



Figure 22-5 shows the ac power cable.

Figure 22-5
Alternating current power cable (220 V/20 A) - NT0H43DB

OM0447.jpg



Figure 22-6 shows the ANSI 10 AWG rectifier to shelf power cable (NT0H4366).

Note: The ETSI equivalent of this cable (NT0H4368 - ETSI 10 AWG rectifier to shelf power cable) has blue and black cables, and only has a lug at one end of the cable.

Figure 22-6
ANSI 10 AWG rectifier to shelf power cable (length 3.0m/9.8 ft) - NT0H4366

OM0449.jpg



Figure 22-7 shows the ac power connector.

Figure 22-7
Alternating current power connector (220 V/20 A) - A0344941

OM0448p.jpg and OM0460.jpg



Figure 22-8 shows the strain relief connector.

Figure 22-8
Strain relief connector - A0849101

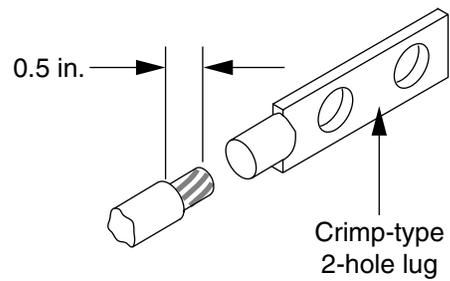
OM0450.jpg



Figure 22-9 shows the grounding lug.

Figure 22-9
Grounding lug - A0772784

DX0390



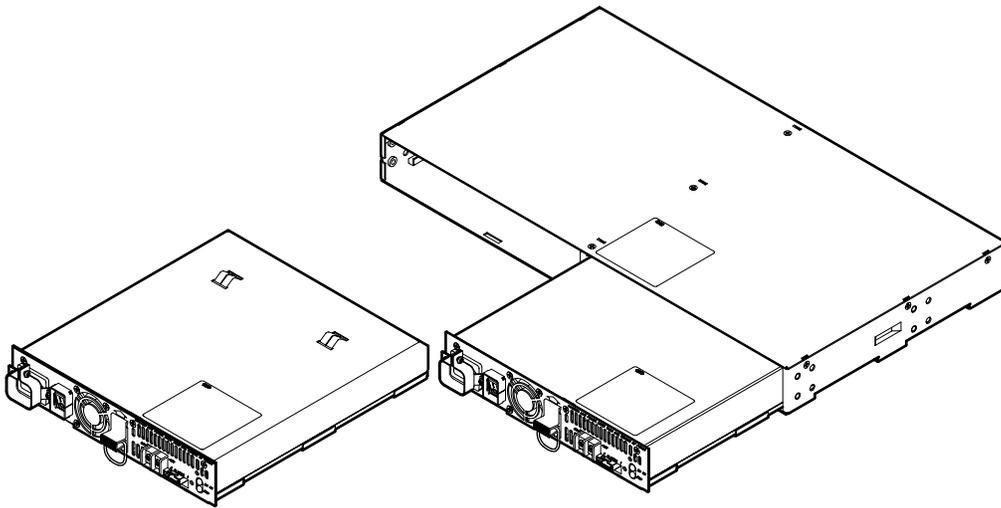
1U APRS

The 1U APRS rectifier is a 1 U high rack-mounted chassis that can hold a maximum of two rectifier modules. The 1U APRS rectifier can provide power to one ETS shelf, one OTS or one Optical Metro 5100 shelf. One chassis with two modules is required to provide a redundant input power supply to each ETS shelf, OTS or Optical Metro 5100 shelf. [Figure 22-10](#) shows the 1U APRS chassis and rectifier modules.

Note: The 1U APRS does not provide sufficient power for an Optical Metro 5200 shelf.

Figure 22-10
1U APRS chassis and rectifier modules

OM1708p

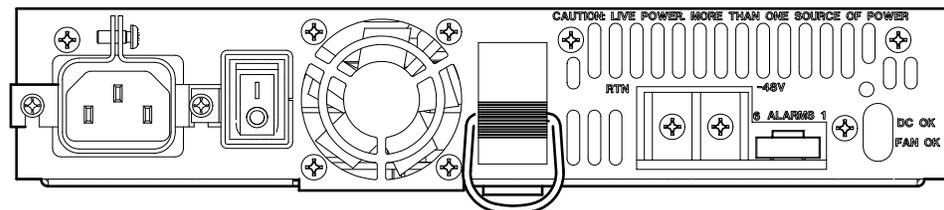


A locking telemetry connector on the front of each module provides alarm contacts that indicate an ac input failure, dc output failure, or fan failure. If there is a short-circuit on the -48V output, the rectifier module provides a controlled shutdown, and recovers when the short circuit is removed. There are no user-serviceable fuses or circuit breakers on the 1U APRS module.

[Figure 22-11](#) shows a front view of a 1U APRS rectifier module.

Figure 22-11
1U APRS module

OM1709p



The 1U APRS modules are identical, and have the following elements (beginning at the left side) accessible on the front of the module:

- IEC 320–C14 (male) connector for the ac power supply cable
- ac power switch
- cooling unit intake
- locking latch
- 2-pin terminal block for dc power output
- locking connector for telemetry connections
- indicator lamps

Cooling unit

Each rectifier module has integrated fans for cooling the unit.

If a fan fails, the rectifier continues to function for several minutes until it shuts down. If you have provided the shelf with a redundant power supply, the second module continues to power the shelf.

Power requirements

The 1U APRS can operate with a 110/120 V ac, or 208/220/240 V ac power source.

The ac power source must be within the following voltage and frequency:

- 90 V ac to 264 V ac (RMS)
- 45 Hz to 65 Hz.

At power-up, each module draws a maximum inrush current of 10 A.

The maximum steady-state ac power source required by each module is 3 A at 90VAC (low-line).

If the input feed is 208/220/240 V ac, a single chassis equipped with two rectifier modules can provide redundant power for one Optical Metro 5100 shelf. In addition to the 208/220/240 V ac input feed you need

- circuit breaker protection, maximum 16 A
- two receptacles appropriately rated for the circuit (country-specific)

The following lists commonly used circuit breakers:

- North America—15 A
- Europe/International—16 A
- UK—13 A

If the input feed is 110/120 V ac, a single chassis equipped with two rectifier modules can provide redundant power to one Optical Metro 5100 shelf. In addition to the 110/120 V ac input feed you need

- 15 A circuit breaker protection
- NEMA 5-15R receptacles (one per circuit) available within the frame



DANGER

Risk of electrical shock

The ac rectifiers require that the ac main receptacles provide a ground/protective earth connection. The ground/protective earth conductor of the ac power cords must be connected to this ground/protective earth connection by way of a suitable plug in accordance with local and national electrical codes.

ATTENTION

For redundant power supply, Nortel Networks recommends that both ac circuits be derived from the same ac phase. Consult your local and national safety codes if you are considering powering each rectifier from different ac phases.

Indicator lamps

Table 22-1 lists the meaning of the indicator lamps on the 1U APRS.

Table 22-1
Indicator lamps on the 1U APRS

Indicator lamp	Color	State	Meaning
DC OK	green	on	The absolute value of the -48V dc output voltage is greater than 41.75 V (± 0.5 V) and the output current is within the normal operating range.
	red	on	The absolute value of the -48V dc output voltage is less than 41.75 V (± 0.5 V), or the output current exceeds the normal operating range.
	red/green	off	The ac mains voltage has failed.
FAN OK	green	on	The fan is operating
	red	on	The fan has failed.
	red/green	off	the ac mains voltage has failed.

Connectors

Each 1U APRS module has

- an IEC 320–C14 (male) connector (requires a cable with an IEC 320–C13 (female) plug to connect to the main ac power supply)
- 2-screw terminal block for dc power connections
- locking connector for telemetry connections

The 1U APRS rectifier kit includes

- cables for the –48V dc power connections
- cables for telemetry connections (The 1U APRS rectifier kit includes the telemetry cables, connectorized with the necessary plugs)

Table 22-2 lists the connectors on the 1U APRS terminal block

Table 22-2
Terminal block connectors on the 1U APRS

Label	Description
RTN	Connect this terminal to the return (RET) terminal on the power card.
–48V	Connect this terminal to the –48 V terminal on the power card.

Figure 22-12 shows the pinout of the alarm connector on the 1U APRS rectifier module.

Figure 22-12
1U APRS alarm connector

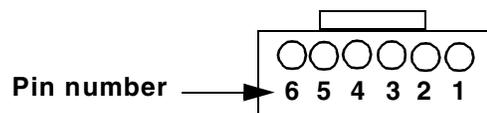


Table 22-3 lists the connectors on the 1U APRS alarm connector.

Table 22-3
Alarm connectors on the 1U APRS

Label	Pin number	Wire color	Description
AC OK			<p>Pins 4 and 5 are relay contact points used to indicate the status of the ac power present at the rectifier.</p> <p>The points are rated for a maximum current of 1 A.</p> <p>Use these pins to connect to the telemetry inputs on the Optical Metro 5100 maintenance panel card.</p>
AC OK N/C	6	—	The Normally Closed pin for the AC OK relay (Not used)
AC OK N/O	5	white/blue	The Normally Open pin for the AC OK relay
COM	4	blue	<p>The COM pin for the AC OK relay contact points. (See Table 22-4)</p> <p>Pin 4 is disconnected from pin 5 (N/O) when ac power is present.</p> <p>Pin 4 is connected to Pin 5 (N/O) when ac power fails.</p>
DC/FAN OK			<p>Pins 1 and 2 are relay contact points used to indicate the status of the internal fan and dc power supply.</p> <p>The points are rated for a maximum current of 1 A.</p> <p>Use these pins to connect to the telemetry inputs on the Optical Metro 5100 maintenance panel card.</p>
DC/FAN OK N/C	3	—	The Normally Closed pin for the DC/FAN OK relay (Not used)
DC/FAN OK N/O	2	white/orange	The Normally Open pin for the DC/FAN OK relay
COM	1	orange	<p>The COM pin for the DC/FAN OK relay contact points (See Table 22-4)</p> <p>Pin 1 is disconnected from pin 2 (N/O) when</p> <ul style="list-style-type: none"> • ac power is present and • the fan is operating and • dc output voltage is within normal operating range. <p>Pin 1 is connected to pin 2 (N/O) when</p> <ul style="list-style-type: none"> • ac power is present and • the fan is not operating, or the dc power has failed

Table 22-4 show the relay connectivity during normal operating conditions, and failure conditions.

Table 22-4
Logic diagram for 1U APRS alarm relays

Condition			AC OK relay		DC/FAN OK relay	
ac power	fan	dc power	pin 5 (N/O)	pin 4 (COM)	pin 2 (N/O)	pin 1 (COM)
OK	OK	OK	●	●	●	●
Failed	N/A	N/A	●—————●		●	●
OK	OK	Failed	●	●	●—————●	
OK	Failed	OK	●	●	●—————●	
OK	Failed	Failed	●	●	●—————●	
N/O = normally open COM = common						

Location

Mount the 1U APRS chassis in the first set of empty mounting brackets directly above the Optical Metro 5100 shelf to which it is supplying power.

Mounting options.

Refer to *Installing Optical Metro 5100 Shelves and Components*, 323-1701-210.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Patch panel

In this chapter

This chapter includes the following sections:

- [OCI SRM 1310 nm, OCI SRM SONET/SDH, and OCI SRM ESCON applications on page 23-2](#)
- [Mode-conditioning plug application on page 23-2](#)
- [OCI SRM 1310 nm LC application on page 23-4](#)
- [OCLD/OTR attenuation at Optical Metro 5100/5200 sites without OMX application on page 23-5](#)
- [OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced back-to-back pass-through connection application on page 23-5](#)
- [Muxponder 10 Gbit/s GbE/FC client-side connection application on page 23-5](#)
- [Muxponder 10 Gbit/s GbE/FC VCAT client-side connection application on page 23-6](#)
- [OMX 16CH DWDM attenuation application on page 23-6](#)
- [Optical Trunk Switch application on page 23-6](#)
- [Patch panel location, mounting, and product specifications on page 23-7](#)

Note: For a list of the product engineering codes (PEC) related to the mode conditioning plug, cables, and patch panels, refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

OCI SRM 1310 nm, OCI SRM SONET/SDH, and OCI SRM ESCON applications

Shelves with OCI SRM 1310 nm, OCI SRM SONET/SDH, or OCI SRM ESCON circuit packs require the use of a patch panel. The patch panel enables compatibility between the SC connectors of subtending equipment and the

- MT-RJ connectors of the OCI SRM or OCI SRM SONET/SDH circuit pack. OCI SRM (MT-RJ to SC) patch cords are available from Nortel Networks in two lengths.
- MPO connectors of the OCI SRM ESCON circuit pack.

You need one patch panel for every two OCI SRM 1310 nm or OCI SRM SONET/SDH circuit packs in a shelf. You can install up to eight OCI SRM or OCI SRM SONET/SDH circuit packs in an Optical Metro 5200 shelf, which means you could require as many as four patch panels for each shelf. You can install up to two OCI SRM or OCI SRM SONET/SDH circuit packs in an Optical Metro 5100 shelf, which means you could require one patch panel for each shelf.

You need one patch panel for every OCI SRM ESCON circuit pack in a shelf. You can install up to eight OCI SRM ESCON circuit packs in an Optical Metro 5200 shelf, which means you could require as many as eight patch panels for each shelf. You can install up to two OCI SRM ESCON circuit packs in an Optical Metro 5100 shelf, which means you could require as many as two patch panels for each shelf.

Mode-conditioning plug application

The mode-conditioning plug integrates the functionality of a mode-conditioning patch cord into a standard SC-SC attenuator package. The mode-conditioning plug optimizes 1310 nm laser based operation over multi-mode fiber (MMF).

A mode-conditioning plug is needed when a 1310 nm laser-based transmitter of an Optical Metro 5100/5200 circuit pack is connected to the subtending equipment using multimode fiber. The mode-conditioning plug is only required for this application if the subtending equipment is not collocated with the Optical Metro 5100/5200. Collocated means less than 30 m (100 ft.) away. Launching a single-mode laser directly into the center of a multimode fiber can generate multiple signals that cause a degradation in the signal quality at the receiver at the other end of the fiber. These multiple signals, caused by Differential Mode Delay (DMD) effects, severely limit the cable distance lengths for error-free operation. A mode-conditioning plug eliminates these multiple signals by allowing the single-mode launch to be offset away from the center of a multimode fiber. This offset point creates a launch that is similar to typical multimode LED launches.

Two separate versions of the mode-conditioning plug exist, one for 50 μ m multi-mode fiber operation and one for 62.5 μ m multi-mode fiber operation.

The mode-conditioning plug:

- optimizes 1310 nm laser-based operation over multi-mode fiber
- complies with IEEE 802.3 for Gigabit Ethernet operation
- removes the need for a post patch-panel mode-conditioning patch-cord
- supports both 50 μ m and 62.5 μ m multi-mode fiber types
- is to be placed in the existing patch panel
- is delivered in a standard SC-SC attenuator package which allows the plug to be used on any product platform using SC connectors
- is deployable with suitable circuit packs in all prior and subsequent releases of the Optical Metro 5100/5200 platform (see “[Compatibility requirements](#)” on page 23-4)

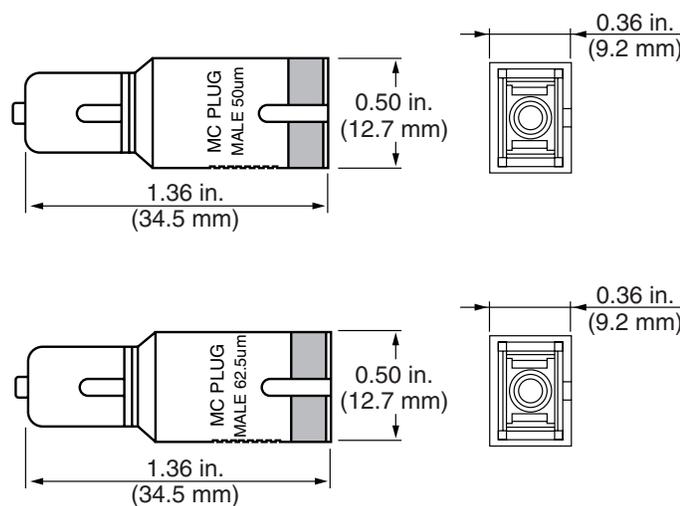
Physical description

The mode-conditioning plug is based on a standard SC-SC fixed attenuator package. Purple labeling identifies the mode-conditioning plug for 50 μ m multi-mode fiber operation and orange labeling identifies the mode-conditioning plug for 62.5 μ m multi-mode fiber operation. [Figure 23-1 on page 23-3](#) shows the mode-conditioning plug.

A green-colored band identifies the mode-conditioning plug for 50 μ m multi-mode fiber operation. An orange-colored band identifies the mode-conditioning plug for 62.5 μ m multi-mode fiber operation.

Figure 23-1
Mode-conditioning plug

OM2568p



Compatibility requirements

The following Optical Metro 5100/5200 circuit packs are compatible with the mode-conditioning plug if the subtending equipment is not collocated with the Optical Metro 5100/5200:

- OCI 1.25 Gbit/s 1310 nm
- OCI SRM 1310 nm
- OCI SRM 1310 nm LC
- OCI SRM GbE/FC 1310 nm
- OCI SRM GbE/FC Enhanced 1310 nm
- OCI SRM GbE 1310 nm
- OCI SRM SONET/SDH LTE
- OTR 2.5 Gbit/s Flex 1310 nm
- OTR 2.5 Gbit/s Flex 100 GHz 1310 nm
- Muxponder 10 Gbit/s GbE/FC
- Muxponder 10 Gbit/s GbE/FC VCAT

Note: The mode-conditioning plug is not compatible with the Transponder Protection Tray. You cannot use the mode-conditioning plug in client protected configurations using the Transponder Protection Tray.

Location

Always deploy the mode-conditioning plug with a patch panel.

Note: Mode-conditioning plugs cannot be connected to the Optical Metro 5100/5200 circuit pack port facing the link. This type of connection prevents the installation of the shelf cover.

Product engineering codes

Note: For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

OCI SRM 1310 nm LC application

The 16-port SC connector patch panel or 20-port SC connector patch panel can be used with the OCI SRM 1310 nm LC circuit pack in certain applications. One example is an application that requires an attenuator to be added in the link connecting the subtending equipment to the OCI SRM 1310 nm LC circuit pack to avoid overloading the Rx port. This application requires a patch panel to hold the attenuator if the attenuator cannot be connected to the subtending equipment ports facing the link.

Another example is when a mode-conditioning plug is required to guarantee error-free performance if the subtending equipment is not collocated with the Optical Metro 5100/5200. Collocated means less than 30 m (100 ft.) away. See [“Mode-conditioning plug application” on page 23-2](#) for more information on the mode-conditioning plug.

Note: Attenuators cannot be connected to the OCI SRM 1310 nm LC circuit pack ports facing the link. This type of connection prevents the installation of the shelf cover. You must use a patch panel to connect attenuators or mode-conditioning plugs to the OCI SRM 1310 nm LC circuit pack.

OCLD/OTR attenuation at Optical Metro 5100/5200 sites without OMX application

Install a patch panel at an Optical Metro 5100/5200 site that does not have an OMX, if attenuation of the OCLD/OTR Rx signal is required. Install the attenuator in the patch panel. The 16-port patch panel can be used to provide attenuation for up to eight signals. The 20-port patch panel can be used to provide attenuation for up to ten signals.

Note: Attenuators cannot be connected to the Optical Metro 5100/5200 circuit pack port facing the link. This type of connection prevents the installation of the shelf cover.

OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced back-to-back pass-through connection application

A patch panel is used to connect a pair of OTR 10 Gbit/s circuit packs with the same band and channel back-to-back for a pass-through connection. The 16-port or 20-port patch panel provides the following functions for this application:

- provides a method to secure the SC-type attenuator required when connecting the client-side interfaces of two OTR 10 Gbit/s circuit packs back-to-back
- provides fiber management for excess fiber

Muxponder 10 Gbit/s GbE/FC client-side connection application

To connect the client-side connectors on the SFP interfaces of the Muxponder 10 Gbit/s GbE/FC circuit pack, you can use the 16-port SC connector patch panel to house eight pairs of LC-SC fiber patch cords with 1.6 mm diameter. (You can also use the 20-port SC connector patch panel.) Other types of fiber patch cord can over-fill the exit openings at the base of the circuit pack slot. Order the multi-mode fiber (MMF) cable for 850 nm client interfaces, and the hybrid single-mode fiber (SMF)/multi-mode fiber (MMF) cable for 1310 nm client interfaces. These fixed-length cables (3.1 meters) connect the circuit pack (with LC connectors) to the patch panel (with SC connectors). The patch

panel is the intended demarcation point. One 16-port patch panel can accommodate all eight client ports on the Muxponder 10 Gbit/s GbE/FC circuit pack.

Note: You can also connect the 1.6 mm LC-to-SC fiber patch cords directly to the subtending equipment if it is co-located with the Optical Metro 5100/5200 shelf.

Muxponder 10 Gbit/s GbE/FC VCAT client-side connection application

To connect the client-side connectors on the SFP interfaces of the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack, use the 20-port SC connector patch panel to house ten pairs of LC-SC fiber patch cords with 1.6 mm diameter. Other types of fiber patch cord can over-fill the exit openings at the base of the circuit pack slot. Order the multi-mode fiber (MMF) cable for 850 nm client interfaces, and the hybrid single-mode fiber (SMF)/multi-mode fiber (MMF) cable for 1310 nm client interfaces. These fixed-length cables (3.1 meters) connect the circuit pack (with LC connectors) to the patch panel (with SC connectors). The patch panel is the intended demarcation point. One 20-port patch panel can accommodate all ten client ports on the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack.

Note: You can also connect the 1.6 mm LC-to-SC fiber patch cords directly to the subtending equipment if it is co-located with the Optical Metro 5100/5200 shelf.

OMX 16CH DWDM attenuation application

Unlike the current OMX 4Ch + Fiber Manager and OMX 4CH Enhanced DWDM OMX, the OMX 16CH DWDM does not support padding at the band level. Receiver overload correction is implemented on a per channel basis using direct padding on the LC-LC sliding adapters with LC-LC attenuators. Direct padding using SC-SC attenuators is not supported on the OMX 16CH DWDM but you can use a patch panel to house the SC-SC attenuators. For details, refer to *Network Planning and Link Engineering*, 323-1701-110.

Optical Trunk Switch application

A patch panel is required when the Optical Trunk Switch network is carrying OTR 10 Gbit/s Enhanced circuit pack signals and the link loss between the primary and standby Optical Trunk Switch paths is greater than 2 dB. The 16-port or 20-port patch panel provides the following functions for this application:

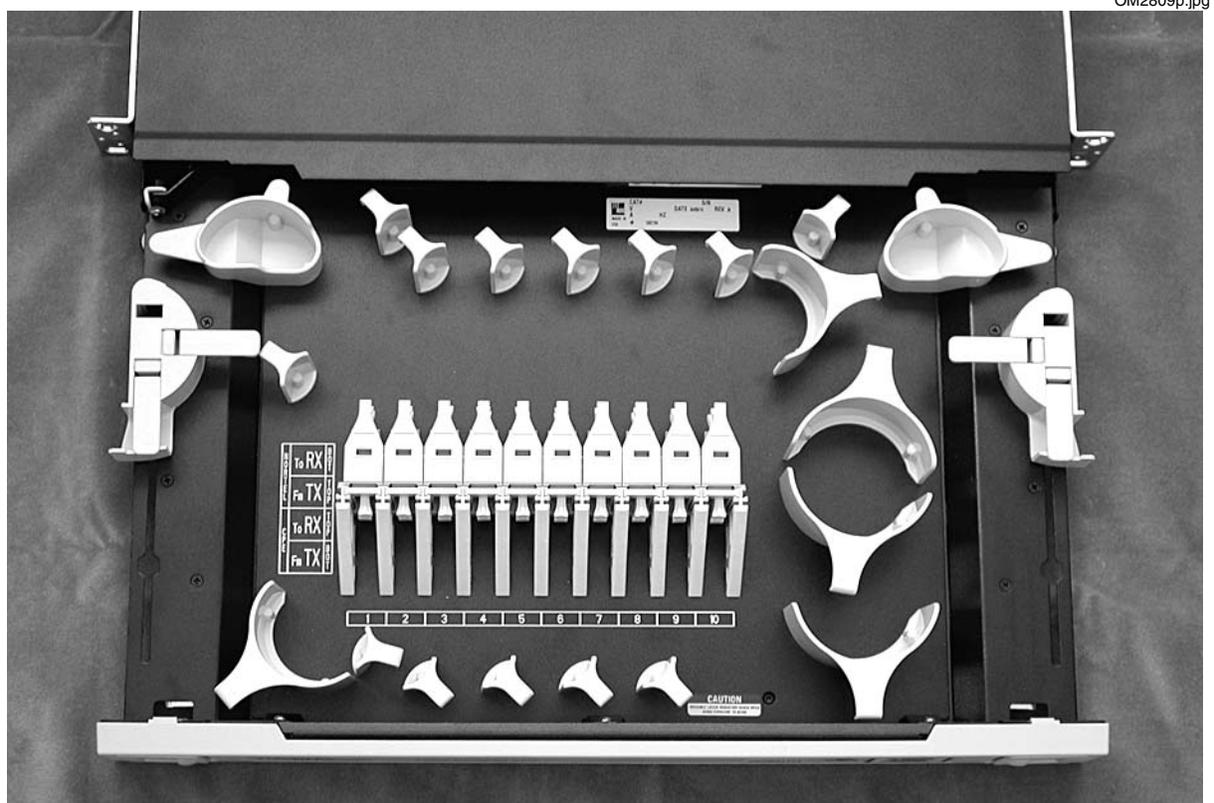
- provides a method to secure the SC-type attenuator required to balance the link loss between the two Optical Trunk Switch paths
- provides fiber management for excess fiber

Patch panel location, mounting, and product specifications

The 20-port patch panel is a 20-port version of the 16-port patch panel. The 20-port patch panel is used in the same applications as the 16-port patch panel, and in the Muxponder 10 Gbit/s GbE/FC VCAT client-side connection application. The four additional ports of the 20-port patch panel are required in this application because the Muxponder 10 Gbit/s GbE/FC VCAT circuit pack has a total of 20 client signals (10 ports of Rx and Tx) on each circuit pack.

Figure 23-2 shows the interior of the 20-port patch panel.

Figure 23-2
Interior view of a 20-port patch panel



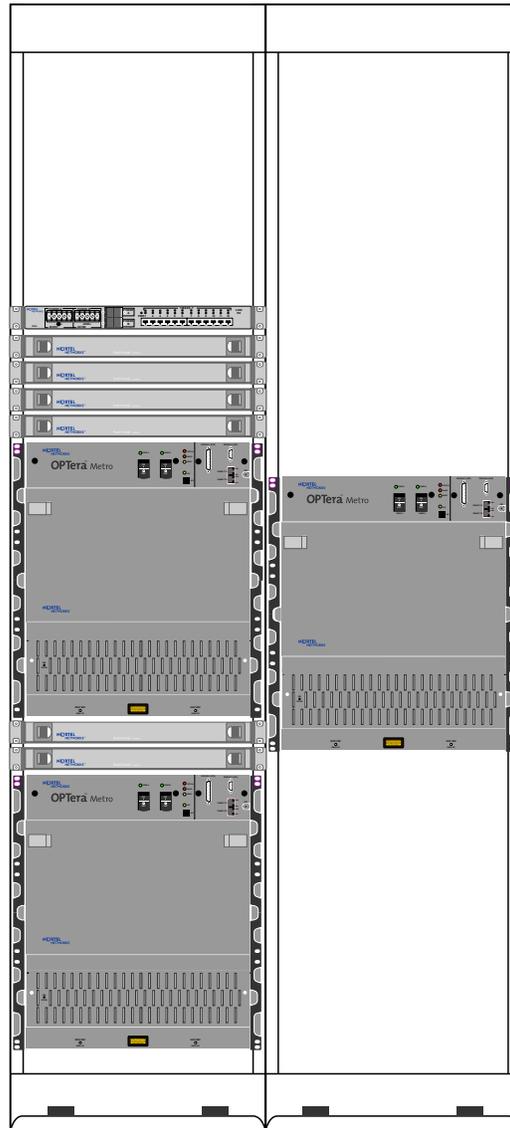
Location

Install above and as close as possible to the equipment to which the patch panel is connected. Nortel Networks recommends that you use separate patch panels for each application. If you are installing more than one patch panel for a shelf, stack the patch panels on top of each other. For more information about positioning equipment in a rack, see the chapter [“Site requirements and equipping rules”](#) in *Network Planning and Link Engineering*, 323-1701-110.

Figure 23-3 on page 23-8 shows six patch panels installed at a site with three Optical Metro 5200 shelves. Two patch panels are connected to OCI SRM or OCI SRM SONET/SDH circuit packs in the bottom shelf of the first rack. Four patch panels are connected to OCI SRM, OCI SRM SONET/SDH, or OCI SRM ESCON circuit packs in the top shelf of the first rack.

Figure 23-3
Patch panels installed at a terminal site with three Optical Metro 5200 shelves

OM0259t



Mounting options

A patch panel can be front-mounted, or mid-mounted, in equipment racks or cabinets of varying sizes. To meet specific installation requirements, the unit is shipped with five different sets of mounting brackets.

[Table 23-1](#) lists the specifications for the 20-port patch panel and patch 16-port panel.

Table 23-1
20-port patch panel and 16-port patch panel drawer dimensions

Dimension	Value
Height	43 mm (1.70 in.) (1 U rack space)
Width (see Note)	443 mm (17.44 in.)
Depth	279 mm (11 in.)
Note: The width specified is with the mounting brackets installed.	

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Transponder Protection Tray

In this chapter

This chapter includes the following sections:

- [Transponder protection](#) on page 24-1
- [Transponder Protection Tray](#) on page 24-2

Transponder protection

Path and equipment protection for signals carried on optical transponder (OTR) circuit packs is provided by the Transponder Protection Tray. The tray contains optical splitter/coupler filters that function as entry and exit points to the Optical Metro network.

Note: Client-side protection using the Transponder Protection Tray (TPT) is not supported on the Muxponder circuit pack.

As an entry point to the Optical Metro 5100/5200 network, the splitter/coupler receives a signal from one client fiber. The filter splits the power of the signal and then transmits it over two separate fibers, to two OTRs. The power of the signals that are transmitted to the two OTRs is approximately 50% of the power of the signal that was received.

As an exit point from the Optical Metro 5100/5200 network, the software within the OTRs determines which signal is best, based on the following conditions:

- Equipment failures
- Rx LOS
- Rx LOF
- Rx AIS
- Wrapper AIS (OTR 10 Gbit/s and OTR 10 Gbit/s Enhanced only)
- Tx LOF (OTR 10 Gbit/s Enhanced only)
- Tx AIS (OTR 10 Gbit/s Enhanced only)
- Tx Loss of Sync (OTR 10 Gbit/s Enhanced only)

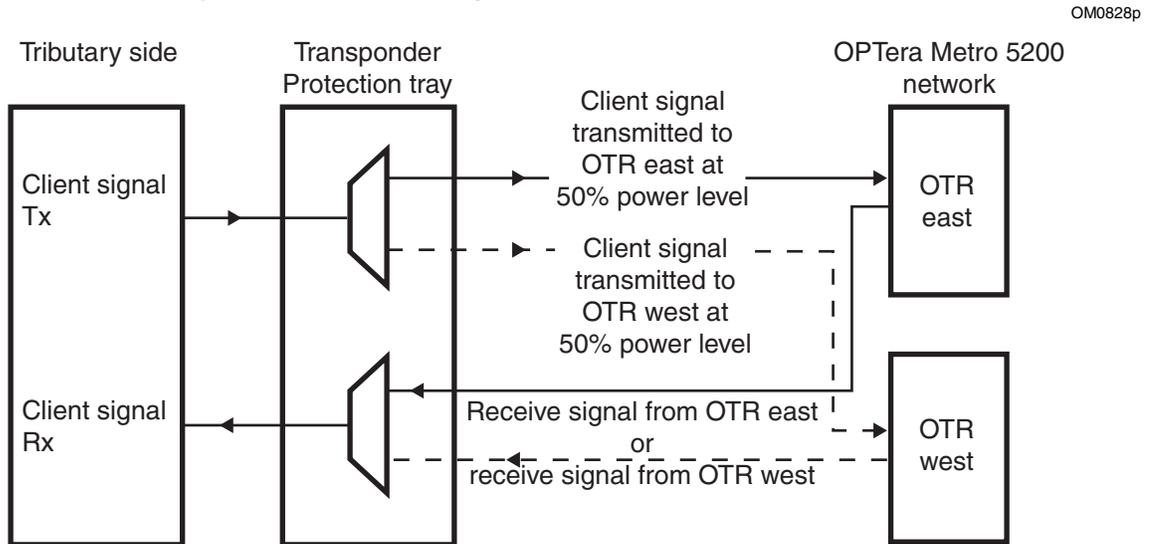
24-2 Transponder Protection Tray

The OTR with the best signal transmits its signal to the Transponder Protection Tray, which transmits the signal to the subtending equipment.

For details about the insertion loss, which varies according to wavelength, refer to [Table 1-32](#) in *Technical Specifications*, 323-1701-180.

[Figure 24-1](#) illustrates the function of the Transponder Protection Tray.

Figure 24-1
Function of the Transponder Protection Tray



Transponder Protection Tray

The Transponder Protection Tray is available in single-mode or multi-mode versions, and contains optical filters that split and couple an optical signal. Each splitter/coupler works in conjunction with a pair of OTR circuit packs.

The Transponder Protection Tray

- is a 1 U high rack-mounted external drawer
- contains a patch panel with SC-SC adapters (24 in the four-filter version and 12 in the two-filter version)
- contains four (or two) splitter/coupler filters, each filter has 6 pigtails
- contains fiber management components to manage fibers entering and exiting the drawer

Four types of Transponder Protection Tray are available:

- single-mode four-channel version that can support a maximum of eight 10 Gbit/s, 10 Gbit/s Enhanced or 2.5 Gbit/s 1310 nm OTRs
- single-mode two-channel version that can support a maximum of four 10 Gbit/s, 10 Gbit/s Enhanced or 2.5 Gbit/s 1310 nm OTRs
- multimode four-channel version that can support a maximum of eight 2.5 Gbit/s 850 nm OTRs
- multimode two-channel version that can support a maximum of four 2.5 Gbit/s 850 nm OTRs

Figure 24-2 shows an interior view of the four-channel tray.

Figure 24-2
Interior view of the Transponder Protection Tray

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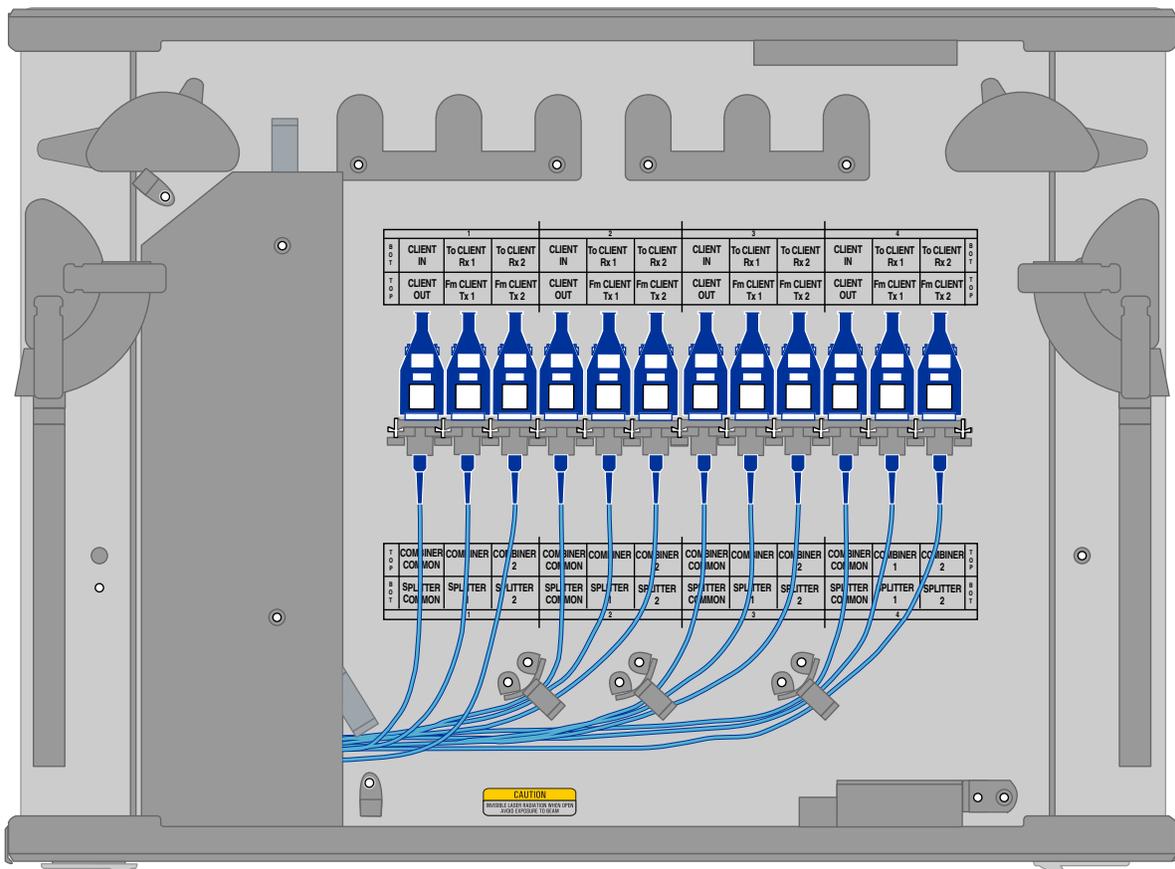
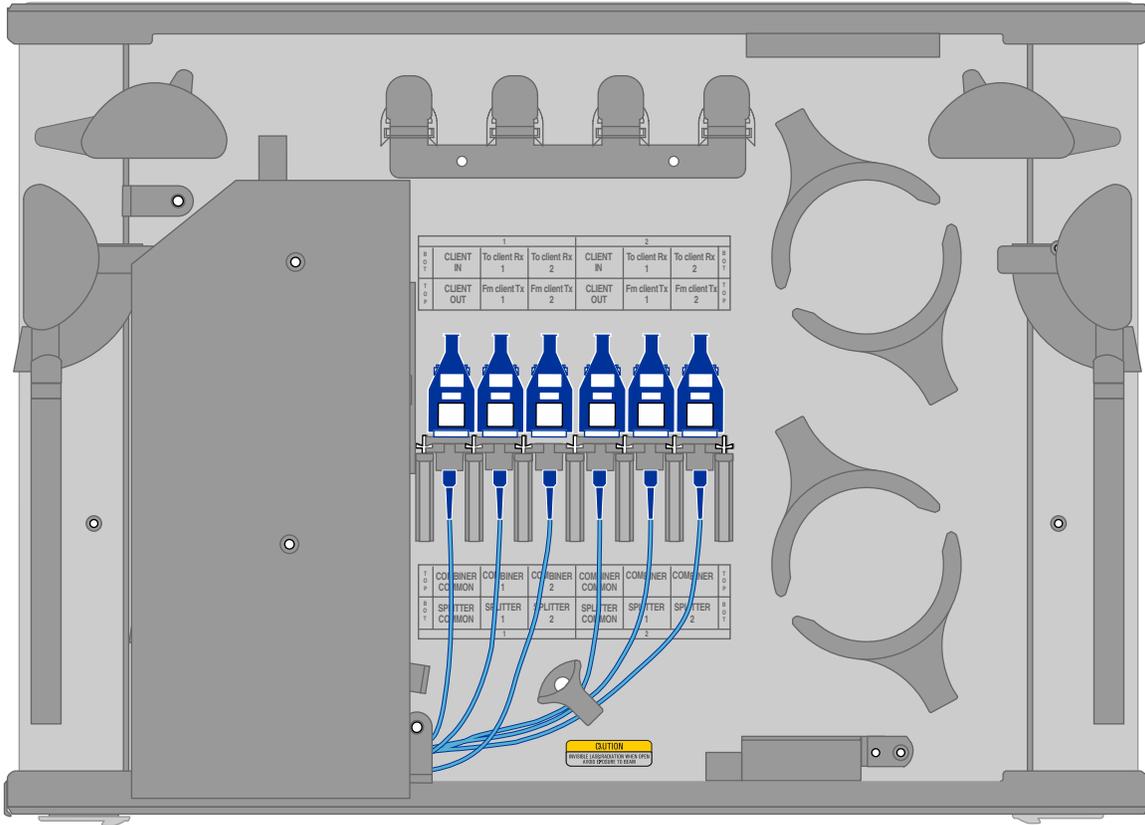


Figure 24-3 shows an interior view of the two-channel tray.

Figure 24-3
Interior view of a two-filter Transponder Protection Tray

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Connectors

Each type of Transponder Protection Tray contains a patch panel with pairs of SC-SC connectors. Use these connectors to make the fiber connections between subtending equipment and the Transponder Protection Tray, and between the tray and the OTR circuit packs. Connectors on the client-side are accessed by lifting the pull-up tab located on top of each bulkhead.

Cables and optical patch cords

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

The Transponder Protection Tray can be located anywhere in the equipment rack or collocated with subtending equipment.

For more information about positioning equipment in a rack, see the chapter [“Site requirements and equipping rules”](#) in *Network Planning and Link Engineering*, 323-1701-110.

The Transponder Protection Tray can be collocated with client equipment.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Optical Trunk Switch

In this chapter

This chapter includes the following sections:

- [Optical Trunk Switch overview on page 25-1](#)
- [Operation modes on page 25-3](#)
- [Front panel on page 25-4](#)
- [Back panel on page 25-6](#)
- [Operational considerations on page 25-7](#)
- [Location on page 25-7](#)
- [Product engineering codes on page 25-8](#)

Optical Trunk Switch overview

The Optical Trunk Switch is a standalone component that provides optical path protection for point-to-point unamplified configurations.

Note: The Optical Trunk Switch is not supported for use in networks with 10 Gbit/s OTR circuit packs unless the 10 Gbit/s OTR Enhanced circuit packs are used.

When the Optical Trunk Switch is installed at each Optical Metro 5100/5200 site in a point-to-point unamplified system, it protects traffic or data from physical damage to fiber-optic cables by switching bi-directionally to a redundant optical fiber path.

[Figure 25-1](#) shows a typical application of the Optical Trunk Switch. An Optical Trunk Switch at two Optical Metro 5100/5200 sites provides fiber protection for the point-to-point unamplified system.

Figure 25-1
Typical application

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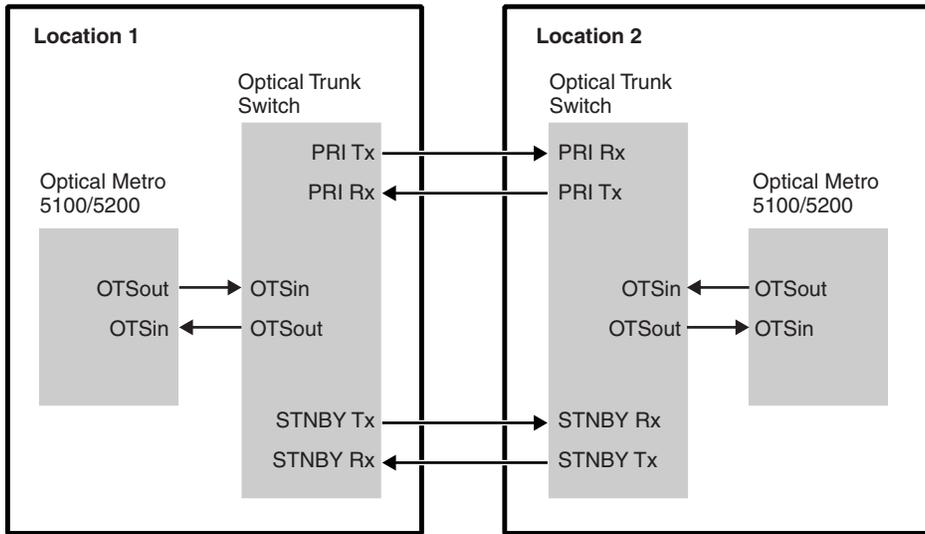
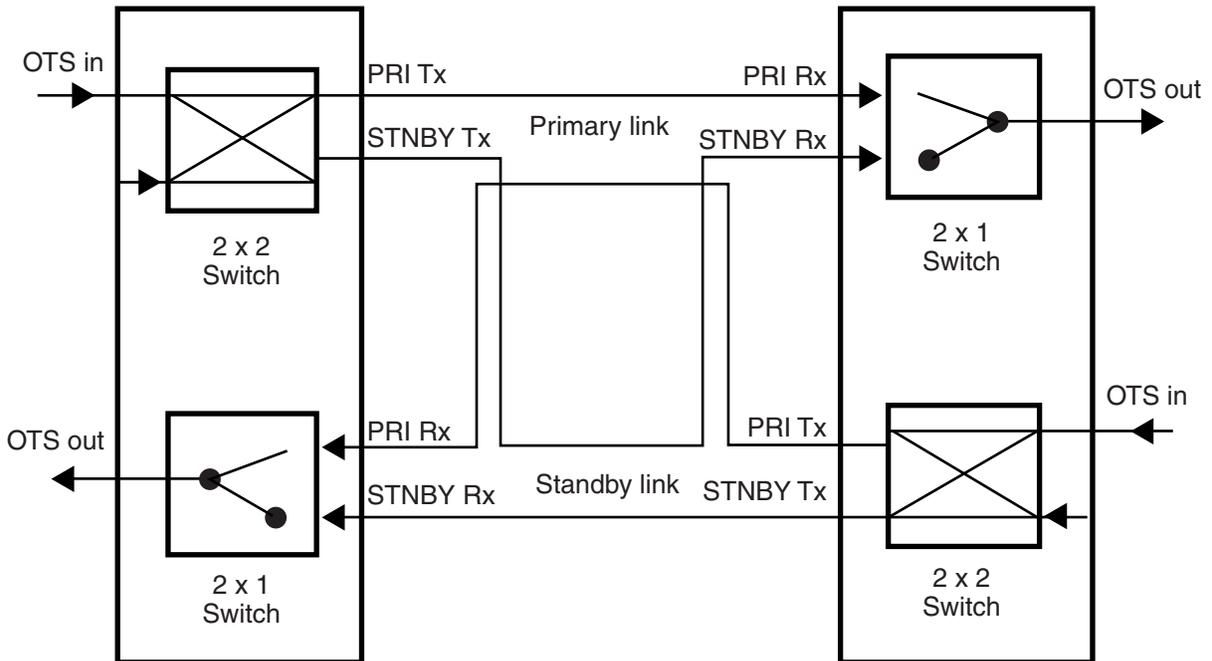


Figure 25-2 shows the functional drawing of the Optical Trunk Switch. This Optical Trunk Switch has two parts, transmit and receive. The transmit part has one input and two outputs, the receive part has two inputs and one output.

Figure 25-2
Functional drawing

OM2349p



Operation modes

There are two modes in which you can operate the Optical Trunk Switch: automatic and manual.

Automatic mode

Automatic is the normal operating mode for the Optical Trunk Switch. The Optical Trunk Switches at both ends must be in automatic mode for the system to operate normally.

In automatic mode:

- traffic is switched bi-directionally in less than 100 ms when the target link is operational and the power received on the active path drops below -30 dBm
- switching is non-revertive
- bi-directional switching from the primary link to the standby link occurs if:
 - there is a failure on one or both of the primary links and the standby link is bi-directionally sound
 - there has been a force switch command executed from the maintenance interface from the primary link to the standby link and the standby link is bi-directionally sound
- bi-directional switching from the standby link to the primary link occurs if:
 - there is a failure on one or both of the standby links and the primary link is bi-directionally sound
 - the SWBK button is pressed on the front panel of a module at either site and the primary link is bi-directionally sound
 - the “trigger switch back to PRI” menu option is elected from the maintenance interface and the primary link is bi-directionally sound

In this mode, each OTS uses the information available on the power taps at the input to the 1x2 switch (see [Figure 25-2 on page 25-2](#)) to determine when to switch. The tap on the active link is used to monitor the working signals. If the power level at this point drops below the threshold, the switch then looks for the pilot tone on the inactive path. If the pilot tone is present, this indicates that the inactive fibre link is valid, causing the OTS to switch. If the pilot tone is not present on the inactive link, the OTS does not switch.

At the other end of the link, the active signal drops below the threshold, causing the OTS at the other end to switch.

Manual mode

Manual mode is used for trouble-shooting purposes only or to restore a pair of OTSs to a known good state. Always use automatic mode to ensure bi-directional switching. Also, ensure that both OTSs are synchronized after using manual mode (i.e., ensure that both OTSs are using the same path).

In manual mode:

- toggling the Rx link selection between the primary and standby link can be done using the PRI/STNBY push button, TL1 command or menu option
- switching is traffic-affecting and uni-directional
- single-ended only
- switches even if the link you select has failed.



CAUTION
Risk of affecting service
 When the Optical Trunk Switch is in manual mode and you switch to the primary or standby link, the module switches traffic regardless of whether or not that link is operating normally. This switching is not synchronized with the Optical Trunk Switch at the other end of the link, and may be service-affecting.

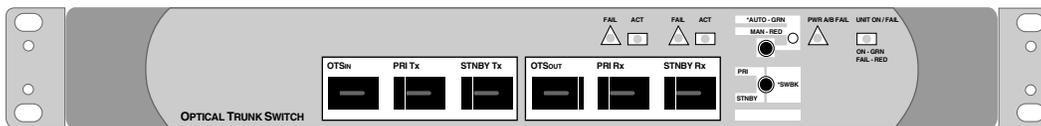
Upon a double path failure, the OTS will always end up switched to Standby. Restoring the standby fibers will return the OTS to normal operation. A switchback command is needed to return the OTS to the primary path (once that fiber path is restored).

Front panel

Figure 25-3 shows the front panel of the Optical Trunk Switch.

Figure 25-3
Front panel

OM0304



The front panel contains:

- six optical connectors
- seven indicator lamps
- two buttons

Front panel connectors

Table 25-1 describes the six optical connectors on the front panel of the Optical Trunk Switch.

Table 25-1
Front panel optical connectors

Connector	Description
OTSin	Connects to the OTSout port of the next optical component at the site.
PRI Tx	Primary link transmit
STNBY Tx	Standby link transmit
OTSout	Connects to the OTSin port of the next optical component at the site.
PRI Rx	Primary link receive
STNBY Rx	Standby link receive

Indicator lamps

The Optical Trunk Switch has the following indicator lamps:

- PRI FAIL
- PRI ACT
- STNBY FAIL
- STNBY ACT
- *AUTO/MAN
- PWR A/B FAIL
- UNIT ON/FAIL

Front panel buttons

Table 25-2 describes the buttons on the front panel of the Optical Trunk Switch.

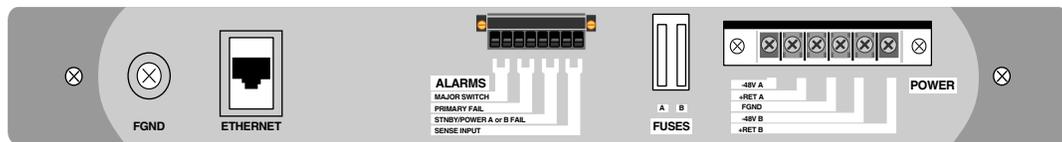
Table 25-2
Front panel buttons

Button	Description
*AUTO/MAN	You can press this button to toggle between automatic and manual mode.
PRI/STNBY *SWBK	When the Optical Trunk Switch is in manual mode, you can press this button to toggle between primary and standby paths. Note: This is a single-ended action and can be traffic-affecting. When the Optical Trunk Switch is in automatic mode, you can press this button to trigger a switch-back to primary. Restoring traffic bi-directionally to the primary fiber pair from the standby fiber pair when the primary and standby links are operating normally.

Back panel

Figure 25-4 shows the back panel of the Optical Trunk Switch.

Figure 25-4
Back panel



OM0305p

The back panel contains

- frame ground lug
- RJ45 Ethernet port
- parallel telemetry contacts
- two 250 mA fuses
- two -48 V dc power connectors

Back panel connectors

Table 25-3 describes the back panel connectors.

Table 25-3
Back panel connectors

Connector	Description
FGND	This connector allows you to ground the Optical Trunk Switch.
ETHERNET	This port provides an Ethernet interface. It carries Ethernet/IEEE on 10BaseT and uses TCP/IP. The interface supports both TL1 and menu commands through which you can configure and monitor the Optical Trunk Switch.
FUSES	Fuses A and B for –48 V power.
POWER	This connector allows both power supply A and power supply B to be connected for redundant power.
Parallel telemetry contacts	
MAJOR SWITCH	This relay is active when there is a switch to standby mode.
PRIMARY FAIL	This relay is active when the module detects a break in the PRI Rx path.
STNBY/POWER A or B FAIL	This relay is active when the module detects a break in the STNBY Rx path or there is a power A or B supply fail.
SENSE INPUT	The sense input connectors can be used to synchronize two Optical Trunk Switches at a site. Contact Technical Support for more information.

Operational considerations

If you press on the PRI/STNBY button repeatedly when the switch is in automatic mode, the STNBY FAIL indicator lamp cycles on and off. This activity is not traffic-affecting and does not cause a path switch.

If you press an invalid key, for example an arrow button, when you are in the menu mode, screen scrolling interrupts. This activity is not traffic-affecting and does not cause a path switch.

Location

The Optical Trunk Switch can be located anywhere in the equipment rack. For more information about positioning equipment in a rack, see the chapter “[Site requirements and equipping rules](#)” in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Enhanced Trunk Switch

In this chapter

- [Enhanced Trunk Switch overview on page 26-1](#)
- [Application overview on page 26-2](#)
- [Operation modes on page 26-3](#)
- [Physical description on page 26-7](#)
- [ETS Shelf on page 26-7](#)
- [ETS Comms on page 26-8](#)
- [ETS Switch on page 26-9](#)
- [Indicator lamps on page 26-10](#)
- [Location on page 26-11](#)
- [Product engineering codes on page 26-11](#)

Enhanced Trunk Switch overview

The Enhanced Trunk Switch (ETS) is new in Release 7.0. Use the ETS with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems. The ETS provides line-side fiber protection for multi-channel links on single-mode fiber. The ETS is supported in unamplified point-to-point configurations like the Optical Trunk Switch (OTS) and in amplified point-to-point configurations that contain a single pre-amplifier in the link.

Note: The ETS does not replace the OTS, nor is it backward compatible with the OTS. You cannot deploy the ETS and the OTS modules in the same point-to-point link.

The ETS supports:

- DWDM, CWDM and ITU CWDM Optical Metro 5100/5200 systems
- 1+1 unidirectional switching
- provisionable operating modes: automatic and manual mode

- provisionable automatic switching modes: absolute switching and window switching and user definable switching thresholds
- user-provisionable protection switches: manual, forced, and lockout commands
- network surveillance using SNMP
- revertive and non-revertive options in automatic switching mode (using the switch-back feature)
- configuration commands and surveillance using TL1

The ETS consists of the following three components:

- ETS Shelf
- ETS Switch module
- ETS Comms module

Figure 26-1 illustrates the ETS Shelf equipped with the ETS Switch and the ETS Comms modules.

Figure 26-1
ETS module (front)

OM2634p.jpg



Application overview

Figure 26-2 shows a typical unamplified point-to-point application for the ETS. An ETS at two Optical Metro sites provides fiber protection for the point-to-point system. If required, pre-amplification using one High Input Power (HIP) Optical Fiber Amplifier (OFA) can be configured at the receiving ends of the link, on Ports D and F. Equalization using Automatic Per Band Equalizer (APBE) modules, Per Band Equalizer (PBE) modules or Equalizer Coupler Trays is not supported. Aggregate power levels into the amplifier are adjusted using fixed attenuators. Figure 26-3 illustrates the pre-amplified point-to-point ETS application. The ETS provides 1+1 unidirectional line side protection switching with both revertive and non-revertive options (switch-back feature).

Figure 26-2
Unamplified point-to-point application

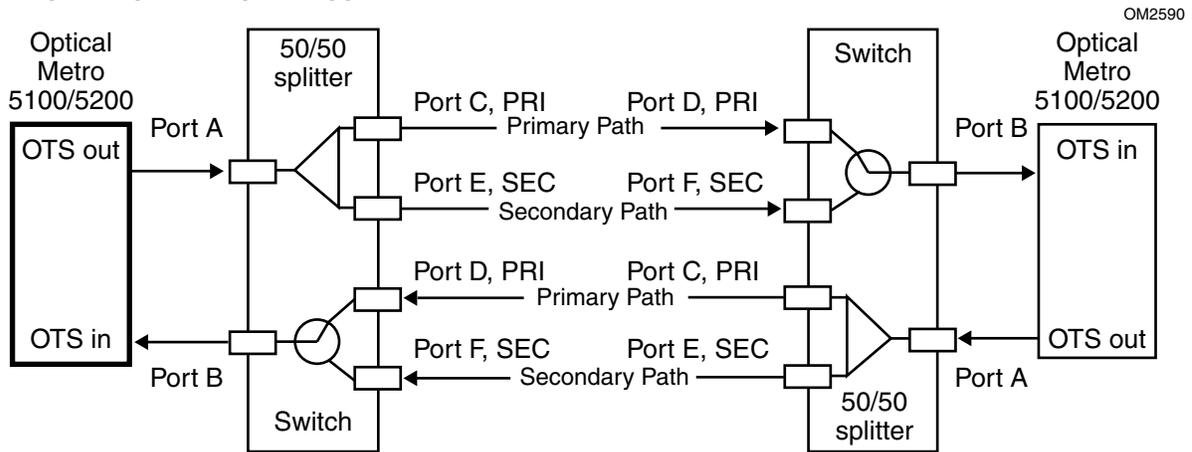
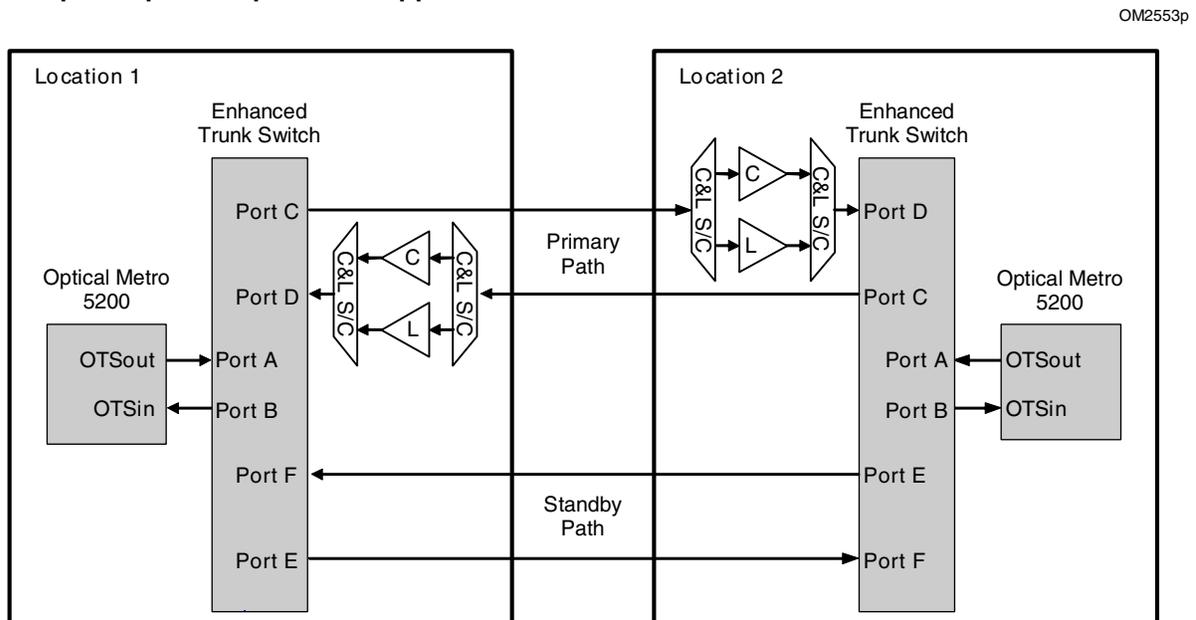


Figure 26-3
Pre-amplified point-to-point ETS application



Operation modes

The ETS Switch module can operate in two modes:

- manual
- automatic

Manual mode

When the ETS Switch module is operating in manual mode, all automatic and revertive switching is disabled. The only way to switch traffic to the alternate path is to press the THR/PRI/SEC button on the front panel, or through an explicit command issued through TL1.

Automatic mode

In automatic mode, the module switches traffic between paths when the measured signal power is less than a preset threshold.

Two switching modes are available when automatic mode is selected:

- absolute switching
- window switching

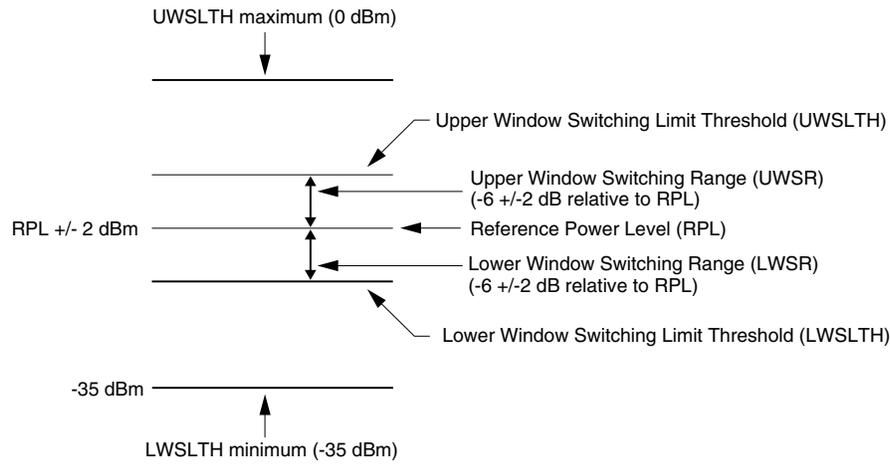
The absolute switching mode uses a threshold called the absolute switching limit threshold (ASLTH) to determine when to switch traffic to the alternate path. By default, ASLTH is set to -35 dBm and is not user-programmable. If the incoming signal power on the active path is less than the ASLTH, the module automatically switches traffic to the alternate path. The default switching mode is absolute switching.

Enabling automatic switch-back ensures that the ETS will revert back to the primary path once the fault on the primary line clears and its power returns to an acceptable level. To avoid instability, the module applies a 3-second hold off and a 2 dB hysteresis to determine when the power level is within the normal operating range.

Window switching mode allows you to define an acceptable power range (window) for the incoming signal, as shown in [Figure 26-4](#).

Figure 26-4
Window switching mode thresholds

OM2554t



Note: All values shown are the factory default values.

Window switching mode requires a measured reference power level (RPL), and a lower window switching limit threshold (LWSLTH), to determine when to activate the switch.

The RPL, UWSR, and LWSR values are all user-configurable. UWSLTH and LWSLTH cannot be configured. The ETS Switch module calculates fixed values for these thresholds as follows:

- Both the UWSR and LWSR must be greater than or equal to 6.0 dB
- $LWSLTH = RPL - LWSR \rightarrow LWSLTH -35 \text{ dBm} \rightarrow RPL \geq -29 \text{ dBm}$
- $UWSLTH = RPL + UWSR \rightarrow UWSLTH \leq 0 \text{ dBm} \rightarrow RPL \leq -6 \text{ dBm}$

Enabling automatic switch-back ensures that the ETS will revert back to the primary path once the fault on the primary line clears and its power returns to an acceptable level. To avoid instability, the module applies a 2 dB hysteresis to determine when the power level is within the normal operating range.

Switching criteria

In automatic mode, the ETS Switch module switches paths when one of the following conditions occurs.

- The active path receives a loss of signal (LOS) when the measured power of the incoming signal is
 - less than the ASLTH (if in Absolute switching mode) or
 - less than the LWSLTH (if in Window switching mode)

- The power level measured on the incoming signal on the alternate path is
 - greater than the ASLTH (if in Absolute switching mode) or
 - greater than the LWSLTH (if in Window switching mode)

Automatic switch-back

The automatic switch-back (revertive) feature allows the module to switch traffic back to the primary path automatically, when the optical power returns to an acceptable level. By default, auto-switch-back is disabled, but you can enable it using TL1.

To prevent oscillations and unintended switch activation, the module applies a 2 dB hysteresis and switch-back hold time, before switching traffic back to the primary path. The switch-back hold time prevents the module from switching traffic back to the primary path too soon. The switch-back hold time is 3 seconds and is not user-programmable.

Operational considerations for the automatic switching modes

You must select the switching mode that is appropriate for your application. Refer to [Table 26-1](#) for a list of operational considerations for each mode..

Table 26-1
Absolute switching and Window switching mode operational considerations

Absolute switching mode	Window switching mode
The switching threshold is fixed at a low power and does not depend on the actual link loss.	The switching threshold is based on the received power level (reference power level) and a programmable window size.
Since the switching threshold is not user provisionable, it requires no further maintenance after initial network installation.	The switching threshold is user provisionable. To maintain the same degree of protection, it is necessary to reprovision the threshold after each change to the wavelength profile (addition or removal of bands or channels).
Provides protection against fiber cuts only. Does not offer protection against excessive power fluctuations that can occur on the line.	Provides protection against fiber cuts and provides improved fiber degradation resiliency since the window size is set according to expected power fluctuations on the line.
	Addition or removal of bands or channels can cause the aggregate power to cross the window thresholds, which can lead to simultaneous failures on both the working and protection paths.
	The Amplified Spontaneous Emission (ASE) noise from a pre-amplifier can mask the line-side signal change especially at low channel counts, and prevents the ETS from switching upon a power degrade condition.

Physical description

The ETS consists of three parts: the ETS shelf, the ETS Comms module, and the ETS Switch module.

ETS Shelf

The ETS Shelf is a two-slot, 1U high, rack-mount shelf that contains the ETS Switch module and ETS Comms module.

The ETS Comms and ETS Switch modules are both individually field replaceable. However, only the ETS Comms can be replaced in-service. The ETS shelf also provides easy front access for fiber connections. The ETS Shelf also includes a 5-pin power terminal block located on the rear of the unit for redundant DC power supply connections. The ETS Shelf requires a fan module to cool the shelf. This fan module and the air filter can both be replaced in-service. For details, refer to *Maintenance and Replacement Procedures*, 323-1701-546.

The internal backplane connection in the ETS Shelf supplies electrical power and supports monitoring and configuration for each module (ETS Switch and ETS Comms module) installed in the unit. You can make a TCP connection to the ETS Shelf by connecting an Ethernet cable to the 10BASE-T Ethernet connector (RJ-45) on the backplane of the ETS Shelf.

Note: Both the RS-232 DB-9 serial port on the ETS Comms module and the RJ-45 Ethernet port on the back panel of the ETS Shelf support the same set of TL1 commands.

Back panel

[Figure 26-5](#) shows the back panel of the Enhanced Trunk Switch.

Figure 26-5
Back panel



[Table 26-2](#) describes the connectors on the back panel of the ETS Shelf.

Table 26-2
Back panel connectors

Module	Connector	Description
ETS Shelf	ETHERNET	One RJ-45 Ethernet connector for TCP communications via a 10BASE-T Ethernet cable. The Ethernet connector is enabled by the ETS Comms module mounted in slot A on the left side of the ETS Shelf.
	ALARMS	One DB-25 connector for aggregated major and minor telemetry alarm relays.
	POWER	One standard five-position terminal block for power connections.

Alarm relay block for parallel telemetry

Hard-wired alarm connections for individual modules mounted in the ETS shelf can be made through the standard DB-25 connector located on the rear of ETS Shelf. A maximum of four telemetry outputs from the ETS to the Optical Metro 5100/5200 shelf is supported. The alarm relay is open under normal condition and closed when the power is off or when the alarm is active. For more information on configuring the ETS telemetry alarms, refer to the *Technical Specifications*, 323-1801-180.

Note: You must manually configure the telemetry alarm description with the appropriate text in the Telemetry configuration screen of the System Manager.

ETS Comms

The ETS Comms module monitors and communicates with the ETS Switch mounted in the ETS Shelf. It polls and reports shelf information, slot occupancy, and the types of modules installed in the shelf, and their status. The ETS Comms is also used to set various parameters of the ETS Switch. The ETS Comms supports a TL1 command line interface.

The ETS Comms has the following features:

- monitoring and alarm reporting for all modules in the ETS shelf
- administration and management for all modules in the ETS Shelf:
 - monitoring and control of the ETS node
 - configuration saving and restoration functions
 - ETS node security management
 - transfer of configuration data files

Note: If a reset occurs as a result of electrical power failure, the ETS Comms module recovers with its current configuration information intact when it resumes operation. However, the date and time must be reset after a reset occurs.

Front panel

The front panel of the ETS Comms contains:

- five indicator lamps
- two buttons
- one RS-232 DB-9 connector for craft interface connections to the ETS Comms module

Note: For the DB-9 RS-232 pin assignments for the ETS, refer to the *Technical Specifications*, 323-1801-180.

Figure 26-6 shows the front panel of the ETS Comms module.

Figure 26-6
Front panel of the ETS Comms module



Table 26-3 describes the buttons on the front panel of the ETS Comms module.

Table 26-3
Front panel buttons of the ETS Comms module

Button	Description
ACO	Interrupts the audible alarms by deactivating the ETS Comms alarm relays.
INIT	Reinitializes the module, which resets the LEDs and alarm relays based on the new startup alarm conditions.

ETS Switch

The ETS Switch module provides continuous optical power monitoring on the primary and secondary paths. It typically provides line-side protection for multi-channel links on single-mode fiber (SMF). If optical power on one path drops below a preset threshold, the ETS Switch will switch traffic to the other path.

Note: If a reset occurs or if a total electrical power failure occurs, the ETS switch recovers on the current (most recent) active path with its current (most recent) switch thresholds and operating mode configuration data.

Front panel

The front panel of the ETS Switch contains:

- six indicator lamps
- six SC/UPC optical connectors for fiber patchcords connections to Port A, Port B, Port C, Port D, Port E and Port F.

Figure 16-3 shows the front panel of the ETS Switch module.

Figure 26-7
Front panel of the ETS Switch module



Indicator lamps

The description of the indicator lamps of all three ETS module components follows.

ETS Shelf

Indicator lamps on the front panel of the ETS Shelf unit show the status of the fans and the status of the primary and secondary power supplies.

ETS Switch

The six indicator lamps on the front panel of the ETS Switch module show the following:

- module status
- path in use
- current operating mode

ETS Comms

The front panel of the ETS Comms module has the following indicator lamps:

- CARD: bi-color LED (green/yellow) that indicates the operating status of the ETS Comms module
- CRIT: indicates that a critical alarm is active against the ETS
- MAJ: indicates that a major alarm is active against the ETS
- MIN: indicates that a minor alarm is active against the ETS
- ACO: indicates that the ETS Comms telemetry alarm relays are deactivated

See [Table 26-4 on page 26-11](#) for more information on the indicator lamps on the ETS Comms.

Table 26-4
Indicator lamps for ETS Comms module

Indicator lamp	Color	Purpose
CARD	Yellow/Green (bi-color)	Indicates the operational state of the ETS Comms module. This LED has the following states: <ul style="list-style-type: none"> • Green — the module is operating normally. • Yellow — the module failed to initialize. This state can indicate that the ETS Comms module is not fully seated in the slot. • Green/Yellow flashing — the ETS Comms module is not mounted in the correct slot of the ETS Shelf. This lamp is off when a loss of power has occurred.
CRIT	Red	Indicates that a module managed by the ETS Comms raised a critical alarm.
MAJ	Red	Indicates that a module managed by the ETS Comms raised a major alarm or the ETS Comms has lost contact to the monitored module.
MIN	Yellow	Indicates that a module managed by the ETS Comms raised a minor alarm or one of the power supplies (A or B) has failed.
ACO	Yellow	Indicates that the alarm cut-off (ACO) button was pressed, deactivating the ETS Comms telemetry alarm relays. Present alarms are no longer reported through the alarm relays in this case.

Location

Each ETS Shelf is 1U high. The ETS Shelf can be mounted anywhere in the Optical Metro 5100/5200 rack. Nortel Networks recommends that you install the ETS Shelves directly beneath the Optical Metro 5100/5200 terminal shelf.

The ETS Comms module must be located in slot A (left side of ETS Shelf) and the ETS Switch module must be located in slot B (right side of the ETS Shelf).

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Fiber Manager

In this chapter

This chapter includes the following section: [Fiber Manager on page 27-1](#).

Note: For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

Fiber Manager

The Fiber Manager is an external drawer that is used to manage slack optical fiber.

The Fiber Manager

- is a 1 U high rack-mounted external drawer
- is used wherever slack fiber needs to be managed
- contains 16 flip-up fiber spools
 - each fiber spool can manage 1.6 meters of fiber (maximum 3-mm diameter)
- can manage a maximum of 16 fibers

[Table 27-1](#) lists the dimensions of the Fiber Manager drawer.

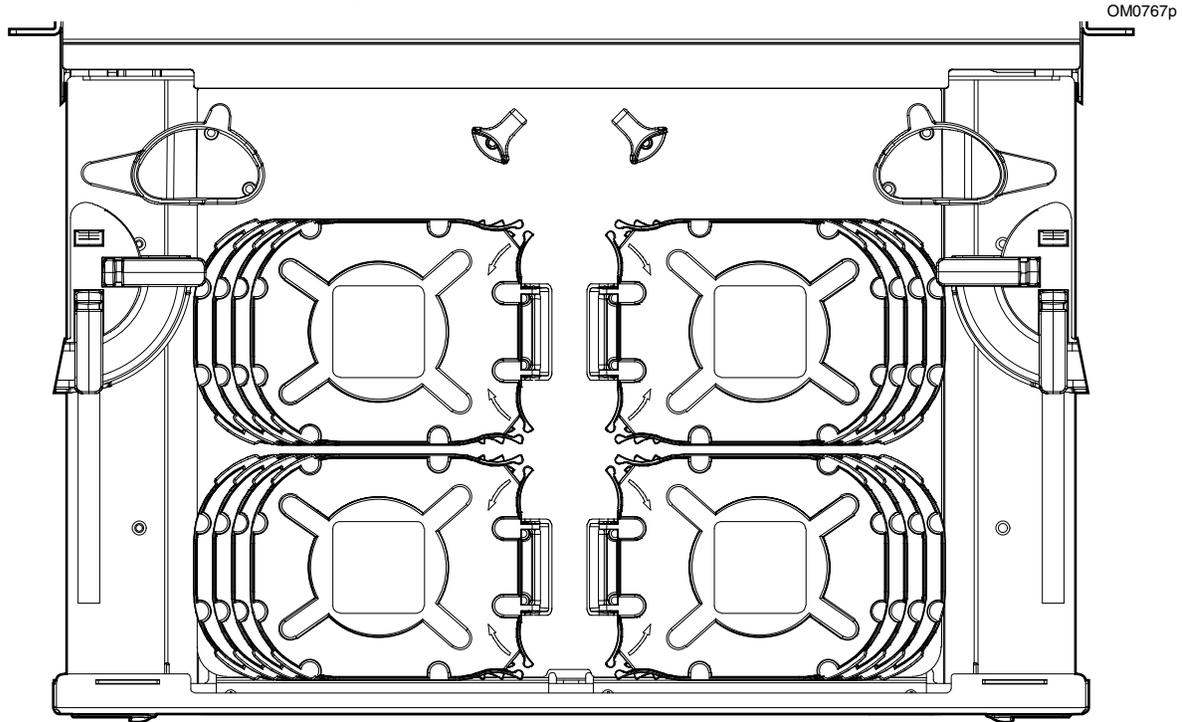
Table 27-1
Fiber Manager dimensions

Dimension	Value
Height	1.7 in. (44 mm)
Width	17.5 in (442 mm)
Depth	11.0 in. (284 mm)

[Figure 27-1](#) shows the interior of the Fiber Manager. Refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110, for equipping rules for Fiber Manager. For

directions for routing fiber for the Fiber Manager tray, refer to [Procedure 8-3 “Guidelines for routing fiber in the Fiber Manager”](#) of the chapter “Fiber management” in *Installing Optical Metro 5200 Shelves and Components*, 323-1701-201, and to [Procedure 8-2 “Guidelines for routing fiber in the Fiber Manager”](#) of the chapter “Fiber management” in *Installing Optical Metro 5100 Shelves and Components*, 323-1701-210.

Figure 27-1
Interior view of the Fiber Manager



Location

In WDM shelves, it is recommended that you install the Fiber Manager in the upper portion of the equipment rack, or in an adjacent rack.

For OFA shelves configured with APBE circuit packs, one Fiber Manager can manage the slack fiber for two shelves. In this configuration, it is recommended that you install the Fiber Manager between the OFA shelves.

For more information about positioning equipment in a rack, see the chapter [“Site requirements and equipping rules”](#) in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering code

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

1310 nm splitter/coupler

In this chapter

- [1310 nm splitter/coupler on page 28-1](#)
- [Signal flow on page 28-2](#)
- [Connectors on page 28-2](#)
- [Cables and optical patch cords on page 28-2](#)
- [Location on page 28-3](#)
- [Product engineering codes on page 28-3](#)

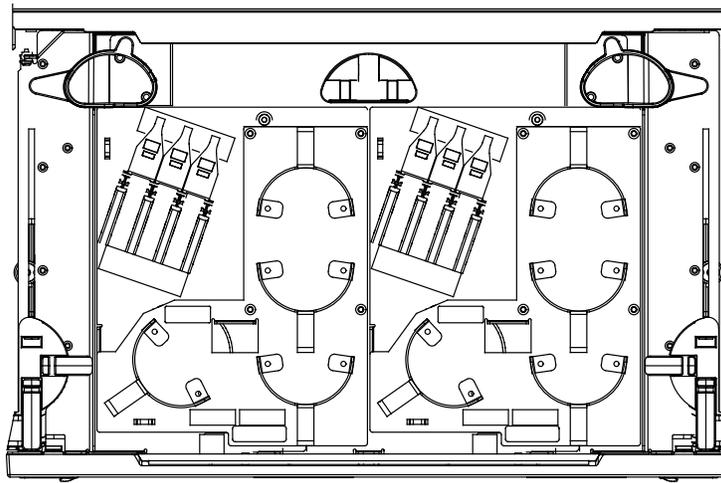
1310 nm splitter/coupler

The 1310 nm splitter/coupler tray assembly consists of two 1310 nm splitter/coupler trays in a 1 U high drawer. The tray is for use in ITU CWDM solutions. It provides optical splitting and coupling of a 1310 nm optical signal from/with the rest of the ITU CWDM signals, allowing you to overlay ITU signals on an existing network that carries 1310 nm traffic.

[Figure 28-1 on page 28-2](#) shows the interior view of the 1310 nm splitter/coupler tray assembly.

Figure 28-1
Interior view of the 1310 nm splitter/coupler tray assembly

OM1962p

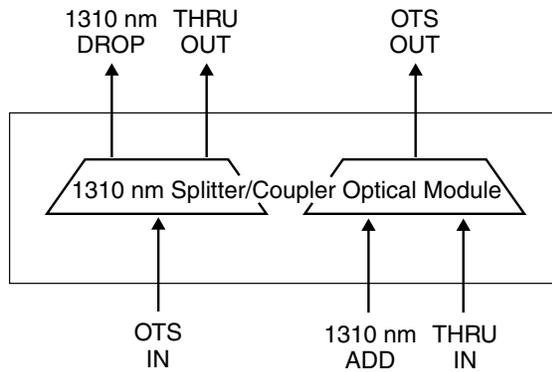


Signal flow

Figure 28-2 on page 28-2 shows the signal flow through the 1310 nm splitter/coupler.

Figure 28-2
Site signal flow through 1310 nm splitter/coupler

OM1978



Connectors

Each 1310 nm splitter/coupler tray has a patch panel with six SC-SC connectors. These connectors are used connect the 1310 nm splitter/coupler tray to other Optical Metro 5100/5200 equipment, and to the network.

Cables and optical patch cords

For information on cables and optical patch cords, refer to “Cables and optical patch cords” on page 21-1.

Location

For slot assignments and equipping rules for the 1310 nm splitter/coupler, refer to the [“Site requirements and equipping rules”](#) chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Equipment Inventory Unit

In this chapter

- [Equipment Inventory Unit \(EIU\) on page 29-1](#)
- [Indicator lamps on page 29-2](#)
- [Connectors on page 29-2](#)
- [Cables and optical patch cords on page 29-2](#)
- [Location on page 29-3](#)
- [Product engineering codes on page 29-3](#)

Equipment Inventory Unit (EIU)

The EIU is 1U high, and allows up to 16 passive devices to be inventoried per shelf. The EIU is connected to the shelf maintenance panel (Optical Metro 5200 or Optical Metro 5100), then the individual passive devices are connected to the EIU. The EIU fits into a 19-inch or 23-inch frame. Only one EIU can be connected to a shelf at one time.

The following passive devices may be inventoried (with or without the EIU):

- OMX
- ECT
- C&L splitter/coupler
- OSC splitter/coupler
- Transponder Protection Tray (TPT)
- VOA tray
- 1310 nm splitter/coupler
- PBE

Front panel

The front panel contains:

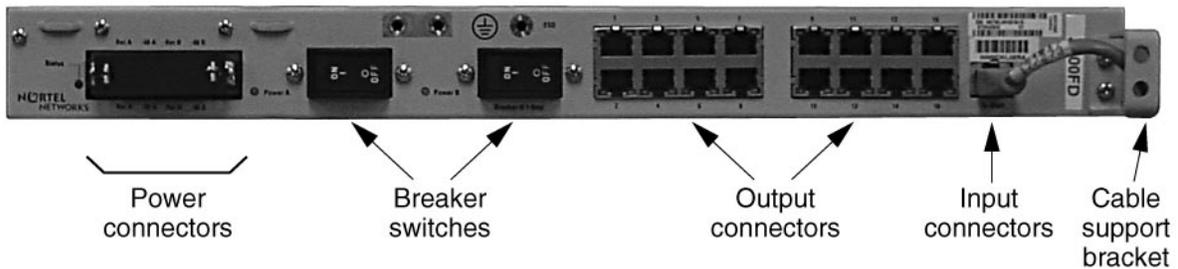
- power connectors (-48V dc)
- two breaker (ON/OFF) switches
- one input connector (connecting the EIU to the maintenance panel)

- 16 output connectors (connecting passive devices to the EIU)
- cable support bracket

Figure 29-1 on page 29-2 shows the front panel of the EIU.

Figure 29-1
Front panel of the EIU

OM2372p.jpg



Indicator lamps

The front panel contains the following indicator lamps:

- two green/red power lamps (labelled “Power A” and “Power B”)
 - power applied (red)
 - power applied and switch on (green)
 - no power (off)
- 16 green/yellow lamps (one per output port)
 - the passive device is connected and there are no alarms associated with it (green)
 - the “Optical Tray Missing” alarm is raised or the passive device is unknown (yellow)
 - no passive device is connected to the port (off)

Connectors

Each EIU has 17 RJ45 connectors. One of these connectors (labelled “To Shelf”) connects the EIU to the shelf maintenance panel. The other 16 RJ45 connectors connect the passive optical devices to the EIU.

Cables and optical patch cords

A cable with RJ-45 connectors connects the EIU to the shelf maintenance panel, and also connects the individual passive devices to the EIU.

For information on cables and optical patch cords, refer to “[Cables and optical patch cords](#)” on [page 21-1](#).

Location

For slot assignments and equipping rules for the EIU, refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

Discrete VOA

In this chapter

- [Discrete VOA on page 30-1](#)
- [Connectors on page 30-3](#)
- [Cables and optical patch cords on page 30-3](#)
- [Location on page 30-3](#)
- [Product engineering codes on page 30-4](#)

Discrete VOA

The VOA Discrete Assembly is used to attenuate the optical input to an OFA when per-band equalization is not required. The VOA attenuates the entire signal, either C-band or L-band. The signal passes through the VOA and a screw on the VOA is turned to achieve the required level of attenuation.

The VOAs are positioned such that the attenuation adjustment screw may be accessed from above when the drawer is open. The position of the bulkhead adaptors enables access to the fibers connected to the front and rear of the bulkhead during installation and maintenance.

The fiber management hardware in the tray assembly ensures that all fibers used with the tray are properly routed to prevent damage or performance degradation. The fiber management hardware guides the fiber to allow full extension of the drawer and protects the fiber as the drawer is opened or closed. The fiber management hardware is also used to guide and protect the data communications cable.

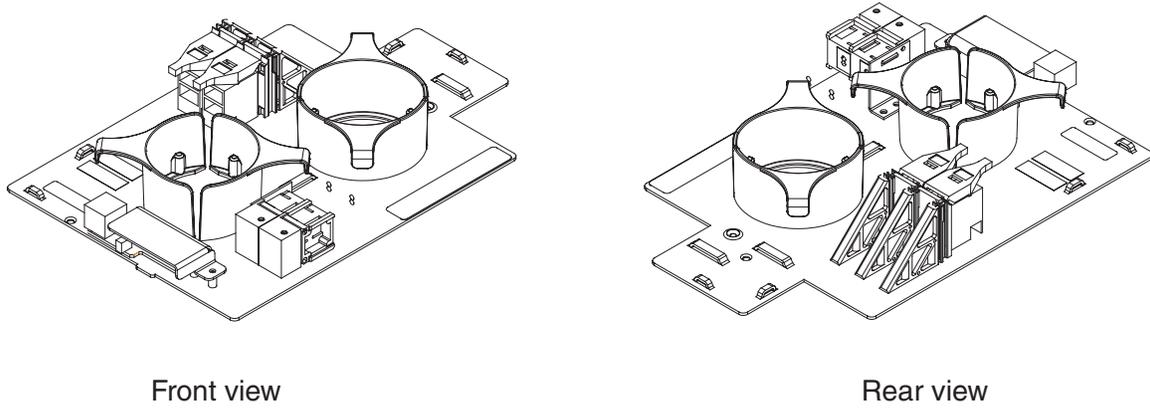
NT0H31AG - VOA tray

The VOA tray is field-replaceable unit, that contains two VOAs, a bulkhead equipped with four SC-SC adapters, an RJ-45 connector for the data communications cable, and bend radius limiters for fiber management and storage of slack fiber.

[Figure 30-1](#) shows the Discrete VOA tray.

Figure 30-1
Discrete VOA tray assembly

OM2289p



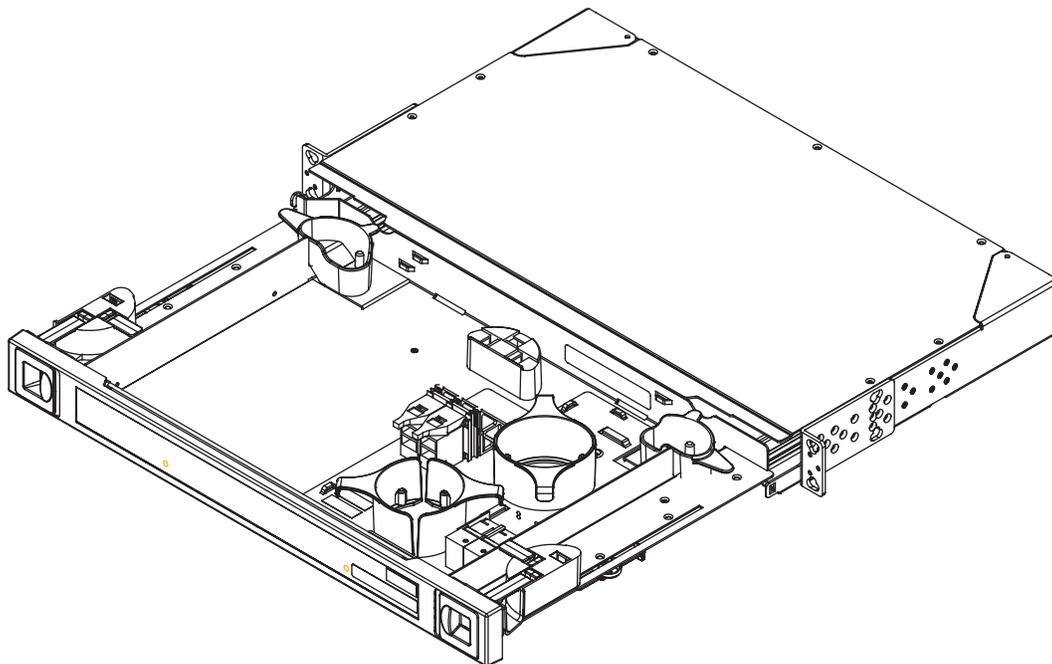
VOA Dual Assembly

The VOA Dual Assembly consists of one VOA Tray installed in the Fiber Manager Drawer. The VOA is installed in the right side of the drawer.

Figure 30-2 shows the Discrete VOA Dual Assembly.

Figure 30-2
Discrete VOA Dual Assembly

OM2288p



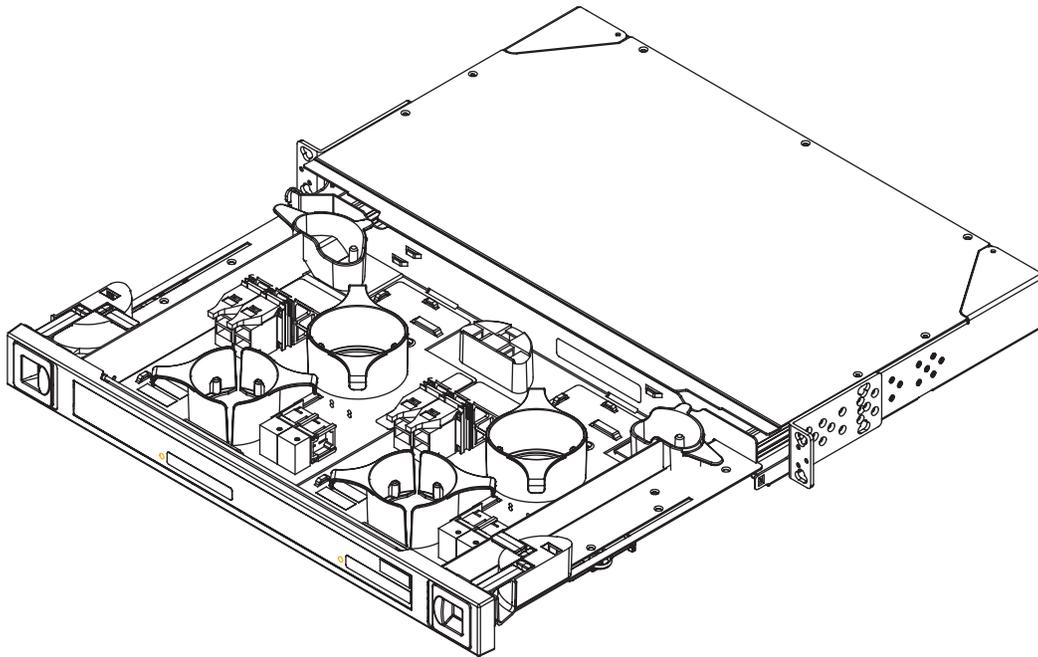
VOA Quad Assembly

The VOA Dual Assembly consists of two VOA Tray installed in the Fiber Manager Drawer. The VOA are installed in both the right and left side of the drawer.

Figure 30-3 shows the Discrete VOA Quad Assembly.

Figure 30-3
Discrete VOA Quad Assembly

OM2290p



Connectors

The VOA Tray is equipped with four SC-SC adapters, and one RJ-45 connector.

Cables and optical patch cords

For information on cables and optical patch cords, refer to “[Cables and optical patch cords](#)” on [page 21-1](#).

Location

For slot assignments and equipping rules for the Discrete VOA, refer to the “[Site requirements and equipping rules](#)” chapter in *Network Planning and Link Engineering*, 323-1701-110.

Product engineering codes

For a list of the product engineering codes (PEC), refer to “[Optical Metro 5100/5200 ordering information](#)” of *Network Planning and Link Engineering*, 323-1701-110.

DSCMs

In this chapter

- [DSCMs on page 31-1](#)
- [Application overview on page 31-1](#)
- [Physical description on page 31-1](#)
- [Signal flow on page 31-4](#)
- [Connectors on page 31-4](#)
- [Cables and optical patch cords on page 31-4](#)
- [Location on page 31-5](#)
- [Product engineering codes on page 31-5](#)

DSCMs

Application overview

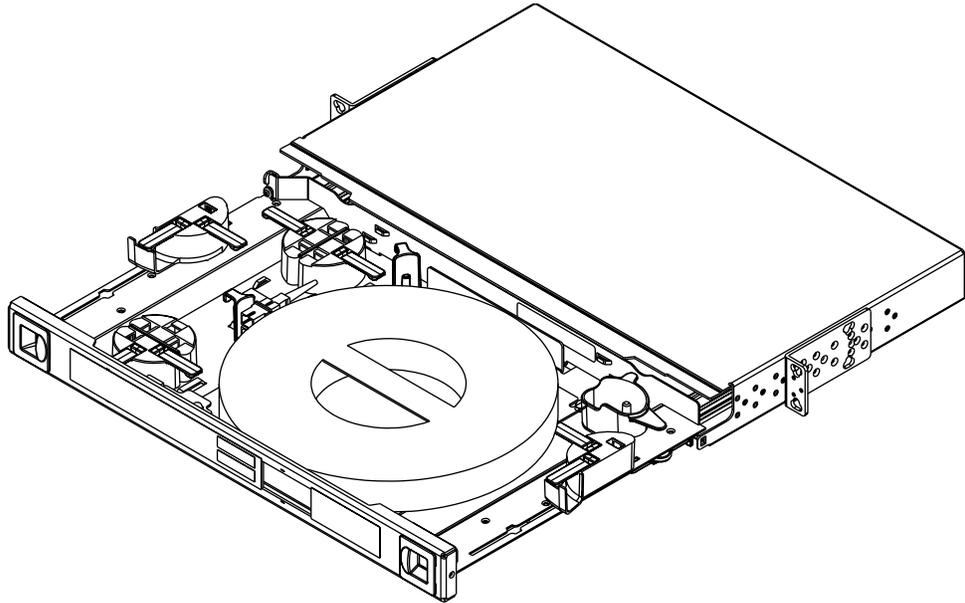
Dispersion slope compensation modules (DSCM) compensate for the chromatic dispersion slope and dispersion accumulated after an optical fiber span of a given length. By deploying dispersion DSCMs and applying a new set of engineering rules, it is possible to extend the reach of Optical Metro 5200 systems beyond typical metro application distances. For more information on the Extended Metro DWDM solution, refer to the *Network Planning and Link Engineering*, 323-1701-110.

Physical description

The DSCM product offering on the Optical Metro 5200 consist of a DSCM tray secured to a DSCM tray drawer (see [Figure 31-1](#)).

Figure 31-1
DSCM tray in a drawer

OM2373



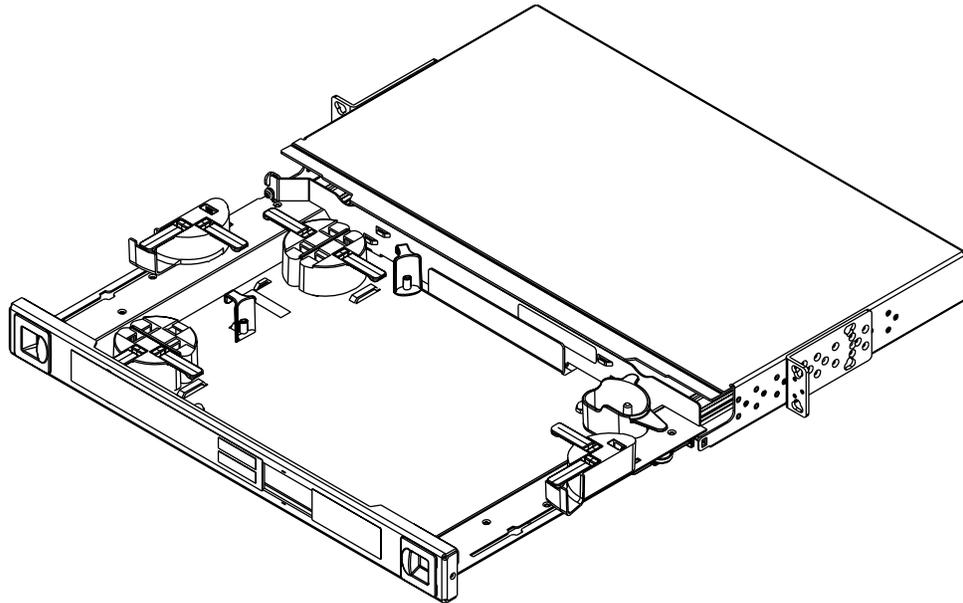
DSCM drawer

The DSCM drawer is a rack mountable, 1U high drawer that houses a single DSCM tray, which is installed in the drawer during field deployment. Since the DSCM drawer and DSCM tray are offered separately, order one DSCM drawer for each DSCM tray. The fiber management assembly provides slack fiber storage and ensures that all fibers used with the tray are correctly routed to prevent damage or performance degradation. The fiber management hardware guides the fiber to allow full extension of the drawer, and protects the fiber as the drawer is opened and closed.

[Figure 31-2 on page 31-3](#) shows the interior view of the DSCM drawer.

Figure 31-2
Interior view of the DSCM drawer

OM2580



DSCM tray

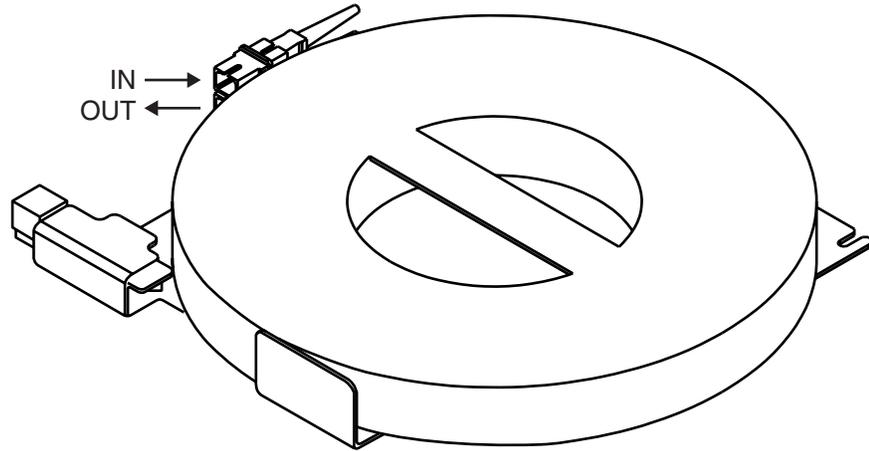
The DSCM tray is a field-replaceable unit. Each tray contains a DSCM variant, a bulkhead equipped with two SC-SC adapters, a digital identification card, and a plate to secure it to the DSCM drawer.

Different types of C-band and L-band DSCM Trays are available to compensate for different amounts of accumulated dispersion.

[Figure 31-3 on page 31-4](#) illustrates a DSCM tray.

Figure 31-3
DSCM tray

OM2581

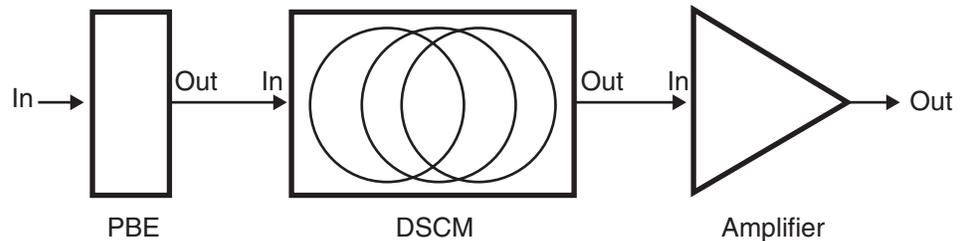


Signal flow

Figure 31-4 on page 31-4 illustrates a typical signal flow through a DSCM tray. The passive components required before and after the DSCM depend on the site configuration.

Figure 31-4
Typical site signal flow through a DSCM tray

OM2646p



Connectors

Each DSCM tray contains two SC-SC bulkhead adapters. The position of the adapters provides access to the fibers connected to the front and rear of the bulkhead during installation and maintenance.

Cables and optical patch cords

An optical patch cord normally connects each DSCM tray to optical passive and active components. No new patch cord is required. A simplex patch cord with an SC connector at one end is required to connect to each adapter on the DSCM tray. The connector at the opposite end of the patch cord must be of the same type as the component to which the DSCM is connected. These patch cords contain single-mode fiber.

For information on cables and optical patch cords, refer to [“Cables and optical patch cords”](#) on [page 21-1](#).

Location

Each DSCM Drawer is a 1U high passive drawer. The DSCM drawer can be mounted anywhere in the Optical Metro 5200 rack. Nortel Networks recommends that you install the DSCM drawer directly beneath the Optical Fiber Amplifier (OFA) shelf.

Product engineering codes

For a list of the product engineering codes (PEC), refer to [“Optical Metro 5100/5200 ordering information”](#) of *Network Planning and Link Engineering*, 323-1701-110.

Nortel

Optical Metro 5100/5200

Hardware Description, Part 2 of 2

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