NT0H65AM **323-1701-110**

Nortel

Optical Metro 5100/5200

Network Planning and Link Engineering, Part 3 of 3

Standard Release 8.0 Issue 1 April 2005

What's inside...

See Part 1 for the following:

See Part 2 for the following:

NORTEL

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About this document

ATTENTION

This document is presented in three parts: Part 1, Part 2, and Part 3. 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. The table of contents in Part 3 contains topics found in Part 3 only.

You are reading Part 3 of *Network Planning and Link Engineering,* 323-1701-110.

This document provides the information needed to understand and plan a Nortel Networks Optical Metro 5100/5200 network (identified prior to Release 7 as Nortel Networks OPTera Metro 5000-series Multiservice Platform).

Part 1 of *Network Planning and Link Engineering* includes:

- system description
- building blocks
- supported configurations
- network interoperability

Part 2 of *Network Planning and Link Engineering* includes:

- link engineering prerequisites
- link engineering components
- link engineering rules
- basic fixed value link engineering
- remodeling a network plan for optimal link budgets
- data communications in the Optical Metro 5100/5200 network
- network security planning

Part 3 of *Network Planning and Link Engineering* includes:

- site requirements and equipping rules
- ordering information
- fiber characterization
- custom link engineering design output

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 lineup and testing (SLAT) personnel
- maintenance technicians
- network administrators

Documentation library for the Optical Metro 5100/5200

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

Technical Publications

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

Descriptive information

These documents provide detailed descriptive information about the Optical Metro 5100/5200, including:

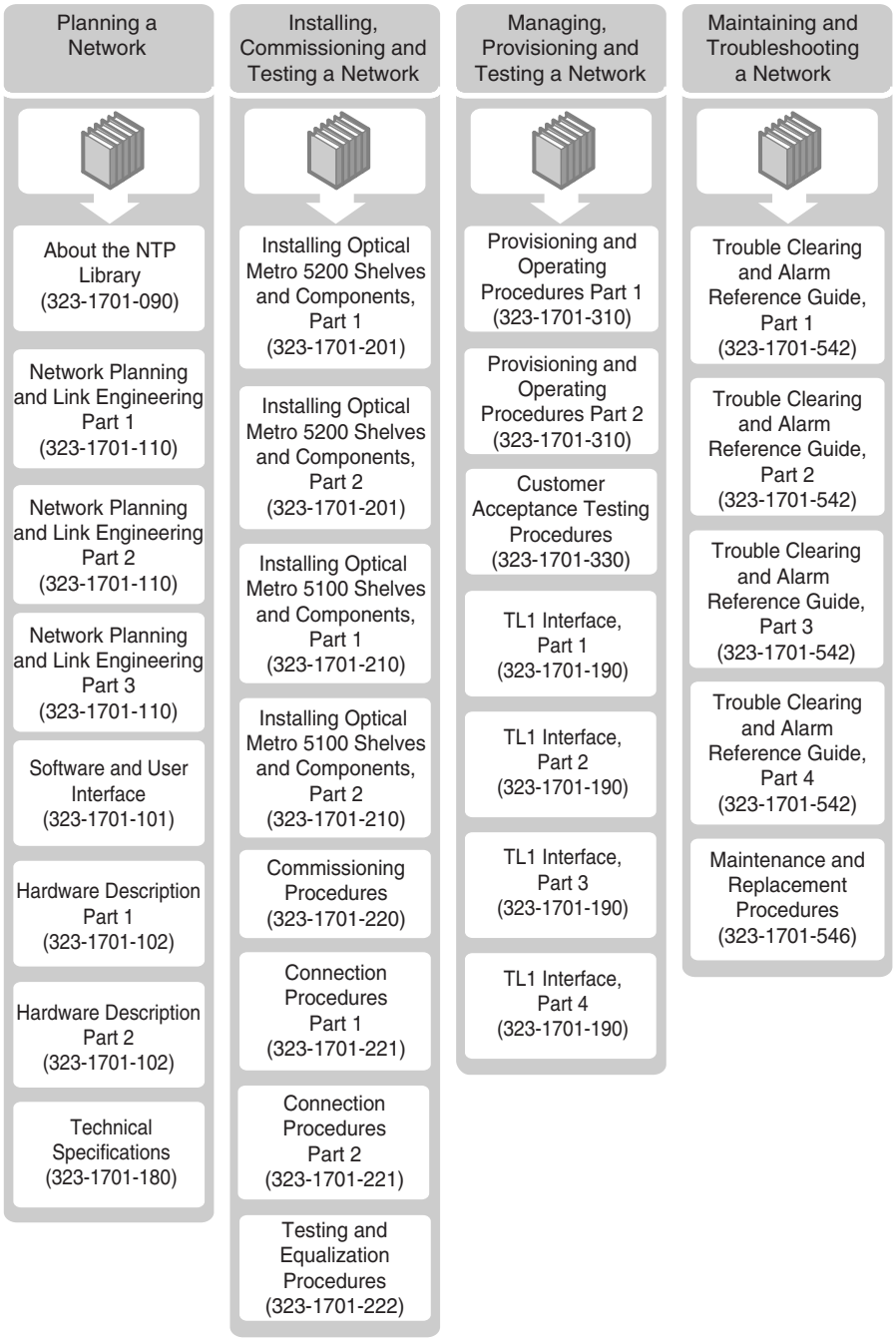
- system description
- software descriptions
- hardware descriptions
- technical specifications
- ordering information
- TL1 user information

Procedures

These documents 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	
For service-affecting problems: For 24-hour emergency recovery or software upgrade support, that is, for: • 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	**North America:** 1-800-4NORTEL (1-800-466-7835) **International:** 001-919-992-8300
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.	**North America:** 1-800-4NORTEL (1-800-466-7835) ***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. **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.
Global software upgrade support:	**North America:** 1-800-4NORTEL (1-800-466-7835) **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.

Site requirements and equipping rules

In this chapter

Precautions

CAUTION
Risk of shelf malfunction
Nortel Networks recommends that you do not use cellular phones at any Optical Metro 5100/5200 site. The use of cellular phones in proximity to Optical Metro 5100/5200 equipment can cause shelf malfunction.

Site requirements

The Optical Metro 5100/5200 system must be installed in a site that meets the requirements described for these areas:

- environment
- power
- floor space
- fiber characterization

Nortel Networks recommends that a site survey be performed prior to installing your equipment to determine if the site meets the requirements.

Environment

The operating environment must comply with the environment specifications in *Technical Specifications*, 323-1701-180. These specifications include operating temperature, relative humidity, and altitude. The Optical Metro 5100/5200 equipment deployed must comply with the floor loading and thermal loading specifications given in *Technical Specifications*, 323-1701-180. The weight and thermal dissipation specifications for the equipment are available in the same book.

Power

The Optical Metro 5100/5200 requires a –48 V dc dual-feed power supply.

If your site does not have a –48 V dc power supply, rectifiers may be used to convert ac power to dc power. The rectifiers can operate at 110/220 V ac and 208/220/240 V ac.

If you use a 110/220 V ac power feed, your site must have:

- two dedicated 120 V ac circuits, each with 20 A circuit breaker protection for the 3U APRS rectifier
- two NEMA 5-20R receptacles (one per circuit) available within the cabinet or frame, for a 3U APRS rectifier
- two dedicated 120 V ac circuits, each with 15 A circuit breaker protection for the 1U APRS rectifier
- two NEMA 5-15R receptacles (one per circuit) for a 1U APRS rectifier

If you use a 208/220/240 V ac power feed, your site must have:

- two dedicated 208/220/240 V ac circuits each with 20 A circuit breaker protection for the 3U APRS rectifier
- two 20 A receptacles (country specific) for the 3U APRS rectifier
- two dedicated 208/220/240 V ac circuits each with 13 A to 16 A circuit breaker protection for the 1U APRS rectifier
- two receptacles (country specific) appropriately rated for the 1U APRS rectifier

For power consumption of the Optical Metro 5100/5200 components, refer to *Technical Specifications*, 323-1701-180.

ATTENTION

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

When planning your site you must also consider the following:

- backup power requirements
- System Manager computer power requirements
- Power requirements for future growth (additional shelves)

Floor space

Your installation site must have adequate space for installing your system components. For more information, refer to the "Space requirements" section on page 12-43. Allowance must also be made for future growth requirements (additional racks).

Fiber characterization

Before you install Optical Metro 5100/5200 equipment, you need to have the network fiber tested by Nortel Networks personnel. Nortel Networks will test the fiber plant to make sure that the fiber meets the quality levels needed to operate DWDM equipment.

Tests are performed on optical fiber that will be used with the Optical Metro 5100/5200 WDM equipment. Nortel Networks defines a customized list of tests and measurements to suit each customer. Tests and measurements may include:

- physical inspection of fiber, patch panels and connectors
- polarization mode dispersion (PMD)
- distance
- span loss profile

Optical Metro 5200 WDM slot configurations

The following sections list the types of circuit packs you may require and the rules for placing the circuit packs in an Optical Metro 5200 WDM shelf.

This information should be used with your network plan to determine the type and number of circuit packs you require as well as the number of Optical Metro 5200 WDM shelves you will need.

Optical Metro 5200 WDM shelves support flexible slot configurations for mixed protocols, versatile upgrade options, and efficient use of bandwidth.

Table 12-1 lists the rules for deploying each type of circuit pack in an Optical Metro 5200 WDM shelf. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Table 12-1
Circuit pack equipping rules for an Optical Metro 5200 WDM shelf

Type of circuit pack	Quantity required	Qualified slots	Notes
SP	1 per shelf	19	Mandatory
OCM	2 per shelf	9, 10	Mandatory
OCI	Up to 8 per shelf	1 to 8, 11 to 18	
OCLD OTR 2.5 Gbit/s Flex OTR 2.5 Gbit/s Universal	Up to 16 per shelf	1 to 8, 11 to 18	
OTR 10 Gbit/s OTR 10 Gbit/s Enhanced Muxponder 10 Gbit/s GbE/FC Muxponder 10 Gbit/s GbE/FC VCAT	Up to 8 per shelf	1 to 7, 11 to 17	occupies 2 slots, the qualified slot and 1 slot to the right of the qualified slot
OSC	1 per site	20	Optional Used with the OSC tray

Table 12-1 (continued)
Circuit pack equipping rules for an Optical Metro 5200 WDM shelf

Type of circuit pack	Quantity required	Qualified slots	Notes
OCLD filler card	1 for each slot not occupied with an OCLD	1 to 4, 15 to 18	Mandatory to hold unused pigtails from the OMX (Standard)
Blank filler card	as required	any slot except slots 9, 10, and 19	Mandatory for empty slots
LC filler card	as required	1 to 8, 11 to 18	optional for pre-fibering applications

General circuit pack requirements

OCM circuit packs

Two OCM circuit packs are required for each shelf in all configurations. The following requirements apply:

- The optical-channel interface (OCI) and optical channel laser and detector (OCLD) circuit packs must be compatible with the optical channel manager (OCM) circuit packs. If the OCI and OCLD circuit packs support 2.5 Gbit/s service, the OCM must support 2.5 Gbit/s service.
- The OCLD 2.5 Gbit/s Flex circuit packs are compatible with both the OCM 1.25 Gbit/s and OCM 2.5 Gbit/s circuit packs.
- The OTR circuit packs are compatible with both the OCM 1.25 Gbit/s and OCM 2.5 Gbit/s circuit packs.
- The Muxponder circuit packs are only compatible with the OCM 2.5 Gbit/s circuit packs and are not compatible with the OCM 1.25 Gbit/s circuit packs.

SP circuit packs

One SP circuit pack is required for each shelf in all configurations.

OSC circuit packs

If your system uses the optical supervisory channel (OSC), one OSC circuit pack is required in one shelf at each site in the system.

Note: The OSC rule (per site) applies to a single system. With multiple systems, you can have more than one OSC circuit pack per site (still one per shelf).

Table 12-2 lists the deployment strategies that Nortel Networks recommends for the OSC circuit pack.

Table 12-2
OSC circuit pack deployment recommendations for the Optical Metro 5200 WDM and OFA shelves

Site	Deployment
Single shelf site	Insert the OSC into slot 20 of the shelf.
Multishelf site with the shelves connected to the Gateway shelf at the site	Insert the OSC into slot 20 of the shelf that is connected to the DCN.
Multishelf site with no shelf connected to the Gateway shelf at the site	Insert the OSC into slot 20 of the shelf that has the simplest fiber routing to the OSC tray. Normally, this shelf is the closest to the drawer containing the OSC trays.
Multishelf site with OADM shelves and OFA shelves	Insert the OSC into slot 20 of one of the OADM shelves.

OCLD and OCI circuit packs

The following rules apply to the deployment of OCLD and OCI circuit packs:

- for a protected channel, deploy one OCI and two OCLDs (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one OCI and one OCLD
- for electrical pass-through channels, either for signal regeneration or for bridging multiple networks, deploy two OCLDs
- All OCI types are supported
- All OCLD types are supported except for the Band 9/Group 9 OCLD 2.5 Gbit/s Flex 100GHz circuit packs
- Supported OCLD 2.5 Gbit/s Flex 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

OTR circuit packs

The following rules apply to the deployment of OTR circuit packs:

- for a protected channel, deploy a Transponder Protection Tray and two OTRs (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one OTR
- electrical pass-through channels are supported for OTR 10 Gbit/s and OTR 10 Gbit/s Enhanced. Deploy two OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit packs for electrical pass-through connections. For 2.5 Gbit/s electrical pass-through connections, deploy OCLDs instead of OTRs.

- All OTR types are supported except for the Band 9/Group 9 OTR 2.5 Gbit/s Flex 100GHz and Band 9/Group 9 OTR 10 Gbit/s Enhanced 100GHz circuit packs
- Supported OTR 2.5 Gbit/s Flex 100GHz and OTR 10 Gbit/s Enhanced 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

Muxponder circuit packs

The following rules apply to the deployment of Muxponder circuit packs:

- for a protected channel, deploy two Muxponders (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one Muxponder
- electrical pass-through channels are supported using OTR 10 Gbit/s Enhanced circuit packs. Deploy two OTR 10 Gbit/s Enhanced circuit packs for electrical pass-through connections.
- Supported Muxponder 10 Gbit/s Enhanced 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

Filler cards

OCLD filler cards have FC connectors on the faceplate. The OCLD filler card is mandatory if you are using the OMX (Standard) tray to hold unused pigtails. The OCLD filler card may also be used in any shelf if you want to pre-fiber any OMX variant other than the OMX (Standard) tray.

LC filler cards have LC connectors on the faceplate. The LC filler card is used if you want to pre-fiber any OMX variant other than the OMX (Standard) tray.

Note: Pre-fibering is an optional exercise. It is not mandatory.

Blank filler cards contain no adaptors.

If OMX (Standard) trays are used, install as many OCLD filler cards as required in slots 1 to 4 and 15 to 18 to accommodate all unused OMX pigtails. Fill the remaining unused slots with blank filler cards. If any other OMX is used, install OCLD, LC or blank filler cards in all unused slots.

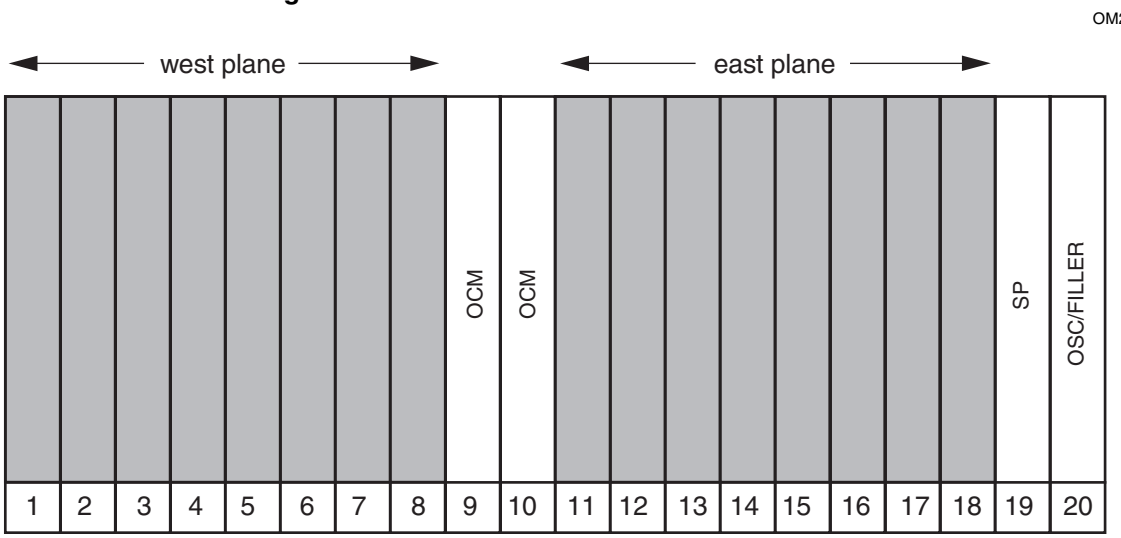
Fixed and flexible slot assignments

Although most slots in an Optical Metro 5200 WDM shelf are flexible, some slots have fixed slot assignments and can contain only certain circuit packs. The fixed slots are:

- Slots 9 and 10 must contain OCMs
- Slot 19 must contain an SP
- Slot 20 can contain only an OSC (or a filler card if the OSC is not being used)

Figure 12-1 shows the fixed and flexible slot assignments. The flexible slot assignments are identified as shaded slots. Refer to Table 12-1 on page 12-4 to determine the circuit pack types that can be equipped in the flexible slots.

Figure 12-1
Fixed and flexible slot assignments



The flexible slot assignments can contain OCLD, OTR, Muxponder, and OCI circuit packs within the following restrictions:

- for protected channels that use two OCLDs, OTRs or Muxponders, one OCLD, OTR or Muxponder must be located anywhere on the east plane, and the other must be located anywhere in the west plane. The east and west planes are shown in Figure 12-1 on page 12-8.
- line side circuit packs in each plane must have a unique wavelength (band and channel) if they belong to the same system (that is, if they are assigned the same optical system identifier). Identical circuit packs can be used on the same shelf plane as long as they belong to different systems (that is, if they are assigned different optical system identifiers).
- because the OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT occupies two slots, you cannot position the circuit pack in slot 8 (and 9) or slot 18 (and 19)

  Note: Although you can position the OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT in any combination of slots 1 to 7 and 11 to 17, you should plan for future expansion and not leave single slots empty between the circuit packs. Because the OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC and Muxponder 10 Gbit/s GbE/FC VCAT circuit packs are two slots wide, if you install the OTR 10 Gbit/s, OTR 10

Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT in slots 2 (and 3) you will leave slot 1 empty. If in the future you want to install another OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT, slot 1 will be unusable as a position for the new circuit pack.

Guidelines for connecting OMX modules to line-side circuit packs

At a site with two fiber pairs, in order to differentiate between two OMX modules of the same band and within the same optical system, the OMX modules are designated as East or West. This direction is determined by the slot location of the line side circuit packs (OCLD, OTR or Muxponder) that are connected to the OMX. In an Optical Metro 5200 shelf, the circuit packs in slots 1 to 8 assume they are transmitting to the west and the circuit packs in slots 11 to 18 assume they are transmitting to the east.

In order to maintain consistency of the OMX reference information in alarms and events, it is recommended that only circuit packs in the west slots be connected to west OMX modules and only circuit packs in the east slots be connected to east OMX modules.

Note: Passive devices connected to (Equipment Inventory Port) EIP 1 and 2 and to (Equipment Inventory Unit) EIU ports 1 to 8 are considered West by software. Passive devices connected to EIP 3 and 4 and to EIU ports 9 to 16 are considered East by software.

In a point-to-point topology, the two terminal sites only have a single fiber pair; there is only one direction of transmission at each end. Since the line-side circuit packs assume their direction from their slot assignment, some assume they are transmitting east and others assume they are transmitting west, even though they are on the same fiber. It is recommended that you designate the OMX modules as being west or east in order to maintain consistency with the reference information.

Special consideration is required if you have a single OMX module that has some channels connected to circuit packs in the west plane and some connected to circuit packs in the east plane. In this case, the alarm OMX reference information will look like there are two independent OMX modules, when there is in fact only one. This will make troubleshooting more difficult and should be avoided whenever possible.

OMX pigtail considerations

The OMX (Standard) trays are designed for use with fixed slot assignments, and contain pigtails whose lengths are designed for connections to OCLDs with FC adaptors in specific slots. It is recommended that you use the fixed slot

assignments for OCLDs. That is, OCLD circuit packs with FC connectors should be installed in slots 1 to 4 and 15 to 18. OCLD filler cards must be used, as needed, in empty slots to manage the unused pigtails.

Table 12-3 lists the specific slot assignments for OCLDs when used with an OMX (Standard).

Table 12-3
Fixed slot assignments for OCLD when used with an OMX (Standard)

Slot	OCLD
1	Channel 1
2	Channel 2
3	Channel 3
4	Channel 4
15	Channel 4
16	Channel 3
17	Channel 2
18	Channel 1

A shelf containing OCLDs in the fixed slot positions for use with an OMX (Standard) is shown in Figure 12-7 on page 12-21.

> ***Note:*** All other OMXs do not use fixed slot assignments. Patch cords allow for flexibility with OCI, OCLD, OTR, and Muxponder circuit pack positioning.

Optical Metro 5100 WDM slot configurations

The following sections list the types of circuit packs you may require, and the rules for positioning the circuit packs in an Optical Metro 5100 WDM shelf.

This information should be used with your network plan to determine the type and number of circuit packs you require, as well as the number of Optical Metro 5100 WDM shelves you will need.

Table 12-4 lists the rules for deploying each type of circuit pack in an Optical Metro 5100 shelf.

Table 12-4
Circuit pack equipping rules for an Optical Metro 5100 shelf

Type of circuit pack	Quantity required	Qualified slots	Notes
SP	1 per shelf	5	Mandatory
OCI	Up to 2 per shelf	1 and 3	
OCLD OTR 2.5 Gbit/s Flex OTR 2.5 Gbit/s Universal	Up to 4 per shelf	1 to 4	
OTR 10 Gbit/s Enhanced Muxponder 10 Gbit/s GbE/FC Muxponder 10 Gbit/s GbE/FC VCAT	Up to 2 per shelf	1 to 3	• occupies two slots, the qualified slot and 1 slot to the right of the qualified slot • only 1 circuit pack of this type can be equipped in the shelf if slot 2 is used • for protected applications, the circuit packs must be in slots 1 and 3
OSC	1 per site	6	Optional Used with the OSC tray
Blank filler card	as required	1 to 4, 6	Mandatory for empty slots
LC filler card	as required	1 to 4	Optional for pre-fibering applications

General circuit pack requirements

SP circuit packs

One SP circuit pack is required for each shelf in all configurations.

OSC circuit packs

If your system uses the optical supervisory channel (OSC), one OSC circuit pack is required in one shelf at each site in the system.

> ***Note:*** The OSC rule (per site) applies to a single system. With multiple systems, you can have more than one OSC circuit pack per site (still one per shelf).

Table 12-5 lists the deployment strategies that Nortel Networks recommends for the OSC circuit pack.

Table 12-5
OSC circuit pack deployment recommendations for the Optical Metro 5100

Site	Deployment
Single shelf site	Insert the OSC circuit pack into slot 6 of the Optical Metro 5100 shelf.
Two shelf site with the shelves connected to the Gateway shelf at the site	Insert the OSC circuit pack into slot 6 of the shelf that is connected to the DCN.
Two shelf site with no shelf connected to the Gateway shelf at the site	Insert the OSC circuit pack into slot 6 of the shelf that has the simplest fiber routing to the OSC tray. Normally, this shelf is the closest to the drawer containing the OSC trays.

OCLD and OCI circuit packs

The following rules apply to the deployment of OCLD and OCI circuit packs:

- for a protected channel, deploy one OCI and two OCLDs (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one OCLD and one OCI
- for electrical pass-through channels, either for signal regeneration or for bridging multiple networks, deploy two OCLDs
- All OCI types are supported
- All OCLD types are supported except for the Band 9/Group 9 OCLD 2.5 Gbit/s Flex 100GHz circuit packs

  Note 1: Optical Metro 5100 shelves are only supported with CWDM OMX, ITU CWDM OMX, OMX 16CH or in OMX-less configurations.

  Note 2: DWDM OCLDs can be provisioned in Optical Metro 5100 shelves provided that they are used in the following applications:

  — OMX-less configurations

  — connection to OMX 16CH

— connection to CWDM or ITU CWDM OMXs and the DWDM OCLD wavelength is compatible with the CWDM or ITU CWDM OMX

- Supported OCLD 2.5 Gbit/s Flex 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

OTR circuit packs

The following rules apply to the deployment of OTR circuit packs:

- for a protected channel, deploy a Transponder Protection Tray and two OTRs (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one OTR
- electrical pass-through channels are supported for OTR 10 Gbit/s Enhanced. Deploy two OTR 10 Gbit/s Enhanced circuit packs for electrical pass-through connections. For 2.5 Gbit/s electrical pass-through connections, deploy OCLDs instead of OTRs.
- All OTR types are supported except for the following:
  - — OTR 10 Gbit/s
  - — Band 9/Group 9 OTR 2.5 Gbit/s Flex 100GHz and Band 9/Group 9 OTR 10 Gbit/s Enhanced 100GHz circuit packs

  Note 1: Optical Metro 5100 shelves are only supported with CWDM OMX, ITU CWDM OMX, OMX 16CH or in OMX-less configurations.

  Note 2: Supported DWDM OTRs can be provisioned in Optical Metro 5100 shelves provided that they are used in the following applications:

  - — OMX-less configurations
  - — connection to OMX 16CH
  - — connection to CWDM or ITU CWDM OMXs and the DWDM OTR wavelength is compatible with the CWDM or ITU CWDM OMX
- Supported OTR 2.5 Gbit/s Flex 100GHz and OTR 10 Gbit/s Enhanced 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

Muxponder circuit packs

The following rules apply to the deployment of Muxponder circuit packs:

- for a protected channel, deploy two Muxponders (one in the east plane and one in the west plane)
- for an unprotected channel, deploy one Muxponder
- electrical pass-through channels are supported using OTR 10 Gbit/s Enhanced circuit packs. Deploy two OTR 10 Gbit/s Enhanced circuit packs for electrical pass-through connections.
- All Muxponder types are supported except for the Band 9/Group 9 Muxponder 10 Gbit/s Enhanced 100GHz circuit packs

Note 1: Optical Metro 5100 shelves are only supported with CWDM OMX, ITU CWDM OMX, OMX 16CH or in OMX-less configurations.

Note 2: Supported DWDM Muxponders can be provisioned in Optical Metro 5100 shelves provided that they are used in the following applications:

— OMX-less configurations

— connection to OMX 16CH

— connection to CWDM or ITU CWDM OMXs and the DWDM Muxponder wavelength is compatible with the CWDM or ITU CWDM OMX

- Supported Muxponder 10 Gbit/s Enhanced 100GHz circuit packs cannot be connected to Optical Metro 5100/5200 OMXs, only to Common Photonic Layer equipment

Filler cards

Any unused slots must be filled with LC, OCLD or blank filler cards.

Fixed and flexible slot assignments

Four slots in an Optical Metro 5100 WDM shelf are flexible. Two slots have fixed slot assignments and can contain only certain circuit packs. The fixed slots are:

- slot 5 must contain an SP circuit pack
- slot 6 can contain only an OSC circuit pack (or a filler card if the OSC slot is not being used)

Figure 12-2 shows the fixed and flexible slot assignments. The flexible slot assignments are identified as shaded slots. Refer to Table 12-4 on page 12-11 to determine the circuit pack types that can be equipped in the flexible slots.

Figure 12-2
Fixed and flexible slot assignments

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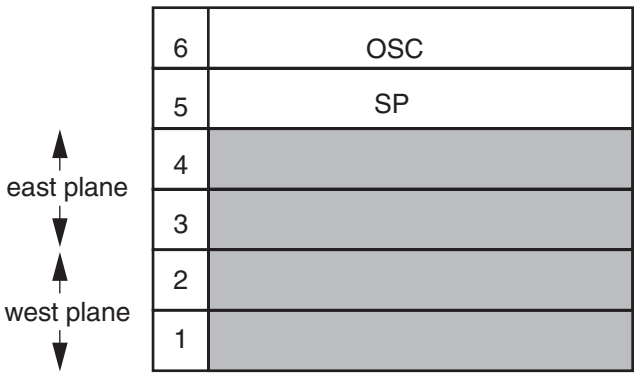


The flexible slot assignments can contain OCLDs, OCIs, OTRs or Muxponders with the following restrictions:

- only slots 1 and 3 can contain OCIs
- for an unprotected channel using an OCI in slot 1 or 3, the OCLD can be located in slot 2 or 4. It is recommended that you keep the OCI and OCLD in the same plane.
- for protected channels that use two OCLDs, the OCLD in the west plane must be located in slot 2, and the other OCLD must be located in slot 4 in the east plane
- for protected channels that use two OTR or Muxponder circuit packs, one OTR or Muxponder must be located anywhere on the east plane, and the other must be located anywhere in the west plane.
- for shelves with electrical pass-through connections, OCLDs in the same channel must be paired in slots 1 and 4, and slots 2 and 3. An example is shown in Figure 12-17 on page 12-31.
- line side circuit packs in each plane must have a unique wavelength (band and channel) if they belong to the same system (that is, if they are assigned the same optical system identifiers). Identical circuit packs can be used on the same shelf plane as long as they belong to different systems (that is, if they are assigned different optical system identifiers).

Guidelines for connecting OMX modules to line-side circuit packs

At a site with two fiber pairs, in order to differentiate between two OMX modules of the same band and within the same optical system, the OMX modules are designated as East or West. This direction is determined by the slot location of the line side circuit packs (OCLD, OTR or Muxponder) that are connected to the OMX. In an Optical Metro 5100 shelf, the circuit packs in slots 1 and 2 assume they are transmitting to the west and the circuit packs in slots 3 and 4 assume they are transmitting to the east.

In order to maintain consistency of the OMX reference information in alarms and events, it is recommended that only circuit packs in the west slots be connected to west OMX modules and only circuit packs in the east slots be connected to east OMX modules.

> ***Note:*** Passive devices connected to (Equipment Inventory Port) EIP 1 and 2 and to (Equipment Inventory Unit) EIU ports 1 to 8 are considered West by software. Passive devices connected to EIP 3 and 4 and to EIU ports 9 to 16 are considered East by software.

In a point-to-point topology, the two terminal sites only have a single fiber pair, so there really is only one direction of transmission at each end. Since the line-side circuit packs assume their direction from their slot assignment, some assume they are transmitting east and others assume they are transmitting west,

even though they are on the same fiber. It is recommended that you designate the OMX modules as being west or east in order to maintain consistency with the reference information.

Special consideration is required if you have a single OMX module that has some channels connected to circuit packs in the west plane and some connected to circuit packs in the east plane. In this case, the alarm OMX reference information will look like there are two independent OMX modules, when there is in fact only one. This will make troubleshooting more difficult and should be avoided whenever possible.

Optical Metro 5200 OFA shelf slot configurations

The following sections list the types of circuit packs you may require and the rules for positioning the circuit packs in an Optical Metro 5200 OFA shelf.

This information should be used with your network plan to determine the type and number of circuit packs you require as well as the number of Optical Metro 5200 OFA shelves you will need.

OFA and APBE circuit packs can be placed in any Optical Metro 5200 OFA shelf slot except the slots reserved for the OCM, the OSC and the SP circuit packs. However, specific slots are recommended in order to maximize the number of OFA and APBE circuit packs that can be equipped in a shelf.

Table 12-6 lists the rules for deploying each type of circuit pack in an Optical Metro 5200 OFA shelf.

Table 12-6
Circuit pack equipping rules for an Optical Metro 5200 OFA shelf

Type of circuit pack	Quantity required	Qualified slots	Notes
SP	1 per shelf	19	Mandatory
OCM	2 per shelf	9, 10	Mandatory
OFA C-band (standard) OFA L-band (standard) OFA C-band (high input power) OFA L-band (high input power) OFA C-band (variable gain) OFA L-band (variable gain)	Up to 4 per shelf (see Note)	3 to 8, 13 to 18 Recommended slots: 4, 8, 14, 18 ***Note:*** Slots 3 and 13 are only available for the Variable Gain OFA	• Standard and High Input Power OFA circuit packs occupy four slots, the qualified slot and 3 slots to the left of the qualified slot • Variable Gain OFA circuit packs occupy three slots, the qualified slot and 2 slots to the left of the qualified slot • Use the recommended slots (4, 8, 14, 18) in order to maximize the number of OFAs that can be equipped in a shelf • Use the following qualified slots when using ECTs: 4, 8, 14, 18
APBE C-band APBE L-band APBE Enhanced C-band APBE Enhanced L-band	Up to 8 per shelf	2 to 8, 12 to 18	Each APBE occupies two slots, the qualified slot and 1 slot to the left of the qualified slot
OSC	Up to 1 per site	20	Optional Used with the OSC tray
OFA filler card	Up to 4 per shelf	1, 5, 11, 15	Mandatory for unused OFA slots when ECTs are used
Blank filler card	1 for each slot not occupied with a circuit pack or an OFA filler card	1 to 18, 20	Mandatory for empty slots
Note: Software prevents provisioning two OFAs with the same location and direction; where the location can be Pre, Post, Thru and the direction can be Eastbound or Westbound. For example, software prevents provisioning two Pre Eastbound OFAs or two Post Westbound OFAs.			

OCM circuit packs

Two OCMs are required for each shelf in all configurations.

SP circuit packs

One SP is required for each shelf in all configurations.

OSC circuit packs

If your system uses the optical supervisory channel (OSC), one OSC circuit pack is required in one shelf at each site in the system.

> ***Note:*** The OSC rule (per site) applies to a single system. With multiple systems, you can have more than one OSC circuit pack per site (still one per shelf).

Refer to Table 12-2 on page 12-6 for OSC deployment recommendations.

OFA circuit packs

Two variants of OFA circuit packs are available: C-band and L-band. Separate OFA circuit packs must be installed for signals requiring amplification in the west-bound and east-bound directions.

APBE circuit packs

Two variants of APBEs are available: C-band and L-band. It is recommended that each APBE be installed in the same shelf as the OFA circuit pack for which it is providing equalization. This recommendation simplifies fibering and allows for logical troubleshooting.

Filler cards

Any unused slots must be filled with filler cards. OFA filler cards contain connections for looping traffic back into another optical component. Blank filler cards contain no connections.

If you are using ECTs, install OFA filler cards in slots 1, 5, 11, and 15 as required, and then fill the remaining slots with blank filler cards. See Figure 12-5 on page 12-20 for an example of a shelf using filler cards.

OFA shelf slot assignments

Although most slots in an Optical Metro 5200 OFA shelf are flexible, some slots have fixed slot assignments and can contain only certain circuit packs. The fixed slots are:

- Slots 9 and 10 must contain OCMs
- Slot 19 must contain an SP
- Slot 20 can contain only an OSC (or a filler card if the OSC is not being used)

Figure 12-3 shows the fixed and flexible slot assignments. The flexible slot assignments are identified as shaded slots. Refer to Table 12-6 on page 12-17 to determine the circuit pack types that can be equipped in the flexible slots.

Figure 12-3
Fixed and flexible slot assignments (TO UPDATE)

OM0755p

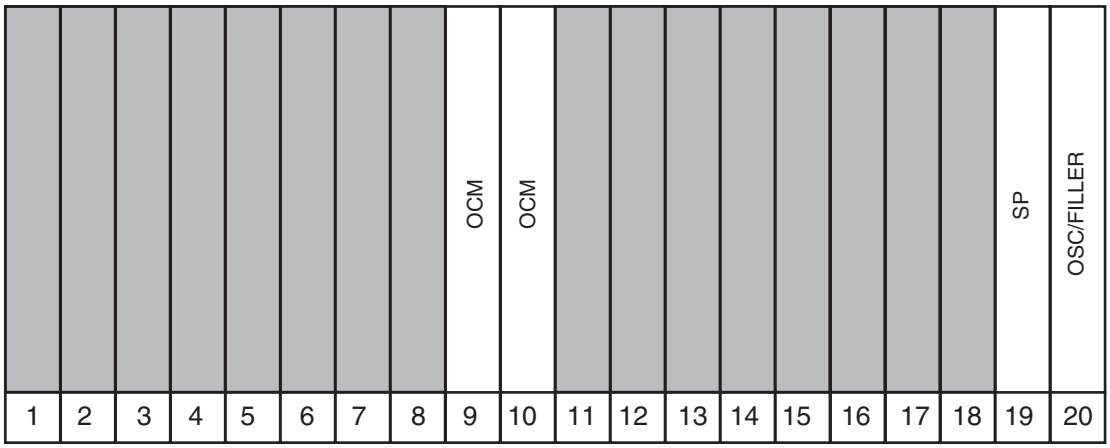


Figure 12-4 shows an example of the slot assignments in an OFA shelf.

Figure 12-4
OFA slot assignments example with OFA circuit packs only (CAN BE UPGRADED)

OM2664p

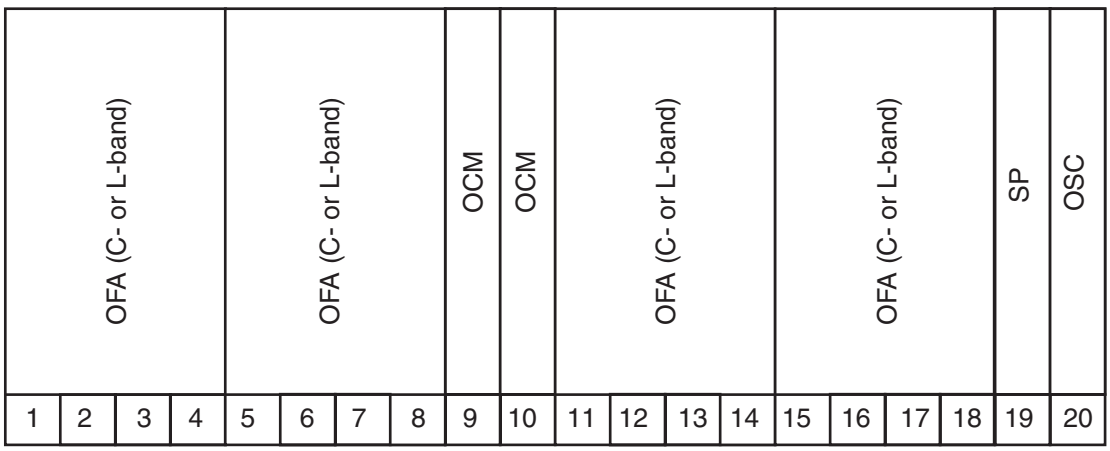


Figure 12-5 shows an example of an OFA shelf with OFA, OFA filler, and blank filler cards.

Figure 12-5
OFA slot assignments example with OFA circuit packs and filler cards

OM2665p

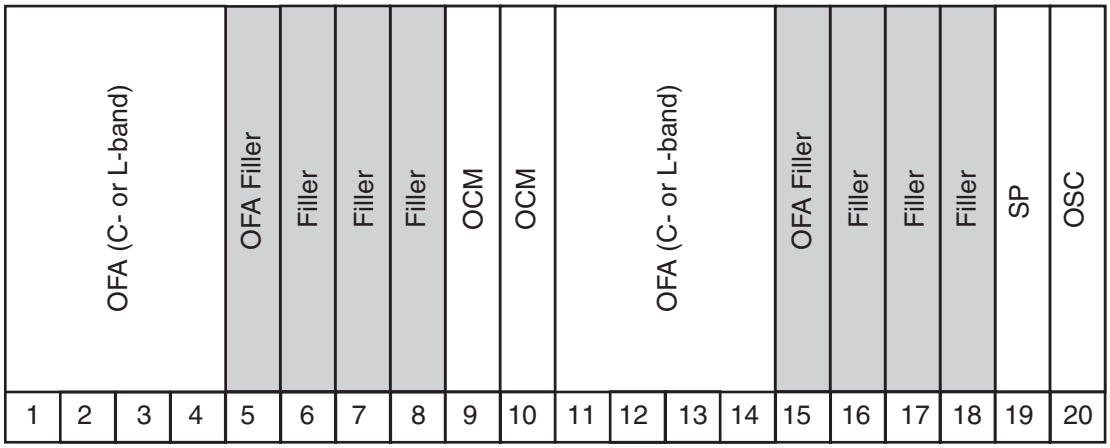
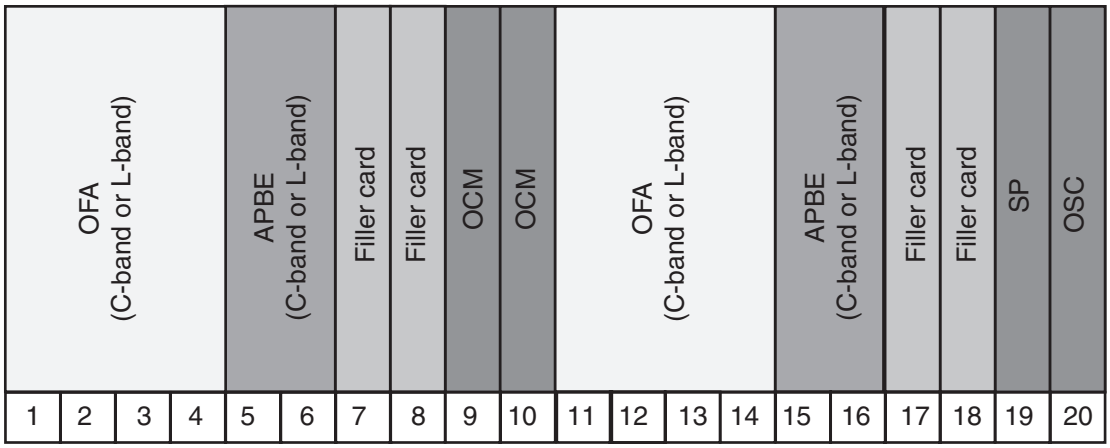


Figure 12-6 shows an example of an OFA shelf with OFA and APBE circuit packs and blank filler cards.

Figure 12-6
OFA slot assignments example with OFA and APBE circuit packs and filler cards

OM2520p



Examples of Optical Metro 5200 and Optical Metro 5100 WDM slot configurations

Optical Metro 5200 slot configuration examples

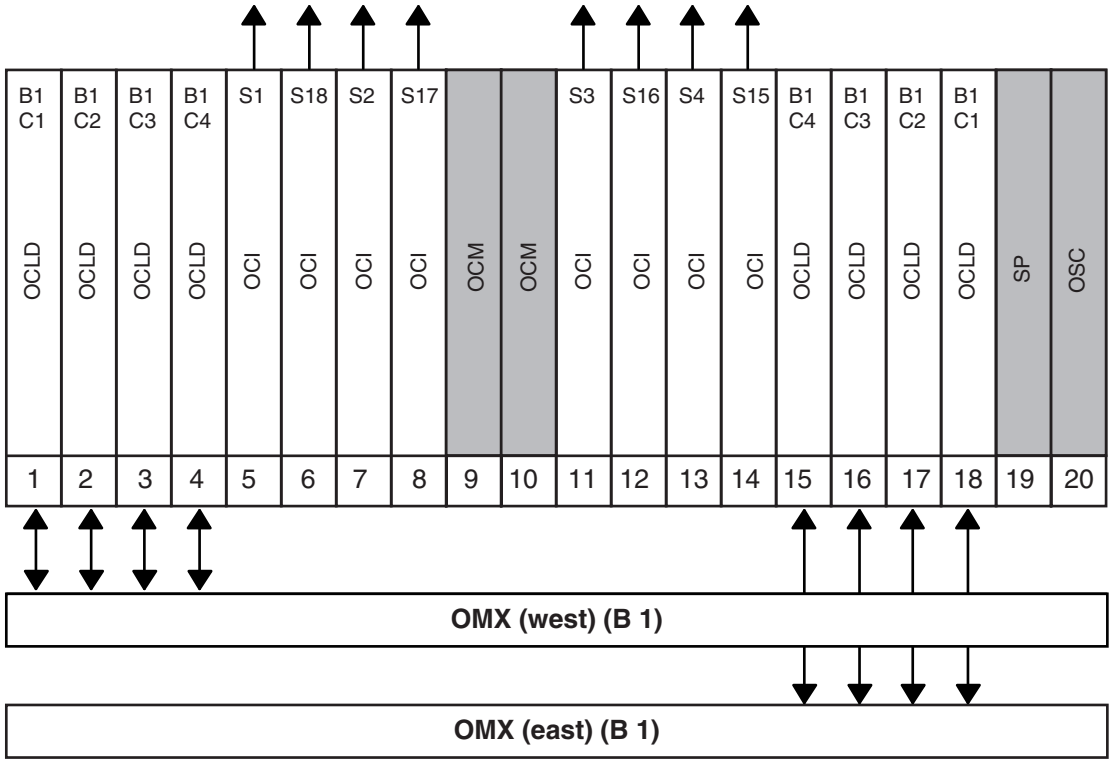
The following examples show some of the available options for slot configurations in Optical Metro 5200 shelves. In all examples, slots 1 to 8 represent the west plane, and slots 11 to 18 represent the east plane. Although not shown in the diagrams, it is assumed that an OSC tray is installed with each shelf.

Example 1

Figure 12-7 shows a shelf with add/drop connections with one band using OCLD and OCI circuit packs. All channels are unprotected. The OCI circuit packs for east and west OCLDs are staggered. That is, slots 5, 7, 11, and 13 contain the OCIs connected to the OCLDs in slots 1, 2, 3, and 4. Slots 6, 8, 12, and 14 contain the OCIs connected to the OCLDs in slots 15, 16, 17, and 18.

Figure 12-7
Example 1

OM0751p



Legend

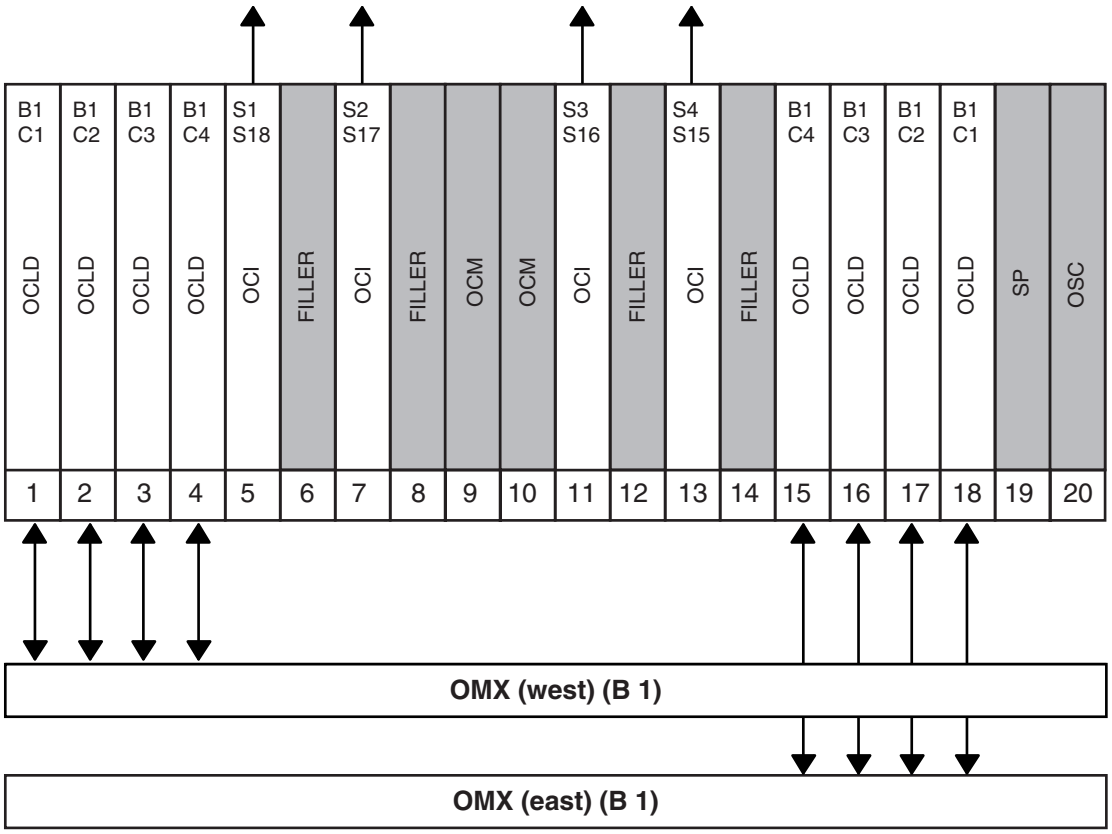
B = band
C = channel
S = associated OCLD slot number

Example 2

Figure 12-8 shows a shelf with add/drop connections with one band using OCLD and OCI circuit packs. All channels are protected. The OCIs for east and west OCLDs are staggered. That is, slot 5 contains the OCI connected to the OCLDs in slots 1 and 18. Slot 7 contains the OCI connected to the OCLDs in slots 2 and 17, and so on. In this configuration, empty slots (shown containing filler cards) are separated from each other.

Figure 12-8
Example 2

OM0750p



Legend

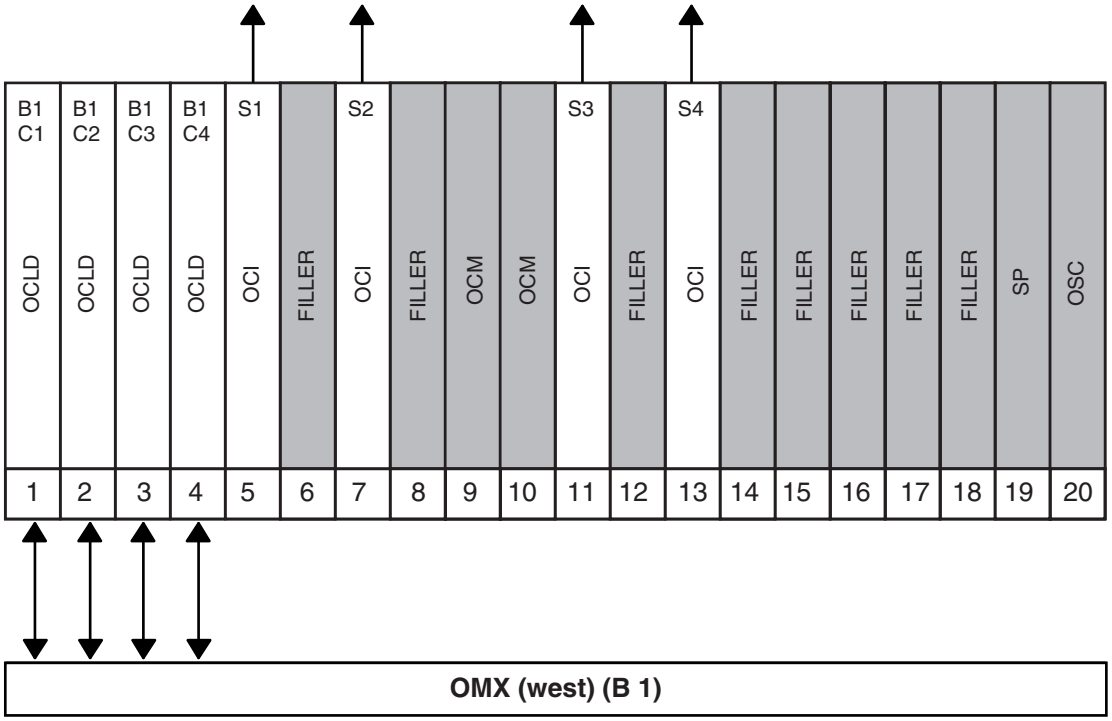
B = band
C = channel
S = associated OCLD slot number

Example 3

Figure 12-9 shows a shelf with add/drop connections with one band using OCLD and OCI circuit packs. All channels are unprotected. This configuration is typically seen in point-to-point network configurations. Because point-to-point networks are two-fiber systems, each band uses a maximum of four OCIs and four OCLDs. This means that, for a shelf with one band, the slots are only half populated with circuit packs. For information about using all slots for point-to-point network configurations, see Example 4.

Figure 12-9
Example 3

OM0748p



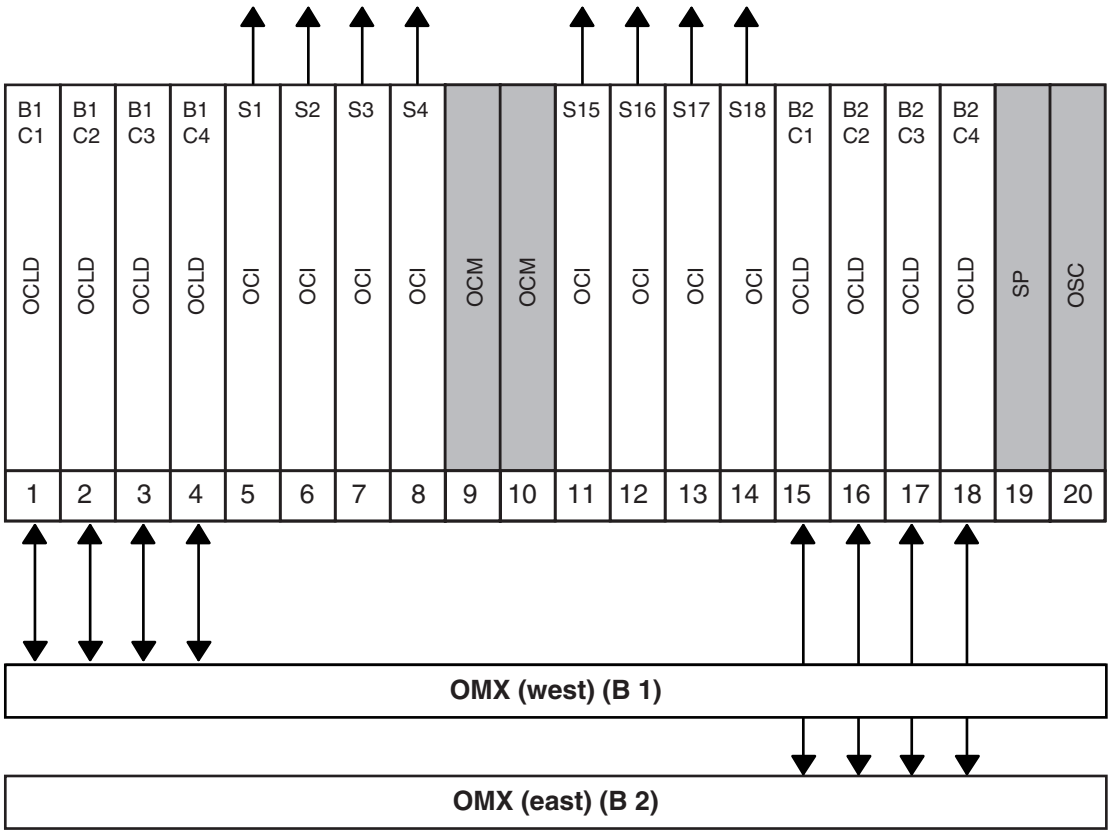
Legend

B = band
C = channel
S = associated OCLD slot number

Example 4

Figure 12-10 shows a shelf with add/drop connections with two bands using OCLD and OCI circuit packs. All channels are unprotected. By deploying two bands in this shelf, all slots can be used. This configuration is called the dual-density wiring method.

Figure 12-10
Example 4



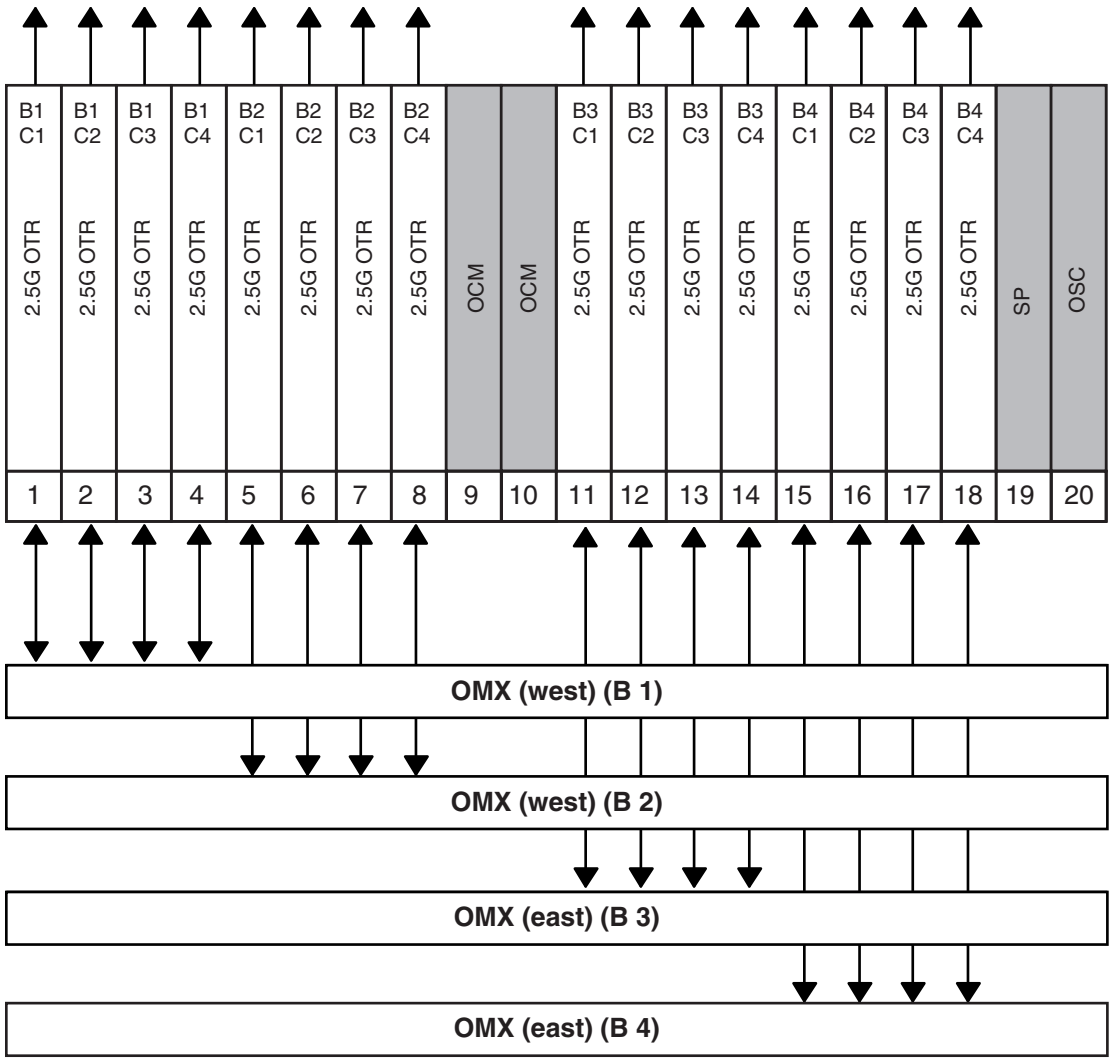
Legend

B = band
C = channel
S = associated OCLD slot number

Example 5

Figure 12-11 shows a shelf with add/drop connections with four bands using OTR 2.5 Gbit/s circuit packs. All channels are unprotected. This point-to-point configuration allows the support of up to 4 full-fill bands of traffic. This configuration is called the quad-density wiring method.

Figure 12-11
Example 5



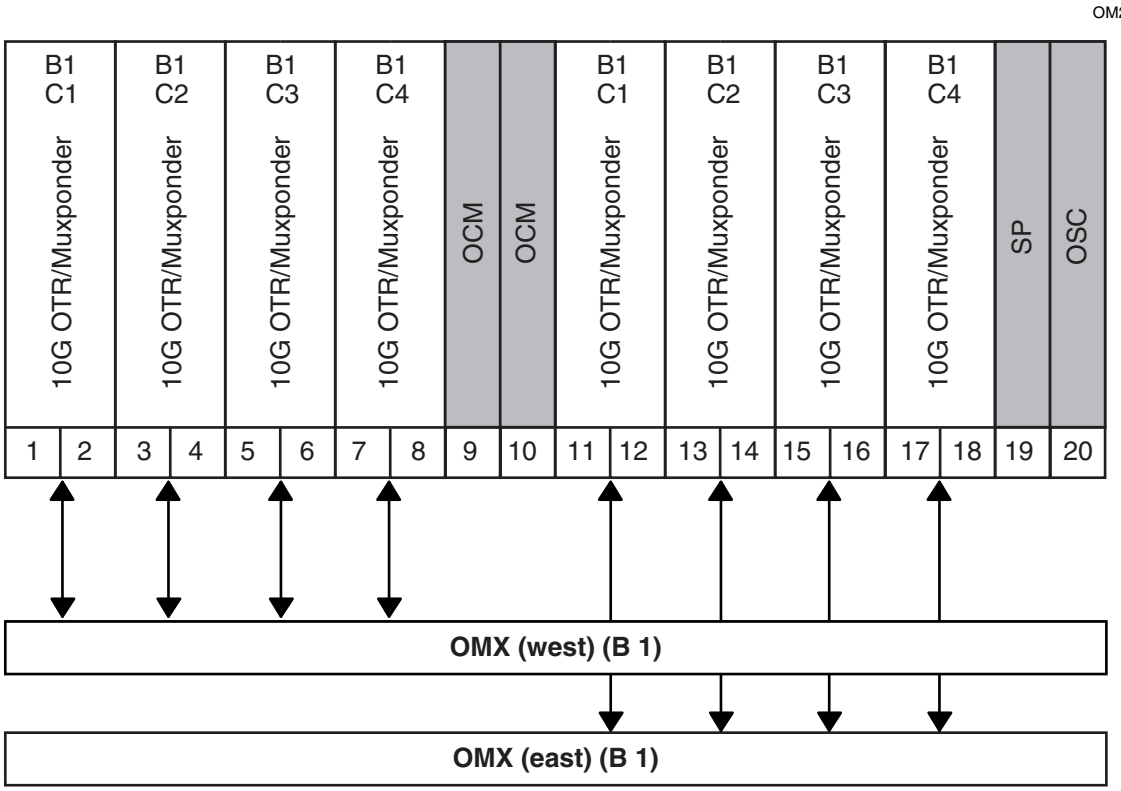
Legend

B = band
C = channel

Example 6

Figure 12-12 shows a shelf with add/drop connections with one band using OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced or Muxponder 10 Gbit/s GbE/FC circuit packs. All channels are protected (although the Transponder Protection Tray is not shown for the OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit pack). It is important to note that the OTR 10 Gbit/s, OTR 10 Gbit/s Enhanced and Muxponder 10 Gbit/s GbE/FC circuit packs require two slots each and cannot be positioned in slots 8 (and 9) or slots 18 (and 19).

Figure 12-12
Example 6



Legend

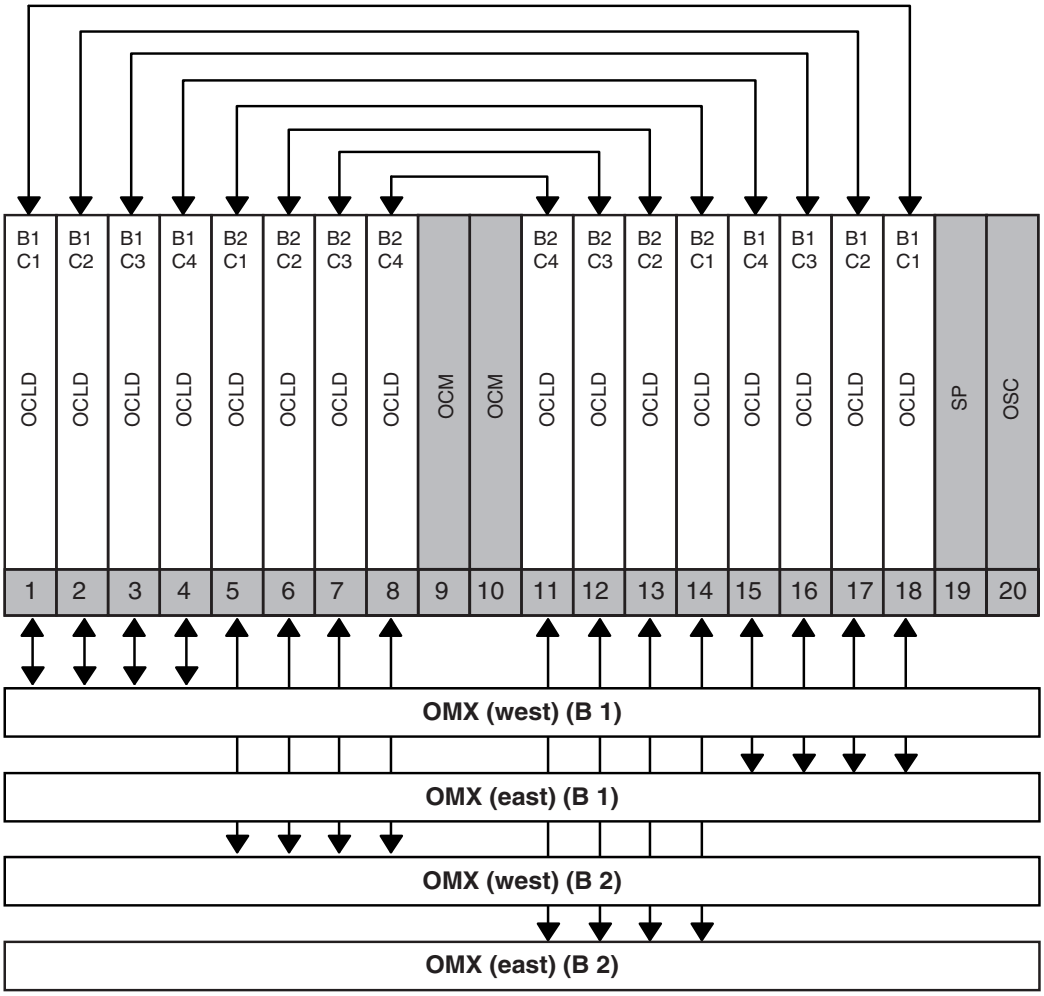
B = band
C = channel

Example 7

Figure 12-13 shows a shelf with electrical pass-through connections for signal regeneration with two bands using OCLD circuit packs. All of the channels in both bands are regenerated as they undergo the optical/electrical/optical (OEO) conversion required to pass through the OCLDs. This shelf would likely be used as an interim shelf in a long fiber span where dispersion is a concern. Because no signals are being added or dropped to the client interface, OCI circuit packs are not required.

Figure 12-13
Example 7

OM0746p



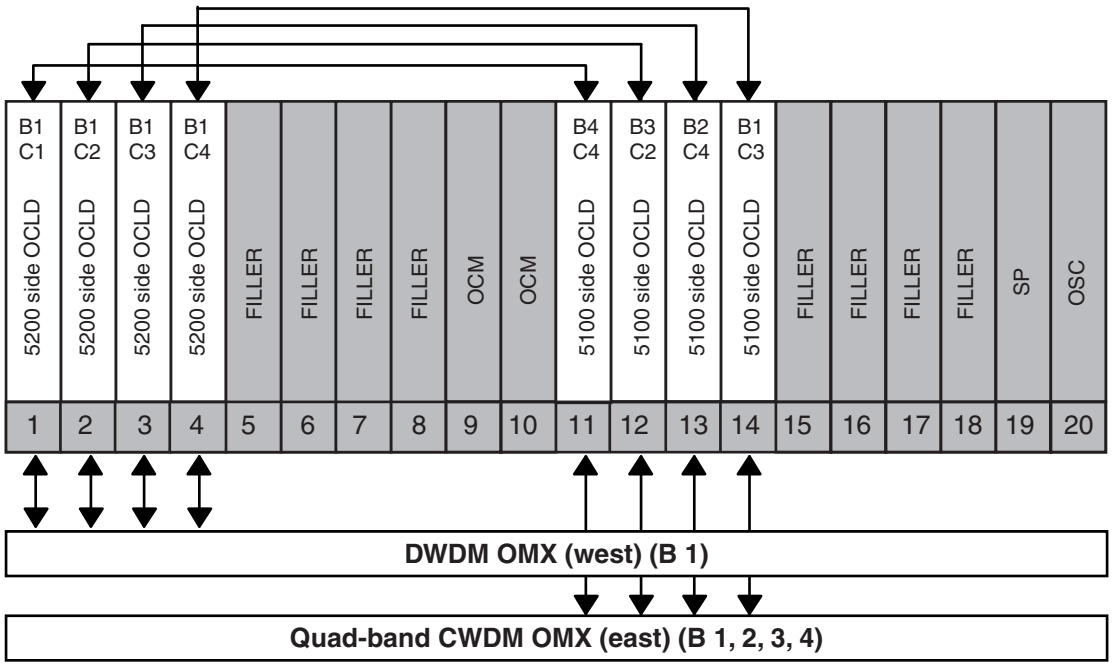
Legend

B = band
C = channel

Example 8

Figure 12-14 shows a bridge shelf with electrical pass-through connections for interconnecting an Optical Metro 5100 and an Optical Metro 5200 network. The CWDM OMX is required for the 5100 network only if fibers carry more than one channel. Slots 1 to 4 hold the OCLDs for the 5200 network, and slots 11 to 14 hold the OCLDs for the 5100 network.

Figure 12-14
Example 8



Legend

B = band C = channel

Optical Metro 5100 slot configuration examples

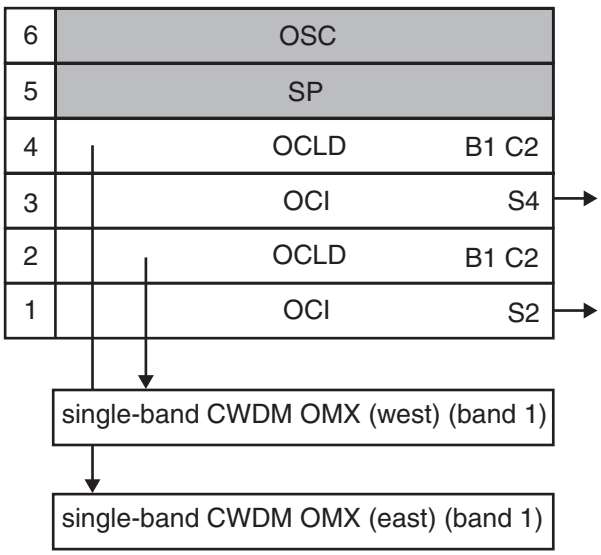
The following examples show some of the available options for slot configurations in Optical Metro 5100 shelves. In all examples, slots 1 and 2 represent the west plane, and slots 3 and 4 represent the east plane.

Example 1

Figure 12-15 shows a shelf with add/drop connections with one CWDM band using OCLD and OCI circuit packs. The channels are unprotected. The OCI in slot 1 is connected to the OCLD in slot 2. The OCI in slot 3 is connected to the OCLD in slot 4. Although this example includes OMXs, Optical Metro 5100 networks that have separate fibers for each wavelength do not require OMXs.

Figure 12-15
Example 1

OM1207t



Legend

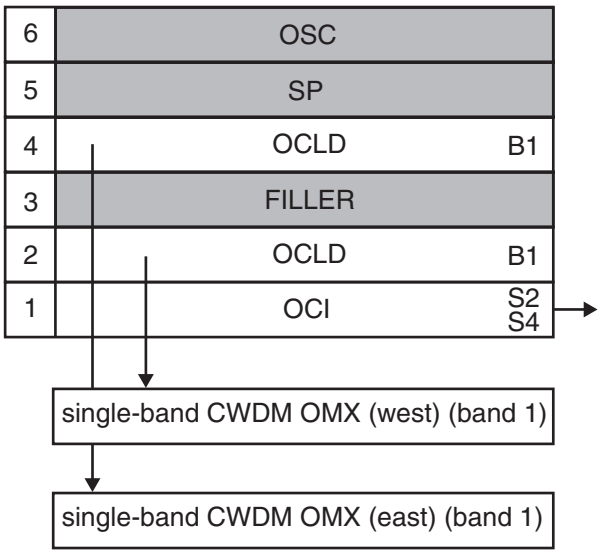
B = band
S = associated OCLD slot number

Example 2

Figure 12-16 shows a shelf with add/drop connections with one CWDM band using OCLD and OCI circuit packs. The channels are protected. The OCI in slot 1 is connected to the OCLD in slots 2 and 4.

Figure 12-16
Example 2

OM1208t



Legend

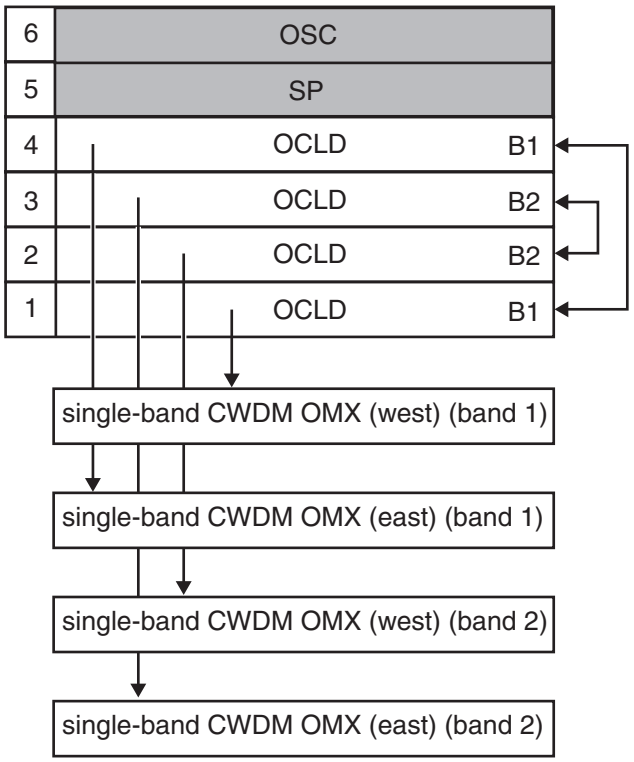
B = band
S = associated OCLD slot number

Example 3

Figure 12-17 shows a shelf with electrical pass-through connections for signal regeneration with two CWDM bands using OCLD circuit packs. Both bands are regenerated as they undergo the optical/electrical/optical (OEO) conversion required to pass through the OCLDs. This shelf would likely be used as an interim shelf in a long fiber span where dispersion is a concern. Because no signals are being added or dropped to the client interface, OCI circuit packs are not required.

Figure 12-17
Example 3

OM1209t



Legend

B = band
S = associated OCLD slot number

Choosing an Optical Metro 5200 WDM shelf

There are three shelf variants available for use as Optical Metro 5200 WDM shelves:

- Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
- Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
- Optical Metro 5200 shelf assembly (standard, 12 U high)

An Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced is recommended for flexibility and ease of use. Use an Optical Metro 5200 shelf assembly (standard, 12 U high) only if rack density is a priority and your site plan shows improved density with the standard shelf (12 U) and an OMX (Standard). For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Choosing an OFA shelf

There are three shelf variants available for use as OFA shelves:

- Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
- Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
- Optical Metro 5200 shelf assembly (standard, 12 U high)

The Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced is recommended if you are not using ECTs (PBEs, APBEs, and/or the C&L splitter/coupler trays are used instead).

Use an Optical Metro 5200 shelf assembly (standard, 12 U high) if you are using ECTs. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Equipping rules for a DWDM OMX

The DWDM OMXs perform the add/drop functions for the Optical Metro 5200 WDM shelves. There are four types of DWDM OMX:

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

The OMX 16CH can be used with Optical Metro 5100 and Optical Metro 5200 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, OMX 4CH + Fiber Manager and the OMX 4CH Enhanced provide more flexibility in physical placement and OCLD/OTR/Muxponder connectivity. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

OMX 16CH

- One OMX 16CH occupies 2 U of height in the rack.
- You can connect one OMX 16CH to multiple shelves.
- You can connect multiple OMXs to one shelf, as required.
- Fiber management is not provided in the OMX 16CH chassis. The Fiber Manager can be used for fiber management.

OMX 4CH + Fiber Manager

- One OMX 4CH + Fiber Manager occupies 1 U of height in the rack.
- You can connect one OMX 4CH + Fiber Manager to multiple shelves.
- You can connect multiple OMXs to one shelf, as required.

OMX 4CH Enhanced

- One OMX 4CH Enhanced occupies 1 U of height in the rack.
- The OMX 4CH Enhanced is recommended for most shelf configurations.
- You can connect one OMX 4CH Enhanced to multiple shelves.
- You can connect multiple OMXs to one shelf, as required.

OMX (Standard)

- Two OMX (Standard) trays occupy 1 U of height in the rack
- A maximum of two OMX (Standard) trays may be used with an Optical Metro 5200 WDM shelf.
- When an Optical Metro 5200 shelf assembly (standard, 12 U high) is used, two OMX (Standard) trays may be placed in the built-in drawer.

- When an Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) or the Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced is used, an OMX Mounting Kit must be installed directly below the WDM shelf. Two OMX (Standard) trays may be placed in the OMX Mounting Kit. This shelf configuration is not recommended.
- The fiber pigtails of the OMX (Standard) tray must be connected to OCLD circuit packs with FC adaptors or OCLD filler cards in slots 1-4 and 15-18 in the WDM shelf.
- If you use patch cords with the fiber pigtails, you can connect to OCLD circuit packs with LC or FC adaptors in slots 1-8 and 11-18.
- Although it is not recommended, you can connect one OMX (Standard) to multiple shelves, using an adaptor and patch cords to lengthen the OMX pigtails. For details about attaching a patch cord to OMX pigtails, see the procedure "Connecting an OMX to OCLD circuit packs" in *Connection Procedures*, 323-1701-221.

Equipping rules for a CWDM OMX

CWDM OMXs perform the add/drop functions for the Optical Metro 5100/5200 shelf. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information". There are two types of CWDM OMXs:

- OMX 1CH CWDM
- OMX 4CH CWDM

OMX 1CH CWDM

- The OMX 1CH CWDM is used with the Optical Metro 5100 shelf.
- The drawer occupies 1 U of height in the rack.
- One or two OMX 1CH CWDMs can be placed in the drawer.

OMX 4CH CWDM

- The OMX 4CH CWDM can be used in CWDM networks with the following shelf types:
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
  - — Optical Metro 5100 shelf
- The OMX 4CH CWDM occupies 1 U of height in the rack.
- You can connect one OMX 4CH CWDM to multiple shelves.

Equipping rules for an ITU CWDM OMX or an OADM ITU CWDM OMX

ITU CWDM OMXs perform the add/drop functions for the Optical Metro 5100/5200 shelf. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information". There are two types of ITU CWDM OMXs:

- OMX 4CH ITU CWDM
- OMX 8CH ITU CWDM

There are two types of OADM ITU CWDM OMXs:

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

OMX 4CH ITU CWDM

- The OMX 4CH ITU CWDM can be used in ITU CWDM networks with the following shelf types:
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
  - — Optical Metro 5100 shelf
- The drawer occupies 1 U of height in the rack.
- You can connect one OMX 4CH ITU CWDM to multiple shelves.

OMX 8CH ITU CWDM

- The OMX 8CH ITU CWDM can be used in ITU CWDM networks with the following shelf types:
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
  - — Optical Metro 5100 shelf
- The drawer occupies 1 U of height in the rack.
- You can connect one OMX 8CH ITU CWDM to multiple shelves.

OMX 1CH OADM ITU CWDM

- The OMX 1CH OADM ITU CWDM can be used in ITU CWDM networks with the following shelf types:
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced

— Optical Metro 5100 shelf

- The drawer occupies 1 U of height in the rack.

OMX 4CH OADM ITU CWDM

- The OMX 4CH OADM ITU CWDM can be used in ITU CWDM networks with the following shelf types:
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high)
  - — Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced
  - — Optical Metro 5100 shelf
- The drawer occupies 1 U of height in the rack.
- You can connect one OMX 4CH OADM ITU CWDM to multiple shelves.

Equipping rules for ECT, PBE, discrete VOAs, C&L splitter/coupler trays, and 1310 nm splitter/coupler trays

The 12 U OFA shelf is equipped with one ECT that is built into the shelf. You must order an OFA installation kit (NT0H44AB) in conjunction with the 12 U OFA shelf. A second ECT may be installed in the drawer included in the OFA installation kit. A maximum of two ECTs can be mounted with an OFA shelf.

The PBE, discrete VOA, C&L splitter/coupler, and 1310 nm splitter/coupler are mounted independently of the shelf. Refer to Table 12-8 on page 12-45 to determine where to locate these components. For a list of Product Engineering Codes (PECs), refer to Chapter 13, “Optical Metro 5100/5200 ordering information”.

Equipping rules for OSC

The OSC functionality at a site is optional. To achieve the OSC functionality, one OSC circuit pack and one OSC dual filter drawer assembly (containing two OSC trays) are required.

The OSC tray assembly consists of a dual filter drawer and two OSC trays. Several combinations are available. For OSC tray product engineering codes refer to Chapter 13, “Optical Metro 5100/5200 ordering information”. The OSC tray assembly occupies 1 U of height in the rack. Refer to Table 12-8 on page 12-45 to determine where to locate the OSC tray assembly.

Equipping rules for DSCM

DSCMs (Dispersion Slope Compensating Module) are designed to compensate the chromatic dispersion slope and dispersion in Extended Metro applications that use OTR 10 Gbit/s Enhanced and Muxponder circuit packs.

The DSCM tray drawer occupies 1 U of height in the rack and is used for containing a single DSCM tray which is installed into the drawer during field deployment. Since the DSCM tray drawer and DSCM tray are offered separately, one DSCM tray drawer must be ordered for each DSCM tray. The fiber management assembly within the drawer provides slack fiber storage and 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 and closed.

The DSCM tray is a field-replaceable unit. Each tray contains a DSCM variant, a bulkhead equipped with two SC-SC adaptors, a digital identification card, and a plate to secure it to the DSCM Drawer. Separate C-band and L-band DSCM trays are available in different lengths to compensate for different amounts of accumulated dispersion.

For DSCM tray drawer and DSCM tray product engineering codes refer to Chapter 13, "Optical Metro 5100/5200 ordering information". Refer to Table 12-8 on page 12-45 to determine where to locate the DSCM tray drawer.

Equipping rules for an Optical Trunk Switch or an Enhanced Trunk Switch

A maximum of one OTS or ETS is required at a site. The OTS or ETS occupies 1 U of height in the rack. Refer to Table 12-8 on page 12-45 to determine where to locate the OTS or ETS.

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

During installation of the OTS or ETS, optical attenuator pads may be required to balance the primary and standby powers if the link containing the trunk switch:

- is to support the 10 Gbit/s OTR Enhanced or the Muxponder circuit pack at day 1
- will be later upgraded with the 10 Gbit/s OTR Enhanced or the Muxponder circuit pack

Note 1: Optical attenuator pads are not required for those OTS or ETS links that will never support the 10 Gbit/s OTR Enhanced or the Muxponder.

Note 2: Bypassing the installation of optical attenuator pads, if required, jeopardizes the means to support 10 Gbit/s OTR Enhanced or the Muxponder circuit packs once service is active.

For the reasons given above, it is highly recommended that Patch Panels (NT0H43CA) are installed on all 10 Gbit/s networks to accommodate the attenuators required for balancing the powers into the trunk switch.

For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Equipping rules for a Transponder Protection Tray

There are four variants of the Transponder Protection Tray:

- single-mode four-channel version (NT0H59AA) that can support a maximum of eight OTRs
- single-mode two-channel version (NT0H59AB) that can support a maximum of four OTRs
- multimode four-channel version (NT0H59BA) that can support a maximum of eight OTRs
- multimode two-channel version (NT0H59BB) that can support a maximum of four OTRs

The Transponder Protection Tray occupies 1 U of height in the rack.

The four-channel versions of the Transponder Protection Trays do not provide slack fiber management components, while the two-channel versions do. Use a Fiber Manager in conjunction with the four-channel Transponder Protection Trays to manage slack fiber as required.

Use your network plan to determine how many Transponder Protection Trays you require, then refer to Table 12-8 on page 12-45 to determine where to locate the Transponder Protection Trays. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Equipping rules for an Equipment Inventory Unit

You can connect one Equipment Inventory Unit to each shelf. It is recommended that you use Nortel Networks patch cords NT0H4322 (9.8 ft.) or NT0H4345 (5 ft.). The Equipment Inventory Unit occupies 1 U of height in the rack. Refer to Table 12-8 on page 12-45 to determine where to locate the Equipment Inventory Unit. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Equipping rules for a Fiber Manager

The Fiber Manager is optional, and may be used to manage slack fiber within the rack. The Fiber Manager occupies 1 U of height in the rack. Refer to Table 12-8 on page 12-45 to determine where to locate the Fiber Manager. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Equipping rules for a Patch Panel

The Patch Panel can be used for a variety of reasons. It occupies 1 U of height in the rack. Refer to Table 12-8 on page 12-45 to determine where to locate the Patch Panel. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

When positioning the Patch Panel in the rack, make sure that the patch cords have the right length. Internal fiber routing inside the Patch Panel requires 0.94 meter (37 inches) of fiber when the fiber enters from the left, and 0.51 meter (20 inches) of fiber when the fiber enters from the right. Slack storage is available within the Patch Panel.

Determining the number of Patch Panels required

The patch panel is required for the following applications:

- when OCI SRM 1310 nm or OCI SRM SONET/SDH circuit packs are used since these circuit packs use MT-RJ type connectors. You need one patch panel for every two OCI SRM 1310 nm or OCI SRM SONET/SDH circuit packs per shelf.
- when OCI SRM ESCON circuit packs are used since this circuit pack uses MPO type connectors. You need one patch panel for every OCI SRM ESCON circuit pack per shelf.
- when OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit packs are used in electrical regen applications. The patch panel is needed to hold the attenuators required in the client-side links to avoid overloading the receiver. One patch panel can be used to connect up to eight pairs of OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit packs back-to-back for an electrical pass-through connection.
- in any configuration without OMXs if attenuation of the OCLD/OTR/Muxponder line-side Rx signal is required. The patch panel is needed to hold the attenuator. One patch panel can be used to provide attenuation for up to eight 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.

- When a mode-conditioning plug is required. A mode-conditioning plug is needed when a 1310 nm laser-based transmitter of an Optical Metro 5100/5200 circuit pack is connected to subtending equipment using multimode fiber. The mode-conditioning plug is only required for this application if the subtending equipment is not colocated with the Optical Metro 5100/5200. Colocated 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 operating error-free. 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. A patch panel is required in this application to hold the mode-conditioning plug. One patch panel can be used to provide mode-conditioning for up to eight signals.

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.

- When an attenuator needs to be added in the link that connects the subtending equipment to a Optical Metro 5100/5200 circuit pack to avoid overloading the Rx port. A patch panel is required in this application to hold the attenuator if the attenuator cannot be connected to the subtending equipment port facing the link. One patch panel can be used to provide attenuation for up to eight 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.

Determining the number of Ethernet hubs and cables required

Sites with more than two Optical Metro 5100/5200 shelves require an Ethernet hub for intershelf messaging. The Ethernet hub provided by Nortel Networks (NT0H43BB) is 1 U high. At sites with only two Optical Metro 5100/5200 shelves, components can be connected directly without an Ethernet hub. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Refer to Table 12-8 on page 12-45 to determine where to locate the Ethernet hub.

Table 12-7 lists the types and lengths of the 10Base-T Ethernet cables available from Nortel Networks.

Table 12-7
Available types and lengths of Ethernet cables

Type of wiring	Length	Use
Straight-through	2.75 m (9 ft.)	Used to connect an Optical Metro 5100/5200 shelf to the System Manager computer.
Cross-over (shielded)	2.15 m (7 ft.)	Used to connect two components in the same rack.
	4.5 m (15 ft.)	Used to connect two components in different racks.

Determining the number of rectifiers required

For sites where –48 V direct current (dc) power is not available, rectifiers can be used to convert alternating current (ac) power to dc power. Nortel Networks provides the following rectifiers for use with the Optical Metro 5100/5200 shelves: the 3U AC Power Rectifier Shelf (3U APRS), and the 1U AC Power Rectifier Shelf (1U APRS). For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

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.

> ***Note:*** The 3U APRS can only be mounted in 19-inch racks. If you want to mount the 3U APRS in a 23-inch rack, you must order and install the "19 to 23-inch extender brackets" (A0704348).

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

If the input feed is 208/220/240 V ac, a single chassis equipped with two rectifier modules can provide redundant input power to two Optical Metro 5200 shelves or two Optical Metro 5100 shelves.

For rectifier specifications for the 3U APRS, refer to *Technical Specifications*, 323-1701-180.

1U APRS

The 1U APRS rectifier is a 1 U high rack-mounted chassis that can hold a maximum of two rectifier modules. One chassis with two modules is required to provide a redundant input power supply to one Optical Metro 5100 shelf.

> ***Note:*** The 1U APRS cannot be used to power Optical Metro 5200 shelves.

For rectifier specifications for the 1U APRS, refer to *Technical Specifications*, 323-1701-180.

NEBS shelf extension

For networks compliant to NEBS Level 3, a NEBS shelf extension must be mounted directly above the Optical Metro 5200 shelves. The shelf extension is 1 U high. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Fiber-optic patch cords

For information about fiber-optic patch cords, refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

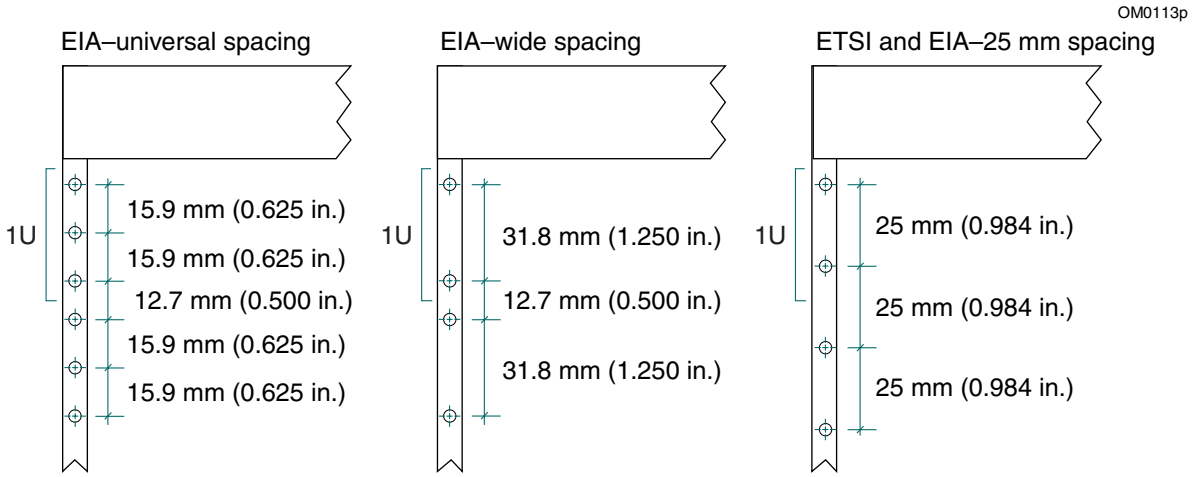
Equipment racks

The Optical Metro 5100/5200 shelves must be mounted in equipment racks. The equipment racks must meet the following requirements:

- racks must be one of the following standard rack widths
  - –EIA 19-inch (preferred internal usable aperture width of 17.75")
  - –EIA 23-inch
  - –ETSI 535-mm (for equipment rack or cabinet)
- Mounting holes must be spaced according to:
  - –EIA universal spacing
  - –EIA wide spacing
  - –EIA 25-mm spacing
  - –ETSI 25-mm spacing

Figure 12-18 shows acceptable EIA and ETSI hole spacing. For a list of Product Engineering Codes (PECs), refer to Chapter 13, "Optical Metro 5100/5200 ordering information".

Figure 12-18
Hole spacing in standard equipment racks



Space requirements

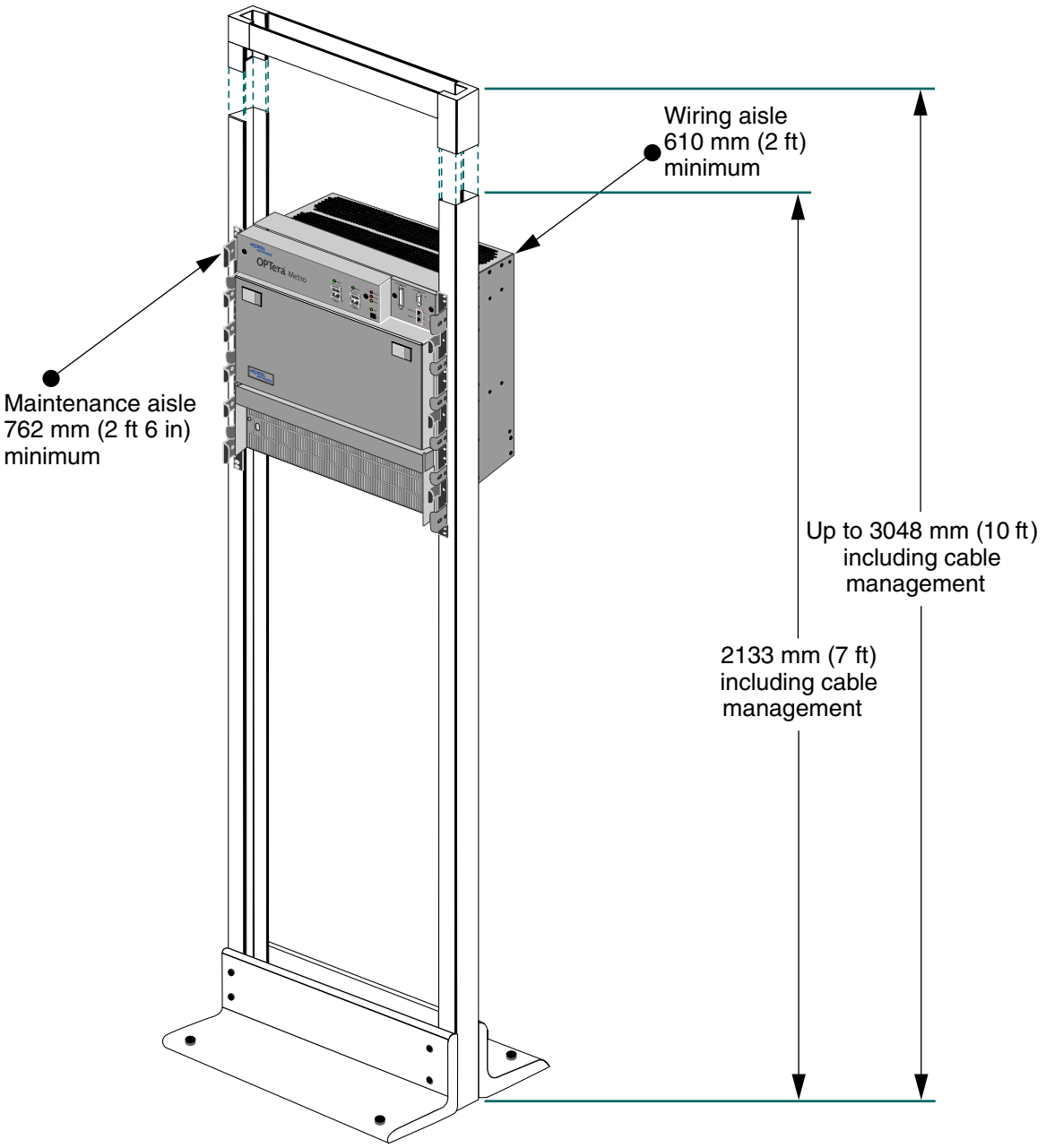
Peripheral space requirements

Each equipment rack or bank of equipment racks must meet the minimum requirements for peripheral space. Leave at least 762 mm (2.5 ft.) in front of the equipment rack to create a maintenance aisle. You must fasten all equipment racks to the floor or equipment platform according to the rack manufacturer's specifications.

Figure 12-19 on page 12-44 shows an example for Telcordia GR-63-CORE compliance for 305 mm deep frames. When Telcordia GR-63-CORE is used with 305 mm deep frames, leave at least 610 mm (2 ft.) behind the equipment rack to create a wiring aisle. The rack equipment and cable management system cannot be higher than 3.05 m (10 ft.).

Figure 12-19
Equipment rack peripheral space requirements

OM0111p



Rack height

A standard 7-ft. equipment rack normally has up to 44 units (U) of vertical space available for the installation of equipment. One unit is equal to approximately 44.5 mm or 1.75 in. Variations in frame design and manufacturing may limit the available height to 43 U. The examples in this section are based on a standard 7-ft. rack with 43 Us of available space.

Planning the rack layout

Equipment positioning

Some equipment should be installed in fixed positions in a rack, while other equipment can be positioned according to the available space in each rack. Table 12-8 lists all Optical Metro 5100/5200 components, and the positioning guidelines that apply to each.

Table 12-8
Component positions in a standard rack

Component	Height	Positioning guidelines
Ethernet hub	1 U	Install at the top of any rack at the site
Fiber manager	1 U	Install in the highest position in each rack as required
Optical trunk switch	1 U	Install in the next highest position in the rack (first rack only)
Enhanced trunk switch	1 U	Install in the next highest position in the rack (first rack only)
OSC tray assembly	1 U	Install in the next highest position in the rack (first rack only) (see Note 1)
DSCM	1 U	Install in the highest rack position below the associated OFA shelf
C&L splitter/coupler	1 U	Install in the next highest position in the rack (first rack only)
1310 splitter/coupler	1 U	Install in the next highest position in the rack (first rack only)
Equipment inventory unit	1 U	Install in the same rack as the shelf and all of the equipment connected to it.
Optical Metro 5200 shelf assembly (standard, 12 U high)	12 U	Install as needed for WDM or OFA applications (see Note 2)
Optical Metro 5200 shelf assembly modified for OMX variants (11 U high) Enhanced	11 U	Install as needed for WDM or OFA applications (see Note 2)

Table 12-8 (continued)
Component positions in a standard rack

Component	Height	Positioning guidelines
NEBS Extension Shelf	1 U	Install directly above the associated WDM or OFA shelf
Air Baffle	1 U	Install directly above the associated WDM or OFA shelf (see Note 3)
Optical Metro 5100 shelf	4 U	Install as needed (see Note 2)
OMX	1 U (2 U for the OMX 16CH)	Install below the associated WDM shelf. If an OMX is to be shared by multiple Optical Metro 5100/5200 shelves, install the OMX(s) below all of the shared shelves.
ECT	1 U	Install below the associated OFA shelf
PBE	1 U	Install below the associated OFA shelf
Discrete VOA	1 U	Install below the associated OFA shelf
Transponder Protection Tray	1 U	Install below the OMX associated with the WDM shelf

Table 12-8 (continued)
Component positions in a standard rack

Component	Height	Positioning guidelines
Patch panels	1 U	Install above, and as close as possible, to the equipment to which the patch panel is connected
Rectifiers • 3U APRS • 1U APRS	 • 3 U • 1 U	 • Install at the bottom of the rack • Install directly above the Optical Metro 5100 shelf

Note 1: Patch cords are used to connect the OSC circuit pack in slot 20 of one shelf at the site to the OSC tray assembly. The fibers enter the OSC tray assembly on the right side. Do not route the fibers upward from slot 20 to the OSC tray assembly using the fiber guide on the right side of the shelf or the minimum fiber bend radius will be violated. Instead, use one of the following alternatives to deploy the OSC tray assembly:

— route the fibers into a vertical fiber manager located at a distance of over 2.4 inches from the centre of the OSC circuit pack

— route the fibers to the left of the shelf, then into the fiber guide on the left side, across the front of another shelf, and finally upward to the OSC shelf

— locate the OSC tray assembly below the shelf containing the OSC circuit pack

Note 2: WDM and OFA shelves should be installed together in the rack with the associated shelf components. The following shelves and shelf components can be considered as groups:

— WDM shelves, patch panels, NEBS shelf extensions, OMXs, Transponder Protection Trays (TPT), Optical Trunk Switches (OTS), Enhanced Trunk Switches (ETS), and C&L splitter/coupler trays

— OFA shelves, NEBS shelf extensions, ECTs, PBEs, discrete VOAs, and C&L splitter/coupler trays

Note 3: It is not possible to use the Air Baffle and the NEBS Extension Shelf at the same time.

Note 4: If possible, start equipping from the bottom of the rack to ensure that any leftover empty space can be used at the top of the rack for inter-rack slack fiber management.

Note 5: An Optical Metro 5200 OFA shelf assembly (standard 12 U high) occupies 13 U of space with a second ECT installed.

Using space efficiently

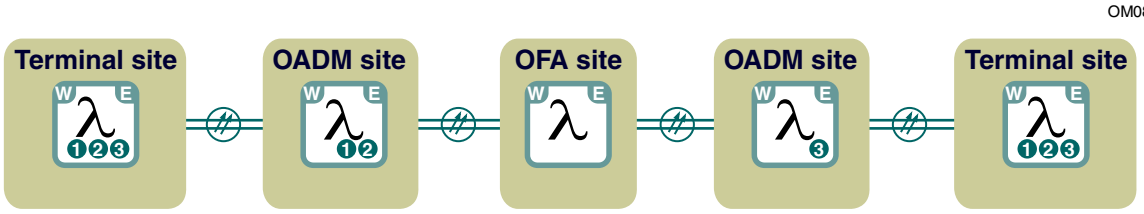
In most cases, you will have empty Us left over in the rack after all the equipment is installed. Plan the rack layout so that the empty Us can be used either to:

- separate groups of components for ease of identification, or
- to accommodate future equipment, or
- to hold slack fiber at the top of the rack for inter-rack fibering

Following network sequence

It is prudent to follow the sequence of bands in the network when installing components in the rack. For example, Figure 12-20 shows a sample linear OADM network.

Figure 12-20
Linear OADM network



In each terminal site in this network, install the shelves in the racks in this order:

- WDM shelf for bands 1 and 2 in the first rack
- WDM shelf for band 3 in the second rack

This approach simplifies the installation activity and the identification of components for future upgrade and maintenance activities.

Fiber bend radius

The fiber bend radius is the amount of bend that can occur in optical fiber before signals may experience attenuation.

You must maintain a minimum fiber bend radius of 1.18 in.(30 mm). For example, if you have several OMXs mounted together in a rack, you cannot directly connect one OMX to an adjacent OMX without violating the minimum fiber bend radius.

You can use a Fiber Manager to route fibers to and from components to avoid fiber bend problems. For example, if you routed the fiber from an OMX to the Fiber Manager, and then from the Fiber Manager to an adjacent OMX in the rack, you will not violate the minimum fiber bend radius. See the examples in this section for applications using a Fiber Manager.

> ***Note:*** You must leave at least 1 U of space beneath the Fiber Manager to avoid violating the fiber bend radius between the drawer and the component directly underneath.

Alternately, you can leave 1 U of space between adjacent components that are to be connected.

Future upgrade plans

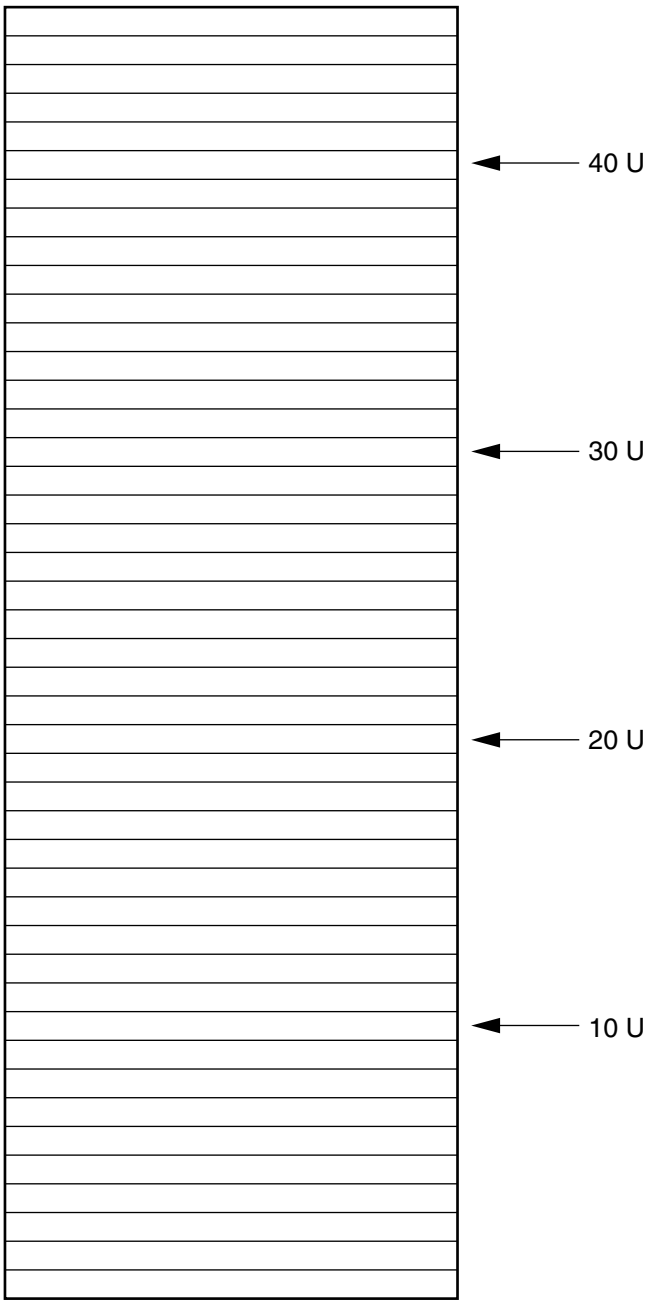
It is prudent to keep future upgrade requirements in mind when installing equipment. For example, if you know that the network will likely deploy the OSC in the future, leave 1 U of rack space empty at each site to accommodate the OSC tray.

Rack planning worksheet

Copy and use Figure 12-21 on page 12-50 to help plan the equipment placement in each rack.

Figure 12-21
Rack planning worksheet

OM0819t

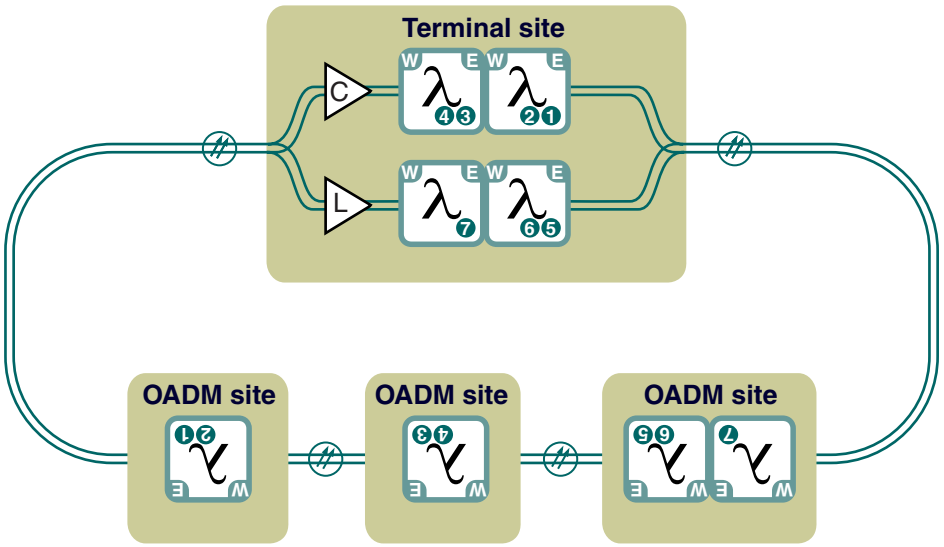


Site example 1

The following example is based on a terminal site in an amplified hubbed ring network. This network is protected, NEBS compliant, and uses the OSC. Bands 1, 2, 3, 4, and 7 use OCLD 1.25 Gbit/s and OCI 1.25 Gbit/s circuit packs. Bands 5 and 6 use OCLD 1.25 Gbit/s and OCI SRM 1310 nm circuit packs. This network will likely expand to include band 8 in the future. Figure 12-22 shows the network.

Figure 12-22
Network example 1

OM0797p



The following figures show the equipped racks at the terminal site in this example network.

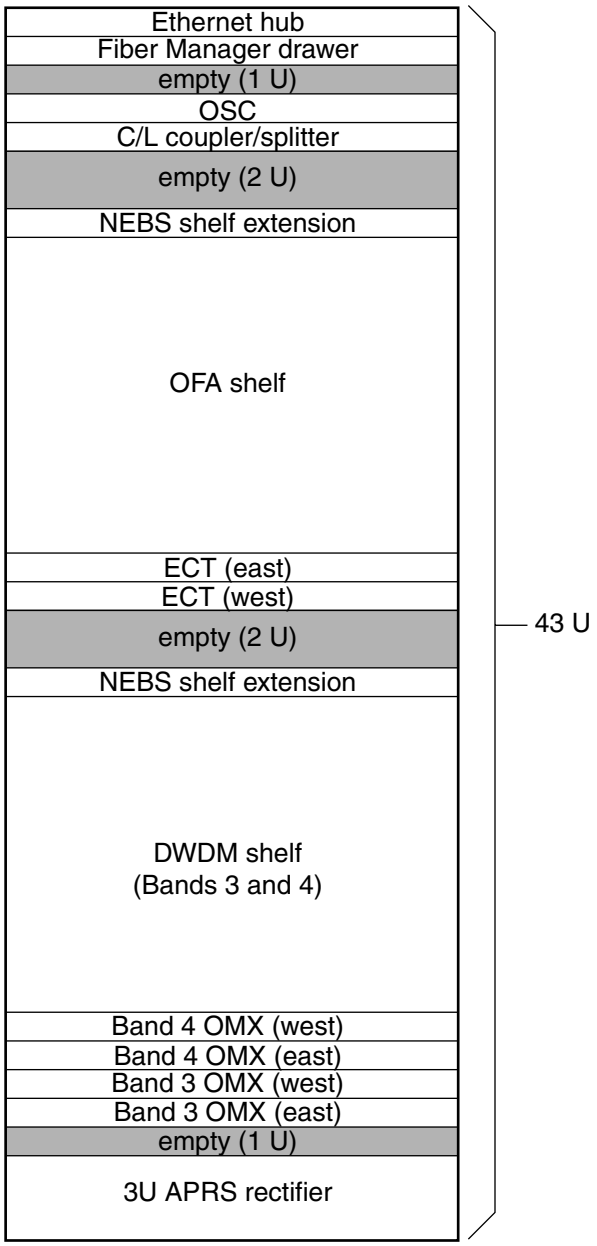
First rack

Figure 12-23 on page 12-52 shows the first rack in the site. This rack contains the Ethernet hub, OSC tray, and C&L splitter/coupler. These three components are site-related, and you require only one of each of these components at a site. The Ethernet hub, OSC tray, C&L splitter/coupler, and Fiber Manager are installed at the top of the rack.

One U of space has been left empty between the Fiber Manager and the OSC tray to avoid violating the fiber bend radius for the fibers exiting the OSC and entering the Fiber Manager. The first OFA shelf (and related components) in the site is positioned below the C&L splitter/coupler. Two U of empty space, between the C&L splitter/coupler and the shelf, simplifies identification of the different component groups. Two empty U of space beneath the OFA shelf simplifies identification of the OFA and DWDM shelf in this rack. A 3U APRS rectifier is installed at the bottom of the rack.

Figure 12-23
First rack in terminal site - example 1

OM0820t

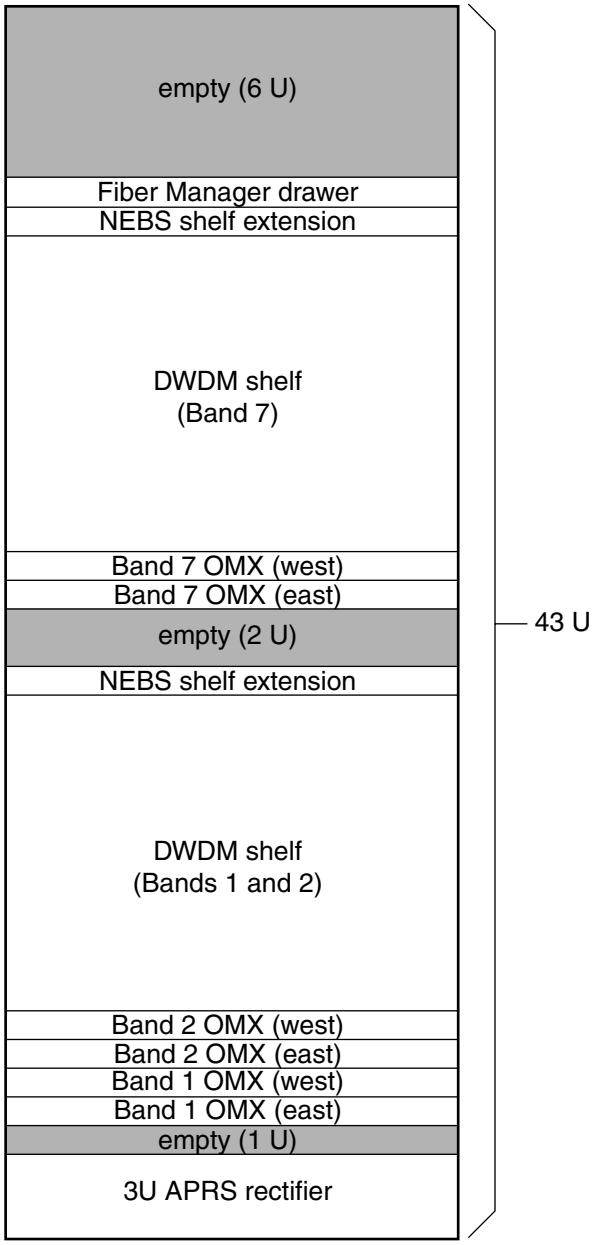


Second rack

Figure 12-24 on page 12-53 shows the second rack in the site. This rack uses a Fiber Manager for intra-rack fiber routing, and contains two DWDM shelves (and related components). Two U of space separate the two shelves to simplify identification. Six U of space are left empty at the top of the rack for inter-rack slack fiber management. A 3U APRS rectifier is installed at the bottom of the rack.

Figure 12-24
Second rack in terminal site - example 1

OM0821t



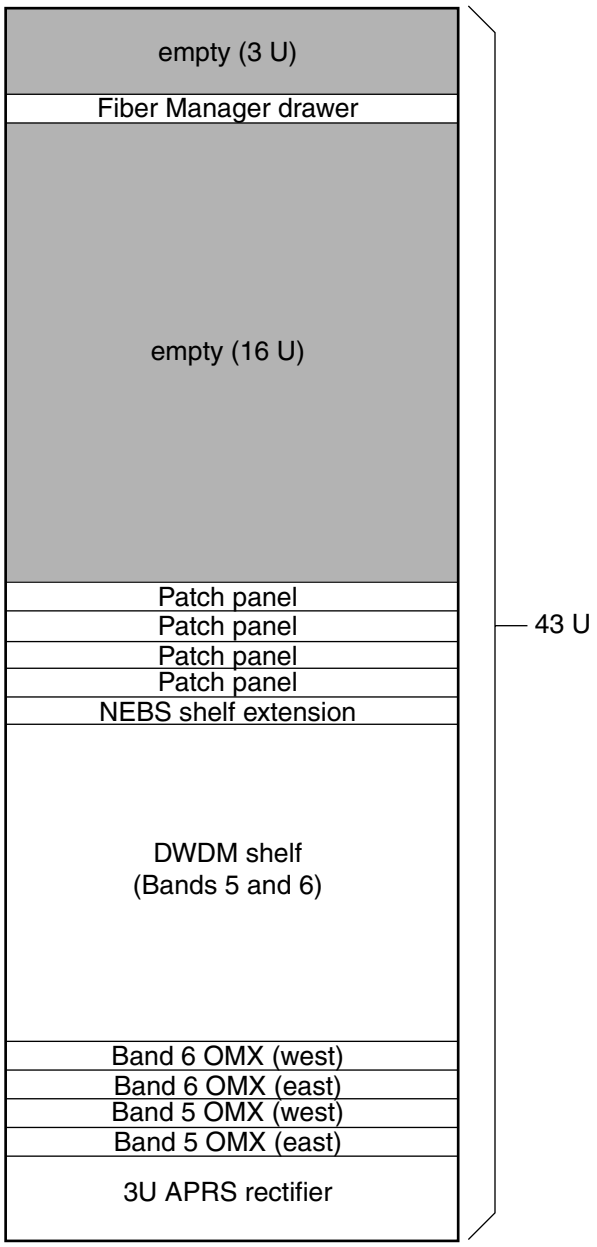
Third rack

Figure 12-25 on page 12-54 shows the third rack in the site. This rack uses a Fiber Manager for intra-rack fiber routing, and contains one DWDM shelf (and related components) for bands 5 and 6. The shelf is filled completely with OCI SRM 1310 nm circuit packs, which require one patch panel for every two OCIs.

Sixteen U of empty space are left to accommodate a future DWDM shelf for band 8. A total of 16 U are required for the shelf (11 U), the NEBS extension (1 U), two OMXs (2 U), and two U of empty space between the shelves to simplify identification. Three U of empty space is left at the top of the rack, which can be used for inter-rack slack fiber management. A 3U APRS rectifier is installed at the bottom of the rack.

Figure 12-25
Third rack in terminal site - example 1

OM0822t



Site example 2

The following example is based on a terminal site in an unamplified point-to-point network. This network uses OTR 10 Gbit/s circuit packs whose signals are protected using a Transponder Protection Tray (TPT). This network does not comply with NEBS standards, and does not use a Fiber Manager for intra-rack fiber routing.

Figure 12-26 shows the network.

Figure 12-26
Network example 2

OM0825p

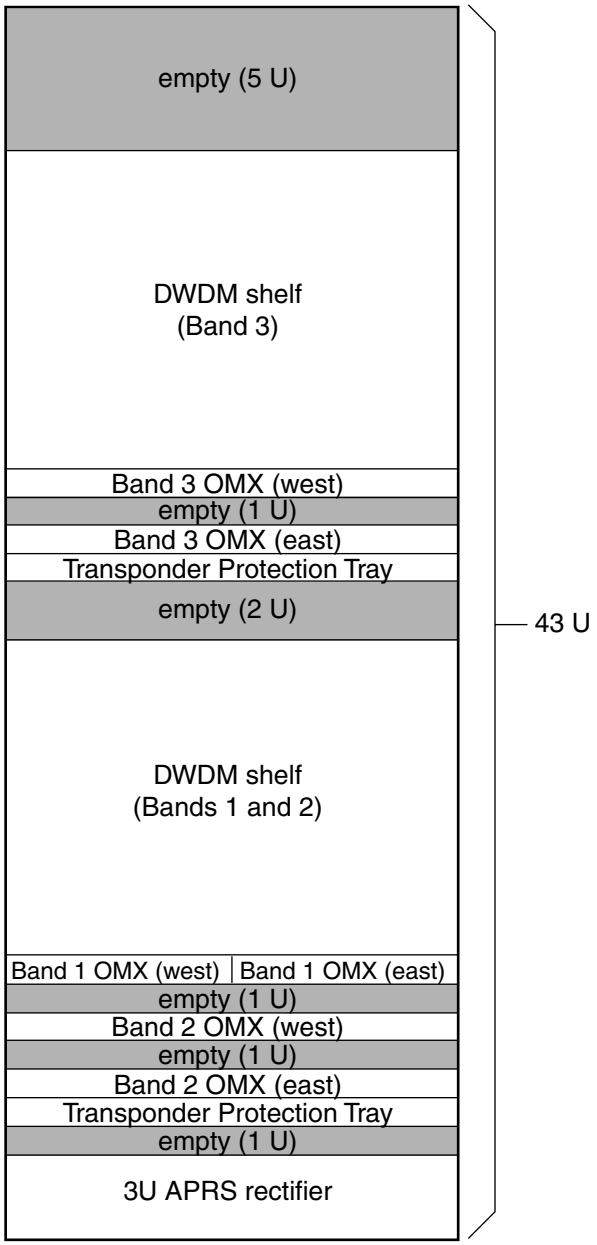
Single rack

Figure 12-27 on page 12-56 shows the only rack in the site. This rack contains two DWDM shelves. Because this site contains only two shelves, no Ethernet hub is necessary. This network also does not use a Fiber Manager or OSC, nor does it contain any C&L splitter/couplers.

Because there is no Fiber Manager, at least 1 U of empty of space must be left between the components (in this case, the west and east OMXs) that are to be connected to each other. The lowest shelf in the rack is a standard (12 U) DWDM shelf with a standard OMX. Two more OMXs 4CH + Fiber Manager have been added to accommodate a second band in the shelf. A 3U APRS rectifier is installed at the bottom of the rack.

Figure 12-27
Single rack in terminal site - example 2

OM0823t



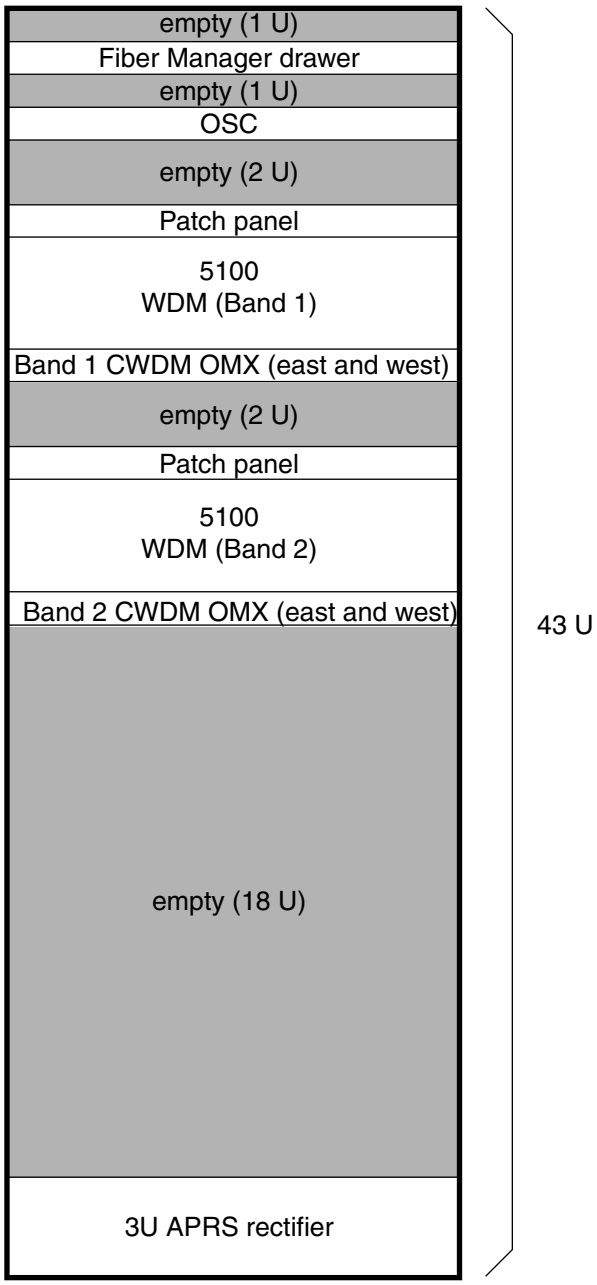
Site example 3

The following example is based on an Optical Metro 5100 site. A patch panel is located above each WDM shelf to support the use of the OCI SRM 1310 nm circuit packs. Space is reserved between components to ease fiber routing, simplify component identification, and allow for future deployment of additional components.

Figure 12-28 on page 12-58 shows the rack for this site. In this example, a 3U APRS rectifier is installed at the bottom of the rack. In cases where a 1U APRS is used to power each shelf, an additional 1U of space is required directly above each shelf to accommodate the 1U APRS. If a cable tie-down bar is used to manage the 1U APRS power and telemetry cables, an additional 1U of space is required above the 1U APRS rectifier.

Figure 12-28
Rack in Optical Metro 5100 site - example 3

OM1219t



Optical Metro 5100/5200 ordering information

In this chapter

Before you order

Make sure that you are familiar with all the requirements of your network before you order equipment.

Optical Metro 5100/5200 software delivery kits

Table 13-1 lists PECs for Optical Metro 5100/5200 software delivery kits. Software delivery kits are to be used for new installations. The kit includes two CDs:

- a software CD for installations from a Windows platform (the CD includes the software and the NTPs for the specific release)
- a software CD for installations from a Solaris platform (the CD includes the software and the NTPs for the specific release)

Table 13-1
Optical Metro 5100/5200 software delivery kits

Release	Product engineering code
8.0	NT0H60NA (see Note 1 and Note 2)
7.01	NT0H60MB (see Note 1 and Note 2)
7.0	NT0H60MA (see Note 1 and Note 2)
6.1	NT0H60LB (see Note 1 and Note 2)
6.0	NT0H60LA (see Note 1 and Note 2)
Note 1: It is mandatory to order an initial purchase RTU (1 per network element) and a release-specific Software certificate (1 per network element) when ordering this PEC. See the "Initial purchase RTUs" section and the "Software certificates" section in Table 13-3 on page 13-5 for the list of PECs. ***Note 2:*** Other RTUs may need to be ordered. See the "Other RTUs" section in Table 13-3 on page 13-5.	

Optical Metro 5100/5200 software upgrade kits

Table 13-2 lists PECs for Optical Metro 5100/5200 software upgrade kits. Software upgrade kits are to be used to upgrade existing installations running a specific software load to a more recent software load. The kit includes three CDs:

- the same two CDs included in the software delivery kit (see Optical Metro 5100/5200 software delivery kits on page 13-3)
- a CD containing the Software Upgrade CAP (Change Application Procedure)

Table 13-2
Optical Metro 5100/5200 software upgrade kits

Release	Product engineering code	Software Upgrade CAP Product engineering code and title
8.0	NT0H61NA (see Note)	NTY434AJ: System software upgrade to Rel. 8.0 from Rel. 6.0, Rel. 6.1, Rel. 7.0 or Rel. 7.01
7.01	NT0H61MB (see Note)	NTY436AH: System software upgrade to Rel. 7.0 from Rel. 5.0, Rel. 6.0, Rel. 6.1, or Rel. 7.0
7.0	NT0H61MA (see Note)	NTY434AH: System software upgrade to Rel. 7.0 from Rel. 5.0, Rel. 6.0 or Rel. 6.1
6.1	NT0H61LB (see Note)	NTY434AG: System software upgrade to Rel. 6.1 from Rel. 4.1, Rel. 5.0 or Rel. 6.0
6.0	NT0H61LA (see Note)	NTY434AF: System software upgrade to Rel. 6.0 from Rel. 4.0, Rel. 4.1 or Rel. 5.0
Note: It is mandatory to order a software upgrade RTU (1 per network element) and a release-specific Software certificate (1 per network element) when ordering this PEC. See the "Software upgrade RTUs" section and the "Software certificates" section in Table 13-3 on page 13-5 for the list of PECs.		

Optical Metro 5100/5200 licenses

Table 13-3 lists Optical Metro 5100/5200 license information.

Table 13-3
Optical Metro 5100/5200 licenses

Product engineering code	Item
Initial purchase RTUs	
NT0H68GA	New Optical Metro 5200 network element RTU (1 per network element): This RTU provides the right to use the Optical Metro 5200 network element on initial purchase.
NTPM68GA	New Optical Metro 5100 network element RTU (1 per network element): This RTU provides the right to use the Optical Metro 5100 network element on initial purchase.
Software upgrade RTUs	
NT0H68HA	Optical Metro 5200 network element Supported Load Upgrade (SLU) RTU (1 per network element): This RTU provides the right to upgrade from any currently supported software load to a more recent software load on an Optical Metro 5200 network element (see Note 1).
NTPM68HA	Optical Metro 5100 network element Supported Load Upgrade (SLU) RTU (1 per network element): This RTU provides the right to upgrade from any currently supported software load to a more recent software load on an Optical Metro 5100 network element (see Note 1).
NT0H68HB	Optical Metro 5200 network element Non-Supported Load Upgrade (NSLU) RTU (1 per network element): This RTU provides the right to upgrade from any non-supported or obsolete software load to a more recent software load on an Optical Metro 5200 network element (see Note 1).
NTPM68HB	Optical Metro 5100 network element Non-Supported Load Upgrade (NSLU) RTU (1 per network element): This RTU provides the right to upgrade from any non-supported or obsolete software load to a more recent software load on an Optical Metro 5100 network element (see Note 1).

Table 13-3 (continued)
Optical Metro 5100/5200 licenses

Product engineering code	Item
Other RTUs	
NT0H68AJ	Optical Metro 5100/5200 System Manager Interface RTU (1 per network element): System Manager Interface is the craft terminal interface based on the network element. System Manager Interface is Web client based and accessible from any browser connected to the shelf using an IP network. This RTU provides the right to launch this software interface from a particular network element, and then to use this software to manage that network element.
NT0H68AK	Optical Metro 5100/5200 SNMP Northbound Interface RTU (1 per network element): SNMP is an interface provided northbound from the network element which provides some management and alarm reporting capabilities. When this interface is used directly by an application other than the System Manager Interface, an SNMP Northbound Interface RTU is required per network element.
NT0H68AM	Optical Metro 5100/5200 TL1 Northbound Interface RTU (1 per network element): TL1 is an interface provided northbound from the network element which allows full management and alarm reporting. When this interface is used by an application other than ONM (Optical Network Management or OMEA), a TL1 RTU is required per network element.
Software certificates (see Note 2)	
NT0H68NA	Rel. 8.0 Optical Metro 5200 network element Software Certificate (1 per network element)
NTPM68NA	Rel. 8.0 Optical Metro 5100 network element Software Certificate (1 per network element)
NT0H68MB	Rel. 7.01 Optical Metro 5200 network element Software Certificate (1 per network element)
NTPM68MB	Rel. 7.01 Optical Metro 5100 network element Software Certificate (1 per network element)
NT0H68MA	Rel. 7.0 Optical Metro 5200 network element Software Certificate (1 per network element)
NTPM68MA	Rel. 7.0 Optical Metro 5100 network element Software Certificate (1 per network element)
NT0H68LB	Rel. 6.1 Optical Metro 5200 network element Software Certificate (1 per network element)
NTPM68LB	Rel. 6.1 Optical Metro 5100 network element Software Certificate (1 per network element)

Table 13-3 (continued)
Optical Metro 5100/5200 licenses

Product engineering code	Item
NT0H68LA	Rel. 6.0 Optical Metro 5200 network element Software Certificate (1 per network element)
NTPM68LA	Rel. 6.0 Optical Metro 5100 network element Software Certificate (1 per network element)
Note 1: A supported load is defined as a software load that has passed the General Availability milestone (GA), but has not passed the End Of Life milestone (EOL). GA and EOL milestones are published through PCNs. Contact Nortel Networks for details on supported loads and MD/EOL dates. Both the SLUs and NSLUs are independent of the number of steps required to upgrade the network element and are a one-time purchase fee per network element. The SLU and NSLU provide a right to upgrade, but do not include media (Software or Documentation CD-ROM). Software subscription services (SRS) are available separately which provide a reduced cost and annual subscription for software upgrades. Additional services are available from Nortel Networks to assist with implementation or consultation on implementation procedures, and for type-approval. ***Note 2:*** Software certificates are used to allow tracking of licensed software loads across each network element. These provide a proof of purchase for a particular software load, on a particular network element.	

Table 13-4 lists the PECs for SNMP MIB CD-ROMs.

Table 13-4
SNMP MIB CD-ROMs

Product engineering code	Description
NT0H70NA	Release 8.0 surveillance MIB for Optical Metro 5100/5200
NT0H70NE	Release 8.0 MIB for Enhanced Trunk Switch (ETS)

Optical Metro 5200 shelf processor (SP) circuit packs

Table 13-5 lists the ordering codes for Optical Metro 5200 SP circuit packs.

Table 13-5
Optical Metro 5200 SP circuit packs

Release	Ordering code
8.0	S0H60NAD1A
7.01	S0H60MBD1A
7.0	S0H60MAD1A
6.1	S0H60LBD1A
6.0	S0H60LAD1A

Optical Metro 5200 optical channel manager (OCM) circuit packs

Table 13-6 lists the ordering codes for Optical Metro 5200 OCM circuit packs.

Table 13-6
Optical Metro 5200 OCM circuit packs

Release	Ordering code
8.0	NT0H40BC
7.01	NT0H40BC
7.0	NT0H40BC
6.1	NT0H40BC
6.0	NT0H40BC

Optical Metro 5100 shelf processor (SP) circuit packs

Table 13-7 lists the ordering codes for Optical Metro 5100 SP circuit packs.

Table 13-7
Optical Metro 5100 SP circuit packs

Release	Ordering code
8.0	S0H60NAD1A
7.01	S0H60MBD1A
7.0	S0H60MAD1A
6.1	S0H60LBD1A
6.0	S0H60LAD1A

Optical Metro 5200 shelf assembly kits

Table 13-8 lists equipment information for the Optical Metro 5200 shelf.

Table 13-8
Product engineering codes for Optical Metro 5200 shelf assemblies and required circuit packs

Product engineering code	Item
NT0H50BA	Optical Metro 5200 OADM or OFA shelf (11 U) assembly kit includes: • installation kit, includes mounting brackets and hardware (NT0H44BA) • cooling unit, includes air filter (NT0H51AC)
NT0H50BB	Optical Metro 5200 OADM or OFA Enhanced shelf (11 U) assembly kit includes: • installation kit, includes mounting brackets and hardware (NT0H44BA) • cooling unit, includes air filter (NT0H51AD)
Note: You need two OCM circuit packs, and one SP circuit pack per shelf. Circuit packs are not included in the shelf assembly kits. See ordering information for OCM and SP circuit packs.	

Each Optical Metro 5200 shelf comes with an installation kit, maintenance panel cards, cooling unit, and air filter. The items listed in Table 13-9 can be ordered separately for sparing purposes.

Table 13-9
Product engineering codes for components of Optical Metro 5200 shelf assembly

Product engineering code	Item
NT0H44BA	Installation kit (Standard 11U high) (includes mounting brackets and hardware)
NT0H44AJ	OMX Mounting Kit (Legacy OMX, Short Shelf)
NT0H53CA	Power card with A/B power separation (See Note 1)
NT0H51AC	Cooling unit for the OMX Variant (11U) shelf (includes air filter)
NT0H51AD	Cooling unit for the OMX Variant (11U) Enhanced shelf (includes air filter) (see Note 2)
NT0H51BA	Air filter
NT0H54AA	Maintenance panel alarm card (See Note 1)
NT0H55AA	Maintenance panel Ethernet card (See Note 1)
NT0H56AA	Maintenance panel telemetry card (See Note 1)
NT0H57AA	Maintenance panel OMX interface card (See Note 1)
NT0H58AA	Maintenance panel serial port card (X.25) (See Note 1)
Note 1: Each shelf comes with power cards and the maintenance panel cards installed. Order additional power and maintenance panel cards for sparing purposes only. Only qualified Nortel Networks technical support personnel can install cards in the maintenance panel. ***Note 2:*** This cooling unit can also be used with the OMX Variant 11U shelf.	

Optical Metro 5100 shelf assembly kit

Table 13-10 lists equipment information for the Optical Metro 5100 shelf assembly kit.

Table 13-10
Optical Metro 5100 shelf assembly kit and required circuit pack

Product engineering code	Item
NTPM50AA	Optical Metro 5100 shelf assembly kit includes • installation kit (includes mounting brackets and hardware) • cooling unit • air filter • power card (with A/B power separation) • maintenance panel card (includes Ethernet, telemetry, and alarms)
Note: You need one SP circuit pack per shelf. The SP circuit pack is not included in the shelf assembly kit. See for ordering information for SP circuit packs.	

Each Optical Metro 5100 shelf comes with an installation kit, maintenance panel card, power cards, cooling unit, and air filter. The items listed in Table 13-11 can be ordered separately for sparing purposes.

Table 13-11
Product engineering codes for components for the Optical Metro 5100 shelf assembly

Product engineering code	Item
NTPM44AA	Installation kit (includes mounting brackets and hardware)
NTPM53AA	Power card (with A/B power separation) (See Note)
NTPM54AA	Maintenance panel card (includes Ethernet, telemetry, and alarms) (See Note)
NTPM56AA	Cooling unit
NTPM51AA	Air filter
Note: Each Optical Metro 5100 shelf comes with the power cards and the maintenance panel card installed. Order additional power cards and maintenance panel cards for sparing purposes only. Only qualified Nortel Networks technical support personnel can install these cards.	

NEBS Extension Shelf kit

The NEBS Extension Shelf must be used in applications which require that the Optical Metro 5200 shelf comply with NEBS flame spread requirements. Use the NEBS Extension Shelf kit with the Optical Metro 5200 shelf assembly (modified for OMX variants, 11U high)

Note: The NEBS Extension Shelf kit is not required for the Optical Metro 5200 shelf assembly (modified for OMX variants, 11U high) Enhanced or the Optical Metro 5100 shelf assembly (standard 4U high) since these shelf types meet NEBS flame spread requirements without the NEBS Extension Shelf kit.

The product engineering code for the NEBS Extension Shelf kit is NT0H44AF. The NEBS Extension Shelf kit uses up 1 U of rack space.

Air Baffle

Use of the Air Baffle is optional. Without the Air Baffle, the exhaust air exits to the rear and sides of the Optical Metro 5200 shelf at the top. With the Air Baffle, no exhaust air will exit to the sides. The Air Baffle can be configured to allow either front or rear exhaust. The Air Baffle can be used with the following Optical Metro 5200 shelf types:

- Optical Metro 5200 shelf assembly (modified for OMX variants, 11U high)
- Optical Metro 5200 shelf assembly (modified for OMX variants, 11U high) Enhanced

  Note: The Air Baffle cannot be used with the Optical Metro 5100 shelf assembly (standard 4U high).

The product engineering code for the Air Baffle is NT0H51CA. The Air Baffle uses up 1 U of rack space.

Note: It is not possible to use both the Air Baffle and the NEBS Extension Shelf kit.

OCI circuit packs

Use the following OCI circuit packs with an Optical Metro 5100 or Optical Metro 5200 shelf for DWDM, CWDM, and ITU CWDM systems. Table 13-12 lists the product engineering codes for OCI circuit packs.

Table 13-12
Product engineering codes for OCI circuit packs

Product engineering code	Item
NT0H10BC	OCI 622 Mbit/s 1310 nm
NT0H10CA	OCI 1.25 Gbit/s 850 nm
NT0H10CB	OCI 1.25 Gbit/s 1310 nm
NT0H20CH	OCI ISC 1310 nm
NT0H20CN	OCI GbE 1310 nm
NT0H20CP	OCI GbE 850 nm
NT0H10HJ	OCI SONET/SDH 1310 nm
NT0H11EK	OCI SRM 1310 nm
NT0H11EL	OCI SRM 1310 nm LC
NT0H11BC	OCI SRM SONET/SDH LTE
NT0H10HK	OCI SONET/SDH IR 1310 nm
NT0H21JN	OCI SRM ESCON
NT0H21CA	OCI SRM GbE/FC 850 nm
NT0H21CC	OCI SRM GbE/FC 850 nm (Enhanced)
NT0H21CB	OCI SRM GbE/FC 1310 nm
NT0H21CD	OCI SRM GbE/FC 1310 nm (Enhanced)
NT0H21CE	OCI SRM GbE 850 nm
NT0H21CF	OCI SRM GbE 1310 nm

OCLD circuit packs

Order OCLDs to match the OMXs in each shelf. For information about OCLD and OCI compatibility, refer to *Hardware Description,* 323-1701-102.

OCLD 2.5 Gbit/s Flex normal reach

Use the OCLD 2.5 Gbit/s Flex normal reach circuit packs listed in Table 13-13 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-13
Product engineering codes for OCLD 2.5 Gbit/s Flex normal reach

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H03AA	1	1	1528.77
NT0H03AB	1	2	1533.47
NT0H03AC	1	3	1530.33
NT0H03AD	1	4	1531.90
NT0H03BA	2	1	1538.19
NT0H03BB	2	2	1542.94
NT0H03BC	2	3	1539.77
NT0H03BD	2	4	1541.35
NT0H03CA	3	1	1547.72
NT0H03CB	3	2	1552.52
NT0H03CC	3	3	1549.32
NT0H03CD	3	4	1550.92
NT0H03DA	4	1	1557.36
NT0H03DB	4	2	1562.23
NT0H03DC	4	3	1558.98
NT0H03DD	4	4	1560.61
NT0H03EA	5	1	1570.42
NT0H03EB	5	2	1575.37
NT0H03EC	5	3	1572.06
NT0H03ED	5	4	1573.71
NT0H03FA	6	1	1580.35
NT0H03FB	6	2	1585.36

Table 13-13 (continued)
Product engineering codes for OCLD 2.5 Gbit/s Flex normal reach

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H03FC	6	3	1582.02
NT0H03FD	6	4	1583.69
NT0H03GA	7	1	1590.41
NT0H03GB	7	2	1595.49
NT0H03GC	7	3	1592.10
NT0H03GD	7	4	1593.80
NT0H03HA	8	1	1600.60
NT0H03HB	8	2	1605.73
NT0H03HC	8	3	1602.31
NT0H03HD	8	4	1604.02

OCLD 2.5 Gbit/s Flex Extended Reach

Use the OCLD 2.5 Gbit/s Flex Extended Reach circuit packs listed in Table 13-14 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-14
Product engineering codes for OCLD 2.5 Gbit/s Flex Extended Reach

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H04AA	1	1	1528.77
NT0H04AB	1	2	1533.47
NT0H04AC	1	3	1530.33
NT0H04AD	1	4	1531.90
NT0H04BA	2	1	1538.19
NT0H04BB	2	2	1542.94
NT0H04BC	2	3	1539.77
NT0H04BD	2	4	1541.35
NT0H04CA	3	1	1547.72
NT0H04CB	3	2	1552.52
NT0H04CC	3	3	1549.32
NT0H04CD	3	4	1550.92
NT0H04DA	4	1	1557.36
NT0H04DB	4	2	1562.23
NT0H04DC	4	3	1558.98
NT0H04DD	4	4	1560.61
NT0H04EA	5	1	1570.42
NT0H04EB	5	2	1575.37
NT0H04EC	5	3	1572.06
NT0H04ED	5	4	1573.71
NT0H04FA	6	1	1580.35
NT0H04FB	6	2	1585.36
NT0H04FC	6	3	1582.02
NT0H04FD	6	4	1583.69

Table 13-14 (continued)
Product engineering codes for OCLD 2.5 Gbit/s Flex Extended Reach

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H04GA	7	1	1590.41
NT0H04GB	7	2	1595.49
NT0H04GC	7	3	1592.10
NT0H04GD	7	4	1593.80
NT0H04HA	8	1	1600.60
NT0H04HB	8	2	1605.73
NT0H04HC	8	3	1602.31
NT0H04HD	8	4	1604.02

OCLD 2.5 Gbit/s Flex Extended Metro

Use the OCLD 2.5 Gbit/s Flex Extended Metro circuit packs listed in Table 13-15 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-15
Product engineering codes for OCLD 2.5 Gbit/s Flex Extended Metro

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H04AE	1	1	1528.77
NT0H04AF	1	2	1533.47
NT0H04AG	1	3	1530.33
NT0H04AH	1	4	1531.90
NT0H04BE	2	1	1538.19
NT0H04BF	2	2	1542.94
NT0H04BG	2	3	1539.77
NT0H04BH	2	4	1541.35
NT0H04CE	3	1	1547.72
NT0H04CF	3	2	1552.52
NT0H04CG	3	3	1549.32
NT0H04CH	3	4	1550.92
NT0H04DE	4	1	1557.36
NT0H04DF	4	2	1562.23
NT0H04DG	4	3	1558.98
NT0H04DH	4	4	1560.61
NT0H04EE	5	1	1570.42
NT0H04EF	5	2	1575.37
NT0H04EG	5	3	1572.06
NT0H04EH	5	4	1573.71

Table 13-15 (continued)
Product engineering codes for OCLD 2.5 Gbit/s Flex Extended Metro

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H04FE	6	1	1580.35
NT0H04FF	6	2	1585.36
NT0H04FG	6	3	1582.02
NT0H04FH	6	4	1583.69
NT0H04GE	7	1	1590.41
NT0H04GF	7	2	1595.49
NT0H04GG	7	3	1592.10
NT0H04GH	7	4	1593.80
NT0H04HE	8	1	1600.60
NT0H04HF	8	2	1605.73
NT0H04HG	8	3	1602.31
NT0H04HH	8	4	1604.02

OCLD 2.5 Gbit/s Universal

Table 13-19 lists the OCLD 2.5 Gbit/s Universal circuit packs.

Table 13-16
Product engineering codes for OCLD 2.5 Gbit/s Universal

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H05AA	1	1	1528.77
NT0H05AB	1	2	1533.47
NT0H05AC	1	3	1530.33
NT0H05AD	1	4	1531.90
NT0H05BA	2	1	1538.19
NT0H05BB	2	2	1542.94
NT0H05BC	2	3	1539.77
NT0H05BD	2	4	1541.35
NT0H05CA	3	1	1547.72
NT0H05CB	3	2	1552.52
NT0H05CC	3	3	1549.32

Table 13-16 (continued)
Product engineering codes for OCLD 2.5 Gbit/s Universal

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H05CD	3	4	1550.92
NT0H05DA	4	1	1557.36
NT0H05DB	4	2	1562.23
NT0H05DC	4	3	1558.98
NT0H05DD	4	4	1560.61
NT0H05EA	5	1	1570.42
NT0H05EB	5	2	1575.37
NT0H05EC	5	3	1572.06
NT0H05ED	5	4	1573.71
NT0H05FA	6	1	1580.35
NT0H05FB	6	2	1585.36
NT0H05FC	6	3	1582.02
NT0H05FD	6	4	1583.69
NT0H05GA	7	1	1590.41
NT0H05GB	7	2	1595.49
NT0H05GC	7	3	1592.10
NT0H05GD	7	4	1593.80
NT0H05HA	8	1	1600.60
NT0H05HB	8	2	1605.73
NT0H05HC	8	3	1602.31
NT0H05HD	8	4	1604.02

OCLD 2.5 Gbit/s Flex CWDM

Use the OCLD 2.5 Gbit/s Flex CWDM circuit packs listed in Table 13-17 with Optical Metro 5100 or Optical Metro 5200 shelves for CWDM systems.

Table 13-17
Product engineering codes for OCLD 2.5 Gbit/s Flex CWDM

Product engineering code	Band number	Wavelength (nm)
NTPM03AB	1	1533.47
NTPM03BC	2	1539.77
NTPM03CD	3	1550.92
NTPM03DC	4	1558.98
NTPM03EB	5	1575.37
NTPM03FA	6	1580.35
NTPM03GA	7	1590.41
NTPM03HD	8	1604.02

OCLD 2.5 Gbit/s Flex ITU CWDM

Use the OCLD 2.5 Gbit/s Flex ITU CWDM circuit packs listed in Table 13-18 with Optical Metro 5100 or Optical Metro 5200 shelves for ITU CWDM systems.

Table 13-18
Product engineering codes for OCLD 2.5 Gbit/s Flex ITU CWDM

Product engineering code	**Wavelength (nm)** (see Note)
NTPM04AA	1511
NTPM04AB	1531
NTPM04AC	1551
NTPM04AD	1571
NTPM04AE	1471
NTPM04AF	1491
NTPM04AG	1591
NTPM04AH	1611

Note: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

OCLD 2.5 Gbit/s Flex 100 GHz

Use the OCLD 2.5 Gbit/s Flex 100 GHz circuit packs listed in Table 13-19 with Optical Metro 5100 or Optical Metro 5200 shelves for Common Photonic Layer DWDM systems.

Table 13-19
Product engineering codes for OCLD 2.5 Gbit/s Flex 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H80AA	1	1	1530.334
NT0H80AB	1	2	1531.116
NT0H80AC	1	3	1531.898
NT0H80AD	1	4	1532.681
NT0H80BA	2	1	1534.250
NT0H80BB	2	2	1535.036
NT0H80BC	2	3	1535.822
NT0H80BD	2	4	1536.609
NT0H80CA	3	1	1538.186
NT0H80CB	3	2	1538.976
NT0H80CC	3	3	1539.766
NT0H80CD	3	4	1540.557
NT0H80DA	4	1	1542.142
NT0H80DB	4	2	1542.936
NT0H80DC	4	3	1543.730
NT0H80DD	4	4	1544.526
NT0H80EA	5	1	1546.119
NT0H80EB	5	2	1546.917
NT0H80EC	5	3	1547.715
NT0H80ED	5	4	1548.515

Table 13-19 (continued)
Product engineering codes for OCLD 2.5 Gbit/s Flex 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H80FA	6	1	1550.116
NT0H80FB	6	2	1550.918
NT0H80FC	6	3	1551.721
NT0H80FD	6	4	1552.524
NT0H80GA	7	1	1554.134
NT0H80GB	7	2	1554.940
NT0H80GC	7	3	1555.747
NT0H80GD	7	4	1556.555
NT0H80HA	8	1	1558.173
NT0H80HB	8	2	1558.983
NT0H80HC	8	3	1559.794
NT0H80HD	8	4	1560.606
NT0H80JA	9	1	1562.233
NT0H80JB	9	2	1563.047
NT0H80JC	9	3	1563.863
NT0H80JD	9	4	1564.679

OTR circuit packs

OTR 2.5 Gbit/s Flex normal reach 1310 nm

Use the OTR 2.5 Gbit/s Flex 1310 nm circuit packs listed in Table 13-20 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-20
Product engineering codes for OTR 2.5 Gbit/s Flex normal reach 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H16AA	1	1	1528.77
NT0H16AB	1	2	1533.47
NT0H16AC	1	3	1530.33
NT0H16AD	1	4	1531.90
NT0H16BA	2	1	1538.19
NT0H16BB	2	2	1542.94
NT0H16BC	2	3	1539.77
NT0H16BD	2	4	1541.35
NT0H16CA	3	1	1547.72
NT0H16CB	3	2	1552.52
NT0H16CC	3	3	1549.32
NT0H16CD	3	4	1550.92
NT0H16DA	4	1	1557.36
NT0H16DB	4	2	1562.23
NT0H16DC	4	3	1558.98
NT0H16DD	4	4	1560.61
NT0H16EA	5	1	1570.42
NT0H16EB	5	2	1575.37
NT0H16EC	5	3	1572.06
NT0H16ED	5	4	1573.71
NT0H16FA	6	1	1580.35
NT0H16FB	6	2	1585.36
NT0H16FC	6	3	1582.02
NT0H16FD	6	4	1583.69

Table 13-20 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex normal reach 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H16GA	7	1	1590.41
NT0H16GB	7	2	1595.49
NT0H16GC	7	3	1592.10
NT0H16GD	7	4	1593.80
NT0H16HA	8	1	1600.60
NT0H16HB	8	2	1605.73
NT0H16HC	8	3	1602.31
NT0H16HD	8	4	1604.02

OTR 2.5 Gbit/s Flex Extended Reach 1310 nm

Use the OTR 2.5 Gbit/s Flex Extended Reach 1310 nm circuit packs listed in Table 13-21 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-21
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Reach 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H17AA	1	1	1528.77
NT0H17AB	1	2	1533.47
NT0H17AC	1	3	1530.33
NT0H17AD	1	4	1531.90
NT0H17BA	2	1	1538.19
NT0H17BB	2	2	1542.94
NT0H17BC	2	3	1539.77
NT0H17BD	2	4	1541.35
NT0H17CA	3	1	1547.72
NT0H17CB	3	2	1552.52
NT0H17CC	3	3	1549.32
NT0H17CD	3	4	1550.92
NT0H17DA	4	1	1557.36
NT0H17DB	4	2	1562.23
NT0H17DC	4	3	1558.98
NT0H17DD	4	4	1560.61
NT0H17EA	5	1	1570.42
NT0H17EB	5	2	1575.37
NT0H17EC	5	3	1572.06
NT0H17ED	5	4	1573.71
NT0H17FA	6	1	1580.35
NT0H17FB	6	2	1585.36
NT0H17FC	6	3	1582.02
NT0H17FD	6	4	1583.69
NT0H17GA	7	1	1590.41

Table 13-21 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Reach 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H17GB	7	2	1595.49
NT0H17GC	7	3	1592.10
NT0H17GD	7	4	1593.80
NT0H17HA	8	1	1600.60
NT0H17HB	8	2	1605.73
NT0H17HC	8	3	1602.31
NT0H17HD	8	4	1604.02

OTR 2.5 Gbit/s Flex Extended Metro 1310 nm

Use the OTR 2.5 Gbit/s Flex Extended Metro 1310 nm circuit packs listed in Table 13-22 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-22
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Metro 1310 nm

Product engineering code	Band number	Channel number	Wavelength
NT0H17AE	1	1	1528.77
NT0H17AF	1	2	1533.47
NT0H17AG	1	3	1530.33
NT0H17AH	1	4	1531.90
NT0H17BE	2	1	1538.19
NT0H17BF	2	2	1542.94
NT0H17BG	2	3	1539.77
NT0H17BH	2	4	1541.35
NT0H17CE	3	1	1547.72
NT0H17CF	3	2	1552.52
NT0H17CG	3	3	1549.32
NT0H17CH	3	4	1550.92
NT0H17DE	4	1	1557.36
NT0H17DF	4	2	1562.23
NT0H17DG	4	3	1558.98
NT0H17DH	4	4	1560.61
NT0H17EE	5	1	1570.42
NT0H17EF	5	2	1575.37
NT0H17EG	5	3	1572.06
NT0H17EH	5	4	1573.71
NT0H17FE	6	1	1580.35
NT0H17FF	6	2	1585.36
NT0H17FG	6	3	1582.02
NT0H17FH	6	4	1583.69
NT0H17GE	7	1	1590.41

Table 13-22 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Metro 1310 nm

Product engineering code	Band number	Channel number	Wavelength
NT0H17GF	7	2	1595.49
NT0H17GG	7	3	1592.10
NT0H17GH	7	4	1593.80
NT0H17HE	8	1	1600.60
NT0H17HF	8	2	1605.73
NT0H17HG	8	3	1602.31
NT0H17HH	8	4	1604.02

OTR 2.5 Gbit/s Universal 1310 nm

Table 13-23 lists the OTR 2.5 Gbit/s Universal 1310 nm circuit packs.

Table 13-23
Product engineering codes for OTR 2.5 Gbit/s Universal 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H06AA	1	1	1528.77
NT0H06AB	1	2	1533.47
NT0H06AC	1	3	1530.33
NT0H06AD	1	4	1531.90
NT0H06BA	2	1	1538.19
NT0H06BB	2	2	1542.94
NT0H06BC	2	3	1539.77
NT0H06BD	2	4	1541.35
NT0H06CA	3	1	1547.72
NT0H06CB	3	2	1552.52
NT0H06CC	3	3	1549.32
NT0H06CD	3	4	1550.92
NT0H06DA	4	1	1557.36
NT0H06DB	4	2	1562.23
NT0H06DC	4	3	1558.98
NT0H06DD	4	4	1560.61

Table 13-23 (continued)
Product engineering codes for OTR 2.5 Gbit/s Universal 1310 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H06EA	5	1	1570.42
NT0H06EB	5	2	1575.37
NT0H06EC	5	3	1572.06
NT0H06ED	5	4	1573.71
NT0H06FA	6	1	1580.35
NT0H06FB	6	2	1585.36
NT0H06FC	6	3	1582.02
NT0H06FD	6	4	1583.69
NT0H06GA	7	1	1590.41
NT0H06GB	7	2	1595.49
NT0H06GC	7	3	1592.10
NT0H06GD	7	4	1593.80
NT0H06HA	8	1	1600.60
NT0H06HB	8	2	1605.73
NT0H06HC	8	3	1602.31
NT0H06HD	8	4	1604.02

OTR 2.5 Gbit/s Flex CWDM 1310 nm

Use the OTR 2.5 Gbit/s Flex CWDM 1310 nm circuit packs listed in Table 13-24 with Optical Metro 5100 or Optical Metro 5200 shelves for CWDM systems.

Table 13-24
Product engineering codes for OTR 2.5 Gbit/s Flex CWDM 1310 nm

Product engineering code	Band number	Wavelength (nm)
NTPM16AB	1	1533.47
NTPM16BC	2	1539.77
NTPM16CD	3	1550.92
NTPM16DC	4	1558.98
NTPM16EB	5	1575.37
NTPM16FA	6	1580.35
NTPM16GA	7	1590.41
NTPM16HD	8	1604.02

OTR 2.5 Gbit/s Flex ITU CWDM 1310 nm

Use the OTR 2.5 Gbit/s Flex ITU CWDM 1310 nm circuit packs listed in Table 13-25 with Optical Metro 5100 or Optical Metro 5200 shelves for ITU CWDM systems.

Table 13-25
Product engineering codes for OTR 2.5 Gbit/s Flex ITU CWDM 1310 nm

Product engineering code	**Wavelength (nm)** (see Note)
NTPM17AA	1511
NTPM17AB	1531
NTPM17AC	1551
NTPM17AD	1571
NTPM17AE	1471
NTPM17AF	1491
NTPM17AG	1591
NTPM17AH	1611

Note: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

OTR 2.5 Gbit/s Flex 1310 nm 100 GHz

Use the OTR 2.5 Gbit/s Flex 1310 nm 100 GHz circuit packs listed in Table 13-26 with Optical Metro 5100 or Optical Metro 5200 shelves for Common Photonic Layer DWDM systems.

Table 13-26
Product engineering codes for OTR 2.5 Gbit/s Flex 100 GHz 1310 nm

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H81AA	1	1	1530.334
NT0H81AB	1	2	1531.116
NT0H81AC	1	3	1531.898
NT0H81AD	1	4	1532.681
NT0H81BA	2	1	1534.250
NT0H81BB	2	2	1535.036
NT0H81BC	2	3	1535.822
NT0H81BD	2	4	1536.609
NT0H81CA	3	1	1538.186
NT0H81CB	3	2	1538.976
NT0H81CC	3	3	1539.766
NT0H81CD	3	4	1540.557
NT0H81DA	4	1	1542.142
NT0H81DB	4	2	1542.936
NT0H81DC	4	3	1543.730
NT0H81DD	4	4	1544.526
NT0H81EA	5	1	1546.119
NT0H81EB	5	2	1546.917
NT0H81EC	5	3	1547.715
NT0H81ED	5	4	1548.515

Table 13-26 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex 100 GHz 1310 nm

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H81FA	6	1	1550.116
NT0H81FB	6	2	1550.918
NT0H81FC	6	3	1551.721
NT0H81FD	6	4	1552.524
NT0H81GA	7	1	1554.134
NT0H81GB	7	2	1554.940
NT0H81GC	7	3	1555.747
NT0H81GD	7	4	1556.555
NT0H81HA	8	1	1558.173
NT0H81HB	8	2	1558.983
NT0H81HC	8	3	1559.794
NT0H81HD	8	4	1560.606
NT0H81JA	9	1	1562.233
NT0H81JB	9	2	1563.047
NT0H81JC	9	3	1563.863
NT0H81JD	9	4	1564.679

OTR 2.5 Gbit/s Flex normal reach 850 nm

Use the OTR 2.5 Gbit/s Flex normal reach 850 nm circuit packs listed in Table 13-27 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-27
Product engineering codes for OTR 2.5 Gbit/s Flex normal reach 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H16JA	1	1	1528.77
NT0H16JB	1	2	1533.47
NT0H16JC	1	3	1530.33
NT0H16JD	1	4	1531.90
NT0H16KA	2	1	1538.19
NT0H16KB	2	2	1542.94
NT0H16KC	2	3	1539.77
NT0H16KD	2	4	1541.35
NT0H16LA	3	1	1547.72
NT0H16LB	3	2	1552.52
NT0H16LC	3	3	1549.32
NT0H16LD	3	4	1550.92
NT0H16MA	4	1	1557.36
NT0H16MB	4	2	1562.23
NT0H16MC	4	3	1558.98
NT0H16MD	4	4	1560.61
NT0H16NA	5	1	1570.42
NT0H16NB	5	2	1575.37
NT0H16NC	5	3	1572.06
NT0H16ND	5	4	1573.71
NT0H16PA	6	1	1580.35
NT0H16PB	6	2	1585.36
NT0H16PC	6	3	1582.02
NT0H16PD	6	4	1583.69

Table 13-27 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex normal reach 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H16QA	7	1	1590.41
NT0H16QB	7	2	1595.49
NT0H16QC	7	3	1592.10
NT0H16QD	7	4	1593.80
NT0H16RA	8	1	1600.60
NT0H16RB	8	2	1605.73
NT0H16RC	8	3	1602.31
NT0H16RD	8	4	1604.02

OTR 2.5 Gbit/s Flex Extended Reach 850 nm

Use the OTR 2.5 Gbit/s Flex Extended Reach 850 nm circuit packs listed in Table 13-28 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-28
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Reach 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H17JA	1	1	1528.77
NT0H17JB	1	2	1533.47
NT0H17JC	1	3	1530.33
NT0H17JD	1	4	1531.90
NT0H17KA	2	1	1538.19
NT0H17KB	2	2	1542.94
NT0H17KC	2	3	1539.77
NT0H17KD	2	4	1541.35
NT0H17LA	3	1	1547.72
NT0H17LB	3	2	1552.52
NT0H17LC	3	3	1549.32
NT0H17LD	3	4	1550.92
NT0H17MA	4	1	1557.36
NT0H17MB	4	2	1562.23
NT0H17MC	4	3	1558.98
NT0H17MD	4	4	1560.61
NT0H17NA	5	1	1570.42
NT0H17NB	5	2	1575.37
NT0H17NC	5	3	1572.06
NT0H17ND	5	4	1573.71
NT0H17PA	6	1	1580.35
NT0H17PB	6	2	1585.36
NT0H17PC	6	3	1582.02
NT0H17PD	6	4	1583.69

Table 13-28 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Reach 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H17QA	7	1	1590.41
NT0H17QB	7	2	1595.49
NT0H17QC	7	3	1592.10
NT0H17QD	7	4	1593.80
NT0H17RA	8	1	1600.60
NT0H17RB	8	2	1605.73
NT0H17RC	8	3	1602.31
NT0H17RD	8	4	1604.02

OTR 2.5 Gbit/s Flex Extended Metro 850 nm

Use the OTR 2.5 Gbit/s Flex Extended Metro 850 nm circuit packs listed in Table 13-29 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-29
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Metro 850 nm

Product Engineering Code	Band number	Channel number	Wavelength
NT0H17JE	1	1	1528.77
NT0H17JF	1	2	1533.47
NT0H17JG	1	3	1530.33
NT0H17JH	1	4	1531.90
NT0H17KE	2	1	1538.19
NT0H17KF	2	2	1542.94
NT0H17KG	2	3	1539.77
NT0H17KH	2	4	1541.35
NT0H17LE	3	1	1547.72
NT0H17LF	3	2	1552.52
NT0H17LG	3	3	1549.32
NT0H17LH	3	4	1550.92
NT0H17ME	4	1	1557.36
NT0H17MF	4	2	1562.23
NT0H17MG	4	3	1558.98
NT0H17MH	4	4	1560.61
NT0H17NE	5	1	1570.42
NT0H17NF	5	2	1575.37
NT0H17NG	5	3	1572.06
NT0H17NH	5	4	1573.71
NT0H17PE	6	1	1580.35
NT0H17PF	6	2	1585.36
NT0H17PG	6	3	1582.02
NT0H17PH	6	4	1583.69

Table 13-29 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex Extended Metro 850 nm

Product Engineering Code	Band number	Channel number	Wavelength
NT0H17QE	7	1	1590.41
NT0H17QF	7	2	1595.49
NT0H17QG	7	3	1592.10
NT0H17QH	7	4	1593.80
NT0H17RE	8	1	1600.60
NT0H17RF	8	2	1605.73
NT0H17RG	8	3	1602.31
NT0H17RH	8	4	1604.02

OTR 2.5 Gbit/s Universal 850 nm

Table 13-30 lists the OTR 2.5 Gbit/s Universal 850 nm circuit packs.

Table 13-30
Product engineering codes for OTR 2.5 Gbit/s Universal 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H07AA	1	1	1528.77
NT0H07AB	1	2	1533.47
NT0H07AC	1	3	1530.33
NT0H07AD	1	4	1531.90
NT0H07BA	2	1	1538.19
NT0H07BB	2	2	1542.94
NT0H07BC	2	3	1539.77
NT0H07BD	2	4	1541.35
NT0H07CA	3	1	1547.72
NT0H07CB	3	2	1552.52
NT0H07CC	3	3	1549.32
NT0H07CD	3	4	1550.92
NT0H07DA	4	1	1557.36
NT0H07DB	4	2	1562.23
NT0H07DC	4	3	1558.98
NT0H07DD	4	4	1560.61
NT0H07EA	5	1	1570.42
NT0H07EB	5	2	1575.37
NT0H07EC	5	3	1572.06
NT0H07ED	5	4	1573.71
NT0H07FA	6	1	1580.35
NT0H07FB	6	2	1585.36
NT0H07FC	6	3	1582.02
NT0H07FD	6	4	1583.69
NT0H07GA	7	1	1590.41
NT0H07GB	7	2	1595.49

Table 13-30 (continued)
Product engineering codes for OTR 2.5 Gbit/s Universal 850 nm

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H07GC	7	3	1592.10
NT0H07GD	7	4	1593.80
NT0H07HA	8	1	1600.60
NT0H07HB	8	2	1605.73
NT0H07HC	8	3	1602.31
NT0H07HD	8	4	1604.02

OTR 2.5 Gbit/s Flex CWDM 850 nm

Use the OTR 2.5 Gbit/s Flex CWDM 850 nm circuit packs listed in Table 13-31 with Optical Metro 5100 or Optical Metro 5200 shelves for CWDM systems.

Table 13-31
Product engineering codes for OTR 2.5 Gbit/s Flex CWDM 850 nm

Product engineering code	Band number	Wavelength (nm)
NTPM16JB	1	1533.47
NTPM16KC	2	1539.77
NTPM16LD	3	1550.92
NTPM16MC	4	1558.98
NTPM16NB	5	1575.37
NTPM16PA	6	1580.35
NTPM16QA	7	1590.41
NTPM16RD	8	1604.02

OTR 2.5 Gbit/s Flex ITU CWDM 850 nm

Use the OTR 2.5 Gbit/s Flex ITU CWDM 850 nm circuit packs listed in Table 13-32 with Optical Metro 5100 or Optical Metro 5200 shelves for ITU CWDM systems.

Table 13-32
Product engineering codes for OTR 2.5 Gbit/s Flex ITU CWDM 850 nm

Product engineering code	**Wavelength (nm)** (see Note)
NTPM17BA	1511
NTPM17BB	1531
NTPM17BC	1551
NTPM17BD	1571
NTPM17BE	1471
NTPM17BF	1491
NTPM17BG	1591
NTPM17BH	1611

Note: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

OTR 2.5 Gbit/s Flex 100 GHz 850 nm

Use the OTR 2.5 Gbit/s Flex 100 GHz 850 nm circuit packs listed in Table 13-33 with Optical Metro 5100 or Optical Metro 5200 shelves for Common Photonic Layer DWDM systems.

Table 13-33
Product engineering codes for OTR 2.5 Gbit/s Flex 100 GHz 850 nm

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H82AA	1	1	1530.334
NT0H82AB	1	2	1531.116
NT0H82AC	1	3	1531.898
NT0H82AD	1	4	1532.681
NT0H82BA	2	1	1534.250
NT0H82BB	2	2	1535.036
NT0H82BC	2	3	1535.822
NT0H82BD	2	4	1536.609
NT0H82CA	3	1	1538.186
NT0H82CB	3	2	1538.976
NT0H82CC	3	3	1539.766
NT0H82CD	3	4	1540.557
NT0H82DA	4	1	1542.142
NT0H82DB	4	2	1542.936
NT0H82DC	4	3	1543.730
NT0H82DD	4	4	1544.526
NT0H82EA	5	1	1546.119
NT0H82EB	5	2	1546.917
NT0H82EC	5	3	1547.715
NT0H82ED	5	4	1548.515

Table 13-33 (continued)
Product engineering codes for OTR 2.5 Gbit/s Flex 100 GHz 850 nm

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H82FA	6	1	1550.116
NT0H82FB	6	2	1550.918
NT0H82FC	6	3	1551.721
NT0H82FD	6	4	1552.524
NT0H82GA	7	1	1554.134
NT0H82GB	7	2	1554.940
NT0H82GC	7	3	1555.747
NT0H82GD	7	4	1556.555
NT0H82HA	8	1	1558.173
NT0H82HB	8	2	1558.983
NT0H82HC	8	3	1559.794
NT0H82HD	8	4	1560.606
NT0H82JA	9	1	1562.233
NT0H82JB	9	2	1563.047
NT0H82JC	9	3	1563.863
NT0H82JD	9	4	1564.679

OTR 10 Gbit/s

Use the OTR 10 Gbit/s circuit packs listed in Table 13-34 with Optical Metro 5200 shelves for DWDM systems.

Table 13-34
Product engineering codes for OTR 10 Gbit/s circuit packs

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H18AA	1	1	1528.77
NT0H18AB	1	2	1533.47
NT0H18AC	1	3	1530.33
NT0H18AD	1	4	1531.90
NT0H18BA	2	1	1538.19
NT0H18BB	2	2	1542.94
NT0H18BC	2	3	1539.77
NT0H18BD	2	4	1541.35
NT0H18CA	3	1	1547.72
NT0H18CB	3	2	1552.52
NT0H18CC	3	3	1549.32
NT0H18CD	3	4	1550.92
NT0H18DA	4	1	1557.36
NT0H18DB	4	2	1562.23
NT0H18DC	4	3	1558.98
NT0H18DD	4	4	1560.61

OTR 10 Gbit/s Enhanced

Tables 13-35, 13-36 and 13-37 list the OTR 10 Gbit/s Enhanced circuit packs.

For DWDM

Use the OTR 10 Gbit/s Enhanced circuit packs listed in Table 13-35 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-35
Product engineering codes for OTR 10 Gbit/s Enhanced circuit packs

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H19AA	1	1	1528.77
NT0H19AB	1	2	1533.47
NT0H19AC	1	3	1530.33
NT0H19AD	1	4	1531.90
NT0H19BA	2	1	1538.19
NT0H19BB	2	2	1542.94
NT0H19BC	2	3	1539.77
NT0H19BD	2	4	1541.35
NT0H19CA	3	1	1547.72
NT0H19CB	3	2	1552.52
NT0H19CC	3	3	1549.32
NT0H19CD	3	4	1550.92
NT0H19DA	4	1	1557.36
NT0H19DB	4	2	1562.23
NT0H19DC	4	3	1558.98
NT0H19DD	4	4	1560.61
NT0H19EA (see Note)	5	1	1570.42
NT0H19EB (see Note)	5	2	1575.37
NT0H19EC (see Note)	5	3	1572.06
NT0H19ED (see Note)	5	4	1573.71
NT0H19FA (see Note)	6	1	1580.35
NT0H19FB (see Note)	6	2	1585.36
NT0H19FC (see Note)	6	3	1582.02

Table 13-35 (continued)
Product engineering codes for OTR 10 Gbit/s Enhanced circuit packs

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H19FD (see Note)	6	4	1583.69
NT0H19GA (see Note)	7	1	1590.41
NT0H19GB (see Note)	7	2	1595.49
NT0H19GC (see Note)	7	3	1592.10
NT0H19GD (see Note)	7	4	1593.80
NT0H19HA (see Note)	8	1	1600.60
NT0H19HB (see Note)	8	2	1605.73
NT0H19HC (see Note)	8	3	1602.31
NT0H19HD (see Note)	8	4	1604.02
Note: Contact Nortel Networks before ordering L-band OTR 10 Gbit/s Enhanced circuit packs.			

For CWDM

Use the OTR 10 Gbit/s Enhanced circuit packs listed in Table 13-36 with Optical Metro 5200 or Optical Metro 5100 shelves for CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for a CWDM environment is more costly.

Table 13-36
Product engineering codes for OTR 10 Gbit/s Enhanced circuit packs that can be used in CWDM systems

Product engineering code	Band number	Wavelength (nm)
NT0H19AB	1	1533.47
NT0H19BC	2	1539.77
NT0H19CD	3	1550.92
NT0H19DC	4	1558.98
NT0H19EB (see Note)	5	1575.37
NT0H19FA (see Note)	6	1580.35
NT0H19GA (see Note)	7	1590.41
NT0H19HD (see Note)	8	1604.02
Note: Contact Nortel Networks before ordering L-band OTR 10 Gbit/s Enhanced circuit packs.		

For ITU CWDM

Use the OTR 10 Gbit/s Enhanced circuit packs listed in Table 13-37 with Optical Metro 5200 or Optical Metro 5100 shelves for ITU CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for an ITU CWDM environment is more costly.

Table 13-37
Product engineering codes for OTR 10 Gbit/s Enhanced circuit packs that can be used in ITU CWDM systems

ITU CWDM channel center wavelength (nm) (see Note 1)	**Recommended OTR 10 Gbit/s Enhanced circuit packs**
1471	not supported
1491	not supported
1511	not supported
1531	B1C3 (NT0H19AC)
1551	B3C3 (NT0H19CC)
1571	B5C1 (NT0H19EA) (see Note 2)
1591	B7C1 (NT0H19GA) (see Note 2)
1611	B8C2 (NT0H19HB) (see Note 2)

Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

Note 2: Contact Nortel Networks before ordering L-band OTR 10 Gbit/s Enhanced circuit packs.

OTR 10 Gbit/s Enhanced 100 GHz

Use the OTR 10 Gbit/s Enhanced 100 GHz circuit packs listed in Table 13-38 with Optical Metro 5200 or Optical Metro 5100 shelves with Common Photonic Layer DWDM systems.

Table 13-38
Product engineering codes for OTR 10 Gbit/s Enhanced 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H83AA	1	1	1530.334
NT0H83AB	1	2	1531.116
NT0H83AC	1	3	1531.898
NT0H83AD	1	4	1532.681
NT0H83BA	2	1	1534.250
NT0H83BB	2	2	1535.036
NT0H83BC	2	3	1535.822
NT0H83BD	2	4	1536.609
NT0H83CA	3	1	1538.186
NT0H83CB	3	2	1538.976
NT0H83CC	3	3	1539.766
NT0H83CD	3	4	1540.557
NT0H83DA	4	1	1542.142
NT0H83DB	4	2	1542.936
NT0H83DC	4	3	1543.730
NT0H83DD	4	4	1544.526
NT0H83EA	5	1	1546.119
NT0H83EB	5	2	1546.917
NT0H83EC	5	3	1547.715
NT0H83ED	5	4	1548.515

Table 13-38 (continued)
Product engineering codes for OTR 10 Gbit/s Enhanced 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H83FA	6	1	1550.116
NT0H83FB	6	2	1550.918
NT0H83FC	6	3	1551.721
NT0H83FD	6	4	1552.524
NT0H83GA	7	1	1554.134
NT0H83GB	7	2	1554.940
NT0H83GC	7	3	1555.747
NT0H83GD	7	4	1556.555
NT0H83HA	8	1	1558.173
NT0H83HB	8	2	1558.983
NT0H83HC	8	3	1559.794
NT0H83HD	8	4	1560.606
NT0H83JA	9	1	1562.233
NT0H83JB	9	2	1563.047
NT0H83JC	9	3	1563.863
NT0H83JD	9	4	1564.679

Muxponder circuit packs

Muxponder 10 Gbit/s GbE/FC

Tables 13-39, 13-40 and 13-41 list the Muxponder 10 Gbit/s GbE/FC circuit packs. Muxponder circuit packs require Small Form Factor Pluggable (SFP) modules to be ordered for each provisioned client-side port. See Table 13-47 on page 13-66 for SFP ordering information.

For DWDM

Use the Muxponder 10 Gbit/s GbE/FC circuit packs listed in Table 13-39 with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-39
Product engineering codes for Muxponder 10 Gbit/s GbE/FC circuit packs

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H15AA	1	1	1528.77
NT0H15AB	1	2	1533.47
NT0H15AC	1	3	1530.33
NT0H15AD	1	4	1531.90
NT0H15BA	2	1	1538.19
NT0H15BB	2	2	1542.94
NT0H15BC	2	3	1539.77
NT0H15BD	2	4	1541.35
NT0H15CA	3	1	1547.72
NT0H15CB	3	2	1552.52
NT0H15CC	3	3	1549.32
NT0H15CD	3	4	1550.92
NT0H15DA	4	1	1557.36
NT0H15DB	4	2	1562.23
NT0H15DC	4	3	1558.98
NT0H15DD	4	4	1560.61
NT0H15EA (see Note)	5	1	1570.42
NT0H15EB (see Note)	5	2	1575.37
NT0H15EC (see Note)	5	3	1572.06
NT0H15ED (see Note)	5	4	1573.71
NT0H15FA (see Note)	6	1	1580.35

Table 13-39 (continued)
Product engineering codes for Muxponder 10 Gbit/s GbE/FC circuit packs

Product engineering code	Band number	Channel number	Wavelength (nm)
NT0H15FB (see Note)	6	2	1585.36
NT0H15FC (see Note)	6	3	1582.02
NT0H15FD (see Note)	6	4	1583.69
NT0H15GA (see Note)	7	1	1590.41
NT0H15GB (see Note)	7	2	1595.49
NT0H15GC (see Note)	7	3	1592.10
NT0H15GD (see Note)	7	4	1593.80
NT0H15HA (see Note)	8	1	1600.60
NT0H15HB (see Note)	8	2	1605.73
NT0H15HC (see Note)	8	3	1602.31
NT0H15HD (see Note)	8	4	1604.02
Note: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC circuit packs.			

For CWDM

Use the Muxponder 10 Gbit/s GbE/FC circuit packs listed in Table 13-40 with Optical Metro 5200 or Optical Metro 5100 shelves for CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for a CWDM environment is more costly.

Table 13-40
Product engineering codes for Muxponder 10 Gbit/s GbE/FC circuit packs that can be used in CWDM systems

Product engineering code	Band number	Wavelength (nm)
NT0H15AB	1	1533.47
NT0H15BC	2	1539.77
NT0H15CD	3	1550.92
NT0H15DC	4	1558.98
NT0H15EB (see Note)	5	1575.37
NT0H15FA (see Note)	6	1580.35
NT0H15GA (see Note)	7	1590.41
NT0H15HD (see Note)	8	1604.02
Note: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC circuit packs.		

For ITU CWDM

Use the Muxponder 10 Gbit/s GbE/FC circuit packs listed in Table 13-41 with Optical Metro 5200 or Optical Metro 5100 shelves for ITU CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for an ITU CWDM environment is more costly.

Table 13-41
Product engineering codes for Muxponder 10 Gbit/s GbE/FC circuit packs that can be used in ITU CWDM systems

ITU CWDM channel center wavelength (nm) (see Note 1)	**Recommended Muxponder 10 Gbit/s GbE/FC circuit packs**
1471	not supported
1491	not supported
1511	not supported
1531	B1C3 (NT0H15AC)
1551	B3C3 (NT0H15CC)
1571	B5C1 (NT0H15EA) (see Note 2)
1591	B7C1 (NT0H15GA) (see Note 2)
1611	B8C2 (NT0H15HB) (see Note 2)

Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

Note 2: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC circuit packs.

Muxponder 10 Gbit/s GbE/FC 100 GHz

Use the Muxponder 10 Gbit/s GbE/FC 100 GHz circuit packs listed in Table 13-42 with Optical Metro 5200 or Optical Metro 5100 shelves for Common Photonic Layer DWDM systems.

Table 13-42
Product engineering codes for Muxponder 10 Gbit/s GbE/FC 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H84AA	1	1	1530.334
NT0H84AB	1	2	1531.116
NT0H84AC	1	3	1531.898
NT0H84AD	1	4	1532.681
NT0H84BA	2	1	1534.250
NT0H84BB	2	2	1535.036
NT0H84BC	2	3	1535.822
NT0H84BD	2	4	1536.609
NT0H84CA	3	1	1538.186
NT0H84CB	3	2	1538.976
NT0H84CC	3	3	1539.766
NT0H84CD	3	4	1540.557
NT0H84DA	4	1	1542.142
NT0H84DB	4	2	1542.936
NT0H84DC	4	3	1543.730
NT0H84DD	4	4	1544.526
NT0H84EA	5	1	1546.119
NT0H84EB	5	2	1546.917
NT0H84EC	5	3	1547.715
NT0H84ED	5	4	1548.515

Table 13-42 (continued)
Product engineering codes for Muxponder 10 Gbit/s GbE/FC 100 GHz

Product engineering code	Band/Group number	Channel number	Wavelength (nm)
NT0H84FA	6	1	1550.116
NT0H84FB	6	2	1550.918
NT0H84FC	6	3	1551.721
NT0H84FD	6	4	1552.524
NT0H84GA	7	1	1554.134
NT0H84GB	7	2	1554.940
NT0H84GC	7	3	1555.747
NT0H84GD	7	4	1556.555
NT0H84HA	8	1	1558.173
NT0H84HB	8	2	1558.983
NT0H84HC	8	3	1559.794
NT0H84HD	8	4	1560.606
NT0H84JA	9	1	1562.233
NT0H84JB	9	2	1563.047
NT0H84JC	9	3	1563.863
NT0H84JD	9	4	1564.679

Muxponder 10 Gbit/s GbE/FC VCAT

Tables 13-43, 13-44 and 13-45 list the Muxponder 10 Gbit/s GbE/FC VCAT circuit packs. Muxponder circuit packs require Small Form Factor Pluggable (SFP) modules to be ordered for each provisioned client-side port. See Table 13-47 on page 13-66 for SFP ordering information.

For DWDM

Use the following Muxponder 10 Gbit/s GbE/FC VCAT circuit packs in conjunction with Optical Metro 5100 or Optical Metro 5200 shelves for DWDM systems.

Table 13-43
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT circuit packs

Muxponder 10 Gbit/s GbE/FC VCAT PEC	Muxponder 10 Gbit/s GbE Uni-add PEC	Muxponder 10 Gbit/s GbE Uni-drop PEC	Band number	Channel number	Wavelength (nm)
NT0H15AE	NT0H15JA	NT0H15JE	1	1	1528.77
NT0H15AF	NT0H15JB	NT0H15JF	1	2	1533.47
NT0H15AG	NT0H15JC	NT0H15JG	1	3	1530.33
NT0H15AH	NT0H15JD	NT0H15JH	1	4	1531.90
NT0H15BE	NT0H15KA	NT0H15KE	2	1	1538.19
NT0H15BF	NT0H15KB	NT0H15KF	2	2	1542.94
NT0H15BG	NT0H15KC	NT0H15KG	2	3	1539.77
NT0H15BH	NT0H15KD	NT0H15KH	2	4	1541.35
NT0H15CE	NT0H15LA	NT0H15LE	3	1	1547.72
NT0H15CF	NT0H15LB	NT0H15LF	3	2	1552.52
NT0H15CG	NT0H15LC	NT0H15LG	3	3	1549.32
NT0H15CH	NT0H15LD	NT0H15LH	3	4	1550.92
NT0H15DE	NT0H15MA	NT0H15ME	4	1	1557.36
NT0H15DF	NT0H15MB	NT0H15MF	4	2	1562.23
NT0H15DG	NT0H15MC	NT0H15MG	4	3	1558.98
NT0H15DH	NT0H15MD	NT0H15MH	4	4	1560.61
NT0H15EE (see Note)	NT0H15NA (see Note)	NT0H15NE (see Note)	5	1	1570.42
NT0H15EF (see Note)	NT0H15NB (see Note)	NT0H15NF (see Note)	5	2	1575.37

Table 13-43 (continued)
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT circuit packs

Muxponder 10 Gbit/s GbE/FC VCAT PEC	Muxponder 10 Gbit/s GbE Uni-add PEC	Muxponder 10 Gbit/s GbE Uni-drop PEC	Band number	Channel number	Wavelength (nm)
NT0H15EG (see Note)	NT0H15NC (see Note)	NT0H15NG (see Note)	5	3	1572.06
NT0H15EH (see Note)	NT0H15ND (see Note)	NT0H15NH (see Note)	5	4	1573.71
NT0H15FE (see Note)	NT0H15PA (see Note)	NT0H15PE (see Note)	6	1	1580.35
NT0H15FF (see Note)	NT0H15PB (see Note)	NT0H15PF (see Note)	6	2	1585.36
NT0H15FG (see Note)	NT0H15PC (see Note)	NT0H15PG (see Note)	6	3	1582.02
NT0H15FH (see Note)	NT0H15PD (see Note)	NT0H15PH (see Note)	6	4	1583.69
NT0H15GE (see Note)	NT0H15QA (see Note)	NT0H15QE (see Note)	7	1	1590.41
NT0H15GF (see Note)	NT0H15QB (see Note)	NT0H15QF (see Note)	7	2	1595.49
NT0H15GG (see Note)	NT0H15QC (see Note)	NT0H15QG (see Note)	7	3	1592.10
NT0H15GH (see Note)	NT0H15QD (see Note)	NT0H15QH (see Note)	7	4	1593.80
NT0H15HE (see Note)	NT0H15RA (see Note)	NT0H15RE (see Note)	8	1	1600.60
NT0H15HF (see Note)	NT0H15RB (see Note)	NT0H15RF (see Note)	8	2	1605.73
NT0H15HG (see Note)	NT0H15RC (see Note)	NT0H15RG (see Note)	8	3	1602.31
NT0H15HH (see Note)	NT0H15RD (see Note)	NT0H15RH (see Note)	8	4	1604.02
Note: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC VCAT circuit packs.					

For CWDM

Use the Muxponder 10 Gbit/s GbE/FC VCAT circuit packs listed in Table 13-44 with Optical Metro 5200 or Optical Metro 5100 shelves for CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for a CWDM environment is more costly.

Table 13-44
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT circuit packs that can be used in CWDM systems

Muxponder 10 Gbit/s GbE/FC VCAT PEC	Muxponder 10 Gbit/s GbE Uni-add PEC	Muxponder 10 Gbit/s GbE Uni-drop PEC	Band number	Wavelength (nm)
NT0H15AF	NT0H15JB	NT0H15JF	1	1533.47
NT0H15BG	NT0H15KC	NT0H15KG	2	1539.77
NT0H15CH	NT0H15LD	NT0H15LH	3	1550.92
NT0H15DG	NT0H15MC	NT0H15MG	4	1558.98
NT0H15EF (see Note)	NT0H15NB (see Note)	NT0H15NF (see Note)	5	1575.37
NT0H15FE (see Note)	NT0H15PA (see Note)	NT0H15PE (see Note)	6	1580.35
NT0H15GE (see Note)	NT0H15QA (see Note)	NT0H15QE (see Note)	7	1590.41
NT0H15HH (see Note)	NT0H15RD (see Note)	NT0H15RH (see Note)	8	1604.02
Note: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC VCAT circuit packs.				

For ITU CWDM

Use the Muxponder 10 Gbit/s GbE/FC VCAT circuit packs listed in Table 13-45 with Optical Metro 5200 or Optical Metro 5100 shelves for ITU CWDM systems. However, it is important to note that these circuit packs are made for a DWDM environment, so using them for an ITU CWDM environment is more costly.

Table 13-45
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT circuit packs that can be used in ITU CWDM systems

Muxponder 10 Gbit/s GbE/FC VCAT PEC	**Muxponder 10 Gbit/s GbE Uni-add PEC**	**Muxponder 10 Gbit/s GbE Uni-drop PEC**	**ITU CWDM channel center wavelength (nm)** (see Note 1)
not supported	not supported	not supported	1471
not supported	not supported	not supported	1491
not supported	not supported	not supported	1511
B1C3 (NT0H15AG)	B1C3 (NT0H15JC)	B1C3 (NT0H15JG)	1531
B3C3 (NT0H15CG)	B3C3 (NT0H15LC)	B3C3 (NT0H15KG)	1551
B5C1 (NT0H15EE) (see Note 2)	B5C1 (NT0H15NA) (see Note 2)	B5C1 (NT0H15NE) (see Note 2)	1571
B7C1 (NT0H15GE) (see Note 2)	B7C1 (NT0H15QA) (see Note 2)	B7C1 (NT0H15QE) (see Note 2)	1591
B8C2 (NT0H15HF) (see Note 2)	B8C2 (NT0H15RB) (see Note 2)	B8C2 (NT0H15RF) (see Note 2)	1611

Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling.

Note 2: Contact Nortel Networks before ordering L-band Muxponder 10 Gbit/s GbE/FC VCAT circuit packs.

Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz

Use the Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz circuit packs listed in Table 13-46 with Optical Metro 5200 or Optical Metro 5100 shelves for Common Photonic Layer DWDM systems.

Table 13-46
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz

Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz PEC	Muxponder 10 Gbit/s GbE Uni-add 100 GHz PEC	Muxponder 10 Gbit/s GbE Uni-drop 100 GHz PEC	Band/ Group number	Channel number	Wavelength (nm)
NT0H84AE	NT0H84JA	NT0H84JE	1	1	1530.334
NT0H84AF	NT0H84JB	NT0H84JF	1	2	1531.116
NT0H84AG	NT0H84JC	NT0H84JG	1	3	1531.898
NT0H84AH	NT0H84JD	NT0H84JH	1	4	1532.681
NT0H84BE	NT0H84KA	NT0H84KE	2	1	1534.250
NT0H84BF	NT0H84KB	NT0H84KF	2	2	1535.036
NT0H84BG	NT0H84KC	NT0H84KG	2	3	1535.822
NT0H84BH	NT0H84KD	NT0H84KH	2	4	1536.609
NT0H84CE	NT0H84LA	NT0H84LE	3	1	1538.186
NT0H84CF	NT0H84LB	NT0H84LF	3	2	1538.976
NT0H84CG	NT0H84LC	NT0H84KG	3	3	1539.766
NT0H84CH	NT0H84LD	NT0H84LH	3	4	1540.557
NT0H84DE	NT0H84MA	NT0H84ME	4	1	1542.142
NT0H84DF	NT0H84MB	NT0H84MF	4	2	1542.936
NT0H84DG	NT0H84MC	NT0H84MG	4	3	1543.730
NT0H84DH	NT0H84MD	NT0H84MH	4	4	1544.526
NT0H84EE	NT0H84NA	NT0H84NE	5	1	1546.119
NT0H84EF	NT0H84NB	NT0H84NF	5	2	1546.917
NT0H84EG	NT0H84NC	NT0H84NG	5	3	1547.715
NT0H84EH	NT0H84ND	NT0H84NH	5	4	1548.515

Table 13-46 (continued)
Product engineering codes for Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz

Muxponder 10 Gbit/s GbE/FC VCAT 100 GHz PEC	Muxponder 10 Gbit/s GbE Uni-add 100 GHz PEC	Muxponder 10 Gbit/s GbE Uni-drop 100 GHz PEC	Band/ Group number	Channel number	Wavelength (nm)
NT0H84FE	NT0H84PA	NT0H84PE	6	1	1550.116
NT0H84FF	NT0H84PB	NT0H84PF	6	2	1550.918
NT0H84FG	NT0H84PC	NT0H84PG	6	3	1551.721
NT0H84FH	NT0H84PD	NT0H84PH	6	4	1552.524
NT0H84GE	NT0H84QA	NT0H84QE	7	1	1554.134
NT0H84GF	NT0H84QB	NT0H84QF	7	2	1554.940
NT0H84GG	NT0H84QC	NT0H84QG	7	3	1555.747
NT0H84GH	NT0H84QD	NT0H84QH	7	4	1556.555
NT0H84HE	NT0H84RA	NT0H84RE	8	1	1558.173
NT0H84HF	NT0H84RB	NT0H84RF	8	2	1558.983
NT0H84HG	NT0H84RC	NT0H84RG	8	3	1559.794
NT0H84HH	NT0H84RD	NT0H84RH	8	4	1560.606
NT0H84JE	NT0H84SA	NT0H84SE	9	1	1562.233
NT0H84JF	NT0H84SB	NT0H84SF	9	2	1563.047
NT0H84JG	NT0H84SC	NT0H84SG	9	3	1563.863
NT0H84JH	NT0H84SD	NT0H84SH	9	4	1564.679

Small Form Factor Pluggable (SFP) modules

Table 13-47 lists the product engineering codes for small form factor pluggable (SFP) modules that can be used on the Muxponder 10 Gbit/s GbE/FC circuit packs client side connections.

Table 13-47
Product engineering codes for SFP modules

Product engineering code	Description
NTTP06AF	850 nm SFP module
NTTP06CF	1310 nm SFP module

Filler cards

Table 13-48 lists the product engineering codes for filler cards.

Table 13-48
Product engineering codes for filler cards

Product engineering code	Item	For use in these shelves
NT0H52AA	Blank filler card	Optical Metro 5200 WDM Optical Metro 5100 WDM Optical Metro 5200 OFA
NT0H52BA	OCLD filler card	Optical Metro 5200 WDM
NT0H52CA	OFA filler card	Optical Metro 5200 OFA
NT0H52DA	LC filler card	Optical Metro 5200 WDM Optical Metro 5100 WDM

OMXs

The OMXs that you install in a shelf determine the bands of that shelf. For each shelf, order OCLD, OTR, or Muxponder circuit packs to match the band of the OMXs. For each band deployed at an OADM site, the corresponding band must be deployed at the terminal site.

OMX 4CH + Fiber Manager DWDM

Use an OMX 4CH + Fiber Manager with an Optical Metro 5200 shelf for DWDM systems. Table 13-49 lists the ordering information for OMX 4CH + Fiber Manager.

Table 13-49
Product engineering codes for OMX 4CH + Fiber Manager

Product engineering code	DWDM band	Wavelength range (nm)
NT0H32AE	1	1528.77 to 1533.47
NT0H32BE	2	1538.19 to 1542.94
NT0H32CE	3	1547.72 to 1552.52
NT0H32DE	4	1557.36 to 1562.23
NT0H32EE	5	1570.42 to 1575.37
NT0H32FE	6	1580.35 to 1585.36
NT0H32GE	7	1590.41 to 1595.49
NT0H32HE	8	1600.60 to 1605.73
Additional equipment		

Table 13-49 (continued)
Product engineering codes for OMX 4CH + Fiber Manager

Product engineering code	DWDM band	Wavelength range (nm)
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
Note: One NT0H4345 cable is shipped with each OMX 4CH + Fiber Manager ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.		

OMX 4CH DWDM Enhanced

Use an OMX 4CH Enhanced with an Optical Metro 5200 shelf for DWDM systems. Table 13-50 lists the ordering information for the OMX 4CH (Enhanced).

Table 13-50
Product engineering codes for OMX 4CH (Enhanced)

Product engineering code	DWDM band	Wavelength range (nm)
NT0H32AF	1	1528.77 to 1533.47
NT0H32BF	2	1538.19 to 1542.94
NT0H32CF	3	1547.72 to 1552.52
NT0H32DF	4	1557.36 to 1562.23
NT0H32EF	5	1570.42 to 1575.37
NT0H32FF	6	1580.35 to 1585.36
NT0H32GF	7	1590.41 to 1595.49
NT0H32HF	8	1600.60 to 1605.73
Additional equipment		

Table 13-50 (continued)
Product engineering codes for OMX 4CH (Enhanced)

Product engineering code	DWDM band	Wavelength range (nm)
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
Note: One NT0H4345 cable is shipped with each OMX 4CH (Enhanced) ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.		

OMX 16CH DWDM

Use an OMX 16CH DWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for DWDM systems. Table 13-51 lists the ordering information for the OMX 16CH DWDM.

Table 13-51
Product engineering codes for OMX 16CH DWDM

Product engineering code	DWDM bands	Wavelength range (nm)
NT0H32JA	C-band (1, 2, 3, 4)	1528.77 to 1562.23
NT0H32KA	L-band (5, 6, 7, 8)	1570.42 to 1605.73
Additional equipment		
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H57BB	The Fiber Manager may be required for fiber slack management since the OMX 16CH DWDM does not have fiber management capabilities.	
Note: One NT0H4345 cable is shipped with each OMX 16CH ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.		

OMX 4CH CWDM

Use an OMX 4CH CWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for CWDM systems. Table 13-52 lists the ordering information for the OMX 4CH CWDM.

Table 13-52
Product engineering codes for the OMX 4CH CWDM OMX

Product engineering code	CWDM bands
NT0H33JA	C-band (1, 2, 3, 4)
NT0H33KA	L-band (5, 6, 7, 8)
Additional equipment	
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: One NT0H4345 cable is shipped with each OMX 4CH CWDM ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

OMX 4CH CWDM with dual taps

Use an OMX 4CH CWDM with dual taps with an Optical Metro 5100 or Optical Metro 5200 shelf for CWDM systems. Table 13-52 on page 13-70 lists the ordering information for the OMX 4CH CWDM with dual taps.

Table 13-53
Product engineering codes for the OMX 4CH CWDM OMX with dual taps

Product engineering code	CWDM bands
NT0H33JB	C-band (1, 2, 3, 4)
NT0H33KB	L-band (5, 6, 7, 8)
Additional equipment	
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.

Table 13-53
Product engineering codes for the OMX 4CH CWDM OMX with dual taps

Product engineering code	CWDM bands
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: One NT0H4345 cable is shipped with each OMX 4CH CWDM with dual taps ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

OMX 1CH CWDM

Use an OMX 1CH CWDM with an Optical Metro 5100 shelf for CWDM systems.

OMX 1CH CWDM modules are components that are installed in a drawer that is mounted in an equipment rack. OMX 1CH CWDMs can be ordered in two ways:

- an OMX 1CH CWDM assembly that includes the drawer plus two OMX modules of the same band
- an OMX 1CH CWDM module only (for sparing purposes or for applications when only one direction is required)

If you require an OMX 1CH CWDM module for one direction only, order the empty drawer (NT0H57BA) and one of the modules listed in Table 13-54 on page 13-71.

Table 13-54
OMX 1CH CWDM assembly (includes two OMX 1CH CWDM modules)

Product engineering code	CWDM band number	Wavelength (nm)
NT0H33AB	1	1533.47
NT0H33BB	2	1539.77
NT0H33CB	3	1550.92
NT0H33DB	4	1558.98
NT0H33EB	5	1575.37
NT0H33FB	6	1580.35
NT0H33GB	7	1590.41
NT0H33HB	8	1604.02

Table 13-54 (continued)
OMX 1CH CWDM assembly (includes two OMX 1CH CWDM modules)

Product engineering code	CWDM band number	Wavelength (nm)
Additional equipment		
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
Note: Two NT0H4345 cables are shipped with each OMX 1CH CWDM assembly ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.		

Table 13-55 lists the ordering information for OMX 1CH CWDM.

Table 13-55
Product engineering codes for OMX 1CH CWDM

Product engineering code	CWDM band number	wavelength (nm)
NT0H33AA	1	1533.47
NT0H33BA	2	1539.77
NT0H33CA	3	1550.92
NT0H33DA	4	1558.98
NT0H33EA	5	1575.37
NT0H33FA	6	1580.35
NT0H33GA	7	1590.41
NT0H33HA	8	1604.02
Additional equipment		
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.	
Note: Two NT0H4345 cables are shipped with each OMX 1CH CWDM assembly (NT0H33AB-HB) ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.		

OMX 4CH ITU CWDM

Use an OMX 4CH ITU CWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for ITU CWDM systems. Table 13-56 lists the ordering information for OMX 4CH ITU CWDMs.

Table 13-56
Product engineering codes for OMX 4CH ITU CWDM

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
NTPM33AA	1511 1531 1551 1571
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling. ***Note 2:*** One NT0H4345 cable is shipped with each OMX 4CH ITU CWDM ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

OMX 8CH ITU CWDM

Use an OMX 8CH ITU CWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for ITU CWDM systems. Table 13-57 lists the ordering information for OMX 8CH ITU CWDMs.

Table 13-57
Product engineering codes for OMX 8CH ITU CWDM

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
NTPM33BA	1471 1491 1511 1531 1551 1571 1591 1611
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling. ***Note 2:*** One NT0H4345 cable is shipped with each OMX 8CH ITU CWDM ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

OMX 4CH OADM ITU CWDM

Use an OMX 4CH OADM ITU CWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for ITU CWDM systems. Table 13-58 lists the ordering information for OMX 4CH OADM ITU CWDMs.

Table 13-58
Product engineering codes for OMX 4CH OADM ITU CWDM

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
NTPM34JA	1471 1491 1511 1531
NTPM34KA	1551 1571 1591 1611
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling. ***Note 2:*** One NT0H4345 cable is shipped with each OMX 4CH OADM ITU CWDM ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

OMX 1CH OADM ITU CWDM

Use an OMX 1CH OADM ITU CWDM with an Optical Metro 5100 or Optical Metro 5200 shelf for ITU CWDM systems.

OMX 1CH OADM ITU CWDM modules are components that are installed in a drawer that is mounted in an equipment rack. OMX 1CH OADM ITU CWDMs can be ordered in two ways:

- an OMX 1CH OADM ITU CWDM dual assembly that includes the drawer plus two OMX modules of the same band
- an OMX 1CH OADM ITU CWDM module only (for sparing purposes or for applications when only one direction is required)

If you require an OMX 1CH OADM ITU CWDM module for one direction only, order the empty drawer (NT0H57BA) and one of the modules listed in Table 13-59 on page 13-76.

Table 13-59
OMX 1CH OADM ITU CWDM dual assembly (includes two OMX 1CH OADM ITU CWDM modules)

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
NTPM34AB	1471
NTPM34BB	1491
NTPM34CB	1511
NTPM34DB	1531
NTPM34EB	1551
NTPM34FB	1571
NTPM34GB	1591
NTPM34HB	1611

Table 13-59 (continued)
OMX 1CH OADM ITU CWDM dual assembly (includes two OMX 1CH OADM ITU CWDM modules)

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling. ***Note 2:*** Two NT0H4345 cables are shipped with each OMX 1CH OADM ITU CWDM dual assembly (NTPM34AB-HB) ordered. The longer ID cable (NT0H4322) is available from Nortel Networks and can be ordered separately, if required.	

Table 13-60 lists the ordering information for OMX 1CH OADM ITU CWDM.

Table 13-60
Product engineering codes for OMX 1CH OADM ITU CWDM

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
NTPM34AA	1471
NTPM34BA	1491
NTPM34CA	1511
NTPM34DA	1531
NTPM34EA	1551
NTPM34FA	1571
NTPM34GA	1591
NTPM34HA	1611

Table 13-60 (continued)
Product engineering codes for OMX 1CH OADM ITU CWDM

Product engineering code	**ITU CWDM wavelengths (nm)** (see Note 1)
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Some Optical Metro 5100/5200 ITU CWDM hardware introduced before the ITU CWDM standard (G.695) was finalized will have 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 will show 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, that is, a passband of 1464.5 to 1477.5 nm. The finalized ITU CWDM standard 1471 nm channel specifies a range of ±6.5 nm, that is, the passband is still 1464.5 to 1477.5 nm. The only difference is one of labeling. ***Note 2:*** This cable is not included when the OMX 1CH OADM ITU CWDM (NTPM34AA-HA) is ordered. Two NT0H4345 cables are shipped with each OMX 1CH OADM ITU CWDM dual assembly (NTPM34AB-HB) ordered. The OMX 1CH OADM ITU CWDM cannot be inventoried in Release 7.0. Do not connect the OMX 1CH OADM ITU CWDM to the maintenance panel or to the Equipment Inventory unit.	

OFA circuit packs

Use the following OFA circuit packs with Optical Metro 5200 shelves for DWDM systems.

Table 13-61
Product engineering codes for OFA circuit packs

Product engineering code	Description
NT0H35AA	OFA Standard C-band
NT0H35BA	OFA Standard L-band
NT0H35AB	OFA High Input Power C-band
NT0H35BB	OFA High Input Power L-band
NT0H35AC	OFA Variable Gain C-band
NT0H35BC	OFA Variable Gain L-band

APBE circuit packs

Use the following APBE circuit packs with Optical Metro 5200 shelves for DWDM systems.

Table 13-62
Product engineering codes for APBE circuit packs and additional equipment

Product engineering code	Description
NT0H34AA	APBE C-band circuit pack
NT0H34BA	APBE L-band circuit pack
NT0H34AB	APBE Enhanced C-band
NT0H34BB	APBE Enhanced L-band

Per band equalizers

Use the following per band equalizers with Optical Metro 5200 shelves for DWDM systems.

Table 13-63
Product engineering codes for PBEs

Product engineering code	Description
NT0H31BA	PBE C-band
NT0H31BB	PBE L-band
NT0H31BC	PBE C&L-band
Additional equipment	

Table 13-63 (continued)
Product engineering codes for PBEs

Product engineering code	Description
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: Order one NT0H4322 or one NT0H4345 cable for each PBE.	

Discrete variable optical attenuators (VOA)

Use the discrete VOA with Optical Metro 5200 shelves for amplified DWDM systems. Table 13-64 lists the PEC codes for the discrete VOA.

Table 13-64
Product engineering codes for the discrete VOA

Product engineering code	Description
NT0H31AG	Variable optical attenuator tray (two VOAs)
NT0H31AH	Variable optical attenuator drawer with one tray (two VOAs)
NT0H31AJ	Variable optical attenuator drawer with two trays (four VOAs)
Additional equipment	
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: Order one NT0H4322 or one NT0H4345 cable for each tray.	

Transponder protection trays

Use the following transponder protection trays with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems.

Table 13-65
Product engineering codes for transponder protection trays

Product engineering code	Description
NT0H59AA (see Note 1)	single-mode four-channel transponder protection tray

Table 13-65 (continued)
Product engineering codes for transponder protection trays

Product engineering code	Description
NT0H59AB	single-mode two-channel transponder protection tray
NT0H59BA (see Note 1)	multimode four-channel transponder protection tray
NT0H59BB	multimode two-channel transponder protection tray
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: One Fiber Manager for each transponder protection tray is required. Use the fiber manager for fiber slack management since these transponder protection trays do not have fiber management capabilities. ***Note 2:*** Order one NT0H4322 or one NT0H4345 cable for each tray.	

OSC tray assembly

Use the OSC tray assemblies listed in Table 13-66 with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM and DWDM systems.

Table 13-66
Product engineering codes for OSC tray assembly

Product engineering code	Description
NT0H57DA (See Note 1)	OSC tray assembly, which includes
• NT0H57BA	• 1 dual filter drawer
• NT0H57CA	• 2 OSC trays
• NT0H4345	• 2 ID cables (1.5 meters)
• NT0H4381	• 2 SC/PC-LC/PC SMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
• NT0H4383	• 2 SC/PC-LC/PC MMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
NT0H57FA (See Note 1)	OSC tray assembly (with optical tap), which includes
• NT0H57BA	• 1 dual filter drawer
• NT0H57EA	• 2 OSC trays with optical tap
• NT0H4345	• 2 ID cables (1.5 meters)
• NT0H4381	• 2 SC/PC-LC/PC SMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
• NT0H4383	• 2 SC/PC-LC/PC MMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
NT0H57GB (See Note 1)	OSC dual tray assembly (with dual optical taps), which includes
• NT0H57BG	• 1 dual filter drawer with front apertures
• NT0H57GA	• 2 OSC trays with dual optical taps
• NT0H4381	• 2 SC/PC-LC/PC SMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
• NT0H4383	• 2 SC/PC-LC/PC MMF duplex patch cords 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
NT0H57GC (See Note 1)	OSC single tray assembly (with dual optical taps), which includes
• NT0H57BG	• 1 dual filter drawer with front apertures
• NT0H57GA	• 1 OSC tray with dual optical taps
• NT0H4381	• 1 SC/PC-LC/PC SMF duplex patch cord 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector
• NT0H4383	• 1 SC/PC-LC/PC MMF duplex patch cord 50 in (1.27 m). Straight boot for SC connector and 45° boot for LC connector

Table 13-66 (continued)
Product engineering codes for OSC tray assembly

Product engineering code	Description
Additional equipment	
NT0H4322 (See Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (See Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4382 (See Note 3)	SC/PC-LC/PC SMF duplex patch cords 123 in (3.12 m). Straight boot for SC connector and 45° boot for LC connector
NT0H4396 (See Note 3)	SC/PC-LC/PC MMF duplex patch cords 123 in (3.12 m). Straight boot for SC connector and 45° boot for LC connector
Note 1: Use NT0H57DA, NT0H57FA, NT0H57GB or NT0H57GC to order the OSC tray assembly as a complete kit. If you want to order an individual item in the kit, use the corresponding PEC for the item. ***Note 2:*** The NT0H57DA and NT0H57FA OSC kits include two NT0H4345 ID cables. The longer ID cable is available from Nortel Networks and can be ordered separately, if required. The NT0H57GB and NT0H57GC OSC kits do not include any ID cables. These need to be ordered separately. Order two ID cables for the NT0H57GB OSC kit and one ID cable for the NT0H57GC OSC kit. ***Note 3:*** The SMF duplex patch cords are used to connect the tray to the OSC ports of the OSC circuit pack and the MMF duplex patch cords are used to connect the tray to the WSC (way-side channel) ports of the OSC circuit pack. These longer SC-LC patch cords are available from Nortel Networks and can be ordered separately, if required. They are not included in the OSC kit.	

OSC circuit pack

Use the OSC circuit packs with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM and DWDM systems. The product engineering code for the OSC circuit pack is NTLW01AA.

DSCM

DSCMs (Dispersion Slope Compensating Module) are designed to compensate the chromatic dispersion slope and dispersion in Extended Metro applications that use OCLD 2.5 Gbit/s Universal, OTR 2.5 Gbit/s Universal, OTR 10 Gbit/s Enhanced, Muxponder 10 Gbit/s GbE/FC and Muxponder 10 Gbit/s GbE/FC VCAT circuit packs.

The DSCM trays are available in different lengths to compensate for different amounts of accumulated dispersion. Order one DSCM drawer for each DSCM tray.

Table 13-67
Product engineering codes for DSCMs

Product engineering code	Description
NT0H57LA	DSCM drawer
see Table 13-68 on page 13-84	C-band DSCM tray
see Table 13-69 on page 13-85	L-band DSCM tray
Additional equipment	
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: Order one NT0H4322 or one NT0H4345 cable for each tray.	

Table 13-68
Product engineering codes for C-band DSCM trays

Product engineering code	Description
NTT870AB	DSCM Tray (Type 1, C-band, DSCM-10)
NTT870AC	DSCM Tray (Type 1, C-band, DSCM-20)
NTT870AD	DSCM Tray (Type 1, C-band, DSCM-30)
NTT870AE	DSCM Tray (Type 1, C-band, DSCM-40)
NTT870AF	DSCM Tray (Type 1, C-band, DSCM-50)
NTT870AG	DSCM Tray (Type 1, C-band, DSCM-60)
NTT870AH	DSCM Tray (Type 1, C-band, DSCM-70)
NTT870AJ	DSCM Tray (Type 1, C-band, DSCM-80)
NTT870AK	DSCM Tray (Type 1, C-band, DSCM-90)
NTT870AL	DSCM Tray (Type 1, C-band, DSCM-100)
NTT870AM	DSCM Tray (Type 1, C-band, DSCM-110)

Table 13-68 (continued)
Product engineering codes for C-band DSCM trays

Product engineering code	Description
NTT870AN	DSCM Tray (Type 1, C-band, DSCM-120)
NTT870AP	DSCM Tray (Type 1, C-band, DSCM-130)
NTT870AQ	DSCM Tray (Type 1, C-band, DSCM-140)

Table 13-69
Product engineering codes for L-band DSCM trays

Product engineering code	Maximum Insertion Loss (dB)
NTT871AB	DSCM Tray (Type 1, L-band, DSCM-10)
NTT871AC	DSCM Tray (Type 1, L-band, DSCM-20)
NTT871AD	DSCM Tray (Type 1, L-band, DSCM-30)
NTT871AE	DSCM Tray (Type 1, L-band, DSCM-40)
NTT871AF	DSCM Tray (Type 1, L-band, DSCM-50)
NTT871AG	DSCM Tray (Type 1, L-band, DSCM-60)
NTT871AH	DSCM Tray (Type 1, L-band, DSCM-70)
NTT871AJ	DSCM Tray (Type 1, L-band, DSCM-80)
NTT871AK	DSCM Tray (Type 1, L-band, DSCM-90)
NTT871AL	DSCM Tray (Type 1, L-band, DSCM-100)
NTT871AM	DSCM Tray (Type 1, L-band, DSCM-110)
NTT871AN	DSCM Tray (Type 1, L-band, DSCM-120)
NTT871AP	DSCM Tray (Type 1, L-band, DSCM-130)
NTT871AQ	DSCM Tray (Type 1, L-band, DSCM-140)

Fiber manager

Use the fiber manager with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems. The product engineering code for the Fiber Manager is NT0H57BB.

Patch panel

Use the patch panel with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems.

The patch panel is required for the following applications:

- When OCI SRM 1310 nm or OCI SRM SONET/SDH circuit packs are used since these circuit packs use MT-RJ type connectors. You need one patch panel for every two OCI SRM 1310 nm or OCI SRM SONET/SDH circuit packs per shelf.
- When OCI SRM ESCON circuit packs are used since this circuit pack uses MPO type connectors. You need one patch panel for every OCI SRM ESCON circuit pack per shelf.
- When OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit packs are used in electrical regen applications. The patch panel is needed to hold the attenuators required in the client-side links to avoid overloading the receiver. One patch panel can be used to connect up to eight pairs of OTR 10 Gbit/s or OTR 10 Gbit/s Enhanced circuit packs back-to-back for an electrical pass-through connection.
- When Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT circuit packs are used. The patch panel is needed to hold the attenuators required in the client-side links to avoid overloading the receiver. One patch panel 16 port can be used to connect up to two pairs of Muxponder 10 Gbit/s GbE/FC circuit packs. One patch panel 20 port can be used to connect up to two pairs of Muxponder 10 Gbit/s GbE/FC or Muxponder 10 Gbit/s GbE/FC VCAT circuit packs.
- In any configuration without OMXs if attenuation of the OCLD/OTR Rx signal is required. The patch panel is needed to hold the attenuator. One patch panel can be used to provide attenuation for up to eight 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.

- When a mode-conditioning plug is required. A mode-conditioning plug is needed when a 1310 nm laser-based transmitter of an Optical Metro 5100/5200 circuit pack is connected to 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 operating error-free. 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. A patch panel

is required in this application to hold the mode-conditioning plug. One patch panel can be used to provide mode-conditioning for up to eight signals.

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.

- When an attenuator needs to be added in the link that connects the subtending equipment to a Optical Metro 5100/5200 circuit pack to avoid overloading the Rx port. A patch panel is required in this application to hold the attenuator if the attenuator cannot be connected to the subtending equipment port facing the link. One patch panel can be used to provide attenuation for up to eight 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.

Table 13-70
Product engineering codes for patch panels

Product engineering code	Description
NT0H43CA	Patch panel 16 port
NT0H43CB	Patch panel 20 port

Ethernet hub

Use the Ethernet hub with Optical Metro 5100 and Optical Metro 5200 shelves for NEBS-compliant CWDM, ITU CWDM, and DWDM systems. The product engineering code for an Ethernet hub (DC version) is NT0H43BB.

Equipment inventory unit

Use the equipment inventory unit with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems. The product engineering code for the equipment inventory unit is NT0H43HA.

Additional equipment:

- NT0H4322 Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or to other optical components.
- NT0H4345 Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or to other optical components.

Optical trunk switch

Use the Optical Trunk Switch with Optical Metro 5100 and Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems.

To install the Optical Trunk Switch you must order both NTUG90AA and NTUG90AK. NTUG90AA provides the Optical Trunk Switch and the cables and screws you need for installation. NTUG90AK provides the brackets you need to install the Optical Trunk Switch.

Table 13-71 on page 13-88 lists the product engineering codes for the Optical Trunk Switch.

Table 13-71
Product engineering codes for the Optical Trunk Switch

Product engineering code	Description
NTUG90AA	Optical trunk switch includes: • NTUG75AA, Optical Trunk Switch module with 19-inch front-mount bracket installed (see Note) • NT0H4303, Optical Trunk Switch mechanical kit which includes: — rear mounting brackets — mounting screws — power cables — telemetry cable and jumper — Ethernet cable
NTUG90AK	Bracket mounting kit for Optical Metro 5100/5200 deployment
Note: The NTUG75AA is separately orderable.	

Enhanced Trunk Switch

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.

The ETS consists of the following three components:

- ETS Shelf
- ETS Switch module
- ETS Comms module

Table 13-72 lists the PECs for the ETS.

Table 13-72
Product engineering codes for Enhanced Trunk Switch

Product engineering code	Description
NTUG90AN	Enhanced Trunk Switch assembly includes: • NTUG90GA: Enhanced Trunk Switch shelf (see Note) • NTUG90GD: ETS Comms module (see Note) • NTUG90GB: ETS Switch module (see Note) • NTUG90GH: ETS shelf installation kit (see Note) which includes: — mounting brackets — mounting screws — Nortel Universal Fiber Tool — NT0H43RA: ETS telemetry cable DB25 (see Note)
Additional equipment	
NTUG90GF	ETS Shelf Replacement Fan Module
NTUG90GG	ETS Shelf Replacement Air Filter
NTUG90GJ	ETS Shelf Replacement Fuses
Note: This item is separately orderable.	

C&L splitter/coupler tray assembly

Use the C&L splitter/coupler trays listed in Table 13-73 with Optical Metro 5200 shelves for DWDM systems.

Table 13-73
Product engineering codes for the C&L splitter/coupler tray assembly

Product engineering code	Description
NT0H31AE	two C&L splitter/coupler trays
NT0H31AF	C&L splitter/coupler drawer with two trays

Table 13-73 (continued)
Product engineering codes for the C&L splitter/coupler tray assembly

Product engineering code	Description
Additional equipment	
NT0H4322 (see Note)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note: Order one NT0H4322 or one NT0H4345 cable for each tray.	

1310 nm splitter/coupler tray assembly

Use the 1310 nm splitter/coupler trays listed in Table 13-74 with Optical Metro 5100 and Optical Metro 5200 shelves for ITU CWDM systems.

Table 13-74
Product engineering codes for the 1310 nm splitter/coupler tray

Product engineering code	Description
NT0H57JA	1310 splitter/coupler tray
NT0H57JB (see Note 1)	1310 splitter/coupler drawer with two trays
NT0H57JC (see Note 1)	1310 splitter/coupler drawer with one tray
Additional equipment	
NT0H4322 (see Note 2)	Simplex RJ45-RJ45 2.98 m (117 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
NT0H4345 (see Note 2)	Simplex RJ45-RJ45 1.5 m (60 in.) ID cable used to connect to the maintenance panel or the Equipment Inventory Unit.
Note 1: Use NT0H57JB or NT0H57JC to order the 1310 splitter/coupler tray assembly as a complete package. If you want to order an individual item in the kit, use the corresponding PEC. ***Note 2:*** Order one NT0H4322 or one NT0H4345 cable for each tray.	

Rectifiers

3U AC Power Rectifier Shelf (3U APRS)

Use the 3U APRS rectifier shelves listed in Table 13-75 with Optical Metro 5100 or Optical Metro 5200 shelves for CWDM, ITU CWDM, and DWDM systems.

Table 13-75
Product engineering codes for the 3U APRS

Product engineering code	Description
NT0H44AH (See Note 1, Note 2, Note 3 and Note 4)	3U APRS kit, which includes
• NT0H4311	• rectifier module (2)
• NT0H4312	• rectifier chassis (1)
• NT0H43DB	• ac power cord, Open Wire to IEC 60320-C19 connector, 3 m (10 ft), 220V 20A (for use with 220V AC service) (2)
• NT0H4366	• ANSI 10 AWG rectifier to shelf power cable, 3 m (10 ft) (2)
• NT0H4368	• ETSI 10 AWG rectifier to shelf power cable, 3 m (10 ft) (2)
	• ac power connector 220V 20A (2) - A0344941
	• strain relief connector (2) - A0849101
	• locking nuts (2) - P0594318
	• grounding lug (1) - A0381622
Additional Equipment	
NT0H49AA (See Note 5)	ANSI 14 AWG Optical Metro 5100 shelf to Fuse Panel or Breaker Interface Panel power cable, 3 m (10 ft)

Table 13-75 (continued)
Product engineering codes for the 3U APRS

Product engineering code	Description
NT0H49AB (See Note 5)	ETSI 14 AWG Optical Metro 5100 shelf to Fuse Panel or Breaker Interface Panel power cable, 3 m (10 ft)
A0735694 (See Note 6)	AC Twist Plug Male 125V 20A, black (NEMA L5-20)
Note 1: Use NT0H44AH to order the 3U APRS as a complete kit. If you want to order an individual item in the kit, use the corresponding PEC. ***Note 2:*** Order the NT0H4362 rectifier to shelf power cable (3.0 m, 10 ft. - quantity 2) when connecting the 3U APRS to a NT0H53AA power card (the power card shipped with earlier Optical Metro 5200 shelves). Optical Metro 5200 shelves are now shipped with the NT0H53BA and NT0H53CA power cards, which require the NT0H4366 or NT0H4368 power cables. ***Note 3:*** If building your own power cable, it must be a twisted pair cable with 1 twist per 1.5 inches (3.8 cm), or 8 twists per foot (30.5 cm). ***Note 4:*** The 3U APRS rectifier is built for installation in a 19-inch rack. If you want to mount the 3U APRS rectifier in a 23-inch rack, you must order and install the “19 to 23-inch extender brackets” (A0704348). ***Note 5:*** In addition to the NT0H44AH, order this cable to connect a 3U APRS to an Optical Metro 5100 shelf. You must use the NT0H44AH 3U APRS installation kit to connect the 3U APRS to a Breaker Interface Panel or a Fuse Panel and use the NT0H49AA or the NT0H49AB to connect the Breaker Interface Panel or the Fuse Panel to the Optical Metro 5100 shelf. You cannot use the NT0H44AH 3U APRS installation kit to connect the 3U APRS to an Optical Metro 5100 shelf directly. ***Note 6:*** The 3U APRS kit NT0H44AH comes equipped to accommodate 220V 20A environments. However, if the input AC power is 110V order part number A0735694, quantity 2.	

1U AC Power Rectifier Shelf (1U APRS)

Use the 1U APRS rectifier shelves listed in Table 13-76 with Optical Metro 5100 shelves for CWDM and ITU CWDM systems.

Table 13-76
Product engineering codes for the 1U APRS

Product engineering code	Description
NTPM43AA (see Note 1) • NTPM43AB • NTPM43AC (see Note 2)	1U APRS rectifier kit, which includes • Rectifier module (2) • Rectifier chassis (1) kit, which includes — Mounting brackets and hardware (5 sets) — Terminal block cover (2) (see Note 3) — Ferrite choke (2) — DC power output cables (4) — Telemetry cable (2)
Additional Equipment	
NT0H43DE (see Note 4)	AC Power Cord (Global) 3 m (10 ft)

Table 13-76 (continued)
Product engineering codes for the 1U APRS

Product engineering code	Description
A0300474 (see Note 4)	AC Twist Plug Male 125V 15A, black (NEMA L5-15)
NT0H43DD (see Note 4)	AC Power Cord (North America) 125V 13A 3 m (10 ft)
Note 1: Use NTPM43AA to order the 1U APRS as a complete kit. If you want to order an individual item in the kit, use the corresponding PEC. ***Note 2:*** Mounting brackets and hardware, ferrite chokes, and DC output and telemetry cables are supplied with the 1U APRS kit (NTPM43AA), and with the rectifier chassis (NTPM43AC). ***Note 3:*** One terminal block cover is supplied with the rectifier module (NTPM43AB). ***Note 4:*** The 1U APRS rectifier kit NTPM43AA does not include AC power connection components. For 110V 15A, twist lock connection environments order qty 2 NT0H43DE and qty 2 A0300474. For 110V 15A, regular connection environments order qty 2 NT0H43DD.	

Mode-conditioning plugs

Table 13-77 lists the product engineering codes for mode-conditioning plugs.

Table 13-77
Product engineering codes for mode-conditioning plugs

Product engineering code	Description
NT0H43JA	Mode-conditioning plug SC 50 µm MMF-SC SMF
NT0H43JB	Mode-conditioning plug SC 62.5 µm MMF-SC SMF

Attenuators

Table 13-78 lists the product engineering codes for SC attenuators and attenuator kits. Table 13-79 lists the product engineering codes for LC attenuators.

Table 13-78
Product engineering codes for SC attenuators

Product engineering code	Description
Attenuator kits	
NT0H44AC	OCLD Distributed Equalization kit (SC connector)
NT0H44AD	OFA output attenuator kit (1 dB and 2 dB) (SC connector)
NT0H44AE	OCLD/OSC overload attenuator kit (6 dB) (SC connector)
Attenuators	
NT0H4352	OCI Attenuator - 12 dB SM (SC connector)
NT0H4354	OCI Attenuator - 7 dB SM (SC Connector)
NT0H4355	OCI Attenuator - 15 dB SM (SC Connector)
N0032819	1 dB SM (SC connector)
N0032817	2 dB SM (SC connector)
N0028270	3 dB SM (SC connector)
N0032816	4 dB SM (SC connector)
N0032815	5 dB SM (SC connector)
N0032814	6 dB SM (SC connector)
N0032813	7 dB SM (SC connector)
N0032812	8 dB SM (SC connector)
N0028267	9 dB SM (SC connector)
N0032810	10 dB SM (SC connector)
N0028268	11 dB SM (SC connector)
N0032809	12 dB SM (SC connector)
N0028269	13 dB SM (SC connector)
N0032808	14 dB SM (SC connector)
N0032807	15 dB SM (SC connector)
N0032805	16 dB SM (SC connector)

Table 13-79
Product engineering codes for LC attenuators

Product engineering code	Description
A0516698 (see Note)	1 dB SM (LC connector)
A0516699 (see Note)	2 dB SM (LC connector)
A0516700 (see Note)	3 dB SM (LC connector)
A0516701 (see Note)	4 dB SM (LC connector)
A0516703 (see Note)	5 dB SM (LC connector)
A0516704 (see Note)	6 dB SM (LC connector)
A0516705 (see Note)	7 dB SM (LC connector)
A0516706 (see Note)	8 dB SM (LC connector)
A0516707 (see Note)	9 dB SM (LC connector)
A0516708 (see Note)	10 dB SM (LC connector)
A0516711 (see Note)	11 dB SM (LC connector)
A0516712 (see Note)	12 dB SM (LC connector)
A0516713 (see Note)	13 dB SM (LC connector)
A0516714 (see Note)	14 dB SM (LC connector)
A0516715 (see Note)	15 dB SM (LC connector)
A0516717 (see Note)	16 dB SM (LC connector)
Note: Can only be used for OMX 16CH DWDM applications.	

Power cables

Table 13-80 lists the product engineering codes for power cables.

Table 13-80
Product engineering codes for power cables

Product engineering code	Description
NT0H4365	3U APRS rectifier to shelf power cable, term. lug, 2 m (6.5 ft)
NT0H4366	3U APRS rectifier to shelf power cable, term. lug, 3 m (10 ft)
NT0H4367	3U APRS rectifier to shelf power cable, ETSI term. lug, 2 m (6.5 ft)

Table 13-80 (continued)
Product engineering codes for power cables

Product engineering code	Description
NT0H4368	3U APRS rectifier to shelf power cable ETSI term. lug, 3 m (10 ft)
NT0H49AA	ANSI 14 AWG Optical Metro 5100 shelf to Fuse Panel or Breaker Interface Panel power cable, 3 m (10 ft)
NT0H49AB	ETSI 14 AWG Optical Metro 5100 shelf to Fuse Panel or Breaker Interface Panel power cable, 3 m (10 ft)
NT0H43DA	AC power cord, Nema 5-15P to IEC 60320-C19 connector, 3 m (10 ft), 125V 15A (for use with 110V/20A ac service)
NT0H43DB	AC power cord, Open Wire to IEC 60320-C19 connector, 3 m (10 ft), 220V 20A (for use with 220V ac service)
NT0H43DC	AC power cord, European wire colors, Open Wire to IEC 60320-C19 connector, 3 m (10 ft), 220V 16A (for use with 220V ac service in Europe (International))
NT0H43DD	AC power cord, Nema 5-15 P to IEC 60320-C13 connector, 3 m (10 ft), 125V, 13A (for use with 110V ac service)
NT0H43DE	AC power cord, Open Wire to IEC 60320-C13 connector, 3 m (10 ft), 250V 10A (for use with 220V ac service)
NT0H43DF	AC power cord, European wire colors, Open Wire to IEC 60320-C13 connector, 3 m (10 ft), 250V 10A (for use with 220V ac service in Europe (International)

Ethernet cables

Table 13-81 lists the product engineering codes for the types and lengths of Ethernet cables.

Table 13-81
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

Table 13-82 lists the product engineering codes of fiber-optic patch cords.

Table 13-82
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H39AA	1.6 mm (single jacket)	MMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	2.4 m (96 in.)	Muxponder 10 Gbit/s circuit pack to subtending equipment or to patch panel (see Note 1 and Note 2)
NT0H39AB	1.6 mm (single jacket)	MMF 62.5 µm on RX side and SMF on TX side duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	2.4 m (96 in.)	Muxponder 10 Gbit/s circuit pack to subtending equipment or to patch panel (see Note 1 and Note 2)
NT0H43JC	3 mm	SMF simplex SC/PC-SC/PC	0.39 m (15.5 in.)	OFA VGA circuit pack to OFA VGA circuit pack in the same shelf
NT0H4319	1.6 mm (single jacket)	MMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.1 m (122 in.)	Client-side connector on Muxponder 10 Gbit/s GbE/FC circuit pack to subtending equipment or to patch panel (see Note 1 and Note 2)
NT0H4320	1.6 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.1 m (122 in.)	Client-side connector on Muxponder 10 Gbit/s GbE/FC circuit pack to subtending equipment or to patch panel (see Note 1 and Note 2)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4321	3 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	1.57 m (62 in.)	• 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, OTR or Muxponder circuit pack to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM • patch panel (see Note 5)
				LC filler card to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4325	3 mm (single jacket)	SMF simplex SC/PC-LC/PC	10.0 m (394 in.)	APBE circuit pack to OFA (see Note 7)
NT0H4326	3 mm (single jacket)	SMF simplex SC/PC-LC/PC	6.0 m (236 in.)	APBE circuit pack to OFA (see Note 7)
NT0H4327	3 mm (single jacket)	SMF simplex SC/PC-LC/PC	0.39 m (15.5 in.)	APBE circuit pack to OFA (see Note 3)
NT0H4328	3 mm	MMF 62.5 µm/MMF 50 µm duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	1.27 m (50 in.)	• 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 1) • OCI SRM GbE/FC 850 nm, OCI SRM GbE/FC Enhanced 850 nm or OCI SRM GbE 850 nm to subtending equipment (see Note 1)
NT0H4330	3 mm	SMF 2 x simplex SC/PC-SC/PC	1.86 m (73 in.)	See Note 4
NT0H4331	3 mm	SMF 2 x simplex SC/PC-SC/PC	2.29 m (90 in.)	See Note 4
NT0H4332	3 mm	SMF 2 x simplex SC/PC-SC/PC	7.92 m (312 in.)	See Note 4
NT0H4333	3 mm (single jacket)	MMF/SMF duplex MTRJ-SC/PC	2.29 m (90 in.)	• OCI SRM 1310 nm circuit pack to patch panel (see Note 5) • OCI SONET/SDH SRM circuit pack to patch panel (see Note 5)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4343	3 mm	SMF simplex SC/PC-FC/PC	1.57 m (62 in.)	OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • Patch panel (see Note 5)
				OCLD filler card to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM
NT0H4344	3 mm (single jacket)	MMF/SMF duplex MTRJ-SC/PC	3.44 m (135 in.)	• OCI SRM 1310 nm circuit pack to patch panel (see Note 5) • OCI SRM SONET/SDH circuit pack to patch panel (see Note 5)
NT0H4346	5 mm x 1.5 mm (twin jacket)	SMF duplex FC/PC-SC/PC	1.57 m (62 in.)	OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • Patch panel (see Note 5)
				OCLD filler card to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM
NT0H4347	3 mm (single jacket)	SMF duplex FC/PC-LC/PC FC-FC adaptor	3.18 m (125 in.)	• OMX (Standard) to line-side connector on OCLD 2.5 Gbit/s Flex, OTR or Muxponder circuit pack (see Note 7)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4348	3 mm (single jacket)	SMF duplex FC/PC-FC/PC FC-FC adaptor	3.18 m (125 in.)	• OMX (Standard) to OCLD 1.25 Gbit/s or OCLD 2.5 Gbit/s circuit pack in slots 5 to 8, and slots 11-14. (see Note 7)
NT0H4349	3 mm (single jacket)	SMF simplex SC/PC-LC/PC	3.0 m (118 in.)	APBE circuit pack to • OFA (see Note 7) • 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 5) • 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 5)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4381	3 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	1.27 m (50 in.)	OSC tray to OSC ports on the OSC circuit pack (see Note 10)
				• 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 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, OTR or Muxponder circuit pack to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM • patch panel (see Note 5)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4381 (continued)	3 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	1.27 m (50 in.)	LC filler card to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM
NT0H4382	3 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.12 m (123 in.)	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 8) • 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)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4382 (continued)	3 mm (single jacket)	SMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.12 m (123 in.)	Line-side connector on OCLD 2.5 Gbit/s Flex, OTR or Muxponder circuit pack to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM • patch panel (see Note 5)
				LC filler card to • OMX 4CH Enhanced • OMX + Fiber Manager 4CH DWDM • OMX 1CH CWDM • OMX 4CH CWDM • OMX (4CH or 8CH) ITU CWDM • OMX (1CH or 4CH) OADM ITU CWDM
NT0H4383	3 mm (single jacket)	MMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	1.27 m (50 in.)	OSC tray to Wayside channel ports on OSC circuit pack (see Note 10)

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4384	3 mm	MMF 62.5 µm/MMF 50 µm duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.12 m (123 in.)	• 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 8) • Client-side connector on OTR 2.5 Gbit/s 850 nm, circuit pack to subtending equipment for unprotected applications (see Note 1) • OCI SRM GbE/FC 850 nm, OCI SRM GbE/FC Enhanced 850 nm or OCI SRM GbE 850 nm to subtending equipment (see Note 1)
NT0H4385	3 mm	MMF 62.5 µm on RX side and SMF on TX side duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.12 m (123 in.)	OCI SRM 1310 nm LC or OCI SRM SONET/SDH LTE to subtending equipment (see Note 1) or to patch panel

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
NT0H4386 (see Note 9)	3 mm	SMF SC/PC-SC/PC	0.86 m (34 in.)	OFA circuit pack Slot 1 to ECT (OUT)
NT0H4387 (see Note 9)	3 mm	SMF SC/PC-SC/PC	0.93 m (37 in.)	OFA circuit pack Slot 5 to ECT (OUT)
NT0H4388 (see Note 9)	3 mm	SMF SC/PC-SC/PC	1.07 m (42 in.)	OFA circuit pack Slot 11 to ECT (OUT)
NT0H4389 (see Note 9)	3 mm	SMF SC/PC-SC/PC	1.17 m (46 in.)	OFA circuit pack Slot 15 to ECT (OUT)
NT0H4390 (see Note 9)	3 mm	SMF SC/PC-SC/PC	0.86 m (34 in.)	OFA circuit pack Slot 1 to ECT (IN)
NT0H4391 (see Note 9)	3 mm	SMF SC/PC-SC/PC	0.93 m (37 in.)	OFA circuit pack Slot 5 to ECT (IN)
NT0H4392 (see Note 9)	3 mm	SMF SC/PC-SC/PC	1.07 m (42 in.)	OFA circuit pack Slot 11 to ECT (IN)
NT0H4393 (see Note 9)	3 mm	SMF SC/PC-SC/PC	1.17 m (46 in.)	OFA circuit pack Slot 15 to ECT (IN)
NT0H4396	3 mm (single jacket)	MMF duplex SC/PC-LC/PC Straight boot for SC connector and 45° boot for LC connector	3.12 m (123 in.)	OSC tray to Wayside channel ports on OSC circuit pack
NT0H4398 (see Note 6)	3 mm at MPO end 1.8 mm at breakout points	MMF MPO-8xSC	3.2 m (126 in.)	OCI SRM ESCON circuit pack to patch panel (see Note 5)
NTTC53AT	2 mm (twin jacket)	SMF duplex LC/PC-LC/PC Straight boot for one end and 45° boot for the other end	1 m (39 in.)	Line-side connector on OCLD 2.5 Gbit/s Flex, OTR or Muxponder 10 Gbit/s GbE/FC circuit pack or LC filler card to • OMX 16CH DWDM • Common Photonic Layer CMD
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.)	

Table 13-82 (continued)
Product engineering codes for patch cords

PEC	Diameter	Type	Length	Used to connect
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 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. 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/NT0H43CB). One NT0H43CA patch panel can accommodate up to 8 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 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 5-6. 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 ***Note 4:*** 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. Refer to the *Hardware Description*, 323-1701-102, and the "Connecting Components chapter in *Connection Procedures*, 323-1701-221, for help to determine the appropriate patch cord. ***Note 5:*** The NT0H43CA patch panel is required for this application. ***Note 6:*** Order two NT0H4398 patch cords per OCI SRM ESCON circuit pack. ***Note 7:*** The NT0H57BB Fiber Manager is required for this application. ***Note 8:*** The NT0H57BB Fiber Manager is required for this application when using the four-channel version Transponder Protection Trays (NT0H59AA or NT0H59BA). ***Note 9:*** This patch cord (quantity 1) is included with the OFA installation kit (NT0H44AB). ***Note 10:*** This patch cord (quantity 2) is included with the OSC kits (NT0H57DA, NT0H57FA).				

Determining fiber lengths to passive optical component drawers

This section provides the minimum length required to route fibers from the entrance of a passive optical component drawer to the various bulkhead connectors within the passive optical component drawer (or for the OMX 16CH DWDM to slider connectors). Included in this section is also the amount of total additional fiber slack storage available in the drawer, if applicable.

To calculate the fiber length, use the information in this section in conjunction with the heights of each unit, which is presented in *Hardware Description*, 323-1701-102.

To determine the minimum fiber lengths required for specific hardware, see the tables listed in Table 13-83.

Table 13-83
Reference table

Hardware	PEC	Fiber lengths information in	Related figure (if applicable)
OMX 4CH + Fiber Manager	NT0H32AE-HE	Table 13-84	Figure 13-1
OMX 4CH DWDM Enhanced	NT0H32AF-HF	Table 13-85	Figure 13-1
OMX 16CH DWDM	NT0H32JA	Table 13-86	Figure 13-2
	NT0H32KA	Table 13-87	Figure 13-3
OMX 4CH CWDM	NT0H33JA	Table 13-88	Figure 13-4
	NT0H33KA	Table 13-89	Figure 13-5
OMX 4CH CWDM with dual taps	NT0H33JB	Table 13-90	Figure 13-6
	NT0H33KB	Table 13-91	Figure 13-7
OMX 1CH CWDM	NT0H33AB-HB NT0H33AA-HA	Table 13-92	—
OMX 4CH ITU CWDM	NTPM33AA	Table 13-93	Figure 13-8
OMX 8CH ITU CWDM	NTPM33BA	Table 13-94	Figure 13-9
OMX 4CH OADM ITU CWDM	NTPM34JA	Table 13-95	Figure 13-10
	NTPM34KA	Table 13-96	Figure 13-11
OMX 1CH OADM ITU CWDM	NTPM34AB-HB NTPM34AA-HA	Table 13-97	—
Per-Band Equalizer	NT0H31BA-BC	Table 13-98	—
VOA drawer	NT0H31AH/AJ	Table 13-99	—
Transponder Protection Tray, 4 channels	NT0H59AA/BA	Table 13-100	Figure 13-12
Transponder Protection Tray, 2 channels	NT0H59AB/BB	Table 13-101	Figure 13-13
OSC tray assembly	NT0H57DA	Table 13-102	—
OSC tray assembly (with optical tap)	NT0H57FA		—
OSC tray assembly (with dual optical taps)	NT0H57GB/GC	Table 13-103	—
DSCM drawer	NT0H57LA	Table 13-104	—
Fiber Manager	NT0H57BB	Table 13-105	—
16-port patch panel	NT0H43CA	Table 13-106	Figure 13-14

Table 13-83 (continued)
Reference table

Hardware	PEC	Fiber lengths information in	Related figure (if applicable)
20-port patch panel	NT0H43CB	Table 13-107	Figure 13-15
C&L Splitter/Coupler drawer with two trays	NT0H31AF	Table 13-108	—
1310 nm Splitter/Coupler	NT0H57JB/JC	Table 13-109	—

Table 13-84
OMX 4CH and Fiber Manager (NT0H32AE-NT0H32HE)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to CH1 ADD/CH1 DROP	
LHS fiber ingress to CH2 ADD/CH2 DROP	0.81 m (32 in.)
LHS fiber ingress to CH3 ADD/CH3 DROP	
LHS fiber ingress to CH4 ADD/CH4 DROP	
RHS fiber ingress to OTS IS/OTS OUT	0.79 m (31 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to CH1 ADD/CH1 DROP	
RHS fiber ingress to CH2 ADD/CH2 DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to CH3 ADD/CH3 DROP	
RHS fiber ingress to CH4 ADD/CH4 DROP	

Note 1: The total additional fiber slack storage available in this drawer is 2.7 m (106 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH + Fiber Manager in a closed position.

Legend

LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side

Figure 13-1
Connector labels in an OMX 4CH + Fiber Manager (or OMX 4CH Enhanced)

OM0700t

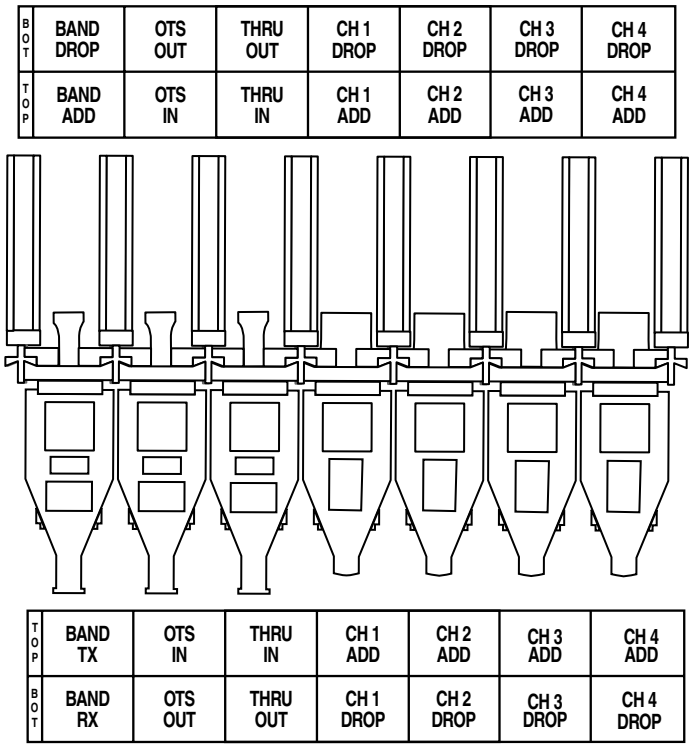


Table 13-85
OMX 4CH DWDM Enhanced (NT0H32AF-HF)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to CH1 ADD/CH1 DROP	
LHS fiber ingress to CH2 ADD/CH2 DROP	0.81 m (32 in.)
LHS fiber ingress to CH3 ADD/CH3 DROP	
LHS fiber ingress to CH4 ADD/CH4 DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.79 m (31 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to CH1 ADD/CH1 DROP	

Table 13-85 (continued)
OMX 4CH DWDM Enhanced (NT0H32AF-HF)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to CH2 ADD/CH2 DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to CH3 ADD/CH3 DROP	
RHS fiber ingress to CH4 ADD/CH4 DROP	
Note 1: The total additional fiber slack storage available in this drawer is 2.7 m (106 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers. ***Note 3:*** The numbers provided are for the OMX 4CH DWDM Enhanced in a closed position. **Legend** LHS = left-hand side; DWDM = dense wavelength division multiplexing; OMX = optical multiplexer; RHS = right-hand side	

Table 13-86
OMX 16CH DWDM (NT0H32JA) C-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to Band 1 slider connectors	0.10 m (4 in.)
LHS fiber ingress to Band 2 slider connectors	0.15 m (6 in.)
RHS fiber ingress to OTS/L-Band slider connectors	0.23 m (9 in.)
RHS fiber ingress to Band 3 slider connectors	0.15 m (6 in.)
RHS fiber ingress to Band 4 slider connectors	0.10 m (4 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OMX 16CH DWDM in a closed position. **Legend** DWDM = division walength mulltiplexer; LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side	

Figure 13-2
Slider connector labels on OMX 16CH DWDM (NT0H32JA) C-band

OM2555p

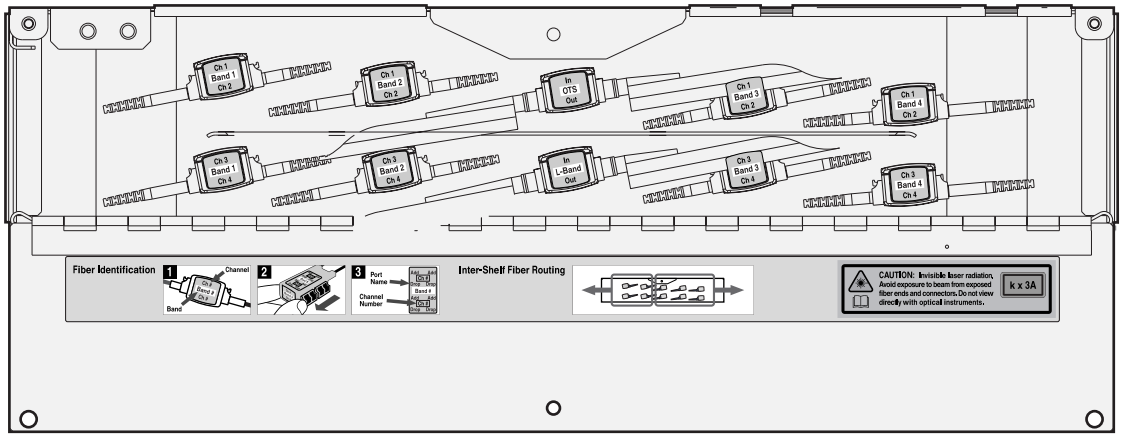


Table 13-87
OMX 16CH DWDM (NT0H32KA) L-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to Band 5 slider connectors	0.10 m (4 in.)
LHS fiber ingress to Band 6 slider connectors	0.15 m (6 in.)
RHS fiber ingress to OTS slider connectors	0.23 m (9 in.)
RHS fiber ingress to Band 7 slider connectors	0.15 m (6 in.)
RHS fiber ingress to Band 8 slider connectors	0.10 m (4 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OMX 16CH DWDM in a closed position. **Legend** DWDM = division walength mulltiplexer; LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side	

Figure 13-3
Slider connector labels on OMX 16CH DWDM (NT0H32KA) L-band

OM2842p

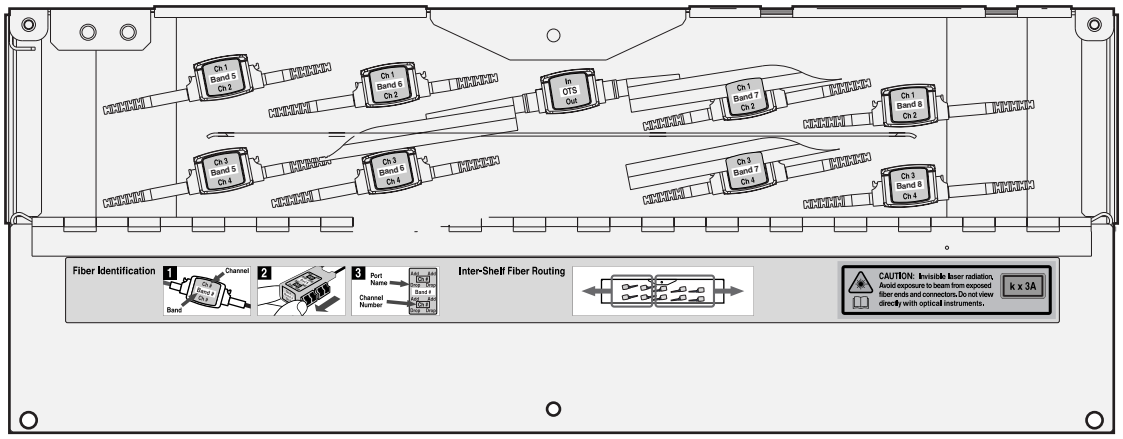


Table 13-88
OMX 4CH CWDM (NT0H33JA) C-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.74 m (29 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to BAND1 ADD/BAND1 DROP	
LHS fiber ingress to BAND2 ADD/BAND2 DROP	0.79 m (31 in.)
LHS fiber ingress to BAND3 ADD/BAND3 DROP	
LHS fiber ingress to BAND4 ADD/BAND4 DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.81 m (32 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to BAND1 ADD/BAND1 DROP	

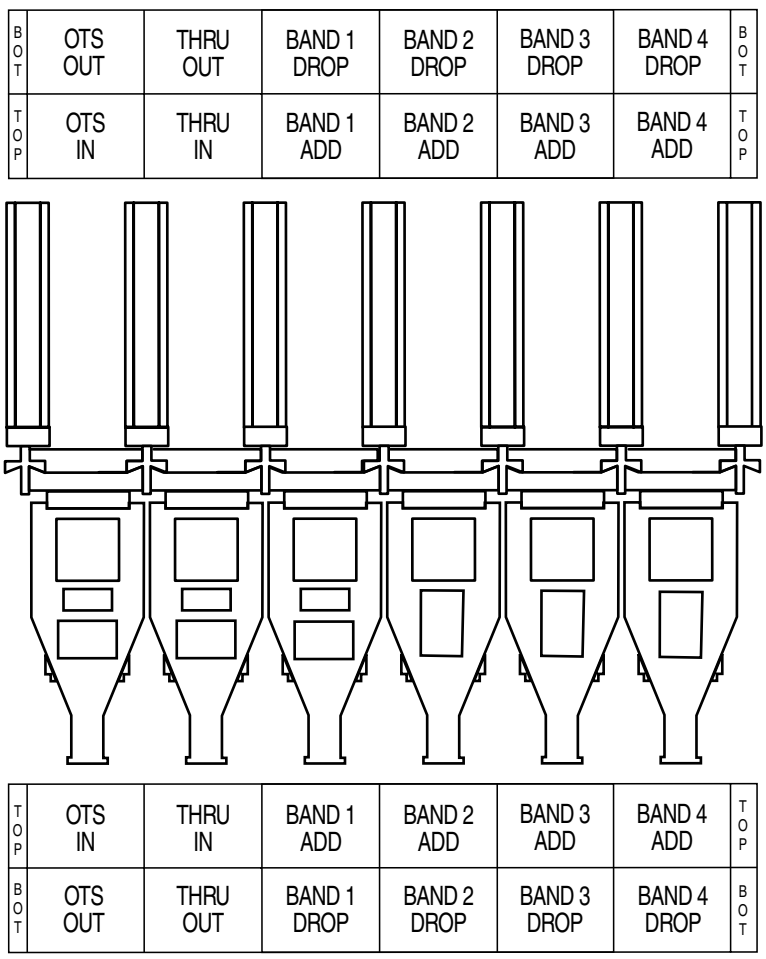
Table 13-88 (continued)
OMX 4CH CWDM (NT0H33JA) C-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to BAND2 ADD/BAND2 DROP	0.76 m (30 in.) (see Note 2)
RHS fiber ingress to BAND3 ADD/BAND3 DROP	
RHS fiber ingress to BAND4 ADD/BAND4 DROP	
Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers. ***Note 3:*** The numbers provided are for the OMX 4CH CWDM in a closed position. **Legend** LHS = left-hand side; CWDM = coarse wavelength division multiplexing; OMX = optical multiplexer; RHS = right-hand side	

Figure 13-4
Connector labeling for an OMX 4CH CWDM (NT0H33JA) C-band

OM0899t

Rear (Filter connections)



Front (External connections)

Table 13-89
OMX 4CH CWDM (NT0H33KA) L-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.74 m (29 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to BAND5 ADD/BAND5 DROP	
LHS fiber ingress to BAND6 ADD/BAND6 DROP	0.79 m (31 in.)
LHS fiber ingress to BAND7 ADD/BAND7 DROP	
LHS fiber ingress to BAND8 ADD/BAND8 DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.81 m (32 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to BAND5 ADD/BAND5 DROP	
RHS fiber ingress to BAND6 ADD/BAND6 DROP	0.76 m (30 in.) (see Note 2)
RHS fiber ingress to BAND7 ADD/BAND7 DROP	
RHS fiber ingress to BAND8 ADD/BAND8 DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH CWDM in a closed position.

Legend

LHS = left-hand side; CWDM = coarse wavelength division multiplexing; OMX = optical multiplexer; RHS = right-hand side

Figure 13-5
Connector labeling for an OMX 4CH CWDM (NT0H33KA) L-band

OM0900t

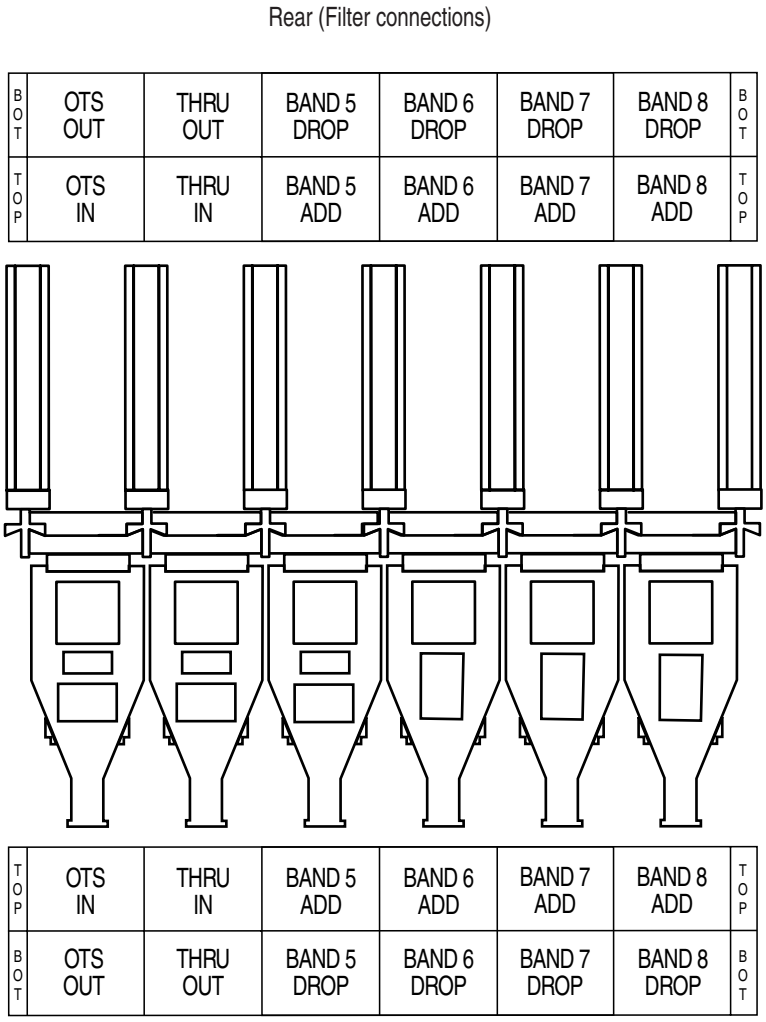


Table 13-90
OMX 4CH CWDM with dual taps (NT0H33JB) C-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.71 m (28 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to BAND1 ADD/BAND1 DROP	
LHS fiber ingress to BAND2 ADD/BAND2 DROP	0.76 m (30 in.)
LHS fiber ingress to BAND3 ADD/BAND3 DROP	
LHS fiber ingress to BAND4 ADD/BAND4 DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.81 m (32 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to BAND1 ADD/BAND1 DROP	
RHS fiber ingress to BAND2 ADD/BAND2 DROP	0.76 m (30 in.) (see Note 2)
RHS fiber ingress to BAND3 ADD/BAND3 DROP	
RHS fiber ingress to BAND4 ADD/BAND4 DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH CWDM with dual taps in a closed position.

Legend

LHS = left-hand side; CWDM = coarse wavelength division multiplexing;
OMX = optical multiplexer; RHS = right-hand side

Figure 13-6
Connector labeling for an OMX 4CH CWDM with dual taps (NT0H33JB) C-band

OM2819t

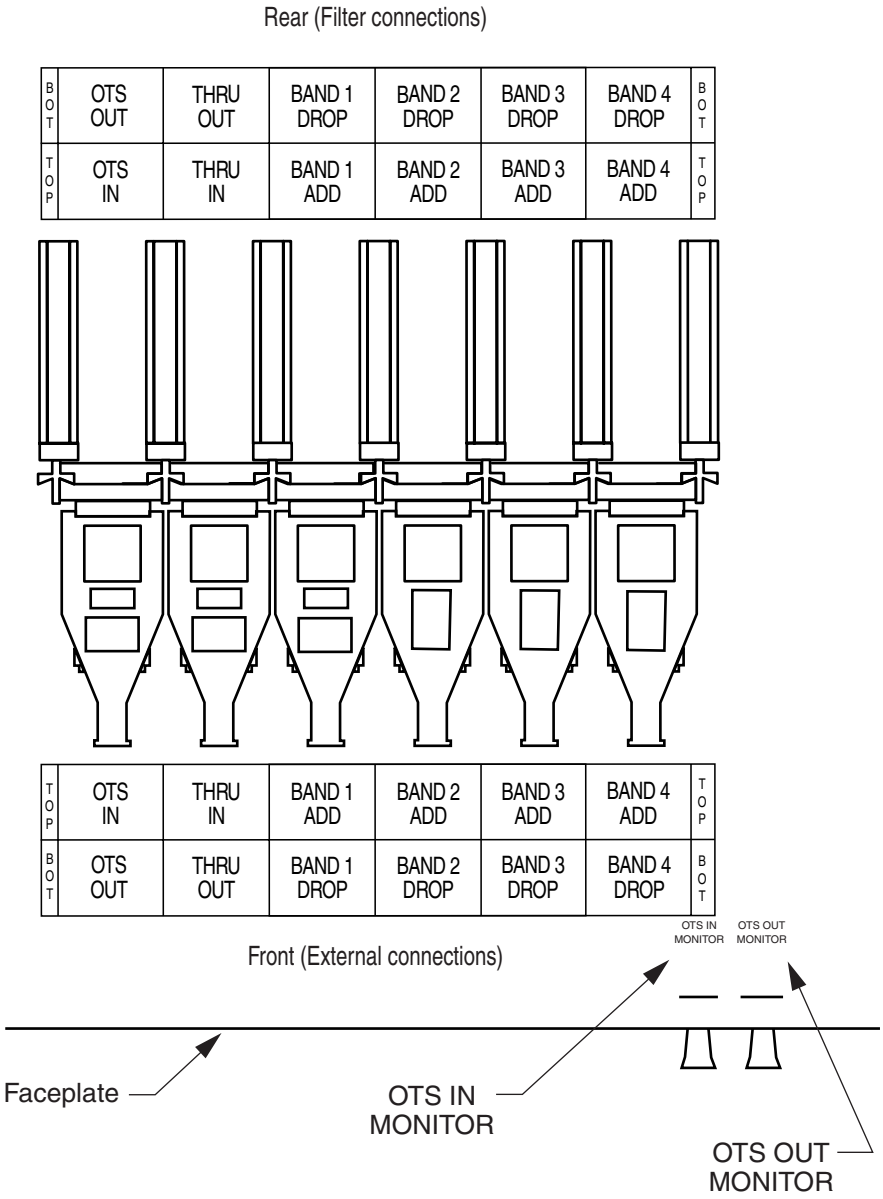


Table 13-91
OMX 4CH CWDM with dual taps (NT0H33KB) L-band

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.71 m (28 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to BAND5 ADD/BAND5 DROP	
LHS fiber ingress to BAND6 ADD/BAND6 DROP	0.76 m (30 in.)
LHS fiber ingress to BAND7 ADD/BAND7 DROP	
LHS fiber ingress to BAND8 ADD/BAND8 DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.81 m (32 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to BAND5 ADD/BAND5 DROP	
RHS fiber ingress to BAND6 ADD/BAND6 DROP	0.76 m (30 in.) (see Note 2)
RHS fiber ingress to BAND7 ADD/BAND7 DROP	
RHS fiber ingress to BAND8 ADD/BAND8 DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH CWDM with dual taps in a closed position.

Legend

LHS = left-hand side; CWDM = coarse wavelength division multiplexing; OMX = optical multiplexer; RHS = right-hand side

Figure 13-7
Connector labeling for an OMX 4CH CWDM with dual taps (NT0H33KB) L-band

OM2828t

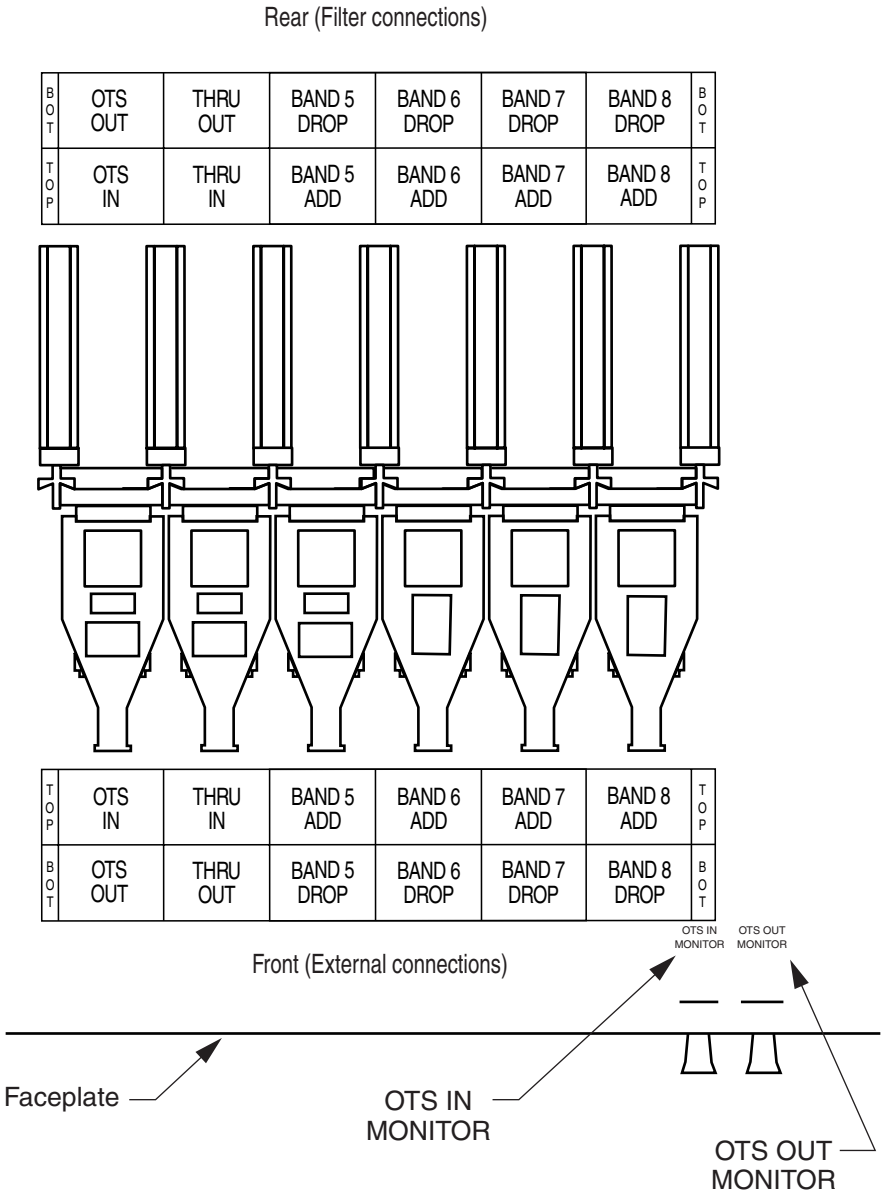


Table 13-92
OMX 1CH CWDM (NT0H33AB-HB, NT0H33AA-HA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OMX 1CH CWDM in a closed position. **Legend** CWDM = coarse wavelength division multiplexing; LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side	

Table 13-93
OMX 4CH ITU CWDM (NTPM33AA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to 1511 nm ADD/1511 nm DROP	
LHS fiber ingress to 1531 nm ADD/1531 nm DROP	
LHS fiber ingress to 1531 nm ADD/1531 nm DROP	0.81 m (32 in.)
LHS fiber ingress to 1551 nm ADD/1551 nm DROP	
LHS fiber ingress to 1571 nm ADD/1571 nm DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.) (see Note 2)
RHS fiber ingress to 1511 nm ADD/1511 nm DROP	
RHS fiber ingress to 1531 nm ADD/1531 nm DROP	

Table 13-93 (continued)
OMX 4CH ITU CWDM (NTPM33AA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to 1531 nm ADD/1531 nm DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to 1551 nm ADD/1551 nm DROP	
RHS fiber ingress to 1571 nm ADD/1571 nm DROP	
Note 1: The total additional fiber slack storage available in this drawer is 8 m (315 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers. ***Note 3:*** The numbers provided are for the OMX 4CH ITU CWDM in a closed position. **Legend** CWDM = coarse wavelength division multiplexing; ITU = International Telecommunication Union; LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side	

Figure 13-8
Connector labels for an OMX 4CH ITU CWDM (NTPM33AA)

OM1956t

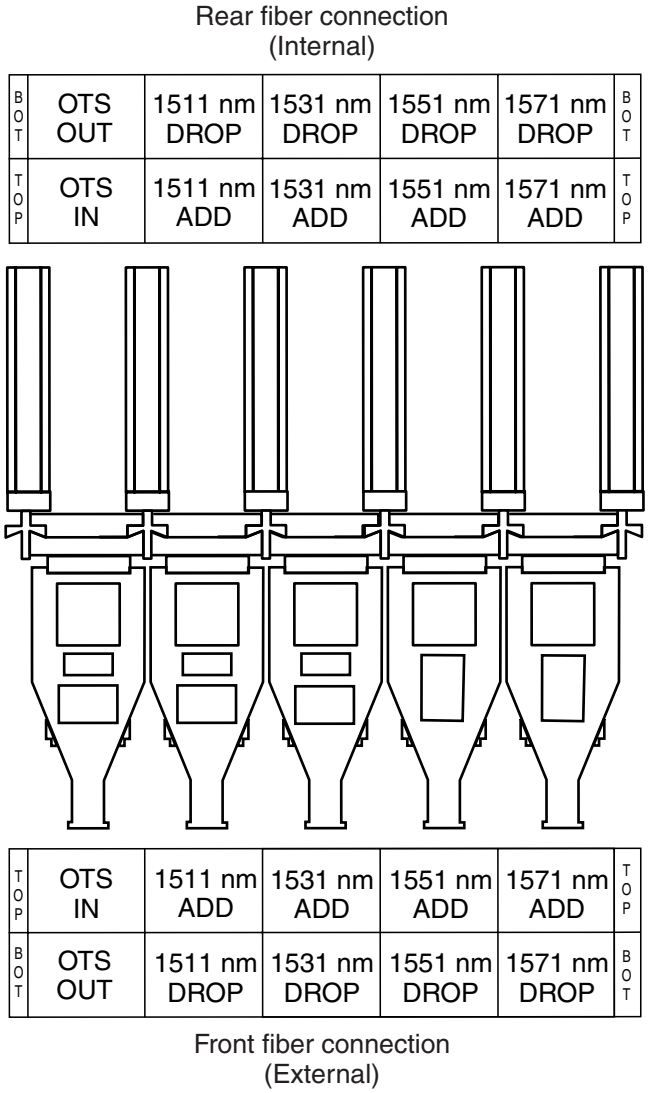


Table 13-94
OMX 8CH ITU CWDM (NTPM33BA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to 1471 nm ADD/1471 nm DROP	
LHS fiber ingress to 1491 nm ADD/ 1491 nm DROP	
LHS fiber ingress to 1511 nm ADD/ 1511 nm DROP	0.81 m (32 in.)
LHS fiber ingress to 1531 nm ADD/1531 nm DROP	
LHS fiber ingress to 1551 nm ADD/1551 nm DROP	
LHS fiber ingress to 1571 nm ADD/1571 nm DROP	0.86 m (34 in.)
LHS fiber ingress to 1591 nm ADD/1591 nm DROP	
LHS fiber ingress to 1611 nm ADD/1611 nm DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.84 m (33 in.) (see Note 2)
RHS fiber ingress to 1471 nm ADD/1471 nm DROP	
RHS fiber ingress to 1491 nm ADD/1491 nm DROP	
RHS fiber ingress to 1511 nm ADD/1511 nm DROP	0.79 m (31 in.) (see Note 2)
RHS fiber ingress to 1531 nm ADD/1531 nm DROP	
RHS fiber ingress to 1551 nm ADD/1551 nm DROP	
RHS fiber ingress to 1571 nm ADD/ 1571 nm DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to 1591 nm ADD/ 1591 nm DROP	
RHS fiber ingress to 1611 nm ADD/1611 nm DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 8CH ITU CWDM in a closed position.

Legend

CWDM = coarse wavelength division multiplexing; ITU = International Telecommunication Union; LHS = left-hand side; OMX = optical multiplexer; RHS = right-hand side

Figure 13-9
Connector labels for an OMX 8CH ITU CWDM (NTPM33BA)

OM1957p

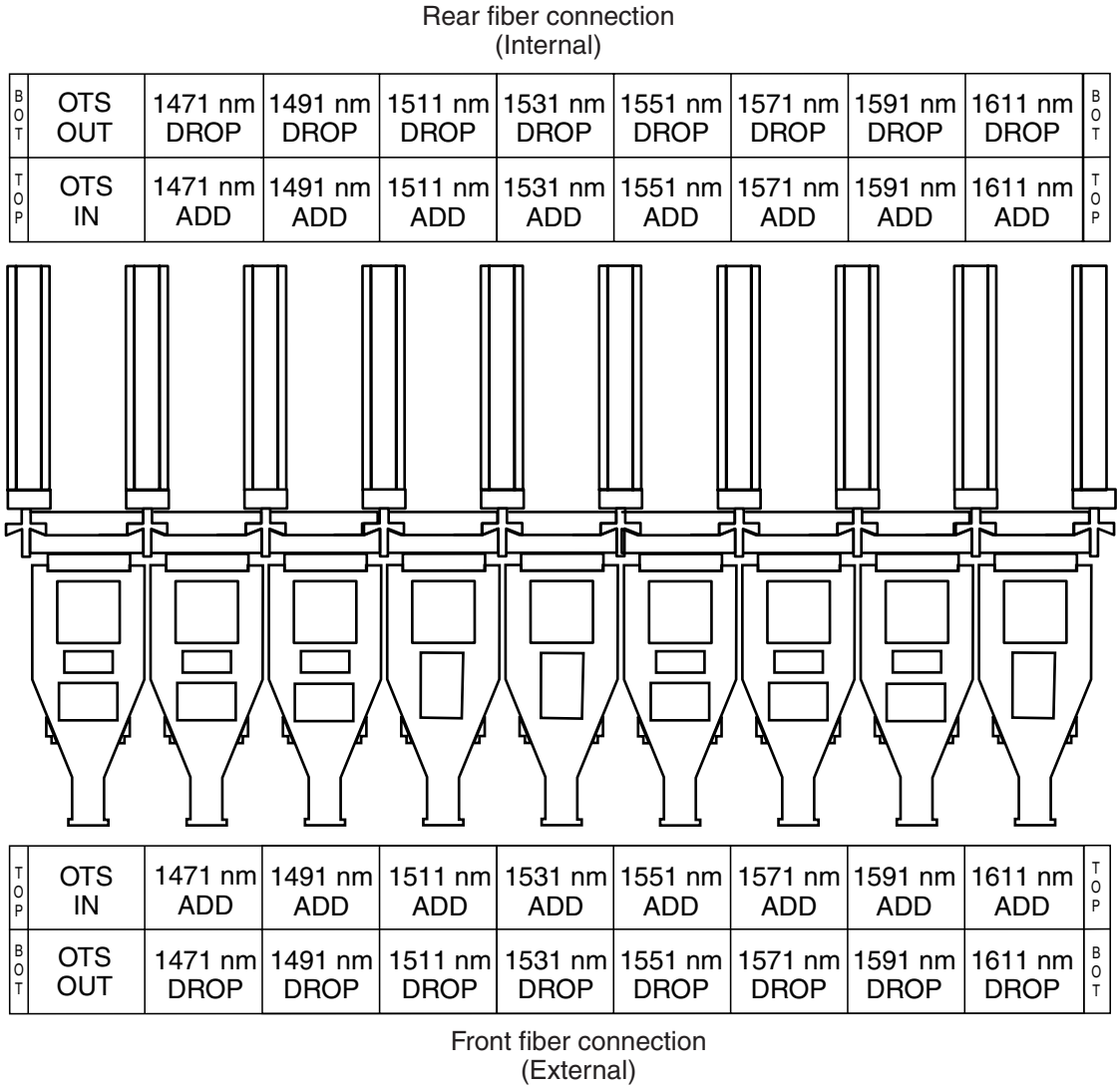


Table 13-95
OMX 4CH OADM ITU CWDM (NTPM34JA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to 1471 nm ADD/1471 nm DROP	
LHS fiber ingress to 1491 nm ADD/1491 nm DROP	0.81 m (32 in.)
LHS fiber ingress to 1511 nm ADD/1511 nm DROP	
LHS fiber ingress to 1531 nm ADD/1531 nm DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.79 m (31 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to 1471 nm ADD/1471 nm DROP	
RHS fiber ingress to 1491 nm ADD/1491 nm DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to 1511 nm ADD/1511 nm DROP	
RHS fiber ingress to 1531 nm ADD/1531 nm DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH OADM ITU DWDM in a closed position.

Legend

CWDM = coarse wavelength division multiplexer; LHS = left-hand side;
OADM = optical add-drop multiplexer; OMX = optical multiplexer;
RHS = right-hand side

Figure 13-10
Connector labels for an OMX 4CH OADM ITU CWDM (NTPM34JA)

OM2843p.

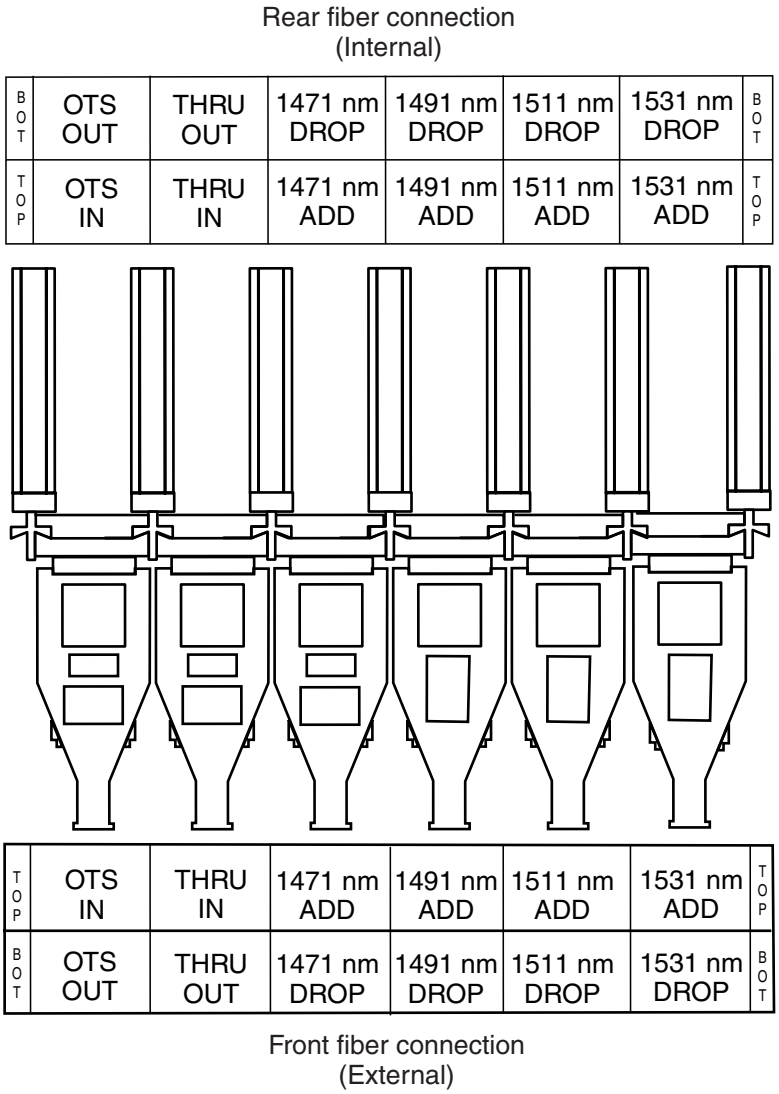


Table 13-96
OMX 4CH OADM ITU CWDM (NTPM34KA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to OTS IN/OTS OUT	0.76 m (30 in.)
LHS fiber ingress to THRU IN/THRU OUT	
LHS fiber ingress to 1551 nm ADD/1551 nm DROP	
LHS fiber ingress to 1571 nm ADD/1571 nm DROP	0.81 m (32 in.)
LHS fiber ingress to 1591 nm ADD/1591 nm DROP	
LHS fiber ingress to 1611 nm ADD/1611 nm DROP	
RHS fiber ingress to OTS IN/OTS OUT	0.79 m (31 in.) (see Note 2)
RHS fiber ingress to THRU IN/THRU OUT	
RHS fiber ingress to 1551 nm ADD/1551 nm DROP	
RHS fiber ingress to 1571 nm ADD/1571 nm DROP	0.74 m (29 in.) (see Note 2)
RHS fiber ingress to 1591 nm ADD/1591 nm DROP	
RHS fiber ingress to 1611 nm ADD/1611 nm DROP	

Note 1: The total additional fiber slack storage available in this drawer is 3 m (118 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B.

Note 2: Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers.

Note 3: The numbers provided are for the OMX 4CH OADM ITU DWDM in a closed position.

Legend

CWDM = coarse wavelength division multiplexer; LHS = left-hand side; OADM = optical add-drop multiplexer; OMX = optical multiplexer; RHS = right-hand side

Figure 13-11
Connector labels in an OMX 4CH OADM ITU CWDM (NTPM34KA)

OM2596p

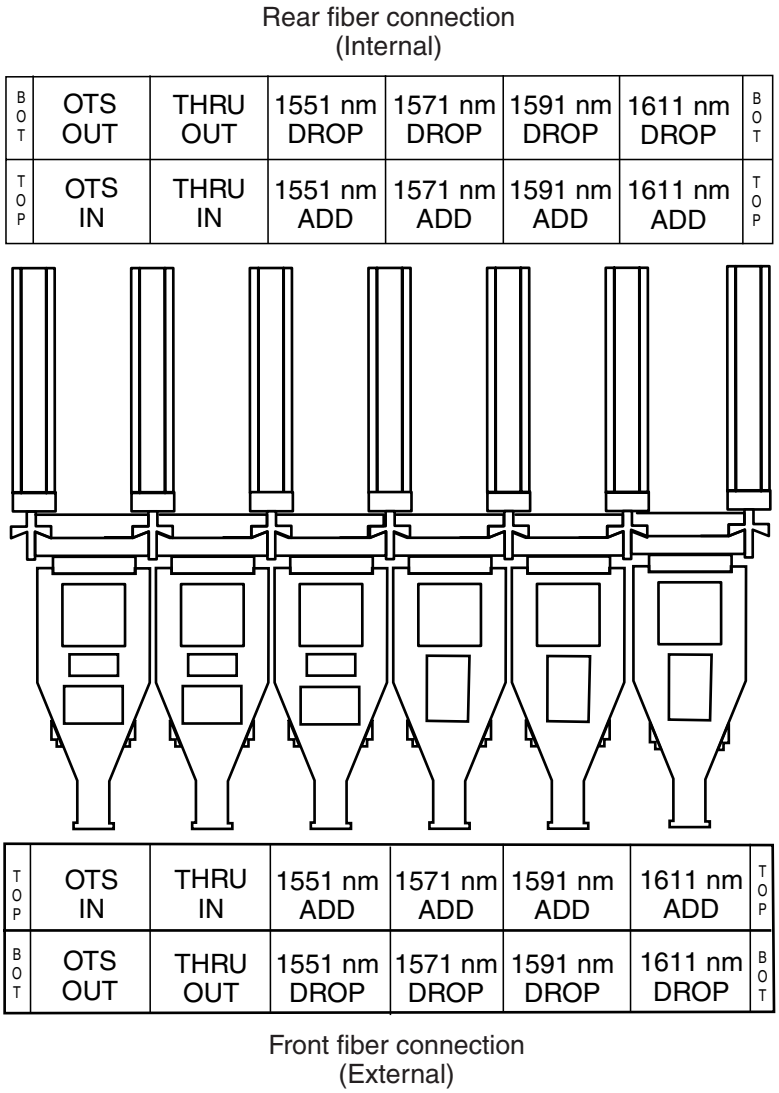


Table 13-97
OMX 1CH OADM ITU CWDM (NTPM34AB-HB, NTPM34AA-HA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OMX 1CH OADM ITU CWDM in a closed position. **Legend** CWDM = coarse wavelength division multiplexing; ITU = International Telecommunication Union; LHS = left-hand side; OADM = optical add=drop multi;plexer; OMX = optical multiplexer; RHS = right-hand side	

Table 13-98
Per-Band Equalizer (NT0H31BA-BC

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to any bulkhead connector	0.86 m (34 in.)
RHS fiber ingress to any bulkhead connector	0.89 m (35 in.)
Note 1: The total additional fiber slack storage available in this drawer is 5 m (197 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the PBE in a closed position. **Legend** LHS = left-hand side; PBE = per-band equalizer; RHS = right-hand side	

Table 13-99
VOA drawer (NT0H31AH/AJ

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to any bulkhead connector on LH tray	0.79 m (31 in.)
LHS fiber ingress to any bulkhead connector on RH tray	0.97 m (38 in.)
RHS fiber ingress to any bulkhead connector on LH tray	0.89 m (35 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.74 m (29 in.)
Note 1: The total additional fiber slack storage available in this drawer is 5 m (197 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the VOA drawer in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side; VOA = variable optical attenuator	

Table 13-100
Transponder Protection Tray, 4 channels (NT0H59AA and NT0H59BA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to CH1 CLIENT IN/CLIENT OUT	0.56 m (22 in.)
LHS fiber ingress to CH1 To CLIENT Rx1/Fm CLIENT Tx1	
LHS fiber ingress to CH1 To CLIENT Rx2/Fm CLIENT Rx2	
LHS fiber ingress to CH2 CLIENT IN/CLIENT OUT	0.64 m (25 in.)
LHS fiber ingress to CH2 To CLIENT Rx1/Fm CLIENT Tx1	
LHS fiber ingress to CH2 To CLIENT Rx2/Fm CLIENT Tx2	
LHS fiber ingress to CH3 CLIENT IN/CLIENT OUT	0.69 m (27 in.)
LHS fiber ingress to CH3 To CLIENT Rx1/Fm CLIENT Tx1	
LHS fiber ingress to CH3 To CLIENT Rx2/Fm CLIENT Tx2	
LHS fiber ingress to CH4 CLIENT IN/CLIENT OUT	0.74 m (29 in.)
LHS fiber ingress to CH4 To CLIENT Rx1/Fm CLIENT Tx1	
LHS fiber ingress to CH4 To CLIENT Rx2/Fm CLIENT Tx2	

Table 13-100 (continued)
Transponder Protection Tray, 4 channels (NT0H59AA and NT0H59BA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to CH1 CLIENT IN/CLIENT OUT	0.66 m (26 in.)
RHS fiber ingress to CH1 To CLIENT Rx1/Fm CLIENT Tx1	
RHS fiber ingress to CH1 To CLIENT Rx2/Fm CLIENT Rx2	
RHS fiber ingress to CH2 CLIENT IN/CLIENT OUT	0.61 m (24 in.)
RHS fiber ingress to CH2 To CLIENT Rx1/Fm CLIENT Rx1	
RHS fiber ingress to CH2 To CLIENT Rx2/Fm CLIENT Tx2	
RHS fiber ingress to CH3 CLIENT IN/CLIENT OUT	0.56 m (22 in.)
RHS fiber ingress to CH3 To CLIENT Rx1/Fm CLIENT Tx1	
RHS fiber ingress to CH3 To CLIENT Rx2/Fm CLIENT Tx2	
RHS fiber ingress to CH4 CLIENT IN/CLIENT OUT	0.51 m (20 in.)
RHS fiber ingress to CH4 To CLIENT Rx1/Fm CLIENT Tx1	
RHS fiber ingress to CH4 To CLIENT Rx2/Fm CLIENT Tx2	
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the Transponder Protection Tray (4 channels) in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side	

Figure 13-12
Connector labels in a Transponder Protection Tray, 4 channels

OM1800o

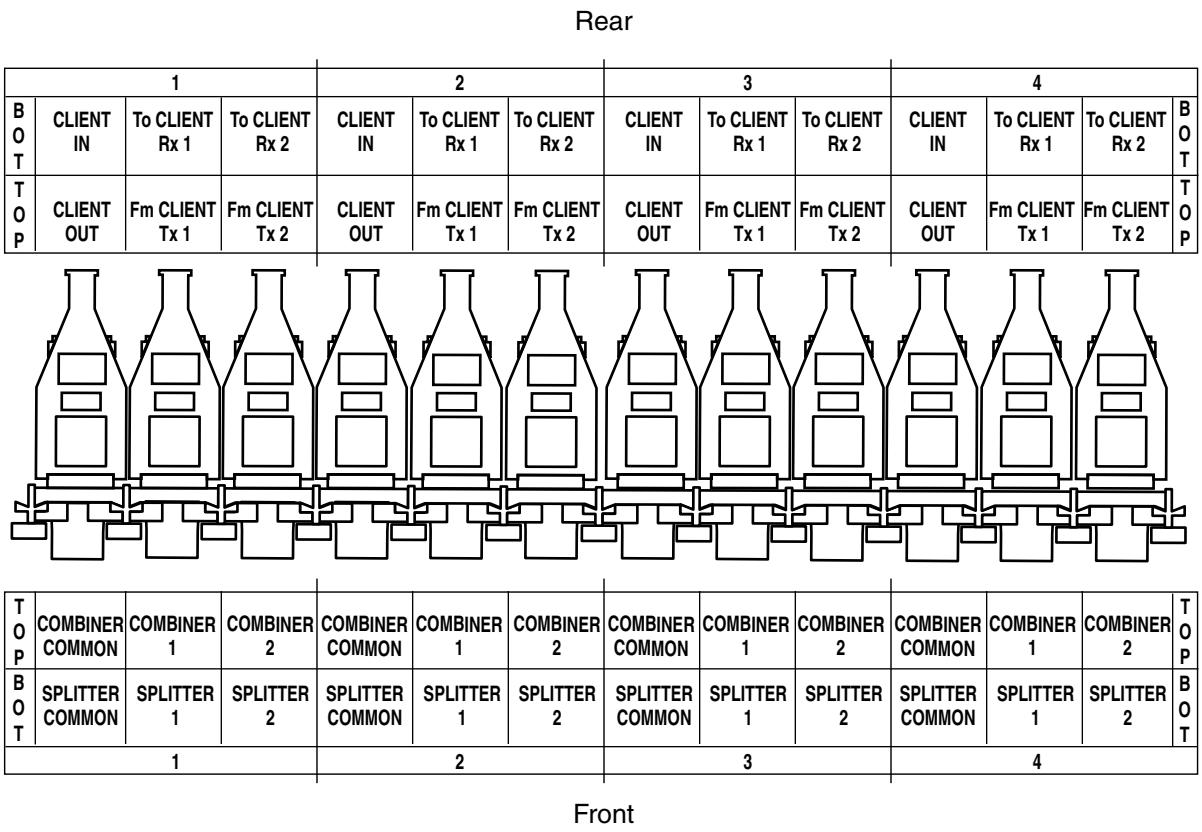


Table 13-101
Transponder Protection Tray, 2 channels (NT0H59AB and NT0H59BB)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to CH1 CLIENT IN/CLIENT OUT	0.58 m (23 in.)
LHS fiber ingress to CH1 To Client Rx1/Fm Client Tx1	
LHS fiber ingress to CH1 To Client Rx2/Fm Client Tx2	
LHS fiber ingress to CH2 CLIENT IN/CLIENT OUT	0.64 m (25 in.)
LHS fiber ingress to CH2 To Client Rx1/Fm Client Tx1	
LHS fiber ingress to CH2 To Client Rx2/FM Client Tx2	

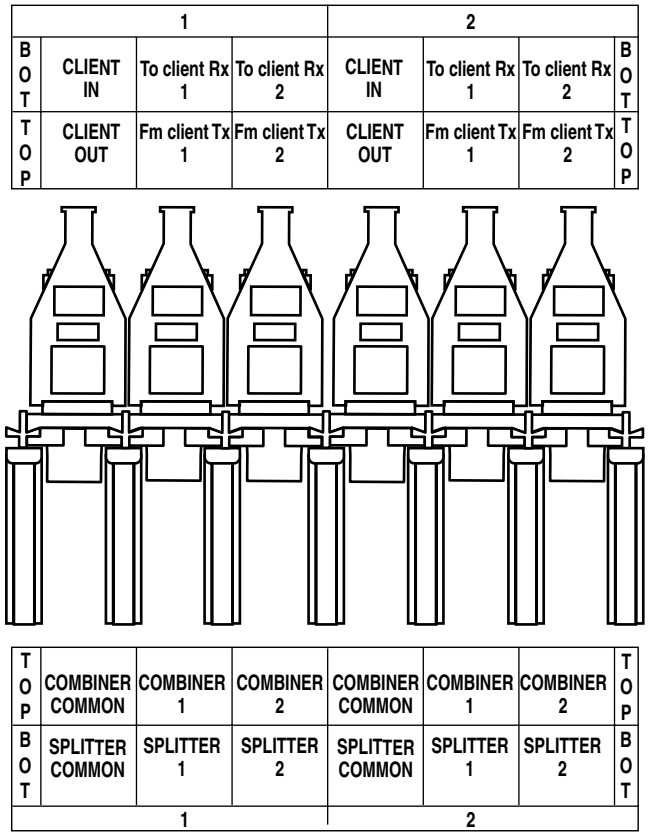
Table 13-101 (continued)
Transponder Protection Tray, 2 channels (NT0H59AB and NT0H59BB)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to CH1 CLIENT IN/CLIENT OUT	0.64 m (25 in.) (see Note 2)
RHS fiber ingress to CH1 To Client Rx1/Fm Client Tx1	
RHS fiber ingress to CH1 To Client Rx2/FM Client Tx2	
RHS fiber ingress to CH2 CLIENT IN/CLIENT OUT	0.61 m (24 in.) (see Note 2)
RHS fiber ingress to CH2 To Client Rx1/Fm Client Tx1	
RHS fiber ingress to CH2 To Client Rx2/Fm Client Tx2	
Note 1: The total additional fiber slack storage available in this drawer is 10 m (393 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** Storing additional fiber slack inside the drawer is not recommended for RHS fiber ingress fibers. ***Note 3:*** The numbers provided are for the Transponder Protection Tray (2 channels) in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side	

Figure 13-13
Connector labels in a Transponder Protection Tray, 2 channels

OM1218p

Rear



Front

Table 13-102
OSC tray assembly (NT0H57DA), OSC tray assembly with optical tap (NT0H57FA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OSC tray assembly and OSC tray assembly with optical tap in a closed position. **Legend** LHS = left-hand side; OSC = optical supervisory channel; RHS = right-hand side	

Table 13-103
OSC tray assembly with dual optical taps (NT0H57GB/GC)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the OSC tray assembly with dual optical taps in a closed position. **Legend** LHS = left-hand side; OSC = optical supervisory channel; RHS = right-hand side	

Table 13-104
DSCM drawer (NT0H57LA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to bulkhead connector	0.76 m (30 in.)
RHS fiber ingress to bulkhead connector	0.97 m (38 in.)
Note 1: The total additional fiber slack storage available in this drawer is 8 m (315 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the DSCM drawer in a closed position. **Legend** DSCM = dispersion slope compensation module; LHS = left-hand side; RHS = right-hand side	

Table 13-105
Fiber Manager (NT0H57BB)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
either side to rear fiber spool	1.14 m (45 in.)
either side to front fiber spool	1.35 m (53 in.)
Note 1: The total additional fiber slack storage available in this drawer is 25.6 m (1008 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the Fiber Manager in a closed position.	

Table 13-106
Patch panel, 16 ports (NT0H43CA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to bulkhead connector Tx/Rx pair 1 (CPE)	0.71 m (28 in)
LHS fiber ingress to bulkhead connector Tx/Rx pair 2 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 3 (CPE)	0.76 m (30 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 4 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 5 (CPE)	0.81 m (32 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 6 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 7 (CPE)	0.84 m (33 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 8 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 1 (NORTEL)	0.91 m (36 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 2 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 3 (NORTEL)	0.86 m (34 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 4 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 5 (NORTEL)	0.84 m (33 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 6 (NORTEL)	

Table 13-106 (continued)
Patch panel, 16 ports (NT0H43CA)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to bulkhead connector Tx/Rx pair 7 (NORTEL)	0.79 m (31 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 8 (NORTEL)	
Note 1: The total additional fiber slack storage available in this drawer is 8 m (315 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the patch panel (16 ports) in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side	

Figure 13-14
Connector labels in a 16-port patch panel (NT0H43CA)

OM1215p

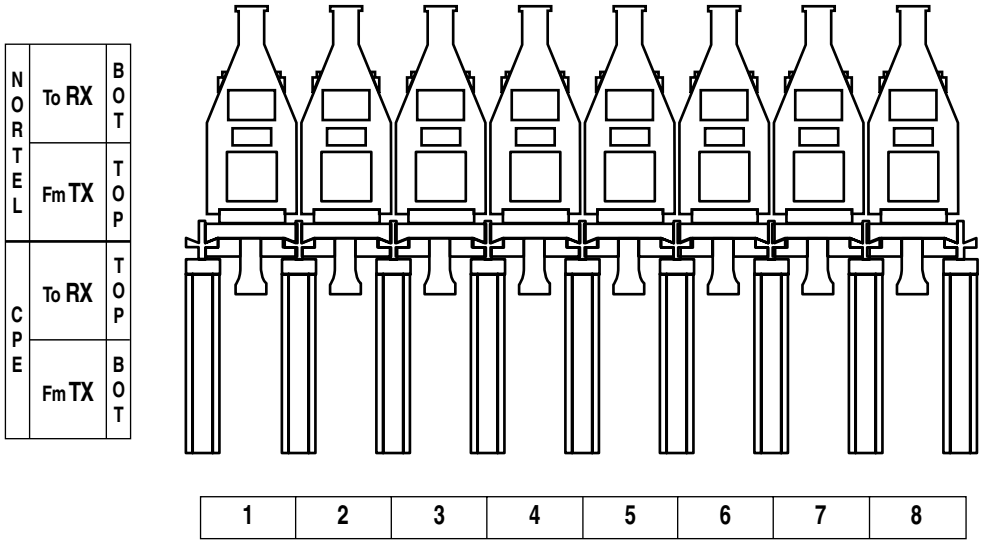


Table 13-107
Patch panel, 20 ports (NT0H43CB)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
LHS fiber ingress to bulkhead connector Tx/Rx pair 1 (CPE)	0.74 m (29 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 2 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 3 (CPE)	0.79 m (31 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 4 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 5 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 6 (CPE)	0.81 m (32 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 7 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 8 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 9 (CPE)	0.86 m (34 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 10 (CPE)	
LHS fiber ingress to bulkhead connector Tx/Rxpair 1 (NORTEL)	1.22 m (48 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 2 (NORTEL)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 3 (NORTEL)	1.17 m (46 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 4 (NORTEL)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 5 (NORTEL)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 6 (NORTEL)	1.14 m (45 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 7 (NORTEL)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 8 (NORTEL)	
LHS fiber ingress to bulkhead connector Tx/Rx pair 9 (NORTEL)	1.09 m (43 in.)
LHS fiber ingress to bulkhead connector Tx/Rx pair 10 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 1 (CPE)	1.30 m (51 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 2 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 3 (CPE)	1.35 m (53 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 4 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 5 (CPE)	

Table 13-107 (continued)
Patch panel, 20 ports (NT0H43CB)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to bulkhead connector Tx/Rx pair 6 (CPE)	1.37 m (54 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 7 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 8 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 9 (CPE)	1.42 m (56 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 10 (CPE)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 1 (NORTEL)	0.97 m (38 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 2 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair (NORTEL)	0.91 m (36 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 4 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 5 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 6 (NORTEL)	0.89 m (35 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 7 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 8 (NORTEL)	
RHS fiber ingress to bulkhead connector Tx/Rx pair 9 (NORTEL)	0.84 m (33 in.)
RHS fiber ingress to bulkhead connector Tx/Rx pair 10 (NORTEL)	
Note 1: The total additional fiber slack storage available in this drawer is 5.3 m (210 in.). To determine the total allowable length for each fiber, divide the total value by the number of incoming fibers and add to column B. ***Note 2:*** The numbers provided are for the patch panel (20 ports) in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side	

Figure 13-15
Connector labels in a 20-port patch panel (NT0H43CB)

OM2799p

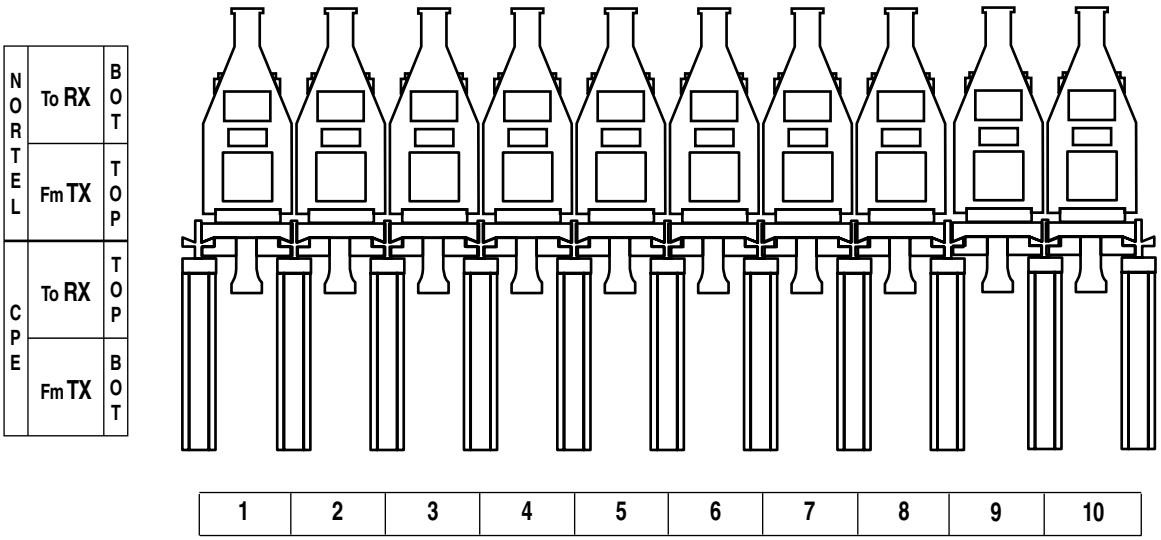


Table 13-108
C&L Splitter/Coupler drawer with two trays (NT0H31AF)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the C&L Splitter/Coupler drawer with two trays in a closed position. **Legend** LHS = left-hand side; RHS = right-hand side	

Table 13-109
1310 nm Splitter/Coupler (NT0H57JB/JC)

A	B
Routing options for customer fiber	**Minimum fiber length required** (see Note 1)
RHS fiber ingress to any bulkhead connector on LH tray	0.69 m (27 in.)
RHS fiber ingress to any bulkhead connector on RH tray	0.51 m (20 in.)
Note 1: No additional fiber slack storage is available in this drawer. ***Note 2:*** The numbers provided are for the 1310 nm Splitter/Coupler in a closed position. **Legend** LHS = left-hand side; OSC = optical supervisory channel; RHS = right-hand side	

Data communications cables

Table 13-110 lists the product engineering codes for the data communications cables.

Table 13-110
Data communication cables

PEC	Length	Use
NT0H4345	Simplex RJ45-RJ45 1.5 m (60 in.)	• Can connect all passive devices and the EIU (equipment inventory unit) to the maintenance panel. • Can connect all passive devices to the EIU.
NT0H4322	Simplex RJ45-RJ45 2.98 m (117 in.)	• Can connect all passive devices and the EIU (equipment inventory unit) to the maintenance panel. • Can connect all passive devices to the EIU.
NT0H4403	Duplex RJ45-RJ45 0.77 m (30 in.)	Connect two ECT trays to the maintenance panel.

Frames and frame filler panels

Table 13-111 lists the product engineering codes for frames and frame filler panels.

Table 13-111
Product engineering codes for frames and frame filler panels

Frames and Frame filler panel		
Frame filler panel	NT7E52AA	21 in.
	NT7E52BA	7 in.
	NT7E52CA	1.75 in.
	NT7E52DA	4.6 in.
Frames	NT7E6020	Frame insulation kit
	NT7E6040	Frame leveling kit
	NT7E70AA	Front access 23 in. frame (2.13 m or 7 ft. high)
	NT7E70BA	Front access 23 in. frame (2.29 m or 7 ft. 6 in. high)
	NT7E70CA	Front access 23 in. frame (2.44 m or 8 ft. high)
	NT7E70DA	Front access 23 in. frame (2.74 m or 9 ft. high)
	NT7E70EA	Front access 23 in. frame (3.51 m or 11 ft. 6 in. high)
	NT7E70FA	Front access 23 in. frame (2.64 m or 8 ft. 8 in. high)

Network Modeling Tool

Table 13-112 lists the product engineering codes for the Network Modeling Tool.

Table 13-112
Network Modeling Tool

Product engineering code	Description
NT0H71NZ	Release 8.0 NMT software (excluding Automated Link Engineering and Site Fibering Diagrams) and documentation
NT0H71NA	Release 8.0 NMT software including Automated Link Engineering and Site Fibering Diagrams) and documentation
NT0H7157	Release 8.0 NMT User Guide
NT0H7156	Release 8.0 Network Planning and Link Engineering NTP (323-1701-110)

Challenge/response application

The product engineering code for the challenge/response tool software CD is NT0H72NA.

Optical Metro 5100/5200 documentation

Table 13-113
Optical Metro 5100/5200 documentation

Item	Product engineering code
Technical Publications Release 8.0 (paper), which includes • Network Planning and Link Engineering 323-1701-110 • Software and User Interface, 323-1701-101 • Hardware Description, 323-1701-102 • Technical Specifications, 323-1701-180 • TL1 Interface, 323-1701-190 • Installing Optical Metro 5200 Shelves and Components, 323-1701-201 • Installing Optical Metro 5100 Shelves and Components, 323-1701-210 • Commissioning Procedures, 323-1701-220 • Connection Procedures, 323-1701-221 • Testing and Equalization Procedures, 323-1701-222 • Provisioning and Operating Procedures, 323-1701-310 • Customer Acceptance Testing Procedures, 323-1701-330 • Trouble Clearing and Alarm Reference Guide, 323-1701-542 • Maintenance and Replacement Procedures, 323-1701-546 • About the Optical Metro 5100/5200 NTP Library, 323-1701-090	NT0H65AM
Release 8.0 Technical Publications (CD-ROM)	NT0H64AM
Release 8.0 Helmsman CD-ROM	NT0H64ZM
System software upgrade CAP to Rel 8.0 from 6.0, 6.1, 7.0 or 7.01	NTY434AJ
Release 8.0 Planning Guide (paper)	NTY410AK

Appendix A—Fiber characterization

In this chapter

Overview

Systems based on dense wavelength division multiplexing (DWDM) technology rely on the capability of fiber to carry many wavelengths of light simultaneously over a length of fiber. Originally developed as 4 or 16 wavelength systems, improvements in technology have allowed the expansion of DWDM systems to 32 or more wavelengths, with each wavelength carrying a high bit-rate time division multiplexed (TDM) signal. However, the decrease in wavelength spacing, increased data rates of TDM systems and increased distances over which new products are deployed have made these systems dependent on the quality of fiber present in the network. Fiber characterization is a key step to assess the fiber quality, to correct non-conforming fiber or events, and to guarantee network performance.

What is fiber characterization?

Fiber characterization is the evaluation of the installed fiber optic cable against a set of specifications such as EIA/TIA 1 standards. It ensures that the DWDM signals transmitted over a span of fiber can be correctly received at the remote end. Data from fiber characterization can also assist with network planning and reveals whether or not the fiber can support network expansion.

Use of a specific fiber type is not sufficient to ensure successful transmission of a DWDM signal. The installation environment, impurities in the fiber, and dirty connections or bad splices can all affect the transmitted signals. Characterization includes all elements that will comprise the final network fiber plant including patch panels, connectors, and patch cords. It is also insufficient to measure only one sample fiber; since many factors are unique to each cable, each fiber used in a network must be examined.

Fiber characterization is performed prior to network deployment. The characterization test results can then be used to fine-tune the network link engineering. Where necessary, amplifiers may be added, shelves re-ordered or discrete attenuators used to obtain the appropriate signal power levels in the network for the actual fiber environment. Testing also identifies problems with the fiber plant in advance of traffic being placed on the network. With fewer components involved and fewer constraints on work hours due to the presence of user traffic, problems are easier to find and resolve.

Fiber optic transmission

Fiber optic transmission is achieved by transmitting a light pulse over a span of fiber optic cable and having that light pulse correctly detected and interpreted by the receiver. Many physical phenomena of the fiber material serve to undermine this transmission, causing signals to lose power or shape by the time they have reached the receiving device. These phenomena include attenuation, dispersion and reflectance.

Attenuation

Attenuation is the loss of optical signal power as light travels down a fiber. It is measured in decibels per kilometer (dB/km) or as a dB value for the whole span. Over distance, a fiber with a lower attenuation will allow more power to reach its receiver than a fiber with higher attenuation. Attenuation becomes critical as distances are increased between unamplified network elements. If power levels drop too low, optical equipment cannot process the inputs, causing signal degradation or loss of signal. If signal levels are too high, attenuators may be needed to prevent signal degradation or receiver damage.

Some attenuation is intrinsic to the fiber itself due to impurities in the glass. As a pulse travels down the fiber, a small percentage of light is absorbed or reflected by these impurities. Many external factors contribute to attenuation. Dirt on connector surfaces can weaken the signal and cause poor mating alignment or air gaps at the connection which further decrease the signal strength. Poor splices, faulty connectors and excessive bends in the fiber can also add to attenuation. Large macro bends cause a change in the refractive index of glass and allows light traveling through the core to refract out. Less visible microbends caused by pressure on the fiber can also cause a reduction in signal power.

Attenuation is wavelength dependent. Attenuation due to bending at 1550 nm is greater than it is at 1310 nm. Events that have no effect at 1310 nm may become apparent at 1550 nm wavelengths.

Dispersion

Chromatic dispersion and polarization mode dispersion are both phenomena that distort DWDM signals and increase the bit error rate in a network. These effects limit the distances and bit rates that can be supported in a network. Chromatic dispersion results from the fact that a light pulse is composed of a range of frequencies. The difference in the index of refraction experienced by different wavelengths causes the frequencies to arrive at the receiver at different times. Pulses will broaden and merge and errors are introduced if a digital one or zero state cannot be identified. As system bit rates increase, pulse widths decrease and less dispersion can be tolerated. Also as bit rates increase, the allowable transmission length decreases for a fixed value of chromatic dispersion.

Chromatic dispersion varies according to wavelength but various fiber types have been created to limit its effects. Non-dispersion shifted fiber (NDSF) is optimized for transmission in the 1310 nm wavelength window. Non-zero dispersion shifted fiber (NZ-DSF) is optimized for high bit-rate and DWDM applications.

Polarization mode dispersion (PMD) is caused by the interaction between light and the material properties of the fiber. The different polarization modes of light end up traveling along the fiber at slightly different speeds, which causes light pulses to spread out. High PMD stems from irregular fiber core geometry, which was quite common in fiber manufactured with older technologies but which is now mostly associated with physical stress on the cable. Such stresses range from the stretching and bending encountered during improper installation to the less obvious effects brought on by vibration and temperature changes. PMD effects can increase the bit error rate, limit bandwidth and create distortion which limits the number of channels that can be used in a system. Some types of fiber, such as aerial or marine cables are more prone to this phenomenon.

Fiber effects such as dispersion and PMD accumulate in extra-long amplified links and must be accounted for. The adverse effects of high PMD on the transmission of information over long distances are accounted for by a power penalty on the link budget.

Generally, chromatic dispersion becomes a concern before polarization mode dispersion.

Optical reflectance

As an optical signal travels down a fiber, a portion of its power is reflected back towards the source of transmission. The fiber optic cable itself creates backscatter as light propagates through it. Reflected power is primarily due to Fresnel reflections caused by abrupt or discrete changes in the index of refraction. System components such as connectors, mechanical splices, attenuators, patch cords and glass/air terminations all create a change in the index of refraction.

The small amount of reflected power due to backscatter cannot be eliminated but is much less than the power from discrete reflections. The sum of these discrete reflections and fiber cable backscatter make up the reflected power seen at the system interface, transmitter or receiver.

The high performance lasers used in DWDM systems are sensitive to reflected light. Reflections can degrade network performance by causing laser instability, possibly damaging the laser and leading to bit errors. Multipath distortions can also occur. Reflections can distort the optical signal as they travel back and forth between reflective components. Components such as connectors have varying degrees of reflectivity depending on the design and physical condition. Some older connector designs, such as Biconic connectors, have high reflection properties which make them unsuitable for DWDM systems.

Fiber characterization tests

Fiber characterization includes a number of tests to evaluate the condition of fiber spans. Tests measuring optical return loss, optical power loss, chromatic dispersion, polarization mode dispersion and the C-band and L-band attenuation profile are used to determine the amount of attenuation, dispersion or reflectance the DWDM signals will experience. Where necessary, corrective action may be required to ensure the fiber plant meets the required specifications and network performance goals.

OTDR trace

An optical time domain reflectometer (OTDR) provides a trace that plots optical signal level. The OTDR sends light pulses through the fiber and measures the light reflected back; the time lapse between launch and detection is used for distance calculations. The trace displays event information such as connector loss, splice loss and reflectance levels as well as any other discontinuities that can occur along a length of fiber.

Since any problems detected in the fiber will adversely affect other characterization tests, such as PMD or attenuation profiles, these problems must be addressed before any other tests are run.

The OTDR also provides an accurate measure of fiber length so that cable cuts or misrouted connections can be identified if the cabling information is known. The total span loss at 1550 nm and 1625 nm wavelengths are also measured to assist with link engineering. Since OTDR traces are directional, they must be acquired in both directions on a fiber span.

Optical return loss

Optical reflectance is assessed by optical return loss (ORL) tests that measure the ratio (dB) of optical power traveling downstream at a system interface to the optical power reflected back upstream to the same interface. Since ORL is defined as the incident minus the reflected power, it is expressed in positive numbers and for DWDM systems must be greater than or equal to 24 dB. That is, the incident power must exceed the reflected power by 24 dB for all wavelengths in the system.

The ORL is measured with the use of either an optical continuous wave reflectometer (OCWR), an ORL test set or an OTDR test set. The OCWR launches a stable, continuous wave signal into the optical fiber and measures the strength of the return signal. An ORL meter can also be used to measure the total reflectance from all components as seen from the point of test. Since the measured values are directional, tests must be performed at both ends of a fiber span.

High reflectance, or low ORL measurements can be indicative of old connectors, poorly mated connections, or dirty connections in the fiber span that require correction prior to successful network deployment.

Polarization mode dispersion

Testing for polarization mode dispersion requires the use of a specialized PMD analyzer. A PMD analyzer can detect the different polarized modes and determine the differential group delay (ps) between modes. The PMD coefficient, which measures how the differential group delay changes over distance, is also recorded. The measured dispersion on the fiber will limit the bit rates and distances supported in the network.

Chromatic dispersion

Chromatic dispersion can be measured with a chromatic dispersion test set or an OTDR, which provides a single-ended test. Both the zero dispersion wavelength and the dispersion slope are recorded during testing. Chromatic dispersion over a fiber link is cumulative and is usually expressed in terms of ps/(nm x km). This gives an indication of the amount a pulsewidth is broadened in relation to distance and wavelength. Dispersion must not exceed the allowable limits for the C-band or L-band range of wavelengths.

> ***Note:*** If a fiber span is comprised of one unknown fiber type, the dispersion and attenuation measurements obtained can be used to determine the type of fiber in the span.

C-band and L-band attenuation profile

Use of L-band wavelengths in DWDM systems increases the numbers of channels and therefore network capacity. Since attenuation varies with the signal wavelength, it is important to measure the fiber loss not only in the C-band (1528 nm to 1565 nm) but in the L-band (1570 nm to 1606 nm) as well. The measured loss versus wavelength trace provides information on the loss differential between C-band and L-band channels.

The C-band and L-band attenuation profile is obtained by using a broadband source to send a signal across the fiber span under test. An optical spectrum analyzer (OSA) is used at the remote end to measure the continuous spectrum of the source. The fiber loss is then sampled at specific wavelengths to record the attenuation profile.

Appendix B—Custom link engineering design output

In this chapter

Overview

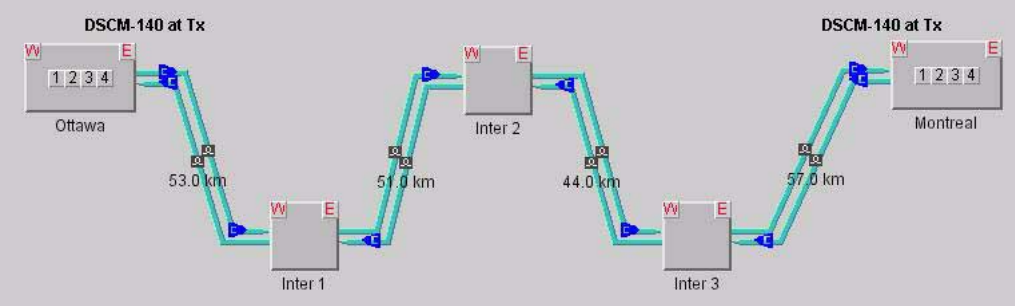
Extended Metro applications require custom link engineering by Nortel Networks. Contact Nortel Networks for more information.

The Equalization Procedure for Extended Metro systems is described in the chapter “Equalizing amplified networks” in *Testing and Equalization Procedures*, 323-1701-222. This procedure requires values from an equalization report, which is an output of each Nortel Networks custom link design intended for deployment. A sample Extended Metro Equalization Report is shown in Table 15-1 on page 15-2.

Table 15-1
Sample Nortel Networks custom equalization report

Network Name	Network Example
Customer Name	Nortel Networks
Design Team	OM5200 System Characterization
Date	February 26, 2004

OM2663p



Clockwise →

Clockwise

Site Ottawa (see Note 1)

			C Band				L Band			
			B1	B2	B3	B4	B5	B6	B7	B8
OMX Pads (dB)	Add	East	—	—	—	—	X	X	X	X
Post Position			PBE				X			
Power Control Device										
Power Targets (dBm / ch)			-20	-20	-20	-20	X	X	X	X
Amplifier Output Pads (dB)			2							
OSC Pads (dB)	Add	East	4							

Table 15-1 (continued)
Sample Nortel Networks custom equalization report

Inter 1									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		VOA				X			
Power Control Device									
	Power Targets (dBm / ch)	-20				X	X	X	X
	Amplifier Output Pads (dB)	2				X			
OSC Pads (dB)	Add East	4							
	Drop West	—							
Inter 2									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		VOA				X			
Power Control Device									
	Power Targets (dBm / ch)	-20				X	X	X	X
	Amplifier Output Pads (dB)	2				X			
OSC Pads (dB)	Add East	4							
	Drop West	—							
Inter 3									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		PBE				X			
Power Control Device									
	Power Targets (dBm / ch)	-21	-21	-21	-21	X	X	X	X
	Amplifier Output Pads (dB)	1				X			
OSC Pads (dB)	Add East	4							
	Drop West	—							

Table 15-1 (continued)
Sample Nortel Networks custom equalization report

Montreal																
								C Band				L Band				
								B1	B2	B3	B4	B5	B6	B7	B8	
Pre Position								VOA				X				
Power Control Device																
							Power Targets (dBm / ch)	-20				X	X	X	X	
							Amplifier Output Pads (dB)	0				X				
OMX Pads (dB)					Drop (see Note 2)		West	14	14	14	14	X	X	X	X	
OSC Pads (dB)					Drop		West	—								
Power required at Rx (see Note 3)	Band 1				Band 2				Band 3				Band 4			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21
	Band 5				Band 6				Band 7				Band 8			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Counterclockwise																
Site Montreal																
								C Band				L Band				
								B1	B2	B3	B4	B5	B6	B7	B8	
OMX Pads (dB)					Add		West	—	—	—	—	X	X	X	X	
Post Position								PBE				X				
Power Control Device																
							Power Targets (dBm / ch)	-20	-20	-20	-20	X	X	X	X	
							Amplifier Output Pads (dB)	2				X				
OSC Pads (dB)					Add		West	4								

Table 15-1 (continued)
Sample Nortel Networks custom equalization report

Inter 3									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		VOA				X			
Power Control Device									
	Power Targets (dBm / ch)	-20				X	X	X	X
	Amplifier Output Pads (dB)	2				X			
OSC Pads (dB)	Add West	4							
	Drop East	—							
Inter 2									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		VOA				X			
Power Control Device									
	Power Targets (dBm / ch)	-20				X	X	X	X
	Amplifier Output Pads (dB)	2				X			
OSC Pads (dB)	Add West	4							
	Drop East	—							
Inter 1									
		C Band				L Band			
		B1	B2	B3	B4	B5	B6	B7	B8
Pre Position		PBE				X			
Power Control Device									
	Power Targets (dBm / ch)	-21	-21	-21	-21	X	X	X	X
	Amplifier Output Pads (dB)	1				X			
OSC Pads (dB)	Add West	4							
	Drop East	—							

Table 15-1 (continued)
Sample Nortel Networks custom equalization report

Ottawa																
								C Band				L Band				
								B1	B2	B3	B4	B5	B6	B7	B8	
Pre Position								VOA				X				
Power Control Device																
							Power Targets (dBm / ch)	-20				X	X	X	X	
							Amplifier Output Pads (dB)	0				X				
OMX Pads (dB)						Drop (see Note 2)	East	14	14	14	14	X	X	X	X	
OSC Pads (dB)						Drop	East	—								
Power required at Rx (see Note 3)	Band 1				Band 2				Band 3				Band 4			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21	-21
	Band 5				Band 6				Band 7				Band 8			
	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4	C1	C2	C3	C4
	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Legend X = Not present in this network

— = No pads required

Note 1: Equalization should start at this site with the Post amplifiers and should be performed in the site order shown in this equalization report.

Note 2: To help derisk in-service channel addition, the overload pad value should be determined based on field measurement during equalization.

Note 3: The powers shown here are minimal powers required at Rx to guarantee expected performance.

Nortel

Optical Metro 5100/5200

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