NTN469GF   **323-1059-201**

Nortel Networks

OPTera Metro 3500 Multiservice Platform
Installation

Standard   Release 12.0   Issue 1   November 2003

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About this document

This document describes how to

- install or remove an OPTera Metro 3500 shelf and its replaceable components
- install or remove an optical multiplexer (OMX) shelf and its replaceable components
- install or remove an OMX fiber-optic cable tray

Supported software

This document supports the software releases for Nortel Networks OPTera Metro 3500 Multiservice Platform Release 12.0.

Supported hardware

This document supports the OPTera Metro 3500 shelf.

Audience

The following members of your company are the intended audience of this Nortel Networks technical publication (NTP):

- planners
- provisioners
- network administrators
- transmission standards engineers

Standards

The Telecommunications Industry Association (TIA) and the Electronics Industries Alliance (EIA) accepted RS-232 as a standard in 1997 and renumbered this standard as TIA/EIA-232. In this document, RS-232 is used to reflect current labels on the hardware and in the software for the OPTera Metro 3500 Multiservice Platform.

Hardware naming conventions

The following naming conventions are used throughout this document to identify the OPTera Metro 3500 Multiservice Platform hardware:

- The extended shelf processor (SPx) is referred to as the shelf processor.
- The extended network processor (NPx) is referred to as the network processor.

OPTera Metro 3500 NTP Library

EX1478p

Guides and Shelf Setup	TL1 Reference	Operations, Administration and Provisioning	Maintenance	Supporting documentation for the OPTera Metro 3500 Library
About the OPTera Metro 3500 NTP Library (323-1059-090)	TL1 Reference (323-1059-190)	System Reconfiguration (323-1059-224)	Performance Monitoring (323-1059-510)	Change Application Procedures (CAPs)
Planning and Ordering Guide (NTRN10AM)		Security and Administration (323-1059-302)	Network Surveillance (323-1059-520)	Data Communications Network Planning Guide (NTR710AM)
OPTera Connect DX/HDX, OM3000 and OC-48/TN-16X Interworking Application Guide (NTRN15AA)		Provisioning Synchronization (323-1059-310)	Alarm and Trouble Clearing (323-1059-543)	OPTera Metro 3000 series DWDM Application Guide (NTRN12AA)
OPTera Metro 3500 Network InteroperabilityGuide (NTRN16AA)		Protection Switching (323-1059-311)		OPTera Packet Edge System Planning Guide (NTRN10YK)
Installation (323-1059-201)		Bandwidth Management (323-1059-320)		OPTera Packet Edge System Network Applications and Management (NTRN11YK)
Commissioning (323-1059-210)		Provisioning Equipment and Facilities (323-1059-350)		OPTera Packet Edge System User Guide (NTN465YG)
System Testing (323-1059-222)				Site Manager Planning and Installation Guide, Rel 6.0 (NTNM35FA)

Technical support and information

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 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.nortelnetworks.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.nortelnetworks.com. Click on the Contact Us link.
Global software upgrade support: For non-service affecting software upgrade issues	**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.nortelnetworks.com. Click on the Contact Us link.

Safety instructions

This chapter contains safety guidelines that must be followed for personal safety and for correct handling and operation of equipment.

Observing product and personnel safety guidelines

This chapter contains safety guidelines that you must follow for personal safety and for the correct handling of equipment.

Nortel Networks documentation contains precautionary messages and safety procedures that refer to specific tasks or conditions. You must read and follow all precautionary messages before you start to work on the equipment.

Personnel working directly on equipment must be:

- trained, authorized, and qualified to carry out the tasks required
- able to follow safety guidelines specific to the product and all local customer-specific safety procedures

Precautionary messages

To prevent personal injury, equipment damage, and service interruptions, you must follow all precautionary messages provided in Nortel Networks documentation and all local safety standards required by your company.

In this documentation, danger and caution notices look like the following.

	DANGER **Risk of personal injury** A danger warning with this symbol indicates a risk of personal injury.

	DANGER **Risk of electrical shock** A danger warning with this symbol indicates a risk of personal injury caused by an electrical hazard.

> **DANGER**
> **Risk of laser radiation exposure**
> A danger warning with this symbol indicates a risk of personal injury caused by exposure to a laser beam.

> **CAUTION**
> **Risk of service interruption**
> A caution warning with this symbol indicates a risk of service interruption or equipment damage.

> **CAUTION**
> **Risk of circuit pack damage**
> A caution warning with this symbol is always used to alert the user to use antistatic protection to avoid damaging circuit packs.

Safety standards

This Nortel Networks product complies with the following list of safety standards:

- EN 60950:2000-Safety of Information Technology Equipment
- CAN CSA-C22.2 No. 950-95/UL 1950 Safety of Information Technology Equipment, Third Edition
- IEC 60825-1:1998, Edition 1.1, Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- IEC 60825-2:2000-05, Safety of Laser Products - Part 2: Safety of Optical Fibre Communication Systems, Second Edition
- EN 60825-1:1994, Amendment A11, Safety of Laser Products - Part 1: Equipment Classification, Requirements and User's Guide
- EN 60825-2:2000, Safety of Laser Products - Part 2: Safety of Optical Fibre Communication Systems
- FDA 21 CFR 1040.10-Performance Standards for Light-Emitting Products, 4-1-00 edition

For continued compliance with the above standards, the following conditions must be considered when the equipment is installed:

- The equipment is intended to be installed in a restricted access location.
- A 20A max rated overcurrent protection device must be provided as part of the building installation for each -48 V dc supply to the shelf.
- A readily accessible disconnect device that is suitably approved and rated must be included in the field wiring for each -48 V dc feed to the shelf.

- The equipment is to be supplied by a reliably grounded SELV circuit isolated from the mains supply by double or strengthened insulation. This supply must not exceed 60 V dc, including any battery float charge.
- All equipment interfaces are classified as SELV and are not intended for outside plant connections. Any voltages applied to the system interfaces as part of the installation must not exceed 60 V dc.

Equipment location and controlling equipment access

> **DANGER**
> **Risk of fire**
> For continued protection against the risk of fire, the following must be considered:
>
> 1. If the equipment is not installed on a concrete or other non-combustible surface, drip tray NTN450ZW must be installed under the shelf bottom openings to complete the fire enclosure.
>
> 2. The shelf front cover is an integral part of the shelf fire enclosure and must be installed at all times.

The OPTera Metro 3500 is intended to be installed in a restricted access location. In North America, location restriction must be in accordance with articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. In Europe, the location restriction must be in accordance with safety standard EN 60950 and EN 60825. In the context of these requirements, a restricted access location is further defined as a location:

- where access is restricted to only trained personnel
- to which unsupervised members of the general public are not admitted

Circuit packs

All circuit packs and small form factor pluggable (SFP) modules are subject to damage by rough handling or from electrostatic discharge. Follow the following procedures to avoid damaging the circuit packs and SFP modules.

Avoiding the development of static electricity

Static electricity charges build up on the body when a person walks a short distance. This static electricity is enough to damage a circuit pack. When you work on a shelf, on cables connected to a circuit pack, on a circuit pack, or on an SFP module always wear a skin-contact ground strap or other appropriate personal grounding device. Ground straps can be the wrist type, or the conductive shoe or heel grounder. Alternatively, your company can provide antistatic protection by mounting the bays on conductive floor coverings.

All circuit packs are shipped in antistatic containers that are marked with the following symbol.

ATTENTION OBSERVER DES PRECAUTIONS POUR LA MANIPULATION DES DISPOSITIFS SENSIBLES AUX CHARGES STATIQUES	⚠	**ATTENTION** OBSERVE PRECAUTIONS FOR HANDLING ELECTRO- STATIC SENSITIVE DEVICES

Handling, installing, or replacing circuit packs

> ⚠ **CAUTION**
> **Risk of service interruption**
> Using radio communication devices like cellular telephones can cause service interruptions. For example, a -1 W North American cellular telephone must not be used within 30 cm of a system with an open service access front cover.

When handling, installing, or replacing circuit packs and SFP modules, you must observe the following precautions:

- Wear a wrist strap or other static grounding device before removing a circuit pack or SFP module from its package or from a shelf.
- Place each circuit pack and SFP module in an antistatic bag when it is not mounted in a shelf.
- Handle each circuit pack by the faceplate.
- Do not touch the solder side of the circuit pack, the pin connector, or the components.
- Do not stack circuit packs on or against each other.
- Inspect all circuit packs and SFP modules for damage, before installation into the shelf. Inspect all connectors to ensure pins are not damaged.
- Do not force circuit packs and SFP modules into their packaging material.
- Cover the connectors of the transmit and receive optical interface circuit packs with clean dust caps at all times.

To prevent damage to circuit packs while in storage, you must prevent the following:

- accumulation of dirt or dust on the pin connectors
- damage to the board or its components

> ⚠ **CAUTION**
> **Risk of service interruption**
> Board warpage can occur to boards stored in areas where the humidity exceeds 95% and the temperature exceeds 70°C.

Transporting circuit packs

When transporting circuit packs and SFP modules, place each circuit pack in its original antistatic shielding bag, padding, and box.

Labeling

In accordance with the IEC 60825 and FDA series of standards, laser labels have been attached to the optical circuit packs of the product.

Circuit pack laser explanatory labels

Each circuit pack and SFP module will have one or two explanatory labels, depending on the class and the output power of the laser. The labels are located adjacent to each aperture/port and will be visible when accessing the fiber optic connections on the circuit pack. A typical Class 3A(IEC)/IIIb (FDA) circuit pack explanatory label and a description of its elements are as follows:

- Laser warning symbol

- Warning text explaining the risk associated with the hazard from exposed optical fiber ends and unterminated connectors

  Note: This warning text indicates a hazard can exist on either the fixed or free end of a connector depending on the direction of transmission.

- 3A (IEC), IIIb (FDA): Indicates that the optical power from the circuit pack aperture does not exceed the limits for class 3A in accordance with IEC 60825-1 and class IIIb in accordance with FDA CFR 1040.10. 3A (IEC) also indicates a hazard level of 3A in accordance with IEC 60825-2 and service group 3a in accordance with ANSI Z136.2.

- Wavelength, shown as a nominal value or dense wavelength division multiplexing (DWDM) range of values, see the following examples:

  — 1550 nm nominal means a single wavelength within the range 1525 nm to 1625 nm is present at the aperture

  — 1510 nm - 1625 nm means that multiple discrete DWDM wavelengths are present at the aperture

- The book symbol which alerts the user to refer to the installation instructions.

OPTera Metro 3500 optical interface circuit packs

The following sections identify the hazards and laser labels associated with each OPTera Metro 3500 optical interface circuit pack.

OC-3, OC-12, OC-48, and OC-192 optical interface circuit packs with a 1300 nm nominal laser module installed

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DANGER
Risk of laser radiation exposure
The OC-3, OC-12, OC-48, and OC-192 interface packs are considered to be a level 3A laser hazard in accordance with IEC 60825-2. Invisible laser radiation is emitted from the circuit pack aperture when the optical fibers are disconnected. Do not stare into the beam or view directly with optical instruments.

OC-12, OC-48, OC-48 DWDM, OC-192, and OC-192 DWDM optical interface circuit packs with a 1550 nm nominal laser module installed

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DANGER
Risk of laser radiation exposure
The OC-12, OC-48, OC-48 DWDM, OC-192, and OC-192 DWDM interface packs are considered to be a level 3A laser hazard in accordance with IEC 60825-2. Invisible laser radiation is emitted from the circuit pack aperture when the optical fibers are disconnected. Do not stare into the beam or view directly with optical instruments.

Circuit packs and SFP modules with a Class 1(IEC)/Class I (FDA) laser output may be provided with an explanatory label. As a minimum the circuit packs will be identified as a Class 1 laser/hazard level in the installation documents. Figure 1-1 is an example of a typical Class 1 (IEC)/Class I (FDA) circuit pack explanatory label showing the Laser warning symbol and the Class number according to IEC 60825-1.

Figure 1-1
Typical Class 1 (IEC)/Class I (FDA) circuit pack explanatory label

1162t

CLASS 1
LASER PRODUCT
to IEC 60825-1

Circuit pack power labels

The circuit pack power label is located on the circuit pack, but does not have to be visible during normal operation. In the case of a Class 1 laser, a circuit pack power label is not required.

Figure 1-2
OC-3, OC-12, OC-48 1300 nm wavelength optical interface circuit pack power label

1163t

Tx

3A (IEC)
IIIb (FDA)
λ=1300nm
nominal

Rx

CAUTION

Avoid exposure to beam from exposed fibre ends and connectors
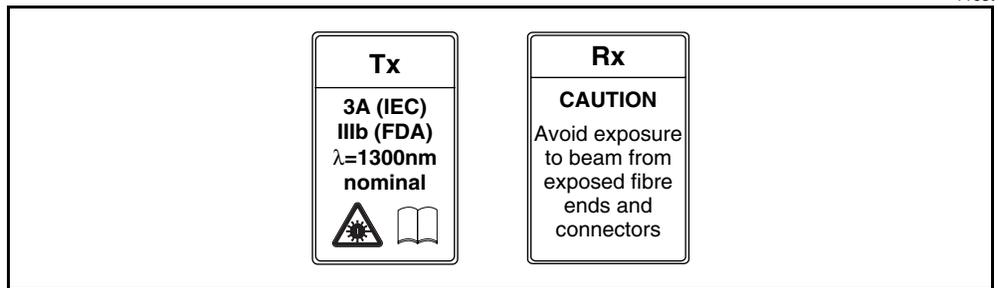
Figure 1-3
1300 nm wavelength optical interface power label

1164t

Max. Optical Output Power ≤ 24 mW (+13.8 dBm)
Standards: IEC 60825-1:1998, Edition 1.1
FDA -21 CFR 1040.10: 2000
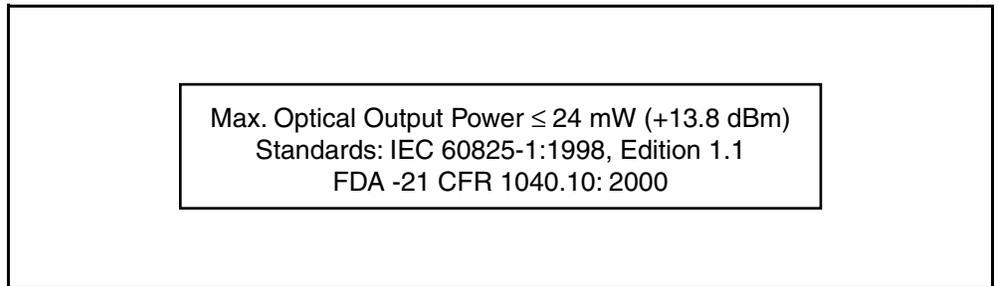
Figure 1-4
OC3x4 1300nm wavelength circuit pack power label
(The OC3x4 interface pack is considered to be a level 1 laser hazard in accordance with IEC 60825-2.)

1165t

Avoid direct
exposure to
beam.
Invisible light
can blind.
Keep all
optical
connectors
capped.

This is a Class 1
laser product.

C
A
U
T
I
O
N
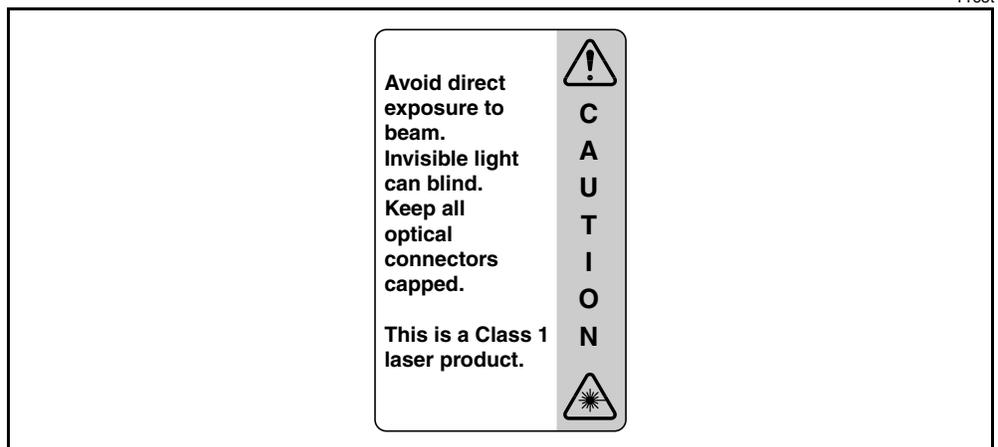
Figure 1-5
OC-3, OC-12, OC-48 1550 nm wavelength optical interface circuit pack power label

1161t

Tx	Rx
3A (IEC) **IIIb (FDA)** λ=**1550nm** **nominal**	**CAUTION** Avoid exposure to beam from exposed fibre ends and connectors
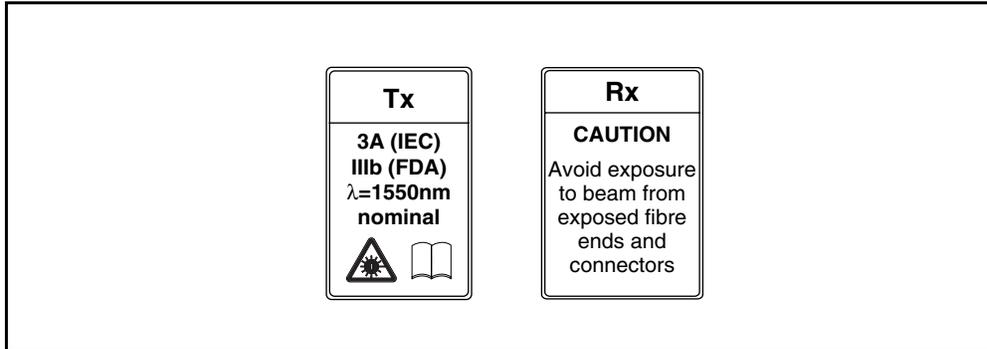
Figure 1-6
1550 nm wavelength power label

1160t

Max. Optical Output Power ≤ 50 mW (+17.0 dBm)
Standards: IEC 60825-1:1998, Edition 1.1
FDA -21 CFR 1040.10: 2000
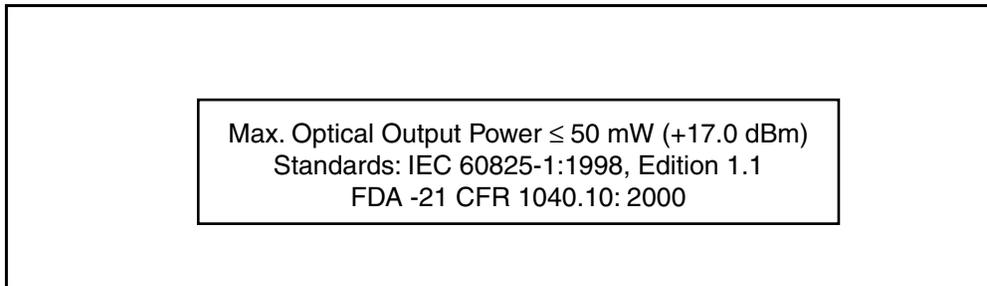
Figure 1-7
OMX label

1168t

OMX

INVISIBLE LASER RADIATION
DO NOT STARE INTO BEAM OR VIEW
DIRECTLY WITH OPTICAL INSTRUMENTS
CLASS 3A LASER PRODUCT
MAX POWER=18Mw λ=1550NM IEC/EN 60825-1
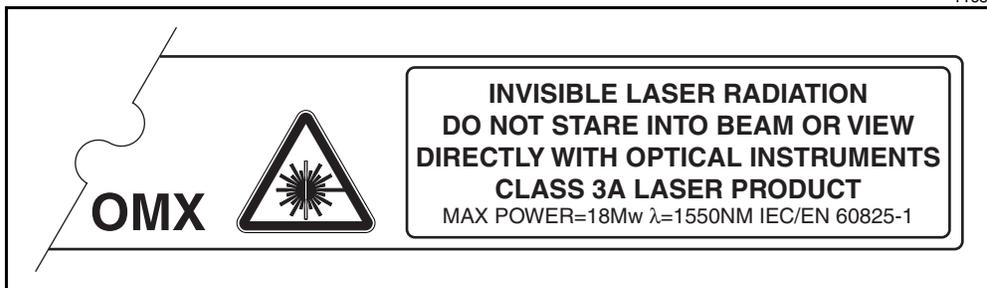
Figure 1-8
4x100FX optical interface circuit pack caution label
(The 4x100FX interface pack is considered to be a level 1 laser hazard in accordance
with IEC 60825-2.)

1165t
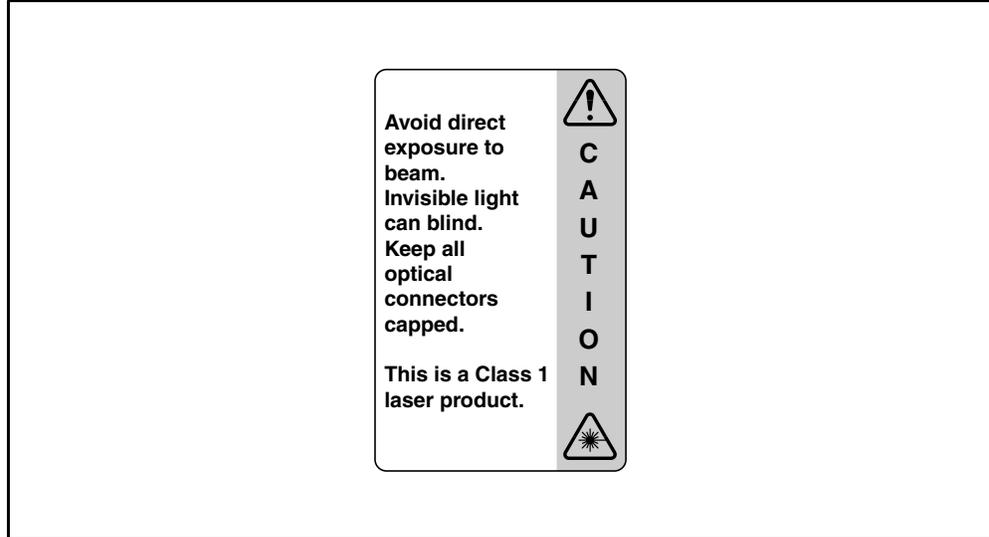
Figure 1-9
2x1000SX and 2x1000LX interface packs with Class 1 laser module
(The 2X1000SX interface pack is considered to be a level 1 laser hazard in
accordance with IEC 60825-2.)
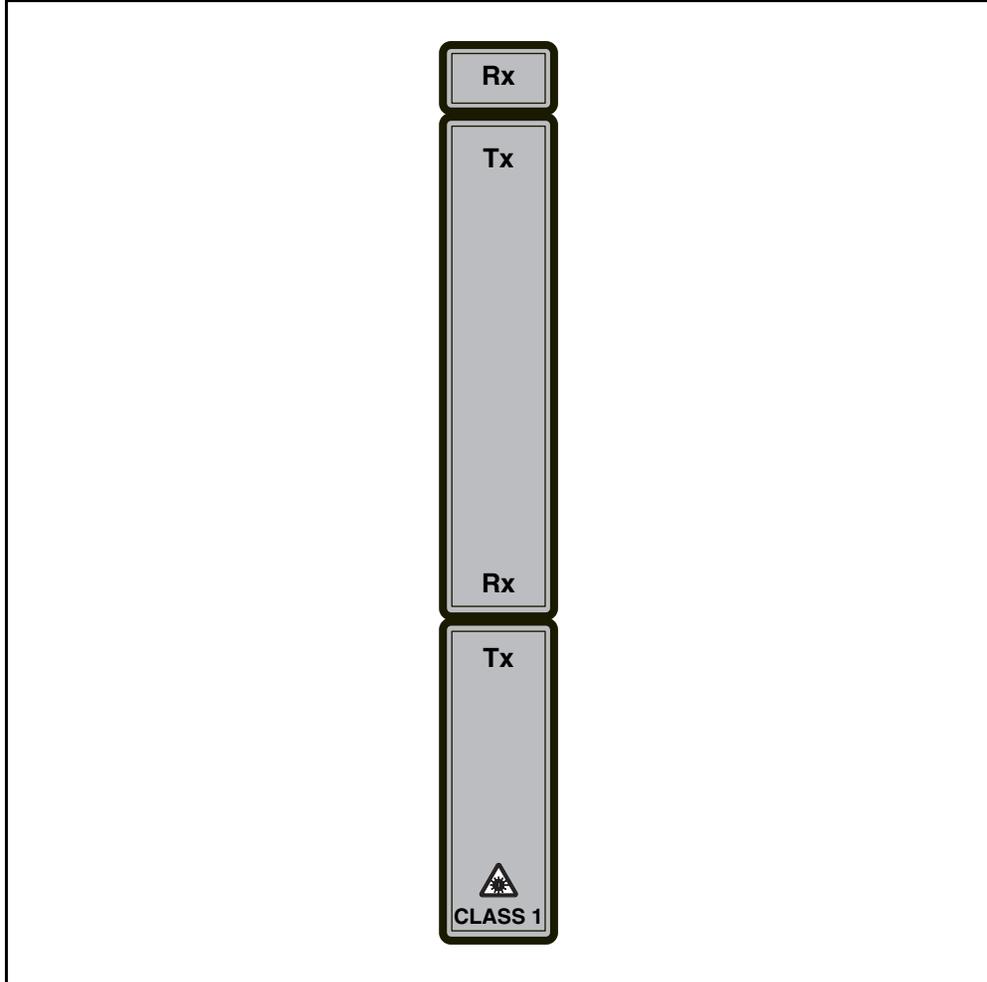
Product-level regulatory label

All products containing optical circuit packs include product-level regulatory
labels. This label is placed on the bay assembly or on the front of the
equipment. This label includes information about equipment compliance to
safety regulatory standards and does not have to be visible after installation of
the equipment. This label also includes all necessary approval marks. See
Figure 1-10 for a typical product-level regulatory label.

Figure 1-10
Typical product-level regulatory label
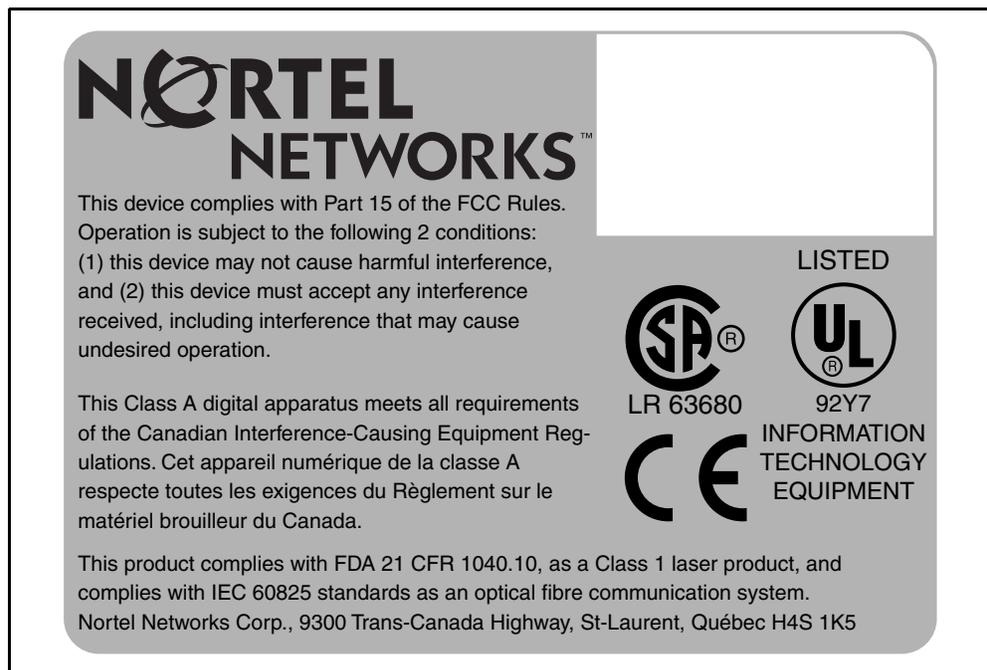
Passive subassemblies

A passive optical subassembly supplied and installed as part of a complete Nortel Networks optical fiber communication system has the appropriate hazard level assigned and labels attached. If Nortel Networks does not supply and install the subassembly, you must determine the maximum accessible optical output level and assign the appropriate hazard level and labels.

Passive subassemblies (for example, optical patch panels, couplers and splitters, and optical switches) can carry optical signals of any power depending on the source optical fibers. These subassemblies require the appropriate laser warning and explanatory labels that you normally place in close proximity to the connectors or to the access panel. You are responsible for ensuring the following requirements are met:

• Be aware of the optical powers at the inputs and outputs of the subassemblies.

• Appropriate labels are placed on subassemblies.

• Only qualified personnel, trained in optical safety, and who understand the optical safety issues associated with the subassemblies, work on the equipment.

Radio-frequency emissions

The following regulatory notice applies to all Nortel Networks SONET transmission products.

This equipment has been tested and found to comply with the limits for a Class A digital device according to Part 15 of the FCC Rules. These limits are designed to provide acceptable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used according to the instruction manual, can cause harmful interference to radio communications. Operation of this equipment in a residential area can cause harmful interference, in which case users must correct the interference at their cost.

Optical fibers

Optical fibers are either single or multiple strand. The following information and precautions apply to all fibers.

Using optical fibers

> **CAUTION**
> **Risk of laser radiation exposure**
> Use of controls or adjustments or performance of procedures other than those specified in Nortel Networks documentation may result in hazardous radiation exposure.

Optical fibers are either single-mode or multimode. The information in the following paragraphs applies to all optical fibers.

Laser radiation - optical transmission systems

Nortel Networks optical products use laser or light-emitting diode (LED) sources that emit light energy into optical fibers. This energy is within the red (visible) and infrared (not visible) areas of the electromagnetic spectrum.

Laser Radiation hazards

When operating the product normally, with all optical connectors in position and correctly terminated, the optical radiation is completely enclosed. The system is a Class I (IEC)/Class I (FDA) product, regardless of the transmitted power within the optical fiber.

If you have unterminated optical cables (breaks in the fiber-optic cable or removal of the connector) the output from circuit packs containing optical transmitters can be greater than Class 1 (IEC)/Class I (FDA).

The maximum radiation hazard achieved when disconnecting a fiber or during a fiber break will not exceed Class 3A (IEC)/ Class IIIB (FDA). The worst case hazard level as defined by IEC 60825-2 would be hazard level 3A (defined by ANSI Z136.2 as a service group 3a). Since the system is intended to be installed in a restricted access location, no additional engineering design features are required to prevent access to the laser radiation.

Handling optical fibers

> ⚠ **DANGER**
> **Risk of eye injury**
> If you have a piece of glass in your eye, get medical help immediately.

When you work with optical fibers, you must take these precautions:

- Wear safety glasses when you install optical fibers.

- Never look into an active optical fiber or an optical fiber connector opening of an active or powered-up unit.

- Prevent direct exposure to optical fiber ends or optical connector ends where you can directly access the laser signal.

- Clean your hands after you handle optical fibers. Small pieces of glass are not always visible and can damage your eyes.

- Do not handle pieces of optical fiber with your fingers. Use tweezers or adhesive tape to lift and discard any loose optical fiber ends.

- Wear rubber gloves when you clean optical connectors. The gloves prevent direct contact with the isopropyl alcohol and prevent contamination of the ferrules with skin oils.

- Place all optical fiber clippings in a plastic container provided for that purpose.

- Handle optical fibers with caution. Place the optical fibers in a safe location during installation.

- Protect all optical fiber connectors with clean dust caps at all times.

- Follow the manufacturer instructions when you use an optical test set. Incorrect calibration or control settings can create hazardous levels of radiation.

Splicing optical fibers

When you must look at a spliced optical fiber with a small magnifier, take the following precautions:

- Power off all laser sources to the optical fiber or disconnect the remote optical fiber end from the laser sources before you start splicing. Make sure that all laser sources remain disconnected or powered off. The sources can be in a central office, on a subscriber premises, or in a remote location.

- Disconnect all optical test sets from the optical fiber before you start splicing. The connections can be local or remote.

- Use only the optical instruments approved by your company.

Repairing optical fibers

When an accidental break occurs in the optical fiber, do the following:

- Report the location of the damaged optical fiber to both the central-office and field-repair personnel.

- Power off all laser sources to the optical fiber or disconnect the remote optical fiber end from the laser sources. The sources can be in a central office, subscriber premises, or a remote location.

Working with power

> **DANGER**
> **Risk of personal injury**
> Battery feeds are capable of providing very high current which, during an unintentional short, can cause burns. Read and understand the power procedures you are performing. Take necessary precautions and use the appropriate insulated tools when working with power

> **DANGER**
> **Risk of electrical shock**
> This equipment is designed to be supplied by a -48 V dc nominal battery supply which does not exceed -60 V dc under any condition. Never connect the equipment to a -60 V dc nominal battery supply where the battery float charge can exceed -60 V dc.

A tripped circuit breaker indicates that an over-current event has occurred. Before resetting the circuit breaker, service personnel must do the following:

- Locate the subassemblies directly receiving power supplied by the circuit breaker.

- Determine if there are any obvious causes for the trip occurring in the affected parts and associated wiring. For example, signs or odors associated with an overheated component.

Equipment interfaces

⚠	**CAUTION** **Risk of equipment damage** Risk of equipment damage All equipment interfaces are intended for connection to intrabuilding or nonexposed wiring or cabling only.

⚡	**DANGER** **Risk of electrical shock** Any voltages applied to the system interfaces, including alarm pins, as part of the installation must not exceed 60 V dc.

Installation overview

This section provides an overview of the various shelf, environmental, power and equipment requirements for the OPTera Metro system.

Environmental requirements

Before you start unpacking the OPTera Metro 3500 shelf, make sure that your installation site is ready for the shelf. Also make sure that you have all the tools and materials on site before you start.

Note 1: When in operation, the OPTera Metro 3500 shelf dissipates heat by forced air convection. If the shelf shares the equipment frame with other equipment, make sure that the other equipment does not interfere with the supply of room temperature air to the shelf. Make sure that other equipment does not vent its heated exhaust air into the shelf air intake area. The shelf is supplied with an air deflector that prevents the heated exhaust air from one shelf entering the bottom of the shelf above it.

Note 2: The minimum amount of clearance required below the OPTera Metro 3500, the OMX, or the DS1 service module (for air intake) is 1.75 in.

Equipment frame requirements

The OPTera Metro 3500, the OMX, and the DS1 service module can be mounted in either a 19-in. or 23-in. equipment frame. The equipment frame must have 1.0-in., 1.75-in., or 2.0-in. mounting centers to accept the shelf. The equipment frame space required by each shelf is given in Table 2-1.

Table 2-1
Physical dimensions of shelves

Physical dimension	Value
OPTera Metro 3500 Shelf (NTN476AA, DA, AH)	
Height (including air deflector)	17.5 in. (444.5 mm) (10 U rack space)
Width (between mounting centers in a 23-in. equipment frame)	22.3 in. (566.4 mm)

Table 2-1 (continued)
Physical dimensions of shelves

Physical dimension	Value
Width (between mounting centers in a 19-in. equipment frame)	18.3 in. (465 mm)
Depth (including front cover)	11.8 in. (300 mm)
OMX + Fiber Manager 4CH (NT0H32AE, BE, CE, DE, EE, FE, GE, HE) (see Note 1)	
Height	1.70 in. (43 mm) (1 U rack space)
Width	17.5 in. (445 mm)
Depth	11.0 in. (280 mm)
OMX Shelf (NTN449ZW) (see Note 2)	
Height	3.45 in. (87.6 mm) (U rack space)
Width (between mounting centers in a 23-in. equipment frame)	22.3 in. (566.4 mm)
Width (between mounting centers in a 19-in. equipment frame)	18.3 in. (464.8 mm)
Depth	11.2 in. (284.5 mm)
Fiber Manager (NT0H57BB) (see Note 2)	
Height	1.75 in. (44.5 mm) (U rack space)
Width (between mounting centers in a 23-in. equipment frame)	22.3 in. (566.4 mm)
Width (between mounting centers in a 19-in. equipment frame)	18.3 in. (464.8 mm)
Depth	11.0 in. (280 mm)
DS1 Service Module Shelf (NTN407MA)	
Height (including OAM adapter module)	5.88 in. (149.4 mm) (4 U rack space)
Width (between mounting centers in a 23-in. equipment frame)	22.3 in. (566.4 mm)

Table 2-1 (continued)
Physical dimensions of shelves

Physical dimension	Value
Width (between mounting centers in a 19-in. equipment frame)	18.3 in. (464.8 mm)
Depth (including front cover)	11.0 in. (280 mm)
Note 1: One OMX + Fiber Manager 4CH equipment drawer is required for each direction.	
Note 2: Two OMX modules fit into each OMX Shelf (NTN449ZW). Therefore, one fully-loaded OMX Shelf accomodates both directions (east and west).	

Power requirements

The electrical characteristics for the OPTera Metro 3500 and the DS1 service module appear in .

Table 2-2
Power requirements

Electrical parameters	Value
OPTera Metro 3500 (see note)	
Maximum possible power dissipation in Release 12	613 watts
Maximum CSA/UL-approved power rating for backplane	640 watts
Power dissipated by Cooling Unit Assembly (NTN458QA)	65 watts
Power dissipated by Universal Cooling Unit Assembly (NTN458QH)	45 watts
dc voltage	-40 to -60 V dc
Maximum current (@ -48 V dc nominal)	14.9 A
Typical current	10.4 A

Table 2-2 (continued)
Power requirements

Electrical parameters	Value
DS1 service module	
Input voltage to shelf	-40V to -60V dc (a filtered battery is required)
Maximum power consumption of DSM shelf (NTN407MA)	13 watts
Maximum power consumption of DS1x84TM circuit pack (NTN313AA or NTN313AC)	67 watts
Maximum power consumption of DSM shelf (NTN407MA) with two DS1x84TM circuit packs installed	22.5 watts
Maximum current (@ -48 V dc nominal)	1.5 A
Typical current	1.2 A

Note: For network equipment-building system (NEBS) compliance, the maximum power dissipation allowed is 181.2 watts/square ft. This translates into a maximum power dissipation of 1272.02 watts for a 7.02 square ft. OPTera Metro 3500 bay. You can populate your bay with different shelf configurations in order to stay within the maximum power dissipation limit. For example, two fully-equipped shelves in a 7.02 square ft. bay equals a power dissipation of 1226.0 watts.

Tools required

The following tools are required for the installation of an OPTera Metro 3500 shelf:

- flathead screwdriver (large)
- utility knife
- flathead screwdriver (standard)
- digital voltmeter (DVM)
- fiber microscope
- fiber-optic patch cords (for all network elements)
- wire stripper
- wire wrap tool
- crimper
- fiber cleaning materials
- torque wrench

- torque screwdriver

Materials required

The following materials are required for the installation of an OPTera Metro 3500 shelf:

- tie wraps
- CLETOP REEL Type A Optical fiber connector cleaner. See Nortel Networks Corporate standard CS184, page 23, table B.4.
- CLETOP REEL Type B Optical fiber connector cleaner. See Nortel Networks Corporate standard CS184, page 23, table B.4.
- CLETOP REEL MTRJ Optical fiber connector cleaner. See Nortel Networks Corporate standard CS184, page 23, table B.4.
- nonabrasive, low-lint, disposable cloth or tissue (Texwipe Absorbent lint-free cloth or Kimwipes)
- alcohol, reagent grade (99.9% pure), ethanol (denatured), or isopropyl.
- lens paper (Fisher Scientific #11-995 or equivalent)
- lint-free wipes

Site preparation

Before trying to install the OPTera Metro 3500 shelf, you must ensure the site has been prepared:

- ensure that the equipment frame has been installed, secured, and grounded according to manufacturer instructions
- check that you have appropriate shelf space, battery power, and ventilation
- ensure that all required interface, power, and communications cables are available

  Note: The OPTera Metro 3500 shelf is not supplied with interface, power, or fiber-optic transmission cables. It is the responsibility of the customer to assemble or purchase these cables according to the specifications given in Chapter 5. Ensure that all appropriate cabling (for example, office power, alarms, optical fiber, DS1) has been brought to the equipment frame before performing the procedures in this book.

Each of the procedures in this document must be performed in the order in which it appears. When performing these procedures, do not begin the subsequent procedure until the current procedure has been completed successfully.

After all the network element shelves in a system have been set up according to the procedures in this document, the system is ready for commissioning testing. For commissioning procedures, see *Commissioning*, 323-1059-210. The system testing procedures are in *System Testing*, 323-1059-222.

Grounding and isolation

> ⚠ **CAUTION**
> **Risk of equipment damage**
> The OPTera Metro 3500 is suitable for connection to intrabuilding or unexposed wiring or cabling only.

The OPTera Metro 3500 has three types of grounds implemented through the LOAM. See Table 2-3.

Note: For a graphical depiction of the LOAM interface pinout, see Figure 3-69 on page 3-109.

Table 2-3
Grounding and isolation at the LOAM pins

Type of grounding	Pins	Recommended pin usage
Environmental Return (ENV. RET)	A9	Used for ENV. ALARMS OUT: OUT-1 (pin C9) OUT-2 (pin F9)
	B9	OUT-3 (pin G9) OUT-4 (pin H9)

Table 2-3 (continued)
Grounding and isolation at the LOAM pins

Type of grounding	Pins	Recommended pin usage
Frame ground/ Logic ground		Additional frame ground for customer defined usage:
	A1	RS-232C grounding pin
	D7	Remote alarm cut off grounding pin
	C8,F8	BITS IN/OUT cable shielding
	F3, F5, H6	X.25 grounding pin
	E9	Can be used in any frame/ logic ground application
	E10-E14	Used as office alarms (ENV. Alarms Input) ground return when powered by source other than battery.
Battery Return	A14, B14, C14, F14, G14, H14	Customer defined usage (used as battery return).
Note 1: The environmental returns are isolated form the other grounds.		
Note 2: The battery return is separated from the frame ground in accordance with Telcordia GR-1089-CORE.		
Note 3: All pins labelled GND on the LOAM are tied together to provide one frame ground.		
Note 4: The frame ground and logic ground are tied together to form an integrated ground. The environmental return and battery return remain isolated from each other and the frame ground.		

Table 2-4
Grounding and isolation at the DSM OAM adapter pins

Type of grounding	Pins	Recommended pin usage
Environmental Return (ENV. RET)	4-3	used for ENV. ALARMS OUT: ENVOU1(pin 6-3), ENVOU2 (pin 7-3)
	5-3	ENVOU3 (pin 8-3), ENVOU4 (pin 9-3)

Table 2-4 (continued)
Grounding and isolation at the DSM OAM adapter pins

Type of grounding	Pins	Recommended pin usage
Frame ground/ Logic ground	1-3, 2-3, 3-3	Additional frame ground for customer defined usage.
	9-1, 9-2	Used as office alarms (ENV. Alarms Input).
Battery Return	9-4, 9-5	Customer defined usage (used as battery return).
Note 1: The environmental returns are isolated form the other grounds.		
Note 2: The frame ground and logic ground are tied together to form an integrated ground.		
Note 3: For a graphical depiction of the DSM OAM adapter environmental pinout, see Figure 3-128 on page 3-240.		

Installing the OPTera Metro 3500 Multiservice Platform

This chapter describes how to install a new OPTera Metro 3500 shelf, an OMX + Fiber Manager 4CH equipment drawer, and a DS1 service module (DSM) shelf. You can install shelves in a 19-in. or a 23-in. equipment frame. As a typical installation, an eight foot bay is treated in this section. You can install up to four OPTera 3500 shelves or up to eight DSM shelves or a combination of OPTera 3500 shelves and DSM shelves in an eight foot bay (Nortel Networks, Newton, or Hendry bay).

> *Note:* You can also install the OPTera Metro 3500 shelf in a single-shelf OPTera Connect DX bay. Refer to Single-Shelf DX Bay User Guide, NTCA69YA.

Go to to begin installing or connecting to hardware.

Procedure 3-1
Installing hardware

Note: You must install equipment from the top of the bay to the bottom.

Requirements

The OPTera Metro 3500 and the DS1 Service Module (DSM) are not supplied with interface power cables, or fiber-optic transmission cables. Users are responsible to purchase or assemble these cables according to the specifications. See Cable and connector details on page 5-1.

Step	Action	
1	**If** you wish to install, connect to, or make hardware additions to	**Then** go to
	• a bay frame	step 2
	• a breaker interface panel (BIP), and	step 6
	— the bay frame is already installed or not required	
	• an OPTera Metro 3500 shelf or hardware on this shelf, and	step 15
	— the bay frame is already installed or not required, and — all required BIPS are already installed	
	• OMX equipment, and	step 86
	— the bay frame is already installed or not required, and — all required BIPS are already installed, and — all the OPTera Metro 3500 shelves are already installed	
	• a DSM shelf or hardware on this shelf, and	step 105
	— the bay frame is already installed or not required, and — all required BIPS are already installed, and — all the OPTera Metro 3500 shelves are already installed	

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action
2	Perform the following procedures in sequence, then continue this procedure at step 3:

    a. Performing preliminary tasks on page 3-29

    b. Preparing the floor to install the bay frame on page 3-32

    c. Securing the bay frame on page 3-34

    d. Connecting the bay frame ground to the office ground on page 3-39

    e. Installing the drip tray on page 3-41

Step	Action
3	Identify your desired frame configuration (if applicable) from the following:

- OPTera Metro 3500 with DS1 service modules - two BIPs (8-foot bay) on page 3-22

- OPTera Metro 3500 with DWDM (8-foot bay) on page 3-23

- OPTera Metro 3500 with or without DWDM - power connection on page 3-24

- Eight DS1 service modules (8-foot bay) on page 3-25

- Eight DS1 service modules - power connection on page 3-26

- OPTera Metro 3500 with DS1 service modules - one BIP (8-foot bay) on page 3-27

- OPTera Metro 3500 with DS1 service modules - one BIP power connection on page 3-28

Step	**If** you	**Then** go to
4	need to install something else	step 1
	do not need to install anything else	step 5

Step	Action
5	You have completed this procedure.
6	Ensure the required number of BIPs are available.
7	Ensure the required number of power cables are available.

Step	**If** you are installing the	**Then** go to
8	NTN458RA BIP	step 9
	NTFW56BA BIP	step 12

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action
9	Perform the following procedures in sequence, then continue this procedure at step 10:

    a. Inspecting the breaker interface panel (NTN458RA) shipping container on page 3-43

    b. Installing the breaker interface panel (NTN458RA) on page 3-45

10	**If** your OPTera Metro 3500 shelves	**Then** go to
	are installed in the bay frame already	step 11
	are not installed in the bay frame already	step 13

11	Connect power cables from the BIP to the shelf, then continue this procedure at step 13. See Connecting the power cables to the shelf from the NTN458RA BIP on page 3-95.
12	Perform the following procedures in sequence, then continue this procedure at step 13:

    a. Inspecting the breaker interface panel (NTFW56BA) shipping container on page 3-52

    b. Installing the breaker interface panel NTFW56BA (for European deployment only) on page 3-53

13	**If** you	**Then** go to
	need to install another BIP	step 8
	need to install something other than a BIP	step 1
	do not need to install anything else	step 14

14	You have completed this procedure.

15	**If** you	**Then** go to
	need to install an OPTera Metro 3500 shelf	step 16
	do not need to install an OPTera Metro 3500 shelf	step 17

16	Perform the following procedures in sequence, then continue this procedure at step 17:

    a. Inspecting the OPTera Metro 3500 shipping container contents on page 3-60

    b. Installing the OPTera Metro 3500 shelf on page 3-63

    c. Grounding the shelf on page 3-69

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action

17	**If** the BIP on your frame	**Then** go to
	is the NTN458RA BIP and power cables have not yet been connected	step 18
	is the NTN458RA BIP and power cables have already been connected	step 19
	is not the NTN458RA BIP	step 19

18   Connect power cables to the shelf, then continue this procedure at step 19. See Connecting the power cables to the shelf from the NTN458RA BIP on page 3-95.

19	**If** you	**Then** go to
	need to install hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware on your OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 20

20   You have completed this procedure.

<center>—**continued**—</center>

Procedure 3-1 (continued)
Installing hardware

Step	Action	
	Step	**Action**
21	**If** you wish to	**Then** go to
	• install I/O modules	step 22
	• connect OAM and tributary cabling (not including optical fiber cabling)	step 29
	• install circuit packs	step 31
	• install or remove small form-factor pluggable (SFP) optical transceivers into a 2xGigE/FC-P2P circuit pack	step 56
	• route T1, T3, Category 5 UTP, or fiber-optic cabling	step 59
	• connect fiber-optic cabling to an optical interface circuit pack	step 59
	• verify circuit pack seating	step 66
	• install or remove a shelf front cover	step 69
	• install or remove a grill/air deflector	step 69
	• lock or unlock an OPTera Metro 3500 shelf	step 74
	• daisy-chain network processors or ILAN circuit packs	step 77
	• connect a terminal or modem to an OPTera Metro 3500 shelf	step 80
	• insert or remove a circuit pack from a shelf	step 83
22	**If** the shelf you wish to add hardware to is an	**Then** go to
	NTN476DA OPTera Metro 3500 shelf	step 23
	NTN476AH OPTera Metro 3500 shelf	step 24

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action
23	Install the required I/O modules (depending on the desired tributary configuration), then continue this procedure at step 25. See Installing I/O modules on the NTN476DA shelf on page 3-71.
24	Install the required I/O modules (depending on the desired tributary configuration), then continue this procedure at step 25. See Installing and removing I/O modules on the NTN476AH (Universal) shelf on page 3-80.

25	**If**	**Then** go to
	your shelf has at least one DS1 I/O module and you require DS1 cable brackets	step 26
	you do not require DS1 cable brackets	step 27

26	Install cable brackets on the DS1 I/O module(s) as required, then continue this procedure at step 27. See Installing cable brackets on a DS1 I/O module on page 3-92.

27	**If** on your shelf	**Then** go to
	there is at least one rear I/O module but there is no rear cable retainer	step 28
	there are no rear I/O modules	step 29
	there is already a rear cable retainer	step 29

28	Install a rear cable retainer on this shelf, then continue this procedure at step 29. See Installing the rear cable retainer on page 3-93.

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action

29	**If** your shelf	**Then** go to
	requires and is missing cable connections for any of the following:	step 30

- BITS
- environmental I/O
- shelf alarms
- TBOS
- ILAN
- COLAN
- X.25
- T1
- T3
- Category 5 UTP (data traffic)

	does not require additional cable connections for the above-mentioned services	step 31

30   Connect the required OAM and tributary cabling to the shelf, then continue this procedure at step 31. See Connecting control, communication, and tributary cables to the shelf on page 3-101.

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action

31

If your shelf	**Then** go to
requires and is missing any of the following core circuit packs:	step 32

- SPx
- VTX-48
- VTX-48e
- STX-192

does not require installation of any of the above-mentioned core circuit packs	step 33

32 Install the required core circuit packs (identified in step 31), then continue this procedure at step 33. See Installing core circuit packs on page 3-110.

33

If your shelf	**Then** go to
requires and is missing any of the following optical interface circuit packs:	step 34

- OC-3
- OC-3x4
- OC-12
- OC-12x4 STS
- OC-48 STS
- OC-48
- OC-48 DWDM
- OC-192 IR
- OC-192 LR G.709 FEC
- OC-192 DWDMG.709 FEC

does not require installation of the above-mentioned optical interface circuit packs	step 35

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action

34   Install the required optical interface circuit packs (identified in step 33), then continue this procedure at step 35. See Installing an optical interface circuit pack on page 3-119.

35

If your shelf	**Then** go to
requires and is missing either of the following circuit packs: • NPx • ILAN	step 36
does not require installation of the above-mentioned circuit packs	step 37

36   Install the required network circuit pack (identified in step 35), then continue this procedure at step 37. See Installing the NPx and the ILAN circuit pack on page 3-125.

37

If your shelf	**Then** go to
will be equipped with at least 1 DS1 circuit pack (not including the DS1x84TM circuit pack), and does not have a PSC circuit pack installed	step 38
will not be equipped with at least 1 DS1 circuit pack (not including the DS1x84TM circuit pack)	step 46
has a PSC already installed	step 39

38   Install the PSC circuit pack in your shelf, then continue this procedure at step 39. See Installing the PSC, the PSX, and the DS1 circuit packs on page 3-129.

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
39	**If** your shelf	**Then** go to
	will have more than 28 DS1 tributaries (not including DSM DS1's) and does not have a PSX circuit pack installed	step 40
	will not have more than 28 DS1 tributaries	step 41
	has a PSX already installed	step 41
40	Install the PSX circuit pack in your shelf, then continue this procedure at step 41. See Installing the PSC, the PSX, and the DS1 circuit packs on page 3-129.	
41	**If** your shelf	**Then** go to
	requires installation of a DS1 circuit pack	step 42
	does not require installation of a DS1 circuit pack	step 46
42	**If** a DS1 circuit pack is	**Then** go to
	not already installed in slot 3	step 43
	already installed in slot 3	step 44
43	Install a protection DS1 circuit pack in slot 3 of your shelf, then continue this procedure at step 44. See Installing the PSC, the PSX, and the DS1 circuit packs on page 3-129.	
44	Install a working DS1 circuit pack in the required slot, then continue this procedure at step 45. See Installing the PSC, the PSX, and the DS1 circuit packs on page 3-129.	
45	**If** your shelf	**Then** go to
	requires installation of another DS1 circuit pack	step 44
	does not require another installation of a DS1 circuit pack	step 46

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action	

46	**If** your shelf	**Then** go to
	requires installation of a DS3x3, DS3x12, DS3x12e, EC-1x3, or EC-1x12 circuit pack	step 47
	does not require installation of any of the above-mentioned circuit packs	step 49

47   Install a DS3x3, DS3x12, DS3x12e, EC-1x3, or EC-1x12 circuit pack as required, then continue this procedure at step 48. See Installing DS3 and EC-1 circuit packs on page 3-134.

48	**If** your shelf	**Then** go to
	requires installation of another DS3x3, DS3x12, DS3x12e, EC-1x3, or EC-1x12 circuit pack	step 47
	does not require another installation of the above-mentioned circuit packs	step 49

49	**If** your shelf	**Then** go to
	requires installation of a 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit pack	step 50
	does not require installation of any of the above-mentioned circuit packs	step 52

50   Install a 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit pack as required, then continue this procedure at step 51. See Installing 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs on page 3-141.

51	**If** your shelf	**Then** go to
	requires installation of another 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit pack	step 50
	does not require another installation of the above-mentioned circuit packs	step 52

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
52	**If** your shelf	**Then** go to
	requires installation of a 2xGigE OPE circuit pack	step 53
	does not require installation of a 2xGigE OPE circuit pack	step 54
53	Install a 2xGigE OPE circuit pack, then continue this procedure at step 54. See Installing 2xGigE circuit packs on page 3-149.	
54	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 55
55	You have completed this procedure	
56	Install or remove an SFP optical transceiver into/from a 2xGigE/FC-P2P circuit pack as required, then continue this procedure at step 57. See Installing and removing small form-factor pluggable (SFP) optical transceiver modules on page 3-152.	
57	**If** you	**Then** go to
	need to install another SFP optical transceiver	step 56
	do not need to install another SFP optical transceiver, but need to install other hardware on your OPTera Metro 3500 shelf	step 21
	do not need to install another SFP optical transceiver, but need to install hardware that is not specific to your OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 58
58	You have completed this procedure.	

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
	If you are	**Then** go to
59	routing T1, T3, or Category 5 UTP cabling to a front-facing I/O module	step 60
	routing T1, T3, or Category 5 UTP cabling to a rear-facing I/O module	step 61
	routing (but not connecting) fiber-optic cabling	step 62
	connecting or disconnecting fiber-optic cabling to/from an optical interface circuit pack	step 63

60 Route T1, T3, or Category 5 UTP cabling from the OPTera Metro 3500 shelf to the bay frame as required, then continue this procedure at step 64. See Routing T1, T3, and Category 5 UTP cabling to front facing I/O modules on page 3-156.

61 Route T1, T3, or Category 5 UTP cabling from the OPTera Metro 3500 shelf to the bay frame as required, then continue this procedure at step 64. See Routing T1, T3, and Category 5 UTP cabling to rear facing I/O modules on page 3-158.

62 Route fiber-optic cabling, then continue this procedure at step 64. See Routing fiber-optic cables on page 3-166.

63 Connect or disconnect fiber-optic cabling to/from an optical interface circuit pack as required, then continue this procedure at step 64. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action

64	**If** you	**Then** go to
	need to route more T1, T3, Category 5 UTP, or fiber-optic cabling	step 59
	need to connect or disconnect more fiber-optic cabling to/from an optical interface circuit pack	step 59
	do not need to route or connect/disconnect cabling, but need to install other hardware on your OPTera Metro 3500 shelf	step 21
	do not need to route or connect/disconnect cabling, but need to install hardware that is not specific to your OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 65

65	You have completed this procedure.
66	Ensure all circuit packs are seated properly in the OPTera Metro 3500 shelf backplane, then continue this procedure at step 67. See Verifying circuit pack seating on page 3-180.

67	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 68

68	You have completed this procedure.

69	**If** you need to install or remove	**Then** go to
	the OPTera Metro 3500 shelf front cover	step 70
	the grill/air deflector for the OPTera Metro 3500 shelf	step 71

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action
70	Install or remove the shelf front cover as required, then continue this procedure at step 72. See Installing and removing the shelf front cover on page 3-181.
71	Install or remove the grill/air deflector as required, then continue this procedure at step 72. See Installing and removing the grill/air deflector on page 3-183.

72	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 73

73	You have completed this procedure.
74	Lock or unlock the OPTera Metro 3500 shelf as required, then continue this procedure at step 75. See Locking and unlocking the OPTera Metro 3500 shelf on page 3-185.

75	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 76

76	You have completed this procedure.
77	Daisy-chain network processors or ILAN circuit packs as required, then continue this procedure at step 78. See Daisy-chaining network processors or ILANs on page 3-187.

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
78	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 79
79	You have completed this procedure.	
80	Connect a terminal or modem to the OPTera Metro 3500 shelf as required, then continue this procedure at step 81. See Connecting a terminal or modem to the shelf on page 3-189.	
81	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 82
82	You have completed this procedure.	
83	Insert or remove a circuit pack as required, then continue this procedure at step 84. See Inserting or removing a circuit pack on page 3-192.	
84	**If** you	**Then** go to
	need to install more hardware on your OPTera Metro 3500 shelf	step 21
	need to install something other than hardware specific to the OPTera Metro 3500 shelf	step 1
	do not need to install anything else	step 85
85	You have completed this procedure.	

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
86	**If** you need to	**Then** go to
	install an OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)	step 87
	connect an OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves	step 90
	install an OMX Shelf (NTN449ZW)	step 93
	install or remove the protective cover of an OMX Shelf (NTN449ZW)	step 96
	connect an OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves	step 99
	install a Fiber Manager equipment drawer (NT0H57BB)	step 102
87	Install the OMX + Fiber Manager 4CH equipment drawer, then continue this procedure at step 88. See Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF) on page 3-204.	
88	**If** you	**Then** go to
	need to connect the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves	step 90
	need to install something else	step 1
	do not need to install anything else	step 89
89	You have completed this procedure.	
90	Connect the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves, then continue this procedure at step 91. See Connecting OMX+Fiber Manager 4CH equipment drawers (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves on page 3-211.	

—continued—

Procedure 3-1 (continued)
Installing hardware

Step	Action	
91	**If** you	**Then** go to
	need to install more OMX-related hardware	step 86
	need to install other non-OMX-related hardware	step 1
	do not need to install anything else	step 92
92	You have completed this procedure.	
93	Perform the following procedures in sequence, then continue this procedure at step 94.	

    a. Inspecting the OMX Shelf (NTN449ZW) container contents on page 3-195

    b. Installing the OMX Shelf (NTN449ZW) on page 3-197

Step	Action	
94	**If** you	**Then** go to
	need to install more OMX-related hardware	step 86
	need to install other non-OMX-related hardware	step 1
	do not need to install anything else	step 95
95	You have completed this procedure.	
96	Remove or install the OMX shelf (NTN449ZW) protective cover, as required, then continue this procedure at step 97. See Removing and installing the OMX Shelf (NTN449ZW) protective cover on page 3-200.	

Step	Action	
97	**If** you	**Then** go to
	need to install more OMX-related hardware	step 86
	need to install other non-OMX-related hardware	step 1
	do not need to install anything else	step 98
98	You have completed this procedure.	
99	Connect the OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves, then continue this procedure at step 100. See Connecting an OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves on page 3-209.	

Step	Action	
100	**If** you	**Then** go to
	need to install more OMX-related hardware	step 86
	need to install other non-OMX-related hardware	step 1
	do not need to install anything else	step 101
101	You have completed this procedure.	

<center>—**continued**—</center>

Procedure 3-1 (continued)
Installing hardware

Step	Action
102	Perform the following procedures in sequence, then continue this procedure at step 103.

    a. Inspecting the Fiber Manager (NT0H57BB) container contents on page 3-201

    b. Installing the Fiber Manager (NT0H57BB) equipment drawer on page 3-202

103

If you	Then go to
need to install more OMX-related hardware	step 86
need to install other non-OMX-related hardware	step 1
do not need to install anything else	step 104

104   You have completed this procedure.

105

If you need to	Then go to
install a DS1 Service Module (DSM) shelf (NTN407MA)	step 106
insert or remove the DSM DS1x84TM circuit pack into/ from the DSM shelf	step 109
connect the DSM shelf to an OPTera Metro 3500 shelf	step 112

106   Perform the following procedures in sequence, then continue this procedure at step 107.

    a. Inspecting the DS1 service module shipping container on page 3-216

    b. Installing the DS1 service module (DSM) shelf on page 3-218

    c. Installing and removing the DS1 service module front cover on page 3-225

    d. Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 5 or earlier) on page 3-226

    e. Connecting alarm control and communication cables to the DS1 service module on page 3-234

    f. Connecting T1 cables to the DS1 service module on page 3-241

    g. Routing T1 cables to/from the DS1 service module on page 3-242

—**continued**—

Procedure 3-1 (continued)
Installing hardware

Step	Action

107

If you	**Then** go to
need to install more DSM-related hardware	step 105
need to install other non-DSM-related hardware	step 1
do not need to install anything else	step 108

108 You have completed this procedure.

109 Insert or remove the DSM DS1x84TM circuit pack as required, then continue this procedure at step 110. See Inserting or removing a DSM DS1x84 termination module on page 3-243.

110

If you	**Then** go to
need to install more DSM-related hardware	step 105
need to install other non-DSM-related hardware	step 1
do not need to install anything else	step 111

111 You have completed this procedure.

112 Connect the DSM shelf to an OPTera Metro 3500 shelf, then continue this procedure at step 113. See Connecting the DS1 service module to OPTera Metro 3500 on page 3-246.

113

If you	**Then** go to
need to install more DSM-related hardware	step 105
need to install other non-DSM-related hardware	step 1
do not need to install anything else	step 114

114 You have completed this procedure.

—**end**—

Figure 3-1
OPTera Metro 3500 with DS1 service modules - two BIPs (8-foot bay)

EX1000p

Labels in figure:
- 0.5 in
- 1.75 in
- BIP 1
- BIP 2
- 1.75 in
- OPTera Metro 3500
- 1.75 in
- 1.75 in
- 1.75 in
- 1.75 in
- DS1 service module (8)
- 1.75 in
- 1.75 in
- 1.75 in
- minimum 1.5 in
- Kick plate
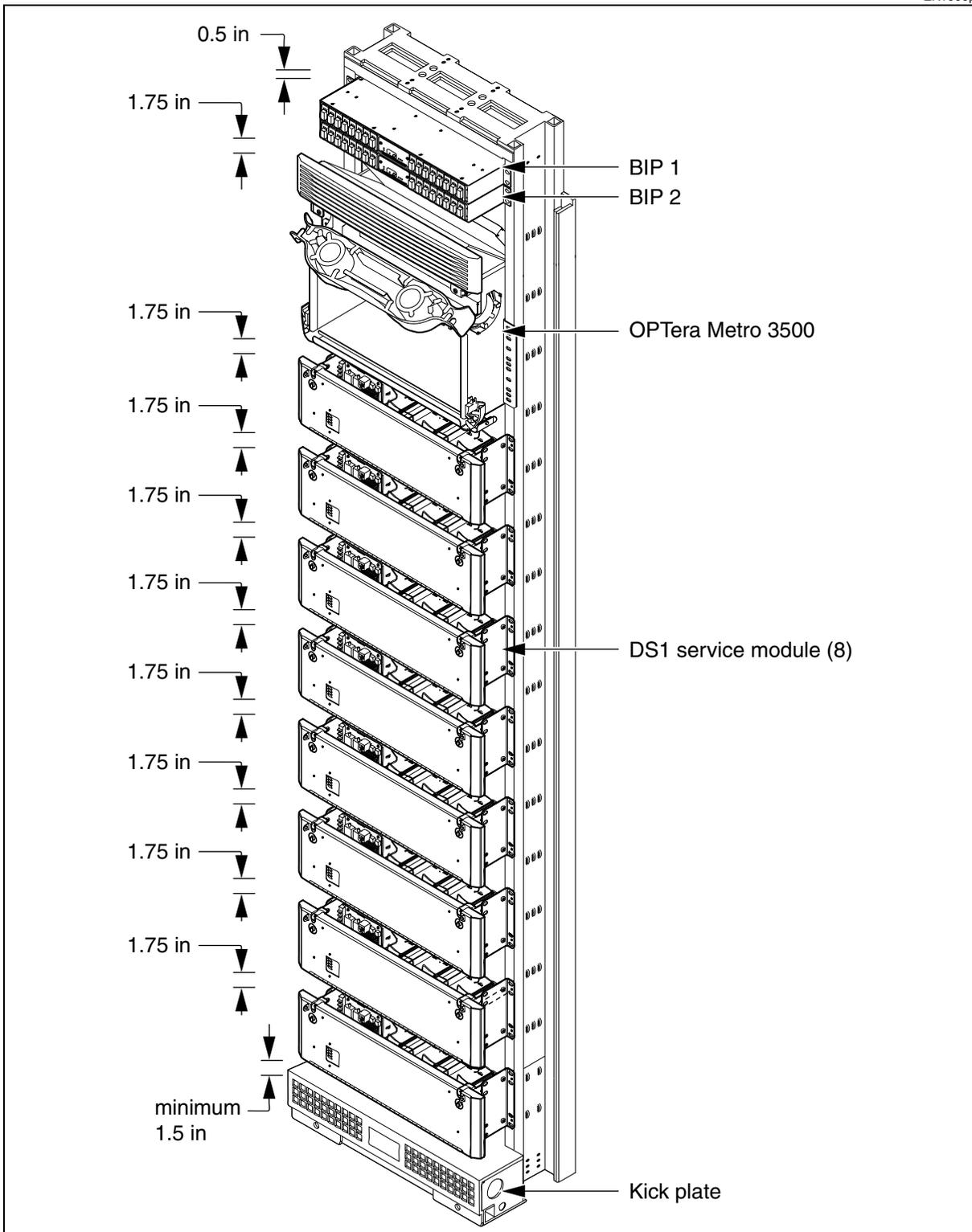
Figure 3-2
OPTera Metro 3500 with DWDM (8-foot bay)

EX0999p

Labels in figure:
- 0.5 in
- 1.75 in
- BIP 1
- Space for BIP 2
- 1.75 in
- OPTera Metro 3500
- 1.75 in
- 0.5 in
- OMX Shelf (NTN449ZW)
- Fiber Manager (NT0H57BB)
- 1.75 in
- 1.75 in
- OPTera Metro 3500
- minimum 1.5 in
- Kick plate
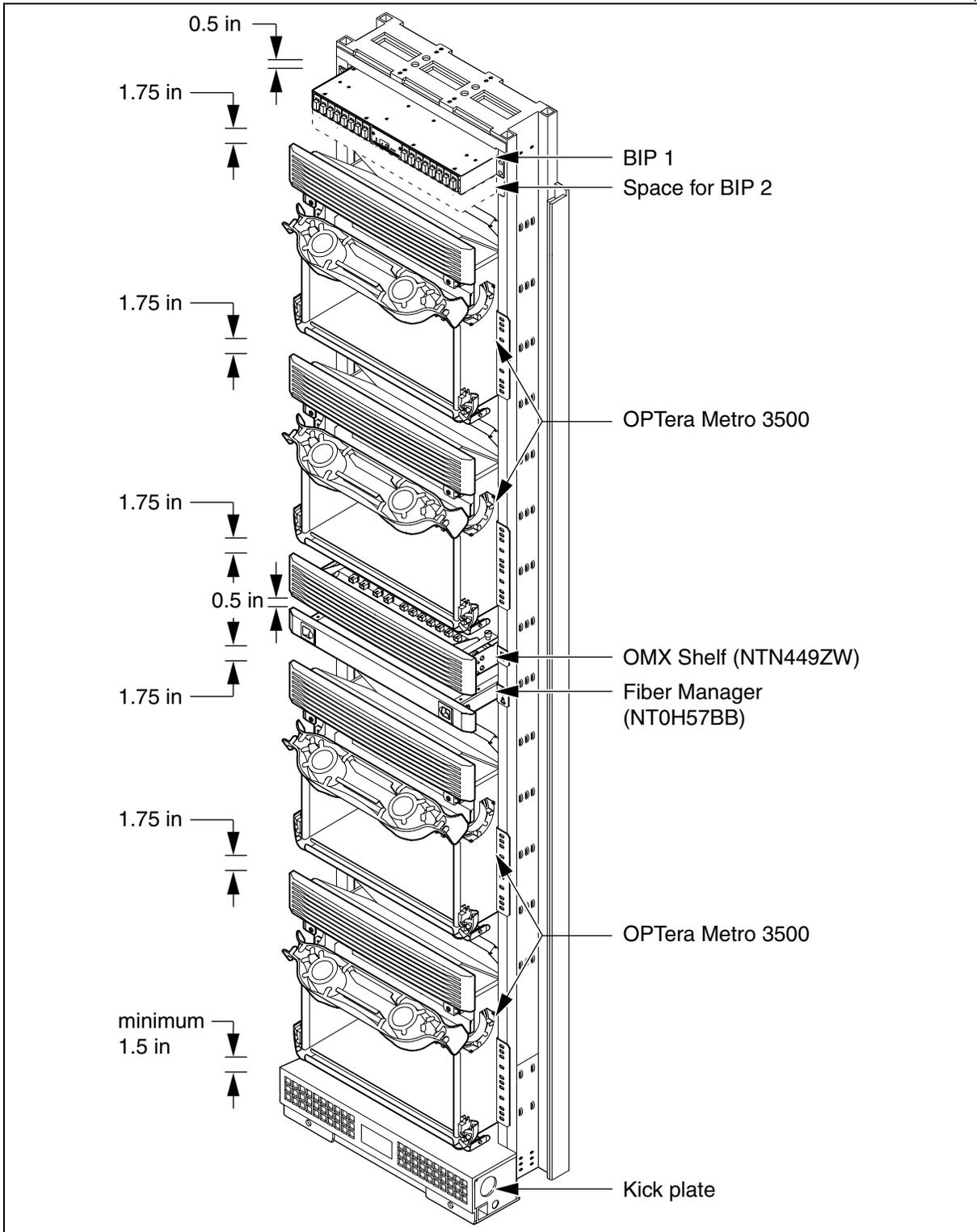
Figure 3-3
OPTera Metro 3500 with or without DWDM - power connection

EX0990p

Central office supply

−48 V DC

Uninterruptable power supply with battery backup.

100-A breaker (optional)

100-A breaker (optional)

A- (-48V) red
A+(return) white with red tracer

B- (-48V) red with blue trace
B+ (return) white with blue trace

A power feed

B power feed

Equipment frame power distribution panel
Note: In a central office environment, there must be a capacitance of 10,000 µF for each shelf power feed.

Fuse

10,000 µF capacitance

Fuse

10,000 µF capacitance

These breakers (or fuses) must be installed in each power feed to a shelf.

5-A breaker   15-A breaker   20-A breaker   20-A breaker

20-A breaker   20-A breaker   15-A breaker   5-A breaker

5-A breaker   5-A breaker   20-A breaker   20-A breaker

20-A breaker   20-A breaker   5-A breaker   5-A breaker

OPTera Metro 3500

I/O   I/O

OPTera Metro 3500

OPTera Metro 3500

OPTera Metro 3500

Note: If you are not using a Nortel Networks BIP, ensure you are using a filtered power source of at least 10,000 µF.

Figure 3-4
Eight DS1 service modules (8-foot bay)

EX1001p

0.5 in

1.75 in

1.75 in — BIP 1
— Space for BIP 2

1.75 in

1.75 in

1.75 in

1.75 in

1.75 in — DS1 service module (8)

1.75 in

1.75 in

minimum 1.5 in

— Kick plate
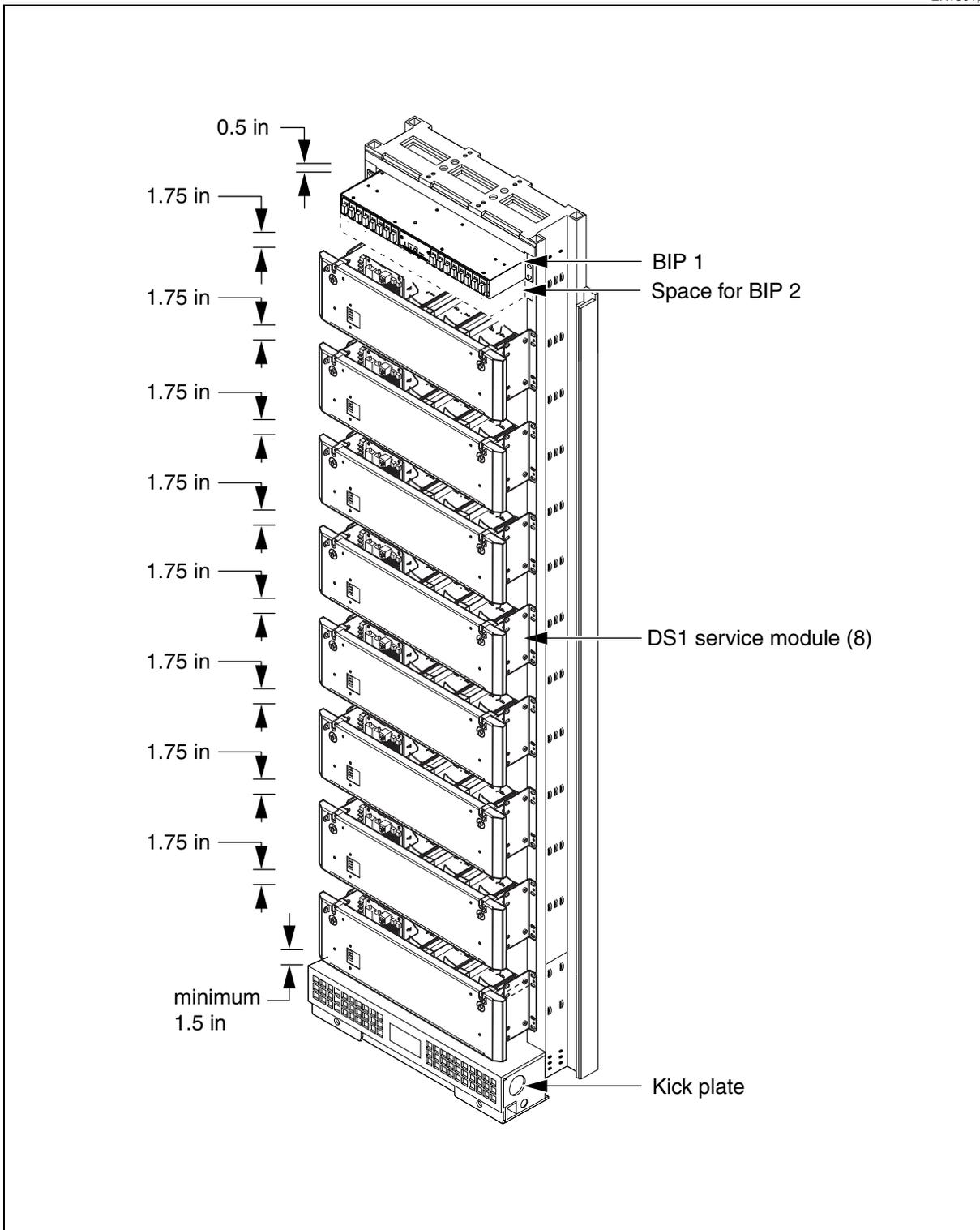
Figure 3-5
Eight DS1 service modules - power connection

EX0998p

Note: If you are not using a Nortel Networks BIP,
ensure you are using a filtered power source of at least 10,000 µF.
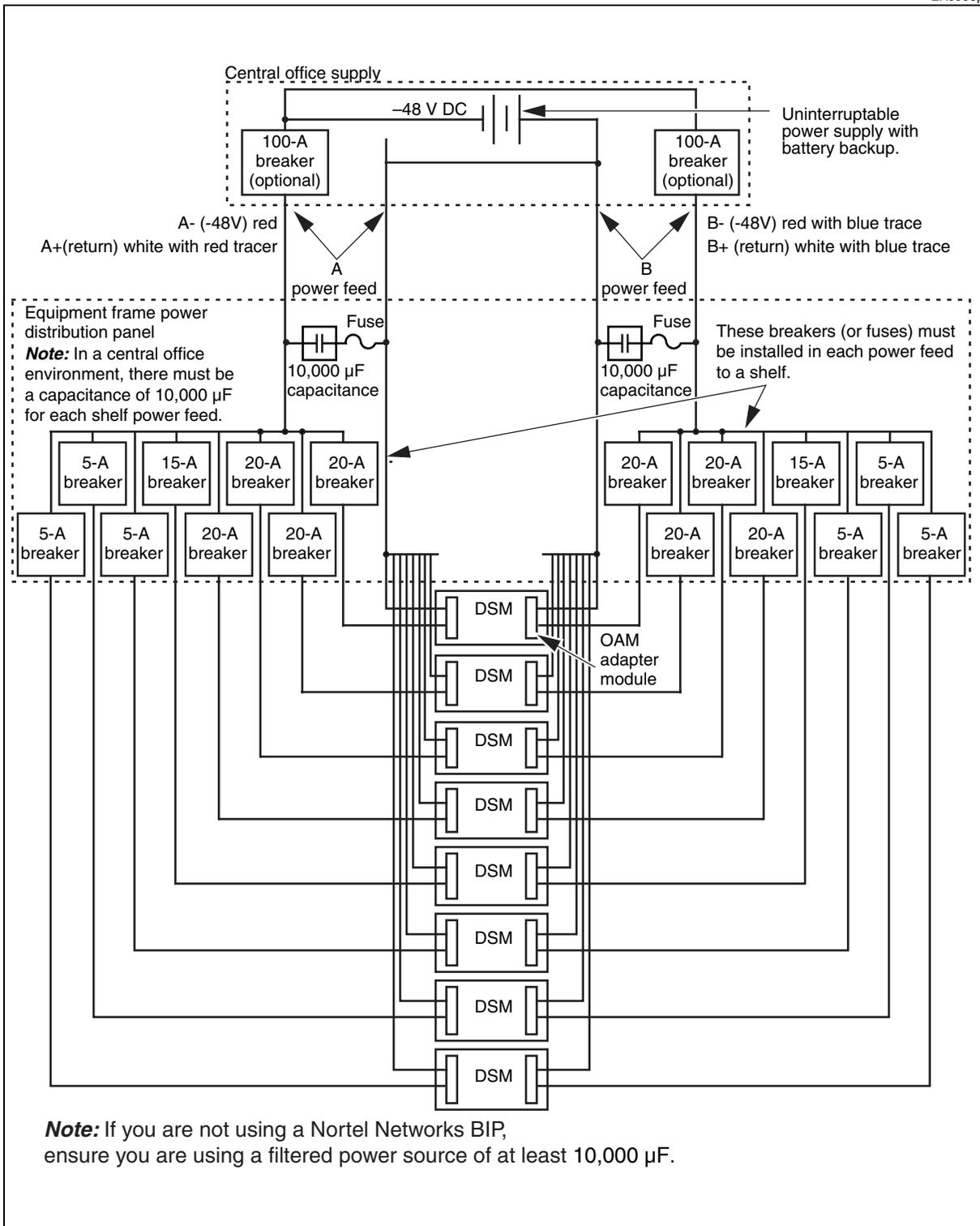
Figure 3-6
OPTera Metro 3500 with DS1 service modules - one BIP (8-foot bay)

EX1032p

0.5 in

1.75 in

BIP 1
Space for BIP 2

1.75 in

OPTera Metro 3500

1.75 in

1.75 in

1.75 in

1.75 in

DS1 service module (7)

1.75 in

1.75 in

minimum 1.5 in

Kick plate
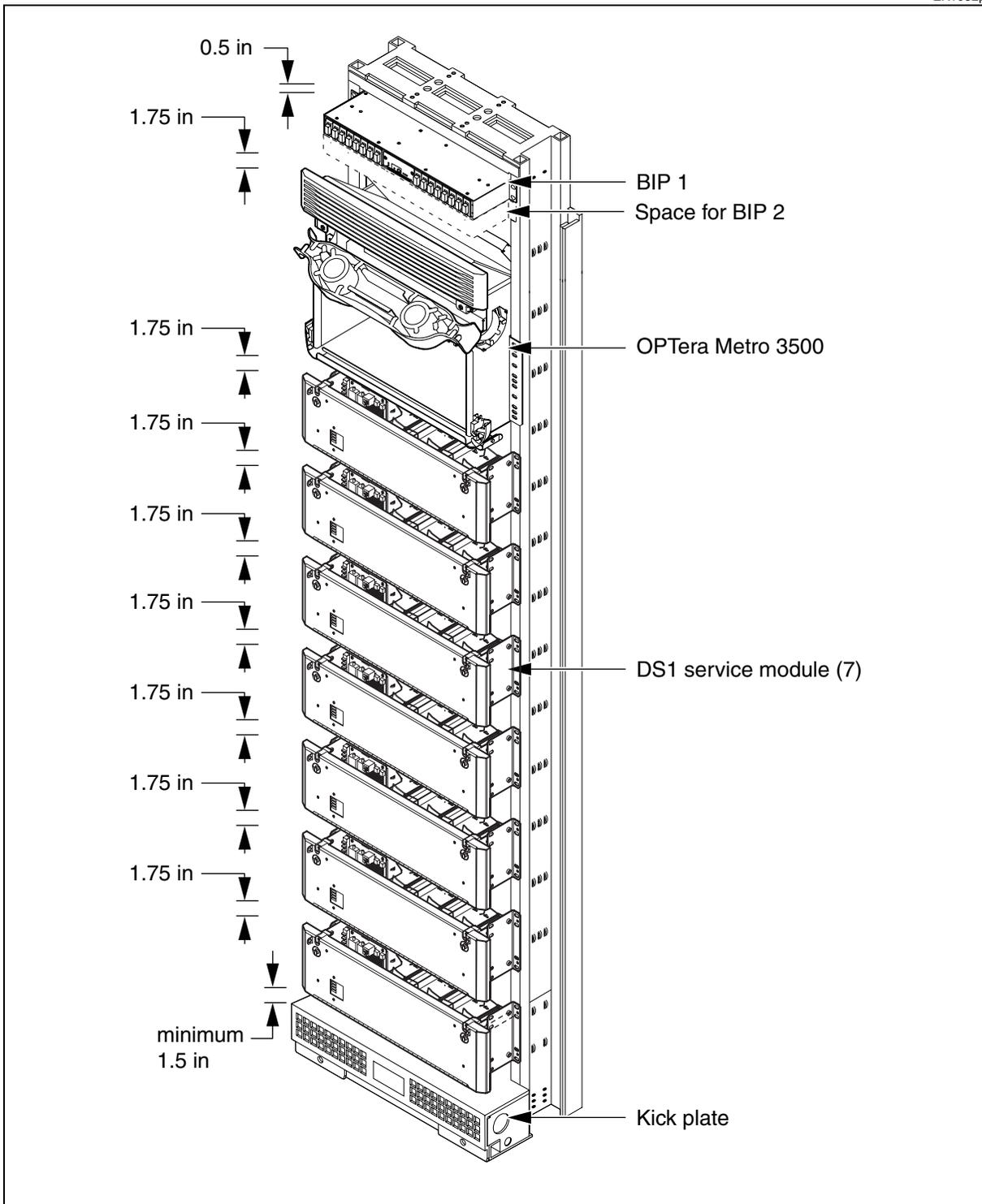
Figure 3-7
OPTera Metro 3500 with DS1 service modules - one BIP power connection

EX0995p

Note: If you are not using a Nortel Networks BIP,
ensure you are using a filtered power source of at least 10,000 µF.
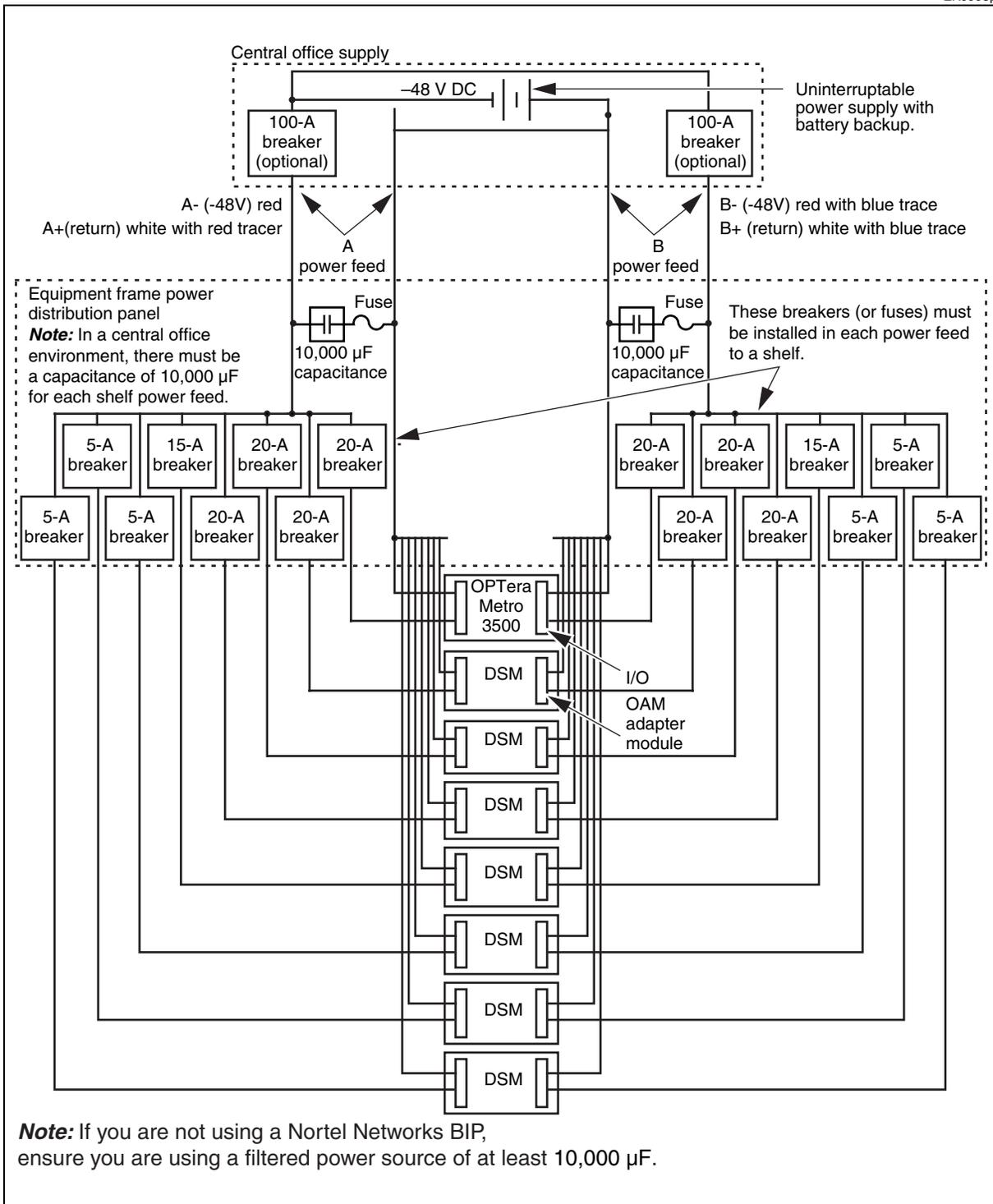
Procedure 3-2
Performing preliminary tasks

Use this procedure to perform preliminary tasks; unpacking, taking inventory and installing frame extenders (as required).

Requirements

- gloves and safety goggles
- claw hammer
- tin snips
- flathead screwdriver and socket set

Step	Action

Take inventory

1   Locate the Engineering Drawing Package (EDP) sent with each engineered order and go to the equipment list section.

2   Check for the receipt of all items.

Unpack the bay frame

3

> ⚠ **DANGER**
> **Risk of personal injury**
> Steel banding recoils when cut.

Use tin snips to cut the metal straps.

4   Open the frame container, cut the remaining metal bands. Remove the wooden cross members, the side supports and all parts that are loosely tied to the equipment. See Figure 3-8 on page 3-30.

5   Verify the contents against the packing lists.

6   Remove the base cover (kick plate) from the frame by loosening the two captive screws located on the bottom front of base and set aside.

Install bay frame extenders (as required)

7   If required, install frame extenders by aligning the frame extender with the top of the bay frame. See Figure 3-9 on page 3-31.

   Note: Ensure that the bolt holes in the bay frame and the frame extender line up.

8   Use the four bolts to fasten the bay extender to the bay frame.

9   Fasten one end of the ground strap to the bay extender and the other end to the bay frame.

—end—

Figure 3-8
Unpacking the bay

F0170

Metal straps

Masonite sheet
in dry, dust-free area
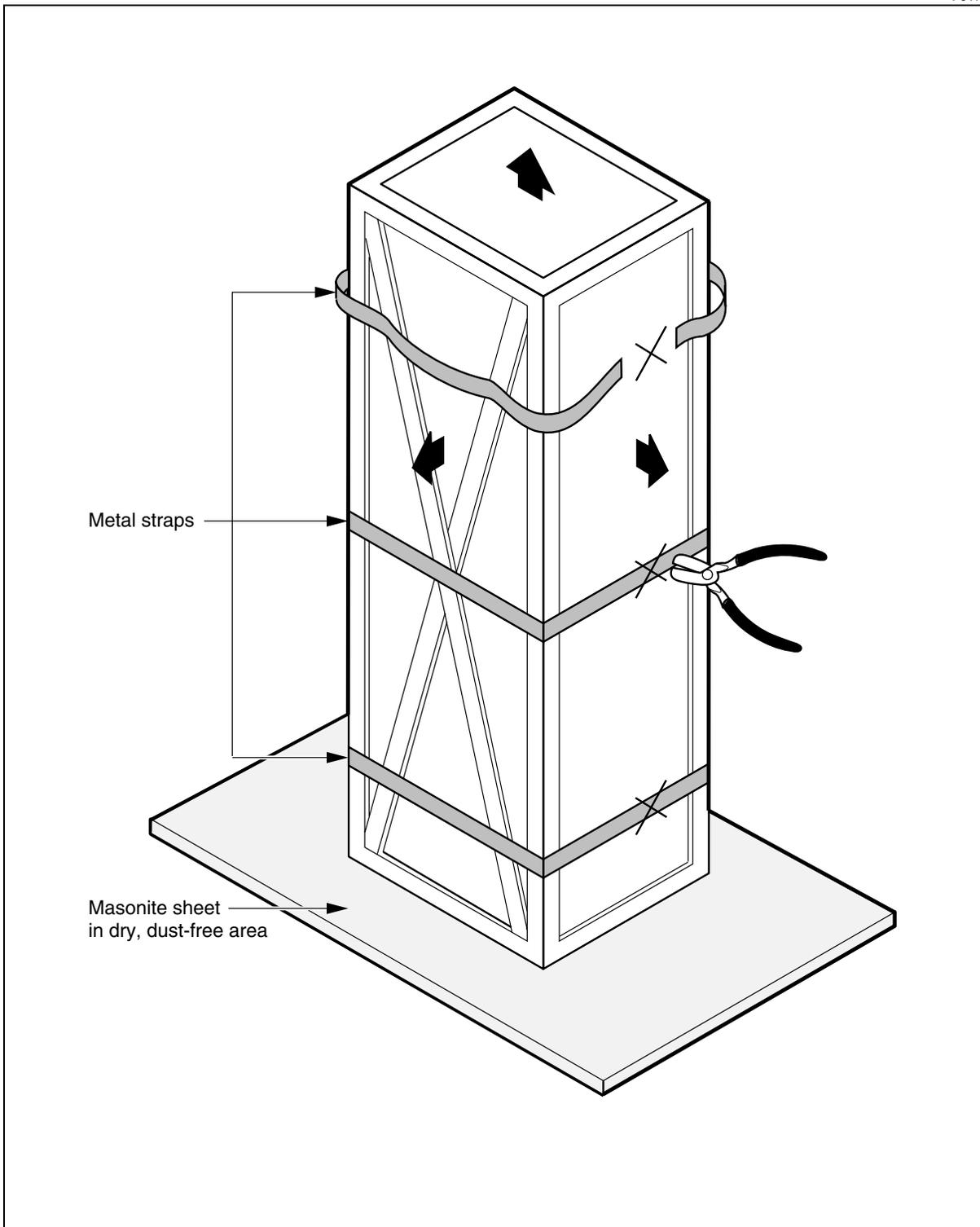
Figure 3-9
Installing frame extenders

F3048

Frame extension

Four bolts secure
the frame extension
to the bay frame

Bay frame

Ground strap

Note: This drawing shows a 2.13 m (7 ft) bay with a 0.31 m (1 ft) extension.
The height of your bay frame and extension may differ.
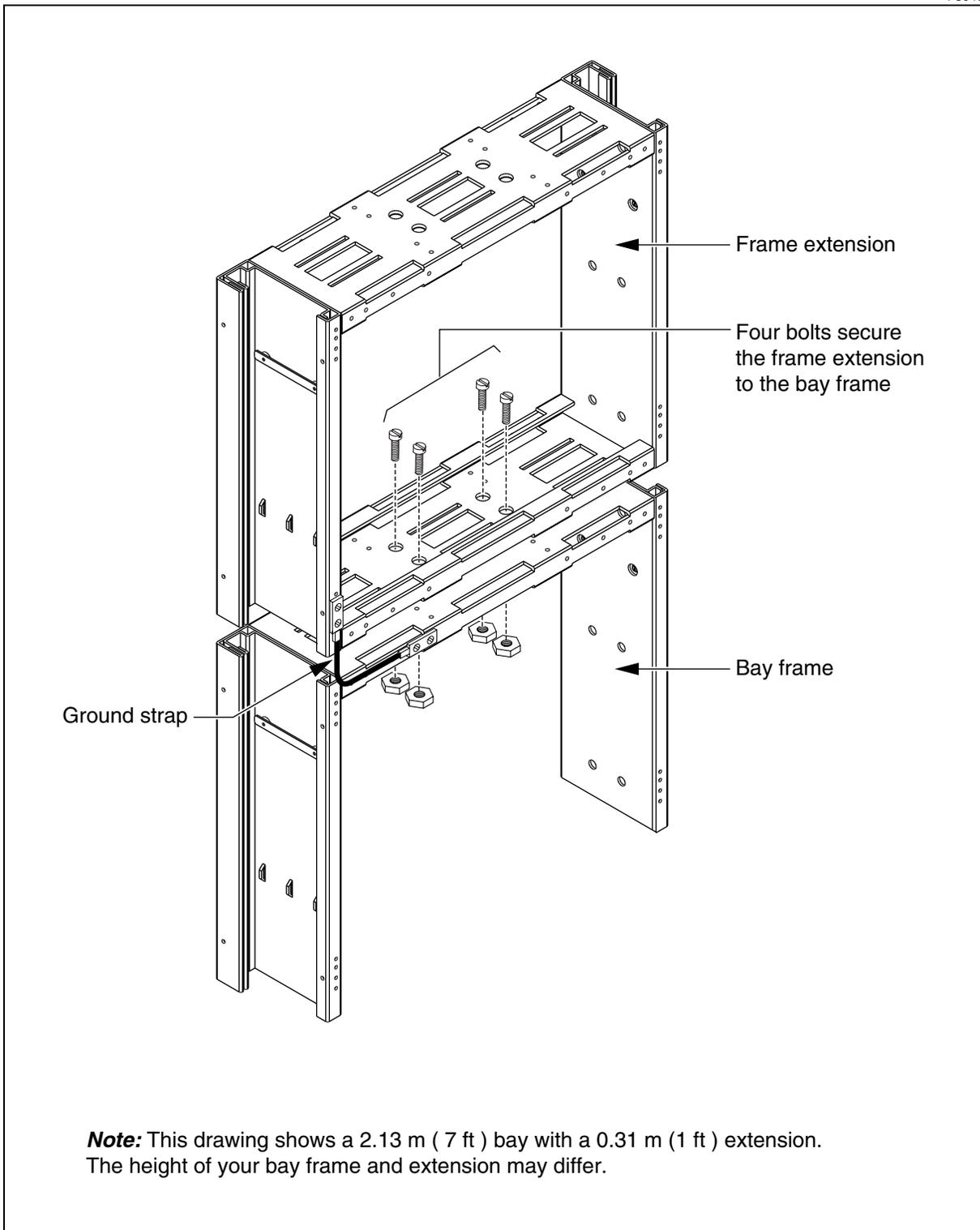
Procedure 3-3
Preparing the floor to install the bay frame

Use this procedure to prepare the floor area before securing the bay frame.

Requirements

Ensure you have:

- a copy of the floor plan for the site that shows the equipment frame line-up, maintenance aisles, wiring aisles and other supporting information.
- frame insulating kit (NT7E6020) (for IBN grounding)
- masonry drill
- 16 mm drill bit (for zone 2) or 18 mm drill bit (for zone 4)
- vacuum
- felt marker
- tape
- safety glasses

Step	Action
1	Check the EDP to determine the location of the new frame.
2	Mark the reference and layout lines on the floor where the isolation pad (part of NTE76020) will be placed.
3	Tape the isolation pad to the floor.
4	Mark the four (4) angled slots on floor using the isolation pad as a template.
5	**DANGER** **Risk of personal injury** Wear safety glasses while drilling. Drill four (4) holes centered within the isolation pad slots. See Figure 3-10 on page 3-33. *Note 1:* Vacuum all debris as you are drilling and ensure no debris remains in holes. *Note 2:* If this is a wood or steel floor make the appropriate pilot holes for lag bolts in wood or clearance holes for machine bolts in steel.
6	Drop an anchor into each of the four (4) drilled holes and tap all four (4) anchors just below flush with the floor.
7	If you do not install the bay immediately, cover the holes with acetate fiber tape.

—end—

Figure 3-10
Isolation pad dimensions

F0169

Bay top view
(Footprint without front guard rail)

Note 1: For standard (zone 2) anchor bolts, use a 16 mm (5/8 in.) masonry bit, and drill a hole 60 mm (2-3/8 in.) deep.

Note 2: For zone 4 anchor bolts, use a 18 mm masonry bit and drill a hole 100 mm (4.0 in.) deep.
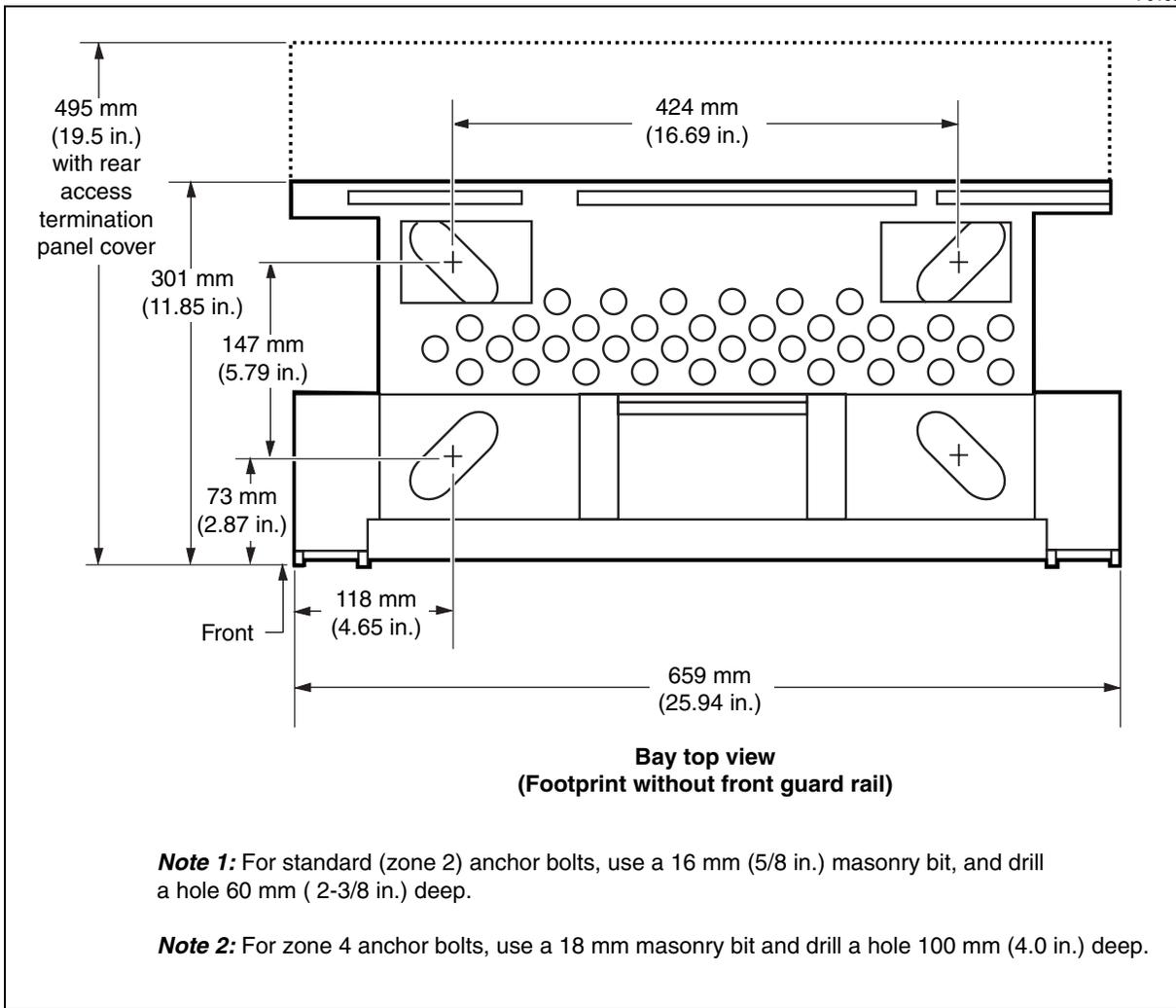
Procedure 3-4
Securing the bay frame

Use this procedure to secure the bay frame to the floor and to adjacent bay frames.

Requirements

- frame mover
- frame leveling kit-NT7E6040 (as required)
- spirit level, 24 in.
- socket wrench set, 1/2 in. drive
- socket, 3/8 in. hexagonal 3 in. deep—for M-10, standard anchoring
- socket, 5/8 in. hexagonal 3 in. deep—for M-12, earthquake anchoring
- torque wrench (100 ft-lb), 1/2 in. drive
- flathead screwdriver

Step	Action
1	Remove the tape covering the anchor holes as required.
2	Plumb the lineup to determine the highest floor spot, as the reference for leveling all bays in that lineup.

3

> ⚠ **DANGER**
> **Heavy equipment, risk of injury**
> Bay frames vary in weight, ensure that you have enough people to assist with the moving of the frame.

Use the frame mover to carefully slide the bay assembly over the insulating pad into its exact position in the bay lineup.

Note: Check that the anchor slots in the bay base and the bay insulating pad line up with the anchor holes.

4 Verify that the bay is leveled. Insert shims, if necessary, to correct the alignment and leveling.

Note: Place the shims between the bay and the bay insulating pad so that they are within the outline of the pad.

5 Assemble and insert anchor hardware.

If the frame is being anchored	**Then** see
to a concrete floor	Figure 3-11 on page 3-36
to a raised floor over concrete	Figure 3-12 on page 3-37

Procedure 3-4 (continued)
Securing the bay frame

Step	Action
6	Tighten the anchor bolts while verifying the level of the bay. Change the shims if necessary.
7	Tighten all anchor bolts with a torque wrench to the following specifications: — Standard anchor (M-10):40 ft-lbs (or 5.52 kg-m) for installation and 28 ft-lbs (or 3-86 kg-m) for inspection. — M-12 anchor for earthquake (zone 4): 58 ft-lbs (or 8 kg-m) for installation and 40 ft-lbs (or 5.52 kg-m) for inspection.

8

> **CAUTION**
> **Risk of damaging equipment**
> Avoid causing any strain on the frames when connecting bays together.

Secure the framework to adjacent bay(s) and overhead rack as applicable. See Figure 3-13 on page 3-38.

—**end**—

Figure 3-11
Anchoring to a concrete floor

F0172

Hex Nut

Flat washer
Threaded rod
Plate washer
Insulating bushing
Isolation pad
Frame base

Standard

Hex Nut

Flat washer
Threaded rod
Plate washer
Load indicating washer
Insulating bushing
Isolation pad
Frame base

Earthquake

Standard anchor bolt assembly requires 5/8 inch hole in floor

Earthquake anchor bolt assembly requires 3/4 inch hole in floor

Insert shims for leveling as required

Kickplate cover

Secure front grill using captive screws

Bay insulating (when required)

Bottom frame junction hardware

Figure 3-12
Anchoring to a raised floor over concrete

F3068

Washer
Hex nut
Washer
Computer floor (raised)
Frame base
Washer
Clamp
Washer
Hex nut
Threaded rod (cut to suit)
Concrete sub-floor
Anchor

Standard anchor bolt assembly requires 3/8 inch hole in floor

Earthquake anchor bolt assembly requires 5/8 inch hole in floor

Insert shims for leveling as required

Computer floor
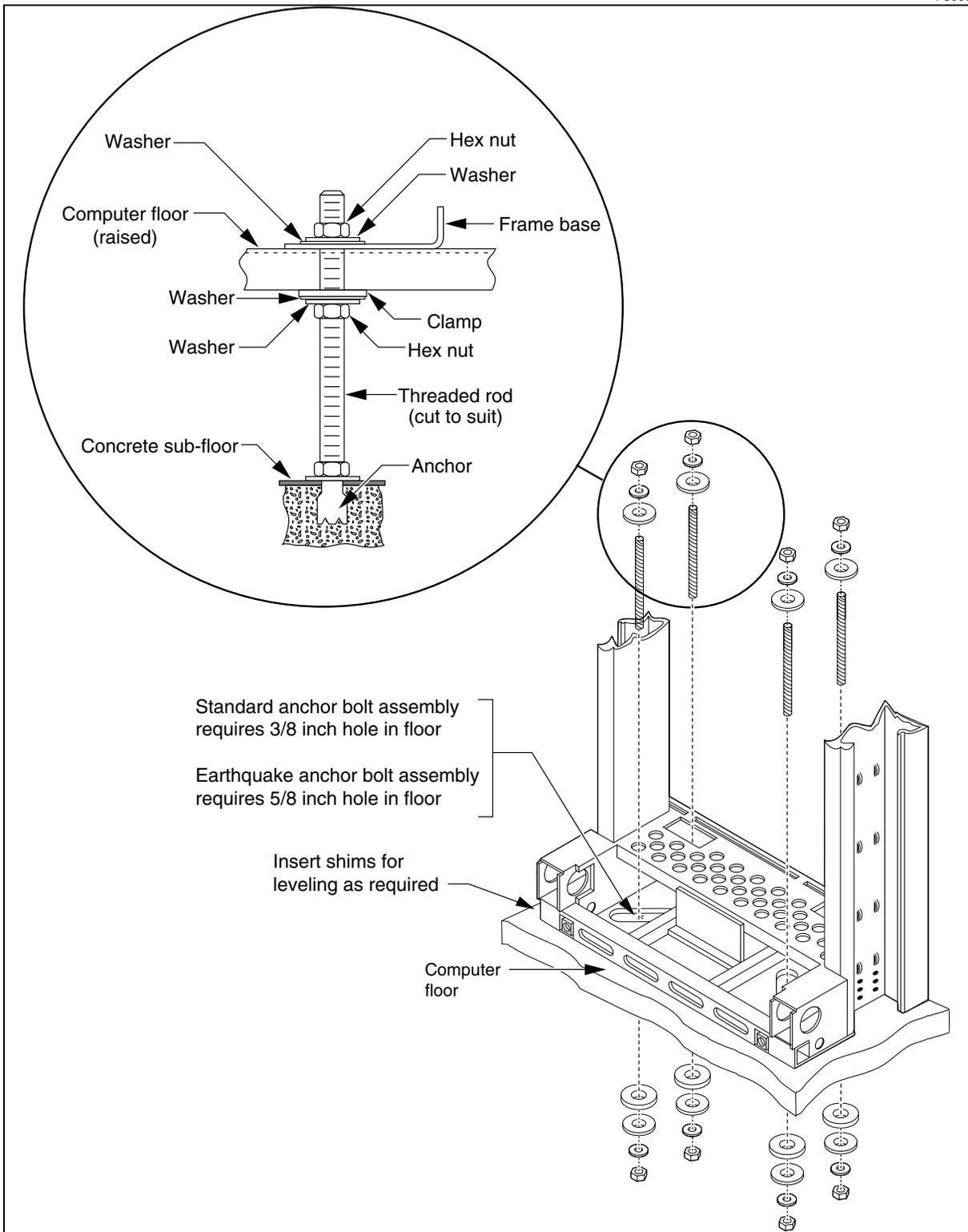
Figure 3-13
Securing adjacent bay frames

F0173

Channel auxiliary framing
(when required)

Top support kit

Spacer

Bay insulating
(when required)

Bay insulating
(when required)

Junction bracket
(Rear)

Ground Bar

Junction bracket
(Front)

Partial Front View
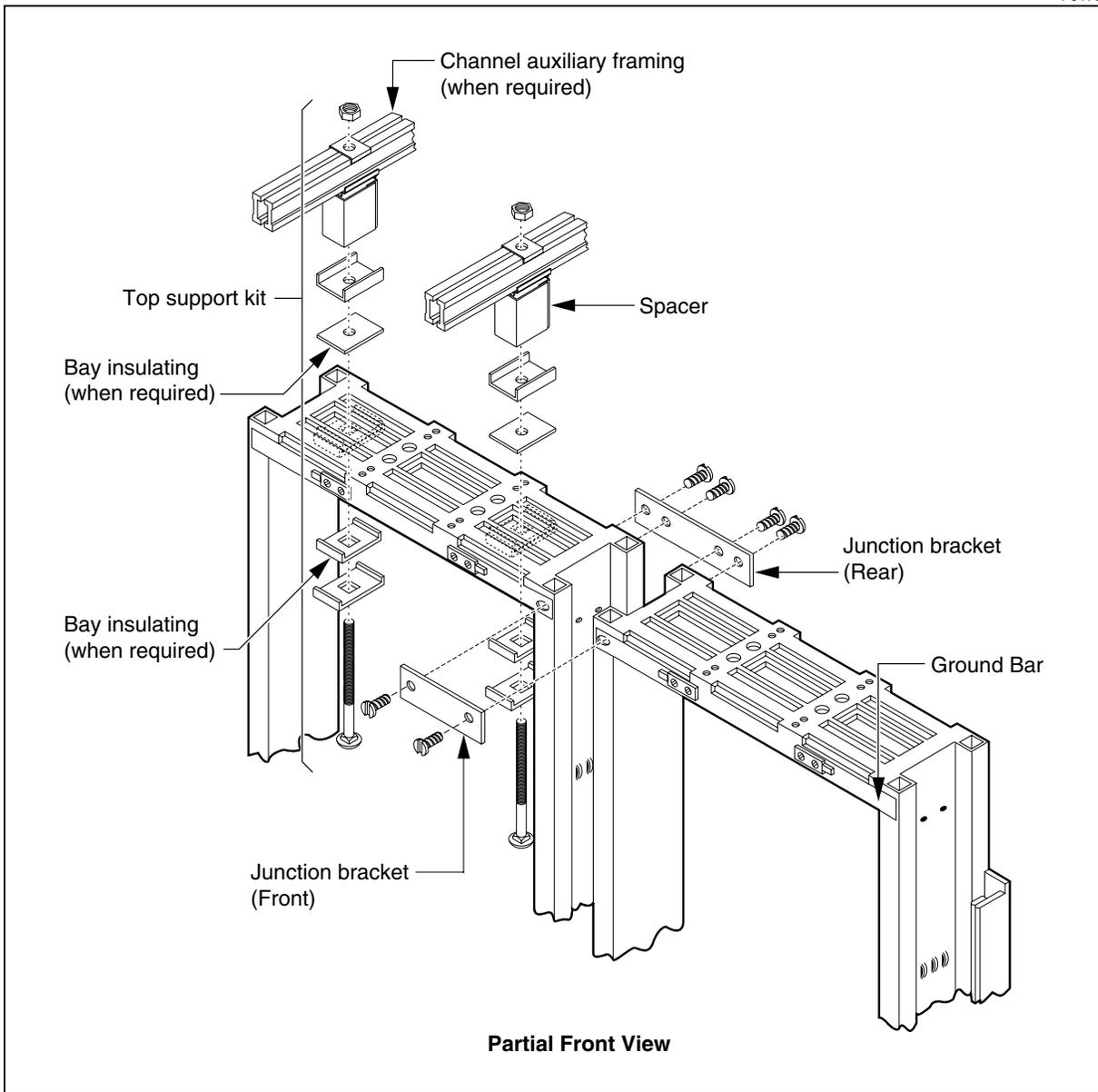
Procedure 3-5
Connecting the bay frame ground to the office ground

Use this procedure to connect the bay frame ground to the office ground.

Requirements

- wire cutters
- pliers
- crimping tool
- nut driver, 5/16 in.
- flathead screwdriver
- #6 AWG, 7-strand copper insulated conductor ground wire (as required)
- grounding lug (part of bay equipment)
- no-oxide paste

Step	Action
	Note 1: Throughout this procedure, apply antioxidant compound to exposed frame metal and exposed wire to prevent oxidation.
	Note 2: If the frame is painted, follow your companies procedures to remove the paint from the area where the lug will be fastened to ensure a proper ground.
1	Check that the bay ground bar is in place and is securely fastened to the bay frame with the self-tapping screws provided.
2	Route the grounding conductor from the office ground point to the bay ground bar at the top of the frame.
3	Strip 13 mm (0.5 in.) of insulation from the conductor and crimp the grounding lug to the conductor. See Figure 3-14 on page 3-40.
4	Attach the ground wire crimped connector to terminal 2 (green screw) on the bay ground bar. See Figure 3-15 on page 3-40. *Note:* For torque values, see Table 3-15 on page 3-255.
	—**end**—

Figure 3-14
Grounding lug

F1688

0.5 in.

Crimp-type
2-hole lug
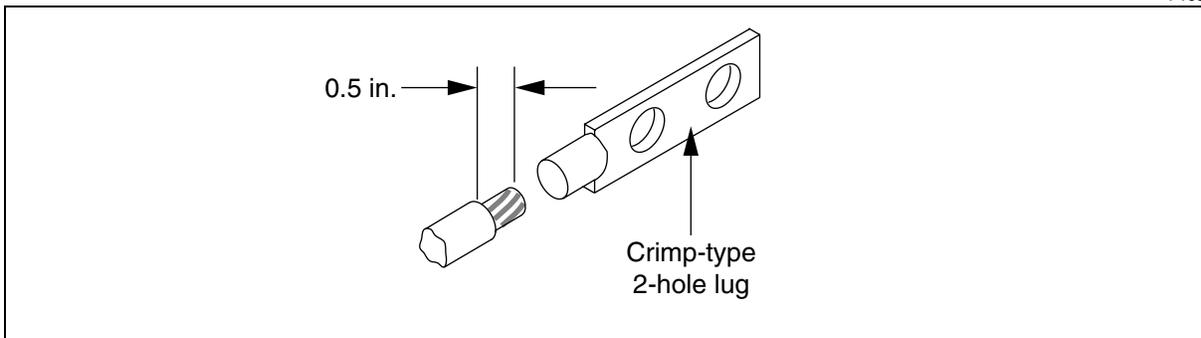
Figure 3-15
Connecting the bay frame ground to the office ground

F0174_R16-1

Pan head
screws

To frame
ground
collector or
single point
building ground

Ground lug

Metallic
ground strip

Ground
bar

Metallic
ground strip
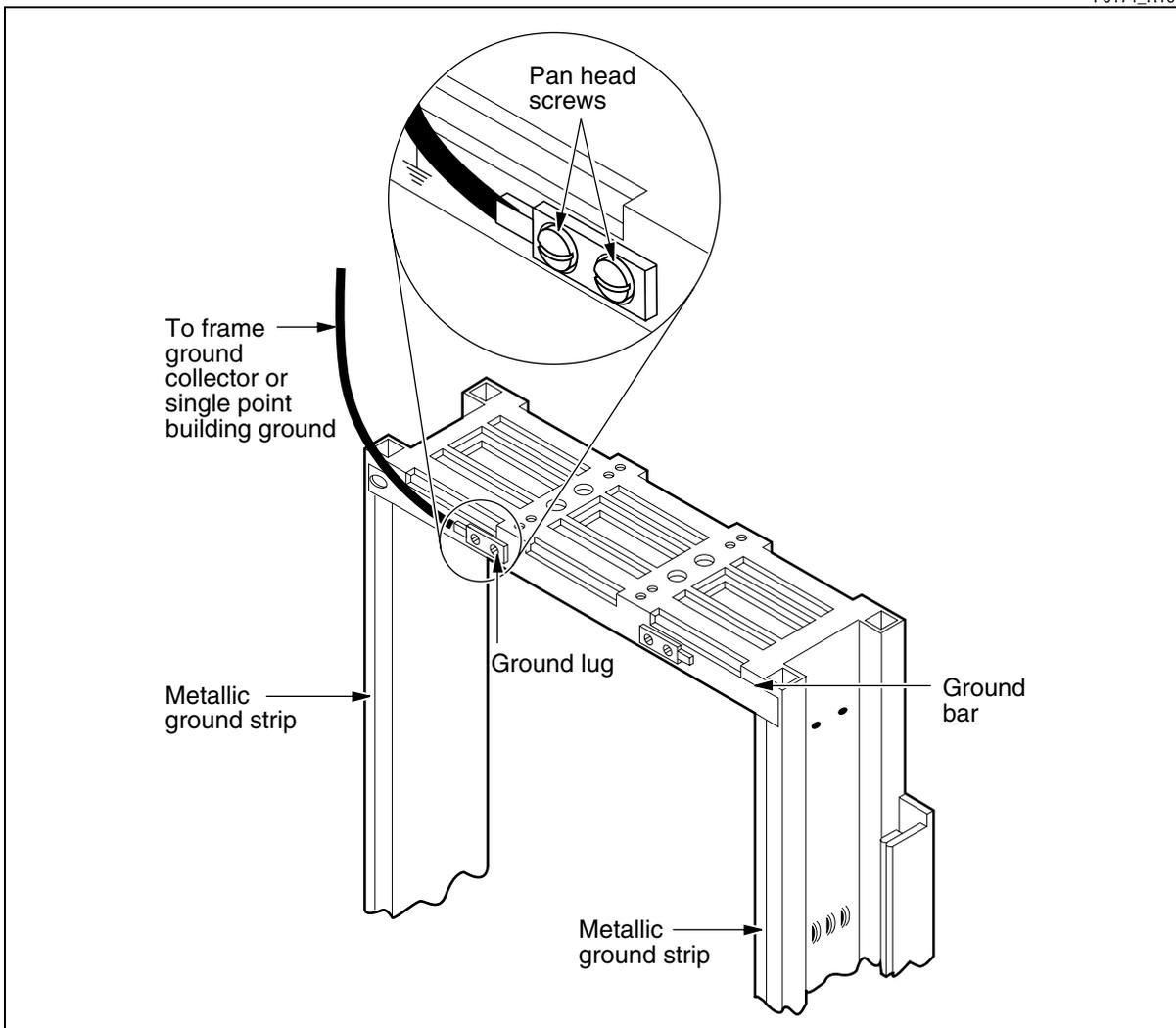
Procedure 3-6
Installing the drip tray

Use this procedure to install a drip tray when equipment is being installed on a flammable surface. See Figure 3-16 on page 3-42.

⚠	**DANGER** **Risk of fire** If the equipment is not installed on a concrete or other non-combustible surface, drip tray NTN450ZW must be installed under the shelf bottom openings to complete the fire enclosure.

Requirements

Ensure you have drip tray (NTN450ZW).

Step	Action

Mounting the bracket to the drip tray

1   **If** you are mounting the drip tray in a | **Then** go to

23-in. equipment frame	step 4
19-in. equipment frame	step 2

Note: The drip tray is shipped with the mounting brackets configured for a 23-in. equipment frame.

2   Detach the brackets from the drip tray.

3   Attach the long side of each bracket to the side of the drip tray.

Note: Use a torque wrench to verify that torque has been applied correctly: 30 in-lbs.

Mounting the drip tray on the equipment frame

4   Determine the correct height for the drip tray on the equipment frame.

Note: The minimum required clearance below a shelf is 1.75 in or 1 U.

5   Mount the drip tray on the equipment frame using mounting screws provided.

- With one hand, hold and position the tray in the frame.

- With the other hand, insert the screws that attach the right side of the drip tray to the frame.

- Continue to hold the drip tray in position with one hand.

- With the other hand, insert the screws that attach the left side of the drip tray to the frame.

- Use a screw driver to tighten the four screws. See Table 3-14 on page 3-254.

—end—

Figure 3-16
Drip tray (NTN450ZW)

EX1433p
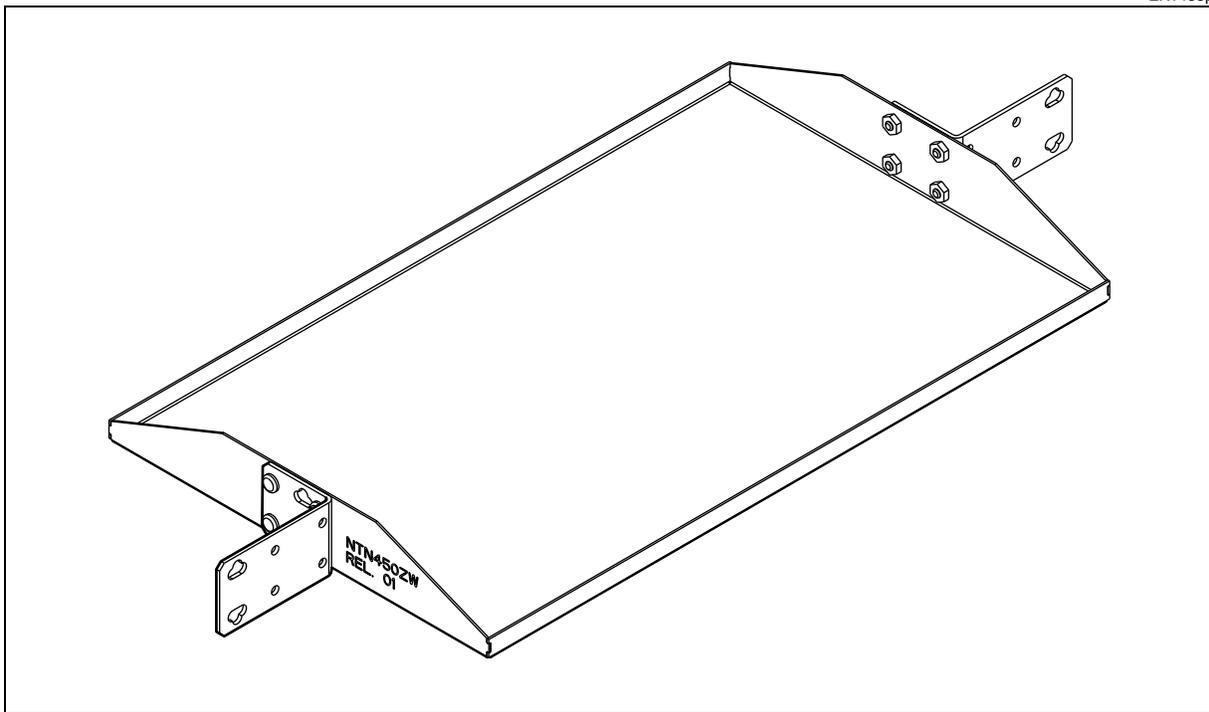
Procedure 3-7
Inspecting the breaker interface panel (NTN458RA) shipping container

The breaker interface panel (BIP) is shipped in a single container. The following components are included in the container:

- a BIP
- a pair of 19-inch brackets and attaching screws.
- a pair of 23-inch brackets and attaching screws.
- four mounting screws
- a ground cable

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify the BIP container contents.
4	Verify that all of the items listed are present.

—**end**—

Figure 3-17
Breaker interface panel (BIP)

EX1052p

Output connectors

Rear view
(rotated)

TOP OF PANEL

PWR ALM	FUSE ALARM		BAY ALARMS				
	VIS	AUD	CONTACTS			ACTIVATE	
NO	NC		NC	NO	C	A	R	CR
NC	NO		NC	NO	C	A	R	MJ
C	C		NC	NO	C	A	R	MN

Top view

5"

— 23" bracket

— 19" bracket

Front view

Output breakers power A

Output breakers power B
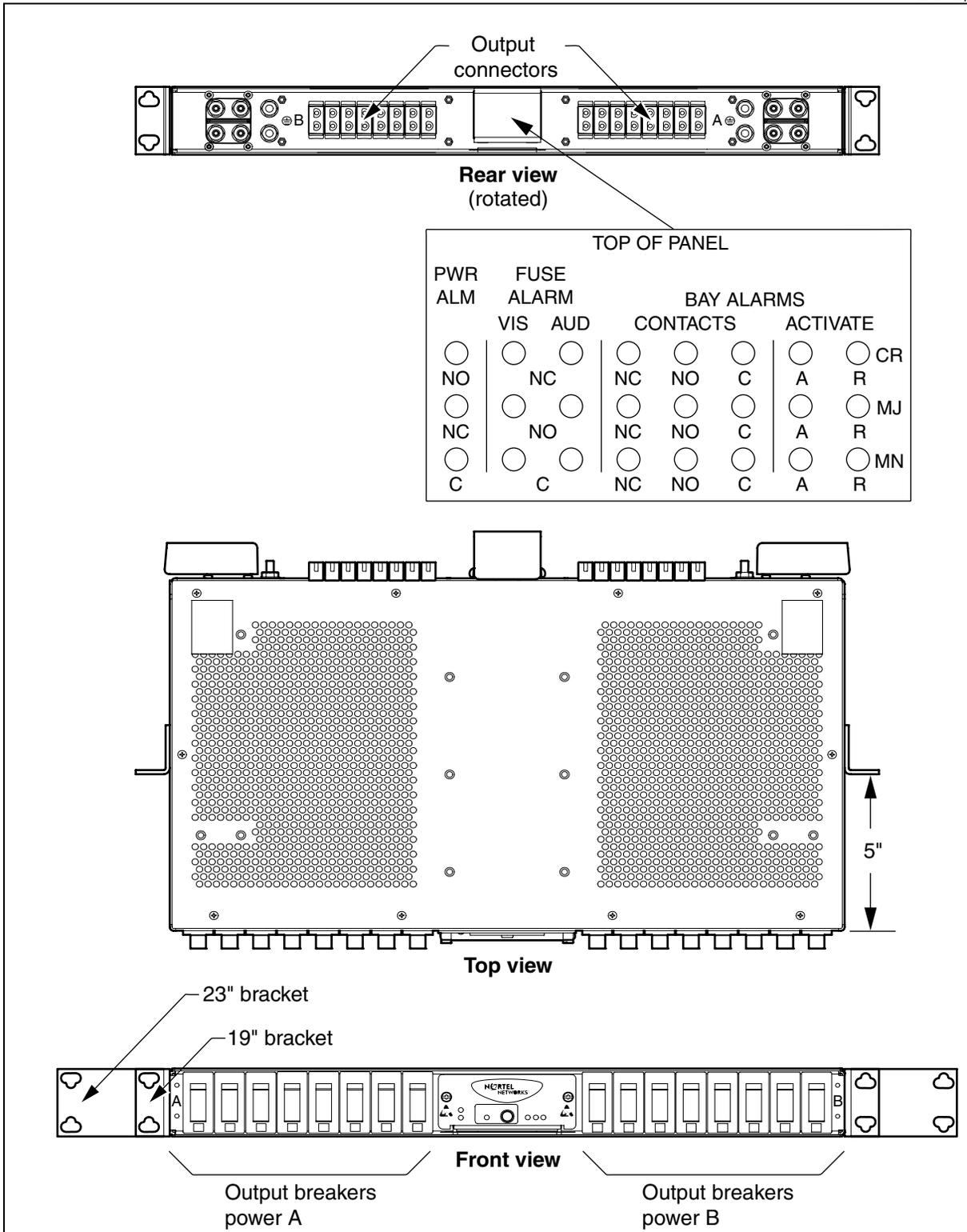
Procedure 3-8
Installing the breaker interface panel (NTN458RA)

Use this procedure to:

- mount the BIP in the equipment frame
- connect the ground cable
- connect power to the equipment frame (input wiring)
- test input power
- connect office (bay) alarm cables to the BIP
- install a second BIP (as required)

Note: The breaker interface panel (BIP) needs to be installed but requires no assembling operation.

Requirements

The BIP is not supplied with power cables. You must purchase or assemble the power cables according to the specifications.

Before you install the BIP, you must

- ensure that the equipment frame is installed, secured, and grounded according to the manufacturer's instructions
- ensure that you have appropriate equipment space and battery power
- ensure that all required interface, power, and communications cables are available
- ensure that you have a voltmeter
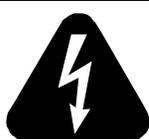
DANGER
Risk of electrical shock
The -48 Vdc office battery supply can deliver severe electrical shock that can cause personal injury. Follow all of your company's safety precautions and those found in this document.

CAUTION
Risk of equipment damage
Before connecting input cables, make sure input power to panel is turned off.

—continued—

Procedure 3-8 (continued)
Installing the breaker interface panel (NTN458RA)

Step	Action

Mounting the BIP in the equipment frame

1 Identify the equipment frame.

If you are mounting the BIP in a	**Then** go to
19-in. equipment frame	step 2
23-in. open equipment frame	step 3

2 Attach the 19-in mounting bracket to the side of the BIP, at five inches from the front. See Figure 3-17 on page 3-44.

Note: Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

Go to step 4.

3 Attach the 23-in mounting bracket to the side of the BIP, at five inches from the front. See Figure 3-17 on page 3-44.

Note: Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

4 Mount the BIP on the equipment frame using four mounting screws provided. See Figure 3-18 on page 3-49.

Note: The minimum clearance required above BIP 1 is 0.5 in.

- With one hand, hold and position the BIP to the frame.
- With the other hand, insert the screws that attach the right side of the BIP to the frame.
- Continue to hold the BIP in position with one hand.
- With the other hand, insert the screws that attach the left side of the BIP to the frame.
- Use a screw driver to tighten the four screws.

  Note: Use a torque wrench to verify that torque has been applied correctly: 35 in-lbs (4.29 N-m).

5 Refer to the *Planning and Ordering Guide*, NTRN10AM, for BIP specifications and power cabling selection.

Connecting the ground cable
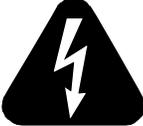
> **DANGER**
> **Improper grounding and risk of electrocution**
> Failure to turn circuit breakers to the OFF position can cause personal injury.

6 Attach a 2-hole compression lug onto the ground wire.

Note: Size of ground wire depends on input interruption device.

—continued—

Procedure 3-8 (continued)
Installing the breaker interface panel (NTN458RA)

Step	Action
7	If required, lightly coat anti-oxidant on lug, grounding terminal and surrounding contacting surface. Connect the lug to the terminal using KEPS nut as shown in Figure 3-19 on page 3-49 at the rear of the BIP.
	Note: Use a torque wrench to verify that torque has been applied correctly: 20 in-lbs (2.27 N-m).
8	Use the thread forming screws that comes with the shelf to attach the other end of the ground cable to the frame.
	Note: See Table 3-14 on page 3-254.

Connecting power to the equipment frame (input wiring)

	Note: Ensure you follow operating company guidelines when attaching input wiring.
9	Ensure that the input power is off and that all circuit breakers located on the front of the BIP are in the OFF (0 position) on both the A and B sides. No LEDs should be on.
10	Crimp straight or angled, 2-hole compression lugs onto copper wires.
11	Insulate lug barrels with UL94 V-0 rated heat shrink tubing.
12	**DANGER** **Risk of electrocution** In all cases, ensure heat shrink tubing completely covers all exposed metal on the power input lugs to the BIP. Failure to comply could result in electrocution.
13	Remove plastic covers from both pairs of BATT and RTN input terminals.
14	Clean all input terminals with a nonabrasive, nonmetallic pad.
15	If required, lightly coat anti-oxidant on lugs and input BATT and RTN terminals, and then connect lugs to input terminals on back of breaker panel, as shown in the Figure 3-20 on page 3-50 and Figure 3-17 on page 3-44.
	Note: Use a torque wrench to verify that torque has been applied correctly: tighten lugs to 20 in-lb (2.27 Nm).
16	After connecting input lugs to both sides (Sides A and B), supply input power to Sides A and B. See Breaker Interface Panel (BIP) (NTN458RA) specifications in the *Planning and Ordering Guide,* NTRN10AM*,* for electrical requirements.
	Both PWR (power) LEDs (A and B) on front panel must light (green).
17	Use a voltmeter to test voltage and polarity at input terminals of breaker panel.

—continued—

Procedure 3-8 (continued)
Installing the breaker interface panel (NTN458RA)

Step	Action
18	Re-attach plastic input terminal covers.
	Note: Before re-attaching plastic input terminal covers, it may be necessary to cut out the tongues of the lug covers in order to accommodate the two-hole lugs for the AWG #2 cabling.

Testing input power

19	Turn off power to either Side A or B.
20	Verify that corresponding PWR (power) LED extinguishes.
21	Verify that ALARM LED turns red.
22	Repeat step 19 to step 21 on the other side not yet tested.
23	Shut-off all power to the breaker interface panel.

Connecting office (bay) alarms to the BIP

24	At the rear of the panel, slide out the alarm wiring pinout insert. The alarm wiring pinout information for this BIP is also shown in Figure 3-17 on page 3-44.
25	Wire wrap the office alarm cable to the appropriate pins. The minimum number of wire-wrap connections for each pin is five.

Installing a second BIP

26	Repeat step 1 to step 25 for BIP 2 if required.
27	Route the BIP cable harness along the frame. See Figure 3-21 on page 3-51.
	Note: The minimum clearance required below BIP 2 is 1.75 in.

<div align="center">**—end—**</div>

Figure 3-18
Installing a BIP

EX1055p

0.5 in

1.75 in

BIP 1
Space for BIP 2

OPTera Metro 3500
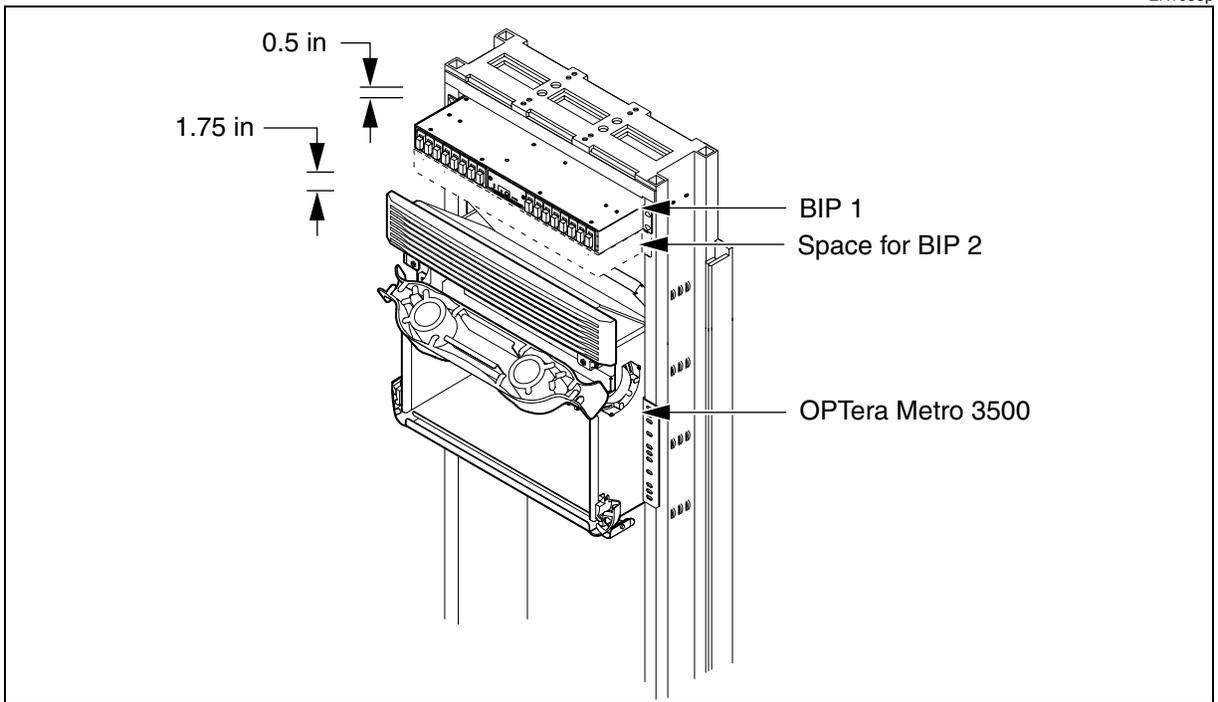
Figure 3-19
Attaching ground lug

TBD

Anti-oxidant
compound
(If required)

CHS
GND

Compression
lug

CHS
GND

If necessary
remove paint
on sheet metal under lug
(recommended)
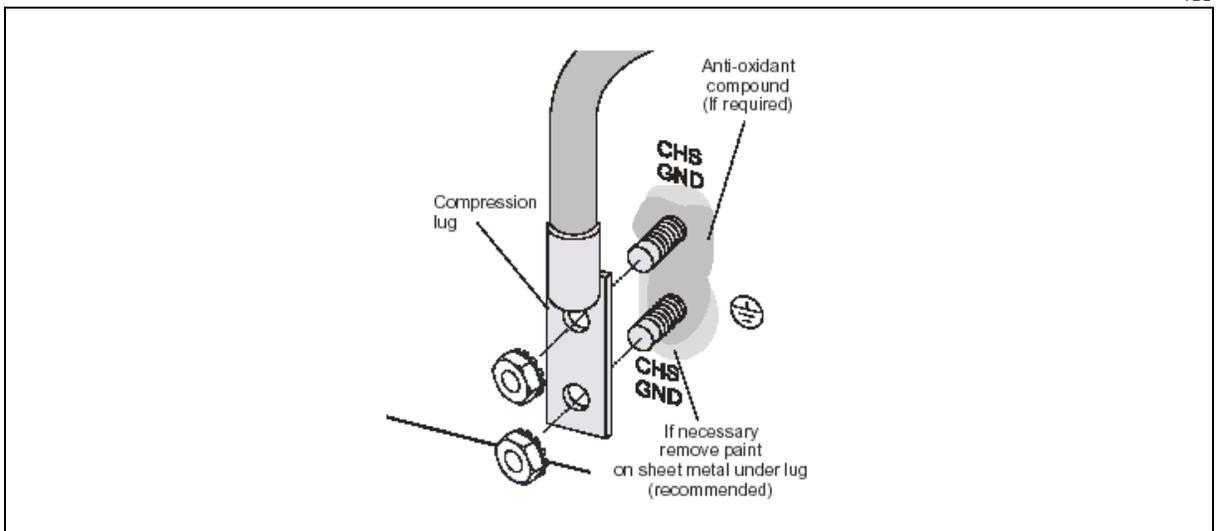
Figure 3-20
Input lug connections

TBD
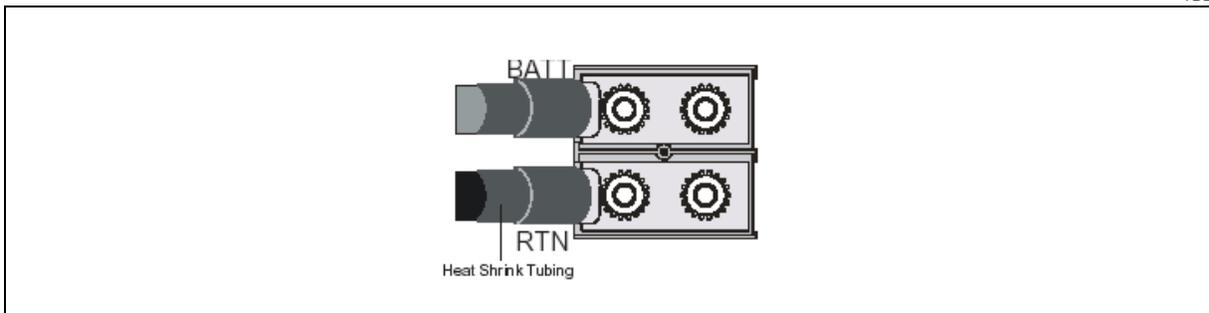
Figure 3-21
Routing the BIP power cables

EX1226p

Power cable harness

BIP (NTN458RA)

Ground cable
Power cable
Fan alarm cable
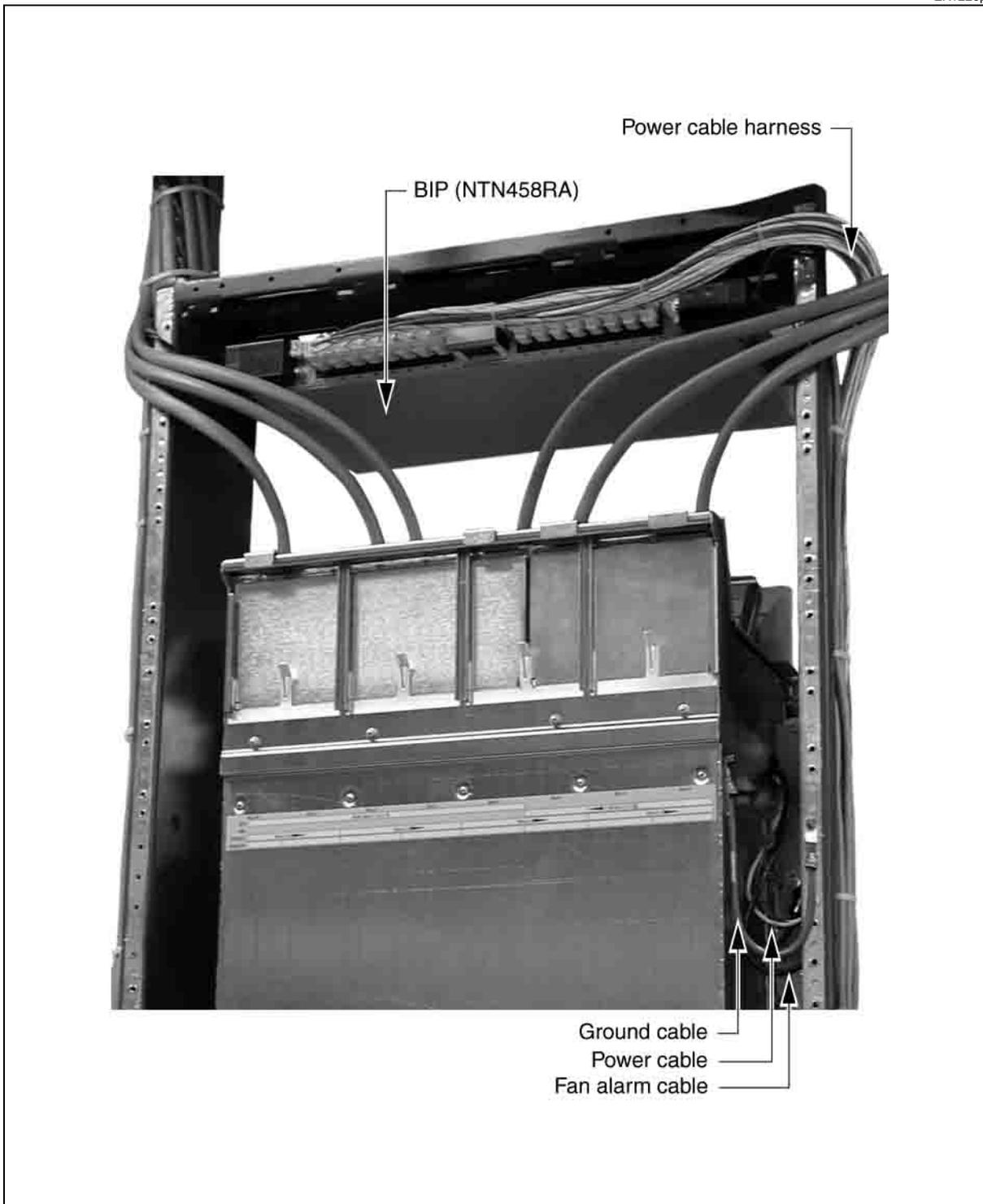
Procedure 3-9
Inspecting the breaker interface panel (NTFW56BA) shipping container

The breaker interface panel (BIP) is shipped in a single container. The following components are included in the container:

- breaker interface panel
- breaker interface panel front cover
- four EOO Cable Lugs, M6, 16 mm2 (#6 AWG)
- two AAH Cables 16 mm2 (#6 AWG) Black
- two AAA Cables 16 mm2 (#6 AWG) Blue
- QOO Cable tie- natural, large 270 mm LG (10.62 in.)
- four mounting screws
- a grounding cable (NTN45061)
- a faceplate
- shelf power cables

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify the BIP container contents.
4	Verify that all of the items listed are present.

—*end*—

Procedure 3-10
Installing the breaker interface panel NTFW56BA (for European deployment only)

Two separately fused 48 V dc supplies are required to connect to the breaker interface panel (BIP). The supplies must be fused at 50A using a High Rupture Capacity (HRC) type fuse. Connections for the dc supply are made using 16 mm^2 (#6 AWG) cable and ring terminal lugs.

Note 1:   The supplies must be fused at 50A using a High Rupture Capacity (HRC) type fuse.

Note 2:   NTFW56BA is classified as SELV for safety and can only be used in locations where electrical connection to external equipment is within the same building and equipotential zone

Requirements

The BIP is not supplied with power cables. You must purchase or assemble the power cables according to the specifications.

Before you install the BIP, you must

- ensure that the equipment frame is installed, secured, and grounded according to the manufacturer's instructions

- ensure that you have appropriate equipment space and battery power

- ensure that all required interface, power, and communications cables are available.

> **CAUTION**
> **Risk of equipment damage**
> Before connecting input cables, make sure input power to panel is turned off.

> **WARNING**
> **Electrical hazard**
> The 48 V dc supply delivers high currents. Ensure you follow all safety guidelines provided by your company and this guide.

—continued—

Procedure 3-10 (continued)
Installing the breaker interface panel NTFW56BA (for European deployment only)

Step	Action
1	Ensure that the 48 V dc supply is isolated from the BIP before commencing work.
2	Remove the snap-on BIP faceplate.
3	Mount the BIP on the equipment frame using alignment studs and the four mounting screws provided.

Note: The minimum clearance required above the highest BIP is 0.5 in.(12.7 mm).

- Insert the alignment studs in the equipment frame.
- Hang the BIP from the alignment studs.
- Insert and tighten the BIP screws in the holes of each bracket.

    Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

- Remove the alignment studs.
- Insert and tighten the mounting screws in the same hole that the alignment studs were in.

    Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

Step	Action
4	Identify the Return A and Feed A, and the Return B and Feed B office battery distribution power cables.
5	Terminate the supply cables with lugs using a BMR16u3 crimp tool prior to routing the cables into the rack.
6	Remove the terminal screws and star washers on the connection terminals. See Figure 3-22 on page 3-56.
7	Route the cables into the BIP and connect as shown using terminal screws, star washers and screw-holding screwdriver. Refer to Figure 3-22 on page 3-56.
8	Unscrew the screws on the access panel that covers the power connectors.
9	Connect the A office battery distribution power cables respectively to first the Return A and then the Feed A connectors at the front of the BIP using a screw-holding screwdriver and the screws you removed in step 6.
10	Connect the B office battery distribution power cables respectively to first the Return B and then the Feed B connectors at the front of the BIP using a screw-holding screwdriver and the screws you removed in step 6.

—continued—

Procedure 3-10 (continued)
Installing the breaker interface panel NTFW56BA (for European deployment only)

Step	Action
11	At the rear of each breaker, connect the colored wire to normally closed (NC) if the breaker is to remain ON, and to normally open (NO) if the breaker is to remain OFF. This extinguishes the circuit breaker alarm lamp during normal operating conditions. See Figure 3-23 on page 3-58.

Note 1: Unused circuit breakers can be left in an OFF or ON position. If unused circuit breakers are left in an ON position, maintenance personnel can easily identify a tripped circuit breaker.

Note 2: There are two types of circuit breakers available. Determine the type of circuit breaker used and wire accordingly.

Step	Action
12	Set the DIP switches on the BIP. See Figure 3-24 on page 3-59 for DIP switch configurations.
13	Connect the office alarms to the BIP.

Note: You require a screwdriver, wire-wrap tool, and wire skinner to complete this task.

   a. Open the BIP right-hand door to reveal the office alarm connection block (see Figure 3-22 on page 3-56).

   b. Remove the plastic cover.

   c. Wire wrap the office alarm cable to the appropriate pins, as shown in Table 3-1 on page 3-57. The minimum number of wire-wrap connections for each pin is five.

   d. Close and secure the left front panel.

Step	Action
14	Install the BIP front cover.
15	Repeat step 2 through step 14 for BIP 2 if required.

Note: The minimum clearance required below the lowest BIP is 1.75 in.

—**end**—

Figure 3-22
Breaker interface panel NTFW56BA dc power connections

Ex1139p

Feed A
Return A
Return B
Feed B

Feed A
Return A
Return B
Feed B

Undo screws completely and
slide access panel to the left

WARNING
Power
Access Panel

Power connections situated
behind access panel

22.5 inches

15A breakers

BIP cables

Power white
Critical red
Major red
Minor yellow

LEDs

ACO

Alarm pins

Critical disable

Trip LED

Front
cover

Battery A
A1 A2 A3 A4
Battery B
B1 B2 B3 B4
Trip

Power
Critical
Major
Minor

Power white
Critical red
Major red
Minor yellow

Table 3-1
BIP office alarm wire wrap pinout

E1 Visual Critical NC	E2 Visual Critical NC	E3 Visual Major NC	E4 Visual Major NC	E5 Visual Minor NC	E6 Visual Minor NC	E7 Audible Critical NC	E8 Audible Critical NC	E9 Audible Major NC	E10 Audible Major NC	E11 Audible Minor NC	E12 Audible Minor NC
E13 Visual Critical COM	E14 Visual Critical COM	E15 Visual Major COM	E16 Visual Major COM	E17 Visual Minor COM	E18 Visual Minor COM	E19 Audible Critical COM	E20 Audible Critical COM	E21 Audible Major COM	E22 Audible Major COM	E23 Audible Minor COM	E24 Audible Minor COM
E25 Visual Critical NO	E26 Visual Critical NO	E27 Visual Major NO	E28 Visual Major NO	E29 Visual Minor NO	E30 Visual Minor NO	E31 Audible Critical NO	E32 Audible Critical NO	E33 Audible Major NO	E34 Audible Major NO	E35 Audible Minor NO	E36 Audible Minor NO
E37 Battery Return	E38 Battery Return	E39 Battery Return	E40 Battery Return	E41 Remote ACO	E42 Remote ACO	E43 Battery Return	E44 Battery Return	E45 Battery Return	E46 Battery Return	E47 Battery Return	E48 Battery Return

ACO = Alarm cut-off

COM = Common connection

NC = Normally closed connection when there is no alarm condition.

NO =Normally open connection when there is no alarm condition.

Note 1: An ACO of the audible alarms is activated when either pin E41 or E42 is connected to battery return.

Note 2: Common interconnect pins are actually shorted together. For example, pins E1 and E2, E3 and E4, E5 and E6, and so on, are physically shorted together.

Figure 3-23
BIP circuit breaker wire connections for NTFW56BA

F0408TBM-CA

Colored wires

Line

Normally closed
Normally open
Common

Load

CBA1
CBA2
CBA3
CBA4
CBB1
CBB2
CBB3
CBB4

Rear view
of Airpax and
Carlingswitch (current design)
circuit breakers

Colored wires

Line

Common
Normally open
Normally closed

Load

CBA1
CBA2
CBA3
CBA4
CBB1
CBB2
CBB3
CBB4

Rear view of
Carlingswitch (previous design)
circuit breakers

Plastic tab
Pull breakers
forward (Note 1)

CBA1
CBA3
CBB1
CBB3

CBA2
CBA4
CBB2
CBB4

NT7E56CA

NT7E56AB/BA

Note 1: Breakers are made accessible by pushing up on plastic retaining tab above breaker, then pulling breaker forward.
Note 2: The electrical connections on the NT7E56CA BIP are the same as on the NT7E56AB/BA BIP.

Figure 3-24
Provisioning BIP DIP switches on NTFW56BA

F2290-CA

SW1

0 ◄——► 1

	1	
Shelf unequipped	2	Shelf equipped
	3	
Audible critical alarm ENABLED	4	Audible critical alarm DISABLED

SW2

0 ◄——► 1

	1	
MODEM unequipped	1	MODEM equipped
Not used	2	Not used

Note 1: DIP switches are shown in the equipped mode.

Note 2: On the NT7E56CA BIP, the modem is equipped automatically upon connection, and therefore SW2 is not required.
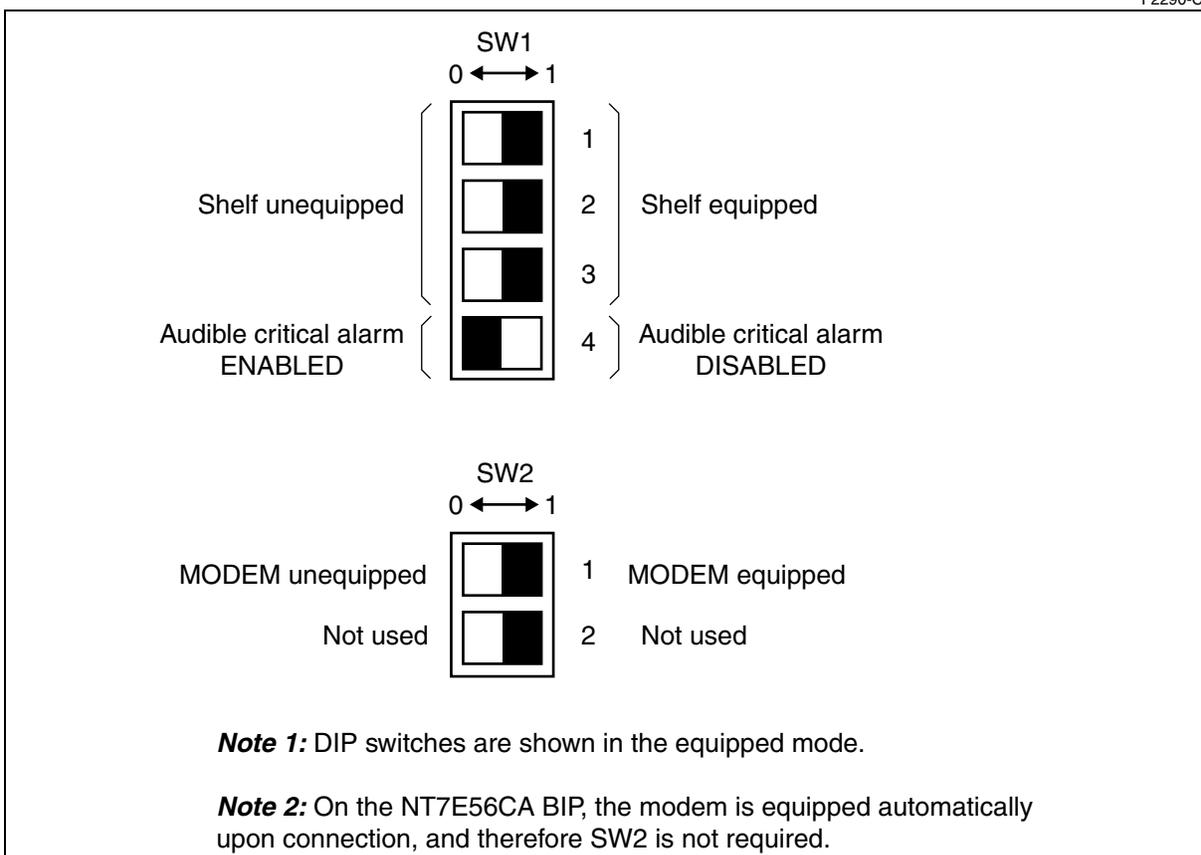
Procedure 3-11
Inspecting the OPTera Metro 3500 shipping container contents

The OPTera Metro 3500 shelf is shipped in a single container. The following components are preassembled on the shelf:

- left interface (LIF)
- left OAM (LOAM)
- power modules
- cooling fan unit
- grill/air deflector
- fiber storage tray
- front cover

Generally circuit packs are shipped in separate containers, except the LIF the LOAM and the power modules are in the shelf container. If the shelf has been hot staged, then the shelf is shipped with circuit packs installed.

⚠️ **CAUTION**
Risk of circuit pack damage
The circuit packs are packed in antistatic containers that protect the circuit packs from your personal static electricity. Do not remove the circuit packs from the containers until you are instructed to in one of the following procedures.

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify the OPTera Metro 3500 shelf container contents.
	See:
	• Figure 3-25 on page 3-61 if you have an NTN476DA shelf.
	• Figure 3-26 on page 3-62 if you have an NTN476AH shelf.
4	Verify that all of the circuit packs required for this shelf are present.

—end—

Figure 3-25
OPTera Metro 3500 (NTN476DA) - shipping container contents

EX1257p

Left mounting bracket

Top left fiber guide

Grill / air deflector

Cable retainer

Fiber storage tray

Lower right
fiber guide

Bottom fiber channel

Connector
applicator

Front cover

LOAM

LIF

Bottom left
fiber guide

Power module B

Power module A

Note: The fiber storage tray capacity is 60 ft.
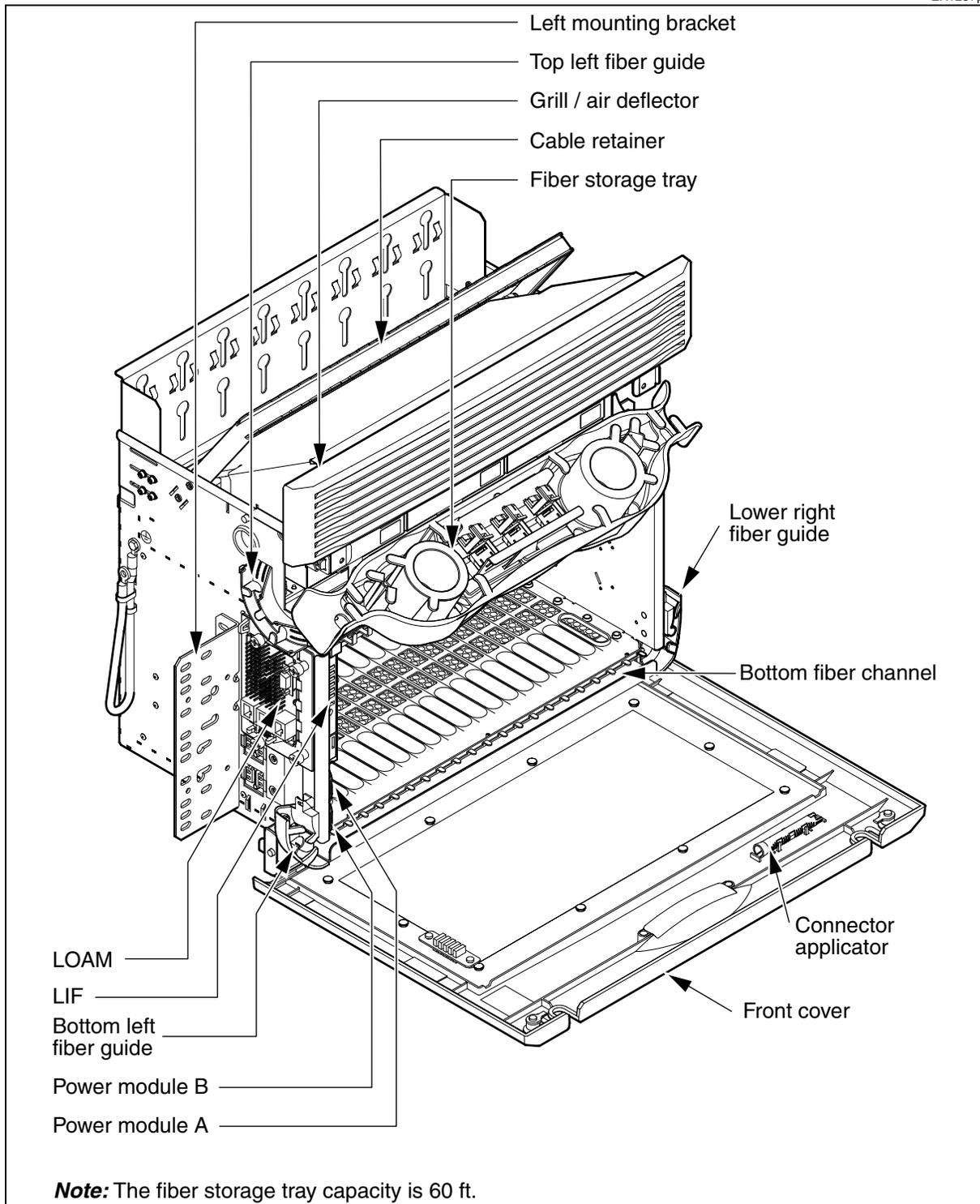
Figure 3-26
OPTera Metro 3500 (NTN476AH) - shipping container contents

EX1256p

Left mounting bracket

Top left fiber guide

Grill / air deflector

Cable retainer

Fiber storage tray

Lower right fiber guide

Bottom fiber channel

Connector applicator

Front cover

LOAM

LIF

Bottom left fiber guide

Power module B

Power module A

Note: The fiber storage tray capacity is 60 ft.
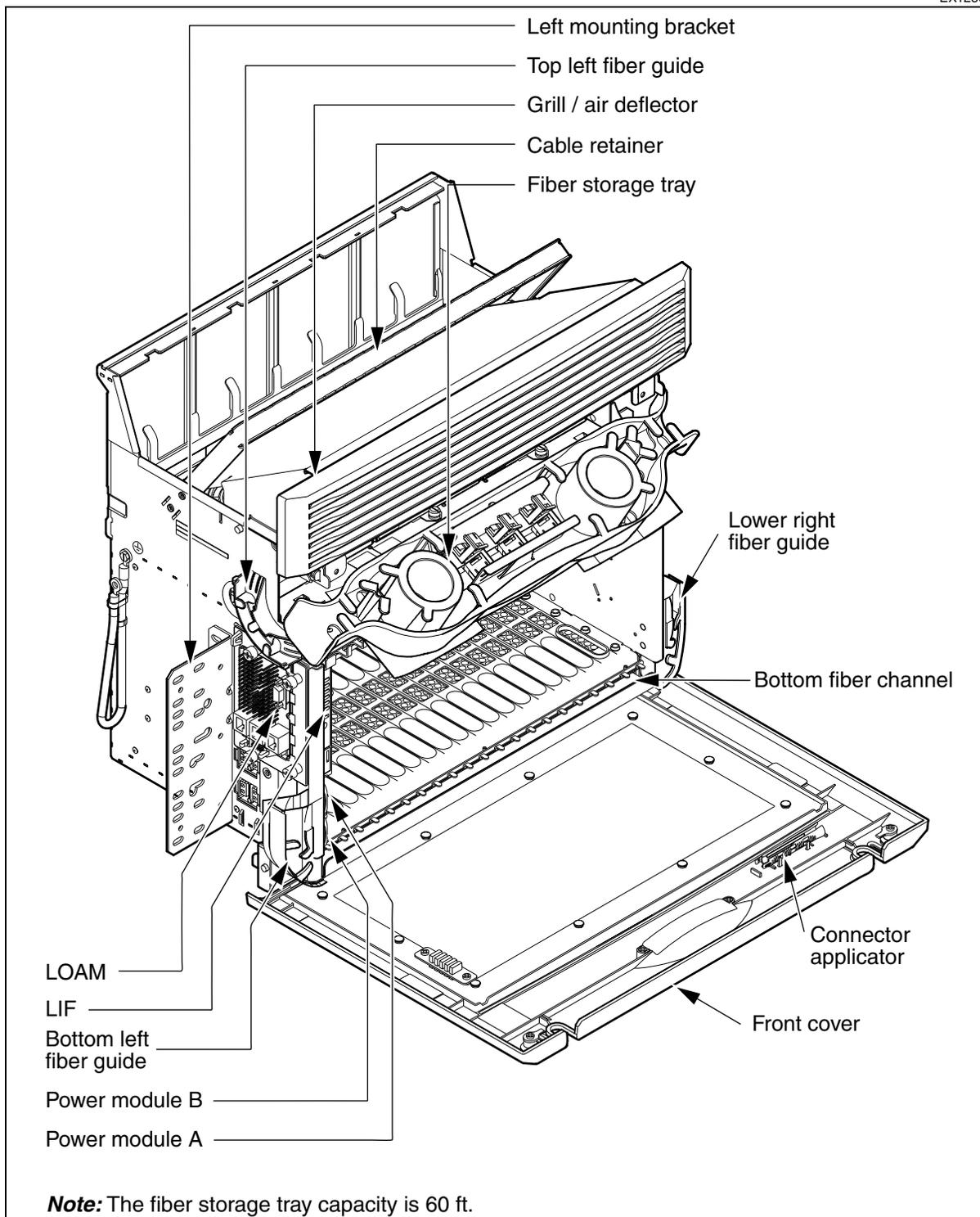
Procedure 3-12
Installing the OPTera Metro 3500 shelf

Use this procedure to mount the OPTera Metro 3500 shelf in a 19-in. or 23-in. equipment frame.

Requirements

To perform this procedure, you must

- ensure the equipment frame is properly installed according to the manufacturer's instructions

- position the existing cables so that the addition of the OPTera Metro 3500 shelf to the frame does not damage the cables or interrupt with traffic

Note 1: The figures in this procedure show a shelf configured for front access. The actions for mounting a shelf configured for rear access are identical to those for mounting a shelf configured for front access.

Note 2: The miscellaneous hardware required for shelf mounting (bolts, lock washers, alignment studs, and screws) is in the NTN45065 installation kit.

⚠	**CAUTION** **Risk of equipment damage and traffic loss** Install this product over a non-inflammable surface only.

⚠	**CAUTION** **Risk of equipment damage and traffic loss** You must install the shelf cover to ensure the design performance and thermal management system.

⚠	**CAUTION** **Risk of exceeding EMI or RFI emission acceptable levels** You must install the shelf cover to keep electromagnetic interference and radio frequency emissions within acceptable levels.

⚠	**CAUTION** **Risk of equipment damage** The OPTera Metro 3500 is suitable for connection to intrabuilding or unexposed wiring or cabling only.

—continued—

Procedure 3-12 (continued)
Installing the OPTera Metro 3500 shelf

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	**Action**

1   Determine the correct height for the shelf on the equipment frame.

Note: The minimum required clearance below a shelf is 1.75 in. The distance from the front of the shelf to the front edge of the frame base plate is 5.07 in. The shelf is flush with the back edge of the frame base plate.

2   Determine where to mount the shelf.

If you are mounting the shelf in a	**Then** go to
23-in. equipment frame	step 5
19-in. equipment frame	step 3

Note: The shelf is shipped with the mounting brackets configured for a 23-in. equipment frame.

3   The shelf is shipped with the mounting brackets configured for a 23-in. equipment frame. Detach the brackets from the shelf. See Figure 3-27 on page 3-66.

4   Attach the long side of each bracket to the side of the shelf.

Note: Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

Mounting the shelf on the equipment frame

Note: Use this procedure for all supported 19-in. and 23-in. equipment frames. For a list and top view of all valid (open) equipment frame mounting arrangements see Figure 3-29 on page 3-68.

5   Mount the shelf on the equipment frame using the alignment studs and four #12-24 self-tapping screws; see Figure 3-28 on page 3-67.

<p align="center">—**continued**—</p>

Procedure 3-12 (continued)
Installing the OPTera Metro 3500 shelf

Step	Action
6	⚠ **Risk of dropping the equipment** To prevent the shelf form tipping and fall, you must install the stud in the holes that matches the bottom holes of the shelf.

Insert the alignment studs in the equipment frame, in the holes that match the bottom holes of the shelf.

7	Hang the shelf from the alignment studs.
8	Insert and tighten the shelf screws in the top hole of each bracket. *Note:* Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.
9	Remove the alignment studs.
10	Insert and tighten the shelf screws in the same hole that the alignment studs were in. *Note:* Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

—**end**—

Figure 3-27
Attaching the mounting brackets to the shelf

EX1258p

19-in configuration

23-in configuration
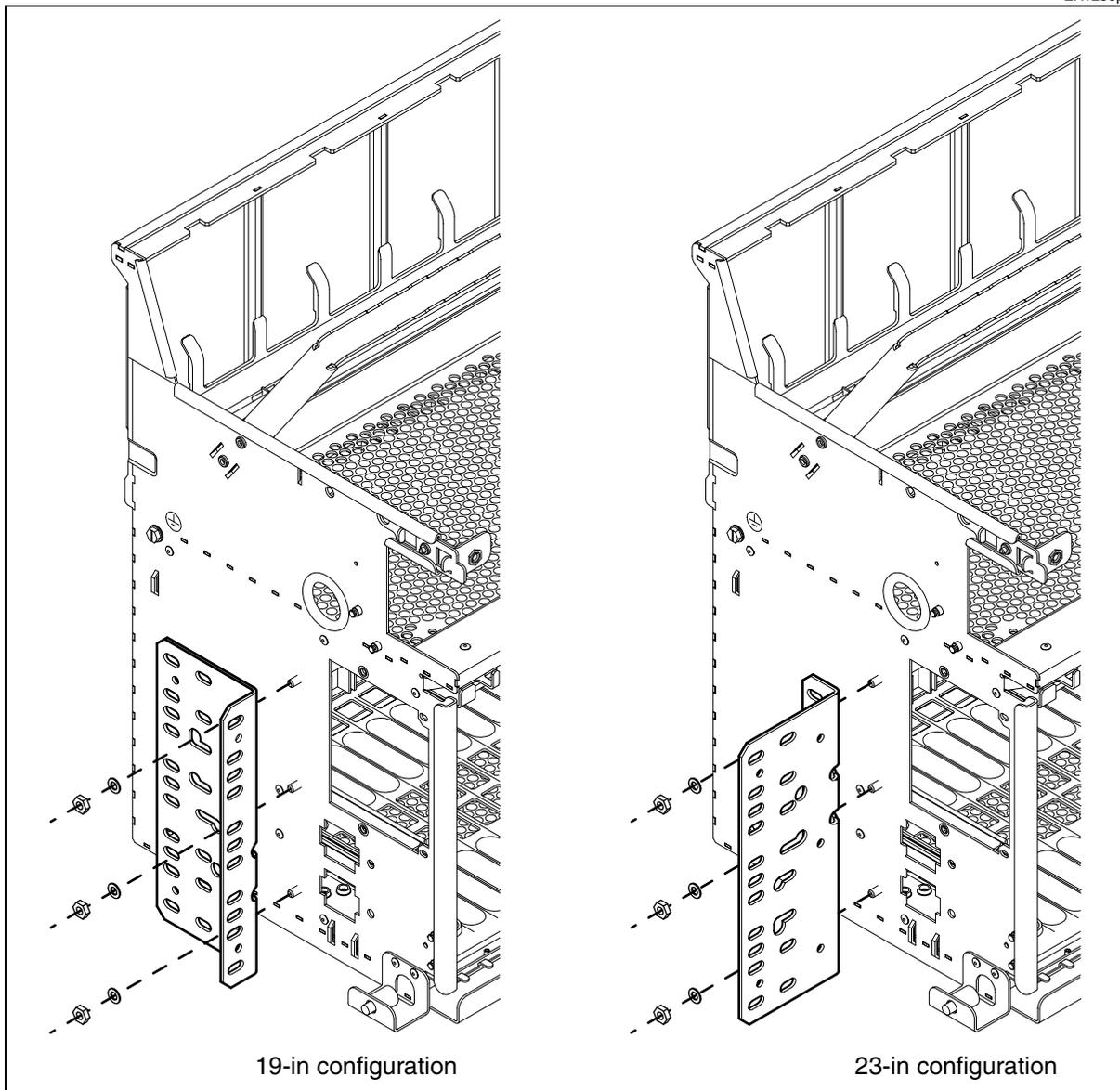
Figure 3-28
Mounting the OPTera Metro 3500 shelf on an equipment frame

EX1276p

Screws

Screws

Studs
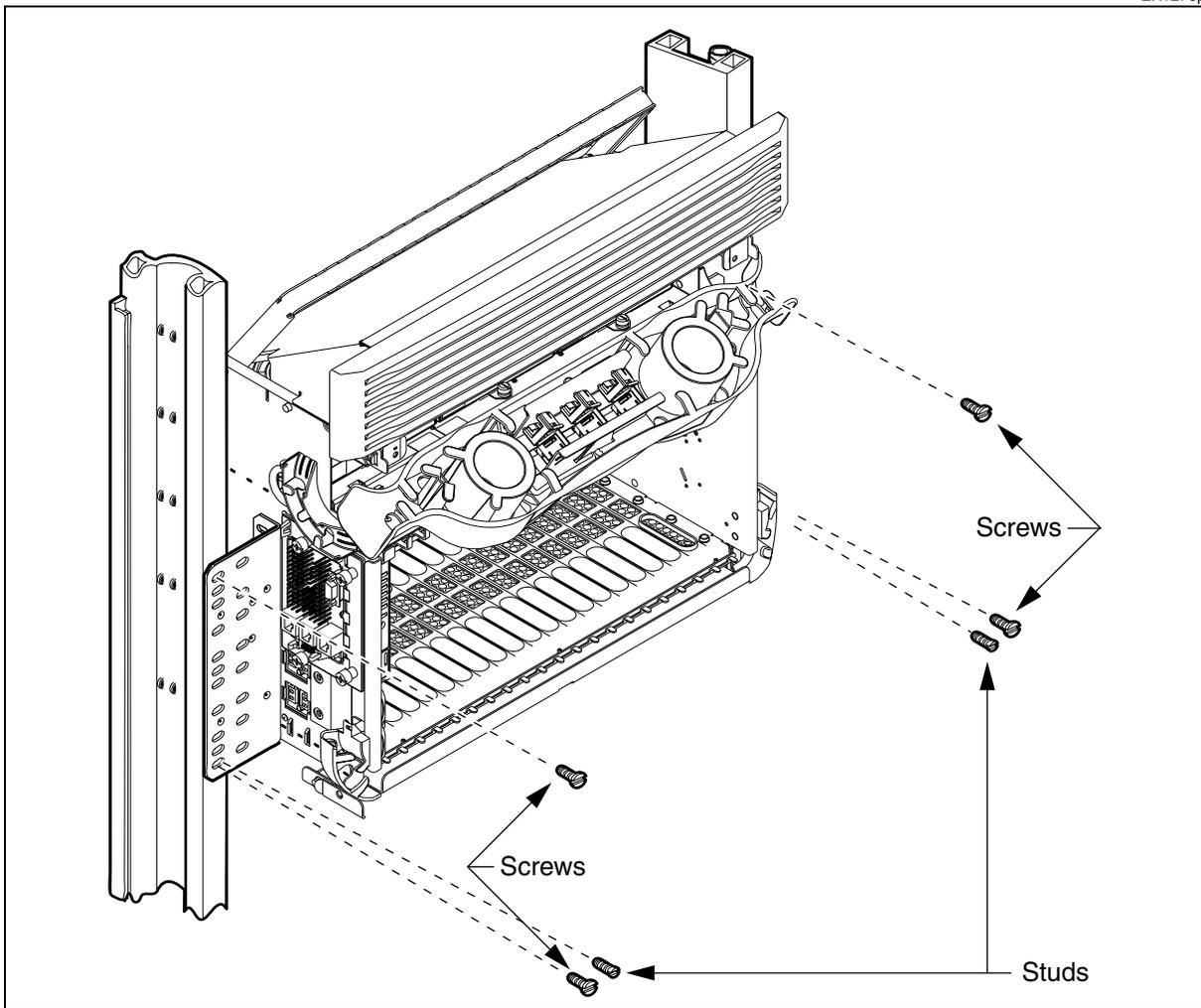
Figure 3-29
Valid mounting arrangements for open equipment frame (top view)

EX0768

23" bay — 3" C channel (front access)

Mounting centers

Bay uprights
Mounting bracket

19" bay — 3" C channel (front access)

Bay uprights
Mounting bracket

Mounting centers

23" bay — unequal flange (rear access)

Mounting centers

Bay uprights
Mounting bracket

19" bay — unequal flange (rear access)

Bay uprights

Mounting bracket

Mounting centers
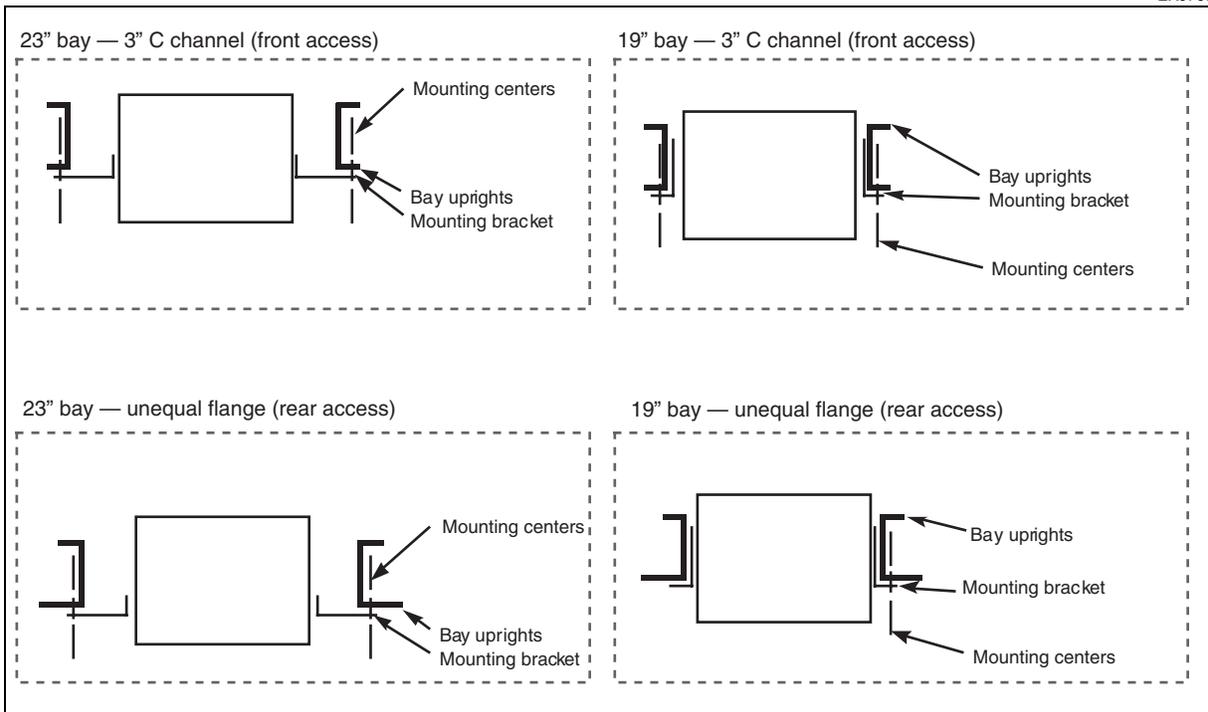
Procedure 3-13
Grounding the shelf

You must ground the shelf before you connect the power cables or any cable to it.

Requirements

To perform this procedure, you must ensure that the equipment frame is correctly grounded according to local grounding practices.

⚠	**CAUTION** **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Run the equipment frame end of the grounding cable to the rack. See Figure 3-30 on page 3-70.

2   Tighten the equipment frame end of the grounding cable to the side of the rack nearest the selected grounding bolt.

Note: See Table 3-15 on page 3-255.

⚠	**CAUTION** **Risk of improper ground due to poor contact with a painted frame** If the frame is painted, follow your companies procedures to remove the paint from the area where the bolt will be fastened. Ensure the bolt washer makes direct contact with the frame.

—end—

Figure 3-30
Grounding the shelf

EX0919p
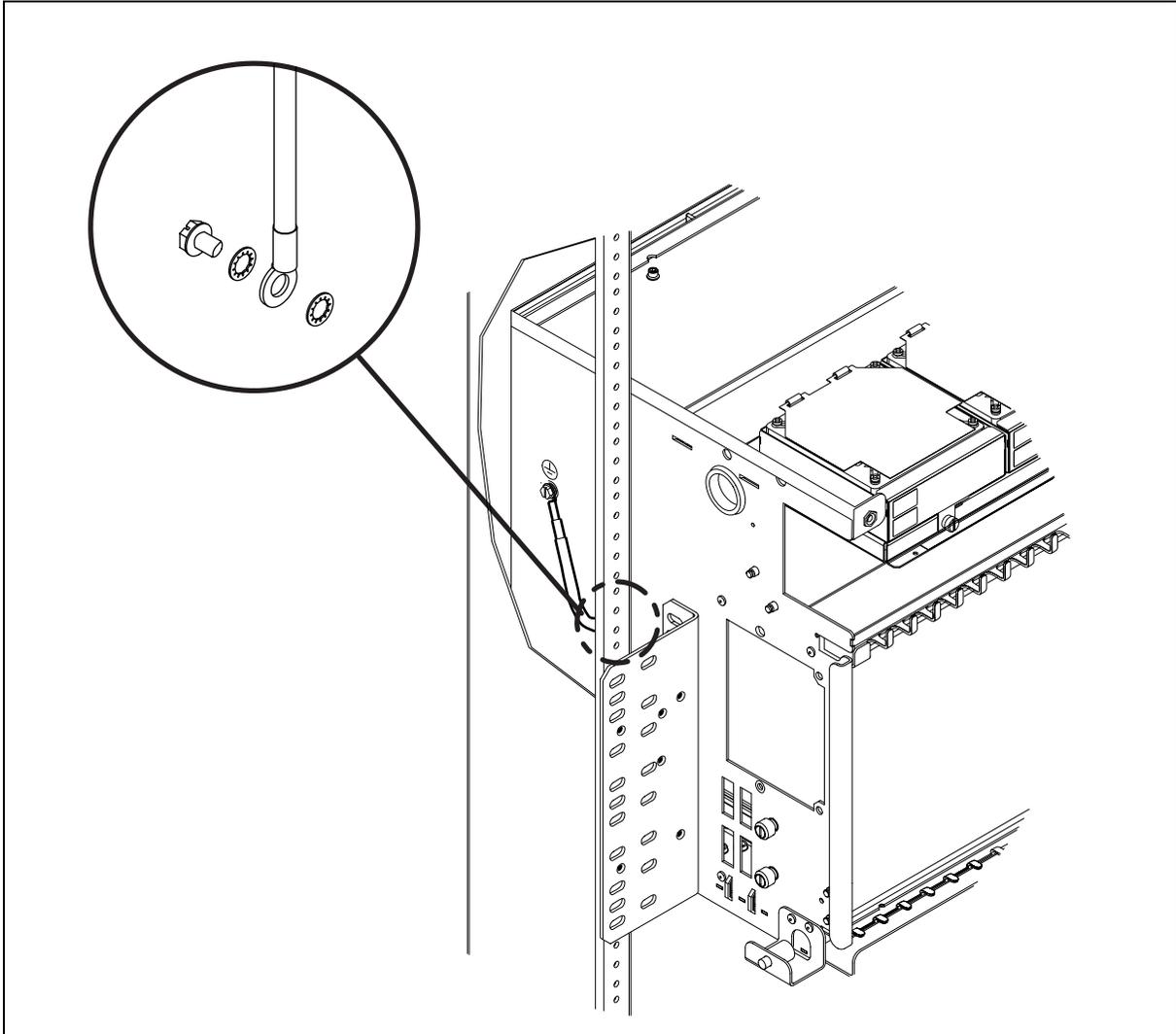
Procedure 3-14
Installing I/O modules on the NTN476DA shelf

Use this procedure to install I/O modules in the OPTera Metro 3500 NTN476DA shelf.

Note 1: If you are installing the I/O modules on an NTN476AH shelf, go to Installing and removing I/O modules on the NTN476AH (Universal) shelf on page 3-80.

Note 2: If the shelf has been hot staged, then the shelf is shipped with I/O modules installed.

The five types of I/O modules are replaceable in the field. For illustrations see:

• DS1 1-28 front I/O module (NTN452AA) and DS1 29-56 front I/O module (NTN452CA) on page 3-73.

Note: DS1 1-28 Front I/O module and DS1 29-56 Front I/O module are physically identical but they are not interchangeable. Use the PEC code or the connector labels to identify a module.

• DS1 29-84 front I/O module (NTN452EA) on page 3-74.
• BNC 12-port front I/O module (NTN452JA) on page 3-75.
• 8xRJ-45 front I/O module (NTN452NA) on page 3-76.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Open the front cover.
2	Remove the grill/air deflector. For instructions, see Installing and removing the grill/air deflector on page 3-183.
3	Fold the fiber storage tray forward to allow access to the I/O compartment.
4	Identify the acceptable I/O slots on the backplane for each I/O module type that you want to install. See Table 3-2 on page 3-90.

—continued—

Procedure 3-14 (continued)
Installing I/O modules on the NTN476DA shelf

Step	Action
5	Determine the build direction of each I/O module type. See Table 3-2 on page 3-90.
6	If you are using a DS1 cable with right angle connector, install cable brackets (NTN458MT) on the I/O module. See Installing cable brackets on a DS1 I/O module on page 3-92.
7	Install the I/O module into the backplane.

See:

- Figure 3-40 on page 3-77 if you are installing DS1 1-28 (NTN452AA) and DS1 29-84 Front I/O modules (NTN452EA).

- Figure 3-41 on page 3-78 if you are installing DS1 29-56 (NTN452CA) Front I/O modules.

- Figure 3-42 on page 3-78 if you are installing BNC 12-port (NTN452JA) Front I/O modules.

- Figure 3-43 on page 3-79 if you are installing 8xRJ-45 (NTN452NA) Front I/O modules.

Note 1: Do not remove the end caps or EMI gaskets from the I/O modules at any time. They are required for correct operations.

Note 2: It is not necessary to loosen the thumbscrew shoulder rivet on the I/O module before you install the I/O module. If you have to loosen the thumbscrew, do not loosen it more than one full turn. The base of the thumbscrew will act as a guide for seating the pins properly.

a. Position the I/O module so that the connectors face forward.

b. Insert the thumbscrew shoulder rivet on the back of the I/O module into the keyhole slots on the back top of the shelf.

c. Push the module down until the locking tabs lock into place on the backplane.

Note: When the connectors are aligned properly, only vertical pressure is required to seat the I/O module.

d. Lock the module in position by pushing down the locking lever; push until the lever latches on the base of the backplane connector.

—*end*—

Figure 3-31
DS1 1-28 front I/O module (NTN452AA) and DS1 29-56 front I/O module (NTN452CA)

EX1198p

Lock/eject lever

Thumbscrews (4 places)

Front View   **Rear View**
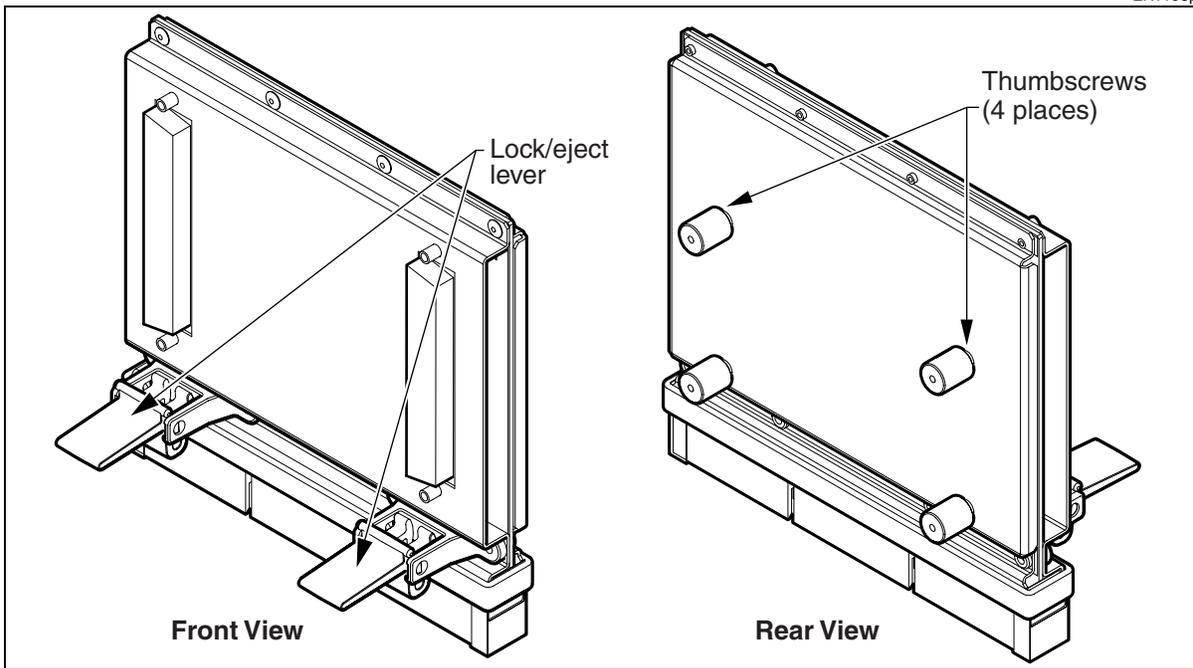
Figure 3-32
DS1 1-28 front I/O module (NTN452AA) - Pinout

EX0769p

Out (DS1 1-28)

In (DS1 1-28)

Lock/eject lever
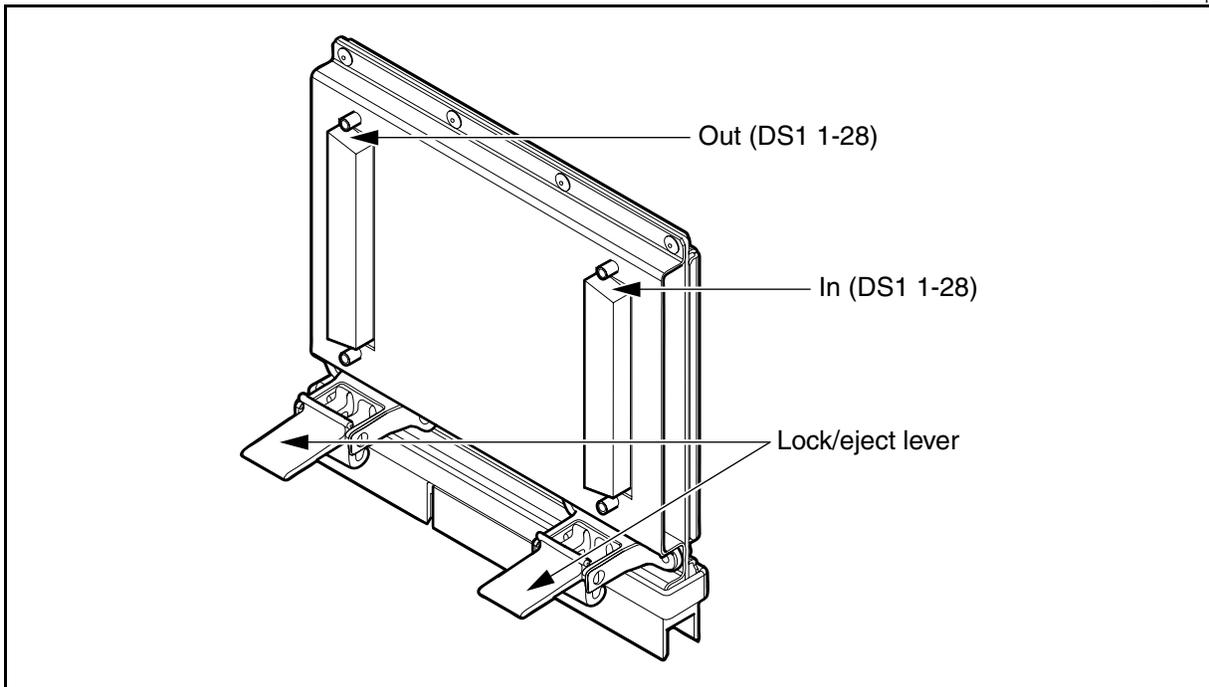
Figure 3-33
DS1 29-56 I/O module (NTN452CA) - Pinout

EX1004t
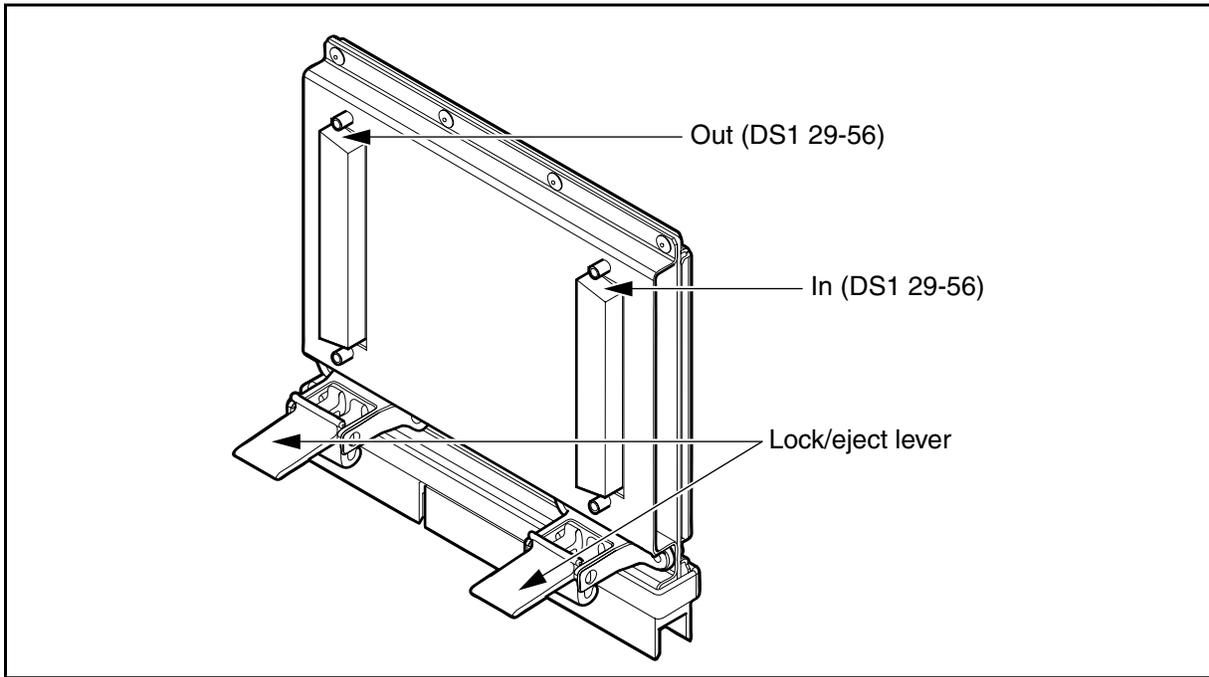
Figure 3-34
DS1 29-84 front I/O module (NTN452EA)

EX1199p
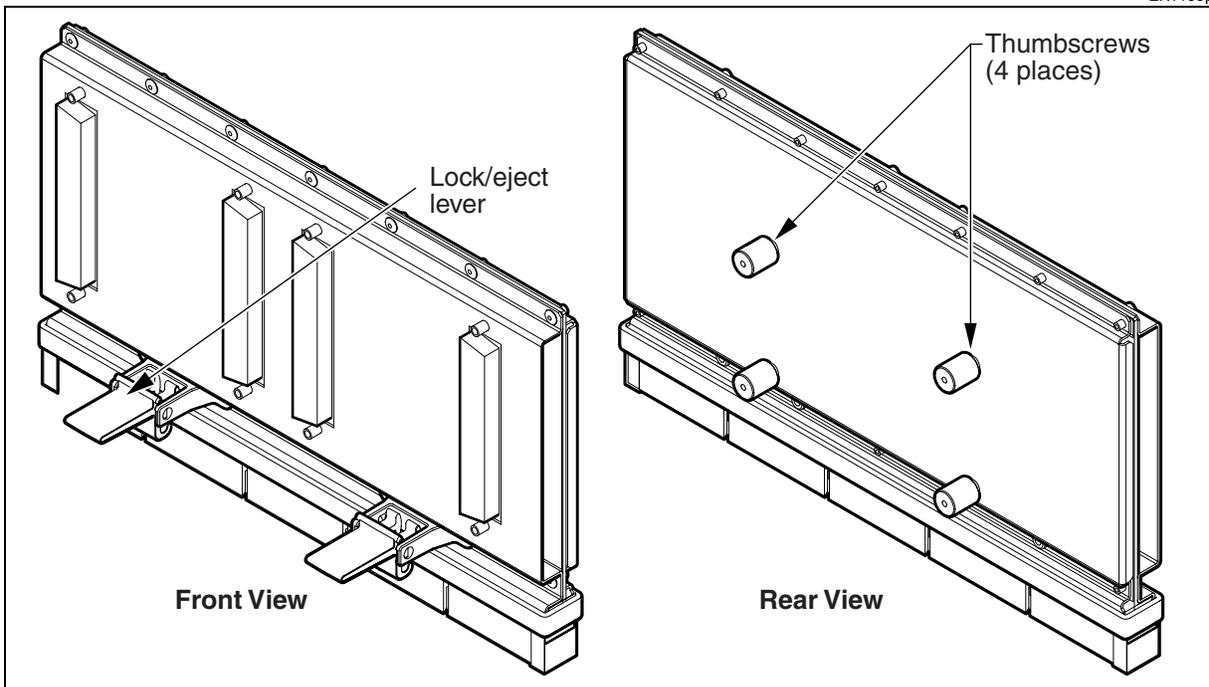
Figure 3-35
DS1 29-84 front I/O module (NTN452EA) - Pinout
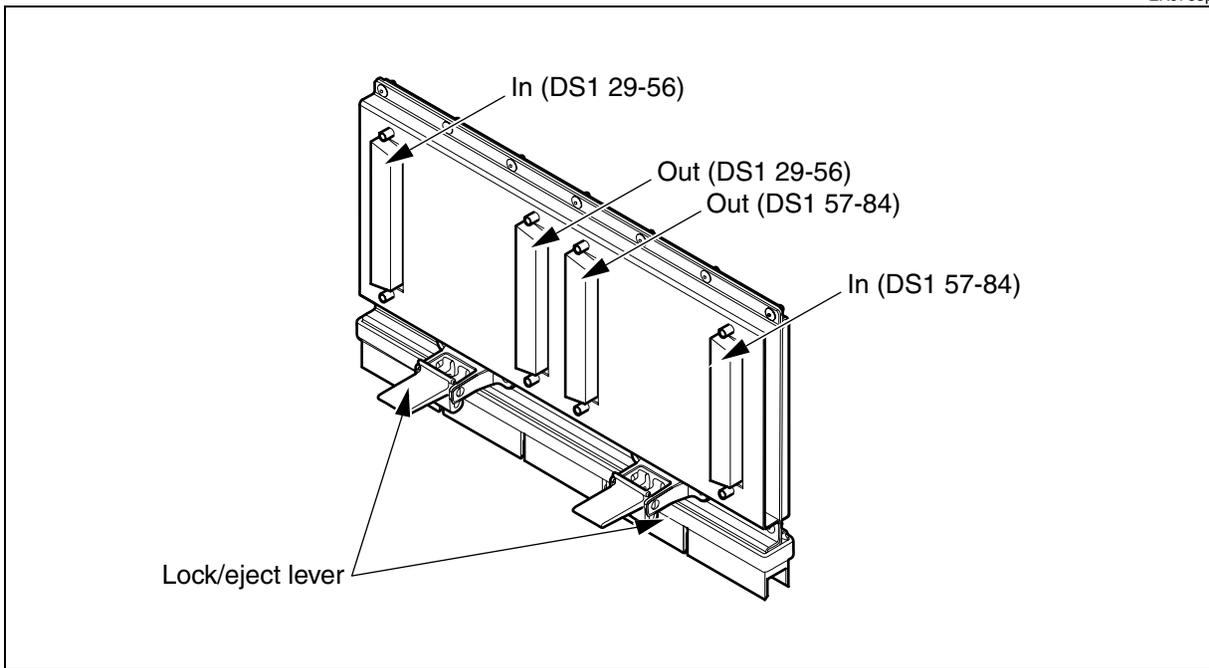
Figure 3-36
BNC 12-port front I/O module (NTN452JA)
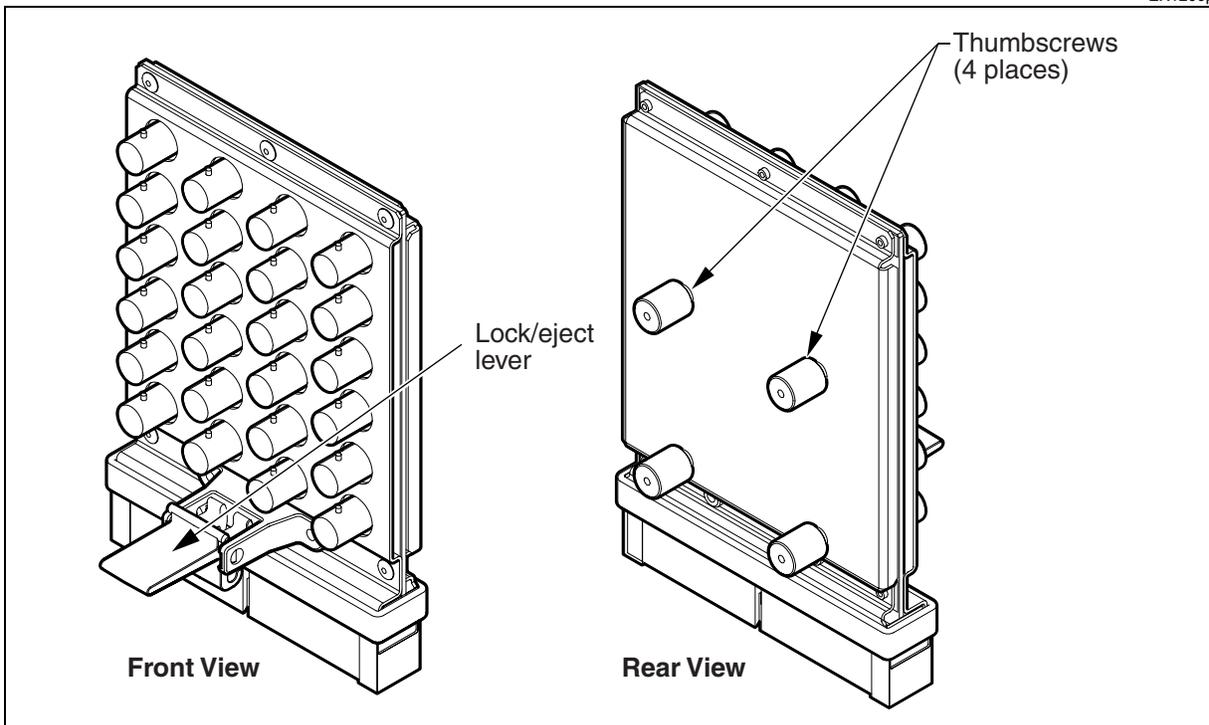
Figure 3-37
BNC 12-port front I/O module - Pinout

EX1065p
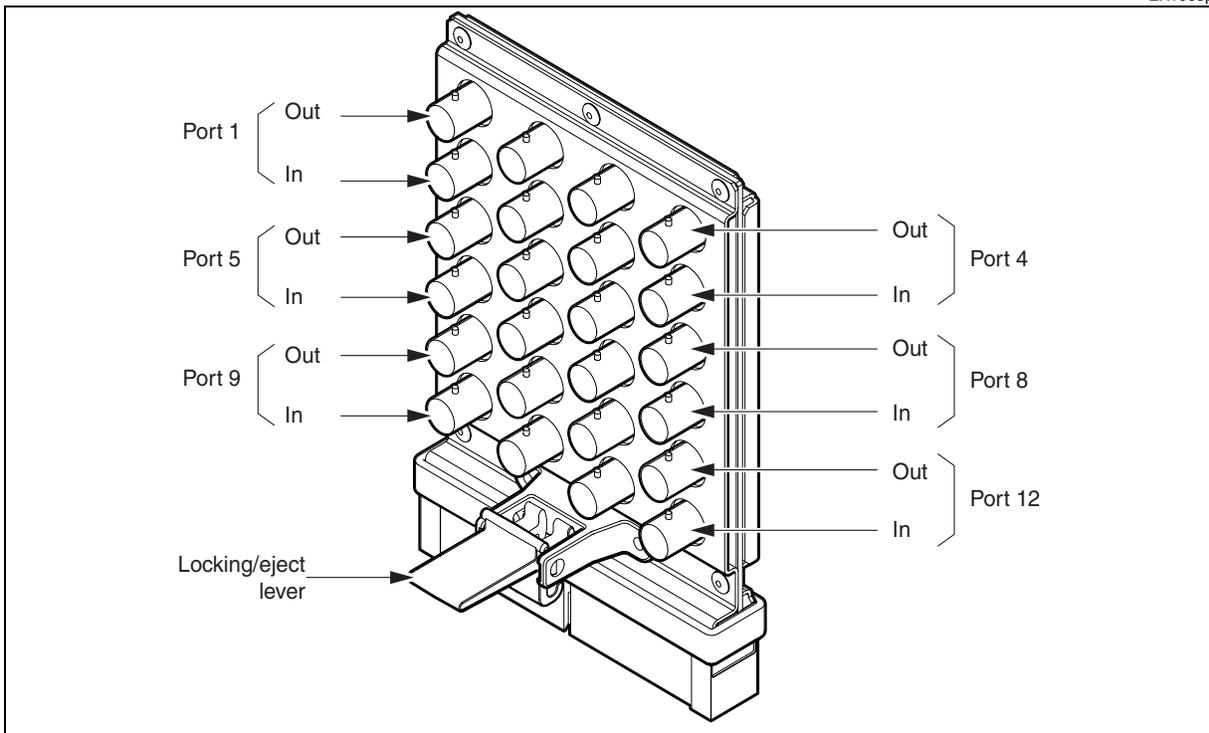
Figure 3-38
8xRJ-45 front I/O module (NTN452NA)

EX1201p
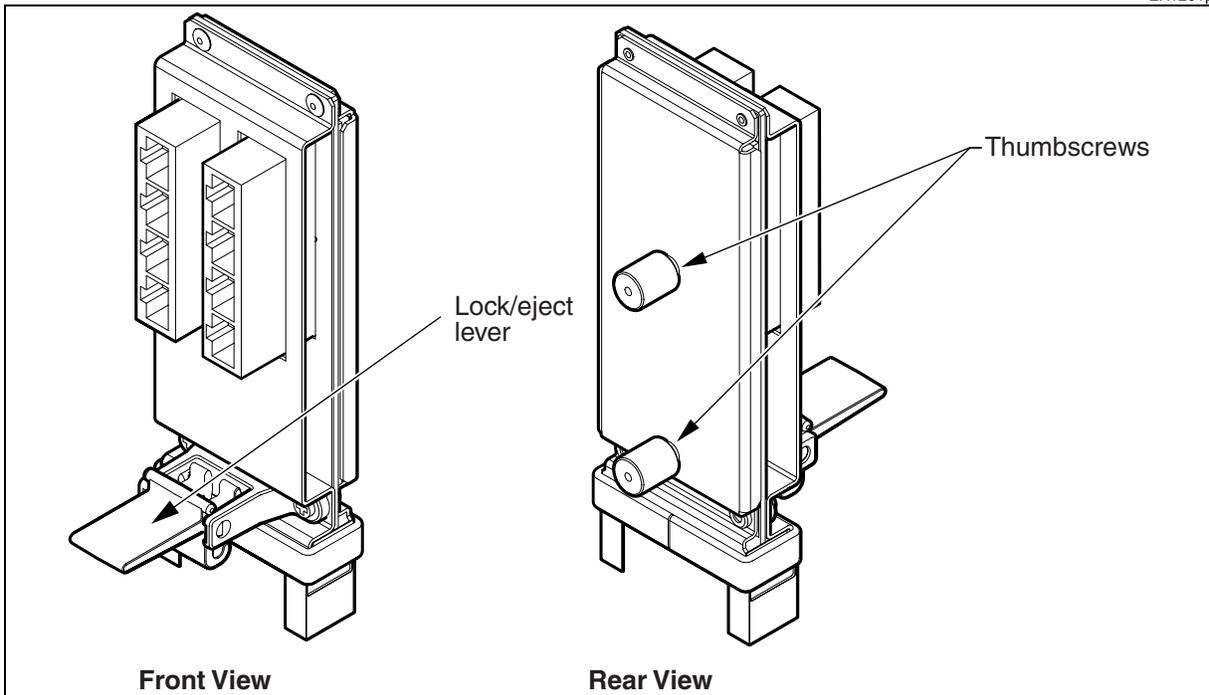
Figure 3-39
8xRJ-45 front I/O module - Pinout

EX0797t

Port 1
Port 2
Port 3
Port 4

Port 5
Port 6
Port 7
Port 8

Lock/eject lever
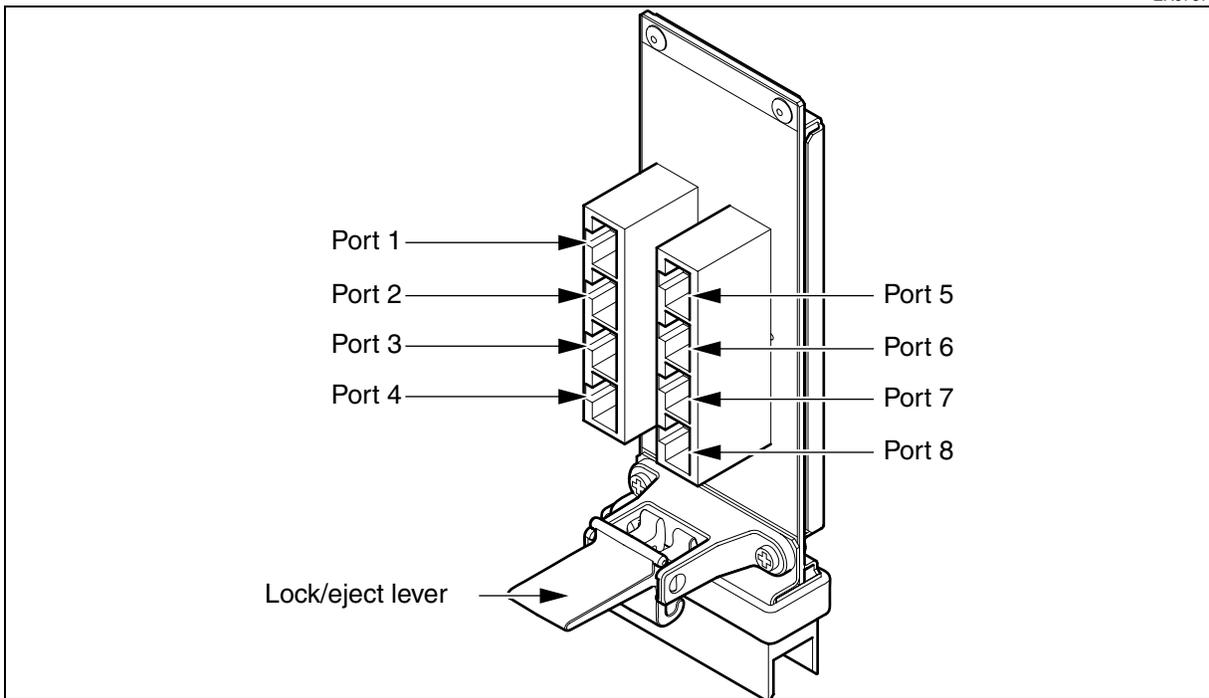
Figure 3-40
Installing DS1 1-28 (NTN452AA) and DS1 29-84 (NTN452EA) Front I/O modules on NTN476DA

EX1273p

DS1 1-28

DS1 29-84
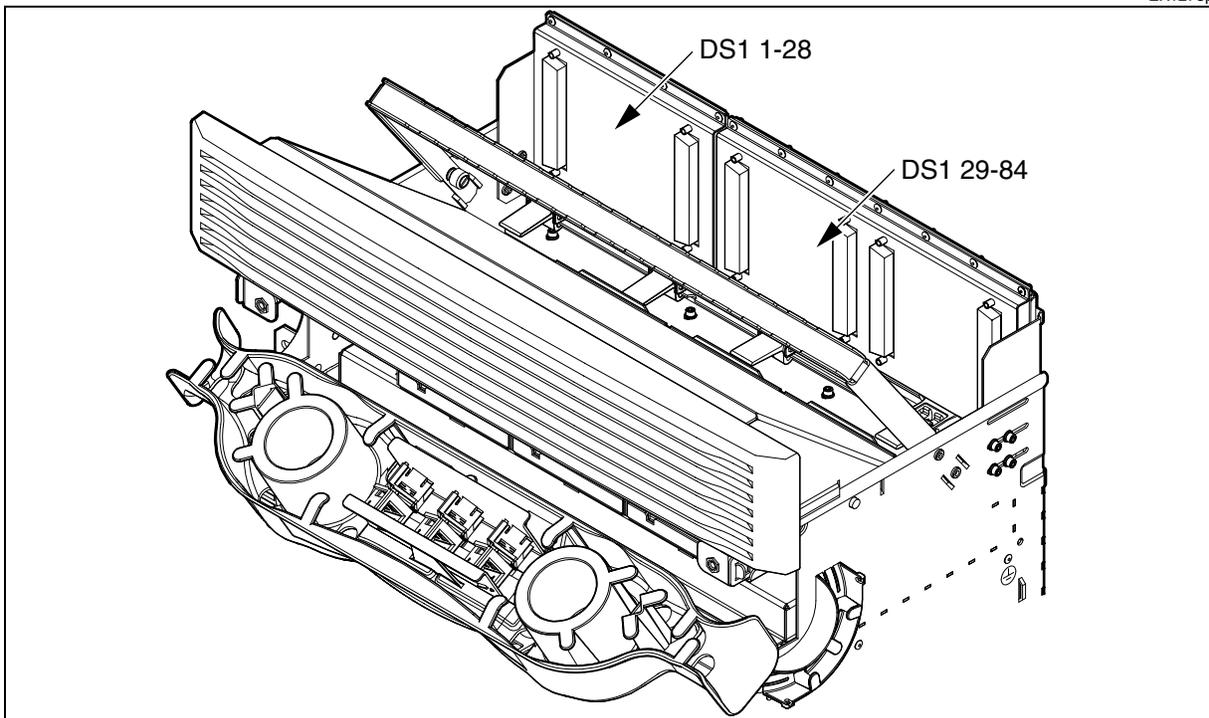
Figure 3-41
Installing a DS1 29-56 (NTN452CA) Front I/O module on NTN476DA

EX1275t

DS1 29-56
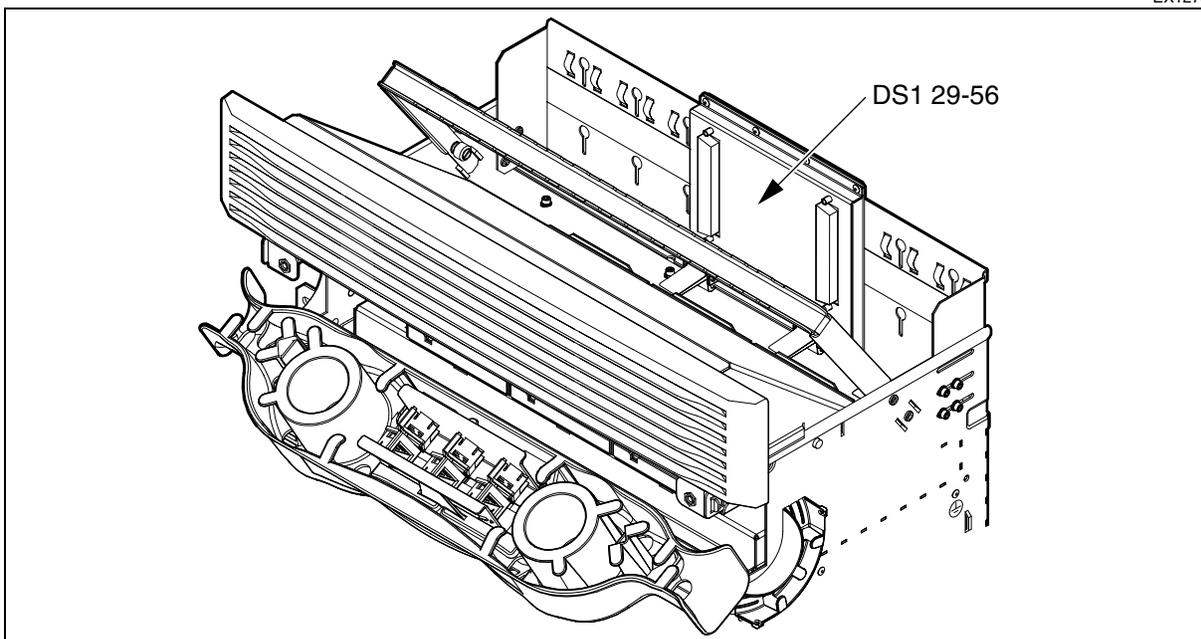
Figure 3-42
Installing a BNC 12-port (NTN452JA) Front I/O module on NTN476DA

EX1274p

BNC 12 port I/O module
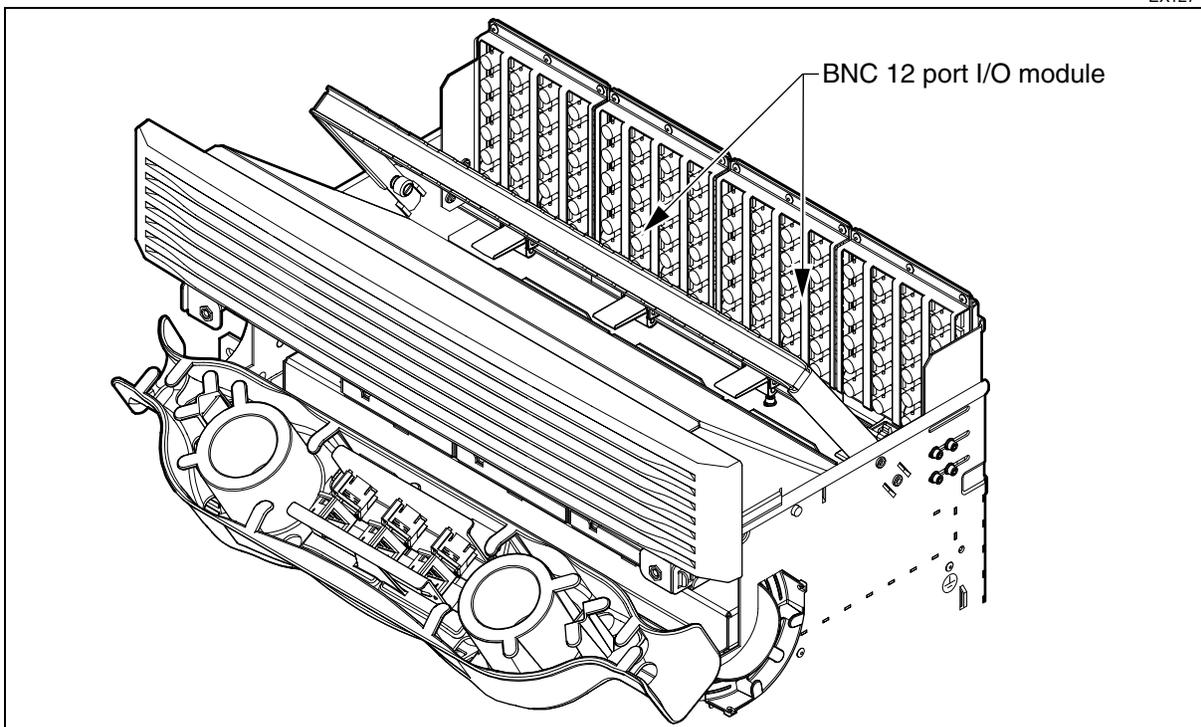
Figure 3-43
Installing an 8xRJ-45 (NTN452NA) Front I/O module on NTN476DA

EX1272p
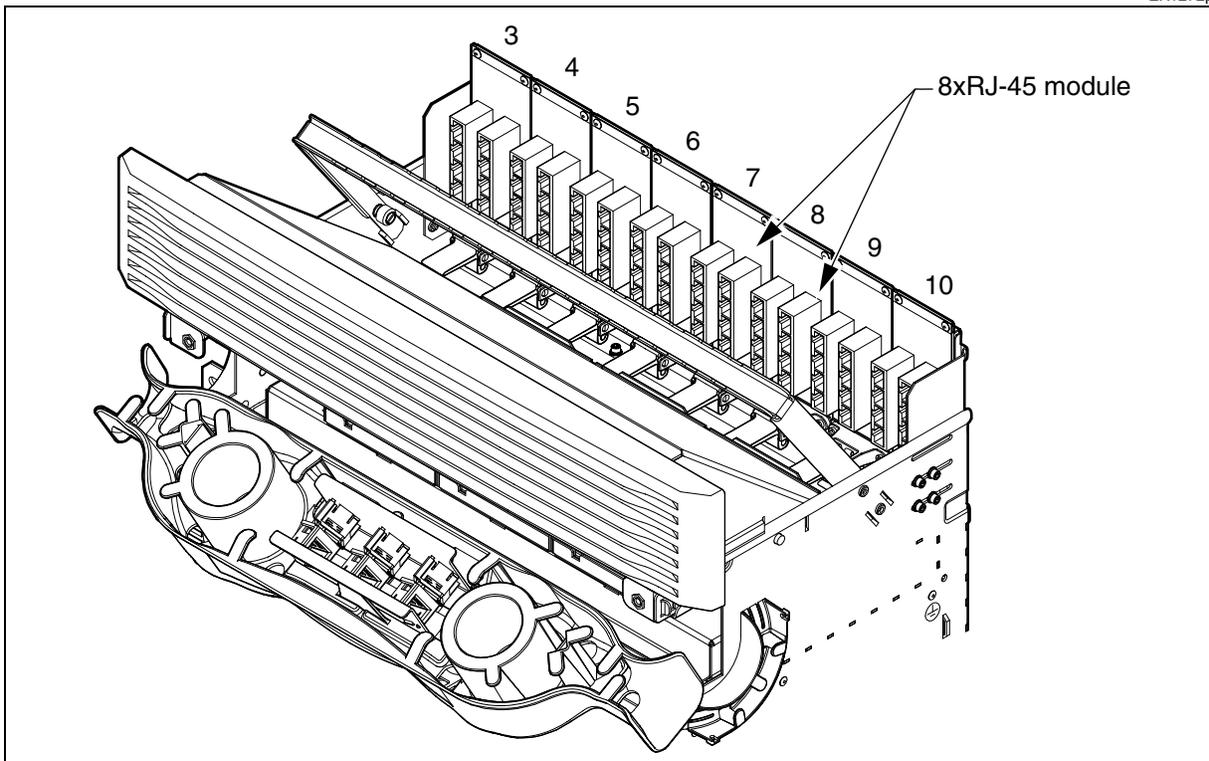
Procedure 3-15
Installing and removing I/O modules on the NTN476AH (Universal) shelf

Use this procedure to install or remove I/O modules in the OPTera Metro 3500 NTN476AH shelf.

Note 1: If you are installing the I/O modules on an NTN476DA shelf, go to Installing I/O modules on the NTN476DA shelf on page 3-71.

Note 2: The NTN476AH shelf supports the front facing I/O modules and the rear facing I/O modules.

Note 3: If the shelf has been hot staged, then the shelf is shipped with I/O modules installed.

The five types of I/O modules (front facing and rear facing) are replaceable in the field. For illustrations see:

- DS1 1-28 Front Enhanced I/O module (NTN452AH) on page 3-82
- DS1 1-28 Rear I/O module (NTN452BA) on page 3-83
- DS1 29-56 Front Enhanced I/O module (NTN452CH) on page 3-83
- DS1 29-56 Rear I/O module (NTN452DA) on page 3-84
- DS1 29-84 Front Enhanced I/O module (NTN452EH) on page 3-84
- DS1 29-84 Rear I/O module (NTN452FA) on page 3-85
- BNC 12-port front Enhanced I/O module (NTN452JH) on page 3-86
- BNC 12-port rear I/O module (NTN452KA) on page 3-86
- 8xRJ-45 Front Enhanced I/O module (NTN452NH) on page 3-87
- 8xRJ-45 Rear I/O module (NTN452HB) on page 3-87

Note: DS1 1-28 Front Enhanced I/O module and DS1 29-56 Front Enhanced I/O module are physically identical but they are not interchangeable. Use the PEC code or the connector labels to identify a module.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Procedure 3-15 (continued)
Installing and removing I/O modules on the NTN476AH (Universal) shelf

Step	Action
1	Open the front cover. For instructions, see Installing and removing the shelf front cover on page 3-181.
2	Remove the grill/air deflector. For instructions, see Installing and removing the grill/air deflector on page 3-183.
3	Fold the fiber storage tray forward to allow access to the I/O compartment.
4	Identify the applicable I/O slots on the backplane for each I/O module type that you want to install. See Table 3-2 on page 3-90 for I/O module position.

Step 4 continued:

For illustrations of:

- PSC, PSX, and DS1 circuit pack slot assignments, see Figure 3-76 on page 3-133.
- DS3 and EC-1 circuit pack slot assignments, see Figure 3-77 on page 3-138.
- 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit pack slot assignments, see Figure 3-80 on page 3-148.

Step	Action
5	Determine the build direction of each I/O module type. See Table 3-2 on page 3-90.
6	If you are using a DS1 cable with right angle connector, install cable brackets (NTN458MT) on the I/O module. See Installing cable brackets on a DS1 I/O module on page 3-92.

7

If you are	**Then** go to
installing the I/O module	step 8
removing the I/O module	step 14

Installing an I/O module

Step	Action
8	Ensure the lock/eject lever on the I/O module is in the up position. See Figure 3-58 on page 3-91.
9	Identify the mating connector on the shelf

If you are installing the	**Then** go to
front I/O module	step 10
rear I/O module	step 11

Step	Action
10	From the front of the shelf, align the alignment tabs on the I/O module with the connector guides on the shelf. Go to step 12.

<div align="center">—continued—</div>

Procedure 3-15 (continued)
Installing and removing I/O modules on the NTN476AH (Universal) shelf

Step	Action
11	From the back of the shelf, align the alignment tabs on the I/O module with the connector guides on the shelf.
12	Hang the I/O module hook on the shelf rear crossmember and insert the latch lock into the rear crossmember slot.
13	Push the lock/eject lever down to connect and attach the I/O module to the shelf.
	You have completed this procedure.

Removing an I/O module

14	Pull the lock/eject lever towards the front of the shelf while lifting the lock/eject lever and release the I/O module from the shelf. See .
15	Unhook the I/O module from the shelf rear crossmember, and remove it from the shelf.

—**end**—

Figure 3-44
DS1 1-28 Front Enhanced I/O module (NTN452AH)

> *Note:* The straight connector is recommended for DS1 cables connected to a front facing I/O module.

EX1152p

Lock/eject lever

In (DS1 1-28)

Out (DS1 1-28)
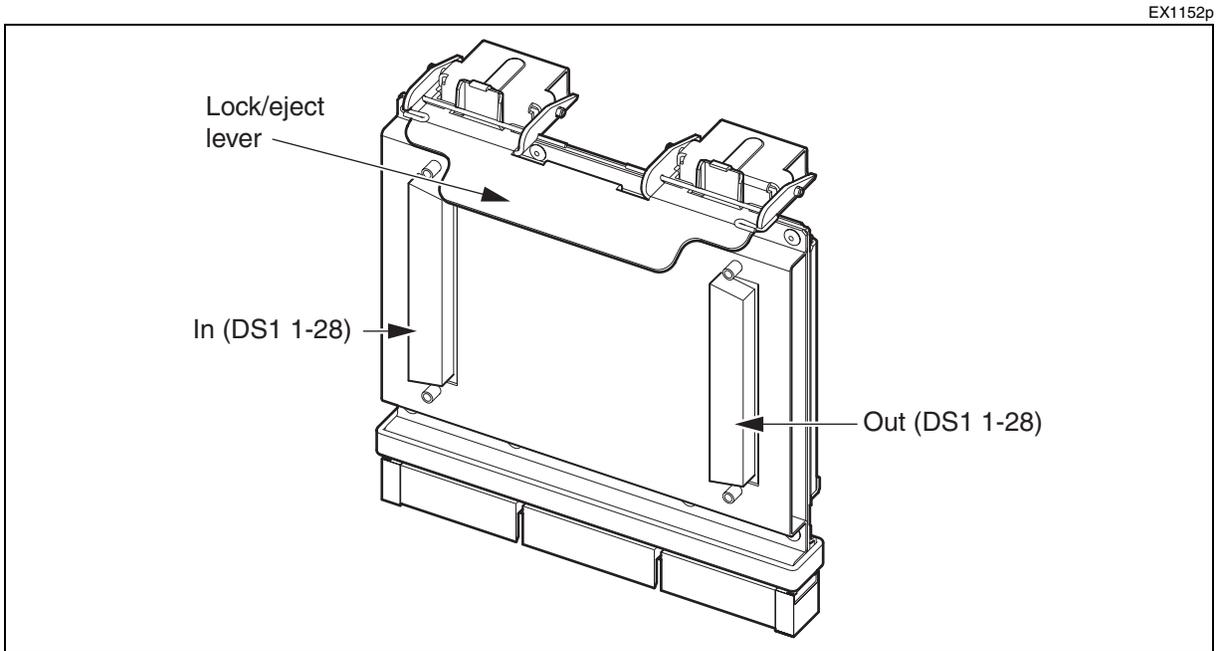
Figure 3-45
DS1 1-28 Rear I/O module (NTN452BA)

Note: The right angle connector is recommended for DS1 cables connected to a rear facing I/O module.

EX1189p

Lock/eject lever

Out (DS1 1-28)

In (DS1 1-28)

Alignment tab
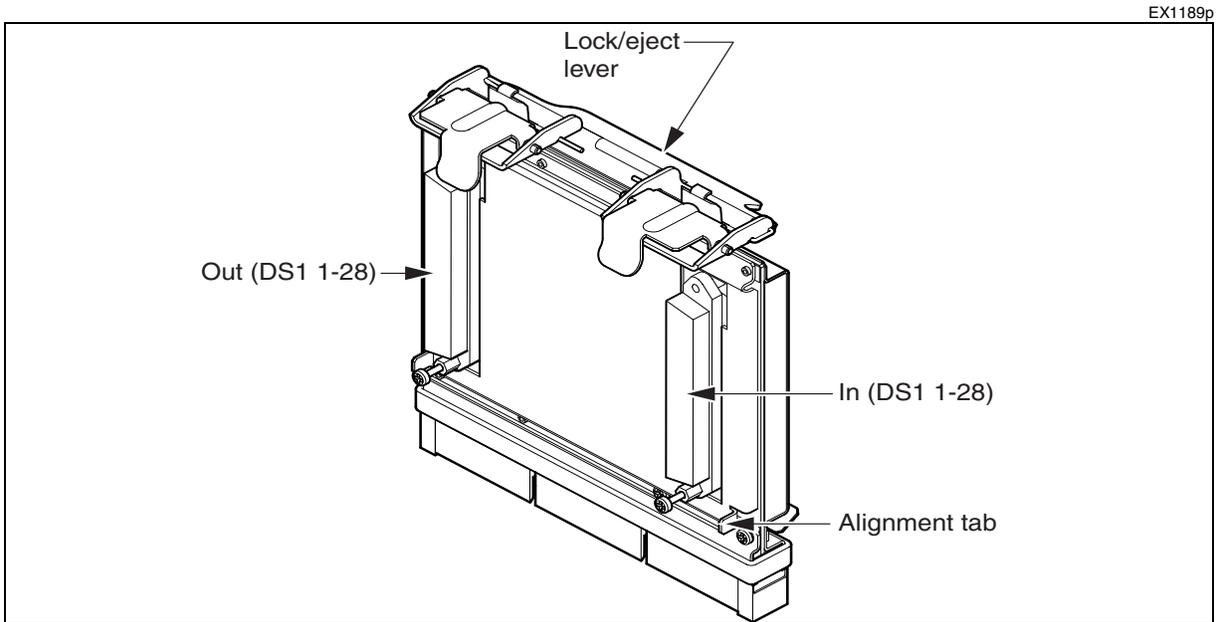
Figure 3-46
DS1 29-56 Front Enhanced I/O module (NTN452CH)

Note: The straight connector is recommended for DS1 cables connected to a front facing I/O module.

EX1169p

Lock/eject lever

In (DS1 29-56)

Out (DS1 29-56)
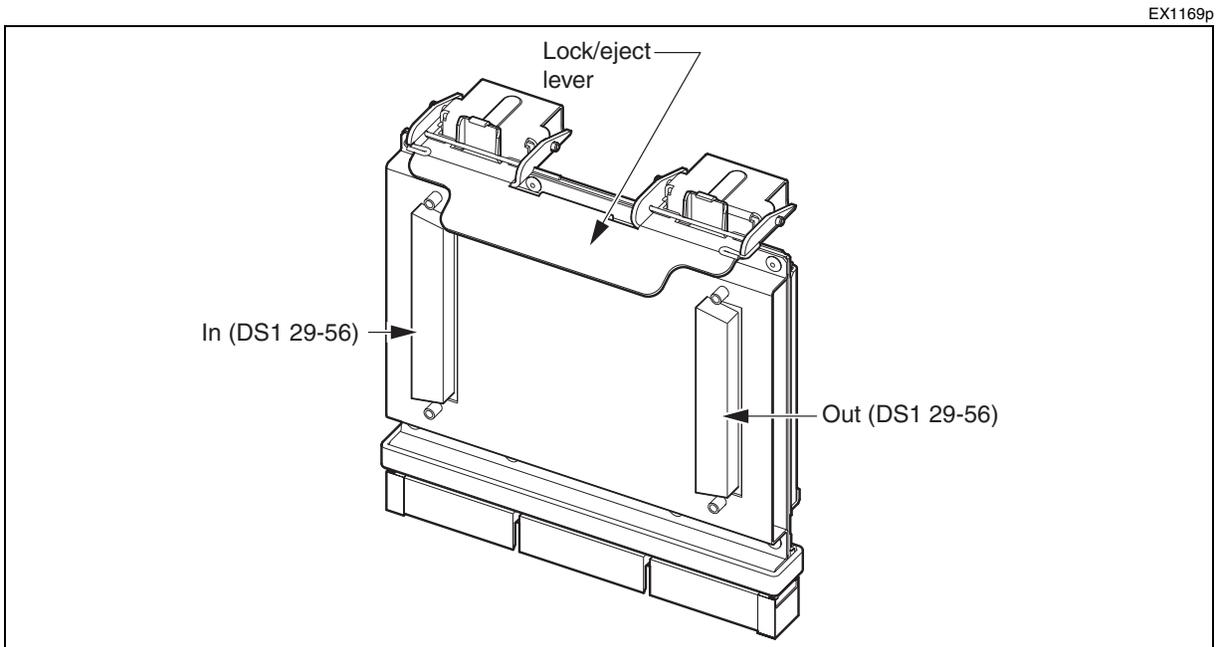
Figure 3-47
DS1 29-56 Rear I/O module (NTN452DA)

> *Note:* The right angle connector is recommended for DS1 cables connected to a rear facing I/O module.

EX1190p
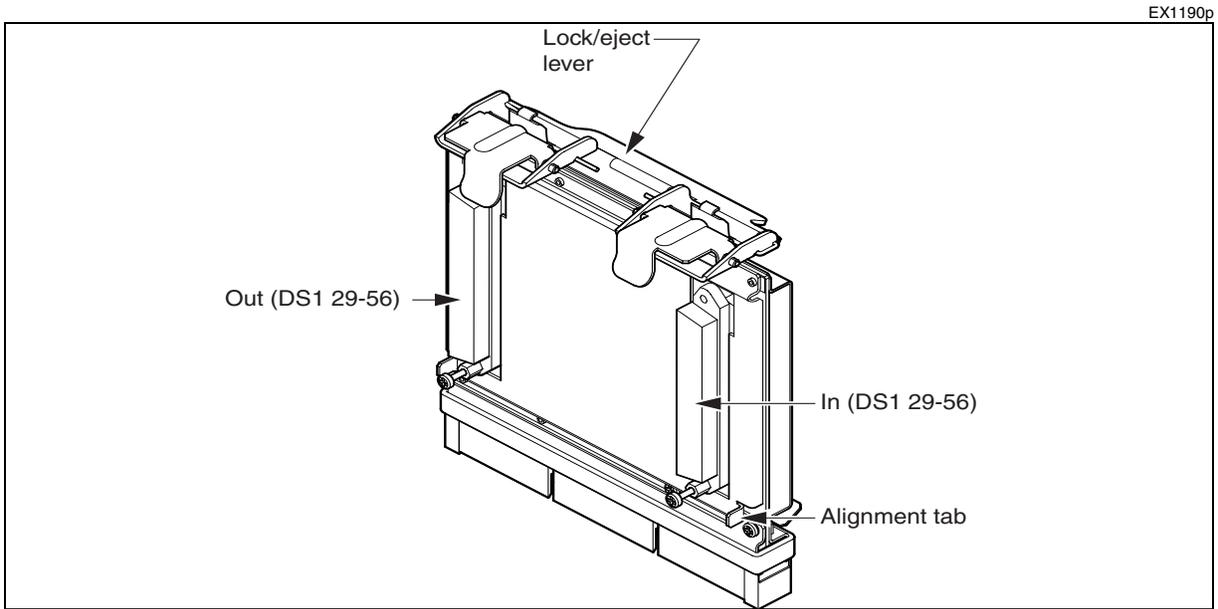
Figure 3-48
DS1 29-84 Front Enhanced I/O module (NTN452EH)

> *Note:* The straight connector is recommended for DS1 cables connected to a front facing I/O module.

EX1153p
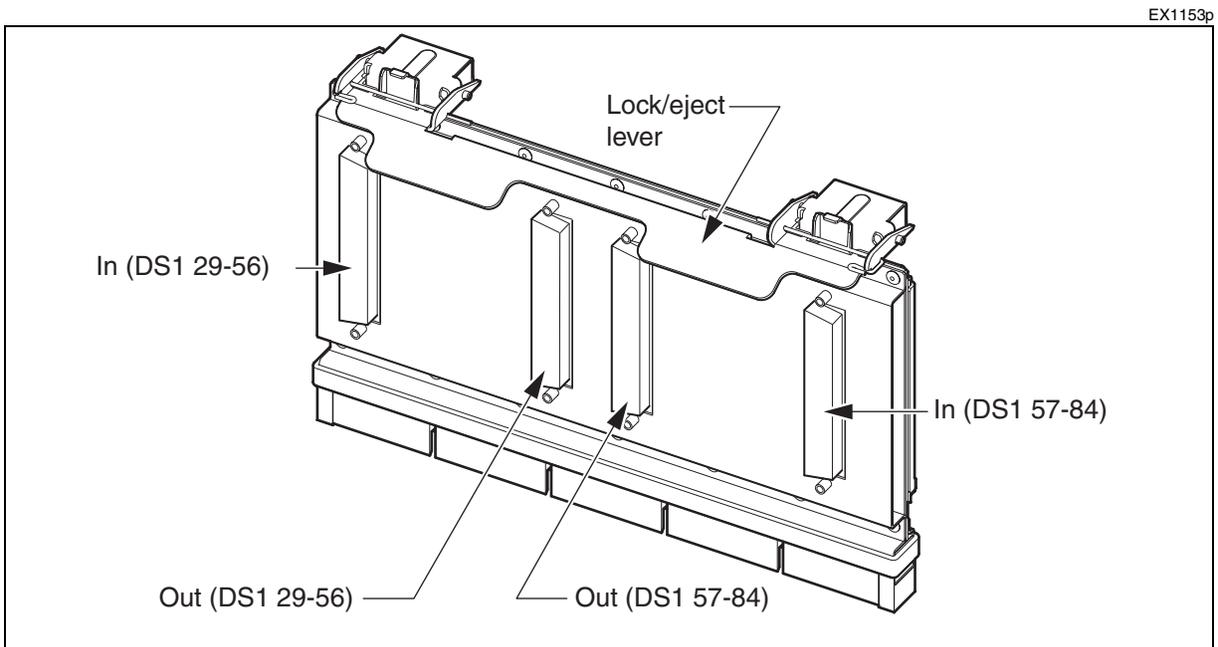
Figure 3-49
DS1 29-84 Rear I/O module (NTN452FA)

> *Note:* The right angle connector is recommended for DS1 cables connected to a rear facing I/O module.
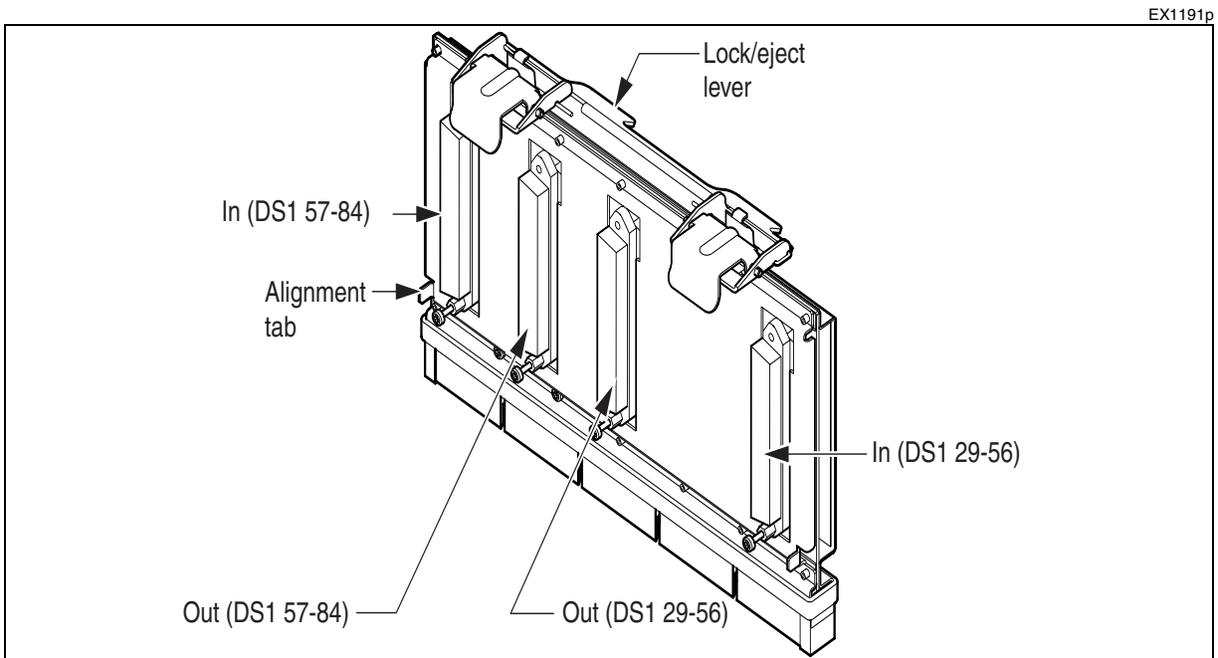
Figure 3-50
BNC 12-port front Enhanced I/O module (NTN452JH)

EX1154p
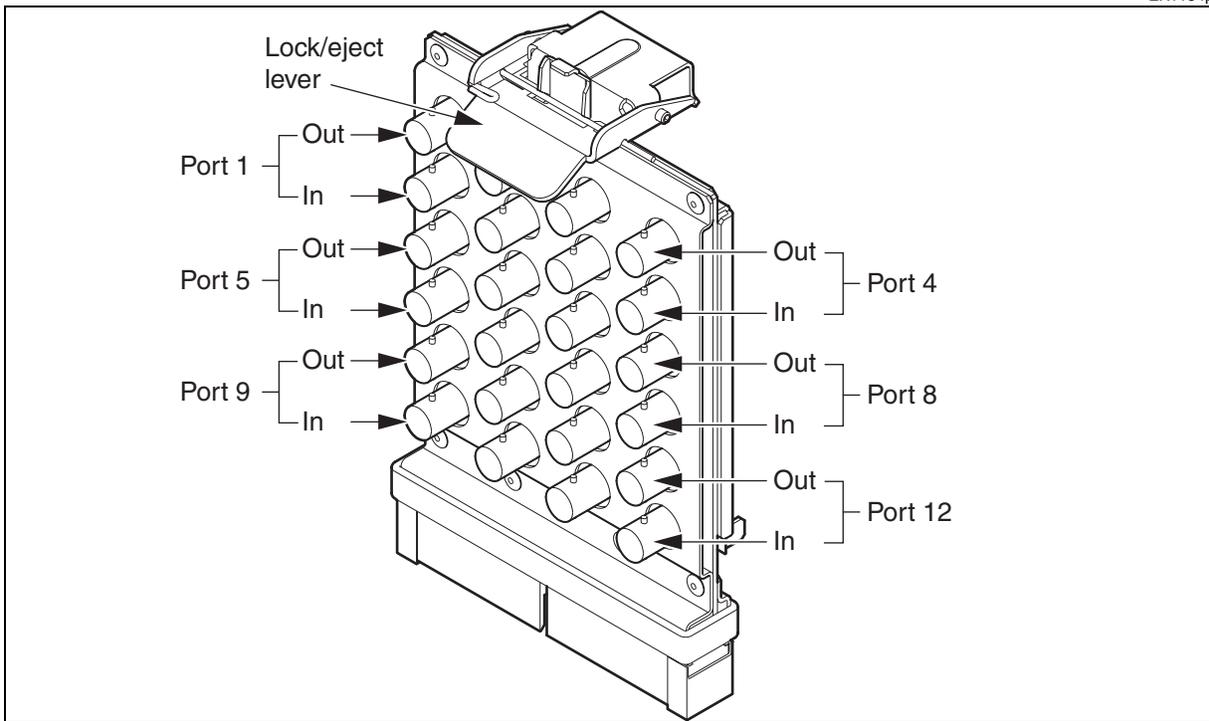
Figure 3-51
BNC 12-port rear I/O module (NTN452KA)

EX1193p
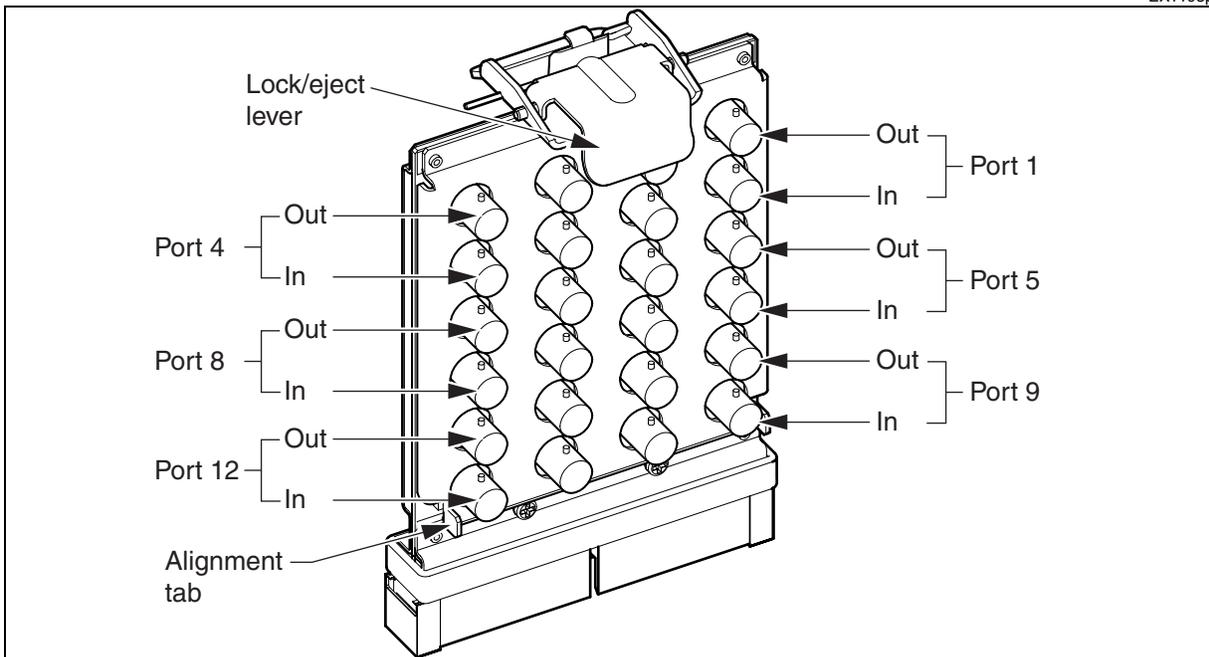
Figure 3-52
8xRJ-45 Front Enhanced I/O module (NTN452NH)

EX1155p

Lock/eject
lever

Port 1
Port 2
Port 3
Port 4

Port 5
Port 6
Port 7
Port 8
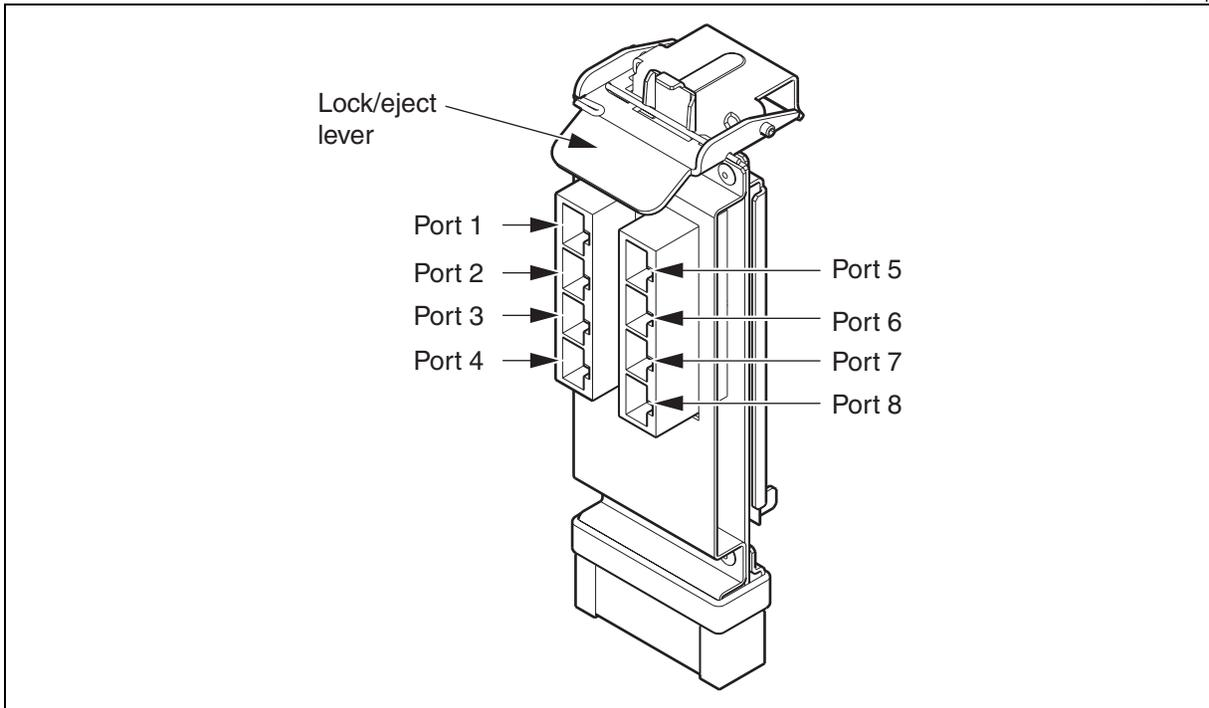
Figure 3-53
8xRJ-45 Rear I/O module (NTN452HB)

EX1192p

Lock/eject
lever

Port 5
Port 6
Port 7
Port 8

Port 1
Port 2
Port 3
Port 4

Alignment tab
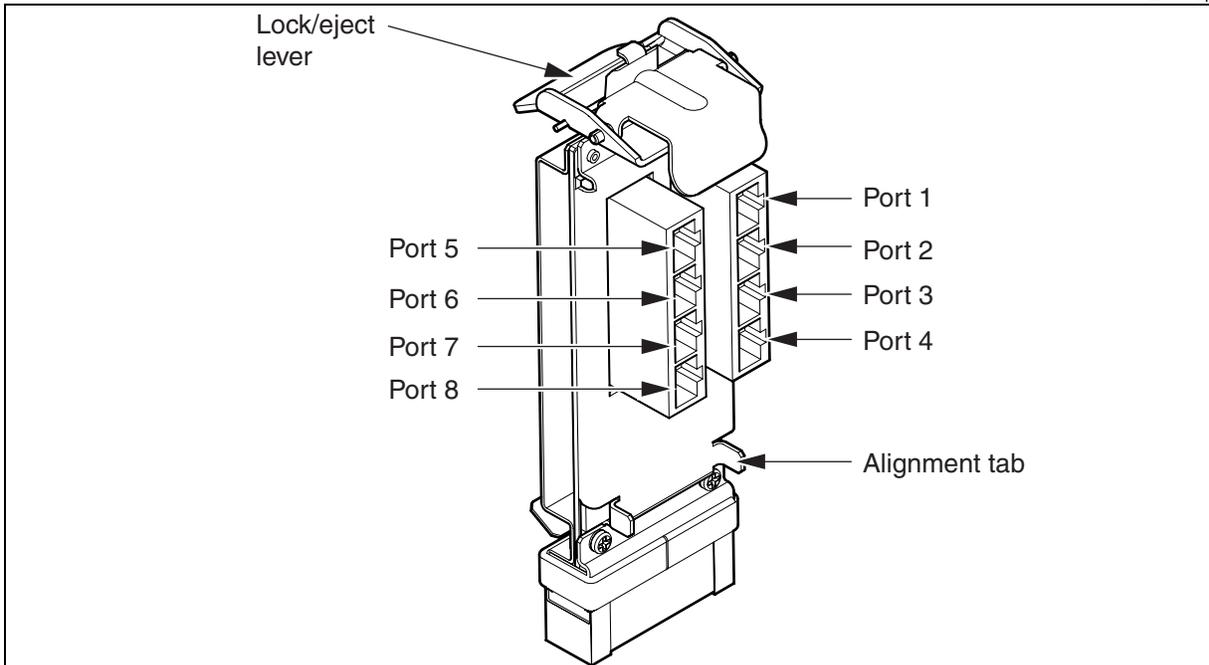
Figure 3-54
Installing DS1 1-28 (NTN452AH) and DS1 29-84 (NTN452EH) Enhanced Front I/O modules on NTN476AH shelf

EX1277p

DS1 1-28

DS1 29-84
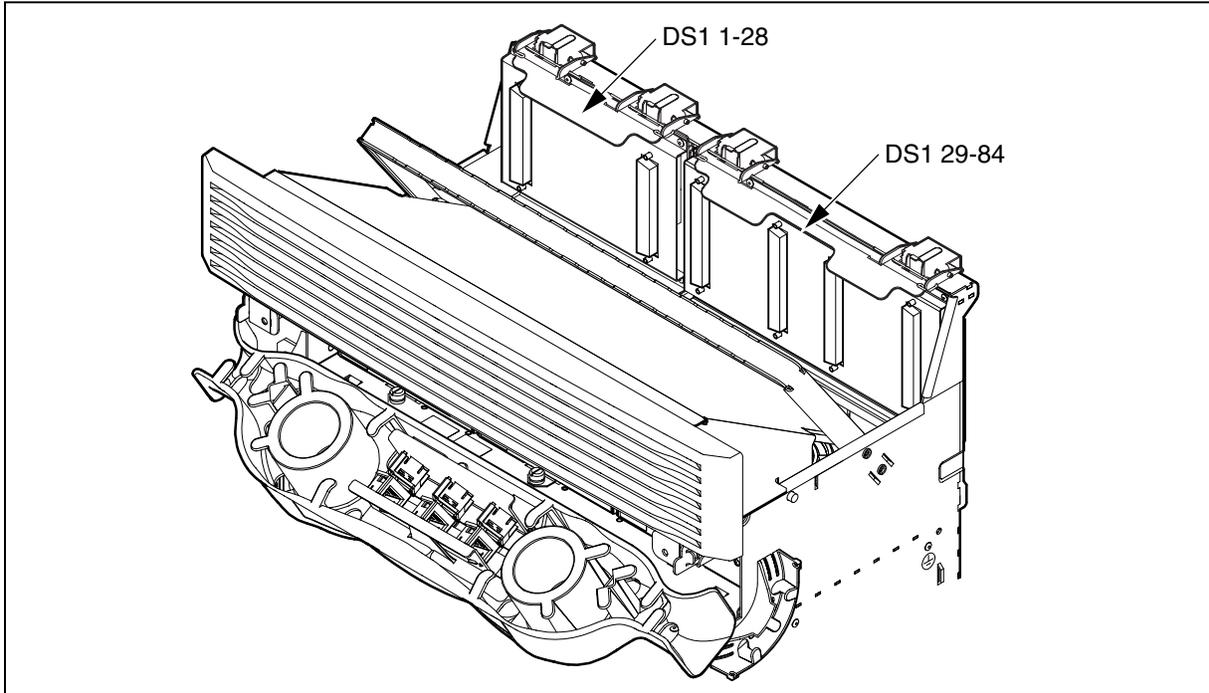
Figure 3-55
Installing a DS1 29-56 (NTN452CH) Enhanced Front I/O module on NTN476AH shelf

EX1278p

DS1 29-56
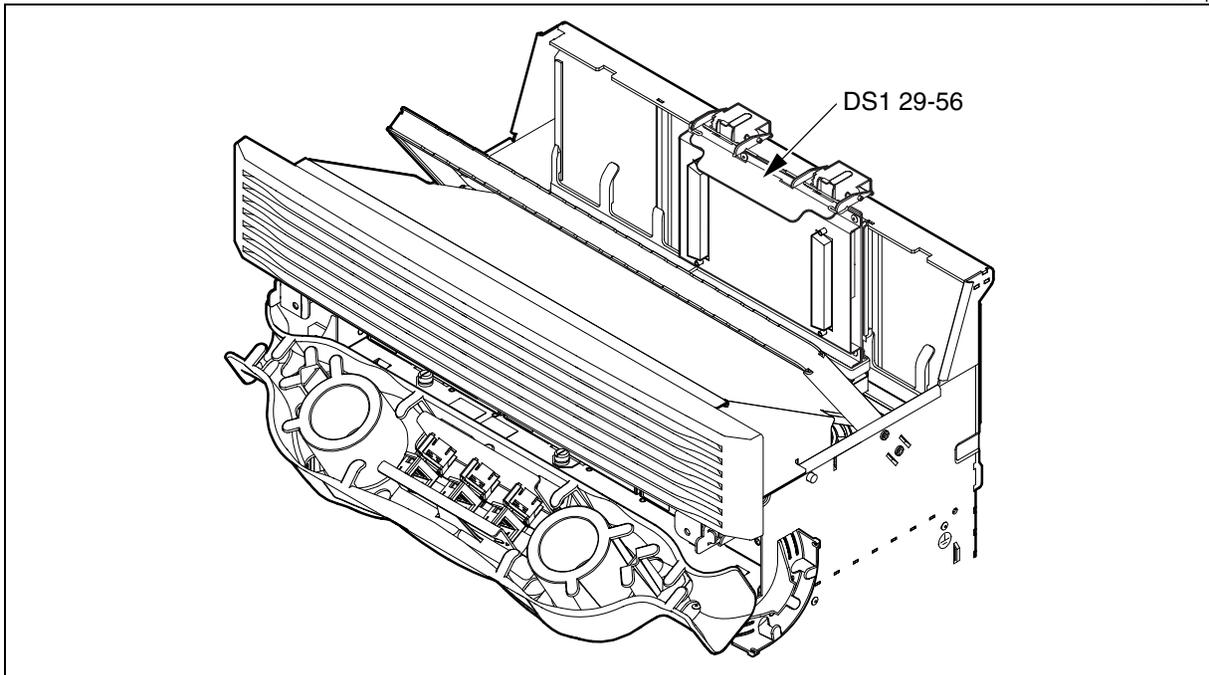
Figure 3-56
Installing a BNC 12-port (NTN452JH) Enhanced Front I/O module on NTN476AH shelf

EX1279p
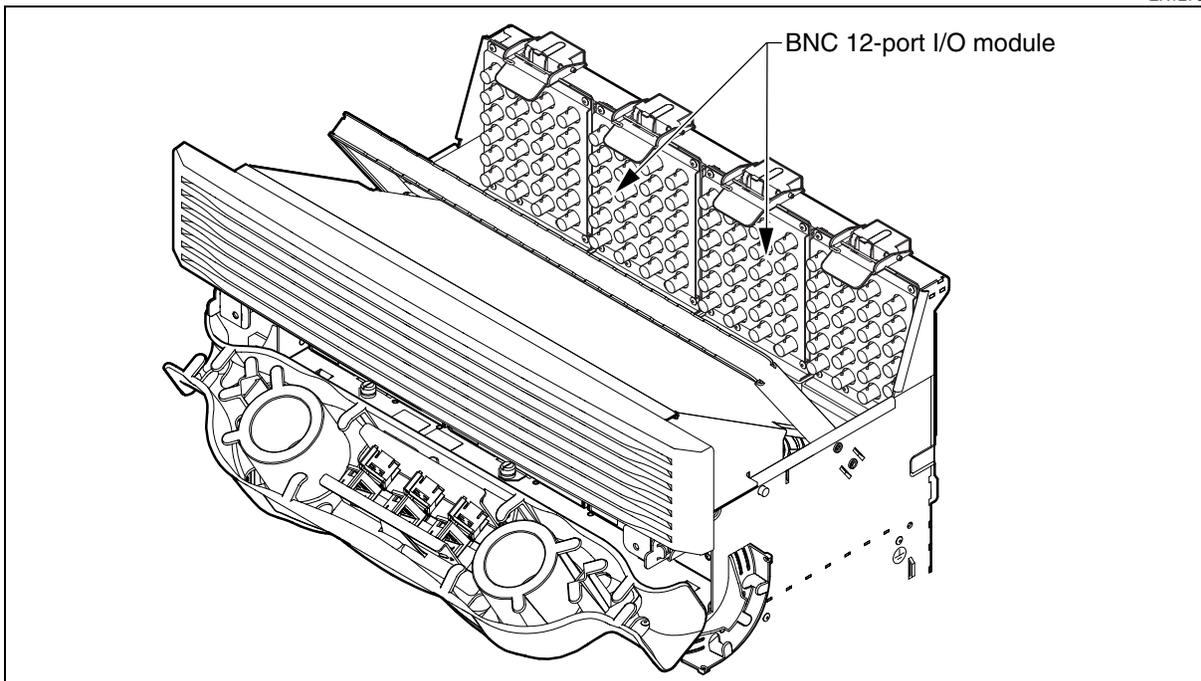
Figure 3-57
Installing an 8xRJ-45 (NTN452NH) Enhanced Front I/O module on NTN476AH shelf

EX1280p
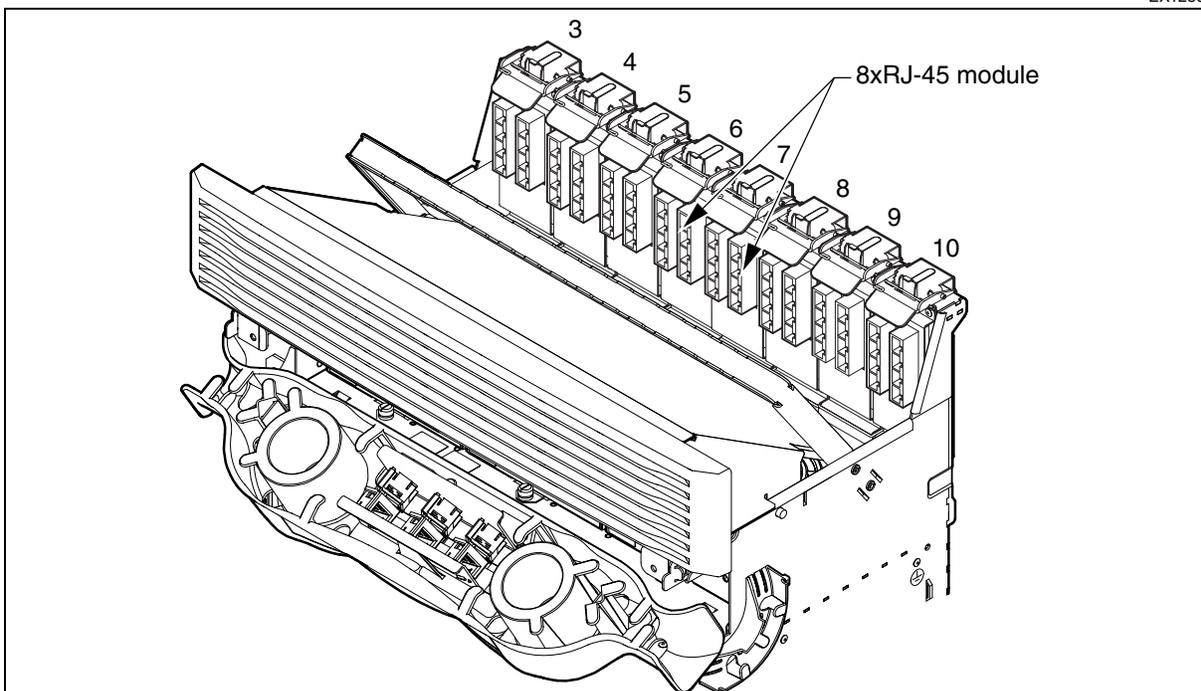
Table 3-2
I/O module position - front access and rear access backplane

Traffic type	Number of ports for each I/O module	I/O module	Corresponding tributary slot number
DS1 See Note 1.	28	DS1 1-28	4, 5, 6
	28	DS1 29-56	6, 7, 8
	56	DS1 29-84	6, 7, 8, 9, 10
DS3 See Note 2.	12	BNC 12-port	9, 10 7, 8 5, 6 3, 4
10BASE-T, 100BASE-TX Ethernet	8	8xRJ-45	3-10

Note 1: Install DS1 I/O modules from left to right. Slot 3 is the 1:N protection slot. Use DS1 1-28 I/O module for tributary slots 4 through 6, DS1 29-56 I/O module for tributary slots 6 through 8, and DS1 29-84 I/O module for tributary slots 6 through 10.

Note 2: Install BNC 12-port I/O modules from right to left. Each input port on the BNC 12-port module feeds the working and the protection slots in pair. In the same way, each output port on the BNC 12-port module receives an output from the working and the protection slot.

Figure 3-58
Installing and removing front facing and rear facing I/Os on NTN476AH shelf

EX1213p
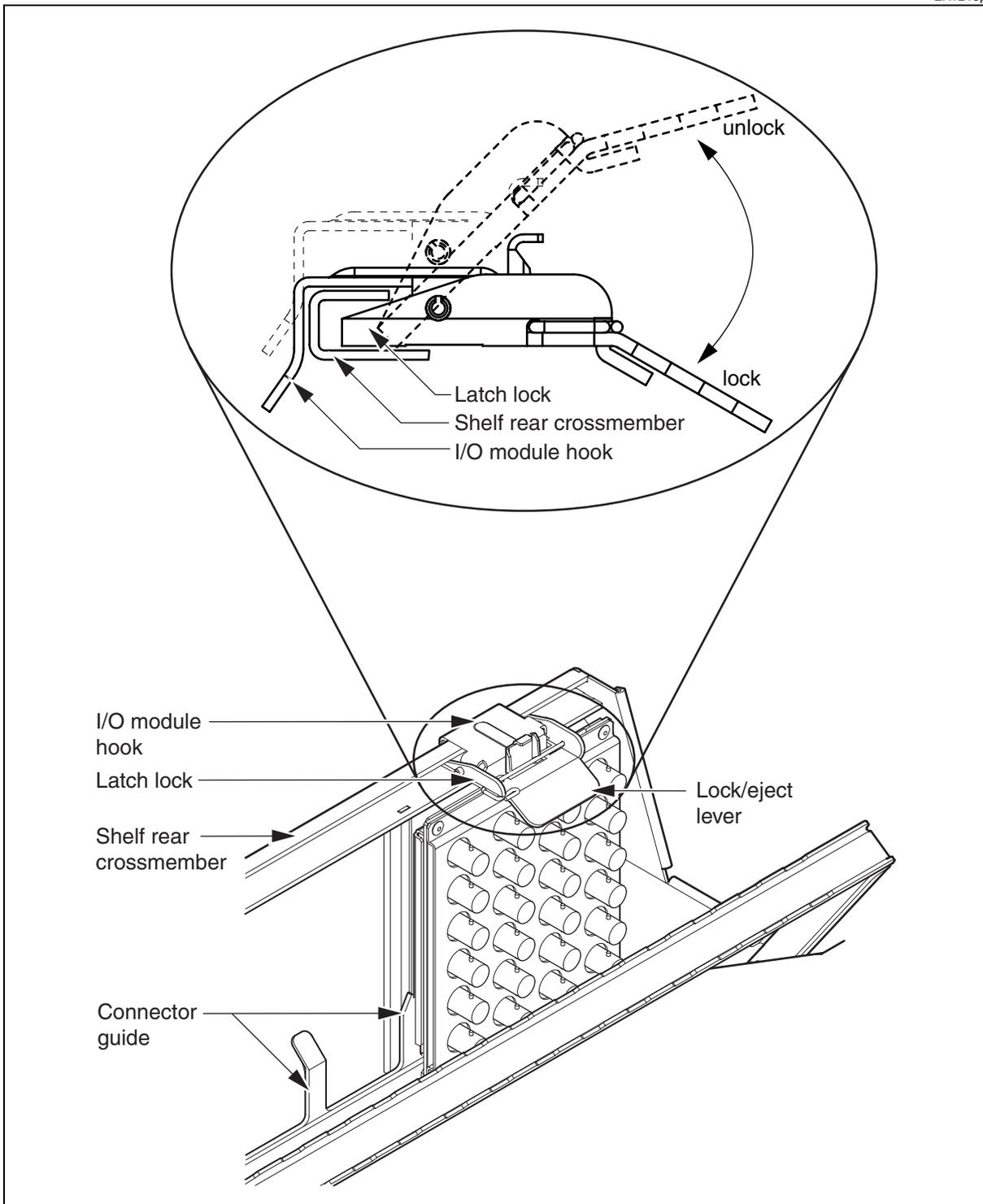
Procedure 3-16
Installing cable brackets on a DS1 I/O module

Step	Action
1	Position the bracket (NTN458MT) on the DS1 I/O module. See Figure 3-59 on page 3-92.
2	Tighten the attaching screw. See Table 3-14 on page 3-254.
3	Repeat steps 1 and 2 for all connectors on the DS1 module.

—**end**—

Figure 3-59
Installing cable brackets on a DS1 1-28 I/O module
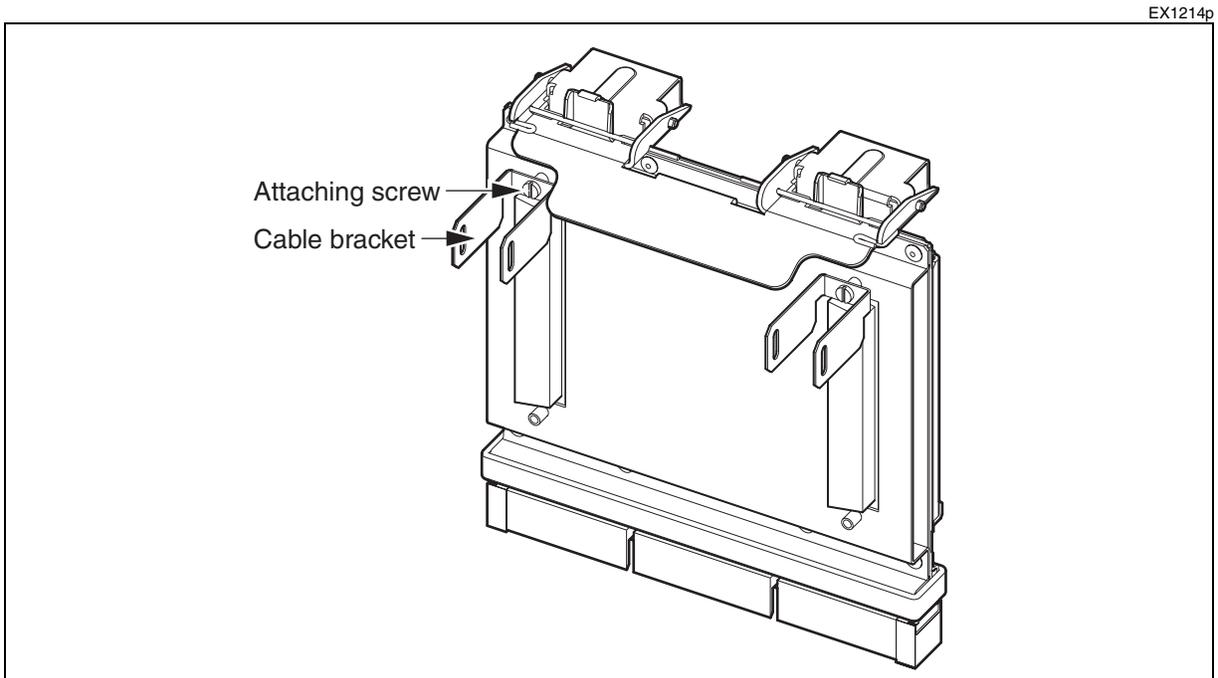
Procedure 3-17
Installing the rear cable retainer

The rear cable retainer is used as strain relief bracket to support the cables that are connected to rear facing I/O modules.

Requirements

To perform this procedure, 6.0-in. space is required at the rear of the shelf, beyond the frame, for hardware and wiring.

Tool required

A flat head screw driver is required to perform this procedure

Step	Action
1	From the rear of the shelf, position the rear cable retainer on the frame. See Figure 3-60 on page 3-94.
2	Insert and tighten the screw that attaches the rear cable retainer to the left side of the frame. See Table 3-14 on page 3-254.
3	Ensure the rear cable retainer is parallel to the shelf. Insert and tighten the screw that attaches the rear cable retainer to the right side of the frame. See Table 3-14 on page 3-254.

—**end**—

Figure 3-60
Installing the rear cable retainer
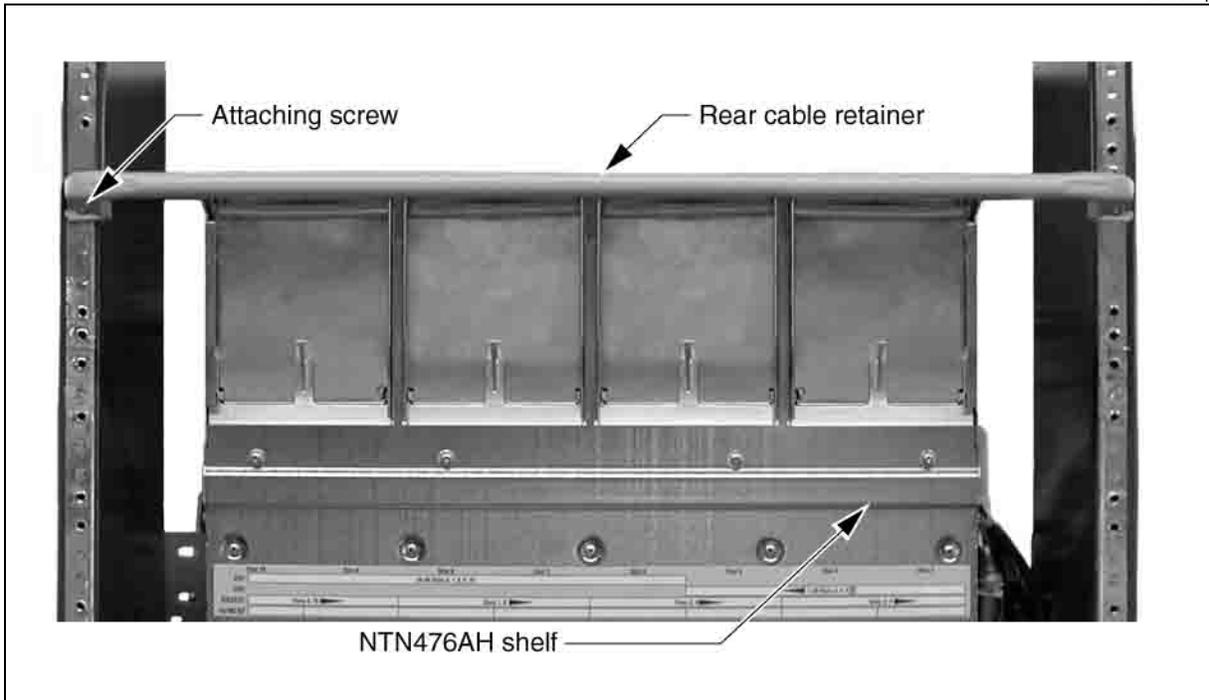
Procedure 3-18
Connecting the power cables to the shelf from the NTN458RA BIP

Requirements

To perform this procedure, you must ensure that the fixed wiring includes a quickly accessible disconnect device.

Note: The OPTera Metro 3500 power cable is not included in the shipping container. You must order this cable separately.

Tool required

A digital voltmeter (DVM) is required to perform this procedure.

⚡	**DANGER** **Risk of electrocution** Working with live circuits is dangerous. Before you continue, ensure that the shelf power is turned off at the power distribution panel and cannot be turned on by accident. Use a multimeter to verify that no potential exists.

✋	**CAUTION** **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step   Action

Connecting power to the shelf (output wiring)

1   Turn off the circuit breakers ("A" and "B" feed) on the power distribution panel or BIP for the shelf that is being connected.

2   Turn power off at the power modules.

3   Connect one end of the power cable to the output connector on the power distribution panel or BIP.

See:

-
-
-

—continued—

Procedure 3-18 (continued)
Connecting the power cables to the shelf from the NTN458RA BIP

Step	Action
4	Turn on the circuit breaker at the power distribution panel or BIP for the "A" feed.
5	Using a DVM, measure the voltage at the power connector pins in reference to ground.

     •   At the mate-n-lock connector for the shelf, the "A" power feed cable (red cable) must indicate -48 V dc. See Figure 3-61 on page 3-98.

     •   At the mate-n-lock connector for the shelf, the "A" battery return cable (white/red cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.

     •   Turn off the circuit breaker at the power distribution panel or BIP for the "A" feed.

If the values indicated by the DVM is not correct, then the cables are wired incorrectly. Verify that the power cables are terminated correctly at the power distribution panel or BIP. If the power cables are terminated properly at the power distribution panel or BIP, you must replace the power cable.

Step	Action
6	Turn on the circuit breaker at the power distribution panel or BIP for the "B" feed. Using a DVM, measure the voltage at the power connector pins in reference to ground.

     •   At the mate-n-lock connector for the shelf, the "B" power feed cable (red/blue cable) must indicate -48 V dc. See Figure 3-61 on page 3-98.

     •   At the mate-n-lock connector for the shelf, the "B" battery return cable (white/blue cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.

     •   Turn off the circuit breaker at the power distribution panel or BIP for the "B" feed.

If the values indicated by the DVM is not correct, then the cables are wired incorrectly. Verify that the power cables are terminated correctly at the power distribution panel or BIP. If the power cables are terminated properly at the power distribution panel or BIP, you must replace the power cable.

—**continued**—

Procedure 3-18 (continued)
Connecting the power cables to the shelf from the NTN458RA BIP

Step	Action
7	Plug the A power cable into the A connector at the shelf power terminal.
	See:
	• Figure 3-62 on page 3-99
	• Figure 3-63 on page 3-99
8	Plug the B power cable into the B connector at the shelf power terminal.
	See:
	• Figure 3-62 on page 3-99
	• Figure 3-63 on page 3-99

Testing the power

Step	Action
9	At the power distribution panel, turn on the power to power module A.
10	In slot 1 of the shelf, turn on power module A.
11	Ensure the green LED in front of each fan module is on.
12	In slot 1 of the shelf, turn off power module A.
13	At the power distribution panel, turn off the power to power module A.
	You have completed the test for power A.
14	At the power distribution panel, turn on the power to power module B.
15	In slot 1 of the shelf, turn on power module B.
16	Ensure the green LED in front of each fan module is on.
17	In slot 1 of the shelf, turn off power module B.
18	At the power distribution panel, turn off the power to power module B.

Resetting the BIP baseline

Step	Action
19	When you have completed connecting power to the bay configuration of shelves from the BIP (NTN458RA), push the Reset button on the BIP's front face plate.

—end—

Figure 3-61
Shelf power cable

EX1044p

to BIP power A

A

B

to BIP power B

Power module A
power connector

A- (-48V) red
A+(return) white
with red trace

A1

A+ (Return)
A- (-48V)

B- (-48V) red
with blue trace
B+ (return) white
with blue trace

B1

B+ (Return)
B- (-48V)

Power module B
power connector
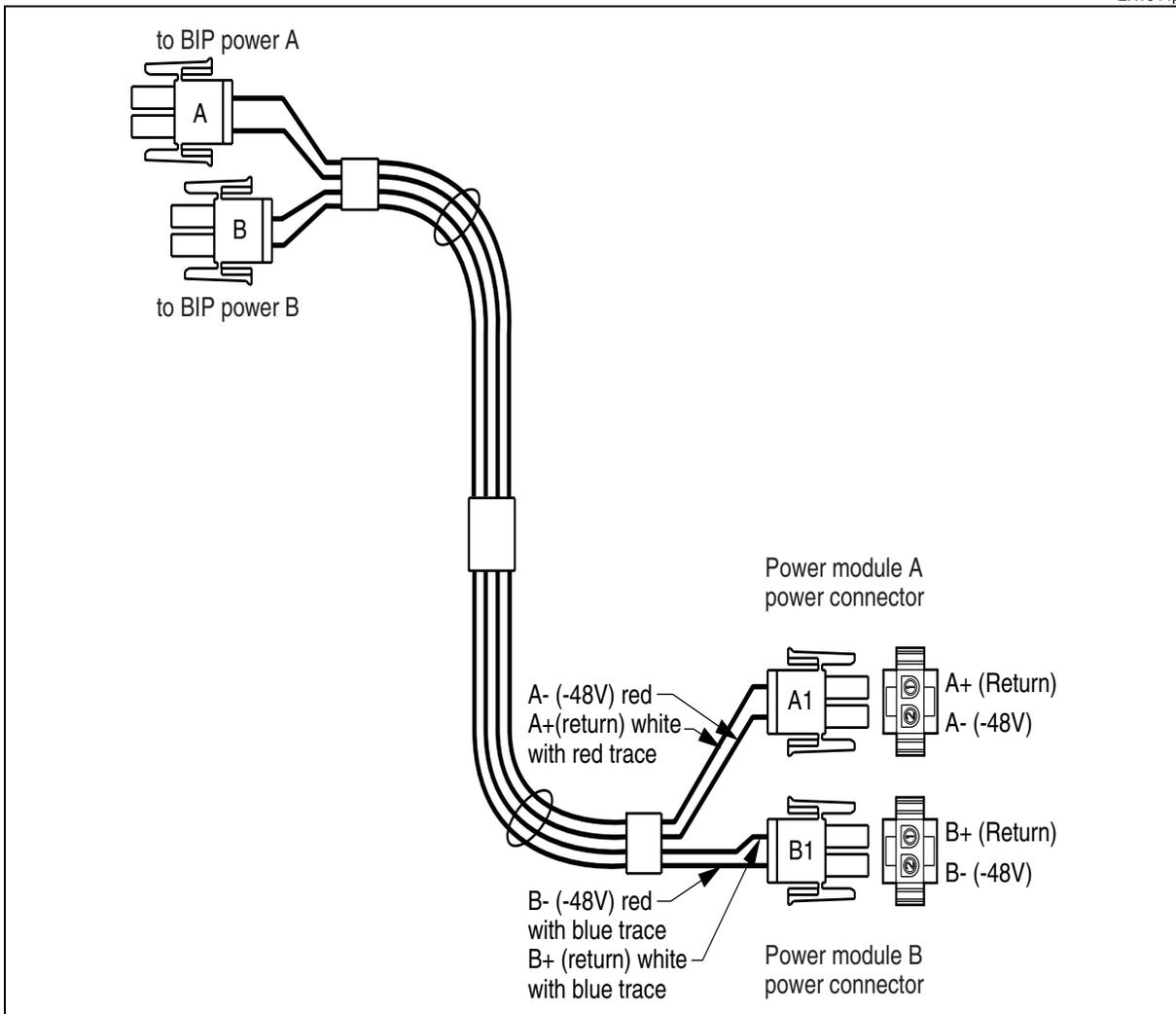
Figure 3-62
Shelf power terminal

EX0886t

Cooling fan power connector A
Cooling fan power connector B
Shelf power connector A
Shelf power connector B
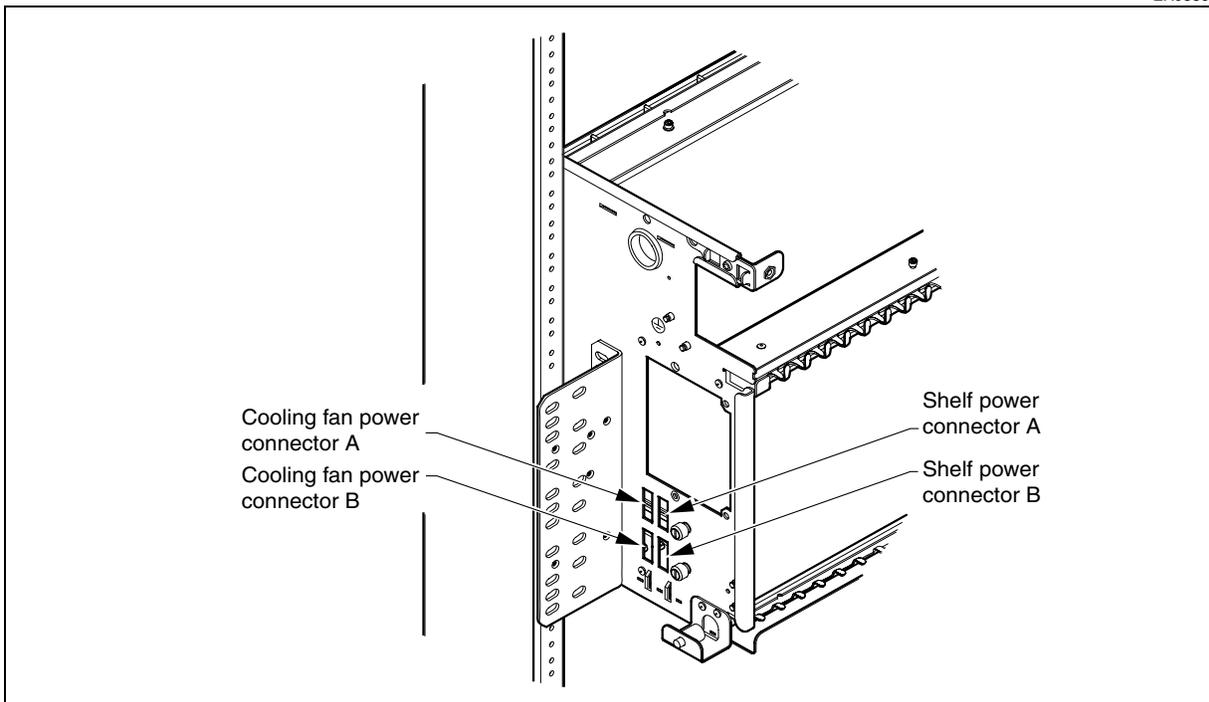
Figure 3-63
Power module

EX0781

Cooling fan power connector
Shelf power connector
Return
-48 V
Power switch
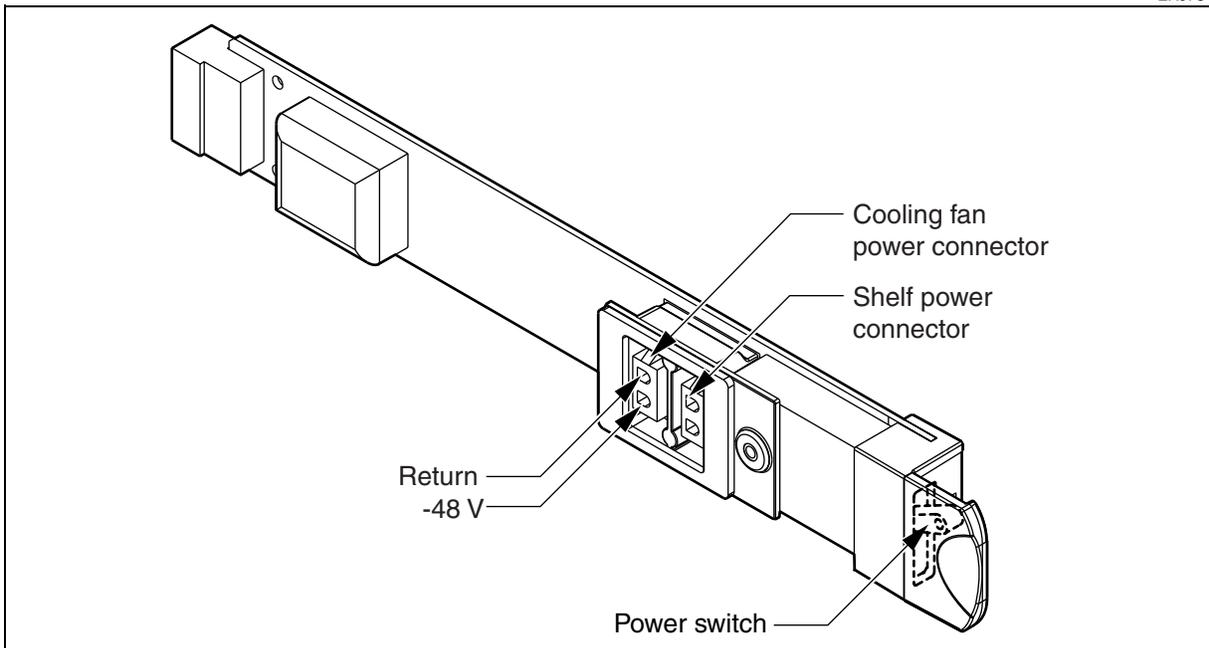
Figure 3-64
Connecting power, alarm control, and communication cables to the OPTera Metro 3500 shelf

EX1223p

Top fiber channel

Top left
fiber guide

Alarm control
cables

Fan alarm
cable

Power cables

Bottom left fiber guide

Bottom fiber channel
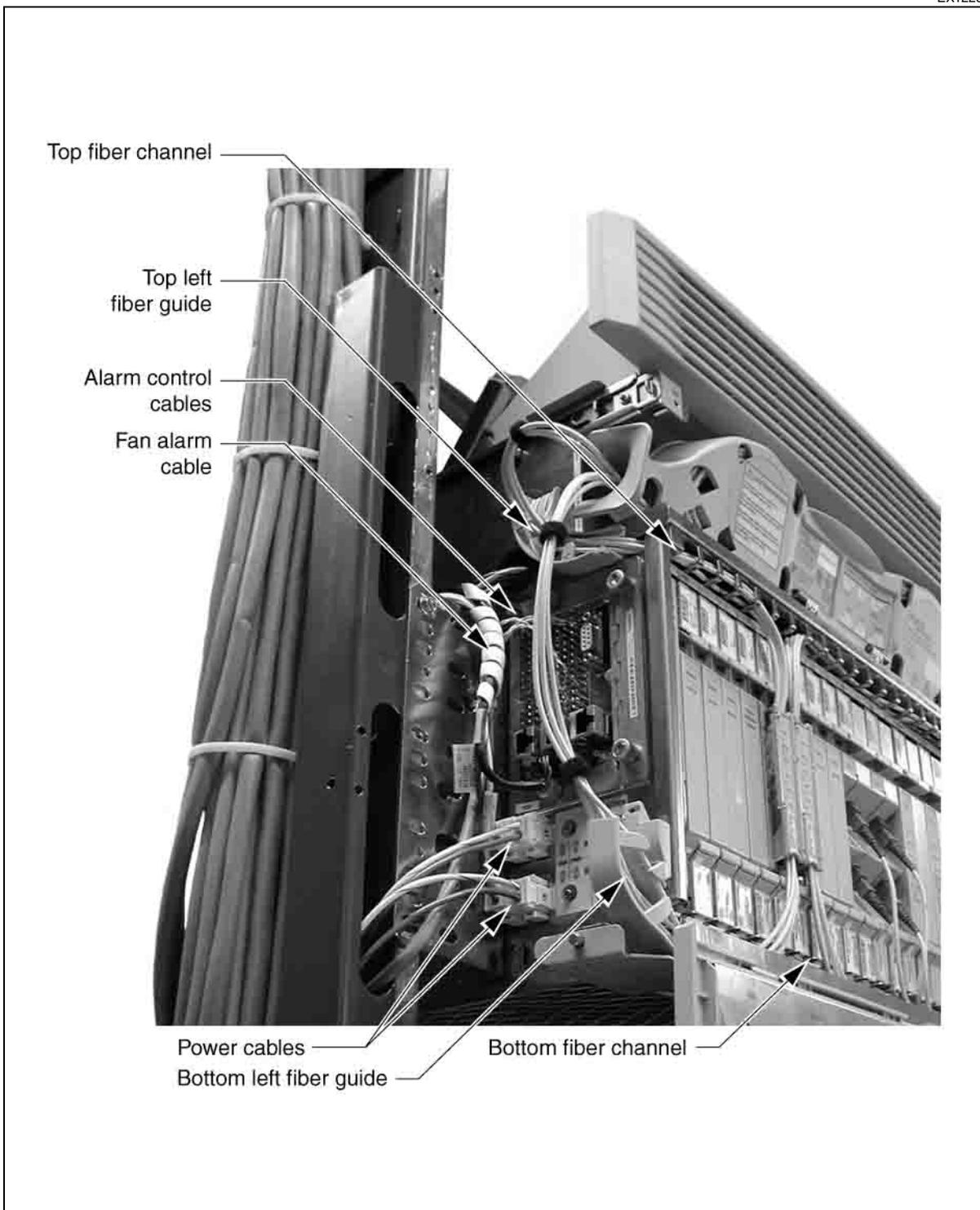
Procedure 3-19
Connecting control, communication, and tributary cables to the shelf

Use this procedure to connect the following cables to the shelf:

- building integrated timing supply (BITS)
- environmental input/output (I/O)
- shelf alarms
- telemetry byte-oriented serial (TBOS)
- ILAN, COLAN, and X.25
- DS1
- DS3

For cable and connector specifications, see Cable and connector details on page 5-1.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Verify the compatibility of your shelf alarm and environmental I/O interfaces. See:

- Figure 3-65 on page 3-105 for environmental inputs

  Note: Figure 3-65 on page 3-105 is an example of a circuit of environmental input connections using a relay interface. Environmental inputs are active low. See Figure 3-68 on page 3-108. To drive one of the inputs low, the control circuit must short it to one of the Environmental ground pins. You can use one ground pin for up to three inputs.

- Figure 3-66 on page 3-106 for environmental outputs

  Note: Figure 3-66 on page 3-106 is an example of a circuit of environmental output connections. Each environmental output pin, see Figure 3-68 on page 3-108, connects to a normally open (NO) relay contact on the LOAM. Connect the common contacts on the output relays to the common return (RET) pins.

- Figure 3-67 on page 3-107 for shelf alarm relays

Procedure 3-19 (continued)
Connecting control, communication, and tributary cables to the shelf

Step	Action

Note: Figure 3-67 on page 3-107 is an example circuit of shelf alarm relays. The LOAM shelf alarm pins connect to relays under the control of the shelf processor. When the shelf processor activates an alarm relay, the normally open line connects to the common line and the normally closed (NC) line disconnects from the common line. The NC, NO, and common lines for each shelf alarm relay are isolated from each other, the shelf ground, and the shelf battery return.

2 On the LOAM, wire wrap pins as required.

See:

- LOAM Interface pinout on page 3-109
- LOAM–connectors on page 3-108
- Grounding and isolation at the LOAM pins on page 2-6
- Connecting power, alarm control, and communication cables to the OPTera Metro 3500 shelf on page 3-100.
- Environmental input connections on page 3-105
- Environmental output connections on page 3-106
- Shelf alarm relays on page 3-107

3 On the LOAM, connect the following cables (if present):

- TBOS
- intershelf LAN 1 and intershelf LAN 2 to connectors ILAN1 and ILAN2
- the COLAN to the COLAN connector
- X.25 to the X.25 connector

Note 1: Use the flipped Category 5 UTP cable for Intershelf (ILAN) connections or for direct connections from COLAN to Preside or to a PC.

Note 2: Straight Category 5 UTP cable is used for direct connections to external or third party hubs.

—continued—

Procedure 3-19 (continued)
Connecting control, communication, and tributary cables to the shelf

Step	Action
4	Connect cables for DS1 facilities 1-28to the IN and OUT connectors on the DS1 1-28 I/O module, as required. For front access and rear access I/O installation, see:

- Connecting and routing T1 cabling-NTN476DA shelf, right angle connectors on page 3-160.
- Connecting and routing T1 cabling - NTN476DA shelf, straight connectors on page 3-160
- Connecting and routing T1 cabling - NTN476AH shelf, front facing I/O on page 3-161
- Connecting and routing T1 cabling - NTN476AH shelf, rear facing I/O on page 3-161

Note 1: See Table 3-2 on page 3-90 for the relationship between connector location, DS1 facility, I/O slot number, and tributary slot number.

Note 2: Secure the DS1 1-28 cables with the strain relief located next to the I/O module.

Step	Action
5	As required, connect cables for the DS1 facilities 29 through 84 to the IN and OUT connectors on the DS1 29-84 I/O module. For front access and rear access I/O installation, see:

- Connecting and routing T1 cabling-NTN476DA shelf, right angle connectors on page 3-160.
- Connecting and routing T1 cabling - NTN476DA shelf, straight connectors on page 3-160
- Connecting and routing T1 cabling - NTN476AH shelf, front facing I/O on page 3-161
- Connecting and routing T1 cabling - NTN476AH shelf, rear facing I/O on page 3-161

Note 1: See Table 3-2 on page 3-90 for the relationship between connector location, DS1 facility, I/O slot number, and tributary slot number.

Note 2: Secure the DS1 29-84 cables with the cable retainer located next to the I/O module.

Procedure 3-19 (continued)
Connecting control, communication, and tributary cables to the shelf

Step	Action
6	As required, connect cables for the DS3 facilities to the IN and OUT connectors on the BNC 12-port I/O module. For front access and rear access I/O installation, see:

- Connecting and routing T3 cabling - NTN476DA shelf on page 3-163
- Connecting and routing T3 cabling - NTN476AH shelf, front facing I/O on page 3-163
- Connecting and routing T3 cabling - NTN476AH shelf, rear facing I/O on page 3-164

Note 1: See Table 3-2 on page 3-90 for the relationship between I/O slot number and tributary slot number. The I/O and tributary slot positions are put in a group of working and protection pairs.

Note 2: Secure the T3 cables with the strain relief located next to the I/O module.

7 As required, connect cables for the OPTera Packet Edge facilities to the connectors on the 8xRJ-45 I/O module. For rear access I/O installation, see Connecting and routing Category 5 UTP cabling - NTN476AH shelf, rear facing I/O on page 3-164

Note: See Table 3-2 on page 3-90 for the relationship between I/O slot number and tributary slot number. The I/O and tributary slot positions are put in a group of working and protection pairs.

8 Secure the Category 5 UTP cables with the strain relief located next to the I/O module.

—**end**—

Figure 3-65
Environmental input connections

EX0856p

Environmental input pins
A3-A6, B3-B6, C3-C6, D3-D6.

Environmental
input

NO   NC

Common

Relay

Environmental
sensing and
relay control
circuits

Environmental
ground
(logic ground)
E10-E14

Twisted wire pair
connects the LOAM
environmental I/O pins
to the relay.

LOAM

OPTera Metro 3500 shelf

Note 1: The environmental input grounds must not have a direct connection to any other
office ground.
Note 2: All of the environmental input grounds are shorted together
on the LOAM

Figure 3-66
Environmental output connections
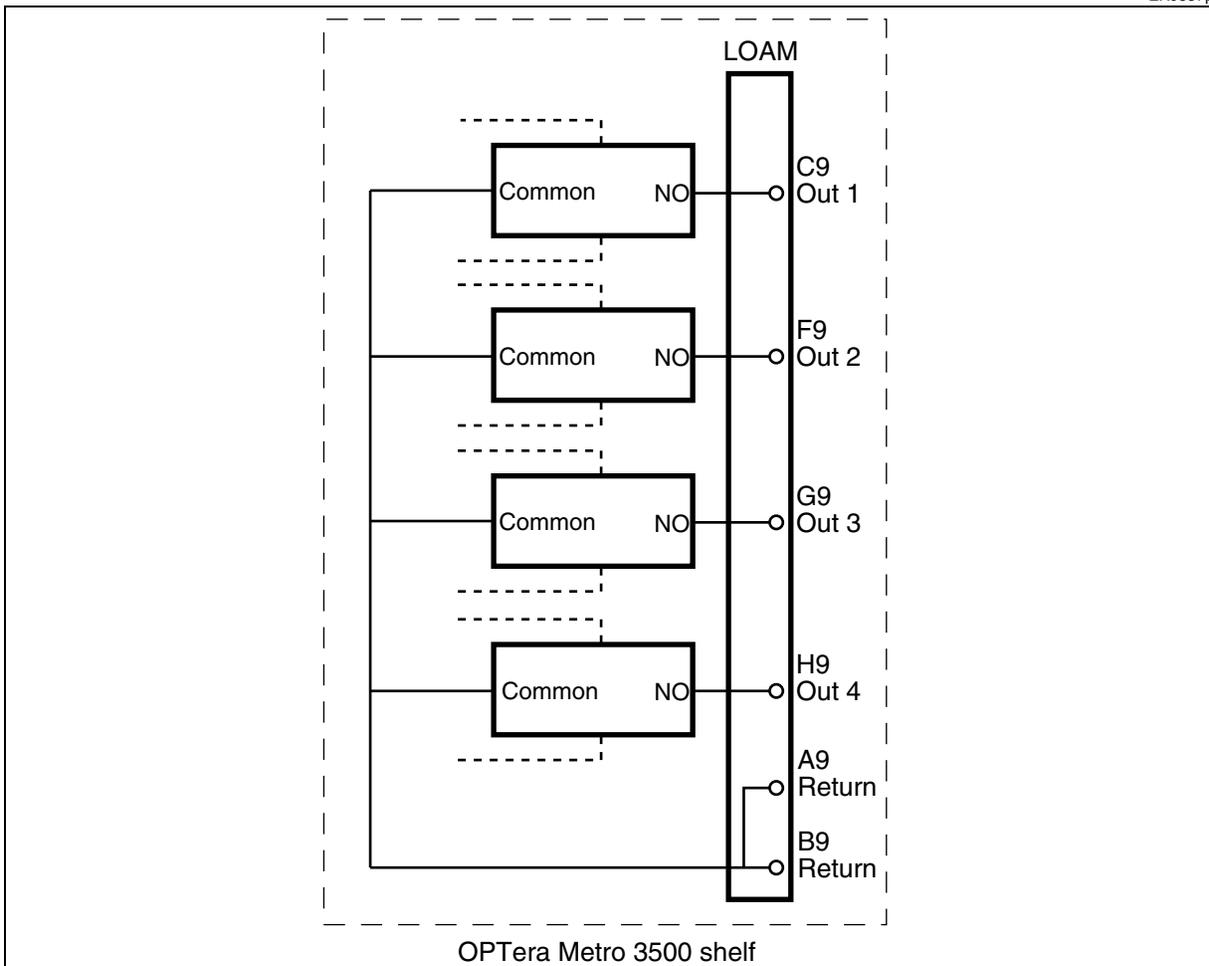
Figure 3-67
Shelf alarm relays

EX0858p

LOAM

Relay

Common

NC — normally closed pin
NO — normally open pin

See Note

common pin

B10-B13
G10-G13

OPTera Metro 3500 shelf

Note: See LOAM interface pinout designations for Visual
and Audible (Critical/MJ/MN/RMT) assignment.
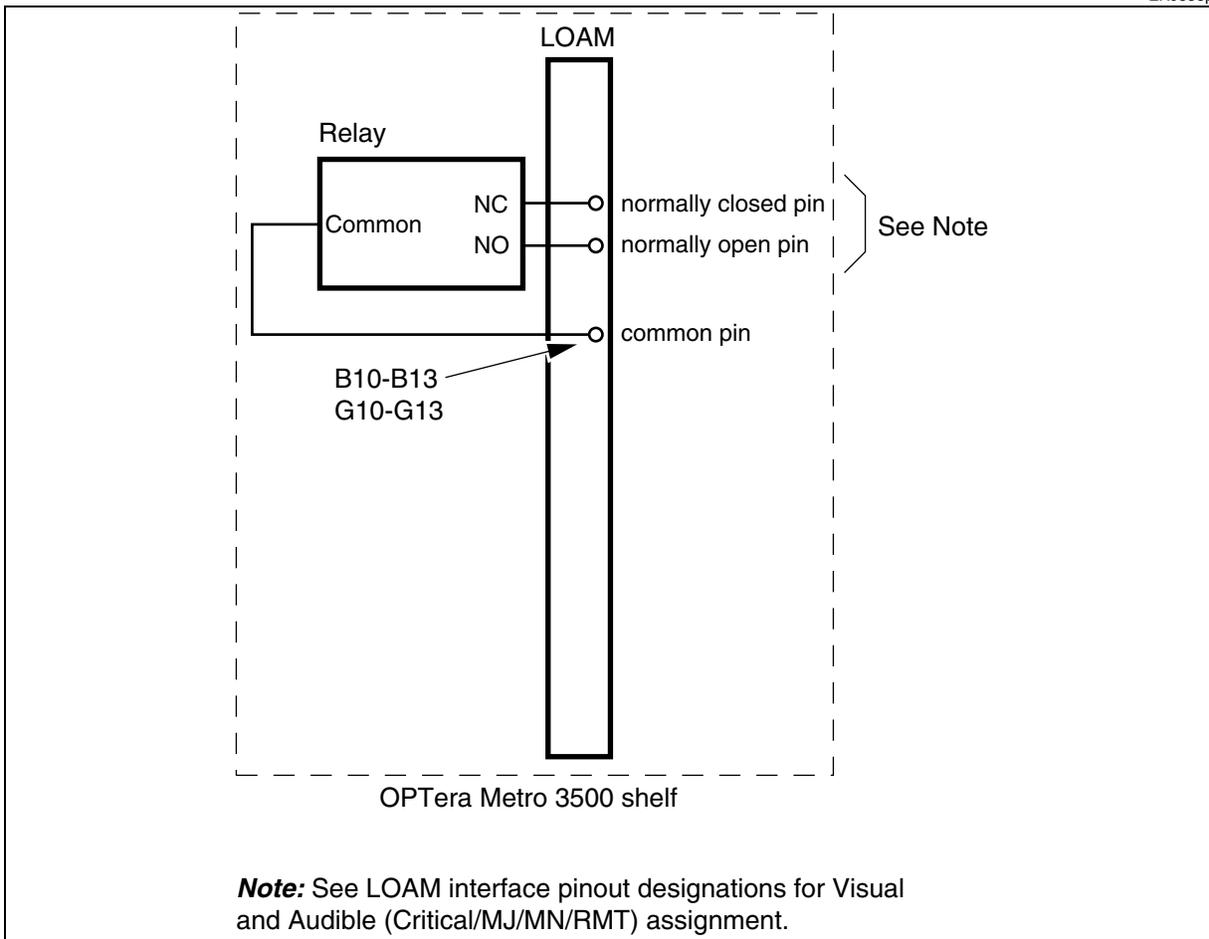
Figure 3-68
LOAM–connectors
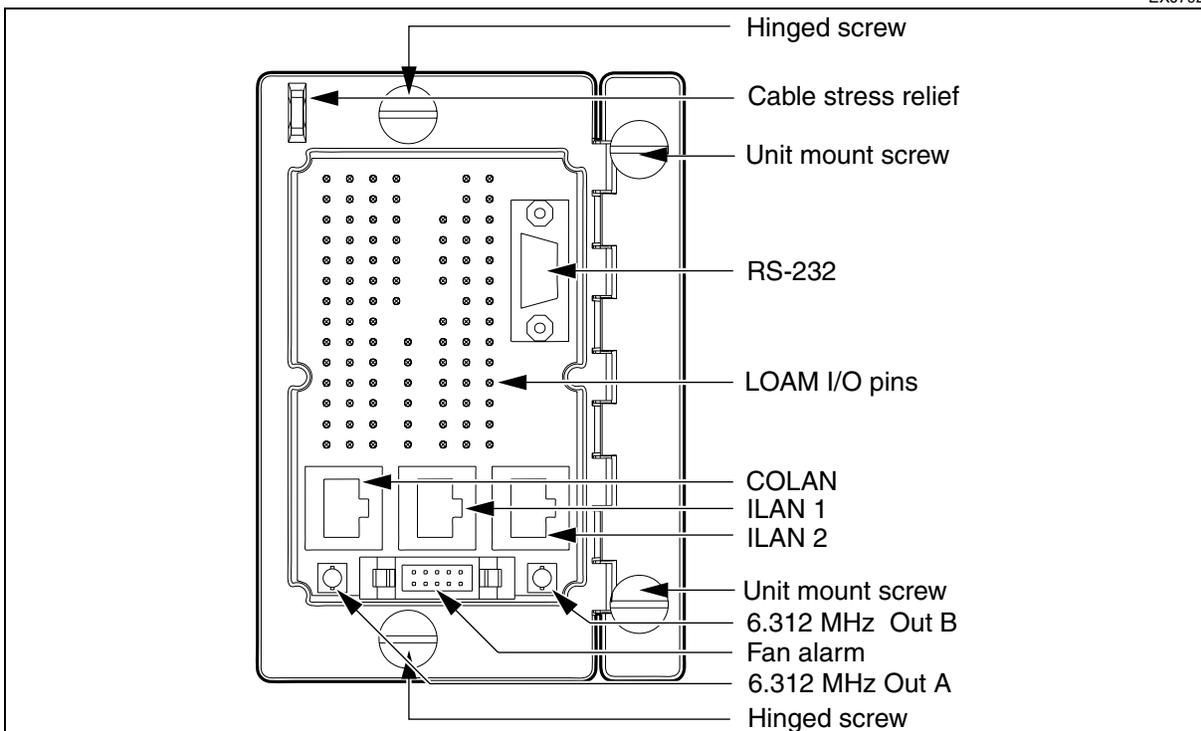
Figure 3-69
LOAM Interface pinout

EX0776p
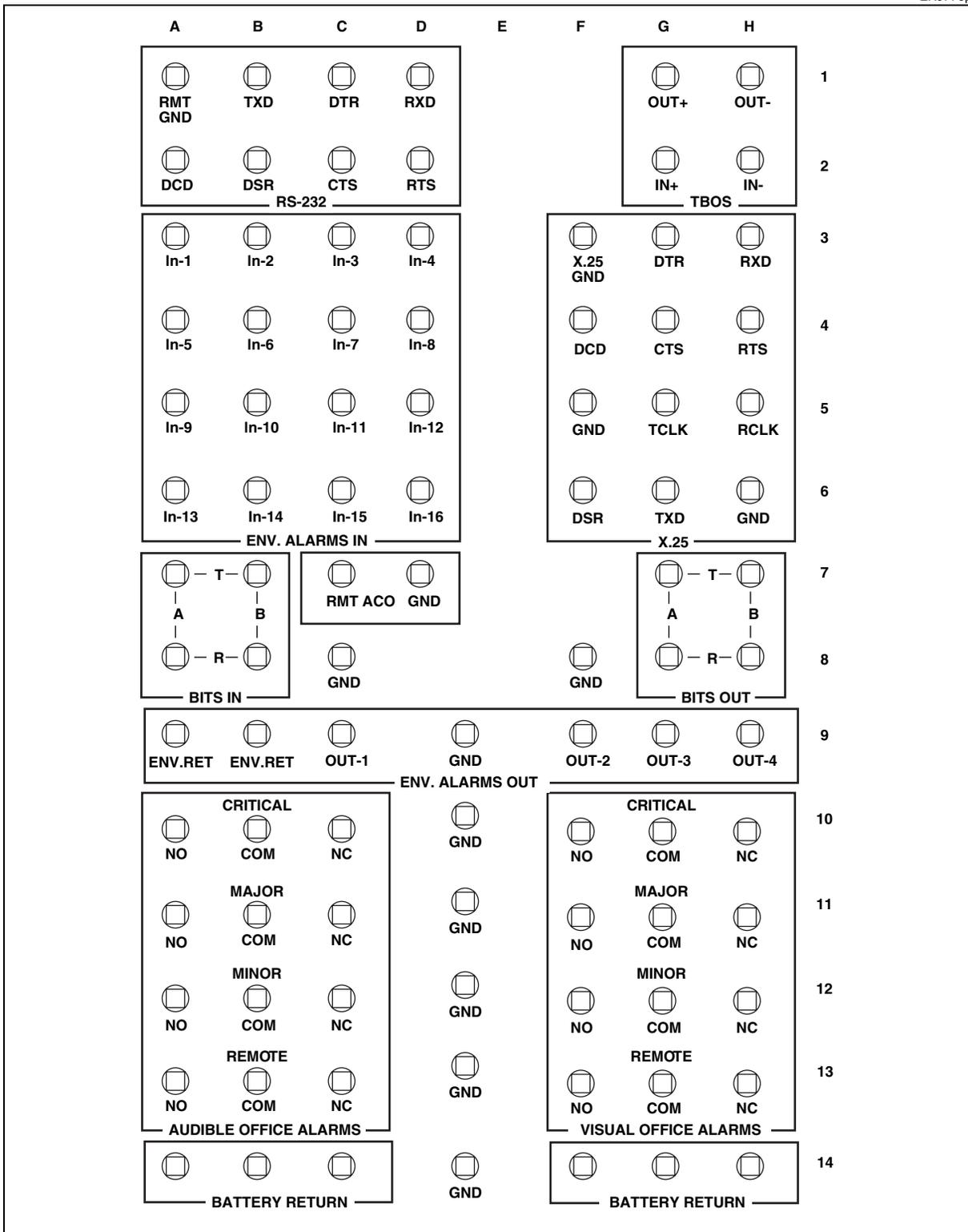
Procedure 3-20
Installing core circuit packs

Use this procedure to install the following OPTera Metro 3500 core circuit packs:

- extended shelf processor (SPx)

- virtual tributary cross-connect VTX-48 for OC-48 in high speed slots

- virtual tributary cross-connect VTX-48e for OC-12 or OC-48 in high speed slots

- synchronous tributary cross-connect STX-192 for supporting:

  — OC-12x4 STS and OC-48 STS in tributary slots

  — OC-48 STS and OC-192 in high speed slots

Note 1: Supported slot assignments for circuit packs depend on the clock and cross-connect (CLX) module type installed. For slot assignments on shelves equipped with either a VTX-48 or VTX-48e circuit pack, see Figure 3-70 on page 3-115. For slot assignments on shelves equipped with an STX-192 circuit pack, see Figure 3-71 on page 3-116.

Note 2: The NPx and ILAN circuit packs are optional except in the BLSR configuration where the NPx becomes a core circuit pack. To install the NPx or the ILAN circuit pack in the OPTera Metro 3500 shelf, see Installing the NPx and the ILAN circuit pack on page 3-125.

Note 3: After you install the SPx, you must commission it. For instructions, see 323-1059-210.

Note 4: If the shelf has been hot staged, then the shelf is shipped with core circuit packs installed.

Note 5: To install the OC-192, OC-48 STS, OC-48, or OC-12 circuit packs in the high speed slots, see Installing an optical interface circuit pack on page 3-119.

> **CAUTION**
> **Risk of autoprovisioning failure**
> Ensure the first circuit pack installed in the system is the SPx and the second circuit pack is the VTX-48 circuit pack. Insert circuit packs in the correct order to prevent the circuit pack autoprovisioning from failing.

Procedure 3-20 (continued)
Installing core circuit packs

> ⚠ **CAUTION**
> **Risk of circuit pack damage**
> Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before installing any of the circuit packs, make sure you know the detailed procedure for insertion of circuit packs.

> ⚠ **CAUTION**
> **Risk of incorrect installation**
> Ensure that the circuit pack lock/eject levers are locked in position. If the lock covers are not locked, the latch sensors on VTX-48 circuit packs do not allow the shelf to identify the circuit packs, and do not allow the circuit packs to autoprovision.

> ⚠ **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1
If you wish to install the	**Then** go to
extended shelf processor (SPx)	step 2
VTX-48 or VTX-48e circuit pack	step 8
STX-192 circuit pack	step 13

Installing the SPx

2   On the LIF, set the major alarm disable switch (service switch) to the ON position. Use an object made of wood or plastic to move the switch to the right position.

See:

- Figure 3-72 on page 3-117, if your shelf will be equipped with VTX-48 or VTX-48e circuit packs

- Figure 3-73 on page 3-118, if your shelf will be equipped with STX-192 circuit packs

Note: This action inhibits audible and visual alarms during the circuit pack installation process.

—**continued**—

Procedure 3-20 (continued)
Installing core circuit packs

Step	Action

3   Ensure power A and power B are switched on at the distribution panel or BIP.

4   In slot 1 of the shelf, switch on the power module A and the power module B.

5   Remove the SPx from its box and install in slot 15.

See:

- Figure 3-72 on page 3-117, if your shelf will be equipped with VTX-48 or VTX-48e circuit packs

- Figure 3-73 on page 3-118, if your shelf will be equipped with STX-192 circuit packs

- Inserting or removing a circuit pack on page 3-192

Note 1: When you insert the SP, the Status LED turns red and the Active LED turns green. These LEDs indicate that the shelf processor software is initializing.

Note 2: Software initialization time (up to 5 minutes) is complete when the Active LED illuminates green. If the Active LED does not illuminate green, the circuit pack has faults and must be returned to Nortel Networks. Do not go to the next step until the shelf processor software initialization is complete.

6

If you	**Then** go to
do not need to install a VTX-48, VTX-48e, or STX-192 circuit pack	step 7
need to install a VTX-48, VTX-48e, or STX-192 circuit pack	step 8

7   On the LIF, set the major alarm disable switch (service switch) to the OFF position. Use an object made of wood or plastic to move the switch to the left position.

See:

- Figure 3-72 on page 3-117, if your shelf will be equipped with VTX-48 or VTX-48e circuit packs

- Figure 3-73 on page 3-118, if your shelf will be equipped with STX-192 circuit packs

You have completed this procedure.

—**continued**—

Procedure 3-20 (continued)
Installing core circuit packs

Step	Action

Installing the VTX-48 circuit pack

8   Connect the PC to the shelf processor. See Connecting a terminal or modem to the shelf on page 3-189.

9   Launch the Preside Site Manager application and log in to the network element. For instructions, see *Security and Administration,* 323-1059-302, Starting Preside Site Manager and Logging in to a network element. You can monitor the shelf when installing the circuit packs.

10   Remove one of the VTX-48 circuit packs from its box and install in slot 13. See:

- Figure 3-70 on page 3-115
- Inserting or removing a circuit pack on page 3-192

When you install the circuit pack into the slot, the status LEDs on the circuit pack illuminates. The top Status LED turns red, the second Status LED turns green, and the primary and secondary reference LEDs turn yellow. These lights indicate that the VTX-48 software is initializing.

Note: Software initialization time (up to 5 minutes) is complete when the top Status LED extinguishes. If the top Status LED does not extinguish, the circuit pack has faults and must be returned to Nortel Networks. Do not go to the next step until the VTX-48 software initialization in slot 13 is complete.

11   Remove the second VTX-48 circuit pack from its box and install in slot 14. See:

- Figure 3-70 on page 3-115
- Inserting or removing a circuit pack on page 3-192

Note: The status LEDs on the circuit pack illuminate when you insert the circuit pack. The top Status LED turns red, the second Status LED turns green and the primary and secondary reference LEDs turn yellow. These LEDs indicate that the circuit pack software is initializing and the VTX-48 circuit pack is synchronizing to the slot 13 circuit pack. Software initialization and circuit pack synchronization are complete when the top status LED extinguishes. If the top Status LED remains red, the VTX-48 circuit pack has faults and must be returned to Nortel Networks.

Do not go to the next step until the VTX-48 software initialization (up to 5 minutes) in slot 14 is complete.

12   On the LIF, set the major alarm disable switch (service switch) to the OFF position. Use an object made of wood or plastic to move the switch to the left position. See Figure 3-72 on page 3-117.

You have completed this procedure.

Procedure 3-20 (continued)
Installing core circuit packs

Step	Action

Installing the STX-192 circuit pack

13 Remove one of the STX-192 circuit packs from its box and install in slot 13. See:

- Figure 3-71 on page 3-116
- Inserting or removing a circuit pack on page 3-192

When you install the circuit pack into the slot, the status LEDs on the circuit pack illuminates. The top Status LED turns red, the second Status LED turns green, and the primary and secondary reference LEDs turn yellow. These lights indicate that the STX-192 software is initializing.

Note: Software initialization time (up to 5 minutes) is complete when the top Status LED extinguishes. If the top Status LED does not extinguish, the circuit pack has faults and must be returned to Nortel Networks. Do not go to the next step until the STX-192 software initialization in slot 13 is complete.

14 Remove the second STX-192 circuit pack from its box and install in slot 14. See:

- Figure 3-71 on page 3-116
- Inserting or removing a circuit pack on page 3-192

Note: The status LEDs on the circuit pack illuminate when you insert the circuit pack. The top Status LED turns red, the second Status LED turns green and the primary and secondary reference LEDs turn yellow. These LEDs indicate that the circuit pack software is initializing and the STX-192 circuit pack is synchronizing to the slot 13 circuit pack. Software initialization and circuit pack synchronization are complete when the top status LED extinguishes. If the top Status LED remains red, the STX-192 circuit pack has faults and must be returned to Nortel Networks.

Do not go to the next step until the STX-192 software initialization (up to 5 minutes) in slot 14 is complete.

15 On the LIF, set the major alarm disable switch (service switch) to the OFF position. Use an object made of wood or plastic to move the switch to the left position. See Figure 3-73 on page 3-118.

—**end**—

Figure 3-70
OPTera Metro 3500 slot assignments (VTX-48/VTX-48e installed in shelf)

Note: The OC-12 circuit pack is a single-width circuit pack.
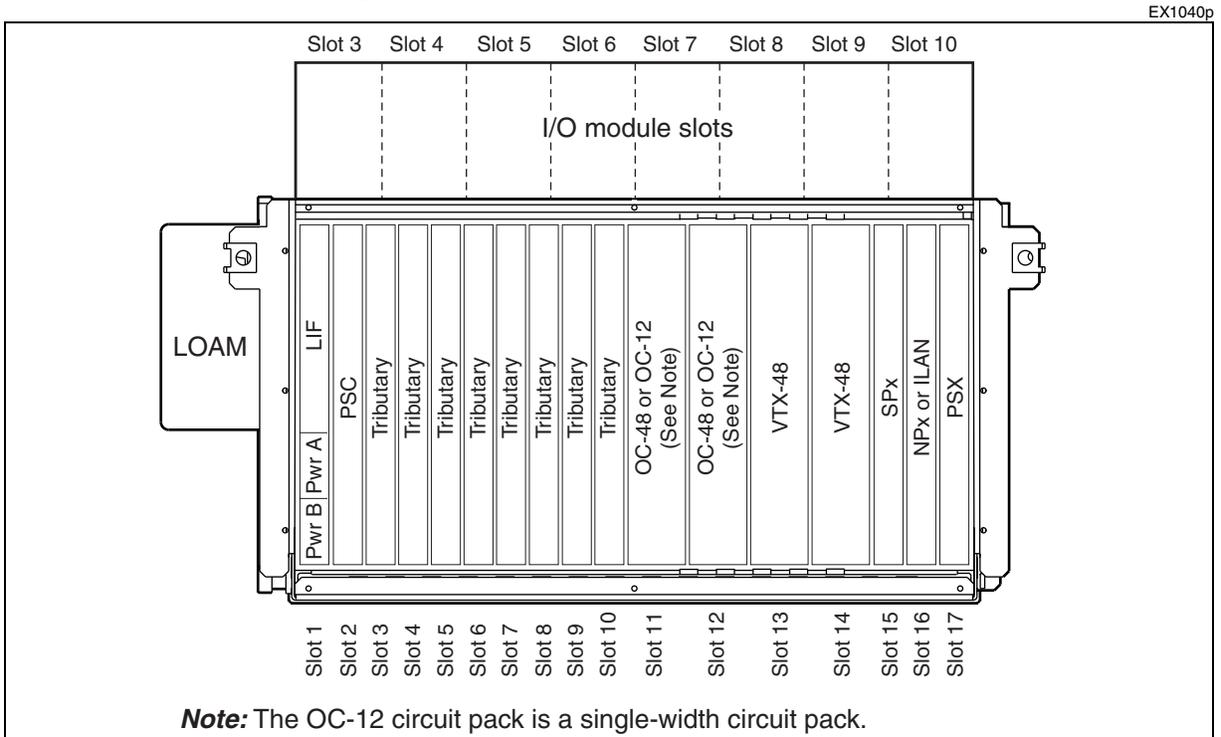
Figure 3-71
OPTera Metro 3500 slot assignments (STX-192 installed in shelf)

Note: The OC-48 STS circuit pack is a single-width circuit pack.
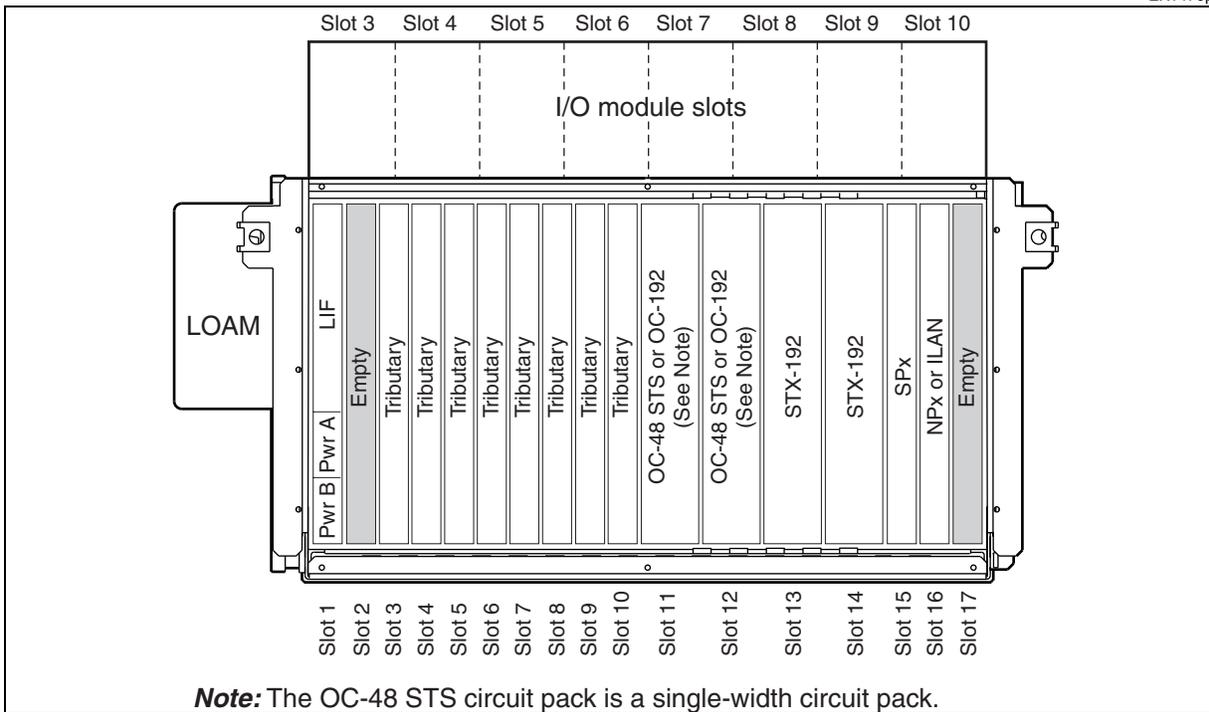
Figure 3-72
Core circuit packs (VTX-48/VTX-48e installed in shelf)

EX1056p

OC-12   OC-48   VTX-48, VTX-48e   SPx   LIF

Note 1: If OC-48 circuit packs are installed in slots 11 and 12, then the OC-12 circuit pack is not a core circuit pack.
Note 2: If OC-12 circuit packs are installed in slots 11 and 12, then the OC-48 circuit pack is not a core circuit pack.
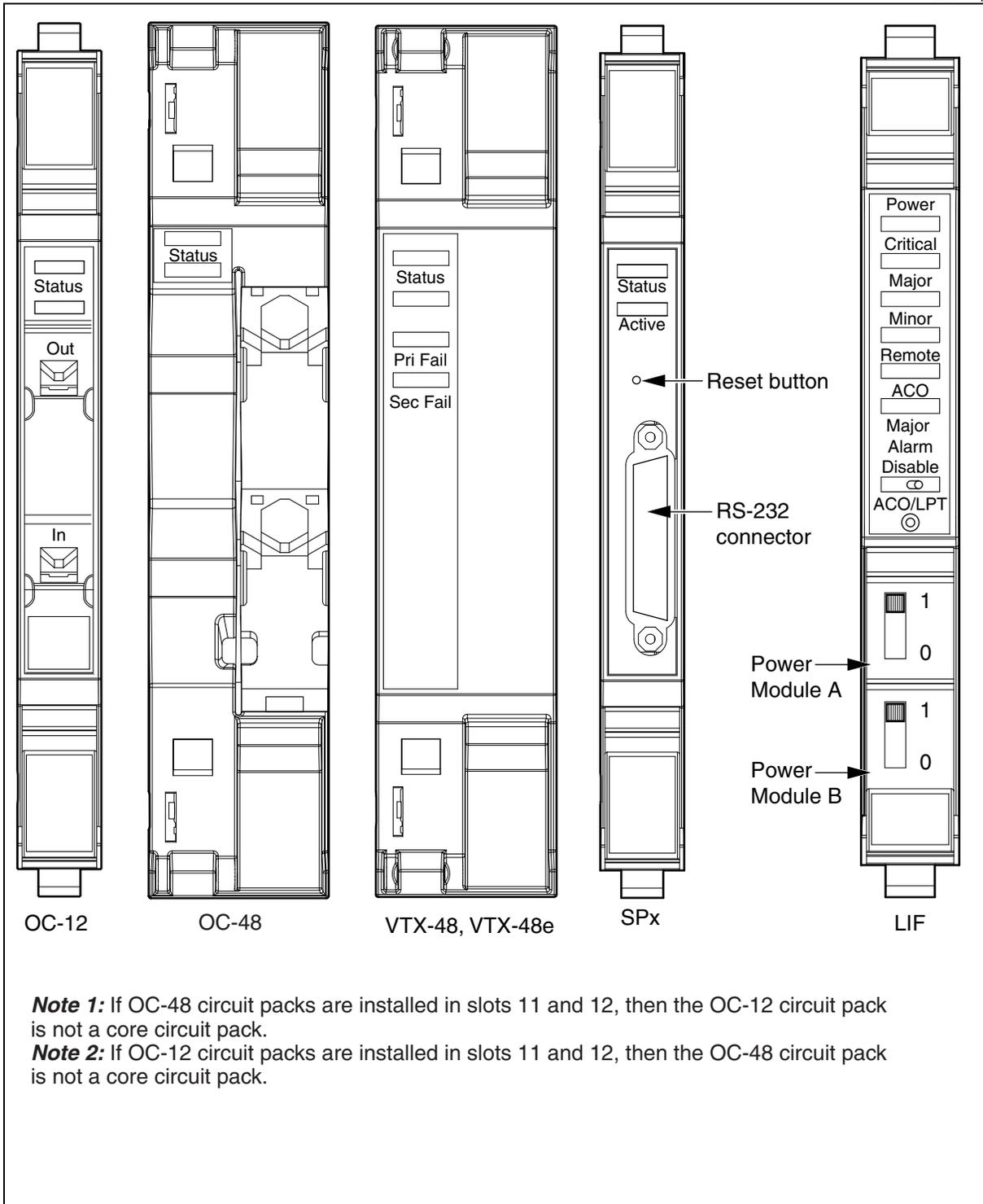
Figure 3-73
Core circuit packs (STX-192 installed in shelf)

EX1473p

OC-192   OC-48 STS   STX-192   SPx   LIF
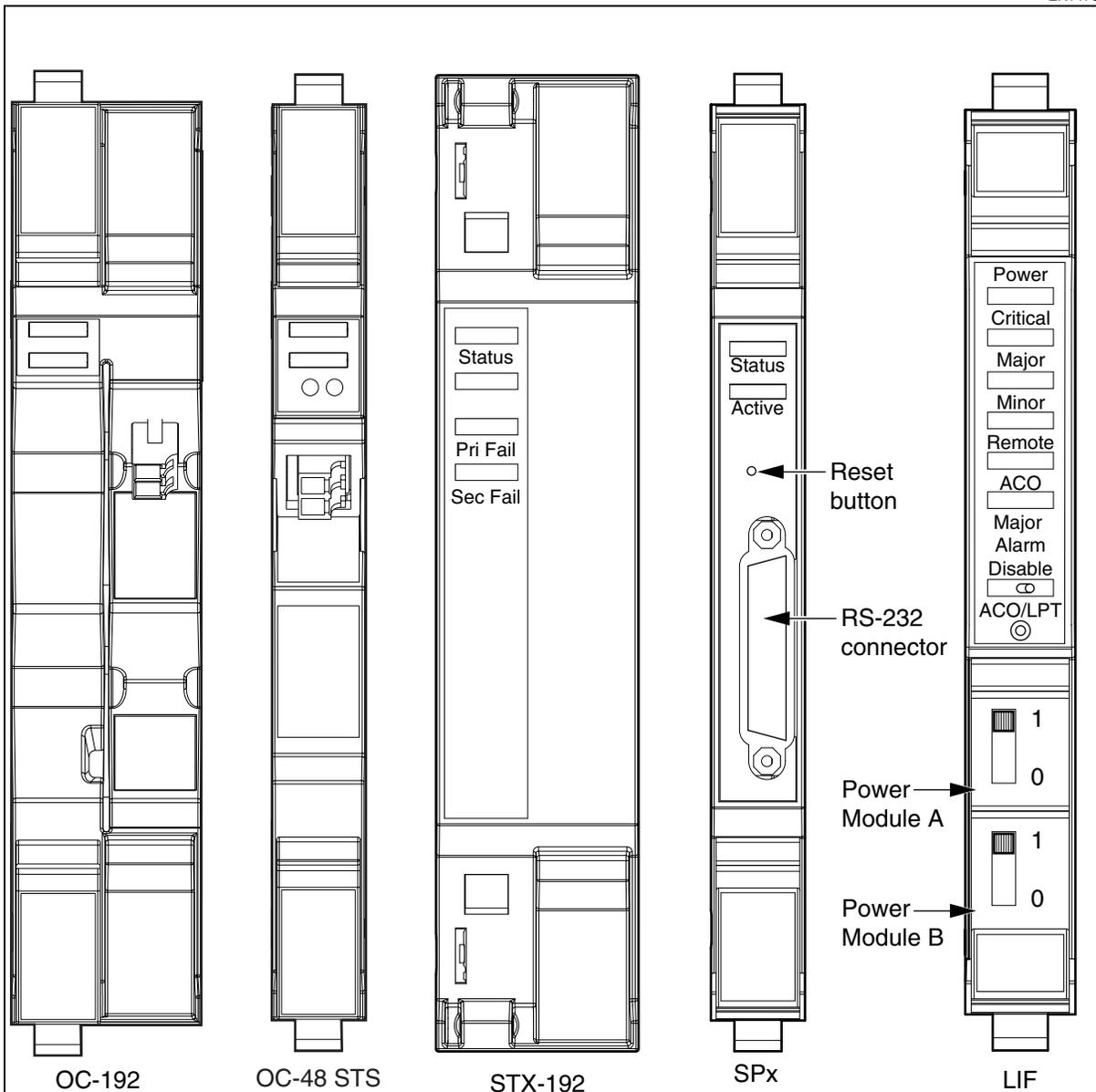
Note 1: If OC-192 circuit packs are installed in slots 11 and 12, then the OC-48 circuit pack
is not a core circuit pack.
Note 2: If OC-48 STS circuit packs are installed in slots 11 and 12, then the OC-192 circuit pack
is not a core circuit pack.

Procedure 3-21
Installing an optical interface circuit pack

Use this procedure to install optical interface circuit packs. Table 3-3 on page 3-119 lists clock and cross-connect module (CLX) and optical interface circuit pack compatibility.

Note 1: To install the 4x100FX or 2xGigE/FC-P2P circuit packs, see Installing 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs on page 3-141.

Note 2: To install the 2xGigE circuit pack, see Installing 2xGigE circuit packs on page 3-149.

Table 3-3
CLX - optical interface compatibility

Optical interface circuit pack	CLX module compatibility		
	VTX-48	**VTX-48e**	**STX-192**
OC-3	√	√	√
OC-3x4	√	√	√
OC-12	√	√	√
OC-12x4			√
OC-48	√	√	
OC-48 STS			√
OC-48 DWDM	√	√	
OC-192 IR			√
OC-192 LR G.709 FEC			√
OC-192 DWDM G.709 FEC			√

See Table 3-5 on page 3-124 for the supported slot assignments for each of the listed optical interface circuit packs.

Note: If the shelf has been hot staged, then the shelf is shipped with optical interface circuit packs installed.

—continued—

Procedure 3-21 (continued)
Installing an optical interface circuit pack

Requirements

To perform this procedure, you must ensure the optical interface circuit pack you are installing is compatible with the CLX module already on your shelf. See Table 3-3 on page 3-119 to ensure compliancy.

	CAUTION **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION **Risk of circuit pack damage** Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before you install any of the circuit packs, make sure you understand the detailed procedure for insertion of circuit packs.

	CAUTION **Risk of incorrect installation** Ensure that the circuit pack lock/eject levers are locked in position. If the lock/eject levers are not locked, the circuit pack does not autoprovision.

	CAUTION **Risk of installation of incorrect VTX-48** When you are using an OC-12 optical interface circuit pack in the high speed slots, ensure that a VTX-48e (NTN414AB) is installed in the shelf.

	DANGER **Risk of personal injury** When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber or components.

—continued—

Procedure 3-21 (continued)
Installing an optical interface circuit pack

Step	Action

Attaching optical connector adapters to the optical interface circuit pack

1

If the optical interface circuit pack you will install	**Then** go to
is not equipped with any optical connector adapters	step 2
is equipped with optical connector adapters of the incorrect type	step 2
is equipped with optical connector adapters of the correct type	step 9

2 Open the lower latch of the circuit pack.

3 On the side of the circuit pack faceplate, insert the end of a flat-head screwdriver into the slotted groove between the adapter retainer and the faceplate.

4 Twist the screwdriver until the adapter retainer becomes loosened.

5 Slide the adapter retainer downward and away from the circuit pack.

6 If your circuit pack is currently equipped with connector adapters that do not match your fiber connector type, remove the connector adapters from the circuit pack's fiber-optic connectors by individually pulling the connector adapters downward and away from the circuit pack.

7 Insert the required type of connector adapters into each fiber-optic connector of the circuit pack.

    a. With one hand, hold the internal side (circuit board side) of the fiber-optic connector to brace the fiber and plug.

    b. With your other hand, insert the connector adapter into the external side (faceplate side) of the fiber-optic connector.

8 Re-attach the adapter retainer to the circuit pack by sliding it upward and into place on the faceplate.

    Note 1: Firmly snap the adapter retainer into place.

    Note 2: The connector adapters should slide through the holes of the adapter retainer as you slide the retainer into place.

9 Insert the fiber-optic into a fiber microscope adapter to verify if the connector is clean.

10 Turn on the light in the fiber microscope.

11 Adjust the focus so that you can identify four different zones. See Figure 4-7 on page 4-16 for the single-mode fiber zones. See Figure 4-8 on page 4-17 for an example of a dirty fiber-optic.

<div align="center">**—continued—**</div>

Procedure 3-21 (continued)
Installing an optical interface circuit pack

Step	Action

12	**If** the connector	**Then** go to
	is clean	step 13
	is not clean	Inspecting and cleaning optical interface internal connectors and fiber on page 4-2, then continue this procedure at step 13

Installing optical interface circuit packs

13 Install the optical interface circuit pack in its assigned slot. See Table 3-5 on page 3-124. For instructions, see Inserting or removing a circuit pack on page 3-192.

All the LEDs on the optical interface circuit pack illuminate when you insert the circuit pack into the slot. The top Status LED turns red and the next, Status LED turns green. These LEDs indicate that the optical interface circuit pack software is initializing.

Note 1: Software initialization time is complete when the top Status LED turns yellow. If the top Status LED remains red, the optical interface circuit pack is damaged and must be returned to Nortel Networks.

Note 2: Do not wait for software initialization time to be complete. Install the next optical interface circuit pack and the tributary circuit packs.

14 After all optical interface circuit packs are installed in the network element, wait until software initialization on all circuit packs is complete before continuing this procedure.

15 For each optical interface circuit pack you installed, perform step 16.

16	**If** the optical interface circuit pack you installed	**Then** go to
	is an ER or ELR circuit pack	step 17
	is not an ER or ELR circuit pack	step 29

17 Ensure you are logged into the network element in which you installed the optical interface circuit pack. See login procedures in *Security and Administration*, 323-1059-302.

18 In Site Manager, select this network element in the navigation tree.

19 Select Facility PM Thresholds in the Performance menu.

20 In the Type box, select the line rate of your ER or ELR circuit pack.

21 In the Facility box, select the circuit pack you installed.

22 In the Location box, select Near end.

23 In the Direction box, select Receive.

24 Click Retrieve.

—**continued**—

Procedure 3-21 (continued)
Installing an optical interface circuit pack

Step	Action
25	In the Monitor Type column of the PM Thresholds list, select OPR.
26	Click Edit.
27	In the Edit Threshold Values dialog box, under Physical PM, select Reset baseline power level.
28	Click OK.
29	Repeat step 16 for the remaining optical interface circuit packs you just installed.

—**end**—

Figure 3-74
Exploded faceplate and connector detail of OC-48, OC-48 DWDM, OC-12, and OC-3 circuit packs

EX1289p
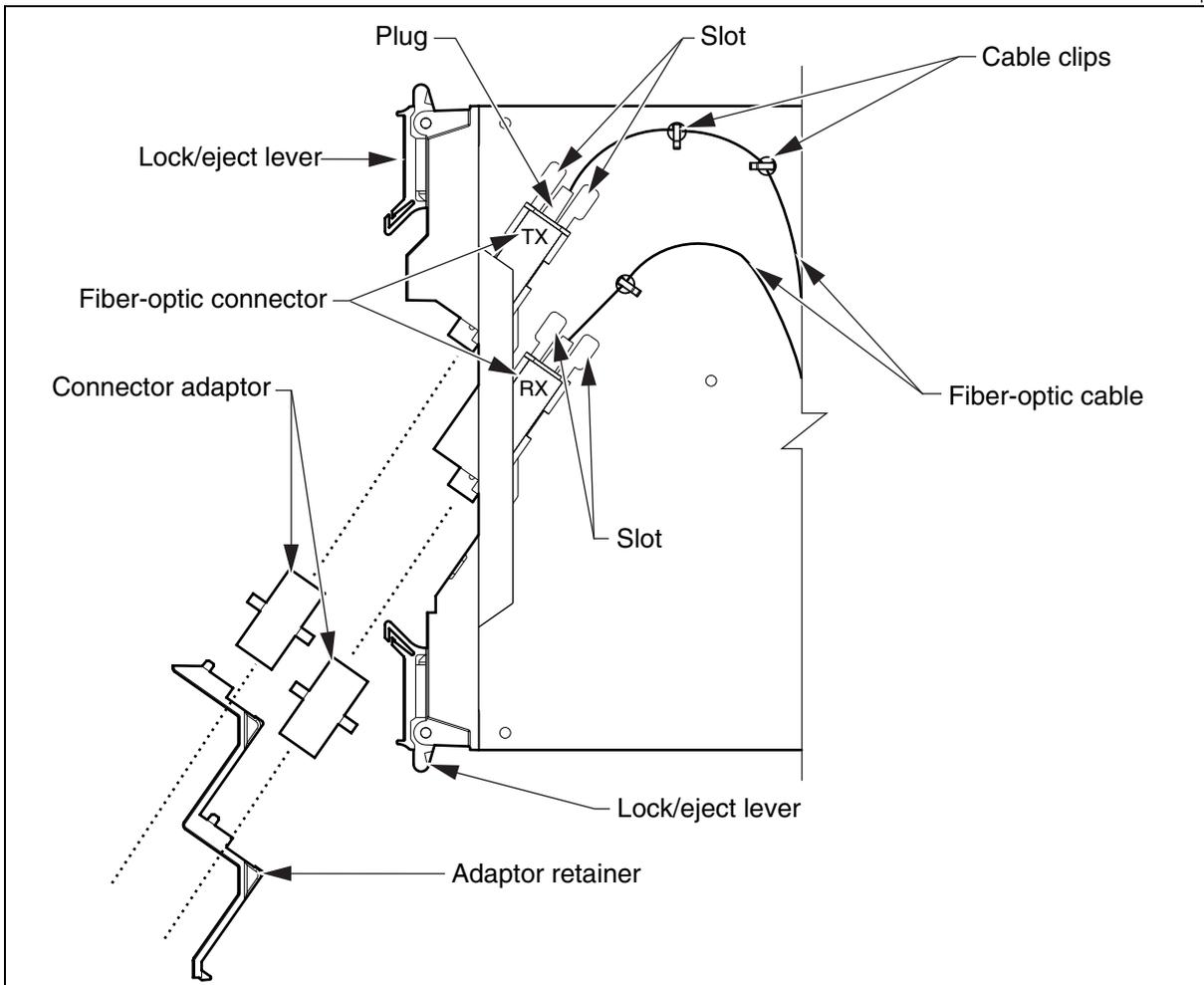
Optical interface circuit pack slot assignments

Table 3-4
Optical interface protected 1+1 slot pairs

Working optical interface slot	Protection optical interface slot
11	12
9	10
7	8
5	6
3	4

CAUTION
Risk of installation of incorrect VTX-48
When you are using an OC-12 optical interface circuit pack in the high speed slots, ensure that a VTX-48e (NTN414AB) is installed in the shelf.

Table 3-5
Optical interface slot assignments

Circuit pack/slot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
OC-192 IR											X	X					
OC-192 LR G.709 FEC											X	X					
OC-192 DWDM G.709 FEC											X	X					
OC-48											X	X					
OC-48 DWDM											X	X					
OC-48 STS			X	X	X	X	X	X	X	X	X	X					
OC-12x4			X	X	X	X	X	X	X	X							
OC-12			X	X	X	X	X	X	X	X	X	X					
OC-3x4			X	X	X	X	X	X	X	X							
OC-3			X	X	X	X	X	X	X	X							

Procedure 3-22
Installing the NPx and the ILAN circuit pack

Use this procedure to install the NPx or the ILAN in the OPTera Metro 3500 shelf.

Note 1: After you install the NPx, you must commission it. For instructions, see 323-1059-210.

Note 2: In the BLSR configuration, the NPx is a core circuit pack.

Note 3: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the NPx or ILAN circuit packs installed.

⚠	**CAUTION** **Risk of circuit pack damage** Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before installing any of the circuit packs, make sure you know the detailed procedure for insertion of circuit packs.

⚠	**CAUTION** **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—**continued**—

Procedure 3-22 (continued)
Installing the NPx and the ILAN circuit pack

Step	Action

1   **If** you are installing an   **Then** go to

NPx	step 2
ILAN	step 6

2   Remove the NPx from its box and install in slot 16. See Inserting or removing a circuit pack on page 3-192.

Note: When you insert the NPx, the top Status LED turns red and the Active LED turns green. These LEDs indicate that the NPx is initializing.

See:

- Figure 3-70 on page 3-115, for circuit pack slot assignments on the OPTera Metro 3500 shelf

- Figure 3-75 on page 3-128, for a depiction of the NPx circuit pack's faceplate

3   Wait until the NPx has finished initializing.

Note: Software initialization time (up to 5 minutes) is complete when the Active LED illuminates green. If the Active LED does not illuminate green, the circuit pack has faults and must be returned to Nortel Networks. Do not go to the next step until NPx software initialization is complete.

4   Log in to the NPx, see *Security and Administration,* 323-1059-302.

5   Load the NPx software, see *Security and Administration,* 323-1059-302, Upgrading the software load on a network processor.

Do not go to the next step until you complete the NPx software load.

Note 1: You have the option of installing the NPx at a later time. You can provision tributary circuit packs without the presence of an NP.

Note 2: When you install an NPx that is running software Release 4 or later, a Loads Mismatch alarm is generated if the software loads on the NPx and collocated SPx are different. To determine the software release of an NPx, and to upgrade or delete a software release on an NPx, see *Security and Administration*, 323-1059-302.

6   Remove the ILAN from its box and install in slot 16. See Inserting or removing a circuit pack on page 3-192.

See:

- Figure 3-70 on page 3-115, for circuit pack slot assignments on the OPTera Metro 3500 shelf

- Figure 3-75 on page 3-128, for a depiction of the ILAN circuit pack's faceplate

When you insert the ILAN, the top Status LED turns red and the Active LED turns green. These LEDs indicate that the ILAN software is initializing.

—**continued**—

Procedure 3-22 (continued)
Installing the NPx and the ILAN circuit pack

Step	Action
7	Wait until the ILAN has stopped initializing.
	Note 1: Software initialization time (up to 30 sec.) is complete when the Active LED illuminates green. If the Active LED does not illuminate green, the circuit pack has faults and must be returned to Nortel Networks. Do not go to the next step until the ILAN software initialization is complete.
	Note 2: You have the option of installing the ILAN at a later time. You can provision tributary circuit packs without the presence of an ILAN.
8	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.

—**end**—

Figure 3-75
Optional circuit packs

EX1195p

PSC
PSX
ILAN

NPx

Reset
button

Status
Active

Status
Active
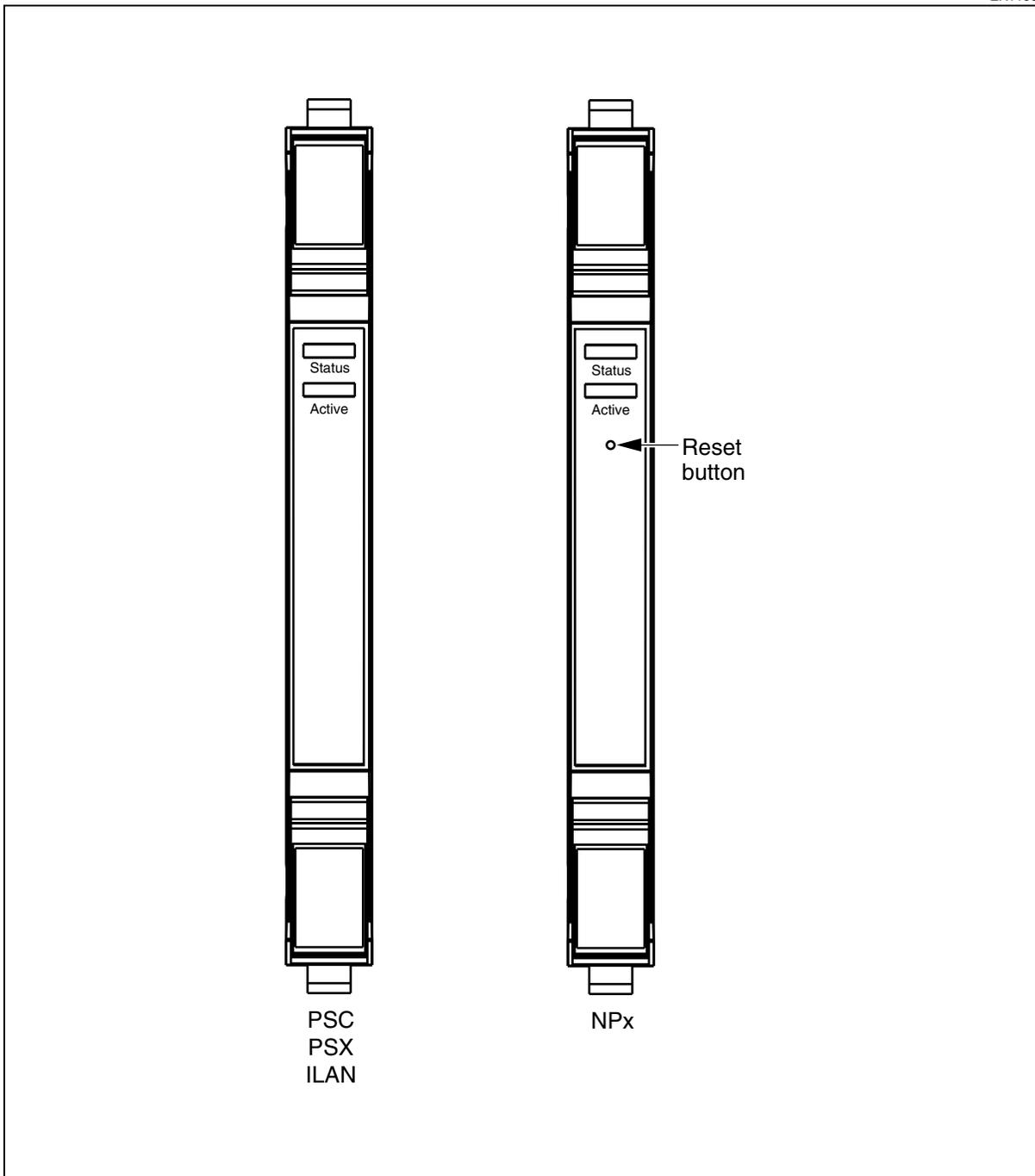
Note: In the BLSR configuration, the NPx is a core circuit pack.

Procedure 3-23
Installing the PSC, the PSX, and the DS1 circuit packs

The protection switch controller (PSC) is installed in tributary slot 2 and acts as a 1:N protection controller for 28 DS1 signals (1 through 28). The protection switch extender (PSX) is installed in tributary slot 17 and acts as a 1:N protection controller for 56 DS1 signals (29 through 84).

DS1 circuit packs have a capacity of 12 DS1s on each circuit pack for a total of 84 DS1s on each shelf (if the shelf contains seven working DS1 circuit packs). Insert the working DS1 circuit packs in tributary slots 4 through 10 as needed. A DS1 circuit pack in tributary slot 3 is working as a protection circuit pack for DS1 circuit packs in tributary slots 4 through 10.

Each slot on the shelf is for a distinct range of facilities from the DS1 I/O modules. For more information, see Table 3-6 on page 3-132.

When installing DS1 circuit packs, assign slots from left to right, beginning with the protection circuit pack in tributary slot 3.

Note: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the PSC, PSX and DS1 circuit packs installed.

⚠ **CAUTION**
Risk of false failures being reported
You must install the I/O modules before you insert the circuit packs that use these modules.

⚠ **CAUTION**
Risk of traffic loss
The PSX must be present on the shelf for DS1 signals 29 through 84 to be protected.

⚠ **CAUTION**
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 3-23 (continued)
Installing the PSC, the PSX, and the DS1 circuit packs

	CAUTION
⚠	**Risk of circuit pack damage**
	Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before you install any of the circuit packs, make sure you understand the detailed procedure for insertion of circuit packs.

	CAUTION
⚠	**Risk of incorrect installation**
	Ensure that the circuit pack lock/eject levers are locked in position. If the lock/eject levers are not locked, the circuit pack does not autoprovision.

	CAUTION
⚠	**Risk of equipment failure**
	If there are DS1 circuit packs in slots 3 and 4, then you cannot have DS3 or EC-1 circuit pack in slots 5 and 6.

Step	Action
1	Remove the protection switch controller (PSC) from its box and install it in slot 2. See instructions on . See .
	All the LEDs on the PSC illuminate when the PSC is installed. The Status LED turns red and the Active LED turns green. These LEDs indicate the PSC software is initializing.
	Note 1: Software initialization time is complete when the status LED is no longer red. If the status LED remains red, the PSC has faults and must be returned to Nortel Networks.
	Note 2: Do not wait for software initialization time to be complete. Install the next circuit pack.
2	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
3	If the shelf is equipped with more than 28 DS1 facilities, remove the protection switch extender (PSX) from its box and install it in slot 17.
	All the LEDs on the PSX illuminate when the PSX is installed. The Status LED turns red and the Active LED turns green. These LEDs indicate that the PSX software is initializing.

—**continued**—

Procedure 3-23 (continued)
Installing the PSC, the PSX, and the DS1 circuit packs

Step	Action
	Note 1: Software initialization time is complete when the Status LED is no longer red. If the Status LED remains red, the PSX has faults and must be returned to Nortel Networks.
	Note 2: Do not wait for software initialization time to be complete. Install the next circuit pack.
4	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
5	Remove a DS1 circuit pack from its box and install it in slot 3. All the LEDs on the circuit pack illuminate when the DS1 circuit pack is installed. The Status LED turns red and the Active LED turns green. These LEDs indicate that the circuit pack software is initializing.
	Note 1: Software initialization time is complete when the Status LED is no longer red. If the Status LED remains red, the circuit pack has faults and must be returned to Nortel Networks.
	Note 2: Do not wait for software initialization time to be complete. Install the next circuit pack.
6	Remove a DS1 circuit pack from its box and install it in the next sequential tributary slot (slots 4 through 10). All the LEDs on the DS1 circuit pack illuminate when you install the circuit pack. The Status LED turns red and the Active LED turns green. These LEDs indicate that the circuit pack software is initializing.
	Note 1: Software initialization time is complete when the Status LED is no longer red. If the Status LED remains red, the DS1 circuit pack has faults and must be returned to Nortel Networks.
	Note 2: Do not wait for software initialization time to be complete. Install the next circuit pack.
7	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
8	Perform step 6 for all DS1 circuit packs.

—**end**—

Table 3-6
DS1 facility and slot relation

I/O module	DS1 facilities	I/O slot number	Corresponding tributary slot number
DS1 1-28	1 to 12	3, 4	4
	13 to 24	4, 5	5
	25 to 28	5	6
DS1 29-56	29 to 36	6	6
	37 to 48	6, 7	7
	49 to 56	7, 8	8
DS1 29-84	29 to 36	6	6
	37 to 48	6, 7	7
	49 to 60	7, 8	8
	61 to 72	8, 9	9
	73 to 84	9, 10	10
Note: For more details on the relation between DS1 facility and tributary slot number, see Table 3-2 on page 3-90.			

Figure 3-76
PSC, PSX, and DS1 circuit pack slot assignments
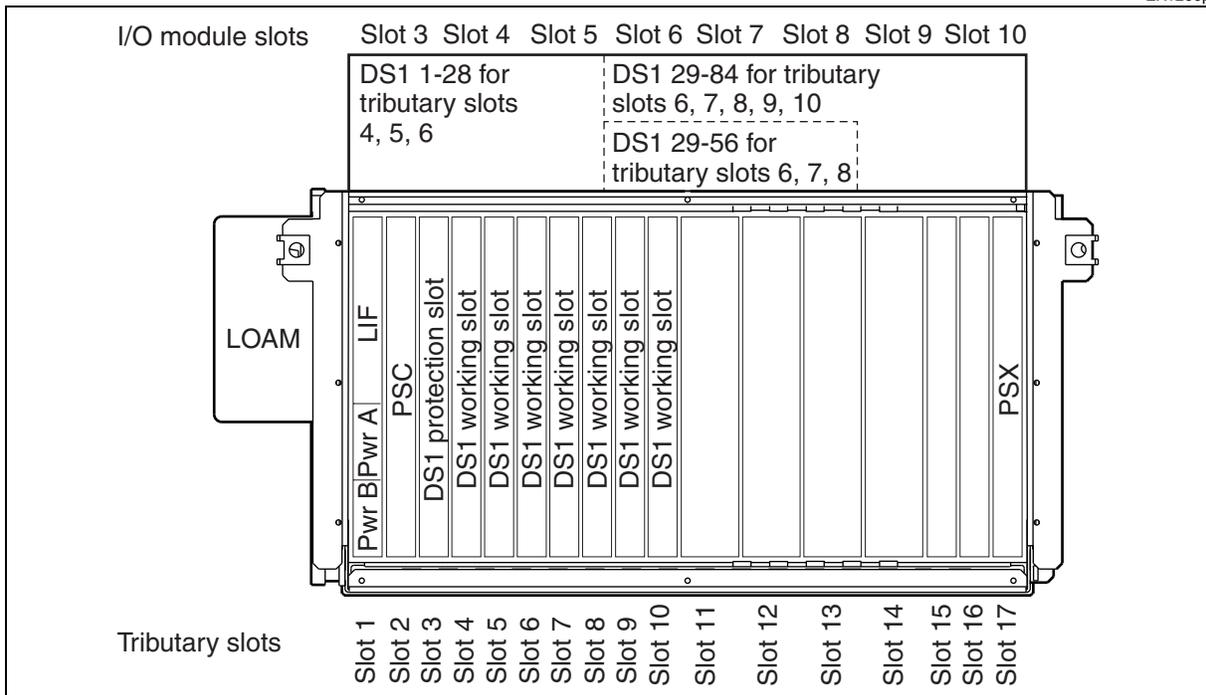
Procedure 3-24
Installing DS3 and EC-1 circuit packs

A DS3x3 circuit pack has a capacity of three DS3 signals for a total of up to 12 DS3 signals on each shelf.

DS3x12, DS3x12e, and DS3VTx12 circuit packs have a capacity of 12 DS3 signals for a total of up to 48 DS3 signals on each shelf.

An EC-1x3 circuit pack has a capacity of three EC-1 signals for a total of up to 12 EC-1 signals on each shelf.

An EC-1x12 circuit pack has a capacity of 12 EC-1 signals for a total of up to 48 EC-1 signals on each shelf.

Note 1: Insert the circuit packs in pairs. Insert the working circuit pack in slot 3, 5, 7, or 9, then the corresponding protection circuit pack in the adjacent even slot 4, 6, 8, or 10.

Note 2: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the DS3 and EC-1 circuit packs installed.

Note 3: Each slot on the shelf is for a distinct BNC 12-port I/O module. See DS3 and EC-1circuit pack slot assignments on page 3-138, and BNC 12-port front I/O module - Pinout on page 3-76.

	CAUTION **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION **Risk of false failures being reported** You must install the I/O modules before you insert the circuit packs that use these modules.

Procedure 3-24 (continued)
Installing DS3 and EC-1 circuit packs

> **CAUTION**
> **Risk of circuit pack damage**
> Do not force any circuit pack all the way to the back of its slot
> if it resists insertion. Before you install any of the circuit packs,
> make sure you understand the detailed procedure for insertion
> of circuit packs.

> **CAUTION**
> **Risk of incorrect installation**
> Ensure that the circuit pack lock/eject levers are locked in
> position. If the lock/eject levers are not locked, the circuit pack
> does not autoprovision.

> **CAUTION**
> **Risk of equipment failure**
> If there are DS1 circuit packs in slots 3 and 4, then you cannot
> have DS3x3, DS3x12, DS3x12e, DS3VTx12, or EC-1x3, EC-
> 1x12 circuit packs in slots 5 and 6.

Step	Action

Installing the DS3 or EC-1 circuit packs

1   Remove the DS3 or EC-1 circuit pack from its box and install it in the working
slot of a protected tributary slot pair. See instructions on Inserting or removing
a circuit pack on page 3-192. See DS3 and EC-1circuit pack slot assignments
on page 3-138.

The LEDs on the circuit pack illuminate when you insert the circuit pack into
the slot. The Status LED turns red and the Active LED turns green. These
LEDs indicate that the circuit pack software is initializing.

Note 1: Software initialization time is complete when the red Status LED
extinguishes. If the Status LED remains red, the circuit pack has faults and
must be returned to Nortel Networks.

Note 2: Do not wait for software initialization time to be complete. Install the
next circuit pack.

2   Remove a DS3 or EC-1 circuit pack from its box and install it in the protection
slot of the protected tributary slot pair. The protection slot must be the
protection mate of the working slot you selected in step 1.

The LEDs on the circuit pack illuminate when you insert the circuit pack into
the slot. The Status LED turns red and the Active LED turns green. These
LEDs indicate that the circuit pack software is initializing.

—continued—

Procedure 3-24 (continued)
Installing DS3 and EC-1 circuit packs

Step	Action
	Note 1: Software initialization is complete when the Status LED extinguishes. If the Status LED remains red, the circuit pack has faults and must be returned to Nortel Networks.
	Note 2: Do not wait for software initialization time to be complete. Install the next circuit pack.
3	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
4	Repeat step 1 and step 2 for each protected DS3 or EC-1 service required on the shelf.

—end—

Table 3-7
DS3x3 and EC-1x3 facilities

Working and protection DS3x3 or EC-1x3 slot numbers	DS3 or EC-1 facilities	BNC 12-port I/O slot numbers	BNC I/O pin (row, column)	
			In (even rows)	**Out** (odd rows)
9, 10	1 to 3	9, 10	(2,1) (2,2) (2,3)	(1,1) (1,2) (1,3)
7, 8	1 to 3	7, 8	(2,1) (2,2) (2,3)	(1,1) (1,2) (1,3)
5, 6	1 to 3	5, 6	(2,1) (2,2) (2,3)	(1,1) (1,2) (1,3)
3, 4	1 to 3	3, 4	(2,1) (2,2) (2,3)	(1,1) (1,2) (1,3)
Note: For DS3x3 and EC-1x3 unprotected modes, you cannot use the adjacent slot for any services.				

Table 3-8
DS3x12, DS3x12e, DS3VTx12, and EC-1x12 facilities

Working and protection DS3x12, DS3x12e, DS3VTx12, or EC-1x12 slot numbers	DS3 or EC-1 facilities	BNC 12-port I/O slot numbers	BNC I/O pin (row, column)	
			In (even rows)	**Out** (odd rows)
9, 10	1 to 12	9, 10	(2,1) (2,2) (2,3) (2,4) (4,1) (4,2) (4,3) (4,4) (6,1) (6,2) (6,3) (6,4)	(1,1) (1,2) (1,3) (1,4) (3,1) (3,2) (3,3) (3,4) (5,1) (5,2) (5,3) (5,4)
7, 8	1 to 12	7, 8	(2,1) (2,2) (2,3) (2,4) (4,1) (4,2) (4,3) (4,4) (6,1) (6,2) (6,3) (6,4)	(1,1) (1,2) (1,3) (1,4) 3,1) (3,2) (3,3) (3,4) (5,1) (5,2) (5,3) (5,4)
5, 6	1 to 12	5, 6	(2,1) (2,2) (2,3) (2,4) (4,1) (4,2) (4,3) (4,4) (6,1) (6,2) (6,3) (6,4)	(1,1) (1,2) (1,3) (1,4) 3,1) (3,2) (3,3) (3,4) (5,1) (5,2) (5,3) (5,4)
3, 4	1 to 12	3, 4	(2,1) (2,2) (2,3) (2,4) (4,1) (4,2) (4,3) (4,4) (6,1) (6,2) (6,3) (6,4)	(1,1) (1,2) (1,3) (1,4) 3,1) (3,2) (3,3) (3,4) (5,1) (5,2) (5,3) (5,4)
Note 1: For DS3x12, DS3x12e, DS3VTx12, and EC-1x12 unprotected mode, you cannot use the adjacent slot for any services.				
Note 2: See BNC 12-port front I/O module - Pinout on page 3-76.				

Figure 3-77
DS3 and EC-1circuit pack slot assignments

EX1267p

OPTera Metro 3500   Multiservice Platform   323-1059-201   Standard   Rel 12.0   Iss 1   Nov 2003
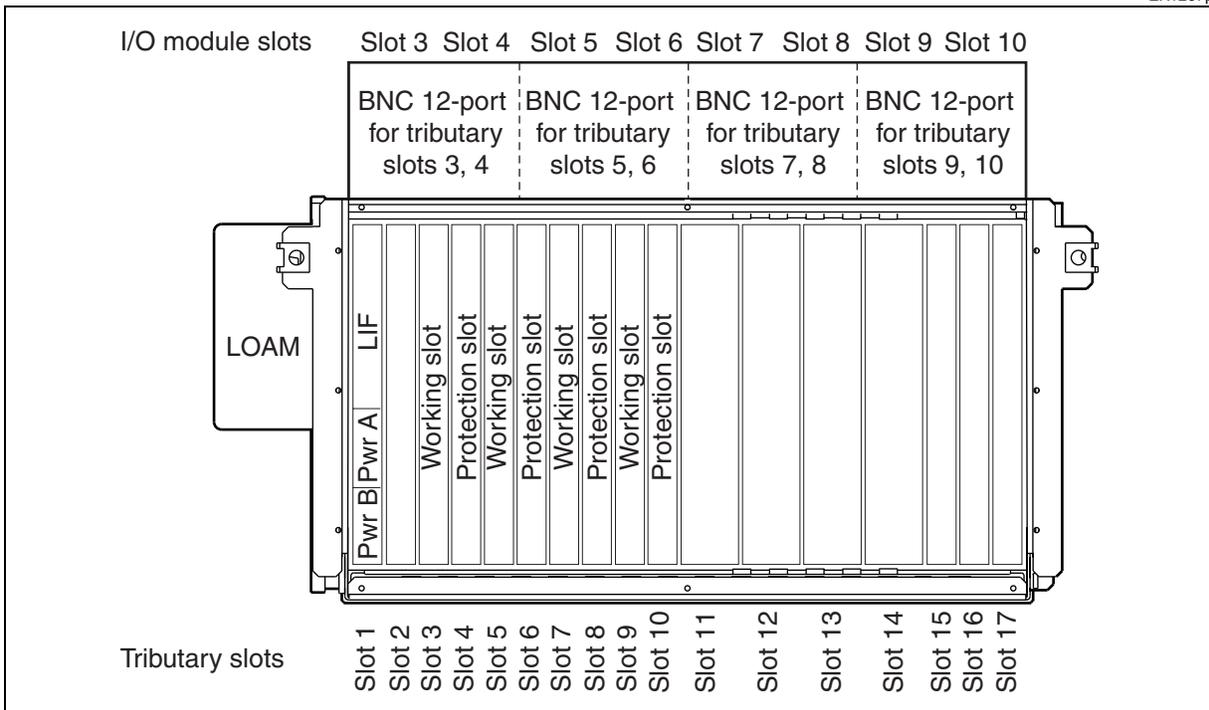
Figure 3-78
Tributary circuit packs

EX1474p

OC-12x4

OC-12
OC-3

DS3x3
EC-1x3

DS3x12
DS3x12e
DS3VTx12
EC-1x12

2x100BT-P2P

OC-3x4
(NTN441AA)

OC-3x4
(NTN441AC)
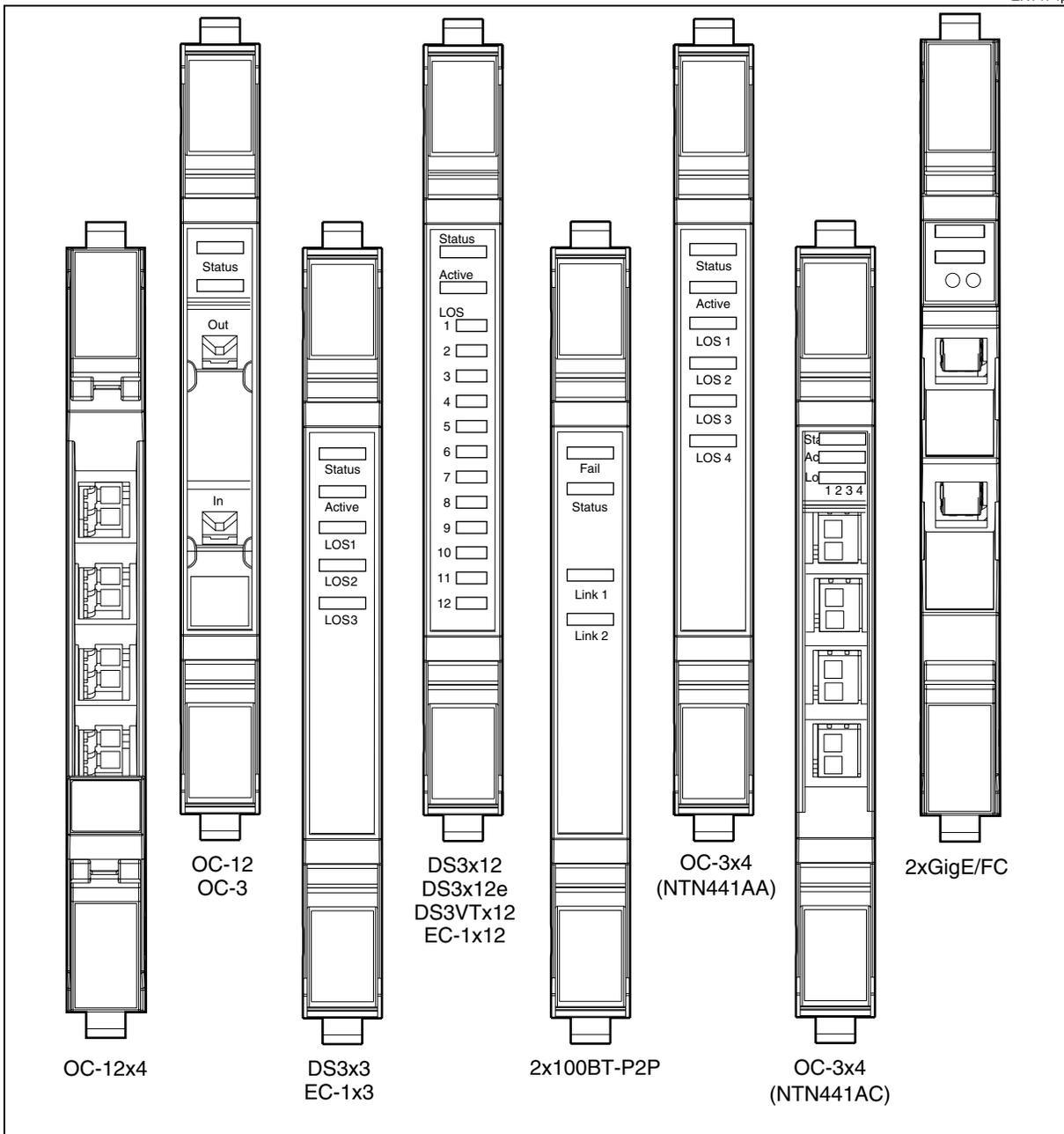
2xGigE/FC

Figure 3-79
OPTera Packet Edge circuit packs

EX1417p

4x100FX
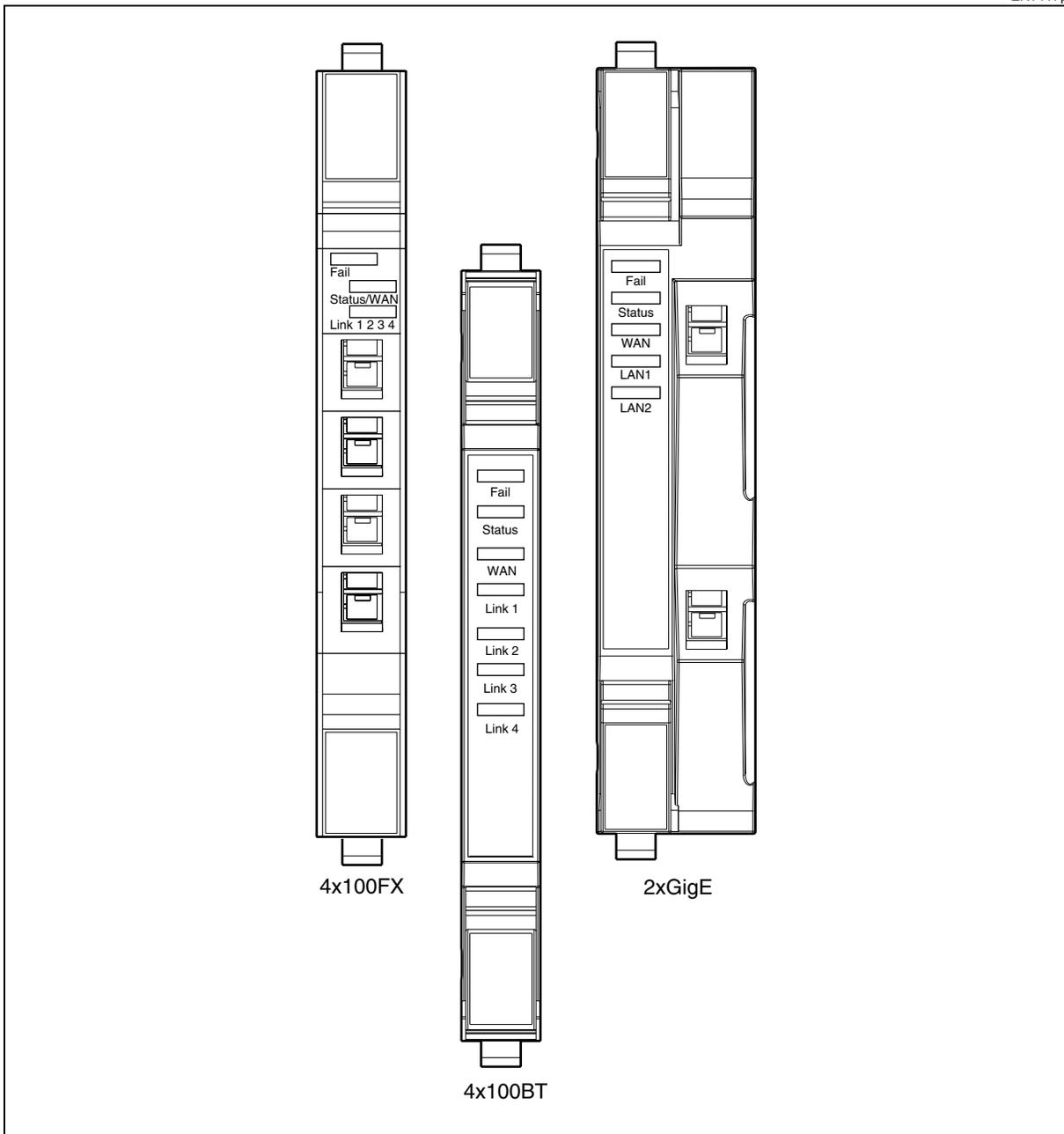
4x100BT

2xGigE

Procedure 3-25
Installing 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs

Use this procedure to install 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs in an OPTera Metro 3500 shelf. You can install up to eight of these circuit packs in an OPTera Metro 3500 shelf.

Note 1: There is no equipment protection for 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit packs.

Note 2: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit packs installed.

For a complete description of equipping rules, see:

- 4x100BT equipping rules on page 3-144
- 4x100FX equipping rules on page 3-145
- 2x100BT-P2P equipping rules on page 3-145
- 2xGigE/FC-P2P equipping rules on page 3-146

⚠	**CAUTION** **Risk of false failures being reported** You must install the I/O modules before you insert the circuit packs that use these modules.

⚠	**CAUTION** **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 3-25 (continued)
Installing 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs

CAUTION
Risk of incorrect installation
Ensure that the circuit pack lock/eject levers are locked in position. If the lock/eject levers are not locked, the circuit pack does not autoprovision.

CAUTION
Risk of circuit pack damage
Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before you install any of the circuit packs, make sure you understand the detailed procedure for insertion of circuit packs.

Requirements

The OPTera Metro 3500 shelf must include an 8xRJ-45 I/O module in the backplane for each 4x100BT or 2x100BT-P2P circuit pack. This module is supported in I/O slots 3 to 10 and provides RJ45 connections to the 4x100BT or 2x100BT-P2P circuit pack in the corresponding tributary slot. For example, a 4x100BT circuit pack in tributary slot 5 requires an 8xRJ-45 I/O module in I/O slot 5.

Note 1: The 4x100FX circuit pack contains MT-RJ connectors on the faceplate. No I/O module installation is required.

Note 2: The 2xGigE/FC-P2P circuit pack contains LC connectors on the small form-factor pluggable (SFP) module mounted on the faceplate. No I/O module installation is required.

—continued—

Procedure 3-25 (continued)
Installing 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit packs

Step	Action
1	Remove the 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC-P2P circuit pack from its box.
2	Install the circuit pack in slot 3 through 10 according to the appropriate equipping rules.

See:

- 4x100BT equipping rules on page 3-144
- 4x100FX equipping rules on page 3-145
- 2x100BT-P2P equipping rules on page 3-145
- 2xGigE/FC-P2P equipping rules on page 3-146
- 4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit pack slot assignments on page 3-148

Note 1: When you install the 4x100BT, 4x100FX, or 2x100BT-P2P circuit pack, the red LED turns on to indicate that the circuit pack software is initializing. When you install the 2xGigE/FC-P2P circuit pack, the red, yellow, and green LEDs toggle on and off to indicate that the circuit pack software is initializing.

Note 2: The software initialization is complete when the red LED turns off. If the red LED remains on, the circuit pack has faults and must be returned to Nortel Networks.

Note 3: Do not wait for software initialization to complete. Install the next circuit pack.

Step	Action
3	If you are installing a 2xGigE/FC-P2P circuit pack, install SFP into the circuit pack. See Installing and removing small form-factor pluggable (SFP) optical transceiver modules on page 3-152.
4	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
5	If you are installing 4x100FX or 2xGigE/FC-P2P circuit packs, clean the fiber-optic cable. See Cleaning optical connectors and adapters on patch cords on page 4-9.
6	Connect the fiber-optic cable to the 4x100FX or 2xGigE/FC-P2P circuit pack as required. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.

Note: If you must disconnect the fiber-optic cable from the 4x100FX or 2xGigE/FC-P2P, see Disconnecting SC, FC, ST, LC or MT-RJ connector on page 3-249.

—**end**—

4x100BT equipping rules

The equipping rules for 4x100BT circuit packs are:

- 4x100BT circuit packs can be installed in slots 3 through 10.

- 4x100BT circuit packs operate unprotected. You can install these circuit packs in adjacent slots.

- 8xRJ-45 I/O modules in slots 3 through 10 correspond to 4x100BT circuit packs in slots 3 through 10. See Installing an 8xRJ-45 (NTN452NA) Front I/O module on NTN476DA on page 3-79.

- Ports 1 to 4 of the 8xRJ-45 I/O module correspond to LAN ports 1 to 4 on the 4x100BT circuit pack. See Table 3-9 on page 3-147. Ports 5 to 8 of the 8xRJ-45 I/O module are reserved for future use. For 8xRJ-45 port positions, see 8xRJ-45 front I/O module - Pinout on page 3-77.

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an odd slot (N_{odd}), then you can only insert one of the following circuit packs into the even slot ($N_{odd} + 1$):
  - 2x100BT-P2P
  - 4x100BT
  - 4x100FX
  - 2xGigE/FC-P2P

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an even slot (N_{even}), then you can only insert one of the following circuit packs into the odd slot ($N_{even} - 1$):
  - 2x100BT-P2P
  - 4x100BT
  - 4x100FX
  - 2xGigE/FC-P2P

- If there is a 1-28 DS1 I/O module installed, and if slots 5 and 6 are not equipped with DS1 mappers, you may not install 4x100BT circuit packs in slots 5 or 6 (there is not enough room for slot 5 or slot 6's 8xRJ-45 I/O modules).

- If there is a 29-56 DS1 I/O module installed, and if slots 7 and 8 are not equipped with DS1 mappers, you may not install 4x100BT circuit packs in slots 7 and 8 (there is not enough room for slot 7 or slot 8's 8xRJ-45 I/O modules).

- If there is a 29-84 DS1 I/O module installed, and if slots 7 through 10 are not equipped with DS1 mappers, you may not install 4x100BT circuit packs in slots 7 through 10 (there is not enough room for slot 7 through slot 10's 8xRJ-45 I/O modules).

4x100FX equipping rules

The equipping rules for 4x100FX circuit packs are:

- 4x100FX circuit packs can be installed in slots 3 through 10.

- 4x100FX circuit packs operate unprotected. You can install these circuit packs in adjacent slots.

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an odd slot (N_{odd}), then you can only insert one of the following circuit packs into the even slot (N_{odd} + 1):
  - 2x100BT-P2P
  - 4x100BT
  - 4x100FX
  - 2xGigE/FC-P2P

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an even slot (N_{even}), then you can only insert one of the following circuit packs into the odd slot (N_{even} - 1):
  - 2x100BT-P2P
  - 4x100BT
  - 4x100FX
  - 2xGigE/FC-P2P

- Use single-mode fiber-optic cables to interface to the 4x100FX (NTN433FA) circuit pack. Use multimode fiber-optic cables to interface to the 4x100FX (NTN433EA) circuit pack.

2x100BT-P2P equipping rules

The equipping rules for 2x100BT-P2P circuit packs are:

- 2x100BT-P2P circuit packs can be installed in slots 3 through 10.

- 2x100BT-P2P circuit packs operate unprotected. You can install these circuit packs in adjacent slots.

- 8xRJ-45 I/O modules in slots 3 through 10 correspond to 2x100BT-P2P circuit packs in slots 3 through 10. See Installing an 8xRJ-45 (NTN452NA) Front I/O module on NTN476DA on page 3-79.

- Ports 1 and 2 of the 8xRJ-45 I/O module correspond to LAN ports 1 and 2 on the 2x100BT-P2P circuit pack. See Table 3-9 on page 3-147. Ports 5 to 8 of the 8xRJ-45 I/O module are reserved for future use. For 8xRJ-45 port positions, see 8xRJ-45 front I/O module - Pinout on page 3-77.

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an odd slot (N_{odd}), then you can only insert one of the following circuit packs into the even slot (N_{odd} + 1):
  - 2x100BT-P2P
  - 4x100BT

— 4x100FX

— 2xGigE/FC-P2P

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an even slot (N_{even}), then you can only insert one of the following circuit packs into the odd slot (N_{even} - 1):

— 2x100BT-P2P

— 4x100BT

— 4x100FX

— 2xGigE/FC-P2P

- If there is a 1-28 DS1 I/O module installed, and if slots 5 and 6 are not equipped with DS1 mappers, you may not install 2x100BT-P2P circuit packs in slots 5 or 6 (there is not enough room for slot 5 or slot 6's 8xRJ-45 I/O modules).

- If there is a 29-56 DS1 I/O module installed, and if slots 7 and 8 are not equipped with DS1 mappers, you may not install 2x100BT-P2P circuit packs in slots 7 and 8 (there is not enough room for slot 7 or slot 8's 8xRJ-45 I/O modules).

- If there is a 29-84 DS1 I/O module installed, and if slots 7 through 10 are not equipped with DS1 mappers, you may not install 2x100BT-P2P circuit packs in slots 7 through 10 (there is not enough room for slot 7 through slot 10's 8xRJ-45 I/O modules).

2xGigE/FC-P2P equipping rules

The equipping rules for 2xGigE/FC-P2P circuit packs are:

- 2xGigE/FC-P2P circuit packs can be installed in slots 3 through 10.

- 2xGigE/FC-P2P circuit packs operate unprotected. You can install these circuit packs in adjacent slots.

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an odd slot (N_{odd}), then you can only insert one of the following circuit packs into the even slot (N_{odd} + 1):

— 2x100BT-P2P

— 4x100BT

— 4x100FX

— 2xGigE/FC-P2P

- If a 2x100BT-P2P, 4x100FX, 4x100BT, or 2xGigE/FC-P2P circuit pack is inserted into an even slot (N_{even}), then you can only insert one of the following circuit packs into the odd slot (N_{even} - 1):

— 2x100BT-P2P

— 4x100BT

— 4x100FX

— 2xGigE/FC-P2P

Table 3-9
4x100BT and 2x100BT-P2P facilities

I/O module	I/O slot number	Corresponding tributary slot number	4x100BT facilities	2x100BT-P2P facilities
8xRJ-45	3	3	1, 2, 3, 4	1, 2
8xRJ-45	4	4	1, 2, 3, 4	1, 2
8xRJ-45	5	5	1, 2, 3, 4	1, 2
8xRJ-45	6	6	1, 2, 3, 4	1, 2
8xRJ-45	7	7	1, 2, 3, 4	1, 2
8xRJ-45	8	8	1, 2, 3, 4	1, 2
8xRJ-45	9	9	1, 2, 3, 4	1, 2
8xRJ-45	10	10	1, 2, 3, 4	1, 2

Figure 3-80
4x100BT, 4x100FX, 2x100BT-P2P, and 2xGigE/FC-P2P circuit pack slot assignments

Note 1: The 8xRJ-45 I/O module is required for 4x100BT or 2x100BT-P2P circuit packs.
Note 2: 4x100BT, 4x100FX, 2x100BT-P2P, or 2xGigE/FC
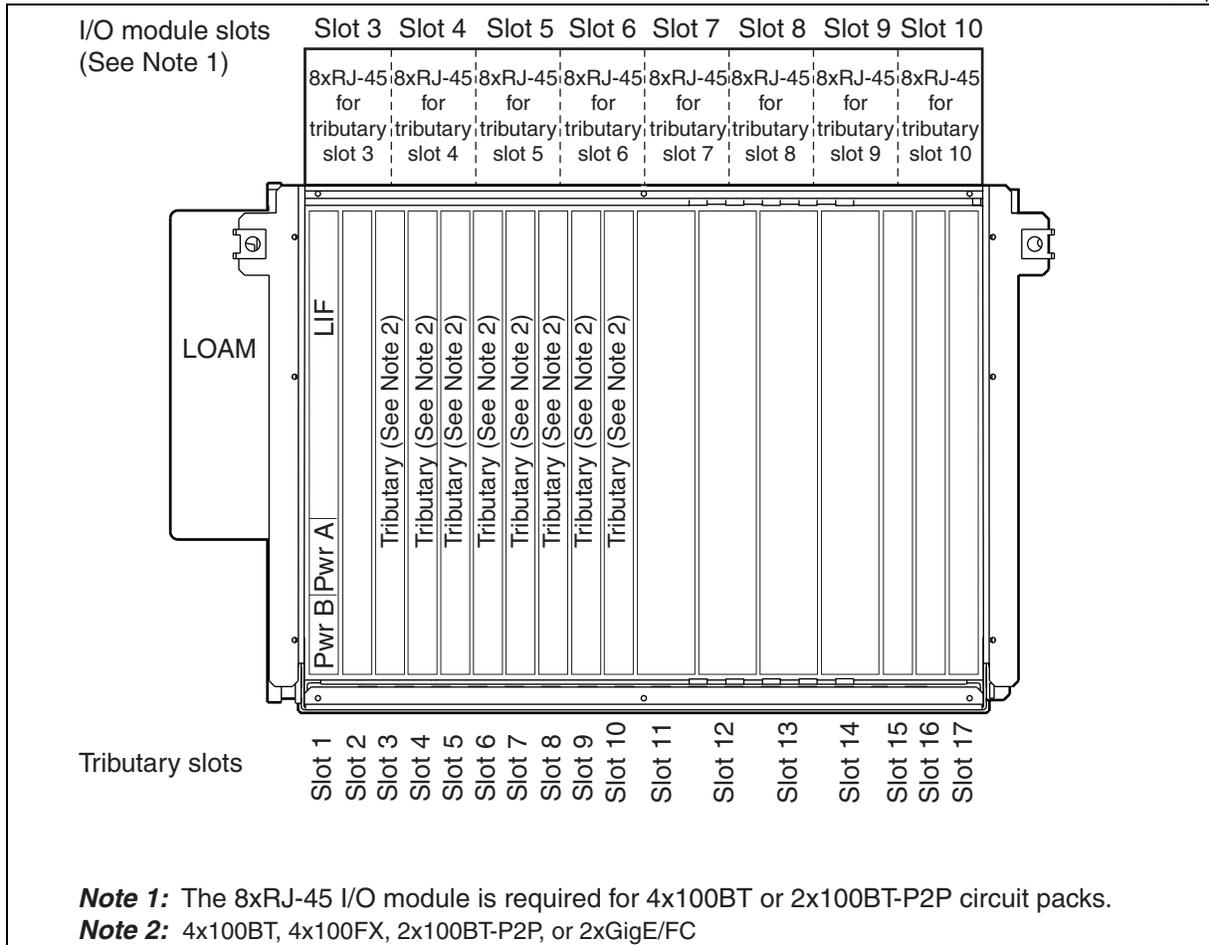
Procedure 3-26
Installing 2xGigE circuit packs

Use this procedure to install the 2xGigE circuit packs in the OPTera Metro 3500 shelf. Up to four 2xGigE circuit packs can be installed in the OPTera Metro 3500 shelf, slots 3, 5, 7, and 9. The 2xGigE is a double width circuit pack.

Note: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the 2xGigE circuit packs installed.

	CAUTION **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION **Risk of circuit pack damage** Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before you install any of the circuit packs, make sure you understand the detailed procedure for insertion of circuit packs.

	CAUTION **Risk of incorrect installation** Ensure that the circuit pack lock/eject levers are locked in position. If the lock/eject levers are not locked, the circuit pack does not autoprovision.

—continued—

Procedure 3-26 (continued)
Installing 2xGigE circuit packs

Step	Action
1	Remove the 2xGigE circuit pack from its box.
2	Install a 2xGigE circuit pack in slot 3, 5, 7, or 9 according to the 2xGigE equipping rules on page 3-151. See 2xGigE circuit pack slot assignments on page 3-151. When you install the 2xGigE circuit pack, the red LED turns on to indicate that the circuit pack software is initializing. *Note 1:* The software initialization is complete when the red LED turns off. If the red LED remains on, the 2xGigE circuit pack has faults and must be returned to Nortel Networks. *Note 2:* Do not wait for software initialization to be complete. Install the next circuit pack.
3	If this circuit pack is the last to be installed, wait 5 minutes for the system to be stable before you start testing.
4	Clean the fiber-optic cable. See Cleaning optical connectors and adapters on patch cords on page 4-9.
5	Connect the fiber-optic cable to the 2xGigE as follows: line up the SC connector with the optical interface in the 2XGigE Circuit, then plug the SC by hand. *Note:* If you have to disconnect the fiber-optic cable from the 2xGigE, see Disconnecting SC, FC, ST, LC or MT-RJ connector on page 3-249.

—**end**—

2xGigE equipping rules

The equipping rules for 2xGigE circuit pack installation are as follows:

— You can install up to four 2xGigE circuit packs into an OPTera Metro 3500.

— You can install 2xGigE circuit packs in slots 3, 5, 7, and 9 only.

— The 2xGigE circuit pack is supported in UPSR and BLSR configurations.

— The 2xGigE circuit pack can coexist with the 4x100BT or 4x100FX circuit pack in an OPTera 3500 shelf, under some conditions. See Bandwidth Management 323-1059-320.

Figure 3-81
2xGigE circuit pack slot assignments
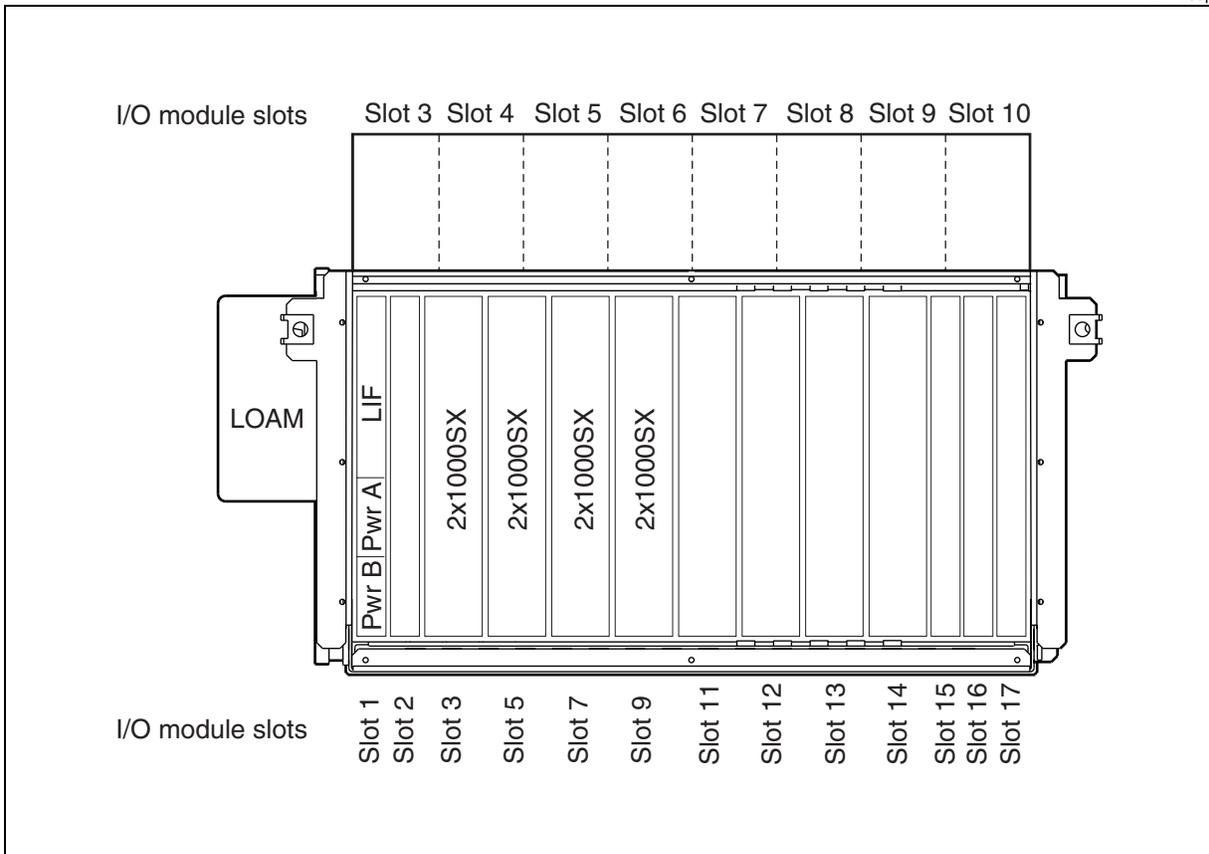
Procedure 3-27
Installing and removing small form-factor pluggable (SFP) optical transceiver modules

Use this procedure to install and remove a small form-factor pluggable (SFP) optical transceiver module into/from a 2xGigE/FC-P2P circuit pack in an OPTera Metro 3500 shelf.

Note 1: Two SFP modules are required for each 2xGigE/FC-P2P circuit pack.

Note 2: If the shelf has been hot staged, then the shelf is shipped (if applicable) with the SFP modules pre-installed in the 2xGigE/FC-P2P circuit packs.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs and small form factor pluggable (SFP) modules.

Requirements
Removing an SFP module
To perform this procedure, you must

- ensure the corresponding LAN facility is out of service. See 'Changing a facility state to Out of Service (OOS)' in *Equipment and Facility Provisioning,* 323-1059-350.

- ensure you obtain dust covers for any empty SFP cages.

  Note: Dust covers are required to prevent damage to empty SFP cages.

- ensure you observe all safety requirements. See Safety instructions on page 1-1.

- ensure you use an account with level 3 or higher user privilege code (UPC).

Installing an SFP module
To perform this procedure, you must

- ensure you are installing a supported SFP module (Optical Communication Products TRP-G1 or TRP-G1D)

- ensure you have the required SFP module type (SX or LX, as required by your network)

—**continued**—

Procedure 3-27 (continued)
Installing and removing small form-factor pluggable (SFP) optical transceiver modules

Step	Action

1

If you want to	**Then** go to
remove an SFP module	step 2
install an SFP module	step 8

Removing an SFP module

2   Wear an antistatic wrist strap and foot straps to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf.

3   Disconnect the fiber-optic cable from the SFP module.

4   Pull the latch on the SFP module to disengage the SFP module from the 2xGigE/FC-P2P circuit pack.

5   Carefully pull the SFP module out of its cage on the circuit pack.

6   If this SFP cage will remain empty, then insert an SFP dust cap into the cage to prevent contamination of the electrical connector. See Planning and Ordering Guide, NTRN10AM.

7   You have completed this procedure.

Installing an SFP module

8   Wear an antistatic wrist strap and foot straps to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf.

9   Remove the dust cap from the SFP cage on the circuit pack.

10   Remove the SFP module from its box.

11   With the label on the SFP module facing to the right and the LC connectors facing away from the shelf, slide the SFP module into the receptacle in the 2xGigE/FC-P2P faceplate.

See:

- Figure 3-82 on page 3-154
- Figure 3-83 on page 3-155

Note: The SFP module should slide easily into its receptacle until it locks into place.

—**end**—

Figure 3-82
SFP module

EX1458p
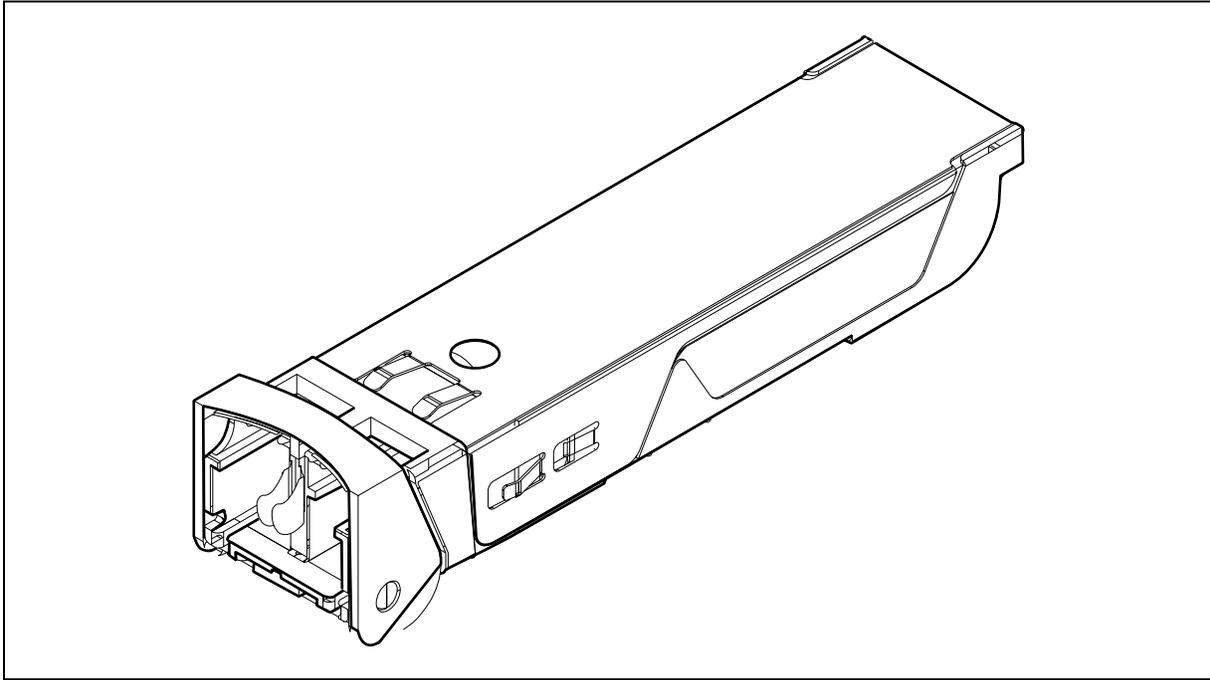
Figure 3-83
SFP module installation in a 2xGigE/FC-P2P circuit pack

EX1459p
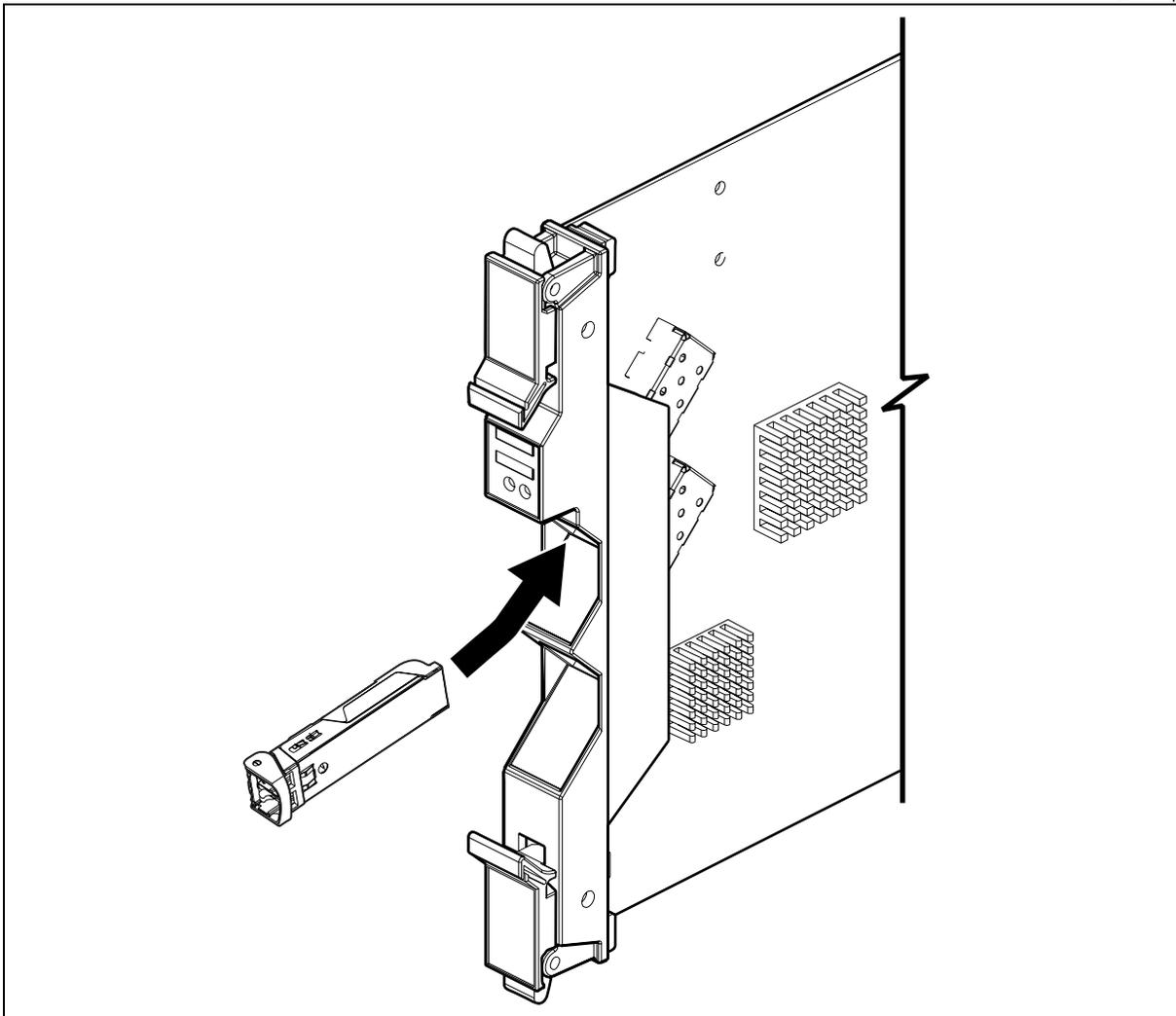
Procedure 3-28
Routing T1, T3, and Category 5 UTP cabling to front facing I/O modules

After you connect the T1, T3, or Category 5 unshielded twisted pair (UTP) cabling to their correct I/O connectors at the top of the shelf, use this procedure to route the cabling from the shelf to the equipment frame.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1

If you are routing	**Then** go to
T1 cabling	step 2
T3 cabling	step 10
Category 5 UTP cabling	step 16

Routing T1 cabling

2 Run the T1 cabling along the frame, inside the bay trail. See Figure 3-88 on page 3-162.

3

If you are connecting to a	**Then**
DS1 1-28 connector	route both cables to the left of the shelf
DS1 29-56 connector	route both cables to the left or to the right depending on availability of space
DS1 29-84 connector	route all cables to the right of the shelf

4 If you are using a DS1 right angle connector, go to step 8.

5 Route T1 cables across the cable retainer. See Figure 3-85 on page 3-160.

6 Use a tie-wrap to attach each T1 cable to the cable retainer.

7 Group and attach T1 cables together along the frame.

—**continued**—

Procedure 3-28 (continued)
Routing T1, T3, and Category 5 UTP cabling to front facing I/O modules

Step	Action
8	Use a tie-wrap to attach each T1 cable to the cable bracket. Run the tie-wrap through the two holes on the cable bracket. See Figure 3-59 on page 3-92.
9	Route and attach T1 cables together. See Figure 3-84 on page 3-160.

Routing T3 cabling

Step	Action
10	Run T3 cables along the frame, inside the bay trail. See Figure 3-93 on page 3-165.
11	Ensure the cables are properly routed. See Figure 3-89 on page 3-163.

If you are connecting to ports	**Then** route cables to the
1 through 24	left of the shelf
25 through 48	right of the shelf

Step	Action
12	Group and attach the 12 IN cables together, as close as possible to the BNC 12-port I/O module.
13	Group and attach the 12 OUT cables together, as close as possible to the BNC 12-port I/O module.
14	Attach the IN group and the OUT group together to the cable retainer.
15	Repeat step 12 through step 14 for all BNC 12-port I/O modules.

Routing Category 5 UTP cabling

Step	Action
16	Run the Category 5 UTP cables along the frame, inside the bay trail. See Figure 3-93 on page 3-165.
17	Ensure the cables are routed across the cable retainer. See Figure 3-92 on page 3-164.

If you are connecting to 8xRJ-45 I/O modules in slots	**Then** route cables to the
3 through 6	left of the shelf
7 through 10	right of the shelf

Step	Action
18	Group and attach together the four cables in the left column of the I/O module.
19	Attach the group of cables to the cable retainer.
	Note: OPTera Metro 3500 release 11.0 supports only port 1 through port 4 on the RJ-45 I/O module. Port 5 through port 8 are reserved for future release.
20	Repeat step 18 through step 19 for all 8xRJ-45 modules.

—**end**—

Procedure 3-29
Routing T1, T3, and Category 5 UTP cabling to rear facing I/O modules

After you connect the T1, T3, and Category 5 unshielded twisted pair (UTP) cabling to their correct I/O connectors at the top of the shelf, use this procedure to route the cables from the shelf to the equipment frame.

	CAUTION **Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1

If you are routing	**Then** go to
T1 cabling	step 2
T3 cabling	step 6
Category 5 UTP cabling	step 12

Routing T1 cabling

2 Run the T1 cabling along the frame, inside the bay trail. See Figure 3-88 on page 3-162.

3

If you are connecting to a	**Then** route
DS1 1-28 connector	both cables to the right of the shelf
DS1 29-56 connector	both cables to the left or to the right depending on availability of space
DS1 29-84 connector	all cables to the left of the shelf

4 Use a tie-wrap to attach each T1 cable to the cable bracket. Run the tie-wrap through the two holes on the cable bracket. See Figure 3-59 on page 3-92.

Note: Only the right angle connector is recommended for DS1 rear facing I/O module.

5 Route and attach T1 cables together. See Figure 3-87 on page 3-161.

You have completed this procedure.

—**continued**—

Procedure 3-29 (continued)
Routing T1, T3, and Category 5 UTP cabling to rear facing I/O modules

Step	Action

Routing T3 cabling

6	Run T3 cables along the frame, inside the bay trail. See Figure 3-93 on page 3-165.
7	Ensure the cables are properly routed. See Figure 3-89 on page 3-163.

If you are connecting to ports	**Then** route cables to the
1 through 24	left of the shelf
25 through 48	right of the shelf

8	Group and attach the 12 IN cables together, as close as possible to the BNC 12-port I/O module.
9	Group and attach the 12 OUT cables together, as close as possible to the BNC 12-port I/O module.
10	Attach the IN group and the OUT group together to the rear cable retainer.
11	Repeat step 8 through step 10 for all BNC 12-port I/O modules.
	You have completed this procedure.

Routing Category 5 UTP cabling

12	Run the Category 5 UTP cabling along the frame, inside the bay trail. Figure 3-93 on page 3-165.
13	Ensure the cabling is routed across the cable retainer. See Figure 3-92 on page 3-164.

If you are connecting to 8xRJ-45 I/O modules in slots	**Then** route cables to the
3 through 6	left of the shelf
7 through 10	right of the shelf

14	Group and attach together the four cables in the left column of the I/O module.
15	Attach the group of cables to the cable retainer.
	Note: OPTera Metro 3500 release 11.0 supports only port 1 through port 4 on the RJ-45 I/O module. Port 5 through port 8 are reserved for future release.
16	Repeat step 14 through step 15 for all 8xRJ-45 modules.

—**end**—

Figure 3-84
Connecting and routing T1 cabling-NTN476DA shelf, right angle connectors
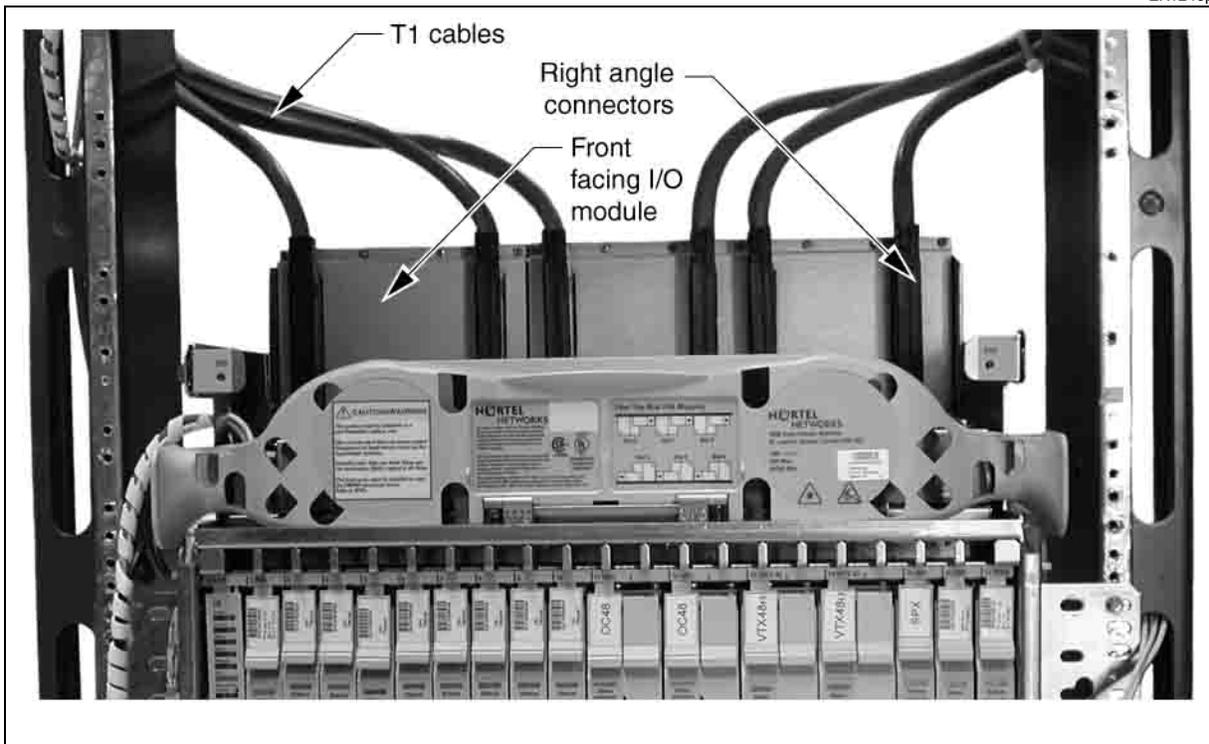
Figure 3-85
Connecting and routing T1 cabling - NTN476DA shelf, straight connectors
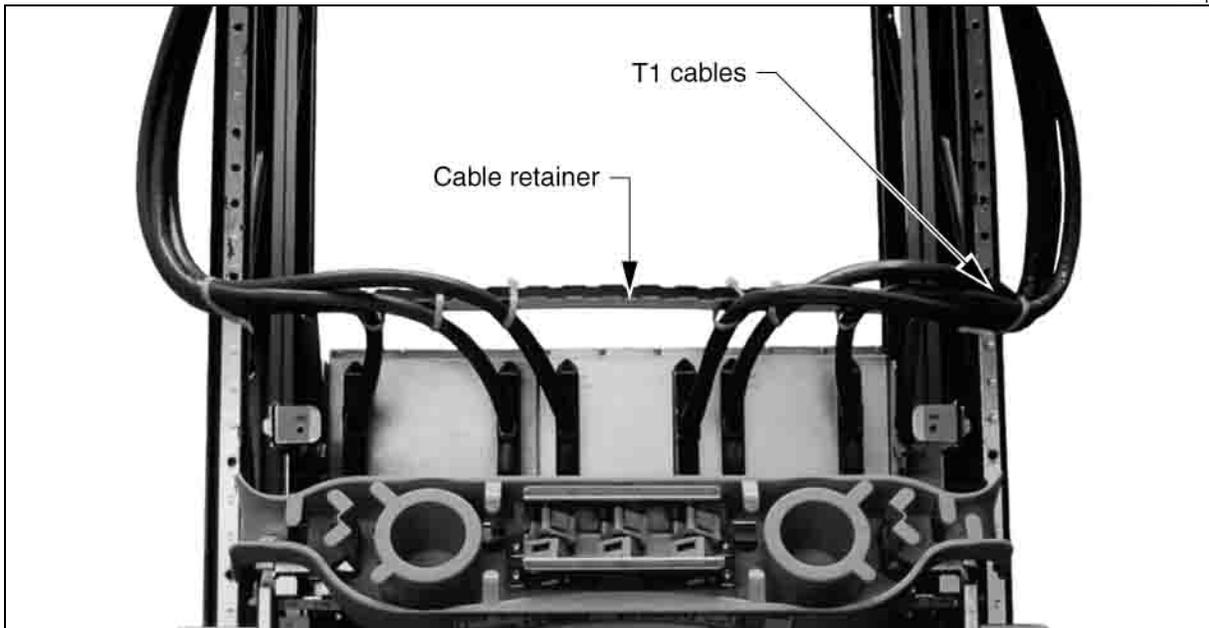
Figure 3-86
Connecting and routing T1 cabling - NTN476AH shelf, front facing I/O
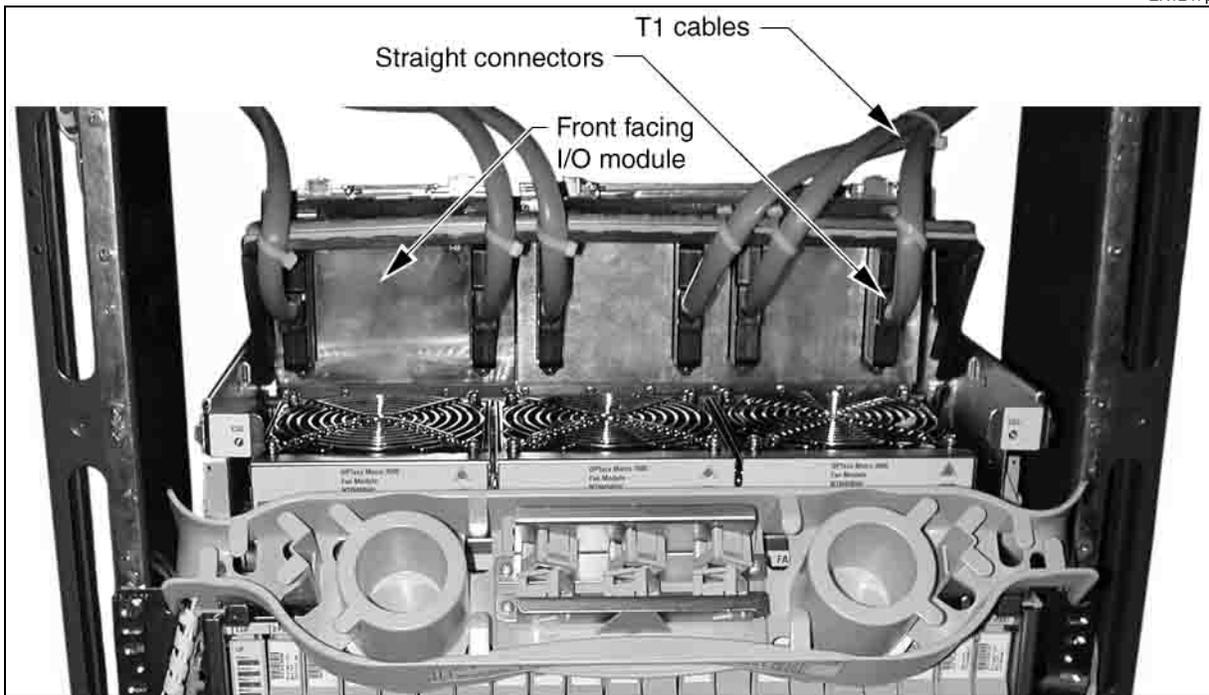
Figure 3-87
Connecting and routing T1 cabling - NTN476AH shelf, rear facing I/O
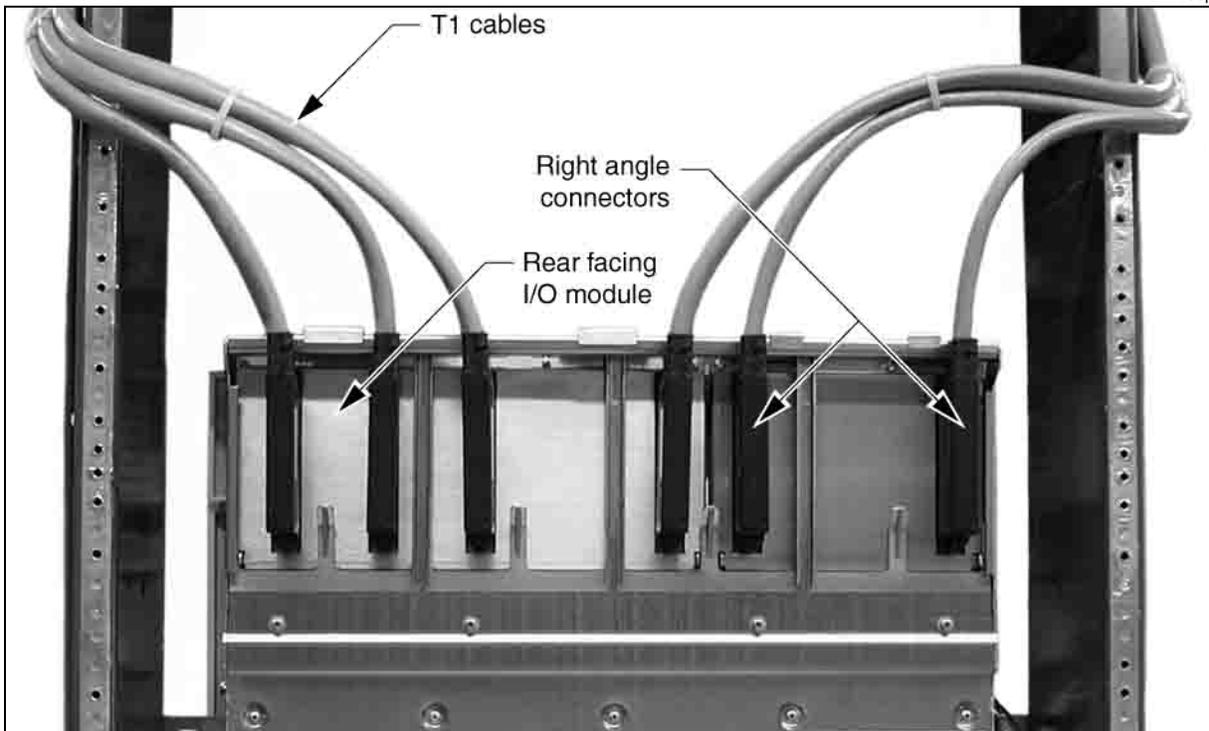
Figure 3-88
Running T1 cabling along the frame

EX1503p
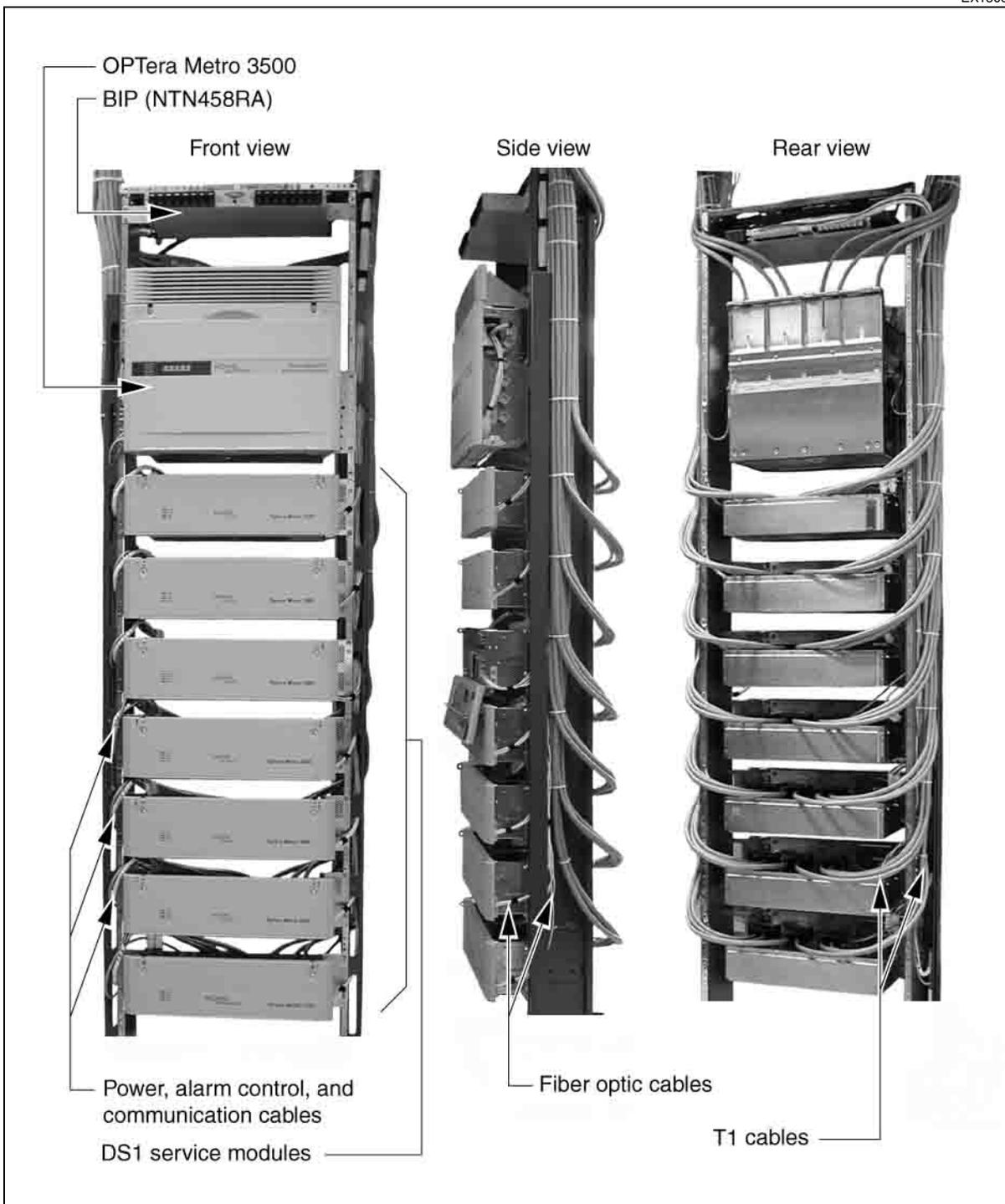
Figure 3-89
Connecting and routing T3 cabling - NTN476DA shelf
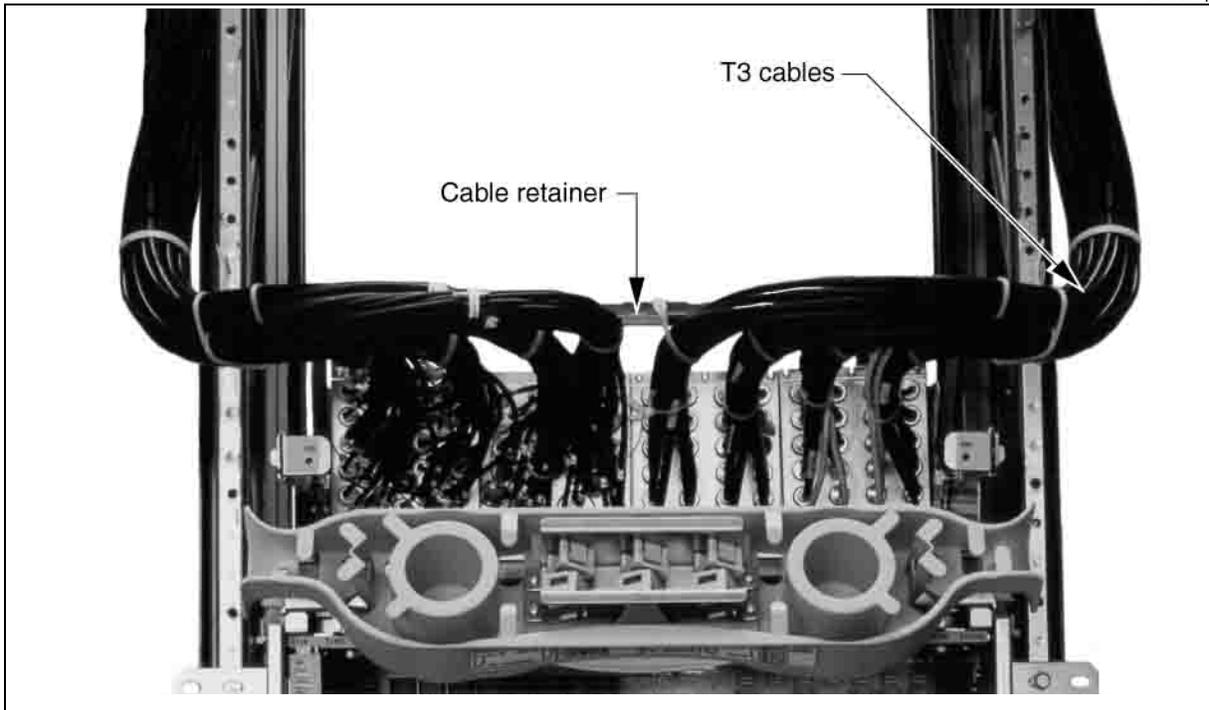
Figure 3-90
Connecting and routing T3 cabling - NTN476AH shelf, front facing I/O
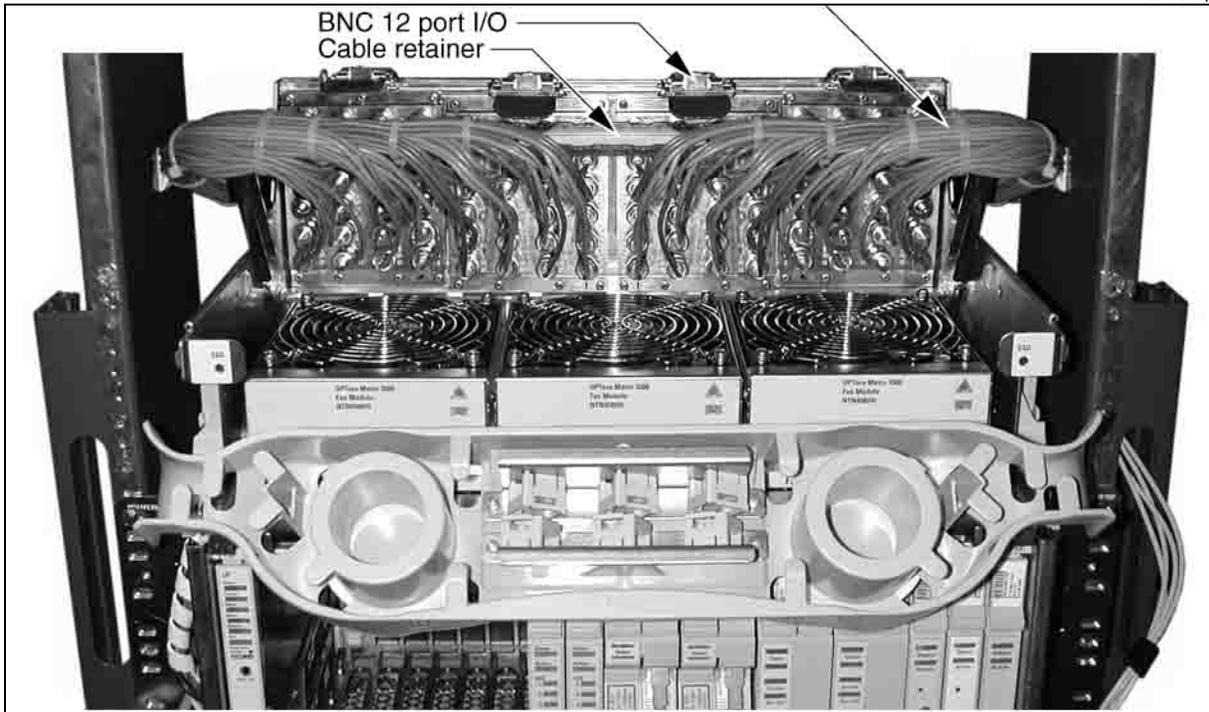
Figure 3-91
Connecting and routing T3 cabling - NTN476AH shelf, rear facing I/O

EX1260p
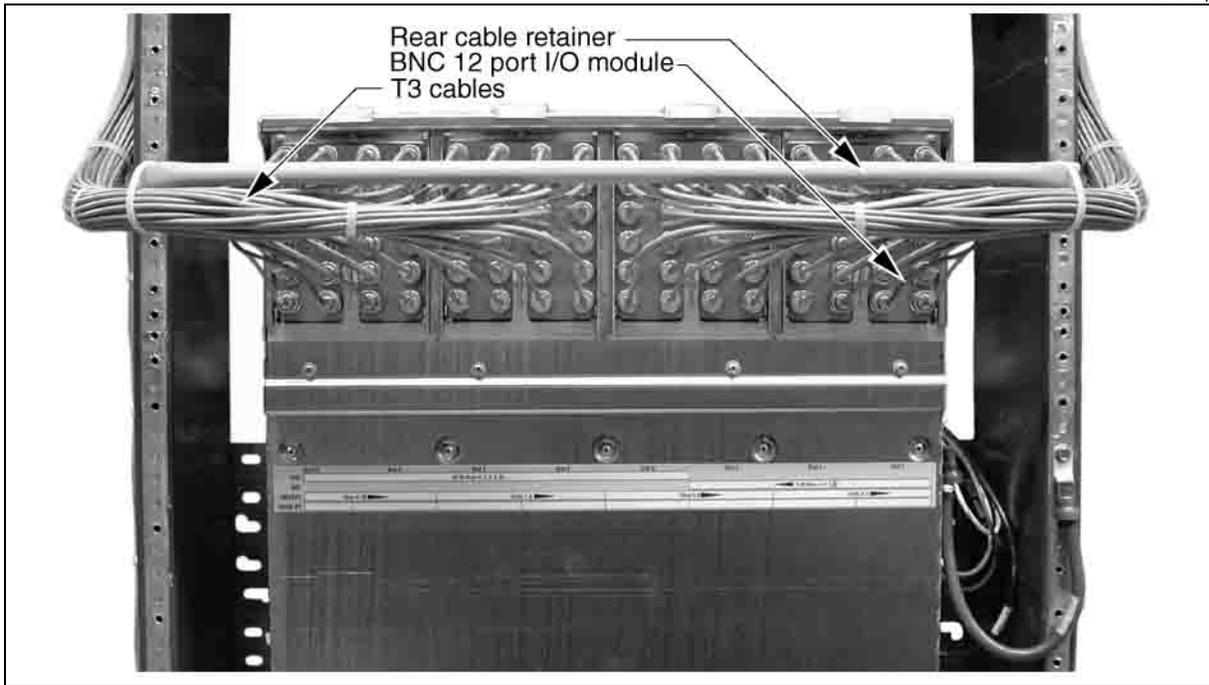
Figure 3-92
Connecting and routing Category 5 UTP cabling - NTN476AH shelf, rear facing I/O

EX1261p
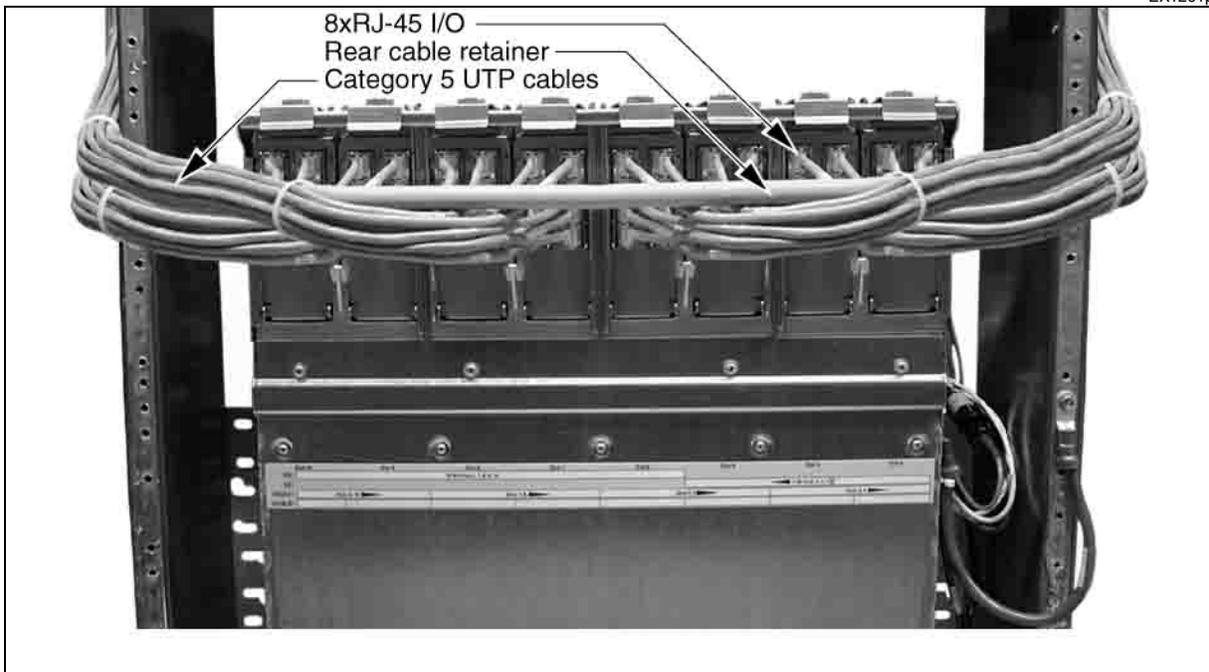
Figure 3-93
Running T3 and Category 5 UTP cabling along the frame

EX1502p
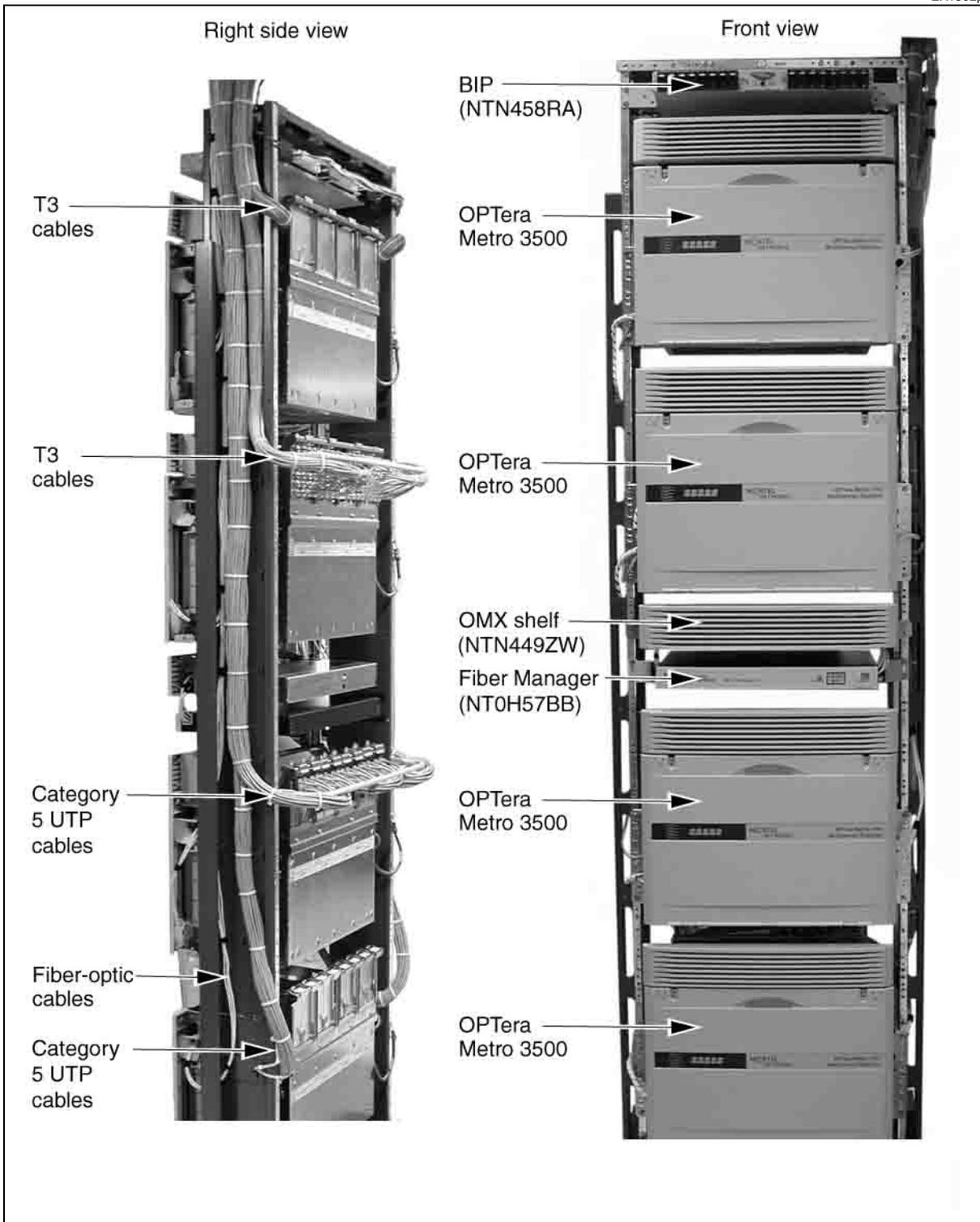
Procedure 3-30
Routing fiber-optic cables

Do not connect the office fiber-optic cable to the OC-3, OC-3x4, OC-12, OC-12x4, OC-48, OC-48 STS, OC-192 IR, OC-192 LR G.709 FEC, or OC-192 DWDM G.709 FEC circuit packs in this procedure. This task is described in Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.

⚠️ **CAUTION**
Risk of fiber-optic cable damage
The minimum bend radius for fiber-optic cable is 1.5 in. Observe this limit at all times to avoid low fiber-optic cable performance or damage.

⚠️ **CAUTION**
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Wear an antistatic wrist strap to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf. See Figure 3-105 on page 3-194.
2	Pull out the top fiber channel. See Figure 3-94 on page 3-168.
3	Route the fiber-optic cables through the top fiber channel, the bottom fiber channel, and the side fiber guides. Store the excess in the fiber storage tray.

See:

- Figure 3-94 on page 3-168
- Figure 3-95 on page 3-169

Use the split tube provided to protect fiber-optic cables that go to the cable channels and storage tray.

4 Push in the top fiber channel.

—**continued**—

Procedure 3-30 (continued)
Routing fiber-optic cables

Step	Action
5	If your configuration requires the use of fiber-optic cables terminated with miniature variable optical attenuators (VOAs), use the provided miniature VOA clips to tighten the fiber-optic cables to the cable tray.

6	**If** you are	**Then**
	using the OMX Shelf (NTN449ZW)	step 7
	using the OMX + Fiber Manager 4CH (NT0H32AE-HE, NT0H32AF-HF)	step 8
	not using any OMX	step 9

Step	Action
7	Route fiber-optic cabling from your OPTera Metro 3500 shelves to the OMX Shelf (NTN449ZW) through the Fiber Manager (NT0H57BB).
	You have completed this procedure.
8	Route fiber-optic cabling from your OPTera Metro 3500 shelves directly to the OMX + Fiber Manager 4CH (NT0H32AE-HE, NT0H32AF-HF) equipment drawers. See Figure 3-100 on page 3-174.
9	You have completed this procedure.

—**end**—

Figure 3-94
Fiber guides and fiber channels on the OPTera Metro 3500

EX1288p
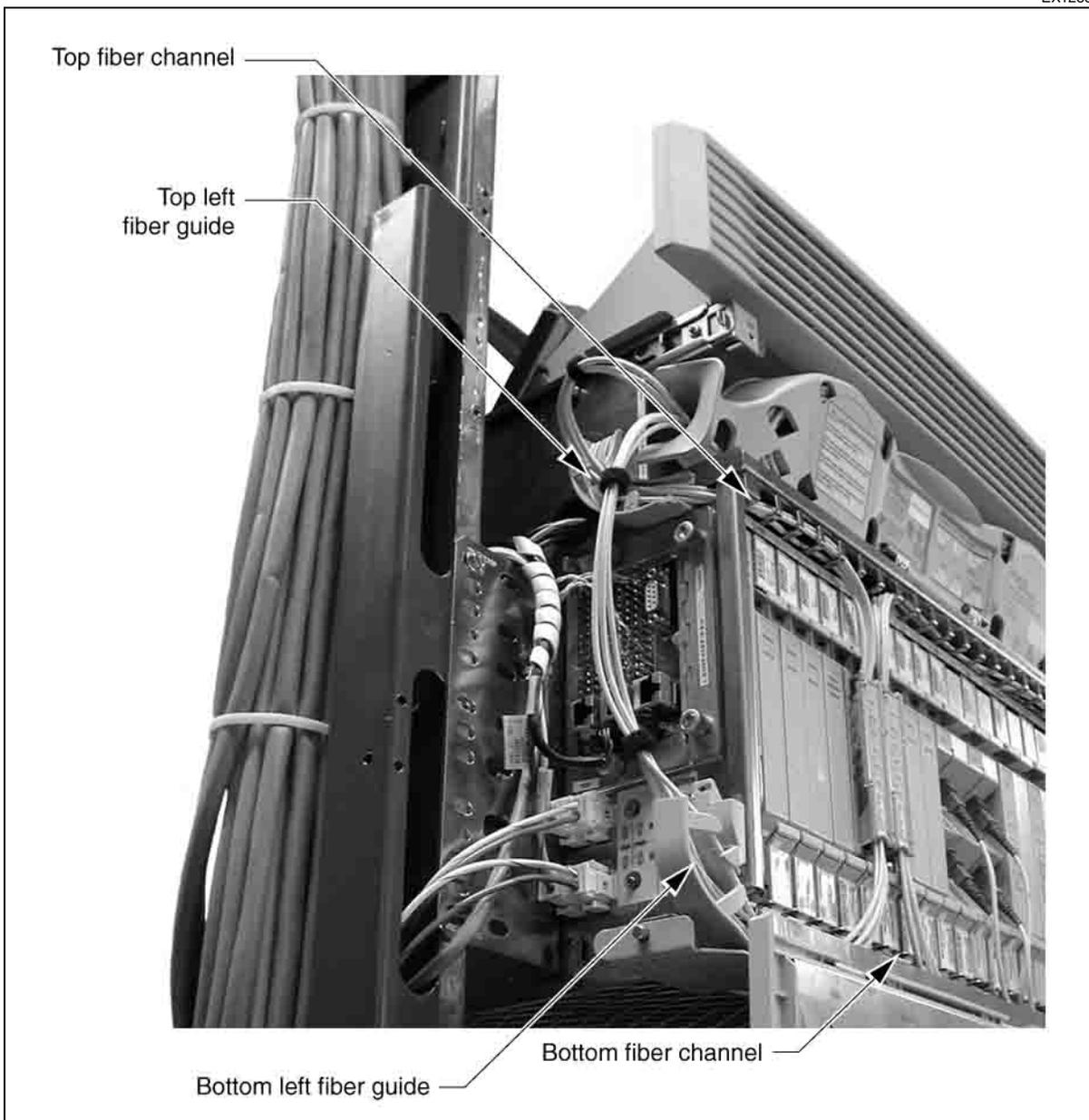
Figure 3-95
Routing fiber-optic cables to/from fiber storage tray

EX1219p

Figure 3-96
Connecting fiber-optic cables to OPTera Metro 3500 shelf

EX1224P

OC-3x4
circuit packs

Line
cables
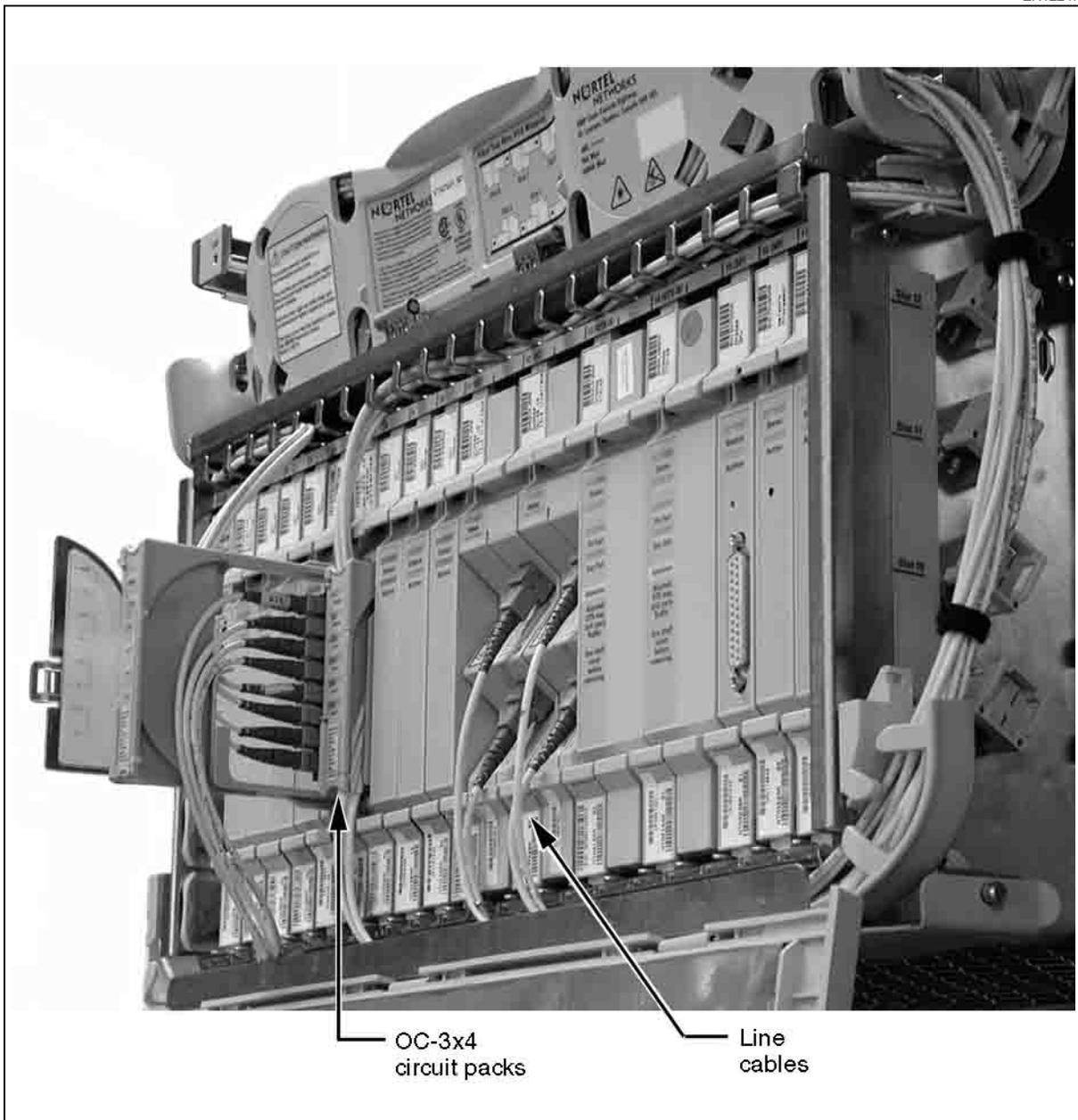
Figure 3-97
Connecting fiber-optic cabling to OC-3x4 (NTN441AA) circuit packs

EX1220p
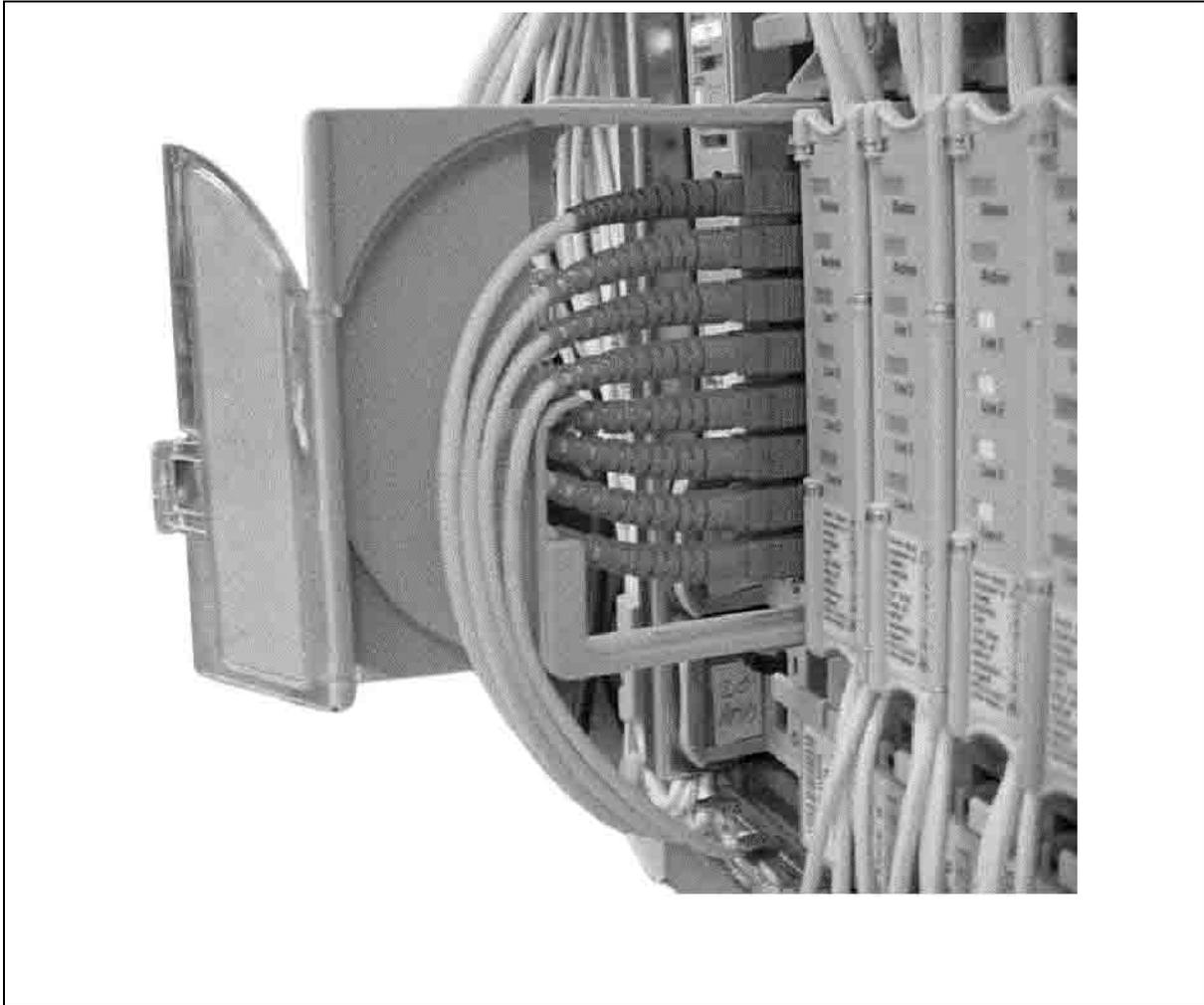
Figure 3-98
Routing fiber-optic cabling from OC-3x4 (NTN441AA) circuit packs

EX1218p

Figure 3-99
Routing fiber-optic cabling from 4x100FX circuit packs

EX1253p

4x100FX circuit packs
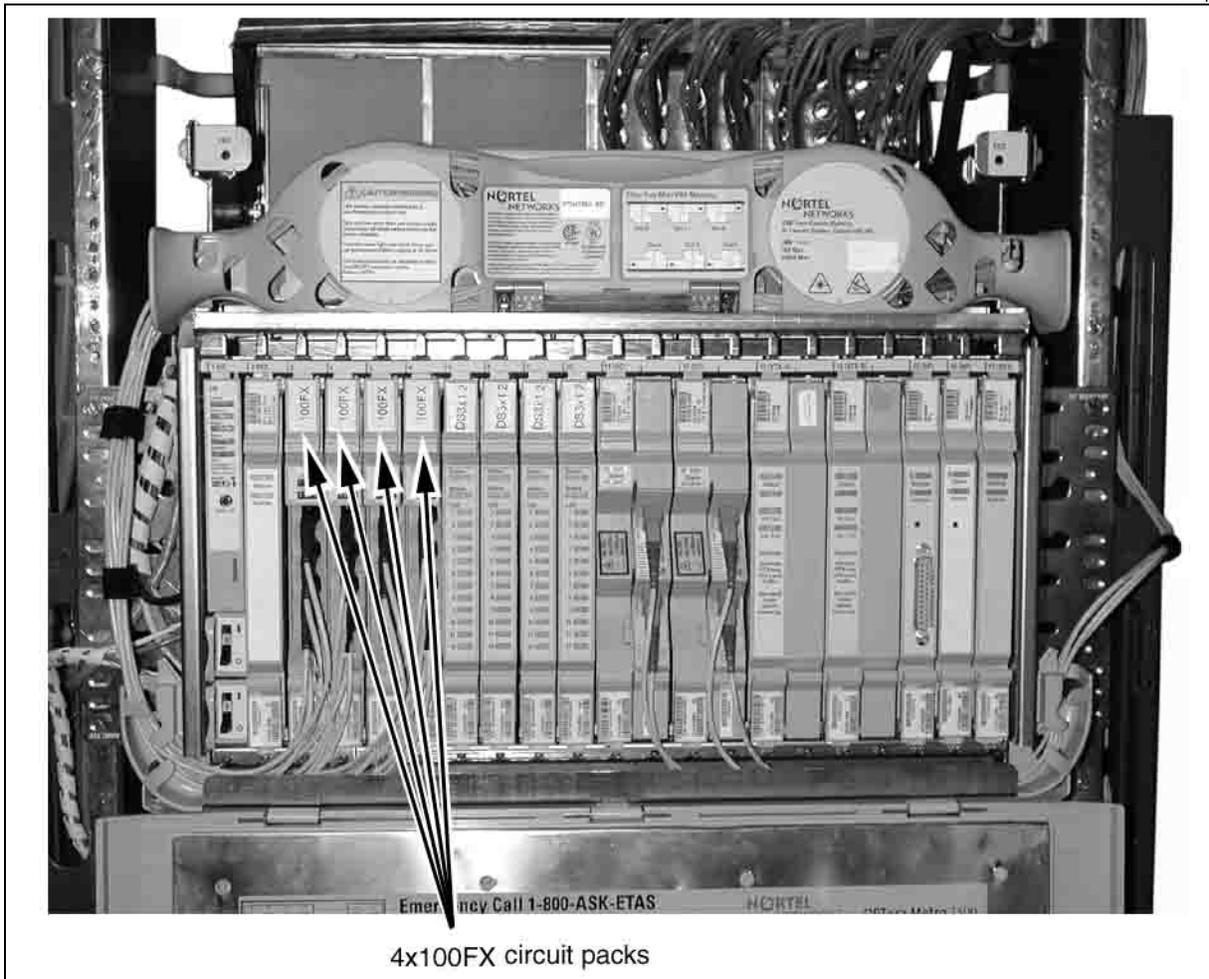
Figure 3-100
Routing fiber-optic cabling through the OMX + Fiber manager 4CH (NTOH32AE-HE, NT0H32AF-HF) equipment drawer

OM0515
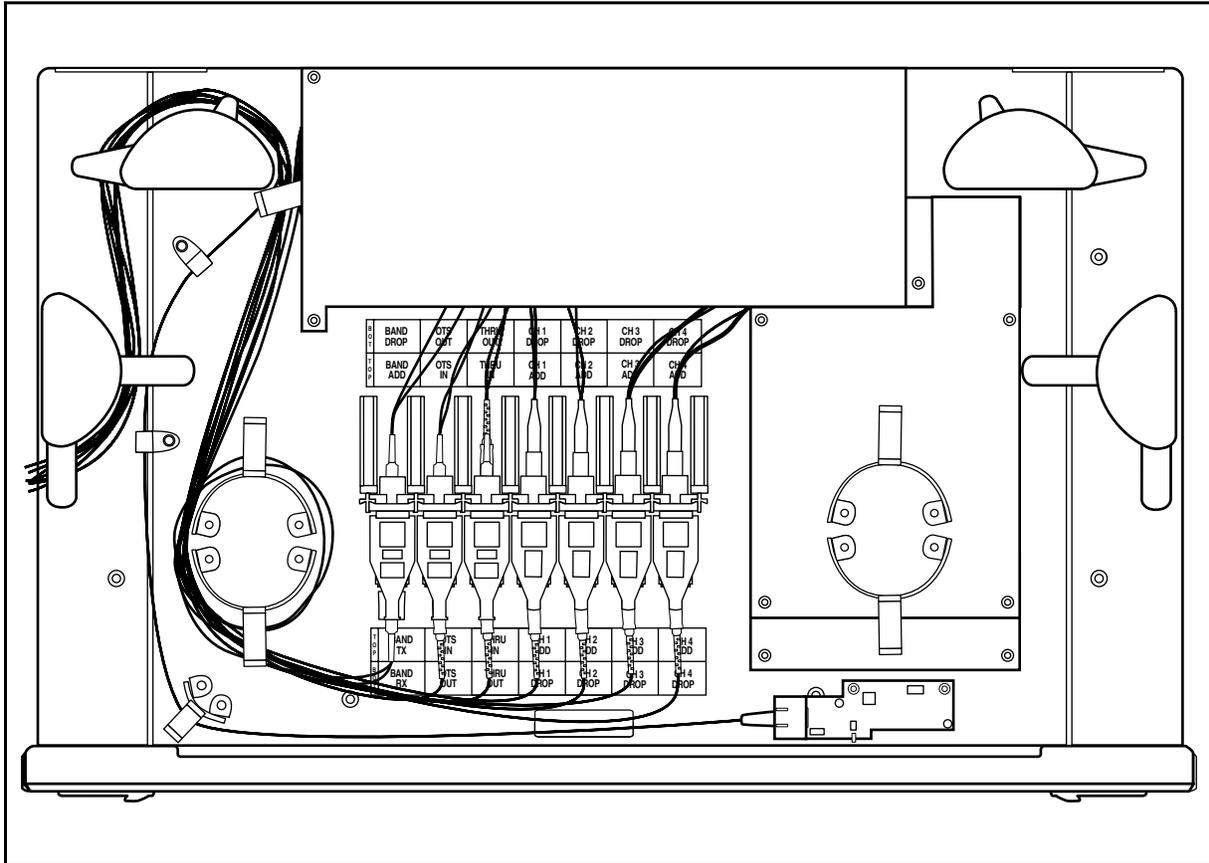
Procedure 3-31
Connecting fiber-optic cables to the optical interface circuit pack

Use this procedure to connect or disconnect fiber-optic cabling to or from the following circuit packs:

- OC-3
- OC-3x4
- OC-12
- OC-12x4
- OC-48
- OC-48 STS
- OC-48 DWDM
- OC-192 IR
- OC-192 LR G.709 FEC
- OC-192 DWDM G.709 FEC
- DSM DS1x84TM
- 4x100FX
- 2xGigE
- 2xGigE/FC-P2P

Note: Connect fiber-optic cables to an optical interface circuit pack in two steps. First, attach the optical adaptor to the optical interface, then the fiber-optic cable to the optical adaptor.

Requirements

To perform this procedure, you must:

- ensure you have LC-SC adapter patch cords, if the optical interface circuit pack does not have LC connectors but will be connected to a DS1 service module with LC connectors.
- ensure you have LC-LC adapter patch cords, if both the optical interface circuit pack and DS1 service module have LC connectors.
- ensure that your SFP modules are already installed, if your optical interface circuit pack is a 2xGigE/FC-P2P. See Installing and removing small form-factor pluggable (SFP) optical transceiver modules on page 3-152.

Procedure 3-31 (continued)
Connecting fiber-optic cables to the optical interface circuit pack

---

	DANGER
	Risk of personal injury
	When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Remove the Universal Fiber Tool from the inside of the front cover of the shelf. See Figure 3-26 on page 3-62.

2

If the circuit pack you will connect to or disconnect from	**Then** go to
is a 2xGigE circuit pack	step 3
is not a 2xGigE circuit pack	step 5

3   On the 2xGigE circuit pack, if any of the LAN ports requiring fiber connection/ disconnection are currently enabled, then disable these LAN ports. For details about how to disable LAN ports, see *OPTera Packet Edge System User Guide*, NTN465YF.

4   Save configuration data to non-volatile RAM for this circuit pack. For details about how to save configuration data, see *OPTera Packet Edge System User Guide*, NTN465YF.

5   Select the required task:

If you are	**Then** go to
disconnecting fiber-optic cables from an optical interface circuit pack	step 6
connecting fiber-optic cables to an optical interface circuit pack	step 12

—continued—

Procedure 3-31 (continued)
Connecting fiber-optic cables to the optical interface circuit pack

Step	Action

6   **If** the circuit pack from which you are disconnecting fiber   **Then** go to

iis an NTN441AA OC-3x4 circuit pack   step 7

is not an NTN441AA OC-3x4 circuit pack   Disconnecting SC, FC, ST, LC or MT-RJ connector on page 3-249

7   Slide out the fiber tray of the circuit pack.

8   Open the clear plastic doors on either side of the fiber tray.

9

CAUTION
Risk of signal degrade or loss of signal
Handle and store fiber-optic cables so that the cables are not kinked, cut, compressed, crushed, twisted, stretched, or snagged. Unwind fiber-optic cables from the spool - do not pull them out. Handle optical connectors and optical components so as to minimize stress at optical interfaces. Visible signs of damage to primary coatings, buffers, or jackets can cause signal degrade or loss of signal to the circuit pack.

Using the Universal Fiber Tool, disconnect the required fiber optic cables from the connectors.

10   Close the clear plastic doors on either side of the fiber tray.

11

CAUTION
Risk of signal degrade or loss of signal
When sliding the fiber tray back into the circuit pack, ensure that the internal fibers are not kinked, twisted, or snagged as they are routed into the fiber retainer. Visible signs of damage to primary coatings, buffers, or jackets can cause signal degrade or loss of signal to the circuit pack.

Pinch the plastic latches on either side of the fiber tray and slide the fiber tray slowly back into the circuit pack so that the internal fibers can be routed into the fiber retainer.

You have completed this procedure.

—**continued**—

Procedure 3-31 (continued)
Connecting fiber-optic cables to the optical interface circuit pack

Step	Action

12	**If** the circuit pack to which you are connecting fiber	**Then** go to
	iis an NTN441AA OC-3x4 circuit pack	step 13
	is not an NTN441AA OC-3x4 circuit pack	step 21

13 Slide out the fiber tray of the circuit pack.

14 Open the clear plastic doors on either side of the fiber tray.

15 Remove the dust plugs on the optical connectors.

16 Inspect and clean the circuit pack internal connectors and fiber. See Inspecting and cleaning optical interface internal connectors and fiber on page 4-2.

Note 1: The NTN441AA OC-3x4 circuit pack is equipped with eight pig-tail internal fibers, each with an SC connector on one end and an LC connector on the other. Both of these plugs (SC and LC) and their respective connector adapters should be cleaned.

Note 2: You should clean the pig-tail internal fibers on the NTN441AA OC-3x4 circuit pack one fiber at a time. Do not disconnect more than one pig-tail from its connector adapters at a time. Do not disconnect more than one end of any pig-tail at a time.

17 Inspect and clean connectors and adaptors on patch cords. See Cleaning optical connectors and adapters on patch cords on page 4-9.

18

> **CAUTION**
> **Risk of signal degrade or loss of signal**
> Handle and store fiber-optic cables so that the cables are not kinked, cut, compressed, crushed, twisted, stretched, or snagged. Unwind fiber-optic cables from the spool - do not pull them out. Handle optical connectors and optical components so as to minimize stress at optical interfaces. Visible signs of damage to primary coatings, buffers, or jackets can cause signal degrade or loss of signal to the circuit pack.

Connect the fiber optic cables to the connectors as required.

- Connect cables for ports 1 and 2 (Tx and Rx) on the right side of the fiber tray.
- Connect cables for ports 3 and 4 (Tx and Rx) on the left side of the fiber tray.

19 Close the clear plastic doors on either side of the fiber tray.

—continued—

Procedure 3-31 (continued)
Connecting fiber-optic cables to the optical interface circuit pack

Step	Action

20

> ⚠️ **CAUTION**
> **Risk of signal degrade or loss of signal**
> When sliding the fiber tray back into the circuit pack, ensure that the internal fibers are not kinked, twisted, or snagged as they are routed into the fiber retainer. Visible signs of damage to primary coatings, buffers, or jackets can cause signal degrade or loss of signal to the circuit pack.

Pinch the plastic latches on either side of the fiber tray and slide the fiber tray slowly back into the circuit pack so that the internal fibers can be routed into the fiber retainer.

You have completed this procedure.

21   Inspect and clean the circuit pack internal connectors and fiber. See Inspecting and cleaning optical interface internal connectors and fiber on page 4-2.

22   Inspect and clean connectors and adaptors on patch cords. See Cleaning optical connectors and adapters on patch cords on page 4-9.

23   Connect the appropriate fiber-optic cables to the required optical interface ports.

You have completed this procedure.

—**end**—

Procedure 3-32
Verifying circuit pack seating

Use this procedure to ensure that all of the circuit packs are seated in the shelf backplane.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1 Press the lamp test button (ACO) on the LIF. All the LEDs on all the circuit packs in the shelf must turn on and remain on for a few seconds. The alarm cutoff (ACO) LED turns green and remains green until an alarm is raised or cleared. See Figure 3-72 on page 3-117.

—**end**—

Procedure 3-33
Installing and removing the shelf front cover

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Select an option

If you want to	Then go to
install the front cover	step 2
remove the front cover	step 6

Installing the shelf front cover

2   Position the shelf cover so that the tab at its bottom is aligned with the mating slot at the bottom of the shelf. See Figure 3-101 on page 3-182.

3   Push in and maintain the spring-loaded pins on each side of the front cover. See Figure 3-101 on page 3-182.

4   Align the pins with the holes in the sides of the shelf, and push in the front cover gently until the spring-loaded pins enter the holes.

5   Close the front cover. For locking the network element, see Locking and unlocking the OPTera Metro 3500 shelf on page 3-185.

Removing the shelf front cover

6   Ensure the shelf is unlocked. See Locking and unlocking the OPTera Metro 3500 shelf on page 3-185.

7   Open the cover completely.

8   Push in the spring-loaded pins on the left side of the front cover and pull the left side of the cover just enough to disengage the pin from the shelf hole. See Figure 3-101 on page 3-182.

9   Push in the spring-loaded pins on the right side of the front cover and pull the right side of the front cover just enough to disengage the pin from the shelf hole.

10   Pull out the front cover and store it in a safe place.

—end—

Figure 3-101
Installing and removing the shelf cover

EX1259p

Tab

Spring-loaded pin
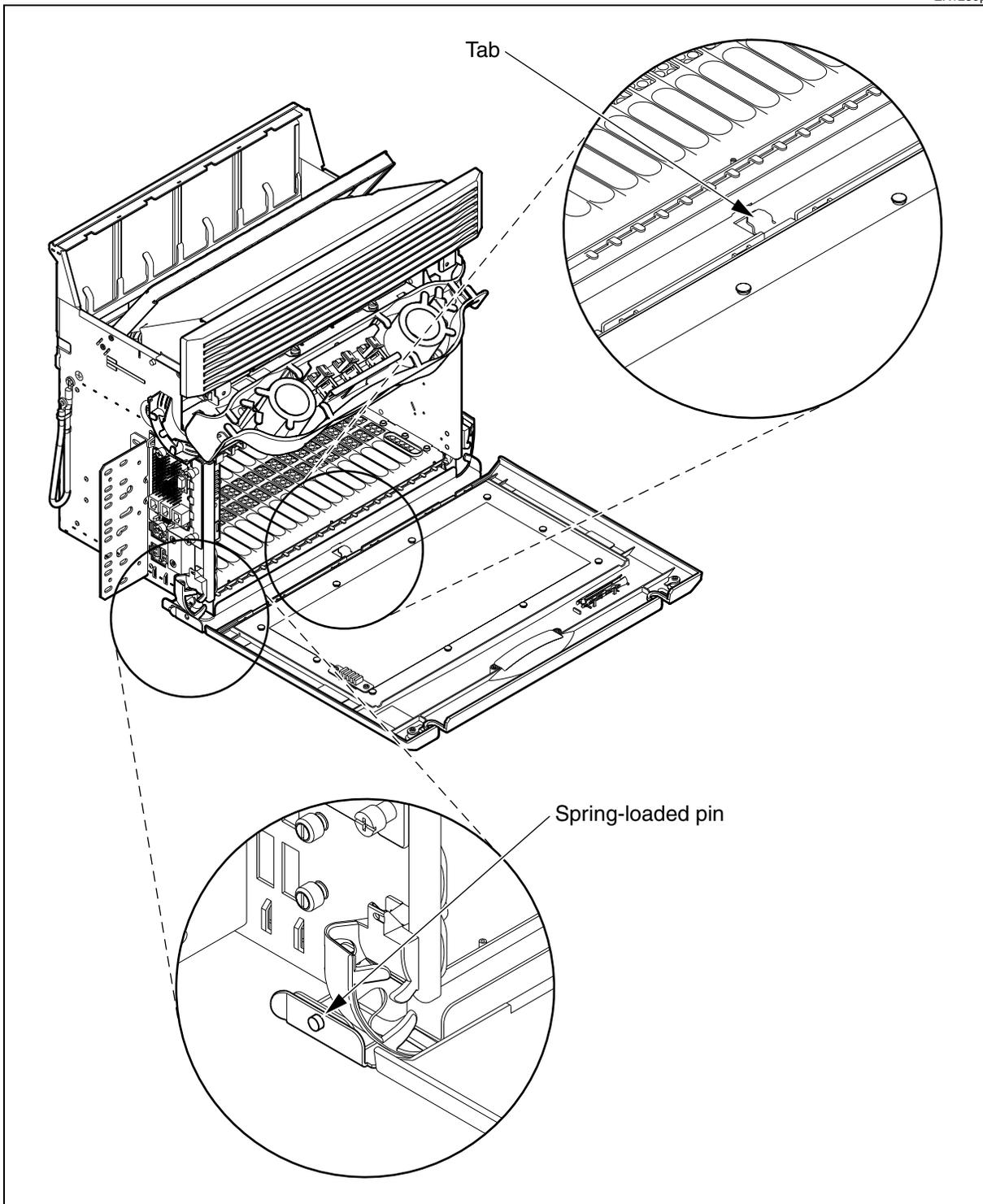
Procedure 3-34
Installing and removing the grill/air deflector

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Open the front cover.
2	Select an option:

If you want to	**Then** go to
remove the grill/air deflector	step 3
install the grill/air deflector	step 6

Removing the grill/air deflector

3	On the left side of the shelf, push in the spring-loaded pins of the grill/air deflector; at the same time pull the left end of the grill/air deflector just enough to disengage the pin from the shelf hole. See Figure 3-102 on page 3-184.
4	On the right side of the shelf, push in the spring-loaded pins of the grill/air deflector; at the same time pull the right end of the grill/air deflector just enough to disengage the pin from the shelf hole.
5	Pull out the grill/air deflector and store it in a safe place.

Installing the grill/air deflector

6	Push in the spring-loaded pins on the sides of the grill/air deflector, insert the grill/air deflector into the shelf and release the pins. See Figure 3-102 on page 3-184.
7	Align the pins with the holes in the sides of the shelf and push the grill/air deflector until the pins enter the holes.

—**end**—

Figure 3-102
Installing and removing the grill/air deflector

EX0828t
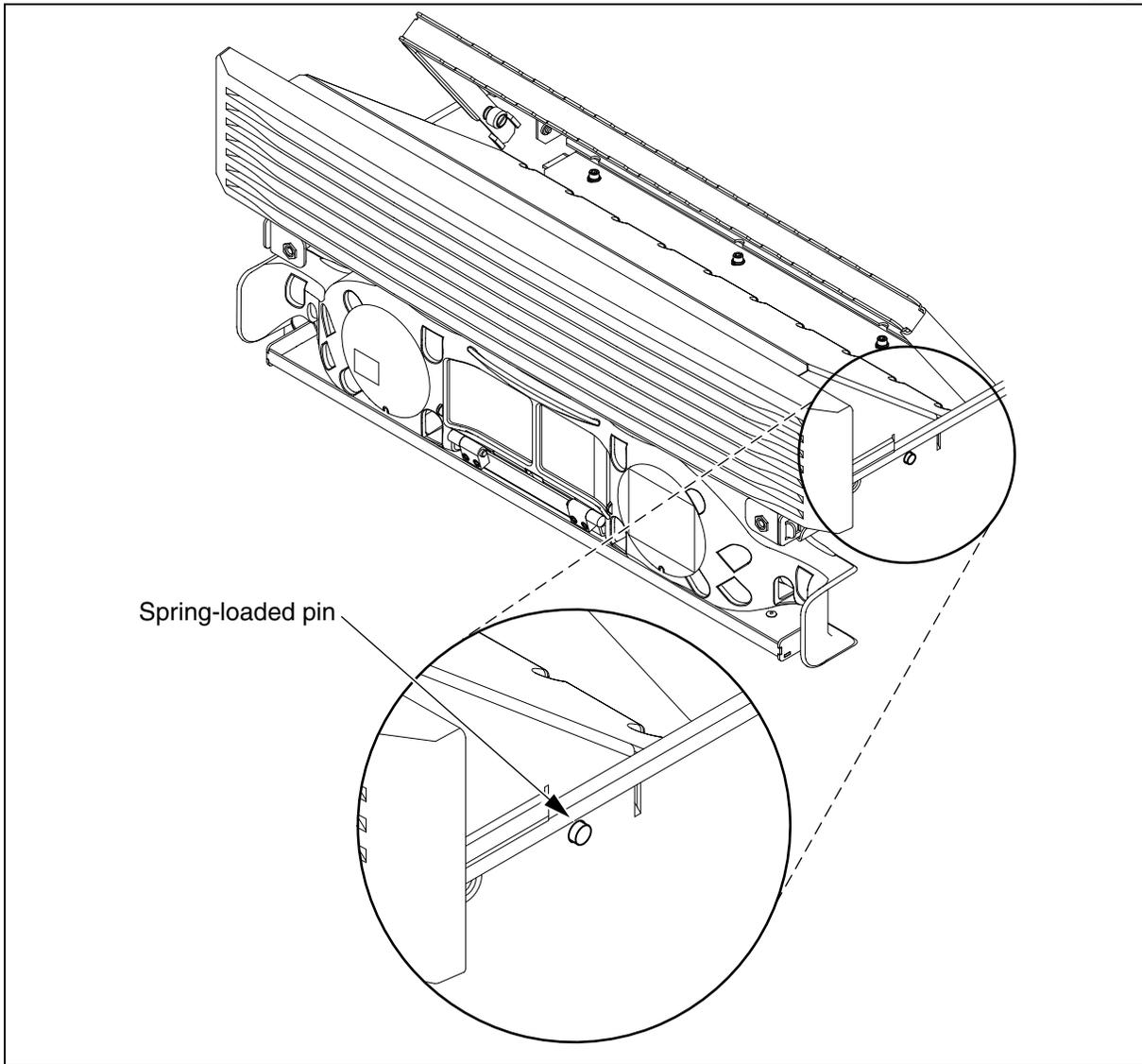
Spring-loaded pin

Procedure 3-35
Locking and unlocking the OPTera Metro 3500 shelf

Use this procedure to lock and unlock the OPTera Metro 3500 shelf.

Requirements

To perform this procedure, a flat head screw driver is required.

Step	Action
1	Select an option:

If you want to	**Then** go to
lock the shelf	step 2
unlock the shelf	step 5

Locking the shelf

2	Using a flat head screw driver, ensure the lock on each side of the front cover is rotated inward. See Figure 3-103 on page 3-186.
3	Close the front cover.
4	Using the screw driver, rotate outward the lock on each side of the front cover.

Unlocking the shelf

5	Using a flat head screw driver, rotate inward the lock on each side of the front cover. See Figure 3-103 on page 3-186.
6	Open the front cover.

—end—

Figure 3-103
Locking the OPTera Metro 3500 shelf

Procedure 3-36
Daisy-chaining network processors or ILANs

Use this procedure to daisy-chain co-located network processors (NP) or inter-shelf LANs (ILAN). A maximum of 16 NPs or ILANs may be daisy-chained.

Note 1: There are two ILAN ports controlled by the NP, that must be provisioned. These ILAN ports use RJ45 connectors. See Figure 5-17 on page 5-32 for pinouts.

Note 2: A shelf processor can be in the span of control (SOC) of a maximum of two NPs. The SOC of an NP can contain a maximum of 16 network elements.

Note 3: The ILAN does not provide any of the networking features available on the NP.

Note 4: ILAN connectivity between nodes is not possible if the NP or ILAN circuit pack are removed, or the shelf that contains the NP and ILAN is powered down.

Requirements

To perform this procedure you must

- have one NP or ILAN on each shelf to be daisy-chained

- ensure each NP or ILAN must be commissioned and have a unique TID.

- have flipped Category 5 UTP cable, a total of 100 m maximum between all NPs or ILANs

- have an account with a level 3 user privilege code (UPC)

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Wear an antistatic wrist strap to protect the circuit packs from damage. Connect the wrist strap to the ESD jack located on the front top left of the shelf marked "GND". See Figure 3-105 on page 3-194.

<p align="center">—continued—</p>

Procedure 3-36 (continued)
Daisy-chaining network processors or ILANs

Step	Action
2	Connect one end of the flipped Category 5 UTP cable to either ILAN1 or ILAN2.
3	Connect the other end of the flipped Category 5 UTP cable to either ILAN1 or ILAN2 of the shelf to be daisy-chained.
4	Repeat step 2 and step 3 for each network element in the chain.
5	Provision the ILAN.

- Select the NP from the navigation tree.
- Log in to the NP.
- Select NP Facility from the Configuration menu.
- Click Add in the NP facilities window.
- Select ILAN1 or ILAN2 from the Facility type drop-down menu in the Add NP facilities window.
- Click OK.

Note 1: If both ILAN1 and ILAN2 are used, provision both ports.

Note 2: Provisioning an ILAN port enables diagnostics on that port. When a problem is detected on the port, a corresponding alarm is raised. Deprovisioning an ILAN port disables diagnostic capabilities on that port and clears the associated alarms.

Note 3: Deprovision alarms on ILAN1 or ILAN2 of the last network element, since one of these will not be connected, causing alarms to be generated.

6	Repeat step 5 for all NPs or ILANs in the chain.
7	Provision the span of control (SOC) on the NPs from which you are doing surveillance.

- Ensure you are logged into the NP.
- Select Span of Control from the Configuration menu.
- Select the network element to be added to the SOC from the network element list.
- Click Add.
- Enter the user identifier and password of the network element being added to the SOC.
- Click OK.

Note: The ILAN circuit pack does not provide the SOC feature available on the NP.

8	Provision either the X.25 or COLAN. Refer to *Network Surveillance*, 323-1051-520.

—end—

Procedure 3-37
Connecting a terminal or modem to the shelf

For cable and connector specifications see Cable and connector details on page 5-1.

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Determine which cable you want to connect to the shelf.

If the device is a	**Then** go to
VT100 (or VT100 emulating) terminal	step 2
modem	step 5

Connecting a terminal for temporary maintenance activity

2   Connect the data circuit-terminating equipment (DCE) end of the terminal cable to the RS-232 connector on the shelf processor. See Figure 3-104 on page 3-191.

3   Connect the data terminating equipment (DTE) end of the null terminal cable to the VT100 terminal (or VT100 terminal emulator).

4   At the VT100 terminal emulator, set the terminal communications parameters to the following values:

Baud Rate = 19200
Bits/Parity = 8
Parity = No
Stop bits = 1

You have completed this procedure.

Connecting a modem

Programming the modem

5   Connect your modem to your personal computer. See the modem manufacturer's instructions.

6   Power up your personal computer and modem.

—continued—

Procedure 3-37 (continued)
Connecting a terminal or modem to the shelf

Step	Action
7	Activate the terminal-emulation program on the personal computer.
8	Configure the modem by using the terminal-emulation program on your personal computer. See Table 3-10 on page 3-191 and the modem manufacturer's instructions.

For US Robotics modems, enter the following commands:

AT	to verify the modem is responding
AT&F1	to load the factory default settings for hardware CTS/RTS flow control
AT&N10	to set connection rate to be 19200 bits per second
AT&W0	to save these settings

Step	Action
9	Program the modem to save this configuration.
10	Disconnect the modem from the personal computer.

Connecting the modem to the OPTera Metro 3500 shelf

Step	Action
11	Connect the DTE end of the modem cable to the RS-232 connector on the LOAM. See Figure 3-68 on page 3-108.
12	Connect the DCE end of the modem cable to the modem. The network element can now support a remote modem-based Preside Site Manager session.
13	Connect a telephone line to the modem. See the modem manufacturer's instructions.

You have completed the terminal connection.

Modifying the modem initialization sequence

Step	Action
14	Connect the server side modem (the one that will be connected to the OPTera Metro 3500 DTE port) to serial port COM1 on your PC.
15	Open HyperTerminal and connect it to COM1.
16	Display a list of the modem settings by entering: AT\S. A list of the modem settings is displayed. If the serial port flow setting is enabled, one of the settings can read "SERIAL FLOW BHW AT\Q3.
17	Disable the serial port flow setting by entering AT\Q0. The modem responds with OK.
18	Check that the setting has changed by entering AT\S. The setting can now read "SERIAL FLOW OFF AT\Q0.
19	Save the settings by entering AT&W.

Note: All the settings are kept when the modem is turned off.

—**continued**—

Procedure 3-37 (continued)
Connecting a terminal or modem to the shelf

Step	Action
20	Disconnect the modem from the PC and connect it to the OPTera Metro 3500 DTE port.
21	Dial up to the modem and log in to the network element with Preside Site Manager or HyperTerminal.

—**end**—

Table 3-10
Modem configuration

Parameter	Setting
Transfer rate	19200 bit/s
Auto-answer	Yes
Flow control	Bidirectional hardware (RTS/CTS)
Answer mode result code	Off (disabled)

Figure 3-104
Connecting a terminal cable

EX0256
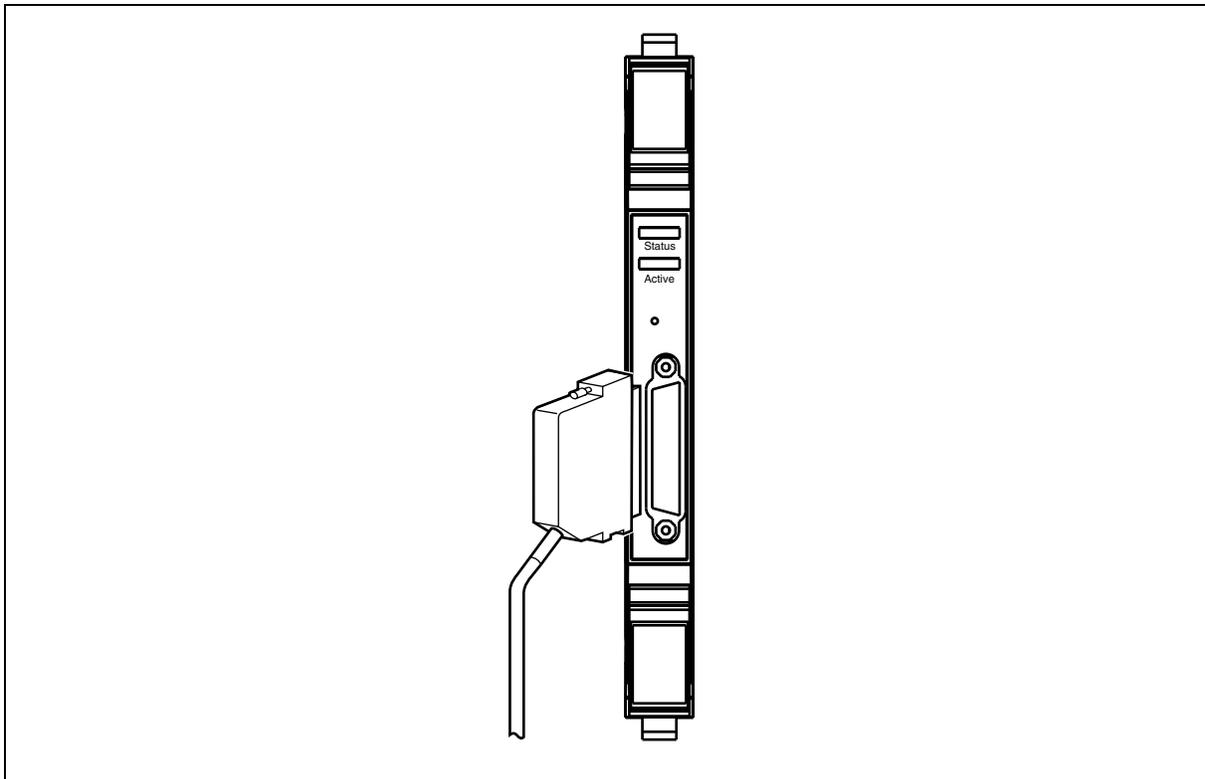
Procedure 3-38
Inserting or removing a circuit pack

	CAUTION
⚠	**Risk of equipment damage** Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION
⚠	**Risk of circuit pack damage** Do not force any circuit pack all the way to the back of its slot if it resists insertion.

Note: Circuit packs are keyed to fit only in some slots. See the shelf diagram on the inside of the shelf cover for circuit pack position information.

Step	Action
1	Put a antistatic wrist strap on your wrist to protect the circuit packs from damage. Connect the cord to the ESD jack located on the front panel of the shelf. See Figure 3-105 on page 3-194.
2	Determine the task you want to perform.

If you are	**Then** go to
inserting a circuit pack	step 3
removing a circuit pack	step 9

Inserting a circuit pack in a slot

Step	Action
3	Check the shelf configuration guide on the shelf cover to make sure that you can install the circuit pack in the slot you have selected. *Note:* Circuit packs are keyed to fit only in specific slots.
4	Lift the circuit pack by the edges of the faceplate.
5	With the circuit pack right side up, guide the back end of the circuit pack into the required slot, making sure that the top and bottom edges of the circuit pack enter the slot guide rails.

—continued—

Procedure 3-38 (continued)
Inserting or removing a circuit pack

Step	Action
6	Push the circuit pack into the shelf until 75% of the length of the circuit pack is in the shelf.
7	Pull the lock/eject levers at the top and bottom of the circuit pack faceplate to their completely extended positions.

8

> ⚠ **CAUTION**
> **Risk of incorrect installation**
> Make sure that the circuit pack lock/eject levers are locked in position. If the lock/eject levers are not locked the circuit pack does not autoprovision.

Push the circuit pack towards the back of the shelf. The lock/eject levers will slip into the grooves at the top and bottom edges of the slot frame.

At the same time, push the top and bottom lock/eject levers towards the circuit pack faceplate so that the connector at the back of the circuit pack mates with the back plane.

You can feel the latch snap into the locked position as the circuit pack mates with the shelf backplane. The lock/eject levers then snap towards the faceplate. (Top lever snaps down and bottom lever snaps up.)

The levers are now locked in position and will hold the circuit pack securely in the shelf.

Note: Do not use excessive force when pushing the lock/eject levers towards the faceplates. If the levers do not want to lock into place, remove the circuit pack and examine the connector at the back of the circuit pack. See the shelf diagram on the inner surface of the shelf cover for circuit pack position information.

Removing a circuit pack from a slot

Step	Action
9	Disconnect the cable from the circuit pack faceplate is applicable.
10	Pull the lock/eject levers at the top and bottom of the circuit pack faceplate to their completely extended positions.
	The circuit pack connector disengages from the backplane.
11	Pull the circuit pack out of the slot.

—end—

Figure 3-105
ESD jack on the OPTera Metro 3500 shelf

EX0827t

ESD jacks
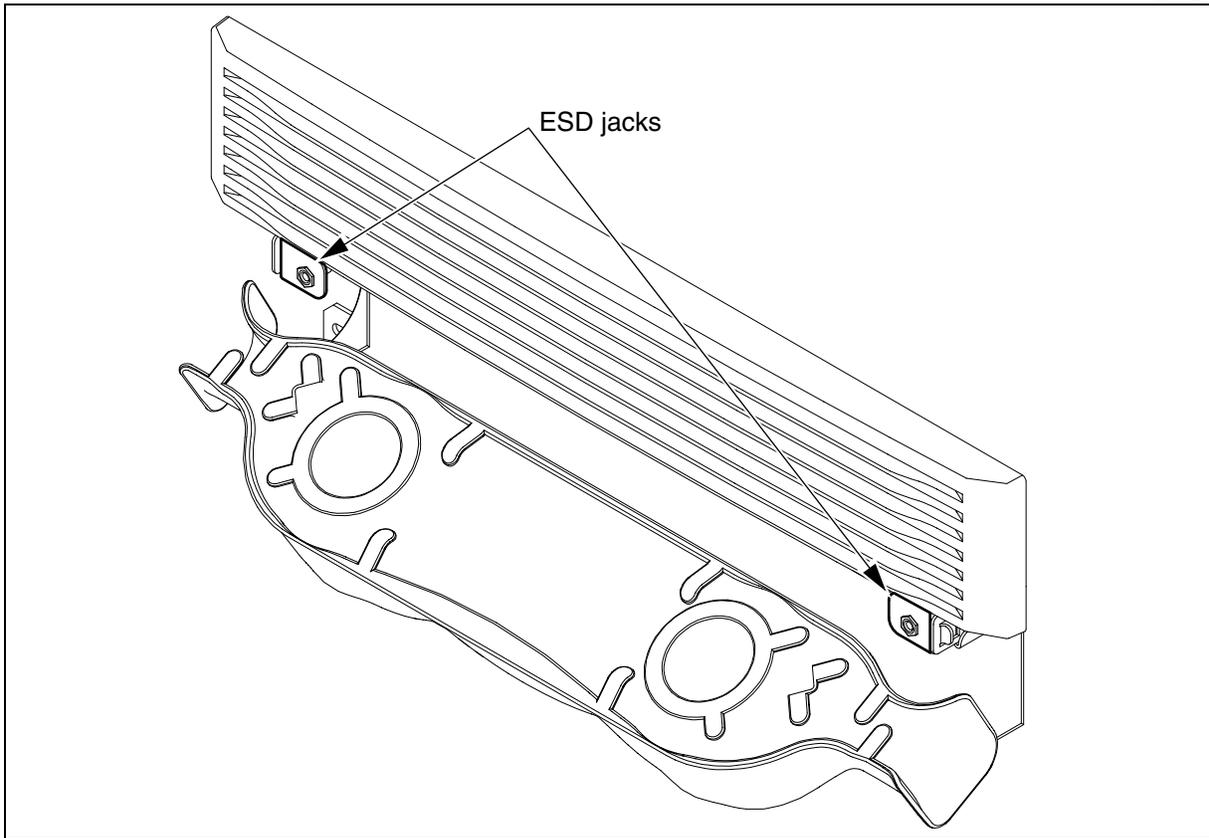
Procedure 3-39
Inspecting the OMX Shelf (NTN449ZW) container contents

The OMX Shelf (NTN449ZW) is shipped in a single container. The following components are preassembled on the OMX:

- top OMX module tray
- bottom OMX module tray
- protective cover
- mounting brackets

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify the OMX Shelf container contents; see .

—*end*—

Figure 3-106
OMX Shelf (NTN449ZW)- shipping container contents

EX0806p

OMX module tray

Protective cover

Protective cover thumbscrew

Top tray lock

Bottom tray lock

19" and 23" mounting bracket
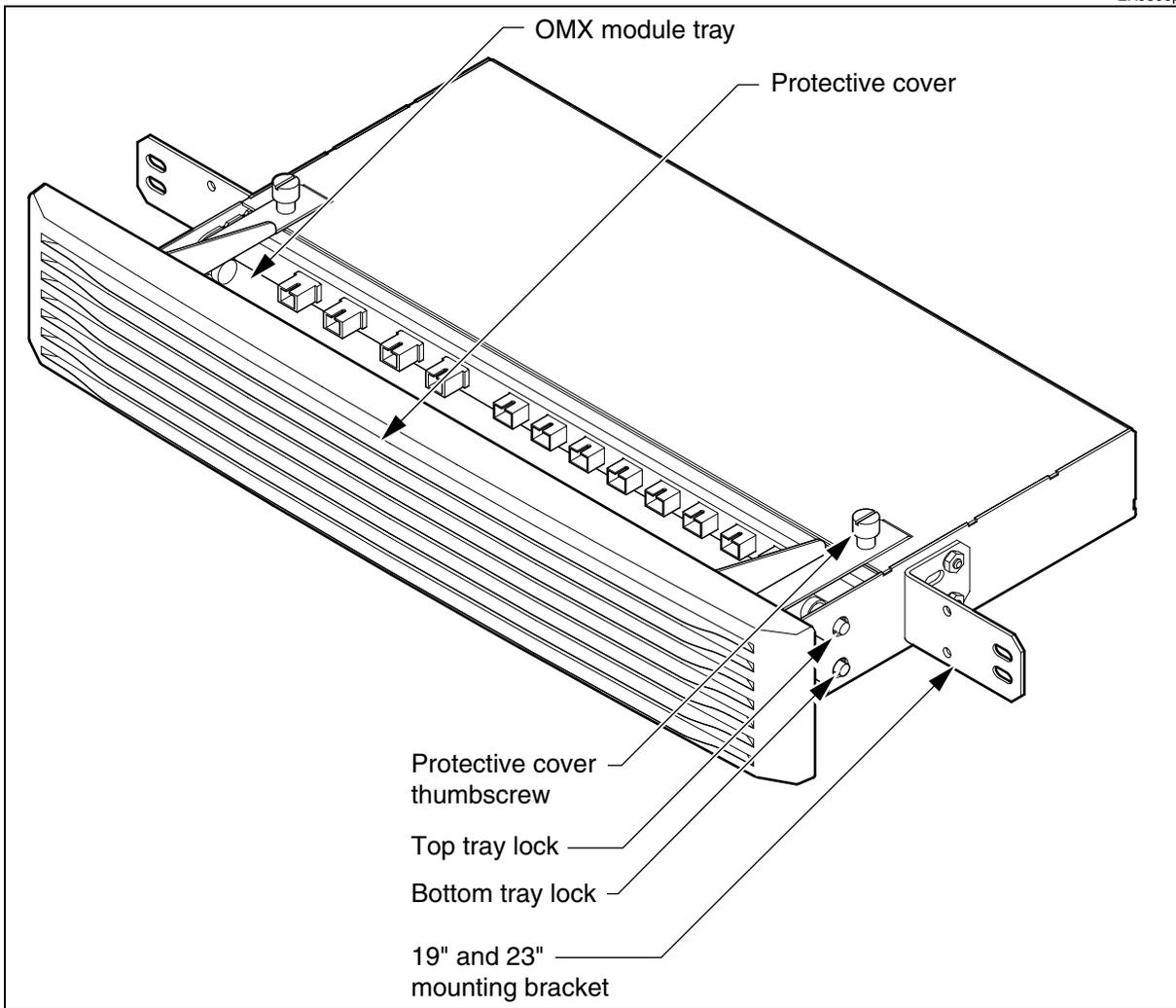
Procedure 3-40
Installing the OMX Shelf (NTN449ZW)

The mounting procedure is valid for all supported 19-in. and 23-in. equipment frames. For all valid equipment frame mounting arrangements, see Figure 3-29 on page 3-68.

Step	Action
1	Determine where to mount the OMX.

Note: The minimum required clearance below the OMX shelf is 1.75 in. The distance from the front of the OMX shelf to the front edge of the frame base plate is 5.09 in. The OMX shelf is flush with the rear edge of the frame base plate.

If you want to mount the shelf in a	**Then** go to
19-in. equipment frame	step 2
23-in. open equipment frame	step 3

Note: The OMX shelf is shipped with the mounting brackets configured for a 23-in. equipment frame.

| 2 | Detach the brackets from the OMX shelf. Attach the long side of each bracket to the side of the OMX shelf. |

Note: Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

Mounting the OMX shelf on the equipment frame

3	Remove the protective cover from the OMX shelf. For instructions, see Removing and installing the OMX Shelf (NTN449ZW) protective cover on page 3-200.
4	Mount the OMX shelf on the equipment frame using the alignment studs and four #12-24 self-tapping screws. See Figure 3-108 on page 3-199.
5	Insert the alignment studs in the equipment frame.
6	Hang the shelf from the alignment studs.
7	Insert and tighten the shelf screws in the bottom hole of each bracket.

Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

| 8 | Remove the alignment studs. |
| 9 | Insert and tighten the shelf screws in the same hole that the alignment studs were in. |

Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

—end—

Figure 3-107
OMX Shelf (NTN449ZW) with OMX modules extended

EX0795t

OMX module tray

OTS In
OTS Out
Thru In
Thru Out
Ch 1 Add
Ch 2 Add
Ch 3 Add
Ch 4 Add
Ch 1 Drop
Ch 2 Drop
Ch 3 Drop
Ch 4 Drop

OTS In
OTS Out
Thru In
Thru Out
Ch 1 Add
Ch 2 Add
Ch 3 Add
Ch 4 Add
Ch 1 Drop
Ch 2 Drop
Ch 3 Drop
Ch 4 Drop

OMX module tray
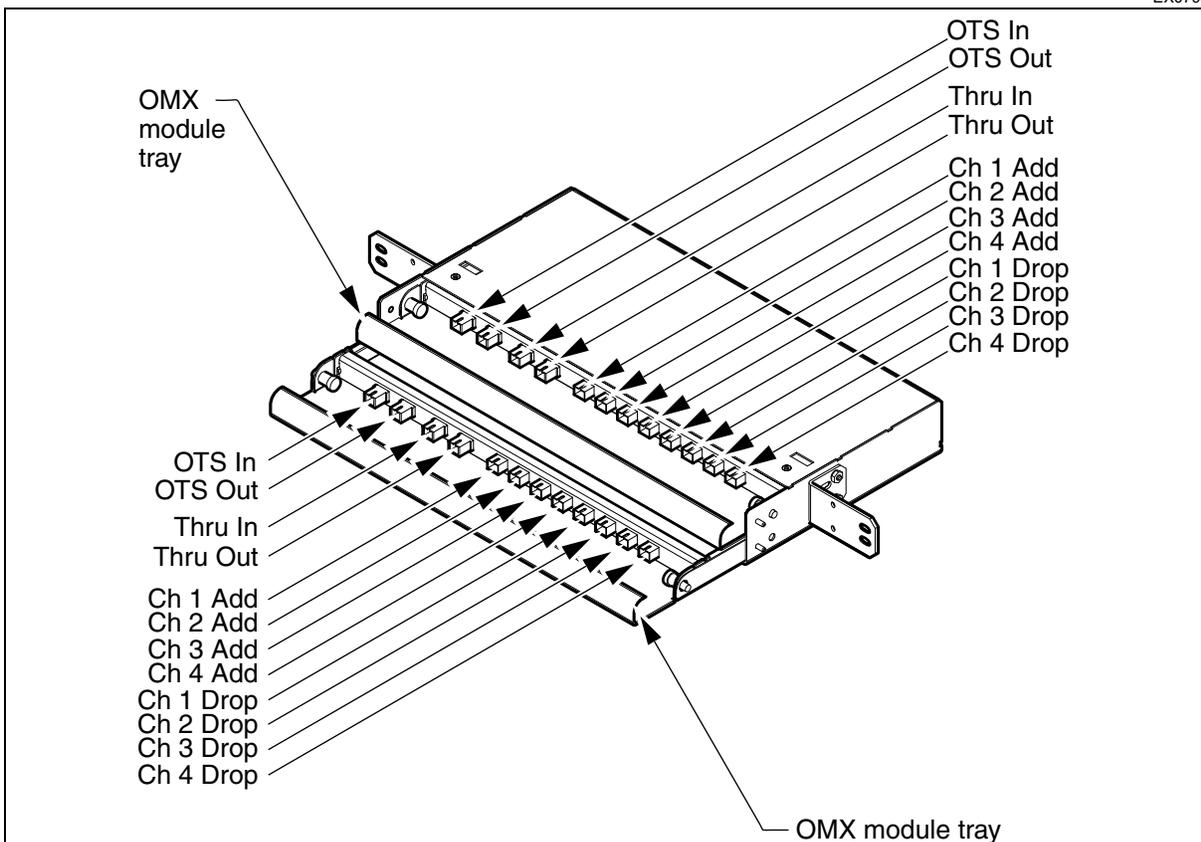
Figure 3-108
Installing the OMX Shelf (NTN449ZW) and the Fiber Manager equipment drawer (NT0H57BB)

EX1013p

1.75 in

0.5 in

OPTera Metro 3500

OMX Shelf
(NTN449ZW)

Fiber Manager
(NT0H57BB))
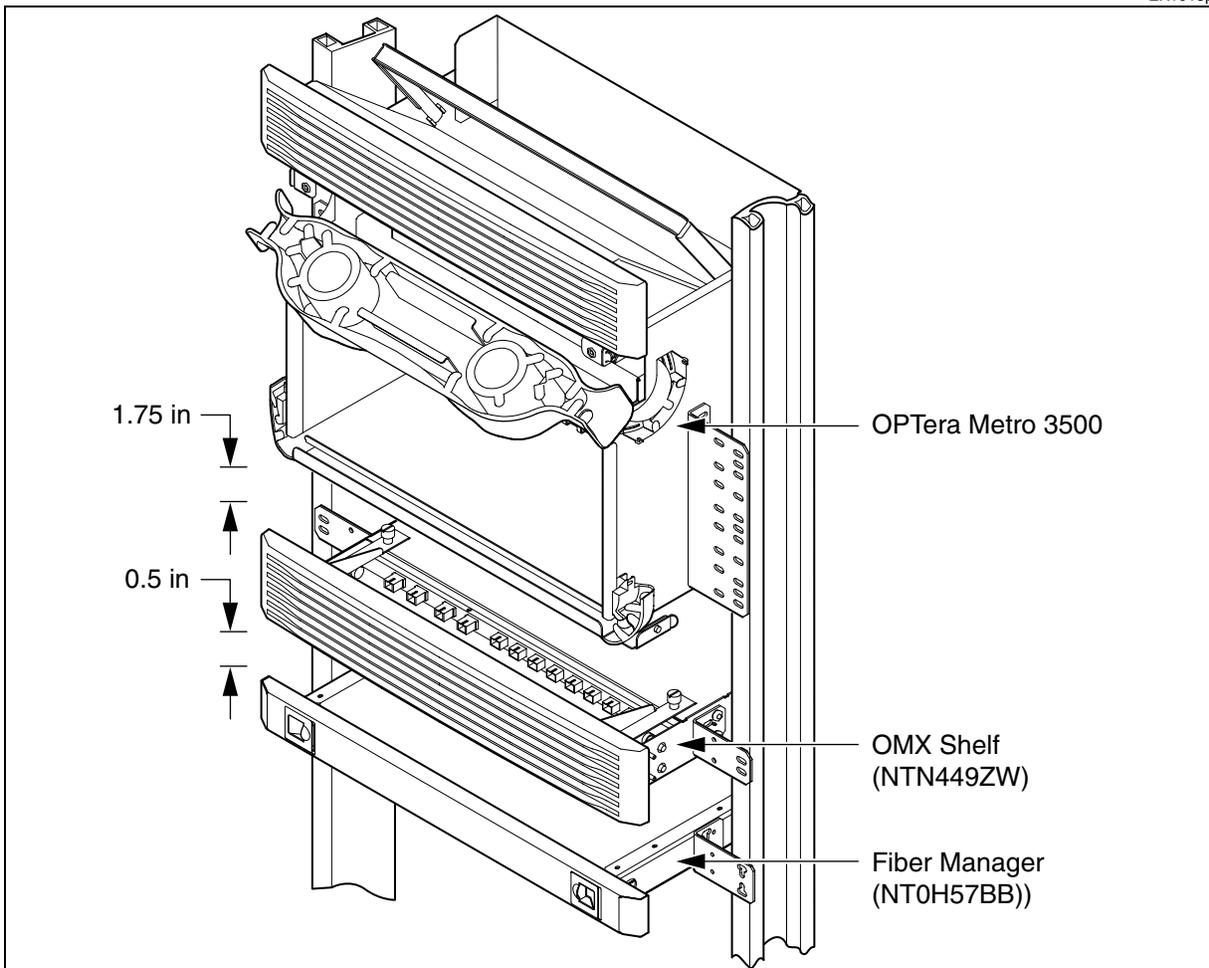
Procedure 3-41
Removing and installing the OMX Shelf (NTN449ZW) protective cover

> *Note:* You must remove the protective cover completely from the OMX Shelf to provide clear access to OMX modules and I/O connectors.

Step	Action

Removing the OMX protective cover

1   Loosen the two thumbscrews attaching the protective cover to the top of the OMX shelf. See Figure 3-106 on page 3-196.

2   Lift the thumbscrew mounts on both sides, then pull out the protective cover slowly.

You have completed this procedure.

Installing the OMX protective cover

3   Position the protective cover so that the far-end of the thumbscrew mount enters the holes on the top of the OMX on each side.

4   Tighten the thumbscrews attaching the protective cover to the top of the OMX shelf. See Figure 3-106 on page 3-196.

—**end**—

Procedure 3-42
Inspecting the Fiber Manager (NT0H57BB) container contents

The Fiber Manager is shipped in a single container. The mounting brackets are preassembled on the fiber storage tray.

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify fiber storage tray container contents. See Figure 3-109 on page 3-201.

—**end**—

Figure 3-109
Fiber Manager (NT0H57BB) - shipping container contents

EX1255p

Spring-loaded lock
Cable outlet
19" mounting bracket

Note: The OMX fiber manager capacity is 16 fibers x 6.56 ft each.
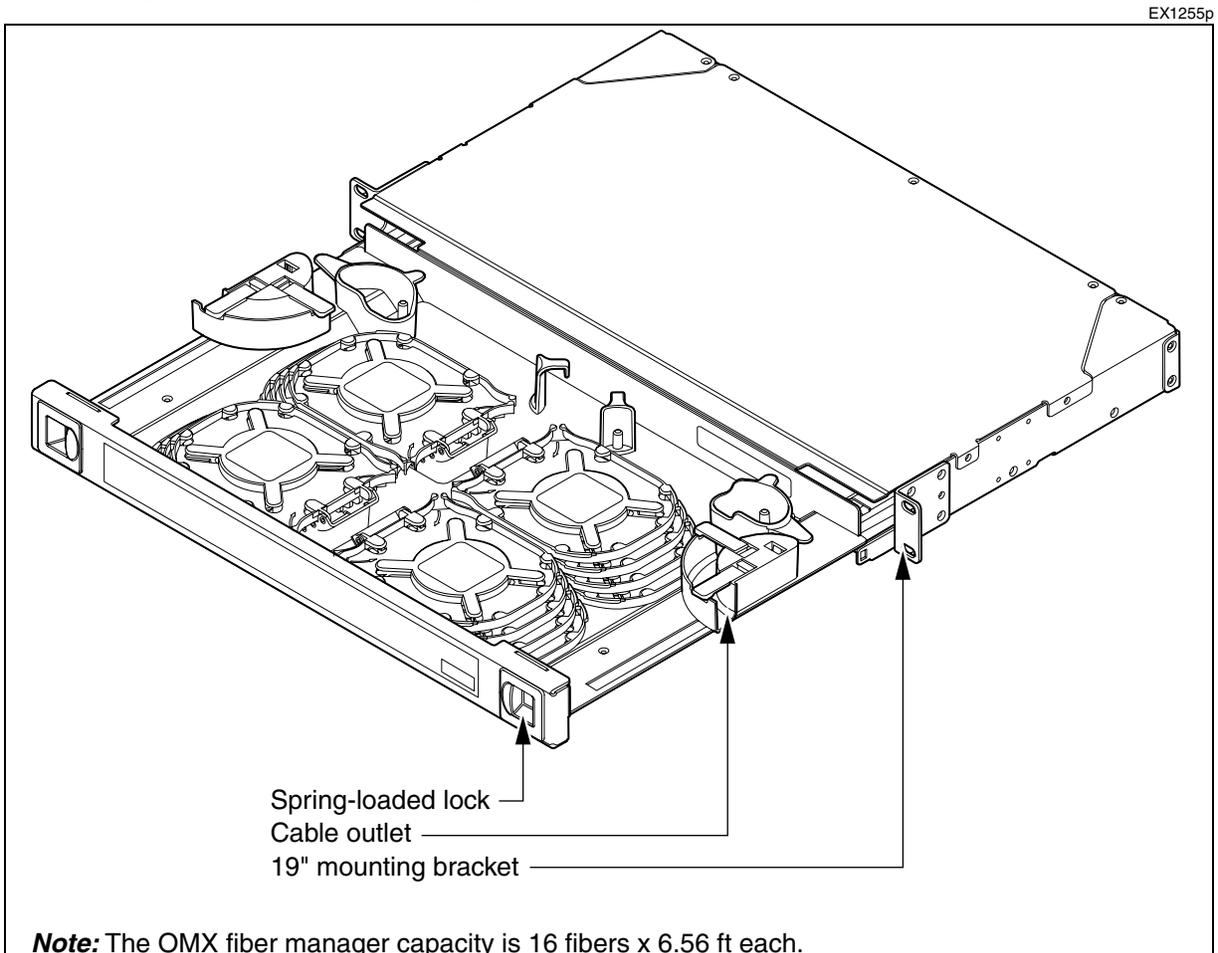
Procedure 3-43
Installing the Fiber Manager (NT0H57BB) equipment drawer

Note: The mounting procedure is valid for all supported 19-in. and 23-in. equipment frames.

Step	Action
1	Determine the correct height for the Fiber Manager equipment drawer below the OMX Shelf, on the equipment frame.

Note: The minimum required clearance below a shelf is 1.75 in. The distance from the front of the Fiber Manager to the front edge of the frame base plate is 1.42 in. The Fiber Manager is flush with the rear edge of the frame base plate.

2	Determine the type of bay frame in which you will mount the Fiber Manager equipment drawer.

If you wish to mount the Fiber Manager in a	**Then** go to
19-in. bay frame	step 3
23-in. open bay frame	step 4

Note: The Fiber Manager equipment drawer is shipped with the mounting brackets pre-configured for a 23-in. bay frame.

3	Detach the brackets from the Fiber Manager. Attach the long side of each bracket to the side of the Fiber Manager.

Note: Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

Mounting the Fiber Manager on the bay frame

4	Mount the Fiber Manager equipment drawer on the bay frame using the alignment studs and four #12-24 self-tapping screws. See Figure 3-108 on page 3-199.
5	 **Risk of dropping the equipment** To prevent the shelf from tipping and falling, you must install the stud in the holes that matches the top holes of the shelf.

Insert the alignment studs in the bay frame.

—continued—

Procedure 3-43 (continued)
Installing the Fiber Manager (NT0H57BB) equipment drawer

Step	Action
6	Hang the shelf from the alignment studs.
7	Insert and tighten the shelf screws in the bottom hole of each bracket.
	Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.
8	Remove the alignment studs.
9	Insert and tighten the shelf screws in the same hole that the alignment studs were in.
	Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

Installing the storage tray cover

10	Position the cover, press the two spring-loaded locks, push the cover in and release the spring-loaded locks. See .

—**end**—

Procedure 3-44
Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)

Use this procedure to mount the OMX + Fiber Manager 4 CH in an bay frame or cabinet.

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

Requirements

- Ensure you have two, single hole grounding lugs.
- Ensure you have 10 AWG wire (for grounding).
- Ensure you have the correct mounting bracket for installation. Table 3-11 on page 3-204 specifies the mounting bracket (A, B, C, D or E) designed to fit a specific rack type and whole spacing.

Table 3-11
Mounting bracket labels

Bracket label	Rack type and hole spacing
A	EIA 19-inch with 1.25-inch (31.75-mm) hole spacing
B	EIA 19-inch wide with 0.98-inch (25-mm) hole spacing
C	EIA 23-inch wide with 1.25-inch (31.75-mm) hole spacing
D	EIA 23-inch wide with 0.98-inch (25-mm) hole spacing
E	ETSI widths with 0.98-inch (25-mm) hole spacing

Note: The OMX + Fiber Manager 4CH equipment drawer can be front-mounted or mid-mounted.

- For front-mounting attach the bracket at the front of the shelf, see Figure 3-110 on page 3-205
- For mid-mounting attach the bracket using the second set of hole, see Figure 3-111 on page 3-205

Procedure 3-44 (continued)
Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)

Figure 3-110
Attaching mounting brackets for front-mounting

OM0282t
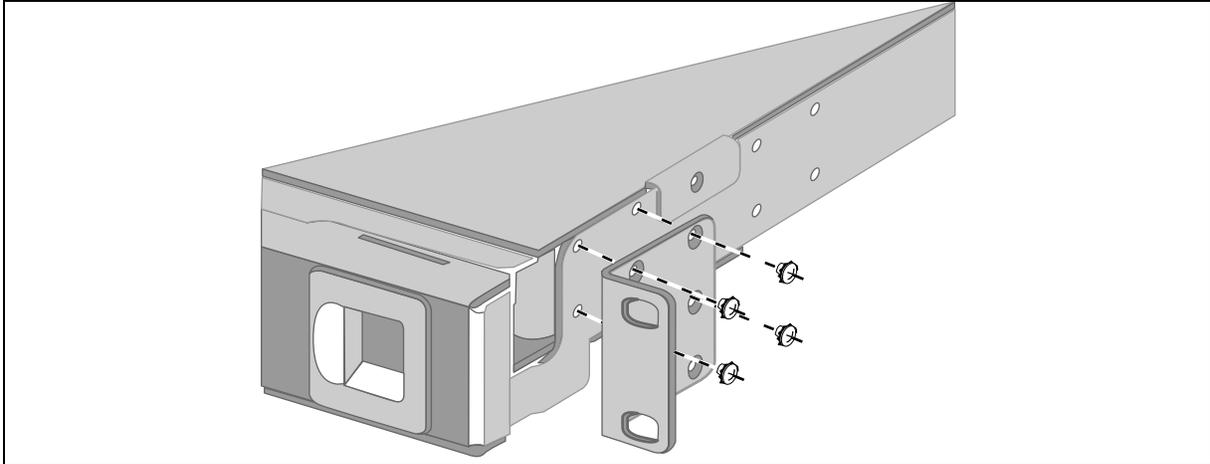
Figure 3-111
Attaching mounting brackets for mid-mounting

OM0258t
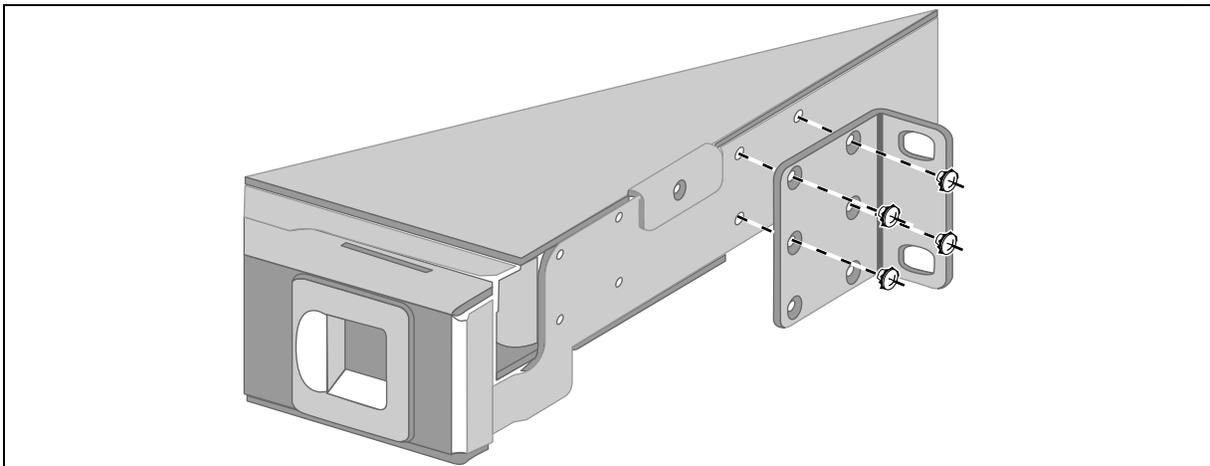
—**continued**—

Procedure 3-44 (continued)
Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)

<div style="border: 1px solid black; padding: 10px;">

ATTENTION

Drawers are shipped with mounting brackets installed for front-mounting into a 19-inch equipment rack with 1.25-inch (31.75 mm) EIA hole spacing. If you are front-mounting the drawer with the brackets already installed into a 19-inch rack, begin with step 8.

</div>

Step	Action

Mounting the brackets on the equipment drawer

1 Select your first step:

If you are	**Then** go to
front-mounting drawers with 19-inch front mounting brackets already installed	step 8
mid-mounting or front-mounting in a 19-inch or 23-inch or 535-mm rack	step 2

2 Remove the 19/23 mounting brackets installed in the front-mounting holes of the shelf.

3 Select the appropriate mounting brackets according to Table 3-11 on page 3-204.

4 Select the appropriate mounting holes to use.

See:

- Figure 3-110 on page 3-205 for front-mounting
- Figure 3-111 on page 3-205 for mid-mounting

5 Position the mounting bracket for your application as follows:

- For mid-mounting on a 19-inch rack, line up the wider face of a 19/23 bracket in the mid-mounting holes on one side of the drawer.
- For front-mounting in a 19-inch or 23-inch or 535-mm rack, line up the narrower face of a 19/23/535 bracket in the front-mounting holes on one side of the drawer.
- For mid-mounting on a 19-inch or 23-inch or 535-mm rack, line up the narrower face of a 19/23/535 bracket in the mid-mounting holes on one side of the drawer.
- For front-mounting in a 535-mm rack, line up the narrower face of a 19/23 bracket in the front-mounting holes on one side of the drawer.

—**continued**—

Procedure 3-44 (continued)
Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)

Step	Action
6	Hold the bracket in position against the side of the drawer. Insert the screws in the top and bottom holes and tighten. *Note:* See Table 3-14 on page 3-254.
7	Attach the second mounting bracket on the other side of the drawer (repeat step 5 and step 6).

Mounting the equipment drawer in the rack

8

> ⚠ **CAUTION**
> **Risk of equipment damage**
> Ensure that the drawer is adequately supported during the rack-mounting procedure.

Lift and position the drawer in the rack.

9	On one side of the drawer, insert a screw with lock washer through the top hole in the mounting bracket and into the rack rail and secure the screw.
10	On the other side of the drawer, insert one screw with lock washer through the top hole in the mounting bracket and into the rack rail and secure the screw.
11	Insert one screw with lock washer into each of the remaining holes on both sides of the drawer.
12	Tighten all the screws to secure the drawer to the rack rails. *Note:* See Table 3-14 on page 3-254.

Grounding the equipment drawer

13	Measure and cut a length of insulated ground wire to reach from the ground point on the drawer to the system ground point. See Figure 3-112 on page 3-208. *Note:* The mounting bracket on the left side of the drawer is the ground point for the drawer. The metallic grounding strip on the rack rail is the connection point for the system ground.
14	Strip 7 mm (0.25 in.) of insulation from both ends of the 10 AWG ground cable.
15	Insert each stripped end into a lug and crimp.

—continued—

Procedure 3-44 (continued)
Installing and grounding the OMX + Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF)

Step	Action
16	Remove the top screw on the mounting bracket on the left side of the drawer, where the bracket is attached to the rack.
17	Position the lug over the hole and insert the screw through the lug, the mounting bracket and into the rail.
18	Tighten the screw. ***Note:*** See Table 3-15 on page 3-255.
19	Use a screw to secure the ring lug on the other end of the ground wire to the system ground point. See Figure 3-30 on page 3-70 for an example.

—*end*—

Figure 3-112
Attaching ring lugs to the ground wire

OM1324p

Strip required amount

Crimp-type 1-hole lug
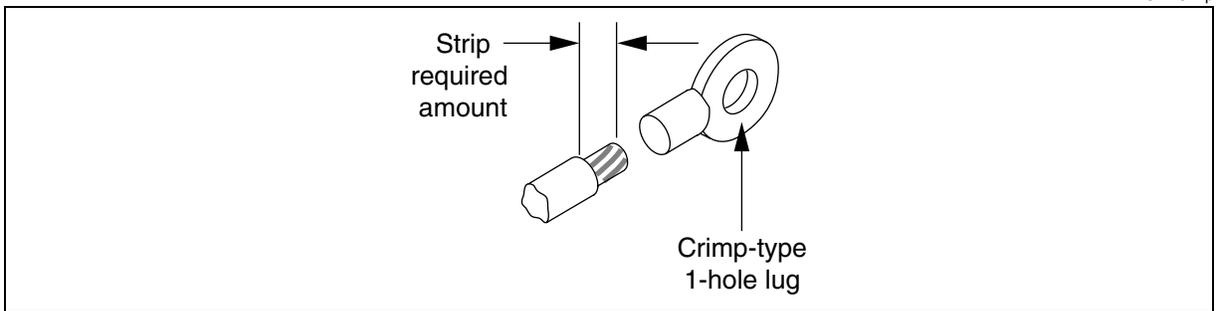
Procedure 3-45
Connecting an OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves

DANGER
Risk of personal injury
When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Scope the channel 1 connector on the OMX add port. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9. For a cross-section of: • a dirty optical fiber, see Figure 4-8 on page 4-17 • a clean optical fiber, see Figure 4-9 on page 4-17
2	Scope the fiber-optic patch cord connector. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
3	Scope the Tx port on DWDM circuit pack. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
4	Connect channel 1 on the OMX add port to the Tx port on the optical interface circuit pack. See Figure 3-113 on page 3-210.
5	Scope the channel 1 connector on the OMX drop port. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
6	Scope the fiber-optic patch cord connector. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.

—continued—

Procedure 3-45 (continued)
Connecting an OMX Shelf (NTN449ZW) to OPTera Metro 3500 shelves

Step	Action
7	Scope the Rx port on DWDM circuit pack. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
8	Connect channel 1 on the OMX drop port to the Rx port on the optical interface circuit pack.
9	Perform step 1 through step 8 for the OMX protection module.
10	Install the OMX protective cover. For instructions, see Removing and installing the OMX Shelf (NTN449ZW) protective cover on page 3-200.

—end—

Figure 3-113
Connecting OMX (NTN449ZW) to OPTera Metro 3500
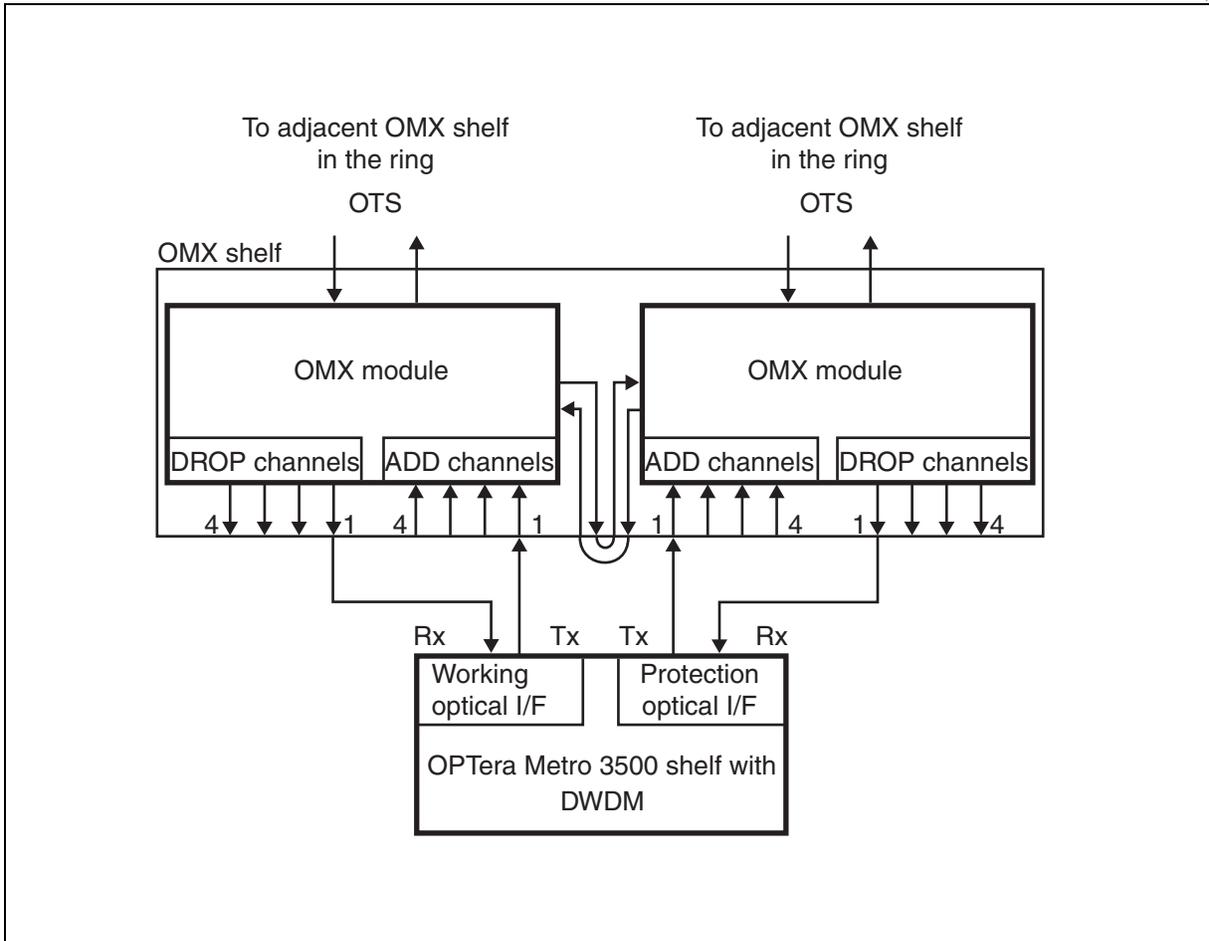
Procedure 3-46
Connecting OMX+Fiber Manager 4CH equipment drawers (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves

Use the procedure to access connectors in an OMX + Fiber Manager 4 CH equipment drawer and to establish connections to the OPTera Metro 3500 shelves.

	DANGER
	Risk of personal injury
	When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION
	Risk of affecting network reliability
	Fiber connectors should always be cleaned prior to making connections to ensure network reliability.

—continued—

Procedure 3-46 (continued)
Connecting OMX+Fiber Manager 4CH equipment drawers (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves

---

⚠ **CAUTION**
Possible risk of damage to equipment and fiber
Make sure that the bulkhead connectors are lowered and snapped into place before closing the drawer. Failure to do so could cause damage to the connector unit, the fibers attached to the connector unit, or both.

Observe the minimum bend radius of 1.18 inches (30 mm) for the patch cords. Always use the fiber management components in the drawer to route the fiber.

Allow for sufficient slack in the fibers entering and exiting the drawer. If sufficient slack is not left, the fibers can become stretched and damaged when the drawer is opened.

Step	Action
1	Open the OMX + Fiber Manager 4CH by pressing and holding the two locking latches on the drawer and pulling the drawer towards you until it is fully open.
2	Locate the connector on the OMX module needed to make the necessary connection. Lift the pull-up tab on the top of the bulkhead to access the connector.

See:

- Figure 3-114 on page 3-214
- Figure 3-115 on page 3-214

Note: In this example we are using channel 1 or (CH1) add port.

3	Scope the channel 1 (CH1) connector on the OMX add port. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.

For a cross-section of a:

- dirty optical fiber, see Figure 4-8 on page 4-17
- clean optical fiber, see Figure 4-9 on page 4-17

4	Scope the fiber-optic patch cord connector. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
5	Scope the Tx port on DWDM circuit pack. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.

Procedure 3-46 (continued)
Connecting OMX+Fiber Manager 4CH equipment drawers (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500 shelves

Step	Action
6	Connect channel 1 (CH1) on the OMX add port to the Tx port on the optical interface circuit pack. See Figure 3-116 on page 3-215.
7	Lower the connector by pushing down on the tab at the top of the unit, until the bulkhead snaps into place.
8	Locate the connector on the OMX module needed to make the necessary connection. In this case (CH1) drop port. Lift the pull-up tab on the top of the bulkhead to access the connector. See: • Figure 3-114 on page 3-214 • Figure 3-115 on page 3-214
9	Scope the channel 1 (CH1) connector on the OMX drop port. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
10	Scope the fiber-optic patch cord connector. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
11	Scope the Rx port on DWDM circuit pack. Clean if necessary, and scope again. See Cleaning optical connectors and adapters on patch cords on page 4-9.
12	Connect channel 1 (CH1) on the OMX drop port to the Rx port on the optical interface circuit pack. Figure 3-116 on page 3-215.
13	Route the slack fiber around the fiber management components in the drawer.
14	Use curly ties or Velcro straps to bundle the fibers where they enter the drawer.
15	Make sure that you have lowered all the bulkheads and that the fibers are routed correctly around the fiber management components.
16	Perform step 2 through step 15 for the OMX protection module.
17	To close the drawer, press and hold the locking tabs on the drawer while you slide the drawer into the shelf. The locking tabs click into position when the drawer is in place.

—**end**—

Figure 3-114
OMX + Fiber Manager 4CH-connectors

OM0700t

B O T	BAND DROP	OTS OUT	THRU OUT	CH 1 DROP	CH 2 DROP	CH 3 DROP	CH 4 DROP
T O P	BAND ADD	OTS IN	THRU IN	CH 1 ADD	CH 2 ADD	CH 3 ADD	CH 4 ADD

T O P	BAND TX	OTS IN	THRU IN	CH 1 ADD	CH 2 ADD	CH 3 ADD	CH 4 ADD
B O T	BAND RX	OTS OUT	THRU OUT	CH 1 DROP	CH 2 DROP	CH 3 DROP	CH 4 DROP
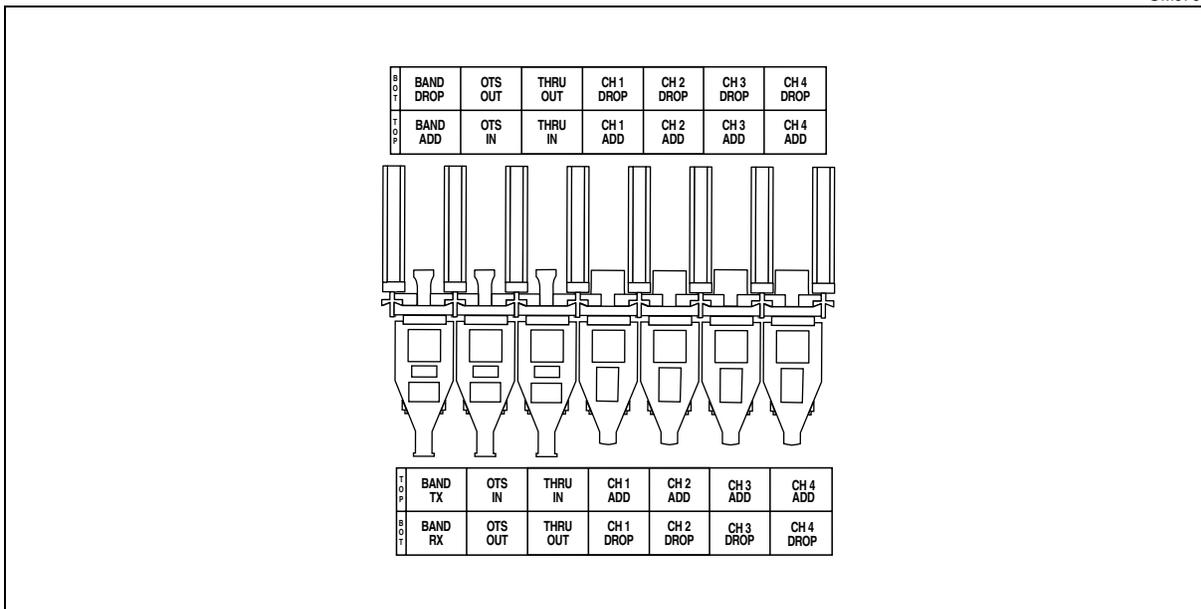
Figure 3-115
OMX + Fiber Manager 4CH-connector bulkheads

OM0325p

TX
RX
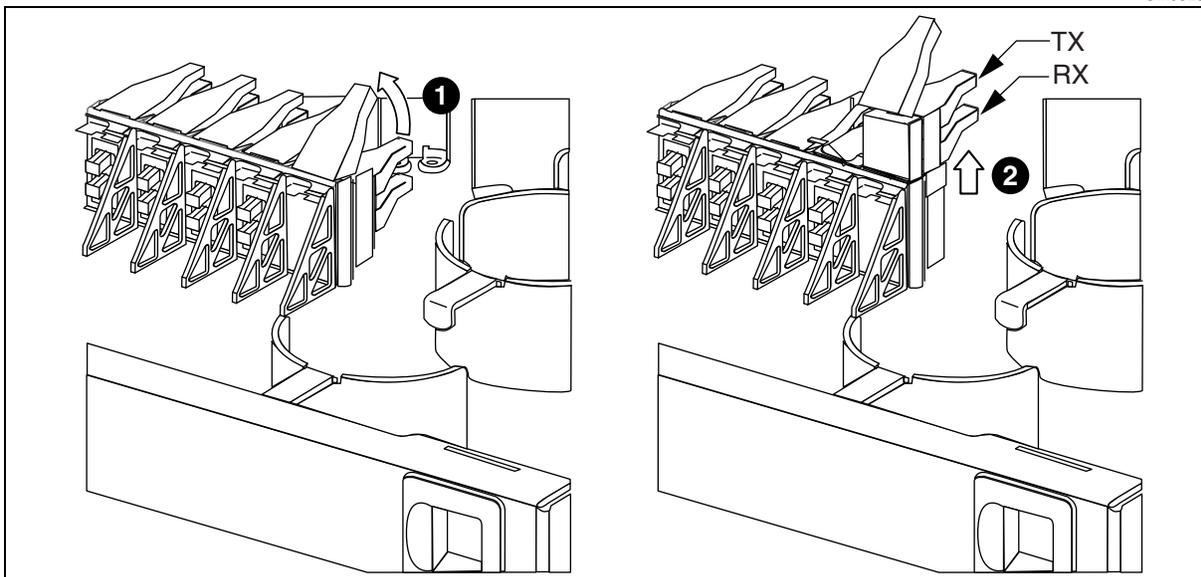
Figure 3-116
Connecting an OMX+Fiber Manager 4CH equipment drawer (NT0H32AE-HE, NT0H32AF-HF) to OPTera Metro 3500

EX1416
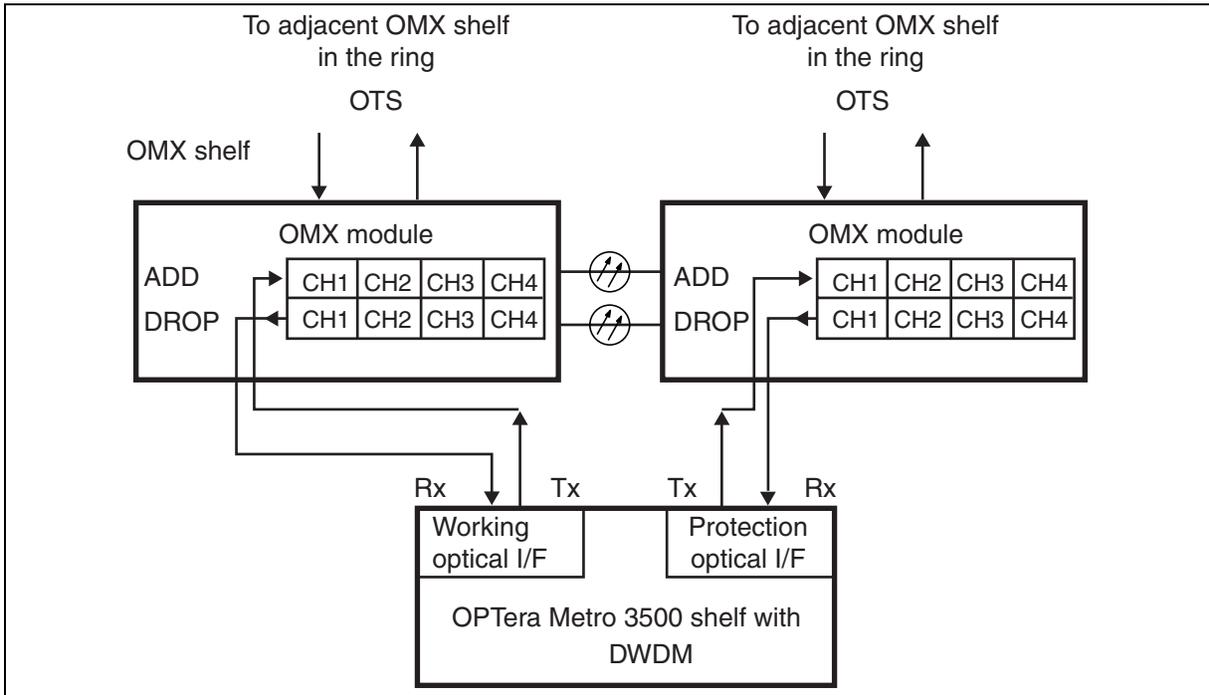
Procedure 3-47
Inspecting the DS1 service module shipping container

The DS1 service module (DSM) is shipped preassembled in a single container. The two circuit packs (DSM DS1x84 termination module) are inserted in their correct slots.

Step	Action
1	Perform a visual inspection of the containers for any sign of damage that can occur during shipment.
2	Remove the contents of the shipping container.
3	Verify the DSM container contents. See Figure 3-117 on page 3-217.
4	Verify that the ground cable and all of the modules required for this shelf are present.

—**end**—

Figure 3-117
DS1 service module - shipping container contents

EX0959p

DSM fan module

LEDs

OAM adapter module

DS1 connector with protective cap

DSM DS1x84 termination module in slot 2

DSM DS1x84 termination module in slot 1

Fiber storage

Front cover

Optical connector applicator

Front cover attaching screws

Note: The DSM fiber storage tray capacity is 45 ft.
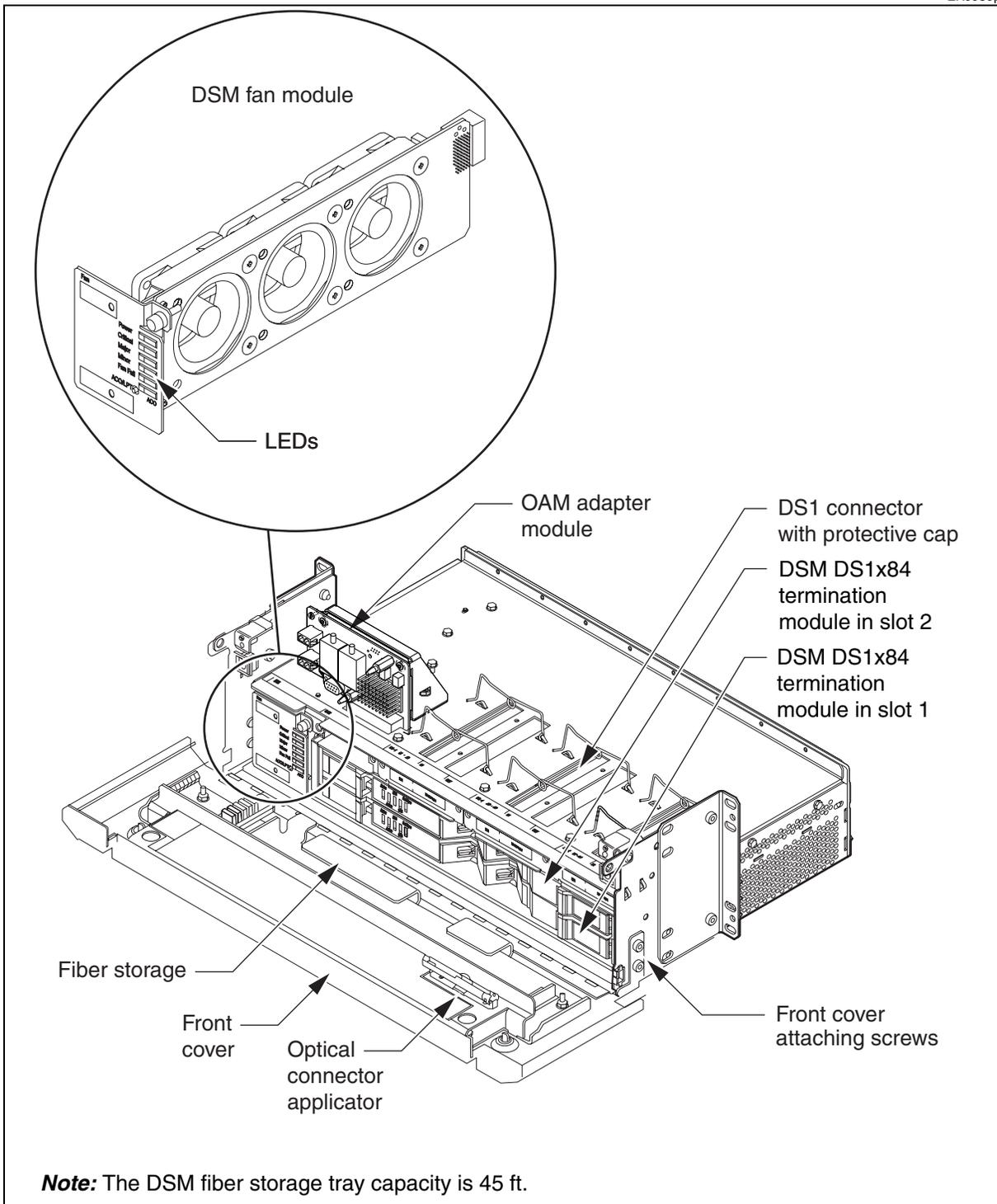
Procedure 3-48
Installing the DS1 service module (DSM) shelf

The DS1 service module (DSM) shelf needs to be installed but requires no assembling operation. The DSM shelf is connected to the OPTera Metro 3500 through the OC-3 line and can be located at the fiber-optic cable reach within the same site. The OPTera Metro 3500 supports up to eight DSMs. The DSM can be installed in the equipment frame with the OPTera Metro 3500 shelf, or in a separate bay.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   Determine if you are installing the DSM in the OPTera Metro 3500 equipment frame or in a separate bay.

> *Note:* The minimum required clearance below a DSM is 1.75 in. The distance from the front of the DSM to the front edge of the frame base plate is 4.97 in. The DSM is flush with the rear edge of the frame base plate.

2   Install the DSM.

If you are mounting the DSM in a	**Then** go to
19-in. bay frame	step 3
23-in. open bay frame	step 4

> *Note:* The DSM shelf is shipped with the mounting brackets configured for a 23-in. bay frame.

3   Detach the brackets from the DSM. Attach the long side of each mounting bracket to the side of the DSM.

> *Note:* Use a torque wrench to verify that torque has been applied correctly: 27 in-lbs (or 311 g-m) for installation and 20 in-lbs (or 230 g-m) for inspection.

4   Carefully open the front cover of the DSM.

—continued—

Procedure 3-48 (continued)
Installing the DS1 service module (DSM) shelf

Step	Action
	Note: This procedure is valid for all supported 19-in. and 23-in. bay frames. For a list and top view of all valid (open) bay frame mounting arrangements see Figure 3-29 on page 3-68.
5	Mount the DSM on the bay frame using the alignment studs and four #12-24 self-tapping screws.

6

> ⚠ **CAUTION**
> **Risk of dropping the equipment**
> To prevent the shelf from tipping and falling, you must install the stud in the holes that matches the bottom holes of the shelf.

Insert the alignment studs in the equipment frame, in the holes that match the top holes of the shelf.

7   Hang the shelf from the alignment studs.

8   Insert and tighten the shelf screws in the bottom hole of each bracket.

Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

9   Remove the alignment studs.

10

> ⚠ **CAUTION**
> **Risk of improper ground due to poor contact with a painted frame**
> If the frame is painted, follow your companies procedures to remove the paint from the area where the bolt will be fastened. Ensure the bolt washer makes direct contact with the frame.

Insert and tighten the shelf screws in the same hole that the alignment studs were in.

Note: Use a torque wrench to verify that torque has been applied correctly: 50 in-lbs (576 g-m) for installation and 40 in-lbs (460 g-m) for inspection.

11   Connect the DSM ground cable. See Figure 3-119 on page 3-222.

12   Connect the DSM I/O connectors. See Connecting T1 cables to the DS1 service module on page 3-241.

13   Connect the DSM power cable. See Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 5 or earlier) on page 3-226.

14   Install the DSM DS1x84 termination module. See Inserting or removing a DSM DS1x84 termination module on page 3-243.

—**continued**—

Procedure 3-48 (continued)
Installing the DS1 service module (DSM) shelf

Step	Action
15	Connect the DSM DS1x84 termination module to OPTera Metro 3500. See Connecting the DS1 service module to OPTera Metro 3500 on page 3-246.
	Note: On the left and right side of the DSM, ensure that cables do not block the ventilation.
16	Repeat step 1 through step 15 for all DSMs.
17	Close the front cover.

<div align="center">—end—</div>

Figure 3-118
DSM shelf

EX0958p
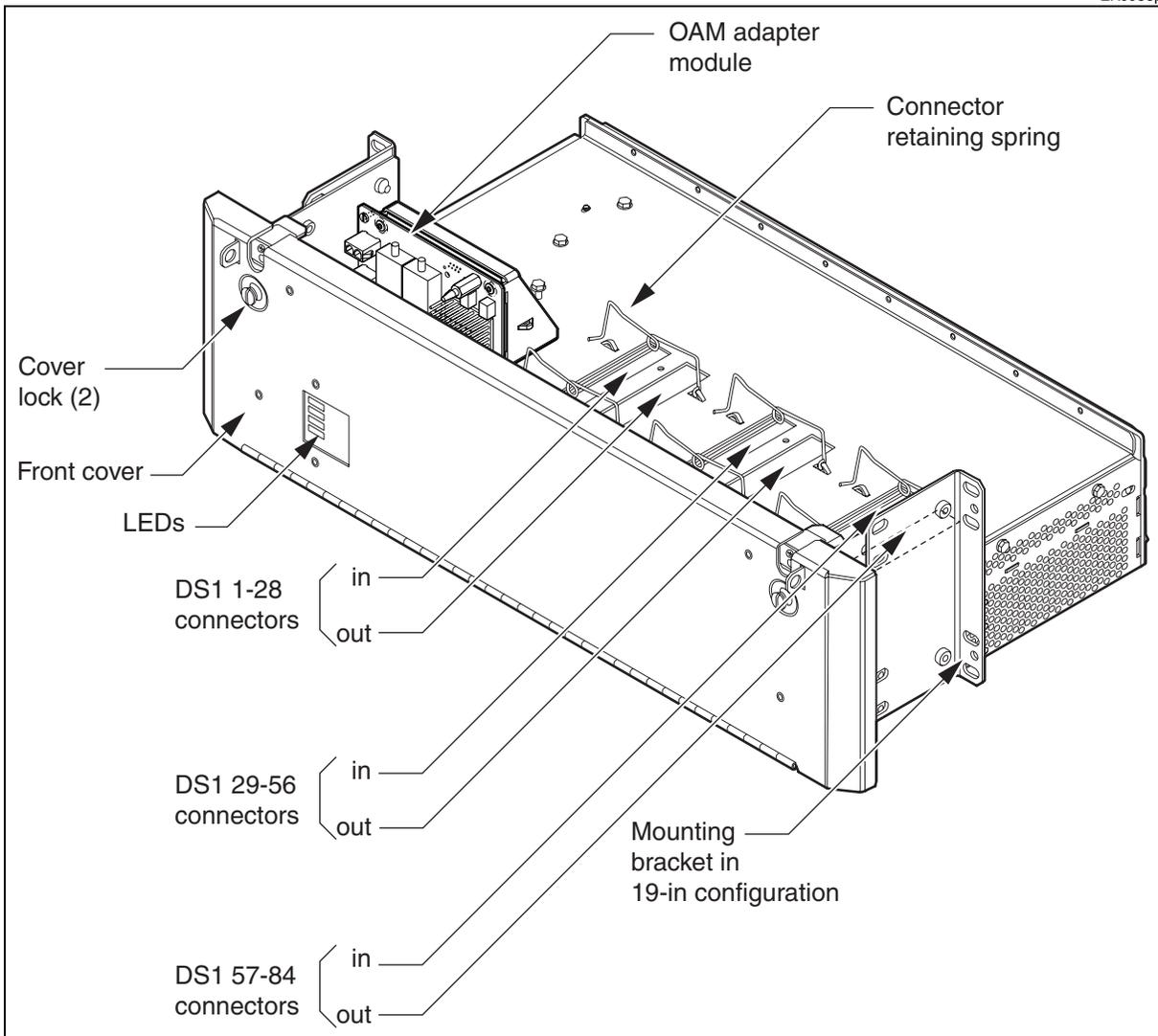
Figure 3-119
Installing the DSM shelf

EX0962p

Grounding
cable
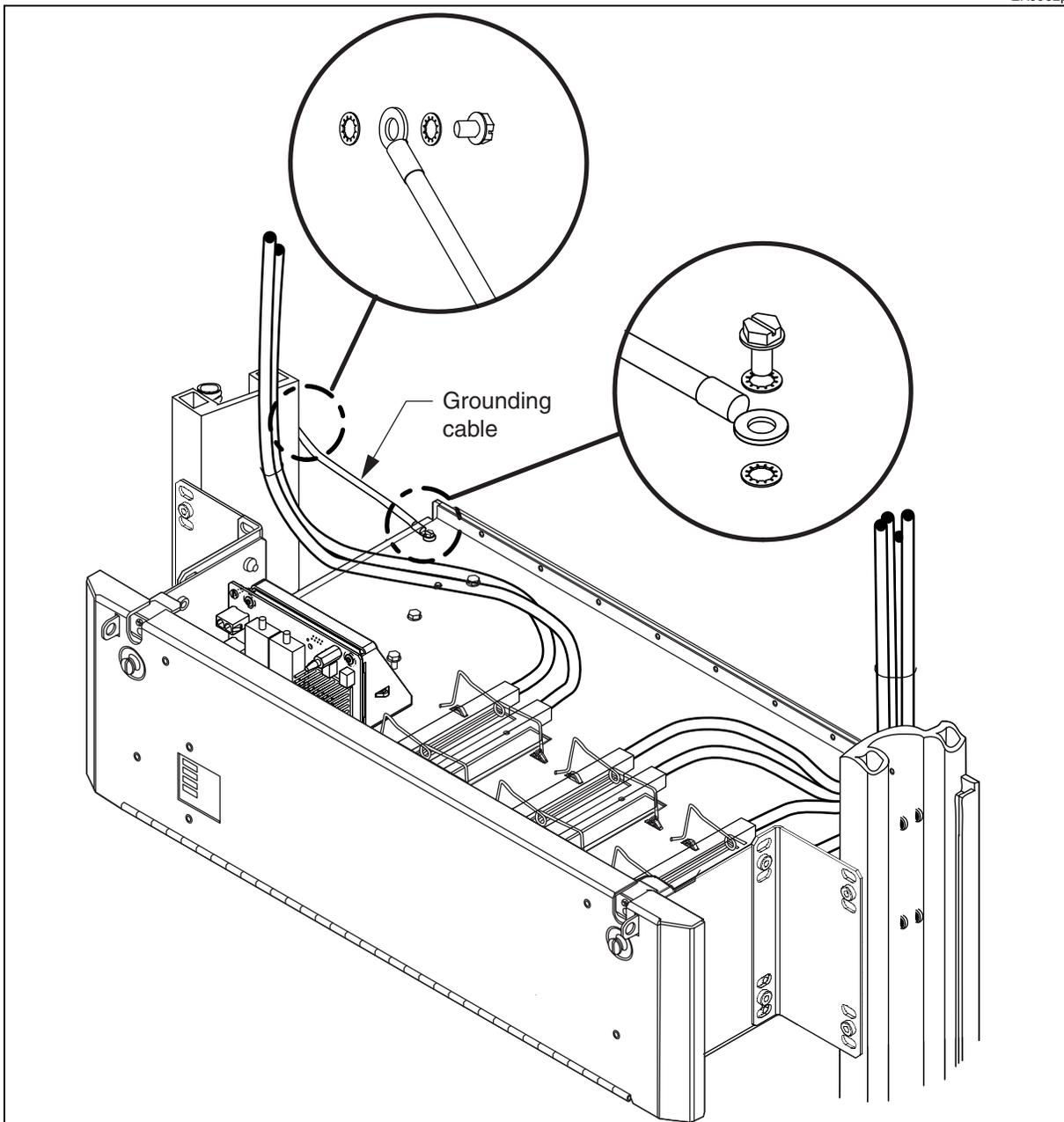
Figure 3-120
DSM OAM adapter module (Hardware Release 5) with cover off

EX0969p

Power terminal block

Power A

A- (-48V) red
A+(return) white
with red trace

B- (-48V) red
with blue trace
B+ (return) white
with blue trace

Power B

A-
A+
B-
B+

Power A breaker

Power B breaker

LUI RS-232 connector

Alarm connectors

Note: The local user interface (LUI) is an RS-232c port with D-type nine pin connector.
The LUI is used for retrieving messages when performing low-level trouble shooting on the DSM.
Used to access the active DS1x84 TM circuit pack, it provides remote login to the host in the
case of an OAM fail.

Figure 3-121
DSM OAM adapter module (Hardware Release 6) with cover off

EX1434p

Note: The local user interface (LUI) is an RS-232c port with D-type nine pin connector. The LUI is used for retrieving messages when performing low-level trouble shooting on the DSM. Used to access the active DS1x84 TM circuit pack, it provides remote login to the host in the case of an OAM fail.
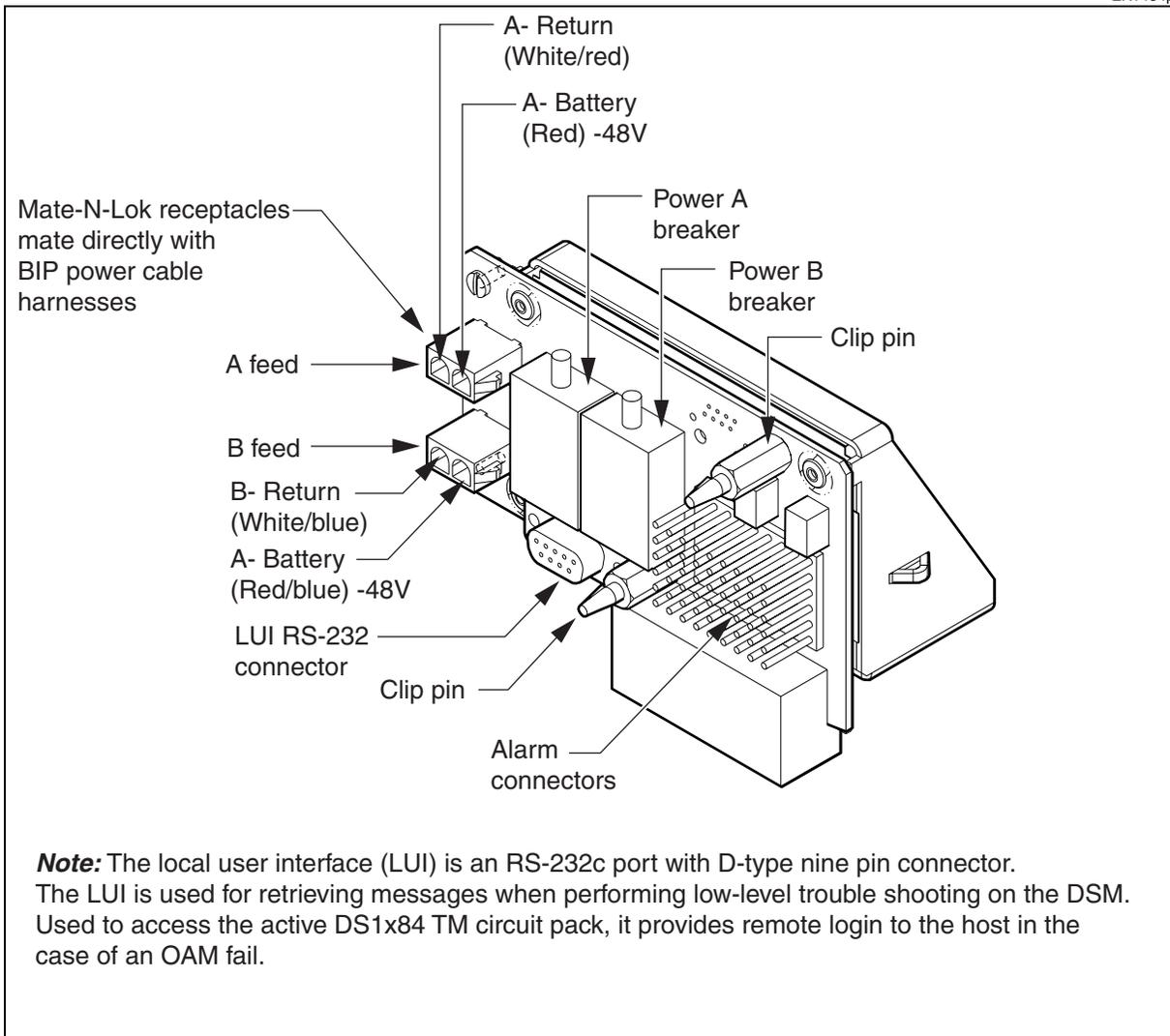
Procedure 3-49
Installing and removing the DS1 service module front cover

	CAUTION
	Risk of equipment damage Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

Removing the DS1 service module front cover

1   Open the DS1 service module (DSM) front cover.

2   Loosen the two screws attaching the front cover to each side of the DSM. See Figure 3-118 on page 3-221.

3   Carefully open the front cover.

You have completed the DSM front cover removal.

Installing the DS1 service module front cover

4   Position the front cover to the DSM.

5   Adjust the front cover attaching brackets to the holes on the DSM left and right lower sides.

6   Insert and tighten the two screws attaching the front cover to each side of the DSM. See Figure 3-118 on page 3-221.

7   Close the DSM front cover.

—**end**—

Procedure 3-50
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 5 or earlier)

Requirements

To perform this procedure, you must:

- ensure that the fixed wiring includes a quickly accessible disconnect device

- ensure the DSM OAM adapter module is Hardware Release 5 or earlier

   Note: Power cabling (NTN458MS, MU, ZB, ZC, or ZD) from the BIP to the DS1 service module (DSM) is not included in the shipping container when you order a DSM shelf (NTN407MA). You must order this cable separately. This power cable corresponds to the long segment in Figure 3-122 on page 3-229.

For EMC purposes, place a ferrite on the DSM power cable. See Figure 3-123 on page 3-230.

DANGER
Risk of electrocution
Working with live circuits is dangerous. Before you continue, ensure that the shelf power is turned off at the power distribution panel and cannot be turned on by accident. Use a multimeter to verify that no potential exists.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

Connecting power to the DSM

1   Turn off the circuit breaker at the power distribution panel or BIP for the A and B feeds.

2   Each of the A and B power cables provided with the DSM is divided into two segments of different sizes. See Figure 3-122 on page 3-229.

—continued—

Procedure 3-50 (continued)
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 5 or earlier)

Step	Action
3	Connect the non-terminated end of the short segment cable A to the power terminal block on the DSM OAM module. See: • Figure 3-120 on page 3-223 • Figure 3-124 on page 3-236
4	Connect the long segment to the output connector on the BIP. See Figure 3-17 on page 3-44.
5	Turn on the circuit breaker at the power distribution panel or BIP for the A feed.
6	Using a digital voltmeter (DVM), measure the voltage at the long segment cable connector pins in reference to the ground. • The red cable and the red/blue cable must respectively indicate -48 V dc and must connect to the -48 V dc terminal at the OAM adapter module. If the red cable and red/blue cable connect in the order given to the Return terminals at the OAM adapter module, then the cables are not assembled properly and must be replaced. • The white/red cable and the white/blue cable must indicate 0 V dc and must connect to the Return terminals at the OAM adapter module. If the power cable is assembled properly and the voltages at the connector pins are reversed, verify the cable connection at the bay power distribution. *Note:* If the values indicated by the DVM are incorrect, then the cables are wired incorrectly. Verify that the power cables are terminated correctly at the power distribution panel or BIP. If the power cables are terminated properly at the power distribution panel or BIP, you must replace the power cable.
7	Turn off the circuit breaker at the power distribution panel or BIP for the A feed.
8	Connect the long segment to the short segment.
9	Turn on the circuit breaker at the power distribution panel or BIP for the A feed.
10	Using a digital voltmeter (DVM), measure the voltage at the power A terminal on the OAM adapter module, in reference to the ground. • The red cable and the red/blue cable must respectively indicate -48 V dc and must connect to the -48 V dc terminal at the OAM adapter module. If the red cable and red/blue cable connect in the order given to the Return terminals at the OAM adapter module, then the cables are not assembled properly and must be replaced. • The white/red cable and the white/blue cable must indicate 0 V dc and must connect to the Return terminals at the OAM adapter module. If the power cable is assembled properly and the voltages at the connector pins are reversed, verify the cable connection at the bay power distribution.

—**continued**—

Procedure 3-50 (continued)
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 5 or earlier)

Step	Action
11	Turn off the circuit breaker at the power distribution panel or BIP for the A feed.
12	Repeat step 3 through step 11 for power B.

Running the power cables along the bay frame

13	Run the power cables along the equipment frame. See Figure 3-88 on page 3-162.

Testing the DSM power levels

14	On the OAM adapter module, switch circuit breaker A and circuit breaker B to off. See Figure 3-120 on page 3-223.
15	Turn off power B on the BIP.
16	Turn on power A on the BIP.
17	On the OAM adapter module, switch the circuit breaker A to on.
18	Ensure the green power LED at the front of the DS1 service module is on.
19	Turn off power A on the BIP.
20	Turn on power B on the BIP.
21	On the OAM adapter module, switch circuit breaker A to off.
22	On the OAM adapter module, switch circuit breaker B to on.
23	Ensure the green power LED at the front of the DS1 service module is on.

Resetting the BIP baseline

24	When you have completed connecting power to the bay configuration of DSM shelves from the BIP (NTN458RA), push the Reset button on the BIP's front face plate.

—*end*—

Figure 3-122
DSM adapter cable (required only for DSM OAM HW Rel 5 or earlier)

EX0961p

to BIP power A

to BIP power B

BIP cable

A- (-48V) red
A+(return) white with red trace

Power module A power connector

A

B

Power module B power connector

B- (-48V) red with blue trace
B+ (return) white with blue trace

DSM adapter cable (the DSM adapter cable is supplied with the DSM)

A-
A+
B-
B+

To OAM adapter module
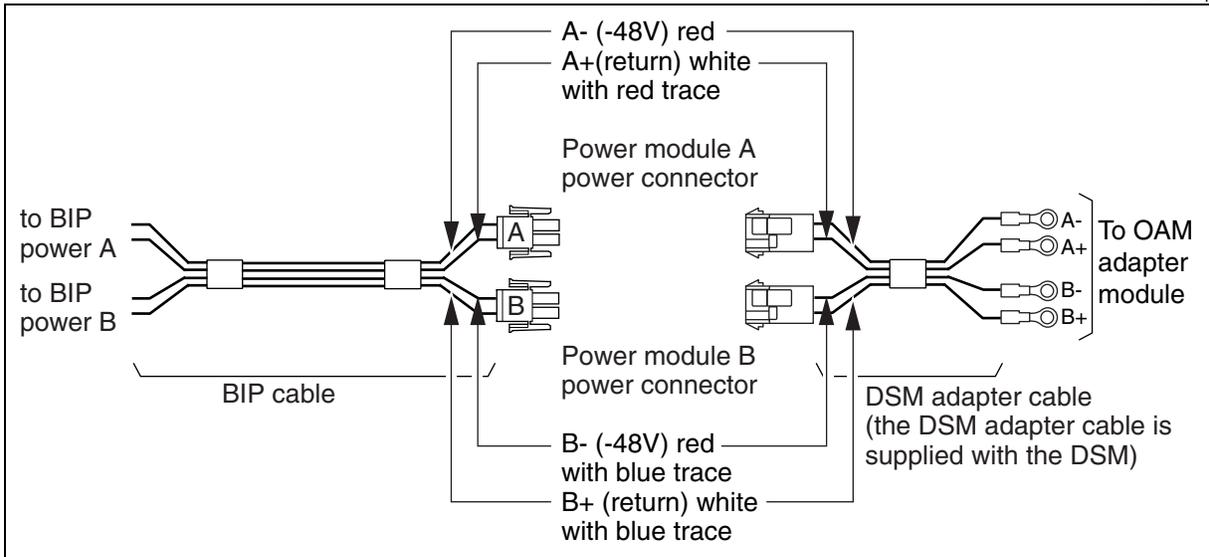
Figure 3-123
Placing the ferrite on the DS1 service module power cable

Note 1: Place the ferrite (CPC A0376837) on the external power DC cable.
Distance from A1/B1 connectors should not be more than 1 foot.
Note 2: Secure two tie wraps on both sides of the ferrite to prevent it from sliding.
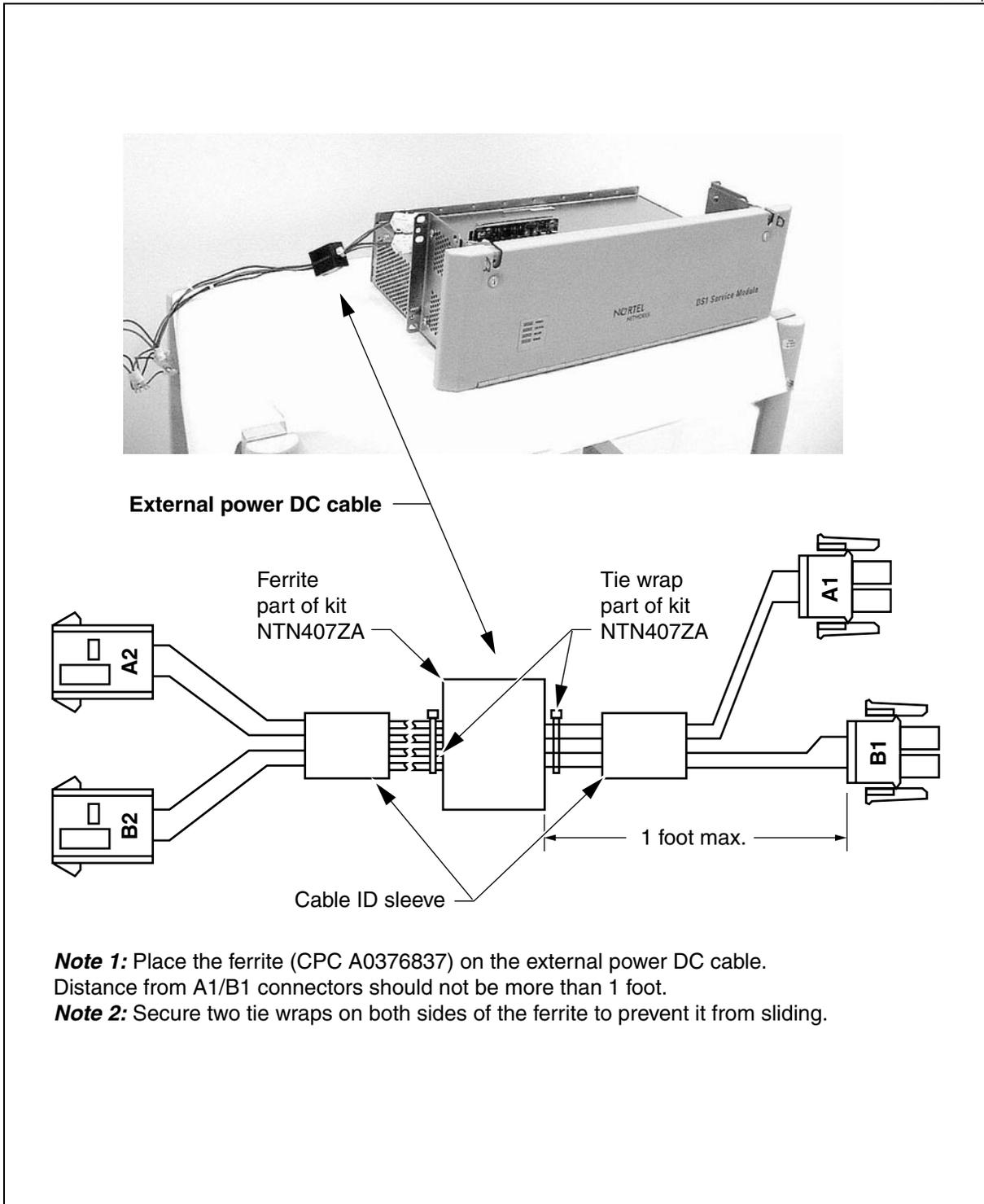
Procedure 3-51
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 6 or later)

Requirements

To perform this procedure, you must:

- ensure that the fixed wiring includes a quickly accessible disconnect device

- ensure the DSM OAM adapter module is Hardware Release 6 or later

    Note: Power cabling (NTN458MS, MU, ZB, ZC, or ZD) from the BIP to the DS1 service module (DSM), is not included in the shipping container when you order a DSM shelf (NTN407MA). You must order this cable separately.

For EMC purposes, place a ferrite on the DS1 service module power cable. See Figure 3-123 on page 3-230.

DANGER
Risk of electrocution
Working with live circuits is dangerous. Before you continue, ensure that the DSM shelf power is turned off at the power distribution panel and cannot be turned on by accident. Use a multimeter to verify that no potential exists.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

Procedure 3-51 (continued)
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 6 or later)

Step	Action

Connecting power to the DS1 service module

1   Turn off the circuit breaker at the power distribution panel or BIP for the A and B feeds.

2   Connect one end of the power cable to the output connector on the power distribution panel or BIP.

         See:

- Figure 3-61 on page 3-98
- Figure 3-17 on page 3-44

3   Turn on the circuit breaker at the power distribution panel or BIP for the "A" feed.

4   Using a digital volt meter (DVM), measure the voltage at the power connector pins in reference to ground.

- At the Mate-N-Lok connector for the DSM shelf, the "A" power feed cable (red cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.
- At the Mate-N-Lok connector for the DSM shelf, the "A" battery return cable (white/red cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.
- Turn off the circuit breaker at the power distribution panel or BIP for the "A" feed.

         Note: If the values indicated by the DVM are not correct, then the cables are wired incorrectly. Verify that the power cables are terminated correctly at the power distribution panel or BIP. If the power cables are terminated properly at the power distribution panel or BIP, you must replace the power cable.

5   Turn on the circuit breaker at the power distribution panel or BIP for the "B" feed. Using a DVM, measure the voltage at the power connector pins in reference to ground.

- At the Mate-N-Lok connector for the DSM shelf, the "B" power feed cable (red cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.
- At the Mate-N-Lok connector for the DSM shelf, the "B" battery return cable (white/red cable) must indicate 0 V dc. See Figure 3-61 on page 3-98.
- Turn off the circuit breaker at the power distribution panel or BIP for the "B" feed.

         Note: If the values indicated by the DVM are not correct, then the cables are wired incorrectly. Verify that the power cables are terminated correctly at the power distribution panel or BIP. If the power cables are terminated properly at the power distribution panel or BIP, you must replace the power cable.

Procedure 3-51 (continued)
Connecting power cables to the DSM shelf (DSM OAM Hardware Rel 6 or later)

Step	Action
6	Plug the "A" power cable into the "A" Mate-N-Lok power receptacle on the DSM OAM adapter module. See Figure 3-121 on page 3-224.
7	Plug the "B" power cable into the "B" Mate-N-Lok power receptacle on the DSM OAM adapter module.

Testing the power

8	On the DSM OAM adapter module, switch circuit breakers "A" and "B" to 'OFF'.
9	Turn off power "B" on the power distribution panel or BIP.
10	Turn on power "A" on the power distribution panel or BIP.
11	On the DSM OAM adapter module, switch circuit breaker "A" to 'ON'.
12	Ensure the green power LED at the front of the DSM shelf is lit.
13	Turn off power "A" on the power distribution panel or BIP.
14	Turn on power "B" on the power distribution panel or BIP.
15	On the DSM OAM adapter module, switch circuit breaker "A" to 'OFF'.
16	On the DSM OAM adapter module, switch circuit breaker "B" to 'ON'.
17	Ensure the green power LED at the front of the DSM shelf is lit.

Resetting the BIP baseline

18	When you have completed connecting power to the bay configuration of DSM shelves from the BIP (NTN458RA), push the Reset button on the BIP's front face plate.

—**end**—

Procedure 3-52
Connecting alarm control and communication cables to the DS1 service module

Use this procedure to connect the following cables to the DS1 service module:

- environmental input/output (I/O)
- OAM alarms
- RS-232

For cable and connector specifications, see Cable and connector details on page 5-1.

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step   Action

---

1   Verify the compatibility of DS1 service module alarm and environmental I/O interfaces.

See:

- Figure 3-125 on page 3-237 for environmental inputs
- Figure 3-126 on page 3-238 for environmental outputs
- Figure 3-127 on page 3-239 for alarm relays

Note 1: Figure 3-125 on page 3-237 is an example of a circuit of environmental input connections using a relay interface. Environmental inputs are active low. To drive one of the inputs low, the control circuit must short it to one of the Environmental ground pins. You can use one ground pin for up to three inputs.

Note 2: Figure 3-126 on page 3-238 is an example of a circuit of environmental output connections. Each environmental output pin, connects to a normally open (NO) relay contact on the LOAM. Connect the common contacts on the output relays to the common return (RET) pins.

—**continued**—

Procedure 3-52 (continued)
Connecting alarm control and communication cables to the DS1 service module

Step	Action

Note 3: Figure 3-127 on page 3-239 is an example circuit of shelf alarm relays. The OAM alarm pins connect to relays under the control of the shelf processor. When the shelf processor activates an alarm relay, the normally open line connects to the common line and the normally closed (NC) line disconnects from the common line. The NC, NO, and common lines for each shelf alarm relay are isolated from each other, the shelf ground, and the shelf battery return.

2   On the OAM adapter module, wire wrap the following pins as required.

See:

- environmental alarms. See Figure 3-128 on page 3-240.

- grounding. See Table 2-4 on page 2-7.

- environmental I/O

- OAM alarms

3   On the OAM adapter module, connect the following cables (if present):

- intershelf LAN to connectors ILAN.

- RS-232 to RS-232 connector

See:

- Figure 3-120 on page 3-223

- Figure 3-124 on page 3-236

4   Route the alarm control and communication cables along the equipment frame.

—end—

Figure 3-124
Connecting power, control, and communication cables to the DS1 service module

EX1236p
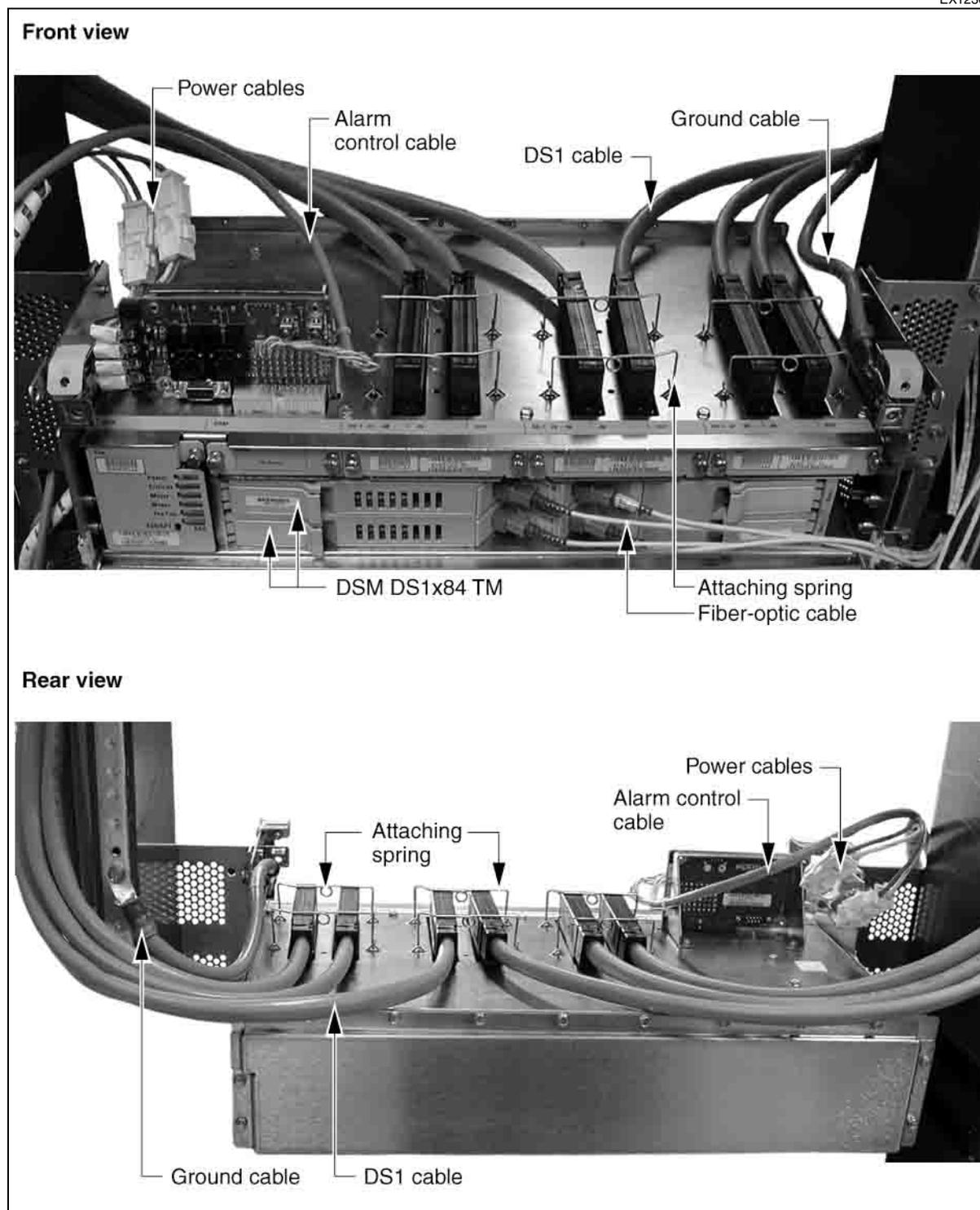
Figure 3-125
Environmental input connections (DS1 service module)

See for the DSM environmental alarm pinout.

EX1209p

Environmental input pins (see note 3)
1-1, 2-1, 3-1, 4-1, 5-1, 6-1, 7-1, 8-1
1-2, 2-2, 3-2, 4-2, 5-2, 6-2, 7-2, 8-2

Environmental Input

Environmental ground (logic ground) 9-1, 9-2

NO   NC

Common

Relay

Twisted wire pair connects the OAM adapter module environmental I/O pins to the relay.

Environmental sensing and relay control circuits

OAM adapter module

DS1 service module

Note 1: The environmental input grounds must not have a direct connection to any other office ground.
Note 2: All of the environmental input grounds are shorted together on the OAM adapter module.
Note 3: See OAM interface matrix pinout for pins assignment.

Figure 3-126
Environmental output connections (DS1 service module)

See Figure 3-128 on page 3-240 for the DSM environmental alarm pinout.

EX1210p

Note: See OAM interface matrix pinout for pins assignment.
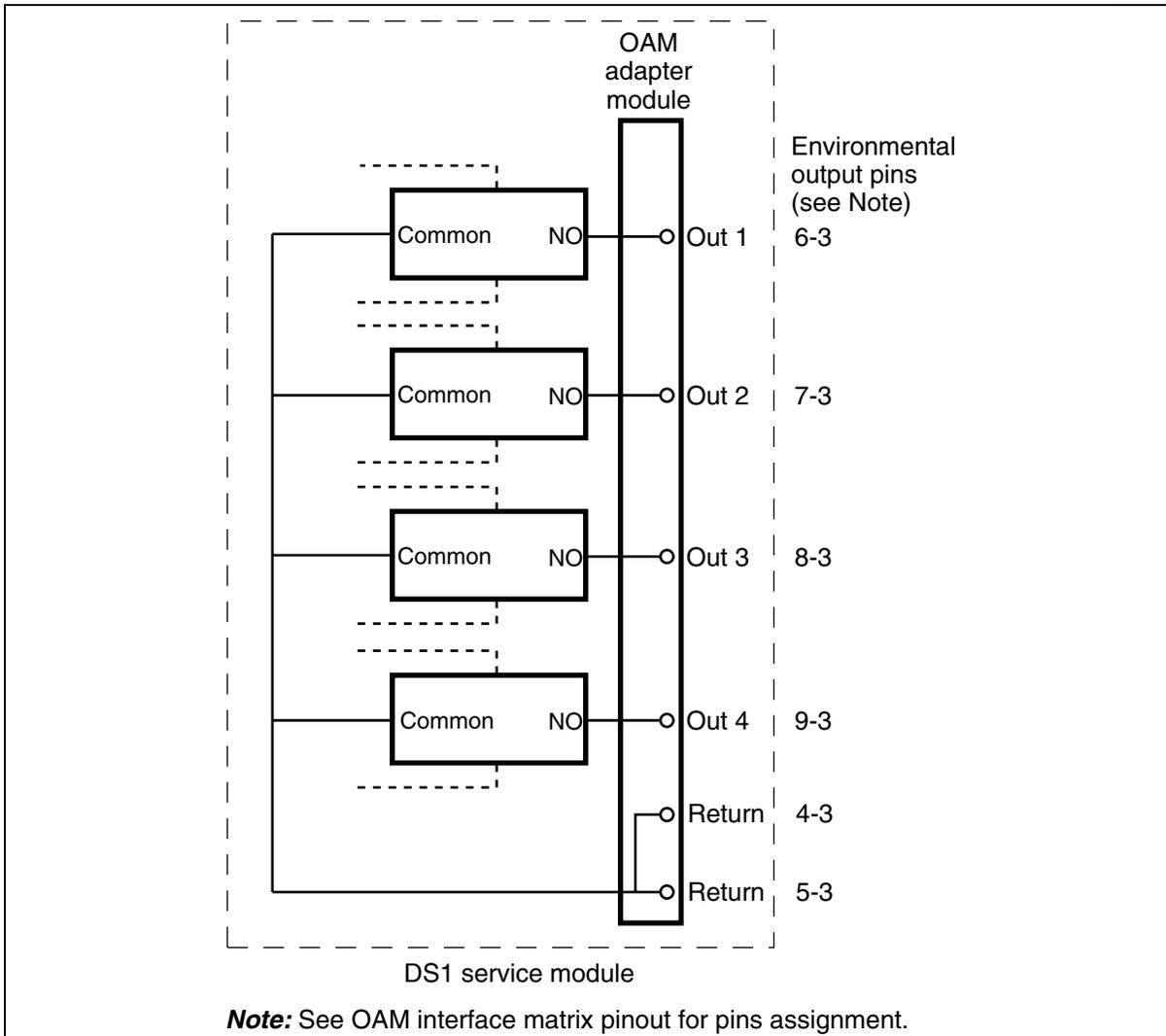
Figure 3-127
OAM alarm relays (DS1 service module)

See for the DSM environmental alarm pinout.

EX1211p

OAM
adapter
module

Relay

Common

NC — normally closed pin ⎫
NO — normally open pin ⎬ See Note 1

common pin

Common pins
(see note 2)
1-5, 2-5, 3-5
5-5, 6-5, 7-5

DS1 service module

Note 1: See OAM interface matrix pinout for Visual
and Audible (Critical/MJ/MN) assignment.
Note 2: See OAM interface matrix pinout for pins assignment.

Figure 3-128
DSM OAM adapter module - environmental alarm pinout

EX1133p

Legend

N.O. = Normally Open
N.C. = Normally Closed

Wirewrap matrix pinout

#	1	2	3	4	5	6	7	8	9
1	ENVIN1	ENVIN2	ENVIN3	ENVIN4	ENVIN5	ENVIN6	ENVIN7	ENVIN8	GND
2	ENVIN9	ENVIN10	ENVIN11	ENVIN12	ENVIN13	ENVIN14	ENVIN15	ENVIN16	GND
3	GND	GND	GND	ENVOUT-RET	ENVOUT-RET	ENVOU1	ENVOU2	ENVOU3	ENVOU4
4	AUD CR N.O.	AUD MJ N.O.	AUD MN N.O.	AUD spare N.O.	VIS CR N.O.	VIS MJ N.O.	VIS MN N.O.	VIS spare N.O.	BRET A
5	AUD CR COM	AUD MJ COM	AUD MN COM	AUD spare COM	VIS CR COM	VIS MJ COM	VIS MN COM	VIS spare COM	BRET B
6	AUD CR N.C.	AUD MJ N.C.	AUD MN N.C.	AUD spare N.C.	VIS CR N.C.	VIS MJ N.C.	VIS MN N.C.	VIS spare N.C.	ACO

Procedure 3-53
Connecting T1 cables to the DS1 service module

The DS1 service module has three DS1 connector units. Each unit has two connectors (DS1 IN and DS1 Out) and supports 28 DS1 facilities.

Table 3-12
DS1 facility and corresponding I/O connector

DS1 I/O connector	DS1 facilities
DS1 1-28	1 to 28
DS1 29-56	29 to 56
DS1 57-84	57 to 84

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action

1   At the top of the DS1 service module, remove the protective cap from the DS1 1-28 IN and Out connectors. See Figure 3-118 on page 3-221.

2   Rotate the connector retaining springs to the side. See Figure 3-118 on page 3-221.

3   Connect the 1-28 IN and Out T1 cable connectors to the DS1 service module. See Figure 3-124 on page 3-236.

4   Rotate the attaching spring toward the top to maintain the connectors in position.

5   Repeat step 1 through step 4 for DS1 29-56 and DS1 57-84 connectors.

—end—

Procedure 3-54
Routing T1 cables to/from the DS1 service module

After you connect the DS1 cables to their correct I/O connectors at the top of the DS1 service module, use this procedure to route the cables from the DS1 service module to the equipment frame.

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Route three T1 cables to the left (DS1 1-28 IN, DS1 1-28 OUT, and DS1 29-56 IN) along the frame, inside the bay trail. Use a tie-wrap to attach the three T1 cables together and to the frame. See Figure 3-124 on page 3-236.
2	Route three cables to the to the right (DS1 29-56 OUT, DS1 57-84 IN, and DS1 57-84 OUT) along the frame, inside the bay trail. Use a tie-wrap to attach the three T1 cables together and to the frame. See Figure 3-124 on page 3-236.

—end—

Procedure 3-55
Inserting or removing a DSM DS1x84 termination module

The DS1 service module is shipped with DSM DS1x84 termination modules (DSM DS1x84 TM) in slots 1 and 2. A DSM DS1x84 TM in slot 2 is optional and works as protection for the DSM DS1x84 TM in slot 1. Use this procedure to remove a DSM DS1x84 TM from slot 2, or reinsert it as required.

Note 1: When the inventory is retrieved for a DSM shelf containing a connected, but unprotected DS1 termination module in slot 1 and an unconnected DS1 termination module in slot 2, complete inventory details are displayed for the DS1 termination module in slot 1. Only the serial number is displayed for the DS1 termination module in slot 2.

Note 2: When the DSM DS1x84TM circuit packs are inserted, the circuit packs start an automatic upgrade. The upgrade of both DSM DS1x84TM circuit packs requires approximately 20 minutes.

Requirements

You must ensure you have a DSM DS1x84 TM in the DS1 service module slot 1.

When installing the DSM DS1x84 TM, assign slots from bottom to top, beginning with the working DSM DS1x84 TM in slot 1, the bottom slot.

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	CAUTION
	Risk of circuit pack damage
	Do not force any circuit pack all the way to the back of its slot if it resists insertion. Before you install any of the circuit packs, make sure you understand the detailed procedure for insertion of circuit packs.

	CAUTION
	Risk of false failure being reported
	You must connect the DS1 I/O cables to the DS1 service module before you insert the DSM DS1x84 termination module in slot 1.

—continued—

Procedure 3-55 (continued)
Inserting or removing a DSM DS1x84 termination module

> ⚠ **CAUTION**
> **Risk of incorrect installation**
> Make sure that the DSM DS1x84 termination module lock/eject levers are locked in position. If the lock/eject levers are not locked the DSM DS1x84 termination module does not autoprovision.

Step	Action

1 Put the antistatic wrist strap on your wrist to protect the DSM DS1x84 TM from damage. Plug the wrist strap connector into the ESD jack on the OPTera Metro 3500 shelf.

2 Determine the task you want to perform.

If you are	**Then** go to
inserting a DSM DS1x84 TM	step 3
removing a DSM DS1x84 TM	step 9

Inserting a DSM DS1x84 TM into a slot

3 Lift the DSM DS1x84 TM by the edges of the faceplate.

4 Turn the DSM DS1x84 TM right side up and guide the back end into the required slot. Make sure that the left and right edges of the DSM DS1x84 TM enter the slot guide rails.

5 Push the DSM DS1x84 TM into the DS1 service module until 75% of its length is in the DS1 service module.

6 Pull the lock/eject levers at the left and right of the DSM DS1x84 TM faceplate to their completely extended positions.

7 Push the DSM DS1x84 TM towards the back of the DS1 service module. The lock/eject levers will slip into the grooves at the left and right edges of the slot frame.

Push the left and right lock/eject levers towards the DSM DS1x84 TM faceplate so that the connector at the back of the DSM DS1x84 TM mates with the backplane.

You can feel the latch snap into the locked position as the DSM DS1x84 TM mates with the DS1 service module backplane. The lock/eject levers then snap towards the faceplate. (The left lever snaps right and the right lever snaps left.)

—**continued**—

Procedure 3-55 (continued)
Inserting or removing a DSM DS1x84 termination module

Step	Action
8	Ensure the levers are locked in position, holding the DSM DS1x84 TM securely in the shelf.
	Note: Do not use excessive force when pushing the lock/eject levers towards the faceplates. If the levers do not want to lock into place, remove the DSM DS1x84 TM and examine the connector at the back of the DSM DS1x84 TM.

Removing a DSM DS1x84 TM from a slot

Step	Action
9	Pull the lock/eject levers at the left and right of the DSM DS1x84 TM faceplate to their completely extended positions.
	The DSM DS1x84 TM connector disengages from the backplane.
10	Pull the DSM DS1x84 TM out of the slot.

<p align="center">—end—</p>

Procedure 3-56
Connecting the DS1 service module to OPTera Metro 3500

Requirements

Before you perform this procedure, you must insert the DSM DS1x84 termination module (DSM DS1x84 TM) in slot 1 and connect the DS1 I/O cables to the DS1 service module.

Note: Clean and scope fiber patch cords, before connecting fiber optic cables. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.

Ensure you have:

- LC-SC adapter patch cords, if the optical interface circuit pack does not have LC connectors but will be connected to a DS1 service module with LC connectors.

- LC-LC adapter patch cords, if both the optical interface circuit pack and DS1 service module have LC connectors.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

Step	Action
1	Connect one end of the patch cord to the working OC-3 Tx port on the OPTera Metro 3500. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.
2	Connect the other end of the patch cord to IN port on the DSM DS1x84 TM slot 1 port. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175
3	Connect one end of the patch cord to working OC-3 Rx port on the OPTera Metro 3500. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.
4	Connect the other end of the patch cord to OUT port on the DSM DS1x84 TM slot 1 port. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175
5	Repeat step 1 through step 4 for the protection OC-3 circuit pack on the OPTera Metro 3500, and the DSM DS1x84 TM slot 2.

—continued—

Procedure 3-56 (continued)
Connecting the DS1 service module to OPTera Metro 3500

Step	Action
6	Ensure there is no alarms on the DS1 service module and OPTera Metro 3500. If an alarm is displayed, perform the troubleshooting. See 323-1059-543, *Alarm and Trouble Clearing*.
7	Return the optical connector applicator back to its location.
8	Route the fiber-optic cable from the DS1service module to the OPTera Metro 3500 shelf. See Figure 3-129 on page 3-248.
9	Store the fiber slack in the fiber storage. See Figure 3-129 on page 3-248.
10	Install the DS1 service module front cover. See Installing and removing the DS1 service module front cover on page 3-225.

—**end**—

Figure 3-129
Routing fiber-optic cables to the DS1 service module

EX1254p
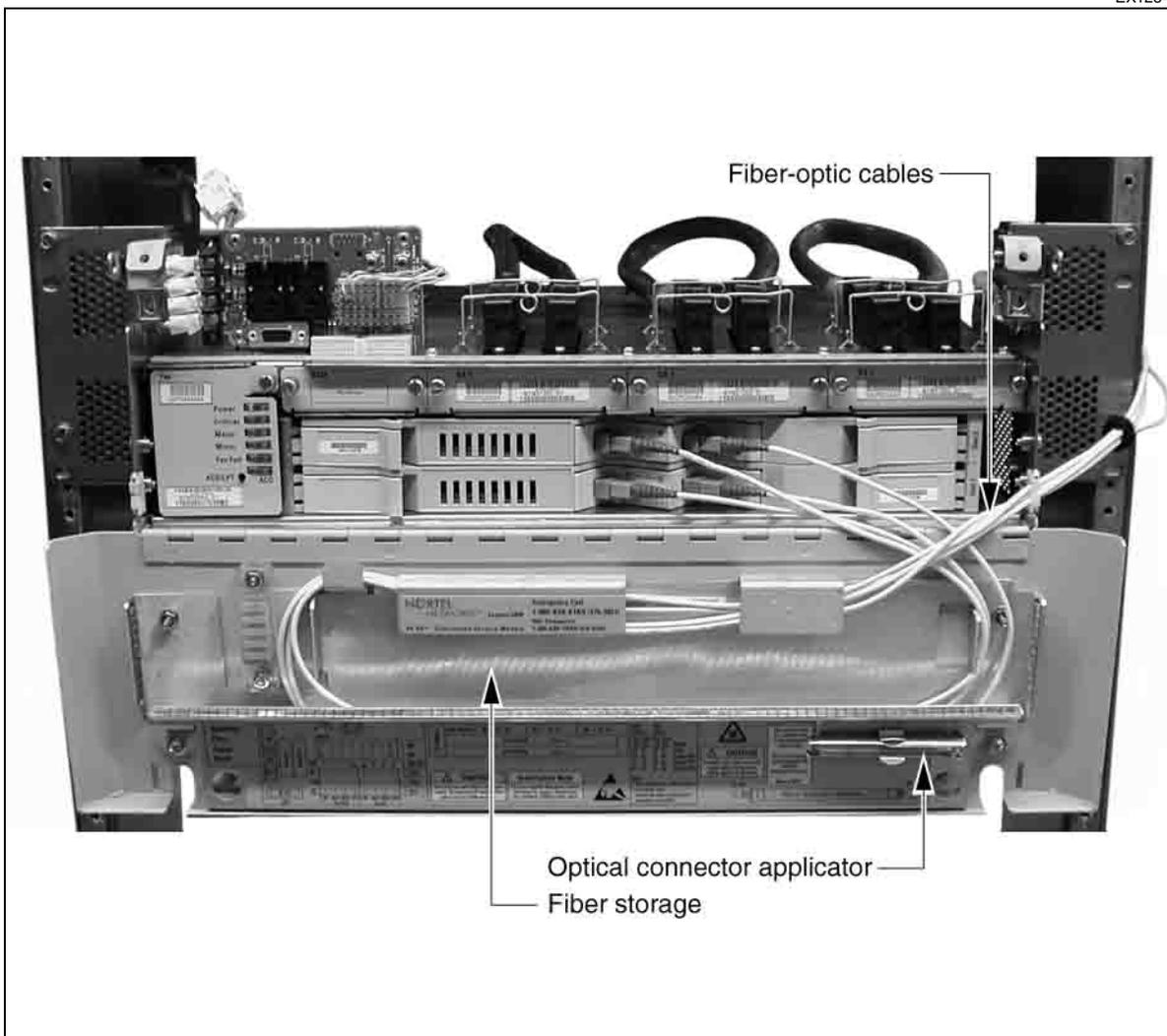
Procedure 3-57
Disconnecting SC, FC, ST, LC or MT-RJ connector

Requirements

Ensure you have the correct tool to disconnect the connector. See Table 3-13 on page 3-249.

Table 3-13
Connector tools

Connector type	Connector tool PEC		
	NTN458TA (see Note 1)	**NTN458TB** (see Note 1)	**NTN458TC** (see Note 2)
SC	yes	no	yes
FC	yes	no	yes
ST	yes	no	yes
LC	no	no	yes
MT-RJ	no	yes	yes
Note 1: Use this tool to disconnect only.			
Note 2: Use this tool to connect or disconnect.			

Note: For connectors with a rounded retainer, use the barrel end of the tool. For connectors with a square shaped retainer use the gripper end of the tool. The following illustrations provide examples of the tools and connectors:

– Disconnecting an SC connector with removal tool NTN458TA on page 3-251

– Disconnecting an FC connector with removal tool NTN458TA on page 3-252

– Disconnecting an FC connector with removal tool NTN458TC on page 3-252

– Disconnecting an ST connector with removal tool NTN458TA on page 3-253

– Disconnecting an MT-RJ connector with removal tool NTN458TB on page 3-253

– Disconnecting an LC connector with removal tool NTN458TC on page 3-254

—continued—

Procedure 3-57 (continued)
Disconnecting SC, FC, ST, LC or MT-RJ connector

Step	Action

> **CAUTION**
> **Risk of equipment damage**
> Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

> **CAUTION**
> **Risk of breaking the connector sleeve**
> Do not use the connector tools; NTN458TA and NTN 458TB to connect, they should only be used to disconnect. Connector tool NTN458TC can be used to connect and disconnect.

1 Perform the following steps:

If you are	**Then** go to
disconnecting an SC, LC or MT-RJ connector	step 2
disconnecting an FC, ST connector	step 6

Disconnecting an SC, LC or MT-RJ connector

2 Position the connector removal tool on the fiber-optic cable so that the fiber-optic cable is inside the tool and parallel to the tool.

   Note: Use the correct removal tool. See Table 3-13 on page 3-249.

3 Slide the removal tool toward the connector until it holds the plug retainer.

> **CAUTION**
> **Risk of breaking the connector sleeve**
> Do not try to rotate the removal tool.

4 Slowly pull out the connector with the removal tool.

5 Separate the removal tool from the connector by holding the removal tool in a fixed position and sliding the connector away from the removal tool.

   You have completed this procedure.

Disconnecting an FC or ST connector

6 Position the connector removal tool on the fiber-optic cable so that the fiber-optic cable is inside the tool and parallel to the tool.

   Note: Use the correct removal tool. See Table 3-13 on page 3-249.

—**continued**—

Procedure 3-57 (continued)
Disconnecting SC, FC, ST, LC or MT-RJ connector

Step	Action
7	Rotate the removal tool counter clockwise until the plug retainer disconnects from the sleeve (FC) or until the retaining pin disengages from the retaining groove.
8	Slowly pull out the connector with the removal tool.
9	Separate the removal tool from the connector by holding the removal tool in a fixed position and sliding the connector to the left.
	You have completed this procedure.
10	Separate the removal tool from the connector by holding the removal tool in a fixed position and sliding the connector downward.

—**end**—

Figure 3-130
Disconnecting an SC connector with removal tool NTN458TA

EX1059p
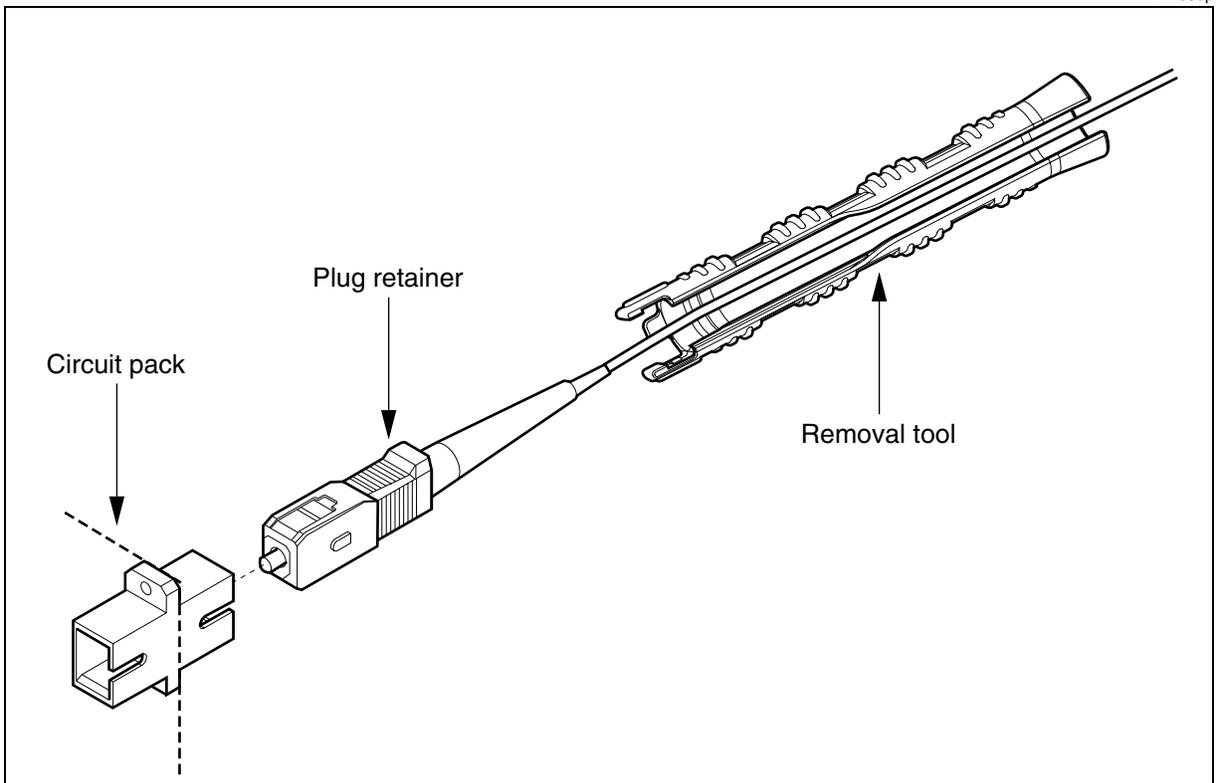
Figure 3-131
Disconnecting an FC connector with removal tool NTN458TA

EX1060p
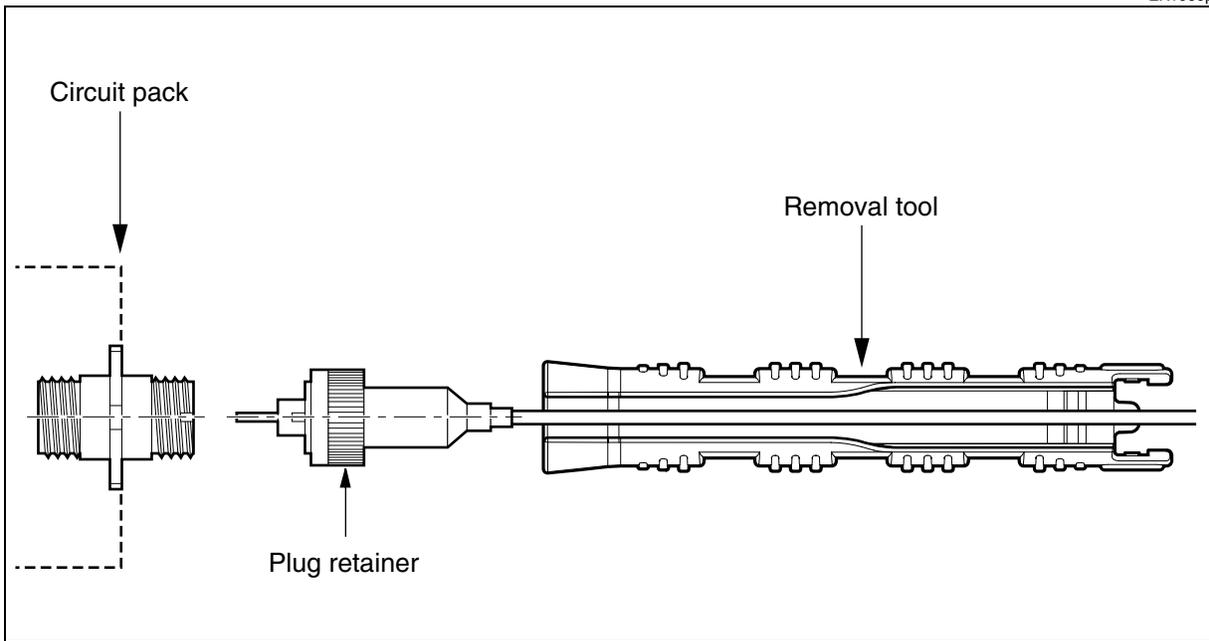
Figure 3-132
Disconnecting an FC connector with removal tool NTN458TC

Ex1411p
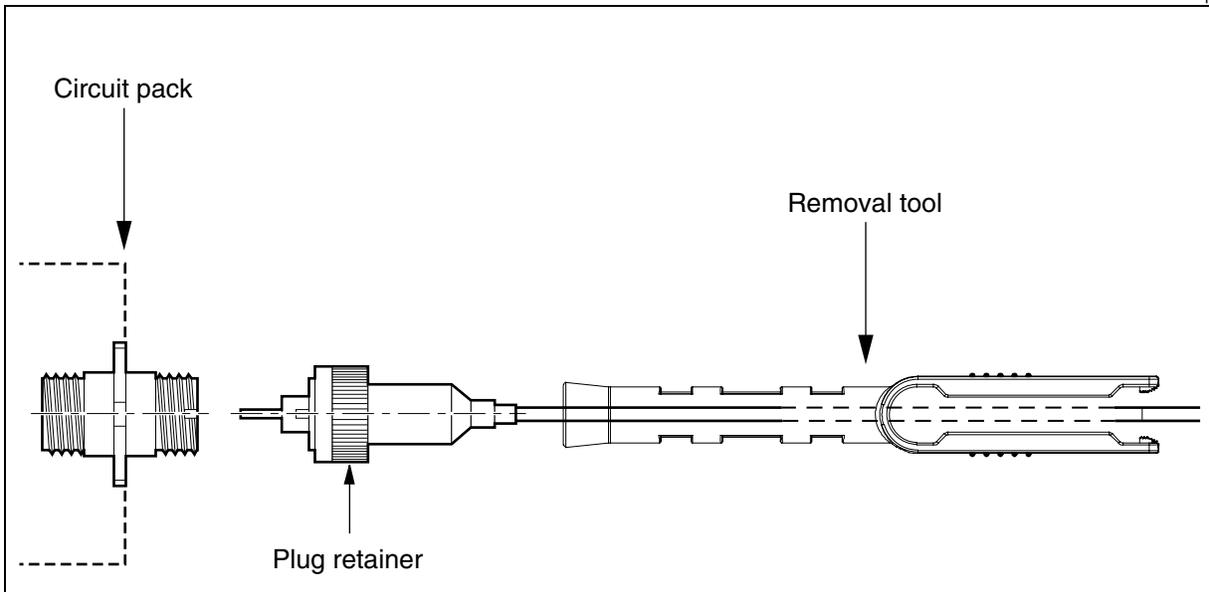
Figure 3-133
Disconnecting an ST connector with removal tool NTN458TA

EX1061p
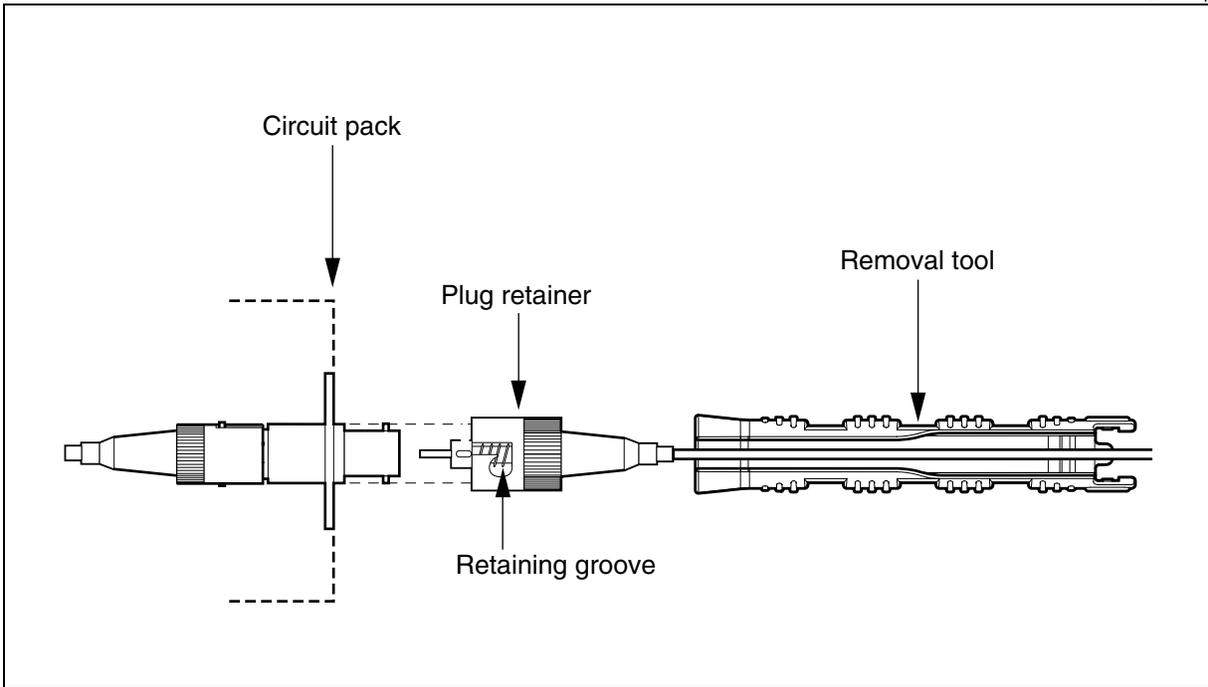
Figure 3-134
Disconnecting an MT-RJ connector with removal tool NTN458TB

EX1062p
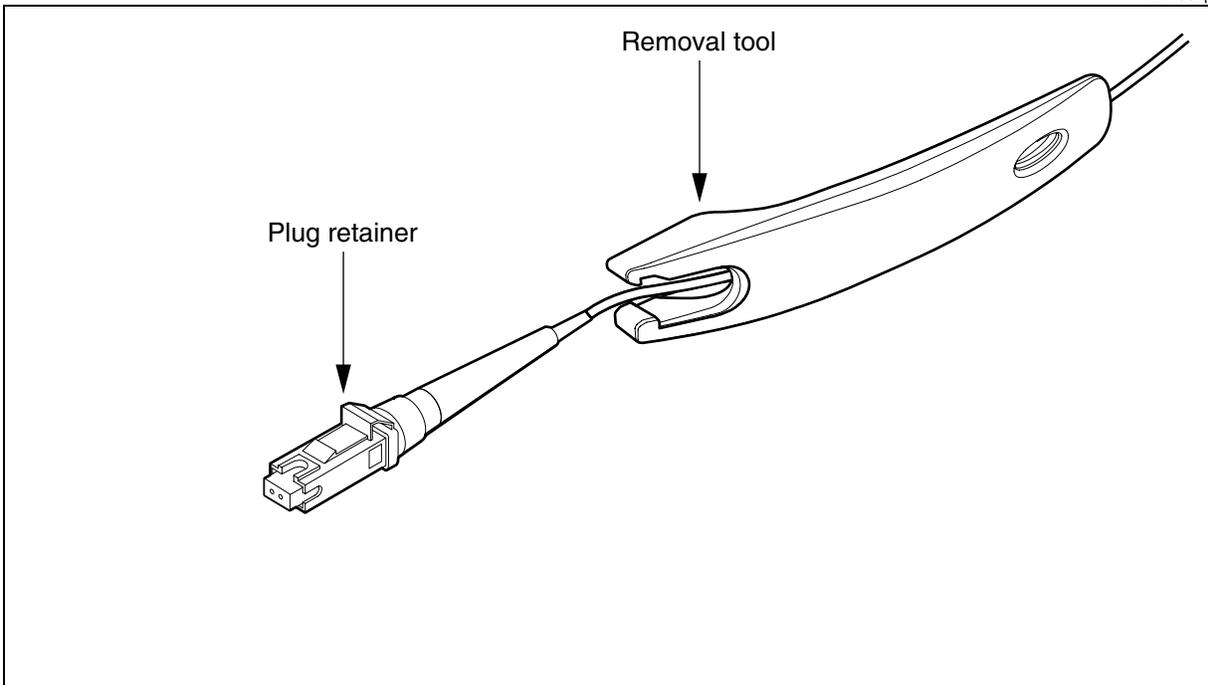
Figure 3-135
Disconnecting an LC connector with removal tool NTN458TC
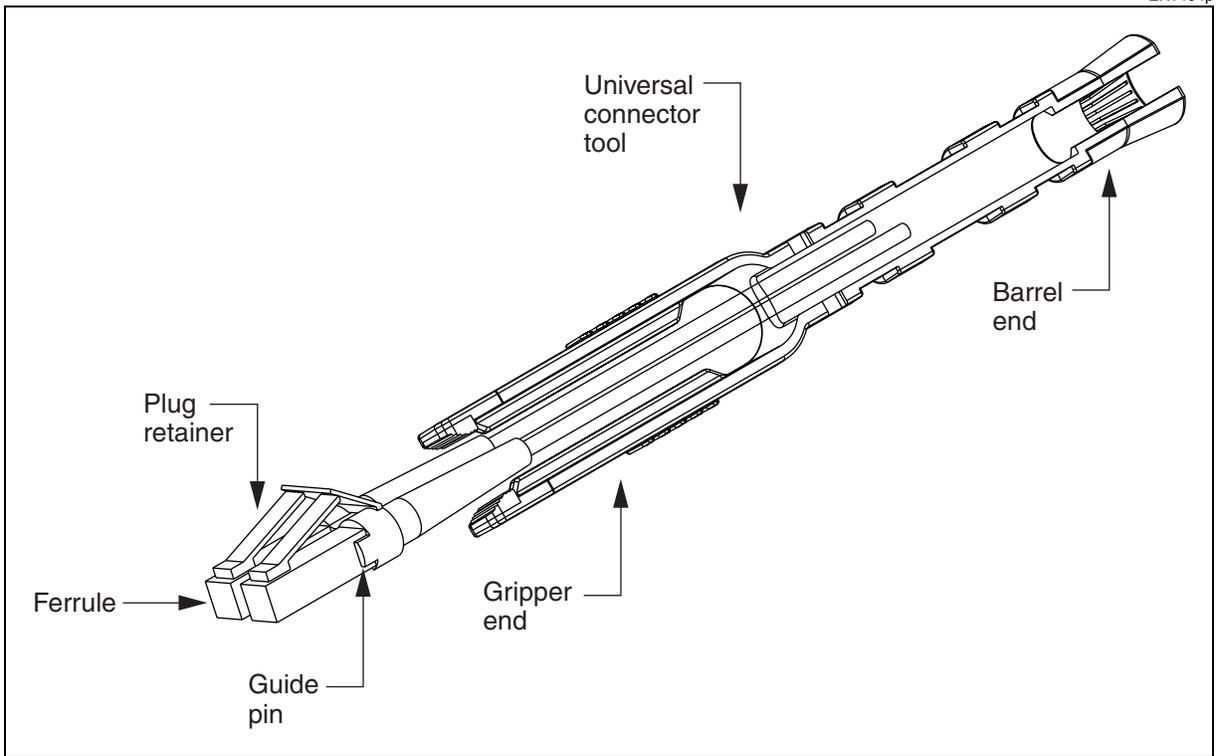
Table 3-14
Torque requirements for mechanical connection

Description	Torque U.S.	Torque Metric	Inspect U.S.	Inspect Metric	Tool No.US/Can
Self-Tapping Screws P097F812 P097F813	50 in-lb	575 g-m	40 in-lb	460 g-m	T001257/A8940 or T000871
1/4" Bolts	5 ft-lb (60 in-lb)	7 kg-m	3 ft-lb (36 in-lb)	41 kg-m	T9958A/A8940
5/16" Bolts	11 ft-lb (132 in-lb)	1.5 kg-m	8 ft-lb (96 in-lb)	1.1 kg-m	T9958A/A8940
3/8" Bolts	18 ft-lb (216 in-lb)	2.5 kg-m	12 ft-lb (144 in-lb)	1.66 kg-m	T9958A/A8322 or A8940
7/16" Bolts	30 ft-lb	4.14 kg-m	21 ft-lb	2.9 kg-m	T9958A/A8322
1/2" Bolts	40 ft-lb	5.52 kg-m	30 ft-lb	4.14 kg-m	T9958A/A8322

Table 3-14 (continued)
Torque requirements for mechanical connection

Description	Torque U.S.	Torque Metric	Inspect U.S.	Inspect Metric	Tool No.US/Can
3/8" Cable Rack Corner Clamps	15 ft-lb (180 in-lb)	2.1 kg-m	10 ft-lb (120 in-lb)	1.38 kg-m	T9958A/A8322 or A8940
8-32 Hex Nuts	20 in-lb	230 g-m	14 in-lb	161 g-m	T001257/T000871
10-32 KEPS (3/8" nut)	27 in-lb	311 g-m	20 in-lb	230 g-m	AT5470/D13A
Cabinet Junction Bolts	20 ft-lb (240 in-lb)	2.76 kg-m	14 ft-lb (168 in-lb)	2.76 kg-m	T0037/A8322

Table 3-15
Torque requirements for power and ground connection

Description	Torque U.S.	Torque Metric	Inspect U.S.	Inspect Metric	Tool No.US/Can.
1/4–20 Ground Plate Bolts	6.5 ft-lb (80 in-lb)	897 kg-m	5 ft-lb (60 in-lb)	69 kg-m	T9958A/A8940
1/4–20 Ground Plate Clinch Studs (instead of bolts)	32 in-lb	368 g-m	22 in-lb	253 g-m	T0008/A9995S
1/4–20 Bolts	32 in-lb	368 g-m	22 in-lb	253 g-m	T0008/A9995S
3/8-16 Bolts	20.8 ft-lb (250 in-lb)	2.87 kg-m	14.2 ft-lb (170 in-lb)	1.95 kg-m	T0037/A8322 or T9958A/A8940
J0T99A-3 Ground Bar	18 in-lb	207 g-m	12 in-lb	138 g-m	T0008/A9995S
1/2"-13 48V/ BAT RTN Bolts	45 ft-lb (540 in-lb)	6.21 kg-m	31.5 ft-lb (378 in-lb)	4.3 kg-m	T9995A/A8940
Ground Connections within Cabinet	41 in-lb	471.5 g-m	29 in-lb	333.5 g-m	T001257/ T000871

Table 3-16
Torque requirements for anchors

Description	Torque U.S.	Torque Metric	Inspect U.S.	Inspect Metric	Tool No.US/Can.
M-10	40 ft-lb	5.52 kg-m	28 ft-lb	3.86 kg-m	T0037/A9986
M-12	58 ft-lb	8 kg-m	40 ft-lb	5.52 kg-m	T0037/A9986
M-16	90 ft-lb	12.42 kg-m	63 ft-lb	8.69 kg-m	T0037/A9986
HDI (Drop In)	Do not torque	Do not torque	7 ft-lb (192 in-lb)	0.97 kg-m	T0037/A9986 or A8940
Internally Threaded Inserts (Epoxy Anchoring System)	Do not torque	Do not torque	14 ft-lb	1.93 kg-m	T0037/A9986 or A8940
Expansion Shields	20 ft-lb	2.76 kg-m	14 ft-lb	1.93 kg-m	T0037/A9986

Fiber maintenance

Procedures for conducting fiber maintenance

Procedure 4-1
Inspecting and cleaning optical interface internal connectors and fiber

Use this procedure to

- inspect and clean the optical interface connector adapters
- inspect and clean the internal fiber-optic cables
- inspect and clean small form-factor pluggable (SFP) module connector cleaning

Requirements

The following tools are mandatory for cleaning the connectors and adapters:

- fiber microscope with the following adapters:
  — 2.5 mm adapter for SC, ST and FC connectors
  — 1.25 mm adapter for LC connectors
  — MT-RJ adapter for MT-RJ connectors
- fiber cleaning materials
  — cleaning cassette (as required)
  — lint-free tissues
  — isopropyl alcohol (90% concentration or higher)
  — 1.25 mm optical swabs for LC connectors
  — 2.5 mm optical swabs for SC, FC or ST connectors

DANGER
Risk of personal injury
When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to optical fiber cables. Never look directly into the end of an optical fiber.

CAUTION
Risk of equipment damage
Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

—continued—

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Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

	DANGER **Risk of personal injury** Ensure there is no laser light in the fiber-optic cable that you want to disconnect.

	DANGER **Risk of vapor inhalation** Always work in a clean and ventilated area to avoid extended inhalation of alcohol vapors. Use small amounts of alcohol to clean optical connectors.

Step	**Action**
1	Wear an antistatic wrist strap to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf. See Figure 3-105 on page 3-194.

2	**If** optical patch cords	**Then** go to
	are connected to the circuit pack	step 3
	are not connected to the circuit pack	step 5

3	Loosen the optical patch cords from the shelf fiber-optic guides to provide enough slack.
4	Disconnect the optical patch cords from the circuit pack, see Disconnecting SC, FC, ST, LC or MT-RJ connector on page 3-249.
5	Remove the optical interface circuit pack from the shelf. See Inserting or removing a circuit pack on page 3-192.

6	**If** the connector is an	**Then** go to
	SC, FC or ST connector	step 7
	LC connector on an OC-192 circuit pack	step 13
	LC connector not on an OC-192 circuit pack	step 14
	MT-RJ connector	step 14

7	**If** the connectors you are cleaning	**Then** go to
	are on an OC-3x4 circuit pack (NTN441AA)	step 8
	are not on an OC-3x4 circuit pack (NTN441AA)	step 13

8	Slide out the fiber tray of the circuit pack.
9	Open the clear plastic doors on either side of the fiber tray.

—**continued**—

Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

Step	Action
10	Disconnect one end of one of the pigtail fibers.

Note 1: The NTN441AA OC-3x4 circuit pack is equipped with eight pig-tail internal fibers, each with an SC connector on one end and an LC connector on the other. Both of these plugs (SC and LC) and their respective connector adapters should be inspected and, if necessary, cleaned.

Note 2: You should clean the pig-tail internal fibers on the NTN441AA OC-3x4 circuit pack one fiber at a time. Do not disconnect more than one pig-tail from its connector adapters at a time. Do not disconnect more than one end of any pig-tail fiber at a time.

11 Go to step 14.

12

> ⚠ **CAUTION**
> **Risk of equipment damage**
> When handling the fiber-optic plug or cleaning the connector ferrule, do not pull the internal fiber-optic cables from the internal transmitter and receiver housing, as this will affect critical fiber bend radii.

Hold the fiber-optic plug from the Tx and Rx pigtails of the circuit pack and slide it towards the back of the holding slots. When the fiber-optic connector reaches the end of the slot, lift it from the printed circuit board.

13 Remove pigtail fiber from the connector adapter.

Cleaning bulkhead , SFF , and SFP connector adapters (dry optical swab)

14	**If**	**Then**
	there are protective caps on the connector adapter	step 15
	there are no protective caps on the connector adapter	step 16

15 Remove the protective caps from the adapter and store in a clean ESD plastic bag until the cleaning of the adapter and alignment sleeve is completed.

16 Take a new and clean optical swab and insert into the connector adapter. Use a 1.25 mm optical swab for an LC or MT-RJ connector adapter or a 2.5 mm optical swab for an FC, SC or ST connector adapter.

17 While rotating the swab in one direction, remove the swab from the connector adapter.

Note: If necessary, repeat this step with a new, clean optical swab.

18 If applicable, perform step 16 to step 17 for both sides of the connector adapter.

Note: If the connector adapter is not to be used immediately, place clean dust caps on.

—**continued**—

Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

Step	Action

19	**If** the connector is an	**Then** go to
	SC, FC, ST connector	step 20
	LC connector on an OC-192 circuit pack	step 20
	LC connector not on an OC-192 circuit pack	step 39
	MT-RJ connector	step 39

Cleaning the connector ferrule (dry cleaning)

20	Put the end face connector in the center of a new lint-free tissue. Apply moderate pressure and wipe the ferrule or plug by rotating the connector along the container and the ferrule or plug tip. Perform four or five rotations. This operation removes any dirt on the ferrule or plug.

Note 1: You can also use a cleaning cassette according to the manufacturer instructions.

Note 2: Use a new lint-free tissue for each connector and avoid contamination of the lint-free tissue by dirty surfaces.

21	Insert the connector into a fiber microscope and examine the connector.

22	**If** the connector is	**Then**
	still dirty after the first attempt of dry cleaning	perform dry cleaning again by completing step 20 to step 21.
	still dirty after 2 attempts of dry cleaning	perform wet and dry cleaning, complete step 23 to step 26
	clean	go to step 27

Cleaning the FC, SC or ST connector ferrule (wet and dry cleaning)

23	

> ⚠ **DANGER**
> **Risk of vapor inhalation**
> Always work in a clean and ventilated area to avoid extended inhalation of alcohol vapors. Use small amounts of alcohol to clean optical connectors.

Wet one corner of the lint-free tissue with alcohol or open an alcohol impregnated lint-free tissue. Wipe across the surface of the ferrule.

Note: Use a new lint-free tissue for each connector and avoid contamination of the lint-free tissue by dirty surfaces.

—continued—

Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

Step	Action

24 While the ferrule is still wet with solvent, dry by performing a dry wipe using the following method:

    a. Put a clean, optical grade, lint-free tissue (or equivalent), on a flat surface.

    b. Gently press the ferrule on the tissue and wipe in one direction.

    c. Rotate the connector a 1/4 turn and wipe again.

    Note 1: Do not allow the alcohol to dry on the ferrule. The alcohol can leave a film on the surface.

    Note 2: Be careful to use only the untouched sections of the wipe.

    Note 3: Always use a new, clean tissue for each connector.

    Note 4: If a flat surface is not available or if the ferrule is not clean enough, use a cleaning cassette according to the manufacturer instructions.

25 Insert the connector into a fiber microscope and examine the connector.

26

If the connector is	**Then**
still dirty	repeat step 23 to step 25
clean	go to step 27

    Note: If after multiple attempts to clean it (wet and dry method), the fiber is still dirty or scratched, return the circuit pack for repairs to Nortel Networks.

27 Place the connector in a new or clean adapter housing to prevent the ferrule from coming in contact with any dirt.

    Note: Always place a clean connector in a clean adapter.

Installing the connector

28

If the connector type is	**Then** go to
an SC, ST, or FC	step 29
an LC	step 38

29

If the circuit pack whose connectors you are cleaning is	**Then** go to
an NTN441AA OC-3x4 circuit pack	step 30
not an NTN441AA OC-3x4 circuit pack	step 35

30 Reconnect the connector you disconnected in step 10 into the appropriate connector adapter.

—continued—

Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

Step	Action

31   Perform step 10 to step 30 for each end of each remaining pig-tail fiber.

Note 1: The NTN441AA OC-3x4 circuit pack is equipped with eight pig-tail internal fibers, each with an SC connector on one end and an LC connector on the other. Both of these plugs (SC and LC) and their respective connector adapters should be inspected and, if necessary, cleaned.

Note 2: You should clean the pig-tail internal fibers on the NTN441AA OC-3x4 circuit pack one fiber at a time. Do not disconnect more than one pig-tail from its connector adapters at a time. Do not disconnect more than one end of any pig-tail at a time.

32   Close the clear plastic doors on either side of the fiber tray.

33

> ⚠ **CAUTION**
> **Risk of signal degrade or loss of signal**
> When sliding the fiber tray back into the circuit pack, ensure that the internal fibers are not kinked, twisted, or snagged as they are routed into the fiber retainer. Visible signs of damage to primary coatings, buffers, or jackets can cause signal degrade or loss of signal to the circuit pack.

Pinch the plastic latches on either side of the fiber tray and slide the fiber tray slowly back into the circuit pack so that the internal fibers can be routed into the fiber retainer.

34   Go to step 39.

35

> ⚠ **CAUTION**
> **Risk of equipment damage**
> Ensure the fiber-optic plug is oriented correctly before inserting, by comparing it to the other fiber-optic plug on the circuit pack.

Insert the fiber-optic connector into the back end of the slot in the printed circuit board.

36   Slide the connector along the slot towards the faceplate until it clicks into the faceplate adapter.

37   Go to step 39.

—**continued**—

Procedure 4-1 (continued)
Inspecting and cleaning optical interface internal connectors and fiber

Step	Action
38	Push the fiber plug back into the connector until it clicks into place.
39	Install the optical interface circuit pack in the shelf. See Inserting or removing a circuit pack on page 3-192.
40	Clean and inspect the optical connectors and adapters on the external patch cords. See Cleaning optical connectors and adapters on patch cords on page 4-9.
41	Reconnect the optical patch cords you removed in step 4. See Connecting fiber-optic cables to the optical interface circuit pack on page 3-175.

—end—

Figure 4-1
Exploded faceplate and connector detail of OC-48, OC-48 DWDM, OC-12, and OC-3 circuit packs

EX1289p
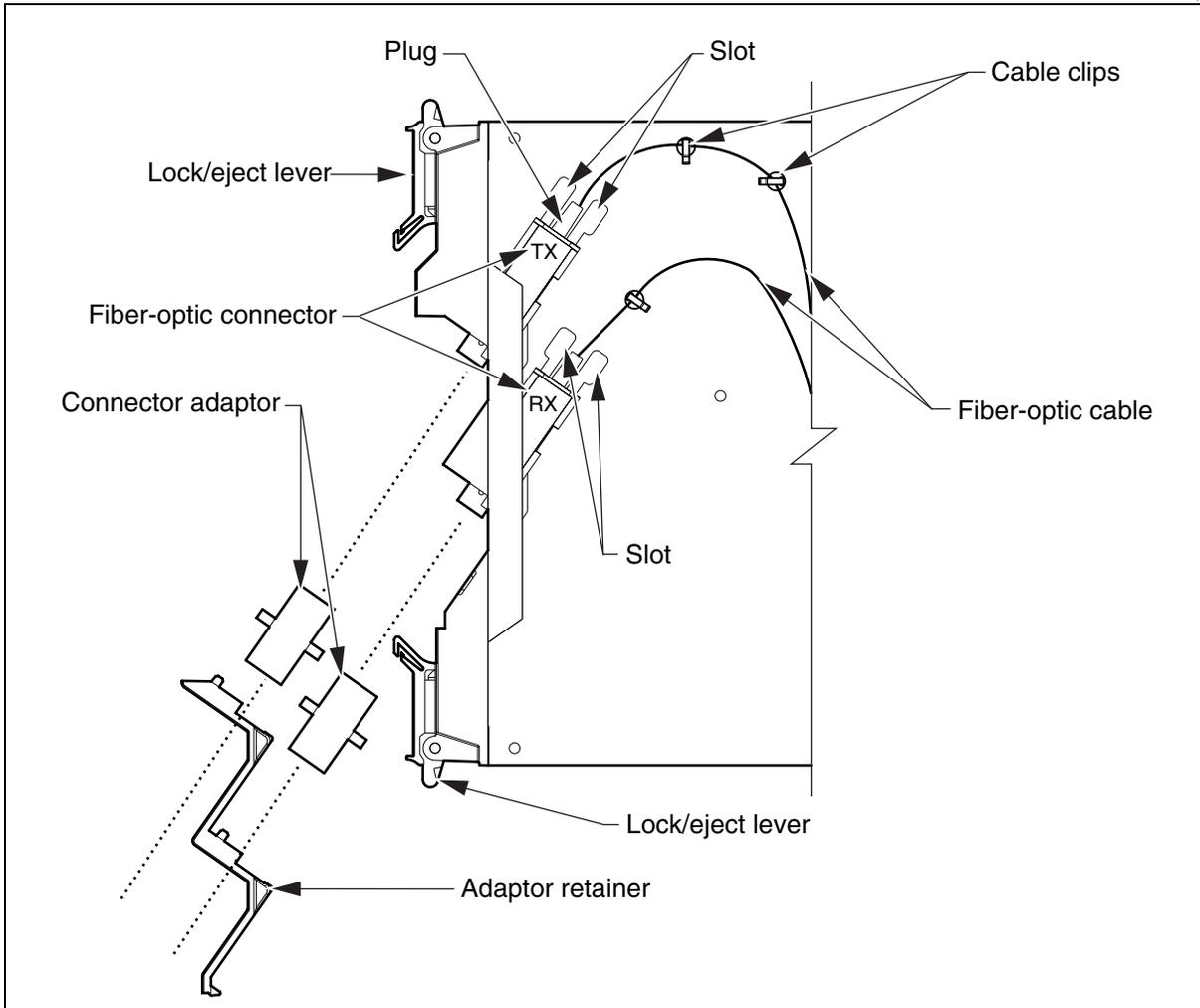
Procedure 4-2
Cleaning optical connectors and adapters on patch cords

Use this procedure to clean ferrule (FC), subscriber (SC), LC, MT-RJ and straight (ST) optical connectors or adapters on patch cords.

Inspect and, if necessary, clean all connectors and universal adapters inside and outside the circuit pack before installation or reconnection. To clean connectors and adapters inside circuit packs, see Inspecting and cleaning optical interface internal connectors and fiber on page 4-2.

Requirements

The following tools are used for cleaning the connectors and adapters:

- fiber microscope with the following adapters:
    - 2.5 mm adapter for SC, ST and FC connectors
    - 1.25 mm adapter for LC connectors
    - MT-RJ adapter for MT-RJ connectors
- fiber cleaning materials
    - cleaning cassette (as required)
    - lint-free tissues
    - isopropyl alcohol (90% concentration or higher)

	CAUTION
	Risk of equipment damage
	Electrostatic discharge can damage electrostatic sensitive devices. Use antistatic protection to avoid damaging circuit packs.

	DANGER
	Risk of personal injury
	When inserted in a shelf slot, the optical interface circuit pack emits laser light that can blind. Keep all optical connectors on the optical interface circuit packs capped when they are not connected to fiber-optic cables. Never look directly into the end of a fiber-optic cable.

—continued—

Procedure 4-2 (continued)
Cleaning optical connectors and adapters on patch cords

	DANGER
	Risk of personal injury
	Ensure there is no laser light in the fiber-optic cable that you want to disconnect.

Step	Action

Disconnecting the fiber-optic patch cord

1   Wear an antistatic wrist strap to protect the shelf from static damage. Connect the wrist strap to the ESD jack on the shelf. See Figure 3-105 on page 3-194.

2   Loosen one of the two optical patch cords from the shelf fiber-optic guides to provide enough slack.

Disconnect the optical patch cord from the circuit pack, see Disconnecting SC, FC, ST, LC or MT-RJ connector on page 3-249. Connectors can be one of five kinds:

- ferrule (FC), the steel-threaded screw type. See Figure 4-2 on page 4-14.
- subscriber (SC), the plastic snap-in type. See Figure 4-3 on page 4-14.
- straight (ST), the bayonet press-and-twist type. See Figure 4-4 on page 4-15.
- LC, the plastic snap-in type with RJ-style latch. See Figure 4-5 on page 4-15.
- MT-RJ, the plastic snap-in type with RJ-style latch. See Figure 4-6 on page 4-16.

Note: To clean a fiber-optic connector inside a circuit pack, see instructions in Inspecting and cleaning optical interface internal connectors and fiber on page 4-2.

Inspecting the optical connector

3   Insert the fiber-optic into the fiber microscope adapter to verify if the connector is clean.

4   Turn on the light in the fiber microscope.

5   Adjust the focus so that you can identify four different zones. See Figure 4-7 on page 4-16 for the single-mode fiber zones. See Figure 4-8 on page 4-17 for an example of a dirty fiber-optic.

Procedure 4-2 (continued)
Cleaning optical connectors and adapters on patch cords

Step	Action

Cleaning the connector ferrule (dry cleaning)

6   Use a new lint-free tissue.

Note: Use new lint-free tissue for each connector and avoid contamination of the lint-free tissue by dirty surfaces.

7   Put the end face connector in the center of the wipe tissue. Apply moderate pressure and wipe the ferrule or plug by rotating the connector along the container and the ferrule or plug tip. Perform four or five rotations. This operation removes any dirt on the ferrule or plug.

8

> **DANGER**
> **Risk of personal injury**
> Ensure there is no laser light in the fiber-optic cable that you want to scope.

Insert the connector into a fiber microscope and examine the connector. See Figure 4-9 on page 4-17 and Figure 4-8 on page 4-17.

9   Select your next option:

If the connector ferrule is	**Then**
still dirty after the first attempt of dry cleaning	perform dry cleaning again by completing step 6 to step 9.
still dirty after 2 attempts of dry cleaning	perform wet and dry cleaning, complete step 10 to step 12
clean	go to step 13

Cleaning the connector ferrule (wet and dry cleaning)

10

> **DANGER**
> **Risk of vapor inhalation**
> Always work in a clean and ventilated area to avoid extended inhalation of alcohol vapors. Use small amounts of alcohol to clean optical connectors.

Wet one corner of the lint-free tissue with alcohol or open an alcohol impregnated lint-free tissue. Wipe across the surface of the ferrule.

Note: Always use a new tissue.

—continued—

Procedure 4-2 (continued)
Cleaning optical connectors and adapters on patch cords

Step	Action

11   While the ferrule is still wet with solvent, dry by performing a dry wipe using the following method:

   a.   Put a clean, optical grade, lint-free tissue (or equivalent), on a flat surface.

   b.   Gently press the ferrule on the tissue and wipe in one direction.

   c.   Rotate the connector a 1/4 turn and wipe again.

   Note 1: Do not allow the alcohol to dry on the ferrule. The alcohol can leave a film on the surface.

   Note 2: Be careful to use only the untouched sections of the wipe.

   Note 3: Always use a new, clean tissue for each connector.

   Note 4: If a flat surface is not available or if the ferrule is not clean enough, use a cleaning cassette according to the manufacturer instructions.

12

> **DANGER**
> **Risk of personal injury**
> Ensure there is no laser light in the fiber-optic cable that you want to scope.

   Insert the connector into a fiber microscope and examine the connector. If it is still dirty, repeat step 10 to step 12 otherwise go to step 13.

   Note 1: If after multiple attempts to clean it (wet and dry method), the fiber-optic is still dirty or scratched, polish or replace the fiber-optic.

   Note 2: Use new lint-free tissue for each connector and avoid contamination of the lint-free tissue by dirty surfaces.

Connecting the optical connector

13   Select your next option:

If you want to	**Then**
connect the optical connector to the circuit pack	step 16
inspect and clean the optical interface internal connectors and fiber	step 14

14   Place the connector in a clean adapter housing to prevent the ferrule from coming in contact with any dirt.

   Note: Never place a clean connector in an adapter that has not been cleaned.

—continued—

Procedure 4-2 (continued)
Cleaning optical connectors and adapters on patch cords

Step	Action
15	Perform the procedure Inspecting and cleaning optical interface internal connectors and fiber on page 4-2
16	Connect the optical connector to the universal adapter of the faceplate.

If you are connecting an	**Then** go to
FC connector	step 17
SC, LC or MT-RJ connector	step 21
ST connector	step 24

Step	Action
17	Insert the ferrule into the universal adapter sleeve. Ensure that the guide pin enters the guide slot. See Figure 4-2 on page 4-14.
18	Hold the base of the connector to keep the ferrule from rotating. Screw the adaptor retainer to the sleeve threads. Tighten the connection with your fingers.
19	Set the tips of the fiber-optic cables by pushing the base of the connector adaptor to the fiber-optic connector.
20	Repeat the procedure for the second connector and adapter.
	You have completed this procedure.
21	Insert the ferrule into the sleeve so the guide pin enters the guide slit.
	• For SC connectors, see Figure 4-3 on page 4-14.
	• For LC connectors, see Figure 4-5 on page 4-15.
	• For MT-RJ connectors, see Figure 4-6 on page 4-16.
22	Hold the adaptor retainer and push it into the connector to lock it in.
23	Repeat the procedure for the second connector and adapter.
	You have completed this procedure.
24	Insert the ferrule into the universal adapter sleeve. Ensure the guide pin enters the guide slot. See Figure 4-4 on page 4-15.
25	Rotate the adaptor retainer so that the holding pin enters the holding groove.
26	Push the connectors together and seat the tips of the fiber-optic cables by pushing the base of the connector.
27	Repeat the procedure for the second connector and adapter.

—**end**—

Figure 4-2
FC connector assembly

EX0349

Guide slot

Guide pin

Base of connector
or strain relief

Ferrule tip
(end face)

Universal adapter
sleeve

Sleeve thread

Ferrule

Plug retainer
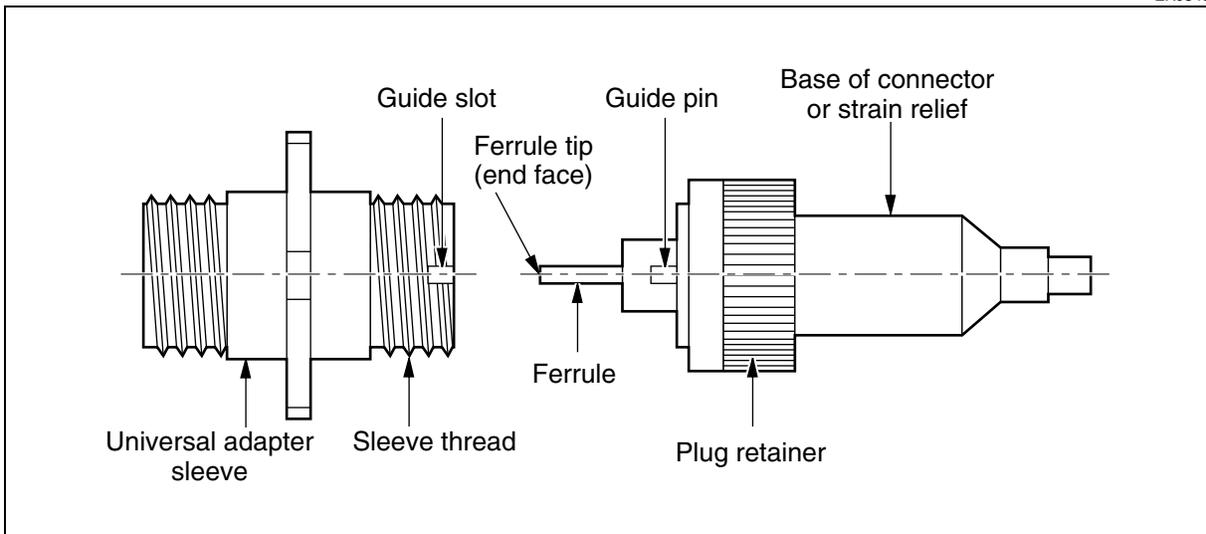
Figure 4-3
SC connector assembly

EX0350

Plug retainer

Sleeve

Ferrule

Guide pin

Guide slot
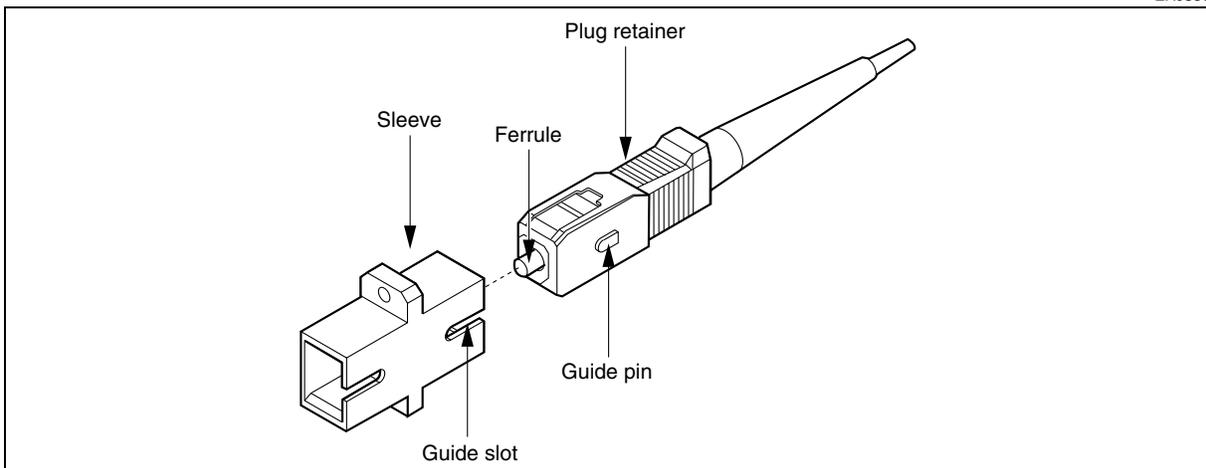
Figure 4-4
ST connector assembly

EX0351
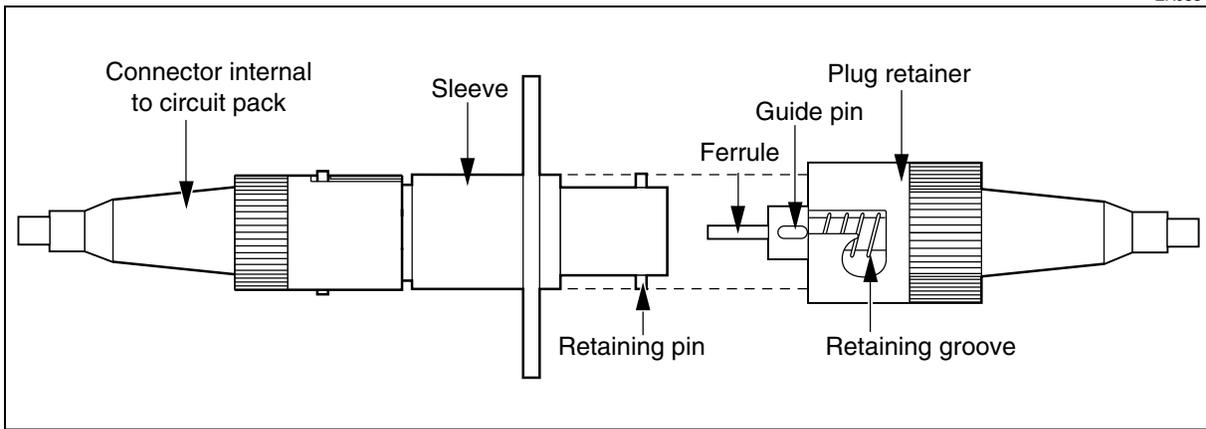
Figure 4-5
LC connector assembly

EX1404p
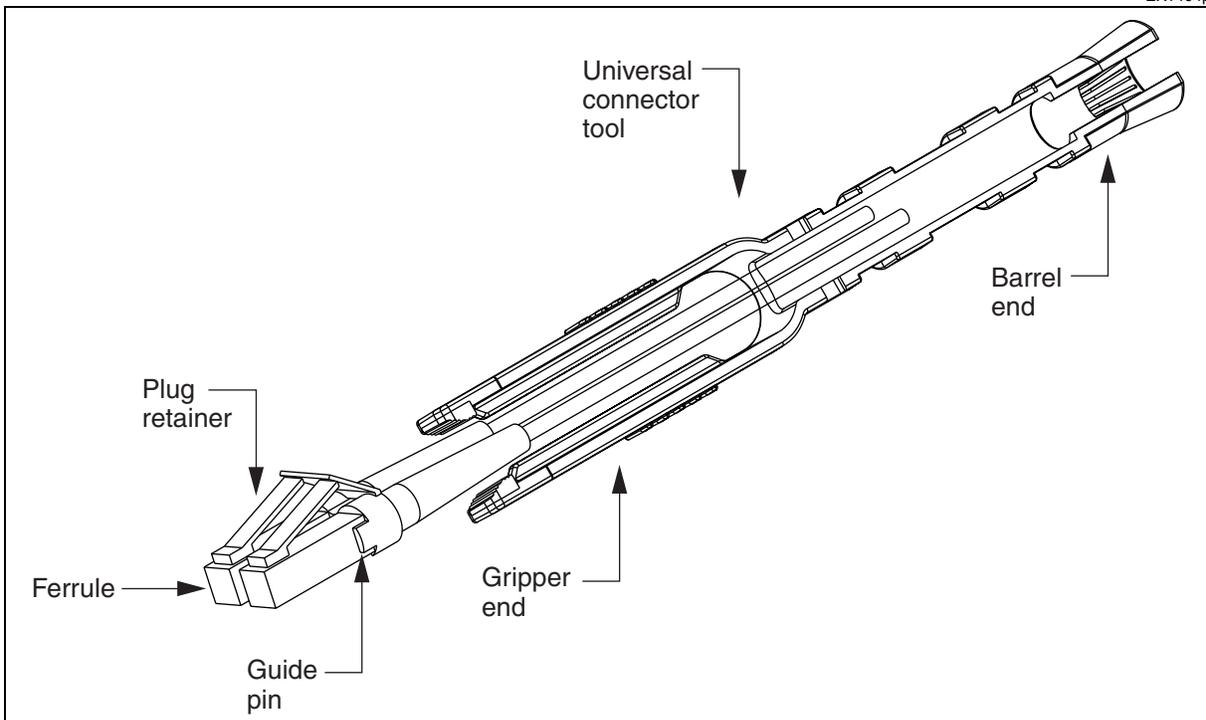
Figure 4-6
MT-RJ connector assembly

EX1454p

Plug retainer
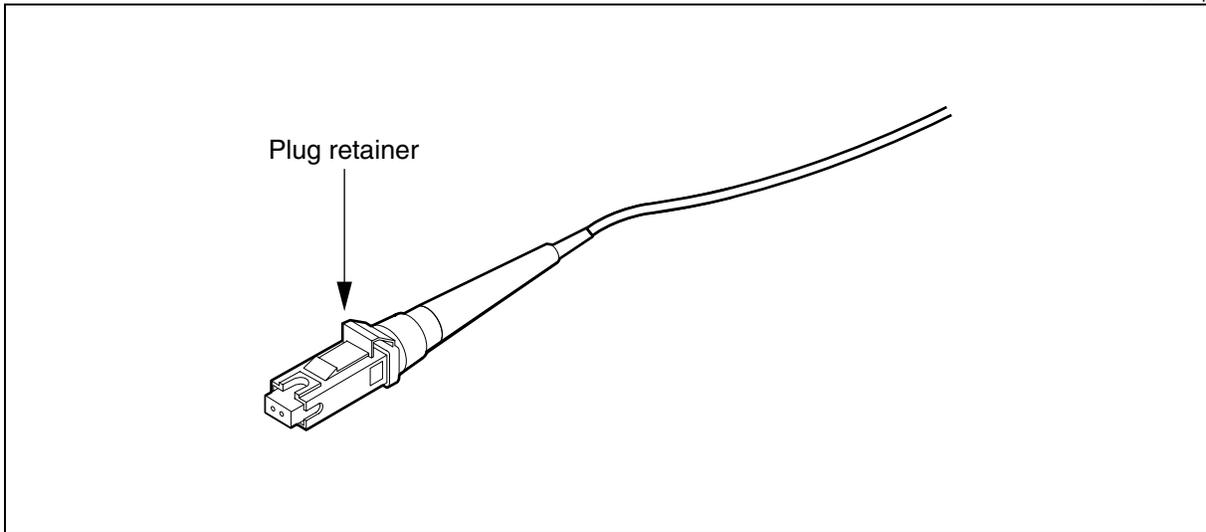
Figure 4-7
Definition of inspection zones (single-mode fiber)

EX0352

Zone B: Cladding

Zone A: Core

Zone D: Ferrule

Zone C: Joint

Legend:

Zone A = Diameter of 25 microns - bigger than physical "core"
Zone B = Diameter of 115 microns - "cladding"
Zone C = Dark zone around the cladding - epoxy
Zone D = White band - ferrule
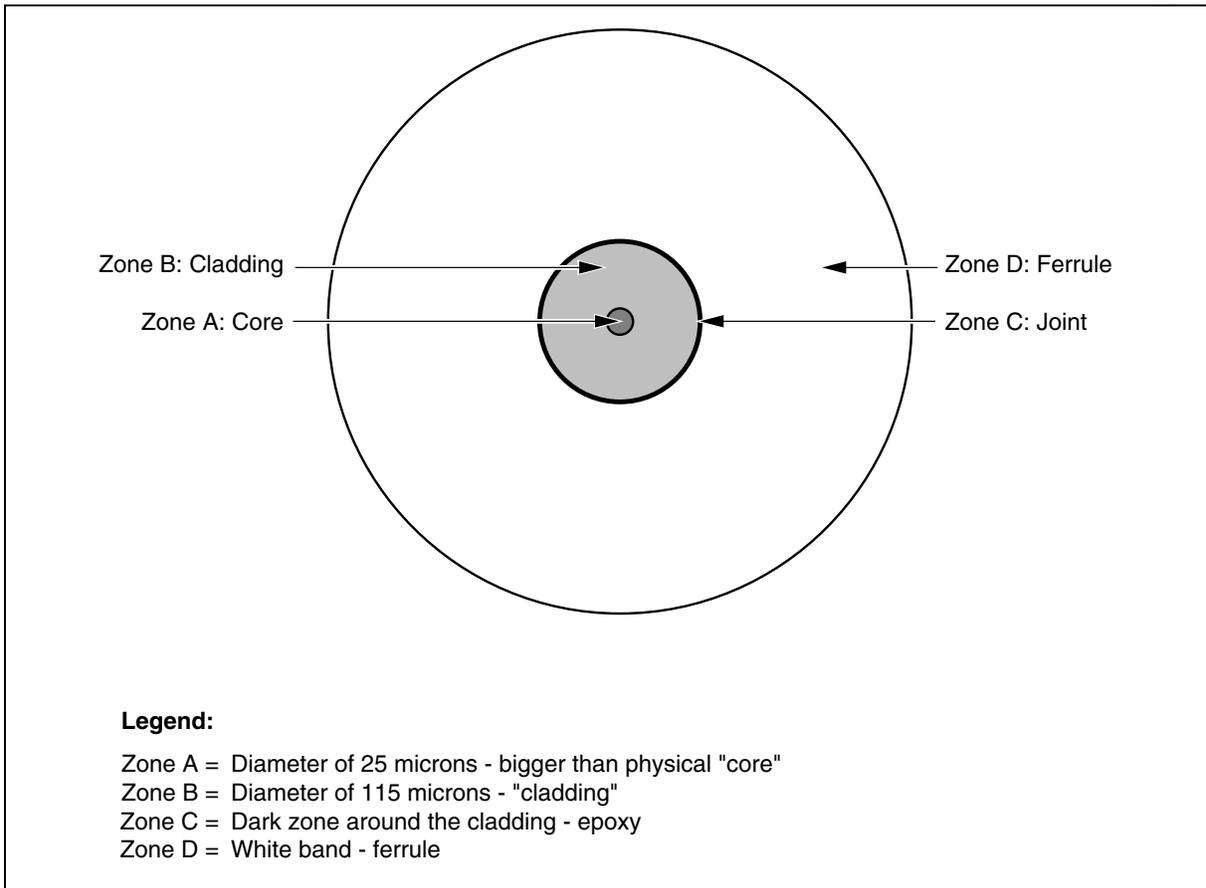
Figure 4-8
Dirty optical fiber

EX0353
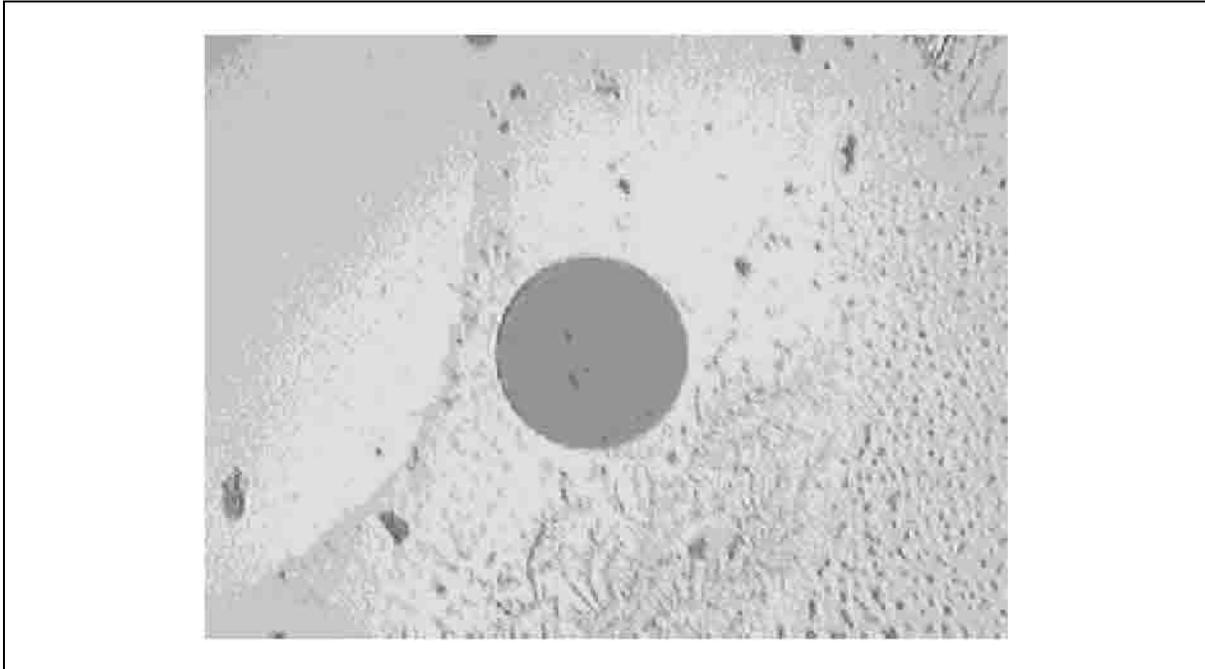
Figure 4-9
Clean optical fiber

EX0354
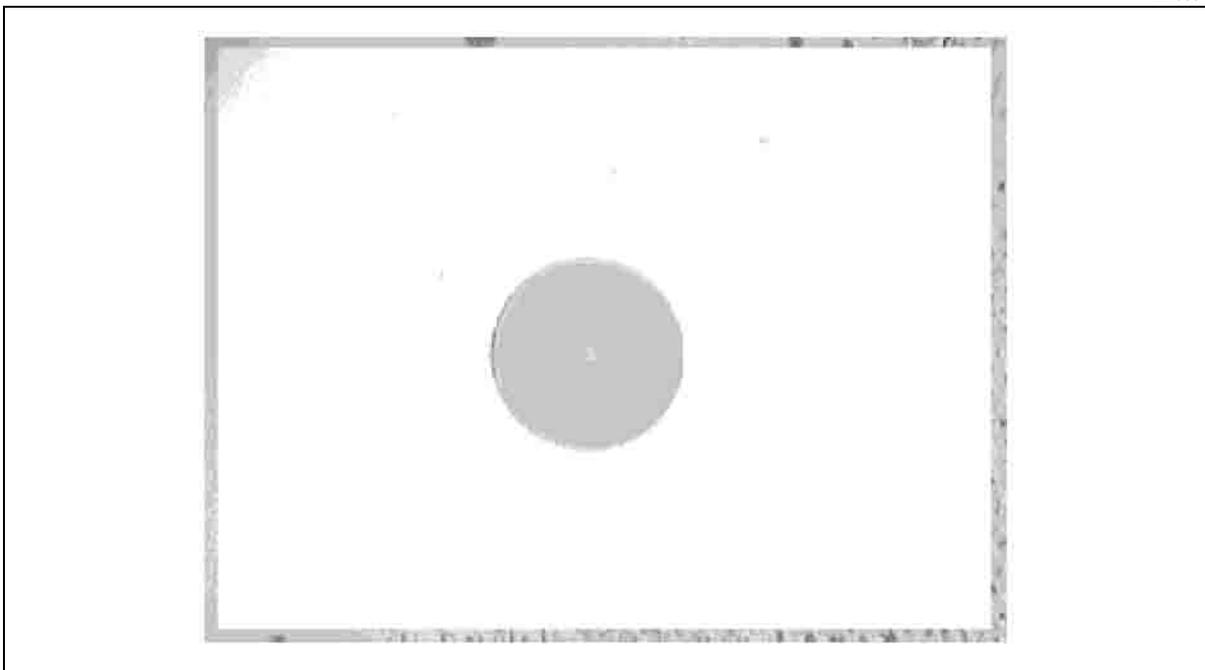
Cable and connector details

This chapter provides the cable assembly information for the OPTera Metro 3500 network element and Universal OPTera Metro 3500 network element. This chapter provides the part numbers for cables used with both shelves and detailed cable assembly drawings for each cable. Specifications are provided for the following cables and cable assemblies.

Table 5-1
OPTera Metro 3500 Multiservice Platform cables

Cable type	Page
DS1 cable pinout and assembly (common to OPTera Metro 3500 I/O and DS1 service module I/O)	5-2
DS3/EC-1 cable pinout and assembly	5-7
TBOS cable pinout and assembly	5-10
RS-232 null modem cable pinout and assembly	5-11
Shelf power cable pinout and assembly	5-13
RS-232 DCE DB25 cable pinout and assembly	5-28
BITS wire wrap cable pinout and assembly	5-30
Office alarm cable pinout and assembly	5-31
Environmental alarm cable pinout and assembly	5-31
NP Ethernet RJ-45 MDI cable pinout and assembly	5-32
Ethernet RJ-45 MDI cable pinout and assembly	5-34
X.25 DSUB cable assembly	5-36
DSM OAM adapter module (Hardware Release 6) with cover off	5-39
Local user interface (LUI) cable pinout	5-39

DS1 cable pinout and assembly (common to OPTera Metro 3500 I/O and DS1 service module I/O)

Two DS1 cable assemblies are required for every 28 DS1s (one for 28 DS1 in, and one for 28 DS1 out).

Note: The color codes and pinout provided apply to the suggested DS1 cables. Color codes and pinout may vary by manufacturer.

Figure 5-1
DS1 straight cable assembly
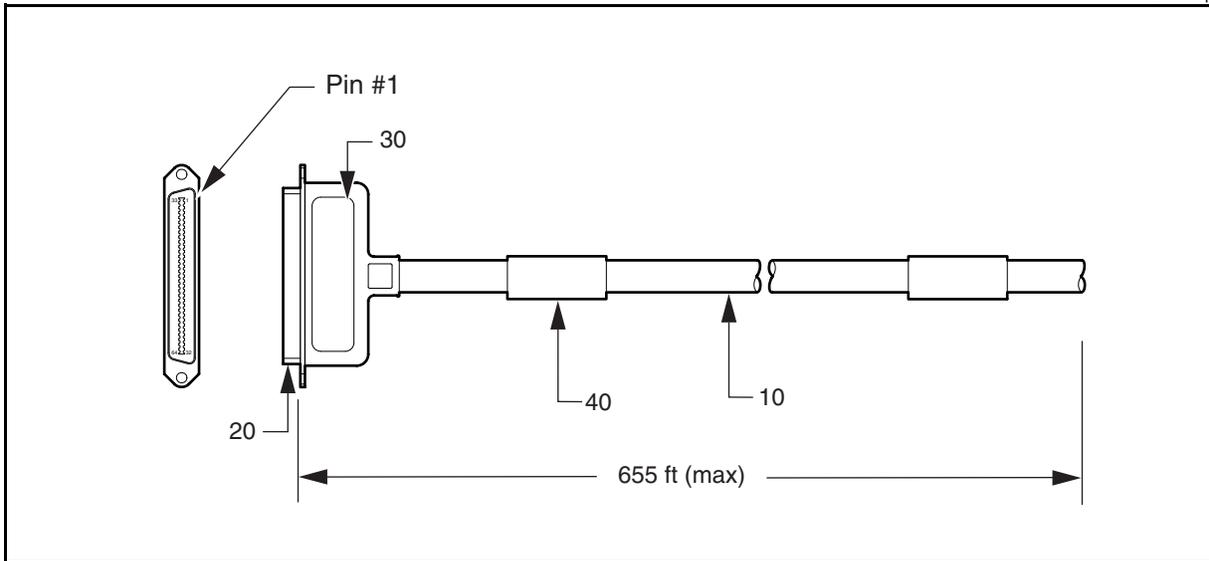
Figure 5-2
DS1 right-angle cable assembly
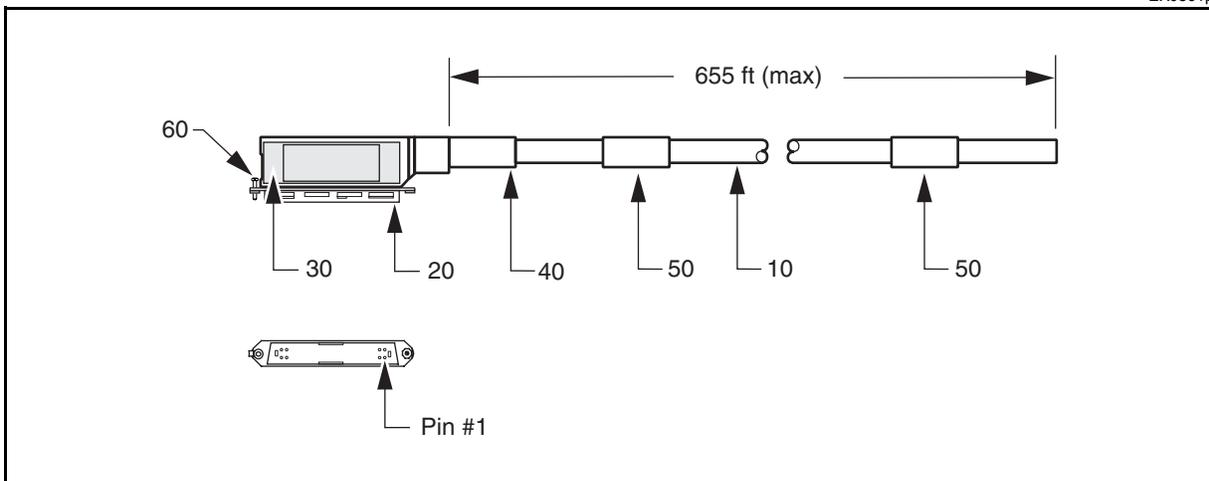
Table 5-2
DS1 J3 and J4 signal routing

DS1 Tributary	Pin #	Colour
1 (ring)	1	bl/w
1 (tip)	33	w/bl
2 (ring)	2	o/w
2 (tip)	34	w/o
3 (ring)	3	gr/w
3 (tip)	35	w/gr
4 (ring)	4	br/w
4 (tip)	36	w/br
5 (ring)	5	sl/w
5 (tip)	37	w/sl
6 (ring)	6	bl/r
6 (tip)	38	r/bl
7 (ring)	7	o/r
7 (tip)	39	r/o
8 (ring)	8	gr/r
8 (tip)	40	r/gr
9 (ring)	9	br/r
9 (tip)	41	r/br
10 (ring)	10	sl/r
10 (tip)	42	r/sl
11 (ring)	11	bl/bk
11 (tip)	43	bk/bl
12 (ring)	12	o/bk
12 (tip)	44	bk/o
13 (ring)	13	gr/bk
13 (tip)	45	bk/gr

Table 5-2 (continued)
DS1 J3 and J4 signal routing

DS1 Tributary	Pin #	Colour
14 (ring)	14	br/bk
14 (tip)	46	bk/br
15 (ring)	15	sl/bk
15 (tip)	47	bk/sl
16 (ring)	16	bl/y
16 (tip)	48	y/bl
17 (ring)	17	o/y
17 (tip)	49	y/o
18 (ring)	18	gr/y
18 (tip)	50	y/gr
19 (ring)	19	br/y
19 (tip)	51	y/br
20 (ring)	20	sl/y
20 (tip)	52	y/sl
21 (ring)	21	bl/v
21 (tip)	53	v/bl
22 (ring)	22	o/v
22 (tip)	54	v/o
23 (ring)	23	gr/v
23 (tip)	55	v/gr
24 (ring)	24	br/v
24 (tip)	56	v/br
25 (ring)	25	sl/v
25 (tip)	57	v/sl
26 (ring)	26	bl/w
26 (tip)	58	w/bl

Table 5-2 (continued)
DS1 J3 and J4 signal routing

DS1 Tributary	Pin #	Colour
27 (ring)	27	o/w
27 (tip)	59	w/o
28 (ring)	28	gr/w
28 (tip)	60	w/gr
GND	29	—
GND	61	—
GND	30	br/w
GND	62	w/br
GND	31	sl/w
GND	63	w/sl
GND	32	—
GND	64	bare (see Note)
Note: Unclad sheath drain wire		

Table 5-3
Required DS1 straight cable assembly part numbers

Item	Quantity	Description	Vendor	Part #
10	655ft (199.6m) max.	22 AWG, 30 pair, Tin Copper Cable (see Note 1)	Norcom/CDT	613M
20	1 piece	CHAMP IDC Cable Connector Screwlock Plug, 64 position, 0.085" pitch, 22 AWG (see Note 2)	Tyco Electronics	552303-1
30	1 piece	180° Snap-on Strain Relief Cover, 64 position, 0.540" to 0.610" cable diameter (see Note 1)	Tyco Electronics	569025-1
40	2 pieces	Wire and cable marker labels	WH Brady Co.	DAT-7-292-10
as required	1 piece	MI-1 64-position hand operated tool	Tyco Electronics	231880-1
Note 1: Ensure that the appropriate gauge wire, plug and snap on cover are used.				
Note 2: The listed connectors must be used to ensure proper mating with the DS1 AMP connectors on the Top I/O.				

Table 5-4
Required DS1 right-angle cable assembly part numbers

Item	Quantity	Description	Vendor	Part #
10	655ft (199.6m) max.	22 AWG, 30 pair, Tin Copper Cable (see Note 1)	Norcom/CDT	613M
20	1 piece	CHAMP IDC Cable Connector Screwlock Plug, 64 position, 0.085" pitch, 22 AWG (see Note 2)	Tyco Electronics	552303-1
30	1 piece	90° Snap-on Strain Relief Cover, 64 position, 0.540" to 0.610" cable diameter (see Note 1)	Tyco Electronics	2-552496-1
40	1 piece	Heat Shrink Tubing Polyolefin-Flexible 0.500 0.25 UL224 VW-1	Alpha Wire Co.	FIT-221V-3/4
50	2 pieces	Wire and cable marker labels	WH Brady Co.	DAT-7-292-10
60	1	Screw	Tyco Electronics	229911-1
as required	1 piece	MI-1 64-position hand operated tool	Tyco Electronics	231880-1
Note 1: Ensure that the appropriate gauge wire, plug and snap on cover are used.				
Note 2: The listed connectors must be used to ensure proper mating with the DS1 AMP connectors on the Top I/O.				

Table 5-5
Nortel Networks customer orderable items (for straight and right-angle cable assemblies)

Quantity	Description	Vendor	Part #
50 ft (15 m)	Straight, DS1 cable assembly	Nortel Networks	NTN458MD
100 ft (30 m)	Straight, DS1 cable assembly	Nortel Networks	NTN458ME
50 ft (15 m), qty 2 (includes 2 bracket kits)	Right-Angle, DS1 cable assembly	Nortel Networks	NTN458MQ
100 ft (30 m), qty 2 (includes 2 bracket kits)	Right-Angle, DS1 cable assembly	Nortel Networks	NTN458MR
as required	Straight, DS1 connector kit	Nortel Networks	NTN458ND
as required	Right-Angle, DS1 connector kit	Nortel Networks	NTN458NE
as required	DS1 Cable Assembly Bracket Kit	Nortel Networks	NTN458MT

Figure 5-3
DS3/EC-1 cable pinout and assembly

EX0870t
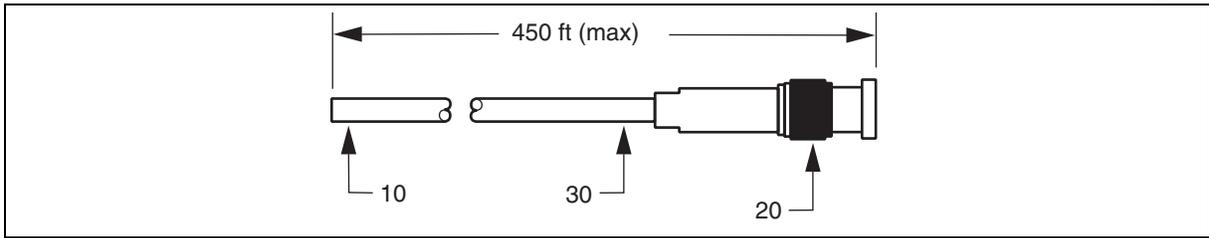
Table 5-6
Suggested DS3 cable assembly part numbers

Quantity: Two cable assemblies are required for every DS3 or EC-1 (1 for IN, 1 for OUT)			
Quantity	**Description**	**Vendor**	**Vendor part**
For 734A type cable:			
450 ft (137.16 m) max.	75-ohm Coaxial Cable	Lucent	734A
1 piece	BNC Coax Straight Plug Connector or BNC Coax Straight Plug Connector	Trompeter Elec. Huber & Suhner AG	105-1484-025 11 BNC-75-5-16C/ 122NT
2 in. (50.8 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp AMP Inc.	FIT-221V-1/2 603328-1
For 735A type cable:			
230 ft (70.1 m) max.	75-ohm Coaxial Cable	Lucent	735A COAX
1 piece	BNC Coax Straight Plug Connector or BNC Coax Straight Plug Connector	Trompeter Elec. Huber & Suhner AG	105-1484-026 11 BNC-75-2-29C/ 122NT
2 in. (50.8 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1
For RG-59B/U type cable:			
275 ft (83.82 m) max.	75-ohm Coaxial Cable 75-ohm Coaxial Cable	Comm Scope Inc. Beldon Electric	5563 8263
1 piece	BNC Coax Straight Plug Connector or BNC Coax Straight Plug Connector	Trompeter Elec. Huber & Suhner AG	105-1484-013 11 BNC-75-4-35C/ 122NT
2 in. (50.8 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1

Table 5-6 (continued)
Suggested DS3 cable assembly part numbers

Quantity: Two cable assemblies are required for every DS3 or EC-1 (1 for IN, 1 for OUT)			
Quantity	**Description**	**Vendor**	**Vendor part**
For 728A type cable:			
450 ft (137.16 m) max.	75 ¾ Coaxial Cable	Beldon Electric	9231
1 piece	BNC Coax Straight Plug Connector	Trompeter Elec.	UPL220-016
2 in. (50.8 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1

Table 5-7
DS3/EC-1 cable line build out break points

Cabling type	Max cable length and line build out (LBO) break point
734A cabling	450 ft (137.16m) max, 225 ft (68.58m) LBO break point
735A cabling	230 ft (70.10m) max, 115 ft (35.05m) LBO break-point
728A cabling	450 ft (137.16m) max, 225 ft (68.58m) LBO break-point
RG-59B/U cabling	275 ft (83.82m) max, 137.5 ft (41.91m) LBO break-point

TBOS cable pinout and assembly

One cable assembly is required for each shelf.

Figure 5-4
TBOS cable assembly
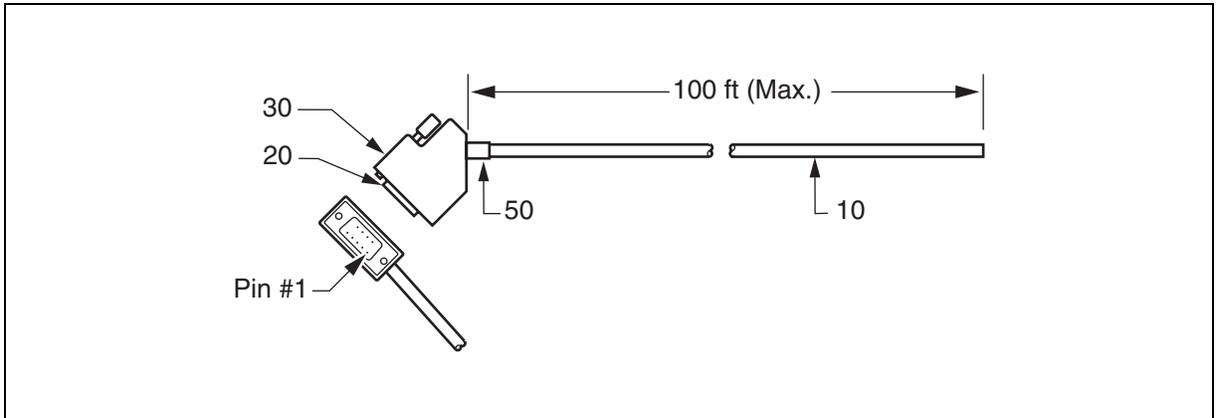
TBOS signal routing

Pin #	Signal	Color	Pin #	Signal
1	Out +	o-2w	6	N/C
2	Out -	o-1w	7	N/C
3	N/C		8	N/C
4	In +	g-2w	9	N/C
5	In -	g-1w	—	—

Table 5-8
Suggested TBOS cable assembly part numbers

Quantity: One cable assembly is required for each shelf.				
Item	**Quantity**	**Description**	**Vendor**	**Part #**
10	100 ft (30.48 m) max.	4 pairs of 24 AWG Stranded Aluminum Poly Shield	Belden Wire and Cable Company	9504
20	1 piece	Conn. D-Sub D-Sub Array 0.109 Pitch, Male or Conn. D-Sub D-Sub Array 0.109 Pitch, Male	Cinch Connector AMP Inc.	234-09-24-120 205204-4
30	1 piece	Conn. Hood D-Sub D-Sub Array	CONEC Corp.	165X00579A

Table 5-8 (continued)
Suggested TBOS cable assembly part numbers

Quantity: One cable assembly is required for each shelf.				
Item	**Quantity**	**Description**	**Vendor**	**Part #**
40	4 piece	Connector Contact D-Sub 20-24 AU or Connector Contact D-Sub 20-24 AU	Cinch Connector AMP Inc.	402-30-14-212 2-66506-4
50	4 in. (101.6 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1
Note: One cable assembly is required per shelf.				

RS-232 null modem cable pinout and assembly

One RS-232 null modem cable assembly is required for each shelf.

Figure 5-5
RS-232 null modem cable assembly
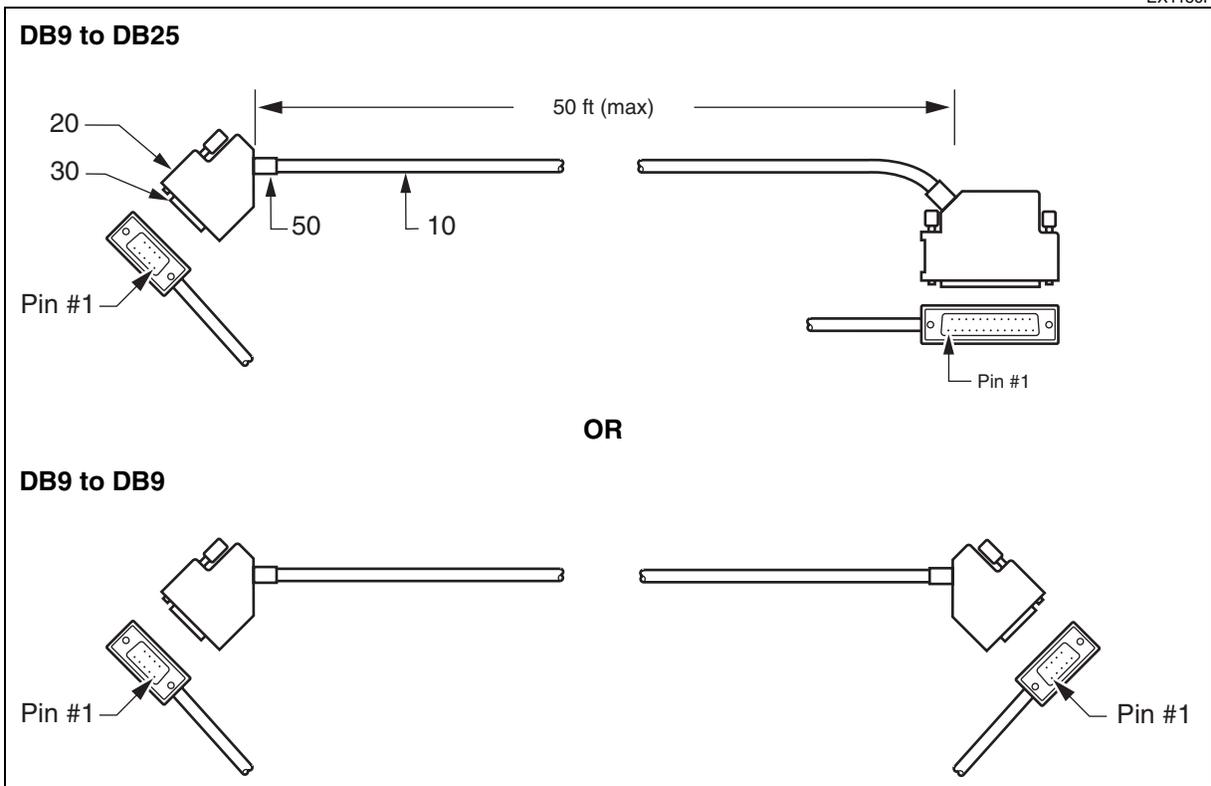
Table 5-9
RS-232 null modem signal routing, DB9 to DB9

9-pin male connector pin #	Signal	Colour	9-pin male connector pin #
1	DCD	V	1
2	RxD	R	2
3	TxD	BR	3
4	DTR	W/BK/BR	4
5	GND	BL	5
6	DSR	G	6
7	RTS	O	7
8	CTS	Y	8
9	N/C	BK	9

Table 5-10
RS-232 null modem signal routing, DB9 to DB25

9-pin female connector pin #	Signal	Colour	25-pin male connector pin #
1	DCD	V	8
2	RxD	R	3
3	TxD	BR	2
4	DTR	W/BK/BR	20
5	GND	BL	7
6	DSR	G	6
7	RTS	O	4
8	CTS	Y	5
9	N/C	BK	N/C

Table 5-11
Suggested RS-232 null modem cable assembly part numbers

| Item	Quantity	Description	Vendor	Part #
10	50 ft (15.01m) max,	24 AWG 10 Cond. TND PVC Ins., SHD W or 24 AWG 10 Cond. TND PVC Ins., SHD W	Belden Wire and Cable Company Madison Cable Corp.	9540 10RFB00004
20	1 piece	Conn. Hood D-Sub D-Sub Array	CONEC Corp.	165X00579A
30	1 piece	Conn. Housing D-Sub D-Sub Array or Conn. Housing D-Sub D-Sub Array	Cinch connector AMP Inc.	234-09-21-120 205204-1
40	8 piece	Connector Contact D-Sub 20-24 AU or Connector Contact D-Sub 20-24 AU	Cinch connector AMP Inc.	402-30-14-212 2-66506-4
50	4 in. (101.6 mm)	Heat Shrink Tubing TBG, Polyolefin, B or Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1
Note: One cable assembly is required per shelf.				

Shelf power cable pinout and assembly

One power cable assembly is required for each shelf. Use the power cable assembly appropriate for your equipment frame power distribution panel.

Standard shelf power cable assembly

The OPTera Metro 3500 shelf can be powered by a Nortel Networks breaker interface panel (BIP). Several options exist for power distribution depending on the BIP cables you order.

BIP cables for BIP NTN458RA

Use the following to assemble the shelf power cable between the BIP and the OPTera Metro 3500 shelf or DS1 service module (DSM):

- Use BIP cable NTN458MS or NTN458MU to connect power to:
    — one OPTera Metro 3500 shelf, or
    — one Universal OPTera Metro 3500 shelf, or
    — one DSM shelf

    Note 1: NTN458MS is 12 AWG cabling. See Figure 5-8 on page 5-17.

    Note 2: NTN458MU is 10 AWG cabling. See Figure 5-9 on page 5-18.

- Use BIP cable NTN458ZB to connect power to:
  — up to four OPTera Metro 3500 shelves, or
  — up to four Universal OPTera Metro 3500 shelves, or
  — up to five DSM shelves, or
  — any combination up to five elements within the bay
  Note: NTN458ZB is 10 AWG cabling. See Figure 5-10 on page 5-19.

- Use BIP cable NTN458ZC to connect power to:
  — one OPTera Metro 3500 shelf and seven DSM shelves, or
  — one Universal OPTera Metro 3500 shelf and seven DSM shelves, or
  — up to eight DSM shelves
  Note: NTN458ZC is 12 AWG cabling. See Figure 5-11 on page 5-22.

- Use BIP cable NTN458ZD to connect power to:
  — up to four OPTera Metro 3500 shelves, or
  — up to four Universal OPTera Metro 3500 shelves, or
  — up to eight DSM shelves, or
  — any combination up to eight elements within the bay
  Note: NTN458ZD is 10 AWG cabling. See Figure 5-12 on page 5-25.

See Figure 5-7 on page 5-16.

DSM BIP cable assembly
(required for Hardware Rel 5 of DSM OAM or earlier)

In Hardware Release 5 of the DSM OAM or earlier, the DSM BIP cable assembly for the NTN458RA BIP is made up of two segments, one short segment and one long segment. The short segment is delivered with the DSM and consists of ring terminal connectors at the DSM shelf connected by wire to Mate-N-Lok connectors. The long segment can be NTN458MS, NTN458MU, NTN458ZB, NTN458ZC, or NTN458ZD. See:

- Figure 5-6 on page 5-15
- Figure 5-7 on page 5-16

Note: For Hardware Release 6 and later versions of the DSM OAM, you do not need a DSM adapter cable. The Mate-N-Lok connectors on the BIP cable connect directly to receptacles on the DSM OAM.

Figure 5-6
DSM adapter cable (required for DSM OAM HW Rel 5 or earlier)

EX0961p
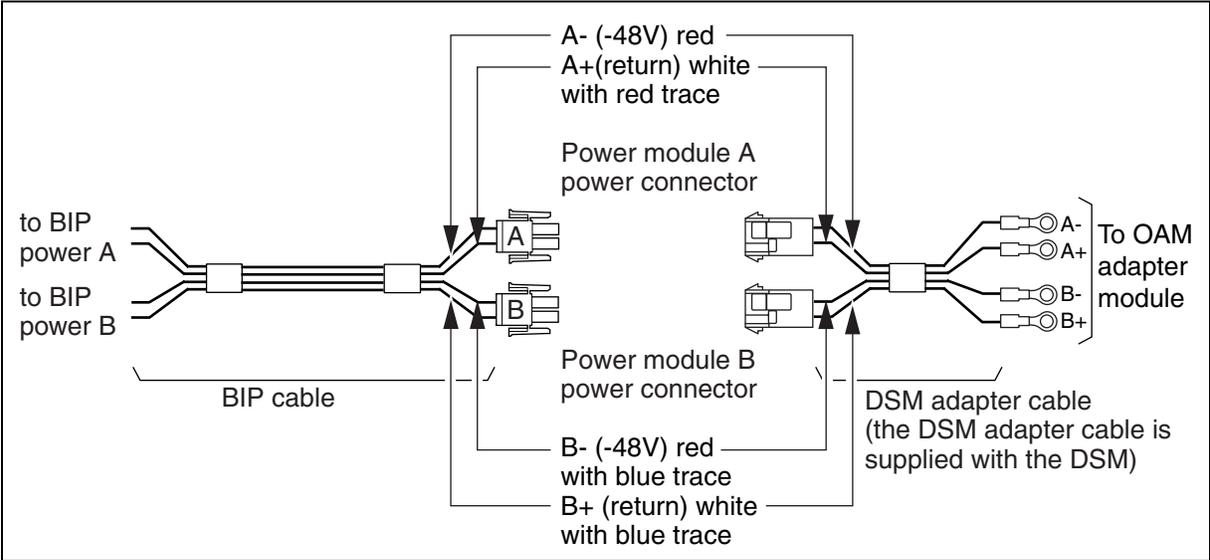
Figure 5-7
BIP cable assembly from a shelf to the BIP
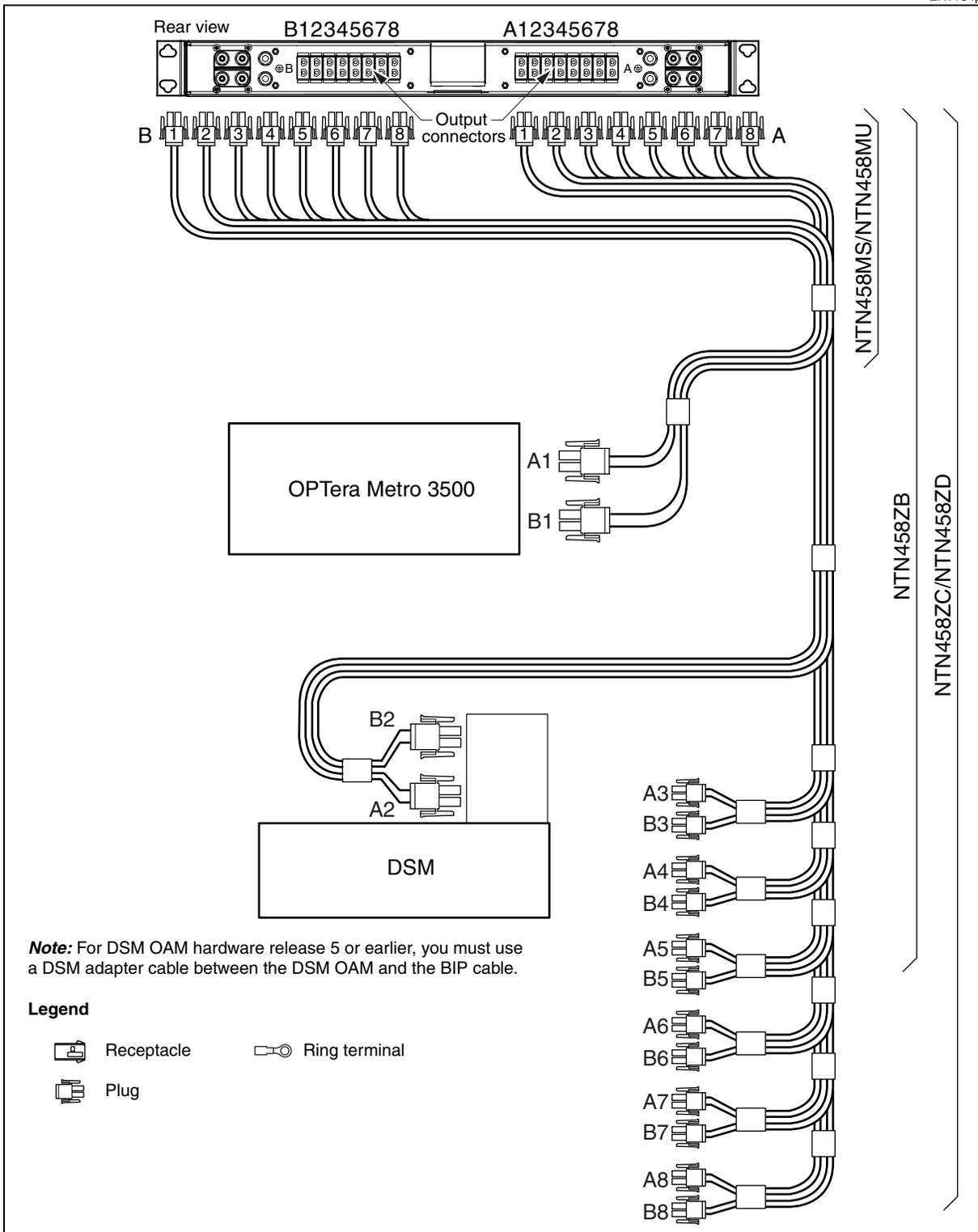
Figure 5-8
BIP cable components for NTN458MS
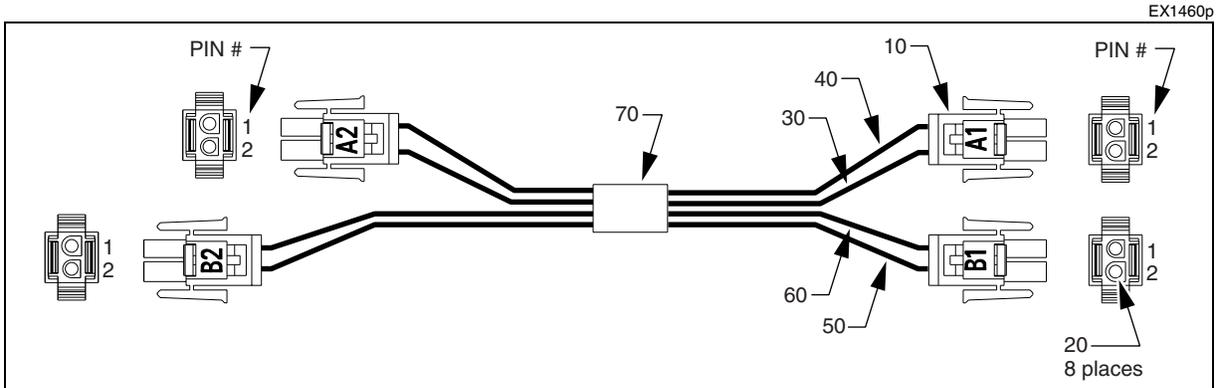
Table 5-12
Cable connector orientation for NTN458MS

From		To		With colour	Signal
Pin #	**Connector**	**Pin #**	**Connector**		
1	A1	1	A2	White/Red	A-RET
2	A1	2	A2	Red	A-BATT
1	B1	1	B2	White/Blue	B-RET
2	B1	2	B2	Red/Blue	B-BATT

Table 5-13
Cabling stock list for NTN458MS

Item	Quantity	Description	Vendor	Part #
10	4	Connector body, plug, Mate-N-Lok 1x2	AMP/Tyco	770017-1
20	8	Connector contact, socket, Mate-N-Lok for 12-14 AWG	AMP/Tyco	194213-1
30	131.0 in (332.74 cm)	12 AWG 65x30 cable, Red	Judd Wire	H0104023 Red
40	131.0 in (332.74 cm)	12 AWG 65x30 cable, Wht1Red	Judd Wire	H0104023 Wht1Red
50	140.0 in (355.60 cm)	12 AWG 65x30 cable, Red1Blu	Judd Wire	H0104023 Red1Blu
60	140.0 in (355.60 cm)	12 AWG 65x30 cable, Wht1Blu	Judd Wire	H0104023 Wht1Blu
70	1	Wire and cable marker labels, 0.8 in (2.03 cm) W x 1.437 in (3.65 cm) H	WH Brady Co.	THT-63-427-3.5 or similar

Figure 5-9
BIP cable components for NTN458MU
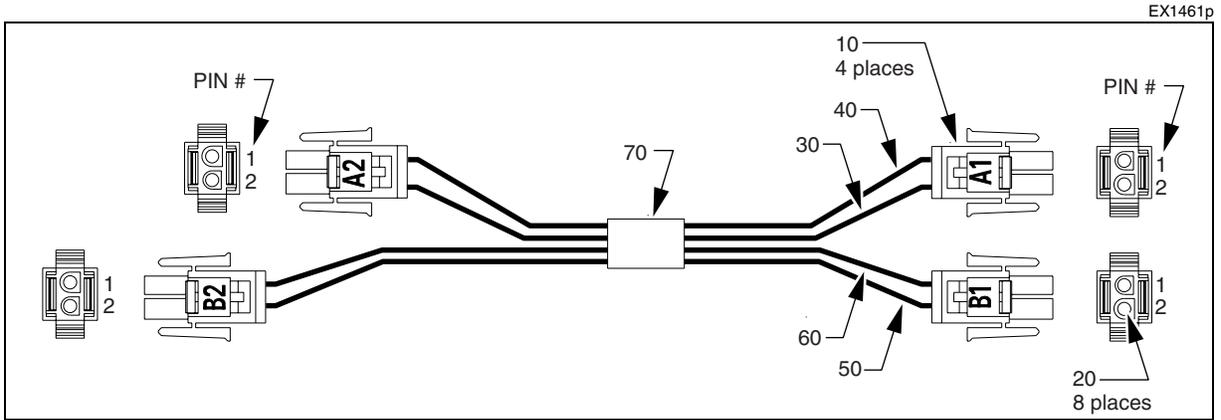
Table 5-14
Cable connector orientation for NTN458MU

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
1	A1	1	A2	White/Red	A-RET
2	A1	2	A2	Red	A-BATT
1	B1	1	B2	White/Blue	B-RET
2	B1	2	B2	Red/Blue	B-BATT

Table 5-15
Cabling stock list for NTN458MU

Item	Quantity	Description	Vendor	Part #
10	4	Connector body, plug, Mate-N-Lok 1x2	AMP/Tyco	770017-1
20	8	Connector contact, socket, Mate-N-Lok for 10 AWG	AMP/Tyco	194211-1
30	131.0 in (332.74 cm)	10 AWG 105x30 cable, Red	Judd Wire	H0104016 Red
40	131.0 in (332.74 cm)	10 AWG 105x30 cable, Wht1Red	Judd Wire	H0104016 Wht1Red
50	140.0 in (355.60 cm)	10 AWG 105x30 cable, Red1Blu	Judd Wire	H0104016 Red1Blu
60	140.0 in (355.60 cm)	10 AWG 105x30 cable, Wht1Blu	Judd Wire	H0104016 Wht1Blu
70	1	Wire and cable marker labels, 0.8 in (2.03 cm) W x 1.437 in (3.65 cm) H	WH Brady Co.	THT-63-427-3.5 or similar

Figure 5-10
BIP cable components for NTN458ZB

EX1462p

DETAIL A
Connector lay-out
for A1 to A5 connectors

DETAIL B
Connector lay-out
for B1 to B5 connectors

DETAIL C
Connector lay-out
for A1 to A5 connectors

DETAIL D
Connector lay-out
for B1 to B5 connectors
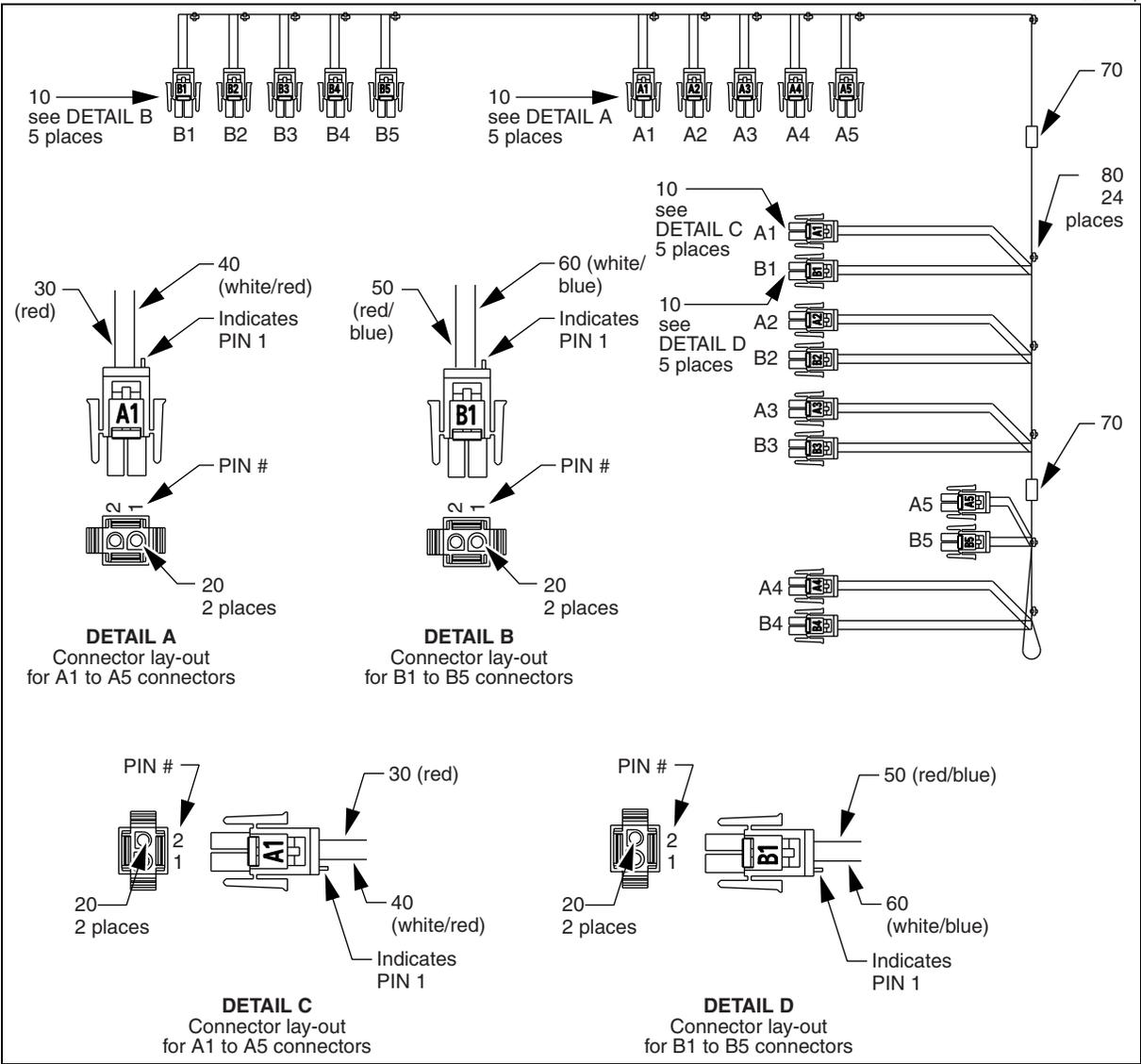
Table 5-16
Cable connector orientation for NTN458ZB

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
1	A1	1	A1	White/Red	A-RET
2	A1	2	A1	Red	A-BATT
1	B1	1	B1	White/Blue	B-RET
2	B1	2	B1	Red/Blue	B-BATT
1	A2	1	A2	White/Red	A-RET
2	A2	2	A2	Red	A-BATT
1	B2	1	B2	White/Blue	B-RET
2	B2	2	B2	Red/Blue	B-BATT
1	A3	1	A3	White/Red	A-RET
2	A3	2	A3	Red	A-BATT
1	B3	1	B3	White/Blue	B-RET
2	B3	2	B3	Red/Blue	B-BATT
1	A4	1	A4	White/Red	A-RET
2	A4	2	A4	Red	A-BATT
1	B4	1	B4	White/Blue	B-RET
2	B4	2	B4	Red/Blue	B-BATT
1	A5	1	A5	White/Red	A-RET
2	A5	2	A5	Red	A-BATT
1	B5	1	B5	White/Blue	B-RET
2	B5	2	B5	Red/Blue	B-BATT

Table 5-17
Cabling stock list for NTN458ZB

Item	Quantity	Description	Vendor	Part #
10	20	Connector body, plug, Mate-N-Lok 1x2	AMP/Tyco	770017-1
20	40	Connector contact, socket, Mate-N-Lok for 10 AWG	AMP/Tyco	194211-1

Table 5-17 (continued)
Cabling stock list for NTN458ZB

Item	Quantity	Description	Vendor	Part #
30	357.0 in (906.78 cm)	10 AWG 105x30 cable, Red	Judd Wire	H0104016 Red
40	357.0 in (906.78 cm)	10 AWG 105x30 cable, Wht1Red	Judd Wire	H0104016 Wht1Red
50	408.0 in (1036.32 cm)	10 AWG 105x30 cable, Red1Blu	Judd Wire	H0104016 Red1Blu

Figure 5-11
BIP cable components for NTN458ZC
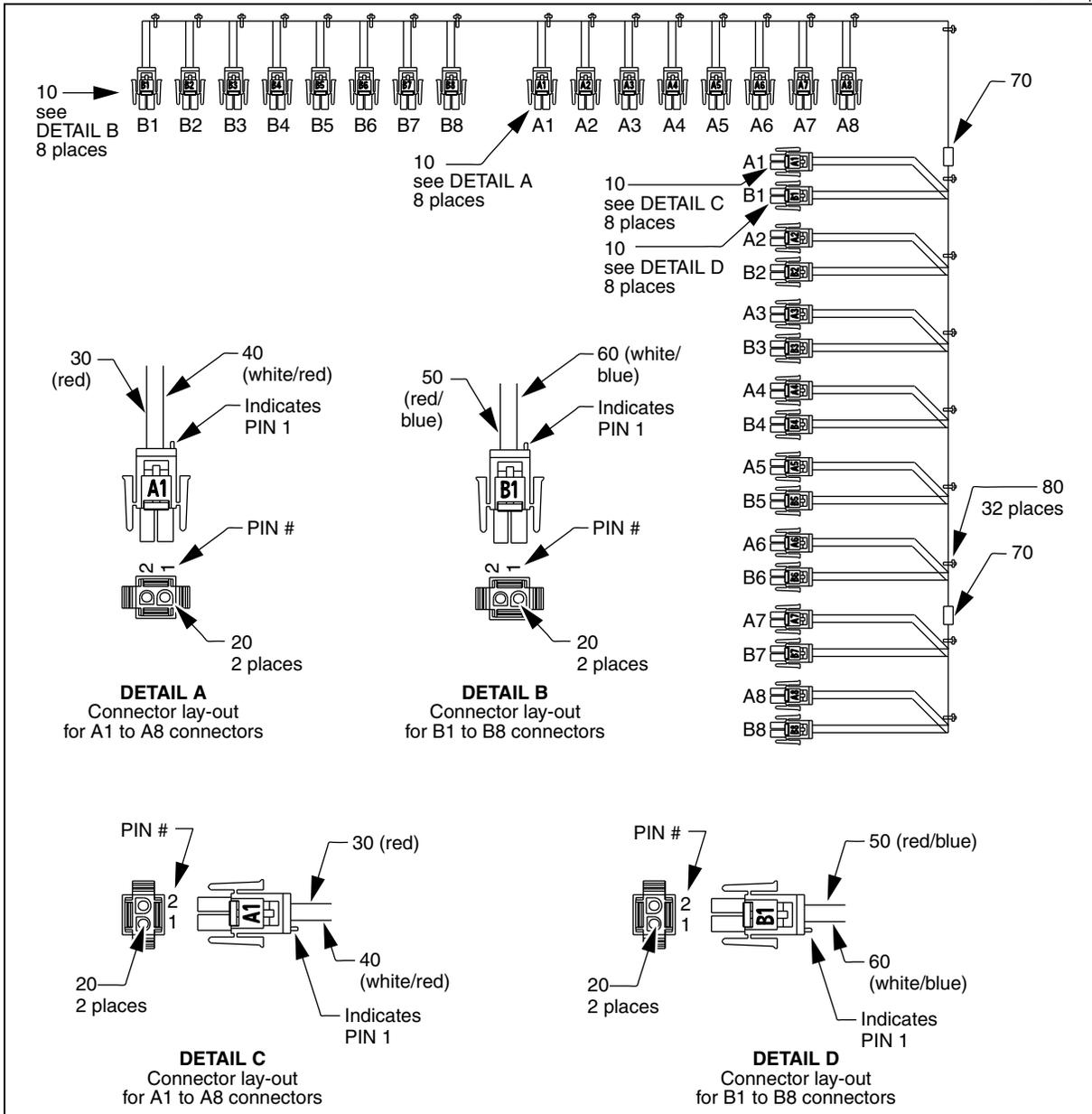
Table 5-18
Cable connector orientation for NTN458ZC

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
1	A1	1	A1	White/Red	A-RET
2	A1	2	A1	Red	A-BATT
1	B1	1	B1	White/Blue	B-RET
2	B1	2	B1	Red/Blue	B-BATT
1	A2	1	A2	White/Red	A-RET
2	A2	2	A2	Red	A-BATT
1	B2	1	B2	White/Blue	B-RET
2	B2	2	B2	Red/Blue	B-BATT
1	A3	1	A3	White/Red	A-RET
2	A3	2	A3	Red	A-BATT
1	B3	1	B3	White/Blue	B-RET
2	B3	2	B3	Red/Blue	B-BATT
1	A4	1	A4	White/Red	A-RET
2	A4	2	A4	Red	A-BATT
1	B4	1	B4	White/Blue	B-RET
2	B4	2	B4	Red/Blue	B-BATT
1	A5	1	A5	White/Red	A-RET
2	A5	2	A5	Red	A-BATT
1	B5	1	B5	White/Blue	B-RET
2	B5	2	B5	Red/Blue	B-BATT
1	A6	1	A6	White/Red	A-RET
2	A6	2	A6	Red	A-BATT
1	B6	1	B6	White/Blue	B-RET
2	B6	2	B6	Red/Blue	B-BATT
1	A7	1	A7	White/Red	A-RET
2	A7	2	A7	Red	A-BATT
1	B7	1	B7	White/Blue	B-RET

Table 5-18 (continued)
Cable connector orientation for NTN458ZC

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
2	B7	2	B7	Red/Blue	B-BATT
1	A8	1	A8	White/Red	A-RET
2	A8	2	A8	Red	A-BATT
1	B8	1	B8	White/Blue	B-RET
2	B8	2	B8	Red/Blue	B-BATT

Table 5-19
Cabling stock list for NTN458ZC

Item	Quantity	Description	Vendor	Part #
10	32	Connector body, plug, Mate-N-Lok 1x2	AMP/Tyco	770017-1
20	64	Connector contact, socket, Mate-N-Lok for 12-14 AWG	AMP/Tyco	194213-1
30	597.0 in (1516.38 cm)	12 AWG 65x30 cable, Red	Judd Wire	H0104023 Red
40	597.0 in (1516.38 cm)	12 AWG 65x30 cable, Wht1Red	Judd Wire	H0104023 Wht1Red
50	732.0 in (1859.28 cm)	12 AWG 65x30 cable, Red1Blu	Judd Wire	H0104023 Red1Blu
60	732.0 in (1859.28 cm)	12 AWG 65x30 cable, Wht1Blu	Judd Wire	H0104023 Wht1Blu
70	2	Wire and cable marker labels, 0.8 in (2.03 cm) W x 1.437 in (3.65 cm) H	WH Brady Co.	THT-63-427-3.5 or similar
80	32	Cable tie, locking - max bundle diameter: 0.87 in (2.21 cm)		

Figure 5-12
BIP cable components for NTN458ZD

EX1463p

DETAIL A
Connector lay-out
for A1 to A8 connectors

DETAIL B
Connector lay-out
for B1 to B8 connectors

DETAIL C
Connector lay-out
for A1 to A8 connectors

DETAIL D
Connector lay-out
for B1 to B8 connectors
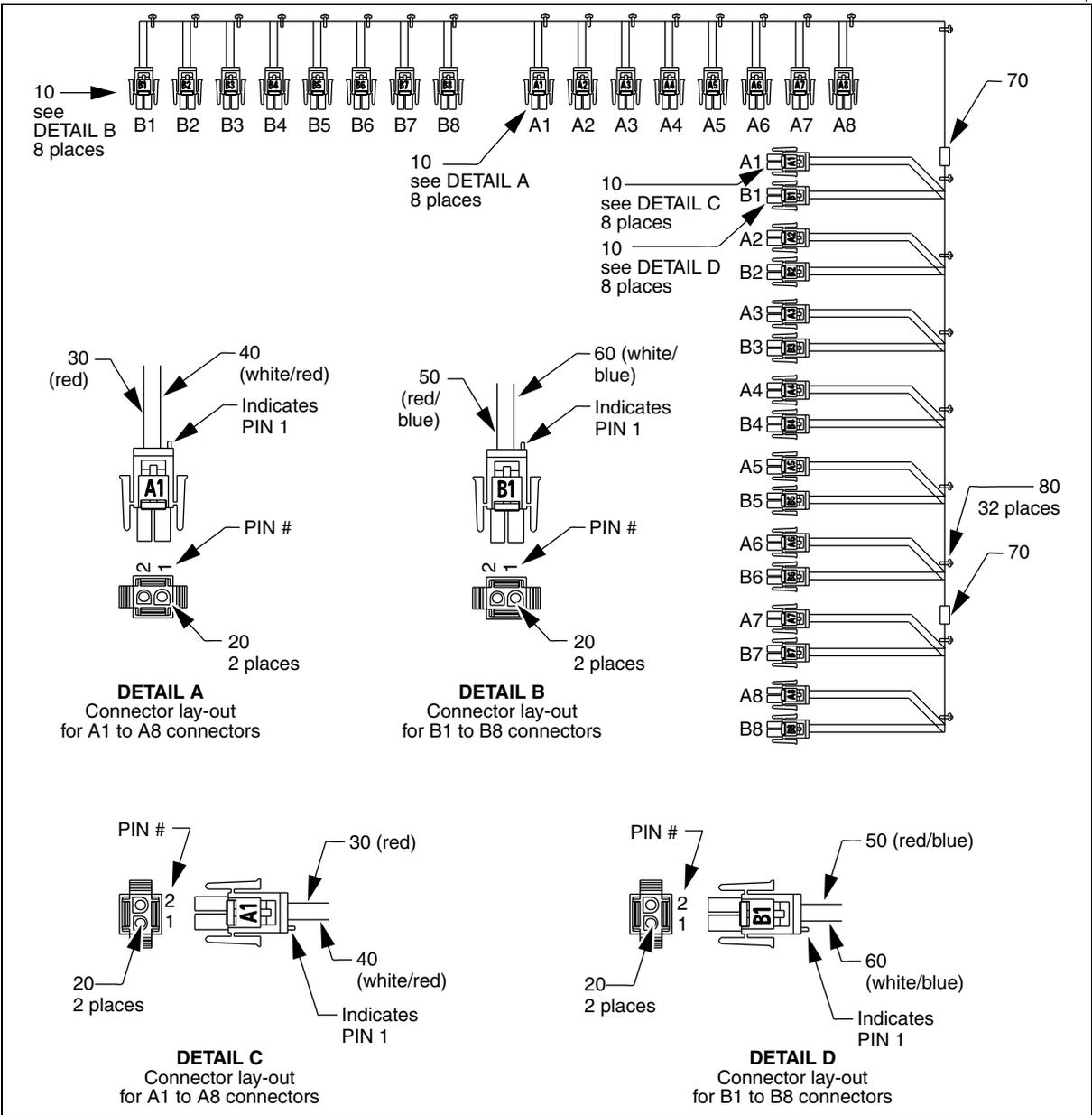
Table 5-20
Cable connector orientation for NTN458ZD

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
1	A1	1	A1	White/Red	A-RET
2	A1	2	A1	Red	A-BATT
1	B1	1	B1	White/Blue	B-RET
2	B1	2	B1	Red/Blue	B-BATT
1	A2	1	A2	White/Red	A-RET
2	A2	2	A2	Red	A-BATT
1	B2	1	B2	White/Blue	B-RET
2	B2	2	B2	Red/Blue	B-BATT
1	A3	1	A3	White/Red	A-RET
2	A3	2	A3	Red	A-BATT
1	B3	1	B3	White/Blue	B-RET
2	B3	2	B3	Red/Blue	B-BATT
1	A4	1	A4	White/Red	A-RET
2	A4	2	A4	Red	A-BATT
1	B4	1	B4	White/Blue	B-RET
2	B4	2	B4	Red/Blue	B-BATT
1	A5	1	A5	White/Red	A-RET
2	A5	2	A5	Red	A-BATT
1	B5	1	B5	White/Blue	B-RET
2	B5	2	B5	Red/Blue	B-BATT
1	A6	1	A6	White/Red	A-RET
2	A6	2	A6	Red	A-BATT
1	B6	1	B6	White/Blue	B-RET
2	B6	2	B6	Red/Blue	B-BATT
1	A7	1	A7	White/Red	A-RET
2	A7	2	A7	Red	A-BATT
1	B7	1	B7	White/Blue	B-RET

Table 5-20 (continued)
Cable connector orientation for NTN458ZD

From		To		With colour	Signal
Pin #	Connector	Pin #	Connector		
2	B7	2	B7	Red/Blue	B-BATT
1	A8	1	A8	White/Red	A-RET
2	A8	2	A8	Red	A-BATT
1	B8	1	B8	White/Blue	B-RET
2	B8	2	B8	Red/Blue	B-BATT

Table 5-21
Cabling stock list for NTN458ZD

Item	Quantity	Description	Vendor	Part #
10	32	Connector body, plug, Mate-N-Lok 1x2	AMP/Tyco	770017-1
20	64	Connector contact, socket, Mate-N-Lok for 10 AWG	AMP/Tyco	194211-1
30	597.0 in (1516.38 cm)	10 AWG 105x30 cable, Red	Judd Wire	H0104016 Red
40	597.0 in (1516.38 cm)	10 AWG 105x30 cable, Wht1Red	Judd Wire	H0104016 Wht1Red
50	732.0 in (1859.28 cm)	10 AWG 105x30 cable, Red1Blu	Judd Wire	H0104016 Red1Blu
60	732.0 in (1859.28 cm)	10 AWG 105x30 cable, Wht1Blu	Judd Wire	H0104016 Wht1Blu
70	2	Wire and cable marker labels, 0.8 in (2.03 cm) W x 1.437 in (3.65 cm) H	WH Brady Co.	THT-63-427-3.5 or similar
80	32	Cable tie, locking - max bundle diameter: 0.87 in (2.21 cm)		

RS-232 DCE DB25 cable pinout and assembly

One DCE DB25 cable assembly is required for each shelf.

Figure 5-13
RS-232 DCE cable assembly
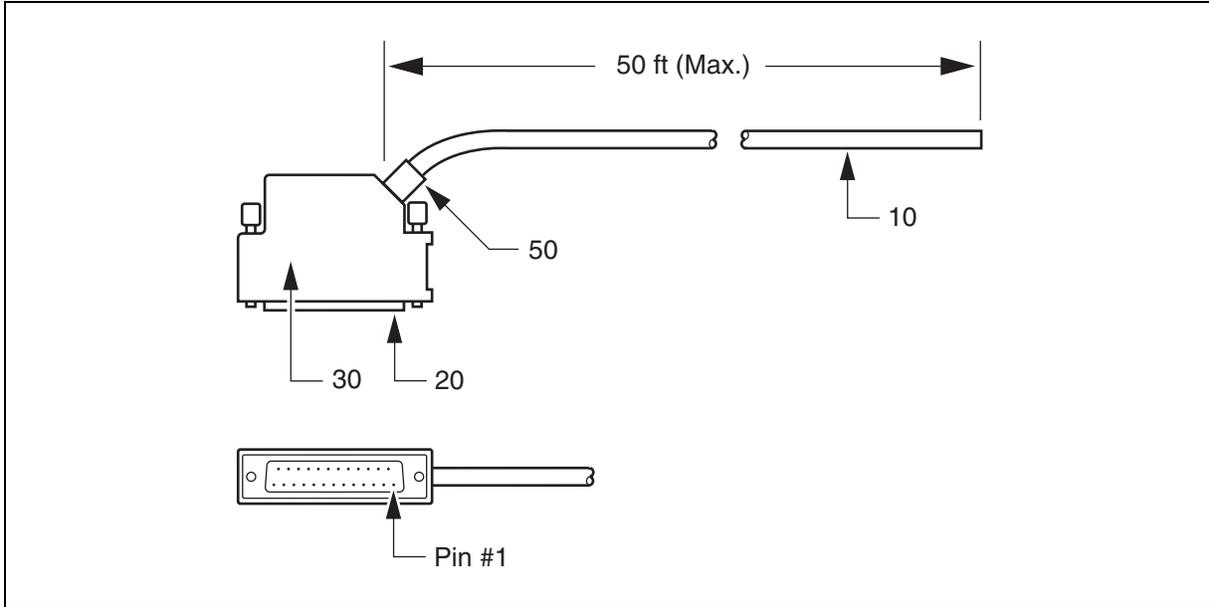
Table 5-22
RS-232 DCE signal routing

Pin #	Signal	Colour
1	GND	BK
2	Rx	BR
3	Tx	R
4	RTS	O
5	CTS	Y
6	DSR	G
7	GND	BL
8	DCD	V
9	N/C	
10	N/C	
11	N/C	
12	N/C	
13	N/C	
14	N/C	
15	N/C	
16	N/C	
17	N/C	
18	N/C	
19	N/C	
20	DTR	W/BK/BR
21	N/C	
22	N/C	
23	N/C	
24	N/C	
25	N/C	

Table 5-23
Suggested RS-232 DCE assembly part numbers

Item	Quantity	Description	Vendor	Part #
10	50 ft (15.01m) max.	24AWG 7x32,Tin CU Stranded SHD 24AWG 7x32,Tin CU Stranded SHD	Alpha Wire Delco Wire & Cable	5120/25C 31825
20	1	Conn. Housing D-Sub D-Sub Array Conn. Housing D-Sub D-Sub Array	AMP Inc. Cinch Connector	207464-2 234-25-24-120
30	1	Conn. Hood D-Sub D-Sub Array	CONEC Corp	165X00599A
40	8	Conn. Contact D-Sub 20-24 AU Conn. Contact D-Sub 20-24 AU	AMP Inc. Cinch Connector	2-66506-4 402-30-14-212
50	3 in. (76.2 mm)	Heat Shrink Tubing TBG, Polyolefin, B Heat Shrink Tubing TBG, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1

Figure 5-14
BITS wire wrap cable pinout and assembly

EX0863p

600 ft (Max.)

10
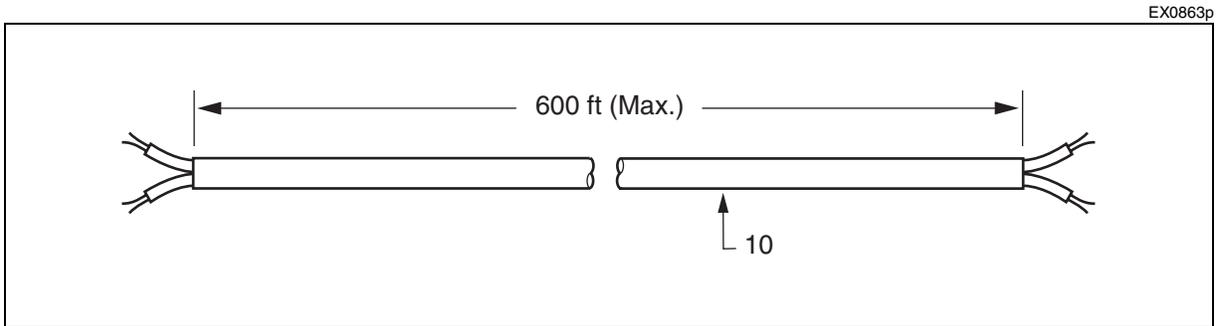
Table 5-24
Suggested BITS cable part numbers

Item	Quantity	Description	Vendor	Part #
10	600 ft (182.88 m) max.	2 pr, Solid, Individual pr. shield	General Cable Co.	By description

Office alarm cable pinout and assembly

Office alarm cables are used as required for each shelf.

Figure 5-15
LOAM wire wrap cable assembly

EX0862P
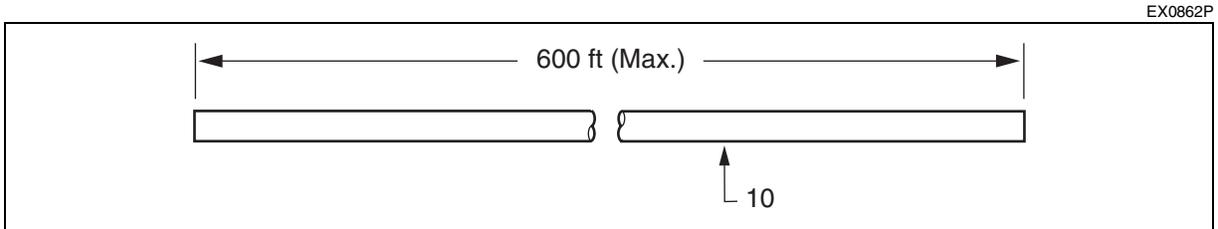
Table 5-25
Suggested office alarm cable part numbers

Item	Quantity	Description	Vendor	Part #
10	600 ft (182.88 m) max.	22AWG, 12x22 pr. Solid Shielded Cable	Lucent	607C 12/22 RVAR

Environmental alarm cable pinout and assembly

Environmental alarm cables are used as required for each shelf.

Figure 5-16
LOAM wire wrap cable assembly

EX0862p

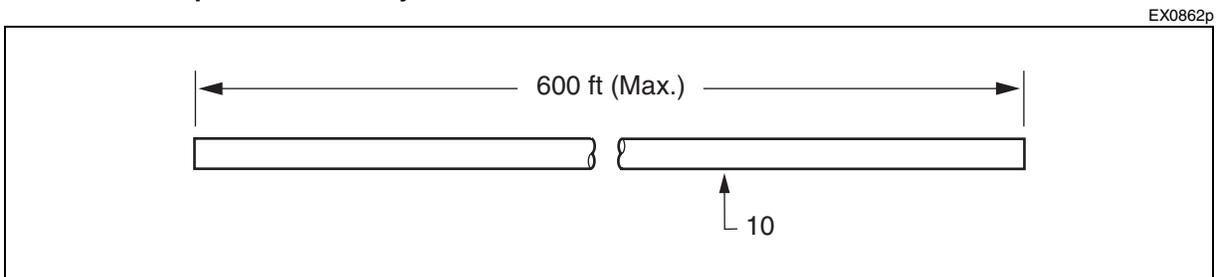**Table 5-26**
Environmental alarm cable part numbers

Item	Quantity	Description	Vendor	Part #
10	600 ft (182.88 m) max.	22 AWG, 16 pr. Solid Cable	Lucent	608 16/22 RVAR

Figure 5-17
NP Ethernet RJ-45 MDI cable pinout and assembly

EX0864p
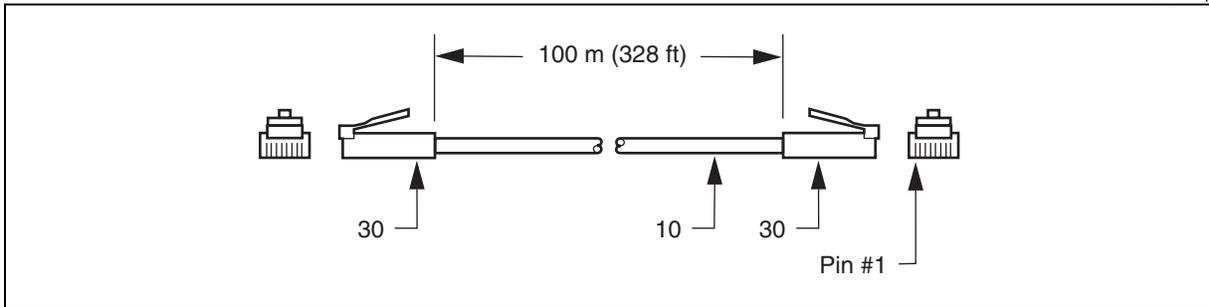
Table 5-27
Ethernet signal routing - straight

Connector # 1			Connector # 2		
Pin #	Signal	Colour	Pin #	Signal	Colour
1	Ethernet Out+	SL	1	Ethernet Out+	SL
2	Ethernet Out-	Y	2	Ethernet Out-	Y
3	Ethernet In+	O	3	Ethernet In+	O
4	N/C		4	N/C	
5	N/C		5	N/C	
6	Ethernet In-	W	6	Ethernet In-	W
7	N/C		7	N/C	
8	N/C		8	N/C	

Note 1: All connection to and from ILAN to another ILAN always use flipped cables.

Note 2: Direct connections from COLAN to Preside or to a PC require flipped cables. Connections to any device from COLAN through a third party hub requires straight cables.

Note 3: The Ethernet cables NT7E44JE/JU/JV can be used to connect ILAN to an OC-48 Shelf Processor (NT7E20GD/KA).

Table 5-28
Ethernet signal routing - flipped

Connector # 1			Connector # 2		
Pin #	Signal	Colour	Pin #	Signal	Colour
1	Ethernet Out+	SL	3	Ethernet In+	SL
2	Ethernet Out-	Y	6	Ethernet In-	Y
3	Ethernet In+	O	1	Ethernet Out+	O
4	N/C		4	N/C	
5	N/C		5	N/C	
6	Ethernet In-	W	2	Ethernet Out-	W
7	N/C		7	N/C	
8	N/C		8	N/C	

Table 5-29
Suggested Ethernet RJ-45 cable part numbers

Item	Quantity	Description	Vendor	Part #
10	328 ft (99.97 m) max.	IBDN plus Cable 4 PR 24 AWG, CMR, Category 5	Nordx/CDT	24570036 **Note**: Nordx part numbers 24570036 and 24570034 are electrically equivalent.
20	2 piece	Wire & Cable Marker Label / Wire & Cable Marker Label	W H Brady Co. / Eletronic Programming Corp.	DAT-52-642-10 / AVW10F
30	2 piece	Conn. Teledapt Tel Array	AMP Inc.	5-555179-2

Note 1: For visibility purposes (SDCC only), use flipped Ethernet cables to connect to ILAN ports on the I/O of the OPTera Metro 3500 shelf.

Note 2: For ESWD or telnet capabilities, connect a straight Ethernet cable to the COLAN port.

Note 3: For any IP capabilities, (i.e: telnet, FTP, ESWD) you need the COLAN port. ESWD uses the FTP protocol to deliver the loads to the Network processor.

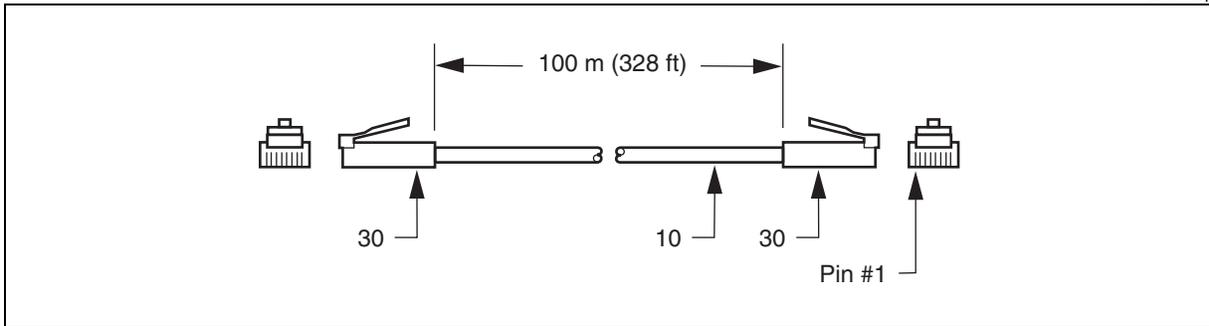**Figure 5-18**
Ethernet RJ-45 MDI cable pinout and assembly

EX0892p

Table 5-30
Ethernet signal routing - straight

Connector # 1			Connector # 2		
Pin #	Signal	Colour	Pin #	Signal	Colour
1	Ethernet Out+	SL	1	Ethernet Out+	SL
2	Ethernet Out-	Y	2	Ethernet Out-	Y
3	Ethernet In+	O	3	Ethernet In+	O
4	Termination 1		4	Termination 1	
5	Termination 2		5	Termination 2	
6	Ethernet In-	W	6	Ethernet In-	W
7	Termination 3		7	Termination 3	
8	Termination 4		8	Termination 4	

Note 1: Use flipped cables for connections to and from 4x100BT to another 4x100BT (or COLAN).

Note 2: Direct connections from COLAN to Preside or to a PC require flipped cables. Connections to any device from COLAN through a third party hub requires straight cables.

Note 3: The Ethernet cables NT7E44JE/JU/JV can be used to connect ILAN to an OC-48 Shelf Processor (NT7E20GD/KA).

Table 5-31
Ethernet signal routing - flipped

Connector # 1			Connector # 2		
Pin #	Signal	Colour	Pin #	Signal	Colour
1	Ethernet Out+	SL	3	Ethernet In+	SL
2	Ethernet Out-	Y	6	Ethernet In-	Y
3	Ethernet In+	O	1	Ethernet Out+	O
4	Termination 1		4	Termination 1	
5	Termination 2		5	Termination 2	
6	Ethernet In-	W	6	Ethernet Out-	W
7	Termination 3		7	Termination 3	
8	Termination 4		8	Termination 4	

Table 5-32
Suggested Ethernet RJ-45 cable part numbers

| Item	Quantity	Description	Vendor	Part #
10	328 ft (99.97 m) max	IBDN plus Cable 4 PR 24 AWG, CMR, Category 5	Nordx/CDT	24570036 **Note**: Nordx part numbers 24570036 and 24570034 are electrically equivalent.
20	2 piece	Wire & Cable Marker Label Wire & Cable Marker Label	W H Brady Co. Eletronic Programming Corp.	DAT-52-642-10 AVW10F
30	2 piece	Conn. Teledapt Tel Array	AMP Inc.	5-555179-2

Figure 5-19
X.25 DSUB cable assembly
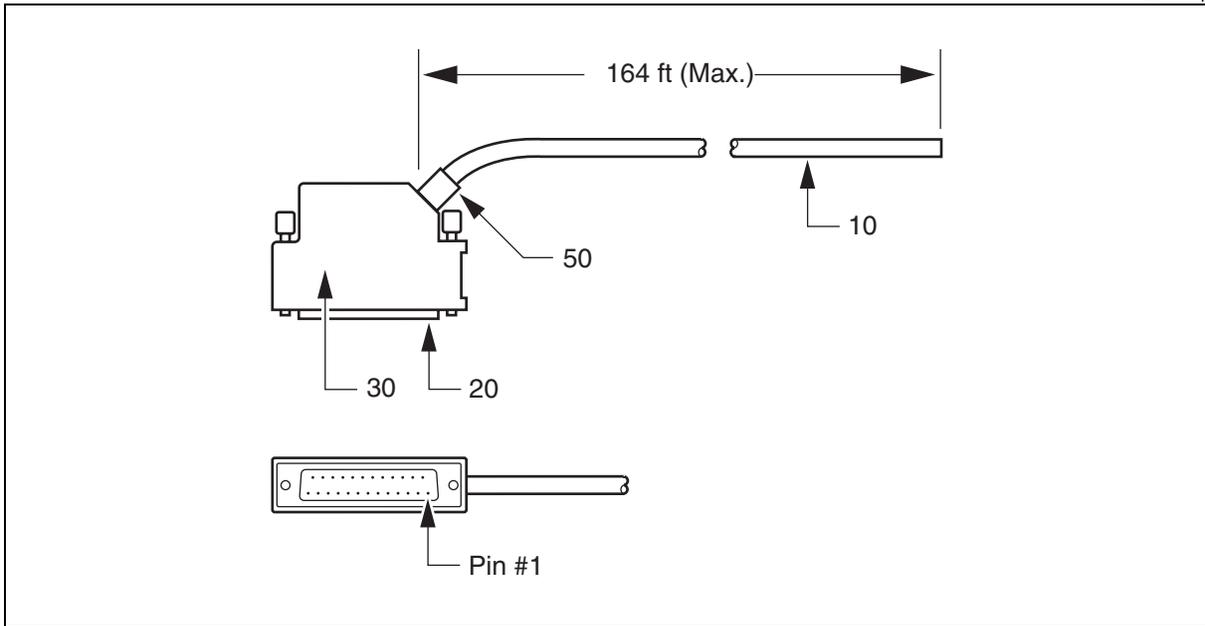
Table 5-33
X.25 DSUB signal routing

Pin #	Signal	Colour
1	N/C	
2	TXD	R
3	RXD	BR
4	RTS	BL
5	CTS	V
6	N/C	
7	GND	Y
8	N/C	
9	N/C	
10	N/C	
11	N/C	
12	N/C	
13	N/C	
14	N/C	

Table 5-33 (continued)
X.25 DSUB signal routing

Pin #	Signal	Colour
15	TCLK	G
16	N/C	
17	RCLK	BK
18	N/C	
19	N/C	
20	DTR	O
21	N/C	
22	N/C	
23	N/C	
24	N/C	
25	N/C	

Table 5-34
Suggested X.25 DSUB cable assembly part numbers

Item	Quantity	Description	Vendor	Part #
10	164 ft (49.99 m) max.	24 AWG 7x32, Tin CU SHD 24 AWG 7x32, Tin CU SHD	Belden Wire & Cable Madison Cable Corp.	9540 10RFB00004
20	1 piece	Conn. Hood D-Sub D-Sub Array	CONEC Corp.	165X00599A
30	1 piece	Conn. Housing D-Sub D-Sub Array Conn. Housing D-Sub D-Sub Array	AMP Inc. Cinch Connector	205208-1 234-25-22-120
40	8 piece	Conn. Contact D-Sub 20-24 AU Conn. Contact D-Sub 20-24 AU	AMP Inc. Cinch Connector	2-66506-4 402-30-14-212
50	7.87 in. 200 mm	Heat Shrink Tubing, Polyolefin, B Heat Shrink Tubing, Polyolefin, B	Alpha Wire Corp. AMP Inc.	FIT-221V-1/2 603328-1

Figure 5-20
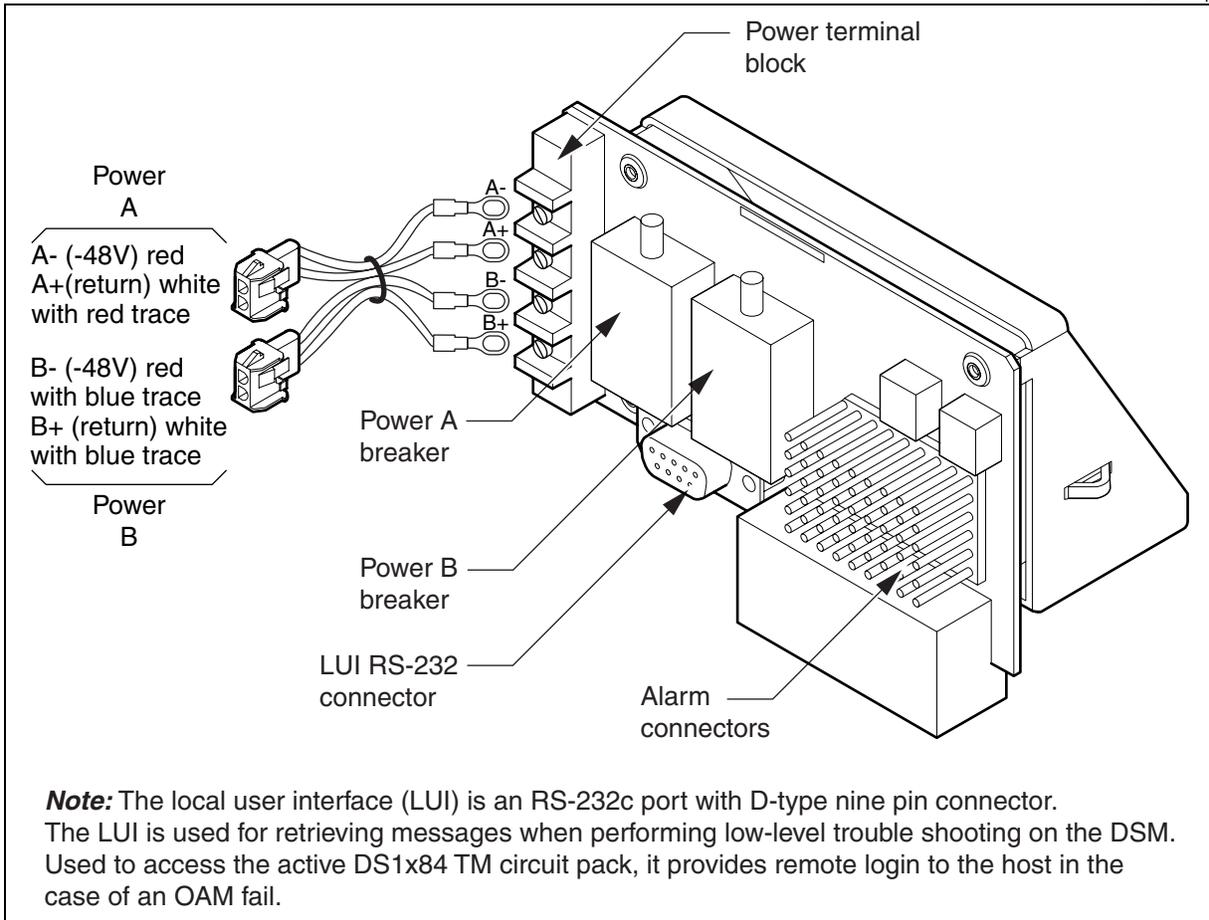**DSM OAM adapter module (Hardware Release 5) with cover off**

EX0960p

Power terminal block

Power A

A- (-48V) red
A+(return) white
with red trace

B- (-48V) red
with blue trace
B+ (return) white
with blue trace

Power B

A-
A+
B-
B+

Power A breaker

Power B breaker

LUI RS-232 connector

Alarm connectors

Note: The local user interface (LUI) is an RS-232c port with D-type nine pin connector. The LUI is used for retrieving messages when performing low-level trouble shooting on the DSM. Used to access the active DS1x84 TM circuit pack, it provides remote login to the host in the case of an OAM fail.

Figure 5-21
DSM OAM adapter module (Hardware Release 6) with cover off
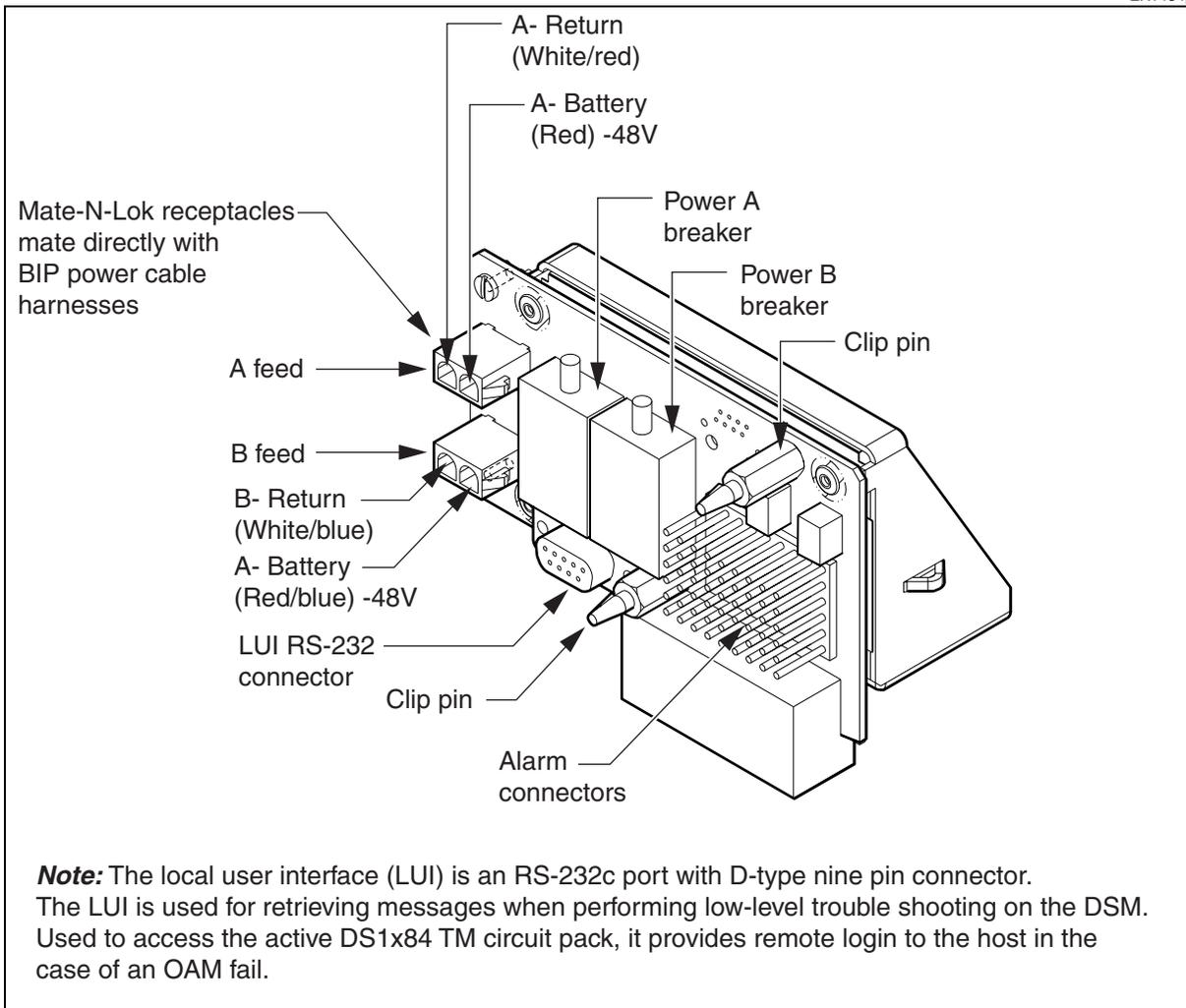
EX1434p

Note: The local user interface (LUI) is an RS-232c port with D-type nine pin connector.
The LUI is used for retrieving messages when performing low-level trouble shooting on the DSM.
Used to access the active DS1x84 TM circuit pack, it provides remote login to the host in the
case of an OAM fail.

Table 5-35
Local user interface (LUI) cable pinout

Pin number	Signal name	Description	Direction
1	DCD	Receive carrier Detected	DSM
2	RxD	Received Data	DSM out
3	TxD	Transmitted Data	DSM in
4	DTR	Data Terminal Ready	DSM in
5	Common	Signal Common	in/out

Table 5-35
Local user interface (LUI) cable pinout

Pin number	Signal name	Description	Direction
6	DSR	Data Set Ready	DSM
7	RTS	Request to Send	DSM in
8	CTS	Clear to Send	DSM
9	Not connected/Not used		

Nortel Networks

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Installation

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