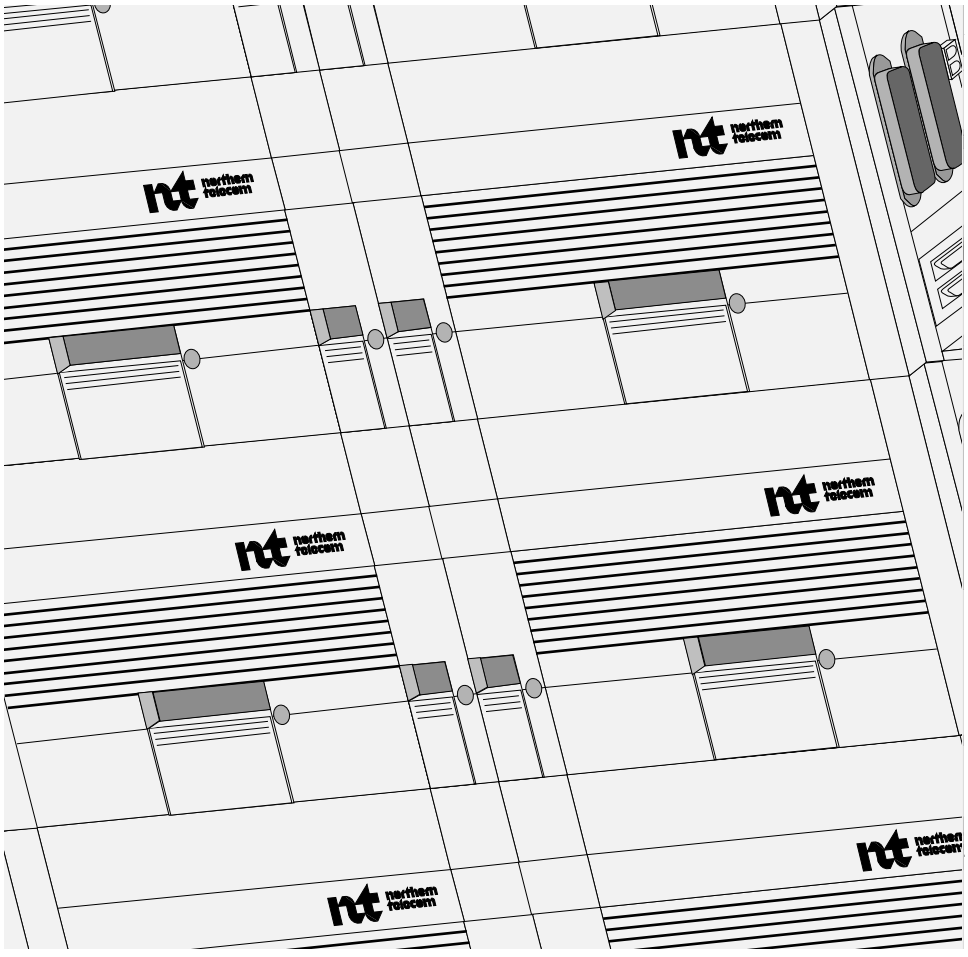
**P0887754** **323-3001-202**

SONET Products

# AccessNode

## Bay in Central Office Installation Manual - TBM

Issue 2.0 June 1999



NORTEL NETWORKS™

SONET Products

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## Bay in Central Office Installation Manual - TBM

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# Publication history

**June 1999**

Standard AN17 release of the document, Issue 2.0, updated to reflect the latest BIP power connections.

**February 1999**

Release-Independent Standard Issue of the document, Issue 1.0.

***Note:*** With the February 1999 release, references to the software release number (such as AN15 or AN16) have been deleted, making this document release-independent. This document will be rereleased only when technical changes occur.

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Standard AN16 release of the document, Issue 1.0.

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# Contents

# About this document

This document contains instructions for installing AccessNode transport bandwidth manager (TBM) bay that is equipped with up to three TBM shelves.

## Audience

This document is intended for installers of AccessNode bay equipment. The users of this document should be familiar with communication equipment and the tools required to complete the tasks.

## How to use this document

Read Chapter 1 for equipment warnings and task lists for installing TBM bay configurations.

The remainder of the document contains instructions for installing the various components of the bay.

## Warnings and safety notices

This document contains notices that are designed to alert you about the risk of personal injury, or of damage to equipment.

Samples of the formats for dangers and caution notices used in this document are as follows:

**DANGER**
**Risk of personal injury**
A danger notice warns you about a risk of personal injury.

**CAUTION**
**Risk to service or equipment**
A caution notice warns you about a risk of service interruption or of equipment damage.

To avoid personal injury, follow all danger warnings provided with this product, along with the safety procedures established by your company.

To avoid damage to equipment, or service interruptions, follow all cautions and warnings provided with this product, as well as the procedures established by your company.

## Related documentation

For additional information related to TBM bay installation, see the documents listed in the following table.

| NTP volume | See NTP | Title |
|---|---|---|
| **TransportNode** | | |
| Description | 323-1111-100 | System Description |
| | 323-1111-151 | Ordering Information |
| | 323-1111-180 | Technical Specifications |
| Installation | 323-1111-201 | Installation Procedures |
| | 323-1111-845 | Common Procedures (Mechanical) |
| **AccessNode** | | |
| Engineering, Configuration, and Ordering Guide, Volume 1 | 323-3001-032 | Engineering and Ordering Information |
| | 323-3001-154 | Mapper Layouts Planning Guide |
| | 323-3001-200 | Site Installation Planning and Engineering |
| Description, Volume 2A | 323-3001-100 | Configuration and equipment Description |
| | 323-3001-101 | Features and Services Description |
| Commissioning and Testing, Volume 3 | | |

## Abbreviations for the colors of conductor jackets in cables

In this document, a uniform system of abbreviations is used to represent the colors of the conductor insulation used in equipment cables. These abbreviations take the form:

**<pair_color> <group_marker_type> <group_marker_color>**

| Item | Abbreviations | | |
|---|---|---|---|
| <pair_color> | This is the background color of the conductor insulation which indicates the pair color. | | |
| | BL | blue | (pair 1 of the binder group) |
| | O | orange | (pair 2 of the binder group) |
| | G | green | (pair 3 of the binder group) |
| | BR | brown | (pair 4 of the binder group) |
| | S | slate | (pair 5 of the binder group) |
| <group_marker_type> | This is the type of group marker used on the conductor insulation. | | |
| | 1 | single dots spaced about 18 mm (3/4 in.) apart | |
| | 2 | two dots spaced about 3 mm (1/8 in.) apart with about 18 mm (3/4 in.) between each pair of dots | |
| | 3 | dashes about 3 mm (1/8 in.) long spaced about 18 mm (3/4 in.) apart | |
| | none | one colored stripe on conductor jacket | |
| <group_marker_color> | This is the color of the dot, dots or the stripe used as the group marker on the conductor insulation. | | |
| | W | white | (binder group 1) |
| | R | red | (binder group 2) |
| | BK | black | (binder group 3) |
| | Y | yellow | (binder group 4) |
| | V | violet | (binder group 5) |

For example, the abbreviation BL 2W (representing Pair 1 of the second 25-pair binder) means that the conductor has a blue insulation background with two white dots spaced 18 mm (3/4 in.) apart. The abbreviation BL W (representing Pair 1 of the first 25-pair binder) means that the conductor has a blue insulation background with a single white stripe.

# Overview of TBM bay installation

This document contains procedures for installing a transport bandwidth manager (TBM) bay in both the standard and enhanced configurations. This chapter contains information about the following:

- warnings and precautions for personal safety, and for proper handling and operation of equipment while it is being installed.
- task list for TBM bay installation

## Planning TBM bay configurations

For information on planning and engineering the TBM bay configurations, see the following AccessNode documentation:

- *Site Installation Planning and Engineering Guide*, 323-3001-200, in *Engineering, Configuration, and Ordering Guide*, Volume 1
- *Mapper Layouts Planning Guide*, 323-3001-154, in *Engineering, Configuration, and Ordering Guide*, Volume 1
- *Configuration and Equipment Description*, 323-3001-100, in *Description*, Volume 2A

## Ordering TBM bay configurations

To order the equipment for each of the TBM bay configurations described in this manual, see *Engineering and Ordering Information*, 323-3001-032, in *Engineering, Configuration, and Ordering Guide*, Volume 1.

## Radio frequency emissions notice

The following regulatory notice applies to AccessNode equipment:

"This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a normal commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area may cause harmful interference, in which case the user is required to correct the interference at the user's own expense."

## Optical fiber cables

AccessNode equipment and associated optical test sets use laser sources that emit light energy into fiber cables. This energy lies within the red (visible) and infrared (invisible) regions of the electromagnetic spectrum.

Laser products are subject to federal and state or provincial regulations, and local practices. Regulation 21 CFR 1040 of the U.S. Bureau of Radiological Health requires manufacturers to certify each laser product as Class I, Class II, III, or Class IV, depending on the characteristics of the laser radiation that are emitted. In terms of health and safety, Class I products represent the least hazard (none at all), while Class IV products represent the greatest hazard.

Although Nortel Networks optical products have a Class I certification, hazardous exposure to laser radiation could occur when fibers that interconnect system components are disconnected, broken, or are installed while equipment is under power. Certain procedures carried out during installation or testing require the handling of optical fibers without dust caps, and therefore increase the risk of exposure. Exposure either to visible or invisible laser light could cause eye damage under certain conditions.

The caution label at the right appears on the optical interface card, near the optical connection, and must be complied with.

**Caution**

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

**DANGER**
**Risk of eye injury**
At all times when handling optical fibers, follow the safety procedures recommend by your company.

Read and follow the precautions in the following paragraphs to reduce the risk of exposure to laser radiation.

### Handling optical fibers

During the installation, service, repair, or removal of optical fiber cables or equipment, follow these rules:

- Avoid direct exposure to fiber ends or optical connections ends where the laser signal is present.
- Wear safety glasses when handling optical fibers to avoid eye injury from flying glass fragments.

**DANGER**
**Risk of eye injury**
If you suspect that you may have a glass chip in the eye, seek medical attention immediately.

- Small bits of glass fiber are almost invisible on the fingers. Therefore, always wipe your hands on a tissue or on a clean absorbent cloth before making any contact with your eyes, or the area around your eyes.
- Handle optical fibers carefully, and always position them in a safe and secure location during the installation procedures.
- Do not handle broken or cut pieces of fiber with your bare fingers. Use tweezers or the sticky side of adhesive tape to pick up and discard loose fiber ends.
- Place all fiber cuttings or ends in a plastic bottle marked “Danger, Sharp Objects.”
- Protect optical fiber connectors with dust caps at all times.

## Installing the TBM bay standard and enhanced configurations

The following table lists the chapters that contain the procedures for performing the installation. Refer to the chapters in the order in which they are listed in the table, and perform all of the procedures in each chapter which are appropriate to your configuration. If you cannot successfully complete these procedures, contact your next level of support.

***Note 1:*** See Chapter 2, “Transport bandwidth manager bay, shelf and cable configurations,” for an introduction to the TBM bay configurations supported by this manual.

***Note 2:*** Installation procedures for the circuit packs used in the TBM bay are contained in *Commissioning and Testing*, Volume 3.

| Task | See |
|---|---|
| Unpacking the equipment | 3-1 |
| Installing the bay frame equipment | 4-1 |
| Installing the external bay cabling on the transport bandwidth manager shelf | 5-1 |
| Installing the equipment covers, the bay end guards, and the bay end guard extenders | 6-1 |

# Transport bandwidth manager bay, shelf and cable configurations

This chapter describes the bay, shelf and cable configurations available with the AccessNode transport bandwidth manager (TBM) bay.

The TBM bay is available in two types of bay configurations, called “standard” and “enhanced”. Standard TBM bay configurations support all AccessNode TBM features and equipment, except for virtual tributary bandwidth manager (VTBM) functionality. Enhanced TBM bay configurations are equipped to support the VTBM functionality.

## Standard TBM bay configurations

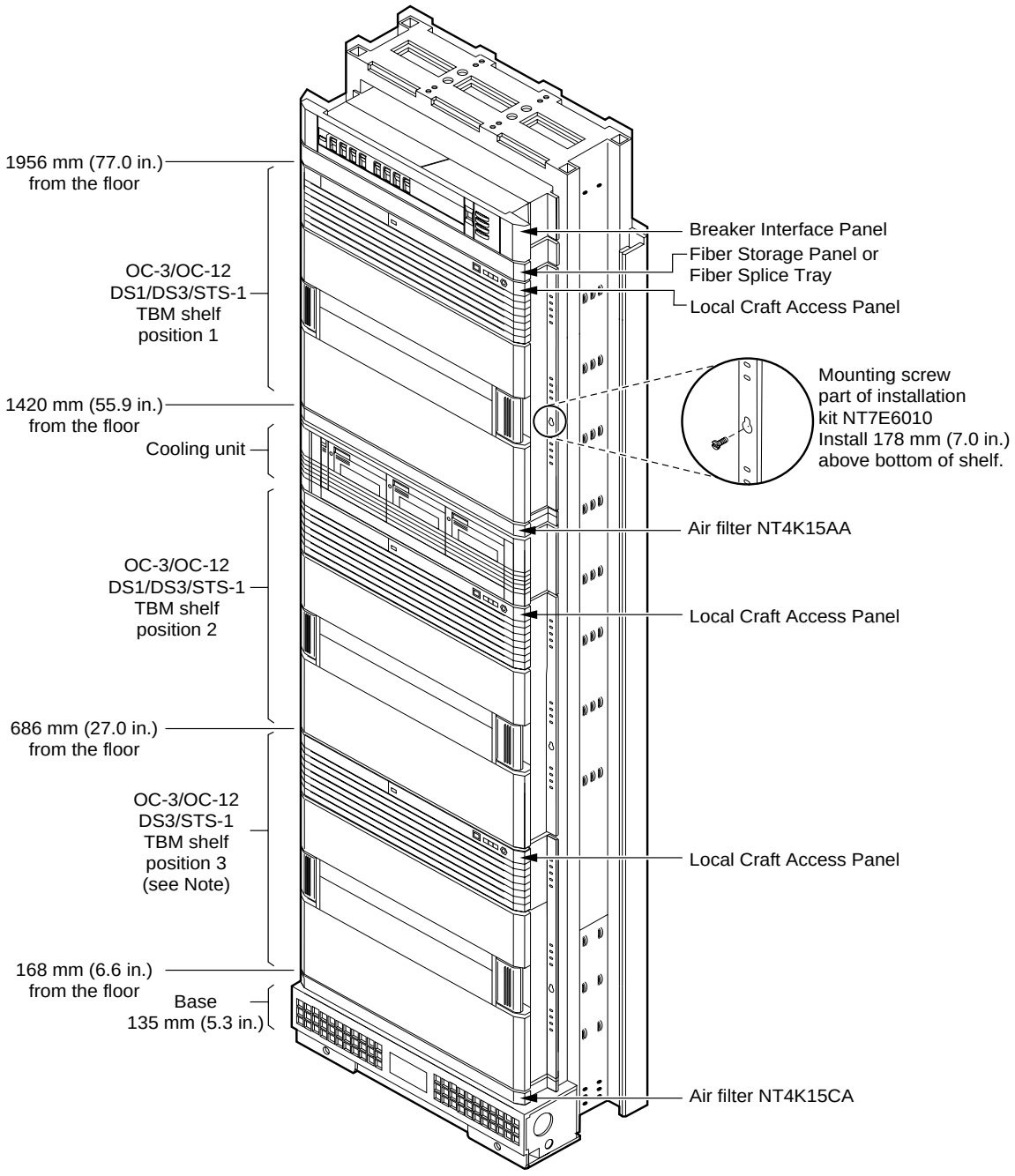
Standard TBM bays can be equipped with up to three TBM shelves and are available in the configurations presented in the table below. Standard TBM bays do not support VTBM functionality.

| **Standard TBM bay Product engineering code (PEC)** | **Shelf configuration** | **Bay Height** | **TBM shelf mounting positions (see Figure 2-4)** |
|---|---|---|---|
| NT7E78AA<br>NT7E78AB<br>NT7E78AC<br>NT7E78AD | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 2.15 m (7 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |
| NT7E78BA<br>NT7E78BB<br>NT7E78BC<br>NT7E78BD | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 2.75 m (9 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |
| NT7E78CA<br>NT7E78CB<br>NT7E78CC<br>NT7E78CD | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 3.5 m (11.5 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |

Figure 2-1 on page 2-2 shows the standard TBM bay NT7E78AC configuration, which has three TBM shelves in a 2.15 m (7 ft) bay.

**Figure 2-1**
**Standard TBM bay configuration 2.15 m (7 ft) equipped with three TBM shelves**

PC-1840




***Note:*** If installing a third shelf on a TBM bay, it must be a DS3 or STS-1 TBM shelf, or a combination DS3 and STS-1 shelf due to space limitations for running DS1 cables in the frame uprights.

## Standard TBM bay cabling configurations

Figure 2-2 on page 2-4 shows the factory-installed intershelf cabling for the TBM shelf in a standard TBM bay. Figure 2-3 on page 2-5 shows the external cables used with the TBM shelf.

Nortel Networks recommends that shelf cabling installations start with the lowermost TBM shelf. That is, install the TBM shelf cabling on the lowermost TBM shelf first and then proceed to the next highest shelf.

These recommendations are suggested in order to enhance the cable routing, installation and management procedures.

**Figure 2-2**
**Intershelf cables for standard TBM bays**

PC-10630

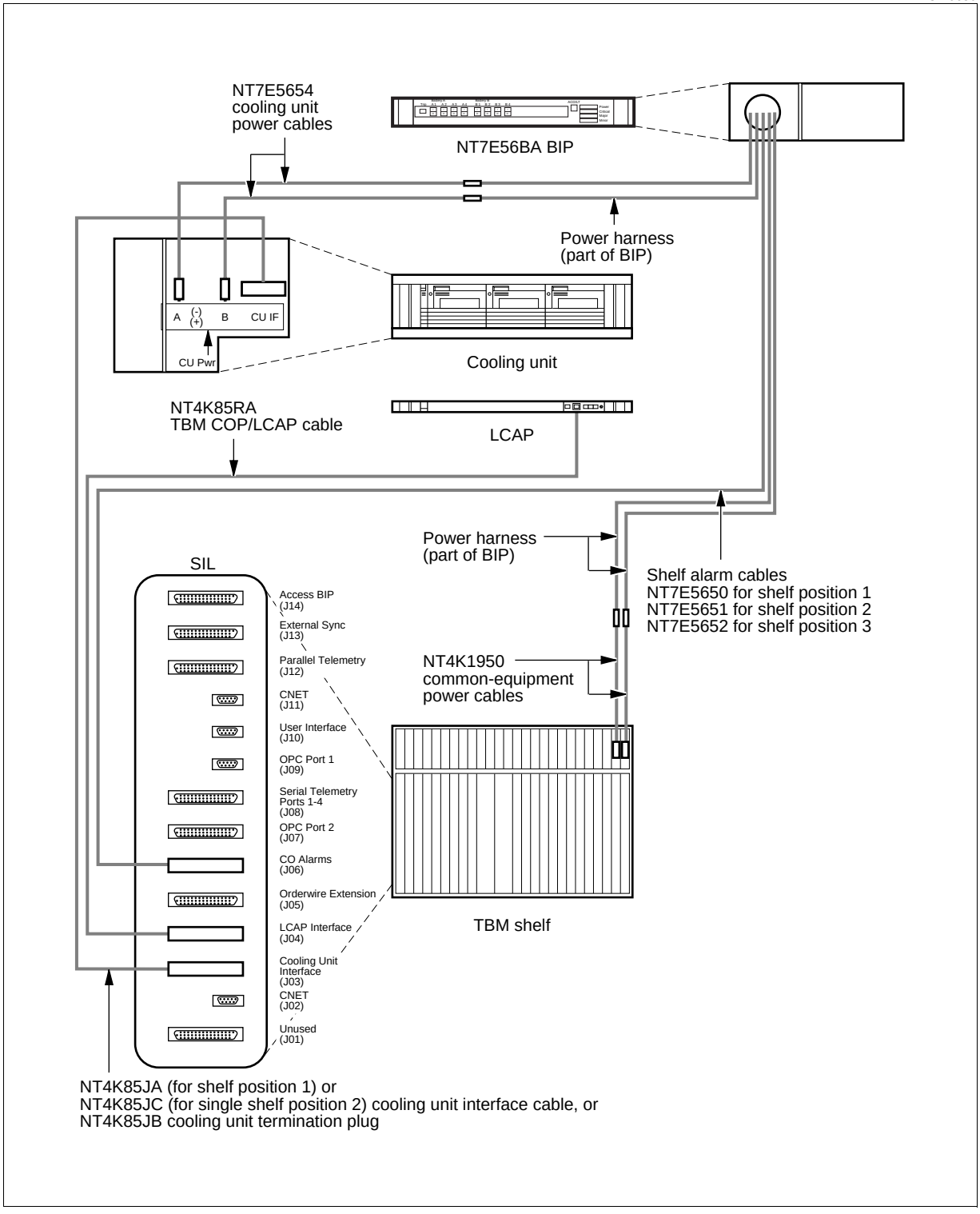
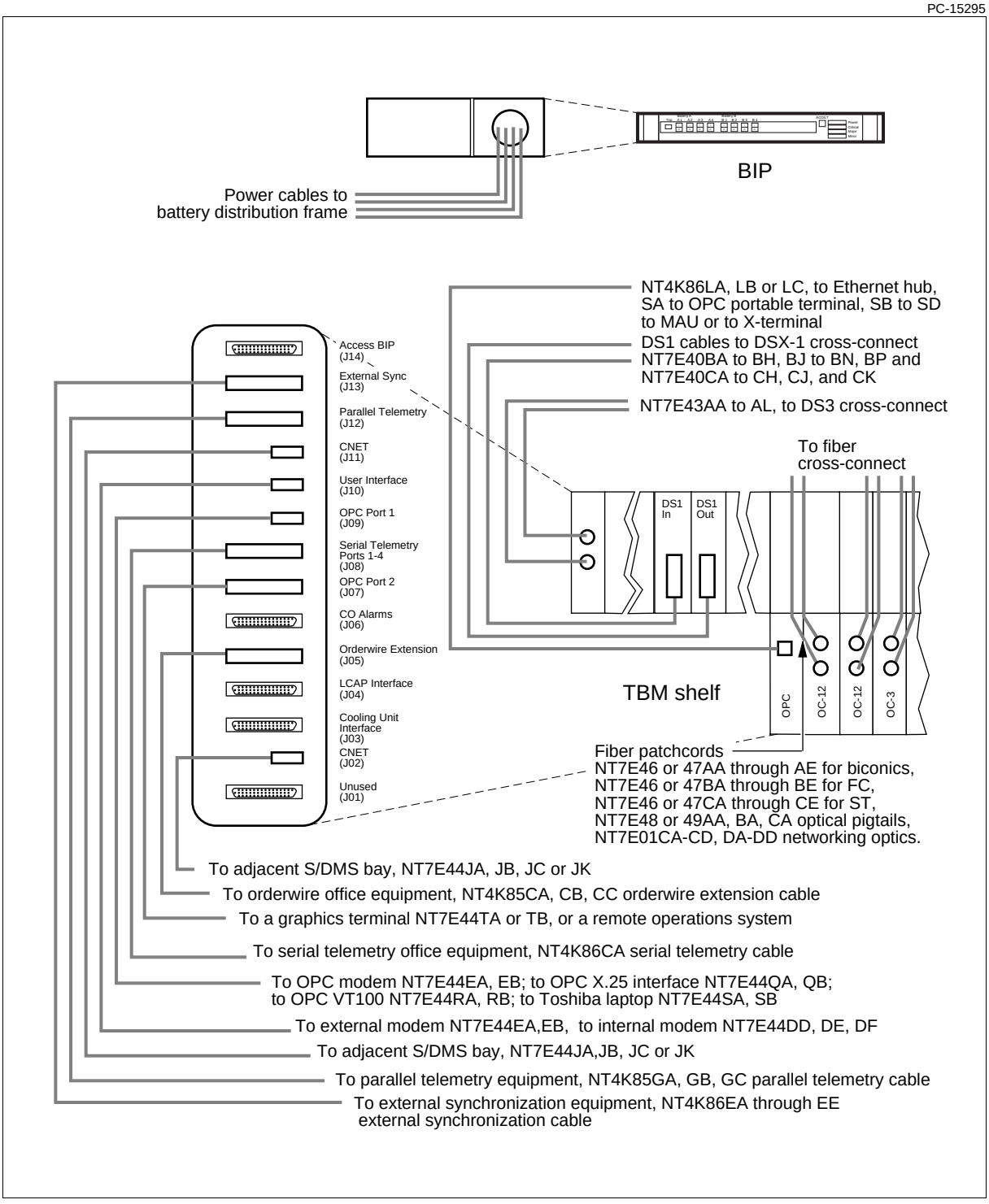


**Figure 2-3**
**External cables for standard TBM bays**



## Enhanced TBM bay configurations

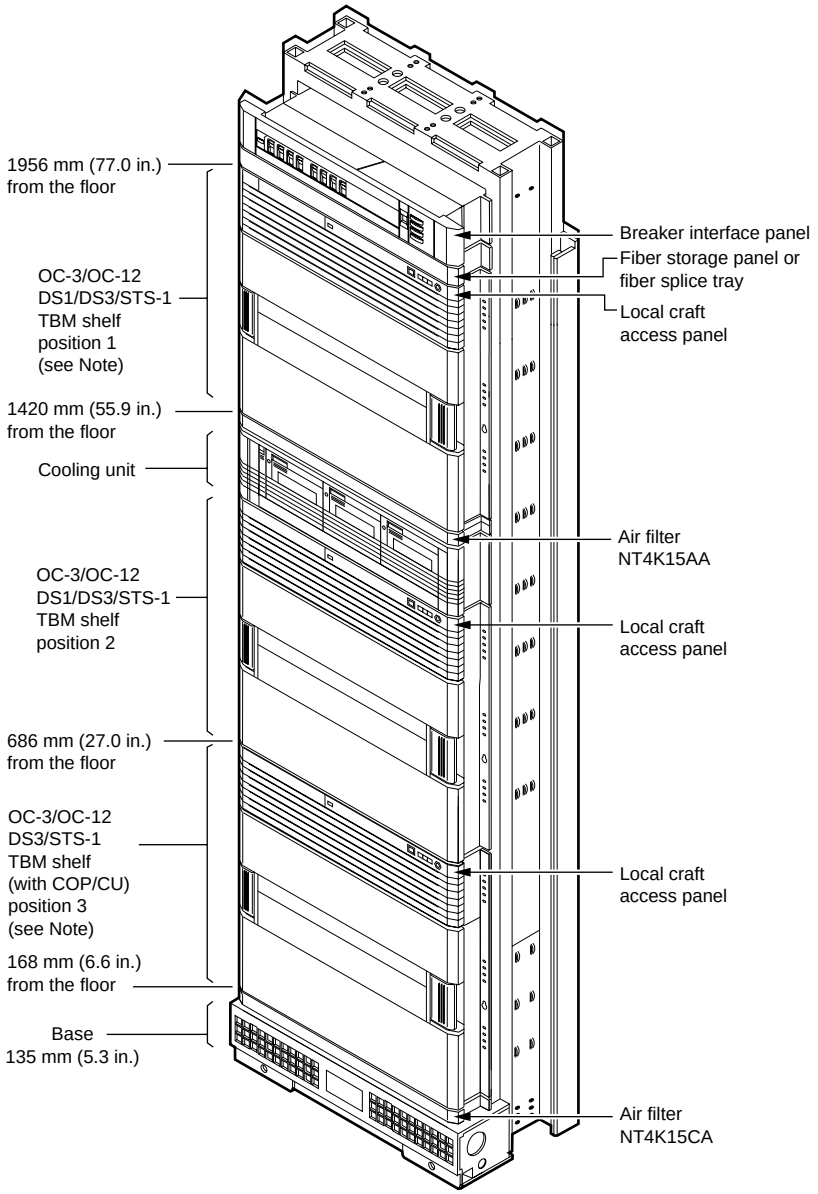
Enhanced TBM bays can be equipped with up to three TBM shelves and support VTBM functionality. Enhanced TBM bays are available in the configurations presented in the table below.

| **Enhanced TBM bay Product engineering code (PEC)** | **Shelf configuration** | **Bay Height** | **TBM shelf mounting positions (see Figure 2-4)** |
|---|---|---|---|
| NT7E78DA<br>NT7E78DB<br>NT7E78DC<br>NT7E78DD | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 2.15 m (7 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |
| NT7E78EA<br>NT7E78EB<br>NT7E78EC<br>NT7E78ED | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 2.75 m (9 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |
| NT7E78FA<br>NT7E78FB<br>NT7E78FC<br>NT7E78FD | 1 TBM shelf<br>2 TBM shelves<br>3 TBM shelves<br>1 TBM shelf | 3.5 m (11.5 ft) | Position 1<br>Positions 1 and 2<br>Positions 1, 2, and 3<br>Position 2 |

Figure 2-4 on page 2-7 shows the enhanced TBM bay NT7E78DC configuration, which has three TBM shelves in a 2.15 m (7 ft) bay.

**Figure 2-4**
**Enhanced TBM bay configuration 2.15 m (7 ft) equipped with three TBM shelves**

PC-15751




***Note:*** For three-shelf TBM bays, there are space limitations for running DS1 cables in the frame uprights: If DS1s are cabled from the top, you must install only DS3/STS mappers and cabling in shelf position 3. If DS1s are cabled from the bottom (raised floor routing), you must install only DS3/STS mappers and cabling in shelf position 1.

## Enhanced TBM bay cabling configurations

Figure 2-5 on page 2-9 shows the factory-installed intershelf cabling for the TBM shelf in a enhanced TBM bay. Figure 2-6 on page 2-10 shows the external cables used with the TBM shelf.

Nortel Networks recommends that shelf cabling installations start with the lowermost TBM shelf. That is, install the TBM shelf cabling on the lowermost TBM shelf first and then proceed to the next highest shelf.

These recommendations are suggested in order to enhance the cable routing, installation and management procedures.

**Figure 2-5**
**Intershelf cables for enhanced TBM bay**

PC-15747

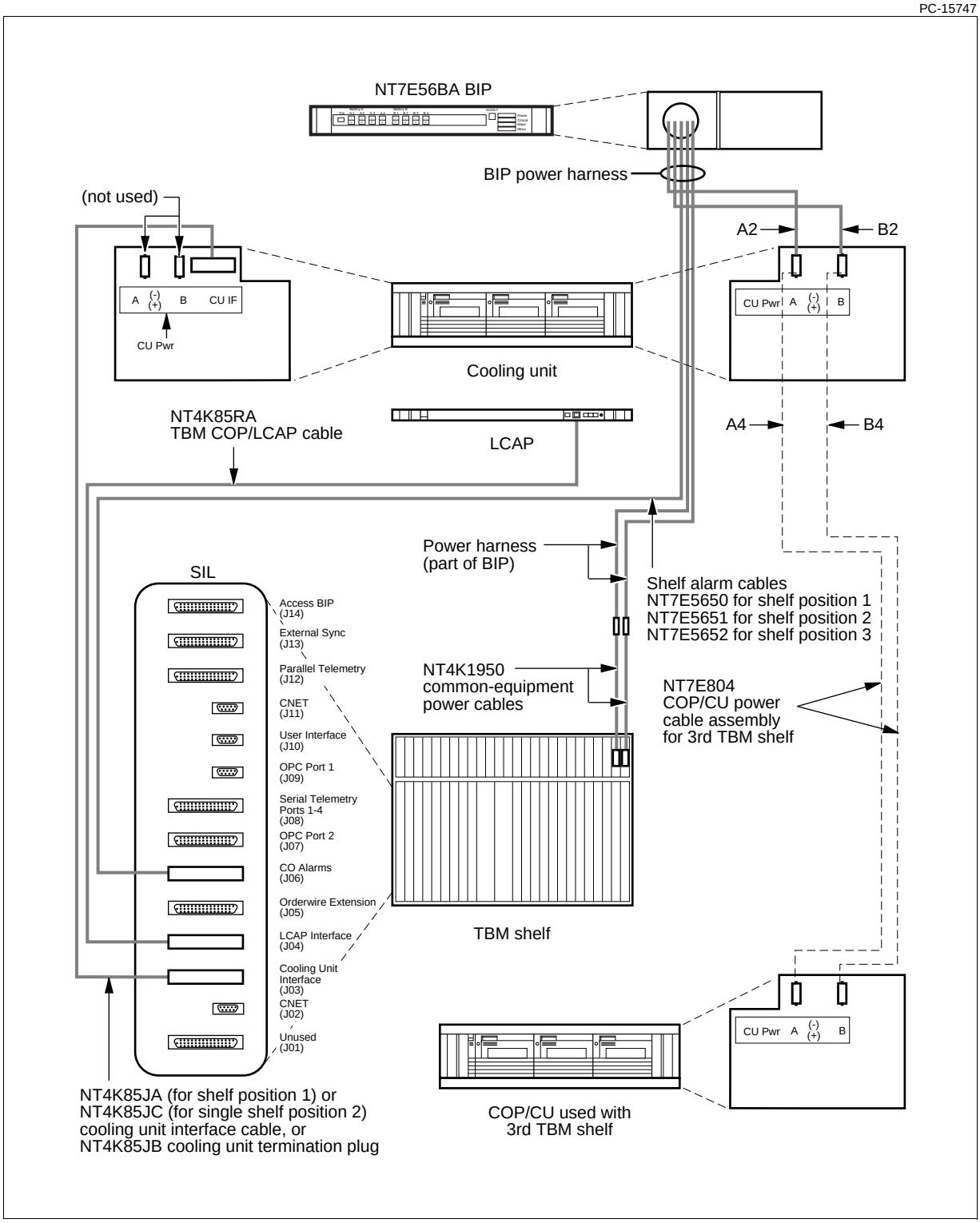
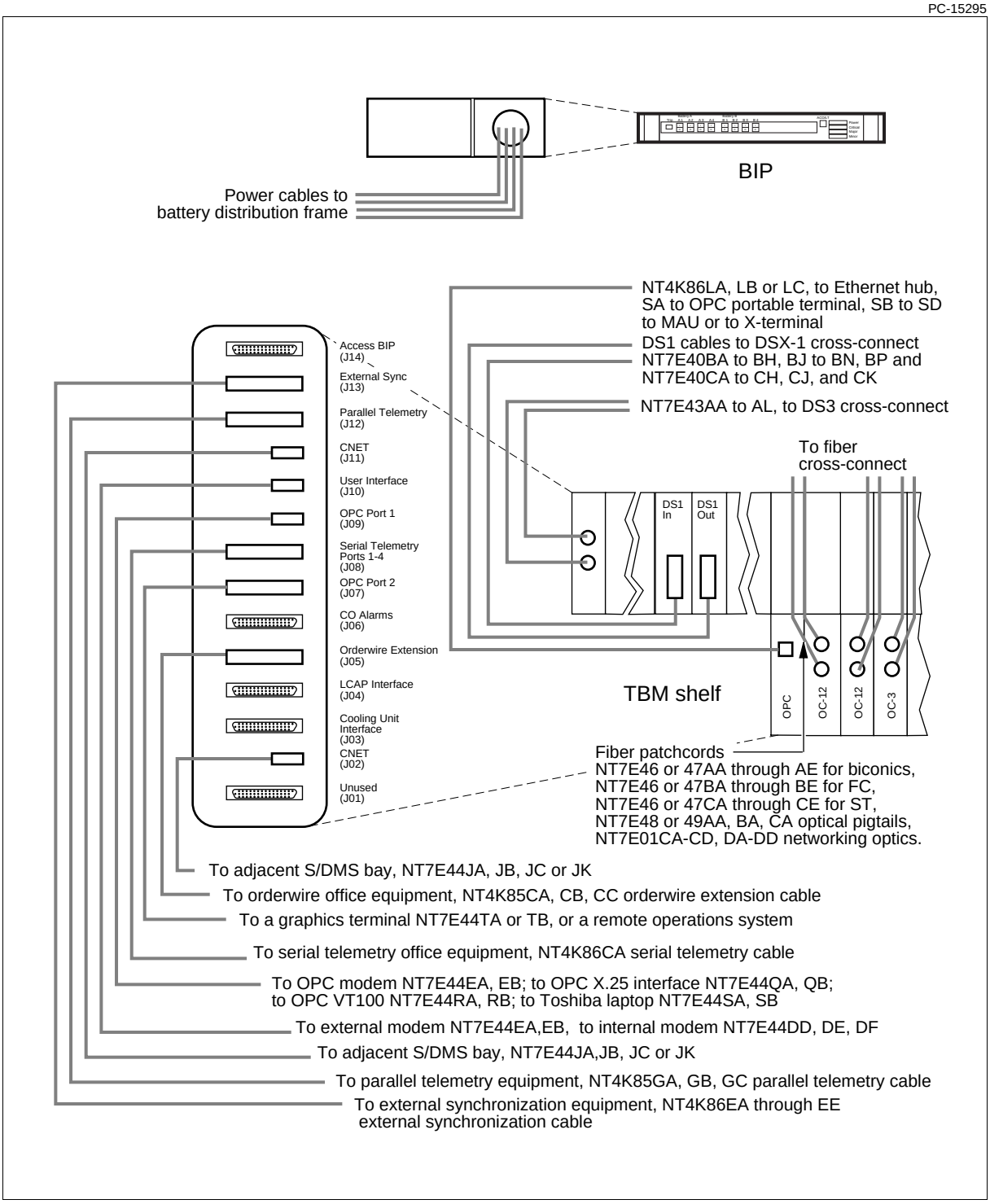


**Figure 2-6**
**External cables for enhanced TBM bays**



### Mapper positions

For information on planning mapper layouts, see *Mapper Layouts Planning Guide*, 323-3001-154, in *Engineering, Configuration and Ordering Guide,* Volume 1.

## TBM bay extender kits

Two extender kits are available with the 2.15 m (7 ft) bay in both the standard and enhanced bay configurations to increase its height to 2.75 m (9 ft), or to 3.5 m (11.5 ft):

- NT7E71DA 0.6 m (2 ft) frame extender
- NT7E71EA 1.5 m (4.5 ft) frame extender

# Unpacking the equipment

This chapter contains the procedure to unpack the bay frame equipment.

Use this procedure to prepare the site and unpack the crated AccessNode equipment bay and bay lifter tool.

**DANGER**

**Risk of the bay toppling over**

With the shelves installed for shipping, the bay is heavier at the top than it is at the bottom and can topple over if mishandled. When using a fork lift to maneuver the bay on its pallet, use rope to tie the top of the bay to the mast of the fork lift. When maneuvering a bay by hand, keep the bay upright and use at least two people to maneuver it.

**CAUTION**

**Risk of equipment damage when maneuvering un-crated bays**

When handling and moving uncrated bays, avoid strain, excessive shock, or vibrations, which might damage the equipment or warp the frame.

## How to use this chapter

This chapter includes the following task. If you cannot successfully complete this task, contact your next level of support.

### Chapter task list

| Task | See |
|---|---|
| Unpack the equipment | Procedure 3-1 on page 3-2 |

# Procedure 3-1
# **Unpacking the equipment**

To ensure smooth movement, prepare any uneven floors over which the crated or uncrated bays are transported.

When unloading and moving a crated bay, keep the bay vertical and move it by the bottom of the skid. If a bay must be moved horizontally, position the bay on one of its sides, and never on the front or back of the bay.

Clear all areas and passage ways to move the crated bays from the receiving area to the equipment room. A clean, dry and dust-free area must be available for unpacking crated bays or shelf equipment. Use a sheet of masonite for floor protection.

The bay lifter is shipped in its own case. Unloaded and set up the bay lifter before unloading the equipment bay.

## Requirements

The following tools and materials are required:

- fork lift or lift truck to move the crated bay from the loading dock to the unpacking area
- bay lifter (available from Nortel Networks part room; part number T001054) or dolly to move a bay from the unpacking area to the installation area
- claw hammer
- tin snips, 10 in.
- power knife (skinning knife)
- masonite sheet
- gloves
- safety goggles

**—continued—**

Procedure 3-1 (continued)
**Unpacking the equipment**

## Action

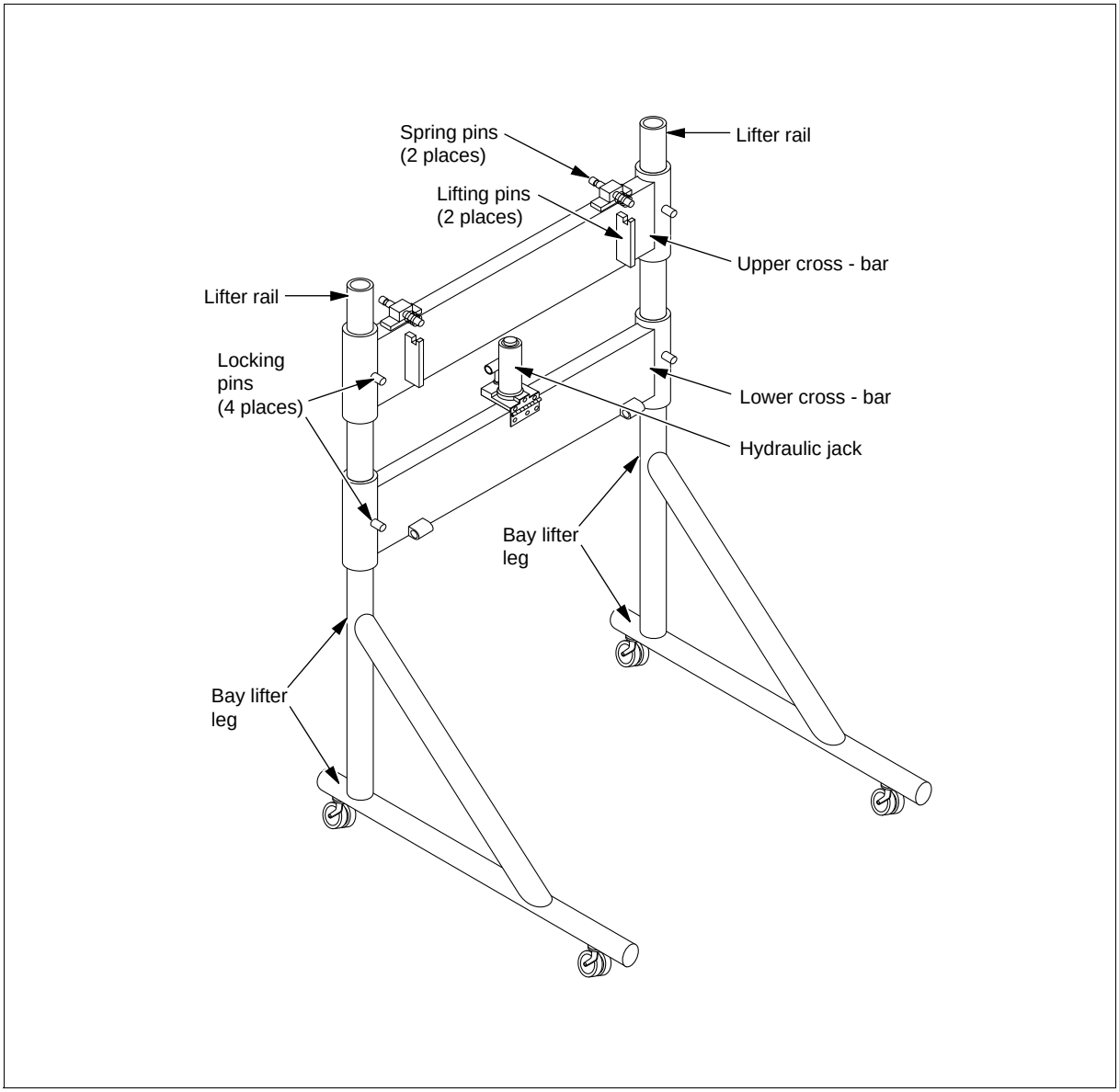
| Step | Action |
|---|---|
| | **Setting up the bay lifter** |
| **1** | Remove the bay lifter from its case (see Figure 3-1 on page 3-4). |
| **2** | Unfold the bay lifter legs into a fully perpendicular position. Insert the locking pins near the top of each leg. |
| **3** | Slide the top bar of the lifter to the top of the bay arms and rotate the sleeves of the arms until the drilled holes line up with the holes on the inner sleeve. |
| **4** | Insert the pins located in the lower bar (two on each side) to lock the sleeves in place. |
| **5** | Slide the hydraulic jack into its upright position, and position the top bar on the jack. Remove the jack handle and attach it to the jack arm. |
| | **Moving the bay** |
| | **DANGER**<br>**Risk of bay toppling over and causing injury**<br>When using a lift truck to maneuver a bay, tie the top of the bay to the mast of the forklift so the bay does not topple over during transport. |
| **6** | Use the lift truck to move the crated bay equipment (see Figure 3-2 on page 3-5) to the unpacking area and place it on a dry sheet of masonite. |
| | **DANGER**<br>**Risk of injury when cutting steel banding**<br>Take care when cutting the steel banding to prevent recoiling. Wear safety glasses and gloves when you cut the steel banding. Fold and hammer the steel banding flat to prevent further recoil during disposal. |
| **7** | Use tin snips to cut the banding surrounding the bay crate. |
| **8** | Carefully remove the top plate and all packing materials from the frame assembly and inspect for any damage to the equipment.<br>***Note:*** Retain the containers for repacking if the equipment has to be returned due to damage. |
| **9** | Remove and retain any assembly parts that are loosely attached to the framework. |

**—continued—**

Procedure 3-1 (continued)
**Unpacking the equipment**

**Figure 3-1**
**Setting up the bay lifter**

PC-15235

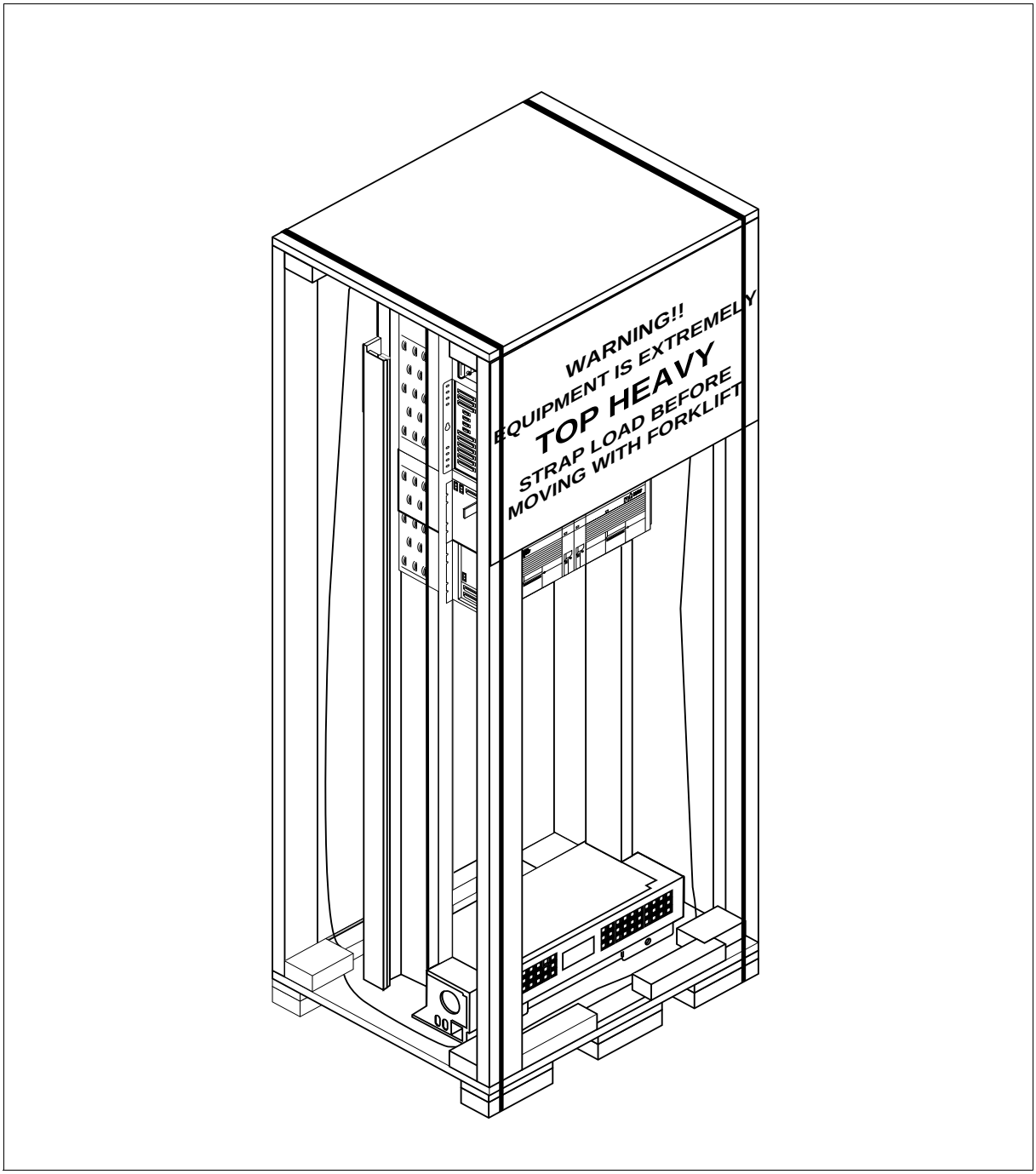



**—continued—**

Procedure 3-1 (continued)
**Unpacking the equipment**

**Figure 3-2**
**Unpacking the crated bay**

PC-15031




**—continued—**

Procedure 3-1 (continued)
**Unpacking the equipment**

| Step | Action |
|---|---|
| **10** | Clear the unpacking area of all debris. |

**DANGER**
**Risk of bay toppling over and causing injury**
Use three people to remove the bay from the pallet: two to maneuver the base of the bay, and one to steady the top of the bay. With the shelves installed, the bay is heavier at the top, than at the bottom, and can topple over, if it is mishandled.

**11** Attach the bay to the bay lifter as follows (see Figure 3-3 on page 3-7):

**a.** Roll the bay lifter behind the bay until the bay lifter arm is almost touching the rear of the bay.

**b.** Line up the attachments on the bay lifter arm with the cutouts near the top of the bay.

**c.** Insert the attachments on the bay lifter arm into the cutouts. Use the jack handle to lift the bay lifter arm until the attachments are flush with the top of the bay cutouts.

**d.** Insert the spring pins on each bay lifter arm into the cutouts above where the bay arm attachments are inserted. After inserting, turn the pins until they lock in the cutout.

**e.** Use the jack handle to lift the bay high enough to clear the pallet.

**f.** Remove the bottom pallet from the bay.

**DANGER**
**Risk of bay toppling over and causing injury**
Use two people to maneuver the bay to the installation area using the bay lifter.

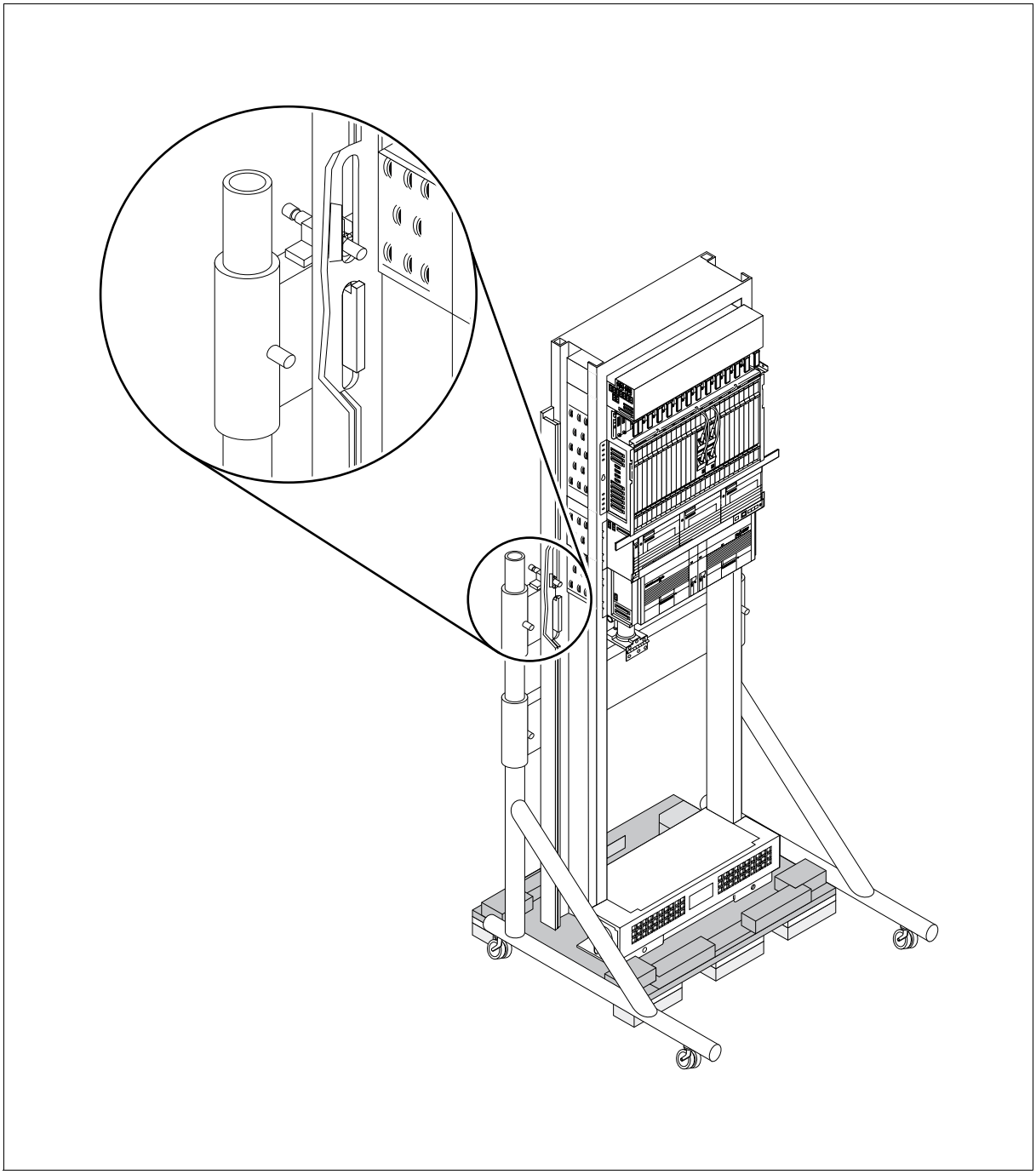
**12** Move the bay to the installation area by slowly pushing the bay lifter to the appropriate space.

**—continued—**

Procedure 3-1 (continued)
**Unpacking the equipment**

**Figure 3-3**
**Attaching the lifter to the bay**

PC-15236



**—end—**

# Installing the TBM bay equipment

This chapter contains warnings and precautions for personal safety and for proper handling and operation of equipment while it is being installed.

This chapter provides the procedures to install the TBM bay equipment in a standard central office bay lineup.

## How to use this chapter

The following table lists the procedures necessary to install the bay equipment.

If you cannot successfully complete these procedures, contact your next level of support.

### Chapter task list

Perform the procedures in the order in which they are listed:

| Task | See |
|---|---|
| Marking and drilling the floor | Procedure 4-1 on page 4-2 |
| Securing the bay framework | Procedure 4-2 on page 4-5 |
| Installing the frame extenders | Procedure 4-3 on page 4-10 |
| Attaching the frame ground | Procedure 4-4 on page 4-12 |
| Connecting the office battery to the breaker interface panel and set the DIP switches | Procedure 4-5 on page 4-16 |
| Connecting the shelf alarms | Procedure 4-6 on page 4-24 |
| Connecting the office alarms | Procedure 4-7 on page 4-31 |
| Installing the ac cabling and the ac receptacle | Procedure 4-8 on page 4-35 |

# Procedure 4-1
# **Marking and drilling the floor**

Use this procedure to mark and drill the floor for the following bay anchors:

- standard anchor NT7E7002
- M12 earthquake zone-4 anchor NT7E74AA

## Requirements

The following tools and materials are required:

- measuring tape, 15 m (50 ft)
- roto hammer drill (Hilti TE-52 or equivalent)
- masonry drill bit, size 18 mm (45/64 in.)—for M12 earthquake anchoring
- masonry drill bit, size 16 mm (5/8 in.)—for standard anchoring
- vacuum cleaner
- rubber bulb
- roll of acetate tape
- felt pen
- masking tape

## Action

| Step | Action |
|---|---|
| **1** | Refer to the customer's floor plan for the intended location of the bay lineups. |
| **2** | Mark the baseline reference line for the front of the bay lineup, similar to that shown in Figure 4-1 on page 4-3. |
| **3** | Mark the four drill hole positions as shown in Figure 4-2 on page 4-4, and allow a 3.0 mm (1/8 in.) space between bays.<br>***Note:*** The isolator pad can be used as a template for marking the floor. |

**—continued—**

Procedure 4-1 (continued)
**Marking and drilling the floor**

| Step | Action |
|---|---|

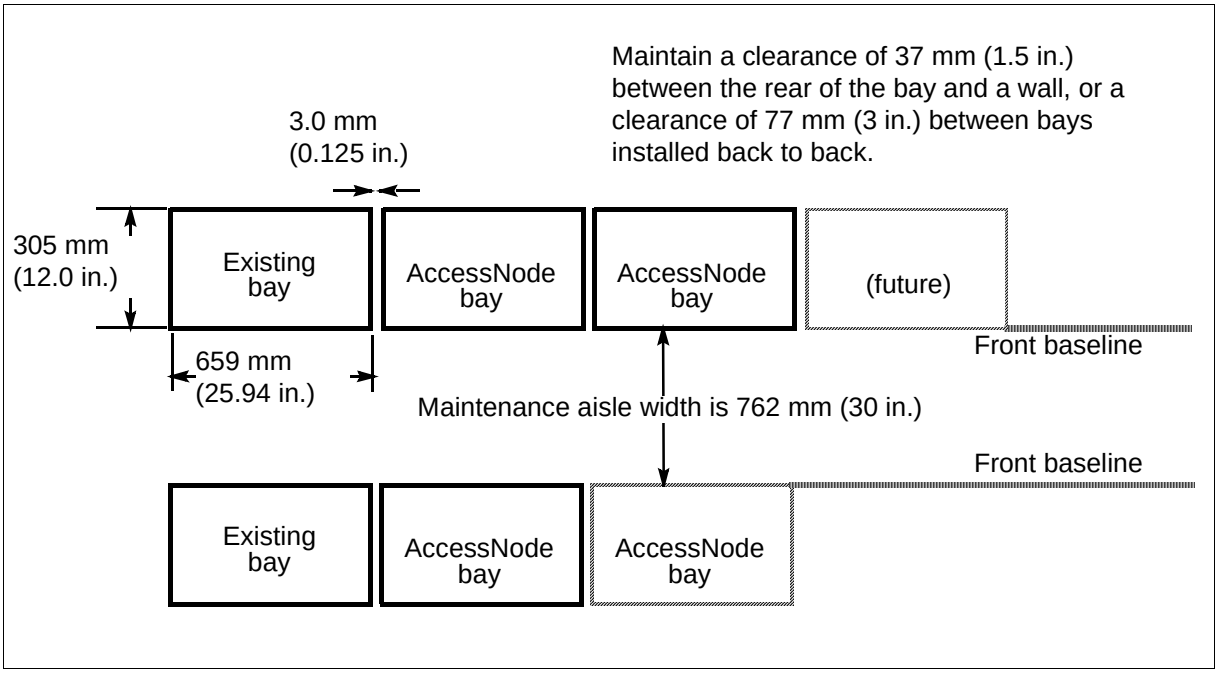
**CAUTION**
**Risk of damage to smoke detectors or wiring under the floor**
For installations on raised floors, check that there are no smoke detectors or wiring underneath the location in which you are going to drill the anchor holes.

**4** Drill four holes based on the type of anchor being used, while at the same time cleaning out each hole thoroughly, using a vacuum cleaner, together with a rubber bulb for blowing out particles:

- *For standard anchor NT7E7002:* Use a 16 mm (5/8 in.) masonry bit, drill a hole 60 mm (2-3/8 in.) deep.
- *For M12 earthquake zone 4 anchor NT7E74AA:* Use an 18 mm (45/64 in.) masonry bit drill a hole 100 mm (4.0 in.) deep.If the bays are not to be secured immediately, cover the holes with tape to prevent them from being filled with debris.

**5** Go to Procedure 4-2 on page 4-5.

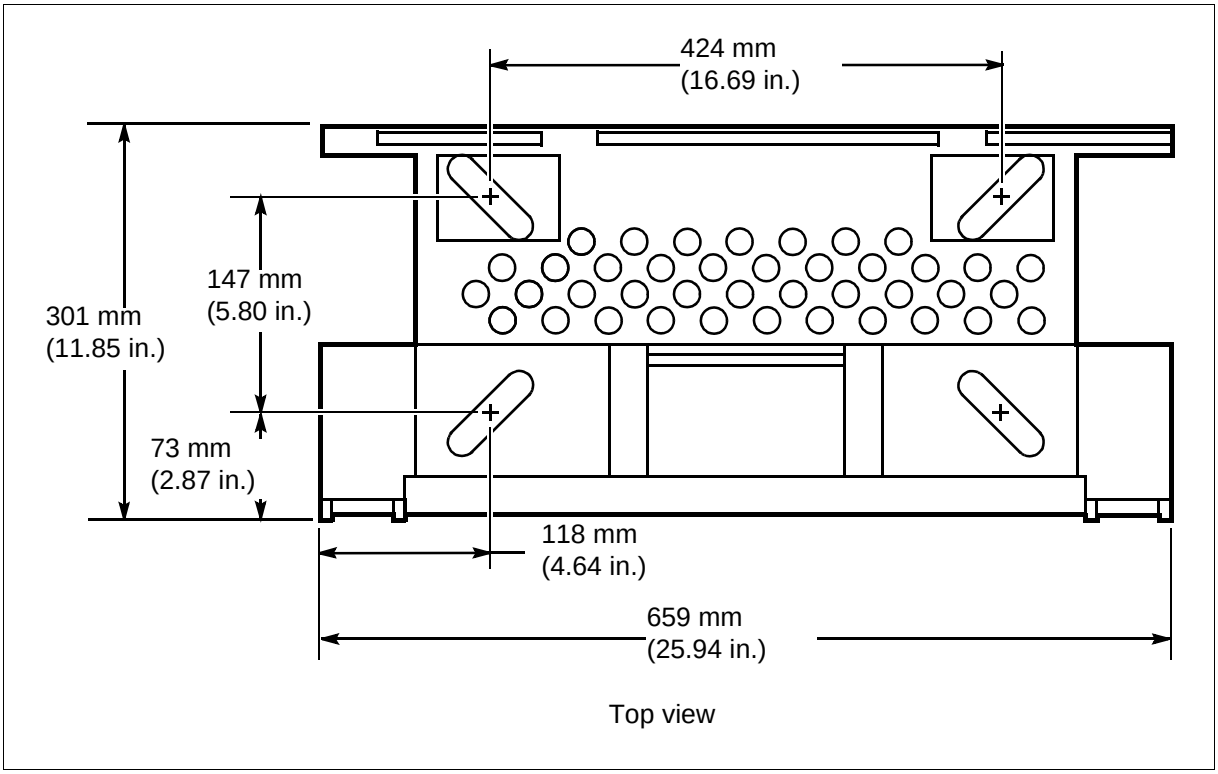
**Figure 4-1**
**Floor space requirements**




**—continued—**

Procedure 4-1 (continued)
**Marking and drilling the floor**

**Figure 4-2**
**AccessNode universal bay footprint**




**—end—**

# Procedure 4-2
# **Securing the bay frame**

This procedure describes how to secure the bay framework to the floor and, if applicable, to an adjacent bay framework.

**DANGER**
**Risk of the bay toppling over**
With the shelves installed for shipping, the bay is heavier at the top than it is at the bottom and can topple over if mishandled. Keep the bay upright except when installing the pad and shims, and use two people to maneuver or tilt the bay while a third person installs the shims.

## Requirements

Complete Procedure 4-1 on page 4-2 first, and where applicable, remove any tape that was placed to protect anchor holes.

The following tools are required:

- frame movers
- socket wrench set, 1/2 in. drive
- deep-well socket, 16 mm (5/8 in.)—for standard anchoring
- deep-well socket, 19 mm (3/4 in.)—for M12 earthquake anchoring
- torque wrench, 1/2 in. drive
- plumb
- spirit level, 610 mm (24 in.), non-metallic
- double sided tape

## Action

| Step | Action |
|---|---|
| **1** | Plumb the lineup to determine the highest spot on the floor. Mark this spot with chalk. You need to use it as a reference point when leveling all bays in the lineup. |
| **2** | Align the isolator pad over the holes drilled in the floor and secure the pad to the floor temporarily with one-inch lengths of double sided tape so that it does not move while the bay is being maneuvered into place. |

**—continued—**

Procedure 4-2 (continued)
**Securing the bay frame**

| Step | Action |
|---|---|
| **3** | Place the bay on the floor by reversing the jack arm switch and gently lowering the bay lifter arm until the bay is standing squarely on the floor. |

**DANGER**
**Risk of the bay toppling over**
Use three people to remove the bay from the bay lifter: two to maneuver the base of the bay, and one to steady the top of the bay. With the shelves installed, the bay is heavier at the top than at the bottom and can topple over, if mishandled.

**4** To release the bay, un-latch the spring pins, remove the bay lifter arm from the bay, and roll the bay lifter away from the bay. Three people are required to perform this step.

**5** Insert a frame mover at each side of the bay, and engage the locking mechanism, as shown in Figure 4-3 on page 4-7.

**6** With the frame movers installed, maneuver the bay into position over the isolator pad.

**7** Add shims as required beneath the base of the bay, ensuring that the anchor holes are not obstructed.

| **If** a bay is being installed in | **Then** use |
|---|---|
| an isolated bonding network (IBN) | plastic shims |
| a common bonding network (CBN) | metallic shims |

***Note:*** If metallic shims are used, they must be installed underneath the isolation pad.

**8** Lift up on the handles of the frame movers and remove the frame movers.

**9** Using the frame movers, carefully slide each subsequent bay framework into its assigned lineup position, adding an isolator pad beneath each bay frame.

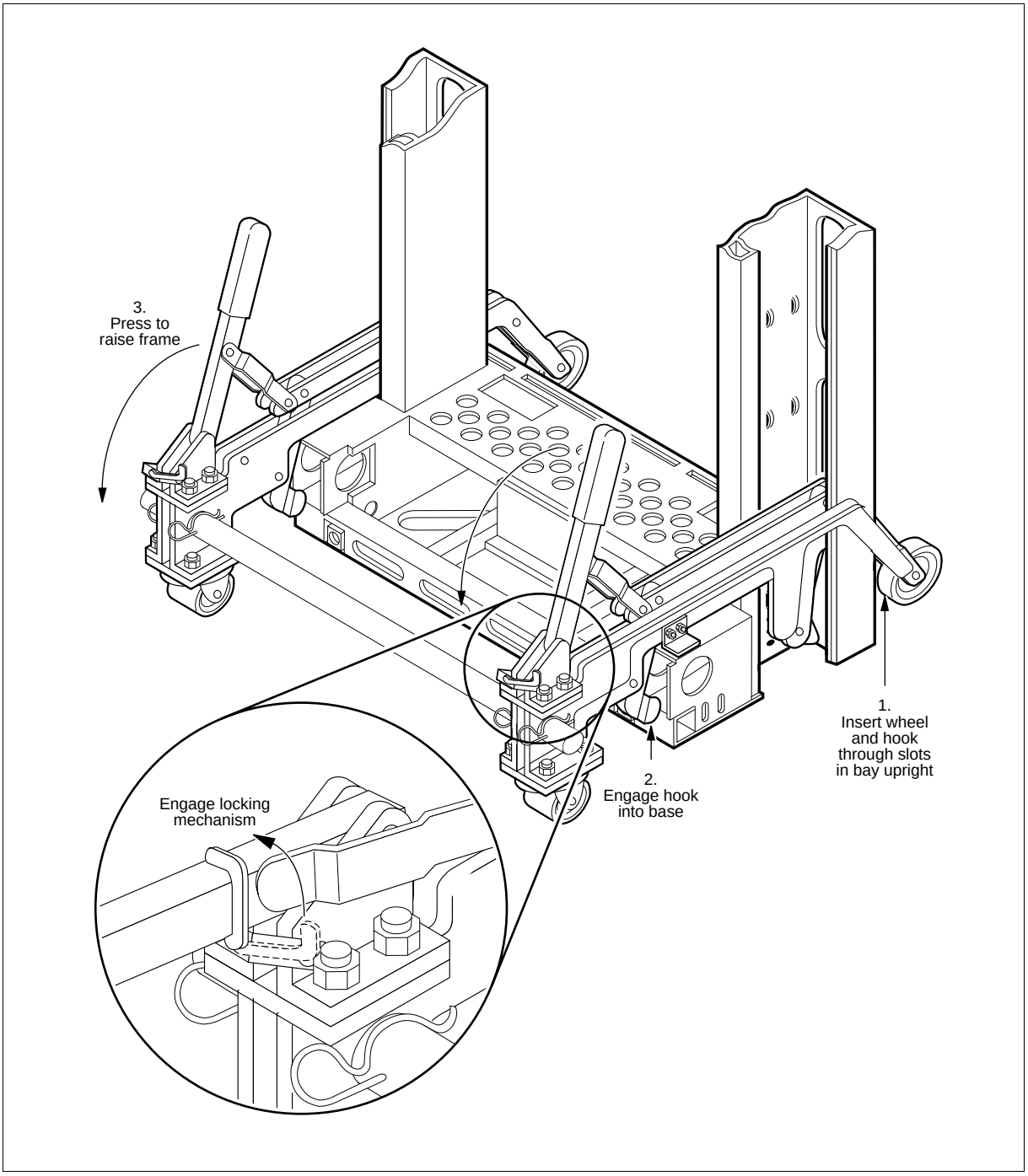
**10** Use a 610 mm (24 in.) non-metallic spirit level, or a plumb bob attached to the top of the frame, to check that each bay is vertically aligned, side to side and front to rear within 4.7 mm (0.1875 in.) of the overall bay height.

**—continued—**

Procedure 4-2 (continued)
**Securing the bay frame**

**Figure 4-3**
**Installing a frame mover into a bay upright**

PC-10955




**—continued—**

Procedure 4-2 (continued)
**Securing the bay frame**

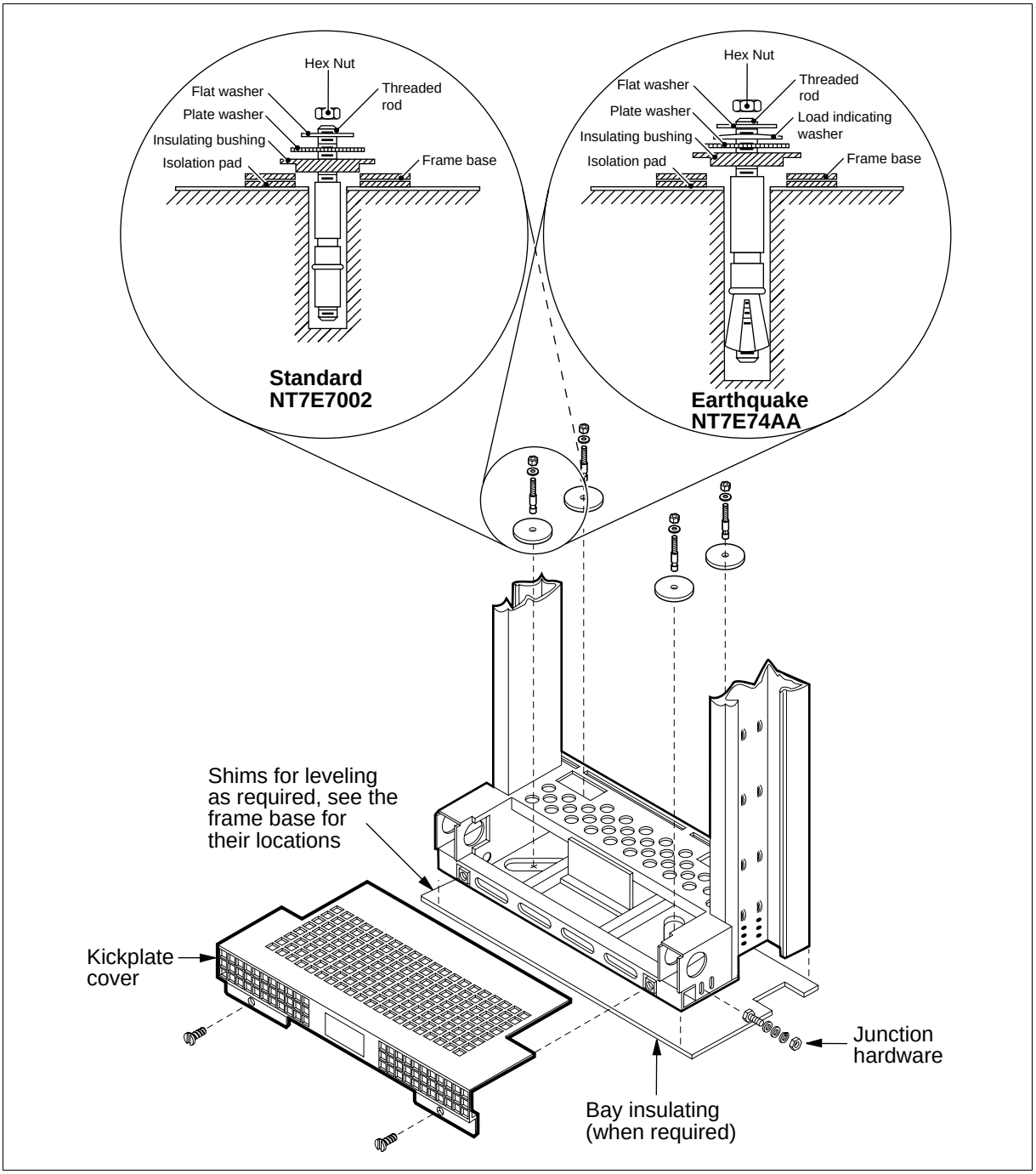
| Step | Action |
|---|---|
| **11** | Insert non-conductive shims (for an isolated bonding network) or conductive shims (for a common bonding network) beneath the appropriate corner of the bay frame to ensure that each bay is vertically aligned. |
| **12** | Tie the end of a roll of twine to the outside top edge of the first bay in the lineup and stretch it along the front edge of the other bays to the last bay of the same lineup.<br>*With the twine pulled tight to ensure a straight reference line, the top edge of all the bays should touch the twine with no significant gap.* |
| **13** | Adjust any bay that does not meet this requirement by adding shims and rechecking. |
| **14** | Assemble for each bay, either four standard anchors or four earthquake anchors (M12), as shown in Figure 4-4 on page 4-9. |
| **15** | Into each hole, insert an assembled anchor as shown in Figure 4-4 on page 4-9, and tap the anchor with a hammer until the sleeve of the anchor is no more than 3 mm (1/8 in.) above the floor. |
| **16** | Loosely connect the junction hardware at the base of the bays, as shown in Figure 4-4 on page 4-9. |
| **17** | Tighten all the anchors with a torque wrench, as follows:<br>• *Standard anchor:* Use a 16 mm (5/8 in.) sockets, and a torque setting of 36 ft-lbs (48.8 N·m).<br>• *M12 anchor for earthquake (zone 4):* Use a 19 mm (3/4 in.) socket, and a torque setting of 57 ft-lbs (77.2 N·m). |
| **18** | Tighten the junction hardware at the base of the bay. |
| **19** | Go to Procedure 4-3 on page 4-10. |

**—continued—**

Procedure 4-2 (continued)
**Securing the bay frame**

**Figure 4-4**
**Bay framework anchoring**

PC-10034




**—end—**

# Procedure 4-3
# **Installing the bay frame extenders**

Use this procedure to install the frame extenders at the top of each bay if bay extenders are required. If bay frame extenders are not required, skip this procedure and go to Procedure 4-4 on page 4-12, “Attaching the frame ground.”

Two bay frame extenders are available to extend the height of a bay. These are the NT7E71DA bay frame extender 0.61 m (2 ft) height, and the NT7E71EA 1.37 m (4.5 ft) height.

## Requirement

The following tools and materials are required:

- socket wrench set, 1/2 in. drive
- installation drawing AD7E6910 (part of NT7E69BA)

## Action

| Step | Action |
|---|---|
| **1** | Unpack the frame extenders and their associated components. |
| **2** | Use the assembly drawing checklist to ensure that all of the required components have been provided with the frame extenders. |
| **3** | Mount and secure the frame extenders to the existing bay frame according to the installation drawing package. |
| **4** | Attach the overhead bay auxiliary supports, as shown in Figure 4-5 on page 4-11. |

| **If** a bay is being installed in | **Then** install isolation hardware |
|---|---|
| an isolated bonding network (IBN) grounding environment | between the top of the bay and the auxiliary bay supports. |

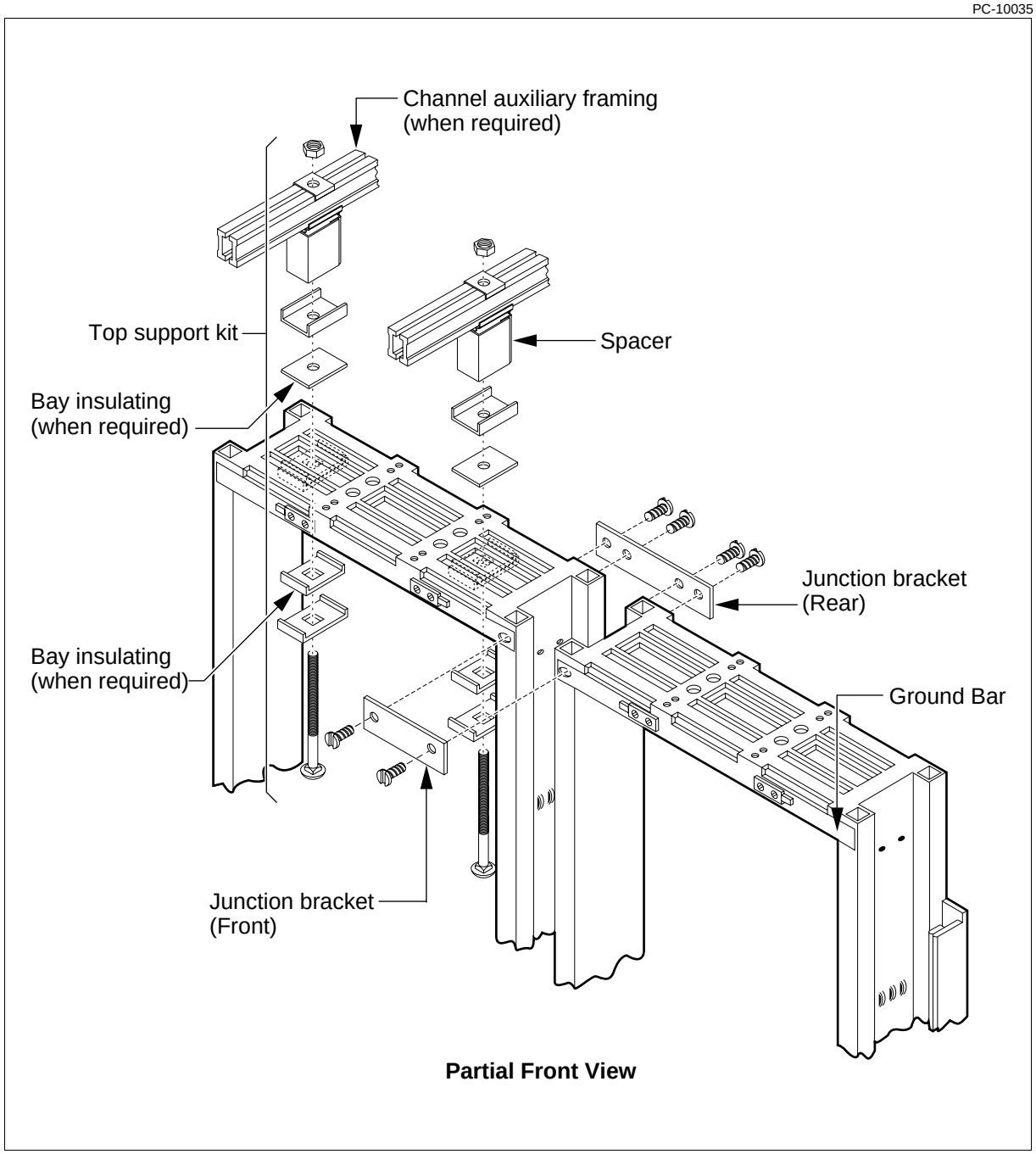
| | |
|---|---|
| **5** | Ground the frame extenders according to the installation drawing package. |
| **6** | Secure each bay to its adjacent bay at the top, as shown in Figure 4-5 on page 4-11. |
| **7** | Go to Procedure 4-4 on page 4-12. |

**—continued—**

Procedure 4-3 (continued)
**Installing the bay frame extenders**

**Figure 4-5**
**Securing a bay framework to an adjacent bay and overhead bay auxiliary supports**

PC-10035




**—end—**

# Procedure 4-4
# Attaching the frame ground

Use this procedure to attach the frame ground. The frame ground installation is considered part of the bay installation and is performed to ensure that:

- The new bays are integrated with the grounding scheme of the existing communication bays.
- The integrity of the grounding network is maintained. See “Power and ground distribution” in the *Site Installation Planning and Engineering*, 323-3001-200, in *Engineering, Configuration, and Ordering Guide*, Volume 1.

## Requirements

The following tools and materials are required:

- 6 AWG conductor (with green-colored insulation)
- cable cutter and power knife
- insulation tester (Megger, KYORITSU model 3001B, KYORITSU model 3111V, or equivalent)
- hex nut driver set
- slotted screwdriver
- crimping tool
- cable ties
- sandpaper or wire brush

## Action

| Step | Action |
|---|---|
| **1** | Route a 6 AWG conductor from each bay frame directly to the office floor ground bar (or single point building ground in an IBN), ensuring that there are no sharp bends in the conductors. Do not connect the cables to the floor ground bar at this time.<br><br>***Note:*** An alternate arrangement must be used for lineups of more than six bays. In this alternative arrangement, the 6 AWG conductors connect in the overhead rack to a common 2 AWG frame ground collector that connects to the floor ground bar (or single point building ground in an IBN). |
| **2** | Route the conductor from the overhead rack to reach the ground bar at the top of the bay. |

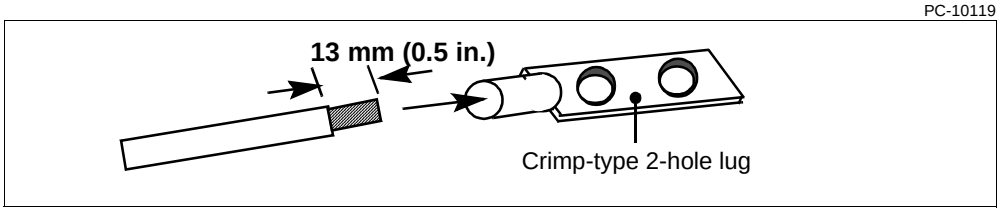
**—continued—**

Procedure 4-4 (continued)
**Attaching the frame ground**

| Step | Action |
|---|---|
| **3** | Strip the 6 AWG conductor 13 mm (0.5 in.) and crimp a grounding lug to the end of the conductor as shown in Figure 4-6 on page 4-13. |

**Figure 4-6**
**Connecting the ground lug**

PC-10119



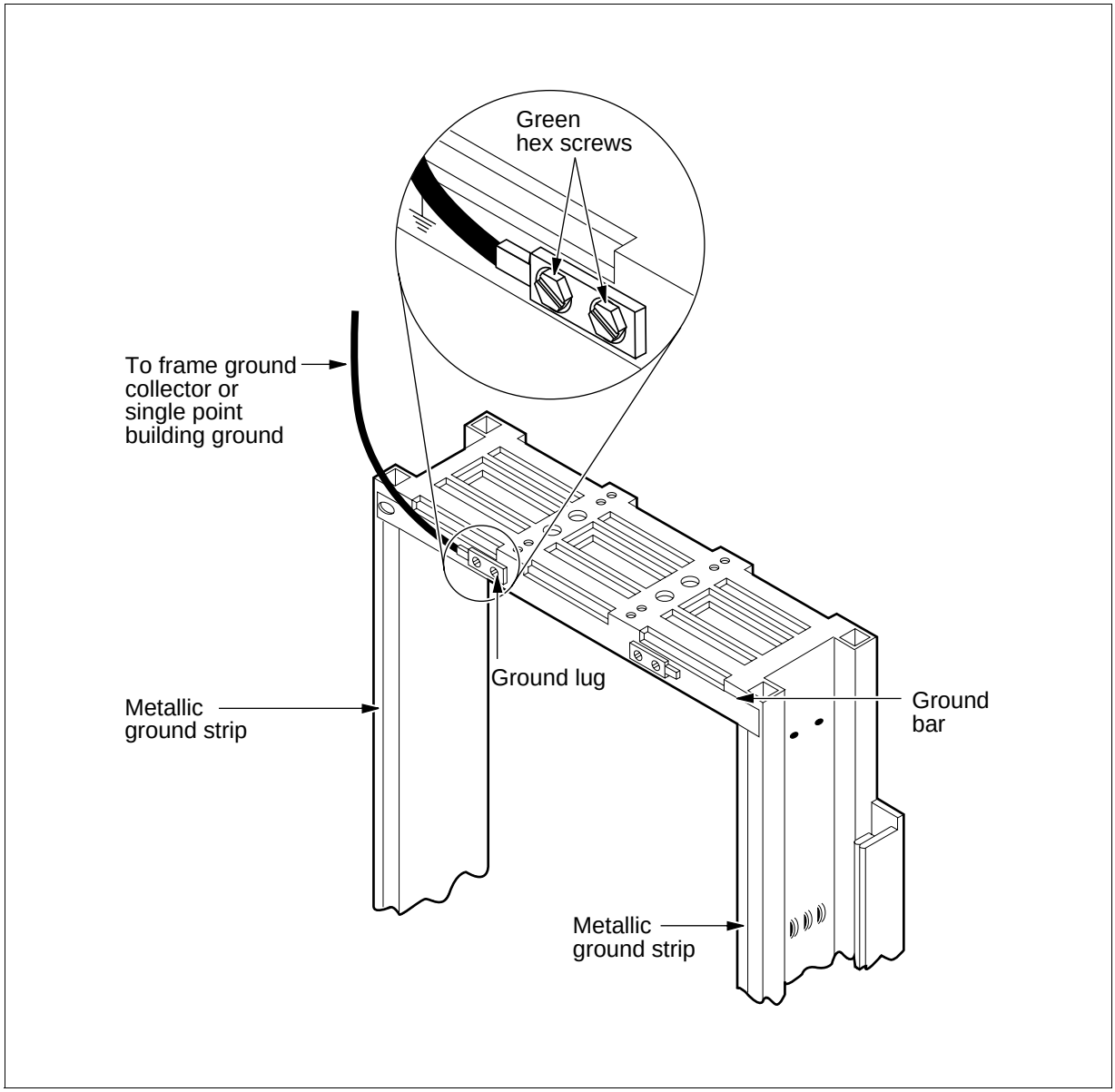

| | |
|---|---|
| **4** | Attach the ground lug with two hex bolts to the ground bar at the top of the bay framework, as shown in Figure 4-7 on page 4-14.<br><br>***Note 1:*** The clearance behind the BIP should allow lug and bolts to be loosely attached.<br><br>***Note 2:*** Each frame in an equipment lineup can be directly connected to the office or frame aisle ground by using either of the two ground lugs. |
| **5** | Use a hex nut driver or a slotted screwdriver to tighten the bolts. |
| **6** | If the office in which you are installing the frame is equipped with a mesh ground bonding network imbedded in the concrete floor, go to step 12. If not, continue with step 7. |
| **7** | Connect one lead of the insulation tester to a known good ground point and the other lead to a grounding cable from the frames you have just installed. The polarity of the leads is not important for this test. |
| **8** | Set the test voltage to 500 V dc and measure the leakage current between the frame ground cable and the known good ground. The leakage current should be less than 1.5 mA (or better than 2 megohms if you are using an instrument that provides an output reading in ohms). |

**—continued—**

Procedure 4-4 (continued)
**Attaching the frame ground**

**Figure 4-7**
**Connecting the frame ground**

PC-10036




**—continued—**

Procedure 4-4 (continued)
**Attaching the frame ground**

| Step | Action |
|---|---|
| **9** | If the leakage current is greater than 1.5 mA (or the resistance is less than 2 megohms) check the installation of the isolation shims and repair as necessary. |
| **10** | Repeat the test on the grounding cable from each frame until you have tested all frame ground cables. |
| **11** | Go to step 13. |
| **12** | Use local procedures to test current leakage to connect the frame ground cable(s) to the mesh ground bonding network. End the procedure here. |
| **13** | Connect the ground cable(s) routed in step 1 and tighten the bolts. |

**—end—**

# Procedure 4-5
# Connecting the office battery to the breaker interface panel

Use this procedure to connect the office battery to the breaker interface panel (BIP) in the TBM bay.

This procedure applies to transport bandwidth manager (TBM) bay configurations with 1, 2, or 3 TBM shelves installed.

## Requirements

The following tools and materials are required:

- screwdriver
- digital multimeter
- skinning knife
- cable shears
- crimping tool
- lug terminals
- power taps (to be set according to the power wire sizes)
- fiber sheet
- adhesive insulating covers
- electrical tape
- cable ties

## Action

| Step | Action |
|---|---|
| **1** | Turn off all circuit breakers on the breaker interface panel (BIP). |
| **2** | Remove the A and B fuses at the BDFB.<br><br>***Note:*** For a schematic showing the distribution of the battery feeders and the ratings for the A and B fuses, see *Site Installation Planning and Engineering Manual*, 323-3001-200, in *Engineering, Configuration, and Ordering Guide,* Volume 1. |
| **3** | Measure the voltages at the equipment side of the A and B leads on the BDFB to ensure that no potentials are present.<br><br>***Note:*** Steps 3 to 18 ensure that the battery distribution fuse board's (BDFB's) A and B supplies are not reversed at the BIP. |

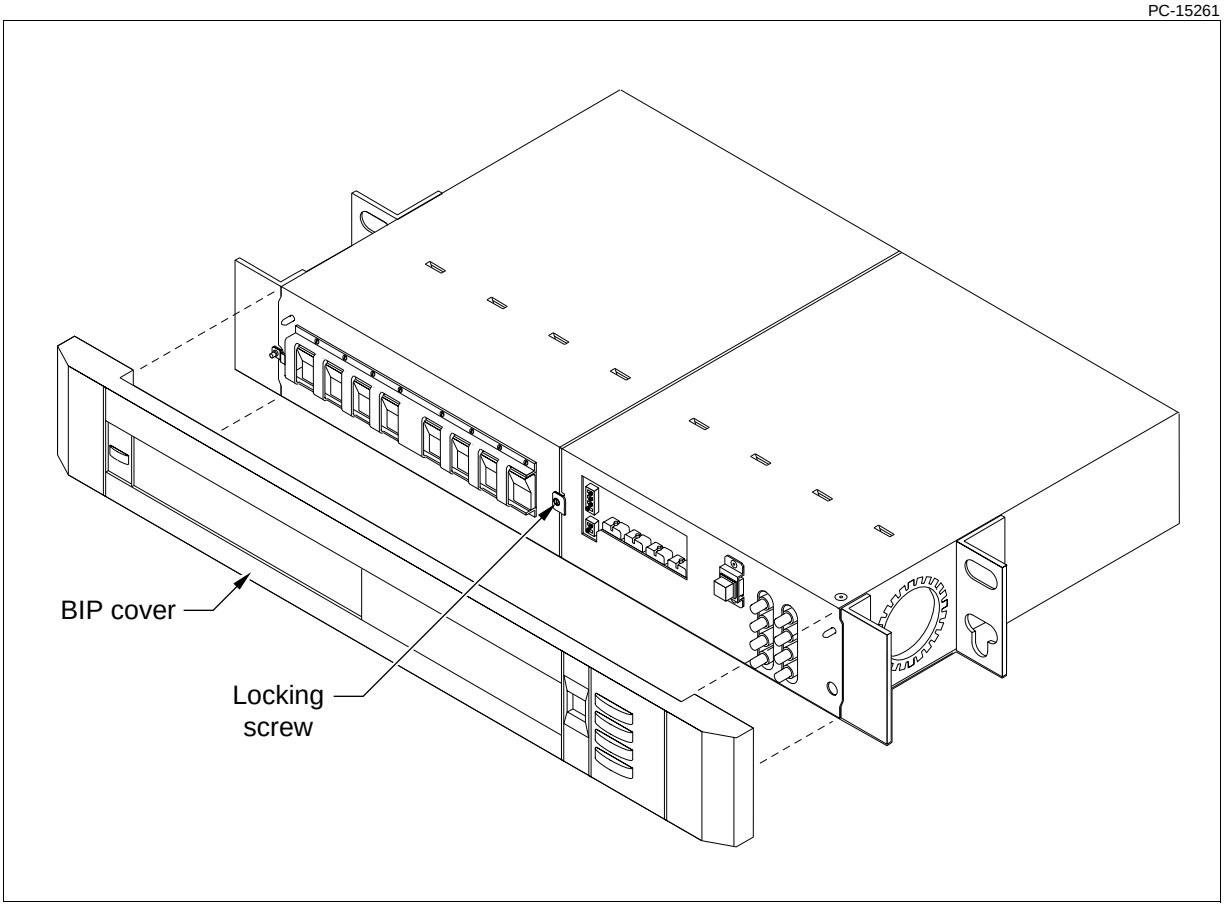
**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

| Step | Action |
|---|---|
| **4** | Remove the BIP snap-on front cover (see Figure 4-8). |

**Figure 4-8**
**Removing the BIP front cover**

PC-15261




**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

| Step | Action |
|---|---|

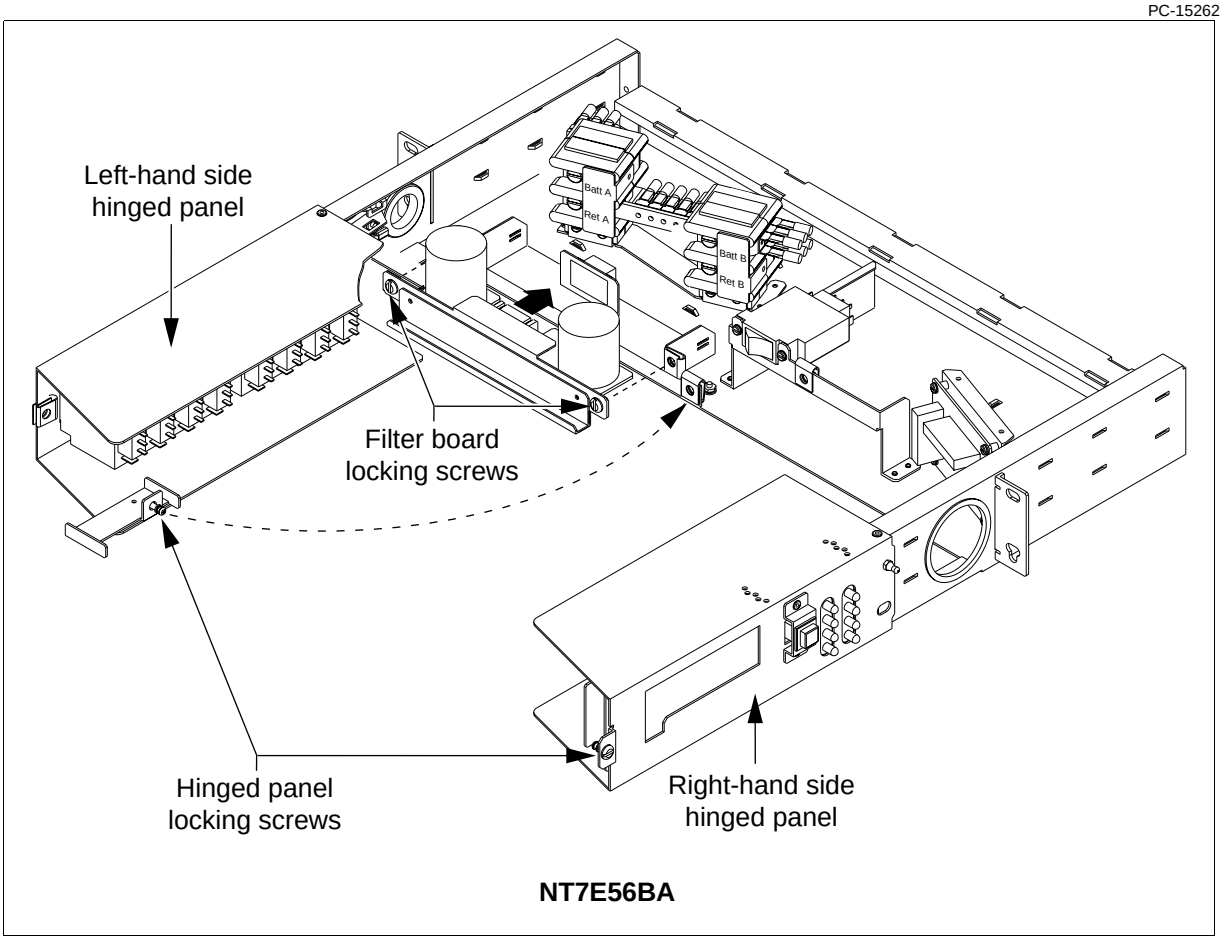
**CAUTION**
**Risk of damage to locking screws and the finish of the equipment covers**
Only use a flat-bladed 1/4 in. screwdriver to tighten or release the locking screw on the BIP doors. Do not use a coin. A coin will damage the slots on the locking screw and may slip and damage the finish on the equipment.

**5** Release the locking screw located in the middle of the left- and right-hand side hinged BIP doors by turning it counterclockwise.

**6** Open the hinged door at the right side of the BIP (see Figure 4-9).

**Figure 4-9**
**Opening the BIP hinged doors**

PC-15262




**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

| Step | Action |
|---|---|
| **7** | Release the locking screw that holds the left-hand BIP door closed, and open the BIP door. |
| **8** | Prepare the equipment-side of the battery leads; remove the plastic cover and crimp the appropriate terminal lugs onto the leads. |
| **9** | Connect the office battery cables (6 AWG wire that is made up of a minimum of seven strands) to the breaker panel, as shown in Figure 4-10 on page 4-20. |
| **10** | Secure the battery cables to the BIP chassis using cable ties.<br>***Note:*** The eight ground wires with the spaced lugs, and the power harness from the BIP to the shelf power blocks are installed at the factory. |
| **11** | At the BIP, short the A+ and A– leads. |
| **12** | On the AccessNode side of the A fuse on the BDFB, measure the resistance across the A+ and A– leads. |

| **If** the resistance is | **Then** |
|---|---|
| 0 ohm | continuity exists on the cables between the BIP and the BDFB.<br>Go to step 14. |
| ∞<br>(that is, an open circuit) | there is most likely a wiring error.<br>Go to step 13. |

| Step | Action |
|---|---|
| **13** | Do not remove the short on the A+ and A– leads at the BIP. On the AccessNode side of the B fuse (or B breaker) on the BDFB, measure the resistance across the B+ and B– leads. |

| **If** the resistance is | **Then** |
|---|---|
| 0 ohm | the A and B supplies are reversed at the BIP. Check and correct the lead reversals.<br>Go to step 12. |
| ∞<br>(that is, an open circuit) | there is most likely an open circuit on the A+ and A– leads between the BDFB and the BIP. Check and repair the broken leads or improperly crimped connections.<br>Go to step 12. |

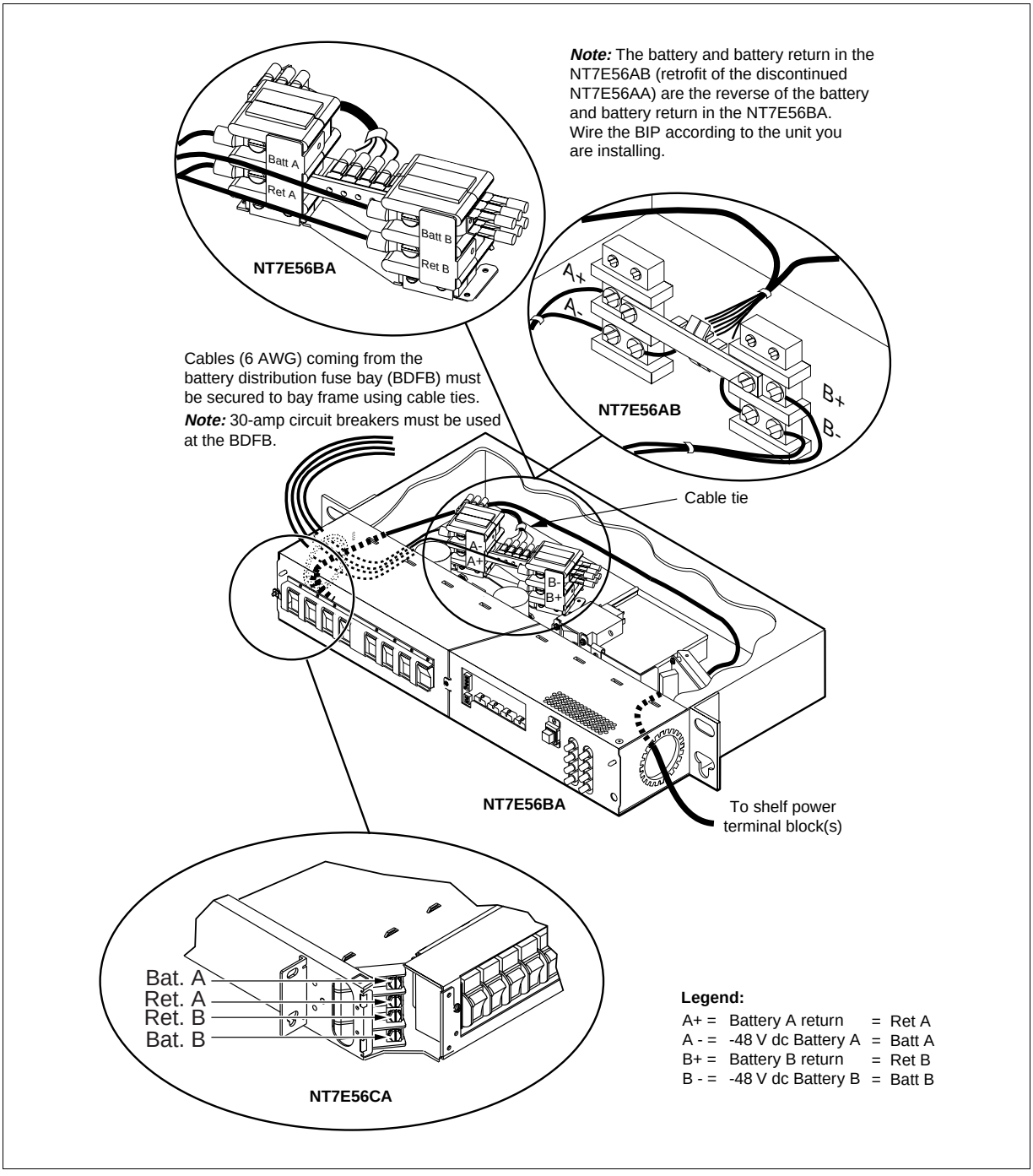
| Step | Action |
|---|---|
| **14** | Remove the short circuit across the A+ and A– leads at the BIP. |

**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

**Figure 4-10**
**Connections for the office battery on the BIP**

PC-15263




**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

| Step | Action |
|---|---|
| **15** | At the BIP, short the B+ and B– leads. |
| **16** | On the AccessNode-side of the B fuse of the BDFB, measure the resistance across the B+ and B– leads. |

| **If** the resistance is | **Then** |
|---|---|
| 0 ohm | the power leads are not reversed at the BIP.<br>Go to step 18. |
| ∞<br>(that is, open circuit) | there is most likely a wiring error.<br>Go to step 17. |

| | |
|---|---|
| **17** | Do not remove the short on the B+ and B– leads at the BIP. On the AccessNode side of the A fuse (or A breaker) on the BDFB, measure the resistance across the A+ and A– leads. |

| **If** the resistance is | **Then** |
|---|---|
| 0 ohm | the A and B supplies are reversed at the BIP. Check and correct the lead reversals.<br>Go to step 11. |
| ∞<br>(that is, open circuit) | there is most likely an open circuit on the B+ and B– leads between the BDFB and the BIP. Check and repair the broken leads or improperly crimped connections.<br>Go to step 11. |

| | |
|---|---|
| **18** | Remove the short circuit across the B+ and B– leads at the BIP. |
| **19** | Set the miniature circuit breakers labeled BIP, Maint Term, Modem, and Lamp in Figure 4-11 on page 4-22, as follows: |

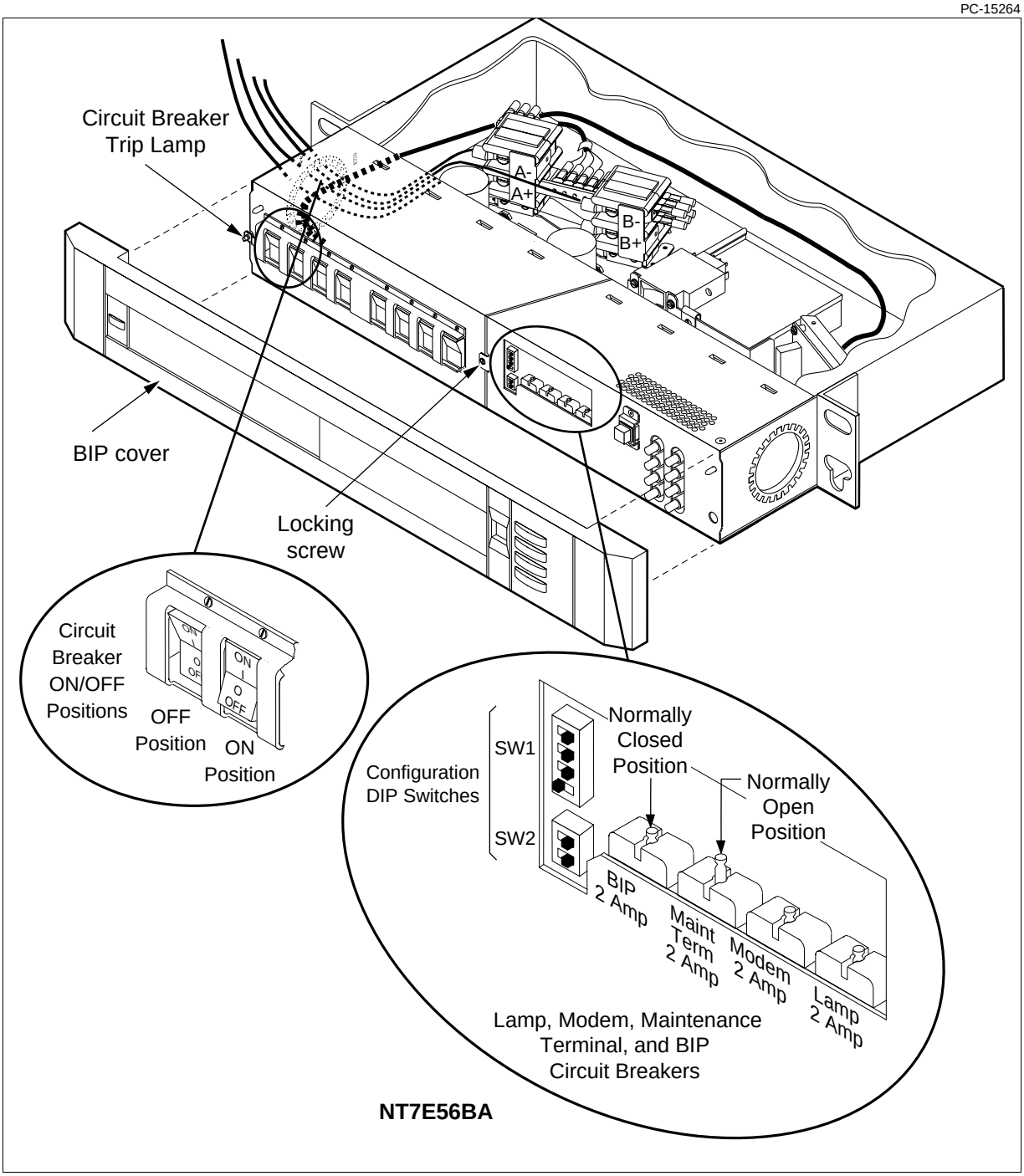
| **Circuit breaker** | **Condition** | **Breaker setting** |
|---|---|---|
| BIP | any condition | set position (reset button pushed down) |
| Maint Term | any condition | open position (reset button pulled upward) |
| Modem | modem is equipped | set position |
| | modem is not equipped | open position |
| Lamp | any condition | set position |

**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

**Figure 4-11**
**Setting the BIP miniature circuit breakers**

PC-15264



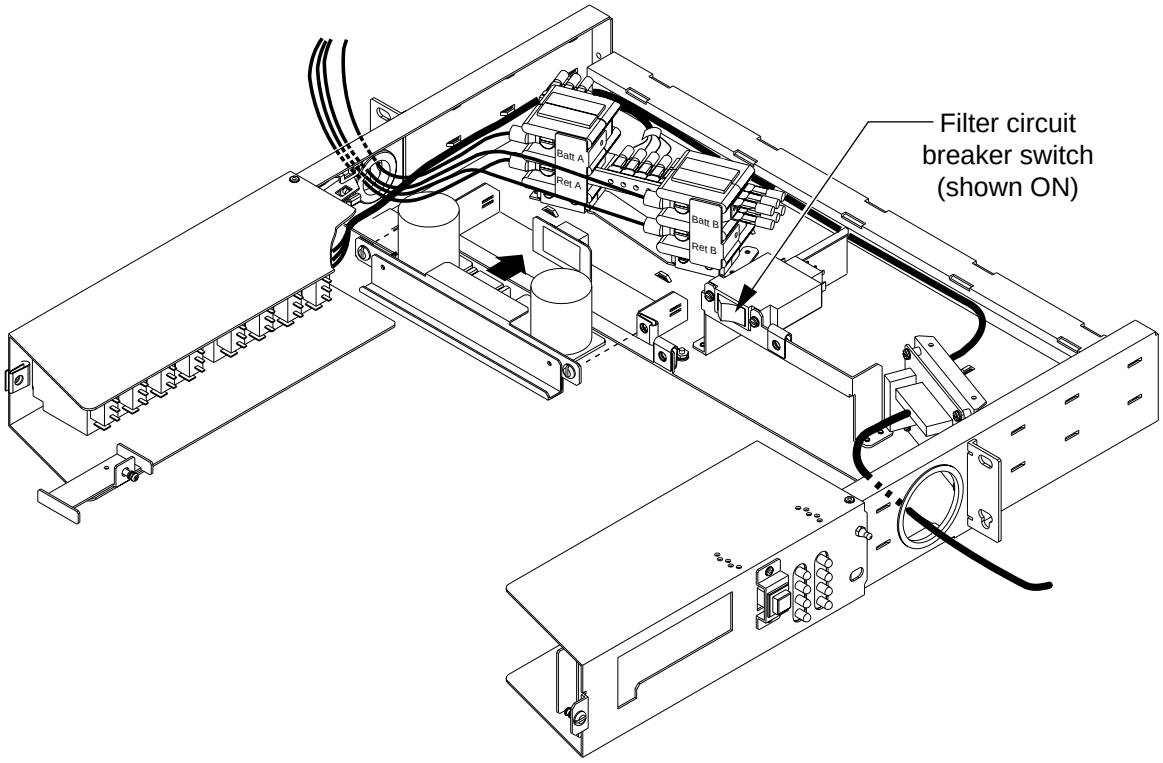

**—continued—**

Procedure 4-5 (continued)
**Connecting the office battery to the breaker interface panel**

| Step | Action |
|---|---|
| **20** | Turn the filter breaker switch to the ON position as shown in Figure 4-12. |
| **21** | Ensure that all circuit breakers remain OFF and that the A and B fuses are not inserted into the BDFB until site testing is performed as outlined in *Commissioning and Testing,* Volume 3. |

**Figure 4-12**
**BIP filter circuit breaker switch location**

PC-15265




**NT7E56BA**

**—end—**

# Procedure 4-6
# Connecting the shelf alarms

Use this procedure to connect the shelf alarm cabling, wire the breaker interface panel (BIP) breaker alarm contacts, and set the DIP switches.

This procedure applies to transport bandwidth manager (TBM) bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

## Requirements

This procedure requires a flat-blade 1/4-inch screwdriver.

## Action

| Step | Action |
|---|---|

**CAUTION**
**Damage to locking screws and the finish of the equipment covers**
Use a flat-bladed 1/4 inch screwdriver to tighten or release the locking screw on the BIP doors. Do not use a coin. A coin will damage the slots on the locking screw and can slip and damage the finish on the equipment.

**1** If it is in place, remove the BIP snap-on front cover and open the left- and right-hinged BIP doors (see Figure 4-8 on page 4-17 and Figure 4-9 on page 4-18).

**2** Refer to Figure 4-13 on page 4-25 to determine the position and location of the TBM shelf in the bay.

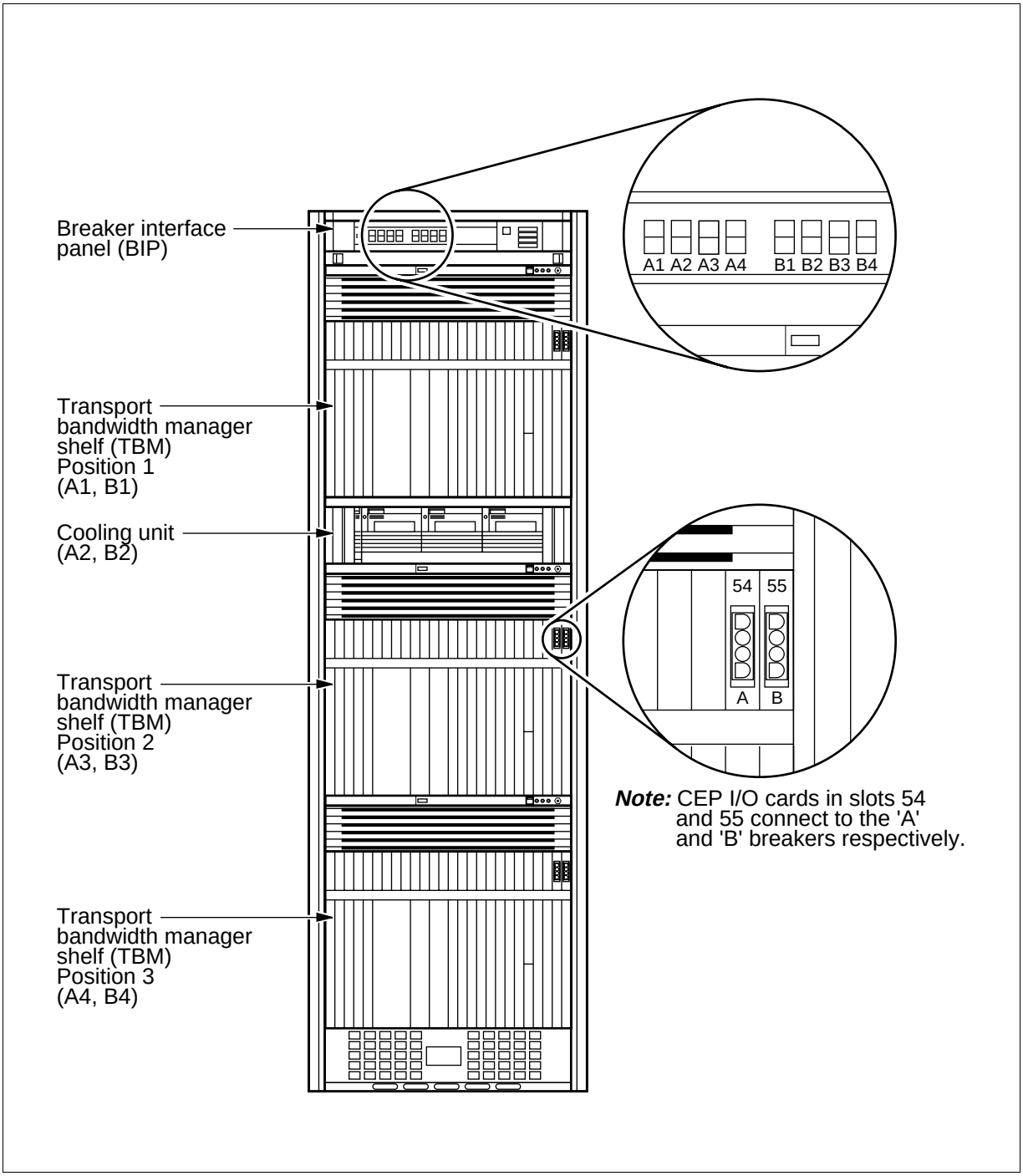
**3** Ensure that the TBM shelf alarm cables are connected to the correct 'J' connector behind the right-hinged BIP door (see Figure 4-14 on page 4-26).

**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

**Figure 4-13**
**TBM shelf positions in bay**

PC-11382

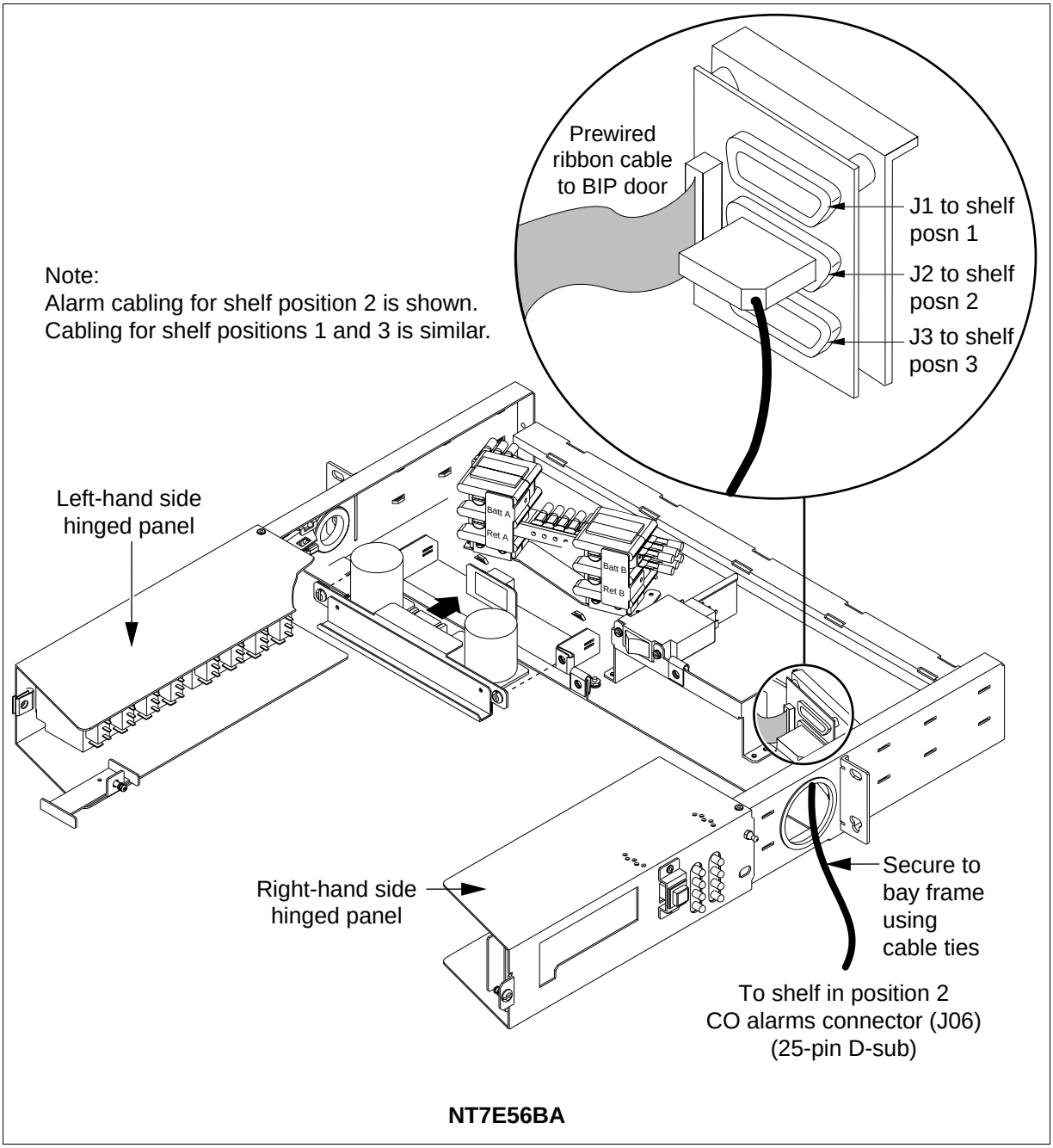



**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

**Figure 4-14**
**Shelf alarm cable connections to the BIP**

PC-15266




**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

| Step | Action |
|---|---|
| **4** | Locate the ‘A’ and ‘B’ breakers associated with the position of the TBM shelf (refer to Figure 4-13 on page 4-25). |
| **5** | At the rear of each breaker, do one of the following so that the circuit breaker alarm lamp is extinguished during normal operating conditions: |

| **If** the circuit breaker is to remain | **Then** connect the colored alarm lead (see Figure 4-15 on page 4-28) |
|---|---|
| ON | to the normally closed (NC) position |
| OFF | to the normally open (NO) position |

***Note 1:*** Cooling unit fans are powered through circuit breakers 'A2' and 'B2' and run regardless of the number of equipped shelf positions in the bay. Therefore, their alarm contacts should always be wired for normally closed (NC) operation.

***Note 2:*** Unused circuit breakers can be set in an OFF or ON position as the normal operating condition. If unused circuit breakers are left in an ON position, maintenance personnel can easily identify a tripped circuit breaker.

***Note 3:*** Two types of circuit breakers are available. Determine the type of circuit breaker used and wire accordingly as shown in Figure 4-15 on page 4-28.

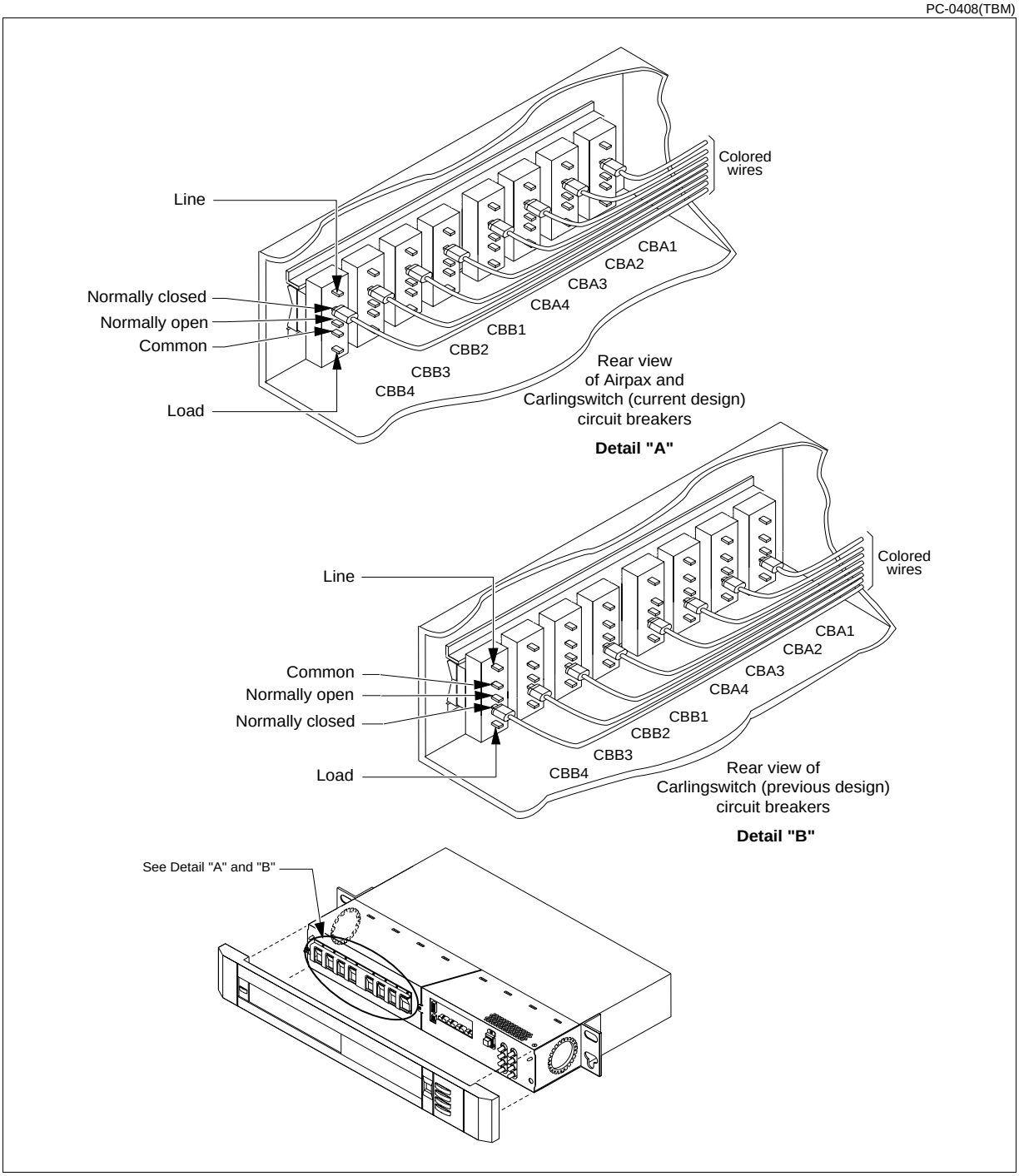
| | |
|---|---|
| **6** | Locate DIP switches SW1 and SW2 as shown in Figure 4-16 on page 4-29. |
| **7** | Set the DIP switches as shown in Figure 4-16 on page 4-29 and Figure 4-17 on page 4-30. |
| **8** | Ensure that the circuit breakers associated with the shelf positions of the TBM shelves remain OFF. They will be turned ON as explained in *Commissioning and Testing,* Volume 3. |
| **9** | To connect the office alarms, go to Procedure 4-7 on page 4-31, “Connecting the office alarms.” If not, go to step 10. |
| **10** | Close the left and right BIP doors, and secure them by turning the locking screw clockwise. |
| **11** | Reinstall the BIP front cover by pushing both ends of the cover towards the BIP. |

**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

**Figure 4-15**
**Shelf alarm cable connections to the BIP**

PC-0408(TBM)

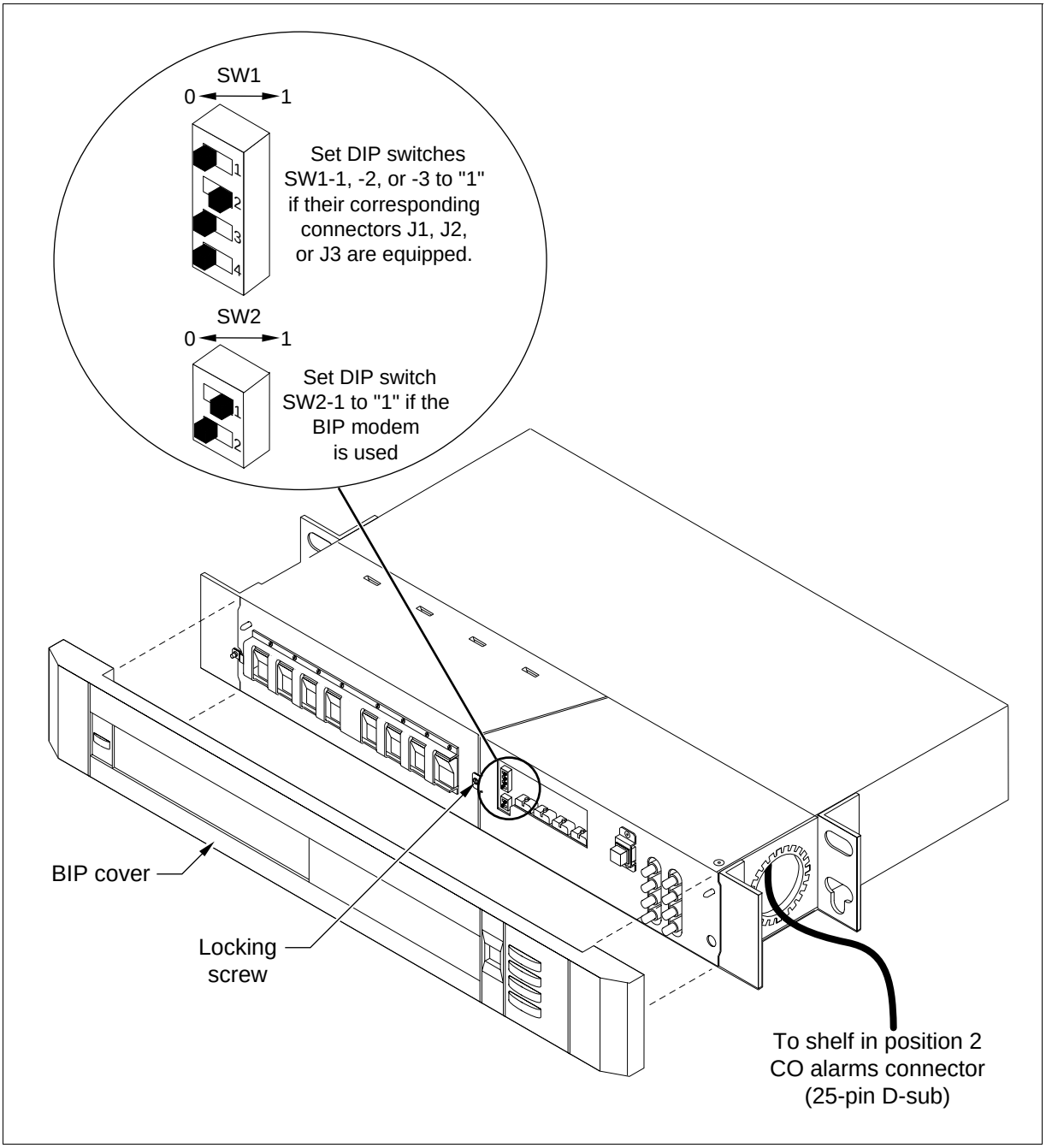



**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

**Figure 4-16**
**DIP switch SW1 and SW2 locations**

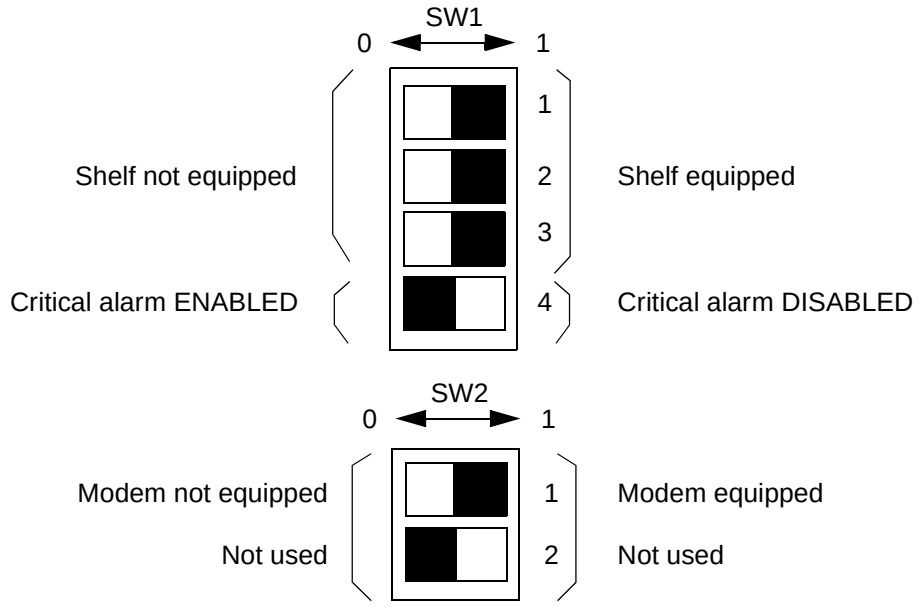
PC-15267




**—continued—**

Procedure 4-6 (continued)
**Connecting the shelf alarms**

**Figure 4-17**
**Settings for DIP switches on the BIP**




| **Switch section SW1** | **Setting** |
|---|---|
| 1 | If shelf position #1 is equipped, set to position 1, otherwise set to position 0. |
| 2 | If shelf position #2 is equipped, set to position 1, otherwise set to position 0. |
| 3 | If shelf position #3 is equipped, set to position 1, otherwise set to position 0. |
| 4 | If critical alarms are to be transmitted to the central office, set to position 0. *Note*: This switch enables the critical office alarms. During installation, set this switch to the disabled position (1). When installation is complete, set this switch to the enabled position (0). |

| **Switch section SW2** | **Setting** |
|---|---|
| 1 | If a modem is equipped, set to position 1, otherwise set to position 0. |
| 2 | Set to position 0. |

**—end—**

# Procedure 4-7
# Connecting the office alarms

Use this procedure to connect the office alarms to the breaker interface panel (BIP).

This procedure applies to transport bandwidth manager (TBM) bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

## Requirements

The following tools are required:

- wire-wrap tool
- wire skinner
- screwdriver

## Action

| Step | Action |
|---|---|
| **1** | If it is in place, remove the BIP snap-on front cover. |

**CAUTION**
**Damage to locking screws and the finish of the equipment covers**
Use a flat-bladed 1/4-inch screwdriver to tighten or release the locking screw on the BIP doors. Do not use a coin. A coin will damage the slots on the locking screw and can slip and damage the finish on the equipment.

| | |
|---|---|
| **2** | Release the locking screw located in the middle of the left- and the right-hand side hinged BIP doors by turning it counterclockwise. |
| **3** | Open the BIP right-hand side door to reveal the office alarm wire-wrap board inside the BIP (see Figure 4-18 on page 4-32). |
| **4** | In the door, slide out the plastic shield that protects the wire-wrap board. |
| **5** | Run the office alarm cable from the office cross-connect equipment, down the right bay upright, and into the BIP through the cable access hole in the right side of the BIP, as shown in Figure 4-18 on page 4-32. |

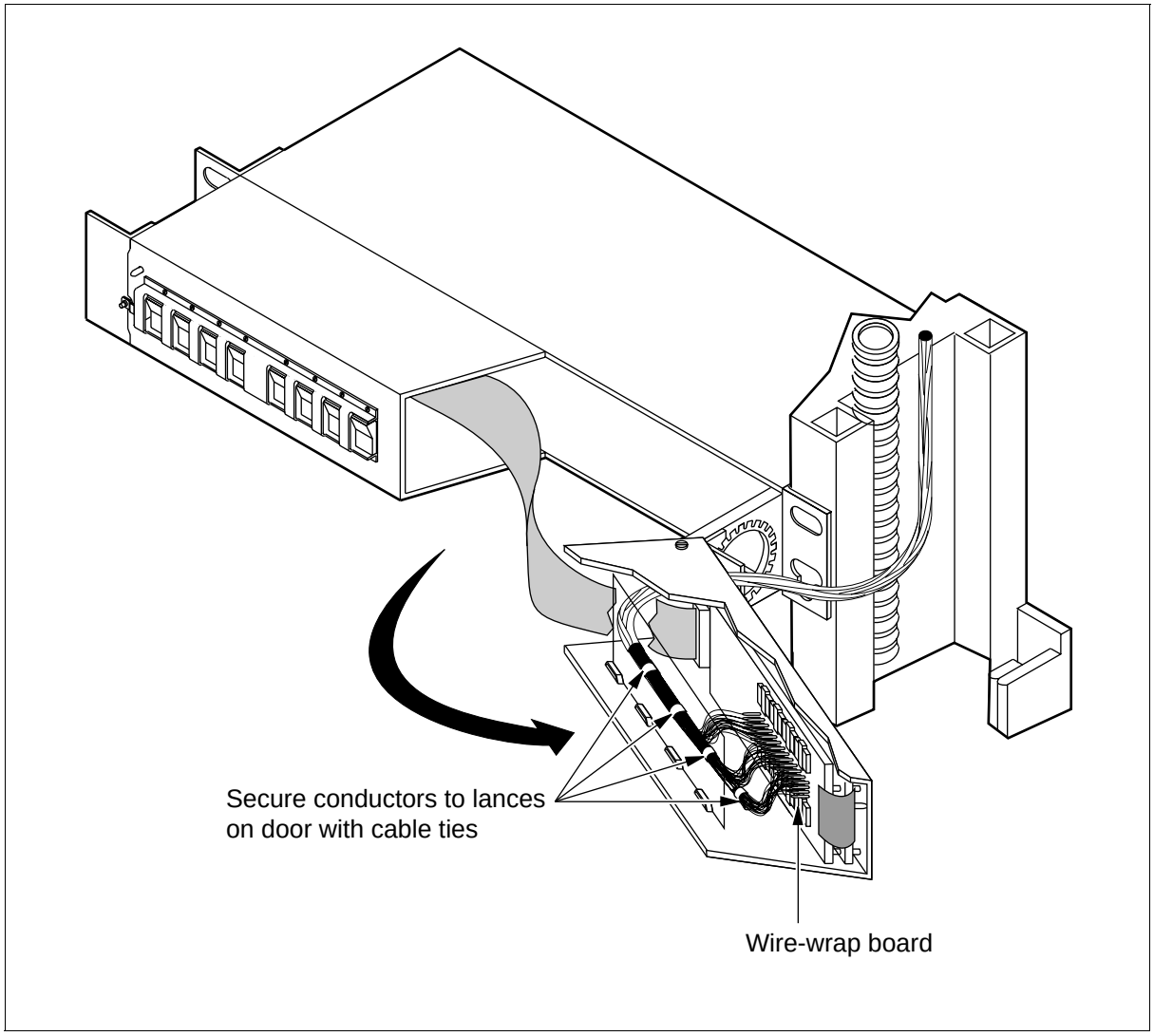
**—continued—**

Procedure 4-7 (continued)
**Connecting the office alarms**

| Step | Action |
|---|---|
| **6** | At the BIP end of the cable, strip back the cable sheath a distance of 200 mm (8 in.). |
| **7** | Install cable ties in the cable lances in the BIP door at the locations shown in Figure 4-18. Leave the cable ties slack and do not cut off the free ends of the cable ties. |

**Figure 4-18**
**Connection of office alarms to the BIP wire-wrap connection board**

PC-10609




**—continued—**

Procedure 4-7 (continued)
**Connecting the office alarms**

| Step | Action |
|---|---|
| **8** | Slip each office alarm lead through the cable ties installed in the BIP door and wire wrap it to the appropriate pin as shown in Figure 4-19 on page 4-34.<br><br>When you wire wrap the leads to the wire-wrap pins, do not pull the conductors tight. Leave enough slack in each lead to permit one repair.<br><br>***Note:*** Up to 3 wire-wrap connections are allowed on each pin. |
| **9** | Verify the connections you just made against the information in Figure 4-19 on page 4-34. If battery connections are needed, ensure that they are wire-wrapped to pins E37 to E40 and E43 to E48. |
| **10** | Tighten the cable ties you installed in the BIP door, which now have the wire-wrap leads passing through them, and cut off the free ends of the cable ties. |
| **11** | Use cable ties to attach the office alarm cable to cable lances in the right bay upright or to existing cables installed in the bay upright. |
| **12** | Reinstall the plastic shield in the BIP door. |
| **13** | Close the BIP door. |
| **14** | Close the right-hand BIP door, and secure the two BIP doors by turning the locking screw clockwise. |
| **15** | Reinstall the BIP front cover by pushing both ends of the cover towards the BIP. |
| **16** | Connect the free end of the office alarm cable to the office alarm cross connect according to local procedures. |

**—continued—**

Procedure 4-7 (continued)
**Connecting the office alarms**

**Figure 4-19**
**Office alarm wire-wrap board pin-outs**

PC-10256

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 Note 2 | E42 ● Remote ACO Note 2 | E43 ● Battery Return | E44 ● Battery Return | E45 ● Battery Return | E46 ● Battery Return | E47 ● Battery Return | E48 ● Battery Return |

**Legend:**

ACO = Alarm cutoff

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:*** Common connections (com) pins are actually shorted together. For example, pins E13 and E14, E15 and E16, E17 and E18, and so on, are physically shorted together.

***Note 2:*** When either pin E41 or E42 is momentarily connected to battery return, an ACO of the audible alarm is acivated. Audible alarm points can be cut off by momentary application of a ground to either remote ACO input.

**—end—**

# Procedure 4-8
# Installing the ac cabling in the ac receptacle

Use this procedure to install the optional ac receptacle in the base of the bay. The recommended ac cable is insulated, metal clad cable, 12 AWG, with three conductors for standard receptacle wiring. A receptacle with an isolated ground (orange) receptacle can be used if local codes require its use.

***Note 1:*** The ac cabling installation must comply with the office distribution and grounding scheme. See *Site Installation Planning and Engineering,* 323-3001-200, in *Engineering, Configuration, and Ordering Guide*, Volume 1.

***Note 2:*** The ac outlet installation must be completed before other external bay cabling, to avoid congestion with other bay cabling.

## Requirements

The following tools and materials are required:

- cable cutters
- hack saw
- power knife
- flat-bladed screwdriver
- socket wrench set, 1/2 in. drive
- pliers
- cable ties
- drawing package NT7E69BA

## Action

| Step | Action |
|---|---|
| **1** | Remove the knock-outs from the narrow sides of an electrical box. |
| **2** | Attach the electrical box to the base of the bay in the location shown in Figure 4-20 on page 4-36.<br><br>***Note:*** Unless otherwise required by the customer, the ac receptacle box is bolted directly to the frame without the use of an insulator. |
| **3** | Route the ac cable from the office distribution panel to the bay frame. |
| **4** | Route the ac cable down the left side of the bay, as shown in Figure 4-20 on page 4-36. |

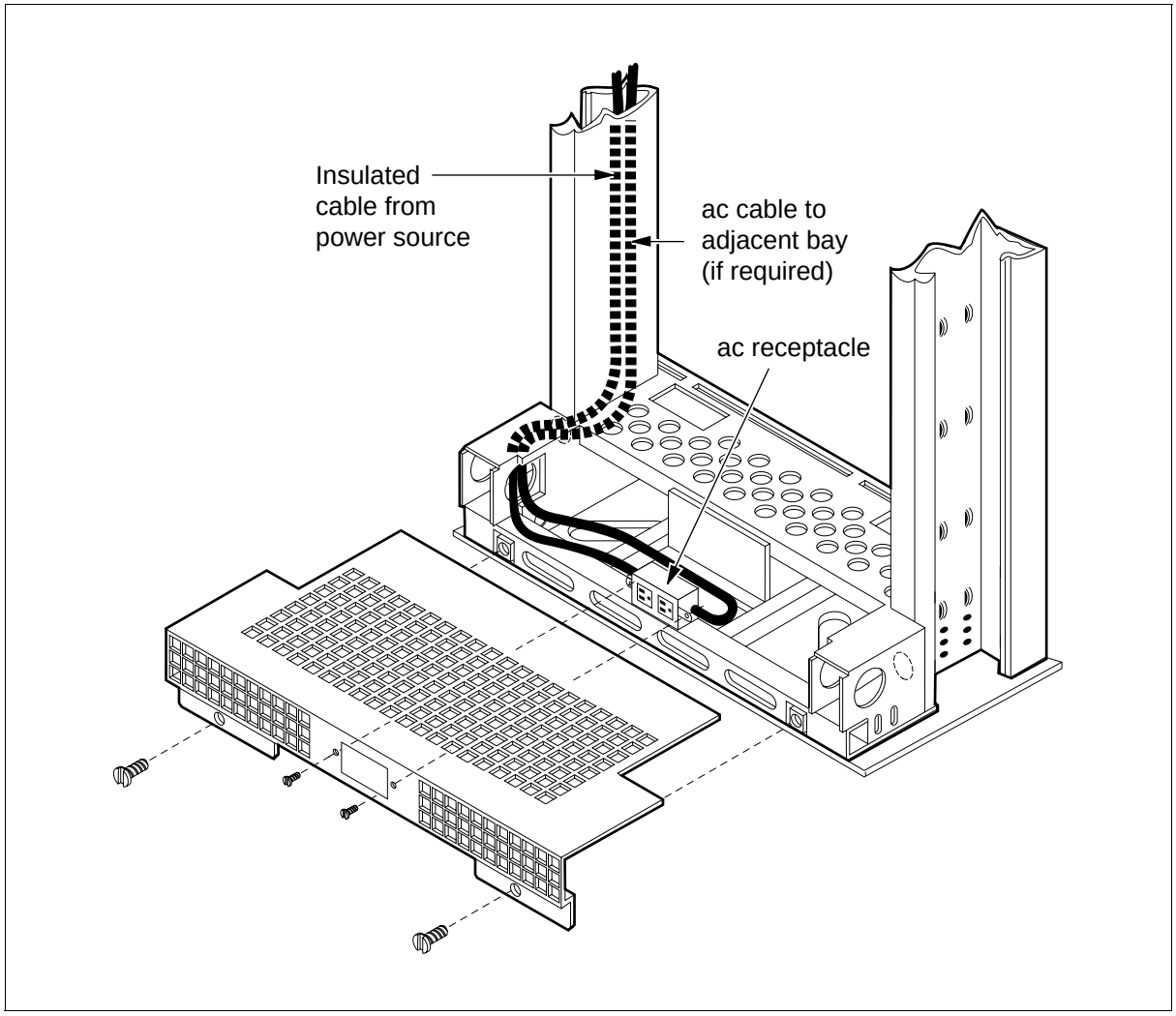
**—continued—**

Procedure 4-8 (continued)
**Installing the ac cabling in the ac receptacle**

| Step | Action |
|---|---|
| **5** | If a single ac feed is used to feed more than one bay in a lineup, route the ac cable from the first electrical box, up the left side of the bay and down the left side of the adjacent bay, for termination in its receptacle box.<br><br>***Note:*** If local codes allow, you can extend the ac cable from the right side of the first electrical box, through the base of the bay horizontally, and terminate it in the receptacle box of the adjacent bay. |

**Figure 4-20**
**Routing the ac cable**

PC-15270

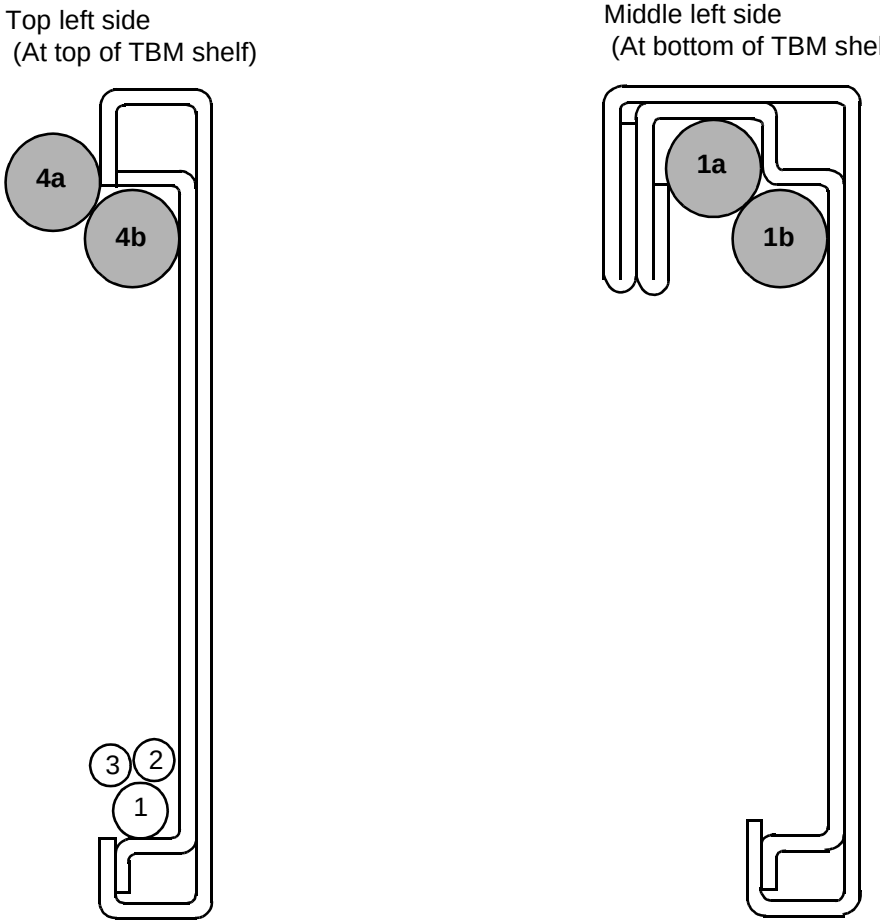



**—continued—**

Procedure 4-8 (continued)
**Installing the ac cabling in the ac receptacle**

| Step | Action |
|---|---|
| **6** | Place the ac cable(s) in the left bay upright to occupy the position shown in Figure 4-21 and secure the cable(s) with cable ties. |

**Figure 4-21**
**Placement of ac cable in the left upright**




| | | | |
|---|---|---|---|
| 1 | BIP control cable, part of shop cabling | **1a** | **ac power cable from ac source** |
| 2 | Shelf alarm cable from BIP, part of shop cabling | **1b** | **ac power cable to adjacent bay** |
| 3 | LCAP cable, part of shop cabling | | |
| **4a** | **ac power cable from ac source** | | |
| **4b** | **ac power cable to adjacent bay** | | |

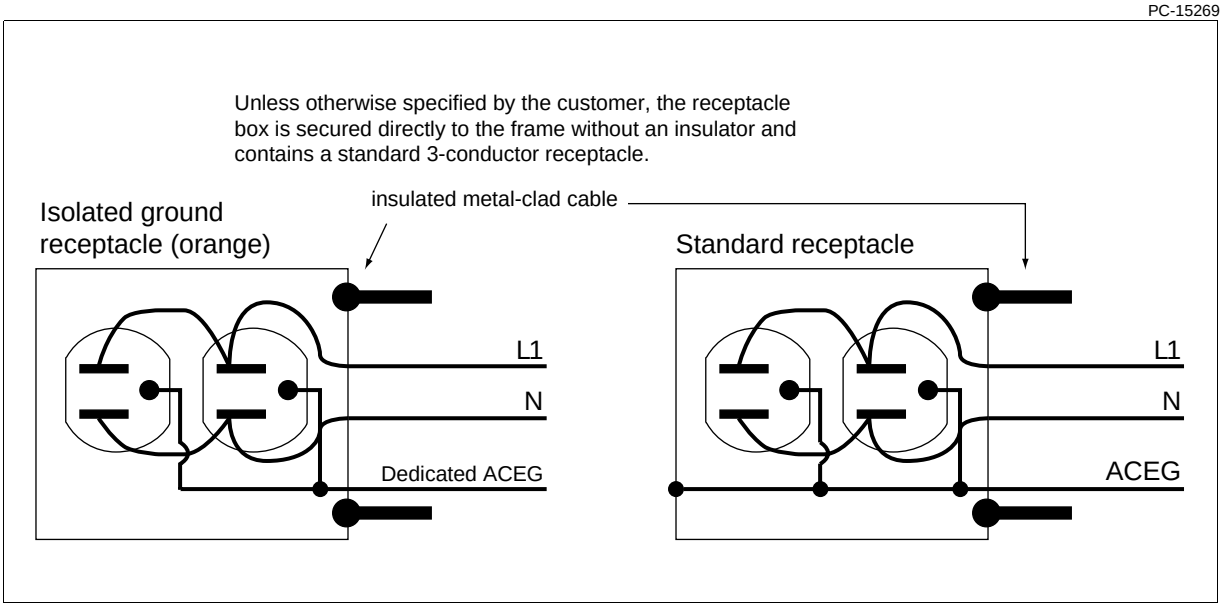
**—continued—**

Procedure 4-8 (continued)
**Installing the ac cabling in the ac receptacle**

| Step | Action |
|---|---|
| **7** | Terminate the ac cable in the electrical box for either a standard receptacle (brown or white) or an isolated ground receptacle (orange) to comply with the connections, as shown in Figure 4-22. |

**Figure 4-22**
**AC receptacle wiring diagram**

PC-15269




**—end—**

# Installing the external cabling for TBM shelves

This chapter contains procedures for installing the external cabling from the transport bandwidth manager (TBM) shelves and the TBM equipment bay to the interfacing office equipment. Pair and pin assignment tables are provided for each office termination cable. Up to three TBM shelves can be installed in the TBM bay. Procedures in this chapter apply to TBM bays with 1, 2 or 3 TBM shelves installed.

The TBM bay is available in two types of bay configurations: standard and enhanced. Standard TBM bay configurations support all AccessNode TBM features and equipment, except for virtual tributary bandwidth manager (VTBM) functionality. Enhanced TBM bay configurations can support the VTBM functionality for bi-directional line-switched rings (BLSR).

## TBM bay external cabling guidelines

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

For illustrations and descriptions of the external cabling configurations, see Chapter 2, “Transport bandwidth manager bay, shelf and cable configurations.”

> ***Note:*** The cable bend radius must not exceed 3 to 5 times the cable diameter.

## How to use this chapter

Perform the procedures in the order in which they are listed. If you cannot successfully complete these procedures, contact your next level of support.

### Chapter task lists

Table 5-1 lists the procedures for installing the external cabling for TBM shelves used as stand-alone OPC shelves supporting fiber-fed, DS1-fed, and single-ended AccessNode applications.

Table 5-2 on page 5-3 lists the procedures installing the external cabling for TBM shelves used in fiber-fed point-to-point applications as fiber central office terminals (FCOTs), and in VTBM applications for FCOT_BLSR and TN_BLSR. Perform the tasks in the order listed in the tables.

> ***Note:*** A TBM shelf installed for point-to-point (FCOT) and VTBM (FCOT_BLSR and TN_BLSR) applications can also contain an OPC module supporting fiber-fed, DS1-fed, and single-ended AccessNode applications.

**Table 5-1**
**Install a stand-alone OPC TBM shelf**

| Task | See |
|---|---|
| Read the power and grounding requirements in NTP 323-3001-200, before installing any external cables. | *Site Installation Planning and Engineering*, 323-3001-200, in *Engineering, Configuration and Ordering Guide*, Volume 1 |
| Installing a PSTN cable | Procedure 5-3 on page 5-18 |
| Installing a parallel telemetry cable | Procedure 5-5 on page 5-25 |
| Installing the control network cables and termination plugs | Procedure 5-6 on page 5-29 |
| Installing a modem cable | Procedure 5-7 on page 5-35 |
| Installing an OPC cable to OPC port 1 | Procedure 5-8 on page 5-46 |
| Installing a serial telemetry cable | Procedure 5-9 on page 5-55 |
| Installing an OPC cable to OPC port 2 | Procedure 5-10 on page 5-59 |
| Installing the OPC Ethernet cable | Procedure 5-16 on page 5-126 |
| Installing the user interface cable to the LCAP | Procedure 5-17 on page 5-130 |

**Table 5-2**
**Install one or more point-to-point and BLSR TBM shelves**

| Task | See |
|---|---|
| Read the power and grounding requirements in NTP 323-3001-200, before installing any external cables. | *Site Installation Planning and Engineering*, 323-3001-200, in *Engineering, Configuration and Ordering Guide*, Volume 1 |
| Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density | Procedure 5-1 on page 5-4 |
| Installing the fiber storage tray and the fiber patch cords on bays with a high-fiber cable density | Procedure 5-2 on page 5-12 |
| Installing a PSTN cable | Procedure 5-3 on page 5-18 |
| Installing an external synchronization cable | Procedure 5-4 on page 5-21 |
| Installing a parallel telemetry cable | Procedure 5-5 on page 5-25 |
| Installing the control network cables and termination plugs | Procedure 5-6 on page 5-29 |
| Installing a modem cable | Procedure 5-7 on page 5-35 |
| Installing an OPC cable to OPC port 1 | Procedure 5-8 on page 5-46 |
| Installing a serial telemetry cable | Procedure 5-9 on page 5-55 |
| Installing an OPC cable to OPC port 2 | Procedure 5-10 on page 5-59 |
| Installing an external orderwire cable | Procedure 5-11 on page 5-64 |
| Installing the DS1 and/or the DS3 cables | Procedure 5-12 through Procedure 5-15 |
| • Installing the DS1 cables<br>• Installing the DS3 cables<br>• Installing a mix of DS1 and DS3 cables<br>• Installing the NTZX16TG transmission ground reference panel | • Procedure 5-12 on page 5-68<br>• Procedure 5-13 on page 5-88<br>• Procedure 5-14 on page 5-100<br>• Procedure 5-15 on page 5-123 |
| Installing the OPC Ethernet cable | Procedure 5-16 on page 5-126 |
| Installing the user interface cable to the LCAP | Procedure 5-17 on page 5-130 |

# Procedure 5-1
# Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density

Use this procedure to install the following items:

- the fiber storage tray below the breaker interface panel (BIP)
- the patch cords from the faceplate of the OC-12 and OC-3 optical interface cards in the transport bandwidth manager (TBM) shelf to the office fiber cross-connect equipment

This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

The OC-12 and OC-3 optical interface cards do not have to be installed at this time. Circuit packs are installed later, refer to *Commissioning and Testing*, Volume 3.

This procedure applies to the patch cords and cables listed in Table 5-3 on page 5-5, Table 5-4 on page 5-6, and Table 5-5 on page 5-7.

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

Table 5-3 lists the TBM shelf's optical patch cords.

**Table 5-3**
**Optical patch cords**

| PEC | Length (in meters) | Connector type |
|---|---|---|
| NT7E46AA | 5 | Biconic-biconic |
| NT7E46AB | 10 | |
| NT7E46AC | 15 | |
| NT7E46AD | 20 | |
| NT7E46AE | 30 | |
| NT7E46BF | 3 | FC-FC |
| NT7E46BA | 5 | |
| NT7E46BB | 10 | |
| NT7E46BC | 15 | |
| NT7E46BD | 20 | |
| NT7E46BE | 30 | |
| NT7E46CF | 3 | ST-ST |
| NT7E46CA | 5 | |
| NT7E46CB | 10 | |
| NT7E46CC | 15 | |
| NT7E46CD | 20 | |
| NT7E46CE | 30 | |
| NT7E46FA | 5 | SC-SC |
| NT7E46FB | 10 | |
| NT7E46FC | 15 | |
| NT7E46FD | 20 | |
| NT7E46FE | 30 | |

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

Table 5-4 lists the TBM shelf's optical patch cords with miniature variable optical attenuators (mVOAs).

**Table 5-4**
**Optical patch cords with miniature variable optical attenuators**

| PEC | Length (in meters) | Connector type |
|---|---|---|
| NT7E47AA | 5 | Biconic-biconic |
| NT7E47AB | 10 | |
| NT7E47AC | 15 | |
| NT7E47AD | 20 | |
| NT7E47AE | 30 | |
| NT7E47BA | 5 | FC-FC |
| NT7E47BB | 10 | |
| NT7E47BC | 15 | |
| NT7E47BD | 20 | |
| NT7E47BE | 30 | |
| NT7E47CA | 5 | ST-ST |
| NT7E47CB | 10 | |
| NT7E47CC | 15 | |
| NT7E47CD | 20 | |
| NT7E47CE | 30 | |
| NT7E47FA | 5 | SC-SC |
| NT7E47FB | 10 | |
| NT7E47FC | 15 | |
| NT7E47FD | 20 | |
| NT7E47FE | 30 | |

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

Table 5-5 lists the TBM shelf's optical pig tails with and without miniature variable optical attenuators (mVOAs).

**Table 5-5**
**Optical pigtails**

| PEC | Length (in meters) | Connector type |
|---|---|---|
| NT7E48AA | 20 | Biconic |
| NT7E48BA | 20 | FC |
| NT7E48CA | 20 | ST |
| NT7E48FA | 20 | SC |
| NT7E49AA | 20 | Biconic (mVOA) |
| NT7E49BA | 20 | FC (mVOA) |
| NT7E49CA | 20 | ST (mVOA) |
| NT7E49FA | 20 | SC (mVOA) |

***Note:*** For short distances between the two terminals, optical patch cords or pigtails with mVOAs are required at the receiver of the OC-12 and OC-3 optical interfaces. Refer to *Site Installation Planning and Engineering,* 323-3001-200, in *Engineering, Configuration, and Ordering Guide,* Volume 1, for details.

## Requirements

The following tools and materials are required:

- wire cutters (flush cutting)
- slotted screwdriver
- two screws 2.5 mm (1/10 in.) diameter for each mVOA
- cable ties
- split tubing, 12 mm (0.5 in.) CPC R0113199, or equivalent.

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

**CAUTION**
**Risk of damaging fiber cables**
Handle fibers with extreme care. Maintain a minimum bending radius of 76 mm (3 in.) at all times. Optical connections to the optical units should be finger-tightened only.

**DANGER**
**Risk of eye injury**
At all times when handling optical fibers, follow the safety procedures recommend by your company.

## Action

| Step | Action |
|---|---|
| **1** | Install the fiber storage tray in the bay directly below the breaker interface panel (BIP) as shown in Figure 5-1 on page 5-10. Secure the tray in place using the screws provided with the tray. |
| **2** | Remove the snap-on tray cover. |
| **3** | Use cable ties to attach split tubing (for the first 10 fibers) in the locations shown in Figure 5-1 on page 5-10.<br><br>TBM shelf position 2 is shown in the figure. Route and secure additional split flex tubing to each additional TBM shelf installed.<br><br>End the flexible tubing conduit 50 mm (2 in.) measured vertically from the points at which the fiber cables will enter the fiber tray and the TBM shelf. |
| **4** | If you are installing more than 10 fibers, repeat the previous step to install split tubing in the same locations at the left side of the bay. |
| **5** | Using local office procedures, label the fibers with the following information:<br>• slot number in the TBM shelf for the intended OC-12 or OC-3 optical interface card<br>• direction of the signal: transmit (Tx) or receive (Rx) |
| **6** | Run the fibers from the overhead cable rack through the flexible tubing conduit (or panduit) down the right side of the bay to the fiber storage tray as shown in Figure 5-1 on page 5-10.<br><br>If you are connecting more than 10 fibers, run the remaining fibers down the left side of the bay. |

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

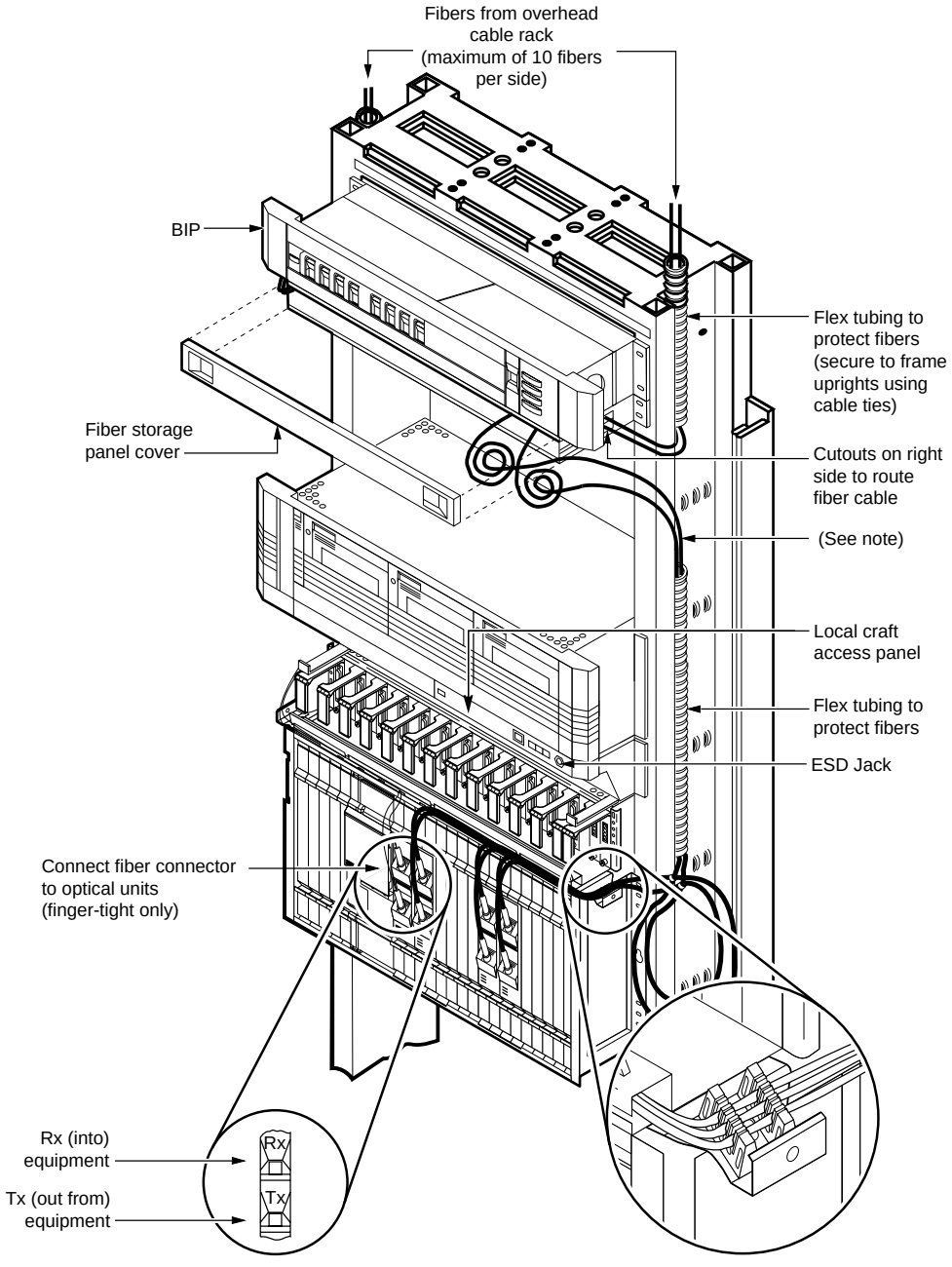
| Step | Action |
|---|---|
| **7** | Coil and store the excess length of the fibers in the storage tray to ensure that the coiled fibers have a minimum coil diameter of 76mm (3 in.). Handle the fibers with care. |
| **8** | Route the fiber patch cords from the fiber storage tray to the TBM shelves down through the flexible tubing at the right or left side of the bay, then into the cable trough at the top of the TBM shelves as shown in Figure 5-1 on page 5-10.<br><br>TBM shelf position 2 is shown in the figure. Route patch cords for any other installed TBM shelves in a similar manner. |
| **9** | Extend the fiber patch cords along the cable trough at the top edge of the TBM shelf, as shown in Figure 5-1 on page 5-10. |
| **10** | Hang the connectorized end of the patch cords out of the trough at the intended locations of the OC-12 and OC-3 optical interface cards. |

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

**Figure 5-1**
**Routing optical fiber cabling**

PC-15297




***Note:*** Fiber routing for shelf position 2 shown. Routing for positions 1 and 3 is similar.

**—continued—**

Procedure 5-1 (continued)
**Installing the fiber storage tray and the fiber patch cords on bays with a low-fiber cable density**

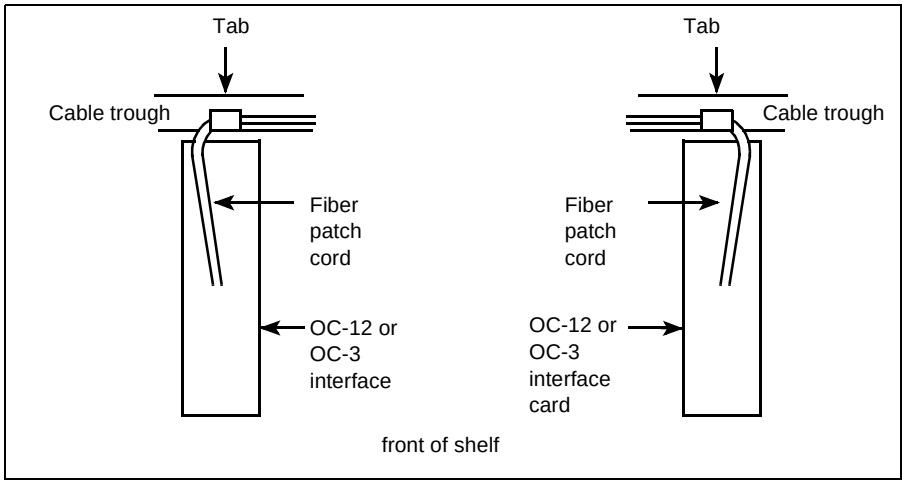
| Step | Action |
|---|---|

**CAUTION**
**Risk of damage to fiber patch cords**
Ensure that each fiber patch cord exits the cable trough to the left of the tab that is immediately above the card to which the patch cord connects. If a cord exits the trough to the right of the tab, it may snag and become damaged when an adjacent card is removed.

Also, do not overtighten the fiber cords when threading them in the mVOA storage assembly—they can be damaged if their surface is squeezed, indented, or broken.

**11** Ensure that each fiber patch cord exits the cable trough, as follows:

| **If** the patch cords enter at | **Then** route the patch cords to |
|---|---|
| left side of each TBM shelf | the right of the tab above the interface card to which it connects |
| right side of each TBM shelf | the left of the tab above the interface card to which it connects |




**12** Slip each fiber into an empty slot in the cable clip in the cable bracket located at the end of the TBM shelf.

**13** Reinstall the snap-on tray cover.

***Note:*** Any subsequent cabling should be done very carefully to avoid damage to these fibers.

**—end—**

# Procedure 5-2
# Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density

The fiber management storage panel is required on bays where more than four fiber cables must be stored in a tray. This tray holds a maximum of 20 fiber cables, 10 of which may have miniature variable-optical attenuators (mVOA). The design of the tray makes each fiber accessible for rerouting or replacement, while minimizing the risk of disruption of traffic.

The storage tray is contained in a pull-out drawer that tilts down for easy access. The tray houses five stacks of spindles. Each stack consists of four fiber reels mounted on a spindle, and each reel can store up to 2.8 meters of slack fiber.

Use this procedure to install a fiber management storage tray, route the fiber cables to and from the tray, and to and from the shelves.

## Requirements

The following tools and materials are required:

- wire cutters (flush-cutting)
- flathead screwdriver
- cable ties
- fiber management storage tray (NT7E58AC)

**CAUTION**
**Risk of damaging fiber cables**
Handle fiber cables with care. Optical connections to the optical units should be finger-tightened only.

**CAUTION**
**Risk of damaging fiber cables**
Observe a minimum bending diameter of 76 mm (3 in.) at all times when bending fibers.

**—continued—**

Procedure 5-2 (continued)
**Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density**

## Action

| Step | Action |
|---|---|
| **1** | Label all fiber connectors and mVOAs (if mVOAs are required). |
| **2** | Install the fiber management storage tray on the bay directly below the breaker interface panel (BIP), as shown in Figure 5-2 on page 5-14. Secure it with the screws provided with the tray. |
| **3** | Run the office fiber cables from the overhead cable rack down the sides of the bay. |
| **4** | Slide the fiber management storage tray as far to the front as possible. |
| **5** | Raise the flip-top cover on the tray (see Figure 5-3 on page 5-16). |
| **6** | Lower the tray to a working angle by simultaneously pressing on the two release tabs located at the sides and underneath the tray. |
| **7** | Select the reel on which to store the fiber cable and the fiber bridge(s) where the fiber cable will enter the tray.<br><br>***Note:*** Fiber cables that are stored on reels in reel stacks 2 and 3 must enter and exit the tray through the fiber bridges at the right of the tray. Fiber cables that are stored on reels in reel stacks 1 and 5 must enter and exit the tray through the fiber bridges at the left of the tray. Fiber cables that are stored on reels in reel stack 4 can enter the tray through a bridge on one side of the tray and exit the tray through a bridge on the other side of the tray. |
| **8** | Use a miniature flathead screw driver to pop open each of the caps on the selected bridge.<br><br>**CAUTION**<br>**Risk of damaging fiber cables**<br>Handle fiber cables with care. Observe a minimum bending diameter of 76 mm (3 in.) at all times when handling optical fiber cables. |
| **9** | Remove the reel on which the fiber is to be stored (see Figure 5-4 on page 5-17). To do this, unscrew the thumbscrew attached to the top reel in the stack. This provides access to all of the reels in the stack. |

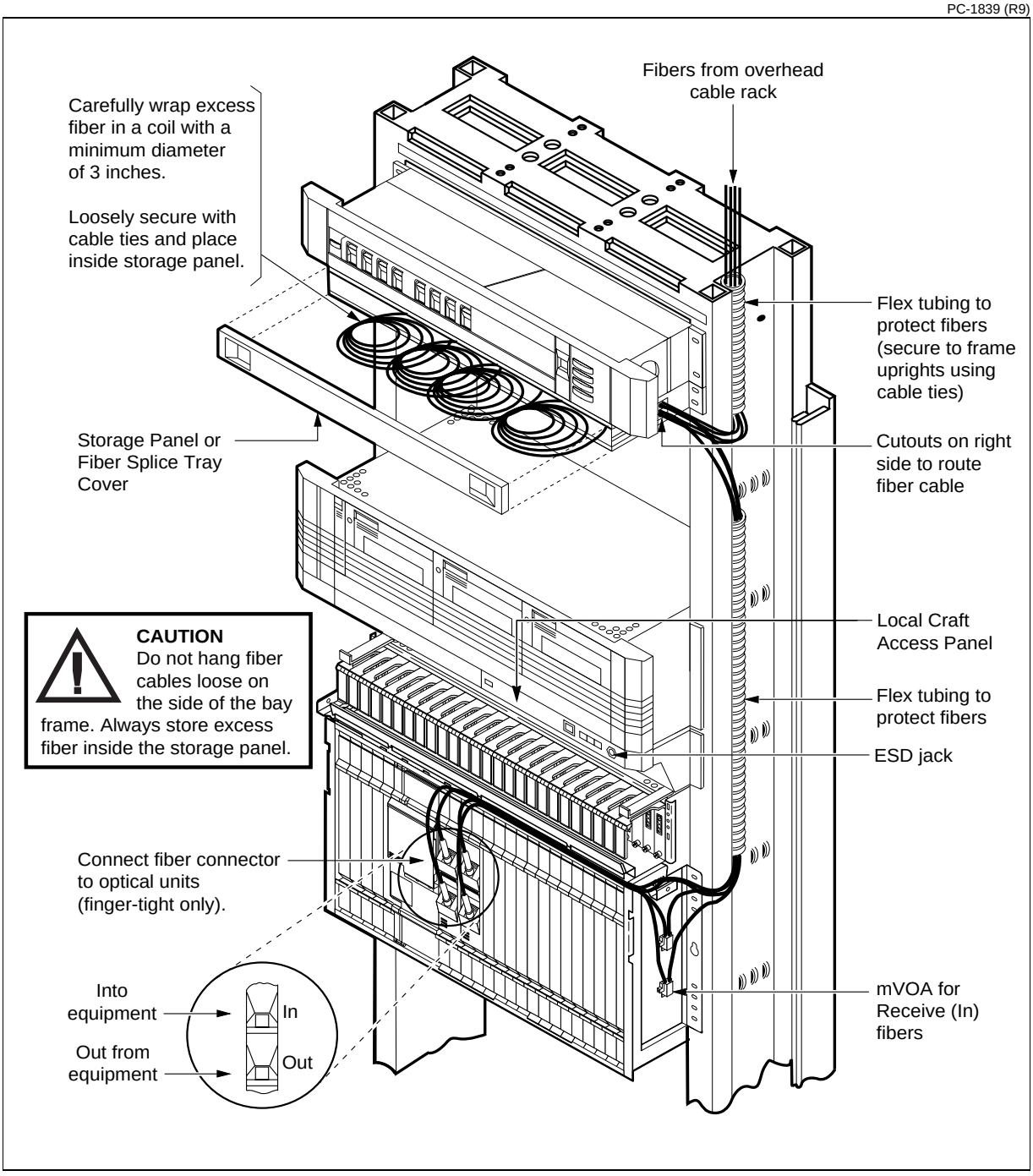
**—continued—**

Procedure 5-2 (continued)

**Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density**

**Figure 5-2**
**Installing the fiber management storage panel and routing the fiber cables**

PC-1839 (R9)




**—continued—**

Procedure 5-2 (continued)
**Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density**

| Step | Action |
|---|---|
| **10** | Remove the desired reel and gently wind the slack fiber cable around the reel, leaving adequate cable to pass around the fiber guides and fiber bridge.<br><br>If the fiber cable contains an mVOA (see Figure 5-3 on page 5-16), wind both fiber cables from the mVOA around the reel simultaneously.<br><br>***Note:*** When unwinding fiber cable from a reel, proceed with caution since the fiber cable can bind in the reel and exceed the minimum bend radius. |
| **11** | Replace the reel on the spindle and make sure the top reel is secured to the spindle with the thumbscrew (see Figure 5-4 on page 5-17). If the fiber cable contains an mVOA, snap it into one of the two mVOA holders located beside each stack (see Figure 5-3 on page 5-16). |
| **12** | Gently route the excess cable along the guides and the fiber bridge. |
| **13** | Replace the bridge caps (see Figure 5-3 on page 5-16). |
| **14** | Update the fiber routing diagram located on the inside of the fiber management storage tray flip-top cover. This diagram should always show the current routing of fiber cables within the tray. |

| If | Then |
|---|---|
| more fiber cables are to be added | repeat steps 7 through 14 |
| no more fiber cables are to be added, rerouted, or removed | go to step 15 |

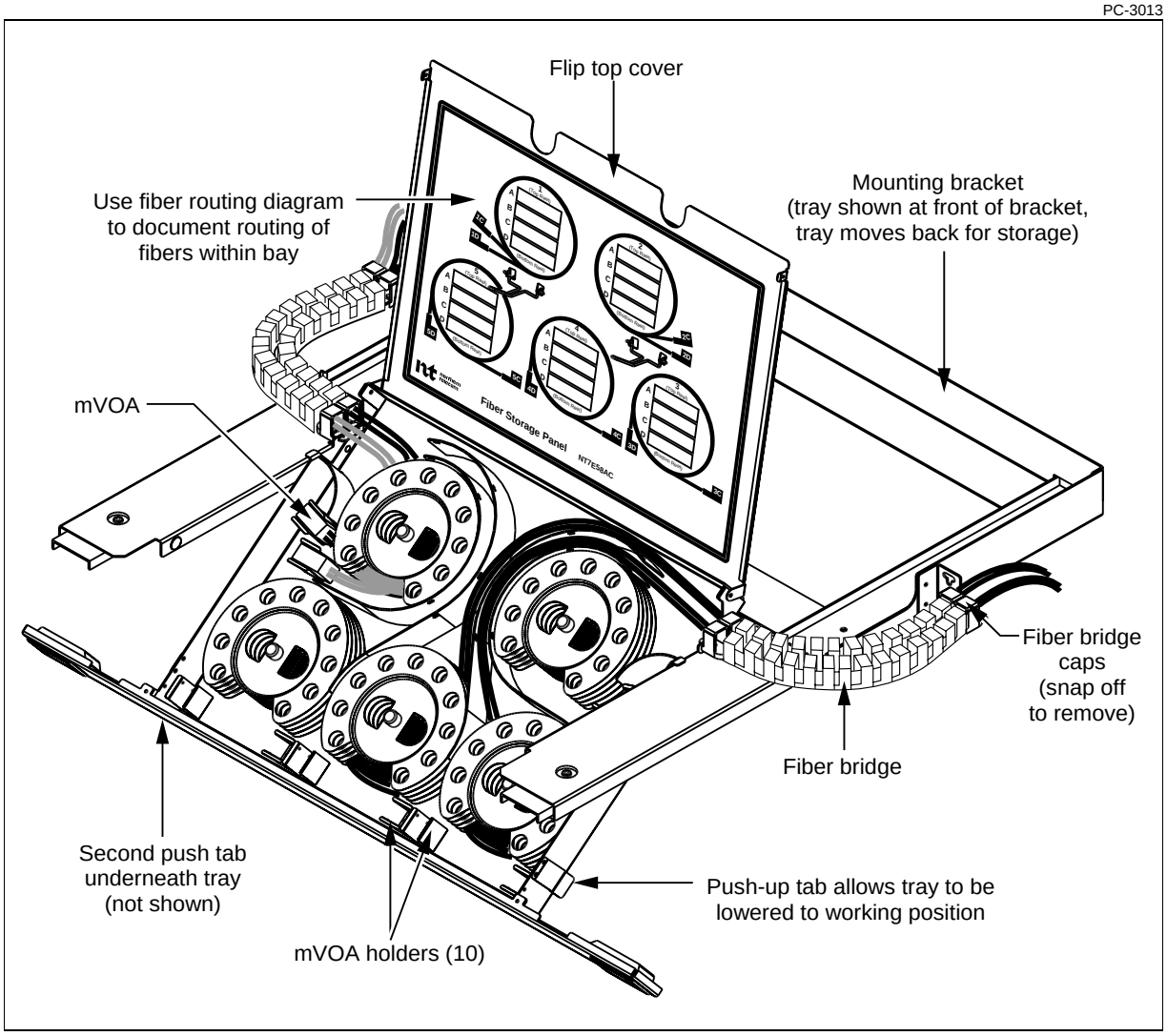
| | |
|---|---|
| **15** | Close the flip top cover (see Figure 5-3 on page 5-16), raise the tray in to the horizontal position, and push the tray to the back of the cabinet. |
| **16** | Run the office fiber cables from the overhead cable rack through the flexible tubing conduit, down the sides of the bay. |
| **17** | Route fiber cables through the guides on top of the shelf and leave enough length to connect them to the optical circuit packs. If mVOAs are required, place them in the appropriate holders. Ensure that the tuning screws of the mVOAs are facing out for mVOA adjustment. Secure the mVOAs with small cable ties.<br><br>***Note:*** Do any subsequent cabling very carefully to avoid damage to these fiber cables. |
| **18** | Enclose the fiber cables running along the side of the bay in the flexible tubing conduit. |
| **19** | Fasten the flexible tubing conduit to the frame uprights using cable ties.<br><br>***Note:*** Place the flexible tubing conduit and fiber cables on the bay uprights in so that they are easily accessible even after all cables have been run and secured. See Figure 5-2 on page 5-14 for a suggestion about how to route fiber cables within the frame uprights. |

**—continued—**

Procedure 5-2 (continued)
**Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density**

**Figure 5-3**
**Fiber management storage tray**

PC-3013



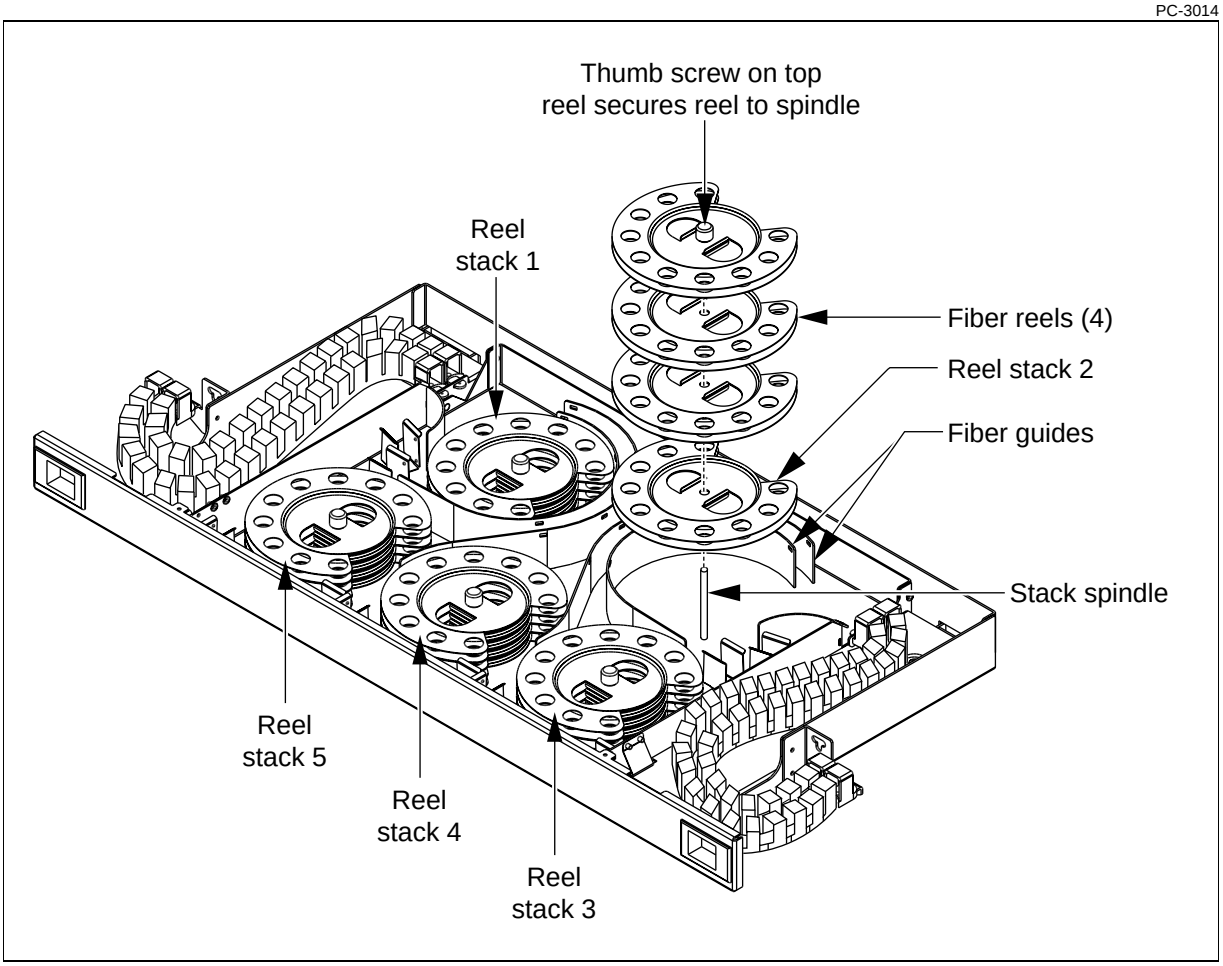

**—continued—**

Procedure 5-2 (continued)

**Installing the fiber management storage tray and routing the fiber cables on bays with a high-fiber cable density**

**Figure 5-4**
**The fiber management storage tray: stacking reels**

PC-3014




**—end—**

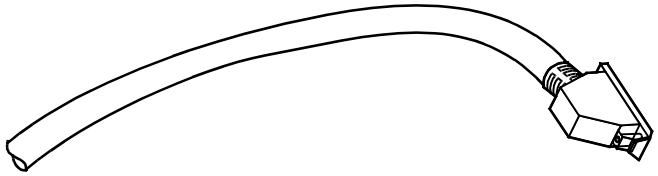
# Procedure 5-3
# Installing a public switched telephone network cable

Use this procedure to install an NT7E44UA cable to the Access BIP connector (J14) on a transport bandwidth manager shelf. This cable can be used for public switched telephone network (PSTN) access from orderwire.

This procedure applies to transport bandwidth manager (TBM) bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**NT7E44UA**



44-pin male D-subminiature

One pair shielded 26 AWG solid wires connectorized at one end with a 44-pin male connector for connection to the TBM shelf. The NT7E44UA cable is provided in 20 m (65 ft) lengths.

## Requirements

The following tools and material are required:

- cable cutters
- cable ties
- wire wrap tool
- wire stripper

## Action

| Step | Action |
|---|---|
| **1** | Route the end of the cable with the 44-pin connector into the left side of the bay. |

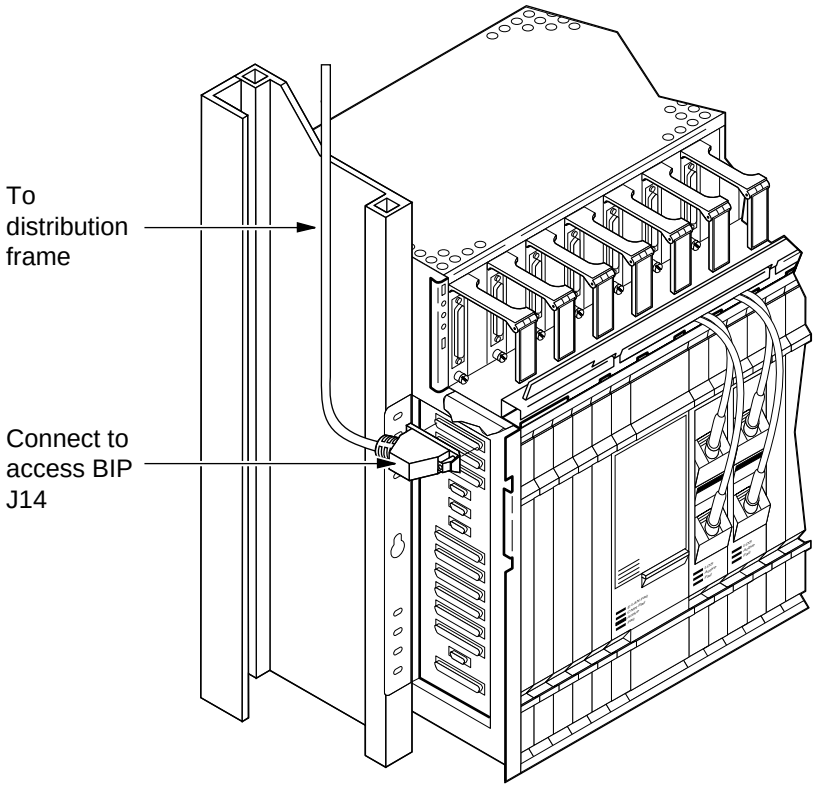
**—continued—**

Procedure 5-3 (continued)
**Installing a public switched telephone network cable**

| Step | Action |
|---|---|
| **2** | Connect the cable to the Access BIP (J14) connector, as shown in Figure 5-5. |

**Figure 5-5**
**Connection of a PSTN cable**

PC-15033A




***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

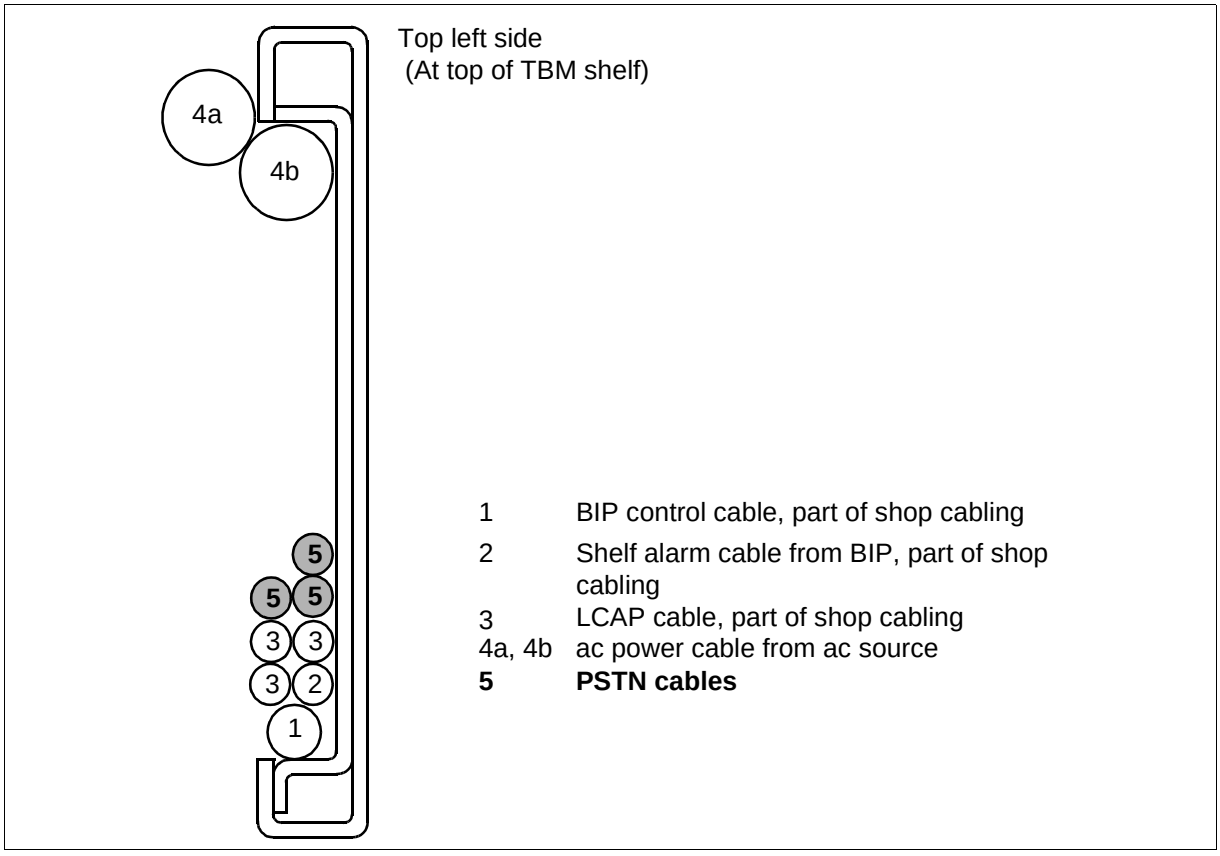
**3** Place the PSTN cable in the bay upright to occupy the position shown in Figure 5-6, and use cable ties to secure the cable to the bay upright, or to other bundles of existing cables.

**—continued—**

Procedure 5-3 (continued)
**Installing a public switched telephone network cable**

| Step | Action |
|---|---|
| **4** | Route the cable up the bay to its termination point on the distribution frame. |

**Figure 5-6**
**Placement of the PSTN cable in the bay upright**




**5** Refer to Table 5-6 to complete the office connections.

**Table 5-6**
**PSTN cable color coding and pin-out details**

| Signal | Pin | Color |
|---|---|---|
| XCOTIP | 35 | W |
| XCORING | 36 | G |
| ***Note:*** All other pins on the PSTN cable are unused. | | |

**—end—**

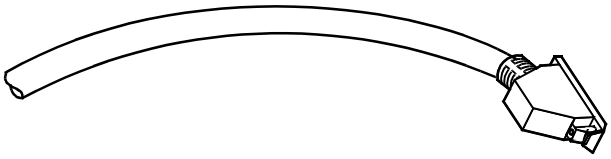
# Procedure 5-4
# Installing an external synchronization cable

Use this procedure to install an external synchronization cable (NT4K86EA through EE) to an AccessNode TBM shelf at a central switching office. A remote TBM shelf is synchronized to the network and does not require installation of this cable.

This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**NT4K86EA through EE**



25-pin male D-subminiature

6-pair, twisted, 22 AWG solid wires with shielding, connectorized with a 25-pin male connector at one end only for connection to the TBM shelf. The NT4K86 is offered in the following lengths:

| | | |
|---|---|---|
| 15 m | (50 ft) | NT4K86EB |
| 30 m | (100 ft) | NT4K86EA |
| 61 m | (200 ft) | NT4K86EC |
| 91 m | (300 ft) | NT4K86ED |
| 198 m | (650 ft) | NT4K86EE |

***Note:*** The external synchronization cable can only be connected to equipment that is bonded to the same ground point.

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties

**—continued—**

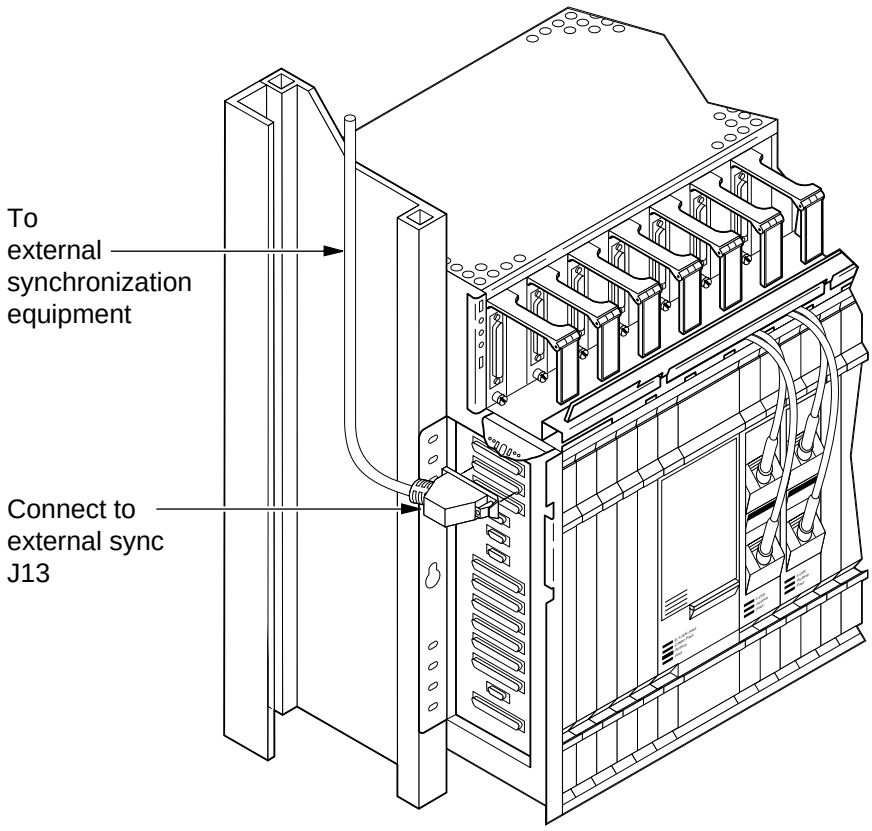
Procedure 5-4 (continued)
**Installing an external synchronization cable**

## Action

| Step | Action |
|---|---|
| **1** | Route the 25-pin connector into the left side of the bay. |
| **2** | Connect the cable to the Sync (J13) connector, as shown in Figure 5-7. |

**Figure 5-7**
**Connecting the external synchronization cable**

PC-10606A



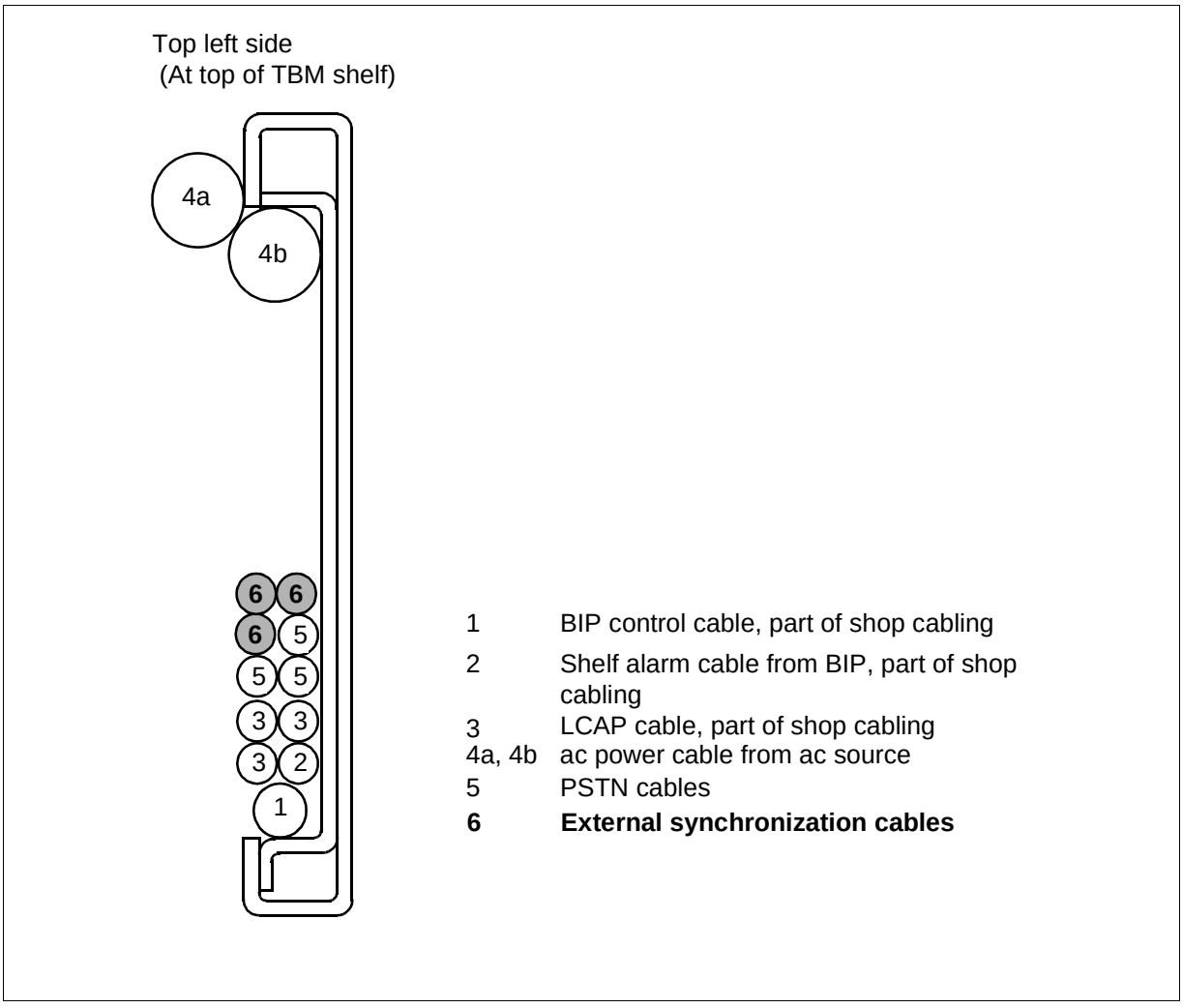

***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-4 (continued)
**Installing an external synchronization cable**

| Step | Action |
|---|---|
| **3** | Place the external synchronization cable in the bay upright to occupy the position shown in Figure 5-8, and use cable ties to secure the cable to the bay upright, or to other bundles of existing cables. |
| **4** | Route the cable up and out of the bay to the external synchronization equipment. |
| **5** | See Table 5-7 on page 5-24 for the cable pair color coding, and terminate the office end of the cable to the external synchronization equipment. |

**Figure 5-8**
**Placement of the external synchronization cable in bay upright**




**—continued—**

Procedure 5-4 (continued)
**Installing an external synchronization cable**

**Step Action**

**Table 5-7**
**External synchronization cable pair color coding and pin-out details**

| Signal | Lead | Pin | Color |
|---|---|---|---|
| Primary reference input | Tip | 1 | W 1BL |
| | Ring | 14 | BL 1W |
| Secondary reference input | Tip | 3 | W 1O |
| | Ring | 16 | O 1W |
| DS1 output, top ESI | Tip | 5 | W 1G |
| | Ring | 18 | G 1W |
| DS1 output, bottom ESI | Tip | 7 | W 1BR |
| | Ring | 20 | BR 1W |
| ***Note:*** All other pins are not connected (NC). | | | |

**—end—**

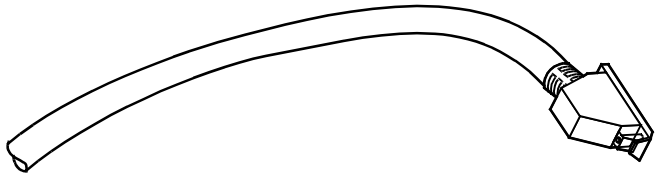
# Procedure 5-5
# **Installing a parallel telemetry cable**

Use this procedure to install a parallel telemetry cable (NT4K85GA, GB, GC, GE or GF) in each of the installed TBM shelves.

This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**NT4K85GA, GB, GC, GE, and GF**



44-pin male D-subminiature

25-pair, twisted, 26 AWG solid wires connectorized with a 44-pin male connector at one end for connection to the TBM shelf. The NT4K85 cable is available in the following lengths:

| | | |
|---|---|---|
| 15 m | (50 ft) | NT4K85GE |
| 30 m | (100 ft) | NT4K85GA |
| 61 m | (200 ft) | NT4K85GB |
| 91 m | (300 ft) | NT4K85GC |
| 122 m | (400 ft) | NT4K85GF |

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties
- wire tool
- wire stripper

**—continued—**

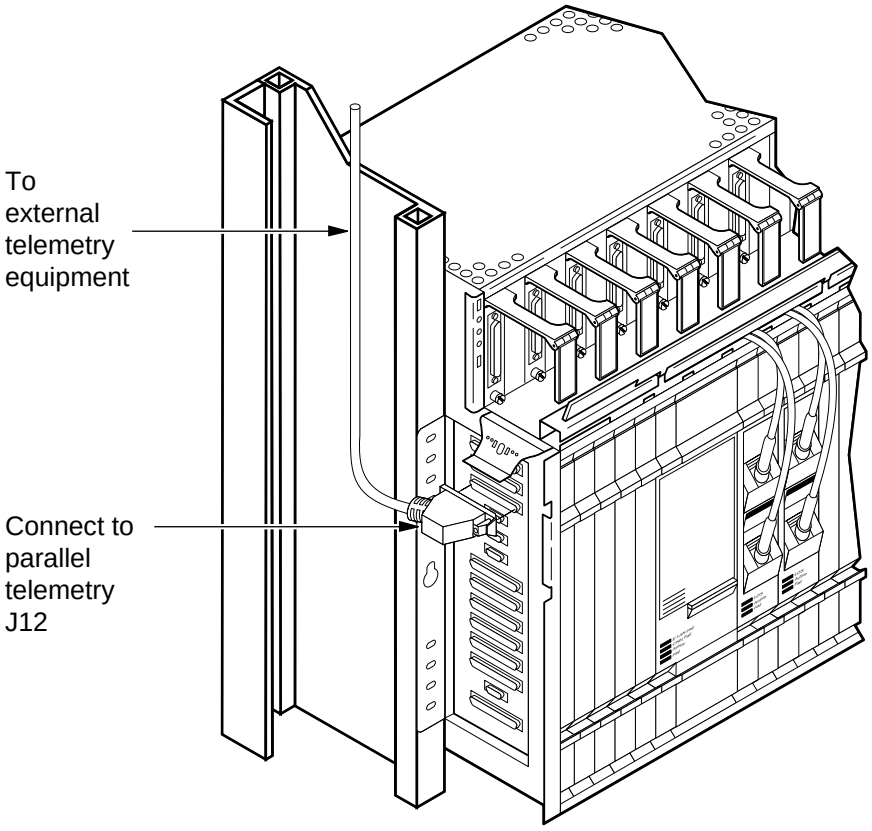
Procedure 5-5 (continued)
**Installing a parallel telemetry cable**

## Action

| Step | Action |
|---|---|
| **1** | Route the end of the cable with the 44-pin connector into the left side of the bay. |
| **2** | Connect the cable to the Parallel Telemetry (J12) connector, as shown in Figure 5-9. |

**Figure 5-9**
**Connection of a parallel telemetry cable**

PC-10607A



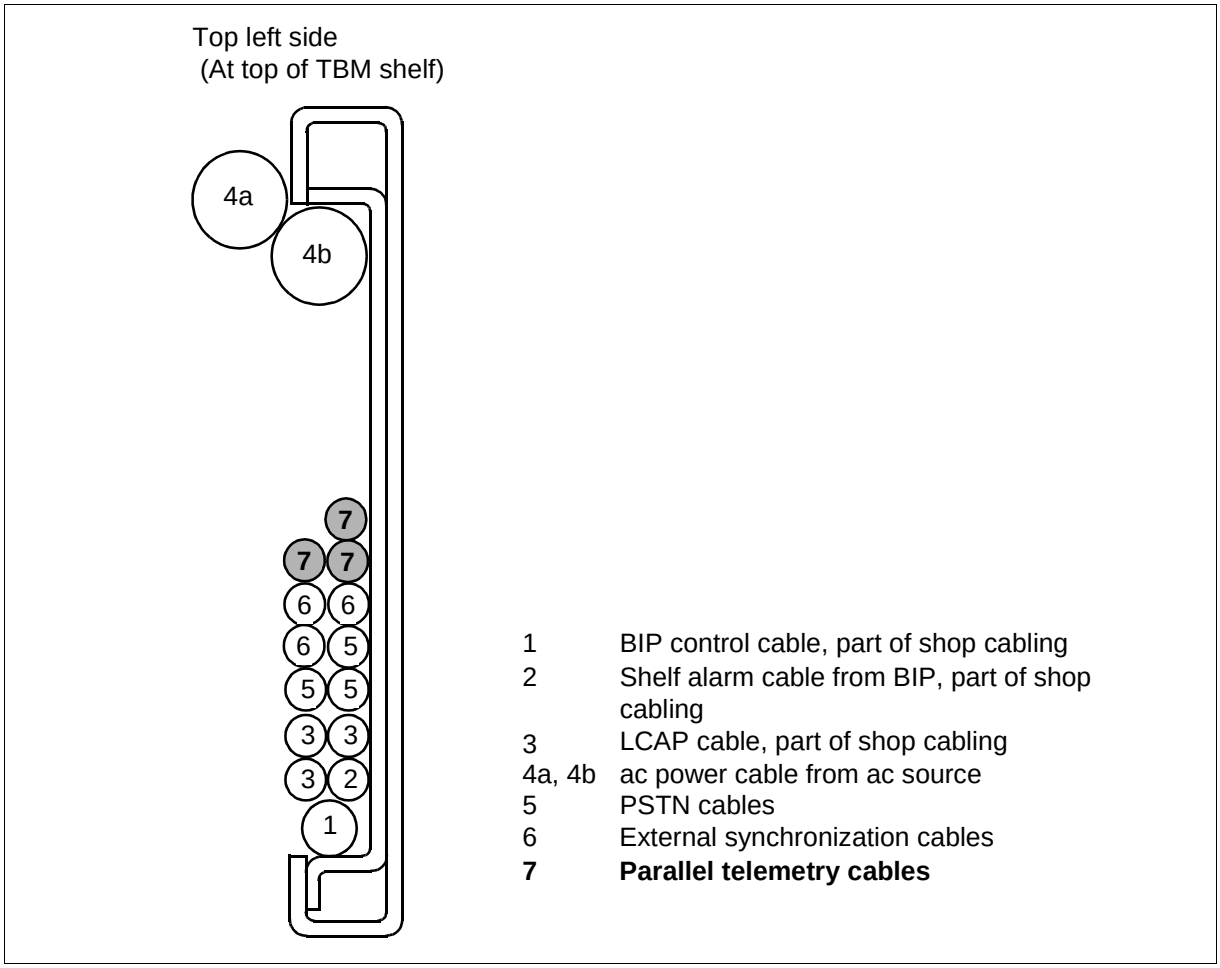

***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-5 (continued)
**Installing a parallel telemetry cable**

| Step | Action |
|---|---|
| **3** | Place the parallel telemetry cable in the bay upright to occupy the position shown in Figure 5-10, and use cable ties to secure the cable to the bay upright, or to other bundles of existing cables. |
| **4** | Route the cable up out of the bay to the external telemetry equipment. |

**Figure 5-10**
**Placement of the parallel telemetry cable in the bay upright**




**—continued—**

Procedure 5-5 (continued)
**Installing a parallel telemetry cable**

| Step | Action |
|---|---|

**5** Refer to the following wiring table and complete the office connections.

**Table 5-8**
**Parallel telemetry cable pair color coding and pin-out detail**

| Signal | Pin | Pair | Color | Signal | Pin | Pair | Color |
|---|---|---|---|---|---|---|---|
| OUT 01 | 1 | 1 | BL 1W | IN 03 | 23 | 12 | O 1BK |
| OUT 02 | 2 | 1 | W 1BL | IN 04 | 24 | 12 | BK 1O |
| OUT 03 | 3 | 2 | O 1W | IN 05 | 25 | 13 | G 1BK |
| OUT 04 | 4 | 2 | W 1O | IN 06 | 26 | 13 | BK 1G |
| OUT 05 | 5 | 3 | G 1W | IN 07 | 27 | 14 | BR 1BK |
| OUT 06 | 6 | 3 | W 1G | IN 08 | 28 | 14 | BK 1BR |
| OUT 07 | 7 | 4 | BR 1W | IN 09 | 29 | 15 | S 1BK |
| OUT 08 | 8 | 4 | W 1BR | IN 10 | 30 | 15 | BK 1S |
| OUT 09 | 9 | 5 | S 1W | IN 11 | 31 | 16 | BL 1Y |
| OUT 10 | 10 | 5 | W 1S | IN 12 | 32 | 16 | Y 1BL |
| OUT 11 | 11 | 6 | BL 1R | IN 13 | 33 | 17 | O 1Y |
| OUT 12 | 12 | 6 | R 1BL | IN 14 | 34 | 17 | Y 1O |
| OUT 13 | 13 | 7 | O 1R | IN 15 | 35 | 18 | G 1Y |
| OUT 14 | 14 | 7 | R 1O | IN 16 | 36 | 18 | Y 1G |
| OUT 15 | 15 | 8 | G 1R | IN 17 | 37 | 19 | BR 1Y |
| OUT 16 | 16 | 8 | R 1G | IN 18 | 38 | 19 | Y 1BR |
| OUT 17 | 17 | 9 | BR 1R | IN 19 | 39 | 20 | S 1Y |
| OUT 18 | 18 | 9 | R1 BR | IN 20 | 40 | 20 | Y 1S |
| OUT Return | 19 | 10 | S 1R | IN 21 | 41 | 21 | BL 1V |
| OUT Return | 20 | 10 | R 1S | IN 22 | 42 | 21 | V 1BL |
| IN 01 | 21 | 11 | BL 1BK | IN Return | 43 | 22 | O 1V |
| IN 02 | 22 | 11 | BK 1BL | IN Return | 44 | 22 | V 1O |
| ***Note***: Signals IN 12 through IN 22 are for future use. | | | | | | | |

**—end—**

# Procedure 5-6
# Installing control network (CNET) cables and termination plugs

Use this procedure to install the control network (CNET) cables for a TBM bay or group of interconnected bays. This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed, and multiple TBM bay facilities.

## Requirements

The following requirements apply to this procedure.

### Tools and materials

You will need the following tools and materials to perform this procedure:

- cable cutters
- cable ties

### Cabling rules

Observe the following cabling rules when performing this procedure:

1 Begin cabling with the TBM shelf in the shelf position that is the farthest away from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and so on.

2 Use one CNET cable (see Figure 5-11 on page 5-30) for each daisy-chain connection between multiple TBM shelves/bays and a termination plug is required on the last CNET OUT connector in the chain.

3 Use a termination plug (see Figure 5-12 on page 5-30) for each unused control network connector [CNET OUT connector (J02) or CNET IN connector (J11)] on each TBM shelf.

***Note:*** If the TBM bay contains only one TBM shelf and no inter-bay CNET connections are used, two termination plugs are required to occupy the CNET IN/OUT connectors of the single TBM shelf.

4 Connect only CNET cables between equipment that is bonded to the same ground point.

5 CNET can support a maximum of 10 interconnected TBM bays (or network elements).

**—continued—**

Procedure 5-6 (continued)
**Installing control network (CNET) cables and termination plugs**

**Figure 5-11**
**CNET cabling**

PC-10103

**NT7E44JA/JB/JC/JK/JX/JY/JW**
**CNET cabling**

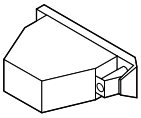

4-pair, twisted, 26 AWG stranded wires with shielding, connectorized with 9-pin male connectors at both ends in the following lengths:

| | | |
|---|---|---|
| 1 m | (3.1 ft) | NT7E44JB |
| 5 m | (16.4 ft) | NT7E44JC |
| 10 m | (32 ft) | NT7E44JK |
| 20 m | (64 ft) | NT7E44JX |
| 30 m | (96 ft) | NT7E44JY |
| 45 m | (144 ft) | NT7E44JW |

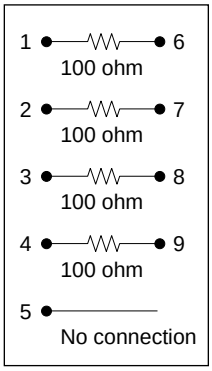
**Figure 5-12**
**CNET termination plug**

PC-11009

**NT7E5072**
**CNET termination plug**



9-pin male
D-subminiature
termination plug




**—continued—**

Procedure 5-6 (continued)
**Installing control network (CNET) cables and termination plugs**

## Action

If the installation contains one TBM shelf, go to step 1. If the installation contains more than one TBM shelf, skip to step 2.

| Step | Action |
|---|---|
| **1** | Make sure both the CNET IN connector (J02) and the CNET OUT connector (J11) have an NT7E5072 termination plug installed. End the procedure here. |
| **2** | Remove the CNET termination plug from the CNET OUT connector (J02) at the left side of the first TBM shelf in the daisy chain. Connect one end of a control network cable to this CNET connector as shown in Figure 5-13 on page 5-32. |
| **3** | Route the control network cable on the left side of the bay. Connect it to the CNET IN connector (J11) on the next TBM shelf in the daisy chain, as shown in Figure 5-13 on page 5-32. |
| **4** | Place the cable into the left bay upright in the position shown in Figure 5-14 on page 5-33 and use cable ties to secure it to the bay upright or to existing cables installed in the upright. |
| **5** | Is this the last TBM shelf in the daisy chain? |

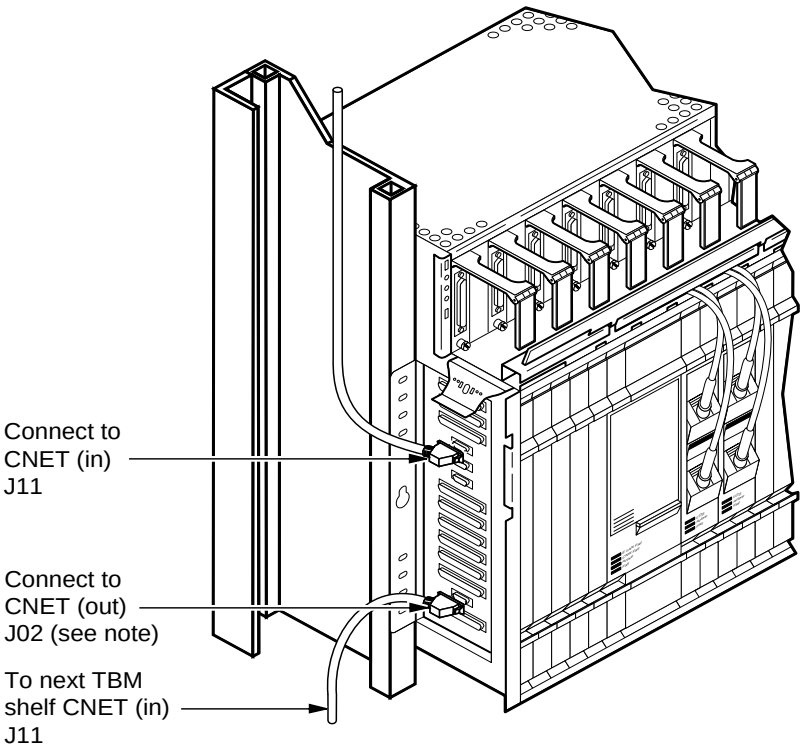
| If | Then |
|---|---|
| It is the last shelf | make sure an NT7E5072 termination plug is installed in both the CNET OUT connector (J02) on the last TBM shelf and the CNET IN connector (J02) on the first TBM shelf.<br><br>Go to Procedure 5-7 on page 5-35. |
| It is not the last shelf | connect one end of a control network cable to the CNET OUT connector (J02) on the TBM shelf.<br><br>Go to step 3. |

**—continued—**

Procedure 5-6 (continued)
**Installing control network (CNET) cables and termination plugs**

**Figure 5-13**
**Connection of control network cables to the CNET OUT connector (J02) and the CNET IN connector (J11)**

PC-10618A

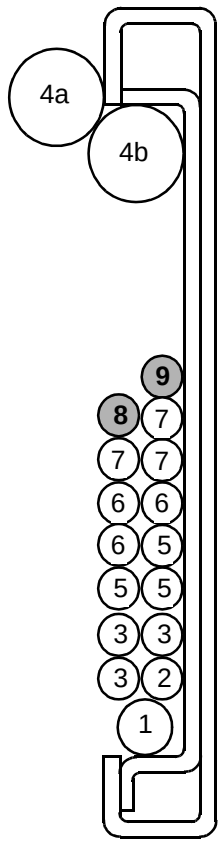



***Note:*** Shelf position 2 shown. An NT7E5072 termination plug connects to both the CNET OUT (J02) connector of the last TBM shelf in the daisy chain and to the CENT IN (J11) connector of the first TBM shelf in the dasiy chain.

**—continued—**

Procedure 5-6 (continued)
**Installing control network (CNET) cables and termination plugs**

**Figure 5-14**
**Placement of control network cables in bay upright**




Top left side
(At top of TBM shelf)

| | |
|---|---|
| 1 | BIP control cable, part of shop cabling |
| 2 | Shelf alarm cable from BIP, part of shop cabling |
| 3 | LCAP cable, part of shop cabling |
| 4a, 4b | ac power cable from ac source |
| 5 | PSTN cables |
| 6 | External synchronization cables |
| 7 | Parallel telemetry cables |
| **8,9** | **Control network cables** |

**—continued—**

Procedure 5-6 (continued)
**Installing control network (CNET) cables and termination plugs**

Table 5-9 lists the pin-outs for the NT7E44JC and JK cables.

**Table 5-9**
**Pin-outs for NT7E44JC and JK cables**

| Pins on CNET In connector | Signal | Pins on CNET Out connector | Signal |
|---|---|---|---|
| 1 | no connection | 1 | no connection |
| 2 | no connection | 2 | no connection |
| 3 | XCN2N | 3 | XCN2N |
| 4 | XCN1N | 4 | XCN1N |
| 5 | no connection | 5 | no connection |
| 6 | no connection | 6 | no connection |
| 7 | no connection | 7 | no connection |
| 8 | XCN2P | 8 | XCN2P |
| 9 | XCN1P | 9 | XCN1P |

**—end—**

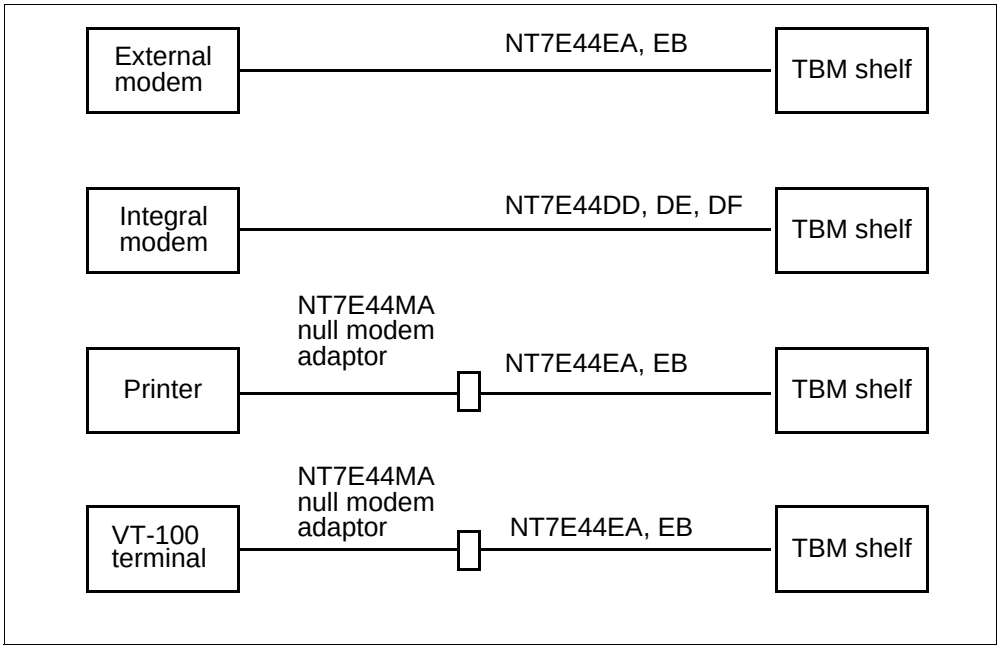
# Procedure 5-7
# **Installing a modem cable**

Use this procedure to do either of the following:

- connect a modem cable from each transport bandwidth manager (TBM) shelf to an external modem, a printer, or a VT-100 terminal.
- install an integral modem inside the breaker interface panel (BIP), connect a modem cable between the integral modem and a TBM shelf, and connect a telephone cable to the integral modem.

Figure 5-15 shows the modem cable connections available for TBM shelves. An NT7E44EA or -EB cable is used to connect an external modem, and an NT7E44DD, -DE, or -DF cable is used to connect an integral modem in the BIP. If a VT-100 terminal or a printer is being connected to the TBM shelf without a modem, an NT7E44MA modem adaptor must be inserted between the NT7E44EA or -EB cable and the terminal or printer.

**Figure 5-15**
**TBM shelf modem cable connections**



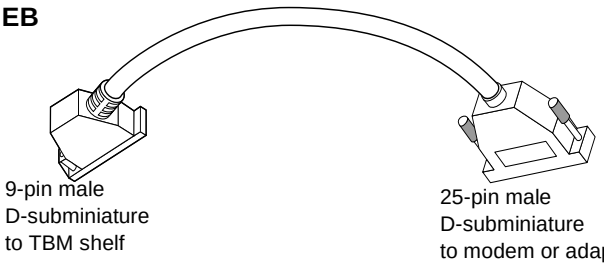

This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed. Begin cabling with the TBM shelf in the shelf position that is farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf positions 2 and 1, respectively.

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

***Note:*** A VT-100 terminal or a printer that is being connected to the TBM shelf without the use of a modem must be bonded to the same ground point as the TBM shelf.

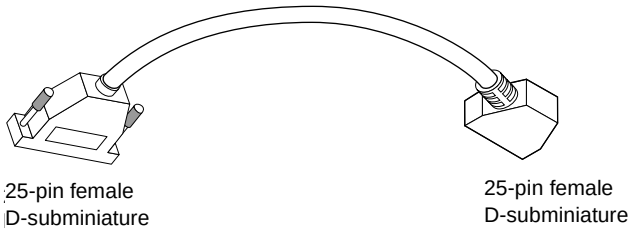
**NT7E44EA, EB**




4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. The 9-pin male end connects to the 9-pin female connector on the TBM shelf. The 25-pin male end connects to a 25-pin female connector of a remote modem or null modem adapter. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (15 ft) | NT7E44EA |
| 20 m | (60 ft) | NT7E44EB |

**NT7E44MA null modem adaptor for direct connection to a printer, or a VT-100 terminal**




4-pair, 26 AWG solid wire connectorized at both ends. One 25-pin female end connects to the 25-pin male connector on the NT7E44EA/EB cable. The other 25-pin female end then connects directly to the VT-100 terminal or printer.

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**NT7E44DD, DE, and DF used for integral modems**


4-pair, twisted, 26 AWG stranded wires with shielding, connectorized with 9-pin male connectors at both ends. One end connects to the 9-pin female connector on the TBM shelf, while the other end connects to a 9-pin female connector on the integral modem. The cable used depends on the location of the TBM shelf within the bay, as follows:

| | |
|---|---|
| TBM shelf in position 1 (topmost shelf position) | use NT7E44DD |
| TBM shelf in position 2 | use NT7E44DE |
| TBM shelf in position 3 | use NT7E44DF |

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties

## Action

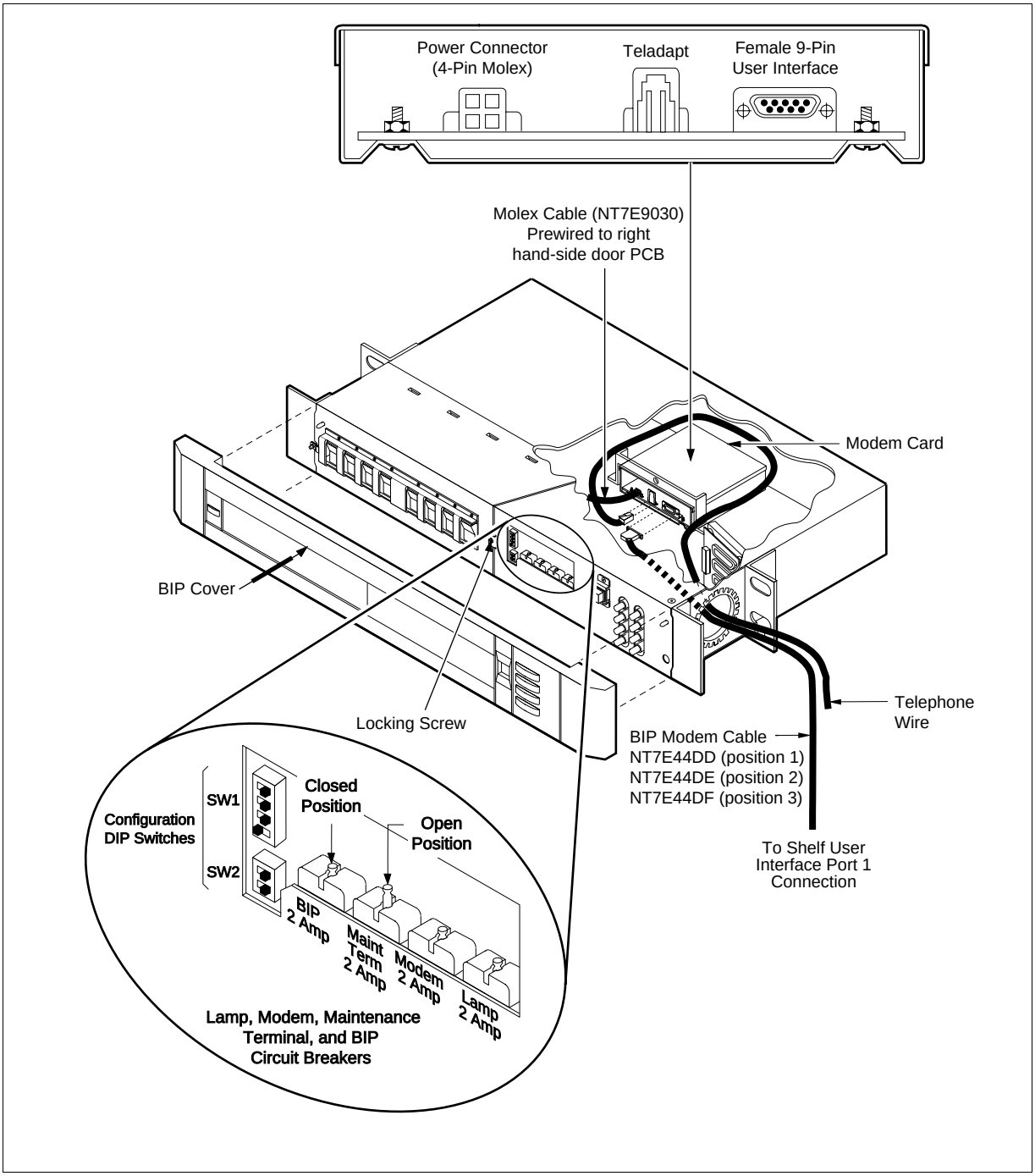
| Step | Action |
|---|---|
| **1** | Remove the snap-on BIP cover (see Figure 5-16 on page 5-38). |
| **2** | Release the locking screw located in the middle of the left- and right-hand hinged covers by turning it counterclockwise. Open both hinged covers. |
| **3** | Set the contacts of the lower of the two DIP switches (SW2) as shown in Figure 5-16 on page 5-38 and Figure 5-17 on page 5-39. |
| **4** | If you are connecting the cable to an external modem, go to step 5. If you are connecting the cable to an integral modem, skip to step 10. |

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**Figure 5-16**
**Connection of an NT7E44DD, DE, or DF modem cable to an integral modem in the BIP**

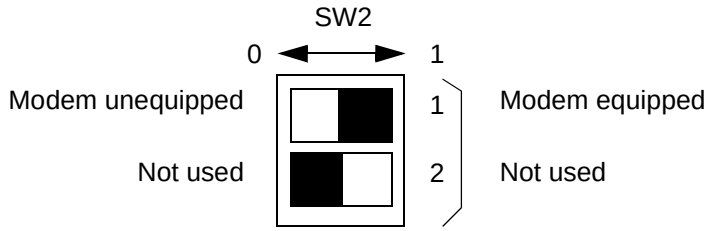
PC-10642




**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**Figure 5-17**
**Setting of DIP switch S2 (lower DIP switch)**




| Switch section SW2 | Setting |
|---|---|
| 1 | If a modem is equipped, set to position 1, otherwise set to position 0. |
| 2 | Set to position 0. |
| ***Note***: For information on the settings for DIP switch SW1, see Figure 4-17 on page 4-30. | |

**5** Route the end of the NT7E44EA or EB cable that has the 9-pin connector cable into the left side of the bay.

**6** Connect the 9-pin connector of the NT7E44EA, EB cable to the User Interface port 1 connector (J10), as shown in Figure 5-18.

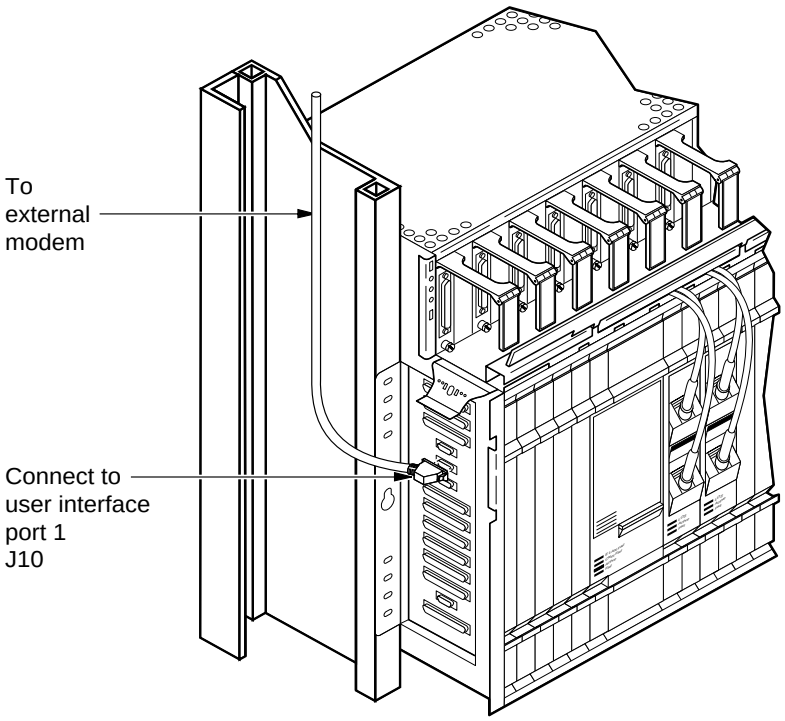
**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**Step Action**

**Figure 5-18**
**Installing an NT7E44EA or EB cable to an external modem, printer, or VT-100 terminal**

PC-10616




***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**7** Place the modem cable in the bay upright to occupy the position shown in Figure 5-19 on page 5-42. Use cable ties to secure the cable to the bay upright or to other bundles of existing cables. Table 5-10 lists the pin-outs for the NT7E44EA and EB cables.

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

| Step | Action |
|---|---|

**8** Proceed according to the following table:

| If you are connecting the cable to | Then route the cable |
|---|---|
| a VT-100 terminal or a printer | out of the bay, and connect the free-end of the cable to the 25-pin female connector of an NT7E44MA null-modem adaptor. Connect the male connector of the adaptor to the VT-100 terminal or the printer.<br>Go to step 9. |
| a modem | out of the bay, and connect the free-end of the cable to the external modem.<br>Go to step 10. |

**Table 5-10**
**Pin-outs for the NT7E44EA, EB cables**

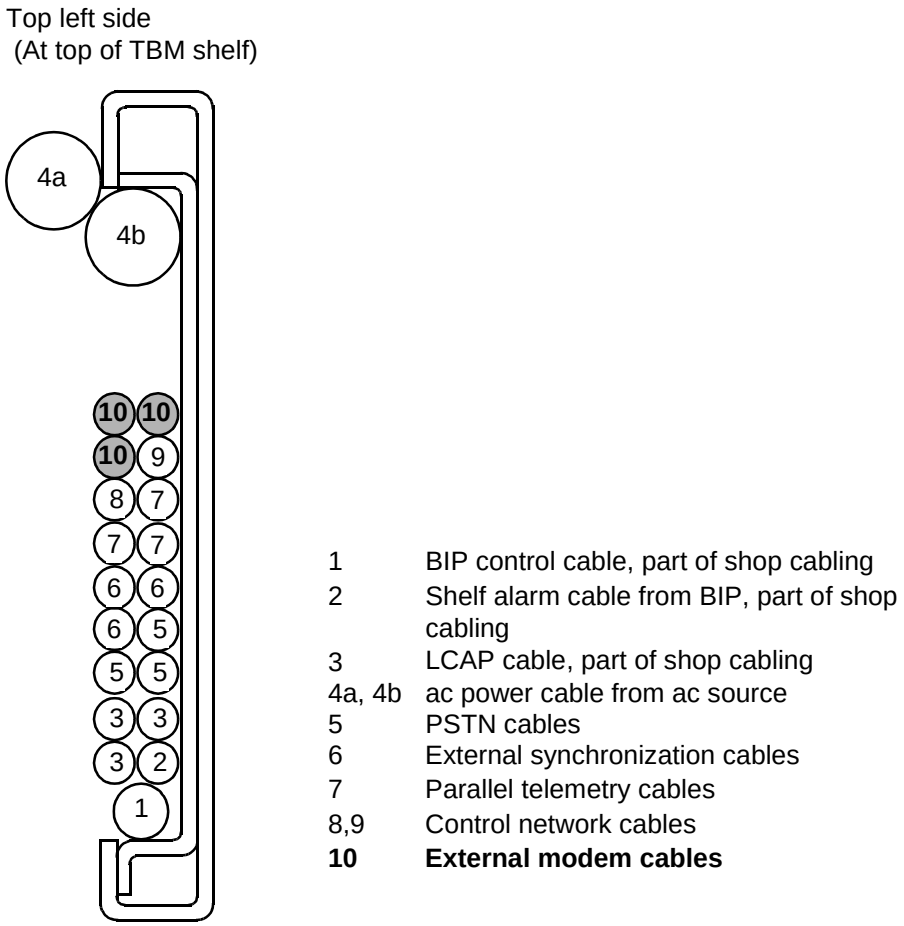
| 25-pin connectors Pin | Signal | 9-pin connectors Pin |
|---|---|---|
| 1 | not used | |
| 2 | Tx | 3 |
| 3 | Rx | 2 |
| 4 | RTS | 7 |
| 5 | CTS | 8 |
| 6 | DSR | 6 |
| 7 | signal ground | 5 |
| 8 | DCD | 1 |
| 9 to19 | not used | |
| 20 | DTR | 4 |
| 21 to 25 | not used | |
| ***Note:*** Pin 9 is not used on the 9-pin connector. The modem shielded cable must connect to the modem for ground decoupling. | | |

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

| Step | Action |
|---|---|

**Figure 5-19**
**Placement of an NT7E44EA or EB cable in the left bay upright**




**9** Close the BIP cover and end the procedure here.

**10** In the BIP, ensure that there are no cables in the area in which the modem is to be installed. If there are, push them out of the way. Refer to Figure 5-16 on page 5-38.

**11** Mount the modem in the BIP by sliding it under the support bracket. The connectors on the modem must be facing the front of the BIP. Refer to Figure 5-16 on page 5-38.

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

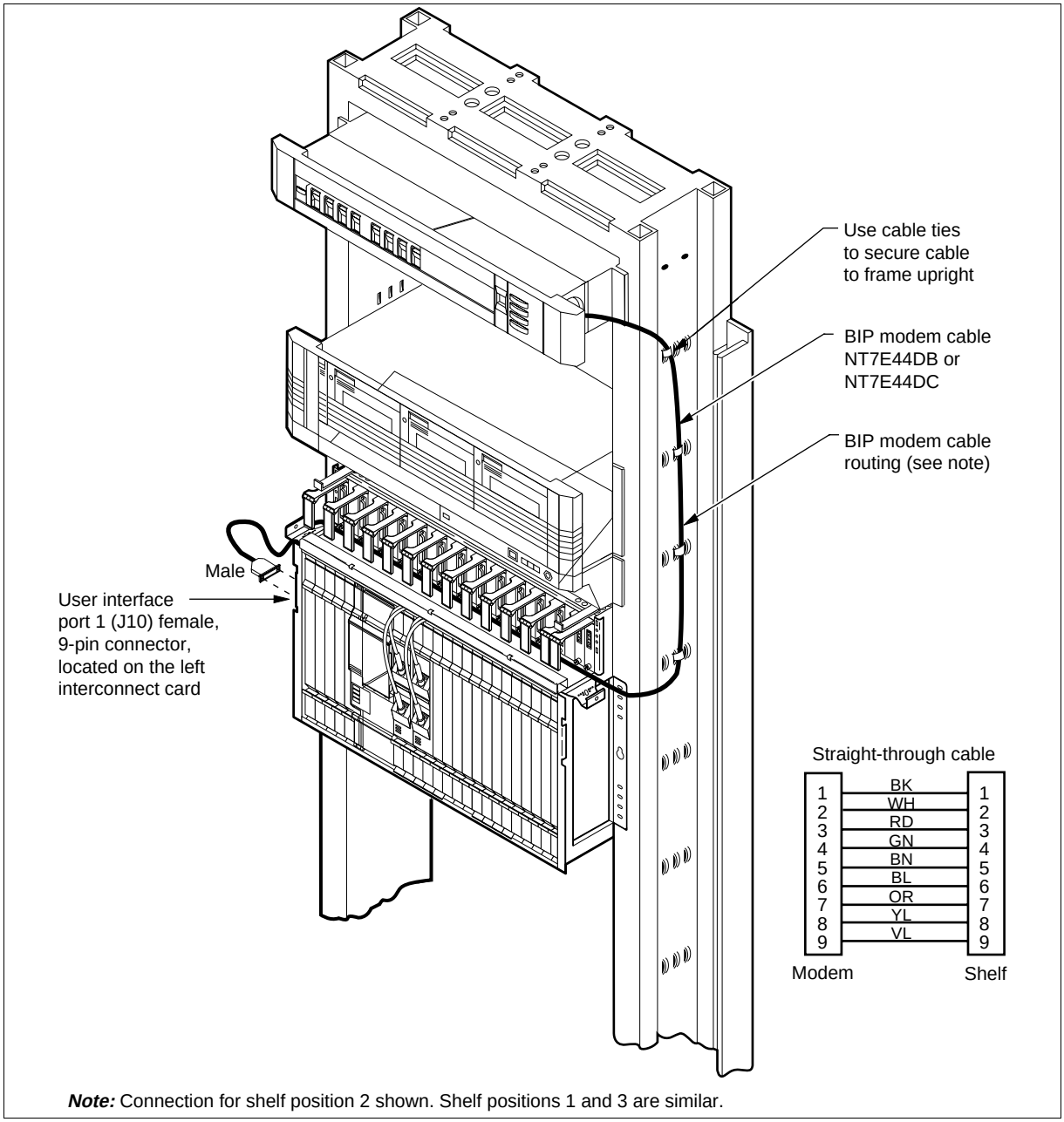
| Step | Action |
|---|---|
| **12** | Route the external telephone cable down the right side of the bay and connect it to the TELADAPT connector on the integral modem, as shown in Figure 5-16 on page 5-38. |
| **13** | Connect one of the 9-pin male connectors on the NT7E44 DD, DE or DF integral modem cable to the 9-pin female connector on the faceplate of the modem, as shown in Figure 5-16 on page 5-38. |
| **14** | Route the NT7E44 modem cable down the right side of the frame, across the cable trough at the top of the TBM shelf, and over to the left side of the frame, as shown in Figure 5-20 on page 5-44. |
| **15** | Attach the 9-pin modem cable to the connector labelled User Interface port 1 (J10) on the left side of the TBM shelf, as shown in Figure 5-18 on page 5-40. |
| **16** | Place the NT7E44 modem cable and the external telephone cable into the right bay upright as shown in Figure 5-21 on page 5-45, and use cable ties to secure the cables to the bay upright or to existing bundles of cables. |
| **17** | Close the BIP covers and reinstall the snap-on BIP cover. |

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**Figure 5-20**
**Route for NT7E44DD, DE, or DF modem cable down the right side of the bay**

PC-10639

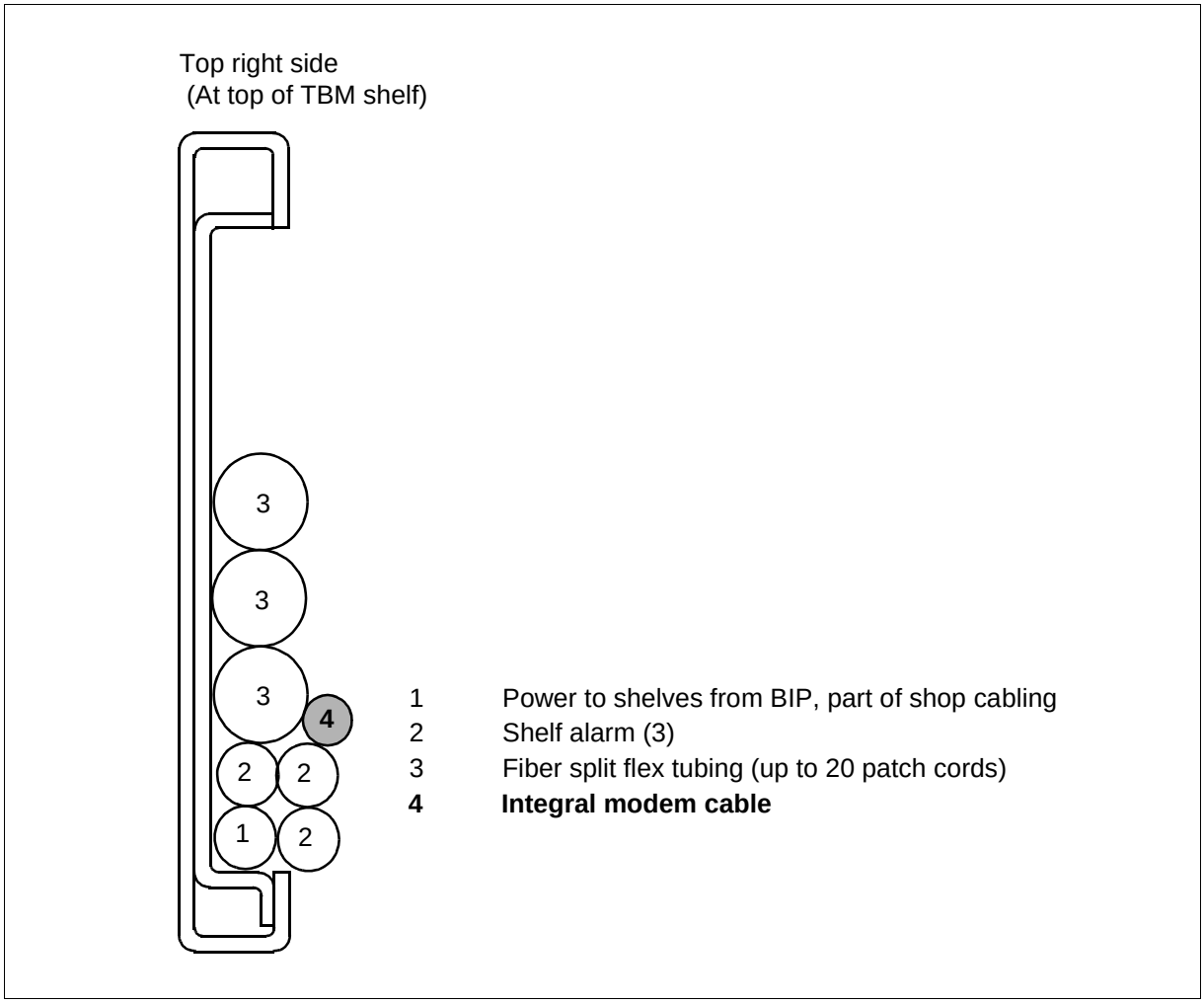



***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-7 (continued)
**Installing a modem cable**

**Figure 5-21**
**Placement of the NT7E44DD, DE, or DF modem cable in the right bay upright**




**—end—**

# Procedure 5-8
# **Installing an OPC cable to OPC port 1**

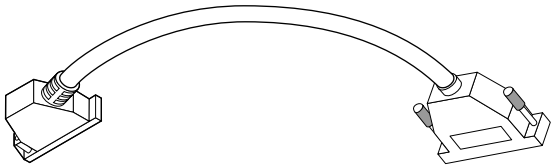
Use this procedure to connect one of the following cables to operations controller (OPC) port 1 on the left side of each transport bandwidth manager (TBM) shelf.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

| PEC | Use |
|---|---|
| NT7E44EA, EB | Asynchronous RS232 interface for a modem to OPC, 9600 baud |
| NT7E44QA, QB | X25 synchronous interface for a graphics terminal or a remote operations system |
| NT7E44RA, RB | Asynchronous RS232 interface for VT-100 terminal or a printer |
| NT7E44SA, SB | Asynchronous RS232 interface for Toshiba laptop computer. |

***Note:*** Connect OPC cables only to equipment that is bonded to the same ground point as the TBM shelf.

**NT7E44EA, EB**



9-pin male
D-subminiature
to TBM shelf

25-pin male
D-subminiature
to remote modem

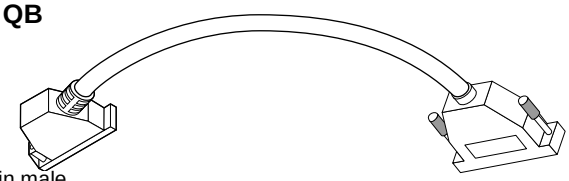
4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. The 9-pin male end connects to the 9-pin female connector on the TBM shelf. The 25-pin male end connects to a 25-pin female connector of a remote modem. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44EA |
| 20 m | (66 ft) | NT7E44EB |

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**NT7E44QA, QB**



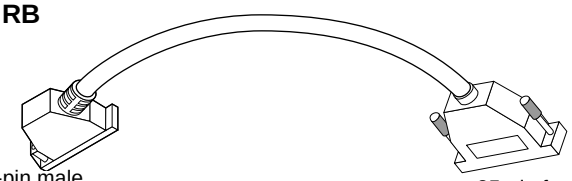
9-pin male
D-subminiature
to TBM shelf

25-pin female
D-subminiature
to VT-100 or printer

4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. The 9-pin male end connects to the 9-pin female connector on the TBM shelf. The 25-pin male end connects to a 25-pin female connector of an RS-232 interface on a graphics terminal or on a remote operations system. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44QA |
| 20 m | (66 ft) | NT7E44QB |

**NT7E44RA, RB**



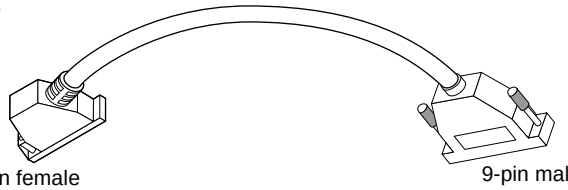
9-pin male
D-subminiature
to TBM shelf

25-pin female
D-subminiature
to VT-100 or printer

4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. The 9-pin male end connects to the 9-pin female connector on the TBM shelf. The 25-pin female end connects to a 25-pin male connector on a VT-100 terminal or on a printer. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44RA |
| 20 m | (66 ft) | NT7E44RB |

**NT7E44SA, SB**



9-pin female
D-subminiature
to RS232 on laptop

9-pin male
D-subminiature
to TBM

4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. The 9-pin male end connects to the 9-pin connector on the TBM shelf. The 9-pin female end connects to a 9-pin male connector of an RS232 interface on a Toshiba Lap-Top computer. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44RA |
| 20 m | (66 ft) | NT7E44RB |

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties

## Action

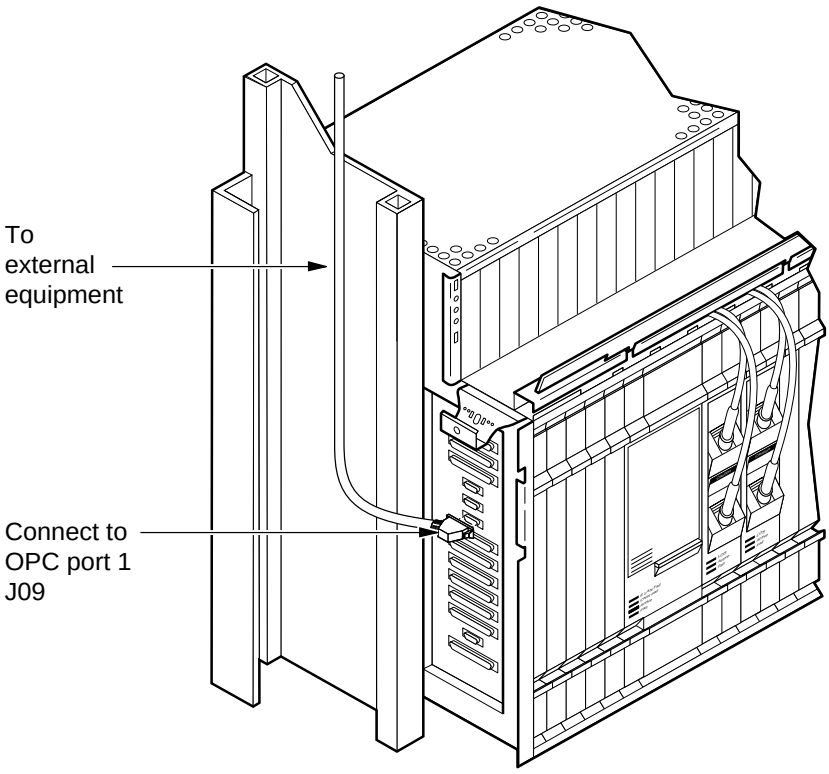
| Step | Action |
|---|---|
| **1** | Route the end of the OPC cable that has the 9-pin connector into the left side of the bay. |
| **2** | Connect the 9-pin connector to OPC port 1 connector (J09) as shown in Figure 5-22 on page 5-49. |
| **3** | Place the cable into the left bay upright as shown in Figure 5-23 on page 5-50, and use cable ties to secure it to the bay upright or to existing bundles of cables. |
| **4** | Route the OPC cable up, out of the bay to the external equipment. |
| **5** | Connect the free end of the cable to the external equipment. For pinouts of the connectors on the external equipment-side of the cable, see Table 5-11 on page 5-51 to Table 5-14 on page 5-54. |

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Figure 5-22**
**Connecting an OPC cable to OPC port 1**

PC-10760A

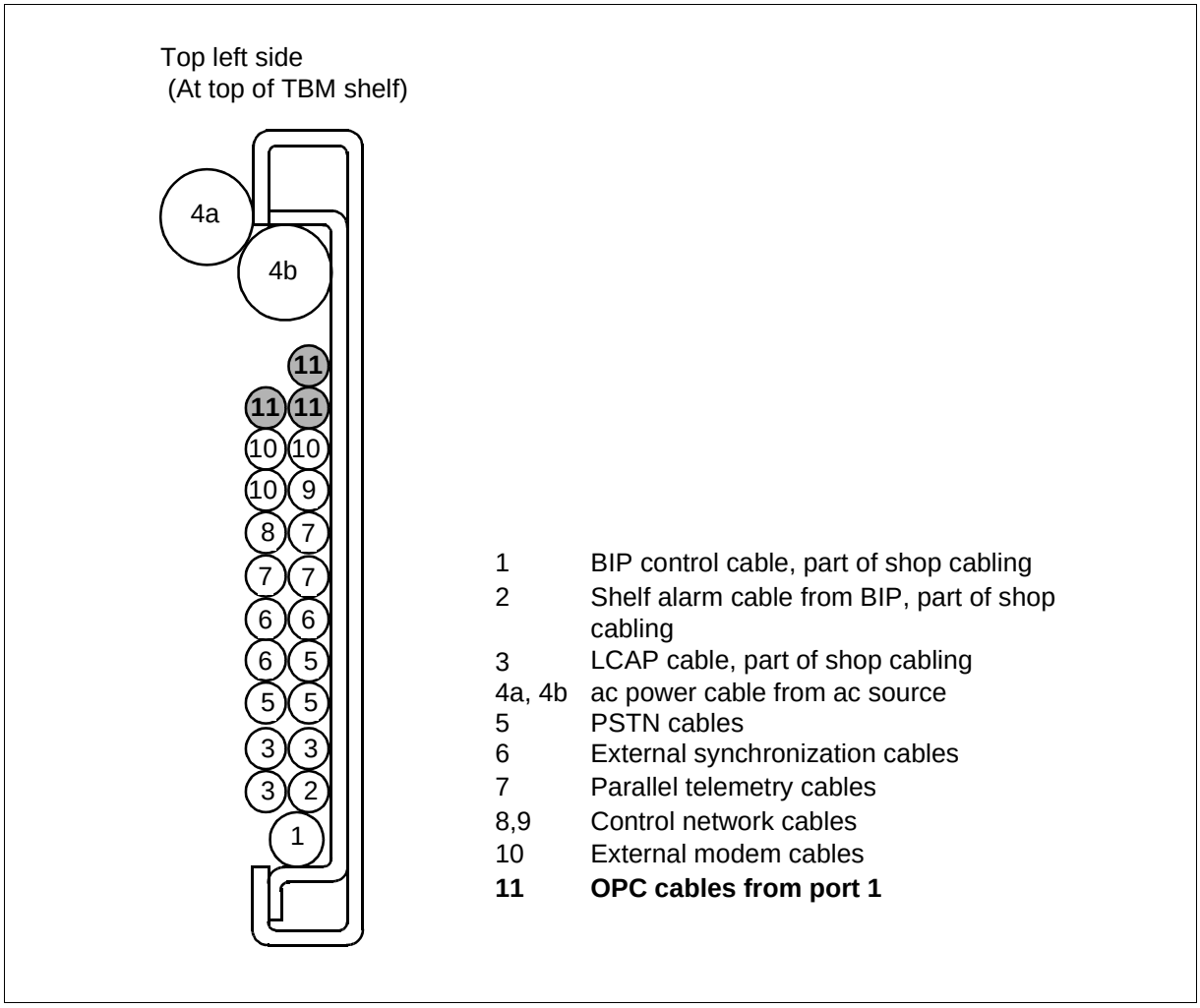



***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Figure 5-23**
**Placement of the OPC cable in the left bay upright**




**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Table 5-11**
**Pin-outs for the 25-pin connector on NT7E44EA, EB**

| 25-pin connector | | 9-pin connector |
|---|---|---|
| **Pin** | **Signal** | **Pin** |
| 1 | not used | |
| 2 | Tx | 3 |
| 3 | Rx | 2 |
| 4 | RTS | 7 |
| 5 | CTS | 8 |
| 6 | DSR | 6 |
| 7 | signal ground | 5 |
| 8 | DCD | 1 |
| 9 to19 | not used | |
| 20 | DTR | 4 |
| 21 to 25 | not used | |

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Table 5-12**
**Pin-outs for the 25-pin connector on NT7E44RA, RB**

| **25-pin connector** | | **9-pin connector** | |
|---|---|---|---|
| **Pin** | **Signal** | **Pin** | |
| 1 | not used | | |
| 2 | Tx | 2 | |
| 3 | Rx | 3 | |
| 4 | RTS | 1 | (note 4) |
| 5 | CTS | 4 | (note 1 and note 4) |
| 6 | DSR | 4 | (note 1) |
| 7 | signal ground | 5 | |
| 8 | DCD | 7 | |
| 9 to19 | not used | | |
| 20 | DTR (note 2) | 6 | |
| 20 | DTR (note 2) | 8 | |
| 21 to 25 | not used | | |

***Note 1:*** Pin 4 on the 9-pin connector is connected to pins 5 and 6 on the 25-pin connector.

***Note 2:*** Pin 20 on the 25-pin connector is connected to pins 6 and 8 on the 9-pin connector.

***Note 3:*** Pin 9 on the 9-pin connector is not used.

***Note 4:*** If you are connecting a North American version of a DEC VT320 or a DEC VT420 terminal, you must short pin 1 (DCD) to pin 4 (DTR) on the 9-pin connector of this cable. If you are connecting an international version of these terminals, you can use the cable without any modification.

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Table 5-13**
**Pin-outs for the 25-pin connector on NT7E44QA, QB**

| **25-pin connector** | | **9-pin connector** | |
|---|---|---|---|
| **Pin** | **Signal** | **Pin** | **Signal** |
| 1 | not used | | |
| 2 | Tx | 3 | |
| 3 | Rx | 2 | |
| 4 | RTS | 7 | |
| 5 | CTS | 8 | |
| 6 | DSR | not connected to this end of the cable | |
| 7 | signal ground | 5 | |
| 8 | DCD | not connected to this end of the cable | |
| 9 to14 | not used | | |
| 15 | TxCLK | 6 | |
| 16 | not used | | |
| 17 | RxCLK | 1 | |
| 18 and 19 | not used | | |
| 20 | DTR | 4 | |
| 21 to 25 | not used | | |
| ***Note:*** Pin 9 is not used on the 9-pin connector. | | | |

**—continued—**

Procedure 5-8 (continued)
**Installing an OPC cable to OPC port 1**

**Table 5-14**
**Pin-outs for the 9-pin connector on NT7E44SA, SB**

| **9-pin connector at laptop** | | **9-pin connector at TBM shelf** | |
|---|---|---|---|
| **Pin** | **Signal** | **Pin** | **Signal** |
| 1 | DCD | 4 | (note 1) |
| 2 | Rx | 3 | |
| 3 | Tx | 2 | |
| 4 | DTR (note 2) | 6 | |
| 4 | DTR (note 2) | 1 | |
| 5 | signal ground | 5 | |
| 6 | DSR | 4 | (note 1) |
| 7 | RTS | 8 | |
| 8 | CTS | 7 | |
| 9 | not used | | |

***Note 1:*** Pin 4 at the TBM shelf end of the cable connects to pins 1 and 6 at the Lap Top end of the cable.

***Note 2:*** Pin 4 at the lap-top end of the cable connects to pins 1 and 6 at the TBM shelf end of the cable.

***Note 3:*** Pin 9 at the TBM shelf end of the cable is not used.

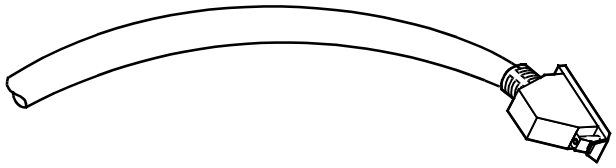
**—end—**

# Procedure 5-9
# Installing a serial telemetry cable

Use this procedure to install the serial telemetry cable (NT4K86CA, CB, or CC) between each transport bandwidth manager (TBM) shelf and the office equipment intended for processing telemetry information.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**NT4K86CA, CB, CC**



25-pin male D-subminiature

8-pair, twisted, 26 AWG solid wires connectorized at one end for connection to the TBM shelf. The other end is free for customer termination to the E2A alarm processing remote (APR). This cable is available in the following lengths:

| | | |
|---|---|---|
| 16 m | (50 ft) | NT4K86CB |
| 30 m | (100 ft) | NT4K86CA |
| 61 m | (200 ft) | NT4K86CC |

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties
- Serial telemetry cable

## Action

| Step | Action |
|---|---|
| **1** | Route the end of the serial telemetry cable that has the 25-pin connector down the left side of the bay. |

**—continued—**

Procedure 5-9 (continued)
**Installing a serial telemetry cable**

| Step | Action |
|---|---|
| **2** | Connect the 25-pin D-Subminiature connector to the serial telemetry ports 1-4 connector (J08), as shown in Figure 5-24 on page 5-57. |
| **3** | Place the serial telemetry cable in the bay upright to occupy the position shown in Figure 5-25 on page 5-58, and use cable ties to secure the cable to the bay upright, or to bundles of existing cables. |
| **4** | Route the serial telemetry cable up out of the bay to the serial telemetry equipment. |
| **5** | Refer to the following wiring table and complete the office connections. |

**Table 5-15**
**Serial telemetry cable pair color coding and pin-out detail**

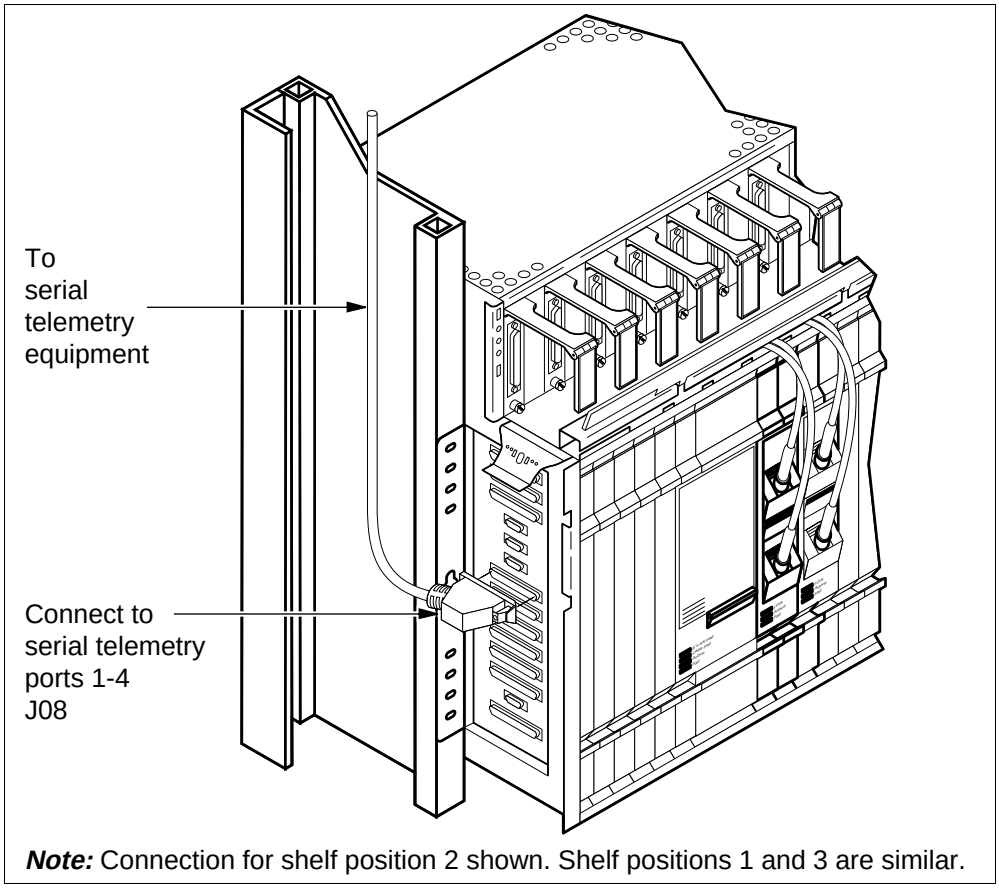
| Signal | Pin | Pair | Color | Signal | Pin | Pair | Color |
|---|---|---|---|---|---|---|---|
| | 1 | | NC | port 2 Tx- | 14 | 7 | O1R |
| | 2 | | NC | port 2 Tx+ | 15 | 7 | O2R |
| | 3 | | NC | port 2 Rx+ | 16 | 1 | BL2W |
| port 2 Rx- | 4 | 1 | BL1W | port 1 Rx+ | 17 | 2 | O2W |
| port 1Rx- | 5 | 2 | O1W | port 1 Tx+ | 18 | 3 | G2W |
| port 1 Tx- | 6 | 3 | G1W | | 19 | | NC |
| | 7 | | NC | | 20 | | NC |
| | 8 | | NC | future | 21 | 8 | |
| | 9 | | NC | future | 22 | 8 | |
| | 10 | | NC | future | 23 | 4 | |
| future | 11 | | | future | 24 | 5 | |
| future | 12 | | | future | 25 | 6 | |
| future | 13 | | | | | | |
| NC = no connection | | | | | | | |

**—continued—**

Procedure 5-9 (continued)
**Installing a serial telemetry cable**

**Figure 5-24**
**Connection of a serial telemetry cable**

PC-10605

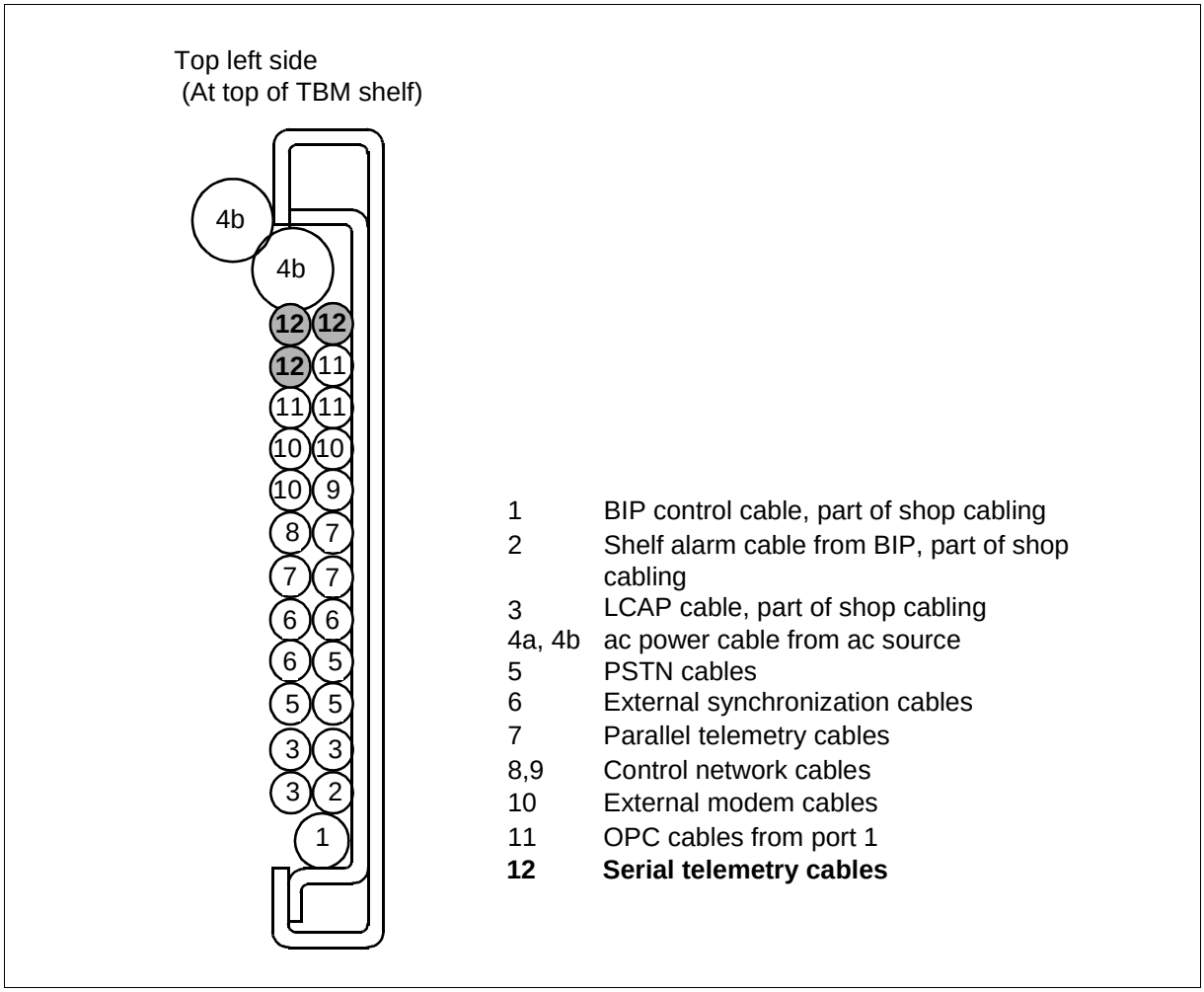



***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-9 (continued)
**Installing a serial telemetry cable**

**Figure 5-25**
**Placement of a serial telemetry cable in the left bay upright**




**—end—**

# Procedure 5-10
# **Installing an OPC cable to OPC port 2**

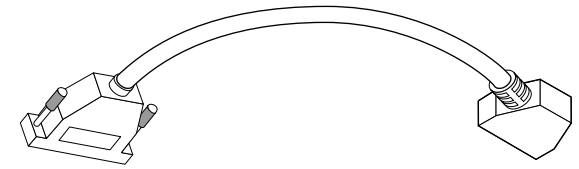
Use this procedure to attach one of the following cables to the OPC port 2 connector (J07) on the left side of each TBM shelf.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

| PEC | Use |
|---|---|
| NT7E44XA, XB | EIA-530 interface for a graphics terminal or a remote operations system |

***Note:*** Connect OPC cables only to equipment that is bonded to the same grounding point as the TBM shelf.

**NT7E44XA or XB**



25-pin male
D-subminiature

25-pin male
D-subminiature

Twisted pair 26 AWG wires with shielding, connectorized at both ends with 25-pin male connectors. One end connects to the 25-pin OPC port 2 connector (J07) on the SIL, and the other end connects to a 25-pin connector of an EA-530 interface. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44XA |
| 20 m | (66 ft) | NT7E44XB |

**—continued—**

Procedure 5-10 (continued)
**Installing an OPC cable to OPC port 2**

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties

## Action

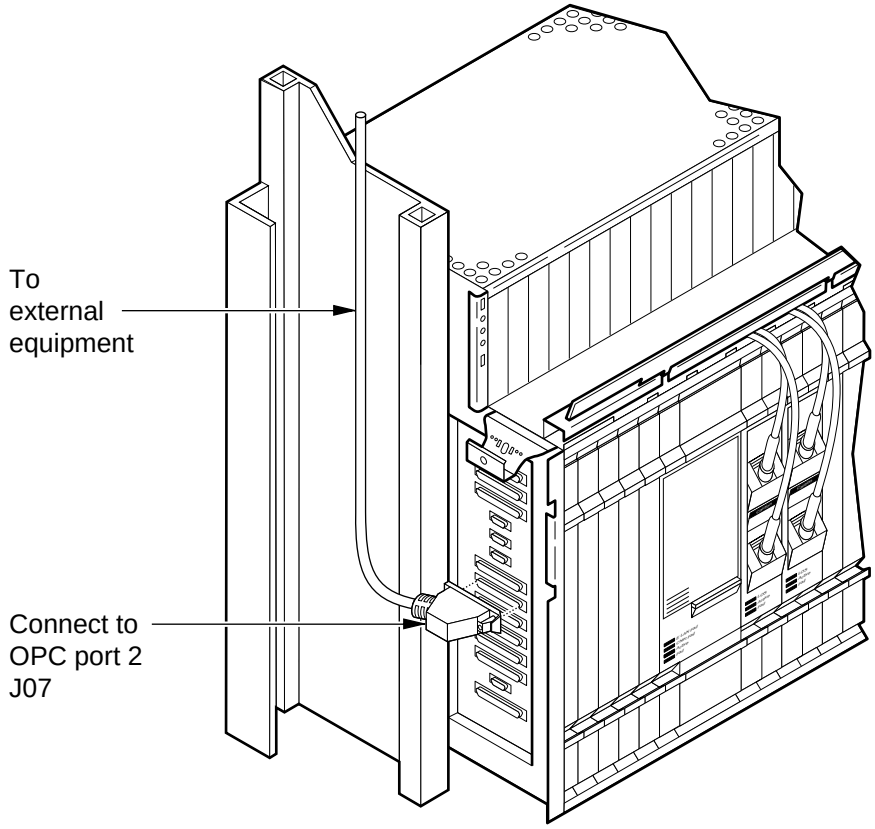
| Step | Action |
|---|---|
| **1** | Route the end of the OPC cable that has a 25-pin male connector into the left side of the bay. |
| **2** | Attach the connector to the OPC port 2 connector (J07) on the TBM shelf, as shown in Figure 5-26 on page 5-61. |
| **3** | Place the cable into the left bay upright, as shown in Figure 5-27 on page 5-62, and use cable ties to secure the cable to the bay upright or to the existing bundles of cables. |
| **4** | Route the OPC cable up and out of the bay to the external equipment. |
| **5** | Attach the free end of the cable to the external equipment. For the pinouts of the cables, see Table 5-16 on page 5-63. |

**—continued—**

Procedure 5-10 (continued)
**Installing an OPC cable to OPC port 2**

**Figure 5-26**
**Connecting an OPC cable to OPC port 2**

PC-10759

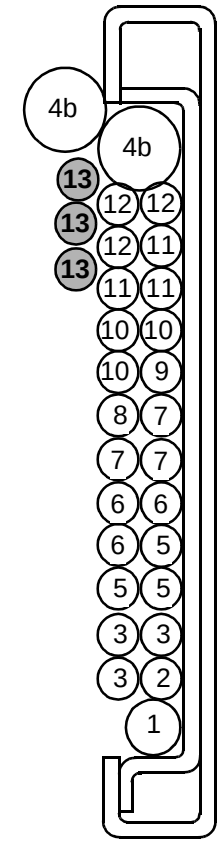



***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-10 (continued)
**Installing an OPC cable to OPC port 2**

**Figure 5-27**
**Placement of an OPC cable in the left bay upright**




| | |
|---|---|
| 1 | BIP control cable, part of shop cabling |
| 2 | Shelf alarm cable from BIP, part of shop cabling |
| 3 | LCAP cable, part of shop cabling |
| 4a, 4b | ac power cable from ac source |
| 5 | PSTN cables |
| 6 | External synchronization cables |
| 7 | Parallel telemetry cables |
| 8,9 | Control network cables |
| 10 | External modem cables |
| 11 | OPC cables from port 1 |
| 12 | Serial telemetry cables |
| **13** | **OPC cable from OPC port 2** |

**—continued—**

Procedure 5-10 (continued)
**Installing an OPC cable to OPC port 2**

**Table 5-16**
**Pinouts for NT7E44XA and XB**

| **Connector for OPC port 2 (J07)** | | **25-pin male connector at the terminal or the remote operations system** | |
|---|---|---|---|
| **P1 pin** | **Color** | **P2 pin** | **Signal** |
| 2 | W BL | 2 | TXD |
| 14 | BL W | 14 | TXDN |
| 3 | W O | 3 | RXD |
| 16 | O W | 16 | RXDN |
| 4 | W G | 4 | RTS |
| 19 | G W | 19 | RTSN |
| 5 | W BR | 5 | CTS |
| 13 | BR W | 13 | CTSN |
| 6 | W S | 6 | DSR |
| 22 | S W | 22 | DSRN |
| 8 | R BL | 8 | CD |
| 10 | BL R | 10 | CDN |
| 17 | R O | 17 | RXCLK |
| 9 | O R | 9 | RXCLKN |
| 15 | R G | 15 | TXCLK |
| 12 | G R | 12 | TXCLKN |
| 20 | R BR | 20 | DTR |
| 23 | BR R | 23 | DTRN |
| 18 | R S | 18 | LL |
| 21 | S R | 21 | RL |
| 11 | BK BL | 11 | NC in SIL |
| 24 | BL BK | 24 | NC in SIL |
| 25 | BK O | 25 | NC in SIL |
| 7 | BK G | 7 | LGND |
| 1 | SHIELD | NC | FGND |

***Note 1****:* Pins 1, 7, and 25 are not twisted pair wires.

***Note 2****:* The shield is connected at the DTE only. This provides shielding at the TBM end of the cable to meet EMI requirements without providing undesirable ground connections between office ground zones.

***Note 3****:* The signal ground pin 7 is connected as specified in EIA RS-422-A and EIA-530. Foreign ground currents will be conducted into the TBM bay as a result, but this connection is required to reduce common mode voltage differences. Observe normal precautions when connecting to equipment in another ground zone.

**—end—**

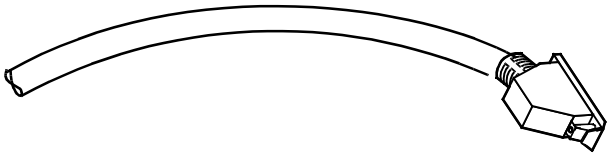
# Procedure 5-11
# Installing an orderwire extension cable

Use this procedure to install the external orderwire extension cable (NT4K85CA, CB, CC, CE, or CF) between each transport bandwidth manager (TBM) shelf and the office cross-connect for the extension of orderwire circuitry.

This procedure applies to TBM bay configurations having 1, 2, or 3 TBM shelves installed.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**NT4K85CA, CB, CC CE and CF**



25-pin male D-subminiature

12-pair, twisted, 26 AWG solid wires connectorized at one end for connection to the TBM shelf. The other is end free for customer termination to the intended office equipment. This cable is available in the following lengths.

| | | |
|---|---|---|
| 15 m | (50 ft) | NT4K85CE |
| 30 m | (100 ft) | NT4K85CA |
| 61 m | (200 ft) | NT4K85CB |
| 91 m | (300 ft) | NT4K85CC |
| 122 m | (400 ft) | NT4K85CF |

## Requirements

The following tools and materials are required:

- cable cutters
- cable ties

**—continued—**

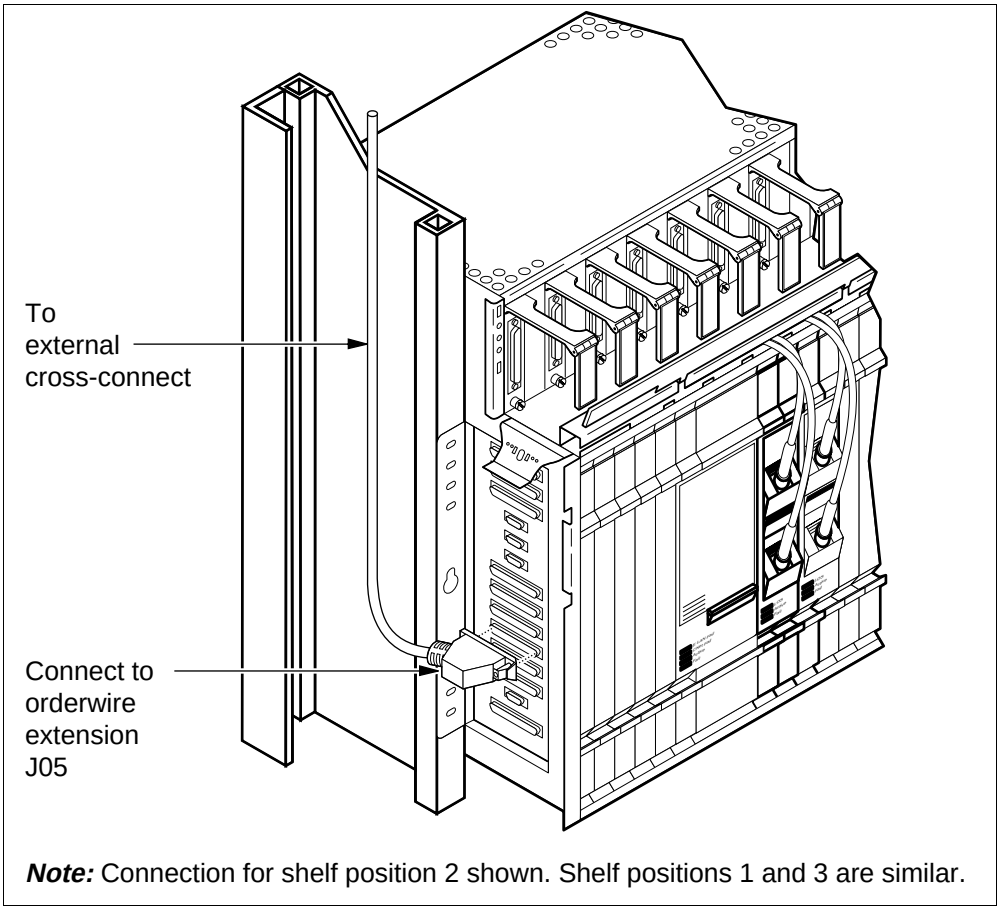
Procedure 5-11 (continued)
**Installing an orderwire extension cable**

## Action

| Step | Action |
|---|---|
| **1** | Route the end of the cable that has the 25-pin connector into the left side of the bay. |
| **2** | Connect the cable to the Orderwire Extension connector (J05), as shown in Figure 5-28 on page 5-65. |

**Figure 5-28**
**Connection of an orderwire extension cable**

PC-10617



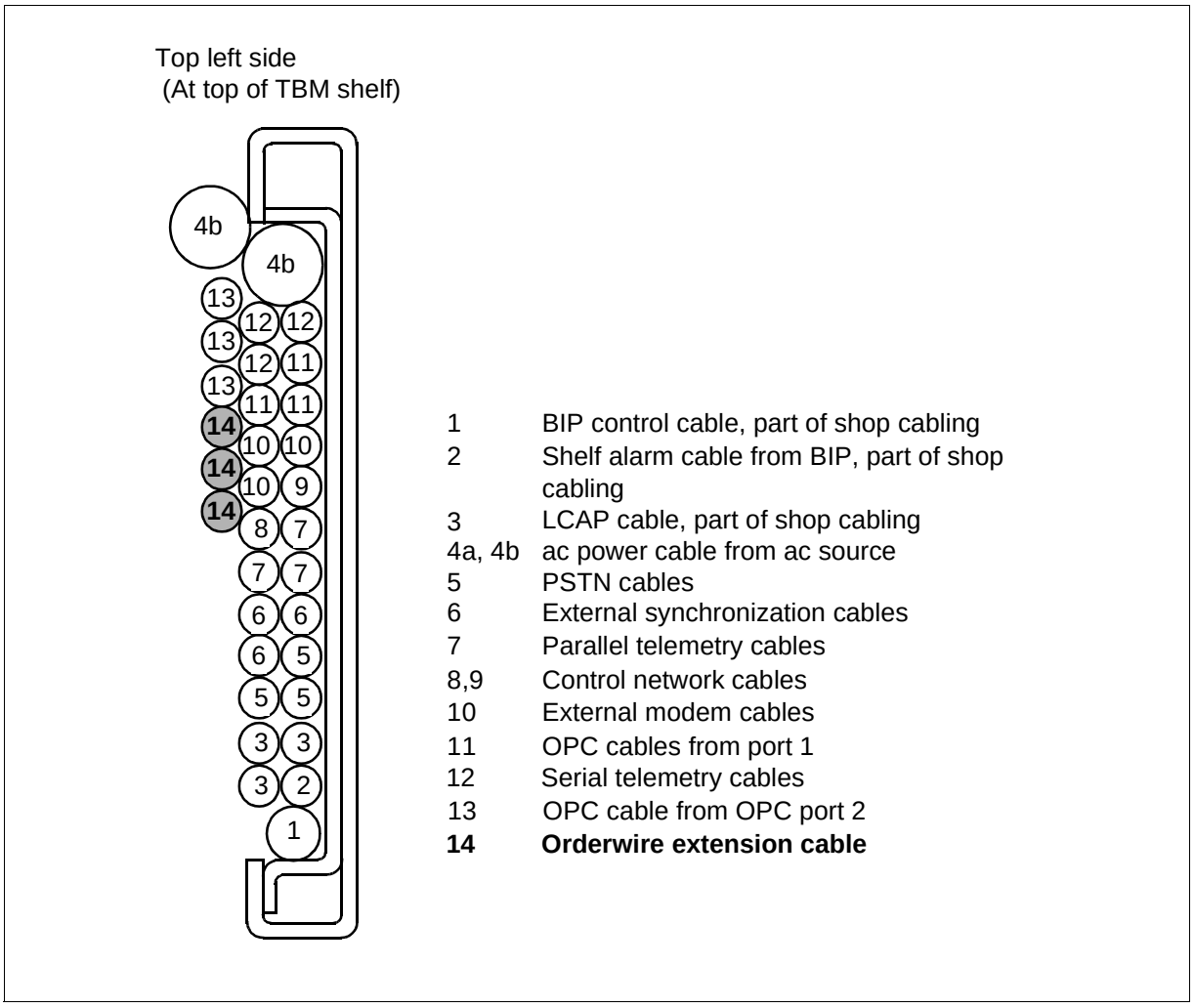

***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-11 (continued)
**Installing an orderwire extension cable**

| Step | Action |
|---|---|
| **3** | Place the orderwire extension cable in the bay upright to occupy the position shown in Figure 5-29. Use cable ties to secure the cable to the bay upright, or to bundles of existing cables. |
| **4** | Route the cable up, out of the bay to the external office cross connect. |
| **5** | Refer to the orderwire extension cable wiring table (see Table 5-17 on page 5-67) and complete the office connections at the cross connect. |

**Figure 5-29**
**Placement of orderwire extension cable in the left bay upright**




**—continued—**

Procedure 5-11 (continued)
**Installing an orderwire extension cable**

**Table 5-17**
**Orderwire extension cable pair color coding and pin-out detail**

| Signal | Pin | Pair | Color |
|---|---|---|---|
| 2W OW jack Tip | 1 | 1 | W |
| 2W OW jack Ring | 2 | 1 | BL |
| 4W OW handset T | 3 | 2 | W |
| 4W OW handset T1 | 4 | 2 | O |
| 4W OW handset R | 5 | 3 | W |
| 4W OW handset R1 | 6 | 3 | G |
| 4W OW handset S | 7 | 4 | W |
| 4W OW handset S1 | 8 | 4 | BR |
| Brdcst Call | 9 | 5 | W |
| Bell Ext OW | 10 | 5 | S |
| Bell (return) | 11 | 6 | R |
| LED Loc OW | 12 | 6 | BL |
| LED Exp OW | 13 | 7 | R |
| Select Loc OW | 14 | 7 | O |
| Select Exp OW | 15 | 8 | R |
| Common Return | 16 | 8 | G |
| Common Return | 17 | jumpered to 16 | |
| 4W Loc OW T input | 18 | 9 | R |
| 4W Loc OW R input | 19 | 9 | BR |
| 4W Loc OW T1 output | 20 | 10 | R |
| 4W Loc OW R1 output | 21 | 10 | S |
| 4W Exp OW T input | 22 | 11 | BK |
| 4W Exp OW R input | 23 | 11 | BL |
| 4W Exp OW T1 output | 24 | 12 | BK |
| 4W Exp OW R1 output | 25 | 12 | O |

**—end—**

# Procedure 5-12
# **Installing the DS1 cables**

This procedure applies to standard and enhanced transport bandwidth manager (TBM) bay configurations with 1, 2, or 3 TBM shelves installed. Use this procedure to install the DS1 cables from the DS1 input and DS1 output cards in a TBM shelf to the DSX-1 cross-connect panel or to the external equipment. Figure 5-33 on page 5-76 shows the available DS1 cables.

***Note 1:*** The *Mapper Layouts Planning Guide*, 323-3001-154, in the *Engineering, Configuration, and Ordering Guide,* Volume 1, contains information for planning TBM shelf mapper layouts, including DS1 configurations.

***Note 2:*** This procedure applies to TBM shelves that only contain DS1s. To install a mix of DS1s and DS3s, see Procedure 5-14 on page 5-100. If the TBM shelf is intended to act as a standalone operations controller (OPC) shelf, no DS1 (or DS3 cables) need to be installed. See *Commissioning and Testing*, Volume 3, for information on commissioning a standalone OPC shelf.

## DS1 input and output

Each DS1 mapper in a TBM shelf has an associated input/output (I/O) card installed in the input/output (I/O) slots above the TBM shelf mapper positions. Each mapper requires one transmit (Tx) cable and one receive (Rx) cable to be connected to the I/O cards for that position.

## DS1 protection capability

If the DS1 protection capability is used, one DS1 protection mapper is installed for each TBM shelf. For the standard fiber central office terminal (FCOT) and enhanced FCOT_BLSR configurations, the DS1 protection mapper is installed in slot 13, with the corresponding protection bridge I/O cards (NT4K31AA) installed in I/O slots 42 and 44. For the enhanced TransportNode bidirectional line-switched ring (TN_BLSR) configuration, the DS1 protection mapper is installed in slot 19, with no protection bridge I/O cards installed.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

## Standard TBM bay external DS1 cabling guidelines

The standard TBM bay equipped with three TBM shelves can support up to 336 DS1s. For standard bay configurations with one or two TBM shelves, each TBM shelf supports up to 126 DS1s. For 3-TBM bay configurations, 2 of the TBM shelves can support up to 126 DS1s and the third TBM shelf can support up to 84 DS1s. (The number of DS1s on the third shelf is limited because of physical constraints in running DS1 cables.)

Table 5-18 lists the maximum number of DS1s for each shelf in a standard FCOT TBM bay.

**Table 5-18**
**Maximum number of DS1s per shelf for a standard FCOT three-TBM configuration**

| Shelf | DS1s | Cables | Tx | Rx |
|---|---|---|---|---|
| first shelf | 126 | 18 | 9 | 9 |
| second shelf | 126 | 18 | 9 | 9 |
| third shelf | 84 | 12 | 6 | 6 |
| ***Note:*** To support 126 DS1s, you must have an OC-12 optical circuit pack. The maximum number of DS1s for OC-3 systems is 84. | | | | |

## Standard TBM bay shelf capacity

Figure 5-30 on page 5-70 shows a standard FCOT integrated configuration, fully equipped with nine working DS1 mapper cards and one protection mapper. In the standard FCOT integrated configuration, the first and second TBM shelves can contain up to nine working DS1 mappers. The third TBM shelf can contain up to six working DS1 mappers.

## Standard TBM bay DS1 cable routing guidelines

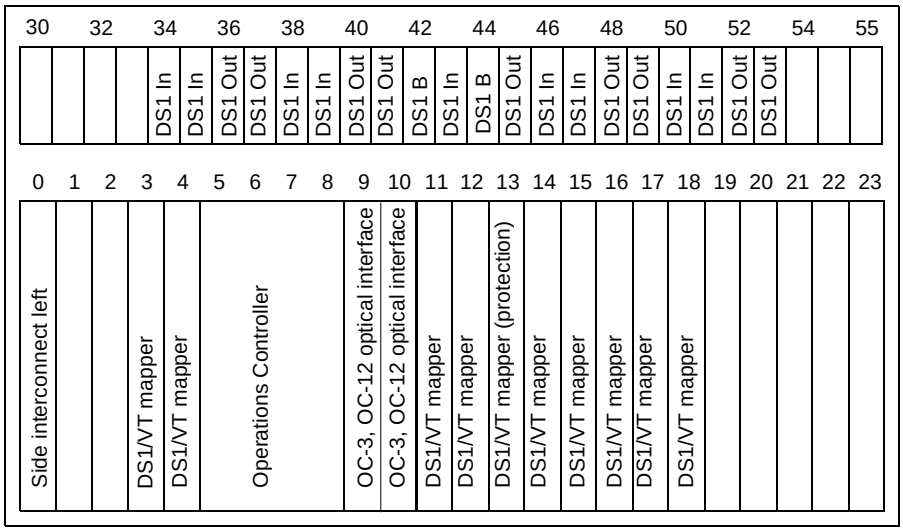
The first and second TBM shelves can contain up to 18 DS1 cables (9 Tx and 9 Rx). The third shelf can contain up to 12 DS1 cables (9 Tx and 9 Rx). Therefore, up to 48 DS1 cables (24 on the left side and 24 on the right side) can be installed in a 3-shelf TBM bay configuration. The Tx and Rx cables for mapper positions 3, 4, 11, 12, and 14 DS1 in are routed to the left side of the bay and the cables for positions 14 DS1 out, 15, 16, 17, and 18 are routed to the right.

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally shelf position 1.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-30**
**DS1 configuration for a standard FCOT TBM shelf**




***Note 1:*** This illustration shows a standard integrated FCOT configuration that is fully equipped with 9 working DS1 mappers. If the shelf has fewer mappers, the corresponding I/O card slots are fitted with blank faceplate cards.

***Note 2:*** For 3-TBM bay FCOT configurations, 2 of the TBM shelves can support up to 126 DS1s (18 DS1 cables) and the third TBM shelf can support up to 84 DS1s (12 DS1 cables). The number of DS1s on the third shelf is limited because of space limitations in the upright.

| | |
|---|---|
| DS1 In | DS1 input card (NT4K32AA) |
| DS1 Out | DS1 output card (NT4K33AA) |
| DS1 B | DS1 protection bridge card (NT4K31AA) |
| P | protection |

| Mappers | | I/O cards | | | |
|---|---|---|---|---|---|
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 |
| DS1 | 11 | DS1 In | 38 | DS1 Out | 40 |
| DS1 | 12 | DS1 In | 39 | DS1 Out | 41 |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 |
| DS1 | 14 | DS1 In | 43 | DS1 Out | 45 |
| DS1 | 15 | DS1 In | 46 | DS1 Out | 48 |
| DS1 | 16 | DS1 In | 47 | DS1 Out | 49 |
| DS1 | 17 | DS1 In | 50 | DS1 Out | 52 |
| DS1 | 18 | DS1 In | 51 | DS1 Out | 53 |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

## Enhanced TBM DS1 mapper and cabling capacity

The enhanced (FCOT_BLSR or TN_BLSR) TBM bay with 3 TBM shelves can support up to 336 DS1s. The number of DS1s per enhanced TBM bay is limited because of physical constraints in running DS1 cables and by the type of shelf (FCOT_BLSR or TN_BLSR).

### FCOT_BLSR shelf capacity

Figure 5-31 on page 5-72 shows an enhanced FCOT_BLSR integrated configuration, fully equipped with 11 working DS1 mapper cards and 1 protection mapper. For FCOT_BLSR TBM shelves, the shelf maximum is 154 DS1s. If the top 2 shelves are each supporting the maximum 154 DS1s (for a total of 308 DS1s), the third shelf can support a total of 28 DS1s to achieve the maximum capacity of 336 DS1s.

Table 5-19 lists the maximum number of DS1s for each shelf in an FCOT_BLSR TBM bay.

**Table 5-19**
**Maximum number of DS1s per shelf for a three-TBM FCOT_BLSR configuration**

| Shelf | DS1s | Cables | Tx | Rx |
|---|---|---|---|---|
| first shelf | 154 | 22 | 11 | 11 |
| second shelf | 154 | 22 | 11 | 11 |
| third shelf | 28 | 4 | 2 | 2 |
| ***Note:*** To support FCOT_BLSR, you must have an OC-12 VTBM optical circuit pack. | | | | |

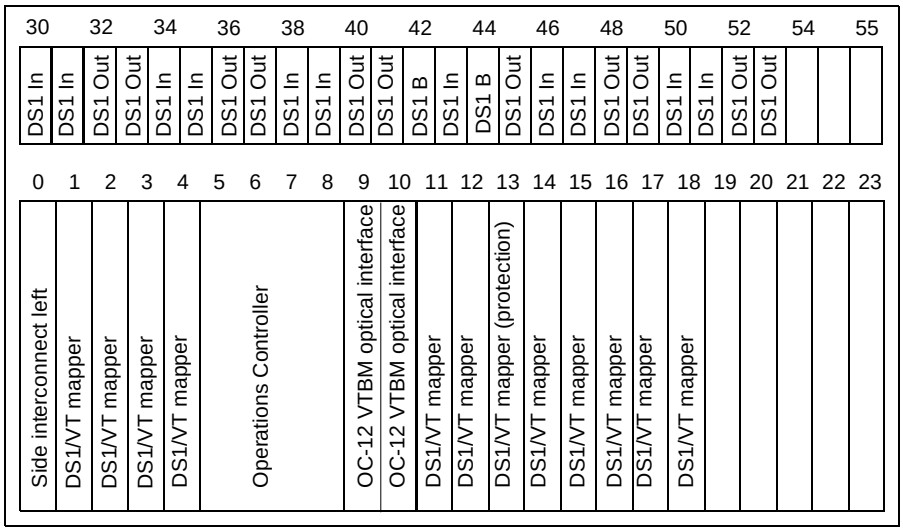
### DS1 cable routing for FCOT_BLSR TBM bays

You can install up to 22 DS1 cables (11 Tx and 11 Rx) per FCOT_BLSR shelf. The Tx and Rx cables for mapper positions 1, 2, 3, 4, 11, and 12 are routed to the left side of the TBM bay and the cables for positions 13, 14, 15, 16, 17, and 18 are routed to the right. Mapper position 13 is used for protection.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-31**
**DS1 configuration for an enhanced FCOT_BLSR TBM shelf**




***Note 1:*** This illustration shows an enhanced FCOT_BLSR integrated configuration, fully equipped with 11 working DS1 mappers and 1 protection mapper. If the shelf has fewer mappers, the corresponding I/O card slots are fitted with blank faceplate cards. The OC-12 VTBM optical interfaces replace the standard OC-12 optics.

***Note 2:*** For 3-TBM bay FCOT_BLSR configurations, 2 of the TBM shelves can support up to 154 DS1s (22 DS1 cables) and the third TBM shelf can support up to 28 DS1s (4 DS1 cables). The number of DS1s on the third shelf is limited because of space limitations in the upright.

| | |
|---|---|
| DS1 In | DS1 input card (NT4K32AA) |
| DS1 Out | DS1 output card (NT4K33AA) |
| DS1 B<br>P | DS1 protection bridge card (NT4K31AA) protection |

| Mappers | | I/O cards | | | |
|---|---|---|---|---|---|
| DS1 | 1 | DS1 In | 30 | DS1 Out | 32 |
| DS1 | 2 | DS1 In | 31 | DS1 Out | 33 |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 |
| DS1 | 11 | DS1 In | 38 | DS1 Out | 40 |
| DS1 | 12 | DS1 In | 39 | DS1 Out | 41 |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 |
| DS1 | 14 | DS1 In | 43 | DS1 Out | 45 |
| DS1 | 15 | DS1 In | 46 | DS1 Out | 48 |
| DS1 | 16 | DS1 In | 47 | DS1 Out | 49 |
| DS1 | 17 | DS1 In | 50 | DS1 Out | 52 |
| DS1 | 18 | DS1 In | 51 | DS1 Out | 53 |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

## TN_BLSR shelf DS1 mapper and cabling capacity

Figure 5-32 on page 5-74 shows an enhanced TN_BLSR integrated configuration, fully equipped with 12 working DS1 mapper cards and 1 protection mapper. For TN_BLSR configurations containing three TBM shelves, only the top two shelves can contain DS1 mappers. The third shelf must be used for DS3s or OC-3 tributaries. The TN_BLSR TBM shelf maximum is 168 DS1s, so 2 fully-equipped TN_BLSR TBM shelves can support the maximum 336 DS1s.

Table 5-20 lists the maximum number of DS1s for each shelf in a TN_BLSR TBM bay.

**Table 5-20**
**Maximum number of DS1s per shelf for a three-TBM TN_BLSR configuration**

| Shelf | DS1s | Cables | Tx | Rx |
|---|---|---|---|---|
| first shelf | 168 | 24 | 12 | 12 |
| second shelf | 168 | 24 | 12 | 12 |
| third shelf | N/A | N/A | N/A | N/A |
| ***Note:*** To support TN_BLSR, you must have an OC-12 VTBM optical circuit pack. | | | | |

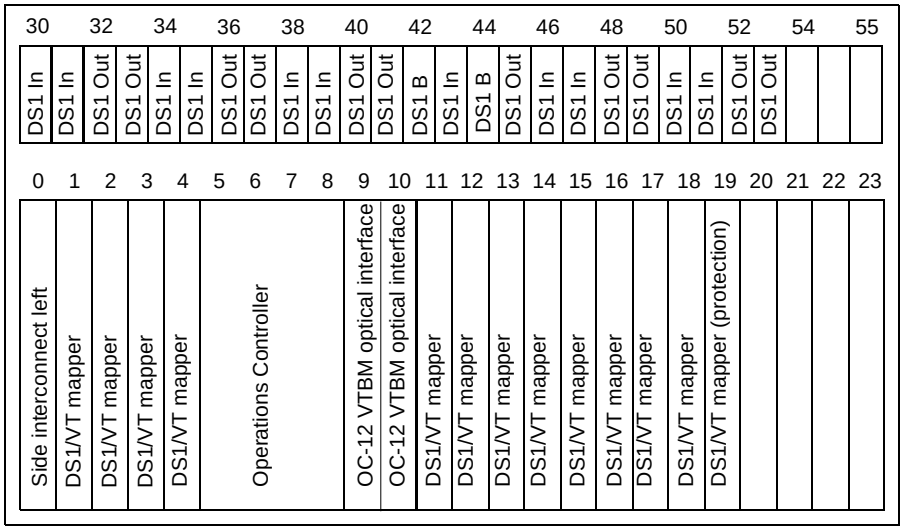
## DS1 cable routing for TN_BLSR TBM bays

You can install up to a 24 DS1 cables (12 Tx and 12 Rx) per TN_BLSR shelf. The Tx and Rx cables for mapper positions 1, 2, 3, 4, 11, and 12 are routed to the left side of the TBM bay and the cables for positions 13, 14, 15, 16, 17, and 18 are routed to the right. Mapper position 19 is used for protection, which in TN_BLSR shelves is handled through the shelf backplane, and has no external cabling requirements.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-32**
**DS1 configuration for an enhanced TN_BLSR TBM shelf**




***Note 1:*** This illustration shows an enhanced TN_BLSR integrated configuration, fully equipped with 12 working DS1 mappers and one protection mapper. If the shelf has fewer mappers, the corresponding I/O card slots are fitted with blank faceplate cards.

***Note 2:*** Note that the protection mapper occupies slot 19 and has no I/O cards associated with it (I/O is handled on the TN_BLSR shelf backplane). The OC-12 VTBM optical interfaces replace the standard OC-12 optics.

***Note 3:*** For 3-TBM bay TN_BLSR configurations, 2 of the TBM shelves can support up to 168 DS1s (24 DS1 cables). The third TBM shelf can support only DS3s and OC-3 tributaries.

| | |
|---|---|
| DS1 In | DS1 input card (NT4K32AA) |
| DS1 Out | DS1 output card (NT4K33AA) |
| DS1 B | DS1 protection bridge card (NT4K31AA) |
| P | protection |

| Mappers | | I/O cards | | | |
|---|---|---|---|---|---|
| DS1 | 1 | DS1 In | 30 | DS1 Out | 32 |
| DS1 | 2 | DS1 In | 31 | DS1 Out | 33 |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 |
| DS1 | 11 | DS1 In | 38 | DS1 Out | 40 |
| DS1 | 12 | DS1 In | 39 | DS1 Out | 41 |
| DS1 | 13 | DS1 In | 42 | DS1 Out | 44 |
| DS1 | 14 | DS1 In | 43 | DS1 Out | 45 |
| DS1 | 15 | DS1 In | 46 | DS1 Out | 48 |
| DS1 | 16 | DS1 In | 47 | DS1 Out | 49 |
| DS1 | 17 | DS1 In | 50 | DS1 Out | 52 |
| DS1 | 18 | DS1 In | 51 | DS1 Out | 53 |
| DS1 P | 19 | DS1 B | N/A | DS1 B | N/A |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

## Requirements

The following tools and materials are required:

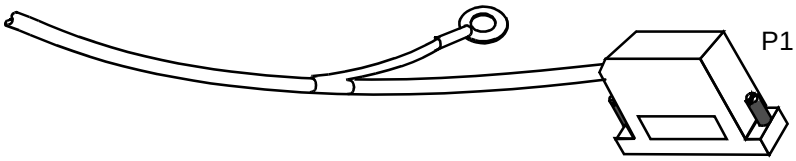
- DS1 cables listed in Figure 5-33 on page 5-76 or equivalent
- cable cutters and cable ties
- electrical tape
- screwdriver, flat-blade 1/4 in.wide blade
- heat shrinkable tubing, black, 9.3 mm (3/8 in.) diameter, R0113153 or equivalent
- heat shrink gun

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-33**
**DS1 cable descriptions**

**NT7E40BA-BH, BJ-BN, BP**
**NT7E40CA-CE, CG-CH, CJ-CL**




44-pin male connector

14 pair, twisted, 22 or 26 AWG solid wires with overall shielding. One end is connectorized (connector P1) for connection to a DS1 input card or to a DS1 output card on the TBM shelf. For cables used on DS1 output cards, a ground lug wire provides connection of the outer shield to the TBM shelf frame ground. The ground lug wire is not used for DS1 input cards. The DS1 cable is available in the following wire gauges and cable lengths:

| Wire gauge | Length | Product engineering code | Description |
|---|---|---|---|
| 22 | 7 m (23 ft) | NT7E40BL | 608, 14 pair |
| 22 | 15 m (49 ft) | NT7E40BA | 608, 14 pair |
| 22 | 30 m (98 ft) | NT7E40BM | 608, 14 pair |
| 22 | 45 m (148 ft) | NT7E40BB | 608, 14 pair |
| 22 | 60 m (197ft) | NT7E40BN | 608, 14 pair |
| 22 | 75 m (246 ft) | NT7E40BC | 608, 14 pair |
| 22 | 90 m (295 ft) | NT7E40BP | 608, 14 pair |
| 22 | 106 m (348 ft) | NT7E40BD | 608, 14 pair |
| 22 | 120 m (394 ft) | NT7E40BQ | 608, 14 pair |
| 22 | 137 m (450 ft) | NT7E40BE | 608, 14 pair |
| 22 | 153 m (502 ft) | NT7E40BR | 608, 14 pair |
| 22 | 168 m (551 ft) | NT7E40BF | 608, 14 pair |
| 22 | 182 m (591 ft) | NT7E40BS | 608, 14 pair |
| 22 | 198 m (650 ft) | NT7E40BG | 608, 14 pair |
| 26 | 7 m (23 ft) | NT7E40CG | 1249C, 14 pair |
| 26 | 15 m (49 ft) | NT7E40CA | 1249C, 14 pair |
| 26 | 30 m (98 ft) | NT7E40CH | 1249C, 14 pair |
| 26 | 45 m (148 ft) | NT7E40CB | 1249C, 14 pair |
| 26 | 60 m (197 ft) | NT7E40CJ | 1249C, 14 pair |
| 26 | 75 m (246 ft) | NT7E40CC | 1249C, 14 pair |
| 26 | 90 m (295 ft) | NT7E40CK | 1249C, 14 pair |
| 26 | 106 m (348 ft) | NT7E40CD | 1249C, 14 pair |
| 26 | 120 m (394 ft) | NT7E40CL | 1249C, 14 pair |
| 26 | 137 m (450 ft) | NT7E40CE | 1249C, 14 pair |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

## Action

| Step | Action |
|---|---|

**1** Use the facility records to identify the TBM shelf slots in which the DS1 mappers are to be installed.

For a description of the shelf configurations and the placement of mappers and I/O cards at the fiber central office terminal (FCOT) and at the remote fiber terminal (RFT), see *Mapper Layouts Planning Guide,* 323-3001-154, in *Engineering, Configuration, and Ordering Guide,* Volume 1*.*

**2** Remove the blank I/O faceplate cards from the following I/O slots according to the TBM card positions where mappers are being installed:

| Mapper card position number | Remove the I/O faceplate cards from I/O slots |
|---|---|
| 1 (see Note 1) | 30 and 32 |
| 2 (see Note 1) | 31 and 33 |
| 3 | 34 and 36 |
| 4 | 35 and 37 |
| 11 | 38 and 40 |
| 12 | 39 and 41 |
| 13 (see Note 2) | 42 and 44 |
| 14 | 43 and 45 |
| 15 | 46 and 48 |
| 16 | 47 and 49 |
| 17 | 50 and 52 |
| 18 | 51 and 53 |

***Note 1:*** Mapper positions 1 and 2 can only be used if there are no DS3s in the shelf.

***Note 2:*** Mapper position 13 contains a DS1/VT mapper used for protection in FCOT and FCOT_BLSR configurations. In TN_BLSR, slot 13 contains a working DS1/VT mapper.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

| Step | Action |
|---|---|

**3** Insert cards into the I/O shelf according to the slots where mappers are being installed, as follows:

| DS1 mapper position | I/O card type | I/O slot | I/O card type | I/O slot |
|---|---|---|---|---|
| 1 | DS1 In (NT4K32AA) | 30 | DS1 Out (NT4K33AA) | 32 |
| 2 | DS1 In (NT4K32AA) | 31 | DS1 Out (NT4K33AA) | 33 |
| 3 | DS1 In (NT4K32AA) | 34 | DS1 Out (NT4K33AA) | 36 |
| 4 | DS1 In (NT4K32AA) | 35 | DS1 Out (NT4K33AA) | 37 |
| 11 | DS1 In (NT4K32AA) | 38 | DS1 Out (NT4K33AA) | 40 |
| 12 | DS1 In (NT4K32AA) | 39 | DS1 Out (NT4K33AA) | 41 |
| 13 (P) | DS1 B (NT4K31AA) | 42 | DS1 B (NT4K31AA) | 44 |
| 13 (TN_BLSR) | DS1 In (NT4K32AA) | 42 | DS1 Out (NT4K33AA) | 44 |
| 14 | DS1 In (NT4K32AA) | 43 | DS1 Out (NT4K33AA) | 45 |
| 15 | DS1 In (NT4K32AA) | 46 | DS1 Out (NT4K33AA) | 48 |
| 16 | DS1 In (NT4K32AA) | 47 | DS1 Out(NT4K33AA) | 49 |
| 17 | DS1 In (NT4K32AA) | 50 | DS1 Out (NT4K33AA) | 52 |
| 18 | DS1 In (NT4K32AA) | 51 | DS1 Out (NT4K33AA) | 53 |

**4** Tighten the hold-down screws at the bottom of the card faceplates.

**5** Label both ends of each DS1 cable with the function of the cable, transmit (Tx) or receive (Rx), and the range of DS1 numbers. Be sure to slip the cable ties into the cable tie lances before inserting the cables.

***Note 1:*** The function of the cable (transmit or receive) is determined from the perspective of the DSX-1 cross-connect panel. Transmit cables carry signals away from the DSX-1 cross-connect panel and receive cables carry signals towards the DSX-1 cross-connect panel.

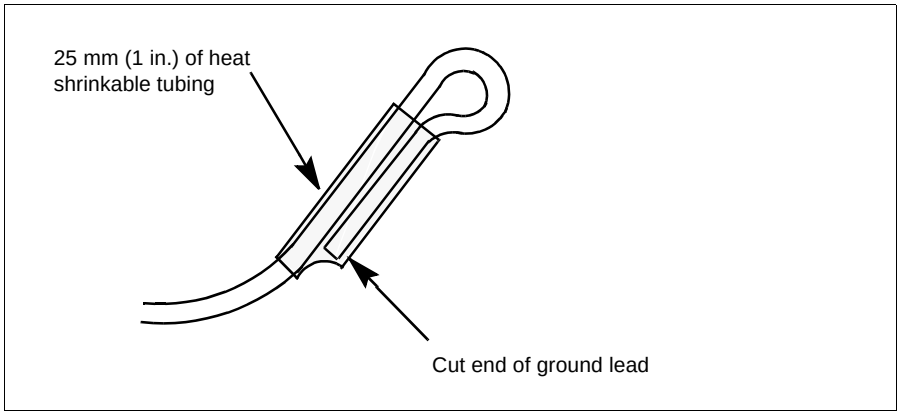
***Note 2:*** The range of DS1 numbers must be two numbers from 1-to-126 (standard FCOT), 1-to-154 (FCOT_BLSR), or 1-to-168 (TN_BLSR).

**6** At the bay end of the transmit DS1 cables, cut off the ground leads 50 mm (2 in.) away from the cable jacket. These ground leads are not used.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

| Step | Action |
|---|---|
| **7** | Bend the cut ends of the ground leads back on themselves and protect the cut ends with a 25 mm (1 in.) length of heat shrinkable tubing, as shown in the following diagram. |



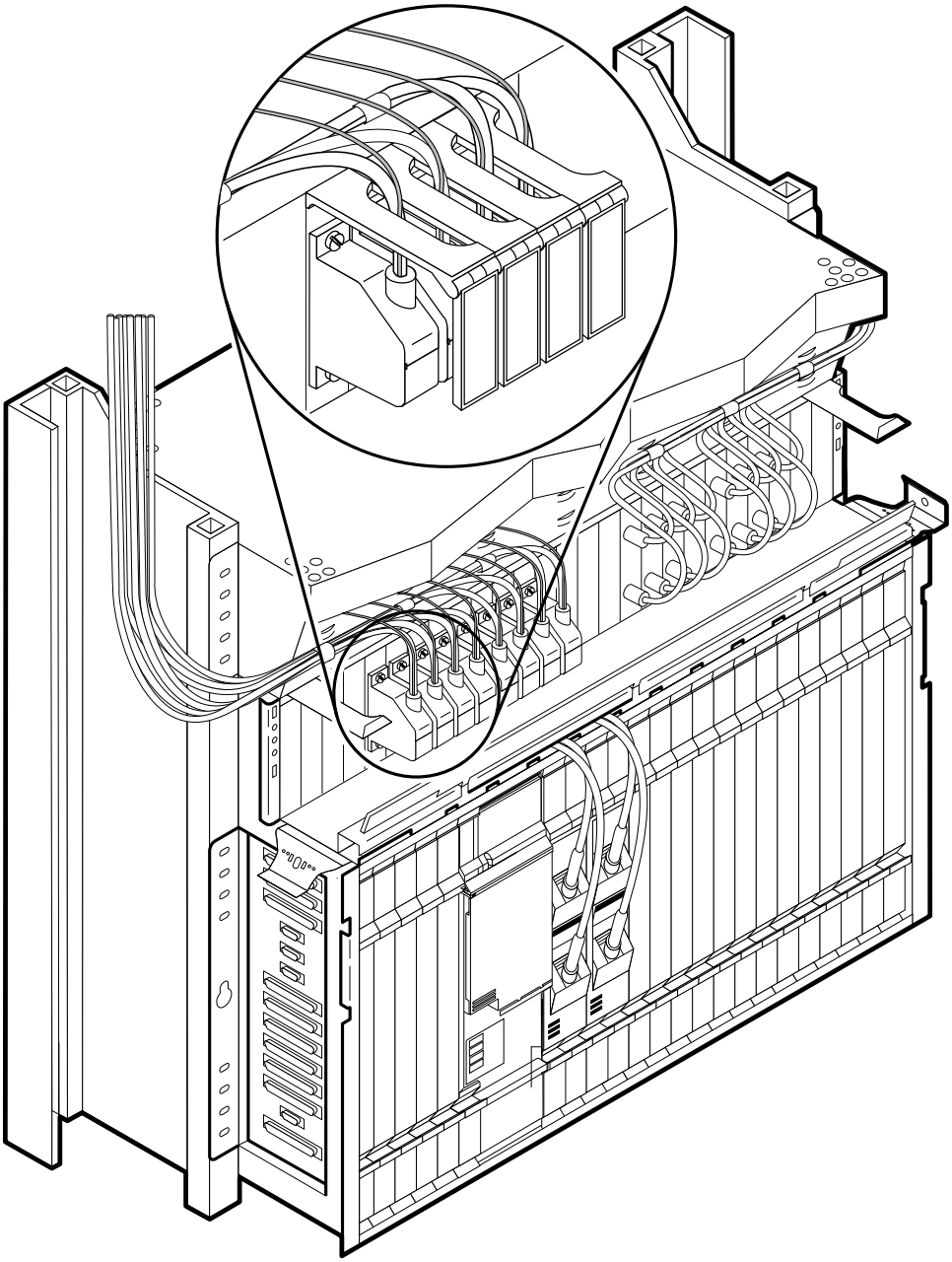

| | |
|---|---|
| **8** | Run one DS1 cable into the left side of the bay for each DS1 In card and DS1 Out card installed in I/O slots 34 though 41. |
| **9** | Attach the connector of each DS1 cable to the DS1 In and DS1 Out cards, in sequence, starting with the card in slot 34 and ending with the card in slot 41.<br><br>Tighten the hold-down screws on each connector just enough to draw the connector into position (2 inch-pounds maximum). Do not overtighten. |
| **10** | Dress the cables into the cable organizer and secure them with cable ties, as shown in Figure 5-34 on page 5-80. |
| **11** | Attach the ground lugs of the receive (out) DS1 cables to the to the ground screws at the upper part of the cable organizer panel, as shown in Figure 5-35 on page 5-81.<br><br>***Note:*** When you have finished connecting all of the grounds, the grounding of the transmit and receive cables will be as shown in Figure 5-36 on page 5-82. |
| **12** | Dress the cables into the left bay upright, as shown in Figure 5-37 on page 5-83 and use cable ties to fasten them to the left bay upright, or to other bundles of existing cables. |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-34**
**Routing the cables down the left side of the bay**

PC-10596



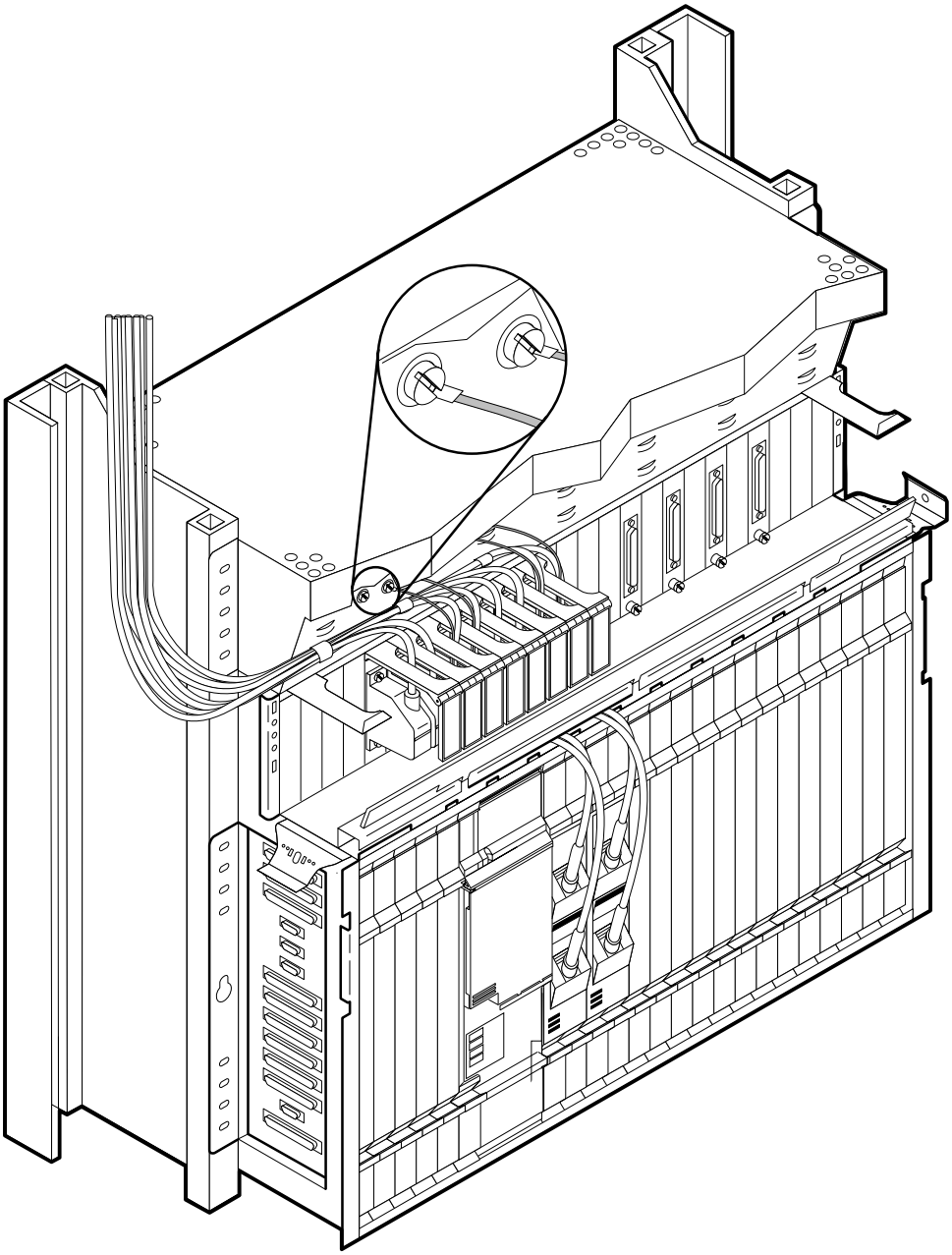
***Note:*** Insert cables in cutouts between bar code label mounting plates (See blowup). Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-35**
**Attaching the ground lugs**

PC-10597

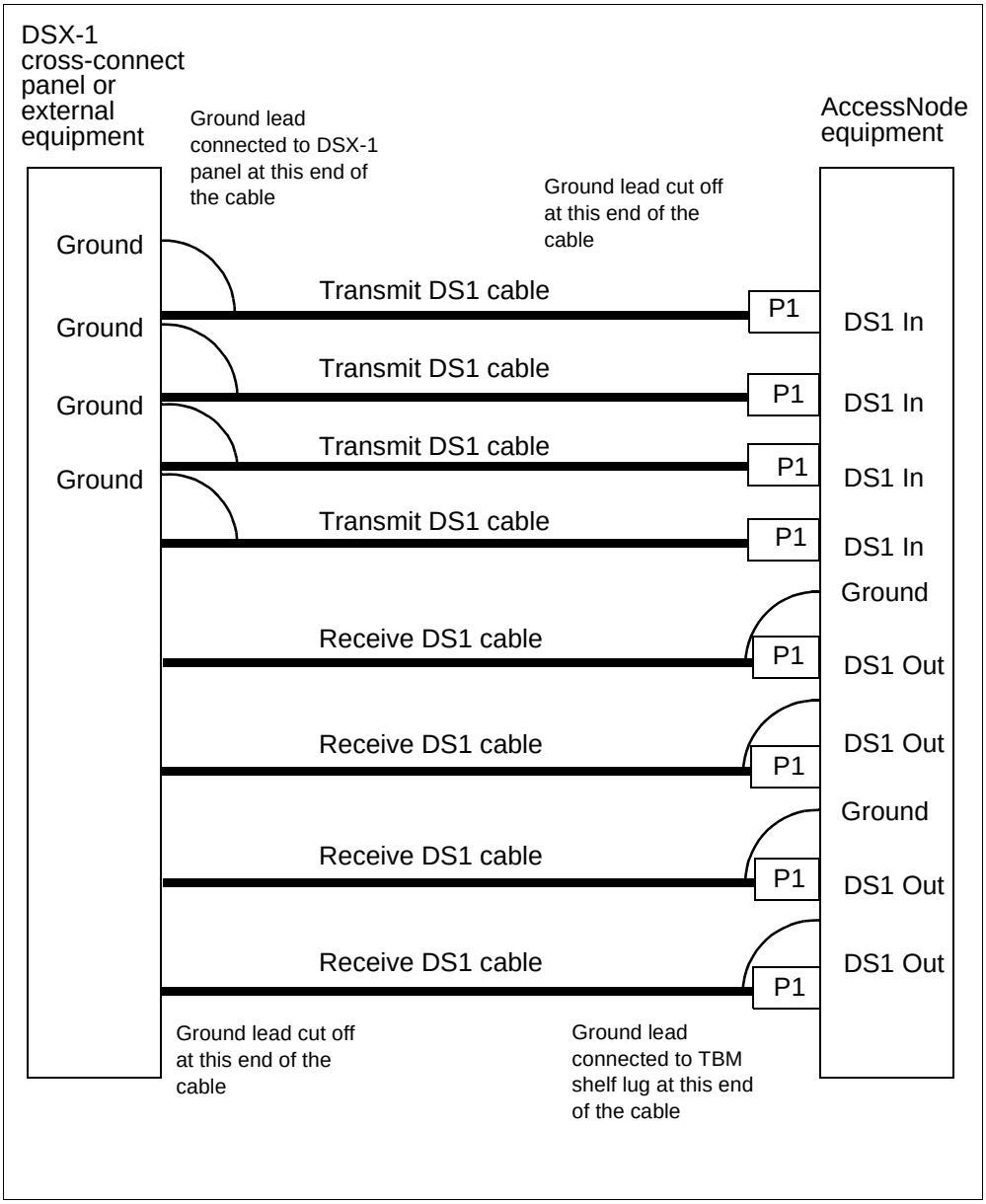


***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

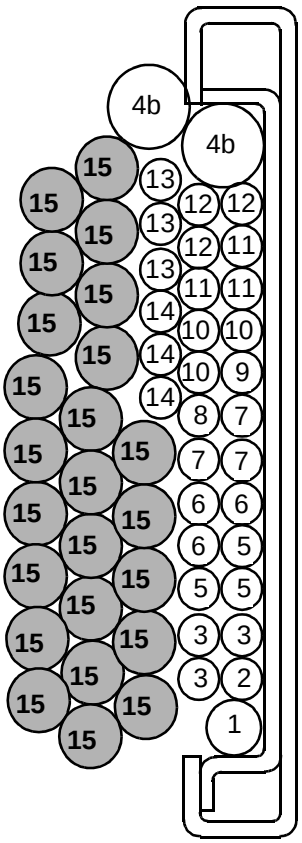
**Figure 5-36**
**Schematic of DS1 cable grounding scheme**




**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-37**
**Dressing the cables into the left bay upright**




| | |
|---|---|
| 1 | BIP control cable, part of shop cabling |
| 2 | Shelf alarm cable from BIP, part of shop cabling |
| 3 | LCAP cable, part of shop cabling |
| 4a, 4b | ac power cable from ac source |
| 5 | PSTN cables |
| 6 | External synchronization cables |
| 7 | Parallel telemetry cables |
| 8,9 | Control network cables |
| 10 | External modem cables |
| 11 | OPC cables from port 1 |
| 12 | Serial telemetry cables |
| 13 | OPC cable from OPC port 2 |
| 14 | Orderwire extension cable |
| **15** | **DS1 cables** |

***Note:*** Graphic shows largest DS1 capacity shelf (TN_BLSR), with 24 DS1 cables that support mapper positions 1, 2, 3, 4, 11, and 12, for two full-filled TBM shelves.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

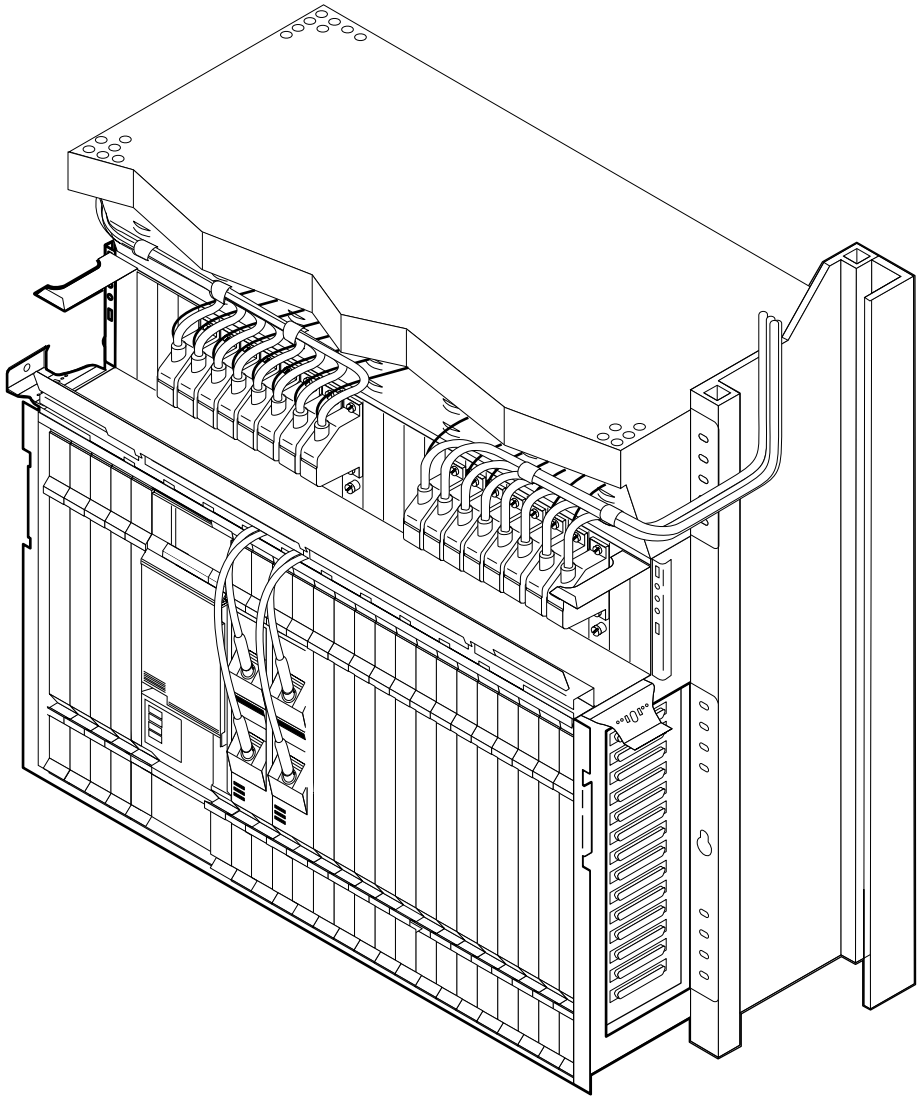
| Step | Action |
|---|---|
| **13** | Run one DS1 cable into the right side of the bay for each DS1 In card and DS1 Out card installed in I/O slots 43 through 53. |
| **14** | Attach the connector of each DS1 cable to the DS1 In and DS1 Out cards, in sequence, starting with the cable to the card in slot 42, and ending with the card in slot 53.<br><br>Tighten the hold down screws on each connector just enough to draw the connector into place (2 inch-pounds maximum). Do not overtighten. |
| **15** | Dress the cables into the organizer and secure them to the cable organizer panel, as shown in Figure 5-38 on page 5-85. |
| **16** | Attach the ground lugs of the receive (out) DS1 cables to the right side of each TBM shelf using hex screws, as shown in Figure 5-35 on page 5-81.<br><br>***Note:*** After you connect all of the grounds, the grounding of the transmit and receive cables are as shown in Figure 5-52 on page 5-108. |
| **17** | At the bay end of the transmit (in) DS1 cables, cut off the ground leads 50 mm (2 in.) away from the cable jacket. These ground leads are not used. |
| **18** | Bend the cut ends of the ground leads back on themselves and protect the cut ends with a 25 mm (1 in.) length of heat shrinkable tubing. |

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

**Figure 5-38**
**Routing the cables down the right side of the bay and installing the cable ties**

PC-15275



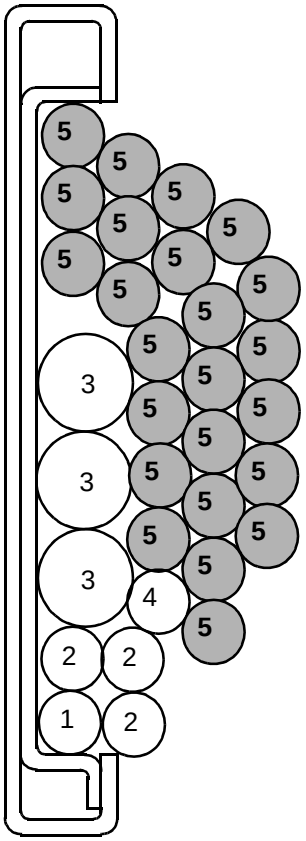
***Note:*** Insert cables in cutouts between bar code label mounting plates.
Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

| Step | Action |
|---|---|
| **19** | Dress the cables into the right bay upright, as shown in Figure 5-39 and use cable ties to fasten them to the left bay upright, or to other bundles of existing cables. |

**Figure 5-39**
**Dressing the cables into the right bay upright**




| | |
|---|---|
| 1 | Power to shelves from BIP, part of shop cabling |
| 2 | Shelf alarm (3) |
| 3 | Fiber split flex tubing (up to 20 patch cords) |
| 4 | Integral modem cables |
| **5** | **DS1 cables** |

***Note:*** Graphic shows largest DS1 capacity shelf (TN_BLSR), with 24 DS1 cables that support mapper positions 13, 14, 15, 16, 17, and 18, for two full-filled TBM shelves.

**—continued—**

Procedure 5-12 (continued)
**Installing the DS1 cables**

| Step | Action |
|---|---|
| **20** | Run the DS1 cables from the bay over to the DSX-1 panel. |
| **21** | Use Table 5-21 to terminate the office end of each DS1 cable to the DSX-1 cross-connect panel. |
| **22** | Connect the ground leads of the transmit DS1 cables to ground lugs on the DSX-1 cross-connect panel. |
| **23** | At the DSX-1 cross-connect-panel-end of the receive DS1 cables, cut off the ground leads 50 mm (2 in.) away from the cable jacket. These leads are not used. |
| **24** | Bend the cut ends of the ground leads back on themselves and protect the cut ends with a 25 mm (1 in.) length of heat shrinkable tubing. |

**Table 5-21**
**Color codes and pin-out details for DS1 cables**

| Connector P1 pin | | | Color of pair | |
|---|---|---|---|---|
| **Ring** | **Tip** | **DS1 No.** | **Ring** | **Tip** |
| 31 | 16 | 1 | BL W | W BL |
| 32 | 17 | 2 | O W | W O |
| 33 | 18 | 3 | G W | W G |
| 34 | 19 | 4 | BR W | W BR |
| 35 | 20 | 5 | S W | W S |
| 36 | 21 | 6 | BL R | R BL |
| 37 | 22 | 7 | O R | R O |
| 38 | 23 | 8 | G R | R G |
| 39 | 24 | 9 | BR R | RB R |
| 40 | 25 | 10 | S R | R S |
| 41 | 26 | 11 | BL BK | BK BL |
| 42 | 27 | 12 | O BK | BK O |
| 43 | 28 | 13 | G BK | BK G |
| 44 | 29 | 14 | BR BK | BK BR |
| - | 30 | - | | |

**—end—**

# Procedure 5-13
# **Installing the DS3 cables**

Use this procedure to connect the DS3 cables (NT7E43AA through AH, and NT7E43AJ to AL) to TBM bay configurations with 1, 2, or 3 TBM shelves installed. The *Mapper Layouts Planning Guide*, 323-3001-154, in the *Engineering, Configuration, and Ordering Guide*, Volume 1, contains information for planning TBM shelf mapper layouts, including DS3 configurations.

This procedure applies to TBM shelves that only contain DS3s. For the procedure to install a mix of DS1s and DS3s, see Procedure 5-14 on page 5-100.

## TBM DS3 cabling guidelines

The DS3 cables used with the TBM shelf are NT-734-E coaxial cables preconnectorized at one end with a BNC connector (see Figure 5-40 on page 5-89). Each mapper has three input/output (I/O) cards installed in the I/O slots above the TBM shelf mapper positions. Each mapper requires one transmit (Tx) cable and one receive (Rx) cable to be connected to each I/O card for that position. A DS3 protection mapper is always installed in slot 1 (if the DS3 protection capability is used).

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-40**
**DS3 cable**

PC-10068

**NT7E43AA through AH, and NT7E43AJ through AL**

NT-734-E coaxial cables preconnectorized at one end with a BNC connector. These cables are available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16.4 ft) | NT7E43AA |
| 10 m | (32.8 ft) | NT7E43AB |
| 20 m | (65.6 ft) | NT7E43AC |
| 30 m | (88.4 ft) | NT7E43AD |
| 40 m | (131.1 ft) | NT7E43AE |
| 50 m | (163.9 ft) | NT7E43AF |
| 60 m | (196.7 ft) | NT7E43AG |
| 75 m | (245.9 ft) | NT7E43AH |
| 80 m | (262.3 ft) | NT7E43AJ |
| 100 m | (327.9 ft | NT7E43AL |
| 140 m | (459 ft) | NT7E43AK |

It is recommended that you use a Schleuniger coaxial stripper tool Model HZ207A (Tool room number T00067) and BNC connector kit (Tool room number K000702) when installing BNC connectors in the field.

## Standard DS3 mapper and cable capacity

Figure 5-41 on page 5-91 shows a standard (FCOT) TBM shelf DS3 configuration. Each FCOT TBM shelf can contain up to three working DS3 mappers (mapper positions 11, 15, and 17).

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

### Standard TBM bay DS3 cable routing

For standard FCOT TBM bays, you can install up to 18 DS3 cables (9 Tx and 9 Rx) in each TBM shelf, up to 54 DS3 cables in a 3-shelf TBM bay configuration. Route the DS3 cables 18 on the left side and 36 on the right side. The Tx and Rx cables for DS3 mapper position 11 is routed to the left side of the TBM bay. The Tx and Rx cables for DS3 mapper positions 15 and 17 are routed to the right.

## Enhanced DS3 mapper and cable capacity

Figure 5-42 on page 5-92 shows an enhanced (TN_BLSR and FCOT_BLSR) TBM shelf DS3 configuration. Each TN_BLSR and FCOT_BLSR TBM shelf can contain up to four working DS3 mappers (mapper positions 11, 13, 15, and 17).

> ***Note:*** Mapper position 13 is only available if no DS1/VT mappers are installed in the shelf.

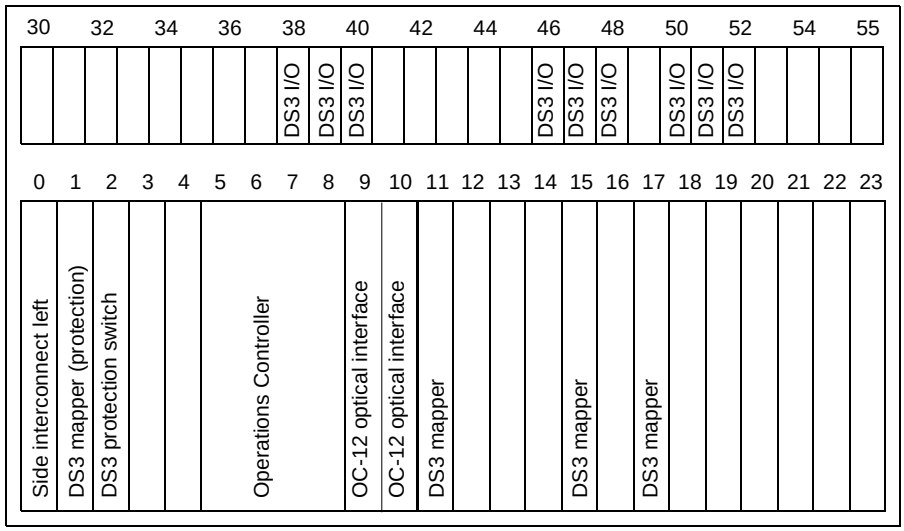
### Enhanced TBM bay DS3 cable routing

For enhanced TN_BLSR and FCOT_BLSR TBM bays, you can install up to 24 DS3 cables (12 Tx and 12 Rx) can be installed in each TBM shelf, up to 72 DS3 cables in a 3-shelf TBM bay configuration. The DS3 cables should be routed 36 on the left side and 36 on the right side. The Tx and Rx cables for DS3 mapper positions 11 and 13 are routed to the left side of the TBM bay. The Tx and Rx cables for DS3 mapper positions 15 and 17 are routed to the right side of the TBM bay.

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-41**
**Standard (FCOT) TBM shelf with three working DS3 mappers**



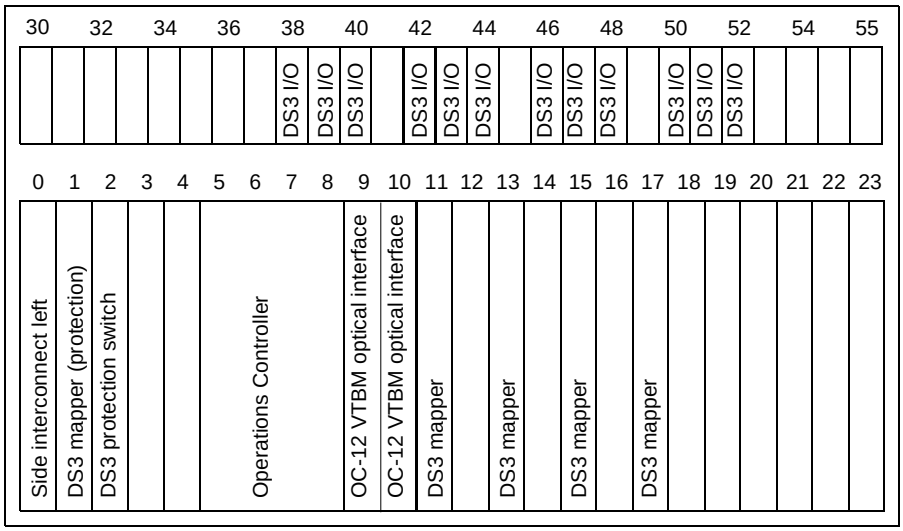

| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS3 | 11 | DS3 I/0 | 38 | DS3 I/O | 39 | DS3 I/O | 40 |
| DS3 | 15 | DS3 I/O | 46 | DS3 I/O | 47 | DS3 I/O | 48 |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

DS3 I/O DS3 input output card (NT4K30AA)
P protection

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-42**
**Enhanced (TN_BLSR and FCOT_BLSR) TBM shelf with four working DS3 mappers**




| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS3 | 11 | DS3 I/0 | 38 | DS3 I/O | 39 | DS3 I/O | 40 |
| DS3 | 13 | DS3 I/O | 42 | DS3 I/O | 43 | DS3 I/O | 44 |
| DS3 | 15 | DS3 I/O | 46 | DS3 I/O | 47 | DS3 I/O | 48 |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

***Note 1:*** Mapper position 13 is available only when no DS1/VT mappers are installed in the TBM shelf.

***Note 2:*** Enhanced TN_BLSR and FCOT_BLSR TBM shelves require the OC-12 VTBM optical interface.

DS3 I/O DS3 input output card (NT4K30AA)
P protection

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

## Requirements

The following tools and materials are required:

- wire cutters (flush cutting)
- screwdriver, flat blade, 1/8 in. wide
- Schleuniger coaxial stripper tool Model HZ207A (if installing BNC connectors in the field)
- cable ties

**CAUTION**
**Risk of damage to DS3 cables**
Do not bend a DS3 cable into a radius smaller than 38 mm (1.5 in.) to avoid damaging the cable.

## Action

| Step | Action |
|---|---|

**1** Use facility records to identify the slots in the TBM shelf into which DS3 mapper cards are to be installed.

For a description of the shelf configurations and the placement of mappers and I/O cards at the fiber central office terminal (FCOT) and at the remote fiber terminal (RFT), see *Mapper Layouts Planning Guide,* 323-3001-154, in the *Engineering, Configuration, and Ordering Guide,* Volume 1.

**2** Remove the blank I/O faceplate cards from the following I/O slots according to the lower slots into which the DS3 mappers are to be installed.

| Slot with DS3 mapper | Remove the I/O faceplate card from the following slots |
|---|---|
| 1 (protection) | none |
| 11 (working) | 38, 39, and 40 |
| 13 (working - enhanced only) | 42, 43, and 44 |
| 15 (working) | 46, 47, and 48 |
| 17 (working) | 50, 51, and 52 |

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

| Step | Action |
|---|---|
| **3** | Insert NT4K30AA DS3 I/O cards into the slots from which you removed the blank faceplate cards. |
| **4** | Tighten the hold-down screw on the faceplate of each I/O card. |
| **5** | Label both ends of each DS3 cable with its DS3 number (1 to 12) and its function: transmit (Tx) or receive (Rx). Slip the cable ties into the cable tie lances before inserting the cables. |
| **6** | If a DS3 mapper is installed in position 11 and/or position 13, go to step 7. If position 11 and/or position 13 is not installed, go to step 13. |
| **7** | Run the connectorized ends of the DS3 cables for mapper position 11 (I/O slots 38, 39 and 40) and/or mapper position 13 (I/O slots 42, 43, and 44) down into the left side of the bay. Leave enough slack to connect the cables to the I/O cards in the TBM shelf. Run one Tx and one Rx DS3 cable for each I/O card installed, as shown in Figure 5-43 on page 5-96. |
| **8** | Connect the BNC connector of each DS3 cable to its I/O card in sequence, starting with the cable that attaches to the Rx connector of the left-most card in the shelf. |
| **9** | Dress the DS3 cables into the cable organizer and secure them with cable ties, as shown in Figure 5-43 on page 5-96. |
| **10** | Dress the DS3 cables into the left bay upright, as shown in Figure 5-44 on page 5-97 and use cable ties to secure them in the bay upright. |
| **11** | Lace the cables to the cable bracket on the top of the bay. |
| **12** | Route the DS3 cables up into the overhead cable rack and along the rack to the DS3 cross-connect panel. |
| **13** | If DS3 mappers are installed in positions 15 and/or 17, go to step 14. If neither of these positions are installed, go to step 20. |
| **14** | Run the connectorized ends of the DS3 cables for mapper positions 15 (I/O slots 46, 47, 48) and 17 (I/O slots 50, 52 and 52) down into the right side of the bay. Leave enough slack to connect the cables to the I/O cards in the TBM shelf. Run one Tx and one Rx DS3 cable for each I/O card installed, as shown in Figure 5-45 on page 5-98. |
| **15** | Connect the BNC connector of each DS3 cable to the I/O cards in sequence, starting with the cable that attaches to the Rx connector of the right-most card. |
| **16** | Dress the DS3 cables into the cable organizer and secure them with cable ties, as shown in Figure 5-45 on page 5-98. |
| **17** | Dress the DS3 cables into the right bay upright, as shown in Figure 5-46 on page 5-99 and use cable ties to secure them in the bay upright. |

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

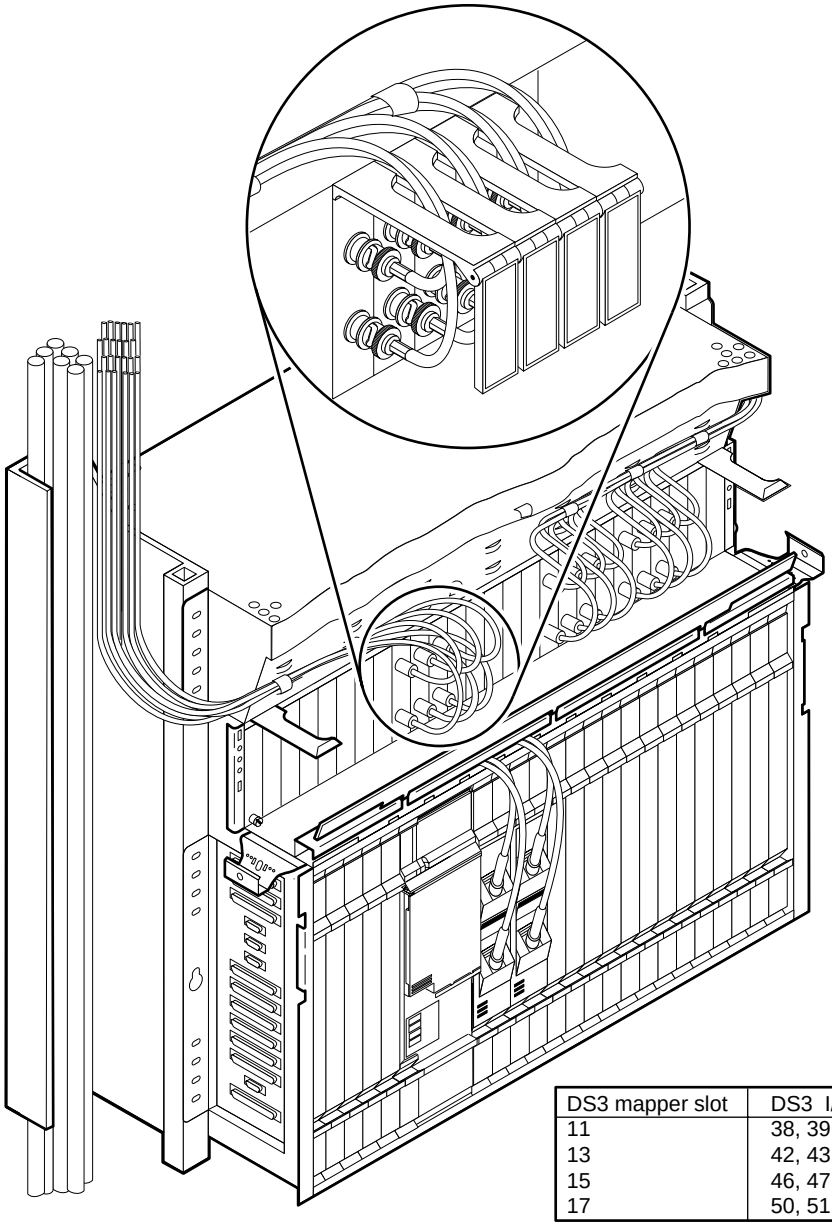
| Step | Action |
|---|---|
| **18** | Lace the cables to the cable bracket on the top of the bay. |
| **19** | Route the DS3 cables up into the overhead cable rack and along the rack to the DS3 cross-connect panel. |
| **20** | Connect the free ends of all of the cables to the DS3 cross-connect panel.<br><br>***Note:*** If the bay is installed in an integrated bonding network (IBN) grounding environment, and the DS3s connect to equipment that is located outside the IBN, the DS3s must be isolated from foreign grounds through a transmission ground reference panel that is bonded to the single point building ground (SPG) within the IBN. |

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-43**
**Routing and connecting DS3 cables to the left side of the shelf**

PC-15268



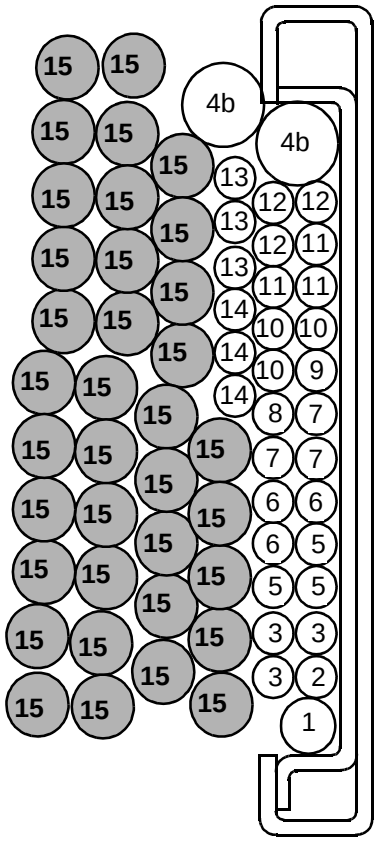
| DS3 mapper slot | DS3 I/O slots |
|---|---|
| 11 | 38, 39, 40 |
| 13 | 42, 43, 44 |
| 15 | 46, 47, 48 |
| 17 | 50, 51, 52 |

***Note:*** Insert cables in cutouts between bar code label mounting plates. (See blowup)
Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-44**
**Dressing the DS3 cables into the left bay upright**




| | |
|---|---|
| 1 | BIP control cable, part of shop cabling |
| 2 | Shelf alarm cable from BIP, part of shop cabling |
| 3 | LCAP cable, part of shop cabling |
| 4a, 4b | ac power cable from ac source |
| 5 | PSTN cables |
| 6 | External synchronization cables |
| 7 | Parallel telemetry cables |
| 8,9 | Control network cables |
| 10 | External modem cables |
| 11 | OPC cables from port 1 |
| 12 | Serial telemetry cables |
| 13 | OPC cable from OPC port 2 |
| 14 | Orderwire extension cable |
| **15** | **DS3 cables** |

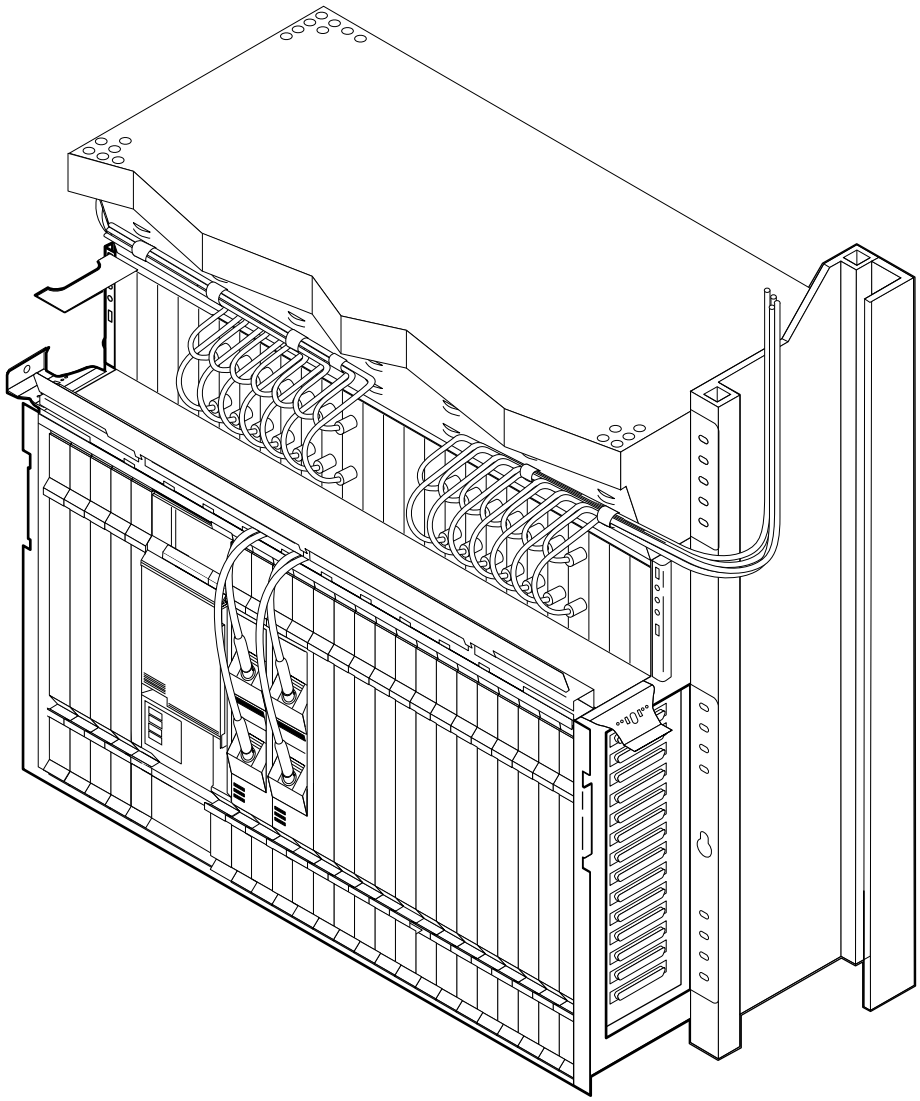
***Note:*** Graphic shows enhanced TBM shelf at maximum capacity, with a total of 36 DS3 cables that support mapper positions 11 and 13 for three fully-equipped TBM shelves.

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-45**
**Routing and connecting DS3 cables to the right side of the shelf**

PC-15276

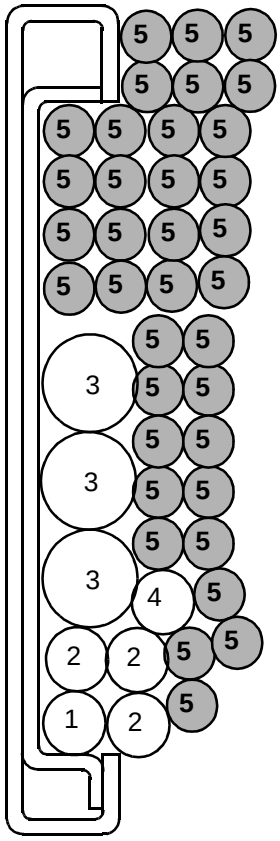


***Note:*** Insert cables in cutouts between bar code label mounting plates.
Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-13 (continued)
**Installing the DS3 cables**

**Figure 5-46**
**Dressing the DS3 cables into the right bay upright**




| | |
|---|---|
| 1 | Power to shelves from BIP, part of shop cabling |
| 2 | Shelf alarm (3) |
| 3 | Fiber split flex tubing (up to 20 patch cords) |
| 4 | Integral modem cables |
| **5** | **DS3 cables** |

***Note:*** Graphic shows enhanced TBM shelf at maximum capacity, with a total of 36 DS3 cables that support mapper positions 15 and 17 for three fully-equipped TBM shelves.

**—end—**

# Procedure 5-14
# Installing a mix of DS1 and DS3 cables

Use this procedure to connect a mix of DS1 and DS3 cables to the transport bandwidth manager (TBM) shelf. The *Mapper Layouts Planning Guide*, 323-3001-154, in the *Engineering, Configuration, and Ordering Guide,* Volume 1, contains information for planning TBM shelf mapper layouts, including DS1/DS3 mixed configurations.

This procedure only applies to TBM shelves that contain a mix of DS1 and DS3s. For the procedure to install a shelf containing DS1s, see Procedure 5-12 on page 5-68, and for the procedure to install a shelf containing DS3s, see Procedure 5-13 on page 5-88.

## TBM DS1/DS3 mixed configurations

This procedure applies to TBM bay configurations with 1, 2, or 3 TBM shelves installed. Figures 5-47 through 5-51 (starting on page 5-103) show typical TBM shelf configurations with a mix of DS1s and DS3s.

Each mapper (with the exception of the DS3 protection mapper) has associated input/output (I/O) cards installed in the I/O slots above the TBM shelf mapper positions. Each mapper requires one transmit (Tx) cable and one receive (Rx) cable to be connected to the I/O cards associated that position.

A DS1 protection mapper (if the DS1 protection capability is used) is always installed in slot 13 and the corresponding protection bridge I/O cards (NT4K31AA) are always installed in I/O slots 42 and 44. A DS3 protection mapper is always installed in slot 1 (if the DS3 protection capability is used).

### Standard TBM bay mixed DS1/DS3 shelf capacity guidelines

In the standard TBM bay configuration, the first and second TBM shelves can contain up to nine working DS1 mappers, three DS3 mappers, or a combination of both. The number of DS1s on the third shelf is limited because of physical constraints in running DS1 cables.

#### FCOT TBM shelf capacity limitations

For standard FCOT TBM bays, if the top two TBM shelves each contain the maximum nine DS1 mappers, then the third TBM shelf can contain a maximum of six working DS1 mappers to support an additional 84 DS1s.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

## Enhanced TBM bay mixed DS1/DS3 capacity guidelines

In the enhanced TBM bay configuration (TN_BLSR or FCOT_BLSR), the first and second TBM shelves can contain up to 12 (TN_BLSR) or 11 (FCOT_BLSR) working DS1 mappers, 4 DS3 mappers, or a combination of each. The number of DS1s on the third shelf in both TN_BLSR and FCOT_BLSR configurations is limited because of physical constraints in running DS1 cables, as described in the following subsections.

### FCOT_BLSR shelf capacity limitations

For enhanced FCOT_BLSR TBM bays, if the top two TBM shelves each contain the maximum 11 DS1 mappers, then the third TBM shelf can contain up to 2 working DS1 mappers to support an additional 28 DS1s.

### TN_BLSR shelf capacity limitations

For enhanced TN_BLSR TBM bays, if the top 2 TBM shelves each contain the maximum 12 DS1 mappers, then the third TBM shelf can only contain DS3s and OC-3 tributaries.

## DS3 cabling

See Procedure 5-13 on page 5-88 for additional guidance on installing the DS3 cabling.

### DS3 cable routing for standard TBM bays

You can install up to 18 DS3 cables (9 Tx and 9 Rx) for each shelf (see Figure 5-52 on page 5-108). You can install up to 54 DS3 cables (18 on the left side and 36 on the right side) in a 3-shelf TBM bay configuration. The Tx and Rx cables for DS3 mapper position 11 are routed to the left side of the TBM bay and the cables for DS3 mapper positions 15 and 17 are routed to the right.

### DS3 cable routing for enhanced TBM bays

You can install up to 24 DS3 cables (12 Tx and 12 Rx) for each enhanced (TN_BLSR or FCOT_BLSR) TBM shelf, up to 72 DS3 cables in a 3-shelf TBM bay configuration. The Tx and Rx cables for mapper positions 11 and 13 are routed to the left side of the TBM bay and the cables for positions 15 and 17 are routed to the right.

***Note:*** Mapper position 13 is only available if no DS1/VT mappers are installed in the shelf.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

## DS1 cabling

See Procedure 5-12 on page 5-68 for additional guidance on installing the DS1 cabling.

### DS1 cable routing for standard FCOT TBM bays

You can install up to 18 DS1 cables (9 Tx and 9 Rx) for each shelf. The Tx and Rx cables for mapper positions 3, 4, 11, and 12 are routed to the left side of the TBM bay and the cables for positions 14, 15, 16, 17, and 18 are routed to the right.

### DS1 cable routing for enhanced FCOT_BLSR TBM bays

You can install up to 22 DS1 cables (11 Tx and 11 Rx) for each shelf. The Tx and Rx cables for mapper positions 1, 2, 3, 4, 11, and 12 are routed to the left side of the TBM bay and the cables for positions 14, 15, 16, 17, and 18 are routed to the right. Mapper position 13 is used for protection.

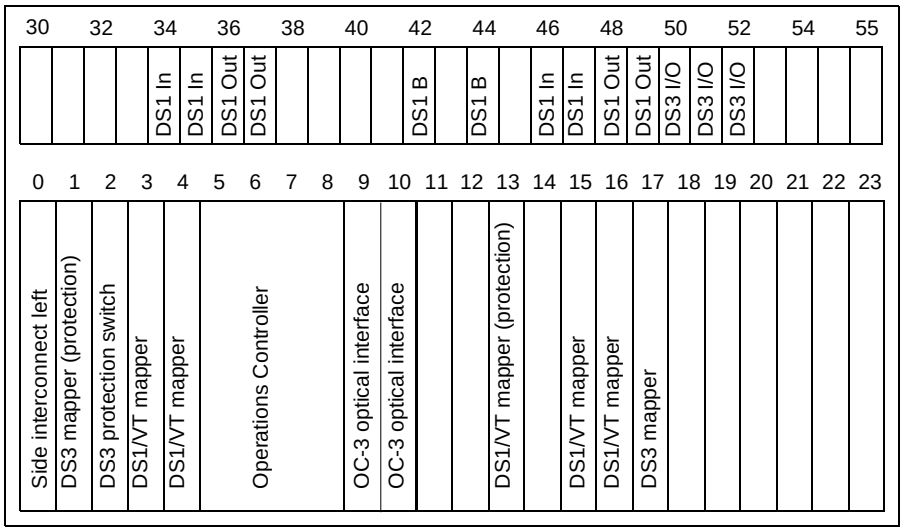
### DS1 cable routing for enhanced TN_BLSR TBM bays

You can install up to 24 DS1 cables (12 Tx and 12 Rx) for each TN_BLSR shelf. The Tx and Rx cables for DS1/VT mapper positions 1, 2, 3, 4, 11, and 12 are routed to the left side of the TBM bay. Cables for DS1/VT mapper positions 13, 14, 15, 16, 17, and 18 are routed to the right. Mapper position 19 is used for protection, which in TN_BLSR shelves is handled through the shelf backplane, and has no external I/O cabling requirements.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-47**
**OC-3 integrated configuration with 4 DS1 working mappers and 1 DS3 working mapper**



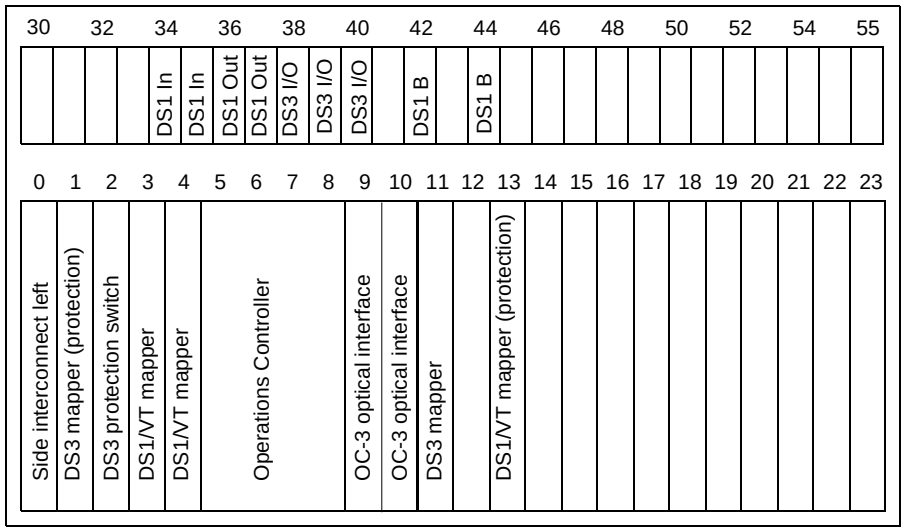

| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 | | |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 | | |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 | | |
| DS1 | 15 | DS1 In | 46 | DS1 Out | 48 | | |
| DS1 | 16 | DS1 In | 47 | DS1 Out | 49 | | |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

DS1 In DS1 input card (NT4K32AA)
DS1 Out DS1 output card (NT4K33AA)
DS1 B DS1 protection bridge card (NT4K31AA)
DS3 I/O DS3 input output card (NT4K30AA)
P Protection

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-48**
**OC-3 integrated configuration with 2 DS1 working mappers and 1 DS3 working mapper**



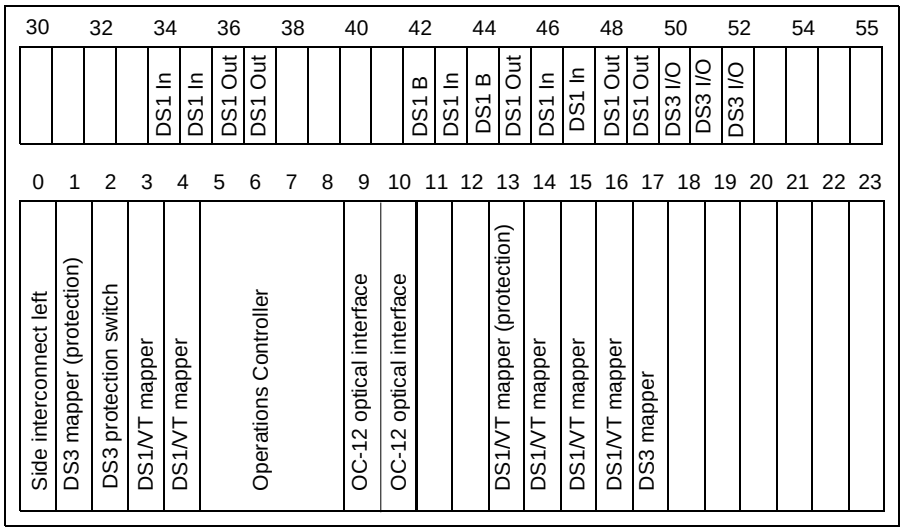

| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 | | |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 | | |
| DS3 | 11 | DS3 I/O | 38 | DS3 I/O | 39 | DS3 I/O | 40 |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 | | |

DS1 In DS1 input card (NT4K32AA)
DS1 Out DS1 output card (NT4K33AA)
DS1 B DS1 protection bridge card (NT4K31AA)
DS3 I/O DS3 input output card (NT4K30AA)
P Protection

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-49**
**OC-12 integrated configuration with 5 DS1 working mappers and 1 DS3 working mapper**



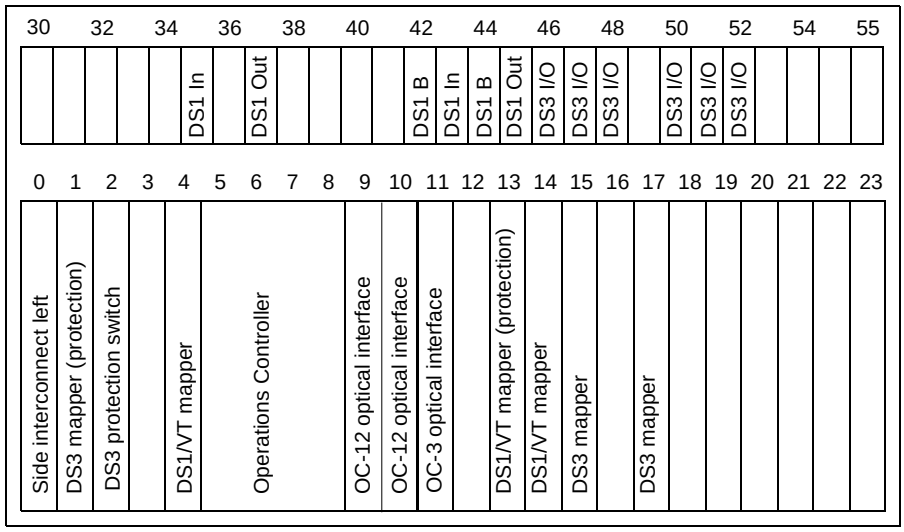

| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 | | |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 | | |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 | | |
| DS1 | 14 | DS1 In | 43 | DS1 Out | 45 | | |
| DS1 | 15 | DS1 In | 46 | DS1 Out | 48 | | |
| DS1 | 16 | DS1 In | 47 | DS1 Out | 49 | | |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

DS1 In DS1 input card (NT4K32AA)
DS1 Out DS1 output card (NT4K33AA)
DS1 B DS1 protection bridge card (NT4K31AA)
DS3 I/O DS3 input output card (NT4K30AA)
P Protection

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-50**
**OC-12 integrated configuration with 2 DS1 working mappers, 2 DS3 working mappers and 1 OC-3 tributary**



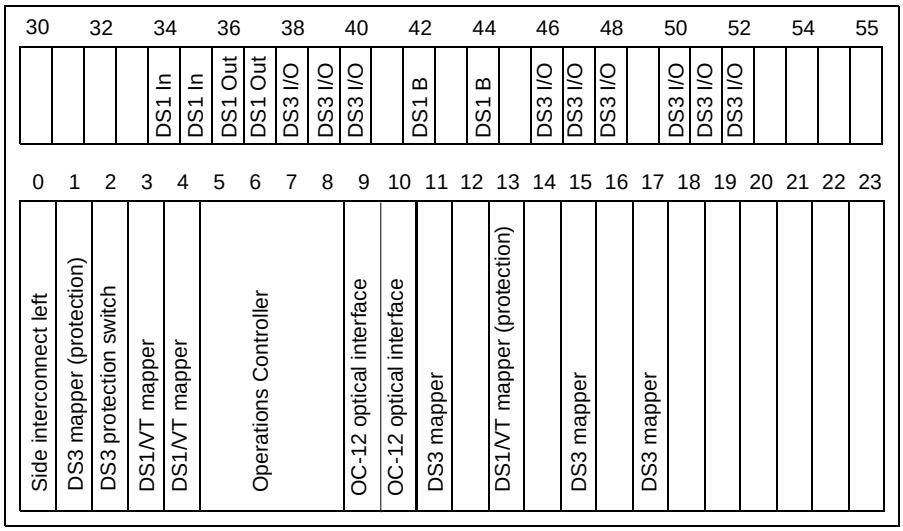

| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 | | |
| DS1P | 13 | DS1 B | 42 | DS1 B | 44 | | |
| DS1 | 14 | DS1 In | 43 | DS1 Out | 45 | | |
| DS3 | 15 | DS3 I/O | 46 | DS3 I/O | 47 | DS3 I/O | 48 |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

DS1 In DS1 input card (NT4K32AA)
DS1 Out DS1 output card (NT4K33AA)
DS1 B DS1 protection bridge card (NT4K31AA)
DS3 I/O DS3 input output card (NT4K30AA)
P Protection

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-51**
**OC-12 integrated configuration with 2 DS1 working mappers and 3 DS3 working mappers**




| Mappers | | I/O cards | | | | | |
|---|---|---|---|---|---|---|---|
| DS3 P | 1 | none | | | | | |
| DS1 | 3 | DS1 In | 34 | DS1 Out | 36 | | |
| DS1 | 4 | DS1 In | 35 | DS1 Out | 37 | | |
| DS3 | 11 | DS3 I/0 | 38 | DS3 I/O | 39 | DS3 I/O | 40 |
| DS1 P | 13 | DS1 B | 42 | DS1 B | 44 | | |
| DS3 | 15 | DS3 I/O | 46 | DS3 I/O | 47 | DS3 I/O | 48 |
| DS3 | 17 | DS3 I/O | 50 | DS3 I/O | 51 | DS3 I/O | 52 |

DS1 In DS1 input card (NT4K32AA)
DS1 Out DS1 output card (NT4K33AA)
DS1 B DS1 protection bridge card (NT4K31AA)
DS3 I/O DS3 input output card (NT4K30AA)
P Protection

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

Begin cabling with the TBM shelf in the shelf position that is the farthest from the cabling entry point. That is, for overhead cable entry, first connect TBM shelf position 3, then shelf position 2 and finally, shelf position 1 in order.

Figure 5-52 and Figure 5-53 on page 5-109 describe the DS3 and DS1 cables, respectively.

**Figure 5-52**
**DS3 cable descriptions**

FW10068

**NT7E43AA through AH, and NT7E43AJ through AL**

NT-734-E coaxial cables preconnectorized at one end with a BNC connector. These cables are available in the following lengths:

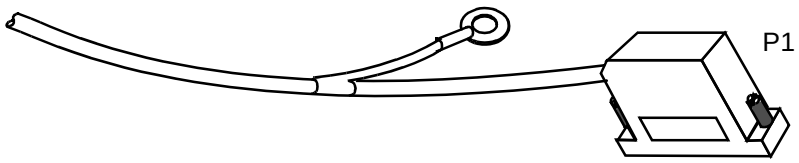
| | | |
|---|---|---|
| 5 m | (16.4 ft) | NT7E43AA |
| 10 m | (32.8 ft) | NT7E43AB |
| 20 m | (65.6 ft) | NT7E43AC |
| 30 m | (88.4 ft) | NT7E43AD |
| 40 m | (131.1 ft) | NT7E43AE |
| 50 m | (163.9 ft) | NT7E43AF |
| 60 m | (196.7 ft) | NT7E43AG |
| 75 m | (245.9 ft) | NT7E43AH |
| 80 m | (262.3 ft) | NT7E43AJ |
| 100 m | (327.9 ft) | NT7E43AL |
| 140 m | (459.3 ft) | NT7E43AK |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-53**
**DS1 cable descriptions**

**DS1 cables**
**NT7E40BA-BH, BJ-BN, BP**
**NT7E40CA-CE, CG-CH, CJ-CL**




44-pin male connector

14 pair, twisted, 22 or 26 AWG solid wires with overall shielding. One end is connectorized (connector P1) for connection to a DS1 input card or to a DS1 output card on the TBM shelf. For cables used on DS1 output cards, a ground lug wire provides connection of the outer shield to the TBM shelf frame ground. The ground lug wire is not used for DS1 input cards. The DS1 cable is available in the following wire gauges and cable lengths:

| Wire gauge | Length | Product engineering code | Description |
|---|---|---|---|
| 22 | 7 m (23 ft) | NT7E40BL | 608, 14 pair |
| 22 | 15 m (49 ft) | NT7E40BA | 608, 14 pair |
| 22 | 30 m (98 ft) | NT7E40BM | 608, 14 pair |
| 22 | 45 m (148 ft) | NT7E40BB | 608, 14 pair |
| 22 | 60 m (197 ft) | NT7E40BN | 608, 14 pair |
| 22 | 75 m (246 ft) | NT7E40BC | 608, 14 pair |
| 22 | 90 m (295 ft) | NT7E40BP | 608, 14 pair |
| 22 | 106 m (348 ft) | NT7E40BD | 608, 14 pair |
| 22 | 120 m (394 ft) | NT7E40BQ | 608, 14 pair |
| 22 | 137 m (450 ft) | NT7E40BE | 608, 14 pair |
| 22 | 153 m (502 ft) | NT7E40BR | 608, 14 pair |
| 22 | 168 m (551 ft) | NT7E40BF | 608, 14 pair |
| 22 | 182 m (591 ft) | NT7E40BS | 608, 14 pair |
| 22 | 198 m (650 ft) | NT7E40BG | 608, 14 pair |
| 26 | 7 m (23 ft) | NT7E40CG | 1249C, 14 pair |
| 26 | 15 m (49 ft) | NT7E40CA | 1249C, 14 pair |
| 26 | 30 m (98 ft) | NT7E40CH | 1249C, 14 pair |
| 26 | 45 m (148 ft) | NT7E40CB | 1249C, 14 pair |
| 26 | 60 m (197 ft) | NT7E40CJ | 1249C, 14 pair |
| 26 | 75 m (246 ft) | NT7E40CC | 1249C, 14 pair |
| 26 | 90 m (295 ft) | NT7E40CK | 1249C, 14 pair |
| 26 | 106 m (348 ft) | NT7E40CD | 1249C, 14 pair |
| 26 | 120 m (394 ft) | NT7E40CL | 1249C, 14 pair |
| 26 | 137 m (450 ft) | NT7E40CE | 1249C, 14 pair |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

## Requirements

The following tools and materials are required:

- wire cutters (flush cutting)
- screwdriver, flat blade, 1/8 in. wide
- heat shrinkable tubing, black, 9.3 mm (3/8 in) diameter, R0113153 or equivalent
- cable ties

**CAUTION**
**Risk of damage to DS3 cables**
Do not bend a DS3 cable into a radius smaller than 38 mm (1.5 in.) to avoid damaging the cable.

## Action

| Step | Action |
|---|---|
| **1** | Use facility records to identify the slots in the TBM shelf into which DS3 and DS1 mapper cards are to be installed.<br><br>For a description of the shelf configurations and the placement of mappers and I/O cards at the central office terminal (FCOT, FCOT_BLSR, or TN_BLSR) and at the remote fiber terminal (RFT), refer to *Mapper Layouts Planning Guide*, 323-3001-154, in *Engineering, Configuration and Ordering Guide*, Volume 1. |
| **2** | Remove the blank faceplate cards from the following I/O slots according to the lower slots in which DS1 and DS3 mappers are to be installed. |

| DS3 mapper card position number | Remove the I/O faceplate card from the following slots |
|---|---|
| 1 (protection) | none |
| 11 (working) | 38, 39, and 40 |
| 13 (working - enhanced only) | 42, 43, and 44 |
| 15 (working) | 46, 47, and 48 |
| 17 (working) | 50, 51, and 52 |
| ***Note:*** DS3 mapper position 13 can only be used if there are no DS1/VT mappers in the shelf. | |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

| DS1/VT mapper card position number | Remove the I/O faceplate cards from I/O slots |
|---|---|
| 1 (see Note 1) | 30 and 32 |
| 2 (see Note 1) | 31 and 33 |
| 3 | 34 and 36 |
| 4 | 35 and 37 |
| 11 | 38 and 40 |
| 12 | 39 and 41 |
| 13 (see Note 2) | 42 and 44 |
| 14 | 43 and 45 |
| 15 | 46 and 48 |
| 16 | 47 and 49 |
| 17 | 50 and 52 |
| 18 | 51 and 53 |
| 19 (TN_BLSR protection) | none |

***Note 1:*** DS1/VT mapper positions 1 and 2 can only be used if there are no DS3s in the shelf.

***Note 2:*** DS1/VT mapper position 13 contains a DS1/VT mapper used for protection in FCOT and FCOT_BLSR configurations. In TN_BLSR, slot 13 contains a working DS1/VT mapper.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

| Step | Action |
|---|---|

**3** Insert I/O cards into the shelf according to the slots into to which mappers are to be installed as follows:

| Mapper position | Type of mapper | Insert the following types of I/O cards into these slots |
|---|---|---|
| 1 | DS1 | DS1 In 30 DS1 Out 32 |
| | DS3 P | none |
| 2 | DS1 | DS1 In 31 DS1 Out 33 |
| 3 | DS1 | DS1 In 34 DS1 Out 36 |
| 4 | DS1 | DS1 In 35 DS1 Out 37 |
| 11 | DS3 | DS3 I/O 38 DS3 I/O 39 DS3 I/O 40 |
| 13 | DS1 P | DS1 B 42 DS1 B 44 |
| | DS3 | DS3 I/O 42 DS3 I/O 43 DS3 I/O 44 |
| 14 | DS1 | DS1 In 43 DS1 Out 45 |
| 15 | DS1 | DS1 In 46 DS1 Out 48 |
| | DS3 | DS3 I/O 46 DS3 I/O 47 DS3 I/O 48 |
| 16 | DS1 | DS1 In 47 DS1 Out 49 |
| 17 | DS1 | DS1 In 50 DS1 Out 52 |
| | DS3 | DS3 I/O 50 DS3 I/O 51 DS3 I/O 52 |
| 18 | DS1 | DS1 In 51 DS1 Out 53 |
| 19 | DS1 P | none |
| DS1 In<br>DS1 Out<br>DS1 B<br>DS3 I/O<br>P | DS1 input card, NT4K32AA<br>DS1 output card, NT4K31AA<br>DS1 protection bridge card, NT4K31AA<br>DS3 input output card, NT4K30AA<br>protection | |

**4** Tighten the hold-down screw on the faceplate of each I/O card. Do not overtighten.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

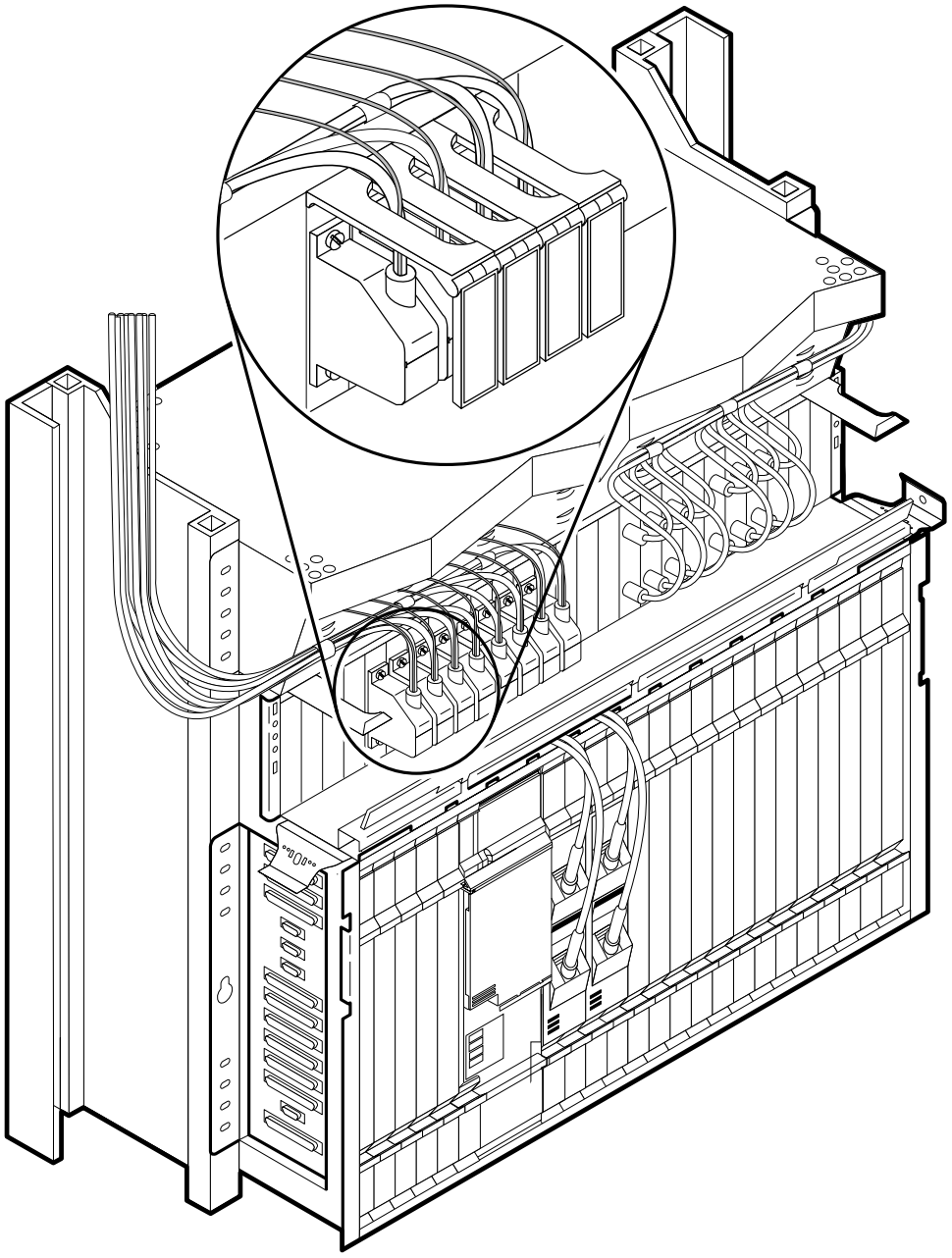
| Step | Action |
|---|---|
| **5** | Label both ends of each DS1 cable with the function of the cable, transmit (Tx) or receive (Rx), and the range of DS1 numbers. Be sure to slip the cable ties into the cable tie lances before inserting the cables.<br><br>***Note 1:*** The function of the cable (transmit or receive) is determined from the perspective of the DSX-1 cross-connect panel. Transmit cables carry signals from the DSX-1 cross-connect panel and receive cables carry signals toward the DSX-1 cross-connect panel.<br><br>***Note 2:*** The range of DS1 numbers must be two numbers from 1-to-126 (standard FCOT), 1-to-154 (FCOT_BLSR), or 1-to-168 (TN_BLSR). |
| **6** | Label both ends of each DS3 cable with the number of the DS3 (1 to 12) and the function of the cable, Tx (transmit) or Rx (receive).<br><br>***Note:*** The function of the cable (transmit or receive) is determined from the perspective of the cross-connect panel. Transmit cables carry signals from the cross-connect panel, and receive cables carry signals toward the cross-connect panel. |
| **7** | Slip the cable ties into the cable tie lances before inserting the cables. |
| **8** | Run one DS1 cable into the left side of the bay for each DS1 I/O card (DS1 in or DS1 Out) that you installed in slots 34 to 41. |
| **9** | Run one pair of DS3 cables into the left side of the bay for each DS3 card that you installed in I/O slots 38 to 40. |
| **10** | Starting at slot 34 and ending at slot 41, attach the DS1 cables and the DS3 cables to the intended connectors on the I/O cards, as shown in Figure 5-54 on page 5-114.<br><br>On the DS1 cables, tighten the hold down screws on each connector just tight enough to draw the connector into place (2 inch-pounds maximum). Do not overtighten. |
| **11** | Attach the ground lugs of the receive DS1 cables to the ground screws at the upper part of the cable organizer panel. |
| **12** | Dress the cables into the cable organizer, and secure them with cable ties, as shown in Figure 5-55 on page 5-115. |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-54**
**Routing DS1 and DS3 cables into the left side of the bay**

PC-10596



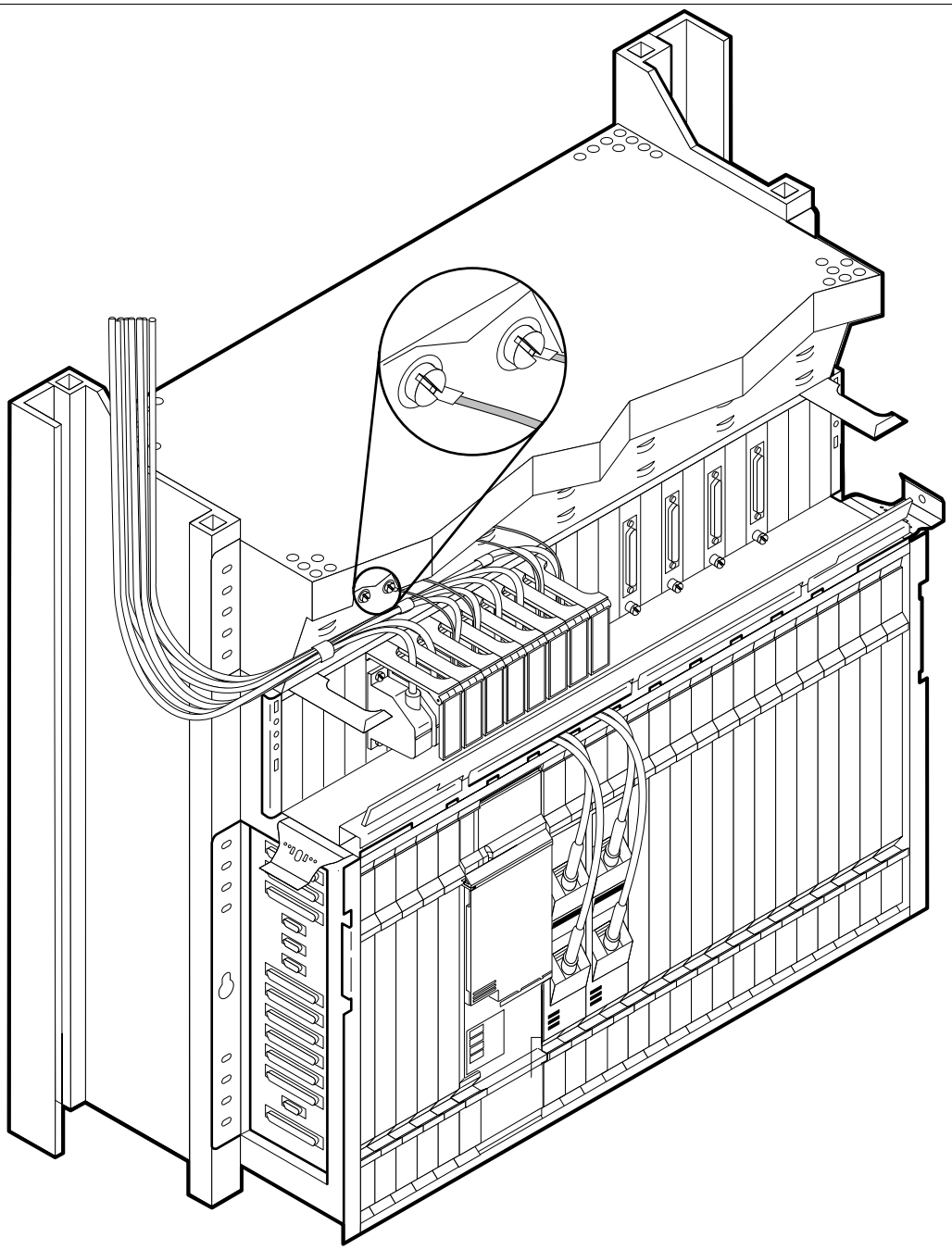
***Note:*** Insert cables in cutouts between bar code label mounting plates (See blowup). Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-55**
**Attaching the ground lugs of the receive DS1 cables and securing the cables**

PC-10597

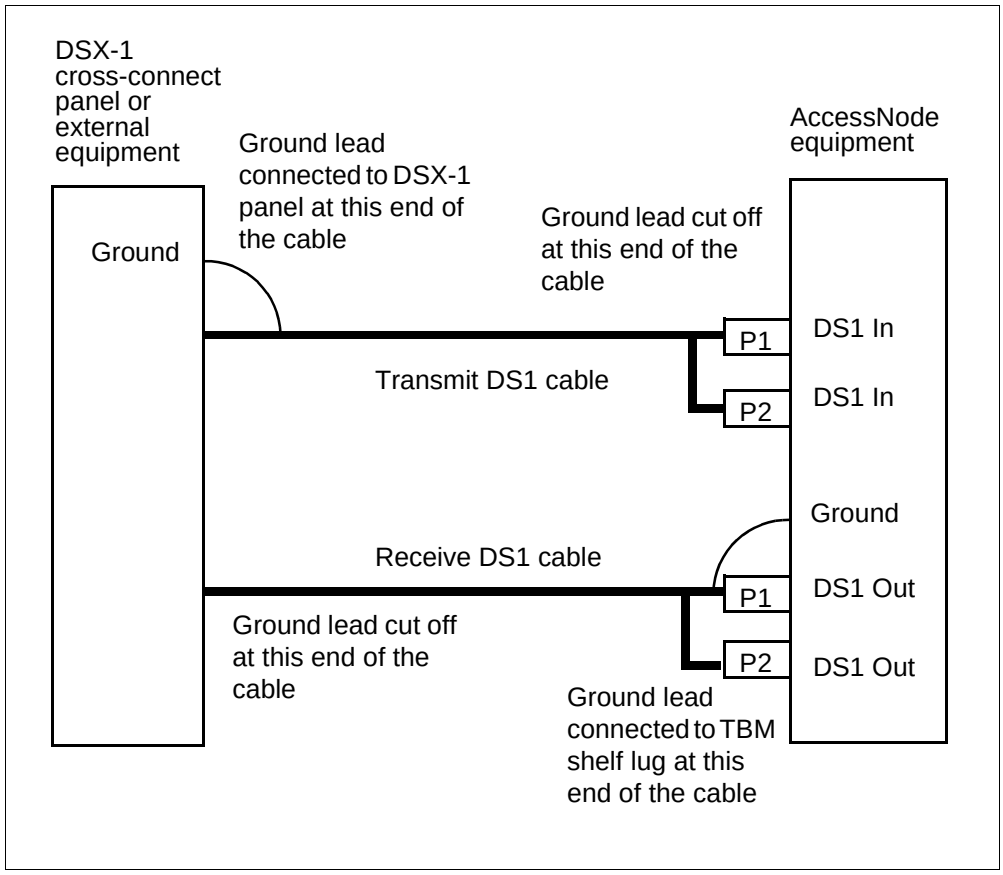


***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

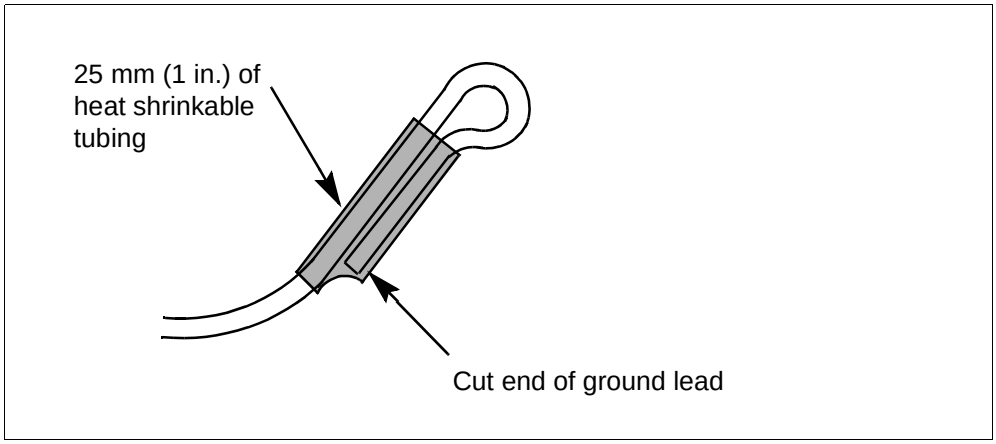
| Step | Action |
|---|---|
| **13** | At the shelf-end of the transmit DS1 cables, cut off the ground lead to within 50 mm (2 in.) of the cable jacket. These ground leads are not used.<br>***Note:*** After you connect all of the grounds, the grounding of the transmit and receive DS1 cables as shown in the following diagram. |




**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

| Step | Action |
|---|---|
| **14** | Bend the cut end of the ground lead back on itself and protect it with a 25 mm (1 in.) length of heat shrinkable tubing, as shown in the following diagram. |

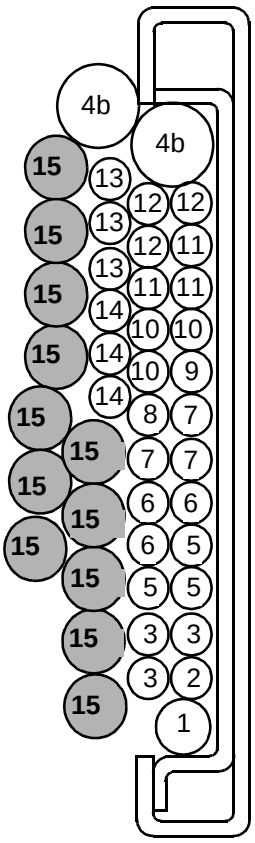



| | |
|---|---|
| **15** | Dress the DS1 and DS3 cables into the position in the left bay upright shown in Figure 5-56 on page 5-118, and use cable ties to fasten them to existing bundles of cables or to the bay upright. |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-56**
**Dressing the cables into the left bay upright**




| | |
|---|---|
| 1 | BIP control cable, part of shop cabling |
| 2 | Shelf alarm cable from BIP, part of shop cabling |
| 3 | LCAP cable, part of shop cabling |
| 4a, 4b | ac power cable from ac source |
| 5 | PSTN cables |
| 6 | External synchronization cables |
| 7 | Parallel telemetry cables |
| 8,9 | Control network cables |
| 10 | External modem cables |
| 11 | OPC cables from port 1 |
| 12 | Serial telemetry cables |
| 13 | OPC cable from OPC port 2 |
| 14 | Orderwire extension cable |
| **15** | **DS1 cables** |
| **16** | **DS3 cables (none for the configuration shown)** |

***Note:*** This figure shows the DS1/DS3 cable routing for the mapper layout shown in Figure 5-49 on page 5-105 (five DS1 working mappers and one DS3 working mapper) for a three-TBM bay.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

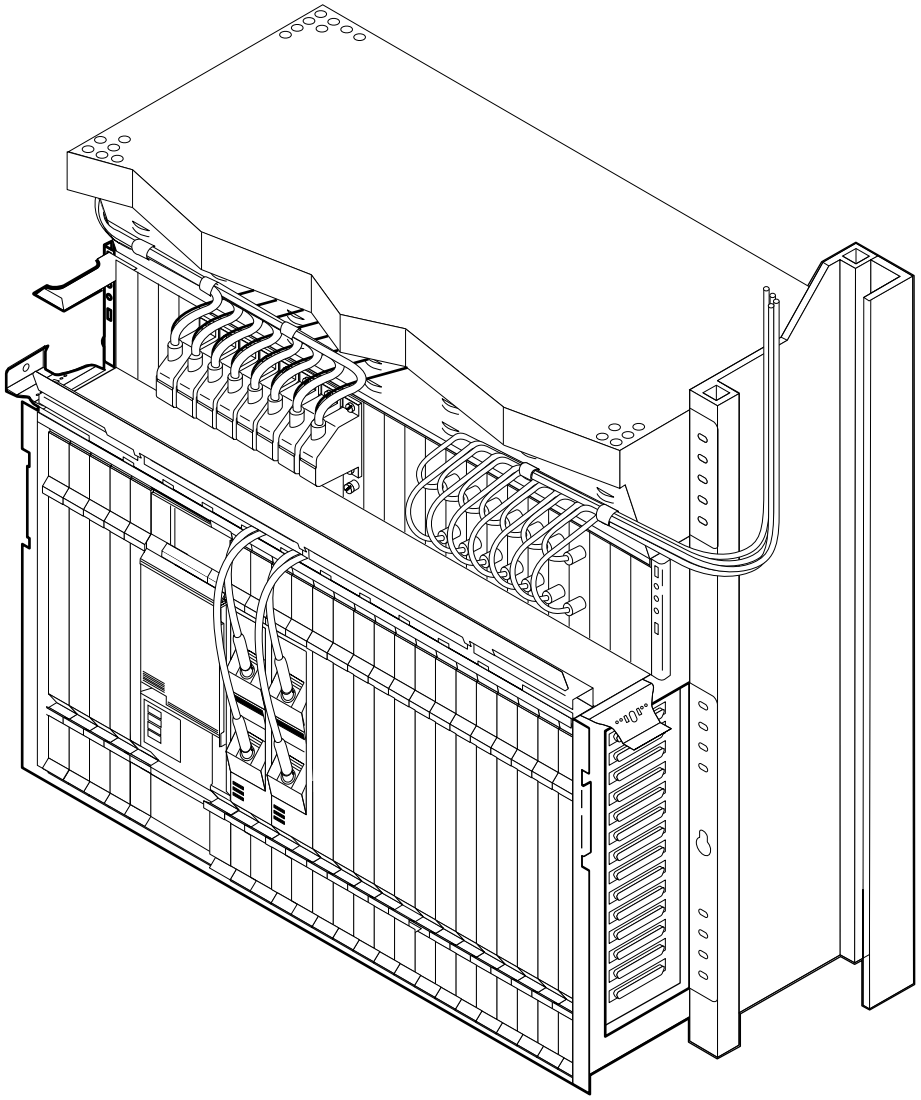
| Step | Action |
|---|---|
| **16** | Run one DS1 cable into the right side of the bay for each DS1 I/O card that you installed in I/O slots 43 to 49. |
| **17** | Run one pair of DS3 cables into the right side of the bay for each DS3 card that you installed in I/O slots 46 through 52. |
| **18** | Starting at slot 42 and ending at slot 52, attach the DS1 cables and the DS3 cables to the intended connectors on the I/O cards, as shown in Figure 5-57 on page 5-120.<br><br>On the DS1 cables, tighten the hold down screws just enough to draw the connector into place (2 inch-pounds maximum). Do not overtighten. |
| **19** | Attach the ground lugs of the receive (out) DS1 cables to the right side of the ABM shelf with hex screws. |
| **20** | At the shelf-end of each transmit (in) DS1 cable, cut off the ground lead to within 50 mm (2 in.) of the cable jacket. The ground lead is not used. |
| **21** | Bend the cut end of each ground lead back on itself and protect it with a 25 mm (1 in.) length of heat-shrinkable tubing. |
| **22** | Dress the cables into the position in the right bay upright as shown in Figure 5-58 on page 5-121, and use cable ties to fasten them to the right bay upright or to existing bundles of cables. |
| **23** | Lace the cables to the cable bracket on the top of the bay. |

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-57**
**Routing cables into the right side of the bay**

PC-15274

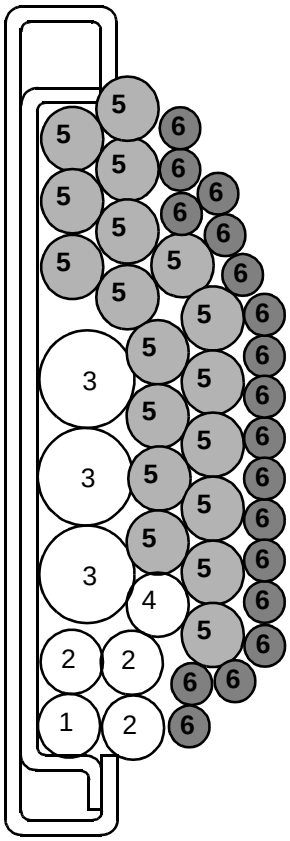


***Note:*** Insert cables in cutouts between bar code label mounting plates. Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

**Figure 5-58**
**Dressing cables into the right bay upright**




1 Power to shelves from BIP, part of shop cabling
2 Shelf alarm (3)
3 Fiber split flex tubing (up to 20 patch cords)
4 Integral modem cables
**5 DS1 cables**
**6 DS3 cables**

***Note:*** This figure shows the DS1/DS3 cable routing for the mapper layout shown in Figure 5-49 on page 5-105 (five DS1 working mappers and one DS3 working mapper) for a three-TBM bay.

**—continued—**

Procedure 5-14 (continued)
**Installing a mix of DS1 and DS3 cables**

| Step | Action |
|---|---|
| **24** | Run the DS1 and DS3 cables from the bay over to the DS1 cross-connect and the DS3 cross-connect panel. |
| **25** | Use Table 5-22 to terminate the office-end of the DS1 cables to the DSX-1 cross-connect panel. |
| **26** | Terminate the DS3 cables to the DS3 cross-connect panel. |

**Table 5-22**
**Color codes and pin-out details for DS1 cables**

| Connector P1 pin | | | Color of pair | |
|---|---|---|---|---|
| **Ring** | **Tip** | **DS1 No.** | **Ring** | **Tip** |
| 31 | 16 | 1 | BL W | W BL |
| 32 | 17 | 2 | O W | W O |
| 33 | 18 | 3 | G W | W GR |
| 34 | 19 | 4 | BR W | W BR |
| 35 | 20 | 5 | S W | W S |
| 36 | 21 | 6 | BL R | R BL |
| 37 | 22 | 7 | O R | R O |
| 38 | 23 | 8 | G R | R GR |
| 39 | 24 | 9 | BR R | R BR |
| 40 | 25 | 10 | S R | R S |
| 41 | 26 | 11 | BL BK | BK BL |
| 42 | 27 | 12 | O BK | BK O |
| 43 | 28 | 13 | G BK | BK GR |
| 44 | 29 | 14 | BR BK | BK BR |
| - | 30 | - | | |
| ***Note:*** The tip lead is positive (+) and the ring lead is negative (–). | | | | |

**—end—**

# Procedure 5-15
# Installing the NTZX16TG transmission ground reference panel

Use this procedure to install a NTZX16TG transmission ground reference (TGR) panel for DS3 cables. A ground reference panel must be installed when AccessNode equipment is installed in an integrated bonding network (IBN) and the DS3 cables extend outside the IBN.

## Requirements

The following tools and materials are required:

- 6 AWG grounding lead, 2 m (6 ft)
- wire stripper, for 6 AWG leads
- two 2-hole grounding lugs
- crimping tool, TBM 2, or equivalent
- screwdriver, flat blade, 1/4 in. wide
- socket wrench, 5/8 in. hexagonal

**CAUTION**
**Risk of damage to DS3 cable**
Do not bend a DS3 cable into a radius smaller than 38 mm (1.5 in.) to avoid damaging the cable.

## Action

| Step | Action |
|---|---|
| **1** | Mount a non-conductive backboard on an isolated structure within 2 m (6 ft) of the SPG or the FGB. For example, a wall could be used if it is within 2 m of the SPG or the FGB.<br><br>***Note:*** If a non-conductive backboard is not available, use nonconductive bushings to mount the conductive panel to a wall or other isolated structure. |
| **2** | Secure the TGR panel to the backboard with mounting screws inserted through the rear of the panel at the locations shown in Figure 5-59 on page 5-125. |
| **3** | Strip both ends of the 2 m (6 ft) grounding lead back a distance of 13 mm (1/2 in.). |
| **4** | Crimp a two-hole grounding lug to each end of the grounding lead. |

**—continued—**

Procedure 5-15 (continued)
**Installing the NTZX16TG transmission ground reference panel**

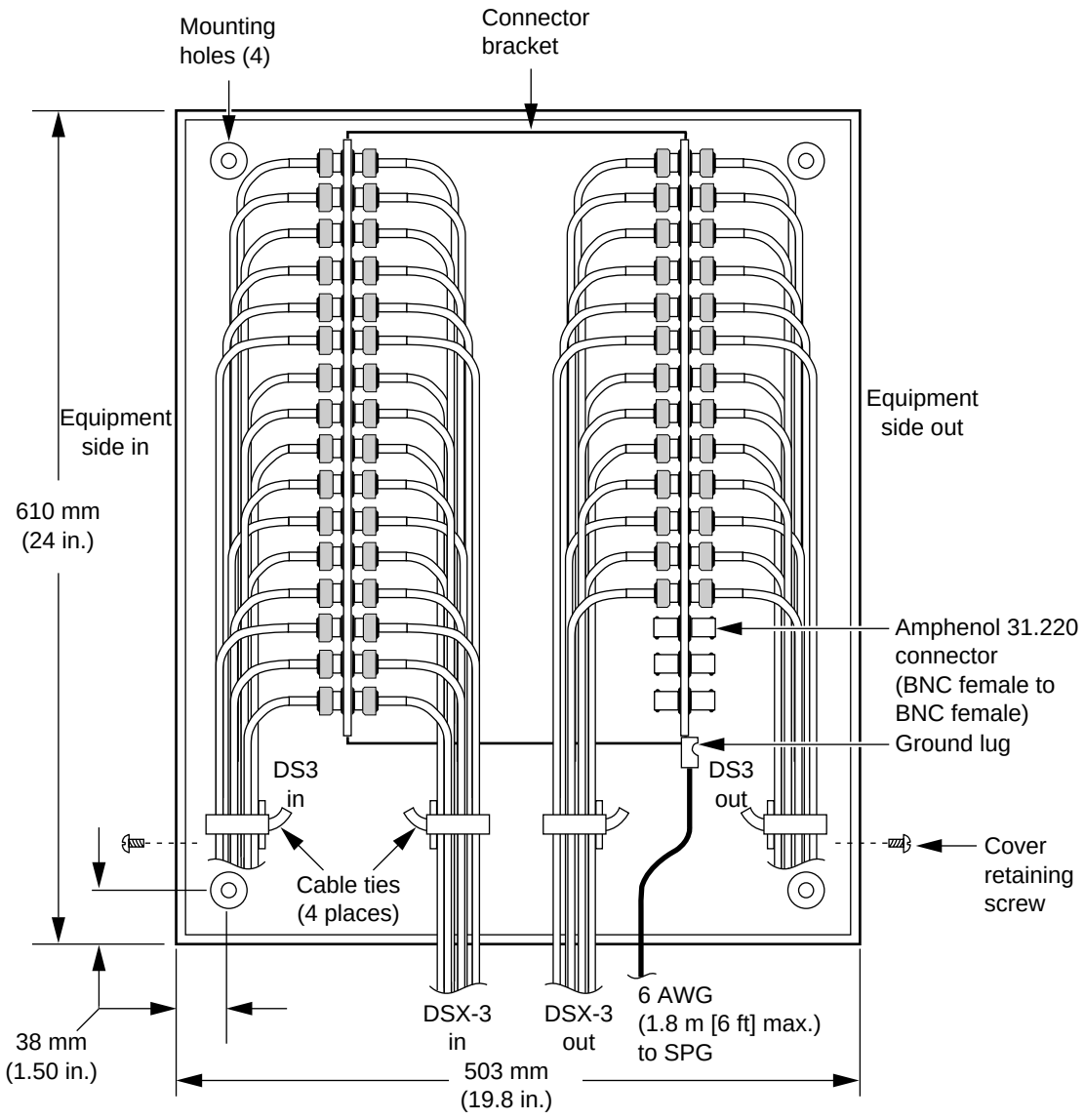
| Step | Action |
|---|---|
| **5** | Attach one of the 2-hole grounding lugs to the transmission ground reference panel in the location, as shown in Figure 5-59 on page 5-125. |
| **6** | Run the grounding lead to the SPG, and attach the second grounding lug to the SPG. |
| **7** | Route all DS3 cables through the opening in the bottom of the TGR panel, as shown in Figure 5-59 on page 5-125. |
| **8** | Label each of the DS3 cables with the following information:<br>• the DS3 number<br>• the transmission path (input or output)<br>• the cable routing direction (from the AccessNode, or to the DSX-3) |
| **9** | Connect the DS3 cables to the IN and OUT connectors. Make sure the cables are not mixed at the TGR panel as IN and OUT. If a cable is for an equipment IN connector, it must go to the DSX3 cross-connect panel as IN. If a cable is for an equipment OUT connector, it must go to the DSX3 cross-connect panel as OUT. |
| **10** | Dress the cables, as shown in Figure 5-59 on page 5-125, and secure them with cable ties. |
| **11** | Hang the front cover on the TGR front panel by engaging the two clips at the top of the cover. |
| **12** | Secure the cover with two self-tapping screws: one at each side of the cover. |

**—continued—**

Procedure 5-15 (continued)
**Installing the NTZX16TG transmission ground reference panel**

**Figure 5-59**
**Installing a TGR reference panel**

PC-10015




**Legend:**
AWG = American wire gauge
SPG = single-point ground

**Note:** The panel is shown with the cover removed.

**—end—**

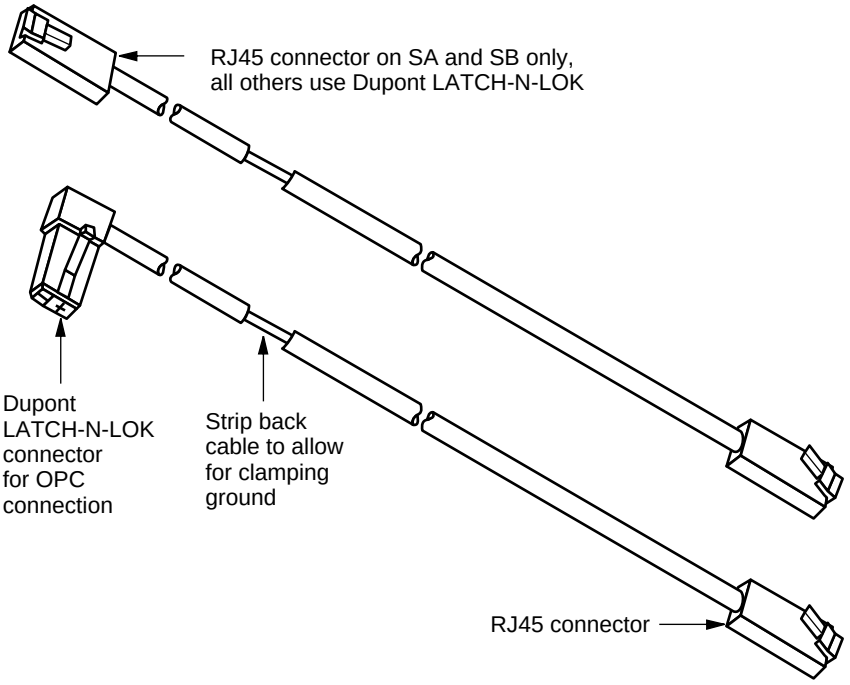
# Procedure 5-16
# **Installing the OPC Ethernet cable kit**

Use this procedure to install the OPC Ethernet cable kit assembly from the connector on the faceplate of the operations controller (OPC) module, to an Ethernet hub, an X-terminal, a MAU, or a portable OPC. The OPC module is installed in *Commissioning and Testing*, Volume 3.

**Figure 5-60**
**Cable descriptions**

PC-10348

**NT4K86LA, LB, LC and NT4K86SA, SB, SC, SD**




Shielded cable, terminated at the OPC-end with a Dupont LATCH-N-LOK connector, and at the terminal-end with an RJ45 connector. The cables, their lengths and uses are as follows:

| Length | PEC | Uses |
|---|---|---|
| 20 m (60 ft) | NT4K86LA | MAU or Ethernet LAN |
| 40 m (120 ft) | NT4K86LB | MAU or Ethernet LAN |
| 100 m (300 ft) | NT4K86LC | MAU or Ethernet LAN |
| 5 m (15 ft) | NT4K86SA | X-terminal or portable OPC |
| 20 m (60 ft) | NT4K86SB | X-terminal or portable OPC |
| 40 m (120 ft) | NT4K86SC | X-terminal |
| 100 m (300 ft) | NT4K86SD | X-terminal |

**—continued—**

Procedure 5-16 (continued)
**Installing the OPC Ethernet cable kit**

***Note:*** To meet noise and ground current requirements, only connect OPC cables between equipment that is bonded to the same ground point.

## Requirements

The following tools and materials are required:

- marker pen
- steel rule
- surgical knife, Exacto or equivalent
- screwdriver, stubby, flat-bladed, 1/8 in. blade with screw-holder blades (See note).
- cable ties

***Note:*** Use a screwdriver with screw-holder blades so that one person can install the grounding clamp. However, if a screwdriver with these blades is not available, two people are required: one to position the cable and the clamp, and another to insert and tighten the screws.

## Action

| Step | Action |
|---|---|

**1** Measure back from the Dupont LATCH-N-LOCK connector-end of the cable (end of cable with right-angle connector), one of the distances in the following table and mark the cable at that point with the marker pen.

| Slots spanned by the OPC card | Measure back a distance of |
|---|---|
| 1 through 4 | 112 mm (4 3/8 in.) |
| 5 through 8 | 182 mm (7 1/8 in.) |

**2** Measure and mark a point 40 mm (1 5/8 in.) further along the cable (further from the LATCH-N-LOCK connector).

**3** Using the surgical knife, skin off the cable jacket between the two points you have just marked and expose the cable shielding underneath.

**4** Route the Dupont LATCH-N-LOCK connector to the area above the slots in the ABM shelf, where the OPC module will be installed, as shown in Figure 5-61 on page 5-128.

Do not install the OPC at this time.

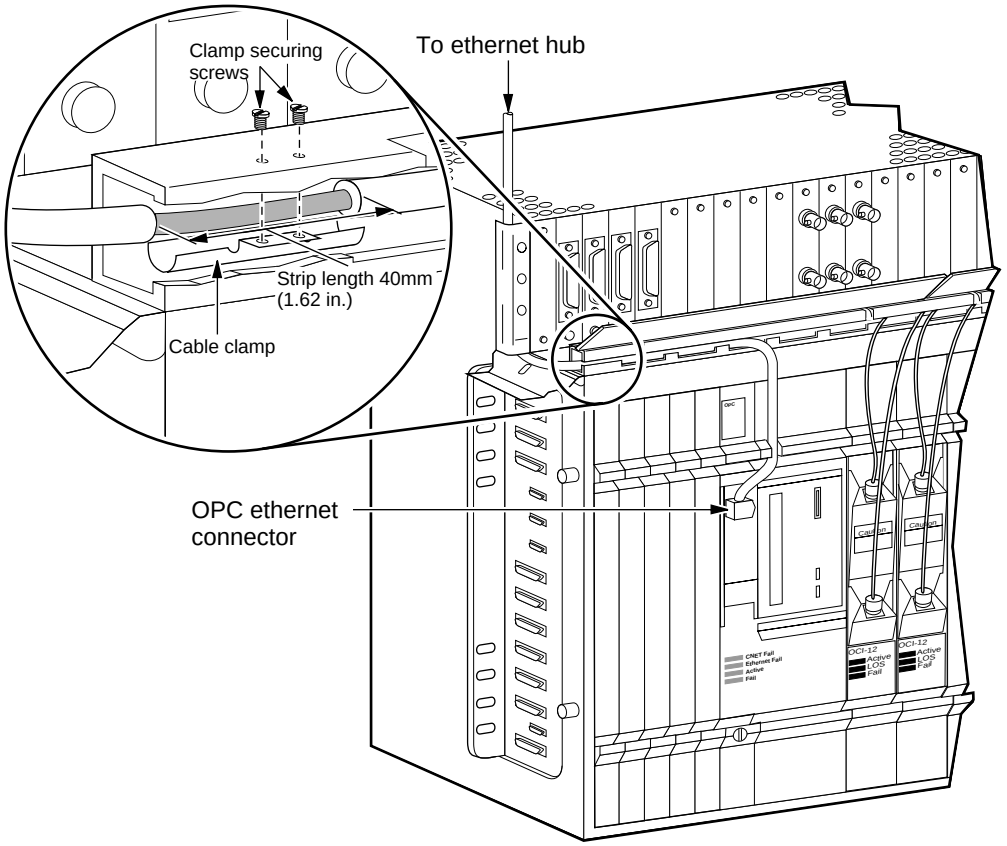
**—continued—**

Procedure 5-16 (continued)
**Installing the OPC Ethernet cable kit**

| Step | Action |
|---|---|
| **5** | Connect the RJ45 connector to the Ethernet hub, MAU, X-Terminal or portable OPC terminal. |
| **6** | Install the cable clamp in the location shown in Figure 5-61 on page 5-128 using the mounting screws and the stubby screwdriver. |
| **7** | Dress the cable slack into the bay upright and secure it into place with cable ties. |

**Figure 5-61**
**Clamping the OPC Ethernet cable**

PC-10347




***Note:*** Connection for shelf position 2 shown. Shelf positions 1 and 3 are similar.

**—continued—**

Procedure 5-16 (continued)
**Installing the OPC Ethernet cable kit**

Table 5-23 lists the pin-outs for the NT4K86LA, LB, and LC cables.

**Table 5-23**
**Pin-outs for NT4K86LA, LB, and LC**

| OPC module faceplate connector | | RJ45 connector | |
|---|---|---|---|
| **Signal** | **Pin** | **Pin** | **Signal** |
| Tx + | 1 | 1 | Tx + |
| Tx - | 2 | 2 | Tx - |
| Rx - | 5 | 6 | Rx - |
| Rx + | 6 | 3 | Rx + |

Table 5-24 lists the pin-outs for the NT4K86SA, SB, SC, and SD cables.

**Table 5-24**
**Pin-outs for NT4K86SA, SB, SC, and SD**

| OPC module faceplate connector | | RJ45 connector | |
|---|---|---|---|
| **Signal** | **Pin** | **Pin** | **Signal** |
| Tx + | 1 | 3 | Rx + |
| Tx - | 2 | 6 | Rx - |
| Rx - | 5 | 2 | Tx - |
| Rx + | 6 | 1 | Tx + |

**—end—**

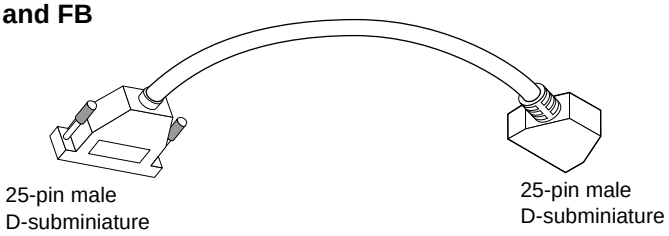
# Procedure 5-17
# **Installing a user interface cable to the LCAP**

Use this procedure to install an NT7E44FA or FB cable between the user interface connector on the front panel of the local craft access panel (LCAP) and a printer, a VT-100 terminal, or a modem.

***Note:*** When a modem is not used, the cables can only be connected to equipment that is bonded to the same ground point as the bay.

PC-15272

**NT7E44FA and FB**

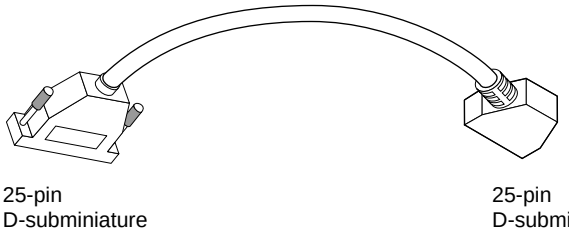



4-pair, twisted, 26 AWG solid wires with shielding, connectorized at both ends. One end connects to the 25-pin female connector on the faceplate of the LCAP. The other end connects to a 25-pin female connector of a VT-100 terminal. This cable is available in the following lengths:

| | | |
|---|---|---|
| 5 m | (16 ft) | NT7E44FA |
| 20 m | (65 ft) | NT7E44FB |

PC-15272

**NT7E44MB null modem adaptor for connection to a modem**




4-pair, 26 AWG solid wire connectorized at both ends. The 25-pin female end connects to the 25-pin male connector on the NT7E44FA/FB cable. The 25-pin male end then connects directly to the modem.

**—continued—**

Procedure 5-17 (continued)
**Installing a user interface cable to the LCAP**

## Requirements

A screwdriver, flat blade, 1/4 in. wide, is required.

## Action

| Step | Action |
|---|---|
| **1** | Connect the female connector of the NT7E44FA or FB cable to connector user interface port 2 on the local craft access panel (LCAP), as shown in Figure 5-62 on page 5-132. |
| **2** | Connect the free-end of the cable to the printer or the VT-100 terminal. If you are connecting the cable to a modem, insert an NT7E44MB null modem adaptor between the NT7E44 cable and the modem.<br><br>See Table 5-25 for the pin-outs of the 25-pin male connectors on the NT7E44FA or FB cable. |

**Table 5-25**
**Pin-outs for the 25-pin male connectors on NT7E44FA or FB**

| Pin on first 25-pin male connector | Color code | Signal | Pin on second 25-pin male connector |
|---|---|---|---|
| 1 | BK | not used | 1 |
| 2 | BR | Rx | 2 |
| 3 | R | Tx | 3 |
| 4 | O | RTS | 4 |
| 5 | Y | CTS | 5 |
| 6 | G | DSR | 6 |
| 7 | BL | signal ground | 7 |
| 8 | V | DCD | 8 |
| 9 to19 | not connected | not used | 9 to19 |
| 20 | W BK BR stripes | DTR | 20 |
| 21 to 25 | not connected | not connected | 21 to 25 |

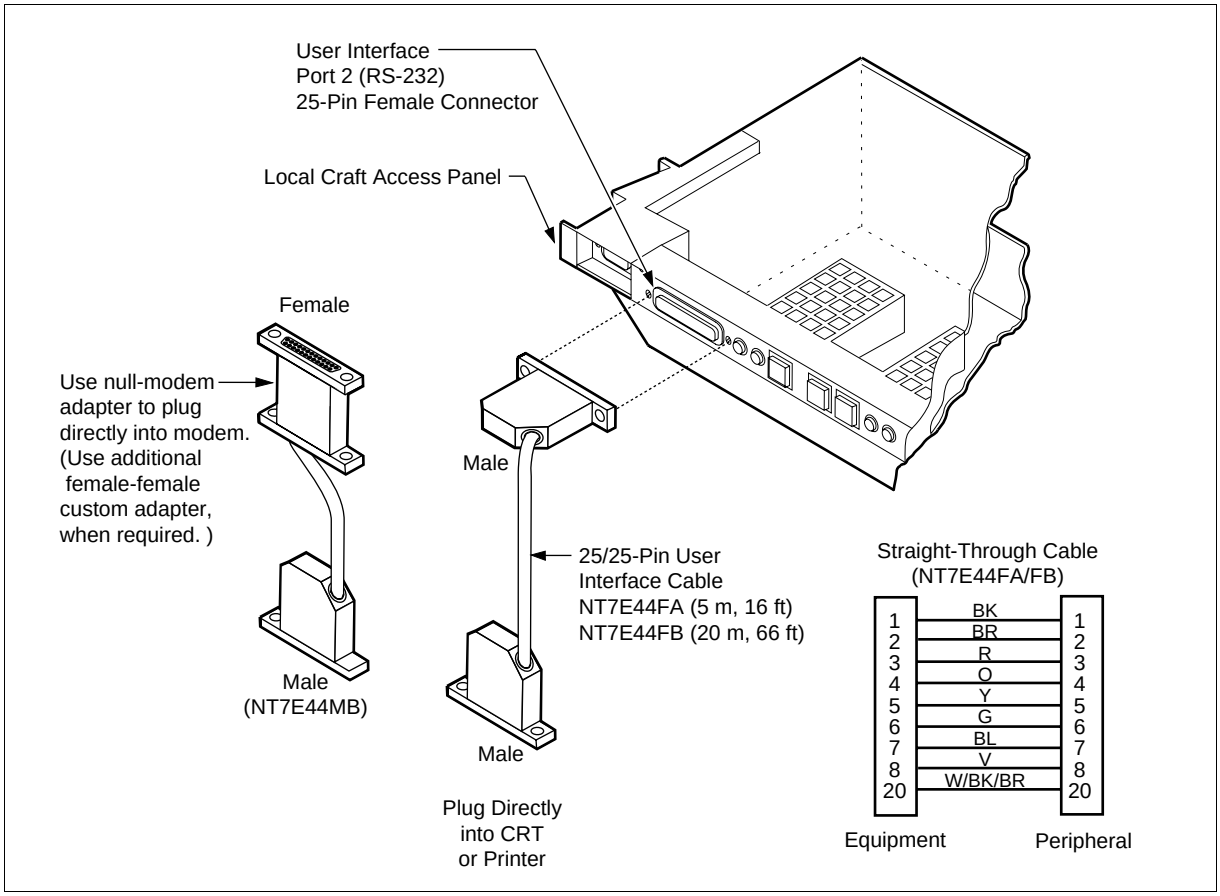
***Note:*** This cable has a “straight-through” construction. Pin 1 on one male connector is connected to pin 1 on the other male connector, pin 2 is connected to pin 2, and so on.

**—continued—**

Procedure 5-17 (continued)
**Installing a user interface cable to the LCAP**

**Figure 5-62**
**Connecting a user interface cable to the LCAP**

PC-1836




**—end—**

# Installing the equipment covers, the bay end guards, and the bay end guard extenders

This chapter contains the procedures for installing the equipment covers on each of the transport bandwidth manager (TBM) shelves in the bays, the equipment cover on the environmental control unit, the end guards on the first and last bays in the line-up, and the frame extenders that install at the top of the cabinet.

## How to use this chapter

This chapter includes the following tasks.

If you cannot successfully complete these procedures, contact your next level of support.

### Chapter task list

| Task | See |
|---|---|
| Installing the TBM shelf cover | Procedure 6-1 |
| Mounting the environmental control panel cover | Procedure 6-2 |
| Installing the end guards | Procedure 6-3 |
| Installing the bay end guard extenders | Procedure 6-4 |

# Procedure 6-1
# Installing a TBM shelf cover

Use this procedure to install the shelf cover for the transport bandwidth manager (TBM) shelf.

## Requirement

The following tool is required:

- screwdriver, flathead 1/4 in.

## Action

| Step | Action |
|---|---|
| **1** | To install the TBM shelf cover, place the cover to engage the aligning pins at the bottom of the shelf. See Figure 6-1 on page 6-3. |
| **2** | Grasp the TBM shelf cover by the two handles and push the cover until the handles snap into the closed position. |

**CAUTION**
**Damage to locking screws and the finish of the equipment covers**
Only use a flat-bladed 1/4 in. screwdriver to tighten or release the locking screws on the equipment covers. Do not use a coin or a narrow screwdriver. Either of these items can damage the slots on the locking screws and may slip and damage the finish on the equipment covers.

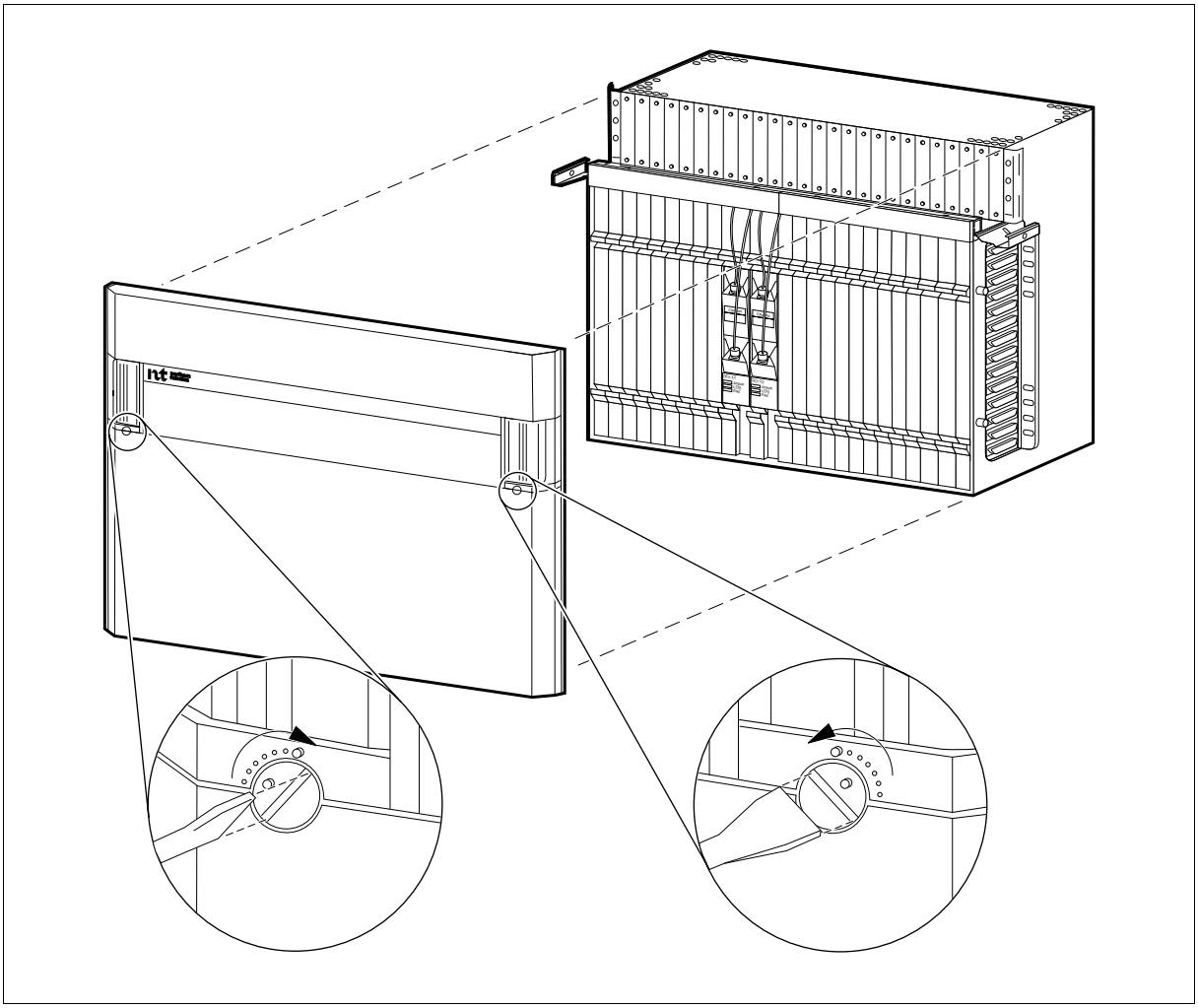
| | |
|---|---|
| **3** | On the front cover of the TBM shelf, use a flathead screwdriver to rotate the locking screw 90 degrees to the locked (vertical position). |
| **4** | Repeat steps 1 through 3 for each TBM shelf installed |

**—continued—**

Procedure 6-1 (continued)
**Installing a TBM shelf cover**

**Figure 6-1**
**Installation of a TBM shelf cover**

PC-10533



**—end—**

# Procedure 6-2
# Mounting the environmental control panel cover

Use this procedure to install the cover for the environmental control panel.

## Requirement

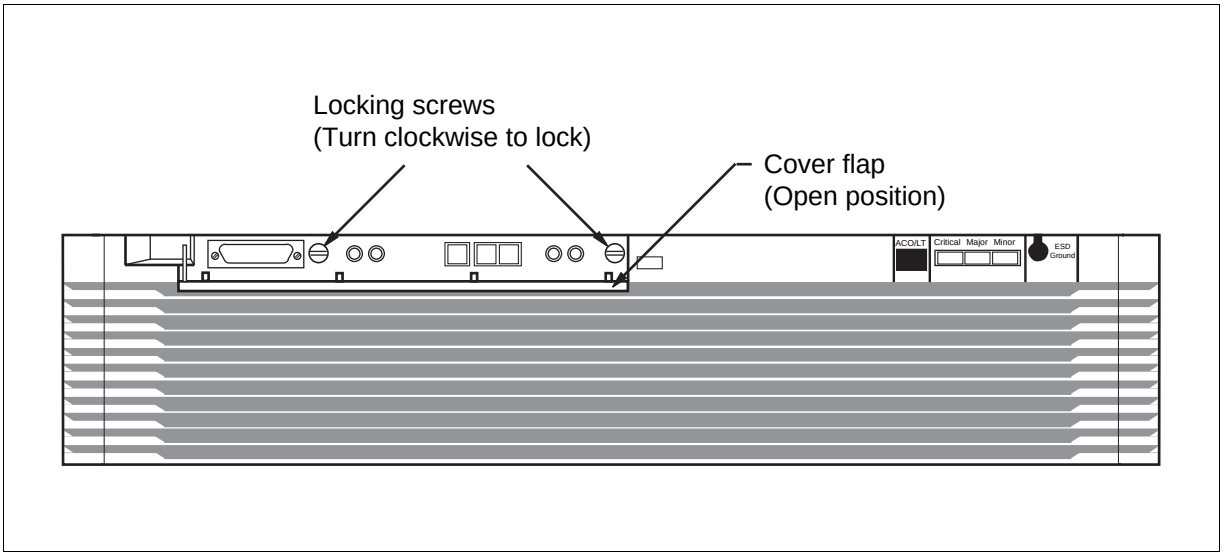
A screwdriver, flathead 1/4 in., is required.

## Action

| Step | Action |
|---|---|
| **1** | Place the notched plastic guide that projects from the lower back portion of the cover onto the corresponding brackets on the lower portion located on the side of the shelf. See Figure 6-2. |
| **2** | Push the cover onto the mounting brackets until the cover fits tightly. |
| **3** | Open the orderwire access cover flap (by flipping it down) and secure the cover in place by turning the two locking screws clockwise. |

**Figure 6-2**
**Mounting of the environmental control panel**

PC-10614




**—end—**

# Procedure 6-3
# Installing the bay end guards

Use this procedure to install the end guards on the first and last bays in a lineup.

## Requirements

The following tools are required:

- socket wrench, 1/2 in. drive
- hexnut screwdriver, 1/4 in.
- bay end guard from the following table

| PEC | Description |
|---|---|
| NT7E72AA | 2.15 m (7 ft) bay end guard |
| NT7E72CA | 2.45 m (8 ft) bay end guard |
| NT7E72DA | 2.75 m (9 ft) bay end guard |
| NT7E72EA | 3.5 m (11 ft 6 in.) bay end guard |

## Action

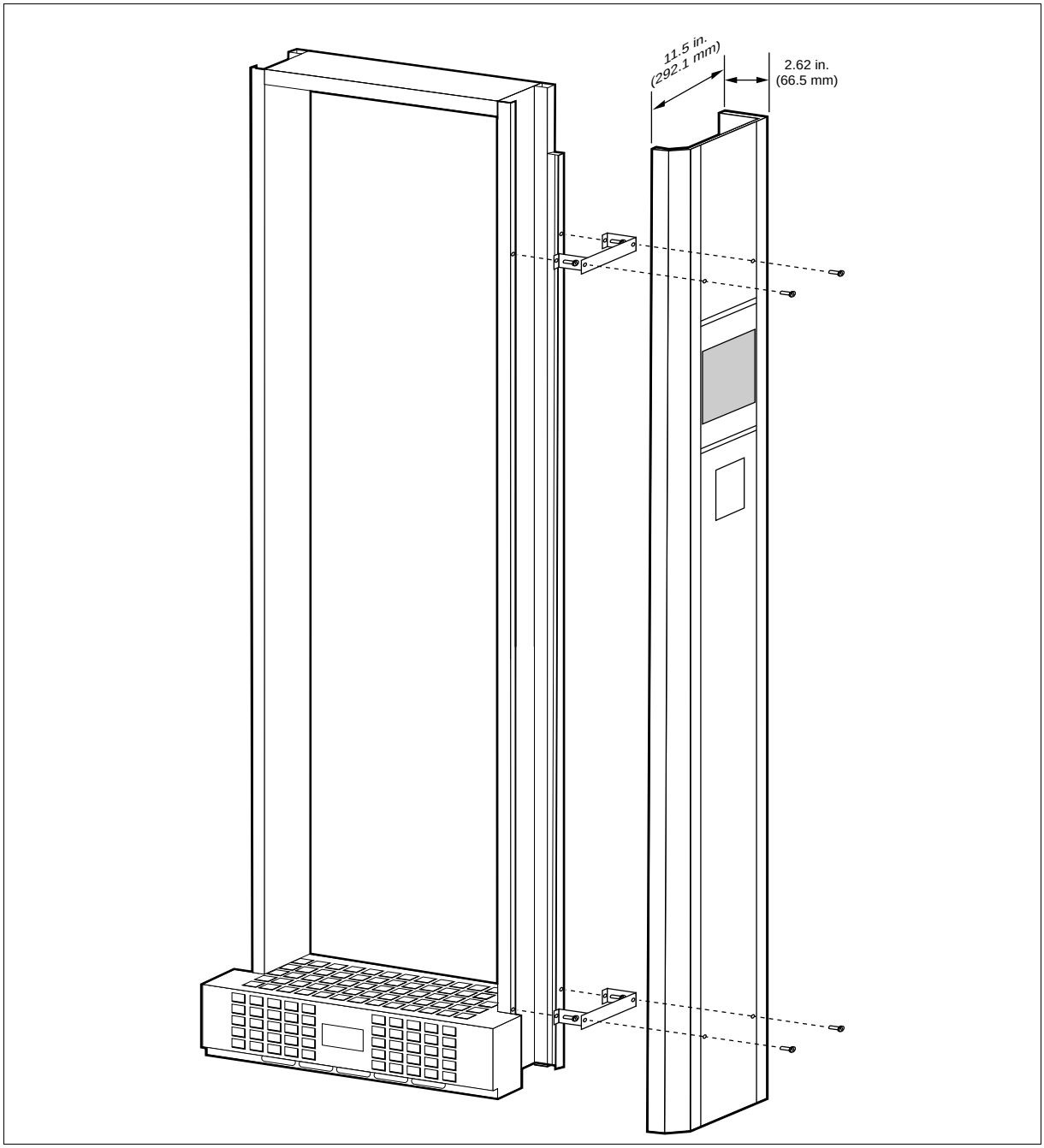
| Step | Action |
|---|---|
| **1** | Ensure that you have selected the correct bay end guard shown in the "Requirement" section.<br><br>***Note:*** If you are installing a 7 ft frame with a one foot frame extender, you can use either the NT7E72AA or -CA bay end guards. Do not use the NT7E72DA and -EA bay end guards with frame extenders. |
| **2** | Attach 2 brackets with 2 screws each to the side of the bay upright, 1at the top and 1 near the bottom, as shown in Figure 6-3 on page 6-6. |
| **3** | Attach the end guard panel to the brackets with 4 screws, 2 at the top and 2 at the bottom, as shown in Figure 6-3 on page 6-6. |
| **4** | Press a protective plastic screw cap into place on each of the 3 screws you just installed. |

**—continued—**

Procedure 6-3 (continued)
**Installing the bay end guards**

**Figure 6-3**
**Installation of the bay end guards**

PC-10022



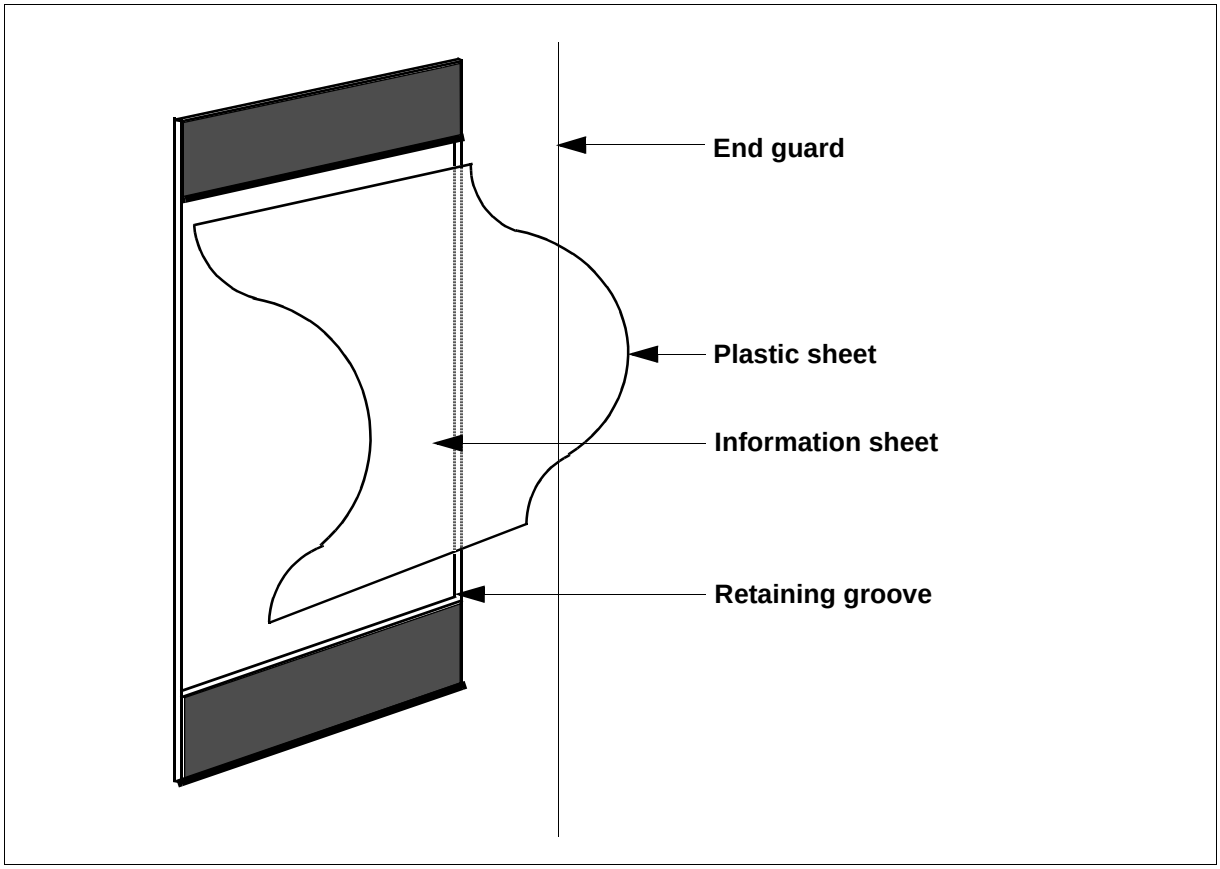

**—continued—**

Procedure 6-3 (continued)
**Installing the bay end guards**

| Step | Action |
|---|---|
| | ***Note:*** The side of the end guard has a holder for an information sheet. |
| **5** | Access the information sheet by flexing the plastic sheet cover outward to allow the top and bottom edges to clear the retaining grooves, as shown in Figure 6-4. |
| **6** | Do one the following: |

| **If** the frame is | **Then** |
|---|---|
| equipped with bay frame extenders | install the bay end guard extender required as described in Procedure 6-4 on page 6-8. |
| not equipped with bay frame extenders | installation is completed. |

**Figure 6-4**
**Installation or removal of the information sheet**




**—end—**

# Procedure 6-4
# Installing the bay end guard extenders

Use this procedure to install the bay end guard extenders onto the frame extenders at the top of the first and the last bays in a lineup. The two types of bay end guard extenders are

- the NT7E75DA end guard extender, 0.61m (2 ft) high
- the NT7E75EA end guard extender, 1.5m (4.5 ft) high

## Requirements

The following tools and materials are required:

- socket wrench, 1/2 in. drive
- installation drawing package (NT7EXCAA)

## Action

| Step | Action |
|---|---|
| **1** | Unpack the bay end guard extenders and their associated components. |
| **2** | Use the assembly drawing checklist to ensure that all of the required components have been provided with the bay end guard extenders. |
| **3** | Mount and secure the bay end guard extenders to the existing bay frame according to the installation drawing package. |
| **4** | Ground the extenders according to the installation drawing package. |

**—end—**

# Technical support information

This section lists the technical support available for AccessNode.

***Note:*** AccessNode Express products are serviced by the AccessNode support team detailed in this section.

## 24-hour emergency technical assistance

This section explains how to contact 24-hour emergency technical assistance.

| If you are here | Then call this number |
|---|---|
| United States | (800) ASK-ETAS<br>(800) 275-3827 |
| Canada | (613) 226-5456 |

## Non-emergency support and software upgrade support

This section explains how to contact non-emergency support and software upgrade support.

| If you are here | Then call this number |
|---|---|
| United States<br>Normal business hours<br>8:00 am - 5:00 pm local time<br>Monday to Friday<br><br>All other times (for urgent software upgrade support only) | (800) ASK-TRAN<br>(800) 275-8726<br><br><br>(800) ASK-ETAS<br>(800) 275-3827 |
| Canada<br>Normal business hours<br>8:00 am - 4:00 pm local time<br>Monday to Friday<br><br>All other times (for urgent software upgrade support only) | Call your regional field service engineering support group.<br><br><br>(800) ASK-ETAS<br>(800) 275-3827 |

## Standard repair service: USA

This section explains how to contact US standard repair service.

US standard repair service consists of like-for-like replacement: a replacement circuit pack is shipped from Nortel Networks within five (5) working days after receiving the order.

| **Call customer service** | **and** | **ship defective unit prepaid to** |
|---|---|---|
| (800) 251-1758 and request a Repair Order Number.<br>7:00 am - 6:00 pm CST Monday to Friday | Mark the defective item with the following:<br>• assigned repair order number<br>• explanation of the problem. | Nortel Networks<br>917 Air Park Center Drive<br>Nashville, TN 37217<br>Attn: Repair and Return |

## Standard repair service: Canada

This section explains how to contact Canadian standard repair service. Canadian standard repair service consists of the following options:

- **Like-for-like replacement**: A replacement circuit pack is shipped from Nortel within five working days after receiving the order.
- **Repair of the circuit pack**: The repaired circuit pack is shipped from Nortel Networks within 14 days after receipt of the defective circuit pack.

| **Call customer service** | **and** | **ship defective unit prepaid to** |
|---|---|---|
| (800) 668-1717 (English)<br>(800) 668-1748 (French)<br>and request a Repair Order Number.<br>Monday to Friday<br>8:00 am - 5:00 pm local time | Mark the defective item with the following:<br>• assigned repair order number<br>• explanation of the problem. | Northern Telecom Canada Ltd.<br>Repair Customer Service Group<br>9300 Trans Canada Highway<br>St. Laurent, Québec<br>H4S 1K5<br>CANADA |

## Emergency repair service: USA

This section explains how to contact US emergency repair service. A replacement circuit pack is shipped from Nortel within 24 hours of receiving the order.

| Call customer service | and | ship prepaid to |
|---|---|---|
| (800) 251-1758<br>and request an emergency replacement. | **1)** Give the following:<br>• name<br>• company name<br>• telephone number<br>• exact unit code and name for emergency replacement<br>• ship-to address<br>**2)** Mark the defective item with the assigned emergency repair order number | Nortel Networks<br>917 Air Park Center Dr.<br>Nashville, TN 37217<br>Attn: Repair and Return |

## Emergency repair service: Canada

This section explains how to contact Canadian emergency repair service. A replacement circuit pack is shipped from Nortel within 24 hours of receiving the order.

| Call customer service | and | ship prepaid to |
|---|---|---|
| Normal business hours<br>Monday to Friday<br>8:00 am - 5:00 pm local time<br>(800) 668-1717 (English)<br>(800) 668-1748 (French)<br>and request an emergency replacement.<br>All other times:<br>(800) 361-2575<br>and request an emergency replacement. | **1)** Give the following:<br>• name<br>• company name<br>• telephone number<br>• exact unit code and name for emergency replacement<br>• ship-to address<br>**2)** Mark the defective item with the assigned emergency repair order number | Northern Telecom<br>Canada Ltd.<br>Repair Customer<br>Service Group<br>9300 Trans Canada<br>Highway<br>St. Laurent, Québec<br>H4S 1K5<br>CANADA |

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