NORTEL NETWORKS™

Nortel Networks Multiservice Switch 15000/20000

Hardware Installation, Maintenance, and Upgrade

NN10600-130

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About this document

This document contains the procedures that are called up in sequence by specific task flows. Task flows identify at a high level what is to be done to get a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000 installed or replaced, or to initially install, add, upgrade, or replace most parts of the system.

The following topics are discussed in this section:

- Who should read this document and why (page 10)
- How to use this document (page 10)
- What's new in this document (page 12)
- Related documents (page 14)
- How to get more help (page 15)

Who should read this document and why

This document is intended for use by field technicians who:

- are qualified to work on the DC electrical power feeds to a Nortel Networks Multiservice Switch 15000, Multiservice Switch 15000 VSS, or Multiservice Switch 20000 according to local electrical codes for the kind of power hookup required
- are qualified to handle cards or modules that plug into a Multiservice Switch 15000, Multiservice Switch 15000 VSS, or Multiservice Switch 20000 without accidently affecting service or to handle, install, or replace mechanical switch hardware and associated equipment without causing personal injury or damage to equipment
- have experience and knowledge of the safe and practical operation of the specialty tools and methods required to do the tasks identified in the procedures throughout this document

How to use this document

The Overview of hardware tasks (page 16) contains references to all the tasks required to install, maintain, and upgrade a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000.

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Some of the procedures required by a task can be located in another NTP, for example software configuration procedures will be found in NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Chapters in this document are listed alphabetically.

For more details about how to use Nortel Networks Multiservice Switch suite of documents, see NN10600-002 *Nortel Networks Using Task-based Documentation Job Aid*.

What you need to know

You must be familiar with fundamental data communications installations and maintenance actions. You must also be familiar with product descriptions in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* and decisions about product deployment that were based on NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

Only information specific to Nortel Networks Multiservice Switch 15000, Multiservice Switch 15000 VSS, and Multiservice Switch 20000 hardware is contained in this guide.

WARNING
Risk of radio interference
Multiservice Switch 15000, Multiservice Switch 15000 VSS, and Multiservice Switch 20000 are class A and class B compliant for radio interference.

WARNING
Risk of radio interference
Multiservice Switch 15000 is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

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What's new in this document

The following hardware features were added to this document:

- 4-port MR POS and ATM FP with PEC NTHW46 (page 13)
- Fabric card NTHR16EA (page 14)
- Recurring fan alarm (page 14)

Other changes made to this document include the following:

- changed the Caution regarding the class B status of equipment in What you need to know (page 11)
- updated the title of the document for an MFA150 system of ac rectifiers in Related documents (page 14)
- updated the procedure Anchoring the NEBS 2000 frame (page 149) to add two available anchor kit part numbers and add Procedure stepswith A0502620 (page 150) and revise Procedure stepswith A0686271 (page 154)
- corrected the width of a frame with doors and extended side panels in the figure Clearance to swing a door open on a NEBS 2000 frame (page 73)
- updated the task flow NEBS 2000 frame installation (page 104) to indicate the switch hardware packages that include the frame
- for the task flow FP addition (page 87):
  - corrected the figure to include the task flow "Cable routing" and the procedures to remove and install SFP optical modules
- for the task flow FP upgrade (page 91):
  - in Prerequisites, indicated the NTP that identifies what type of LAPS an optical FP supports
  - corrected the figures Task flow of an electrical FP upgrade (page 93) and Task flow of an optical FP upgrade (page 94) to include the task flows "Card testing" and "Cable routing", and the procedures for removing, installing, and configuring SFP optical modules
- for the task flow Replacement of a failed FP (page 95):
  - in Prerequisites, indicated what to do about SFP optical modules for an FP return, redeployment, or verifying operation
  - corrected the figure to include the procedures for removing and installing SFP optical modules
- corrected the figure Task flow for a NEBS 2000 frame installation (page 106) to unpackage the hardware before removing it from the pallet
- added the switch hardware packages to Multiservice Switch 15000 VSS installation (page 111)

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- added cable grounding requirements to Connecting an FP cable (page 234)
- indicated that BIMs are shipped installed in Installing a BIM (page 283)
- updated these procedures to address handling BIMs that are already installed:
  - Installing a BIP onto a NEBS 2000 frame (page 293)
  - Installing a shelf-based BIP (page 410)
- updated the Prerequisites of procedure Installing an SFP optical module (page 478) to change a reason for generating the software alarm and to cross-reference where the procedure to verify operations is located
- added the figure A plastic cable management bracket P0937935 (page 510) to Installing high-density cable management brackets (page 509)
- updated the Prerequisites of procedure Removing an FP (page 631) to indicate what to do about SFP optical modules and replaced the SFP removal steps with a reference to the SFP module removal procedure
- added retrofit kit NTPS40 for installing fiber cable guides to the Prerequisites of the procedures:
  - Installing an FP (page 465)
  - Routing FP cables (page 707)
- added what to do about levelling feet in Removing a horizontal frame from the pallet (page 584) and Removing a vertical frame from the pallet (page 629)
- changed the procedure “Testing the power to the BIP” to Testing the input power to the BIP (page 737)
- removed all mention of the frame joining kit NTRU0101 which is not supported

4-port MR POS and ATM FP with PEC NTHW46

The following sections were updated or added for this feature:

- Cleaning an SFP optical module (page 199)
- Connecting an FP cable (page 234)
- Actions to engage types of FP connectors (page 239)
- Installing an SFP optical module (page 478)

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Fabric card NTHR16EA

The following sections were updated or added for this feature:

- bullets in Prerequisites to fabric replacement (page 65)
- the figure in Task flow of a fabric replacement (page 66)
- the Prerequisites and steps in the procedure Installing a fabric card into a Multiservice Switch 15000 (page 340)
- the steps in the procedure Removing a fabric card from a Multiservice Switch 15000 (page 566)

Recurring fan alarm

The following sections were updated for this feature:

- Installing a fan (page 352)
- Installing a fan controller (page 356)
- Installing a lower cooling unit (page 375)
- Installing an upper cooling unit (page 482)
- Removing a fan (page 571)
- Removing a fan controller (page 575)
- Removing a lower cooling unit (page 590)
- Removing an upper cooling unit (page 643)

Related documents

See the following documents for related information:

- NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*, which indicates the integrated purpose and operational behavior of Multiservice Switch hardware and all supported interworking hardware
- NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*, which specifies all requirements, recommendations, and considerations for planning the installation of all Multiservice Switch hardware, and interworking hardware
- NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*, which contains test descriptions and verification procedures
- NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*, which contains software tasks and procedures used by hardware tasks

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- NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*, which contains the descriptions and capabilities of each type of function processor (FP) card
- NN10600-175 *Nortel Networks Multiservice Switch 7400 Hardware Installation, Maintenance, and Upgrade*
- NN10600-172 *Nortel Networks Multiservice Switch 7400 FP Cabling Reference*
- If you received an MFA150 system of ac rectifiers, these documents are included in the shipping container or provided from Astec Advanced Power Systems
  - UM6C28C (167-9021-102) *MFA150 Modular Front Access Power System -- Nt6C28C User Manual*
  - UM6C28D (167-9021-107) *Modular Front Access Power System MFA150 NT6C28D User Manual*
  - 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*
- If you received a SER 5500 switch in package NTHW85 or otherwise, the document S-623-01 *Shasta 5000 BSN Installation and Maintenance Manual* is included to complete the installation of the SER 5500 (for example, installing cards and cables, power and alarm cabling, and powering up) and to operate it.
- If you received an EdgeLink DS3 mux, the document *EdgeLink 100 Digital Multiplexer General Description,* section 825-102-001 is included in the shipping container or provided from Telco Systems.

How to get more help

For information on training, problem reporting, and technical support, see the “NNortel Networks support services” section in NN10600-030 *Nortel Networks Multiservice Switch 7400/15000/20000 Overview*.

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Overview of hardware tasks

The tasks in this book are organized under the following hardware subjects:

- Alarm/BITS module (page 38)
- Alarm hardware (page 35)
- Control processors (page 62)
- Cooling units (page 53)
- Fabrics (page 65)
- Function processors (page 87)
- Initial switch hardware installations (page 101)
- MAC address module (page 99)
- Peripheral equipment (page 117)
- Power-and-ground hardware for a Multiservice Switch (page 126)
- CP and FP cables and associated hardware (page 45)
- Shelf assembly (page 140)
- Sparing panel replacement (page 144)

For a view of installed switch hardware parts, see the figures:

- Multiservice Switch 15000 and Multiservice Switch 20000, front view (page 17)
- Multiservice Switch 15000 and Multiservice Switch 20000, rear view (page 18)

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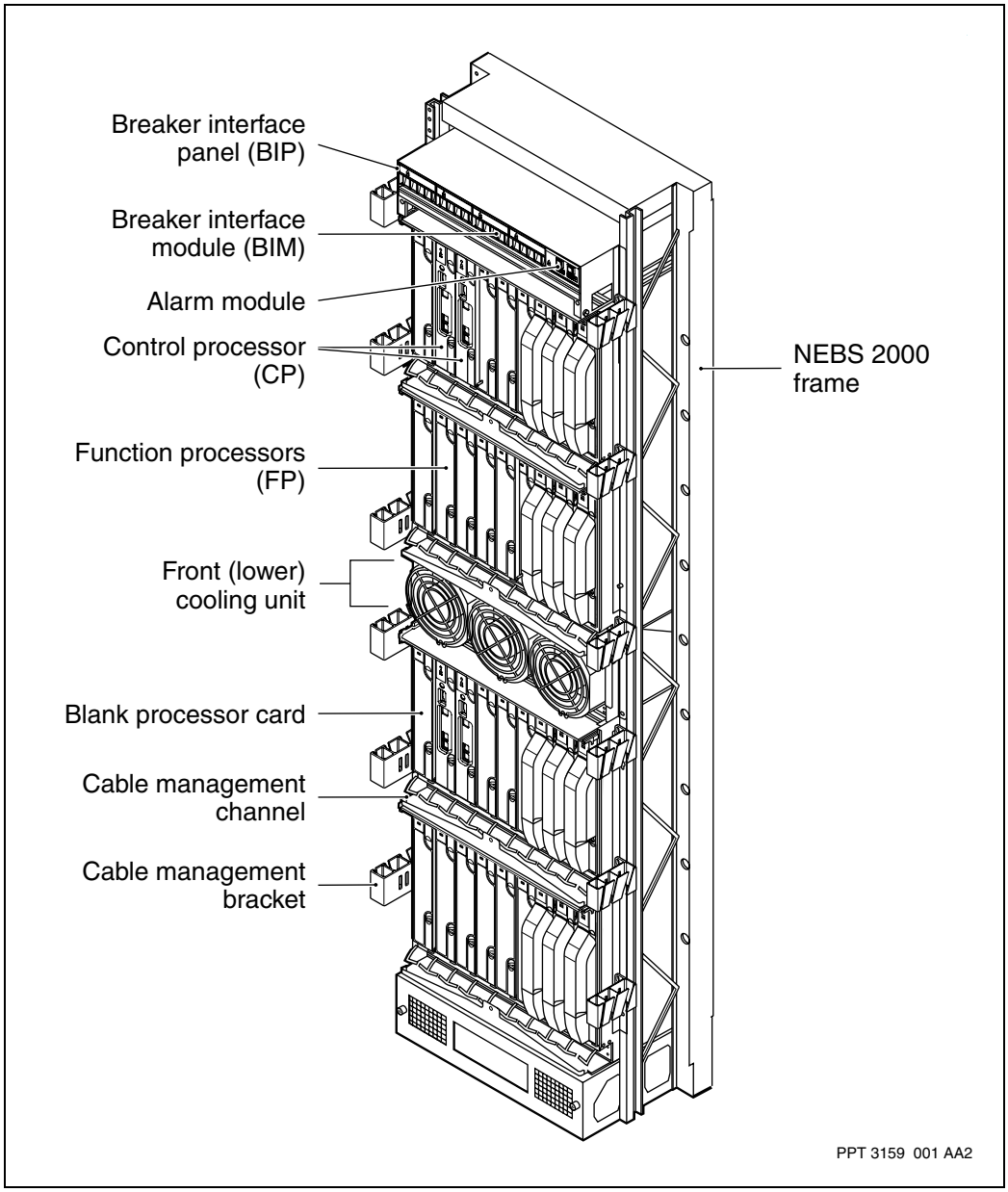
Multiservice Switch 15000 and Multiservice Switch 20000, front view



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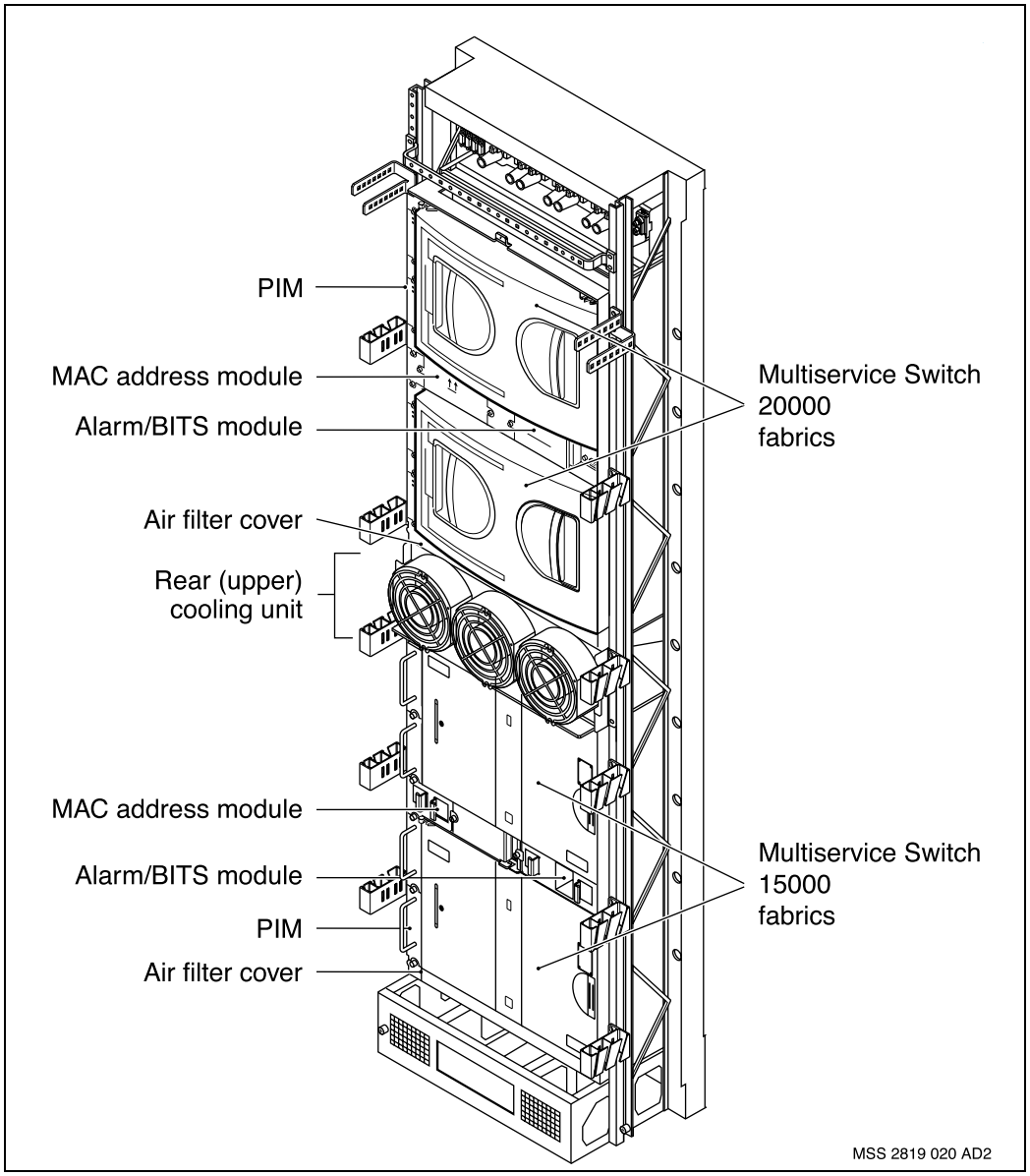
Multiservice Switch 15000 and Multiservice Switch 20000, rear view



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Safety considerations and best practices

You must be familiar with all of the safety considerations and best practices before attempting the tasks included in this document:

Navigation

- Risk of personal injury (page 19)
- Risk of service loss (page 21)
- Risk of equipment damage (page 22)
- Avoiding damage from ESD (page 24)
- Choosing slots for FPs (page 25)
- Equipment maintenance (page 27)
- Handling cables (page 30)
- Hot-swapping hardware parts (page 31)
- Packing and unpacking a processor card or module (page 31)
- Processor card compatibility (page 31)

Risk of personal injury

The following items provide an overview of common personal safety considerations when working with Nortel Networks Multiservice Switches.

WARNING

Risk of injury by fan blades

While working on any equipment near cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a rotating fan with anything.

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WARNUNG

Verletzungsgefahr durch Lüfterblätter

Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

WARNING

Never place a foot or a hand under any part of the frame while it is being tilted or moved. Always move it with three or four people. The weight of a shipped frame with one Multiservice Switch 15000 or Multiservice Switch 20000 installed is approximately 419 kg (926 lbs); with two switches the weight is approximately 612 kg (1,344 lbs). For additional protection, wear safety boots with steel toes.

WARNUNG

Verletzungsgefahr beim Gestelltransport

Stellen Sie niemals einen Fuß unter das Gestell, wenn dieses bewegt oder gekippt wird, und greifen Sie nicht unter das Gestell. Die Einheit muß mit vier Personen von der Transportpalette genommen werden. Ein Gestell wiegt mit einem Multiservice Switch 15000 oder Multiservice Switch 20000 ca. 420 kg, mit zwei Multiservice Switch-Einheiten ca. 610 kg. Tragen Sie zu Ihrem zusätzlichen Schutz Sicherheitsschuhe mit Stahlkappen.

WARNING

Risk of eye injury by laser

Never look directly into the end of a fiber cable, let an end pass in front of your eyes, or use an optical device to look at the end of an optical fiber unless you are certain the other end is not connected. The LASER travelling through a fiber cable can injure the human retina.

WARNUNG

Gefahr von Augenverletzungen durch Laserstrahlen

Blicken Sie nie direkt auf das Ende eines Glasfaserkabels, und überprüfen Sie auch einzelne Faserenden nicht mit einem optischen Gerät, wenn Sie nicht sicher sind, daß das andere Kabelende nicht angeschlossen ist. Der über die Glasfasern übertragene Laser kann die menschliche Netzhaut verletzen.

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DANGER

Risk of injury or damage by electricity

When toggling off power breakers on a breaker interface module (BIM) or in the circuit up to it, or removing a fuse from the circuit up to it, always put tape over the breaker or fuse cavity. The tape indicates it was manually toggled off, and not tripped by the system. This prevents accidental activation of the power circuit, especially if power cables are being handled.

DANGER

Schäden oder Verletzungen durch Elektrizität

Wenn die Leistungstrennschalter an einem Trennschalterkopplungsmodul (BIM) oder im zuführenden Stromkreis geöffnet bzw. Sicherungen aus dem Stromkreis entfernt werden, decken Sie den Trennschalter oder den Sicherungssteckplatz mit Klebeband ab. Das Klebeband signalisiert, daß er/sie manuell ausgeschaltet und nicht vom System ausgelöst wurde. Damit verhindern Sie eine versehentliche Aktivierung der Stromversorgung, besonders beim Hantieren mit Netzkabeln.

- Multiservice Switch hardware parts can be unexpectedly heavy and awkward to install. Personal injury or equipment damage can occur if the equipment is dropped or bumped.

Risk of service loss

The following items provide an overview of common service loss risks when working with Nortel Networks Multiservice Switches:

- If a card is moved between rooms with very different levels of temperature and humidity, allow the card to acclimatize for at least one hour before installation. Condensation on a card can cause card failure.
- Unspared FPs, including FPs configured with intra-card LAPS (port-to-port sparing on a single FP), will experience a loss of service on any active ports for the time it takes to replace the FP.
- Whenever you install an FP that uses a control cable, in a sparing configuration, you must always insert the FP into a slot on the shelf before you connect the control cable. If you connect the control cable between the FP and the termination or sparing panel before you insert the FP in the shelf, you can disrupt service to the other FP(s) in the sparing configuration.
- Before seating an FP in its slot or removing it from the slot, ensure that the cables on the faceplate are disconnected. Otherwise seating a cabled FP may cause a traffic loss on the active FP.

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Risk of equipment damage

This section provides an overview of common equipment damage risks when working with Nortel Networks Multiservice Switches.

- When an FP receives a LASER signal that exceeds its range of receive sensitivity, the FP can be damaged or fail. The ranges for transmit and receive are not always the same on an optical FP. Always check if each FP signaling connection requires an attenuator.
- The protection covers on fabric cards are to prevent accidental bending of any connector pins. Once a cover is removed, ensure that nothing contacts the rows of exposed pins. Use the procedure Checking the backplane pins (page 178) to ensure there are no bent pins on the backplane.
- All metallic telecom equipment interfaces must be connected only to intra-building or non-exposed wiring or cabling.
- Where compliance with local electrical specifications, guidelines, or standards conflicts with a Nortel Networks procedure, contact your Nortel Networks service representative.
- Power cycling the breakers can be done on a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000 without damaging equipment. Power cycling can cause a loss of traffic depending on the hardware and software configurations for redundancy and on the amount of traffic throughput as each breaker is toggled.

Fastening screws to a frame or rack

When fastening screws for the first time into the front surface of the vertical uprights of a NEBS 2000 frame or a mounting apparatus that requires self-tapping (thread-forming) screws, ensure the flat-tipped screw is perpendicular to the hole. On the uprights of a NEBS 2000 frame, dimples in the silvery grounding strip indicate where the unthreaded screw holes are located. To see dimples, run and press your finger along the strip. When turning a thread-forming (self-tapping) screw into a dimple for the first time, exert enough force to puncture the strip.

When fastening screws back into threaded holes, especially in the front surface of a frame upright, fully seat the fastener threads perpendicularly in the hole before turning it. The tapered tip of the fastener should allow you to gently start threading by using your fingers.

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Unless otherwise specified, all screws are unfastened counter-clockwise and fastened clockwise. Some screws require a hand tool to fasten or unfasten them (for example, an air filter cover).

CAUTION

Risk of equipment damage and service loss

Do not use any kind of power tool on a captive screw. The screw is necessary to keep the card, module, or cover properly seated. If the screw is overtightened (stripping it or its hole), the hardware cannot operate correctly.

Fastening captive screws

Most screws on Nortel Networks Multiservice Switch 15000 and Multiservice Switch 20000 plug-in field replaceable units (FRUs) or service replaceable units (SRUs) are captive screws. A captive screw is a type of fastener that remains attached to the unit after it is loosened.

Do not use any kind of power tool on a captive screw. The screw is necessary to keep the card, module, or cover properly seated. If the screw is overtightened by stripping it or its hole:

- the hardware assembly that accommodates the unit will need to be replaced (for example, a cooling unit for a fan controller or a BIP for a BIM)
- the unit with the captive screw will need to be replaced (for example, a fabric for its cover)
- if the unit or what it fastens to is not replaced, the hardware will not likely operate correctly (for example, the reset button on a Multiservice Switch 15000 fabric would not be engaged) and EMI containment is jeopardized

Fastening termination panels

When fastening a fanout panel or a sparing panel to a Nortel Networks Multiservice Switch 7400 cabinet, you will need EIA screws instead of the 10-mm (3/8-inch) screws that were provided with the sparing panel.

When fastening Multiservice Switch 15000 and Multiservice Switch 20000 fanout panels or sparing panels to a Multiservice Switch 7400 cabinet (for example, an NTQS31), you must ground the panel by fastening a No. 6 AWG (13.3 mm^2) cable between the screw head and the mounting ear, and at the designated grounding points on the cabinet uprights. Ensure that the grounding point is a bare, clean bond and that the ground window is shared by the switch to which the sparing panel is connected.

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Avoiding damage from ESD

Electrostatic discharge (ESD) is a discharge of stored static electricity that can damage equipment and impair electrical circuitry. ESD damage can cause complete or intermittent failure of electronic components. The transfer of ESD occurs when any hardware part is handled by a person who is not protected from ESD. When the part has electronic components, it can be damaged by the ESD transfer. When the part has no electronic components, installing it into other hardware will transfer the ESD it carries to the ESD-sensitive hardware that is already present.

Handling cables for a card or module can also transfer ESD, even when the cable itself is not electrically conductive. For example, connecting a fiber optic cable to an FP faceplate connector or a small-form pluggable (SFP) module can enable the ESD from yourself to transfer to the part you are plugging into.

DANGER

Risk of equipment damage by ESD

Always ground yourself by an approved anti-ESD method before and while handling any tools or hardware on or near the Multiservice Switch. You can plug the provided wrist strap (part number A0378999) into an anti-ESD jack on the lower left mounting ear of either cooling unit (row of fans) on a switch.

When handling any part of a Multiservice Switch, including parts with or without electronic components, at least wear a wrist strap (part number A0378999). Nortel Networks recommends also using conductive carpet, conductive shoes, and heel grounders in the room where the equipment is anchored.

See the figure Location of ESD jacks, front lower (shown) or upper shelf (page 25).

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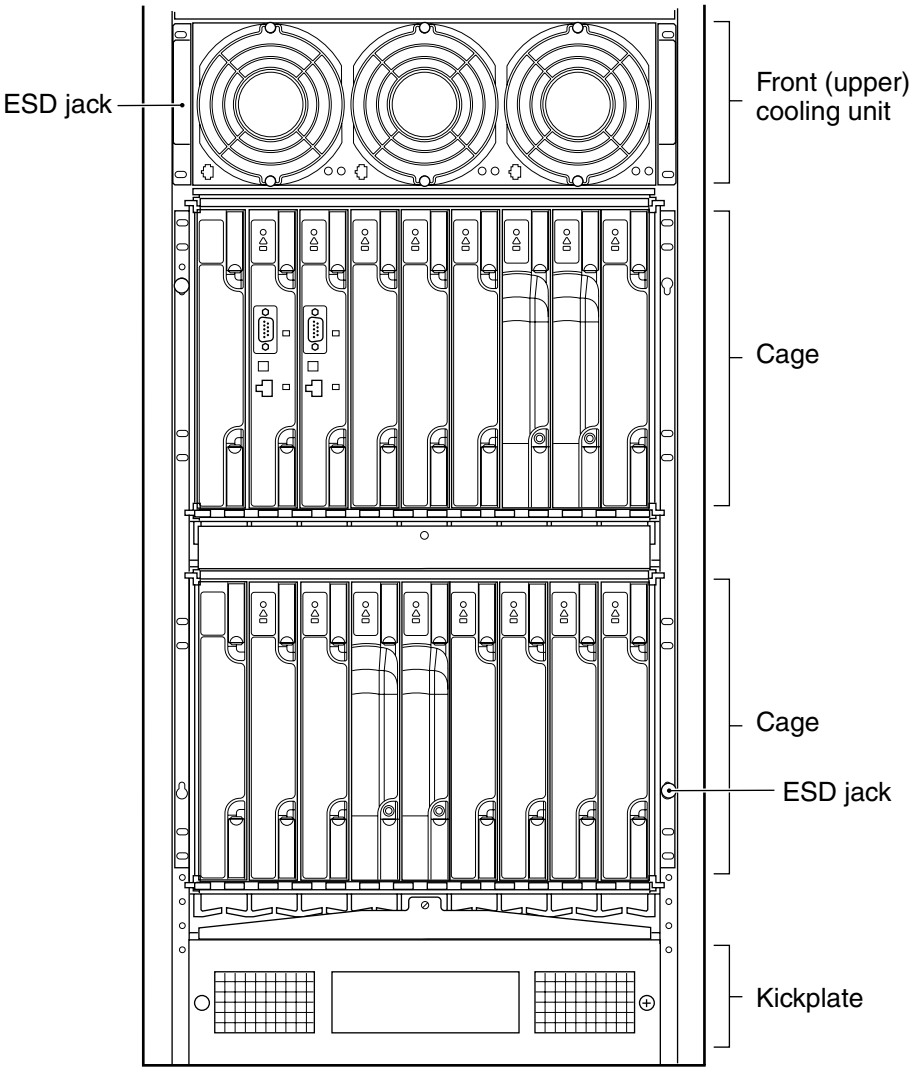
Location of ESD jacks, front lower (shown) or upper shelf



Choosing slots for FPs

Determine if a site record already specifies the slot number, type, and version of FP for each Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000. Otherwise, consider the following criteria for choosing the slots for FPs before installing the FPs.

- FPs are installed in slots 1 to 15. Slot 1 can accommodate either the second CP for redundant (backup) operation or an FP.

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- Record the position of each card in your site records by including the location of the equipment, equipment identifier, slot number, the FP type as indicated on the faceplate of the FP itself, and the PEC with vintage.
- When combining DS3 or E3, and OC-n or STM-n FPs, consider separating them into separate cages within the same node. If they can not be separated, install blank processor cards (NTHR64) in any empty slots between them.
- Since the electrical current from power cables can interfere with the transmission of signals over coax cable, route coax cables to the right side of the frame (facing the front) opposite where the power cables can be when routed under the floor.
- If equipment sparing of optical cards is planned but not being implemented, install FPs into even-numbered slots first. If equipment sparing of optical cards is being implemented, install the main FP into an even-numbered slot other than slot 0 and the spare FP in the adjacent slot with the next higher number. For more information about main FPs, refer to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.)
- Dual-FP line automatic protection switching (LAPS) protects both the external line and equipment from failure. To use the LAPS functionality, spared FPs need to be installed in adjacent slots.
- For a Multiservice Switch that combines sparing of optical cards with one-for-n (1:n) sparing of electrical cards, select the slots for all the main and spare optical cards first. Then use the remaining slots to provide one-for-n sparing of the electrical cards. This ensures that the electrical cards do not occupy slots that are needed to provide optical card sparing.
- Providing Media Gateway with hot equipment protection (HEP) requires a configuration with a Hot 1 + 1 standby OC-3 STM-1 TDM FP, a Hot 1+1 standby VSP FP, and a Hot 1 + 1 standby ATM FP. Providing hitless software migration for Media Gateway services requires all the cards involved in a call (OC-3 STM-1 TDM FP, VSP FP, and ATM FP) to support this feature, including the mechanisms for synchronizing the call states between cards across the fabric interface. HSM and HEP as defined here apply to Media Gateway services supported by cards in the same shelf.
- A VSP3 card can spare up to nn cards in the same Multiservice Switch 15000 or Multiservice Switch 20000 shelf, where nn is 14 FP slots minus however many TDM cards share the shelf, and the far-end supports sparing that many VSP3s. At least one TDM card is required to operate with the VSP3s to enable Media Gateway. The number of TDM cards varies according to the capacities you choose. Consider how to group the VSP3s in paired slots. For more information on the sparing setup of VSP3 cards, see NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

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- Keep all fiber optical (OC-n or STM-n) and electrical (DSn or En) FPs grouped together (for example, all OC-3/STM-1s grouped beside all OC-12c/STM-4s and separate from DS3s).
- Add DS3 or E3s starting at the right side of a cage so that coax cables are routed to the right side of the frame, that is, to the side that is opposite the input power cables. If the power cables are fastened to the side of the frame from the floor up to the BIP, and coax cables are fastened to the cable management brackets next to the power cables, the EMI from the power cables will interfere with signals on the coax cables.

Attention: The power input cables do not interfere with the signals on fiber cables.

- Since fiber cables are to be routed to the left side of the switch and since the optional extended cable management brackets accommodate up to 7 FPs, reserve slot 8 for the OC-n or STM-n card from the network; the extended brackets are intended mostly for the density of mini-coax cables from DS3s or E3s and it is assumed that a switch will have at least one OC-n or STM-n card when provisioning with DS3s or E3s.
- Add OC-n or STM-n cards starting at the left side of a cage, keeping similar cards grouped together (for example, OC-48/STM-16s and OC-12/STM-4s are in separate groups).
- Decide which slot in the cage is to house the spare (redundant) FP for the other FPs in that cage. To support sparing, optical FPs must be paired (for example, slot 4 to slot 5, slot 6 to slot 7, etc.).
- For a Multiservice Switch 20000, consider that slots 6, 7, 14, and 15 can each contain a 10 Gbit/s FP when the cards become available, or a 2.5 Gbit/s FP now.

Equipment maintenance

See the following sections for an overview of common maintenance tasks:

- Accessing equipment inside a NEBS 2000 frame with a door (page 28)
- Air filter replacement (page 28)
- Equipment vacuuming (page 28)
- Fiber cable cleaning (page 29)
- SFP optical module cleaning (page 29)
- Monitoring equipment status LEDs (page 29)
- Storing and transporting circuit cards (page 30)

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Accessing equipment inside a NEBS 2000 frame with a door

When a NEBS 2000 frame has a door mounted across its front or rear, the door could be locked. Whenever you need to access equipment behind a door (for example, to add, replace, or test equipment), you will need a key from kit NTQS37. One key fits all doors from any version of the kit NTQS37xx. The procedure to control access through a door is Locking or unlocking a door on a NEBS 2000 frame (page 522).

Air filter replacement

The rate of airflow for a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000 is different from that of other products because of the higher volume and faster speed of blown air to cool the equipment. The air filter of a Multiservice Switch must be replaced every 3 months or more often. A filter in an upper or lower shelf in a NEBS 2000 frame has the same interval of replacement.

A clogged air filter may cause alarm 7002 0003. It means you need to increase the replacement interval. After initial powering up of the system, and before getting the alarm, it is recommended you periodically check the air filters to determine if you need a more frequent replacement.

Never re-use an air filter because its effectiveness is reduced regardless of the method of cleaning it.

Vacuuming around a Multiservice Switch can maximize the efficiency of the air filters, but does not increase the interval of change. Refer to Equipment vacuuming (page 28).

Use the procedure Replacing an air filter (page 681) as a part of regular maintenance. The procedure includes a one-page form that is intended to be printed and kept with the switch so that each air filter replacement can be recorded. Each form accommodates three switches for a period of one year.

CAUTION

Risk of warranty loss

Processor cards that are damaged due to the accumulation of dust are not covered by a Nortel Networks warranty. When claiming equipment warranty service, you may be asked to produce a copy of the form.

Equipment vacuuming

You must determine your own period of vacuuming equipment based on the environmental conditions surrounding your equipment.

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Use the procedure Vacuuming equipment (page 746), which includes the criteria for specific vacuum equipment. Consider doing this procedure in the same frequency as needed for Air filter replacement (page 28).

Fiber cable cleaning

Cleaning the ends of optical fiber cables is necessary to maintain optimum connectivity between the end of a fiber cable and its connection. Dirt in an alignment sleeve, along the side of a ferrule, in an adaptor sleeve, or in a transceiver bore can cause a misalignment of the optical fiber. Dirt on the endface of a ferrule can damage the optical fiber or cause a non-contacting connection.

Use the following procedures to clean fiber cables to maintain optimum connectivity:

- Cleaning LC or SC connectors (page 202)
- Cleaning MT-RJ connectors (page 206)
- Cleaning the bore of a transceiver (page 209)

SFP optical module cleaning

Cleaning a small-form pluggable (SFP) optical transceiver module is necessary to maintain optimum connectivity between the FP socket (port) and its interfacing fiber cable. Ensure that an SFP optical module is clean each time you are about to insert it into an optical module socket on the faceplate of an FP.

When you store an SFP for re-use, keep it in a container that prevents contamination by dust, moisture, and electrostatic discharge (ESD).

Use the procedure Cleaning an SFP optical module (page 199) as required.

Monitoring equipment status LEDs

Plug-in processor cards (and some Nortel Networks Multiservice Switch 15000 and Multiservice Switch 20000 plug-in modules) and screw-on peripheral equipment such as sparing panels use colored LEDs to indicate operational status. Some control processor (CP) cards and function processor (FP) cards have additional LEDs to indicate the operational status of specific ports on their faceplates. Not all hardware parts have the same number, combination, or orientation of LEDs, The pattern of LED behavior can be different for each type of hardware part when you

- initially install each plug-in part while the system is under power but not yet in service
- add a card or module to an in-service node
- remove a card, cable, module, or other equipment from an

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When handling equipment, be familiar with the behavior of the LEDs for each hardware part as described in the chapter on using status indicator LEDs and sounds in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*. Knowing what each LED pattern is supposed to be will enable you to know when there is a problem with newly installed equipment. For example, a red LED can be transitory and does not necessarily mean a failure has occurred.

Storing and transporting circuit cards

Care is required to store or transport circuit cards or modules.

Store each card or module in its own antistatic material and transportation package to avoid physical or ESD damage or the accumulation of dust on contacts. Be careful not to bump the card or module while packaging it.

Store packaged cards or modules in areas where the relative humidity is less than 95% and the temperature is less than 70 degrees Celsius (158 degrees Fahrenheit). This significantly reduces the chances of warping the circuit board and corrosion of electrical contacts. The nominal storage humidity is 55% and the nominal storage temperature is 20 degrees Celsius (68 degrees Fahrenheit).

Handling cables

See the following sections for information about handling power and processor card cables:

- Power cables (page 30)
- Processor card cables (page 31)

Power cables

A Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000 requires input power cables, which are installed on-site up to the location where the switch's mounting apparatus will be anchored. Planning and installing the power cables in readiness for connecting to the breaker interface panel (BIP) after the NEBS 2000 frame is anchored is typically done during the site preparation for the installation. The cables that distribute power from the input feeds at the BIP to hardware parts in the frame are pre-installed at the time the frame is shipped. The power distribution cables for a second switch are provided even if the second one is not yet installed.

Mount the power cables against the NEBS 2000 frame in bundles on different paths than the signaling cables from the front of the switch. The current from power cables can interfere with the transmission of signals over coax. Route power cables at the rear of the frame.

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When routing the power cables, keep the battery return (positive) and battery (negative) cable pairs together. Otherwise, the cables can behave like antennas that transmit electromagnetic interference (EMI).

See NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for information about routing power cables.

Processor card cables

Keep FPs that use coax cables on the opposite side of the self from FPs that use fiber cables. Mixing FP cable types can cause entangled cables, affect signal quality, and may cause service failure. Keep coax cable clusters separate from power cables to avoid interference.

Hot-swapping hardware parts

Most Nortel Networks Multiservice Switch 15000 and Multiservice Switch 20000 powered components are hot-swappable, which means a plug-in card or module can be replaced while it is powered. No physical damage is caused by the removal or the insertion. The impact of hot-swapping on traffic is determined by the preparation you are instructed to do in software according to the part's replacement procedure.

With the power interface modules (PIMs) that distribute power from the BIP to the shelves, each module must be unplugged before it can be removed. This is a personal safety action because of the amount of voltage that feeds each PIM. Since each cage of a shelf has a pair of redundant PIMs, unplugging one does not affect power to the cage.

Although a fan must be unplugged before removing it to replace it or to access its controller, it is considered hot-swappable because the power to the cooling unit remains on.

Packing and unpacking a processor card or module

Use the procedure Unpacking a processor card or module (page 743) for a new or re-deployed card immediately prior to the installation procedure, or to verify a shipment. If you unpack to verify a shipment, always re-pack the item. Repackaging protects the item, especially from ESD.

Use the procedure Packing a processor card or module (page 532) for a failed or re-deployed card immediately following a removal procedure.

Processor card compatibility

When choosing a processor card to replace, upgrade, or downgrade another card in a slot, the card (new or redeployed) must have a compatible or equivalent product engineering code (PEC). In general, for control processors

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(CPs) to be considered compatible, all eight alphanumerical characters of the PECs must match. For function processors (FPs) to be considered compatible, the first six alphanumerical characters of the PECs must match.

A compatible card or module

- has a PEC with the same first six alphanumerical characters
- typically has more or less functionality distinguished by version increments (for example, an AB card can have more capacity than its AA version)
- usually can be replaced only one way, that is, from an older to a newer vintage (for example, AA to AB) or lower to higher performance specifications (for example, AA to CA), especially if the card slot requires additional software configuration for optimum operation

An equivalent card

- has the same root PEC or a different PEC with the same card type
- supports the same features and services
- operates at different rates of performance
- usually can be replaced either way, that is, interchanged in the same slot without a decrease in services or functionality

See NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*, which identifies for each card type the compatible and equivalent FPs that can be used to replace the FP with the same or increased functionality.

Processor cards also have minimum software requirements. For FP minimum software requirements, see NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*. For CP minimum software requirements, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

If you are in doubt about the compatibility or equivalence of your replacement card, contact your Nortel Networks sales or support representative for assistance. If you must use a card with a different card type or an earlier vintage as a temporary replacement, you must consult Nortel Networks to understand the consequences of the deficiency.

In Multiservice Switch documentation, downgrading a card slot by replacing the card with one of less or different capabilities is treated as a redeployment that involves decommissioning an FP and configuring or re-configuring an empty slot.

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The same applies to the rear plug-in modules of a Multiservice Switch 15000 or Multiservice Switch 20000, with the exception that these modules do not have configurable software.

Backplane pins (To Be Determined)

If the backplane connectors that are shown in the figure "____A fabric of a Multiservice Switch 20000, rear view___", have a fabric cover over them like the one shown in the figure "A protection cover for the fabric backplane connectors (page 34)", remove each cover by pulling one end of the finger hold straight upwards. If you must use two hands, place the fabric face down (lever on the bottom) onto a soft ESD-protection surface. Do not rock or jerk the cover to get it off, or the connector might break.

If the replacement fabric has the covers and the original fabric did not, press the covers onto the connectors of the original fabric. Use the same notch orientation.

Place the fabric on a flat horizontal ESD-protected surface and gently press a protection cover over each row of connector pins. Notice the notch in the figure "A protection cover for the fabric backplane connectors (page 34)". Prevent breaking the connectors by orienting the cover straight over the connector and avoiding lateral force as you press them together.

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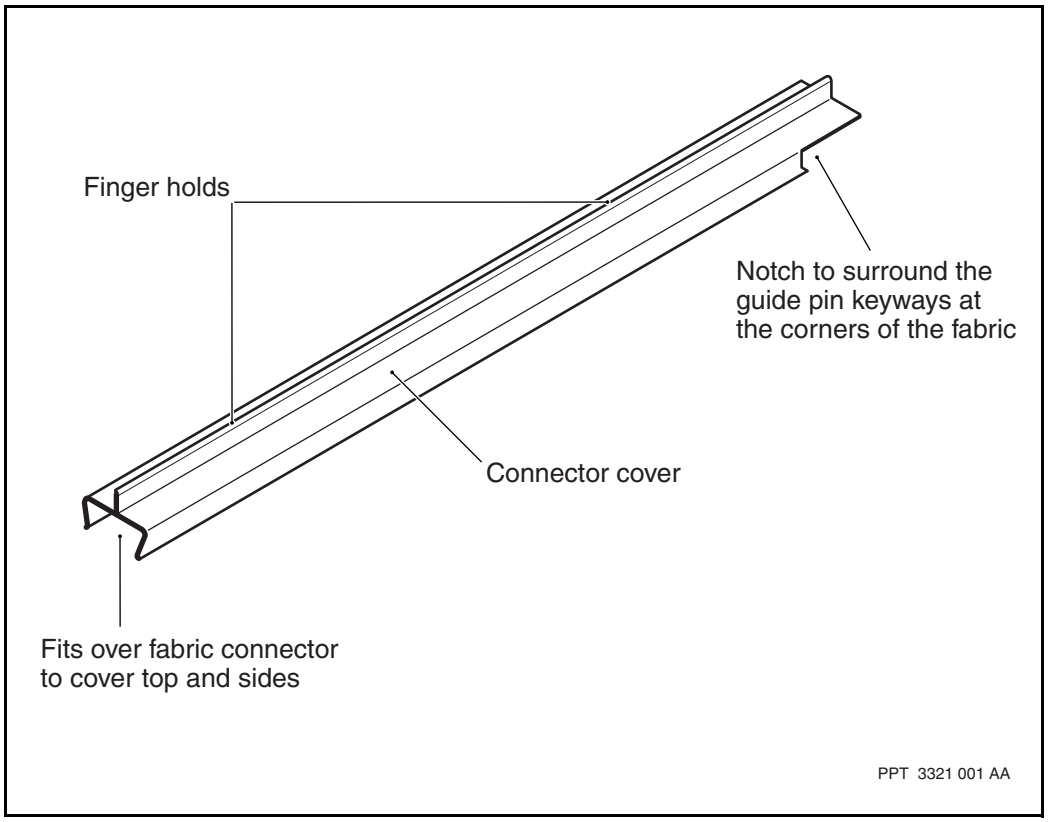
A protection cover for the fabric backplane connectors



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Alarm hardware

Select from the following tasks and procedures to handle any hardware that is involved in the shelf alarm system of a Nortel Networks Multiservice Switch 15000 or a Multiservice Switch 20000:

- BIP alarm module replacement (page 35)
- BIP external alarm cable replacement (page 36)
- Installing a BIP external alarm cable (page 287)

BIP alarm module replacement

Replace a BIP alarm module if it fails.

- Prerequisites to BIP alarm module replacement (page 35)
- Task flow of a BIP alarm module replacement (page 35)

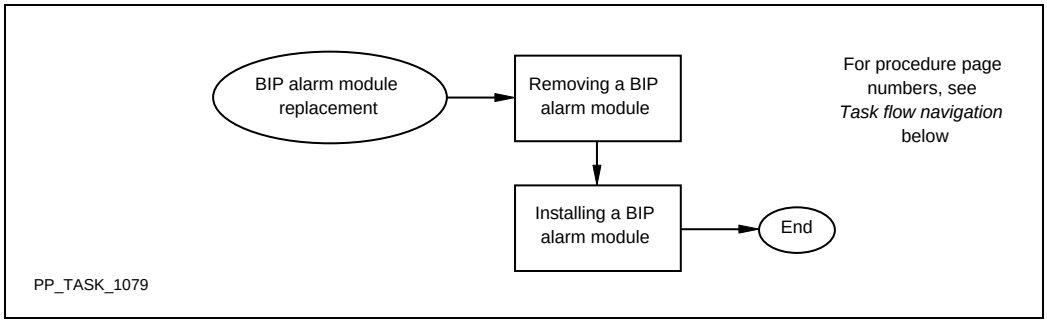
Prerequisites to BIP alarm module replacement

- While the BIP alarm module is removed, the reporting of alarms to the CP are temporarily suspended.

Task flow of a BIP alarm module replacement

This task flow shows the sequence of procedures you do to replace a BIP alarm module in a Multiservice Switch 15000 or Multiservice Switch 20000. To link to any procedure, go to Navigation (page 36).

Task flow of a BIP alarm module replacement



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Navigation

- Installing a BIP alarm module (page 286)
- Removing a BIP (page 545)

BIP external alarm cable replacement

Replace an external alarm cable that runs from the BIP to a piece of customer to set up external alarm reporting. You can also use this task flow for an alarm cable installation.

- Prerequisites to a BIP external alarm cable replacement (page 36)
- Task flow of a BIP external alarm cable replacement (page 36)

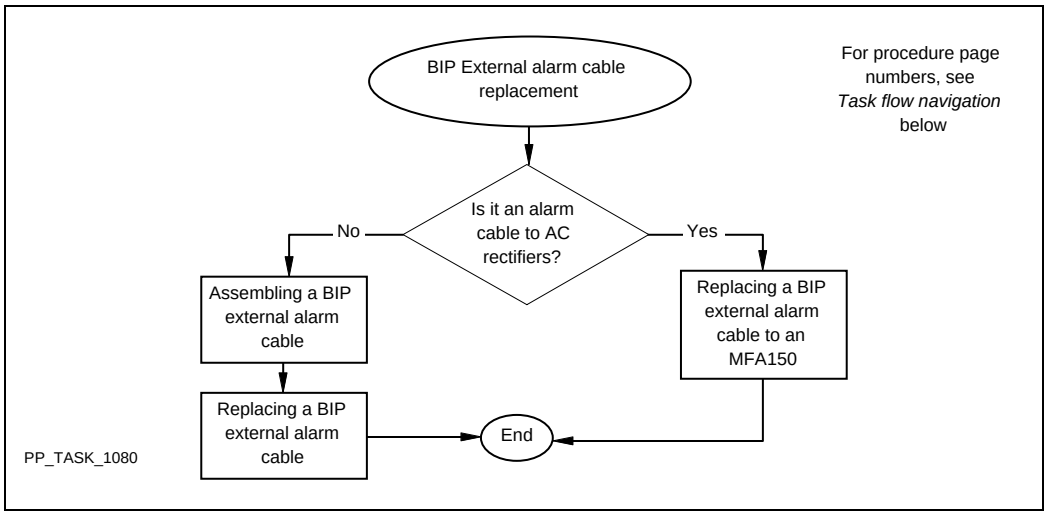
Prerequisites to a BIP external alarm cable replacement

- You must assemble your own cable to replace an external alarm cable. If the BIP is powered by an MFA150 system of ac rectifiers, the external alarm cable may be prefabricated and can be ordered as a field replaceable unit with part number P0940531.
- For a complete list of BIP alarm connections and their features, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Task flow of a BIP external alarm cable replacement

This task flow shows the sequence of procedures you do to install or replace an external alarm cable in a Nortel Networks Multiservice Switch. To link to any procedure, go to Navigation (page 36).

Task flow of a BIP external alarm cable installation



Navigation

- Assembling a BIP external alarm cable (page 159)

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- Replacing a BIP external alarm cable (page 659)
- Replacing a BIP external alarm cable to an MFA150 (page 661)

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Alarm/BITS module

Select from the following tasks and procedures to handle any hardware that is involved in the external timing of a Nortel Networks Multiservice Switch 15000 or a Multiservice Switch 20000:

Navigation

- Alarm/BITS module replacement (page 38)
- Timing cable installation (page 40)
- Timing cable replacement (page 42)
- Replacing an alarm cable assembly to the alarm/BITS module (page 688)

Alarm/BITS module replacement

Replace an alarm/BITS module to restore monitoring for alarms and sending the building integrated timing supply (BITS) signal to the CPs. Do not replace an alarm/BITS module in a Multiservice Switch 15000 without first contacting Nortel Networks technical support.

- Prerequisites to an alarm/BITS module replacement (page 38)
- Task flow of an alarm/BITS module replacement (page 39)

Prerequisites to an alarm/BITS module replacement

- Some of the procedures in this task are not located in this NTP. Ensure you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* and NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*.
- The task of replacing an alarm/BITS module for a Multiservice Switch 15000 is different from that for a Multiservice Switch 20000. A Multiservice Switch 15000 requires you to remove the top fabric card (fabric X) in order to properly align the connectors of the replacement alarm/BITS module.
- The name of the switch is identified on the front of the hardware. The front of an older Multiservice Switch 15000 is blank.

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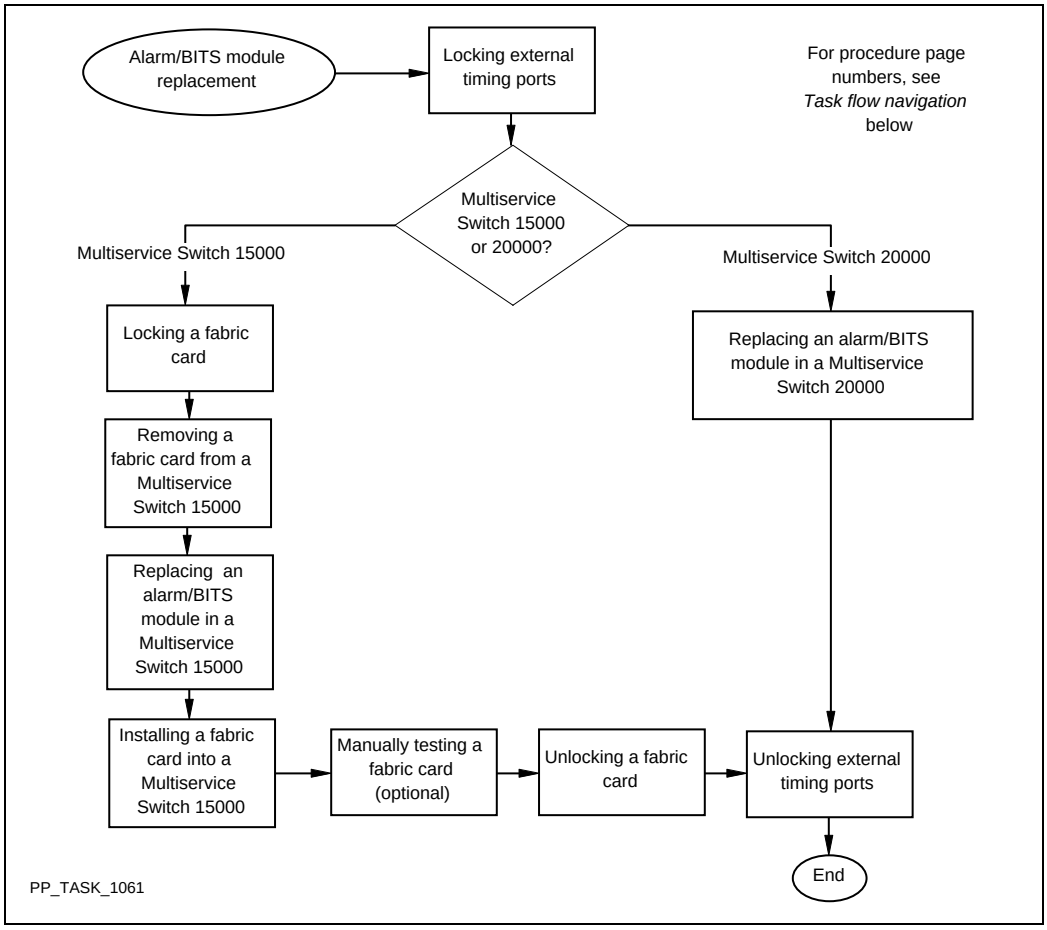
- Following the replacement, have the software operator restore the former timing setup and verify that the network synchronized timing is restarted.
- While the alarm/BITS module has failed or is removed, there is no:
  - BITS timing signal sent to the control processors (CPs)
  - reporting of fabric LED status to the software
  - reporting of any cooling unit alarms to the CPs
  - reporting of any CP alarms to the breaker interface panel (BIP)

Task flow of an alarm/BITS module replacement

This task flow shows the sequence of procedures and tasks to follow to replace an alarm/BITS module in a Multiservice Switch 15000 or Multiservice Switch 20000. To link to any procedure or task, go to Navigation (page 39).

Task flow of an alarm/BITS module replacement



Navigation

- Installing a fabric card into a Multiservice Switch 15000 (page 340)

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- "Locking a fabric card". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- "Locking external timing ports". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- "Manually testing a fabric card". See NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*.
- Removing a fabric card from a Multiservice Switch 15000 (page 566)
- Replacing the alarm/BITS module in a Multiservice Switch 15000 (page 695)
- Replacing the alarm/BITS module in a Multiservice Switch 20000 (page 699)
- "Unlocking a fabric card". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- "Unlocking external timing ports". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Timing cable installation

Install the required timing cables after initial installation of a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000, to enable external timing functionality.

- Prerequisites to a timing cable installation (page 40)
- Task flow of a timing cable installation (page 41)

Prerequisites to a timing cable installation

- A timing cable refers to the cable that runs from the external timing source to the alarm/BITS module or to one of the prefabricated cable assemblies connected to the module.
- Your choices for timing cable installation include:
  - — two pairs of wires from the site BITS source, one pair to each connector on the alarm/BITS module, providing full redundancy
  - — one pair of wires from the site BITS source split to each connector on the alarm/BITS module, providing redundancy only inside the switch
  - — one pair of wires from the site BITS source to one connector on the alarm/BITS module, providing no redundancy
- You need one of the following cable assemblies:

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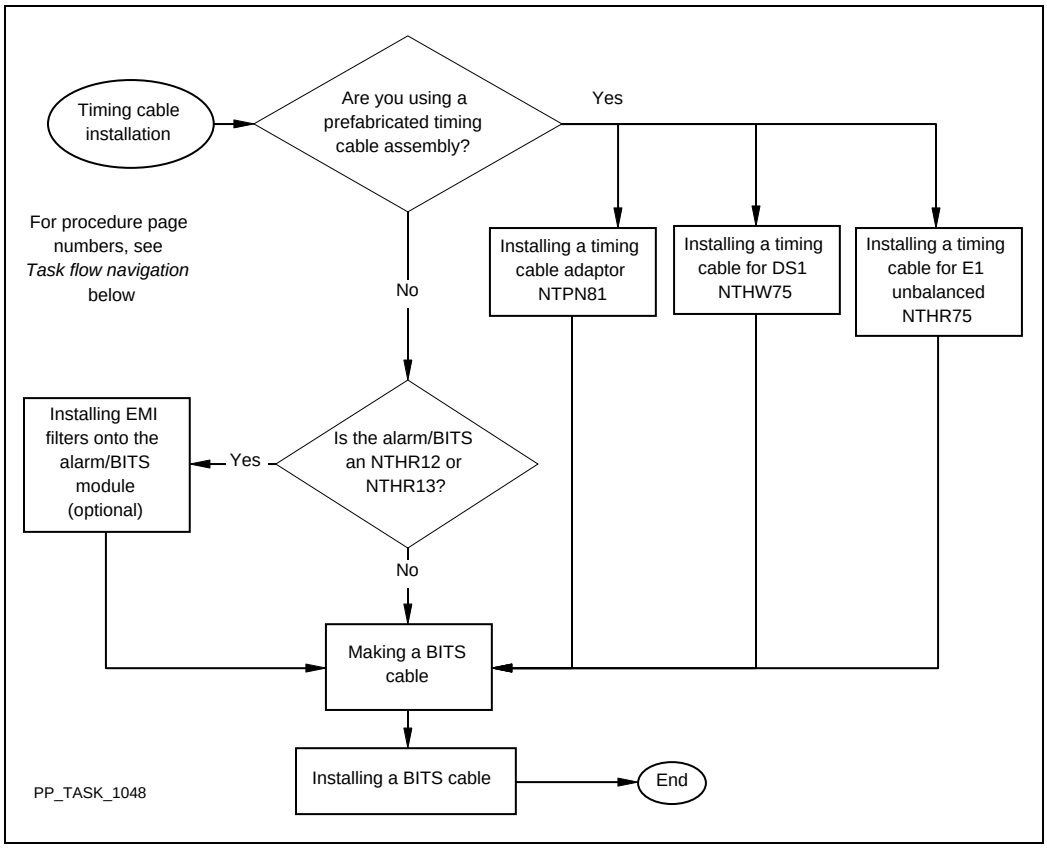
- Some versions of the alarm/BITS module in Multiservice Switch 15000 or Multiservice Switch 20000 have prefabricated cable assemblies, which connect to the module at one end and connect to the site BITS timing source at the other end. Since the alarm/BITS module is pre-installed at the factory, so are its prefabricated cable assemblies. There are two cable assemblies per module for redundant timing signal input.

Task flow of a timing cable installation

This task flow shows the sequence of procedures to install a timing cable. To link to any procedure, go to Navigation (page 41).

Task flow of a timing cable installation



Navigation

- Making a BITS cable (page 526)
- Installing a timing cable adaptor NTPN81 (page 444)
- Installing a timing cable DS1 wire-wrap NTHW75 (page 447)
- Installing a timing cable for E1 unbalanced NTHR75 (page 450)
- Installing EMI filters on the alarm/BITS module (page 489)
- Making a BITS cable (page 526)

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Timing cable replacement

Replace a timing cable, if it fails, to restore the main or redundant external timing reference.

- Prerequisites to a timing cable replacement (page 42)
- Task flow of a timing cable replacement (page 42)

Prerequisites to a timing cable replacement

- Some of the procedures in this task are not located in this NTP. Ensure you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- A timing cable refers to the cable that runs from the external timing source to the alarm/BITS module or to one of the prefabricated cable assemblies connected to the module.
- As soon as the replacement is completed, the former timing activity of this connection is automatically restored. For example, if the connection provided the primary reference, then it becomes the primary again.

Task flow of a timing cable replacement

This task flow shows the sequence of procedures to replace any of the timing cables. To link to any procedure, go to Navigation (page 43).

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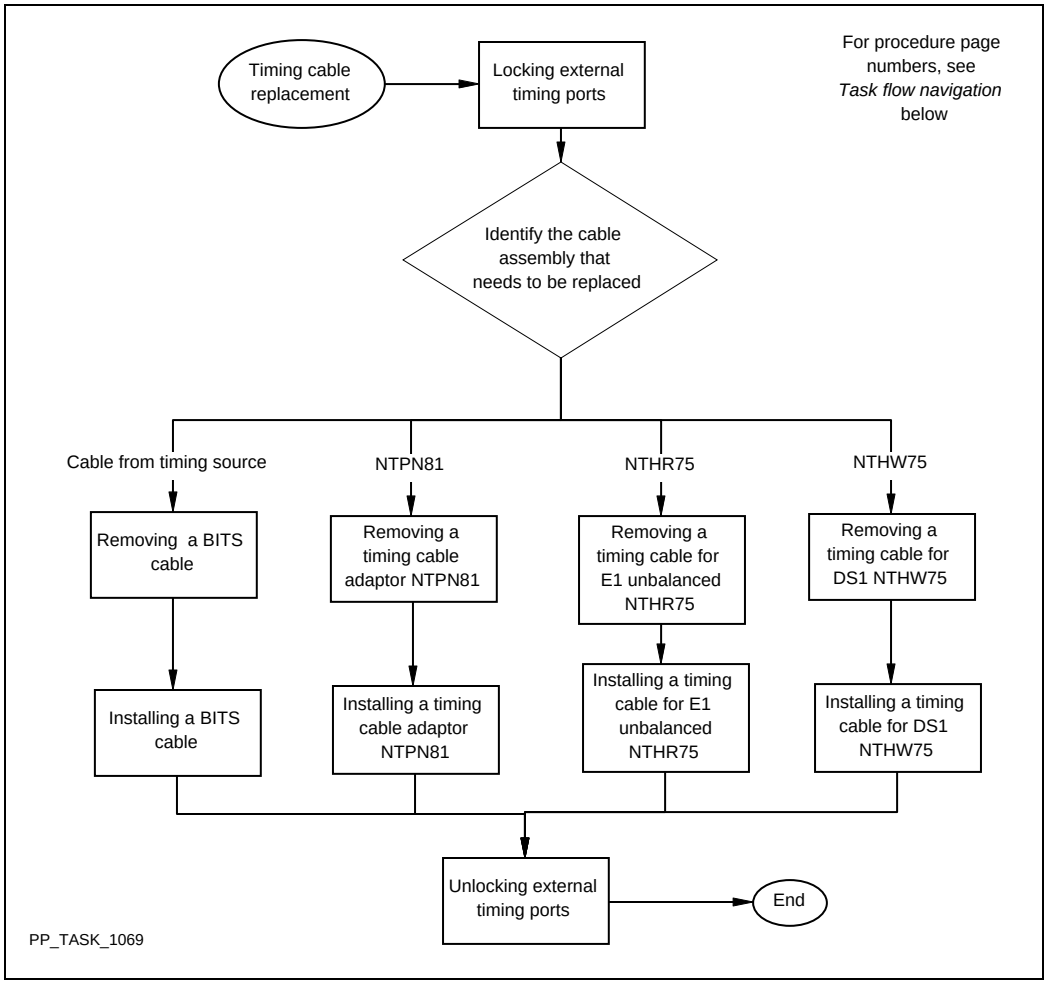
Task flow of a timing cable replacement



Navigation

- Installing a BITS cable (page 296)
- Installing a timing cable adaptor NTPN81 (page 444)
- Installing a timing cable DS1 wire-wrap NTHW75 (page 447)
- Installing a timing cable for E1 unbalanced NTHR75 (page 450)
- “Locking external timing ports”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- Removing a BITS cable (page 548)
- Removing a timing cable adapter NTPN81 (page 624)
- Removing a timing cable for DS1 NTHW75 (page 625)
- Removing a timing cable for E1 unbalanced NTHR75 (page 627)

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- “Unlocking external timing ports” See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

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CP and FP cables and associated hardware

Select from the following tasks and procedures to handle the cables that connect to the faceplate of a control processor (CP) or function processor (FP) that is installed in a Nortel Networks Multiservice Switch 15000 or a Multiservice Switch 20000:

- Cable routing (page 45)
- Connecting a CP Ethernet cable (page 212)
- Connecting a CP local operator terminal cable (page 215)
- Connecting a CP modem cable (page 216)
- Connecting an FP cable (page 234)
- FP cable replacement (page 48)
- SFP module replacement (page 50)
- Replacing a CP Ethernet cable (page 663)

Cable routing

Route cables between equipment to prepare for connecting the cables.

- Prerequisites to cable routing (page 45)
- Task flow of cable routing (page 46)

Prerequisites to cable routing

- See NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* to determine if you need low-density, high-density, or very high-density cable management hardware. Be familiar with the functional differences between the extended cable management brackets, the standard plastic (or metal) brackets, and the paired plastic brackets.
- When the extended cable management brackets are needed to accommodate very high-density coax cables, you must have ensured that the footprint of the NEBS 2000 frame has 8.0 cm (3.25 in.) for the required additional space, or that the brackets were already installed according to

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the task flow NEBS 2000 frame installation (page 104). You should already have addressed the location and spacing of the footprint as part of your site planning as described in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

- You can install both the high-density cable management paired brackets and the extended cable management brackets on either side of the frame or on the same side.

Task flow of cable routing

This task flow shows the sequence of procedures you do to route high- or low-density cables. To link to any procedure, go to Navigation (page 47).

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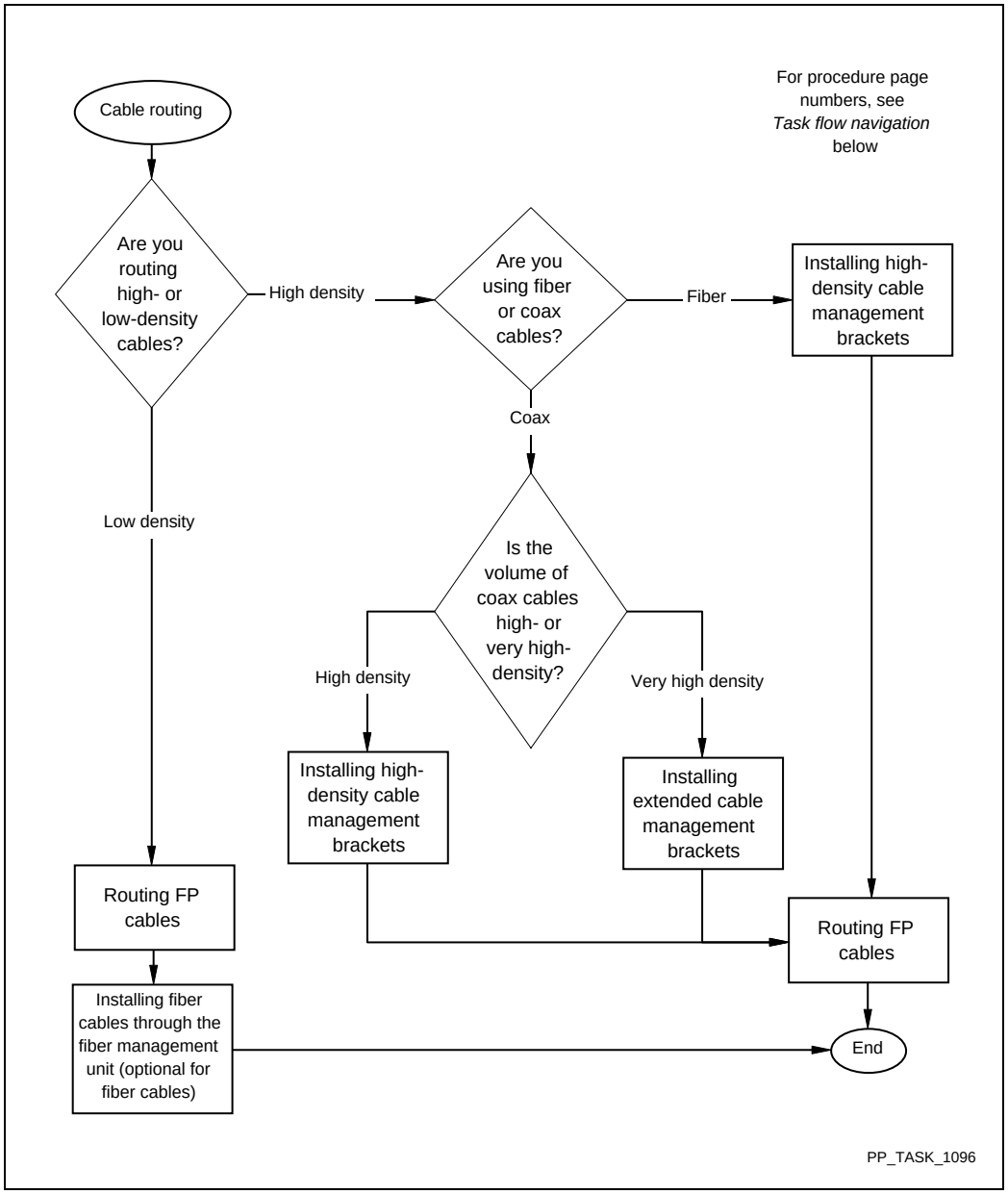
Task flow of cable routing



Navigation

- Installing extended cable management brackets (page 491)
- Installing fiber cables through the fiber management unit (page 495)
- Installing high-density cable management brackets (page 509)
- Routing FP cables (page 707)

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FP cable replacement

Replace an FP cable promptly, if it fails, or as part of a cable or FP upgrade, to restore delivery of configured services.

- Prerequisites to a replacement of a failed FP cable (page 48)
- Task flow of a replacement for a failed FP cable (page 48)

Prerequisites to a replacement of a failed FP cable

- Some of the procedures in this task are not located in this NTP. Ensure you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Unless prefabricated cable assemblies are available from Nortel Networks, you must provide a custom-made replacement cable assembly. For cable specifications refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- Replacing an FP cable has no effect on the switch's performance if FP has an in-service redundant FP configured for equipment protection.

Task flow of a replacement for a failed FP cable

This task flow shows the sequence of procedures you do to replace a failed FP cable. To link to any procedure, go to Navigation (page 49).

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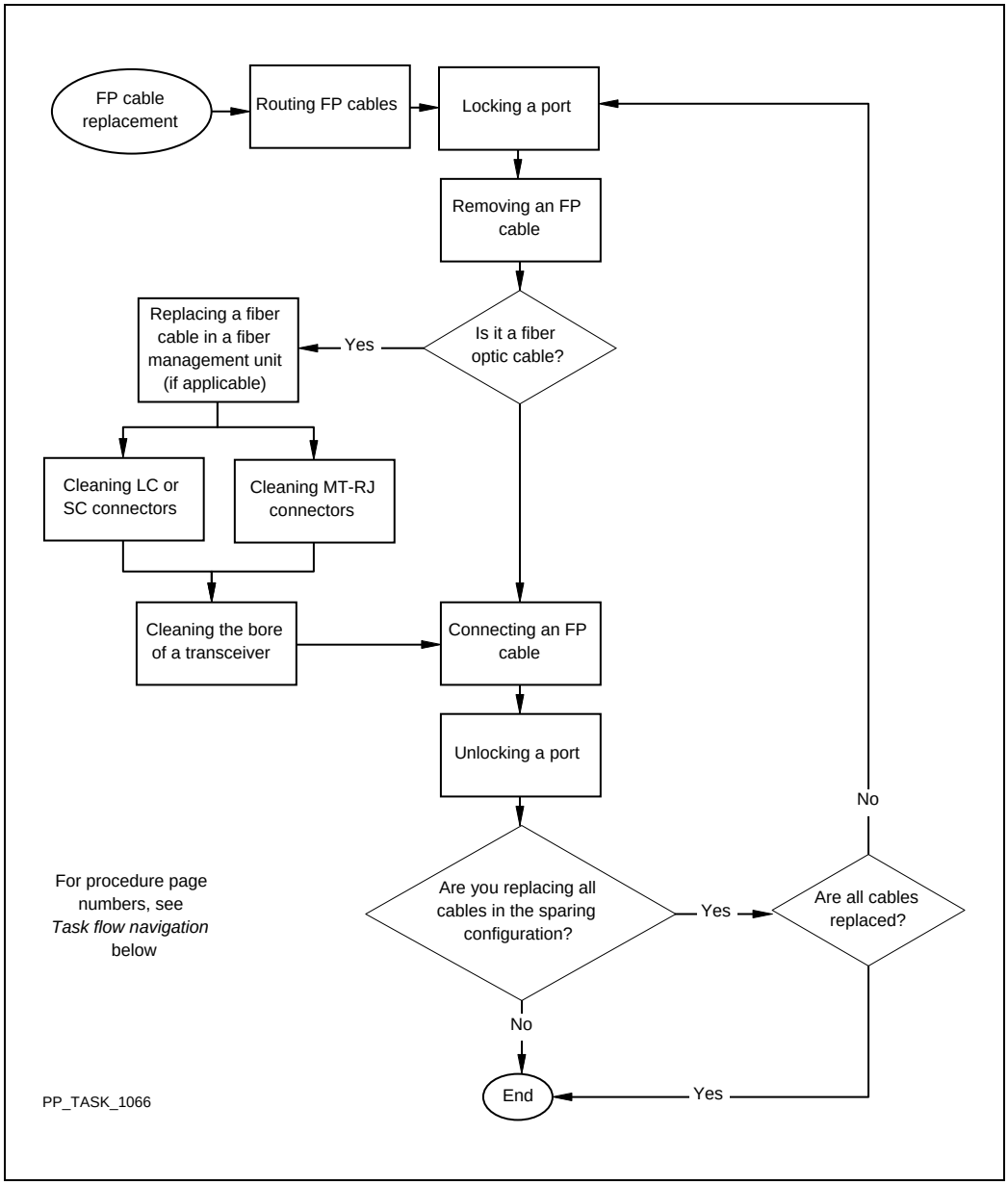
Task flow of FP cable replacement



Navigation

- Cleaning LC or SC connectors (page 202)
- Cleaning MT-RJ connectors (page 206)
- Cleaning the bore of a transceiver (page 209)
- Connecting an FP cable (page 234)
- “Locking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

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- Replacing a fiber cable in a fiber management unit (page 672)
- Removing an FP cable (page 636)
- Routing FP cables (page 707)
- “Unlocking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

SFP module replacement

Replace a failed small-form factor pluggable (SFP) optical module to restore service through the port, or replace it to change the type of SFP module that is to be used by the port.

- Prerequisites to an SFP module replacement (page 50)
- Task flow of an SFP module replacement (page 50)

Prerequisites to an SFP module replacement

- Each type of SFP module has its own PEC. You need a replacement SFP PEC from the list of FPs in the Prerequisites of the procedure Installing an SFP optical module (page 478).
- When changing the signal type for a port, for example, changing it from multimode (MM) to single-mode (SM), ensure that:
  - the other junctions and endpoints of the port connection path are also handling the same type of signal. Nortel Networks does not support using a mix of MM and SM on parts of the same port connection.
  - the replacement SFP module type can handle the total distance of the port connection path
  - you address any required attenuation at either end of the connection. Refer to the procedure Determining if you need to use inline attenuators with optical FPs (page 256).
  - you have FP replacement cables to match the type of signal
- Some of the procedures in this task are not located in this NTP. Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Task flow of an SFP module replacement

This task flow shows the sequence of procedures you must do to replace an SFP module. To link to any procedure, go to Navigation (page 51).

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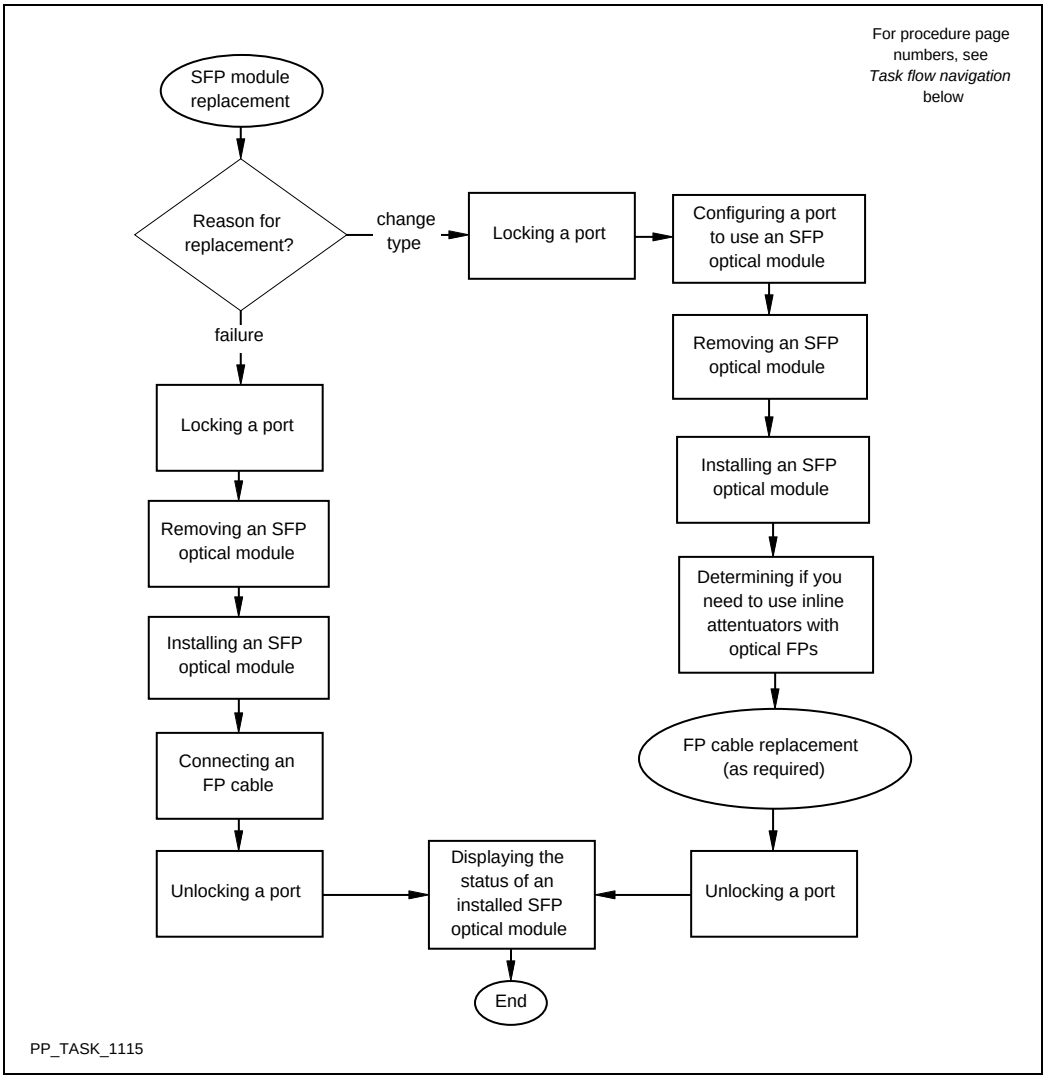
Task flow of an SFP module replacement



Navigation

- "Configuring a port to use an SFP module". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Connecting an FP cable (page 234)
- "Displaying the status of an installed SFP optical module". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Determining if you need to use inline attenuators with optical FPs (page 256)
- FP cable replacement (page 48)

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- Installing an SFP optical module (page 478)
- “Locking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing an SFP optical module (page 639)
- “Unlocking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

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Cooling units

Select from the following tasks and procedures for any hardware that is involved in the cooling of a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000:

- Cooling unit replacement (page 53)
- Fan controller replacement (page 55)
- Fan replacement (page 56)
- Replacing a cooling unit alarm cable (page 667)
- Replacing a cooling unit power cable (page 669)
- Replacing an air filter (page 681)
- Temperature sensor replacement (page 58)
- Temperature sensor bracket assembly replacement (page 60)

When you have a cooling unit to install, see the task flow Installation of a second switch into a NEBS 2000 frame (page 101) or Multiservice Switch installation into an EIA rack (page 112).

Cooling unit replacement

Replace a cooling unit if it fails or to facilitate the replacement of cooling unit parts.

- Prerequisites to cooling unit replacement (page 54)
- Task flow of a cooling unit replacement (page 54)

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Prerequisites to cooling unit replacement

CAUTION
Service degradation or interruption by heat
When the cooling unit of an in-service node loses power, the air temperature inside the shelf rises rapidly. When the temperature inside a fabric exceeds 55 degrees Celsius (131 fahrenheit), high temperasture fabric alarm 7002 0003 is generated. When the temperature exceeds 70 degrees Celsius (158 degrees Fahrenheit), alarm 7012 0059 warns that one or both fabrics will automatically shut down at 72 degrees Celsius (or 161.6 degrees Fahrenheit) until the temperature drops below 68 degrees Celsius (154.4 degrees Fahrenheit).

- You need one of the following versions of the cooling unit:
  - NTHR51AA or NTHR51AB for a lower (rear) cooling unit
  - NTHR52AA or NTHR52AB for an upper (front) cooling unit
- The PEC of the cooling units NTHR51AB and NTHR52AB is visible on its mounting ear. The mounting ears are blank for the NTHR51AA and NTHR52AA versions. To distinguish a lower cooling unit NTHR51AA from an upper unit NTHR52AA, observe the cable connectors that are only on the mounting ear of a lower cooling unit.
- The AA and AB versions of the cooling units are interchangeable, but their parts are not.
- Get a helper to assist the removal and insertion of a cooling unit because it weighs 9.1 kg (20 lbs) and has a tendency to slide out of position when it is unfastened.
- Replacing an entire cooling unit is not necessary because of a part failure, however, the task might be considered a safer method of working around live fan blades or inside tight spaces or both. It should take less than 5 minutes to replace an entire cooling unit.

Task flow of a cooling unit replacement

This task flow shows the sequence of procedures you do to replace a cooling unit. To link to any procedure, go to Navigation (page 55).

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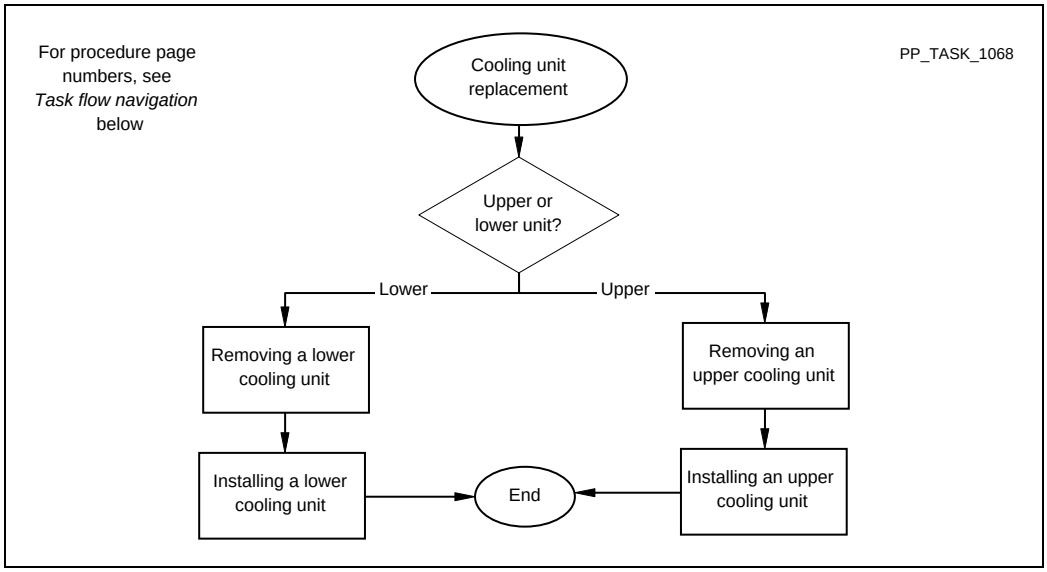
Task flow of a cooling unit replacement



Navigation

- Installing a lower cooling unit (page 375)
- Installing an upper cooling unit (page 482)
- Removing a lower cooling unit (page 590)
- Removing an upper cooling unit (page 643)

Fan controller replacement

Replace a fan controller module to restore fan operation.

- Prerequisites to fan controller replacement (page 55)
- Task flow of a fan controller replacement (page 56)

Prerequisites to fan controller replacement

- You need the appropriate version of a fan controller:
  - NTHR10AA for an NTHR51AA lower (rear) cooling unit
  - NTHR10AB for an NTHR51AB lower (rear) cooling unit
  - NTHR10AA for an NTHR52AA for an upper (front) cooling unit
  - NTHR10AB for an NTHR52AB for an upper (front) cooling unit
- The PEC of the cooling units NTHR51AB and NTHR52AB is visible on its mounting ear. The mounting ears are blank for the NTHR51AA and NTHR52AA versions. To distinguish a lower cooling unit NTHR51AA from an upper unit NTHR52AA, observe the cable connectors that are only on the mounting ear of a lower cooling unit.

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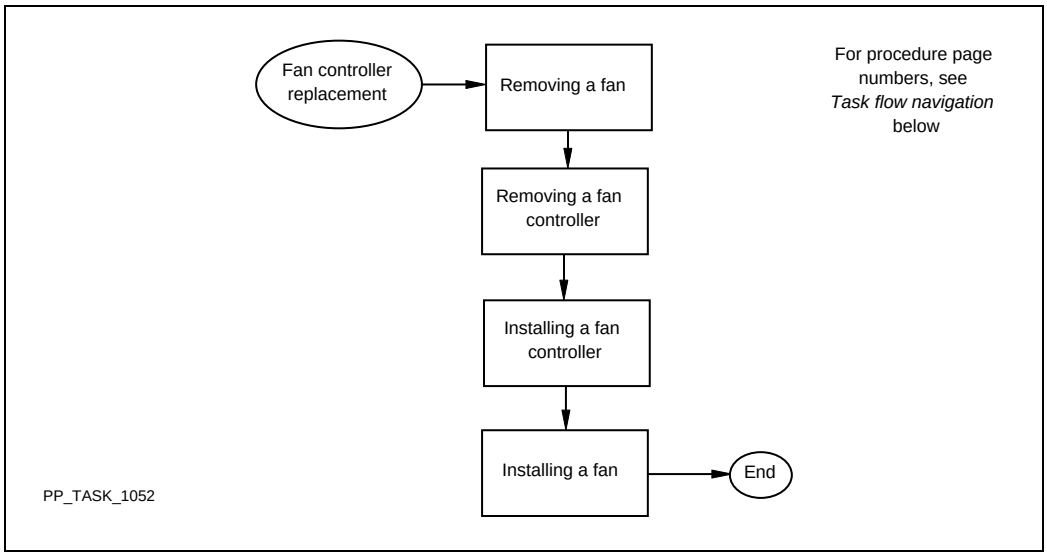
- The AA and AB versions of the cooling units are interchangeable, but their parts are not.
- When a fan still does not operate after replacing the fan and its controller, replace the cooling unit as indicated in Cooling unit replacement (page 53).

Task flow of a fan controller replacement

This task flow shows the sequence of procedures you do to replace a fan controller. To link to any procedure, go to Navigation (page 56).

Task flow of a fan controller replacement



Navigation

- Installing a fan (page 352)
- Installing a fan controller (page 356)
- Removing a fan (page 571)
- Removing a fan controller (page 575)

Fan replacement

Replace a fan promptly, if it fails, to maintain the required temperature in the shelf assembly.

- Prerequisites to fan replacement (page 57)
- Task flow of a fan replacement (page 57)

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Prerequisites to fan replacement

CAUTION
Service degradation or interruption by heat
When the cooling unit of an in-service node loses power, the air temperature inside the shelf rises rapidly. When the temperature inside a fabric exceeds 55 degrees Celsius (131 fahrenheit), high temperasture fabric alarm 7002 0003 is generated. When the temperature exceeds 70 degrees Celsius (158 degrees Fahrenheit), alarm 7012 0059 warns that one or both fabrics will automatically shut down at 72 degrees Celsius (or 161.6 degrees Fahrenheit) until the temperature drops below 68 degrees Celsius (154.4 degrees Fahrenheit).

- You need the appropriate version of a fan:
  - A0758423 for any fan in an NTHR51AA lower (rear) cooling unit or an NTHR52AA upper (front) cooling unit
  - A0522179 for the middle fan of an NTHR51AB lower (rear) cooling unit or an NTHR52AB upper (front) cooling unit
  - A0522182 for either side fan of an NTHR51AB lower (rear) cooling unit or an NTHR52AB upper (front) cooling unit
- The PEC of the cooling units NTHR51AB and NTHR52AB is visible on its mounting ear. The mounting ears are blank for the NTHR51AA and NTHR52AA versions. To distinguish a lower cooling unit NTHR51AA from an upper unit NTHR52AA, observe the cable connectors that are only on the mounting ear of a lower cooling unit.
- The NTHR51AA and NTHR51AB versions of the cooling units are interchangeable, but their parts are not.
- The NTHR52AA and NTHR52AB versions of the cooling units are interchangeable, but their parts are not.
- Minimize the impact or risk of having a fan out of service by always replacing only one fan at a time.
- When a fan still does not operate after replacing the fan and its controller, replace the cooling unit as indicated in Cooling unit replacement (page 53).

Task flow of a fan replacement

This task flow shows the sequence of procedures you do to replace a fan. To link to any procedure, go to Navigation (page 58).

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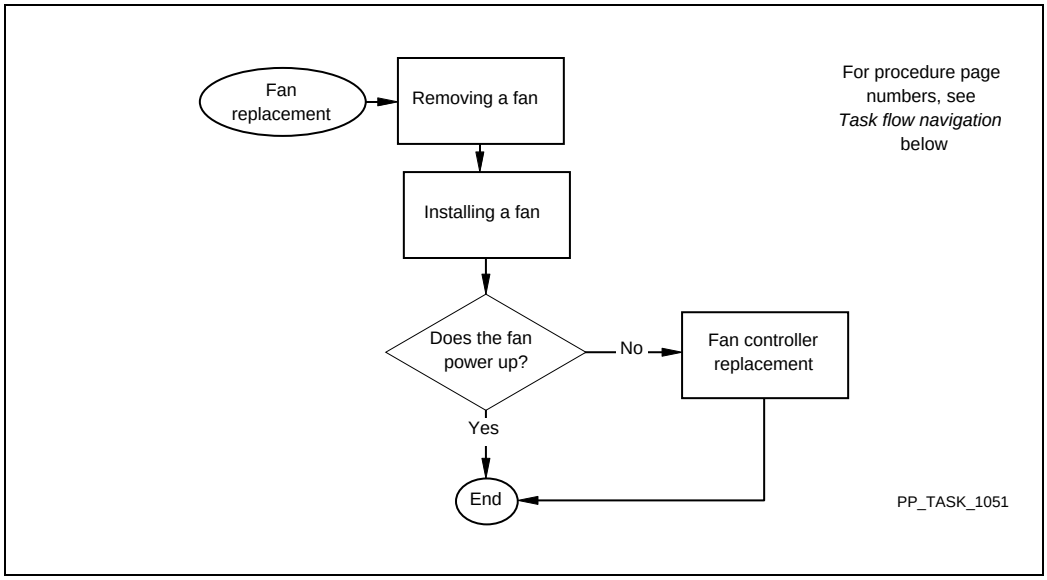
Task flow of a fan replacement



Navigation

- Fan controller replacement (page 55)
- Installing a fan (page 352)
- Removing a fan (page 571)

Temperature sensor replacement

Replace a temperature sensor if it fails.

- Prerequisites to temperature sensor replacement (page 58)
- Task flow of a temperature sensor replacement (page 59)

Prerequisites to temperature sensor replacement

- You need the appropriate version of temperature sensor:
  - NTCC8938 (or A0647397) for the temperature sensor inside an NTHR51AA lower (rear) cooling unit
  - A0521940 for the temperature sensor inside an NTHR51AB lower (rear) cooling unit
  - NTCC8938 (or A0647397) for the temperature sensor on the bracket assembly NTHR68AA used with an NTHR52AA upper (front) cooling unit
  - A0521944 for the temperature sensor on the bracket assembly NTHR68AB used with an NTHR52AB upper (front) cooling unit
- The NTCC8938 (or A0647397) and A0521944 temperature sensors are not interchangeable and can only be used with the indicated equipment.

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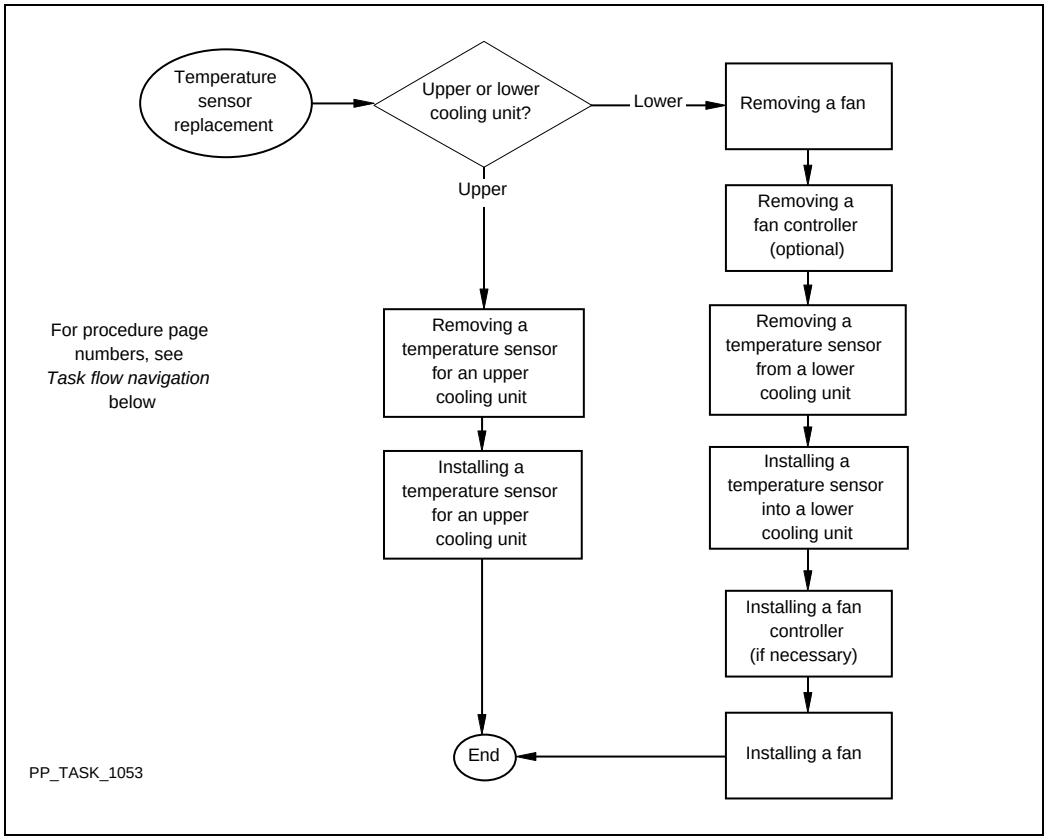
- The PEC of the cooling units NTHR51AB and NTHR52AB is visible on its mounting ear. The mounting ears are blank for the NTHR51AA and NTHR52AA versions. To distinguish a lower cooling unit NTHR51AA from an upper unit NTHR52AA, observe the cable connectors that are only on the mounting ear of a lower cooling unit.
- The PEC of the temperature sensor bracket assembly with version AB is visible on the installed bracket. The AA version is not visible.

Task flow of a temperature sensor replacement

This task flow shows the sequence of procedures you do to replace a temperature sensor. To link to any procedure, go to Navigation (page 59).

Task flow of a temperature sensor replacement



Navigation

- Connecting a temperature sensor cable assembly (page 227)
- Installing a fan (page 352)
- Installing a fan controller (page 356)
- Installing a temperature sensor for an upper cooling unit (page 436)
- Installing a temperature sensor inside a lower cooling unit (page 439)

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- Removing a fan (page 571)
- Removing a fan controller (page 575)
- Removing a temperature sensor for an upper cooling unit (page 617)
- Removing a temperature sensor from a lower cooling unit (page 620)

Temperature sensor bracket assembly replacement

Replace an upper cooling unit temperature sensor bracket assembly to restore optimum cooling by the fans.

- Prerequisites to temperature sensor bracket assembly replacement (page 60)
- Task flow of a temperature sensor bracket assembly replacement (page 60)

Prerequisites to temperature sensor bracket assembly replacement

- You need the appropriate version of temperature sensor assembly bracket:
  - NTHR68AA used with an NTHR52AA upper (front) cooling unit
  - NTHR68AB used with an NTHR52AB upper (front) cooling unit
- The NTCC8938 (or A0647397) and A0521944 (the latter from NTHR68) temperature sensors are not interchangeable on the bracket assembly and can only be used with the indicated equipment.
- The PEC of the cooling units NTHR51AB and NTHR52AB is visible on its mounting ear. The mounting ears are blank for the NTHR51AA and NTHR52AA versions. To distinguish a lower cooling unit NTHR51AA from an upper unit NTHR52AA, observe the cable connectors that are only on the mounting ear of a lower cooling unit.
- The PEC of the temperature sensor bracket assembly with version AB is visible on the installed bracket. The AA version is not visible.
- The lower cooling unit does not have a temperature sensor bracket assembly that can be removed.

Task flow of a temperature sensor bracket assembly replacement

This task flow shows the sequence of procedures you do to replace a temperature sensor bracket assembly. To link to any procedure, go to Navigation (page 61).

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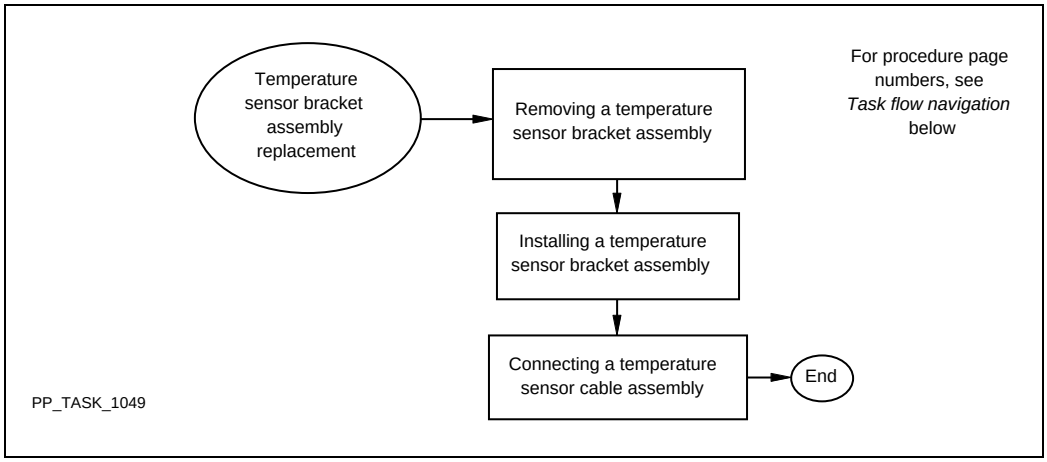
Task flow of a temperature sensor bracket assembly replacement



Navigation

- Connecting a temperature sensor cable assembly (page 227)
- Installing a temperature sensor bracket assembly (page 431)
- Removing a temperature sensor bracket assembly (page 615)

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Control processors

Select from the following tasks and procedures to handle a control processor (CP) of a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000:

- CP upgrade (page 62)
- Failed CP replacement (page 64)

For CP cabling tasks see CP and FP cables and associated hardware (page 45).

CP upgrade

Upgrade CPs in your shelf assembly to increase functionality. Upgrading means replacing a CP that is already installed with one of a higher PEC version.

- Prerequisites to a CP upgrade (page 62)
- Task flow of a CP upgrade (page 63)

Prerequisites to a CP upgrade

CAUTION
Risk of service loss from inappropriate firmware
In a Multiservice Switch 15000, the CP3 card supports only release 1.3 software or later. Upgrade the software, if necessary, before inserting a CP3. If the CP3 card is loaded with firmware from pre-1.3 software, it will crash. In this particular situation, a crashed CP3 cannot be recovered on site because its flash memory for firmware must be reprogrammed at Nortel Networks.

CAUTION
Risk of service loss from shelf reset
If you attempt to change the activity of CPs when the backup is unavailable (in-service and connected), the Multiservice Switch 15000 or Multiservice Switch 20000 undergoes a reset to try resolving not being able to find the backup.

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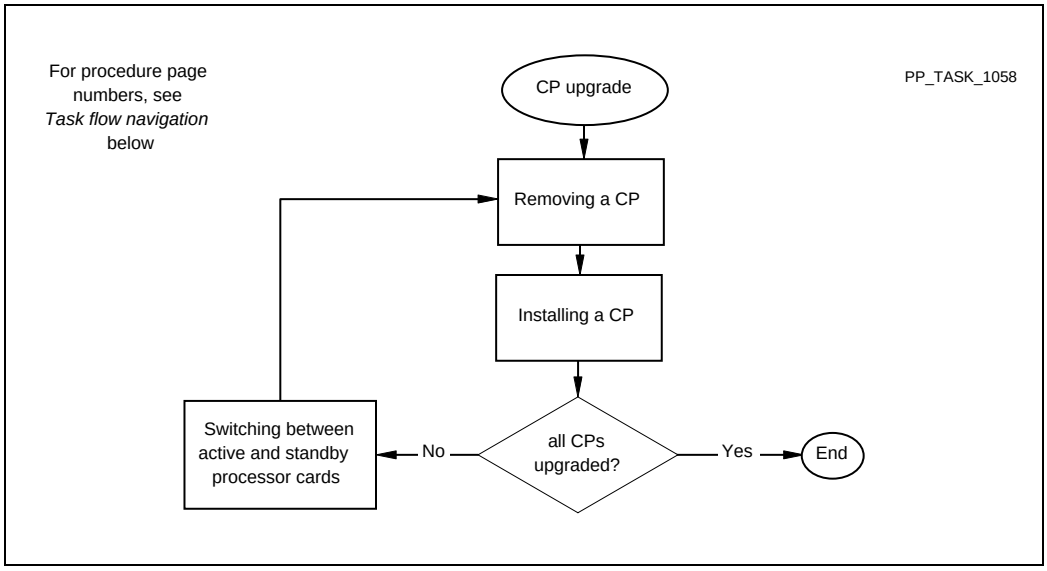
- A Multiservice Switch 20000 only supports CP3s with PEC NTHW06 or NTHW08.
- Ensure that the appropriate level of software is installed. To verify the minimum software requirements of the CPs, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- When upgrading an unspared CP, the entire node will be out of service while the CP is replaced and the replacement is configured in software.
- Ensure that the file system is synchronized.

Task flow of a CP upgrade

This task flow shows the sequence of procedures you do to upgrade a CP in a Multiservice Switch. To link to any procedure, go to Navigation (page 63).

Task flow of a CP upgrade



Navigation

- Installing a CP (page 306)
- Removing a CP (page 559)
- “Switching between active and standby processor cards” See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

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Failed CP replacement

Replace a failed CP to restore services and redundancy.

- Prerequisites to a failed CP replacement (page 64)
- Task flow of a failed CP replacement (page 64)

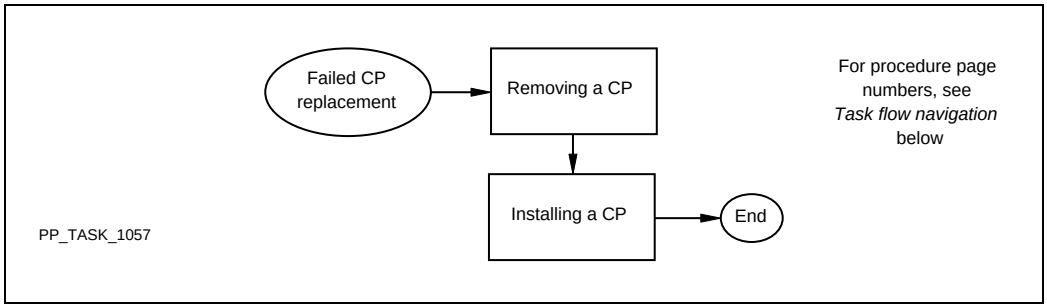
Prerequisites to a failed CP replacement

- A Multiservice Switch 20000 supports using only CP3s with PEC NTHW06 or NTHW08.
- When you are redeploying a CP, the software on it must be the same as the software running on the node. When redeploying a CP from a Multiservice Switch 15000 into a Multiservice Switch 20000, only CP3s loaded with PCR 3.1 software level or later will operate.

Task flow of a failed CP replacement

This task flow shows the sequence of procedures you do to replace a failed CP in a switch. To link to any procedure, go to Navigation (page 64).

Task flow of a failed CP replacement



Navigation

- Installing a CP (page 306)
- Removing a CP (page 559)

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Fabrics

Use the following task to handle the fabric cards of a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000.

Replace a fabric card to restore load-sharing of traffic after having been removed from service by the system or to upgrade to a new hardware version.

- Prerequisites to fabric replacement (page 65)
- Task flow of a fabric replacement (page 66)

Prerequisites to fabric replacement

- Replacing a fabric is a time-sensitive task.
- Seating a fabric is a relatively complex series of actions. If a fabric is not properly seated, it may not operate correctly and EMI containment is jeopardized.
- When the system has automatically disabled the fabric (removed it from service) because it exceeds a temperature threshold, alarm 7002 0003 is generated. The solid red LED status is the same for a failed fabric as for a fabric undergoing a temperature shutdown. Ensure that you are replacing a failed fabric.
- Once the writable bank is loaded with fabric firmware, it automatically becomes the active bank, controlling the operation of the fabric card. When a download succeeds, the system commits the writable bank, ensuring that the new firmware is used thereafter by a shelf reset. If the download fails, the writable bank retains the firmware that was present before the download.
- Replacing a fabric typically means by one of the same vintage.
- Upgrading a fabric typically means replacing both fabrics with the same later vintage.
- When replacing a Multiservice Switch 15000 fabric that has a pre-EA version with an NTHR16EA, the activity is considered an upgrade. To operate at full capability, the EA version needs the shelf to have CP3s and the switch to be running PCR 6.1 GA, 5.1.4, or 5.2.3, or an earlier PCR with the fabric software patch. Otherwise the NTHR16EA will operate the

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same as its mate. Note, however, that there is no impact to the customer should the customer decide not to apply the fabric software patch.

- When you must operate an NTHR16EA without the feature software or the patch for it, the fabric firmware runs mismatched and you will have to ignore the alarms 7002 0005 that indicate a driver mismatch.

Task flow of a fabric replacement

This task flow shows the sequence of procedures you do to replace a fabric in a Multiservice Switch 15000 or Multiservice Switch 20000. To link any procedure, go to Navigation (page 68).

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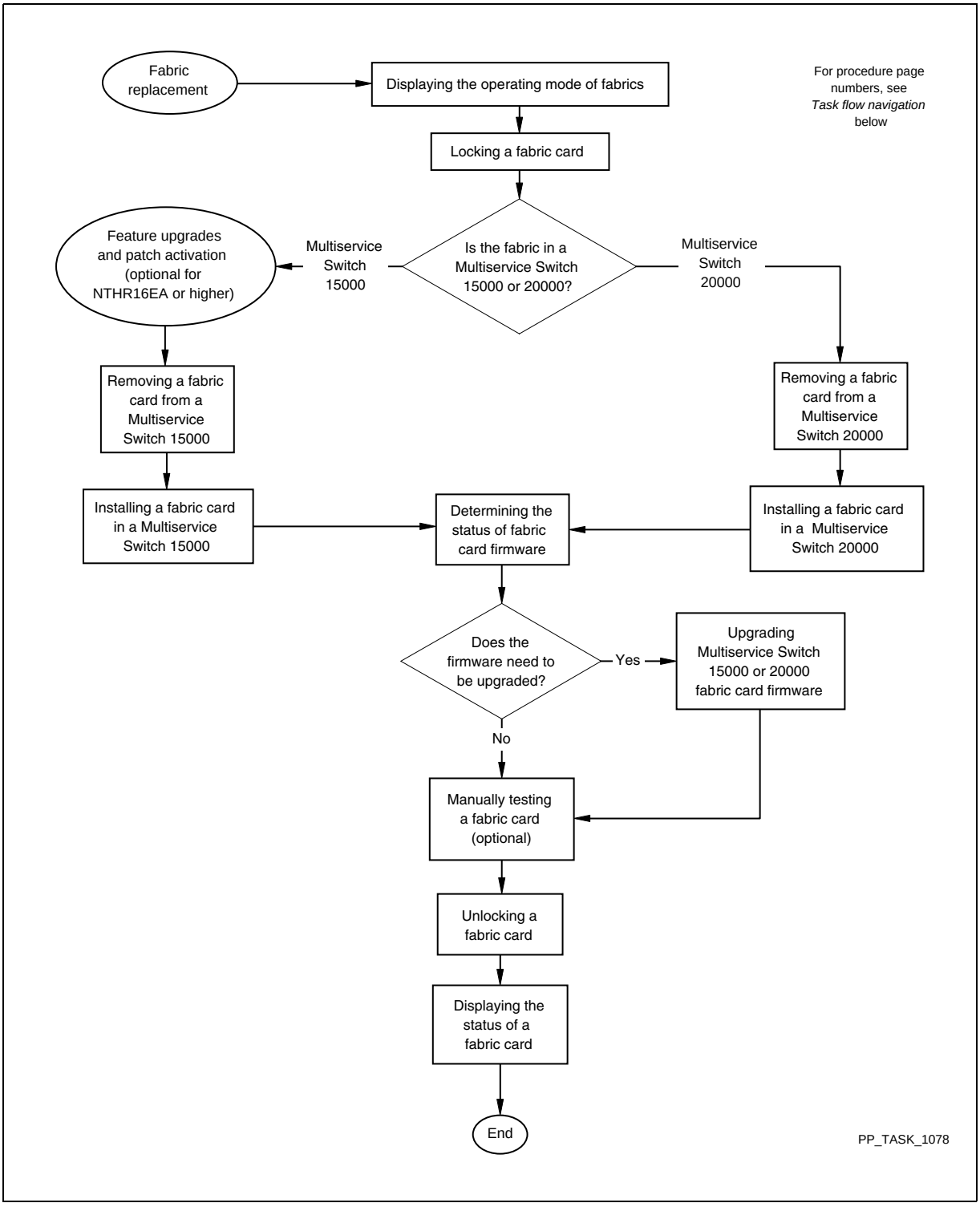
Task flow of a fabric replacement



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Navigation

- “Determining the status of fabric card firmware”. See NN10600-272 *Nortel Networks Multiservice Switch 7400/15000/20000 Upgrading Software*.
- “Displaying the operating mode of fabrics”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- “Displaying the status of a fabric card”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*
- “Feature upgrades and patch activation”. See NN10600-272 *Nortel Networks Multiservice Switch 7400/15000/20000 Upgrading Software*.
- Installing a fabric card into a Multiservice Switch 15000 (page 340)
- Installing a fabric card into a Multiservice Switch 20000 (page 345)
- “Locking a fabric card”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Manually testing a fabric card”. See NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*.
- Removing a fabric card from a Multiservice Switch 15000 (page 566)
- Removing a fabric card from a Multiservice Switch 20000 (page 568)
- “Unlocking a fabric card”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Upgrading Multiservice Switch 15000 and Multiservice Switch 20000 fabric card firmware”. See NN10600-272 *Nortel Networks Multiservice Switch 7400/15000/20000 Upgrading Software*.

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NEBS 2000 frame accessories

Frame accessories include optional enclosure hardware and optional cable management hardware for a NEBS 2000 frame. Enclosure hardware includes doors, side panels, and top frame covers as shown in the figure Frame enclosure hardware, exploded view (page 70). Cable management hardware includes the extended cable management brackets and front and rear covers. Handle an accessory for a NEBS 2000 frame by selecting from the following alphabetical tasks and procedures:

- Door installation onto a NEBS 2000 frame (page 70)
- Door hardware removal from a NEBS 2000 frame (page 77)
- Illuminated brandline cover installation (page 80)
- NEBS 2000 frame enclosure installation (page 82)
- Installing a shelf filler panel (page 408)
- Installing a top cover onto a frame bracket (page 452)
- Installing a top frame bracket onto a NEBS 2000 frame (page 459)
- Side panel installation onto a NEBS 2000 frame (page 83)
- Removing a filler panel (page 581)
- Removing a side frame panel, regular or extended sizes (page 609)

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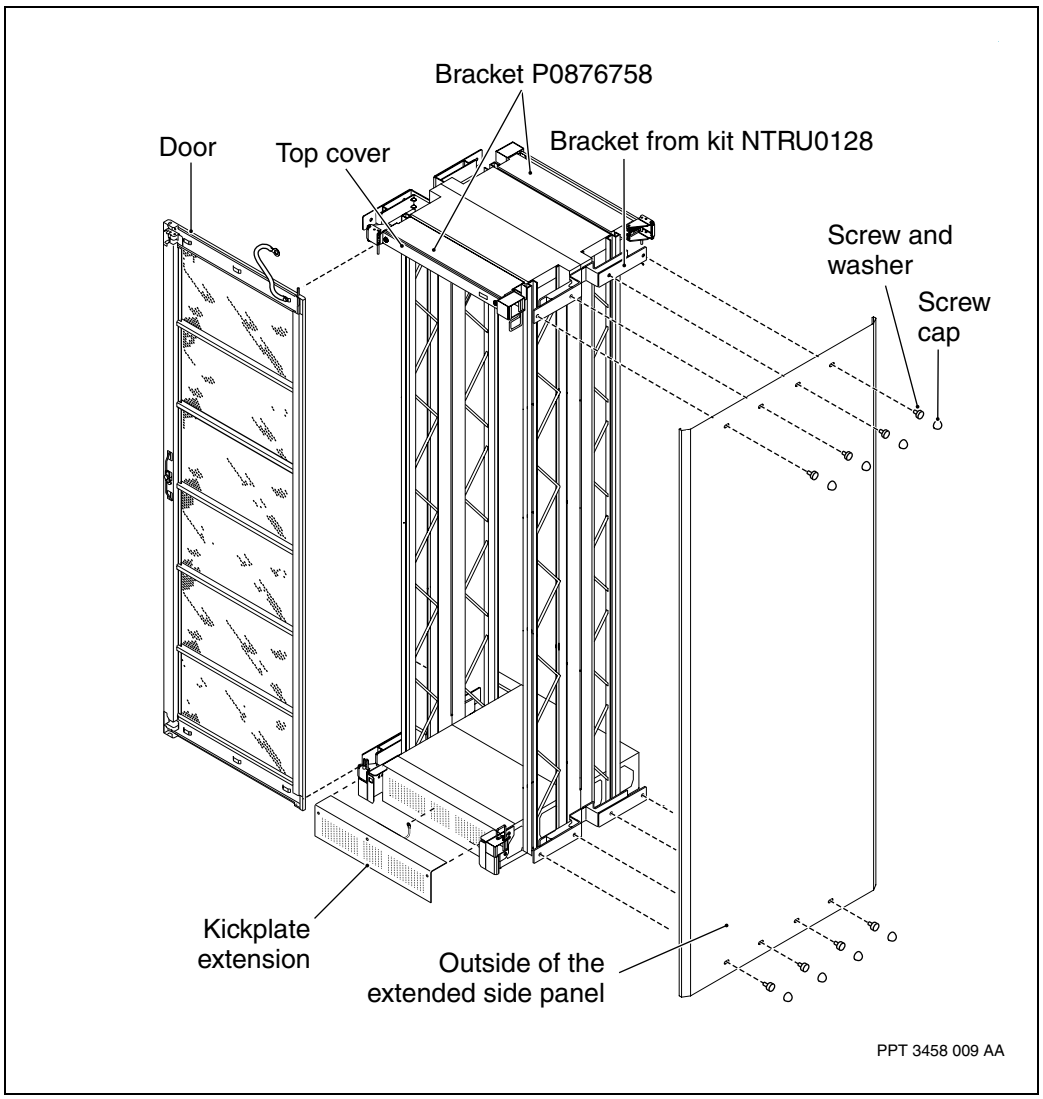
Frame enclosure hardware, exploded view



Door installation onto a NEBS 2000 frame

Install a door and its mounting hardware onto the front or rear (or both) of a NEBS 2000 frame to control access to Nortel Networks Multiservice Switch hardware or other equipment.

- Prerequisites to door installation onto a NEBS 2000 frame (page 70)
- Task flow of a door installation onto a NEBS 2000 frame (page 75)

Prerequisites to door installation onto a NEBS 2000 frame

- You need one of the following door kits:
  - — NTQS37AA, which contains 2 doors (NTRU0423), door mounting hardware (NTRU0192), and the frame extension kit (NTPX4060)

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— NTQS37AB, which contains the same contents as NTQS37AA plus an illuminated brandline cover NTPN53

- You need these tools:
  - — a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - — a driver to fasten the very large slotted captive screws of the cover as shown in the figure Types of screws used with frame enclosure hardware (page 74)
  - — if a frame ground cable needs to be disconnected, a driver for the very large slotted pan-head screws P0883403 as shown in the figure Types of screws used with frame enclosure hardware (page 74) and a 10-cm (4-in.) shaft to reach through the bracket to the cable lug
  - — a driver for a 10-mm (3/8-in.) thread-forming hex-head mounting screw P0601478 as shown in the figure Types of screws used with frame enclosure hardware (page 74) with a 10-cm (4-in.) reach past the front of the bracket to the frame uprights as shown in the figure Locations of installed brandline covers and top frame brackets (page 462)
  - — a driver to fasten very large Pozidriv screws as shown in the figure Types of screws used with frame enclosure hardware (page 74)
  - — a driver for a 6-mm (1/4-in.) KEPS nut P0601382
  - — a driver for medium-sized slotted captive screws on the kickplate extension
  - — a flashlight to see inside the frame base where screw holes must be aligned
- When the NEBS 2000 frame is not already installed as indicated by NEBS 2000 frame installation (page 104), you must ensure that the increased frame footprint from adding the door hardware can be accommodated where you plan to anchor the frame. Information regarding the effects of adding the enclosure hardware are identified in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- Whether the NEBS 2000 frame is already anchored or not, for each door that is to be added you must ensure that there is enough space
  - — to safely add the door extension hardware at the upper front or rear corners of the frame
  - — to safely accommodate increasing the frame footprint by 6.6 cm (2 5/8 in.) for each added door, as shown in the figure Clearance to swing a door open on a NEBS 2000 frame (page 73)

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Attention: If clearance is not available, for example, the frame is already installed, an unlocked door can easily be removed to enable access to switches inside the frame. Use the procedures Removing a door (page 561) and Installing a door (page 314).

- The door kit NTQS37AA or NTQS37AB is not intended to be used with the following other frame accessories:
  - extended cable management brackets (NTRU0368 or NTRU0369)
  - front or rear frame panels from kit NTRU0366
  - frame spacer hardware from kit NTR0365
  - side panels, regular sized from kit NTRU0128
- When adding a door hides an installed shelf filler panel, as shown in the figure Location of the front shelf filler panel (page 409), the panel may no longer be required for your hardware configuration.
- The front of a NEBS 2000 frame is the face that presents the rows housing the vertical cards installed in the shelf assembly.
- For the installed location of an illuminated brandline cover, see the figure A door in relation to extension hardware (page 75).

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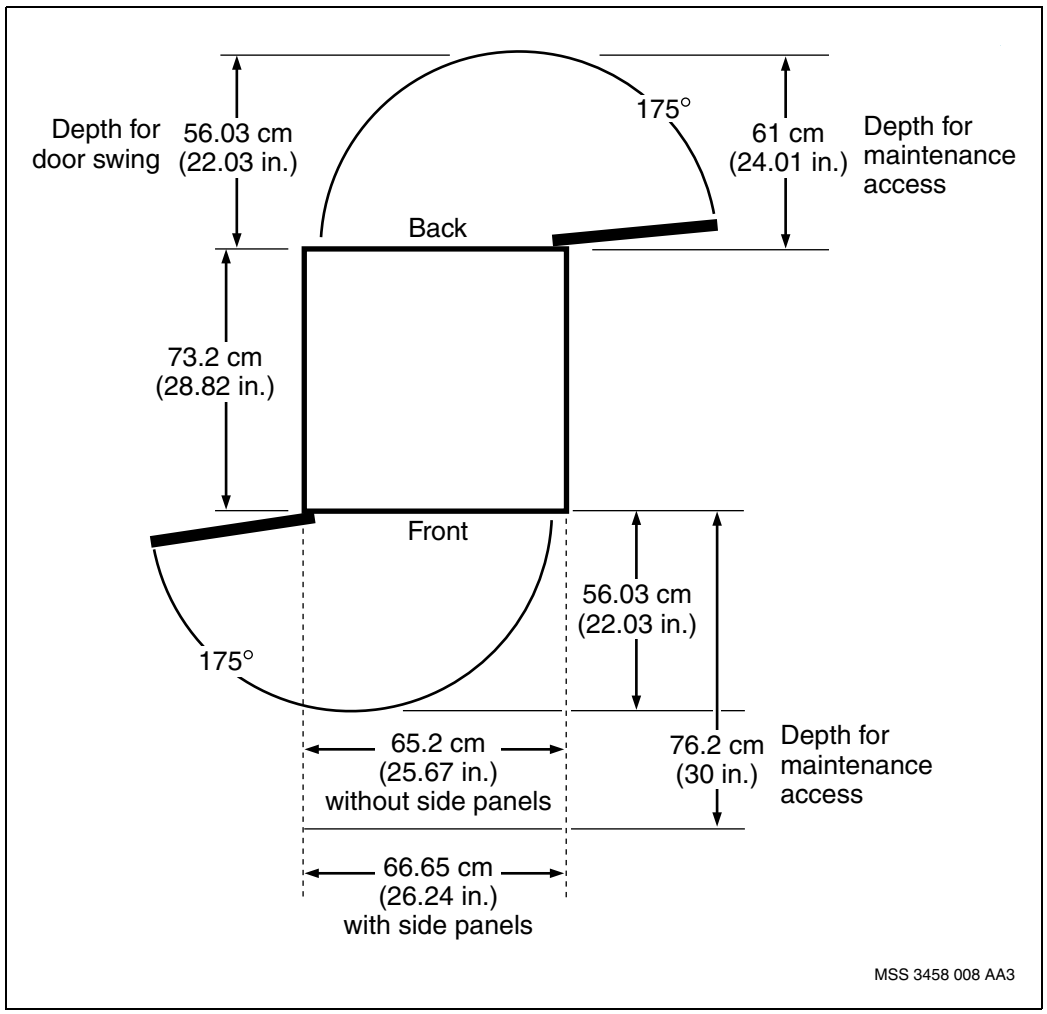
Clearance to swing a door open on a NEBS 2000 frame



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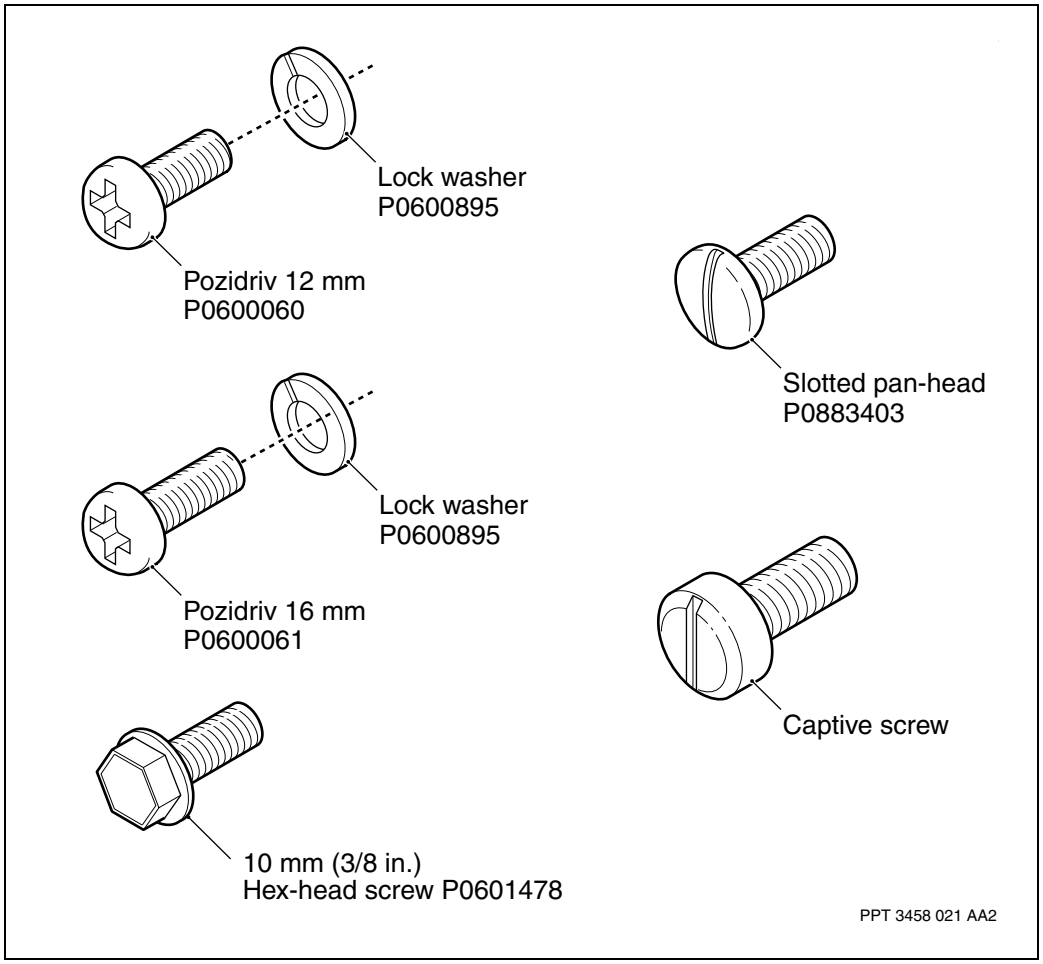
Types of screws used with frame enclosure hardware



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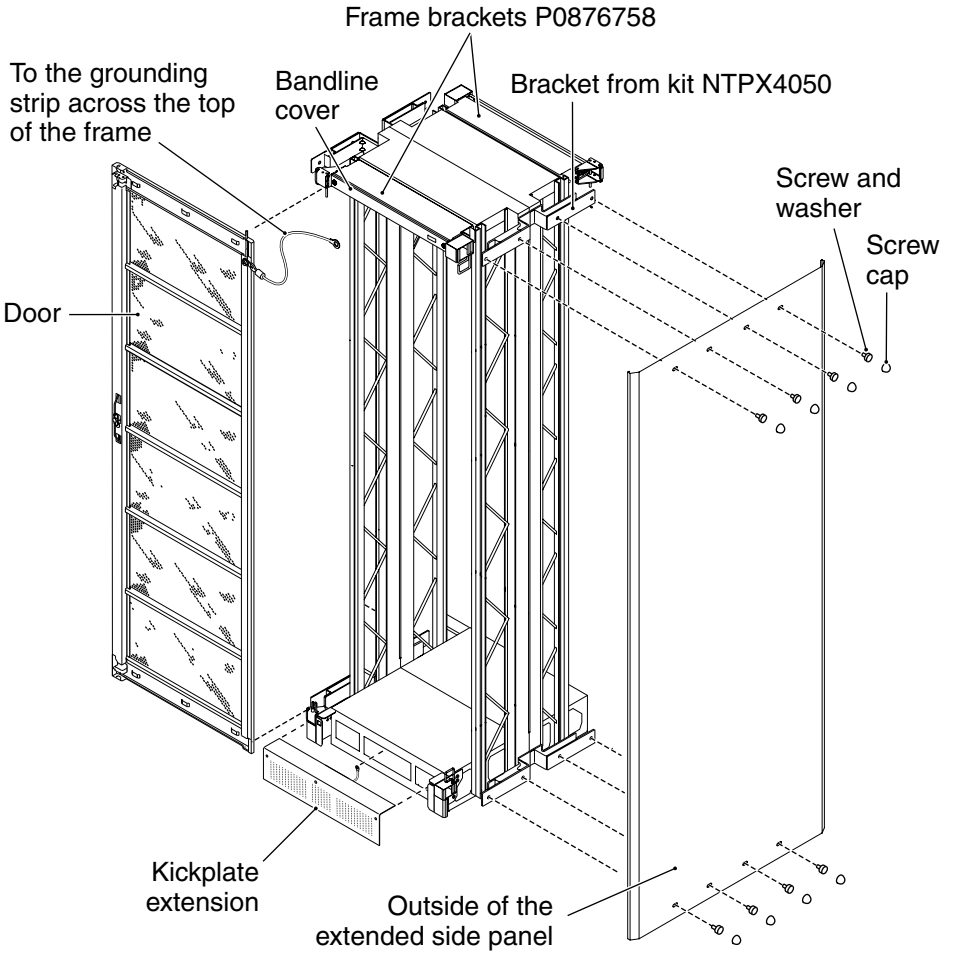
A door in relation to extension hardware



Task flow of a door installation onto a NEBS 2000 frame

This task flow shows the sequence of procedures you do to install a door onto the front or rear of a NEBS 2000 frame. To link to any procedure, go to Navigation (page 76).

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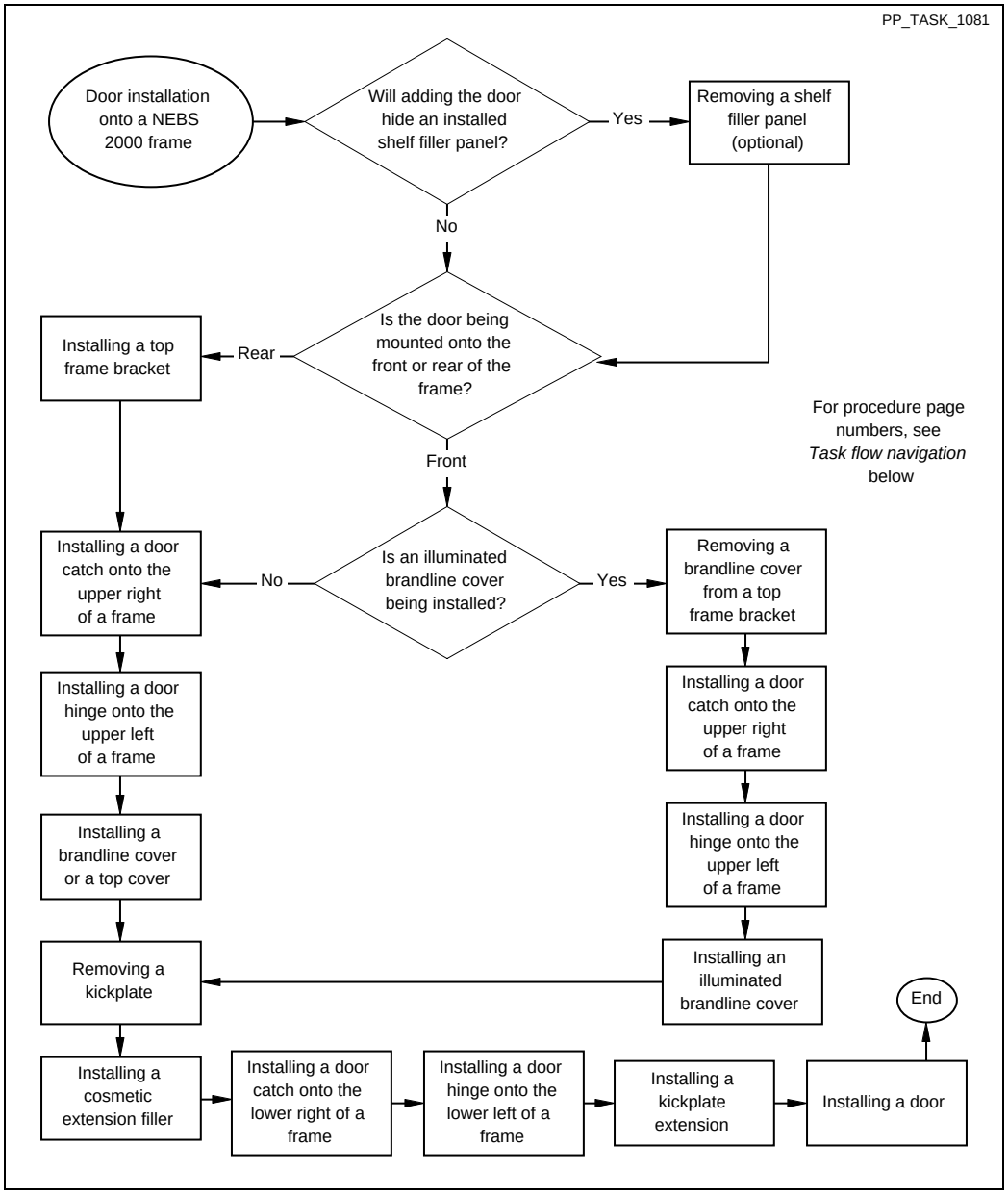
Task flow of a door installation onto a NEBS 2000 frame



Navigation

- Installing a brandline cover or a top cover (page 303)
- Installing a cosmetic extension filler (page 309)
- Installing a door (page 314)
- Installing a door catch onto the lower right of a frame (page 322)
- Installing a door catch onto the upper right of a frame (page 328)

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- Installing a door hinge onto the lower left of a frame (page 332)
- Installing a door hinge onto the upper left of a frame (page 336)
- Installing a kickplate extension (page 373)
- Installing a top frame bracket onto a NEBS 2000 frame (page 459)
- Installing an illuminated brandline cover (page 469)
- Removing a brandline cover from a top frame bracket (page 552)
- Removing a filler panel (page 581)
- Removing a kickplate (page 588)

Door hardware removal from a NEBS 2000 frame

Remove door hardware from a NEBS 2000 frame to provide uncontrolled access to the switches, or to re-deploy the hardware on another frame.

- Prerequisites to door hardware removal from a NEBS 2000 frame (page 77)
- Task flow of door hardware removal from a NEBS 2000 frame (page 79)

Prerequisites to door hardware removal from a NEBS 2000 frame

- You need the key for the door lock (originally from kit NTQS37).
- Power down switches and equipment only as directed by your company's policy when doing hardware maintenance tasks around live equipment.
- Since a shelf (frame) filler panel encloses the upper half of a NEBS 2000 frame and is used independently of frame doors, it is not included here as enclosure hardware. Replace a frame filler panel by doing the procedures Removing a filler panel (page 581) and Installing a shelf filler panel (page 408).
- You need these tools:
  - a step ladder to access the top of the 212.5-cm (7-ft.) NEBS 2000 frame
  - a driver to fasten the very large slotted captive screws of the cover as shown in the figure Types of screws used with frame enclosure hardware (page 74)
  - if a frame ground cable needs to be disconnected, a driver for the very large slotted pan-head screws P0883403 as shown in the figure Types of screws used with frame enclosure hardware (page 74) and a 10-cm (4-in.) shaft to reach through the bracket to the cable lug
  - a driver for a 10-mm (3/8-in.) thread-forming hex-head mounting screws P0601478 as shown in the figure Types of screws used with frame enclosure hardware (page 74) with a 10-cm (4-in.) reach past the front of the bracket to the frame uprights as shown in the figure

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Locations of installed brandline covers and top frame brackets (page 462)

— a driver to fasten very large Pozidriv screws as shown in the figure Types of screws used with frame enclosure hardware (page 74)

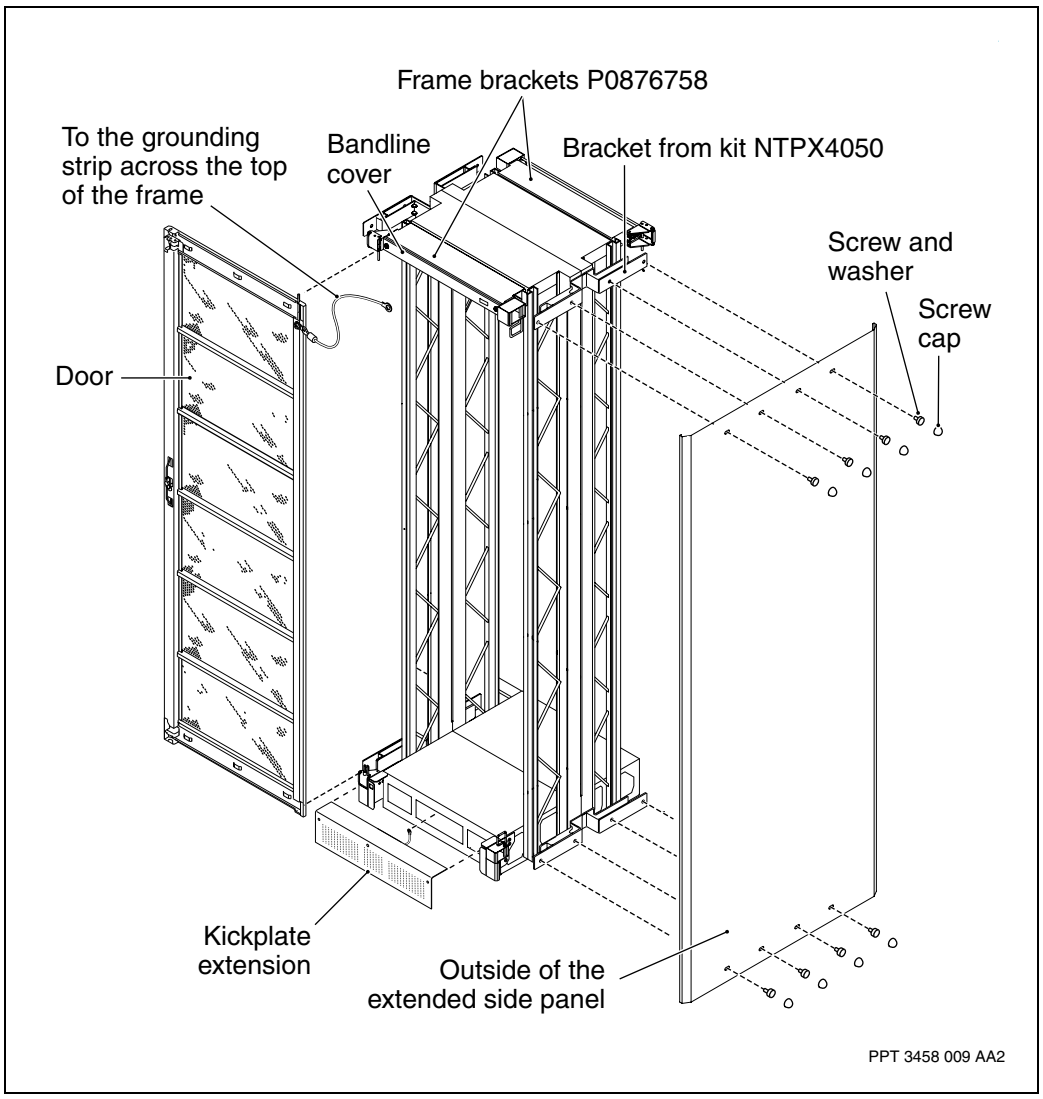
— a driver for a 6-mm (1/4-in.) KEPS nut P0601382

— a driver for medium-sized slotted captive screws on the kickplate extension

— a flashlight to see inside the frame base where screw holes must be aligned

- For the installed location of door hardware, see the figure A door in relation to extension hardware (page 75).

A door in relation to extension hardware



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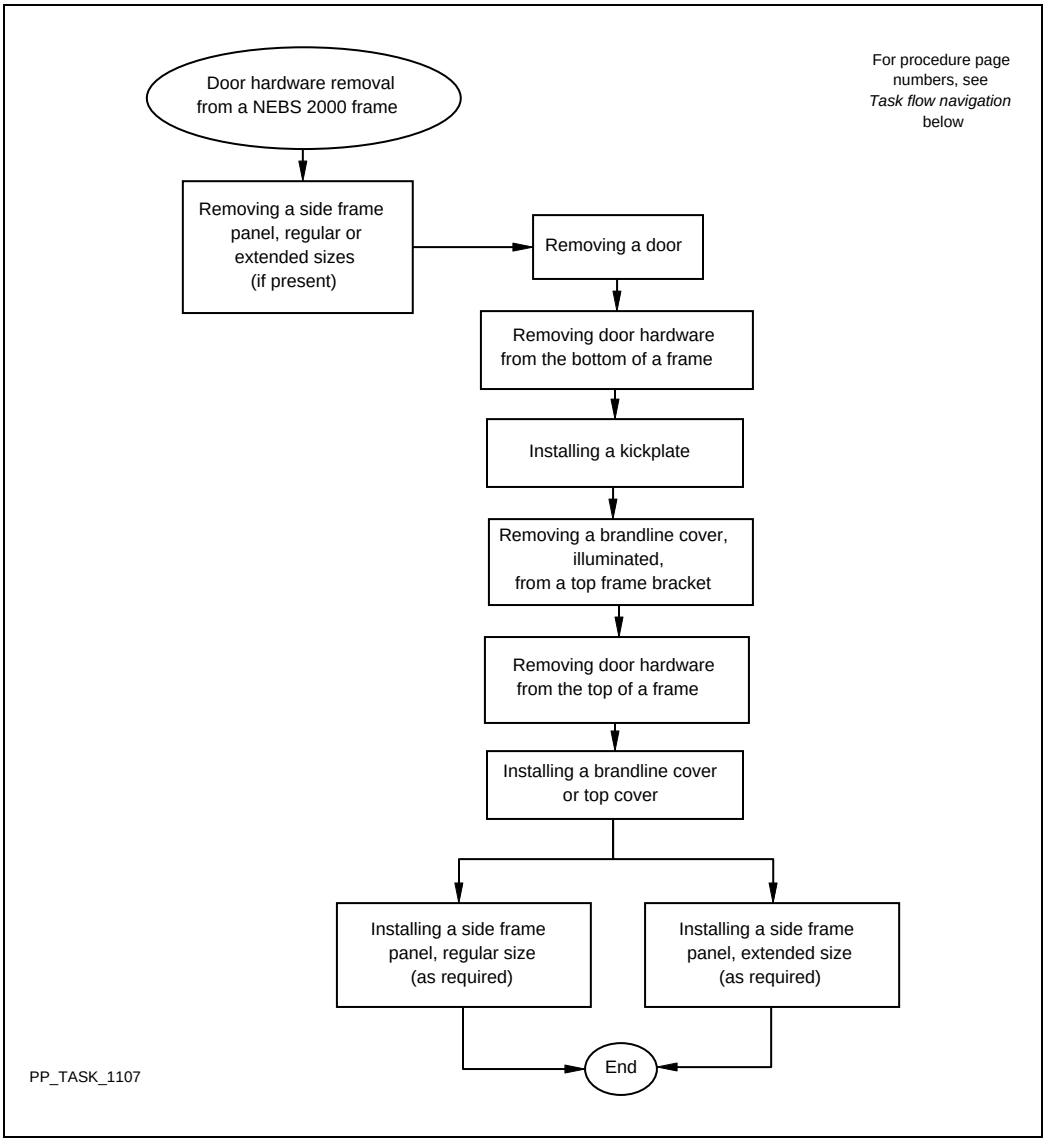
Task flow of door hardware removal from a NEBS 2000 frame

This task flow shows you the sequence of tasks you do to remove the door hardware that is used to cover the front or rear of a NEBS 2000 frame. To link any procedure in the flow, go to Navigation (page 79).

Task flow of door hardware removal from a NEBS 2000 frame



Navigation

- Installing a brandline cover or a top cover (page 303)
- Installing a kickplate (page 371)
- Installing a side frame panel, extended size (page 415)
- Installing a side frame panel, regular size (page 420)

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- Removing a brandline cover, illuminated, from a top frame bracket (page 555)
- Removing a door (page 561)
- Removing door hardware from the bottom of a frame (page 646)
- Removing door hardware from the top of a frame (page 650)
- Removing a side frame panel, regular or extended sizes (page 609)

Illuminated brandline cover installation

Install an illuminated brandline cover onto the top front (preferred position) or top rear (optional position) of a NEBS 2000 frame to facilitate the identification of switch status, especially when a door encloses the front of the frame.

- Prerequisites to illuminated brandline cover installation (page 80)
- Task flow of an illuminated brandline cover installation (page 81)

Prerequisites to illuminated brandline cover installation

- You need one of the following brandline cover kits:
  - NTPN52, which contains the brandline cover with the LED that makes it “illuminated”, the top frame bracket P0876758, the extension mounting bracket P0995495, and the V-cable NTHW66
  - NTPN53, which contains the brandline cover with the LED and V-cable NTHW66
- Brandline cover installation does not affect the operation of in-service equipment inside the NEBS 2000 frame unless adding the top frame cover requires disconnecting the frame ground cable to the site ground window, or any other grounding cable.
- When the NEBS 2000 frame is already installed, adding the bracket hardware can be done provided there is enough space at the outside of the upper corners of the frame and for you to install it with hand tools.
- When door kit NTQS37AA or NTQS37AB is also to be installed onto the NEBS 2000 frame, you can coordinate installing the brandline cover with the upper door hinge and catch that is indicated in the door installation document P0608792.
- The front of a NEBS 2000 frame is the face that presents the rows housing vertical cards installed in the switch.
- For the installed location of an illuminated brandline cover, see the figure An illuminated brandline cover in relation to extension hardware (page 81).

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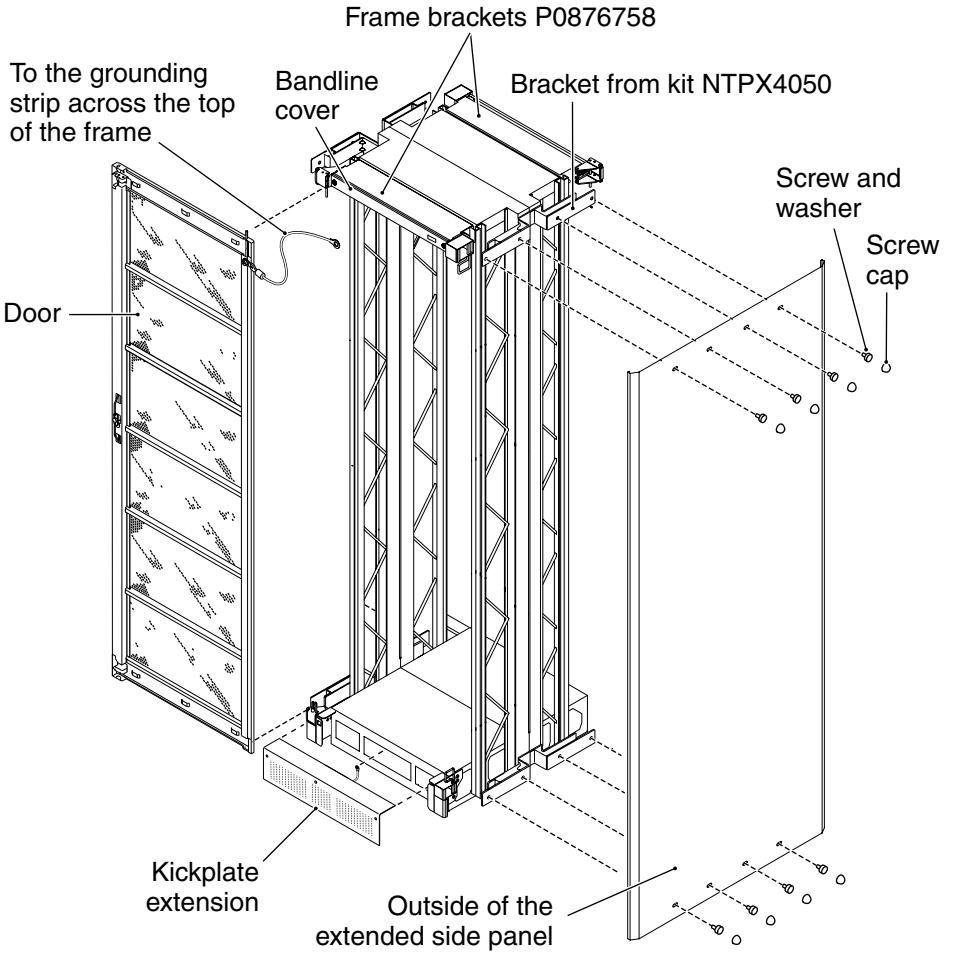
An illuminated brandline cover in relation to extension hardware



Task flow of an illuminated brandline cover installation

The following task flow shows the sequence of procedures you do to install an illuminated brandline cover onto the front or rear of a NEBS 2000 frame. The page reference of each procedure is listed immediately after the task flow.

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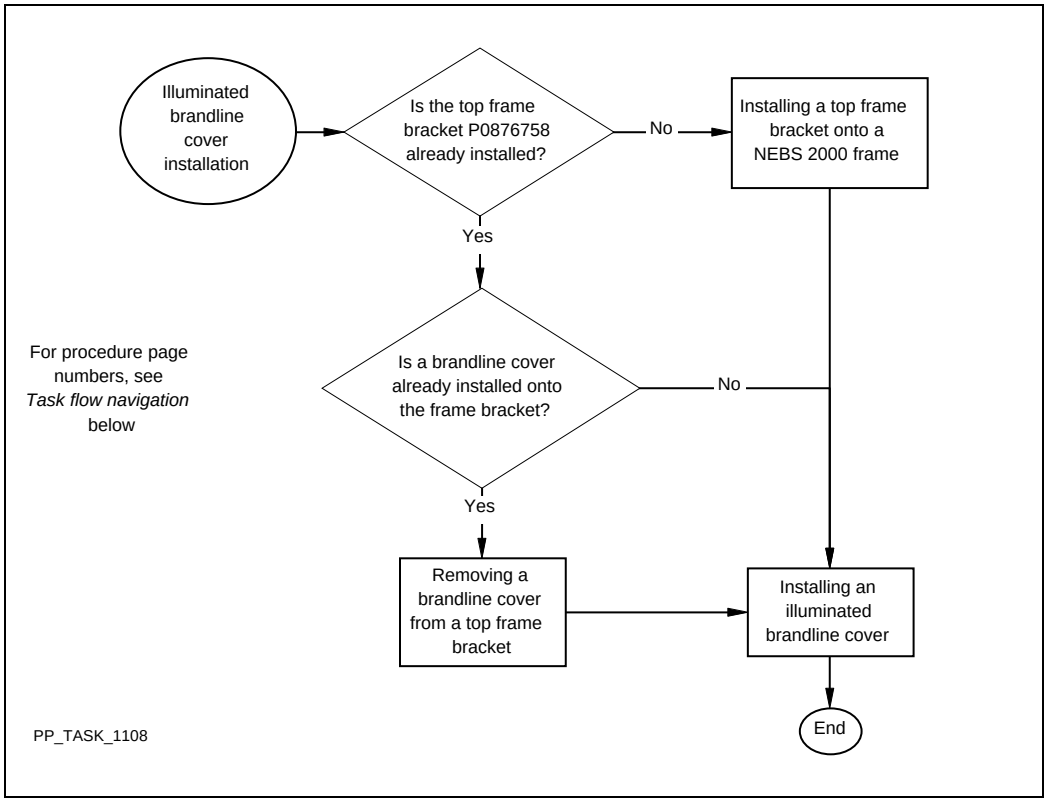
Task flow of an illuminated brandline cover installation onto a NEBS 2000 frame



Navigation

- Installing an illuminated brandline cover (page 469)
- Installing a top frame bracket onto a NEBS 2000 frame (page 459)
- Removing a brandline cover from a top frame bracket (page 552)

NEBS 2000 frame enclosure installation

Enclose a NEBS 2000 frame to control access to the switches and equipment mounted inside the frame.

- Prerequisites to NEBS 2000 frame enclosure installation (page 82)
- Task flow of a NEBS 2000 frame enclosure installation (page 83)

Prerequisites to NEBS 2000 frame enclosure installation

- Installing the frame enclosure hardware does not cause a loss of service to live equipment. Power down switches and equipment only as directed by your company's policy when doing hardware maintenance tasks around live equipment.

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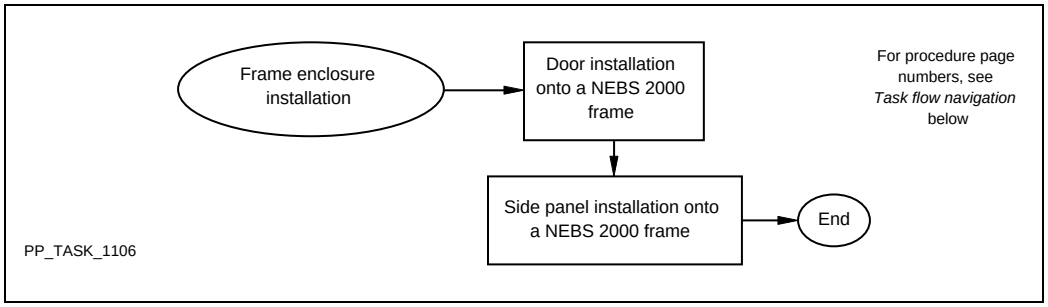
Task flow of a NEBS 2000 frame enclosure installation

This task flow shows you the sequence of tasks you do to enclose panels and doors around a NEBS 2000 frame. To link any procedure in the flow, go to Navigation (page 83).

Task flow of a NEBS 2000 frame enclosure installation



Navigation

- Door installation onto a NEBS 2000 frame (page 70)
- Side panel installation onto a NEBS 2000 frame (page 83)

Side panel installation onto a NEBS 2000 frame

Install a side panel onto a NEBS 2000 frame to control access to that side of the switches and equipment that is installed in the frame.

- Prerequisites to side panel installation onto a NEBS 2000 frame (page 83)
- Task flow of a side panel installation onto a NEBS 2000 frame (page 85)

Prerequisites to side panel installation onto a NEBS 2000 frame

- You need one of the following kits, depending on the other enclosure hardware that could be installed with it:
  - kit NTRU0128 for side panels, regular sized, that could be used with kits NTRU0365, NTRU0366, NTRU0368, or NTRU0369
  - kit NTPX4050 for side panels, extended size, that could be used with the door kits NTQS37AA and NTQSAB
- When the NEBS 2000 frame is already installed as indicated by NEBS 2000 frame installation (page 104), adding the side panel hardware can be done provided there is enough space at the side of the frame for the panel to reside and for you to fasten it at the top and bottom with hand tools.
- The grounding cable that is to be attached between the side panel and the frame is handled by the side panel installation rather than the Power-and-ground hardware for a Multiservice Switch (page 126).

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- When one or two side panels are being installed with door kit NTQS37AA or NTQS37AB, do Door installation onto a NEBS 2000 frame (page 70) before this task. Otherwise installed side panels will prevent access to the top and bottom mounting holes of other extension hardware.
- Do not install the extended side panels to cover any extended cable management brackets (NTRU0368 or NTRU0369). The extended side panels are intended to cover regular cable management brackets (P0937935 and P0879577) and their twin high-density configuration.
- At the widest flat surfaces at the sides of a NEBS 2000 frame, any wire that crosses the surface can prevent an extended side panel from being fastened to the frame.
- When the extended cable management brackets (NTRU0368 or NTRU0369) are not being installed, and the door kit is going to be installed, omit using the bracket spacers in kit NTRU0365. This enables the edges of the side panels to meet flush with the edges of a closed door.
- The front of a NEBS 2000 frame is the face that presents the rows housing vertical cards installed in a switch.
- For the installed location of extended side panels, see the figure An extended side panel in relation to extension hardware (page 85).

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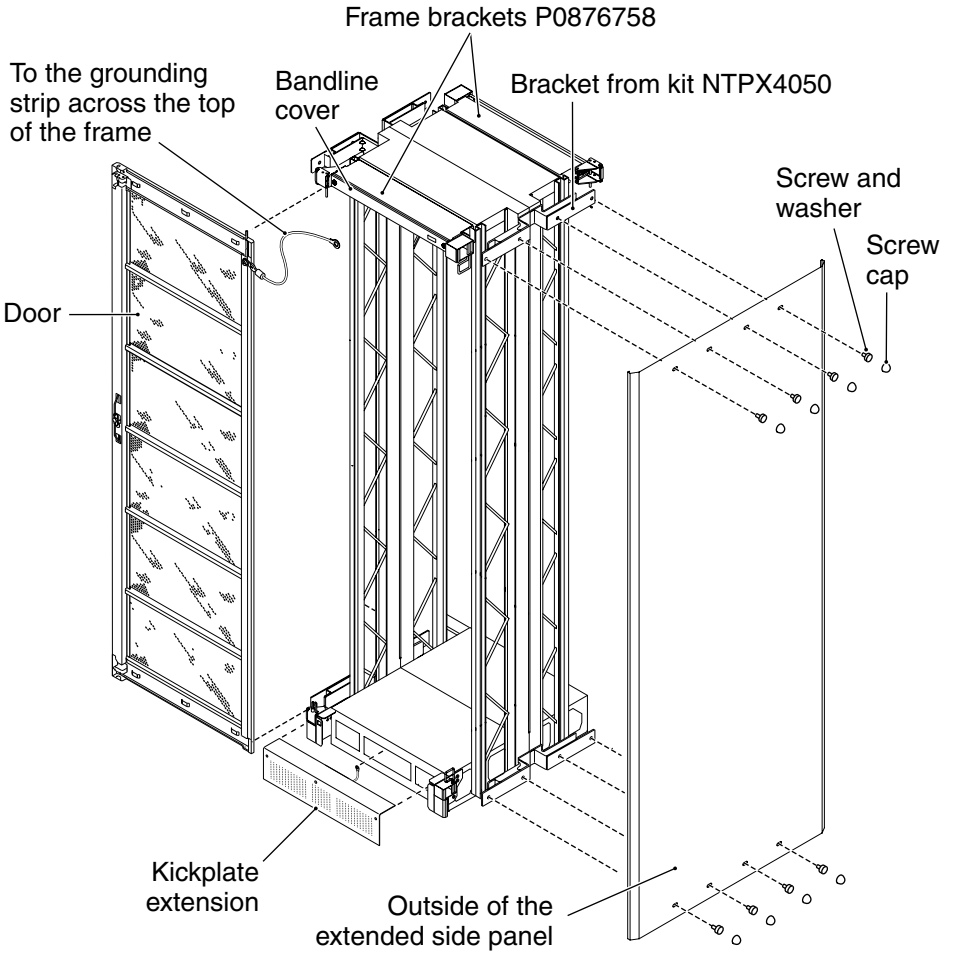
An extended side panel in relation to extension hardware



Task flow of a side panel installation onto a NEBS 2000 frame

This task flow shows the sequence of procedures you do to install a side panel onto either side of a NEBS 2000 frame. To link to any procedure, go to Navigation (page 86).

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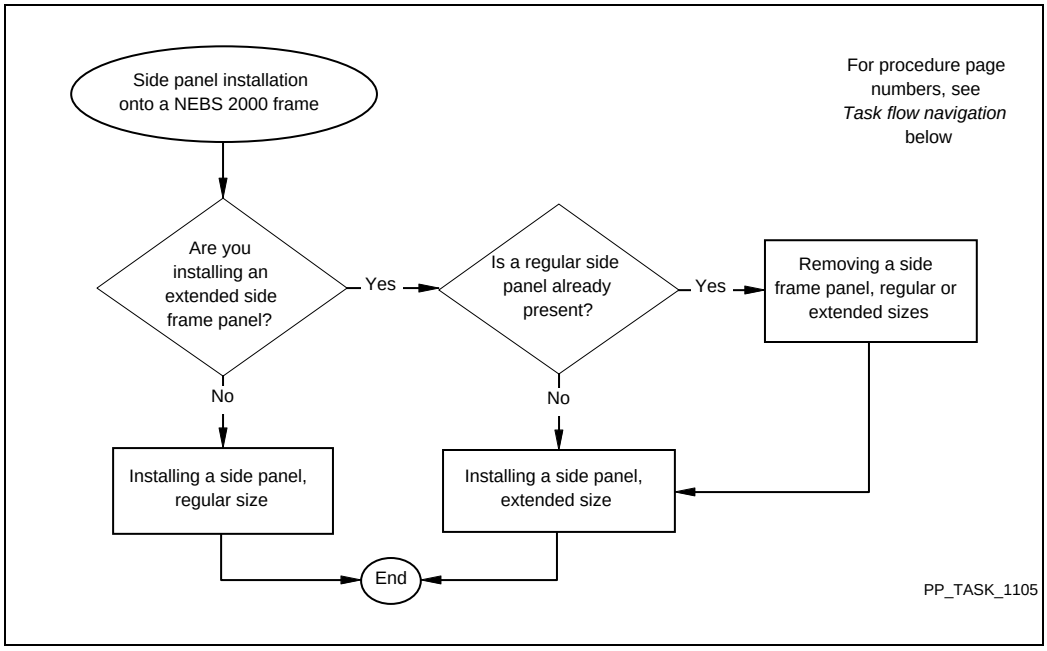
Task flow of a side panel installation onto a NEBS 2000 frame



Navigation

- Installing a side frame panel, extended size (page 415)
- Installing a side frame panel, regular size (page 420)
- Removing a side frame panel, regular or extended sizes (page 609)

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Function processors

Select from the following tasks to manage the function processors (FPs) installed in a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000:

- FP addition (page 87)
- FP decommissioning (page 90)
- FP upgrade (page 91)
- Replacement of a failed FP (page 95)
- Replacement of an FP with one of a different card type (page 97)

For FP cabling tasks, see CP and FP cables and associated hardware (page 45).

FP addition

Add an FP to an unconfigured slot in a shelf to add services or introduce sparing.

- Prerequisites to an FP addition (page 87)
- Task flow of an FP addition (page 88)

Prerequisites to an FP addition

CAUTION
Risk of damage to equipment from software
An incompatible software load can damage an FP beyond a field repair. Ensure that the software running on the node meets the minimum software requirement for a replacement FP. For information on minimum software requirements see NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*.

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CAUTION
Risk of service loss or degradation
Install FPs of the same kind side by side. Mixing FPs that use coax cables with FPs that use fiber cables causes entangled cables that can drop service.

- Ensure that you are familiar with Choosing slots for FPs (page 25).
- Optical sparing requires FPs to be located side by side in the shelf assembly.
- Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* so that you can follow the software procedures used by this task.
- Route and label all required cables. See Routing FP cables (page 707).

Task flow of an FP addition

This task flow shows the sequence of procedures to install an FP in an empty slot. To link to any procedure, go to Navigation (page 89).

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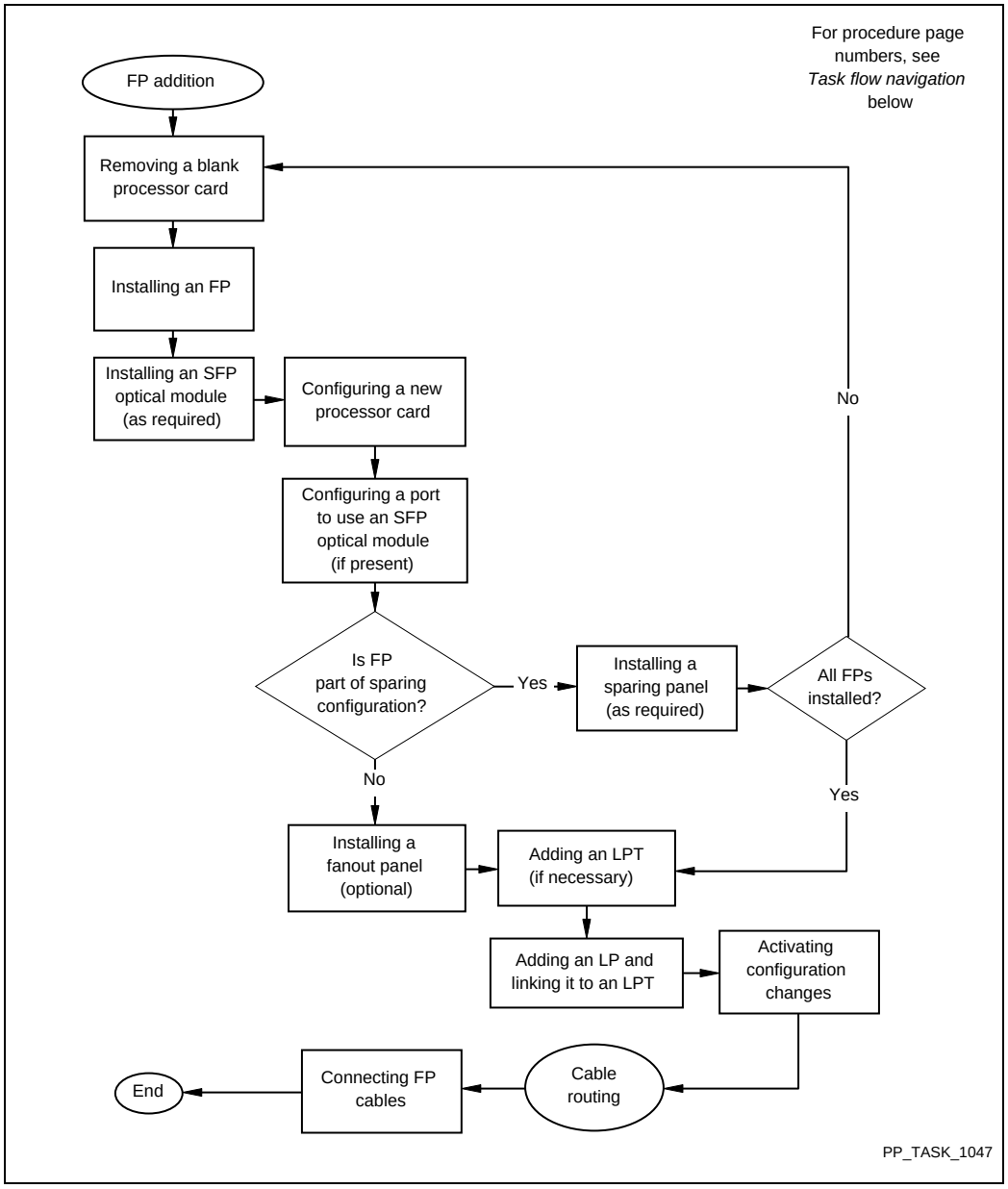
Task flow of an FP addition



Navigation

- “Activating configuration changes”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Adding an LP and linking it to an LPT”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

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- “Adding an LPT”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Cable routing (page 45)
- “Configuring a new processor card”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Configuring a port to use an SFP optical module”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Connecting an FP cable (page 234)
- Installing a fanout panel (page 366)
- Installing a sparing panel (page 428)
- Installing an FP (page 465)
- Installing an SFP optical module (page 478)
- Removing a blank processor card (page 551)
- Removing an SFP optical module (page 639)

FP decommissioning

Decommission an FP by nullifying the existing slot configuration and replacing the card with a blank processor card.

- Prerequisites for an FP decommissioning (page 90)
- Task flow of an FP decommissioning (page 90)

Prerequisites for an FP decommissioning

- Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* so that you can follow the software procedures used by this task.
- You must have a replacement card to fill the empty slot so that system cooling and EMI protection are maintained. A blank processor card has PEC NTHR64. This card is also referred to as a filler module.

Task flow of an FP decommissioning

This task flow shows the sequence of procedures to decommission an FP. To link to any procedure, go to Navigation (page 91).

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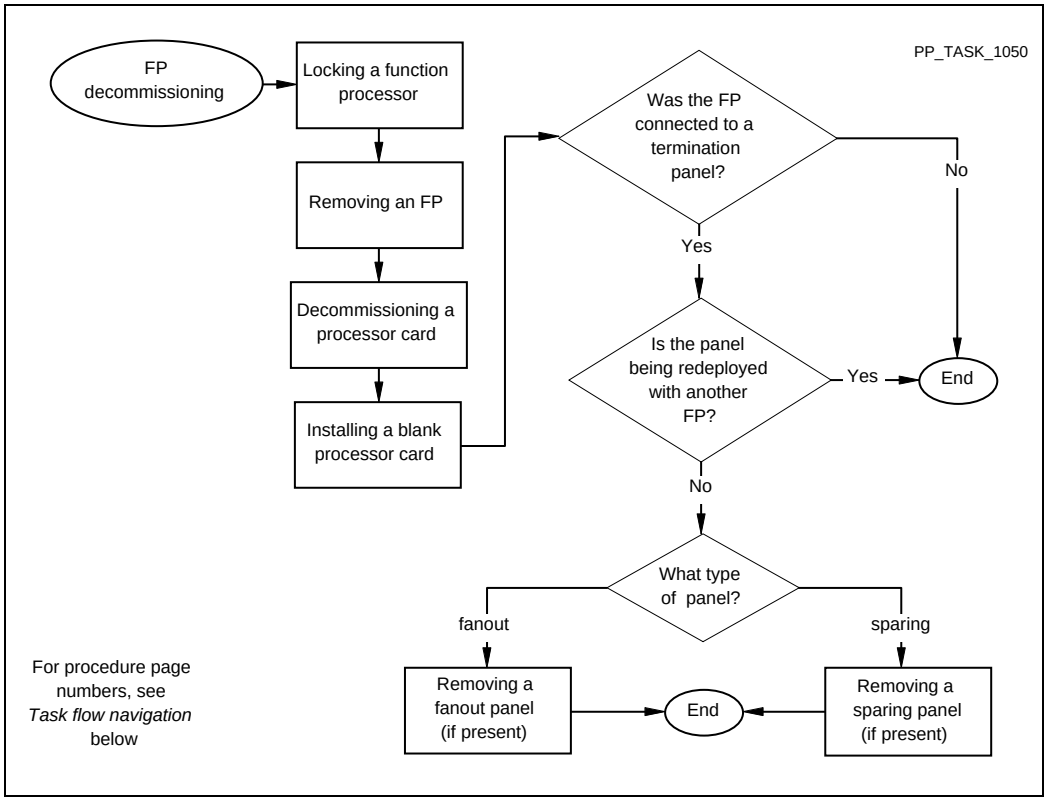
Task flow of an FP decommissioning



Navigation

- "Decommissioning an FP". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Installing a blank processor card (page 301)
- "Locking a function processor". See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing a fanout panel (page 580)
- Removing a sparing panel (page 613)
- Removing an FP (page 631)

FP upgrade

Upgrade an FP in the shelf with one of the same cardtype but a different PEC or version to enable the enhancement of configured services.

- Prerequisites to an FP upgrade (page 92)
- Task flows of an FP upgrade (page 92)

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Prerequisites to an FP upgrade

CAUTION
Risk of damage to equipment from software
An incompatible software load can damage an FP beyond a field repair. Ensure that the software running on the node meets the minimum software requirement for a replacement FP. For information on minimum software requirements see NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*.

- Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* so that you can follow the software procedures used by this task.
- Use an FP with a compatible or equivalent PEC as defined in Processor card compatibility (page 31).
- Choose a period of low average traffic for upgrading cards to minimize the impact of removing the standby card from service.
- Determine if any cabling changes are required by the new FP(s). If you are replacing only a few FPs and there are not many new cables required, you can route new cables and leave the existing cables in place. If you are replacing a large number of FPs with many cables, you will need to consider removing some of the existing cables to make room in the cable management path.

  For example: If you are replacing all of the 16-port OC-3/STM-1 MT-RJ cards in your shelf with the newer LC version, the volume of cables will require that you remove the existing cables from the cable trough in order to make room. Refer to FP cable replacement (page 48).
- The description of each type of optical FP in NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference* includes whether inter-card or intra-card LAPS is supported.
- When you upgrade an FP you must also upgrade all other FPs in the same sparing configuration.
- Use the appropriate task flow for optical or electrical FPs. Optical FPs, for example OC-n, use fiber cables. Electrical FPs, for example Dsn or En, use coax or mini-coax (copper-based) cables.

Task flows of an FP upgrade

These task flows show you the sequence of procedures to upgrade an FP.

- Task flow of an electrical FP upgrade (page 93)
- Task flow of an optical FP upgrade (page 94)

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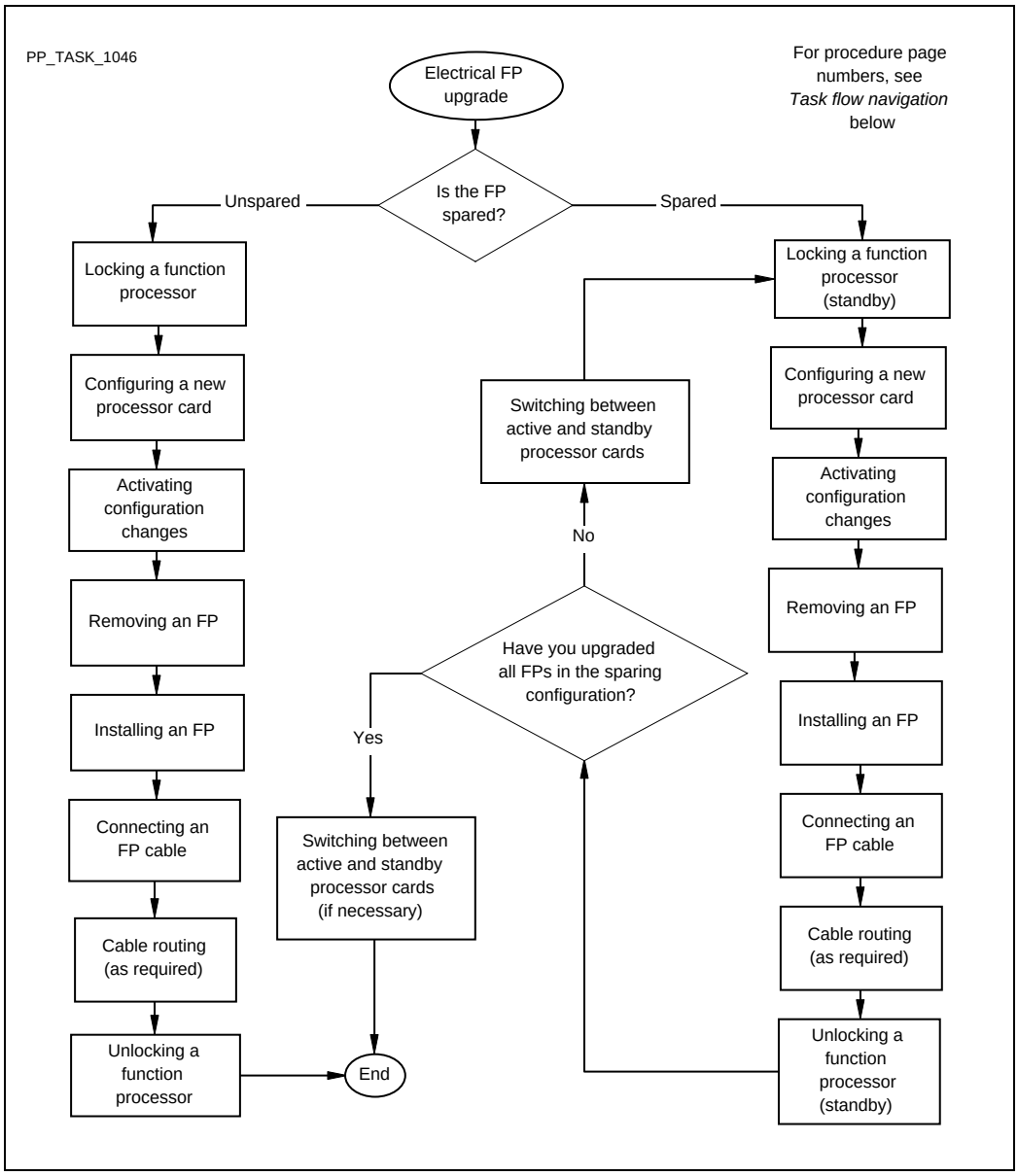
To link to any procedure, go to Navigation (page 94)

Task flow of an electrical FP upgrade



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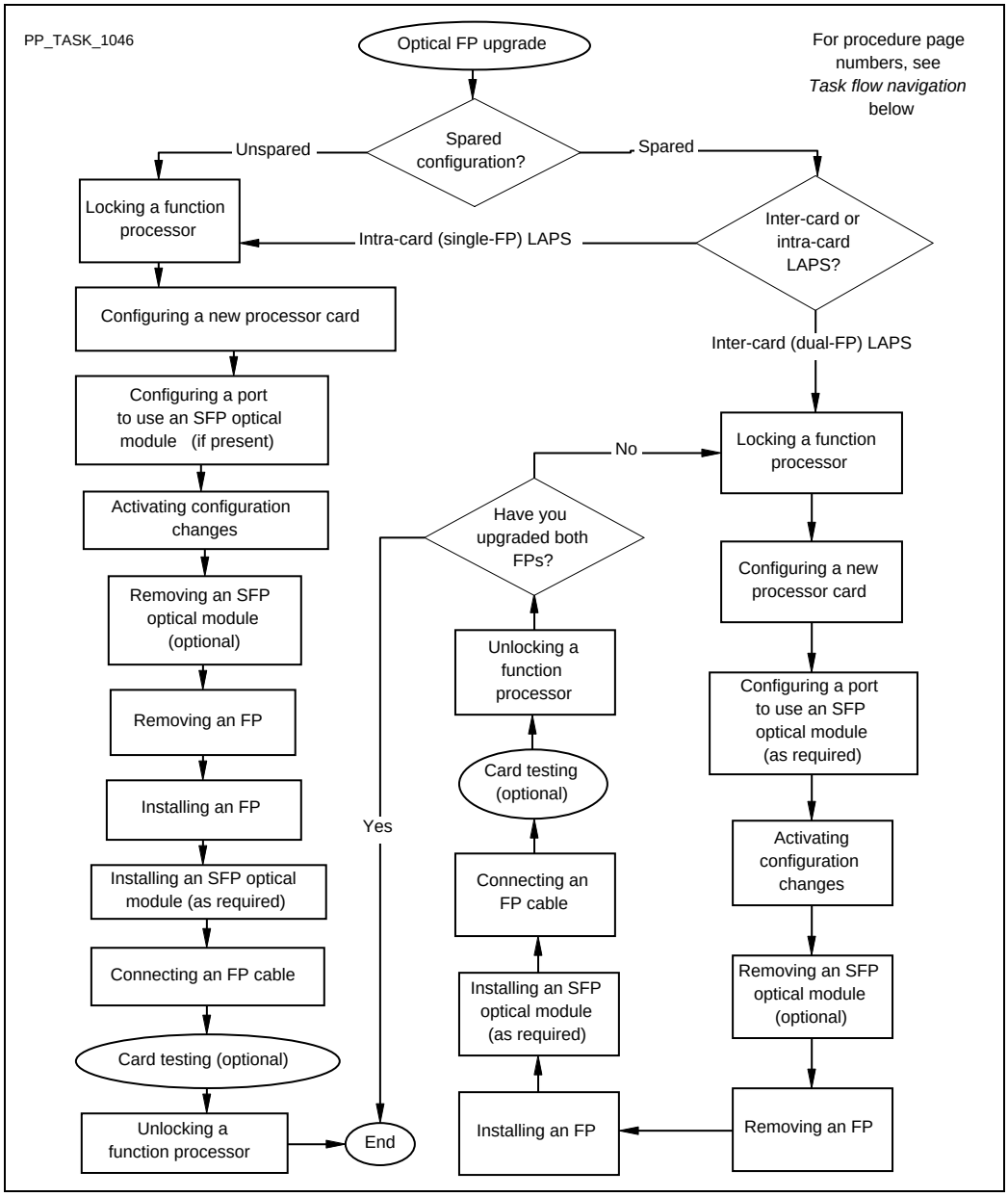
Task flow of an optical FP upgrade



Navigation

- “Activating configuration changes”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Cable routing (page 45)
- “Card testing”. See NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*.

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- “Configuring a new processor card”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Configuring a port to use an SFP optical module”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Connecting an FP cable (page 234)
- Installing an FP (page 465)
- Installing an SFP optical module (page 478)
- “Locking a function processor”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing an FP (page 631)
- Removing an SFP optical module (page 639)
- “Switching between active and standby processor cards”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Unlocking a function processor”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Replacement of a failed FP

Replace a failed FP or an FP with at least one failed port to restore or maintain delivery of configured services.

- Prerequisites to a failed FP replacement (page 95)
- Task flow of a failed FP replacement (page 96)

Prerequisites to a failed FP replacement

- Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* so that you can follow the software procedures used by this task.
- Use a replacement FP with a compatible or equivalent PEC as defined in Processor card compatibility (page 31).
- This task assumes a compatible replacement will be used, that is, one that maintains the same card services, capacities, and performance capabilities. When using a compatible FP with increased functionality or capability, you must configure the slot for the change. When the replacement FP is a mate card in a sparing configuration, ensure that the

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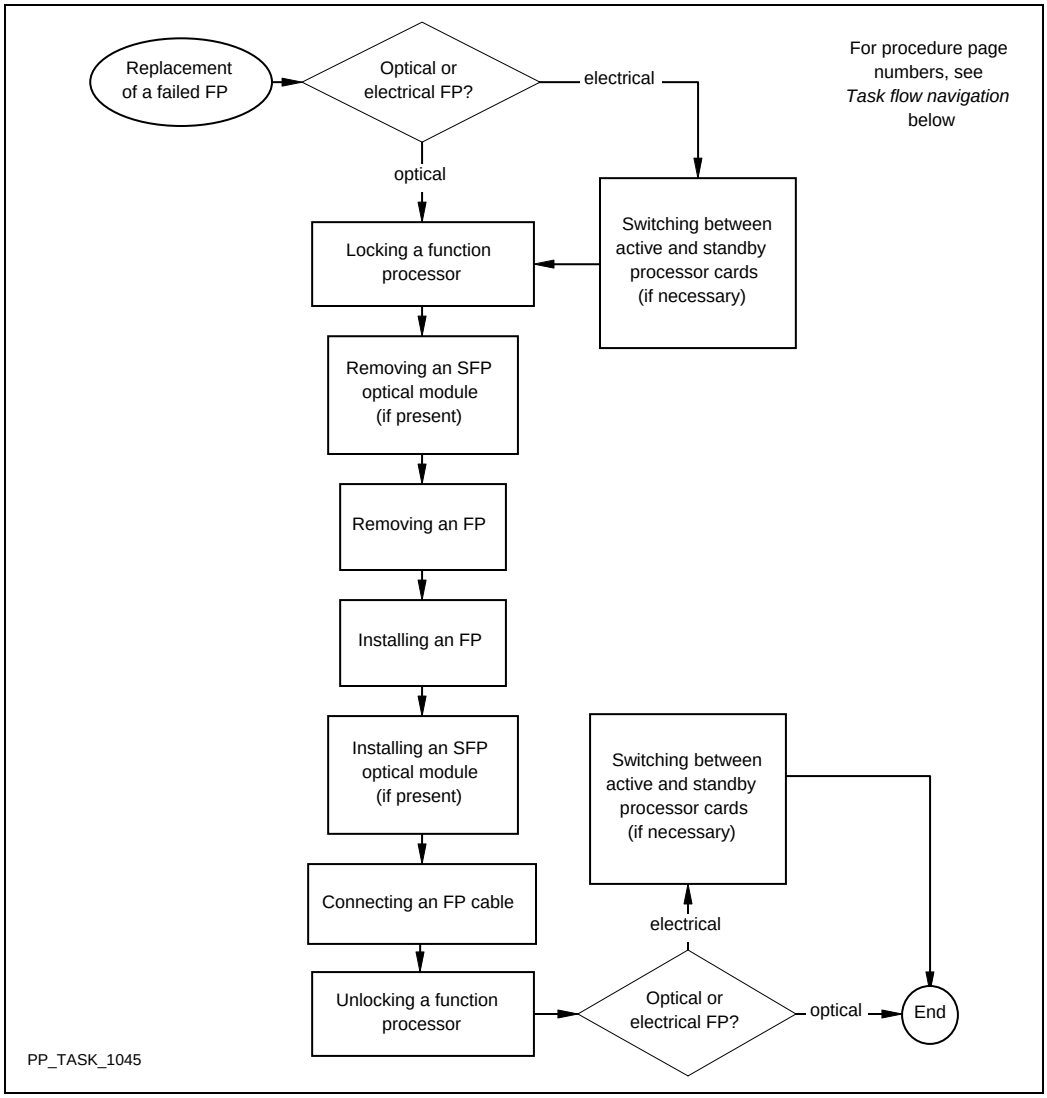
pair can still operate with the lowest existing common functionality, capacity, and capabilities.

- When a failed FP has SFP optical modules in its faceplate, you must remove the modules for re-deployment and before returning the card to Nortel Networks. The procedure to do this is included in the task flow. SFP modules are ordered separately and are not provided with the replacement FP.

Task flow of a failed FP replacement

This task flow shows the sequence of procedures to replace a failed FP. To link to any procedure, go to Navigation (page 97).

Task flow of a replacement of a failed FP



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Navigation

- Connecting an FP cable (page 234)
- Installing an FP (page 465)
- Installing an SFP optical module (page 478)
- “Locking a function processor”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing an FP (page 631)
- Removing an SFP optical module (page 639)
- “Switching between active and standby processor cards”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- “Unlocking a function processor”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Replacement of an FP with one of a different card type

Replace an FP with one of a different card type to change the type of services provided by that card slot.

Prerequisites to replacement of an FP with one of a different card type

CAUTION
Risk of damage to equipment from software
An incompatible software load can damage an FP beyond a field repair. Ensure that the software running on the node meets the minimum software requirement for a replacement FP. For information on minimum software requirements see NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*.

- You must first decommission the slot of the existing FP before installing the replacement.

Task flow of a replacement of an FP with one of a different type

This task flow shows the two tasks you can do to replace an FP with one of a different type. To link to either task, go to Navigation (page 98).

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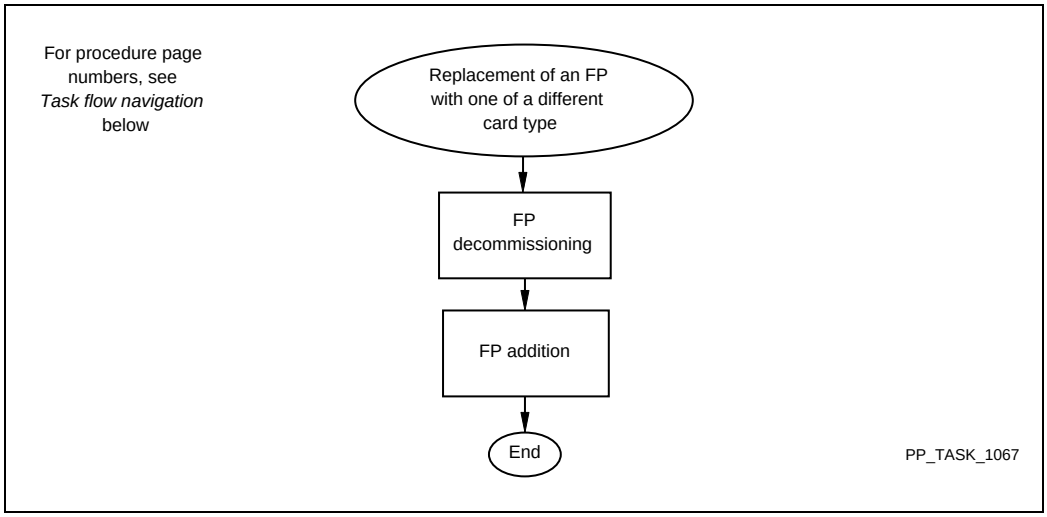
Task flow of a replacement of an FP with one of a different type



Navigation

- FP addition (page 87)
- FP decommissioning (page 90)

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MAC address module

Use the following task to handle the MAC address module in a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000.

Replace a MAC address module if it fails. Although it is improbable that a MAC address module will fail, its failure or removal means some services cannot operate if the node resets.

- Prerequisites to a MAC address module replacement (page 99)
- Task flow of a MAC address module replacement (page 100)

Prerequisites to a MAC address module replacement

CAUTION

Possible service loss by invalidating all configuration

Replacing the MAC address module means a different address will be read by the system at a startup, restart, reset, or reboot. Reading a different address invalidates all previous software configuration. After installing a replacement module, always re-configure the node software and reset it.

- The procedure for replacing the MAC address module in a Multiservice Switch 15000 is different from replacing one in a Multiservice Switch 20000.
- The MAC address module provides the unique node identification within a network. Its address is read by the system only at initial power up, after power cycling, or a software startup, restart, reboot, or reset.
- Duplicated addresses can occur if:
  - a MAC address module is replaced in a switch (for example, node A) and node A does not undergo a manual or a system reset
  - the MAC address module from node A replaces the one in node B
  - node B undergoes a manual or a system reset, restart, or reboot before node A does, with the result that node B's new address is the same as node A's former address because the former address itself had not actually been replaced yet

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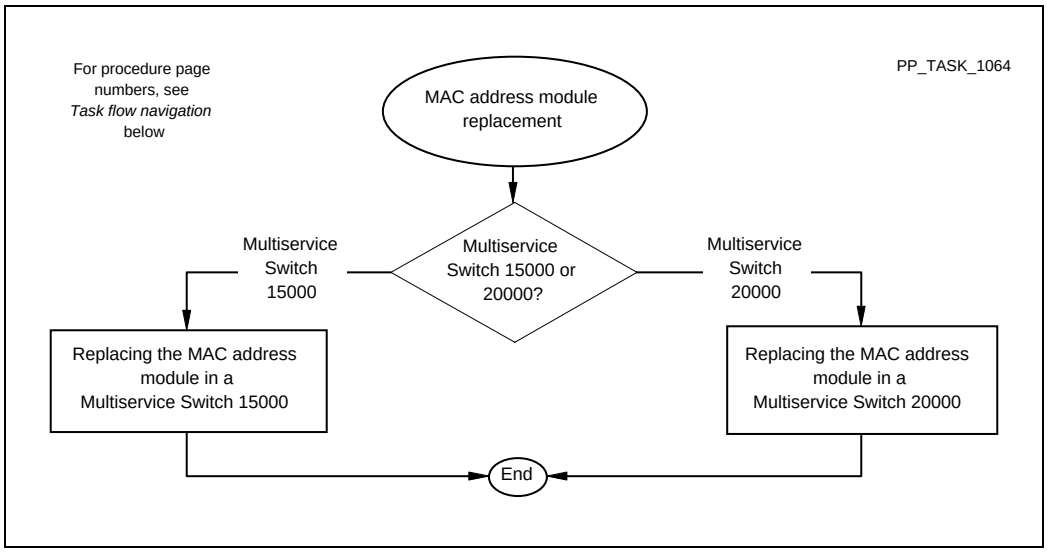
- Unlike most other hardware parts of the system, there is no software command associated with preparing the MAC address module for removal.
- The alarm 7012 0053 indicates when a MAC address module has failed.
- There is no software or hardware alarm for removing the MAC address module itself or leaving its slot empty.

Task flow of a MAC address module replacement

This task flow shows the procedures you do to replace the MAC address module. To link to any procedure, go to (page 100).

Task flow for a MAC address module replacement



- Replacing the MAC address module in a Multiservice Switch 15000 (page 702)
- Replacing the MAC address module in a Multiservice Switch 20000 (page 705)

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Initial switch hardware installations

Select from the following tasks in the alphabetical list to complete initial installation of a Nortel Networks Multiservice Switch 15000, Multiservice Switch 20000, or Multiservice Switch 15000 VSS into an empty NEBS 2000 frame or an equivalent mounting apparatus such as an EIA rack:

- Installation of a second switch into a NEBS 2000 frame (page 101)
- NEBS 2000 frame accessories (page 69)
- NEBS 2000 frame installation (page 104)
- Multiservice Switch 15000 parts installation into a NEBS 2000 frame (page 107)
- Multiservice Switch 20000 parts installation into a NEBS 2000 frame (page 109)
- Multiservice Switch 15000 VSS installation (page 111)
- Multiservice Switch installation into an EIA rack (page 112)

For other initial installations of equipment that is used with a Multiservice Switch in a NEBS 2000 frame or equivalent mounting apparatus, see Peripheral equipment (page 117).

Installation of a second switch into a NEBS 2000 frame

Install a second Multiservice Switch into a NEBS 2000 frame to maximize traffic capacity for the same footprint area.

- Prerequisites to an installation of a second switch into a NEBS 2000 frame (page 101)
- Task flow of an installation of a second switch into a NEBS 2000 frame (page 102)

Prerequisites to an installation of a second switch into a NEBS 2000 frame

- The switch in the bottom of the NEBS 2000 frame must be completely installed. You can add the second switch without affecting the service.
- You need one of these Multiservice Switch hardware packages:

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— NTQS10 for a Multiservice Switch 15000

— NTQH10 for a Multiservice Switch 20000

- If the NEBS 2000 frame that is to contain the added shelf has a door mounted on its front, you need the key for the door lock from kit NTQS37.
- To power the second switch, you can safely use the BIM pair for that switch in either version of BIP. That is, you can use a pair of 25-amp BIMs (AP6C67PA) from a Multiservice Switch 20000 in a Multiservice Switch 15000 BIP (NT6C62). Or you can use a pair of 20-amp BIMs (NT6C60PA) from a Multiservice Switch 15000 in a Multiservice Switch 20000 BIP (AP6C68). Each BIM pair must be installed to power the appropriate Multiservice Switch.
- Adding a second switch to a frame increases the cable density that is supported by the cable management brackets on the frame. The total number and type of FPs in the two switches can increase the cable density such that you must use the extended cable management brackets. Unless you planned for the brackets as described in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* by ensuring that there is enough space around the frame footprint or by installing them according to the task flow NEBS 2000 frame installation (page 104), you cannot add the brackets without moving the frame.

Task flow of an installation of a second switch into a NEBS 2000 frame

This task flow shows the sequence of procedures you do to install a second Multiservice Switch into a NEBS 2000 frame. To link to any procedure, go to Navigation (page 103).

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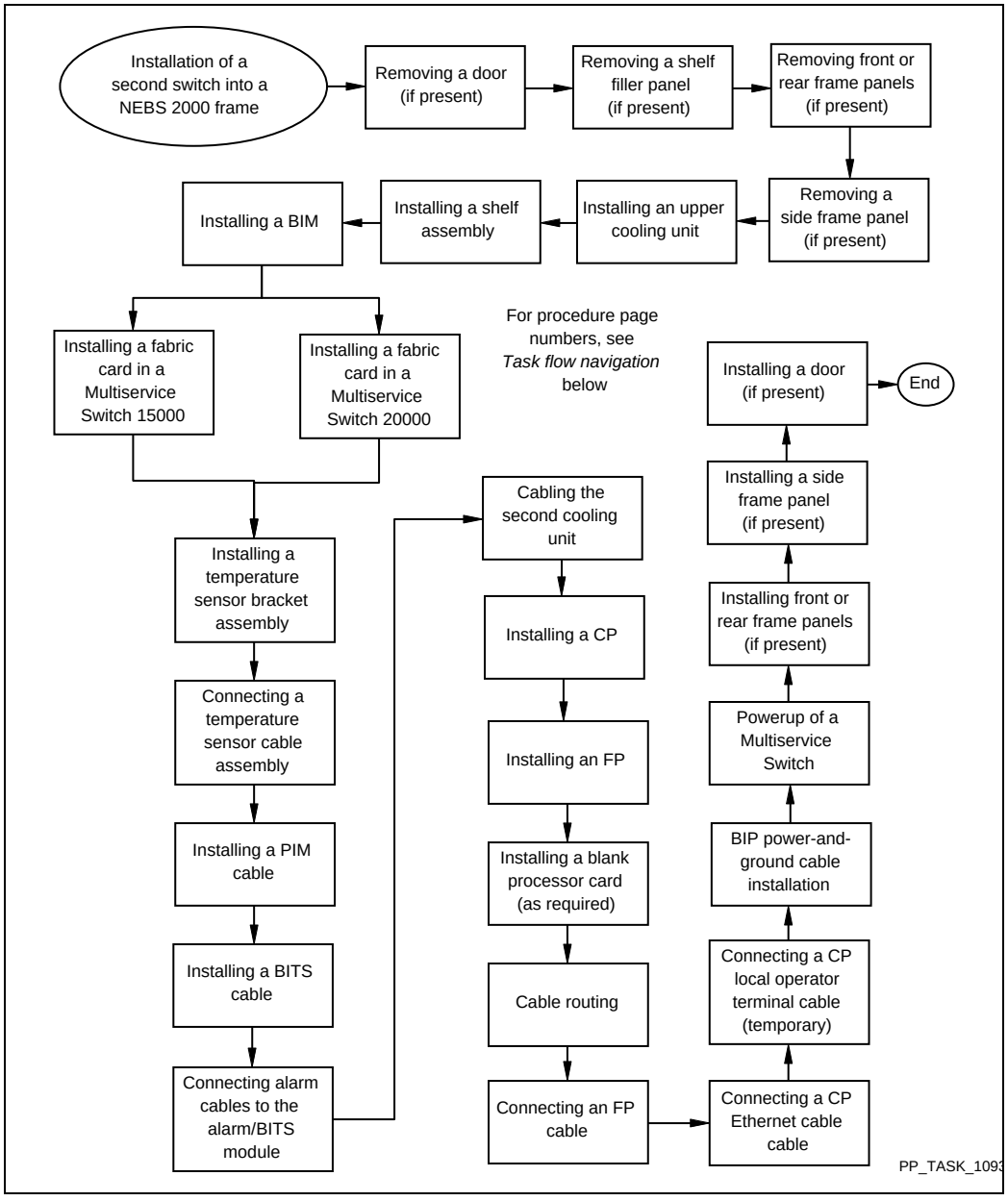
Task flow for an installation of a second switch into a NEBS 2000 frame



Navigation

- BIP power-and-ground cable installation (page 128)
- Cable routing (page 45)
- Cabling the second cooling unit (page 175)
- Connecting a CP Ethernet cable (page 212)
- Connecting a CP local operator terminal cable (page 215)

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- Connecting a temperature sensor cable assembly (page 227)
- Connecting alarm cables to the alarm/BITS module (page 229)
- Connecting an FP cable (page 234)
- Installing a BIM (page 283)
- Installing a BITS cable (page 296)
- Installing a blank processor card (page 301)
- Installing a CP (page 306)
- Installing a door (page 314)
- Installing a fabric card into a Multiservice Switch 15000 (page 340)
- Installing a fabric card into a Multiservice Switch 20000 (page 345)
- Installing a PIM cable (page 388)
- Installing a shelf assembly (page 403)
- Installing a side frame panel, regular size (page 420)
- Installing a temperature sensor bracket assembly (page 431)
- Installing an FP (page 465)
- Installing an upper cooling unit (page 482)
- Installing front or rear frame panels (page 502)
- Powerup of a Multiservice Switch (page 136)
- Removing a door (page 561)
- Removing a filler panel (page 581)
- Removing a side frame panel, regular or extended sizes (page 609)
- Removing front or rear frame panels (page 655)

NEBS 2000 frame installation

Install a NEBS 2000 frame to unpack, place, and anchor it onto its footprint.

- Prerequisites to a NEBS 2000 frame installation (page 104)
- Task flow of a NEBS 2000 frame installation (page 105)

Prerequisites to a NEBS 2000 frame installation

WARNING

Risk of injury or damage from an unanchored rack

Mounting equipment into or onto a frame can make it top heavy. To prevent a frame from tipping over, possibly causing a serious injury, always anchor it to the floor.

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WARNUNG

Verletzungs- oder Beschädigungsrisiko durch ein unverankertes Rack

Beim Montieren von Geräten in oder auf einem Rack besteht die Gefahr der Kopflastigkeit. Verankern Sie ein Rack immer am Boden, um ein Umkippen und dadurch verursachte mögliche Verletzungen zu vermeiden.

- You need a NEBS 2000 frame with PEC NTRU04. The frame is provided in the following switch hardware packages:
  - NTQS10 with a single Multiservice Switch 15000
  - NTQS20 with dual Multiservice Switch 15000s
  - NTQS80 with a Multiservice Switch 15000 VSS
  - NTQH10 with a single Multiservice Switch 20000
  - NTQH20 with a dual Multiservice Switch 20000
- The anchor holes must already have been drilled according to the criteria and procedures in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- A NEBS 2000 frame does not use an isolator pad because of its levelling feet and isolator bushings used with its anchor kits.

Task flow of a NEBS 2000 frame installation

This task flow shows the sequence of procedures you do to install a NEBS 2000 frame. To link to any procedure, go to Navigation (page 106).

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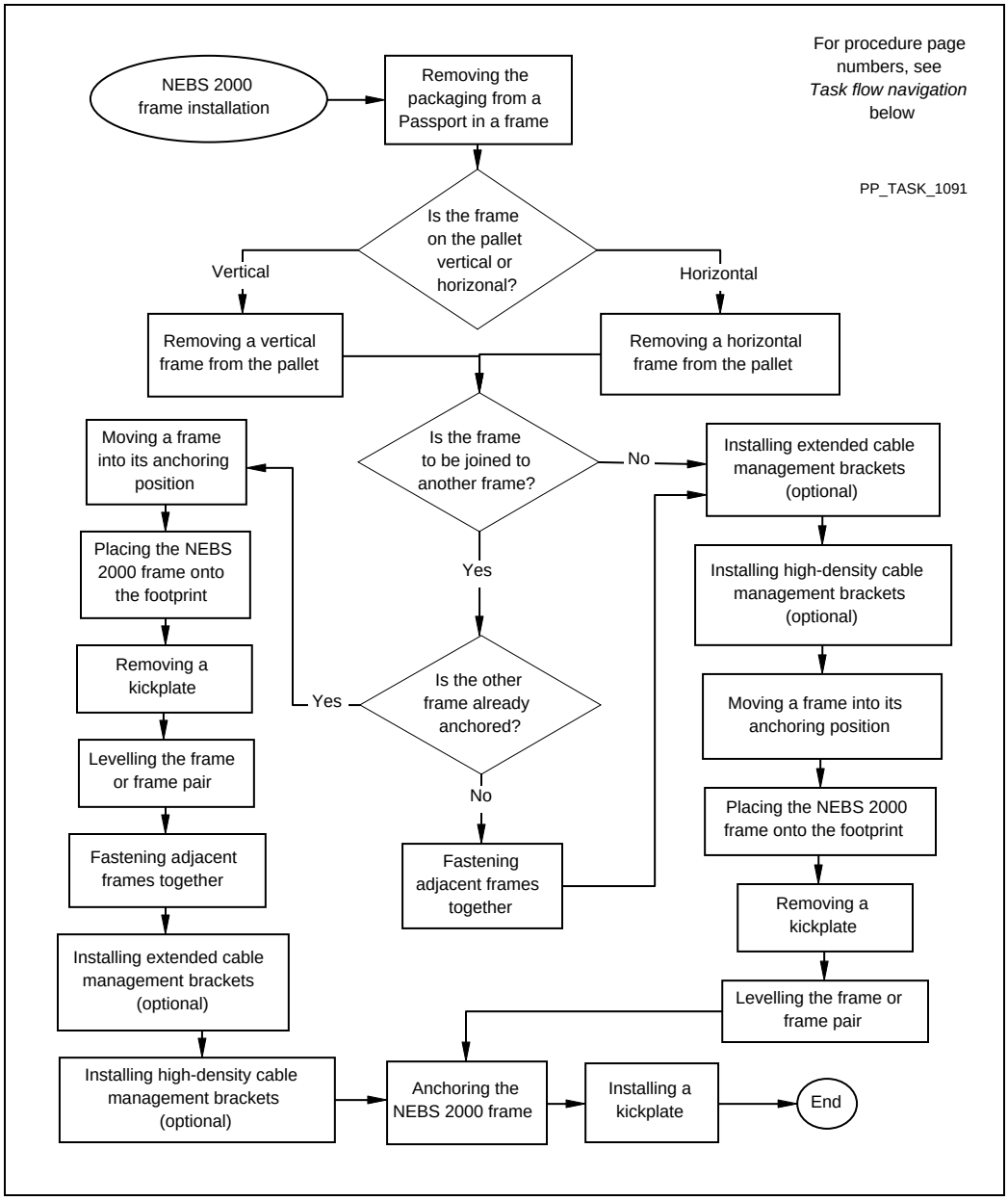
Task flow for a NEBS 2000 frame installation



Navigation

- Anchoring the NEBS 2000 frame (page 149)
- Fastening adjacent frames together (page 269)
- Installing a kickplate (page 371)
- Installing extended cable management brackets (page 491)
- Installing high-density cable management brackets (page 509)

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- Levelling the frame or frame pair (page 520)
- Moving a frame into its anchoring position (page 529)
- Placing the NEBS 2000 frame onto the footprint (page 533)
- Removing a horizontal frame from the pallet (page 584)
- Removing a kickplate (page 588)
- Removing a vertical frame from the pallet (page 629)
- Removing the packaging from a switch in a frame (page 657)

Multiservice Switch 15000 parts installation into a NEBS 2000 frame

Install the parts of a Nortel Networks Multiservice Switch 15000 that is mounted into a NEBS 2000 frame to enable the switch to be put into service.

- Prerequisites to Multiservice Switch 15000 parts installation into a NEBS 2000 frame (page 107)
- Task flow of a Multiservice Switch 15000 parts installation into a NEBS 2000 frame (page 107)

Prerequisites to Multiservice Switch 15000 parts installation into a NEBS 2000 frame

- The NEBS 2000 frame must already be installed as indicated by NEBS 2000 frame installation (page 104).
- Power and ground cables must be routed to the planned location of the frame prior to beginning this task. See the NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

Task flow of a Multiservice Switch 15000 parts installation into a NEBS 2000 frame

This task flow shows the sequence of procedures you do to install the parts of a Multiservice Switch 15000 into a NEBS 2000 frame. To link to any procedure, go to Navigation (page 108).

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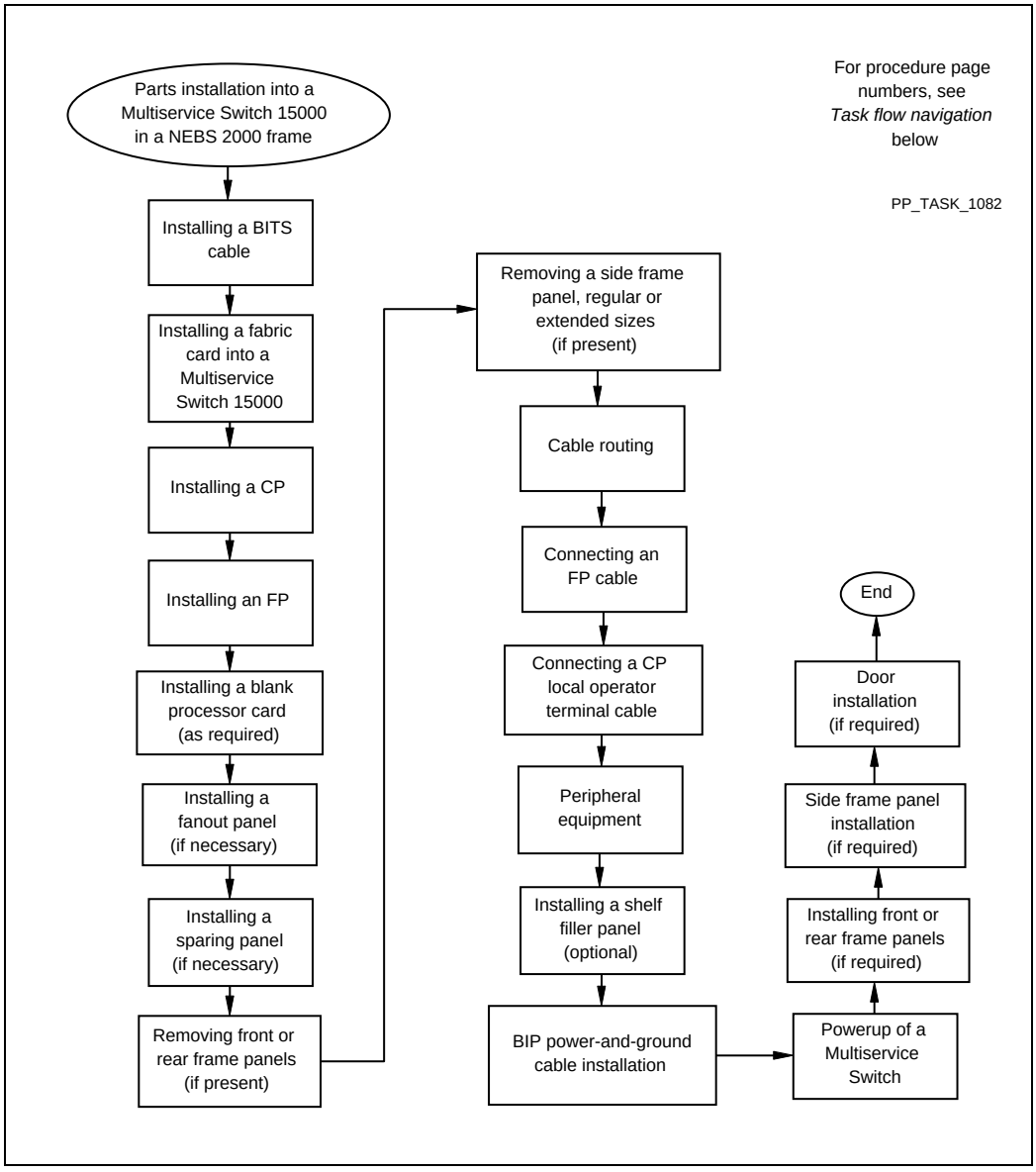
Task flow for Multiservice Switch 15000 parts installation into a NEBS 2000 frame



Navigation

- BIP power-and-ground cable installation (page 128)
- Cable routing (page 45)
- Connecting a CP local operator terminal cable (page 215)
- Connecting an FP cable (page 234)
- Door installation onto a NEBS 2000 frame (page 70)
- Installing a BITS cable (page 296)
- Installing a blank processor card (page 301)

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- Installing a CP (page 306)
- Installing a fabric card into a Multiservice Switch 15000 (page 340)
- Installing a fanout panel (page 366)
- Installing a shelf filler panel (page 408)
- Installing a side frame panel, regular size (page 420)
- Installing a sparing panel (page 428)
- Installing an FP (page 465)
- Installing front or rear frame panels (page 502)
- Peripheral equipment (page 117)
- Powerup of a Multiservice Switch (page 136)
- Removing a side frame panel, regular or extended sizes (page 609)
- Removing front or rear frame panels (page 655)
- Side panel installation onto a NEBS 2000 frame (page 83)

Multiservice Switch 20000 parts installation into a NEBS 2000 frame

Install the parts of a Multiservice Switch 20000 into a NEBS 2000 frame to enable the switch to be put into service.

- Prerequisites to a Multiservice Switch 20000 parts installation into a NEBS 2000 frame (page 109)
- Task flow of a Multiservice Switch 20000 parts installation into a NEBS 2000 frame (page 109)

Prerequisites to a Multiservice Switch 20000 parts installation into a NEBS 2000 frame

- The NEBS 2000 frame must already be installed as indicated by NEBS 2000 frame installation (page 104).
- Power and ground cables must be routed to the planned location of the switch before beginning this task. See the NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

Task flow of a Multiservice Switch 20000 parts installation into a NEBS 2000 frame

This task flow shows the sequence of procedures you do to install the parts of a Multiservice Switch 20000 into a NEBS 2000 frame. To link to any procedure, go to Navigation (page 110).

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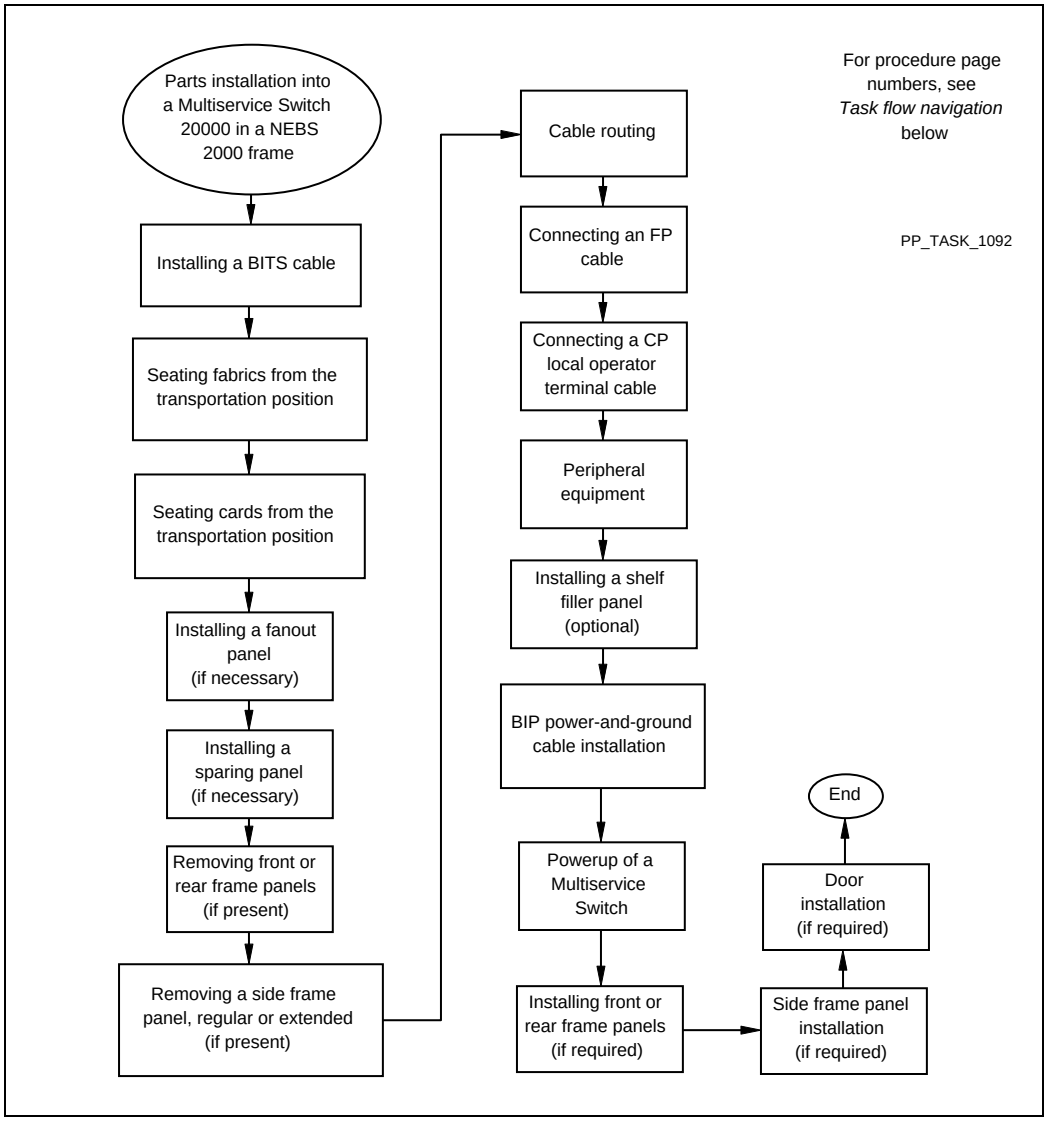
Task flow for Multiservice Switch 20000 parts installation into a NEBS 2000 frame



Navigation

- BIP power-and-ground cable installation (page 128)
- Cable routing (page 45)
- Connecting a CP local operator terminal cable (page 215)
- Connecting an FP cable (page 234)
- Door installation onto a NEBS 2000 frame (page 70)
- Installing a BITS cable (page 296)
- Installing a fanout panel (page 366)
- Installing a shelf filler panel (page 408)

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- Installing a side frame panel, regular size (page 420)
- Installing a sparing panel (page 428)
- Installing front or rear frame panels (page 502)
- Peripheral equipment (page 117)
- Powerup of a Multiservice Switch (page 136)
- Removing a side frame panel, regular or extended sizes (page 609)
- Removing front or rear frame panels (page 655)
- Seating cards from the transportation position (page 721)
- Seating fabrics from the transportation position (page 724)
- Side panel installation onto a NEBS 2000 frame (page 83)

Multiservice Switch 15000 VSS installation

Install a Multiservice Switch 15000 VSS to put into service the Multiservice Switch 7480 and Multiservice Switch 15000 while they are mounted together in a NEBS 2000 frame.

- Prerequisites to a Multiservice Switch 15000 VSS installation (page 111)
- Task flow of a Multiservice Switch 15000 VSS installation (page 112)

Prerequisites to a Multiservice Switch 15000 VSS installation

- You need Nortel Networks Multiservice Switch package NTQS80, NTQS81, or NTQS82.
- The NEBS 2000 frame must already be installed as indicated by NEBS 2000 frame installation (page 104).
- The power source for the Multiservice Switch 7400 must not be the same breaker interface panel (BIP) as the Multiservice Switch 15000, but both switches must share the same ground window.
- Power and ground cables must be routed to the planned location for the switches before beginning this task. See the NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- The fiber link between the Multiservice Switch 15000 and the Multiservice Switch 7480 in the Multiservice Switch 15000 VSS can be made using an external OC-3 connection between OC-3 single-mode or multimode function processors (FPs). The fiber cable requires SC connectors at each end. You must provide the customized fiber cable and connectors.
- When the OC-3 card pair has different laser reaches (SR, IR, or LR), you may need to use in-line attenuators. See the procedure Determining if you need to use inline attenuators with optical FPs (page 256).

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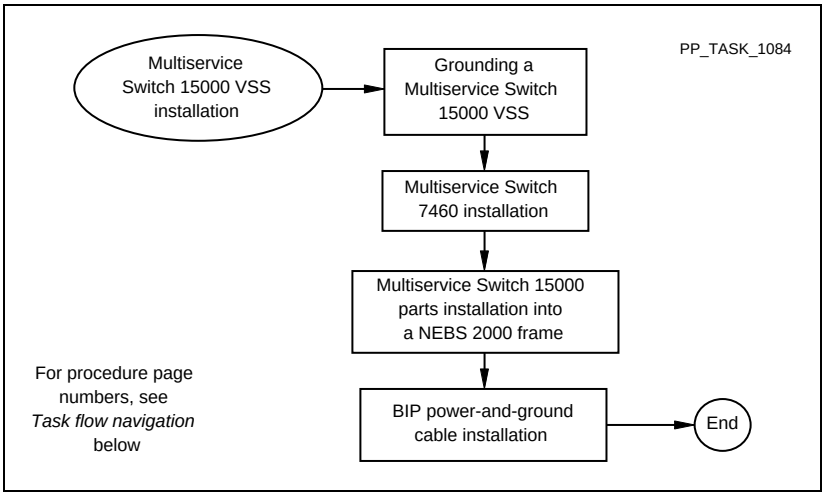
Task flow of a Multiservice Switch 15000 VSS installation

This task flow shows the sequence of tasks you do to install a Multiservice Switch 15000 VSS. To link to any task, go to Navigation (page 112).

Task flow for a Multiservice Switch 15000 VSS installation



Navigation

- "16-slot Multiservice Switch 7480 installation". See NN10600-175 *Nortel Networks Multiservice Switch 7400 Hardware Installation, Maintenance, and Upgrade*.
- BIP power-and-ground cable installation (page 128)
- Grounding a Multiservice Switch 15000 VSS (page 272)
- Multiservice Switch 15000 parts installation into a NEBS 2000 frame (page 107)

Multiservice Switch installation into an EIA rack

Install a Multiservice Switch 15000 or Multiservice Switch 20000 into a standard 23-inch EIA frame, equipment rack, or enclosed cabinet.

- Prerequisites to a Multiservice Switch installation into a 23-inch EIA rack (page 113)
- Task flow of a Multiservice Switch installation into a 23-inch EIA rack (page 114)

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Prerequisites to a Multiservice Switch installation into a 23-inch EIA rack

WARNING
Risk of injury or damage from an unanchored rack
Mounting equipment into or onto a rack can make it top heavy. To prevent a rack from tipping over, possibly causing a serious injury, always anchor it to the floor. Follow the methods prescribed by Zone 2 or 4 anchoring.

WARNUNG
Verletzungs- oder Beschädigungsrisiko durch ein unverankertes Rack
Beim Montieren von Geräten in oder auf einem Rack besteht die Gefahr der Kopflastigkeit. Verankern Sie ein Rack immer am Boden, um ein Umkippen und dadurch verursachte mögliche Verletzungen zu vermeiden. Folgen Sie den Anweisungen zur Verankerung in Zone 2 oder 4.

- You need one of these Multiservice Switch hardware packages:
  - NTQS04 for a Multiservice Switch 15000
  - NTQH04 for a Multiservice Switch 20000
- If you install the switch in a mounting apparatus other than a NEBS 2000 frame, you are responsible for making the setup compliant to earthquake standards. Refer to the rack manufacturer's installation instructions.
- For the installation of a switch to begin, the 23-inch EIA rack must already be completely installed and anchored.
- Typically, the weight of a fully provisioned and fully installed Multiservice Switch 15000 prohibits adding other equipment to the rack. Install the equipment that connects to the switch in a different mounting apparatus as described in:
  - Installing a fanout panel (page 366)
  - Installing a sparing panel (page 428)
  - Peripheral equipment (page 117)
- You must not install a second switch in a mounting apparatus other than a NEBS 2000 frame because of the total installed weight or cooling requirements. See NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for the criteria involved with installing a shelf-based switch.
- The switch must always be positioned in the lowest possible part of your rack.

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- The optional extended cable management brackets cannot be used with the adapter brackets.
- The optional hardware kits NTQS37AA, NTQS37AB, or NTPX4050 should not be used for a mounting apparatus other a NEBS 2000 frame.
- See “Planning for the use of an equivalent mounting apparatus” in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for additional information.

Task flow of a Multiservice Switch installation into a 23-inch EIA rack

This task flow shows the sequence of procedures and tasks you do to install a Multiservice Switch 15000 or Multiservice Switch 20000 into a 23-inch EIA rack. To link to any procedure or task, go to Navigation (page 115).

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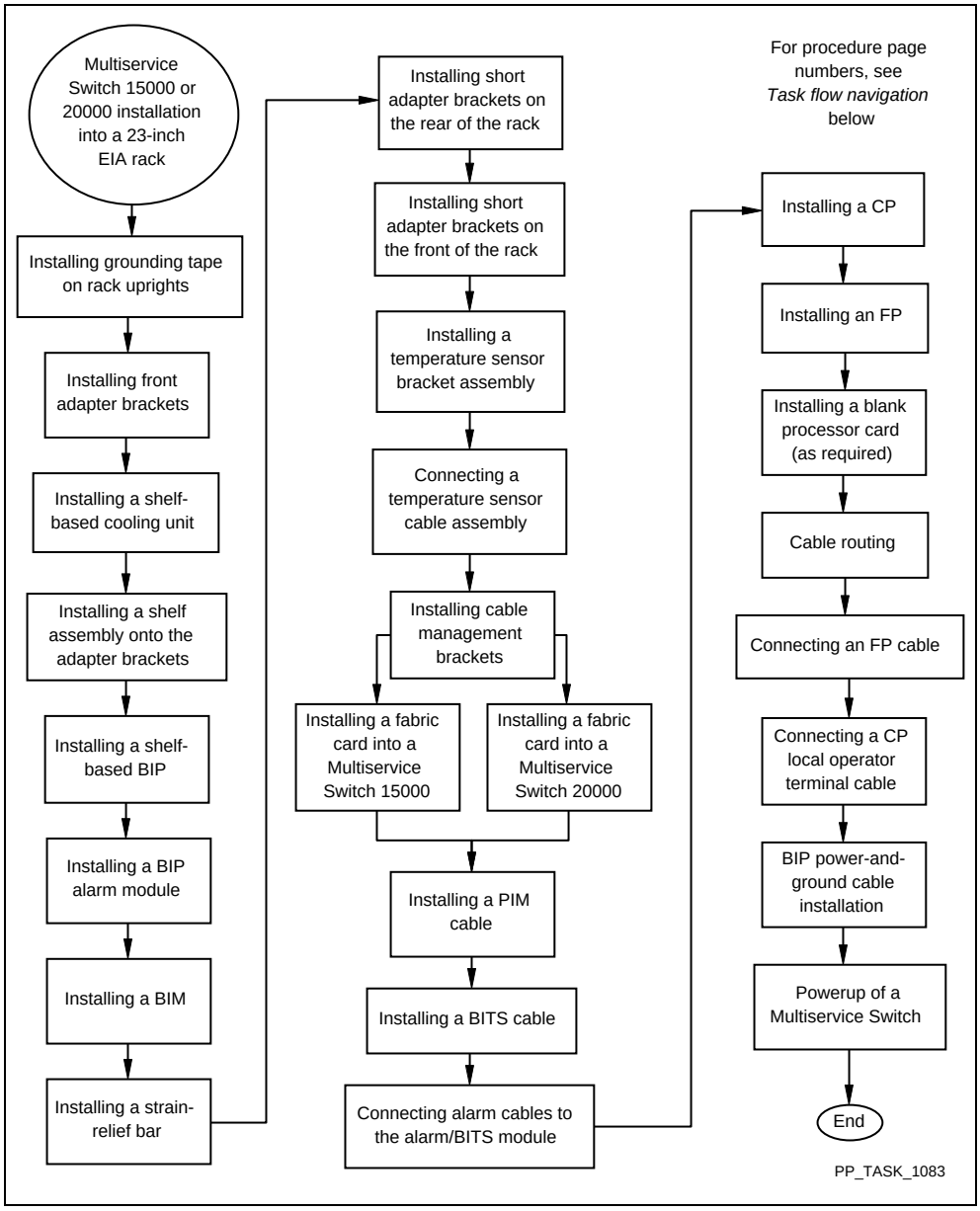
Task flow for a Multiservice Switch installation into a 23-inch EIA rack



Navigation

- Cable routing (page 45)
- BIP power-and-ground cable installation (page 128)
- Connecting alarm cables to the alarm/BITS module (page 229)
- Connecting a CP local operator terminal cable (page 215)
- Connecting a temperature sensor cable assembly (page 227)
- Connecting an FP cable (page 234)

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- Installing a BIM (page 283)
- Installing a BIP alarm module (page 286)
- Installing a BITS cable (page 296)
- Installing a blank processor card (page 301)
- Installing a CP (page 306)
- Installing a fabric card into a Multiservice Switch 15000 (page 340)
- Installing a fabric card into a Multiservice Switch 20000 (page 345)
- Installing a PIM cable (page 388)
- Installing a shelf assembly (page 403)
- Installing a shelf-based BIP (page 410)
- Installing a shelf-based cooling unit (page 412)
- Installing a strain-relief bar (page 430)
- Installing a temperature sensor bracket assembly (page 431)
- Installing an FP (page 465)
- Installing cable management brackets (page 487)
- Installing front adapter brackets (page 500)
- Installing grounding tape on rack uprights (page 508)
- Installing short adapter brackets on the front of the rack (page 519)
- Installing short adapter brackets on the rear of the rack (page 515)
- Powerup of a Multiservice Switch (page 136)

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Peripheral equipment

Peripheral equipment is any other Nortel Networks equipment that connects directly to a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000. Select from the following tasks and procedures:

- Connecting a CP local operator terminal cable (page 215)
- Connecting a Multiservice Switch to an EdgeLink 100 (page 218)
- Modem installation (page 117)
- Multiport aggregate device installation (page 119)
- Multiport aggregate device replacement (page 120)
- Replacing a SER 5500 interface cable (page 679)
- Replacing an EdgeLink 100 interface cable (page 692)
- SER 5500 switch installation (page 122)

Modem installation

Install a modem to enable a remote user to connect to a Multiservice Switch so that it can enter and receive local operator software commands.

- Prerequisites to a modem installation (page 117)
- Task flow of a modem installation (page 118)

Prerequisites to a modem installation

CAUTION

Risk of service loss by leaving a modem live

The operator port to which you connect the modem is intended for temporary access. Use the modem to communicate with the switch only for as long as you need to, then drop the dialup. You can leave the hardware and cables in place, but the link must not be left live between login sessions.

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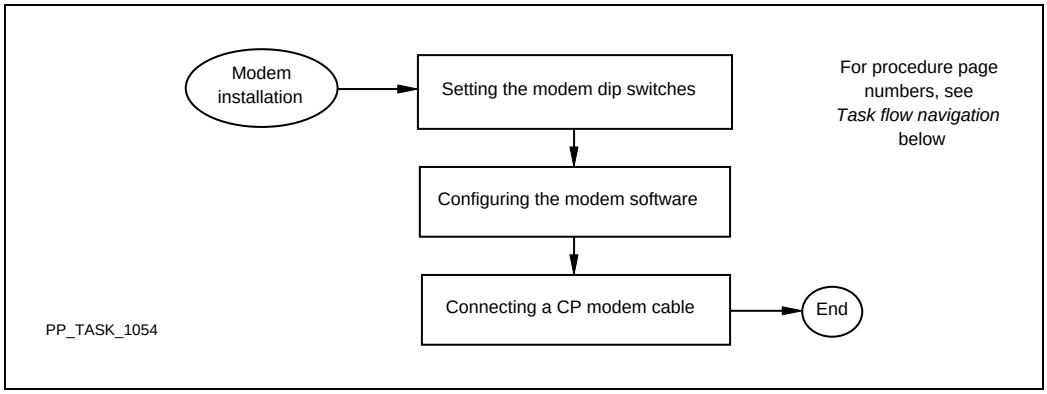
CAUTION
Risk of service loss by incorrectly setting a modem
Unless the hardware settings, the custom cable, and the software configuration of a modem is done correctly, the CP may crash and fail to reboot.

- An asynchronous modem can be connected to the local operator port on a control processor (CP). The optional connection enables a remote user to dial up to the switch to enter and receive local operator software commands. You must supply the modem and follow all instructions in this section.
- There is no software configuration of the switch to enable using a modem connected to the CP. The hardware setup of the switch requires a specific modem setup.
- Mount the modem according to its manufacturer's instructions. Ensure that the distance between the modem and the CP installed in the switch is within the modem's recommended transmission distances in either direction of the connection path.
- Have a dedicated ac power outlet available to operate the modem while it is connected to the switch.

Task flow of a modem installation

This task flow shows the sequence of procedures you do to install a modem and connect it to a Multiservice Switch. To link to any procedure, go to Navigation (page 118).

Task flow for a modem installation



Navigation

- Configuring modem software (page 210)
- Connecting a CP modem cable (page 216)
- Setting modem DIP switches (page 731)

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Multiport aggregate device installation

Install a multiport aggregate device to break out the ports of a 32-port E1 TDM FP.

- Prerequisites to a multiport aggregate device installation (page 119)
- Task flow of a multiport aggregate device installation (page 119)

Prerequisites to a multiport aggregate device installation

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a multiport aggregate devices with one of the following PECs:
  - NT0486 for the balanced
  - NT0421 for the unbalanced
- The multiport aggregate device installs in a 19-inch rack or requires one pair of the adapter brackets from kit NTHW14 to be installed in a NEBS 2000 frame.

Task flow of a multiport aggregate device installation

This task flow shows the sequence of procedures you do to install a multiport aggregate device and connect it to a Multiservice Switch. To link to any procedure, go to Navigation (page 122).

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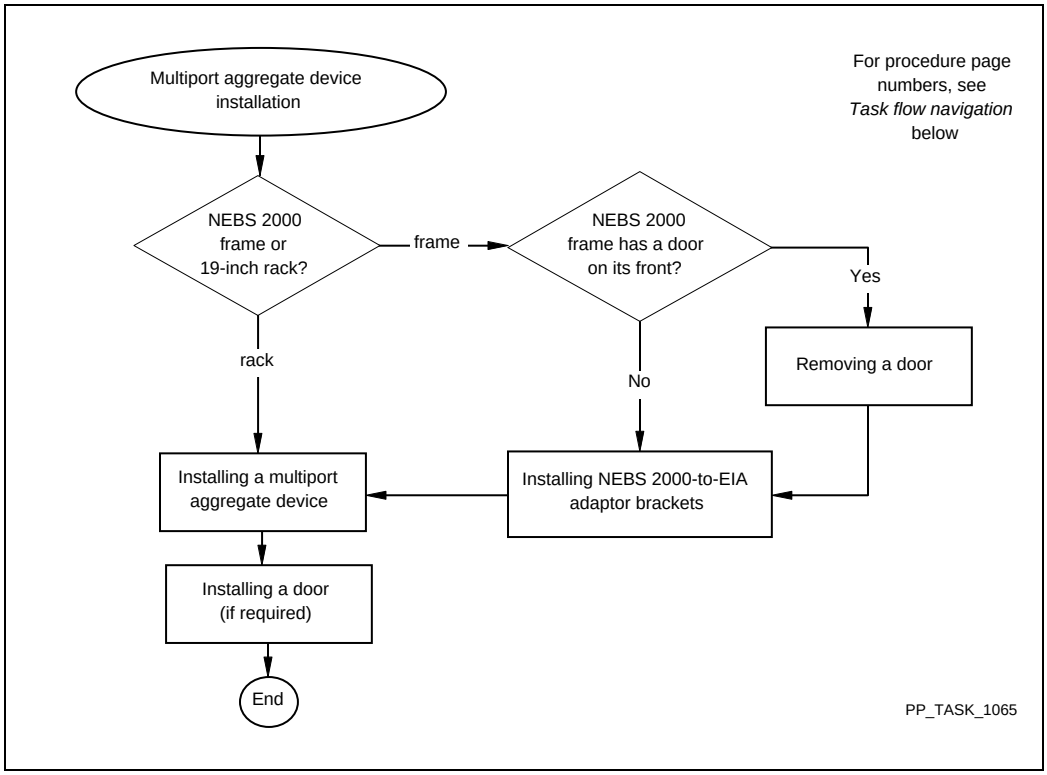
Task flow for a multiport aggregate device installation



Navigation

- Installing a door (page 314)
- Installing a multiport aggregate device (page 380)
- Installing NEBS 2000 frame-to-EIA adapter brackets (page 513)
- Removing a door (page 561)

Multiport aggregate device replacement

Replace a multiport aggregate device, if it fails.

- Prerequisites to a multiport aggregate device replacement (page 121)
- Task flow of a multiport aggregate device replacement (page 121)

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Prerequisites to a multiport aggregate device replacement

CAUTION
Service loss on active ports
Replacing a multiport aggregate device requires you to remove all the E1 ports connected to the device from service for the duration of the replacement. Minimize the impact of the hardware outage by rerouting traffic to other nodes in the network before locking the ports.

CAUTION
Service interruption by powering down
Before you power down a multiport aggregate device, inform appropriate personnel that service will be interrupted.

- Some of the procedures in this task are not located in this NTP. Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Task flow of a multiport aggregate device replacement

This task flow shows the sequence of procedures you do to replace a multiport aggregate device that is connected to a Multiservice Switch. To link to any procedure, go to Navigation (page 122).

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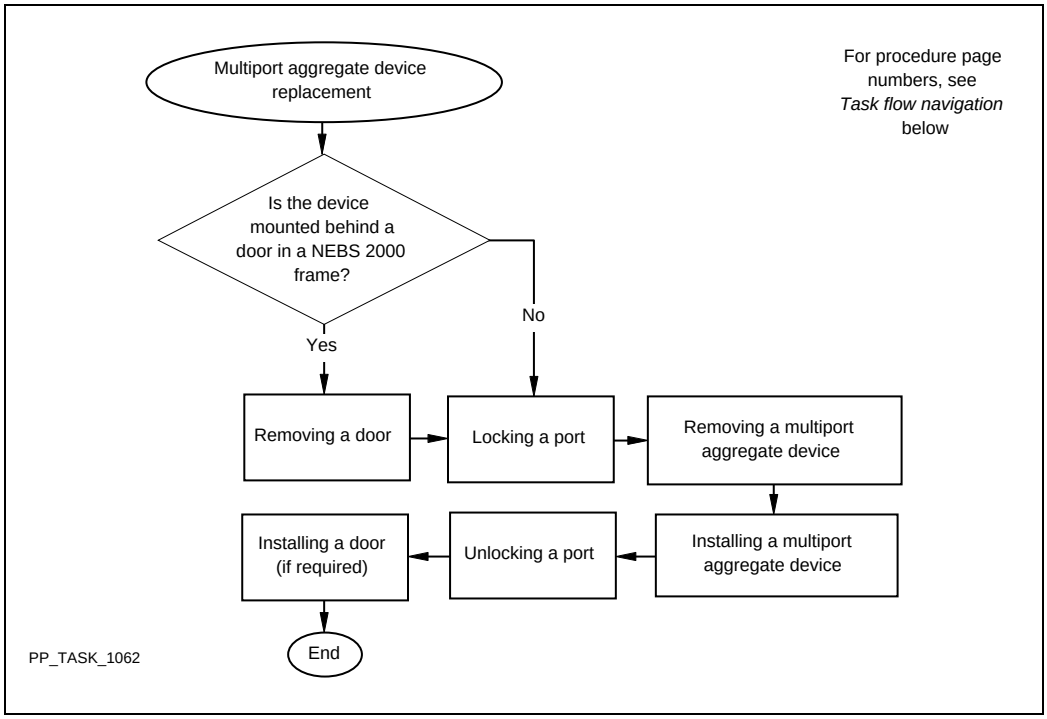
Task flow for a multiport aggregate device replacement



Navigation

- Installing a door (page 314)
- Installing a multiport aggregate device (page 380)
- “Locking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing a door (page 561)
- Removing a multiport aggregate device (page 593)
- “Unlocking a port”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

SER 5500 switch installation

Install a SER 5500 switch into a NEBS 2000 frame for interworking with a Multiservice Switch 15000 or Multiservice Switch 20000 that is already installed in the same frame.

- Prerequisites to a SER 5500 switch installation (page 122)
- Task flow of a SER 5500 switch installation (page 123)

Prerequisites to a SER 5500 switch installation

- Determine if the floor can accommodate the combined weight of both the SER 5500 and Multiservice Switch. The combined weight of two fully

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provisioned nodes will be approximately 568 kg (1,252 lbs). Aside from this consideration, the normal site preparations of a SER 5500 apply to the installation.

- You will need the hardware kit NTHW85 required to add a SER 5500 to a NEBS 2000 frame. The kit contains
  - a pair of adapter brackets (P0914660 for the right and P0914659 for the left) to mount a SER 5500 onto a NEBS 2000 frame
  - an air-flow grill (P0914658) for the front space between the two nodes
  - a cable management assembly to be installed above the SER 5500
  - self-tapping mounting screws with 10-mm (3/8-inch) hex heads
- You will need drivers for 10-mm (3/8-inch) hex-head screws.
- Before installing a SER 5500 switch into a NEBS 2000 frame (NTRU04), the frame must already be anchored to the floor, and a Multiservice Switch 15000 or Multiservice Switch 20000 installed in the lower half.
- You must supply power and ground cables, and any signalling cables.
- After installing the SER 5500 hardware into the NEBS 2000 frame, follow the appropriate procedures in S-623-01 *Shasta 5000 BSN Installation and Maintenance Manual* to complete the installation of the SER 5500 (for example, installing cards and cables, power and alarm cabling, and powering up).

Task flow of a SER 5500 switch installation

This task flow shows the sequence of procedures you do to install a SER 5500 into a NEBS 2000 frame. To link to any procedure, go to Navigation (page 124).

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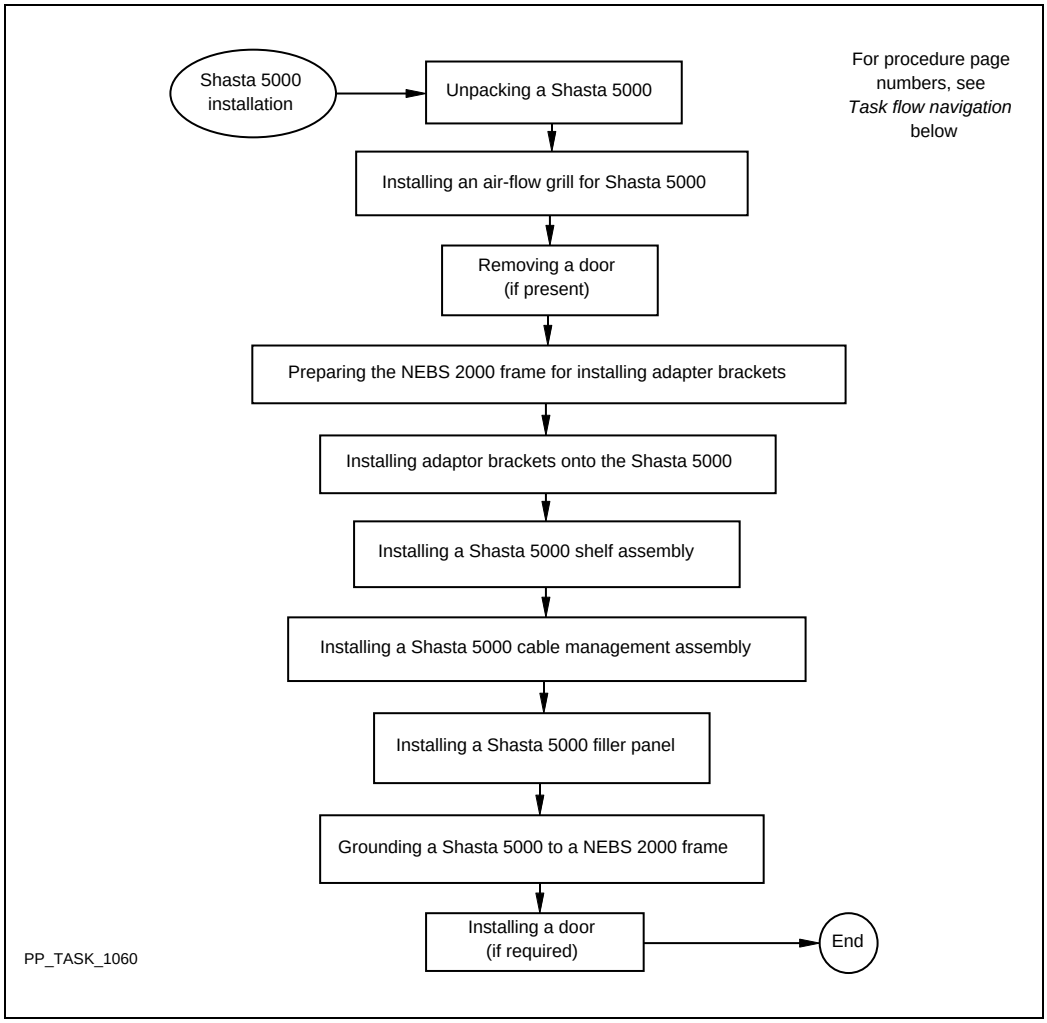
Task flow for a SER 5500 installation



Navigation

- Grounding a SER 5500 to a NEBS 2000 frame (page 275)
- Installing a door (page 314)
- Installing a SER 5500 air-flow grill (page 395)
- Installing a SER 5500 cable management assembly (page 397)
- Installing a SER 5500 filler panel (page 399)
- Installing a SER 5500 shelf assembly (page 401)
- Installing adapter brackets onto a SER 5500 (page 463)
- Preparing the NEBS 2000 frame for installing adapter brackets (page 540)
- Removing a door (page 561)
- Unpacking a SER 5500 (page 745)

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Power-and-ground hardware for a Multiservice Switch

Select from the following tasks or procedures to install or replace power and ground hardware of a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000:

- BIM replacement (page 126)
- BIP power-and-ground cable installation (page 128)
- BIP power input cable replacement (page 131)
- BIP replacement (page 133)
- Power-and-ground cable assembly replacement (page 135)
- Powerup of a Multiservice Switch (page 136)
- PIM replacement (page 138)
- Replacing a PIM cable (page 676)

The grounding cable installations and disconnects for the frame accessories are included in the task and procedures of NEBS 2000 frame accessories (page 69).

BIM replacement

Replace a breaker interface module (BIM) to restore power from a breaker interface panel (BIP) to its half of the shelf assembly, or to accommodate replacing an upper shelf Multiservice Switch 15000 with a Multiservice Switch 20000 in a NEBS 2000 frame.

- Prerequisites to a BIM replacement (page 126)
- Task flow of a BIM replacement (page 127)

Prerequisites to a BIM replacement

- You need a BIM with one of the appropriate PECs identified in the table Combinations of BIM pairs in a BIP (page 127).

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— When using a new BIM, identify the PEC from its shipping container.

— When redeploying one or both BIMs from another BIP, you must identify the PEC of each from your site records.

- Since the PEC of a BIP is not visible on the hardware and there are no exterior features to distinguish an AP6C62 from an AP6C68, you must verify which BIP you have from

  — a label on the cover of the upper cable management channel located on the front of the lower shelf assembly, identifies the switch as a Multiservice Switch 15000 or Multiservice Switch 20000. Older Multiservice Switch 15000 models do not have this label and their cover is blank.

  — your site records

- The BIP for a Multiservice Switch 20000 accommodates BIMs with higher power ratings than the BIP for a Multiservice Switch 15000. A BIM pair for a Multiservice Switch 15000 can operate in the BIP of a Multiservice Switch 20000 to power a Multiservice Switch 15000. The BIM pair for a Multiservice Switch 20000 must not be operated in the BIP of a Multiservice Switch 15000 to power a Multiservice Switch 20000. The PECs of BIM pairs must always match exactly. For the safe mix of BIMs, see the table Combinations of BIM pairs in a BIP (page 127).

Combinations of BIM pairs in a BIP

Equipment type	PEC of a BIP with 2 BIMs	PEC of the BIM pairs that can be added
Multiservice Switch 20000	AP6C68	two or four AP6C67PA, or two AP6C67PA and two NT6C60PA
Multiservice Switch 15000	NT6C62	two or four NT6C60PA, or two NT6C60PA and two AP6C67PA

Task flow of a BIM replacement

This task flow shows the sequence of procedures you do to replace a BIM in a BIP. To link any procedure, go to Navigation (page 128).

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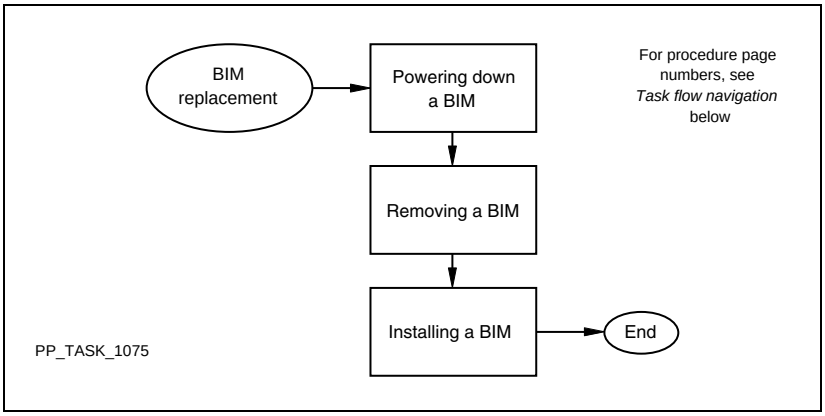
Task flow for a BIM replacement



Navigation

- Installing a BIM (page 283)
- Powering down a BIM (page 535)
- Removing a BIM (page 542)

BIP power-and-ground cable installation

Install BIP power-and-ground cables to provide power from an on-site power source or system of ac rectifiers to the breaker interface panel (BIP), and to ground a Multiservice Switch to the site ground window.

- Prerequisites to a BIP power-and-ground cable installation (page 128)
- Task flow of a BIP power-and-ground cable installation (page 129)

Prerequisites to a BIP power-and-ground cable installation

- Determine the types, ratings, size, length, and current capacity for the power and ground cables from site planning in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- Install the power cabling with or without conduit between the source of power and the BIP according to your local electrical standards. Leave enough cable slack at each end to accommodate the approximate final position of the terminal connections. Label both ends of each cable to indicate the mapping of the power source connection points to the studs at the rear of the BIP. Map the feeds according to “Prerequisites to installing dc power input cables” in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- Record the electrical hookup information as you install the cables for both your site records and on each junction of a cable. Include such information as

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— the grounding method and the available grounding points for all hardware that will interwork with the switch, and therefore share the same ground window

— the type of power source as dc from the site power plant or from a system of ac rectifiers

— if used, any particulars about the system of ac rectifiers

— the A1, A2, B1, and B2 feed cables relative to the specific BIM connections

— which upstream breakers or fuses control which feeds at the BIP

— the cable path from the power source to the BIP

— the size and distance of each leg of power cables

— any non-typical hookup or hookup that exceeds your local electrical standards

Task flow of a BIP power-and-ground cable installation

This task flow shows the sequence of procedures you do to install the BIP power-and-ground cable. To link any procedure, go to Navigation (page 130).

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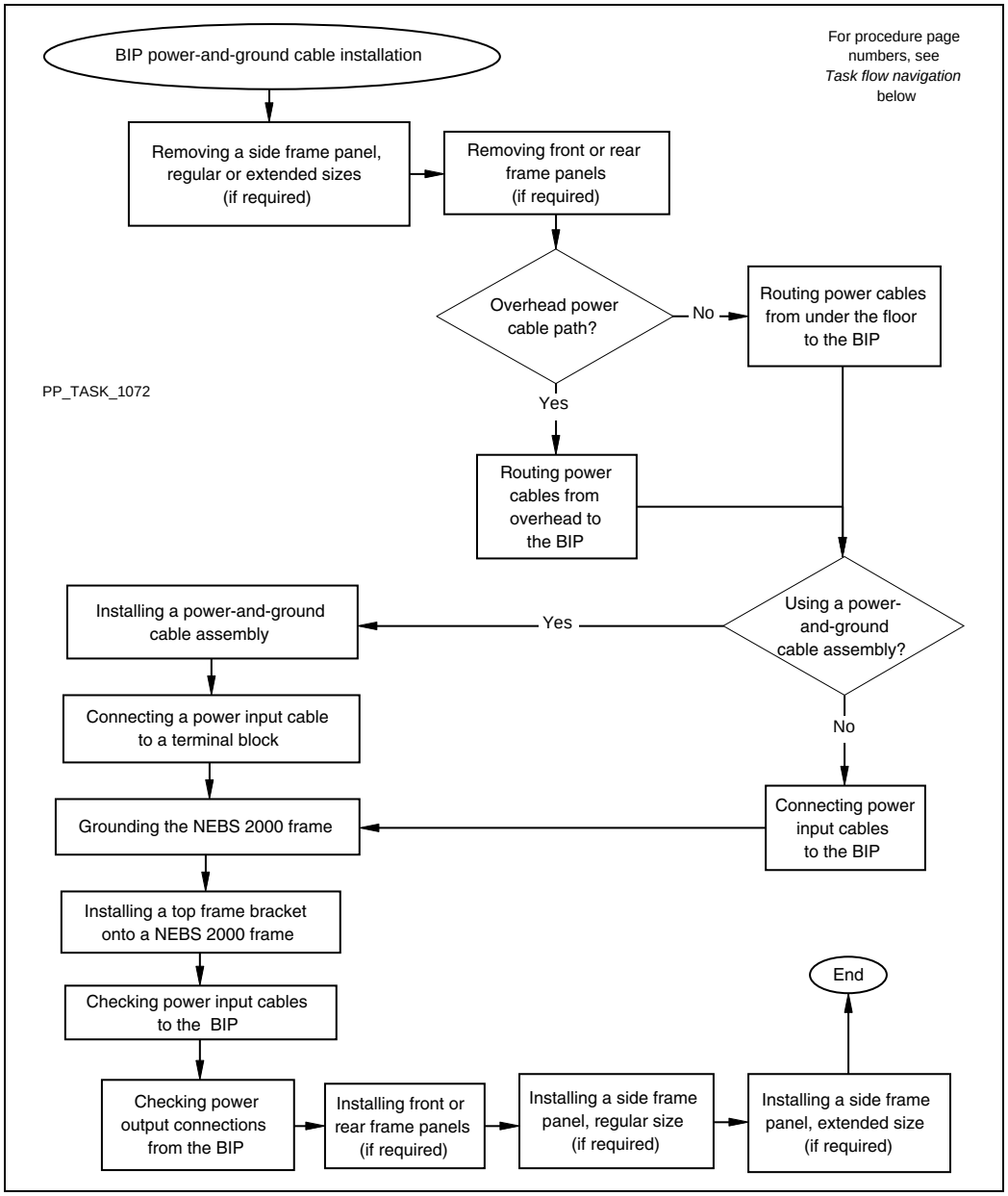
Task flow for a BIP power-and-ground cable installation



Navigation

- Checking power input cables to the BIP (page 181)
- Checking power output connections from the BIP (page 191)
- Connecting a power input cable to a terminal block (page 223)
- Connecting power input cables to the BIP (page 245)
- Grounding the NEBS 2000 frame (page 277)

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- Installing a side frame panel, extended size (page 415)
- Installing a side frame panel, regular size (page 420)
- Installing a top frame bracket onto a NEBS 2000 frame (page 459)
- Installing front or rear frame panels (page 502)
- Installing a power-and-ground cable assembly (page 390)
- Removing a side frame panel, regular or extended sizes (page 609)
- Removing front or rear frame panels (page 655)
- Routing power cables from overhead to the BIP (page 712)
- Routing power cables from under the floor to the BIP (page 716)

BIP power input cable replacement

Replace a breaker interface panel (BIP) power input cable to restore power to a BIM of the BIP.

- Prerequisites to a power input cable replacement (page 131)
- Task flow of a power input cable replacement (page 131)

Prerequisites to a power input cable replacement

- You need a replacement cable with the same ratings, gauge, length, and quality or better.

Task flow of a power input cable replacement

This task flow shows the sequence of procedures you do to replace a BIP power input cable. To link any procedure, go to Navigation (page 132).

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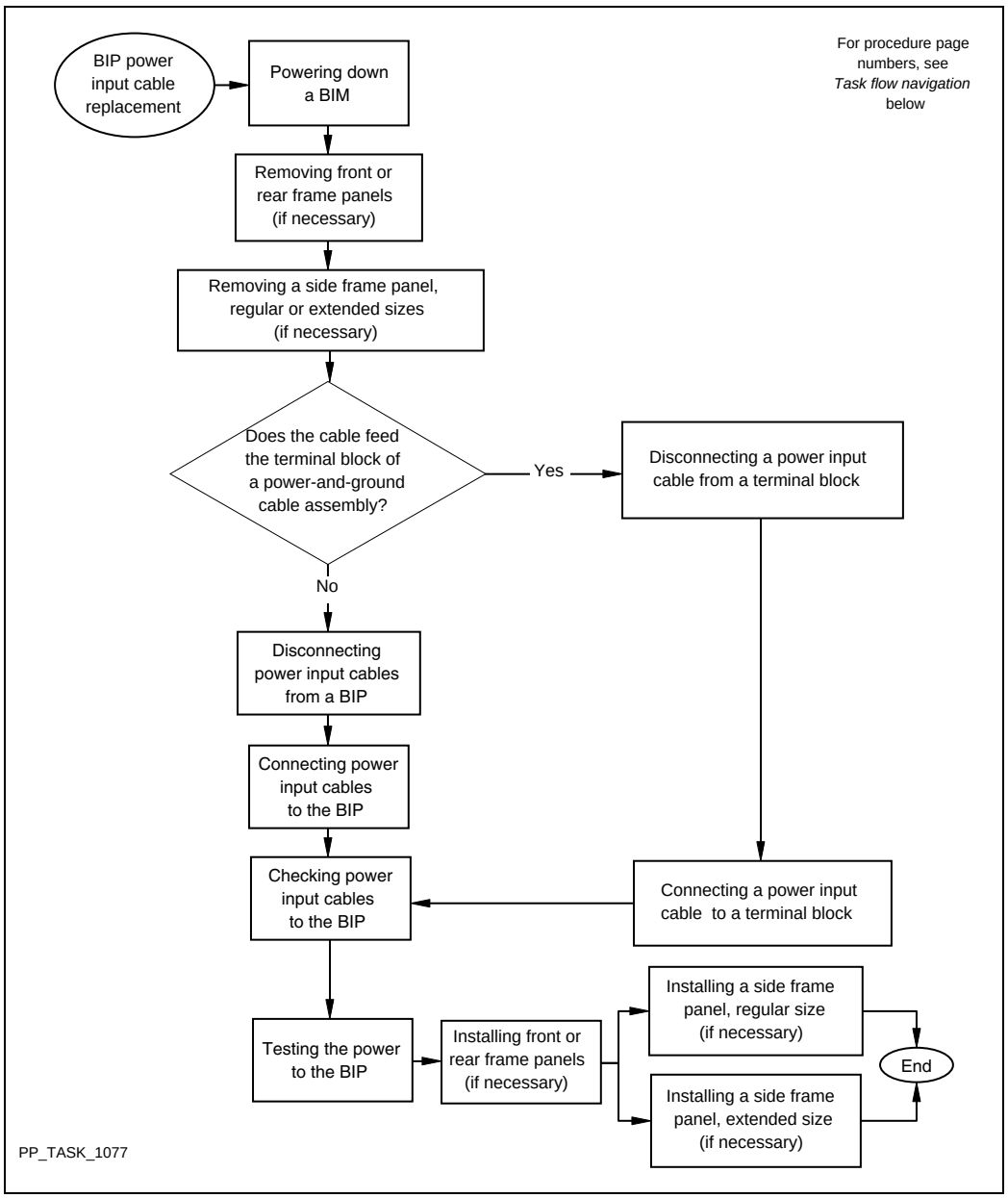
Task flow for a BIP power input cable replacement



Navigation

- Checking power input cables to the BIP (page 181)
- Connecting power input cables to the BIP (page 245)
- Connecting a power input cable to a terminal block (page 223)
- Disconnecting a power input cable from a terminal block (page 258)
- Disconnecting power input cables from the BIP (page 264)

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- Installing a side frame panel, extended size (page 415)
- Installing a side frame panel, regular size (page 420)
- Installing front or rear frame panels (page 502)
- Powering down a BIM (page 535)
- Removing a side frame panel, regular or extended sizes (page 609)
- Removing front or rear frame panels (page 655)
- Testing the input power to the BIP (page 737)

BIP replacement

Replace a breaker interface panel (BIP) to increase the power input capability of a dual-shelf frame setup that includes adding a Multiservice Switch 20000, or to correct a hardware failure of a non-modular part of the unit.

- Prerequisites to a BIP replacement (page 133)
- Task flow of a BIP replacement (page 133)

Prerequisites to a BIP replacement

- You must be familiar with Safety considerations and best practices (page 19).
- You need a BIP with one of the following PECs:
  - NT6C62 for a frame with one Multiservice Switch 15000
  - NT6C61 for a frame with two Multiservice Switch 15000s
  - AP6C68 for a frame with one Multiservice Switch 20000
  - AP6C67 for a frame with two Multiservice Switch 20000s
  - AP6C67 for a frame with one Multiservice Switch 20000 and one Multiservice Switch 15000, with the appropriately matched BIM pairs inside the BIP to match the upper or lower position of the node (refer to Installing a BIM (page 283))
- Have a helper assist you in handling the BIPs. A BIP weighs up to 16 kg (35 lbs) if four BIMs and the alarm module are already installed.
- Removing a BIP means disconnecting power to it. Without power, the switch or switches are out of service until the BIP is re-connected and the system is powered up. Choose a maintenance window with the lowest average amount of traffic to the node.

Task flow of a BIP replacement

This task flow shows the sequence of procedures you do to replace the BIP. To link any procedure, go to Navigation (page 134).

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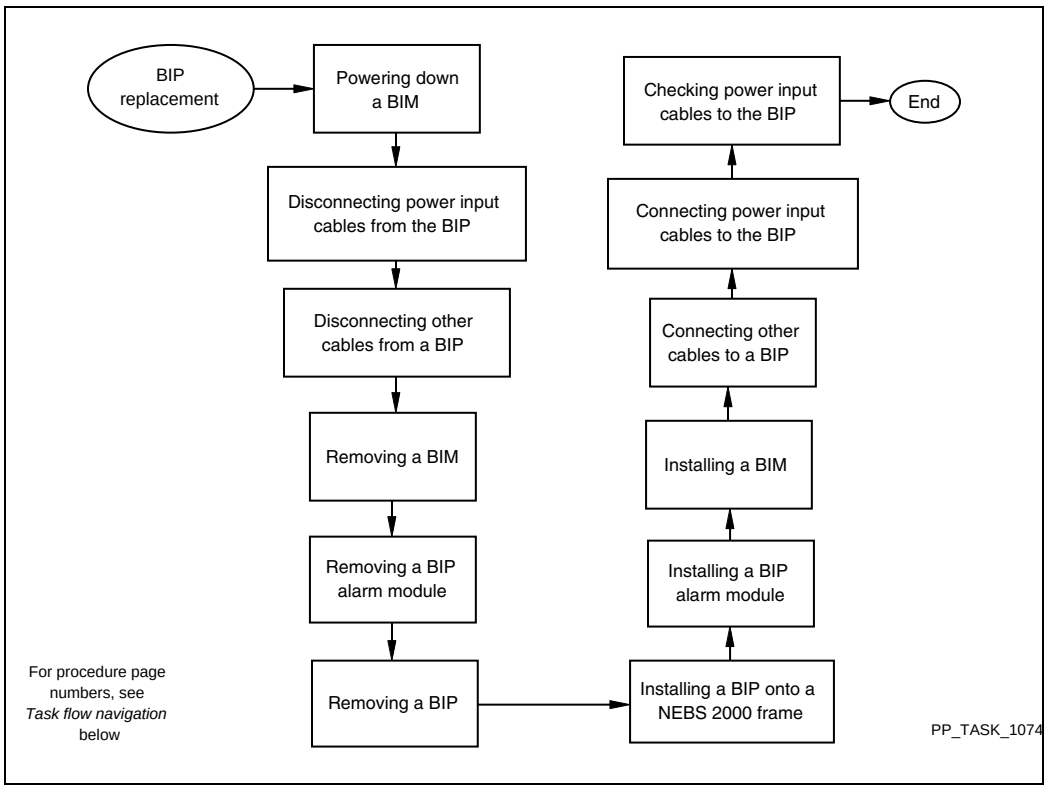
Task flow for a BIP replacement



Navigation

- Checking power input cables to the BIP (page 181)
- Connecting other cables to a BIP (page 244)
- Connecting power input cables to the BIP (page 245)
- Disconnecting power input cables from the BIP (page 264)
- Disconnecting other cables from a BIP (page 267)
- Installing a BIM (page 283)
- Installing a BIP alarm module (page 286)
- Installing a BIP onto a NEBS 2000 frame (page 293)
- Powering down a BIM (page 535)
- Removing a BIM (page 542)
- Removing a BIP (page 545)
- Removing a BIP alarm module (page 546)

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Power-and-ground cable assembly replacement

Replace a power-and-ground cable assembly to restore full power to the breaker interface panel (BIP).

- Prerequisites to a power-and-ground cable assembly replacement (page 135)
- Task flow of a power-and-ground assembly replacement (page 135)

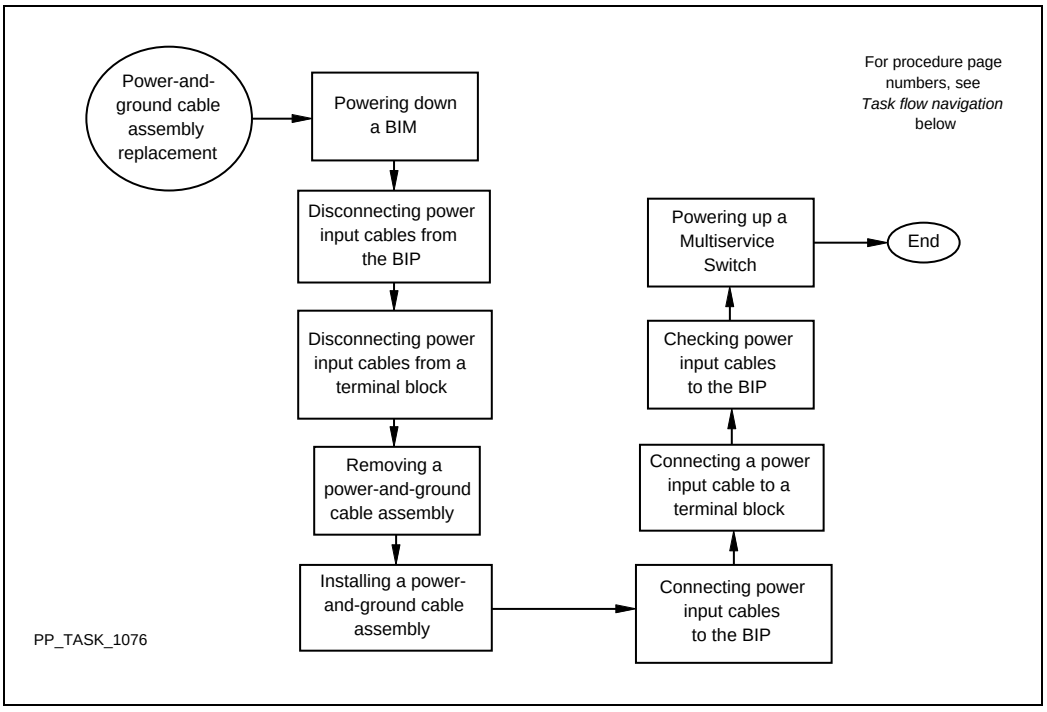
Prerequisites to a power-and-ground cable assembly replacement

- The power-and-ground kit for the polyvalent assembly is A0834143 and for the European Telecommunications Standards Institutes (ETSI) assembly is A0834149.
- Minimize the down time of the system by reviewing all procedures and planning to do all consecutively without delays in between. Also do the procedures during a period of lowest average traffic for each node.

Task flow of a power-and-ground assembly replacement

This task flow shows the sequence of procedures you do to replace the power-and-ground cable assembly. To link any procedure, go to Navigation (page 135).

Task flow for a power-and-ground cable assembly replacement



Navigation

- Checking power input cables to the BIP (page 181)

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- Connecting a power input cable to a terminal block (page 223)
- Connecting power input cables to the BIP (page 245)
- Disconnecting a power input cable from a terminal block (page 258)
- Disconnecting power input cables from the BIP (page 264)
- Installing a power-and-ground cable assembly (page 390)
- Powering down a BIM (page 535)
- Powerup of a Multiservice Switch (page 136)
- Removing a power-and-ground cable assembly (page 598)

Powerup of a Multiservice Switch

Power up a Multiservice Switch 15000 or Multiservice Switch 20000 to enable the software to be downloaded for initial operation, or to return the system to operation.

- Prerequisites to a powerup of a Multiservice Switch (page 136)
- Task flow of a powerup of a Multiservice Switch (page 137)

Prerequisites to a powerup of a Multiservice Switch

- You need access to NN10600-270 *Nortel Networks Multiservice Switch 7400/15000/20000 Software Installation*.
- All cables must be installed for interworking equipment, signalling (traffic), timing, and alarms.
- All power cables must be installed from the breaker interface panel (BIP) up to the power source without being connected and must have passed the checks with the power off.
- All equipment that is connected to or interworking with the switch must share the same site ground window.
- Each sparing panel will be powered up from the function processor (FP) cards through the control port cable when at least one FP is powered up.
- The following interworking equipment can be powered up independently from the BIP, but needs to be on to verify operation of the system:
  - an EdgeLink 100 DS3 multiplexor
  - the hardware of a Nortel Networks Multiservice Data Manager workstation
  - a local operator terminal and its modem (if present)
  - a multiport aggregate device
  - the Multiservice Switch 7400 hardware in a Multiservice Switch 15000 VSS

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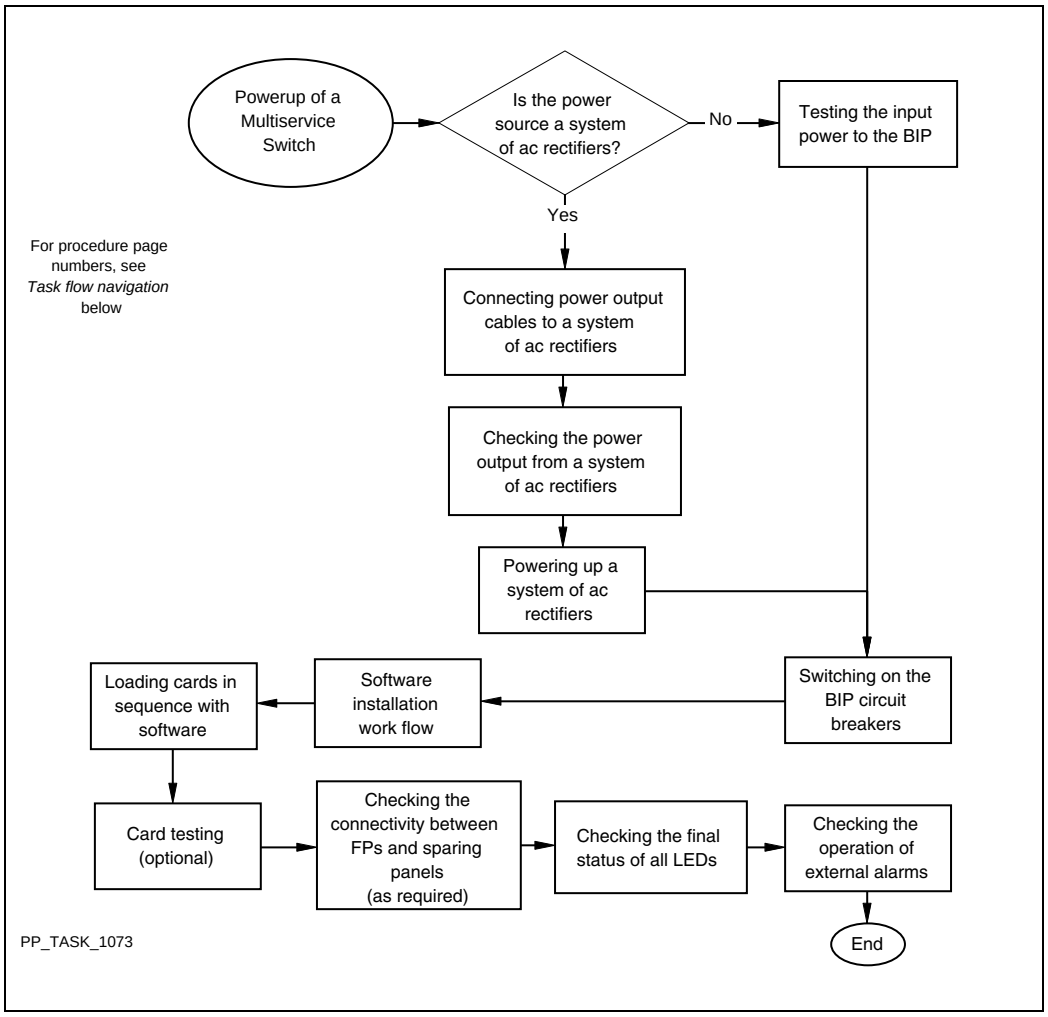
— a SER 5500 switch that shares a NEBS 2000 frame with a Multiservice Switch 15000 or Multiservice Switch 20000

Task flow of a powerup of a Multiservice Switch

This task flow shows the sequence of tasks to power up a Multiservice Switch 15000 or Multiservice Switch 20000. To link any procedure, go to Navigation (page 137).

Task flow for a power-up of a Multiservice Switch 15000 or Multiservice Switch 20000



Navigation

- "Card testing". See NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting*.
- Checking power output from a system of ac rectifiers (page 185)
- Checking the connectivity between FPs and sparing panels (page 193)

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- Checking the final status of all LEDs (page 195)
- Checking the operation of external alarms (page 197)
- Connecting power output cables to a system of ac rectifiers (page 252)
- Loading cards in sequence with software (page 524)
- Powering up a system of ac rectifiers (page 538)
- “Software installation work flow”. See NN10600-270 *Nortel Networks Multiservice Switch 7400/15000/20000 Software Installation*.
- Toggling on the BIP circuit breakers (page 732)
- Testing the power output from a system of ac rectifiers (page 736)
- Testing the input power to the BIP (page 737)

PIM replacement

Replace a power interface module (PIM) to restore back-up power to a shelf cage of a Multiservice Switch 15000 or Multiservice Switch 20000.

- Prerequisites to a PIM replacement (page 138)
- Task flow of a PIM replacement (page 138)

Prerequisites to a PIM replacement

- Each PIM has terminations for the SCB (HSCX bus) and clock distribution such that disconnecting a PIM can affect the software system. Terminations are spread across the PIMs to ensure that removing one will not affect the redundant pairs. Replace the PIM during a period of lowest traffic to minimize the impact on clock distribution.

Task flow of a PIM replacement

This task flow shows the sequence of procedures you do to replace a PIM. To link any procedure, go to Navigation (page 137).

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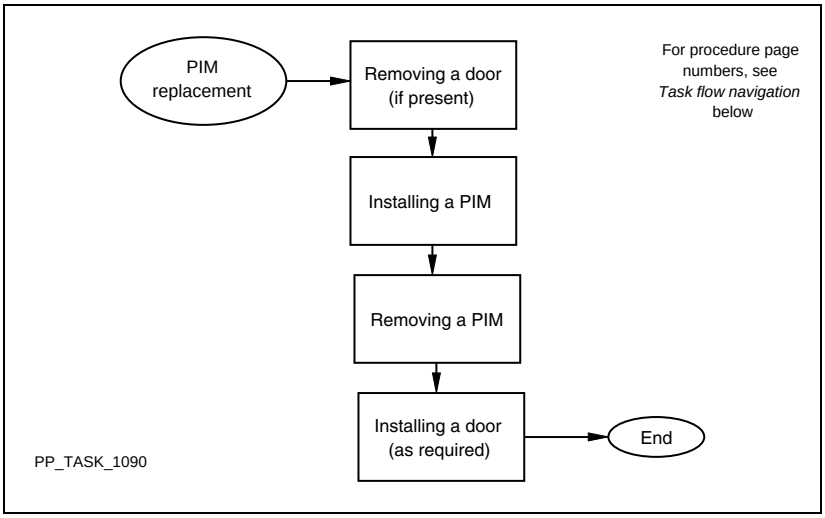
Task flow for a PIM replacement



Navigation

- Installing a door (page 314)
- Installing a PIM (page 386)
- Removing a door (page 561)
- Removing a PIM (page 595)

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Shelf assembly

Replace a shelf assembly to restore the operation of a card or module slot that is out of service because of one or more bent pins.

Prerequisites to shelf assembly replacement

CAUTION
Risk of prevented service
The CPs and FPs are configured in software according to specific slot numbers. For the software to operate again, each card must be returned to the same slot it came from. Otherwise, the node, or portions of it, may not return to service. Record your card locations.

- Replacing a shelf assembly requires the node to be removed from service. The minimum estimated down time from power-down to power-up for a Multiservice Switch 15000 or Multiservice Switch 20000 is 1 hour and 15 minutes. Anticipate a 2-hour window of activities to allow a sufficient margin to handle all hardware. The estimate excludes the time to power up the system. The duration depends on:
  - one person doing most of the activities who has experience working on a Multiservice Switch 15000 or Multiservice Switch 20000
  - a helper available to assist with removing and installing an empty shelf assembly (a Multiservice Switch 15000 weighs about 99 kg (218 lbs) and a Multiservice Switch 20000 weighs about 34 kg (74 lbs))
  - having all temporary ESD-protection storage containers at hand
  - having no delays or problems with any of the procedure steps
- Minimize the impact of downtime by beginning the replacement during the period of lowest average traffic for the node.
- When returning a shelf assembly to Nortel Networks, the rear modules must remain installed. A replacement shelf assembly includes the following rear modules installed at the factory:
  - the alarm/BITS module
  - the MAC address module

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— the four power interface modules (PIMs)

- Ensure that all front and rear cable ends are labeled with specific connection information. This will enable a quicker re-connection of each cable to the same connection. At the rear, the 4 cables connecting to the alarm/BITS module should be labeled J1, J2, J3, and J4 as on the module itself.
- If the NEBS 2000 frame that contains the existing shelf has a door mounted on its front, you need the key for the door lock from kit NTQS37.

Task flow of a shelf assembly replacement

This task flow shows the sequence of tasks you do to replace a Multiservice Switch 15000 or Multiservice Switch 20000 shelf assembly. To link any procedure, go to (page 142).

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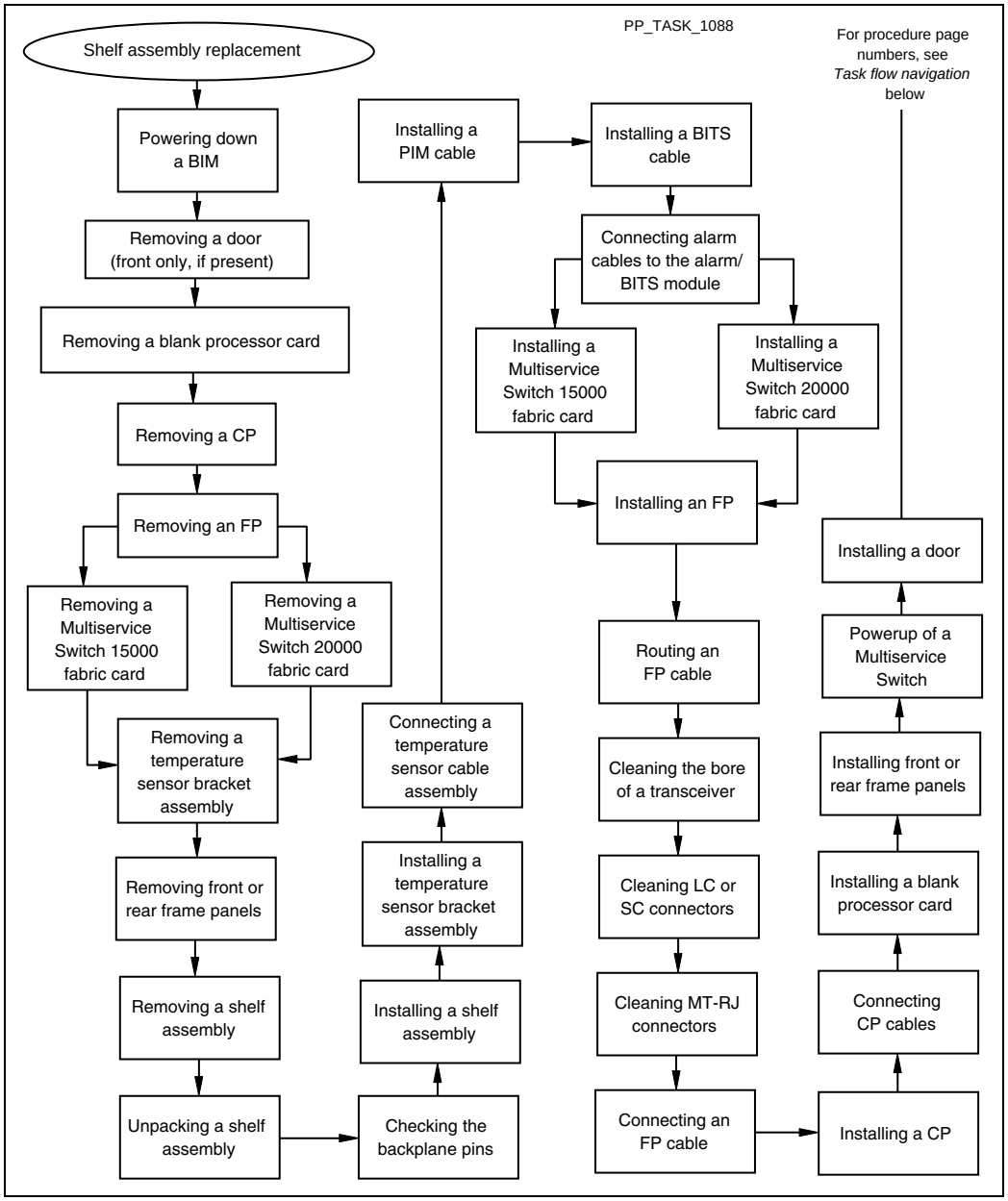
Task flow for a shelf assembly replacement



- Checking the backplane pins (page 178)
- Cleaning LC or SC connectors (page 202)
- Cleaning MT-RJ connectors (page 206)
- Cleaning the bore of a transceiver (page 209)
- Connecting a temperature sensor cable assembly (page 227)

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- Connecting alarm cables to the alarm/BITS module (page 229)
- Connecting an FP cable (page 234)
- Installing a BITS cable (page 296)
- Installing a blank processor card (page 301)
- Installing a CP (page 306)
- Installing a door (page 314)
- Installing a fabric card into a Multiservice Switch 15000 (page 340)
- Installing a fabric card into a Multiservice Switch 20000 (page 345)
- Installing a PIM cable (page 388)
- Installing a shelf assembly (page 403)
- Installing a temperature sensor bracket assembly (page 431)
- Installing an FP (page 465)
- Installing front or rear frame panels (page 502)
- Powering down a BIM (page 535)
- Powerup of a Multiservice Switch (page 136)
- Removing a blank processor card (page 551)
- Removing a CP (page 559)
- Removing a door (page 561)
- Removing a fabric card from a Multiservice Switch 15000 (page 566)
- Removing a fabric card from a Multiservice Switch 20000 (page 568)
- Removing a PIM (page 595)
- Removing a shelf assembly (page 602)
- Removing a temperature sensor bracket assembly (page 615)
- Removing an FP (page 631)
- Removing front or rear frame panels (page 655)
- Routing FP cables (page 707)
- Unpacking a shelf assembly (page 744)

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Sparing and fanout panels

Select from the following tasks to handle a sparing panel or fanout panel that is connected to function processors (FPs) that are installed in a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000:

- Sparing panel replacement (page 144)
- Fanout panel replacement (page 146)

Sparing panel replacement

Replace a failed sparing panel to restore connectivity and sparing functionality between FPs in a Multiservice Switch 15000 or Multiservice Switch 20000 and customer premises equipment.

- Prerequisites to a sparing panel replacement (page 144)
- Task flow of a sparing panel replacement (page 144)

Prerequisites to a sparing panel replacement

- Some of the procedures in this task are not located in this NTP. Ensure you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/ 15000/20000 Common Configuration Procedures*.
- When replacing a sparing panel, all traffic passing through it is dropped.
- If the sparing panel is mounted in a NEBS 2000 frame that has a door mounted on its front, you need the key for the door lock from kit NTQS37.

Task flow of a sparing panel replacement

This task flow shows the sequence of procedures you do to replace a sparing panel. To link to any procedure, go to Navigation (page 145).

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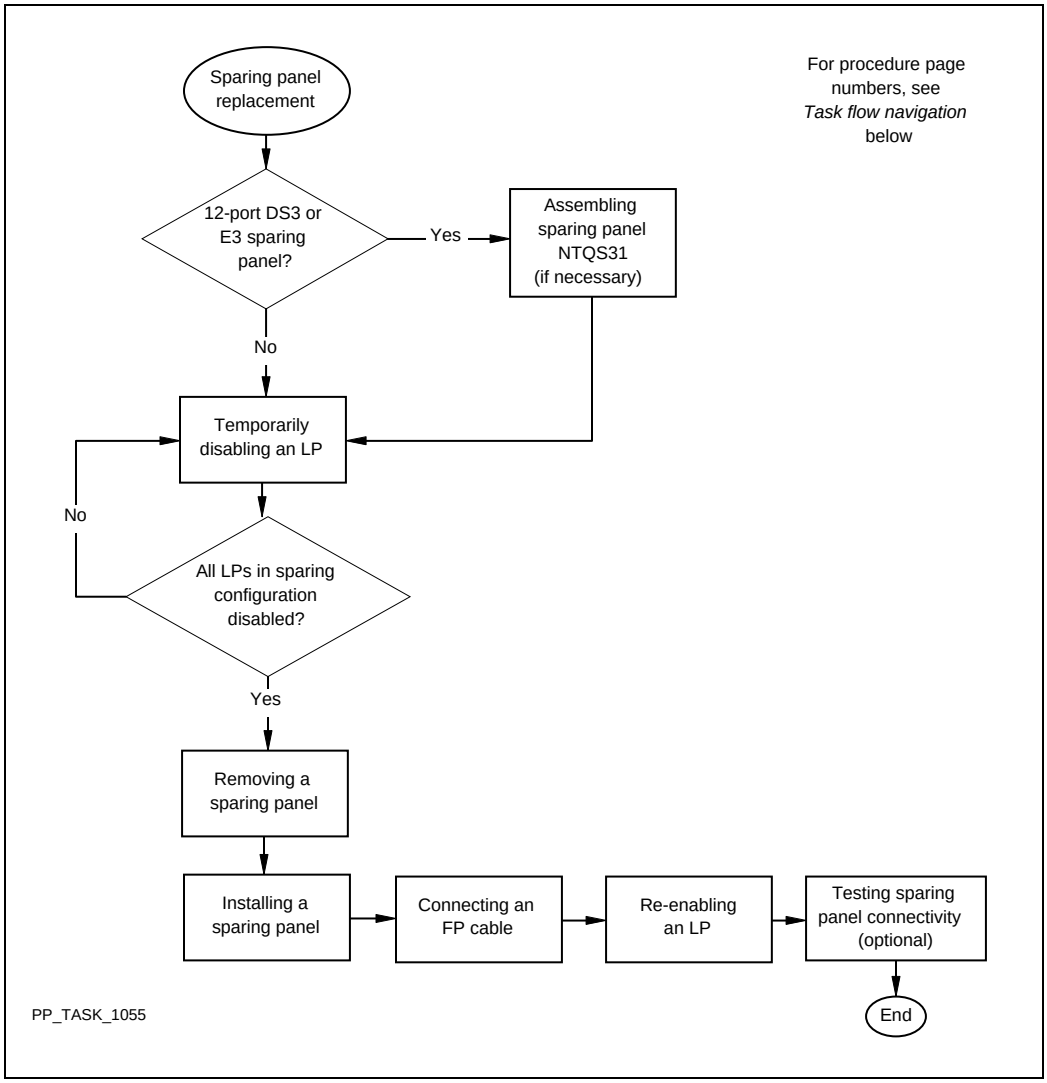
Task flow for a sparing panel replacement



Navigation

- Assembling sparing panel NTQS31 (page 169)
- Connecting an FP cable (page 234)
- Installing a sparing panel (page 428)
- “Re-enabling an LP”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing a sparing panel (page 613)
- “Temporarily disabling an LP”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

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- Testing sparing panel connectivity (page 734)

Fanout panel replacement

Replace a failed fanout panel to restore the connections of the DS3 or E3 FPs in a Multiservice Switch 15000 or Multiservice Switch 20000 to customer premises equipment.

- Prerequisites to a fanout panel replacement (page 146)
- Task flow of a fanout panel replacement (page 146)

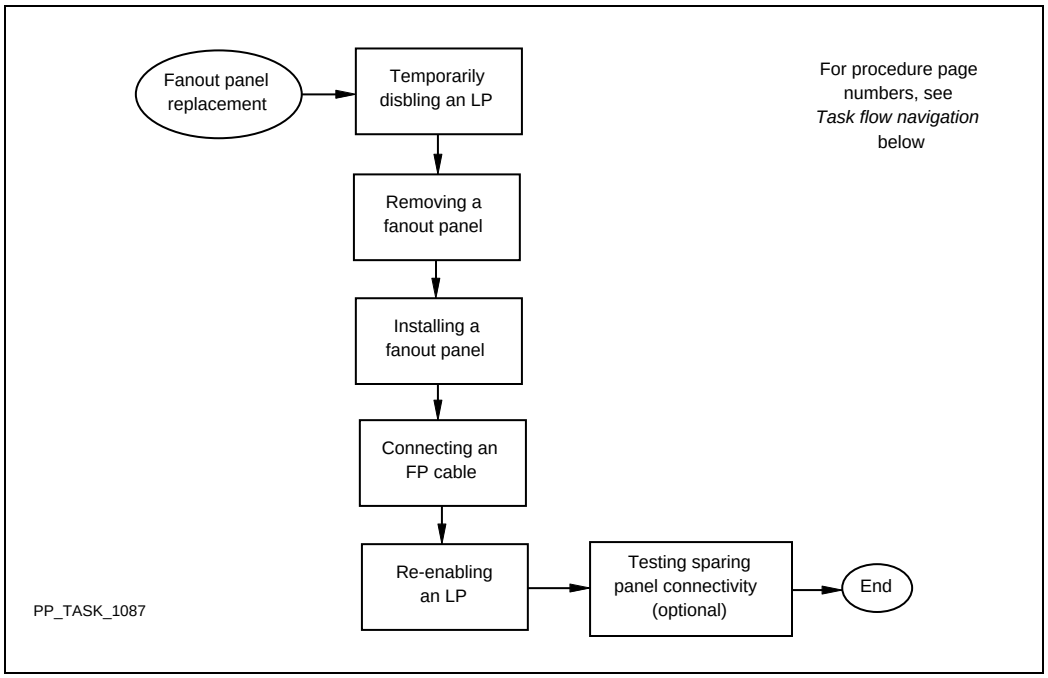
Prerequisites to a fanout panel replacement

- Ensure that you have access to NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* for procedures in this task that are not located in this NTP.
- You will need a fanout panel with PEC NTHW52.
- When replacing a fanout panel, all traffic passing through it is dropped.
- If the fanout panel is mounted in a NEBS 2000 frame that has a door mounted on its front, you need the key for the door lock from kit NTQS37.

Task flow of a fanout panel replacement

This task flow shows the sequence of procedures you do to replace a fanout panel. To link to any procedure, go to Navigation (page 147).

Task flow for a fanout panel replacement



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Navigation

- Connecting an FP cable (page 234)
- Installing a fanout panel (page 366)
- “Re-enabling an LP”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Removing a fanout panel (page 580)
- “Temporarily disabling an LP”. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Testing sparing panel connectivity (page 734)

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Hardware procedures

This chapter contains, in sequence, all of the hardware-specific procedures that are invoked by Nortel Networks Multiservice Switch 15000 and Multiservice Switch 20000 tasks. The name of the procedure in this chapter matches the name used in the box of each task flow figure that invokes it. The procedures are listed here alphabetically.

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Anchoring the NEBS 2000 frame

Anchor the NEBS 2000 frame to the floor to prevent it from tipping over.

Prerequisites

CAUTION
Risk of damage by fire
In the bottom rear center of the NEBS 2000 frame, each removable plate (drip tray, part number P0870734) may have two knockout disks. Each knockout disk must remain intact and unbent unless a power conduit from a raised floor will be routed through it. Leaving an opening reduces the fire-proofing of the switch.

- You must be familiar with Safety considerations and best practices (page 19).
- You need the appropriate number of anchor kits as described in the chapter on mounting apparatuses in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*. The anchor and stack-up kit numbers are:
  - raised floor threaded rod kit NTRU0302 and anchor A0502620 (intended to replace raised floor anchor kit NTRU0327)
  - anchor kit NTRU0328 (intended to replace anchor kit NTRU0325 and anchor A0686271)
- Refer to the figures
  - Anchor A0502620 for a NEBS 2000 frame (page 152)
  - Anchor A0686271 for a NEBS 2000 frame (page 156)
- A minimum of six anchors are required at the corners of the frame for any installation. Refer to the description of the anchor kits in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* for each kit to provide earthquake zone compliance. Adding two more anchors increases resistance to earthquakes. Adding more to a raised floor installation increases the distribution of frame weight within the NEBS footprint.
- The footprint of the frame must already be marked on the floor and the anchor holes should already have been drilled as described in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*, the chapter on site preparation.
- Verify that the frame is still level. If not, do Levelling the frame or frame pair (page 520).
- Refer to Additional information for installing the frame anchors (page 158).
- Follow the procedure for the anchor in your kits:

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— Procedure stepswith A0502620 (page 150)
— Procedure stepswith A0686271 (page 154)

Procedure steps with A0502620

Step	Action
1	From the anchor assembly, separate the torque nut, the 3 washers, the bushing, and both threaded rods. Refer to the figure Anchor A0502620 for a NEBS 2000 frame (page 152).
2	Remove the spacer sleeve from the anchor assembly only if the anchor holes are 65 mm (2.56 in.) deep instead of 80 mm (3.15 in.).
3	Remove whatever is covering the anchor holes.
4	For a raised floor, ensure that the 745-mm (29.33-in.) threaded rod reaches from the subfloor to 10 cm (4 in.) into the base of the frame. The length into the base accommodates setting the rod into the anchor and leaving enough to add the fastening hardware. If the rod is too short, contact your Nortel Networks sales representative. If the rod is too long, cut it as follows. • From the end of the rod with the screwdriver slot (the top), mark the length to accommodate the distance between the subfloor and 10 cm (4 in.) into the base of the frame. Refer to the figure Anchoring to a raised floor (page 153). • Cut the rod. • File the thread pitch until it turns easily into the anchor assembly.
5	This is an optional step for anchoring with a raised floor. Add an extra 16-mm (5/8-in.) nut and a 10-cm (4-in.) wide by 0.5-cm (3/16-in.) thick washer onto the rod to help support the frame weight on a raised floor. (Nut and washer are not included in the anchor kit.) Refer to the figure Anchoring to a raised floor (page 153). Thread the nut onto the rod so that it will be below the raised floor when the rod is threaded into the anchor. Add the washer.
6	Set an anchor into a floor hole and tighten the lower threaded rod as described by the instructions provided with the anchor assembly.
7	Place the upper threaded rod through the oval opening in the base of the frame. Pass the 120-mm rod from above the base or pass the 745-mm rod from below.
8	Thread the upper rod and add the hardware as described by the instructions provided with the anchor assembly. The slot in the rod is for tightening from inside the frame base. Refer to the figures Frame height with anchors (page 153) and Anchor A0502620 for a NEBS 2000 frame (page 152). Do not tighten the anchor yet.
9	Repeat step 4 to step 8 for each other anchor assembly. Ensure that at least 4 anchors are installed, one at each of the 4 outer corners of the frame base.

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WARNING
Risk of hand injury by impact
The torque nuts for the anchors are designed to snap off at 81.35 Nm (60 lbs-ft). Wear gloves and be prepared for the sudden transfer of force from your hand.

10 Starting at a middle anchor (if any) and moving outwards in a spiral, tighten each 16-mm (5/8-in.) anchor nut until it snaps off.

11 Around each protruding anchor rod, fasten a triangular drip tray plate (P0872813) using the provided thread-forming 10-mm (3/8-in.) hex-head screw. Each oval opening has a screw hole beside it. The plate restricts access by fire.

12 For each remaining oval opening that does not have an anchor rod passing through it, fasten a plate (P0_____) over the opening so that no gap appears. The plates are square with a screw hole in one corner. Use the provided thread-forming 10-mm (3/8-in.) hex-head screw.

13 Verify that each levelling foot still touches the floor. If not, tighten each until it touches, then tighten a 1/4 turn more.

If you need to level the frame again by unfastening the anchor nuts, you must remove the plastic collar from the anchor nut. When you re-fasten the anchor rod, you must use a new torque nut. For additional nuts, contact your local Nortel Networks sales representative.

14 For a raised floor, if you added 16-mm (5/8-in.) nuts to the rods in step 5, tighten each nut until the washer is snugly against the underside of the floor tile, as shown in the figure Anchoring to a raised floor (page 153). Then tighten each nut another 1/4 turn.

--End--

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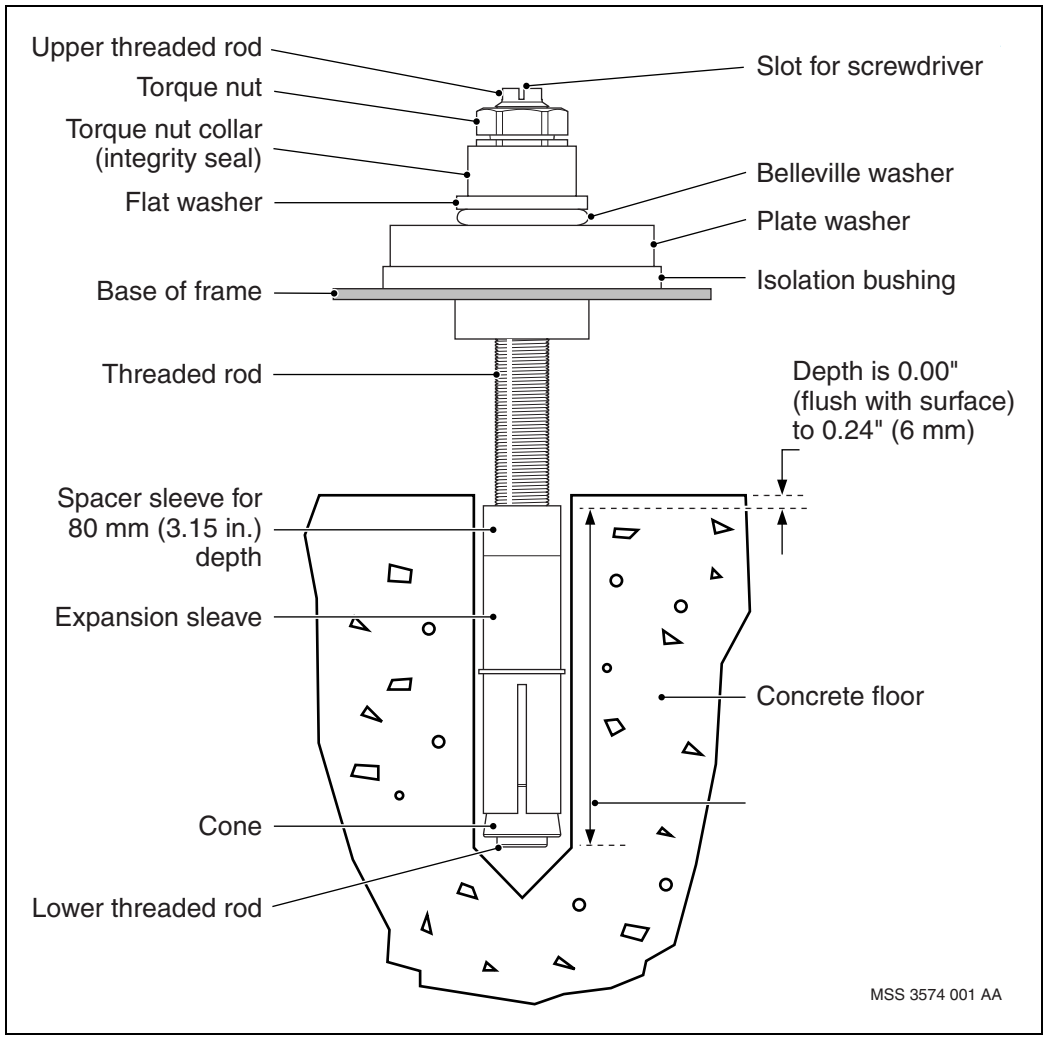
Procedure job aid

Anchor A0502620 for a NEBS 2000 frame



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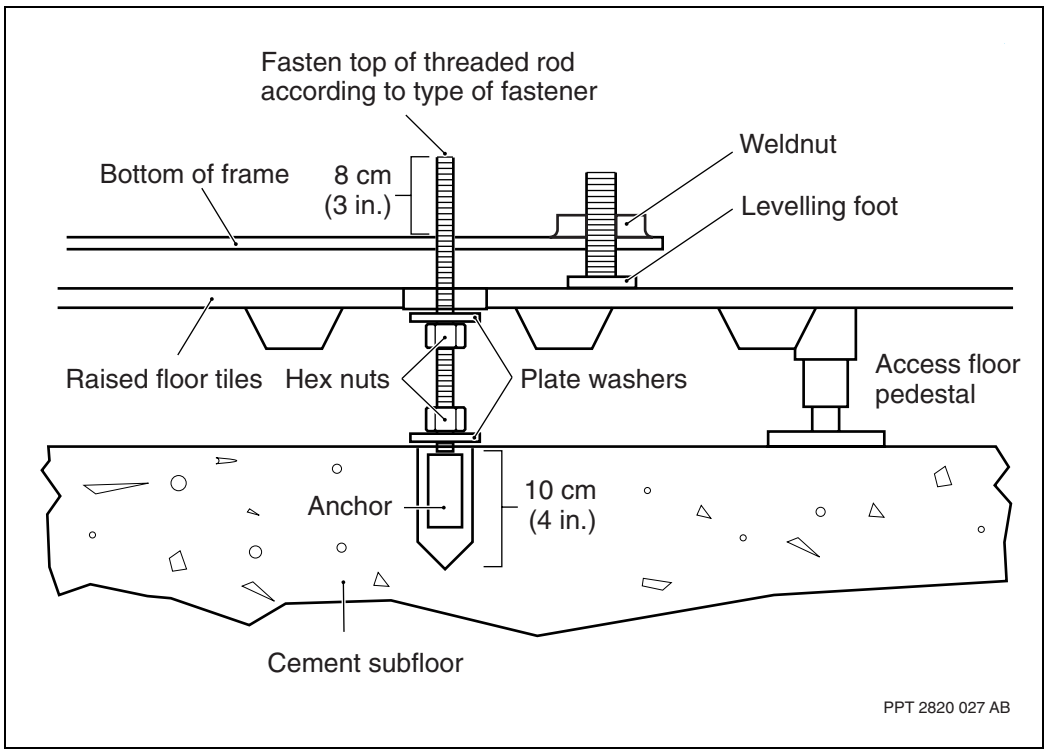
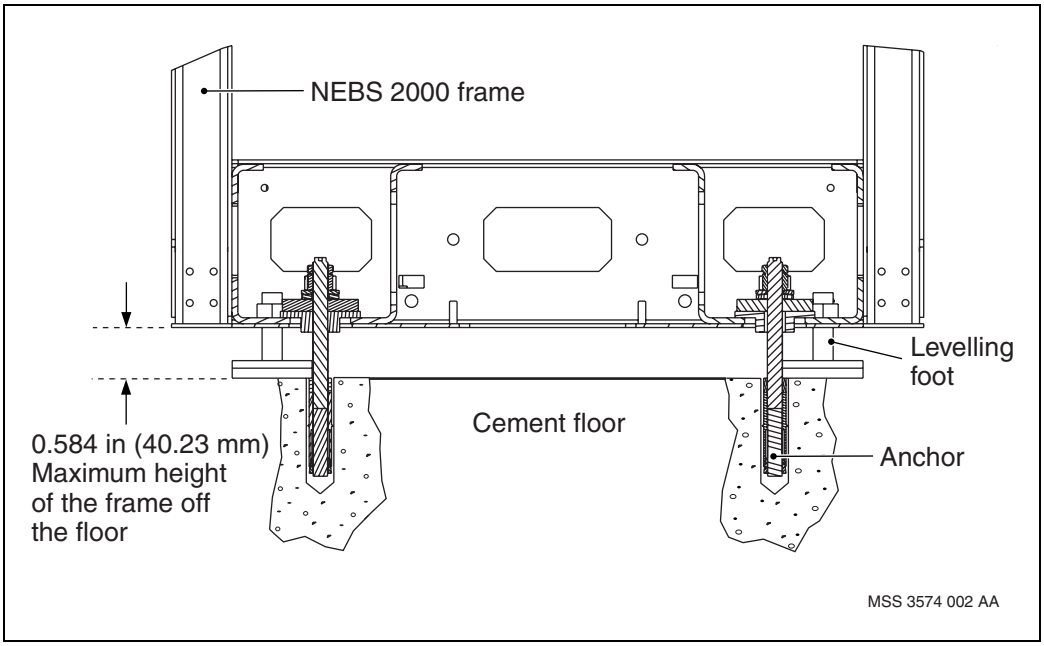
Anchoring to a raised floor



Frame height with anchors



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Procedure steps with A0686271

Step	Action
1	Remove from the threaded rod anchor assembly the items 1 to 6 in the figure Anchor A0686271 for a NEBS 2000 frame (page 156). Lay them out in sequence. If present, shims are not used with a NEBS 2000 frame.
2	Remove whatever is covering the anchor holes.
3	For each threaded rod to be installed, it must be measured and cut as follows. • From an uncut end of each threaded rod, mark a length to accommodate the anchor, for example, 10 cm (4 in.) as shown in the figure Anchor A0502620 for a NEBS 2000 frame (page 152). If the anchor holes are deeper than this measurement, you must plan to either have the anchor sit flush with the floor or at the bottom of the hole. If you choose the bottom, you must measure the depth of the hole and mark the difference on the rod. • From a specific hole intended for the rod, measure the perpendicular distance between the floor at the hole and the base of the frame at the oval opening. Mark the same distance on the rod above the mark for the anchor length. • Add 7.5 cm (3 in.) above the second mark to indicate the length that the rod is to pass above the base of the frame into the kick-plate cavity. • Cut the rod at the last mark. File the thread pitch so that its nut can thread onto the rod easily.
4	Place an anchor assembly into each anchor hole and seat it flush with the floor or at the bottom of the hole, whichever one you measured for. Refer to the figure Frame height with anchors (page 157).
5	This is an optional step for anchoring with a raised floor. Add an extra 18-mm (23/32-in.) nut and a 10-cm (4-in.) wide by 0.5-cm (3/16-in.) thick washer onto the rod to help support the frame weight on a raised floor. (Nut and washer may not be included in the anchor kit.) Thread the nut to about 28 cm (11 in.) from the cut end of the rod, or at least enough to clear the raised floor structure when the rod will be threaded into the anchor. Add the washer on top of the nut from the cut end.

CAUTION
Risk of damage by tilting
When tilting a NEBS 2000 frame with one or two switches installed in it, its levelling feet are likely to break off from the weight of the equipment. If you must tilt the frame to get it over threaded rods, first thread the 4 levelling feet all the way in.

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6 From under the raised floor, insert the cut end of the threaded rod up through the oval opening in the base of the frame and then thread the uncut end of the rod into the anchor. For non-raised floors, reach through the kick-plate cavity. To thread the rod, you must first align the rod with the free-moving cone at the bottom of the anchor. Do this by feel until the rod starts to thread into the cone. Tighten the rod into the cone so that 10 cm (4 in.) of rod is inside the anchor as shown in the figure Anchor A0502620 for a NEBS 2000 frame (page 152).

7 Repeat step 3 to step 6 for each other anchor.

8 For each anchor rod placed through an oval opening in the base of the frame, do the following.

- Place a plate (P0872813) over the oval opening so that the threaded rod passes through its hole, the cut-off corner allows room for the weldnut of the nearest levelling foot, and no gap is visible.
- Add the remaining parts of the anchor assembly onto the rod in sequence, as shown in the figure Anchor A0502620 for a NEBS 2000 frame (page 152).
- Holding the rod vertical, center it and all washers through the oval opening, while finger-tightening the nut (item 2). If you have to tilt the rod away from being right-angled relative to the frame base in order to center the rod in the oval opening, then keeping the rod vertical is more important.

9 For each remaining oval opening that does not have an anchor rod passing through it, fasten a plate (P0_____) over the opening so that no gap appears. The plates are square with a screw hole in one corner. The frame base has a screw hole beside the inner oval openings. Fasten each plate using a provided thread-forming 10-mm (3/8-in.) hex-head screw.

10 Starting at a middle anchor (if any) and moving outwards in a spiral, tighten all nuts.

For M12 anchors, torque each nut to 78 Nm (58 lbs-ft) using an 18-mm (23/32-in.) 6-point deep socket.

For 10-mm (3/8-in.) anchors, torque each nut to 48 Nm (36 lbs-ft) using a 16-mm (41/64-in.) 6-point deep socket.

11 After fastening the anchors, the levelling feet may no longer touch the floor. Check each levelling foot to ensure it touches the floor. If not, tighten each until it touches, then tighten a 1/4 turn more.

You may need to level the frame again by unfastening the anchor nuts, adjusting the levelling feet, and re-fastening the anchor nuts.

12 If you added an extra nut and washer to the rod in step 5, thread each 18-mm (23/32-in.) nut up the rods until the washer is snugly against the underside of the floor tile, as shown in the figure Anchoring to a raised floor (page 157). Then tighten each nut another 1/4 turn.

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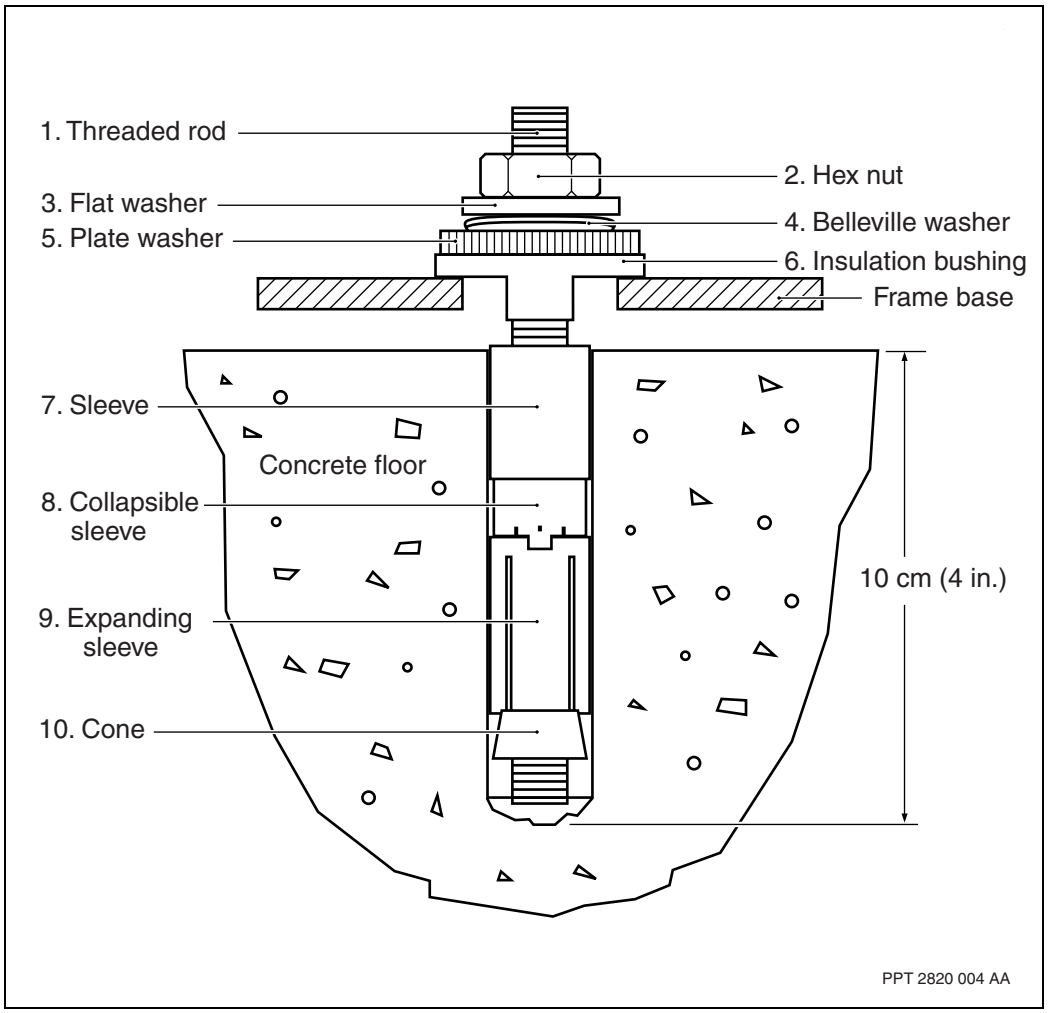
--End--

Procedure job aid

Anchor A0686271 for a NEBS 2000 frame



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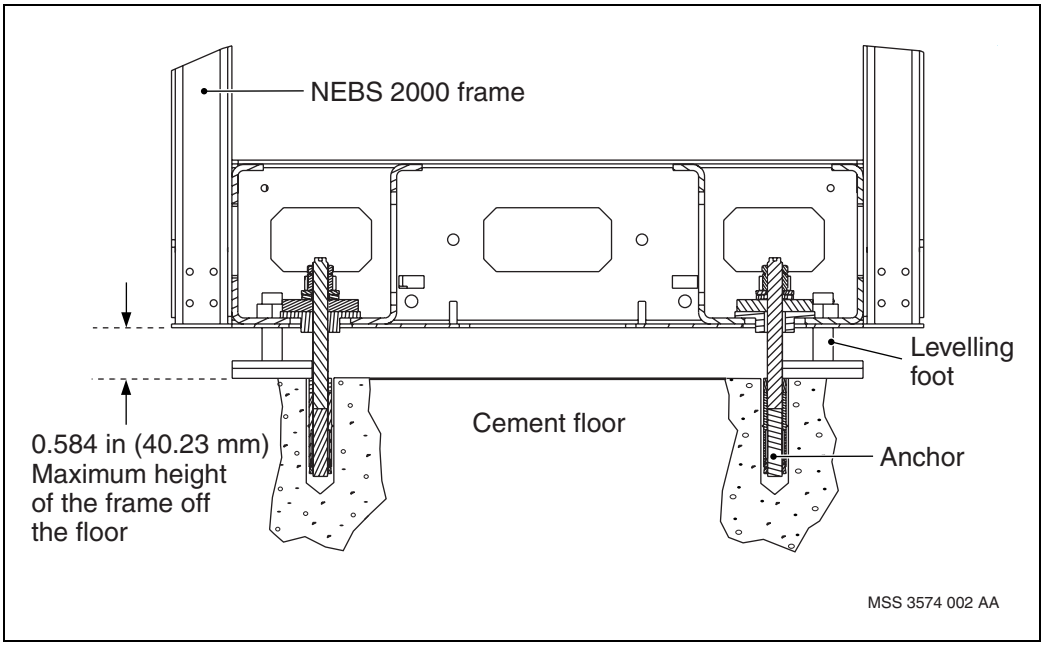
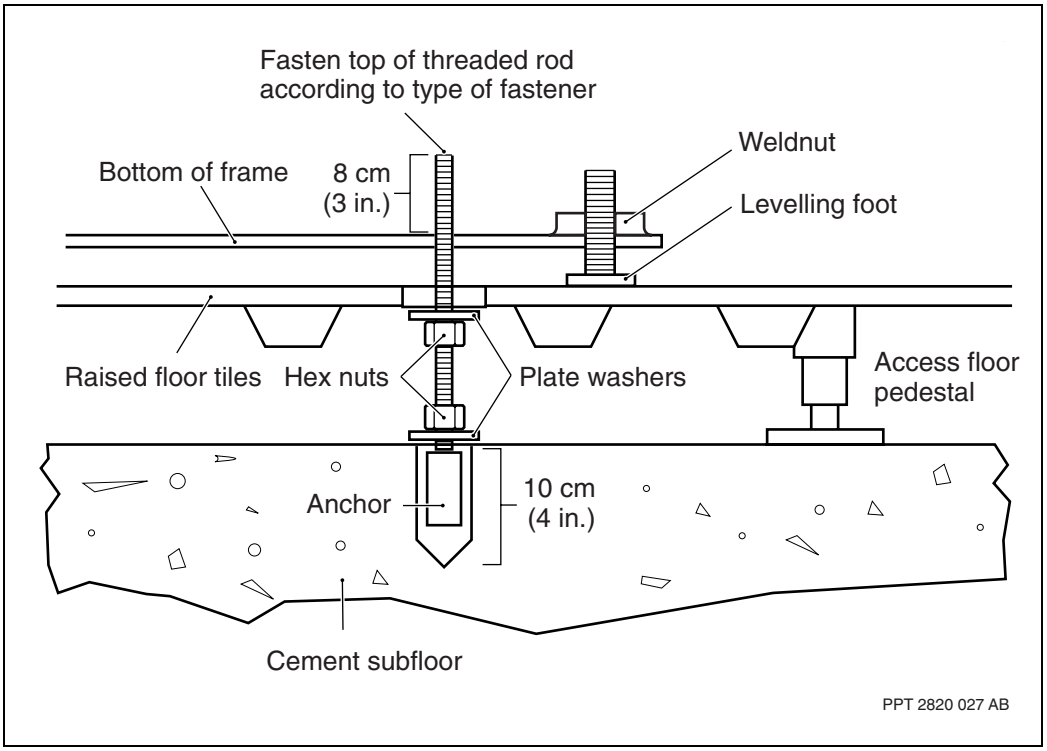
Frame height with anchors



Anchoring to a raised floor



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Additional information for installing the frame anchors

After a frame with two fully provisioned switches is completely installed with all plug-ins and cabling, the footprint holds a worst-case weight of up to 725 kg (1,600 lbs). (No practical hardware setup would ever reach this weight because it is based on having only 12-port DS3s in the switch, plus every possible optional heavier add-on.) For installations on a raised floor, the M12 anchor rods to help support the weight. Add an extra 18-mm (23/32-in.) nut and a 10-cm (4-in.) wide by 0.5-cm (3/16-in.) thick washer to each M12 threaded rod before the rod is inserted in the floor holes. The nuts and washers are to help support the weight from underneath the frame base. The washer must be wide enough to span inches evenly beyond an anchor opening and thick enough not to bend from the weight. After the frame is anchored, the optional nuts and washers cannot be added.

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Assembling a BIP external alarm cable

Assemble a BIP external alarm cable to connect the BIP to a customer premises external alarm indicator.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- To connect the external alarms, you must provide the cables with D-sub connectors with the appropriate number of male or female wired pins ready to be plugged in. In preparation for assembling the cable, do the following:
  - identify which BIP connector you are replacing to a CPE alarm; for the types of alarms and their purposes, refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*
  - locate the table in Procedure job aid (page 160) that corresponds to the BIP connector so that you can identify the orientation and type of connector to be used on the cable
  - get the appropriate connector for the BIP connection
  - measure the path between the alarm cable endpoints and match the gauge of wire to use; 22 or 24 AWG wire is typical, however, the gauge of wire can vary according to local electrical codes, the distance between endpoints, and the amount of power required to operate whichever terminal device is to be used (for example, a lamp or a LED).

Procedure steps

Step	Action
1	Refer to the site's record of alarm connections to verify where the endpoints occur. Locate the endpoints of the alarm cable between the BIP connector at the rear of the BIP and the CPE connection.
2	Measure the distance between the endpoints and match the gauge of wire to be soldered to the connector pins.
3	Strip the wire and solder it to the connector using prescribed methods for the type of connector.
4	Repeat step 3 for each additional wire for the BIP connector assembly. You may need to refer to the pinout tables in Procedure job aid (page 160).
5	Using an ohmmeter, test the connectivity through the cable one pin after the other. Verify the readings are acceptable for the type of CPE terminal. Record which connections fail.
6	Fix any failed connections and repeat the connectivity test.

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--End--

Procedure job aid

The position of pin numbers on the Pn D-sub connectors follows the standard D-sub configuration. The pinouts for each external alarm connector are listed in these tables:

- Pinout of the BIP female D-sub 15-pin connector P1 (page 160)
- Pinout of the BIP female D-sub 25-pin connectors P2 and P4 (page 161)
- Pinout of the BIP female D-sub 25-pin connector P3 (page 162) for empowered contacts
- Pinout of the BIP female D-sub high-density 26-pin connectors P7 through P10 (page 164)
- Pinout of the BIP female 1x2 MATE-N-LOK connector J1 (page 165)
- Pinout of the BIP male 2x4 Berg connector J3 (page 166)
- Pinout of the BIP male 1x4 Berg connector J2 (page 166)
- Pin-to-pin connections between an MFA150 controller card and a BIP (page 168)

Attention: BIP connectors P5 and P6 are 110-pin and 55-pin connectors inside the alarm module. These connectors are not used for cabling by a customer.

Pinout of the BIP female D-sub 15-pin connector P1

Pin	Signal	Function	Description
1	TTA	input or output	voice communication from telephone jacks for TEL tip A
2	none	none	none
3	TTB	input or output	data communication from data jacks for TEL tip B
4	DIA	input or output	data communication from data jacks
5	DIB	input or output	data communication from data jacks
6	none	none	none
7	none	none	none

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Pinout of the BIP female D-sub 15-pin connector P1 (continued)

Pin	Signal	Function	Description
8	none	none	none
9	none	none	none
10	none	none	none
11	TRA	input or output	voice communication from telephone jacks for TEL ring A
12	none	none	none
13	TRB	input or output	voice communication from telephone jacks for TEL ring B
14	D2A	input or output	data communication from data jacks
15	D2B	input or output	data communication from data jacks

(2 of 2)

Pinout of the BIP female D-sub 25-pin connectors P2 and P4

Pin	Signal	Function	Description
1	TTA	input or output	voice communication from telephone jacks for TEL tip A
2	TRB	input or output	voice communication from telephone jacks for TEL ring B
3	D2A	input or output	data communication from data jacks
4	SPARE1B	output	signal provided for office alarm connectivity
5	SPARE3A	output	signal provided for office alarm connectivity
6	SPARE4B	output	signal provided for office alarm connectivity
7	none	none	none
8	none	none	none
9	none	none	none
10	AISALM2	output	normally open circuit (O/C); switches to AISALM1 on aisle alarm activation (follow me)
11	TTB	input or output	voice communication from telephone jacks for TEL tip B
12	D1A	input or output	data communication from data jacks

(1 of 2)

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Pinout of the BIP female D-sub 25-pin connectors P2 and P4 (continued)

Pin	Signal	Function	Description
13	D2B	input or output	data communication from data jacks
14	SPARE2A	output	signal provided for office alarm connectivity
15	SPARE3B	output	signal provided for office alarm connectivity
16	SPARE5A	output	signal provided for office alarm connectivity
17	none	none	none
18	none	none	none
19	AISALM1	output	externally tied to the battery return (BR) at the office alarm cross-connect panel
20	TRA	input or output	voice communication from telephone jacks for TEL ring A
21	D1B	input or output	data communication from data jacks
22	SPARE1A	output	signal provided for office alarm connectivity
23	SPARE2B	output	signal provided for office alarm connectivity
24	SPARE4A	output	signal provided for office alarm connectivity
25	SPARE5B	output	signal provided for office alarm connectivity

(2 of 2)

Pinout of the BIP female D-sub 25-pin connector P3

Pin	Signal	Function	Description
1	CRITVNC	output	critical visual alarm contact; NC of form C isolated contact, normally closed on alarm
2	MAJVNC	output	major visual alarm contact; NC of form C isolated contact, normally closed on alarm
3	MINVNC	output	minor visual alarm contact; NC of form C isolated contact, normally closed on alarm
4	CRITANC	output	critical audible alarm contact; NC of form C isolated contact, normally closed on alarm
5	MAJANC	output	major audible alarm contact; NC of form C isolated contact, normally closed on alarm
6	MINANC	output	minor audible alarm contact; NC of form C isolated contact, normally closed on alarm
7	EXTALMNC	output	aisle alarm contact; NC of form C isolated contact, normally closed on alarm

(1 of 2)

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Pinout of the BIP female D-sub 25-pin connector P3 (continued)

Pin	Signal	Function	Description
8	none	none	none
9	none	none	none
10	CRITVC	output	critical visual alarm contact; C of form C isolated contact, common connection on alarm
11	MAJVC	output	major visual alarm contact; C of form C isolated contact, common connection on alarm
12	MINVC	output	minor visual alarm contact; C of form C isolated contact, common connection on alarm
13	CRITAC	output	critical audible alarm contact; C of form C isolated contact, common connection on alarm
14	MAJAC	output	major audible alarm contact; C of form C isolated contact, common connection on alarm
15	MINAC	output	minor audible alarm contact; C of form C isolated contact, common connection on alarm
16	EXTALMC	output	aisle alarm contact; C of form C isolated contact, common connection on alarm
17	none	none	none
18	none	none	none
19	CRITVNO	output	critical visual alarm contact; NO of form C isolated contact, normally open on alarm
20	MAJVNO	output	major visual alarm contact; NO of form C isolated contact, normally open on alarm
21	MINVNO	output	minor visual alarm contact; NO of form C isolated contact, normally open on alarm
22	CRITANO	output	critical audible alarm contact; NO of form C isolated contact, normally open on alarm
23	MAJANO	output	major audible alarm contact; NO of form C isolated contact, normally open on alarm
24	MINANO	output	minor audible alarm contact; NO of form C isolated contact, normally open on alarm
25	EXTALMNO	output	aisle alarm contact; NO of form C isolated contact, normally open on alarm

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Pinout of the BIP female D-sub high-density 26-pin connectors P7 through P10

Pin	Signal	Function	Description
1	MINA	input	minor audible alarm input from the shelf; normally open circuit (O/C) to LGND to activate
2	MAJA	input	major audible alarm input from the shelf; normally O/C to LGND to activate
3	CRITA	input	critical audible alarm input from the shelf; normally O/C to LGND to activate
4	SHID4	output	shelf identification, switch 2, bit 2; 10 mA maximum for O/C or LGND
5	LGND	input	is LGND at 0 V dc for the shelf-provided reference for all BIP and shelf alarms
6	+5 V	input	+5 V of secondary power from the shelf with a 70 mA maximum is needed to run the LED portion of the optocouplers for the shelf-to-BIP interface (an optocoupler is a transistor triggered by light, used to separate primary and secondary alarm circuits inside the BIP)
7	ALMFAIL	output	signal to the shelf that the alarm module has a failure or has lost input power; normally LGND to O/C on report of a failure
8	FOLLOW	input	method by which the shelf can activate the frame level follow me indicator and an aisle alarm; normally O/C to LGND to activate
9	LEDTEST	output	report to the shelf that testing the LEDs (LEDTEST) has been requested; upon receipt of the signal, all the LEDs light for about 5 seconds; O/C or LGND at 50 mA to test
10	MINV	input	minor visible alarm input from the shelf; normally O/C to LGND to activate
11	MAJV	input	major visible alarm input from the shelf; normally O/C to LGND to activate
12	CRITV	input	critical visible alarm input from the shelf; normally O/C to LGND to activate
13	SHID3	output	shelf identification, switch 2, bit 1; 10 mA maximum for O/C or LGND
14	LGND	input	is LGND at 0 V dc for the shelf-provided reference for all BIP and shelf alarms
15	+5 V	input	+5 V of secondary power from the shelf with a 70 mA maximum is needed to run the LED portion of the optocouplers for the shelf-to-BIP interface
16	BKRFAILB	output	signal to the shelf that the BIM B has a failure or has lost input power; normally O/C to LGND on report of a failure

(1 of 2)

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Pinout of the BIP female D-sub high-density 26-pin connectors P7 through P10 (continued)

Pin	Signal	Function	Description
17	EXTPWR	output	report to the shelf any failure of power equipment monitored by BIP connection J2 that is external to the BIP; 50 mA maximum for O/C or LGND on alarm
18	ACO	output	signal to the shelf requesting shelves to reset all active audible alarms; normally O/C to LGND for the cutoff request
19	SHID0	output	shelf identification, switch 1, bit 1; 10 mA maximum for O/C or LGND
20	SHID1	output	shelf identification, switch 1, bit 2; 10 mA maximum for O/C or LGND
21	SHID2	output	shelf identification, switch 1, bit 3; 10 mA maximum for O/C or LGND
22	SHID5	output	shelf identification, switch 2, bit 3; 10 mA maximum for O/C or LGND
23	BKRTRIPA	output	signal to the shelf that the BIM A has one or more tripped breakers; normally O/C to LGND on report of a trip
24	BKRFAILA	output	signal to the shelf that the BIM A has a failure or has lost input power; normally O/C to LGND on report of a failure
25	BKRTRIPB	output	signal to the shelf that the BIM B has one or more tripped breakers; normally O/C to LGND on report of a trip
26	BIPFAIL	output	report to the shelf a failure in the BIP (an ORing of BKRTRIP, BKRFAIL, and ALMFAIL; LGND has a 50 mA maximum or O/C on alarm (report to shelf)
			(2 of 2)

Pinout of the BIP female 1x2 MATE-N-LOK connector J1

Pin	Signal	Function	Limitations
1	L -(ABS)	output	-75 V dc
2	AISALM2	output	open circuit (O/C) to 0 V dc on the alarm

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Pinout of the BIP male 1x4 Berg connector J2

Pin	Signal	Function	Description
1	L +(ABS)	output	is the source is 0 V dc for ALM1; connect it to the common of the external equipment's isolated contacts
2	ALM1	input	is the scan point for the first piece of power equipment; connect it to normally closed on the alarm of the external equipment's isolated contacts; open circuit (O/C) to 0 V dc with 20 mA to activate the alarm
3	L +(ABS)	output	is the source is 0 V dc for ALM2; connect it to the common of the external equipment's isolated contacts
4	ALM2	input	is the scan point for the second piece of power equipment; connect it to normally closed on the alarm of the external equipment's isolated contacts; O/C to 0 V dc with 20 mA to activate the alarm

Pinout of the BIP male 2x4 Berg connector J3

Pin	Signal	Function	Description
1	L +(ABS)	output	0 V dc for the front LED board (NTRU09)
2	L +(ABS)	output	0 V dc for the front LED board
3	EXFRMFLF	output	open circuit (O/C) to 20 mA dc on the follow me activation for the front LED board
4	EXFRMFLF	output	O/C to 20 mA dc on the follow me activation for the front LED board
5	L +(ABS)	input	0 V dc for the front LED board
6	L +(ABS)	output	0 V dc for the front LED board
7	EXFRMFLR	output	O/C to 20 mA dc on the follow me activation for the rear LED board
8	EXFRMFLR	output	O/C to 20 mA dc on the follow me activation for the rear LED board

The cable from BIP connector J3 to the external LED board has product engineering code (PEC) NTRU09. The pin numbers of the cable connectors are shown in the figure Cable for BIP connector J3 to the external LED board (page 167). The pinouts are listed in the table Pinout of the cable between BIP connector J3 and the LED board (page 166).

Pinout of the cable between BIP connector J3 and the LED board

Connector	Pin	Connector	Pin	Signal
P1	1	P2	1	L +(ABS)
	2		3	L +(ABS)

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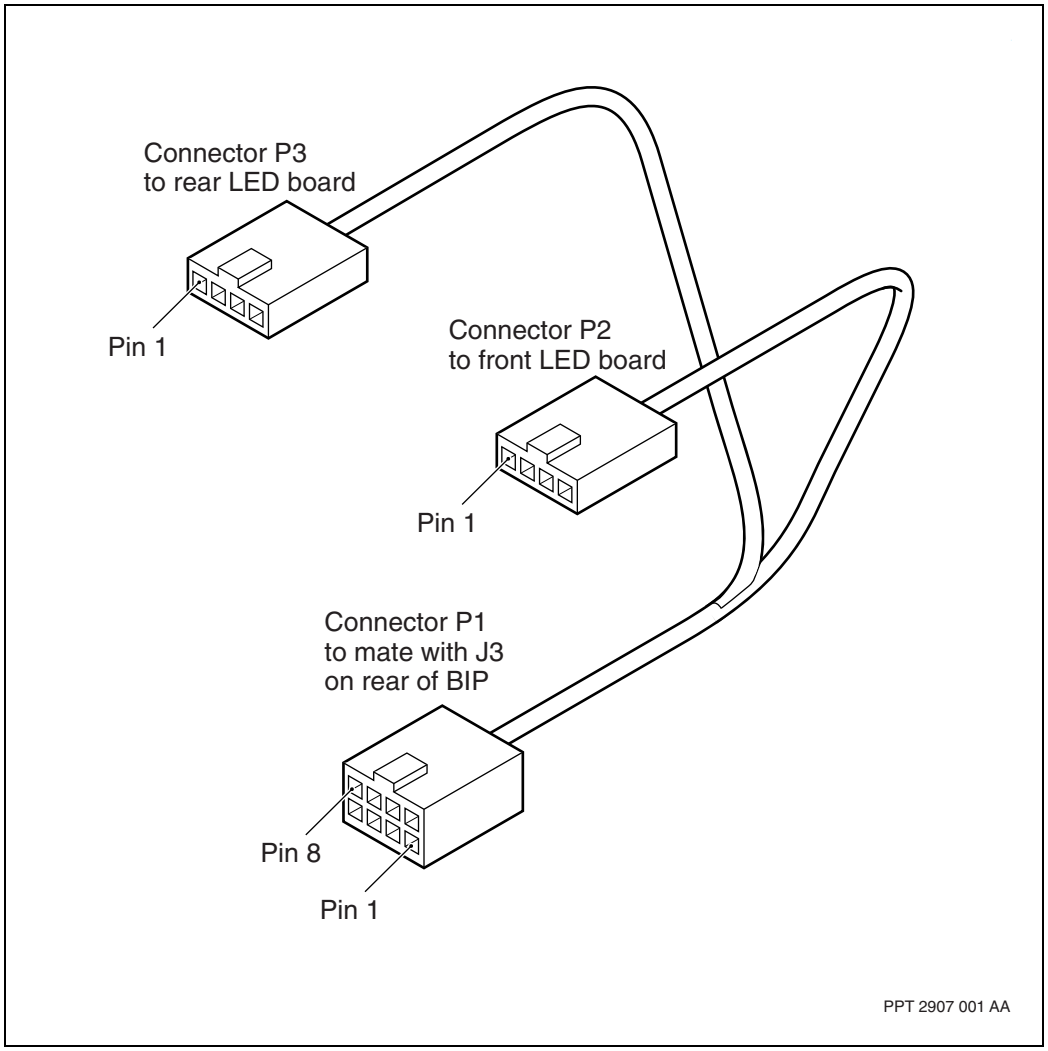
Pinout of the cable between BIP connector J3 and the LED board (continued)

Connector	Pin	Connector	Pin	Signal
	3		4	EXFRMFLF
	4	not used	na	not used
	5	P3	1	L +(ABS)
	6		3	L +(ABS)
	7		4	EXFRMFLR
	8	not used	na	not used

(2 of 2)

Cable for BIP connector J3 to the external LED board



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Pin-to-pin connections between an MFA150 controller card and a BIP

At the MFA150	At the BIP	Type of alarm
terminal block TB2: pin 1 for the black wire, pins 2 and 4 for the red wire, no connection (NC) for the white and the green wires	J2, pin 2, L-	major

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Assembling sparing panel NTQS31

Assemble an NTQS31 sparing panel prior to installing the panel on a frame.

Prerequisites

- A sparing panel with PEC NTQS31 may arrive unassembled in these main parts:
  - NTHR37 for the sparing panel module
  - NTHR39 for the sparing panel relay module, one relay per DS3 or E3 port that will be connected to the panel
  - NTHR42 for the sparing panel control module

Procedure steps

Step	Action
1	On the sparing panel module (NTHRU37), unfasten the 2 captive screws by hand and put them aside for re-use.
2	Lift the front panel cover off the chassis and put the cover aside for re-use.
3	Insert the control module (NTHR42) into the leftmost slot and press in the retention studs in the module guides. The control module mates with the panel in only one slot.
4	Insert the relay modules (NTHR39) into the remaining slots, ensuring each is held in position by the retention studs. A relay module will not fit in the slot for the control module. Use 1 relay per DS3 or E3 port.
5	Place the panel cover back onto the sparing panel.
6	Align the 2 captive screws and fasten them by hand to snug plus a 1/5 turn. Do not overtighten because the panel will not operate properly.
7	The assembled result should look like the figure A 12-port DS3 or E3 one-for-six sparing panel NTQS31, fully assembled (page 170).

--End--

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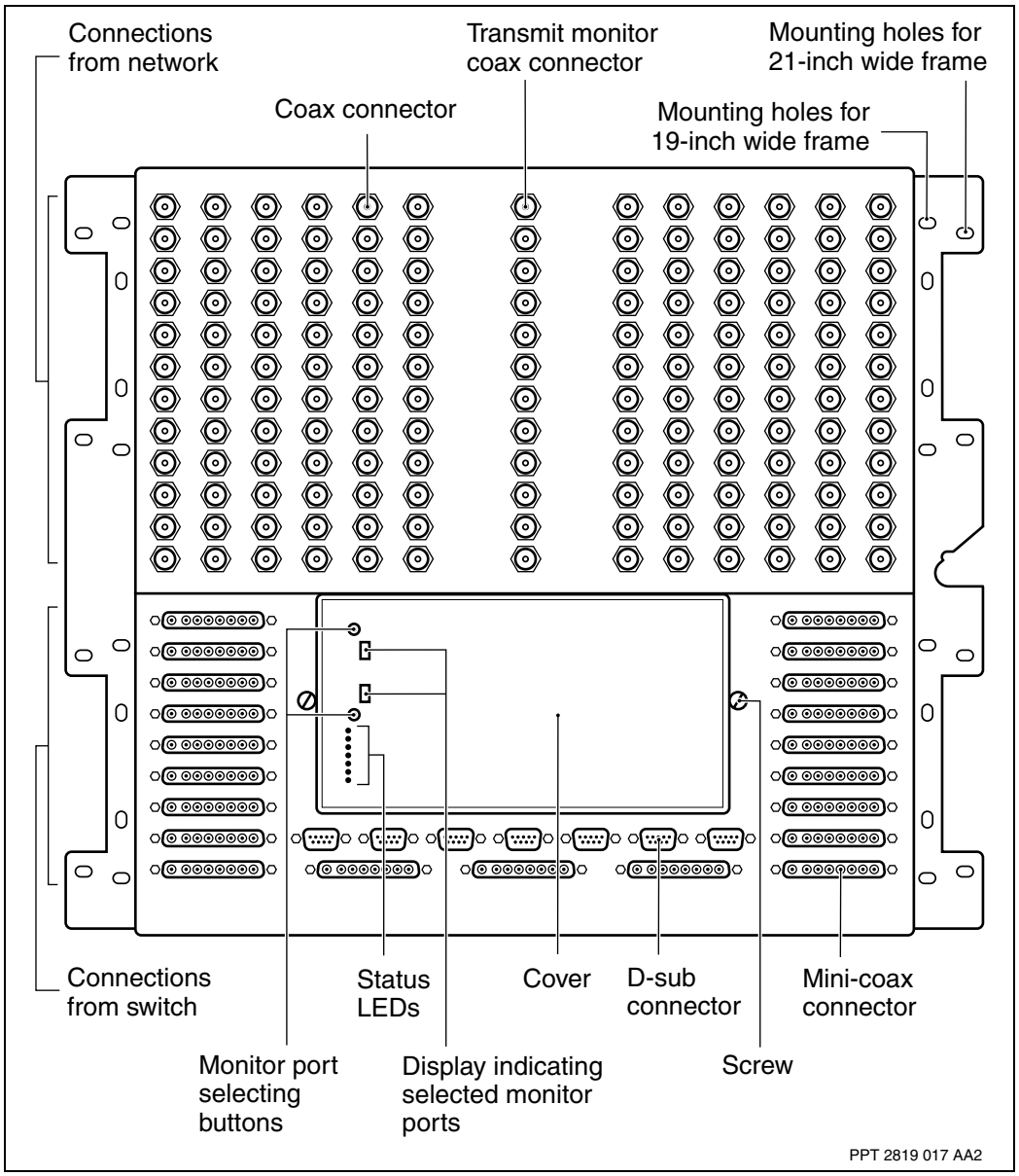
Procedure job aid

A 12-port DS3 or E3 one-for-six sparing panel NTQS31, fully assembled



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Bundling FP cables

Bundle FP cables to make cable management easier and to evenly distribute the weight of the coax cables in the extended cable management brackets.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Bundle cables in groups of four or six.
- The cables for each FP must be connected, labeled, bundled together, and tie-wrapped along the entire cable path before the cables of another FP are connected. To maintain sequential organization of cable bundles, the FP adjacent to the connected FP must be cabled and bundled next.
- Ensure that you have addressed the criteria in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for assessing cable management. See Cable routing (page 45) to determine the cable management strategy that is appropriate for your situation.

Procedure steps

Step	Action
1	When all the transmitting cables from the same FP are connected to the termination panel, use tie-wraps to bundle them together. For example, with 12 transmitting cables coming from half of the faceplate of a 12-port DS3, bundle the first sequential 6 in one cluster, then the second 6 in another. (The mini-coax cables for each 8w8 connector may already be sheathed into a bundle.) Repeat the same pattern for the 12 receiving cables on the same faceplate. For a 4-port DS3, bundle the 4 transmitting cables together, then the 4 receiving cables. Include the control port cable in one of the bundles for the FP, keeping the cable at the outside of the cluster.
2	Tighten the tie-wraps of each bundle snugly, but not tightly. The cables must not be crimped by the tie-wraps. Do not tie-wrap the portion of the cable bundle that is under the FP faceplates to the cable channel. This enables the card to be unseated without stressing the cable connections.
3	When using the extended cable management brackets, fasten the adjacent FP's cables to the finger beside this one, until the row fills. Fasten the next FP's cables to the inner finger of the next nearest row. The rows and columns in the table map directly onto the finger and arm pattern of each extended bracket. For the pattern of cable bundles per finger, see • the table Position of each FP cable bundle on right-side extended cable brackets (page 172) • the table Position of each FP cable bundle on left-side extended cable brackets (page 173)

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- the figure Mini-coax cables bundled onto extended brackets (page 174)

Slot 8 is omitted from the tables because it is intended to house an OC or STM card. OC or STM fiber cables are routed to the left side of the frame. To understand logical card positioning, refer to Choosing slots for FPs (page 25).

4 Fasten the cable bundle to the bracket by

- looping the tie-wrap around behind the cable
- sliding the loop down past the tabs into the space around the bracket finger
- connecting the tie-wrap ends and pulling the tail until the loop holds the bundle snugly (though not tightly) against the finger

5 Use tie-wraps to snugly fasten the remainder of the cable bundle to whatever cable support routes the cables to the termination panel.

6 Label the FP cable bundle on the bracket that is nearest the cable management channel. Put the label on the flat surface nearest the bundle. Identify the FP's slot number and the termination panel ports that this FP is connected to. For terminations to a sparing panel, see also assigning sparing panel connections for a 12-port DS3 or E3 FP in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

--End--

Procedure job aid

Position of each FP cable bundle on right-side extended cable brackets

Lower shelf slot numbers	Lower shelf slot numbers	Upper shelf slot numbers	Upper shelf slot numbers
15	7	15	7
14	6	14	6
13	5	13	5
12	4	12	4
11	3	11	3
10	2	10	2
9	1	9	1
Note: slot 1 may contain a CP instead of an FP. Slot 8 is not shown.			

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Position of each FP cable bundle on left-side extended cable brackets

Upper shelf slot numbers	Upper shelf slot numbers	Lower shelf slot numbers	Lower shelf slot numbers
15	7	15	7
14	6	14	6
13	5	13	5
12	4	12	4
11	3	11	3
10	2	10	2
9	1	9	1
Note: slot 1 may contain a CP instead of an FP. Slot 8 is not shown.			

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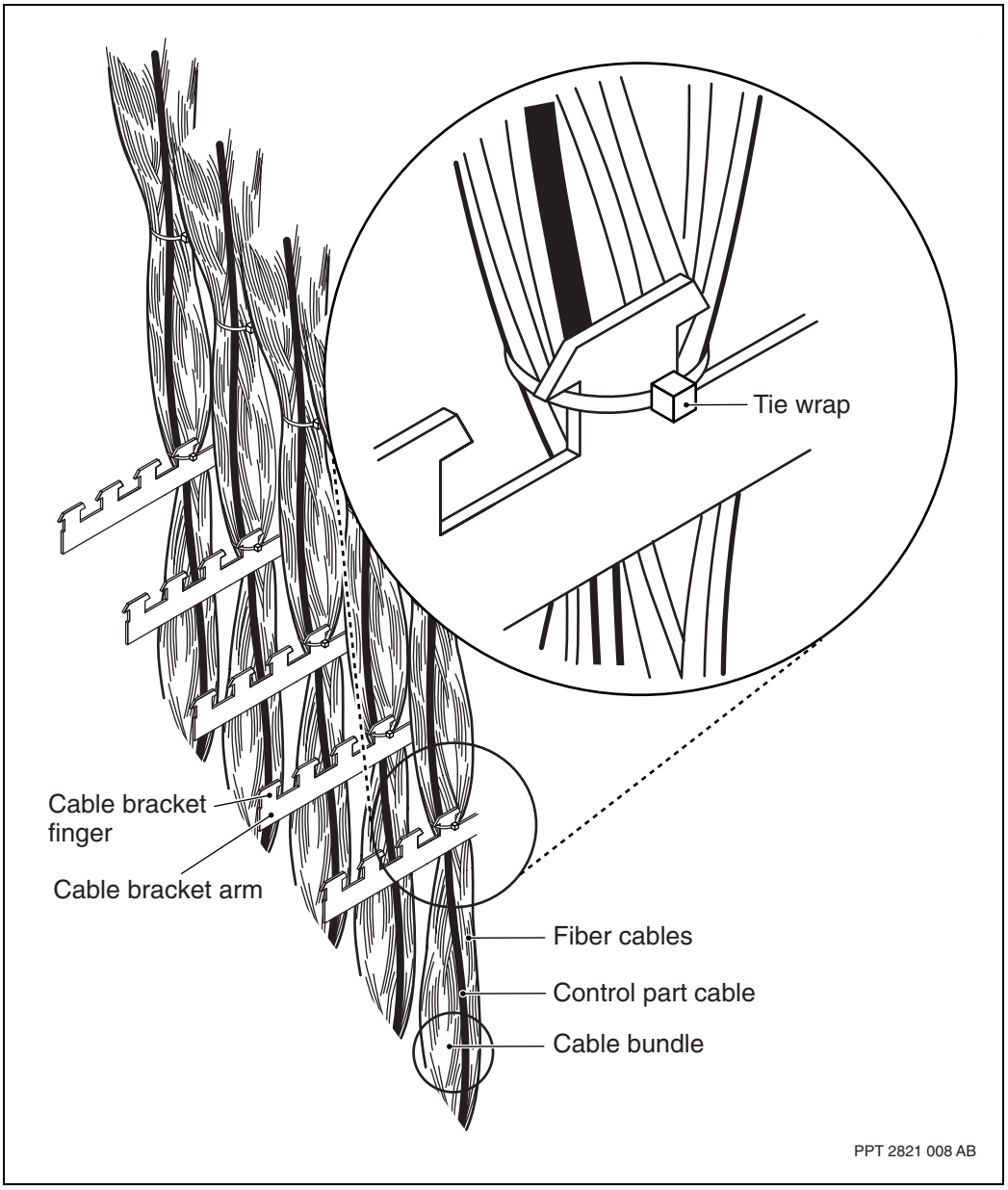
Mini-coax cables bundled onto extended brackets



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Cabling the second cooling unit

Cable a second cooling unit to complete the installation when a second switch is added to a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Before connecting the cables at the second cooling unit, the cooling unit and the second shelf assembly must already be installed.
- The cable assemblies for the second cooling unit are installed at the factory whether the second cooling unit is present in the NEBS 2000 frame or not. The cable connectors at the BIP end are already plugged in. The cable connectors for the second cooling unit are located at the rear of the BIP, left side. Notice that the tie-wraps loosely hold the cables in place.
- The second cooling unit power and alarm cable assemblies include:
  - NTHR66 for the A and B power cables
  - NTHR55 for the BIP alarm cable for the upper shelf
  - NTHR57 for the cooling unit alarm cables
  - NTHR5250 for the upper temperature sensors
- Cabling the second cooling unit involves plugging in the cables in the appropriate connections on both the lower (front) and upper (rear) cooling units. The second cooling unit has the same pattern of cables as the lower (front) cooling unit. Use the lower cooling unit as an example to cable the second (upper) cooling unit. See the figure Power and alarm cable paths between the BIP and cooling units (page 177).
- Mount the alarm cable assembly for the second cooling unit even if the second unit will be installed at a later date. Otherwise, the fans of the lower cooling unit will run on high speed and the CP will receive a high temperature alarm.

Procedure steps

Step	Action
1	Facing the front of the BIP, ensure the middle breakers of BIMs A1 and B1 on the left half are off (O is pressed in).
2	At the rear of the BIP on BIM A2, from the connection labeled A, trace the individual cable down to the loose connector at the other end. The cable assembly may be labelled NTHR66. See the figure Power and alarm cable paths between the BIP and cooling units (page 177).

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3 Plug the loose connector into the receptacle labelled PWR A on the second (upper) cooling unit at the front of the NEBS 2000 frame. A tab on the connector engages when fully plugged in.

4 At the rear of the BIP on BIM B2, from the connection labelled B, trace the cable down to its other connector and plug it into the receptacle labelled PWR B on the second (upper) cooling unit at the front of the frame.

5 From the 3 upper temperature sensors labelled S1, S2, and S3, trace the cable down to its other connector and plug it into the receptacle labelled TEMP. SENS. on the second (upper) cooling unit at the front of the frame.

6 From the alarm/BITS module of the upper shelf assembly (the second switch) at the connection labeled J5, trace the cable (NTHR57) down to its other connector and plug it into the receptacle labeled ALARM on the lower (front) cooling unit. A tab on the connector engages when fully plugged in.

--End--

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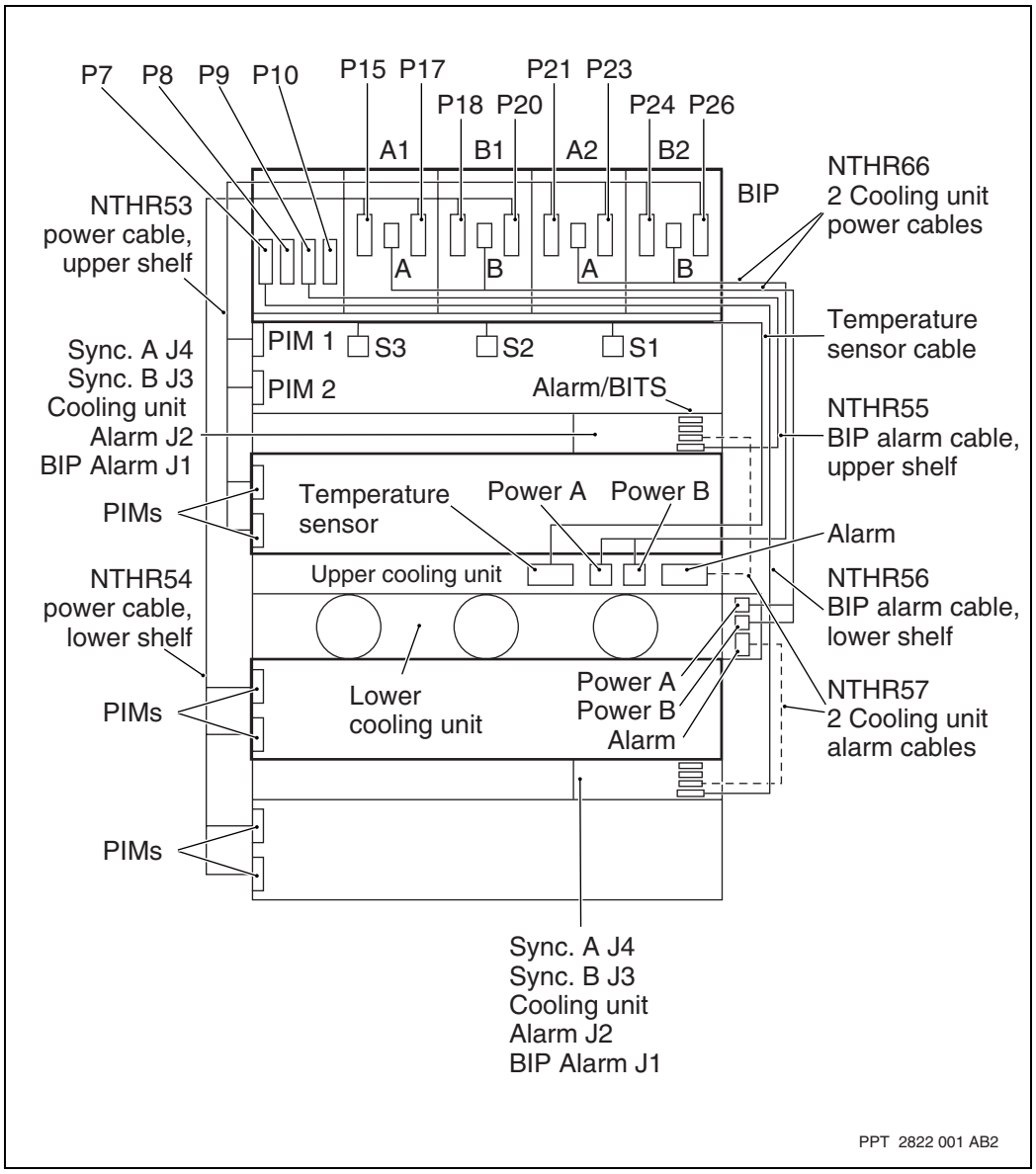
Procedure job aid

Power and alarm cable paths between the BIP and cooling units



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Checking the backplane pins

Check the backplane pins after unpacking a Nortel Networks Multiservice Switch 15000 shelf assembly, and before any processor cards are installed, to ensure there are no bent pins.

Prerequisites

- Do not check the pins of a Multiservice Switch 20000 shelf assembly unless cards have been accidently unlatched by impact, inadvertently removed, or if the switch was shipped with empty slots.

CAUTION

Risk of equipment damage and service loss by bent pins

While checking for bent backplane pins, especially if you are wielding a flashlight or mirror inside the shelf assembly, ensure that you do not contact any pins. Contacting the pins with a sideways force can easily bend them.

Procedure steps

Step	Action
1	Look inside the shelf assembly at each row of pins at the rear. Refer to the figure An empty shelf assembly of a Multiservice Switch 15000, front view (page 179). You may need a flashlight to see the patterns of pins. Do not allow the flashlight to contact anything inside the shelf assembly.

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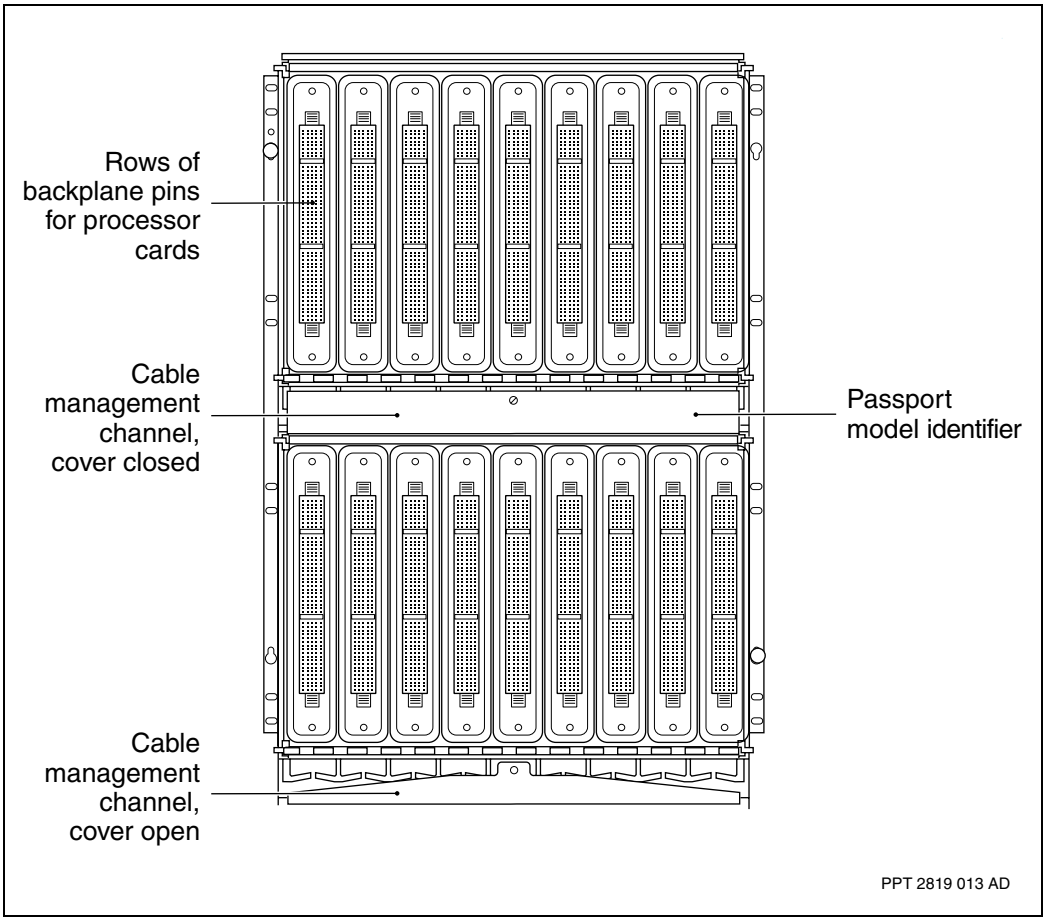
An empty shelf assembly of a Multiservice Switch 15000, front view



2 Check each row of pins to see whether any pin seems visibly bent, that is, even slightly out of pattern or worse. Slightly bent means you notice a change in the pattern of pins.

CAUTION

Risk of equipment damage and service loss by bent pins

When at least one backplane pin is bent, attempting to seat a processor card risks damaging the backplane connector and the card such that neither the card nor the slot can be used. If you have any doubts about the straightness of the pins on the backplane, contact your local Nortel Networks technical support representative to decide whether the shelf assembly should be replaced.

3 If no pins are bent, proceed with the installation of the switch.

If at least one pin is bent slightly or worse, terminate the installation and contact your local Nortel Networks technical support prime to arrange having the shelf assembly replaced. You must identify the PEC that is labelled on the shelf assembly as one of the following:

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- NTHR50 or NTHW99 for a Multiservice Switch 15000
- NTPN70 or NTPN77 for a Multiservice Switch 20000

4 If replacing an unmounted and empty shelf assembly, put it back in its shipping container.

If replacing a mounted shelf assembly, wait for the replacement and then replace it according to Shelf assembly (page 140).

When returning a shelf assembly, always leave the pre-installed PIMs, MAC address module, and alarm/BITS module in the assembly. The replacement shelf assembly always includes these modules.

--End--

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Checking power input cables to the BIP

Check the dc power input cable connections to the BIP or power-and-ground cable assembly to verify matching end labels, polarity, and firm connectivity to prevent injury or equipment damage before powering up the BIP or after a reconnecting a power input cable.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need the following specialty tools
  - a medium Pozidriv screwdriver, for example a number 2 (do not substitute a Phillips) for an insulation boot clamp
  - a crimper for lugs up to 1/0 AWG (53.5 mm^2), depending on the size of cable feeding the BIP
  - an 11-mm (7/16-in.) deep socket with a properly calibrated torque wrench capable of 6.5 Nm (57.5 in.-lbs) and a 20-cm (8-in.) extender for the lug nuts
- All four or eight power cables must be connected to the BIP and visibly labelled with the power feed connection information prescribed by dc cable installation in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

DANGER

Risk of injury or equipment damage by electricity

When checking power input cables at the BIP, ensure that the source of power at the other ends of the cables (feeds) is off (disconnected), fuses are removed, or the breakers are off). Also ensure that all BIP breakers are off (the O is pressed in).

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Vergewissern Sie sich bei der Überprüfung der Netzkabel am Trennschalterkopplungsmodul (BIP), daß die Stromversorgung an den anderen Kabelenden (Speisestromzuführungen) getrennt ist oder daß die Sicherungen entfernt bzw. die Trennschalter ausgeschaltet sind. Stellen Sie außerdem sicher, daß alle BIP-Trennschalter ausgeschaltet sind (O ist gedrückt).

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CAUTION
Risk of equipment damage by reversed polarity
Use the plus (+) and minus (-) symbols on the rear of the breaker interface panel (BIP) to ensure that the polarity of each A and B battery (-48/-60 V dc) and battery return for the input power feeds is correct. When powering up the BIP, reversed polarity will damage circuits inside it. The BIP would have to be replaced.

Procedure steps

Step	Action
1	On the rear of the BIP, ensure that the cables to the insulation boots are labelled from left to right as indicated in the figure Overhead power input cables for the lower shelf connected to the BIP (page 183). If the cables to the studs come from a power-and-ground assembly (part number A0834143 or A0834149), ensure that the labels on the assembly or on each cable near the terminal blocks has the correct label. If any label does not match, correct the label or the change the connection, and trace all connections back to the power source to confirm an end-to-end match.

CAUTION
Risk of damage to power connections
The metal of the top stud of each pair is softer than the bottom lug because of increased electrical conductivity. Ensure that you do not overtighten either stud, nor leave one too loose. Damaging a stud means its BIM cannot be powered up until the BIP is replaced.

2	Check the security of the cable fastening by gently but firmly wiggling the cable between the insulating boot and the first tie-wrap. • If the cable moves, ensure that the nearest tie-wrap is snug enough. • If the cable still moves, unfasten the Pozidriv screw that retains the boot clamp, slide the boot away from the lug, and wiggle the cable again. Determine if the cable moves because the lug crimp is insufficient or the lug is not tight enough. Re-crimp the lug or re-torque the nuts to 6.5 Nm (57.5 in.-lbs).
3	When a power-and-ground cable assembly is installed, check the security of each cable entering a terminal block. If any cable wiggles, tighten the clamping screw until the wiggling stops. If the wiggling persists, determine why and fix it.

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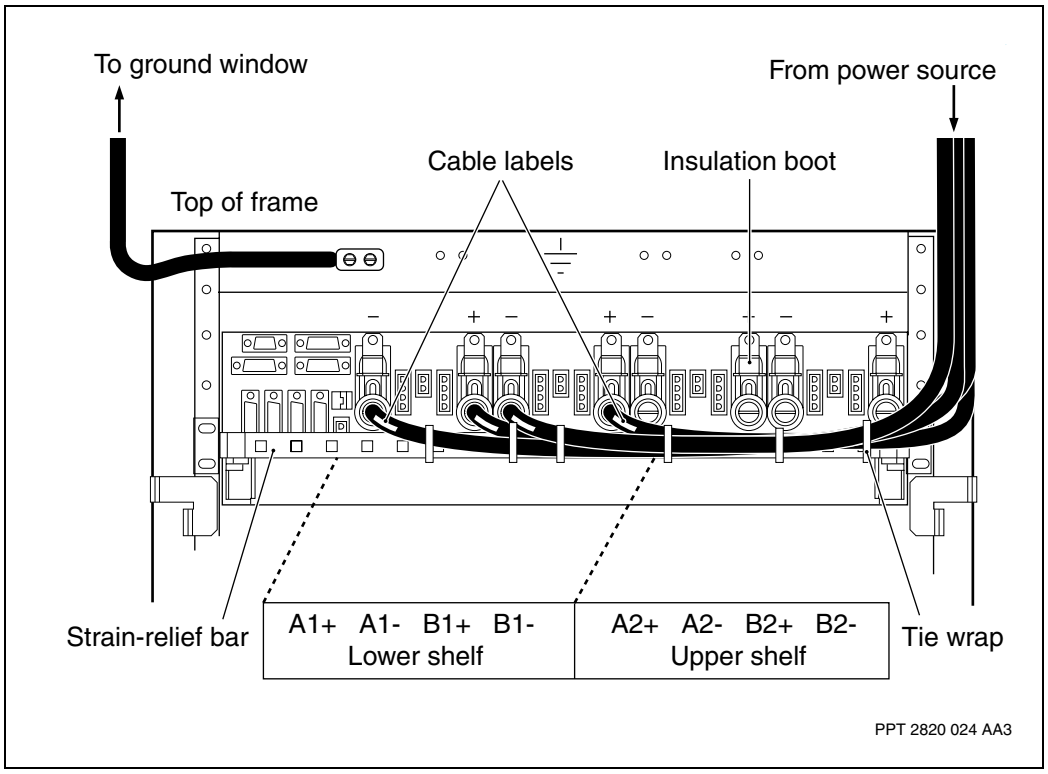
4 Trace each cable away from the BIP to its next terminations up to the power source. At each junction or panel, ensure both halves of the connection are labelled and match the BIP end.

If any label does not match, correct the label or the change the connection, and trace all connections back to the BIP to confirm an end-to-end match.

--End--

Procedure job aid

Overhead power input cables for the lower shelf connected to the BIP



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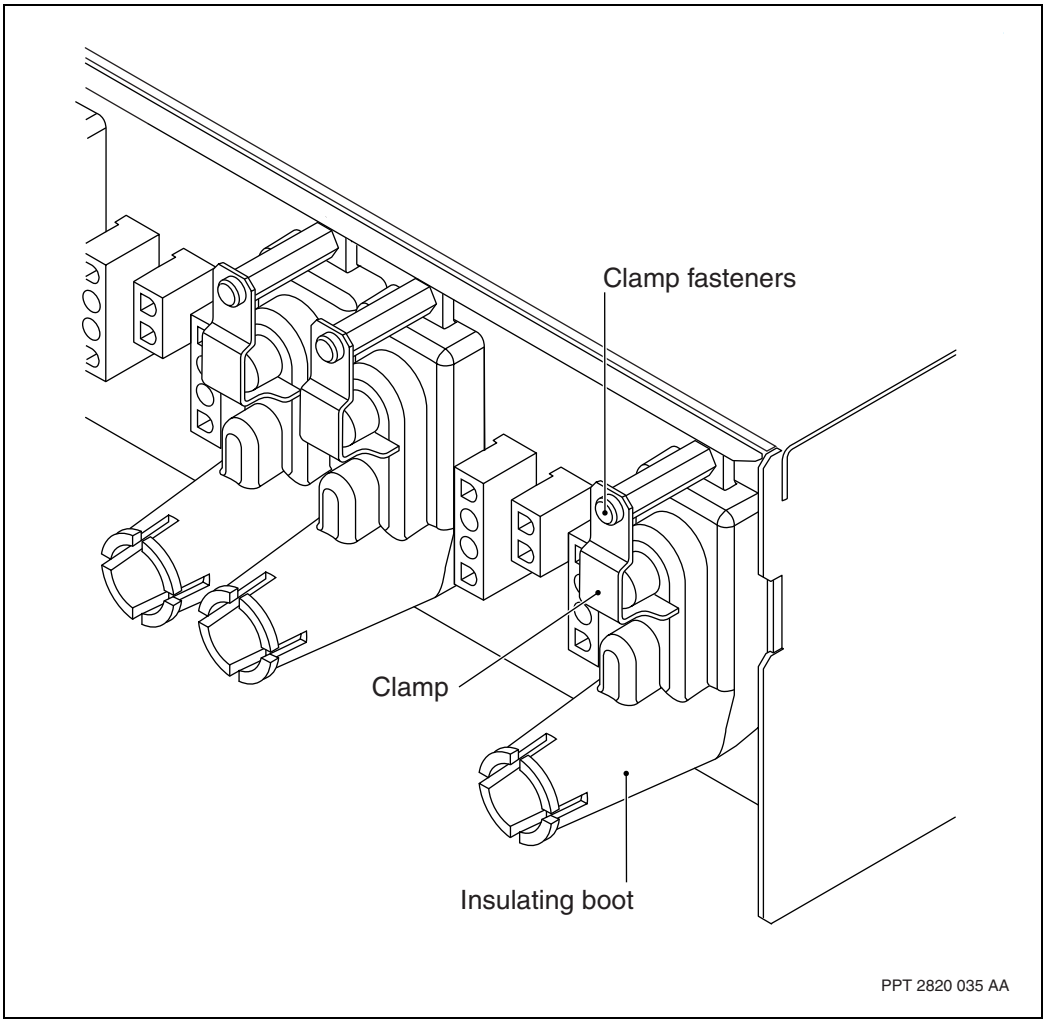
Insulating boots and clamps at the rear of the BIP



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Checking power output from a system of ac rectifiers

Check power output cable connections from a system of ac rectifiers to the BIP to verify matching end labels, polarity, and firm connectivity to prevent injury or equipment damage before powering up the BIP or a circuit breaker from a replaced power cable.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Test the power output connections from a system of ac rectifiers by following the instructions provided by that product. When the system of ac rectifiers is an Astec MFA150, do this procedure and then follow the testing instructions provided in the Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*.

DANGER

Risk of injury or equipment damage by electricity

When using an MFA150 and you cause a short circuit of the A or B feed to the BIP, it impacts the other feed and resets all of the rectifiers without tripping their circuit breakers. There is still enough power to prevent tripping the breakers, but that power output can cause damage to the switch.

WARNUNG

Verletzungs- oder Gerätebeschädigungsgefahr durch Elektrizität

Wenn Sie einen MFA 150 verwenden und einen Kurzschluss der A oder B-Versorgungsanschlusses am BIP auslösen, so hat dies Auswirkungen auf den anderen Versorgungsanschluss und setzt alle Gleichrichter zurück, ohne die Schutzschaltung auszulösen. Es ist immer noch genügend Strom vorhanden, um ein Auslösen der Schutzschaltung zu verhindern, aber die Stromausgabe kann den Multiservice Switch 15000 oder Multiservice Switch 20000 beschädigen.

Procedure steps

Step	Action
1	Ensure that all mid-trip circuit breakers on the front of the MFA150 system are off, that is, fully down and OFF is visible. This includes the breakers on the controller and each rectifier. See the figure Front of an MFA150 power system of five ac rectifiers (page 187).

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2 Place a step ladder in front of the controller (top unit) so that you can access its top.

3 Access the inside of the controller by unfastening the small Phillips screws at the top edges of its cover. Remove the cover. Put the screws and cover aside temporarily.

4 At the back of the controller, locate the cable pair entering on the left side. Confirm that the inside collar nut for the pair's conduit elbow is tight against the back panel.

5 On the faceplate of the controller, confirm that all cabled circuit breakers labelled CBn are rated 60 A.

6 Confirm that the red cable

- connects to the BIP stud labelled A1+
- is labelled the same as the BIP stud
- is screwed to circuit breaker CB1 and the connection is tight; see the figure Power cable connections at the rear of an MFA150 system of ac rectifiers (page 189)

7 Confirm that its mate black cable

- connects to the BIP stud labelled A1-
- is labelled the same as the BIP stud
- is screwed to the ground busbar and the connection is tight; see the figure Power cable connections at the ground busbar inside an MFA150 controller (page 190)

8 Correct any incorrect label or connection inside the controller.

9 Repeat step 4 to step 8 for each other cable pair moving from left to right across the rear of the controller. The cables to the BIP must be grouped together. While viewing the rear of the BIP and the front of the controller, the cable pair mappings are identified in the table Connection mapping between the BIP and the MFA150 controller (page 187).

10 Fasten the cover back on top of the controller.

--End--

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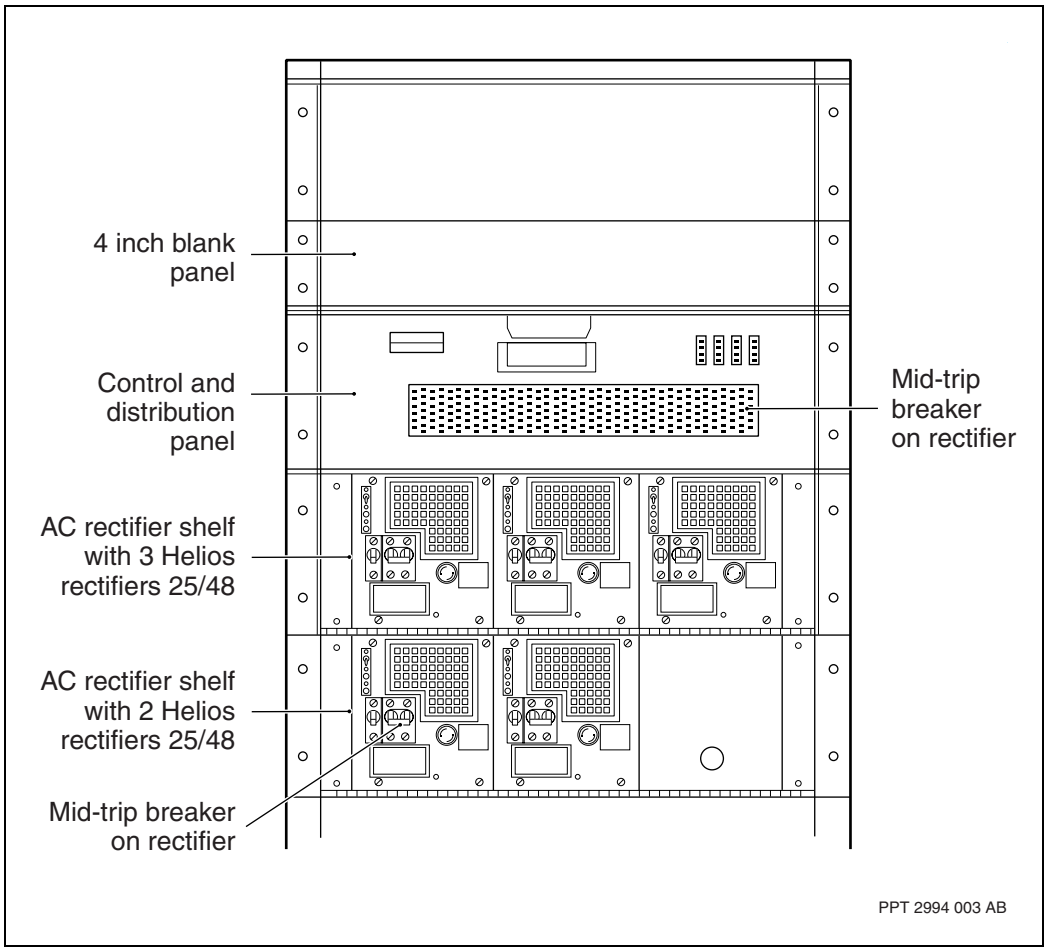
Procedure job aid

Front of an MFA150 power system of five ac rectifiers



Connection mapping between the BIP and the MFA150 controller

Position of switch	Label of BIM cable	Location of connection on BIM while facing the rear of the BIP	Cable color	Label of MFA150 cable	Location of MFA150 connection
lower shelf	A1-	left BIM, left pair of studs	black	A1-	ground busbar
lower shelf	A1+	left BIM, right pair of studs	red	A1+	CB1
lower shelf	B1-	middle left BIM, left pair of studs	black	B1-	ground busbar
lower shelf	B1+	middle left BIM, right pair of studs	red	B1+	CB2

(1 of 2)

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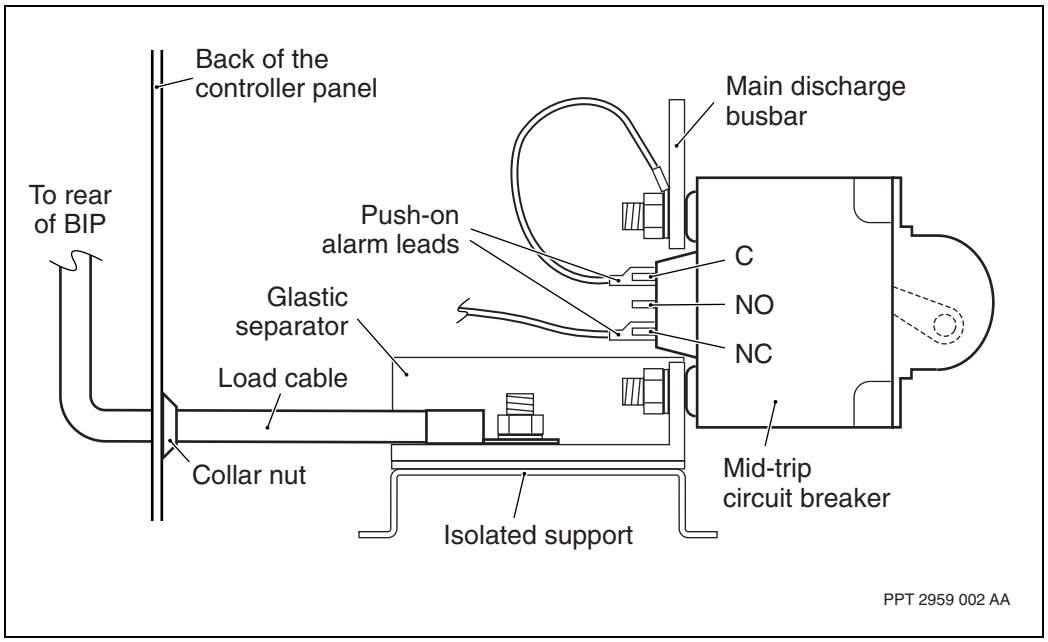
Connection mapping between the BIP and the MFA150 controller (continued)

Position of switch	Label of BIM cable	Location of connection on BIM while facing the rear of the BIP	Cable color	Label of MFA150 cable	Location of MFA150 connection
upper shelf	A2-	middle right BIM, left pair of studs	black	A2-	ground busbar
upper shelf	A2+	right BIM, right pair of studs	red	A2+	CB3
upper shelf	B2-	right BIM, left pair of studs	black	B2-	ground busbar
upper shelf	B2+	right BIM, right pair of studs	red	B2+	CB4

(2 of 2)

Power cable connections at the breakers inside an MFA150 controller, side view



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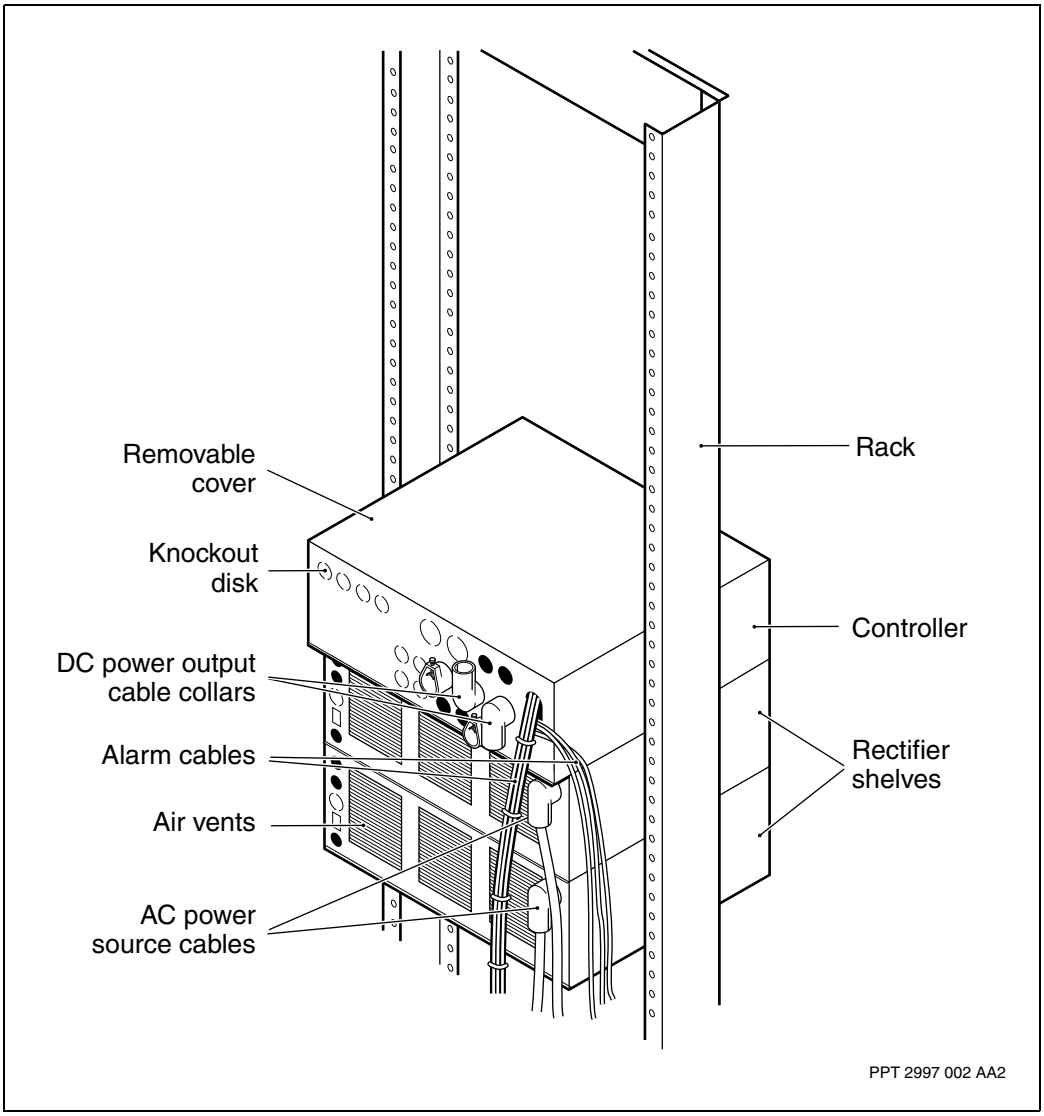
Power cable connections at the rear of an MFA150 system of ac rectifiers



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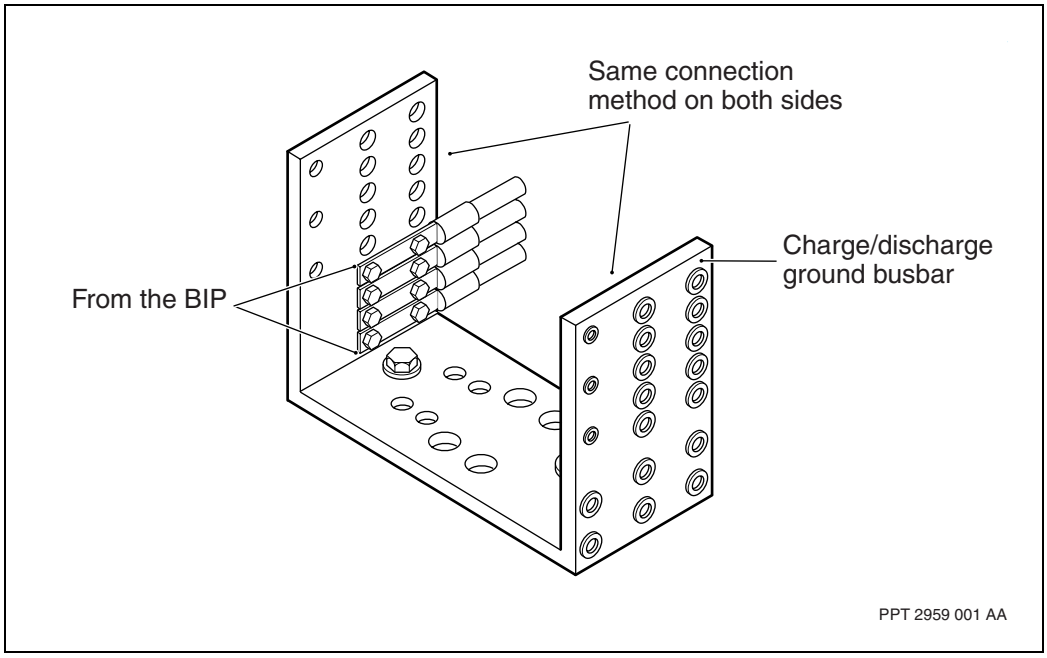
Power cable connections at the ground busbar inside an MFA150 controller



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Checking power output connections from the BIP

Check the power output cable connections from the BIP to the shelf assembly hardware to verify firm connectivity for power distribution before powering up the BIP or after replacing a power interface module (PIM) cable.

Transporting a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000, or installing hardware onto it, can loosen a power connection between the breaker interface panel (BIP) and the other parts of the hardware. Before powering up the BIP, check each power output connection from the BIP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Facing the rear of the BIP, locate the left-most cable connection. Refer to the figure Power cable paths between the BIP and two shelves (page 192).
2	Using your fingers, firmly push the connector of the cable in towards the BIP. Decide if the connection is fully seated. If fully seated, proceed. If not, remove the connector and install it again until it is fully seated. D-sub connectors usually have small slotted screws. If re-seating cannot be done, record why and proceed.
3	Repeat step 2 for each cable connection across the rear of the BIP up to but not including the power input cables. The black and white cables are power output cables, while the red are alarm cables. Check each connector.
4	Locate the next lower batch of connectors down the left rear of the switch. The black and white connectors have locking tabs. Ensure that the tabs are engaged.
5	Methodically check the connector of each rear cable until all have been done, or record any that cannot be fully seated.
6	Return to the connector or connectors that could not be fully seated, and fix the problem. Otherwise, do not power up the BIP and contact your next higher level of technical support.

--End--

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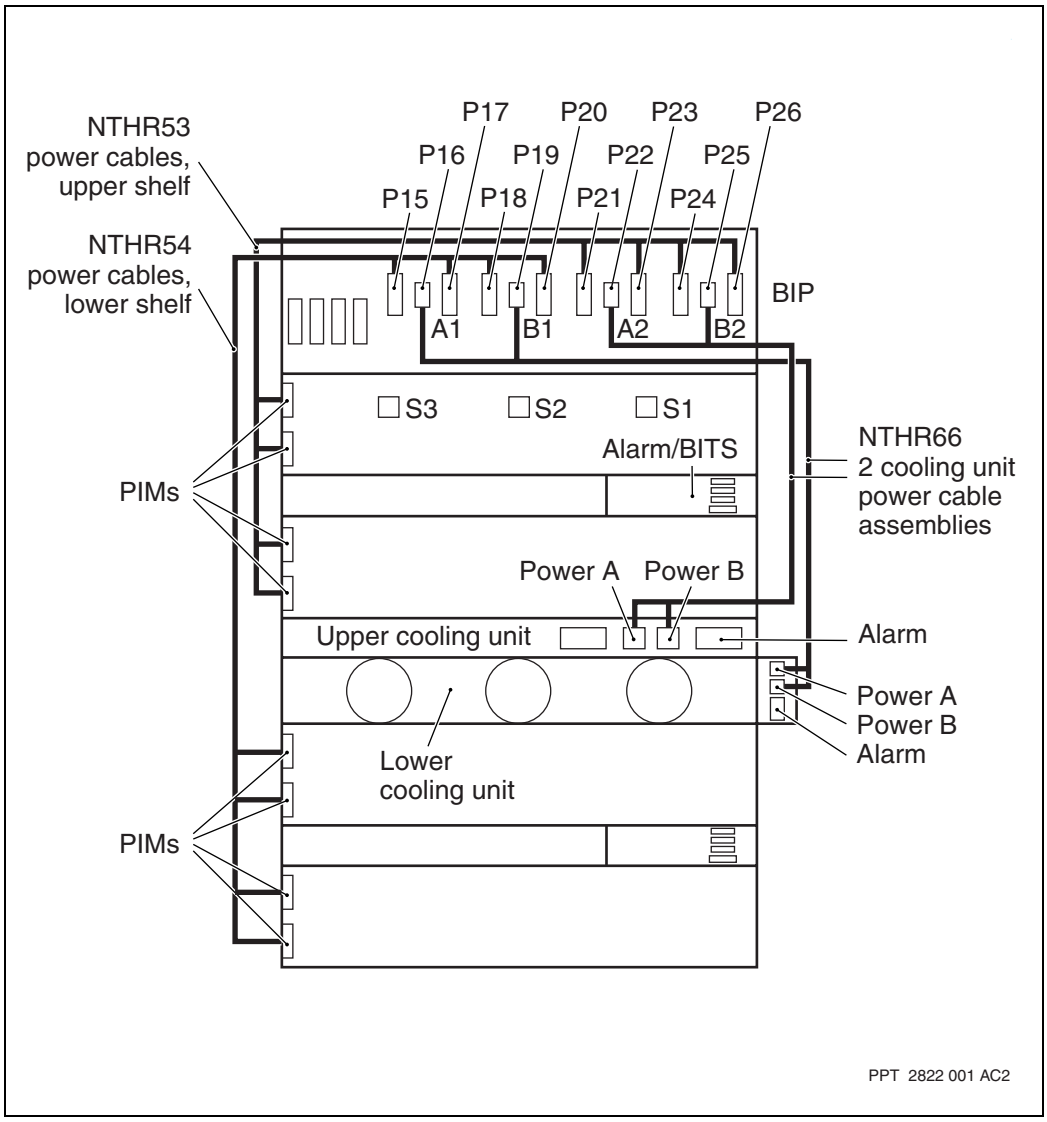
Procedure job aid

Power cable paths between the BIP and two shelves



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Checking the connectivity between FPs and sparing panels

Check the connectivity between spared (redundant) electrical FPs and their sparing panel to verify the panel has powered up and indicates the appropriate operational status.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Electrical FPs include DS1s, DS3s, E1s, and E3s.
- The FPs must be:
  - fully cabled to the sparing panel
  - powered up and loaded
  - running traffic through the active connections
- A sparing panel receives power through each control port cable.
- When power initially reaches the sparing panel, the status LED of the Main connections lights first. Depending on which FP is configured to be the active one, the LED status on the sparing panel may change to indicate the standby FP is active.
- When a sparing panel has connectors for monitoring the transmit signal on any port of a specific FP, use your own testing equipment to verify the transmission. The monitoring signal of the 12-port DS3 or E3 sparing panel NTQS31 is 25 dB lower than the transmit signal so that the transmission is insignificantly affected. Ports of the same number cannot be monitored on different FPs at the same time.

Procedure steps

Step	Action
1	Coordinate with the software operator of the node to ensure traffic is running through the FPs that are connected to the sparing panel.
2	Have the software operator check for occurrences of any of these alarms that are associated with spared electrical FPs: • 7054 0100, indicating is not connected to a sparing panel • 7054 0101, indicating an incorrect connection or a configuration (provisioning) error, for example, the FP is connected to the wrong sparing panel • 7054 0102, indicating an FP port is connected to the wrong sparing panel port • 7054 0103, indicating the sparing panel is not responding

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Do whatever remedial action is required to get rid of the alarms.

3 On an NTQS31 sparing panel, press the FP selection button until the numeral 1 appears in the LED display beside it. The button is the upper one of the pair.

4 Press the port selection button until the hexadecimal number for one appears in the LED display beside the button. The button is the lower one of the pair.

5 Connect the test equipment according to the equipment manufacturer's instructions.

6 Run the test equipment to verify connectivity according to the equipment manufacturer's instructions.

7 Record the test result for the FP to sparing panel path.

8 Repeat step 1 to step 7 until you cycle through all of the ports of each FP connected to the sparing panel and test each one.

9 For each port that failed the transmit connectivity test, check the cable connectors, cable, and cable connections, then test the FP. Re-test each as you check. If any port still fails the test, contact your administration to decide what to replace.

--End--

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Checking the final status of all LEDs

Check the final status of all LEDs to verify the equipment is operating before putting the switch and all interworking equipment into service.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- When a LED stays solid red after loading is attempted, the card is
  - an incompatible vintage
  - was previously loaded with software that is incompatible with the current software running on the node
  - has failed
- The NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting* can help you with identifying possible reasons why the hardware is not initiating properly.

Procedure steps

Step	Action
1	On the node, verify that at least one LED is lit on each hardware part that has LEDs. If no LED is lit on a part after powering up, then one or more of the following conditions prevails: • the green LED is burned out and software can verify if the part is actually operational • there is a problem in a cable assembly or a connection between the BIP and the PIMs • there is a problem with one of the power feeds to the BIP, but this means a series of hardware LEDs would not be lit • there is a problem in the backplane of the shelf
2	On the node, press the LED Test button on the front of the alarm module. Verify that all LEDs on the following hardware parts light up for approximately ten seconds: • the BIMs and alarm module of the BIP • the cooling unit or units • the fabrics in one or both switches
3	Repeat the LED test as required until you verify the operational status of all LEDs.

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4 LEDs may show lit amber if the switch's startup software has not yet been initiated or if the CP or FP has not been configured.

If a combination of some CPs and FPs are amber, re-seat each module.

If only the CPs are amber, wait for the software to be started. Re-seat them without powering down any part of the system.

--End--

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Checking the operation of external alarms

Check the operation of external alarms between the BIP and the terminal indicators to confirm the alarms are working and all equipment is operating normally.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The external alarm indicators are typically non-Nortel Networks Multiservice Switch terminations, for example, an aisle lamp or LED, or an audible alarm for a system of ac rectifiers as the power source. Know what external alarms have been connected to the BIP.
- The status LED that is provided by the illuminated top cover of a NEBS 2000 frame is checked by the procedure Installing an illuminated brandline cover (page 469).

Procedure steps

Step	Action
1	Test the operation of each external alarm connection by simulating the failure conditions before putting the node into service.
2	When the power source of the BIP is an MFA150 system of ac rectifiers, test the external alarm connection between them by powering off and disengaging two of the rectifiers in the same rectifier shelf. This simulates a failed rectifier. The amber test LEDs of the alarm module light up and critical alarm number 7012 0050 indicates a rectifier failure. When the rectifiers are engaged into the shelf and powered up, the LEDs extinguish and alarm 7012 0050 indicates the failure is cleared. A status change can take up to two minutes to be shown.
3	For any external alarm that is not operating, reseat the connectors at both ends and repeat the test.
4	For any external alarm that is still not operating, contact your next level of technical support.
5	For any alarm that is operating properly and indicates a problem, fix the problem.

--End--

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Procedure job aid

For a complete list of the possible external alarm connections, refer to these tables:

- Pinout of the BIP female D-sub 15-pin connector P1 (page 160)
- Pinout of the BIP female D-sub 25-pin connectors P2 and P4 (page 161)
- Pinout of the BIP female D-sub 25-pin connector P3 (page 162) for empowered contacts
- Pinout of the BIP female D-sub high-density 26-pin connectors P7 through P10 (page 164)
- Pinout of the BIP female 1x2 MATE-N-LOK connector J1 (page 165)
- Pinout of the BIP male 2x4 Berg connector J3 (page 166)
- Pinout of the BIP male 1x4 Berg connector J2 (page 166)
- Pin-to-pin connections between an MFA150 controller card and a BIP (page 168)

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Cleaning an SFP optical module

Clean a small form pluggable (SFP) optical module to remove contamination and to restore optimum signal throughput between an interfacing LC fiber cable and its optical transceiver of the module socket (port) in the FP faceplate.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The procedure applies to an SFP optical module with any of the following PECs:
  - NTTP01AB for multimode (MM) fiber cables for an NTHW49
  - NTTP01CB for single-mode (SM) fiber cables for an NTHW49
  - NTTP04CF for SM fiber cables for an NTHW46
  - NTTP05EF for SM fiber cables for an NTHW46
- To avoid contamination, clean an SFP module only when there is evidence of contamination or performance is reduced through the module socket (port).
- You need clean dust caps for the connector ends of each SFP module, and a clean anti-electrostatic discharge bag.
- You need a microscope with at least 40x magnification to inspect the pair of lenses on each SFP module.
- You need these supplies:
  - optical fiber cleaning swabs (such as those made by Cletop) with a 1.25 mm diameter or other equivalent swabs that are rated to not shed material (for example, a cotton swab sheds and must not be used)
  - 3M's HFE-7100 cleaning fluid or iso-propyl alcohol (IPA)
  - low pressure clean nitrogen or air
- The SFP module must not be installed when cleaning it. Remove, clean, and insert each module one at a time to avoid installing it back in the wrong socket module (port).
- Do not touch the circuitry inside the large open end of an SFP optical module or you may cause the unit to malfunction. This end does not get cleaned. See the figure The open end of an SFP optical module (page 201).
- The procedure steps are based on the Application Note by Agilent Technologies called "Inspection and Cleaning of Fiber Optic Transceiver Ports", May 2, 2002, revision 1.2.

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Procedure steps

Step	Action
1	Remove the dust cap (if present) from the LC connector end of the SFP module, as shown in the figure The LC connector end of an SFP optical module (page 201). Store the dust cap in a clean anti-ESD bag.
2	Place the LC connector-end of the SFP module under the microscope so that 1 of the 2 lenses is viewed.
3	Inspect the lens, then inspect the other lens.
4	On each lens that appears to be contaminated, press a dry swab gently against the lens surface and rotate it 3 times in the same direction. Use a new clean swab on each lens and discard the swab after 1 use.
5	Inspect the lenses with the microscope again. If the lenses are clean, install the dust cap or proceed immediately with installing the SFP module. If a lens still shows contamination, continue to the next step.
6	Soak a swab in the cleaning fluid or IPA. Press it gently against the surface of the lens and rotate it 3 times in the same direction. Repeat for the second lens, as required, using a new swab. Discard a swab after 1 use.
7	Blow low pressure clean nitrogen or air onto the lens to remove solvent residues. Do not use your breath.
8	Inspect the lenses with the microscope again. If the lenses are clean, install the dust cap or proceed immediately with installing the SFP module. If a lens still shows contamination, use a different SFP module.

--End--

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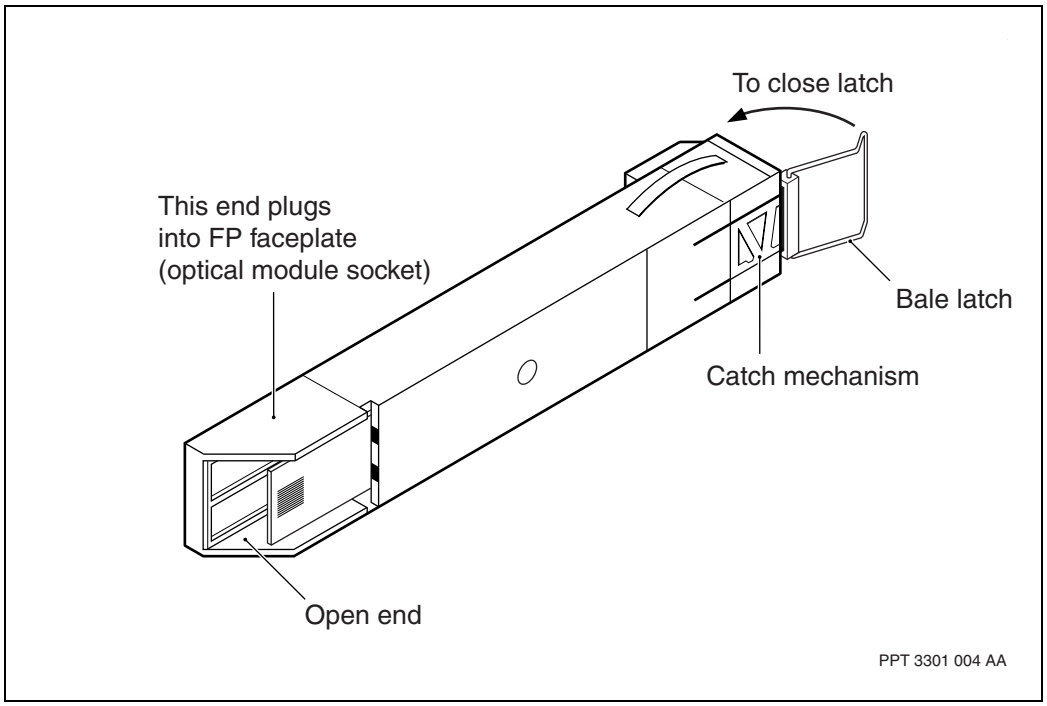
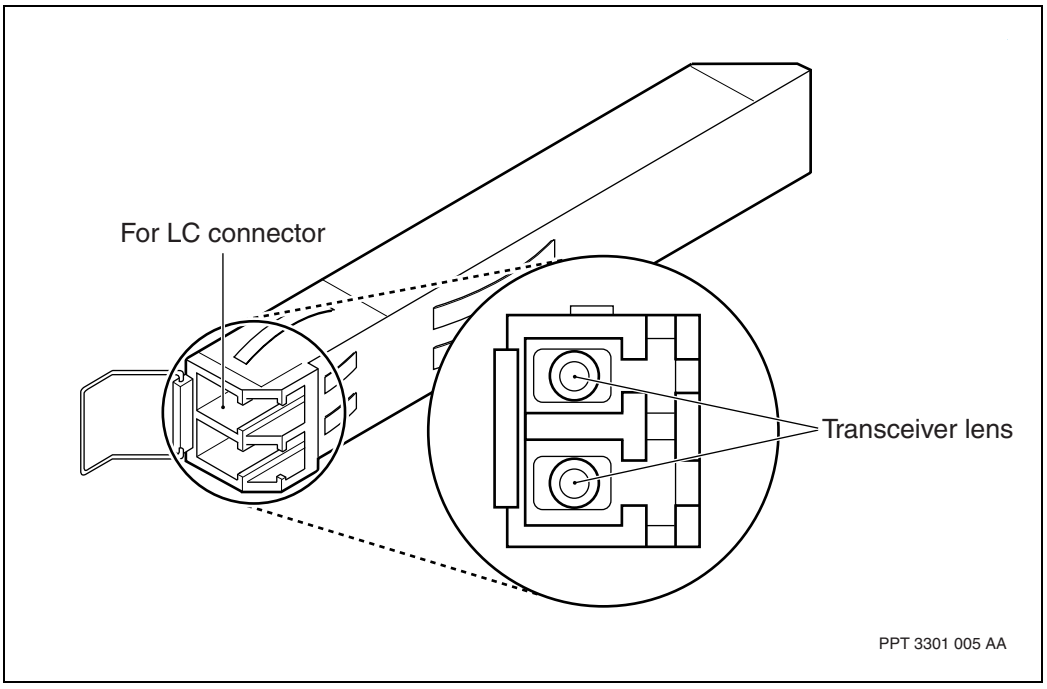
Procedure job aid

The open end of an SFP optical module



The LC connector end of an SFP optical module



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Cleaning LC or SC connectors

Clean LC or SC connectors to maintain optimum connectivity between the end of a fiber cable and its connection or to stop an intermittent transmission error.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- For Nortel Networks Multiservice Switch 15000 and Multiservice Switch 20000 FPs, each fiber cable connection either directly plugs into a transceiver or into an adapter on the faceplate. A dust cap on the end of a fiber connector, in a transceiver, or an adapter is synonymous with any form of plug-in protection cap.
- Avoid direct skin contact with the part of the connector, ferrules, or transceiver being cleaned.
- Protect your eyes with safety goggles during cleaning.
- Work in a well-ventilated area. Use small amounts of cleaning alcohol and avoid breathing the vapors.
- Once a fiber cable is plugged into an FP, it does not require cleaning until it is unplugged. A fiber cable connector must be cleaned immediately prior to plugging it into an FP or a test device.
- Refer to the figures LC fiber connectors (page 205) and SC fiber connector (page 205). The ferrule and end face of an LC connector is the same shape as an SC connector but is a different diameter.
- The ferrule is the rigid stem at the connector that contains the optical fiber. Only clean one ferrule at a time. Wear vinyl gloves to avoid contaminating the ferrule or the cleaning cloth with skin oil.
- Clean the transceiver (or adapter) before cleaning the connector that was or is to be plugged into it. See Cleaning the bore of a transceiver (page 209).

WARNING

Risk of eye injury by laser

Never look directly into the end of a fiber cable, let an end pass in front of your eyes, or use an optical device to look at the end of an optical fiber unless you are certain the other end is not connected. The laser travelling through a fiber cable can injure the human retina.

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WARNUNG

Gefahr von Augenverletzungen durch Laserstrahlen

Blicken Sie nie direkt auf das Ende eines Glasfaserkabels, und überprüfen Sie auch einzelne Faserenden nicht mit einem optischen Gerät, wenn Sie nicht sicher sind, daß das andere Kabelende nicht angeschlossen ist. Der über die Glasfasern übertragene Laser kann die menschliche Netzhaut verletzen.

Procedure steps

Step	Action
1	If the connector is in use, disconnect it from the function processor (FP). If the connector is not in use, slide the protective dust cap off the end to expose the ferrule. If an inline attenuator is used for the connection at the FP end, the receptacles of the attenuator and the connectors that plug into it must also be cleaned according to its manufacturer's instructions.
2	Holding a can of compressed gas upright, blow into the cavity surrounding the ferrule. Avoid having propellant fluid coat the connector. Do not blow onto the ferrule with your breath. Moisture from your breath will contaminate the surface.
3	Use the plastic squeeze bottle to apply 1 drop of isopropyl alcohol on the ferrule.
4	While the ferrule is wet, use a new dry TEXWIPE cloth to firmly wipe its endface and lateral surface. Do not allow the alcohol to dry on the ferrule because it will leave a residual film on the adaptor. If the ferrule is visibly dirty, use figure-eight motions when wiping the endface. Dirt on the ferrule may not be visible to the human eye. Use a new cloth for each ferrule so that dirt is not transferred from one ferrule to the next.
5	Assess the cleanliness of the ferrule endface through an appropriate microscope. If it is not satisfactory, repeat step 2 to step 5. If it is satisfactory, replace the dust cap on the connector or immediately plug the connector to an adapter or a transceiver that has already been cleaned.

--End--

Procedure job aid

The recommended cleaning material for fiber optics is in the table Cleaning tools and supplies for fiber connectors (page 204).

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Cleaning tools and supplies for fiber connectors

Tool or supply	Vendor	Comment
pipe cleaners	any	lint free, for cleaning alignment sleeves
vinyl gloves	any	comfortable fit for your hand
Optimate Fiber scope, 602970-1/2	AMP of Canada or equivalent	microscope kit at 100X or 200X magnification for inspecting fiber optic cores
plastic squeeze bottle	Chemtronics	rated to handle isopropyl alcohol
isopropyl alcohol, reagent grade	Hunt or other chemical supplier	certified particle grade (filtered at 0.2 um) for semiconductors
TX409 Absorbond	TEXWIPE or equivalent	lint-free, fiber-free, 100% polyester wiper, clean-room certified
TX2510 AccuDuster III	TEXWIPE or equivalent	compressed gas for precision cleaning (tetrachlorethane)
mini foam swabs (48040)	Coventry (division of Chemtronics)	for cleaning transceivers that have a fiber connected at the back end
adapter cleaning tips (AlcoaFL ACT-1)	any	for cleaning adapters that have a fiber connected at the back end
plastic bags, approximately 15 cm by 15 cm (6-in. by 6-in.)	any	must be sealable, for storing dust caps of connection adaptors
Universal cleaning cassette	Corning Cable Systems	a special tool used to clean MT-RJ connectors with or without pins

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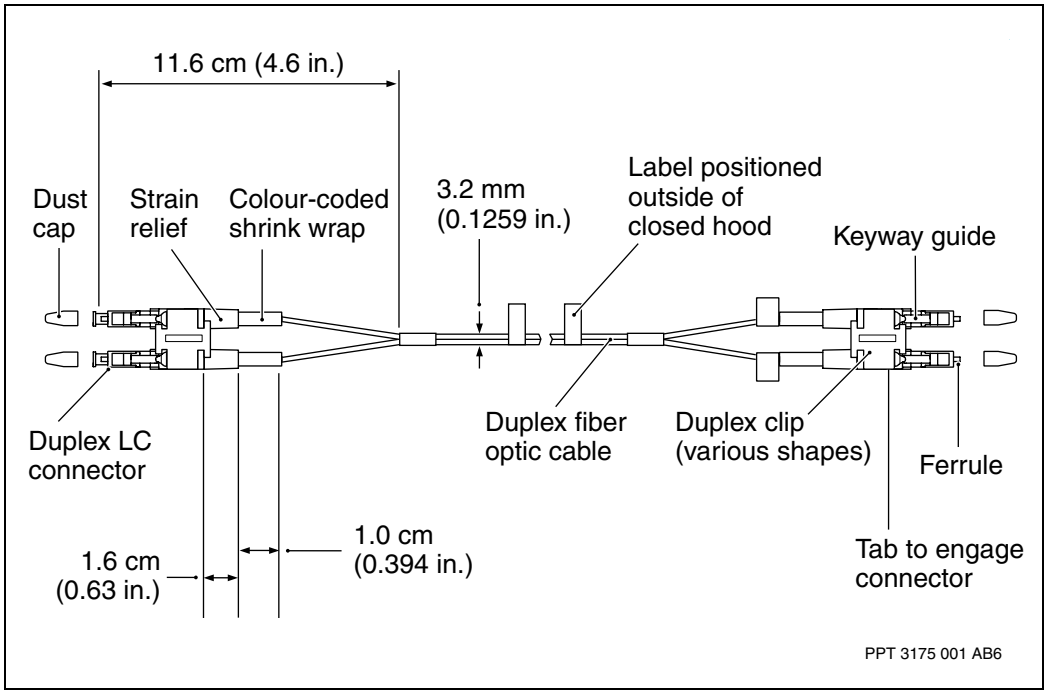
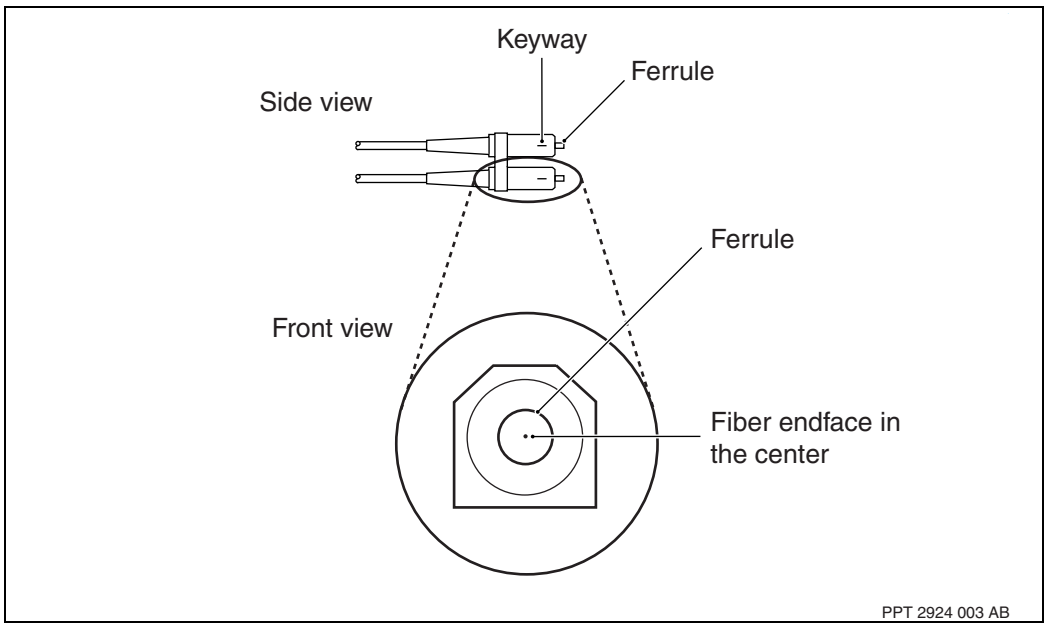
LC fiber connectors



SC fiber connector



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Cleaning MT-RJ connectors

Clean MT-RJ connectors to maintain optimum connectivity between the end of a fiber cable and its connection, or to stop an intermittent transmission error.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Refer to the table Cleaning tools and supplies for fiber connectors (page 204)
- Avoid direct skin contact with the part of the connector, ferrules, or transceiver being cleaned.
- Protect your eyes with safety goggles during cleaning.
- Work in a well-ventilated area. Use small amounts of cleaning alcohol and avoid breathing the vapors.
- MT-RJ connectors should only be cleaned when they are suspected to be dirty. Excessive contact can damage the fiber and cause full or partial signal loss.
- The figure MT-RJ fiber connector (page 208) shows the location of the fiber ends on a MT-RJ connector. These are not likely to be visible to your eye.
- The ferrule is the rigid stem at the connector that contains the optical fiber. Only clean one ferrule at a time. Wear vinyl gloves to avoid contaminating the ferrule or the cleaning surface with skin oil.
- Clean the transceiver (or adapter) before cleaning the connector that is to be plugged into it. See Cleaning the bore of a transceiver (page 209).

WARNING

Risk of eye injury by laser

Never look directly into the end of a fiber cable, let an end pass in front of your eyes, or use an optical device to look at the end of an optical fiber unless you are certain the other end is not connected. The laser travelling through a fiber cable can injure the human retina.

WARNUNG

Gefahr von Augenverletzungen durch Laserstrahlen

Blicken Sie nie direkt auf das Ende eines Glasfaserkabels, und überprüfen Sie auch einzelne Faserenden nicht mit einem optischen Gerät, wenn Sie nicht sicher sind, daß das andere Kabelende nicht angeschlossen ist. Der über die Glasfasern übertragene Laser kann die menschliche Netzhaut verletzen.

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Procedure steps

Step	Action
1	If the connector is in use, disconnect it from the function processor (FP). If the connector is not in use, remove the dust cap to expose the ferrule. The cap is removed by pushing the cap and the ferrule together, squeezing the release tab and then pulling off the cap. If an inline attenuator is used for the connection at the FP end, the receptacles of the attenuator and the connectors that plug into it must also be cleaned according to its manufacturer's instructions.
2	Holding a can of compressed clean-room grade gas upright, blow the surface of the ferrule. Avoid having propellant fluid coat the connector. Do not blow onto the ferrule with your breath. Moisture from your breath will contaminate the surface.
3	Inspect the fiber endface with an appropriate microscope. Replace the cap if the ferrule is clean. If particles are still present proceed with step 4.
4	Use the plastic squeeze bottle to apply 1 drop of isopropyl alcohol on a ferrule. Do not allow the alcohol to dry on the connector because it will leave a residual film on the ferrule.
5	While the ferrule is wet, use a Corning Cable Systems, universal connector cleaning cassette. Do not use a substitute. Flip up the flap of the cassette to expose the cleaning surface. Position the ferrule so the fiber ends are in contact with the cleaning surface. The ferrule should be perpendicular to the cassette so it creates a "T" with the cleaning surface. The cleaning cassette can be used for MT-RJ connectors that have pins or are pinless. Use the appropriate cleaning surface for the ferrule you are cleaning.
6	Turn the cogwheel on the cleaning cassette to advance the cleaning surface.
7	Blow dry the ferrule end with clean-room grade air. Do not blow breath or use in-house air to dry the ferrule.
8	Assess the cleanliness of the ferrule endface through an appropriate microscope. If it is not satisfactory, repeat steps 2 through 7. If it is satisfactory, replace the dust cap on the connector or immediately plug the connector to an adapter or a transceiver that has already been cleaned.

--End--

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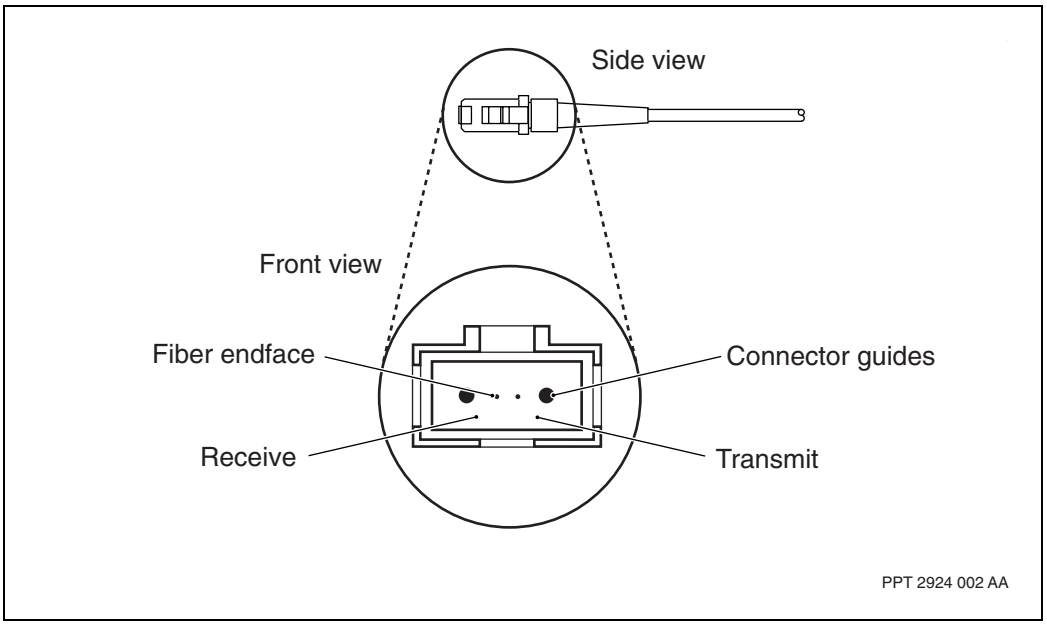
Procedure job aid

MT-RJ fiber connector



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Cleaning the bore of a transceiver

Clean the bore of a transceiver to maintain optimum connectivity between the end of a fiber cable and its connection.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The bore is the opening in the transceiver which accepts a fiber optic connector. Multiservice Switch FPs have either LC, MT-RJ, or SC connector bores. With LC or SC transceivers the transmit portion of the device aligns the ceramic ferrule of the laser with a split sleeve. Any dirt in this sleeve can compromise the quality of the optical connection. With MT-RJ connectors the fibers are aligned to the transceiver with internal metal pins which mate to the MT-RJ fiber connector. Any dirt on the pins, or on the end face of the ferrules can prevent proper alignment and compromise the quality of the optical connection.
- Wear vinyl gloves to avoid contaminating the sleeve or the cleaning tools with skin oil.
- Refer to Cleaning tools and supplies for fiber connectors (page 204).

Procedure steps

Step	Action
1	Remove the connector from the transceiver by pressing the tab fully down and pulling straight away from it, or remove the dust cap by pulling straight away from it. Put the cable aside for cleaning, or put the dust cap aside for re-use.
2	Using a can of compressed gas, blow one or two short bursts to remove any large contaminants from the sleeve or pins. Do not blow onto the ferrule with your breath. Moisture from your breath will contaminate the surface.
3	Moisten a lint-free foam swab with alcohol. Shake off any excess alcohol.
4	Carefully insert the swab into the port. When it bottoms out, slowly rotate the stick once or twice in one direction only. Discard the swab after each use.
5	Repeat step 4 with a new swab to ensure that the alcohol has fully evaporated.

--End--

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Configuring modem software

Configure modem software after setting the modem DIP switches to enable a remote operator connection.

Prerequisites

- Ensure you have a computer or terminal with an RS-232 port that you can temporarily connect to the modem while you adjust the modem settings. The RS-232 port must be capable of running at 9600 BPS; otherwise, the modem will not be able to communicate with the node's local operator port.
- Complete the procedure Setting modem DIP switches (page 731).

Procedure steps

Step	Action
1	On the modem, set DIP switch 8 for the smart mode to on (down).
2	Toggle the modem power off, then on again.
3	Get a computer or terminal with an RS-232 port to temporarily connect the modem to while settings are adjusted. The RS-232 port must be capable of running at 9600 BPS. Otherwise the modem will not be able to communicate with the node's local operator port.
4	Set the computer or terminal to use to use software flow control, also referred to as the data leads only mode. Otherwise the modem may not be able to communicate with the computer or terminal.
5	Connect the modem to the RS-232 port of a computer or terminal using a standard straight-through serial cable. Typically the cable has a 9-pin D-sub female connector at one end and a 25-pin D-sub male connector at the other end. Do not use the V.24 DCE cable (PEC NTBP25 or custom-length equivalent) provided with the switch. Use a custom-made cable that complies with the specifications identified in the Procedure job aid of Connecting a CP modem cable (page 216).
6	Enter the following one-word commands. Explanations are provided for each one. • **`ATQ0`** (with a zero, displays result codes so that the modem responds with OK after this command and whenever an attention command (AT) is entered) • **`ATZ4`** (loads a generic hardware flow control configuration when the cable from "Assembling the custom connection cable" (page 568) is to be used. Otherwise enter **`ATZ5`**. Some functionality will be disabled) • **`ATQ0`** (with a zero, displays result codes and OK)

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- **AT&M0** (optional command) (with a zero, disables error control; use only if the dialing modem does not support error control)
- **AT&W0** (with a zero, writes the current configuration to non-volatile memory, NVRAM 0)
- **ATY0** (with a zero, uses NVRAM 0 as the default configuration)

7 Disconnect the modem from the computer or terminal.

8 While the modem is still powered, return its operation to dumb mode by setting DIP switch 8 back to off (up).

9 Turn the modem off and on again to load the changes.

--End--

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Connecting a CP Ethernet cable

Replace a CP Ethernet cable if it is faulty or as part of a CP replacement procedure.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a kit with PEC NT0479, which contains:
  - CP Ethernet cables for 10Base-T or 100Base-T connections (NT0460). Used with CP2, CP2E, or CP3 and extends 1.2 m (4 ft.)
  - CP2 Ethernet crossover cable (NT0477), used with CP2 or CP2E and extends 3 m (9.8 ft.)
  - CP2 10-Base-T transceiver (928A), used only with CP2
  - CP2 Ethernet cable assembly guide
- If you using a custom-made cable, it should conform to the standards available from Nortel Networks. For information on cable specifications, NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- The expected behavior if an Ethernet cable fails, or is pulled from the active CP, is for a CP switchover to occur. You can change this behavior by disabling the *SwitchoveronFailure* attribute. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

Procedure steps

Step	Action
1	Measure the exact path the cable will follow from port P0 on the faceplate of the CP, through the cable management channel, out the left side of the frame and up or down the side of the frame to the other termination. Choose a path that avoids placing the cable next to an input power cable. See the figure Route of a CP cable (page 214).
2	Open the kit NT0479.
3	While holding the cable NT0460, plug the 45-degree D-sub connector (the end with the cable label) into the P0 D-sub receptacle on the front of the CP.
4	Route the cable down to the cable management channel and out the left side of the frame. The cable is 1.2 m (4 feet) long.
5	Optionally for CP2, connect the other end of cable NT0460 into the D-sub of the inline transceiver (part number 928A). While holding the cable NT0477, plug the RJ45 connector with the ferrite bead into the inline transceiver.

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6 Route the cable NT0477 to the connection on the hub or router through which the Multiservice Data Manager or CPE connectivity is established. The cable is 3.0 m (9.8 feet) long. Plug the RJ45 connector into the hub or router.

7 Fasten the cable in place with tie-wraps except along or inside the cable channel under the CP faceplate. Avoid resting the cable against a power cable. Ensure that the LEDs of the transceiver remain visible.

Management of slack cable must be done at the non-CP end of the connection or through the fiber management unit described in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

8 Label the cable at the hub or router end as a CP cable with its node identifier (from site records) and slot number.

9 Label the cable near the CP with information identifying which termination port this CP is connected to.

10 Once one or both CPs are confirmed to seat properly, pull each CP out far enough for the latches to engage the transportation ridge. Close the latches flush with each faceplate. CPs must remain unseated until the switch powers up.

--End--

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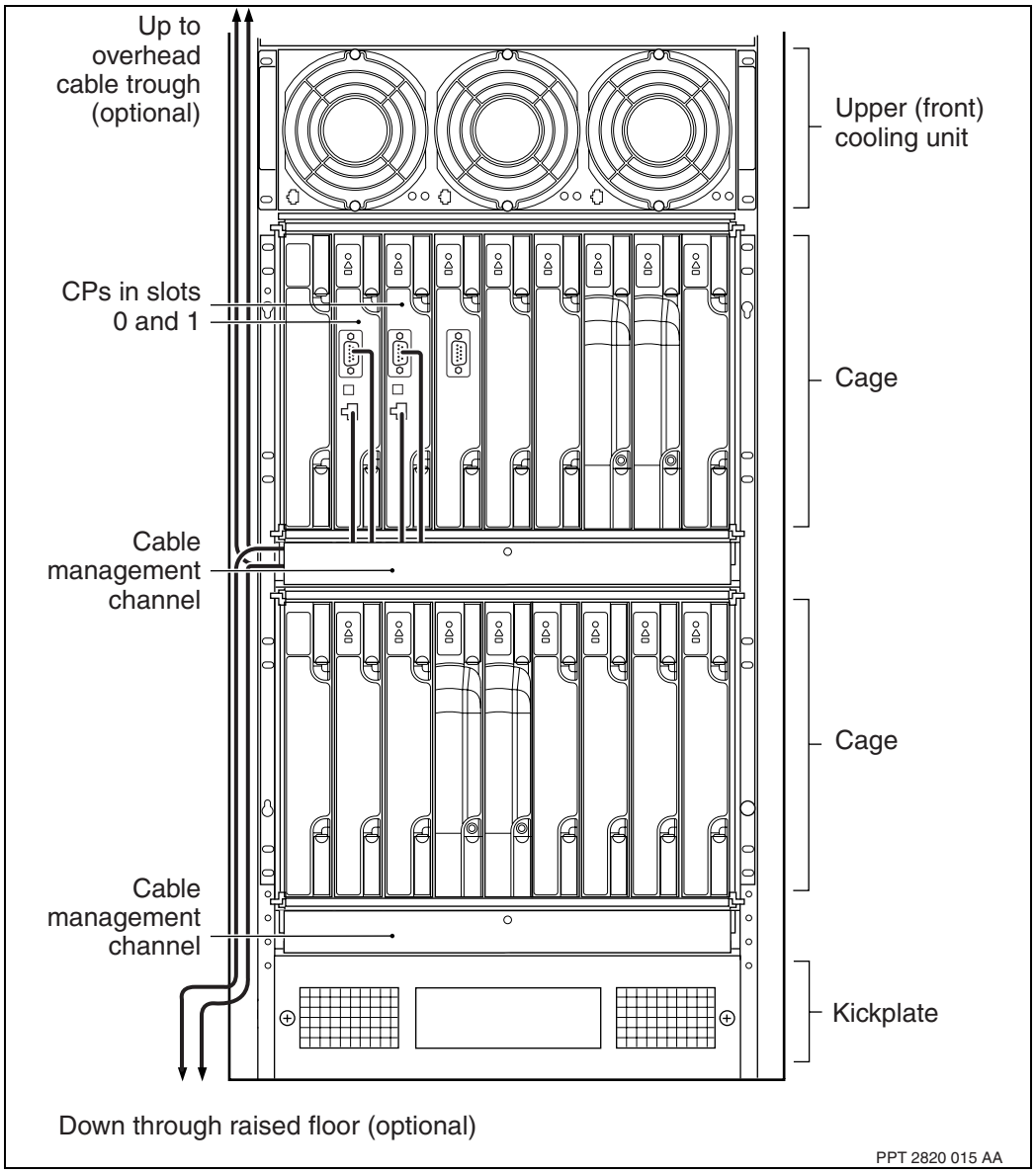
Procedure job aid

Route of a CP cable



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Connecting a CP local operator terminal cable

Connect a local operator terminal to a switch to enable local communication with the node for commissioning. You can use this terminal to set up a connection to your network management system.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The operator cable is intended only for commissioning the switch and must not remain hooked up permanently.
- The operator terminal must be installed and located in the same room as the node. Refer to preparing the site and selecting the type of operator terminal in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- You need a computer terminal interface cable with PEC NTBP25 or alternatively have a spool of interface cable and the appropriate end point connectors at hand before starting the procedure.

Procedure steps

Step	Action
1	Ensure the settings on the terminal match the output of the CP module at 9600 bit/s, 1 stop bit, and no parity. Refer to the terminal manufacturer's instructions on how to do this.
2	Unpack the RS232 CP cable with PEC NTBP25. Otherwise, at the end of the spool of RS232 interface cable, attach a V.24 DCE connector according to the instructions that came with the connector.
3	Connect the V.24 DCE connector into the active CP faceplate at the RS232 connector labeled P1.
4	Route the interface cable from the CP faceplate up to the connector on the terminal.
5	At the terminal end of the interface cable, cut the interface cable so that it can accommodate a connector and plug into the terminal without straining the connection.
6	At the terminal end of the interface cable, attach a 9-pin D-sub connector to the cable according to the instructions that came with the connector.
7	Connect the D-sub connector into the terminal. Ensure there is no stress on the cable or connector, nor a right-angle bend.

--End--

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Connecting a CP modem cable

Connect a CP modem cable between the modem and the switch after you have configured the modem software. This allows a remote user to dial-up the switch and enables a local operator connection.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Do not use the DCE V.24 cable assembly (PEC NTBP25) to connect a modem to port 1 of the CP in a switch. The connector on the faceplate is for a customized DB-9 cable. Ensure the modem cable complies with the specifications in Procedure job aid (page 216).

Procedure steps

Step	Action
1	On the front of the switch, locate the CP in slot 0 or 1.
2	Locate the 9-pin D-sub connection on the faceplate labeled port 1.
3	Plug the 9-pin connector on the cable into the connector on the faceplate.
4	Route the other end of the cable up through the cable organizer, over the top, and down to the rear of the shelf. Leave the remainder of the cable hanging loosely.
5	Place the modem at the rear of the shelf. Find a way to fasten it to the cable guide on the side that is nearest to where the cable passes over the top of the shelf.
6	Plug the modem into its own power outlet. Follow the instructions provided by the manufacturer of the modem.
7	Connect the remaining end of the custom cable into the modem.

--End--

Procedure job aid

Assemble the custom modem cable using:

- a V.24 serial interface cable; to determine the length, trace the cable path from either CP at the front of the switch, up through the cable organizer, over the top, and down to the rear of the shelf where the modem can be located inside the cabinet and optionally fastened to the cable management guides
- a male 25-pin D-sub connector to connect to the modem

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- a male 9-pin D-sub connector to connect to port 1 on the faceplate of the CP in the switch

The cable and its connectors must be custom-made according to the table Pinout for the DB 9-pin connecting to the modem DB 25-pin (page 217).

Pinout for the DB 9-pin connecting to the modem DB 25-pin

DB 9-pin	DB 25-pin	Signal name of the switch to modem	Direction at the switch
2	3	transmitted data [TXD] / received data (Rx)	input
3	2	received data [RXD] / transmitted data (Tx)	output
4	8	data terminal ready [DTR] / data carrier detect (CD)	input
5	7	signal ground [GND]	not applicable
6	20	data carrier detect [DCD] / data terminal ready (DTR)	output
7	5	request to send [RTS] / clear to send (CTS)	input
8	4	clear to send [CTS] / request to send (RTS)	output
Text in square brackets [ ] indicates the signal terminology used in Nortel Networks Multiservice Switch documents. Text in parenthesis ( ) indicates the signal terminology commonly used by modem venders.			

The modem used as an example hookup is a 56K modem manufactured by US Robotics, which includes their older Sportster series modems. Choose a modem that supports the same DIP switch settings and AT software commands. The modem must also support the dumb mode so that the switch will not reconfigure the modem while it is on-hook.

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Connecting a Multiservice Switch to an EdgeLink 100

Connect a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000 to an EdgeLink 100 to enable DS3 FPs to communicate with a DS1 and DS3 multiplexor.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Before installing the interface cables and connecting them, the EdgeLink 100 multiplexor must be mounted and the DS3 function processor (FP) with BNC connectors must already be installed.
- The EdgeLink interfaces to a DS3 function processor (FP) with BNC connectors in the Multiservice Switch and to an RJ48 termination through an access panel. The RJ48 connections are either:
  - 64-pin Cinch or wirewrap to an RJ48 T1 access panel with monitor jacks (part number A0718812)
  - 64-pin Cinch or wirewrap to an RJ48 T1 access panel (part number A0718813)
- The interface cables that connect an EdgeLink 100 to the Multiservice Switch, or the Ethernet hub for a Nortel Networks Multiservice Data Manager workstation, are listed in the table Interface cables between a Multiservice Switch and an EdgeLink 100 (page 219). Two cables are required, one for transmitting and one for receiving.
- Configuring the software for the EdgeLink can be done before or after the interface cable is connected. There is no software configuration required to enable the switch to interwork with the EdgeLink.

Procedure steps

Step	Action
1	Identify the cable path between the rear of the EdgeLink and the front of the DS3 card in the switch.
2	Measure the exact distance of the cable path from end to end and record it. Whether the DS3 interface cable is custom-made or prefabricated, ensure that the cable is long enough and can be fastened safely along the path.
3	Route the cable along the path and loosely fasten it with tie-wraps.
4	If the cable is to be a custom-made DS3, attach the BNC connectors to each end of an appropriate length of coax cable.
5	Plug the cable connector into the receptacle labelled IN at the rear of the EdgeLink.

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6 Route the cable to the FP in the switch.

7 Plug the cable into the faceplate at a female BNC connector labelled Tx.

8 Label the cable at each end point to identify its other end and direction of signaling.

9 Manage any cable slack so that it is away from the switch.

10 Fasten the cable tie-wraps snugly along the path between the EdgeLink and the switch.

11 Repeat step 1 to step 10 for the second DS3 cable at the connectors labelled OUT and Rx.

12 When both DS3 interface cables are connected, the software of the EdgeLink establishes the links with the switch or Nortel Networks Multiservice Data Manager workstation (or both). Coordinate with the software operator of the EdgeLink to activate its software. Ensure that the configuring is done and there is connectivity.

--End--

Procedure job aid

Interface cables between a Multiservice Switch and an EdgeLink 100

Type and quantity	Part number	Length	Type of connector at EdgeLink	Type of connector at other end
DS1, two	A0718801, Telco Systems' AWX432G5	1.5 m (5 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ-48 termination or wirewrap
DS1, two	A0718802, Telco Systems' AWX432G15	4.6 m (15 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ-48 termination or wirewrap
DS1, two	A0718803, Telco Systems' AWX432G30	9.1 m (30 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ-48 termination or wirewrap
DS1, set of two	A0718779, Telco Systems' AXX432G5	1.5 m (5 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	Wirewrap at RJ-48 termination
DS1, set of two	A0718780, Telco Systems' AXX432G25	7.6 m (25 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	Wirewrap at RJ-48 termination
DS1, set of two	A0718781, Telco Systems' AXX432G50	15.2 m (50 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	wirewrap at RJ-48 termination
DS3, two	rated as 728A RG-6U or equivalent	custom	90-degree male-to-female BNC adapter for standard BNC male connector	male BNC on a DS3 FP

(1 of 2)

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Interface cables between a Multiservice Switch and an EdgeLink 100 (continued)

Type and quantity	Part number	Length	Type of connector at EdgeLink	Type of connector at other end
DS3, two	NTFP19AC	1 m (3.2 ft)	male BNC	male BNC on a DS3 FP
DS3, two	NTFP19AA	3 m (9.8 ft)	male BNC	male BNC on a DS3 FP
DS3, two	NTFP19AB	15 m (48.2 ft)	male BNC	male BNC on a DS3 FP
Ethernet	Telco Systems' AWX454G10 for standard LAN trunk cable IEEE 802.3	3 m (10 ft)	male RJ-45, eight-position modular	a male RJ-45 connector for a female connector on the hub that is linked to Multiservice Data Manager

(2 of 2)

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Connecting a PIM cable

Connect a PIM cable to power a second switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- PIM cables are pre-installed in a NEBS 2000 frame for both upper and lower switches.

Procedure steps

Step	Action
1	At the front of the BIP, ensure that the BIM breaker for the PIM you are about to connect is toggled off (O symbol). The mapping of breakers to PIMs is labelled on the rear of the BIM captive screw cover.
2	Locate the pre-installed PIM cable to be connected. Refer to the cable path for each PIM as shown in the figure Connection points of the PIM cables (page 222).
3	At the PIM, press the cable connector in until both tabs click. The connector mates only one way.
4	Toggle on the BIM breaker for that PIM (I symbol).
5	For a Multiservice Switch 20000, confirm the PIM LED is lit, indicating it is powered.
6	Dress the cable slack and fasten with tie-wraps. Cut off the tie-wrap tails.

--End--

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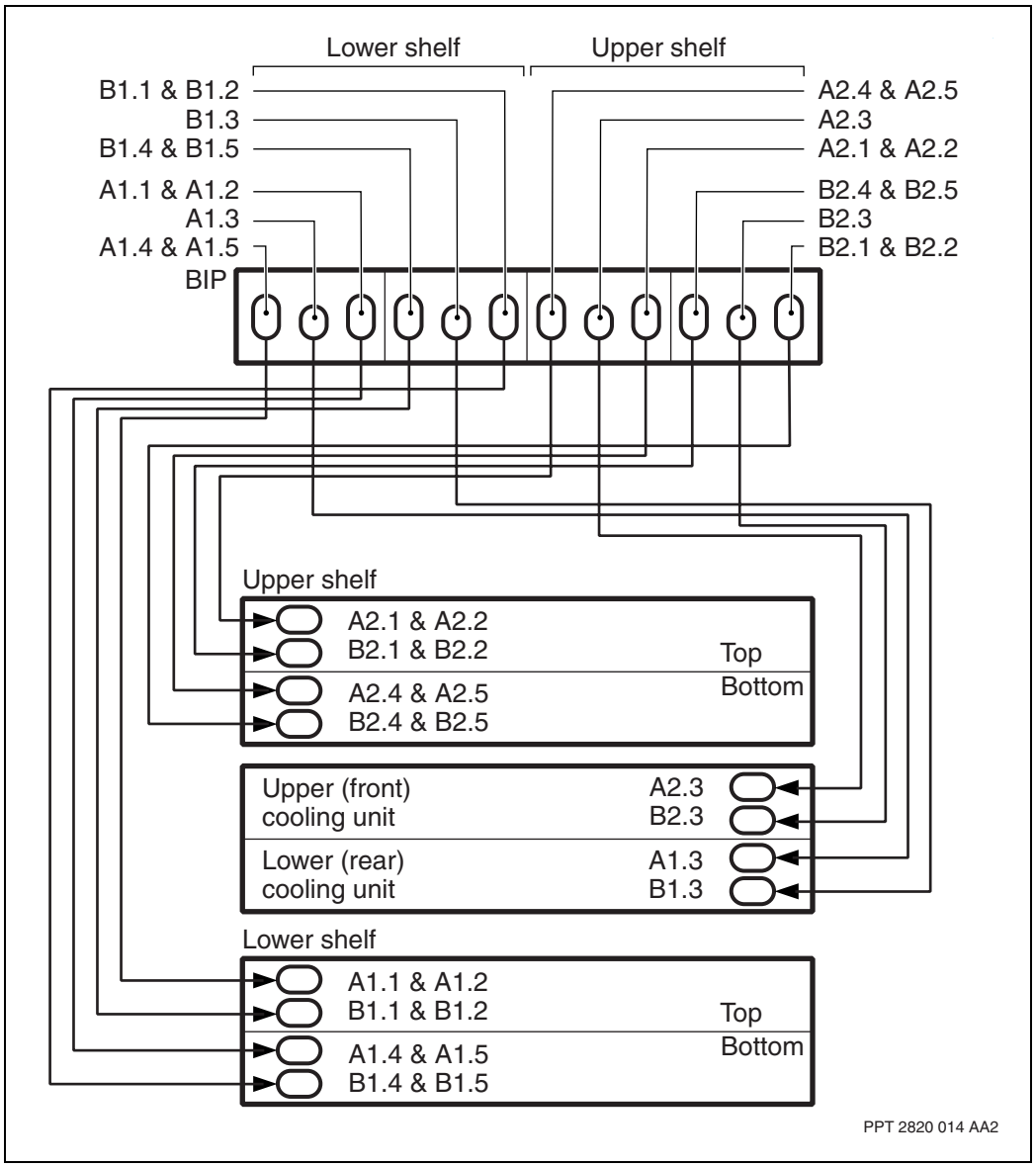
Procedure job aid

Connection points of the PIM cables



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Connecting a power input cable to a terminal block

Connect a power input cable to a terminal block of a polyvalent or ETSI power-and-ground assembly to provide power to the assembly which feeds the breaker interface panel (BIP).

Prerequisites

DANGER

Risk of injury or equipment damage by electricity

When connecting power input cables at the BIP, ensure that the source of power at the other ends of the cables (feeds) is off (disconnected), fuses are removed, or the breakers are off). Also ensure that all BIP breakers are off (the O is pressed in).

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Vergewissern Sie sich beim Verbinden der Netzkabel am Trennschalterkopplungsmodul (BIP), daß die Stromversorgung an den anderen Kabelenden (Speisestromzuführungen) getrennt ist oder daß die Sicherungen entfernt bzw. die Trennschalter ausgeschaltet sind. Stellen Sie außerdem sicher, daß alle BIP-Trennschalter ausgeschaltet sind (O ist gedrückt).

CAUTION

Risk of equipment damage by reversed polarity

Use the plus (+) and minus (-) symbols on the rear of the breaker interface panel (BIP) to ensure that the polarity of each A and B battery (-48/-60 V dc) and battery return for the input power feeds is correct. When powering up the BIP, reversed polarity will damage circuits inside it.

- You must be familiar with Safety considerations and best practices (page 19).
- You need an installed polyvalent power-and-ground assembly with part number A0834143 or an ETSI power-and-ground assembly with part number A0843149.
- You need power input cables rated to the hardware configuration of the switch.
- You need a cutter for up to 1/0 AWG (53.5 mm^2) cable.
- Grounding the assembly is provided when the NEBS 2000 frame is cabled to the site ground window.

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Procedure steps

Step	Action
1	At the front of the BIP, ensure that all breakers are toggled off (the O is pressed in).
2	Near the rear of the BIP, locate the power input cable labelled A1+. All of the power input cables should have been labelled according to the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).
3	Route the cable up to the terminal block that aligns with the appropriate BIP connection, and dress the cable above for permanent suspension. Refer to the figures • Power input cables connected to a polyvalent power-and-ground assembly A0834143 (page 225) • The ETSI power-and-ground assembly A0834149 (page 226)
4	Cut the cable so that it can be stripped to fit into the block and hang unstressed but not sagging.
5	Strip 2.5 cm (1 in.) of insulation from the end of the cable.
6	On the rear of the BIP, locate the right cable from the rightmost pair of studs. It has a + sign beside it.
7	Trace the cable from the BIP to the bottom of the terminal block. Note which side of the block that the cable connects to.
8	Locate the screw hole on the side of the noted block facing you, unfasten it, and put it aside momentarily. If complete removal is resisted, unfasten the screw as far as it will go without forcing it.
9	Insert the end of the cable into the top opening in the block so that: • the cable aligns with the traced bottom cable • the exposed wires stop at the bottom of the screw hole • the edge of cut insulation is flush with the top of the terminal block; you may have to strip more insulation or shorten the wires
10	Remove the cable and coat the exposed wire with anti-oxidizing grease, unless your local electrical codes specify otherwise.
11	Insert the cable back into the top opening in the block.
12	Fasten the screw back into its opening until it firmly clamps the end of the cable. The cable sheath must be flush against the block so that no wire is exposed.
13	For each remaining power cable, repeat step 2 to step 12. Identify the next cable by its label according to the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).

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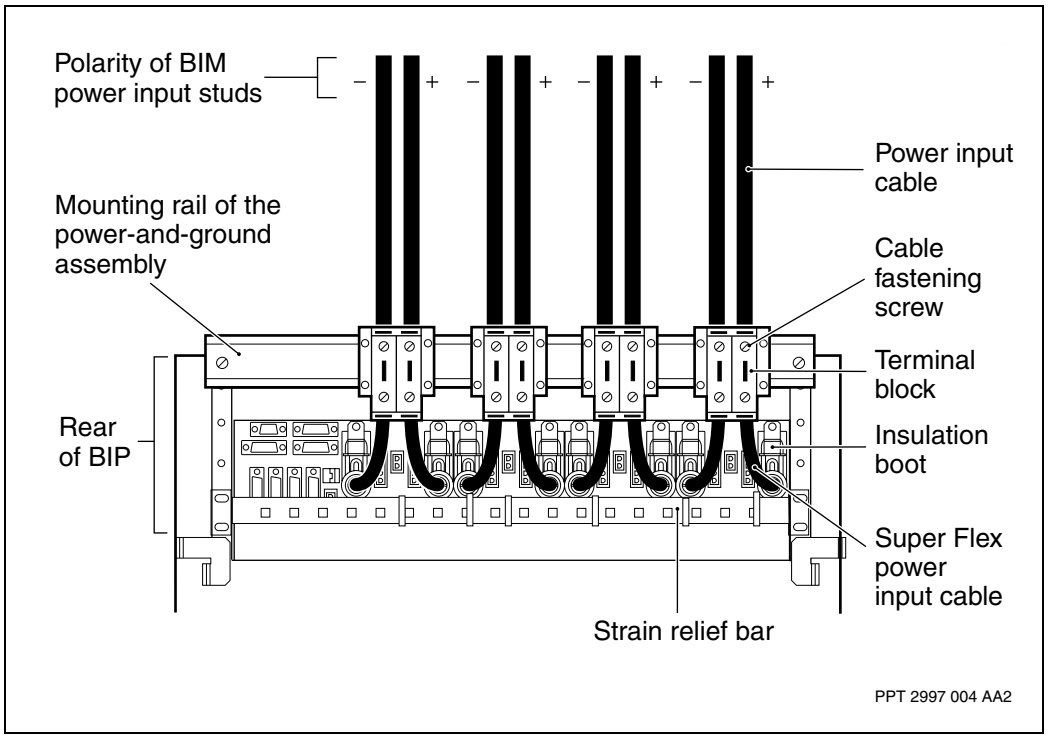
--End--

Procedure job aid

Power input cables connected to a polyvalent power-and-ground assembly A0834143



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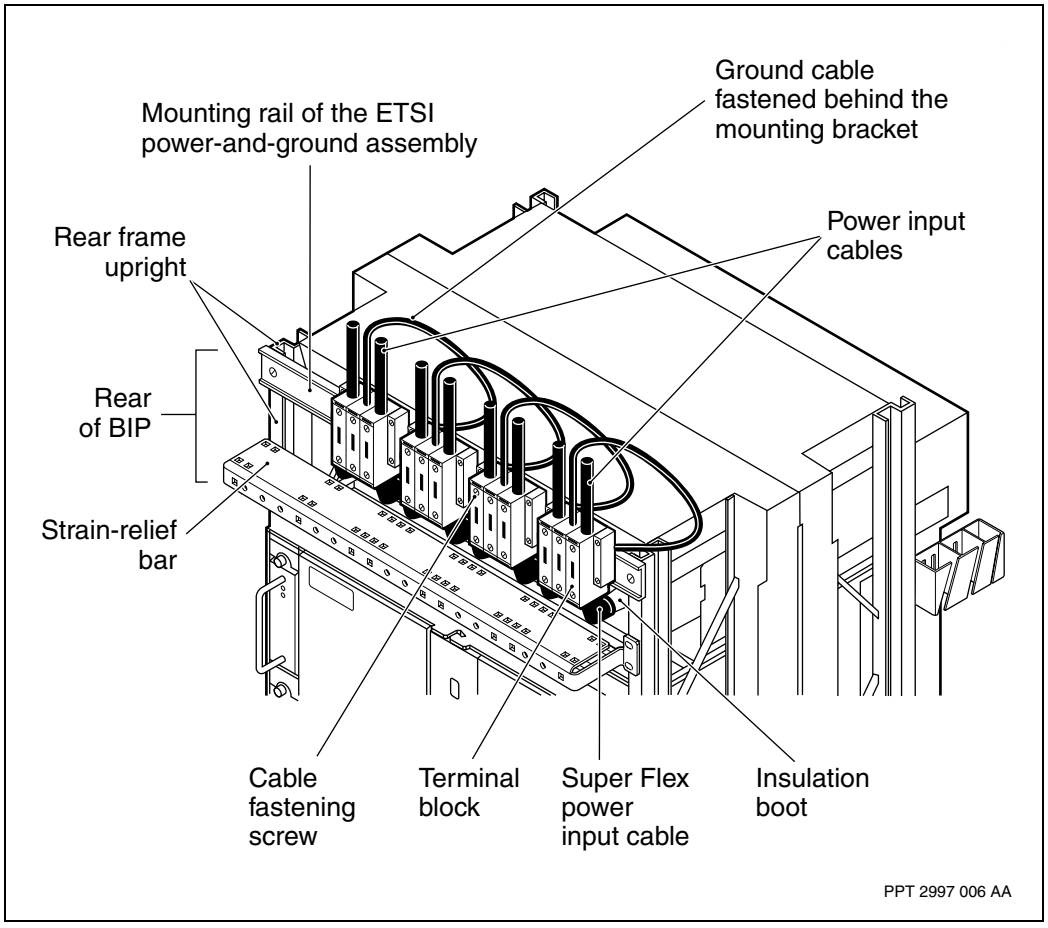
The ETSI power-and-ground assembly A0834149



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Connecting a temperature sensor cable assembly

Connect the upper temperature sensor cable assembly to enable monitoring of the air flow temperature from the upper (front) cooling unit.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a step ladder to see the top of an upper shelf assembly that is mounted in a NEBS 2000 frame or other mounting apparatus.

Procedure steps

Step	Action
1	While facing the rear of the switch, locate the temperature sensor assembly under the BIP and on top of the shelf. See the figure Location of upper temperature sensors (page 228).
2	Trace the cluster of red cables routed to the right side down to the connector at the end.
3	Trace the cluster of red cables from the 3 sensors to the right side down to the connector at the end. See the figure Cable assembly connector on a temperature sensor bracket assembly (page 228).
4	Align the connector with the D-sub of the nearest red cable assembly from the upper cooling unit. The cable assembly is labeled NTHR55.
5	Engage the D-sub connectors and fasten the small slotted captive screws. When the switch is already powered, all 3 fans of the upper (front) cooling unit should start rotating at the lower (normal) rpm speed.
6	Fasten the cable cluster with the provided tie-wraps to the inside of each cable management bracket along the route. If there is any slack cable, loop the cluster and fasten the loop closed without crimping the cable. Have the loop occur in the middle of the vertical leg of cables.

--End--

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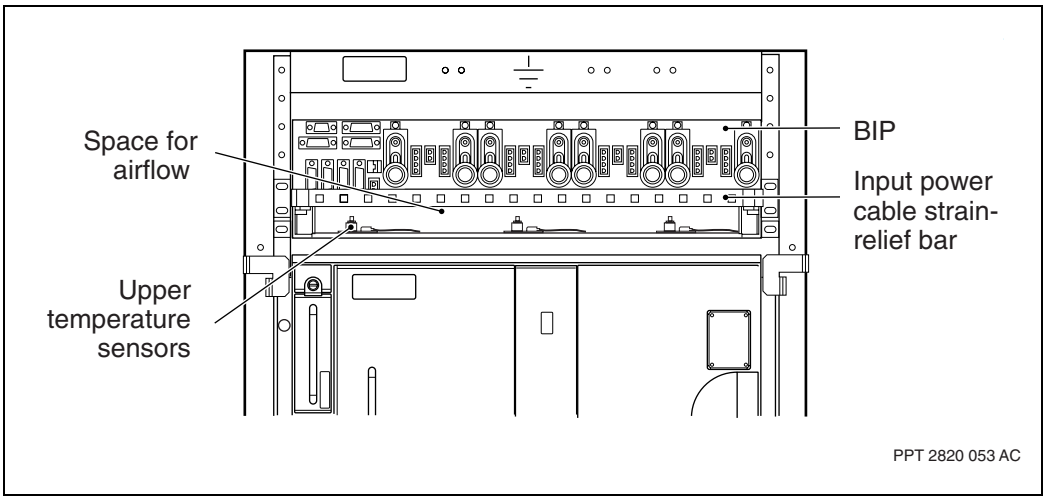
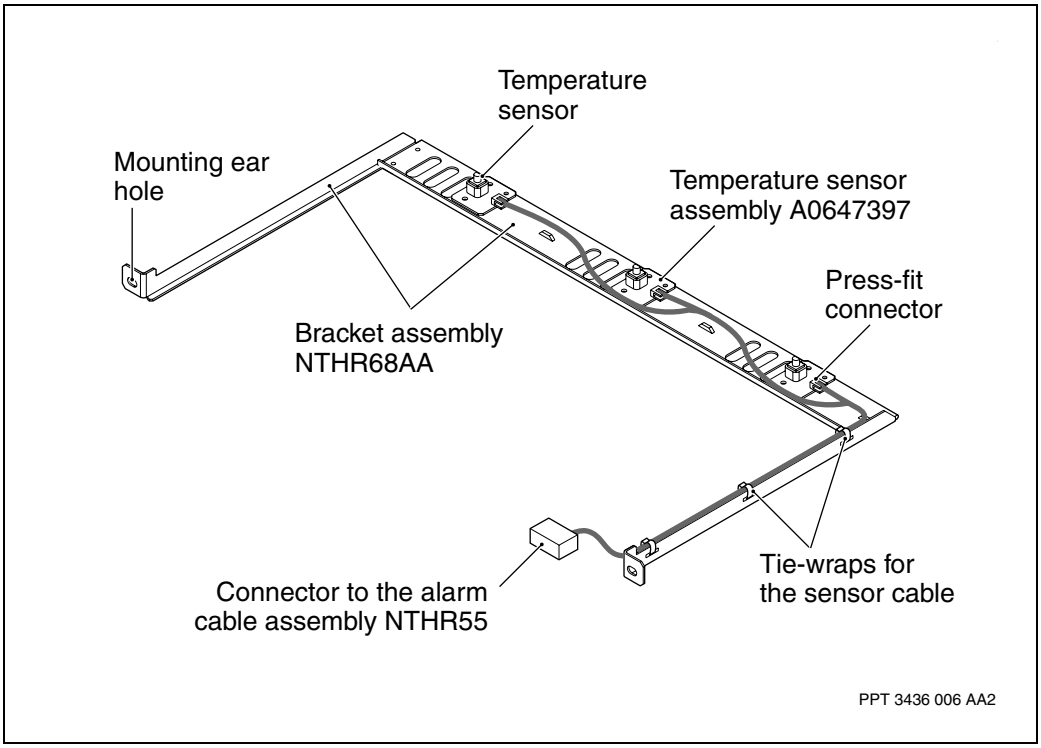
Procedure job aid

Location of upper temperature sensors



Cable assembly connector on a temperature sensor bracket assembly



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Connecting alarm cables to the alarm/BITS module

Connect alarm cables to the alarm/BITS module to enable the BIP alarm and cooling unit alarm.

Prerequisites

- The cable assemblies may already be installed. If not, they must be added.
- The PECs for the alarm cable assemblies are
  - NTHR55 for the BIP alarm to the upper alarms/BITS module
  - NTHR56 for the BIP alarm to the lower alarms/BITS module
  - NTHR57 for each cooling unit alarm to the alarms/BITS module
- The cable assembly NTHR57 has eight wires between connectors. A Multiservice Switch 15000 uses four of the wires and Multiservice Switch 20000 uses all eight. The former version of the cable assembly had four wires. Both versions have the same connectors and cable length. The cable assembly with eight wires can replace one with four wires with no effect on performance or operation. The 4-wire version cannot replace the 8-wire version. For connection information, see the table Pinout of the alarm cable assembly from NTHR57 (page 230).
- See the location of the cable connections in the figures:
  - Connection points of cables for the alarm/BITS module in a Multiservice Switch 15000 (page 232)
  - Connection points of cables for the alarm/BITS module in a Multiservice Switch 20000 (page 233)

Procedure steps

Step	Action
1	At the rear of the BIP, locate the 26-pin female D-sub connector labeled P7 (for lower unit) or P9 (for upper unit). See the figure Locations of the alarm cable connectors and paths (page 231).
2	Connect one end of the BIP alarm cable to that D-sub connector.
3	Route the cable to the right along the strain-relief bar, fastening snugly with tie-wraps every 15 cm (6 in.).
4	Route the cable down the right side of the frame against the cable management brackets.
5	Connect the other end of the cable to the female D-sub connector beside the label J1. The connection already has an inline EMI filter plugged in, so connect the cable to the filter.
6	Fasten the cable with tie-wraps to the cable management brackets.

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7 At the connector labeled J2, connect one end of the cable identified as NTHR57. The connection already has an inline EMI filter plugged in, so connect the cable to the filter.

8 Route the cable out to the right side of the frame (facing the rear) and down the frame against the cable management brackets to the front of the lower (rear) cooling unit.

9 Connect the remaining D-sub connector of the cable to the connection on the cooling unit labeled ALARM.

10 Fasten the cable with tie-wraps to the cable management brackets.

--End--

Pinout of the alarm cable assembly from NTHR57

Pin number at J1 end	Pin number at the P1 end	Signal on the connection for the switch
2	2	FAN TEMP
4	4	GND
7	7	GND
8	8	FAN FAIL
1	1	LED TEST
3	3	LED TEST
5	5	LED TEST
9	9	GND

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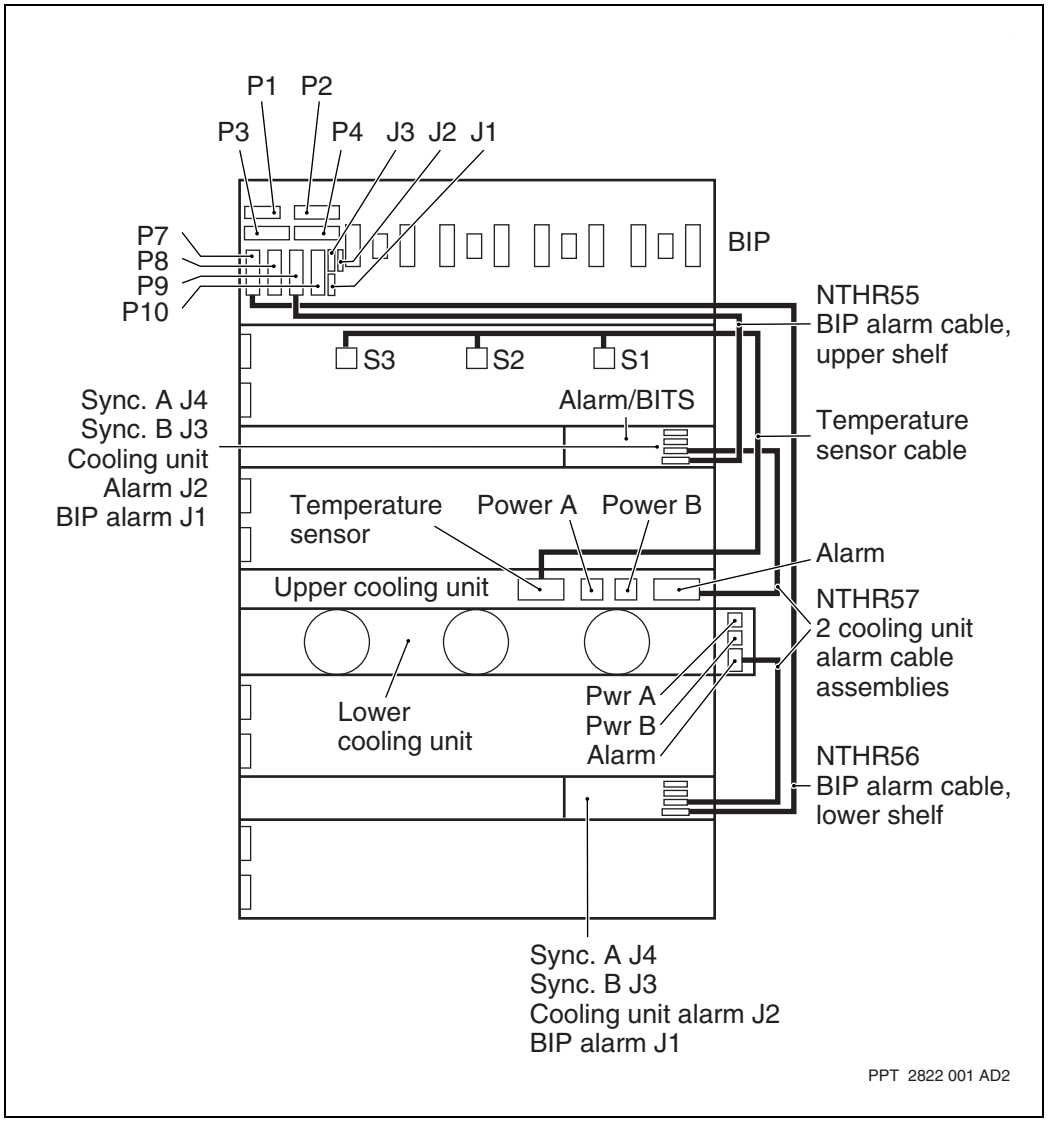
Locations of the alarm cable connectors and paths



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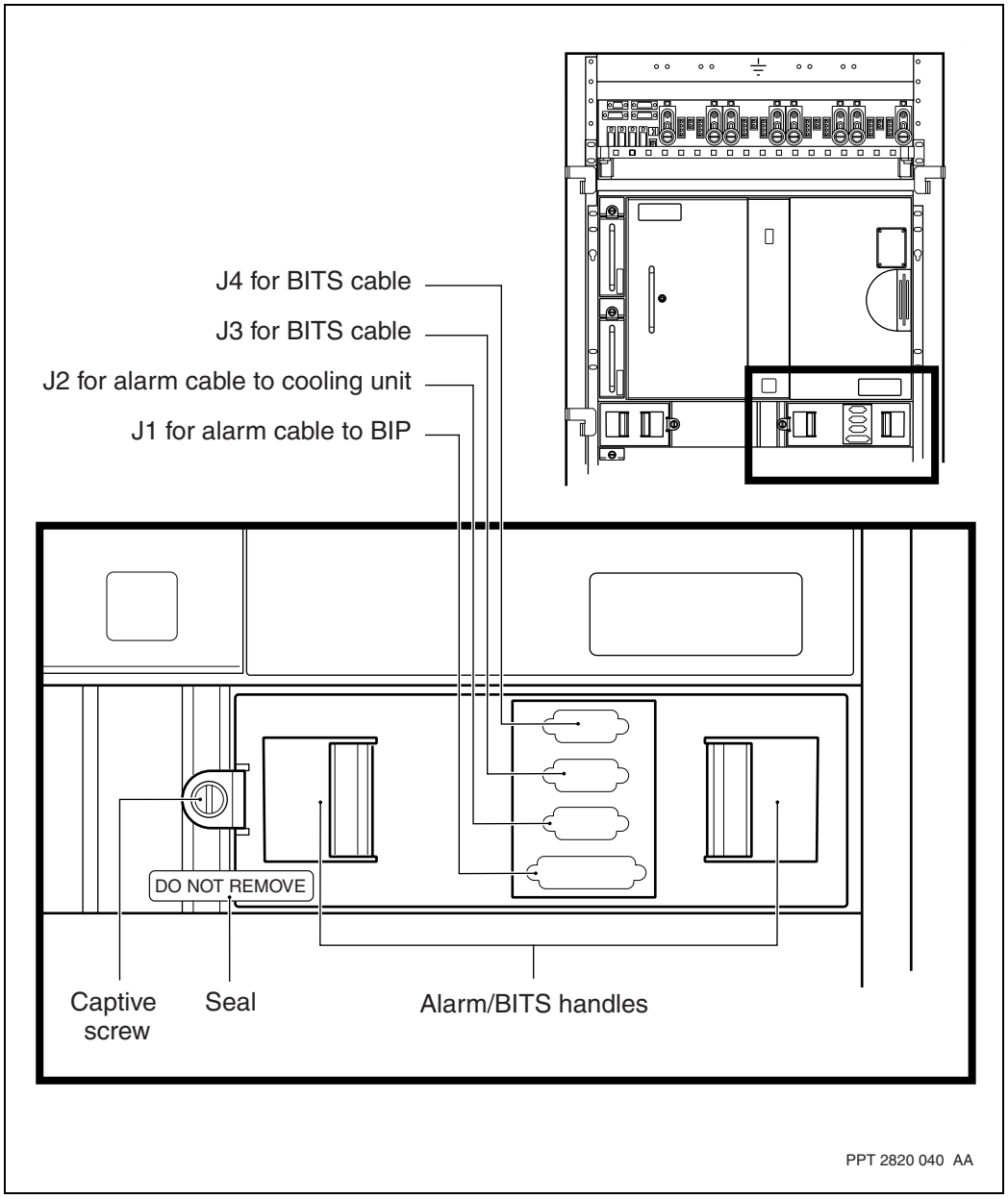
Connection points of cables for the alarm/BITS module in a Multiservice Switch 15000



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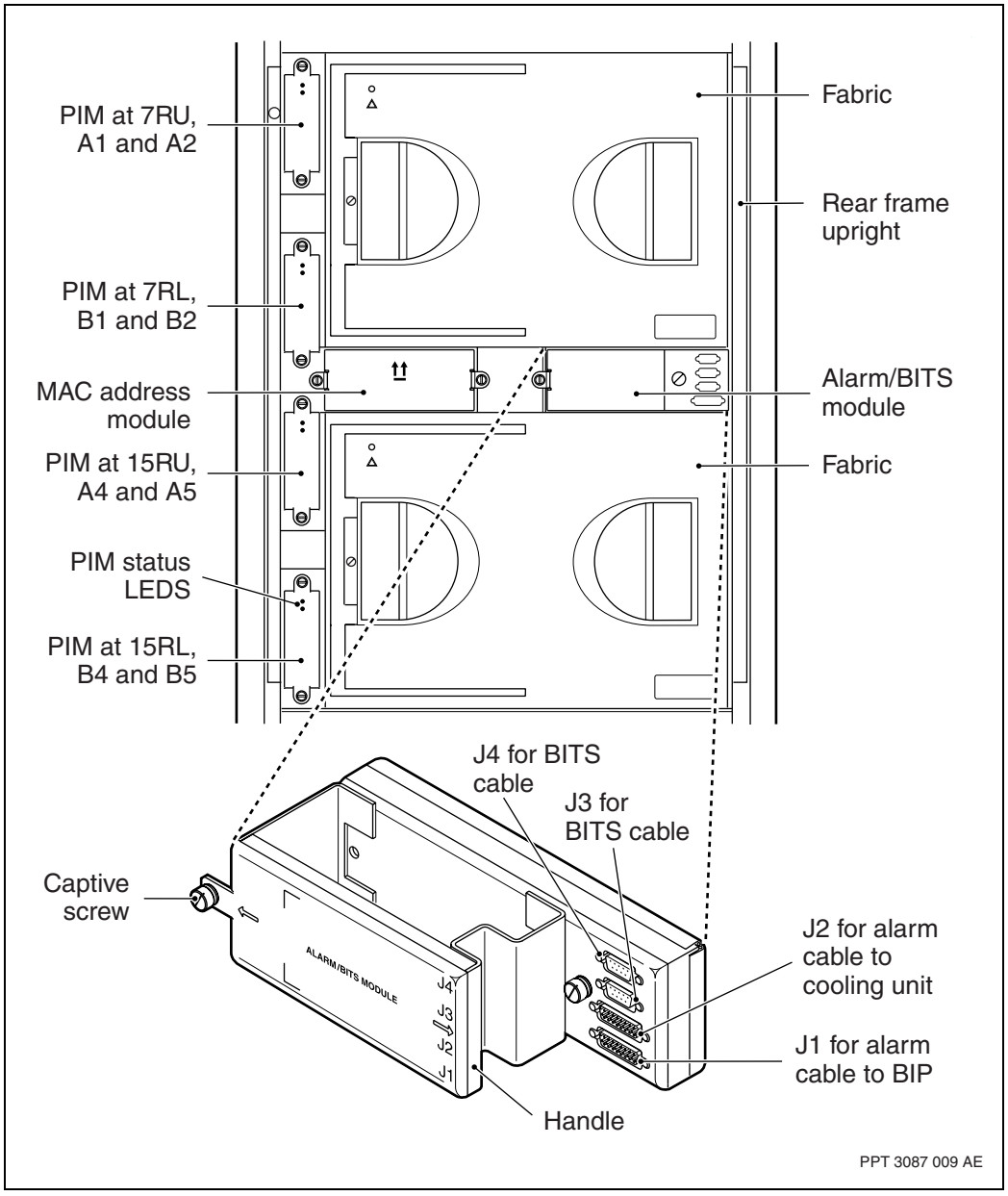
Connection points of cables for the alarm/BITS module in a Multiservice Switch 20000



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Connecting an FP cable

Connect an FP cable to enable an installed or replaced FP to transmit and receive traffic signals.

Prerequisites

WARNING

Risk of personal injury

Connect device interfaces to safety extra-low voltage (SELV) circuits only. Connections to telephone network voltage (TNV) circuits must be through an external device that provides current protection and isolation, such as an approved channel service unit (CSU). All such devices must meet the equipment safety standards of the country of installation.

CAUTION

Verletzungsgefahr

Verbinden Sie Multiservice Switch-Schnittstellen nur mit SELV-Schaltungen (Schutzkleinspannung). Verbindungen zu TNV-Schaltungen müssen über ein externes Gerät erfolgen, das Stromschutz und -isolierung bietet, z.B. eine geprüfte Kanaldiensteinheit (CSU, Channel Service Unit). Alle Geräte müssen den Sicherheitsstandards des jeweiligen Landes entsprechen.

CAUTION

Risk of personal injury

Do not directly connect devices to cables exposed to outdoor hazards (such as lightning) as defined by BS6701: Part I, 1986 “Installation of apparatus intended for connection to certain telecommunications systems.” Such cables include external overhead cables that extend more than four spans (used in the U.K. for connecting telecommunications systems).

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WARNUNG

Verletzungsgefahr

Verbinden Sie Multiservice Switch Schalter nicht direkt mit außenliegenden Kabeln, die gefährlichen Wettereinflüssen wie Blitzschlag ausgesetzt sind (wie definiert in BS6701; Britischer Standard 6701: Teil I, 1986 „Installation of apparatus intended for connection to certain telecommunications systems.“; „Installation von Geräten zur Verbindung mit bestimmten Telekommunikationssystemen“). Zu solchen Kabeln gehören auch Überlandleitungen, deren Länge vier Spannen überschreitet (werden in Großbritannien zur Verkabelung von Telekommunikationssystemen eingesetzt).

CAUTION

Risk of equipment damage by bent pins

Ensure that the cable pins are not shorted together or to any metal surface. When connected to an on-line shelf assembly, these cables can carry power signals (+12 V dc) that are used to supply power to the termination panel.

Do not bend the pins when you attach the cable to the connector.

CAUTION

Risk of service loss by an unseated FP

Before connecting any cables to an FP, ensure it is properly seated. Seating a cabled FP can cause a traffic loss on the other FPs in the sparing configuration.

CAUTION

Risk of damage to the fiber transceivers on the FPs

When engaging or disengaging a fiber optical cable connector to the connector on the FP faceplate (the transceiver), you can damage the nose shield on the connector or the optic transceiver by improper coupling. This especially applies to MT-RJ connectors.

Refer to the table Actions to engage types of FP connectors (page 239)

WARNING

Risk of equipment damage by improper grounding

All metallic telecom equipment interfaces must be connected only to intra-building or non-exposed wiring or cabling.

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- You must be familiar with Safety considerations and best practices (page 19).
- Connect all cables in a logical bottom-to-top and side-to-side sequence for an initial installation to minimize cable congestion on the front of the switch.
- You must ensure that all FP cables are routed and labelled as described in Routing FP cables (page 707).
- You must install all attenuators that are required by an optical FP, as described in Determining if you need to use inline attenuators with optical FPs (page 256).
- When a prefabricated interface cable from Nortel Networks is connected between a DS3 FP and a Nortel Networks termination panel, the connection is grounded.
- For FPs requiring small-form pluggable (SFP) optical transceiver modules on the faceplate sockets (ports), you must ensure that the part is installed according toInstalling an SFP optical module (page 478).
- To determine the operational status of a port that has an SFP plugged into it, especially if a LED is unlit, use the procedure NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* to display the status of an installed SFP optical module.
- When a port pair on dual-FPs is to be configured for Y-protection, ensure that the software configuration is completed before connecting the Y-splitter cables.
- When connecting cables in a spared configuration, complete the main connections first, and then the spare connections. Many sparing panels automatically start operating through the main connections.
- For coax cables between an FP and a sparing panel or a fanout panel, connect the transmit (Tx) at the FP to the Tx at the panel, and the receive (Rx) to Rx.
- For more information about cable management refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Match the label on the connector or connectors of the fiber cable to the port on the faceplate of the FP. For an initial installation, always start cabling from the rightmost FP and move left. The intent is to have the FP cable cluster that is nearest the brackets stay closest to the FP on the brackets so that crossing cable clusters is minimized.

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For each FP, always start at the bottom right port and move upwards. If the FP has two columns of ports, continue down to the bottom left. This facilitates efficient cable management especially when port densities are high (for example, with 16-port OC-3/STM-1 FPs).

2 On the fiber cable, ensure that its label will reside outside the faceplate hood when it is closed, especially for the 16-port OC-3/STM-1 FPs.

3 Remove the dust plug or boot from the transceiver or connector on the port connection of the FP. Put them aside for re-use in another procedure.

4 Remove the dust boot or cover from the end of the cable connector. If the connector is duplex, also remove the boot from its mate. Put the boots aside for re-use in another procedure.

5 Connect the cable as indicated in the figure Types of connectors on Multiservice Switch FP cables (page 238) and in the table Actions to engage types of FP connectors (page 239).

6 Repeat step 1 to step 5 for each other cable on the faceplate moving from the bottom right up to the top, then down to the bottom left, as required.

7 For any electrical FP with a control port cable connecting to a sparing panel, fasten the D-sub connector of the cable to the labelled receptacle on the faceplate. Refer to the figure Types of connectors on Multiservice Switch FP cables (page 238) and in the table Actions to engage types of FP connectors (page 239). Run the control port cable parallel to its mate cables from the same FP.

8 Repeat step 1 to step 7 for each other FP in the shelf moving from left to right.

9 When all FPs in the shelf are connected, methodically check each connection one after the other by repeating the engagement action. Avoid bumping adjacent connectors. Never pull on the cable or connector to confirm that it is engaged.

10 If the shelf is powered, wait until the FP LEDs cycle to eventually become solid or fast flashing green to indicate in service.

If a LED is any other color after 5 minutes, there is a problem with the FP. See NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* to understand LED behaviors as described in the chapter on using status indicators, then see NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting* to diagnose and fix the FP problem.

If a Tx or Rx LED on an NTHW49 is unlit, determine why by doing the procedure in NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures* to display the status of an installed SFP optical module.

--End--

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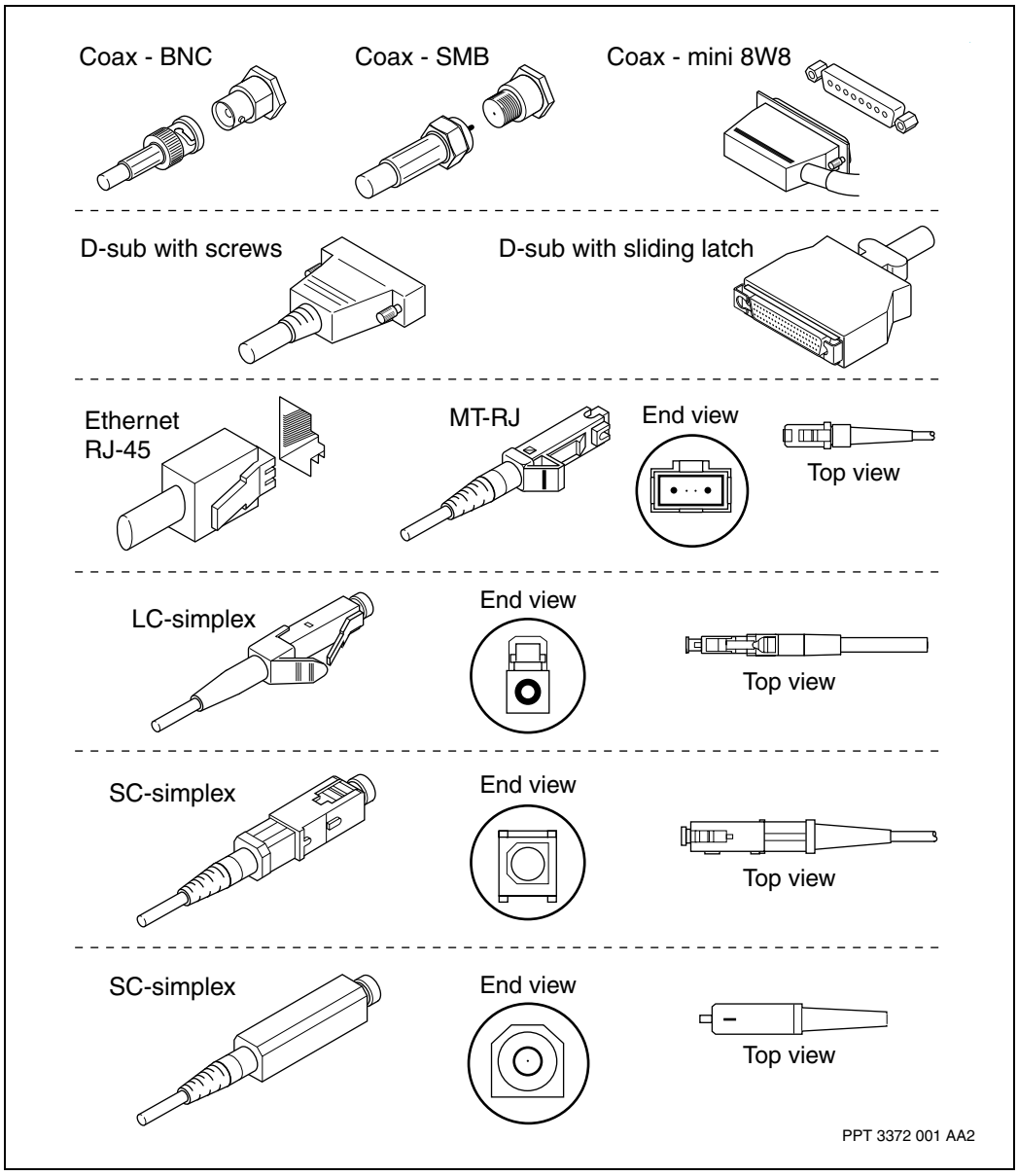
Procedure job aid

Types of connectors on Multiservice Switch FP cables



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Actions to engage types of FP connectors

Type of connector	Type of FP	Connection action
coax, BNC	DSn, En	Press each male connector onto the female connector combined with a counter-clockwise twist until the peg on the male connector reaches the detent at the end of the groove on the female connector.
coax, mini (8W8)	DSn, En	Ensure the threads of the slotted screws are disengaged from the connector shroud. Align the connector with the mate and press firmly and steadily together. Avoid rocking. Fasten the slotted screws to ensure that the connectors are fully and evenly engaged and cannot be bumped into becoming an intermittent contact. Each 8W8 cable connector is labelled P0, P1, or P2. Each has the same pattern of 4 ports repeated to accommodate the 4-port or 12-port FPs. Use only P3 when connecting a control port cable from a one-for-n (1:n) sparing panel.
coax, SMB	DSn, En	Align the copper wire with the hole on the mate connector and press them together until the cable stops.
D-sub with screws (DB9)	DSn, En	Ensure the threads of the slotted screws are disengaged from the connector shroud. Align the connector with the mate and press firmly and steadily together. Avoid rocking. Fasten the slotted screws to ensure that the connectors are fully and evenly engaged and cannot be bumped into becoming an intermittent contact.
D-sub with sliding latch	DSn, En	Open the sliding latch by pushing the smaller crescent away from the shroud. Align the connector with the mate and press firmly and steadily together. Avoid rocking. Slide the latch to the other side to engage it to the D-sub stud.
RJ-45 (Ethernet)	2-port GPDsk, VPN extender	Align the shape of the connector with the shape of the receptacle. Insert the connector until the tab clicks. Some RJ-45 connectors have guide ridges to prevent them from being plugged into other switches.

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Actions to engage types of FP connectors (continued)

Type of connector	Type of FP	Connection action
LC, duplex	4-port GigE, 4-port MR, OC-3, STM-1, VSP3	Align the pair of ridges on the connectors with the pair of keyways on the optical transceiver. Gently and smoothly push the connector in until feeling very slight resistance up to the tab clicking. With SFP optical modules, the bale latch must be closed against the body of the module before plugging in the connector. The latch prevents removing the SFP without first disconnecting the LC cables. See the figure A typical SFP optical module (page 480). With NTHW24 or NTHW31 FPs, the transmit (Tx) is oriented above the receive (Rx) for ports 0-7 and below the Rx for ports 8-15. The two columns of ports also have opposite keyway orientations, and the P is omitted from port numbers 10 to 15. See the figure The transmit and receive orientation on a 16-port OC-3/STM-1 ATM FP (NTHW24 or NTHW31) (page 242). With NTHW46, NTHW49, and NTHW84 FPs, the transmit (Tx) is oriented below the receive (Rx) on the transceiver. See the figures of the faceplates in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
LC, simplex	4-port GigE, 4-port MR, OC-3, STM-1	Align the ridge on the connector with the keyway on the optical transceiver. Gently and smoothly push the connector in until the tab clicks.
MT-RJ	OC-3, STM-1, 16-port	Align the ridge on the connector with the keyway on the faceplate. Gently and smoothly push the connector in until you feel the tab engage or hear it click. The Tx and Rx pairs have opposed keyway orientations on each side of the faceplate, and the P is committed from port numbers 10 to 15. See the figure The transmit and receive orientation on a 16-port OC-3/STM-1 ATM FP (NTHW21) (page 241).
SC, simplex or duplex	OC-n, STM-n	Align the ridge on each connector with each keyway on the faceplate. Gently and smoothly push the connector in until the tab or tabs click.

(2 of 2)

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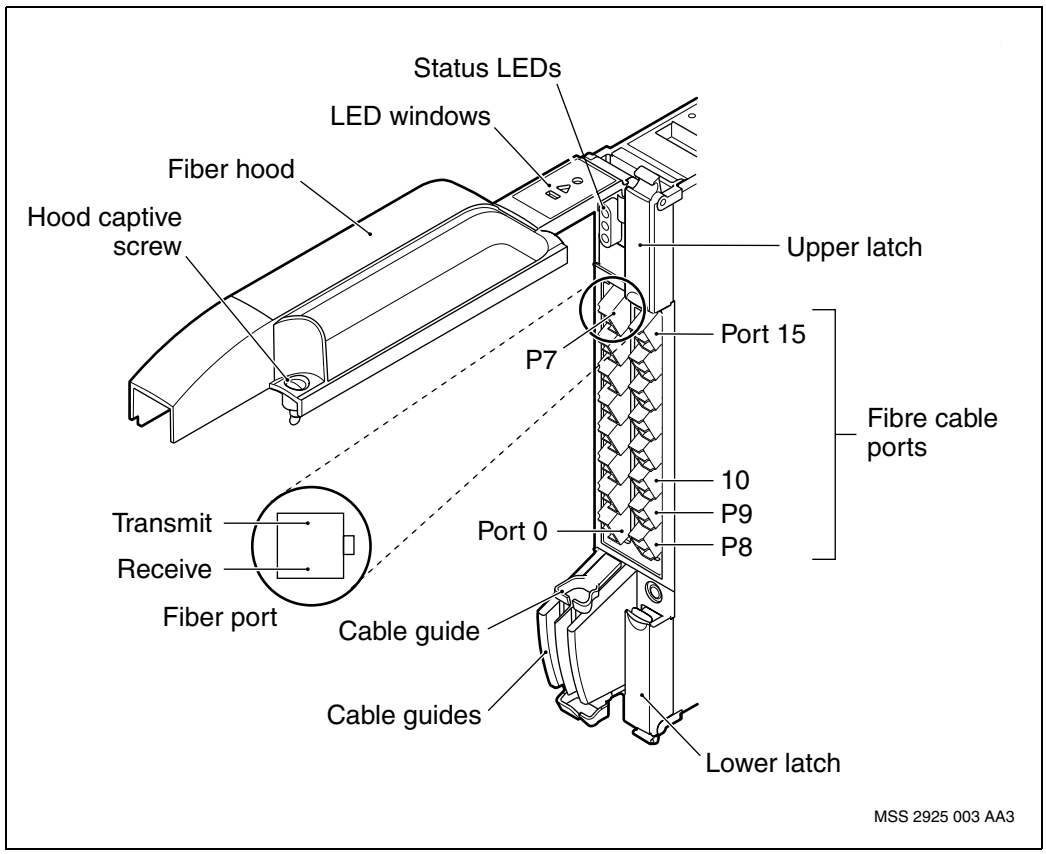
The transmit and receive orientation on a 16-port OC-3/STM-1 ATM FP (NTHW21)



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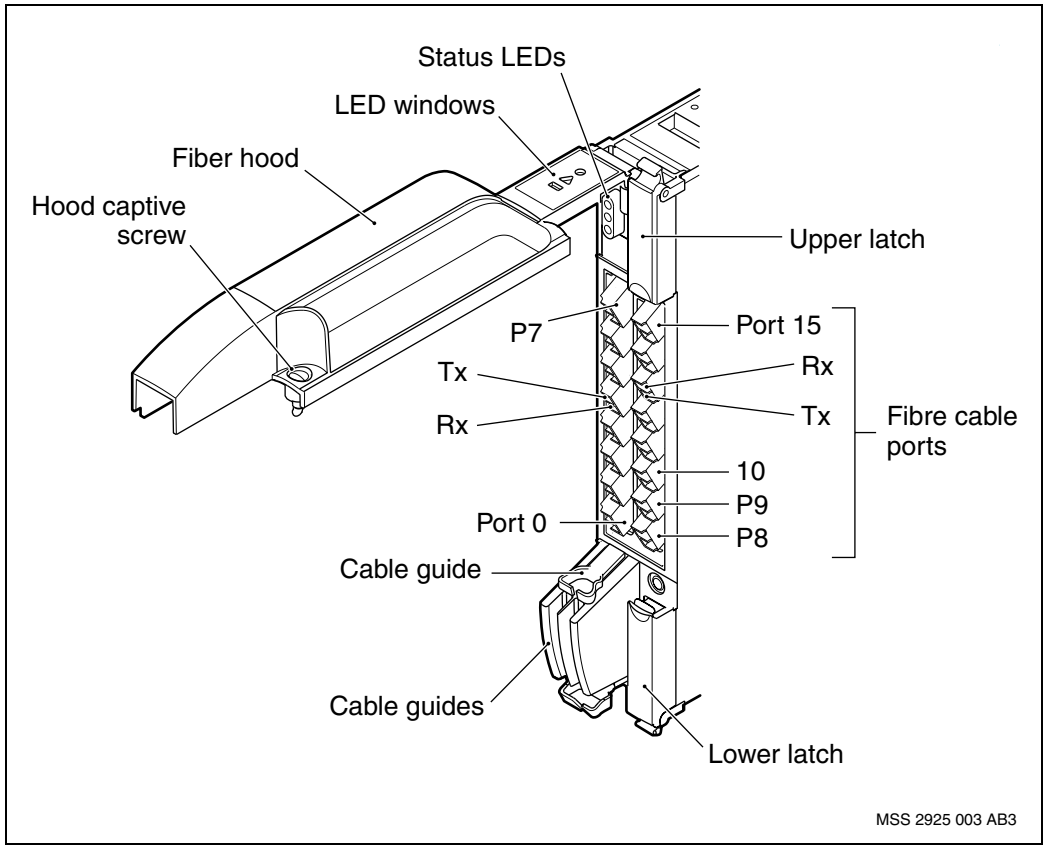
The transmit and receive orientation on a 16-port OC-3/STM-1 ATM FP (NTHW24 or NTHW31)



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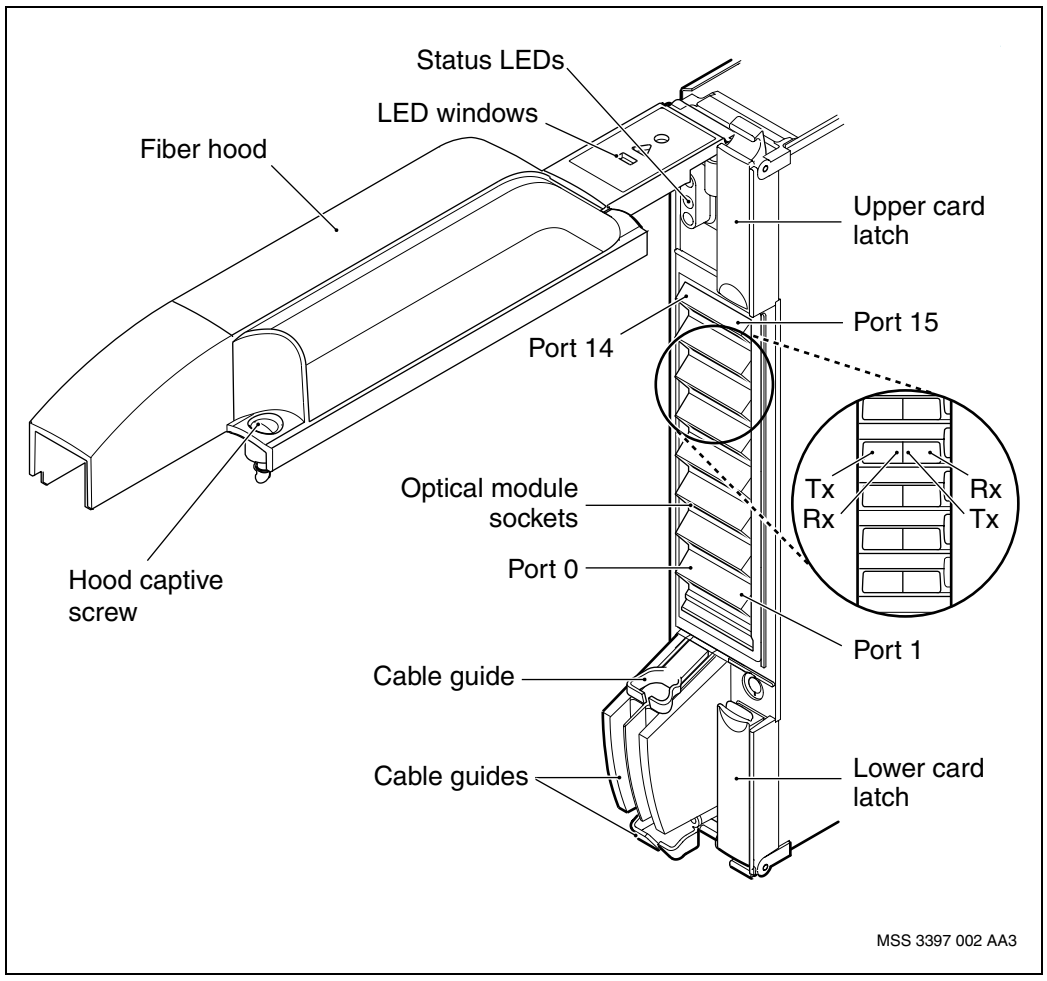

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Connecting other cables to a BIP

Connect other cables to a BIP to enable its normal power distribution and shelf alarms after installing a BIP fro an upgrade or replacement.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	One at a time, use the label on each black-and-white power output cable from a PIM or a cooling unit to reconnect it to the rear of the BIP. Pinch the tabs on the sides of the connector together and push to engage it.
2	One at a time, use the label on each red power and alarm cable to reconnect it by engaging the D-sub connector and fastening its 2 small slotted screws.
3	One at a time, use the label on each external alarm cable (all of the remaining cables) to reconnect them as follows. • for a D-sub connector, engage the connector and fasten its 2 small slotted screws • for a Berg connector, engage it while lifting the tab on the side • for a MATE-N-LOK connector, engage it while lifting the tabs on the either end

--End--

Procedure job aid

The labels on the cables correspond to the labels on the rear of the BIP as shown in the figure Cable connections at the rear of a BIP (page 268).

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Connecting power input cables to the BIP

Connect power input cables to the BIP to power for one or two switches that are installed in a NEBS 2000 frame, or to power one switch mounted in an equivalent mounting apparatus.

Prerequisites

DANGER

Risk of injury or equipment damage by electricity

When connecting power input cables at the BIP, ensure that the source of power at the other ends of the cables (feeds) is off (disconnected), fuses are removed, or the breakers are off). Also ensure that all BIP breakers are off (the O is pressed in).

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Vergewissern Sie sich beim Verbinden der Netzkabel am Trennschalterkopplungsmodul (BIP), daß die Stromversorgung an den anderen Kabelenden (Speisestromzuführungen) getrennt ist oder daß die Sicherungen entfernt bzw. die Trennschalter ausgeschaltet sind. Stellen Sie außerdem sicher, daß alle BIP-Trennschalter ausgeschaltet sind (O ist gedrückt).

CAUTION

Risk of equipment damage by reversed polarity

Use the plus (+) and minus (-) symbols on the rear of the breaker interface panel (BIP) to ensure that the polarity of each A and B battery (-48/-60 V dc) and battery return for the input power feeds is correct. When powering up the BIP, reversed polarity will damage circuits inside it.

CAUTION

Risk of damage to power connections by weight

Use tie-wraps every 10 cm (4 in.) to fasten the cables to the 7-mm (0.25-in.) thick strain-relief bracket (part number P0891284 or P0911981) at the rear of the BIP. Use tie-wraps every 15 cm (6 in.) to fasten the cables to the cable ladder from an overhead cable trough or down the side of the NEBS 2000 frame or equivalent. Fastening the power cables provides strain relief from the weight of the cables on the power input lugs at the rear of the BIP.

- You must be familiar with Safety considerations and best practices (page 19).

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- You need an installed BIP with PEC NT6C61 or NT6C62 for a Multiservice Switch 15000, and AP6C67 or AP6C68 for a Multiservice Switch 20000.
- You need the following specialty tools:
  - a cutter for up to 1/0 AWG (53.5 mm^2) cable
  - a crimper for lugs up 1/0 AWG (53.5 mm^2), depending on the size of cable feeding the BIP
  - a medium Pozidriv screwdriver, for example a number 2 (do not substitute a Phillips) for the insulation boot clamp
  - an 11-mm (7/16-in.) deep socket with a properly calibrated torque wrench capable of 6.5 Nm (57.5 in.-lbs) and a 20-cm (8-in.) extender for the lug nuts
- When the feed cables are any size less than 1/0 AWG (53.5 mm^2), you must either provide 90-degree offset 2-hole lugs that fit under the insulation boots on the BIP and match the cable size, or use an optional power-and-ground cable assembly.

Procedure steps

Step	Action
1	At the front of the BIP, ensure that all breakers are toggled off (the O is pressed in).
2	At the rear of the BIP, locate the stud for the B1+ connection as identified in the figure Overhead power input cables for the lower shelf connected to the BIP (page 250). See also the figure Power input cable connected to the BIP stud labelled B1+ (page 249).
3	Loosen the clamp of the insulation boot by using a medium Pozidriv bit that fits snugly. Loosen the clamp until you can pivot it easily with your finger.
4	Slide the insulation boot onto the power input cable, narrow opening first. The larger opening of the boot must face the end of the cable so that it can overlap the cable lug when fastened.
5	Unfasten the lug retaining nuts from the stud using an 11-mm (7/16-in.) deep socket with a 20-cm (8-in.) extender. Put the nuts aside temporarily. If the thread pitch of the 2 studs is different, remember which one goes where.
6	Remove the 2 Belleville washers from the studs. A Belleville washer is a dome-shaped spring washer. Put the washers aside temporarily.
7	Run the power input cable labelled B1+ along the strain relief bar. At a right angle to the pair of studs, run the cable up to the studs. Estimate where to cut the cable.
8	Cut the cable so that it can reach the studs without stress. Cut the cable in stages so that the cable stays long enough.

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9 Put the cable end through the narrowest part of the insulation boot and past the wide opening. See the figure Insulating boots and clamps at the rear of the BIP (page 251).

DANGER

Risk of injury or equipment damage by electricity

The insulation boot is designed to fit 1/0 AWG (53.49 mm^2) cable. When connecting power input cables that are a size smaller, use the insulation boots anyway. Where the cable passes through the neck of the boot, wrap electrical tape around the cable at the neck to snugly fill the gap between the outside of the cable and the inside of the boot.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Die Isoliermuffe ist passend für 1/0 AWG-Kabel (53,49 mm^2), sollte jedoch auch beim Anschließen von Speisestromkabeln verwendet werden, die eine Größe kleiner sind. Umwickeln Sie das Kabelstück, das durch den Hals der Muffe geführt wird, mit Isolierband, um den Zwischenraum zwischen Kabelaußen- und Muffeninnenseite auszufüllen.

10 Strip enough insulation off the end of the cable to be 0.5 cm (3/16 in.) longer than the length of the lug barrel or below the clamping screw of the terminal block.

DANGER

Risk of injury or equipment damage by electricity

The lugs that are provided with the BIP are for 1/0 AWG (53.49 mm^2) cable. For each power cable to the BIP that is smaller, then you must replace the provided lug with an appropriately sized lug barrel with the same 2-hole size and spacing on a 90-degree offset narrow-tongued lug.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Die mit dem BIP gelieferten Kabelschuhe sind passend für 1/0 AWG-Kabel (53,49 mm^2). Ersetzen Sie bei dünneren Kabeln den mitgelieferten Kabelschuh durch eine passende Kabelschuhhülse mit der gleichen Doppellochgröße und dem gleichen Lochabstand auf einem schmallaschigen Winkelkabelschuh.

11 Put the lug aside and fully cover the bare wire with anti-oxidizing grease or equivalent if your local electrical code allows it.

12 Crimp the lug firmly onto the cable.

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13 Wipe off the excess grease and wipe the lug clean.

14 Wrap electrical tape over the joint between the barrel and the insulation.

15 When the power input cable is less than 1/0 AWG (53.49 mm^2), wrap electrical tape around the cable where the neck of the insulation boot will reside. Wrap enough tape to snugly close the gap.

16 Permanently label the cable near the lug as B1+. Position the label so it can be easily read and traced to termination after all cables are installed. After the first cable, label the others according to the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).

17 Put the lug of the cable onto the studs, barrel at the bottom, and flush against the rear of the BIP.

18 Put a Belleville washer back onto each stud, convex upwards. The high part of the washer must be furthest from the lug.

19 Finger-fasten the nuts back onto each stud. The nuts thread easily, so if there is resistance, check

- that the thread pitch of the nut matches the thread pitch of the stud (since the 2 studs may have different pitches)
- that you are not cross-threading

CAUTION
Risk of damage to power connections
The metal of the top stud of each pair is softer than the bottom stud because of increased electrical conductivity. Ensure that you do not overtighten either stud, nor leave one too loose. Damaging a stud means its BIM cannot be powered up until the BIP is replaced.

CAUTION
Risk of damage to power connections
At the rear of the BIP, the top stud of each pair carries the power. The bottom stud prevents rotation of the lug from the weight of the power cable. To avoid arcing and rotation, ensure both studs are fastened securely with the provided 2-hole lug.

20 Tighten each stud nut to 6.5 Nm (57.5 in.-lbs). Use a properly calibrated torque wrench with the measurement near the middle of wrench's range.

21 Slide the insulating boot to the BIP end of the cable and align it with the shape of the lug (toe upwards). Rest the boot flush against the rear of the BIP. The boot retainer clamp will be fastened in a later procedure after testing the installation of the power cables.

22 Dress the cable by

- fastening it to the strain relief bar at the point perpendicular to the insulation boot; consider that other cables will be nesting against the cable and bar

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- balancing the slack up to the other end
- tightening the tie-wraps up to the other end
- cutting off the tie-wrap tails

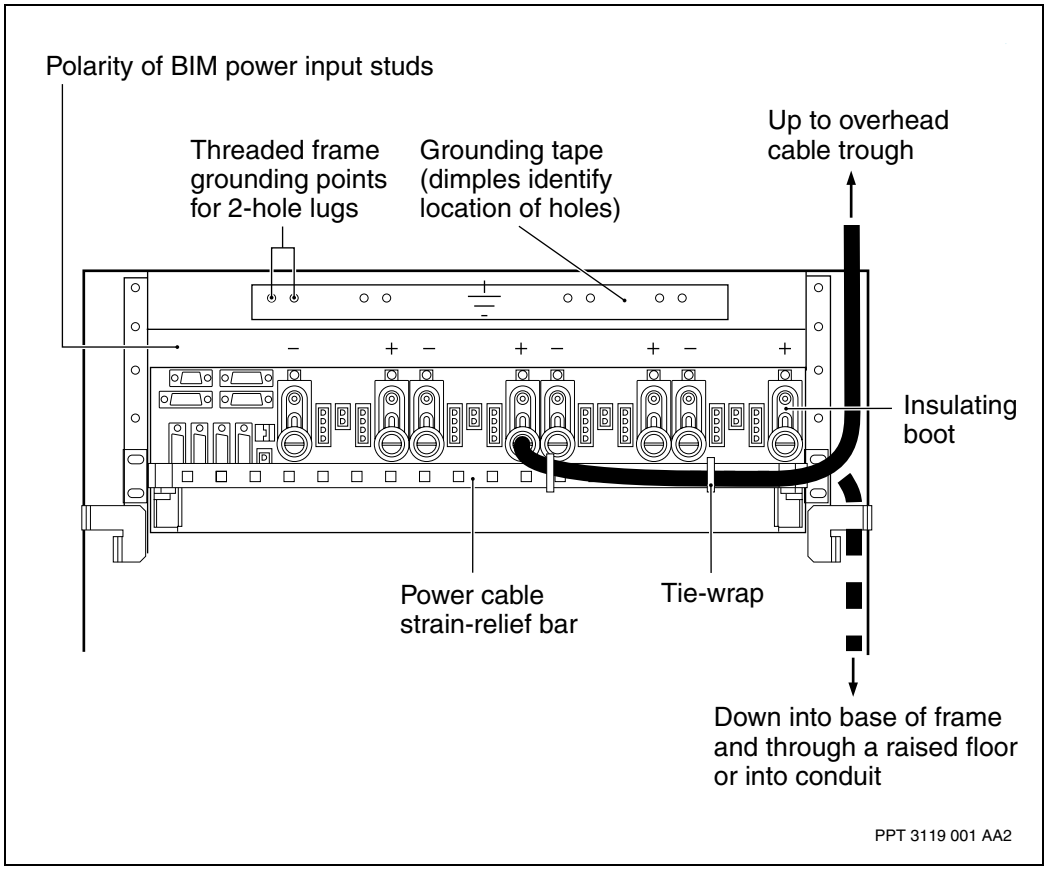
23 Locate the adjacent cable by its label as indicated in the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).

24 Repeat step 1 to step 23 for each of the remaining 3 or 7 power input cables. Adjust each cable label.

--End--

Procedure job aid

Power input cable connected to the BIP stud labelled B1+



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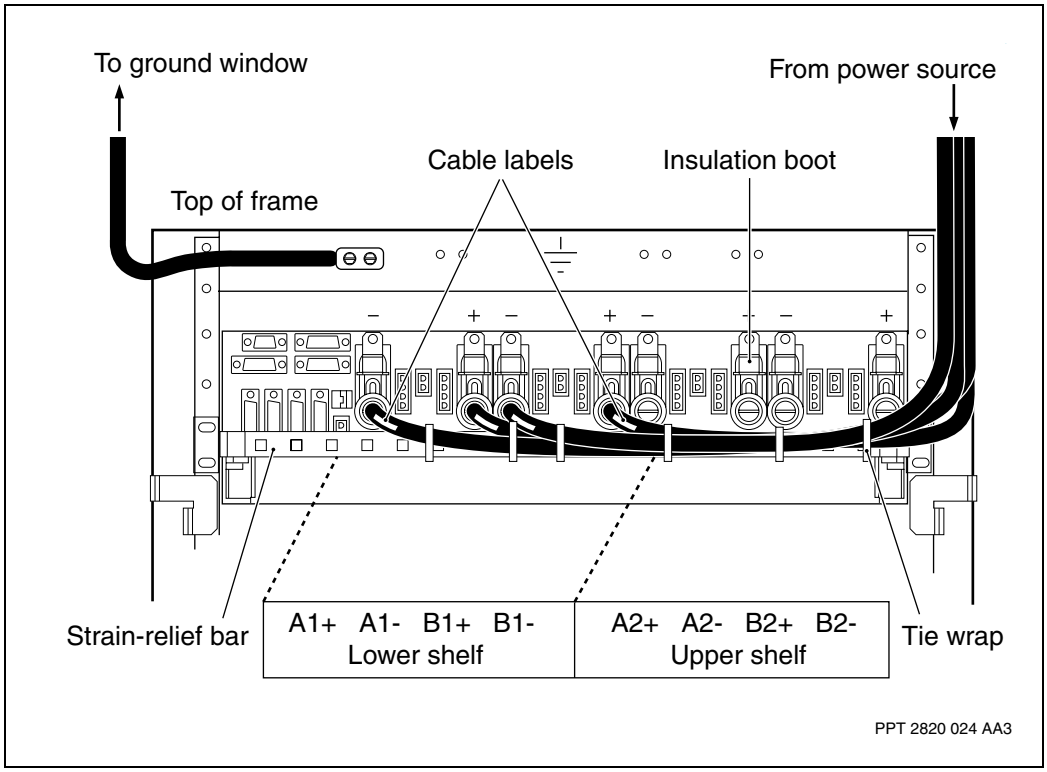
Overhead power input cables for the lower shelf connected to the BIP



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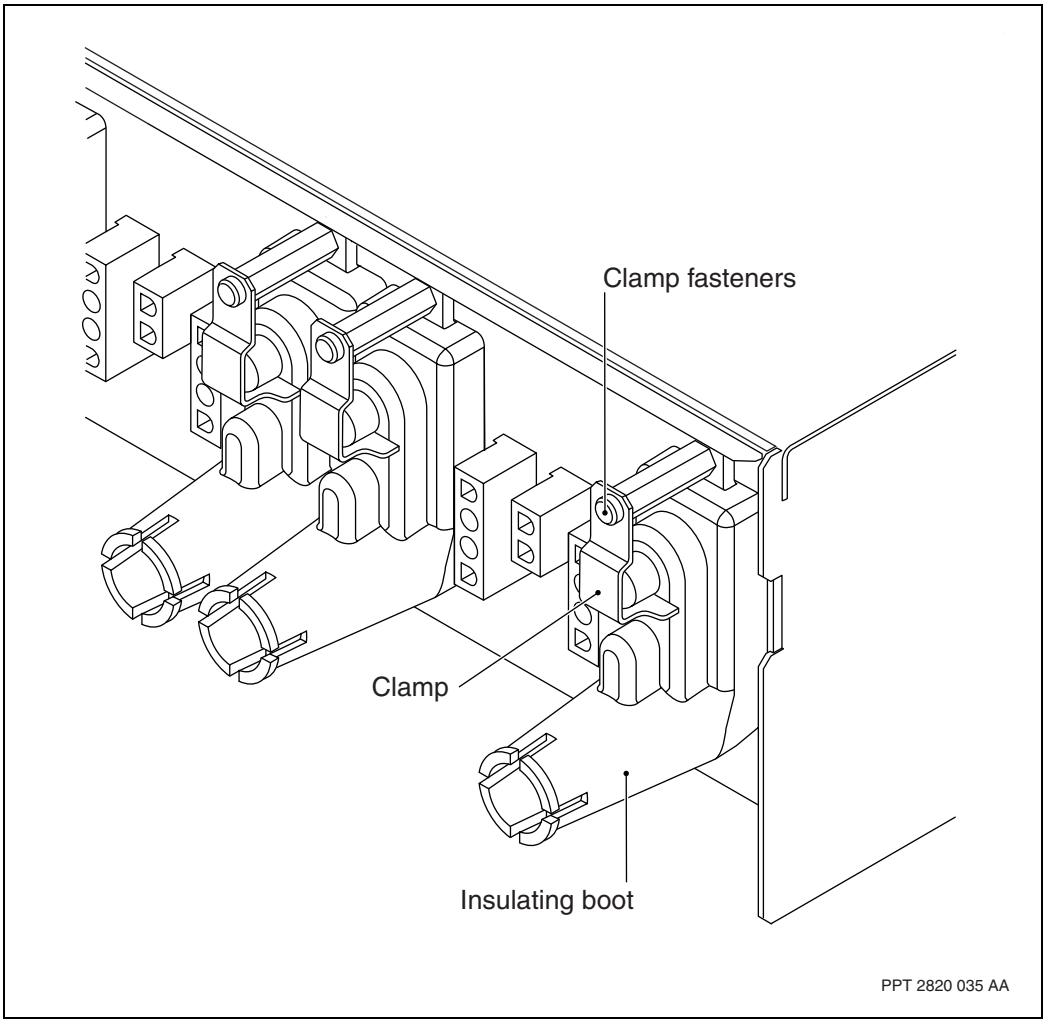
Insulating boots and clamps at the rear of the BIP



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Connecting power output cables to a system of ac rectifiers

Connect dc power output cables to a system of ac rectifiers to provide the source of power to the breaker interface panel (BIP) of a switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The power input cables from the BIP must already have been installed and labelled up to the system of ac rectifiers.
- The system of ac rectifiers must already be installed according to the product's own hardware instructions. When the system of ac rectifiers is an Astec MFA150, follow the installation instructions in the Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*. The power and alarm cabling between the MFA150 and the BIP is covered in this document.
- When the system is an MFA150, you need cable kit AP5C90FJ, which includes
  - 100 m (328 ft) of No. 2 AWG (33.62 mm^2) cable, to be cut equally for the input cables
  - for the MFA150, five 1-hole 2 AWG lugs and six 2-hole 5/8-in. lugs
- Any system of ac rectifiers must be grounded to the same ground window as the Multiservice Switch. When using an MFA150 power system of ac rectifiers, follow the ac power requirements for the rectifiers and the system grounding procedure in the Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*.
- The MFA150 rectifier shelves are labelled A and B at the front of the hardware setup. These designations have no relationship to individual circuit breakers on the controller or to the A and B power feeds connecting the MFA150 to the Multiservice Switch.

Procedure steps

Step	Action
1	Ensure that all mid-trip circuit breakers on the front of the MFA150 system are off, that is, fully down and OFF is visible. Include the breakers on the controller and each rectifier.
2	Access the inside of the controller by unfastening the small Phillips screws at the top edges of its cover. Put the screws and cover aside temporarily. See the figure Power cable connections at the rear of an MFA150 system of ac rectifiers (page 254).

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3 At the inside back of the controller, locate the larger knockout disks that are nearest the 60 A circuit breakers labelled CB1 to CB4. If you are powering a single switch, remove the disks aligned with CB1 and CB2. If you are powering a second node, for example, another Multiservice Switch or SER 5500 switch, also remove the disks aligned with CB2 and CB3.

4 Through each hole where a knockout disk was, insert a conduit elbow provided with the MFA150, and fasten it with a collar nut. See the figure Power cable connections at the breakers inside an MFA150 controller, side view (page 255). For more information, refer to the Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*.

CAUTION

Risk of equipment damage by reversed polarity

Use the plus (+) and minus (-) symbols on the cables from rear of the breaker interface panel (BIP) to ensure that the polarity of each A and B battery (-48/-60 V dc) and battery return for the input power feeds is correct. When powering up the BIP, reversed polarity will damage circuits inside it.

5 Locate the power cable from the BIP that has the 2-wire pair labelled A1+ and A1- and insert it through the conduit elbow that is aligned with CB1. Insert the cable far enough so that the red cable can easily connect with the circuit breaker.

6 Using the large slotted screw, fasten the conduit elbow clamp onto the cable so that there will be no strain on either cable connection inside the controller.

7 Place the lug of the red cable onto the stud at CB1 and fasten the 11-mm (7/16-in.) nut. Use the example shown in the figure Power cable connections at the breakers inside an MFA150 controller, side view (page 255).

8 Place the 2-hole lug of the black cable against the ground busbar and fasten the 11-mm (7/16-in.) pan-head screws. Use the example shown in the figure Power cable connections at the ground busbar inside an MFA150 controller (page 255).

9 Repeat step 5 to step 8 for each other cable pair moving from left to right across the back of the controller. The cables to the BIP must be grouped together. While viewing the rear of the BIP and the front of the controller, the cable pair mappings are identified in the table Connection mapping between the BIP and the MFA150 controller (page 187).

10 Record the connection mapping for your site records.

11 Fasten the cover back on top of the controller.

--End--

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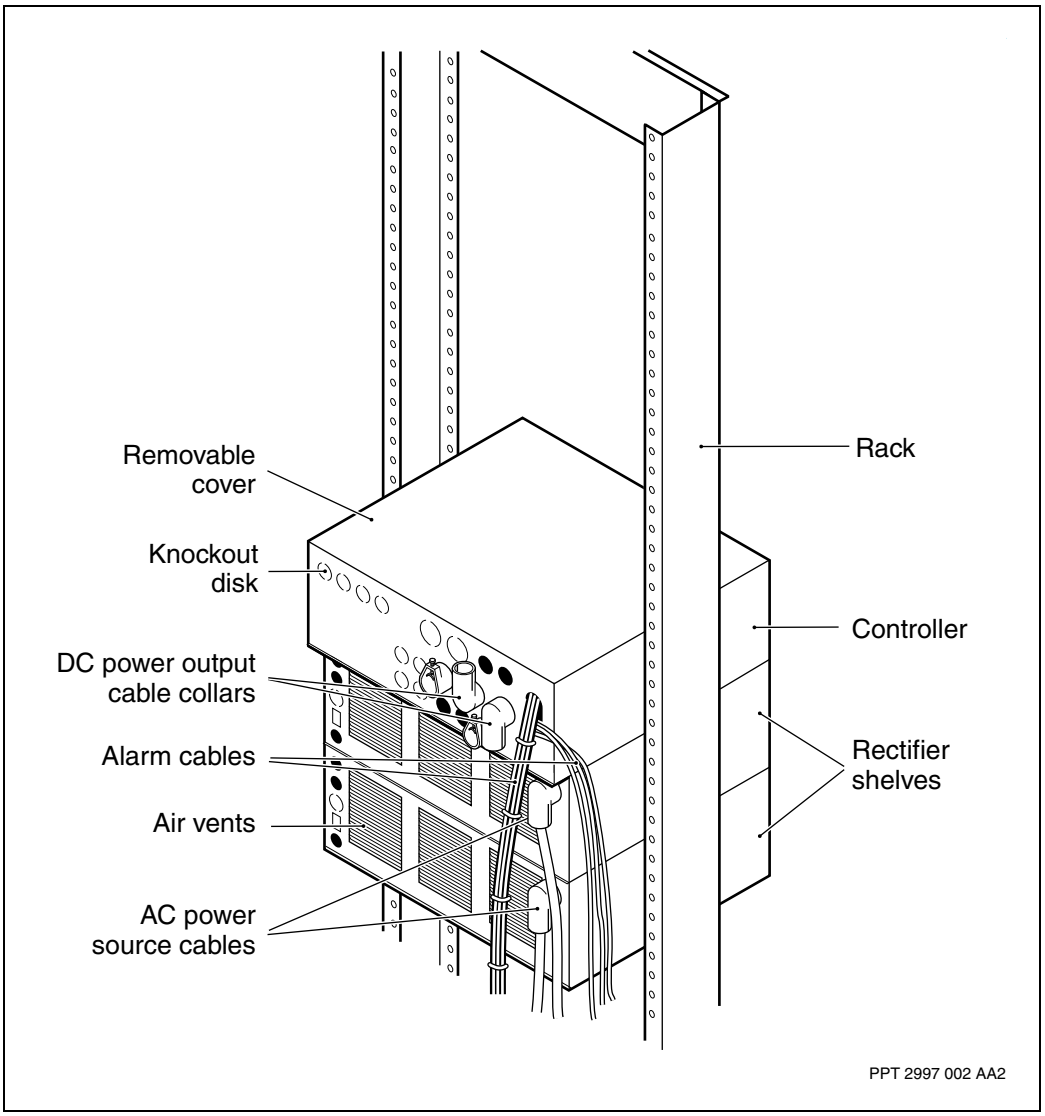
Procedure job aid

Power cable connections at the rear of an MFA150 system of ac rectifiers



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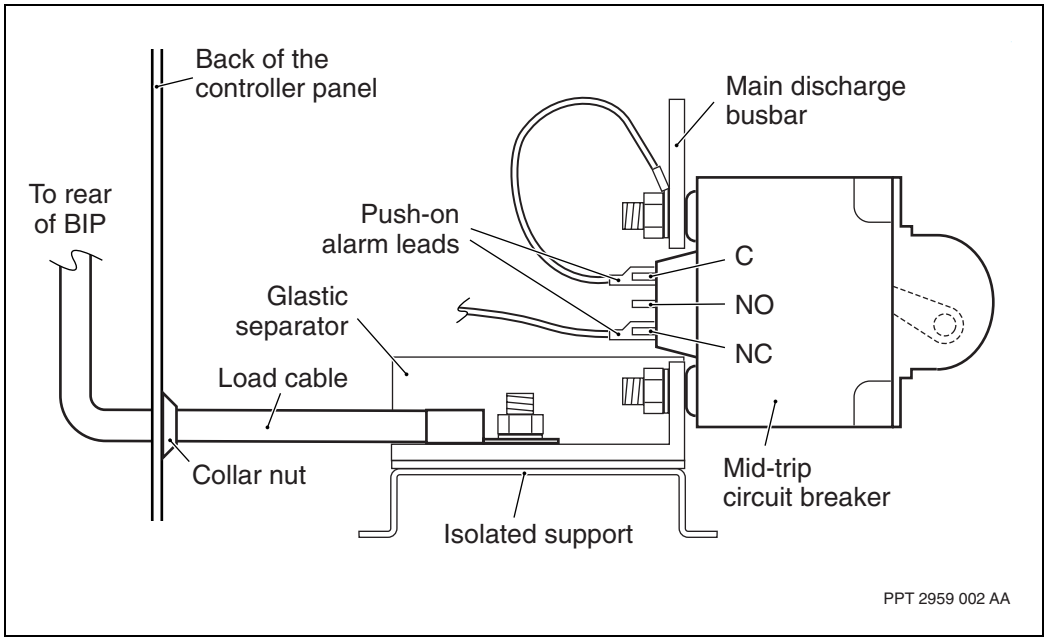
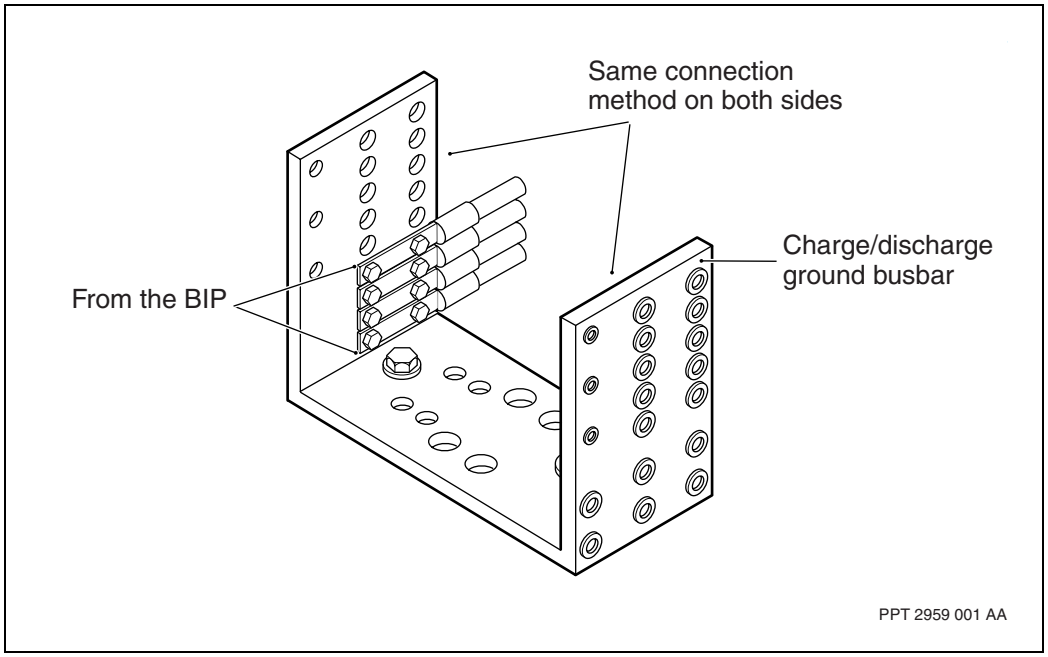
Power cable connections at the breakers inside an MFA150 controller, side view



Power cable connections at the ground busbar inside an MFA150 controller



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Determining if you need to use inline attenuators with optical FPs

Determine if you need to use inline attenuators with optical FPs prior to cabling the FPs. Perform this procedure for every pair of optical FPs.

Prerequisites

CAUTION
Risk of damage to equipment by laser strength
When an FP receives a laser signal that exceeds its range of receive sensitivity, the FP can be damaged or fail. The ranges for transmit and receive are not always the same on an optical FP. Always check whether each FP signaling connection requires an attenuator.

- You must be familiar with Safety considerations and best practices (page 19).
- Optical function processors (FPs) have different transmit and receive strengths for short reach (SR), intermediate reach (IR), and long reach (LR) capabilities. When the maximum transmit (Tx) power is higher than the maximum receive (Rx) sensitivity, an inline optical attenuator is required to reduce the signal strength to an acceptable level. Adding an optical attenuator with the appropriate amount of signal reduction at either the input or output end of the shared signal cable reduces the transmit signal strength to be within the range of acceptable receive sensitivity.
- When connected optical FPs are the same type and have the same reach, that is, SR, IR, or LR, an attenuator may still be required. For example, the 1-port OC-12 (NTHR29) requires an attenuator for a loopback.

Procedure steps

Step	Action
1	Identify a pair of optical cards that are intended to be a connected pair, for example, FP-to-FP or FP to another vendor's equivalent optical card of the same type of signaling.
2	Record the location of each pair, that is, floor number, room, aisle number, node ID, slot numbers of the pair.
3	Compare the transmit laser range (launch power budget) and the receive sensitivity range (overload sensitivity) of each card in the pair. For every FP • the type of FP is labelled on the faceplate • the specifications are listed in the characteristics tables for each type of FP in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* For any non-Nortel Networks optical card, refer to its documentation.

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4 Determine the combined signal loss caused by the anticipated length of each fiber cable, its end connectors and receptacles, and any fiber-to-fiber connectors in a patch panel that lies between the optical cards.

5 Calculate the difference between each transmit and receive direction for all connections to and from the FP.

6 Use the difference and the loss to determine the amount of signal reduction an attenuator must do for each cable. Ensure that each connection has enough transmit power to overcome the path attenuation from fiber, connectors, splices, and whatever else affects the signal, or has enough path attenuation to avoid receiving an overload.

7 If an attenuator is required, determine a location for it to be installed. Consider whether they will fit behind the cable channel cover, on a frame upright, or on a cable management bracket. Record the planned location.

8 Obtain any required attenuators before the FPs are cabled.

--End--

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Disconnecting a power input cable from a terminal block

Disconnect a power input cable to a terminal block of a polyvalent or an ETSI power-and-ground assembly from the power source to replace the cable or as part of replacing the assembly.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- When disconnecting a power input cable to replace it, you need one of equal specifications or better. Install the cable in parallel to the existing cable from the source up to the power-and-ground assembly.

Procedure steps

Step	Action
1	Toggle off all breakers or remove all fuses that enable power to that branch of cable. Put tape over the breakers or fuse openings to indicate deliberate disablement.
2	Toggle off all breakers (press O in) on the BIM that is fed by that cable. Refer to the figures Overhead power input cables for the lower shelf connected to the BIP (page 250) and BIMs for specific shelf nodes (page 263). Toggling off a breaker raises a software alarm. This is normal during a replacement.
3	Unfasten the large slotted captive screw in the terminal block in which the cable is connected.
4	Ensure that the power input cable is labelled to enable its appropriate re-connection or the connection of a replacement cable.
5	Repeat step 1 to step 4 for each other power cable that is to be disconnected.

--End--

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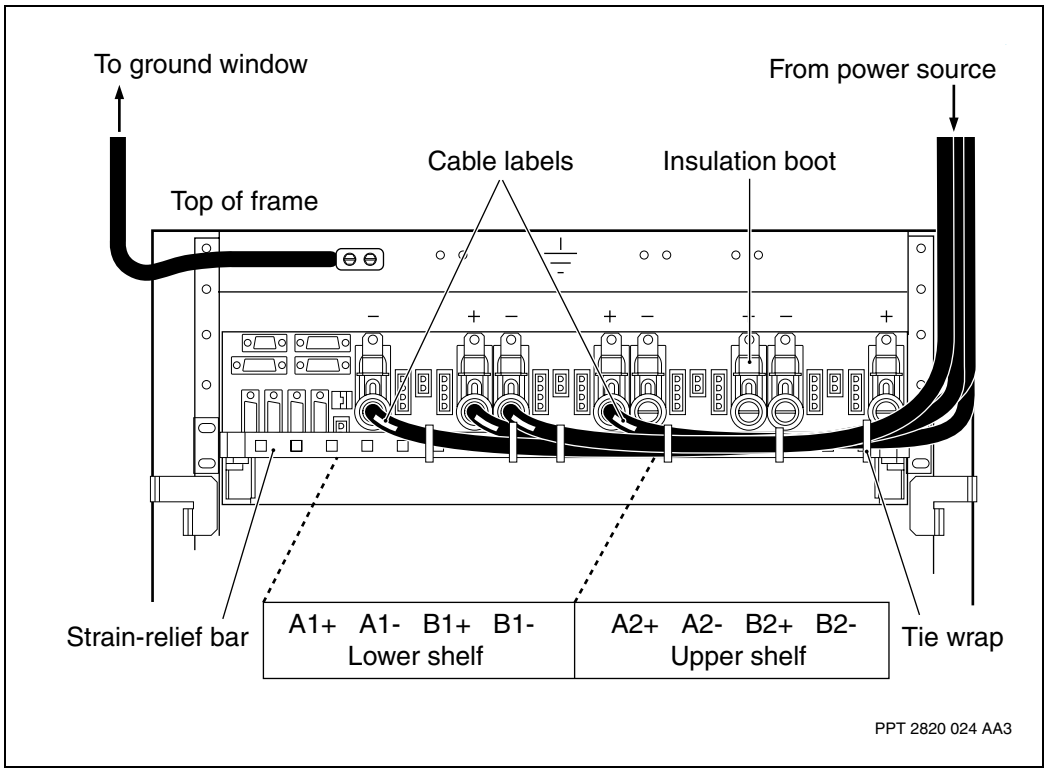
Procedure job aid

Overhead power input cables for the lower shelf connected to the BIP



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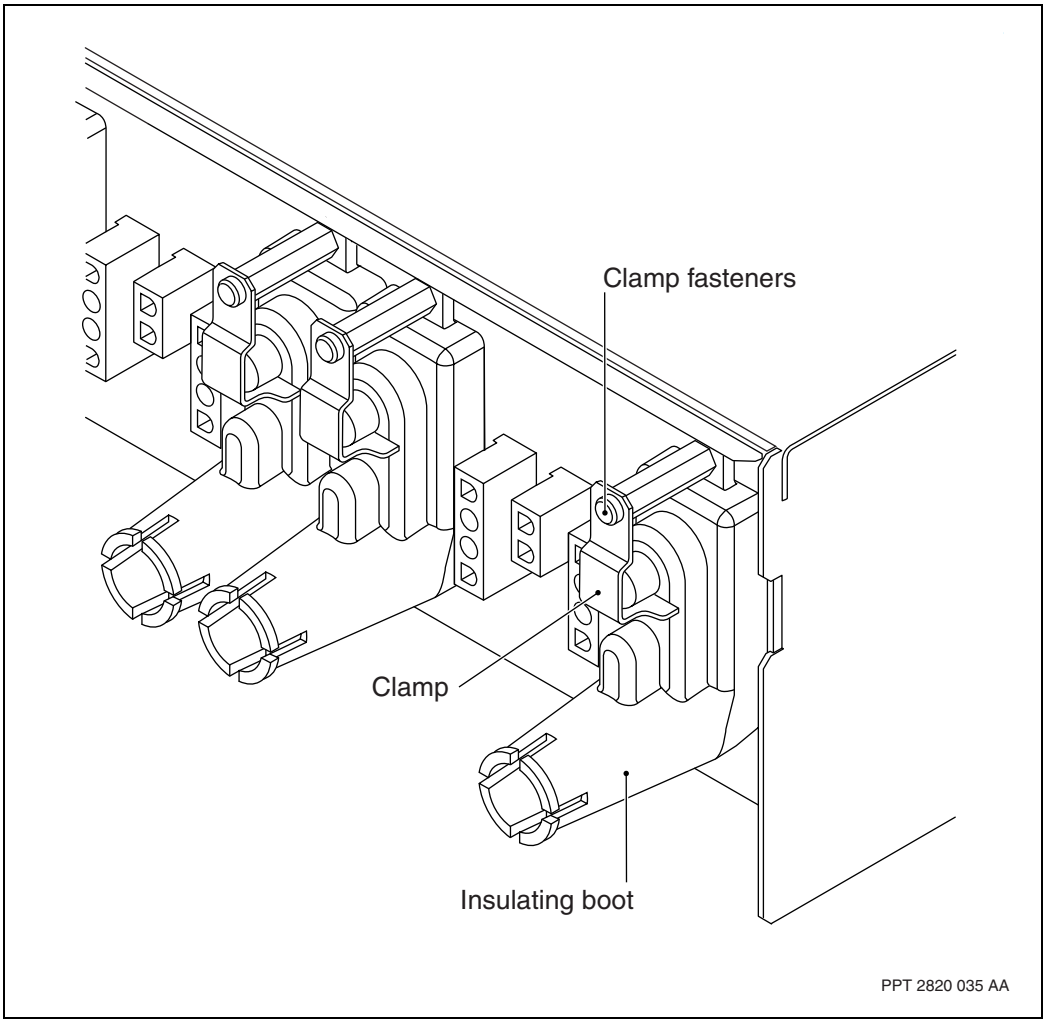
Insulating boots and clamps at the rear of the BIP



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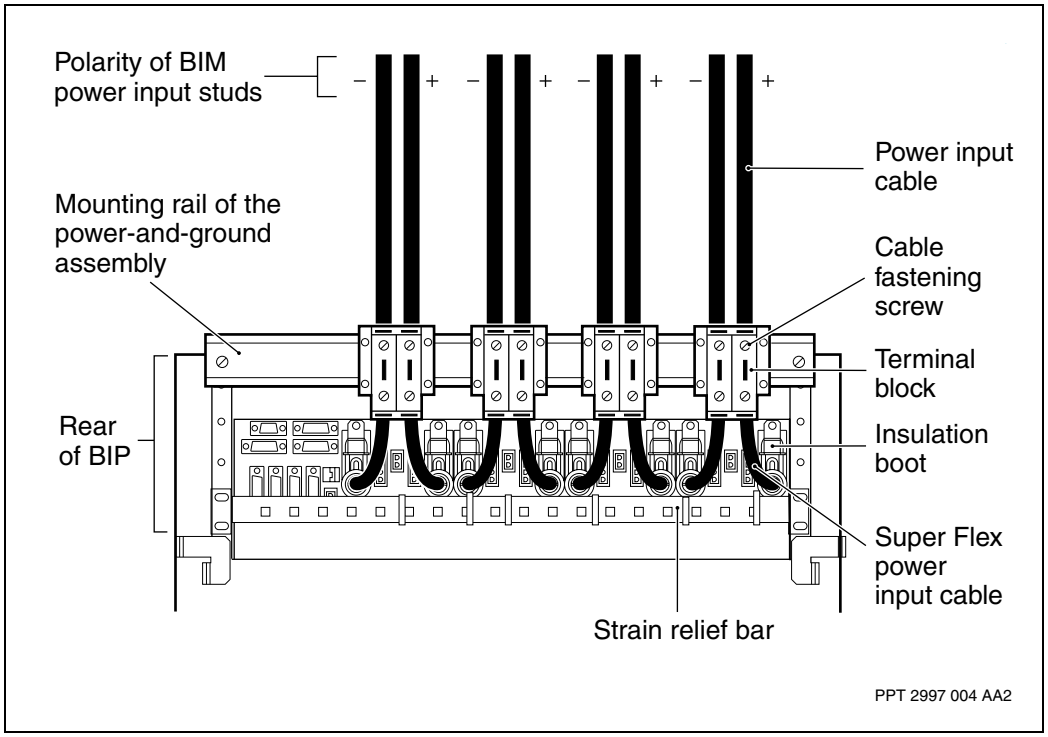
Power input cables connected to a polyvalent power-and-ground assembly A0834143



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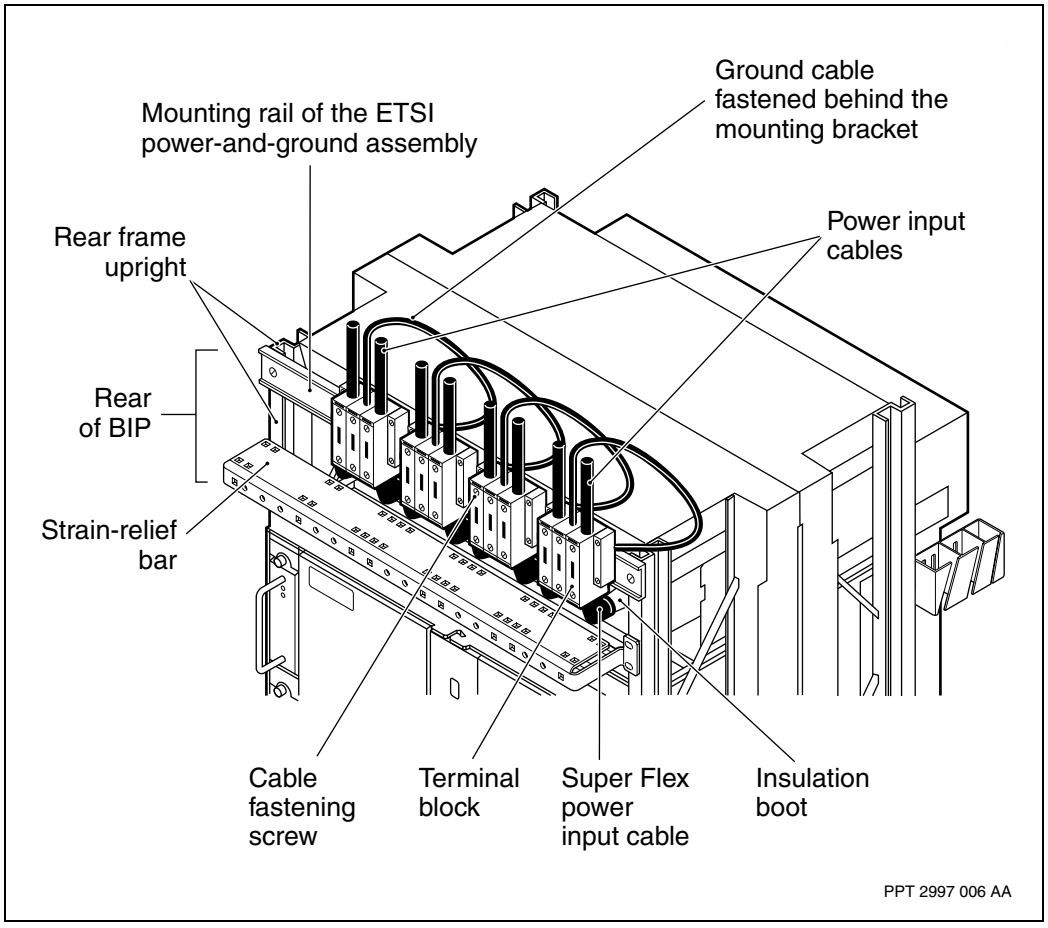
The ETSI power-and-ground assembly A0834149



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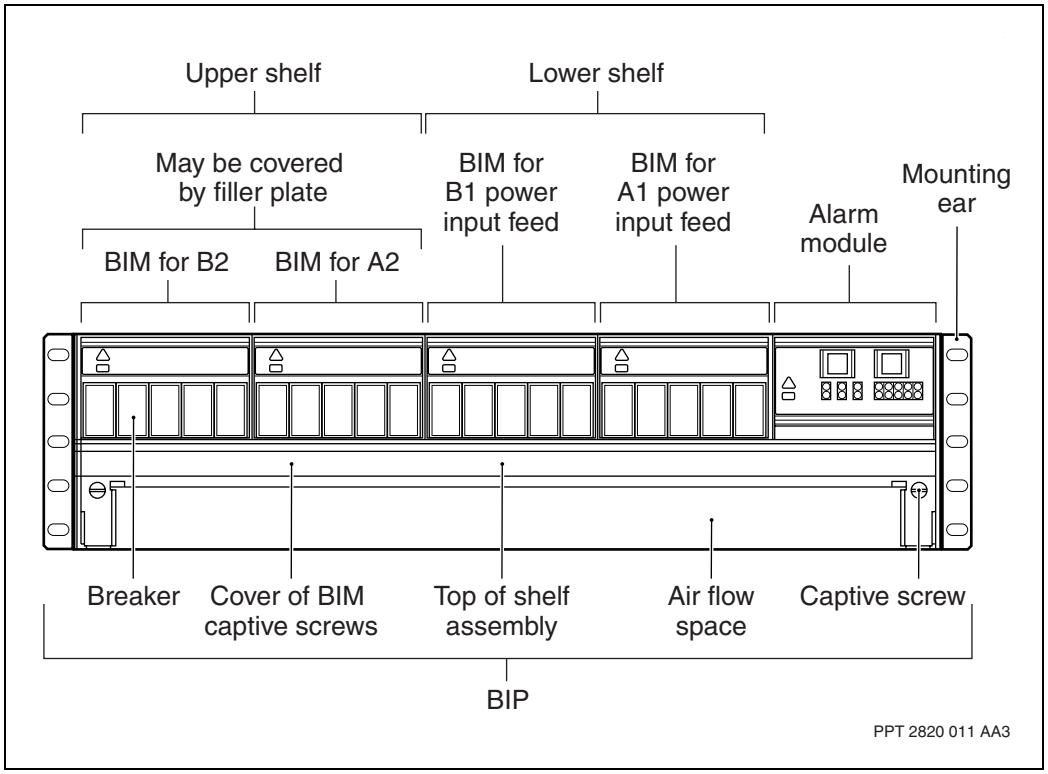
BIMs for specific shelf nodes



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Disconnecting power input cables from the BIP

Disconnect power input cables from the BIP to enable removing the BIP for an upgrade or a replacement due to failure, or to enable replacing the cable.

Prerequisites

DANGER

Risk of injury by electrocution

Each power input feed to a breaker interface module (BIM) is rated up to 100 A. All breakers on the BIMs must be toggled off (the O is pressed in) and power to the BIP must be toggled off.

WARNUNG

Gefahr durch elektrischen Schlag

Alle Speisestromzuführungen am Trennschalterkopplungsmodul (BIM) sind auf 100 A ausgelegt. Alle Trennschalter an den BIMs müssen ausgeschaltet sein (O ist gedrückt) und die Stromversorgung zum BIP muß getrennt sein.

DANGER

Risk of injury or damage by electricity

When toggling off power breakers on a breaker interface module (BIM) or in the circuit up to it, or removing a fuse from the circuit up to it, always put tape over the breaker or fuse cavity. The tape indicates it was manually toggled off, and not tripped by the system. This prevents accidental activation of the power circuit, especially when power cables are being handled.

WARNUNG

Schäden oder Verletzungen durch Elektrizität

Wenn die Leistungstrennschalter an einem Trennschalterkopplungsmodul (BIM) oder im zuführenden Stromkreis geöffnet bzw. Sicherungen aus dem Stromkreis entfernt werden, decken Sie den Trennschalter oder den Sicherungssteckplatz mit Klebeband ab. Das Klebeband signalisiert, daß er/sie manuell ausgeschaltet und nicht vom System ausgelöst wurde. Damit verhindern Sie eine versehentliche Aktivierung der Stromversorgung, besonders beim Hantieren mit Netzkabeln.

- You must be familiar with Safety considerations and best practices (page 19).
- You need the following specialty tools:

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— a medium Pozidriv screwdriver bit, for example, a number 2. Do not use a Phillips bit.

— an 11-mm (7/16-in.) deep socket with a properly calibrated torque wrench capable of 6.5 Nm (57.5 in.-lbs) and a 20-cm (8-in.) extender for the lug nuts

- Disconnecting the cables at the BIP is the same procedure for any of these power sources:

  — a power-and-ground assembly (with part numbers A0834143 for the polyvalent version or A0834149 for the ETSI)

  — a system of ac rectifiers, including an MFA150

  — a site dc power cable or branch panel

Procedure steps

Step	Action
1	At the front of the BIP, ensure that all of the breakers are toggled off (the O is pressed in) and tape covers each breaker to indicate it is off deliberately. When you are replacing a power input cable, do the following steps that apply only to that cable.
2	Terminate the appropriate power source feeds to the BIP and put tape over the fuses or breakers to indicate that off is deliberate as opposed to tripped. If your power source is a system of ac rectifiers, power down the system according to that product's instructions. When using an Astec MFA150 power system of ac rectifiers, power down the system according to the Astec document UM6C28C (167-9021-102) *MFA150 Modular Front Access Power System -- Nt6C28C User Manual*.
3	Across the horizontal strain-relief bar near the rear of the BIP, remove the tie-wraps that fasten cables to the top and bottom sides of the bar. Let the red cables hang loosely under the bar.
4	Locate a cable at the far right or left side of the rear of the BIP, whichever is easiest to access.
5	At the rear of the BIP, loosen the clamp of the insulation boot by using a medium Pozidriv bit that fits snugly. Loosen the clamp until you can pivot it easily with your finger.
6	Unfasten the lug retaining nuts from the stud using a 11-mm (7/16-in.) deep socket with a 20-cm (8-in.) extender. Put the nuts aside temporarily. If the thread pitch of the studs is different, remember which nut matches each stud.
7	Remove the 2 Belleville washers from the studs. A Belleville washer is a dome-shaped spring washer. Put the washers aside temporarily.

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8 Pull the lug straight off the studs.

9 Ensure that the power input cable is labeled with a plus (+) or minus (-) A or B at the BIP end. If the label is or was on the tie-wrap, transfer its information to the cable itself.

If there is no label, refer to the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).

If the cable is being replaced, transfer the connection information to the replacement cable.

10 Let the cable hang freely away from the BIP.

11 Loosely fasten a Belleville washer and nut back onto each stud.

12 Put an insulation boot over each stud pair and lightly clamp it back on.

13 For each remaining power input cable at the rear of the BIP, repeat step 4 to step 12.

--End--

Procedure job aid

For power cable labels, refer to the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).

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Disconnecting other cables from a BIP

Disconnect other cables from a BIP to enable its removal for an upgrade or a replacement due to failure.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need temporary labels for cables.

Procedure steps

Step	Action
1	One at a time, label each black-and-white power output cable to a PIM or a cooling unit with its relative position at the BIP, and disconnect it by pinching the tabs on the sides of the connector together and pulling. For label identifiers, refer to the figure Cable connections at the rear of a BIP (page 268).
2	One at a time, label each red power and alarm cable with its relative position at the BIP, and disconnect it by unfastening the small slotted screws of the D-sub connector and pulling.
3	One at a time, label each external alarm cable (all of the remaining cables) with its relative position at the BIP, and disconnect them as follows. • for a D-sub connector, unfasten the 2 small slotted screws on either side of the connector • for a Berg connector, unplug it while lifting the tab on the side • for a MATE-N-LOK connector, unplug it while lifting the tabs on the either end

--End--

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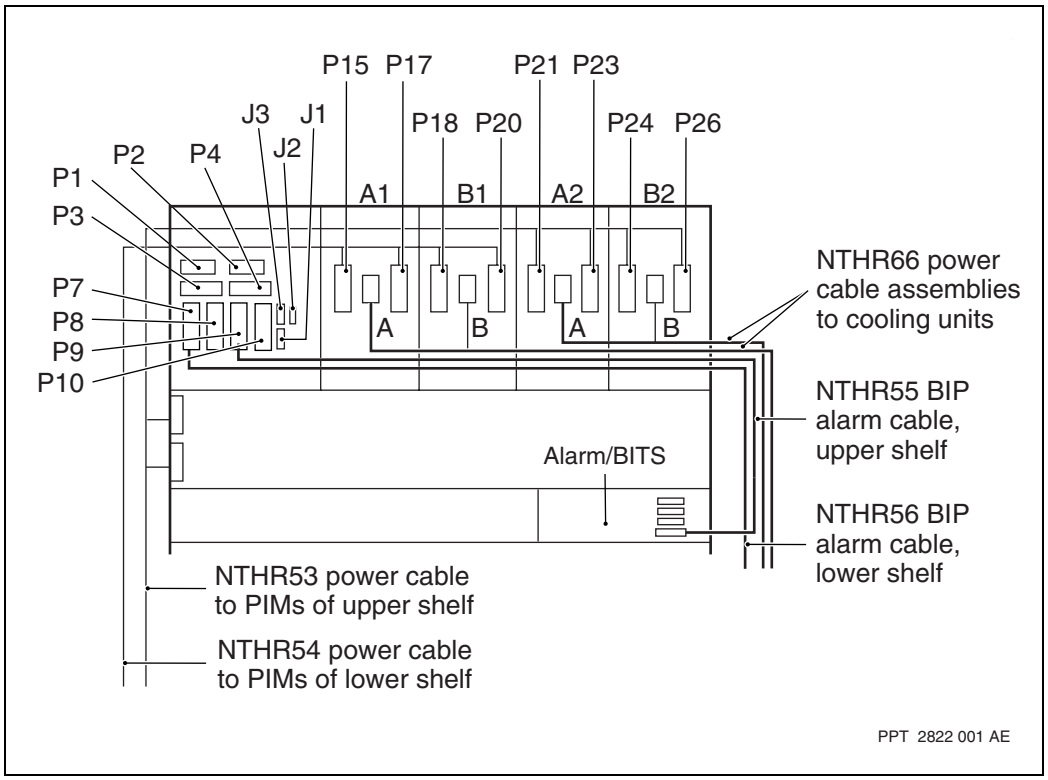
Procedure job aid

Cable connections at the rear of a BIP



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Fastening adjacent frames together

Fasten adjacent NEBS 2000 frames together to maximize the use of floor space between frames with the optional extended cable management brackets.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You must be familiar with the criteria for joining frames as described in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.
- You need kits numbered NTRU0365 and NTHR0370. NTRU0365 keeps the frames apart the minimum space to allow the optional extended cable management brackets (kit number NTRU0368 or NTRU0369) to be mounted on each side between the frames.
- When joining a pair of NEBS 2000 frames, you must either join them first and position them for levelling together and anchoring, or position one beside a frame that is already anchored, then level and join the added one relative to it.
- When adjacent NEBS 2000 frames are fastened together using the frame joining kits, the space between frames accommodates having the larger optional extended cable management brackets on each frame and 1 cm (3/8 in.) between each pair of brackets to enable cabling. Once the frames are fastened together and installed (anchored and cabled), a frame would have to be disconnected, moved, and re-installed in order to fit the extended cable management brackets in between.

Procedure steps

Step	Action
1	Ensure the frames are positioned side by side and touching on the footprints where they are to be anchored.
2	Remove the packaging from the contents of kits NTRU0365 and NTHR0370. Keep the contents separate.
3	See the figure Frame-to-frame joining brackets in kit numbers NTRU0365 and NTHR0370 (page 271). Observe the position of the upper and lower pairs of brackets. The upper pair of brackets has the same orientation as the lower pair, and there is a pair at the front and rear where the frames are joined.
4	From NTRU0365, align an L-shaped bracket (part number P902817) on the middle upper left front according to the figure (long arm outwards).

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5 Fasten the bracket to the frame using the 4 thread-forming 6-mm (1/4-in.) screws provided. Ensure the screws are fully seated perpendicularly to the hole before turning. Tighten to snug plus a 1/5 turn.

6 Repeat step 4 and step 5 for the upper right bracket.

7 From NTHR0370, place the U-shaped bracket (part number P0902826) over the arm created from the left and right brackets. Fasten it to both frames using the 4 provided screws and washers. You may need to temporarily shim some frame feet to align both the left and right bracket holes.

8 From NTRU0365, align an L-shaped bracket (part number P902817) on the middle upper right front according to the figure (long arm outwards).

9 Fasten the bracket to the frame using 4 screws and washers.

10 Repeat step 8 and step 9 for the lower right bracket.

11 From NTHR0370, place the U-shaped bracket (part number P0902826) over the arm created from the left and right brackets. Fasten it to both frames using the 4 screws and washers. You may need to temporarily shim some frame feet to align both the left and right bracket holes.

12 Repeat step 4 to step 11 for the upper and lower rear joining brackets.

13 Remove any shims under the frame feet that were used to align bracket holes for fastening.

--End--

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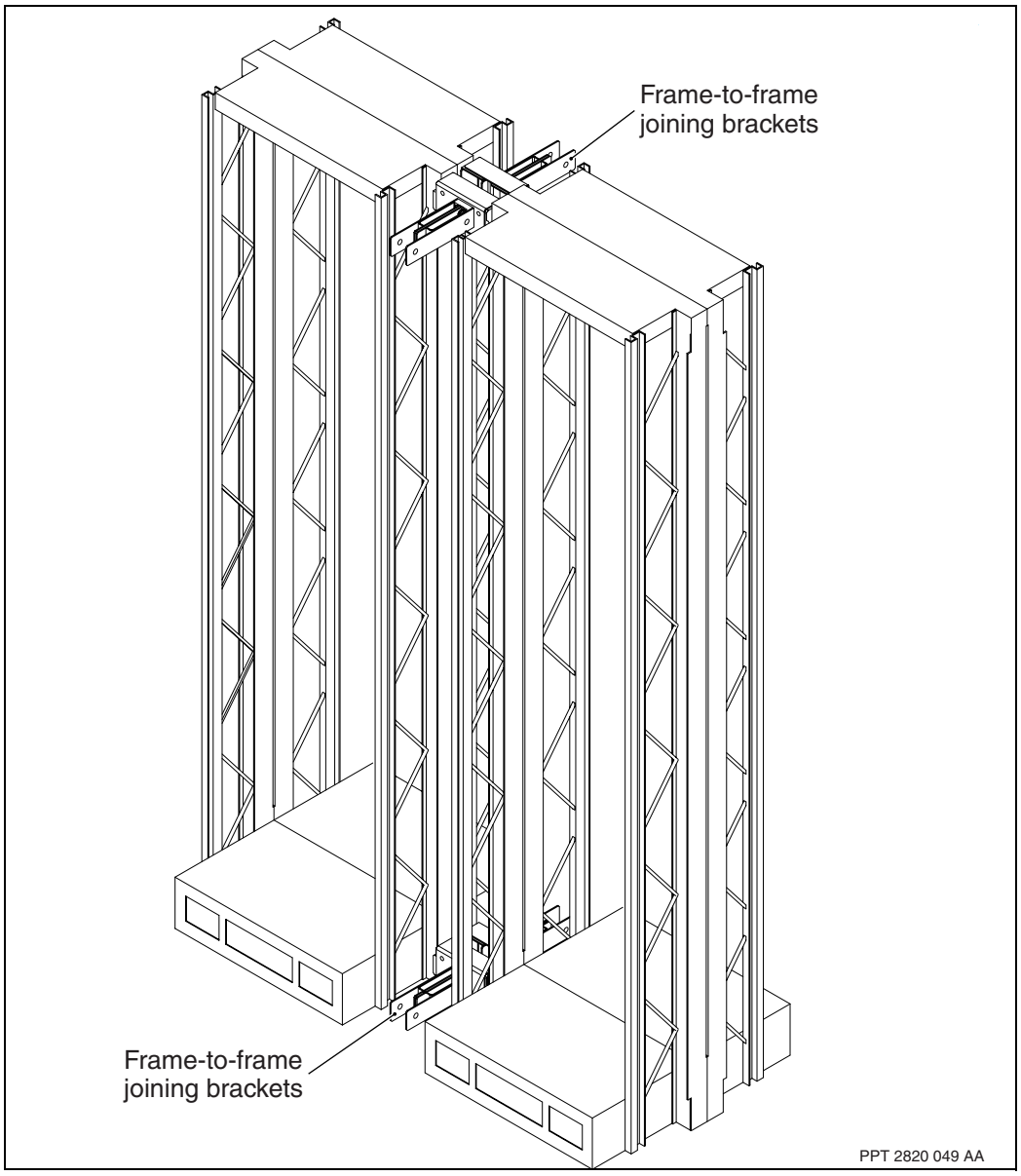
Procedure job aid

Frame-to-frame joining brackets in kit numbers NTRU0365 and NTHR0370



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Grounding a Multiservice Switch 15000 VSS

Ground a Nortel Networks Multiservice Switch 15000 Variable Speed Switch (VSS) in order for the Multiservice Switch 15000 and the Multiservice Switch 7480 to share the same ground window.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Before grounding Multiservice Switch 15000 VSS equipment, be sure you have performed the steps in Grounding the NEBS 2000 frame (page 277).

Procedure steps

Step	Action
1	At the rear of the Multiservice Switch 7480, unfasten the 9-mm (11/32-in.) nut on the grounding stud and put it aside temporarily. See the figure Multiservice Switch 7480 shelf assembly grounding stud (page 273).
2	At one end of the grounding cable (#6 AWG min.), crimp on a 1-hole lug according to your local electrical code.
3	Place the 1-hole lug onto the grounding stud and fasten the nut back onto it. Tighten to snug plus a 1/4 turn. Avoid stripping the nut or the stud.
4	Strip the sheath off the end of the cable to accommodate the lug barrel, coat the strands in anti-oxidizing grease if your local electrical code allows it, and crimp on an appropriately sized straight 2-hole lug.
5	Place the end of the cable with the 2-hole lug at the top of the NEBS 2000 frame against the silvery grounding strip. Avoid pinching or kinking the cable. See the figure Overhead power input cables for the lower shelf connected to the BIP (page 250).
6	Fasten the lug to the frame using 2 thread-forming 10-mm (3/8-in.) hex-head screws. Some dc-powered shelves have an extra lug on the right-hand side of the terminal block labelled GND. Do not use this extra lug and leave it unconnected.

--End--

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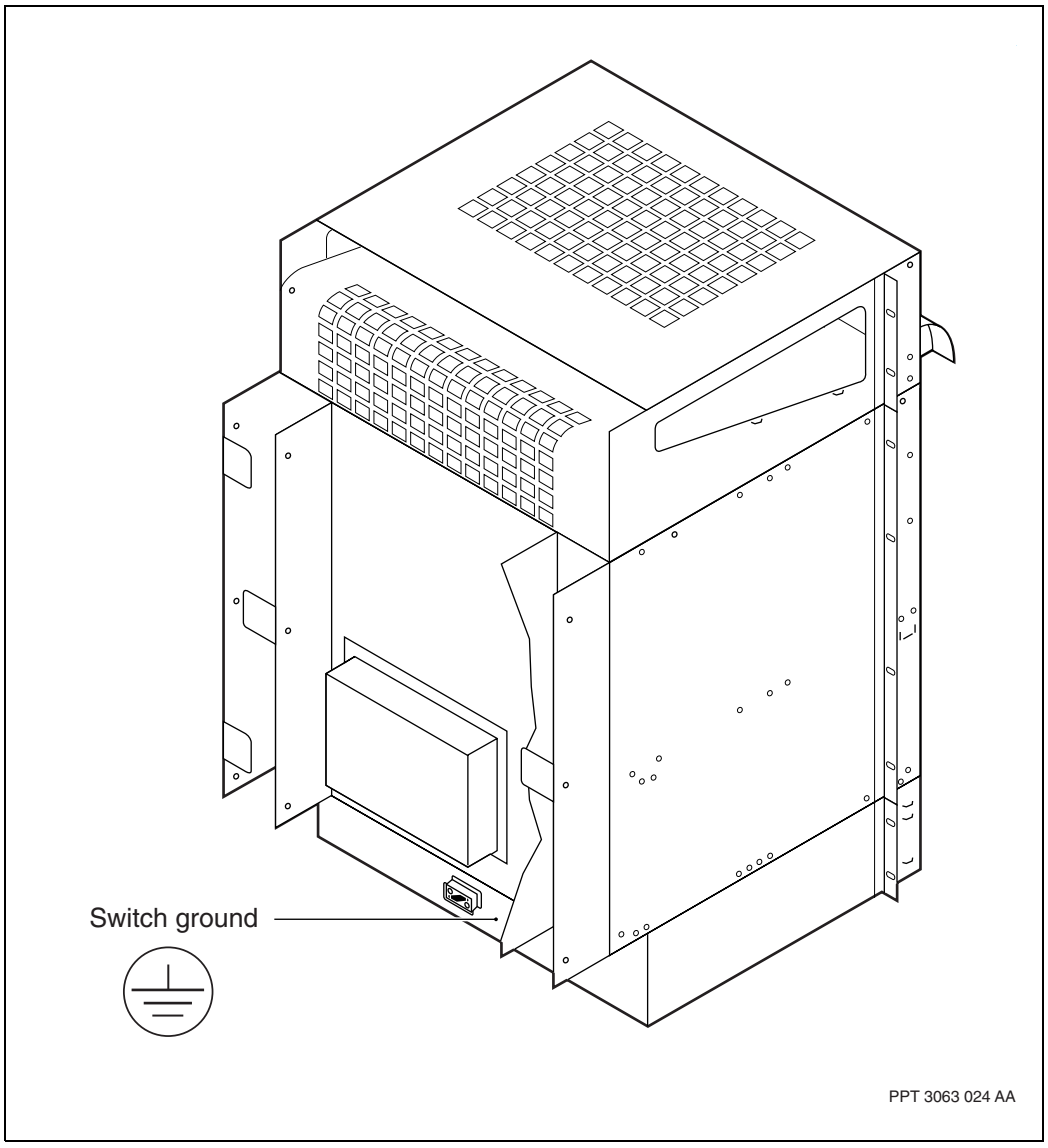
Procedure job aid

Multiservice Switch 7480 shelf assembly grounding stud



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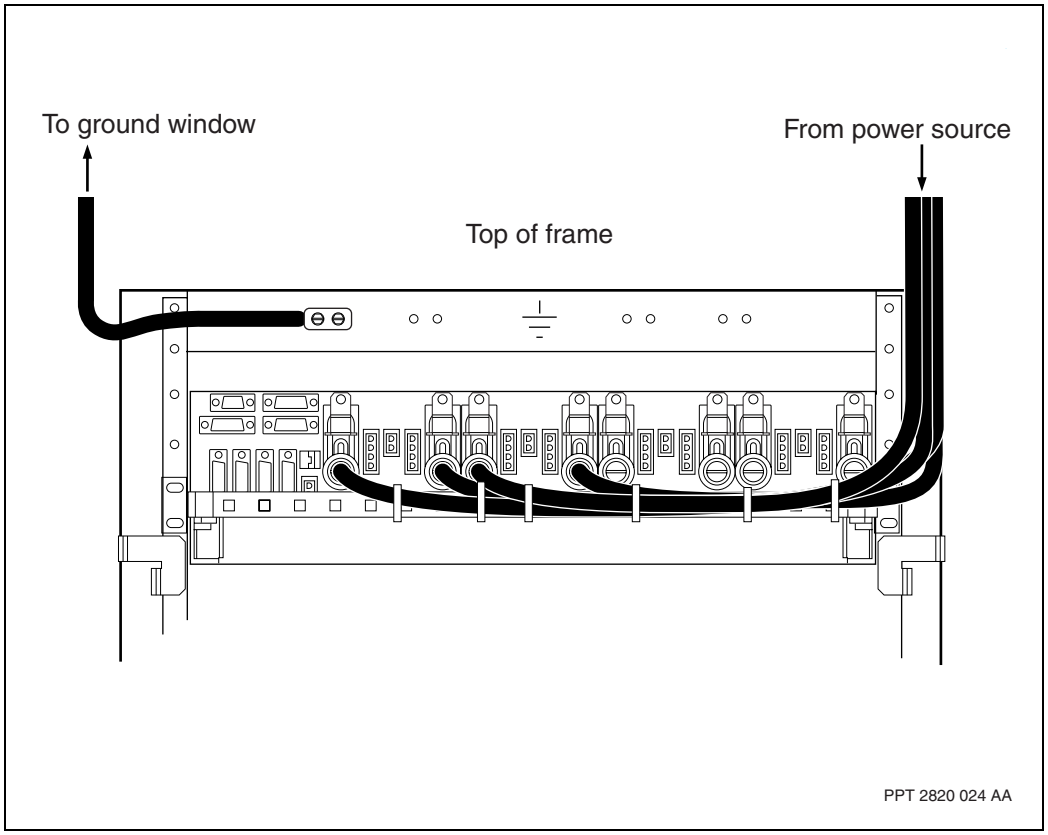
Location of the grounding strip at the top of NEBS 2000 frame



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Grounding a SER 5500 to a NEBS 2000 frame

Ground a SER 5500 to a NEBS 2000 frame to ensure that the setup shares the same ground window.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Before grounding the SER 5500, ensure that you have done the procedure Grounding the NEBS 2000 frame (page 277).

Procedure steps

Step	Action
1	Cut 152 cm (5 ft.) of No. 6 AWG (13 mm^2) cable for grounding.
2	As shown the figure SER 5500 shelf assembly grounding studs (page 276), use a straight 2-hole lug to connect one end of the grounding cable to both grounding studs on the rear of the shelf assembly.
3	Route the grounding cable from the SER 5500 to the nearest upright.
4	Route the cable along the upright up to the top of the frame where the silvery grounding strip is located. To locate the grounding strip, see the figure Location of the grounding strip at the top of NEBS 2000 frame (page 276). Use tie-wraps to loosely fasten the cable to the cable management brackets.
5	Choose a pair of dimples in the silvery grounding strip across the top rear of the frame where the 2-hole lug of the grounding cable will fasten. Each dimple pair covers unthreaded screw holes. Puncture the dimples at the 2 holes. Do not use the grounding holes behind the safety label.
6	At the point of the dimple pair, cut off any excess cable, strip the sheath off the end to accommodate the lug barrel, coat the exposed strands in anti-oxidizing grease, and crimp on a straight No. 6 AWG (13 mm^2) 2-hole lug. The lug holes must align with the dimple pair without causing the cable to exceed the maximum bend radius and without looping any cable slack.
7	Fasten the lug to the frame using 2 thread-forming 10-mm (3/8-in.) hex-head screws from the hardware kit NTHW85. Tighten to snug plus a 1/3 turn.
8	Tighten the tie-wraps along the cable path.

--End--

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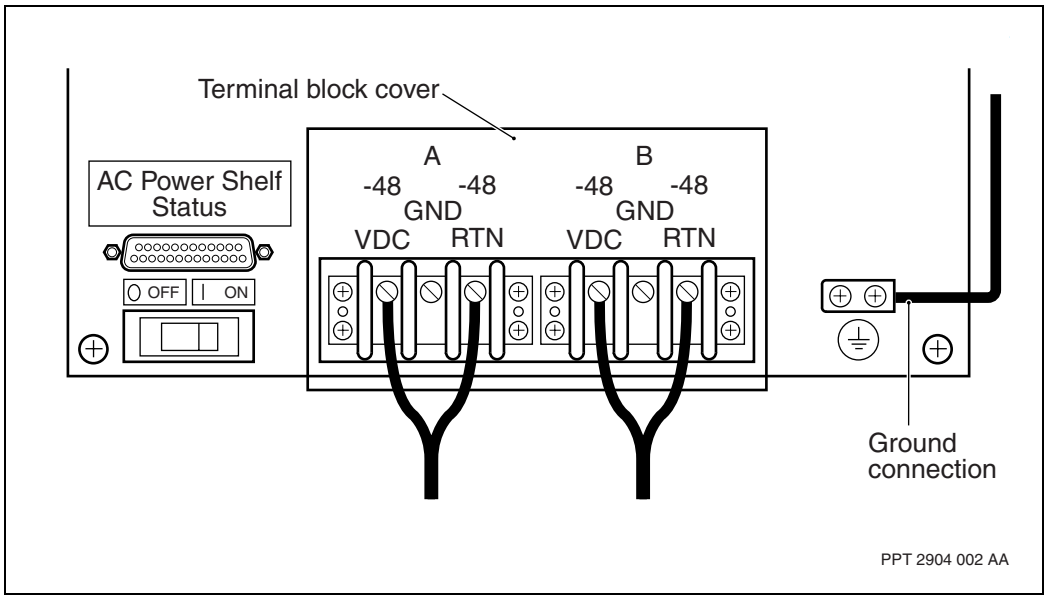
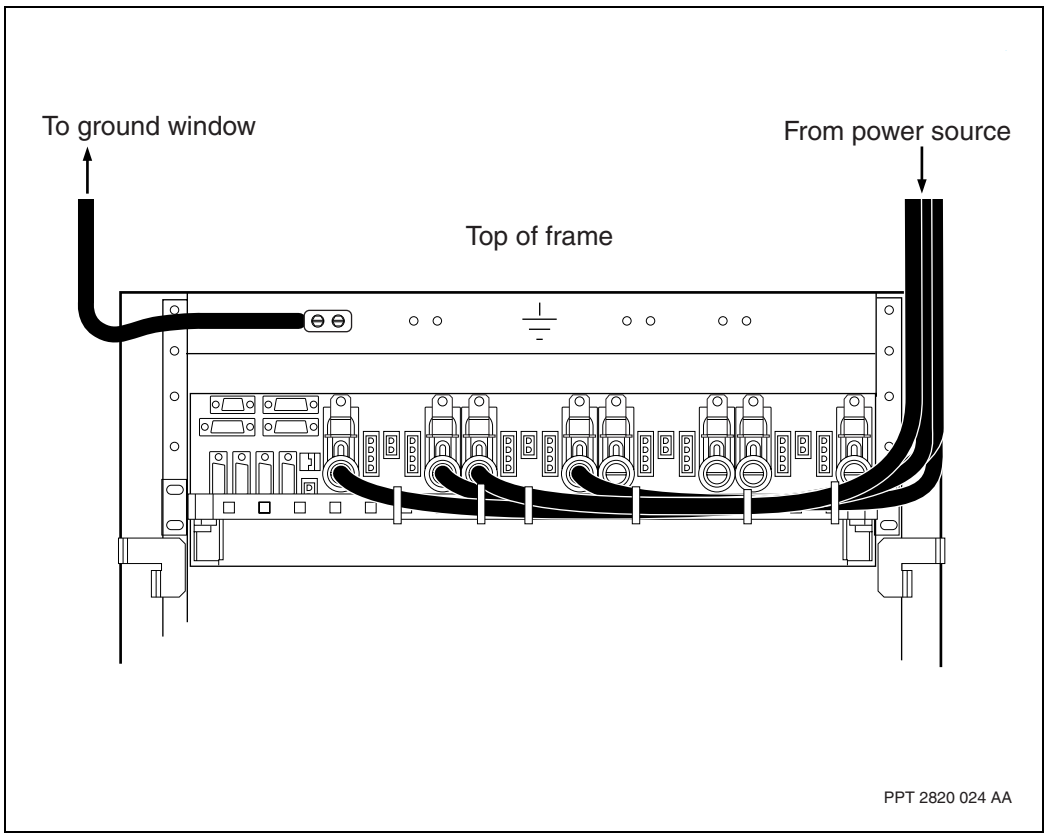
Procedure job aid

SER 5500 shelf assembly grounding studs



Location of the grounding strip at the top of NEBS 2000 frame



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Grounding the NEBS 2000 frame

Install a cable onto the top front or rear of a NEBS 2000 frame to ground all equipment in the frame to the site ground window, or onto the mounting apparatus of a shelf-based Multiservice Switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need the kit A0682225 which includes a straight 2-hole lug for a No. 6 AWG (13.3 mm^2) cable and 2 thread-forming10-mm (3/8-in.) hex-head screws or green pan-head machine screws. If you use a thicker grounding cable, provide your own lug and fasteners.
- When measuring the length of the frame grounding cable, ensure that you accommodate having the cable go through the frame bracket in the procedure Installing a top frame bracket onto a NEBS 2000 frame (page 459). It is easier to fasten the thread-forming screws of the ground cable before the bracket is installed. However, you should install the bracket before powering up any equipment in the frame.
- For top or bottom grounding to a common bonding network (CBN) or an isolated bonding network (IBN), meet the following criteria, especially when using a common power plant to feed both IBN and co-located small CBN equipment.
  - — Locate all IBN equipment within one floor of the power plant.
  - — Use only one single point ground (SPG) for all IBN equipment fed from the power plant. That is, use a non-current-carrying section of the insulated battery return (BR) bar of the power plant.
  - — Insulate the BR bar of the power plant from the Multiservice Switch and bond to the frame ground bar (FGB) for CBN or to the SPG for IBN.
  - — Bond the framework of the power plant to the FGB overhead or under the floor.
  - — Grounding conductors are not designed to carry current under normal operating conditions.
- Routing a ground cable under the floor up to the NEBS 2000 frame has the same grounding point as routing the ground cable from an overhead trough. There is an alternative grounding point on frames equipped with the optional side panel brackets from kit number NTRU0128. A ground cable can also be screwed against the silvery grounding tape on the outside face of a frame upright.
- When the polyvalent power-and-ground assembly (part number A0834149) is to be installed, the frame ground cable to the site ground

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window must be located on or re-located to the silvery grounding strip at the top front of the frame.

- When using an equivalent mounting apparatus to house a Multiservice Switch, ground the apparatus to the site ground window because the hardware is grounded through the adapter brackets to the apparatus.

Procedure steps

Step	Action
1	Cut the ground cable to run from the silvery strip at the top of the front or the rear of the NEBS 2000 frame. Leave an extra 20 cm (8 in.).
2	Attach one end of the grounding cable to the main ground reference cable as required by your local electrical codes. Ensure that the connection is secure and weather-proofed.
3	Across the top front or top rear of the NEBS 2000 frame, choose a pair of screw holes behind the silvery grounding strip by pressing and running a finger along the length of the strip. Any pair accommodates the provided 2-hole lug of the grounding cable. Puncture the strip at the 2 holes. Do not use the pair of holes behind the safety label on the far left.
4	Route the other end of the grounding cable to the pair of holes on the frame. When the cable comes from overhead and spans more than 0.6 m (2 feet) of air, then an insulated fixed cable ladder (or equivalent immovable structure) must be run down so that the cable can be attached to it. When the cable comes from under the floor, route it on the right side facing the front of the frame.
5	Fasten the lug to the cable according to your local electrical code.
6	Fasten the lug to the frame using 2 thread-forming 10-mm (3/8-in.) hex-head screws or the green pan-head screws. Tighten to snug plus a 1/3 turn.

--End--

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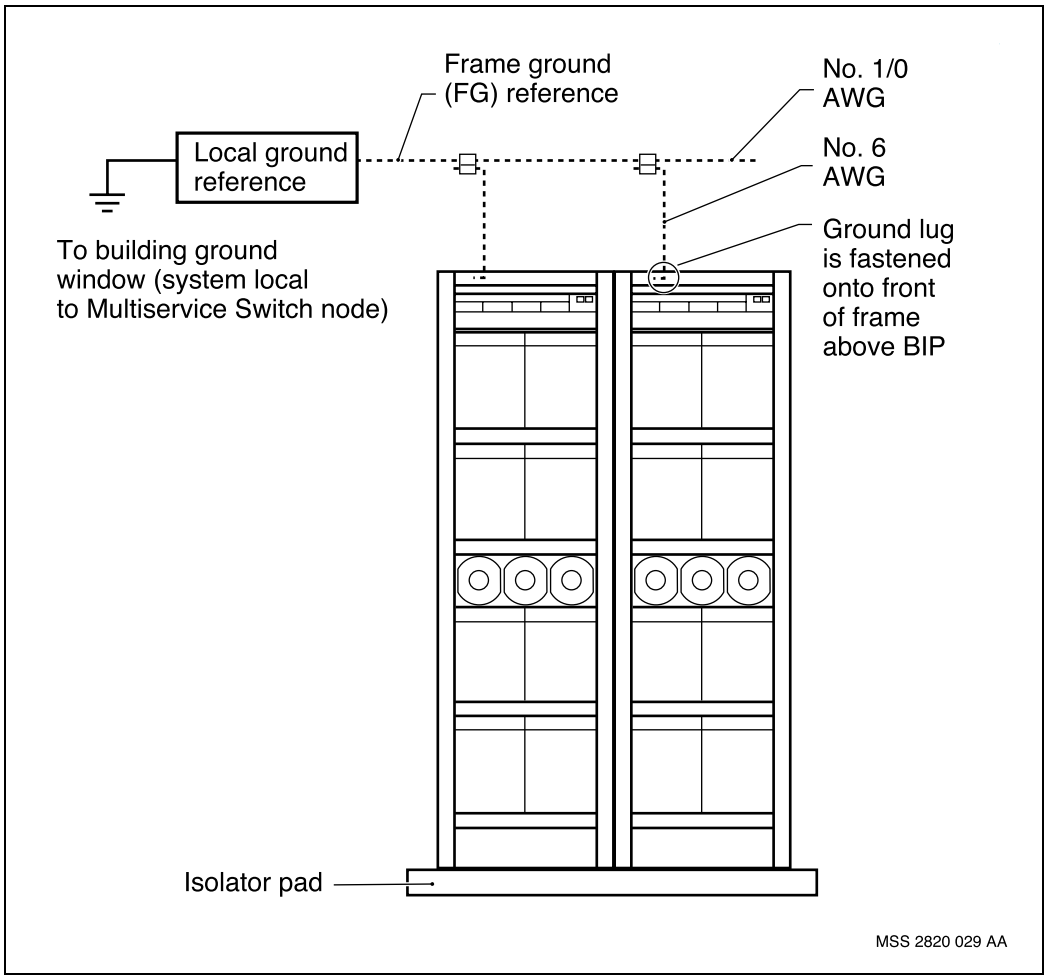
Procedure job aid

Top grounding for CBN, side view



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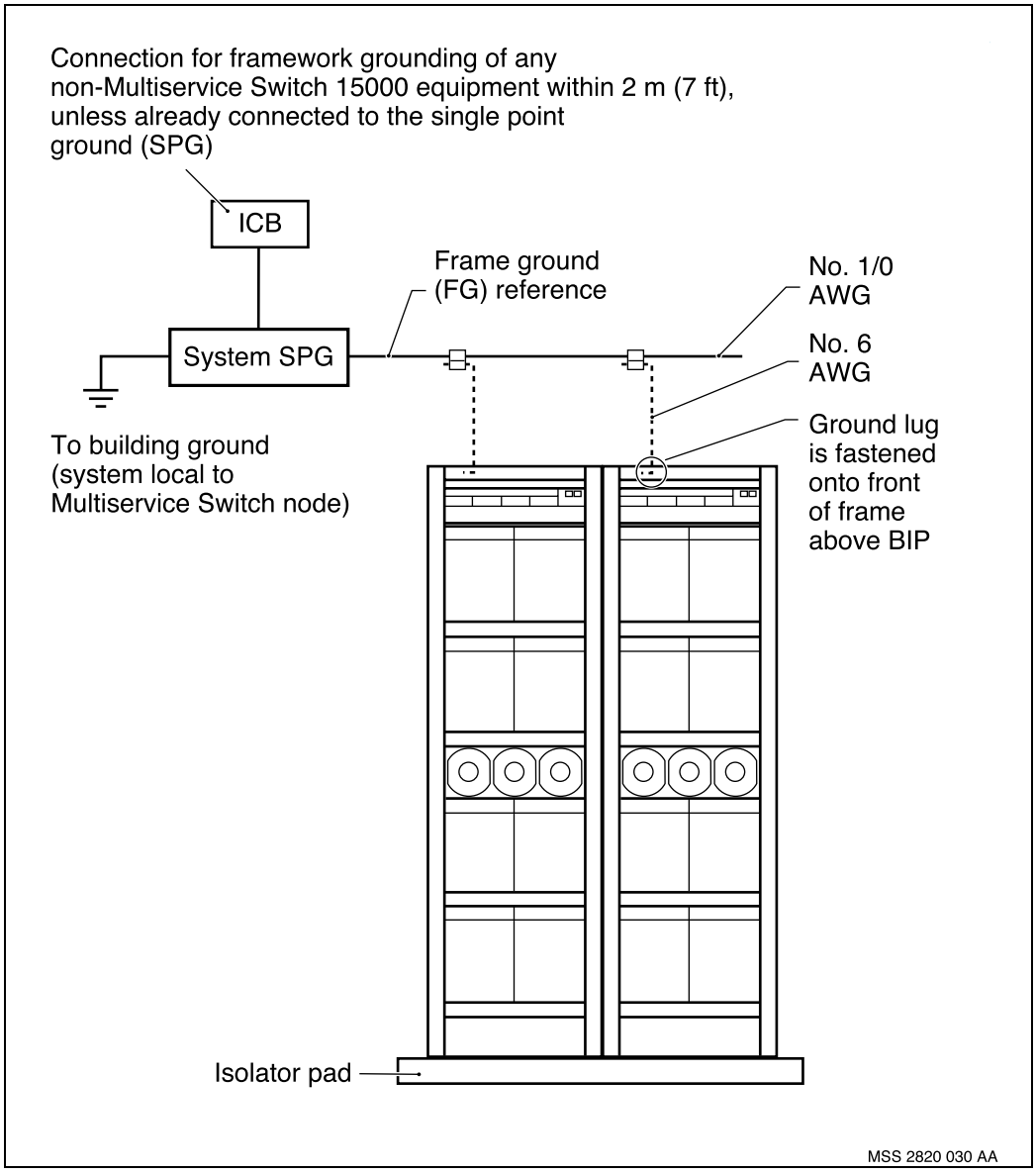
Top grounding for IBN, side view



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Installing a 19-inch sparing panel

Install a 19-inch wide sparing panel into a NEBS 2000 frame to use a Nortel Networks Multiservice Switch 7440 sparing panel, which is 19 inches wide.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You must install the appropriate adaptor brackets as described in Installing NEBS 2000 frame-to-EIA adapter brackets (page 513).
- This section applies to these sparing panels:
  - NTFP99, the 3-port DS3 or E3 sparing panel
  - NTHR79, the 4-port DS3 sparing panel
  - any of the DS1 or E1 19-inch sparing panels used with Media Gateway FPs
- Before installing a sparing panel into a NEBS 2000 frame, consider the following criteria for choosing an efficient and practical location of the panel within the frame.
  - For a NEBS 2000 frame with one switch, install the sparing or fanout panels on only the rear uprights and facing inwards.
  - Determine whether the panel will face into the frame or out of it. For example, outwardly facing panels with coax cables that have straight connectors will exceed the perimeter of the NEBS 2000 footprint. When adding sparing panels to a frame that already has a switch installed, mounting the sparing panels at the rear and facing inwards enables easier connection access for maintenance or redeployment of cables.
  - For one or more panels, determine the impact of the cable density that will be connected to each faceplate. Determine the accessibility to the faceplate especially to read cable connection information and if panels are to be installed on both sides of the frame. Confirm the routing path that the cables must follow to the FPs and the other end of the FP connection can safely accommodate the density of cables. Choose an optimum access and the least congested route.

Procedure steps

Step	Action
1	Unpack the sparing panel from its container.
2	At the front or rear of the NEBS 2000 frame, determine where on the 2 NTHW14 adapter brackets that the top mounting holes of the panel are to

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be. Count holes from the top or bottom (whichever is shorter) on both brackets to ensure a level installation. Mark the holes.

3 Hold the panel in one hand so that:

- the faceplate lettering reads right to left and top to bottom
- the connections face into or out of the frame as desired

4 Position the sparing panel against the brackets and align the mounting holes.

5 Thread an EIA thread-forming screw through the upper left and the upper right mounting ear holes of the sparing panel. Leave the fastener almost seated. Use the fasteners that were included with the panel because the 10-mm (3/8-in.) frame fasteners are too wide for thread-forming into the adapter brackets.

When turning a thread-forming screw into a hole for the first time, ensure that the screw is perpendicular to the hole.

On any other mounting apparatus, use whatever screws were provided and follow whatever instructions are provided with it.

6 Align the remaining mounting holes on the panel with the holes on the brackets and loosely tighten the remaining 2 screws.

7 Tighten all screws to snug plus a 1/4 turn. If you strip a hole or a fastener, you must move the sparing panel so that it has 4 firm fastenings.

--End--

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Installing a BIM

Install a breaker interface module (BIM) to control the power supply to the power interface modules (PIMs) and to the cooling unit or units.

Prerequisites

CAUTION
Risk of equipment damage by mixing BIMs
You must never mix a 20-amp BIM (NT6C60PA) and a 25-amp (AP6C67PA) together to power the same shelf. Mixing BIMs in a pair will damage the equipment.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a BIM with PEC AP6C67PA for a Multiservice Switch 20000, or NT6C60PA for a Multiservice Switch 15000. The PEC of a replacement BIM must match the PEC of the previous BIM. When adding a second switch to a NEBS 2000 frame, you need a pair of BIMs matched with the same PEC and matched to the hardware to which they will supply power. Refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* for the safe combinations of BIMs within a BIP.
- The BIMs of a BIP are typically shipped already installed, so initial installations may not require handling them.
- A BIP can contain the BIMs for a second switch before the switch is installed in the NEBS 2000 frame. That is, the BIP may have been shipped with the second pair already installed.

Procedure steps

Step	Action
1	When adding a pair of BIMs to power a second switch, the 2 left-hand BIM slots are likely to be covered by BIM filler plates (P0887704) at the front of the BIP. When the filler plates are present, you must: • unfasten the 2 slotted captive screws of the cover of the BIM captive screws as shown in the figure Physical characteristics of a BIM in a BIP (page 285) and let the cover swing down • remove each BIM filler plate by unfastening the large slotted captive screw at the front of the BIP • put the plates aside for re-use on another BIP
2	At the front of the BIP, grip the replacement BIM with the fingers and thumb of one hand on the lower front lip (the screw end) and use the other hand to align the rear of the module with the slot in the BIP.

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3 Push the module gently but firmly straight in until you feel it engage. Stop pushing when the front of the module is flush with the front of the BIP.

4 Align and fasten the large slotted captive screw of the module. Do not strip the threads or the hole because safety regulations require that the BIM be secured. Tighten the screw to snug plus a 1/5 turn.

5 Toggle on all of the breakers, one at a time, by pushing the bar symbol (|) in on each breaker.

6 Check the BIM status LEDs.

- If the color is other than green, have the network operator confirm the status in software.
- If the color is still other than green, contact your next higher level of technical support to identify what to do, replace the module or contact Nortel Networks.

7 Close the BIP screw cover upwards.

8 Fasten each of the 2 slotted captive screws on the cover about a 1/4 turn each until it stops.

--End--

Procedure job aid

Combinations of BIMs in a BIP

Shelf type	PEC of a BIP with 2 BIMs	PECs of the BIM pairs that can be installed
Multiservice Switch 15000	NT6C62	two or four 20-amp NT6C60PA for one or two Multiservice Switch 15000s or two 20-amp NT6C60PA for a Multiservice Switch 15000 in the lower half of the NEBS 2000 frame and two 25-amp AP6C67PA for a Multiservice Switch 20000 in the upper half of the NEBS 2000 frame
Multiservice Switch 20000	AP6C68	two or four 25-amp AP6C67PA for one or two Multiservice Switch 20000s or two 25-amp AP6C67PA for a Multiservice Switch 20000 in the lower half of the NEBS 2000 frame and two 20-amp NT6C60PA for a Multiservice Switch 15000 in the upper half of the NEBS 2000 frame

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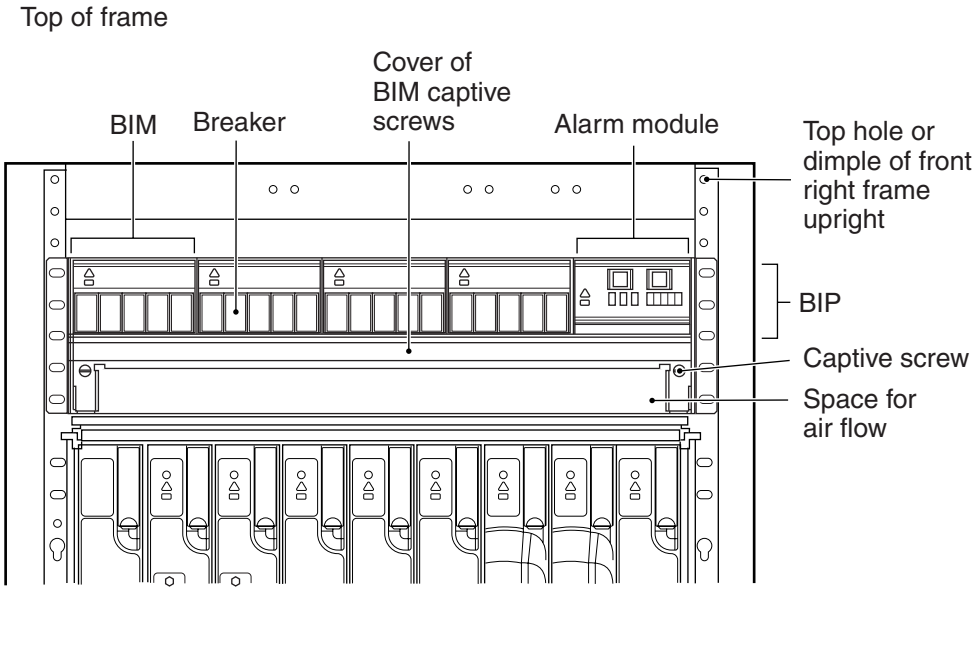
Physical characteristics of a BIM in a BIP



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Installing a BIP alarm module

Install a BIP alarm module as part of a replacement or initial installation task. The BIP alarm module indicates hardware alarms, drives the alarm LED board and monitors the state of the power breakers.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a BIP alarm module with PEC NT6C60PB.
- To minimize the effect of removing an alarm module, insert the replacement immediately. Once the alarm module is installed, the software alarms will soon stop.

Procedure steps

Step	Action
1	At the front of the BIP, grip the replacement alarm module with the fingers and thumb of one hand on the lower front lip (the screw end) and use the other hand to align the rear of the module with the opening in the BIP.
2	Push the module gently but firmly straight in until you feel it engage. Stop pushing when the front of the module is flush with the front of the BIP.
3	Engage and fasten the large slotted captive screw of the alarm module. Do not strip the threads or the hole because the module cannot seat properly.
4	Check the alarm module status LEDs. • If the color is other than green, have the network operator confirm the status in software. • If the color is still other than green, troubleshoot the problem.
5	Close the BIP screw cover upwards.
6	Align and fasten the slotted captive screws of the cover.

--End--

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Installing a BIP external alarm cable

Install a BIP external alarm cable from the BIP to a custom alarm indicator to enable the reporting of a hardware failure.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You must provide the appropriate BIP external alarm cable according to Assembling a BIP external alarm cable (page 159).
- To install an external alarm cable between the BIP and an MFA150 system of ac rectifiers, see Installing a BIP external alarm cable to an MFA150 (page 289).
- For a complete list of BIP alarm connections and their features, refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Locate the BIP connector at the rear of the BIP. For assistance, refer to the figure Locations of the alarm cable connectors and paths (page 288).
2	While holding the cable, align the appropriate connector on the cable with the connector on the BIP. Any connector fits only one way.
3	Press the connectors together firmly but gently so that the lip of the cable connector is even with the base of the BIP connector. For a D-sub connector, use a screw driver to fasten the 2 screws on either side of the connector. Tighten to snug (no extra turns). For a Berg connector, press until the tab on the side engages. For a MATE-N-LOK connector, press until the tabs on either end engage.
4	Route the cable from the BIP to the connector on the hardware at the other end.
5	Connect the other end of the cable to the appropriate connector.
6	Use tie-wraps to fasten the cable along the path between the endpoints.

--End--

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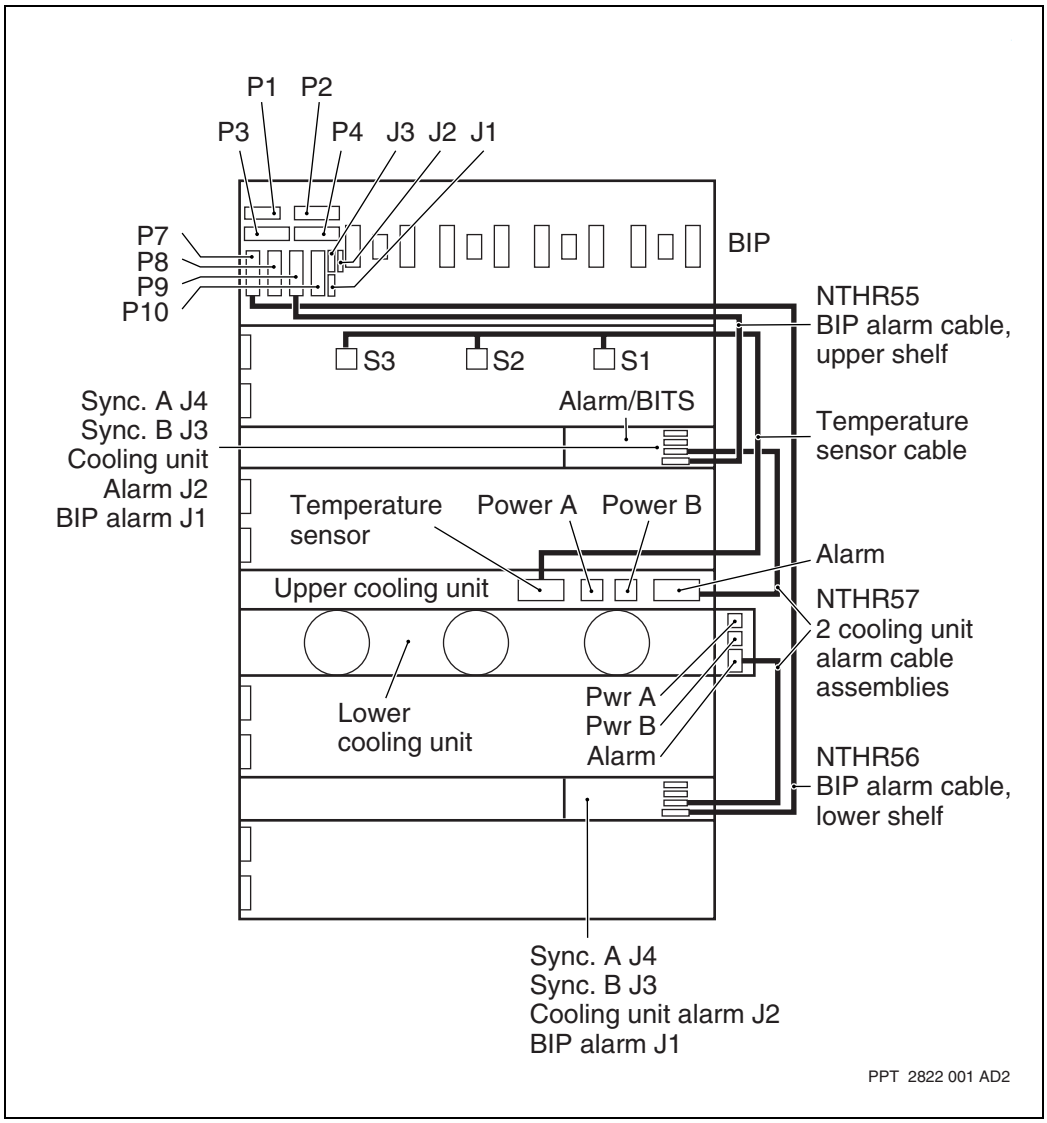
Procedure job aid

Locations of the alarm cable connectors and paths



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Installing a BIP external alarm cable to an MFA150

Install an external alarm cable from a BIP to an MFA150 to enable a failure in the power source to be indicated by BIP LEDs and reported to Nortel Networks Multiservice Data Manager software.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need an external alarm cable with part number P0940531.
- Before installing the cable at the MFA150 system, consider the safety information provided in Astec's document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*. Observe the requirements for electrical safety when connecting to the terminal blocks (TBn).
- The connection path is shown in the figure Connection path of the external alarm cable between the BIP and an MFA150 (page 291). The connection points of the cable assembly are shown in the figure Cable connection points of the alarm cable at the BIP and an MFA150 (page 292).

Procedure steps

Step	Action
1	Locate the BIP connector labelled J2 at the rear of the BIP. For assistance, refer to the figure "Locations of the alarm cable connectors and paths" (page 363). The connection end points of the alarm cable are identified in the table Pin-to-pin connections between an MFA150 controller card and a BIP (page 289).

Pin-to-pin connections between an MFA150 controller card and a BIP

At the MFA150	At the BIP	Type of alarm
terminal block TB2: pin 1 for the black wire, pins 2 and 4 for the red wire, no connection (NC) for the white and the green wires	J2, pin 2, L-	major

2	While holding the cable P0940531, align the Berg connector on the cable with the connector on the BIP. The connectors fit only one way.

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3 Press the connectors together firmly but gently until the tab on the side engages. See the J2 inset in the figure Cable connection points of the alarm cable at the BIP and an MFA150 (page 292).

4 Route the cable from the BIP up to the controller of feed A at the MFA150. Loosely fasten tie-wraps to secure the cable assembly along the path.

5 Determine the distance between TB2 for feed A and TB2 for feed B in the same controller. Cut 2 wires of 22 AWG (0.326 mm^2) to be used for daisy chaining between the TB2s. See the wiring of the terminal blocks in the figure Cable connection points of the alarm cable at the BIP and an MFA150 (page 292).

6 Prepare the ends of the black and the red wires in the cable assembly and the 2 daisy-chain wires for insertion into TB2 according to Astec's document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*. For example, twist the wire strands of both wires together or solder them. Ensure that the resulting connections can each fit the TB2 receptacles.

7 Cut the ends of the green and white wires in the cable assembly and cover the ends with electrical tape to safely insulate each one from contact.

8 Pass the cluster of wires into the controller up to the controller card for power feed A. To identify the point of access, refer to Astec's installation document.

9 Connect the wires of the cable assembly to the TB2 terminal blocks of the controller cards for power feeds A and B as shown in the figure Cable connection points of the alarm cable at the BIP and an MFA150 (page 292).

10 When more than one controller is used (that is, for more than one switch), daisy chain the TB2 terminal blocks between controllers with 22 AWG (0.326 mm^2) wire.

11 Check each wire connection at the TB2 terminal blocks and grounding points to ensure a firm contact.

12 Tighten the tie-wraps along the cable path.

13

--End--

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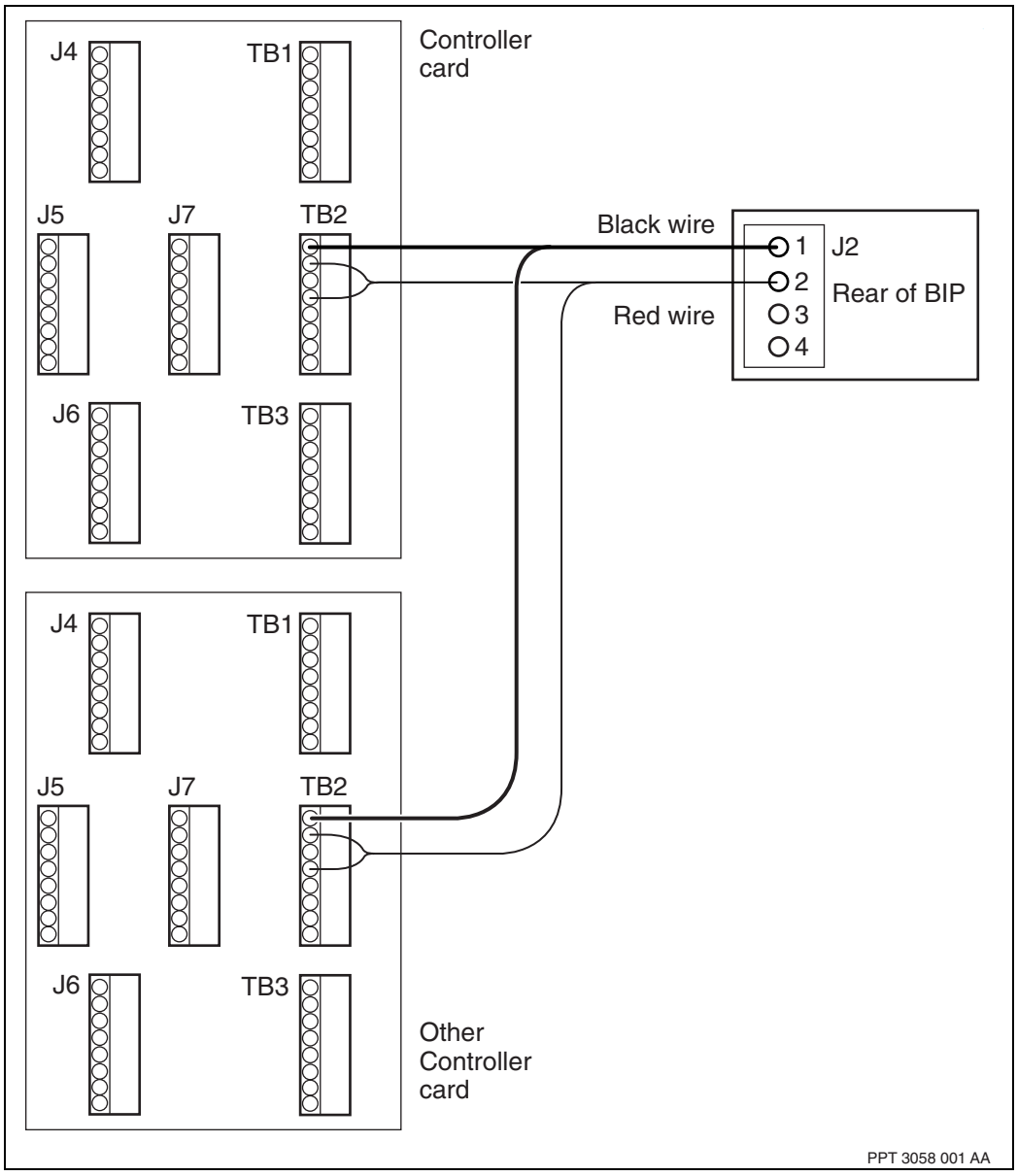
Procedure job aid

Connection path of the external alarm cable between the BIP and an MFA150



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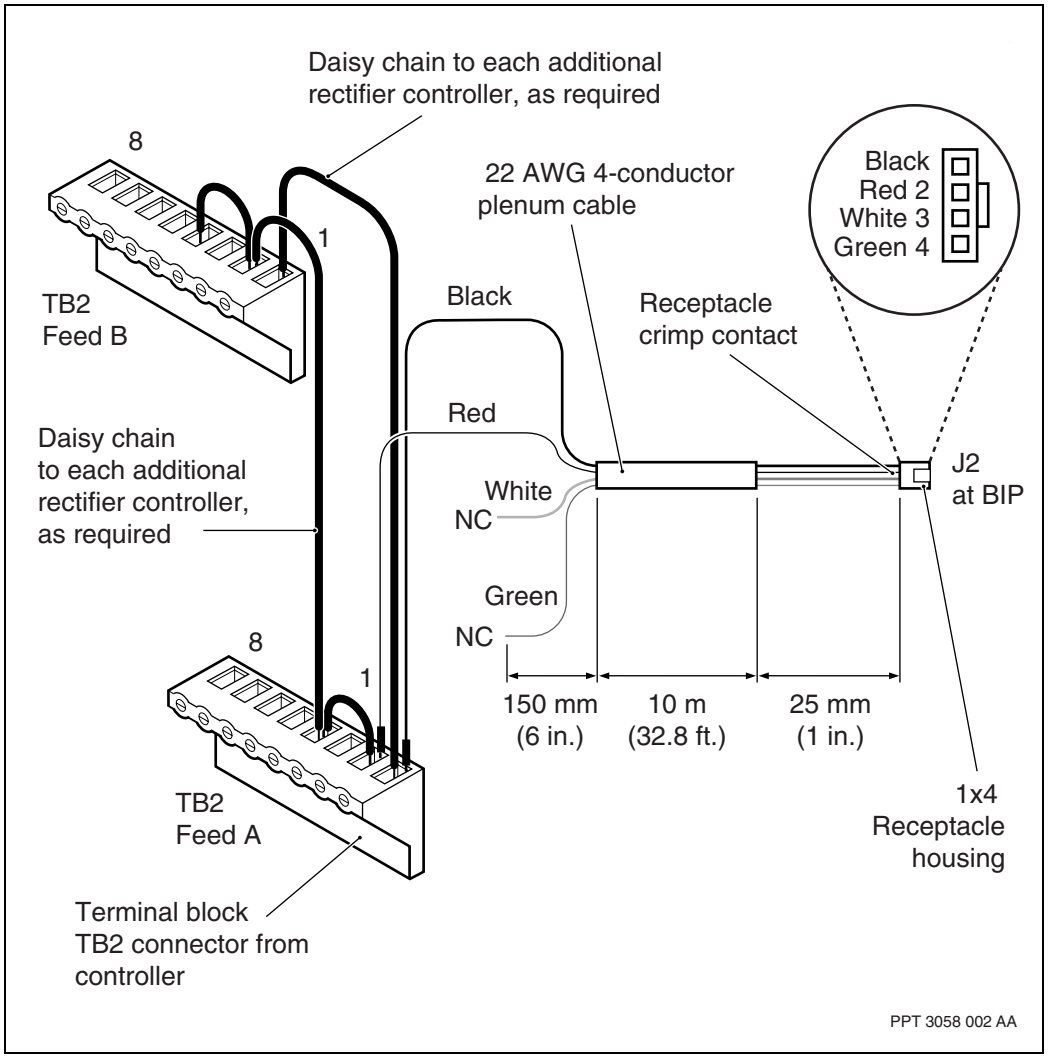
Cable connection points of the alarm cable at the BIP and an MFA150



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Installing a BIP onto a NEBS 2000 frame

Install a BIP onto a NEBS 2000 frame to enable powering up one or two shelf nodes.

Prerequisites

CAUTION
Risk of equipment damage from dropping
The various BIPs weigh up to about 16 kg (36 lbs). The weight of a free-falling BIP can damage it. As the mounting screws of the BIP are being unfastened, do not allow the BIP to drop onto the shelf assembly.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a BIP with one of the following PECs:
  - NT6C62 for a frame with one Multiservice Switch 15000
  - NT6C61 for a frame with two Multiservice Switch 15000s
  - AP6C68 for a frame with one Multiservice Switch 20000
  - AP6C67 for a frame with two Multiservice Switch 20000s
  - AP6C67 for a frame with one Multiservice Switch 20000 and one Multiservice Switch 15000, with the appropriately matched BIM pairs inside the BIP to match the upper or lower position of the node (refer to BIM replacement (page 126))
- BIMs and the alarm module are typically shipped already installed in the BIP.
- You need a helper to support the weight of the BIP until it is fastened into position, even if you remove the BIMs.

Procedure steps

Step	Action
1	Hold the BIP so that the mounting ears are at the sides and nearest you. If the BIMs and the alarm module were shipped or stored inside the BIP, remove them. Remember where to put them back in case there is a mix of BIM pairs.
2	While facing the front of the mounting apparatus, insert the BIP between the uprights of a NEBS 2000 frame or the adapter brackets on a 23-inch EIA rack and above the shelf.

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3 Gently lower the BIP until the bottom edge of its mounting ears touch the top edge of the shelf mounting ears. Prevent the weight of the BIP from resting on the shelf.

4 Align the screw holes on the 2 mounting ears with the nearest holes on the outside face of the uprights or the adapter brackets. Partially fasten a 10-mm (3/8-in.) thread-forming hex-head screw through the upper left mounting-ear hole.

5 Loosely fasten another screw through the lower right mounting-ear hole, then the remaining 2.

6 Center the unit, then tighten all 4 screws to snug plus a 1/4 turn.

7 If modules were removed from the BIP, put them back in the same place and orientation as shown in the figure Orientation of plug-in modules in a BIP (page 295).

8 If the BIP is installed in a mounting apparatus other than a NEBS 2000 frame, ground the BIP chassis to the apparatus by firmly attaching a ground of minimum size 6 AWG cable E/W (13.3 mm^2) between the studs and the common grounding point. The stud nuts on the chassis are number 10-32 unc and are provided with star washers on the studs. There is no metric equivalent to the stud nuts. Use the star washers between the lug and the grounding point. Do not overtighten the nuts.

--End--

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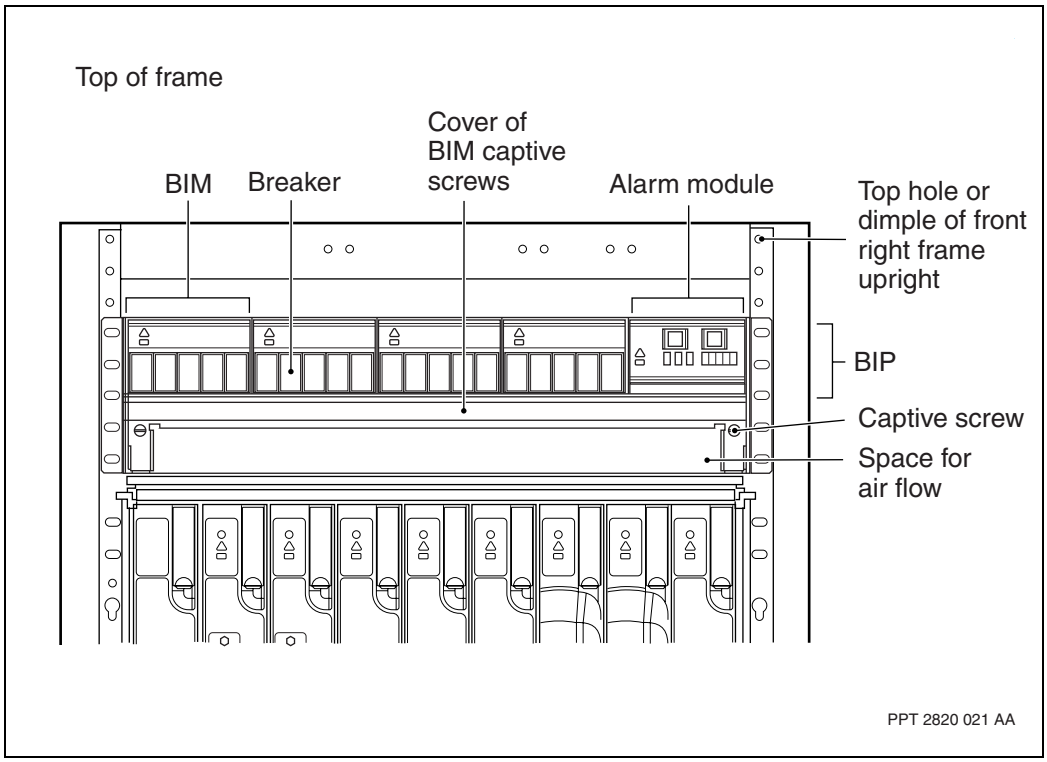
Procedure job aid

Orientation of plug-in modules in a BIP



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Installing a BITS cable

Install a BITS cable from the timing source directly to the alarm/BITS module or to a prefabricated cable assembly to enable network synchronization with the node.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The prefabricated alarm/BITS timing cables that you can connect to include:
  - NTHR75
  - NTHW75
  - NTPN81
- When your timing connection requires a cable that connects directly to the alarm/BITS module or connects to one of the prefabricated timing cable assemblies, you need a custom-made BITS cable. See Making a BITS cable (page 526).
- The BITS wire pairs from the site's B reference timing source plug into the J3 receptacle and the A reference timing source plug into the J4 receptacle. J3 and J4 are located on the alarm/BITS module at the rear of the NEBS 2000 frame. The alarm/BITS module receptacle connects to a male 9-pin D-sub (DB9) connector directly from a site source or as part of the prefabricated cable assemblies. For a redundant timing setup (using both the A and the B timing references), a DB9 connector is needed for each reference at J3 and J4.

Procedure steps

Step	Action
1	Test the signal strength of the site source at the end of the cable before connecting it to J 3 and J4 of the alarm/BITS module. The signal strength must be within the range indicated in Making a BITS cable (page 526). If the signal is not within the range, fix the problem between the point of test and the site source. Depending on the length of cable from the site source, you many need a thicker gauge cable to ensure the signal strength.
2	At the alarm/BITS module, plug the female D-sub connector of the timing wire labeled reference B into the connector beside the label J3. See the figure Location of alarm/BITS module and cable connections in a Multiservice Switch 15000 (page 298) or Location of alarm/BITS module and cable connections for a Multiservice Switch 20000 (page 550). If the alarm/BITS module on a Multiservice Switch 15000 is either an NTHR12 or NTHR13, it has factory-installed inline EMI filters attached to the

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J3 and J4 connectors as shown in the figure An EMI filter on an alarm/BITS connector for a Multiservice Switch 15000 (page 300). If the EMI filters are missing, add them as described in Installing EMI filters on the alarm/BITS module (page 489).

3 Fasten the 2 small slotted screws of the D-sub connector to the alarm/BITS module.

4 For a switch using the redundant timing setup, plug the female D-sub connector of the timing wire labeled reference A into the connector beside the label J4.

5 Fasten the 2 small slotted screws of the other D-sub connector to the alarm/BITS module.

The operation of the timing signals inside the switch will be verified after the network synchronization is configured and the timing tests pass.

--End--

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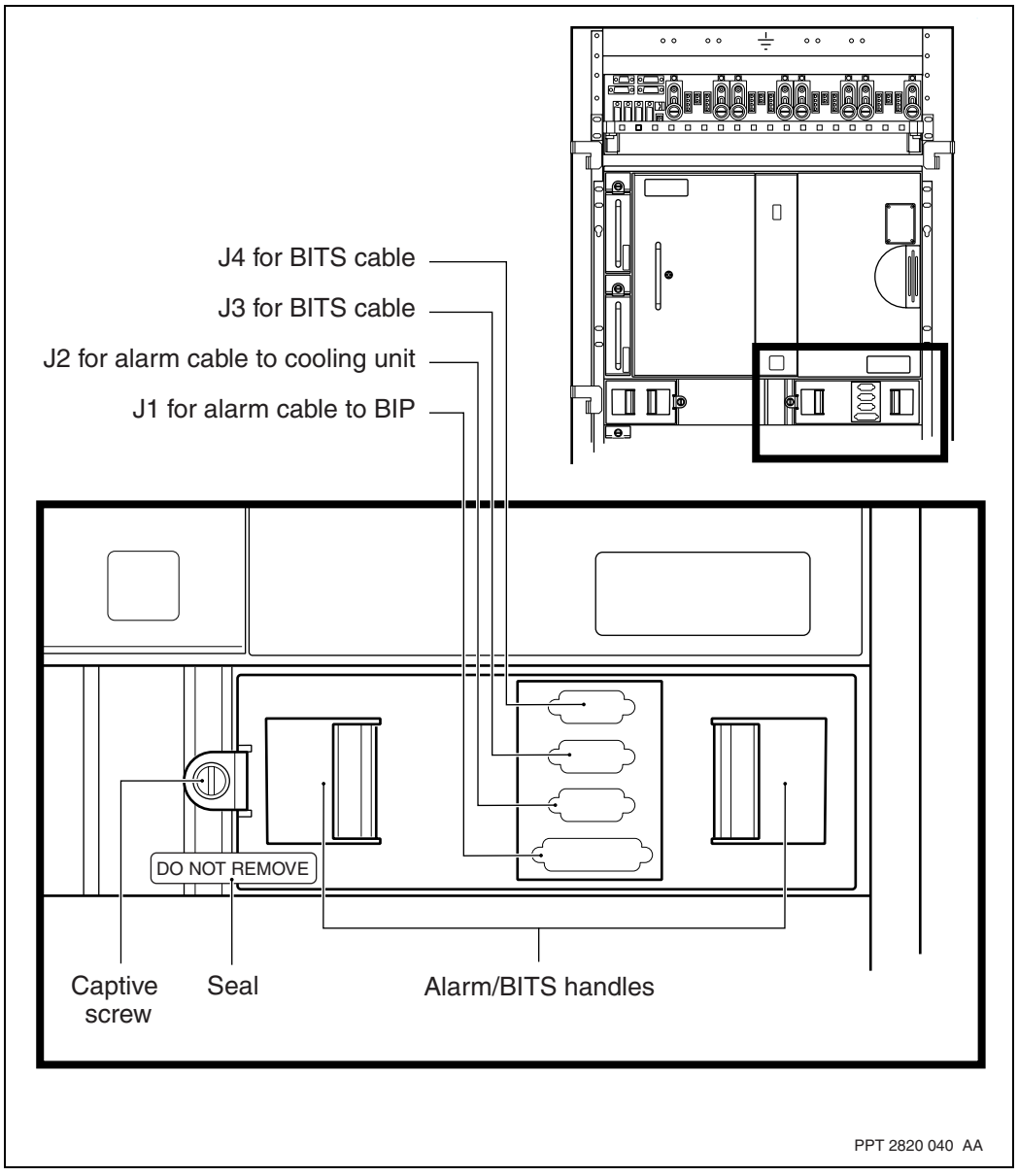
Procedure job aid

Location of alarm/BITS module and cable connections in a Multiservice Switch 15000



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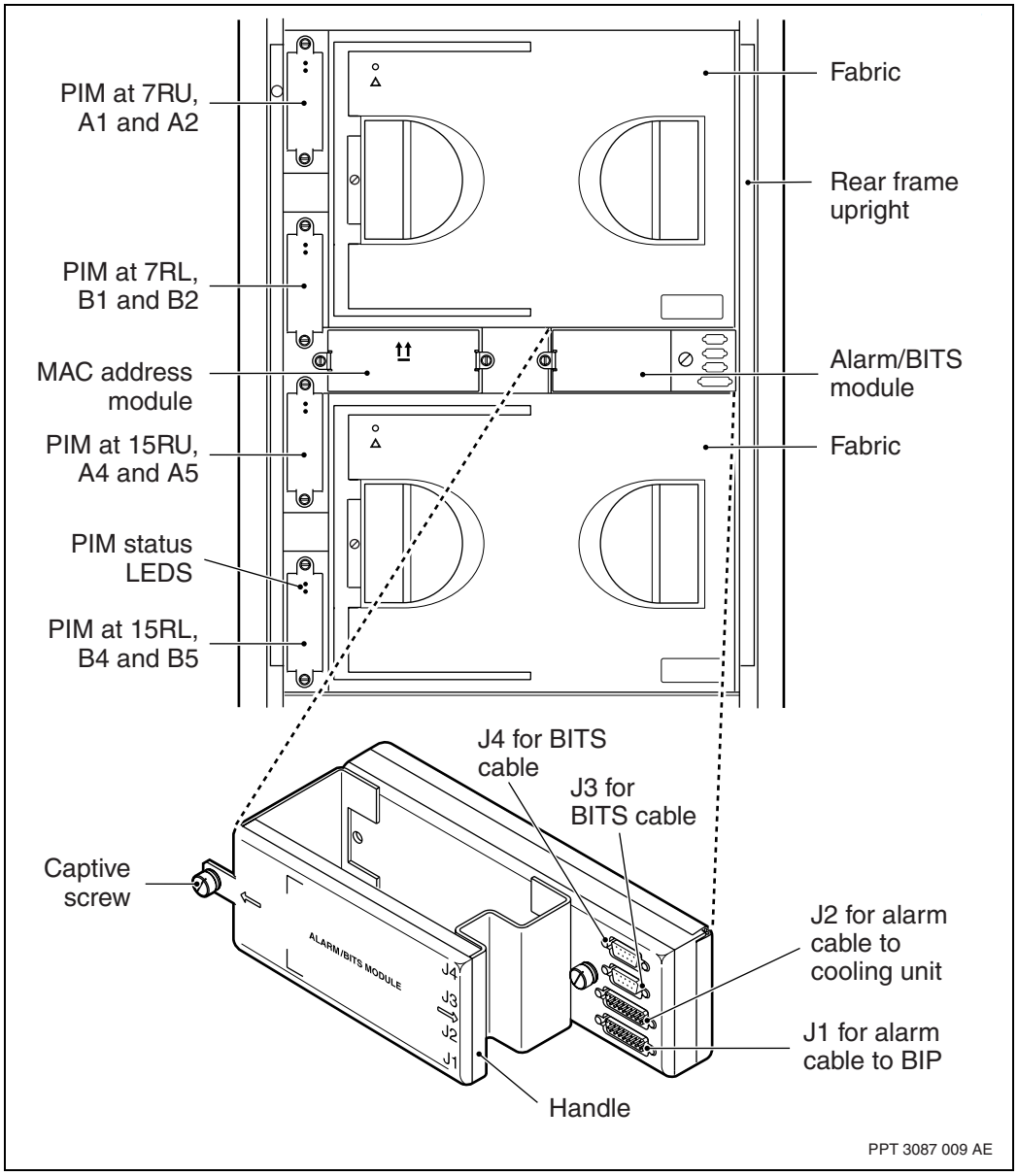
Location of alarm/BITS module and cable connections in a Multiservice Switch 20000



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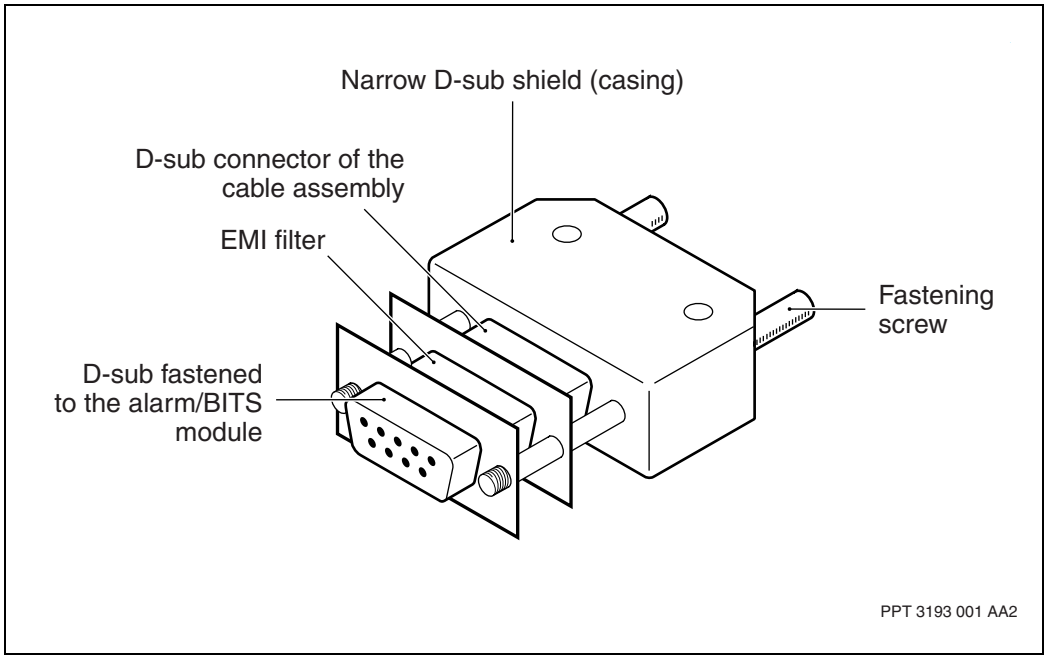
An EMI filter on an alarm/BITS connector for a Multiservice Switch 15000



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Installing a blank processor card

Install a blank processor card into an empty slot to ensure the effectiveness of the cooling air flow and to maximize containment of electromagnetic interference (EMI).

Prerequisites

CAUTION
Risk of service degradation or equipment damage
Always have a blank processor card (labeled BLANK) in a slot that does not house another card. The blank cards enable efficient performance of the fans for temperature control and also facilitate fire protection and EMI containment.

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a blank processor card with PEC NTHR64. The faceplate is labeled BLANK. See the figure Blank processor card NTHR64 (page 302). This card is also referred to as a filler module.
- Slots 0E and 1E are reserved for later development and must contain blank cards in the meantime. Blank processor cards for these slots are typically installed before a shelf is shipped.

Procedure steps

Step	Action
1	Locate an empty CP or FP slot in any cage.
2	At the ends of the faceplate, swing each latch fully open by pinching the inner edge of the latch and lifting away from the faceplate. Refer to the figure Open card latches on a CP, FP, or blank processor card (page 467).
3	While holding each latch open horizontally, gently slide the card inwards until it stops and the faceplate is flush with the shelf edges above and below it.

CAUTION
Risk of damage to the backplane from seating a card
When latching a card into its final seating position, the card latches must be closed simultaneously to ensure that the card evenly engages the gaskets and pins on the backplane. Otherwise, improperly seating a card can damage the backplane hardware such that the slot becomes unusable. Restoring a slot to service from this kind of damage means replacing the shelf assembly.

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4 Close both latches simultaneously until they are flush against the faceplate as shown in the figure Blank processor card NTHR64 (page 302).

When a latch will not sit flush against the faceplate, do not force it. Fully open both latches, slide the card out to disengage contact from the backplane, and return to step 3.

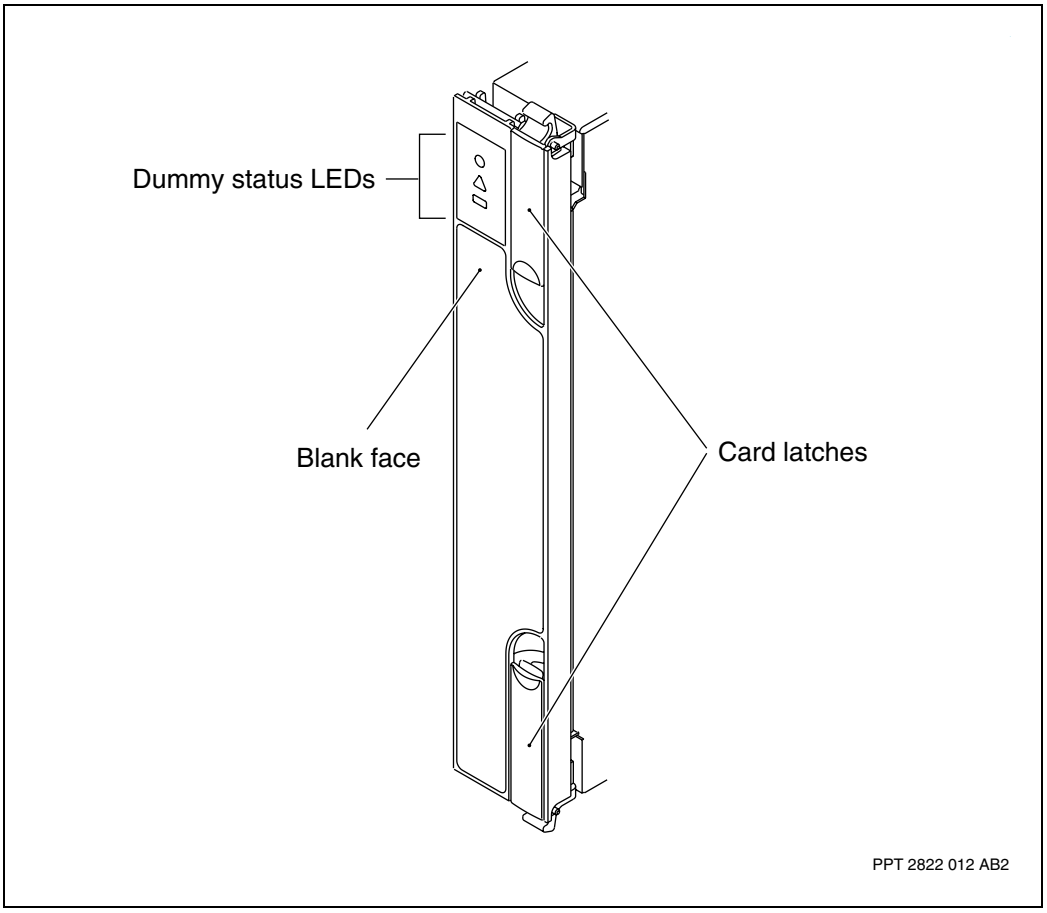
When a latch does not sit flush after a second attempt, abort the seating and contact your next higher level of technical support.

5 Repeat step 1 to step 4 for each remaining empty CP or FP slot.

--End--

Procedure job aid

Blank processor card NTHR64



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Installing a brandline cover or a top cover

Install a brandline cover or a top cover onto a top frame bracket that is mounted onto a NEBS 2000 frame bracket. When enclosing a frame with doors, install the cover on the rear of the frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a brandline cover NTPN51 or a top cover that is part of kit NTRU0185. (If you have a brandline cover with an amber LED lens on it, use the procedure “Installing an illuminated brandline cover” in the document P0608794 “Installing an illuminated brandline cover onto a NEBS 2000 frame”.)
- A brandline cover has words on it and is typically mounted at the front of the frame at the factory. A top cover is a blank cover and is typically to be mounted at the rear of the frame after the frame is anchored and cabled for power. Either cover can be mounted in the front or rear position. Refer to the figure Locations of installed brandline covers and top frame brackets (page 462).

Procedure steps

Step	Action
1	Hold the brandline or top cover so that: • the captive screw heads face you • the words read correctly (brandline only)
2	Fasten each captive screw of the cover to each of the 2 mounting brackets at the ends of the top frame bracket P0876758 as shown in the figures • Orientation of an upper door hinge and an extension bracket (page 304) • Orientation of an upper door catch and an extension bracket (page 305)

--End--

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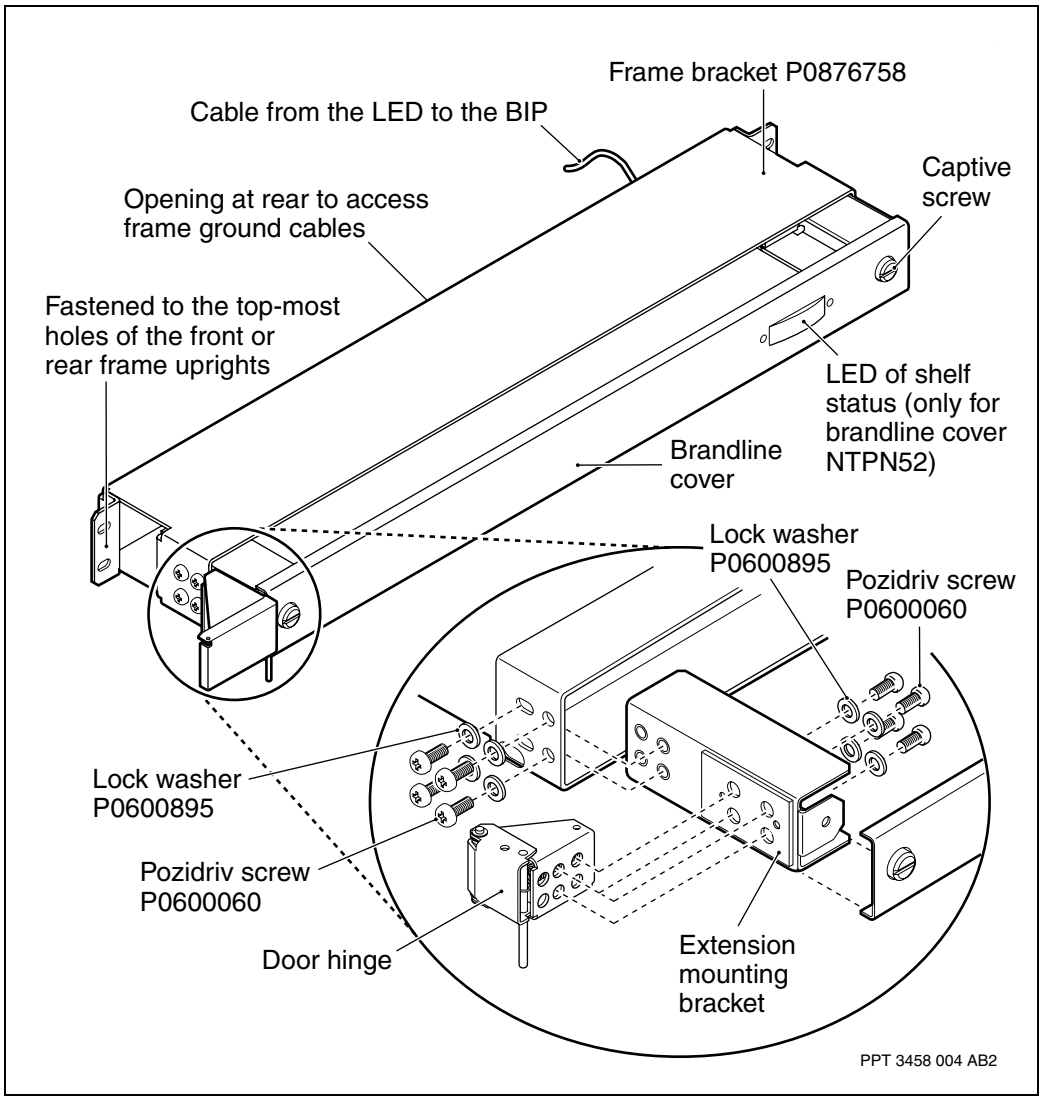
Procedure job aid

Orientation of an upper door hinge and an extension bracket



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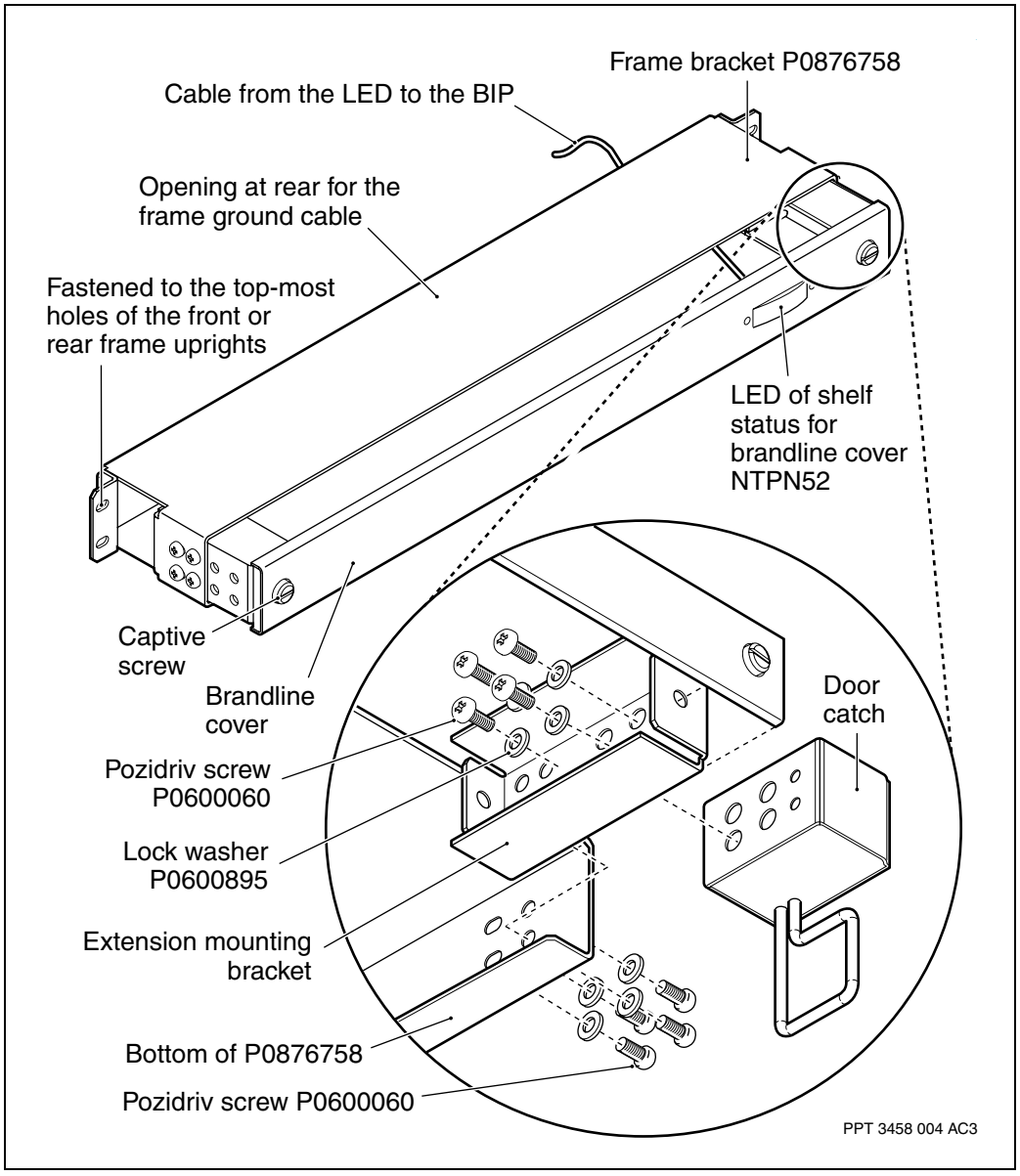
Orientation of an upper door catch and an extension bracket



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Installing a CP

Install a CP into an empty CP slot to enable switch operation or to resume back-up for the active CP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a CP with one of the following PECs:
  - NTHR06 for a DS1 CP2E BITS interface
  - NTHR35 for an E1 CP2E BITS interface
  - NTHW06 for a DS1 CP3 BITS interface
  - NTHW08 for an E1 CP3 BITS interface
- For a Multiservice Switch 15000 or Multiservice Switch 20000, install the first CP in slot 0 and the second in slot 1. Refer to the figure Location of CPs in a lower Multiservice Switch (page 308). (Slots 0E and 1E are reserved for later development.)

Procedure steps

Step	Action
1	If there is a blank processor card in slot 0 (zero) or 1 (one) where the CP is to be installed, remove it according to Removing a blank processor card (page 551).
2	At the ends of the faceplate, swing each latch fully open by pinching the inner edge of the latch and lifting away from the faceplate. Refer to the figure Open card latches on a CP, FP, or blank processor card (page 467).
3	While holding the CP by its top and bottom edges with the latches on the right side of the faceplate, align the end with the backplane pins to the tracks in the slot.
4	Gently slide the CP into the slot until the CP stops moving. There are keyways and guide pins to ensure that the CP aligns with the connections at the backplane (inside at the rear of the shelf). If you feel resistance, do not force the CP in. Remove it, and check the backplane at the rear of the slot for bent pins. You may need a flashlight to see into the slot. If no pins are bent, re-seat the CP. If any pin is bent, do not insert a CP and contact your technical support representative of Nortel Networks.

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CAUTION

Risk of damage to the backplane from seating a card

When latching a card into its final seating position, the card latches must be closed simultaneously to ensure that the card evenly engages the gaskets and pins on the backplane. Otherwise, improperly seating a card can damage the backplane hardware such that the slot becomes unusable. Restoring a slot to service from this kind of damage means replacing the shelf assembly.

5 Close both latches simultaneously until they are flush against the faceplate. Refer to the figure Closed card latches on a CP, FP, or blank processor card (page 468).

When a latch will not sit flush against the faceplate, do not force it. Fully open both latches, slide the card out to disengage contact from the backplane, and return to step 3.

When a latch does not sit flush after a second attempt, abort the seating and contact your next higher level of technical support.

6 If the shelf is powered, wait until the LEDs cycle to eventually become solid or fast flashing green to indicate in service.

If the LED is any other color after 5 minutes, there is a problem with the CP. Refer to NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting* to diagnose and fix the CP problem.

--End--

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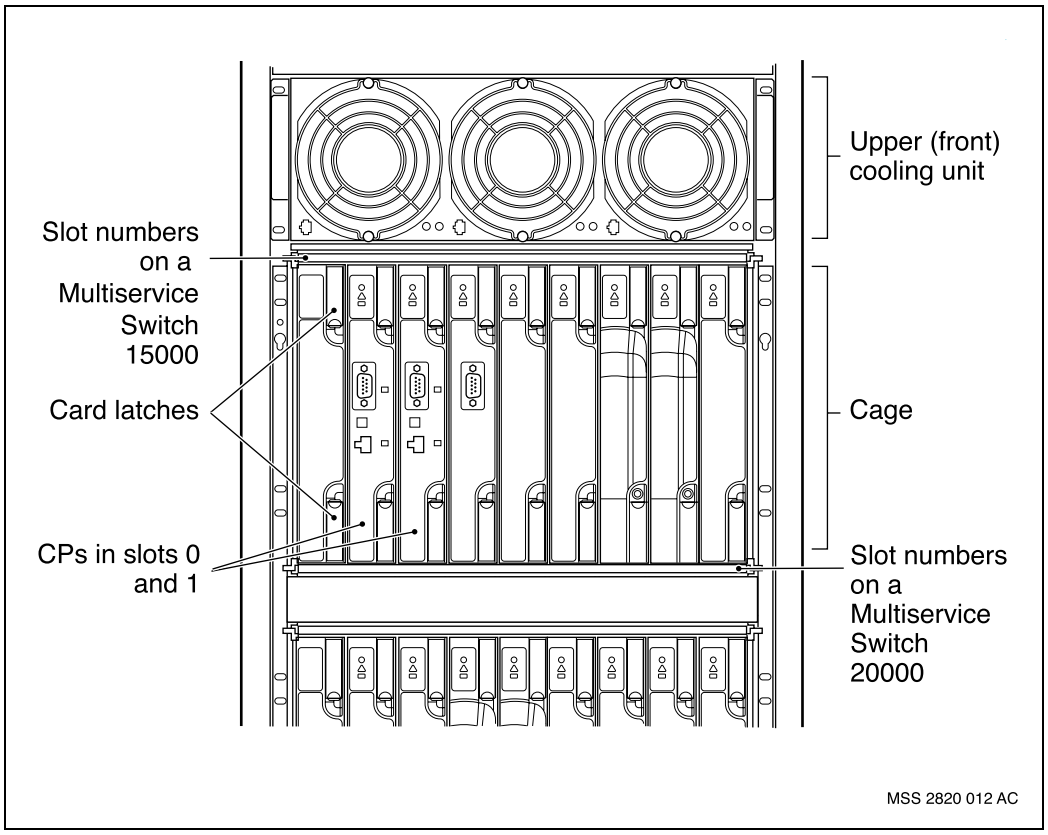
Procedure job aid

Location of CPs in a lower Multiservice Switch



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Installing a cosmetic extension filler

Install a cosmetic extension filler onto the lower left and right of the base of a NEBS 2000 frame at its front or rear (or both) as part of enclosing a frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need 2 cosmetic extension fillers from kit NTRU0192 as shown in the figure A cosmetic extension filler P0884951 (page 310) and a bracket as shown in the figure A lower right extension bracket P0995493 (page 311) and its left version P0995494. A filler is the same shape and orientation for either the left or right side of the frame.
- For two cosmetic fillers, you need 4 Pozidriv screws P0600060, 12 P0600061, and 16 lock washers P0600895 from kit NTPX4060 as shown in the figure Types of screws used with frame enclosure hardware (page 74).

Procedure steps

Step	Action
1	Loosely fasten 6 Pozidriv 16-mm screws P0600061 each with a lock washer P0600895 through the lower right extension bracket P0995493 from inside the base of the frame as shown in the figure Orientation of a cosmetic filler, a lower door catch, and a lower right extension bracket (page 312). Drive the screws from the inside of the frame base to the outside.
2	Align the holes of the filler with the holes on the outside of the lower right extension bracket as shown in the figure Orientation of a cosmetic filler, a lower door catch, and a lower right extension bracket (page 312).
3	Loosely fasten the filler to the extension bracket with 2 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895. Drive the screws from the direction shown in the figure.
4	Tighten all screws to snug plus a 1/4 turn.
5	Repeat step 1 to step 4 for the lower left side using the figure Orientation of a cosmetic filler, a lower door hinge, and a lower left extension bracket (page 313).

--End--

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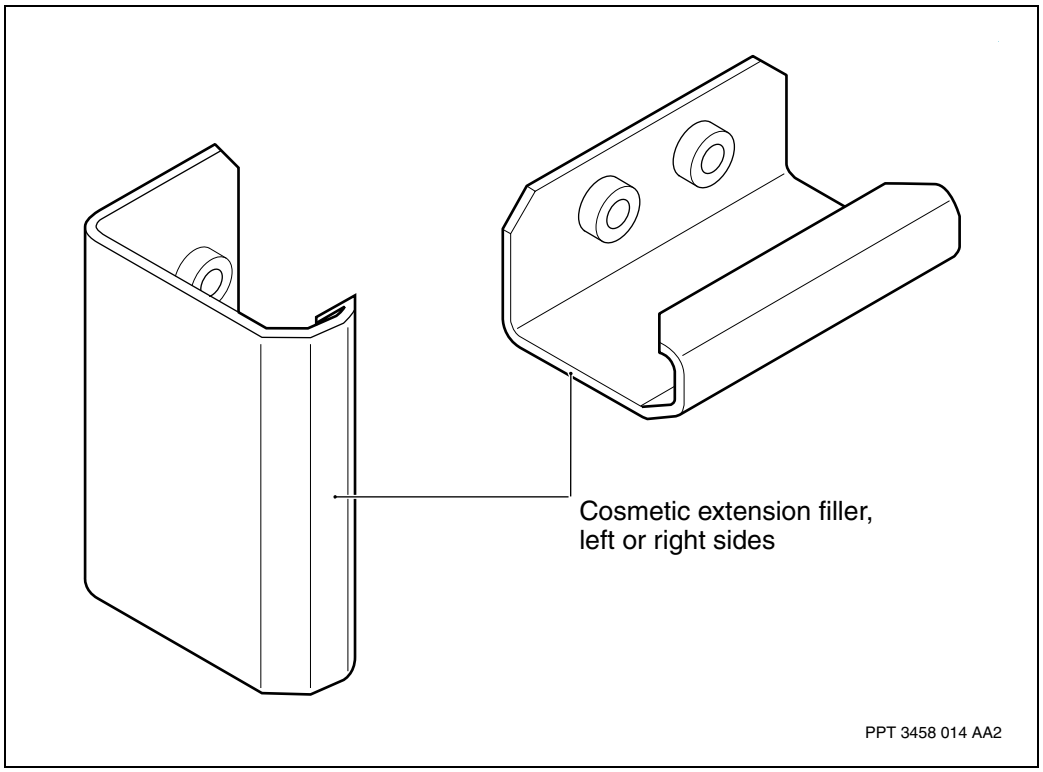
Procedure job aid

A cosmetic extension filler P0884951



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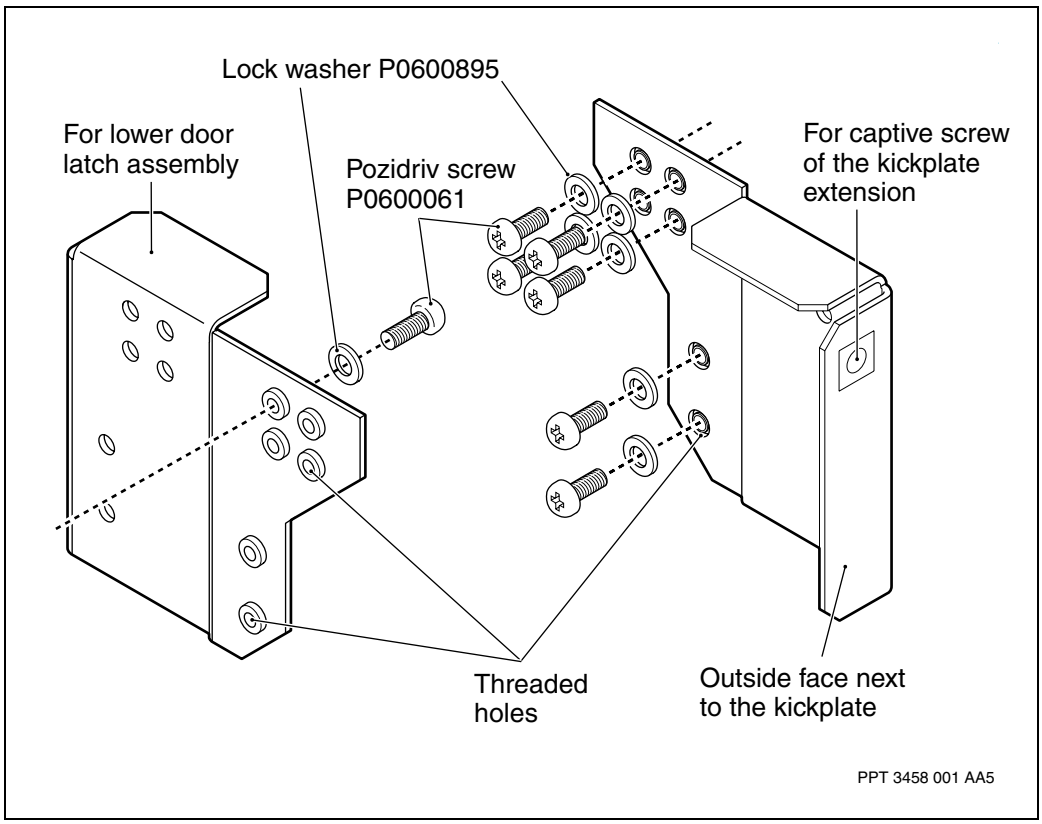
A lower right extension bracket P0995493



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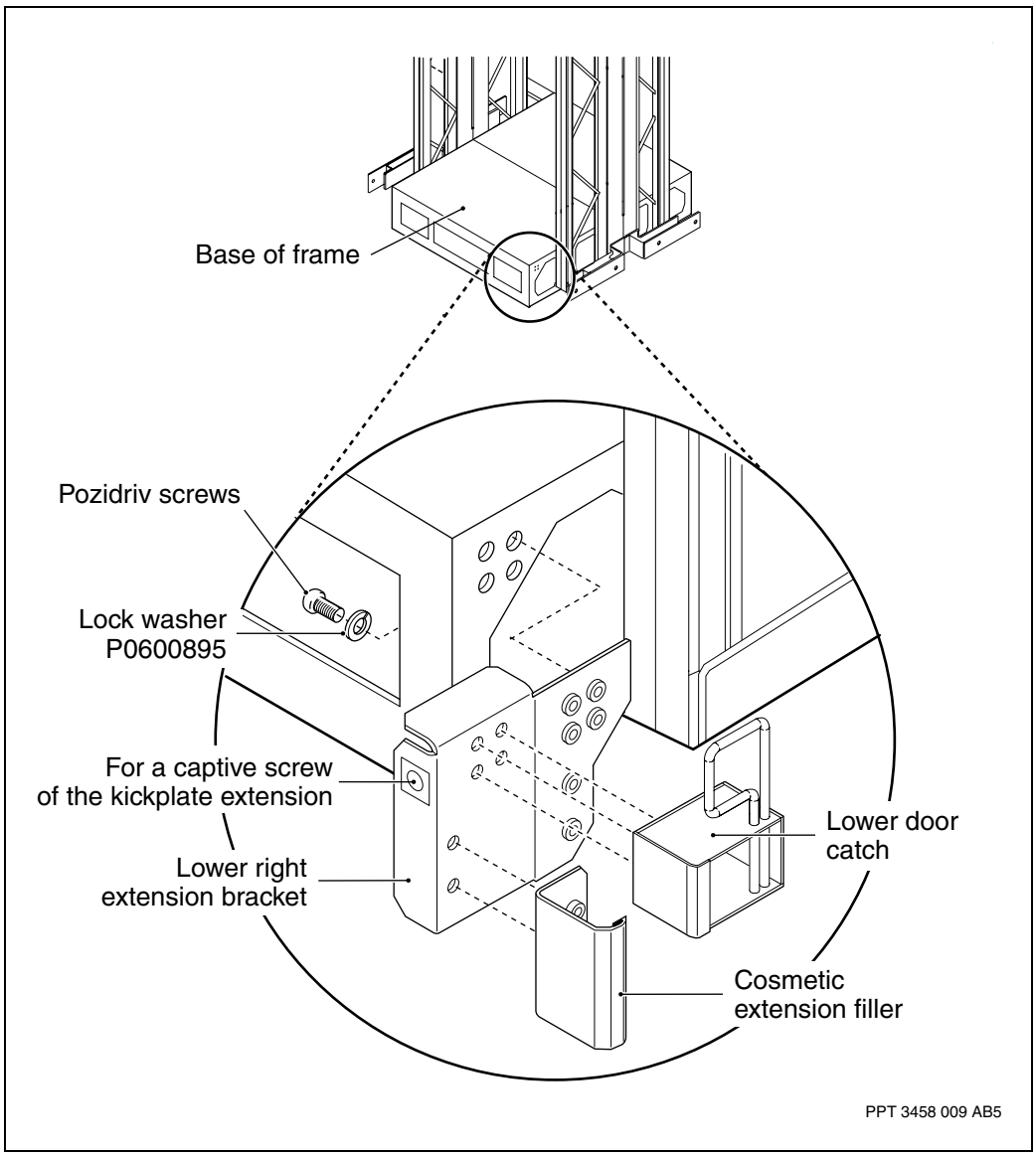
Orientation of a cosmetic filler, a lower door catch, and a lower right extension bracket



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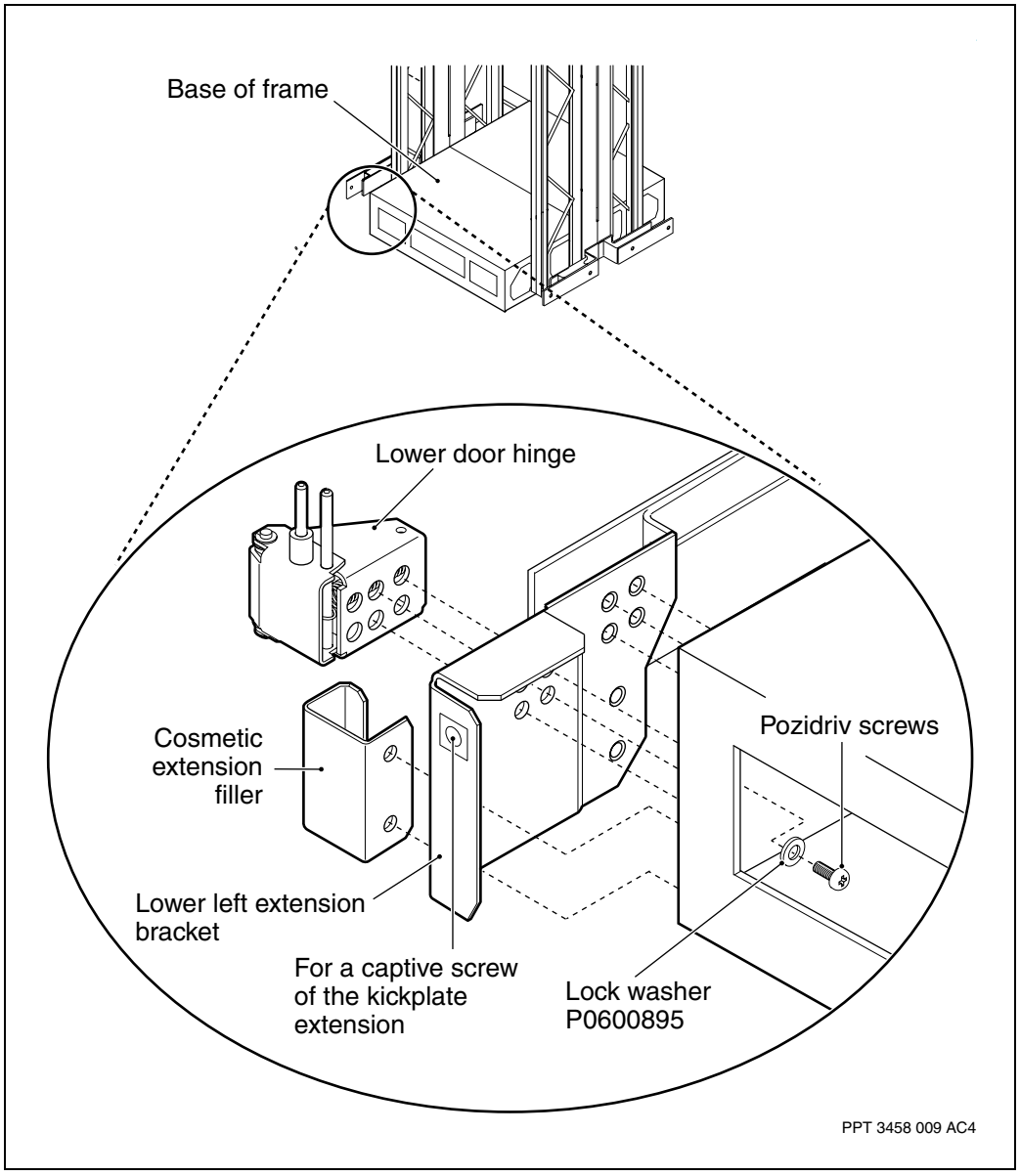
Orientation of a cosmetic filler, a lower door hinge, and a lower left extension bracket



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Installing a door

Install a door onto a NEBS 2000 frame to control access to equipment inside the frame.

Prerequisites

WARNING

Risk of injury or equipment damage by dropping a door

The size and weight of a door can make it awkward for one person to handle it safely while attempting to install or remove it. Dropping a door can injure a head or a foot, can damage whatever it hits, or be damaged on impact. Have a helper assist handling the 18 kg (40 lbs) door.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Fall einer Tür

Aufgrund der Größe und des Gewichts der Türen sollte die Installation oder das Entfernen einer Tür stets von mindestens 2 Personen durchgeführt werden. Das Fallenlassen oder die unsachgemäße Handhabung der 18 kg schweren Tür kann zu Kopf- und Fußverletzungen, Verletzung anderer Personen sowie Sachbeschädigung oder Beschädigung der Tür selbst führen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a door from kit NTRU0192 as shown in the figures:
  - — A lockable vented door NTRU0423, inside view (page 316)
  - — A lockable vented door NTRU0423, outside view (page 317)
- The door keys are the same for all NTRU0423 doors on NEBS 2000 frames.

Procedure steps

Step	Action
1	Align the hole at the lower right corner of the door with the lower hinge pin as shown in the figures • A lower door hinge P0884947 (page 318) • Orientation of a door with frame enclosure hardware (page 319)
2	Insert the door over the pin. Keep holding the door.

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3 Roughly align the upper door pin with the pair of holes in the upper door hinge as shown in the figures

- An upper door hinge P0884031 (page 320)
- Orientation of a door with frame enclosure hardware (page 319)

4 While still holding the door, compress the door pin spring downwards until the tip of the pin passes the edge of the door. Refer to the inset of the figure A lockable vented door NTRU0423, inside view (page 316).

5 Align the door pin with the bottom hole of the upper door hinge and release the spring.

6 Before releasing the door, check that the door is still on the lower hinge (not on the door stop) and through the upper hinge.

7 For an initial installation, untape the ground cable from the door. Ensure that you do not damage or loosen the connection. Go to step 8.

When installing a door after removing it to access equipment in the frame, slide the ground cable connector onto the bent spade terminal on the door as shown in the figure A lockable vented door NTRU0423, inside view (page 316). Go to step 12.

8 Unfasten the lower left 10-mm (3/8-in.) mounting screw of the top frame bracket, as indicated in the figure A top frame bracket P0876758, underside view (page 321). The screw hole is the second from the top of the frame upright.

9 Route the loose end of the ground cable through the opening in the bottom of the top frame bracket that is shown in the figure A top frame bracket P0876758, underside view (page 321), and then through the left side of the same bracket.

Ensure that the resting position of the cable will be unstressed when the door is opened fully. The length of the cable is shown in the figure The cable NTRU0103 to ground the door to the frame (page 321). Reduce stress by adjusting the angel of the cable's bent tab terminal on the door, for example, to point at an angle.

10 Fasten the eye-looped end of the ground cable shown in the figure to the mounting ear of the top frame bracket. See the figure The cable NTRU0103 to ground the door to the frame (page 321). Ensure that the resting position of the cable is still unstressed when the door is opened fully.

11 Unlock the door lock by turning the key counter-clockwise until it is horizontal as shown in the figure A lockable vented door NTRU0423, outside view (page 317).

12 Verify the operation and position of the door by closing it. To engage the upper and lower catches, lift the door handle and turn it to the left, then push the door closed, and release the handle. A spring returns the handle to the starting position. Refer to the figure A lockable vented door NTRU0423, outside view (page 317). While closing the door, ensure that the ground cable is not rubbed or pinched. Dress the cable as required.

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Pull on each corner of the door on the lock side to ensure that the catches have engaged.

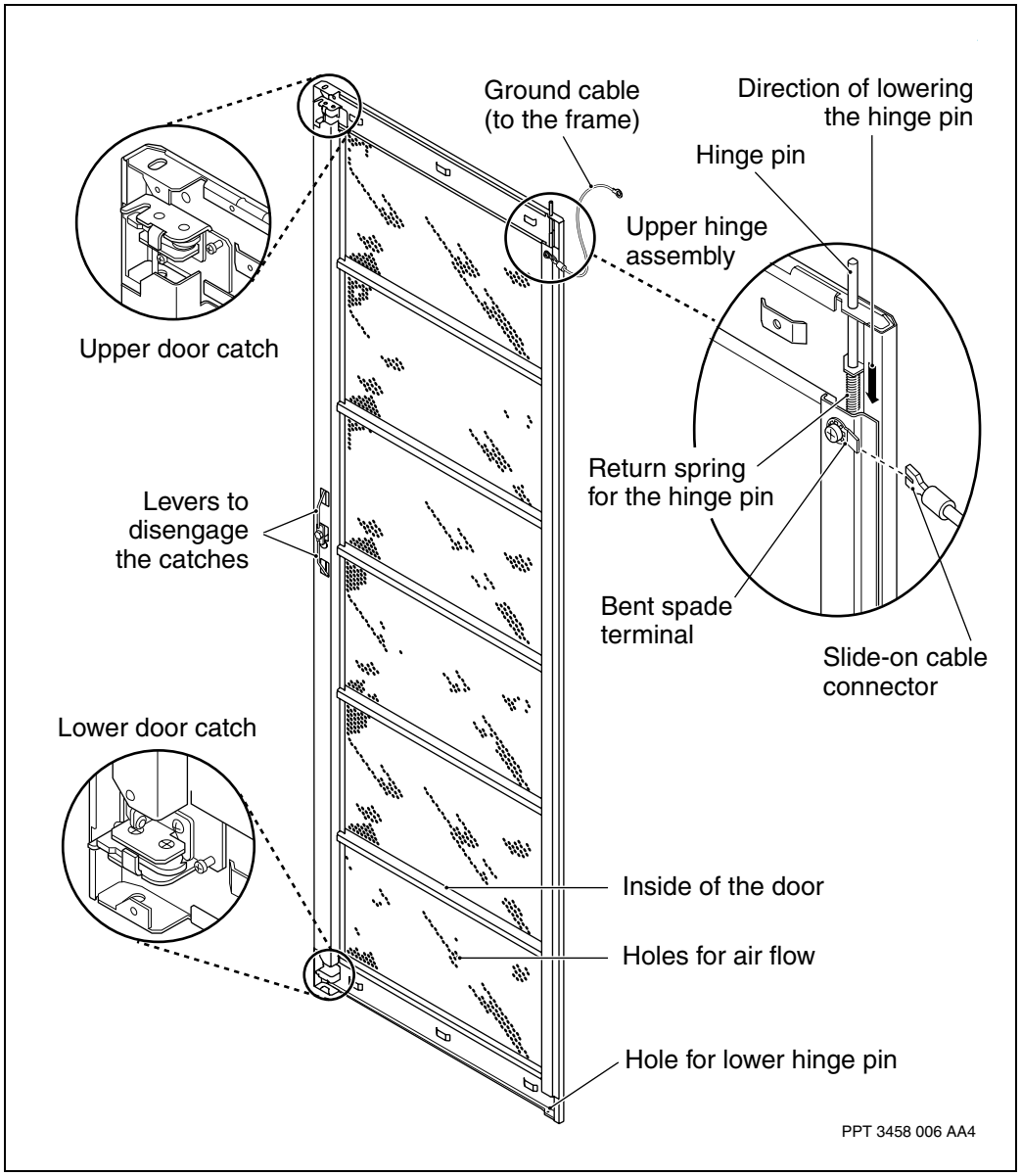
13 As required, lock the door by turning the key clockwise until it is vertical.

14 Store the door keys according to your company's security policies.

--End--

Procedure job aid

A lockable vented door NTRU0423, inside view



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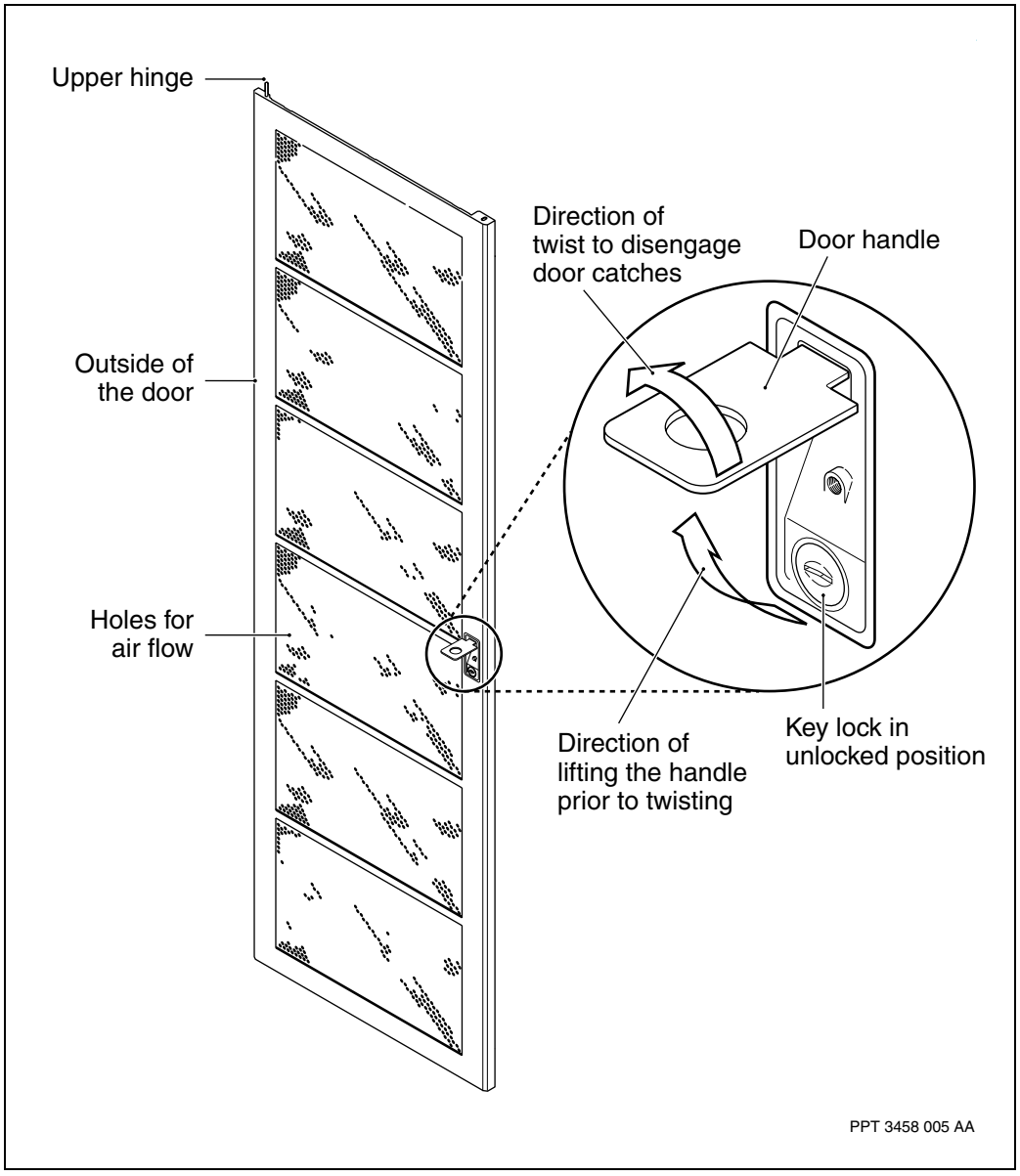
A lockable vented door NTRU0423, outside view



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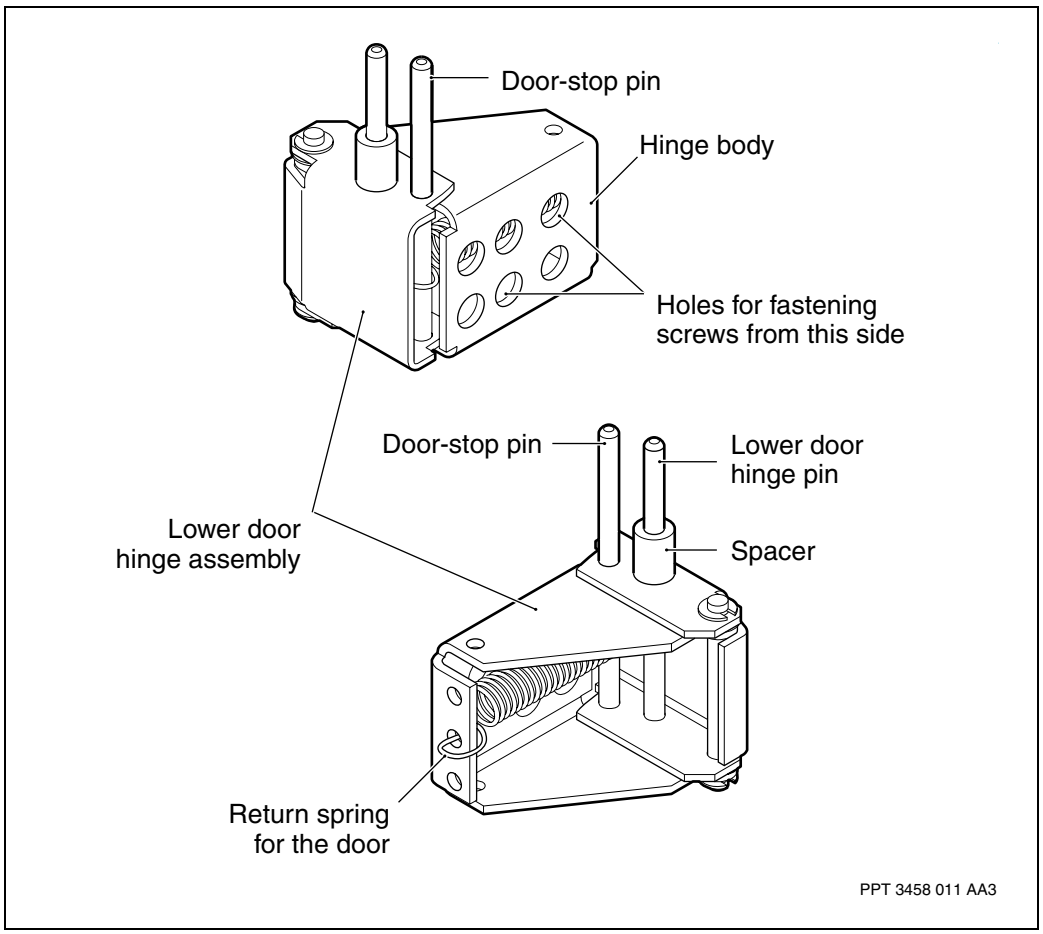
A lower door hinge P0884947



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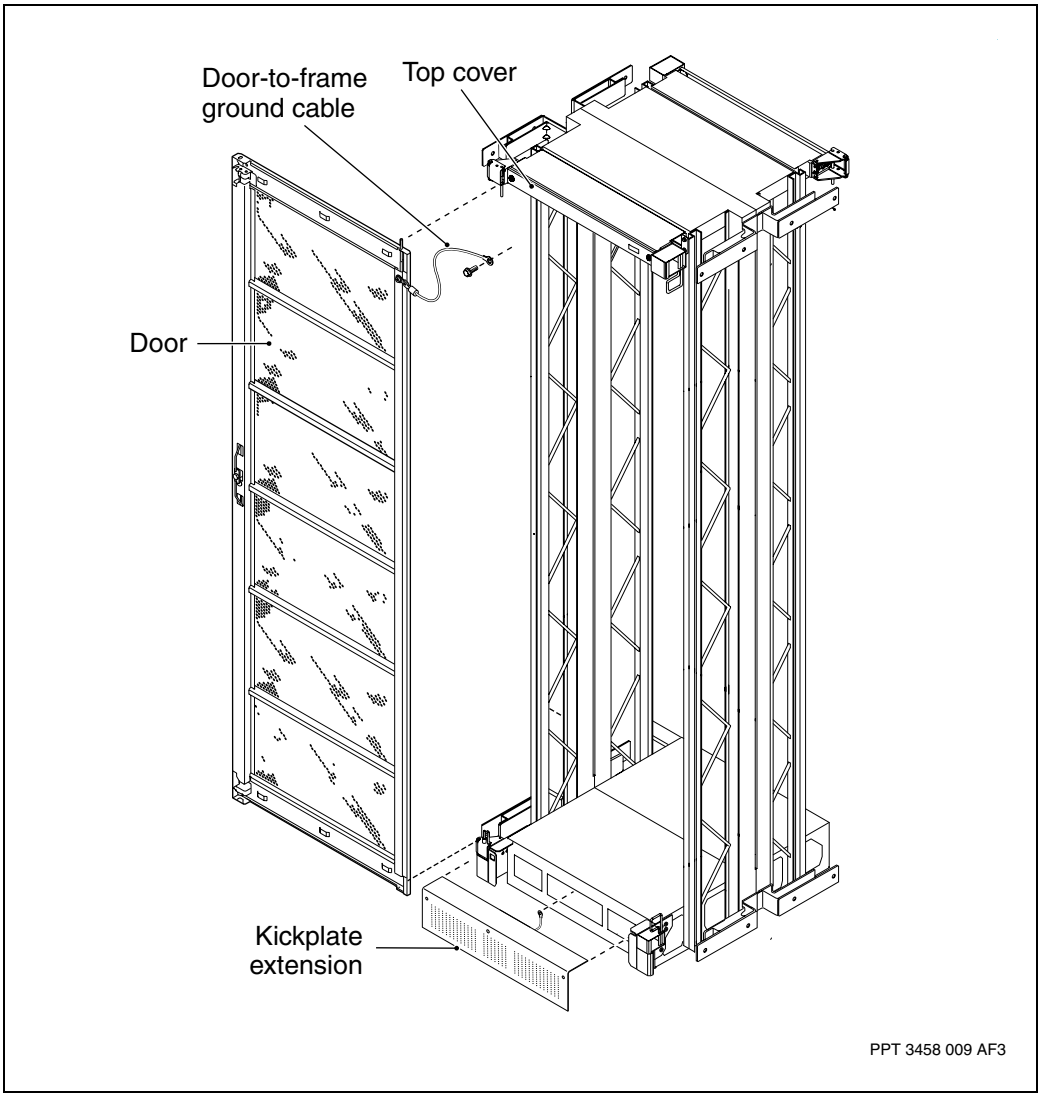
Orientation of a door with frame enclosure hardware



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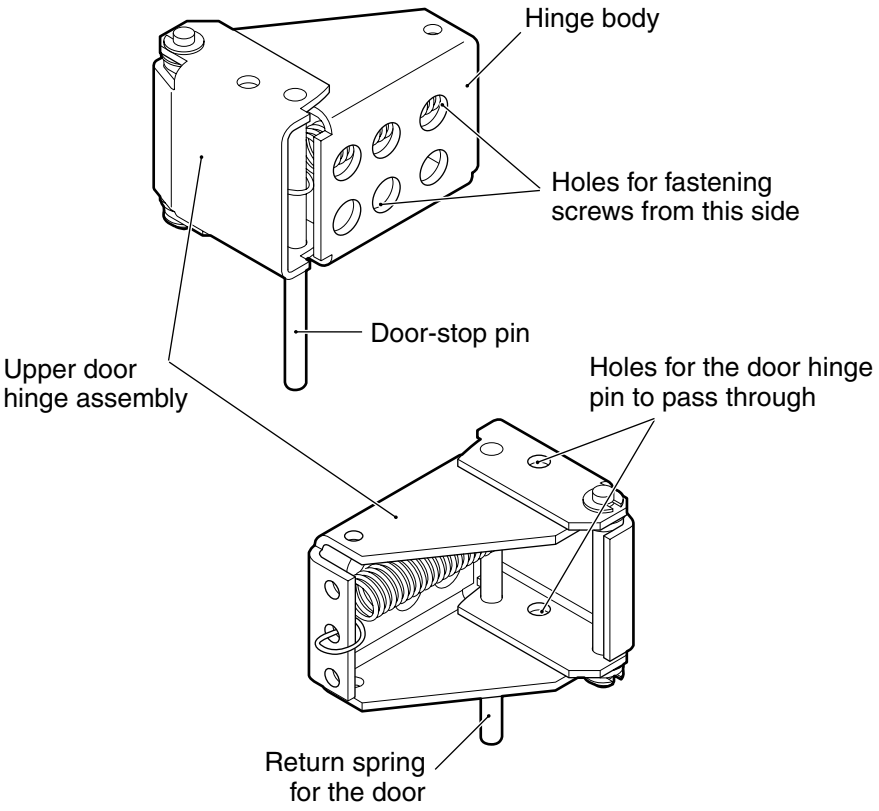
An upper door hinge P0884031



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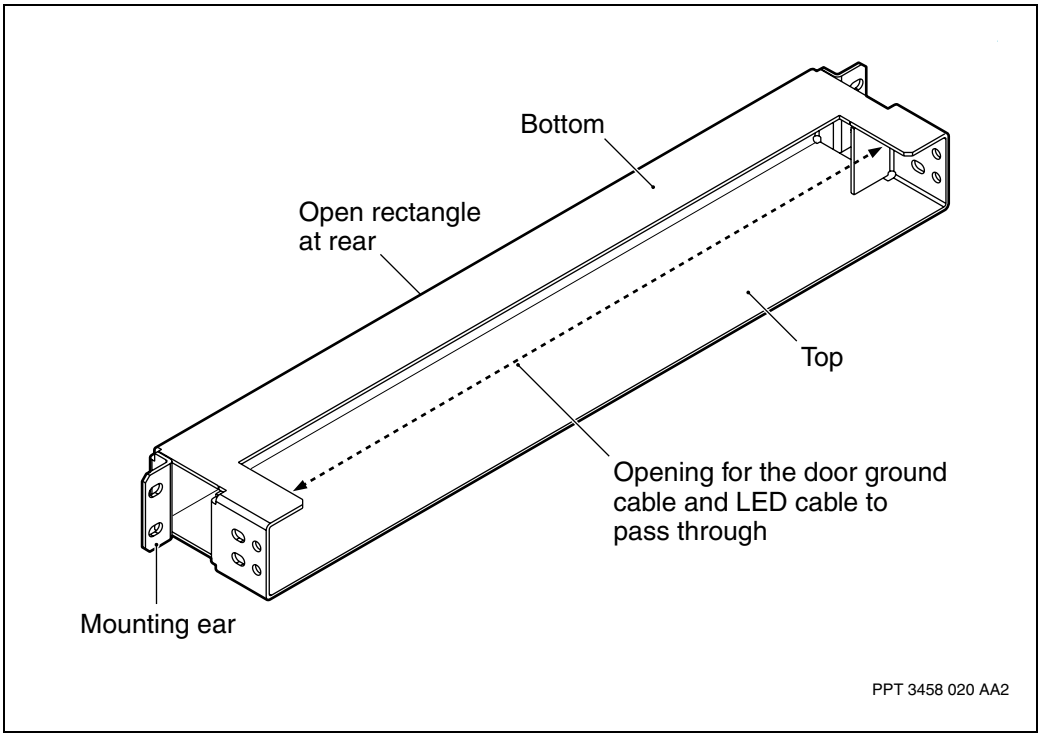
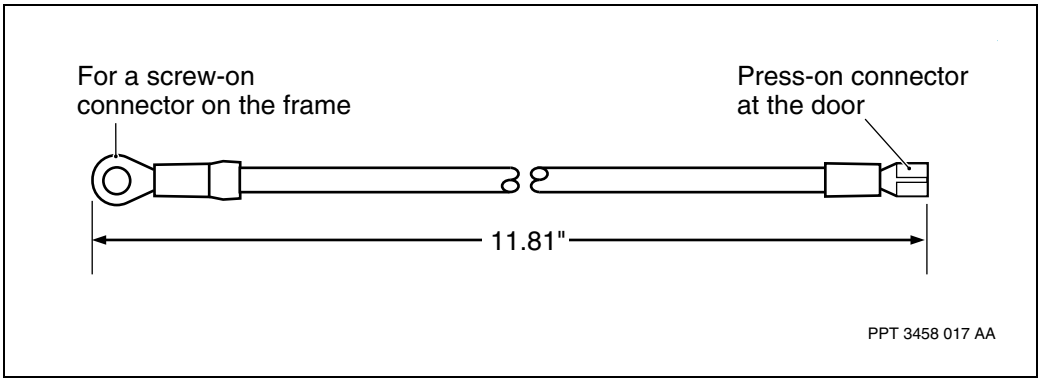
A top frame bracket P0876758, underside view



The cable NTRU0103 to ground the door to the frame



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Installing a door catch onto the lower right of a frame

Install a door catch onto the lower right front or rear of a NEBS 2000 frame to enable keeping a door closed and locking it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a door catch from kit NTRU0192 as shown in the figure A lower door catch P0884950 (page 323) and A lower right extension bracket P0995493 (page 311) that is already installed onto the base of the NEBS 2000 frame from another procedure.
- You need 4 Pozidriv screws P0600060 and 4 lock washers P0600895 from kit NTPX4060 as shown in the figure Types of screws used with frame enclosure hardware (page 74).

Procedure steps

Step	Action
1	Align the holes of the catch with the holes on the outside of the lower extension bracket as shown in the figure Orientation of a cosmetic filler, a lower door catch, and a lower right extension bracket (page 312).
2	Loosely fasten the door catch through the extension bracket using 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895. Drive the screws from the direction shown in the figure so that the parts are assembled as shown in the figure Orientation of an installed cosmetic filler, door catch, and extension bracket (page 326).
3	Tighten all screws to snug plus a 1/4 turn.

--End--

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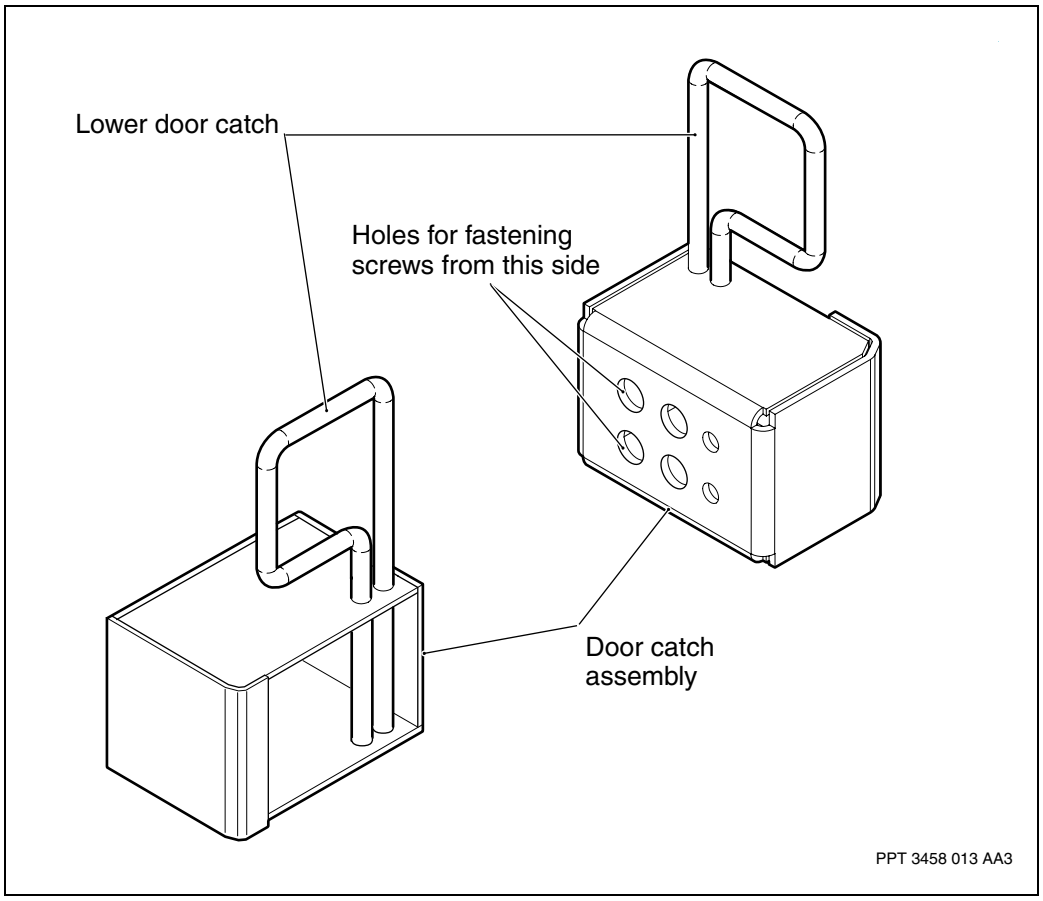
Procedure job aid

A lower door catch P0884950



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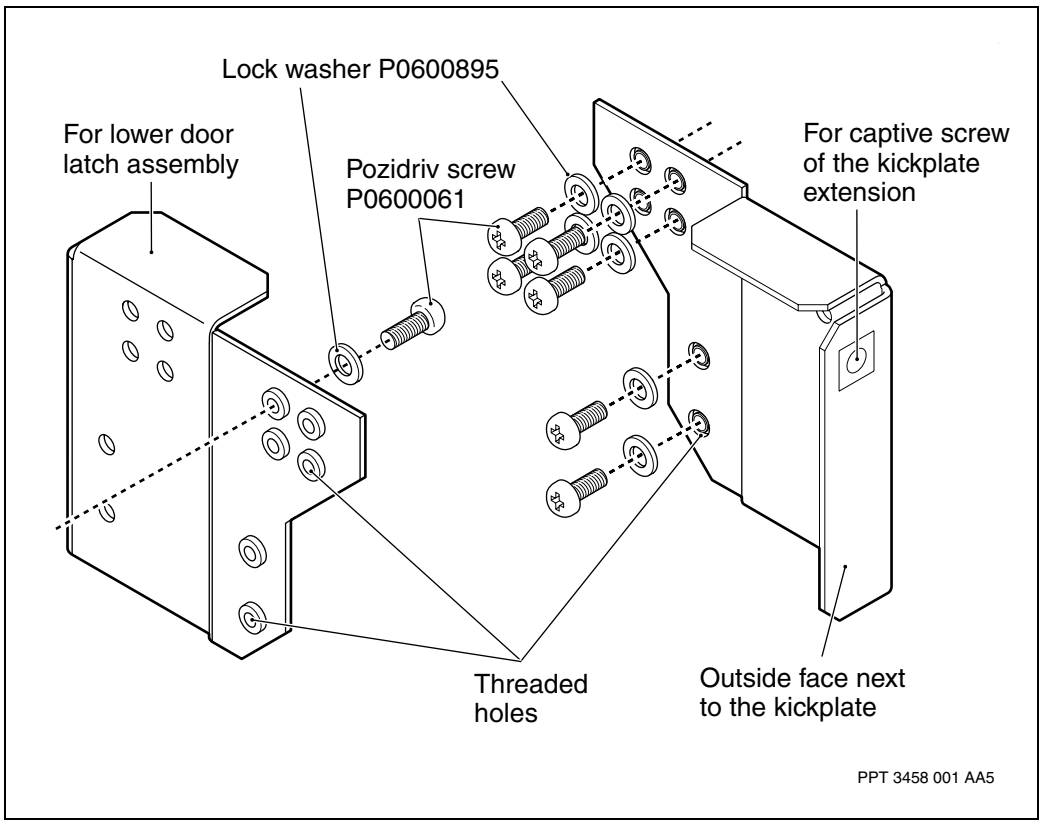
A lower right extension bracket P0995493



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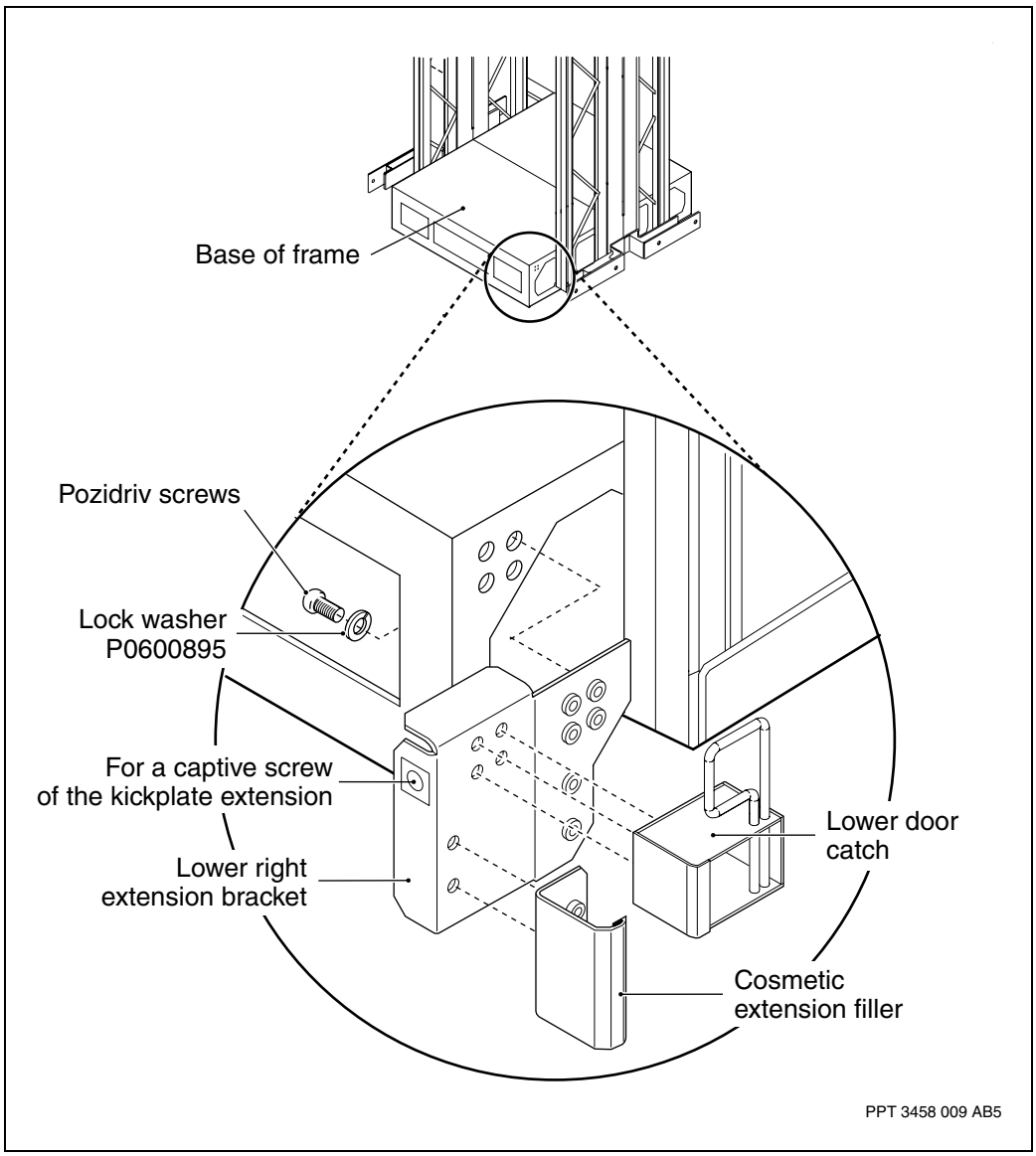
Orientation of a cosmetic filler, a lower door catch, and a lower right extension bracket



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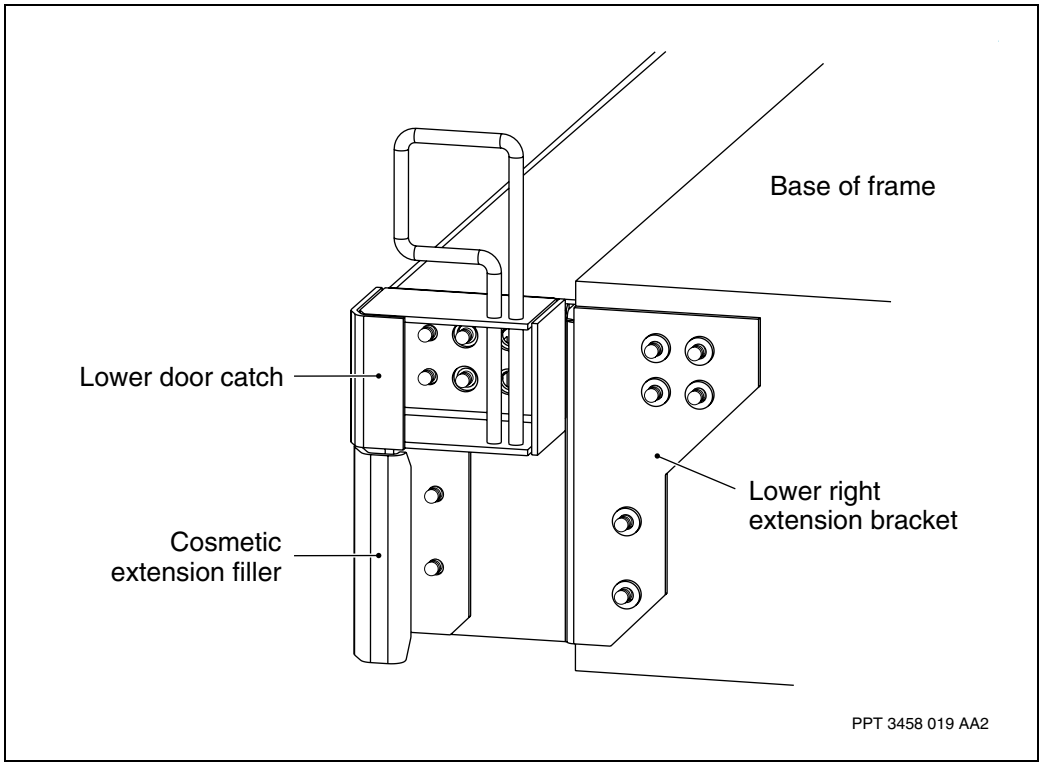
Orientation of an installed cosmetic filler, door catch, and extension bracket



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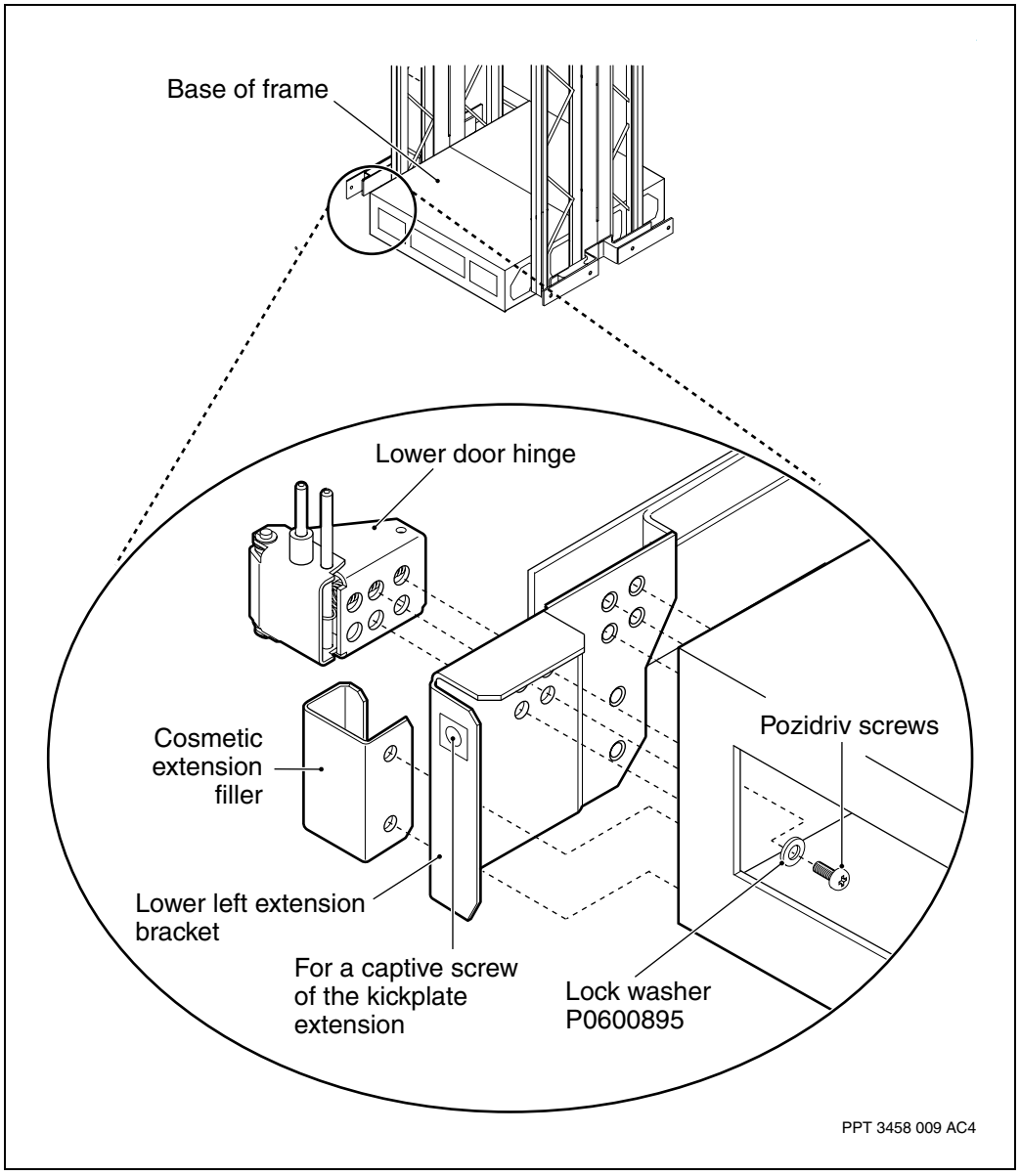
Orientation of a cosmetic filler, a lower door hinge, and a lower left extension bracket



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Installing a door catch onto the upper right of a frame

Install a door catch onto the upper right front or rear of a NEBS 2000 frame to enable keeping a door closed and locking it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a door catch from kit NTRU0192 as shown in the figure An upper door catch P0884949 (page 329) and two of the extension brackets that are shown in the figure An extension mounting bracket P0995495 (page 330). The extension brackets are already installed on the front of the frame from another procedure, but may not be on the rear.
- You need 4 Pozidriv screws P0600060 and 4 lock washers P0600895 from kit NTPX4060 as shown in the figure Types of screws used with frame enclosure hardware (page 74).

Procedure steps

Step	Action
1	Loosely fasten 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895 through an extension mounting bracket P0995495 to the right side of the top frame bracket as shown in the figure Orientation of an upper door catch and an extension bracket (page 305).
2	Align the holes of the door catch with the holes on the extension bracket on the right side of the top frame bracket as shown in the figure.
3	Loosely fasten the door catch onto the extension bracket using 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895. Drive the screws from the direction shown in the figure.
4	Tighten all screws to snug plus a 1/4 turn.

--End--

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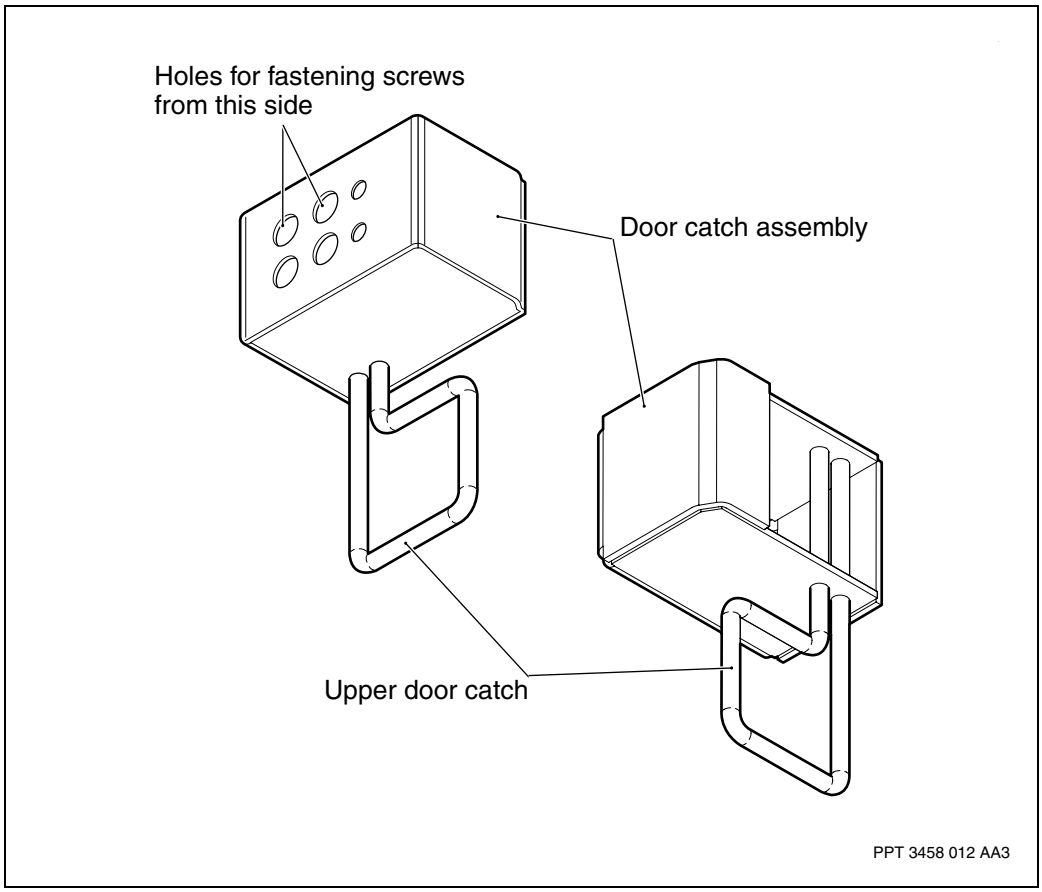
Procedure job aid

An upper door catch P0884949



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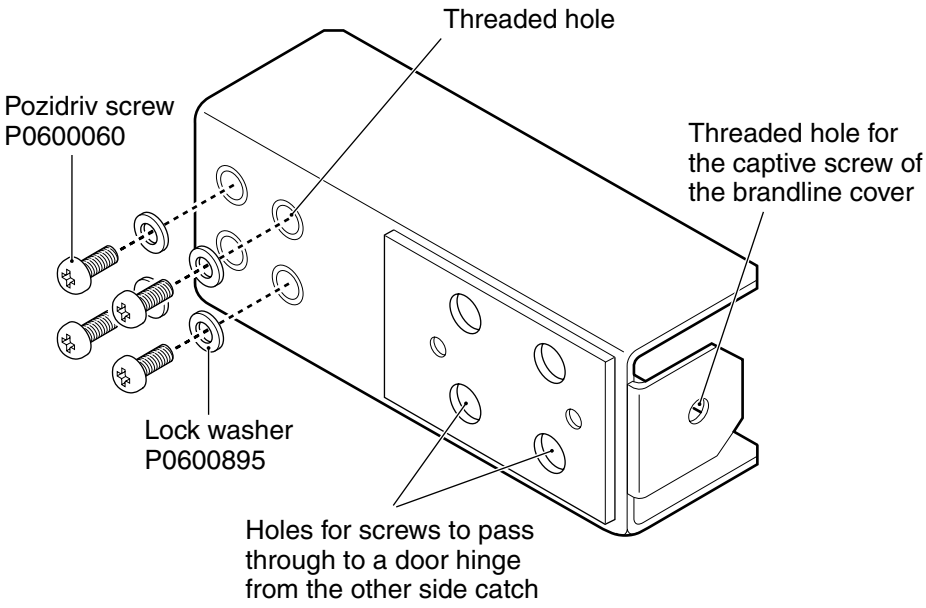
An extension mounting bracket P0995495



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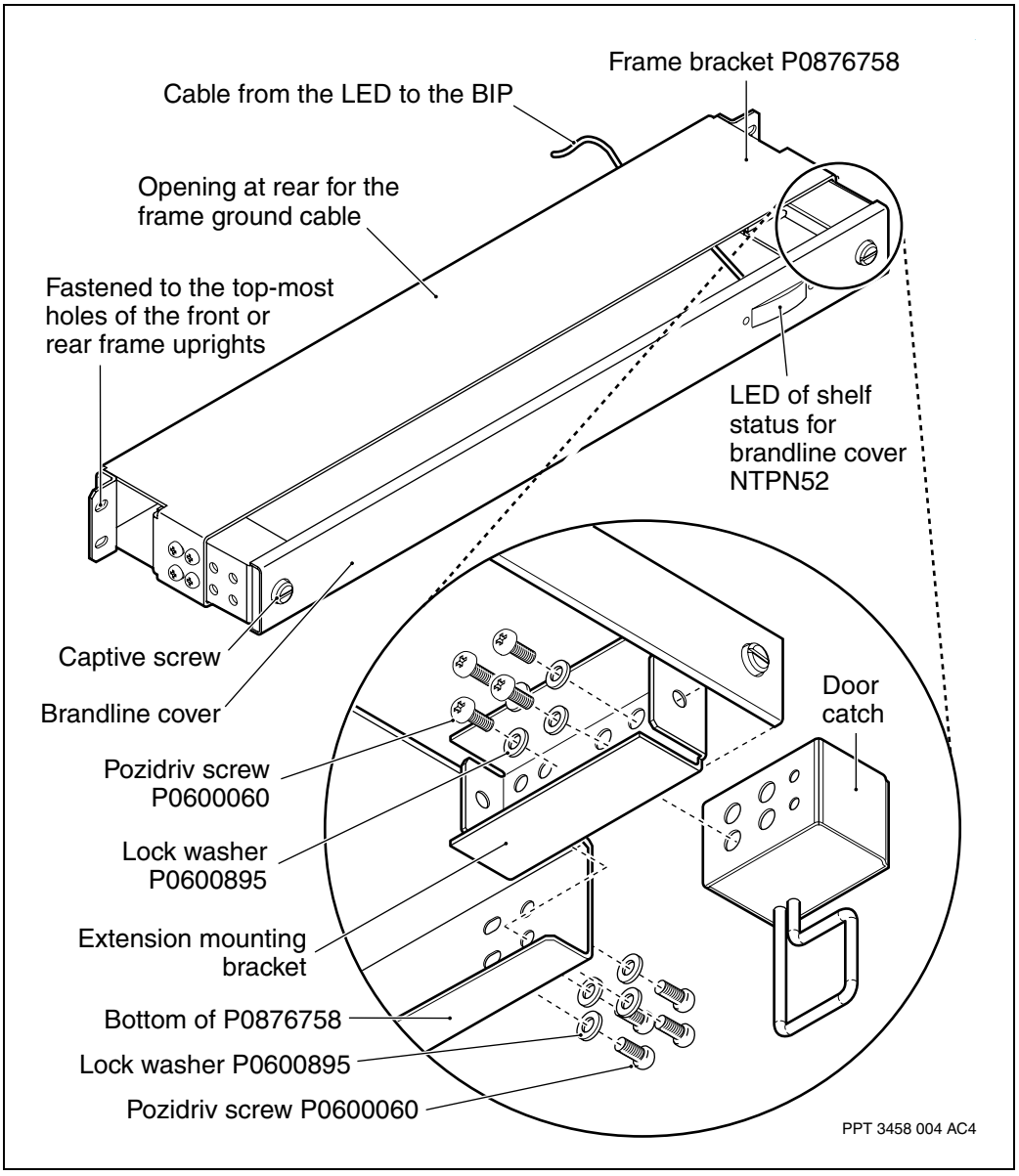
Orientation of an upper door catch and an extension bracket



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Installing a door hinge onto the lower left of a frame

Install a door hinge onto the lower left front or rear of a NEBS 2000 frame to enable opening a door.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a door hinge from kit NTRU0192 as shown in the figure A lower door hinge P0884947 (page 318) and the lower left extension bracket P0995494 that is the opposite of the figure A lower right extension bracket P0995493 (page 311). The lower left extension bracket is already installed onto the base of the NEBS 2000 frame from another procedure.
- You need 4 Pozidriv screws P0600060 and 4 lock washers P0600895 from kit NTPX4060as shown in the figure Types of screws used with frame enclosure hardware (page 74).

Procedure steps

Step	Action
1	Align the holes of the hinge with the holes on the outside of the lower left extension bracket as shown in the figure Orientation of a cosmetic filler, a lower door hinge, and a lower left extension bracket (page 313).
2	Loosely fasten the door hinge through the extension bracket using 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895. Drive the screws from the direction shown in the figure.
3	Tighten all screws to snug plus a 1/4 turn.

--End--

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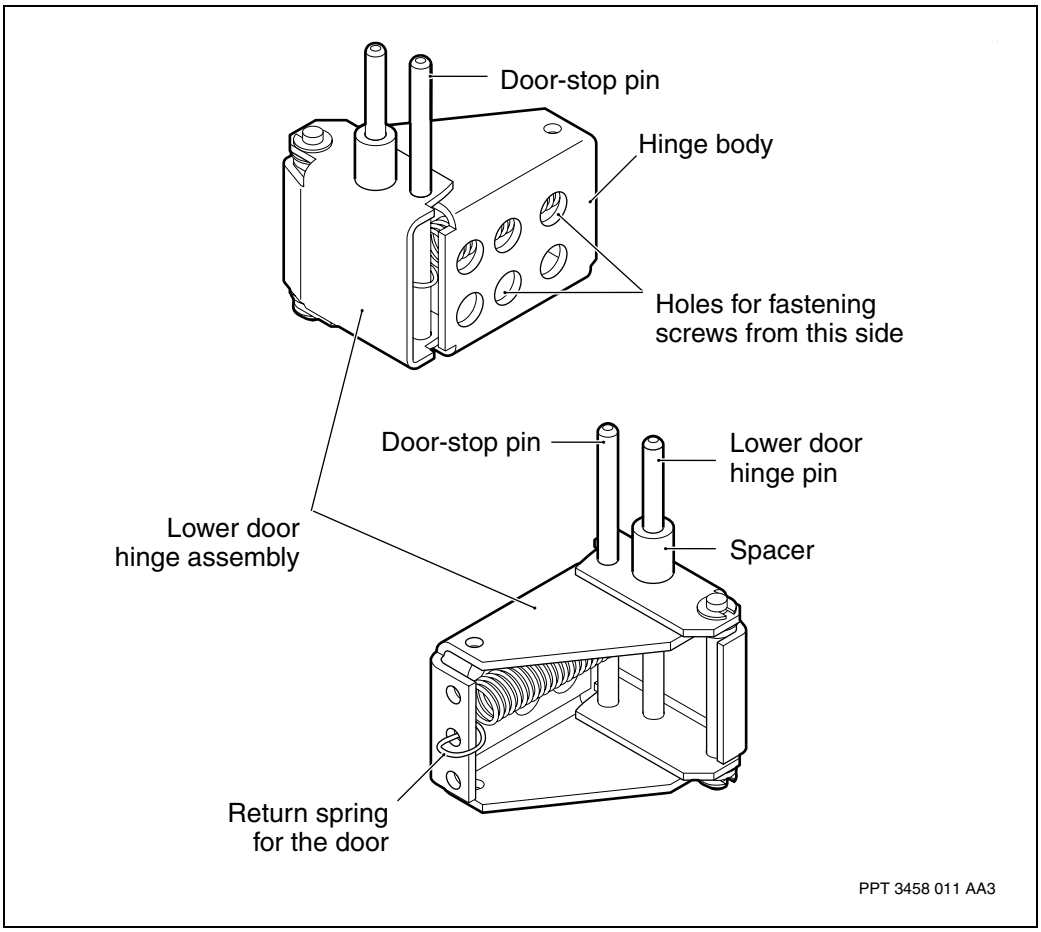
Procedure job aid

A lower door hinge P0884947



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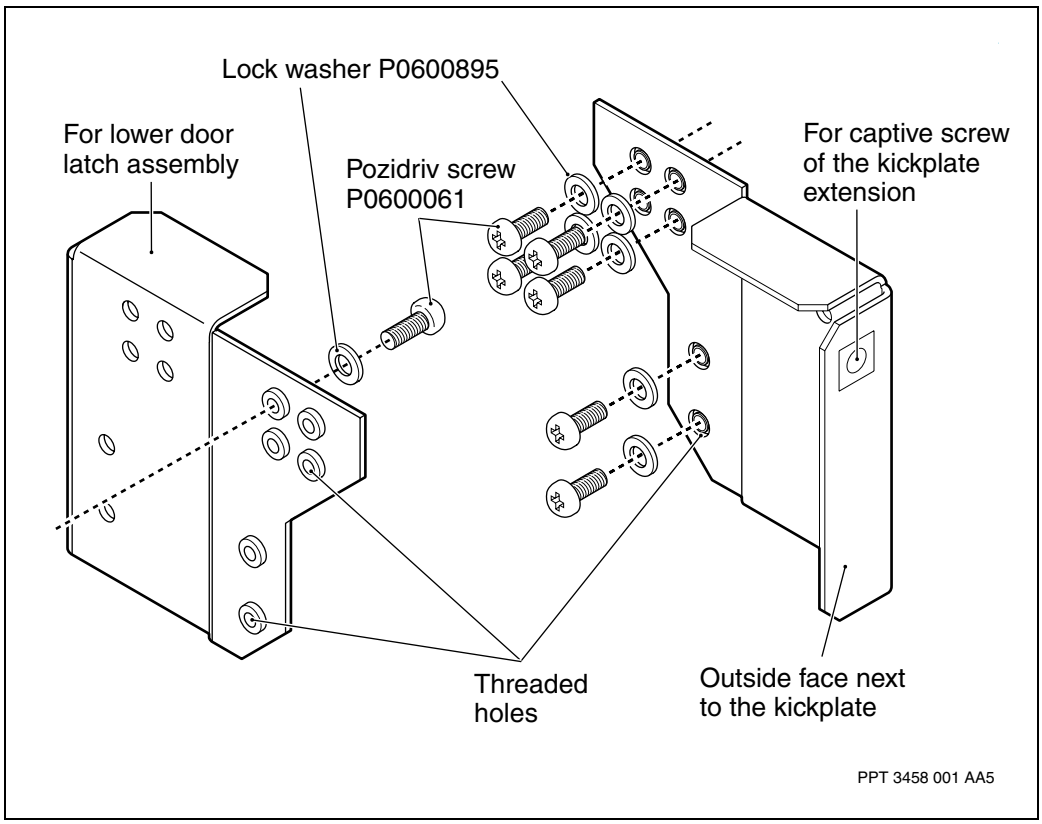
A lower right extension bracket P0995493



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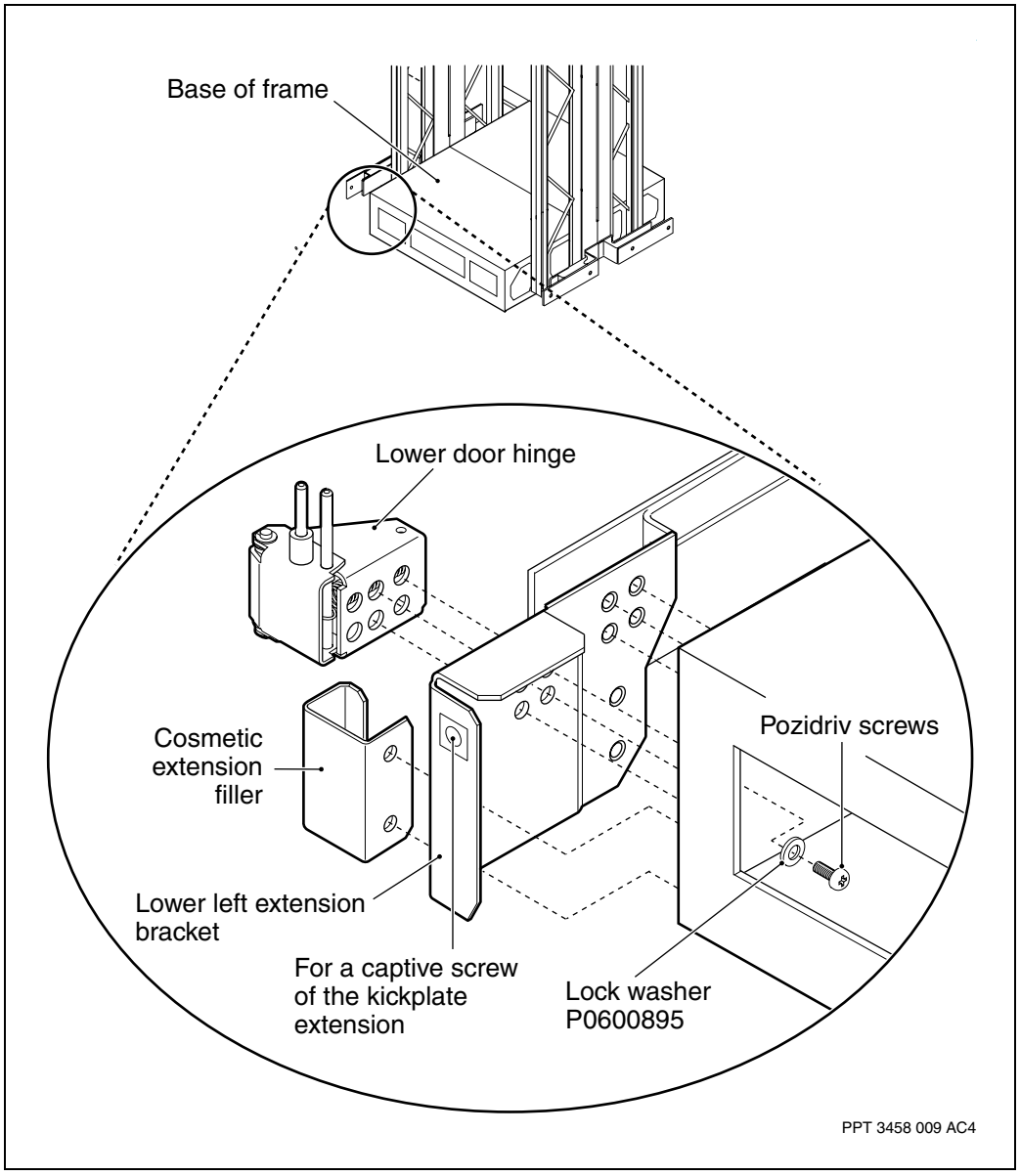
Orientation of a cosmetic filler, a lower door hinge, and a lower left extension bracket



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Installing a door hinge onto the upper left of a frame

Install a door hinge onto the upper left front or rear of a NEBS 2000 frame to enable opening a door.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a door hinge from kit NTRU0192 as shown in the figure An upper door hinge P0884031 (page 320) and two of the extension brackets that are shown in the figure An extension mounting bracket P0995495 (page 330). The extension brackets are already installed on the front of the frame from another procedure, but may not be on the rear.
- You need 4 Pozidriv screws P0600060 and 4 lock washers P0600895 from kit NTPX4060 as shown in the figure Types of screws used with frame enclosure hardware (page 74).

Procedure steps

Step	Action
1	Loosely fasten 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895 through an extension mounting bracket P0995495 to the left side of the top frame bracket as shown in the figure Orientation of an upper door hinge and an extension bracket (page 304).
2	Align the holes of the hinge with the holes on the left side of the extension bracket as shown in the figure.
3	Loosely fasten the door hinge to the top frame bracket using 4 Pozidriv 12-mm screws P0600060 each with a lock washer P0600895. Drive the screws from the direction shown in the figure.
4	Tighten all screws to snug plus a 1/4 turn.

--End--

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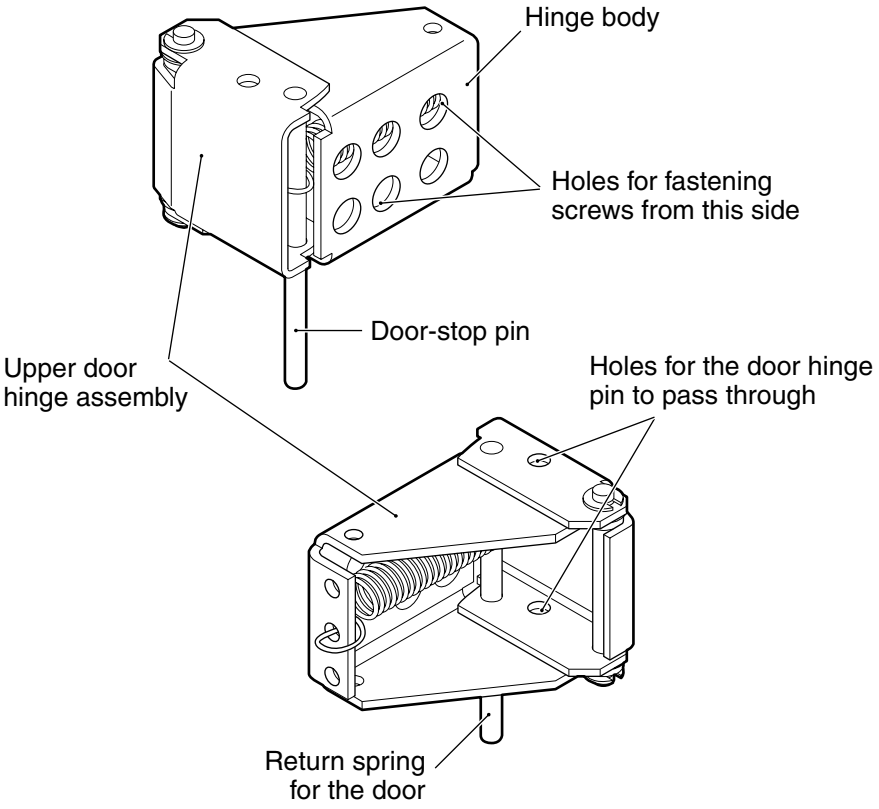
Procedure job aid

An upper door hinge P0884031



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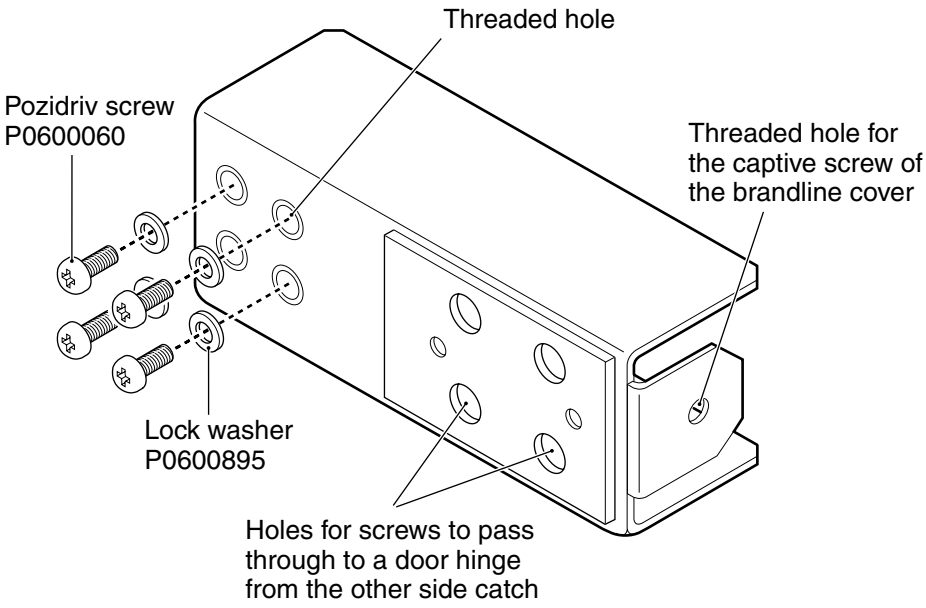
An extension mounting bracket P0995495



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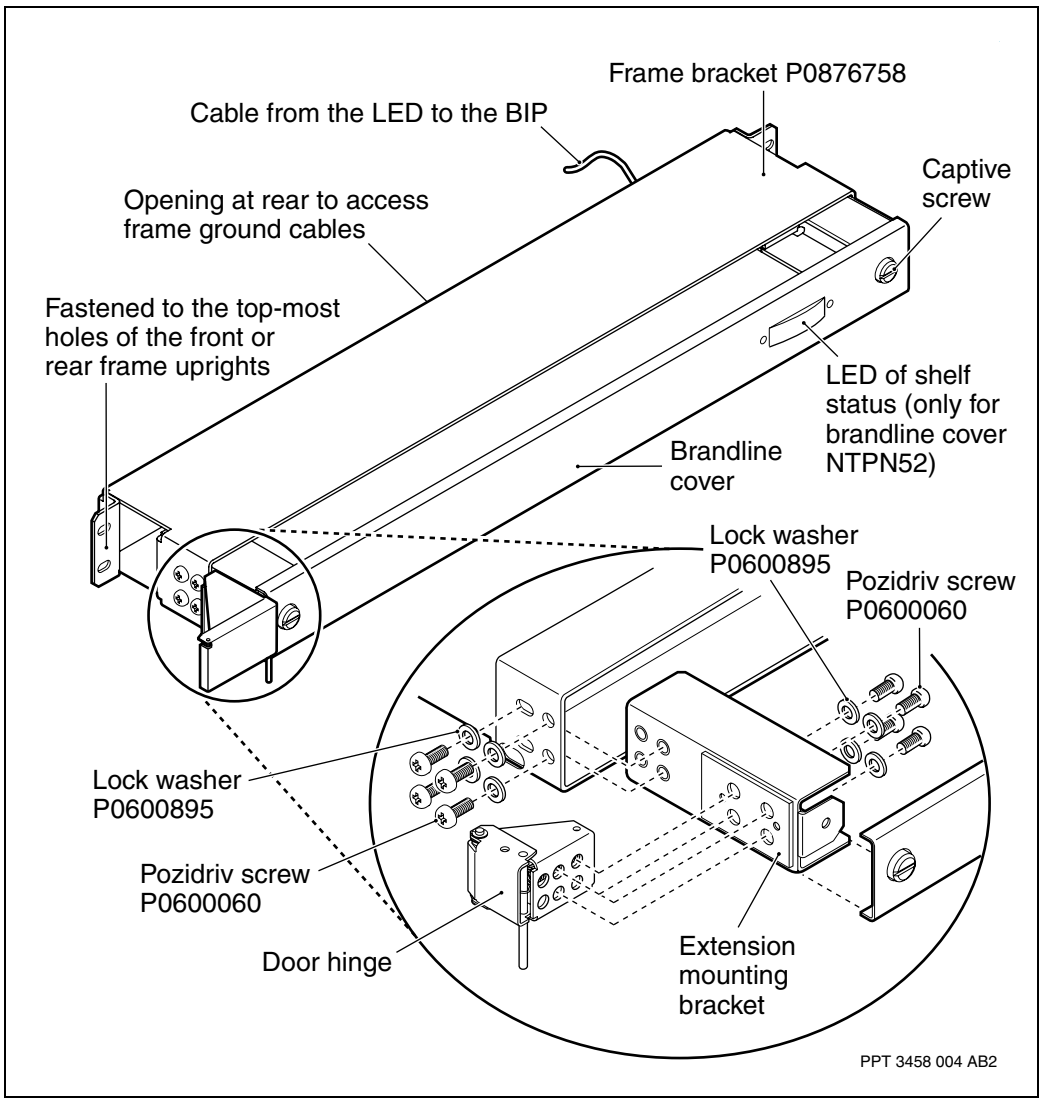
Orientation of an upper door hinge and an extension bracket



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Installing a fabric card into a Multiservice Switch 15000

Install a fabric card into the rear of a Multiservice Switch 15000 to

- complete a fabric replacement or upgrade and restore the load-sharing mode of operation
- initially install it in preparation for powering up the system
- complete an alarm/BITS replacement

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a Multiservice Switch 15000 fabric with PEC NTHR16.
- You need to have a medium Phillips screwdriver in reach while handling the fabric.
- After fastening the casing cover, the status LED of the fabric should be solid green. This means the fabric is powered (provided the shelf is also powered), but is not necessarily communicating with the switch. Unlocking a fabric runs tests. Displaying the software status of the fabric at the end of the Task flow of a fabric replacement (page 67) confirms whether it is enabled for operation.

Procedure steps

Step	Action
1	Hold the fabric so that you have one hand on the handle and one on the lever as indicated in the figure A fabric for a Multiservice Switch 15000, front view (page 342).
2	Check each row of backplane connector pins to see whether any pin seems visibly bent, that is, even slightly out of pattern or worse. If at least one pin is slightly bent or worse, use another fabric with straight rows of pins. The location of the pins are shown in the figure A fabric for a Multiservice Switch 15000, rear view (page 343).

CAUTION

Risk of equipment damage and service loss by bent pins

Attempting to seat a fabric with at least one bent connector pin risks damaging the backplane connectors such that another fabric with straight pins cannot be seated, risks a short across other pins, and risks bending more pins. The field replacement for any damaged backplane connector is to replace the shelf assembly. If you have any doubts about the straightness of the pins on the fabric, use another fabric with straight pins or contact your next level of technical support.

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3 Disengage the casing's Phillips captive screw shown in the figure A fabric for a Multiservice Switch 15000, front view (page 342). Hold the cover closed.

4 Center the fabric at the opening at the rear of the shelf assembly as shown in the figure Location of the curved channels for the fabric hinge pegs on a Multiservice Switch 15000 (page 344).

5 Orient the fabric such that the black alignment arrow on the fabric casing points to the arrow on the shelf. See the arrow in the figure A fabric for a Multiservice Switch 15000, front view (page 342).

6 Align the 4 guide pins on the backplane with the 4 keyway holes in the rear of the fabric. See the keyway holes in the figure A fabric for a Multiservice Switch 15000, rear view (page 343). The keyway hole pattern is asymmetrical in only 1 orientation so that either fabric is installed in only 1 way.

7 Insert the hinge pegs of the pair of covers into the curved channels at the center. See these characteristics in the figure Location of the curved channels for the fabric hinge pegs on a Multiservice Switch 15000 (page 344). Ensure that the top and bottom pegs are seated all the way in; otherwise, damage can occur to the fabric when the casing is closed. You may have to jiggle the pins very gently into place.

8 Slowly move the fabric to engage the keyways over the guide pins.

9 While holding the fabric against the curved channels, open the casing by pulling the fabric lever towards yourself. Stop when the lever touches the casing on the opposite side.

CAUTION

Risk of equipment damage by too much force

If you feel resistance against the fabric while seating it, do not force it. Re-align it and if there is still more resistance, remove the fabric and look for an obstruction, a bent guide pin, or a bent hinge pin.

10 Seat the fabric onto the backplane using gentle, even force, and simultaneously close the casing by closing the lever. The closing action seats 1 side of the fabric sooner than the other.

Seating the fabric compresses the EMI gaskets on the rear perimeter of a fabric. Ensure that you compress the gaskets evenly. The NTHR16DA and EA versions of the fabric have slightly stiffer gaskets than earlier versions.

11 Press against the face of the fabric casing that is fixed so that the closing action does not move the hinge pegs out of alignment or their grooves. Close the casing flush while observing the 2 hinge pegs. Each peg should travel to the end of its groove when the lever is fully closed. Some resistance is normal as the casing nears being fully closed.

Stop closing if a hinge peg is not aligned or is out of its groove. Do not let go of the fabric. Go back to step 9 and try again.

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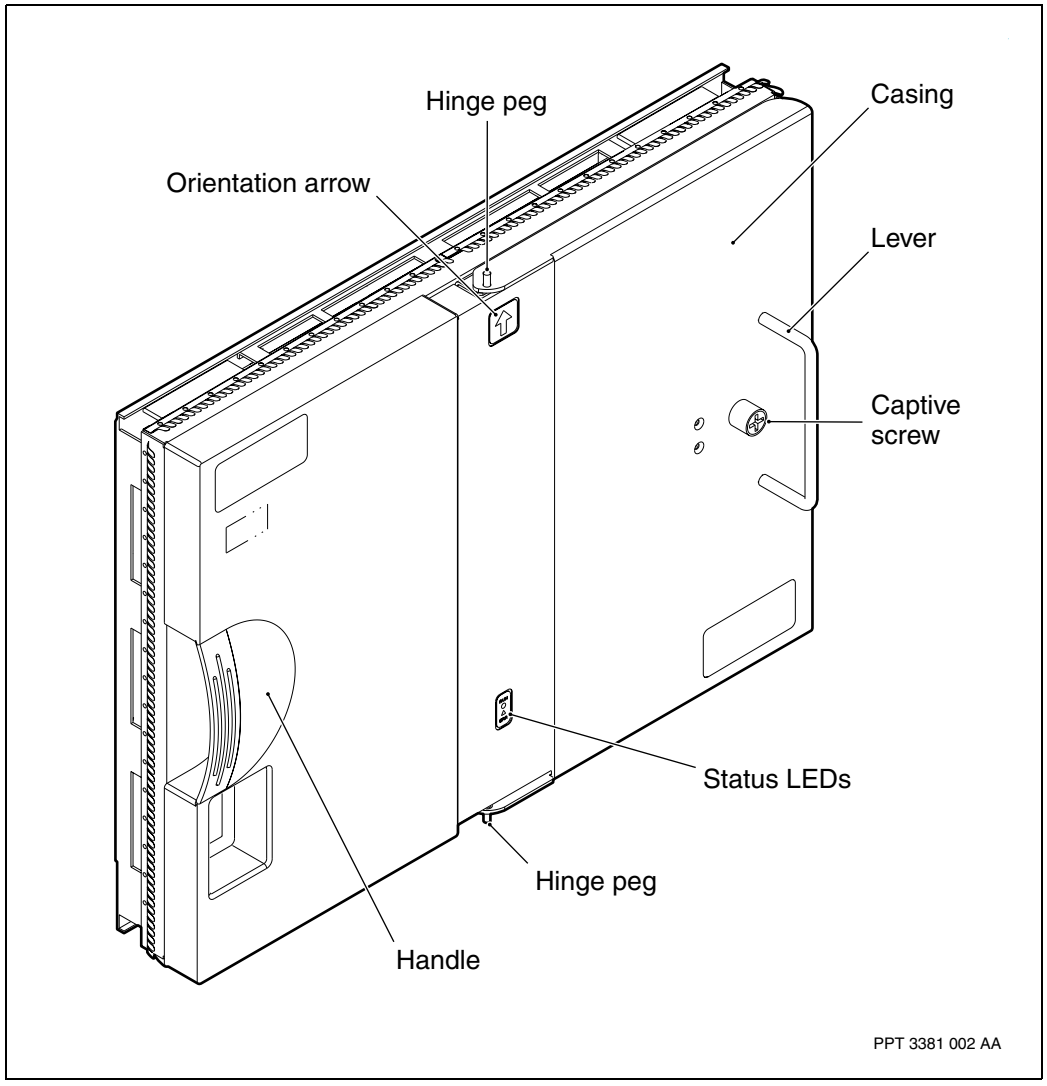
CAUTION
Risk of equipment damage by stripping
Stripping the screw or its hole on the fabric casing will prevent the fabric from seating properly and may allow the fabric to fall out.

12 Align and fasten the captive screw until snug plus a 1/5 turn.

--End--

Procedure job aid

A fabric for a Multiservice Switch 15000, front view



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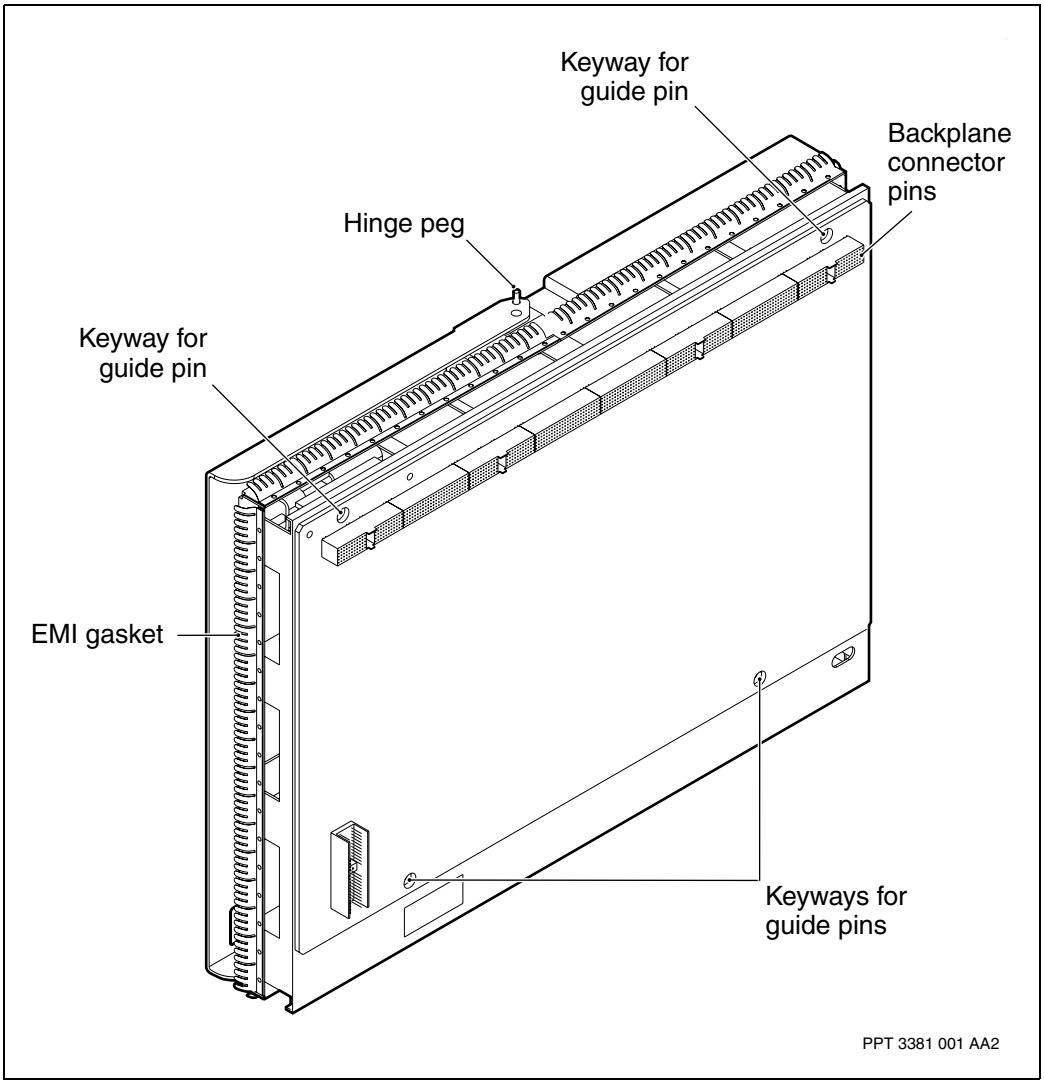
A fabric for a Multiservice Switch 15000, rear view



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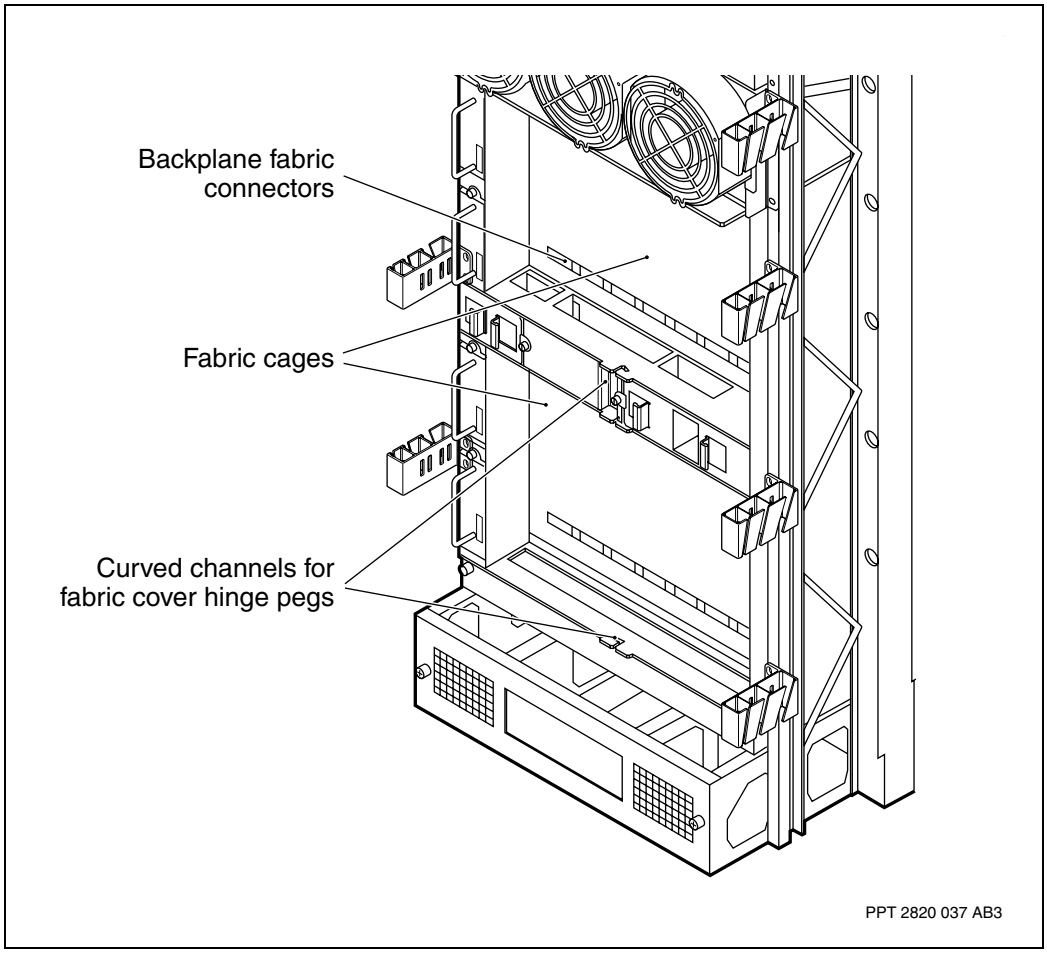
Location of the curved channels for the fabric hinge pegs on a Multiservice Switch 15000



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Installing a fabric card into a Multiservice Switch 20000

Install a fabric card into the rear of a Multiservice Switch 20000 to complete a fabric replacement and restore the load-sharing mode of operation, or to initially install it from a shipping container in preparation for powering up the system.

Prerequisites

CAUTION
Risk of service degradation or damage by heat
The tape covering the gap at the top of an upper fabric card cage in the upper frame position prevents foreign objects from entering the cavity behind the fabric during transportation. The tape must be completely removed as part of an initial fabric installation.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a Multiservice Switch 20000 fabric with PEC NTPN02.
- When pressed in, the fabric reset button enables the fabric to be loaded with firmware when the switch is powered. Whenever the fabric reset button is not fully depressed, the fabric cannot be put into service.

Procedure steps

Step	Action
1	For an initial installation, peel off the tape (if present) covering the air vent at the top outside of the top fabric card cage of an upper shelf assembly. See the location of the vent in the figure Location of protective tape over fabric airflow opening (page 348). The vent must be completely cleared of tape.
2	Hold the fabric so that • you have a hand on each handle shown in the figure A fabric of a Multiservice Switch 20000, front view (page 350) • the lever is closed and fastened at the left side
3	Check each row of backplane connector pins to see whether any pin seems visibly bent, that is, even slightly out of pattern or worse. If at least one pin is slightly bent or worse, use another fabric with straight rows of pins.

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CAUTION

Risk of equipment damage and service loss by bent pins

Attempting to seat a fabric with at least one bent connector pin risks damaging the backplane connectors such that another fabric with straight pins cannot be seated, risks a short across other pins, and risks bending more pins. The field replacement for any damaged backplane connector is to replace the shelf assembly. If you have any doubts about the straightness of the pins on the fabric, use another fabric with straight pins or contact your next level of technical support.

4 Stand the fabric on its bottom and unfasten the Phillips captive screw on the handle. It is normal for the handle to open slightly.

5 Align the fabric bushings at the 4 corners of the fabric chassis on the shelf assembly with the nearest transportation notch (identified in the figure Locations of notches for fabric hinge bushings in a Multiservice Switch 20000 shelf (page 351).

6 Place the alignment bushings into the 4 transportation notches as shown in the figure Locations of notches for fabric hinge bushings in a Multiservice Switch 20000 shelf (page 351).

7 While holding the fabric by one handle, pull the fabric lever slowly towards you until it stops perpendicular to the face of the fabric. While the lever opens, the alignment bushings at the 4 corners of the fabric move inwards. The transportation notches are angled so that opening the fabric lever rolls the alignment bushings out of the notch and into the opening of the alignment grooves. See the figure Locations of notches for fabric hinge bushings in a Multiservice Switch 20000 shelf (page 351).

If the lever does not move or any of the 4 alignment bushings is catching, close the lever and re-align the fabric by very gently jiggling it. Try opening the lever again.

8 Once the 4 bushings are at the start of the alignment grooves, place a hand in each fabric handle and gently push the fabric into the shelf such that

- the fabric lever remains fully open as shown in the figure A fabric of a Multiservice Switch 20000, front view (page 350)
- each rolling alignment bushing at the outside corners evenly enters the 4 alignment grooves shown in the inset of the figure Locations of notches for fabric hinge bushings in a Multiservice Switch 20000 shelf (page 351)
- the 4 guide pin keyways at the rear corners of the fabric align with the 4 guide pins on the backplane (inside the shelf); see the figure A fabric of a Multiservice Switch 20000, rear view (page 349)

9 Hold the fabric in place with one hand and close the fabric lever. Moving the lever starts seating the fabric and requires a firm, steady motion to the left

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against variable resistance. When the lever is almost closed, the tension on it will lessen noticeably.

Seating the NTPN02 requires slightly more force than an NTHR16 of a Multiservice Switch 20000. If the NTPN02 hinge bushings squeak during seating, this is normal.

If inserting the fabric is stopped by a blockage, typically you can feel it but not see it. When you feel blockage, stop the insertion. Move the fabric away from the shelf to check for foreign objects. If you cannot find the cause of the blockage, return to step 5 to re-align the fabric hinge pegs. If the blockage persists, contact your Nortel Networks technical support representative.

10 When the alignment bushings reach the end of the groove, the fabric lever is almost fully closed. Fully seat the fabric and depress the reset button by closing the fabric lever flush with the cover of the fabric.

11 Align and tighten the captive screw on the lever to snug plus a 1/5 turn when

- all 4 alignment bushings are at the end of the alignment grooves
- the 4 corners of the fabric cover are evenly aligned with the surrounding edges of the shelf assembly
- the fabric lever is closed flush

Avoid stripping the screw.

--End--

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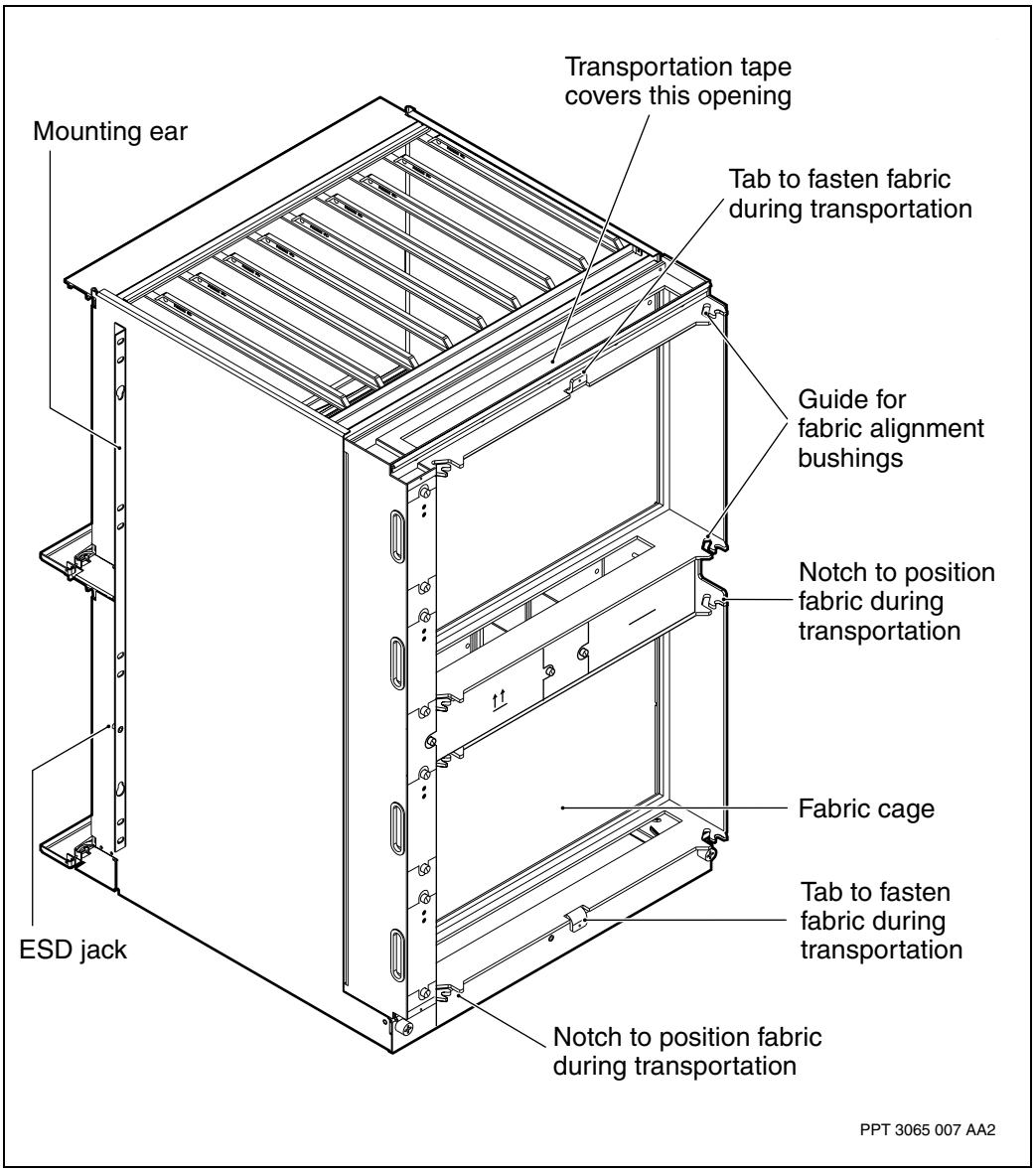
Procedure job aid

Location of protective tape over fabric airflow opening



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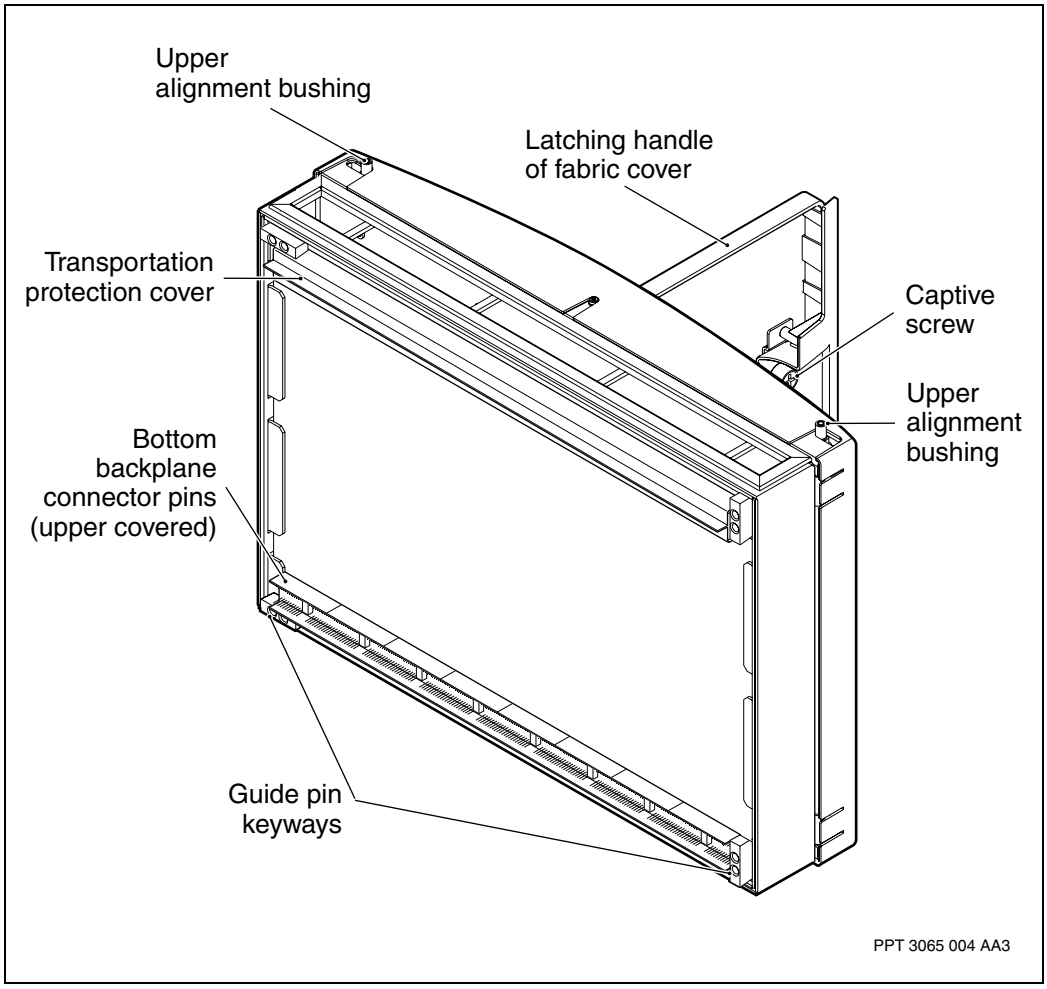
A fabric of a Multiservice Switch 20000, rear view



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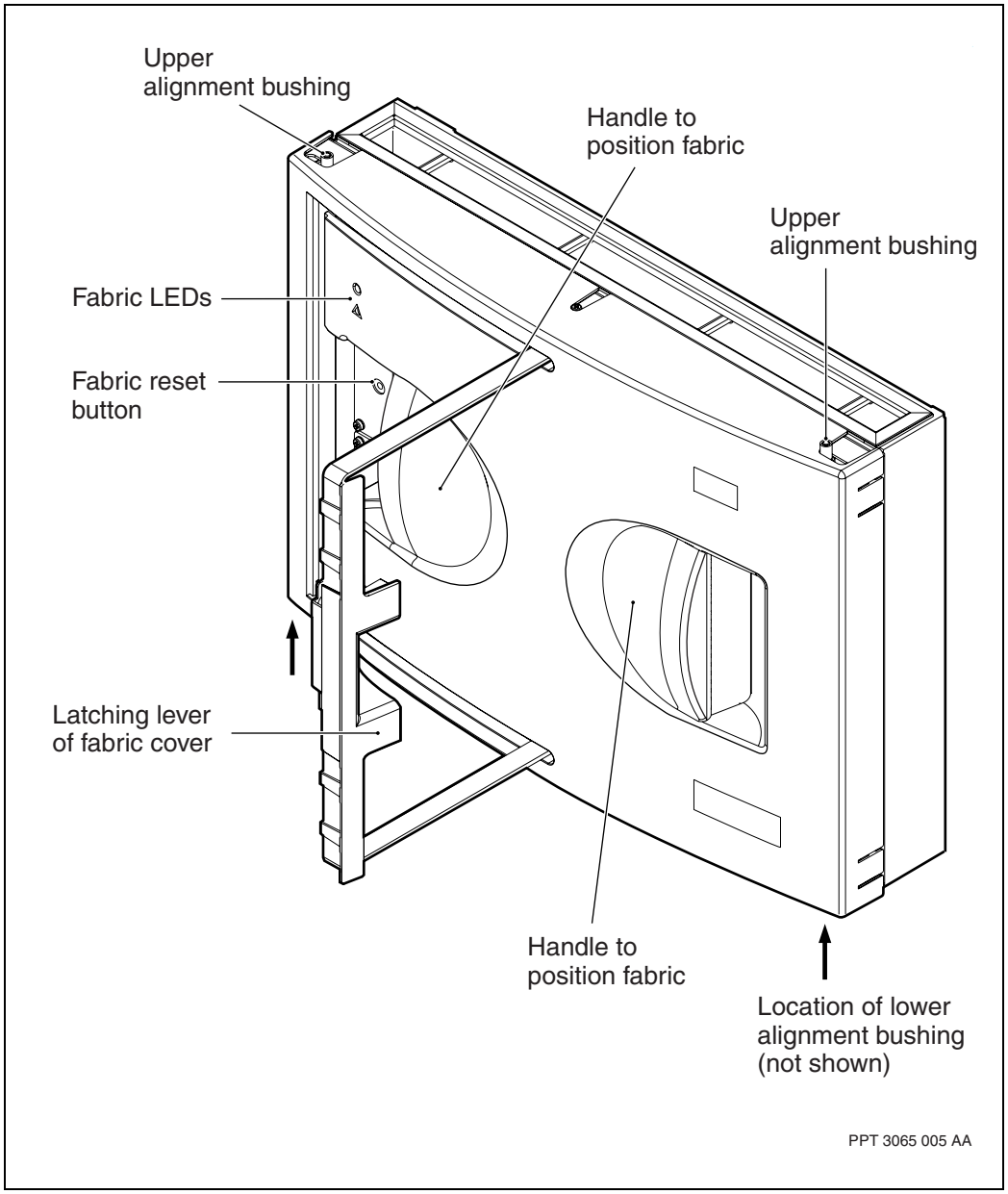
A fabric of a Multiservice Switch 20000, front view



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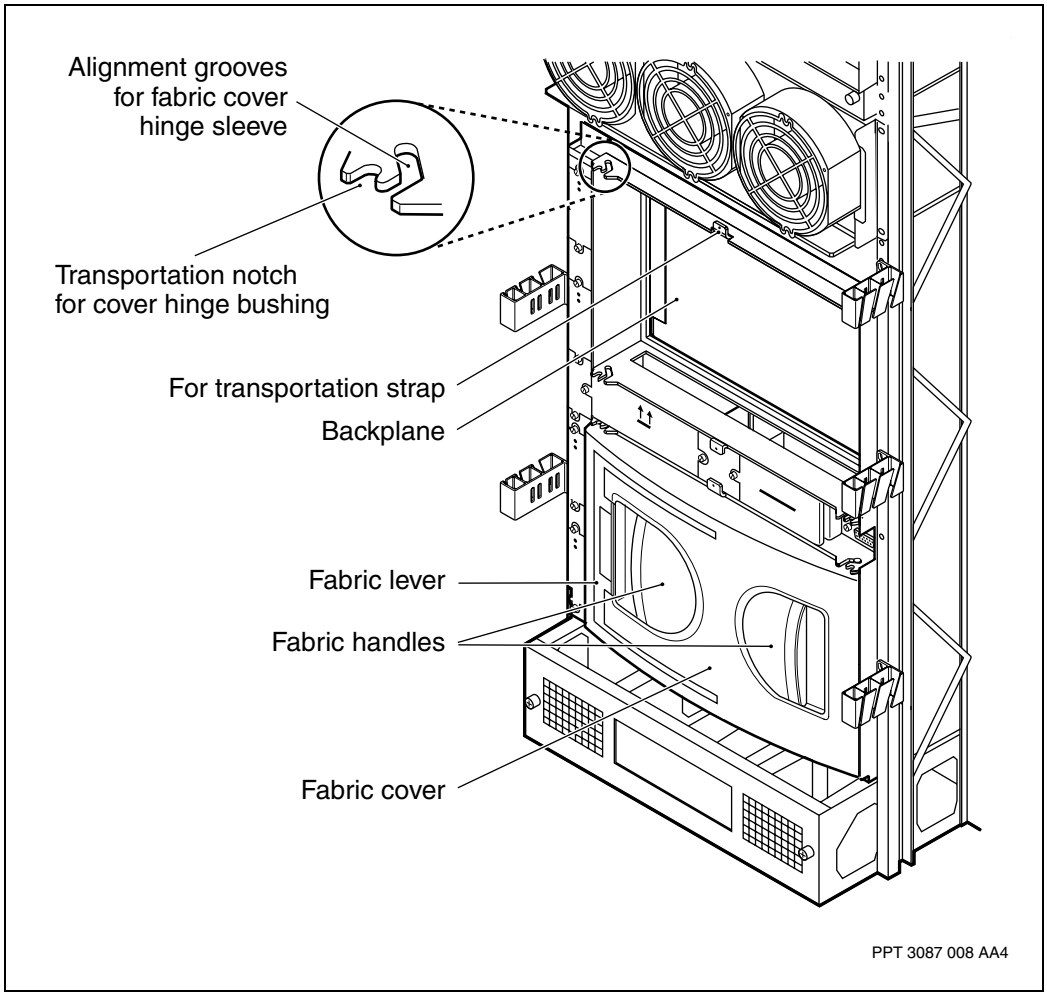
Locations of notches for fabric hinge bushings in a Multiservice Switch 20000 shelf



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Installing a fan

Install a fan to increase the cooling efficiency of the cooling unit.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need the appropriate version of a fan:
  - A0758423 for any fan in a lower (rear) cooling unit NTHR51AA or a upper (front) cooling unit NTHR52AA
  - A0522179 for the middle fan of a lower (rear) cooling unit NTHR51AB or a upper (front) cooling unit NTHR52AB
  - A0522182 for either side fan of a lower (rear) cooling unit NTHR51AB or a upper (front) cooling unit NTHR52AB
- For any version of a fan, you need a driver for the 4-mm (11/64-in.) screws that fasten the fan and its grill to the cooling unit. The screws are 65-mm long for an A0758423 in an NTHR51AA or an NTHR52AA. The screws are 60-mm long for an A0522179 or an A0522182 in an NTHR51AB or an NTHR52AB.
- A fan in an NTHR51AA or an NTHR52AA is the same for all installed positions. The middle fan in an NTHR51AB or an NTHR52AB is a different shape than the side fans that are adjacent to it. To distinguish one fan unit from another, see these figures:
  - Location and orientation of the fans on any version of cooling unit (page 354)
  - A side fan A0522182 for a cooling unit NTHR51AB or NTHR52AB (page 355)
  - A middle fan A0522179 for a cooling unit NTHR51AB or NTHR52AB (page 355)
- The system must provide a minimum of -48 V dc as the start-up power for either an A0522179 or A0522182.
- Minimize the impact of removing a fan by inserting the replacement immediately.
- When the fan was removed to gain access to a fan controller module or a temperature sensor, insert the same fan.
- When installing a cooling unit component as part of a replacement, high temperature alarms will not clear until the replaced component has had time to lower the temperature. For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

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Procedure steps

Step	Action
1	Put tape on the fan blades to temporarily prevent them from spinning freely when the airflow from the other fans reaches the replacement as it is being installed. When power is applied to fan blades that are freely spinning in the opposite direction from operation, the reversal under power strains the fan motor.
2	Orient the fan with the vacant cavity on the cooling unit so that you: • aim the nose of the fan blades towards yourself • position the power cable (indicated in the figures) relatively the same as the others • align the 2 holes of the shroud with the 2 holes on the face of the cooling unit • can read the words on the central hub of the fan shroud
3	Gently and evenly slide the fan assembly straight into the opening. Stop when the rear of the shroud touches the front face of the cooling unit.
4	Loosely fasten an M4 screw through the fan shroud into the face of the cooling unit.
5	Insert one notch of the finger guard grill under the M4 screw head so that the caution label on the grill: • is horizontal • faces where it can be read
6	Align the second grill notch with the other hole in the fan shroud and thread the remaining M4 screw through the notch and shroud into the cooling unit. Ensure that the rungs of the grill notches are centered under the screw heads for maximum grip.
7	Tighten the screws to snug plus a 1/5 turn. Snug means the screw head, grill rung, and shroud are all touching. If you over tighten the screws, you risk having to replace the entire cooling unit. If you under tighten the screws, vibrations from the fans can free the grill and then risk having a loose fan fail prematurely.
8	Gently remove the tape from the fan blades. Ensure no tape or glue remains. Do not bend the blades to wipe off glue.
9	Plug the power cable connector from the fan back into F1, F2, or F3. The connector mates only one way and clicks when fully engaged. The fan motor starts immediately. The major software alarm and both the major and minor hardware alarms are cleared. The status LED should be green to indicate the fan is operating normally.

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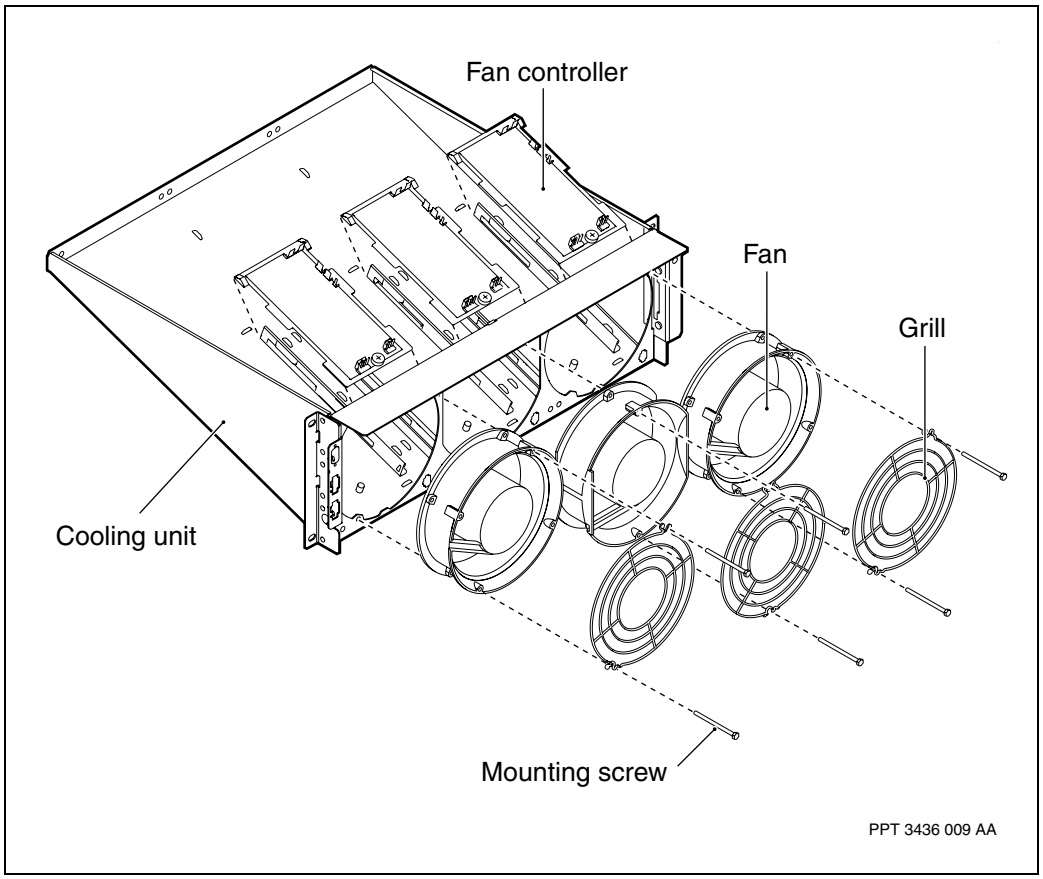
10 Within seconds of powering the fan:

- ensure that you hear the other 2 fans reduce rpm to the lower (normal) speed
- ensure that the alarm 7012_0051 has cleared

--End--

Procedure job aid

Location and orientation of the fans on any version of cooling unit



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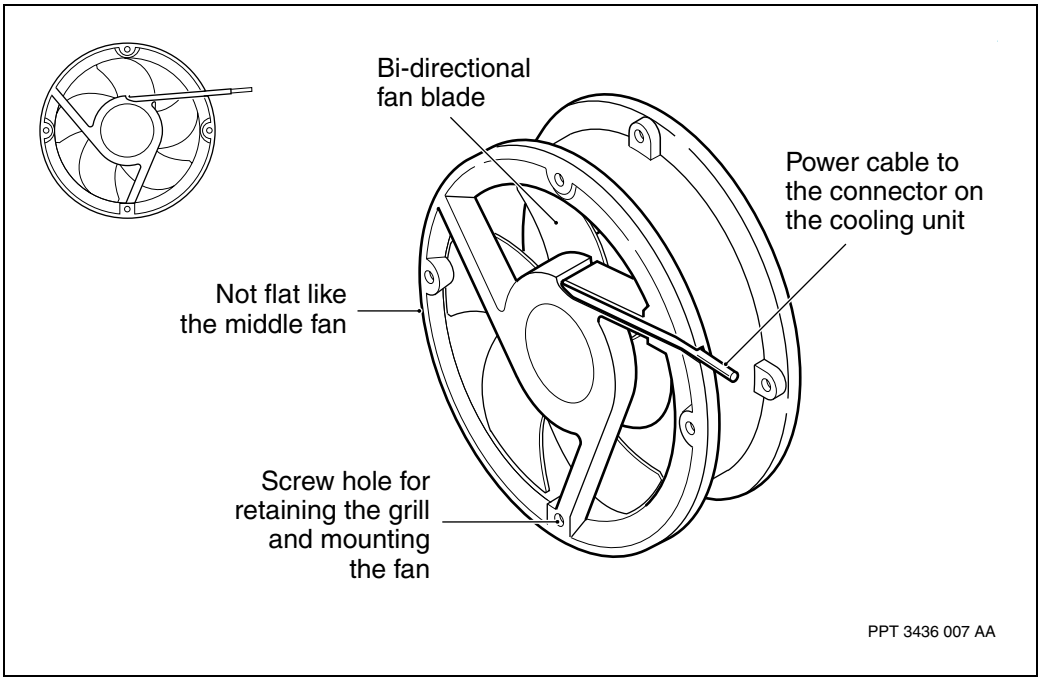
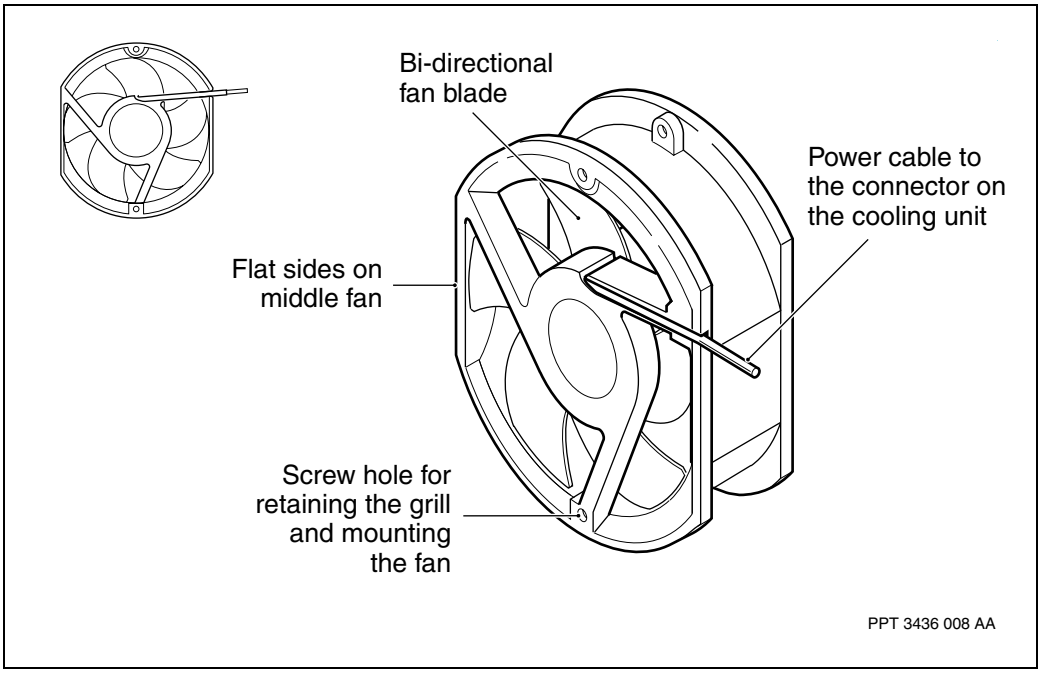
A side fan A0522182 for a cooling unit NTHR51AB or NTHR52AB



A middle fan A0522179 for a cooling unit NTHR51AB or NTHR52AB



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Installing a fan controller

Install a fan controller to restore the operation of a fan.

Prerequisites

WARNING
Risk of injury by fan blades
While working on any equipment near cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a rotating fan with anything.

WARNUNG
Verletzungsgefahr durch Lüfterblätter
Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

- You must be familiar with Safety considerations and best practices (page 19).
- You need an appropriate fan controller for the version of cooling unit:
  - NTHR10AA for a lower (rear) cooling unit NTHR51AA
  - NTHR10AB for a lower (rear) cooling unit NTHR51AB
  - NTHR10AA for a for an upper (front) cooling unit NTHR52AA
  - NTHR10AB for a for an upper (front) cooling unit NTHR52AB
- For controller NTHR10AA, you need a non-magnetic one-piece short-shafted screwdriver to fasten the very large slotted captive screw.
- For controller NTHR10AB, you need:
  - a non-magnetic one-piece screwdriver to fasten the very large Phillips captive screw
  - a flashlight to see inside the cooling unit while using one hand to put electrical tape on the temperature sensor connector
- The location of the mounting screw is different for each version of the lower and upper cooling units. Refer to these figures:
  - Location of the fan controllers inside a cooling unit NTHR51AA or NTHR52AA (page 359)
  - Location of the fan controllers inside a cooling unit NTHR51AB or NTHR52AB (page 360)

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— A fan controller for inside a cooling unit NTHR51AA or NTHR52AA (page 361)

— A fan controller for inside a cooling unit NTHR51AB or NTHR52AB (page 362)

- When a fan controller is removed to increase access to removing a temperature sensor, insert the same controller instead of a replacement. This ensures that a working controller operates with the replaced part.
- When installing a cooling unit component as part of a replacement, high temperature alarms will not clear until the replaced component has had time to lower the temperature. For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	For an NTHR10AA fan controller as shown in the figure A fan controller for inside a cooling unit NTHR51AA or NTHR52AA (page 361), examine the replacement fan controller to determine if it is already mounted onto a carriage plate. • If the controller is already mounted, continue. • If the controller is not, remove the faulty controller from the carriage plate by unfastening its 6 M3 screws. Mount the replacement controller in its place using the same screws. Tighten the screws to snug (no extra turn). Tightening beyond snug can crack the carriage plate.
2	When installing an NTHR10AB into an upper (front) cooling unit NTHR52AB, you must unplug the temperature sensor that is on the module as shown in the figures A fan controller for inside a cooling unit NTHR51AB or NTHR52AB (page 362) and Cable connections inside an upper cooling unit NTHR52AB (page 364). This also applies to the fan controller of the upper cooling unit that is used in the lower position of a shelf-based (rack-mounted) switch in hardware kit NTQS04 or NTQH04. Keep the sensor as a spare part for the temperature sensor bracket assembly NTHR68AB. Store the part in an anti-ESD pouch.
3	When installing an NTHR10AB into an upper (front) cooling unit NTHR52AB, you must also ensure that the temperature sensor cable connector remains disconnected from the module, is taped, and is fastened aside. Refer to the figure Cable connections inside an upper cooling unit NTHR52AB (page 364). If the connector has not already been fastened aside, securely put a strip of electrical tape over the connector or tuck the connector aside so that the pins on the module will not contact the metal in

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the connector, and the air flow from the fans will not remove the tape or move the connector. Use a flashlight to do it and check your work.

4 While facing the cooling unit, hold the controller so that the captive screw is nearest you and:

- on the left with an NTHR10AA
- centered with an NTHR10AB

5 Since the orientation of the controller is opposite between a lower (rear) and an upper (front) cooling unit, always keep the captive screw accessible. Orient the controller for a lower or an upper unit.

6 Look inside the cooling unit so that you can see where the captive screw is to be fastened. Once the controller is positioned inside the cooling unit, you will not be able to see the screw hole.

7 Slide the controller between the rails inside the cooling unit.

8 With an NTHR10AA, refer to the figure Location of the fan controllers inside a cooling unit NTHR51AA or NTHR52AA (page 359). Align the far-end connector on the board with the connector on the cooling unit and slide the controller along the cooling unit housing to engage the connectors. While engaging, ensure that the connectors are straight. If the controller is being installed in a lower (front) cooling unit, you must continue to hold the controller in position.

With an NTHR10AB, refer to the figure Location of the fan controllers inside a cooling unit NTHR51AB or NTHR52AB (page 360). Slide the corner feet to the ends of the rails on the cooling unit housing. If the controller is being installed in a lower (front) cooling unit, you must continue to hold the controller in position.

9 Fasten the captive screw on the controller to the cooling unit housing by using your fingers. You will have to find the hole by feeling it through the screw. You may have to re-seat the controller to align the screw with the hole in the housing.

10 When your fingers can no longer turn the screw, use the appropriate driver to tighten the screw to snug plus a 1/5 turn. If you overtighten the captive screw, you will have to replace the controller or the entire cooling unit.

11 With an NTHR10AB, you must connect 5 cable assemblies to the controller when in an NTHR51AB or 4 cable assemblies when in an NTHR52AB as shown in these figures:

- A fan controller for inside a cooling unit NTHR51AB or NTHR52AB (page 362)
- Cable connections inside a lower cooling unit NTHR51AB (page 363)
- Cable connections inside an upper cooling unit NTHR52AB (page 364)

Press the keyed Molex connector of each cable assembly onto the connector of the controller. Stop pressing when the pins of each controller

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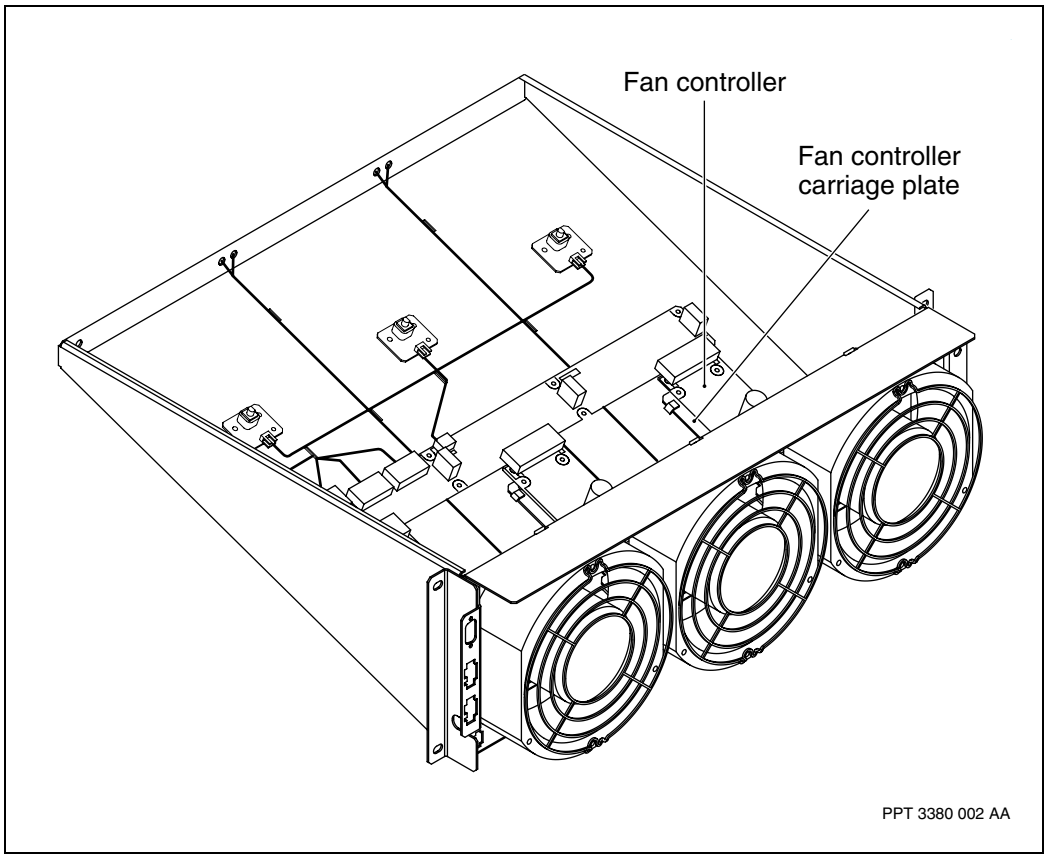
connector can no longer be seen. There is no tab on each Molex connector to indicate a fully engaged connection.

--End--

Procedure job aid

Location of the fan controllers inside a cooling unit NTHR51AA or NTHR52AA



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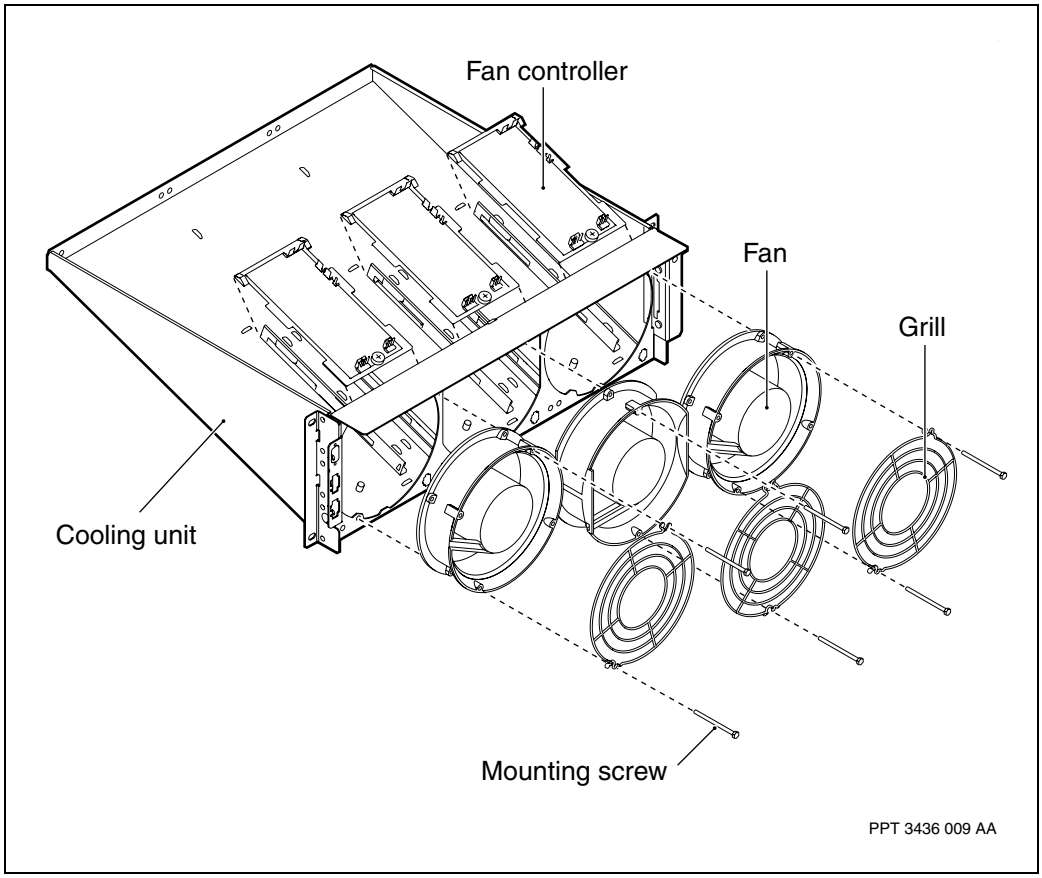
Location of the fan controllers inside a cooling unit NTHR51AB or NTHR52AB



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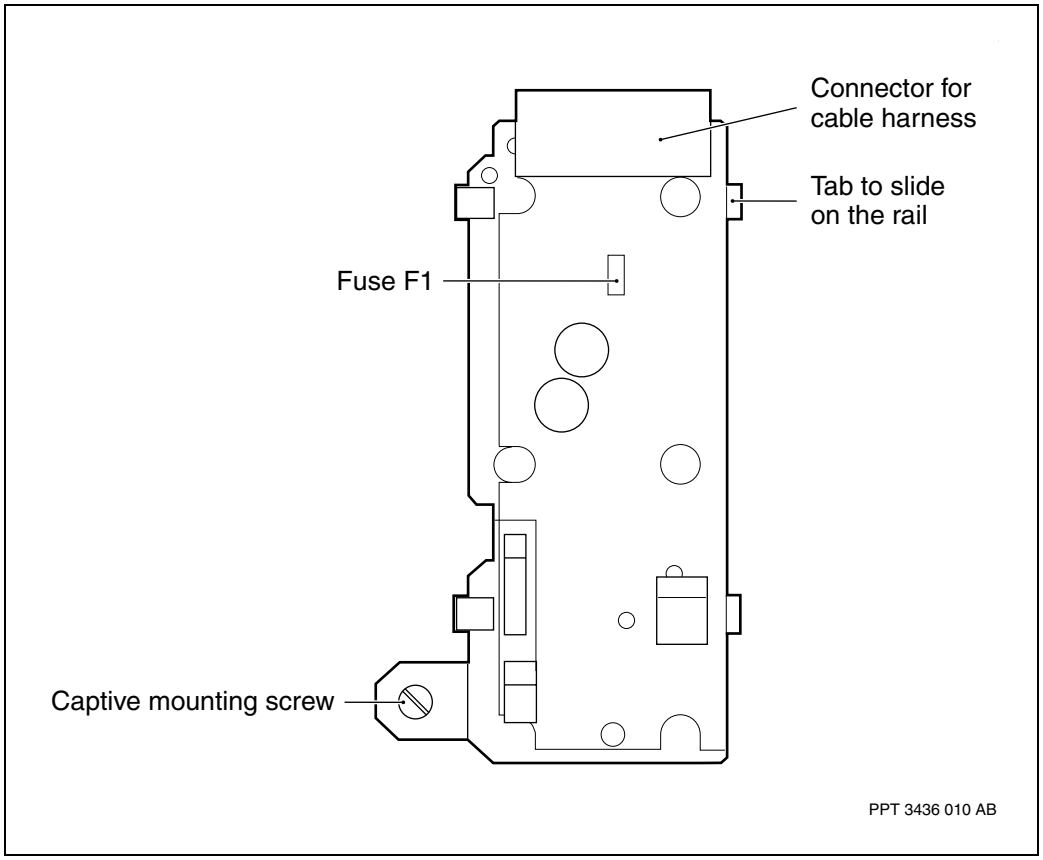
A fan controller for inside a cooling unit NTHR51AA or NTHR52AA



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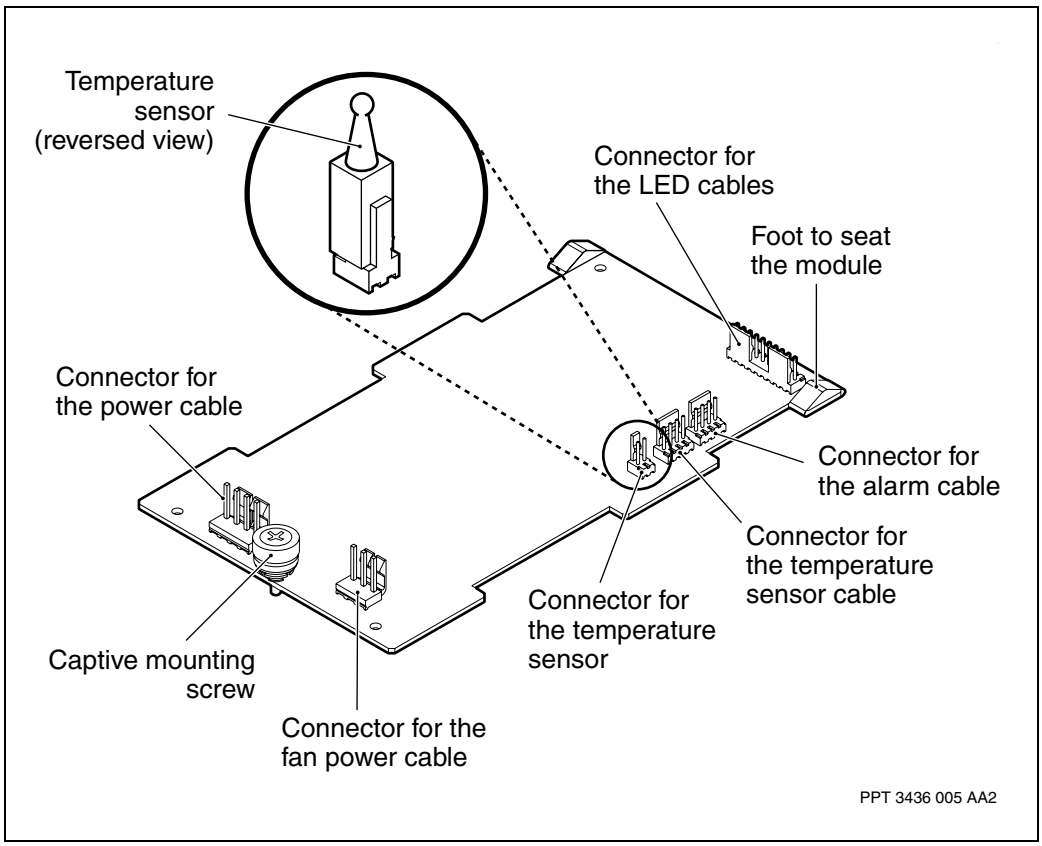
A fan controller for inside a cooling unit NTHR51AB or NTHR52AB



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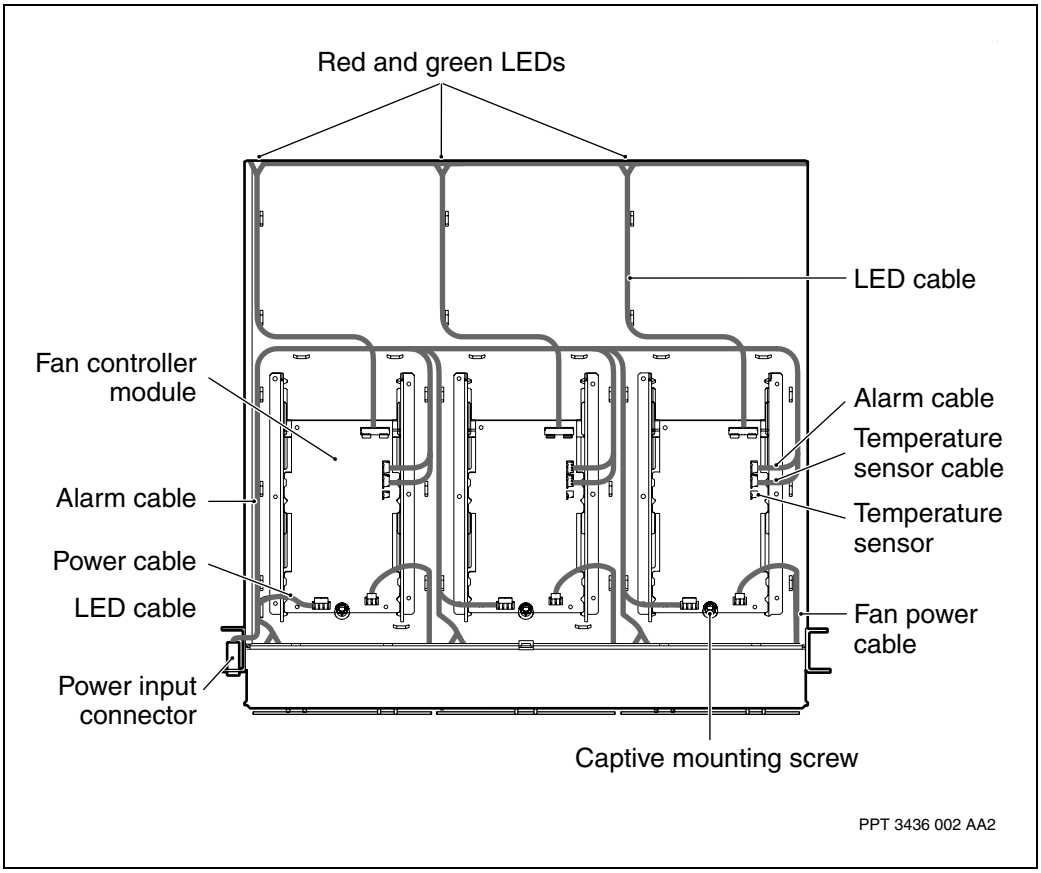
Cable connections inside a lower cooling unit NTHR51AB



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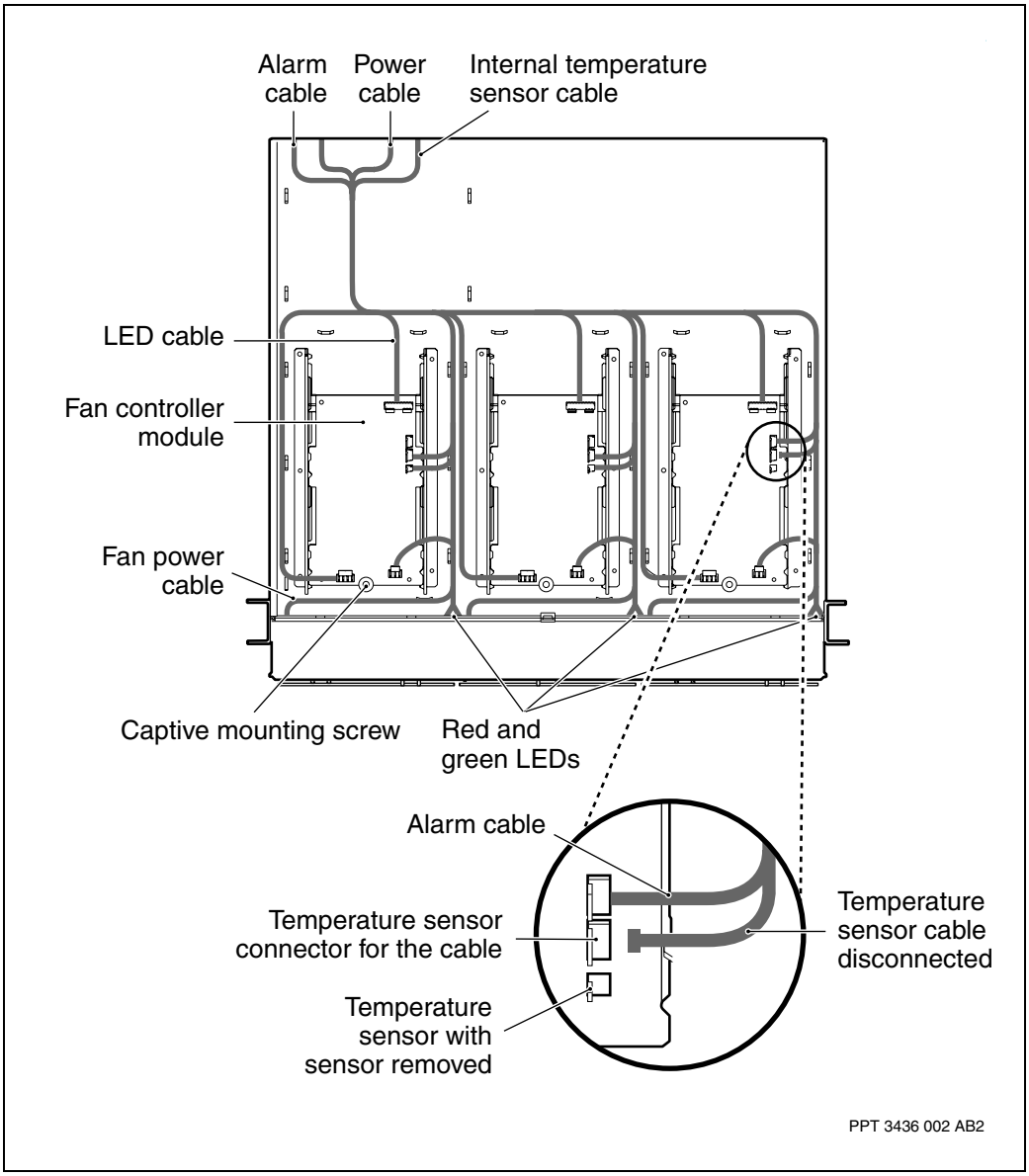
Cable connections inside an upper cooling unit NTHR52AB



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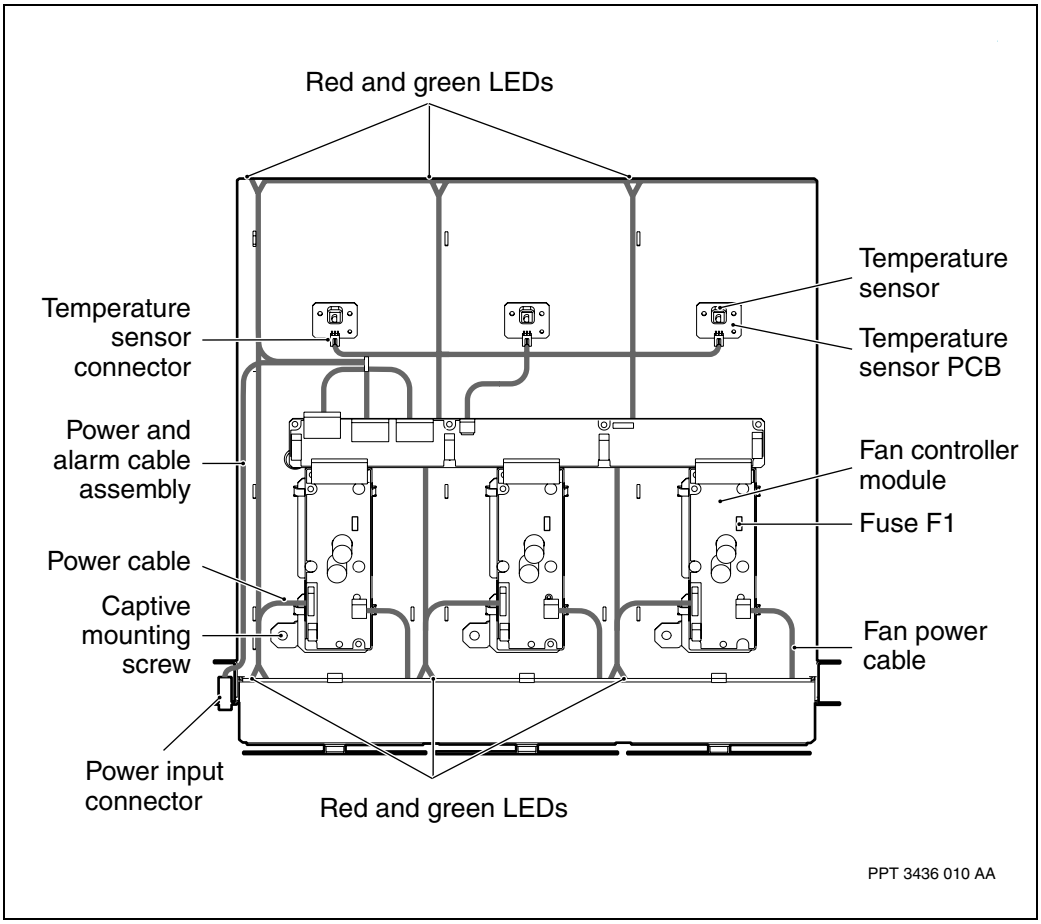
Cable connections inside a cooling unit NTHR51AA or NTHR52AA



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Installing a fanout panel

Install a fanout panel in a frame or rack to connect a 12-port DS3 or E3 FP to customer premises signalling equipment.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a fanout panel with PEC NTHW52. The NTHW52 is pre-assembled, including two adapter brackets fastened by four Phillips screws to the panel mounting ears. See A 12-port DS3 or E3 fanout panel (page 367).
- For fanout panel connections refer to NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Unpack the fanout panel from the container.
2	Place the front of the panel against the frame uprights so that it aligns with the previous top holes in the brackets with the holes in the frame. The panel has key-hole pins that align with the holes in the frame.
3	Hold the panel in one hand so that: • the label TOP is at the top of the panel • the Phillips screw heads of the adapter brackets face you • the bracket holes are nearest you on the left and right and the BNC connectors are farthest from you
4	While holding the panel in position, fasten a thread-forming 10-mm (3/8-in.) hex-head screw through the upper left and the upper right mounting holes. Leave the screws close to being seated.
5	Align the other bracket holes on the panel with the frame holes under the grounding strip.
6	Loosely tighten the remaining 2 screws.
7	Tighten all screws to snug plus a 1/4 turn.

--End--

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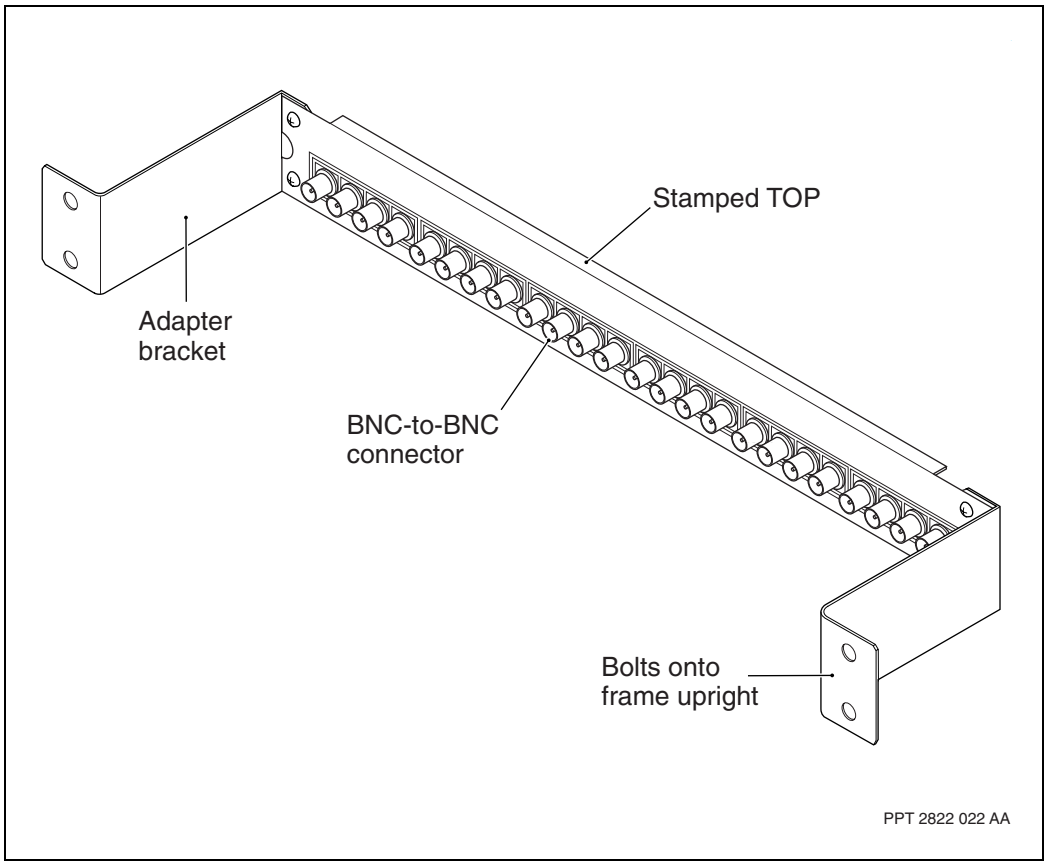
Procedure job aid

A 12-port DS3 or E3 fanout panel



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Installing a fiber management unit

Install a fiber management unit to help manage fiber cables near a Multiservice Switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need the optional hardware identified by PEC NTHW50. See the figure A dual-drawer fiber management unit NTHW50 (page 370).
- You need a NEBS 2000 frame or equivalent mounting apparatus that is already installed with a space large enough to house the fiber management unit.
- You need a helper to hold a fiber management unit until it is fastened because it weighs 8.25 kg (18.2 lbs).
- The fiber management units do not require a deliberate gap between them when installed one above the other.
- A fiber management unit does not require electrical grounding. When mounted in a NEBS 2000 frame according to the installation procedure, the unit is automatically grounded. When the fiber unit is installed in any other mounting apparatus, follow its telecommunications grounding rules.
- When installing the fiber unit in a 21-in. (53.34-cm) mounting apparatus other than a NEBS 2000 frame, the 10-mm (3/8-in.) screws that are provided with the fiber unit are likely to be inappropriate. You will need to use mounting screws to match the mounting holes of the other mounting apparatus.
- When the fiber management unit is to be installed in a NEBS 2000 frame that has a switch in the bottom position, there is usually a shelf filler panel at the upper front (NTHR76), rear (NTHR77), or both faces of the frame. Before installing the fiber management unit, remove whichever filler panel covers the position where you want the fiber management unit (or units) to be installed. See the procedure Removing a filler panel (page 581). The 10-mm (3/8-in.) screws and the panel are no longer needed for this installation.

Procedure steps

Step	Action
1	At the front or rear of the NEBS 2000 frame or equivalent, locate where the top mounting holes of the fiber unit are to be on the 2 frame uprights. Count holes from the top or bottom (whichever is shorter) of the left and right uprights to ensure that a level installation. Mark the holes.

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2 Unpack the fiber management unit from the container labelled NTHW50.

3 Hold the fiber unit so that the drawers face you and are closed, and the labels on the drawers read the normal way.

4 Position the fiber unit between the uprights, and align the 2 top holes of the mounting ears with the marked holes on the uprights.

5 While a helper holds the unit in position, thread a thread-forming 10-mm (3/8-in.) hex-head screw through the top left and right mounting holes. Leave the screws almost seated.

When installing the fiber unit in a 21-inch (53.34-cm) wide mounting apparatus (that is, in other than a NEBS 2000 frame), you will likely need to add mounting screws of a different size.

6 Align the bottom mounting-ear holes of the fiber unit with the holes on the uprights.

7 Add the remaining 2 screws in the lowest left and right mounting holes. Use a middle mounting hole only if the nearest corner hole strips.

8 Tighten all screws to snug plus a 1/4 turn.

--End--

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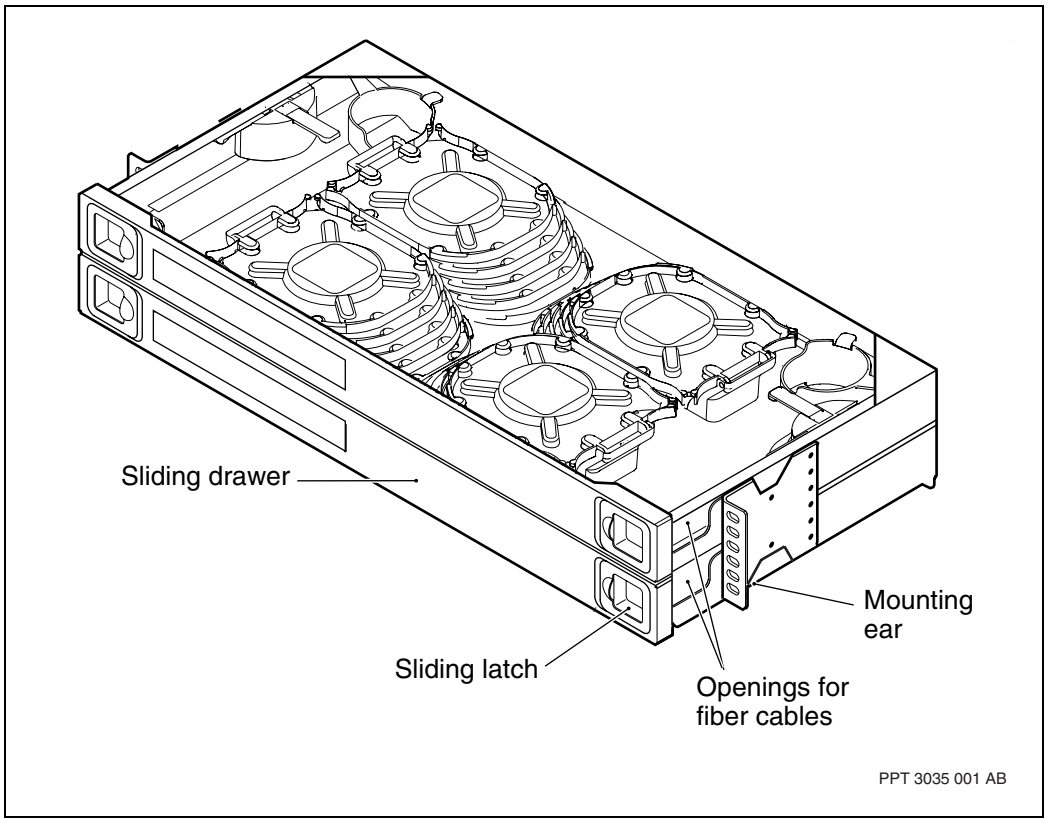
Procedure job aid

A dual-drawer fiber management unit NTHW50



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Installing a kickplate

Install a kickplate to enclose the front or rear base of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Use the kickplate that was installed on the frame at factory, as shown in the figure A standard kickplate on the base of a NEBS 2000 frame (page 372).
- You need a driver for
  - the medium slotted captive screws that fasten the kickplate to the base of the frame
  - whatever fastener was used to connect the frame ground cable to the kickplate or the kickplate extension

Procedure steps

Step	Action
1	Align the kickplate and screws to the base of the frame as shown in the figure A standard kickplate on the base of a NEBS 2000 frame (page 372).
2	If present, fasten the ground cable from the frame onto the kickplate.
3	Fasten the captive screws at the ends of the kickplate.

--End--

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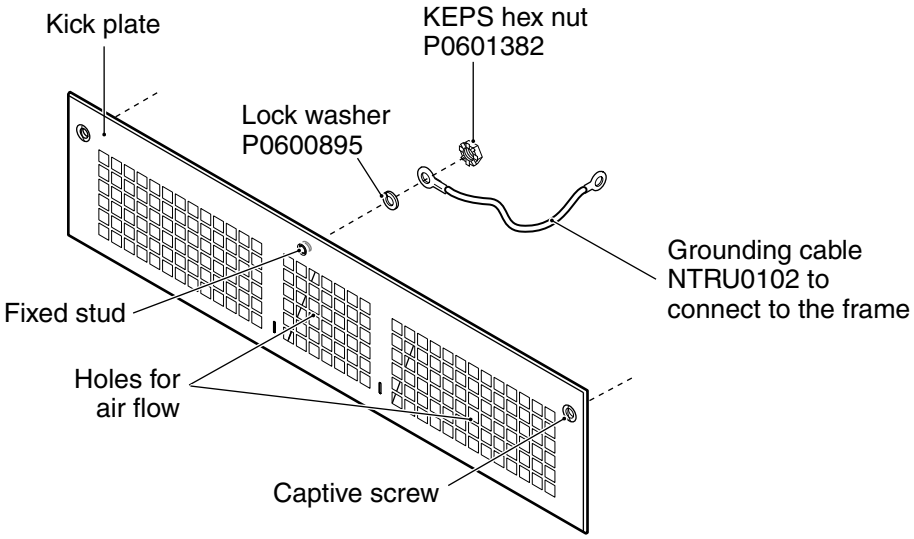
Procedure job aid

A standard kickplate on the base of a NEBS 2000 frame



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Installing a kickplate extension

Install a kickplate extension onto the base of a NEBS 2000 frame at its front or rear as part of enclosing a frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a kickplate extension with a ground cable NTRU0102 from kit NTPX4060 as shown in the figure A kickplate extension P0995497 (page 374). The cable has eye-loop fasteners at both ends and is 30.5 cm (1 ft.) long and size 10 AWG (5.26 mm^2).
- You need a driver for
  - the medium slotted captive screws that fasten the kickplate extension to the base of the frame
  - whatever fastener is to be used to connect the frame ground cable to the kickplate extension

Procedure steps

Step	Action
1	Fasten the ground cable NTRU0102 to the kickplate as shown in the figure A kickplate extension P0995497 (page 374) by • putting a lock washer P0600895 over the stud on the kickplate • putting a cable lug over the stud while ensuring that the cable points towards the frame to minimize the angle of stress on the cable neck when the kickplate extension will be fastened • fastening a KEPS nut P0601382 onto the stud with the attached star washer contacting the cable lug
2	Fasten the other end of the ground cable to a welded nut in an L-shaped bracket inside the base of the frame using a Pozidriv 12-mm thread-forming screw P0600060 and a lock washer P0600895.
3	Align the 2 captive screws of the kickplate extension with the holes on the facing edge of the lower left and right extension brackets as shown in the figure Orientation of a kickplate extension to the lower extension brackets (page 374).
4	Fasten the slotted captive screws a 1/4 turn clockwise at the ends of the kickplate into the extension brackets P0995493 and P0995494 at the corners of the frame base. Ensure that the ground cable is not pinched.

--End--

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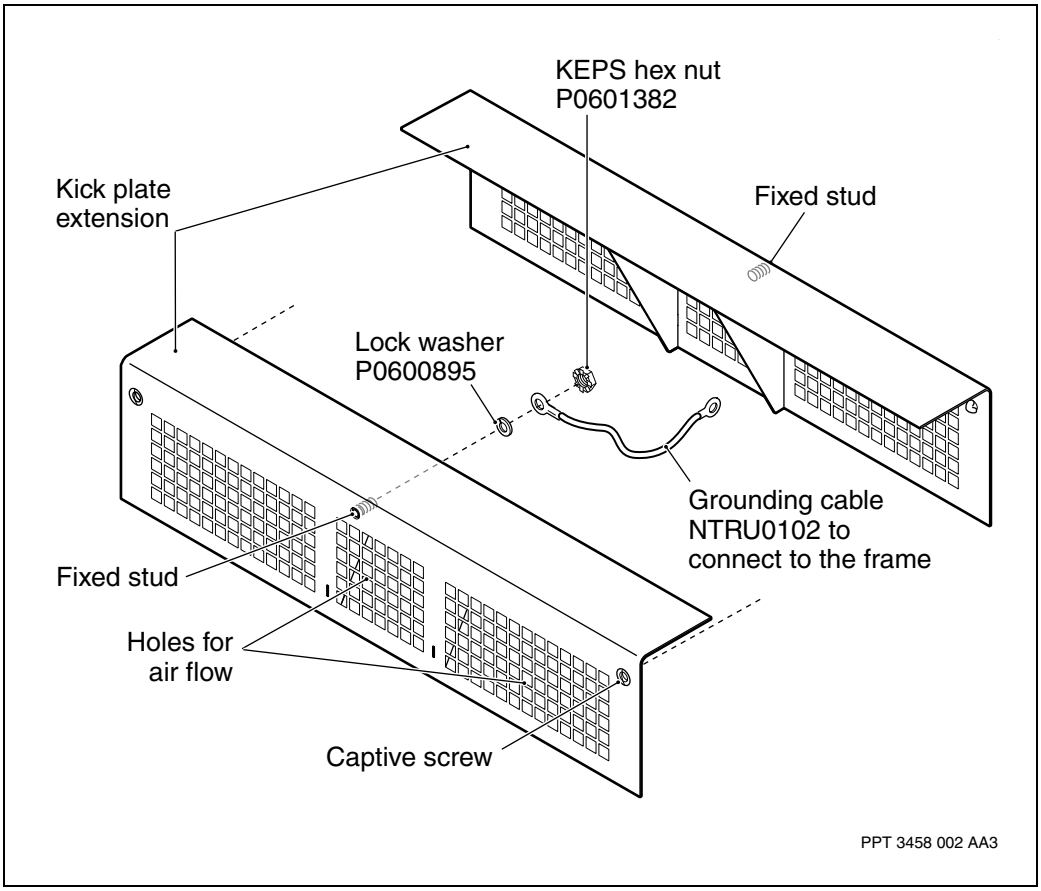
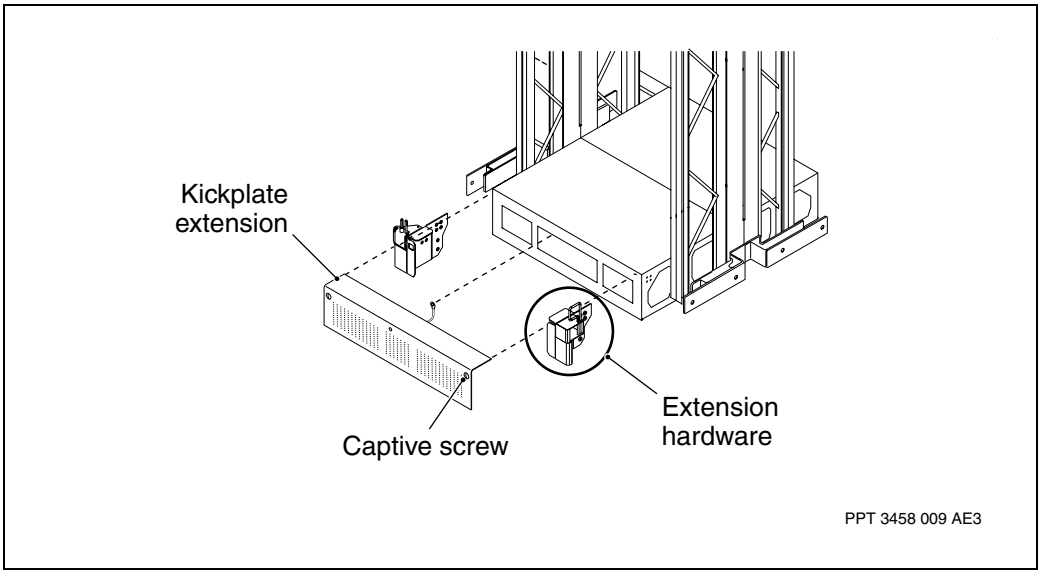
Procedure job aid

A kickplate extension P0995497



Orientation of a kickplate extension to the lower extension brackets



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Installing a lower cooling unit

Install a lower (rear) cooling unit to enable temperature control for the Multiservice Switch hardware in the lower position of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need an NTHR51AA or NTHR51AB version of a lower (rear) cooling unit. Since the fans of the unit are at the rear of the switch, that is, on the same side that the fabric cards plug into, the lower cooling unit is also the rear cooling unit.
- You need a driver for the 10-mm (3/8-in.) screws that fasten each cooling unit to the frame or rack.
- A lower cooling unit is accessed from the rear of the NEBS 2000 frame or equivalent.
- When installing a cooling unit as part of a replacement, high temperature alarms will not clear until the replaced unit has had time to lower the temperature. For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	While referring to the figures A lower cooling unit NTHR51AA (page 377) and A lower cooling unit NTHR51AB (page 378), hold the ends of the cooling unit so that • you face the fans • the open side is at the bottom • a hand holds the narrow rear end • a hand holds the fan end
2	Facing the rear of the switch, insert the narrow end of the cooling unit between the uprights of the NEBS 2000 frame and along the top of the shelf assembly.
3	Slide the cooling unit inwards until the mounting ears at the fan end touch the frame uprights.
4	Align the mounting-ear holes with the screw holes on the frame uprights. The cooling unit should be in position as shown in the figure Location of a lower (rear) cooling unit (page 379).

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5 While holding the cooling unit in position, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through an upper mounting-ear hole.

6 Loosely fasten another screw through the other upper mounting-ear hole, then the bottom 2. While turning a screw, ensure that it is perpendicular to the hole to prevent cross-threading.

7 Tighten all screws to snug plus a 1/4 turn.

8 If any cable for the F1, F2, or F3 connectors on the front of the unit is unplugged, plug it in. The connectors fit only one way. Ensure the tab on the side engages.

9 Using the labels from the removal, plug in the A and B power cable assembly connectors into the appropriate connector on the unit. Each connector fits only one way. Ensure that the tab on each side of a connector fully engages.

10 Restore power to the unit at the BIP by removing the tape from the cooling unit breakers (in the middle) in each BIM and toggling on the breakers by pressing the bar symbol (|) in.

11 Check the LEDs on the cooling unit to verify that each fan is operating. Normal operation is indicated by a lit green LED. If any LEDs are red, disconnect and re-connect the F1, F2, or F3 cable that is nearest the fan unit that is nearest the LED.

At the front of the NEBS 2000 frame or equivalent, the LEDs of both cooling units are visible together. Ensure that you check the F1, F2, or F3 connector that is associated with the lit red LED.

12 Pack the removed cooling unit in the container from the replacement unit. Ensure that you change the PEC on the container to match the PEC on the unit.

--End--

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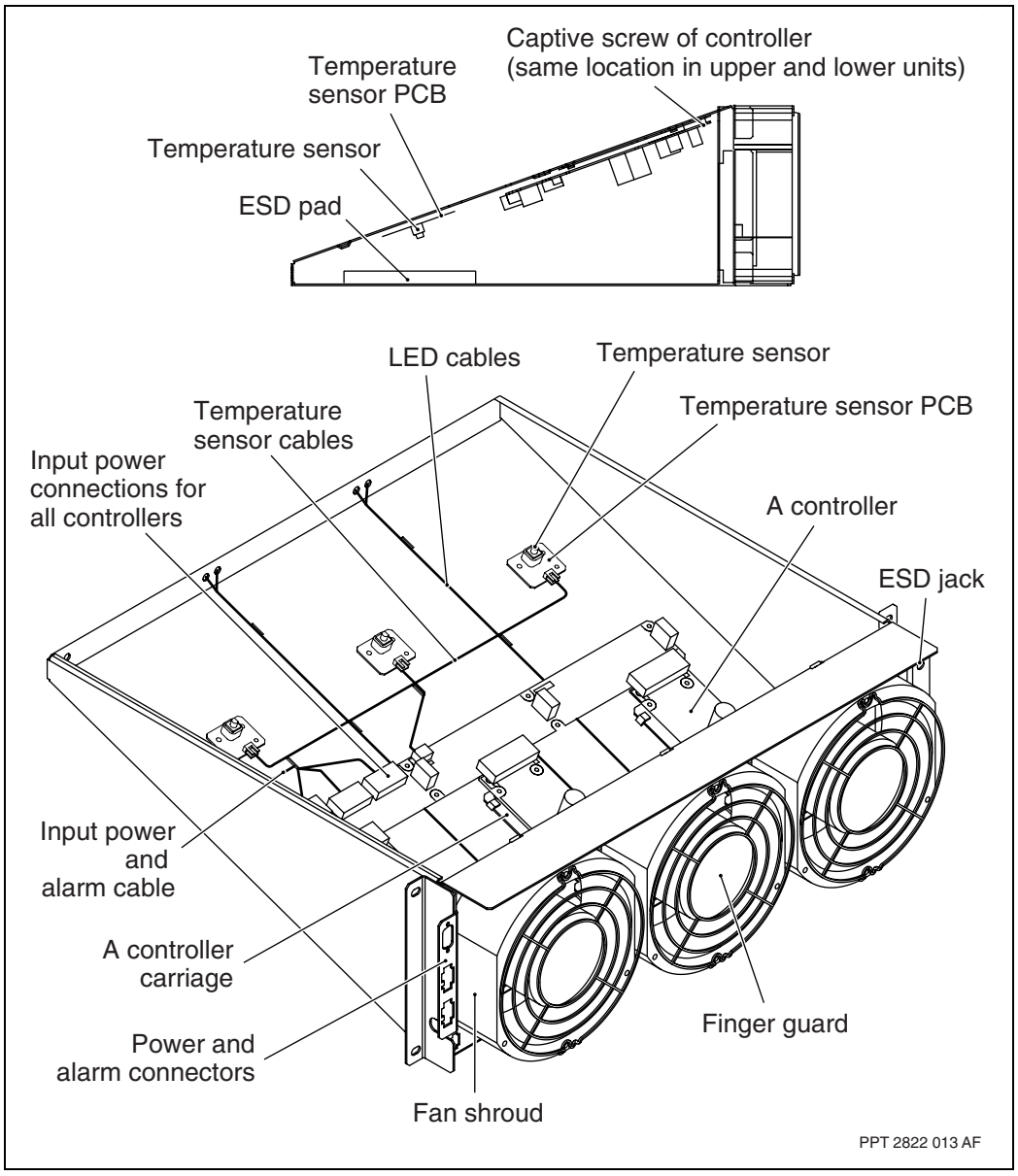
Procedure job aid

A lower cooling unit NTHR51AA



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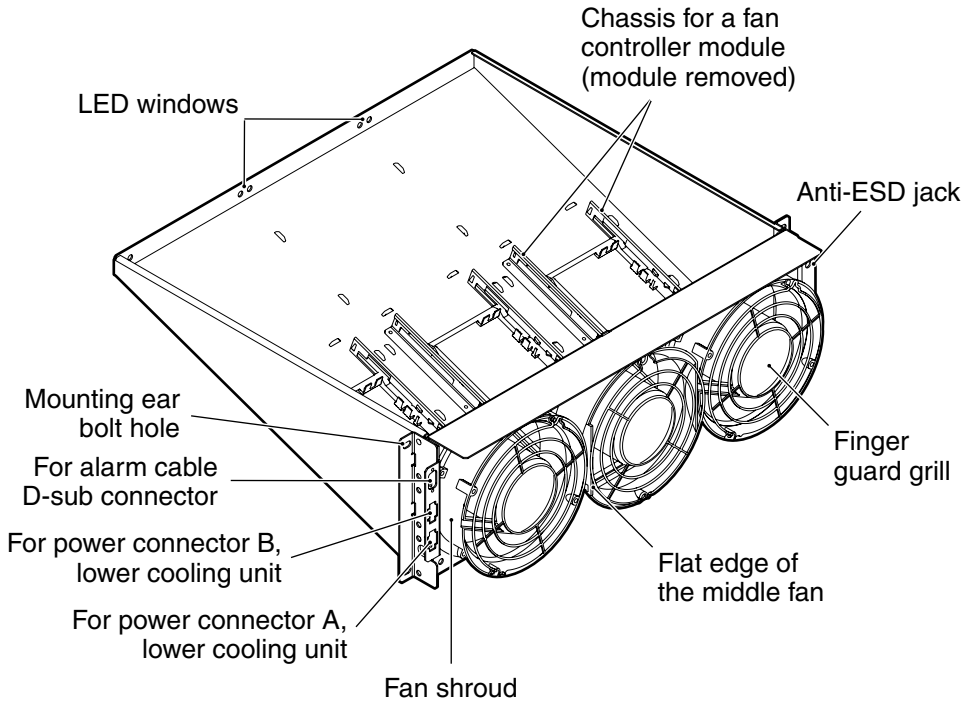
A lower cooling unit NTHR51AB



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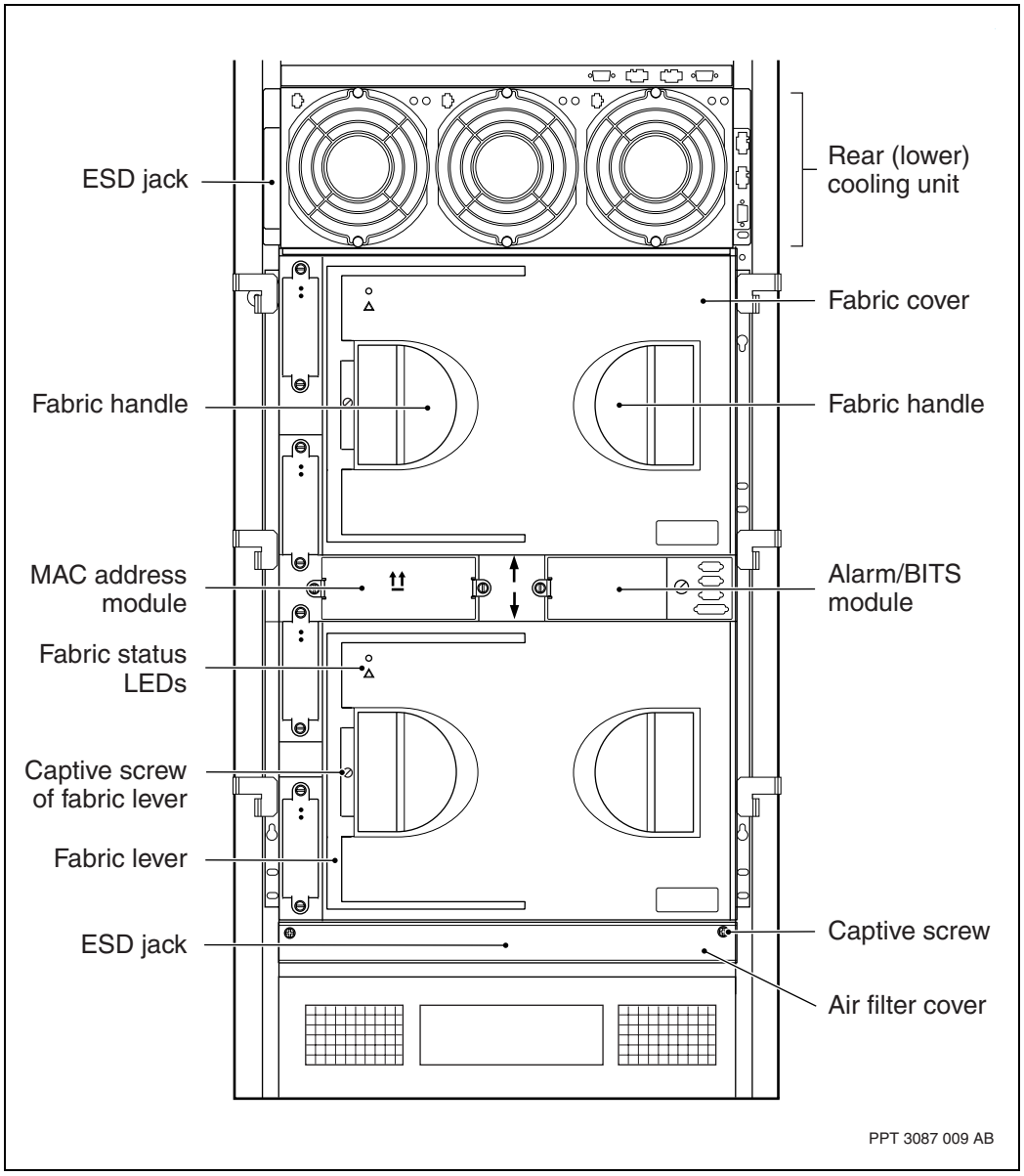
Location of a lower (rear) cooling unit



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Installing a multiport aggregate device

Install a multiport aggregate device to break out the ports of a 32-port E1 TDM FP.

Prerequisites

WARNING
Risk of personal injury
Connect multiport aggregate device interfaces to safety extra-low voltage (SELV) circuits only. Connections to telephone network voltage (TNV) circuits must be through an external device that provides current protection and isolation, such as an approved channel service unit (CSU). All such devices must meet the equipment safety standards of the country of installation.

WARNUNG
Verletzungsgefahr
Schließen Sie Schnittstellengeräte für Mehrfach-anschlussaggregate zur eigenen Sicherheit nur an Schaltkreise mit Niedrigspannung an. Anschlüsse an Telefonnetze müssen über ein Außengerät erfolgen, das den Stromfluss schützt und isoliert, wie z.B. ein Kanal-Servicegerät. Alle diese Geräte müssen den Sicherheitsbestimmungen des jeweiligen Landes entsprechen.

DANGER
Risk of injury or equipment damage by electricity
Before connecting cables or turning on power, ensure that the device is properly grounded. Failure to provide a proper ground may result in electrical shock causing equipment damage or personal injury. For information, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

WARNUNG
Verletzungs- oder Gerätebeschädigungsgefahr durch Elelkritzität
Bevor Sie Kabel anschließen oder das Gerät anschalten, vergewissern Sie sich, dass das Gerät ordnungsgemäß geerdet ist. Ohne eine Erdung können durch Elektroschocks Geräte beschädigt oder Personen verletzt werden. Für weitere Informationen siehe NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

- You must be familiar with Safety considerations and best practices (page 19).

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- You will need a multiport aggregate device with one of the following PECs:
  - NT0486 for the balanced version
  - NT0421 for the unbalanced version
- To mount the device onto a NEBS 2000 frame, you will need adapter kit NTHW14.

Procedure steps

Step	Action
1	Ensure that all cables, including the power cables, are disconnected from the unit.
2	If mounting the unit onto a NEBS 2000 frame, install the adapter brackets from kit NTHW14 according to the procedure Installing NEBS 2000 frame-to-EIA adapter brackets (page 513). Use the long side of the mounting ear brackets with NTHW14, unlike figure Installing mounting ears on a multiport aggregate device (page 383).
3	Fasten the provided mounting ears to each side of the multiport aggregate device using 2 screws and flat washers. See the figure Installing mounting ears on a multiport aggregate device (page 383).
4	
5	If you are installing the first panel on the rack, connect the grounding wire (supplied separately by Nortel Networks) to the top right securing screw. or If you are installing the lowest panel on the rack, secure the bottom of the grounding strip and a grounding wire to the rack with a screw.
6	Position the device between the uprights of the mounting apparatus to allow at least 90 cm (36 in.) clearance in front of the device for operator access. Allow at least 10 cm (4 in.) clearance at the rear of the device for cable connections.
7	Fasten the 4 provided 5/16-in. screws through the mounting ears into the cabinet or rack.
8	Attach the cable management panel to the cabinet or rack between the multiport aggregate device and other equipment using 4 of the provided screws. For proper cooling, you must also allow at least one vertical unit of space between the multiport aggregate device and other equipment. The cable management panel provides the required space. You can route cables through the panel as appropriate.
9	Connect the dc power cable for each power supply to the output terminals of the disconnect device.
10	Route the dc power cables into the cabinet or rack through the knockout.

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11 Attach the terminal connector to the ends of the wires. Each cable contains 3 wires: a positive, a negative, and a ground. Each connector has 3 openings: a positive, a negative, and a ground. Insert each wire into the opening that it matches and fasten it in place by tightening the screw on the top of the connector. See the figure Connecting power wires to the terminal connector (page 384).

12

13 Connect the terminal connectors to the terminal block for one of the power supplies (on the rear of the unit); connect the second cable to the other terminal block. Push the connector into the terminal block until it clicks and feels secure. See the figure Connecting the terminal connector (page 385).

14

15 Connect the power cables from the disconnect device to the power source.

16 Attach the appropriate cables to the multiport aggregate device.

17 At the rear of the device, toggle on the power for each power supply outlet.

18 Verify the state of the following LEDs

- The PWR A and B LEDs should be green.
- The TST LED should be yellow when power is first turned on during the time in which the device runs a self test.
- The SIG LED for link A (on the back) should be green if the cabling to the FP or termination panel is installed and the device is powered. A green LED indicates the device detects the receive signal.

If the FLT LED is red, the device has failed the self test and needs to be replaced. If the SYNC LOSS or AIS LEDs are lit, check the cabling to the device. If necessary, you can run loopback tests to determine whether the problem is with an external device.

--End--

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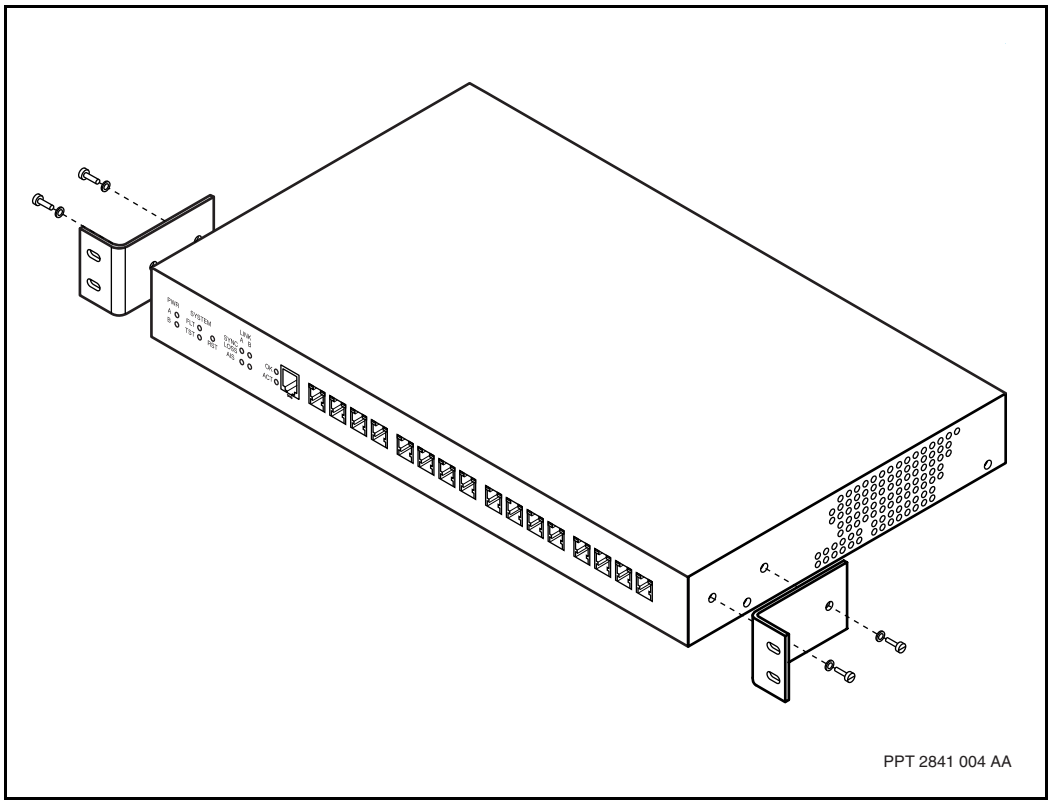
Procedure job aid

Installing mounting ears on a multiport aggregate device



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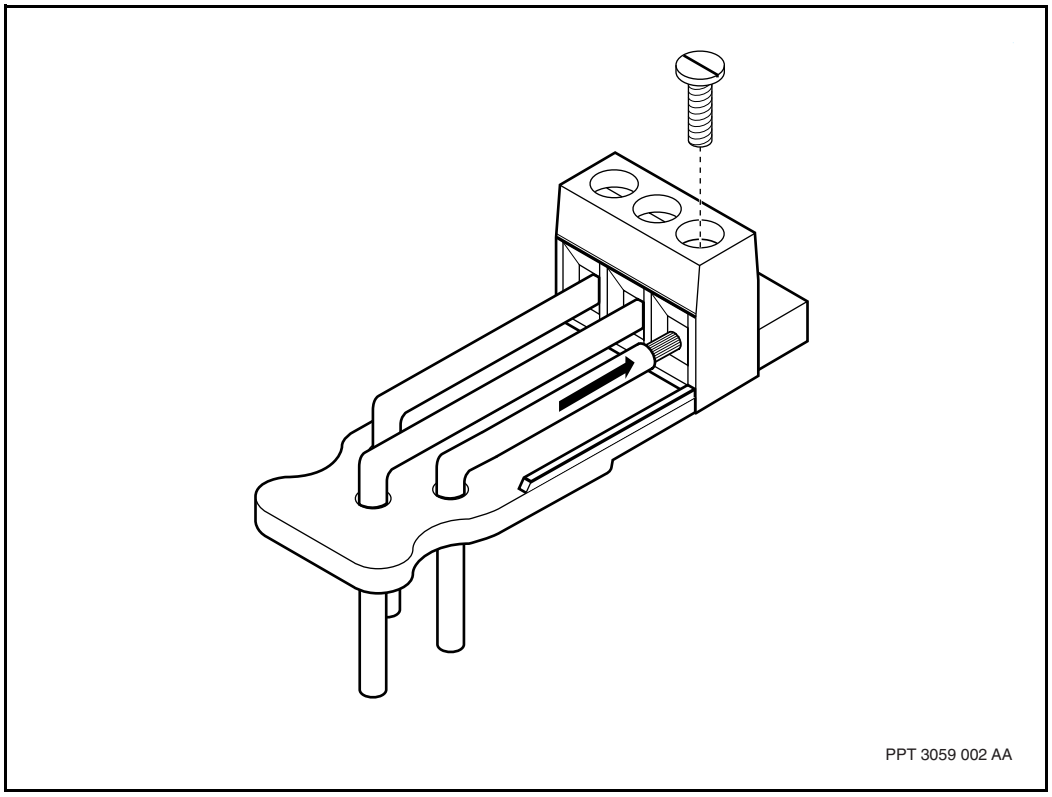
Connecting power wires to the terminal connector



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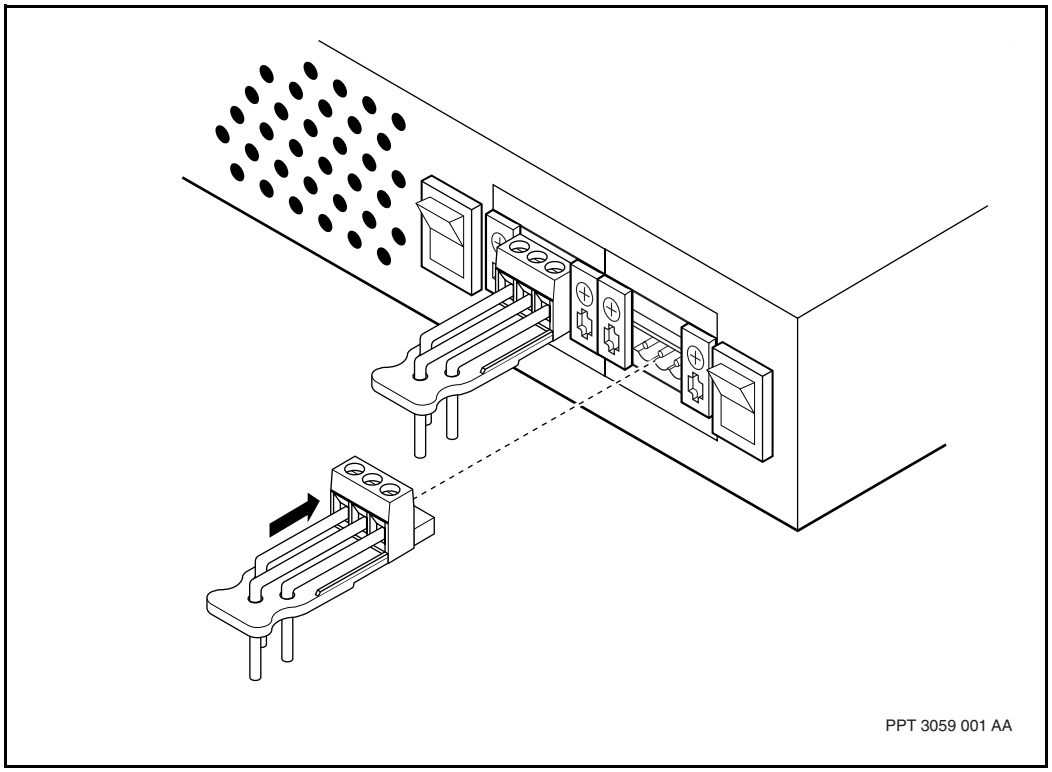
Connecting the terminal connector



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Installing a PIM

Install a PIM to restore back-up power to the shelf cage.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a replacement PIM with the PEC:
  - NTHR15 for a Multiservice Switch 15000
  - NTPN15 for a Multiservice Switch 20000

Procedure steps

Step	Action
1	Hold the PIM so that the side with the connector is at the left. An NTHR15 has a large slotted captive screw on the upper edge of the PIM faceplate. An NTPN15 has 2 large slotted captive screws, as shown in the figure A PIM NTPN15 for a Multiservice Switch 20000 (page 387).
2	Plug the PIM into the slot, holding both the left and the right sides even and pressing gently but firmly inwards. Ensure that the faceplate is flush with the surrounding surfaces.
3	Align and turn the captive screw or screws on the PIM with your fingers until you cannot turn any further. Ensure that you do not strip the threads or the hole because the module will not seat properly.
4	Plug the power cable connector back into the PIM until both tabs click. The connector mates only one way.
5	Remove the tape from the BIM breakers and toggle on the breaker (pressing | in). The triggered alarm stops. The A and B LEDs on a PIM in a Multiservice Switch 20000 are lit solid green when power is restored.

--End--

Procedure job aid

Refer to the figure Connection points of the PIM cables (page 389).

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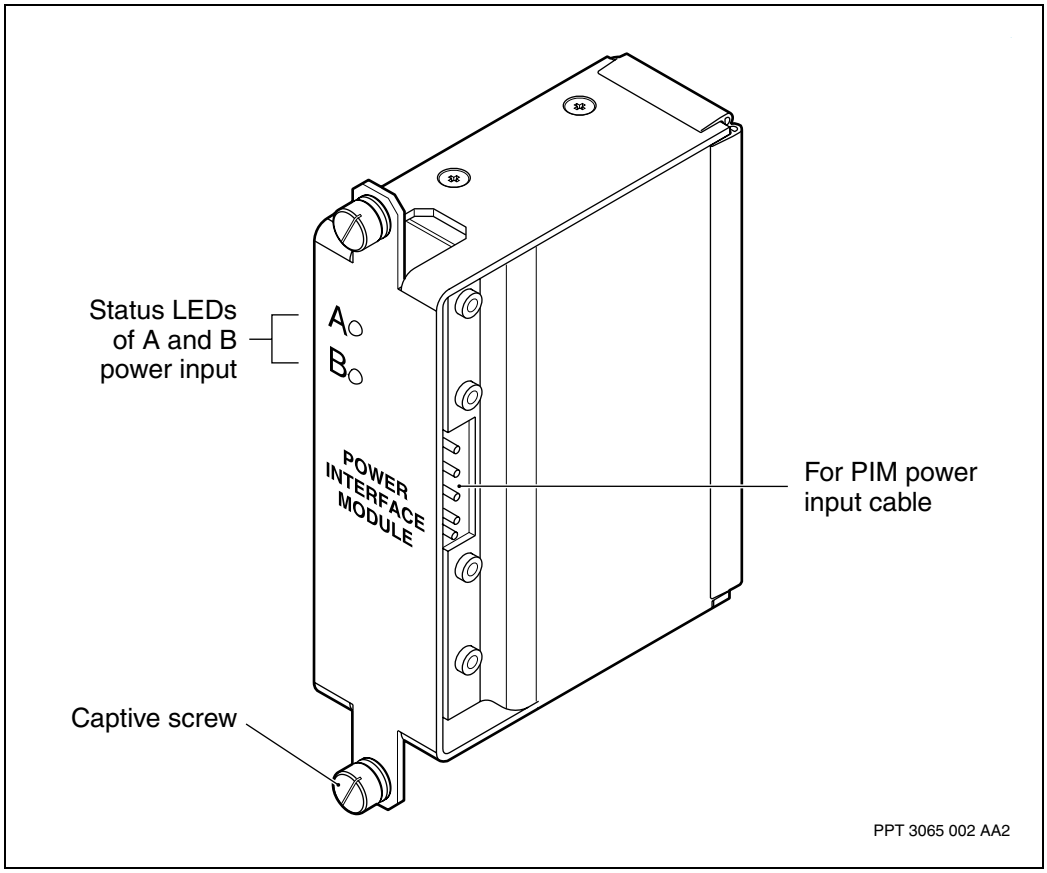
A PIM NTPN15 for a Multiservice Switch 20000



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Installing a PIM cable

Install a PIM cable to provide the power connection to the BIP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a PIM cable assembly identified by one of these PECs (labelled at each end of the cable assembly near the connectors):
  - NTHR54 for the cables to the PIMs in the lower shelf
  - NTHR53 for the cables to the PIMs in the upper shelf
  - NTHR55 for both upper and lower shelves
- The original PIM cable assemblies have been replaced by single cable assemblies, and the amount of cable slack is less on the newer versions. Although the PECs are similar, you may receive either version as a replacement. Both versions perform the same. All versions have a MATE-N-LOK II connector with Louvertec contacts at each end.

Procedure steps

Step	Action
1	At the PIM, press the connector in until both tabs click. The connector mates only one way.
2	If the PIM cable is not already routed, route the cable up to the BIP through the cable management brackets and up the BIP connector. The cable path for each PIM is shown in the figure Connection points of the PIM cables (page 389).
3	Plug the other end of the PIM cable into the BIP.
4	Dress the cable slack and fasten with tie-wraps. Cut off the tie-wrap tails.

--End--

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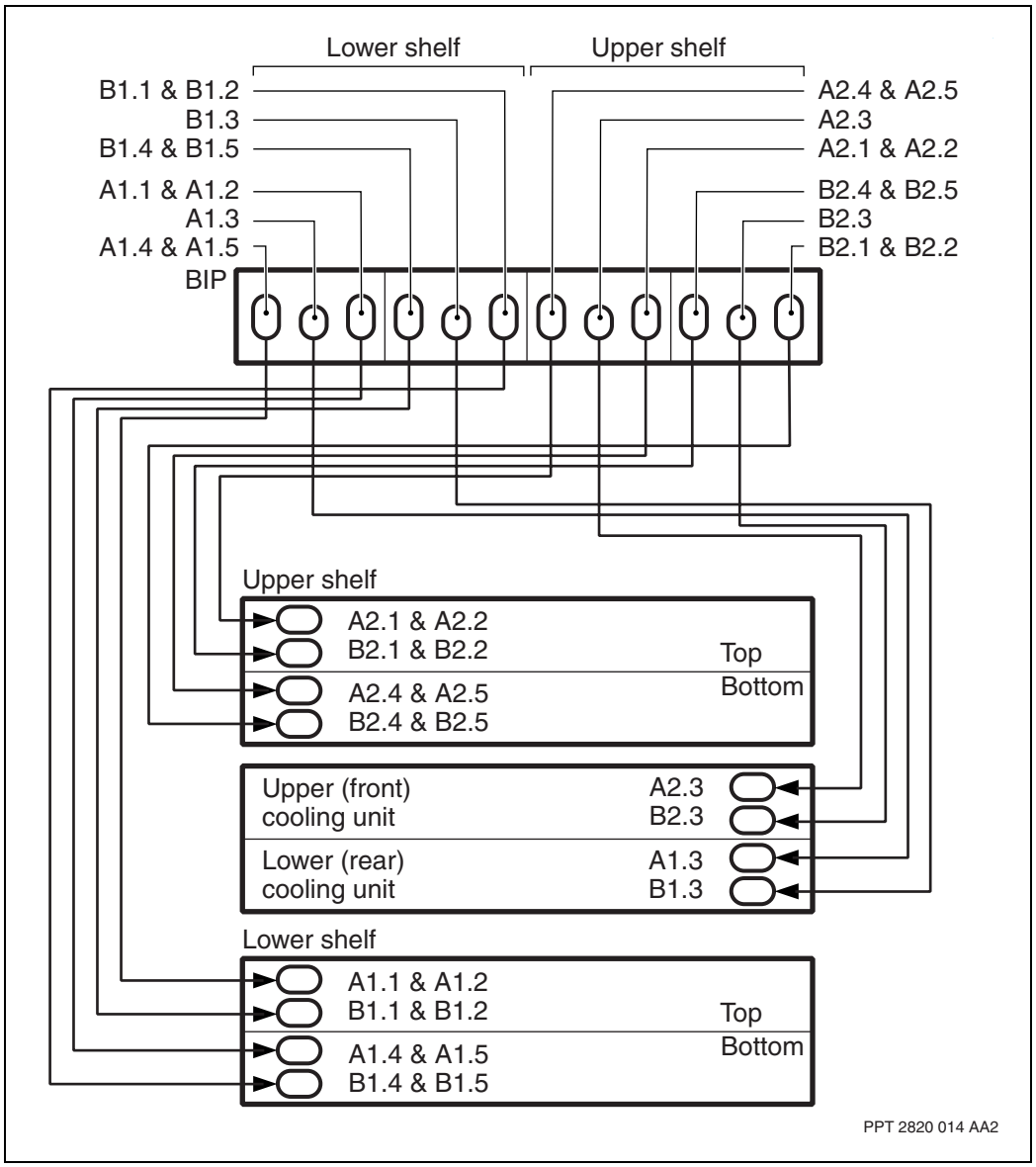
Procedure job aid

Connection points of the PIM cables



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Installing a power-and-ground cable assembly

Install a power-and-ground cable assembly to enable using power input cables smaller than 1/0 AWG (53.5 mm^2) or less flexible than Super Flex cables to feed the breaker interface panel (BIP).

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a polyvalent power-and-ground assembly with part number A0834143 or an ETSI power-and-ground assembly with part number A0843149. The ETSI kit contains large green pan-head slotted machine screws or 10-mm (3/8-in.) thread-forming hex-head screws for fastening the frame ground cables.
- You need the following specialty tools:
  - a medium Pozidriv screwdriver, for example a number 2 (do not substitute a Phillips bit)
  - an 11-mm (7/16-in.) deep socket with a properly calibrated torque wrench capable of 6.5 Nm (57.5 in.-lbs) and a 20-cm (8-in.) extender for the lug nuts
- You need a helper to hold the power-and-ground assembly until it is fastened to the mounting apparatus.
- The terminal blocks on the assembly rail approximately align with the pairs of battery and battery return studs at the rear of the BIP. Their uneven spacing is normal.

Procedure steps

Step	Action
1	At the rear of the BIP, unfasten any cables dressed along the horizontal strain-relief bar. These are likely to be the red power output and alarm cables from the BIP to other hardware parts. Leave the cables connected at both ends.
2	Note the orientation of the strain-relief bar at the uprights and remove its four 10-mm (3/8-in.) screws, as shown in the figure The polyvalent power-and-ground assembly A0834143 (page 393). Put the screws and bar aside temporarily.
3	Hold the power-and-ground assembly in the air so that: • the rail is horizontal • the labels on the terminal blocks face you • the connected cables point downwards

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4 Have a helper hold the assembly behind the BIP where the strain relief bar was.

5 For the ETSI assembly only, locate the terminal block on the right end. Fasten the 2-hole lug of the middle cable to the grounding strip using the provided screws or green screws. Bend the cable in a loop to the right so that the barrel side of the lug points to the right. Refer to the figure The ETSI power-and-ground assembly A0834149 (page 394).

6 Repeat step 5 for the remaining middle cables of each ETSI terminal block set. Work from 1 end to the other for ease of access. Fasten all 4 ground cables even if the frame houses only one switch.

7 Press your finger along the silvery grounding strips at the top left and right rear of the frame uprights so that dimples appear to indicate where the screw holes are located. The uprights are indicated in the figures The polyvalent power-and-ground assembly A0834143 (page 393) and The ETSI power-and-ground assembly A0834149 (page 394).

8 Using the provided 10-mm (3/8-in.) screws, fasten the rail to the uprights at the top or second dimple (or hole) from the top of each upright. Tighten to snug plus a 1/4 turn.

9 On the rear of the BIP, loosen the clamp of the rightmost insulation boot by using a medium Pozidriv bit that fits snugly. Loosen the clamp until you can pivot it easily with your finger. The clamp may already have been loosened.

DANGER

Risk of injury or equipment damage by electricity

Any feed cable that is connected to the rear of the BIP must be shielded by the provided insulation boot. If you strip the head of the screw that fastens the clamp against the boot, you cannot fasten the boot securely to the BIP. You must not operate the BIP unless you replace a stripped screw to secure the boot.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Alle Speisestromzuführungen, die mit der Rückseite des BIP verbunden sind, müssen mit der mitgelieferten Isoliermuffe abgeschirmt werden. Wenn Sie den Kopf der Schraube abtrennen, mit der die Klemme an der Isoliermuffe befestigt wird, kann die Muffe nicht sicher am BIP befestigt werden. Betätigen Sie das BIP nur, nachdem Sie eine Schraube mit abgetrenntem Kopf zum Befestigen der Muffe ersetzt haben.

10

11 Remove the insulation boot and put it aside temporarily. Removing the boot reveals the power input studs.

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12 Using an 11-mm (7/16-in.) deep socket with a 20-cm (8-in.) extender, remove the nuts and Belleville washers from the studs and put them aside temporarily. If the thread pitch of the studs is different, remember which nut goes to each stud.

13 Slip the lower power cable from rightmost terminal block through the narrow neck of the insulation boot and slide it along the cable away from the lug.

14 Put the lug onto the studs, barrel at the bottom. Ensure that the lug is flush against the rear of the BIP.

15 Put a Belleville washer onto each stud, convex upwards. A Belleville washer is a dome-shaped spring washer. The high part of the washer must be away from the lug.

CAUTION
Risk of damage to power connections
At the rear of the BIP, the top stud of each pair carries the power. The bottom stud prevents rotation of the lug from the weight of the power cable. To avoid arcing and rotation, ensure that both studs are fastened securely with an appropriate 2-hole lug.

16

CAUTION
Risk of damage to power connections
The metal of the top stud of each pair is softer than the bottom lug because of increased electrical conductivity. Ensure that you do not overtighten either stud, nor leave one too loose. Damaging a stud can mean the BIP must be replaced.

17 Finger-fasten the nuts back onto each stud. The nuts thread easily, so check for cross-threading or mismatched thread pitches if there is resistance.

18 Tighten each stud nut to 6.5 Nm (57.5 in.-lbs) using a properly calibrated torque wrench with the measurement near the middle of wrench's range.

19 Slide the insulating boot to the BIP end of the cable, and align it with the shape of the lug (toe upwards). Rest the boot flush against the rear of the BIP.

20 Fasten the boot retainer clamp over the stud.

21 For each remaining power cable, working from right to left, repeat step 9 to step 20 for the 7 remaining cables.

22 Fasten the strain-relief bar back onto the frame uprights.

23 Use tie-wraps to fasten the black-and-white and red cables along the underside of the strain-relief bar and to the lower half.

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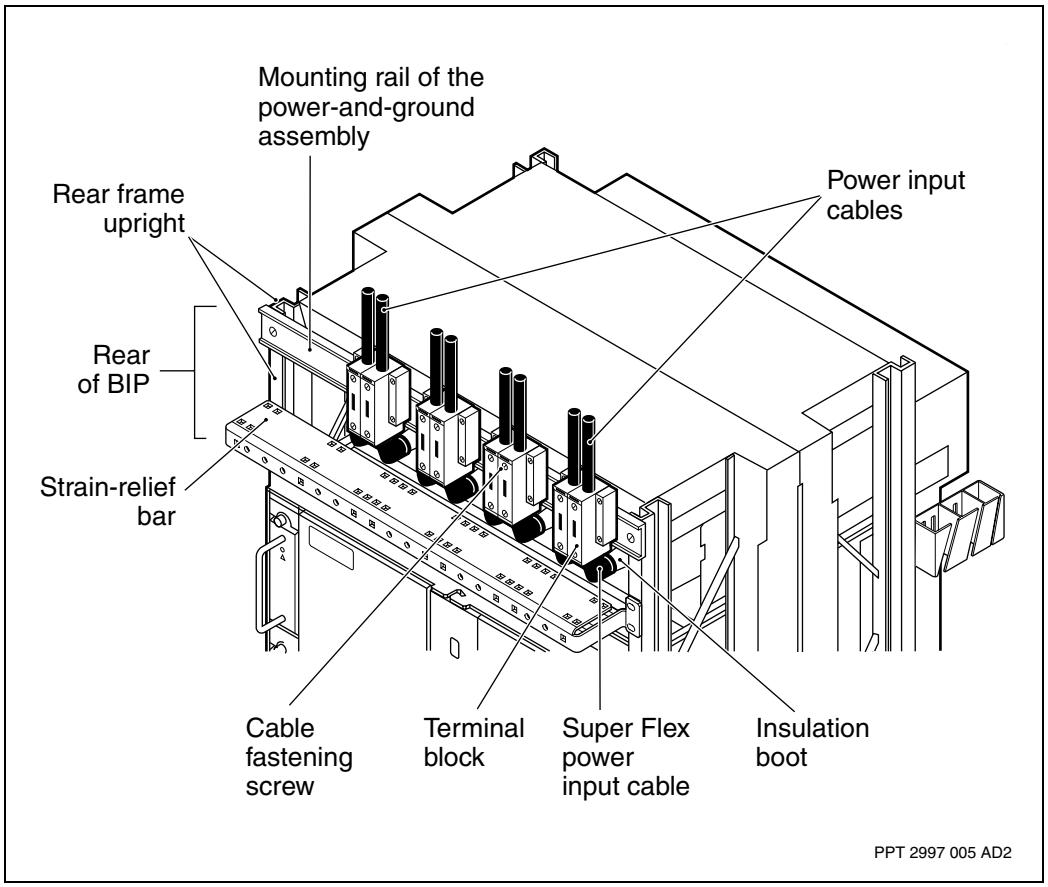
--End--

Procedure job aid

The polyvalent power-and-ground assembly A0834143



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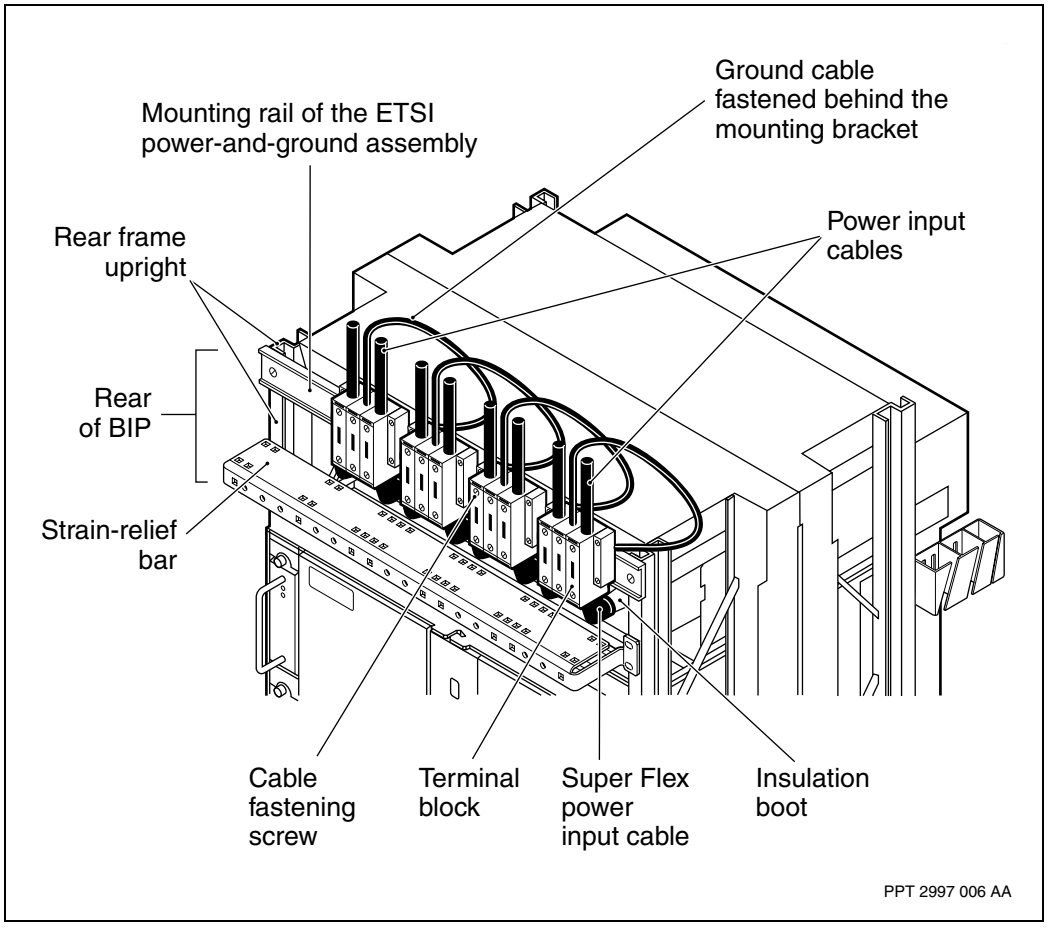
The ETSI power-and-ground assembly A0834149



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Installing a SER 5500 air-flow grill

Install a SER 5500 air-flow grill to maintain the ability to cool switch hardware when that installed in a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You will need an air-flow grill with part number P0914658, from the hardware kit with PEC NTHW85.

Procedure steps

Step	Action
1	If the upper half of the NEBS 2000 frame has front or rear shelf filler panels, remove them. Store the panels and 10-mm (3/9-in.) screws for an alternate use of your choosing.
2	Unpack the air-flow grill with part number P0914658 from kit NTHW85.
3	For orientation, refer to the figure Location of the grill for a SER 5500 in a NEBS 2000 frame (page 396). Hold the grill in the air so that • the mounting-ear screw holes are left and right • the open edge of the grill is at the bottom facing you
4	Place the top flange of the grill between the NEBS 2000 frame uprights until the mounting ears are flush against silvery grounding strip. The front surface of the frame uprights is covered with a silvery strip of metal tape for grounding. Dimples in the strip indicate where screw holes are located. To see the dimples clearly, run your finger firmly along the upright.
5	Align and center the 4 holes of the mounting ears with dimples or holes on the silvery strip. The air-flow grill is correctly positioned when each bottom hole of the mounting ears aligns with the second dimple in the frame upright that occurs above the top edge of the switch's cooling unit.
6	While holding the grill in position, fasten a thread-forming 10-mm (3/8-in.) hex-head screw from the kit through each mounting ear into the frame uprights.
7	Fasten the 2 remaining screws through the other mounting ear holes.
8	Tighten the screws to snug plus a 1/4-turn.

--End--

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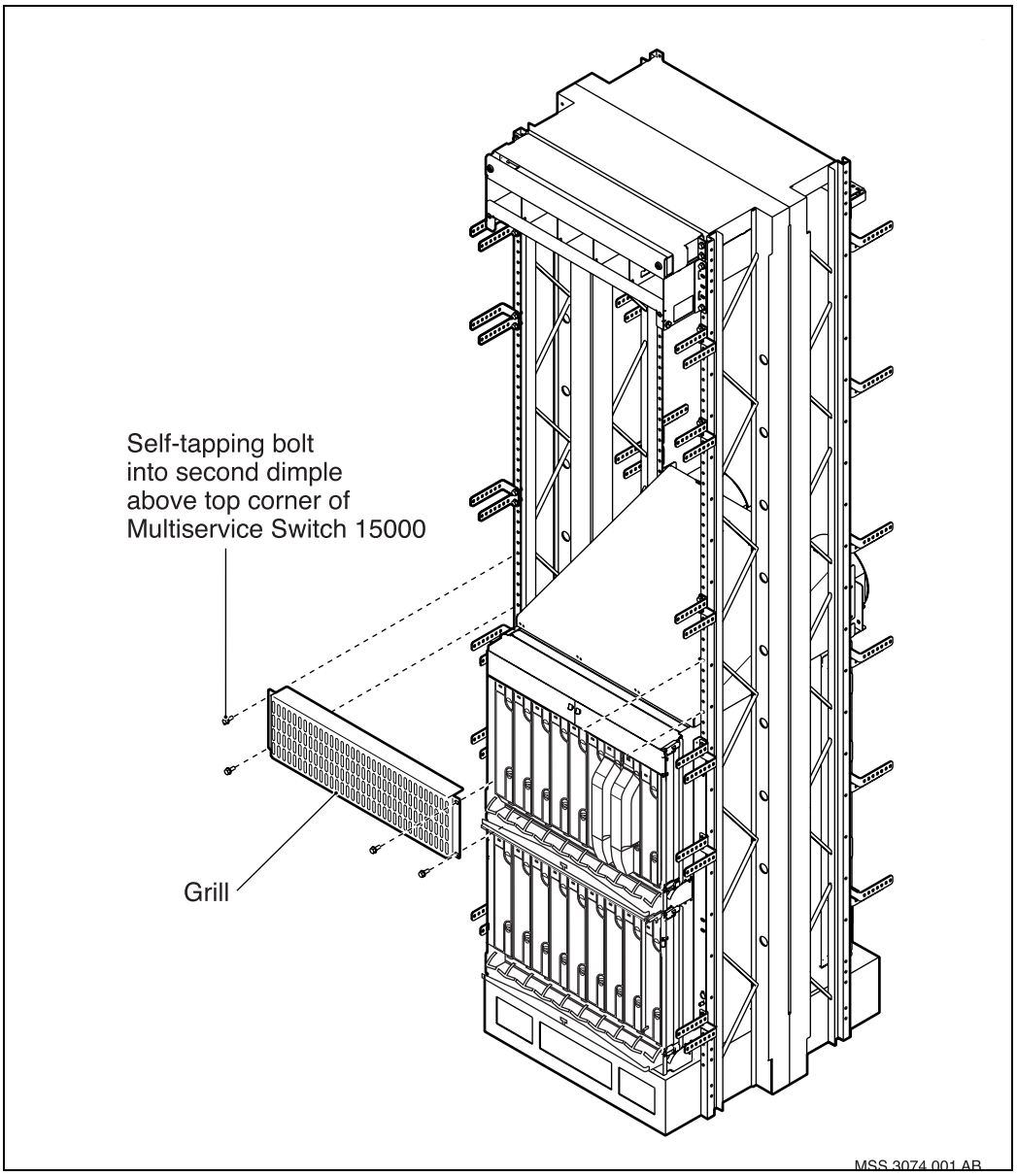
Procedure job aid

Location of the grill for a SER 5500 in a NEBS 2000 frame



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Installing a SER 5500 cable management assembly

Install a SER 5500 cable management assembly to manage its cables when the switch is installed in a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a cable management assembly with PEC NTHR94, from the hardware kit NTHW85.
- To identify the cable management assembly, see the figure Location of the cable management assembly for a SER 5500 in a NEBS 2000 frame (page 398).

Procedure steps

Step	Action
1	Unpack the cable management assembly.
2	Position the assembly between the adapter brackets and above the SER 5500 shelf so that • the cable channels face you and are at the bottom of the assembly • each mounting-ear hole is flush against the uprights • the bottom edge of each mounting ear on the assembly rests against the top edge of each mounting ear on the shelf • each bottom mounting-ear hole aligns with the next available screw hole above the shelf on the adapter bracket
3	While holding the cable management assembly in position, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through one mounting ear hole, then a second screw through a hole in the other mounting ear.
4	Loosely fasten the remaining 2 screws.
5	Tighten all screws to snug plus a 1/4-turn.

--End--

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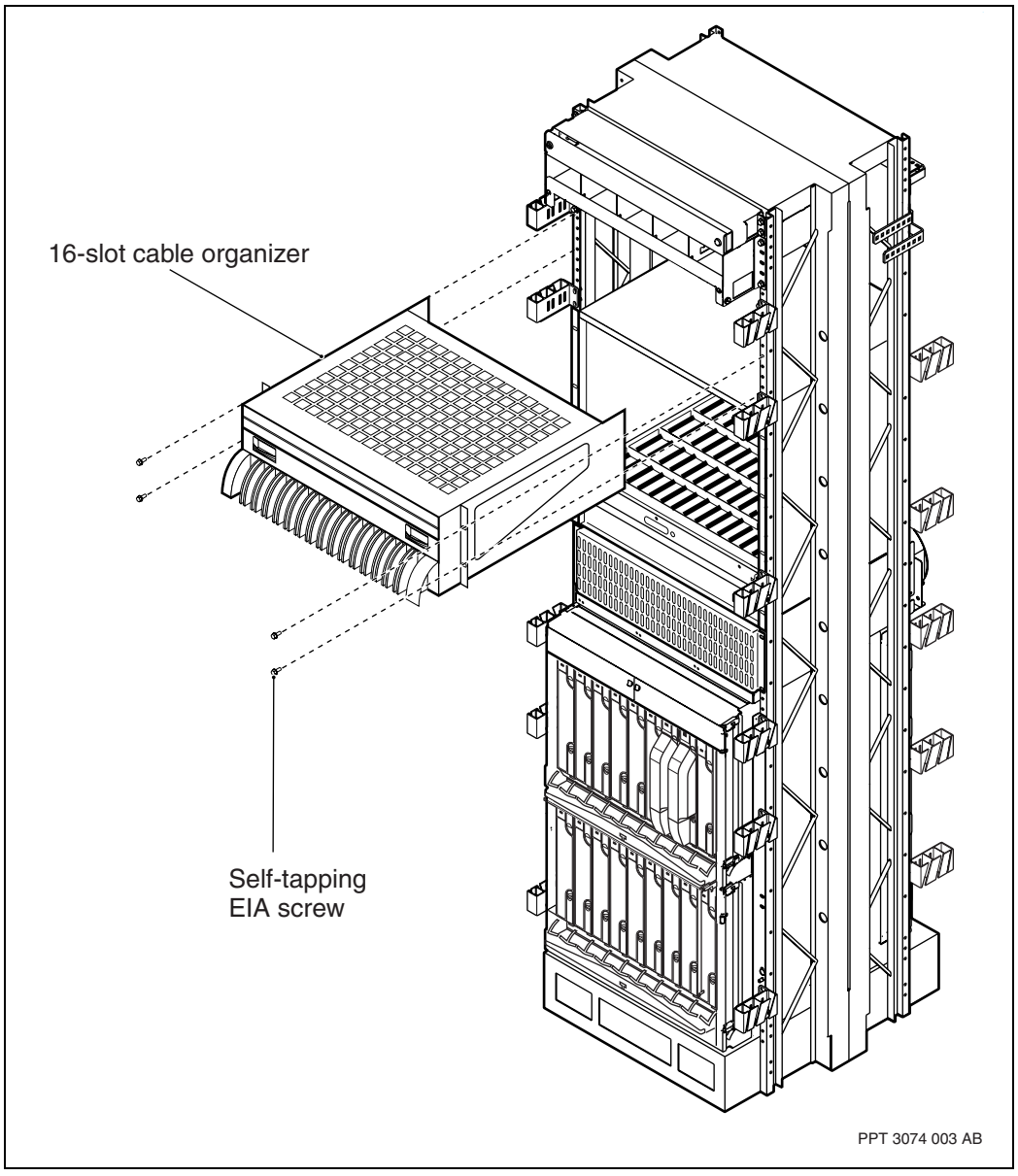
Procedure job aid

Location of the cable management assembly for a SER 5500 in a NEBS 2000 frame



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Installing a SER 5500 filler panel

Install a SER 5500 filler panel to maintain proper air flow through the NEBS 2000 frame and to comply with NEBS 2000 equipment containment.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You will need a filler panel with part number P0914657, from the hardware kit NTHW85.

Procedure steps

Step	Action
1	Unpack the filler panel.
2	Position the filler panel between the frame uprights below the breaker interface panel (BIP) and above the cable management assembly. See the figure Location of the filler panel for a SER 5500 in a NEBS 2000 frame (page 400).
3	Using four 10-mm (3/8-in.) screws, fasten the filler panel to the frame uprights.
4	Tighten all screws to snug plus a 1/4-turn.

--End--

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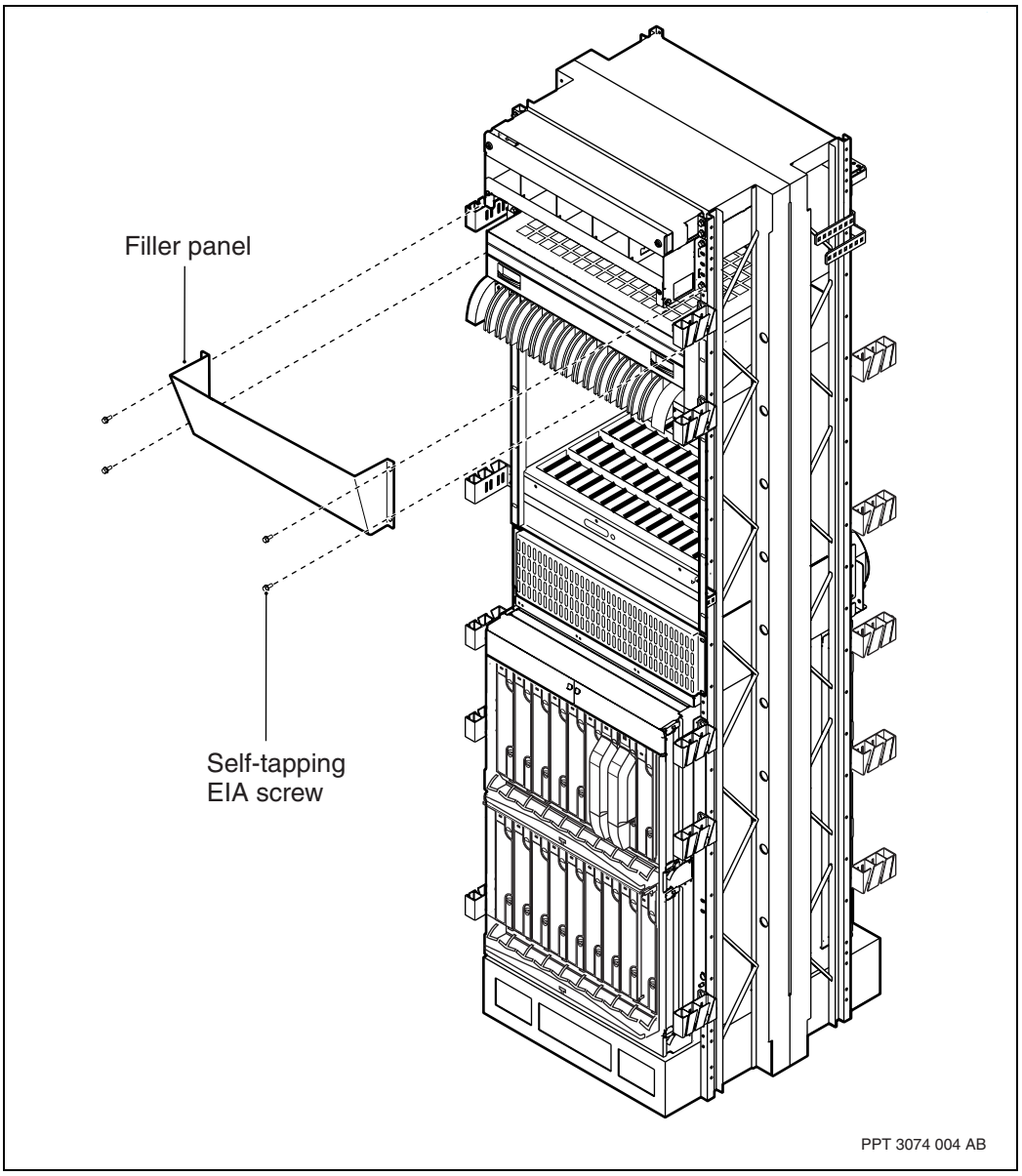
Procedure job aid

Location of the filler panel for a SER 5500 in a NEBS 2000 frame



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Installing a SER 5500 shelf assembly

Install a SER 5500 shelf assembly in a NEBS 2000 frame above a Multiservice Switch 15000 or Multiservice Switch 20000 to enable the interworking of VPN traffic.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need hardware kit with PEC NTHW85.
- You need two helpers capable of lifting and holding the SER 5500 (18-kg or 39 lbs without cards) until it is fastened to the adapter brackets.

Procedure steps

Step	Action
1	Separate and lay out the parts from the kit NTHW85.
2	On the silvery strip on the front surface of the left and right uprights, locate the next available screw hole or dimple above each mounting ear of the grill. Puncture each hole to mark where it is. For orientation, refer to the figure Location of shelf hardware for a SER 5500 in a NEBS 2000 frame (page 402).
3	Move the SER 5500 shelf to the front of the Multiservice Switch.
4	Have 2 helpers lift and position the SER 5500 above the grill and between the uprights in the NEBS 2000 frame.
5	Carefully lower the shelf until the bottom adapter bracket holes align with the marked holes on each upright.
6	Fasten a thread-forming 10-mm (3/8-in.) hex-head screw through the bracket into each marked hole in the upright, then through each top hole of the bracket into the upright. The top holes of the bracket align with the first hole or dimple below the BIP's mounting ear. Do not let go of the shelf until the four screws are fully seated.
7	Fasten 14 more screws through the adapter brackets into the uprights, 7 per side. Space the screws apart leaving 3 empty holes. Tighten all screws to snug plus a 1/4-turn.
8	Re-install the cable management brackets in their original positions.
9	Store the crate in case the shelf must be returned to the manufacturer.

--End--

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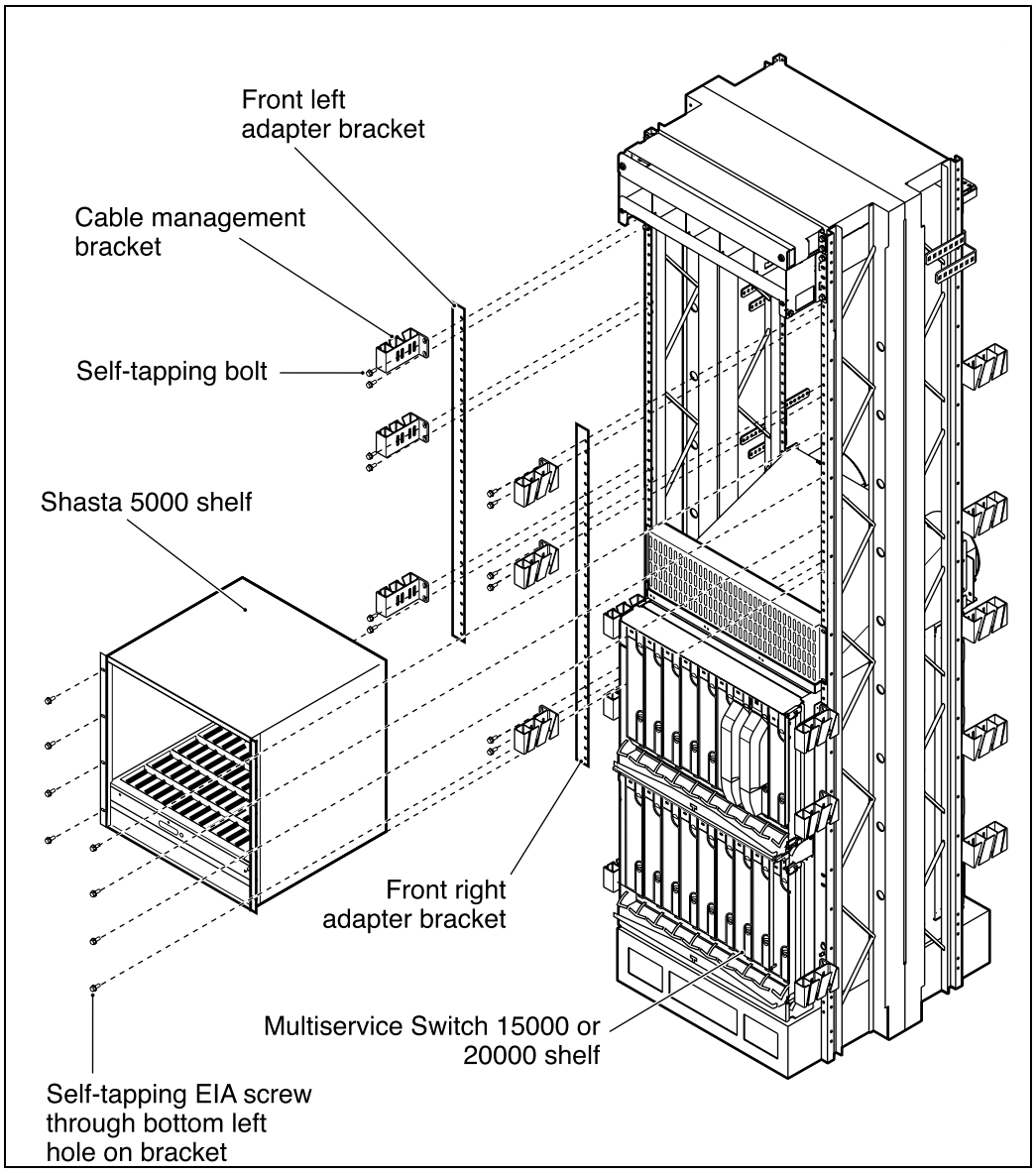
Procedure job aid

Location of shelf hardware for a SER 5500 in a NEBS 2000 frame



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Installing a shelf assembly

Install a shelf assembly to enable adding all of the plug-in cards that are required in order for a Multiservice Switch to become operational.

Prerequisites

CAUTION
Risk of equipment damage and service loss by bent pins
While handling a shelf assembly or working near it, ensure that nothing contacts the backplane pins inside the shelf assembly. Contacting a pin with a sideways force can easily bend it, thereby rendering the card slot unusable.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a Multiservice Switch shelf assembly with one of the following PECs:
  - For a Multiservice Switch 15000, an NTHW99CA with DS1timing
  - For a Multiservice Switch 15000, an NTHW99DA with E1 balanced timing
  - For a Multiservice Switch 15000, an NTHW99EA with E1 unbalanced timing
  - For a Multiservice Switch 20000, an NTPN77BA with DS1timing
  - For a Multiservice Switch 20000, an NTPN77CA with E1 balanced or unbalanced timing
- You need two helpers to prevent the shelf assembly from falling while it is being fastened. An empty shelf assembly weighs 99 kg (218 lbs).
- If the NEBS 2000 frame has a door installed on its front, that is, covering where the shelf assembly is to be added, for safer and easier access do the procedures Removing a door (page 561) and Installing a door (page 314).

Procedure steps

Step	Action
1	Have the helpers hold the replacement shelf assembly in front of the frame or rack so that the large deeper opening is facing you and the cable management channel is at the bottom. This is the same orientation as the removed shelf assembly.
2	Insert the shelf above the cooling unit and between the frame uprights. Do not let the shelf rest against the cooling unit.

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3 While holding the shelf, align its 16 screw holes (8 per vertical side) on the 2 mounting ears with the previous holes on the frame uprights or rack's adapter brackets. Ensure that the bottom holes are as close to the cooling unit as possible without touching it.

4 Loosely fasten a screw through 1 of the top mounting holes on 1 upright or adapter bracket. Loosely fasten the top screw on the other side.

If you use a pair of the eye holes that allows threading 2 screws before placing the shelf assembly against the uprights, and then passing the mounting ears over the screws to hang there until other screws are fastened, you must use only the top two, thread at least four-fifths of the each screw into the upright, and hang the shelf assembly on both screws simultaneously. Otherwise the weight of the assembly can bend the mounting ear.

5 Orient, place, and loosely fasten each cable mounting bracket back where it was on top of the mounting ears of the shelf assembly.

6 Check that all remaining mounting ear holes are still aligned with the previous upright or adapter bracket holes, then loosely fasten the remaining screws through the shelf mounting ears.

7 From bottom to top, tighten all screws to snug plus a 1/4 turn.

8 When a door covered the front of the frame, put it back by doing the procedure Installing a door (page 314).

--End--

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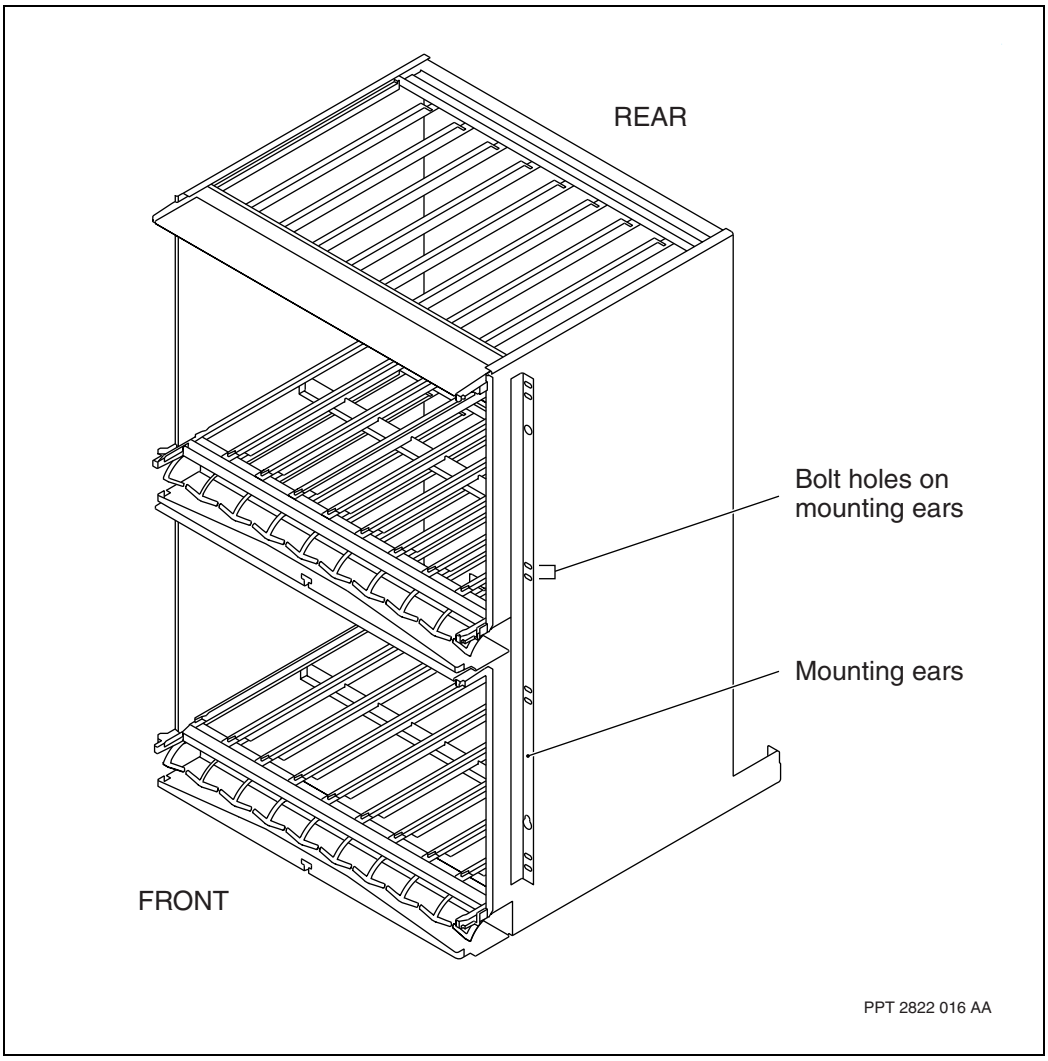
Procedure job aid

An empty shelf assembly, front isometric view



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Installing a shelf assembly onto adapter brackets

Install the shelf assembly onto the adapter brackets to mount the Multiservice Switch into a 23-inch EIA rack or cabinet.

Prerequisites

CAUTION
Risk of equipment damage and service loss by bent pins
While handling a shelf assembly or working near it, ensure that nothing contacts the backplane pins inside the shelf assembly. Contacting a pin with a sideways force can easily bend it, thereby rendering the card slot unusable.

- You must be familiar with Safety considerations and best practices (page 19)
- You need one of these Multiservice Switch shelf assembly kits:
  - NTQS04 for a Multiservice Switch 15000
  - NTQH04 for a Multiservice Switch 20000
- You need two helpers to prevent the shelf assembly from falling while it is being fastened. An empty shelf assembly weighs 99 kg (218 lbs).

Procedure steps

Step	Action
1	While facing the front of the rack, insert the shelf between the adapter brackets and above the cooling unit.
2	Gently lower the shelf until the bottom edge of its mounting ears touch the top edge of the cooling unit mounting ears. Prevent the weight of the shelf from resting on the unit. If you use a pair of the eye holes that allows threading 2 screws before placing the shelf assembly against the uprights, and then passing the mounting ears over the screws to hang there until other screws are fastened, you must use only the top two, thread at least 4/5s of each screw into the upright, and hang on both screws simultaneously. Otherwise the weight of the assembly can bend the mounting ear.
3	Align the screw holes on the 2 mounting ears with the nearest holes on the outside face of the adapter brackets.
4	Loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw from pack P0601478 through one of the top mounting-ear holes on one bracket, then another screw through the opposite bracket and hole.
5	Loosely fasten a screw through one of the bottom mounting-ear holes on one bracket, then another screw on the opposite bracket and hole.

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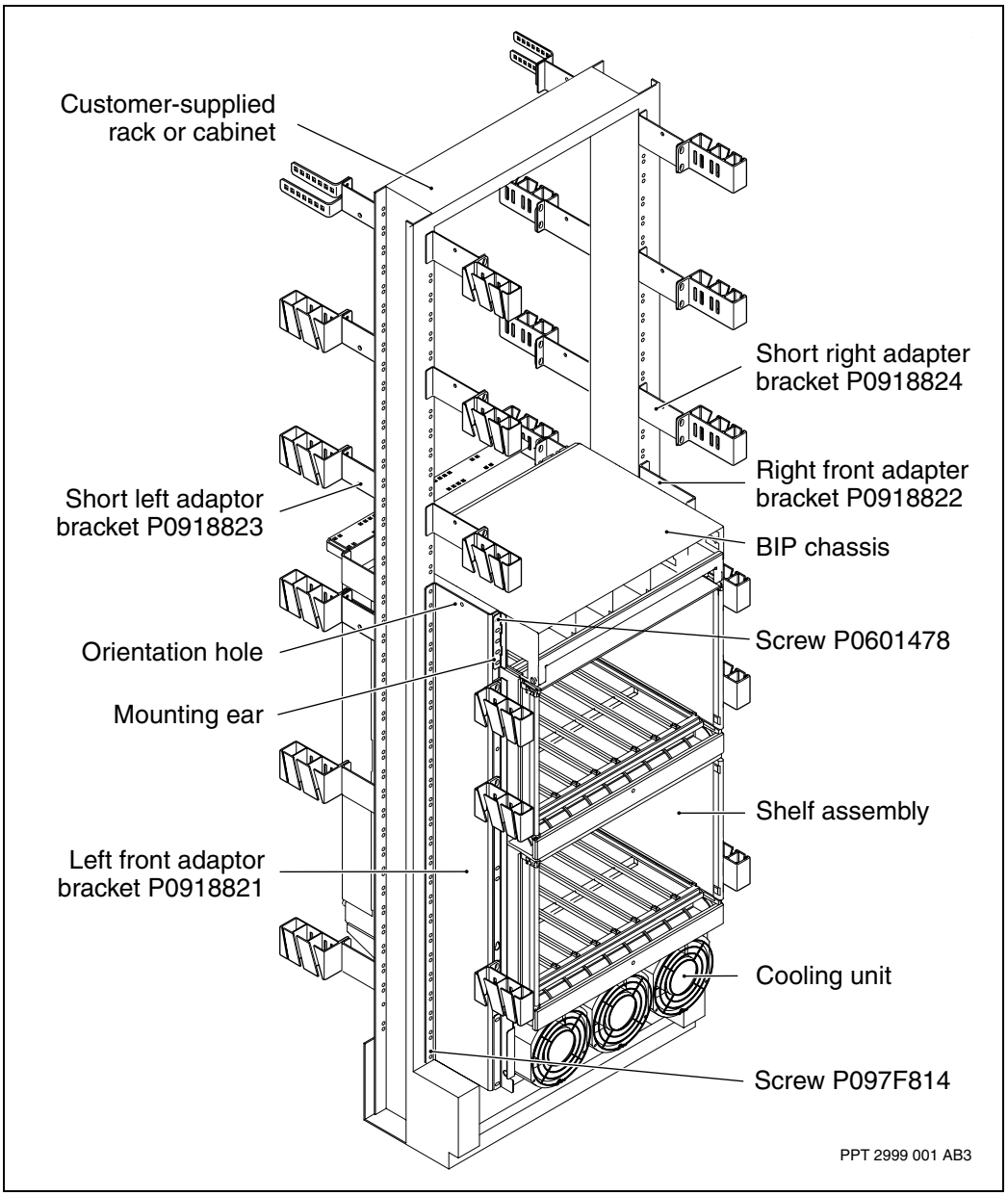
6 Loosely fasten the remaining 4 screws (2 per vertical side) through the mounting-ear holes into the rack uprights. Evenly space the screws between the top and bottom screws, and mirror the positions on both sides.

7 Center the shelf between the adapter brackets, then from bottom to top, tighten all 8 screws to snug plus a 1/4 turn.

--End--

Procedure job aid

A shelf assembly in a 23-inch EIA rack, isometric front view



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Installing a shelf filler panel

Install a shelf filler panel to cover an opening in the upper half of the front or rear of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need one or both of these parts:
  - front filler panel with PEC NTHR76 (1 m or 3.3 ft)
  - rear filler panel with PEC NTHR77 (800 mm or 2.6 ft)
- When a sparing panel or fanout panel is to be or is already mounted onto the upper half of a NEBS 2000 frame, the termination panel must be mounted between the frame and the filler panel. The termination panel and the filler panel can share the same mounting screws, but you will need at least one helper to hold the parts until they are fastened.
- You may need a helper to hold a panel until the first 2 mounting screws are fastened.

Procedure steps

Step	Action
1	Open the kit and unpack the filler panel and thread-forming screws.
2	Count 4 dimples or holes or both in the grounding strip on the outside face of the right front frame upright starting below the top cable management bracket. The dimples cover holes in the uprights. Count downwards and mark the hole (or poke through the dimple). Mark its mate on the opposite upright.
3	Hold the panel against the front (or rear) face of the frame uprights as in the figureLocation of the front shelf filler panel (page 409) so that • the edge labeled TOP is pointing upwards • the hollow space between the sides faces inwards to the front of the frame • the top two holes in the sides of the panel align with the 2 holes marked on the frame uprights • the cut-ins at the sides of the panel surround the cable management brackets, that is, the panel does not overlap any bracket
4	While a helper holds the panel while the top 2 screws are fastened. While still holding the panel, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through each of the 2 holes so that the panel is supported.

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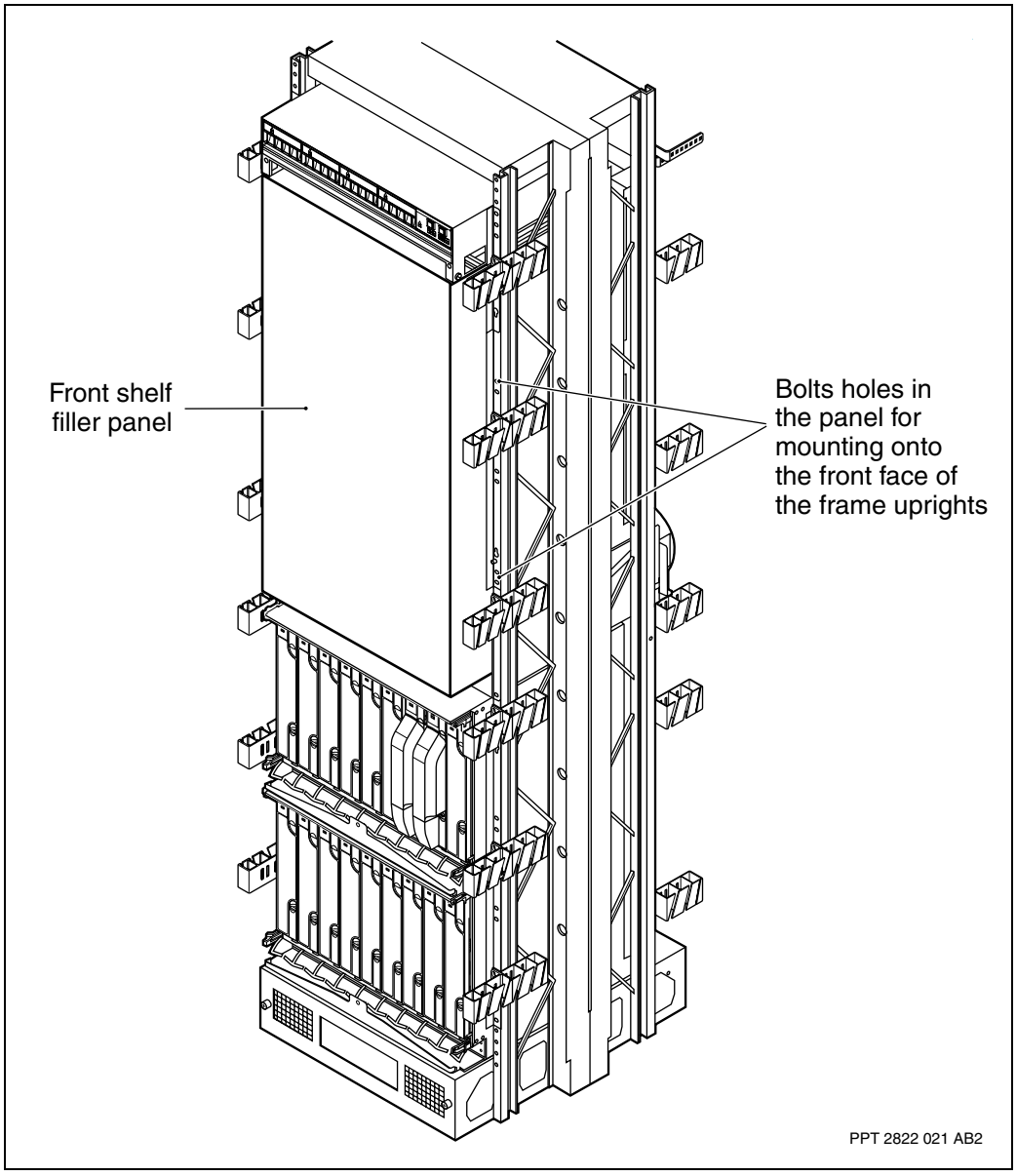
5 Align and loosely fasten a screw through the 6 remaining panel holes, starting at a bottom corner.

6 Tighten all screws to snug plus a 1/4 turn.

--End--

Procedure job aid

Location of the front shelf filler panel



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Installing a shelf-based BIP

Install the shelf-based breaker interface panel (BIP) into a mounting apparatus other than a NEBS 2000 frame to distribute power to the Multiservice Switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a BIP with one of the following PECs:
  - NT6C62 for a Multiservice Switch 15000
  - AP6C68 for a Multiservice Switch 20000
- The BIMs and alarm module are typically shipped already installed in a BIP. You may wish to reduce the weight of handling the BIP by removing the slide-in modules. Remember the orientation and position of each module as you remove it.
- When installing the BIP in a rack other than a NEBS 2000 frame, a secondary grounding point is provided in the BIP chassis. There are two studs at the rear lower right of the chassis. Use two straight 2-hole lugs, one to the chassis and the other to the rack ground bonding point. Ground the BIP chassis to the rack by firmly attaching a ground of minimum size 6 AWG cable E/W (13.3 mm^2) between the studs and a common grounding point. The stud nuts on the chassis are number 10-32 unc and are included with washers on the studs. Use star washers between the lug and the rack. Do not overtighten the nuts.

Procedure steps

Step	Action
1	Hold the BIP so that the mounting ears are at the sides and nearest you.
2	While facing the front of the rack, insert the BIP between the adapter brackets and above the shelf.
3	Gently lower the BIP until the bottom edge of its mounting ears touch the top edge of the shelf mounting ears. Prevent the weight of the BIP from resting on the shelf.
4	Align the screw holes on the 2 mounting ears with the nearest holes on the outside face of the adapter brackets. Loosely fasten a thread-forming 10-mm (3/8-in.) head-hex screw from pack P0601478 through the upper left mounting-ear hole.
5	Loosely fasten another screw through the lower right mounting-ear hole, then the remaining 2.
6	Center the unit, then tighten all 4 screws to snug plus a 1/4 turn.

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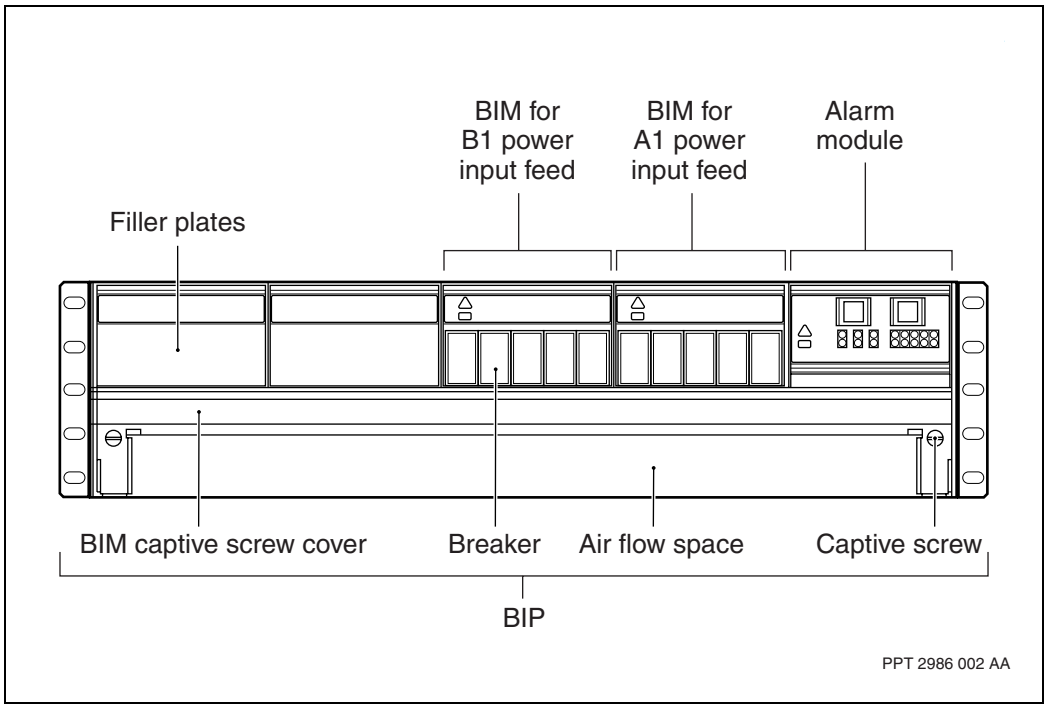
7 If you removed modules to install the BIP, put them back as shown in the figure The BIP, front view (page 411).

--End--

Procedure job aid

The BIP, front view



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Installing a shelf-based cooling unit

Install the shelf-based cooling unit into a mounting apparatus, other than a NEBS 2000 frame, to ensure that ambient temperature inside the Multiservice Switch is maintained.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The shelf-based cooling unit is included in the shelf-based kits NTQS04 for a Multiservice Switch 15000 or NTQH04 for a Multiservice Switch 20000. To install the shelf-based cooling unit, you need this part:
  - NTHR52AA or NTHR52AB, an upper cooling unit assembly
- You need a helper to hold the cooling unit until it is fastened because it weighs about 9 kg (20 lbs) and tends to slide out of position before it is fastened to the rack.
- As shown in the figure Position and orientation of the upper cooling unit NTHR52 in a 23-inch wide rack (page 414), the cooling unit must be mounted in the lowest equipment position on the mounting apparatus. Enough room must remain above it to install:
  - the shelf assembly flush against it
  - the upper temperature sensor bracket assembly
  - about 10 cm (4 in.) of ventilation space
  - the strain relief bar
  - the BIP
- The front of the rack is the side that faces, or will face the same way as, the front of the switch.

Procedure steps

Step	Action
1	Hold the ends of the cooling unit so that • you face the fans • the open side is at the top • a hand holds the narrow rear end • a hand holds the fan end
2	Facing the front of the rack, insert the narrow end of the cooling unit between the adapter brackets fastened to the rack uprights.

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3 Slide the cooling unit inwards until the mounting ears at the fan end touch the adapter brackets as shown in the figure Position and orientation of the upper cooling unit NTHR52 in a 23-inch wide rack (page 414).

4 Align the mounting-ear holes to the screw holes on the brackets.

5 While holding the unit in position, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw (P0601478) through an upper mounting-ear hole. See the figure The upper cooling unit, front and rear views (page 413).

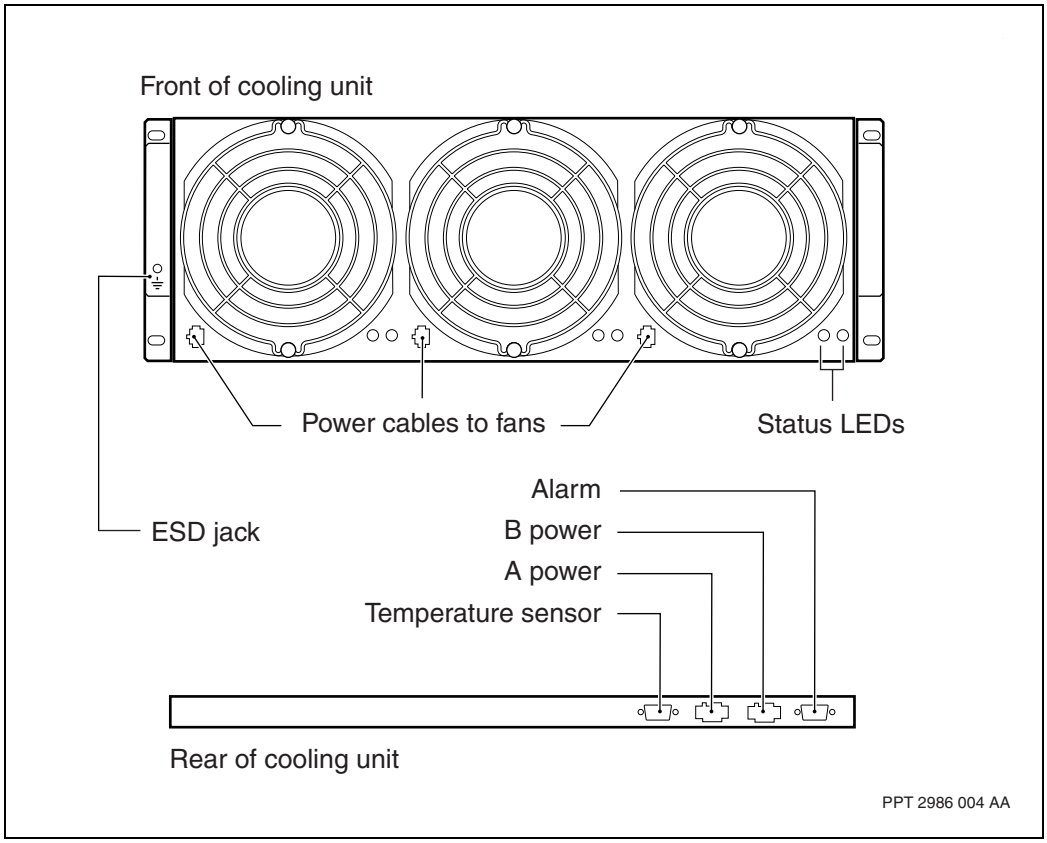
6 Loosely fasten another screw through a lower mounting-ear hole on the opposite side of the unit, then the remaining 2 screws.

7 Center the unit between the brackets and tighten all 4 screws to snug plus a 1/4 turn.

--End--

Procedure job aid

The upper cooling unit, front and rear views



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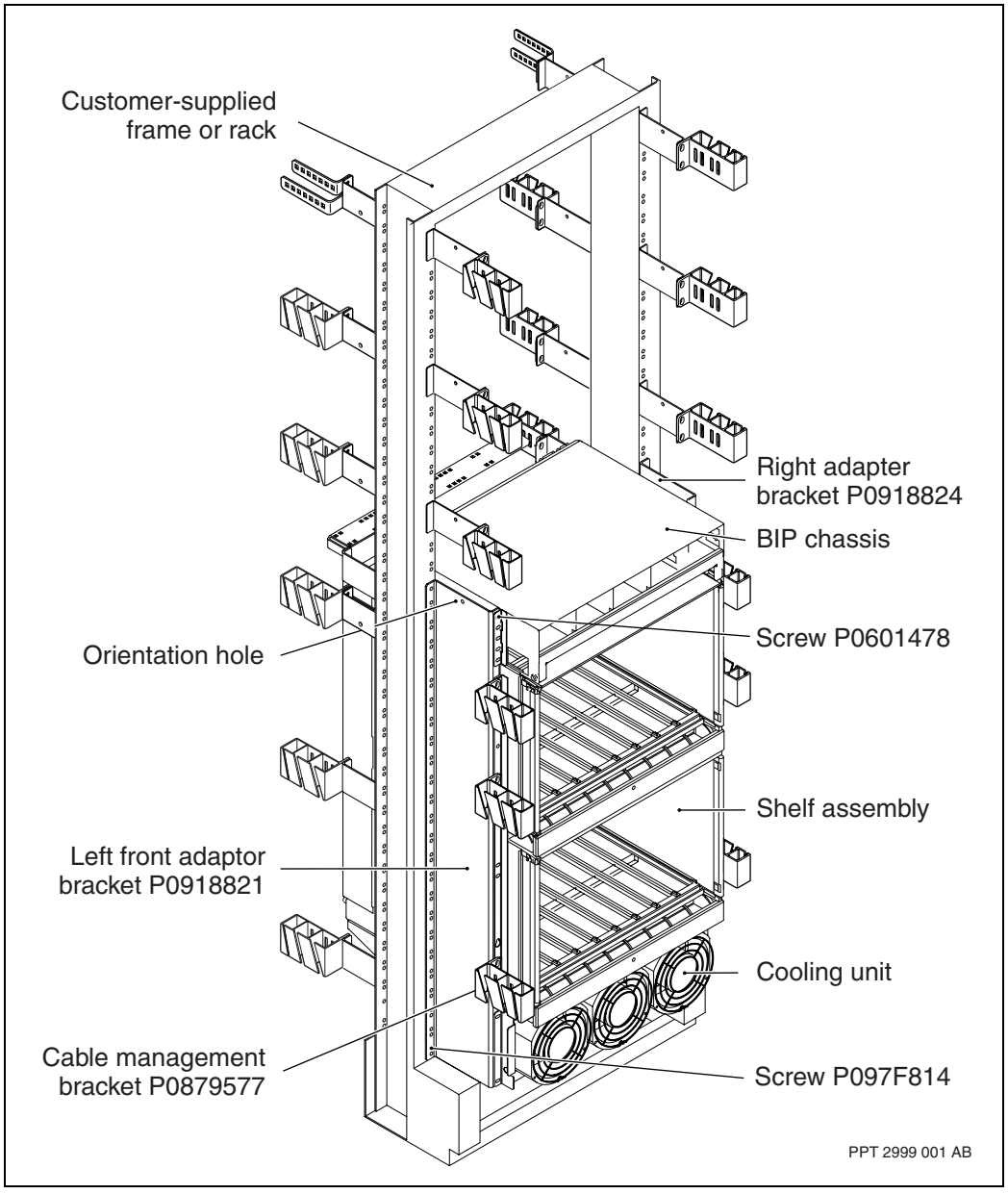
Position and orientation of the upper cooling unit NTHR52 in a 23-inch wide rack



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Installing a side frame panel, extended size

Install an extended side frame panel to protect exposed cabling that runs up or down the side of a NEBS 2000 frame or as part of enclosing a frame.

Prerequisites

WARNING

Risk of injury or equipment damage by dropping a side panel

The size and weight of a side panel make it awkward for one person to handle it safely while attempting to fasten or unfasten the panel. Dropping a side panel can injure a head or a foot, can damage whatever it hits, or be damaged on impact. Have a helper assist handling the 18 kg (40 lbs) side panel.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Fall eines Seitenpanels

Aufgrund der Größe und des Gewichts der Seitenpanele sollte das Anbringen oder das Entfernen eines Seitenpanels stets von mindestens 2 Personen durchgeführt werden. Das Fallenlassen oder die unsachgemäße Handhabung des 18 kg schweren Seitenpanels kann zu Kopf- und Fußverletzungen, Verletzung anderer Personen sowie Sachbeschädigung oder Beschädigung des Seitenpanels selbst führen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need kit number NTPX4050 for each extended side panel to be installed, especially if the panels are used with kit NTQS37AA or NTQS37AB to enclose a NEBS 2000 frame.
- You need these tools:
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - a driver to fasten the very large slotted screws of the side panel
  - a light hammer to tap plastic caps onto the panel screws
- Fastening the ground cable assembly NTRU0102 from kit NTPX4050 provides additional grounding because the side panel brackets are fastened to painted surfaces. The cable has eye-loop connectors at each end and is 30.5 cm (1 ft) long and size 10 AWG (5.26 mm^2).

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Procedure steps

Step	Action
1	Assemble the side panel brackets. A side bracket pointing frontwards (facing the side of the frame) and a side bracket pointing rearwards have the same part number. Refer to the figures • Assembly of a side panel bracket NTRU0371, left and right, upper or lower (page 422) • Extended side panels, exploded view (page 418)
2	In the figure Extended side panels, exploded view (page 418)“, observe the position of the upper and lower pairs of brackets.
3	Fasten the side panel brackets onto the spacer brackets using the 4 provided thread-forming counter-sunk 6-mm (15/64-in.) screws. Tighten the screws to snug plus a 1/4 turn. The upper brackets are oriented the same way as the lower. Ensure all 4 panel brackets extend away from the middle of the frame on an even vertical plane.
4	Using 2 of the provided 10-mm (3/8-in.) hex-head screws P0601478 and lock washers, fasten the grounding cable assembly NTRU0102 from the frame upright to an upper bracket. Position a toothed lock washer between each end-cable eye loop and the upright or the bracket. Use the third hole from the top of the upright at one end of the cable, and a lower middle hole on the side of the upper bracket nearest the upright.
5	Position the side panel against the 4 brackets with the smooth side facing outwards as shown in the figure Extended side panels, exploded view (page 418).
6	Have a helper hold the panel off the floor to align the 4 upper holes in the side panel with the 4 holes in the upper brackets.
7	While holding the panel aligned in position (off the floor), loosely fasten a screw A0377259 and special washer A0377315 through a corner hole. Loosely fasten another screw and washer through the opposite corner hole so that the panel is evenly supported.
8	Align and loosely fasten a screw and washer through each of the remaining 6 panel holes, starting at a bottom corner.
9	If a door was installed, check for gaps or significant misalignment between the nearest edge of the door and the panel. You can slightly re-position the panel to align with the door.
10	Tighten all screws to snug plus a 1/4 turn.
11	Lightly tap a plastic cap onto each special washer. Installed side panels are shown in the figure Installed extended side panels with a door (page 419).

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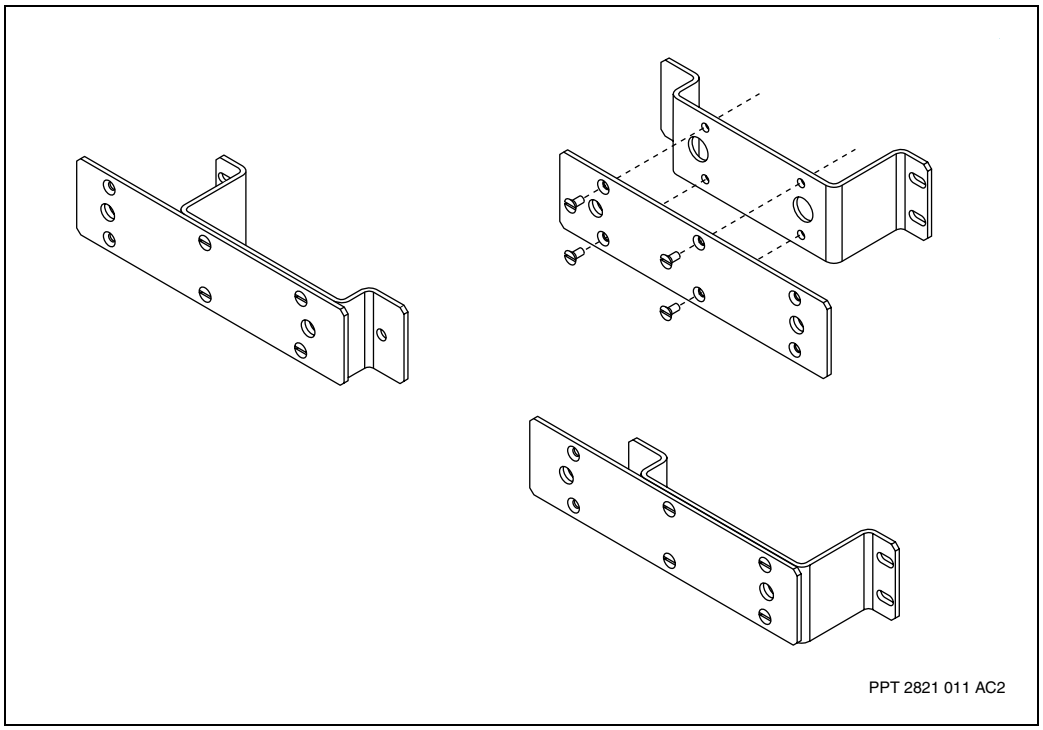
--End--

Procedure job aid

Assembly of a side panel bracket NTRU0371, left and right, upper or lower



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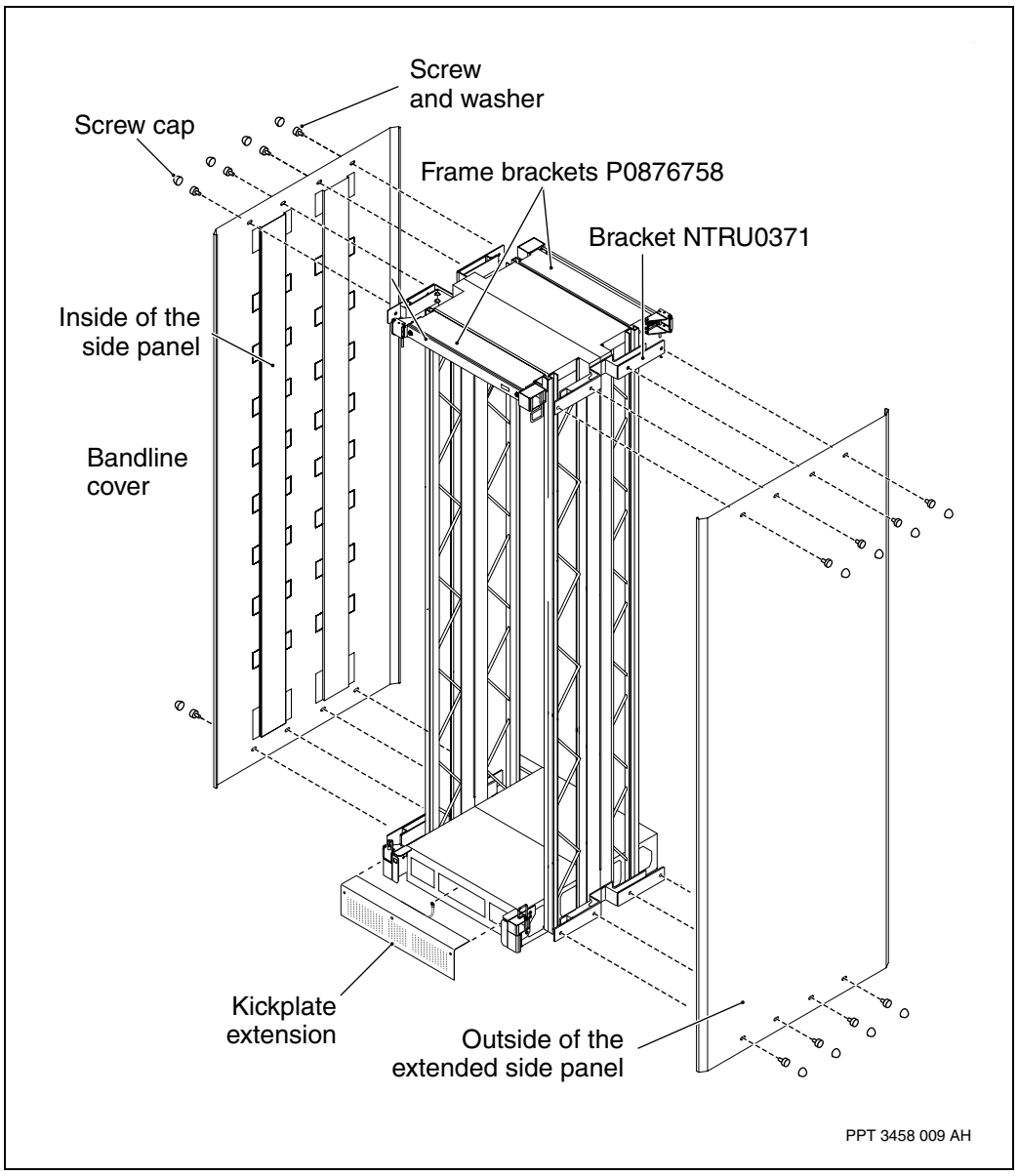
Extended side panels, exploded view



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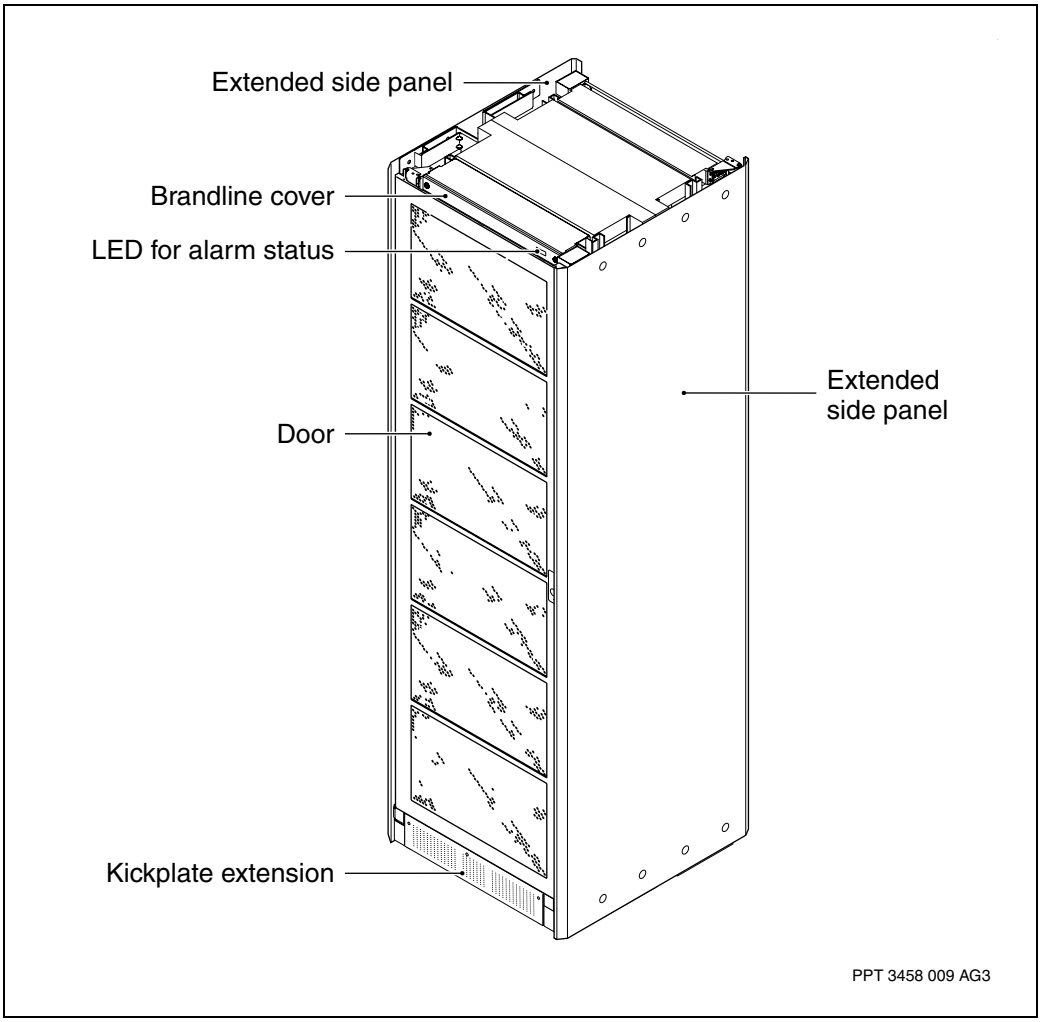
Installed extended side panels with a door



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Installing a side frame panel, regular size

Install a side frame panel to protect exposed cabling that runs up or down the side of a NEBS 2000 frame.

Prerequisites

WARNING

Risk of injury or equipment damage by dropping a side panel

The size and weight of a side panel make it awkward for one person to handle it safely while attempting to fasten or unfasten the panel. Dropping a side panel can injure a head or a foot can damage whatever it hits, or be damaged on impact. Have a helper assist handling the side panel.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Fall eines Seitenpanels

Aufgrund der Größe und des Gewichts der Seitenpanele sollte das Anbringen oder das Entfernen eines Seitenpanels stets von mindestens 2 Personen durchgeführt werden. Das Fallenlassen oder die unsachgemäße Handhabung des 18 kg schweren Seitenpanels kann zu Kopf- und Fußverletzungen, Verletzung anderer Personen sowie Sachbeschädigung oder Beschädigung des Seitenpanels selbst führen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need kit number NTRU0128 for each side panel to be installed. If the frame has the extended cable management brackets, you also need kit NTRU0365 present.
- You need a helper to hold the side panel until it is fastened because it weighs approximately 13 kg (28 lbs) and its size can be awkward.
- You need these tools:
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - a screwdriver with a very large slotted bit to fasten the screws of the side panel
  - a light hammer to tap plastic caps onto the panel screws
- Fastening the ground cable assembly (NTRU0102) from kit NTRU0128 provides additional grounding because the side panel brackets are

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fastened to painted surfaces. The cable is 30.5 cm (1 ft) long and size 10 AWG (5.26 mm^2).

Procedure steps

Step	Action
1	Assemble the side brackets. A side bracket pointing frontwards (facing the side of the frame) and a side bracket pointing rearwards have the same part number. Refer to the figures • Assembly of a side panel bracket NTRU0371, left and right, upper or lower (page 422) • Upper brackets for frame panels (page 423) • Lower brackets for frame panels (page 424)
2	See the figures Side panels, exploded view (page 425) and Installed front, rear, and side panels (page 427)“. Observe the position of the upper and lower pairs of brackets. Align a bracket according to the figure.
3	When the extended cable management brackets are installed or to be installed on the same side of the frame as the panel to be installed, fasten the spacer bracket (P0902817) from kit NTRU0365 to the frame using the 3 provided thread-forming 6-mm (15/64-in.) hex-head screws. Tighten the screws to snug plus a 1/4 turn. See the figure Lower brackets for frame panels (page 424).
4	Repeat step 3 for the other 3 spacer brackets, moving sideways. After the second bracket, temporarily position the panel beside the pair of brackets to verify if the mounting holes align. If not, reposition the brackets until they align.
5	From NTRU0128, fasten the panel brackets onto the spacer brackets using the 4 provided thread-forming counter-sunk 6-mm (15/64-in.) screws. Tighten the screws to snug plus a 1/4 turn. See the figures Upper brackets for frame panels (page 423)“and Lower brackets for frame panels (page 424). The upper brackets are oriented the same way as the lower. If the spacer brackets from NTRU0365 are not required, fasten the panel brackets from NTRU0128 directly to the upper and lower frame in the holes provided. With or without the spacer brackets, ensure all 4 panel brackets extend away from the frame on an even vertical plane.
6	From NTRU0128, using 2 of the provided 10-mm (3/8-in.) hex-head screws and lock washers, fasten the grounding cable assembly (NTRU0102) from the frame upright to an upper bracket. Position a toothed lock washer between each end-cable eye loop and the upright or the bracket. Use the third hole from the top of the upright at one end of the cable, and a lower middle hole on the side of the upper bracket nearest the upright. For the

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position of the cable, refer to the figure Side panel grounding cable (page 426).

7 Position the side panel against the 4 brackets with the smooth side facing outwards as shown in the figure Side panels, exploded view (page 425). Have a helper hold the panel off the floor until 2 top screws are fastened.

8 Align the 4 upper holes in the side panel with the 4 holes in the upper brackets.

9 While holding the panel aligned in position (off the floor), loosely fasten a screw (A0377259) and special washer (A0377315) through a corner hole. Loosely fasten another screw and washer through the opposite end hole so that the panel is evenly supported.

10 Align and loosely fasten a screw and washer through the remaining 6 panel holes, starting at a bottom corner.

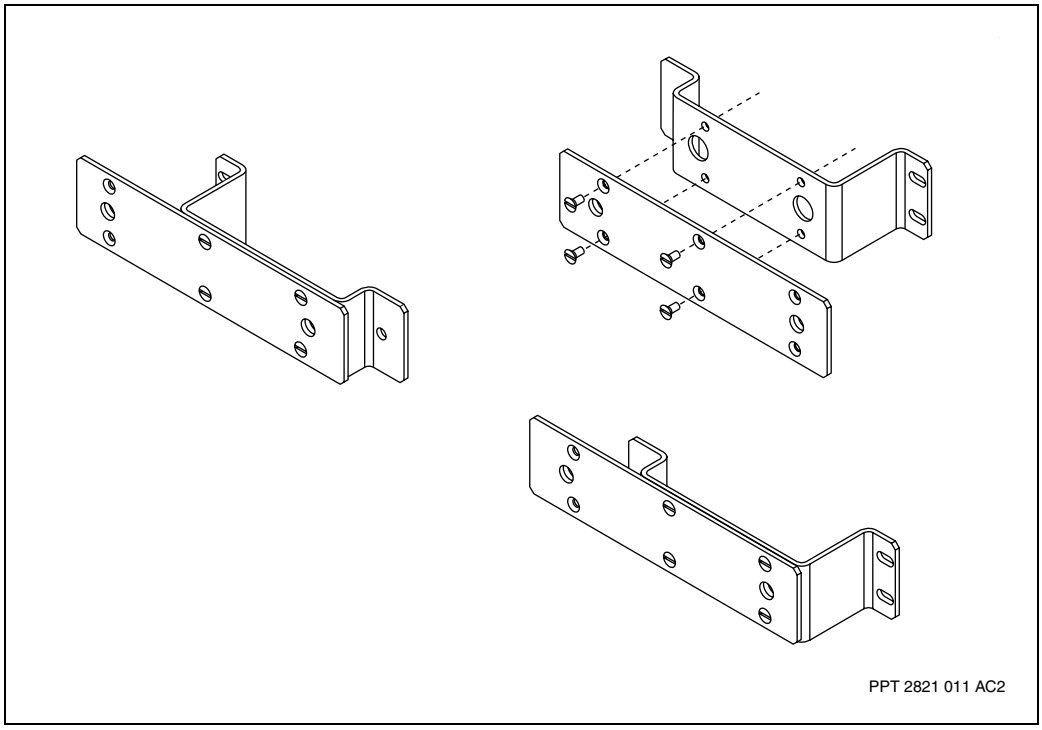
11 Tighten all screws to snug plus a 1/4 turn.

12 Lightly tap a plastic cap onto each special washer.

--End--

Procedure job aid

Assembly of a side panel bracket NTRU0371, left and right, upper or lower



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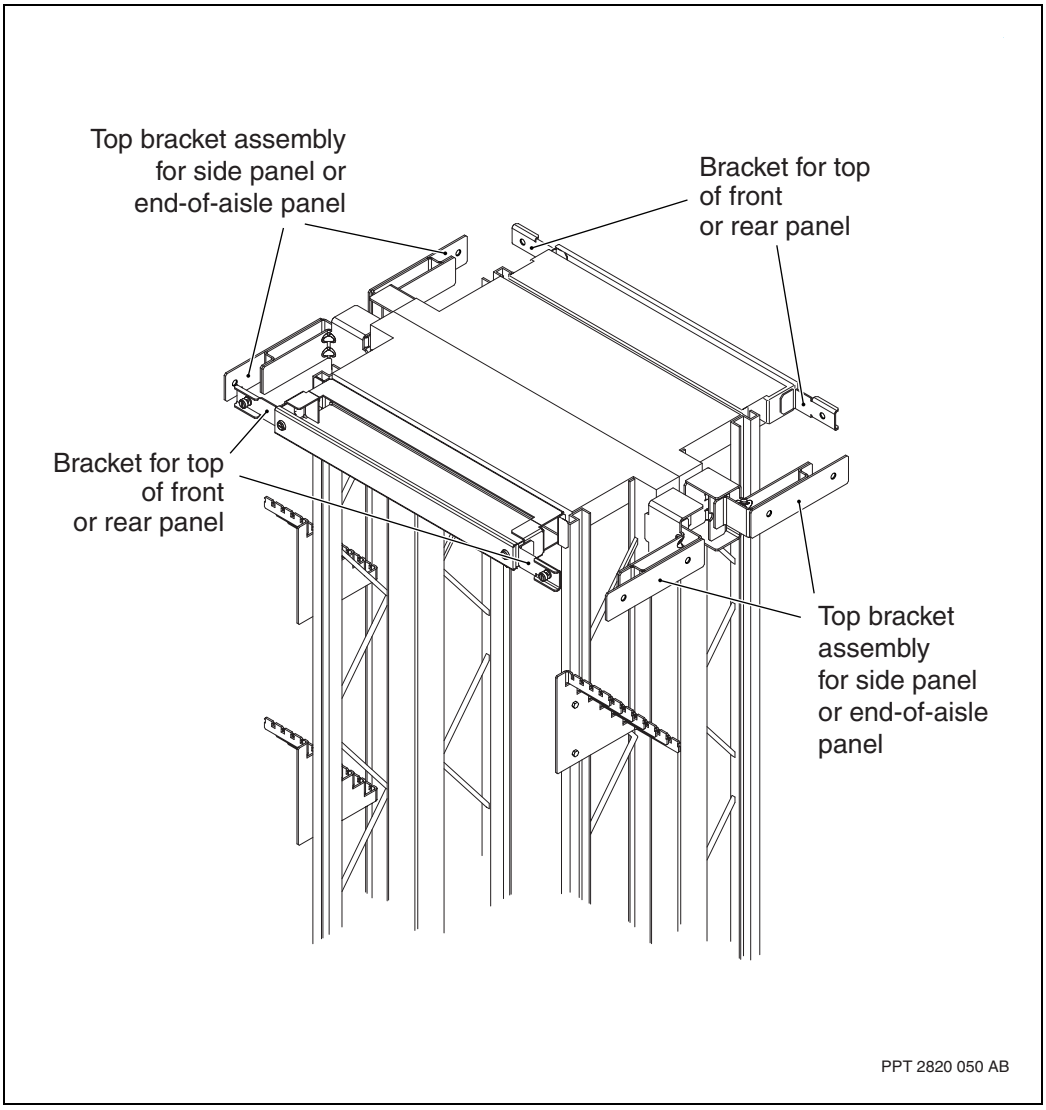
Upper brackets for frame panels



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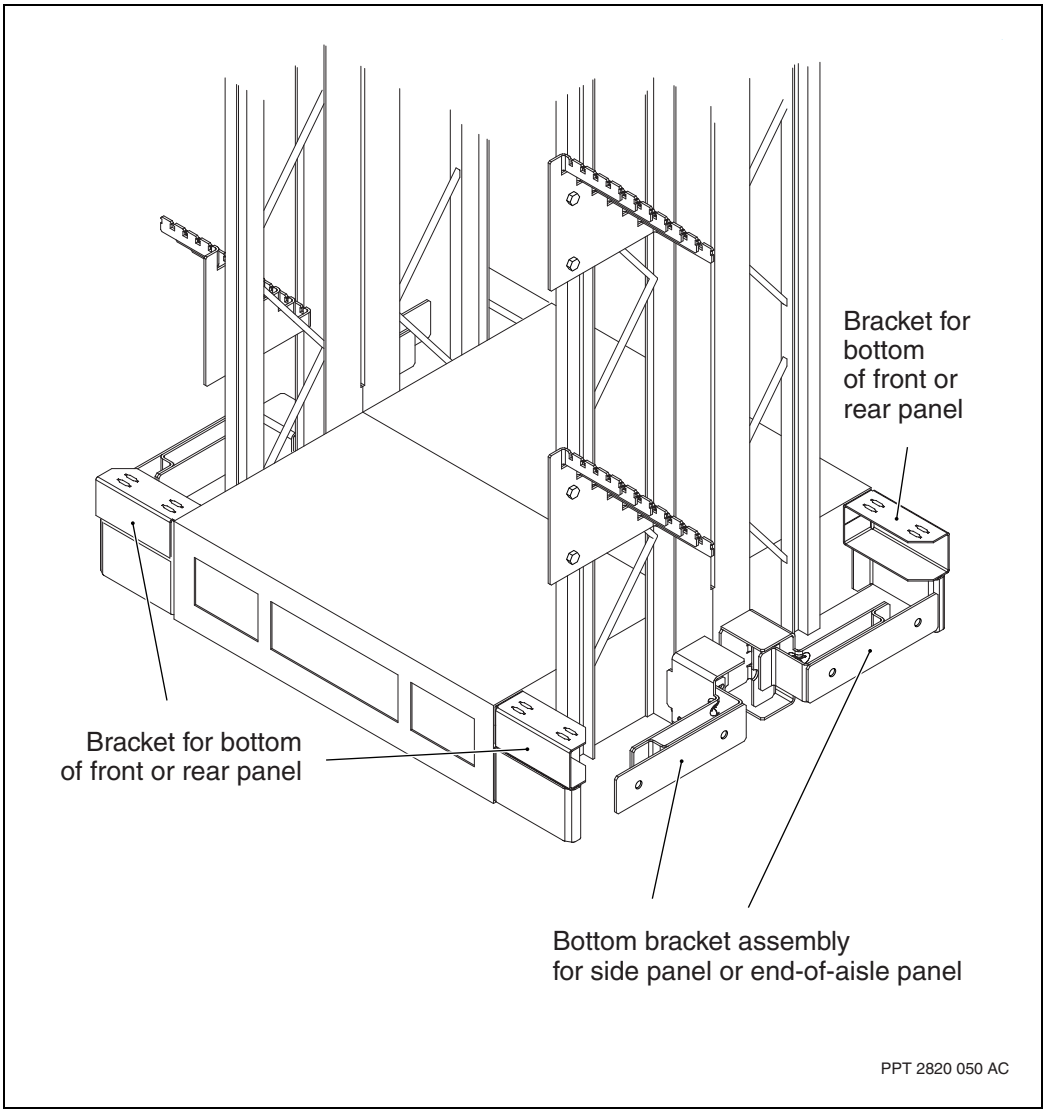
Lower brackets for frame panels



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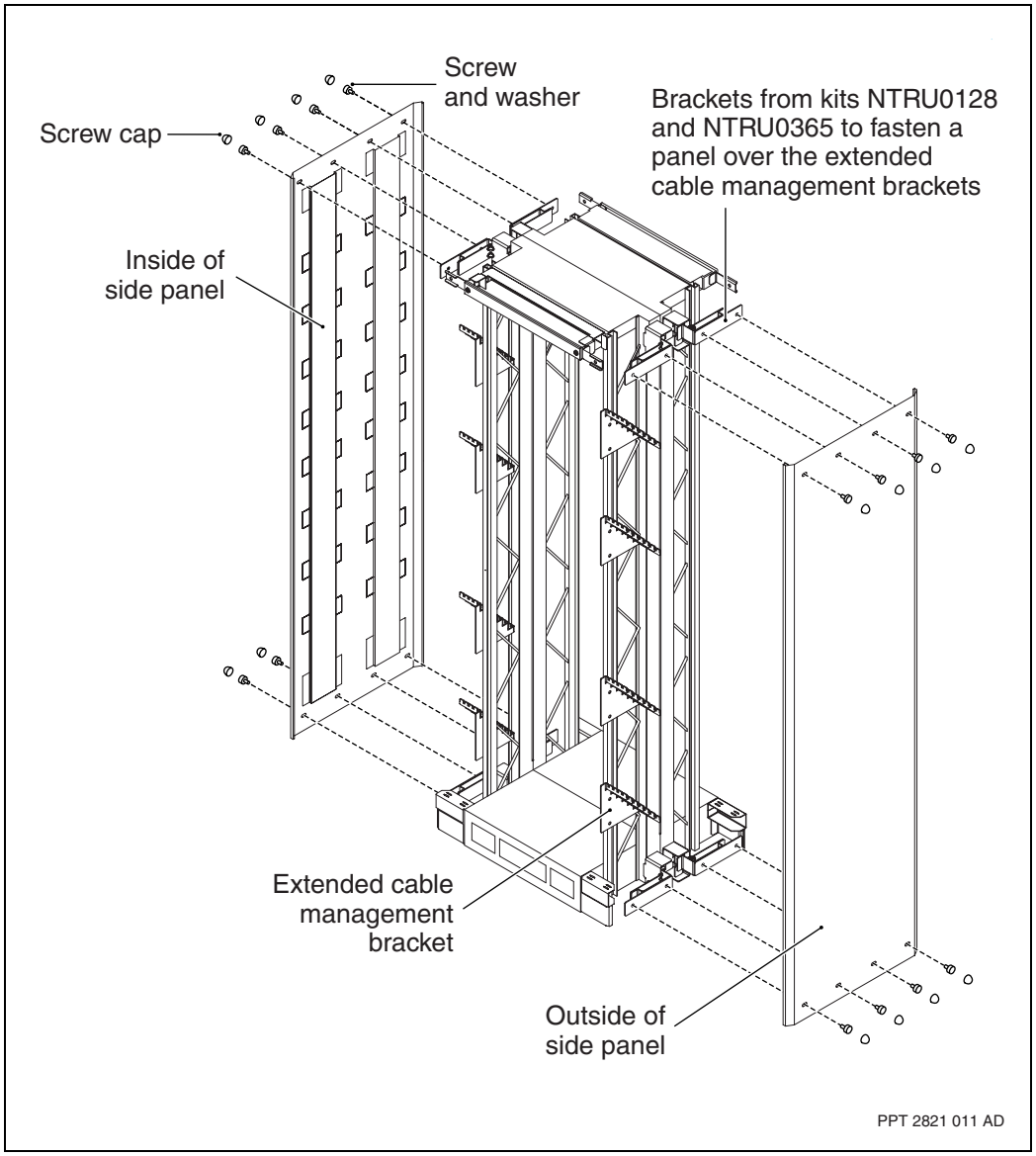
Side panels, exploded view



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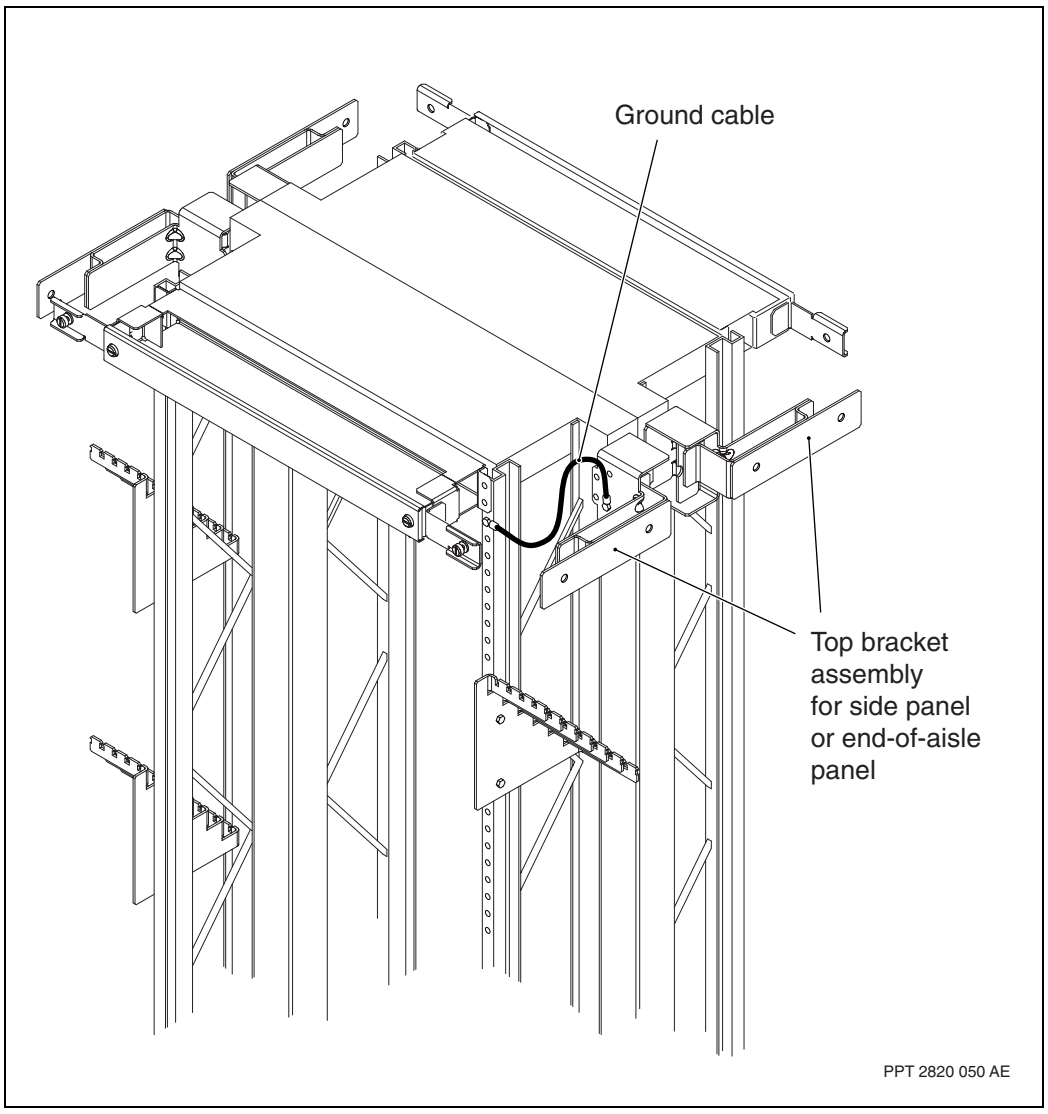
Side panel grounding cable



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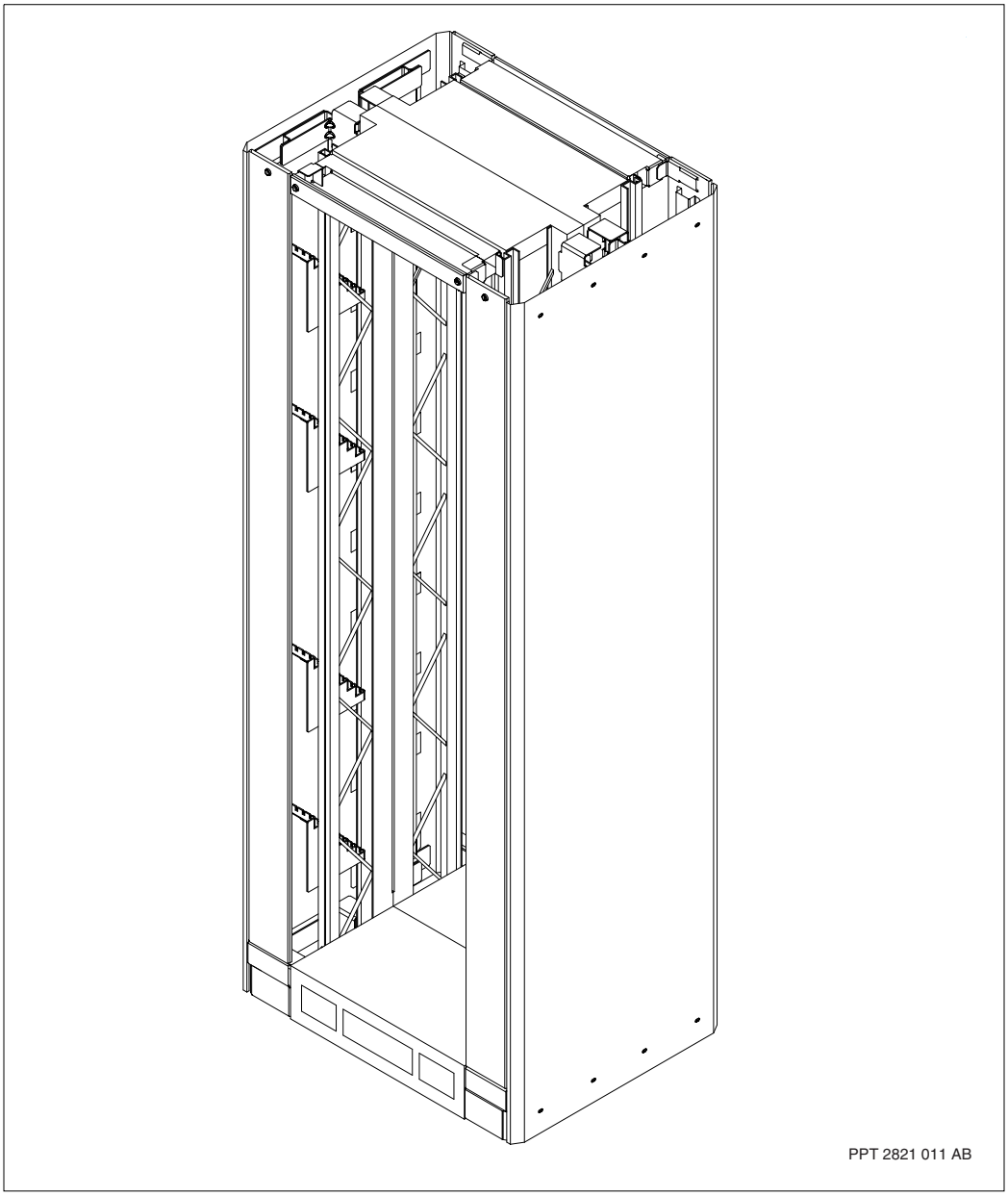
Installed front, rear, and side panels



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Installing a sparing panel

Install sparing panel in a frame, rack, or cabinet to enable sparing configuration as part of an initial installation or as part of a replacement.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You may need to assemble the NTQS31 sparing panel prior to mounting. See the procedure Assembling sparing panel NTQS31 (page 169).

Procedure steps

Step	Action
1	Unpack the sparing panel from its container.
2	Orient the sparing panel as shown in the figure A 12-port DS3 or E3 one-for-six sparing panel NTQS31, fully assembled (page 429).
3	With a helper holding an end of the new sparing panel with the connectors facing into the frame and the standard coax connectors at the top, Place the replacement panel against the mounting apparatus so that it aligns with the appropriate mounting holes. With the 12-port NTQS31, have a helper hold the panel in position for fastening. The sparing panel has key-hole pins that align with the holes in the frame.
4	While the helper continues to hold an end of the panel in position, fasten a thread-forming 10-mm (3/8-in.) hex-head screw through the upper left and the upper right mounting holes. Leave the screws close to being seated.
5	Align the centers of the remaining mounting holes on the panel with the holes on the mounting apparatus.
6	If the sparing panel is rack-mounted, fasten the grounding cable to the panel where it was before.
7	Add the remaining fasteners, starting with a lower corner. Finger-tighten all screws.
8	Tighten all screws to snug plus a 1/4 turn.
9	If you strip any of the fasteners • with a 12-port 21-inch wide sparing panel NTQS31, you must use one of the unused mounting holes or move the panel • with a 4-port 19-inch wide sparing panel, you must reposition the panel
10	While waiting to confirm whether the LED status of each connected FP shows solid or flashing green, pack the old panel in the container.

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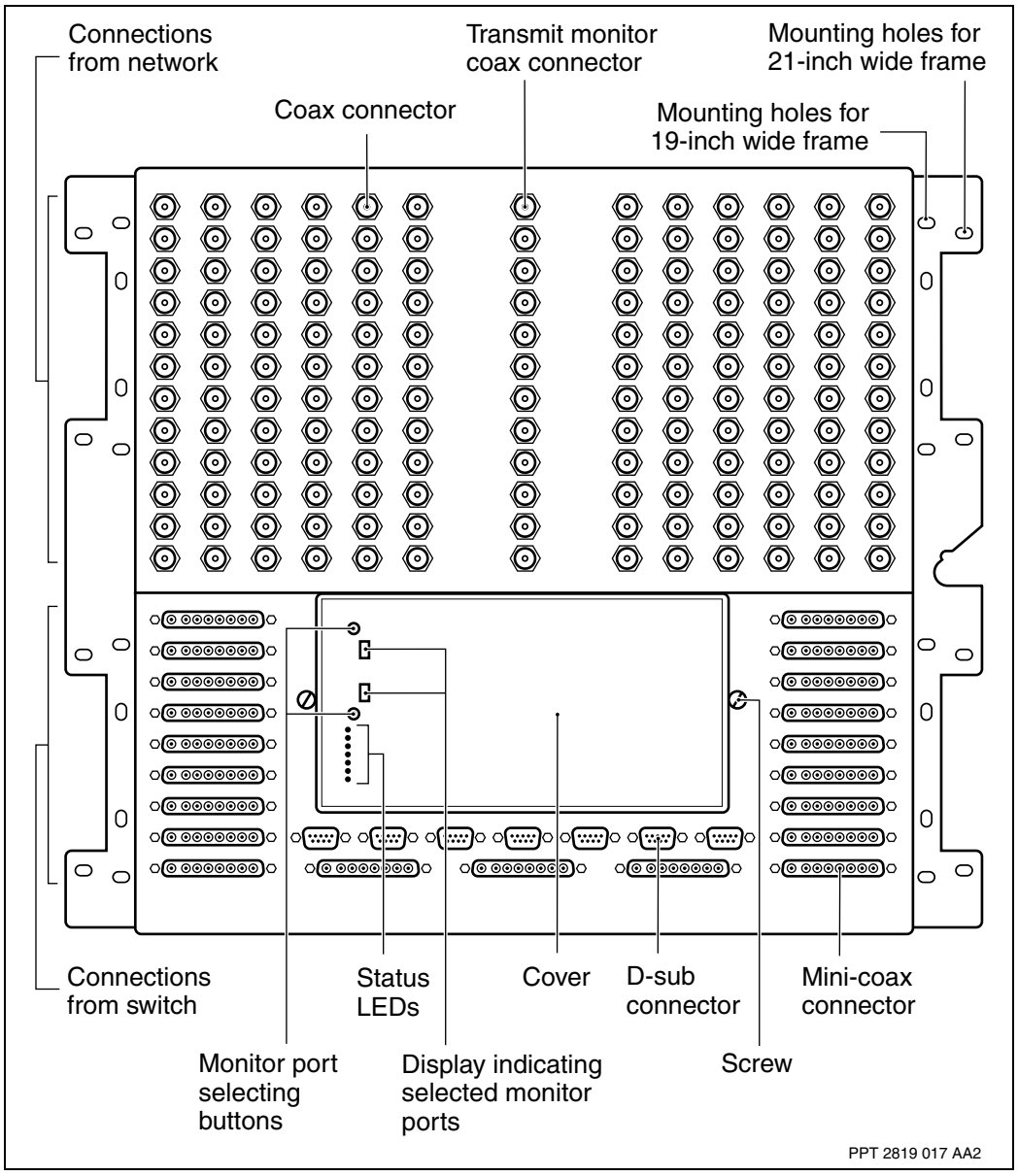
If the Spare path through the sparing panel was active before the panel was unpowered, it will become the active path again. The Main LED will light first and then only the Spare LED.

--End--

Procedure job aid

A 12-port DS3 or E3 one-for-six sparing panel NTQS31, fully assembled



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Installing a strain-relief bar

Instal the strain-relief bar to support the weight of the power input cables and the BIP-to-shelf cable assemblies.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a strain relief bar with the part number P0911981.

Procedure steps

Step	Action
1	While facing the rear of the BIP, hold the bar so that: • the long flat side is at the top • the short flat side faces you • the mounting ears point away from you
2	Locate the top rear adapter brackets mounted to the rack.
3	Position the mounting ears of the bar against the top adapter brackets so that the ear holes align with the remaining 4 adapter holes. The temperature sensor bracket and the strain-relief bar share the same adapter brackets. See the figure Location of the temperature sensor bracket assembly on a NEBS 2000 frame or a rack (page 434).
4	While holding the bar in position, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw from pack P0601478 through each upper mounting-ear hole.
5	Loosely fasten the remaining 2 screws.
6	Center the bar and tighten all 4 screws to snug plus a 1/4 turn.

--End--

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Installing a temperature sensor bracket assembly

Install a temperature sensor bracket assembly for an upper cooling unit to monitor the temperature of the air flow exiting the top of the shelf assembly.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need either version of a temperature sensor assembly bracket:
  - NTHR68AA used with an upper (front) cooling unit NTHR52AA or NTHR52AB
  - NTHR68AB used with an upper (front) cooling unit NTHR52AA or NTHR52AB
- You need a driver for the thread-forming 10-mm (3/8-in.) hex-head screws that fasten the bracket to the frame or rack.
- You need a step ladder to see the top of an upper shelf assembly that is mounted in a NEBS 2000 frame or other mounting apparatus.
- You must the install the temperature sensor bracket when you have these hardware kits:
  - upper shelf upgrade NTQS03 for a Multiservice Switch 15000 or NTQH03 for a Multiservice Switch 20000
  - shelf-based NTQS04 for a Multiservice Switch 15000 or NTQH04 for a Multiservice Switch 20000

Procedure steps

Step	Action
1	If not already assembled, fasten each of 3 sensors to the NTHR68 bracket with a circuit board in between them. Use the small Phillips screws. Ensure that the wire connectors point to the right along the axis of the bracket as shown in the figure A temperature sensor bracket assembly NTHR68AA for a cooling unit NTHR52AA (page 433). The sensors may be different on the NTHR68AA version as shown in the figures A temperature sensor bracket assembly NTHR68AA for a cooling unit NTHR52AA (page 433) and A temperature sensor bracket assembly NTHR68AB for a cooling unit NTHR52AB (page 434).
2	While facing the rear of the BIP, hold the bracket assembly so that: • the sensors point upwards • the 3-prong wire connectors point to the right side • the mounting ears are above the flat span of the bracket

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3 Locate the nearest mounting holes on the uprights of the NEBS 2000 frame as shown in the figure Location of the temperature sensor bracket assembly on a NEBS 2000 frame or a rack (page 434) or on the adapter brackets that are already fastened to a 23-in. wide EIA rack as shown in the figure Location of the temperature sensor bracket assembly on a 23-inch wide EIA rack (page 435).

4 Insert the bracket assembly between the frame uprights or the rack adapter brackets, below the BIP, and above the shelf until the mounting ears touch the uprights or the adapter brackets.

5 Align the mounting-ear screw holes (shown in the figures) with the lowest holes on the brackets.

6 Loosely fasten a threading-forming 10-mm (3/8-in.) hex-head screw from pack P0601478 through the 2 mounting-ear holes.

7 Center the sensor bracket and tighten both screws to snug plus a 1/4 turn.

8 At the end of the cable assembly with the 3 connectors occurring at different lengths, connect the longest one to the left sensor, the middle one to the middle sensor, and the shortest the right. Ensure that you plug in each connector, with gentle, even, steady, straight force.

9 Route the rest of the cable assembly to the right side of the rack and down to the rear of the cooling unit. Leave it hanging loosely for now.

--End--

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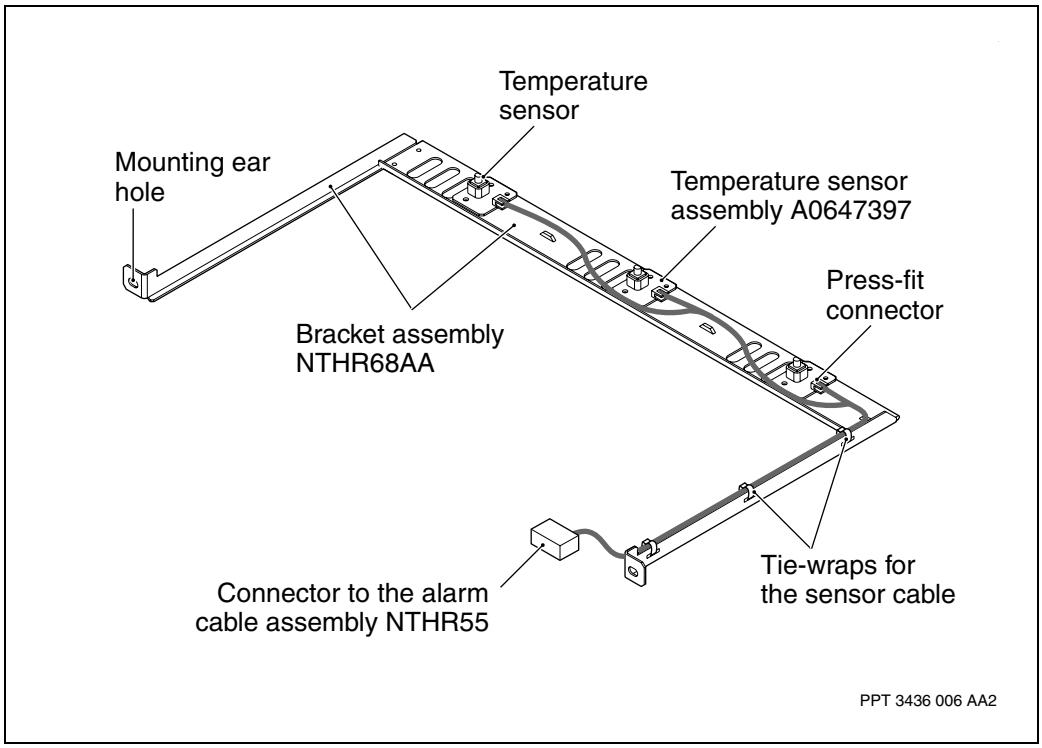
Procedure job aid

A temperature sensor bracket assembly NTHR68AA for a cooling unit NTHR52AA



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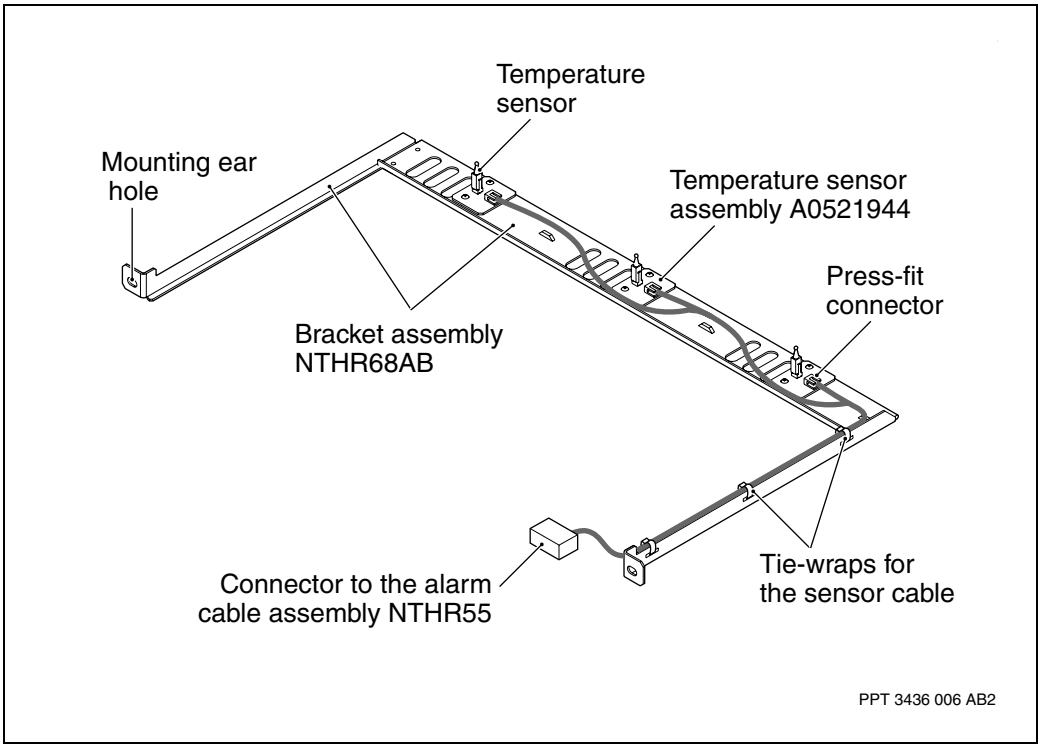
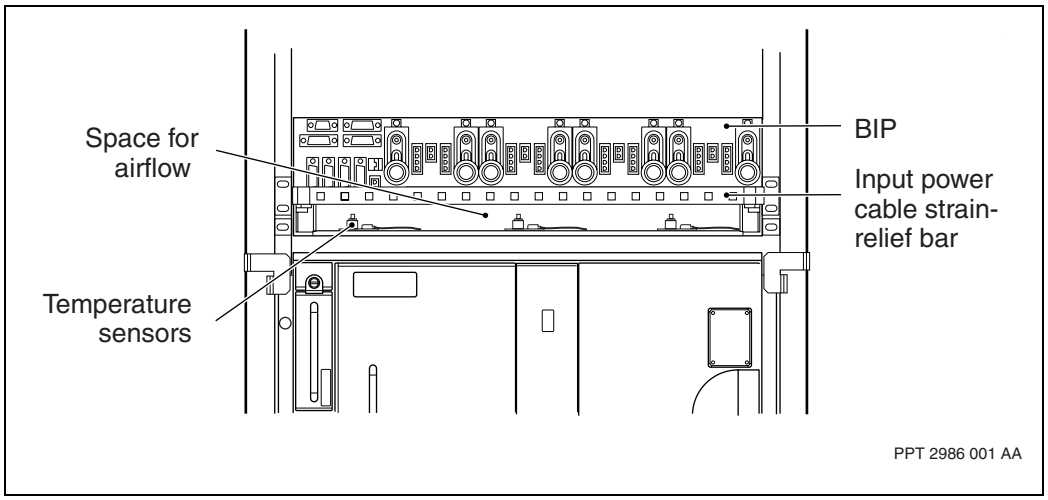
A temperature sensor bracket assembly NTHR68AB for a cooling unit NTHR52AB



Location of the temperature sensor bracket assembly on a NEBS 2000 frame or a rack



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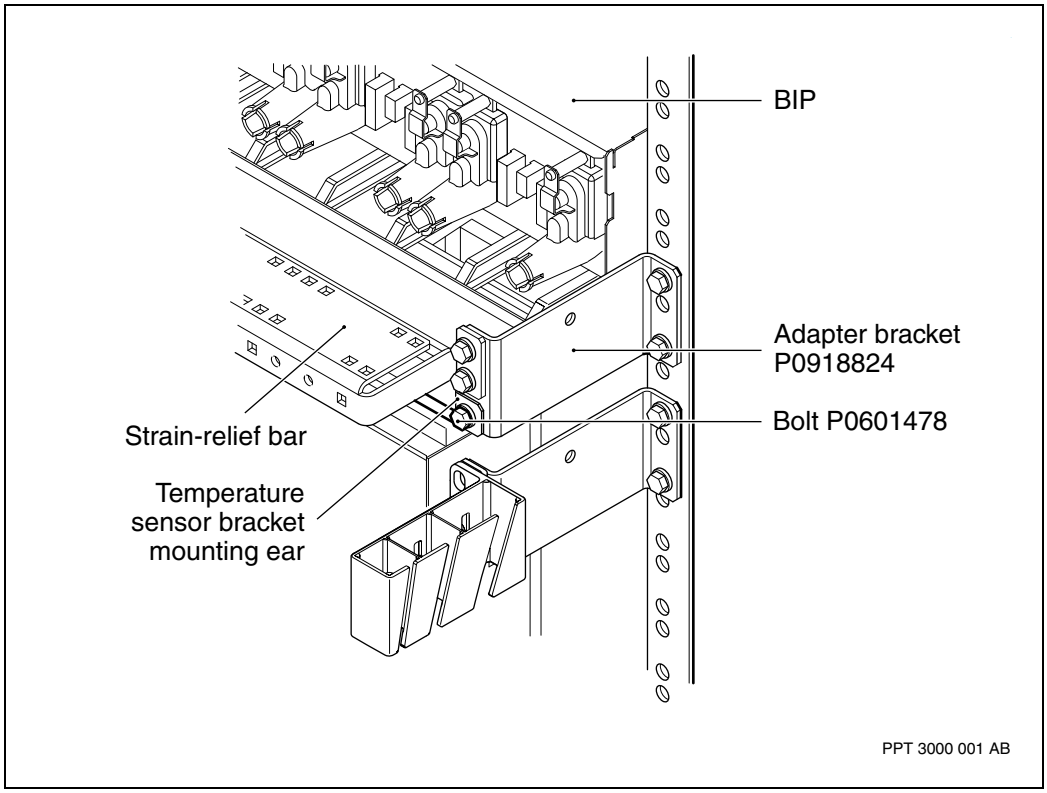
Location of the temperature sensor bracket assembly on a 23-inch wide EIA rack



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Installing a temperature sensor for an upper cooling unit

Install an upper cooling unit temperature sensor to restore optimum cooling and to reduce the rpm of the fans to normal speed.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need the appropriate version of temperature sensor:
  - NTCC8938 (or A0647397) for the temperature sensor in the bracket assembly NTHR68AA used with an upper (front) cooling unit NTHR52AA; all sensors on a bracket assembly must have the same part number
  - A0521944 or NTCC8938 (or A0647397) for the temperature sensor in the bracket assembly NTHR68AB used with an upper (front) cooling unit NTHR52AB
- You need a very short-shafted screwdriver for a small Phillips screw and a step ladder to see onto the top of an upper shelf in a NEBS 2000 frame or other mounting apparatus.

Procedure steps

Step	Action
1	At the rear top of the upper shelf, align the replacement temperature sensor and circuit board with the 2 screw holes. Refer to the figure Location of the temperature sensors on a bracket assembly (page 437). Avoid dropping the sensor assembly.
2	Fasten the sensor assembly using the 2 M6 Phillips screws from the removal. Tighten the screws to snug plus a 1/5 turn. If you drop a screw, you must retrieve it to prevent equipment damage. See the orientation of the sensors in the figures: • A temperature sensor on the bracket assembly NTHR68AA for a cooling unit NTHR52AA (page 437) • A temperature sensor on the bracket assembly NTHR68AB for a cooling unit NTHR52AB (page 438)
3	Plug the unplugged cable connector into the new sensor assembly. Apply gentle, even, steady, and straight force.
4	Verify the operation of the replaced sensor by waiting: • for the fan LED to change from lit red to lit green • a few minutes to hear the fans reduce rpm • for the software alarm 7012 0051 with FANFAIL to clear

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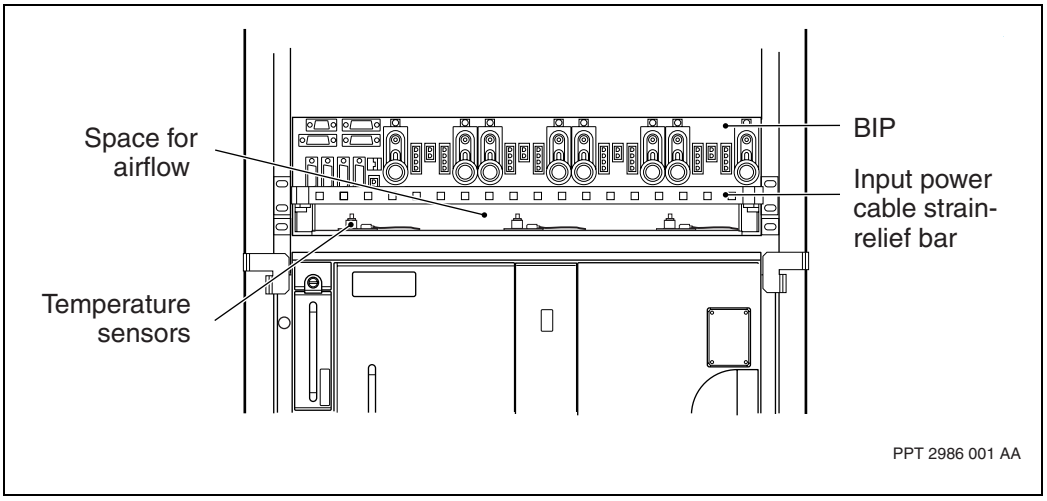
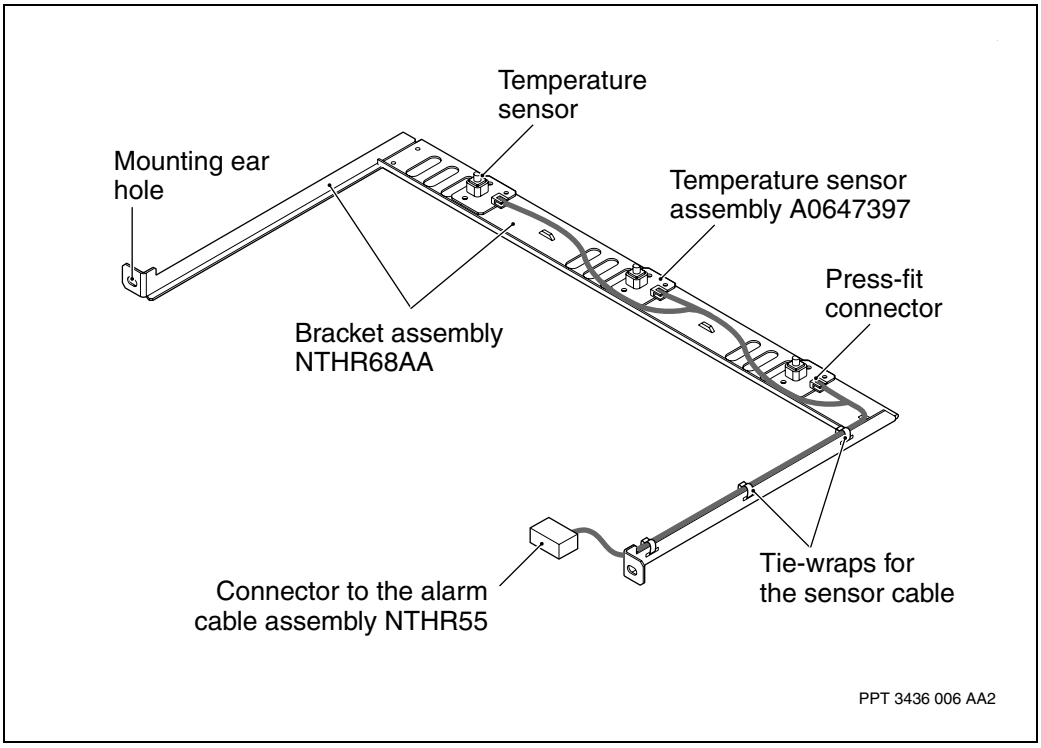
--End--

Procedure job aid

Location of the temperature sensors on a bracket assembly



A temperature sensor on the bracket assembly NTHR68AA for a cooling unit NTHR52AA



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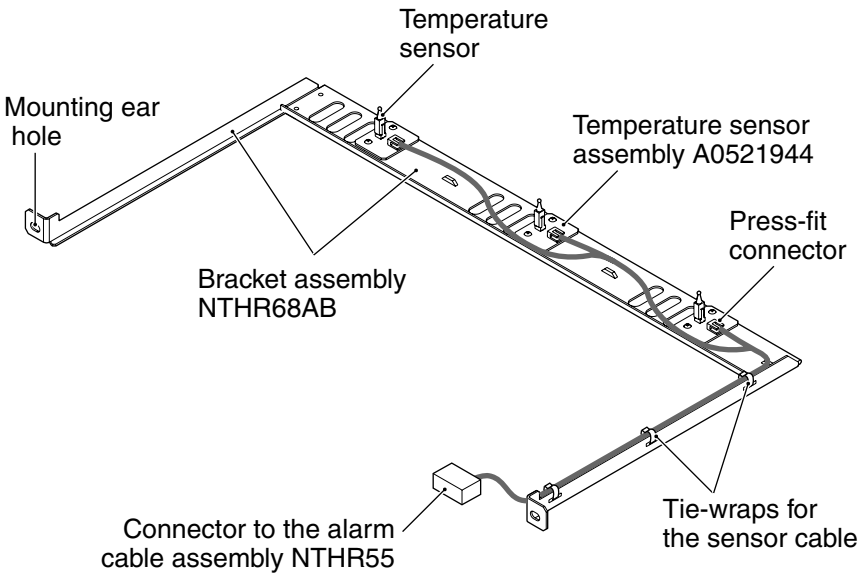
A temperature sensor on the bracket assembly NTHR68AB for a cooling unit NTHR52AB



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Installing a temperature sensor inside a lower cooling unit

Install a lower (rear) cooling unit temperature sensor to restore optimum cooling and to reduce the rpm of the fans to normal speed.

Prerequisites

DANGER

Risk of injury or equipment damage by electricity

While installing a temperature sensor inside a cooling unit, less than -48/-60 V dc is still live on the controllers and other two fans. Do not drop a screw, and because of the exposed electronics inside the unit, do not use a magnetic screwdriver. A dropped screw must be retrieved. Also, do not touch anything other than the sensor, its screws, or its wires.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Beachten Sie beim Austauschen eines Temperaturfühlers in einem Kühlaggregat, daß die Steuerungen und verbleibenden beiden Lüfter immer noch eine Spannung von bis zu -48/-60 V führen. Lassen Sie keine Schrauben fallen, und arbeiten Sie aufgrund der freiliegenden Elektronikbauteile in der Einheit nicht mit einem Magnetschraubendreher. Heben Sie fallengelassene Schrauben auf. Berühren Sie nur den Temperaturfühler, seine Schrauben und Verdrahtungen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need the appropriate version of temperature sensor:
  - NTCC8938 (or A0647397) for the temperature sensor inside a lower (rear) cooling unit NTHR51AA
  - A0521940 or NTCC8938 (or A0647397) for the temperature sensor inside a lower (rear) cooling unit NTHR51AB
- You need these specialty tools:
  - a medium non-magnetic one-piece Phillips screwdriver with a very short shaft
  - a flashlight to see through the spinning fan blades at what your hand is touching inside the cooling unit
- The air filter will prevent a dropped screw or tool from reaching the powered processor cards below the cooling unit.
- The temperature sensors for the lower (rear) cooling unit are located inside the cooling unit.

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Procedure steps

Step	Action
1	Put the replacement temperature sensor above the circuit board, and put them inside the cooling unit where the old one was removed. Note the orientation of the screw holes in the figures Location of the temperature sensors inside a lower cooling unit NTHR51AA (page 441) and Location of the temperature sensors inside a lower cooling unit NTHR51AB (page 443). Avoid dropping the parts. To see what your hand is doing, look through the spinning blades of the adjacent fan. You may need a flashlight to increase visibility. The plug-in of the right sensor is hidden behind a cluster of wires which cannot be moved. Find the plug-in by touch.
2	Fasten the sensor and circuit board using the 2 M6 Phillips screws from the removal. Tighten the screws to snug plus a 1/5 turn. If you drop a screw, you must retrieve it to prevent equipment damage.
3	Remove the ESD mat.
4	Plug the unplugged red cable connector into the new sensor assembly as shown in the figures Cable connections inside a cooling unit NTHR51AA or NTHR52AA (page 442) and Location of the temperature sensors inside a lower cooling unit NTHR51AB (page 443).
5	Re-install the fan controller according to the procedure Installing a fan controller (page 356).
6	Re-install the fan according to the procedure Installing a fan (page 352).
7	Verify the operation of the replaced sensor by waiting • for the fan LED to change from lit red to lit green • a few minutes to hear the fans reduce rpm • for the software alarm 7012 0051 with FANFAIL to clear

--End--

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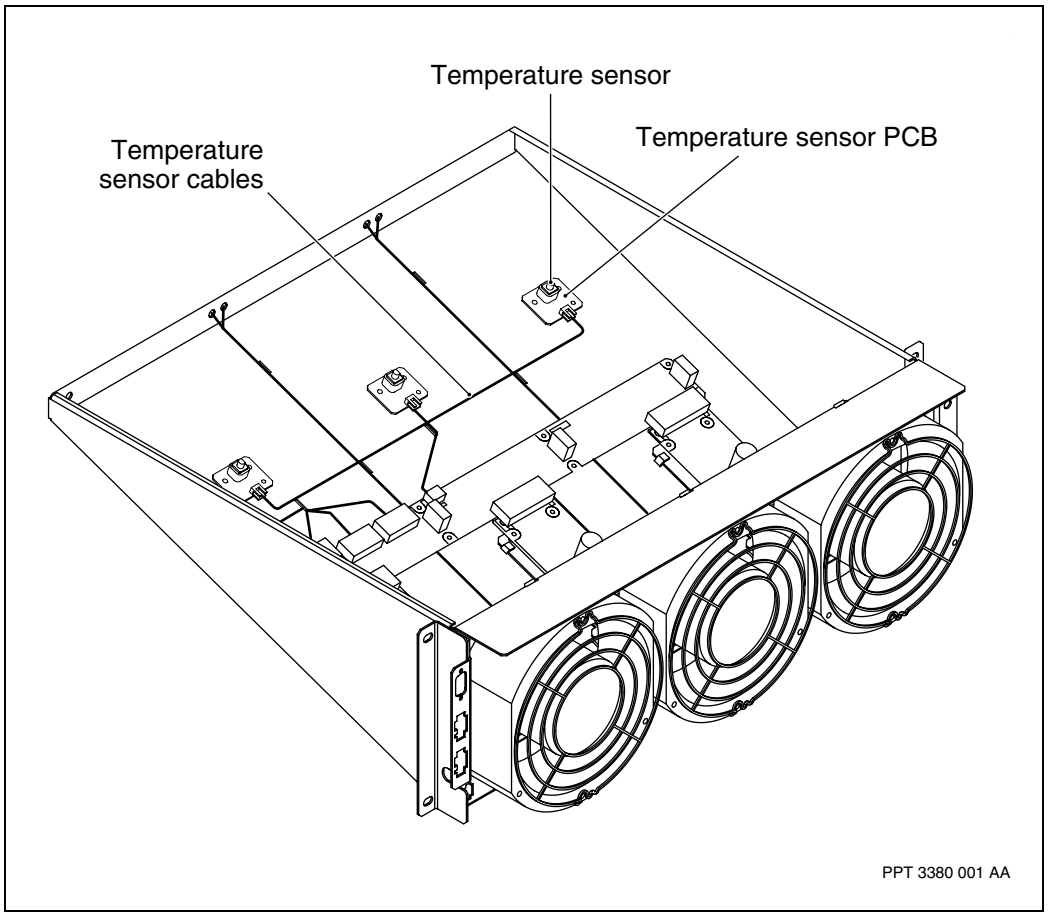
Procedure job aid

Location of the temperature sensors inside a lower cooling unit NTHR51AA



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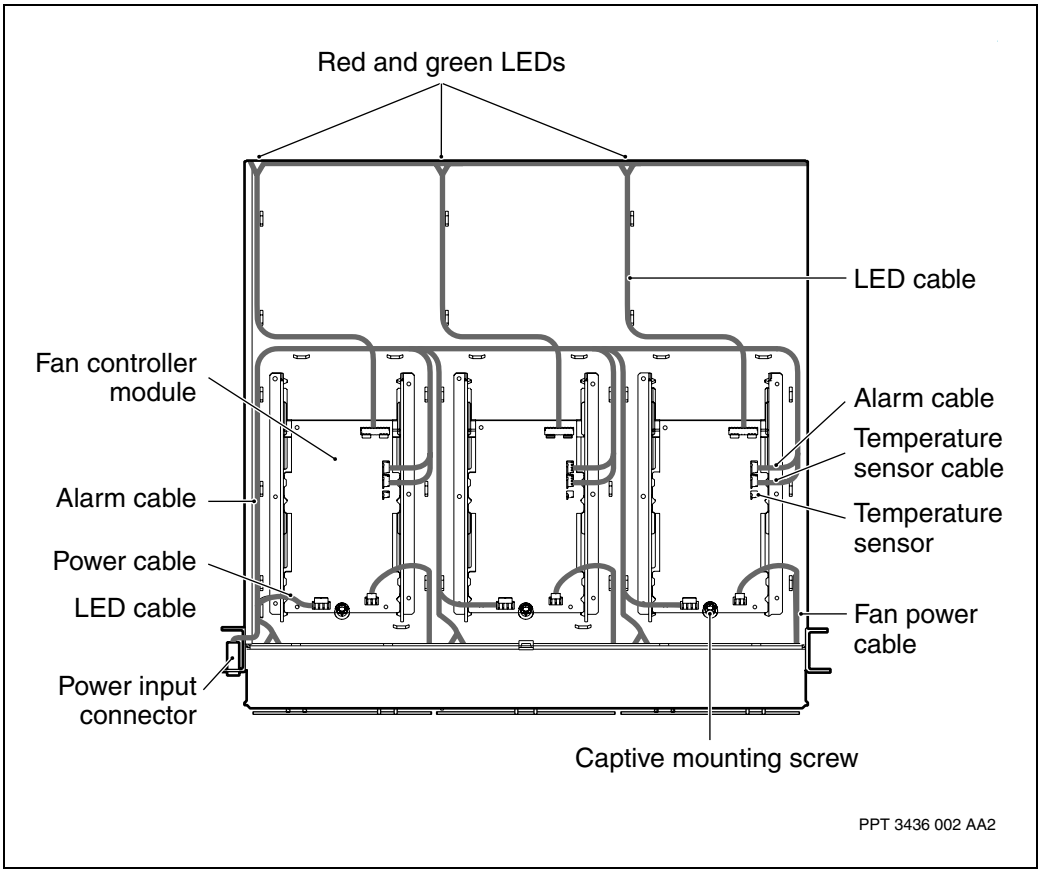
Cable connections inside a cooling unit NTHR51AA or NTHR52AA



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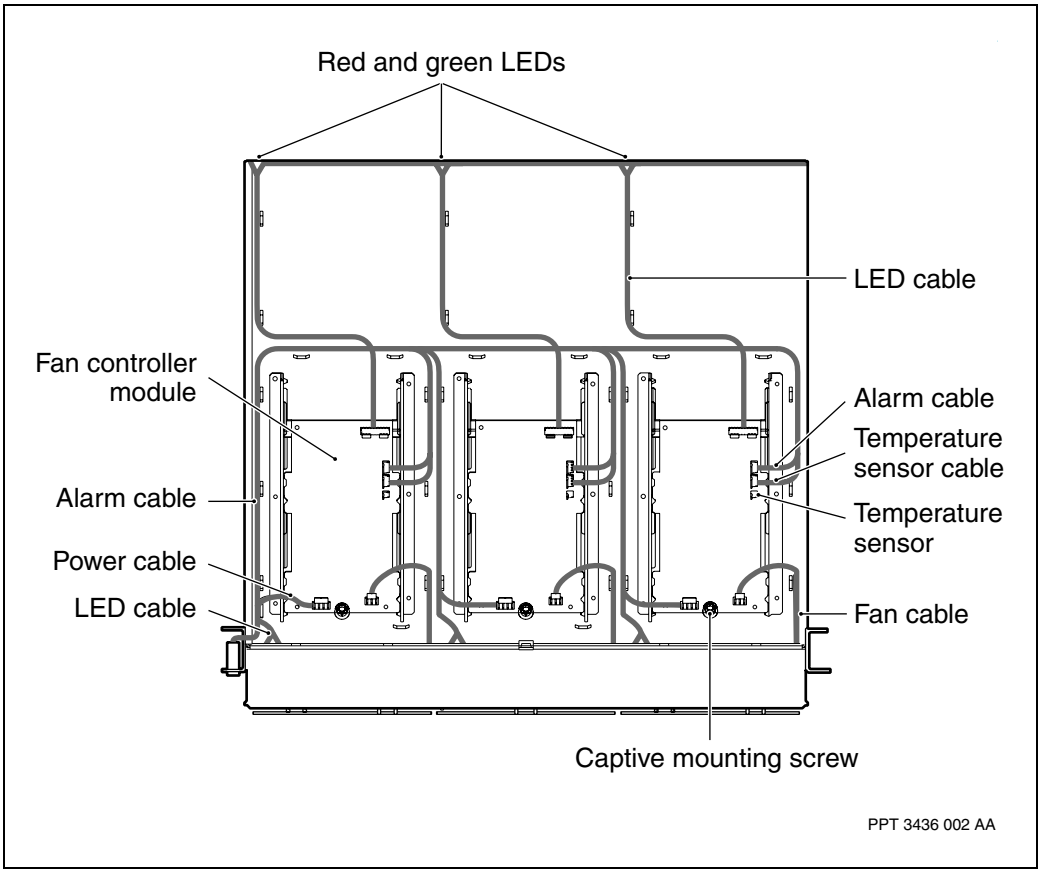
Location of the temperature sensors inside a lower cooling unit NTHR51AB



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Installing a timing cable adaptor NTPN81

Install a balanced-to-unbalanced timing cable adaptor (NTPN81) to convert an E1 alarm/BITS module into an unbalanced version on a Multiservice Switch 20000.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a hardware kit with PEC NTPN81. The kit provides a cable assembly and a balun adapter to convert an NTPN13 alarm/BITS module into an unbalanced version. For a redundant timing configuration, two kits are required. The kit includes:
  - a 38-cm (15-in.) E1 timing cable assembly with a DB-9 connector at one end and an RJ-45 at the other
  - a balun adapter unit, G.703 model 460 series manufactured by Patton Electronics Co.
- The cable assembly and the adapter provide a balanced-to-unbalanced coax-to-twisted-pair connection. The cable allows 75-ohm coax hardware to communicate with 120-ohm twisted pair hardware through standard unshielded category 3 cable. See the figure A timing cable assembly from kit NTPN81 (page 445) and the figures in the User Manual provided with the 460.
- The cable assembly NTPN81 does not require EMI filters on the J3 or J4 connections.
- The balun cable connection is designed for common bond grounding. The cable is always grounded on a switch unless you alter it for the receive (Rx) end of the connection. The transmit (Tx) end of the connection is ungrounded for a switch because that connection is unused. When you choose to not ground the timing cable, jumper JP2 must be removed to break the shield connection. The instructions to remove it are included in the User Manual of the model 460.

Procedure steps

Step	Action
1	At the alarm/BITS module, plug the male D-sub connector of the cable into the connector labelled J3.
2	Fasten the 2 small slotted screws of the D-sub connector to the alarm/BITS module. Tighten to snug plus a 1/5 turn.
3	At the other end of the cable, plug the RJ-45 connector into the model 460 adapter. Press them together until the tab engages.

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4 Fasten a coax cable to the output of the site timing source and route it to the receive (Rx) coax connector on the model 460 adapter. Ensure that there is enough slack to fasten the cable and adapter to structures with tie-wraps.

5 Connect the coax cable to the adapter. Let the adapter hang free or tie-wrap it to the switch's mounting apparatus. Ensure that the adapter is positioned out of the way from personnel or equipment passing at the rear of the switch.

6 Cover the transmit (Tx) coax connector on the model 460 adapter with electrical tape. The Tx connection is not used on a Multiservice Switch 20000.

7 Label the coax cable at the site BITS source to identify the switch receiving the timing signal.

8 Use a line analyzer to determine the signal strength for the timing signals at the J3 and J4 connections from the site source. The signal strength must be within the range indicated in Making a BITS cable (page 526).

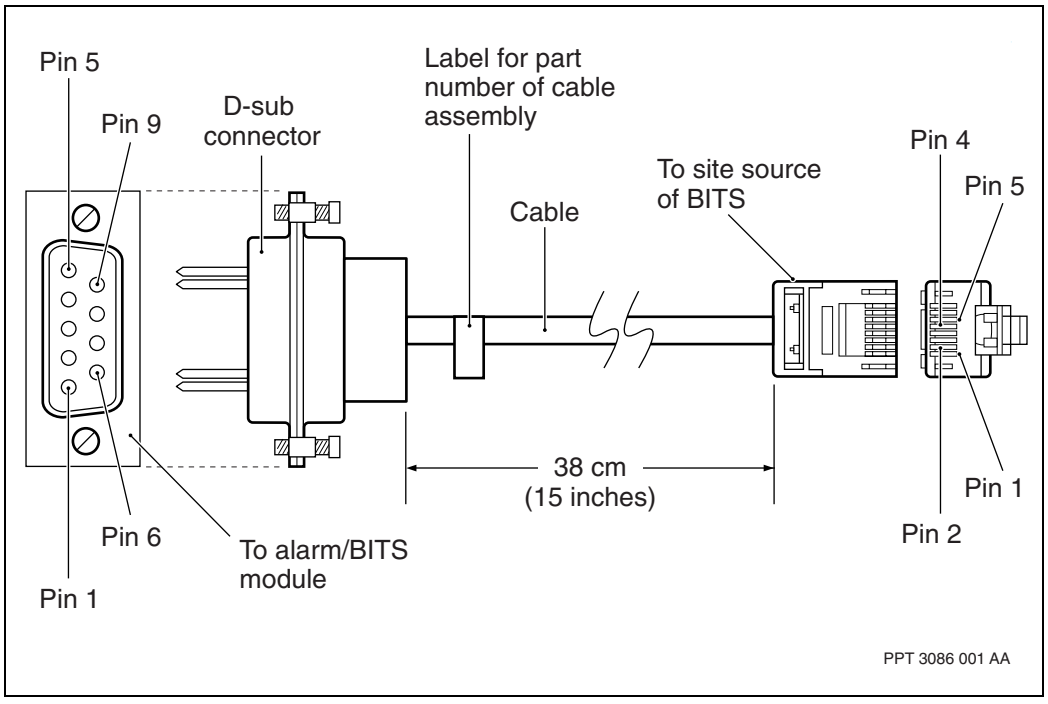
If each signal is not within the range, fix the problem between the point of test and the site source. Depending on the length of cable from the site source, you many need a thicker gauge cable to provide the signal strength.

9 Repeat this procedure for the redundant timing setup. Connect the second timing cable into the alarm/BITS connector labelled J4.

--End--

Procedure job aid

A timing cable assembly from kit NTPN81



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Pinout of the timing cable assembly from NTPN81

Pin number at J3 or J4 end	Pin number at timing source	Signal on the connection for the Multiservice Switch	Description of signal
1	2	BITSTXAP	BITS transmit BIT A, positive
5	4	BITSRXAP	BITS receive BIT A, positive
6	1	BITSTXAN	BITS transmit BIT A, negative
9	5	BITSRXAN	BITS receive BIT A, negative

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Installing a timing cable DS1 wire-wrap NTHW75

Install a wire-wrap timing cable assembly to use with a DS1 alarm/BITS module when required to comply with GR-1244 and where an external 8-kHz BITS timing source signal is used.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The module and cable assembly are typically factory-installed. In case of a retrofit, the cable assembly and termination block are also available in the kit NTHW74.
- You need a timing cable assembly with PEC NTHW75. This optional external sync cable assembly is a 2-pair tightly twisted wire-wrap cable connecting J3 and J4 on the alarm/BITS module to an externally mounted termination block. See the figure A timing cable assembly NTHW75 (page 449).
- The external sync wire-wrap cable assembly NTHW75 can only be used with the DS1 alarm/BITS module NTHW76 for a Multiservice Switch 15000, or NTPN78 for a Multiservice Switch 20000.
- You need a driver for the 10-mm (3/8-in.) hex screws that has at least a 10-cm (4-in.) reach to get past the terminal block.
- For custom-made cables, see cable specifications in the NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Use 2 thread-forming 10-mm (3/8-in.) hex-head screws to fasten the wire-wrap terminal block to the rear of the NEBS 2000 frame uprights within 63.5 cm (25 in.) of the alarm/BITS module. The mounting ears are shown in the figure "A timing cable assembly NTHW75 (page 449)".
2	Run the cable assembly down the side of the NEBS 2000 frame until the alarm/BITS module is within reach.
3	Use tie-wraps to loosely dress the cables to the side of the frame.
4	Run the customer-supplied BITS cables from the site timing source to the terminal block of the NTHW75. If you currently have a site timing cable connected to J3 and J4, you can use the existing timing cable by removing the DB9 connectors from the cable assembly and stripping the wires back in order to terminate onto the terminal block.

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5 Remove the terminal cover from the wire-wrap terminal block. The cover is shown in the figure A timing cable assembly NTHW75 (page 449).

6 Using hook-up wire and a ring lug, jumper the shield pins S5, S8, S9, S11 together and connect to the frame stiffener. The pin designations are labeled on the terminal block.

7 Strip back the timing cable approximately 15 cm (6 in.).

8 Route the timing cable into the terminal block.

9 Wire wrap the timing cable to the pins identified in the tables

- Wiring pinout for J3 of cable assembly NTHW75 (page 448)
- Wiring pinout for J4 of cable assembly NTHW75 (page 448)

Wiring pinout for J3 of cable assembly NTHW75

Wire wrap	Wire color	DB9 connector A0329608	Description of signal	Termination required?
T4	black	5	BITSRXBP BITS I/F receive +(pos)	yes
R4	black and red	9	BITSRXBN BITS I/F receive -(neg)	yes

Wiring pinout for J4 of cable assembly NTHW75

Wire wrap	Wire color	DB9 connector A0329608	Description of signal	Termination required?
T1	black	5	BITSRXAP BITS I/F receive +(pos)	yes
R1	black and red	9	BITSRXAN BITS I/F receive -(neg)	yes

10 The timing cable shield needs to be grounded on one end. Normally, do this on the site's BITS shelf of the timing source generator.

11 Determine the signal strength of the timing signals for the alarm/BITS module by connecting a line analyzer at the wire-wrap terminals on the terminal block, then at the DB9 connector pins of the cable assembly. The pins to test are identified in:

- the table Wiring pinout for J3 of cable assembly NTHW75 (page 448)
- the table Wiring pinout for J4 of cable assembly NTHW75 (page 448)
- the figure A timing cable assembly NTHW75 (page 449)

The range of DS1 signal strengths are identified in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

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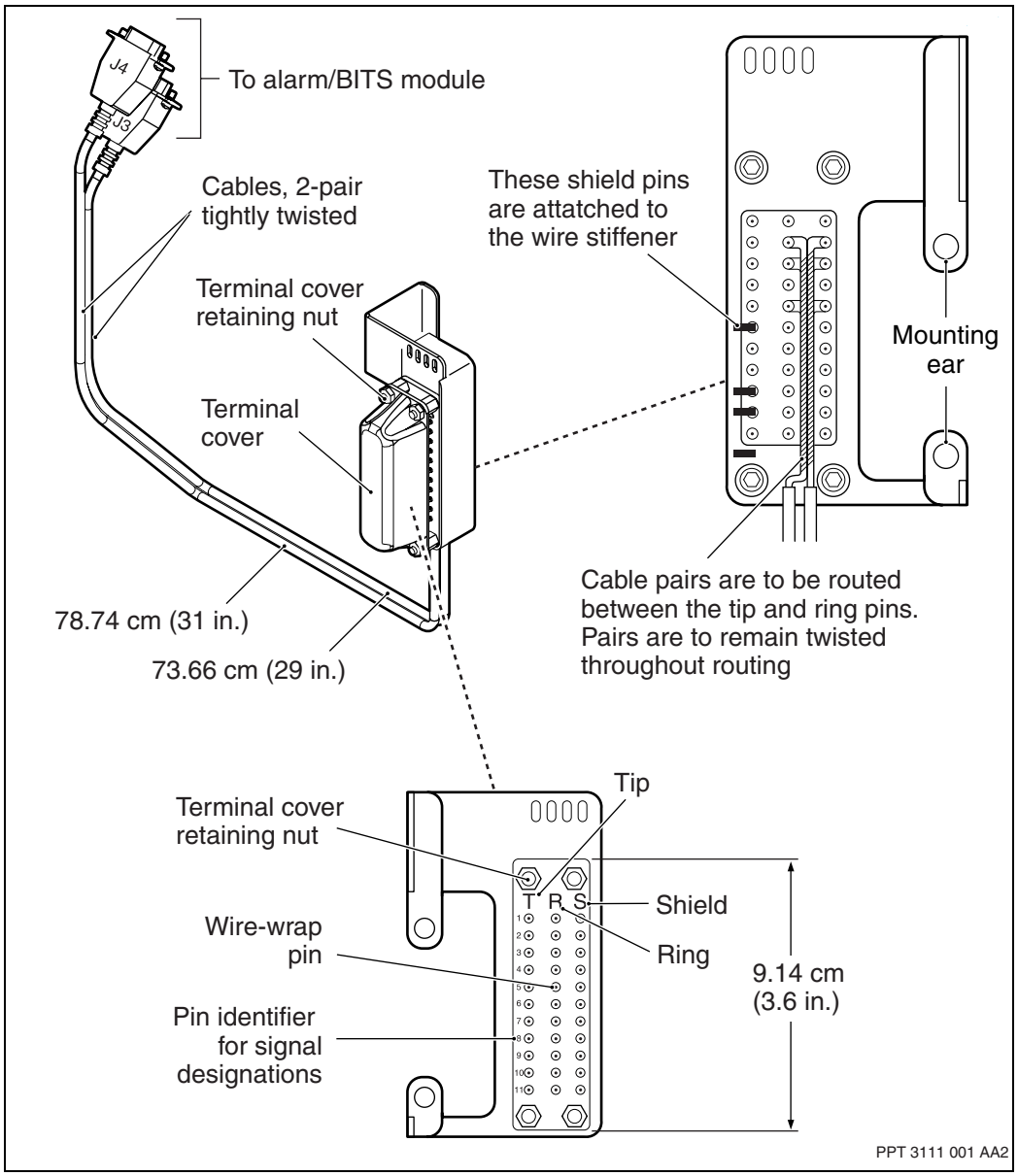
Depending on the length of cable from the site source, you many need a thicker gauge cable to provide adequate signal strength.

12 Connect the DB9 connector labelled J3 on the cable assembly to the J3 connection on the alarm/BITS module. Repeat for the J4 connection.

--End--

Procedure job aid

A timing cable assembly NTHW75



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Installing a timing cable for E1 unbalanced NTHR75

Install a timing cable assembly for E1 unbalanced in a Multiservice Switch 15000 to connect an E1 unbalanced timing signal from the site source to the alarm/BITS module with PEC NTHR14.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a timing cable assembly with PEC NTHR75. This timing cable is a 46-cm (18-in.) red cable assembly that converts the site coax BNC connector to a 2W2 interface at the BITS module for E1 unbalanced applications. See the figure A timing cable assembly NTHR75 (page 451).
- For custom-made cables, see cable specifications in the NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Connect the cable end labeled Rx to the Tx of the site timing source. Do not use the end labelled Tx. Wrap electrical tape around the Tx end to prevent metal-to-metal contact.
2	Use a line analyzer to determine the signal strength for the timing signals at the J3 and J4 connections from the site source. The signal strength must be within the range indicated in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*. If the signal is not within the range, fix the problem between the point of test and the site source. Depending on the length of cable from the site source, you many need a thicker gauge cable to provide the signal strength.
3	At the alarm/BITS module, plug the male D-sub connector of the cable into the connector labelled J3.
4	Fasten the 2 small slotted screws of the D-sub connector to the alarm/BITS module. Tighten to snug plus a 1/5 turn.
5	Repeat this procedure for the redundant timing setup. Connect the second timing cable into the alarm/BITS connector labelled J4.

--End--

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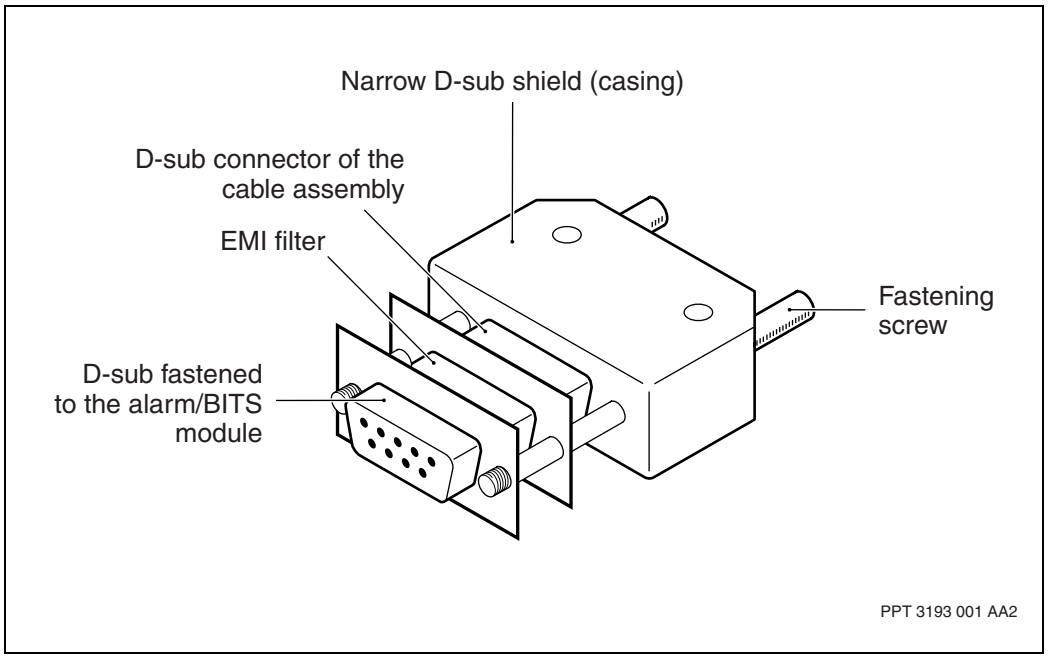
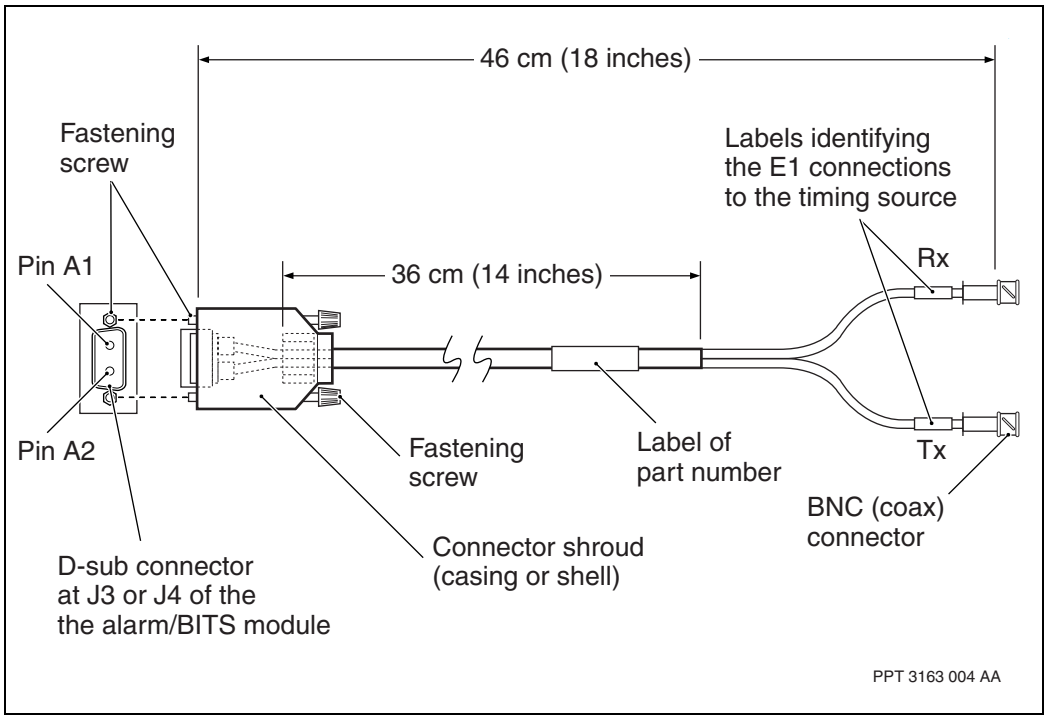
Procedure job aid

An inline EMI filter on a connector for an E1 alarm/BITS module



A timing cable assembly NTHR75



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Installing a top cover onto a frame bracket

Install a top cover onto a NEBS 2000 frame bracket at the front or rear of a frame as part of enclosing the frame and identifying the series and brand of equipment.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need kit number:
  - NTPN51 for the plain top cover kit
  - NTPN52 or NTPN53 for the top cover with the shelf status LED that is required when using door kit NTQS37AB
- You need these tools:
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - a screwdriver with a very large slotted bit to fasten the captive screws of the cover
  - a flashlight to see the connections at the rear of the BIP
- The bracket to which a top cover is fastened must already be mounted as indicated by the procedure Installing a top frame bracket onto a NEBS 2000 frame (page 459).

Procedure steps

Step	Action
1	Fasten a top cover mounting bracket at each end of the top cover frame bracket (P0876758) as shown in the figure Top cover and mounting brackets without door hardware (page 454). Use two 10-mm (3/8-in.) hex screws on each bracket. When upper door hardware is to be installed, combine fastening the door hardware to the same mounting bracket as shown in the figures: • Top cover and mounting brackets with door catch (page 455) • Top cover and mounting brackets with door hinge (page 456)
2	With an NTPN52 or NTPN52, connect an end of cable assembly NTHW66 to the LED board at the rear of the cover. The connector fits only one way.
3	Hold the top cover so that: • the captive screw heads face you • the words read correctly

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- with an NTPN52 or NTPN53, the LED is at the right end
- with an NTPN52 or NTPN53, the LED cable is flipped over the top of cover and hangs freely

4 Align the captive screws with the holes in the brackets and fasten them as shown in the figure Top cover and mounting brackets without door hardware (page 454).

5 With an NTHW66, route the other end of the cable to the rear of the BIP. When the top frame bracket is mounted at the front of the frame, route the cable under the top of the frame and above the BIP as shown in the figures

- Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame (page 457)
- Path of the LED cable NTHW66 passing through the bottom of the top frame bracket (page 458)

6 Connect the other end of NTHW66 to the rear of the BIP at the 4-pin connector labeled J2. The connector fits only one way.

7 When the BIP is powered up, confirm LED operation by pressing the LED Test button on the front of the alarm module in the BIP.

If the LED lit up as soon as the cable was connected, there is already at least one shelf alarm indicated by the alarm module.

If the LED does not light, press the cable connections together at both ends of the cable NTHW66 and press the button again.

If the LED still does not light, contact your Nortel Networks sales representative.

--End--

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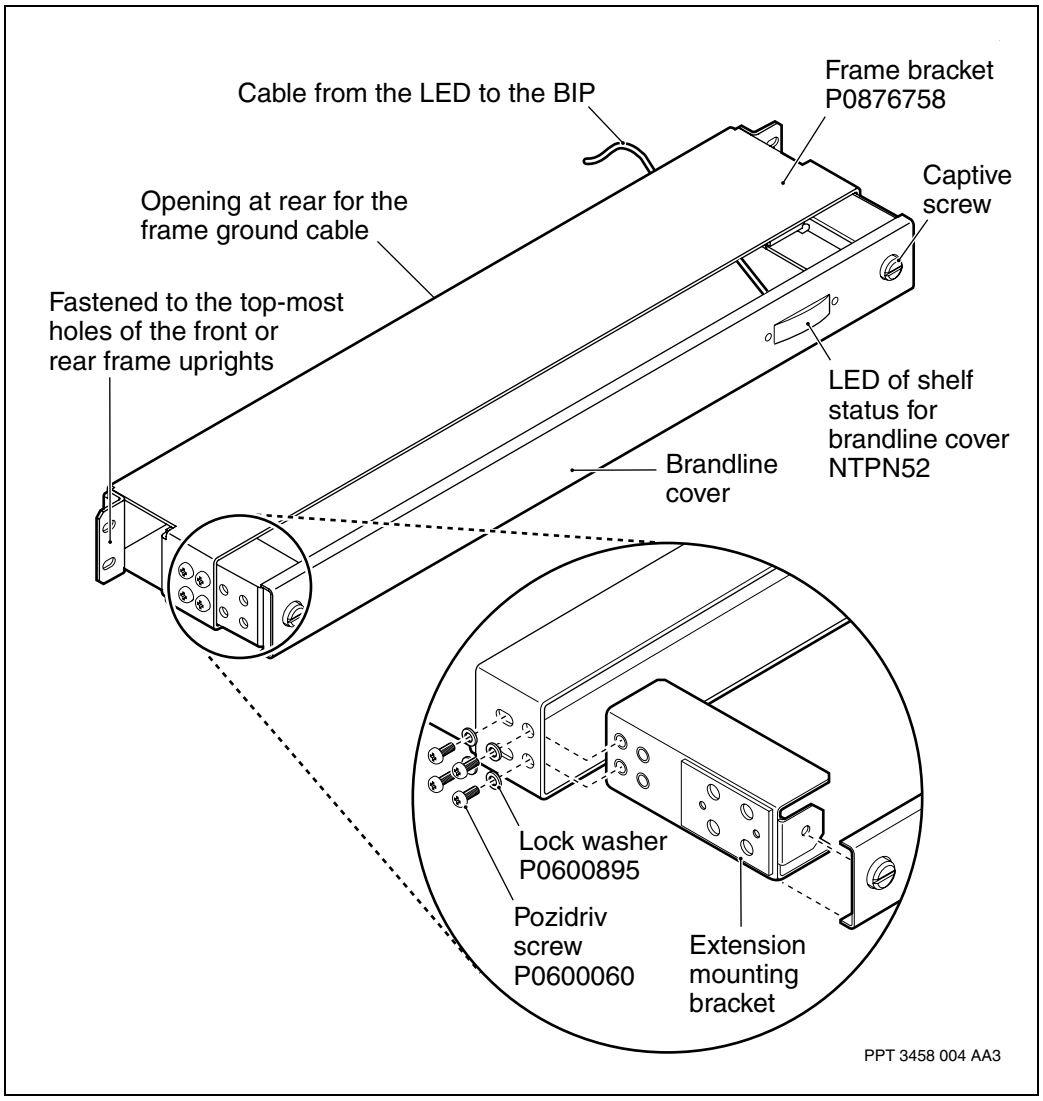
Procedure job aid

Top cover and mounting brackets without door hardware



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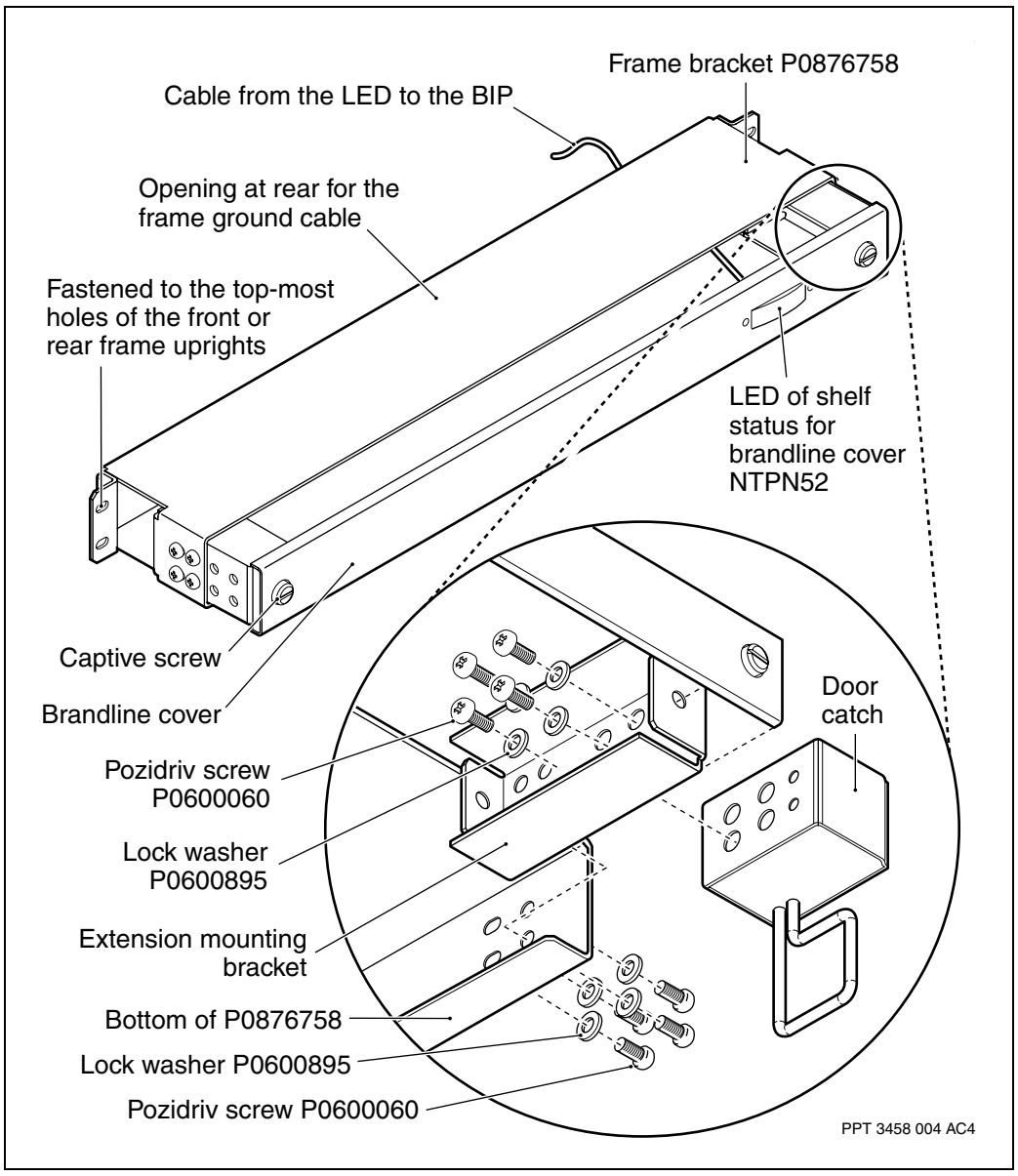
Top cover and mounting brackets with door catch



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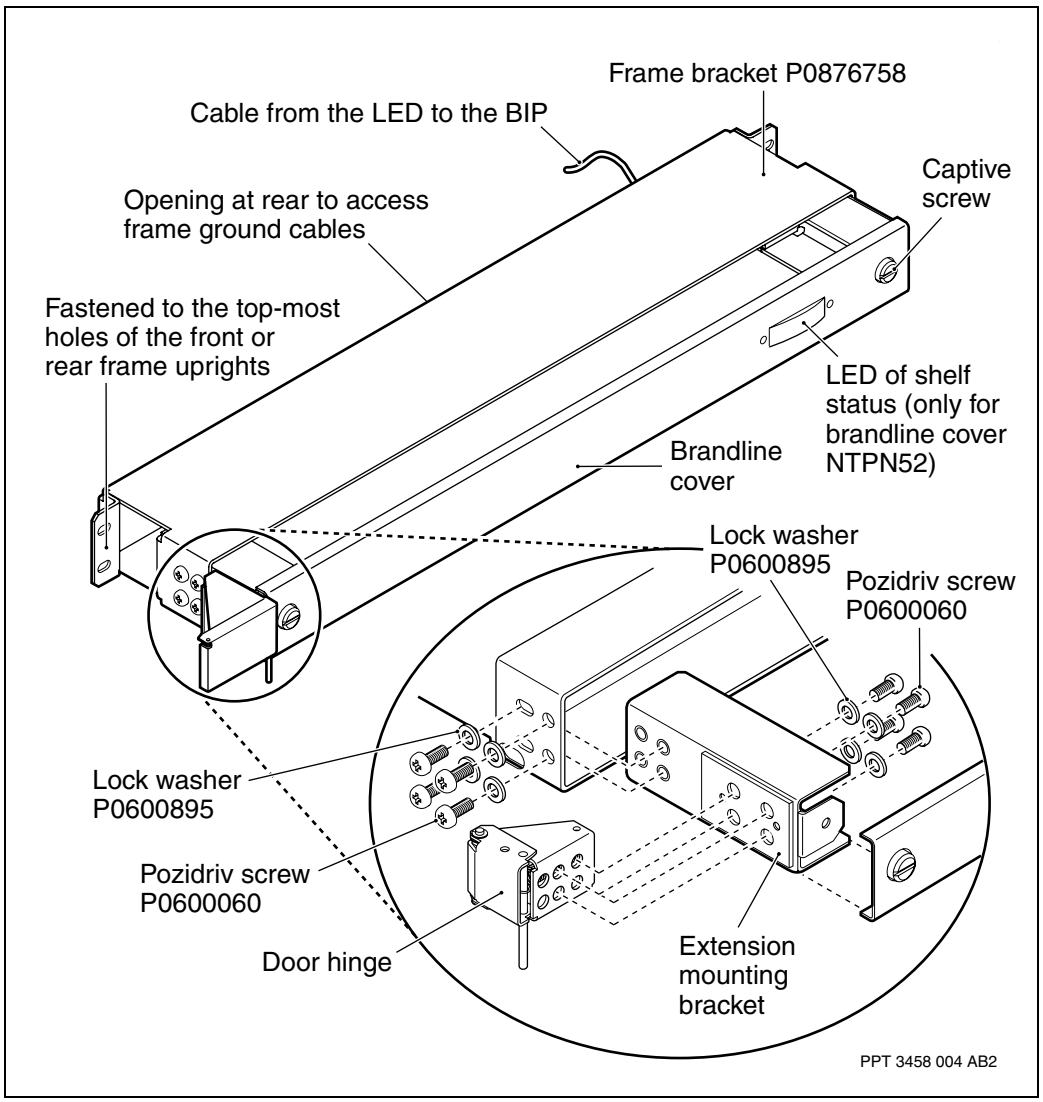
Top cover and mounting brackets with door hinge



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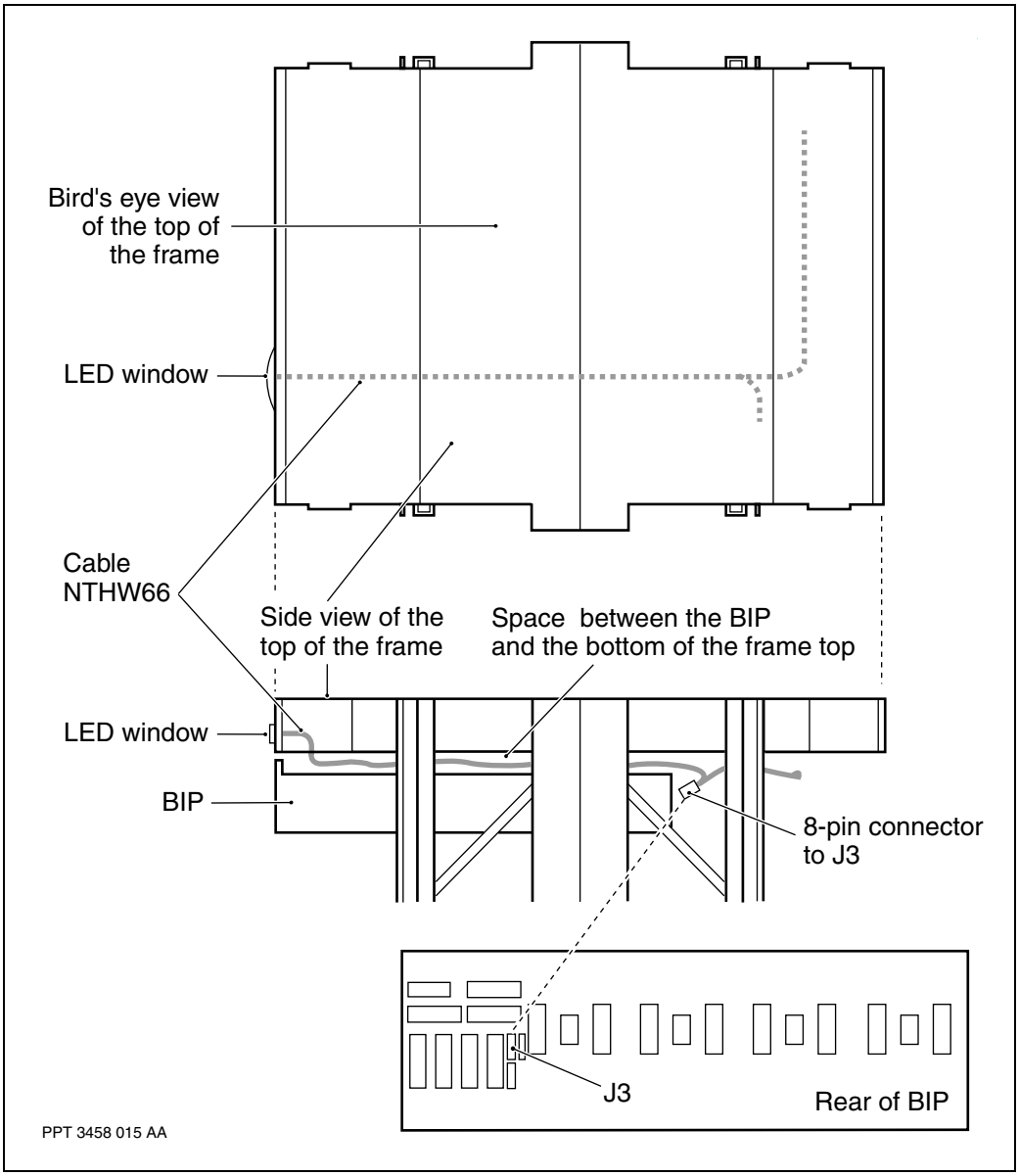
Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame



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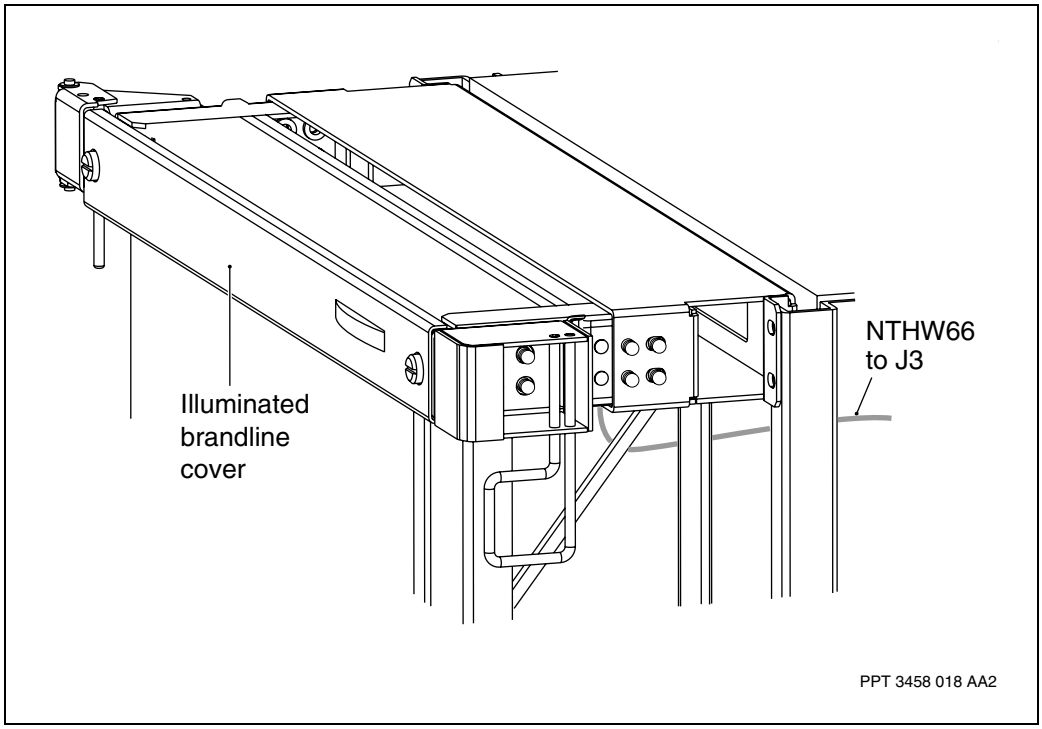
Path of the LED cable NTHW66 passing through the bottom of the top frame bracket



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Installing a top frame bracket onto a NEBS 2000 frame

Install a top frame bracket onto the front or rear of a NEBS 2000 frame to enable mounting a brandline cover (illuminated or not) or a top cover and optional upper door hardware.

Prerequisites

DANGER

Risk of injury by electrocution

When the ground cable between the NEBS 2000 frame and the site ground window is already fastened where a top frame bracket (P0876758) is to be installed, the cable must be temporarily disconnected until the bracket is installed and the cable can be re-connected through the bracket. Before disconnecting the cable, terminate the power source to all equipment in the frame that shares the same ground window.

WARNUNG

Gefahr durch elektrischen Schlag

Wenn das Massekabel zwischen dem NEBS 2000 Gestell und dem lokalen Masseteil bereits an der für die Installation der oberen Gestellbefestigungsschelle (P0876758) vorgesehenen Stelle befestigt ist, muss die Kabelverbindung solange getrennt werden, bis die Befestigungsschelle installiert wurde und die Kabelverbindung durch die Schelle wiederhergestellt werden kann. Vor dem Trennen der Kabelverbindung muss die Stromversorgung zu allen Geräten im Gehäuserahmen mit dem gleichen Masseteil getrennt sein.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a top frame bracket with part number P0876758 (stamped on the top) from hardware kit NTRU0185 or NTPN52. Refer to the figures
  - A top frame bracket P0876758, underside view (page 461)
  - Locations of installed brandline covers and top frame brackets (page 462)
- You need these tools (and refer to the figure Types of screws used with frame enclosure hardware (page 74)):
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - if a frame ground cable needs to be disconnected, a driver for the very large slotted pan-head screws P0883403 and a 10-cm (4-in.) shaft to reach through the bracket to the cable lug

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— a driver for the 10-mm (3/8-in.) thread-forming hex-head mounting screws P0601478 with a 10-cm (4-in.) reach past the front of the bracket to the frame uprights as shown in the figure Locations of installed brandline covers and top frame brackets (page 462)

- Do this procedure before the installation procedure “Grounding the NEBS 2000 frame” and before “Powerup of a Multiservice Switch”.

Procedure steps

Step	Action
1	When any ground cables are already fastened to the top of the frame, terminate the power sources to all equipment in the frame. Also toggle off all breakers on the BIP.
2	Record the position of all cables grounded to the top of the frame.
3	Disconnect the 2 slotted screws P0883403 from the frame ground cable lug. Leave the cable hanging freely. Put the screws aside for re-use.
4	Disconnect any other ground cables at the top of the frame. Put the screws aside for re-use.
5	Hold the top frame bracket so that: • the part number is on top • the smaller rectangular opening between the mounting ears faces away from you
6	Align the mounting ears at both sides of the bracket with the top 2 pairs of dimples or holes on the frame uprights as indicated by the figure Locations of installed brandline covers and top frame brackets (page 462). The top of the bracket (largest surface) should align with the top of the frame.
7	Fasten the mounting ears to the frame using four 10-mm (3/8-in.) screws P0601478.
8	Pass the frame ground cable through the opening in the side of the top frame bracket, as shown in the figure Locations of installed brandline covers and top frame brackets (page 462). You must maintain the direction of the cable’s former installation. If the cable cannot easily reach any of the 3 pairs of grounding holes across the top of the frame, you must replace the cable or at least comply with your local electrical codes.
9	Reconnect the frame ground cable lug and any other ground cables that were disconnected.
10	Restore power to all equipment in the frame only if it was powered off for this installation. Also, toggle on the BIP breakers if they were toggled off for this procedure.

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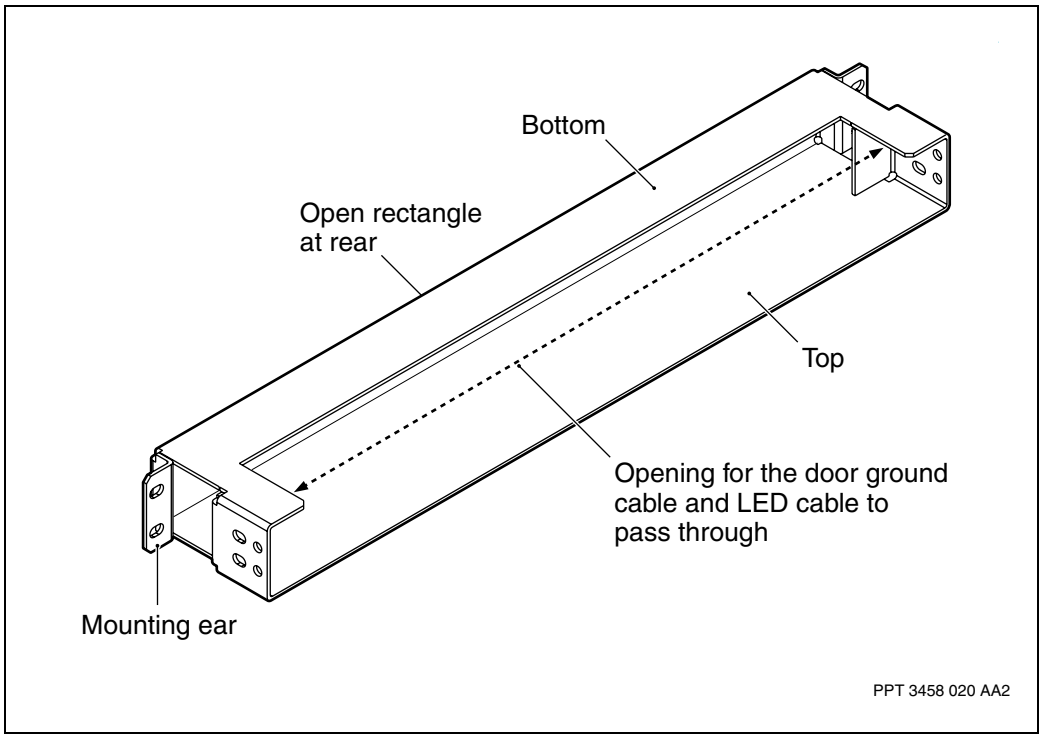
--End--

Procedure job aid

A top frame bracket P0876758, underside view



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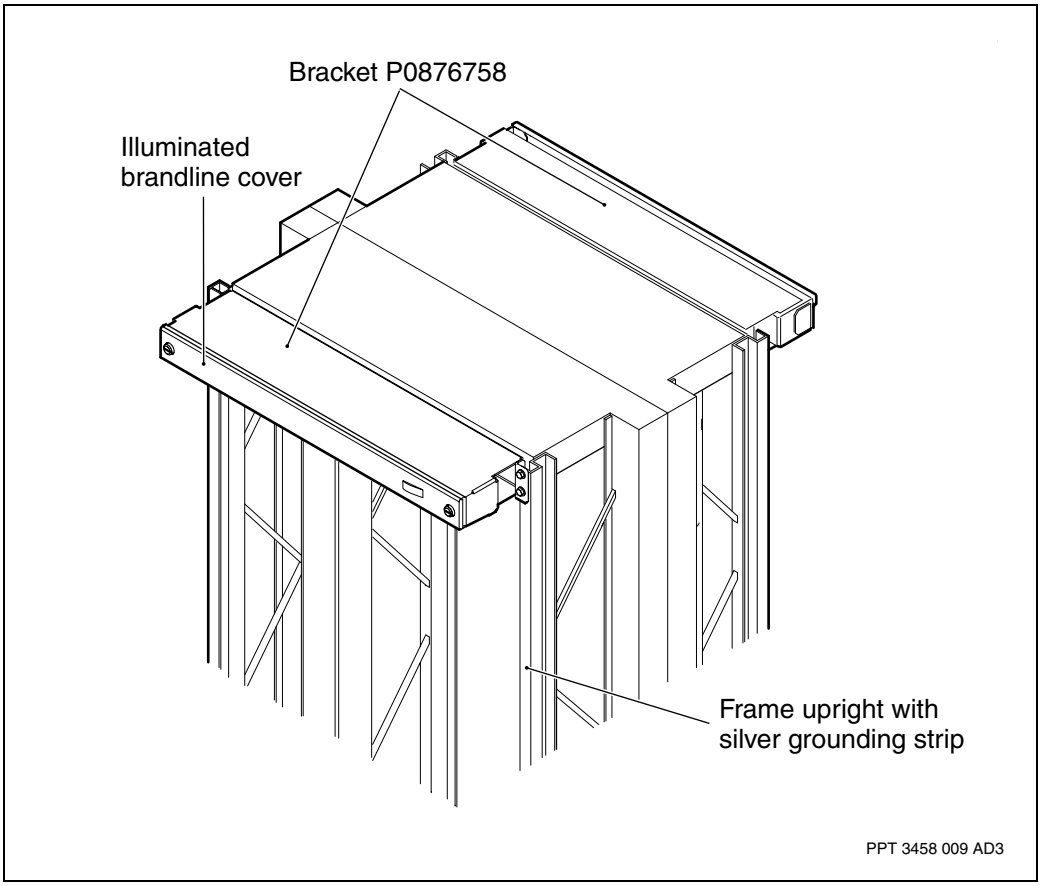
Locations of installed brandline covers and top frame brackets



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Installing adapter brackets onto a SER 5500

Install adaptor brackets onto a SER 5500 to prepare it for mounting onto a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need adapter brackets with the following part numbers, from the hardware kit NTHW85:
  - — P0914659, left adapter bracket
  - — P0914660, right adapter bracket

Procedure steps

Step	Action
1	Hold the left bracket so that • it is vertical and two columns of holes face you • the label TOP faces you and is at the top • the wider spaced holes are at the left side
2	While facing the front of the SER 5500 (at the open cavity) shelf, position the surface of the bracket that is facing you against the rear of the left mounting ear on the shelf. For orientation, see the figure Location of shelf hardware for a SER 5500 in a NEBS 2000 frame (page 464).
3	The column of narrower holes are intended to fasten to the mounting ear. Align the bottom mounting ear hole with the left hole second from the bottom on the adapter bracket. A portion of each adapter bracket extends above the SER 5500 shelf.
4	Fasten the bracket to the mounting ear using 4 thread-forming 10-mm (3/8-in.) hex-head screws from the kit NTHW85. Thread the screws from the front towards the rear.
5	Tighten all screws to snug plus a 1/4-turn. Avoid stripping by over-tightening.
6	Repeat step 1 to step 5 for the right adapter bracket. Ensure the column of wider holes is at the right side and not attached to the mounting ears of the shelf.

--End--

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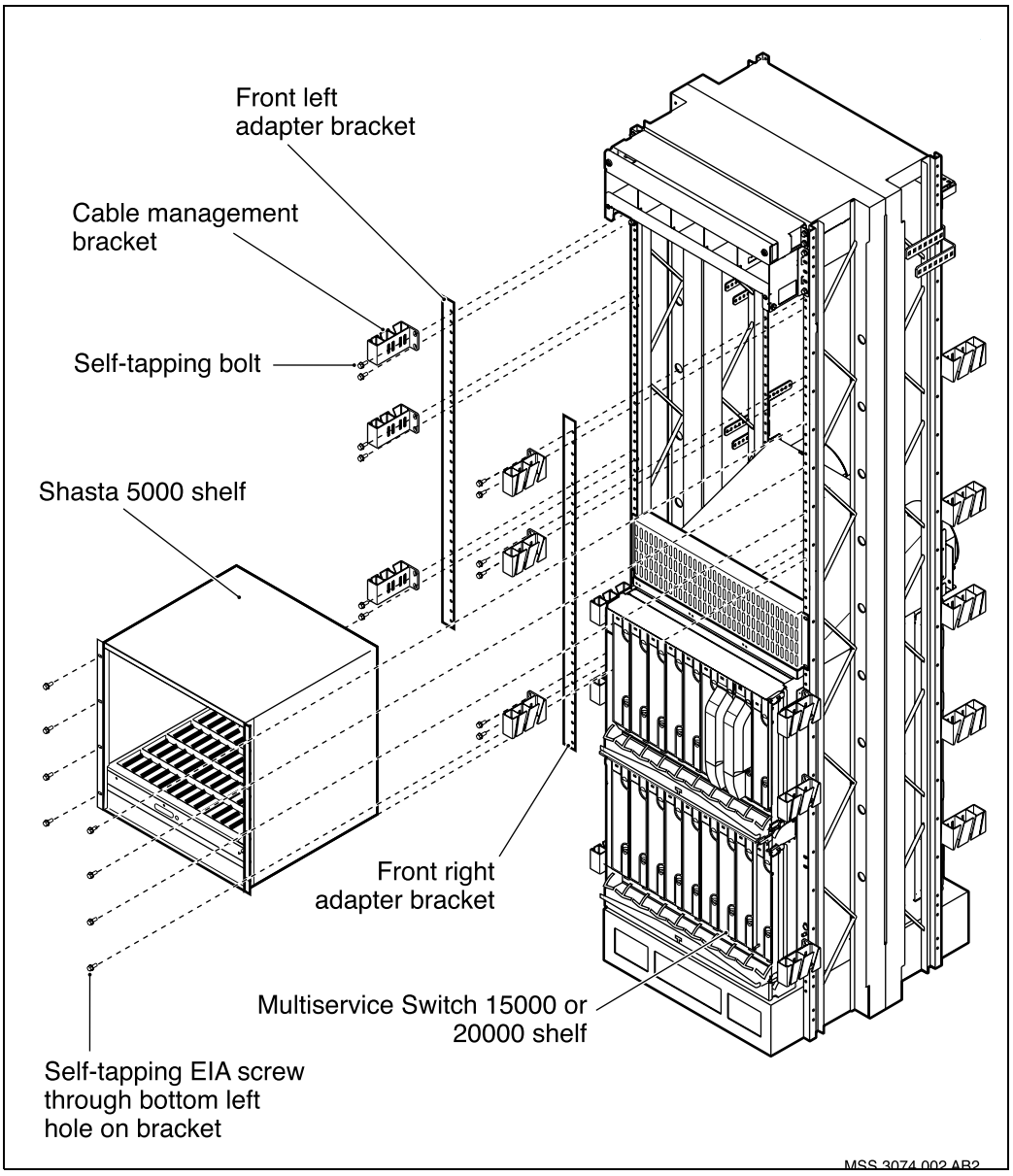
Procedure job aid

Location of shelf hardware for a SER 5500 in a NEBS 2000 frame



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Installing an FP

Install an FP into an empty slot in a Nortel Networks Multiservice Switch shelf to enable a Multiservice Switch to provide configured services, or to resume backing up the active FP.

Prerequisites

CAUTION
Risk of damage to equipment from software
An incompatible software load can damage an FP beyond a field repair. Ensure that the software running on the node meets the minimum software requirement for a replacement FP. For information on minimum software requirements see NN10600-551 *Nortel Networks Multiservice Switch 7400/15000/20000 FP Configuration Reference*.

- You must be familiar with Safety considerations and best practices (page 19).
- When installing an FP as part of a replacement and that FP has SFP optical modules, you must use the same type of module per port on the replacement FP (otherwise a change is considered an upgrade). When a failed FP with SFP modules is being replaced, swap the modules from the failed FP to the replacement. Ensure that you swap one port at a time to prevent a mix-up. The task flow that has “installing an FP” also has the procedures to handle SFP modules.
- Use optional retrofit kit NTPS40 with its own instructions for adding cable guides to the faceplate of these fiber optical FPs before or after inserting the card into a shelf:
  - NTHW21
  - NTHW24
  - NTHW31
  - NTHW44
  - NTHW49
- The list of FPs supported by this procedure are in the chapter “Field replaceable units” in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	If there is a blank processor card in the slot where the FP is to be installed, remove it according to Removing a blank processor card (page 551).

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2 At the ends of the faceplate, swing each latch fully open by pinching the inner edge of the latch and lifting away from the faceplate. Refer to the figure Open card latches on a CP, FP, or blank processor card (page 467).

3 While holding the FP by its edges with the latches on the right side of the faceplate, align the end with the pins to the channels in the slot. Avoid touching anything on the FP.

4 Gently slide the FP into the slot until the FP stops moving. There are keyways and guide pins to ensure that the FP aligns with the connections at the backplane (inside at the rear of the shelf). If you feel resistance, do not force the FP in. Remove it, and check the backplane at the rear of the slot for bent pins. You may need a flashlight to see into the slot. If no pins are bent, re-seat the FP. If any pin is bent, do not insert an FP and contact your technical support representative of Nortel Networks.

CAUTION

Risk of damage to the backplane from seating a card

When latching a card into its final seating position, the card latches must be closed simultaneously to ensure that the card evenly engages the gaskets and pins on the backplane. Otherwise, improperly seating a card can damage the backplane hardware such that the slot becomes unusable. Restoring a slot to service from this kind of damage means replacing the shelf assembly.

5 Close both latches simultaneously until they are flush against the faceplate. Refer to the figure Closed card latches on a CP, FP, or blank processor card (page 468).

When a latch will not sit flush against the faceplate, do not force it. Fully open both latches, slide the card out to disengage contact from the backplane, and return to step 4.

When a latch does not sit flush after a second attempt, abort the seating and contact your next higher level of technical support.

--End--

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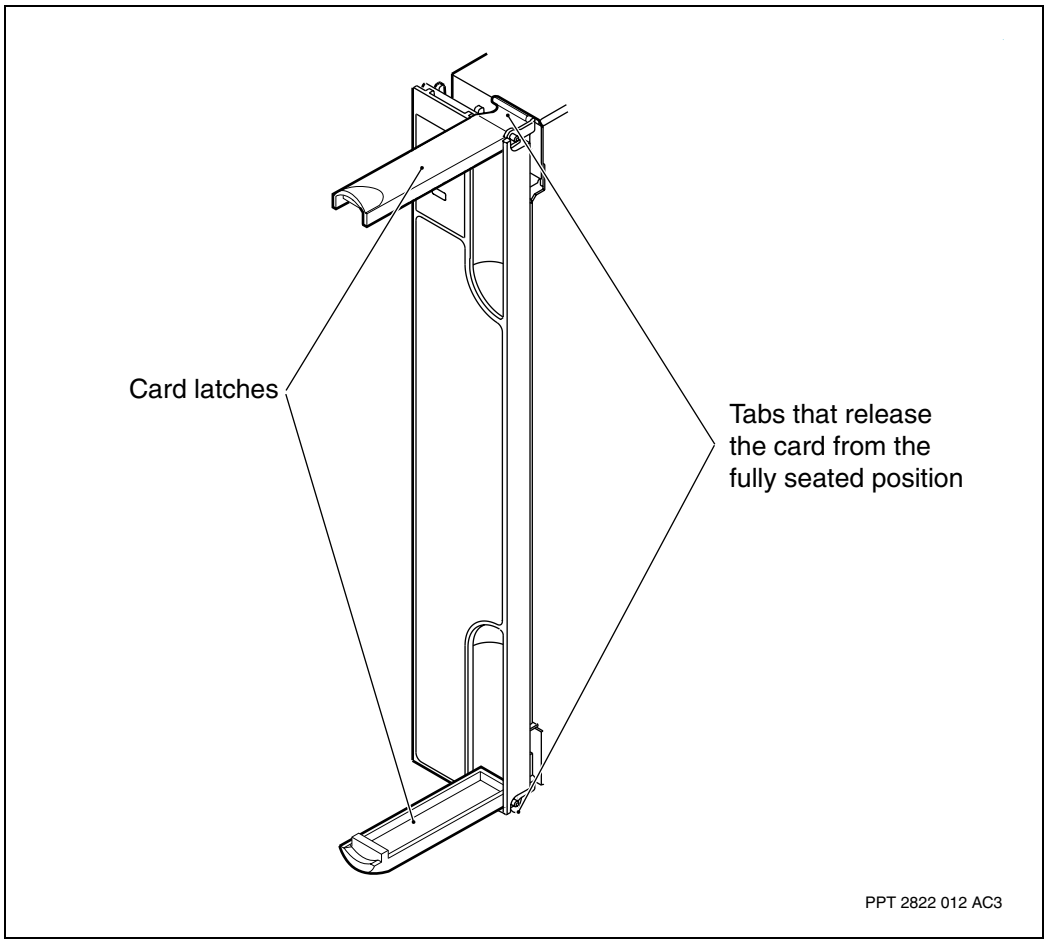
Procedure job aid

Open card latches on a CP, FP, or blank processor card



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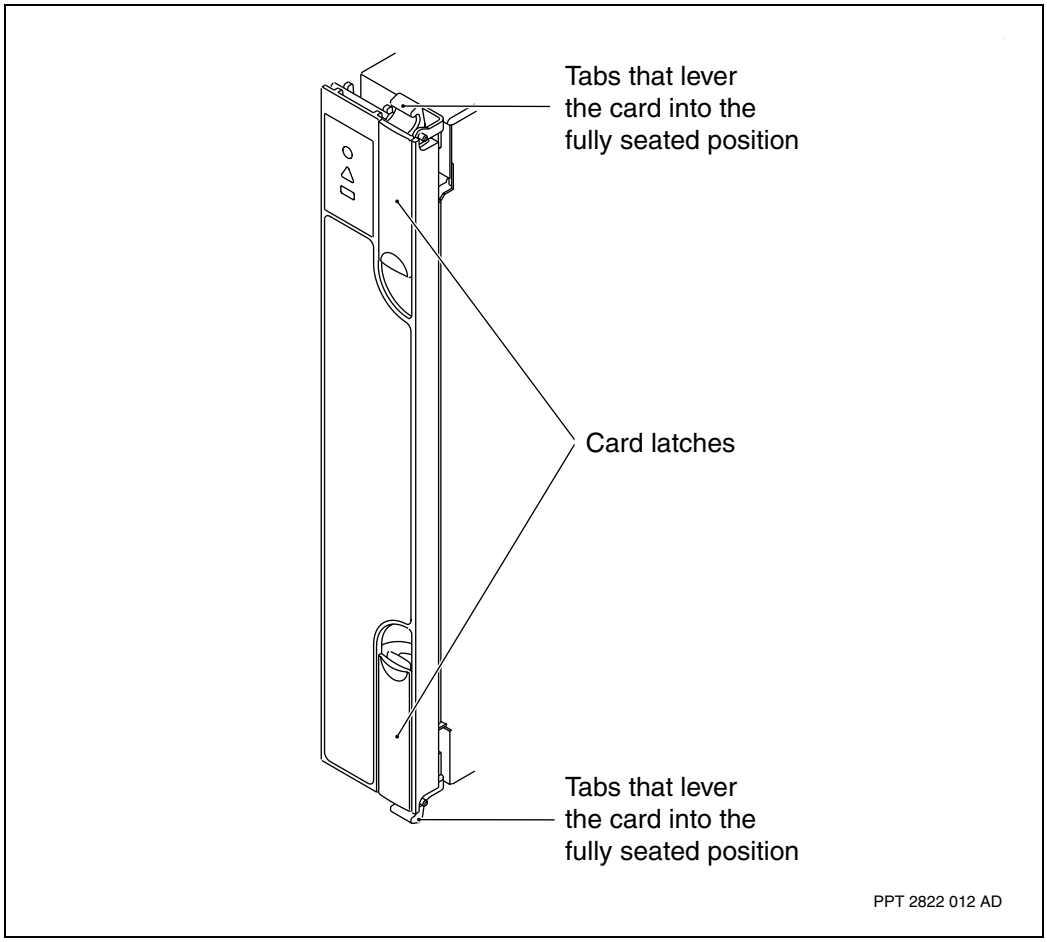
Closed card latches on a CP, FP, or blank processor card



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Installing an illuminated brandline cover

Install an illuminated brandline cover onto a top frame bracket at the front or rear of a NEBS 2000 frame to extend the shelf status indicators when the frame is enclosed with doors.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need these tools:
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - a driver to fasten and unfasten very large slotted captive screws as shown in the figure Types of screws used with frame enclosure hardware (page 74)
  - a driver to fasten the very large Pozidriv P0600060 screws as shown in the figure Types of screws used with frame enclosure hardware (page 74)
  - a flashlight to see the connections at the rear of the BIP
- The illuminated brandline cover is intended to be installed at the front of a NEBS 2000 frame, but you can choose to mount it instead at the rear. The LED cable accommodates installing an illuminated brandline cover at the front or the rear, but not both simultaneously.
- For initial installations of a Multiservice Switch 20000 in a NEBS 2000 frame, the LED V-cable NTHW66 is already installed and connected at J3.

Procedure steps

Step	Action
1	Use the figure Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame (page 472) to determine whether the NTHW66 is already installed and connected to J3. The cable is labelled. If it is installed, go to step 4. If it is not installed, go to step 2.
2	Route 1 of the 4-pin connectors of the cable NTHW66 from the left rear of the BIP above J3 to the front of the frame as shown in the side view in the figures Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame (page 472) and Path of the LED cable NTHW66 passing through the bottom of the top frame bracket (page 473). Route the cable so that: • it fits between the top of the BIP and the bottom of the top of the frame

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- at the front of the frame, it routes up through the bottom opening of the top frame bracket P0876758 as shown in the figure A top frame bracket P0876758, underside view (page 473)
- it temporarily hangs freely down the front of the frame

If a front-mounted illuminated brandline cover is not being installed at this time, ensure that the connector is protected from causing electrical shorting (for example, wrap electrical tape over it). Dress the cable aside until an illuminated brandline cover is installed.

3 Route the other 4-pin connector of NTHW66 across the rear of the BIP to the right where the LED of a rear-mounted illuminated brandline cover could be installed. Dress the cable as if an illuminated cover will be installed.

If a rear-mounted illuminated brandline cover is not being installed at this time, ensure that the connector is protected from causing electrical shorting.

4 Fasten a U-shaped bracket P0995495 at each end of the top frame bracket P0876758 as shown in the figures An extension mounting bracket P0995495 (page 474) and An illuminated brandline cover and mounting brackets P0995495 without door hardware (page 475). Use four Pozidriv 12-mm screws P0600060 each with a lock washer P0600895 on each bracket.

When upper door hardware is to be installed, combine fastening the door hardware to the same mounting bracket as shown in the figures:

- An illuminated brandline cover and mounting brackets P0995495 with a door catch (page 476)
- An illuminated brandline cover and mounting brackets P0995495 with a door hinge (page 477)

5 Connect an end of the cable assembly NTHW66 to the LED board at the rear of the illuminated brandline cover. The 4-pin connector fits only one way.

When connecting to a front-mounted brandline cover, route the cable up through the rectangular opening in the bottom of the top frame bracket, as shown in the figures A top frame bracket P0876758, underside view (page 473) and Path of the LED cable NTHW66 passing through the bottom of the top frame bracket (page 473).

6 Hold the illuminated brandline cover so that:

- the captive screw heads of the figure Types of screws used with frame enclosure hardware (page 74) face you
- the words read correctly
- the LED is at the right end

7 Align the captive screws with the holes in the brackets and fasten them as shown in the figure An illuminated brandline cover and mounting brackets P0995495 without door hardware (page 475).

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8 Press the 8-pin connector of the V-cable NTHW66 onto the connector that is labelled J3 at the rear of the BIP as shown in the inset of the figure Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame (page 472). The connector fits only one way.

When the power source to the BIP is on, the cable conducts power as soon as it is connected to J3.

9 Dress the cable near the J3 connection so that it remains unstressed.

10 When the BIP is powered up, confirm LED operation on the brandline cover by pressing the LED Test button on the front of the alarm module in the BIP.

If the LED on the illuminated brandline cover lit up as soon as the cable was connected, there is already at least one shelf alarm indicated by the alarm module.

If the LED does not light, press the cable connections together at both ends of the cable NTHW66 and press the button again.

If the LED still does not light, contact your Nortel Networks support representative.

--End--

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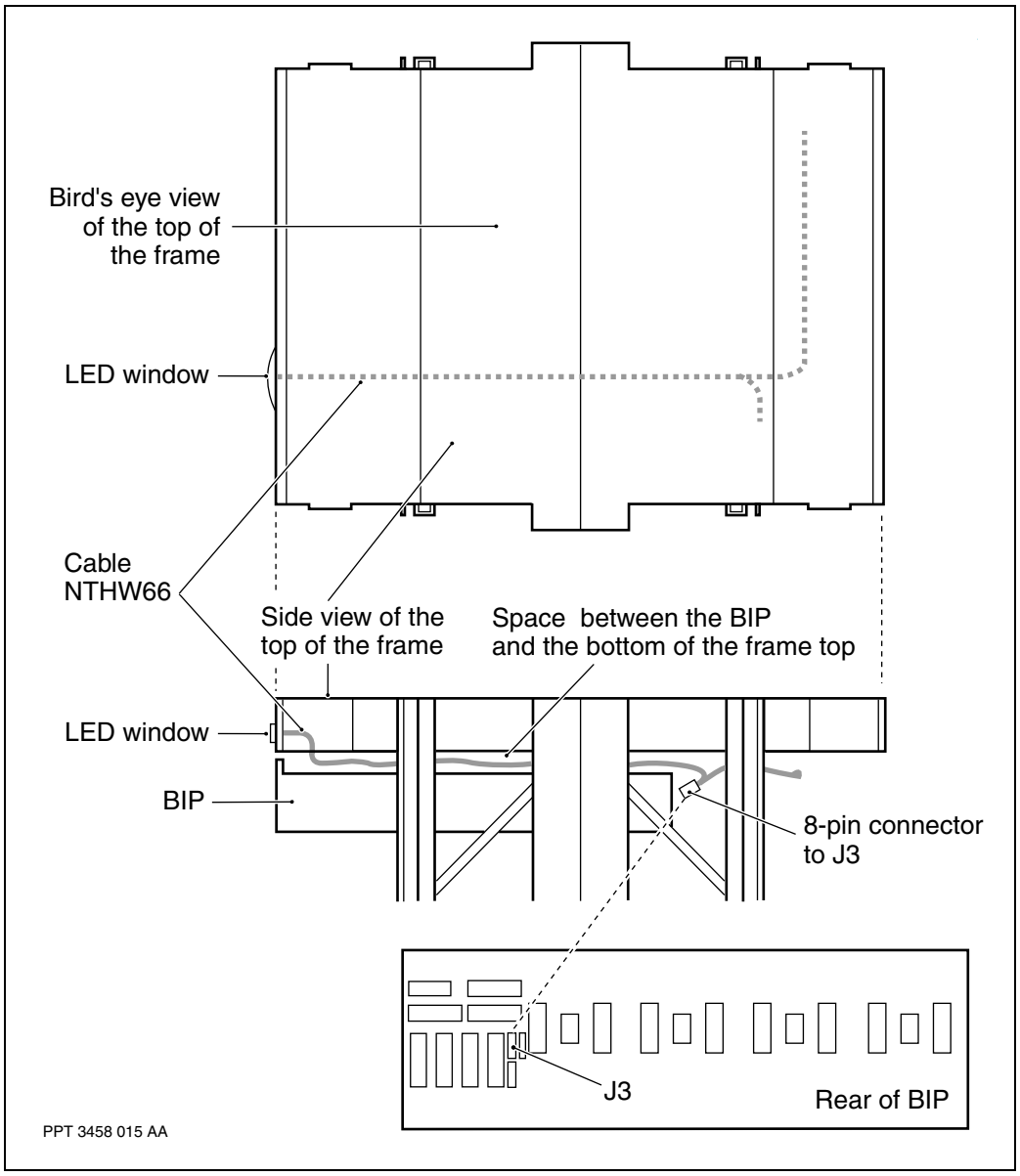
Procedure job aid

Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame



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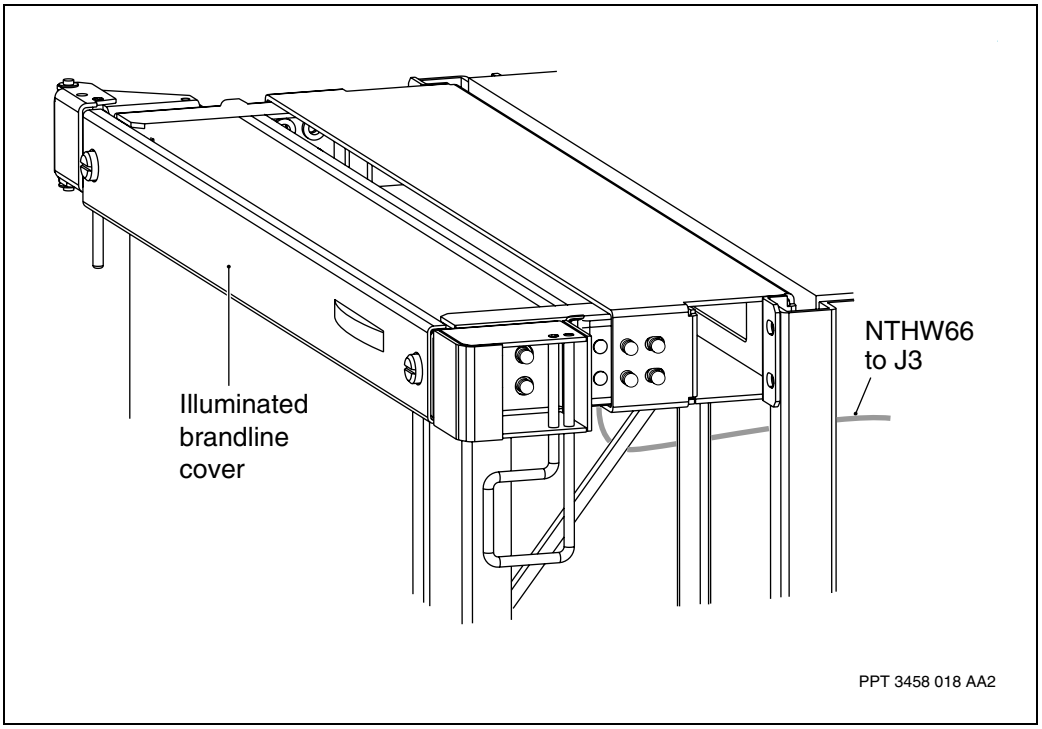
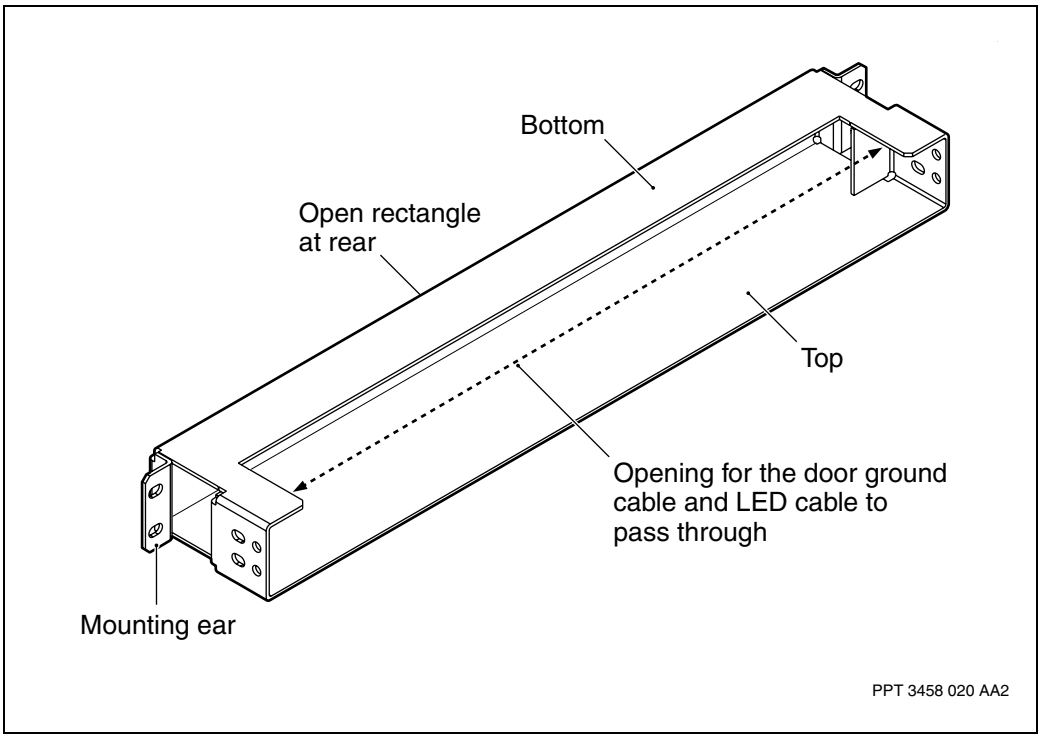
Path of the LED cable NTHW66 passing through the bottom of the top frame bracket



A top frame bracket P0876758, underside view



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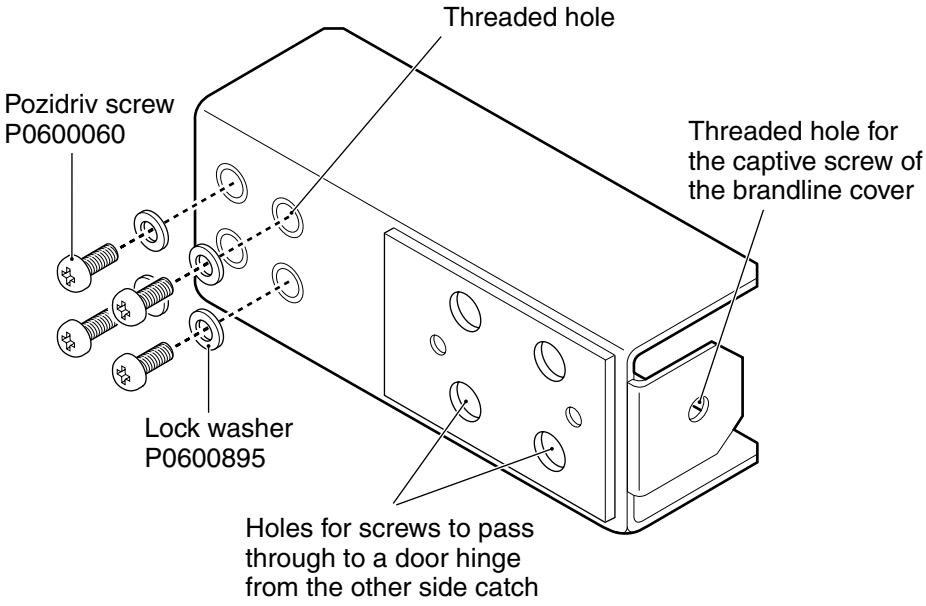
An extension mounting bracket P0995495



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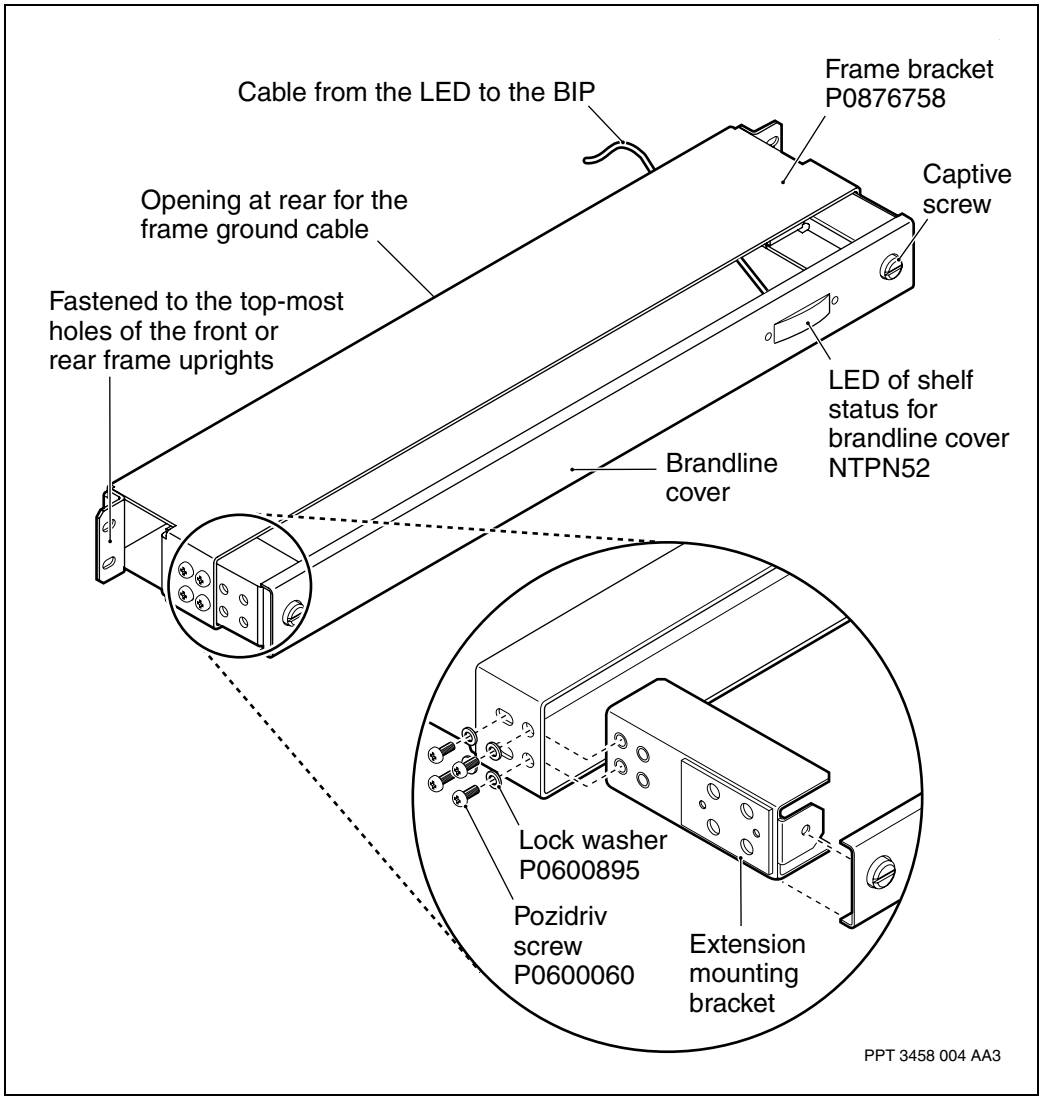
An illuminated brandline cover and mounting brackets P0995495 without door hardware



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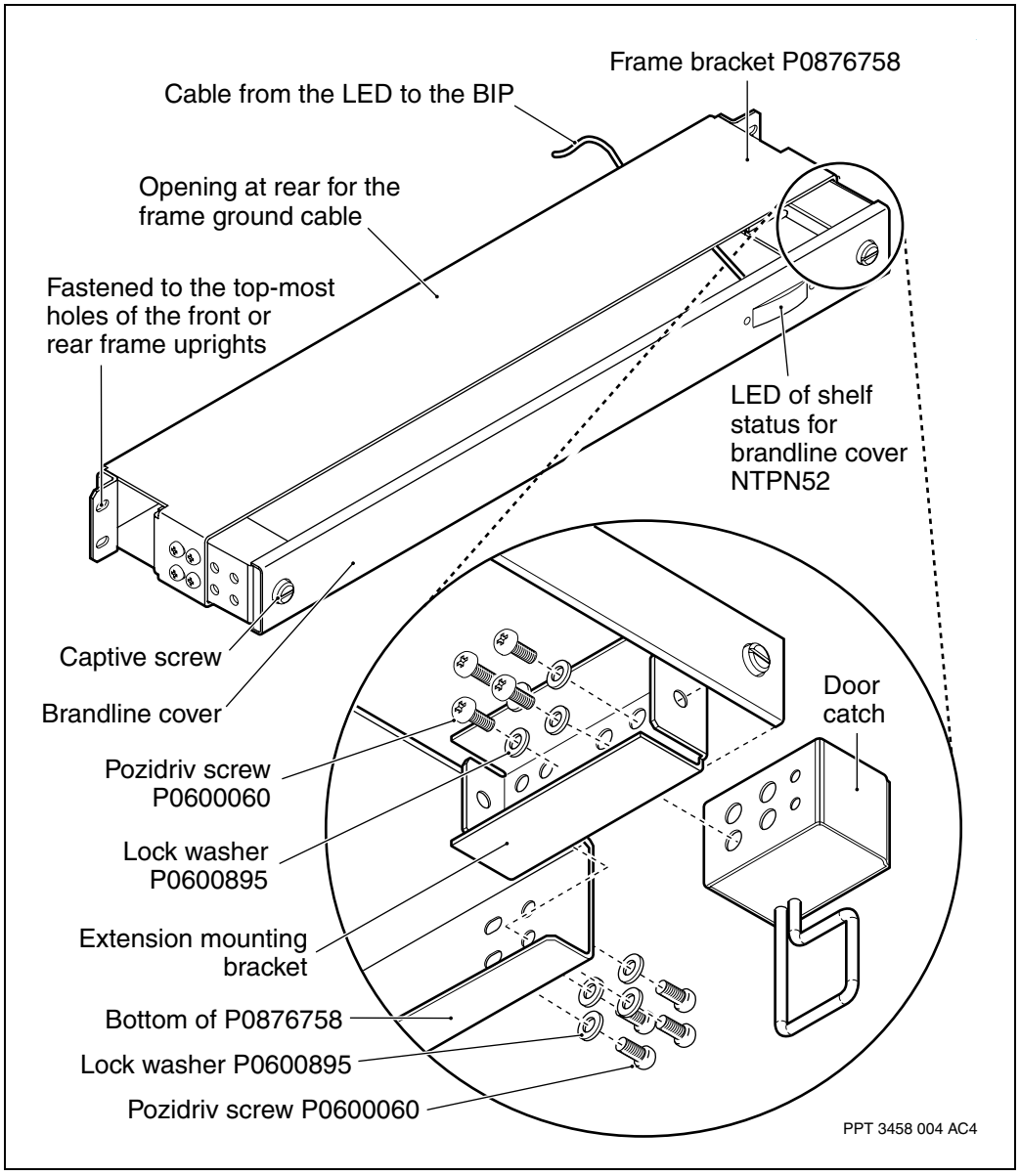
An illuminated brandline cover and mounting brackets P0995495 with a door catch



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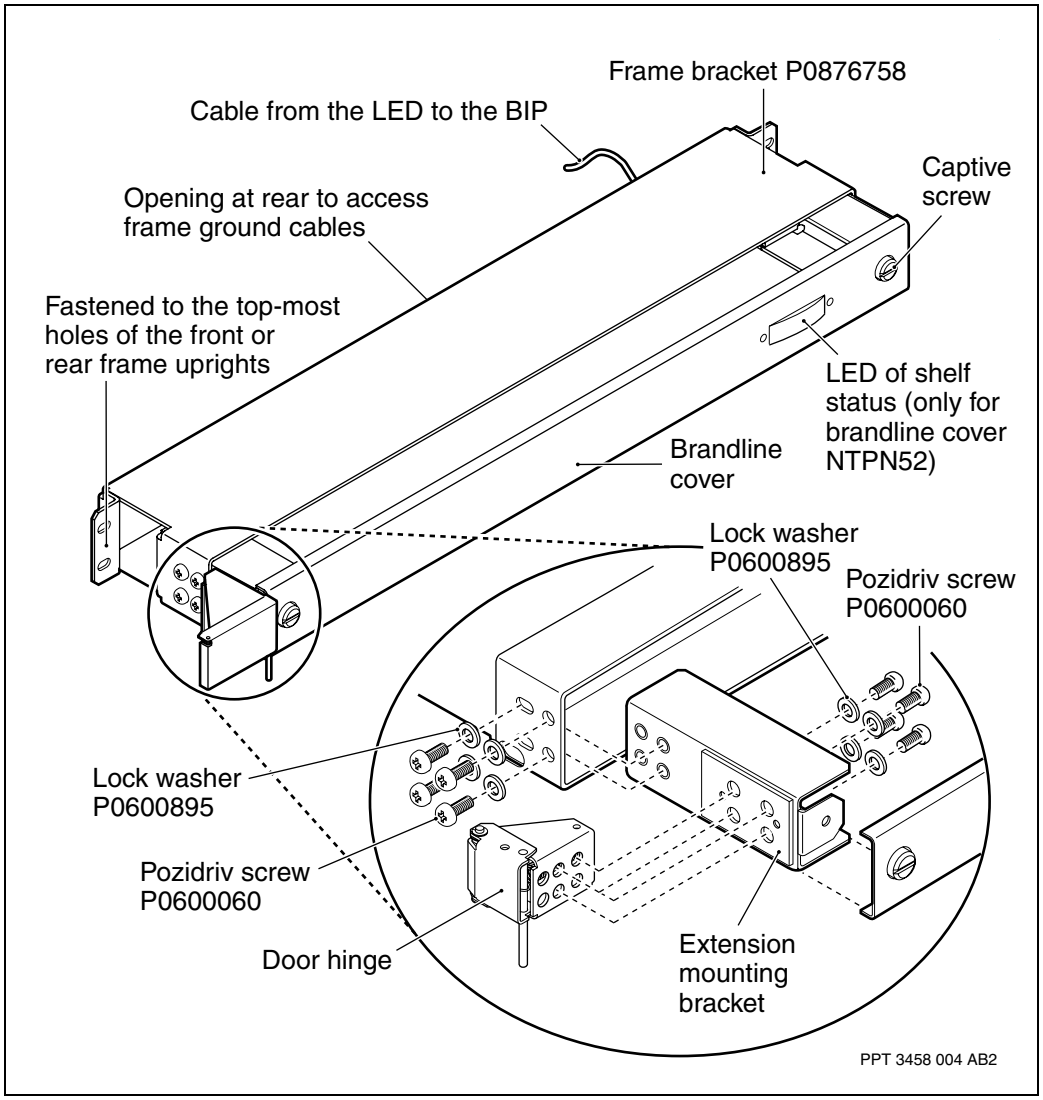
An illuminated brandline cover and mounting brackets P0995495 with a door hinge



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Installing an SFP optical module

Install a small-form pluggable (SFP) optical transceiver module into an optical FP socket (port) to use a specific type of interface connector.

Prerequisites

CAUTION
Risk of equipment damage by ESD
Always ground yourself by an approved anti-ESD method before and while handling any tools or hardware on or near the Multiservice Switch. You can plug the provided wrist strap (part number A0378999) into an anti-ESD jack on the lower left mounting ear of either cooling unit (row of fans) on a switch.

- SFP optical modules are unusually susceptible to damage by electrostatic discharge (ESD).
- You must be familiar with Safety considerations and best practices (page 19).
- With an NTHW46 FP, you need an SFP optical module with one of these PECs:
  - NTTP04CF for SM fiber cables for intermediate reach (OC-12 IR-1/S-4.1) up to 15 km (9.3 mi.) and with a nominal wavelength of 1310 nm
  - NTTP05EF for SM fiber cables for long reach (OC-12 LR-1/L-4.1) up to 15 km (9.3 mi.) and with a nominal wavelength of 1310 nm
- With an NTHW49 FP, you need an SFP optical module with one of these PECs:
  - NTTP01AB for a 1000Base-SX multimode (MM) fiber cables for short reach (SR) up to 0.55 km (0.31 miles) using 50/125 fiber or up to 0.275 km (0.17 mi.) using 62.5/125 fiber and with a nominal wavelength of 850 nm
  - NTTP01CB for a 1000Base-LX single-mode (SM) fiber cables for intermediate reach (IR) up to 10 km (6.25 mi.) and with a nominal wavelength of 1310 nm
- Do not touch the circuitry inside the large open end of an SFP optical module or you may cause the unit to malfunction.
- The FP port must be locked in software. For information on locking a port, see NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- The user-defined software configuration of each port must match the type of module it will house. When all FP ports are already configured in software to use SFP optical modules and the added FP is powered, software alarm 7011 5480 indicates when an installed SFP optical module

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is not operating. Verifying the operation of a module is provided by a procedure in NN10600-520 *Nortel Networks Multiservice Switch 7400/15000/20000 Fault and Performance Management: Troubleshooting* to display the status of an SFP optical module.

- For information on configuring the optical module, see NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- For information on verifying the operation of each optical module by displaying its installed status, see NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- For information about the hardware of an optical module, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Ensure that the bale latch is closed, that is, engaged against the end of the module. Refer to the figure A typical SFP optical module (page 480).
2	Hold the module so that: • the end with the latch faces you
3	At about a 45-degree angle to the faceplate, gently slide the module into the socket on the faceplate until you feel or hear a click confirm that the module is engaged. The edge of the end of the module with the pair of connector openings should be almost flush with the surface of the faceplate.

--End--

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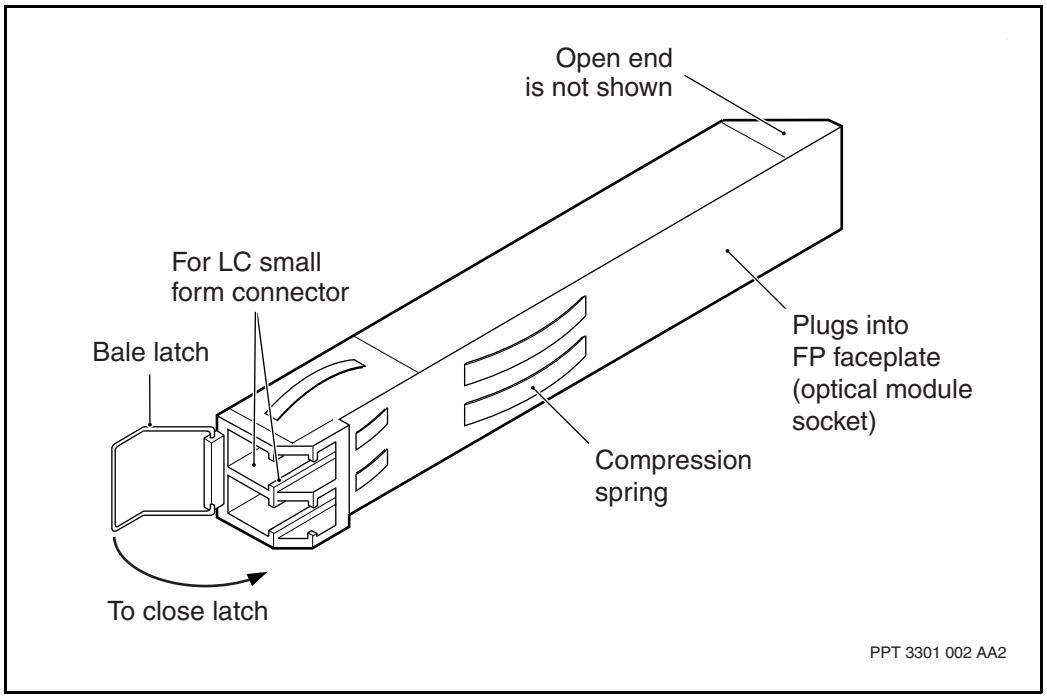
Procedure job aid

A typical SFP optical module



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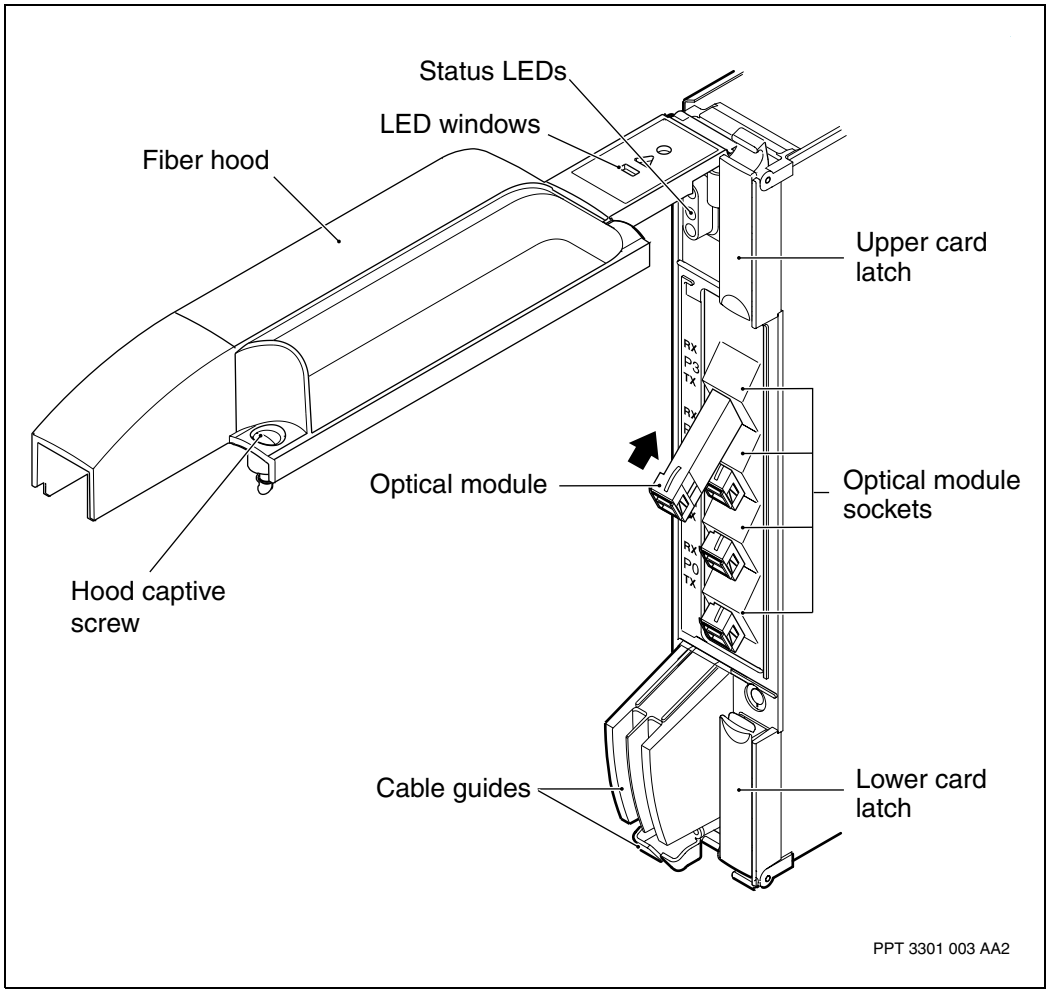
Orientation of an installed SFP module in a NTHW46 or a NTHW49



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Installing an upper cooling unit

Install an upper (front) cooling unit to enable temperature control for the hardware installed in the upper position of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need an NTHR52AA or NTHR52AB version of an upper (front) cooling unit. Since the fans of the unit are on the front face of the hardware, that is, on the same side that the processor cards plug into, the upper cooling unit is also the front cooling unit.
- You need a driver for the thread-forming 10-mm (3/8-in.) hex-head screws that fasten each cooling unit to the frame or rack.
- You need a helper to hold the unit until it is fastened because it weighs (9.1 kg or 20 lbs) and tends to slide out of position when it is unfastened.
- When installing a cooling unit as part of a replacement, high temperature alarms will not clear until the replaced unit has had time to lower the temperature. For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Open the container identifying the cooling unit as NTHR52 and remove the unit.
2	While referring to the figures An upper cooling unit NTHR52AA (page 484) and An upper cooling unit NTHR52AB (page 485), hold the ends of the cooling unit so that • the open side is at the top • a hand holds the narrow rear end • a hand holds the fan end
3	Facing the rear of the switch, insert the narrow end of the cooling unit between the uprights of the NEBS 2000 frame and above the lower (rear) cooling unit.
4	Rest the narrow end of the cooling unit on the top of the lower cooling unit.
5	Slowly slide the cooling unit inwards until the mounting ears at the fan end touch the frame uprights.

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6 Align the mounting-ear holes with the screw holes on the frame uprights. The cooling unit should be in position as shown in the figure Location of an upper (front) cooling unit (page 486).

7 While holding the cooling unit in position, loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through an upper mounting-ear hole.

8 Loosely fasten another screw through the other upper mounting-ear hole, then the bottom 2. While turning a screw, ensure that it is perpendicular to the hole to prevent cross-threading.

9 Tighten all screws to snug plus a 1/4 turn.

10 If any cable for the F1, F2, or F3 connectors is unplugged, plug it in. A connector fits only one way. Ensure the tab on the side engages.

11 Using the labels from the removal, plug in the A and B power cable assembly connectors into the appropriate connector on the unit. Each connector fits only one way. Ensure that the tab on each side of a connector fully engages.

12 Restore power to the unit at the BIP by removing the tape from the cooling unit breakers (in the middle) in each BIM and toggling the breakers back on (I is pressed in).

13 Check the LEDs on the cooling unit to verify that each fan is operating. Normal operation is indicated by a lit green LED. If any LEDs are red, disconnect and re-connect the F1, F2, or F3 cable that is nearest the fan unit that is nearest the LED.

At the front of the NEBS 2000 frame, the LEDs of both cooling units are visible together. Ensure that you check the F1, F2, or F3 connector that is associated with the lit red LED.

14 Pack the removed cooling unit in the container from the replacement unit. Ensure that you change the PEC on the container to match the PEC on the unit.

--End--

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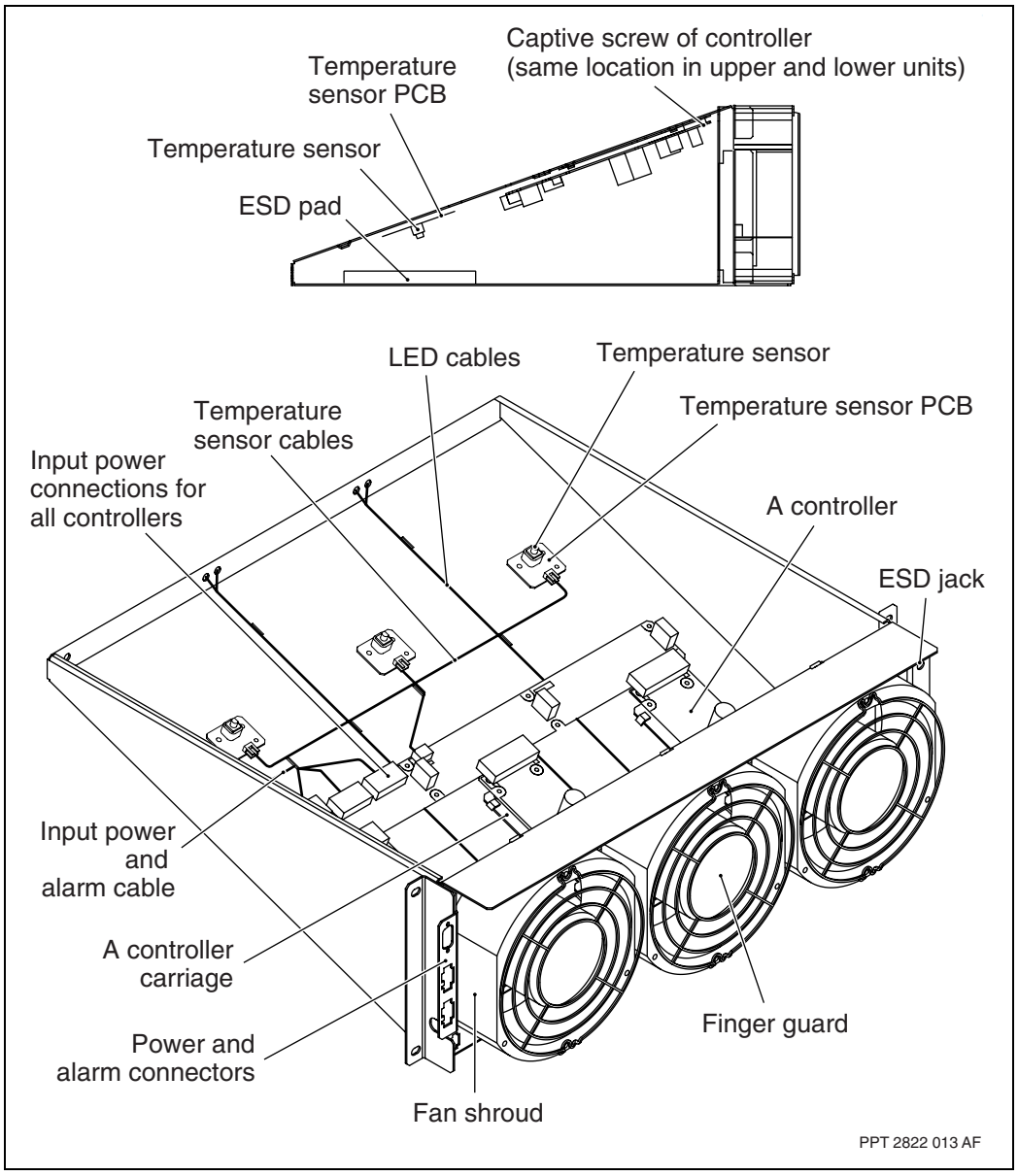
Procedure job aid

An upper cooling unit NTHR52AA



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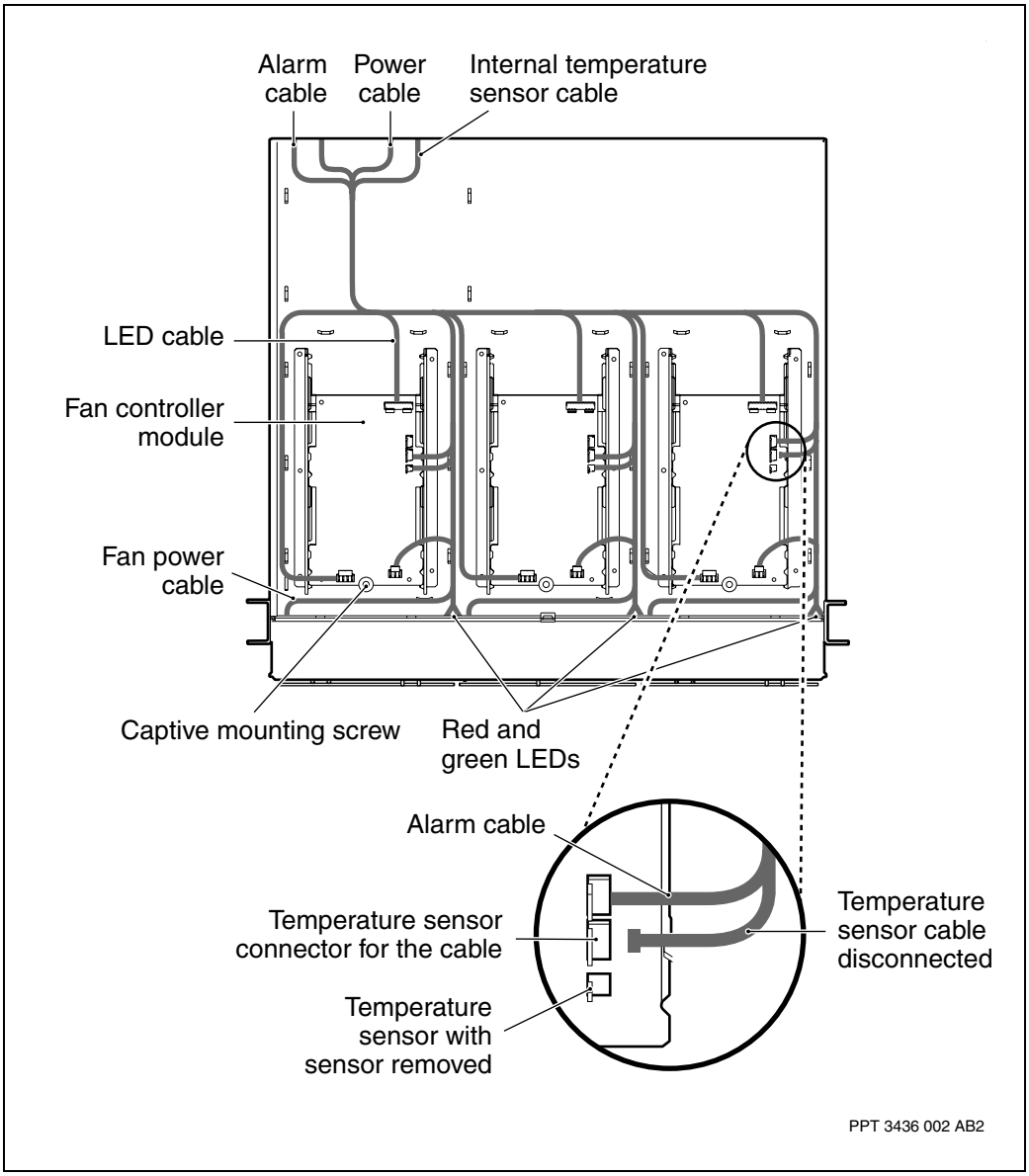
An upper cooling unit NTHR52AB



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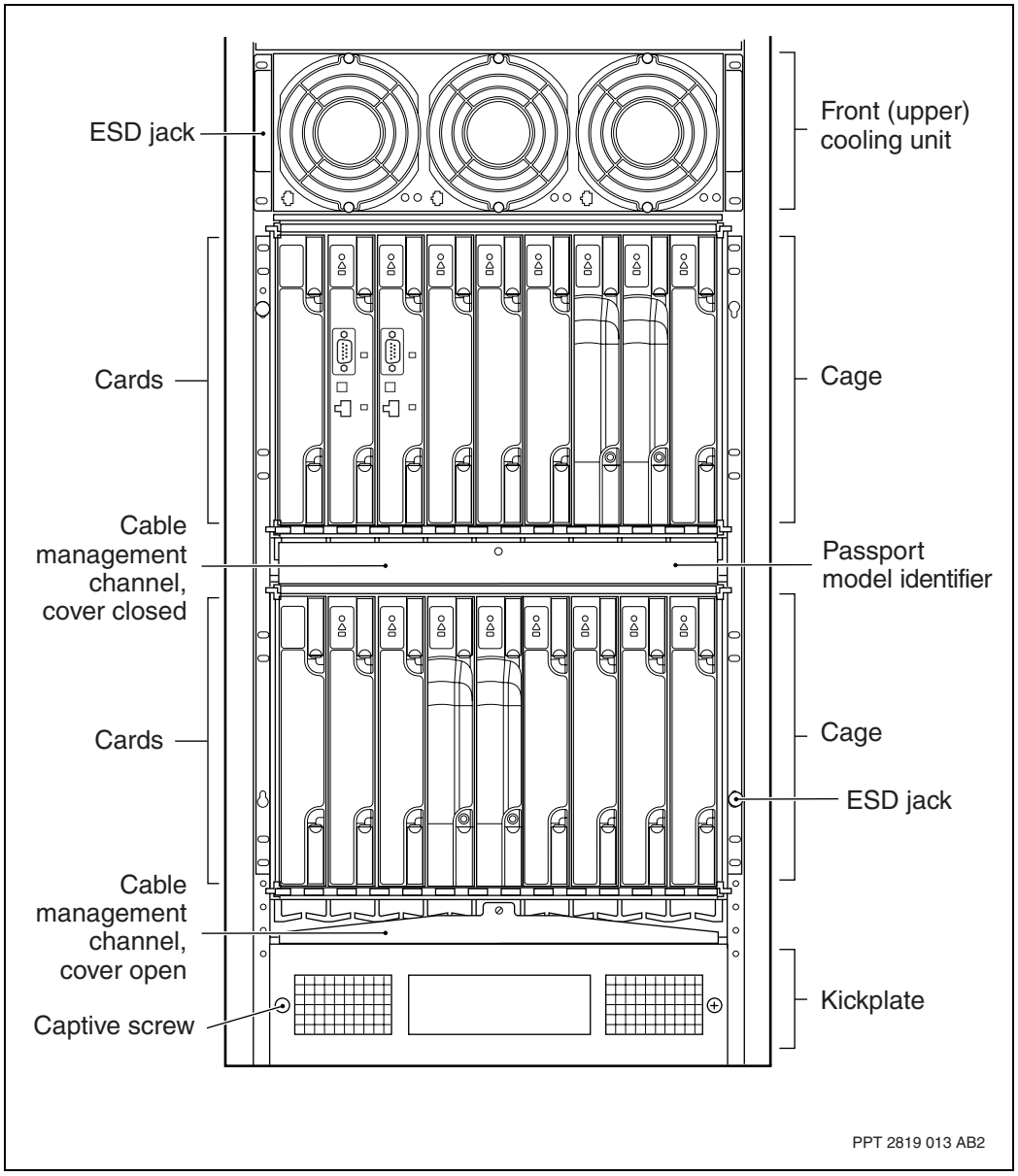
Location of an upper (front) cooling unit



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Installing cable management brackets

Install cable management brackets onto the adapter brackets of a 23-inch wide rack to enable cable management.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The cable management brackets to mount a shelf onto a 23-inch wide rack are included in hardware packages NTQS04 with a Multiservice Switch 15000, and in NTQH04 with a Multiservice Switch 20000. To install cable management brackets, you need these parts:
  - 2 metal cable management brackets (part number P0879577)
  - 28 plastic brackets (part number P0937935)

Procedure steps

Step	Action
1	While facing the rear of the rack, locate the left and right short adapter brackets that have the strain-relief bar and the temperature sensors fastened to them. These are the only short brackets that will not have cable management brackets fastened to them.
2	Loosely fasten a cable management bracket to each remaining short adapter bracket on the rear uprights. Use the thread-forming 10-mm (3/8-in.) hex-head screws from pack P0601478 through each mounting-ear hole. Notice the orientation of the cable management brackets in the figure Mounted cable management brackets onto rear adapter brackets (page 488). The top 8 cable management brackets (4 per side) are metal, while the bottom 2 or 4 (1 or 2 per side) are plastic.
3	Tighten all rear cable management bracket screws to snug plus a 1/4 turn.
4	While facing the front of the rack, loosely fasten a plastic cable management bracket in the positions shown by the figure Mounted cable management brackets onto rear adapter brackets (page 488).
5	Tighten all front cable management bracket screws to snug plus a 1/4 turn.

--End--

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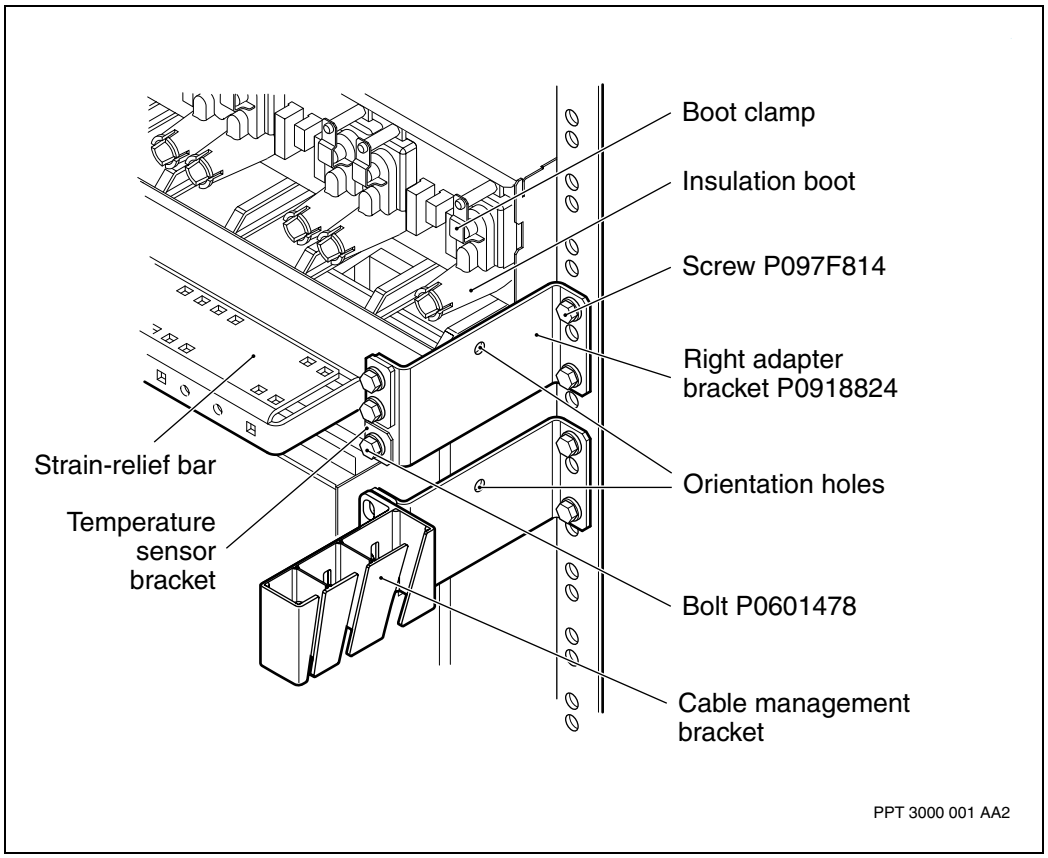
Procedure job aid

Mounted cable management brackets onto rear adapter brackets



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Installing EMI filters on the alarm/BITS module

Install EMI filters on the timing connectors of a Nortel Networks Multiservice Switch 15000 alarm/BITS module with the PEC NTHR12 or NTHR13 to shield the emission of electromagnetic interference (EMI).

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need 2 inline EMI filters per alarm/BITS module each with part number A066557. Some alarm/BITS modules have factory-installed inline EMI filters.
- The J3 and J4 timing connectors on newer versions of the Multiservice Switch 15000 alarm/BITS modules NTHR12 and NTHR13 have factory-installed inline EMI filters. If the alarm/BITS module requires these filters, do the following procedure. (This does not apply to any Multiservice Switch 20000 alarm/BITS modules.) Contact your Nortel Networks service representative to obtain the required parts.

Procedure steps

Step	Action
1	Examine the figure An EMI filter on an alarm/BITS connector for a Multiservice Switch 15000 (page 490) to see how the EMI filters are to be fitted to the alarm/BITS module connector.
2	Inject Loctite RD112D06 into the threaded standoffs on the J3 and J4 connectors.
3	Install an EMI filter onto each of the J3 and J4 connectors.
4	Install 2 Jack screws P0991106 to secure each EMI filter to the J3 and J4 connectors. When you are connecting timing cables to J3 and J4, the screws of the timing cable D-sub connectors are fastened into the threaded tops of the Jack screws.

--End--

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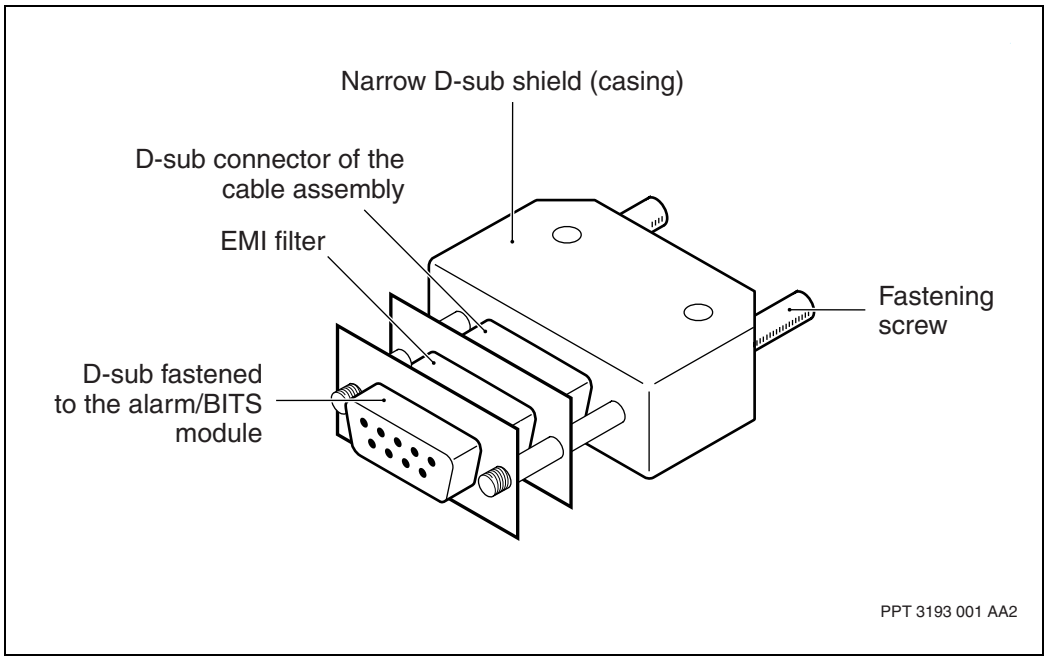
Procedure job aid

An EMI filter on an alarm/BITS connector for a Multiservice Switch 15000



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Installing extended cable management brackets

Install extended cable management brackets on a NEBS 2000 frame to accommodate high-density cabling for electrical FPs. The extended cable management brackets can only be used with coax cables.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need four extended cable management brackets per side of a frame with these part numbers:
  - NTHRU0368 for the left side facing the front of the frame
  - NTHRU0369 for the right side facing the front of the frame
- Each kit contains all of the hardware to mount one bracket. You will need up to four for each side of the frame, depending on how you are handling the cable management. For example, if FP cables are routed overhead of the frame from the upper cage of the lower shelf, you need three brackets.
- The NEBS 2000 frame arrives with standard cable management brackets already attached to the uprights at the front and rear sides of the frame. When a cage is provisioned with a specific type and quantity of FPs, the standard cable management brackets must be replaced by the optional extended brackets in kits. Refer to the criteria for using extended cable management brackets in assessing cable management in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- To accommodate fiber optical FP cables, use the procedure Installing high-density cable management brackets (page 509).

Procedure steps

Step	Action
1	Open the kit NTHRU0369 and remove all packaging.
2	Cut the tie-wraps off the cables on the pre-installed cable management brackets on the front right upright of the frame. Be careful not to cut any of the cables.
3	Unfasten the 6-mm (15/64-in.) hex-head screws of each cable bracket up the front and put the brackets aside. Also put the screws and washers aside for re-use. Leave the cables connected and hanging loosely.
4	See the figures Cable management bracket kits on a frame (page 493) and Cable management extended brackets on a frame (page 494). Observe the orientation and spacing of the four brackets on the side.
5	Position the cable bracket the way it is in the figure so that

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- the flat surface is against the frame upright and the arms extend outwards from the frame
- the 2 holes in the bracket align with the holes along the side of the frame upright
- the lower arm of the bracket is nearest the rear of the frame and the upper arm is nearest the front of the frame

6 Align its bottom mounting hole with the 6th hole, counted from the bottom side of the frame upright.

7 While holding the bracket in position, fasten a thread-forming 6-mm (15/64-in.) hex-head screw and a washer through each hole. Tighten the screws to snug plus a 1/4 turn.

8 Counting three holes along the side of the frame upright upwards from the top edge of the cable bracket, align the bottom hole of the next cable bracket.

9 While holding the bracket in position, fasten a screw and washer through each hole. Always ensure that a screw is fully seated perpendicularly to the hole before tuning it.

10 Counting 5 holes along the side of the frame upright upwards from the top edge of the previous cable bracket, align the bottom hole of the next cable bracket.

11 While holding the bracket in position, fasten a screw and washer through each hole.

12 Counting 3 holes along the side of the frame upright upwards from the top edge of the previous cable bracket, align the bottom hole of the next cable bracket.

13 While holding the bracket in position, fasten a screw and washer through each hole.

14 Repeat the steps for the left side of the frame with kit NTRU0368, if required.

--End--

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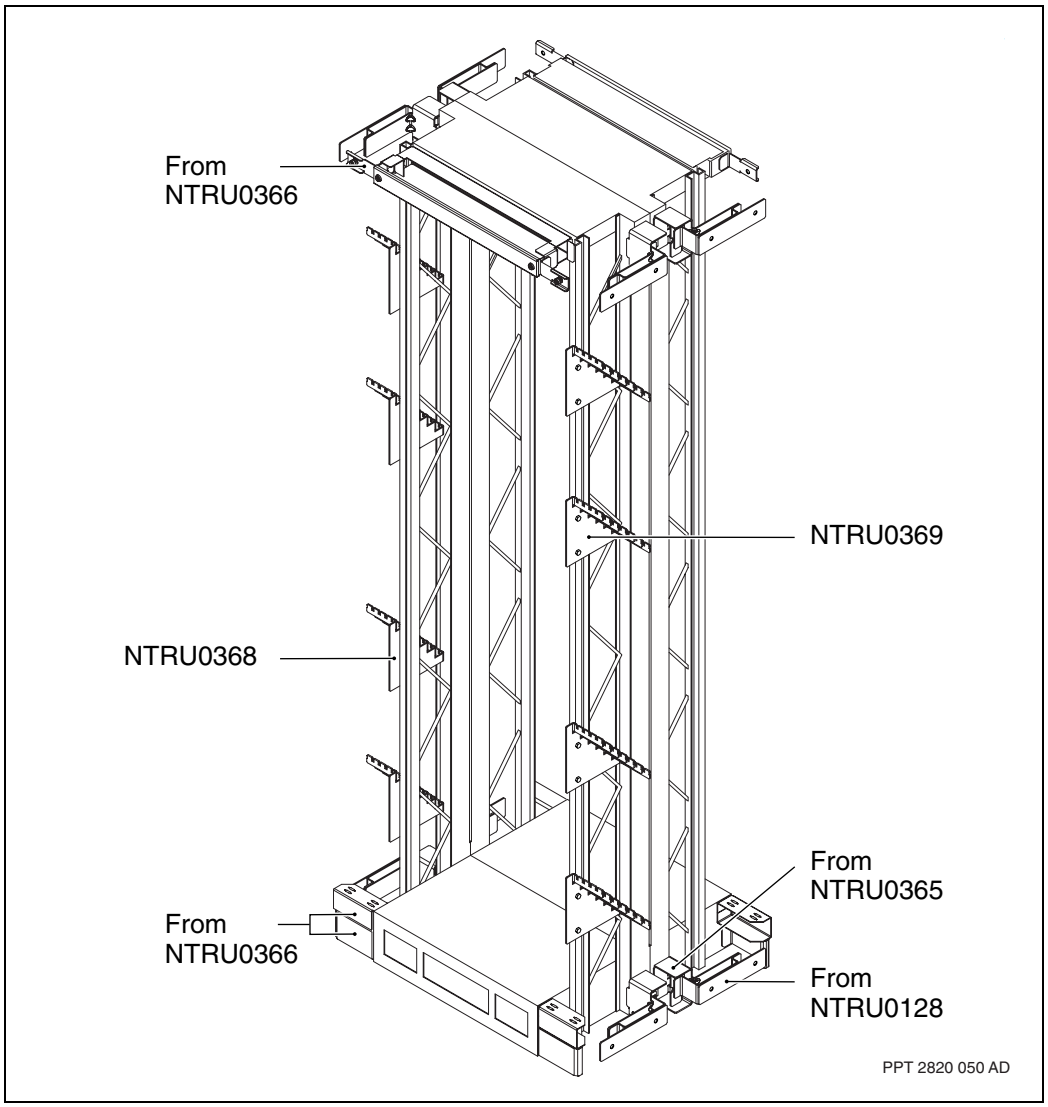
Procedure job aid

Cable management bracket kits on a frame



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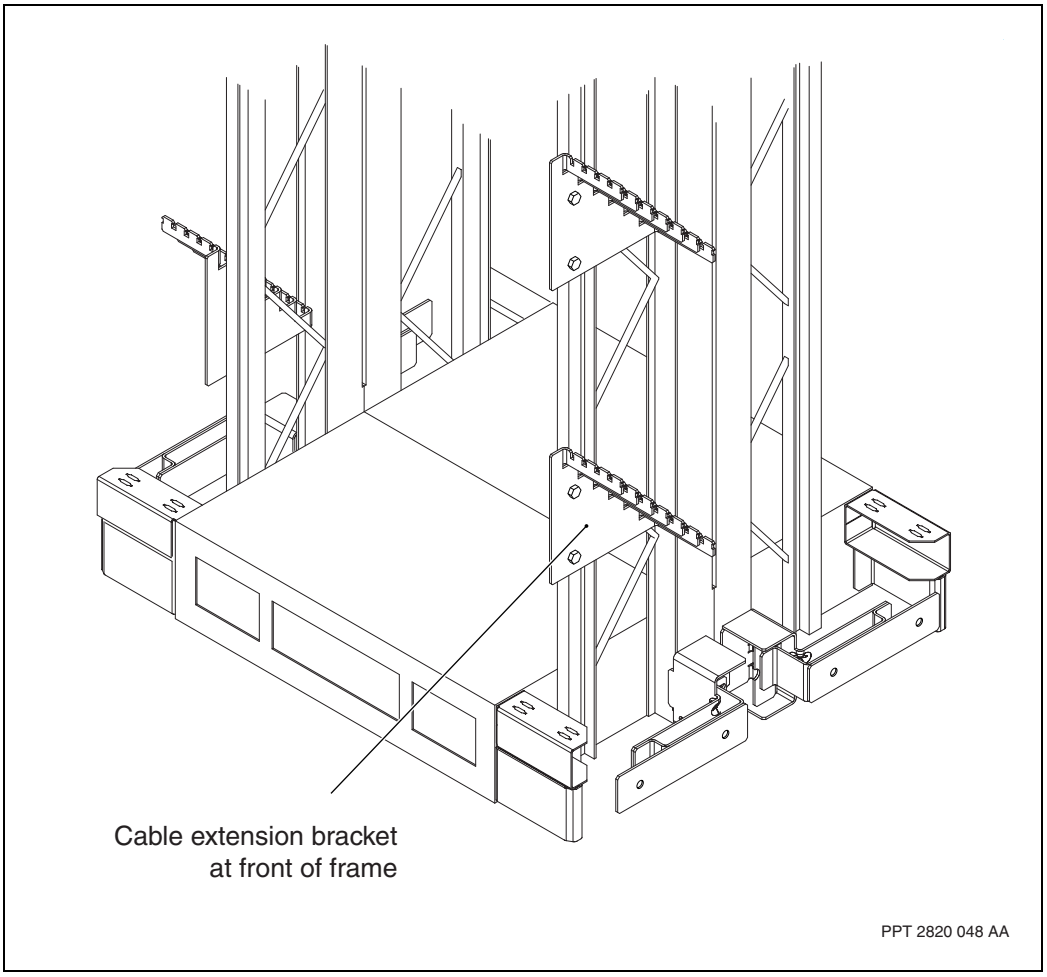
Cable management extended brackets on a frame



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Installing fiber cables through the fiber management unit

Install fiber cables through the fiber management unit to manage cable slack in the connection path between FPs and their next connection.

Prerequisites

CAUTION
Risk of damage to fiber cables
Connecting the ends of a fiber cable to its terminations and then looping the middle portion of the cable into the fiber management unit causes twisting of the fiber cable. Twisting a fiber cable can break the fiber inside. Avoid this by using the unidirectional method of installation in the following procedure.

- You must be familiar with Safety considerations and best practices (page 19).
- The fiber management unit (NTHW50) must already be installed into a NEBS 2000 frame or equivalent.
- FPs must already be installed (not necessarily powered up).
- Ensure easier installing, load balancing, and planning for maintenance by following this logical method of cabling the fiber management unit:
  - install each fiber cable one at a time completely from end to end
  - route all cables from each FP faceplate one after another from bottom to top
  - route the fiber cables from the optical FP closest to the fiber unit, then continuing with each further optical FP
  - start at the bottom drawer of the fiber unit and continue upwards
  - use the trays front to rear on the same side, then the other side, and always from the bottom to the top tray
  - route each cable into a tray at the rear corner and exit the same corner (the trays are symmetrical to accommodate left and right access at the rear)
  - record the same connection information at the FP end and the other end onto the label on the tray
  - route all fiber cables into one side of the fiber management unit and out the same side to the connections at the other end
- Since the NTHW50 accommodates 20 fiber cables per drawer, you may wish to route the fiber cables of each cage into a separate drawer or set of drawers. Use the bottom drawer or drawers for the bottom cage. There is space on the drawer faceplate to add your own labels to indicate, for example, the type of FP and its location information.

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- When a cage has empty slots covered by blank processor cards that may eventually contain optical FPs, you may wish to leave a series of vacant trays in the middle of the overall sequence of routing.
- A ladder-rackable fiber cable will not likely ravel onto a tray because either the cable is too stiff (cannot meet the required bend radius) or its diameter is too thick. Supported fiber cable specifications for the unit are identified per FP type in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Measure the exact path that the fiber cable is intended to be routed from the fiber management unit to the next hop connection towards the far end. Measure from the side of the fiber unit where the fiber cable will exit.
2	Using a piece of electrical tape, temporarily mark that distance on the fiber cable from the unconnected end. Ensure that the tape can be easily removed later, but will not move during minor handling.
3	At the fiber unit, open the drawer by sliding the latches towards each other, holding them inwards, and pulling slowly towards yourself. Stop pulling when the rear of the drawer is at the front of the fiber unit. As the drawer opens, half-spools at the sides of the drawer will move with it towards the front. If a half-spool does not reach the front of the drawer, move it manually. The rear half-spools are fixed. If the drawer already contains fiber cables, ensure that no cable is snagged or pinched as the drawer opens.
4	Route the cable from the FP faceplate towards the fiber management unit. Use tie-wraps to very loosely fasten the cable at bends in the path. Leave the tie-wraps open enough to accommodate more fiber cable connectors.
5	At the side of the fiber unit that is nearest the FP, route the cable through the opening and around the half-spools as shown in the figure A dual-drawer fiber management unit NTHW50 (page 498).
6	Pull up the slack on the cable outside the fiber unit.
7	Inside the drawer, locate the tray to contain the fiber cable. To access a tray in a stack, flip up the ones above it from the center of the drawer towards the nearest side.
8	At the tray, route the cable through the slot in the rear corner, then under the tabs and around the center, and finally out the same corner of the tray. For a view of a fiber on a tray, refer to the figure A dual-drawer fiber management unit NTHW50 (page 498). Notice the position of the crossover point of the cable. Ensure that the electrical tape on the cable is not ravelled onto the tray.

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9 From the tray corner, route the cable along the same path as it entered the fiber unit. Adjust the slack on the tray and outside the fiber unit so that the electrical tape resides at the opening outside the unit.

10 Lower the tray or trays. Ensure that no cable is pinched between trays.

11 On the tray label, record the connection information of the FP (node identifier, FP slot number, port number, signal direction). Decide whether this is To or From information. Be consistent with all cables.

12 Slowly close the drawer to test the slackness of the cable cluster.

13 Route the cable to the other end connection. Use tie-wraps to very loosely fasten the cable at bends in the path. Leave the tie-wrap open enough to easily accommodate more fiber cable connectors.

If the entire cable path and the tray cannot accommodate all of the cable slack, you must use a shorter cable.

14 Connect the cable. Record the connection information.

15 On the tray label, record the connection information of the other end (node identifier, type of equipment, port number, signal direction).

16 Carefully remove the temporary electrical tape from the cable. Avoid cutting or nicking the cable sheath. Avoid crimping or pinching the cable during its removal.

17 Repeat for each fiber cable that must pass through the fiber unit drawer.

- Bundle the fiber cable slack outside the drawer using the provided curlie ties. There are 4 curlie ties per drawer.
- Slowly close the drawer to test the slackness of the cable cluster. Closure is indicated by a click sound and the faceplate is flush with the other drawer's faceplate. Adjust the slackness of any cable showing tension.

--End--

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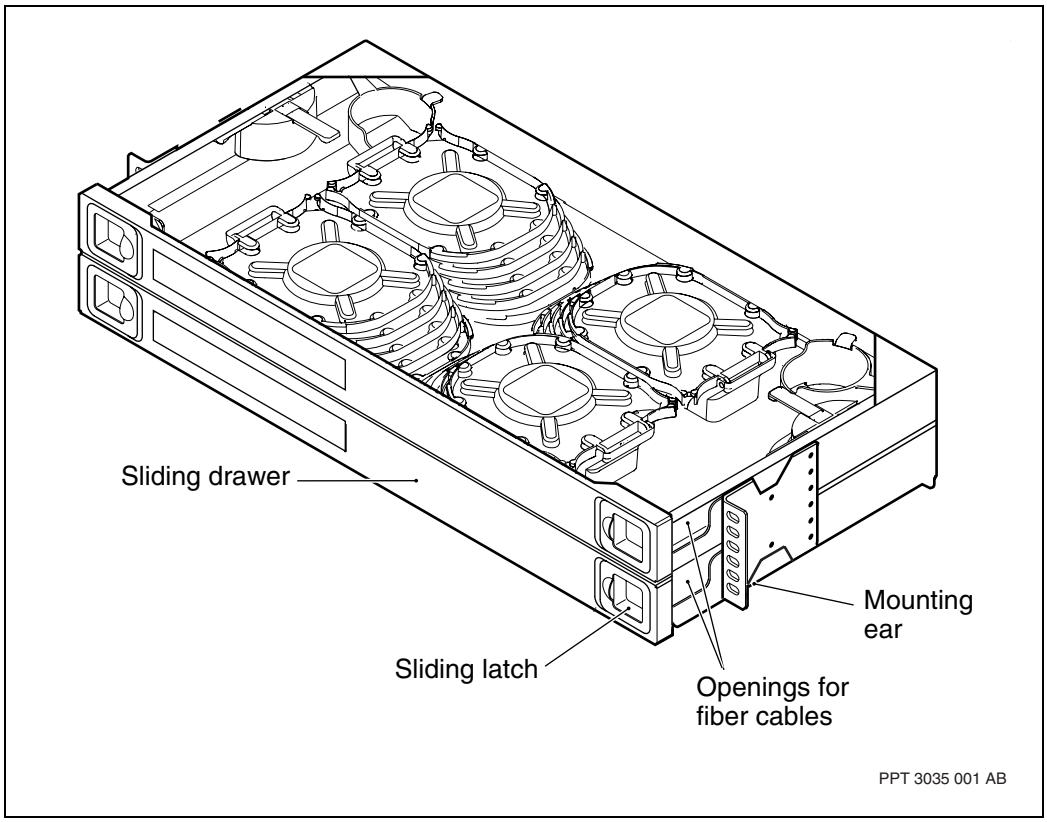
Procedure job aid

A dual-drawer fiber management unit NTHW50



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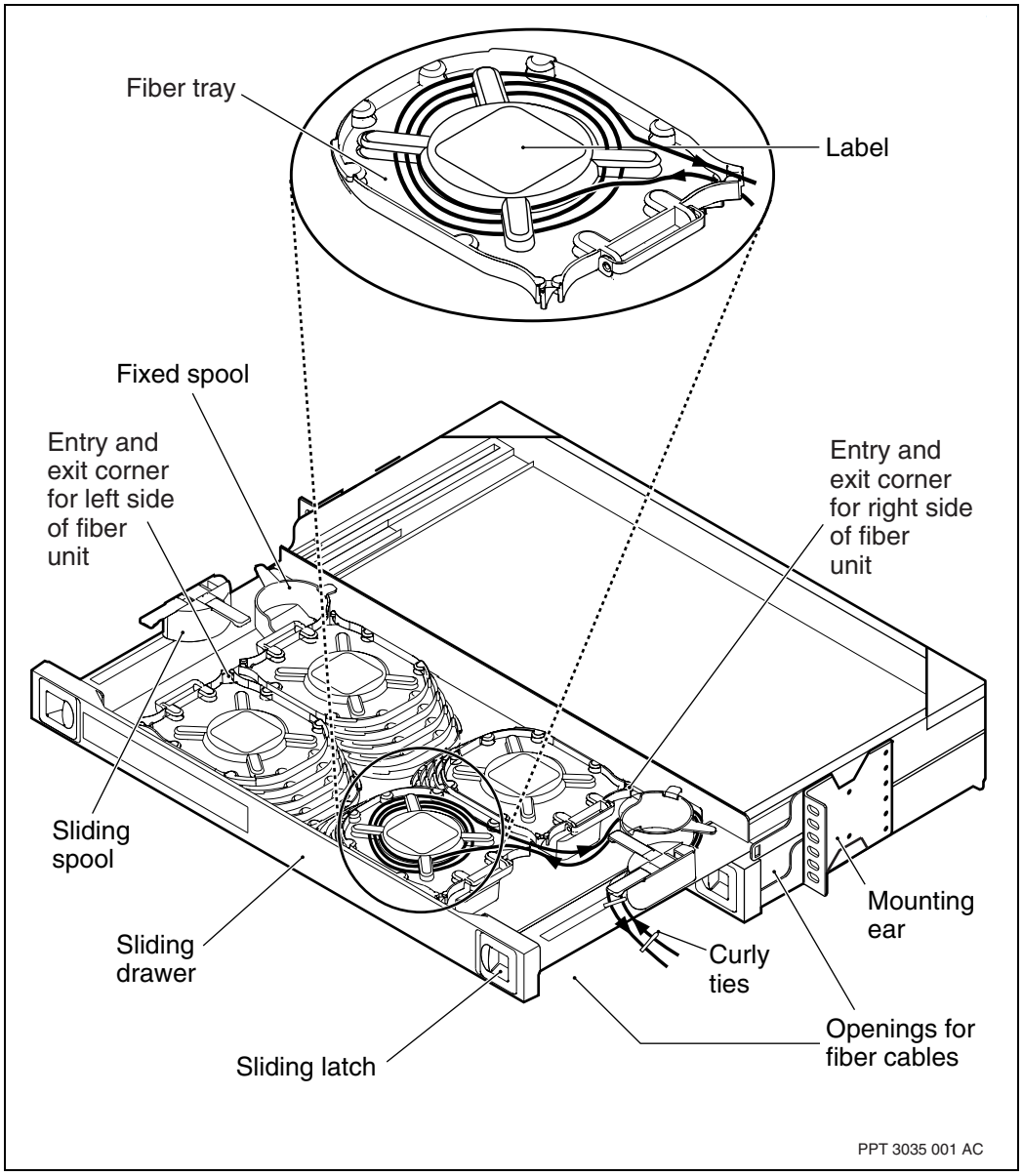
Routing a cable through a fiber management unit NTHW50



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Installing front adapter brackets

Install the front adapter brackets onto a 23-inch wide EIA rack to mount a 21-inch wide Multiservice Switch 15000 or Multiservice Switch 20000.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The front adapter brackets for mounting a shelf onto a 23-inch wide rack are included in hardware packages NTQS04 with a Multiservice Switch 15000, or NTQH04 with a Multiservice Switch 20000. To install front adapter brackets, you need these parts:
  - the left front (long) adapter bracket (part number P0918821)
  - the right front (long) adapter bracket (part number P0918822)
  - the thread-forming 10-mm (3/8-in.) hex-head screws in a pack labelled P097F814
- Hex head screws (from P097F814) remaining at the end of this procedure are needed for the rear adapter brackets.

Procedure steps

Step	Action
1	Hold the right bracket so that: • the center-hole at one end is at the top • the edge with the paired holes that are covered on one side by a strip of silvery grounding tape points away from you
2	At the front of the rack, position the edge with the paired holes against the front face of the right upright. (The left bracket is for the left upright.)
3	Align the bottom hole of the bracket with the bottom hole on the rack upright. Slide the bracket up to the next hole and loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through it.
4	Align the top hole of the bracket with the top hole on the rack upright. Loosely fasten a screw through the hole.
5	At equal lengths apart from the top and bottom screws, loosely fasten 2 more screws.
6	Tighten all 4 screws to snug plus a 1/4 turn.
7	Repeat this procedure for the left adapter bracket on the left upright.

--End--

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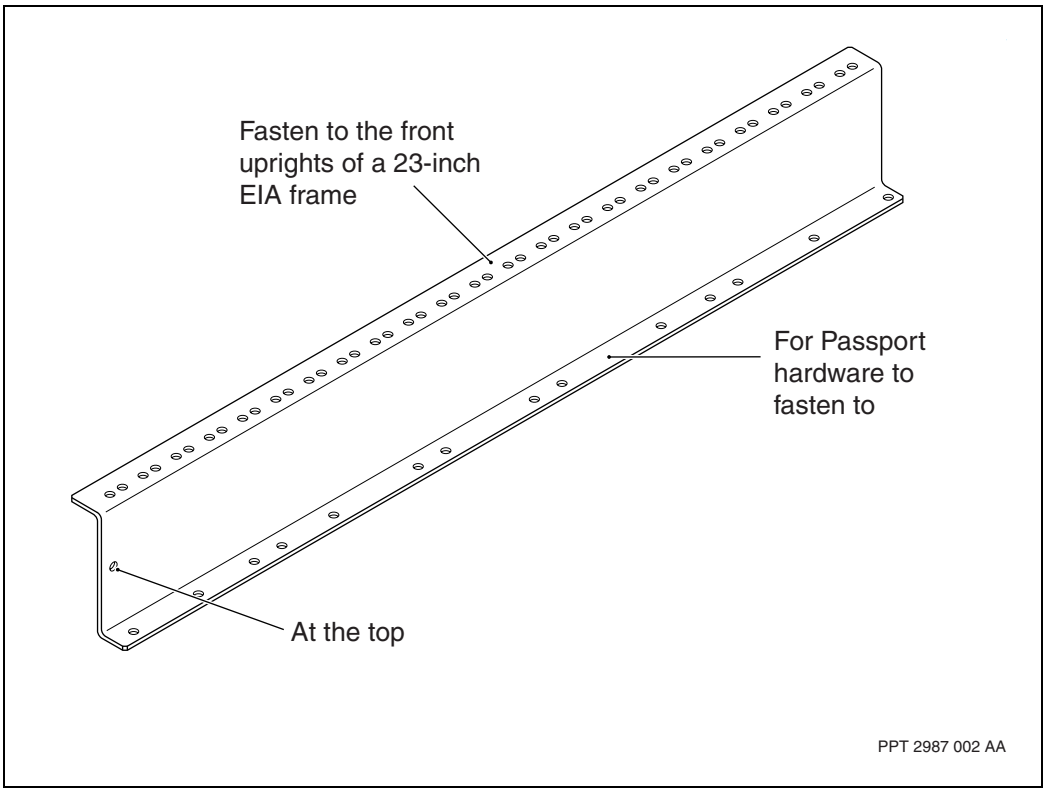
Procedure job aid

A front adapter bracket



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Installing front or rear frame panels

Install the front or rear panels on a NEBS 2000 frame to protect and hide the cable installations up and down the sides.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need kit numbers NTRU0185 and NTRU0366. Kit NTRU0185 includes the panel that spans across the top edge of the NEBS 2000 frame, and has threaded screw holes at each end to fasten the panel of kit NTRU0366. Kit NTRU0366 contains a vertical panel that can be installed in a front or rear location at the left or right side of the frame. The panel brackets differ for front and rear fastenings, but the procedure to mount either is the same. Kit NTHW51 is the same as NTRU0185 except it includes an equipment label. A panel with the label is intended for the top front of a NEBS 2000 frame.

Procedure steps

Step	Action
1	Separate the contents of the kits.
2	See the figures Location of front and rear panels, exploded view (page 504) and Installed front, rear, and side panels (page 507). Observe the position of the upper and lower pairs of brackets. The upper brackets differ in shape from the lower brackets. The upper brackets fasten to the top cover assembly from kit NTRU0185.
3	From the kit NTRU0185, place the top bracket in position according to the figure Location of front and rear panels, exploded view (page 504).
4	Fasten the top bracket using the provided thread-forming 6-mm (15/64-in.) hex-head screws. Tighten the screws to snug plus a 1/5 turn.
5	Fasten the top cover to the top bracket to complete the top cover assembly.
6	From the kit NTRU0366, align an upper bracket (P0902814) according to the figure Upper brackets for frame panels (page 505).
7	Fasten the bracket to the cover using the 2 provided thread-forming 6-mm hex-head screws.
8	Repeat step 6 and step 7 for the other 3 upper brackets.
9	From the kit NTRU0366, align a lower bracket (P0902815) according to the figure Lower brackets for frame panels (page 506).
10	Fasten the bracket to the kick plate using the 2 provided 6-mm screws.
11	Repeat step 6 and step 7 for the other 3 lower brackets.
12	Hold a panel (P0902812) so that

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- the smooth surface faces you
- the end hole is at the top
- the two tabs are at the bottom

13 Place the two tabs into the slots in a lower bracket and swing the panel against the upper bracket.

14 Align the screw hole on the panel with the hole in the upper bracket and fasten a large-slotted screw through them both. Hand tighten the screw to snug plus a 1/5 turn.

15 Repeat step 12 to step 14 for the remaining panels so that 2 are installed on the front of the frame and 2 on the rear.

16 Fasten the filler (P0902816) as shown using the 2 provided thread-forming 6-mm (15/64-in.) hex-head screws.

--End--

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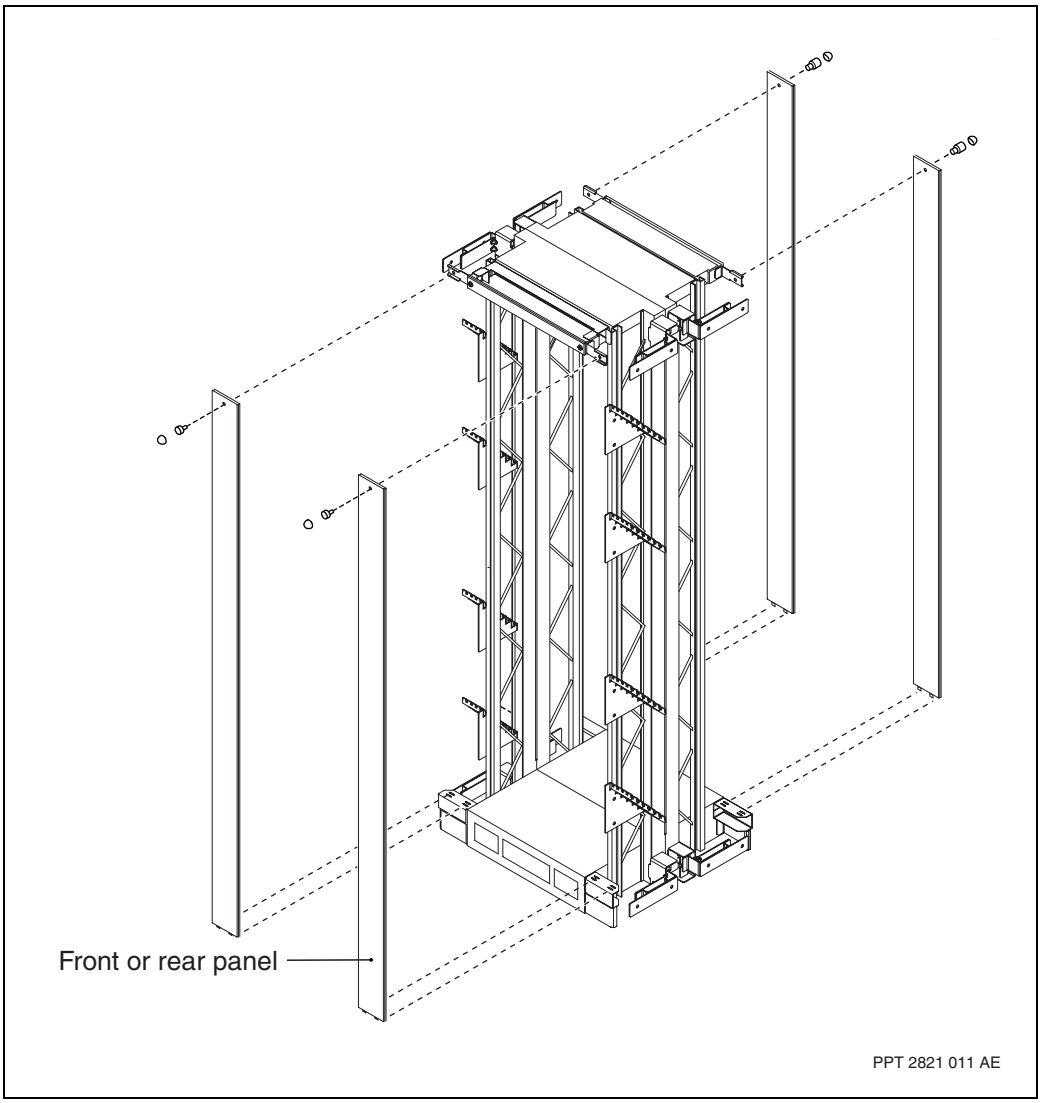
Procedure job aid

Location of front and rear panels, exploded view



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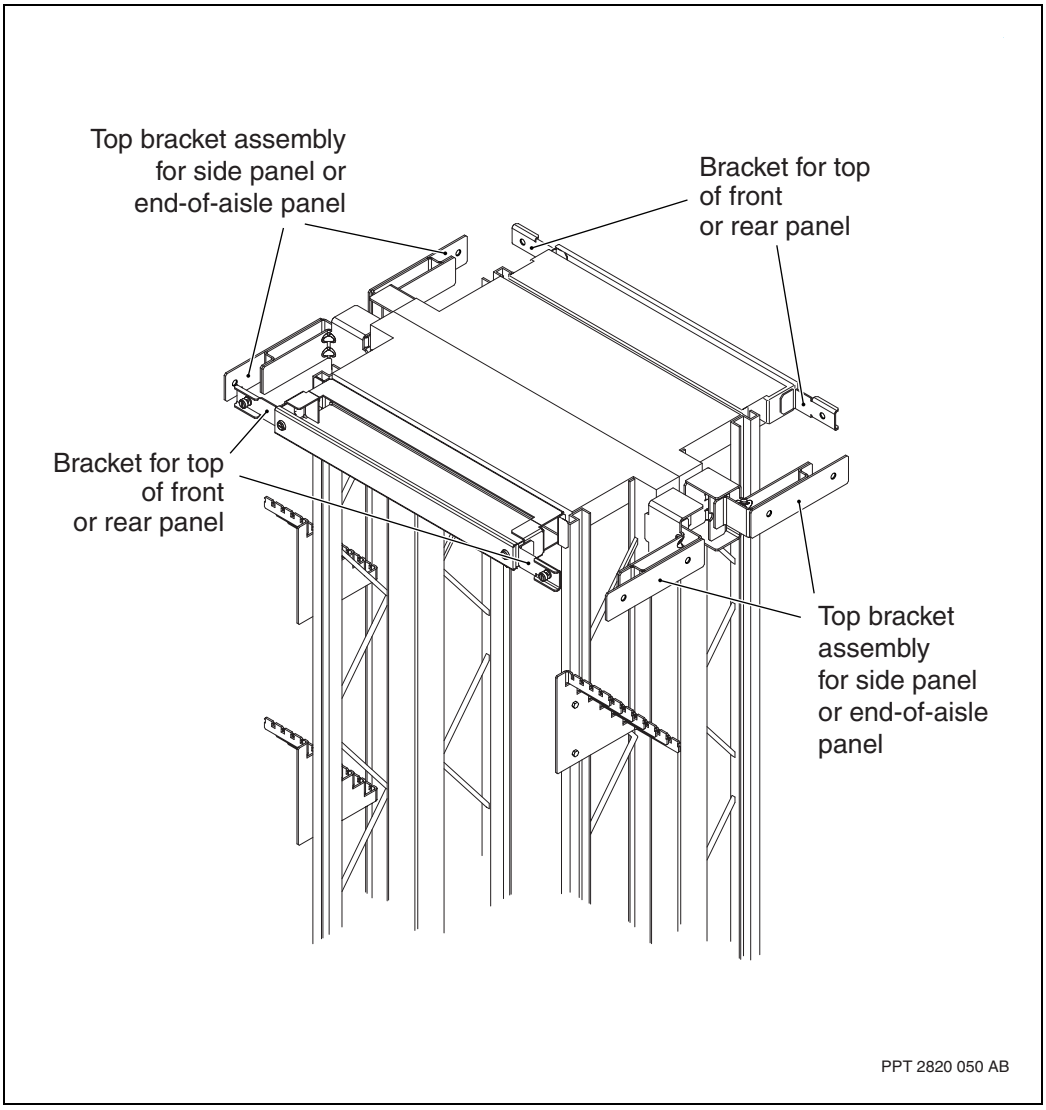
Upper brackets for frame panels



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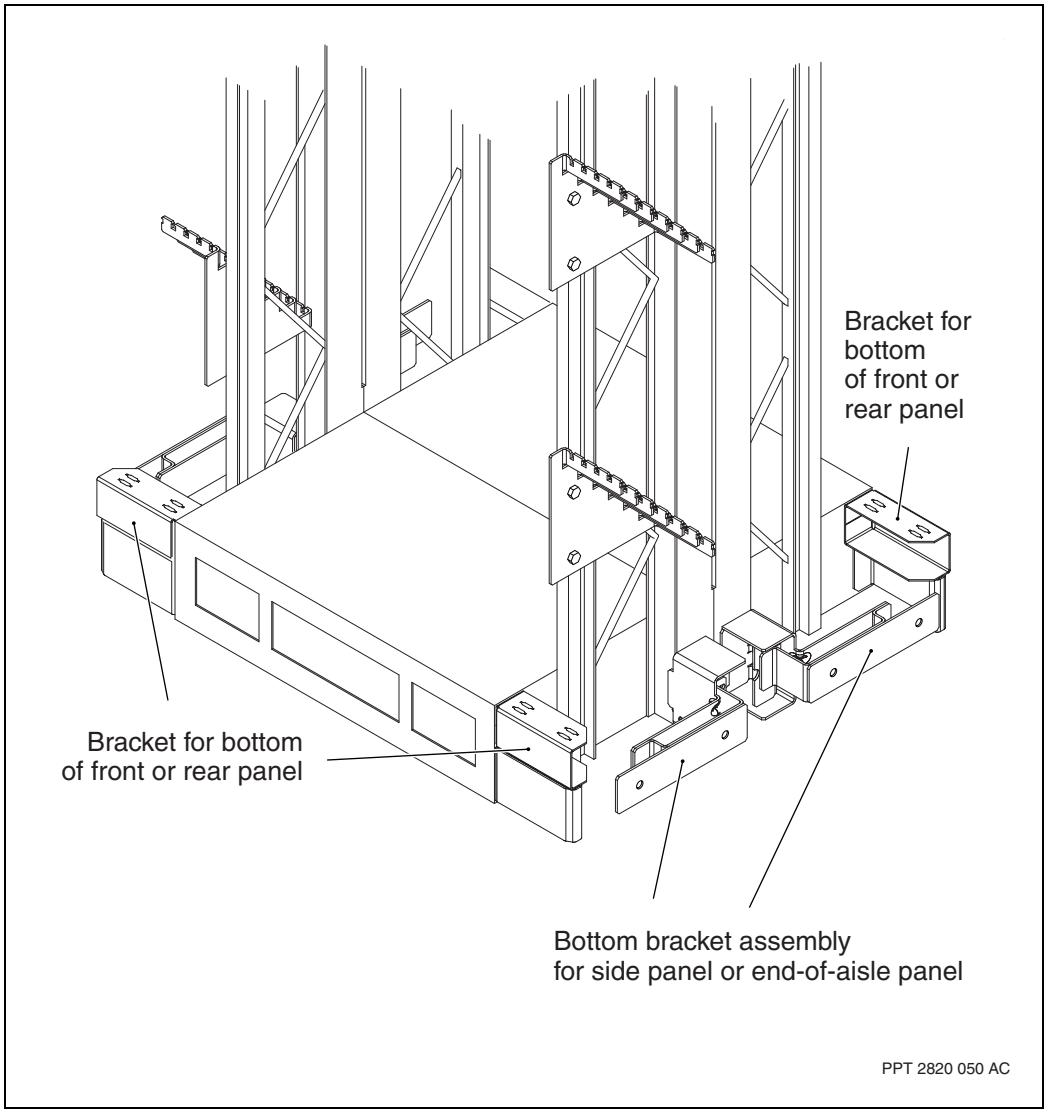
Lower brackets for frame panels



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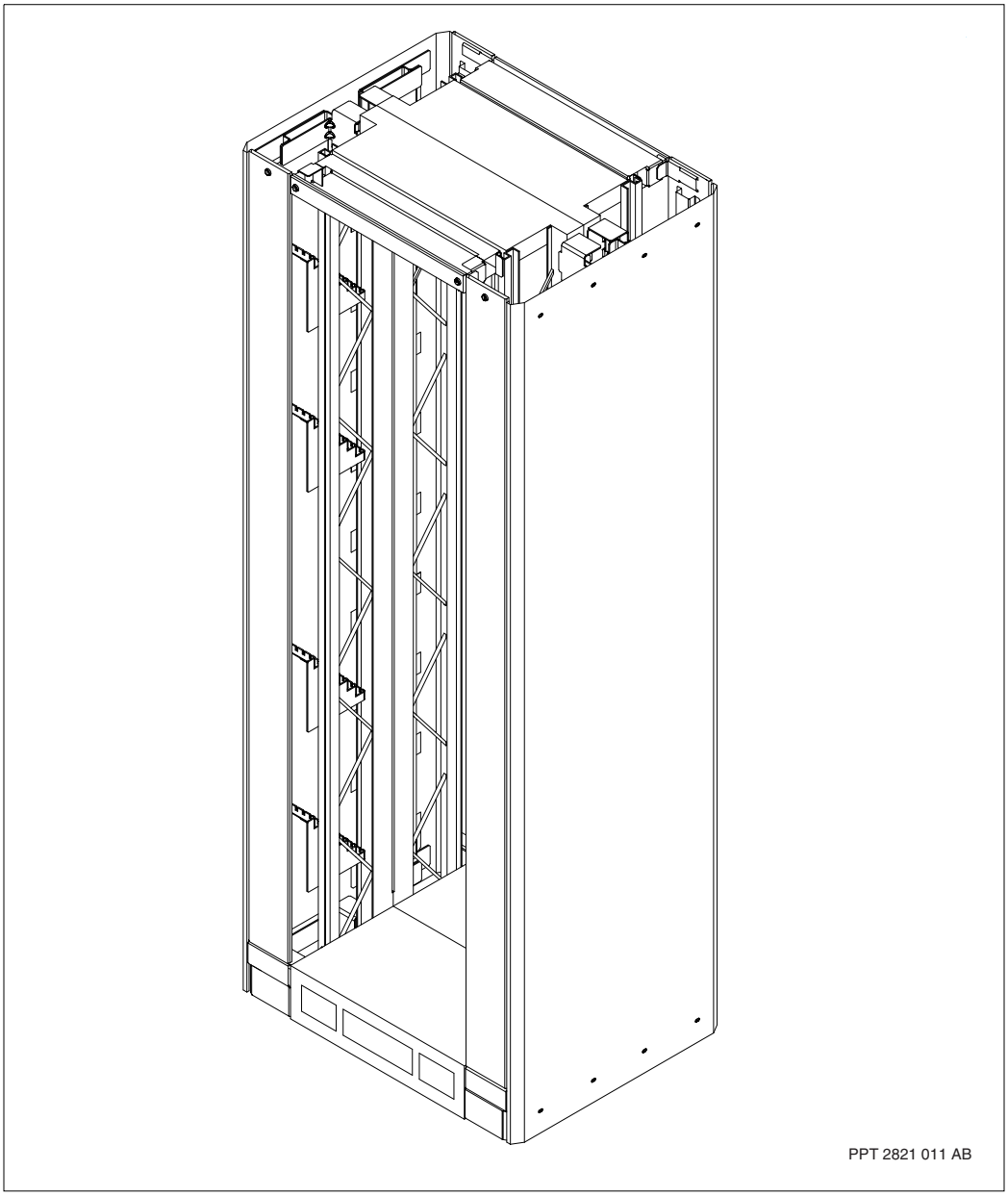
Installed front, rear, and side panels



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Installing grounding tape on rack uprights

Install grounding tape on the front faces of a rack to ensure a proper grounding connection for all hardware parts fastened to the rack.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a roll of tape identified by C-HT108-0625.
- To increase the surface area of grounding, the face of the adapter brackets that contacts the rack has a strip of silvery grounding tape. For the grounding strip to be effective, the mounting holes on the outward face of the uprights must be clean, bare (unpainted) metal.

Procedure steps

Step	Action
1	Expose the bare metal of the outward face of both front and both rear uprights. Remove the paint and any undercoating by using a finely abrasive hand tool, for example, a drill with a clean wire wheel. Avoid removing the paint on the sides of the upright.
2	Wipe the bare metal with a non-residual solvent to ensure that the metal is clean.
3	From the container identified as Box 1, remove the roll or rolls of silvery grounding tape. A roll is identified by C-HT108-0625.
4	Peel the backing off the adhesive side of the tape for about 15 cm (6 in.).
5	Apply the sticky side of the tape to the bottom of any upright face and continue up to the top of the edge of the upright. Peel the backing off as you progress. Ensure that the tape is centered on the face.
6	At the top edge of the upright, cut the tape.
7	Run a finger along the length of tape on the upright. Press hard enough for dimples in the tape to indicate where the screw holes are located. Avoid tearing the tape.
8	Repeat step 4 to step 7 for the remaining 3 uprights.

--End--

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Installing high-density cable management brackets

Install high-density cable management brackets to double the capacity of cables on a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need these parts:
  - 34 plastic brackets (part number P0937935) as shown in the figure A plastic cable management bracket P0937935 (page 510)
  - 2 thread-forming 10-mm (3/8-in.) hex-head screws per bracket
- See NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* to determine if your cabling requirements are high-density.
- The NEBS 2000 frame arrives with standard cable management brackets already screwed to the uprights at the front and rear sides of the frame. When the types and quantities of FPs in a shelf require high-density cabling, the standard cable management brackets must be doubled or changed as follows.
  - To accommodate high-density fiber optical FP cables, use pairs of the plastic cable management brackets (P0937935) as described in this procedure.
  - To accommodate high-density coax FP cables, use pairs of the plastic cable management brackets (P0937935), or for very high density, follow the procedure Installing extended cable management brackets (page 491).

Procedure steps

Step	Action
1	Remove the pre-installed cable management brackets on the frame uprights at the front of the shelf by unfastening the 10-mm (3/8-in.) screws. If the left or right frame upright has unused holes in the silvery strip, note where the cable management brackets were installed so that you ensure re-using their screw holes.
2	Add another bracket to the removed one to make a pair as shown in the figure Aligned pair of plastic cable management brackets (page 511).
3	Loosely fasten each pair of plastic cable management brackets back onto the front uprights using their previous screw holes. See the figure High-density cable management brackets installed on a NEBS 2000 frame (page 512).

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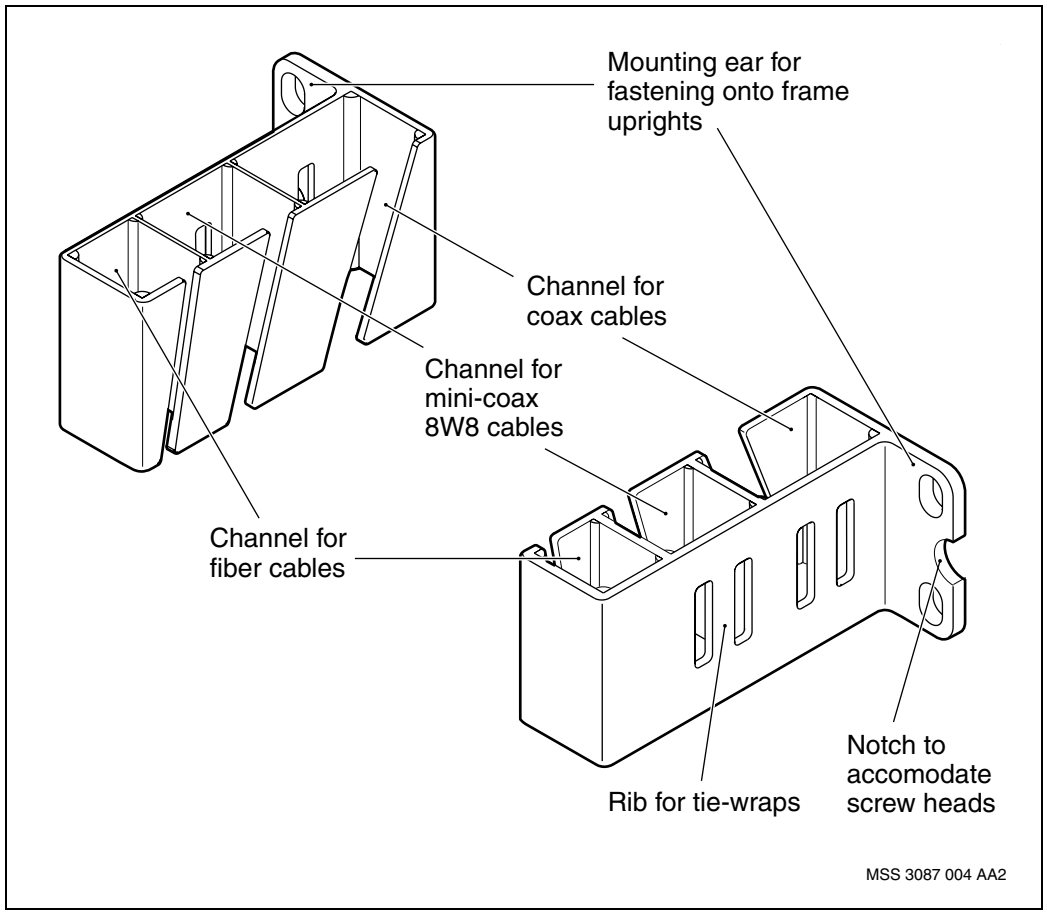
4	Tighten all front cable management bracket screws to snug plus a 1/4 turn.

--End--

Procedure job aid

A plastic cable management bracket P0937935



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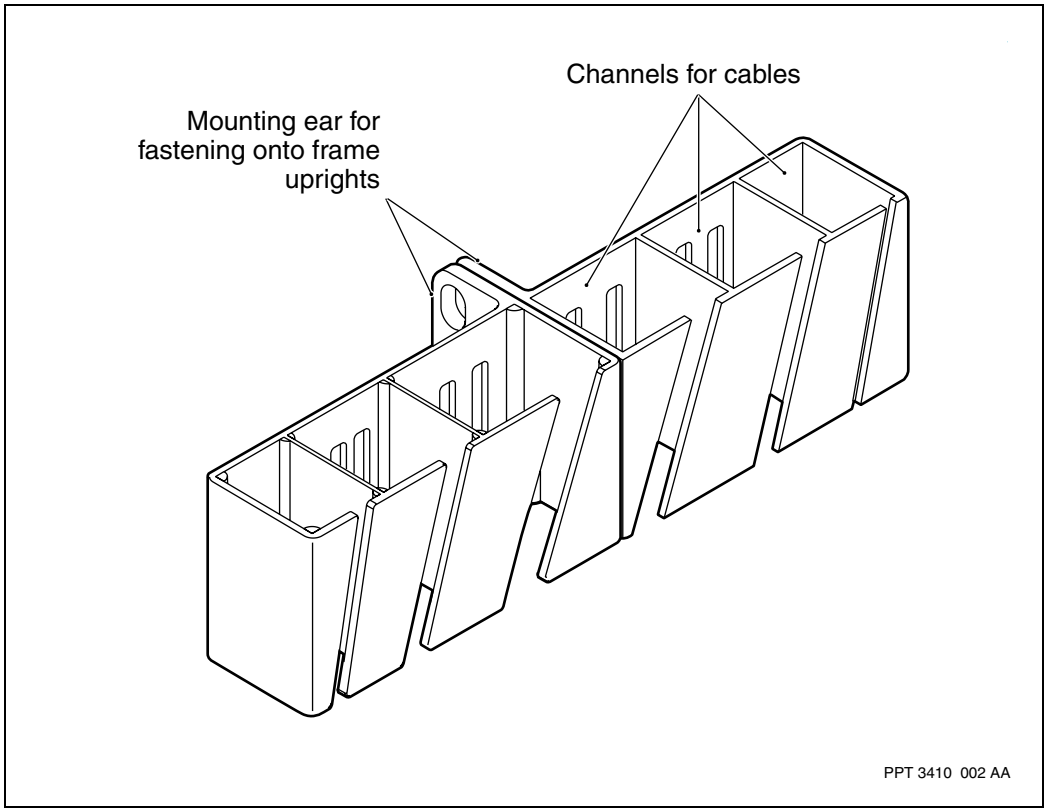
Aligned pair of plastic cable management brackets



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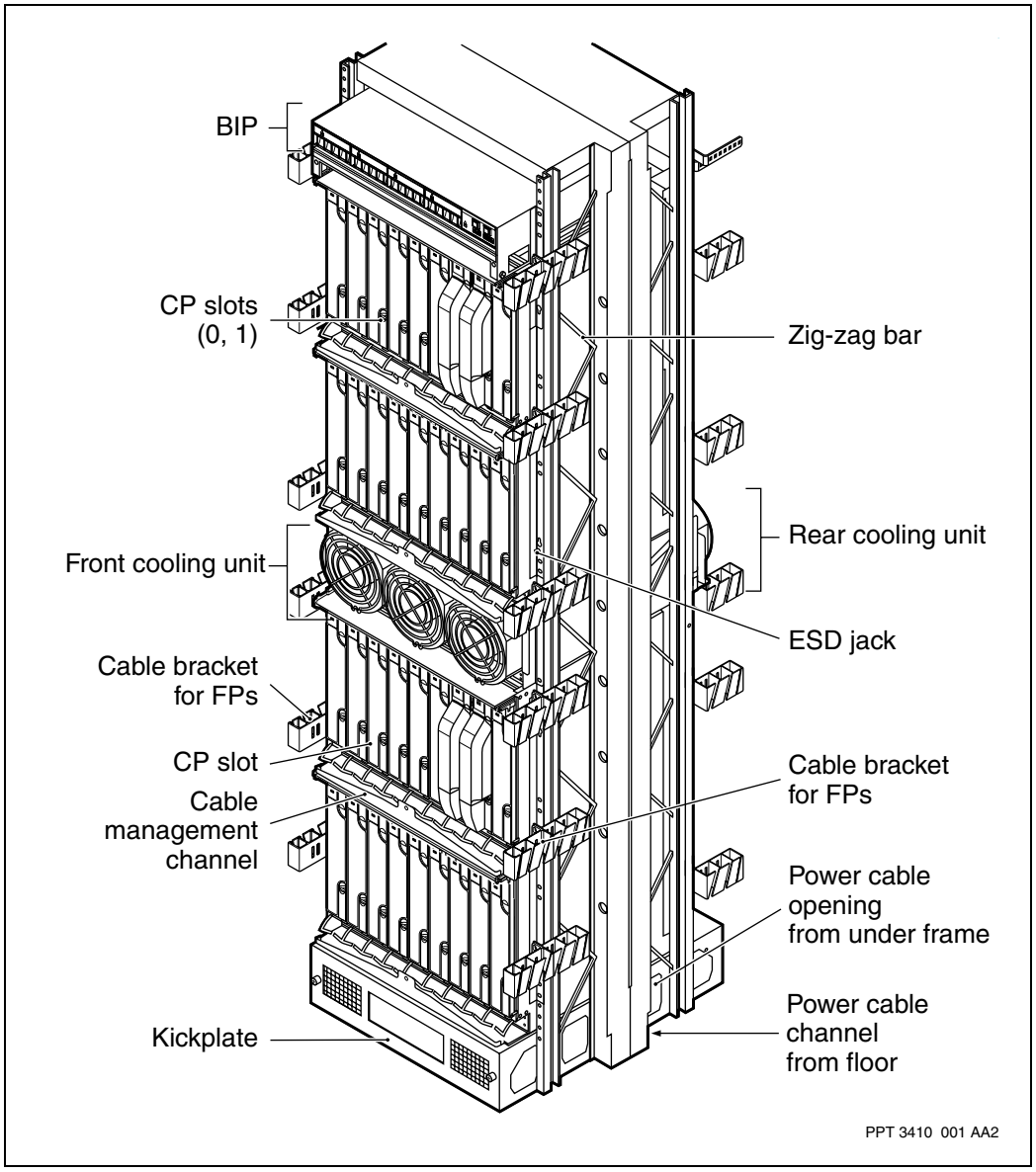
High-density cable management brackets installed on a NEBS 2000 frame



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Installing NEBS 2000 frame-to-EIA adapter brackets

Install NEBS 2000 frame-to-EIA adaptor brackets to the uprights of a NEBS 2000 frame to allow 19-inch wide equipment to be mounted in the 21-inch wide NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a hardware kit with PEC NTHW14.
- The NEBS 2000 frame-to-EIA adapter brackets are required to mount 19-inch wide equipment onto the 21-inch wide NEBS 2000 frame.

Procedure steps

Step	Action
1	While facing the front of the switch, unfasten the pairs of thread-forming 10-mm (3/8-in.) hex-head screws of the top 3 brackets on each side of the frame. Put the screws and brackets aside to be re-installed later.
2	On the front of the NEBS 2000 frame, locate the first screw hole or dimple below the mounting ear of the breaker interface panel.
3	Locate any cable management brackets at the rear of the frame. Record the location and orientation (do the arms point forwards or rearwards) of any bracket in the top half of the frame.
4	Unfasten the 10-mm (3/8-in.) screws of the cable brackets on the back of the frame. Put the screws and brackets aside to be re-installed later.
5	Remove the left and the right adapter brackets (part number P0905867) from the hardware kit NTHW14.
6	Hold the left bracket so that • it is vertical and two columns of holes face you • the label TOP faces you and is at the top • the wider spaced holes are at the left side
7	The column of wider spaced holes are intended to fasten to the frame upright. Align the top hole of the bracket with the dimple immediately below the BIP.
8	Fasten a 10-mm (3/8-in.) screw through the bracket into the marked hole in the upright. The top holes of the bracket align with the first hole or dimple below the BIP's mounting ear.
9	Repeat step 2 to step 4 for the right adapter bracket. Ensure the column of wider holes is at the right side.

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10 Fasten 14 more screws through the adapter brackets into the uprights, 7 per side. Space the screws apart leaving 3 empty holes. Tighten all screws to snug plus a 1/4-turn.

11 Re-install the cable management brackets in their original positions.

12 Remove the rear adapter bracket (part number P0907006) from the hardware kit NTHW14.

13 Hold the bracket so that

- the large square hole is at the bottom
- the screw homes are to the left and right
- the bent lips of the bracket are pointed away from you

14 Locate the 16th hole from the top on the two rear frame uprights.

15 Fasten a 10-mm (3/8-in.) screw through the top left hole of the bracket into the marked hole in the upright (hole 16).

16 Fasten a 10-mm (3/8-in.) screw through the top right hole of the bracket into the marked hole in the upright (hole 16).

17 Fasten 10 more screws through the adapter bracket into the uprights, 5 per side. Tighten all screws to snug plus a 1/4-turn.

18 Re-install the cable management brackets in their original positions.

--End--

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Installing short adapter brackets on the rear of the rack

Install short adapter brackets on the rear of a 23-inch wide rack to accommodate the cable management brackets of a 21-inch wide Multiservice Switch 15000 or Multiservice Switch 20000.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The short adapter brackets are included in hardware kits NTQS04 for a Multiservice Switch 15000 and NTQH04 for a Multiservice Switch 20000. To install short adapter brackets, you need these parts:
  - 12 left short adapter brackets (P0918823)
  - 12 right short adapter brackets (P0918824)
  - two thread-forming 10-mm (3/8-in.) hex-head screws per adapter bracket (from a pack labelled P097F814)

Procedure steps

Step	Action
1	See the figure A short adapter bracket (page 516). Hold a right bracket so that: • the center-hole at one end is at the top • the edge with the paired holes that are covered on one side by a strip of silvery grounding tape points away from you
2	At the rear of the rack, counting from the bottom of the right upright, locate the 24th pair of holes. Mark their location on the inside of the upright.
3	Position the edge of the adapter bracket with the paired holes against the 24th pair of the upright. (The left brackets are for the left upright.)
4	Align the pairs of holes and loosely fasten a thread-forming 10-mm (3/8-in.) hex-head screw through each of the holes.
5	Repeat to install a bracket at the 2nd and 11th hole-pairs below the newly installed bracket. Refer to the figure • A Multiservice Switch 15000 mounted in a rack, rear view (page 517) • A Multiservice Switch 20000 mounted in a rack, rear view (page 518)
6	Repeat step 4 and step 5 to install a bracket at the 2nd pair of holes from the top of the upright.
7	Between the top bracket and the one at the 24th hole-pair, loosely fasten 2 more adapter brackets so that all 4 are evenly spaced. Repeat step 4 and step 5 to install the brackets.

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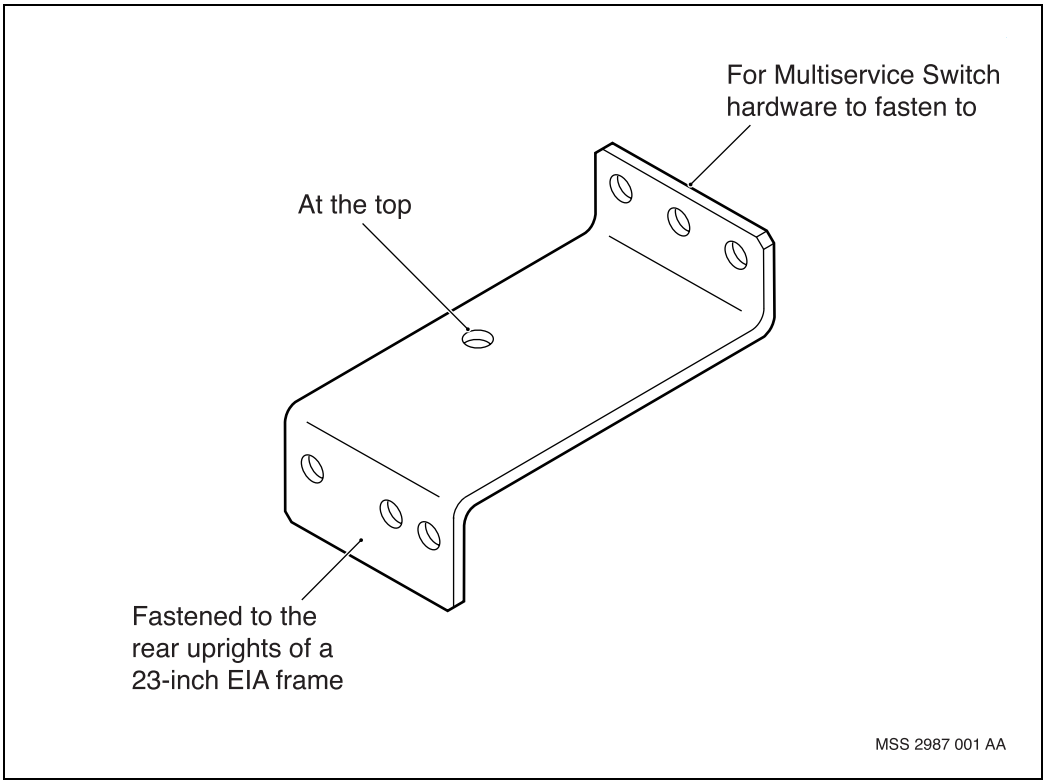
8 Repeat step 2 to step 7 for the left adapter brackets on the left upright.

9 Tighten all screws to snug plus a 1/4 turn.

--End--

Procedure job aid

A short adapter bracket



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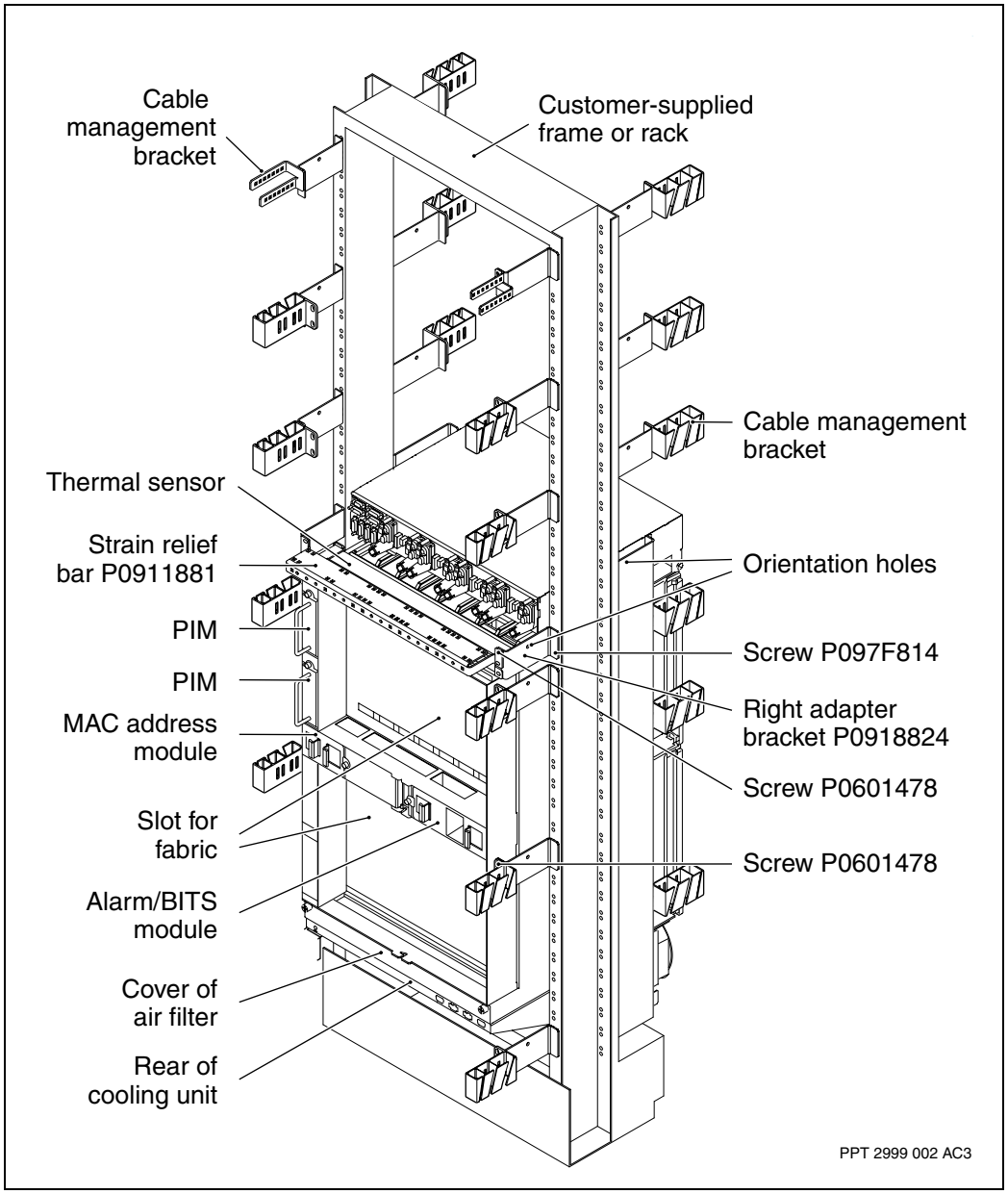
A Multiservice Switch 15000 mounted in a rack, rear view



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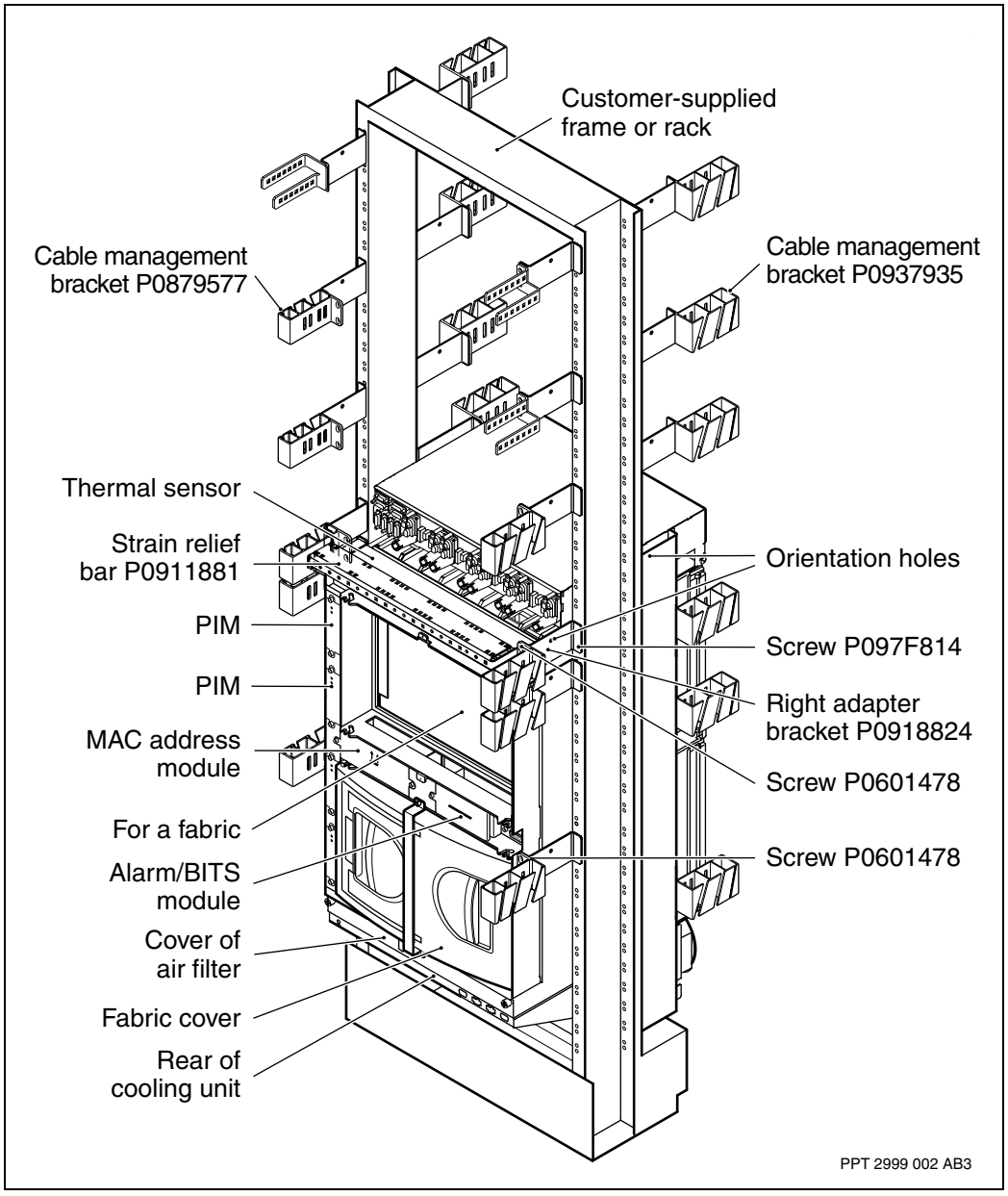
A Multiservice Switch 20000 mounted in a rack, rear view



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Installing short adapter brackets on the front of the rack

Install short adapter brackets on the front uprights of a 23-inch wide EIA rack to maintain the cable path to the top of the rack for Multiservice Switch 15000 or Multiservice Switch 20000.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The short adapter brackets are included in kits NTQS04 for a Multiservice Switch 15000, and NTQH04 for a Multiservice Switch 20000. To install short adapter brackets on the front uprights, you need these parts:
  - 3 left short adapter brackets with part number P0918823
  - 3 right short adapter brackets with part number P0918824)
  - 2 thread-forming10-mm (3/8-in.) hex-head screws per adapter bracket (from a pack labelled P097F814)
- Rear adapter brackets must be mounted on the front of the rack uprights above the BIP.

Procedure steps

Step	Action
1	On the front of the rack upright, locate the pairs of holes that align with the top 3 short adapter brackets that are already installed on the rear uprights as shown in the figure A Multiservice Switch 20000 mounted in a rack, rear view (page 518).
2	Loosely fasten the 3 left and 3 right short adapter brackets onto the front of the rack uprights at these mirrored positions. Use the thread-forming 10-mm (3/8-in.) hex-head screws from pack P097F814 through each of the holes.
3	Tighten all screws to snug plus a 1/4 turn.

--End--

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Levelling the frame or frame pair

Level the frame or level the connected pair of frames, after they have been aligned over the anchor openings.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The NEBS 2000 frame has PEC NTRU04. Its identification label is on the top rear left of the frame.

Procedure steps

Step	Action
1	See the figure Location of the frame levelers and anchor openings (page 521). The frame feet are the levelers.
2	Reach through the side openings of the frame (or front, depending on ease of access) to adjust the middle levelers so that each foot is away from the floor. Adjust a leveler by turning the threaded shaft counter-clockwise. If your fingers cannot turn the shaft, use an 8-cm (5/16-in.) hex driver at the top of the threaded shaft.
3	Place a level vertically against the side of a middle frame upright at the side of a frame or frame pair to determine which side of the frame is highest.
4	Reach past a kick plate opening to adjust the foot downwards at the highest side of the frame. Adjust each foot by an 8-cm (5/16-in.) hex driver at the top of the threaded shaft. Monitor the level while adjusting. Stop when that face of the frame is level.
5	Place the level vertically against the front of the middle frame upright to determine which is highest, the front or the rear of the frame.
6	Adjust the highest corner feet downwards until the frame or frame pair is level from all sides.
7	Reach through the side openings of the frame (or front, depending on ease of access) to adjust the middle levelers so that each foot touches the floor. Adjust each leveler by turning the threaded shaft clockwise. If your fingers cannot turn the shaft, use an 8-cm (5/16- in.) hex driver at the top of the threaded shaft. After the levelers touch the floor, turn each with the hex driver 1/8 turn clockwise.

--End--

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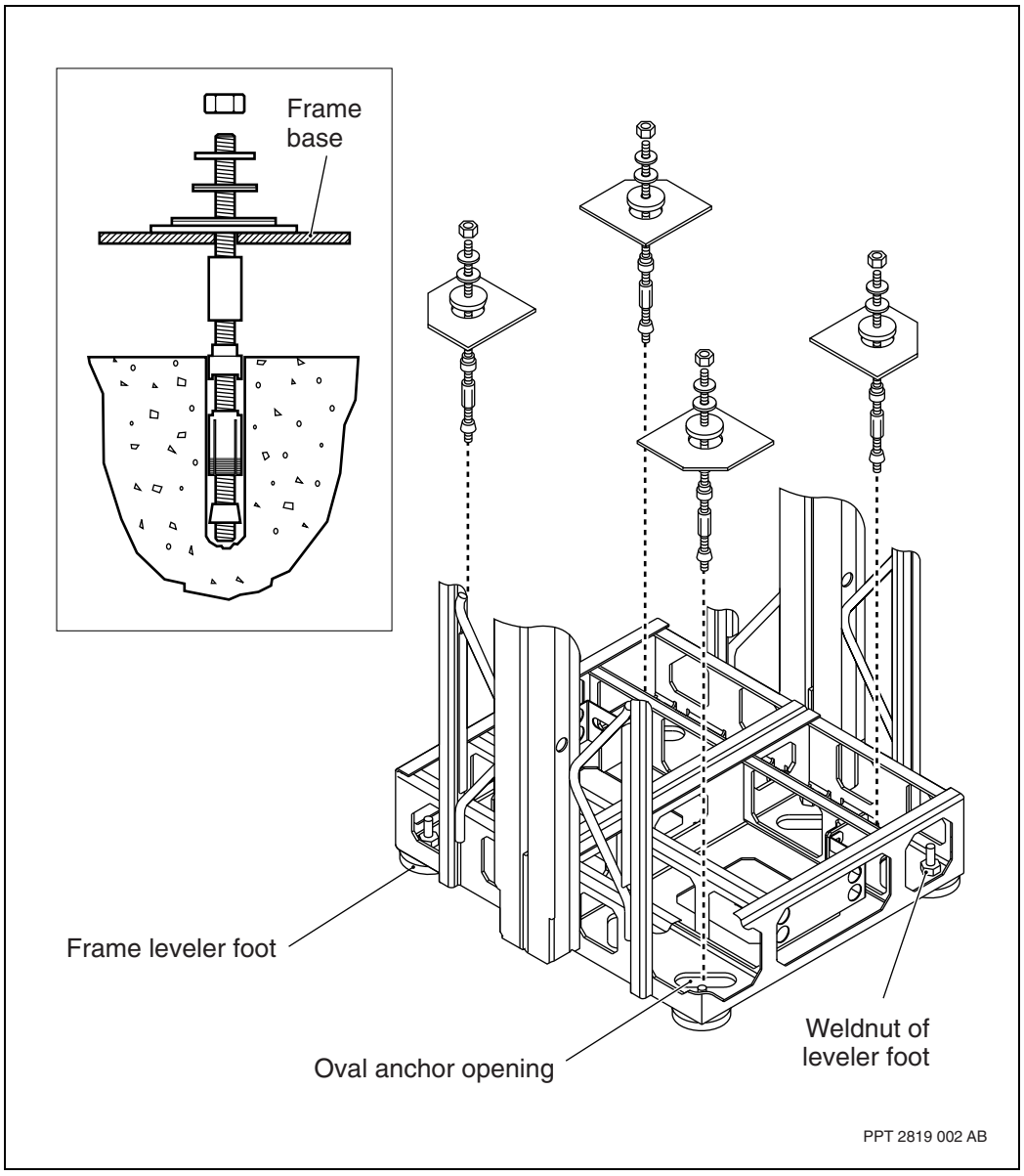
Procedure job aid

Location of the frame levelers and anchor openings



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Locking or unlocking a door on a NEBS 2000 frame

Lock or unlock a door on a NEBS 2000 frame to control access to the equipment mounted inside the frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a key from any of the NTQS37 kits.

Procedure steps

Step	Action
1	Unlock a door lock by turning the key counter-clockwise until it is horizontal as shown in the figure A lockable vented door NTRU0423, outside view (page 523).
2	When locking a door, ensure that the upper and lower catches are engaged by • putting the lock horizontal in the unlocked position • lifting the door handle • turning it to the left • pushing the door closed • releasing the handle A spring returns the handle to the starting position. While closing the door, ensure that its grounding cable near a hinge is not rubbed or pinched. Dress the cable as required. Pull on each corner of the door on the lock side to ensure that the catches have engaged.
3	Lock the door by turning the key clockwise until it is vertical.
4	Store the door keys according to your company's security policies.

--End--

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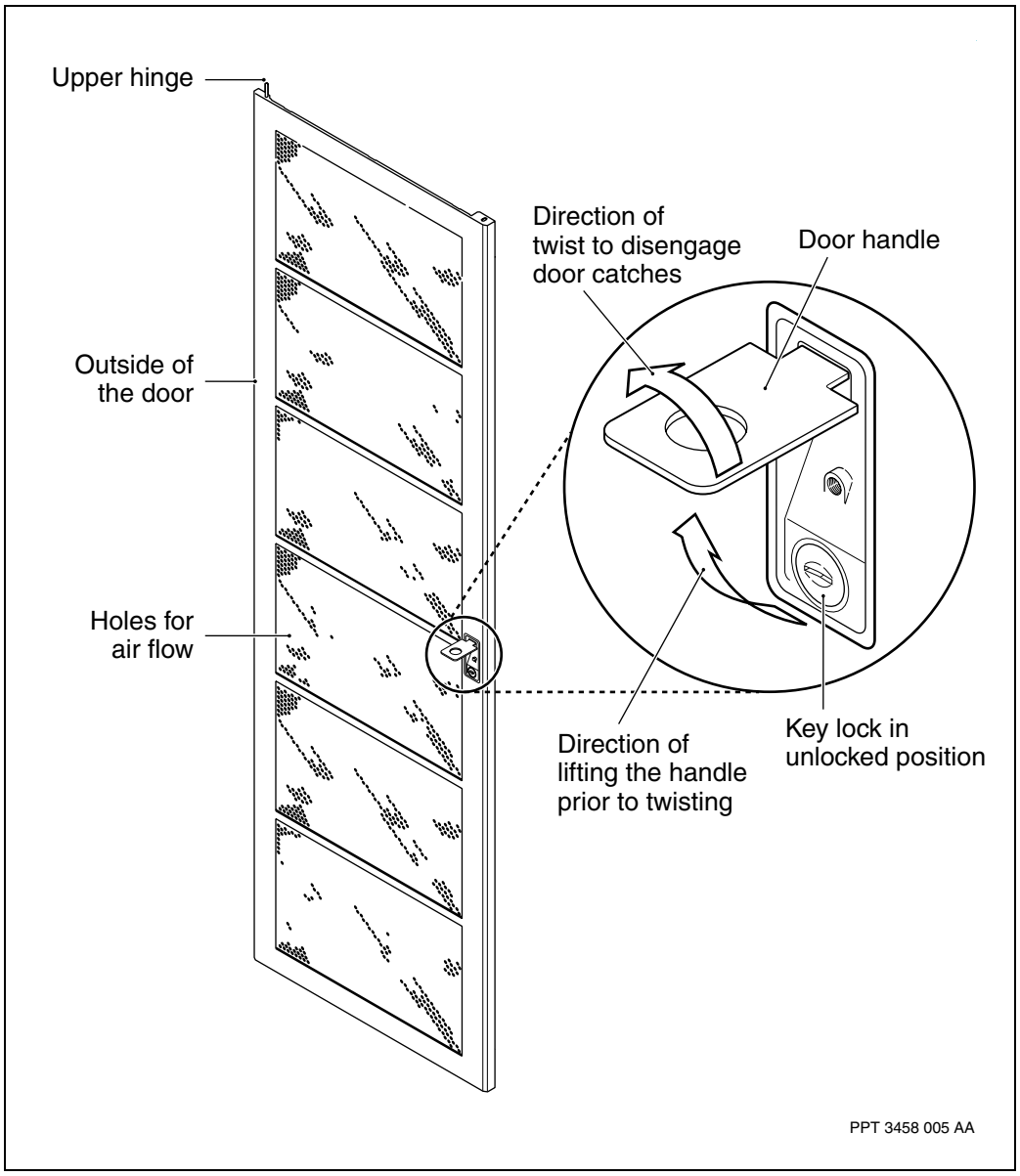
Procedure job aid

A lockable vented door NTRU0423, outside view



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Loading cards in sequence with software

Load cards in sequence with software to confirm each card's ability to successfully accept the software.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need access to NN10600-270 *Nortel Networks Multiservice Switch 7400/15000/20000 Software Installation*.
- Cards that were shipped installed but unseated (in the transportation position) at the factory have already been loaded with basic software.
- The LEDs of seated cards prior to loading software are green for the fabrics or amber for the CPs and FPs.

Procedure steps

Step	Action
1	Lift the latches of the CP in slot 0 and slide it gently into the slot until you feel it engage the backplane. After the card is engaged, power up begins.
2	Observe the CP's LEDs complete the following cycle: • solid red (a final state), indicating powering up or after power-up, or is being reset or restarted; during solid red, the hardware and fabric backplane is tested and initialized; if there is a problem, the CP reboots and remains solid red • flashing red (an intermediate state), indicating that initializing and testing the fabric backplane has passed and the CP software is loading • solid amber (a final state), indicating the software is not yet loaded or configured for that CP, that is, the slot is unconfigured • slow flashing green (an intermediate state), indicating the software has been loaded and the applications are being initialized • solid green (a final state), indicating power is on, software is loaded, the CP is in service operating normally, and is the active CP If the LED stays red, remove the CP and use a flashlight to inspect the pins inside the slot at the backplane. If any are bent, contact your local Nortel Networks support representative. If none are bent, gently insert a replacement CP and observe the LED cycle again.
3	When the CP LED in slot 0 is green, start seating the FPs one at a time. As each FP is seated, observe its LED completing the following cycle. • solid green, confirming initial power up

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- solid red (a final state), indicating a reset or restart to test hardware; if there is a problem, the FP reboots
- flashing red (an intermediate state), indicating the software is initializing for a reset or is loading
- slow flashing green (an intermediate state), indicating the software has been loaded and the FP is being initialized
- solid green (a final state), indicating power is on, software is loaded, and the card is in service operating normally.

4 After all the FPs are seated and showing solid or flashing green LEDs, locate the spare (redundant mate) CP in slot 1 and repeat step 2. The LED of the second CP cycles to fast flashing green, indicating it is on standby as the redundant (spare, back-up, or inactive) mate.

5 Verify successful loading of each CP and FP by checking the status LEDs for each card one at a time. Record the switch number and slot number of any CP or FP that does not have a solid or fast flashing green LED. Report the problem to your local Nortel Networks technical support representative.

If the LED stays solid amber, the FP software is improperly configured or not configured.

If the LED stays flashing red, the FP card type is configured for the slot, but the for the card itself

If the LED stays solid red, the FP has failed.

6 If present, remove the label on any faceplate that indicates the former PCR software version.

--End--

Procedure job aid

For the locations of the status LEDs, refer to these figures:

- A fabric for a Multiservice Switch 15000, rear view (page 343)
- A fabric of a Multiservice Switch 20000, rear view (page 349)
- Circuit breakers on the front of the BIP (page 733)
- Location of BIM status LEDs (page 739)
- Location of alarm module status LEDs (page 740)

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Making a BITS cable

Make a BITS cable to connect from the timing source directly to the alarm/BITS module or to one of the prefabricated timing cables to enable external timing.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- For cable specifications refer to the section on alarm/BITS module in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Each timing connection requires 2 wires. When connecting both the A and the B timing references, select color-coded twisted pair wires to distinguish between the 2 (this does not apply to E1 unbalanced connections).
2	Ensure the size of wire (for example, 22 AWG or 6 mm^2) can be soldered to the DB9 connector pins. The wire size depends on the length between the end points.
3	Locate the CPE timing source at your site.
4	Lay the wires from the timing source up to the connectors J3 and J4 on the alarm/BITS module at the rear of the switch. Route the wires up or down the right side of the frame against the cable management brackets.
5	Connect the wires at the source, using whatever method of connection is required.
6	Label each timing wire pair at both end points to distinguish which is reference A and which is reference B.
7	Fasten the wires snugly with tie-wraps to whatever CPE wire support system leads to the cable management brackets on the switch mounting apparatus. Leave enough length at the switch end of the wire to attach the D-sub connectors.
8	From the DB9 connector kit, insert the rubber grommet over the wires, wider end first. Repeat on the second pair of timing wires if the redundant reference is being used. Slide the grommet away from the ends.
9	In preparation for soldering, cut two lengths of wire, approximately 2 cm (3/4 in.) each. Use the same type and size wire as the timing wire pairs.
10	Strip 3 mm (1/8 in.) off both ends of the two pieces of wire and off the switch end of the timing wire pair. Twist the exposed wire ends, and dip the twists in flux.

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11 As shown in the figure D-sub pinout for J3 and J4 BITS cables for DS1 or E1 balanced (page 528), solder each wire onto the appropriate DB9 pin. For the appropriate wire-to-pin connections, see the tables

- Pinouts of the J3 and J4 connectors for DS1 or E1 balanced (page 527)
- Pinouts of the J3 and J4 connectors for E1 unbalanced (page 528)

The minimum connection between the BITS site timing source and the D-sub, DS1, or E1 balanced uses pins 5 and 9 with the ground, while E1 unbalanced uses pins 1-1 and 1-2 with the ground. A minimum connection has no backup signal for any part of the timing path to the CP.

12 Assemble the D-sub jacket halves with the grommet in the grooves of the halves. Ensure the jumper wires are not snagged by the jacket.

--End--

Procedure job aid

Pinouts of the J3 and J4 connectors for DS1 or E1 balanced

Pin	DS1/E1 for J3	DS1/E1 for J4	Description of the connection
1	no connection	no connection	no connection
2	no connection	no connection	no connection
3	GND	GND	ground
4	no connection	no connection	no connection
5	BITSRXBP	BITSRXAP	BITS receive (signal is from the external clock into the BITS interface) reference B (or 2) or A (or 1), positive (for balanced means tip)
6	no connection	no connection	no connection
7	no connection	no connection	no connection
8	no connection	no connection	no connection
9	BITSRXBN	BITSRXAN	BITS receive (signal is from the external clock into the BITS interface) reference B (or 2) or A (or 1), negative (for balanced means ring)

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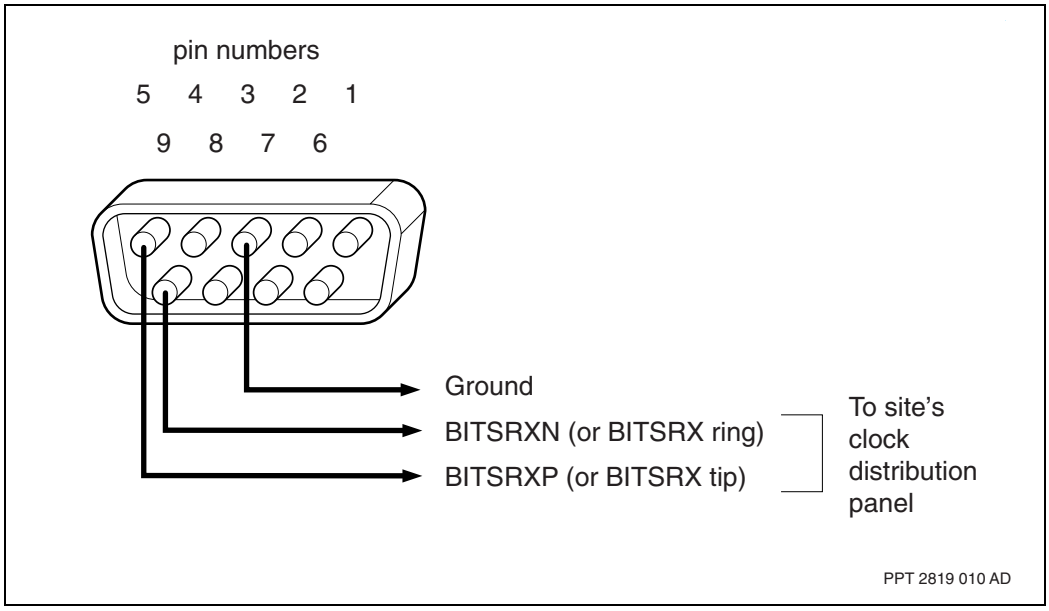
Pinouts of the J3 and J4 connectors for E1 unbalanced

Pin	J3 E1 signal, unbalanced	J4 E1 signal, unbalanced	Description of the connection
1-1	BITSRXBN	BITSRXAN	BITS receive (signal is from the external clock into the BITS interface) reference B (or 2) or A (or 1), negative (for unbalanced means ground)
2-1	no connection	no connection	no connection
1-2	BITSRXBP	BITSRXAP	BITS receive (signal is from the external clock into the BITS interface) reference B (or 2) or A (or 1), positive (for unbalanced means signal)
2-2	no connection	no connection	no connection
1-3	no connection	no connection	no connection
2-3	no connection	no connection	no connection
E1 unbalanced uses D-sub coax cables.			

D-sub pinout for J3 and J4 BITS cables for DS1 or E1 balanced



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Moving a frame into its anchoring position

Move a frame into its anchoring position to prepare the NEBS 2000 frame for anchoring.

Prerequisites

WARNING

Risk of injury when handling a frame

Never place a foot or a hand under any part of the frame while it is being tilted or moved. Always move it with at least four people. The weight of a shipped frame with one Multiservice Switch 15000 or Multiservice Switch 20000 is approximately from 330 kg (730 lbs) to 355 kg (780 lbs); with two switches the weight is from approximately 480 kg (1052 lbs) to 490 kg (1076 lbs). For additional protection, wear safety boots with steel toes and gripping soles.

WARNUNG

Verletzungsgefahr beim Gestelltransport

Stellen Sie niemals einen Fuß unter das Gestell, wenn dieses bewegt oder gekippt wird, und greifen Sie nicht unter das Gestell. Zum Bewegen des Gestells sind mindestens vier Personen erforderlich. Ein Gestell mit einem Multiservice Switch 15000 oder Multiservice Switch 20000 wiegt ca. 330 kg und mit zwei Multiservice Switch-Einheiten ca. 490 kg. Tragen Sie zu Ihrem zusätzlichen Schutz Sicherheitsschuhe mit Stahlkappen und griffigen Sohlen.

- You must be familiar with Safety considerations and best practices (page 19).
- The NEBS 2000 frame has PEC NTRU04.
- You need a machine or hand tool rated for an overall load capacity of 600 kg (approximately 1,300 lbs) to move the frame to its final footprint. Nortel Networks recommends using a four-wheeled 2-m (7-foot) fridge cart equipped with a foot-plate and two tie-down straps. Notice in the figure Fridge cart to move a NEBS 2000 frame (page 531) that the frame of the cart rests on top of the secondary wheels (see insert) to ensure that the weight of the load keeps the wheels in position, and that no wheels pivot. Another name for a fridge cart is appliance cart. Using a fridge cart to move the frame means it can
  - — be handled safely by two people (although three is best)
  - — ride on four non-pivoting wheels, which means the cart carries the full weight
  - — be moved while tilted, which means it is less likely to hit the top of a doorway; in the upright position, a NEBS 2000 frame is about 2.3 m (7.5 feet) tall

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— be tilted in motion over obstacles on the floor (for example, cables on the floor or a raised or sunken doorway threshold)

Procedure steps

Step	Action
1	From where the frame is positioned on the floor, determine how far it can be moved by machine towards the footprint where the frame is to be located. The frame dimensions are 60 cm (23.62 in.) wide by 60 cm (23.62 in.) deep by 212.5 cm (83.66 in.) tall.
2	Move the fridge cart as close as possible to the footprint where the frame is to be anchored to the floor. At least 2 people should move the cart. When the loaded cart must be tilted over an obstacle (such as a cable or doorway threshold), at least one other person must help control the tilting.
3	Unload the frame from the fridge cart by getting two or three helpers to tilt the frame away from the fridge cart enough to slide the foot plate out from underneath.
4	Slide the frame by hand to its pre-marked position on the floor. Use two or three helpers to push and pull in unison while holding the uprights of the frame.
5	If the frame will be anchored to the floor later, wrap and tape the original plastic sheet around it. The sheet minimizes contamination by dust.

--End--

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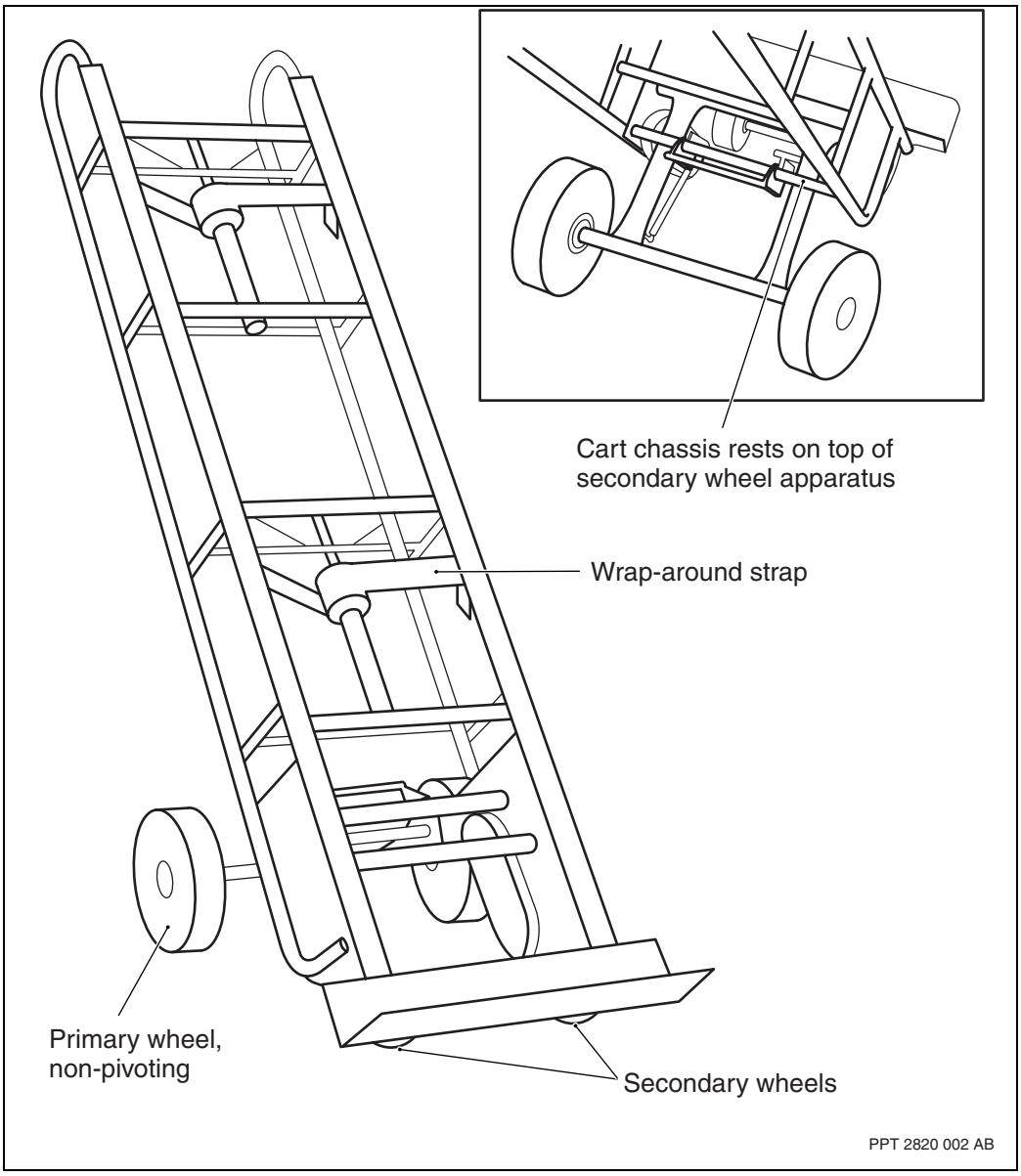
Procedure job aid

Fridge cart to move a NEBS 2000 frame



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Packing a processor card or module

Pack a processor card, fabric card, or module in its original container to protect it from damage while it is being stored or returned.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Prevent damage to card electronics from electrostatic discharge (ESD) by using effective anti-ESD gear that is appropriately grounded. A Nortel Networks Multiservice Switch antistatic wrist strap has part number A0378999. Work near the switch so that you can reach the package while wearing a wrist strap that is plugged into an ESD jack on the switch.
- For a Multiservice Switch 20000 a NEBS 2000 frame (NTRU04), there are no separate shipping containers for the CPs, FPs, or fabrics. Instead the cards are shipped in the transportation positions (latched but not seated) in each shelf assembly. The plug-in modules of the breaker interface panel (BIP) are also shipped in a transportation position. There are no original containers for these cards or modules. When returning a failed card or module from a frame-based Multiservice Switch 20000, you must pack it in anti-ESD protective material so that further damage does not occur to the unit.

Procedure steps

Step	Action
1	Get the original packaging and container, or equivalent anti-ESD packing materials. If using a non-original container, put the PEC of the card or module on the outside of the container.
2	Label the pouch and container with the operational status of the card, fabric, or module at the time of its removal. For example, use failed or spare (for re-deployment).
3	Insert the card or module into the antistatic ESD protection pouch and put the pouch into the container, or put it directly into the container lined with antistatic foam slots.
4	Seal the container with packing tape.

--End--

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Placing the NEBS 2000 frame onto the footprint

Place the NEBS 2000 frame onto the footprint to install the frame above the isolator pad before leveling.

Prerequisites

WARNING

Risk of injury when handling a frame

Never place a foot or a hand under any part of the frame while it is being tilted or moved. Always move it with three or four people. The weight of a shipped frame with one Multiservice Switch 15000 or Multiservice Switch 20000 is approximately 419 kg (926 lbs); with two switches the weight is approximately 612 kg (1,344 lbs). For additional protection, wear safety boots with steel toes.

WARNUNG

Verletzungsgefahr beim Gestelltransport

Stellen Sie niemals einen Fuß unter das Gestell, wenn dieses bewegt oder gekippt wird, und greifen Sie nicht unter das Gestell. Die Einheit muß mit vier Personen von der Transportpalette genommen werden. Ein Gestell wiegt mit einem Multiservice Switch 15000 oder Multiservice Switch 20000 ca. 420 kg, mit zwei Multiservice Switch-Einheiten ca. 610 kg. Tragen Sie zu Ihrem zusätzlichen Schutz Sicherheitsschuhe mit Stahlkappen.

- You must be familiar with Safety considerations and best practices (page 19).
- The NEBS 2000 frame has PEC NTRU04.
- The location of the NEBS 2000 frame footprint must already have been prepared and marked on the floor according to the criteria in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements*.

Procedure steps

Step	Action
1	Place the isolator pad (footprint template) on the footprint marked on the floor and align the two. The isolator pad helps insulate the NEBS 2000 frame from electrical current.
2	Tape the isolator pad to the floor to keep it from moving when the frame is placed on it. Keep the tape off the spots where the levelling feet will go.
3	With 3 or 4 helpers, slide the frame on its feet over the footprint template so that the edges and all anchor openings in the floor align with the oval

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openings in the bottom of the frame. To slide the frame on its feet, push in unison on one side of the frame.

4 For installations where the power cabling is routed upwards from the floor, remove the plate (part number P0870734) in the bottom of the frame nearest where the cable comes through the floor. The plate screws are 10 mm (3/8 in.). Ensure the alignment of the knock-out disks for conduit in the bottom of the frame is close enough to the power cable opening to prevent right-angle bends.

5 While 3 or 4 helpers tilt and hold the frame at a slight angle, slide the isolator pad under the raised feet and push it against the other feet. Holding the pad in position by stepping on it, slide the frame away from the pad on the side with the feet on the floor. Move it only the distance of one frame foot.

6 Slide the isolator pad over the footprint and align the edges and openings.

7 While 2 or 3 helpers tilt and hold the frame at a slight angle, slide the frame feet onto the isolator pad. While sliding, hold the pad in position by stepping on it. Align all three sets of openings: those on the frame, isolator pad, and anchor holes.

--End--

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Powering down a BIM

Power down a BIM to accommodate safe activities involving any hardware or cables that are connected to it.

Prerequisites

CAUTION
Service interruption from power interruption
Toggling off the BIP means that the Multiservice Switches cannot operate. To minimize the impact on traffic of powering down, choose a period of lowest average traffic for the affected switches.

DANGER
Risk of injury or damage by electricity
When toggling off power breakers on a breaker interface module (BIM) or in the circuit up to it, or removing a fuse from the circuit up to it, always put tape over the breaker or fuse cavity. The tape indicates it was manually toggled off, and not tripped by the system. This prevents accidental activation of the power circuit, especially if power cables are being handled.

WARNUNG
Schäden oder Verletzungen durch Elektrizität
Wenn die Leistungstrennschalter an einem Trennschalterkopplungsmodul (BIM) oder im zuführenden Stromkreis geöffnet bzw. Sicherungen aus dem Stromkreis entfernt werden, decken Sie den Trennschalter oder den Sicherungssteckplatz mit Klebeband ab. Das Klebeband signalisiert, daß er/sie manuell ausgeschaltet und nicht vom System ausgelöst wurde. Damit verhindern Sie eine versehentliche Aktivierung der Stromversorgung, besonders beim Hantieren mit Netzkabeln.

- You must be familiar with Safety considerations and best practices (page 19).
- Prepare the far-end traffic for the impact of taking one or two switches out of service.
- Toggling off the breakers in sequence protects the equipment from damage.

Procedure steps

Step	Action

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1 Locate the BIM to be powered off. Refer to the figure BIM pairs for specific shelf switches (page 537).

When powering down an entire switch, locate the mate BIM for the switch.

2 Toggle off each breaker one at a time from left to right, excluding the middle breaker. Toggle off a breaker by pressing in the O symbol.

3 When the mate BIM is also to be powered down, toggle off each breaker one at a time from left to right, excluding the middle breaker.

4 When two switches are to be powered down, repeat step 1 to step 3.

5 When the entire BIP is powered down to enable work on hardware (for example, removing a shelf assembly), wait 10 minutes for the fans to continue cooling down the unpowered circuit cards.

6 Toggle off the middle breakers one at a time from left to right. The fan blades in the cooling units take a while to slow down.

When all BIM breakers off and the input feeds are still powered to the BIP, the BIM LEDs are still lit.

7 Check the status LEDs of all plug-ins of the shelf assembly. Ensure that no LEDs are lit on:

- both CPs and all FPs at the front
- the 2 fabric cards at the rear
- the 4 PIMs at the rear of a Multiservice Switch 20000 (Multiservice Switch 15000 do not have PIM LEDs)

--End--

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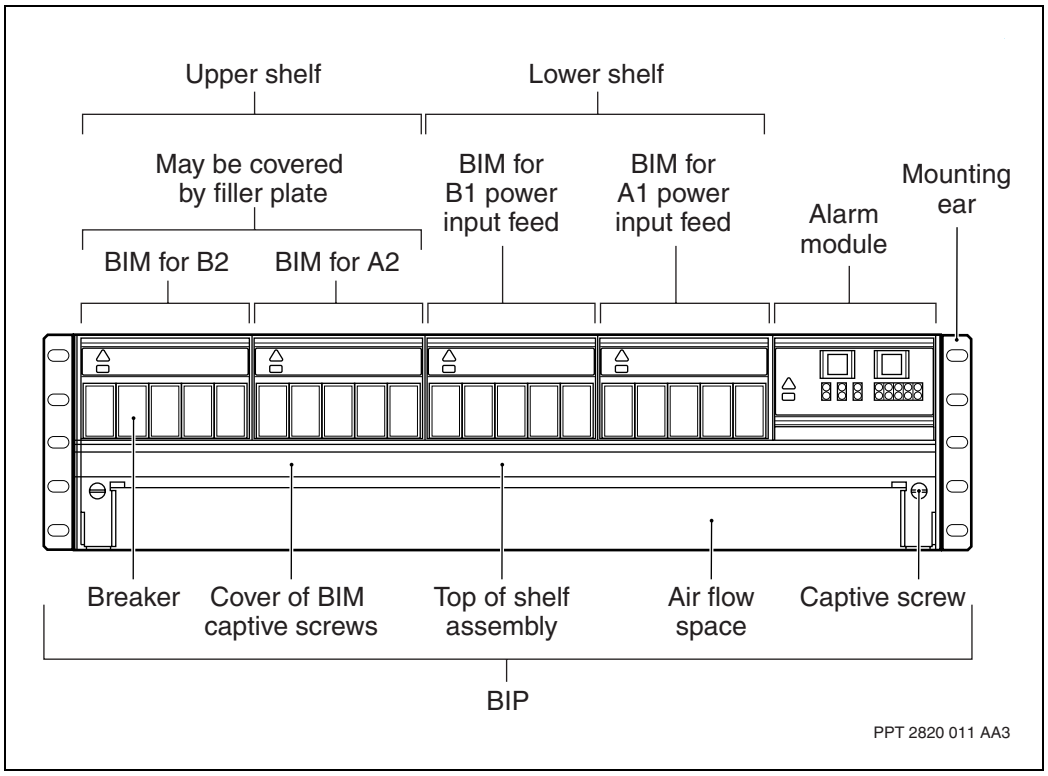
Procedure job aid

BIM pairs for specific shelf switches



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Powering up a system of ac rectifiers

Power up a system of ac rectifiers to provide power to the breaker interface panel (BIP).

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- When the source of power to the BIP is a system of ac rectifiers, follow the powering up instructions provided by the product. When the system is an Astec MFA150 power system, have Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual* available to coordinate with the following procedure.

Procedure steps

Step	Action
1	At the front of the BIP, ensure that all of the breakers are toggled off (O is pressed in).
2	At the front of the MFA150 system, ensure that all of the mid-trip circuit breakers labelled CB1 to CB4 on the front of the controller are toggled off (fully down).
3	Locate the one or two shelves of ac rectifiers. Starting from left to right, top to bottom, toggle the circuit breaker on each rectifier on (fully up). There are 3 or 5 rectifiers.
4	Locate the circuit breakers labelled CB1 to CB4 on the front of the controller (top unit). Starting from left to right, toggle the circuit breakers CB1 and CB2 on (fully up). Toggle on CB3 and CB4 if a second switch is being powered from the controller.
5	Check each rectifier to verify that: • the LED beside the label RFA on the faceplate is solid green • the fan may not activate immediately, therefore the red LED stays unlit
6	On the front of the controller, set the toggle to VOLTS. A nominal reading at startup for the switch is around -52 V. A reading below -46 V or above -59.5 indicates a problem.
7	Set the controller toggle to AMPS. With the BIP off, the reading is zero since there is no load. Otherwise, a reading of 5 amps or more indicates there is a fault with the setup.
8	Do the testing and adjustments to the system as prescribed in 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*.

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9	Trouble-shoot and replace any MFA150 hardware part that is not supplying a nominal range of power to the switch.

--End--

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Preparing the NEBS 2000 frame for installing adapter brackets

Prepare the NEBS 2000 frame to accommodate NEBS 2000 frame-to-EIA adapter brackets.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The NEBS-to-EIA adapter brackets are required to mount 19-inch wide equipment onto the 21-inch wide NEBS 2000 frame (NTRU04).

Procedure steps

Step	Action
1	When a NEBS 2000 frame has a Multiservice Switch 15000 or Multiservice Switch 20000 installed in it, cable management brackets are installed on the front of the frame uprights, on the side of the uprights near the front, or both. If any brackets are on the front surface of the frame uprights, record their location and whether their arms point frontwards or rearwards.
2	While facing the front of the switch, unfasten the pairs of thread-forming 10-mm (3/8-in.) hex-head screws of the top 3 brackets on each side of the frame.
3	Put the screws and brackets aside to be re-installed later.
4	On the front of the NEBS 2000 frame, locate the first screw hole or dimple above the mounting ear of the air-flow grill. The air-flow grill is located immediately above the cooling unit.
5	Locate any cable management brackets at the rear of the frame. Record the location and whether the arms point forwards or rearwards of any bracket in the top half of the frame.
6	Unfasten the 10-mm (3/8-in.) screws of the cable brackets on the back of the frame.
7	Put the screws and brackets aside to be re-installed later.

--End--

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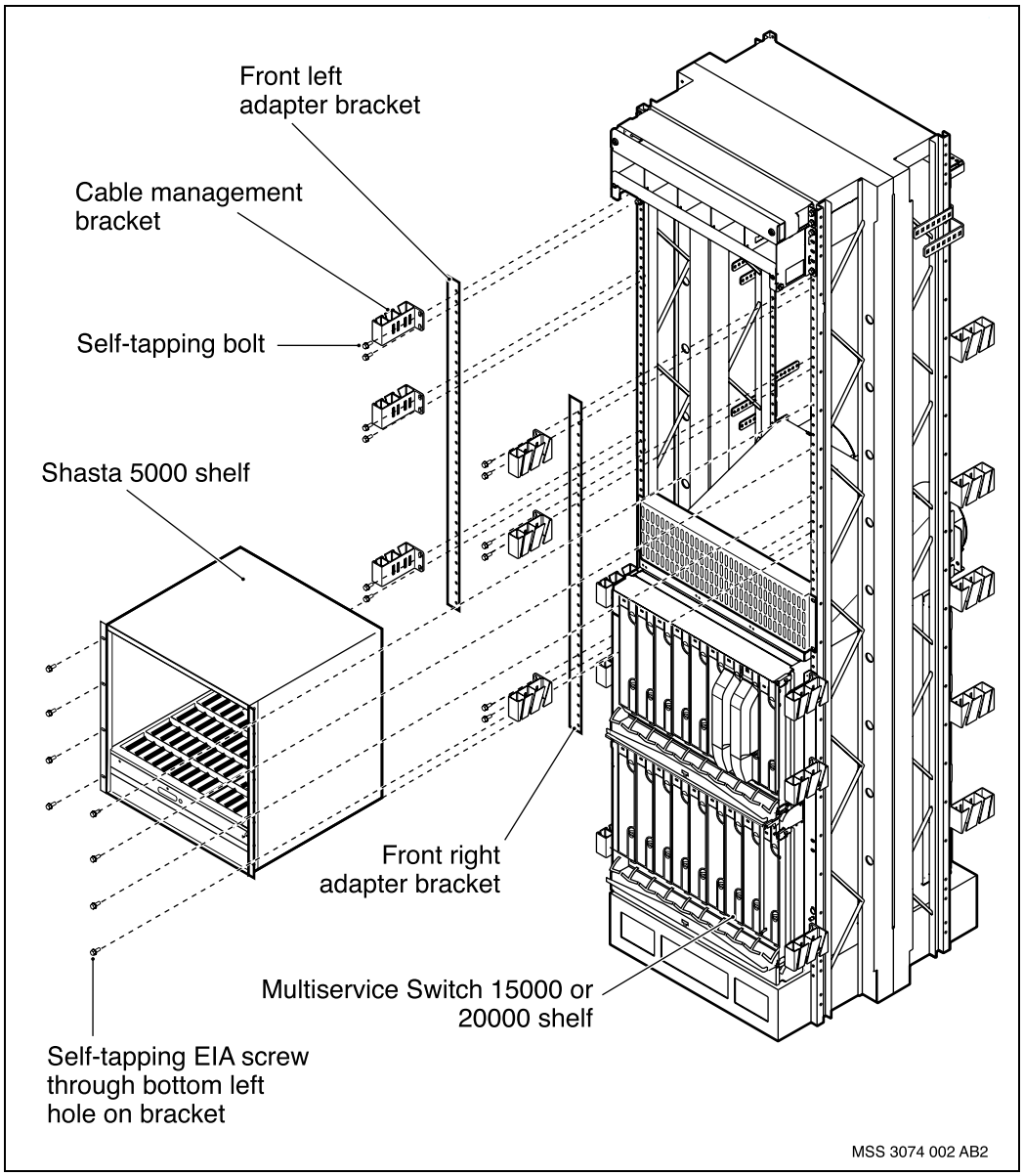
Procedure job aid

Location of shelf hardware for a SER 5500 in a NEBS 2000 frame



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Removing a BIM

Remove a BIM to replace it due to a failure or to enable safer removal of the BIP.

Prerequisites

DANGER

Risk of injury by electrocution

Each power input feed to a breaker interface module (BIM) is rated up to 100 A. Prior to removing a BIM, power to the BIM must be toggled off for the last leg of site power up to the BIM, and all breakers on the BIM must be toggled off (the O is pressed in).

WARNUNG

Lebensgefahr

Die Speisestromzuführungen zu jedem Trennschalterkopplungsmodul (BIM) sind für bis zu 100 A ausgelegt. Bevor ein BIM ausgebaut wird, muß unbedingt die gesamte Stromversorgung für das BIM abgeschaltet werden und sämtliche Trennschalter auf dem BIM müssen ausgelöst werden (O ist gedrückt).

- You must be familiar with Safety considerations and best practices (page 19).
- Removing a BIP BIM causes hardware parts in the switch to lose their backup power when its mate BIM remains powered. While one BIM of a pair is disengaged, the software reports major alarms for the shelf and cooling unit powered by that BIM. The label on the back of the cover of the captive screws indicates which parts of the shelf assembly are powered by each breaker of each BIM.

Procedure steps

Step	Action
1	At the front of the BIP, unfasten the slotted captive screws of the BIP screw cover (do not use power tools), as indicated in the figure Locations of modules in a BIP (page 544).
2	Swing the cover downward.
3	Identify which of the 4 BIMs is to be removed. A failed BIM shows a red LED.
4	On the BIM, toggle off all of the breakers one at a time, by pushing in the O symbol.
5	Manually unfasten the large slotted captive screw of the BIM.

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DANGER

Risk of injury by electrocution

When a breaker interface module (BIM) is unseated, regardless of whether the breakers are toggled on or off, the capacitors inside a BIM need time to discharge. Wait 15 seconds before re-seating the BIM or removing it from the breaker interface panel (BIP). Otherwise, damage to the BIM can occur.

WARNUNG

Lebensgefahr

Wenn ein Trennschalterkopplungsmodul (BIM) ausgebaut wird, unabhängig von der Stellung der Trenn- oder Hauptschalter, benötigen die Kondensatoren im BIM Zeit zur Entladung. Warten Sie 15 Sekunden, bevor Sie das BIM wieder einsetzen oder vom BIP trennen. Andernfalls kann das BIM beschädigt werden.

6 Pinching the lower front lip of the module between your thumb and finger tips, pull straight out, gently but firmly, until you feel it disengage. Stop pulling when the front of the module is past the front of the BIP.

7 Leave the module disengaged for 15 seconds before removing it from the BIP. This safely allows the inside power capacitors to discharge. The BIM LED remains red until the capacitors have discharged.

8 If you are removing BIMs in preparation to removing the BIP, repeat step 4 to step 7 for the remaining three BIMs.

Remember which BIM goes into which opening.

9 If you are upgrading a pair of BIMs, repeat step 4 to step 7 for the mate BIM. For example, BIMs A2 and B2 are mates shown in the figure Locations of modules in a BIP (page 544).

--End--

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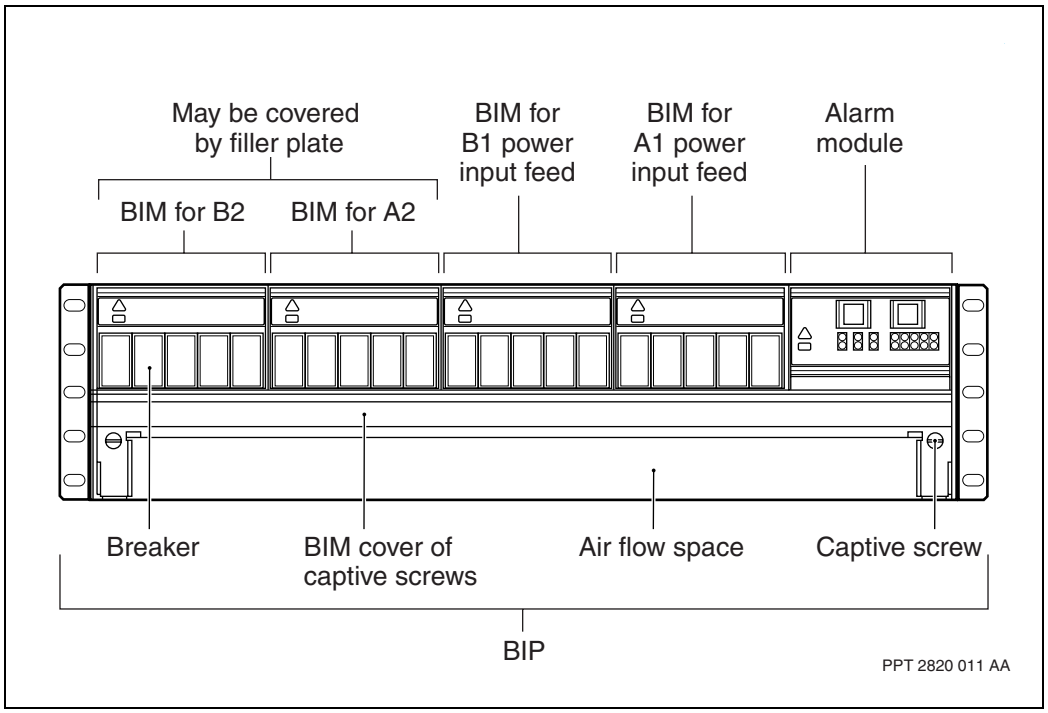
Procedure job aid

Locations of modules in a BIP



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Removing a BIP

Remove a BIP to replace it due to a failure or to upgrade a NEBS 2000 frame containing a Multiservice Switch 15000 to accommodate a Multiservice Switch 20000.

Prerequisites

CAUTION
Risk of equipment damage from dropping
The various BIPs weigh up to about 16 kg (36 lbs). The weight of a free-falling BIP can damage it. As the mounting screws of the BIP are being unfastened, do not allow the BIP to drop onto the shelf assembly.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a helper to support the BIP while it is unfastened.

Procedure steps

Step	Action
1	At the front of the BIP, close the cover of the BIM captive screws by engaging the 2 slotted captive screws.
2	If the two studs at the rear lower right of the BIP chassis have a cable fastened to them, unfasten the number 10-32 unc nuts. (It is a secondary ground bonding point.) Disconnect the cable and put the nuts back on the studs.
3	Unfasten the 4 thread-forming 10-mm (3/8-in.) hex-head screws that hold the mounting ears against the frame uprights or adapter brackets. Put the screws aside for re-use. While the mounting screws are being unfastened, have a helper be ready to hold the BIP. After you begin to loosen the top screws, the rear of the BIP starts to sag downwards on to the top of the shelf assembly.
4	Remove the BIP by sliding it out the front of the frame or rack.

--End--

Procedure job aid

For the location of the mounting screws, refer to the figure Locations of modules in a BIP (page 544).

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Removing a BIP alarm module

Remove a BIP alarm module to replace it due to a failure or to enable safe removal of the BIP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- While the module is removed, the reporting of alarms to the CP is temporarily suspended.
- The module is located at the front right side of the BIP. See Location of a BIP alarm module (page 547)

Procedure steps

Step	Action
1	At the front of the BIP, unfasten the slotted captive screws of the BIP screw cover. The screws are shown in the figure Locations of modules in a BIP (page 544).
2	Swing the cover downwards.
3	Unfasten the large captive screw of the BIP alarm module.
4	Pinching the lower front lip of the module between your thumb and finger tips, pull straight out, gently but firmly, until you feel it disengage. Stop pulling when the front of the module is past the front of the BIP.
5	Pull the module straight out of the BIP.

--End--

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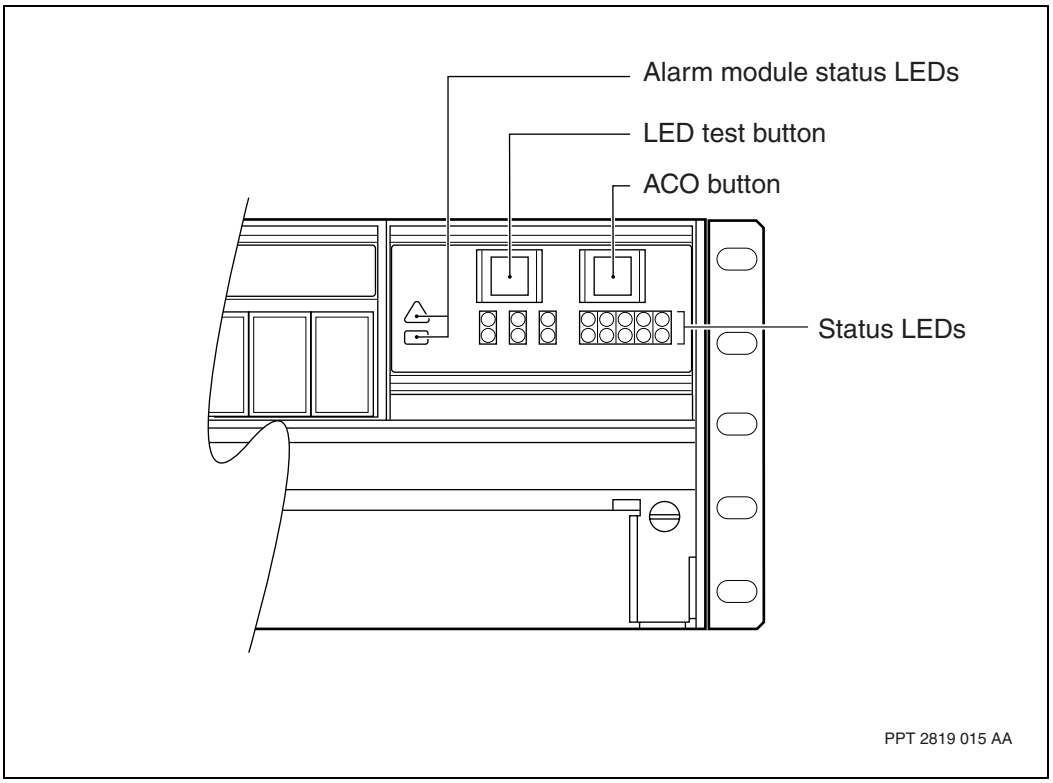
Procedure job aid

Location of a BIP alarm module



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Removing a BITS cable

Remove an alarm/BITS cable to complete a cable replacement.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The timing port must be locked for the cable you are about to remove.

Procedure steps

Step	Action
1	At the rear of the frame, locate the alarm/BITS module. See the figure • Location of alarm/BITS module and cable connections for a Multiservice Switch 15000 (page 549) • Location of alarm/BITS module and cable connections for a Multiservice Switch 20000 (page 550)
2	Record which cable connects to which J number. Label them if they are not already labeled.
3	Unfasten and remove the D-sub cable connectors. Unplugging the cable (at either end) generates software alarms for the cooling unit and high temperature. This is normal during a replacement. Examples of some of the generated alarms include: • SET major equipment equipmentFailure • ADMIN: unlocked OPER: enabled USAGE: active • AVAIL: PROC: CNTRL: • ALARM: STBY: notSet UNKNW: false • Id: 010000EF Rel: Lp/0 • Com: The hardware reports a fan failure. • Int: 1/0/2/24083; pcsShelfMgr.cc; 722; PCR2.3.73 • SET warning equipment equipmentFailure • ADMIN: unlocked OPER: enabled USAGE: active • AVAIL: PROC: CNTRL: • ALARM: STBY: notSet UNKNW: false • Id: 010000F0 Rel: Lp/0 • Com: The cooling unit exhaust air temperature exceeds the specific range. • Int: 1/0/2/24083; pcsShelfMgr.cc; 722; PCR2.3.73

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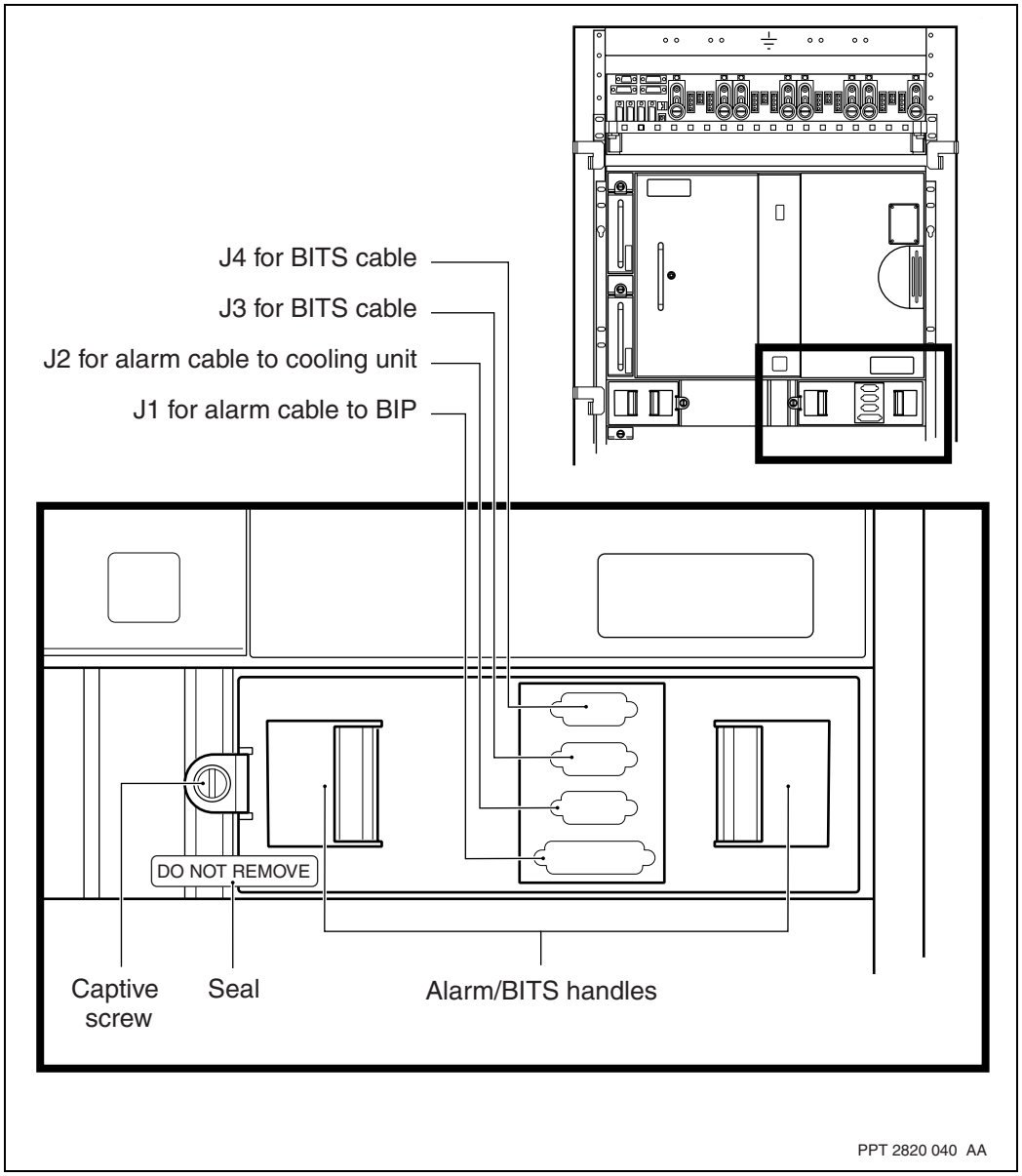
--End--

Procedure job aid

Location of alarm/BITS module and cable connections for a Multiservice Switch 15000



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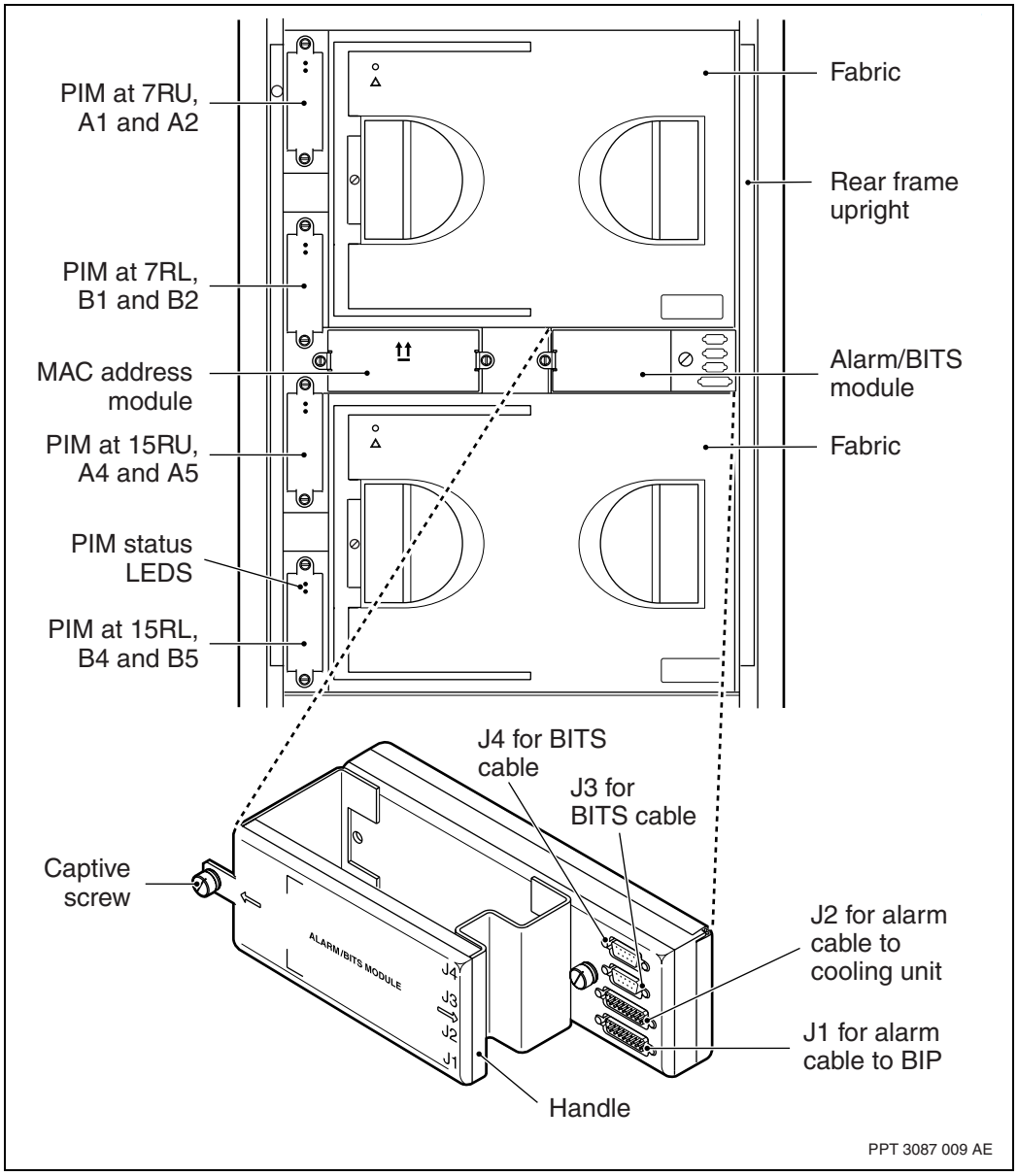
Location of alarm/BITS module and cable connections for a Multiservice Switch 20000



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Removing a blank processor card

Remove a blank processor card to replace it with an FP or CP.

Prerequisites

CAUTION
Risk of service degradation or equipment damage
Always have a blank processor card (labeled BLANK) in a slot that does not house another card. The blank cards enable efficient performance of the fans for temperature control and also facilitate fire protection and EMI containment.

- You must be familiar with Safety considerations and best practices (page 19).
- A blank processor card has PEC NTHR64 and is labeled with BLANK on the faceplate.

Procedure steps

Step	Action
1	At the front of the switch, locate the blank card to be removed. See the figure Locations of FPs (page 634). Blank cards are labeled BLANK.
2	On the faceplate of the blank card, fully swing out the upper and lower latches until they stop. See the figure Fully opened card latches (page 635).
3	Place fingers on the exposed tabs and gently, but firmly, pull the card out of its slot.
4	Put the card aside into the spare anti-ESD package and pack it later.
5	Store any removed blank card for re-use in another slot. No slot in a switch is to remain empty for more than a few minutes while the switch is powered up, especially if it is operating at full service.

--End--

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Removing a brandline cover from a top frame bracket

Remove a brandline cover from a NEBS 2000 frame bracket, at the front or rear of a frame, to upgrade it to an illuminated brandline cover as part of enclosing the frame with doors.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need these tools:
  - a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - a driver to unfasten the medium slotted captive screws of the cover as shown in the figure Types of screws used with frame enclosure hardware (page 74)

Procedure steps

Step	Action
1	Locate the brandline cover on the frame as shown in the figure Locations of installed brandline covers and top frame brackets (page 553).
2	While holding the brandline cover, unfasten the 2 captive screws that are shown in the figure An illuminated brandline cover and mounting brackets P0995495 without door hardware (page 554). A 1/4 turn counter-clockwise disengages each screw.
3	Put the cover aside for re-use with another NEBS 2000 frame, or the rear of the same frame.

--End--

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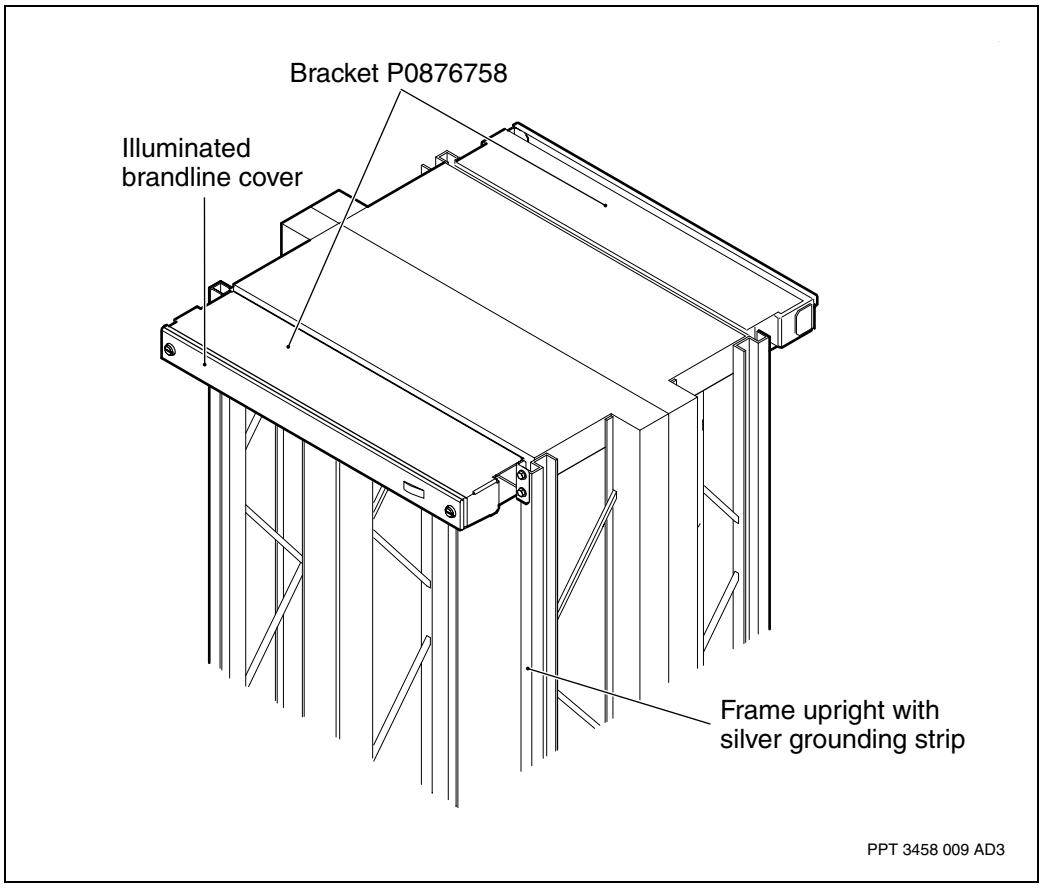
Procedure job aid

Locations of installed brandline covers and top frame brackets



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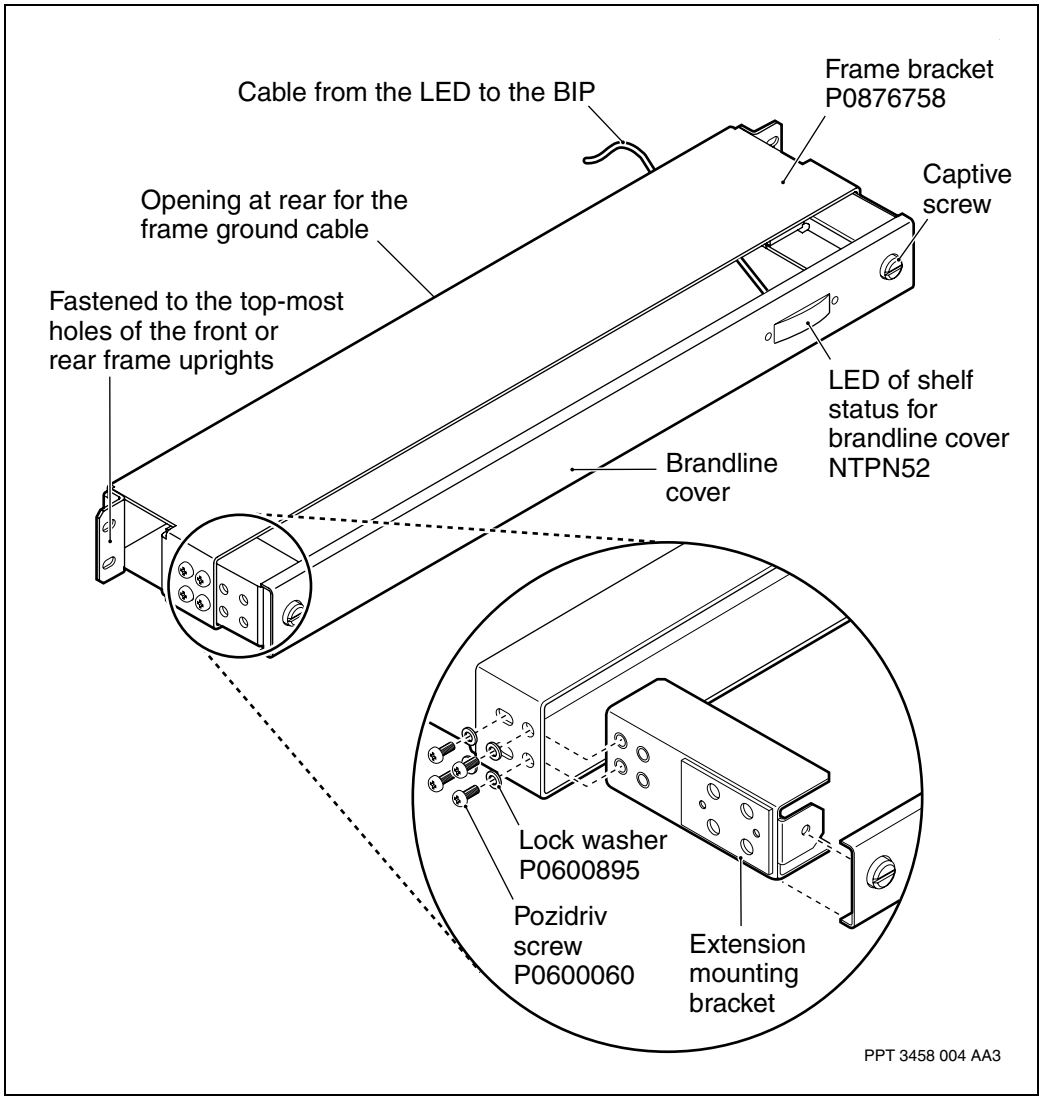
An illuminated brandline cover and mounting brackets P0995495 without door hardware



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Removing a brandline cover, illuminated, from a top frame bracket

Remove a top cover from a NEBS 2000 frame bracket at the front or rear of a frame to upgrade it as part of enclosing the frame with doors or to re-deploy the enclosure hardware.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need these tools:
  - — a step ladder to access the top of the 212.5 cm (7-ft.) NEBS 2000 frame
  - — a screwdriver with a very large slotted bit to unfasten the captive screws of the cover
  - — for a top cover NTPN52 or NTPN53 with a LED, a flashlight to see the power connection at the rear of the BIP

Procedure steps

Step	Action
1	With an NTPN52 or NTPN53, at the rear of the BIP disconnect the cable NTHW66 at J2.
2	Route the cable to the other side of the frame and let it hang free, over the front of the top cover. Refer to the figures • Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame (page 556) • Path of the LED cable NTHW66 passing through the bottom of the top frame bracket (page 557)
3	While holding the top cover, unfasten the 2 captive screws that are shown in the figure Top cover and mounting brackets (page 558).
4	When the cover has the NTHW66, ravel the cable gently around the cover for storage until it is redeployed.

--End--

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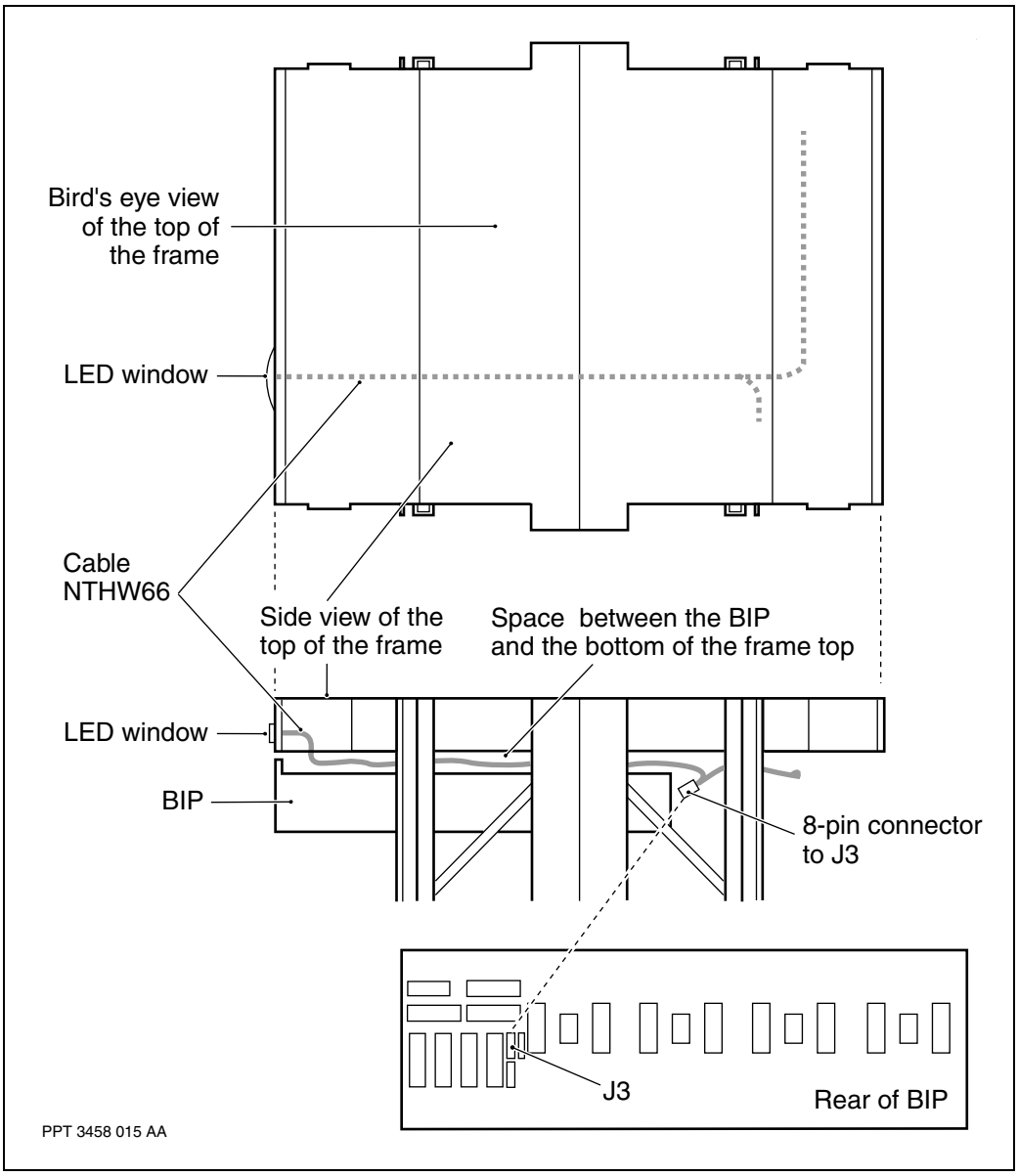
Procedure job aid

Paths of the LED cable NTHW66 to the front and rear of a NEBS 2000 frame



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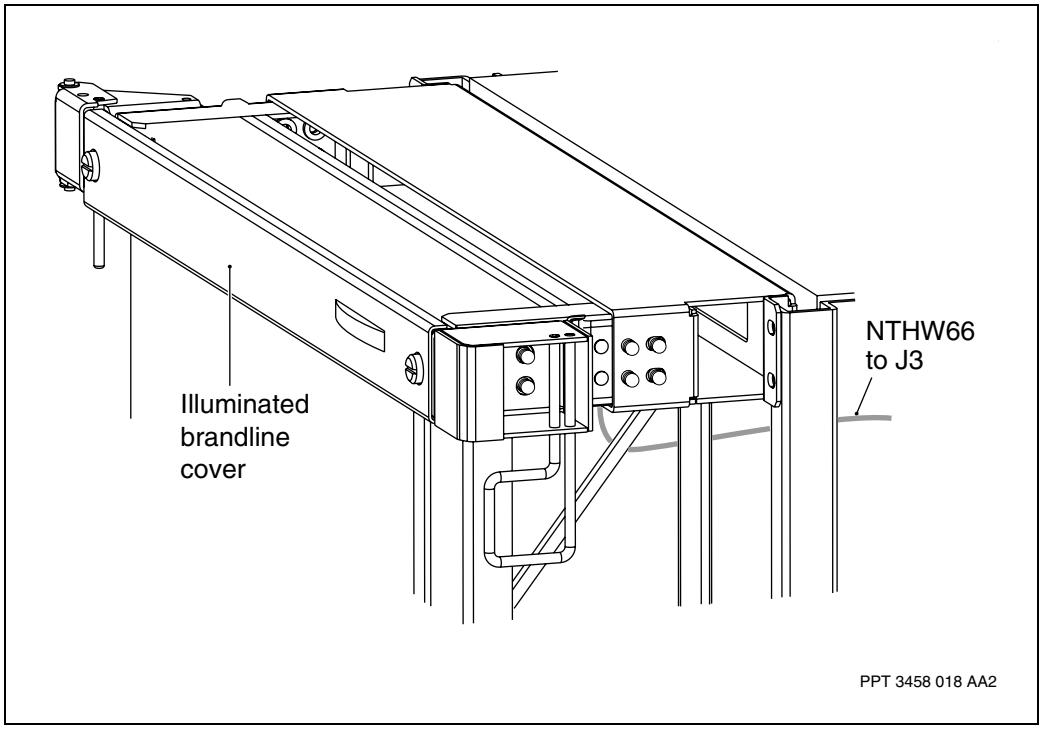
Path of the LED cable NTHW66 passing through the bottom of the top frame bracket



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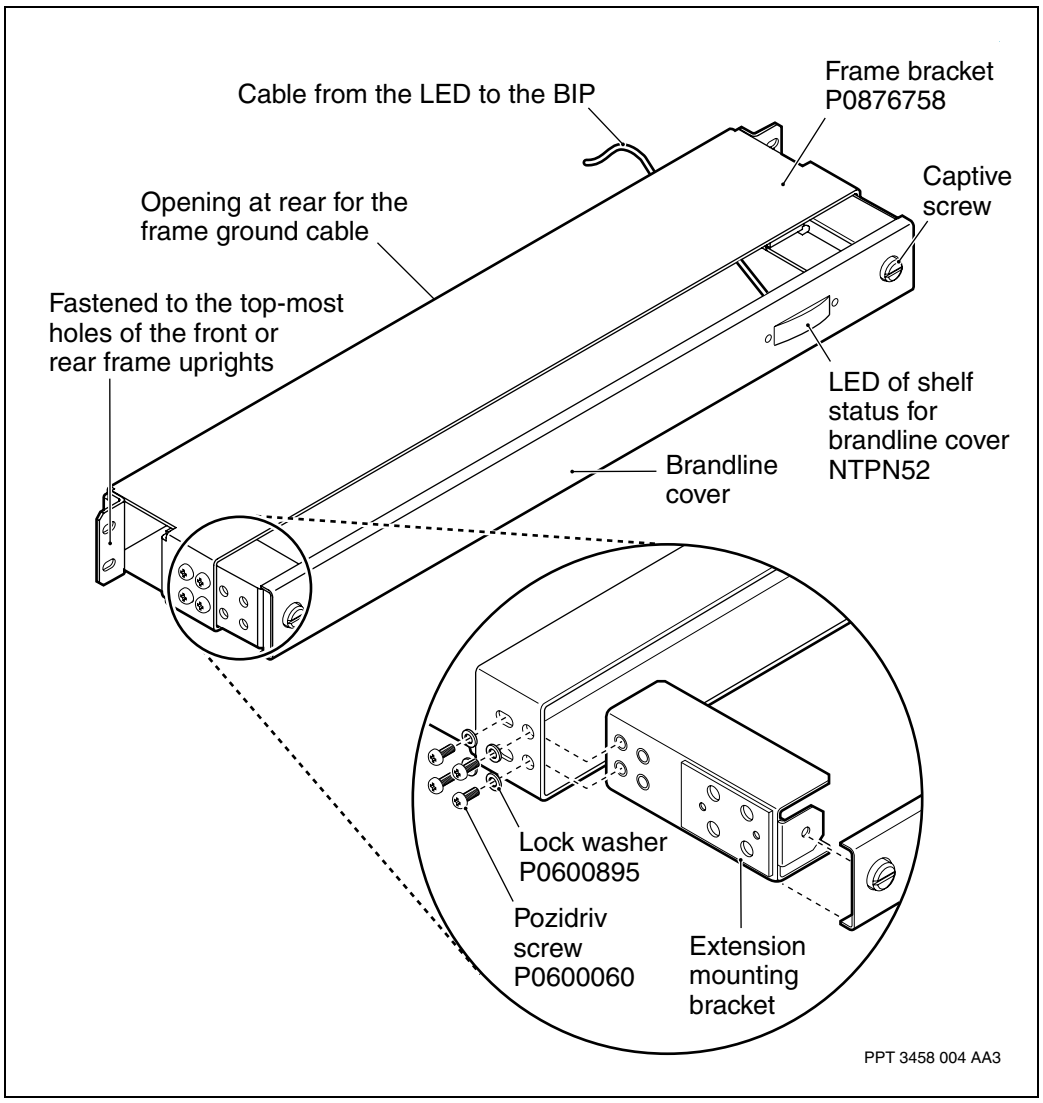
Top cover and mounting brackets



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Removing a CP

Remove a CP from a switch to replace it or upgrade it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- When upgrading (or downgrading) CP2 and CP3 card pairs, ensure that you have followed the criteria identified in NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.

Procedure steps

Step	Action
1	At the front of the switch, locate the CP to be removed. The slot numbers are labeled on the shelf below the cards.
2	To ensure that proper connection of cables at the faceplate, verify that each cable has a label matching the faceplate receptacle label or that its connector is a unique size and shape for that its receptacle. If a label is missing, add it.

CAUTION
Risk of shelf reset by disconnecting an active cable
If the Ethernet cable is disconnected from the active CP, the shelf undergoes a switchover to the spare if the mate is in-service. The status LED of an active CP is solid green. Only one CP can be active.

3	Wait in readiness until the software operator confirms that the CP is offline, that is, out of service and ready to be replaced. The CP LED indicates solid red for only a few seconds. While the LED is solid red, unseat the CP by fully swinging out the upper and lower card latches until they stop horizontally, then pull the card at the faceplate to remove it about 10 cm (4 in.). After a few seconds of being offline, the CP is automatically reloaded. The LED changes from solid red to flashing red to indicate loading has begun. If reloading begins, do not remove the CP. You must wait until loading completes. Otherwise, traffic on other hardware parts such as a fabric card or an active CP can be degraded or dropped by the subsequent steps.
4	While the CP is unseated, carefully unplug the cable connectors on the faceplate of the CP, and let them hang aside. Avoid touching any part of the card behind the faceplate.
5	On the faceplate of the card, fully swing out the upper and lower latches until they stop. See the figure Fully opened card latches (page 635).

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6 Place fingers on the exposed tabs to gently, but firmly, pull the CP out of its slot. Hold only the edges of the CP. Be careful because a CP weighs about 5 kg (11 lbs).

7 Put the CP aside onto its original packaging. Packing it after the replacement CP is installed minimizes the amount of time the CP is out of service.

--End--

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Removing a door

Remove a door from a NEBS 2000 frame to access equipment inside the frame or as part of re-deploying door hardware.

Prerequisites

WARNING

Risk of injury or equipment damage by dropping a door

The size and weight of a door can make it awkward for one person to handle it safely while attempting to install or remove it. Dropping a door can injure a head or a foot, can damage whatever it hits, or be damaged on impact. Have a helper assist handling the 18 kg (40 lbs) door.

CAUTION

Verletzungsgefahr oder Geräteschäden durch Fall einer Tür

Aufgrund der Größe und des Gewichts der Türen sollte die Installation oder das Entfernen einer Tür stets von mindestens 2 Personen durchgeführt werden. Das Fallenlassen oder die unsachgemäße Handhabung der 18 kg schweren Tür kann zu Kopf- und Fußverletzungen, Verletzung anderer Personen sowie Sachbeschädigung oder Beschädigung der Tür selbst führen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a pair of pliers to pull or pry apart a slide-on door cable connector.
- The location of an open door is shown in the figure Orientation of a door with frame enclosure hardware (page 563).

Procedure steps

Step	Action
1	Unlock the door by turning the key to the left as shown in the figure A lockable vented door NTRU0423, outside view (page 565) and open it as the arrows indicate.
2	Using the figure A lockable vented door NTRU0423, inside view (page 564), locate the door-to-frame ground cable.
3	Disconnect the ground cable by prying its end off of the spade on the door. Avoid bending the spade or the neck of the cable connector.
4	Using the figure A lockable vented door NTRU0423, inside view (page 564), locate the return spring on the upper hinge pin.

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5 While still holding the door, compress the door pin spring downwards until the tip of the pin passes the edge of the door.

6 Tilt the top of the door away from the frame until the hinge pin clears the hole.

7 Release the hinge pin.

8 Raise the door off the lower hinge pin.

9 Lie the door on a side temporarily out of your way where it will not be a safety hazard. The rounded edge of the door means it can more easily slide to the floor.

--End--

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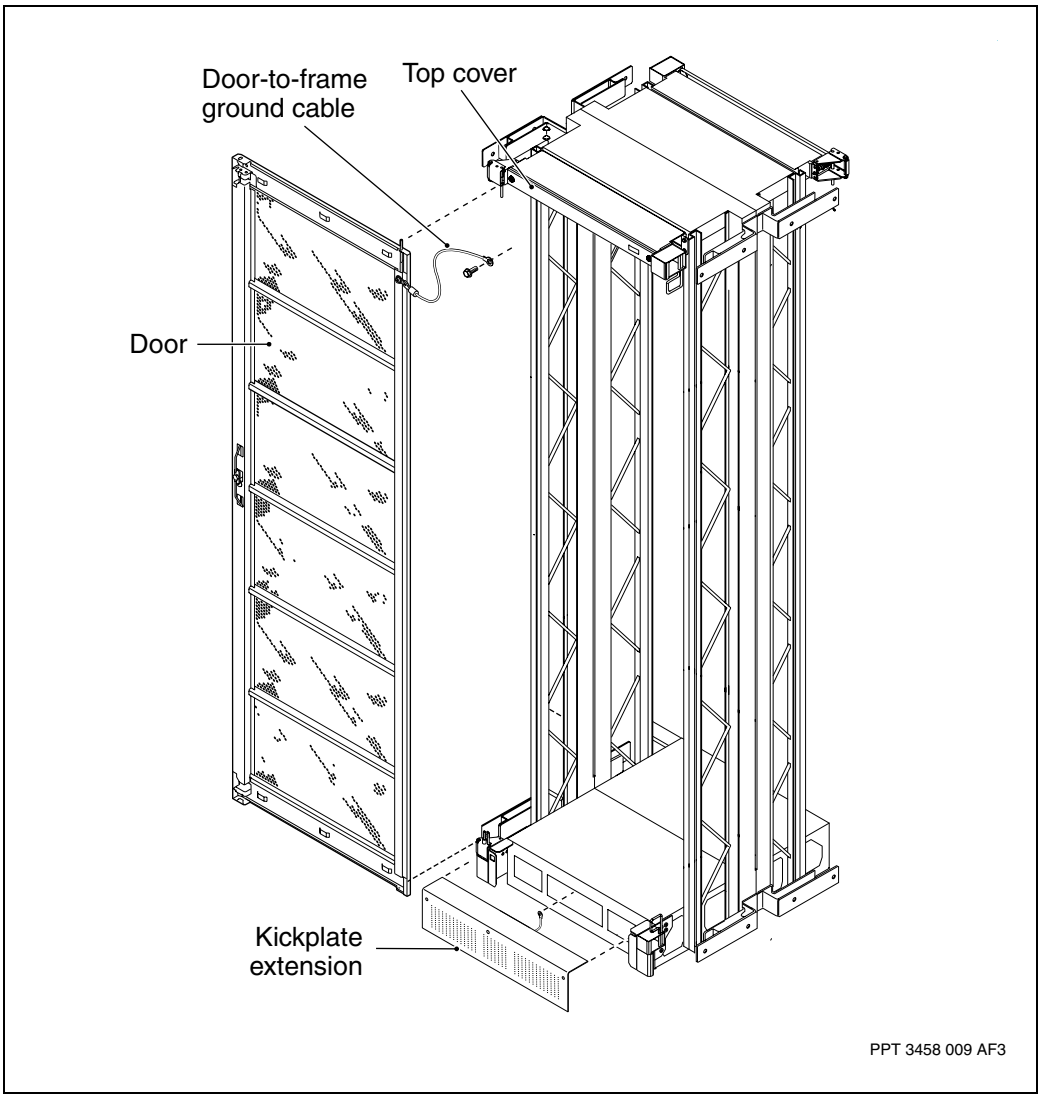
Procedure job aid

Orientation of a door with frame enclosure hardware



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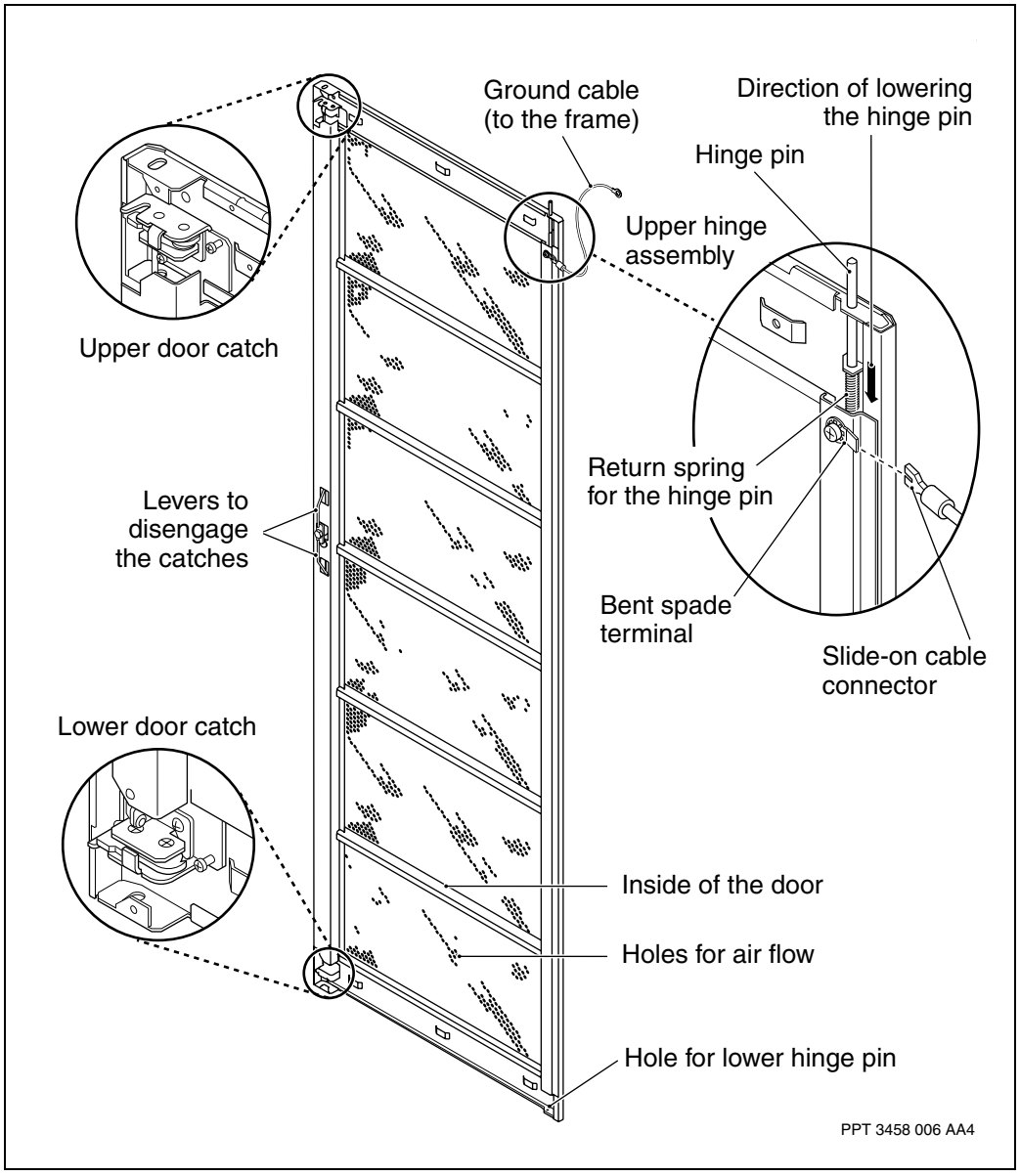
A lockable vented door NTRU0423, inside view



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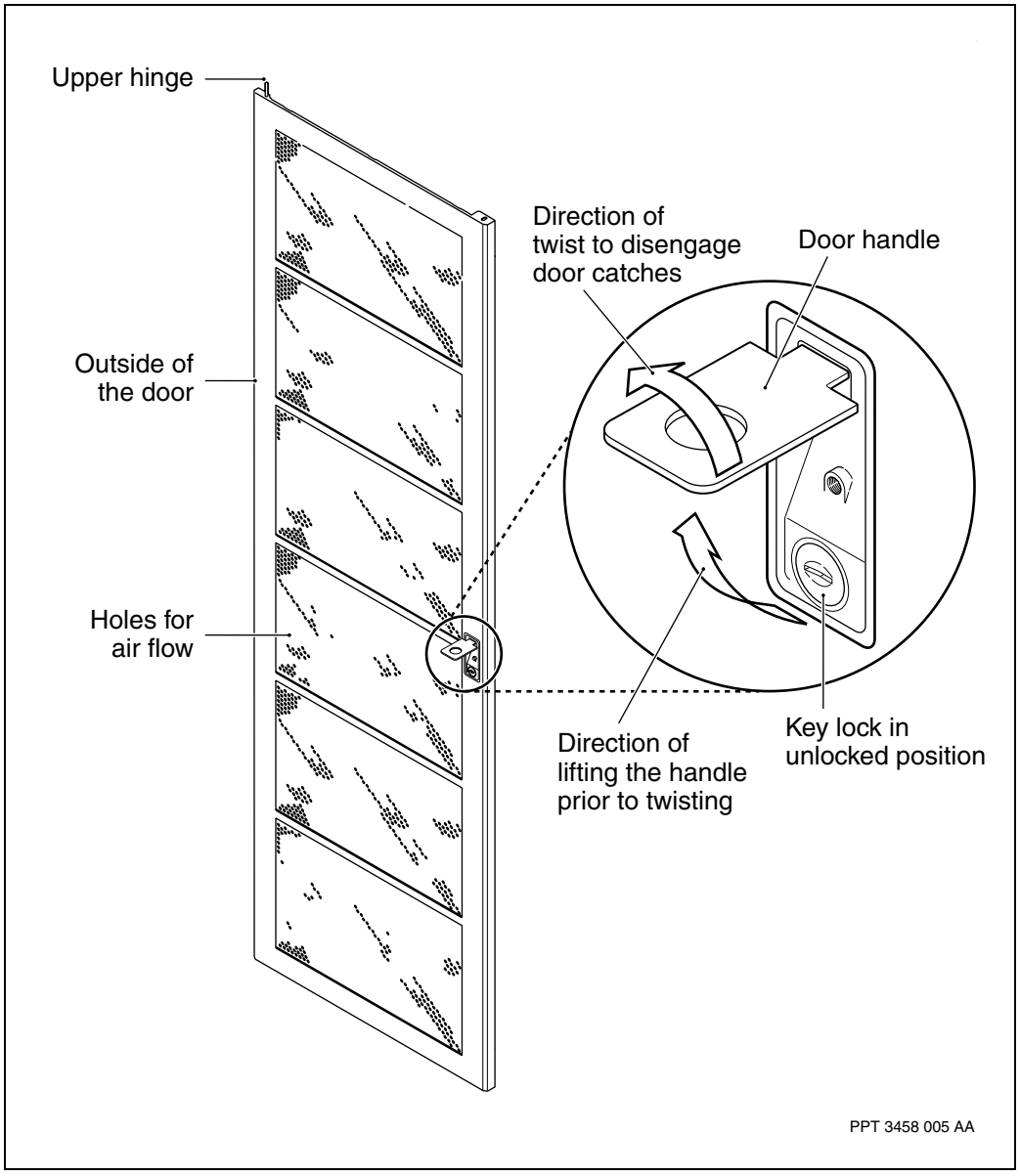
A lockable vented door NTRU0423, outside view



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Removing a fabric card from a Multiservice Switch 15000

Remove a fabric card from the rear of a Multiservice Switch 15000 to replace it due to failure, an upgrade, or to assist in replacing an alarm/BITS module.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Unfasten the Phillips captive screw beside the fabric lever.
2	Put one hand into the fabric card handle and the other hand on the card lever.
3	Start removing the card by gently pulling the lever toward you. Pulling the lever opens the casing and unseats the card. The uneven tension on the lever is normal.
4	Stop at full extension of the lever. Keep holding the fabric card in position. A fabric card is surprisingly heavy.
5	Gently slide the 2 hinge pegs together out of the upper and lower middle hinge grooves until the fabric is completely disengaged. Unseating the fabric uncompresses the EMI gaskets on the rear perimeter of a fabric. The NTHR16DA and EA versions of the fabric have slightly stiffer gaskets than earlier versions.
6	Pack the fabric card in its original anti-ESD protection packaging.

--End--

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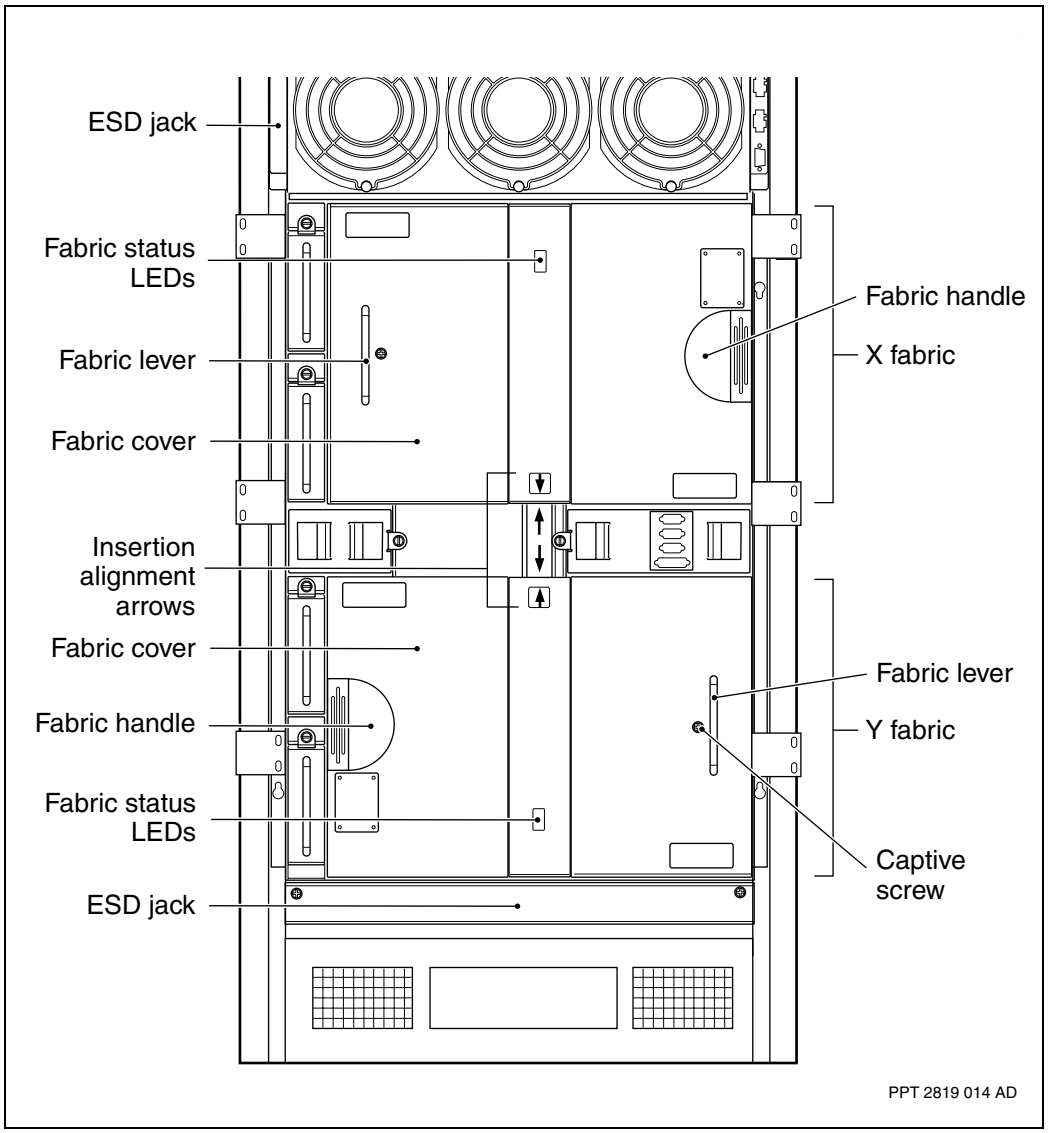
Procedure job aid

Physical characteristics of a Multiservice Switch 15000 fabric card, covers closed



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Removing a fabric card from a Multiservice Switch 20000

Remove a fabric card from the rear of a Multiservice Switch 20000 to replace it because of a failure or an upgrade.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Have two protection covers for the fabric card connectors present. You should find them in the original packaging of the card. If the card was shipped in the transportation position, use the protection covers from the replacement fabric card.

Procedure steps

Step	Action
1	Unfasten the Phillips captive screw on the fabric card lever. As the screw is unfastened, the fabric card reset button is released, which slightly pushes out the lever, and the card LED turns solid red unless it is not already solid red.
2	Put one hand on the fabric card handle and the other hand on the card lever.
3	Start removing the card by gently pulling the lever toward you. Pulling the lever opens the casing and unseats the fabric card. The uneven tension on the lever is normal.
4	Stop at full extension of the lever. Keep holding the card in position. Its weight may surprise you.
5	Gently slide the hinge pins together out of the 2 upper and 2 lower middle hinge grooves until the fabric is completely disengaged.
6	Pack the fabric card in anti-ESD protection packaging. A shipped-in-place fabric card has no packaging, so use whatever can protect the card.

--End--

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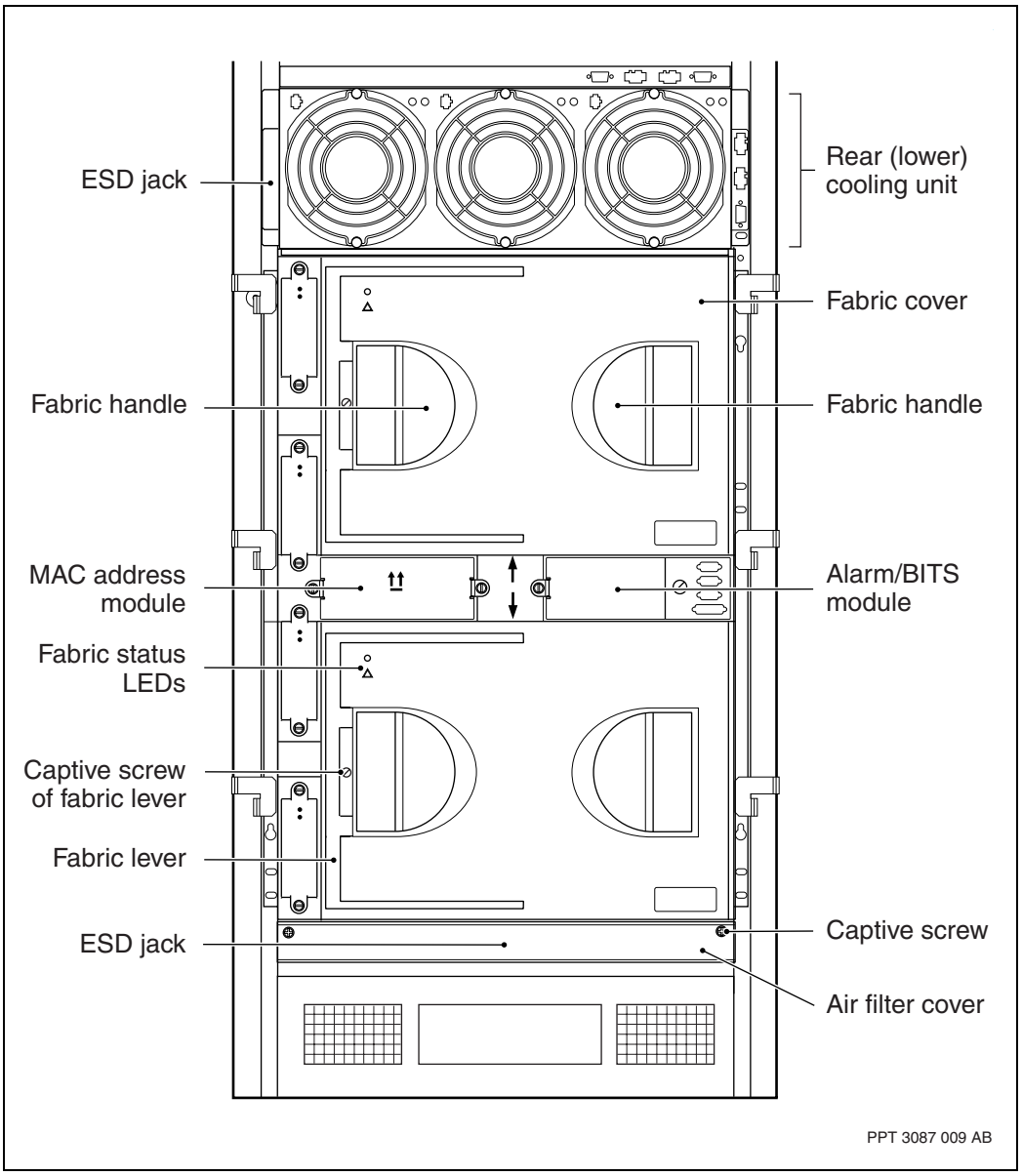
Procedure job aid

Physical characteristics of a Multiservice Switch 20000 fabric card, covers closed



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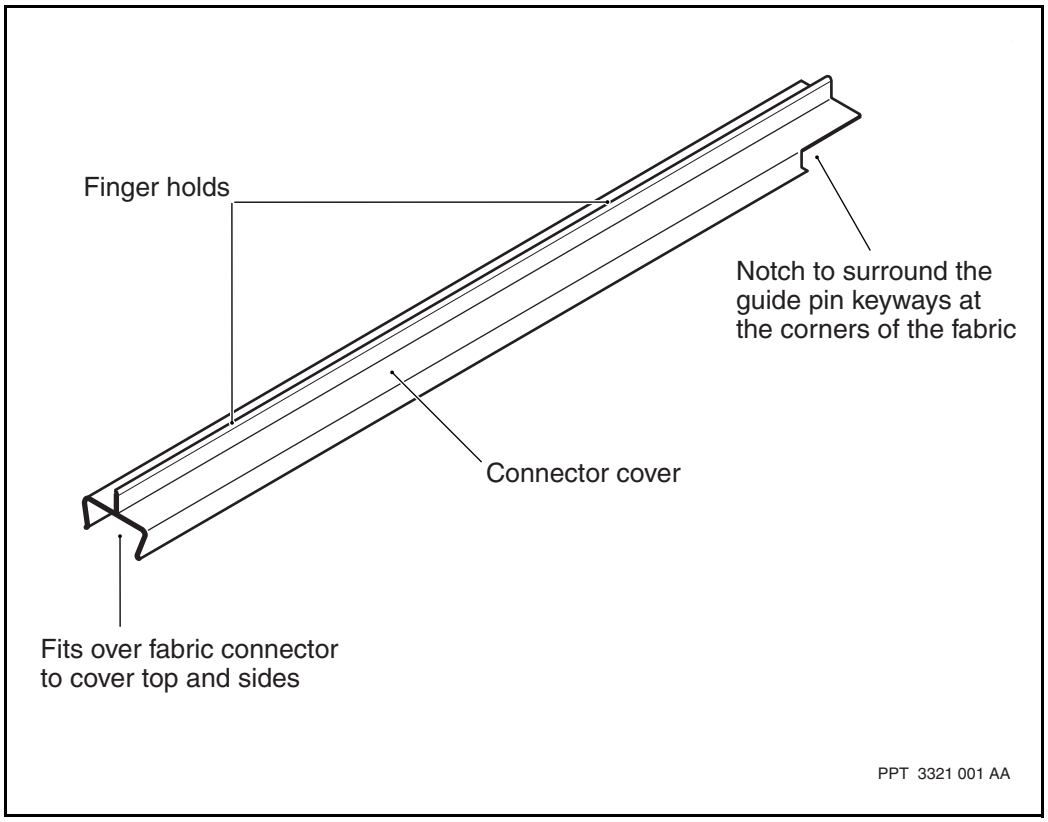
A protection cover for the fabric card backplane connectors



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Removing a fan

Remove a fan to replace it if it fails, or to gain access to the cooling unit assembly for replacing the fan controller or the temperature sensors.

Prerequisites

DANGER

Risk of electrocution from a fan cable

When replacing a fan or a fan controller, the first task is to unplug the appropriate power cable connector at the left labelled F1, F2, or F3. Temporarily loosely tie it aside and tape over the end. Remember the cable still has power.

WARNUNG

Verletzungsgefahr durch Lüfterkabel

Beim Austauschen von Lüftern oder Lüftersteuerungen muß immer zuerst die Stromversorgungsleitung der Lüfterbaugruppe abgezogen werden. Der Anschluß befindet sich auf der linken Seite und ist mit F1, F2 oder F3 beschriftet. Binden Sie das Kabel vorübergehend zur Seite, damit es nicht im Weg hängt. Denken Sie daran, daß das Kabel noch Spannung führt.

- You must be familiar with Safety considerations and best practices (page 19).
- For any version of a fan, you need a driver for the 4-mm (11/64-in.) hex-head screws that fasten the fan and its grill to the cooling unit. The screws are 65-mm long for an A0758423 in an NTHR51AA or an NTHR52AA. The screws are 60-mm long for an A0522179 or an A0522182 in an NTHR51AB or an NTHR52AB.
- You need a flashlight and a hand-mirror to clearly see a fuse inside the cooling unit on the fan controller.
- The cause of a fan failure can be a blown fuse on the fan controller module. The fuse on an NTHR10AA is a 4-amp fast-acting surface-mount technology (SMT) device, while an NTHR10AB has a 5-amp fast-acting SMT device. The fuse is soldered to the circuit board and is not resettable. The fuse's in-rush circuit has an electronic over-current protection which prevents the fuse from blowing under normal operation or limited-duration short circuits. The fuse will blow only under unusual electrical circumstances.
- For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

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Procedure steps

Step	Action
1	Locate the fan with a lit red LED, which indicates the fan is out of service. The lower (front) cooling unit also has duplicate LEDs for the upper (rear) cooling unit, as shown in the figure Location and orientation of the fans on an upper (front) or lower (rear) cooling unit (page 573). If more than one is lit red, give priority to any on the lower (rear) cooling unit. The fan closest to the lit red LED is the one to be replaced.
2	Unplug the power cable to the fan. A power cable connection is labeled F1, F2, or F3. When the cable is unplugged: • the red LED turns on (may already be on) and the green LED turns off • software alarm 7012 0051 is generated to indicate a fan failure • the BIP alarm module indicates a minor cooling unit alarm • the remaining 2 fans increase rpm speed to compensate an out-of-service fan unless they have already done so due to a fan or fan controller failure
3	Watch for the fan blades to stop. When the fan blades stop, put tape on a blade to temporarily fasten it securely to the shroud. Otherwise, the blades will automatically reverse direction and spin freely because of the airflow from the other fans. Injury or damage can occur when removing free-spinning fan blades. The direction of blade rotation is opposite for front and rear fans. The direction under power is indicated on the top outside lip of each fan shroud.
4	At the front of the fan, unfasten the two M4 hex-head screws at the sides. Put the screws and the finger guard grill aside for re-use.
5	Grip the outside of the fan shroud, and using firmly even force, pull the fan assembly straight out of the cooling unit. Put the fan aside.
6	While looking into the opening where the fan was removed, on the fan controller NTHR10 behind and below or above the opening, check the fuse for evidence of blackening. Refer to the figure Location of the fuse on fan controller NTHR10AA (page 574). You may need a flashlight and a hand mirror to see the fuse clearly. • If the fuse is blown, the controller is the cause of the apparent fan failure. Do the task Fan controller replacement (page 55) and then put the same fan back in place. • If the fuse is not blown, the fan has failed. Continue replacing the fan.
7	Unless your Multiservice Switch is still covered by a replacement warranty for hardware, a failed fan is not returned to Nortel Networks.

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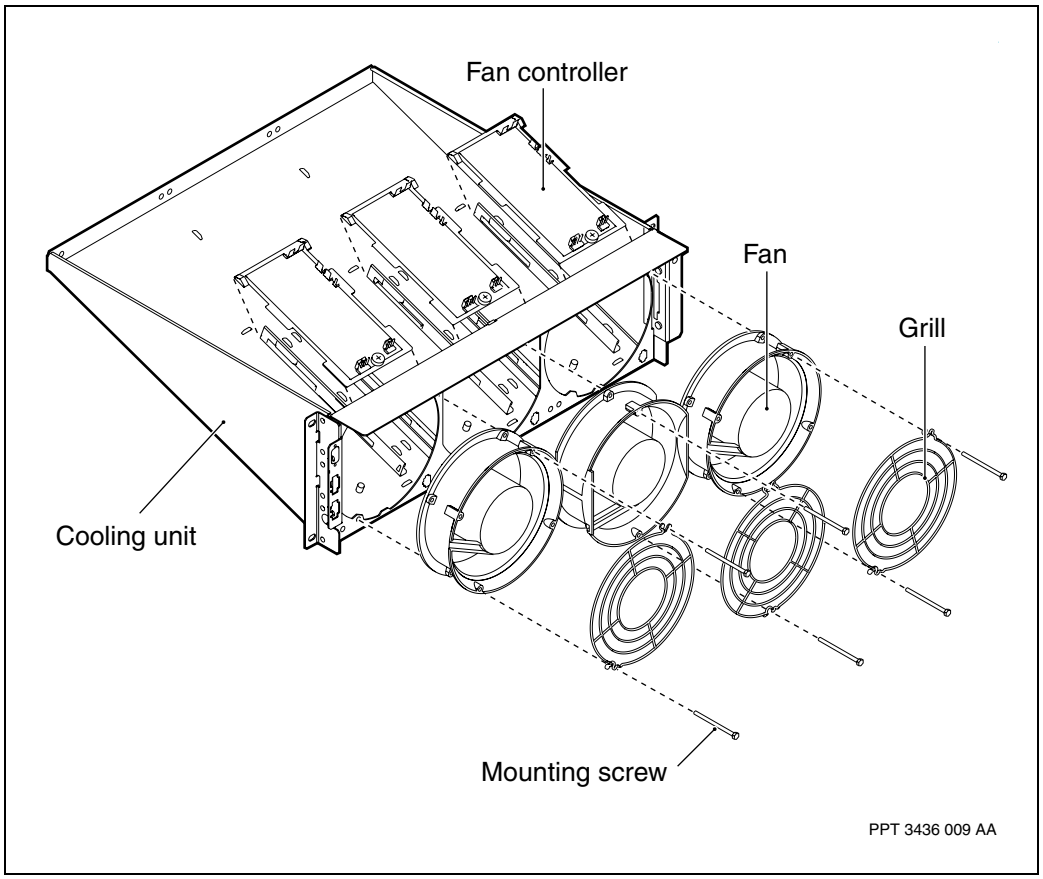
--End--

Procedure job aid

Location and orientation of the fans on an upper (front) or lower (rear) cooling unit



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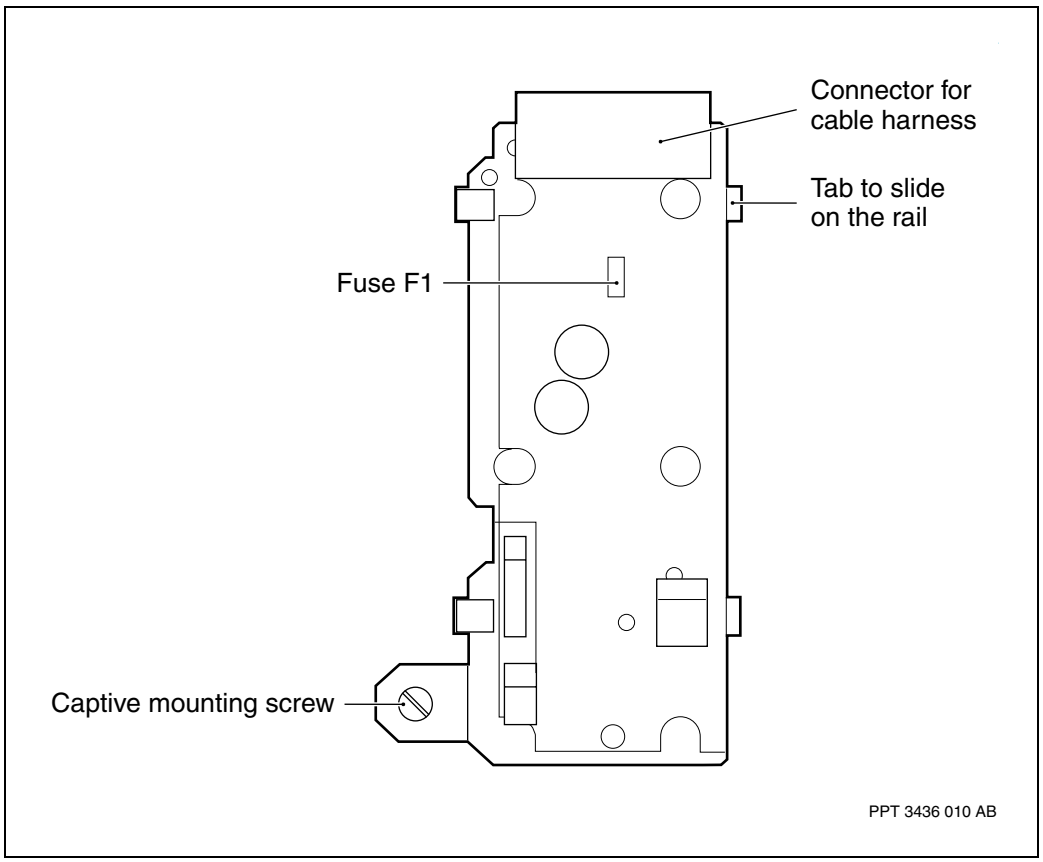
Location of the fuse on fan controller NTHR10AA



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Removing a fan controller

Remove a fan controller if it fails and replace it immediately prior to re-inserting the fan.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Each controller is mounted on a carriage plate inside the cooling unit and behind the fan it controls. Before removing a fan controller, you must do the procedure Removing a fan (page 571).
- For controller NTHR10AA in a lower cooling unit NTHR51AA or an upper cooling unit NTHR52AA, you need a one-piece short-shafted large-bladed slotted screwdriver to unfasten the captive screw.
- For controller NTHR10AB in a lower cooling unit NTHR51AB or an upper cooling unit NTHR52AB, you need a one-piece large Phillips screwdriver to unfasten the captive screw.
- You may need a bright flashlight to see through the spinning fan blades at what your hand is touching inside the cooling unit.
- For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	With the fan removed, look inside the cooling unit to find where the wires are connected to the controller and where the large captive screw is. The number of connectors vary between the AA and AB versions of the controller, as shown in these figures: • Location of the fan controllers inside an NTHR51AA or NTHR52AA cooling unit (page 576) • Location of the fan controllers inside a cooling unit NTHR52AB (page 577) • Location of the fan controllers inside a cooling unit NTHR51AB (page 578) • Fan controller connections on an NTHR10AB (page 579)
2	Reaching inside the cooling unit through the opening where the fan was, unplug the cable connectors from the controller. While pressing tabs inwards on the sides of each connector, pull upward perpendicularly to the

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controller. The Molex connectors of the NTHR10AB do not have tabs that secure the connector.

To see what your hand is doing inside the cooling unit, look through the spinning blades of the adjacent fan. You may need a flashlight to see clearly.

3 Unfasten the large slotted captive screw using the appropriate screwdriver. Do not drop any tool inside the cooling unit. The impact or a metal-to-metal cross-connection can damage a controller or a live fan blade.

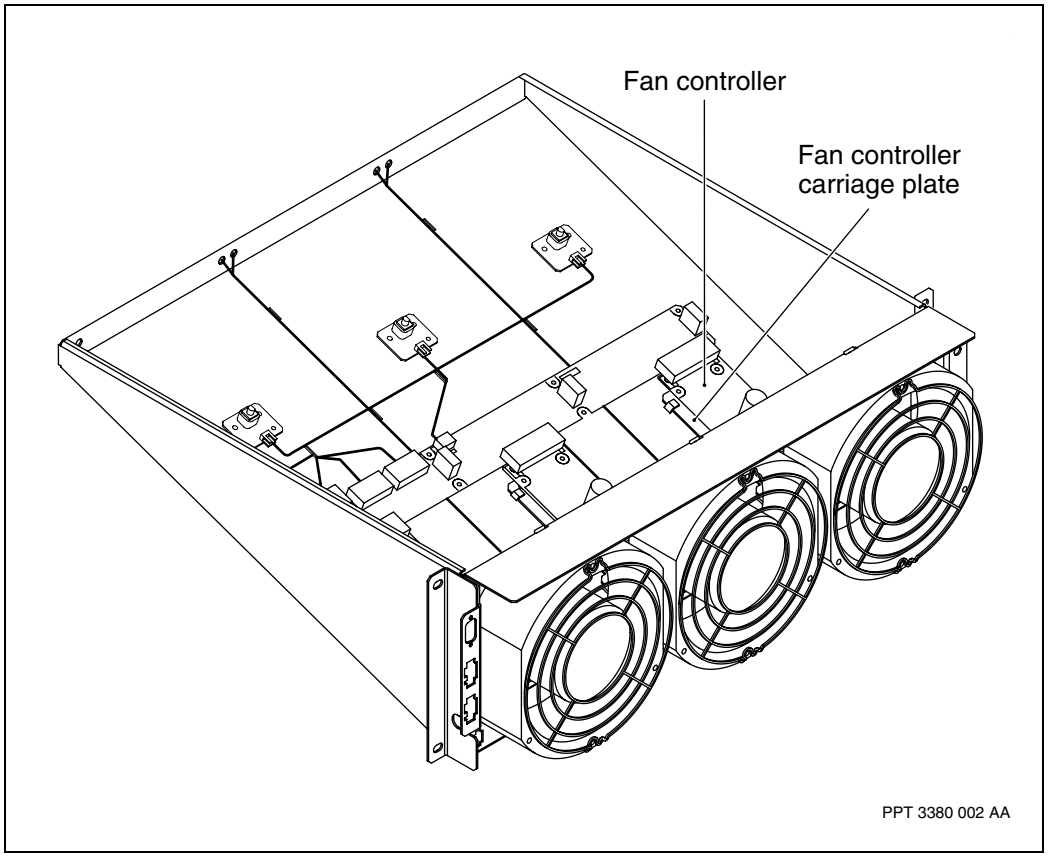
4 Use the captive screw to pull the controller toward the opening. Move the controller past the guide tabs on the cooling unit housing until the tabs or feet on the controller disengage from the housing.

5 Pull the controller out of the cooling unit.

--End--

Procedure job aid

Location of the fan controllers inside an NTHR51AA or NTHR52AA cooling unit



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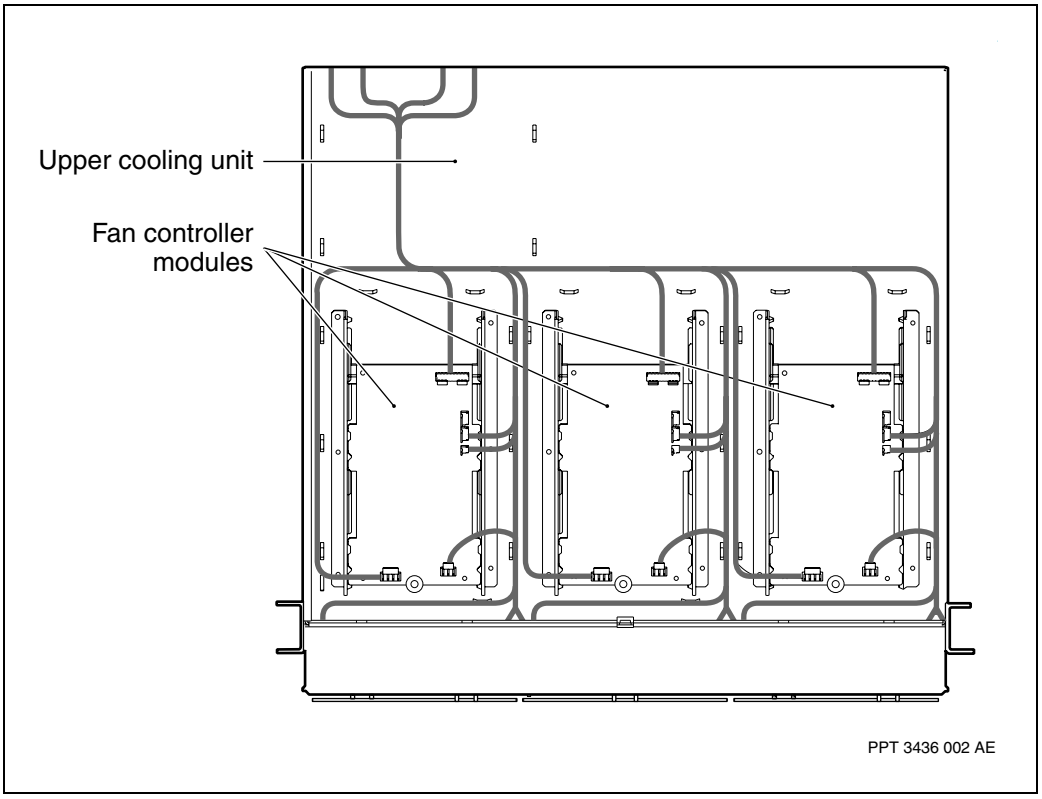
Location of the fan controllers inside a cooling unit NTHR52AB



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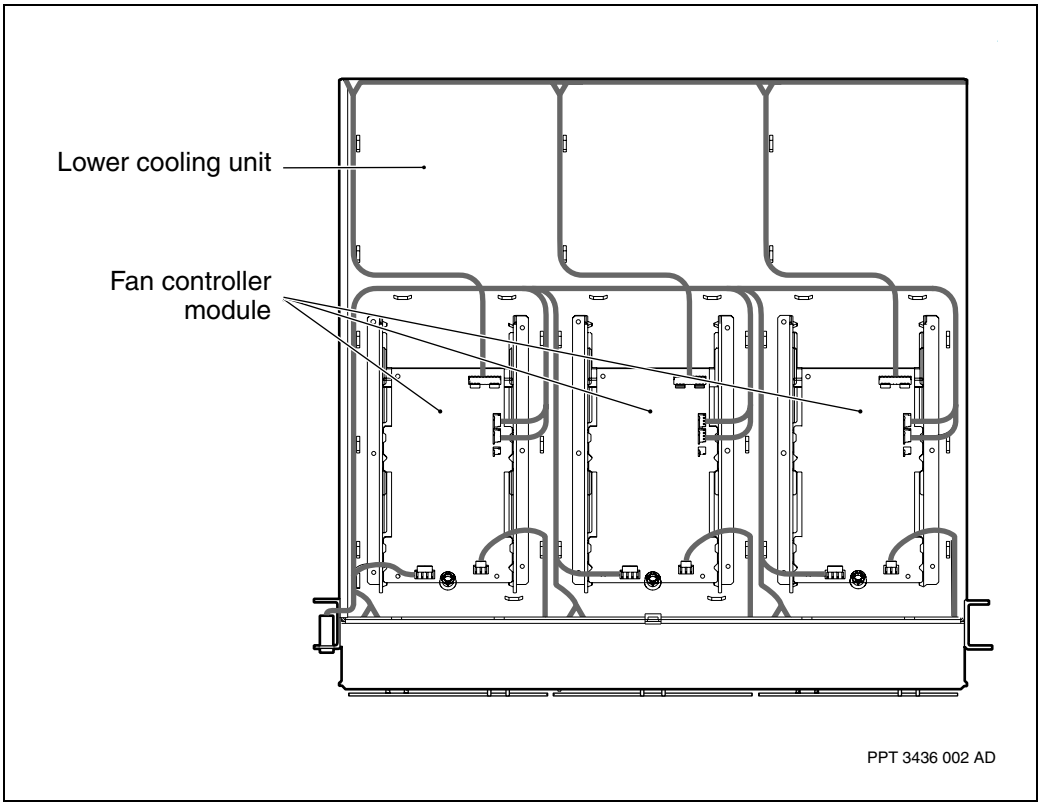
Location of the fan controllers inside a cooling unit NTHR51AB



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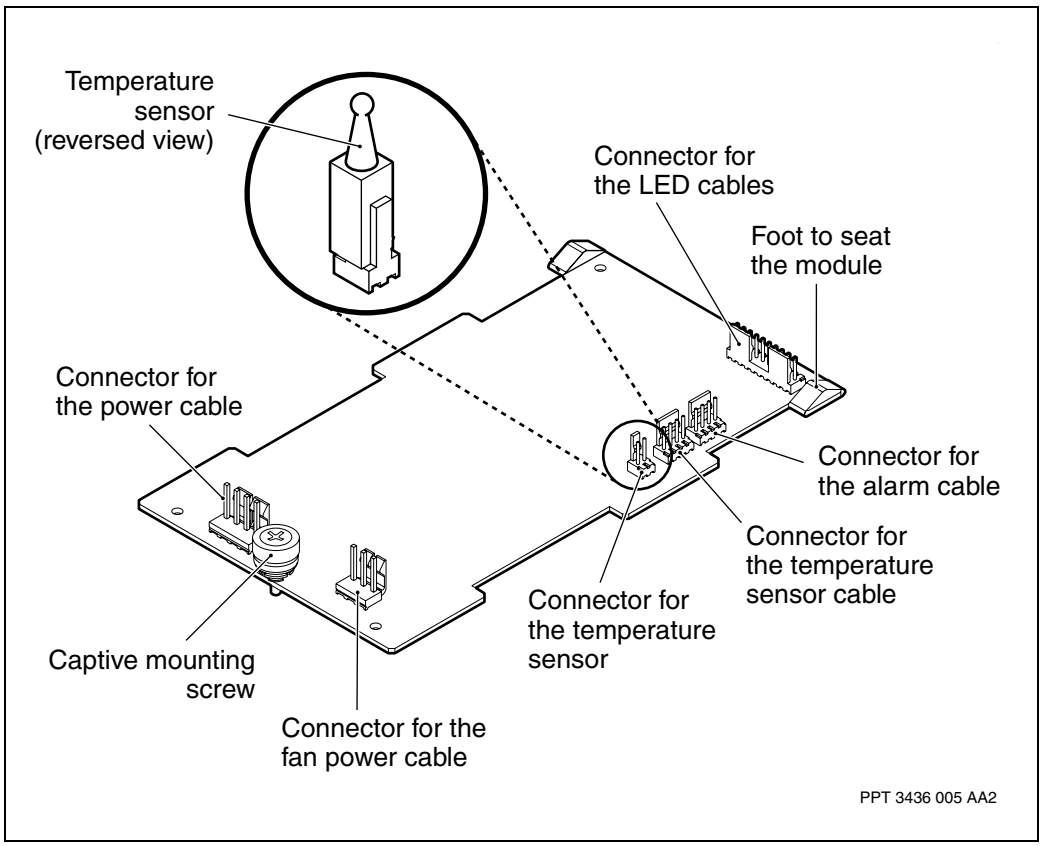
Fan controller connections on an NTHR10AB



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Removing a fanout panel

Remove a fanout panel to replace it or if you are decommissioning the FP that requires it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Obtain the site record of the fanout panel connections. Otherwise, label each cable and record the connection of each relative to the panel.
2	Unplug all of the cable connections. (A fanout panel is unpowered.)
3	If the fanout panel is rack-mounted, remove the grounding cable where it is attached to the panel. Put the screw aside for re-use.
4	Note where the top screw holes are on the frame (or rack).
5	Unfasten the 10-mm (3/8-in.) mounting screws at the sides of the panel, progressing from bottom to top. Put the screws aside for re-use.
6	Put the panel aside for packing later.

--End--

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Removing a filler panel

Remove a shelf filler panel from the front and/or rear of a NEBS 2000 frame to enable installing other equipment onto or between the frame uprights. With a door installed, you no longer need the panel to prevent access to the inside of the frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a helper to support:
  - the weight of the panel when it is unfastened because it weighs about 6.8 kg (15 lbs) and can be awkward by its size
  - any other equipment that shares the same mounting screws, for example, an NTQS31 sparing panel or NTHW52 fanout panel
- When removing a filler panel that shares mounting screws with other equipment (other than cable management brackets), you may have to remove its opposite filler panel to enable easier access to the other equipment. Other equipment includes sparing panels or fanout panels (termination panels).

Procedure steps

Step	Action
1	Behind the filler panel, determine if any termination panel shares screws with the filler panel. If so, you must decide how to remove the termination panel before removing the filler panel. If the opposite side of the frame also has a filler panel, you must decide whether removing the opposite panel enables easier access with less risk of dropping the shared equipment.
2	If decided, remove the opposite filler panel. Have a helper hold the panel while unfastening the 2 remaining 10-mm (3/8-inch) screws. Put the panel and screws aside temporarily.
3	If the filler panel shares screws with a termination panel, unfasten the bottom 10-mm (3/8-inch) shared screws. Have a helper hold the termination panel from the other side of the frame while you unfasten the last 2 screws. Put the termination panel and screws aside temporarily.
4	Repeat step 3 for each other termination panel or other equipment except cable management brackets.
5	On the outside face of the filler panel mounting ears, determine whether any cable management bracket shares screws with the panel. Refer to the figure Physical characteristics of a front shelf filler panel (page 583). If you cannot access the 2 screws of each bracket without stressing the cables that are fastened to it, you must unfasten the cables from the brackets.

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The filler panel also has cuts in each mounting ear to surround cable management brackets without sharing the bracket screws.

6 For any bracket or pair of brackets that shares screws with the filler panel, note the position and orientation of each bracket. Unfasten the 10-mm (3/8-inch) screws, remove the bracket, and put them aside temporarily.

7 Unfasten the remaining screws of the filler panel. When unfastening the last 2 screws of the filler panel, have the helper hold the panel to prevent it from falling.

8 If the opposite filler panel was removed, install it back where it was.

9 If the filler panel is not being replaced, you must either

- re-install the equipment that formerly shared mounting screws with the filler panel, especially since a termination panel should not be operated while it is unmounted
- install the equipment somewhere else because a second shelf is being installed where the filler panel was

10 If the filler panel is not being replaced, you must re-install the cable management brackets and fasten the cables back onto them.

--End--

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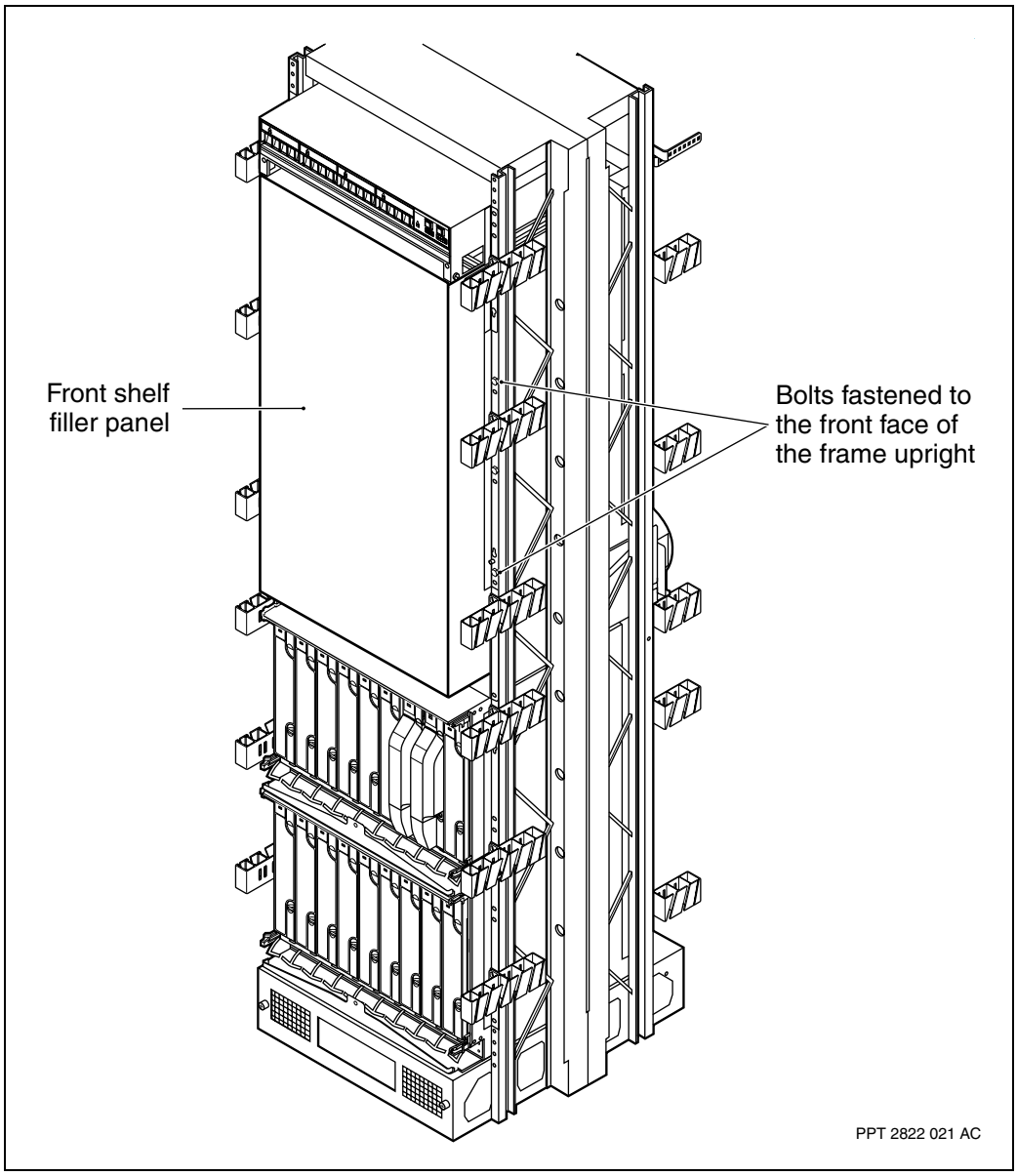
Procedure job aid

Physical characteristics of a front shelf filler panel



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Removing a horizontal frame from the pallet

Remove a horizontal NEBS 2000 frame from the shipping pallet after removing the packaging.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need three to four helpers to safely lift the frame off the pallet.
- The frame is not attached to the bottom of the crate or the pallet, and will slide off if tilted enough.

Procedure steps

Step	Action
1	Slit open the plastic wrap so that it can be taped closed while the frame is being stored before being anchored to the floor. Be careful not to contact anything under the plastic, especially wires or cables.
2	Latch any cards inside the shelf that may have become unlatched. Ensure that you latch each card to the transportation position. Refer to the figures Upper transportation pockets for card latches (page 586) and Lower transportation pockets for card latches (page 587).
3	Cut any straps that fasten the frame to the pallet.
4	Remove the plastic sheet around the frame by cutting it. Do it neatly without pulling it off. Removing the plastic enables firm grips on the hardware to tilt it upright.
5	Ensure each levelling foot at the bottom end of the frame is threaded all the way inwards until it touches the base of the frame. You may need an 8-mm (5/16-in.) allen key to turn the shafts from the inside end. For the location of the feet, see the figure Unpacking a horizontal Multiservice Switch 15000 or Multiservice Switch 20000 in a frame (page 658).

WARNING

Risk of injury when handling a frame

Never place a foot or a hand under any part of the frame while it is being tilted or moved. Always move it with at least four people. The weight of a shipped frame with one Multiservice Switch 15000 or Multiservice Switch 20000 is approximately from 330 kg (730 lbs) to 355 kg (780 lbs); with two switches the weight is from approximately 480 kg (1052 lbs) to 490 kg (1076 lbs). For additional protection, wear safety boots with steel toes and gripping soles.

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WARNUNG

Verletzungsgefahr beim Gestelltransport

Stellen Sie niemals einen Fuß unter das Gestell, wenn dieses bewegt oder gekippt wird, und greifen Sie nicht unter das Gestell. Zum Bewegen des Gestells sind mindestens vier Personen erforderlich. Ein Gestell mit einem Multiservice Switch 15000 oder Multiservice Switch 20000 wiegt ca. 330 kg und mit zwei Multiservice Switch-Einheiten ca. 490 kg. Tragen Sie zu Ihrem zusätzlichen Schutz Sicherheitsschuhe mit Stahlkappen und griffigen Sohlen.

6 With 4 helpers, lift the top of the frame until the frame feet touch the floor. While tilting:

- do not slide the frame feet or the pallet along the floor
- do not allow the full weight of the frame to sit on the levelling feet
- do allow the feet to gently touch the floor

7 When the frame is vertical, move the fridge cart beside one side of the frame so that the foot plate touches the frame feet. Put the cart at the side of the frame with the least amount of cabling. A side is a full-height flat metal surface. Ensure the secondary feet are extended and locked into position.

8 If the frame has panels fastened over the sides, remove one by prying the 8 screw caps off and unfastening the large slotted screws. Put the panel, caps, and screws aside for re-use later.

9 While the 4 helpers tilt the frame enough to enable the foot-plate to slide under the frame feet, push the cart flush against the side of the frame that does not have a side panel.

10 Lower the frame gently onto the foot-plate. Ensure no cables are pinched between the frame and the cart.

11 Strap the frame snugly to the fridge cart. Place the straps around the frame and cabinets. Prevent the straps from pinching any cables or overlapping any handles. The module handles and cables are not designed to withstand pulling from the weight of the frame.

12 Strap the frame snugly to the fridge cart. Place the straps around the frame and cabinets. Prevent the straps from pinching any cables or overlapping anything protruding from the frame. The module handles on a Multiservice Switch 15000 are not designed to withstand pulling from the weight of the frame.

13 Keep the packaging, pallet, and any re-usable fasteners in case the frame must be returned.

--End--

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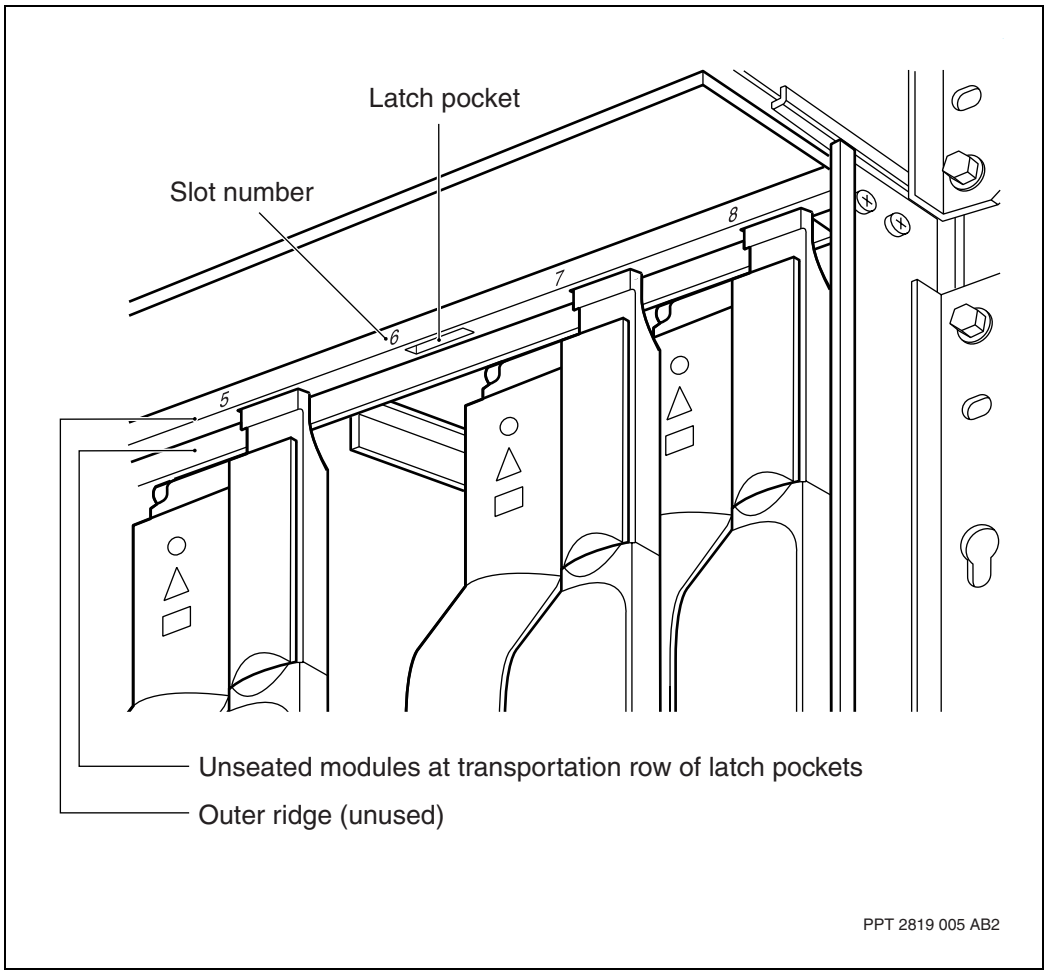
Procedure job aid

Upper transportation pockets for card latches



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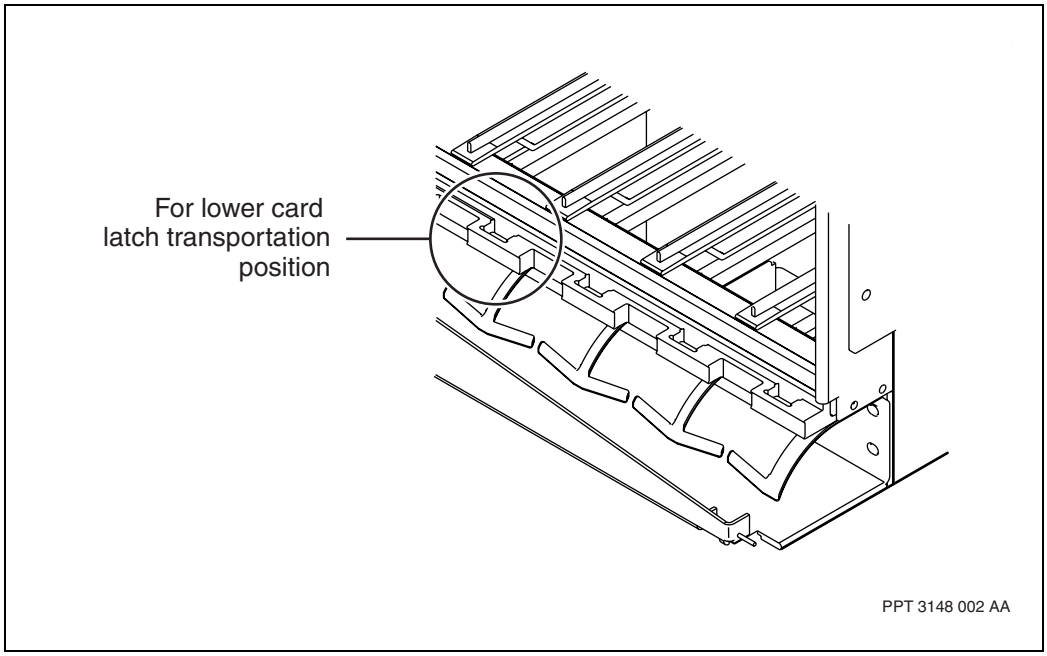
Lower transportation pockets for card latches



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Removing a kickplate

Remove a regular-sized kickplate from the front or rear base of a NEBS 2000 frame so that a kickplate extension can replace it as part of adding a door to the frame, or so that you can access anchors bolts of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a medium slotted driver for the captive screws of the kickplate.

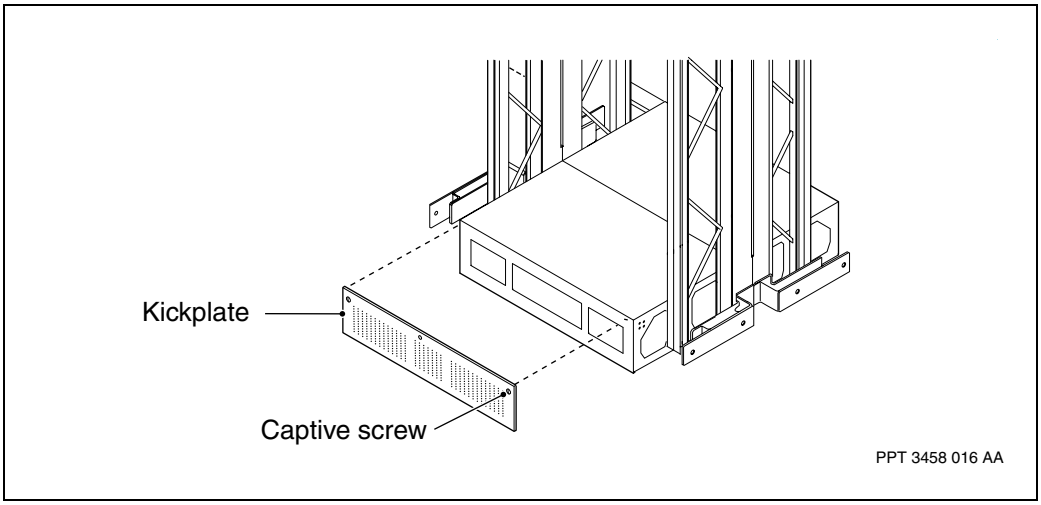
Procedure steps

Step	Action
1	Unfasten the 2 captive screws at ends of the kickplate as shown in the figure Orientation of a standard kickplate to the base of a NEBS 2000 frame (page 588).
2	If a grounding cable is attached to the kickplate, record where and disconnect it. Refer to the figure A standard kickplate (page 589). Re-connect the cable fastener to either the cable or the kickplate, whichever is the most secure temporary storage.
3	Put the kickplate aside as a spare part for a NEBS 2000 frame that still has the standard kickplate.

--End--

Procedure job aid

Orientation of a standard kickplate to the base of a NEBS 2000 frame



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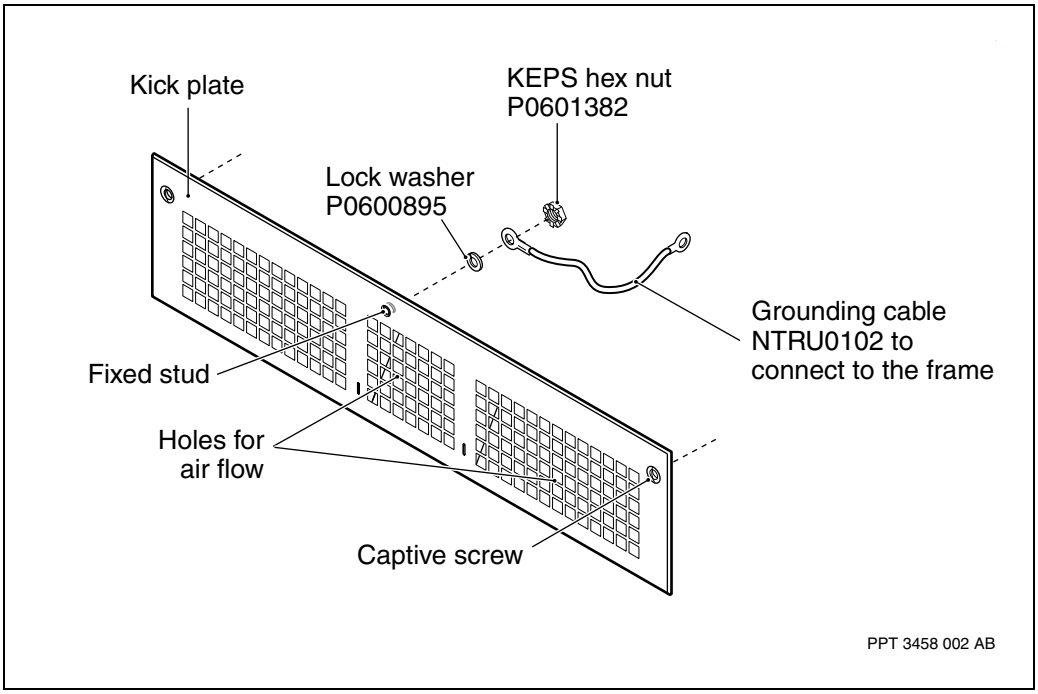
A standard kickplate



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Removing a lower cooling unit

Remove a lower cooling unit to replace it.

Prerequisites

WARNING
Risk of injury by fan blades
While working on any equipment near the cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a live fan with anything.

WARNUNG
Verletzungsgefahr durch Lüfterblätter
Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a 65 cm by 65 cm (2 ft., 2 in. square) anti-ESD pad to protect the cooling unit and other Nortel Networks Multiservice Switch hardware from damage by transferred ESD until the unit is either installed or packaged. You also need a driver for the thread-forming 10-mm (3/8-in.) hex-head screws that fasten each cooling unit to the frame or rack.
- As soon as the cooling unit is unplugged, software alarm 7012 0051 will be generated.
- For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

Procedure steps

Step	Action
1	Toggle off both cooling unit breakers and put tape on them to indicate neither was tripped. To ensure that you toggle off the correct breakers, refer to the table Location of cooling unit breakers on the front of the BIP (page 591).
2	Facing the fans, check the LEDs of the cooling unit to ensure that none are lit. This confirms that power is off since the fan blades can still be rotating freely while slowing down.

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3 At the right side of the lower cooling unit, disconnect power cable A by pressing and holding the tabs on the side of the connector and pulling straight out. (If A and B cables are above the lower cooling unit, they are for the upper cooling unit.)

4 Label the cable to identify which connector it plugs into (for example, with LA for lower unit, power connector A).

5 Repeat step 3 to step 4 for power cable B, using LB for the label.

6 Unfasten the 2 small slotted captive screws on the D-sub connector below the A and B power connectors.

7 Leave the F1, F2, and F3 cables connected on the fan side of the cooling unit.

8 Unfasten the 4 thread-forming 10-mm (3/8-in.) hex-head mounting screws through the 2 mounting ears as shown in the figure Location of the mounting screws of a lower (front) cooling unit (page 592). Put the screws aside for re-use.

9 By gripping the mounting ears at either side of the unit, slide it straight out and away from the frame. Be ready to support its weight of 9 kg (20 lbs).

10 Put the cooling unit on an anti-ESD protection pad or container.

--End--

Procedure job aid

Location of cooling unit breakers on the front of the BIP

Cooling unit	Position of BIM in the BIP	BIP slot number	Cooling unit breaker
lower	right BIM	4	middle
lower	middle right BIM	3	middle
upper	middle left BIM	2	middle
upper	left BIM	1	middle

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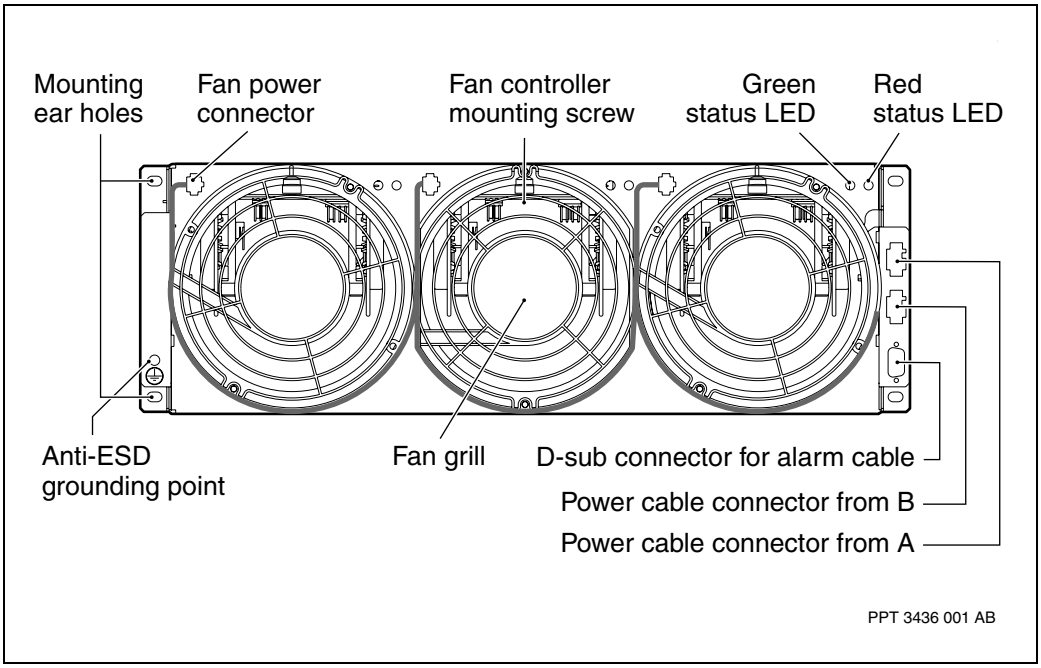
Location of the mounting screws of a lower (front) cooling unit



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Removing a multiport aggregate device

Remove a multiport aggregate device from a Nortel Networks Multiservice Switch cabinet, frame or non-Multiservice Switch mounting apparatus to replace a failed device or to decommission the device.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Lock any affected ports before removing a multiport aggregate device.

Procedure steps

Step	Action
1	On the rear of the unit, toggle the power breaker for each power supply to the off position.
2	Turn off the power source to the outlet that feeds the device. Put electrical tape on the breaker or over the fuse hole to indicate deliberate action.
3	Label the cables connected to the device.
4	Remove all of the cables from the device and coil them out of the way.
5	Remove the 5/16-in. screws that fasten the device's brackets to the adapter brackets of a frame or the uprights of its mounting apparatus. Support the device while the last screws are unfastened, and remove the device. The device weighs 2 kg (4.4 lbs).
6	If you are returning the device to Nortel Networks for repair, label the device. Include the failure time, date, fault, your name, organization, department, telephone number, and the multiport aggregate device part and serial number. Then, pack the device in its original packaging.

--End--

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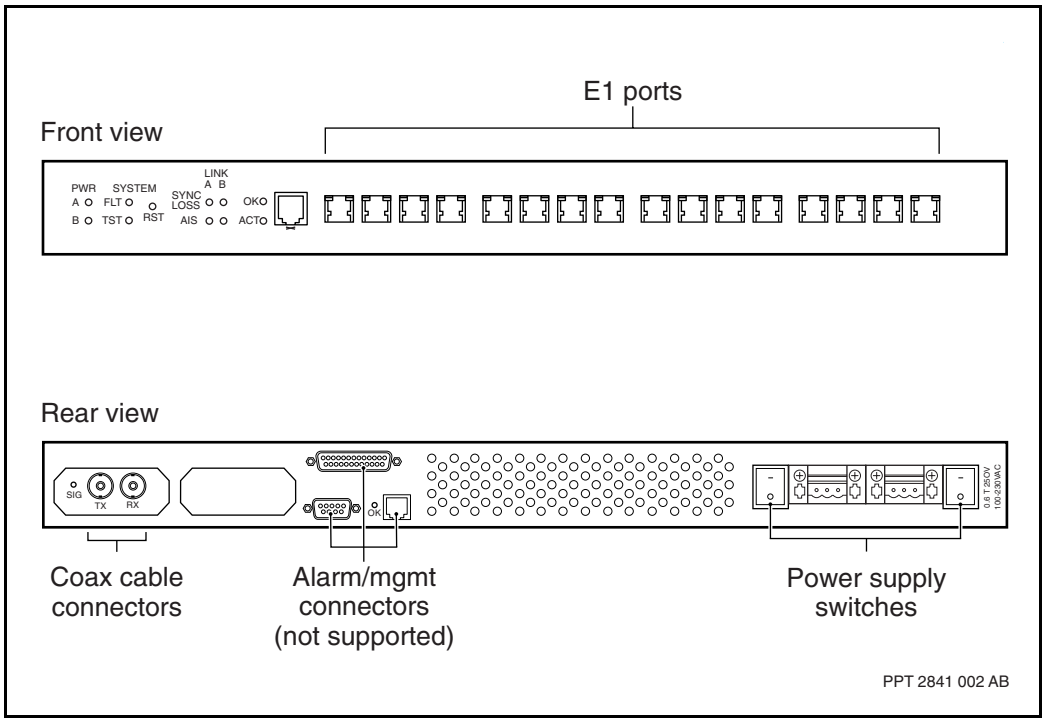
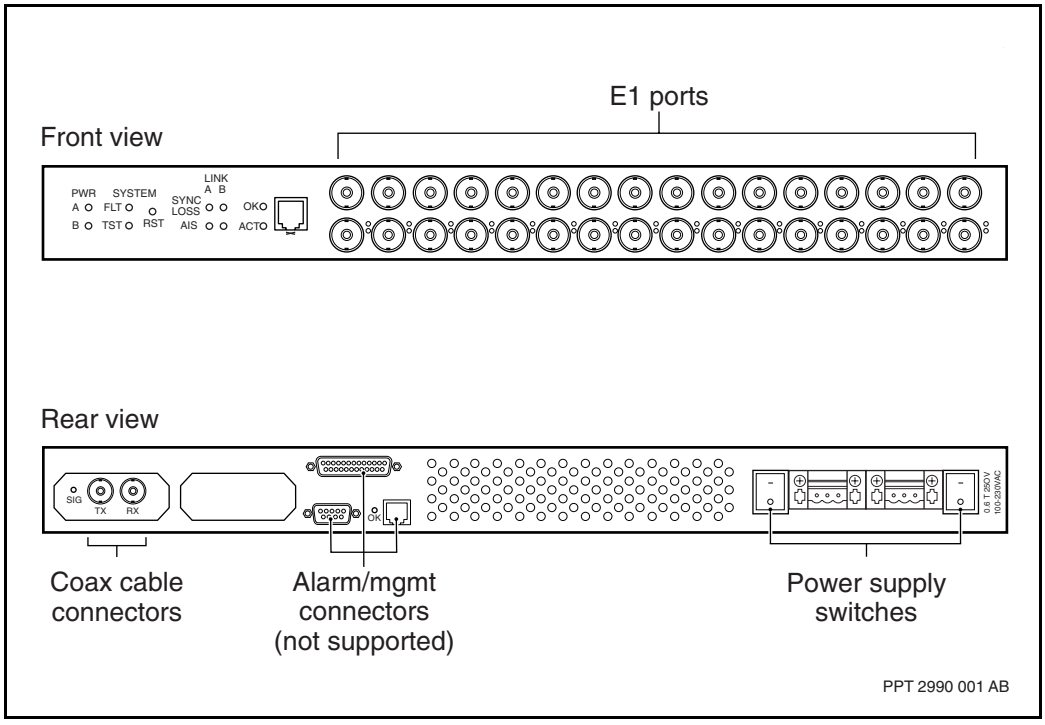
Procedure job aid

Balanced multiport aggregate device NT0486



Unbalanced multiport aggregate device NT0421



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Removing a PIM

Remove a PIM to replace it to restore back-up power to the shelf cage.

Prerequisites

WARNING

Risk of injury or equipment damage

Power interface modules (PIMs) are not hot swappable. The power breaker on the BIM that is connected to the PIM must be toggled off before unplugging the power cables at the PIM. Wait 15 seconds for the capacitors in the BIM to discharge before unplugging the PIM cable. The power cable must be unplugged before the PIM can be removed for replacement. If the mate PIM is present and in service, it maintains power to the shelf so that service is uninterrupted.

WARNUNG

Verletzungsgefahr oder Geräteschäden

Die PIMs (Power Interface Modules) können nicht während des Betriebs ausgetauscht werden. Bevor die Netzkabel am PIM abgezogen werden, muß der Trennschalter an dem BIM, das an das PIM angeschlossen ist, ausgelöst werden. Warten Sie dann 15 Sekunden, bis sich die Kondensatoren entladen haben, bevor Sie die PIM-Kabel abziehen. Das Netzkabel muß abgezogen sein, bevor das PIM zum Austausch ausgebaut wird. Wenn das redundante PIM bestückt und in Betrieb ist, übernimmt dieses die Stromversorgung des Baugruppenträgers, so daß der Anlagendienst nicht unterbrochen wird.

- You must be familiar with Safety considerations and best practices (page 19).
- PIMs are labeled top to bottom on a frame as 7RU, 7RL, 15 RU, and 15 RL. 7RU means rear upper PIM behind slot 7 of the shelf assembly.
- Replacing a PIM will temporarily affect the SCB (HSCX bus) and clock distribution unless it has an installed and operating mate.
- When a door covers the rear of a NEBS 2000 frame where the PIMs are, you must remove the door to access the PIMs, as described in Removing a door (page 561).

Procedure steps

Step	Action
1	At the rear of the BIP, identify the PIM to be replaced. Note the label indicating which breaker it is part of. The breakers are listed in the figure Connection points of the PIM cables (page 597).

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2 Facing the front of the BIP, locate the 2 breakers controlling the feeds of the PIM. A label on the front of the screw cover indicates which slots each breaker feeds. From top to bottom, the 4 PIMs of a switch are:

7RU for rear upper PIM behind slot 7 of the shelf assembly
7RL for rear lower PIM behind slot 7 of the shelf assembly
15RU for rear upper PIM behind slot 15 of the shelf assembly
15RL for rear lower PIM behind slot 15 of the shelf assembly

3 Toggle off the 2 breakers (pushing O in) and put tape on each to indicate it has not been tripped. An alarm is triggered while the breaker is off.

The A and B LEDs on the PIM of a Multiservice Switch 20000 are extinguished when power is removed.

4 Unfasten the captive screw or screws on the faceplate.

5 Unplug the cable by pinching the connector tabs and pulling the cable away from the PIM.

6 Remove the PIM by pulling it firmly and evenly away from shelf. Avoid jerking the pull or applying lateral movement. The PIMs of a Multiservice Switch 15000 have handles.

7 Put the PIM aside.

--End--

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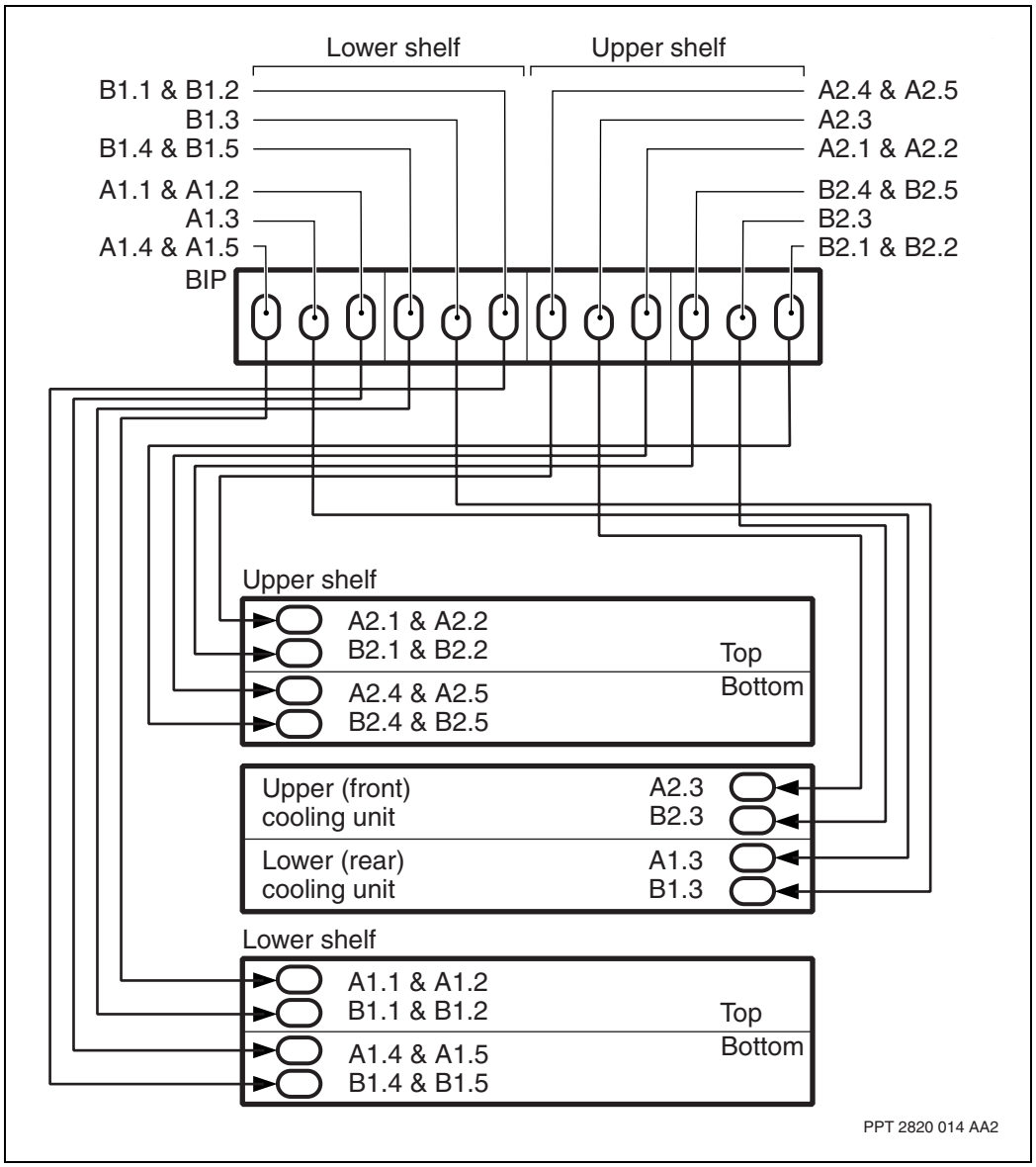
Procedure job aid

Connection points of the PIM cables



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Removing a power-and-ground cable assembly

Remove a power-and-ground cable assembly to replace it to restore full power to the BIP.

Prerequisites

DANGER

Risk of injury by electrocution

Each power input feed to a breaker interface module (BIM) is rated up to 100 A. Prior to removing a power-and-ground assembly, power to the BIP must be toggled off, and all breakers on the BIM must be toggled off (the O is pressed in).

WARNUNG

Lebensgefahr

Die Speisestromzuführungen zu jedem Trennschalterkopplungsmodul (BIM) sind für bis zu 100 A ausgelegt. Bevor ein BIM ausgebaut wird, muß unbedingt die gesamte Stromversorgung für das BIM abgeschaltet werden und sämtliche Trennschalter auf dem BIM müssen ausgelöst werden (O ist gedrückt).

CAUTION

Service interruption from power interruption

Toggling off the power input to a BIP means that the one or two switches cannot operate. To minimize the impact on traffic of powering down, disconnect the dc power input cables at the beginning of a period of lowest traffic over the network or switch.

DANGER

Risk of injury or damage by electricity

When toggling off power breakers on a breaker interface module (BIM) or in the circuit up to it, or removing a fuse from the circuit up to it, always put tape over the breaker or fuse cavity. The tape indicates it was manually toggled off, and not tripped by the system. This prevents accidental activation of the power circuit, especially if power cables are being handled.

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WARNUNG

Schäden oder Verletzungen durch Elektrizität

Wenn die Leistungstrennschalter an einem Trennschalterkopplungsmodul (BIM) oder im zuführenden Stromkreis geöffnet bzw. Sicherungen aus dem Stromkreis entfernt werden, decken Sie den Trennschalter oder den Sicherungssteckplatz mit Klebeband ab. Das Klebeband signalisiert, daß er/sie manuell ausgeschaltet und nicht vom System ausgelöst wurde. Damit verhindern Sie eine versehentliche Aktivierung der Stromversorgung, besonders beim Hantieren mit Netzkabeln.

- You must be familiar with Safety considerations and best practices (page 19).
- You need the following specialty tools:
  - — a medium Pozidriv screwdriver, for example a number 2 (do not substitute a Phillips) for an insulation boot clamp
  - — an 11-mm (7/16-in.) deep socket with a properly calibrated torque wrench capable of 6.5 Nm (57.5 in.-lbs) and a 20-cm (8-in.) extender for the lug nuts

Procedure steps

Step	Action
1	Hold the assembly rail or a terminal block with one hand. Refer to the figures • The polyvalent power-and-ground assembly A0834143 (page 600) • The ETSI power-and-ground assembly A0834149 (page 601)
2	Unfasten both 10-mm (3/8-in.) hex-head screws at the ends of the rail. Keep the screws for re-use.

--End--

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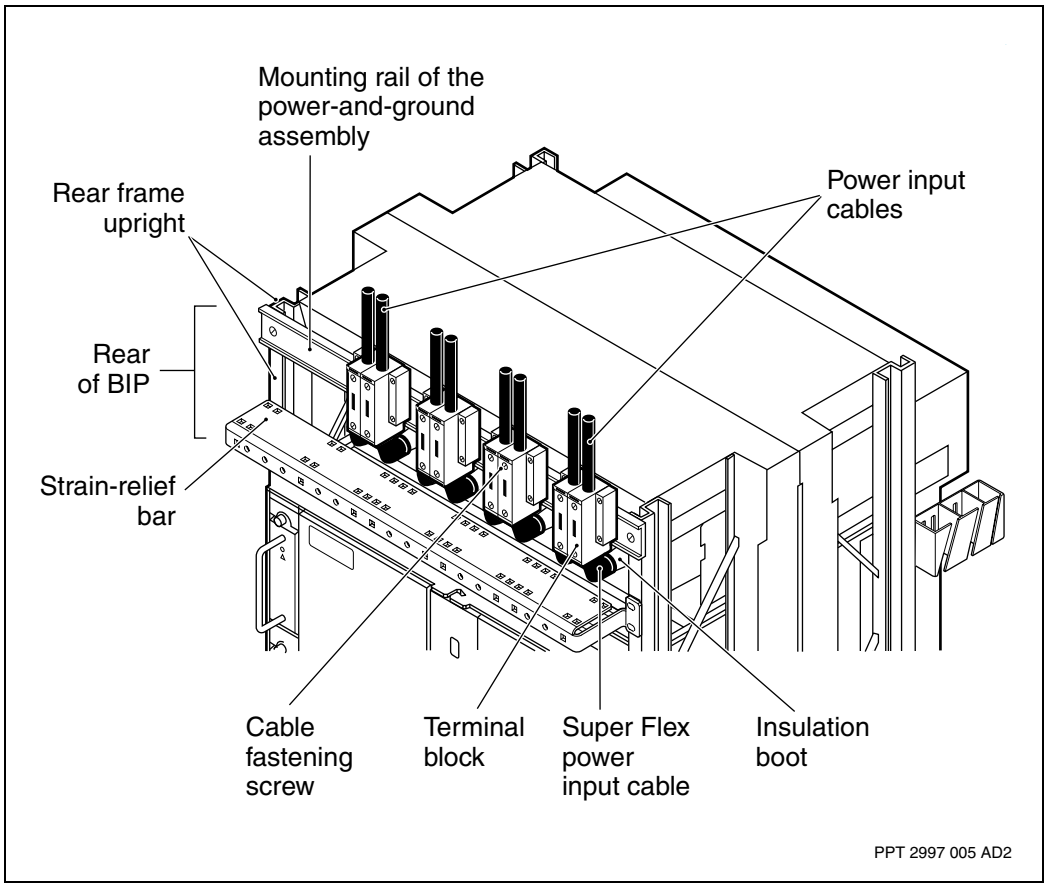
Procedure job aid

The polyvalent power-and-ground assembly A0834143



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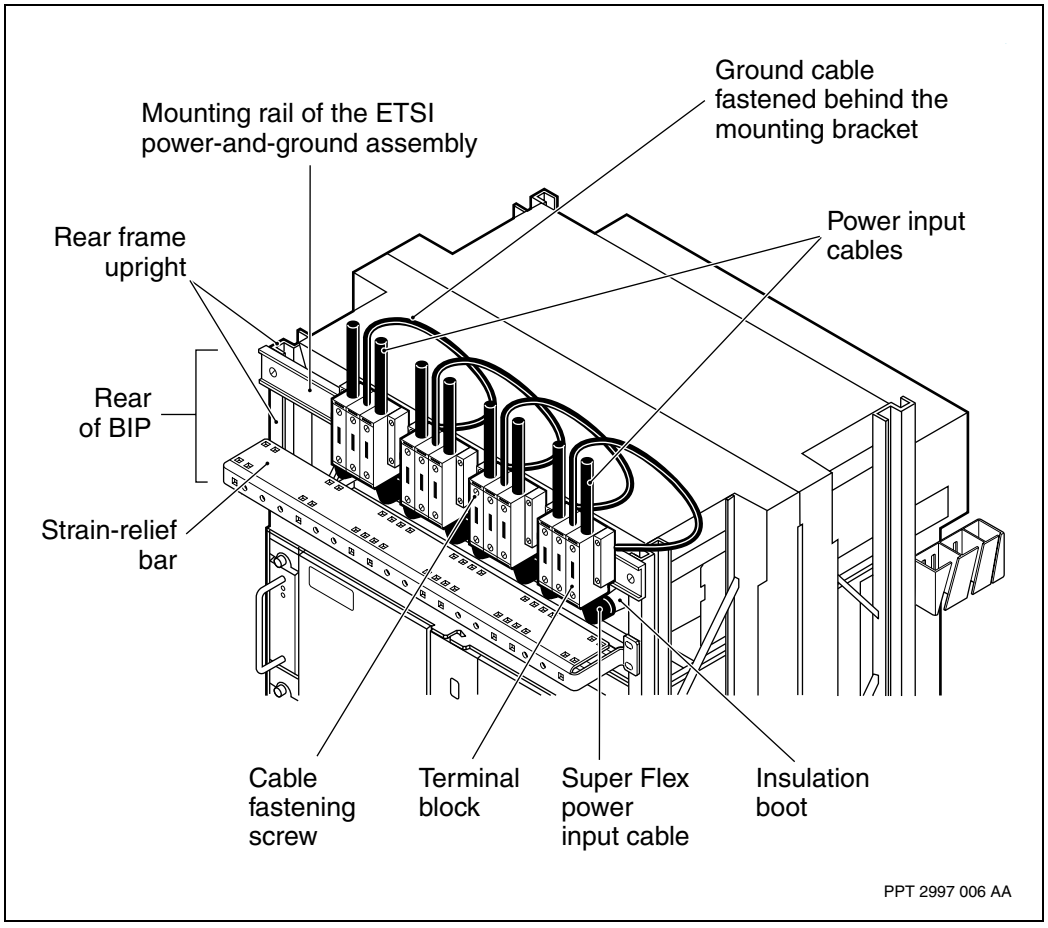
The ETSI power-and-ground assembly A0834149



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Removing a shelf assembly

Remove a shelf assembly as part of restoring operation to a bent backplane pin or to re-locate it.

Prerequisites

DANGER

Risk of injury or equipment damage by electricity

The power breakers on the BIMs that are connected to the PIMs must be toggled off before unplugging the power cables at the PIMs. Wait 15 seconds for the capacitors in the BIMs to discharge before unplugging the PIM cables.

WARNUNG

Verletzungsgefahr oder Geräteschäden

Bevor die Netzkabel am PIM (Power Interface Module) abgezogen werden, muß der Trennschalter an dem BIM, das an das PIM angeschlossen ist, ausgelöst werden. Warten Sie dann 15 Sekunden, bis sich die Kondensatoren entladen haben, bevor Sie die PIM-Kabel abziehen.

DANGER

Risk of injury by electrocution

When toggling off breakers at the power source of a breaker interface module (BIM), wait 15 seconds for the capacitors in the BIM to discharge. Each BIM controls up to 100 A.

WARNUNG

Lebensgefahr

Wenn ein Trennschalterkopplungsmodul (BIM) ausgebaut wird, unabhängig von der Stellung der Trenn- oder Hauptschalter, benötigen die Kondensatoren im BIM Zeit zur Entladung. Warten Sie 15 Sekunden, bevor Sie das BIM wieder einsetzen oder vom BIP trennen. Andernfalls kann das BIM beschädigt werden.

CAUTION

Risk of equipment damage and service loss by bent pins

While handling a shelf assembly or working near it, ensure that nothing contacts the backplane pins inside the shelf assembly. Contacting a pin with a sideways force can easily bend it, thereby rendering the card slot unusable.

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- You must be familiar with Safety considerations and best practices (page 19).
- You need two helpers to prevent the shelf assembly from falling while it is being unfastened. An empty shelf assembly weighs 99 kg (218 lbs).
- If the NEBS 2000 frame has a door on the front of the frame, enable safer and easier access to the shelf assembly by first performing the procedure Removing a door (page 561).
- This procedure applies to a NEBS 2000 frame, but the steps involving the frame uprights are equivalent to a 23-inch wide EIA rack's uprights with the adapter brackets.
- Recognize the size and shape of a shelf assembly by these figures:
  - An upper shelf assembly of a Multiservice Switch 15000, front isometric view (page 606)
  - An upper shelf assembly of a Multiservice Switch 20000, front isometric view (page 607)
  - An upper shelf assembly of a Multiservice Switch 20000, rear isometric view (page 608)

Procedure steps

Step	Action
1	At the rear of the shelf assembly, unplug the black-and-white power cabling from all 4 PIMs on the left side of the shelf by pinching the tabs on the connectors. Move the loose cable ends aside. Refer to the figure Location of the rear plug-in hardware (page 605).
2	Unfasten the D-sub connectors on the alarm/BITS module, unplug them, and move the loose cable ends aside.
3	At the front of the shelf assembly, open the 2 cable channel covers by turning their medium slotted captive screws 1/4 turn counter-clockwise.
4	Remove all disconnected cabling from the cable channels and cable management brackets that are fastened on top of the shelf assembly mounting ears along the frame uprights or along the adapter brackets used with a rack. Avoid tangling the clusters of cables.
5	Tie the loose cable ends aside so that the shelf assembly can be slid out the front without snagging a cable.
6	Record the position and orientation of each cable management bracket that overlaps a mounting ear of the shelf assembly so that they can be put back the same way later.
7	Remove the thread-forming 10-mm (3/8-in.) hex-head screws of all overlapping cable management brackets at the sides of the shelf assembly

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and from the mounting ears. Start with the bottom screws on both sides and work upwards. Put the screws aside for re-use.

When removing the last 2 screws, have the helpers grip the shelf at the sidewalls where the cable channel openings are and at the top cross member of the shelf assembly.

CAUTION
Risk of equipment damage
Do not grip any plastic parts as a means to supporting the weight of the unfastened shelf assembly. These parts will break, especially the card tracks (rails) or cable guides.

8 Pull the shelf assembly straight out and away from the frame or rack. Change your grip as required to the bottom of the shelf assembly to support its weight.

9 Put the shelf assembly into the container of the replacement shelf assembly and add the packing material as it was before.

--End--

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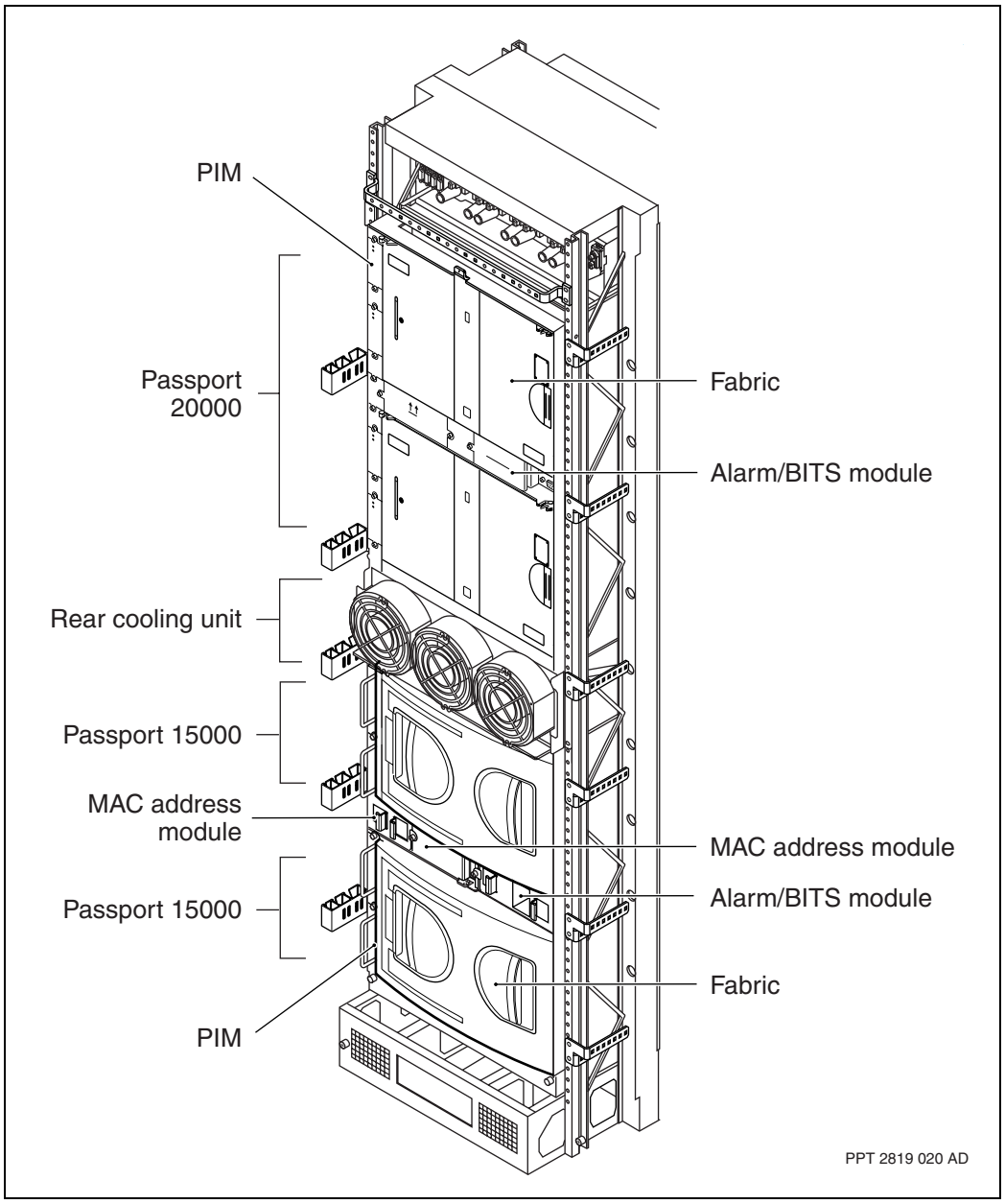
Procedure job aid

Location of the rear plug-in hardware



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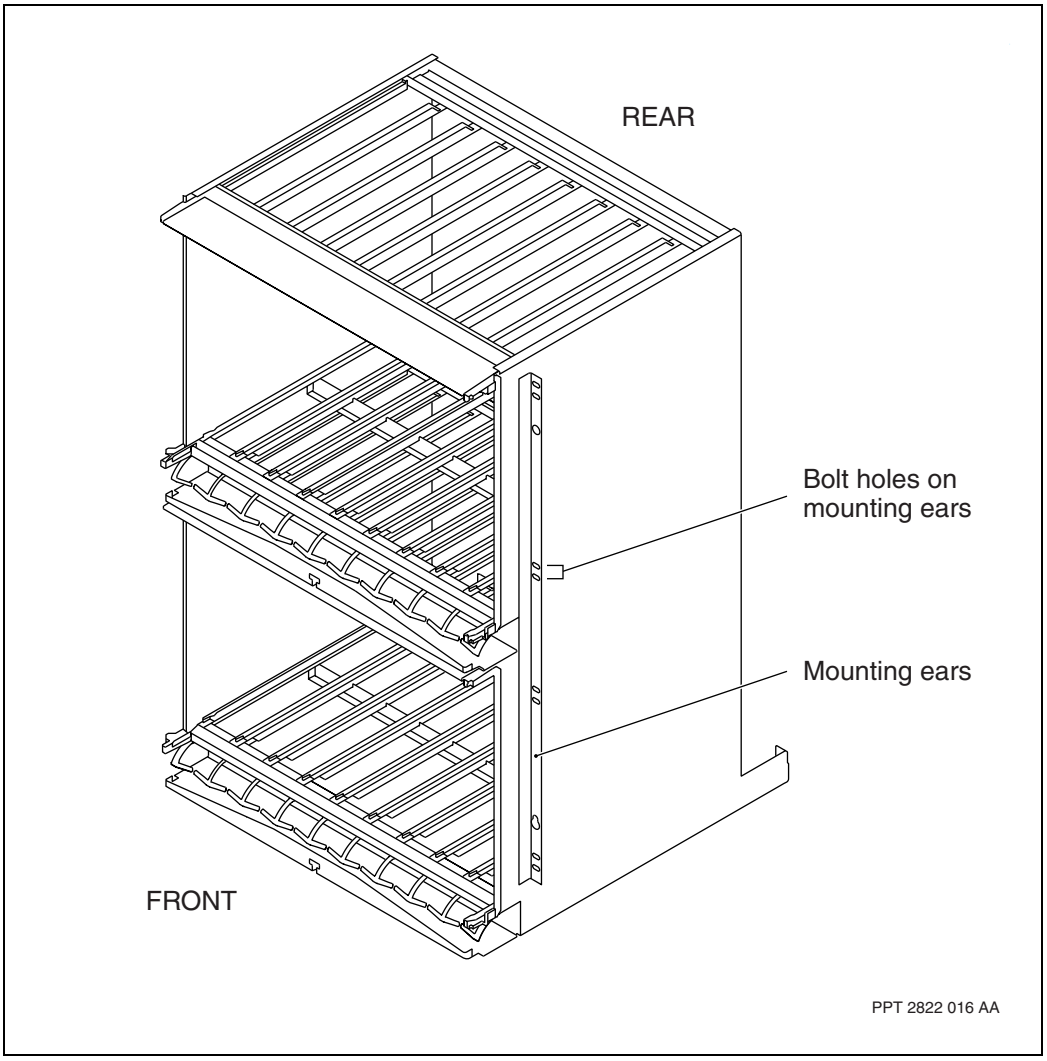
An upper shelf assembly of a Multiservice Switch 15000, front isometric view



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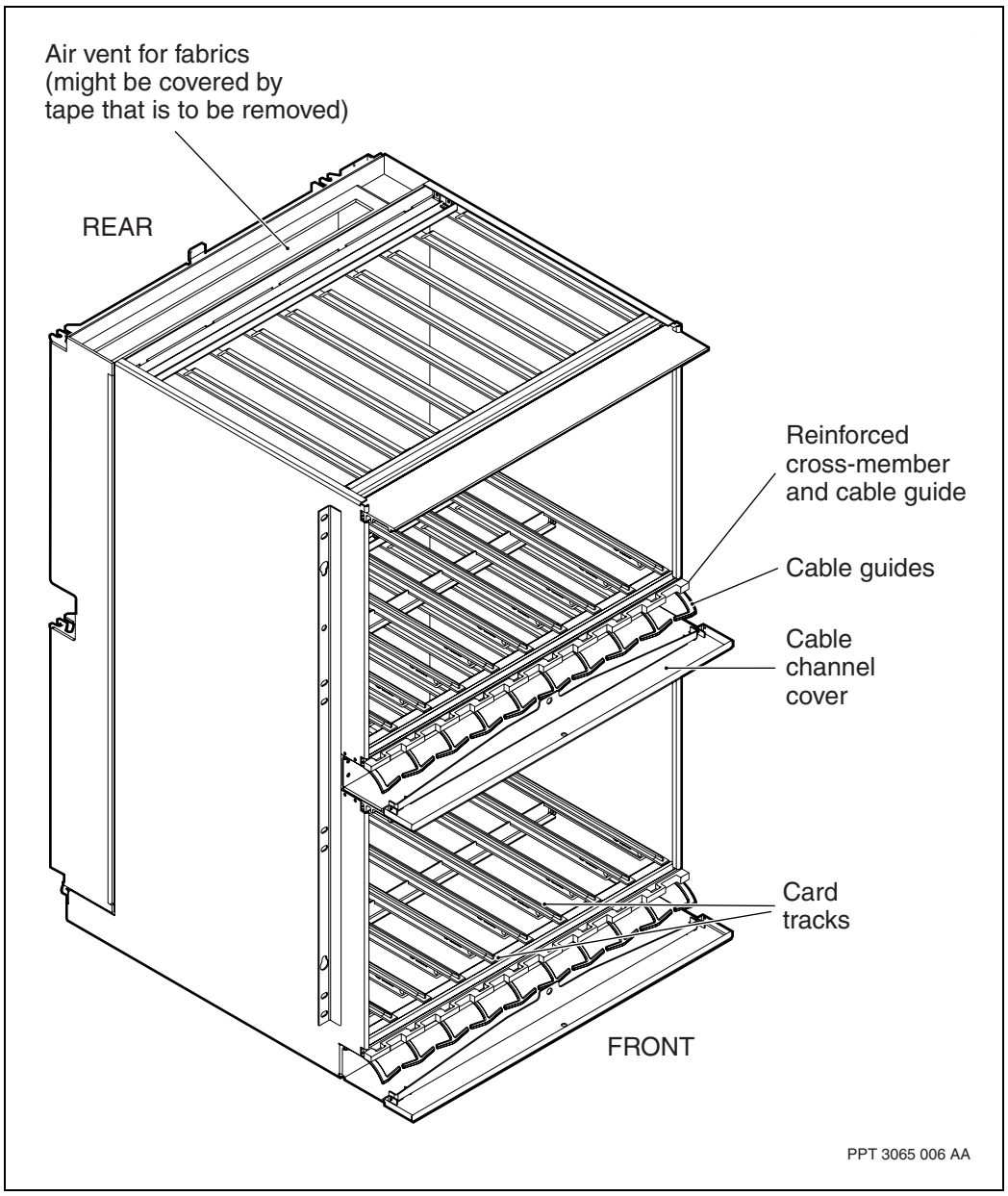
An upper shelf assembly of a Multiservice Switch 20000, front isometric view



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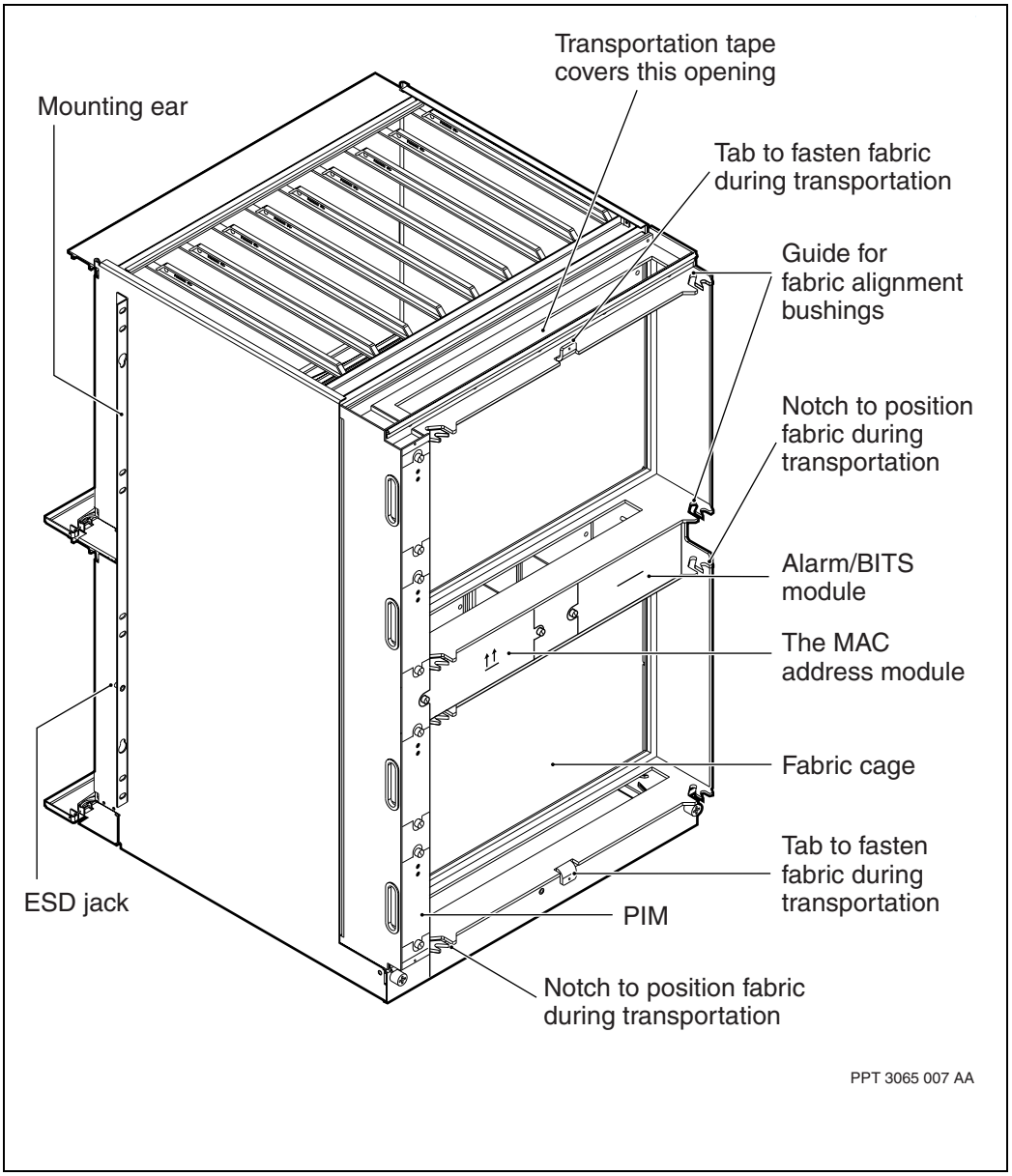
An upper shelf assembly of a Multiservice Switch 20000, rear isometric view



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Removing a side frame panel, regular or extended sizes

Remove a regular or extended side frame panel when

- replacing a regular panel with an extended one
- accessing power or signaling cables that run up or down the side of the NEBS 2000 frame
- replacing a damaged side frame panel

Prerequisites

WARNING

Risk of injury or equipment damage by dropping a side panel

The size and weight of a side panel make it awkward for one person to handle it safely while attempting to fasten or unfasten the panel. Dropping a side panel can injure a head or a foot, can damage whatever it hits, or be damaged on impact. Have a helper assist handling the 13 kg (28 lbs) side panel.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Fall eines Seitenpanels

Aufgrund der Größe und des Gewichts der Seitenpanele sollte das Anbringen oder das Entfernen eines Seitenpanels stets von mindestens 2 Personen durchgeführt werden. Das Fallenlassen oder die unsachgemäße Handhabung des 18 kg schweren Seitenpanels kann zu Kopf- und Fußverletzungen, Verletzung anderer Personen sowie Sachbeschädigung oder Beschädigung des Seitenpanels selbst führen.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a helper to hold a side panel until it is unfastened and lowered to the floor because its sizes are awkward and
  - — an NTRU0128 regular panel weighs approximately 13 kg (28 lbs)
  - — an NTPX4050 extended panel weighs approximately 13 kg (40 lbs)
- You need a thin strong blade to pry plastic caps off each fastener, and a screwdriver to unfasten very large slotted screws.

Procedure steps

Step	Action

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1 On the outside face of the panel, pry the 8 plastic caps off of the fasteners as shown in the figures

- Side panels, exploded view (page 611)
- Extended side panels, exploded view (page 612)

Put the caps aside for re-use.

2 Starting at the bottom of the panel, unfasten all the screws except 2 at the top corners.

3 Unfasten the last screws while a helper prevents the panel from falling. Put all screws aside for re-use.

4 Decide what to do with the removed panel (for example, re-deploy on another frame or re-install it when maintenance actions are completed).

--End--

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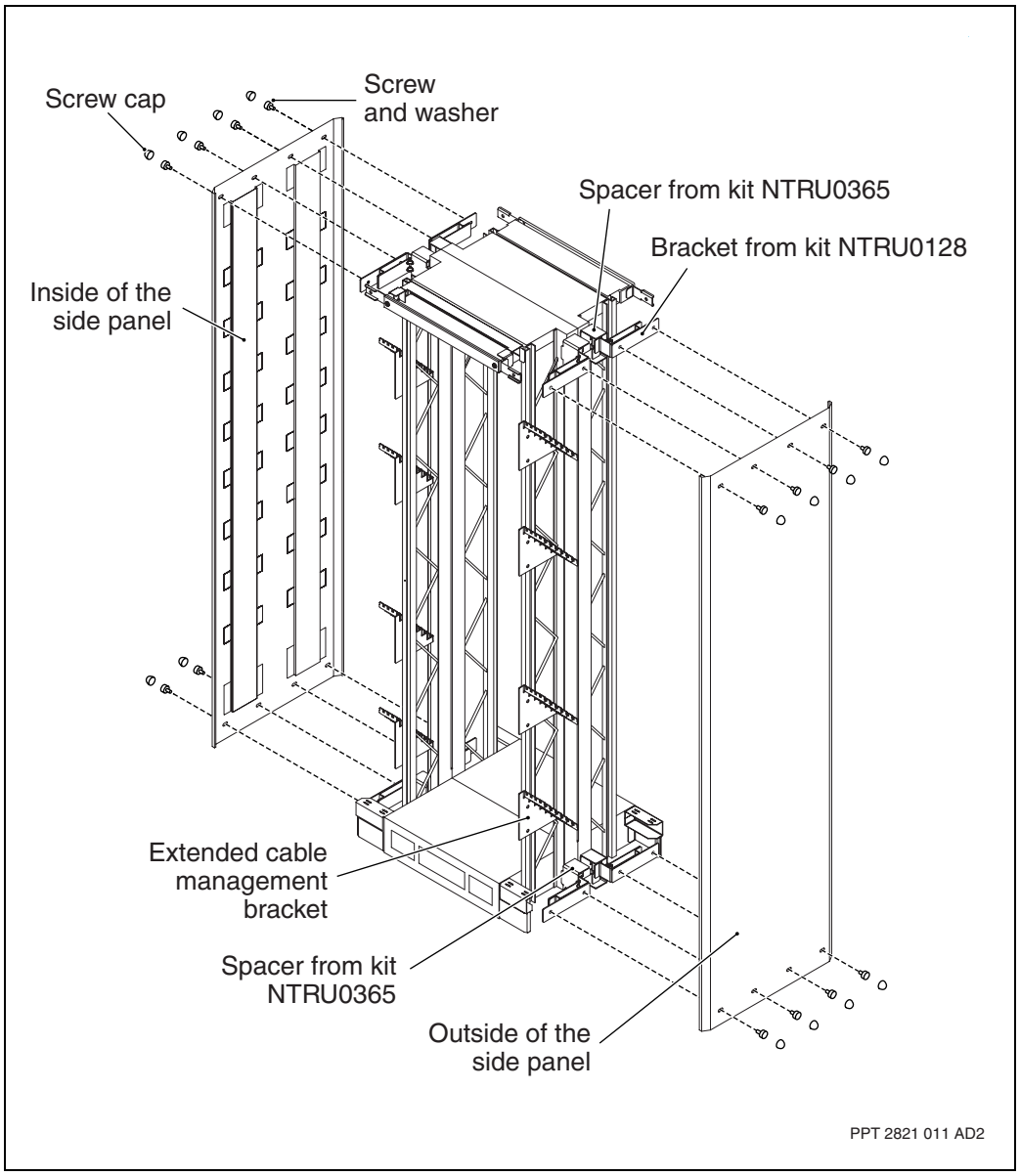
Procedure job aid

Side panels, exploded view



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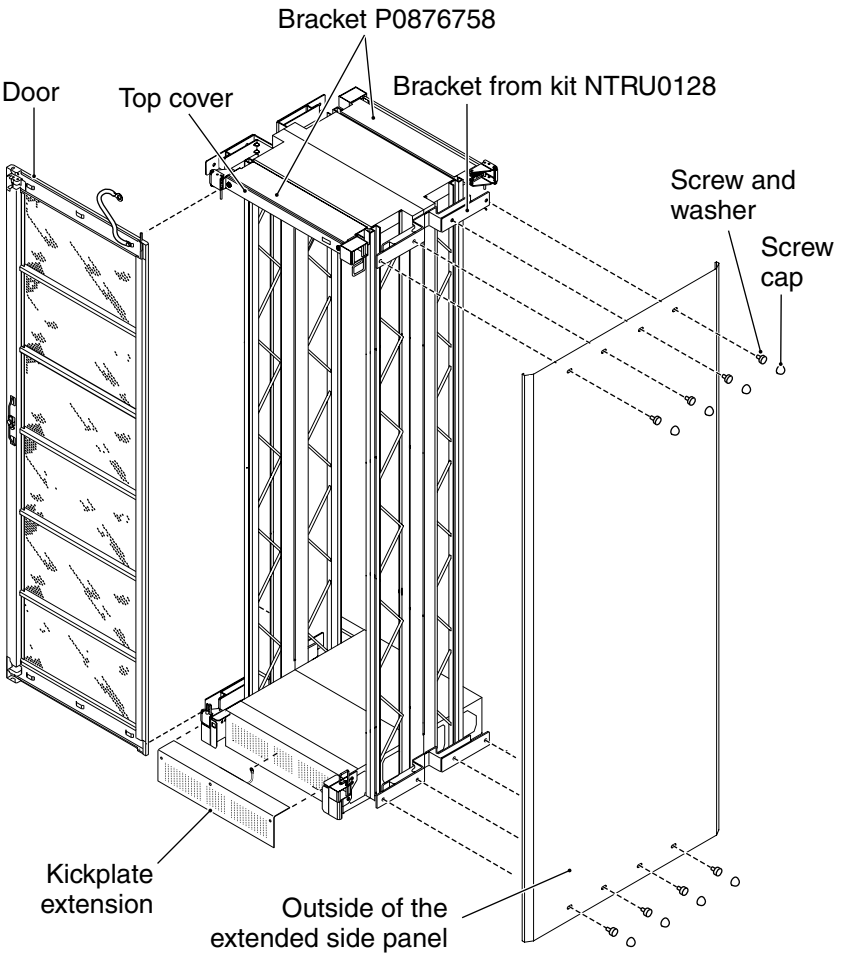
Extended side panels, exploded view



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Removing a sparing panel

Remove a sparing panel if you are decommissioning the services that require it or if you are replacing or upgrading the sparing panel.

Prerequisites

WARNING

Risk of injury or equipment damage by impact

A sparing panel can be heavy and awkward for one person to install. Have a helper available at the start of the installation. Do not drop or bump the panel into anything, as injury or damage can occur.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Stöße

Ein Blindfeld hat ein hohes Gewicht und kann nur schlecht von einer einzigen Person angebracht werden. Führen Sie diese Arbeit zu zweit aus. Vermeiden Sie Stöße und stürzen Sie die Blindfelder nicht, da dadurch Verletzungen oder Geräteschäden verursacht werden können.

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Obtain the site record of the sparing panel connections. Label each cable and record the connection of each relative to the panel. (Labelling cables should already have been done during initial installation.)
2	On the sparing panel, unplug all of the cable connections starting with the control cables. Put the cables aside temporarily so that they are not snagged by the removal of the panel. Disconnecting the second FP control port cable cuts off the power source for the sparing panel. Loss of power is indicated by no LEDs being lit.
3	If the sparing panel is rack-mounted, remove the grounding cable where it is attached to the panel. Put the screw aside for re-use. If the sparing panel is mounted in a NEBS 2000 frame (NTRU04), the sparing panel is grounded through the mounting ears into the frame uprights.
4	Note the orientation of the sparing panel, for example, do the connectors face into the mounting apparatus or out of it.
5	Note where the sparing panel fasteners are located on the mounting apparatus.

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6 Unfasten the sparing panel, progressing from bottom to top. Put the fasteners aside for re-use.

When you are removing a 12-port sparing panel NTQS31, as the top 2 thread-forming 10-mm (3/8-in.) hex-head screws are unfastened, have your helper hold the sparing panel. The helper must also wear a properly grounded anti-static wrist strap.

When you are removing a 19-inch wide sparing panel, and a ground cable shares one of the panel mounting fasteners (usually 8-mm or 5/16-in. EIA screws), loosely fasten the cable back in the same hole after the panel is removed.

7 Put the panel aside for packing later.

--End--

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Removing a temperature sensor bracket assembly

Remove a temperature sensor bracket assembly for an upper cooling unit to replace it or to remove the upper shelf assembly.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a step ladder to see down onto the top of the upper shelf assembly and a driver for the thread-forming 10-mm (3/8-in.) hex-head screws that fasten the bracket to the frame or rack.
- See the figures:
  - Location of the temperature sensor bracket assembly (page 616)
  - A temperature sensor bracket assembly (page 616)
- Minimize the impact or risk of having an out-of-service temperature sensor by Installing a temperature sensor for an upper cooling unit (page 436) immediately.

Procedure steps

Step	Action
1	Standing on a step ladder at the rear top of the upper shelf assembly, identify which upper temperature sensor is to be replaced as shown in the figure Location of the temperature sensor bracket assembly (page 616).
2	Disconnect the D-sub connector of the wire cluster at the right end of the bracket as shown in the figure A temperature sensor bracket assembly (page 616). Apply gentle, even, steady, and straight force using a hand on each half of the connector. When the temperature sensors on the bracket assembly are disconnected, the fans immediately speed up to their higher rpm.
3	Unfasten the 2 mounting screws, one at each end of the bracket. Put the screws aside for re-use. If you drop a screw, you must retrieve it to prevent equipment damage.
4	Pull the bracket assembly straight away from the shelf assembly.

--End--

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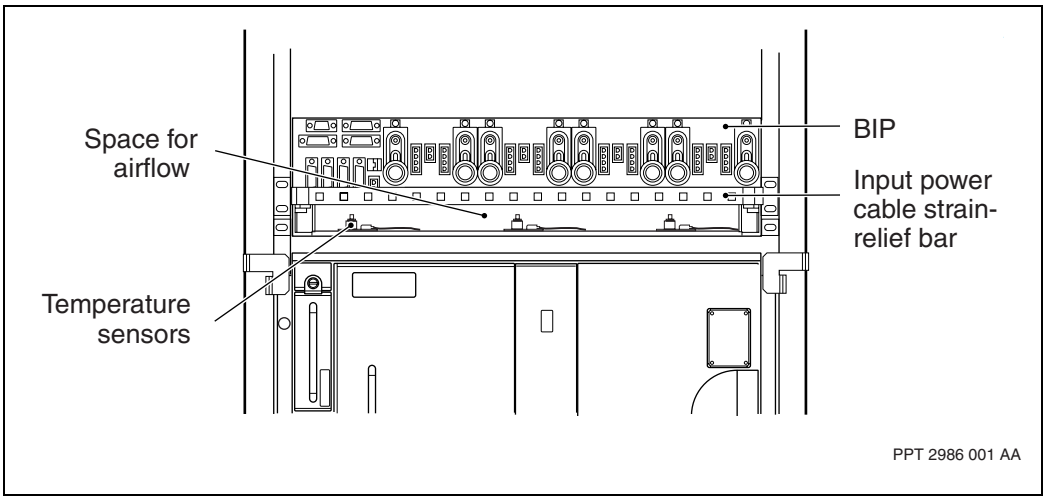
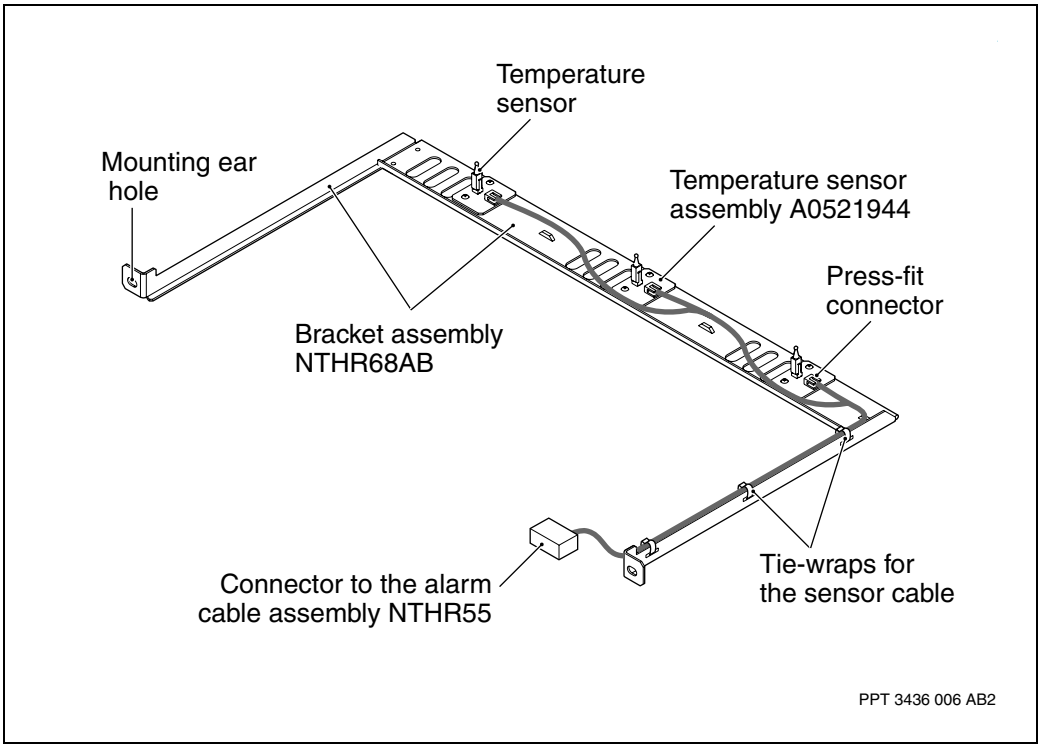
Procedure job aid

Location of the temperature sensor bracket assembly



A temperature sensor bracket assembly



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Removing a temperature sensor for an upper cooling unit

Remove an upper (front) cooling unit temperature sensor to replace it or as part of removing a shelf assembly.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The upper sensors are located in the airflow space beneath the rear of the breaker interface panel (BIP). The sensors are labeled S1, S2, and S3 from left to right looking at the rear of the BIP. See the figure Location of upper temperature sensors (page 618).
- Minimize the impact or risk of having an out-of-service temperature sensor by Installing a temperature sensor for an upper cooling unit (page 436) immediately.
- You need a step ladder to see the top of the upper shelf assembly and a medium non-magnetic one-piece Phillips screwdriver with a very short shaft.

Procedure steps

Step	Action
1	At the rear top of the upper shelf, locate the upper temperature sensor to be replaced.
2	Unplug the cable connector from the temperature sensor assembly. Apply gentle, even, steady, and straight force. There are no tabs on the connector to engage it. Refer to the figures: • A temperature sensor on the bracket assembly NTHR68AA for a cooling unit NTHR52AA (page 618) • A temperature sensor on the bracket assembly NTHR68AB for a cooling unit NTHR52AB (page 619)
3	Unfasten the sensor's 2 Phillips retaining screws. If you drop a screw, you must retrieve it to prevent equipment damage.
4	Put the screws aside for re-use.

--End--

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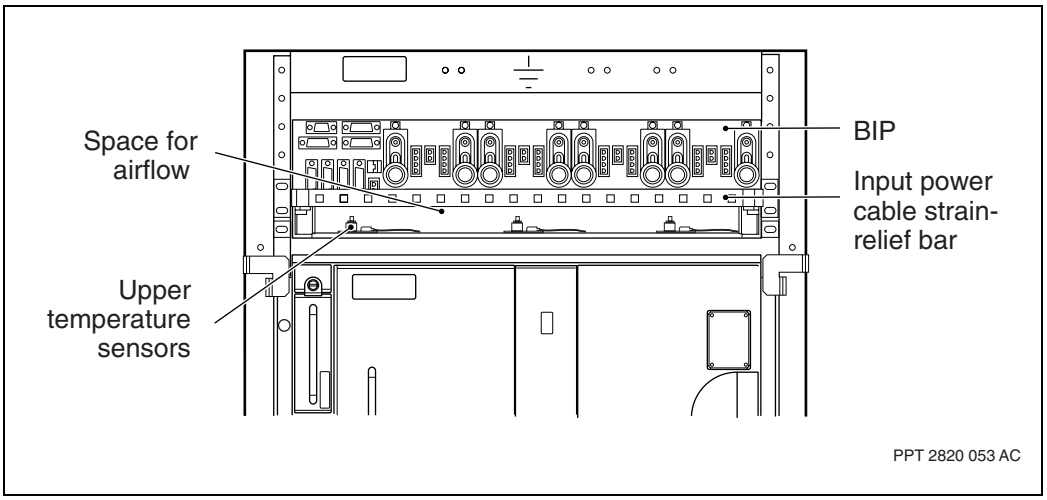
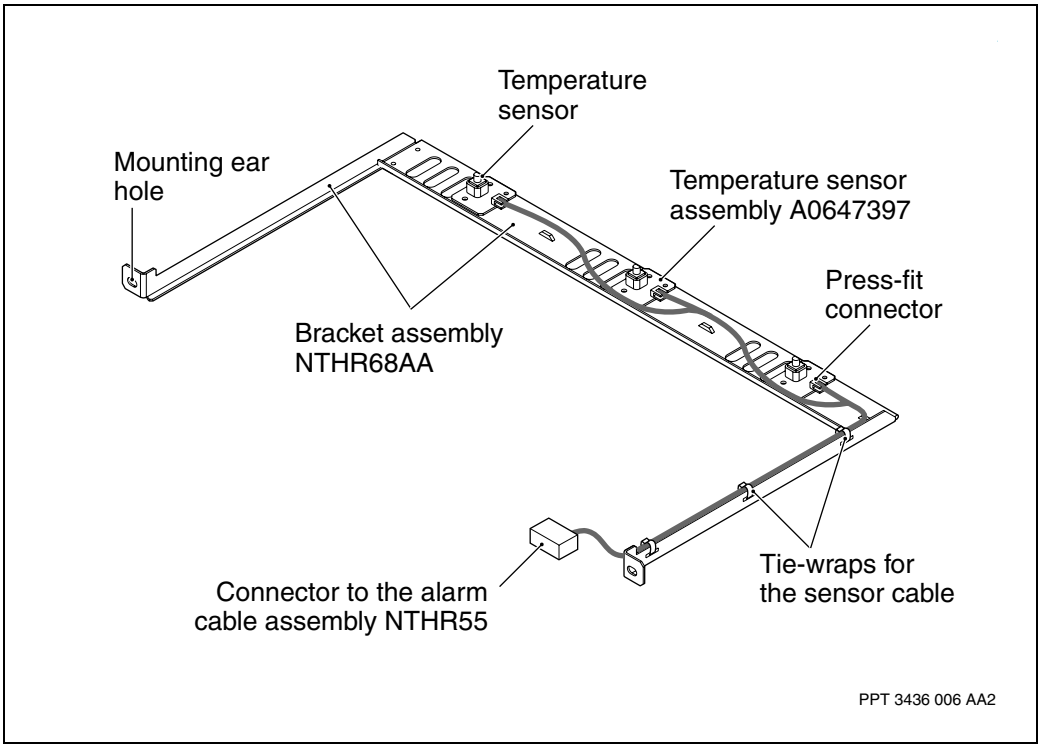
Procedure job aid

Location of upper temperature sensors



A temperature sensor on the bracket assembly NTHR68AA for a cooling unit NTHR52AA



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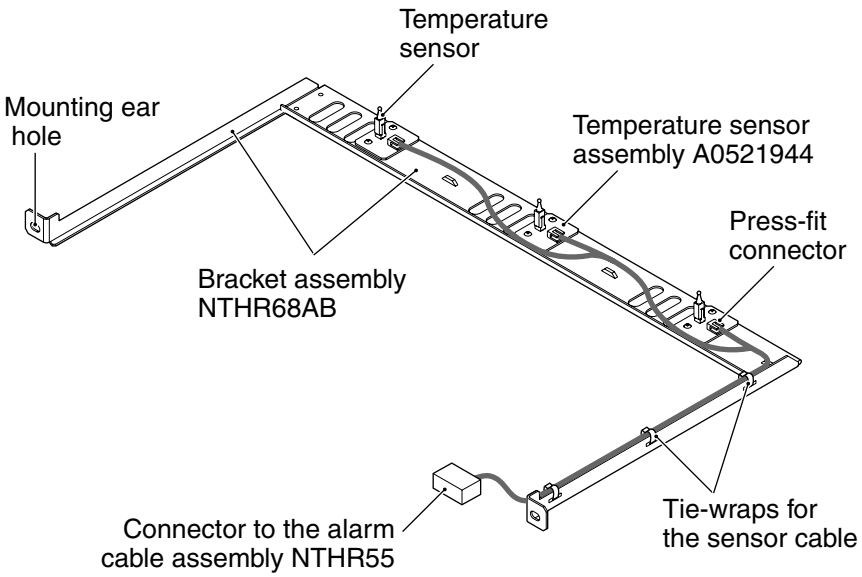
A temperature sensor on the bracket assembly NTHR68AB for a cooling unit NTHR52AB



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Removing a temperature sensor from a lower cooling unit

Remove a lower (rear) cooling unit temperature sensor to replace it.

Prerequisites

DANGER

Risk of injury or equipment damage by electricity

While removing a temperature sensor inside a cooling unit, less than -48/-60 V dc is still live on the controllers and other two fans. Do not drop a screw, and because of the exposed electronics inside the unit, do not use a magnetic screwdriver. A dropped screw must be retrieved. Also, do not touch anything other than the sensor, its screws, or its wires.

WARNUNG

Verletzungsgefahr oder Geräteschäden durch Elektrizität

Beachten Sie beim Austauschen eines Temperatursensors in einem Kühlaggregat, daß die Steuerungen und verbleibenden beiden Lüfter immer noch eine Spannung von bis zu -48/-60 V führen. Lassen Sie keine Schrauben fallen, und arbeiten Sie aufgrund der freiliegenden Elektronikbauteile in der Einheit nicht mit einem Magnetschraubendreher. Heben Sie fallengelassene Schrauben auf. Berühren Sie nur den Sensor, seine Schrauben und Verdrahtungen.

CAUTION

Risk of injury by fan blades

While working on any equipment near the cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a live fan with anything.

WARNUNG

Verletzungsgefahr durch Lüfterblätter

Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

- You must be familiar with Safety considerations and best practices (page 19).
- The lower sensors are located inside the cooling unit and are labeled S1, S2, and S3 from left to right looking up into the cooling unit through the fan shroud past the fan blades. (For example, S1 aligns with F1.)

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— in an NTHR51AA, the sensor is located near the rear of the unit as shown in the figure Location of temperature sensors inside a lower cooling unit NTHR51AA (page 622) with a small separate PCB

— in an NTHR51AB, the sensor is located on the fan controller module as shown in the figure Location of temperature sensors inside a lower cooling unit NTHR51AB (page 623) without a small separate PCB

- You need to remove the fan and the fan controller to access the temperature sensor.
- You need these specialty tools:
  — when the sensor is in an NTHR51AA, a medium non-magnetic one-piece Phillips screwdriver with a very short shaft
  — a flashlight to see through the spinning fan blades at what your hand is touching inside the cooling unit
- The air filter will prevent a dropped screw or tool from reaching the powered processor cards below the cooling unit.

Procedure steps

Step	Action
1	Locate the red LED on the cooling unit. The position of the LED identifies which lower temperature sensor is to be replaced.
2	Reaching inside the cooling unit, unplug the red cable connector from the temperature sensor assembly. Apply gentle, even, steady, and straight force. The plug-in of the right sensor is hidden behind a cluster of wires which cannot be moved. Find the plug-in by touch. See the figures Location of temperature sensors inside a lower cooling unit NTHR51AA (page 622) and Location of temperature sensors inside a lower cooling unit NTHR51AB (page 623). To see what your hand is doing inside the cooling unit, look through the spinning blades of the adjacent fan. You may need a flashlight to see clearly.
3	Unfasten the sensor's 2 Phillips retaining screws and remove them. If you drop a screw, you must retrieve it to prevent equipment damage. Put the screws aside for re-use.
4	Remove the sensor and circuit board.

--End--

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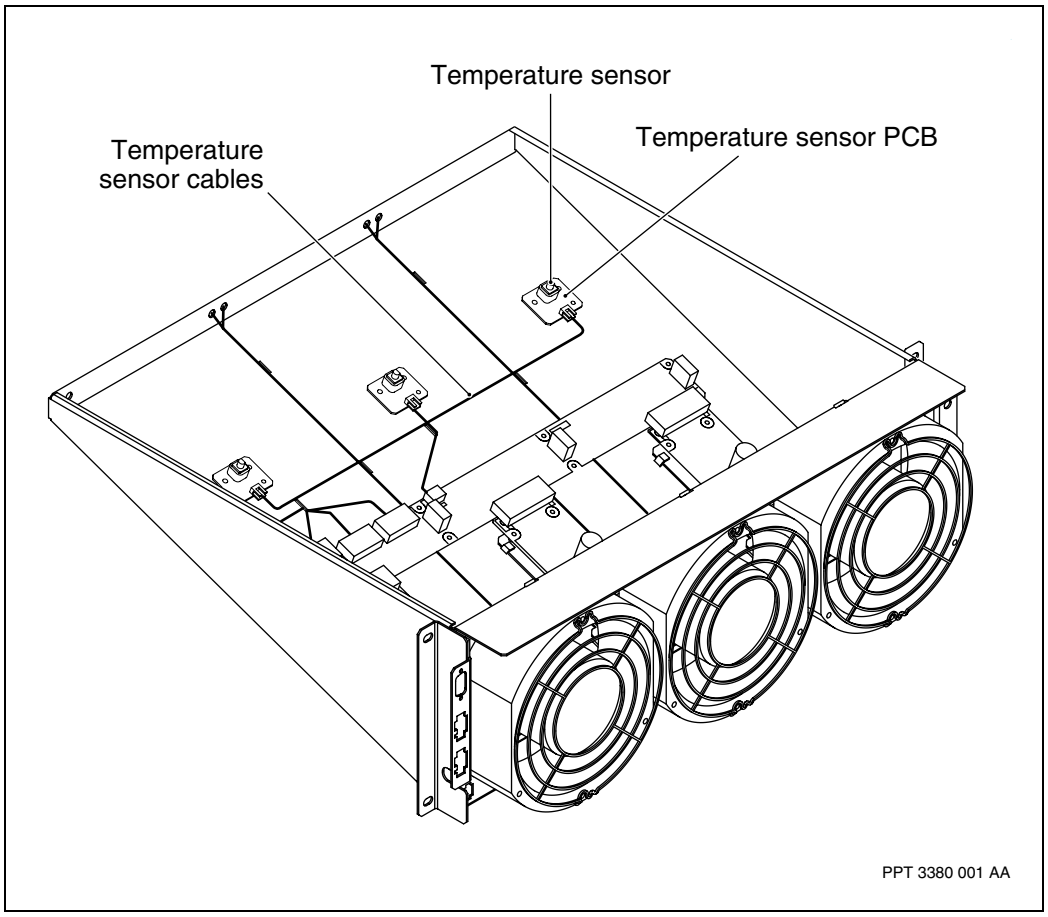
Procedure job aid

Location of temperature sensors inside a lower cooling unit NTHR51AA



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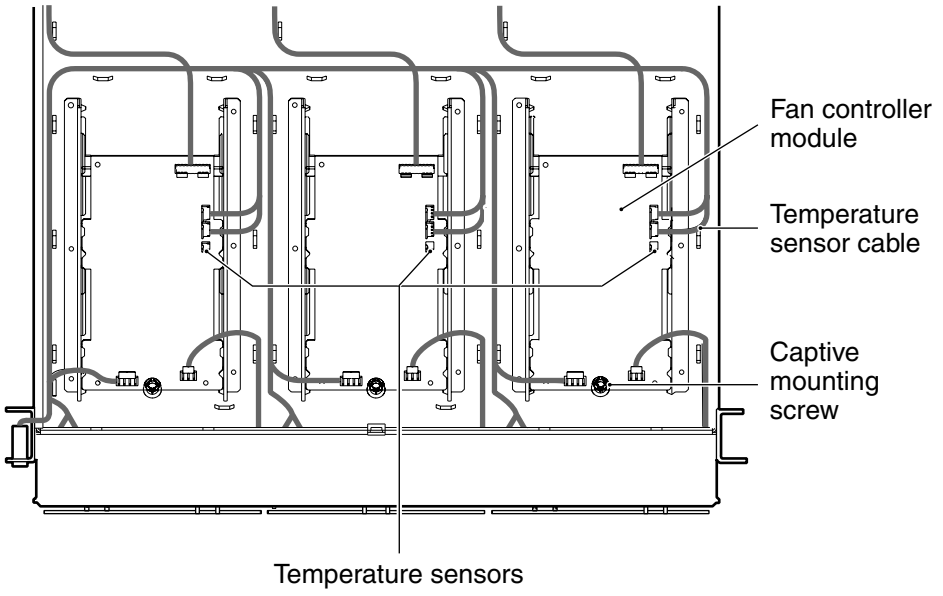
Location of temperature sensors inside a lower cooling unit NTHR51AB



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Removing a timing cable adapter NTPN81

Remove a timing cable adapter NTPN81 to replace it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Locate the adapter to be removed at the rear of a Multiservice Switch 20000.
2	Inform the software network operator that disconnecting the timing cable will generate software alarms for loss of primary timing signal and a switchover to the secondary (if configured and available), or a loss of the secondary as a backup timing reference. This is normal during a replacement. For information about BITS alarms, refer to NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*.
3	At the adapter, unplug the coax connector and let the cable hang freely without allowing the end to contact other metal. It is still signaling.

--End--

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Removing a timing cable for DS1 NTHW75

Remove a wire-wrap timing cable NTHW75 to replace it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Inform the software network operator that disconnecting the cable to replace it will generate software alarms.

Procedure steps

Step	Action
1	Note the path of the old cable assembly.
2	Unplugging either end of the cables at J3 or J4 generates software alarms for loss of primary timing signal and a switchover to the secondary (if configured and available), or a loss of the secondary as a backup timing reference. For information about BITS alarms, refer to NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*.
3	Unfasten the captive D-sub connector screws and unplug the ends of the old cable assembly from the alarm/BITS module.
4	Remove the terminal cover from the wire-wrap terminal block. See the figure A timing cable assembly NTHW75 and terminal connections (page 626).
5	Remove the wire wrapped ends of the old cable assembly from the pins on the terminal block, noting the pins that were used for the connections.
6	Remove the old cable assembly from any cable management brackets on the frame and put it aside.

--End--

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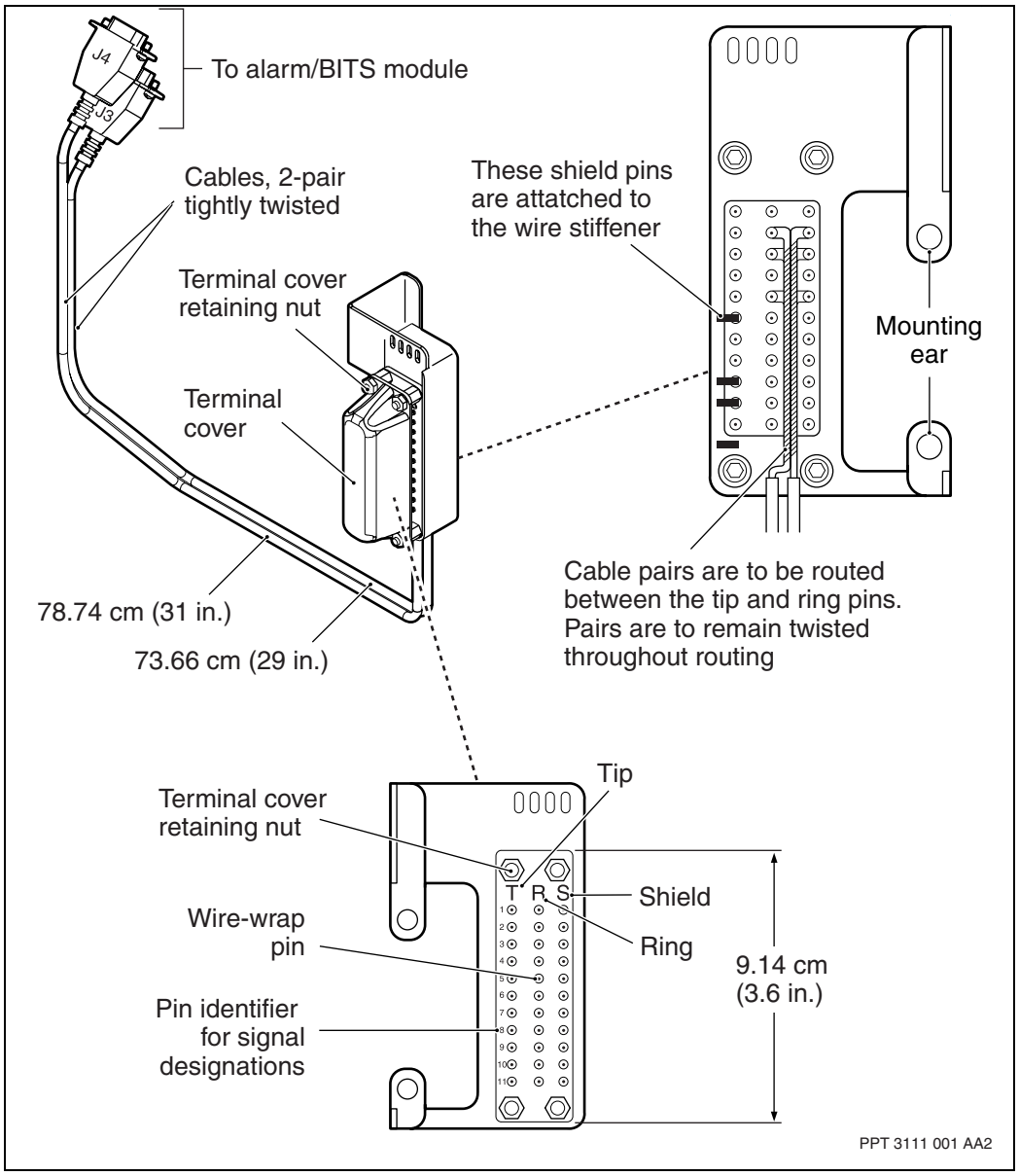
Procedure job aid

A timing cable assembly NTHW75 and terminal connections



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Removing a timing cable for E1 unbalanced NTHR75

Remove a timing cable for E1 unbalanced NTHR75 to replace it. The NTHR75 connects an unbalanced E1 Nortel Networks Multiservice Switch 15000 alarm/BITS module (NTHR14).

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Inform the software network operator that disconnecting the cable to replace it will generate software alarms.

Procedure steps

Step	Action
1	Note the path of the old cable assembly.
2	Remove the D-sub connector from J3 as shown in the figure A timing cable assembly NTHR75 (page 628).
3	Remove the other end of the cable (Rx) from the Tx of the site timing source. The Tx end of the NTHR75 cable is not used.

--End--

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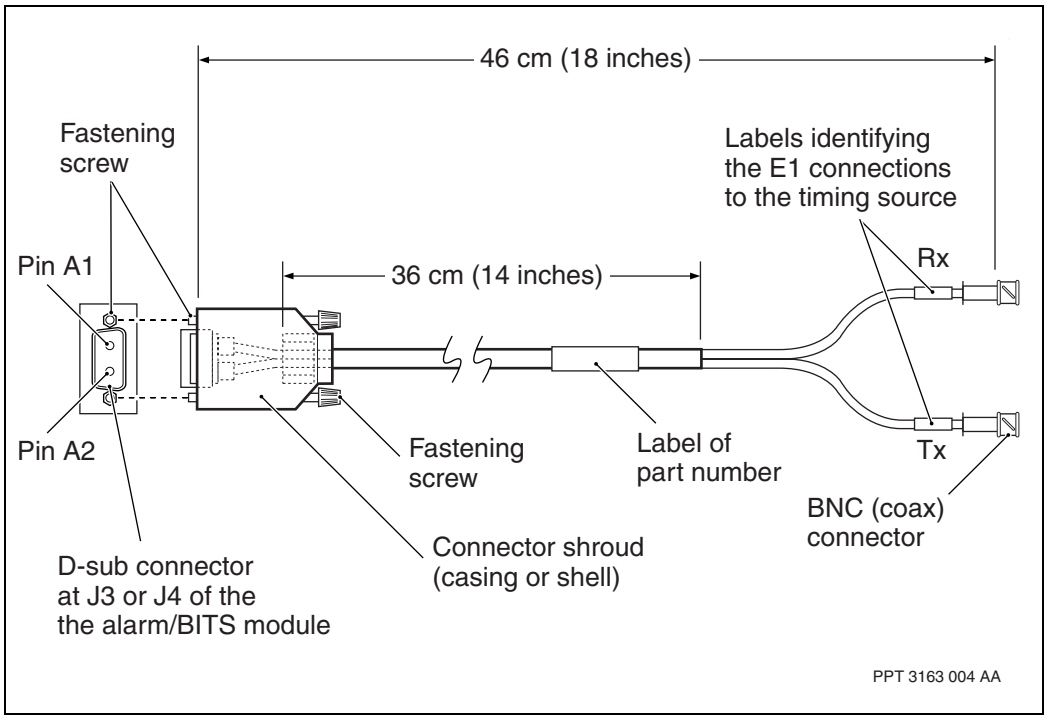
Procedure job aid

A timing cable assembly NTHR75



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Removing a vertical frame from the pallet

Remove a vertical NEBS 2000 frame from the shipping pallet after removing the packaging requires. Remove a vertical frame from the pallet directly onto the equipment for moving the frame to where it is to be anchored.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need three helpers to assist tilting the frame off of the pallet. A frame with two switches in it is top heavy and can fall over if tilted too much.

Procedure steps

Step	Action
1	Latch any cards inside the shelf that may have become unlatched. Ensure that you latch each card to the transportation position. Refer to the figures Upper transportation pockets for card latches (page 586) and Lower transportation pockets for card latches (page 587).
2	Remove the plastic sheet around the frame by cutting it. Since the foam padding is attached to the plastic, put it aside for re-use later.
3	Undo the four 14-mm (9/16-in.) screws in the pallet that fasten the frame-to-pallet shipping brackets.
4	Remove the shipping brackets from the frame feet. Gently tap with a hammer if required.
5	If the frame has panels fastened over the sides, remove one by prying the 8 screw caps off and unfastening the screws. Put the panel, caps, and screws aside for re-use later.

WARNING

Risk of injury when handling a frame

Never place a foot or a hand under any part of the frame while it is being tilted or moved. Always move it with at least four people. The weight of a shipped frame with one Multiservice Switch 15000 or Multiservice Switch 20000 is approximately from 330 kg (730 lbs) to 355 kg (780 lbs); with two switches the weight is from approximately 480 kg (1052 lbs) to 490 kg (1076 lbs). For additional protection, wear safety boots with steel toes and gripping soles.

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WARNUNG

Verletzungsgefahr beim Gestelltransport

Stellen Sie niemals einen Fuß unter das Gestell, wenn dieses bewegt oder gekippt wird, und greifen Sie nicht unter das Gestell. Zum Bewegen des Gestells sind mindestens vier Personen erforderlich. Ein Gestell mit einem Multiservice Switch 15000 oder Multiservice Switch 20000 wiegt ca. 330 kg und mit zwei Multiservice Switch-Einheiten ca. 490 kg. Tragen Sie zu Ihrem zusätzlichen Schutz Sicherheitsschuhe mit Stahlkappen und griffigen Sohlen.

6 Move the fridge cart beside the side of the frame without the side panel so that the foot plate touches the pallet. Ensure the secondary feet of the cart are extended and locked into position.

7 While 3 helpers slightly tilt and hold the frame to raise the side nearest the cart, ensure the 2 frame feet nearest the cart are threaded upwards until each touches the base of the frame.

8 While 3 helpers slightly tilt and hold the frame to raise the side nearest the cart, slide the foot-plate of the cart under the frame feet until the side of the frame is flush against the back of the cart.

9 Lower the frame gently onto the foot-plate. Ensure no cables are pinched between the frame and the cart.

10 Check the position of the cart wheels relative to the pallet. The wheels must be extended past the edge of the pallet so that they can be lowered directly onto the floor (that is, not onto the pallet). If not extended enough, remove the cart and carefully slide the frame closer to the edge of the pallet.

11 Strap the frame snugly to the fridge cart. Place the straps around the frame and cabinets. Prevent the straps from pinching any cables or overlapping anything protruding from the frame. The module handles of a Multiservice Switch 15000 are not designed to withstand pulling from the weight of the frame.

12 With 3 helpers, tilt the frame and cart towards the wheels. Allow the extended wheels to touch the floor gently. While still holding the cart and frame from falling, pull the cart away from the pallet and lower the other set of wheels gently onto the floor.

13 When the cart is on the floor, ensure all of the frame feet are threaded snugly all the way inwards (upwards). You may need an 8-mm (5/16-in.) allen key to turn the shafts from the inside end.

14 Keep the screws, brackets, packing, and pallet in case the frame must be returned.

--End--

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Removing an FP

Remove an FP from a shelf to empty the slot.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You must identify from the description of the FP in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description* if the faceplate has small form pluggable (SFP) optical modules. When such an FP is removed due to a failure, its SFPs are to be removed and kept for re-use. When an FP that uses SFP modules is to be re-deployed, each optical module socket (port) on the FP must be re-configured to match the version of SFP that will be plugged into it.
- The FP to be removed must be locked in software.
- When an optical FP has small-form pluggable (SFP) optical modules, the modules must be removed if
  - — the card is being returned to Nortel Networks
  - — the card has failed
  - — the modules are to be redeployed in another FP
- As each cable is disconnected between an electrical FP and its sparing panel, software alarm 7054 0100 is generated.

Procedure steps

Step	Action
1	At the front of the switch, locate the FP to be replaced. See the figure Locations of FPs (page 634).
2	Record the position of each cable connector relative to the label of the connector on the faceplate. Each cable should already have been labeled with port connection information that will enable you to quickly reconnect the cables to appropriate ports.
3	For fiber optic cards with cable hoods on the faceplate of the card, release the hood by turning the lower latching screw counter-clockwise a 1/4 turn with a slotted screw driver. Turn the screw by hand, not a power tool. Lift the hood upwards and hold it perpendicular to the faceplate.

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CAUTION
Risk of service interruption
Unseating an FP while at least one traffic port cable is still connected to the faceplate means that any PNNI links and some services (for example, ATM) to that FP through that port will be dropped and will not recover when a replacement FP is returned to service. Always disconnect all cables after locking a card and before unseating it.

CAUTION
Risk of equipment damage
To prevent equipment damage, disconnect the cables attached to the ports of an FP before you disconnect the control cable that connects the FP to a termination panel.

CAUTION
Risk of damage to the fiber transceivers on the FPs
When engaging or disengaging a fiber optical cable connector to the connector on the FP faceplate (the transceiver), you can damage the nose shield on the connector or the optic transceiver by improper coupling. This especially applies to MT-RJ connectors.

Before pulling the cable connector away from the transceiver, you must ensure that the tab (latch) on the cable connector is fully pinched against its side.

4 Unplug the cable connectors on the faceplate of the FP. While unplugging, pull straight away from the faceplate connector. Different types of connectors have various disengaging mechanisms, as follows.

- For standard coax or BNC cables, twist the connector until the pin disengages the groove and pull.
- For 8w8 mini-coax D-sub connectors, unfasten the captive screws and pull.
- For any other type of D-sub connector, unfasten the captive screws and pull.
- For FPs with Ethernet RJ-45 connectors, fully press down the tab on the connector and pull. (The VSP3 card has Ethernet LC connectors.)
- For SC, LC, or MT-RJ fiber cable connectors, fully pinch the tab on the connector against its side and pull straight out. Cover the ferrule with an appropriate dust cap.

5 Allow the cables to hang aside temporarily.

6 When the FP has SFP optical modules on the faceplate, remove all of them according to the procedure Removing an SFP optical module (page 639).

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7 On the faceplate of the FP, fully swing out the upper and lower latches until they stop as shown in the figure Fully opened card latches (page 635).

8 Place fingers on the exposed tabs to gently but firmly slide the FP out of its slot. Hold only the edges of the FP. Be careful because an FP weighs up to 5.4 kg (12 lbs).

9 Insert appropriate dust boots into the port transceivers or covers onto the faceplate connectors.

10 Pack the FP in appropriate packaging.

--End--

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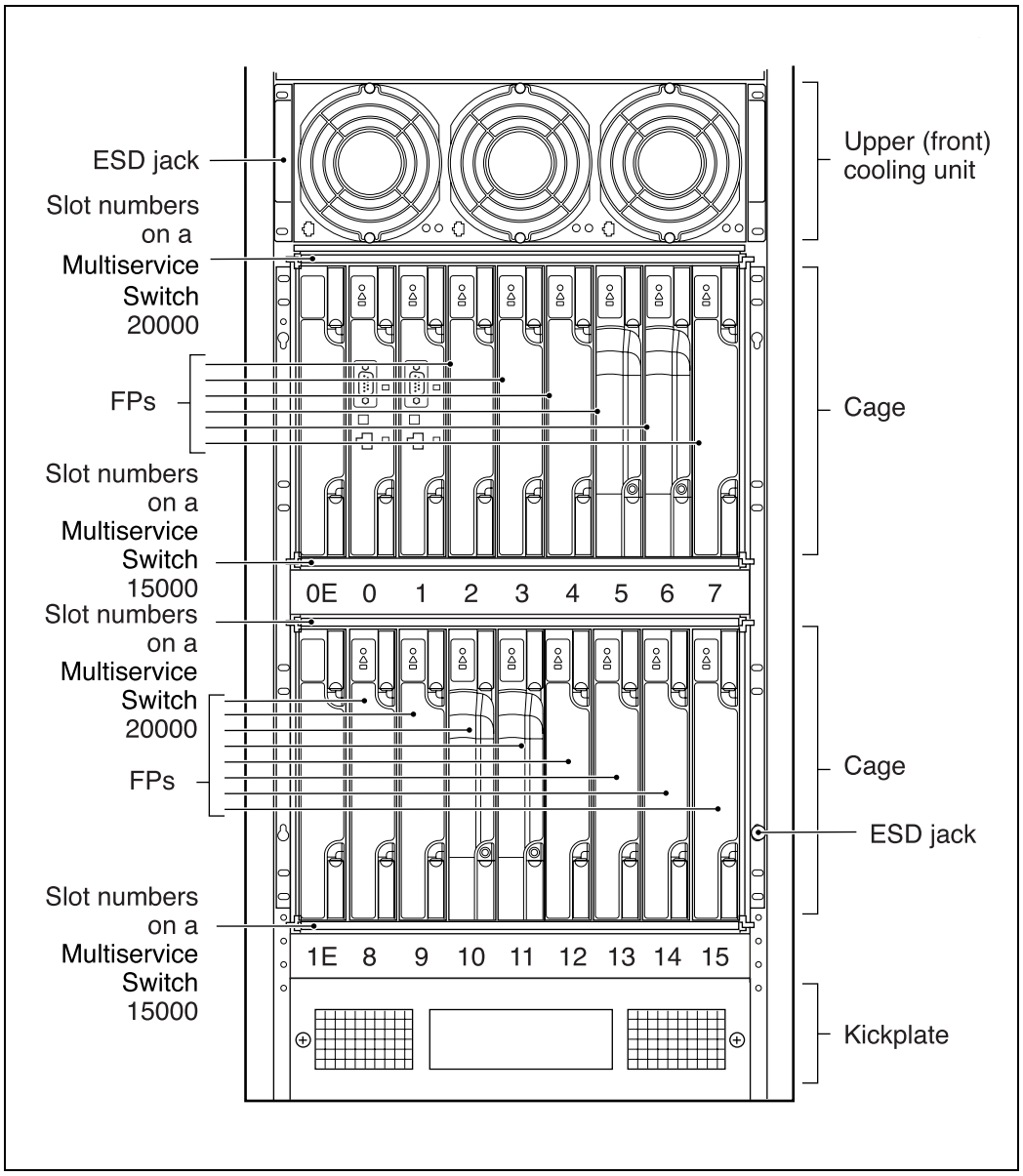
Procedure job aid

Locations of FPs



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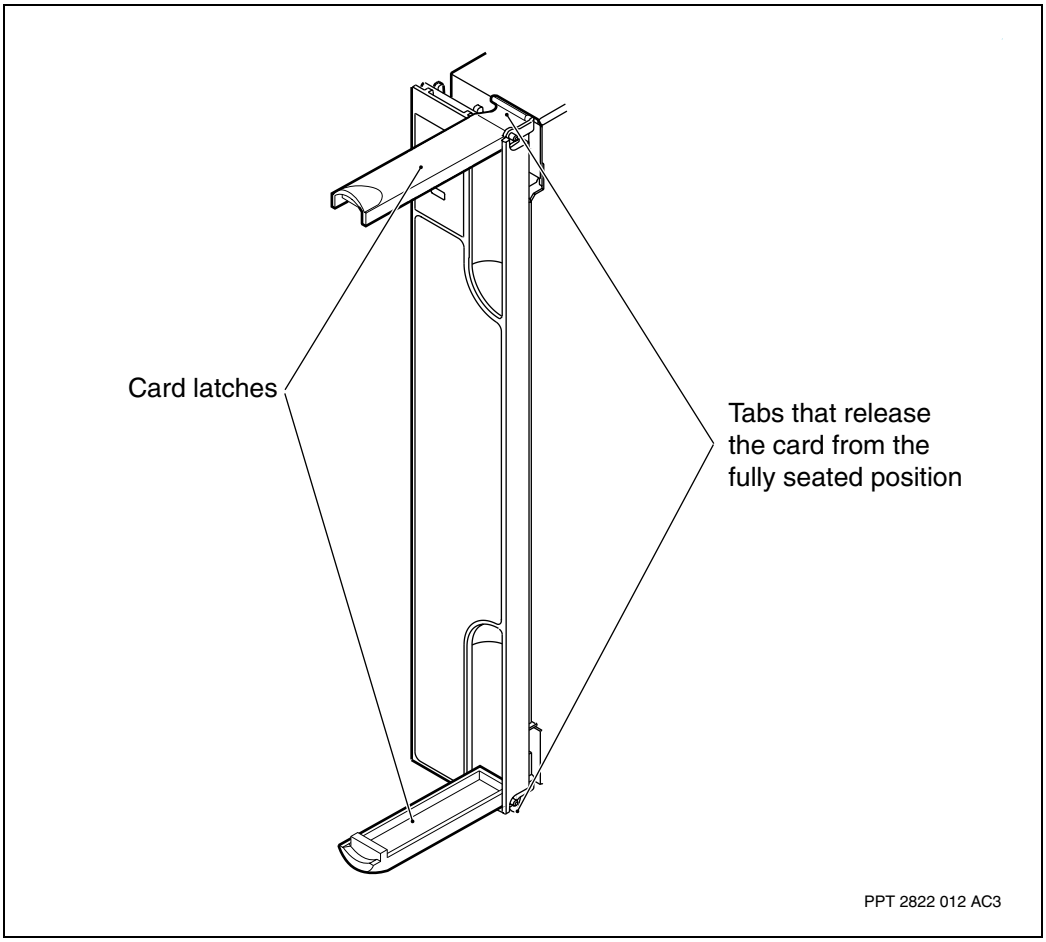
Fully opened card latches



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Removing an FP cable

Remove an FP cable to replace it due to a fault, an upgrade, or a change (re-deployment).

Prerequisites

CAUTION
Risk of service loss
Ensure that the cable being removed is not carrying traffic before you remove it.

CAUTION
Risk of equipment damage
To prevent equipment damage, disconnect the cables attached to the ports of an FP before you disconnect the control cable that connects the FP to a termination panel.

- You must be familiar with Safety considerations and best practices (page 19).
- Unless prefabricated cable assemblies are available from Nortel Networks, you must provide a custom-made replacement cable assembly. Cable specifications are located in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- When you are replacing a cable from an FP that uses small-form pluggable (SFP) optical modules between the cable and the FP faceplate, leave the SFP module inserted in the faceplate.

Procedure steps

Step	Action
1	Locate the cable to be removed.
2	Unplug the cable connector at the faceplate of the FP. While unplugging, pull straight away from the angle of the receptacle on the faceplate. If the cable connection includes an inline attenuator, re-use it. Fiber optic cards have cable hoods that must be propped open while disengaging connectors. Different types of connectors have various disengaging mechanisms, as follows. • For standard coax or BNC cables, twist the connector until the pin disengages the groove and pull. • For 8w8 mini-coax D-sub connectors, unfasten the captive screws and pull the shroud. Avoid rocking the connector.

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- For any other type of D-sub connector, unfasten the captive screws and pull the shroud. Avoid rocking the connector.
- For FPs with Ethernet RJ-45 connectors, fully press down the tab on the connector and pull. (A VSP3 card has Ethernet LC connectors.)
- For SC, LC, and MT-RJ fiber cable connectors, fully pinch the tab on the connector against its side and pull straight out. Cover the ferrule with an appropriate dust cap.

CAUTION

Risk of damage to the fiber transceivers on the FPs

When engaging or disengaging a fiber optical cable connector to the connector on the FP faceplate (the transceiver), you can damage the nose shield on the connector or the optic transceiver by improper coupling. This especially applies to MT-RJ connectors.

Before pulling the cable connector away from the transceiver, you must ensure that the tab (latch) on the cable connector is fully pinched against its side.

3

4 Repeat these steps at the other end of the cable.

5 Cut the connector off the end of the old cable. Cutting tie-wraps and tugging or pulling on the old cable can affect the operation of any other cable. If possible, leave the old cable in position.

If necessary to make room in the cable management path, remove the cable completely.

6 If the cable being removed passes through a slack management unit, locate the original cable that was put aside. Open the curlie ties beside the fiber unit that it passes through. Carefully separate the cable from the cluster. Minimize your handling of fiber cables along the path. Cut the original cable at the next downstream and upstream tie-wraps so that the loop of slack cable is removed from the path. Leave the remainder of the old cable in position.

--End--

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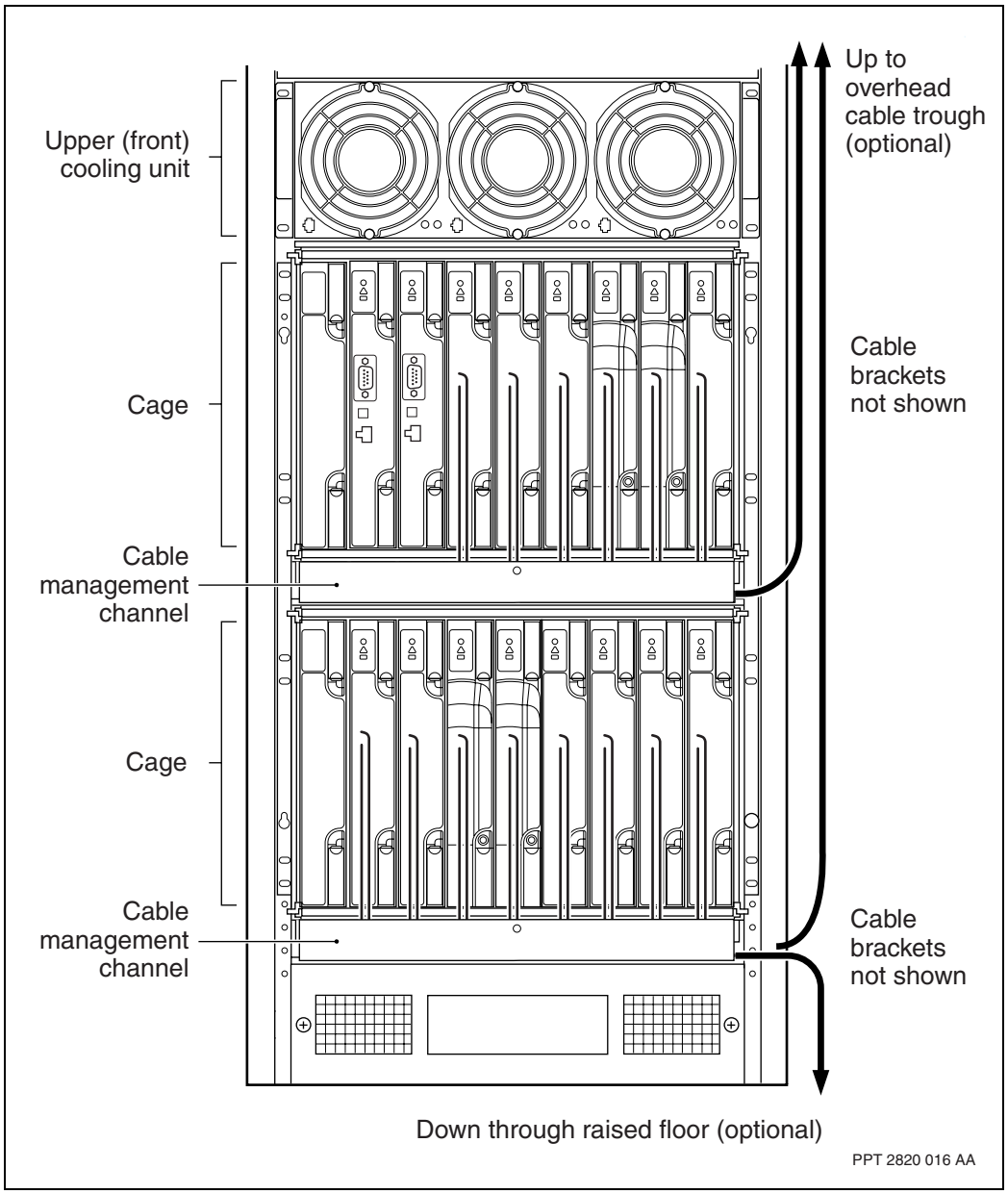
Procedure job aid

Route of an FP cable



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Removing an SFP optical module

Remove an optical module to replace it or re-deploy it.

Prerequisites

CAUTION
Risk of equipment damage by ESD
Always ground yourself by an approved anti-ESD method before and while handling any tools or hardware on or near the Multiservice Switch. You can plug the provided wrist strap (part number A0378999) into an anti-ESD jack on the lower left mounting ear of either cooling unit (row of fans) on a switch.

- SFP optical modules are unusually susceptible to damage by electrostatic discharge (ESD).
- You must be familiar with Safety considerations and best practices (page 19).
- The FP should already be installed in the shelf.
- The FP port of the SFP module must be locked in software. For the procedure on locking a port, see NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*.
- Do not touch the circuitry inside the large open end of an SFP optical module or you may cause the unit to malfunction. Refer to the figure A typical SFP optical module (page 641).
- A failed optical module generates software alarm 7011 5480.

Procedure steps

Step	Action

WARNING
Risk of eye injury by laser
Never look directly into the end of a fiber cable, let an end pass in front of your eyes, or use an optical device to look at the end of an optical fiber unless you are certain the other end is not connected. The LASER travelling through a fiber cable can injure the human retina.

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WARNUNG

Gefahr von Augenverletzungen durch Laserstrahlen

Blicken Sie nie direkt auf das Ende eines Glasfaserkabels, und überprüfen Sie auch einzelne Faserenden nicht mit einem optischen Gerät, wenn Sie nicht sicher sind, daß das andere Kabelende nicht angeschlossen ist. Der über die Glasfasern übertragene Laser kann die menschliche Netzhaut verletzen.

7 Unplug each cable that is attached to the optical module by pressing on the release tab and gently pulling straight away until the fiber is fully disengaged.

8 When the FP is being replaced due to a failure or an upgrade and the FP has SFP modules, record the PEC of each module relative to its position on the faceplate so that you can plug it into the same socket (port) on the replacement FP. The SFP version must match the software configuration of it in the same port.

When the FP is being re-deployed and the FP has SFP modules, leave the modules in the faceplate until the card's new slot is configured for the FP, and the FP's ports are configured for the SFP modules. In the meantime, insert dust boots into the pair of LC connector openings on each SFP.

9 Remove the SFP module by:

- swinging the bale latch away from the body of the SFP until it is at about a 90-degree angle relative to the SFP
- pulling the latch along the axis of the SFP until the module is fully disengaged

For an example, see the figure Orientation of an installed SFP module in a NTHW46 or a NTHW49 (page 642).

--End--

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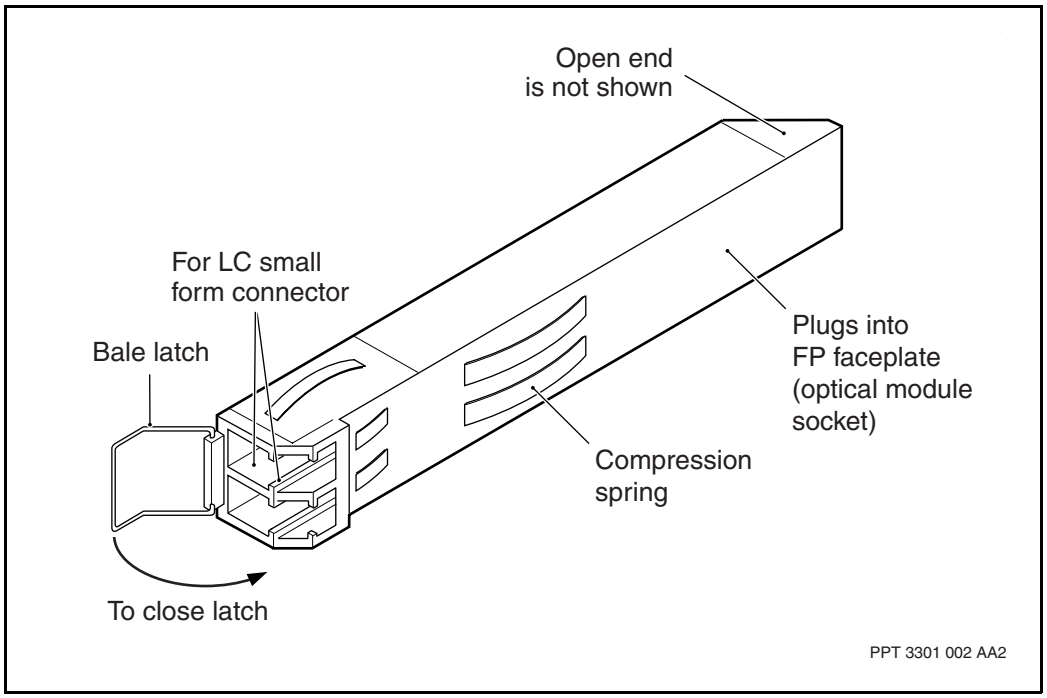
Procedure job aid

A typical SFP optical module



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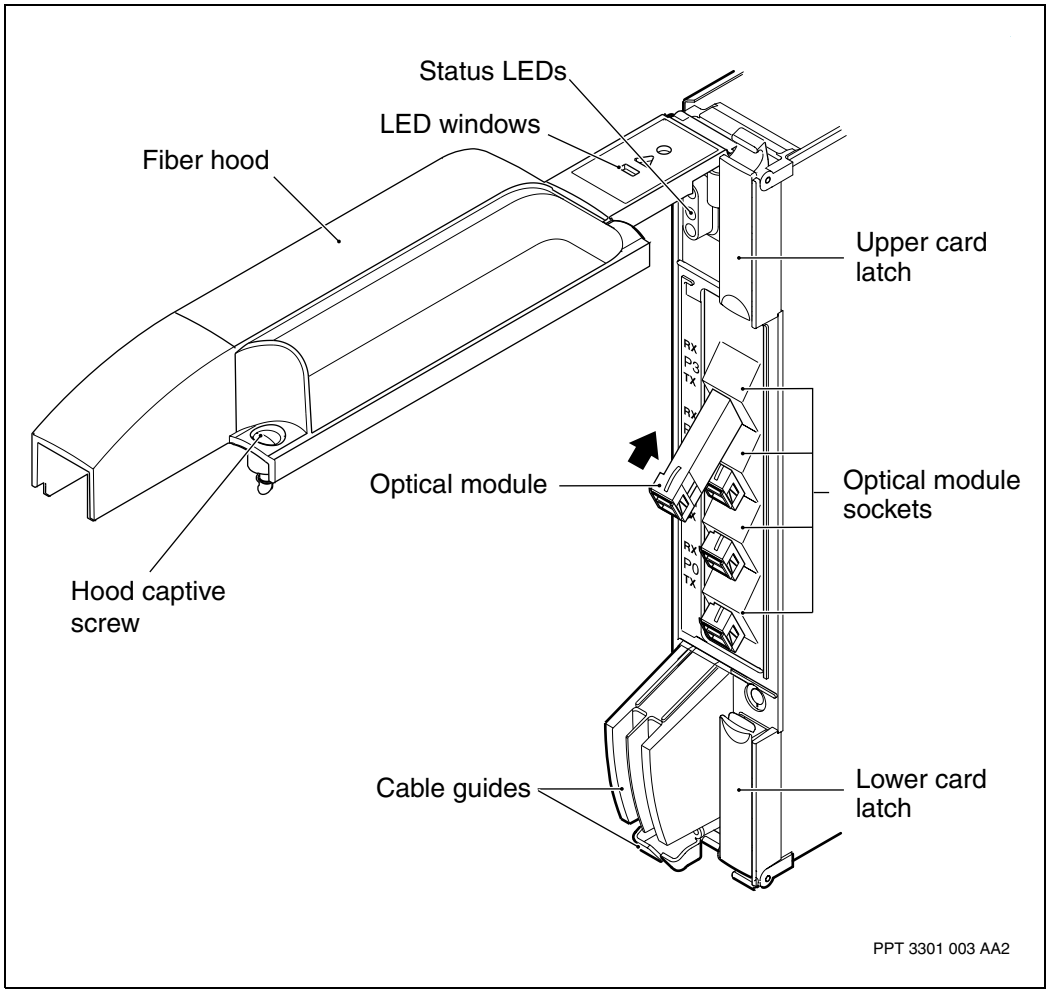
Orientation of an installed SFP module in a NTHW46 or a NTHW49



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Removing an upper cooling unit

Remove an upper cooling unit to access the cooling unit parts for replacement, or to replace the entire cooling unit.

Prerequisites

WARNING

Risk of injury by fan blades

While working on any equipment near the cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a live fan with anything.

WARNUNG

Verletzungsgefahr durch Lüfterblätter

Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

CAUTION

Service degradation or interruption by heat

When the cooling unit of an in-service node loses power, the air temperature inside the shelf rises rapidly. When the temperature inside a fabric exceeds 55 degrees Celsius (131 fahrenheit), high temperasture fabric alarm 7002 0003 is generated. When the temperature exceeds 70 degrees Celsius (158 degrees Fahrenheit), alarm 7012 0059 warns that one or both fabrics will automatically shut down at 72 degrees Celsius (or 161.6 degrees Fahrenheit) until the temperature drops below 68 degrees Celsius (154.4 degrees Fahrenheit).

- You must be familiar with Safety considerations and best practices (page 19).
- You need a driver for the thread-forming 10-mm (3/8-in.) hex-head screws that fasten each cooling unit to the frame or rack.
- You need a helper to hold the unit until it is fastened because it weighs (9.1 kg or 20 lbs) and tends to slide out of position when it is unfastened.
- For the behavior of temperature alarms before, during, and after replacing a part, refer to the section on hardware alarm definitions and behaviors in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.

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Procedure steps

Step	Action
1	Place a temporary anti-ESD pad or container near the NEBS 2000 frame or equivalent so that the removed cooling unit can sit on it while waiting for the packaging of the replacement unit. The pad needs to be a minimum of about 65 cm by 65 cm (2 feet, 2 in. square). Disregarding ESD protection can affect the results of diagnosing equipment failure.
2	Contact the software operator of the switch to inform that cooling unit alarms will be generated while the unit is being replaced.
3	Toggle off both cooling unit breakers and put tape on them to indicate neither was tripped. To ensure that you turn off the correct breakers, refer to the table Location of cooling unit breakers on the front of the BIP (page 591).
4	At the rear of the NEBS 2000 frame or equivalent, check the LEDs of the cooling unit to ensure that none are lit. This confirms that power is off since the fan blades can still be rotating freely while slowing down.
5	Facing the rear of the upper cooling unit at the rear of the frame and above the fans of the lower (front) cooling unit, disconnect power cable A by pressing and holding the tabs on the side of the connector and pulling straight out. (The cables at the right side are for the lower cooling unit.)
6	Label the cable to identify which connector it plugs into (for example, with UA for upper unit, power connector A).
7	Repeat the two previous steps for power cable B, using UB for the label.
8	Unfasten the 2 small slotted captive screws on the D-sub connector below the A and B power connectors.
9	Leave the F1, F2, and F3 cables connected on the fan side of the cooling unit.
10	Unfasten the 4 thread-forming 10-mm (3/8-in.) hex-head mounting screws at both sides of the frame. Put the screws aside for re-use. Be ready for the unit to slide out on its own and to support its weight of 9 kg (20 lbs).
11	By gripping the mounting ears at either side of the unit, slide it straight out and away from the frame.
12	Put the cooling unit on the ESD protection pad or container.

--End--

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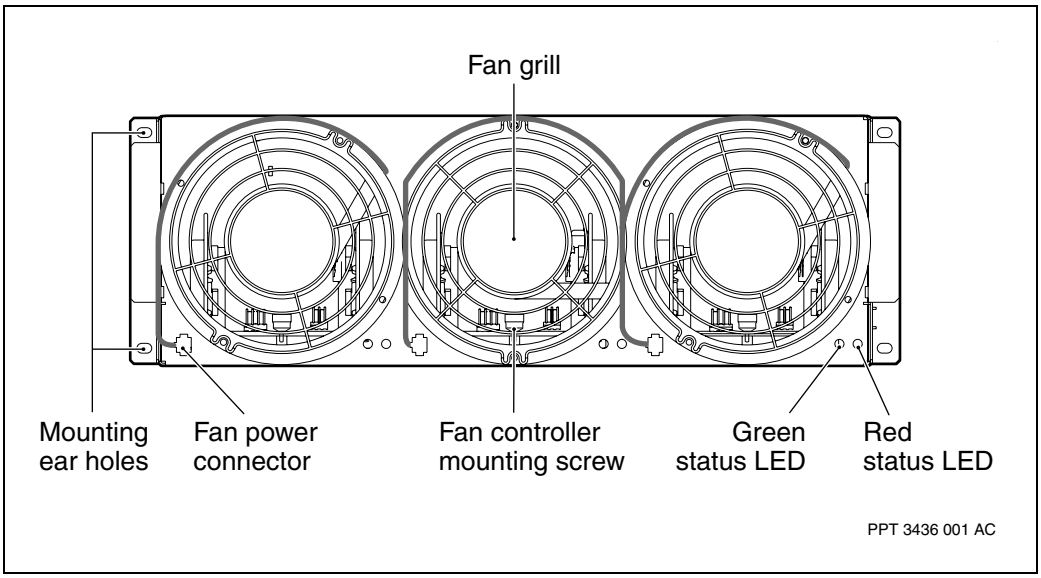
Procedure job aid

Location of the mounting screws of an upper cooling unit



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Removing door hardware from the bottom of a frame

Remove door hardware from the bottom of a NEBS 2000 frame as part of re-deploying all of the door hardware.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Identify the hardware in the figures
  - Orientation of a kickplate extension to the base of a NEBS 2000 frame (page 647)
  - Orientation of lower right door hardware (page 648)
  - Orientation of lower left door hardware (page 649)
- You need the tools identified in the Prerequisites of Door hardware removal from a NEBS 2000 frame (page 77).
- As each part is removed, thread the screws and washers back into it so that screws of different lengths remain associated with the appropriate part.

Procedure steps

Step	Action
1	Unfasten the 2 captive screws of the kickplate extension and pull it away from the frame as far as the ground cable allows.
2	Unfasten the ground cable on the kickplate extension. Put the extension, screw, and washer aside temporarily.
3	Reaching inside the base of the frame from the aisle, on the right side unfasten: • the 4 screws of the lower door catch (or lower door hinge) • the 2 screws of the cosmetic extension filler • the 6 screws of the lower right (or left) extension bracket
4	Repeat step 3 at the left side bottom of the frame.

--End--

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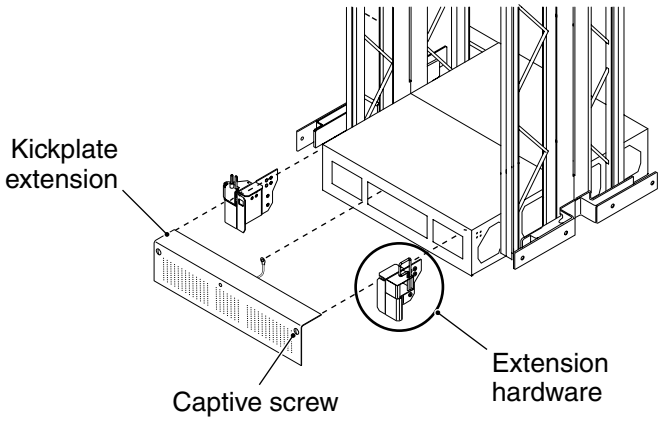
Procedure job aid

Orientation of a kickplate extension to the base of a NEBS 2000 frame



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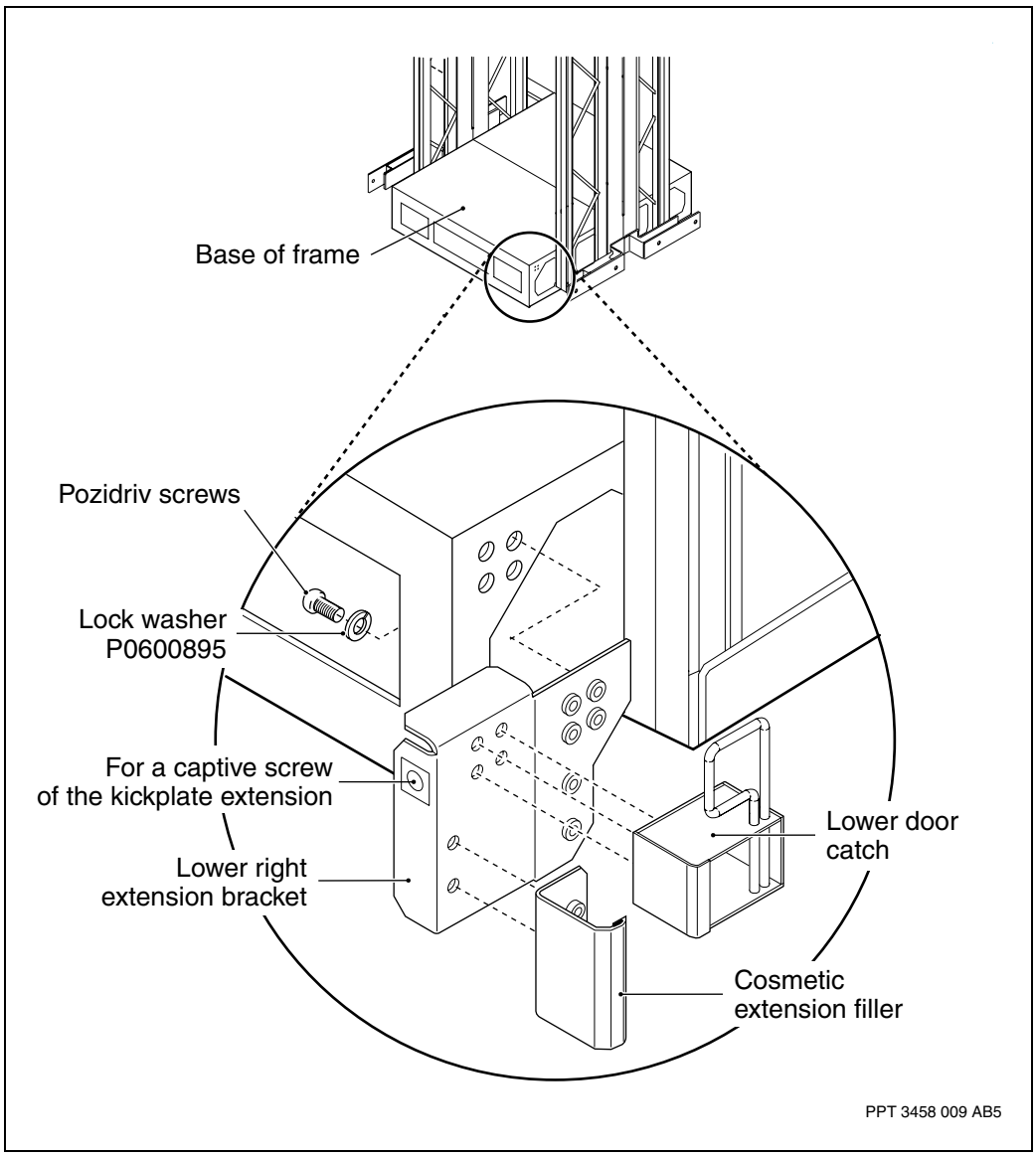
Orientation of lower right door hardware



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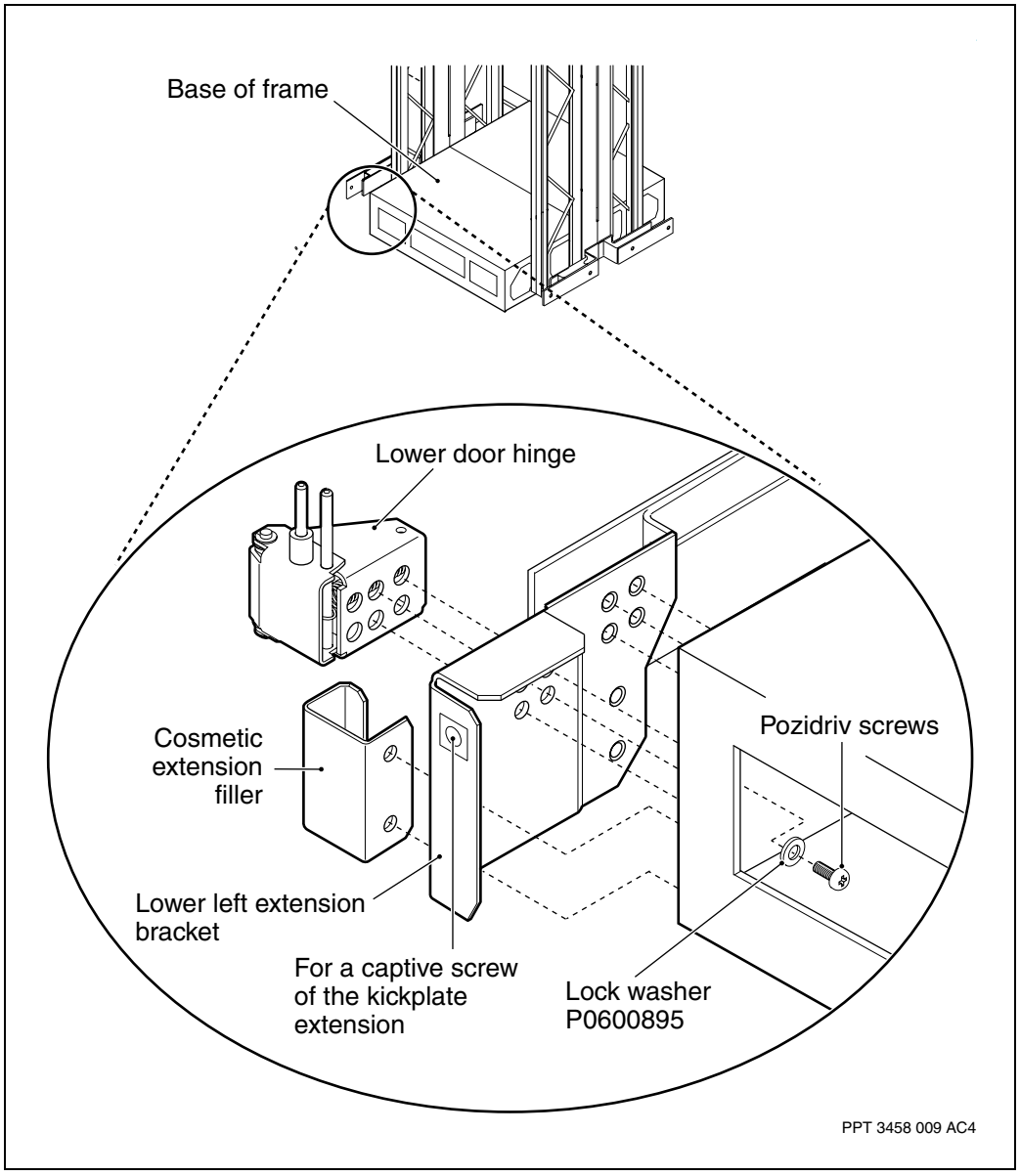
Orientation of lower left door hardware



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Removing door hardware from the top of a frame

Remove door hardware from the top of a NEBS 2000 frame as part of re-deploying all of the door hardware.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Identify the hardware in the figures
  - Location of the upper door hardware on a top frame bracket on a NEBS 2000 frame (page 651)
  - Orientation of upper right door hardware (page 652)
  - Orientation of upper left door hardware (page 653)
- You need the tools identified in the Prerequisites of Door hardware removal from a NEBS 2000 frame (page 77).
- As each part is removed, thread the screws and washers back into it so that screws of different lengths remain associated with the appropriate part.

Procedure steps

Step	Action
1	At the top right side of the frame, unfasten the 4 screws of the door catch as shown in the figure Orientation of upper right door hardware (page 652).
2	At the top left side of the frame, unfasten the 4 screws of the door hinge as shown in the figure Orientation of upper left door hardware (page 653).

--End--

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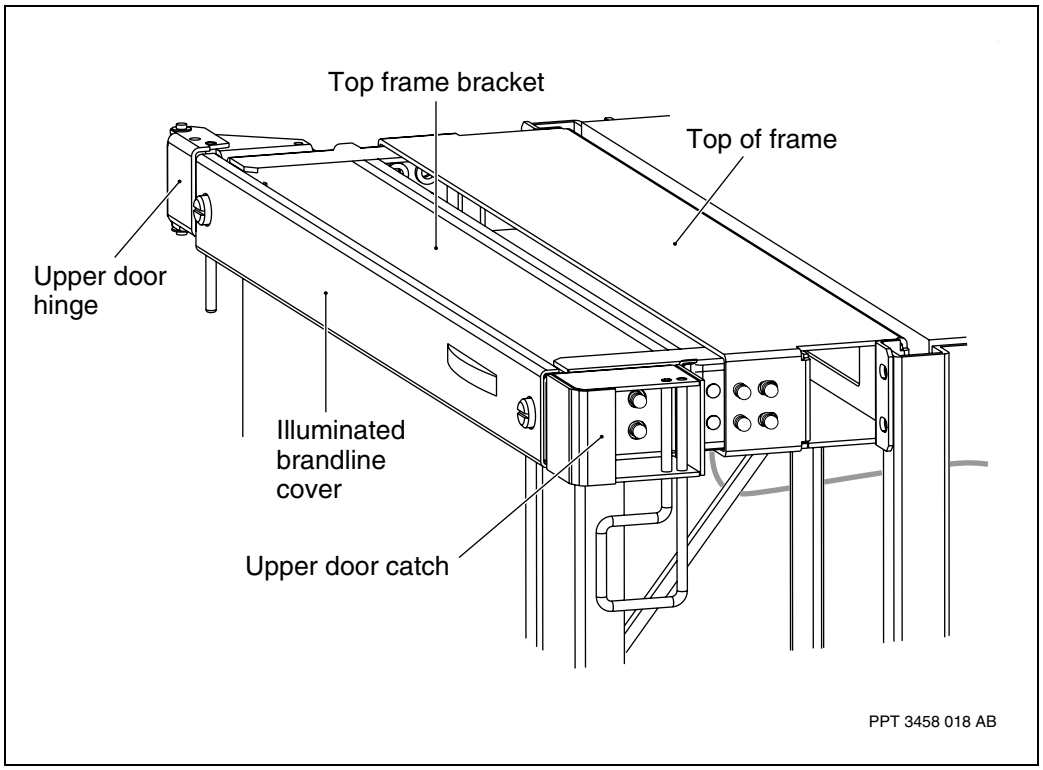
Procedure job aid

Location of the upper door hardware on a top frame bracket on a NEBS 2000 frame



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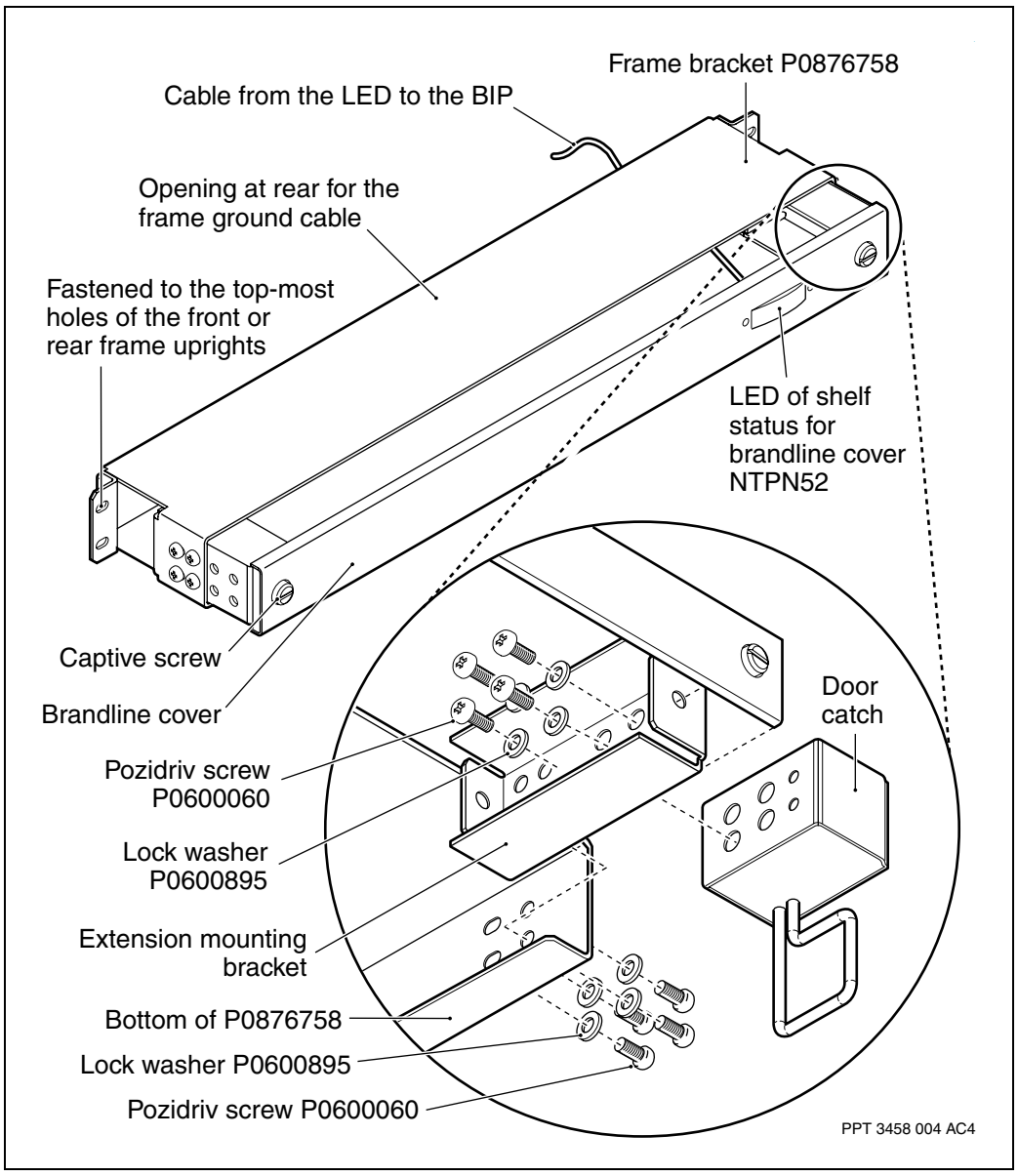
Orientation of upper right door hardware



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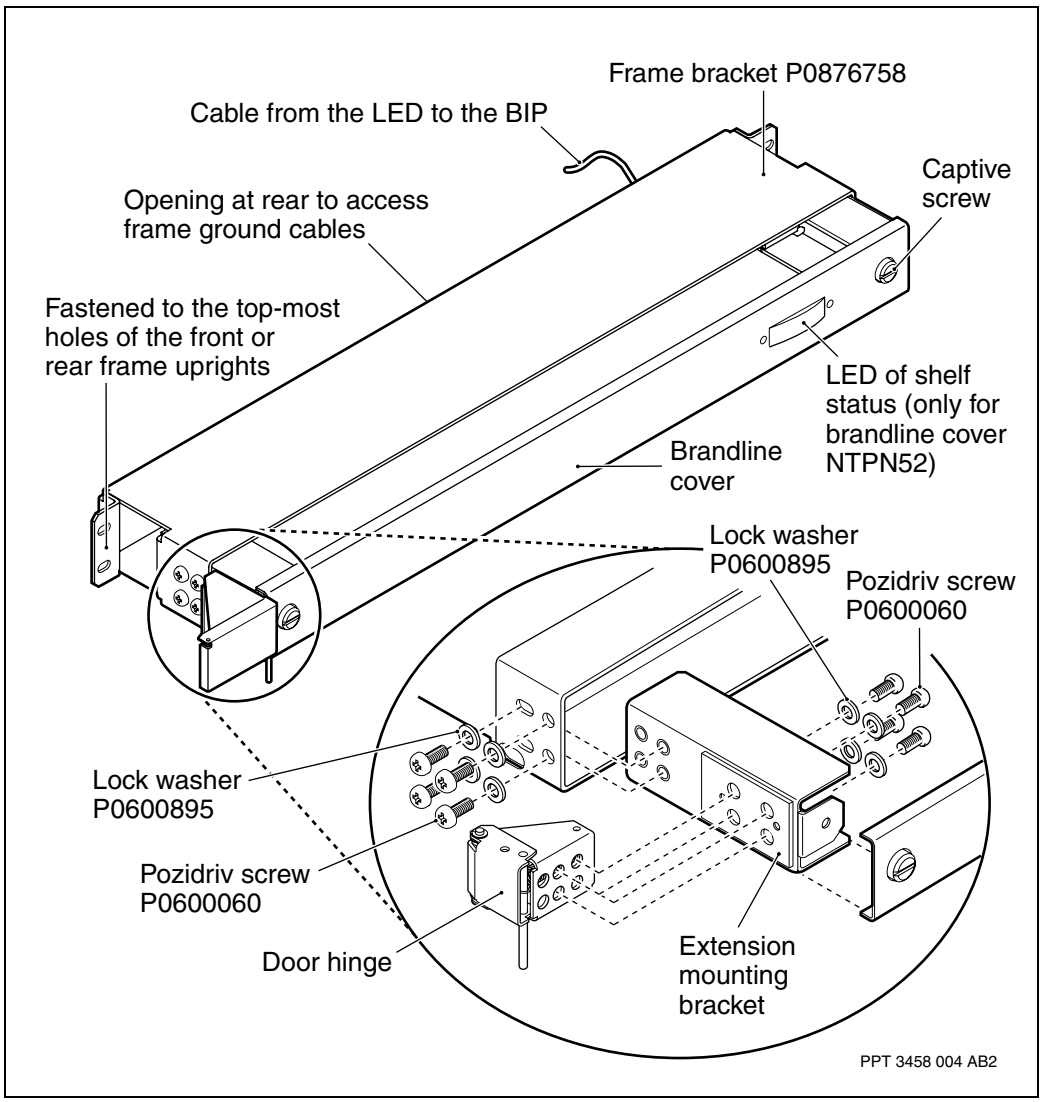
Orientation of upper left door hardware



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Removing fiber cables from the fiber management unit

Remove fiber cables from the fiber management unit in preparation for replacing the unit, or one or more cables.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Open the cable management unit drawer by sliding the latches toward each other, holding them inward, and pulling slowly. Stop pulling when the rear of the drawer is at the front of the fiber unit.
2	Ensure that the tray labels are complete.
3	Label the trays in the replacement fiber management unit to match the one to be replaced.
4	Beginning with the topmost trays, carefully unwind the fiber cables from around the half-spools. If you are removing all the cables in order to replace the fiber management unit, be sure to temporarily label each cable, so that it can matched to the appropriate tray in the replacement unit. You may need to remove the tie-wraps or curlie-ties from around the bundle of fibers at the sides of the fiber management unit so that cable slack is increased enough to allow unstressed handling of all the cables.

--End--

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Removing front or rear frame panels

Remove a front or rear panel to enable access to the cables on the cable management brackets that are installed on the sides of a NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	See the figure Locations of front and rear frame panels, exploded view (page 656). Note whether the bottom of the panel has 2 slots visible or not.
2	Unfasten the captive screw at the top of the panel.
3	Pull the top of the panel away from the frame while pulling upwards until the bottom tabs disengage.

--End--

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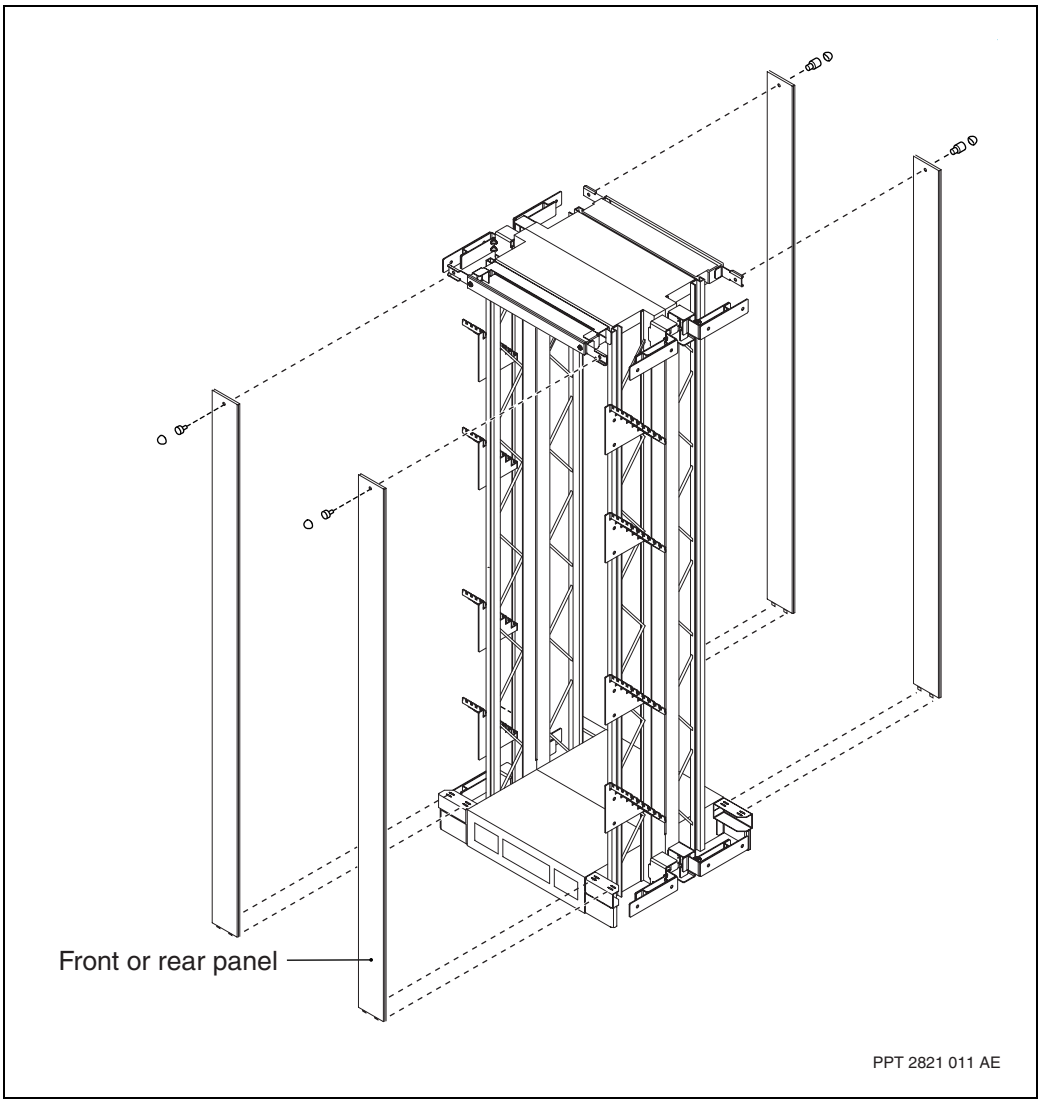
Procedure job aid

Locations of front and rear frame panels, exploded view



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Removing the packaging from a switch in a frame

Remove the packaging from any Multiservice Switch that is mounted in a NEBS 2000 frame before moving the equipment off the pallet.

Prerequisites

- The packaging for a Multiservice Switch in a NEBS 2000 frame is typically a wooden crate surrounding it on a pallet.

Procedure steps

Step	Action
1	Use a pair of pliers to straighten and remove the fastening tabs around the lid. Refer to the figure Unpacking a horizontal Multiservice Switch 15000 or Multiservice Switch 20000 in a frame (page 658).
2	Lift the lid away from the crate.
3	Straighten and remove the fastening tabs along the base of the crate.
4	At each end of the crate, one corner is permanently joined to a side (without tabs). The joined corners are diagonally opposite each other. Straighten and remove the fastening tabs along the corner at each end of the crate, working from bottom to top. After the tabs are unfastened, be prepared to catch the L-shaped panels if they fall away from the crate. Packing foam may fall with the panels.
5	Move the lid and panels away from the pallet so that there is enough room to safely stand the frame on end off the pallet.
6	Remove the foam packaging from around the frame.
7	Store all panels, padding materials, and tabs aside for re-use later.

--End--

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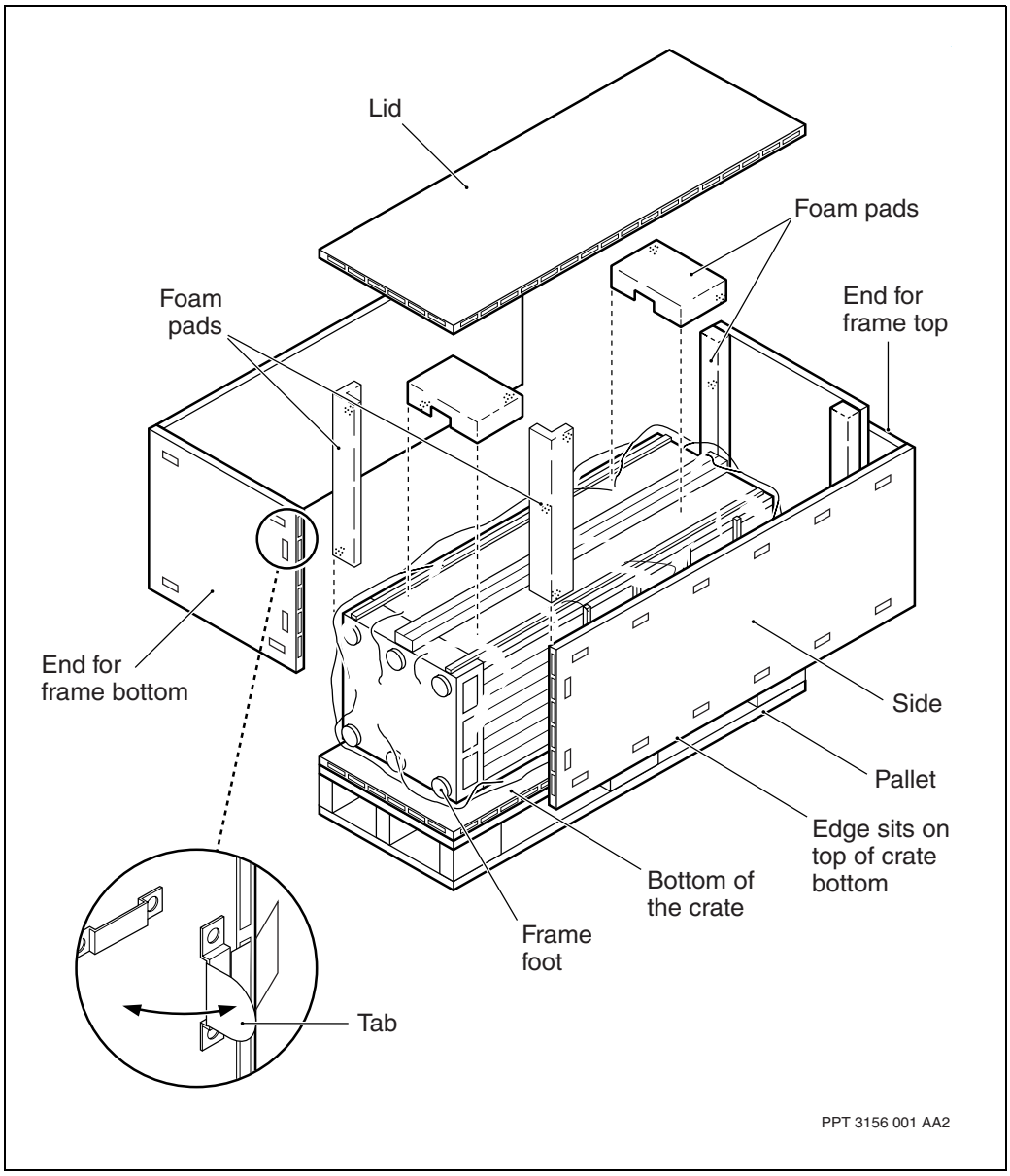
Procedure job aid

Unpacking a horizontal Multiservice Switch 15000 or Multiservice Switch 20000 in a frame



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Replacing a BIP external alarm cable

Replace a BIP external alarm cable to restore enabling a customer premises indicator.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- For the complete list of BIP alarm connections and their features or purpose, see NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*. (Avoid confusing the Jn connectors on the BIP with the Jn connectors on the alarm/BITS module because they have different functions.)
- When the cable connection is disrupted at either end, the reporting of the external alarm is suspended. If the alarm condition still exists after the cable is re-connected, the alarm is reported.
- For the paths of alarm cables, see the figure Locations of the alarm cable connectors and paths (page 660).

Procedure steps

Step	Action
1	Locate the BIP connector at the rear of the BIP.
2	Align the connector on the replacement cable with the connector on the BIP. Each connector fits only one way.
3	Unplug the connector on the BIP: • for a D-sub connector, use a screwdriver to unfasten the 2 screws on either side of the connector • for a Berg connector, unplug it while lifting the tab on the side • for a MATE-N-LOK connector, unplug it while lifting the tabs on the either end
4	Align the replacement cable connector with the BIP connector and press them together firmly but gently so that the lip of the cable connector is even with the base of the BIP connector.
5	Ensure that the connectors are appropriately engaged: • for a D-sub connector, use a screwdriver to fasten the 2 screws on either side of the connector; tighten to snug (no extra turns) • for a Berg connector, press together until the tab on the side engages • for a MATE-N-LOK connector, press together until the tabs on either end engage

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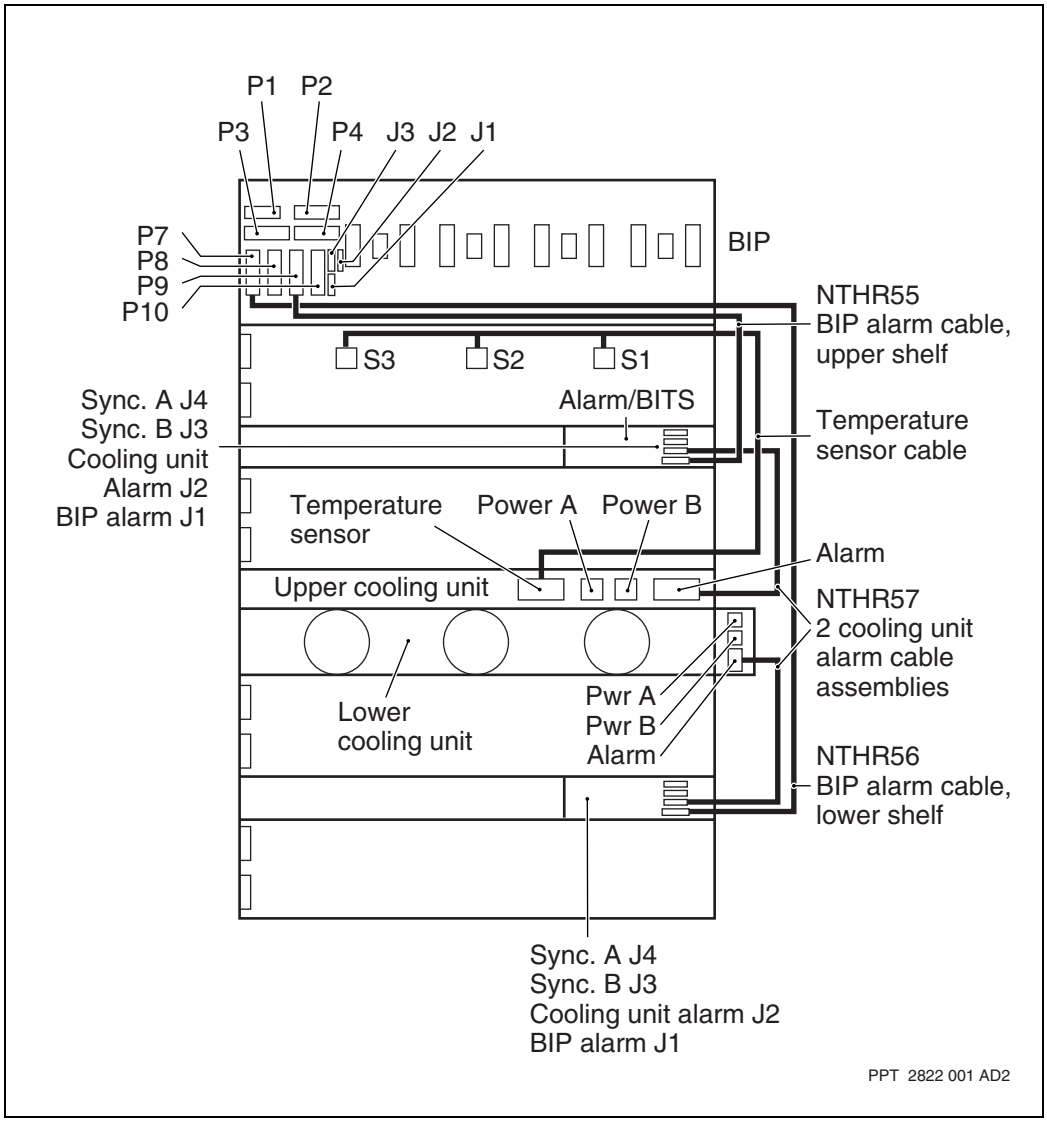
--End--

Procedure job aid

Locations of the alarm cable connectors and paths



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Replacing a BIP external alarm cable to an MFA150

Replace a BIP external alarm cable to an MFA150 system of ac rectifiers to have external alarm reporting.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- When the cable connection is disrupted, the reporting of alarm 7012 0050 is suspended. The alarm indicates a failed rectifier for the network and is reported to Nortel Networks Multiservice Data Manager. If the alarm condition still exists after the cable is re-connected, the alarm is reported.

Procedure steps

Step	Action
1	Locate the BIP connector at the rear of the BIP.
2	Align the connector on the replacement cable with the connector on the BIP. Each connector fits only one way.
3	Unplug the Berg connector at J2 on the rear of the BIP.
4	Align the replacement cable connector with the BIP connector and press them together until the tab on the side engages.
5	Route the cable parallel to the existing cable's path. Fasten the cable loosely along the path. Decide whether to unfasten the old cable now or later, whichever is easier for adding the replacement.
6	At the controller of the MFA150, access the connection points of the cable inside. Copy the method of connection at the TB2 terminal blocks on the controller cards for power feeds A and B. For an example of the wire connections from the cable assembly, refer to the figure Connections for external alarm cable P0940531 at an MFA150 (page 662).

--End--

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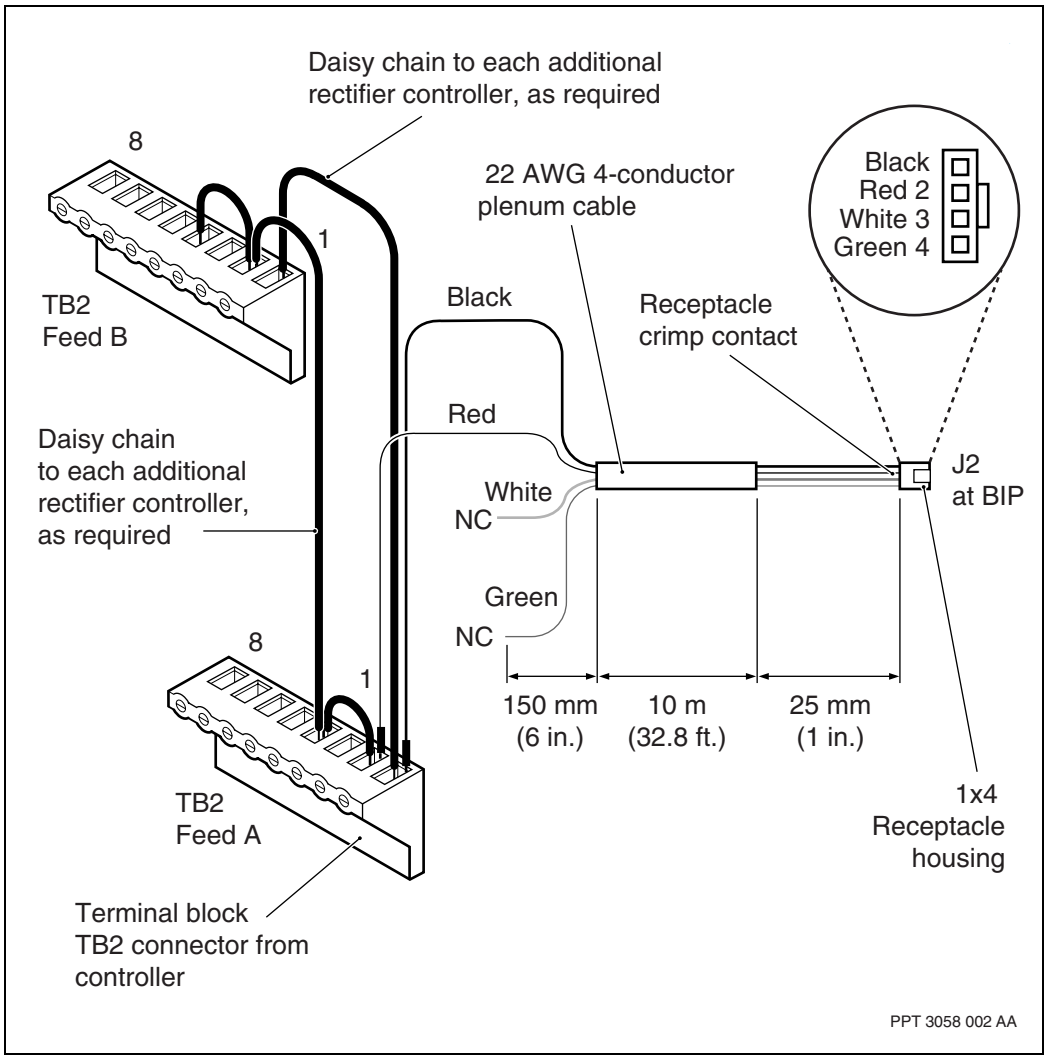
Procedure job aid

Connections for external alarm cable P0940531 at an MFA150



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Replacing a CP Ethernet cable

Replace a CP Ethernet cable if it is faulty or as part of a CP replacement procedure.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- If you using a custom-made cable, it should conform to the standards available from Nortel Networks. For information on cable specifications, NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
- The expected behavior when an Ethernet cable fails, or is pulled from the active CP, is that a CP switchover will occur. You can change this behavior by disabling the *SwitchoveronFailure* attribute. See NN10600-550 *Nortel Networks Multiservice Switch 7400/15000/20000 Common Configuration Procedures*

Procedure steps

Step	Action
1	On the faceplate of the CP, locate the cable to be replaced at port P0.
2	Measure the exact length of the cable to be replaced to ensure that the replacement will reach both terminations. See the figure Route of a CP cable (page 664).
3	Using the part number labels, match a duplicate of the old cable to a pre-assembled cable from Nortel Networks, or if making a cable, match quality, ratings, length, and the connectors at either end. The existing cable sheath has identification markings on it. If making the cable, add the connectors according to the manufacturer's instructions.
4	Route the replacement cable parallel to the cable bundle that has the older cable being replaced. Fasten the middle span of the replacement cable independently from the older cable.
5	Unplug the old cable at each end and immediately plug in the new cable.
6	Cut the connectors off the end of the old cable. If tugging or pulling on the older cable can affect the operation of any other cable, leave the old cable in position unless it can be easily removed.

--End--

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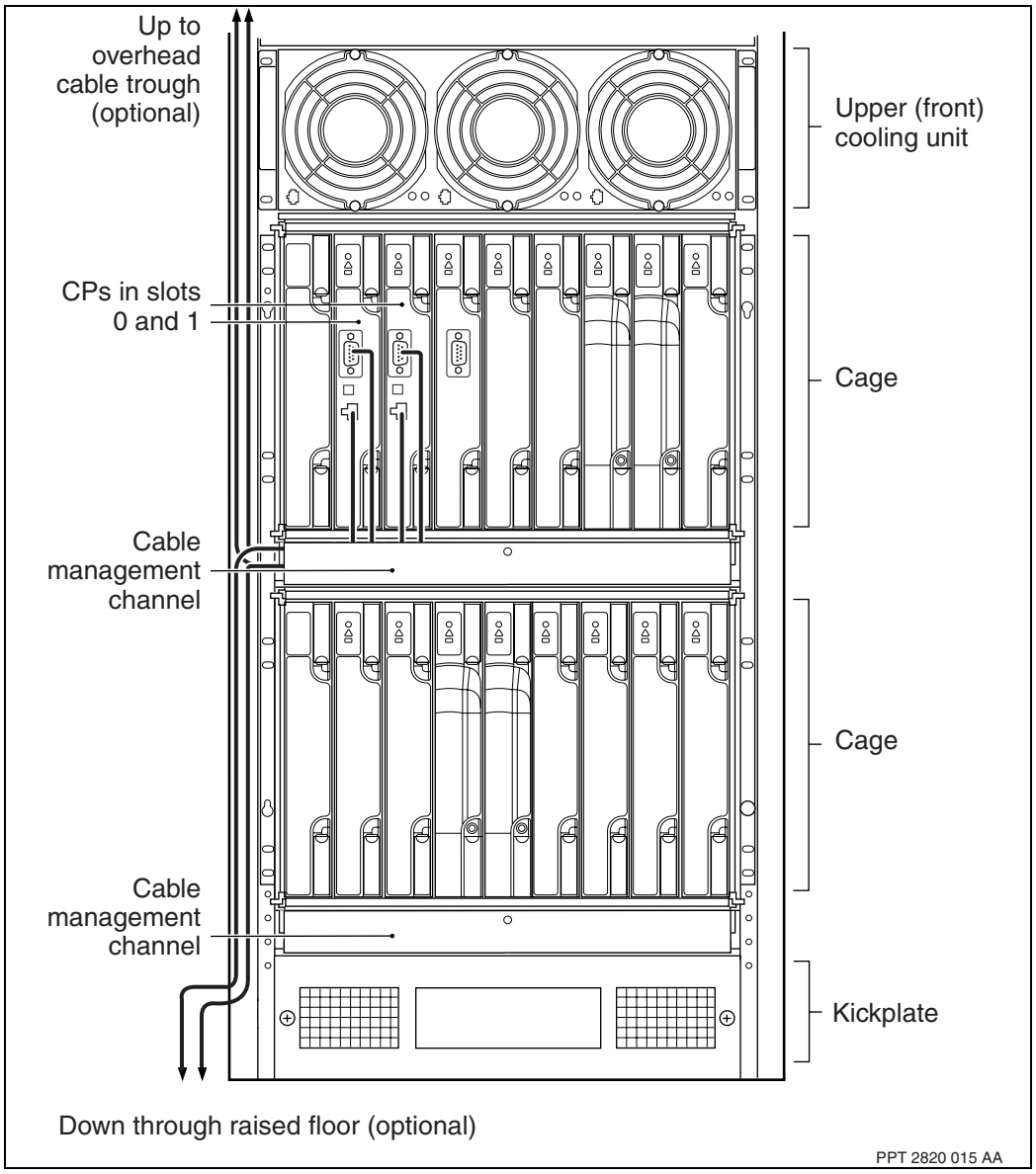
Procedure job aid

Route of a CP cable



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Replacing a cable management channel cover

Replace a cable management channel cover to restore protection to FP interface cables.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The cable management channel cover spans the width of the cage, and covers the CP and the FP cables. See the figure Location of cable management channel covers, lower shelf (page 666).

Procedure steps

Step	Action
1	Unlock the channel cover by turning the slotted lock counterclockwise. Do not use a power tool.
2	Swing the top of the cover out and towards you until it rests horizontally.
3	Disengage the hinge pins at opposite ends of the cover by gently bending the middle of the flat side of the cover towards yourself until one pin is free. Put the cover aside.
4	Engage the hinge pins of the replacement cover.
5	Swing the top of the cover towards the shelf until it rests against the slotted latch plate.
6	Align the lock through the slotted latch plate and turn the slotted screw gently clockwise. Do not use a power tool.

--End--

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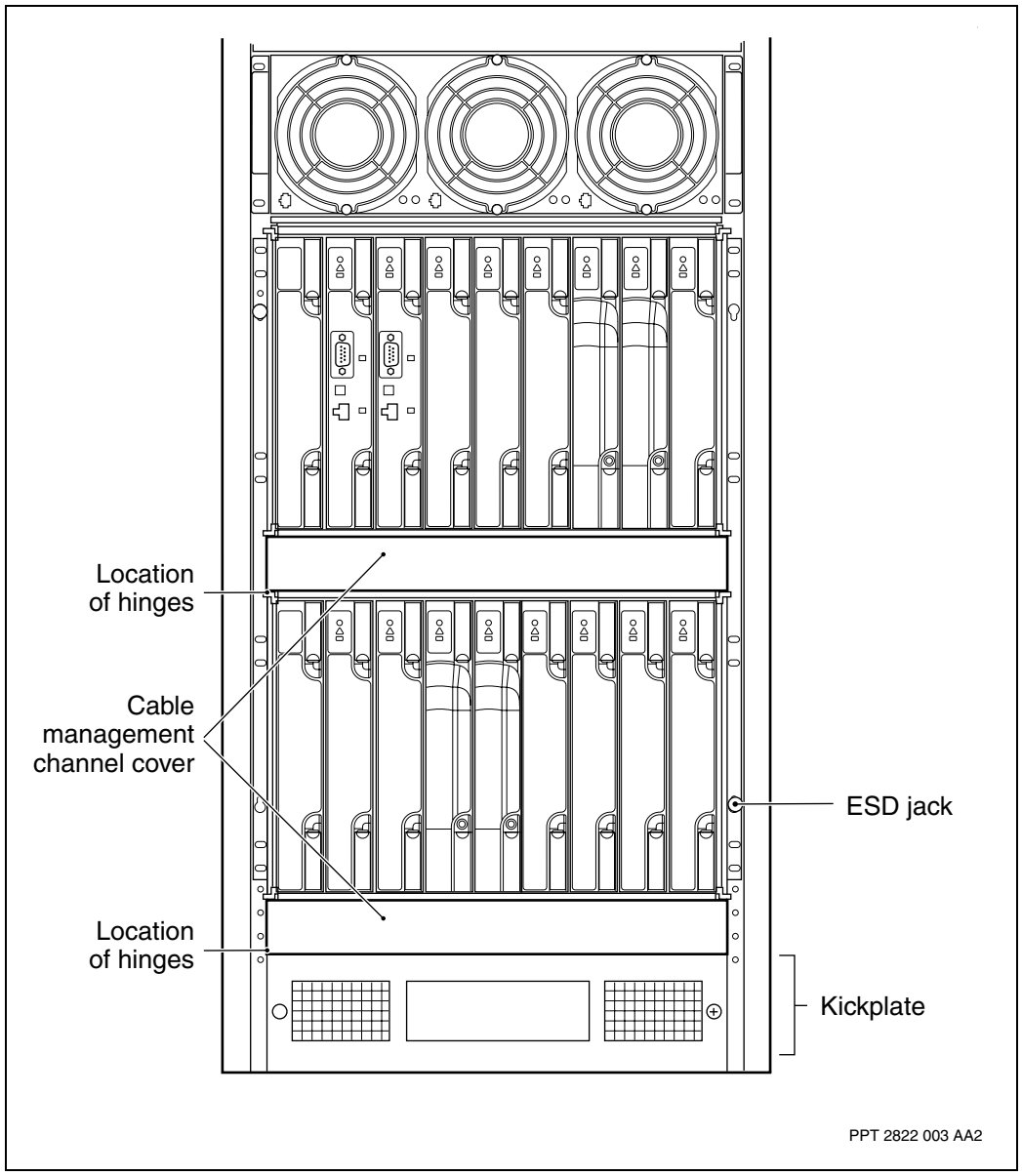
Procedure job aid

Location of cable management channel covers, lower shelf



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Replacing a cooling unit alarm cable

Replace a cooling unit alarm cable to restore proper reporting of temperature-related alarms.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need cable assembly NTHR55 for the connection from the BIP to any version of the upper or lower cooling unit.

Procedure steps

Step	Action
1	Note the path of the old cable as indicated in the figure Connection paths of the shelf alarm cables (page 668).
2	Carefully cut the tie-wraps of the old cable assembly.
3	Plug in the lower connection of the new cable. The connector is keyed to fit only one way.
4	Route the cable along the noted path, loosely fastening tie-wraps.
5	Plug in the other end (also fits one way). Plugging in both ends of the cable enables the reporting of the alarms to resume, and the existing alarms to clear.
6	Balance the cable slack and tighten the tie-wraps. Cut off the tie-wrap tails unless you use re-usable tie-wraps.

--End--

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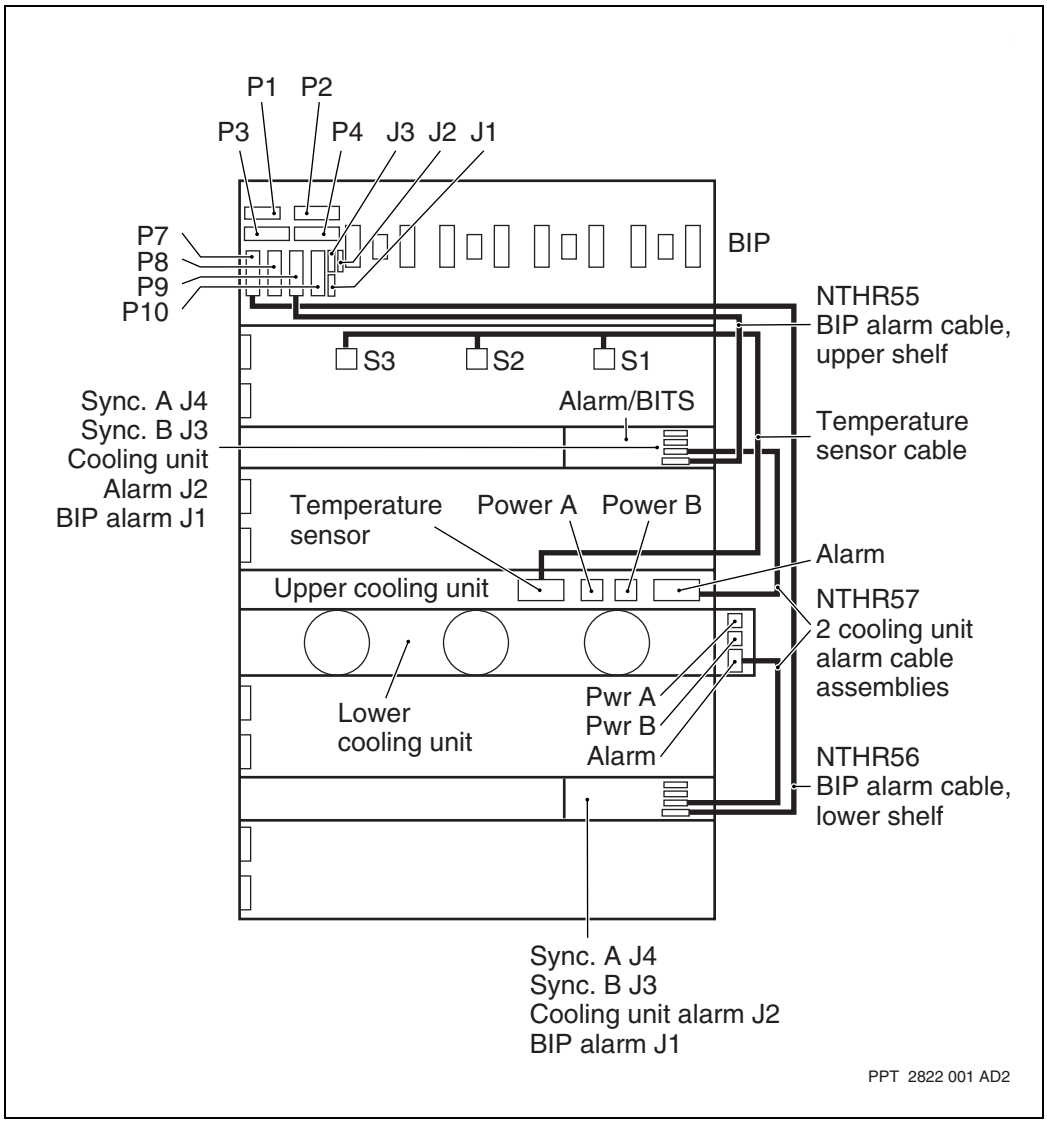
Procedure job aid

Connection paths of the shelf alarm cables



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Replacing a cooling unit power cable

Replace a BIP power output cable to restore power to the cooling unit.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need cable assembly NTHR66 for the connection from the BIP to any version of the upper or lower cooling unit.
- Replacing a BIP power output cable includes replacing a cooling unit power cable because they are part of the same power cable assembly. Replacing one power cable means also replacing the other cables of the assembly. Replacing one power cable at a time end-to-end until all cables of the assembly are replaced minimizes the impact of having a fan out of service.
- Toggling off BIM breakers during the replacement will generate software alarm 7012 0050.

Procedure steps

Step	Action
1	Note the path of the old cable as indicated in the figure Connection paths of the power cables (page 671).
2	Determine which BIM powers the cooling unit. See NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*.
3	Toggle off power to the cooling unit by pressing in the bar symbol (|) on each middle breaker of the 2 BIMs that power the cooling unit.
4	Put tape over the breakers to indicate they are deliberately off.
5	Carefully cut the tie-wraps of the old cable assembly.
6	Using fingers only, unplug both ends of the old cable assembly by pinching the tabs and pulling straight out.
7	Tracing from the disconnected ends, cut and discard the tie-wraps of all power cables from the cooling unit up to the BIP. If tie-wraps were shared between the power input cables on top of the strain-relief bar and the cable assembly under the bar, replace the tie-wraps on the power input cables.
8	Plug in one end of the new cable in the new cable assembly. The connectors mate only one way.
9	Route the cable along the noted path.

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10 Plug in the other end. Ensure the tabs on the connector have engaged. Leave the other cables of the new assembly temporarily hanging and disconnected.

11 Remove the tape and toggle on the breaker for that PIM (press the | half in). The generated alarms end.

12 Repeat step 2 to step 11 for each other cooling unit cable until the new cable assembly completely replaces the old.

13 Balance all cable slack and fasten with tie-wraps. Cut off the tie-wrap tails.

14 Observe the LEDs of the cooling units fed by that cable. Green indicates normal operation.

--End--

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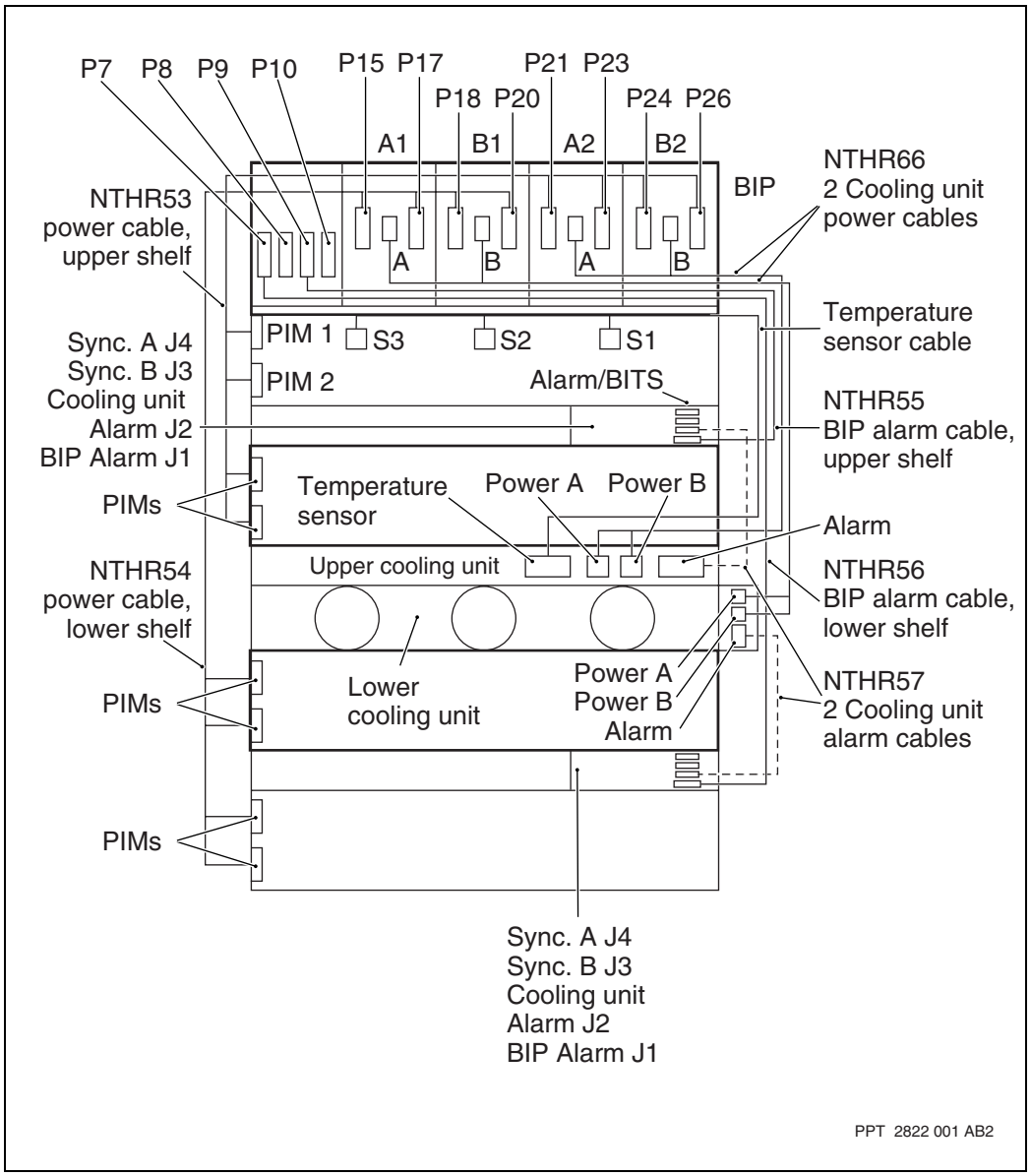
Procedure job aid

Connection paths of the power cables



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Replacing a fiber cable in a fiber management unit

Replace a fiber cable in a fiber management unit to repair a damaged fiber tray or drawer.

Prerequisites

CAUTION
Risk of service loss or degradation
When fiber cables are clustered together, they typically become entangled. Removing a cable from the cluster can cause other cables to be pinched or crimped, which can cause traffic to be lost. When your fiber cable setup has space to route an additional cable, this method is preferred over removing the original cable.

- You must be familiar with Safety considerations and best practices (page 19).
- Replacing a fiber cable in a fiber management unit can be done by:
  - — removing the cable from end to end and routing the replacement along the same path
  - — routing the replacement cable parallel to the original except for using a vacant tray, and leaving the original installed with its connectors cut off

Procedure steps

Step	Action
1	After the replacement cable is routed up to the outside of the fiber management unit, measure the exact path that the fiber cable is intended to be routed from the fiber management unit to the other end (non-FP) connection. Measure from the side of the fiber unit where the fiber cable will exit.
2	Using a piece of electrical tape, temporarily mark that distance on the fiber cable from the unconnected end. Ensure that the tape can be easily removed later, but will not move during minor handling.
3	At the fiber unit, locate the drawer that houses the cable being replaced.
4	Carefully open the drawer by sliding the latches towards each other, and holding them there while pulling the drawer towards you. Stop pulling when the rear of the drawer is at the front of the fiber unit. As the drawer opens, ensure that no cable is snagged or pinched. Also as the drawer opens, half-spools at the sides of the drawer will move with it towards the front. If a half-spool does not reach the front of the drawer, move it manually. The rear half-spools are fixed. Refer to the figure Locating a fiber cable in a fiber management unit NTHW50 (page 674).

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5 Locate the tray inside the drawer that contains the fiber cable being replaced. Access a lower tray by lifting the stack above it from the center edge up towards the nearest side.

6 Use the label information to confirm that you found the correct cable.

7 Unravel the fiber cable from the tray and loosely place it aside temporarily.

8 Ravel the replacement cable onto the tray in and out the rear corner, and route it along the same path as the other fiber cables on that side of the drawer.

9 After ravelling and routing, ensure that the tape on the cable resides outside the drawer close to the fiber unit and with the same amount of cable slack as the other cables in the curlie ties. Adjust as required.

10 Slowly close the drawer to test the slackness of the replaced cable. Closure is indicated by a click sound and the faceplate is flush with the other drawer's faceplate. Adjust the slackness if the cable shows tension.

11 Route the cable up to the other end connection. Follow a parallel path to the cable being replaced. Leave the cable unconnected.

12 Fasten the replacement cable in place. Ensure that no portion of the cable is stressed by a bend or a tie-wrap.

13 Carefully remove the temporary electrical tape from the cable. Avoid cutting or nicking the cable sheath. Avoid crimping or pinching the cable during its removal.

--End--

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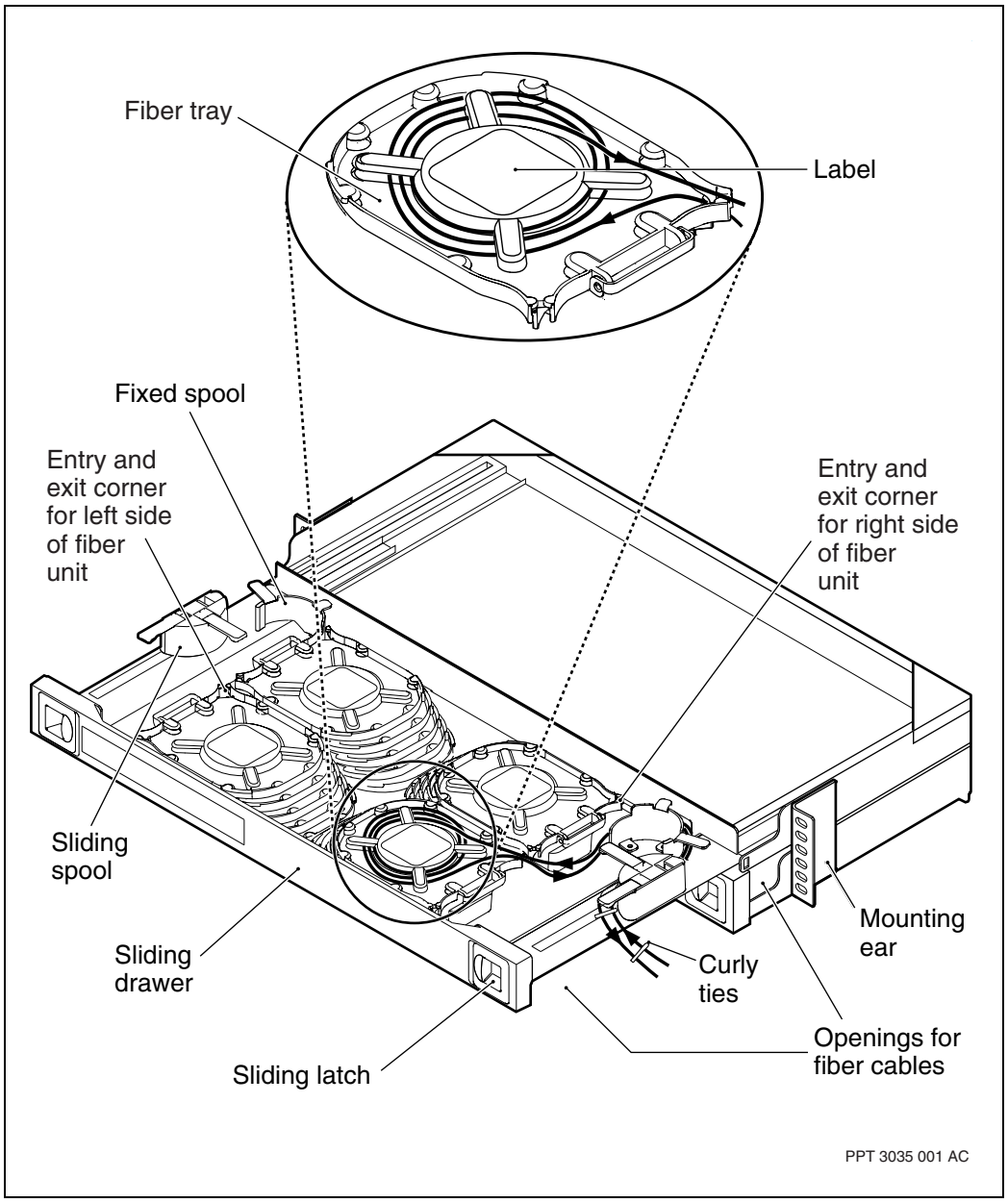
Procedure job aid

Locating a fiber cable in a fiber management unit NTHW50



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Replacing a local operator terminal cable

Replace a local operator terminal cable to restore communication to the CP in a switch.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The RS232 port on a CP2 or a CP3 connects the switch to a local operator terminal.
- For any CP, the PEC of the cable for the RS232 port is NTBP25.

Procedure steps

Step	Action
1	Locate the cable to be replaced at port P1.
2	Measure the exact length of the cable to be replaced to ensure that the replacement will reach both terminations. See the figure Route of a CP cable (page 664).
3	Using the part number labels, match a duplicate of the old cable to a pre-assembled cable from Nortel Networks, or if making a cable, match quality, ratings, length, and the connectors at either end. The existing cable sheath has identification markings on it. If making the cable, add the connectors according to the manufacturer's instructions.
4	Route the replacement cable parallel to the cable bundle that has the older cable being replaced. Fasten the middle span of the replacement cable independently from the older cable.
5	Coordinate with the operator of the local terminal that its communication is about to be dropped.
6	Unplug the old cable at each end and immediately plug in the new cable.
7	Cut the connectors off the end of the old cable. If tugging or pulling on the older cable can affect the operation of any other cable, leave the old cable in position unless it can be easily removed.

--End--

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Replacing a PIM cable

Replace a PIM cable if it fails.

Prerequisites

WARNING

Risk of injury or equipment damage

Power interface modules (PIMs) are not hot swappable. The power breaker on the BIM that is connected to the PIM must be toggled off before unplugging the power cables at the PIM. Wait 15 seconds for the capacitors in the BIM to discharge before unplugging the PIM cable. The power cable must be unplugged before the PIM can be removed for replacement. If the mate PIM is present and in service, it maintains power to the shelf so that service is uninterrupted.

WARNUNG

Verletzungsgefahr oder Geräteschäden

Die PIMs (Power Interface Modules) können nicht während des Betriebs ausgetauscht werden. Bevor die Netzkabel am PIM abgezogen werden, muß der Trennschalter an dem BIM, das an das PIM angeschlossen ist, ausgelöst werden. Warten Sie dann 15 Sekunden, bis sich die Kondensatoren entladen haben, bevor Sie die PIM-Kabel abziehen. Das Netzkabel muß abgezogen sein, bevor das PIM zum Austausch ausgebaut wird. Wenn das redundante PIM bestückt und in Betrieb ist, übernimmt dieses die Stromversorgung des Baugruppenträgers, so daß der Anlagendienst nicht unterbrochen wird.

- You must be familiar with Safety considerations and best practices (page 19).
- If your replacement cable is part of a two-cable assembly, repeat this procedure. The intent is to have one PIM of the cage always powered.

Procedure steps

Step	Action
1	At the front of the BIP, toggle off the BIM breaker that controls power to the PIM by pressing in the O symbol. The mapping of breakers to PIMs is labelled on the rear of the BIM captive screw cover. The A and B LEDs on the PIM of Multiservice Switch 20000 are extinguished when power to the switch is removed. Toggling off a breaker generates a software alarm. This is normal for a replacement.

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2 Put tape over the breaker to indicate it is deliberately off.

3 At the rear of the BIP, note the path of the old black-and-white cables to the PIM and its mate in the same cage.

4 Cut and discard the tie-wraps of all PIM cables from the PIM up to the BIP.

5 At the PIM, pinch the tabs on the side of the connector to unplug it. While pinching the tabs on the connector, pull straight out.

6 At the other end of the cable at the BIP, disconnect the cable the same way.

7 At the PIM, press the connector of the replacement cable in until both tabs click. The connector mates only one way.

8 Route the cable up to the BIP through the cable management brackets and up the BIP connector. The cable path for each PIM is shown in the figure Connection points of the PIM cables (page 678).

9 Plug the other end of the PIM cable into the BIP.

10 Remove the tape and toggle on the BIM breaker for that PIM by pressing in the I symbol). The generated alarms end.

11 For a Multiservice Switch 15000, confirm the PIM LED is lit, indicating it is powered.

12 If your replacement cable is part of a two-cable assembly, repeat this procedure.

13 Dress the cable slack and fasten with tie-wraps. Cut off the tie-wrap tails.

--End--

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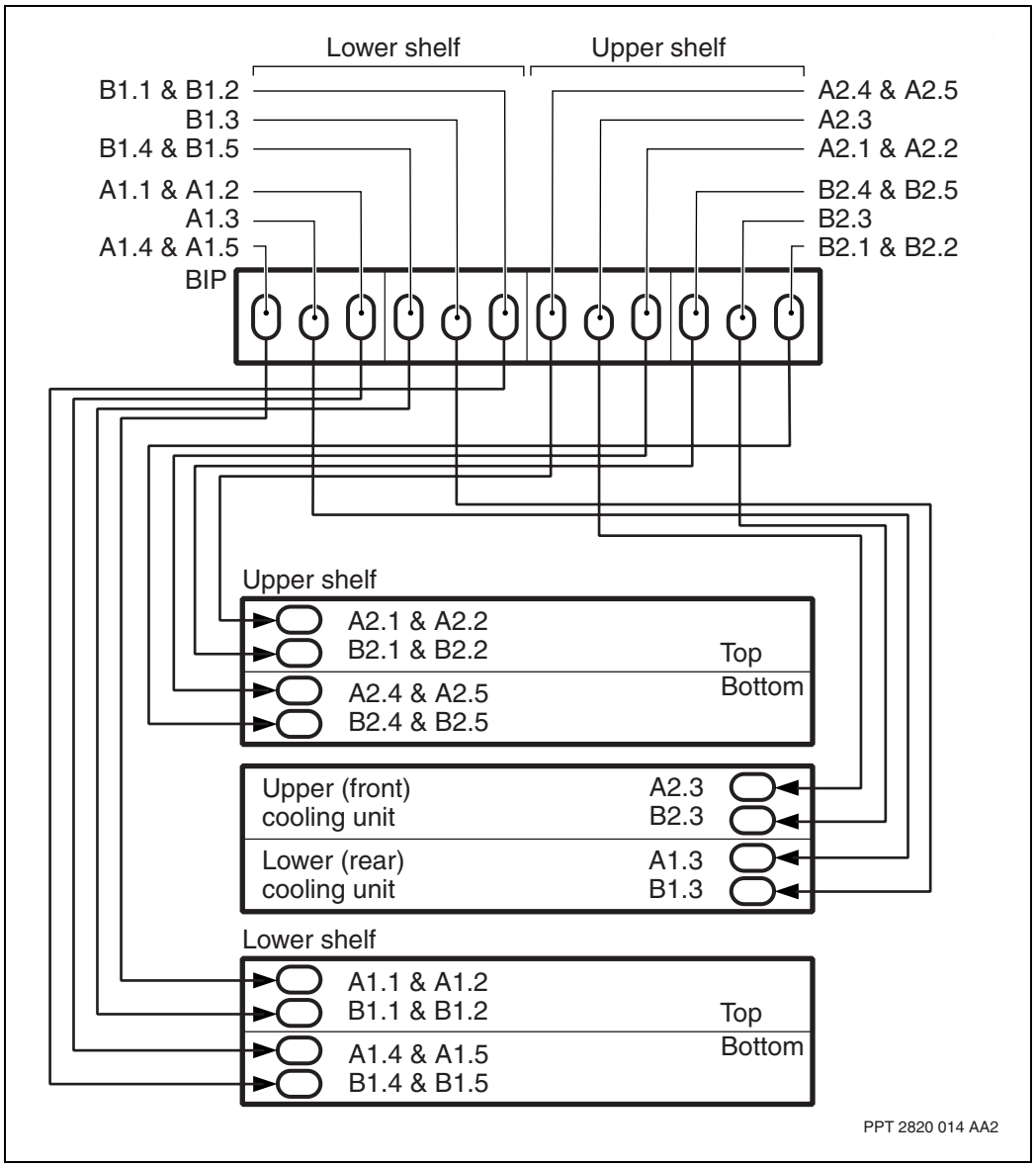
Procedure job aid

Connection points of the PIM cables



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Replacing a SER 5500 interface cable

Replace a SER 5500 interface cable to restore interworking with the Multiservice Switch 15000 or Multiservice Switch 20000 that is mounted below it in the same NEBS 2000 frame.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The interface cable that connects a SER 5500 to a Multiservice Switch occurs between OC-3 cards. The fiber cable requires SC connectors at each end.

Procedure steps

Step	Action
1	Locate an end point of the cable path at either the SER 5500 or the Multiservice Switch.
2	By tracing the cable to the other end point, measure the actual length of the cable. If the fiber cable passes through a fiber management unit such as an NTHW50, you may be able to use a shorter replacement cable.
3	Get or make a fiber cable the same length with the same type of connectors, that is, an SC on each end. If an inline attenuator is present, keep it as part of the connection.
4	Without disconnecting the original cable, route the replacement cable to both end points and loosely tie-wrap it in place.
5	Duplicate the cable labels of the original cable onto the replacement.
6	At each end of the cable, unplug the cable to be replaced and plug in the replacement.
7	Manage any cable slack, as required.
8	You may wish to remove the old cable. If removal means tugging on or potentially crimping other in-service cables, leave it where is and cut off the connectors.
9	Tighten the cable with tie-wraps along the path between the SER 5500 and the Multiservice Switch.
10	When the interface cable is connected, the software of the SER 5500 re-establishes awareness of the links with the Multiservice Switch. Coordinate with the software operator of the SER 5500 to ensure that there is connectivity.

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--End--

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Replacing an air filter

Replace an air filter as part of regular maintenance to ensure proper air flow in the Multiservice Switch and to validate processor card warranties.

Prerequisites

WARNING
Risk of injury by fan blades
While working on any equipment near the cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a live fan with anything.

WARNUNG
Verletzungsgefahr
Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

WARNING
Risk of injury, equipment damage, or service degradation
Never operate a switch with the air filter removed or the cover off, except to replace the filter. The air filter and its screen prevent a hand or a hand-held tool from contacting the upper fan blades from above.

WARNUNG
Verletzungsgefahr, Geräteschäden oder Leistungbeeinträchtigung
Betreiben Sie den Multiservice Switch 15000 oder Multiservice Switch 20000, außer zum Filterwechsel, niemals mit abgenommenem Luftfilter oder mit geöffneter Abdeckung. Der Luftfilter und dessen Gitter verhindern, daß ein handbetätigtes Werkzeug oder ein Körperteil von oben mit den oberen Lüfterblättern in Berührung kommen.

- You must be familiar with Safety considerations and best practices (page 19), especially the section on air filters.
- You need an air filter with part number A0778937 (medium arrestance).
- Replace an air filter while the switch continues to operate. Remove and insert an air filter without delay to minimize the amount of time the switch operates without a filter.

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- The air filter must be replaced every 3 months or more often, regardless of the position of the filter (lower or upper shelf). You can access both filters at the rear of the frame. Record the frequency of replacement for each filter in the tables Customer and equipment profile (page 685) and Schedule for replacing air filters and vacuuming equipment (page 686). Ensure that you follow this frequency. These tables and the figure Location of air filters in a Multiservice Switch 15000 or Multiservice Switch 20000 (page 687) are intended to be printed on one physical page for your records.
- A clogged air filter may also cause alarm 7002 0003 to be generated. When the filter is replaced, it may need a few minutes of air flow for the alarm to clear.
- When replacing an air filter, consider cleaning the exterior surface of the switch as described in Vacuuming equipment (page 746). The form for recording the air filter replacement also accommodates vacuuming.

Procedure steps

Step	Action
1	Locate the form for recording the air filter replacement for this switch. The form is a hardcopy combination of the following: • the table Customer and equipment profile (page 685) • the table Schedule for replacing air filters and vacuuming equipment (page 686) • the figure Location of air filters in a Multiservice Switch 15000 or Multiservice Switch 20000 (page 687) If a form has not been started for this switch, print a copy of the form and fill in the table Customer and equipment profile (page 685).
2	Remove any packaging from the replacement filter.
3	Locate the air filter cover. See the figures • Location of the lower air filter (page 684) • Location of the upper air filter (page 685) • Location of air filters in a Multiservice Switch 15000 or Multiservice Switch 20000 (page 687)
4	Unfasten the 2 large Phillips or slotted captive screws of the air filter cover and put the cover aside. Do not use a power tool to unfasten the screws.
5	A Multiservice Switch 20000 has a large slotted captive screw instead of a Phillips.

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6 Remove the air filter from its housing and put it aside. If dust is visible on it, bag it or remove it to another area to prevent dust re-contamination.

7 Holding the new filter by its short sides with the airflow arrows pointing upwards, align it with the opening in the shelf and slide it gently in using even force at both corners.

The airflow arrows are stamped into each metal side of the filter case.

8 Put the air filter cover back on by engaging and turning the 2 Phillips captive screws until snug plus a 1/5 turn. Make sure you do not strip the threads of the hole because the cover cannot seat properly. Do not use a power tool to fasten the screws.

9 Record the filter replacement on the hardcopy of table Schedule for replacing air filters and vacuuming equipment (page 686). Keep this record to validate the warranties of processor cards that are returned to Nortel Networks.

--End--

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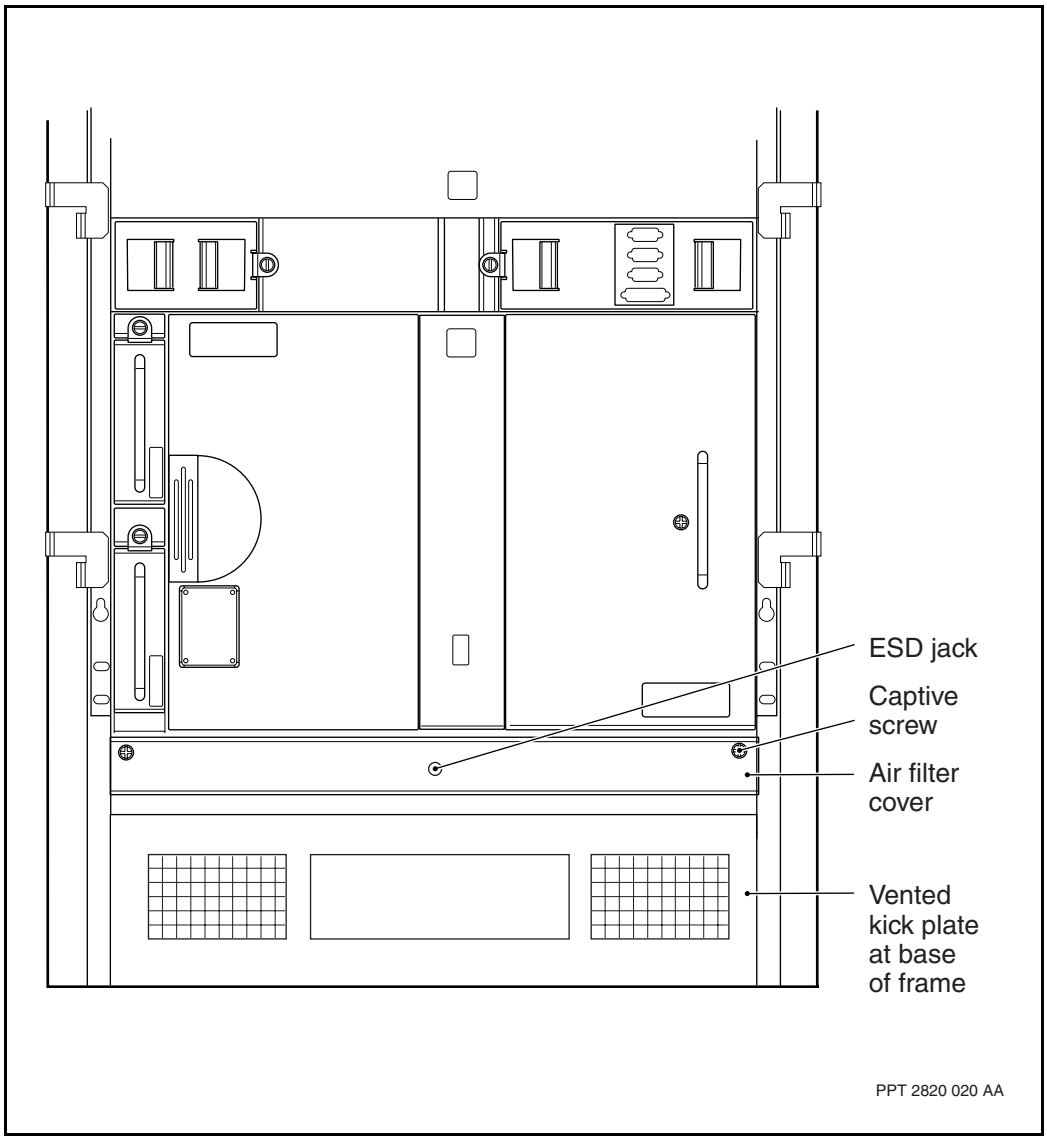
Procedure job aid

Location of the lower air filter



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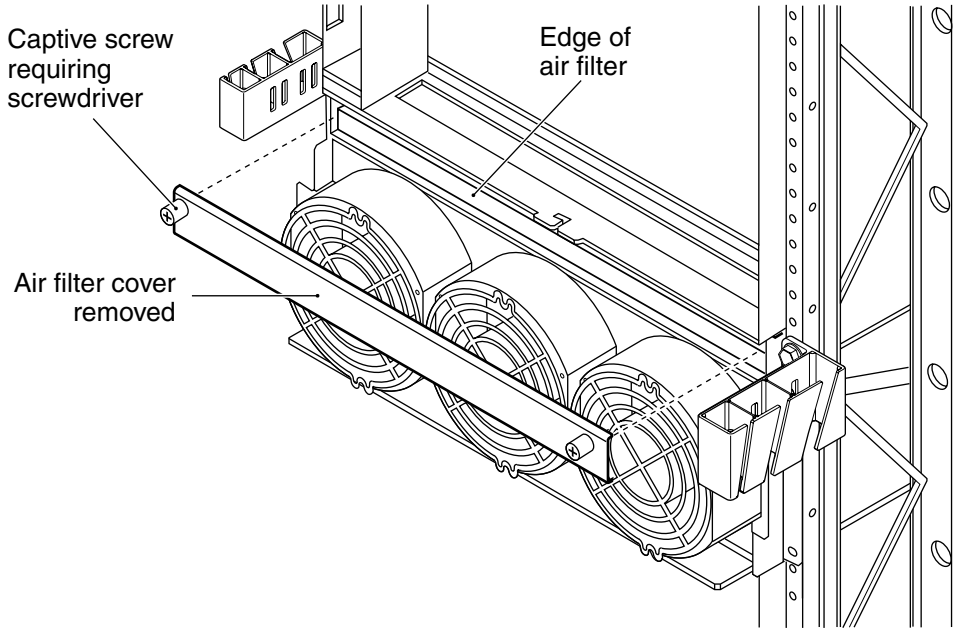
Location of the upper air filter



Customer and equipment profile

Customer name	Equipment model	Equipment ID	Equipment location	Frequency

The order number of an air filter for a Multiservice Switch 15000 or 20000 is A0778937.

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Schedule for replacing air filters and vacuuming equipment

Year: ____	Eqpt. ID:_____				Eqpt. ID:_____				Eqpt. ID:_____			
	Filter	Vacuum	Person	Date	Filter	Vacuum	Person	Date	Filter	Vacuum	Person	Date
(e.g.)	√	√	B. B.	20								
Jan												
Feb												
Mar												
Apr												
May												
Jun												
Jul												
Aug												
Sep												
Oct												
Nov												
Dec												

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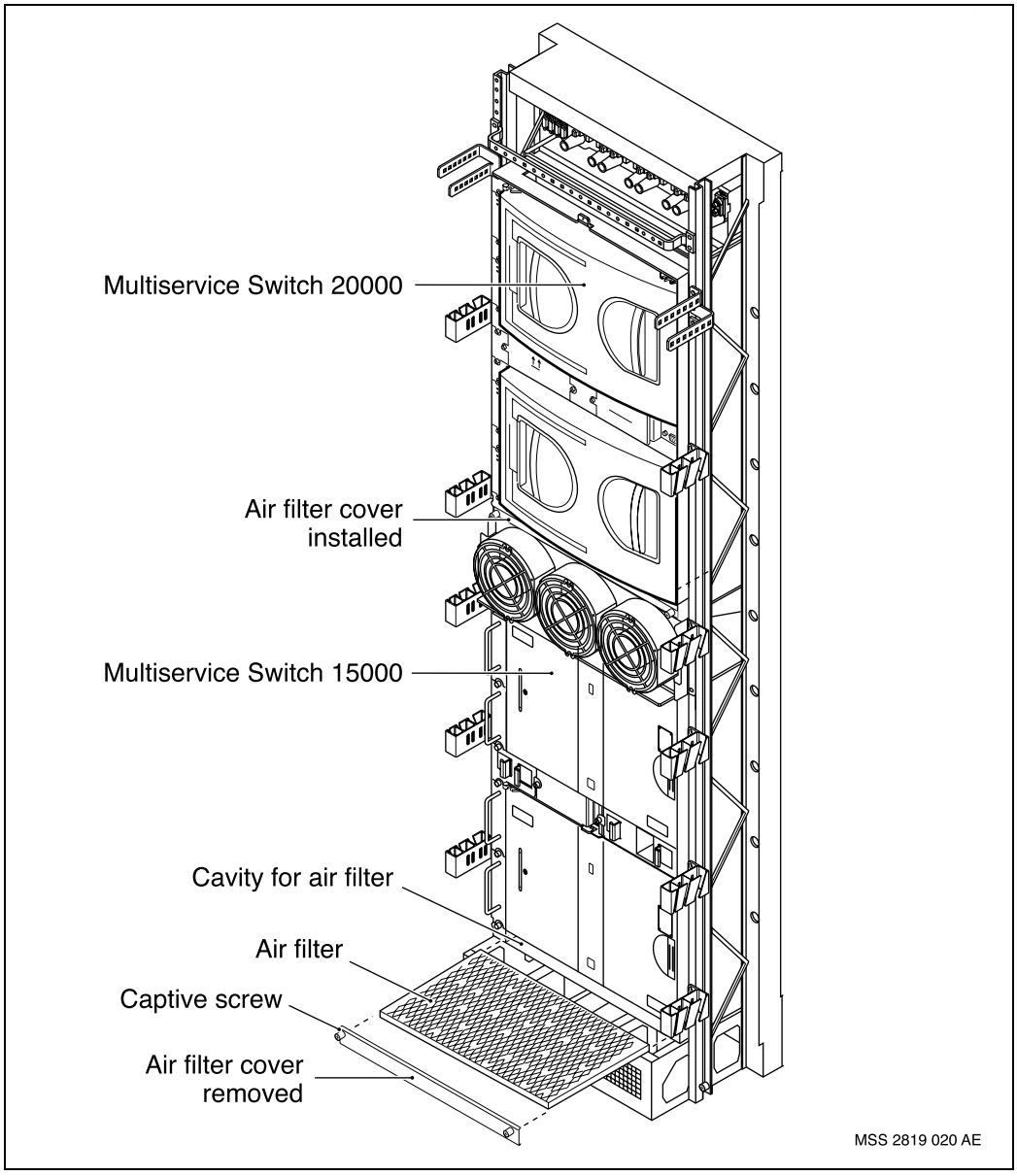
Location of air filters in a Multiservice Switch 15000 or Multiservice Switch 20000



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Replacing an alarm cable assembly to the alarm/BITS module

Replace an alarm cable assembly to the alarm/BITS module to restore reporting of shelf alarm data to the CPs.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The figure A typical alarm cable assembly (page 689) applies to the multi-cable assemblies NTHR55, NTHR56, and NTHR57. The pinouts of the cables differ but the method of replacement is the same.

Procedure steps

Step	Action
1	Note the path of the old cable. See the figures • Connection points of cables for the alarm/BITS module in a Multiservice Switch 15000 (page 232) • Connection points of cables for the alarm/BITS module in a Multiservice Switch 20000 (page 233)
2	Inform the software network operator that disconnecting the cable to replace it will temporarily generate software alarms. For information about BITS alarms, see NN10600-500 *Nortel Networks Multiservice Switch 6400/7400/15000/20000 Alarms Reference*.
3	Starting at the BIP, unplug the ends of the old cable. Unplugging either end of the cable at J2 generates software alarms for a fan failure. No alarm is generated for unplugging J1. This is normal during a replacement.
4	Plug in the connector of the replacement cable and fasten the D-sub connector screws. The connector fits only one way.
5	Route the cable along the noted path, loosely fastening tie-wraps.
6	Plug in the other end at the BIP (also fits one way). Plugging in both ends of the cable enables the reporting of the alarms to resume, and the existing alarms to clear.
7	Balance the cable slack along the cable management brackets and snugly tighten the tie-wraps. Cut off the tie-wrap tails.

--End--

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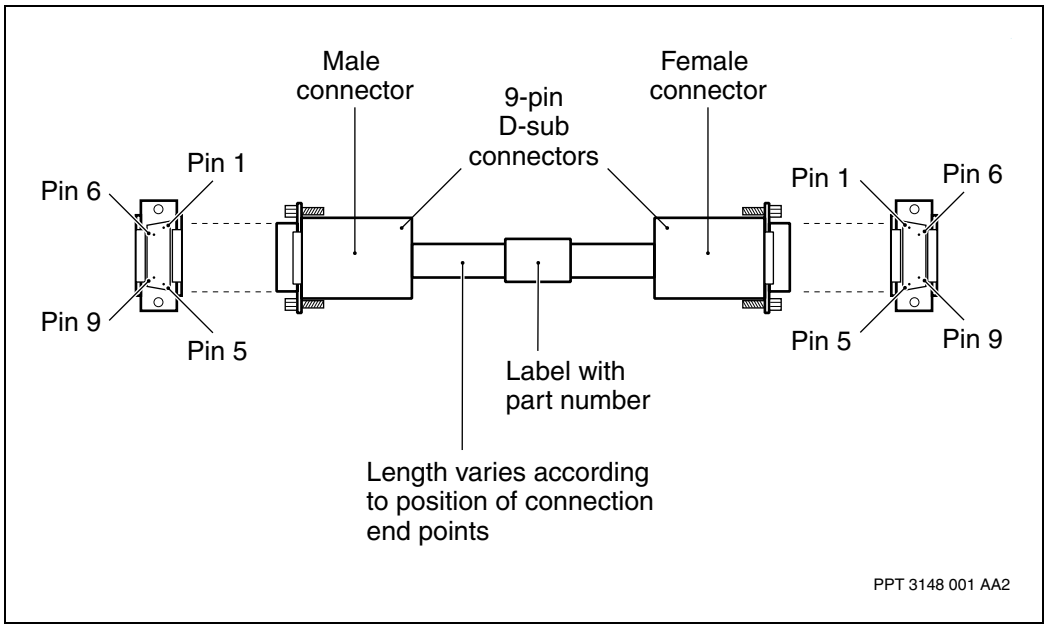
Procedure job aid

A typical alarm cable assembly



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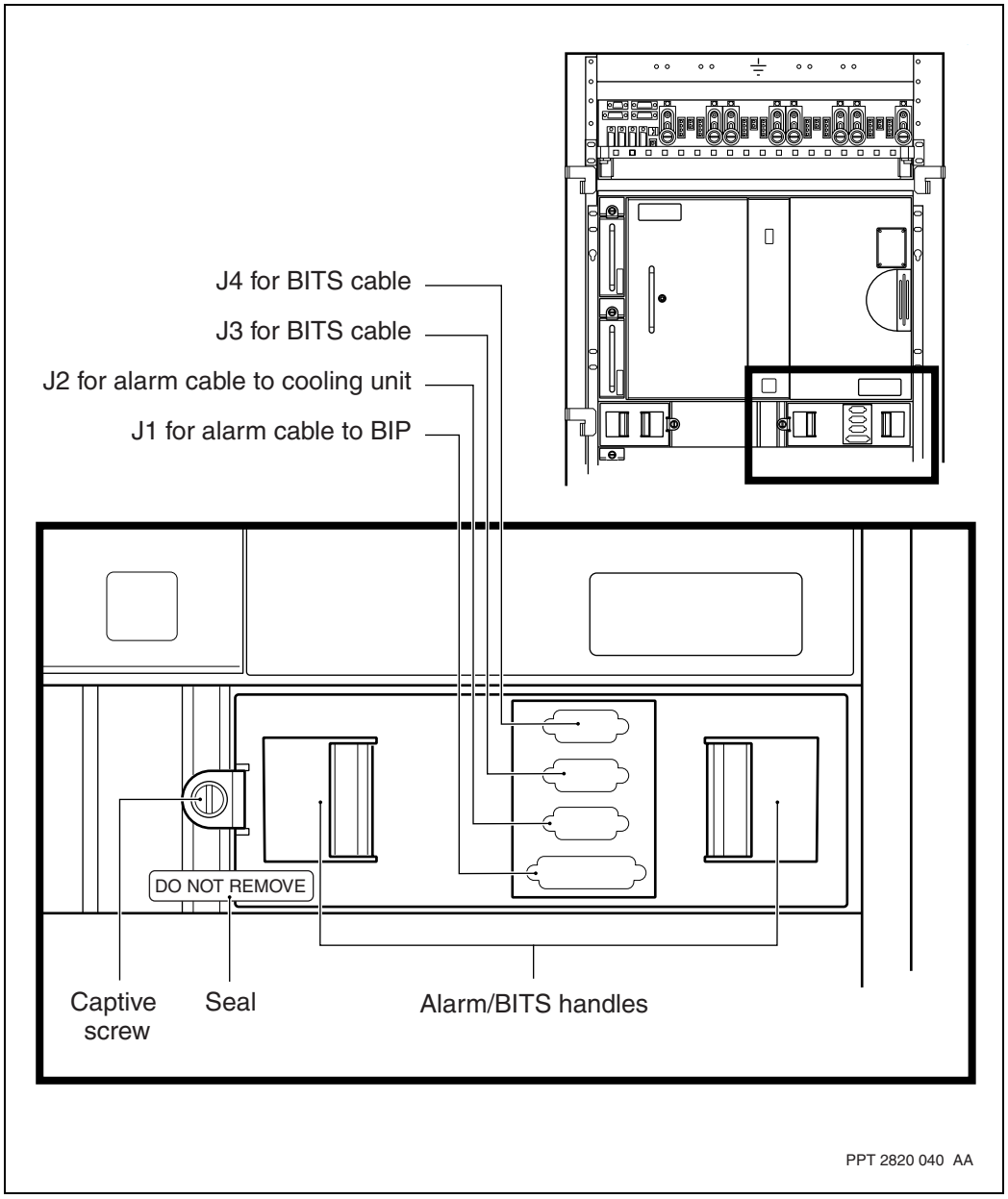
Connection points of cables on an alarm/BITS module in a Multiservice Switch 15000



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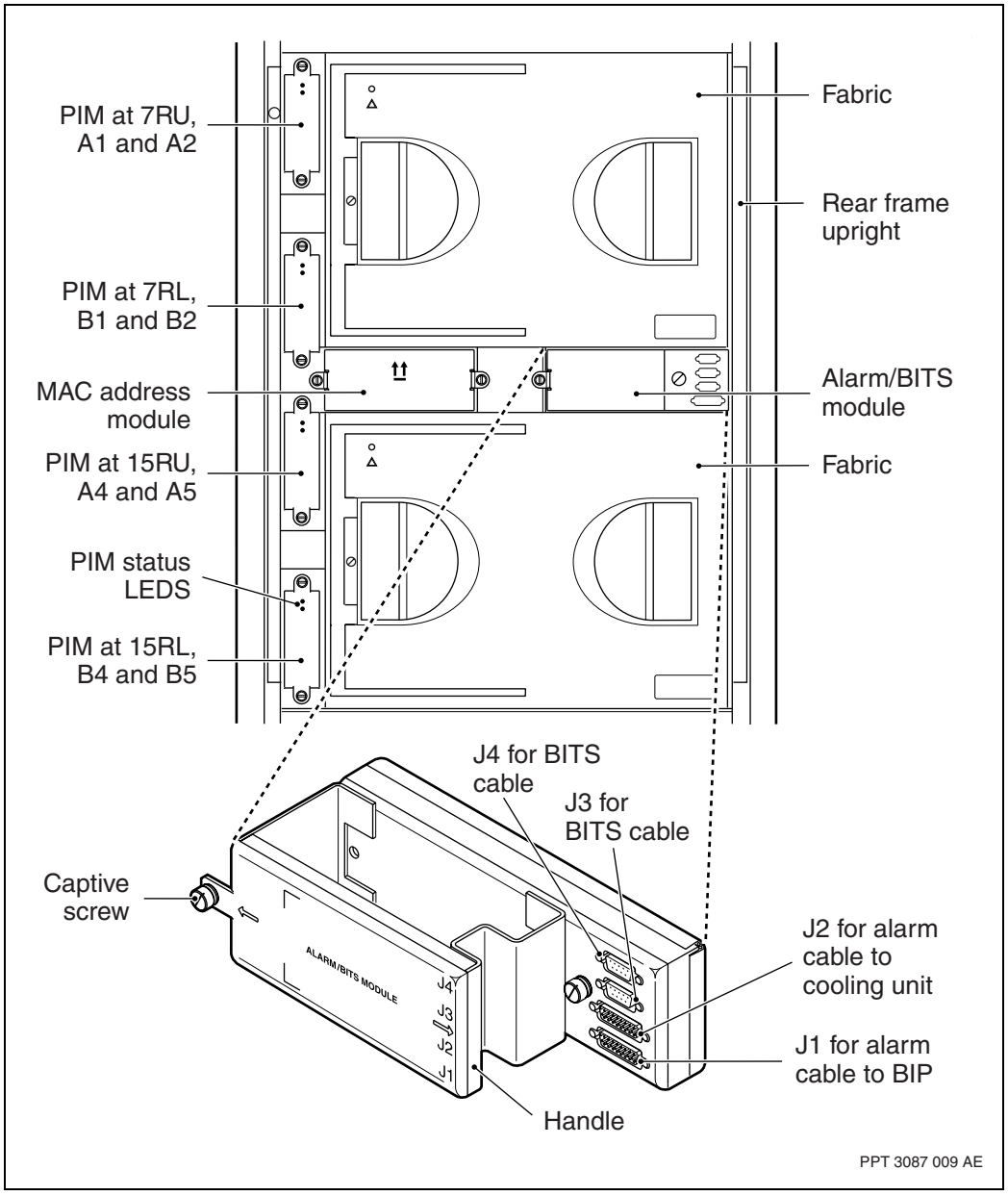
Connection points of cables on an alarm/BITS module in a Multiservice Switch 20000



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Replacing an EdgeLink 100 interface cable

Replace an EdgeLink 100 interface cable to restore communication with a port on a DS3 FP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The interface cables that connect an EdgeLink 100 to a Nortel Networks Multiservice Switch 15000 or Multiservice Switch 20000, or the Ethernet hub of a Multiservice Data Manager workstation are listed in the table Interface cables between an EdgeLink 100 and a Multiservice Switch (page 693). Two cables are required, one for transmitting and one for receiving.

Procedure steps

Step	Action
1	Using the table Interface cables between an EdgeLink 100 and a Multiservice Switch (page 693), and using the labels at the cable ends, locate the end points of a cable path.
2	If the interface cable is from a DS3, make a cable the same length with the same type of connectors. attach the appropriate connector to the cable according to the manufacturer's instructions. If the interface cable is from a DS1, use the prefabricated cables.
3	Route the replacement cable to both end points and loosely tie-wrap it in place.
4	Duplicate the cable labels of the original cable onto the replacement.
5	At both ends of the cable, unplug the cable to be replaced and plug in the replacement.
6	Manage any cable slack so that it is away from the Multiservice Switch.
7	You may wish to remove the old cable. If removal means tugging on or potentially crimping other in-service cables, leave it where is and cut off the connectors.
8	Tighten the cable with tie-wraps along the path between the EdgeLink and the Multiservice Switch.
9	When the interface cable is connected, the software of the EdgeLink re-establishes awareness of the links with the Multiservice Switch, or Nortel Networks Multiservice Data Manager (or both). Coordinate with the software operator of the EdgeLink to ensure that there is connectivity.

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--End--

Procedure job aid

Interface cables between an EdgeLink 100 and a Multiservice Switch

Type and quantity	Part number	Length	Type of connector at EdgeLink	Type of connector at other end
DS1, two	A0718801, Telco Systems' AWX432G5	1.5 m (5 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ48 termination or wirewrap
DS1, two	A0718802, Telco Systems' AWX432G15	4.6 m (15 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ48 termination or wirewrap
DS1, two	A0718803, Telco Systems' AWX432G30	9.1 m (30 ft)	90-degree male 64-pin to 64-pin Amphenol/Cinch	RJ48 termination or wirewrap
DS1, set of two	A0718779, Telco Systems' AXX432G5	1.5 m (5 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	wirewrap at RJ48 termination
DS1, set of two	A0718780, Telco Systems' AXX432G25	7.6 m (25 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	wirewrap at RJ48 termination
DS1, set of two	A0718781, Telco Systems' AXX432G50	15.2 m(50 ft)	90-degree male 64-pin Amphenol/Cinch to wirewrap	wirewrap at RJ48 termination
DS3, two	rated as 728A RG-6U or equivalent	custom	90-degree male-to-female BNC adapter for standard BNC male connector	male BNC on a DS3 FP
DS3, two	NTFP19AC	1 m (3.2 ft)	male BNC	male BNC on a DS3 FP
DS3, two	NTFP19AA	3 m (9.8 ft)	male BNC	male BNC on a DS3 FP

(1 of 2)

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Interface cables between an EdgeLink 100 and a Multiservice Switch (continued)

Type and quantity	Part number	Length	Type of connector at EdgeLink	Type of connector at other end
DS3, two	NTFP19AB	15 m (48.2 ft)	male BNC	male BNC on a DS3 FP
Ethernet	Telco Systems' AWX454G10 for standard LAN trunk cable IEEE 802.3	3 m (10 ft)	male RJ-45, eight-position modular	a male RJ45 connector for a female connector on the hub that is linked to Multiservice Data Manager

(2 of 2)

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Replacing the alarm/BITS module in a Multiservice Switch 15000

Replace an alarm/BITS module in a Multiservice Switch 15000 to restore external timing signals to the CPs, or transmitting the shelf alarm data to the alarm module. Replace the module only by instruction from Nortel Networks technical support.

Prerequisites

CAUTION
Risk of equipment damage or service loss
Inserting a replacement alarm/BITS module in a Multiservice Switch 15000 can cause equipment damage. The modules have no serviceable parts. Cut the seal and remove the module only if you have been instructed to by Nortel Networks technical support.

- You must be familiar with Safety considerations and best practices (page 19).
- Contact Nortel Networks technical support and obtain a case number for replacing the alarm/BITS module. Record the case number on the shelf near the replaced module. Once the timing is successfully restarted, contact Nortel Networks technical support to close the case number.
- The PEC for an alarm/BITS module in a Multiservice Switch 15000 is one of:
  - NTHR12 for balanced DS1 (shielded twisted pair), matched with CP type NTHR06 or NTHW06
  - NTHW76, for the external sync cable wire-wrap assembly NTHW75 (matched to the DS1 CP type NTHR06 or NTHW06)
  - NTHR13 for balanced E1 (shielded twisted pair), matched with CP type NTHR35 or NTHW08
  - NTHR14 for unbalanced E1 (coax), matched with CP type NTHR35

Procedure steps

Step	Action
1	At the rear of the frame, locate the alarm/BITS module. See the figure Location of the alarm/BITS module and cable connections in a Multiservice Switch 15000 (page 698)
2	Disconnect the alarm and BITS cables from the alarm/BITS module.
3	Cut the seal when instructed by Nortel Networks technical support.
4	Unfasten the large slotted captive screw or screws on the alarm/BITS module.

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5 Remove the module by firmly pinching the U-shaped handle and gently pulling straight out.

6 Put the module aside.

7 Hold the replacement module firmly so that the U-shaped handle is facing you and the captive screw is at your left.

8 Align the module with the vacant opening and then align the connector on the module with the connector at the rear of the opening.

Removing Multiservice Switch 15000 fabric X allows you to see the module connector by looking down through the chassis. See the figure Proper alignment of an alarm/BITS module in a Multiservice Switch 15000 (page 697). If the module is not aligned properly the connector on the module will not fit flush with the connector on the chassis.

9

10 Gently push the module straight in until its faceplate is flush with the surrounding surfaces. Avoid bending any of the metal fingers or any of the connector pins.

11 Align and fasten the captive screw or screws. Tighten until snug plus a 1/5 turn. Do not over tighten.

12 Plug the cables back into the module. The connectors mate only one way. Plugging in the cable ends the alarms generated by the software for the cooling unit and temperature.

For a Multiservice Switch 15000 only, the J3 and J4 connectors on the replaced alarm/BITS module that has PEC NTHR12 or NTHR13 may have had inline EMI filters installed. The replacement alarm/BITS module does not require the old filters, since the unit is shipped with factory-installed filters. If the replacement module does not have the filters, follow the procedure Installing EMI filters on the alarm/BITS module (page 489).

--End--

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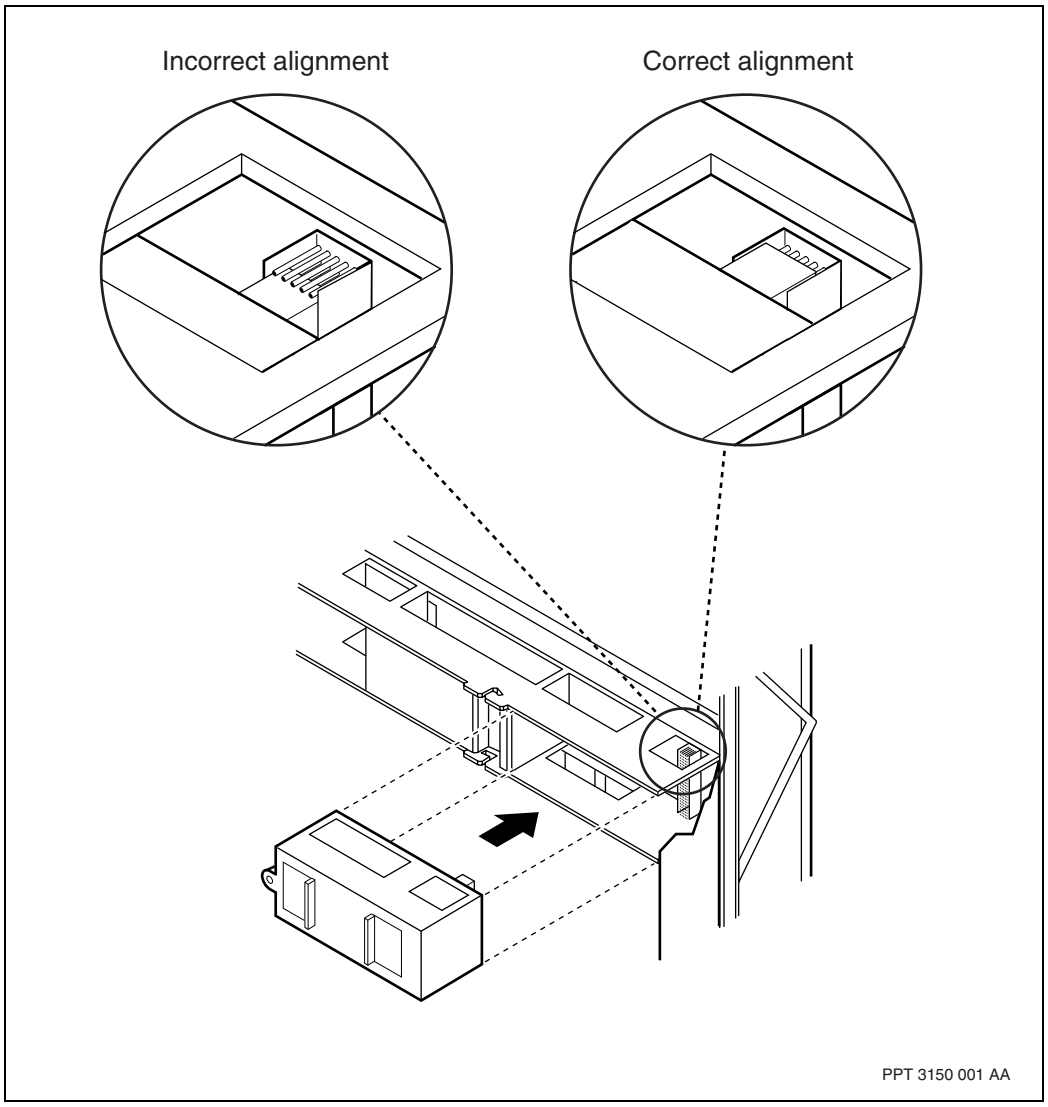
Procedure job aid

Proper alignment of an alarm/BITS module in a Multiservice Switch 15000



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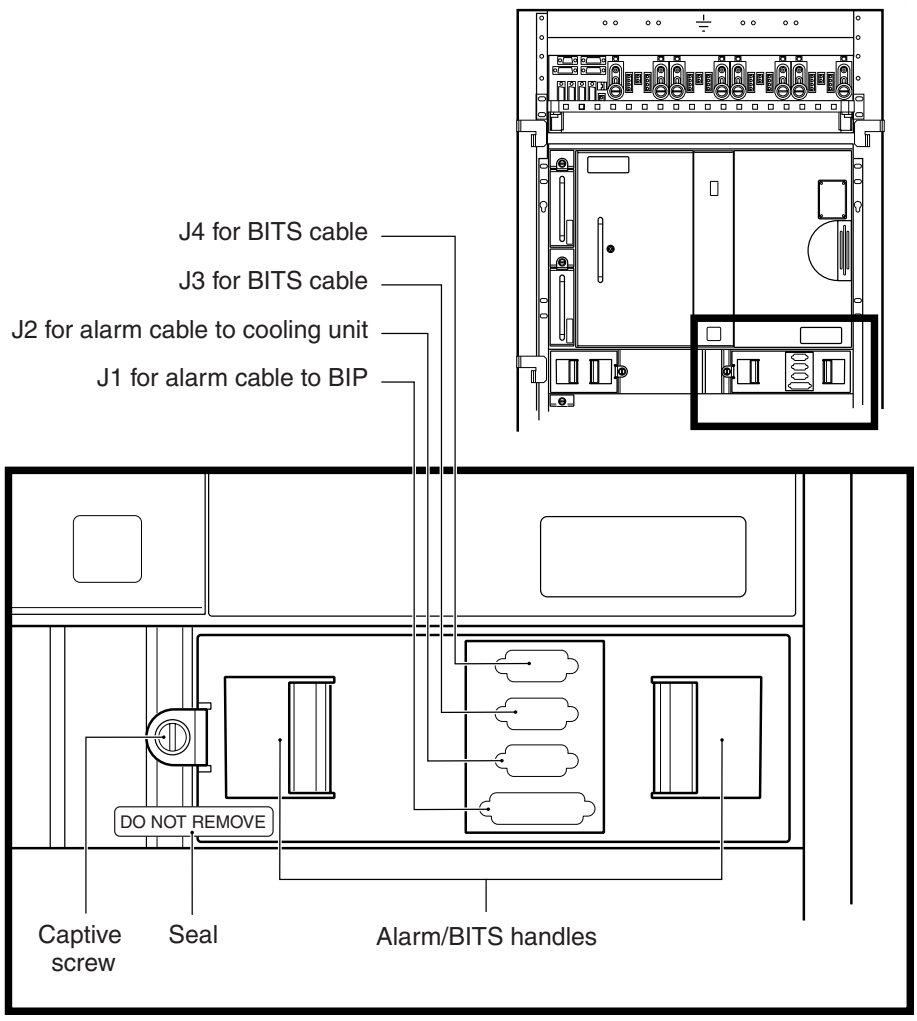
Location of the alarm/BITS module and cable connections in a Multiservice Switch 15000



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Replacing the alarm/BITS module in a Multiservice Switch 20000

Replace an alarm/BITS module in Multiservice Switch 20000 to restore external timing signals to the CPs or sending the shelf alarm data to the alarm module.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- The PEC for an alarm/BITS module in a Multiservice Switch 20000 is one of:
  - NTPN12 for balanced DS1 (shielded twisted pair), matched with CP type NTHW06
  - NTPN78, for the external sync cable wire-wrap assembly NTHW75 (matched to the DS1 CP type NTHW06)
  - NTPN13 for balanced E1 (shielded twisted pair), matched with CP type NTHW08
  - NTPN13 for balanced E1 (coax) with kit NTPN81 which converts the signal to unbalanced E1, matched with CP type NTHW08

Procedure steps

Step	Action
1	At the rear of the frame, locate the alarm/BITS module. See the figure Location of the alarm/BITS module and cable connections in a Multiservice Switch 20000 (page 701)
2	Disconnect the alarm and BITS cables from the alarm/BITS module.
3	Unfasten the large slotted captive screw on the alarm/BITS module.
4	Remove the module by pinching the left captive screw with your left hand and place your right fingers behind the edge labelled with Jn at the middle right portion of the module. Pull the module straight out.
5	Put the module aside.
6	While still wearing a wrist strap, hold the replacement module firmly and pinch the left captive screw with your left hand and place your right fingers behind the edge labelled with Jn at the middle right portion of the module.
7	Align the module with the vacant opening and then align the connector on the module with the connector at the rear of the opening.
8	Gently push the module straight in until its faceplate is flush with the surrounding surfaces.

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CAUTION
Risk of equipment damage and service loss
Do not use any kind of power tool on a captive screw. The screw is necessary to keep the card, module, or cover properly seated. If the screw is overtightened (stripping it or its hole), the hardware may not operate correctly and EMI containment is jeopardized.

9

10 Align and fasten the captive screw or screws. Tighten until snug plus a 1/5 turn. Ensure that you do not strip the threads or hole because the module cannot seat properly.

11 Plug the cables back into the module. The connectors mate only one way. Plugging in the cable ends the alarms generated by the software for the cooling unit and temperature.

For a Multiservice Switch 15000 only, the J3 and J4 connectors on the replaced alarm/BITS module that has PEC NTHR12 or NTHR13 may have had inline EMI filters installed. (See the figure An EMI filter on an alarm/BITS connector for a Multiservice Switch 15000 (page 490).) The replacement alarm/BITS module does not require the old filters, since the unit is shipped with factory-installed filters. If the replacement module does not have the filters, follow the procedure Installing EMI filters on the alarm/BITS module (page 489).

--End--

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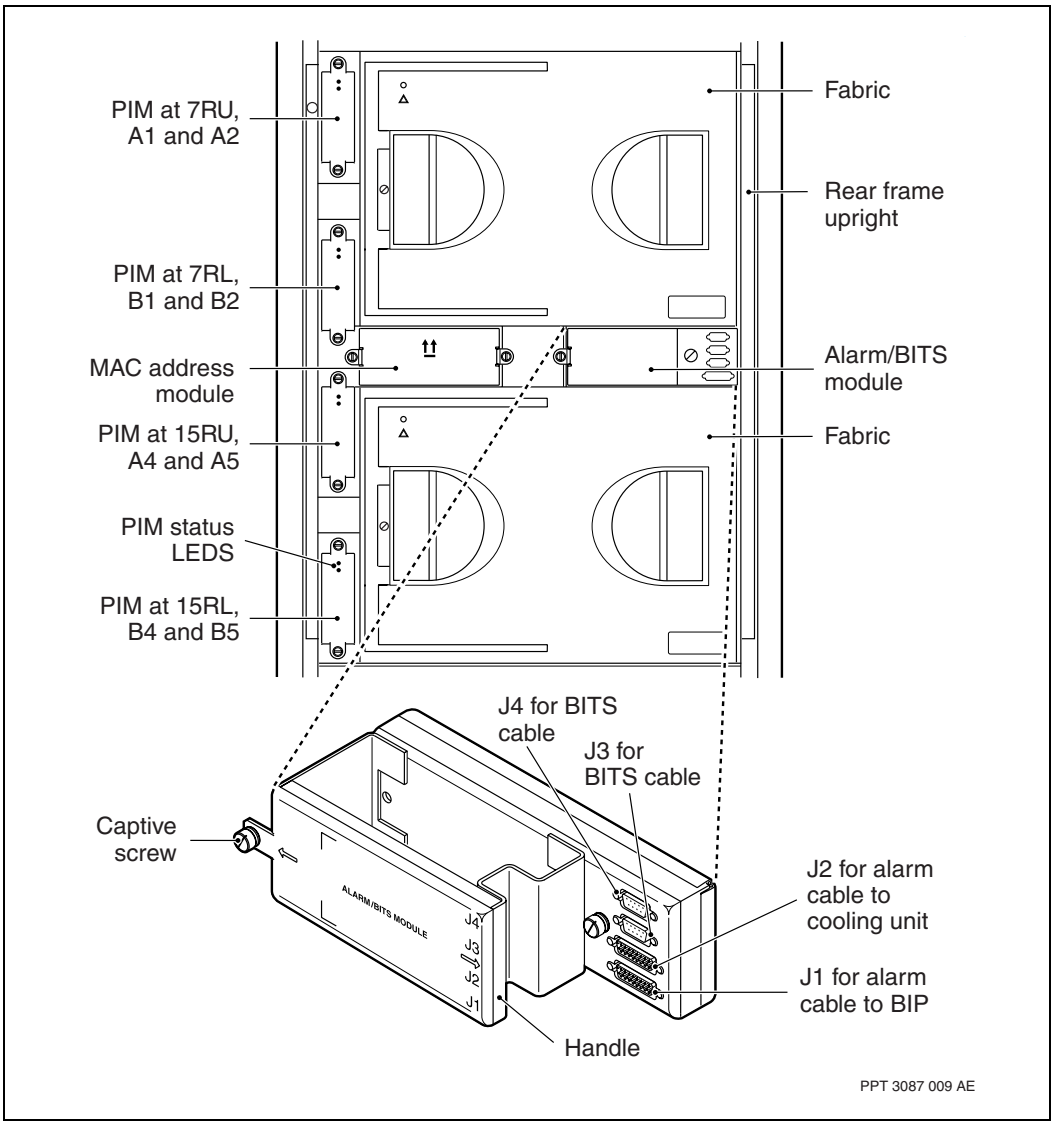
Procedure job aid

Location of the alarm/BITS module and cable connections in a Multiservice Switch 20000



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Replacing the MAC address module in a Multiservice Switch 15000

Replace a failed MAC address module in a Multiservice Switch 15000 to enable a network to recognize the switch and to enable the switch to restart. Replace it only on the instruction of a Nortel Networks support technician.

Prerequisites

CAUTION
Risk of equipment damage or service loss
Inserting a replacement MAC address module in a Multiservice Switch 15000 can cause equipment damage. The modules have no serviceable parts. Cut the seal and remove the module only if you have been instructed to by Nortel Networks technical support.

- You must be familiar with Safety considerations and best practices (page 19).
- Contact Nortel Networks technical support to obtain a case number for removing the MAC address module before cutting the seal or removing the module. Record the case number on the shelf near the module.
- You need a Multiservice Switch 15000 MAC address module with PEC NTHR11.

Procedure steps

Step	Action
1	At the rear of the switch, locate the MAC address module to be replaced. See the figure Location of the MAC address module in a Multiservice Switch 15000 (page 704).
2	Cut the seal when instructed by Nortel Networks technical support.
3	Unfasten the large slotted captive slotted screw.
4	Remove the module by pinching the U-shaped handle and pulling straight out. Removing the module does not generate a software or hardware alarm. This is normal.
5	Put the module aside.
6	Hold the replacement module so that the U-shaped handle is facing you and the captive screw is at your right.
7	Align the module with the vacant opening and then align the connector on the module with the connector at the rear of the opening.
8	Gently push the module straight in. Avoid bending any of the metal fingers (gasket) or any of the connector pins. If you feel resistance when pushing the module in, stop and re-align.

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9 Align and fasten the captive screw. Tighten until snug plus a 1/5 turn. Ensure that you do not strip the threads or hole because the module cannot seat properly.

10 Contact your software operator of the switch to begin re-configuring the software.

11 Verify with the software operator that the re-configuration was successful and that the switch reboots.

12 Contact Nortel Networks technical support to close the case for replacing the MAC address module.

--End--

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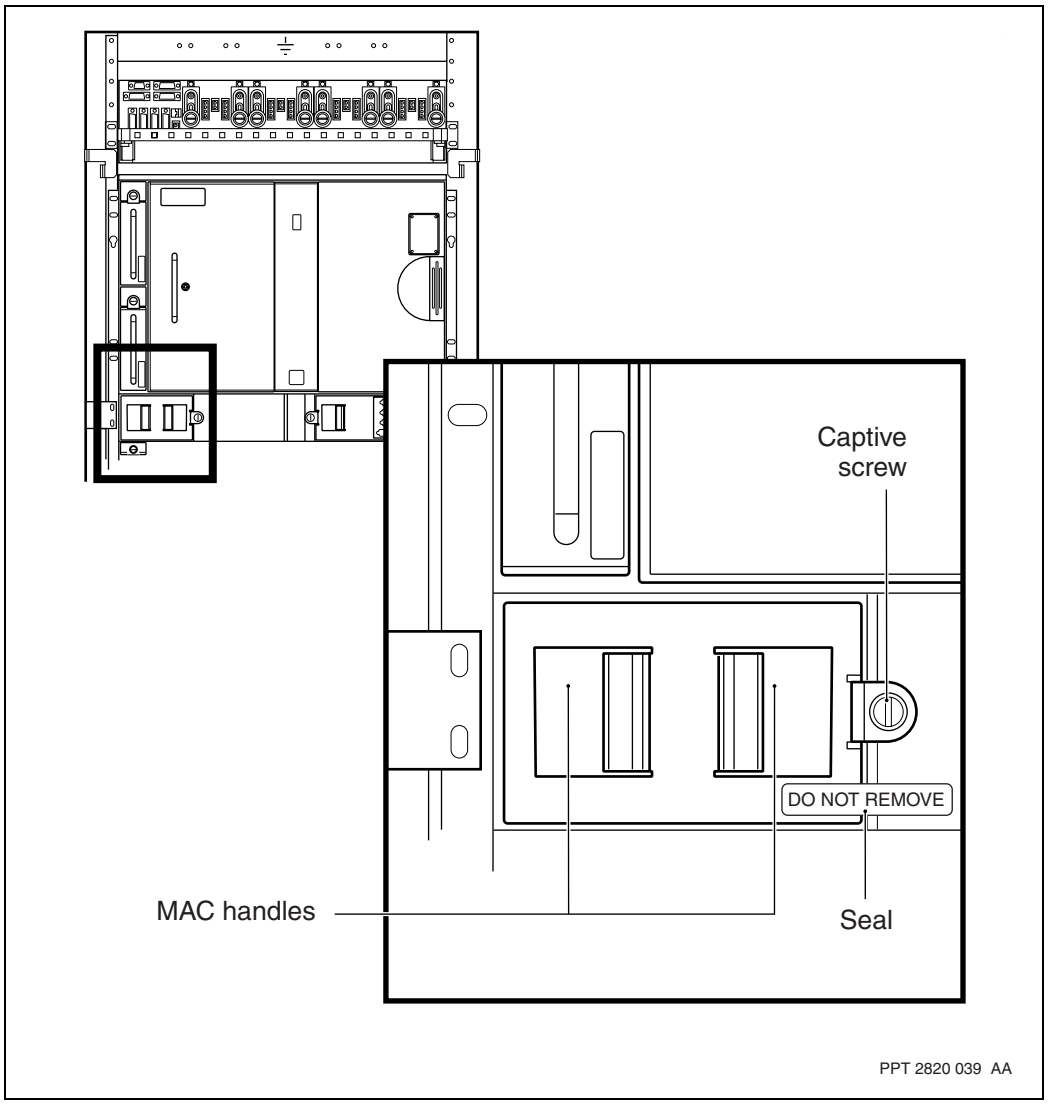
Procedure job aid

Location of the MAC address module in a Multiservice Switch 15000



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Replacing the MAC address module in a Multiservice Switch 20000

Replace a MAC address module in Multiservice Switch 20000 to enable a network to recognize the switch and to enable the switch to restart.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need a Multiservice Switch 20000 MAC address module with PEC NTPN11.

Procedure steps

Step	Action
1	At the rear of the switch, locate the MAC address module to be replaced. See the figure Location of the MAC address module in a Multiservice Switch 20000 (page 706)
2	Unfasten the large slotted captive screws.
3	Remove the module by pinching a captive screw in each hand, and pulling straight out of the backplane using equal force on each screw. Removing the module does not generate a software or hardware alarm. This is normal.
4	Put the module aside.
5	Hold the replacement module so that the label reads upright and the arrows point upwards.
6	Align the module with the vacant opening and then align the connector on the module with the connector at the rear of the opening and with the 2 guide pins inside the module cavity.
7	Gently push the module straight in.
8	Align and fasten the screws. Tighten until snug plus a 1/5 turn. Ensure that you do not strip the threads or hole because the module cannot seat properly.
9	Contact your software operator of the switch to begin re-configuring the software.
10	Verify with the software operator that the re-configuration was successful and that the switch reboots.

--End--

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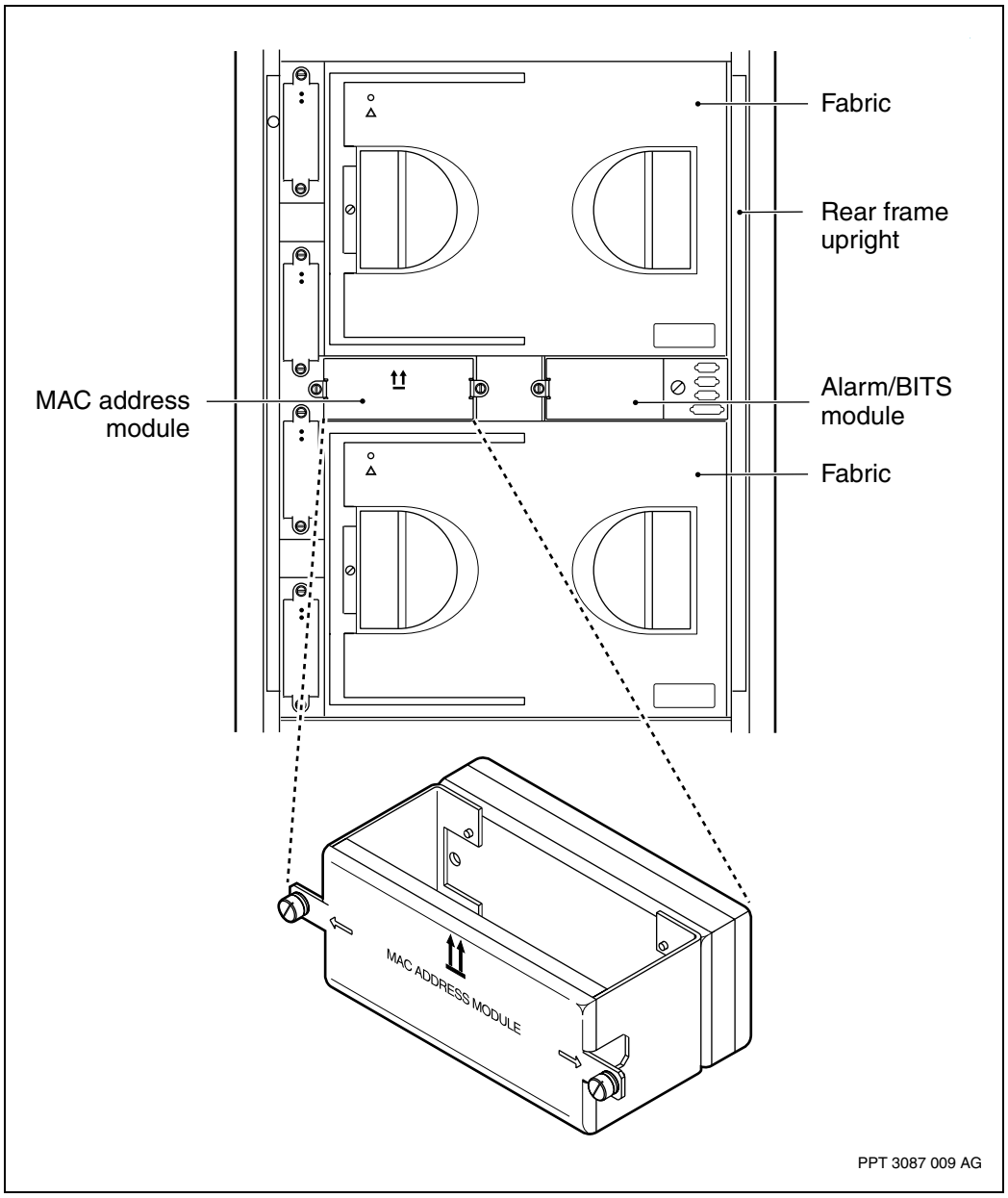
Procedure job aid

Location of the MAC address module in a Multiservice Switch 20000



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Routing FP cables

Route FP cables up to the cable connection points between FPs and the next hop equipment, which can be another FP or equivalent interface card, or a combination of a termination panel, intermediate interworking equipment, and the far-end termination.

Prerequisites

WARNING

Risk of eye injury by laser

Never look directly into the end of a fiber cable, let an end pass in front of your eyes, or use an optical device to look at the end of an optical fiber unless you are certain the other end is not connected. The laser travelling through a fiber cable can injure the human retina.

WARNUNG

Gefahr von Augenverletzungen durch Laserstrahlen

Blicken Sie nie direkt auf das Ende eines Glasfaserkabels, und überprüfen Sie auch einzelne Faserenden nicht mit einem optischen Gerät, wenn Sie nicht sicher sind, daß das andere Kabelende nicht angeschlossen ist. Der über die Glasfasern übertragene Laser kann die menschliche Netzhaut verletzen.

CAUTION

Risk of damage to optical fiber cables from handling

While handling optical fiber cables, do not crimp, kink, snag, or step on any part of a cable or its connectors. Do not exceed the bend radius recommended by Nortel Networks or the manufacturer of the fiber, whichever is wider. Fasten tie-wraps snugly around fiber cables without squeezing into the outer sheath.

CAUTION

Risk of damage to optical fiber card from drilling

When installing retrofit fiber optical cable guides to an FP faceplate by drilling the faceplate to accommodate screws, you must remove the FP from the shelf so that metal shavings do not contaminate handling optical fiber cables, do not crimp, kink, snag, or step on any part of a cable or its connectors. Do not exceed the bend radius recommended by Nortel Networks or the manufacturer of the fiber, whichever is wider. Fasten tie-wraps snugly around fiber cables without squeezing into the outer sheath.

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- You must be familiar with Safety considerations and best practices (page 19), especially regarding the handling of fiber optical cables.
- Ensure that you have addressed the criteria in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for assessing cable management requirements.
- Routing cables does not include connecting them. Connecting is handled at a separate stage by the task flow for cabling an FP.
- When routing FP cables under the floor, ensure that you have addressed the criteria in NN10600-125 *Nortel Networks Multiservice Switch 15000/20000 Planning Site Requirements* for the diameter of a processor card cable passing through a raised floor opening.
- The stress allowance for bending a multimode (MM) fiber cable is the same as for a single-mode (SM) fiber cable. The typical bend radius allowance for handling a fiber cable is ten times its diameter, or 30.5 mm (1.2 in.). The typical bend radius allowance for installed (resting position) fiber cable is 20 times its diameter, or 61 mm (2.4 in.). When using the 1.6-mm (0.063 in.) duplex SM cable (for example, with small form LC connectors), the handling bend radius is 5.0 cm (1.97 in.) while its installed bend radius is 3.0 cm (1.18 in.).
- Use optional retrofit kit NTPS40 with its own instructions for adding cable guides to the faceplate of these fiber optical FPs before routing the cable onto the faceplate:
  - NTHW21
  - NTHW24
  - NTHW31
  - NTHW44
  - NTHW49
- If you are routing fiber optical Y-splitter cable assemblies, ensure that you have addressed the criteria for the cable as described for the type of FP in NN10600-120 *Nortel Networks Multiservice Switch 15000/20000 Hardware Description*, especially for the position of the coupler on each cable. The position of the coupler affects the routing of this type of cable.
- If you are routing cables through a fiber management unit, seeInstalling fiber cables through the fiber management unit (page 495)
- The mini-coax cables used to connect the DS3s have a 15-mm (0.6-in.) bend radius. The coax guides at the ends of the cable channel at the front of a Multiservice Switch 15000 or Multiservice Switch 20000 have a 2-in. bend radius.

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- The figure MT-RJ fiber connector (page 208) has two fibers inside the cable. Over-rotating or twisting the duplex cable can cause a failure underneath the strain relief boot.

Procedure steps

Step	Action
1	Label the cable with unique connection information so that the cable can always be re-connected to the correct FP and the correct port on that FP. Include such information as switch ID, shelf position (upper or lower), slot number, port number, and whether it is the transmit (Tx) or receive (Rx) connection. When a fiber FP has 16 ports, the label must reside on the cable outside the hood and in the cable management channel across the front of the shelf. Adding labels under the hood would prevent the hood from being closed or would pinch a fiber cable, causing a loss of traffic. Stagger the labels of each FP along the channel so that they are not bunched into a bulge that prevents the channel cover from being closed.
2	Connect the first cable to the faceplate using the procedure Connecting an FP cable (page 234).
3	From the faceplate, route the cable down through the cable guide or guides and into the cable management channel. Route a DS3 or E3 coax cable to the right side of the frame and a fiber cable to the left side of the frame. Avoid crossing coax and fiber cables. The coupler of a Y-splitter cable cannot reside across the front of the shelf either inside or outside the cable management channel.
4	From the cable management channel, route the cable over the bend relief organizers at either end of the cable management channel. The part numbers of the relief organizers are P0902861 for the left end (facing the front of the frame) and P0902862 for the right end.
5	Route the cable up or down the side of the frame towards the next leg of the cable path. Route the cable to the closest cable management bracket. When the optional extended cable management brackets are present on one or both sides of the frame, route the cable to the closest cable management bracket, then to the rear (lowest) arm, innermost finger. All cables from the same FP will eventually be fastened to the same finger. For details on the strategies of cable management, you must do Bundling FP cables (page 171). The coupler of a Y-splitter cable should not reside inside a cable management bracket and must not be used with an extended cable management bracket. The couplers should reside between brackets provided their size does not risk traffic loss through cable congestion. Depending on the size of the couplers, you may have stagger where the couplers reside along the cable path.

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6 Route the cable to the next higher or lower brackets, same fingers, in whichever direction the cables are being routed for an overhead or under-floor cable path.

7 Route the cable and dress it loosely up to the next connection.

8 Repeat step 1 to step 7 for each other cable of the FP, moving from the bottom right of the faceplate upwards, then down to the bottom left, as required by the position and number of ports on the FP. The pattern is intended to facilitate efficient and organized clustering of cables inside the cable management channel.

For electrical FPs, also include the control port cable.

9 Loosely fasten the cables of the same FP with tie-wraps along the path. Do not tie-wrap any portion of the cables under the hood of a fiber optic FP. Avoid crimping fiber cables by overtightening the tie-wraps.

For Y-splitter fiber optical cables, follow the manufacturer's method of dressing the cable. For example, it may not be recommended to put a tie-wrap at a neck of a coupler where the fiber meets the coupler.

10 Tuck the cable cluster into the cable management channel.

11 Repeat step 1 to step 10 for each other FP of the same type and in the same group in the cage, moving from the ends towards the middle so that the cable clusters maximize the use of space inside the cable management channel.

--End--

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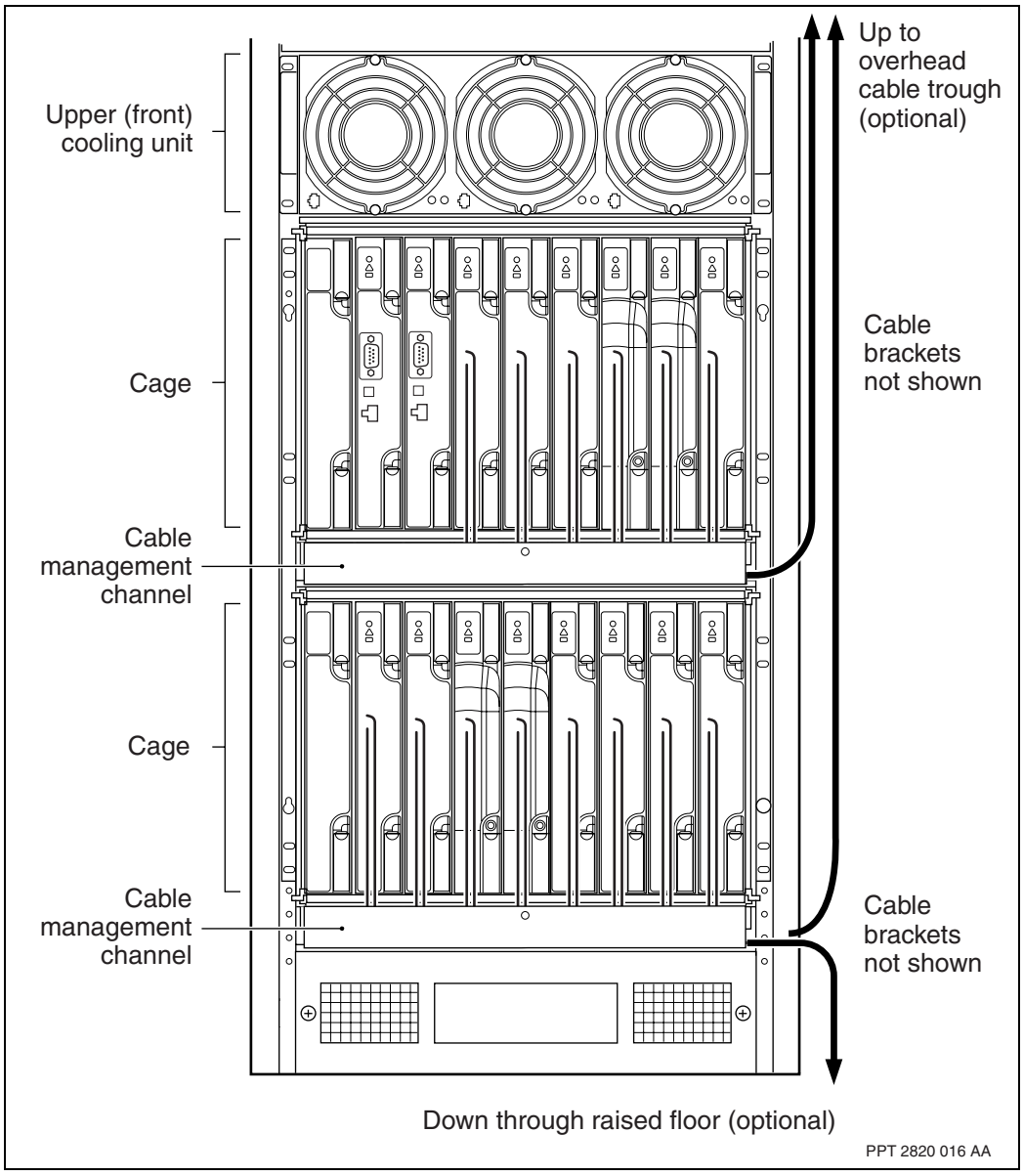
Procedure job aid

FP cable paths, front view, lower shelf



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Routing power cables from overhead to the BIP

Route power input cables in sequence from overhead to the BIP in a NEBS 2000 frame to establish a significant portion of the power cable path.

Prerequisites

CAUTION

Risk of damage to power connections by weight

Use tie-wraps every 10 cm (4 in.) to fasten the cables to the 7-mm (0.25-in.) thick strain-relief bracket (part number P0891284 or P0911981) at the rear of the BIP. Use tie-wraps every 15 cm (6 in.) to fasten the cables to the cable ladder from an overhead cable trough or down the side of the NEBS 2000 frame or equivalent. Fastening the power cables provides strain relief from the weight of the cables on the power input lugs at the rear of the BIP.

- You must be familiar with Safety considerations and best practices (page 19).
- When using conduit for the power cables, you need kit NTHR78, which contains a conduit junction box with two 16-mm (5/8-in.) hex-head screws.
- You need the following specialty tools a cutter for up to No. 1/0 AWG (53.5 mm^2) cable.
- When the source of power is from tapping off a main cable, the minimum gauge of the cable to the BIP must be very flexible 1/0 AWG (53.5 mm^2) unless a power-and-ground cable assembly is used.

Procedure steps

Step	Action
1	If you are using conduit, fasten the conduit junction box to the top rear of the NEBS 2000 frame using the 2 provided screws and threaded screw holes. Tighten the screws to snug plus a 1/2 turn.
2	Stop the conduit just past the lip of the holes in the conduit junction box, leaving enough room for 4 or 8 cables to bend smoothly onto the strain-relief bar at the rear of the BIP.
3	If you are not using conduit, position a cable ladder at the right of the frame while facing the rear of the BIP. The position and capacity of the ladder must meet your local electrical codes, especially for supporting the weight of 4 or 8 power input cables.
4	From the ladder or the conduit box, route and align the appropriate positive (+) and negative (-) cables with the labelled studs as indicated by the figure Overhead power input cables for the lower shelf connected to the BIP (page 714). Permanently label each cable. Place the label so it will be easily

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read and traced to termination after all cables are fastened in a cluster along the strain relief bar.

CAUTION

Risk of equipment damage by reversed polarity

Use the plus (+) and minus (-) symbols on the rear of the breaker interface panel (BIP) to ensure that the polarity of each A and B battery (-48/-60 V dc) and battery return for the input power feeds is correct. When powering up the BIP, reversed polarity will damage circuits inside it.

5

6 Dress the power cable above the BIP so that it remains aligned.

7 Cut the cable at about 38 cm (15 in.) below the strain relief bar, wrap the end with electrical tape, and leave it hanging.

8 Repeat the previous two steps for the other 3 or 7 power cables. Install them 1 at a time, end to end, from right to left across the rear of the BIP. (The bottom switch is powered from the studs on the left half of the rear of the BIP.)

--End--

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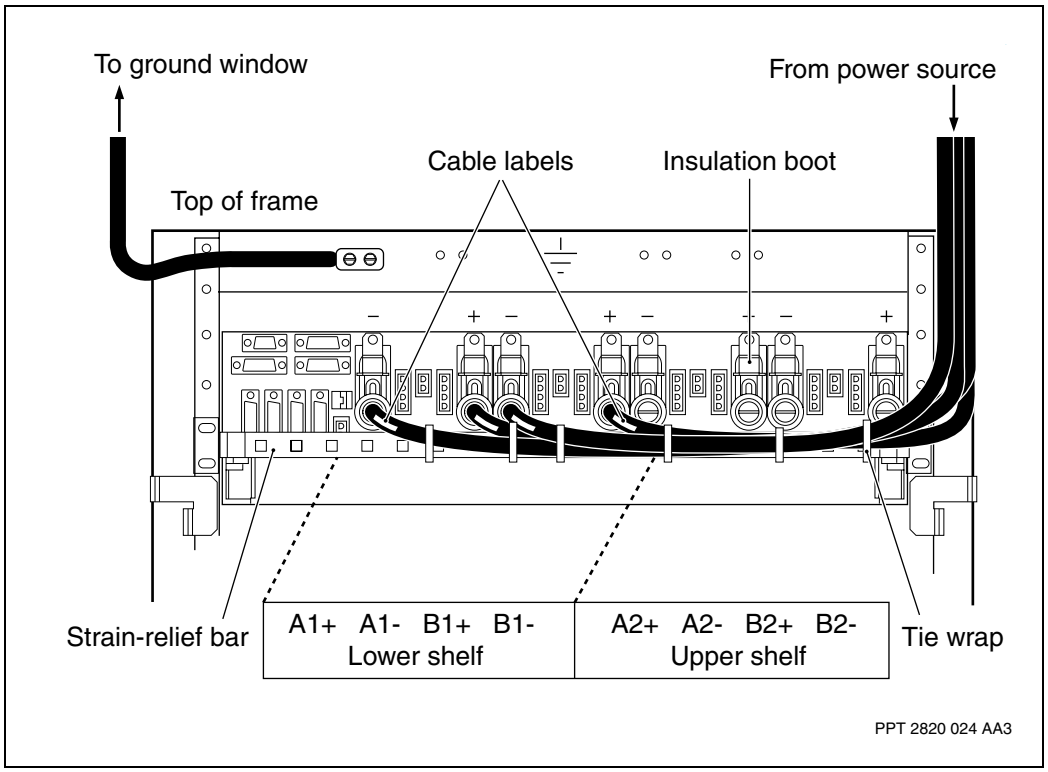
Procedure job aid

Overhead power input cables for the lower shelf connected to the BIP



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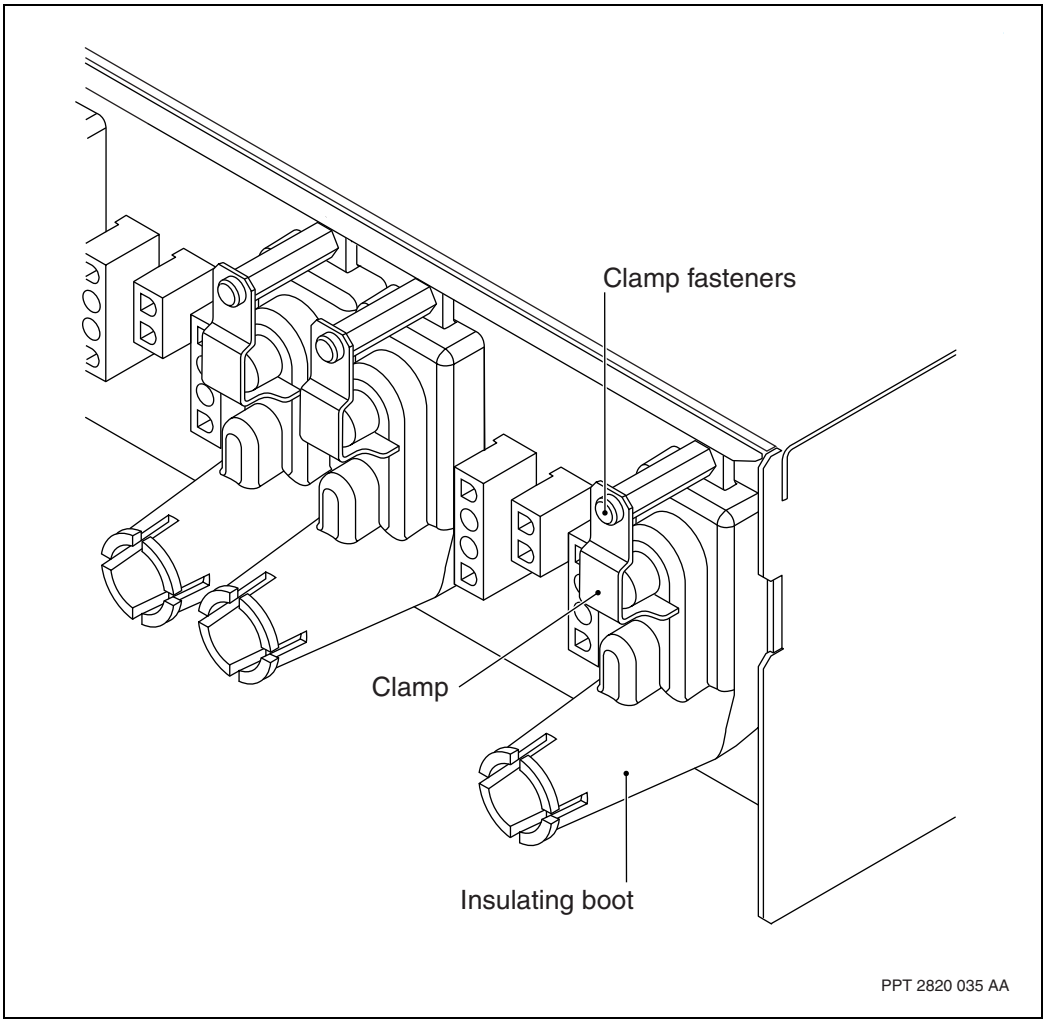
Insulating boots and clamps at the rear of the BIP



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Routing power cables from under the floor to the BIP

Route power input cables in sequence from under the floor to the BIP in a NEBS 2000 frame to establish a significant portion of the power cable path.

Prerequisites

CAUTION
Risk of damage to power connections by weight
Use tie-wraps every 10 cm (4 in.) to fasten the cables to the 7-mm (0.25-in.) thick strain-relief bracket (part number P0891284 or P0911981) at the rear of the BIP. Use tie-wraps every 15 cm (6 in.) to fasten the cables to the cable ladder from an overhead cable trough or down the side of the NEBS 2000 frame or equivalent. Fastening the power cables provides strain relief from the weight of the cables on the power input lugs at the rear of the BIP.

- You must be familiar with Safety considerations and best practices (page 19).
- You need the following specialty tools:
  - a deburring tool for metal
  - a stable work surface for clamping and bending metal from a knockout disk
- Four No. 1/0 AWG (53.5 mm^2) power cables fit through each knockout hole in a bottom frame plate. Since each Multiservice Switch 15000 or Multiservice Switch 20000 needs 4 cables (2 feeds), a second switch in the same NEBS 2000 frame means two holes are needed. Use only the number of knockouts as required to pass cable or conduit through the bottom frame plate. Compliance to fire regulations mandates that no openings occur in the bottom of the frame.

Procedure steps

Step	Action
1	Remove the rear plate at the bottom of the rear half of the NEBS 2000 frame by unfastening the 4 screws.

CAUTION
Risk of equipment damage by fire
A bent bottom plate leaves an opening into the frame area which reduces the fire proofing effect of the hardware in a NEBS 2000 frame.

2	

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3 At a workbench, remove a 5-cm (2-in.) knockout disk from the plate by

- clamping the plate to the edge of a bench so that it does not move and so that the disk is over open air
- pressing on an unfastened edge of the disk until you can pivot it in the opening
- wobbling the disk back and forth until it detaches
- filing the burrs off the top and bottom edges of the opening

4 If you are using conduit, test fit the plate so that the conduit just passes the lip of the knocked out hole. If the location of the hole is inconvenient for routing the cables, swap the positions of the plates.

5 Facing the rear of the frame, route a power cable through the opening of the bottom plate. Pass the cable through a hole in the plate. Leave the plate unfastened for easier cable manipulation.

6 Facing the rear of the frame, route the cable through the right rear side opening as shown in the figure Power cabling to the BIP from the floor (page 720).

7 Route the cable up along the frame to the BIP. Plan nesting your cables because the other 3 or 7 cables will run parallel to it.

8 Fasten the cable securely on the zig-zag bars of the frame with tie-wraps having a minimum width of 0.5-cm (3/8-in.). The tie-wraps must not overlap the outermost side of the frame uprights when supporting power cables, as shown in the figure Power cabling to the BIP from the floor (page 720). This would interfere with the optional frame-to-frame brackets for joining 2 frames.

9 Route the remainder of the cable up to the BIP and along the strain relief bar at the rear of the BIP. Cut the cable so that it can easily reach the rear stud on the BIP from a right-angled turn off the strain relief bar.

If the BIP is to be equipped with a power-and-ground assembly (A0834143 or A0834149), each cable must be routed above the BIP, permanently suspended from above, and routed down past the appropriate terminal block. Cut each cable at the strain relief bar.

10 Wrap the end of the cable in electrical tape and leave it hanging.

11 Permanently label the cable as indicated in the figure Overhead power input cables for the lower shelf connected to the BIP (page 718), for example, B1+. Position the label so it can be easily read and traced to termination after all cables are installed.

12 Repeat step 5 to step 11 for the remaining power cables. Install them 1 at a time, end to end, from right to left across the rear of the BIP. (The bottom switch is powered from the studs on the left half of the rear of the BIP.)

13 Fasten the bottom plate back onto the frame.

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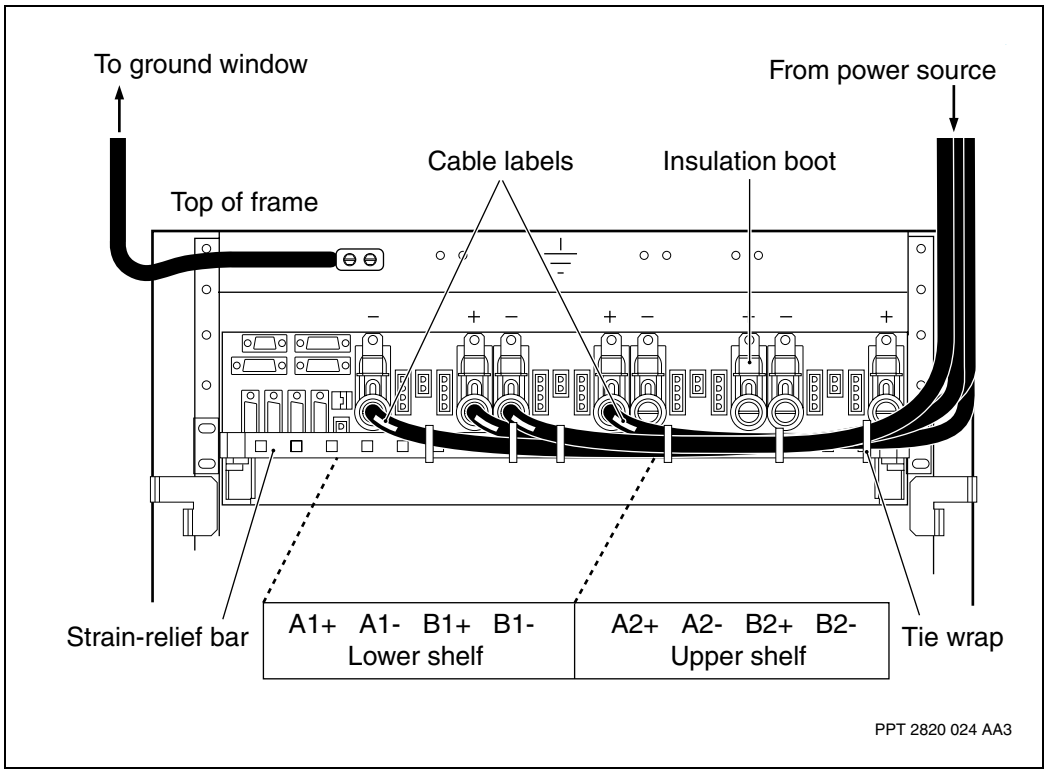
--End--

Procedure job aid

Overhead power input cables for the lower shelf connected to the BIP



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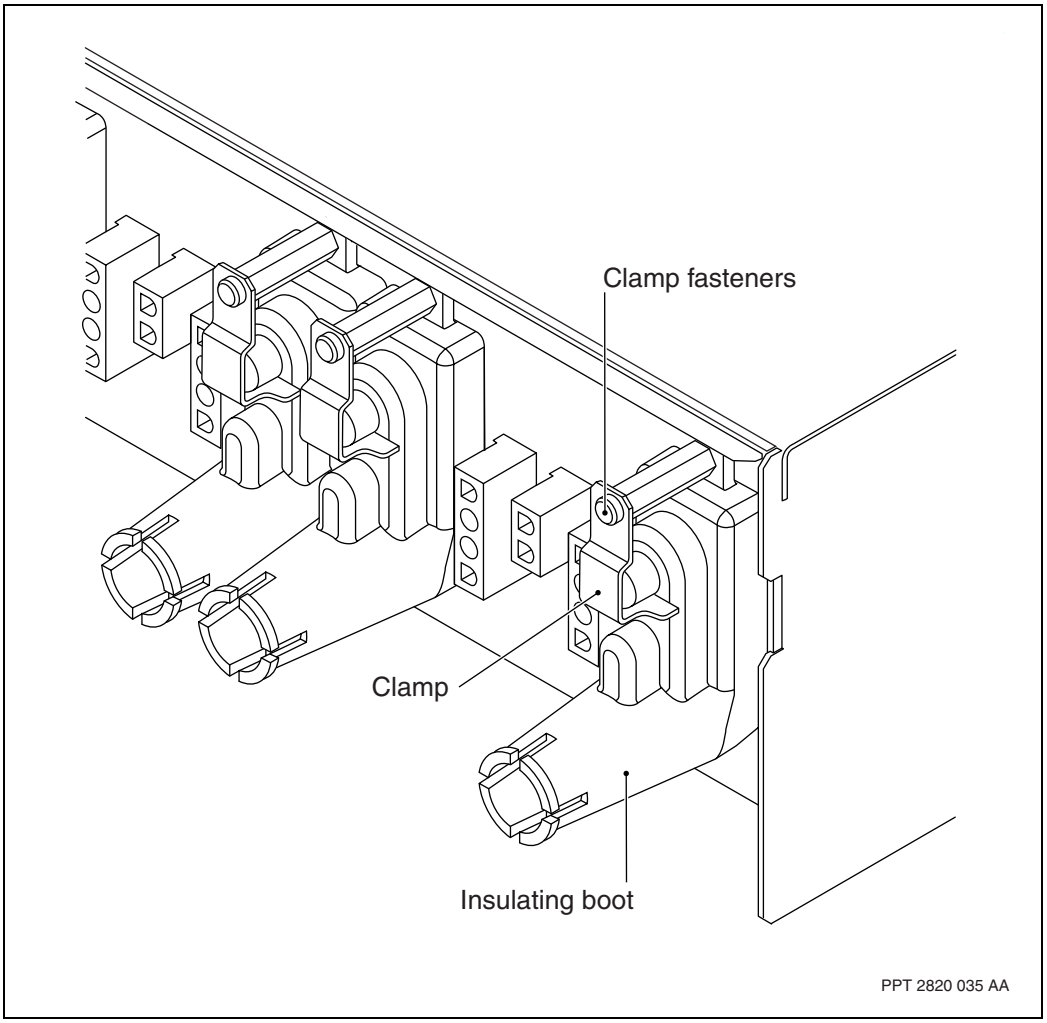
Insulating boots and clamps at the rear of the BIP



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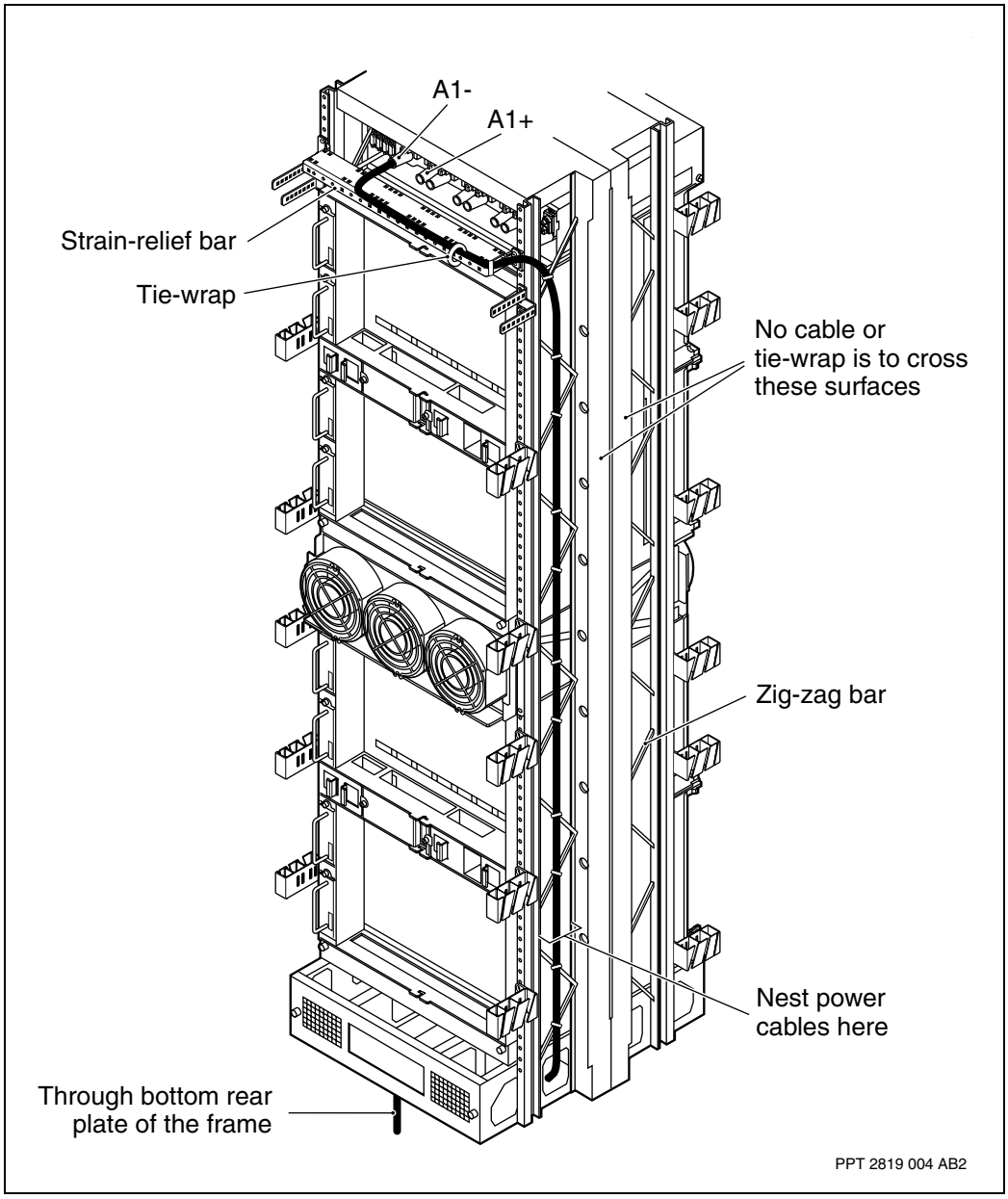
Power cabling to the BIP from the floor



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Seating cards from the transportation position

Seat CP and FP cards from the transportation position of an initial installation to enable them to be powered up and loaded with software. Blank processor cards are also seated, but they are filler cards that do not operate.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- For the initial installations of the processor and blank processor cards, for example, in a Nortel Networks Multiservice Switch 20000, the cards are transported partially installed in their appropriate shelf slots and latched to a transportation ridge at the top of the shelf assembly and latched to individual slot pockets at the bottom of the shelf assembly. The FP cards are held firmly in position, but unseated. This protects the backplane connectors and pins from damage by vibrations during transportation.
- Fully seat each processor and blank processor card as follows, starting at the card on the right and proceeding to the right for each cage.

Procedure steps

Step	Action
1	On the faceplate of each card, open each latch fully by pinching the inner edge of the latch and lifting away from the faceplate.
2	While holding each latch open horizontally, gently slide the card inward until it stops and the faceplate is flush with the shelf edges above and below it. There are keyways and guide pins to ensure that each card aligns with the connections at the backplane (inside, at the rear of the cage).
3	Bypass any blank cards that are already fully seated. Otherwise, seat them like any other card. A blank card has BLANK labeled on the faceplate. Slots 0E and 1E are reserved for later development and must contain blank cards in the meantime.
4	Latch each card closed so that the latch is flush with the faceplate. If not, unlatch and re-seat the card. If a card still does seat properly, latch the FP in the unseated position and report the slot number, switch identifier, and switch location to your local Nortel Networks technical support representative.
5	For any empty slot, do the procedureInstalling a blank processor card (page 301).

--End--

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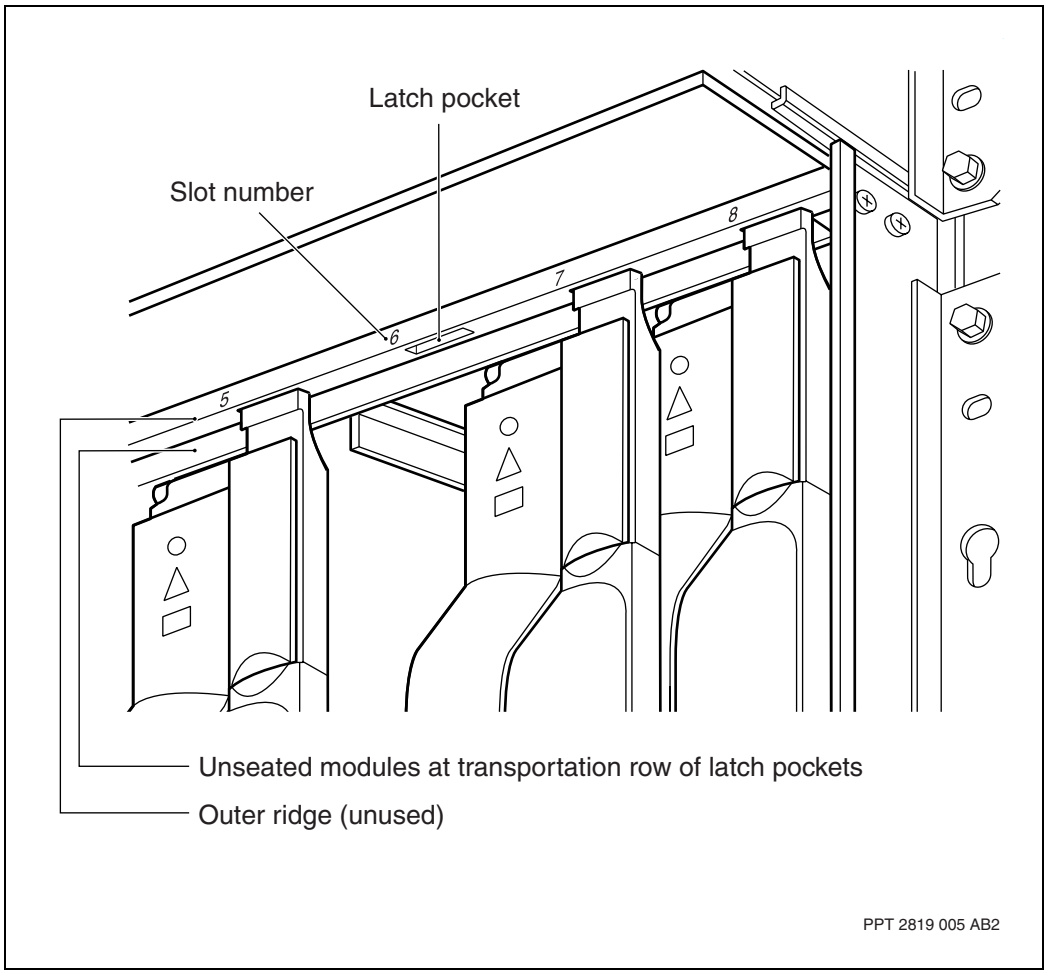
Procedure job aid

Upper transportation pockets for card latches



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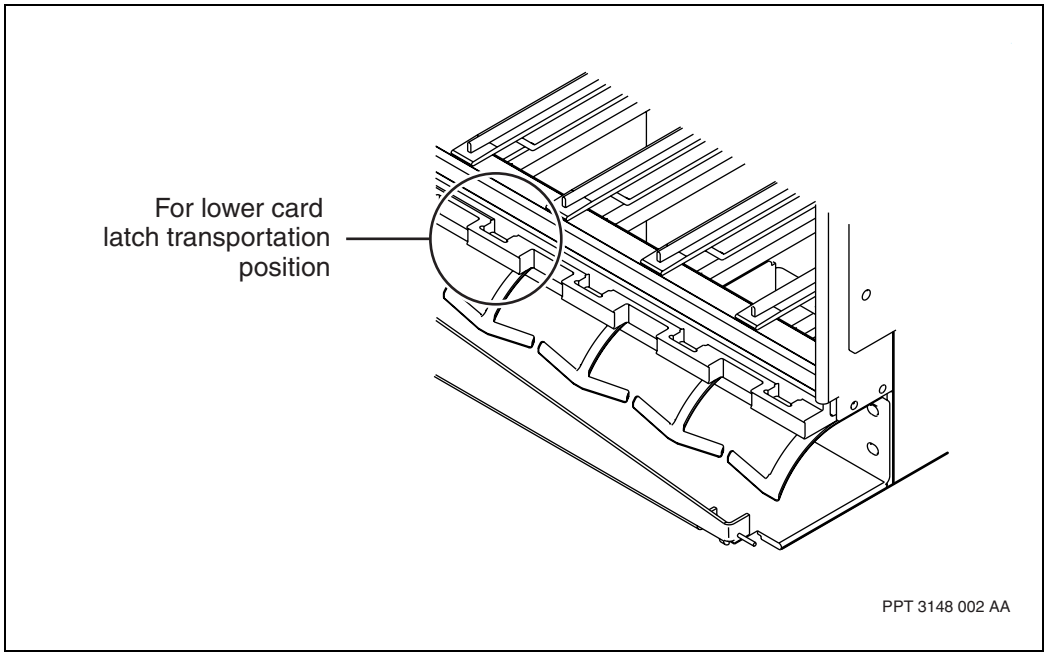
Lower transportation pockets for card latches



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Seating fabrics from the transportation position

Seat a fabric card from the transportation position at the rear of a Nortel Networks Multiservice Switch 20000 to initially install it.

Prerequisites

CAUTION
Risk of service degradation or damage by heat
The tape covering the gap at the top of an upper fabric card cage in the upper frame position prevents foreign objects from entering the cavity behind the fabric during transportation. The tape must be completely removed as part of the fabric installation.

- You must be familiar with Safety considerations and best practices (page 19).
- When fabric cards are shipped in the transportation position, they do not have protection covers installed over the connectors. Do not remove the fabric card to look. The position protects the connectors from accidental contacts.

Procedure steps

Step	Action
1	Peel off all of the strip of tape that covers the air vent at the top outside of the top fabric card cage of an upper shelf assembly. See the location of the vent in the figure Location of protective tape over fabric card airflow opening (page 726).
2	While holding the fabric in position, unfasten the 2 slotted captive screws of the retaining strap. See the figure Straps retaining Multiservice Switch 20000 fabric cards in the transportation position (page 727). Be careful not to let the fabric card slip out of the transportation notches at the corners. The card can rest against the notches such that the upper alignment bushings tilt away from shelf assembly, however, tapping the card can cause it to fall off.
3	While using the right fabric card handle to hold the card against the transportation notches, unfasten the Phillips captive screw on the lever. The lever may pop out slightly.
4	Once the 4 bushings enter the alignment grooves, place a hand in each fabric card handle and gently push the fabric into the back such that • the lever remains fully open as shown in the figure A fabric card for a Multiservice Switch 15000, front view (page 728) • each rolling alignment bushing at the outside corners evenly enters the 4 alignment grooves shown in the inset of the figure Locations of

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notches for hinge bushings in a Multiservice Switch 20000 shelf assembly (page 729)

- the 4 guide pin keyway blocks at the rear corners of the fabric in the figure A fabric card for a Multiservice Switch 20000, rear view (page 730) align with the 4 guide pins on the backplane

5 Hold the fabric card in place with one hand and close the lever. Moving the lever starts seating the card and requires a firm, steady motion to the left against variable resistance. When the lever is almost closed, the tension on it will lessen noticeably. Any squeaking is normal.

If inserting the fabric card is stopped by a blockage, typically you can feel it but not see it. When you feel blockage, stop the insertion and re-align the hinge pins. If the blockage persists, contact your Nortel Networks technical support representative.

6 When the alignment bushings reach the end of the groove, the lever is almost fully closed. Fully seat the fabric card and depress the reset button by closing the lever flush with the cover of the fabric card.

Seating the NTPN02 requires slightly more force than an NTHR16 of a Multiservice Switch 20000. If the NTPN02 hinge bushings squeak during seating, this is normal.

When pressed in, the reset button enables the card to be loaded with firmware when the switch is powered. If the reset button is not fully depressed, the fabric card cannot be put into service.

7 Tighten the captive screw on the lever to snug plus a 1/5 turn when

- all 4 alignment bushings are at the end of the alignment grooves
- the 4 corners of the fabric card cover are evenly aligned with the surrounding edges of the shelf assembly
- the lever is closed flush

Avoid stripping the screw.

--End--

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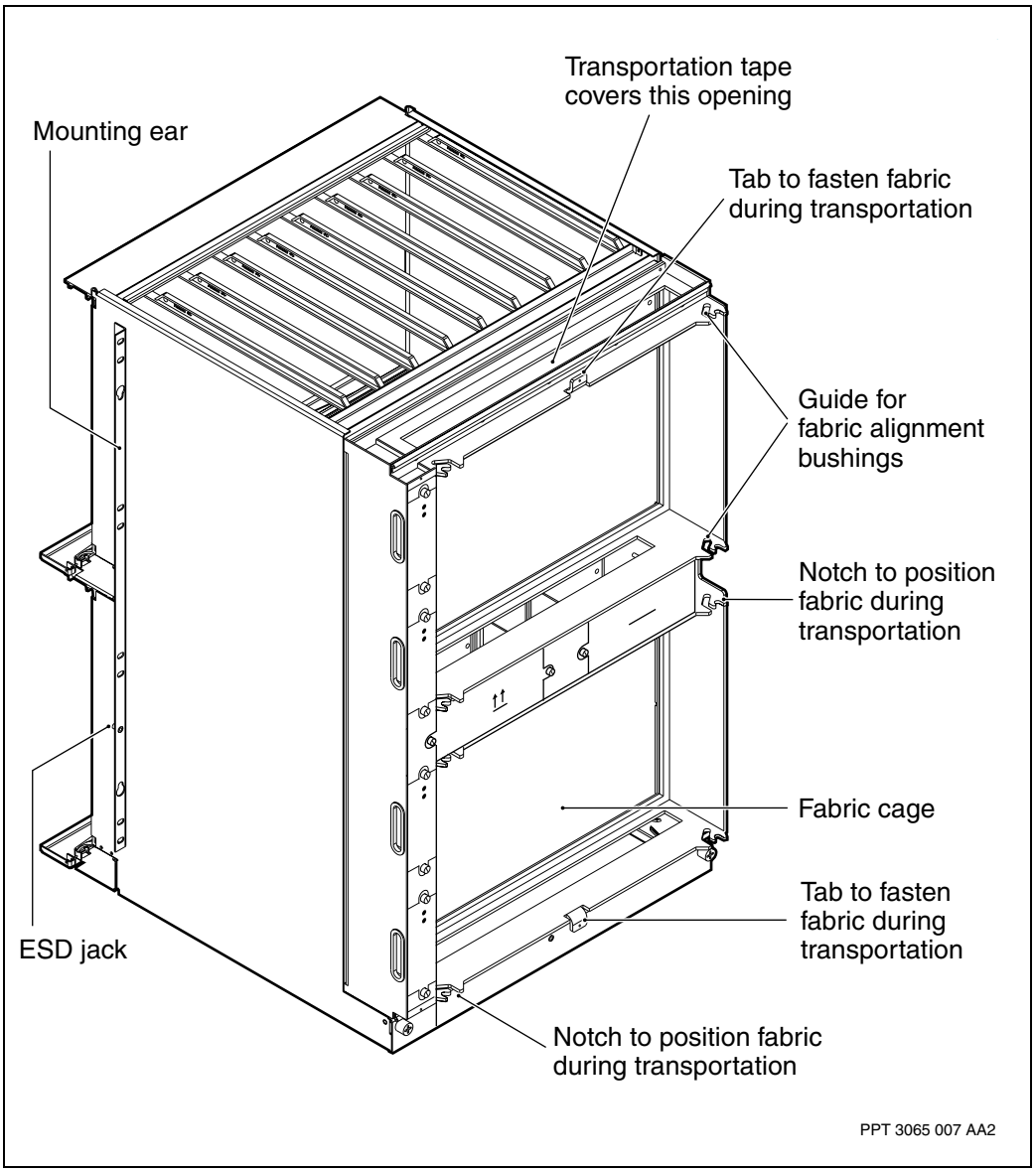
Procedure job aid

Location of protective tape over fabric card airflow opening



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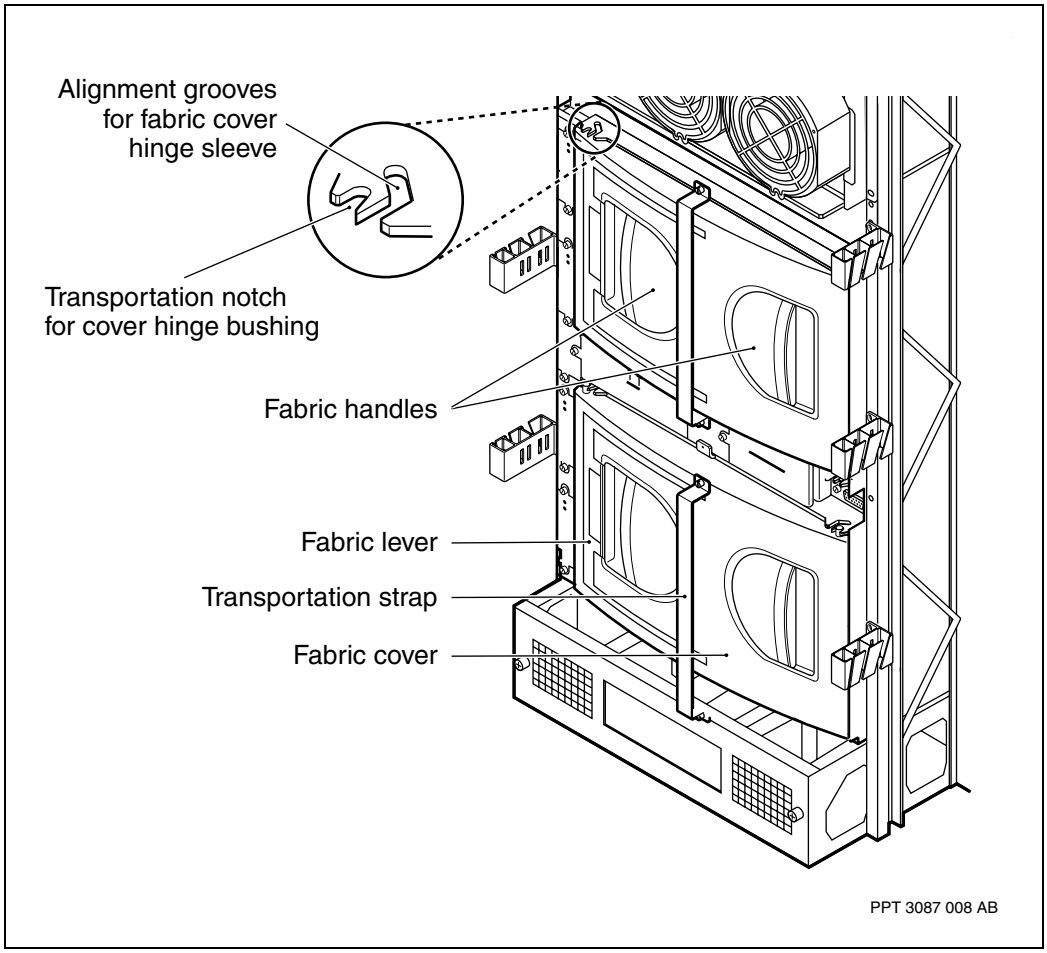
Straps retaining Multiservice Switch 20000 fabric cards in the transportation position



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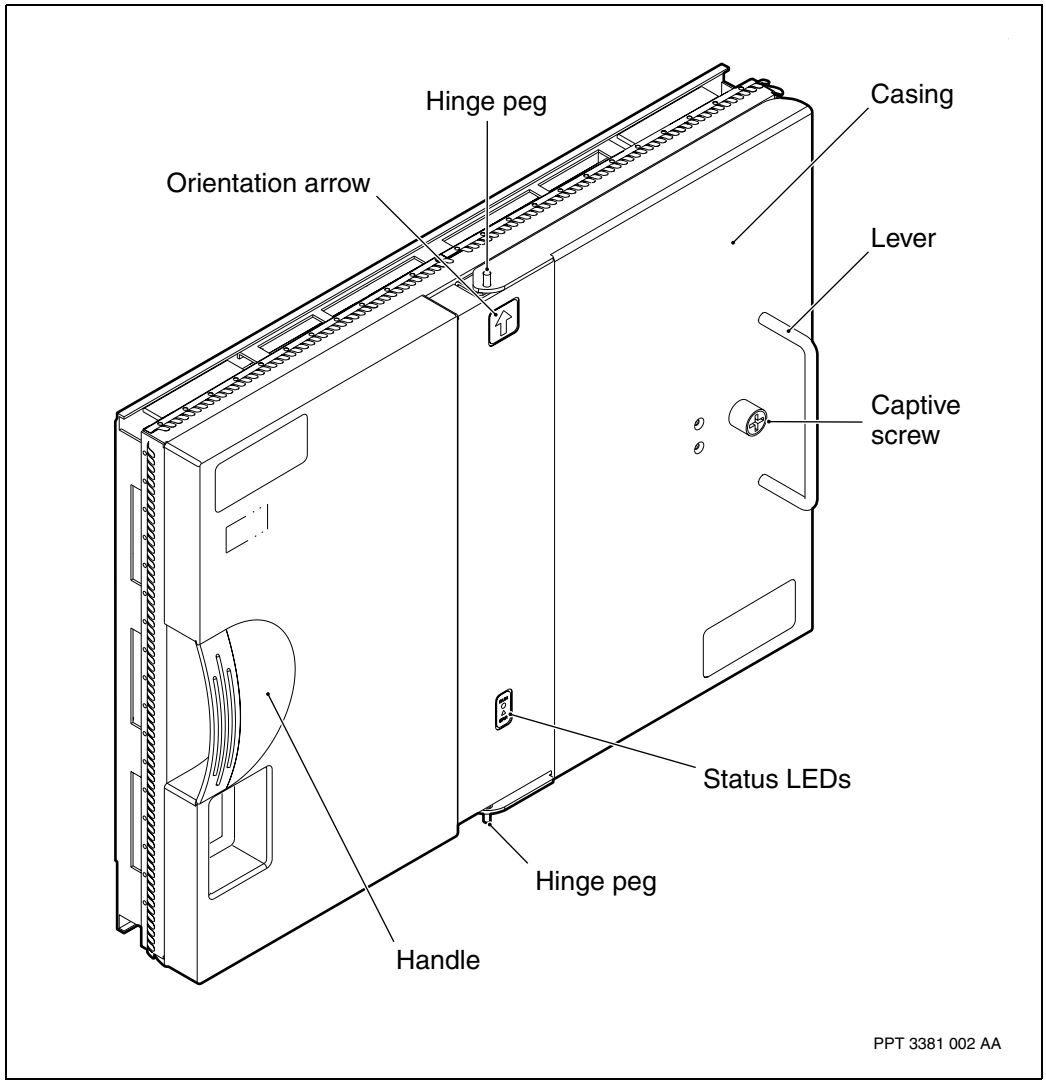
A fabric card for a Multiservice Switch 15000, front view



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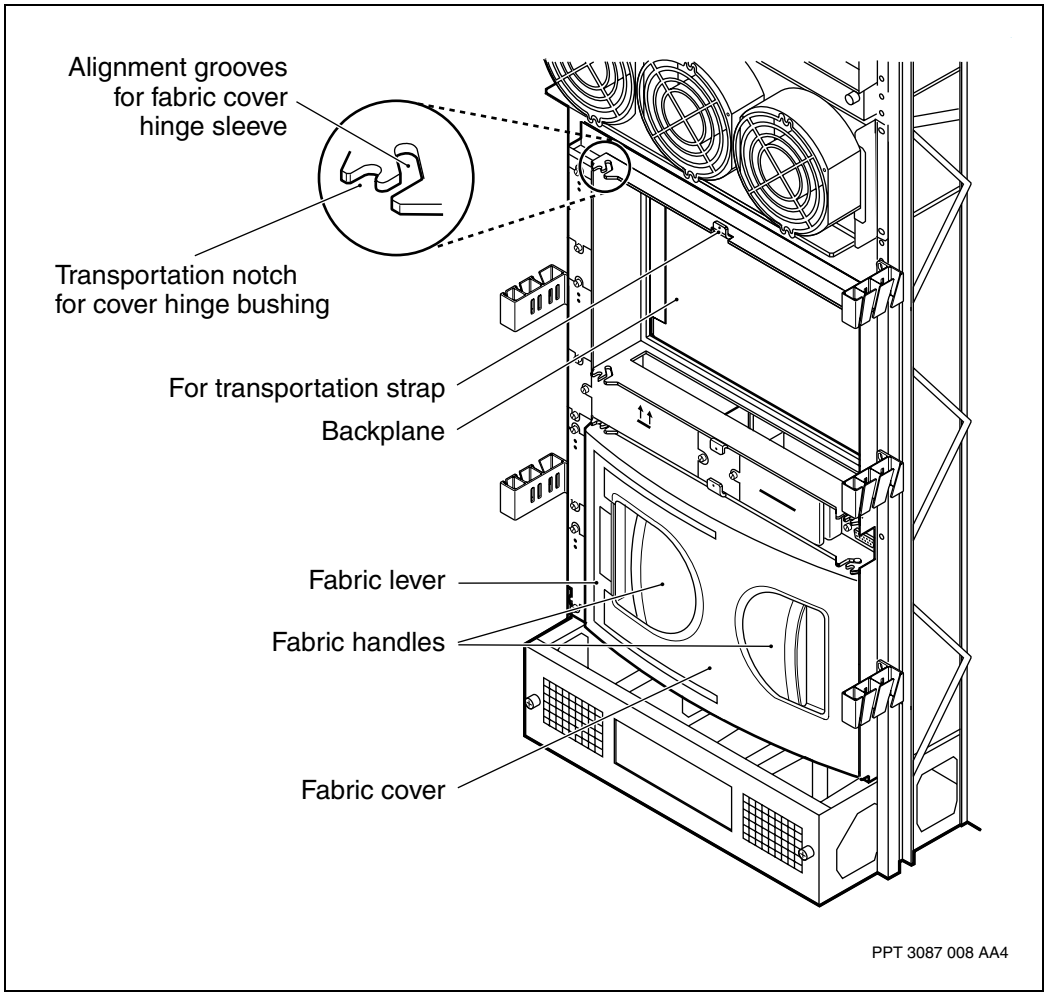
Locations of notches for hinge bushings in a Multiservice Switch 20000 shelf assembly



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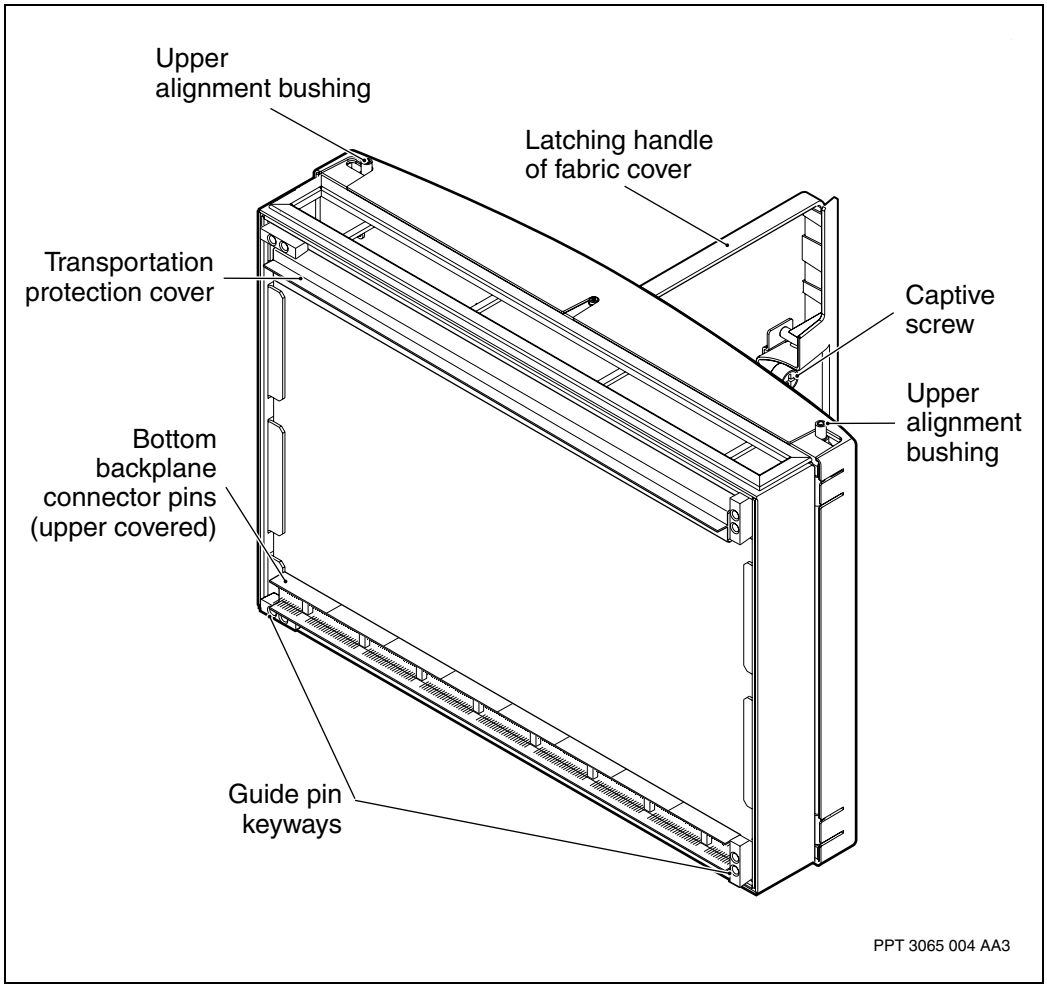
A fabric card for a Multiservice Switch 20000, rear view



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Setting modem DIP switches

Set modem DIP switches to enable the configuration of the modem software.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- This procedure uses a US Robotics 56K modem as an example. Follow the instructions provided by the manufacturer of your modem to access and set the DIP switches. Set the DIP switches as indicated in the table Modem settings of the hardware DIP switches (page 731). This table applies to a US Robotics.

Procedure steps

Step	Action
1	Set the modem DIP switches as specified in the table Modem settings of the hardware DIP switches (page 731). The table applies to a US Robotics 56K modem as an example of the settings you must apply.

--End--

Procedure job aid

Modem settings of the hardware DIP switches

DIP switch number	Description of the setting	Required setting
1	modem ignores DTR (override)	on (down)
2	verbal (word) results	off (up)
3	disable word codes	off (up)
4	suppresses echo	on (down)
5	modem answers on first ring, or higher if specified in non-volatile memory (NVRAM)	off (up)
6	modem sends CD signal when it connects with another modem, drops CD on disconnect	off (up)
7	loads Y or Y1 configuration from user-defined NVRAM	off (up)
8	disables command recognition (dumb mode)	off (up)

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Toggling on the BIP circuit breakers

Toggle on BIP circuit breakers to begin the powering up of Multiservice Switch 15000 and Multiservice Switch 20000 systems.

Prerequisites

WARNING
Risk of injury by fan blades
While working on any equipment near the cooling unit fans, be continuously aware that the rpm of a live fan can suck loose clothing, hair, or jewelry into the fan blades or amputate a finger. Do not touch a live fan with anything.

WARNUNG
Verletzungsgefahr durch Lüfterblätter
Beim Arbeiten in der Nähe der Lüfter des Kühlaggregats besteht die Gefahr, daß ein rotierender Lüfter lose Kleidung, Haare oder Schmuck in die Lüfterblätter saugt oder einen Finger abtrennt. Berühren Sie einen Lüfter niemals, weder direkt noch indirekt.

- You must be familiar with Safety considerations and best practices (page 19).
- Toggling on the BIP breakers automatically distributes power from the BIP to the power interface modules (PIMs), which feed all plug-ins of the shelf assembly.
- For a Multiservice Switch 20000, the two LEDs on each PIM indicate solid green when powered up. There is a LED for each A and B power feed from the BIP.

Procedure steps

Step	Action
1	Unseat the spare CP and all of the FPs in the shelf. Ensure that their rear connectors are not touching the backplane. The CP in slot 0 must remain seated.
2	Facing the power source that feeds the BIP, toggle on power to the BIP unless the BIP is already sharing power through a C-tap from larger cables.
3	Facing the front of the BIP, ensure all breakers are off (the O is pushed in). See the figure Circuit breakers on the front of the BIP (page 733).
4	Turn on the cooling unit by toggling on the third breaker (the middle one) on the 2 BIMs at the right. Toggle on a breaker by pushing the bar symbol (|) in.

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5 Continuing from the right side of the 2 BIMs on the right, toggle on the breakers one at a time until all breakers are on. For switches with BIMs installed in a NEBS 2000 frame that is waiting for a second (upper) switch, leave the breakers of BIMs in slots 1 and 2 off.

6 On the alarm module, test the operation of the LEDs in the BIP by pressing the button labelled Test LED that is identified in the figure Location of alarm module status LEDs (page 740). (The BIM breakers can be on or off.) The six LEDs below the button pass the test when they stay on for approximately 10 seconds.

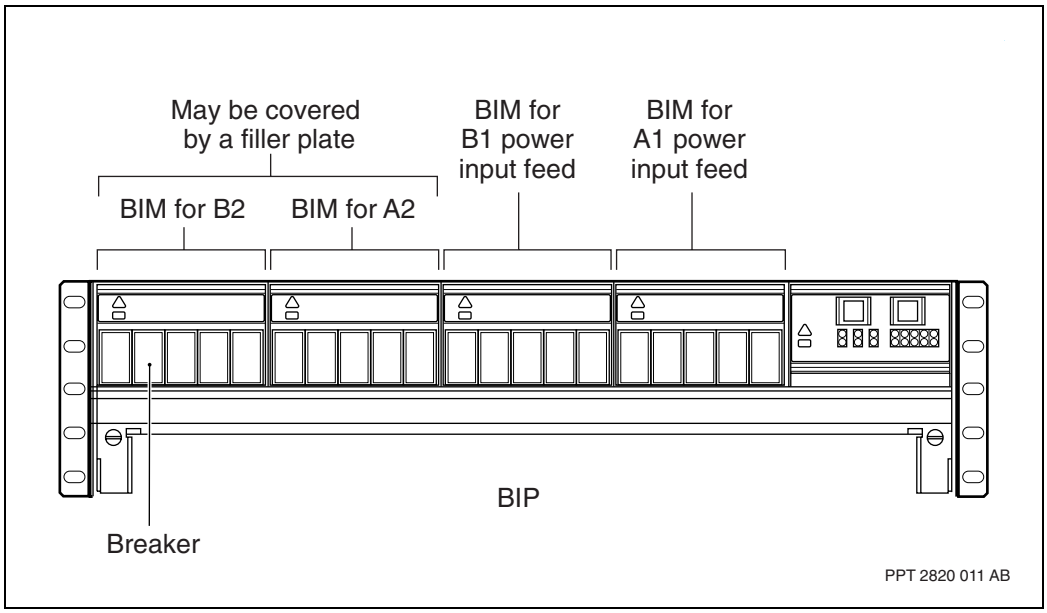
7 After all breakers of each BIM are toggled on, observe the LEDs cycling from solid red to solid green. Ensure that the LED status of the alarm module and the BIMs are green. See the figure Location of BIM status LEDs (page 739). If not, toggle off all breakers and trouble-shoot the problem.

8 When the BIP is powered from an MFA150 system of ac rectifiers, check the AMP readings on the front of each rectifier. The acceptable range of current is approximately 7 to 50 amps depending on the number and type of seated processor cards in the switch.

--End--

Procedure job aid

Circuit breakers on the front of the BIP



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Testing sparing panel connectivity

Test sparing panel connectivity after a hardware replacement to ensure proper functioning.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- After replacing a hardware part that is directly connected to a fanout or sparing panel that is connected to a Multiservice Switch 15000 or Multiservice Switch 20000, test the transmit and receive connectivity between the FPs and the panel. Replacing a part includes any one or more of:
  - a DS3 or E3 FP
  - the cable or cable assembly connecting the FP port to the sparing panel port or fanout panel connection
  - a connector at either end of the cable connecting an FP port to a sparing panel port or fanout panel connection
  - the sparing panel, fanout panel, or a part of either one
- The one-for-six sparing panel (NTQS31) has the hardware capability for monitoring the transmit signal on any port on a specific FP. Ports of the same number cannot be monitored on different FPs at the same time. The monitoring signal of the panel is 25 dB lower than the transmit signal so that the transmission is insignificantly affected.
- Testing must be done by your own customer premises test equipment.

Procedure steps

Step	Action
1	Ensure traffic is running through the FPs that are connected to the sparing panel.
2	On the sparing panel, press the FP selection button until the numeral of the appropriate FP appears in the LED display beside it. The button is the upper one of the pair.
3	Press the port selection button until the hexadecimal number of the port appears in the LED display beside the button. The button is the lower one of the pair. • When replacing an FP, select the first port of all connected ports on the FP. • When replacing a cable or part of a cable, select only the port associated with the cable.

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- When replacing (or re-locating) the sparing panel, select the first port of the first FP that is connected to the sparing panel.

4 Connect the test equipment according to the equipment manufacturer's instructions.

5 Run the test equipment to verify connectivity according to the equipment manufacturer's instructions.

6 Record the test result for the FP-to-sparing panel port path.

7 Repeat this procedure until you cycle through all of the ports that are connected to the part that was replaced.

8 For each port that failed the transmit connectivity test, test the FP, and check the cable connectors, cable, and cable connections. Re-test each as you check. If any port still fails the test, contact your equipment administrator to decide what to replace.

--End--

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Testing the power output from a system of ac rectifiers

Test the power output from a system of ac rectifiers to the BIP to prevent inadvertent damage to equipment by verifying the polarity, connectivity, and appropriate levels of power before the BIP is powered up.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- Test the power output connections from a system of ac rectifiers by following the instructions provided by that product. When the system of ac rectifiers is an MFA150 power system, ensure that you have done Checking power output from a system of ac rectifiers (page 185) and then follow the testing instructions provided in the Astec document 167-9021-133 *Advanced Power Systems MFA150 Modular Front Access Power System Detailed Installation Guidelines and Procedures Manual*.

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Testing the input power to the BIP

Test the input power to the BIP from each feed to confirm appropriate levels of power to run a Multiservice Switch 15000 or Multiservice Switch 15000, and to prevent inadvertent damage to the cards before powering up the BIP.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- You need an accurate multi-meter with about 25-cm (10-in.) probes (leads) as the specialty tool. A digital read-out is recommended as easier to read.
- When a polyvalent or the ETSI power-and-ground assembly has been installed, do the testing procedure at the terminal block clamping screws that retain the power input cables. This test confirms connectivity and the correct polarity of the power input cables to the terminal blocks. Then repeat the testing procedure at the BIP studs.
- You must ensure the power to the unit is turned off before starting this procedure.

Procedure steps

Step	Action
1	Facing the front of the BIP, ensure all of the breakers are off (O is pushed in).
2	Verify there is no potential difference at the rear of the BIP using a voltmeter as follows: Place the positive lead of the meter on the A1+ stud and the negative lead of the meter on the A1- stud. A correct hookup shows 0.0 volts. Repeat this step for the A2, B1, and B2 feeds.
3	Using an ohmmeter at the rear of the BIP, indicate the match up of the battery lead with its return by placing the positive lead of the meter on the A1+ stud and the negative lead of the meter on the A1- stud. A normal reading is approximately 6.5 K ohms because of the capacitors inside the BIP. Repeat this step for the A2, B1, and B2 feeds. If the ohmmeter points to the infinity symbol (open circuit) or displays “0.L” (overload) for a pair, a discontinuity exists in that pair. To perform power reversal checks, place a short circuit between the A1+ and A1- studs. Measure the resistance across the B1+ and B1- studs. A reading of 0 (zero) ohms indicates the battery leads are reversed. Remove the short circuit from the A1+ and A1- studs, and measure the resistance between the A1- and B1- studs to Frame Ground. There should be no direct connection to the ground and the meter should read 6.5 K ohms. A low resistance reading to ground (close to zero ohms) indicates a power feed reversal. Correct the reversal and recheck the measurements. Repeat for the A2 and B2 feeds.
4	After correcting a reversal or a mismatch, repeat the two previous steps until all battery and battery return pairs are confirmed.

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5 Unseat all the BIMs in the BIP by gripping the lower front lip and pulling firmly and evenly straight out of the BIP. Stop when the front of the BIMs are approximately 10 cm (4 in.) past the front of the BIP.

6 Apply the site's battery power to only the A1 feed going to the BIP.

7 Verify that the voltage between the A1- and the A1+ pair is negative and ranges within -40 and -60 V dc by applying the voltmeter's COM, LO, or black lead to the BIP's A1+ lug and the V, HI, or red lead to the BIP's A1- lead. A system with batteries can read up to 65 V dc.

While probing the terminals with the multi-meter, the voltage at the unpowered A or B feed is slightly less than the voltage at the powered feed. For example, if the powered reading is -52 V dc, the unpowered reading can be -51.6 V dc. This is normal.

DANGER

Risk of injury by electrocution

When toggling off breakers at the power source of a breaker interface module (BIM), wait 15 seconds for the capacitors in the BIM to discharge. Each BIM controls up to 100 A.

WARNUNG

Lebensgefahr

Warten Sie nach dem Auslösen der Trennschalter an der Stromversorgung (BIM) 15 Sekunden, bis sich die Kondensatoren in der Schaltereinheit entladen haben. Ein BIM steuert bis zu 100 A.

8

9 Turn off the site's battery power to the A1 feed going to the BIP and toggle on the power to the B1 feed.

10 Verify that the voltage between the B1- and the B1+ is negative and ranges within -40 and -60 V dc.

11 Slide the insulating boot to the BIP end of the cable, align it with the shape of the lug (toe upwards), rest the boot flush against the rear of the BIP, and add the boot retainer as shown in the figure Insulating boots and clamps at the rear of the BIP (page 715). Using a small Pozidriv screwdriver bit, tighten the boot retainer screw at the rear of the BIP to snug plus a 1/5 turn (1.7 Nm or 16 in.-lbs of torque).

12 Repeat step 3 to step 11 for the A2 and B2 feeds.

13 Check the labels of the power cables at the BIP to match the labels at the power sources, all to indicate the shelf being powered. Ensure the identifications are in the site records.

14 Seat all the BIMs in the BIP.

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15 Toggle on the BIP breakers one at a time, from right to left. A breaker is on when the | is pushed in. Although other equipment turns on, they will be tested by a different procedure later.

16 Ensure the LEDs on the BIM at the front of the BIP are showing green. If showing red, toggle off the BIM breakers and re-inspect the cabling for appropriate polarity. If green, proceed. See the figures Location of alarm module status LEDs (page 740) and Location of BIM status LEDs (page 739).

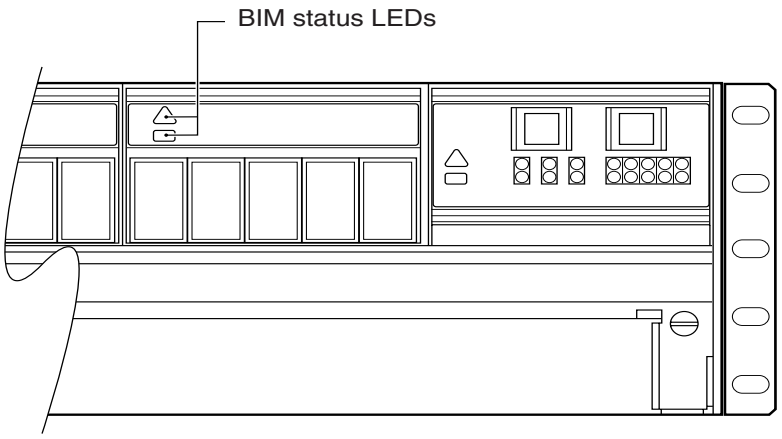
17 Toggle off all BIP breakers.

If the power to the BIP is on except for a BIM that was toggled off for replacing an input power cable, restore power to the cable and toggle on the breakers the | is pressed in) of the BIM that aligns with that cable. The software alarms associated with replacing a cable are cleared.

--End--

Procedure job aid

Location of BIM status LEDs



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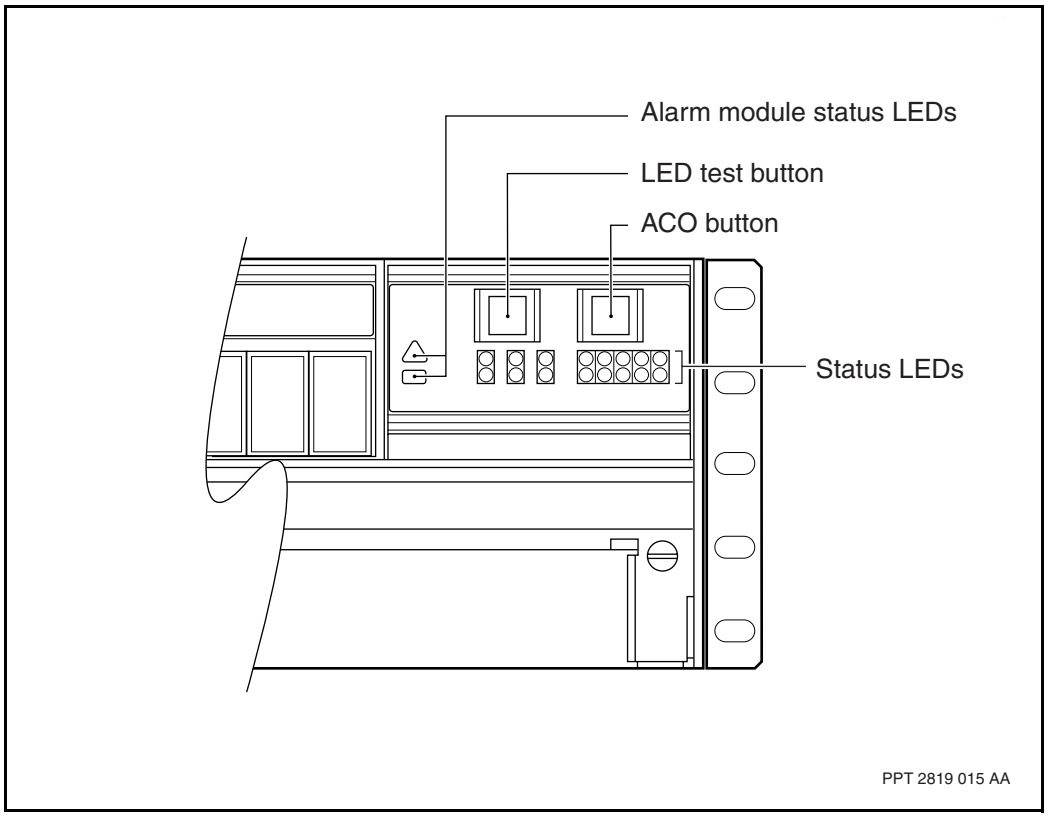
Location of alarm module status LEDs



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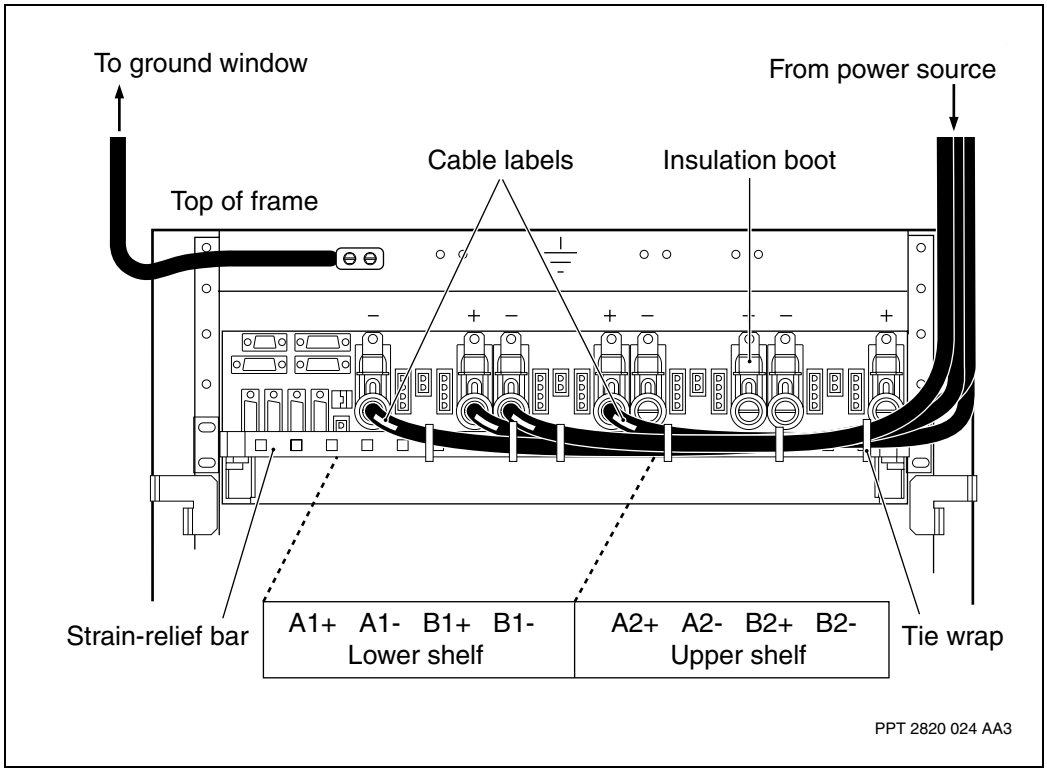
Overhead power input cables for the lower shelf connected to the BIP



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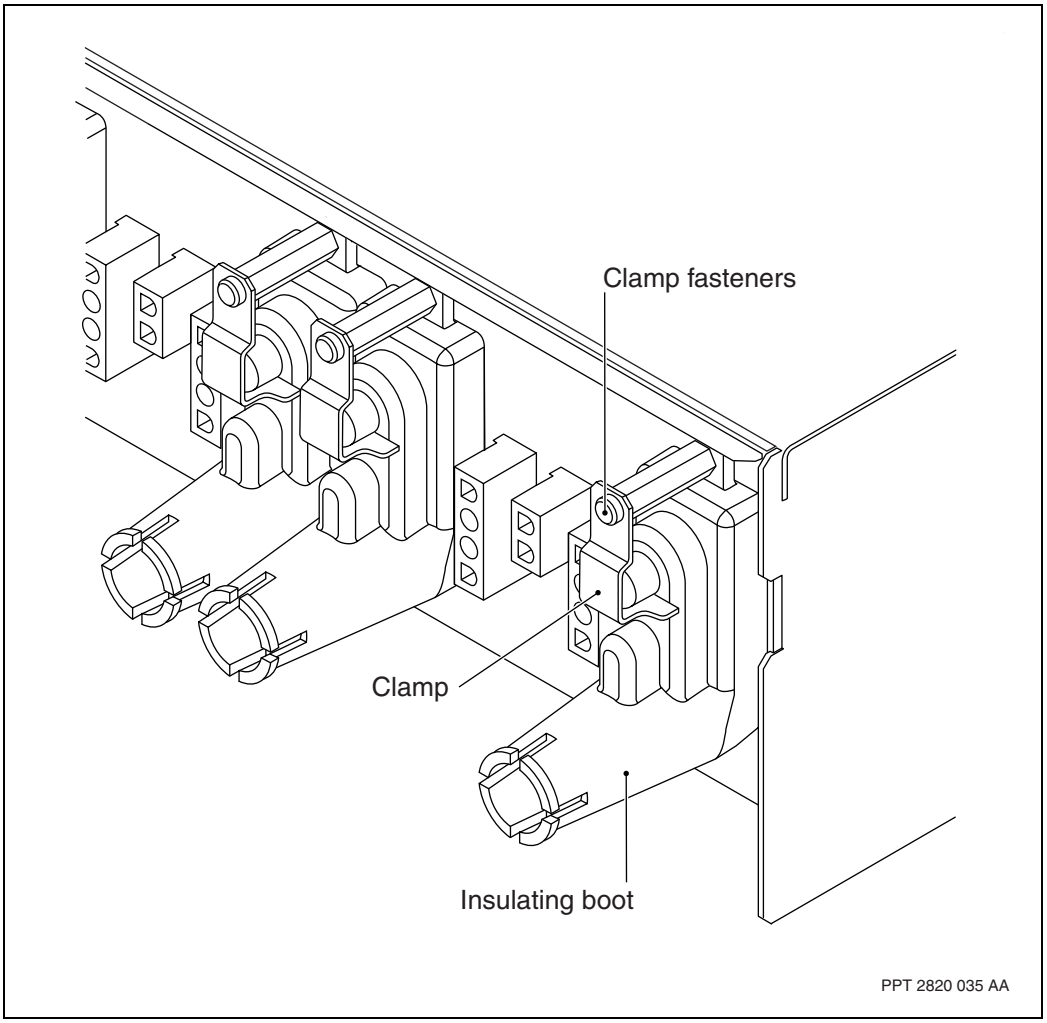
Insulating boots and clamps at the rear of the BIP



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Unpacking a processor card or module

Unpack a processor card, fabric card, or module just prior to installing it into the shelf assembly.

Prerequisites

CAUTION
Risk of equipment damage by ESD
Unpack a card or module only minutes before it is to be inserted in its slot. The packaging protects the circuitry from electrostatic discharge (ESD).

CAUTION
Risk of equipment damage by ESD
Whenever unpacking or handling unpacked circuit cards or modules, always wear an antistatic wrist strap that is plugged into an appropriate electrostatic discharge (ESD) receptacle. Hold a card by its faceplate, and a module or a fabric card by its handle or handles. Never touch other parts (for example, electrical connections, pins, soldered surfaces, or chips).

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Carefully move the containers to the location of the switch.
2	Open the container. When cutting the tape or straps that seal the container, make very shallow cuts.
3	Gently remove any loose padding surrounding the contents, if present. Avoid contacting any rows of pins with the packing material.
4	If the part is inside a pouch, remove it and the pouch. Remove the part from the pouch or container by holding only its top and bottom edges. Be ready for it to be heavier than it looks.
5	Install the part as instructed.
6	Store the container and packing material for re-use.

--End--

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Unpacking a shelf assembly

Unpack a shelf assembly just prior to installing it.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).
- A shelf assembly is identified by one of the following PECs:
  - For a Multiservice Switch 15000, NTHW99CA with DS1timing
  - For a Multiservice Switch 15000, NTHW99DA with E1 balanced timing
  - For a Multiservice Switch 15000, NTHW99EA with E1 unbalanced timing
  - For a Multiservice Switch 20000, NTPN77BA with DS1timing
  - For a Multiservice Switch 20000, NTPN77CA with E1 balanced or unbalanced timing

Procedure steps

Step	Action
1	Carefully move the shipping container to the site of the anchored NEBS 2000 frame.
2	Plug in an anti-static wrist strap or equivalent into a properly grounded receptacle and wear the strap whenever handling a hardware part.
3	Open the container of the shelf assembly. When cutting the tape or straps that seal the container, make very shallow cuts. Do the box ends before the sides so that you can raise the middle slightly to cut it.
4	Gently remove any loose padding surrounding the contents, if present. Avoid contacting the rows of exposed pins or connectors with the packing material. Do not touch any pins or connectors.
5	Remove the shelf from all packaging so that you can see all sides. Do not hold the shelf assembly anywhere inside the cavity. Tracks will break.
6	Verify the straightness of the backplane pins according to the procedure Checking the backplane pins (page 178).
7	If the unit seems undamaged, put the original packing material and container aside for returning the removed shelf assembly.

--End--

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Unpacking a SER 5500

Unpack a SER 5500 just before installing it in the shelf.

Prerequisites

- You must be familiar with Safety considerations and best practices (page 19).

Procedure steps

Step	Action
1	Position the shipping crate in front of the NEBS 2000 frame. Ensure that the 4 metal clasps are at the bottom of each corner.
2	Release each clasp by lifting the key and then turning it counter clockwise.
3	Grasp the top of the crate and lift straight up.
4	Store the upper half of the crate where it will not interfere with the installation of the SER 5500.
5	Cut the metal strap that holds the SER 5500 to the base of the crate.
6	Locate the 2 screws in the bottom corners at the front of the SER 5500.
7	Unfasten the 2 screws that secure the SER 5500 to the crate bottom.
8	Store the screws where they will not interfere with the installation of the SER 5500.

--End--

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Vacuuming equipment

Vacuum equipment after initial installation, and periodically thereafter to reduce the risk of damage to electronic parts by the accumulation of dust.

Prerequisites

CAUTION
Risk of equipment damage by impact
Never vacuum inside the shelf assembly of any Nortel Networks Multiservice Switch. Even the gentle impact of a nozzle can bend a backplane pin. A bent pin means the card slot cannot be used until the entire shelf assembly is replaced.

- You must be familiar with Safety considerations and best practices (page 19).
- You need a vacuum cleaner with an induction-wound motor, which reduces the potential for damage of cards or modules by electromagnetic interference (EMI). Also use a plastic shaft and attachments to prevent electrical shock and scratching the anti-corrosive coatings on the equipment.

Procedure steps

Step	Action
1	At the front of the NEBS 2000 frame or equivalent mounting apparatus, ensure that the cable management channel cover is closed.
2	At the rear of the NEBS 2000 frame or equivalent mounting apparatus, ensure that the fabric card casings or levers are closed.
3	Select the long-bristle dusting attachment for the vacuum.
4	While standing on a ladder, vacuum the top of the mounting apparatus. Use slow brushing motions to prevent masses of dust from falling into the top of the frame or from being blown around by the airflow exhaust.
5	Vacuum the rear, the sides (if accessible), then the front of the mounting apparatus, leaving all panels closed.
6	Vacuum in and around the exposed portions of the mounting apparatus, shelves, and cabling. Be careful not to bump any part of the equipment. Do not force the nozzle into places it will not fit without friction. Remove the dust brush to improve access if necessary.
7	Vacuum the floor around the frame, especially in front of the kick plates.
8	Record the date you vacuumed the equipment on the same form that is used for recording the air filter replacement, namely on a hardcopy of the table Schedule for replacing air filters and vacuuming equipment (page 686).

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--End--

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Nortel Networks Multiservice Switch 15000/20000

Hardware Installation, Maintenance, and Upgrade

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