Meridian 1

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System installation procedures

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Introduction

About this document

This document provides installation and acceptance testing procedures for Meridian 1 system options 51C, 61C, 81, and 81C.

System installation is to be performed by qualified personnel only. To use this document, you should have a basic knowledge of Meridian 1 equipment and operation. (Contact Northern Telecom Training Centers for information on installation courses.) You should also read and fully understand the *Meridian 1 system overview* (553-3001-100) before you install a system.

References

See the *Meridian 1 planning and engineering guide* for:

— *Meridian 1 system overview* (553-3001-100)

— *Meridian 1 installation planning* (553-3001-120)

— *Meridian 1 system engineering* (553-3001-151)

— *Meridian 1 power engineering* (553-3001-152)

— *Spares planning* (553-3001-153)

— *Meridian 1 equipment identification* (553-3001-154)

See the *Meridian 1 installation and maintenance guide* for:

— *Library navigator* (553-3001-000)

— *Circuit card installation and testing* (553-3001-211)

— *Telephone and attendant console installation* (553-3001-215)

— *Meridian 1 general maintenance information* (553-3001-500)

— *Meridian 1 fault clearing* (553-3001-510)

— *Meridian 1 hardware replacement* (553-3001-520)

For information on the MFA150 Modular Front Access Power System, see the following documents:

— *MFA150 Modular Front Access Power System: Description, installation, operation and maintenance manual* (167-9021-104)

— *MFA150 Modular Front Access Power System user guide* (P0730121)

For information on the System 600/48 Power Plant see the following document:

— *Meridian 1 applications—Systems 600/48 Description, Installation, Operation, and Maintenance Manual* (167-9021-111)

For information on the MPP600 Modular Power Plant, see the following documents:

— *MPP600 Modular Power Plant: Description, installation, operation and maintenance manual* (167-9021-105)

— *50-amp Rectifier Expansion Assembly Installation* (P0743512)

For information on the NT6D82 Power System, see the following documents:

— *NT6D82 Power System description, installation, and maintenance* (553-3001-110)

— *Reference manual for NT6D82 Power System* (P0714863)

— *Reference manual for 100A Rectifier* (P0714864)

For information on the QCA13 DC power system, see the following documents:

— *Power Distribution Plant J2412A* (167-2191-200)

— *NT5C03 Switched Mode Rectifier –48V/50A: Description, Maintenance and Ordering Information* (169-2031-200)

See the *Meridian 1 X11 software guide* for:

— *Software conversion procedures* (553-2001-320)

— *X11 features and services*

See the *X11 input/output guide* for a description of all administration programs, maintenance programs, and the *X11 system messages guide* for information about system messages.

Meridian 1 equipment

In Meridian 1 systems, modules are stacked one on top of another to form a column. Each column contains a pedestal, a top cap, and up to four modules that can include the:

— NT5D21 Core/Network Module
  required for Options 51C, 61C, and 81C

— NT6D60 Core Module
  required for option 81

— NT8D35 Network Module
  required for options 81 and 81C

— NT8D36 InterGroup Module
  required for options 81 and 81C

— NT8D37 Intelligent Peripheral Equipment (IPE) Module
  required for options 51C, 61C, 81, and 81C

— NT8D47 Remote Peripheral Equipment (RPE) Module
  optional for options 51C, 61C, 81, and 81C

In addition, modules that house application specific equipment, such as Meridian Mail and Meridian Link modules, can be included in a column.

Each pedestal houses a blower unit, air filter, power distribution unit (PDU), and system monitor.

The top cap provides airflow exits, input/output (I/O) cable access, and overhead cable-rack mounting. Thermal sensor assemblies for the column are attached to a perforated panel, which is placed on top of the highest module in the column, under the top cap.

A system can have one column or multiple columns. For compliance with EMI/RFI standards, spacer kits are provided to interconnect the columns in a multiple-column system.

The procedures in this document apply to the following system options:

— option 51C: enhanced common control complex with single CPU, half network group

— option 61C: enhanced common control complex with dual CPU, full network group

— option 81:   enhanced common control complex with dual CPU, multiple network groups

— Option 81C   enhanced common control complex with dual CPU, multiple network groups

All system options are available in both AC- and DC-powered versions.

Meridian 1 system architecture and each type of module are described in *Meridian 1 system overview* (553-3001-100). The components of AC-powered systems, DC-powered systems, and reserve power options for both are described in *Meridian 1 power engineering* (553-3001-152).

Equipment handling precautions

To avoid personal injury and equipment damage, review the following guidelines before handling Meridian 1 equipment.

Unloading equipment

Special ramps, packed inside the pallet holding Column 0, must be used to move the equipment off the pallet. Follow the instructions provided with the ramps.

CAUTION

Never pry up the pedestal to lift the column. This could cause major damage to the pedestal. Manually slide the column down the ramps provided.

Power equipment

There are no user-repairable components in the power system. If a power supply fails, the complete unit must be replaced. Do *not* disassemble a power supply under any circumstances.

WARNING

To avoid the danger of electric shock, be very careful when you work with power equipment and connections. Warning notices are displayed and *must* be heeded.

External power equipment, such as a UPS, power plant, or batteries, may be very heavy and may require special handling procedures and additional personnel for unloading and installation. Also, be aware of weight distribution and keep the equipment room floor from being overly stressed.

Circuit cards

Handle cards as follows:

— Unpack or handle cards away from electric motors, transformers, or similar machinery.

— Handle cards by the edges only. Do not touch the contacts or components.

— Set cards on a protective antistatic bag. If an antistatic bag is not available, hand-hold the card, or set it in a card cage unseated from the connectors.

— Store cards in protective packing. Do not stack cards on top of each other unless they are packaged.

To avoid card damage from static discharge, wear a properly connected antistatic wrist strap when you work on Meridian 1 equipment. If a wrist strap is not available, regularly touch one of the bare metal strips in the module to discharge static. Figure 1 shows connection points for the wrist strap and the bare metal strips you should touch.

Figure 1
Static discharge points
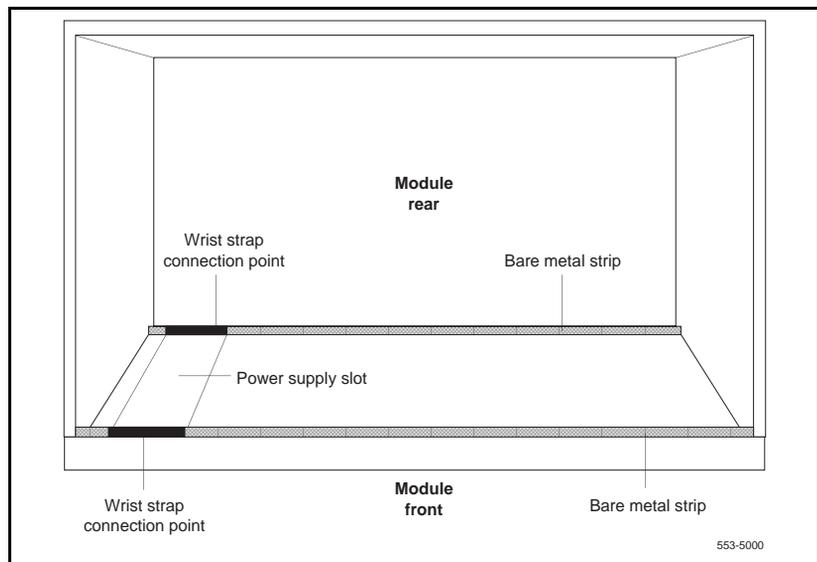
Data disks

Check the disk identification to make sure it is the correct disk. Compare software options with the data cartridge. Follow these precautions to avoid damaging disks:

— Handle only the hard surface; never touch the recording surface.

— Keep disks away from strong magnetic fields.

— Avoid exposing disks to extreme heat, rapid changes in temperature, or high humidity.

— Store disks in a suitable container.

To install a disk, make sure the arrow on the label is pointing up and the rounded corner is on the bottom on the right-hand side (see Figure 2).

CAUTION

The disk drive can be damaged if an upside-down disk is forced into the slot. If there is significant resistance when you try to insert a disk, remove the disk and check the position.

Figure 2
Disk position
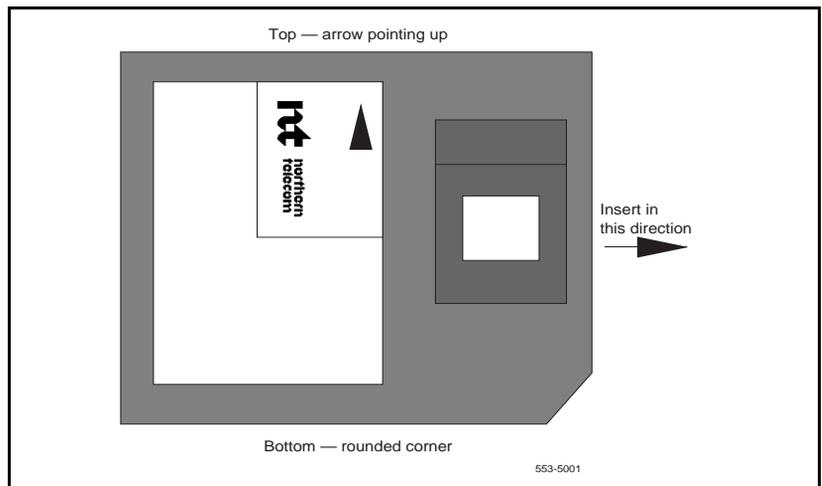
Cable routing guidelines

A system layout, preconfigured at the factory, is included in the software box with each system shipment. Before you route cables, refer to the "to-from" cable connections in the system layout. Note that there are a variety of cable lengths. Make sure you install the designated cable for each connection.

Because the cable troughs (see Figure 3) and spaces on the sides of each module are within the EMI shielding of the system, unshielded cables can be routed in those areas. The corner vertical channels in the rear of the module are outside of the EMI shield. Cables routed in the vertical channels must be shielded, and must enter and exit the EMI-shielded area through I/O panels and adapters.

As space permits, cables can be routed

— horizontally in the cable troughs at the front, rear, and sides of the module

   Note: In a DC-powered module, because there is no MPDU, there is room to route cables horizontally from front to rear on the left side (front view) of the module.

— vertically on the sides of the module

— vertically in the corner channels in the rear of the module (shielded cables only)

CAUTION

Cables must be routed as perpendicular as possible to any nearby power cables. Avoid routing cables near power cables if alternate routing is available. (At the rear of the module, cables routed between the I/O panel and the rear cover can be parallel to the power cables because the panel provides EMI shielding.)

Figure 3
Cable routing troughs—front view of module

Cabling troughs

553-3117
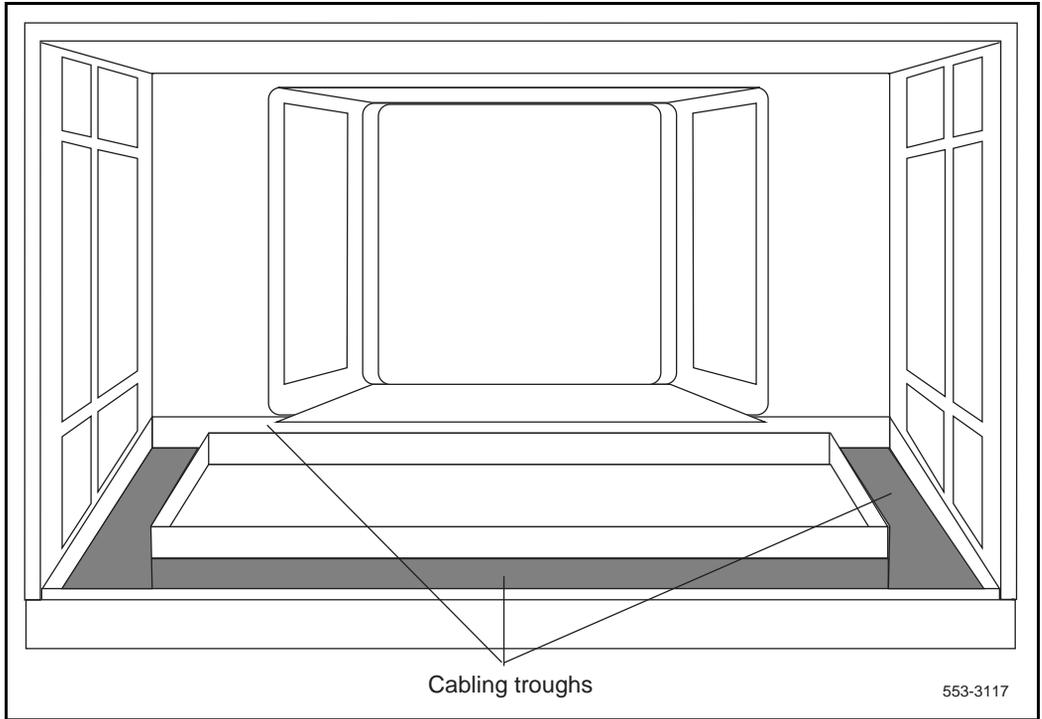
Initial Meridian 1 installation

Before Meridian 1 equipment is delivered to the installation site, you must consider

— fire protection and safety requirements

— equipment room requirements

— grounding and power requirements

— cable requirements

Specifications for these requirements and for developing the equipment room floor plan are provided in *Meridian 1 installation planning* (553-3001-120).

For proper installation, perform the steps in this procedure in the order given. If you go to a subsection to perform a step, return to the next step in this procedure when the tasks in the subsection are completed. For example, when you complete Step 3 "position and level equipment," return to Step 4 in this procedure. See Table 1 for a list of tasks in subsections.

Whenever possible, install external power equipment before the system installation. If reserve power equipment is used, install it according to the manufacturer's instructions.

To install telephones and attendant consoles, see *Telephone and attendant console installation* (553-3001-215).

System installation is to be performed by qualified personnel only.

System installation procedures

1   Prepare equipment for installation; go to "Preparing equipment for installation" on page 15.

2   Place the fourth module on a column (if required); go to "Placing the fourth module on a column" on page 23.

3   Position and level equipment; go to "Positioning and leveling equipment" on page 27.

   Note: If earthquake bracing is required, go to "Installing earthquake bracing" on page 315 to install column and floor bracing and to position and level equipment. When those procedures are complete, return to Step 4 or Step 5 (as applicable) in this procedure.

4   Install overhead cable tray kits (if required); go to "Installing overhead cable tray kits" on page 33.

5   Install power supplies in all modules:

   •   Make sure the system is disconnected from any power source.

   •   Set switches and breakers on all module power supplies or module power distribution units (MPDUs) to OFF**.**

   •   Insert each power supply into the appropriate card cage and hook the locking devices.

   Note: In option 21E, a battery pack on the NTND02 Misc/SDI/Peripheral Signaling (MSPS) Card can provide up to 60 minutes of backup for CPU memory during power failures. To enable this function, pull the MSPS Card out, plug the connector from the battery pack assembly into the connector on the card (make sure the connector key is centered on J2), and reseat the card.

6   Install the disk drive unit in a CPU Module.

   Note: In options 61C, 81, and 81C, there are two disk drive units. Install a disk drive unit in each Core/Network or Core Module.

7   Install power equipment and ground wiring:

   •   For AC-powered systems, go to "Installing AC power" on page 35.

   •   For DC-powered systems, go to "Installing DC power" on page 45.

8 Plan and designate the main distribution frame (MDF); go to "Planning and designating the Modular Distribution Frame (MDF)" on page 67.

9 Install power fail transfer units (PFTUs) (if required); go to "Installing PFTUs" on page 83.

10 Configure the system monitor; go to "Configuring the system monitor" on page 91.

11 Connect a system terminal (or modem); go to "Connecting a system terminal (or modem)" on page 105.

Note: The NT7D15 System Monitor used in option 21A does not connect to an SDI port or to the system terminal.

12 Install cabling:

   •   To cable common equipment, go to "Cabling common equipment" on page 133.

Note: This procedure does not apply to single CPU systems (options 21A, 21, 21E, 51, and 51C).

   •   To cable network loops, go to "Cabling network loops" on page 177.

Note: In options 21A, 21, and 21E, IPE slots 0–9 in the NT8D11 CE/PE Module are served by the NT8D18 Network/Digitone Receiver (DTR) Card. There is no cabling between the Network/DTR card and the IPE Cards.

   •   To cable PE/IPE Modules to the MDF and to connect lines and trunks, go to "Cabling lines and trunks" on page 203.

13 Power up the system and load the system software; go to "Powering up the system and initial loading" on page 299. However, if you are upgrading your system, do not install new software, but return to the upgrade procedures in *Upgrade system installation to release 22* (553-3001-258).

14 Perform acceptance tests; go to "Performing acceptance tests" on page 305.

Note: To test circuit cards, see "Acceptance tests" in *Circuit card installation and testing* (553-3001-211). To test telephones and attendant consoles, see *Telephone and attendant console installation* (553-3001-215).

15 Replace all covers and grills on the front and rear of the system.

Table 1
Initial system installation—list of tasks in subsections

Task	Go to
Prepare equipment for installation	page 15
Place the fourth module on a column	page 23
Position and level equipment	page 27
Install overhead cable tray kits	page 33
Install power supplies in all modules*	—
Install the disk drive unit(s)*	—
Install power equipment and ground wiring AC power DC power	 page 35 page 45
Plan and designate the MDF	page 67
Install PFTUs	page 83
Configure the system monitor	page 91
Connect a system terminal (or modem)	page 105
Cable common equipment	page 133
Cable network loops	page 177
Cable lines and trunks	page 203
Power up the system and load system software	page 299
Perform acceptance tests	page 305
* See "System installation procedures" on page 12 and 2-3 for details on tasks that are not described in subsections.	

Preparing equipment for installation

Use the equipment room floor plan to position equipment. See *Meridian 1 installation planning* (553-3001-120) to prepare the equipment room and floor plan.

WARNING

A fully loaded column weighs 274.4 kg (605 lbs). More than one person is required to remove equipment from shipping pallets.

WARNING

Module covers are *not* hinged; do not let go of the cover. Lift the cover away from the module and set it out of the work area.

---

1   Remove equipment from the shipping pallets; follow the unpacking instructions that come with the packaging material.

2   Remove the front and rear covers from each module:

•   With a flat blade screwdriver, turn the lock clockwise on the two locking latches (see Figure 4).

•   Simultaneously push the latches toward the center of the cover and pull the cover toward you while lifting it away from the module.

•   Set the covers aside until the installation is complete.

Figure 4
Locking latches on the module cover
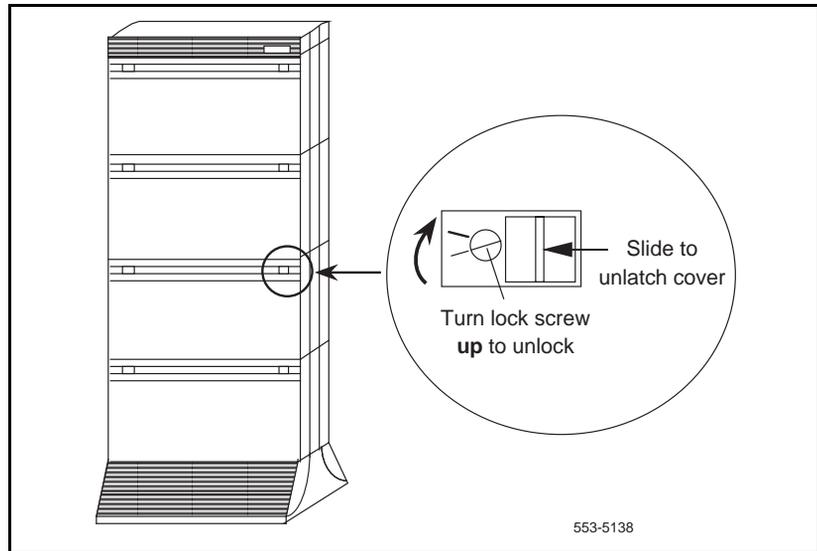
3   Remove the front and rear grills from each pedestal:

   •   Loosen the two captive screws that secure the grill.

   •   Pull the grill forward and lift it out of the base of the pedestal (see
        Figure 5).

   •   Set the grills aside until the installation is complete

4   Make sure all of the items on the system order form are on the packing
     slip that comes with the equipment.

5   Inspect all equipment for physical damage. Report any damage to your
     supplier.

Figure 5
Removing the pedestal grill

Captive screw

Captive screw

553-3054
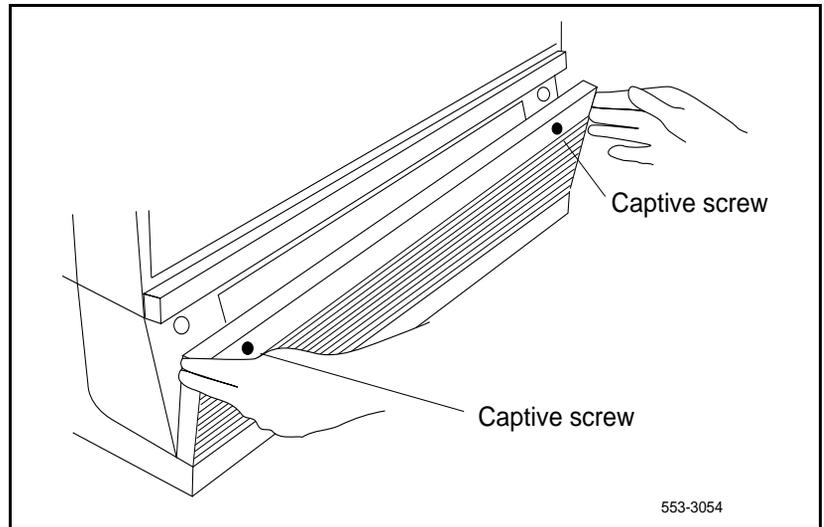
Figure 6
Pedestal grill (UK)

Air intake grill

UEM

Captive screws

Note: The front and rear air intake grills are secured by captive panel screws located in the face of the grill. Use a slotted screwdriver to release or secure the grill.

553-6457
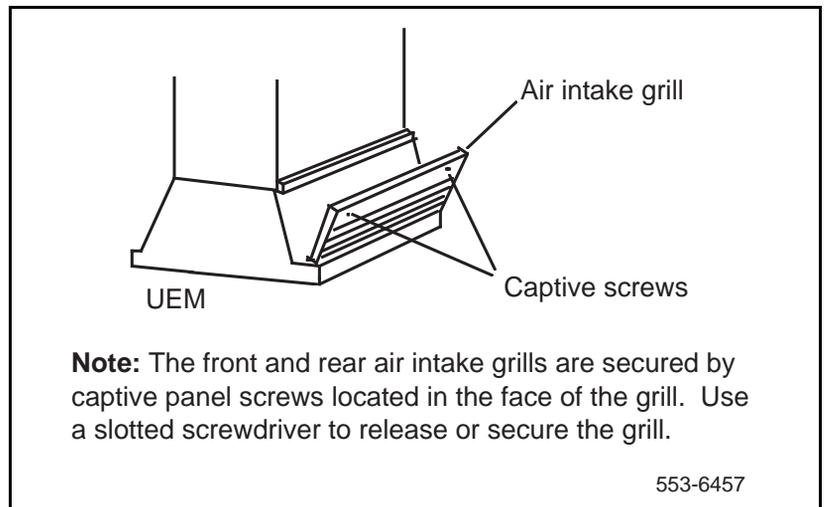
6   Remove the foam pieces that secure bus terminating units (BTUs) in the following modules. Verify that the BTUs are installed in the correct positions:

- **In options 51 and 61**, check the NT6D39 CPU/Network Module:

    – between slots 1 and 2—QPC477A10 or B10
    – between slots 2 and 3—QPC477A9
    – between slots 12 and 13— QPC477A22

- **In option 61C**, check the NT9D11 Core/Network Module:

    – between slots 0 and 1—QPC477A9
    – between slots 1 and 2—QPC477B10

- **In option 71**, check the NT8D34 CPU Module:

    – for CPU 0 between slots 13 and 14—QPC477A20
    – for CPU 1 between slots 13 and 14—QPC477A21

    Check the NT8D35 Network Module:

    – between slots 11 and 12—QPC477A9
    – between slots 12 and 13—QPC477A10 or B10

- **In option 81**, check the NT6D60 Core Module:

    – between slots 4 and 5—QPC477A9
    – between slots 5 and 6—QPC477B10

    Check the NT8D35AA and NT8D35DC Network Modules:
    – between slots 11 and 12—QPC477A9
    – between slots 12 and 13—QPC477A10 or B10

Note 1: For those option 51C, 61C, or 81C systems that use the NT5D21 Core/Network Modules, BTUs are not required; this fact is also true of the NT8D35BA and NT8D35EA Network Modules. All these modules use hybrid bus terminators that are an integral part of their respective backplanes.

7   Check the option settings on all cards that have a switch symbol on the faceplate. Also check the jumper settings on the NT6D6003 CBT card, if equipped. For a list of all option switch and jumper settings, refer to *Circuit card installation and testing* (553-3001-211).

In option 51C, 61C, and 81C, there is a single jumper in the NT5D21 Core/Network Module. The jumper is located on the front of the backplane behind card slot 14 (see Figure 9).

• Verify that the jumper is closed (there is a plug over both pins).

In option 61C, a single jumper in each of the NT9D11 Core/Network Modules determines whether the module is designated as Core/Network 0 or Core/Network 1. The jumper is located on the front of the backplane behind card slot 14 (see Figure 7).

• In Core/Network Module 0, verify that the jumper is closed (there is a plug over both pins).

• In Core/Network Module 1, verify that the jumper is open (there is not a plug over the pins).

In option 81, four jumpers in the NT6D60 Core Modules determine whether the module is designated as Core 0 or Core 1. The jumpers are located on the backplane, along the bottom of the front side (behind the circuit cards) (see Figure 8).

• In Core 0, verify that all four jumpers are closed (there is a plug over both pins).

• In Core 1, verify that jumper JB4, between slots 9 and 10, is open (jumper plug not installed). Verify that the other three backplane jumpers are closed.

CAUTION

If the Core Module jumpers are set incorrectly, the system will not load and operate correctly.

Figure 7
Location of the backplane jumper in NT9D11 Core/Network Modules (Option 61C)

Slot   0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18   Slot

Core Jumper

553-5958
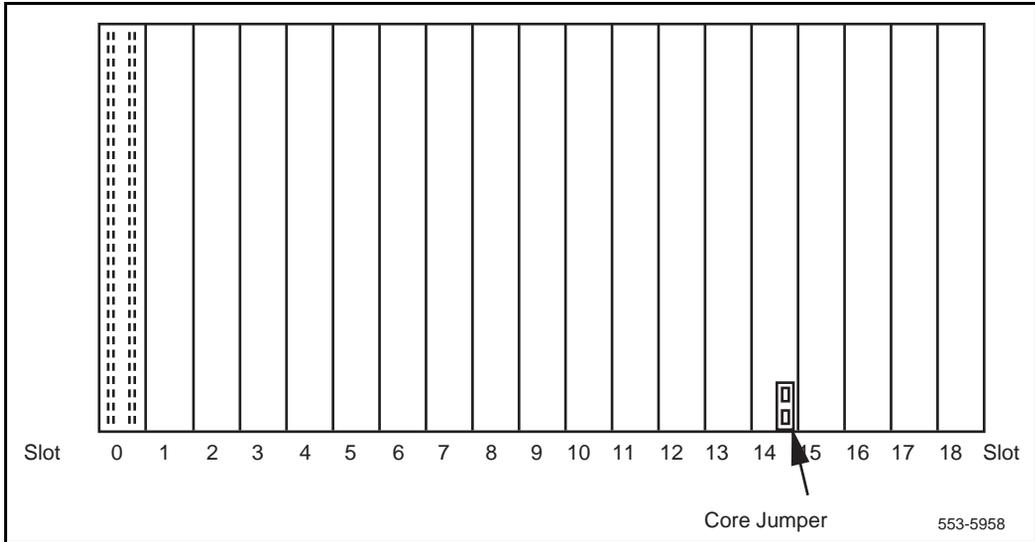
Figure 8
Location of the backplane jumpers in NT6D60 Core Modules (Option 81)

JB4 JB3 JB2 JB1

Berg jumpers

Backplane

Card cage — Front

553-5479
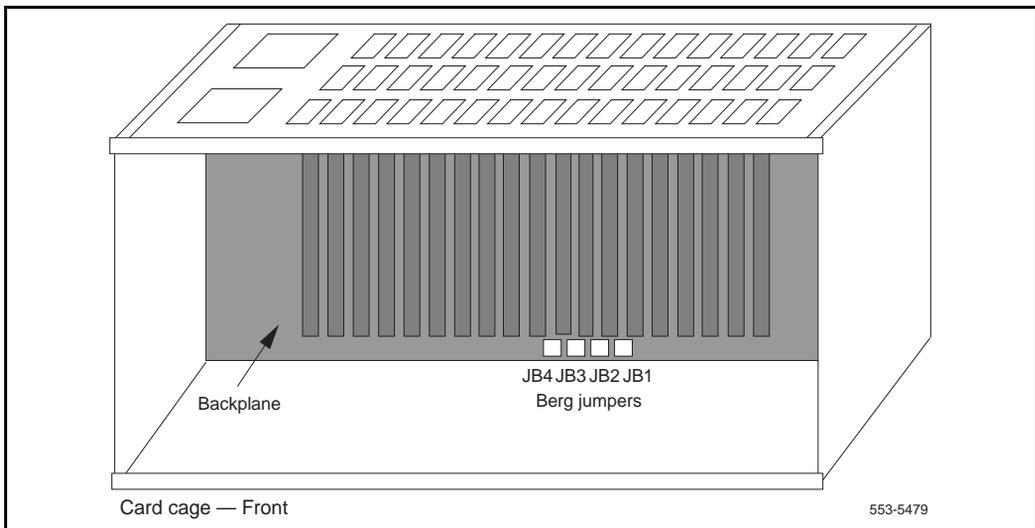
Figure 9
Location of the backplane jumper in the NT5D21 Core/Network Module
(Options 51C, 61C, and 81C)

Core/Network Jumper

553-7472
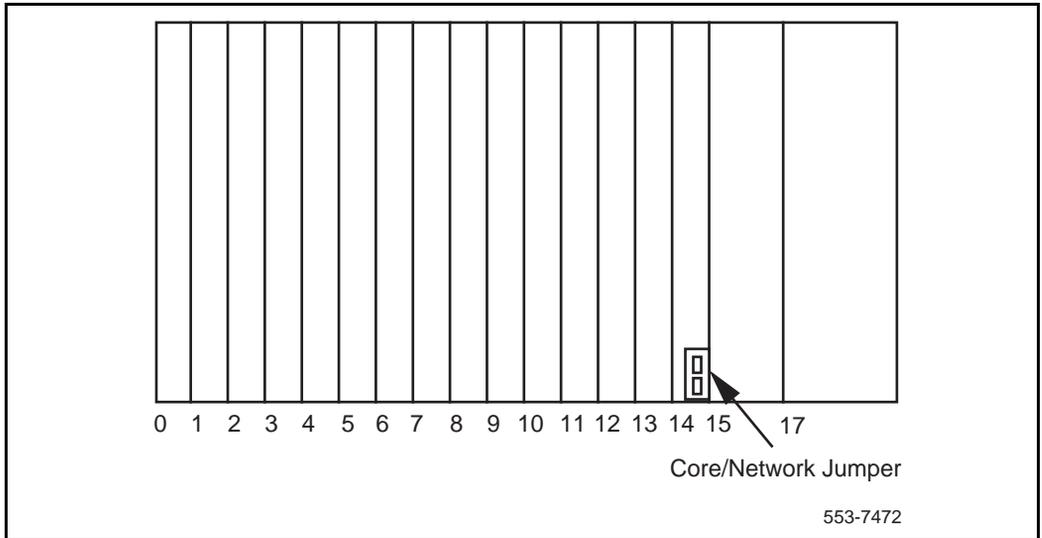
Placing the fourth module on a column

A four-module column is shipped in two segments. One shipping pallet carries the pedestal and three modules. Another shipping pallet carries the fourth module and top cap. Starting at the bottom of the column, modules are numbered from zero to three in each column. Use this procedure to place the fourth module (and top cap) on the column.

WARNING

Never add a common equipment module in the third of the fourth tier in an Meridian 1 column.

To add a module to a column that is already powered, see the procedures in "Adding a module to a column" on page 361.

WARNING

A fully loaded module weighs approximately 58.9 kg (130 lbs). More than one person is required to place a module on a column.

---

1   Position and secure the fourth module:

- Locate the positioning guides on the third module (see Figure 10).

- Position the fourth module so it faces the same direction as the column.

- Remove the front and rear module covers on the fourth module and rear module cover on the third module.

- Place the fourth module on top of the column and adjust it until it is seated securely on the positioning guides.

- Remove the I/O safety panel in the fourth module to gain access for installing the center mounting bolt.

- Use a 9/16-in. socket wrench to secure the fourth module with five mounting bolts (see Figure 11).

Figure 10
Module positioning guides

Positioning guides

Front

Rear

Opening for cables

553-3056
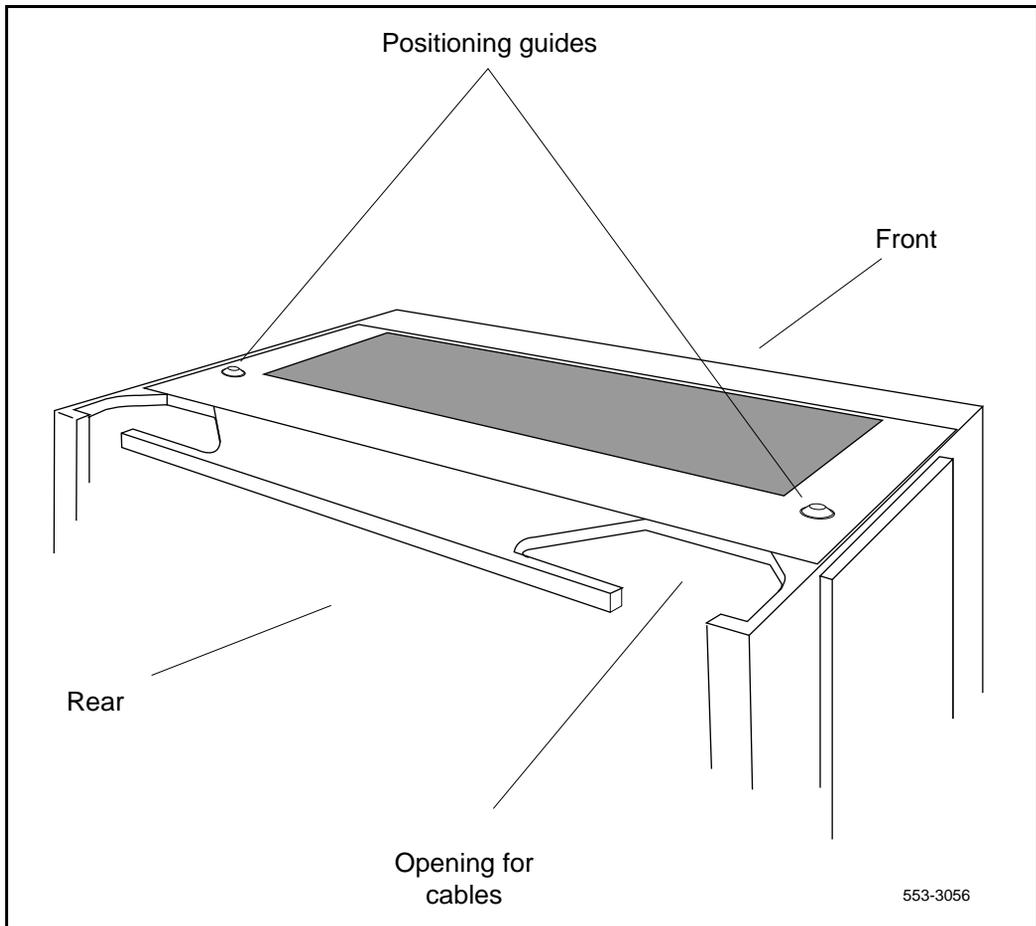
Figure 11
Module mounting bolts

553-3057
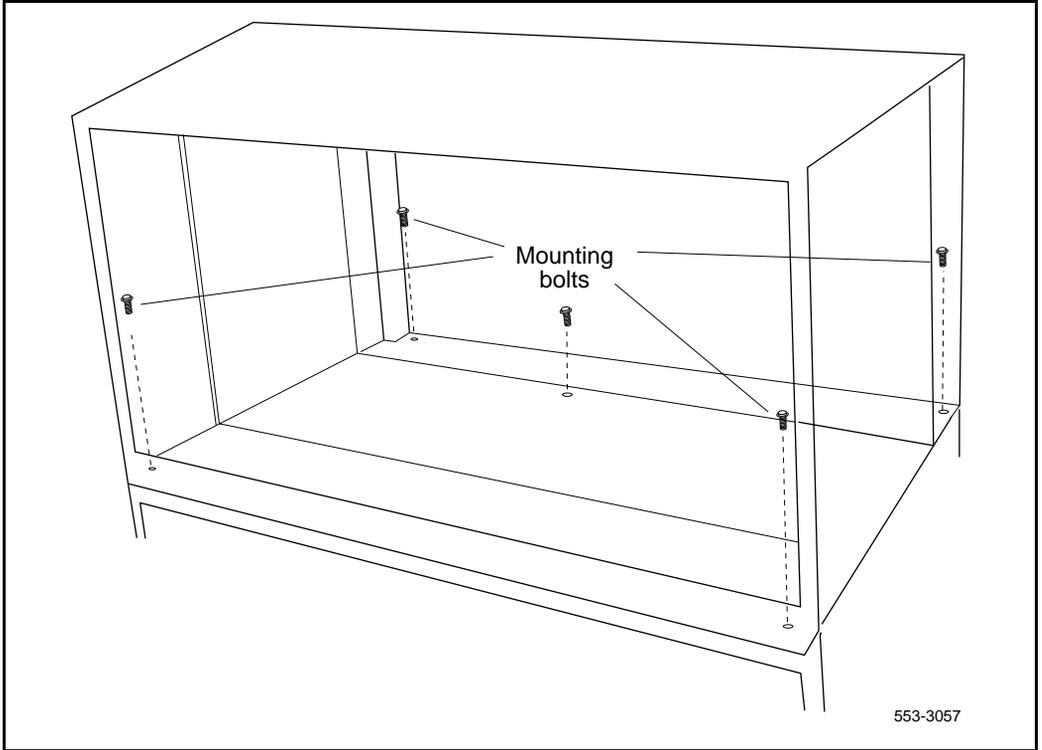
2   Connect the module-to-module power and system monitor cables:

- Connect the power connectors between the modules (see Figure 12).

- Connect the system monitor cable from connector J2 on the third module to J1 on the fourth module.

Note: There are no power or system monitor connectors in the NT8D36 InterGroup Module; connect the top cap cables (extra length is provided) to the module below the InterGroup Module.

3   Reinstall the I/O safety panel in each module.

Figure 12
Power and system monitor connections
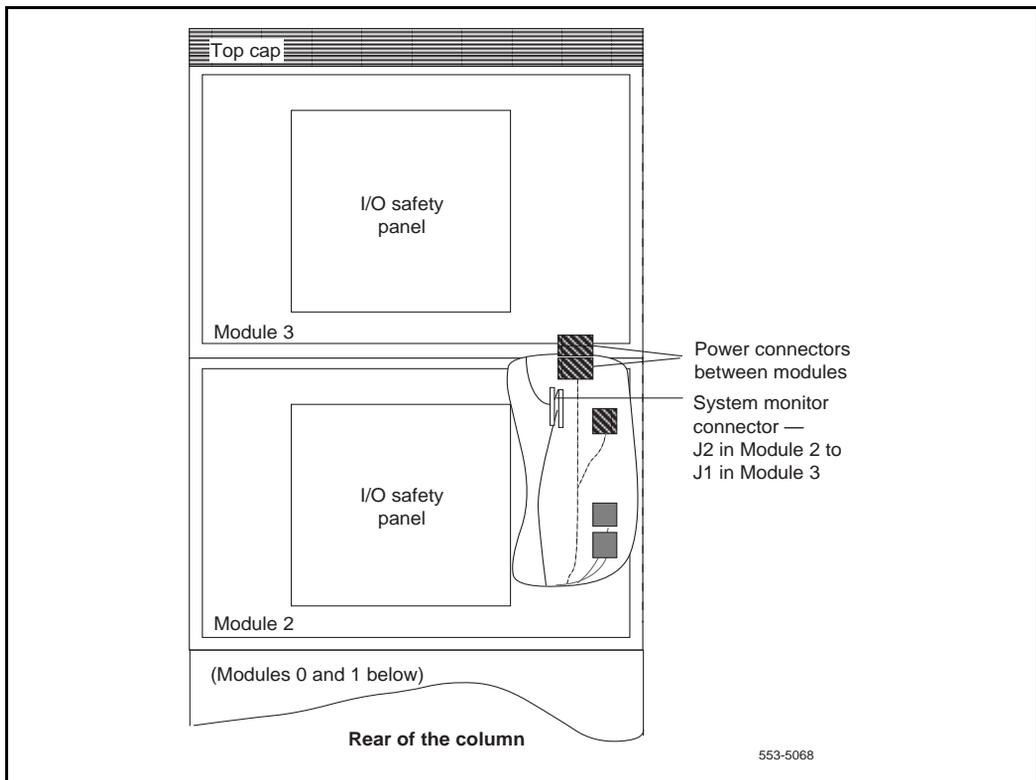
4   Replace the module covers.

Positioning and leveling equipment

Columns normally stand on adjustable feet that provide leveling capability and ground isolation. However, casters are available and can be used for two-tier columns. If a third module is added to a column with casters, the casters must be replaced with leveling feet.

Note: If earthquake bracing is required, go to "Installing earthquake bracing" on page 315 to install column and floor bracing and to position and level equipment. When those procedures are complete, return to Step 4 or Step 5 (as applicable) in the initial installation procedure.

1   Check the equipment room floor plan to position columns.

2   Do the following to level a column:

   a   Remove the front and rear exhaust grills.

   b   Remove the front and rear air intake grills.

   c   Position a level across the top module cover on the front of the column.

   d   Loosen the locking nuts on the feet.

   e   Adjust the feet on each pedestal up or down to level the column.

   f   Tighten the locking nuts.

   g   Perform steps *a - e* for leveling the rear of the system.

Note: Leave at least 1.27 cm (1/2 in.) between the floor and the bottom of the pedestal for air flow required by the blower unit.

3   **For a multiple-column system**, install NT8D49 Spacer Kits between columns:

a   Remove the front and rear module covers.

b   Remove the front and rear intake grills, if not already removed.

c   Remove the trim plates from the module side where the spacer will be attached by removing the four screws securing the trim plates to the module.

d   Remove the side panel from the module's side where the spacer is being attached by removing the four screws securing the side panel to the module.

e   Attach gaskets to both sides in the front section of each spacer (see Figure 13).

f   Attach a spacer to one side of each module, except the end column (see Figures 14 and 15).

  •   Position a spacer against the module.

  •   Insert one standoff between the spacer and module.

  •   Insert the one screw and tighten.

  •   Repeat the process for the remaining standoff and screws.

CAUTION

Do not try to adjust the horizontal position of a column by tightening the spacer screws. Tightening the screws with the columns too far apart will warp the spacer.

---

g   One at a time, push columns together, level, align, and attach the other side of the spacers.

Figure 13
Positioning spacer gaskets

Gasket placement

Rear

Front

553-5641
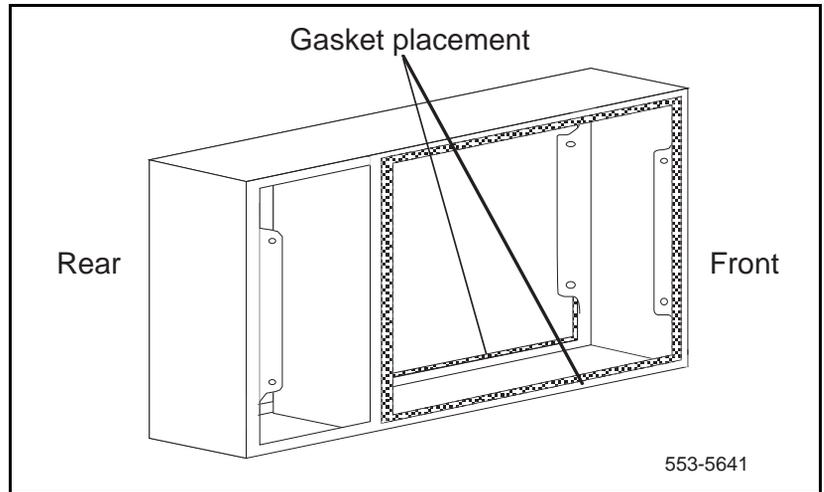
Figure 14
Spacer positioning

553-3068
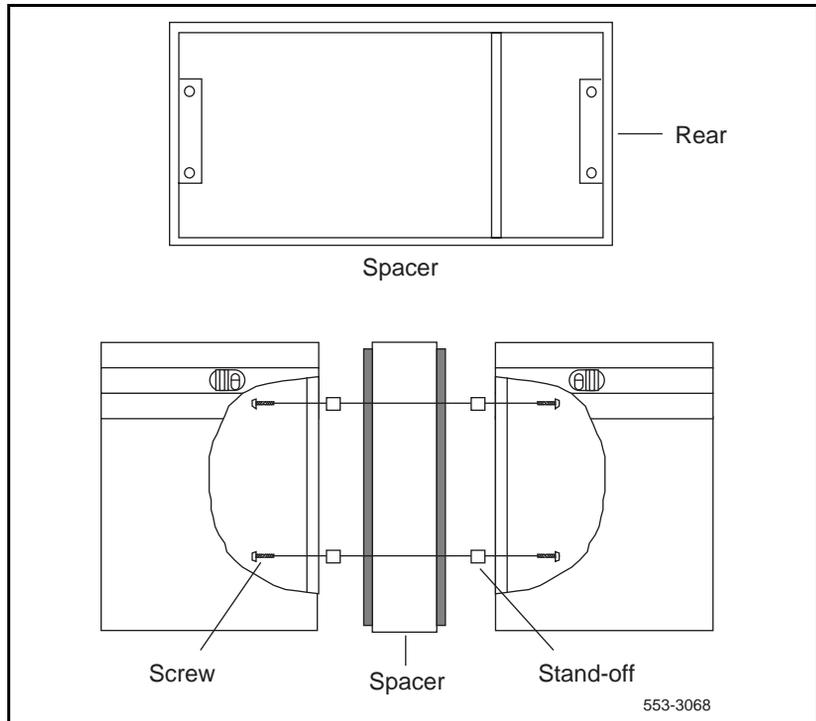
Figure 15
Column positioning with spacers

Step 1 Attach spacers to one side of each column
(except the end column)

(end column)

Spacers   Spacers

Step 2 One at a time, push columns together, level, align,
and attach the other side of the spacer

Step 3 Positioning completed

553-5067
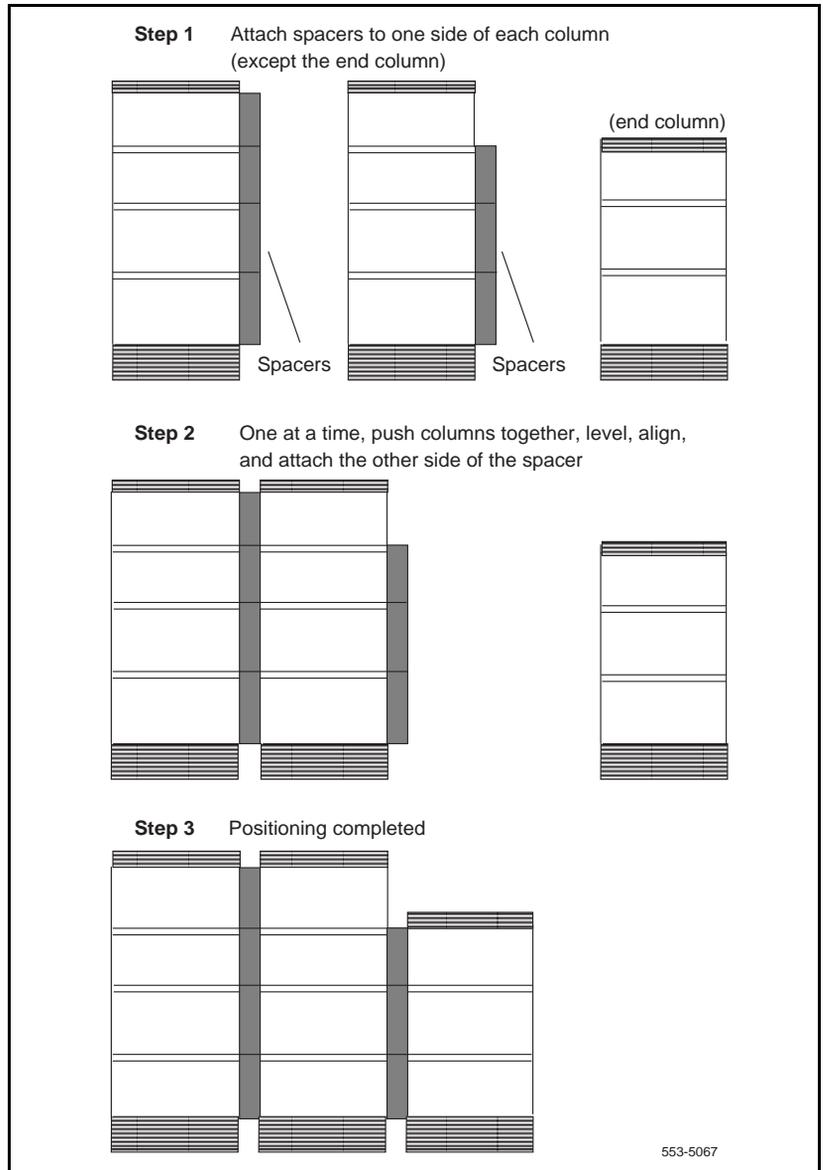
Installing overhead cable tray kits

Cable trays (also called ladder racks) can hang from a ceiling, or they can be mounted across the tops of the Meridian 1 columns.

If ceiling-hung racks are used, the rear top cap grill on each column must be replaced with a P0699851 Top Cap Cable Egress Panel, which provides cutouts for cable routing. The cable trays and the equipment required to hang them must be provided by the customer and installed according to the manufacturer's instructions.

Northern Telecom offers an NT8D63 Overhead Cable Tray Kit that provides equipment for mounting cable trays on the Meridian 1 columns. The kit includes two support brackets and front and rear exhaust grills with cutouts for cable routing. The cable tray itself must be provided by the customer; it is not included in the kit. Use this procedure to install the NT8D63 kit.

CAUTION

Column frames must be insulated from contact with building structures such as concrete walls, floors, and ceilings. Whether the cable racks are column-mounted or ceiling-hung, the installation must maintain the integrity of the Meridian 1 grounding architecture.

---

1   Remove air exhaust grills at the front and rear of the top cap. Pull forward on the two clips underneath the front edge of each grill and lift up to remove the grill (see Figure 16).

2   Mount a support bracket at the front and rear of the module (see Figure 17). Using two bolts, secure each support to the threaded holes in the top of the module.

3   Install the front and rear air exhaust grills that come with the kit.

4   Place the cable rack on top of the support brackets and fasten it to the supports with the J-bolts as shown in Figure 17.

Figure 16
Removing top cap grills
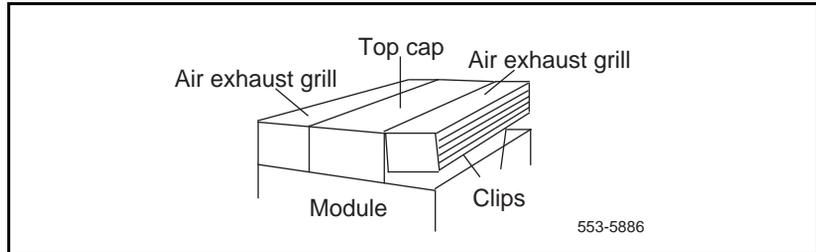
Figure 17
Overhead cable tray kit
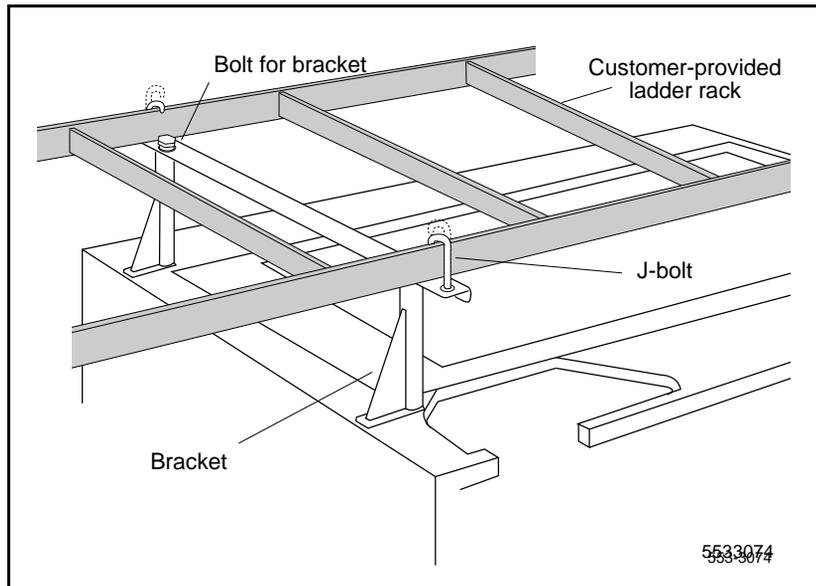
Installing AC power

For AC-powered systems, use this procedure to install safety ground/protective earth and logic return wiring and to install ground and alarm cabling for a UPS.

For AC-powered systems without reserve power, one input receptacle is required per column, within 2.4 m (8 ft) of each pedestal. One IG-L6-30 or L6-30 receptacle is required for each column (option 21A requires one L6-20 receptacle).

Instead of using the power plug provided, the PDU can be hard-wired to the power source. In this case, #10 AWG conductors routed through 3/4-in. conduit are generally used. The leads connect to the L1, L2, and GND terminations on the field wiring terminal block on the PDU.

Note: Do not use ground fault circuit interrupt (GFCI) devices on Meridian 1 AC power feeds.

Systems that use reserve power plug into the UPS, which in turn plugs into the power source (associated batteries can be located within the UPS or installed externally). Consult the UPS documentation for receptacle requirements.

As a safety precaution, all AC service panels should be located in an area that is easily accessible at all times to allow for emergency shutdown. Additionally, each circuit breaker within a panel should be clearly marked to identify the system component or components it services. An optimal location would be near, or just outside the entry to the room containing the Meridian 1 (or the UPS, if equipped).

Safety ground/protective earth and logic return wiring

A separate safety ground/protective earth connection is required. The safety ground/protective earth wire must be #6 AWG or larger and must connect the pedestal to the single-point ground (SPG) in the service panel. The single-point ground can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. Figures 18, 19, and 20 show an ACEG as the single-point ground.

Depending on the distances between columns, the location of the service panel, and the availability of panel SPG connection points, safety ground/protective earth wiring can be daisy-chained or run independently from each column to the service panel. Figures 19 and 20 show safety ground/protective earth wiring in daisy-chain configurations.

> *Note:* Refer to *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Multiple-column systems use a logic return equalizer (LRE) as the point where the logic return wires from different columns are consolidated before connecting to the single-point ground. The NT6D5304 small LRE (usually used with AC power systems) is available from Nortel Networks.

Figure 18
Single column—ground and logic return distribution
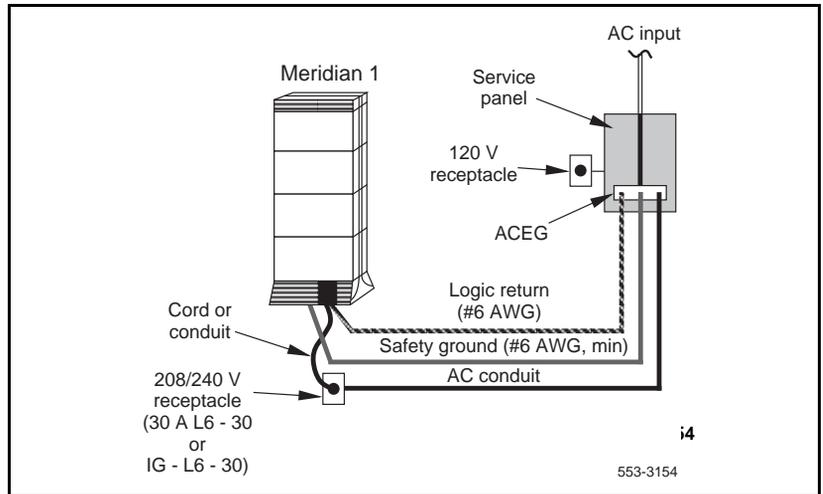
Figure 19
Multiple column—ground and logic return distribution
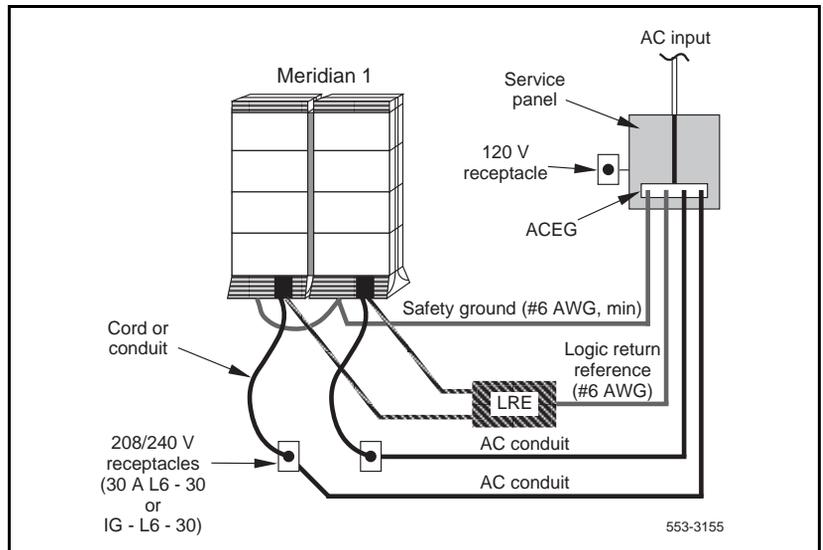
Figure 20
Multiple-column, multiple-row—ground and logic return distribution
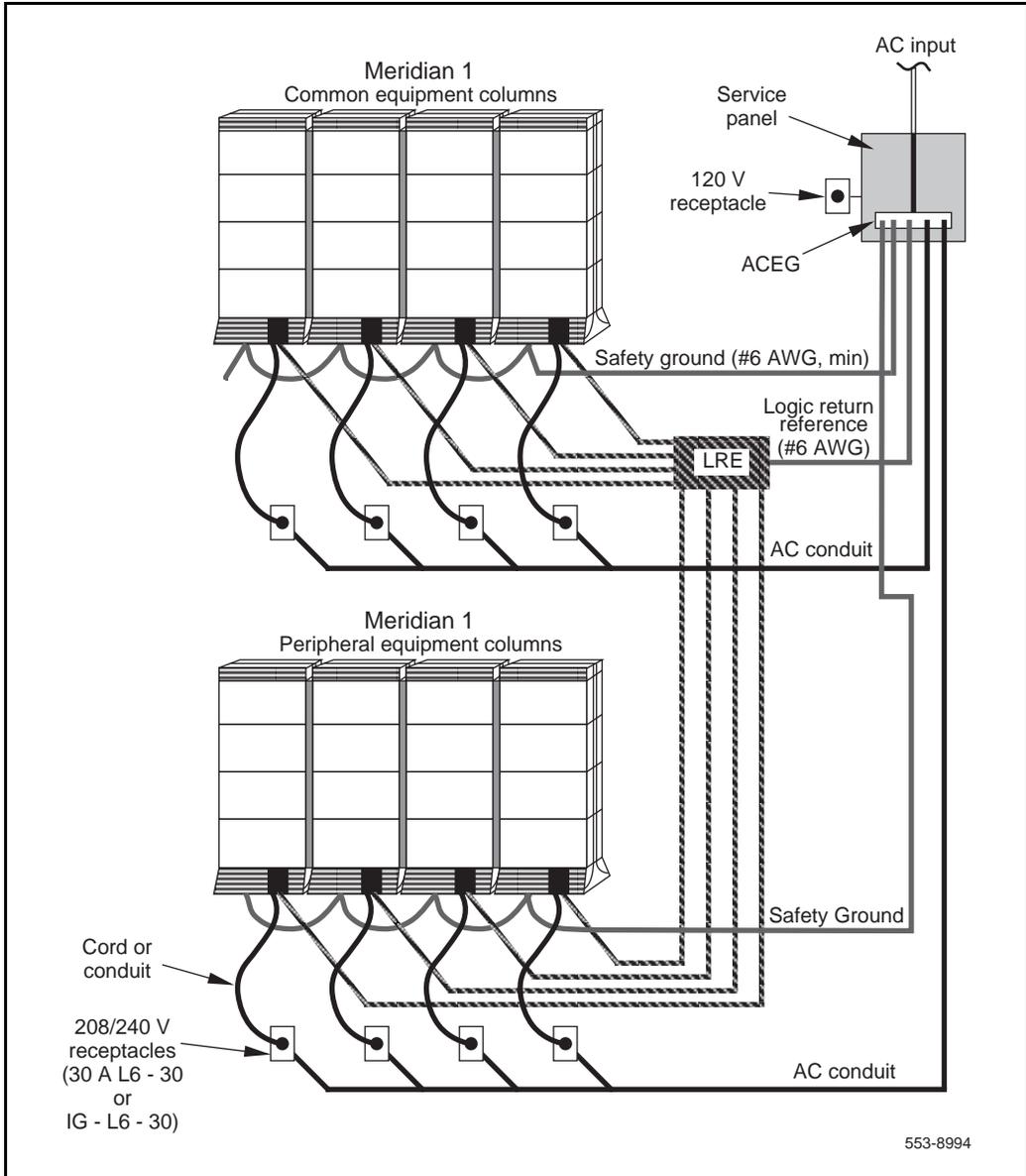
Installation procedures

Installing safety ground/protective earth and logic return wiring

---

WARNING

Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods.

---

1   Make sure the power cord is disconnected from the power source.

    Note: As a safety precaution, disable the circuit of each column at the service panel.

2   Remove the air intake grill.

3   Using a volt/ohm meter, measure the resistance between the ground pin on the power plug and a ground lug on the rear of the pedestal (see Figure 21).

    The resistance should be 0 ohms; if it is greater than 0.5 ohms, check the power cord connections.

Figure 21
PDU ground lug locations

Ground lugs

553-8993
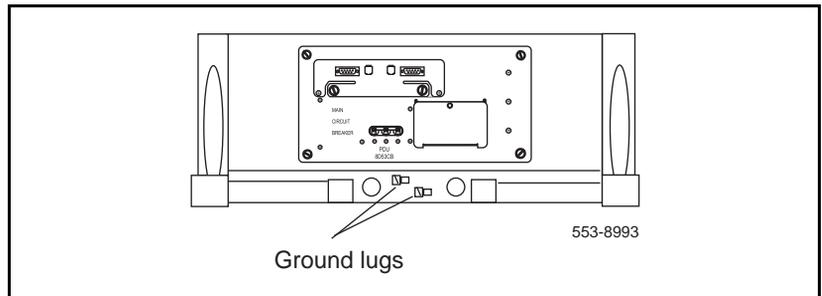
4   Connect the safety ground/protective earth wire (insulated ground wire *must* be used for system grounding):

    For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

System installation procedures

For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next as illustrated in Figure 22, connecting all of the columns together. You can also run a #6 AWG wire from the ground source to each column individually. If the columns are not bolted together, physically separated groups of columns should be grounded individually as shown in Figure 20.

Figure 22
AC column ground lug daisy chain connection
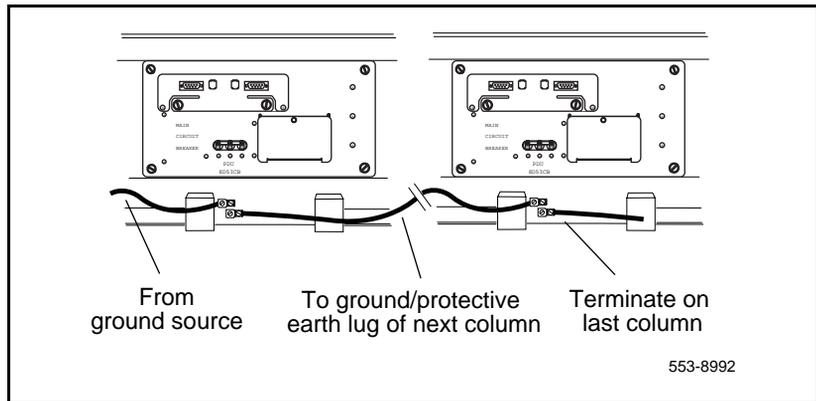
From ground source

To ground/protective earth lug of next column

Terminate on last column

553-8992

5   Place a warning tag (WARNING—TELEPHONE SYSTEM GROUND CONNECTION—DO NOT DISCONNECT) on the connection at the ground source.

6   Using a volt/ohm meter, measure the resistance between the ground pin on the power plug and the ground terminal on the power outlet.

The resistance should be 0 ohms. If the resistance is greater than 0.5 ohms, check the power outlet ground and safety ground/protective earth connections.

7   Remove the PDU field wiring access plate.

8   Connect the logic return wire.

Starting at the LRE, connect a #8 AWG wire and route it to the column and up or down the I/O channel area, as appropriate. Then route the wire through the conduit hole in the pedestal to LRTN on the field wiring block (see Figure 23).

9   Replace the PDU field wiring access plate.

Figure 23
Logic return connection for each column
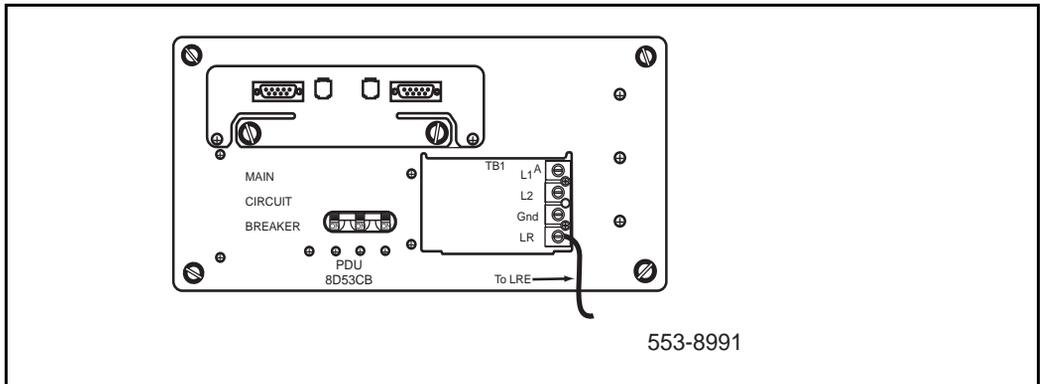
UPS ground cabling

Use the manufacturer's documents to install and cable a UPS. If the UPS does not contain an integral bypass switch, add one externally during initial UPS wiring. Figure 24 is a block diagram of a UPS installation and associated wiring.

Note: Because UPS installation can be complex, Nortel Networks recommend that installers attend vendor training programs.

CAUTION
Take care when connecting battery leads to the UPS. A battery reversal can result in severe damage to the UPS.

Figure 24
AC reserve power configuration

Note: The AC safety ground (green wire) must route from the service panel, through the UPS, to the Meridian 1 panel or receptacles.

553-3163
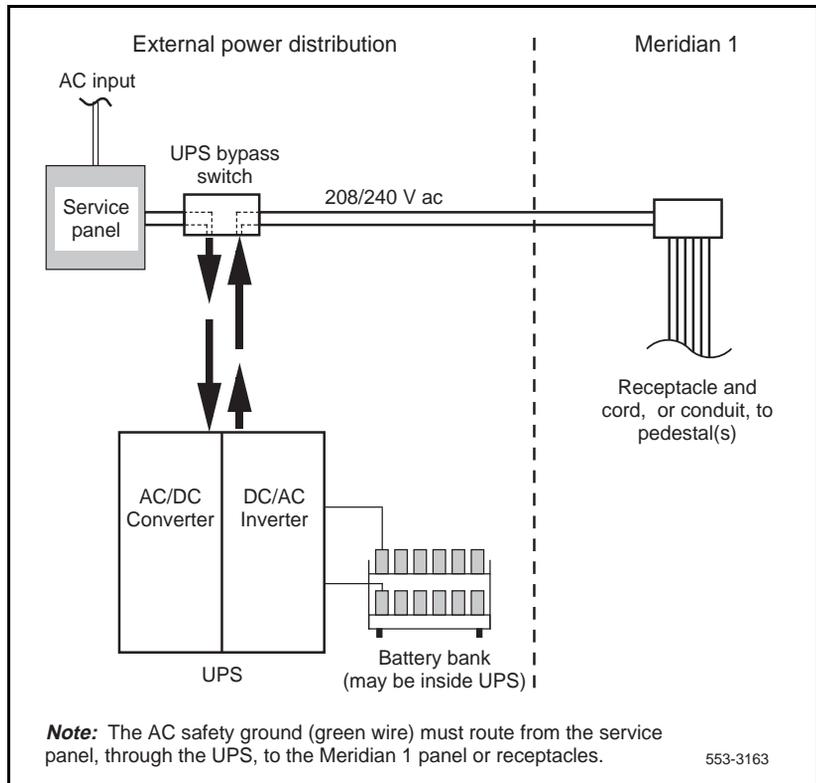
1   Make sure the safety ground/protective earth wire is connected on all Meridian 1 columns.

2   Daisy-chain ground cables to each UPS (see Figure 25) using #6 AWG wire.

3   Daisy-chain ground cables to each bypass switch (if equipped) using #6 AWG wire.

4   Run a #6 AWG wire between the ground lug on the rear of the pedestal, the bypass switch, and the UPS to a common frame ground point.

5   Run a #6 AWG wire between the common ground point and the ground bus in the service panel.

Figure 25
UPS grounding diagram

Column frame grounds

| Column 0 | Column 1 | Column n |

UPS frame grounds

| UPS 0 | UPS 1 | UPS n |

Bypass switch frame grounds

| 0 | 1 | n |

Isolated ground bus

Service panel   553-3089
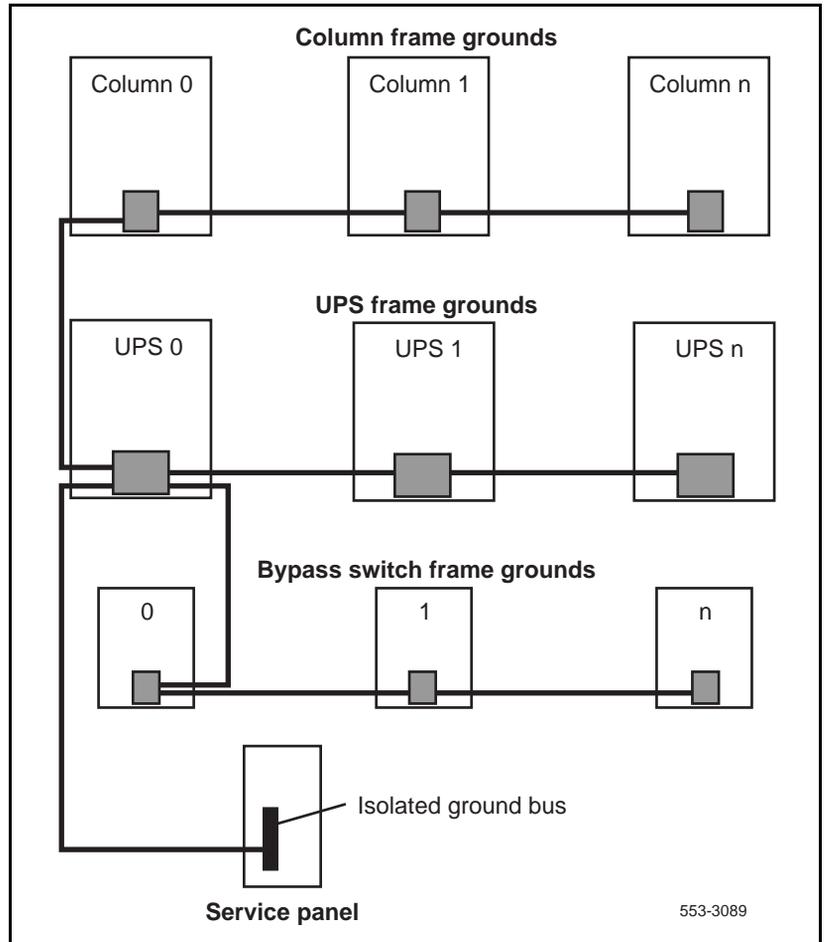
Installing DC power

Use this chapter to install safety ground/protective earth and logic return wiring, configure system monitors, and connect PFTUs for DC-powered systems using an MFA150 or 600/48 power system.

> *Note:* The procedures in this chapter apply to the global power distribution unit (PDU). Throughout this document, the global PDU is referred to as the "NT4N50AA PDU."

To install reserve power equipment (batteries), follow the instructions provided with the equipment. To comply with safety requirements, consult the following articles before working with any battery systems:

— Read the "Material Safety Data Sheet" that must be posted to meet OSHA requirements. This article outlines appropriate reserve battery handling procedures.

— Refer to National Electric Code 645-10. This article outlines requirements that call for the installation of AC- and DC-power kill switches to battery systems in certain environments.

As a safety precaution, all AC service panels should be located in an area that is easily accessible at all times to allow for emergency shutdown. Additionally, each circuit breaker within a panel should be clearly marked to identify the system component or components it services. An optimal location would be near, or just outside the entry to the room containing the DC power system for Meridian 1.

See Appendix A: "NT0R72, NT6D82, QBL12, QBL15, QCA13" on page 383 in this document to perform one of the following tasks:

— connect an NT6D82 Power System

— install and connect a QBL12 Power Distribution Box

— install and connect a power plant consisting of a

- QBL15 Power Distribution Box
- NT6D52 or NT0R72 Switched Mode Rectifier (NT0R72 replaces NT6D52)

— connect a QCA13 Power System

External DC power equipment

The MFA150 Modular Power System and the System 600 Power Plant are considered "external" power equipment because they are not housed in Meridian 1 columns.

DC-powered systems generally require one input receptacle per rectifier, within 1.8 m (6 ft) of each rectifier. The commercial power receptacles required are determined by the number and type of rectifiers used.

MFA150 Modular Power System

The MFA150 is a DC power system for options 21, 21E, 51, 51C, 61, 61C, 71, 81, and 81C. It replaces the rectifier/rack assembly consisting of the NT6D52 or NT0R71 Rectifier and QBL15 Power Distribution Unit.

The MFA150 is a modular, front access power system with a positive ground and –48 V dc output capacity of 150 amps, provided in 25-amp increments using plug-in rectifier modules. The MFA150 is suitable for any system with power requirements of less than 150 amps. One MFA150 is required per DC system (configured with one to six NT5C06 rectifiers, as required by system power consumption), installed in one or two MPS75 shelves.

The ordering codes for the complete power plant are NT5C90EF and NT5C90EG. Each of these configurations is a complete power bay with an NT6C14GB Control and Distribution Panel mounted on an NT6C40DC Seismic Rack:

— NT5C90EF is a single MPS75 shelf, with a capacity of 75 amps.

— NT5C90EG is a dual-shelf configuration, with a capacity of 150 amps.

The MFA150 power system requires one 50-amp power feed per shelf.

System 600/48 Power Plant

The System 600/48 Power Plant is a positive ground, –48 V dc, 600-A power plant. It can be used with all Meridian 1 DC-powered systems, but is optimized for larger system configurations such as system options 71, 81, and 81C. Other switchroom equipment that requires –48 V dc power may also be powered from the System 600 Power Plant, as long as there are sufficient output circuit breakers or auxiliary fuses, the total load does not exceed 600 A, and a consistent, single-point ground topology is maintained for all associated equipment.

The System 600 Power Plant consists of either the NT6C32AD main bay (for loads requiring up to 300 A) or the NT6C32AD main bay and the NT6C32AE supplemental bay (for loads up to 600 A), a front access common equipment panel, one front access controller, one front access circuit breaker panel, and two rectifier shelves that can contain up to six NT5CO7AC rectifiers. Included with the supplemental bay are all DC cables and signal wires to connect the supplemental bay to the main bay.

The System 600/48 Power Plant utilizes up to twelve 50-A switch mode rectifiers (NT5CO7AC) as building blocks connected in parallel to reach the maximum capacity of 600 A. This maximum capacity may be attained without power interruption to the load.

The rectifiers operate on single-phase 50 or 60 hertz AC service from either 208 V or 240 V nominal input. The power system may operate with or without –48 V dc batteries for reserve power. If batteries are connected, the rectifiers can operate in either the float or equalize mode.

The System 600/48 Power Plant is designed with access from the front. All operational controls are accessible from the front of the unit. It is designed for seismic environments to Zone 4 (Bellcore) free standing configurations, with no external bracing required.

The System 600/48 Power Plant has a variety of monitoring and alarm features, such as high and low voltage alarms, fuse and breaker alarms, rectifier failure alarms, and low voltage disconnect. An interface to the NT8D22 System Monitor provides a subset of these alarms.

NT6D53 Junction Box

If a rectifier is positioned at a distance from the Meridian 1, the NT6D53 Junction Box can provide an interim connection between the rectifier and the field wiring terminal block in the pedestal. One junction box supports one column. The junction box can be used with the NT4N50AA PDU, but it is not required.

The junction box is equipped with a 3-m (10-ft) flexible conduit that contains all the wiring needed to connect the rectifier to the pedestal. (Make sure the junction box is installed close enough to the pedestal for the conduit to reach the terminal block in the pedestal.)

On the input side, the junction box has allowance for up to four #4 AWG pairs and one logic return, and up to two 1-1/4 in. conduit fittings (one fitting is supplied). On the output side, the junction box is prewired with four #10 AWG pairs (one pair per module) and a logic return. This wiring is routed in a 3-m (10-ft) length of 3/4-in. conduit that connects to the pedestal.

The junction box connects to the pedestal as follows:

— For distances of up to 30 m (100 ft), there are

- four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit

- two 30-amp feeds from the distribution point to the junction box with five #4 AWG conductors in a single 1-1/4 in. conduit

— For distances of up to 60 m (200 ft), there are

- • four split feeds per column with nine #10 AWG conductors in a single 3/4-in. conduit

- • two 30-amp feeds from the distribution point to the junction box, with nine #4 AWG conductors in two 1-1/4 in. conduits

Safety ground/protective earth and logic return wiring

The single-point ground (SPG) required by the system can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. The system must be connected to safety ground/protective earth in accordance with NEC requirements. For international use, the system must be connected to safety ground/protective earth in accordance with Paragraph 2.5 of EN60950/IEC950.

Note: Refer to *Meridian 1 installation planning* (553-3001-120) and *Meridian 1 power engineering* (553-3001-152) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Depending on the distances between columns, the location of the service panel, and the availability of panel SPG connection points, safety ground/ protective earth wiring can be daisy-chained or run independently from each Meridian 1 column to the SPG or alternately to a logic return equalizer (LRE). Figures 27 and 27 show safety ground/protective earth wiring in daisy-chain configurations. For the MFA150, safety ground is daisy-chained between columns and then run directly to the ACEG in the service panel. For the System 600/48 Power Plant, safety ground is daisy-chained between columns and then run to the ACEG. The System 600/48 safety ground is connected to the AC panel through the AC input conduit.

Multiple-column systems use an LRE as the point where the logic return wires from different columns are consolidated before connecting to the single-point ground. The LRE used with the MFA150 and System 600/48 is a copper bus bar mounted in the control/distribution panel of the power system.

Figure 26
Ground and logic return distribution—MFA150 Modular Power System

Meridian 1

AC input

Service panel

120 V receptacle

ACEG

Safety ground (#6 AWG, min)

See Note 1

BRE/LRE

Battery / logic return reference

Optional Batteries

AC conduit

Rectifier (see Note 2)

Rack

Battery trays (see Note 3)

Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT(–), two BATRTN(+), and one LRTN(+) conductors.
Note 2: The MFA150 power system may be equipped with one or two power shelves for a maximum of 75 amps or 150 amps, respectively. Each shelf accommodates up to three NT5C06 rectifiers.
Note 3: Batteries may be installed in two optional battery trays located under the rectifier shelves.

553-5345

Figure 27
Ground and logic return distribution—System 600/48 Power Plant

Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN (+) conductors. All (5) conductors terminate **inside** the distribution panel.
Note 2: Up to six NT5C07 rectifiers can be equipped in a cabinet for a total of 300 amps.
Note 3: The cabinet safety ground is furnished through the green wire ground in the AC input wiring.

553-5811
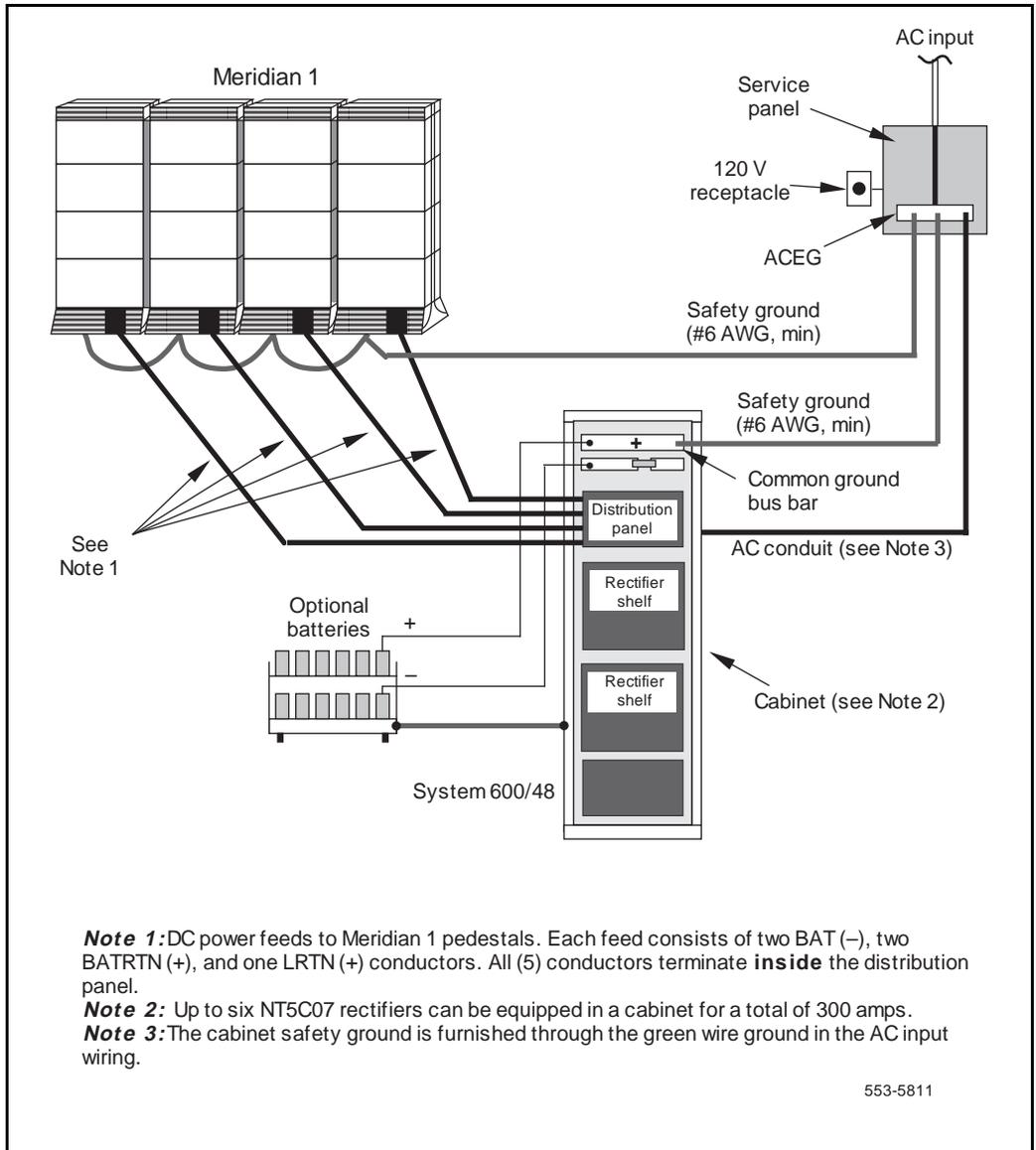
PDU connections

A readily accessible disconnect device for input power is required.

CAUTION

DC power for the NT7D09 pedestal must be provided with circuit protection of 30 amps for the -BAT 0/1 and -BAT 2/3 feeds (see Figure 27).

Circuit breakers must be located next to each other and labeled to show that both must be shut off to remove all power to the system.

Figure 28
PDU circuit protection
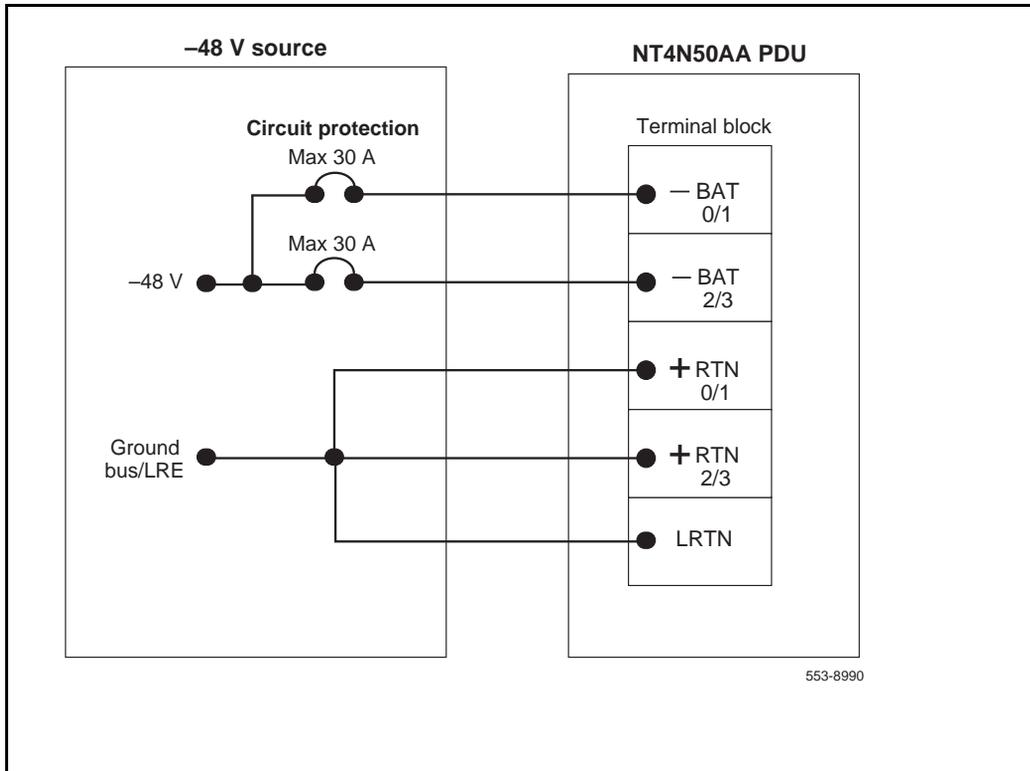
A maximum loop drop of two volts is allowed between the pedestal, or junction box, and the external power equipment. See Table 2 for allowable wire sizes. See *Meridian 1 power engineering* (553-3001-152) for detailed information on calculating wire size.

Table 2
Wire gauge requirements with two 30-amp feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0–3 m (10 ft)	Yes	Yes	Yes	Yes
3–6 m (20 ft)	Yes	Yes	Yes	Yes
6–9 m (30 ft)	Yes	Yes	Yes	Yes
9–12 m (40 ft)	Yes	Yes	Yes	Yes
12–15 m (50 ft)	Yes	Yes	Yes	Yes
15–18 m (60 ft)	No	Yes	Yes	Yes
18–21 m (70 ft)	No	Yes	Yes	Yes
21–24 m (80 ft)	No	Yes	Yes	Yes
24–27 m (90 ft)	No	No	Yes	Yes
27–30 m (100 ft)	No	No	Yes	Yes
30–60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No

Note 1: Two 30-amp feeds are typically adequate for a column with four modules (five wires total—two 30-amp feed pairs plus logic return).

Note 2: If dual conduit is used, the wires must be run in battery/battery return pairs, with one pair in one conduit and the other pair, plus logic return, in the other conduit.

Legend: Yes= Wire size is adequate for the distance.
　　　　　No= Wire size has too high a voltage drop and is inadequate for the distance.

The following equipment is located in the rear of each pedestal (see Figure 29) in Meridian 1 columns:

— The PDU distributes power to the entire column.

— The field wiring terminal provides the connection point for wiring brought into the pedestal.

— A circuit breaker is provided for each module in the column and for the blower unit

Note: All column circuit breakers will trip if a column thermal overload is detected or a DC-power low-voltage condition is sensed.

— The system monitor checks the column temperature, cooling system status, and system voltage status, and controls alarms and line transfer states accordingly.

Figure 29
DC-power equipment in the rear of the pedestal—NT4N50AA PDU
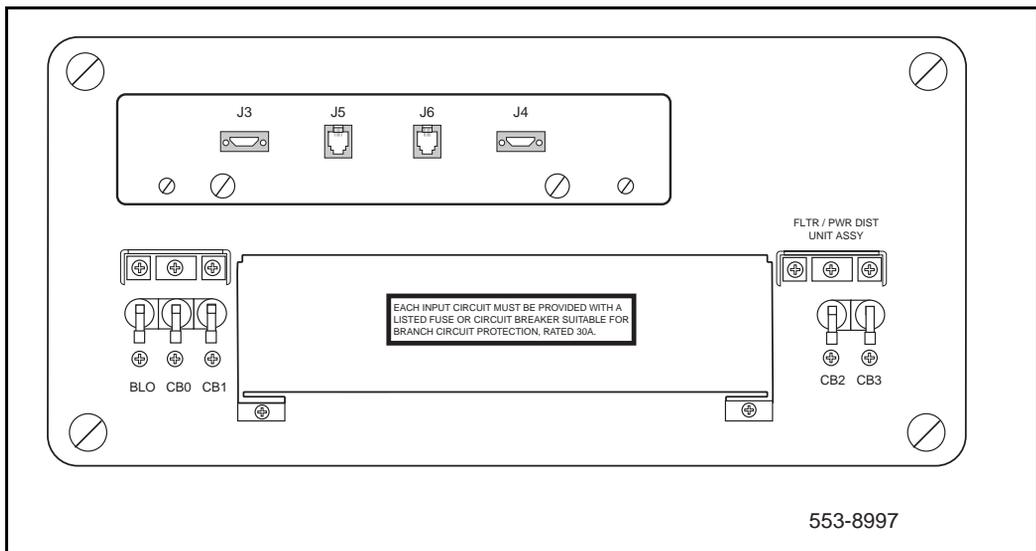
With the NT4N50AA PDU, the safety ground/protective earth wires and all wiring to the terminal block in the PDU must be neatly routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal (see Figure 30). This ensures that there is room to install the PDU cover, safety cover, and rear grill.

Conduit is not required with the NT4N50AA PDU. However, 1-1/4 or 3/4 in. conduit can be used if local codes or individual installations require it. Conduit can be routed down through the column from overhead racks or up through the floor. Conduit clamps and the hardware to fasten the conduit are provided in the pedestal. If the NT7D0902 Rear Mount Conduit Kit is used, conduit can enter from the rear of the column (above the floor).

Figure 30
Cable routing in the rear of the pedestal—NT4N50AA PDU
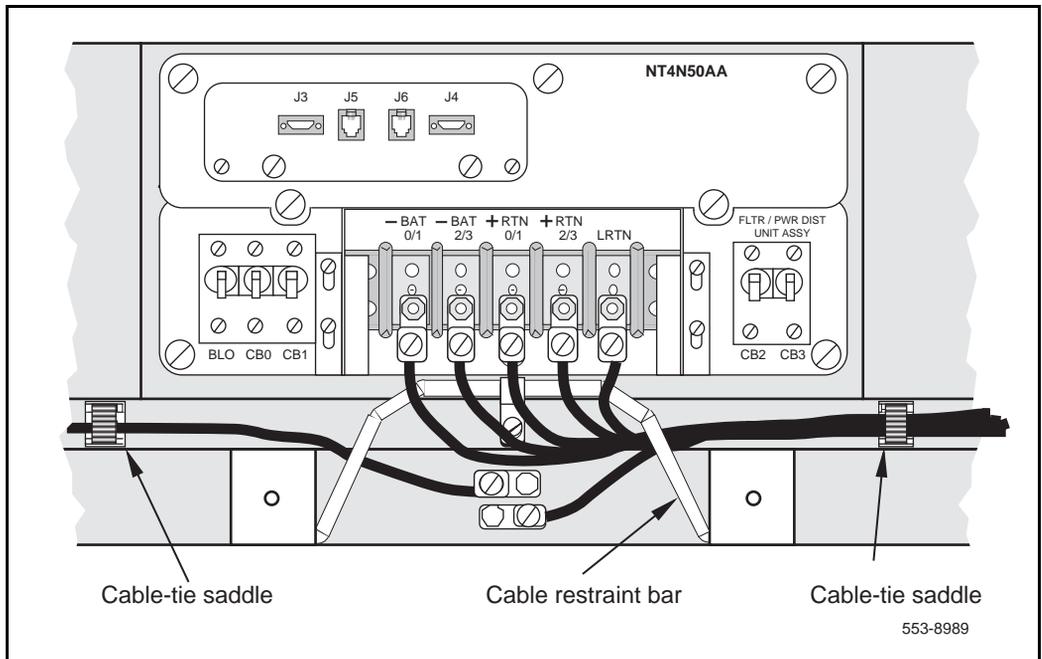
Cable-tie saddle   Cable restraint bar   Cable-tie saddle

553-8989

Installation procedures

Installing safety ground/protective earth wiring

WARNING

Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods.

---

1 Remove the associated 30-amp fuse or set circuit breakers to the OFF position in the power plant, to disconnect each pedestal from the power source.

2 Remove the air intake grill from the rear of the pedestal.

3 At the rear of the pedestal, use a Phillips screwdriver to remove the metal cover over the terminal block to access the safety ground/protective earth lugs. Leave the cover off until all pedestal connections are made.

4 Connect the safety ground/protective earth wire:

   Note: Use only insulated ground wire for system grounding.

   For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

   For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next as illustrated in Figure 31, connecting all of the columns together (or run a #6 AWG wire from the ground source to each column individually)

   Note: The safety ground/protective earth wire must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

5 Place a warning tag (WARNING—TELEPHONE SYSTEM GROUND CONNECTION—DO NOT DISCONNECT) on the connection at the ground source.

Figure 31
DC Column ground lug daisy chain connection

From
ground source

To ground/protective
earth lug (or service panel)

Terminate on
last column

553-8995
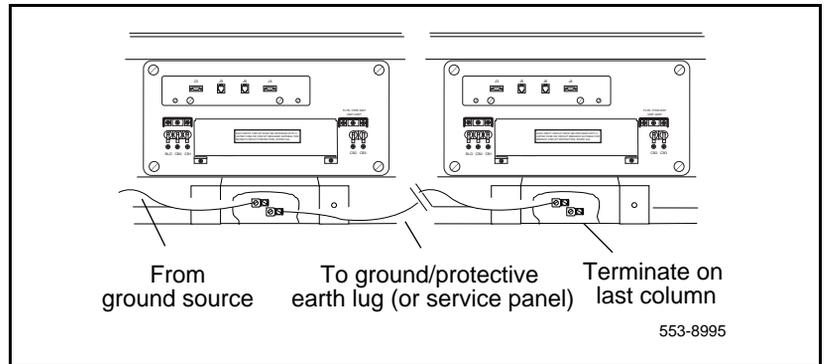
Preparing the NT4N50AA PDU

When a system is shipped, a set of screws secures the leveling bracket at the rear of the NT4N50AA PDU to protect it from vibration damage during transit. The shipping screws should be removed during initial installation.

6   For access to the rear of the PDU, temporarily remove the blower unit in the front of the pedestal:

- Turn the screws on the front of the blower unit counterclockwise.

- Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal. (Keep the blower unit in an upright position.)

7   Remove the two shipping screws holding the PDU to the vertical shield in the pedestal.

8   Reinstall the blower unit:

- Set the blower unit on the bottom ledge of the pedestal.

- Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.

- Tighten the screws on the front of the blower unit.

Connecting power from the power plant to the NT4N50AA PDU

Note 1: On columns which have only two modules, run five wires to facilitate future expansion to a four module column.

Note 2:   If only two modules are used in the column, set the CB2 and CB3 circuit breakers to off.

9   Ensure that power to the power plant is removed from the service panel.

10   Remove the air intake grill from the rear of the column pedestal being wired:

- Remove the two screws securing the air intake grill to the pedestal.

11   Use a Phillips screwdriver to remove the PDU safety cover.

12 Remove the top cover from the power plant:

- Remove the six screws from the top of the power plant.

- Release the captive screw on the front control panel.

- Lay the control panel down and remove the top cover.

13 Route the wires between the power plant and the pedestal of the column being wired.

Using a junction box:

- If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

- Route the wires within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

- Connect the wires to the matching connections on the terminal block on the junction box:

  — Connect the red wires to BAT 0,1 and BAT 2, 3

  — Connect the black wires to BATRTN 0,1 and BATRTN 2, 3

  — Connect the orange or white wire to LRTN.

Without a junction box:

- Route two red wires between the power plant and the pedestal of the column being wired.

- Route two black wires between the power plant and the pedestal of the column being wired.

- Route one (orange or white) wire for the logic return ground (LRTN) between the power plant and the pedestal of the column being wired.

- Route the wires within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

14 Connect wires to the PDU:

- Connect a red wire to -BAT 0/1 for modules 0 and 1, and another red wire to -BAT 2/3 for modules 2 and 3 on the connection block.

- Connect a black wire to +RTN 0/1 for modules 0 and 1, and another black wire to +RTN 2/3 for modules 2 and 3 on the connection block.

- Connect the (orange or white) wire to the LRTN terminal on the connection block.

15 Connect wires to the power plant:

- Connect the red wires to the first two circuit breakers in the main control/distribution panel. See Figure 32 for PDU to MFA150 connections and Figure 33 for PDU to System 600/48 connections. Each new column connects the next two available circuit breakers.

Note: If only two modules are used in the column, make sure the CB2 and CB3 circuit breakers are set to off.

- Connect the black wires to the ground bus/LRE.

- Connect the orange or white wire to ground bus/LRE.

16 Replace the metal safety cover over the terminal block on the PDU.

- Lower the front panel over the mounting screws on the PDU.

- Tighten the screws holding the cover.

17 Replace the power plant cover.

18 Replace the junction box cover.

Figure 32
PDU to MFA150 connections

TB1		
8	EQL	
7	EQL	
6	LVA	NO
5	LVA	C
4	LVA	NC
3	LVDA	NO
2	LVDA	C
1	LVDA	NC

TB2		
8	FA	NO
7	FA	C
6	FA	NC
5	RFA MAJ	NC
4	RFA MAJ	NC
3	RFA MIN	NC
2	RFA MIN	NC
1	RFA	C

DCON 0: 1 wire; black

DCON 0,2,3: 3 wires; green, white, red

Alarm: 1 wire; orange

To system monitor via NT8D46AV cable (*Note:* Do not connect trip lead.)

Ground bus/LRE (battery/logic return) (+)

Charge battery (-) bus bar

MFA150 distribution panel

Shunt

LVD contactor

Discharge battery (-) bus bar

To BLO (blower), CB0 (module 0), CB1 (module 1)

To CB2 (module 2), CB3 (module 3)

To connections in pedestal

TB1 in PDU

— BAT 0/1	— BAT 2/3	+ RTN 0/1	+ RTN 2/3	LRTN

553-5386

553-5386

System installation procedures

Figure 33
PDU to System 600/48 Power Plant connections

Alarm & Control Circuit Pack

Common ground BUSBAR/LRE (Battery/Logic Return) (+)

NT6C14GI

CHG BAT BUSBAR

SHUNT

LVD CONTRACTOR

8	EQL	
7	EQL	
6	LVA	NO
5	LVA	C
4	LVA	NC
3	LVDA	NO
2	LVDA	C
1	LVDA	NC
	TB2	
8	FA	NC
7	FA	C
6	FA	NC
5	RFA MAJ	NO
4	RFA MAJ	NC
3	RJA MN	NO
2	RFA MN	NC
1	RFA	C

System 600/48 Distribution & Control Panel

DISCH BAT (BUSBAR0 Common feed FO CB's

QFF (0–5A) fuse blocks (4 places)

DC ON 0–1 wire - Black

DC ON 1.1.3–3 wires
Alarm - 1 wire - Orange

To NT8D22 System Monitor via NT8D46AV, BV, or CV cable.

Note: Do not connect the trip leads.

To BLO (blower), CB0 (module 0), & CB1 (module 1)

To CB2 (module 2) & CB3 (module 3)

To connections in pedestal

TB1 in PDU

— BAT 0/1	— BAT 2/3	+ RTN 0/1	+ RTN 2/3	LRTN

Factory installed inside pedestal

553-5925

Connecting UK power to the NT4N50AA PDU

To connect the external power system to the pedestal, use the following procedure for each column (this procedure gives the connections for a four-module column).

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

1   Open the front door of the 8B/2R or 8B/4R master power cabinet

2   If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

    Connect the wires from the junction box to the matching connections on the terminal block on the PDU:

    • Connect the red wires BAT0 through BAT3.

    • Connect the black wires RTN0 through RTN3.

    • Connect the remaining LRTN wire (orange or white wire).

    Note: If a junction box is used, the connections described in Steps 2 through 4 apply to the junction box rather than the pedestal.

3   Connect the red BAT (–48V) wires:

    • At the 8B/2R or 8B/4R master power cabinet, connect wires to the first two terminals on the –ve distribution rail (see Figure 32).

    • At the PDU, connect the wires to the terminal block (one wire feeds two modules):

    for modules 0 and 1 connect to -BAT 0/1

    for modules 2 and 3 connect to -BAT 2/3

4   Connect the black BATRTN (+48V) wires:

    • At the 8B/2R or 8B/4R master power cabinet, connect wires to the +ve bus

    • At the PDU, connect the wires to the terminal block (one wire feeds two modules):

    for modules 0 and 1 connect to +RTN 0/1

    for modules 2 and 3 connect to +RTN 2/3

5   Connect an orange #8 AWG (10 sq mm) LRTN wire from the logic return equalizer (LRE) in the rear of the master power cabinet to LRTN on terminal block TB1 in the pedestal. (See Figure 32.)

6   Reinstall the metal safety cover over the terminal block:

• Lower the front panel over the mounting screws on the PDU.

• Tighten the screws holding the cover.

7   Close the covers on the 8B/2R or 8B/4R master power cabinet.

System monitor connections

When connecting to an 8B/2R or 8B/4R master power cabinet, one NT8D46AT cable is required to extend the alarm terminal to the master system monitor in the pedestal. See Figure 32.

The orange colored wire on NT8D46AT marked "ALARM" extends from any of three alarm terminals on the top of the power cabinet to connector marked J4 in the system monitor. The remaining "Trip" and "DC ON" wires on the NT8D46AT cable are not used and should be snipped before installing the cable.

Figure 34
UEM to 8B/2R or 8B/4R master power cabinet 2R or
8B/4R master power cabinet connections

To Test Jack Frame (TJF)
16 sq mm green/yellow

Master Power Cabinet(s)

Positive Bus

Black wires

Factory installed
(16 sq mm green/yellow)

Logic Return Equalizer,
LRE (functional earth)

-VE Distribution Rail

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Orange wire
(10 sq mm)

Alarm terminal
(3 off)

Each output is rated at 30 A maximum.
Maximum total output is 150 A.

Red wires

Power alarm cable
(NT8D46AT)

J4 in
system
monitor
(XSM)

TB1 in Power distribution unit

TO CB4,CB0,CB1
(blower, module 0,
module 1)

TO CB2,CB3
(module 2,
module 3)

To Connections
in Pedestal

| — BAT 0/1 | — BAT 2/3 | **+** RTN 0/1 | **+** RTN 2/3 | LRTN |

553-6458

553-6458

Planning and designating the Modular Distribution Frame (MDF)

WARNING
Electrical shock hazard
Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

All Meridian 1 terminations are cross-connected on frame-mounted or wall-mounted BIX Modules and connecting blocks. The layout of the blocks can vary to meet the requirements of the site. See the following documents for a complete description of the BIX cross-connect system:

— *BIX In-Building Cross-Connect System Material Description* (631-4511-100)

— *BIX In-Building Cross-Connect System Planning* (631-4511-150)

— *BIX In-Building Cross-Connect System Material Installation and Servicing* (631-4511-200)

— *Customer premises distribution frame description and installation* (631-4511-201)

— *Protection entrance terminal description and installation* (631-4511-202)

Table 3 lists part numbers for BIX designation labels.

Table 3
Order codes for BIX designation strips

Label	Part number
NT8D11 CE/PE Module (basic label)	P0711373
NT8D37 IPE Module (basic label)	P0711372
NT8D37 IPE Module (fully expanded label)	P0711371
NT8D14 Universal Trunk Card (RAN)	P0711376
NT8D14 Universal Trunk Card (paging)	P0711378
NT8D14 Universal Trunk Card (CO/FX/WATS and all other modes)	P0711380
NT8D15 E&M Trunk Card (2-wire, type 1)	P0711379
NT8D15 E&M Trunk Card (2-wire, paging)	P0711377
NT8D15 E&M Trunk Card (4-wire, type 1)	P0711374
NT8D15 E&M Trunk Card (4-wire, type 2)	P0711375
A0355200 PFTU: Dees Model 154A	P0711382
Gordon-Kapes Model BP-2-48	P0711383

BIX installation and designation

1   Install BIX cross-connect blocks according to the installation procedure described in *BIX Installation and Servicing* (631-4511-200).

- The BIX Module includes one QMBIX10A mount, ten QCBIX1A connectors, and five QSBIX20A designation strips. A QMBIX12E mount, which holds 12 QCBIX1A connectors, is also available.

- Figure 35 shows a wall-mounted BIX Module.

- Figure 36 shows the recommended BIX Module layout for NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules.

2   Attach the adhesive designation labels for lines to the BIX designation strips. Figure 37 shows samples of the basic BIX designation labels for NT8D11 CE/PE and NT8D37 IPE Modules.

3   Attach the labels for trunks on top of the basic labels according to the assignments shown on the work order. The transparent window on the trunk labels allows the card number on the basic labels to be seen.

- Figure 38 shows samples of the overlay BIX designation labels for all NT8D14 Universal Trunk modes.

- Figure 39 shows samples of the overlay BIX designation labels for all NT8D15 E&M Trunk modes.

4   Attach the labels for the P1, P2 (from the PFTU), and P3 (alarm) cable connections. Figure 40 shows samples of the BIX designation labels for the PFTU.

5   Attach the labels for incoming trunks, telephones, and riser cables according to the work order.

Figure 35
BIX Module
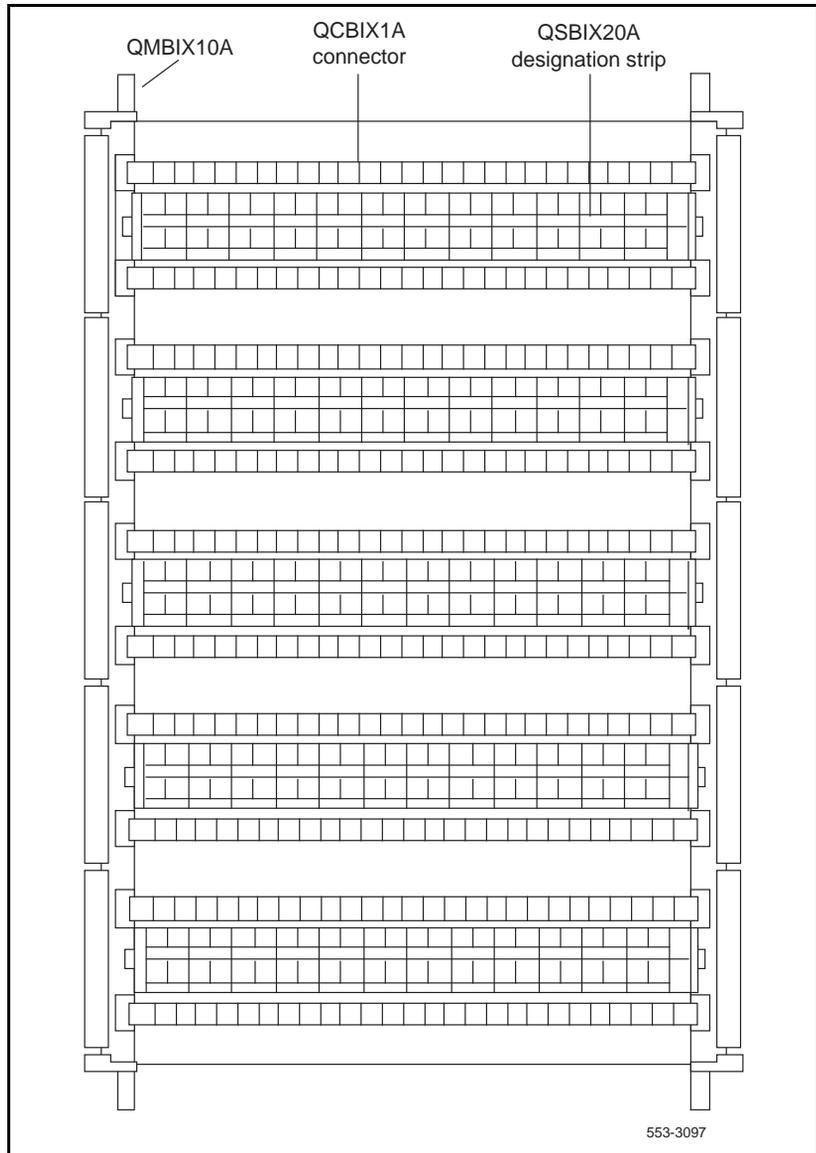
Figure 36
Recommended BIX layout for NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules

Cable terminations for NT8D11 CE/PE Module		Cable terminations for one NT8D37 IPE Module		Cable terminations for multiple NT8D13 PE Modules	
PFTU Cable 1		From I/O panel	Cable A	From I/O panels	Cable A
PFTU Cable 2			Cable B		Cable B
			Cable C		Cable C
Monitor/Alarm connections			Cable D (Note)		Cable D
Monitor/Alarm connections			Cable E		Cable E
			Cable F		Cable F
			Cable G		Cable G
			Cable H (Note)		Cable A
			Cable K		Cable B
			Cable L		Cable C
From I/O panel	Cable A		Cable M		Cable D
	Cable B		Cable N (Note)		Cable E
	Cable C		Cable R		Cable F
	Cable D (Note)		Cable S		Cable G
	Cable E		Cable T		Cable A
	Cable F		Cable U (Note)		Cable B
	Cable G (Note)		Spare		Cable C
	Cable H		Spare		Cable D
	Cable K		Spare		Cable E
	Cable L (Note)		Spare		Cable F

Note: In NT8D11AC or NT8D11DC CE/PE and NT8D37AC or NT8D37DC IPE Modules, these slots *are not* used. They *are* used in NT8D11BC or NT8D11EC CE/PE and NT8D37BA or NT8D37EC IPE Modules.

553-3099

Figure 37
Sample basic BIX labels—NT8D11 CE/PE and NT8D37 IPE Modules

553-3102
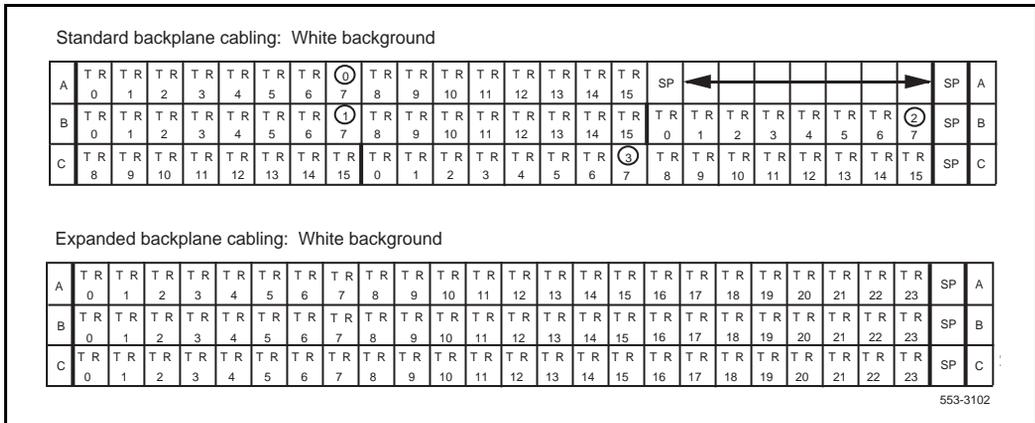
Figure 38
Sample overlay BIX labels—NT8D14 Universal Trunk Card

Note: ⬚ Indicates a transparent window

553-3109
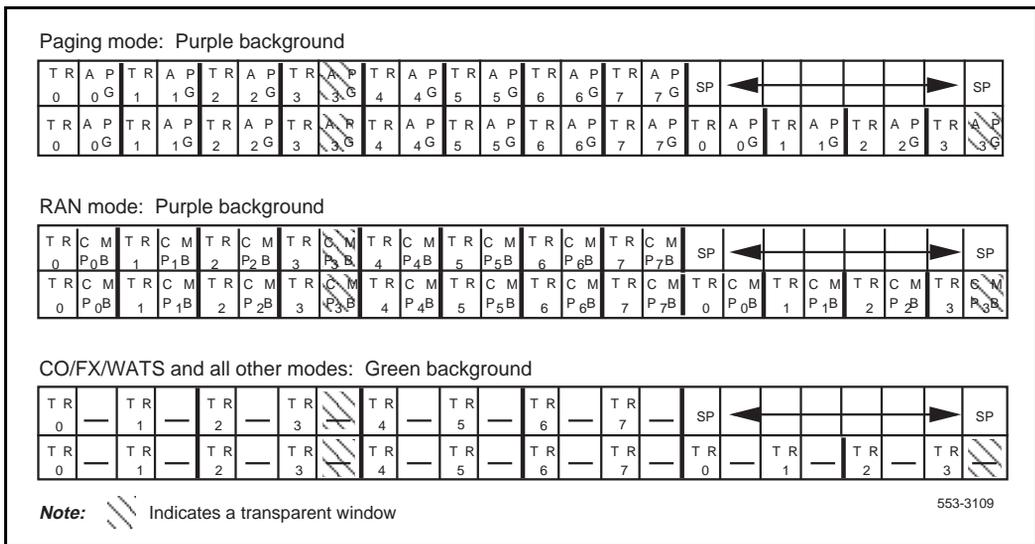
Figure 39
Sample overlay BIX labels—NT8D15 E&M Trunk Card

2-wire — Type 1 mode: Yellow background)

T R 0	—	E M 0	—	T R 1	—	E M 1	▨	T R 2	—	E M 2	—	T R 3	—	E M 3	—	SP	←				→	SP
T R 0		E M 0		T R 1		E M 1	▨	T R 2		E M 2		T R 3		E M 3		T R 0		E M 0		T R 1		E M 1	▨

2-wire — Paging mode: Yellow background

T R 0	—	—	A P G 0	T R 1	—		▨ A P G	T R 2	—	—	A P G 2	T R 3	—	—	A P G 3	SP	←				→	SP
T R 0	—	—	A P G 0	T R 1	—	—	▨ A P G	T R 2	—	—	A P G 2	T R 3	—	—	A P G 3	T R 0	—	—	A P G 0	T R 1	—	—	▨ A P G

4-wire — Type 1 mode: Yellow background)

4-wire — Type 2 mode: Yellow background

Note: ▨ Indicates a transparent window

553-3100
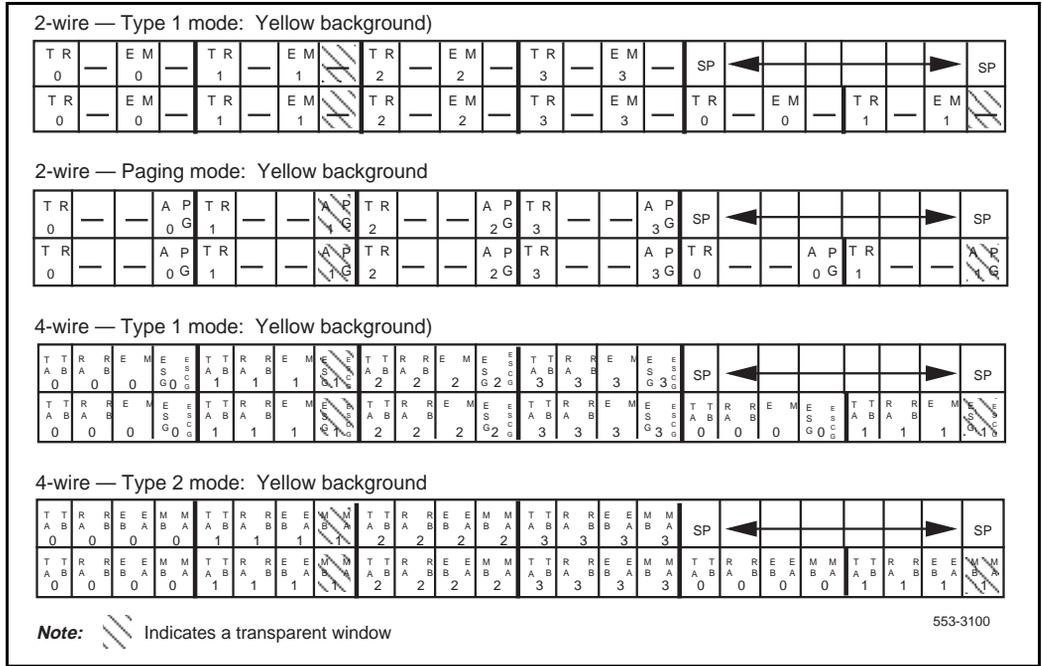
Figure 40
Sample BIX labels—PFTU

Yellow background

P1	T R Ext 1	T R Stn 1	T R Cot 1	T R Trk 1	T R Ext 2	T R Stn 2	T R Cot 2	T R Trk 2	T R Ext 3	T R Stn 3	T R Cot 3	T R Trk 3	T R Ext 4	T R Stn 4	T R Cot 4	T R Trk 4	SP	←			→	SP	-48 VDC	SWE	P1
P2	T R Ext 5	T R Stn 5	T R Cot 5	T R Trk 5	T R Ext 6	T R Stn 6	T R Cot 6	T R Trk 6	T R Ext 7	T R Stn 7	T R Cot 7	T R Trk 7	T R Ext 8	T R Stn 8	T R Cot 8	T R Trk 8	SP	←			→	SP	N O O 1	GRD	N C C 1	P2

553-3106
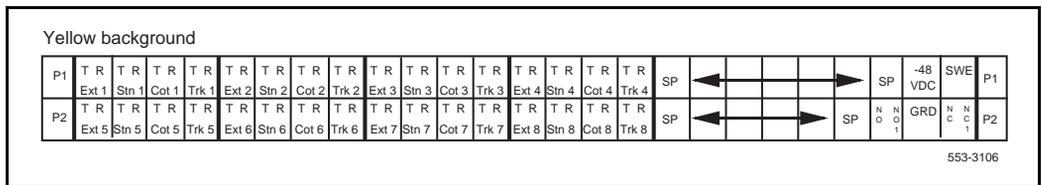
Backplane cable expansion

In the backplane configuration in NT8D11AC or NT8D11DC CE/PE and NT8D37AC or NT8D37DC IPE Modules, only some of the slots on the backplane are fully cabled to accommodate 24 tip and ring pairs (three cable connectors). Most of the backplane slots accommodate 16 pairs (two cable connectors). By adding and reconfiguring cable ends in the backplane slots, 24 pairs can be connected to each backplane slot.

With the 7-cable backplane configuration in the NT8D11AC and NT8D11DC CE/PE Modules, cable designations D, G, and L on the I/O panel are reserved for expansion (as shown in Figure 36). Those cable designations are utilized in the 10-cable expanded configuration in NT8D11BC and NT8D11EC Modules.

With the 12-cable backplane configuration in the NT8D37AC and NT8D37DC IPE Modules, cable designations D, H, N, and U on the I/O panel are reserved for expansion (as shown in Figure 36). Those cable designations are utilized in the 16-cable expanded configuration in NT8D37BA and NT8D37EC Modules.

When backplane slots are reconfigured for expanded cabling, the labeling for NT8D11 CE/PE and NT8D37 IPE Modules must be changed at the MDF to reflect the change in the backplane slots. Figure 37 gives a sample of the basic BIX labels for NT8D11 CE/PE and NT8D37 IPE Modules with the standard backplane cabling configuration and with the expanded backplane cabling configuration.

Krone cross connect system (UK)

In the Krone cross connect system, one terminating strip holds 10 pairs of cable. When cross connecting a 25-pair cable on this system, 8 of the 10 terminating points are used on each strip. One 25-pair cable, therefore, occupies three terminating strips:

8 pairs per strip X 3 strips = 24 pairs

Card allocations

Figures 41 and 42 provide IPE and CE/PE module card allocations for the Krone cross connect system.

Figure 41
IPE module card allocation—Krone cross connect system
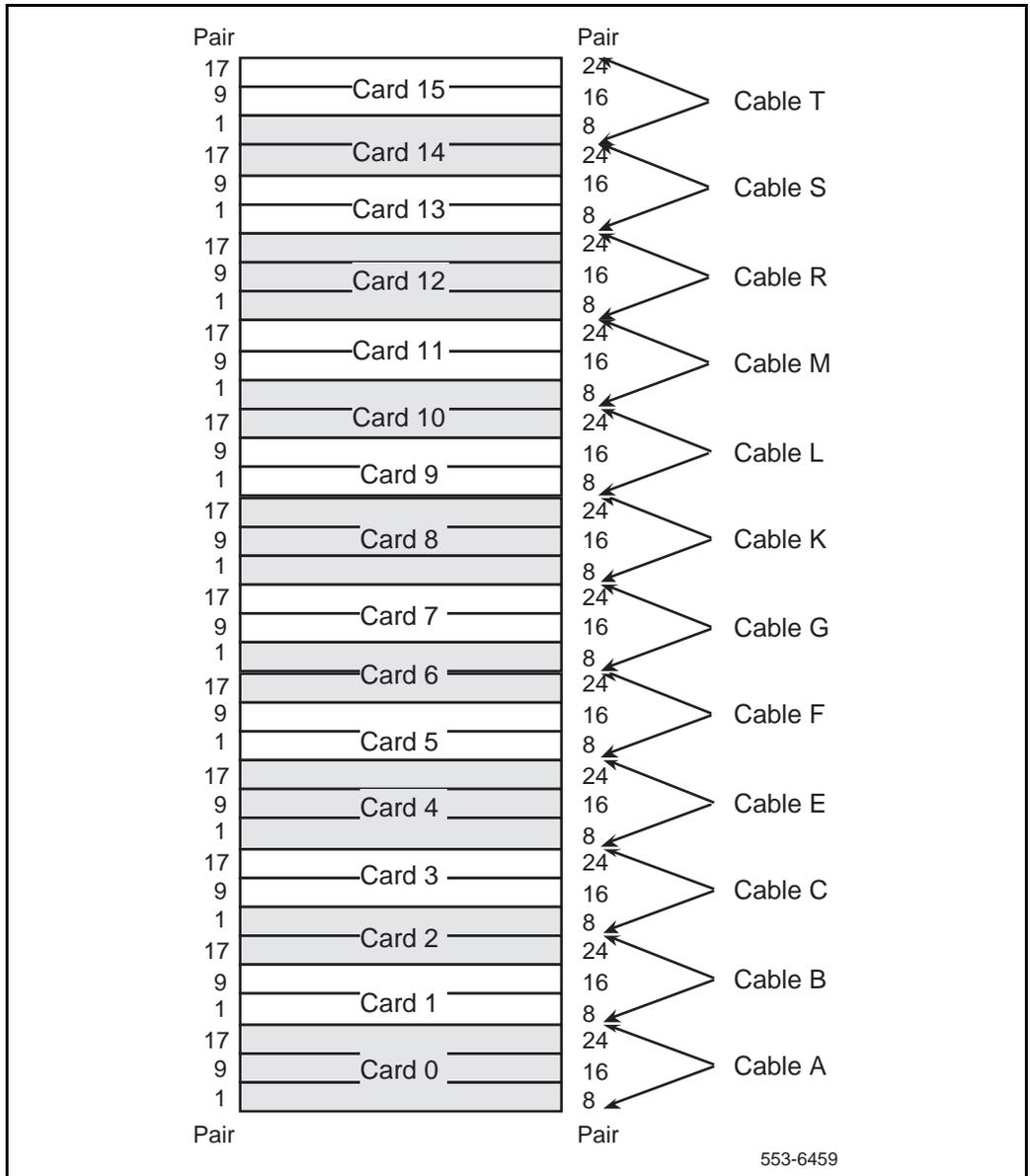
Figure 42
CE/PE module card allocation—Krone cross connect system
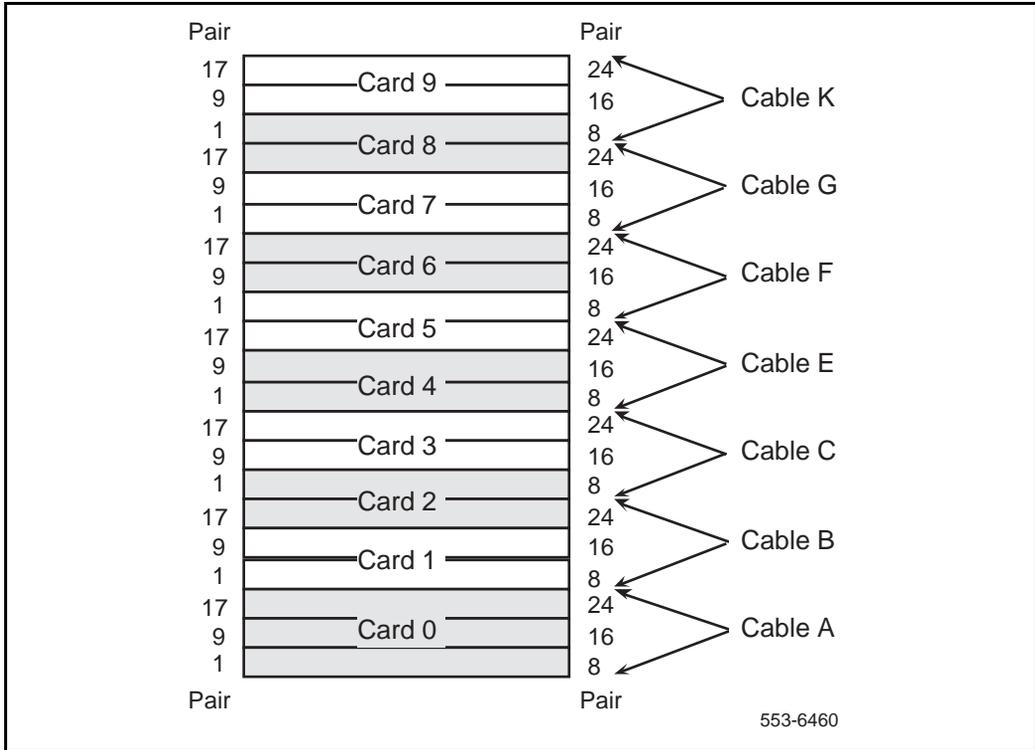
Labels

Terminating strips on the Krone cross connect must be labeled if they contain wiring. The labels that attach to the terminating strips have two sides: the front side shows the name of the card and the card number, the reverse side (flip-up side) shows pair designations for that card.

There are two types of mandatory labels: those with safety warnings and those without. Mandatory labels with safety warnings are required for the following cards:

— NT5K02 analog line card

— NT5K19 analog tie trunk card

— QUA6 Power Fail Transfer Unit (PFTU)

Labels are mandatory for the following cards but they do not need safety warnings:

— NT5K18 Exchange line card

— NT5K17 Direct Dial Inwards (DDI) card

Figures 43 through 49 show labels for the Krone cross connect system.

Figure 43
Label for analog line card

553-6461

Figure 44
Label for analog tie trunk card

553-6462

Figure 45
Label for Data Access line card (NT7D16)

553-6463

Figure 46
Label for Power Fail Transfer Unit
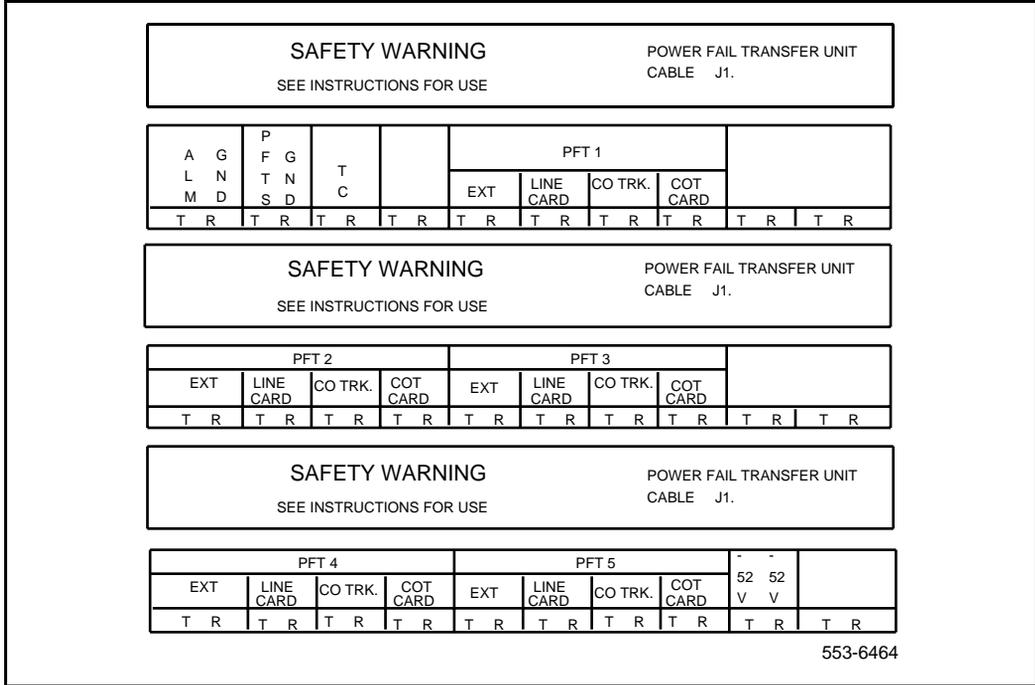
Figure 47
Label for Digital line card (NT8D02)

SAFETY WARNING

SEE INSTRUCTIONS FOR USE : DIGITAL TELEPHONES

LOOP..........
SHELF.........
CARD..........

								DIR. NO.'S	
0	1	2	3	4	5	6	7		
T R	T R	T R	T R	T R	T R	T R	T R	T R	T R

SAFETY WARNING

SEE INSTRUCTIONS FOR USE : DIGITAL TELEPHONES

LOOP..........
SHELF.........
CARD..........

								DIR. NO.'S	
8	9	10	11	12	13	14	15		
T R	T R	T R	T R	T R	T R	T R	T R	T R	T R

553-6465

Figure 48
Label for Exchange line trunk card (NT5K18)

EXCHANGE LINES

LOOP..........
SHELF.........
CARD..........

				EXCHANGE NO.'S
0	1	2	3	
T R	T R	T R	T R	

EXCHANGE LINES

LOOP..........
SHELF.........
CARD..........

				EXCHANGE NO.'S
4	5	6	7	
T R	T R	T R	T R	

EXCHANGE LINES

LOOP..........
SHELF.........
CARD..........

				EXCHANGE NO.'S
0	1	2	3	
T R	T R	T R	T R	

553-6466

System installation procedures

Figure 49
Label for Direct Dial Inward trunk card (NT5K17)

553-6467
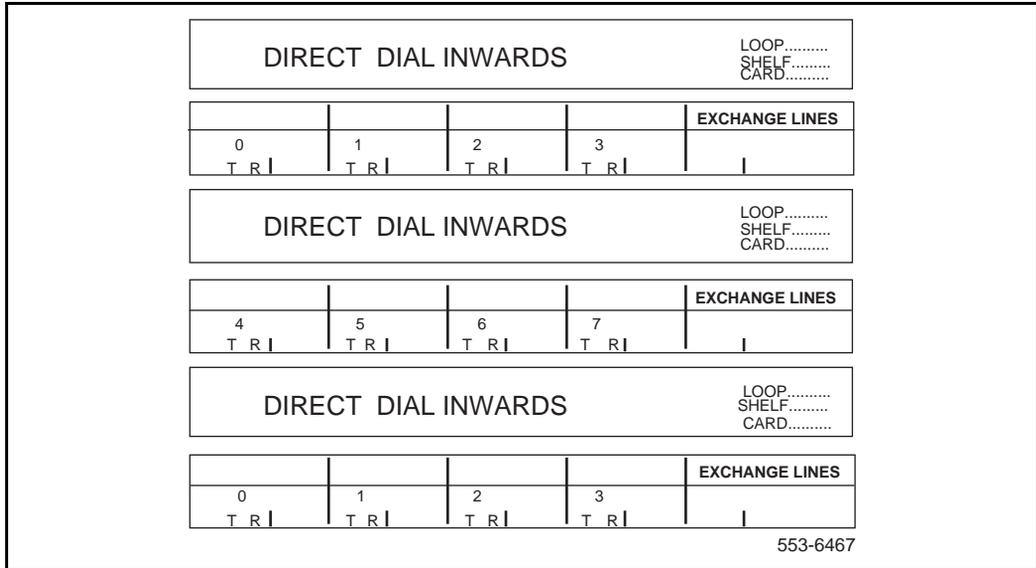
Installing PFTUs

Use the PFTU manufacturer's instructions and this procedure to install and connect A0355200 Power Fail Transfer Units. In AC-powered systems, PFTUs are powered by the A0367916 Auxiliary –48V Power Supply (up to six PFTUs can be supported by one power supply). In DC-powered systems, PFTUs are powered from an auxiliary –48 V dc fused output from the external power equipment.

Figure 50 shows a high-level view of PFTU alarm connections. For PFTU operation, wiring from the following equipment cross-connects through termination areas at the MDF:

— PFTU

— auxiliary power supply

— system monitor

— attendant console (optional)

— designated telephones (DTMF or rotary dial types)

— central office trunks

Figure 50
MDF terminations for typical PFTU operation

Figure 51 shows detail view of the PFTU alarm connections. The PFTU can be activated by system power failure and using the Attendant console TC switch. If more than one Attendant console is connected to the system, it must be connected in parallel with the main Attendant console as shown in the figure.

Figure 51
Typical PFTU connection to the MDF and the Master System Monitor

Installation procedure

1   Install PFTUs according to the manufacturer's instructions.

2   Attach the yellow PFTU label to the BIX designation strip, indicating the top BIX connector as P1 and the bottom connector as P2.

3   Install two NE-A25B type 25-pair cables from connectors P1 and P2 on the front of the PFTU to the PFTU termination area at the MDF.

4   Cross-connect wiring for PFTU operation as shown in Table 4.

Table 4
MDF cross-connections for PFTU operations

Description	Connection
–48 V dc + return (GND)	PFTU connector P1, pin 49 PFTU connector P2, pin 49 and MDF GND
All grounds on system monitor cable	MDF GND
Console cable pin 11 Console cable pin 36	PFTU connector P1, pin 25 MDF GND
LFBEN (line forced bypass enable) LFBENR (line forced bypass enable return)	PFTU connector P1, pin 50 MDF GND
MDF GND	PFTU connector P2, pin 24
Note: At connector P1 on the PFTU, pins 25 and 50 are labeled SWE for "switch enable." When pin 25 is grounded by the attendant console or pin 50 is grounded by the system monitor, line transfer is activated.	

5 For AC-powered systems, install the A0367916 auxiliary power supply:

- Attach the unit to the wall using screws in the four mounting holes.

- Connect a #24 (or larger) AWG wire from the –48 V connection on the auxiliary power supply to the PFTU termination area on the MDF.

- Connect a #24 (or larger) AWG wire from the ground (GND) connection on the auxiliary power supply to the PFTU termination area on the MDF.

- Connect a second #24 (or larger) AWG wire from the GND connection on the auxiliary power supply to the Meridian 1 alarm termination area on the MDF.

- Plug in the A0367916 auxiliary power supply:

  If a UPS is used, you must plug the power supply into an auxiliary output on the UPS.

  Without a UPS, plug the power supply into an outlet in the equipment room.

6 For DC-powered systems, power the PFTU from the fused low-current auxiliary power outputs on the DC power system. One 1.33-amp fuse supports up to six PFTUs.

Connecting trunks and telephones

The "ground start" feature on 500/2500-type telephones connected to CO trunks requiring a ground start condition is not required. Automatic ground start is performed by the PFTU. However, rotary dials (dial pulse) are required on telephones assigned to trunks that are not equipped to recognize tone pulses (touch tone).

See the PFTU documentation for MDF cable terminations for telephones and trunks associated with the PFTU. If the connections are not designated on the connecting blocks, mark the blocks as shown in the documentation or install the appropriate designation strips.

1   For each telephone assigned to the PFTU:

- Connect the tip and ring of the line card to the first pair of the assigned PFTU.

- Connect the tip and ring of the telephone to the second pair of the assigned PFTU.

2   For each trunk assigned to the PFTU:

- Connect the tip and ring of the CO card to the third pair of the assigned PFTU.

- Connect the tip and ring of the trunk to the fourth pair of the assigned PFTU.

Installing QUA6 PFTUs (UK installations)

QUA6 PFTUs are used in United Kingdom Meridian 1 installations. The QUA6 PFTU is powered from an auxiliary –48V dc fused output from the external power equipment.

Figure 50 shows a high-level view of QUA6 PFTU alarm connections. For PFTU operation, wiring from the following equipment cross-connects through termination areas at the MDF:

— PFTU

— auxiliary –48 V dc

— system monitor

— attendant console (optional)

— designated telephones

— Central Office trunks

Configuring the system monitor

The NT8D22 System Monitor is used in options 21, 21E, 51, 51C, 61, 61C, 71, 81, and 81C. The NT7D15 System Monitor is used in only option 21A.

Configuring the NT8D22 System Monitor

The master NT8D22 System Monitor interfaces with a Serial Data Interface (SDI) port in the column with CPU 0.

1 Set the baud rate for the SDI port associated with the system monitor to 1200 baud in DTE mode.

2 In the rear of the pedestal, loosen the two retaining screws on the system monitor and remove it from the PDU.

3 Set the option switches for each system monitor. (See *Circuit card installation and testing* (553-3001-211) for a detailed description of switch setting options.)

For a single-column system, set the switches as shown in Table 5.

Note: Connect and cable the system monitor in a single-column system like a master system monitor for the rest of this procedure.

Table 5
NT8D22 switch settings for a single-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	on**	off	off	off	off
SW2	on	off	on	on	on	on	on	on
SW3	on	on	on	on				
* Set to on for a DC-powered system; set to off for an AC-powered system. ** Set to off if the system is not equipped with a PFTU.								

For a multiple-column system, set the system monitor in the column with CPU 0 as the master, using the settings shown in Tables 6 and 8.

Set option switches on slave system monitors as shown in Tables 7 and 9. If CPU 0 and CPU 1 are in different columns, set the system monitor in the column with CPU 1 as slave unit 1. Number the slaves sequentially wherever possible.

Table 6
Switch settings for *master* in multiple-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	on**	off	off	off	off
SW2	on	off	To set positions 3–8, see Table 8					
SW3	on	on	on	on				
* Set to on for a DC-powered system; set to off for an AC-powered system. ** Set to off if the system is not equipped with a PFTU.								

Table 7
Switch settings for *slaves* in multiple-column system

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	**	off	off	off	off
SW2	off	off	To set positions 3–8, see Table 9					
SW3	off	off	off	off				
* Set to on for a DC-powered system; set to off for an AC-powered system. ** Set to on to enable PFTU (if equipped) during over-temperature condition. Set to off to disable PFTU during over-temperature condition.								

Table 8
SW2 on *master*—total number of slaves in the system

How many slave units	Switch position						How many slave units	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
0	on	on	on	on	on	on	32	off	on	on	on	on	on
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off

Table 9
SW2 on each *slave*—unit number for the slave

Slave unit address	Switch position						Slave unit address	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off
32	off	on	on	on	on	on	58	off	off	off	on	off	on

Cabling the NT8D22 System Monitor

1   Remove the I/O safety panel in the rear of the module with CPU 0.

2   Connect the master system monitor to the SDI port.

For options 21, 21E, 51, 51C, 61, and 61C, connect the narrow ribbon on one of the cables listed below from connector J2 on the backplane to the assigned port on the SDI card (see Figure 52).

•   To connect an NT8D41 SDI Paddle Board, use an NT8D46AG cable.

•   To any other type of SDI card, use an NT8D46AD cable.

Figure 52
Options 21, 21E, 51, 51C, 61 and 61C—
cable master system monitor to SDI port
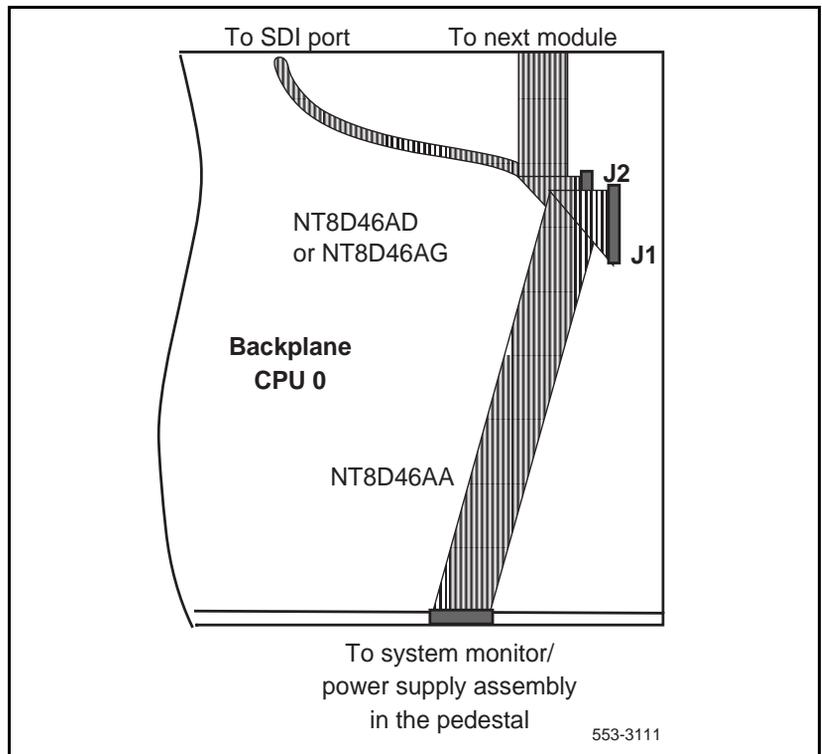
For options 71, 81, and 81C

- Connect the master system monitor to slave unit 1 with an
  NT8D46AS cable.

- Connect the narrow ribbon on an NT8D46AD cable from connector
  J2 in the module with CPU 0 to the assigned port on the SDI card
  (see Figure 53).

Figure 53
Options 71, 81, and 81C—cabling for master system monitor to slave unit 1 and SDI port
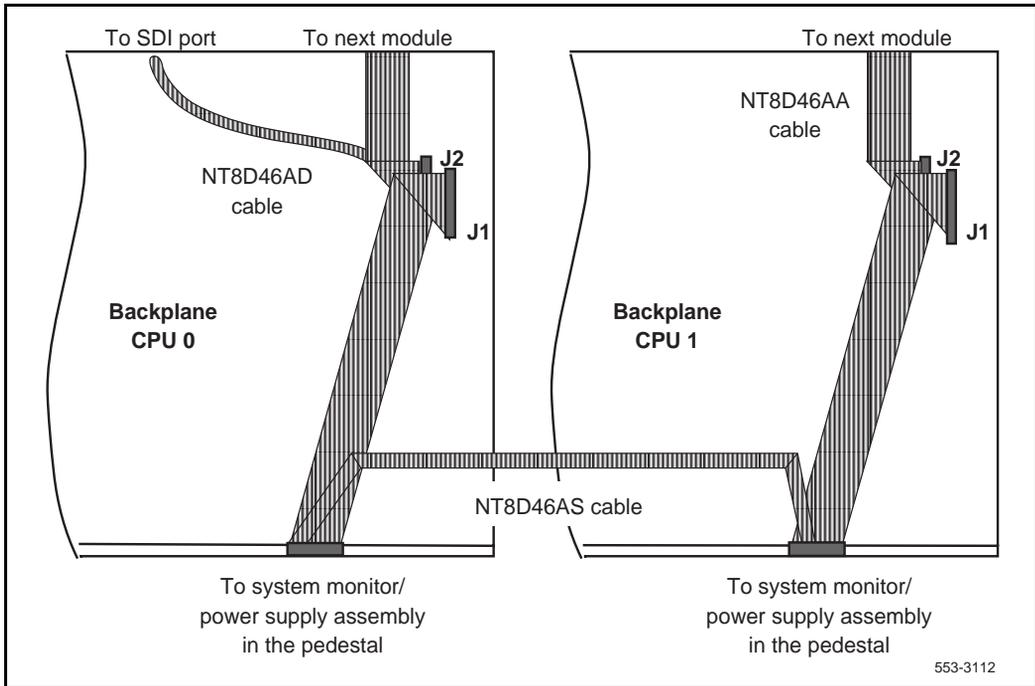
3 Daisy-chain slave system monitors to the master.

For a single-column system, skip this step.

For a multiple-column system, beginning with the master system monitor, cable in series (slave 1 to slave 2, slave 2 to slave 3, and so on) from connector J6 to connector J5 on each system monitor (see Figure 54). Terminate at connector J5 on the last column.

- If columns are adjacent, use an NT8D46AL cable.

- If columns are not adjacent, use an NT8D46AP cable.

Figure 54
Multiple-column system monitor connections
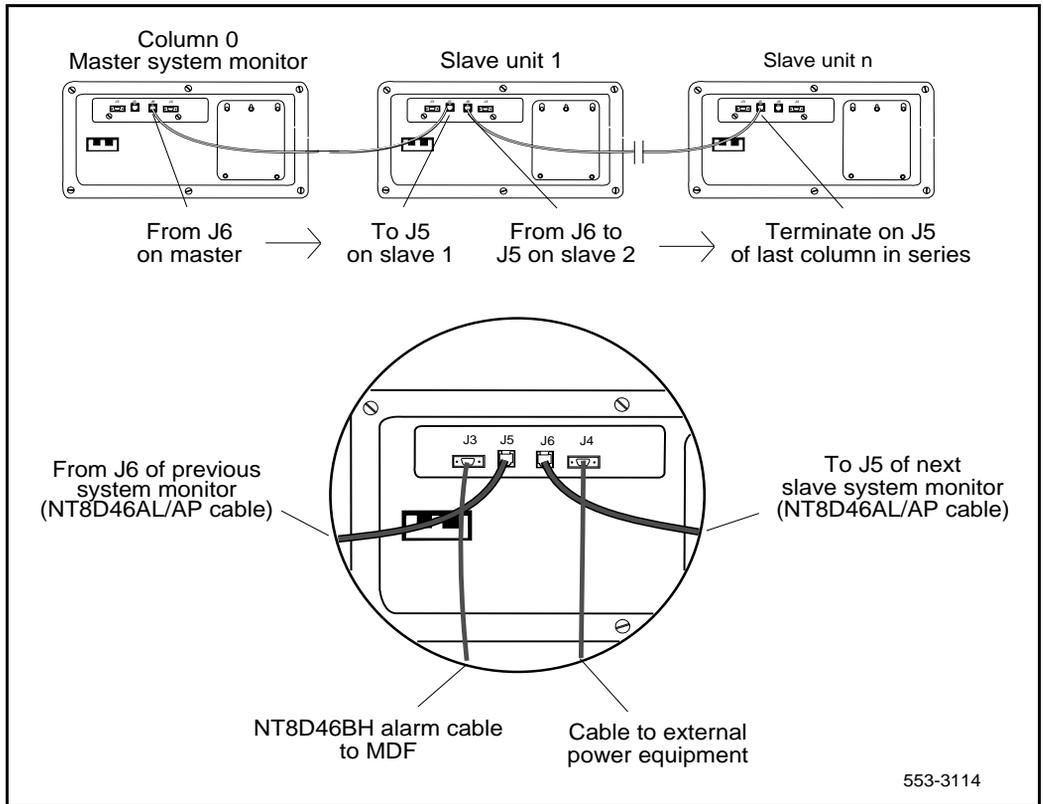
4   For PFTU or external alarm cabling, connect a system monitor to MDF cable:

- Connect a system monitor to MDF cable to connector J3 on the master system monitor.

- Connect the cable at the Meridian 1 alarm termination area at the MDF. See Table 10 for the terminating sequence.

Note 1:   The system monitor to MDF cable is available in three lengths: NT8D46BH (32 ft), NT8D46EH (100 ft), and NT8D46DH (150 ft).

Note 2:   If additional contact closures are required through the J3 REMALMA or REMALMB leads (for a hard alarm in case a column loses power, for example), additional system monitor to MDF cables can be ordered.

Table 10
NT8D22 System Monitor— pin assignments at J3

Pin	Direction	Color	Signal name	Description
1	out	BL/W	REMALMA	Remote major alarm (connect for external alarm)
2	out	OR/W	REMALMB	Remote major alarm return (connect for external alarm)
3	out	GR/W	CE-SYSLT	CE system line transfer (upgraded systems only)
4	—	BR/W	MDF0/GND	MDF return (ground)
5	in	SL/W	CEALMIN	CE alarm (upgraded systems only)
6	—	BL/R	SYSLTIN	System line transfer in (upgraded systems only)
7	out	W/BL	LFBEN	Line forced bypass enable (connect for PFTU operation)
8	out	W/OR	LFBENR	Line forced bypass enable return (connect for PFTU operation)
9	—	W/GR	GND	Ground
Note: Pins 6, 8, and 9 should be connected and grounded at the MDF.				

5   For AC-powered systems with a UPS:

- Connect the appropriate cable (see the following list) from connector J4 on the system monitor in the column with CPU 0 (the master system monitor) to the associated UPS. Table 11 gives the pin assignments and signal descriptions for the alarm cables.

  For a Best Inc. UPS, use an NT8D46AJ alarm cable.

  For an Exide UPS, use an NT8D46AQ alarm cable.

  For an Alpha UPS, use an NT8D46AU alarm cable.

- Connect the cable to the UPS as specified by the manufacturer.

- Repeat this step for each system monitor with an associated UPS (see Figure 55).

Table 11
NT8D22 System Monitor— pin assignments at J4

Pin	Signal description
1	Not used
2	Not used
3	Not used
4	Not used
5	Alarm 1 (AC fail; to UPS)
6	Alarm 1 return
7	Alarm 2 (Power sense; from UPS)
8	Alarm 2 return
9	Not used

Figure 55
UPS alarm cabling

Meridian 1 columns

J4 on system monitor   J4 on system monitor

UPS alarm cable

UPS for each column

553-3088
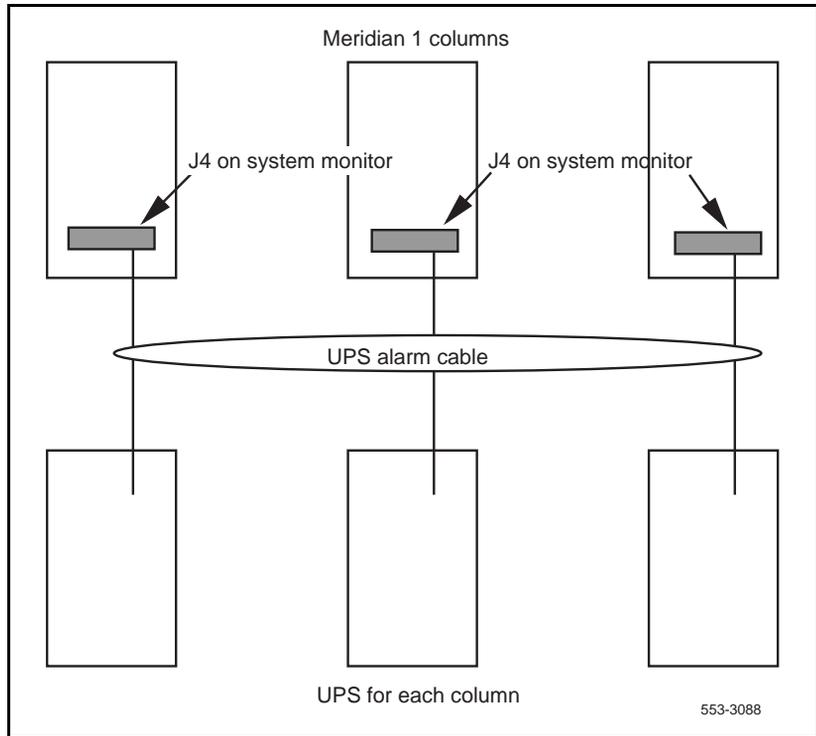
6   For DC-powered systems, extend the alarm and trip leads from connector J4 on the system monitor in the column with CPU 0 (the master system monitor) to the external power equipment using an NT8D46AV cable (Table 12).

Note 1: Conduit is not required.

Note 2: An NT8D46BV cable, 20 m (64 ft), or NT8D46CV cable, 33 m (100 ft), can be used instead of the NT8D46AV cable. Connections are the same as the NT8D46AV cable.

Table 12
Alarm and trip lead connections—NT8D46AV cable

Color	Description	Connection at control and distribution panel	
		Terminal block No	**Pwr Sys Alarm Name**
OR	Alarm	TB2 Position 6	Low Float
BL	DCON 0	TB4 Position 8	Rectifier Fail Alarm
R	DCON 1*	TB5 Position 2	Major Alarm
W	DCON 2*	TB5 Position 2	Major Alarm
GR	DCON 3*	TB5 Position 2	Major Alarm
* Connect the red, white, and green wires together at MJA.			

The System 600/48 Power Plant produces a Major Alarm for the fallowing faults:

— High voltage shut down (HVSD)

— High voltage (HV)

— Battery on discharge (BOD)

— Low voltage (LV)

— Low voltage disconnect (LVD)

— Alarm busy supply (ABSF)

— Internal fuse alarm (INT FA)

— Fuse alarm (FA)

— Rectifier fail alarm (RFA)

Installing the NT7D15 System Monitor

In option 21A, the NT7D15 System Monitor can be installed in any of the four slots on the rear of the backplane in the NT8D11 CE/PE Module. Note that there are no system terminal or SDI port connections to the NT7D15.

CAUTION

Cables must be *disconnected* when the system monitor is installed. When you connect the cables, follow the order given in this procedure or the system will shut down.

---

1   Remove the I/O safety panel in the rear of the CE/PE Module. Insert the system monitor into one of the slots on the rear of the backplane *before* you connect any cables to the system monitor.

2   Connect an NT8D40BJ cable from P1 on the system monitor to connector J1 on the backplane.

3   Connect an NT8D84BA cable from P2 on the system monitor to an available connector on the interior of the I/O panel; connect a system monitor to MDF cable from the external side of the I/O connector to the MDF (see Table 13).

Note: The system monitor to MDF cable is available in three lengths: NT8D46BH (32 ft), NT8D46EH (100 ft), and NT8D46DH (150 ft).

4   Connect an NT8D40BK cable from P3 on the system monitor to connectors C1 and C2 on the circuit breaker assembly in the pedestal.

Table 13
NT7D15 System Monitor—system monitor to MDF cable pin assignments at the MDF

Pin	Direction	Signal name	Description
1	out	REMALMA	Remote major alarm (connect for external alarm)
2	—	NC	Do not connect
3	—	NC	Do not connect
4	out	LFBEN	Line forced bypass enable (connect for PFTU operation)
5	—	GND	Ground
6	out	REMALMB	Remote major alarm return (connect for external alarm)
7	—	NC	Do not connect
8	—	GND	Ground
9	out	LFBENR	Line forced bypass enable return (connect for PFTU)
Note: Pins 5, 8, and 9 should be connected and grounded at the MDF.			

Connecting a system terminal (or modem)

At this point in the installation, a terminal must be connected to a serial data interface (SDI) port to provide an I/O interface to the system. When the installation is complete, a terminal (for local access) or a modem (for remote access) must remain permanently connected to an SDI port to provide a constant I/O interface to the system (see Figure 56).

Figure 56
Terminal connection diagram

Meridian 1

Terminal

Modem

To remote terminal
2- or 4-wire loop

NT8D95AJ
cable to
SDI port

553-3094
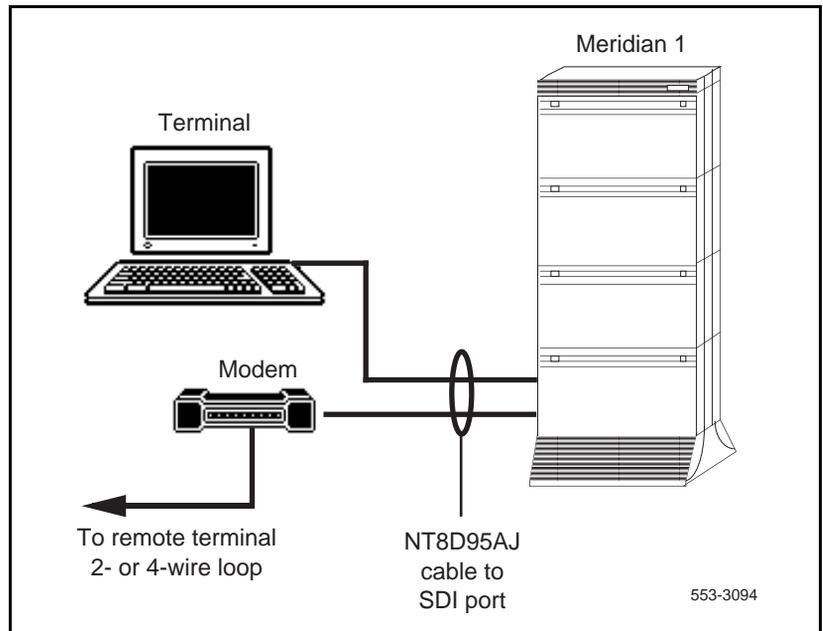
During the initial installation of a dual CPU system, you may want to temporarily install additional terminals for split mode monitoring, or programming, or both.

> *Note:* In options 61 and 71, SDI cards can be temporarily installed in CPU slots during a software conversion. In options 51C, 61C, 81, and 81C, I/O ports on the NT6D66 (or NT9D19) Call Processing (CP) Cards can be used to monitor CPU operations. These configurations should not be used as the permanent I/O connection for the system because the port is only active when the associated CPU, or CPU, is active.

For a modem connection to the Meridian 1, Bell 103/212 compatible dumb modems are recommended for all systems, except options 51C, 61C, 81, and 81C.

CAUTION

If a Hayes command-set compatible (smart) modem is used at the Meridian 1 end, you *must* select the dumb mode of operation, Command Recognition OFF and Command Echo OFF, before connecting the modem to the SDI port. Refer to the modem instructions to set the mode of operation.

If a printer is connected to an SDI port (locally or remotely), you must disable XON/XOFF flow control, so no characters or signals are sent to the port, to avoid a "ping-pong" effect.

> *Note:* For information specific to options 51C, 61C, 81, and 81C, see "Options 51C, 61C, 81, and 81C terminal and modem connections" on page 113.

Installing a Maintenance Terminal (TTY)

Note: Device 0 and 1 are already programmed in software and do not need to be enabled in software. Device 0 is used for the System Monitor and device 1 is available for the Maintenance TTY.

1   Install and cable a system terminal or a modem:

   • Unpack the terminal/modem and place it in its assigned location.

   • Install the terminal/modem according to the manufacturer's instructions.

   • Connect an NT8D95AJ cable to a matching connector on the terminal/modem.

   Note: At a remote location, install and connect a compatible modem and terminal. Connect the NT8D95AJ cable to the modem.

2   Install and cable the SDI card:

   • Set the Enb/Dis switch to Dis (down).

   • See *Circuit card installation and testing* (553-3001-211) to set the option switches for each port.

   See Figure 57 for switch locations on an NT8D41 SDI Paddle Board. (The paddle board cannot be used in options 71, and 81.)

   See Figure 58 for switch locations on an NTND02 MSPS Card. (The MSPS card is used in option 21E only.)

   • Insert the SDI card into its assigned slot.

   • Cable the SDI card:

   See Figure 59 to cable the NT8D41 SDI Paddle Board. (There is no faceplate on the paddle board; Figure 59 identifies the ports.)

   See Figure 60 to cable an NTND02 MSPS Card.

   See Figure 61 to cable a QPC841 Four-Port SDI Card.

   • Set the Enb/Dis switch to Enb (up).

3   Connect an NT8D95AJ cable from the terminal to the assigned SDI port.

Installing a secondary system terminal (or modem)

1   Install and cable a system terminal or a modem:

- Unpack the terminal/modem and place it in its assigned location.

- Install the terminal/modem according to the manufacturer's instructions.

- Connect an NT8D95AJ cable to a matching connector on the terminal/modem.

Note: At a remote location, install and connect a compatible modem and terminal. Connect the NT8D95AJ cable to the modem.

2   Install and cable the SDI card:

- Set the Enb/Dis switch to Dis (down).

- See *Circuit card installation and testing* (553-3001-211) to set the option switches for each port.

  See Figure 57 for switch locations on an NT8D41 SDI Paddle Board. (The paddle board cannot be used in options 71, and 81.)

  See Figure 58 for switch locations on an NTND02 MSPS Card. (The MSPS card is used in option 21E only.)

- Insert the SDI card into its assigned slot.

- Cable the SDI card:

  See Figure 59 to cable the NT8D41 SDI Paddle Board. (There is no faceplate on the paddle board; Figure 59 identifies the ports.)

  See Figure 60 to cable an NTND02 MSPS Card.

  See Figure 61 to cable a QPC841 Four-Port SDI Card.

- Set the Enb/Dis switch to Enb (up).

3 Software enable the SDI card:

- Define each SDI port in the Configuration Record (LD 17).

- Enable each SDI port using the appropriate software program for the port application. Typical SDI applications and associated programs include.

    Terminal and printer ports   LD 37
    Call Detail Recording (CDR) ports   LD 42
    Automatic Call Distribution (ACD) ports LD 48

4 Connect an NT8D95AJ cable from the terminal, or modem, to the assigned SDI port.

Figure 57
Ports and switches on the NT8D41 SDI Paddle Board

553-3174
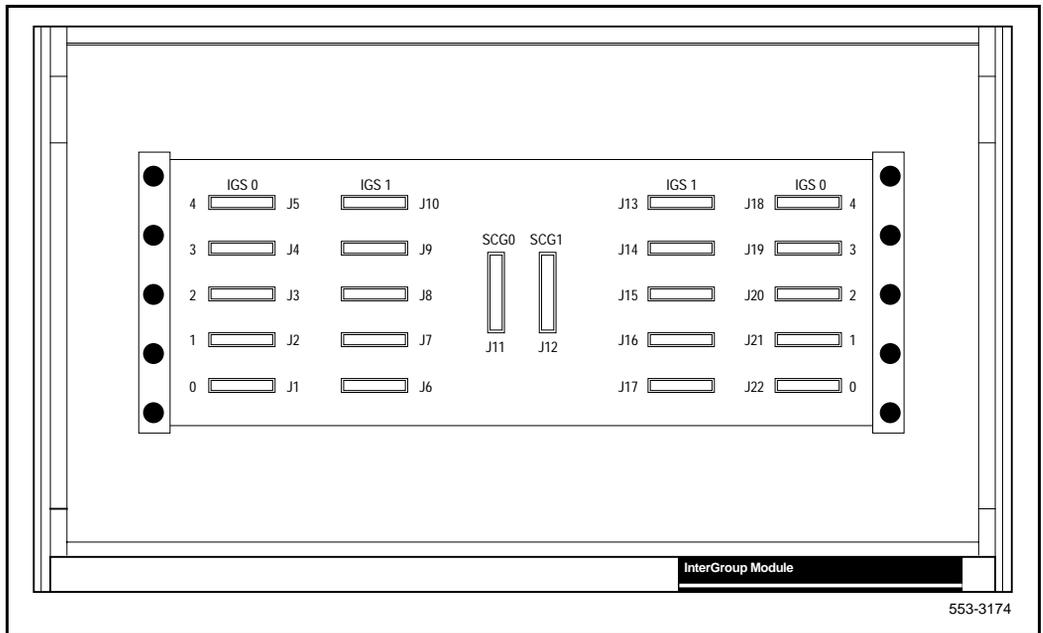
Figure 58
Switch locations on the NTND02 MSPS Card

LED

Enable

Disable

SW3

SW2

SDI cable
connector

SW5

SW4

SW6   SW7 SW8   SW9   SW10 SW11

Backplane
connectors

553-5419
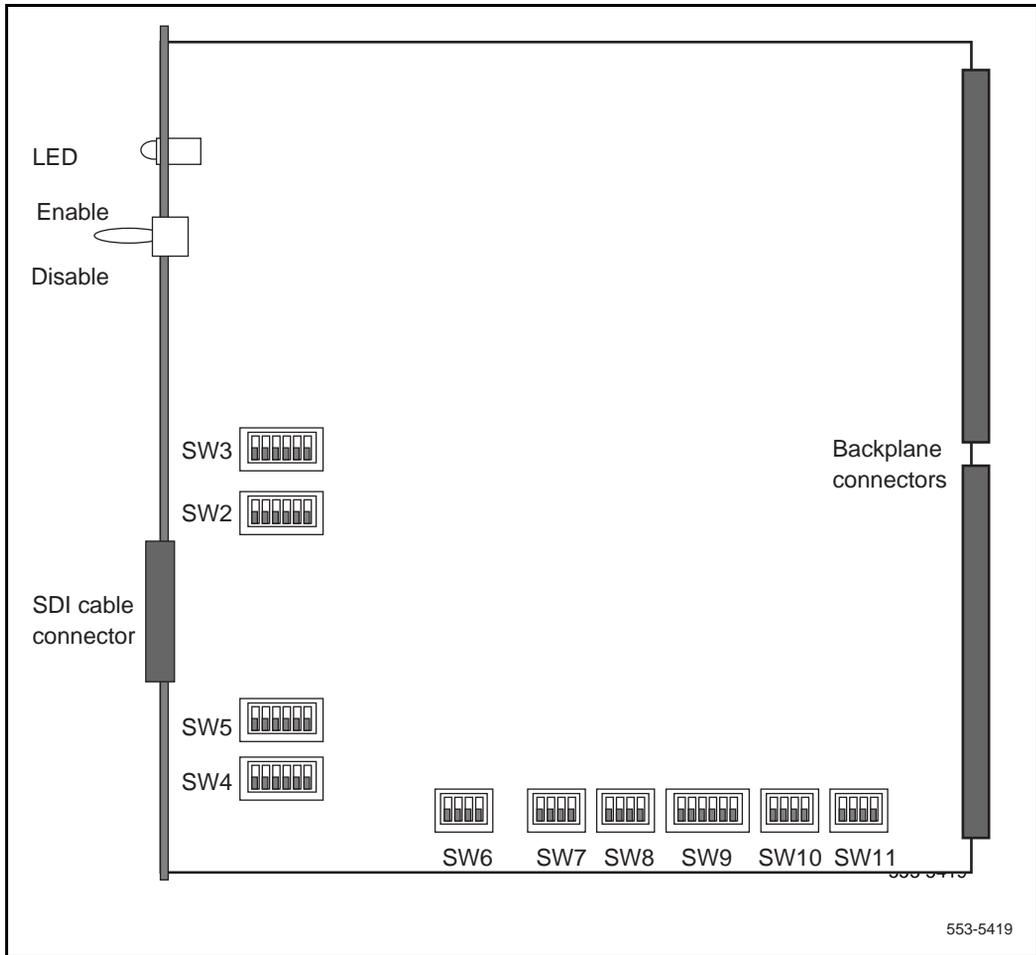
Figure 59
Cabling diagram for the NT8D41 SDI Paddle Board

Note: To connect J2 to external equipment, cable as shown for J1.

553-53819
553-5381
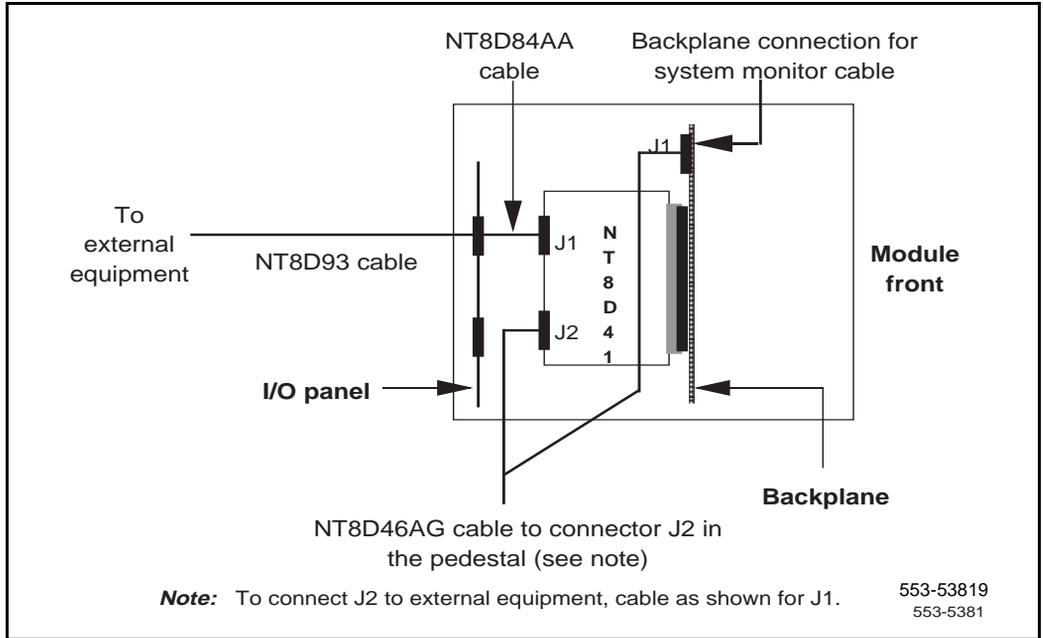
Figure 60
Cabling diagram for the NTND02 MSPS Card
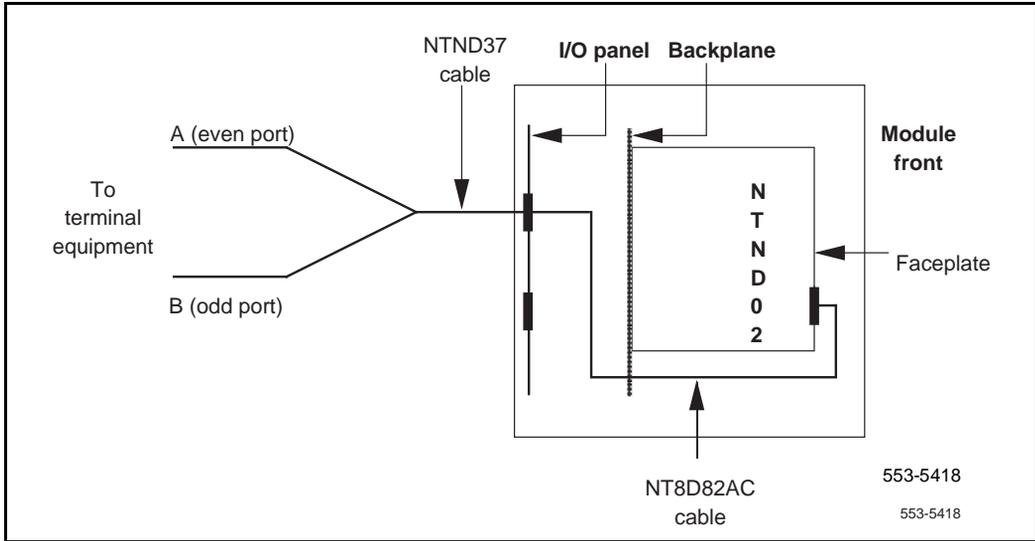
Figure 61
Cabling diagram for the QPC841 Four-Port SDI Card
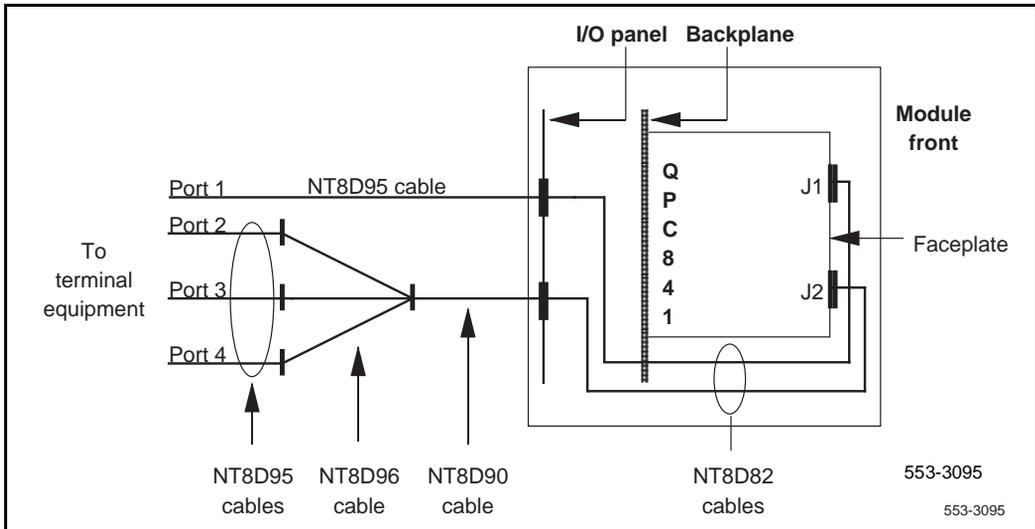
Options 51C, 61C, 81, and 81C terminal and modem connections

During the system installation and for continuing system operation, a terminal must be connected to an SDI port in a network slot to provide an I/O interface to the active CPU in the system. In addition, a data terminal equipment (DTE) port and a data communication equipment (DCE) port on each NT6D66 or NT9D19 CP Card can be used for direct access to the Core or Core/Network Module that houses the card. Typically, the CPSI ports are preconfigured on I/O addresses four and five.

The CP card ports (CPSI ports) are active only when the CPU associated with the CP card is active. Therefore, the CPSI ports should not be used as the only I/O connection for the system.

When the initial installation is complete, you must leave a terminal or a modem connected to the system. One SDI port in a network slot must be permanently connected to a terminal or modem. On the CPSI ports you can

— disconnect the ports

— leave terminals connected for local monitoring

— connect modems for remote monitoring

The Black Box ABCDE-Switch, which provides up to four-to-one switching, is available from Northern Telecom as part number A0377992. The switch box can be used to connect the SDI and CPSI ports to a terminal or a modem. If used, one switch box must be used for terminals and one for modems.

Options 51C, 61C, 81, and 81C terminal guidelines

During an installation, you can connect terminals to the CPSI ports for split mode monitoring, or programming, or both. (Due to the speed of the system messages displayed, personal computers are useful for file capture and review.) Terminals connected to the CPSI ports can be installed as follows:

— one terminal connects to a CPSI port in one CPU (the cable is switched from module to module as needed); one terminal is required in addition to the terminal for the SDI port connection (see Figure 62)

— one terminal connects to a switch box that connects to a CPSI port in each CPU: one terminal and a switch box are required in addition to the terminal for the SDI port connection (see Figure 63)

— one terminal connects to a switch box that connects to an SDI port and to a CPSI port in each CPU: one terminal and a switch box are required (see Figure 64)

The Option 51C has only one CPU module and requires only one CPSI terminal connection and one SDI port connection. A single terminal with a switch box can be used.

Connecting a terminal to a CPSI port

Use the following procedure to connect a CPSI port directly (no switch box) to a terminal (see Figure 62):

— Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.

— Connect an NT8D95 cable to a matching connector on the terminal.

— Connect the NT8D95 cable to J25 on the I/O panel in the rear of the Core or Core/Network Module.

— If you are using only one terminal for both CPSI ports, switch the cable as needed. The terminal connected to the SDI port will always communicate with whichever CPU is active.

Figure 62
One terminal for the CPSI ports
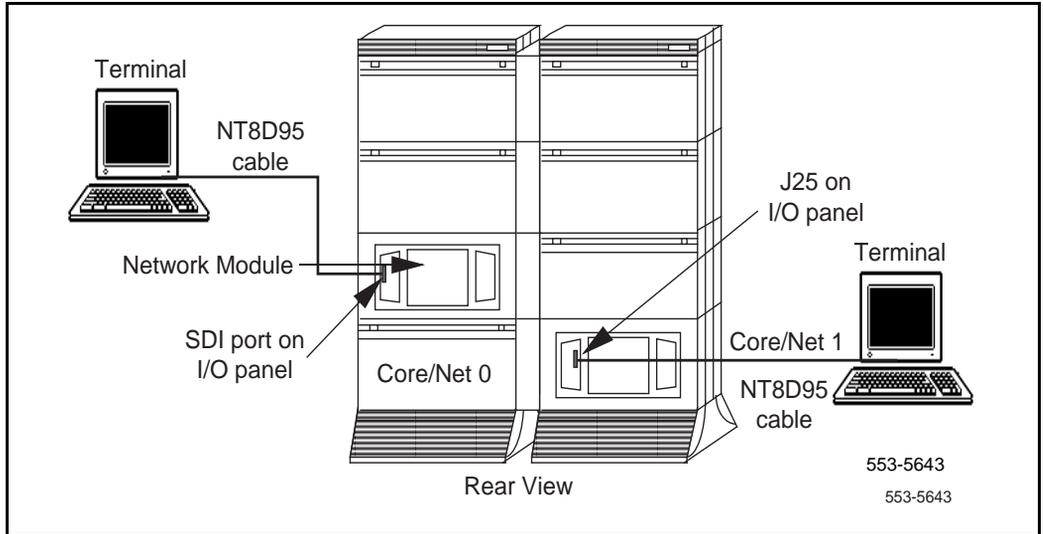
Connecting a switch box and terminal to CPSI ports

Use the following procedure to connect CPSI ports to a switch box and a terminal (see Figure 63):

— Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.

— Connect an NT8D95 cable to the terminal and to the switch box.

— Connect NT8D95 cables to a matching connector on the switch box.

If you are using an A0377992 ABCDE box, connect cables as follows:

• Connect CPU 0 to connector A.

• Connect CPU 1 to connector B.

— Connect the NT8D95 cables from the switch box to J25 on the I/O panel in the rear of the Core/Network Modules.

— To communicate directly with a CPSI port, switch the cable as needed. The terminal connected to the SDI port will always communicate with whichever CPU is active.

Figure 63
One terminal and a switch box to two CPSI ports

Note: The A0377992 switch box can be used in this configuration.
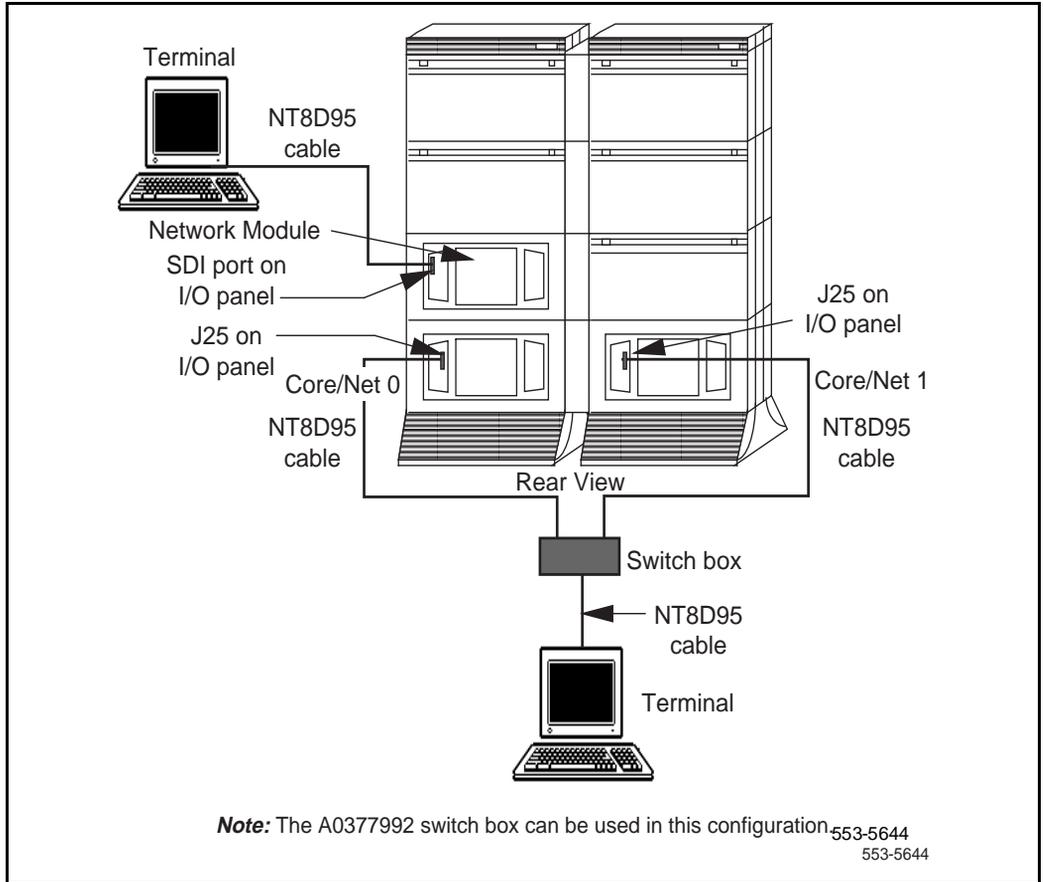
Connecting a switch box and terminal to the SDI and CPSI ports

Use the following procedure to connect CPSI ports to a switch box and a terminal (see Figures 63 and 64):

— Set the terminal to 9600 baud, 7 data, space parity, one stop bit, full duplex, XON.

— Connect an NT8D95 cable to the terminal and to the switch box.

— Connect NT8D95 cables to a matching connector on the switch box.

    If you are using an A0377992 ABCDE box, connect cables as follows:

    • Connect CPU 0 to connector A.

    • Connect CPU 1 to connector B.

    • Connect the SDI port to connector D (connector C is common).

— Connect NT8D95 cables from the switch box to J25 on the I/O panel in the rear of each Core or Core/Network Module.

— Connect an NT8D95 cable from the switch box to the I/O panel slot for the SDI card.

— To communicate with the system in general, set the switch box to the SDI port. To communicate directly with a CPSI port, switch the cable as needed.

Figure 64
One terminal and a switch box to the SDI and CPSI ports

Network Module

SDI port on I/O panel

J25 on I/O panel

Core/Net 0

NT8D95 cables

J25 on I/O panel

Core/Net 1

NT8D95 cable

Rear View

Switch box

NT8D95 cable

Terminal

Note: The A0377992 switch box can be used in this configuration.

553-5654
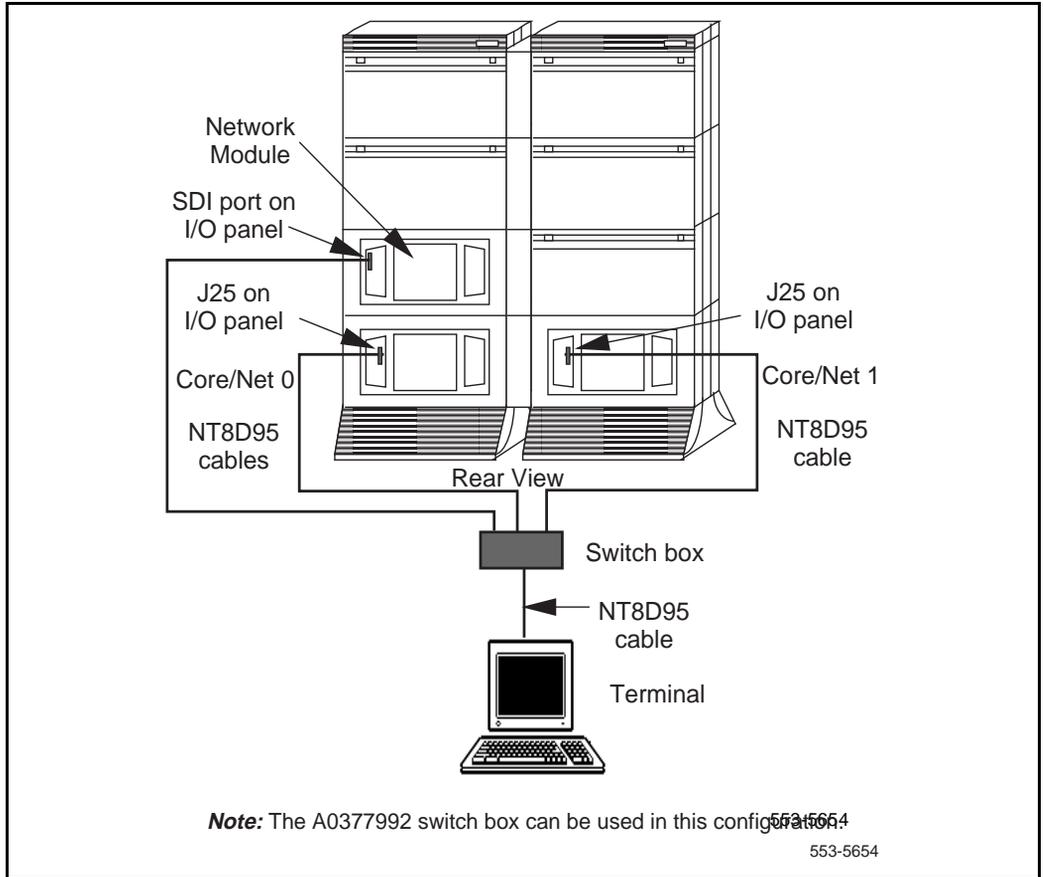
Options 51C, 61C, 81, and 81C modem guidelines

You can connect a modem to an SDI port to remotely monitor general system operation. Or you can connect a modem to the CPSI ports for debugging and patch downloading (through your Northern Telecom representative). Or you may want a remote connection to both the SDI and CPSI ports.

At the Meridian 1 end (the local end), modems must be set to dumb mode (command recognition OFF, command echo OFF). Modems at the local end can be connected as follows:

— one modem connects to the SDI port and the cable is switched to each CPSI port as needed (see Table 65 on page 128)

— one modem connects to a switch box that connects to the SDI and CPSI ports (see Table 66 on page 130)

> *Note:* The second method listed here is preferred. Other configurations, such as a separate modem for each port, are possible.

At the remote end, at least one modem (which can be set to smart mode), one terminal, and one RS-232 cable are required in all modem configurations.

Modems at the local end must meet the following required specifications to be compatible with options 51C, 61C, 81, and 81C. Modems that meet the following recommended specifications must also meet the required specifications.

— *Required:* true, not buffered, 9600 baud support (required for remote Northern Telecom technical support)

— *Required:* CCITT V.32 or V.32bis compliance

— Recommended: the ability to adjust to lower and higher speeds, depending on line quality, while maintaining 9600 baud at local DTE

— Recommended: V.42 error correction

— Recommended: V.42 bis data compression

A dispatch or call back modem, normally connected to the SDI port, can be used if it meets the requirements. If you want to use a modem of this type that does not meet the requirements, the modem can only be used in addition to a modem that does meet specifications.

Any modem that meets the required specifications should be compatible with options 51C, 61C, 81, and 81C. The following models have been tested and verified as compatible:

— Hayes V-series ULTRA Smartmodem 9600

— UDS FastTalk V.32/42b

— US Robotics Courier HST Dual Standard V.32bis

The UDS FastTalk modem is available through Northern Telecom as part number A0381391. The modem is equipped with a 6-ft power cord for a standard 110 V ac wall socket and a cable that connects to an RJ11C jack. (The A0377992 Black Box ABCDE-Switch can be used with the UDS FastTalk modem.)

Configuring the Motorola 28.8 Data/Fax Modem

Use the following procedure to configure a Motorola 28.8 Data/Fax Model 3400 modem for operation with options 51C, 61C, 81, and 81C.

The modem can be configured:

— for local mode of operation

— for remote mode of operation

Note: After the modem is configured, power down of the modem will not result in loss of the configuration settings. However, by pushing the RESET button on the modem and holding it down until the "MR" light flashes 5 only, and by releasing the RESET button before the next 5 flashes start, will reset the modem to its factory default settings. It will then be necessary to reconfigure the modem to the settings required for operation with Meridian 1 systems.

Installation procedure

1   Unpack the modem and read the installation instructions included with the modem.

2   Position the modem in its designated space, install its power cord, and plug it into the power receptacle.

3   Connect a 25-pin RS-232 cable to the modem and to a terminal.

Local configuration procedure

1   Set the terminal with these parameters:

   • 9600 baud

   • 8 data bits

   • 1 stop bit

   • no parity

2   Install the communication utility program shipped with the modem or use an appropriate alternate communication utility program such as Procomm, Telix, SmartCom, Bitcom, or CrossTalk.

3   Enter the following command string in one line, followed by the carriage return <cr>:

AT&F \Q0 &S1 S0=1 S7=60 S2=128 Q1 E0 &W &W1 <cr>

After you press the carriage return <cr>, the modem will appear to have stopped functioning. This is normal.

4   Power off the modem and connect it to a Call Processor CPSI port in the Meridian 1 system. To do this:

- Set the power switch to OFF.

- Connect the NT8D95 cable between the modem and the J25 on the I/O panel at the rear of the Core/Network module.

- Connect the modem to the telephone jack (RJ11) using the RJ11 telephone cord. If the cord is not supplied, use the NT8D46 cable.

- Turn the power switch on the modem to ON.

The modem is now configured for local communication with the Meridian 1 system.

Remote configuration procedure

To configure a modem in the remote mode, connect the modem as described above in "Local configuration procedure" and proceed as follows:

1   To place the modem in the remote configuration mode:

- Press and hold the RESET button until the "MR" light flashes 10 times. There is a 3 second pause before each set of five flashes are received. The "AA" lite comes on at the beginning of the last five flashes and remains on.

- Do not release the RESET button until you receive all 10 flashes, the "MR", and the "AA" lights are on. The modem is now placed in the remote mode.

2   Dial up the modem at 9600 bps.

Note: Dialing up the modem at a baud rate other than 9600 bps will result in configuration errors.

3   Enter five equal signs (=====) after you received the connection message.

4   Press carriage return <cr> after the PASSWORD prompt appears.

5   RC ESTABLISHED prompt will appear. Now you can enter the following commands, each followed by the carriage return <cr>:

AT\Q0	<cr>	Disable Computer Flow Control
AT&S1	<cr>	DSR on when ready to accept data
ATS0=1	<cr>	Answer on the first ring
ATS7=60	<cr>	How long to wait for carrier
ATS2=128	<cr>	Escape sequence character
AT*NT	<cr>	Turn AT command set OFF (very important)
ATQ1	<cr>	Response display OFF
AT&W	<cr>	Write to first profile
AT&W1	<cr>	Write to second profile
AT*RQ	<cr>	End remote configuration and save changes

6   The modem is now configured for remote communication with the Meridian 1 system.

Configuring an A0381391 UDS FastTalk modem

Use the following procedure to configure a UDS FastTalk modem for operation with options 51C, 61C, 81, and 81C.

Note: With the exception of the smart/dumb mode jumper setting, configuration changes to the modem are made through software. The modem must remain in smart mode (as shipped) until the software configuration is complete.

- ATE   turn off local character echo
- ATS0=2 enable autoanswer on second ring
- ATDT   set for tone dialing (default is pulse dialing)
- AT&W   store changes in profile 0
- AT&Y   use profile 0 at power up

1   Disconnect the power cord, RS-232 cable, and any other cables from the modem.

2   Remove the top cover on the modem:

- Stand the unit on its side.

- Using a medium-size flat screwdriver, lightly pry the four lock tabs off the locks (located on the bottom of the case) and pull the cover away from the modem as the locks release.

3   Set the modem to smart mode:

- Locate the option jumper. The jumper is located just to the left of the speaker (when viewed from the front of the modem).

- Place the jumper on the two pins farthest from the speaker.

4   Connect a 25-pin RS-232 cable to the modem and to a terminal.

5   Set the terminal with these parameters:

- 9600 baud (no other speeds will work)

- 8 data bits

- 1 stop bit

- no parity

Note: The modem will communicate at 9600 bps *only;* the terminal or computer must be set to 9600 bps also.

6   Enter the following commands to set compatible parameters. Follow each command with a carriage return (press the "Return" or "Enter" key):

AT&F	load active profile containing factory settings
AT\N0	select normal mode, error control disabled
AT\Q0	set serial port flow control
ATV3	form-of-response message = DTE
AT&D2	modem disconnects when DTR signal is lost
AT&S1	select DSR control
ATS0=1	answer after 1 ring
ATS2=128	escape character = ascii 128
ATS7=60	pause 1 second for carrier detection
ATQ1	

After you enter this last command (ATQ1), the modem no longer responds with "OK". Enter the next command:

AT&W	store active profile

The modem should respond to every command (except the last two commands) with "OK". If you do not get this response, turn the modem off and on and try again.

7   Disconnect the power cord and serial cable.

8   Set the modem to dumb mode:

- Locate the option jumper. The jumper is located just to the left of the speaker (when viewed from the front of the modem).

- Place the jumper on the two pins closest to the speaker.

9   Replace the cover on the modem:

- Align the tabs, locks, and rear guide grooves.

- Press the cover into place until the locks and the tabs snap together.

10   Reconnect the power cord and any other cables that will be used.

Connecting a modem to an SDI port

Use the following procedure to connect an SDI port directly (no switch box) to a modem (see Figure 65):

— At the remote end, connect an RS-232 cable to the terminal and to the modem.

— At the remote end, connect the cable from the modem to an RJ11 telephone jack. (If a cable is required, connect an NT8D46 cable to the modem and to the RJ11 jack.)

— At the local end, configure the modem:

  • If you are using an A0381391 UDS FastTalk modem, follow the instructions in this document.

  • If you are using a different type of modem, follow the manufacturer's instructions to set the modem for 9600 baud, autoanswer, dumb mode, command recognition OFF, command echo OFF.

— At the local end, connect an NT8D95 cable to the SDI port on the I/O panel in the rear of the module and to the modem.

— At the local end, connect the cable from the modem to an RJ11 telephone jack. (If a cable is required, connect an NT8D46 cable to the modem and to the RJ11 jack.)

— To communicate with a CPSI port, switch the cable from the modem to the port as needed:

  • For debugging or monitoring, connect the cable to the *active* CPU at J21 on the I/O panel in the rear of the Core/Network Module.

  • For patch downloading, connect the cable to the *inactive* CPU at J21 on the I/O panel in the rear of the Core or Core/Network Module.

Connecting a modem to a switch box and CPSI and SDI ports

Use the following procedure to connect SDI and CPSI ports to a switch box and a modem (see Figures 66 and 67):

— At the remote end, connect an RS-232 cable to the terminal and to the modem.

Figure 65
Modem to SDI port
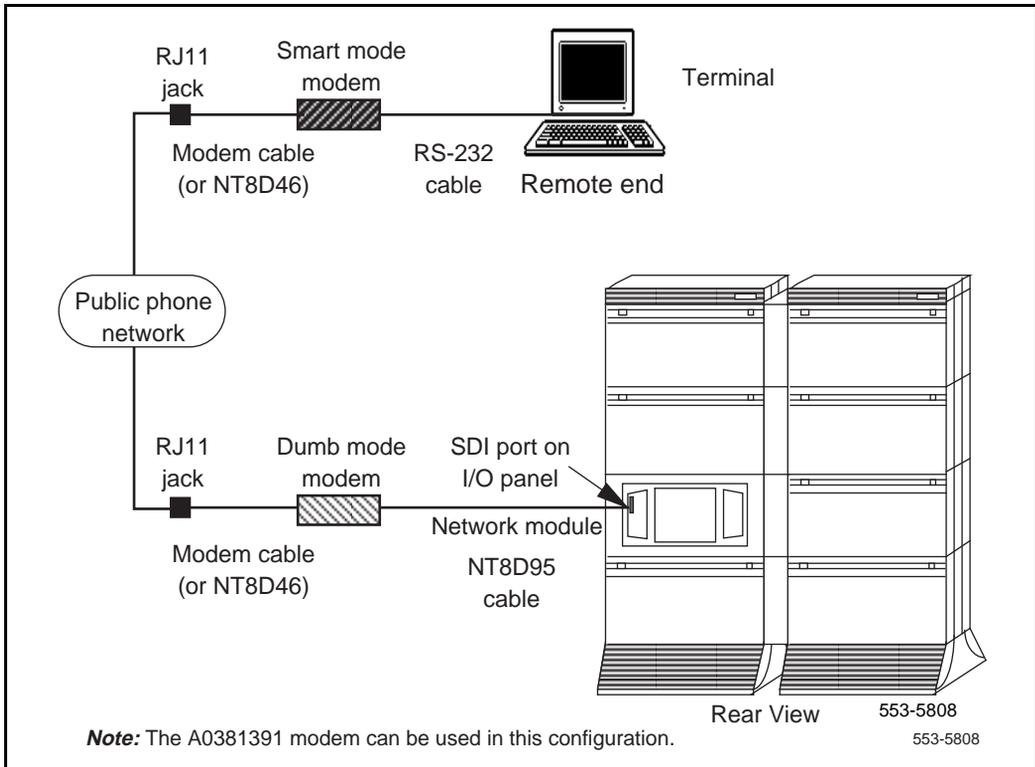
Note: The A0381391 modem can be used in this configuration.

— At the remote end, connect the cable from the modem to an RJ11 telephone jack. (If a cable is required, connect an NT8D46 cable to the modem and to the RJ11 jack.)

— At the local end, configure the modem:

  • If you are using an A0381391 UDS FastTalk modem, follow the instructions in this document. (See "Configuring an A0381391 UDS FastTalk modem" on page 125.)

  • If you are using a different modem, follow the manufacturer's instructions to set the modem for 9600 baud, autoanswer, dumb mode, command recognition OFF, command echo OFF.

— At the local end, connect NT8D95 cables to

- J21 on the I/O panel in the rear of the Core or Core/Network Modules

- the SDI port on the I/O panel in the rear of the Network module

— At the local end, connect NT8D84 cables to

- the SDI Paddle Board at the Core/Network backplane to the I/O panel in the rear of the Core/Network Module.

— At the local end, connect NT8D95 cables from the I/O panels to a matching connector on the switch box.

If you are using an A0377992 ABCDE box, connect cables as follows:

- Connect CPU 0 to connector A.

- Connect CPU 1 to connector B.

- Connect the SDI port to connector D (connector C is common).

— At the local end, connect an NT8D95 cable from the switch box to the modem.

— At the local end, connect the cable from the modem to an RJ11 telephone jack. (If a cable is required, connect an NT8D46 cable to the modem and to the RJ11 jack.)

— At the local end, set the switch box as needed to communicate with the CPSI ports:

- During normal operation, set the switch to the SDI port.

- For debugging, set the switch to the *active* CPU.

- For patch downloading, set the switch to the *inactive* CPU.

Figure 66
Modem to a switch box and SDI and CPSI ports (dual-column systems)

Note: The A0377992 switch box and A0381391 modem can be used in this configuration.

553-5809

Figure 67
Modem to a switch box and SDI and CPSI ports (single-column systems)

553-6300
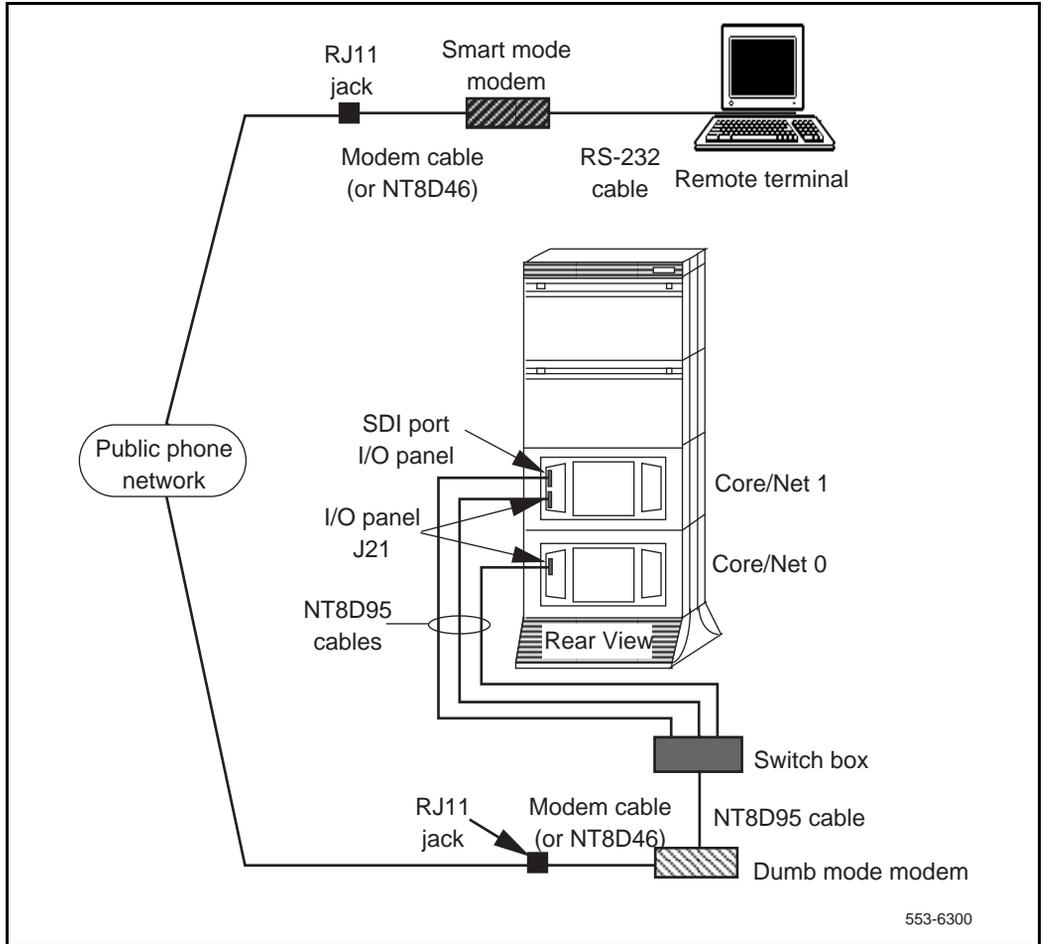
Cabling common equipment

Note: This procedure does not apply to the option 51C system.

Use the following guidelines for routing common equipment cables for options 61C, 81, and 81C:

— When routing CNI to 3PE cables, store any excess cable length near the associated Network Module. Do not store excess cable in the Core/Net Module.

— When routing DIGS to intergroup cables, store excess length near the InterGroup Module.

Because the cable troughs and spaces on the sides of a module are within the EMI shielding of the system, unshielded cables can be routed in those areas. As space permits, common equipment cables can be routed:

— horizontally in the cable troughs at the front, rear, and sides of the module

Note: In a DC-powered module, because there is no MPDU, there is room to route cables horizontally from front to rear on the left side (front view) of the module.

— vertically on the sides of the module

CAUTION

Cables must be routed as perpendicular as possible to any nearby power cables. Avoid routing cables near power cables if alternate routing is available. (At the rear of the module, cables routed between the I/O panel and the rear cover can be parallel to the power cables because the panel provides EMI shielding.)

System option 61C

Option 61C is a dual CPU system with standby processing capability, fully redundant memory, and a full network group. Two Core/Net Modules and one IPE Module are required. Additional IPE Modules, PE Modules, RPE Modules, and application modules can be used.

Figure 68 shows a basic configuration.

Figure 68
Option 61C dual CPU, full network group
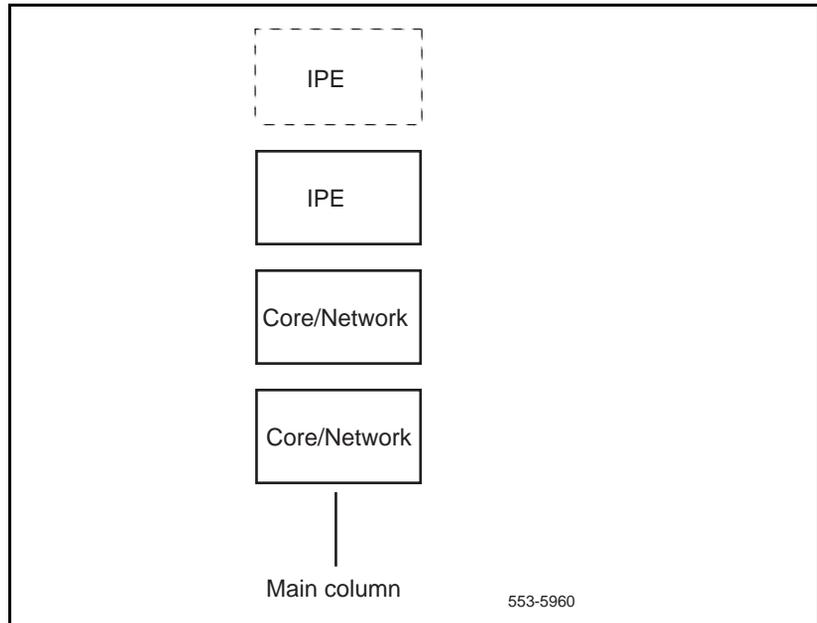
CNI configuration

In the NT5D21 Core/Net Module, port 0 on the NT6D65 Core to Network Interface (CNI) Card in slot 12 must be configured as "group 0." Communication between the CNI and 3PE cards for group 0 is accomplished through the backplane; no cable is required.

Since only one network group is supported in option 61C, only one CNI card is required. The CNI card must be installed in slot 12 in the Core/Net Module, and Port 0 is dedicated to "group 0."

Cable installation guidelines

Core/Net module backplanes, like all circuit boards, have a primary side and a secondary side. The primary side, which faces the front of the module, contains the primary shrouds, which provide mechanical guidance for the pins of the card edge connectors. The secondary side of the backplane, which faces the rear of the module, contains the secondary shrouds, which provide mechanical guidance for cable connectors.

The columns of secondary backplane shrouds are designated 18 through 12 from left to right (facing the rear of the backplane). This numbering matches the card slots in the front of the module. The connector rows of secondary backplane shrouds are designated A through F from top to bottom.

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

1   Orient the cable connector so the strain relief paddle is to the right.

2   Partially insert the cable connector so its guides mate to the corresponding backplane connector.

3   Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Using the cable extraction tool

To disconnect cables from the Core/Net Module backplane, you will be required to use the P0741489 Extraction Tool provided, located in the rear of the module (behind the I/O safety panel).

CAUTION

You must use the extraction tool to disconnect cables from the backplane in NT5D21 Core/Net Modules to avoid bending or breaking backplane pins. Do not improvise with common hand tools.

CAUTION

You must use the P0741489 Extraction Tool to disconnect cables from the backplane shrouds in NT9D11 Core/Network Modules.
Follow the procedure below to avoid bending or breaking pins when removing cable connectors from the backplane shrouds. Do not insert the extraction tool unless the cable connector is locked into the shroud. Do not force the extraction tool deeper than the detent on the cable connector.

Follow the procedure below to remove cable connectors from the backplane. Use extreme caution to avoid bending or breaking backplane pins. Do not insert the extraction tool unless the cable connector is locked into the securing clip; a gentle tug on the cable will allow you to determine whether or not the connector is secured. Do not force the extraction tool deeper than the tab on side of the cable connector hood.

1   Grasp the cable connector by the strain relief tab.

2   Center the long flat edge at the angled end of the tool between the cable connector hood and the securing clip.

   Note: If the straight end of the tool is notched, use that end if the connector can be accessed straight-on. If you must approach the connector from any angle at all, use the angled end.

3   Gently insert the extraction tool and gradually apply pressure in the direction directly toward the backplane while gently pulling the cable away from the backplane. A gentle side-to-side rocking motion may be used on the cable if needed.

CAUTION

Do not pry the against the connector with the extraction tool. Simply inserting the tool between the connector and the securing clip is sufficient to unlock the connector. Prying may cause damage to the connector or the backplane pins.

---

4   Stop applying pressure as soon as the cable connector comes loose from the backplane.

5   Slowly remove the extraction tool and the cable connector.

Cable installation procedures

A P0738866 label kit is included in all option 61C packages. The kit is included in all packages because the preprinted labels may be useful. Use of the labels is optional.

1   Connect network half-group 0 in Core/Net 0 to half-group 1 in Core/Net 1:

   •   Cable the D connectors (on the rear of the backplane) together with an NT8D99AB cable.

   •   Cable the E connectors (on the rear of the backplane) together with another NT8D99AB cable.

   •   Figure 69 shows the D and E connectors on the backplane of the NT5D21 Core/Net Module and the cables required.

Figure 69
NT5D21 Core/Net Module (rear view)—location of D and E connectors
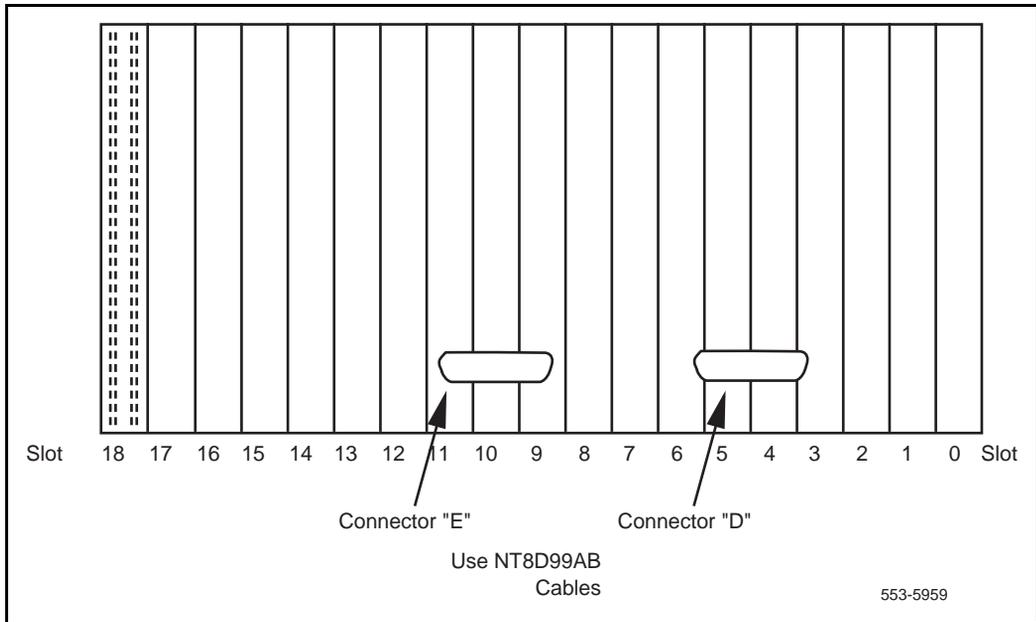
2   At the rear of the module, remove the left I/O panels. Verify that the following cables are installed in both Core/Net Modules (see Figure 70):

   •   An NT7D89 RS-232 cable (CP to I/O panel) should be connected to backplane connector position 15D and to ports J21 and J25 on the I/O panel. Check the labeling on the cables to identify the J21 and J25 connectors.

   •   An NT7D90 Ethernet cable should be connected to backplane connector position 17F and to port J28 on the I/O panel.

3   On the faceplates of the 3PE cards in the Core/Net Modules:

   •   connect an NT8D80BZ cable from J4 in Core/Net 0 to J4 in Core/Net 1

   •   connect another NT8D80BZ cable from J3 in Core/Net 0 to J3 in Core/Net 1.

4   In the rear of the Core/Net Modules, connect the cables between Core/Net 0 and Core/Net 1 (see Figure 71 on page 140):

Figure 70
NT5D21 Core/Net Module (rear)—pre-installed backplane connections
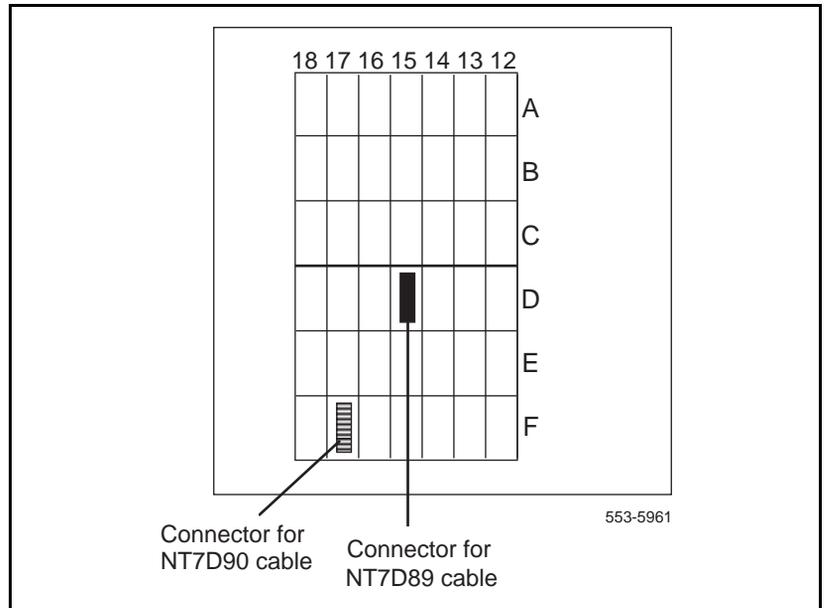
553-5961

Connector for
NT7D90 cable

Connector for
NT7D89 cable

Note 1: The following cables may already be connected in one of the modules. If so, leave them connected and attach the loose end.

Note 2: The cables must be routed as perpendicular as possible to nearby power cables.

- Connect the NTND13 IOP to IOP SCSI Cable from backplane connector position 17A in Core/Net 0 to backplane connector position 17A in Core/Net 1 (see Figure 71).

- Connect one NTND11 CP to CP Cable from backplane connector position 15C in Core/Net 0 to backplane connector position 15C in Core/Net 1 (see Figure 71).

- Connect another NTND11 cable from backplane connector position 15A in Core/Net 0 to backplane connector position 15A in Core/Net 1 (see Figure 71).

- Reinstall the left I/O panels in both Core/Net Modules. Use and tighten all eight screws.

Figure 71
NT5D21 Core/Net Module (rear)—connections for IOP/CMDU to IOP/CMDU and CP to CP cables
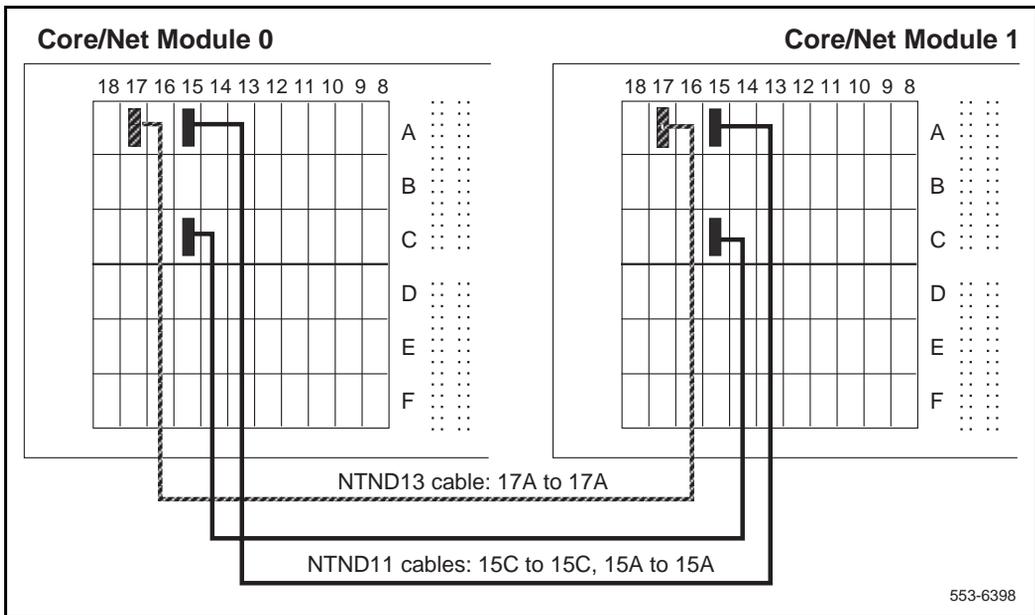
5   Interconnect the clock controller cards in both Core/Net Modules (see Figure 72).

- Connect an NT8D75 (BC or BD length as needed) from the faceplate connector on the clock controller card in Core/Net 0 to the faceplate connector on the clock controller card in Core/Net 1.

Figure 72
NT5D21 Core/Net Module (front)—clock controller card connections
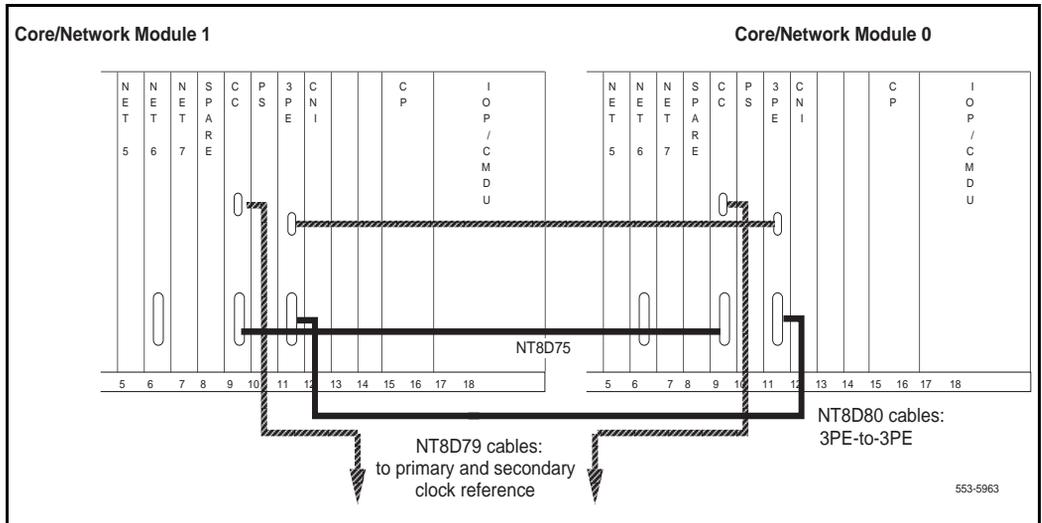
6   If PRI/DTI cards are equipped in the Core/Net Modules, connect the faceplate cables.

Note: For detailed instructions on PRI/DTI connections, see *ISDN Primary Rate Interface installation* (553-2901-200).

- Connect a QCAD133 cable from connector J4 on the card to the I/O panel.

- Connect an NT8D85 cable from connector J3 on the card to the selected QPC414 Network Card.

- If needed, connect two NT8D79 cables from connectors J1 and J2 on the card to the respective clock controller cards in each Core/Net Module.

System option 81

Option 81 is a dual CPU system with standby processing capabilities, fully redundant memory, and up to five full network groups. Option 81 is equipped with two redundant disk drive units.

The following modules are required:

— two Core Modules

— one InterGroup Module

— a minimum of two Network Modules (provides one network group)

— a minimum of one IPE Module

Additional Network and IPE Modules are required for additional network groups. PE Modules, RPE Modules, and application modules can also be used.

Note: The terminating plugs in the InterGroup Module for unused connectors are pre-installed in the factory. These should be removed only when additional groups are installed. Remove a plug just before the connector is installed for a new group and installed a plug immediately after a cable is disconnected when a group is removed.

Figure 73 shows a typical configuration for five full network groups. Additional columns can be added, and there can be more than one row of columns.

CNI configuration

In the NT6D60 Core Module, port 0 on the NT6D65 Core to Network Interface (CNI) Card in slot 8 must be configured as "group 5." This is not equivalent to a network switching group (groups 0–4). "Group 5" extends the CE bus to the interface section in the Core Module. This extension is through the CNI card in slot 8, backplane bussing, and a QPC441 3-Port Extender (3PE) Card in slot 7. No cable is used.

Figure 73
Option 81 dual CPU, multiple network group configuration
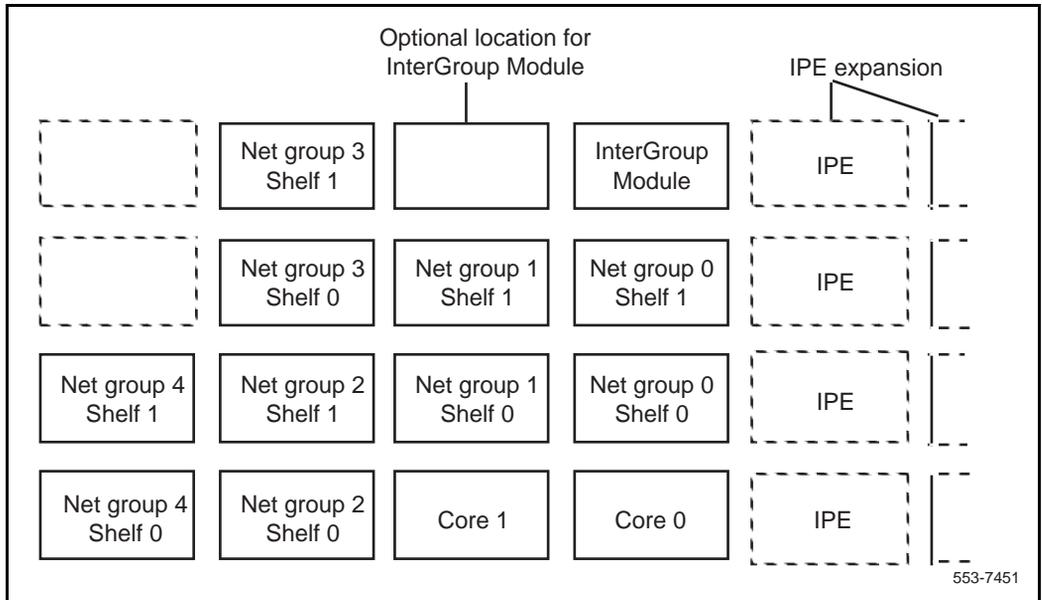
There are two ports on each CNI card. However, if only one CNI card is equipped, only one network group is supported. This is because the CNI card must be installed in slot 8 in the Core Module, and Port 0 is dedicated to "group 5." Only Port 1 is available to support a network switching group. Therefore, to support two network groups, two CNI cards are required. To support three network groups, still only two CNI cards are required, because one port is available in slot 8 and two ports are available on the second CNI card.

In a typical configuration, there are three CNI cards for five network groups (see Table 18) in each Core Module.

Table 14
Typical CNI configuration (option 81)

CNI card slot / port	Network group supported
CNI 8 / Port 0	Core bus extender (preconfigured as "group 5")
CNI 8 / Port 1	Group 0
CNI 9 / Port 0	Group 1
CNI 9 / Port 1	Group 2
CNI 10 / Port 0	Group 3
CNI 10 / Port 1	Group 4

Note: Each port on the CNI card provides functions similar to one QPC215 SBE Card in option 71. You do not have to configure both ports on the CNI card.

Cable installation guidelines

Core Module backplanes, like all circuit boards, have a primary side and a secondary side. The primary side, which faces the front of the module, contains the primary shrouds, which provide mechanical guidance for the pins of the card edge connectors. The secondary side of the backplane, which faces the rear of the module, contains the secondary shrouds, which provide mechanical guidance for cable connectors.

The columns of secondary backplane shrouds are designated 18 through 8 from left to right (facing the rear of the backplane). This numbering matches the card slots in the front of the module. The connector rows of secondary backplane shrouds are designated A through F from top to bottom.

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

1   Orient the cable connector so that the cable runs downwards.

2   Partially insert the cable connector so its guides mate to the corresponding backplane connector.

3   Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Using the extraction tool

To disconnect a cable from the Core Module backplane, use the P0741489 Extraction Tool provided in the rear of the module (behind the I/O safety panel).

CAUTION

You must use the P0741489 Extraction Tool to disconnect cables from the backplane shrouds in NT6D60 Core Modules.

Follow the procedure below to avoid bending or breaking pins when removing cable connectors from the backplane shrouds. Do not insert the extraction tool unless the cable connector is locked into the shroud. Do not force the extraction tool deeper than the detent on the cable connector.

---

1   Grasp the cable connector by the strain relief tab.

2   Center the longer flat edge on the angled end of the tool between the cable connector and the wall of the shroud on the right side of the cable connector.

Note: If the straight end of the tool is notched, use that end if the connector can be accessed straight-on. If you must angle the tool at all, use the angled end.

3 *Gently* insert the extraction tool and gradually apply pressure while gently rocking the cable connector up and down.

4 Stop applying pressure as soon as the detent of the cable connector comes loose from the shroud.

5 Slowly remove the extraction tool and the cable connector.

Cable installation procedures

A P0738866 Label Kit is included in all option 81 packages. The kit is included in all packages because the preprinted labels may be useful (such as for labeling CNI to 3PE cables). Use of the labels is optional.

1 At the rear of the module, remove the left I/O panels. Verify that the following cables are installed in both Core Modules (see Figure 74):

- An NT7D89 RS-232 cable (CP to I/O panel) should be connected to backplane connector position 14D and to ports J21 and J25 on the I/O panel. Check the labeling on the cables to identify the J21 and J25 connectors.

- An NT7D90 Ethernet cable should be connected to backplane connector position 16F and to port J28 on the I/O panel.

- NTND14 CNI to 3PE Cables should be connected to the appropriate backplane connector positions for all network groups (Table 15). The cables should be secured to the cable restraint bracket behind the right (facing the rear) I/O panel.

Table 15
CNI backplane connector positions—NTND14 cables

Backplane connection	Group
8D	0
8F	0
9A	1
9C	1
9D	2
9F	2
10A	3
10C	3
10D	4
10F	4

Note: Backplane shroud designations are 18 through 8 from left to right and A through F from top to bottom.

Figure 74
NT6D60 Core Module (rear)—preinstalled backplane connections

553-7452
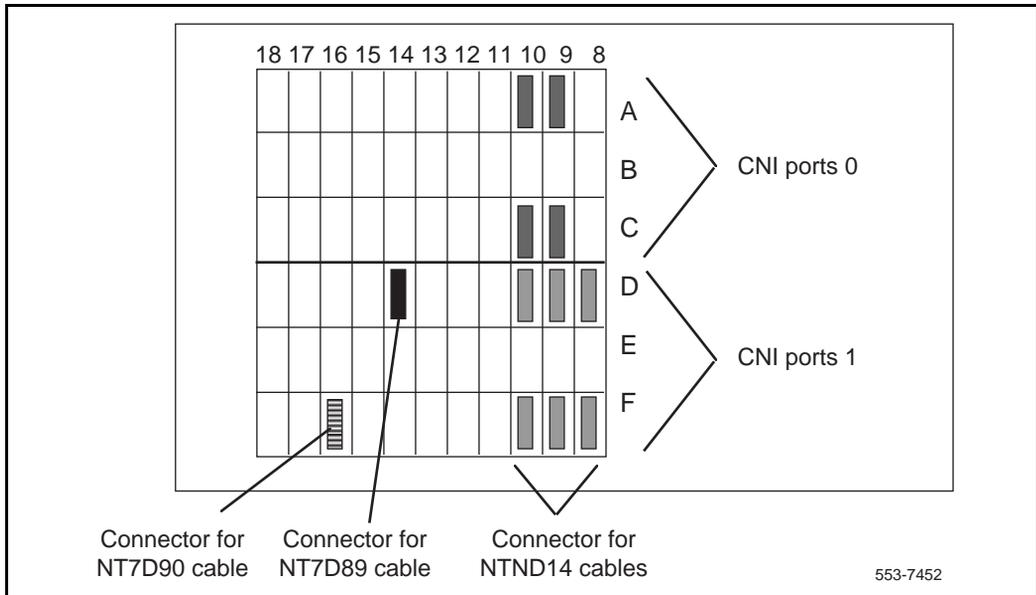
2   On the faceplates of the 3PE cards in the Core Modules

- connect an NT8D80BZ cable from J4 in Core 0 to J4 in Core 1
- connect another NT8D80BZ cable from J3 in Core 0 to J3 in Core.

3   In the rear of the Core Modules, connect the cables between Core 0 and Core 1 (see Figure 75):

Note 1: The following cables may already be connected in one of the modules. If so, leave them connected and attach the loose end.

Note 2: The cables must be routed as perpendicular as possible to nearby power cables.

- Connect the NTND13 IOP to IOP SCSI Cable from backplane connector position 16A in Core 0 to backplane connector position 16A in Core 1 (see Figure 75).

- Connect one NTND11 CP to CP Cable from backplane connector position 14C in Core 0 to backplane connector position 14C in Core 1 (see Figure 75).

- Connect another NTND11 cable from backplane connector position 14A in Core 0 to backplane connector position 14A in Core 1.

- Reinstall the left I/O panels in both Core Modules. Use and tighten all eight screws.

Figure 75
NT6D60 Core Module (rear)—connections for IOP to IOP and CP to CP cables

Core Module 0   **Core Module 1**

18 17 16 15 14 13 12 11 10 9 8   18 17 16 15 14 13 12 11 10 9 8

NTND13 cable: 16A to 16A

NTND11 cables: 14C to 14C, 14A to 14A

Note: NT7D89 RS-232 cables and NT7D90 Ethernet cables are pre-installed at the factory.

553-7453
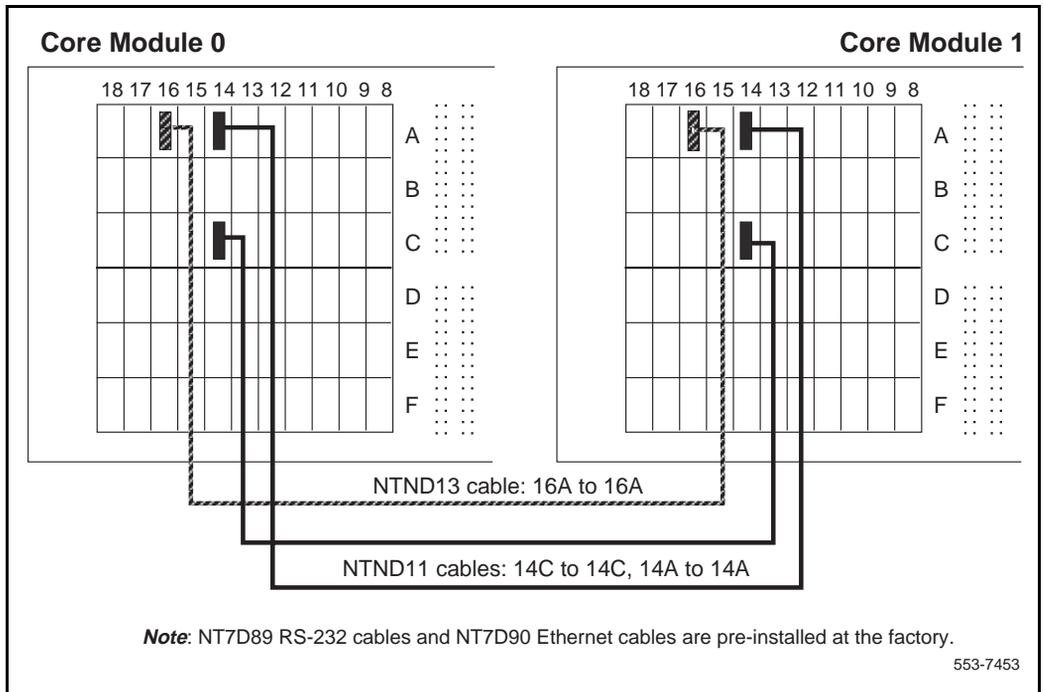
4   Connect the clock controller cards in both Core Modules to the junctor
board in the InterGroup Module (see Figure 76). Route the cables as
shown in Figure 77.

- Connect an NT8D74 (AE or AF length as needed) from the faceplate
  connector on the clock controller card in Core 0 to connector SCG 0
  (J11) in the InterGroup Module.

- Connect an NT8D74 (AE or AF length as needed) from the faceplate
  connector on the clock controller card in Core 1 to connector SCG 1
  (J12) in the InterGroup Module.

5   If PRI/DTI cards are equipped in the Core Modules, connect the
faceplate cables.

Note: For detailed instructions on PRI/DTI connections, see *ISDN
Primary Rate Interface installation* (553-2901-200).

- Connect a QCAD133 cable from connector J4 on the card to the I/O
  panel.

- Connect an NT8D85 cable from connector J3 on the card to the
  selected QPC414 Network Card.

- If needed, connect two NT8D79 cables from connectors J1 and J2
  on the card to the respective clock controller cards in each Core
  Module.

Figure 76
NT6D60 Core Module (front)—clock controller card connections

553-7450
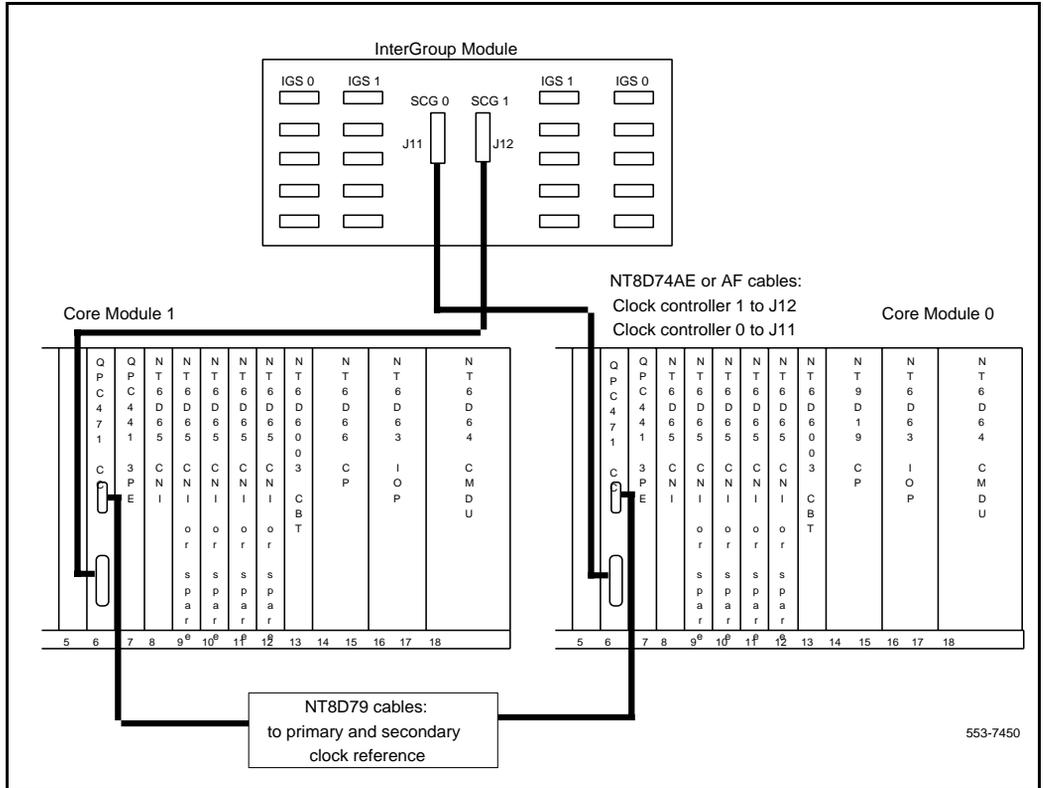
Figure 77
Cable routing from clock controller cards to InterGroup Module
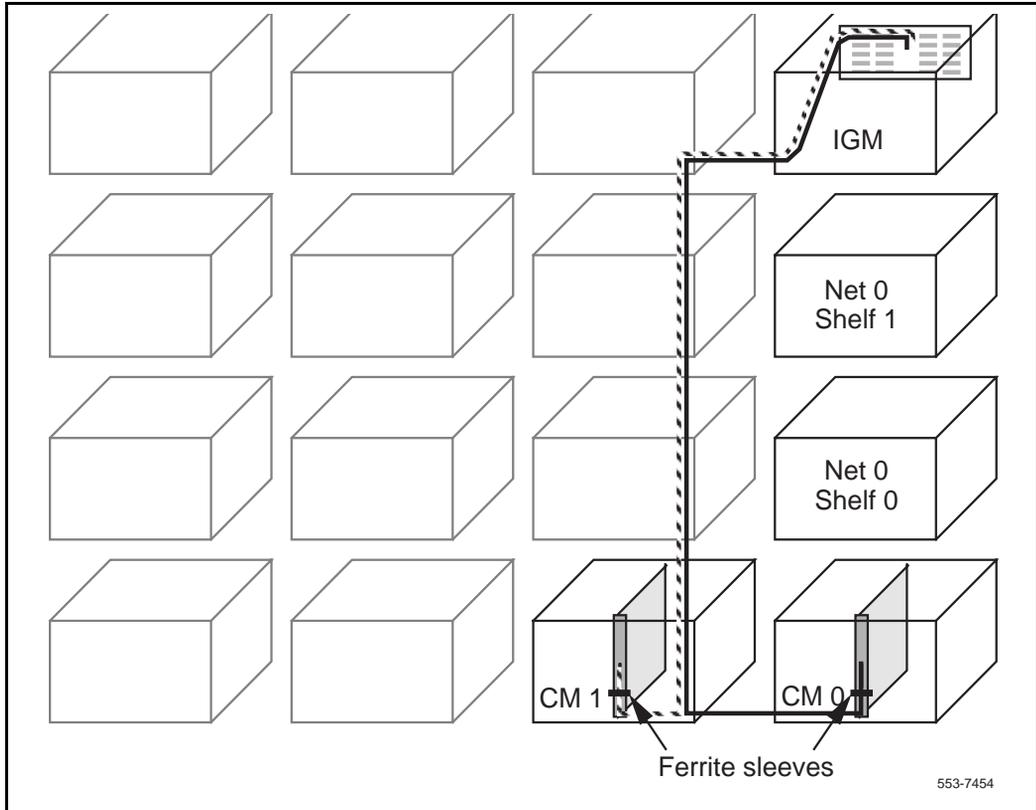
6   Connect the NTND14 cable pairs to the QPC441 3PE Cards in the
Network Modules. Table 16 lists the CNI to 3PE connections. Figures 78
through 82 show the recommended cable routing.

Note: This step does not apply to the QPC441 3PE card in the Core
Module.

Table 16
CNI to 3PE connections—NTND14 cables

Core	Backplane Connector	Group	Shelf	3PE connection
0	8D	0	0	J3
0	8F	0	0	J4
0	9A	1	0	J3
0	9C	1	0	J4
0	9D	2	0	J3
0	9F	2	0	J4
0	10A	3	0	J3
0	10C	3	0	J4
0	10D	4	0	J3
0	10F	4	0	J4
1	8D	0	1	J3
1	8F	0	1	J4
1	9A	1	1	J3
1	9C	1	1	J4
1	9D	2	1	J3
1	9F	2	1	J4
1	10A	3	1	J3
1	10C	3	1	J4
1	10D	4	1	J3
1	10F	4	1	J4

Note: Backplane shroud designations are 18 through 8 from left to right and A
through F from top to bottom.

7   Connect QPC412 InterGroup Switch (IGS) Cards 0 and 1 for each
network group to the junctor board in the InterGroup Module.

- With NT8D76 cables, connect the faceplate connectors on the IGS
cards to the InterGroup Module. Table 22 lists the IGS to InterGroup
connections.

- Figures 78 through 82 show the recommended cable routing.

Table 17
IGS to InterGroup cable assignment—use NT8D76 cables

From			To
Network group	Network shelf	IGS connector J1	InterGroup connector
0	0	0	J1
0	0	1	J6
0	1	1	J17
0	1	0	J22
1	0	0	J2
1	0	1	J7
1	1	1	J16
1	1	0	J21
2	0	0	J3
2	0	1	J8
2	1	1	J15
2	1	0	J20
3	0	0	J4
3	0	1	J9
3	1	1	J14
3	1	0	J19
4	0	0	J5
4	0	1	J10
4	1	1	J13
4	1	0	J18

Figure 78
Network Group 0—cable routing to Core and InterGroup Modules
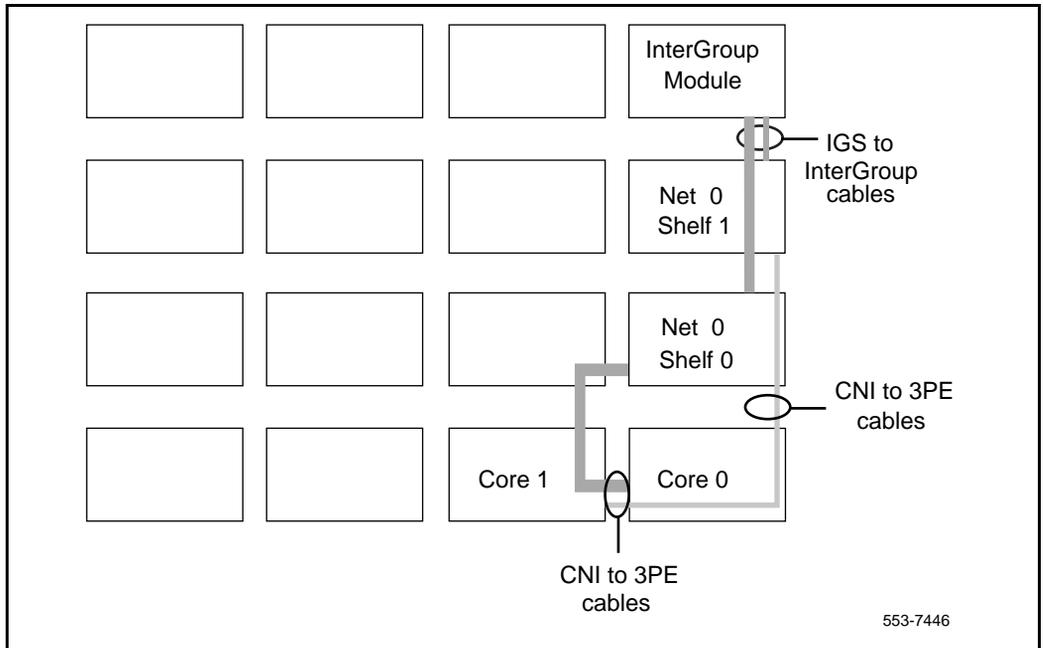
Figure 79
Network Group 1—cable routing to Core and InterGroup Modules
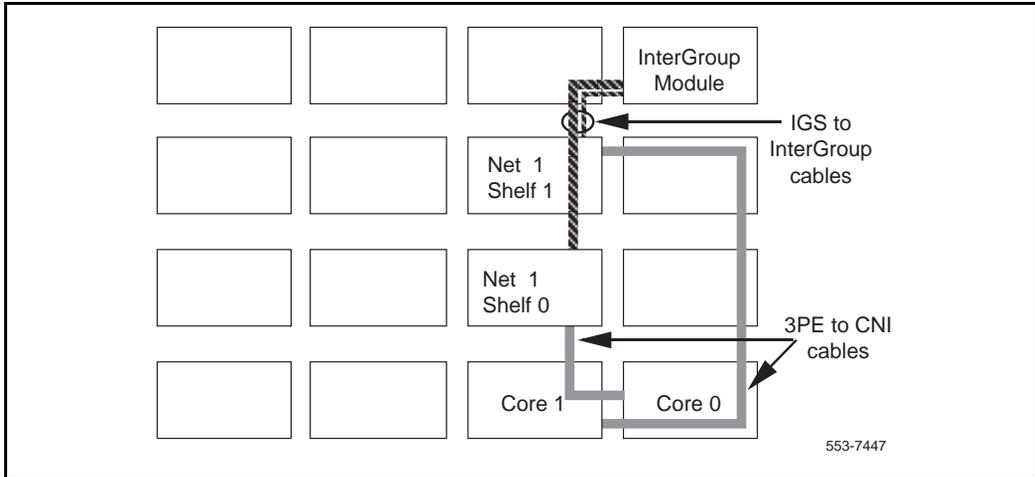
Figure 80
Network Group 2—cable routing to Core and InterGroup Modules
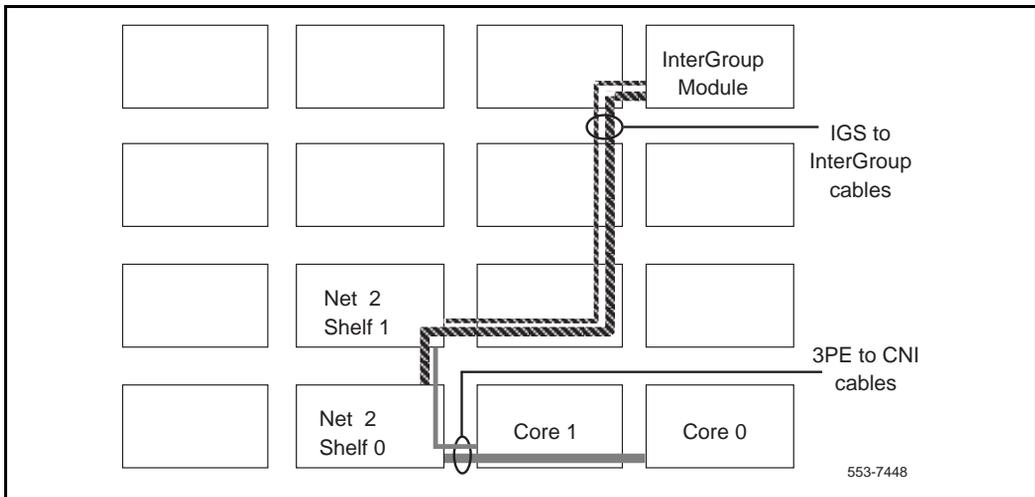
Figure 81
Network Group 3—cable routing to Core and InterGroup Modules
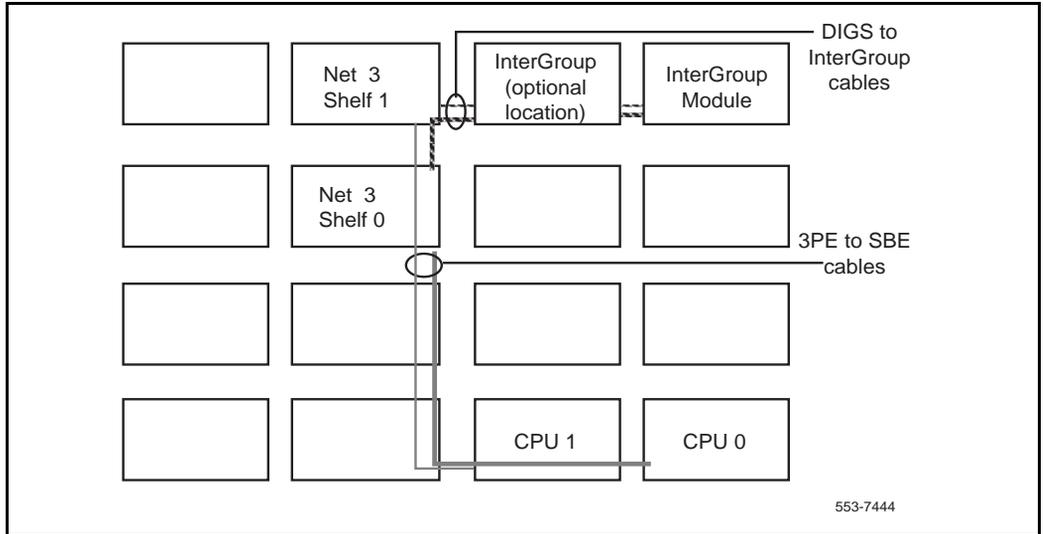
Figure 82
Network Group 4—cable routing to Core and InterGroup Modules
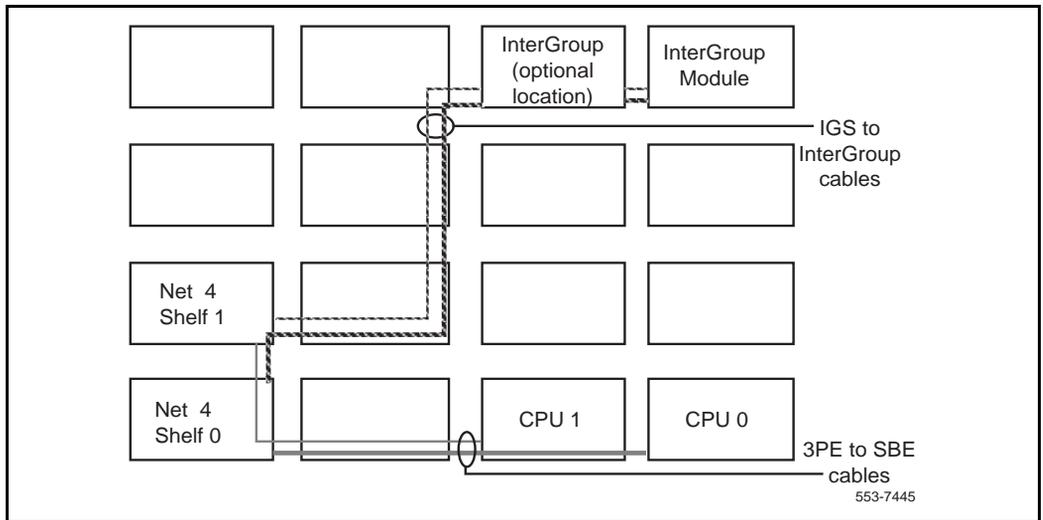
To secure network group cables with tie-wraps, follow these instructions:

1   Tie-wrap to the Core 0 strain relief bracket, all Core 0 CNI to 3PE cables and Core 1 CNI to 3PE cables for groups 0 and 1. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core 0 Module, as viewed from the rear of the module.

2   Tie-wrap to the Core 1 strain relief bracket, Core 1 CNI to 3PE cables for network groups 2, 3, and 4. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core 1 Module, as viewed from the rear of the module.

System option 81C

Option 81C is a dual CPU system with standby processing capabilities, fully redundant memory, and up to five full network groups. Option 81C is equipped with two redundant disk drive units.

The following modules are required:

— two Core/Net Modules (houses CPU and one network group)

— one InterGroup Module

— a minimum of two Network Modules (provides one additional network group)

— a minimum of one IPE Module

Additional Network and IPE Modules are required for additional network groups. PE Modules, RPE Modules, and application modules can also be used.

Note: The terminating plugs in the InterGroup Module for unused connectors are pre-installed in the factory. These should be removed only when additional groups are installed. Remove a plug just before the connector is installed for a new group and installed a plug immediately after a cable is disconnected when a group is removed.

Figure 83 shows a typical configuration for five full network groups. Additional columns can be added, and there can be more than one row of columns.

Figure 83
Option 81C dual CPU, multiple network group configuration
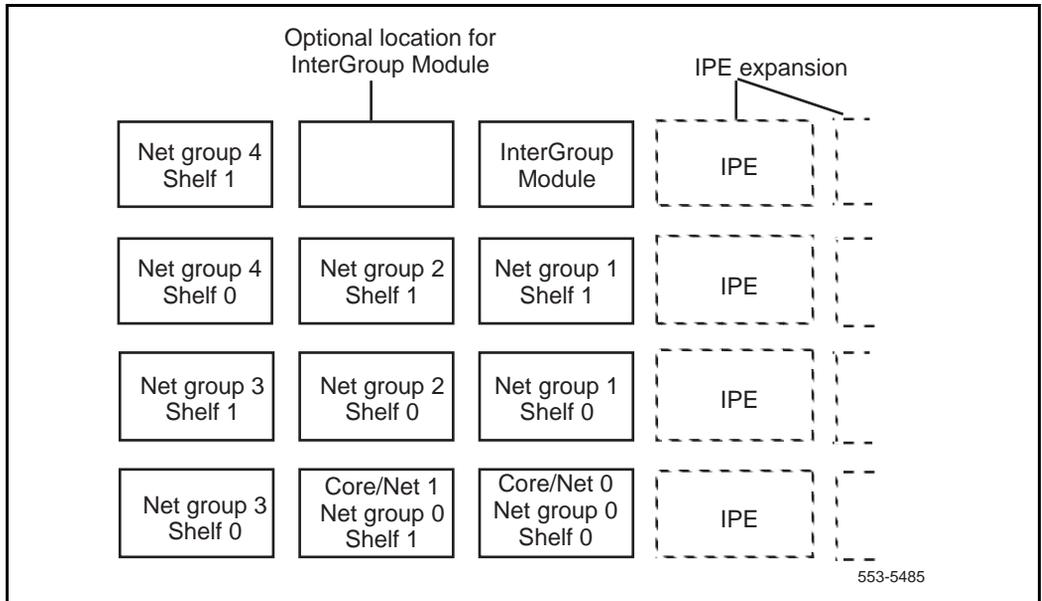
553-5485

CNI configuration

In the NT5D21 Core/Net Module, port 0 on the NT6D65 Core to Network Interface (CNI) Card in slot 12 supports a half-group, which does not have to be group 0, however, in new system it is normally configured as group 0. Communication between the CNI and 3PE cards for group 0 is accomplished through the backplane; no cable is required.

There are two ports on each CNI card. For every additional two network groups, you must add an additional CNI card.

In a typical configuration, there are three CNI cards for five network groups (see Table 18) in each Core/Net Module.

Table 18
Typical CNI configuration (option 81C)

CNI card slot / port	Network group supported
CNI 12/ Port 0	Group 0
CNI 12/ Port 1	Group 1
CNI 13/ Port 0	Group 2
CNI 13/ Port 1	Group 3
CNI 14/ Port 0	Group 4

Note: Network groups configuration is flexible. Any CNI port may support any given network group, however, for ease of maintenance, associate network groups and CNI ports in a logical sequence. Refer to Table 18 for a typical CNI port assignment and the associated network group in option 81C. Port 0 of the CNI in slot 12 and the 3PE card are hard-wired at the module's backplane.

Cable installation guidelines

Core/Net Module backplanes, like all circuit boards, have a primary side and a secondary side. The primary side, which faces the front of the module, contains the primary shrouds, which provide mechanical guidance for the pins of the card edge connectors. The secondary side of the backplane, which faces the rear of the module, contains the secondary shrouds, which provide mechanical guidance for cable connectors.

The columns of secondary backplane shrouds are designated 18 through 12 from left to right (facing the rear of the backplane). This numbering matches the card slots in the front of the module. The connector rows of secondary backplane shrouds are designated A through F from top to bottom.

Before you connect cables to the backplane, visually inspect the backplane shroud connectors to make sure there are no bent pins. To connect cables:

1   Orient the cable connector so that the cable runs downwards.

2   Partially insert the cable connector so its guides mate to the corresponding backplane connector.

3   Apply a small amount of pressure to push the cable connector straight into the backplane connector. You will feel a detent click when the connector seats.

CAUTION

Pins may be bent or broken if you try to insert the cable connector at an angle. Do not push the connector in any further after you hear the detent click.

Using the extraction tool

To disconnect a cable from the Core/Net Module backplane, use the
P0741489 Extraction Tool provided in the rear of the module (behind the I/O
safety panel).

CAUTION

**You must use the P0741489 Extraction Tool to disconnect cables
from the backplane shrouds in NT5D21 Core/Net Modules.**

Follow the procedure below to avoid bending or breaking pins when
removing cable connectors from the backplane shrouds. Do not insert
the extraction tool unless the cable connector is locked into the shroud.
Do not force the extraction tool deeper than the detent on the cable
connector.

---

1   Grasp the cable connector by the strain relief tab.

2   Center the longer flat edge on the angled end of the tool between the
    cable connector and the wall of the shroud on the right side of the cable
    connector.

    Note: If the straight end of the tool is notched, use that end if the
    connector can be accessed straight-on. If you must angle the tool at all,
    use the angled end.

3   *Gently* insert the extraction tool and gradually apply pressure while
    gently rocking the cable connector up and down.

4   Stop applying pressure as soon as the detent of the cable connector comes
    loose from the shroud.

5   Slowly remove the extraction tool and the cable connector.

Cable installation procedures

A label kit is included in all option 81C packages. The kit is included in all packages because the preprinted labels may be useful (such as for labeling CNI to 3PE cables). Use of the labels is optional.

1   At the rear of the module, remove the left I/O panels. Verify that the following cables are installed in both Core/Net Modules (see Figure 84):

- An NT7D89 RS-232 cable (CP to I/O panel) should be connected to backplane connector position 15D and to ports J21 and J25 on the I/O panel. Check the labeling on the cables to identify the J21 and J25 connectors.

- An NT7D90 Ethernet cable should be connected to backplane connector position 17F and to port J28 on the I/O panel.

- NTND14 CNI to 3PE Cables should be connected to the appropriate backplane connector positions for all network groups (Table 19). The cables should be secured to the cable restraint bracket behind the right (facing the rear) I/O panel.

Table 19
CNI backplane connector positions—NTND14 cables

Backplane connection	Group
12D	1
12F	1
13A	2
13C	2
13D	3
13F	3
14A	4
14C	4

Note: Backplane shroud designations are 18 through 12 from left to right and A through F from top to bottom.

Figure 84
NT5D21 Core/Net Module (rear)—preinstalled backplane connections
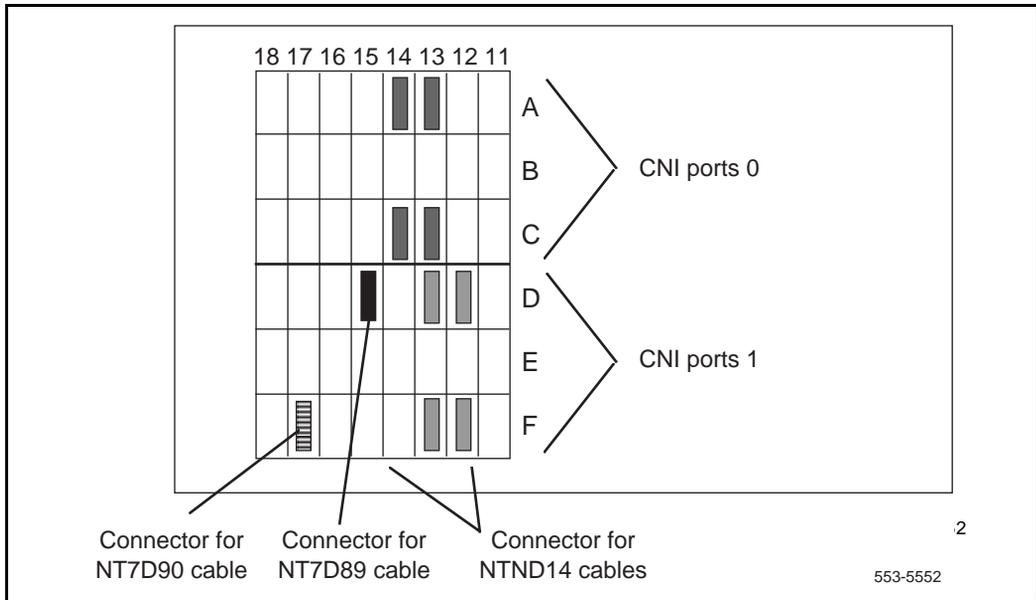
2   On the faceplates of the 3PE cards in the Core/Net Modules

- connect an NT8D80BZ cable from J4 in Core/Net 0 to J4 in Core/Net 1

- connect another NT8D80BZ cable from J3 in Core/Net 0 to J3 in Core/Net 1.

3   In the rear of the Core/Net Modules, connect the cables between Core/Net 0 and Core/Net 1 (see Figure 85):

Note 1: The following cables may already be connected in one of the modules. If so, leave them connected and attach the loose end.

Note 2: The cables must be routed as perpendicular as possible to nearby power cables.

- Connect the NTND13 IOP to IOP SCSI Cable from backplane connector position 17A in Core/Net 0 to backplane connector position 17A in Core/Net 1 (see Figure 85).

- Connect one NTND11 CP to CP Cable from backplane connector position 15C in Core/Net 0 to backplane connector position 15C in Core/Net 1 (see Figure 85).

- Connect another NTND11 cable from backplane connector position 15A in Core/Net 0 to backplane connector position 15A in Core/Net 1.

- Reinstall the left I/O panels in both Core/Net Modules. Use and tighten all eight screws.

Figure 85
NT5D21 Core/Net Module (rear)—connections for IOP/CMDU to IOP/CMDU and CP to CP cables
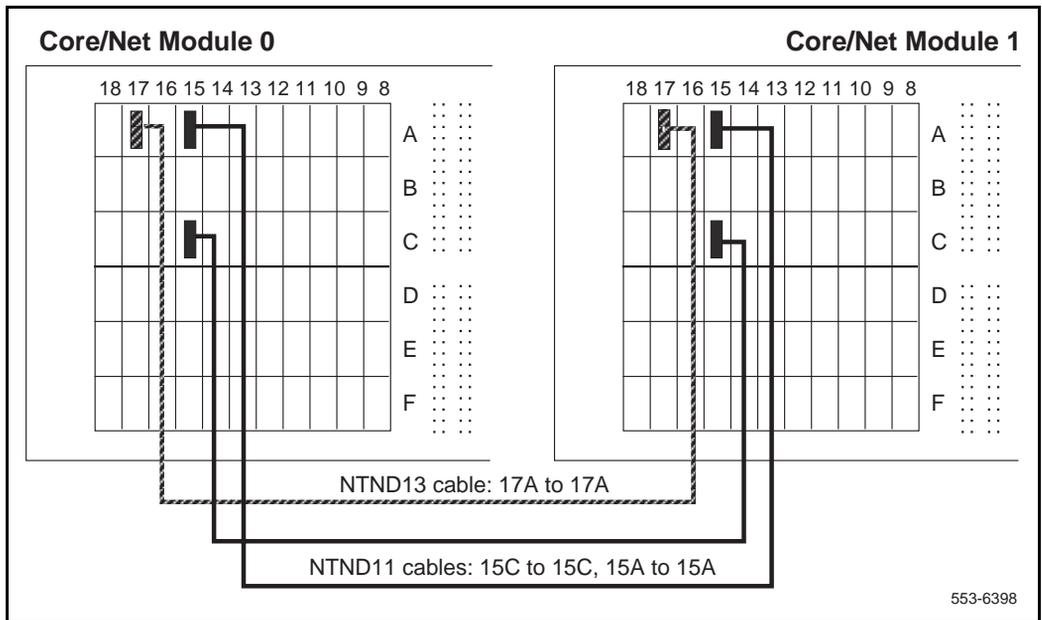
4   Connect the clock controller cards in Network Modules to the junctor board in the InterGroup Module (see Figure 86). Route the cables as shown in Figure 87.

- Connect an NT8D74 (AE or AF length as needed) from the faceplate connector on the clock controller card in Network group 1, side 0 to connector SCG 0 (J11) in the InterGroup Module.

- Connect an NT8D74 (AE or AF length as needed) from the faceplate connector on the clock controller card in Network group 1, side 1 to connector SCG 1 (J12) in the InterGroup Module.

For each additional network group:

- Connect an NT8D74 (AE or AF length as needed) from the faceplate connector on the clock controller card in Network group 2 (and each additional group), side 1 to connector SCG 1 (J12) in the InterGroup Module.

5   If PRI/DTI cards are equipped in the Core/Net Modules, connect the faceplate cables.

Note: For detailed instructions on PRI/DTI connections, see *ISDN Primary Rate Interface installation* (553-2901-200).

- Connect a QCAD133 cable from connector J4 on the card to the I/O panel.

- Connect an NT8D85 cable from connector J3 on the card to the selected QPC414 Network Card.

- If needed, connect two NT8D79 cables from connectors J1 and J2 on the card to the respective clock controller cards.

Note: Step 6 does not apply to the QPC441 3PE card in the Core/Net Module.

Figure 86
NT8D35 Network Module (front)—clock controller card connections

InterGroup Module

IGS 0   IGS 1   **SCG 0**   **SCG 1**   IGS 1   IGS 0

J11   J12

NT8D74AE or AF cables

Network Module   **Network Module**

C C 1

C C 0

5 6 7 8 9 10 11 12 13 14

5 6 7 8 9 10 11 12 13 14

NT8D79 cables:
to primary and secondary
clock references

553-6391
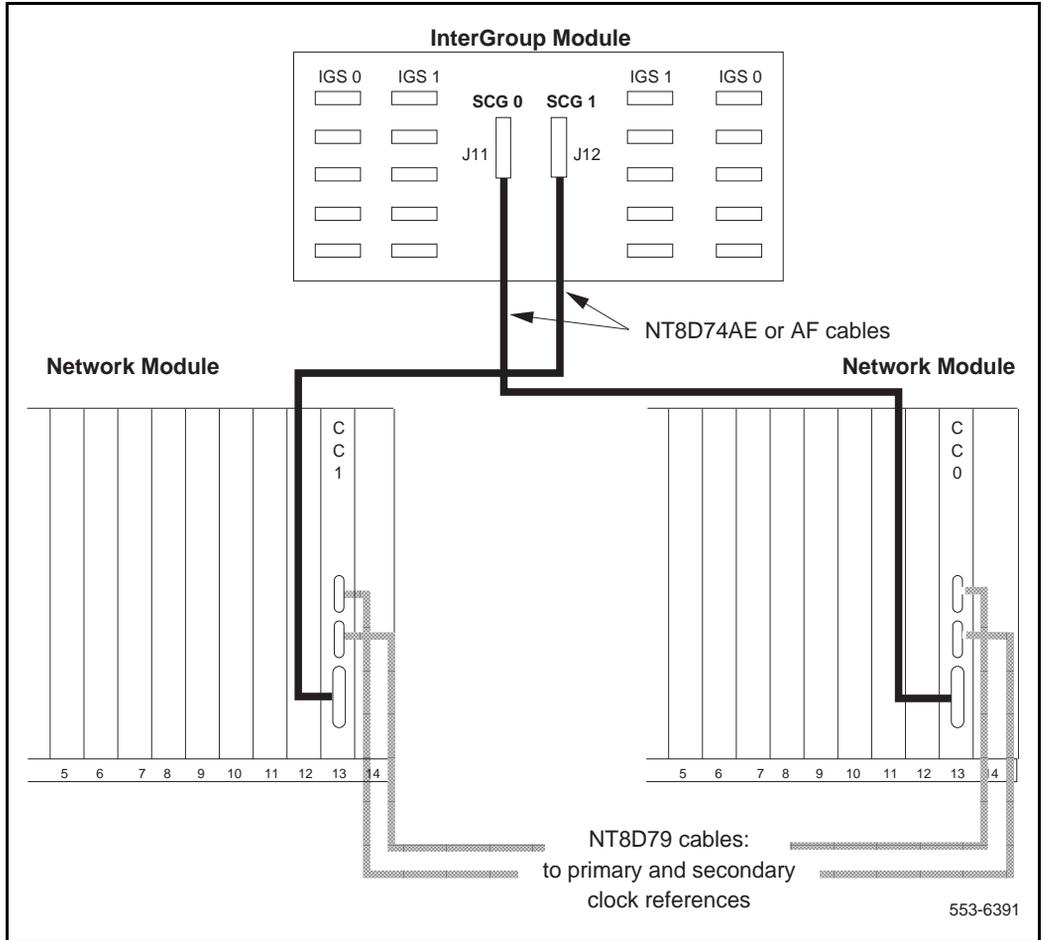
Figure 87
Cable routing from clock controller cards to InterGroup Module

IGM

Net 2
Shelf 1

See Note

Net 1
Shelf 1

Net 1
Shelf 0

Core/Net 1

Core/Net 0

553-5554

Clock controller cards
(cables with ferrite sleeves)

Note: Alternate clock controller card location is in slot 13 of any equipped Network Module.
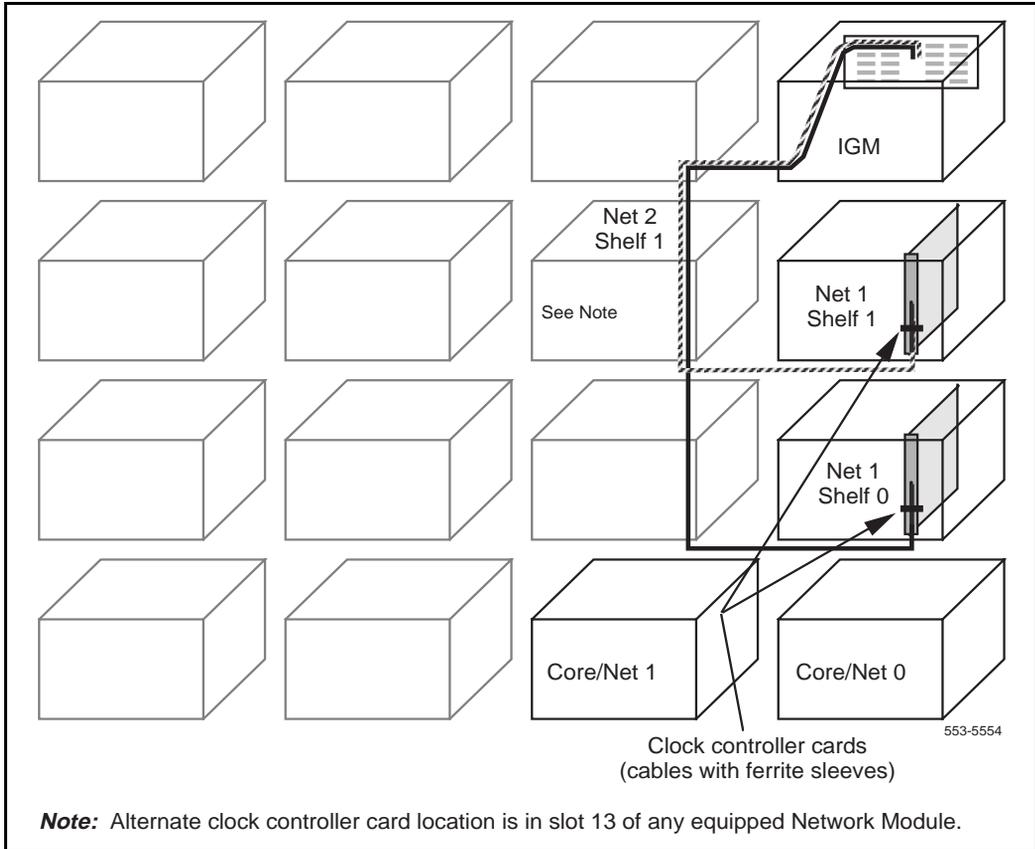
6 Connect the NTND14 cable pairs to the QPC441 3PE Cards in the Network Modules. Tables 20 and 21 list the CNI to 3PE connections. Figures 89 through 93 show the recommended cable routing.

When referencing Figures 89 through 93, note where cables are routed. If the figure shows the cable along the right side of the module, route the cable up the right side of the column. If the figure shows the cable along the bottom of the module, route the cable along the front cable trough.

Table 20
CNI to 3PE NTND14 cable connections for Core/Net 1

Cable for Group		Backplane connector on Core/Net 1		3PE card connector on Net Shelf 1
1	connects from	12D	to	J3
1		12F		J4
2		13A		J3
2		13C		J4
3		13D		J3
3		13F		J4
4		14A		J3
4		14C		J4

Note: Backplane connections are designated 18 through 12 (from left to right viewed from the back of the module) and A through F (from top to bottom).

Table 21
CNI to 3PE NTND14 cable connections for Core/Net 0

Cable for Group		Backplane connector on Core/Net 0		3PE card connector on Net Shelf 0
1	connects from	12D	to	J3
1		12F		J4
2		13A		J3
2		13C		J4
3		13D		J3
3		13F		J4
4		14A		J3
4		14C		J4

Note: Backplane connections are designated 18 through 12 (from left to right viewed from the back of the module) and A through F (from top to bottom).

7 Install cables between the QPC412 InterGroup Switch (IGS) Cards 0 and 1 for each network group and the junctor board in the InterGroup Module.

- Connect the faceplate connectors on the IGS cards with NT8D76 cables to the InterGroup Module. Table 22 lists the IGS to InterGroup connections and the slots into which the IGS cards are located on each shelf.

- Figure 88 shows the IGS connection points in the NT8D36 InterGroup Module.

- Figures 89 through 93 show the recommended cable routing.

Table 22
IGS to InterGroup cable assignment—use NT8D76 cables

From				To
Network group	**Network shelf**	**Slot**	**IGS connector J1**	**InterGroup connector**
0	0 (Core/Net 0)	8	0	J1
0	0(Core/Net 0)	9	1	J6
0	1(Core/Net 1)	9	1	J17
0	1(Core/Net 1)	8	0	J22
1	0	3	0	J2
1	0	2	1	J7
1	1	2	1	J16
1	1	3	0	J21
2	0	3	0	J3
2	0	2	1	J8
2	1	2	1	J15
2	1	3	0	J20
3	0	3	0	J4
3	0	2	1	J9
3	1	2	1	J14
3	1	3	0	J19
4	0	3	0	J5
4	0	2	1	J10
4	1	2	1	J13
4	1	3	0	J18

Figure 88
NT8D36 InterGroup Module—connectors for IGS cards
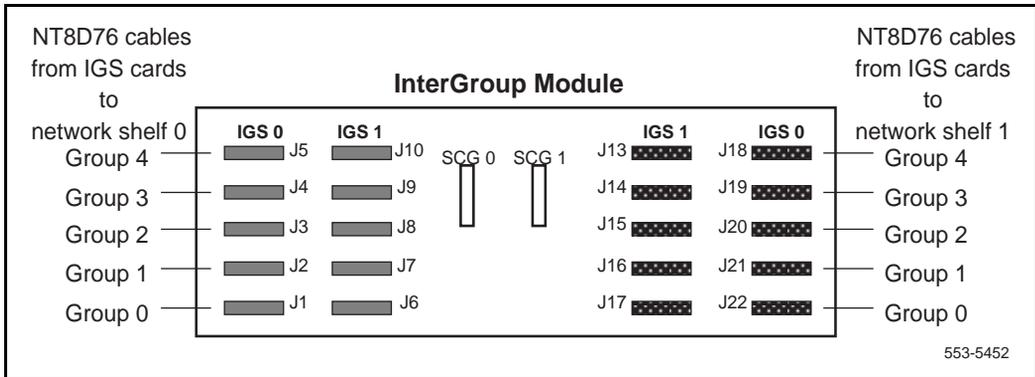
Figure 89
Network Group 0—cable routing to Core/Net and InterGroup Modules
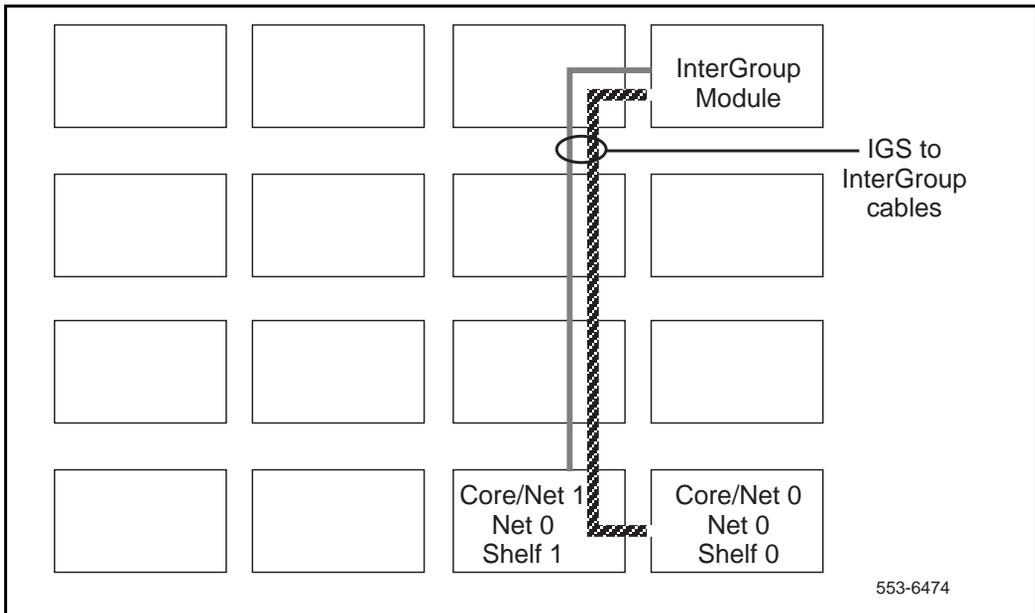
Figure 90
Network Group 1—cable routing to Core/Net and InterGroup Modules
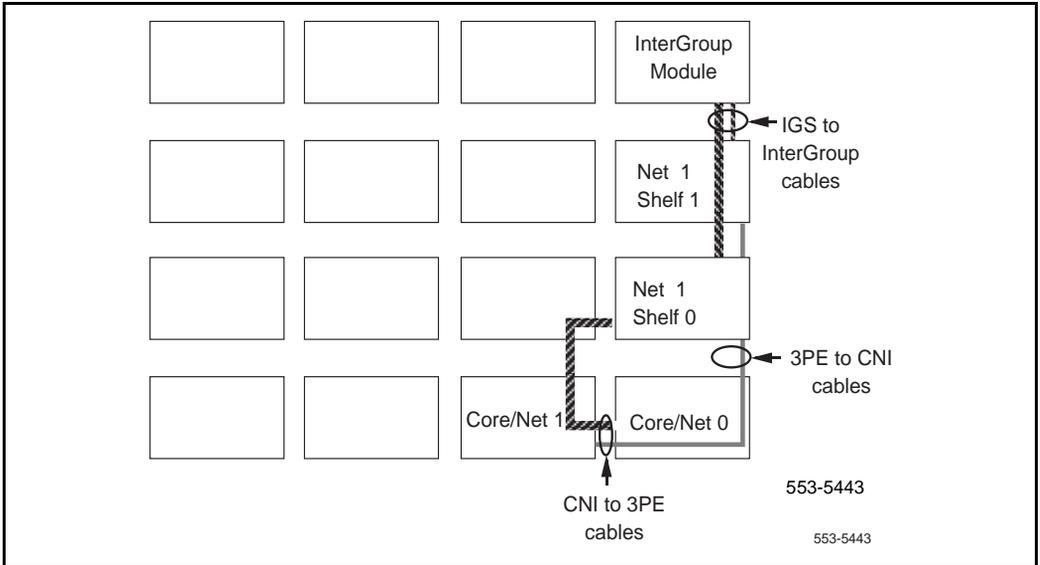
Figure 91
Network Group 2—cable routing to Core/Net and InterGroup Modules
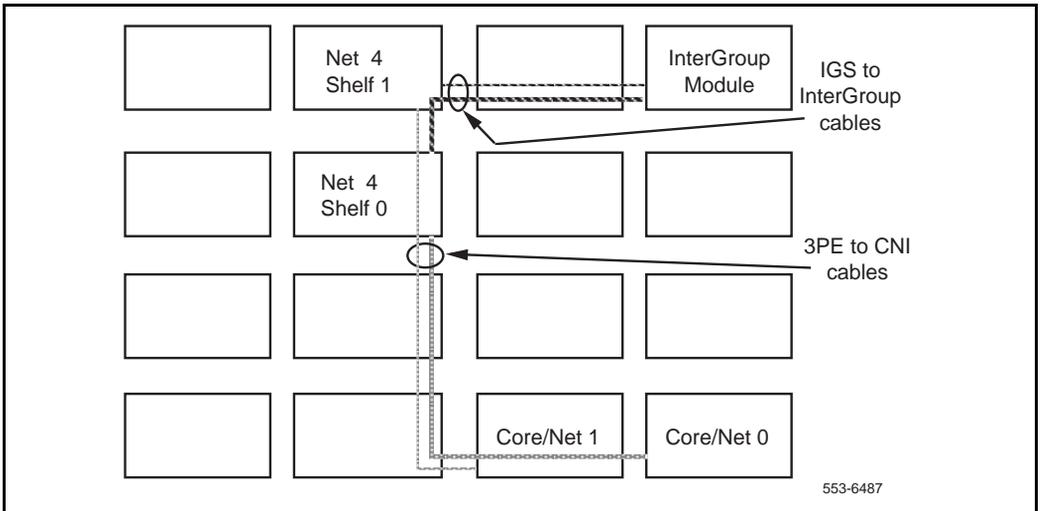
Figure 92
Network Group 3—cable routing to Core/Net and InterGroup Modules
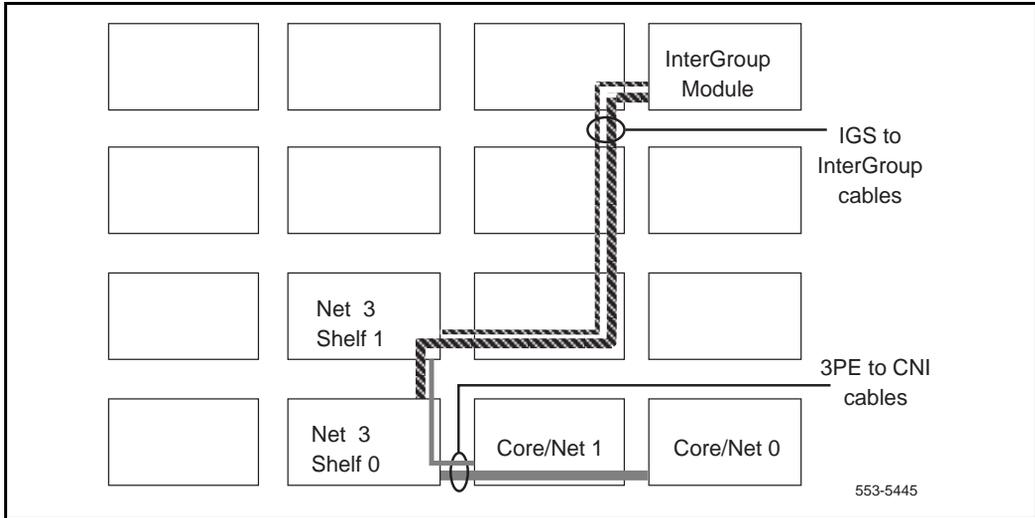
Figure 93
Network Group 4—cable routing to Core/Net and InterGroup Modules
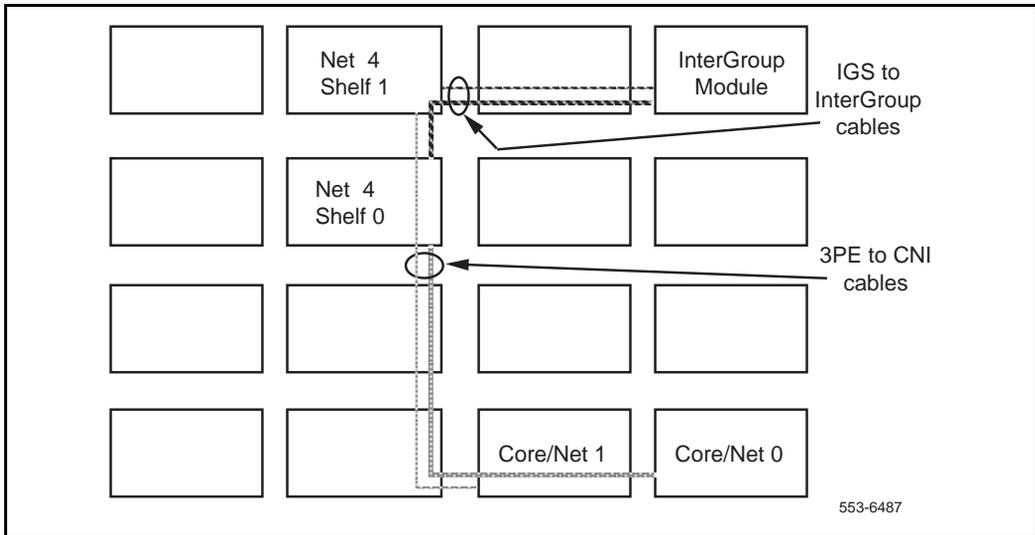
To secure network group cables with tie-wraps, follow these instructions:

1   Tie-wrap to the Core/Net 0 strain relief bracket, all Core/Net 0 CNI to 3PE cables and Core/Net 1 CNI to 3PE cables for groups 0 and 1. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core/Net 0 Module, as viewed from the rear of the module.

2   Tie-wrap to the Core/Net 1 strain relief bracket, Core/Net 1 CNI to 3PE cables for network groups 2, 3, and 4. The strain relief bracket is located at the bottom of the right-hand-side I/O panel of the Core/Net 1 Module, as viewed from the rear of the module.

Figure 94 shows the NT5D21 Core/Network Module backplane connectors D and E, which connect the backplane connectors D and E on the other Core/Network module respectively. These connectors are used when configuring the network group in the Core/Network Modules for a dual CPU system.

Figure 94
NT5D21 Core/Network Module (rear view)—location of D and E connectors

Slot   18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0 Slot

Connector "E"   Connector "D"

Use NT8D99AB
Cables

553-5959
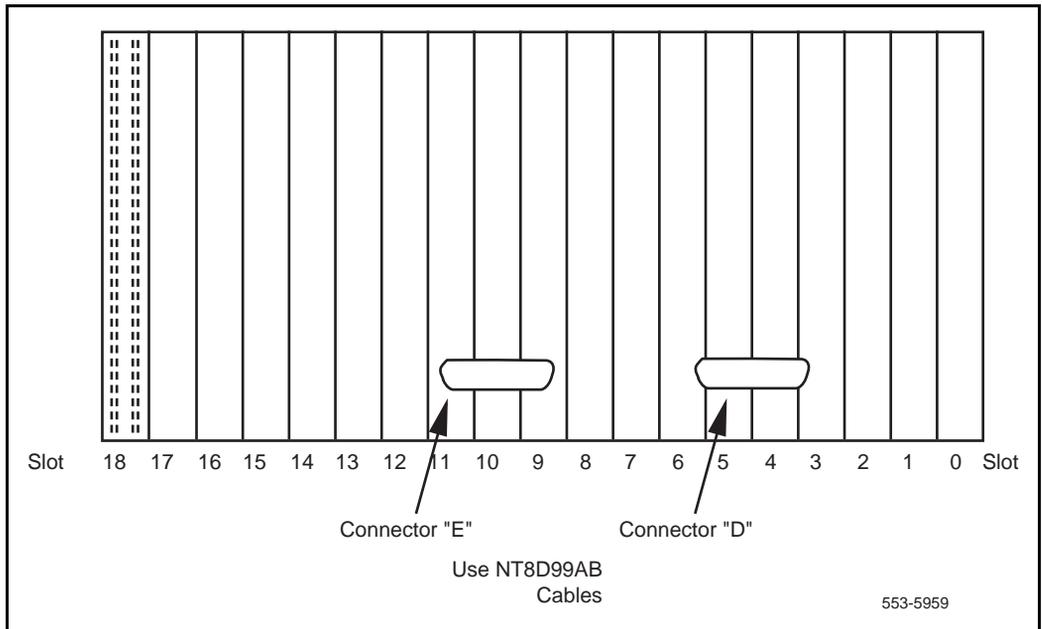
Cabling network loops

In Options 81 and 81C, the columns can be configured as a single row or multiple rows (see Figure 95):

— For superloops: NT8D04 Superloop Network Cards and associated NT8D01 Controller Cards

  • If the columns containing the network and controller cards are in the same row, the network loop is cabled from the faceplate of the network card to the backplane for the controller card.

  • If the columns containing the network and controller cards are in different rows, the cards require I/O panel connections, and a shielded cable connects the network card I/O panel to the controller card I/O panel.

— For regular loops: QPC414 Network Cards and associated QPC659 Dual Loop Peripheral Buffer (DLB) Cards

  • If the columns containing the network and DLB cards are in the same row, the network loop is cabled from the faceplate of the network card to the faceplate of the DLB card.

  • If the columns containing the network and DLB cards are in different rows, the cards require I/O panel connections, and a shielded cable connects the network card I/O panel to the DLB card I/O panel.

Figure 95
Options 81 and 81C configuration: multiple rows of columns (top view)
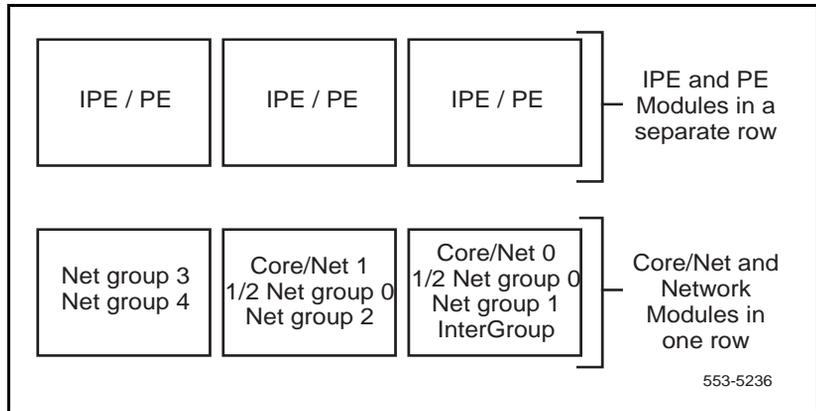
NT8D04 Superloop Network Card

Depending on whether your system is configured as a single row of columns or double row of columns, proceed with "Basic cabling for single-row network connections," below, or "Basic cabling for multiple-row network connections" on page 181.

CAUTION

Due to the possibility of EMI/RFI noise, do not route cables from front to rear next to the power supply unit.

Basic cabling for single-row network connections

1 Refer to the work order and the cabling layout shipped with the system to determine

- each loop number assigned

- the module and slot assignments for the NT8D04 Superloop Network Card associated with each loop

- the location of NT8D37 IPE Modules that contain NT8D01 Controller Cards associated with each loop

2   Set the Enb/Dis switch on each superloop network card to Dis.

3   Cable network loops from the faceplate connector on the superloop network card to the backplane for associated controller cards (see Table 23).

  •   Label both ends of an NT8D91 cable with the loop number, then connect one end of the cable to the superloop network card faceplate connector:

          J1 for shelf 1

          J2 for shelf 0

  •   On the backplane for the controller card, connect the cable to the SL0, SL1, SL2, or SL3 connector assigned to the loop.

  Note: The key (polarizing tab) on the side of the cable connector must be inserted into the keyway on the left side, facing the backplane, of the backplane connector. Blue and white wires should show through the top of the cable connector and, if there is a directional label, the arrow on the cable connector should be located at the top right.

  •   Figure 96 shows the superloop network card faceplate connectors, the backplane connectors for the controller card, and the cables required.

4   Seat and secure all connectors.

5   Set the Enb/Dis switch on each network card to Enb.

6   During system software configuration, use the *X11 input/output guide* to enter loop assignments.

Figure 96
NT8D04 Superloop Network Card network loops—connectors for single-row connections
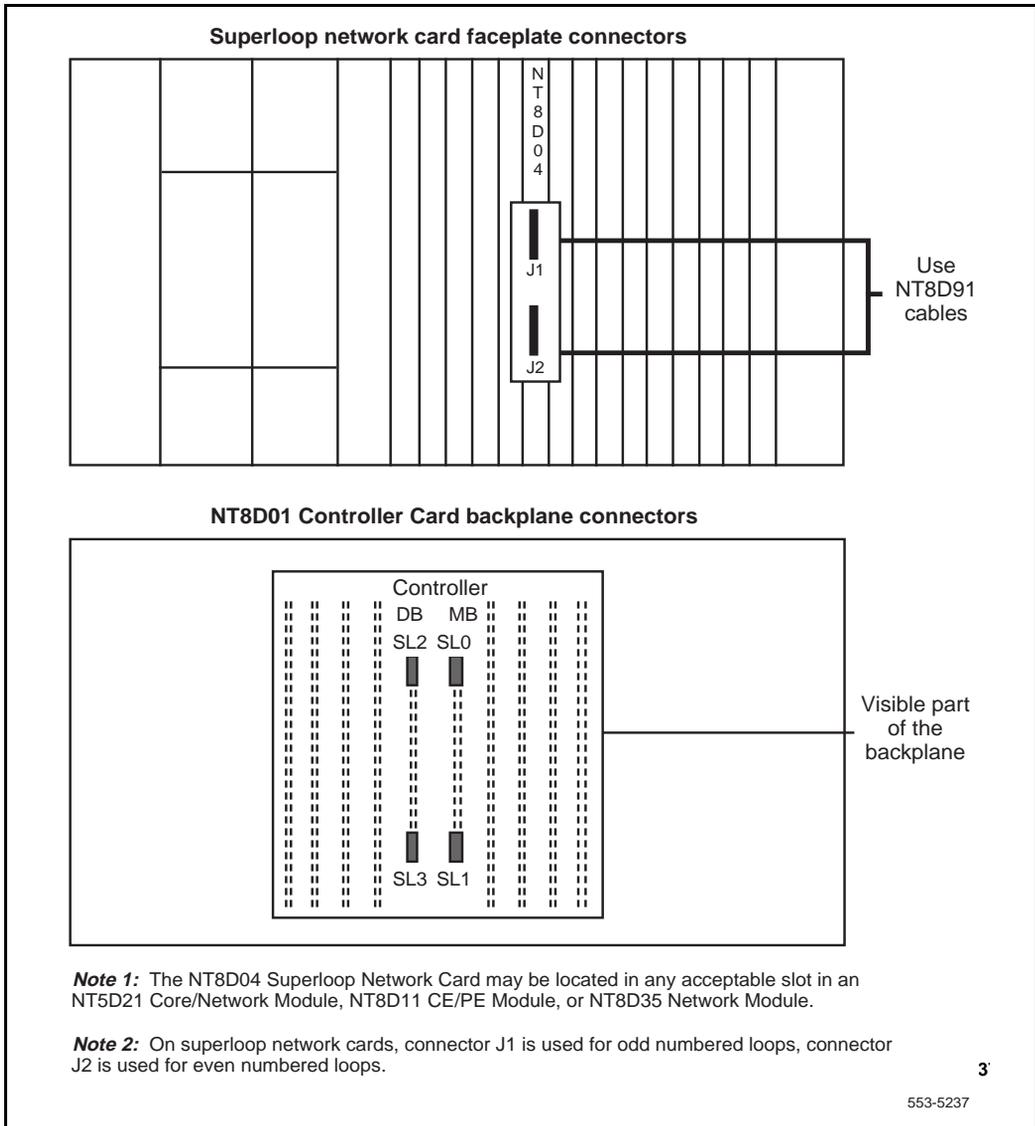
Superloop network card faceplate connectors

N
T
8
D
0
4

J1

J2

Use
NT8D91
cables

NT8D01 Controller Card backplane connectors

Controller
DB   MB
SL2 SL0

SL3 SL1

Visible part
of the
backplane

Note 1: The NT8D04 Superloop Network Card may be located in any acceptable slot in an
NT5D21 Core/Network Module, NT8D11 CE/PE Module, or NT8D35 Network Module.

Note 2: On superloop network cards, connector J1 is used for odd numbered loops, connector
J2 is used for even numbered loops.

553-5237

Basic cabling for multiple-row network connections

1 Refer to the work order and the cabling layout shipped with the system to determine

- each loop number assigned

- the module and slot assignments of the NT8D04 Superloop Network Card associated with each loop

- the location of NT8D37 IPE Modules that contain NT8D01 Controller Cards associated with each loop

2 Set the Enb/Dis switch on the faceplate of each network card to Dis.

3 Install NT8D1107 Superloop Adapter Plates on universal I/O panels (P0715058), if required. The superloop adapter plate reduces a QPC414 network loop cutout to the size for a superloop connection.

The recommended order for installing superloop adapter plates is over I/O panel locations J2, J6, J10, J22, J26, J31.

- Position the adapter plate over the QPC414 cutout and install the screw and washer at the bottom of the plate.

- Position the cable connector on the adapter plate and install one screw and washer at the top and one screw and washer at the bottom of the connector.

- Figure 97 shows mounting details for the superloop adapter plate.

Figure 97
Installing a superloop adapter plate

553-5289
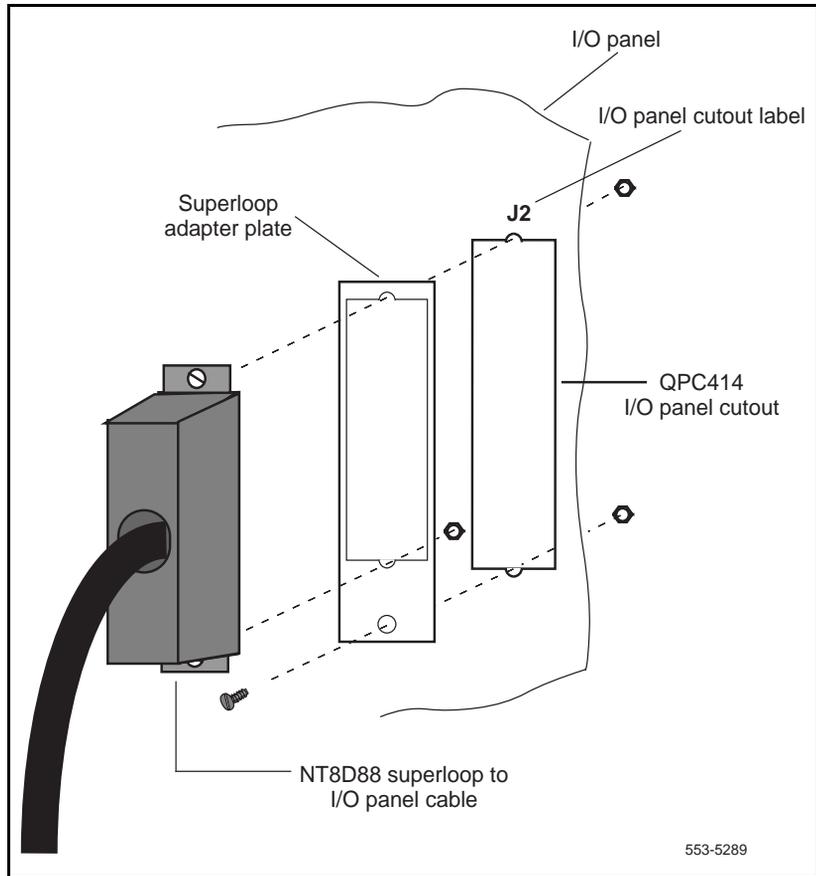
4   Cable network loops from the faceplate connector on the network card to the I/O panels on the rear of the Core/Net or Network Module.

- Label both ends of an NT8D88AD cable with the loop number, then connect one end of the cable to the network card faceplate connector:

    J1 for shelf 1

    J2 for shelf 0

- Route the cable around the card cage to the I/O panel and mount the cable connector in one of the cutouts in the panel.

    the recommended order for connections is J16, J17, J37, J38, then, with superloop adapter plates, J2, J6, J10, J22, J26, J31

- Figure 98 shows the network card faceplate connectors, the I/O panel connectors, and the cables required.

5   Cable the backplane connectors (SL0, SL1, SL2, SL3) for the controller card to the I/O panels on the rear of the IPE Module.

- Label both ends of an NT8D92 cable with the loop number, then connect one end of the cable to the backplane connector.

- Mount the connector on the other end of the cable in one of the cutouts in the I/O panels. The recommended order for connections is:

    SL0 to J2

    SL1 to J3

    SL2 to J4

    SL3 to J5

- Figure 99 shows the controller card backplane connectors and the I/O panels for the IPE Module.

6   Complete the network loop connection (see Table 23).

- Connect one end of an NT8D98 cable to the I/O panel connector for the network card.

- Connect the other end of the cable to the I/O panel connector for the associated controller card.

Figure 98
NT8D04 Superloop Network Card network loops—network card to I/O panel connections

Superloop network card faceplate connectors

NT8D04

J1

J2

Use NT8D88AD cables

Core/Network Module I/O Panels

J23 J22 J21 J20

J3 J2 J1

J24

J25

J27 J26

J6 J5 J4

J28

J30

J8 J7

J32 J31 J29

J9

J34 J33

J11 J10

J38 J37

J36 J35

J14 J13 J12

Left

Right

Network Module I/O Panels

J23 J22 J21 J20

J4 J3 J2 J1

J24

J8

J25

J7

J27 J26

J6 J5

J28

J12

J30

J11

J32 J31 J29

J13

J10 J9

J34 J33

J15 J14

J38 J37

J36 J35

J19 J18

J17 J16

Left

Right

553-5290
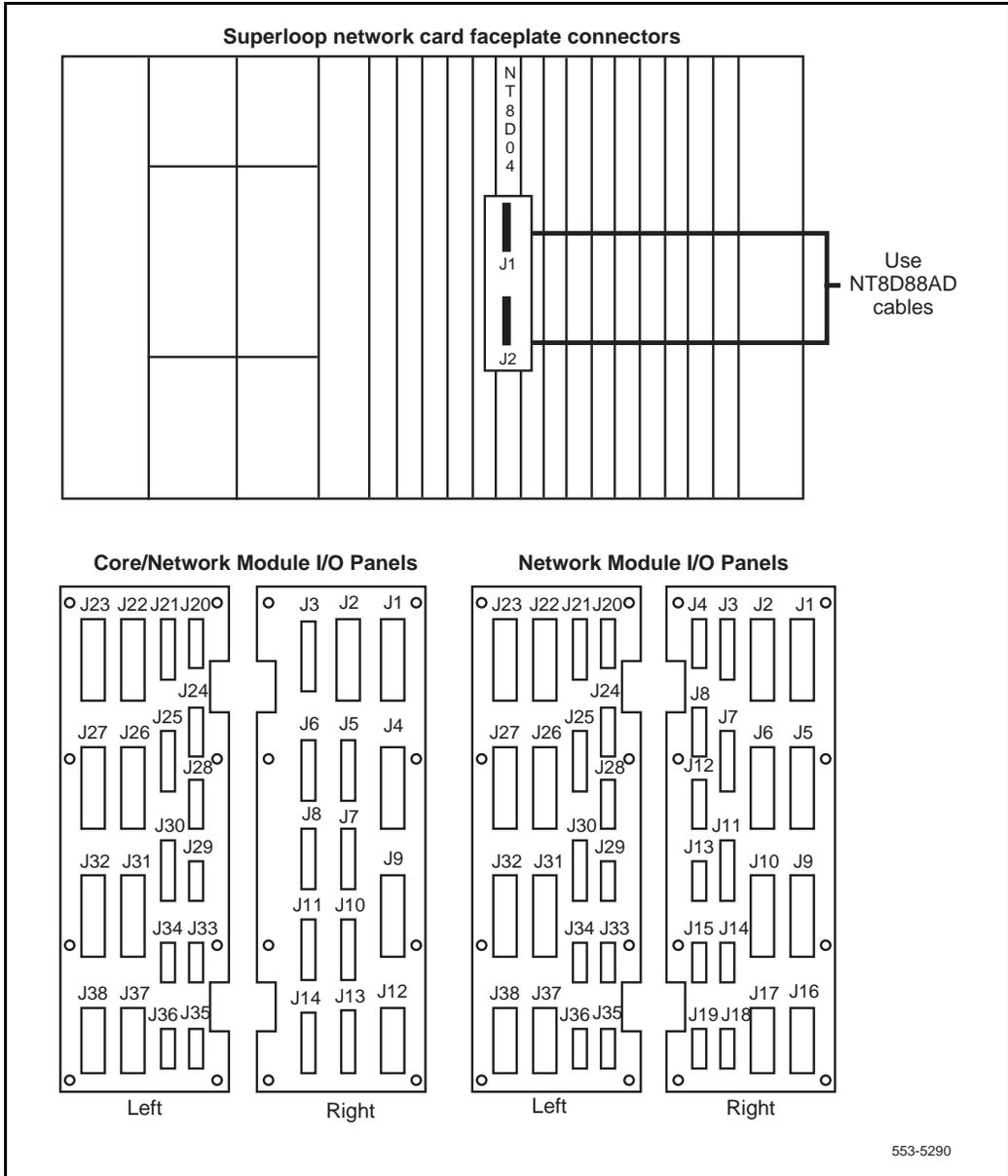
Figure 99
NT8D04 Superloop Network Card network loops—controller card to I/O panel connections
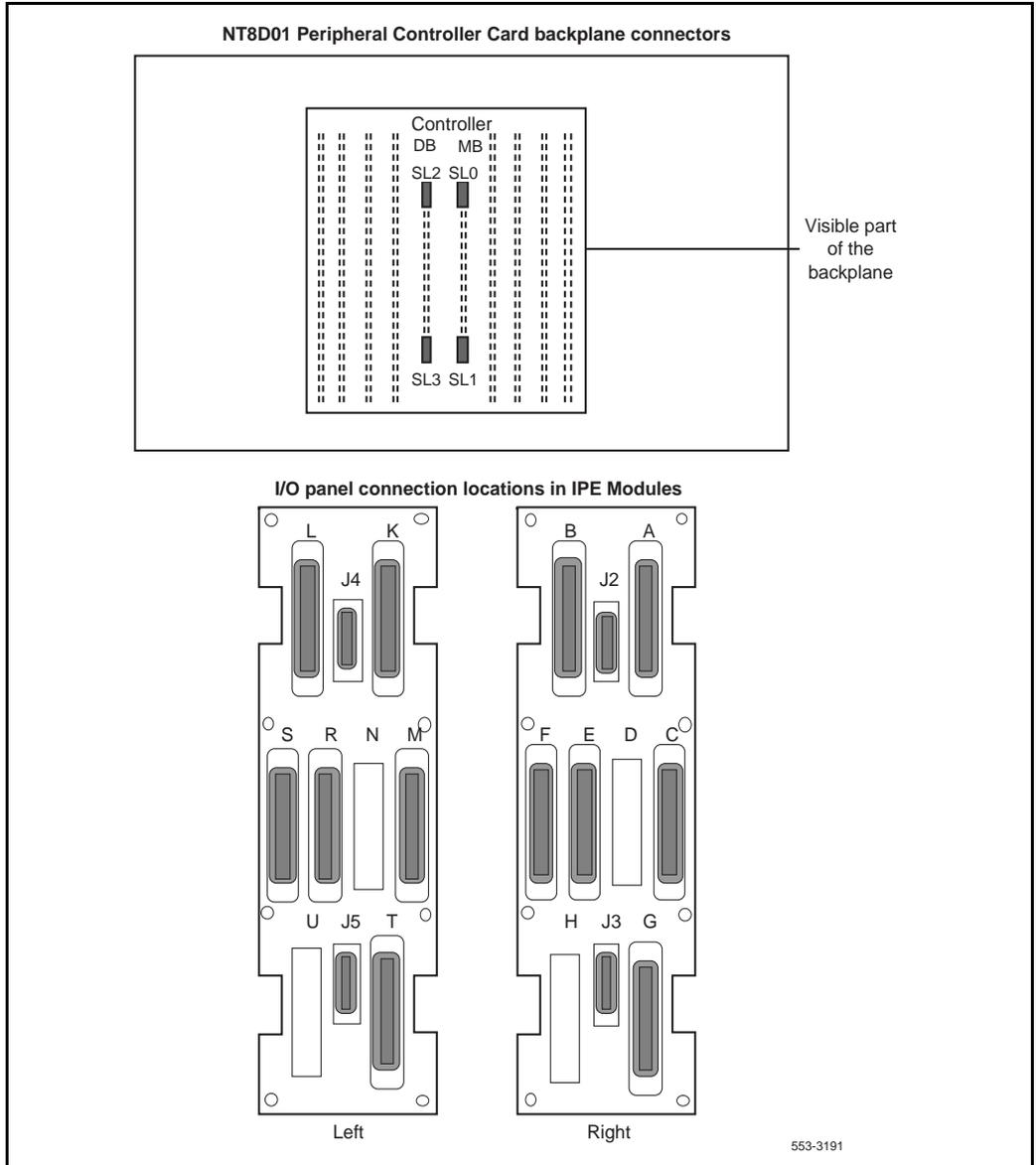
7   Seat and secure all connectors.

8   Set the Enb/Dis switch on each network card to Enb.

9   During system software configuration, use the *X11 input/output guide* to enter loop assignments.

Table 23
NT8D04 network loop configurations

	FROM		TO	
	Superloop network card	**Faceplate connector**	**Controller card**	**Backplane connector**
One segment per superloop	NT8D04 #1	J2	NT8D01AC #1	SL0
	NT8D04 #2	J2	NT8D01AC #1	SL1
	NT8D04 #3	J2	NT8D01AC #1	SL2
	NT8D04 #4	J2	NT8D01AC #1	SL3
Two segments per superloop	NT8D04 #1	J2	NT8D01AD #1	SL0
	NT8D04 #2	J2	NT8D01AD #1	SL1
Four segments per superloop	NT8D04 #1	J2	NT8D01AD #1	SL0
Eight segments per superloop	NT8D04 #1	J2	NT8D01AD #1	SL0
	NT8D04 #1	J1	NT8D01AD #2	SL0
One segment per superloop/three segments per another superloop	NT8D04 #1	J2	NT8D01AD #1	SL0
	NT8D04 #2	J2	NT8D01AD #1	SL1
Two segments per superloop/six segments per another superloop	NT8D04 #1	J2	NT8D01AC #1	SL0
	NT8D04 #2	J2	NT8D01AC #2	SL0
	NT8D04 #2	J1	NT8D01AC #2	SL1
Note: NT8D01AC is a controller-4				
NT8D01AD is a controller-2				

QPC414 Network Card

Depending on whether your system is configured as a single row of columns or double row of columns, proceed with "Basic cabling for single-row network connections," below, or "Basic cabling for multiple-row network connections" on page 189.

CAUTION

Due to the possibility of EMI/RFI noise, do not route cables from front to rear next to the power supply unit.

Basic cabling for single-row network connections

1   Refer to the work order and the cabling layout shipped with the system to determine

- each loop number assigned

- the module and slot assignments for the QPC414 Network Card associated with each loop

- the location of NT8D13 PE Modules that contain QPC659 DLB Cards associated with each loop

2   Set the Enb/Dis switch on the faceplate of each network card to Dis.

3   Cable network loops from the faceplate connector on the network card to the faceplate connector on the associated DLB card.

- Label both ends of an NT8D85 cable with the loop number, then connect one end of the cable to the network card faceplate connector:

     J1 for shelf 0

     J2 for shelf 1

- On the DLB card, connect the cable to the LPX or LPY connector assigned to the loop.

- Figure 100 shows the network card and DLB card connectors and the cables required.

Figure 100
QPC414 Network Card network loops—connectors and cables for single-row connections
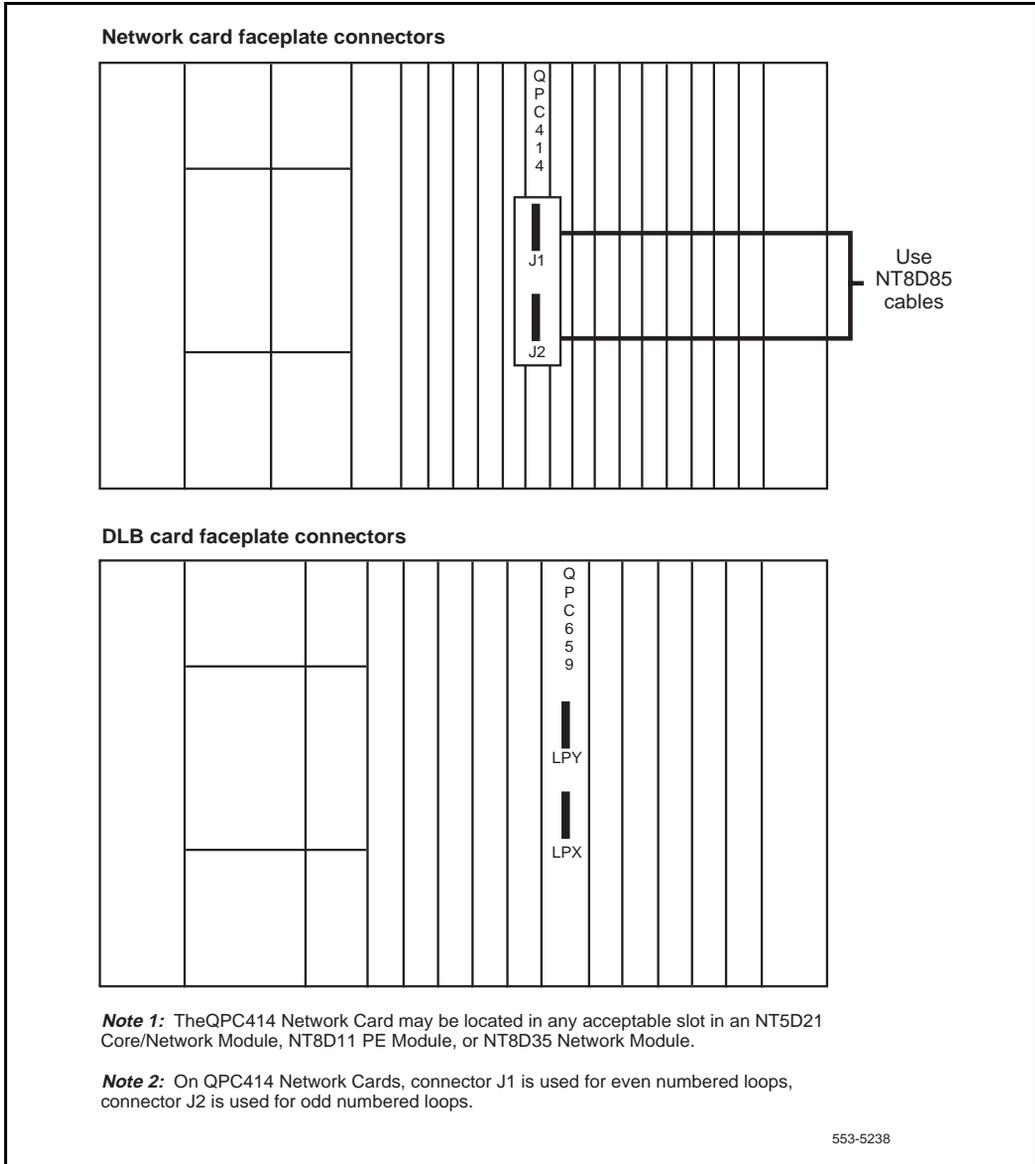
Network card faceplate connectors

QPC414

J1

J2

Use
NT8D85
cables

DLB card faceplate connectors

QPC659

LPY

LPX

Note 1: TheQPC414 Network Card may be located in any acceptable slot in an NT5D21 Core/Network Module, NT8D11 PE Module, or NT8D35 Network Module.

Note 2: On QPC414 Network Cards, connector J1 is used for even numbered loops, connector J2 is used for odd numbered loops.

553-5238

4 Seat and secure all connectors.

5 Set the Enb/Dis switch on each network card to Enb.

6 During system software configuration, use the *X11 input/output guide* to enter loop assignments.

Basic cabling for multiple-row network connections

1 Refer to the work order and the cabling layout shipped with the system to determine

- each loop number assigned

- the module and slot assignments of the QPC414 Network Card associated with each loop

- the location of NT8D13 PE Modules that contain QPC659 DLB Cards associated with each loop

2 Set the Enb/Dis switch on the faceplate of each network card to Dis.

3 Cable network loops from the faceplate connector on the network card to the I/O panels on the rear of the Network Module.

- Label both ends of an NT8D86AD cable with the loop number, then connect one end of the cable to the network card faceplate connector:

    J1 for shelf 0

    J2 for shelf 1

- Route the cable around the card cage to the I/O panel and mount the cable connector in one of the cutouts in the panel.

    the recommended order for connections is J1, J2, J5, J6, J9, J10, J22, J23, J26, J27, J31, J32

- Figure 101 shows the network card faceplate connectors, the universal I/O panel connectors, and the cables required.

Figure 101
QPC414 Network Card network loops—network card to I/O panel connections
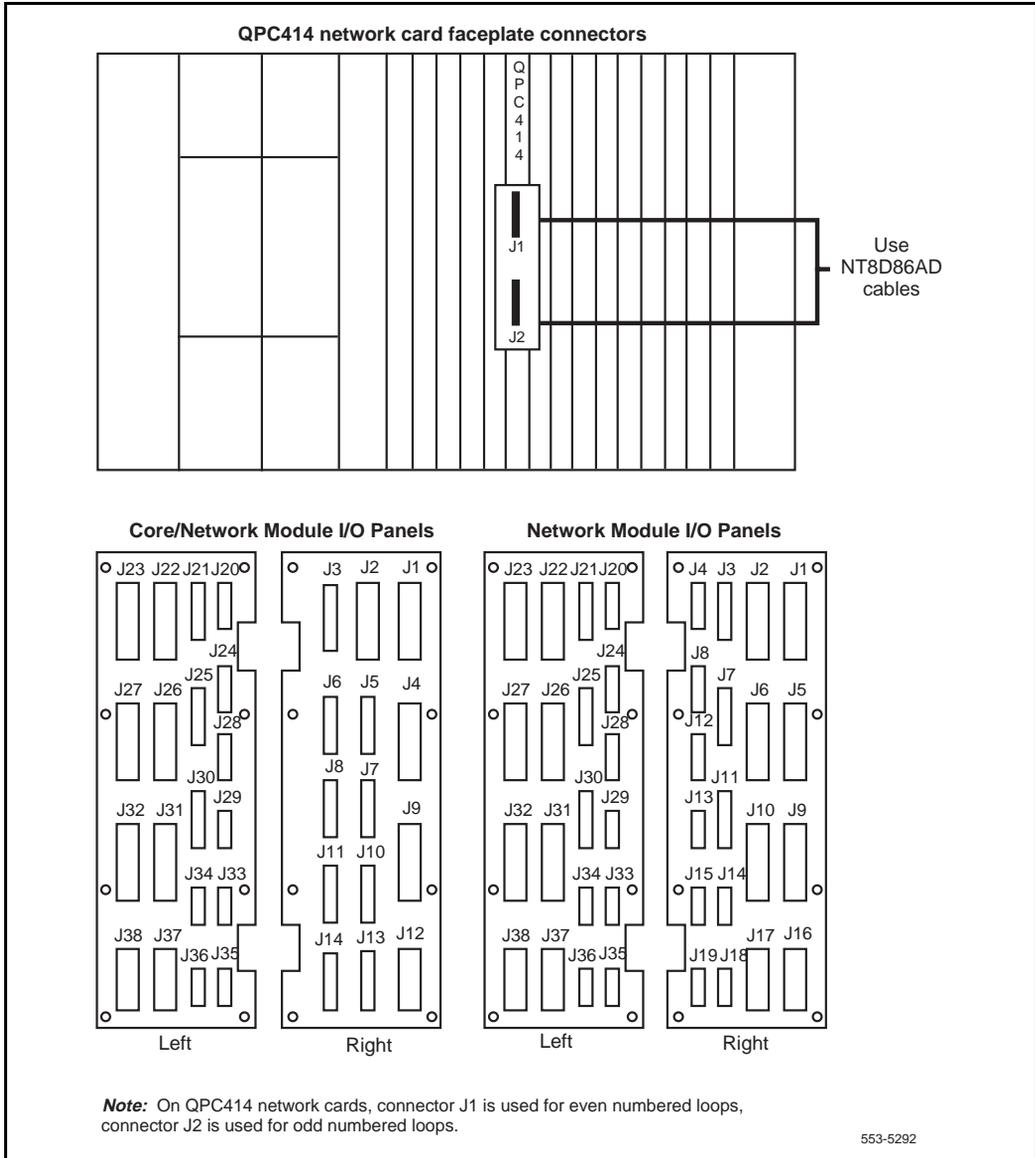
4   Cable the DLB card to the I/O panels on the rear of the PE Module.

- Label both ends of an NT8D86AD cable with the loop number, then connect one end of the cable to the assigned LPX or LPY faceplate connector on the DLB card.

- Mount the connector on the other end of the cable in one of the cutouts in the I/O panels:

    LPX to J1

    LPY to J2

- Figure 102 shows the DLB card connectors, the I/O panels for the PE Module, and the cables required.

5   Complete the network loop connection.

- Connect one end of an NT8D73 cable to the I/O panel connector for the network card.

- Connect the other end of the cable to the I/O panel connector for the associated DLB card.

6   Seat and secure all connectors.

7   Set the Enb/Dis switch on each network card to Enb.

8   During system software configuration, use the *X11 input/output guide* to enter loop assignments.

Figure 102
QPC414 Network Card network loops—DLB card to I/O panel connections

553-5293
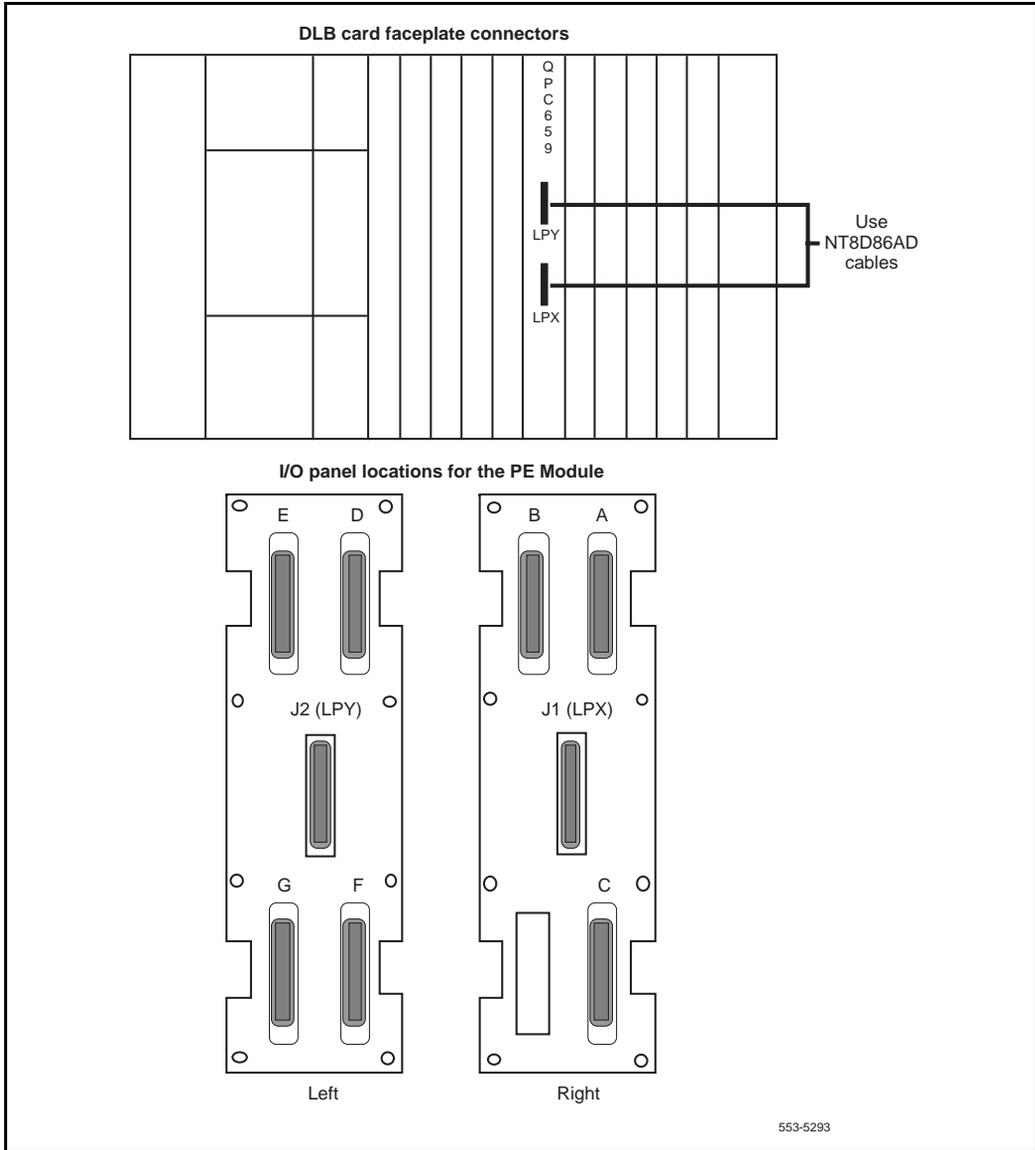
Network loop configurations

Figure 103 shows shelf configurations for single, dual, and quad density loops using the QPC414 Network Card.

Figure 103
QPC414 network loop configurations
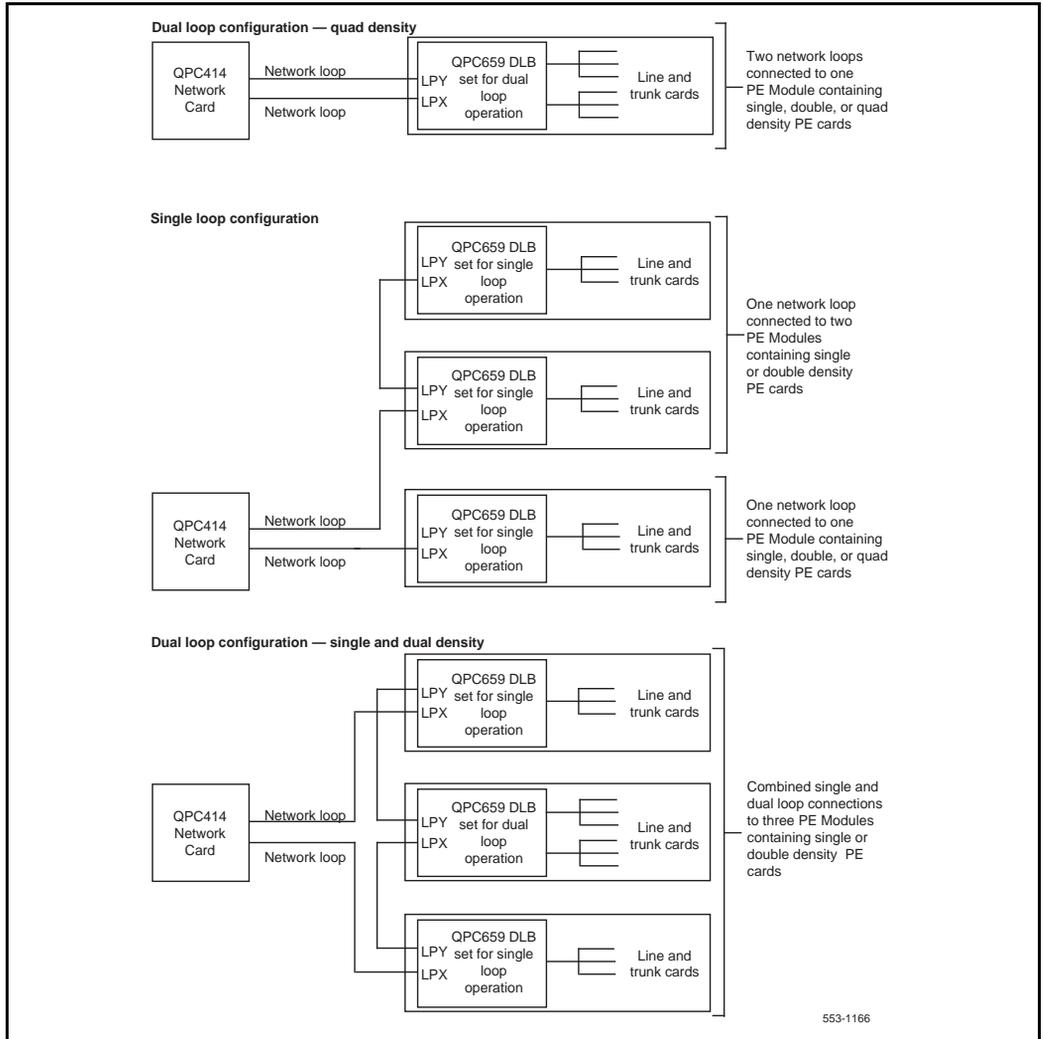
QPC414 Network Card connected to an NT5K11 EEPE module

<div style="border:1px solid">

CAUTION

Due to the possibility of EMI/RFI noise, do not route cables from front
to rear next to the power supply unit.

</div>

Basic cabling for single-row network connections

1   Refer to the work order and the cabling layout shipped with the system
to determine:

- each loop number assigned

- the module and slot assignments for the QPC414 Network Card
associated with each loop

- the location of NT5K11 EEPE Modules which contain NT5K10
DLB Cards associated with each loop

2   Set the ENB/DIS switch on the faceplate of each network card to DIS.

3   Cable network loops from the faceplate connector on the network card to
the faceplate connector on the associated DLB card.

- Label both ends of an NT8D85 cable with the loop number, then
connect one end of the cable to the network card faceplate
connector:

    — J1 for an even numbered loop

    — J2 for an odd numbered loop

- On the DLB card, connect the cable to the LPX or LPY connector
assigned to the loop.

- Figure 104 shows the network card and DLB card connectors and
the cables required.

4   Seat and secure all connectors.

5   Set the ENB/DIS switch on each network card to ENB.

6   During system software configuration, use the *X11 input/output guide* to
enter loop assignments.

Figure 104
QPC414 Network Card network loops—connectors and cables for single-row connections
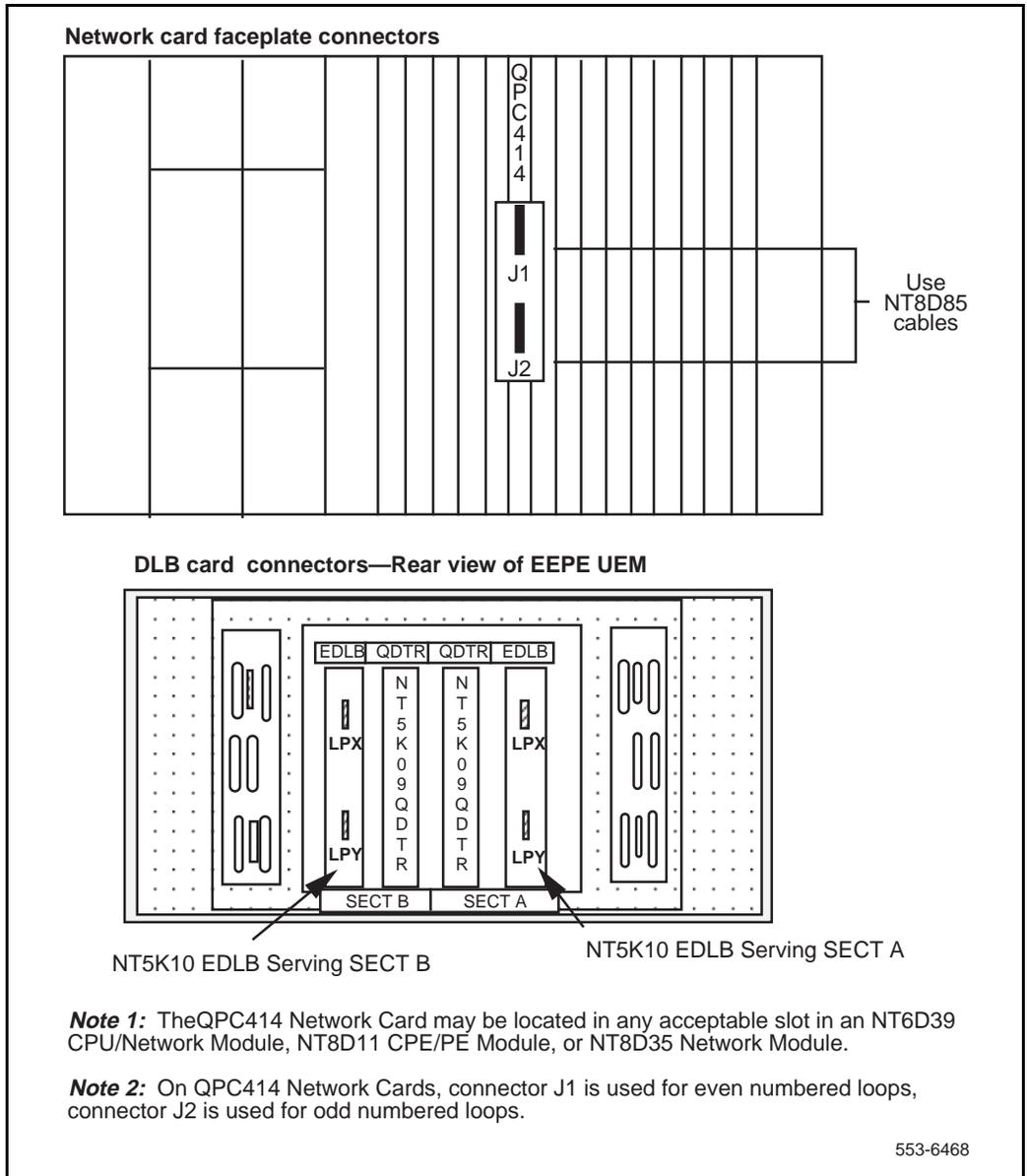
Network card faceplate connectors

QPC414

J1

J2

Use NT8D85 cables

DLB card connectors—Rear view of EEPE UEM

EDLB QDTR QDTR EDLB

LPX

N T 5 K 0 9 Q D T R

N T 5 K 0 9 Q D T R

LPX

LPY

LPY

SECT B   SECT A

NT5K10 EDLB Serving SECT B

NT5K10 EDLB Serving SECT A

Note 1: TheQPC414 Network Card may be located in any acceptable slot in an NT6D39 CPU/Network Module, NT8D11 CPE/PE Module, or NT8D35 Network Module.

Note 2: On QPC414 Network Cards, connector J1 is used for even numbered loops, connector J2 is used for odd numbered loops.

553-6468

Basic cabling for multiple-row network connections

1   Refer to the work order and the cabling layout shipped with the system to determine:

   • each loop number assigned

   • the location (NT8D35 Network Module and slot assignments) of the QPC414 Network Card associated with each loop

   • the location of NT5K11 EEPE Modules which contain NT5K10 DLB Cards associated with each loop

2   Set the ENB/DIS switch on the faceplate of each network card to DIS.

3   Cable network loops from the faceplate connector on the network card to the I/O panels on the rear of the Network Module.

   • Label both ends of an NT8D86AD cable with the loop number, then connect one end of the cable to the network card faceplate connector:

      — J1 for an even numbered loop

      — J2 for an odd numbered loop

   • Route the cable around the card cage to the I/O panel and mount the cable connector in one of the cutouts in the panel.

      — with the universal I/O panel (P0715058), the recommended order for connections is J1, J2, J5, J6, J9, J10, J22, J23, J26, J27, J31, J32

      — with any other I/O panel, the recommended order for connections is J20, J17, J16, J2, J1, J4

   • Figure 105 shows the network card faceplate connectors, the universal I/O panel connectors, and the cables required.

4   Cable the NT5K10 DLB card to the I/O panels on the NT5K11 EEPE Module.

- Remove the backplane access plate from the rear of the NT5K11 EEPE module and set it aside.

- Using an NT5K1110 cable, connect the JA1 connector on the NT5K11 I/O panel to connector LPY on the assigned NT5K10 DLB card in shelf section A. Similarly, connect JA2 on the I/O panel to connector LPX on the NT5K10 DLB card.

- Repeat for section B of the shelf:

  — JB1 on the I/O panel connects to LPY on NT5K10

  — JB2 on the I/O panel connects to LPX on NT5K10

- Figure 106 shows the NT5K10 DLB card connectors and the I/O panels for the NT5K11 EEPE Module. Figure 107 shows the NT5K11 I/O panel in detail.

5   Complete the network loop connection.

- Connect one end of an NT8D73 cable to the I/O panel connector for the network card.

- Connect the other end of the cable to the I/O panel connector for the associated DLB card.

6   Seat and secure all connectors.

7   Set the ENB/DIS switch on each network card to ENB.

8   During system software configuration, use the *X11 input/output guide* to enter loop assignments.

Figure 105
QPC414 Network Card network loops—network card to I/O panel connections

Note: On QPC414 network cards, connector J1 is used for even numbered loops, connector J2 is used for odd numbered loops.

553-5292
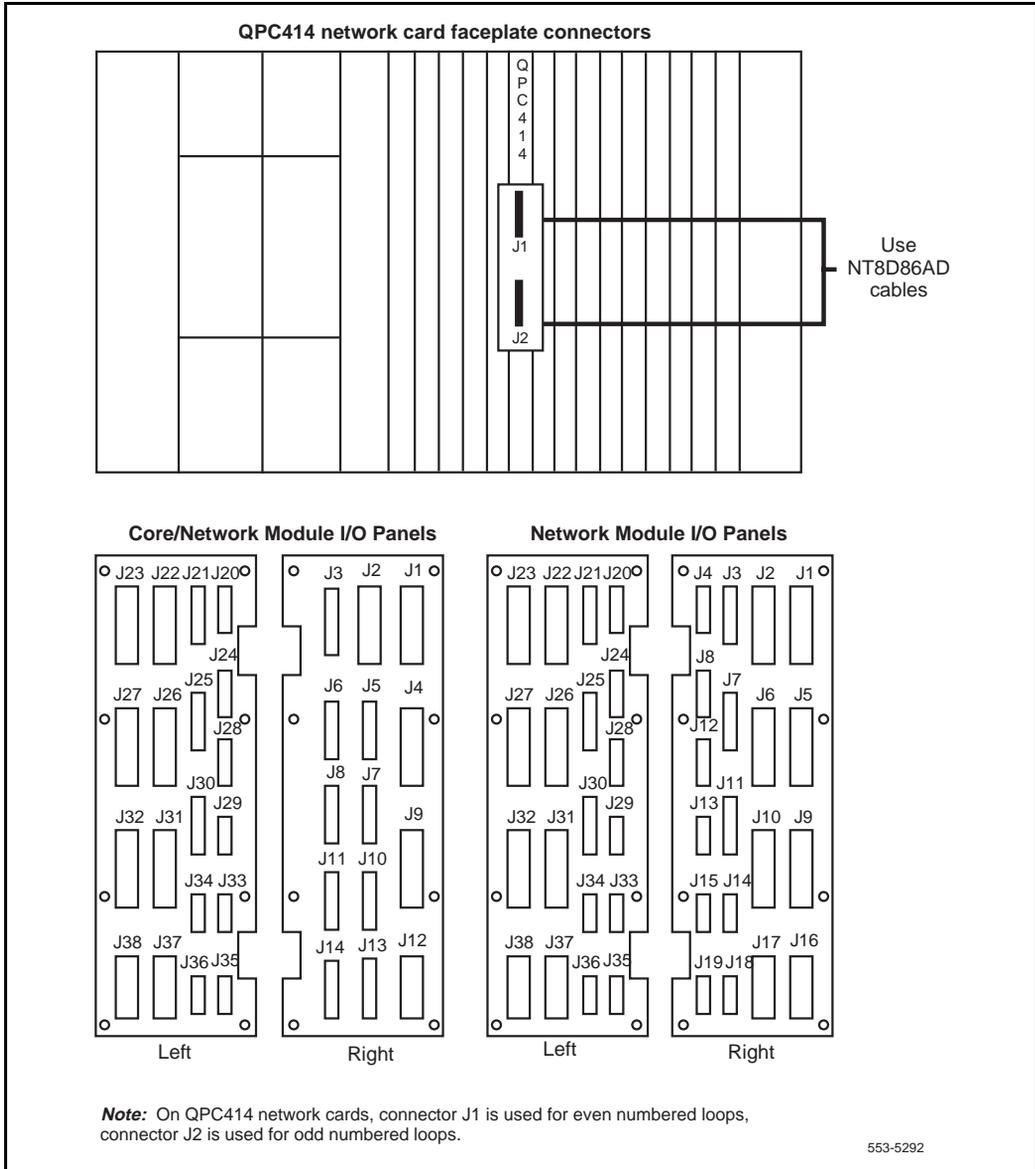
Figure 106
QPC414 Network Card network loops—NT5K10 DLB card to NT5K11 I/O panel connections

Rear View of EEPE UEM with Cover and Access Plate Removed

NT8D86 Cables to I/O Panel or to ENET Circuit Pack

I/O Panel

I/O Panel

EDLB QDTR QDTR EDLB

N T 5 K 09 Q D T R

N T 5 K 09 Q D T R

LPX

LPX

LPY

LPY

SECT B   SECT A

NT5K10 EDLB Serving SECT B

NT5K10 EDLB Serving SECT A

553-6469
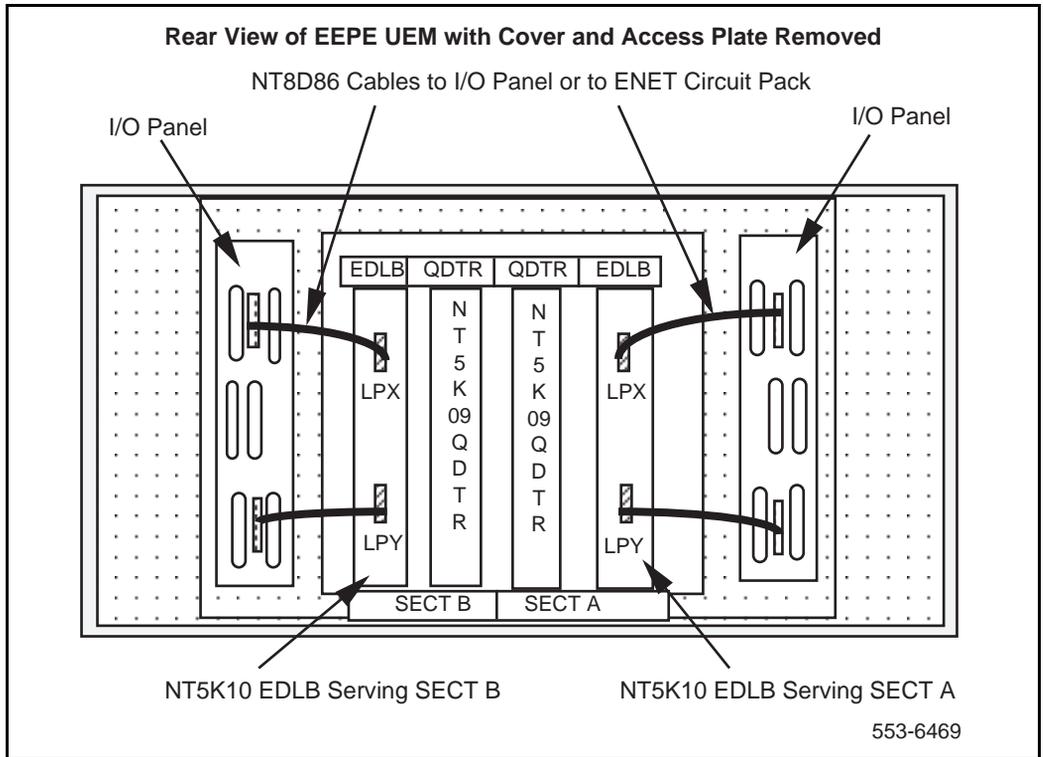
Figure 107
NT5K11 I/O panel
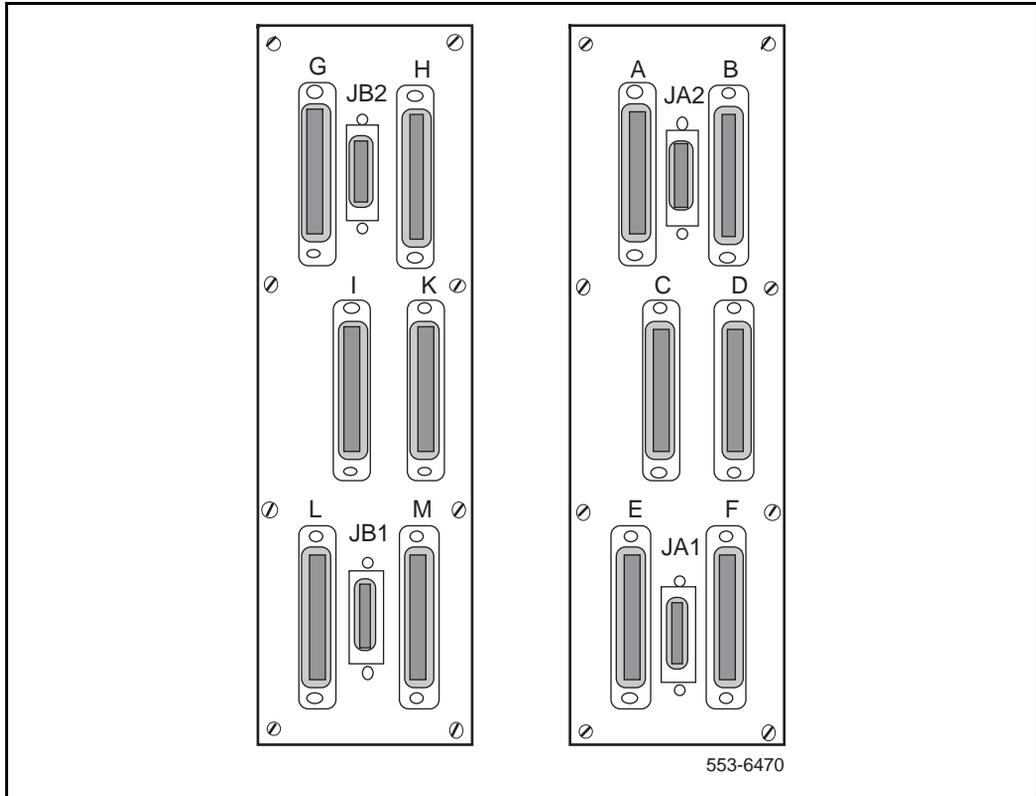
553-6470

Network loop configurations

Figure 108 shows the module (shelf) configurations for single and dual loops using the QPC414 network card.

Figure 108
QPC414 network loop configurations

Network loop configurations

Figure 108 shows the module (shelf) configurations for single and dual loops using the QPC414 network card.

Figure 108
QPC414 network loop configurations
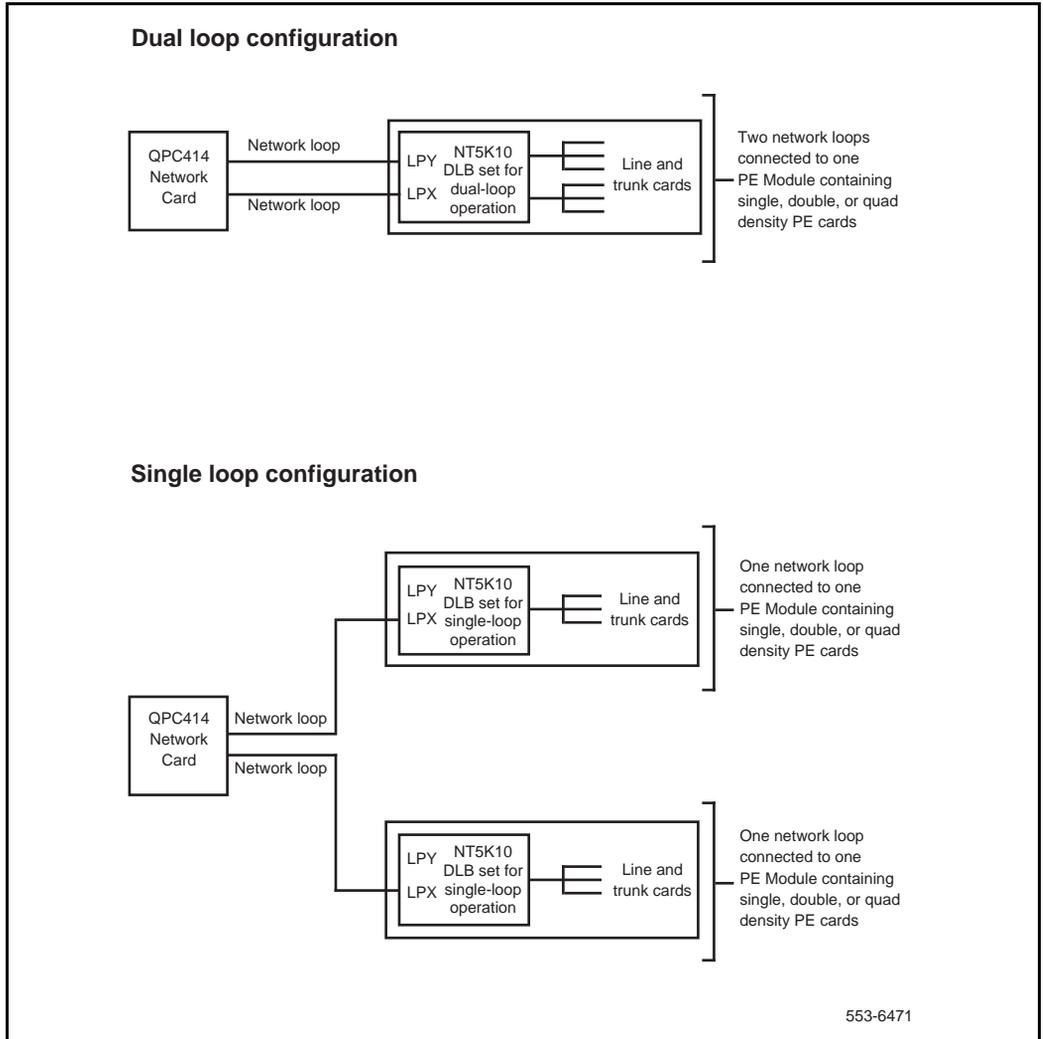
Cabling lines and trunks

Cables are designated by the letter of the I/O panel cutout (A, B, C, and so on) where the 50-pin cable connector is attached. Each cable has three 20-pin connectors (16 positions are used), designated 1, 2, and 3, that attach to the backplane. Using the designations described, the backplane ends of the first cable are referred to as A-1, A-2, and A-3.

The locations of the cable connectors on the backplane are designated by the slot number (L0 through L9 for NT8D11, L0 through L15 for NT8D37) and the shroud row (1, 2, and 3). Using these designations, the slot positions in the first slot are referred to as L0-1, L0-2, and L0-3.

In NT8D11BC and NT8D11EC (and later vintage) CE/PE Modules, all 10 IPE card slots support 24-pair cable connections. Table 24 shows the cable connections from the backplane to the inside of the I/O panel. Figure 109 shows the designations (such as A-1) for the backplane end of the cables, and the backplane slot designations (such as L0) for the cable connections.

Table 24
NT8D11 cable connections

Backplane slots–shroud rows	I/O panel/cable designation
L0–1,2,3	A
L1–1,2,3	B
L2–1,2,3	C
L3–1,2,3	D
L4–1,2,3	E
L5–1,2,3	F
L6–1,2,3	G
L7–1,2,3	H
L8–1,2,3	K
L9–1,2,3	L

Figure 109
NT8D11 backplane cable designations
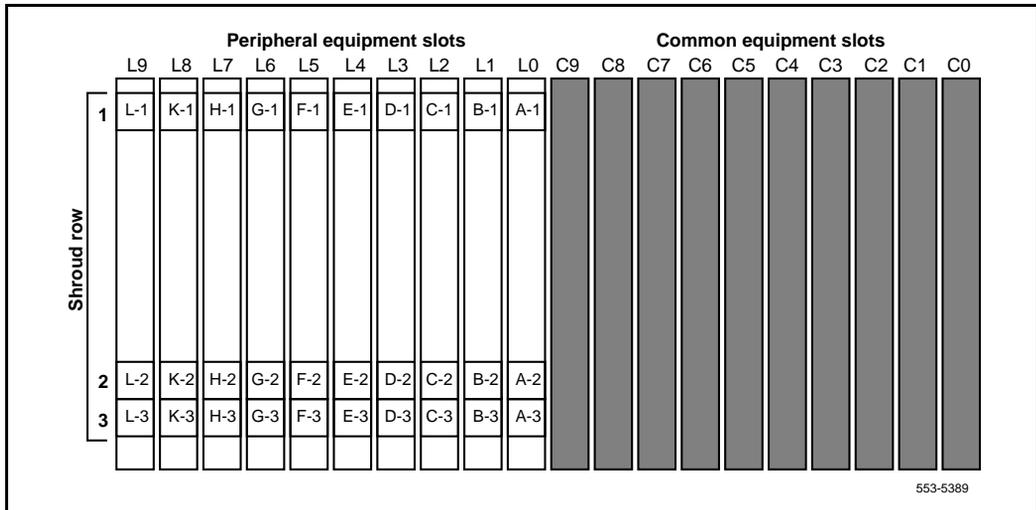
In NT8D37BA and NT8D37EC (and later vintage) IPE Modules, all 16 IPE card slots support 24-pair cable connections. Table 25 shows the cable connections from the backplane to the inside of the I/O panel. Figure 110 shows the designations for the backplane end of the cables, the backplane slot designations for the cable connections, and the associated network segments for the backplane slots.

Table 25
NT8D37 cable connections

Backplane slots–shroud rows	I/O panel/cable designation
L0–1, 2, 3	A
L1–1, 2, 3	B
L2–1, 2, 3	C
L3–1, 2, 3	D
L4–1, 2, 3	E
L5–1, 2, 3	F
L6–1, 2, 3	G
L7–1, 2, 3	H
L8–1, 2, 3	K
L9–1, 2, 3	L
L10–1, 2, 3	M
L11–1, 2, 3	N
L12–1, 2, 3	R
L13–1, 2, 3	S
L14–1, 2, 3	T
L15–1, 2, 3	U

Note: To cable lines and trunks in NT8D11AC or DC modules (7-cable configuration), and in NT8D37AA or DC modules (12-cable configuration), go to Appendix C.

Figure 110
NT8D37 backplane cable designations

553-5391
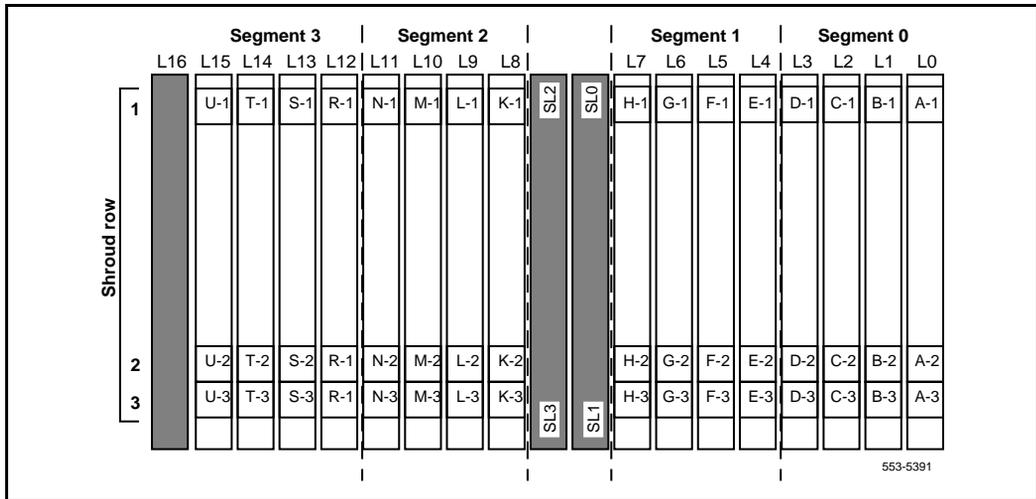
I/O panel connections

Use this procedure to cable NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules.

Note: The corner vertical channels in the rear of the module are outside of the EMI shield. Cables in those vertical channels must be shielded, and must enter and exit the EMI-shielded area through I/O panels and adapters.

CAUTION
Electrical shock hazard
Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

---

1 Select an appropriate number of NE-A25B (or equivalent) cables long enough to run from the I/O panels on the rear of the module to the MDF.

- Figure 111 shows the I/O panels on the NT8D11 CE/PE Module.

- Figure 112 shows the I/O panels on the NT8D13 PE Module.

- Figure 113 shows the I/O panels on the NT8D37 IPE Module.

- Figures 114 shows the I/O panels on the NT5K11 EEPE Module.

2 Attach a tag that shows the module number and the I/O connector designation to both ends of each cable.

3 Connect each cable to the appropriate connector on the I/O panel and run the cables to the MDF.

4 Terminate each cable on the cross-connect block designated with the appropriate module number.

Note: For information on the MDF layout see "Planning and designating the Modular Distribution Frame (MDF)" on page 67.

5 Make sure all cables are neatly run, properly seated, and secured with cable ties.

Figure 111
NT8D11 CE/PE Module I/O panels
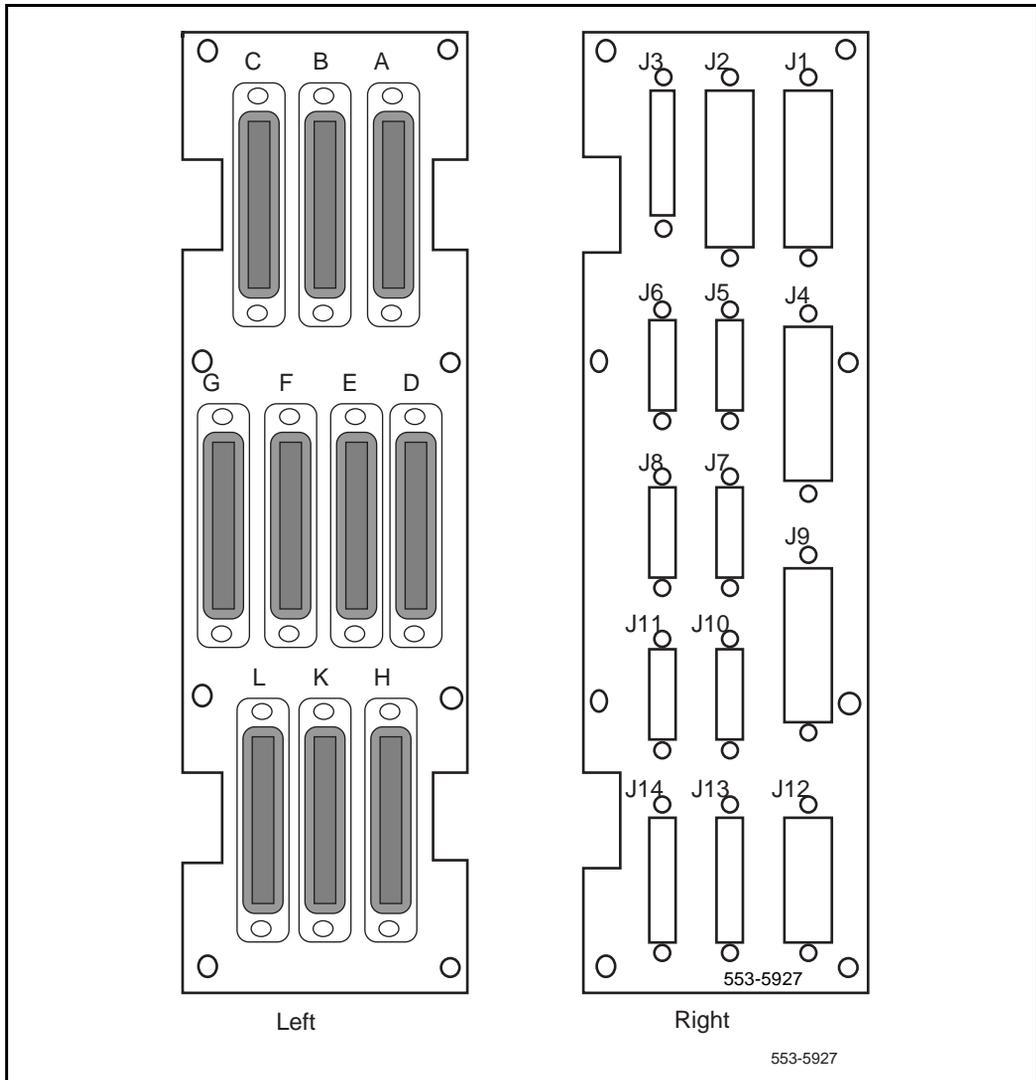
Figure 112
NT8D13 PE Module I/O panels
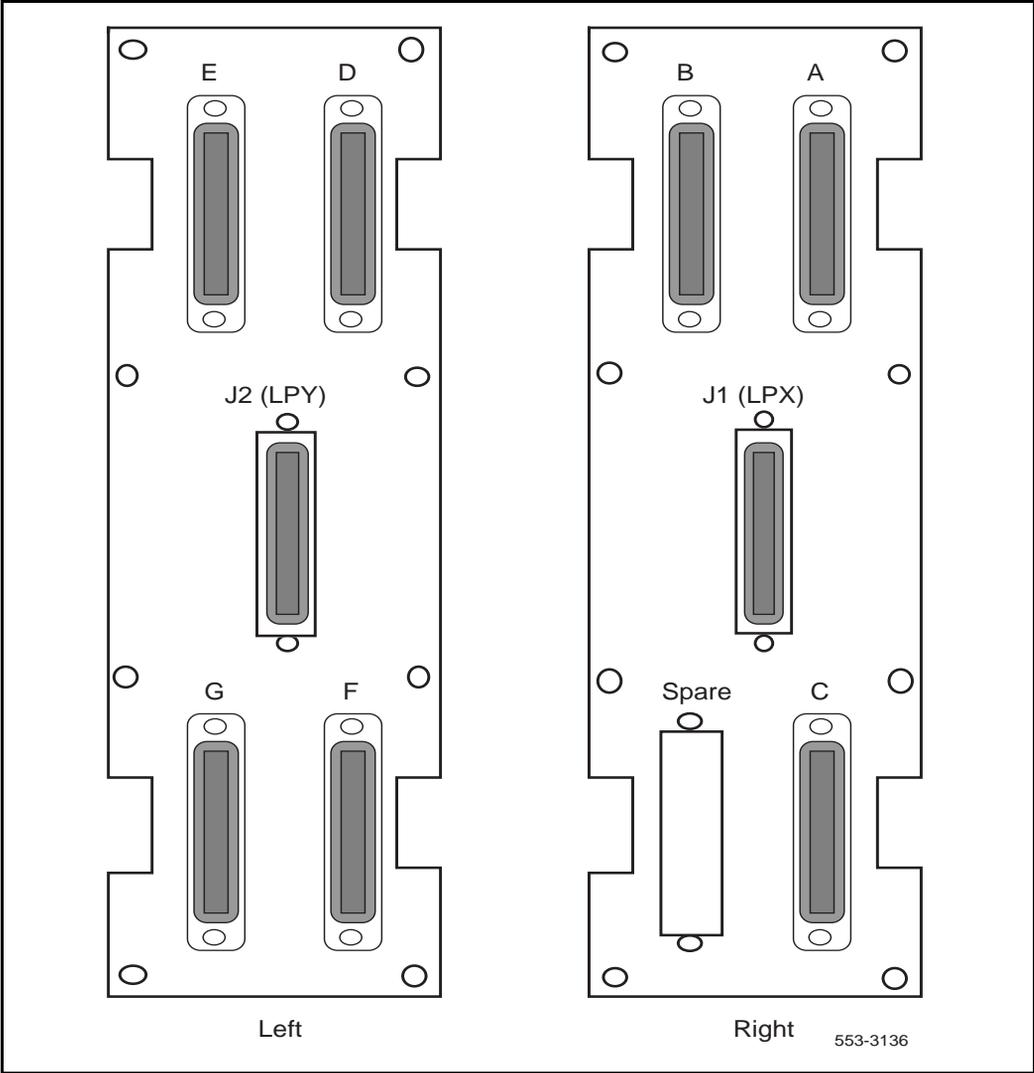
Figure 113
NT8D37 IPE Module I/O panels

553-5928
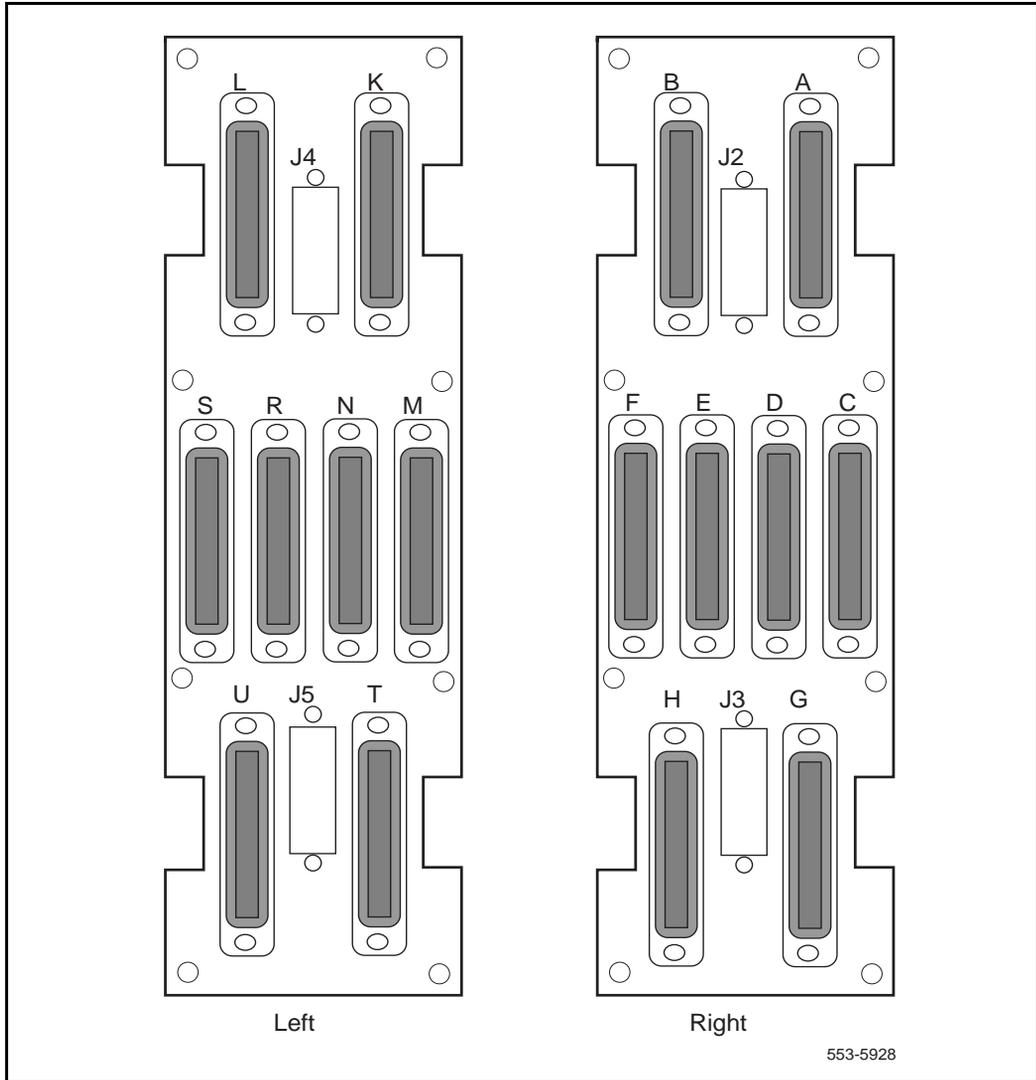
Figure 114
NT5K11 EEPE Module I/O panels

553-6470

Connecting lines and trunks

Throughout this procedure, make sure wiring is not reversed and is on the proper terminals. Allow enough slack in the wiring to allow tracing and to reconnect wires if they break at the terminal.

1   Extend incoming wiring (such as cables from the central office or wiring from a recorded announcement machine) to the MDF and terminate them on separate connecting blocks.

2   Assign and record terminal numbers (TNs) for each line or trunk. Determine the location of the line or trunk connection and its assigned TN from the work order or assignment records.

3   Connect each line and trunk to the TN using cross-connecting wire (typically 24 AWG type-Z wire). Table 26 lists pair-termination tables for line and trunk cards in NT8D11 CE/PE, NT8D13 PE, and NT8D37 IPE Modules.

Cross-connect incoming wiring and lines and trunks at the MDF.

Table 26
Line and trunk pair-termination tables

	NT8D11 CE/PE Module	NT8D13 PE Module	NT8D37 IPE Module	NT5K11 EEPE Module
Line cards	Table 27	Single loop mode: Tables 54, 55; Dual loop mode: Tables 56, 57	Table 64	Tables 89 through 96
Trunk cards	NT8D14 Universal Trunk Card: Table 28 NT8D15 E&M Trunk Card: Tables 29 through 31 NT5K17 DDI Trunk card; Tables 33 through 35 NT5K18 Flexible Central Office Trunk card; Tables 36 through 38 NT5K19 Flexible E&M Trunk card; Tables 39 through 53	QPC71, QPC74, QPC237, QPC239, QPC250, QPC449, QPC450, and announcement and music trunk cards: Tables 58 through 63	NT8D14 Universal Trunk Card: Table 65 NT8D15 E&M Trunk Card: Figures 66 through 68 NT5K17 DDI Trunk card; Tables 70 through 72 NT5K18 Flexible Central Office Trunk card; Tables 73 through 75 NT5K19 Flexible E&M Trunk card; Tables 76 through 88	Tables 89 through 96

Table 27
NT8D11 CE/PE Module: line card pair-terminations

Pair	Pin numbers	Pair color	Unit 24/card
1T/1R	26/1	W-BL/BL-W	0
2T/2R	27/2	W-O/O-W	1
3T/3R	28/3	W-G/G-W	2
4T/4R	29/4	W-BR/BR-W	3
5T/5R	30/5	W-S/S-W	4
6T/6R	31/6	R-BL/BL-R	5
7T/7R	32/7	R-O/O-R	6
8T/8R	33/8	R-G/G-R	7
9T/9R	34/9	R-BR/BR-R	8
10T/10R	35/10	R-S/S-R	9
11T/11R	36/11	BK-BL/BL-BK	10
12T/12R	37/12	BK-O/O-BK	11
13T/13R	38/13	BK-G/G-BK	12
14T/14R	39/14	BK-BR / BK-BR	13
15T/15R	40/15	BK-S/S-BK	14
16T/16R	41/16	Y-BL/BL-Y	15
17T/17R	42/17	Y-O/O-Y	16
18T/18R	43/18	Y-G/G-Y	17
19T/19R	44/19	Y-BR/BR-Y	18
20T/20R	45/20	Y-S/S-Y	19
21T/21R	46/21	V-BL/BL-V	20
22T/22R	47/22	V-O/V-O	21
23T/23R	48/23	V-G/G-V	22
24T/24R	49/24	V-BR/BR-V	23
25T/25R	50/25	V-S/S-V	Spare

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Table 28
NT8D11 CE/PE Module: NT8D14 Universal Trunk Card pair-terminations

Lead designations			Pin numbers	Pair color	Unit
RAN mode	Page mode	Other modes			
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W	1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R	2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R	3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK	5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR	6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y	7

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Note 2: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 29
NT8D11 CE/PE Module: NT8D15 E&M Trunk Card 2-wire paging mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R	1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Table 30
NT8D11 CE/PE Module: NT8D15 E&M Trunk Card 2-wire type 1 mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R	1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK	2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Table 31
NT8D11 CE/PE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	**Type 2**			
TA/TB	TA/TB	26/1	W-BL/BL-W	0
RA/RB	RA/RB	27/2	W-O/O-W	
E/M	EA/EB	28/3	W-G/G-W	
ESC/ESCG	MA/MB	29/4	W-BR/BR-W	
TA/TB	TA/TB	30/5	W-S/S-W	1
RA/RB	RA/RB	31/6	R-BL/BL-R	
E/M	EA/EB	32/7	R-O/O-R	
ESC/ESCG	MA/MB	33/8	R-G/G-R	
TA/TB	TA/TB	34/9	R-BR/BR-R	2
RA/RB	RA/RB	35/10	R-S/S-R	
E/M	EA/EB	36/11	BK-BL/BL-BK	
ESC/ESCG	MA/MB	37/12	BK-O/O-BK	
TA/TB	TA/TB	38/13	BK-G/G-BK	3
RA/RB	RA/RB	39/14	BK-BR/BR-BK	
E/M	EA/EB	40/15	BK-S/S-BK	
ESC/ESCG	MA/MB	41/16	Y-BL/BL-Y	

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.

Table 32
NT8D11 CE/PE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	Type 2			
TA/TB	TA/TB	26/1	W-BL/BL-W	0
RA/RB	RA/RB	27/2	W-O/O-W	
E/M	EA/EB	28/3	W-G/G-W	
ESC/ESCG	MA/MB	29/4	W-BR/BR-W	
TA/TB	TA/TB	30/5	W-S/S-W	1
RA/RB	RA/RB	31/6	R-BL/BL-R	
E/M	EA/EB	32/7	R-O/O-R	
ESC/ESCG	MA/MB	33/8	R-G/G-R	
TA/TB	TA/TB	34/9	R-BR/BR-R	2
RA/RB	RA/RB	35/10	R-S/S-R	
E/M	EA/EB	36/11	BK-BL/BL-BK	
ESC/ESCG	MA/MB	37/12	BK-O/O-BK	
TA/TB	TA/TB	38/13	BK-G/G-BK	3
RA/RB	RA/RB	39/14	BK-BR/BR-BK	
E/M	EA/EB	40/15	BK-S/S-BK	
ESC/ESCG	MA/MB	41/16	Y-BL/BL-Y	

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, and L. These connectors are associated with backplane slots 0 through 9, sequentially.

Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.

Table 33
NT8D11 CE/PE Module: NT5K17 Direct Dial Inward Trunk Card pair terminations for I/O panel connector A

Lead designations	Pins	Pair color	I/O panel connectors	Unit number
DDI Mode			**A**	
T0 R0	26 1	W-BL BL-W	Slot 0	Unit 0
	27 2	W-O O-W		
T1 R1	28 3	W-G G-W		Unit 1
	29 4	W-BR BR-W		
T2 R2	30 5	W-S S-W		Unit 2
	31 6	R-BL BL-R		
T3 R3	32 7	R-O O-R		Unit 3
	33 8	R-G G-R		
T4 R4	34 9	R-BR BR-R		Unit 4
	35 10	R-S S-R		
T5 R5	36 11	BK-BL BL-BK		Unit 5
	37 12	BK-S S-BK		
T6 R6	38 13	BK-G G-BK		Unit 6
	39 14	BK-BR BR-BK		
T7 R7	40 15	BK-S S-BK		Unit 7
	41 16	Y-BL BL-Y		

Table 34
NT8D11 CE/PE Module: NT5K17 Direct Dial Inward Trunk Card pair terminations for I/O panel connectors B, E, H (Part 1 of 2)

Lead designations DDI Mode	Pins	Pair color	I/O panel connectors B	E	H	Unit number
T0 R0	26 1	W-BL BL-W				Unit 0
	27 2	W-O O-W				
T1 R1	28 3	W-G G-W				Unit 1
	29 4	W-BR BR-W				
T2 R2	30 5	W-S S-W				Unit 2
	31 6	R-BL BL-R				
T3 R3	32 7	R-O O-R				Unit 3
	33 8	R-G G-R	Slot 1	Slot 4	Slot 7	
T4 R4	34 9	R-BR BR-R				Unit 4
	35 10	R-S S-R				
T5 R5	36 11	BK-BL BL-BK				Unit 5
	37 12	BK-S S-BK				
T6 R6	38 13	BK-G G-BK				Unit 6
	39 14	BK-BR BR-BK				
T7 R7	40 15	BK-S S-BK				Unit 7
	41 16	Y-BL BL-Y				

Table 34
NT8D11 CE/PE Module: NT5K17 Direct Dial Inward Trunk Card pair terminations
for I/O panel connectors B, E, H (Part 2 of 2)

| Lead designations | Pins | Pair color | I/O panel connectors | | | Unit number |
DDI Mode			B	E	H	
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 5	Slot 8	Unit 0
	43 18	Y-G G-Y				
T1 R1	44 19	Y-BR BR-Y				Unit 1
	45 20	Y-S S-Y				
T2 R2	46 21	V-BL BL-V				Unit 2
	47 22	V-O O-V				
T3 R3	48 23	V-G G-V				Unit 3
	49 24	V-BR BR-V				

Table 35
NT8D11 CE/PE Module: NT5K17 Direct Dial Inward Trunk Card pair terminations
for I/O panel connectors C, F, K (Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors			Unit number
DDI Mode			C	F	K	
T0 R0	26 1	W-BL BL-W				Unit 4
	27 2	W-O O-W				
T1 R1	28 3	W-G G-W				Unit 5
	29 4	W-BR BR-W	Slot 2	Slot 5	Slot 8	
T2 R2	30 5	W-S S-W				Unit 6
	31 6	R-BL BL-R				
T3 R3	32 7	R-O O-R				Unit 7
	33 8	R-G G-R				

Table 35
NT8D11 CE/PE Module: NT5K17 Direct Dial Inward Trunk Card pair terminations for I/O panel connectors C, F, K (Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors			Unit number
DDI Mode			C	F	K	
T4 R4	34 9	R-BR BR-R				Unit 0
	35 10	R-S S-R				
T5 R5	36 11	BK-BL BL-BK				Unit 1
	37 12	BK-S S-BK				
T6 R6	38 13	BK-G G-BK				Unit 2
	39 14	BK-BR BR-BK				
T7 R7	40 15	BK-S S-BK				Unit 3
	41 16	Y-BL BL-Y	Slot 3	Slot 6	Slot 9	
T0 R0	42 17	Y-O O-Y				Unit 4
	43 18	Y-G G-Y				
T1 R1	44 19	Y-BR BR-Y				Unit 5
	45 20	Y-S S-Y				
T2 R2	46 21	V-BL BL-V				Unit 6
	47 22	V-O O-V				
T3 R3	48 23	V-G G-V				Unit 7
	49 24	V-BR BR-V				

Table 36
NT8D11 CE/PE Module: NT5K18 Flexible Central Office Trunk Card pair terminations for I/O panel connector A

Lead designations	Pins	Pair color	I/O panel connectors	Unit number
COT			**A**	
T0 R0	26 1	W-BL BL-W		Unit 0
	27 2	W-O O-W		
T1 R1	28 3	W-G G-W		Unit 1
	29 4	W-BR BR-W		
T2 R2	30 5	W-S S-W		Unit 2
	31 6	R-BL BL-R		
T3 R3	32 7	R-O O-R		Unit 3
	33 8	R-G G-R		
T4 R4	34 9	R-BR BR-R	Slot 0	Unit 4
	35 10	R-S S-R		
T5 R5	36 11	BK-BL BL-BK		Unit 5
	37 12	BK-S S-BK		
T6 R6	38 13	BK-G G-BK		Unit 6
	39 14	BK-BR BR-BK		
T7 R7	40 15	BK-S S-BK		Unit 7
	41 16	Y-BL BL-Y		

Table 37
NT8D11 CE/PE Module: NT5K18 Flexible Central Office Trunk Card pair terminations for I/O panel connectors B, E, H (Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors			Unit number
COT			B	E	H	
T0 R0	26 1	W-BL BL-W				Unit 0
	27 2	W-O O-W				
T1 R1	28 3	W-G G-W				Unit 1
	29 4	W-BR BR-W				
T2 R2	30 5	W-S S-W				Unit 2
	31 6	R-BL BL-R				
T3 R3	32 7	R-O O-R				Unit 3
	33 8	R-G G-R				
T4 R4	34 9	R-BR BR-R	Slot 1	Slot 4	Slot 7	Unit 4
	35 10	R-S S-R				
T5 R5	36 11	BK-BL BL-BK				Unit 5
	37 12	BK-S S-BK				
T6 R6	38 13	BK-G G-BK				Unit 6
	39 14	BK-BR BR-BK				
T7 R7	40 15	BK-S S-BK				Unit 7
	41 16	Y-BL BL-Y				

Table 37
NT8D11 CE/PE Module: NT5K18 Flexible Central Office Trunk Card pair terminations for I/O panel connectors B, E, H (Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors			Unit number
COT			B	E	H	
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 5	Slot 8	Unit 0
	43 18	Y-G G-Y				
T1 R1	44 19	Y-BR BR-Y				Unit 1
	45 20	Y-S S-Y				
T2 R2	46 21	V-BL BL-V				Unit 2
	47 22	V-O O-V				
T3 R3	48 23	V-G G-V				Unit 3
	49 24	V-BR BR-V				

Table 38
NT8D11 CE/PE Module: NT5K18 Flexible Central Office Trunk Card pair terminations for I/O panel connectors C, F, K (Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors			Unit number
COT			C	F	K	
T0 R0	26 1	W-BL BL-W				Unit 4
	27 2	W-O O-W				
T1 R1	28 3	W-G G-W				Unit 5
	29 4	W-BR BR-W	Slot 2	Slot 5	Slot 8	
T2 R2	30 5	W-S S-W				Unit 6
	31 6	R-BL BL-R				
T3 R3	32 7	R-O O-R				Unit 7
	33 8	R-G G-R				

Table 38
NT8D11 CE/PE Module: NT5K18 Flexible Central Office Trunk Card pair terminations for I/O panel connectors C, F, K (Part 2 of 2)

Lead designations COT	Pins	Pair color	I/O panel connectors C	F	K	Unit number
T4 R4	34 9	R-BR BR-R				Unit 0
	35 10	R-S S-R				
T5 R5	36 11	BK-BL BL-BK				Unit 1
	37 12	BK-S S-BK				
T6 R6	38 13	BK-G G-BK				Unit 2
	39 14	BK-BR BR-BK				
T7 R7	40 15	BK-S S-BK				Unit 3
	41 16	Y-BL BL-Y	Slot 3	Slot 6	Slot 9	
T0 R0	42 17	Y-O O-Y				Unit 4
	43 18	Y-G G-Y				
T1 R1	44 19	Y-BR BR-Y				Unit 5
	45 20	Y-S S-Y				
T2 R2	46 21	V-BL BL-V				Unit 6
	47 22	V-O O-V				
T3 R3	48 23	V-G G-V				Unit 7
	49 24	V-BR BR-V				

Table 39
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Paging mode pair terminations for I/O panel connector A

Pair	Pins	Pair color	I/O panel connectors	Unit number
			A	
T0 R0	27 2	W-O O-W		Unit 0
A PG	29 4	W-BR BR-W		Unit 0
T1 R1	31 6	R-BL BL-R		Unit 1
A PG	33 8	R-G G-R	Slot 0	Unit 1
T2 R2	35 10	R-S S-R		Unit 2
A PG	37 12	BL-O O-BL		Unit 2
T3 R3	39 14	BK-BR BR-BK		Unit 3
A PG	41 16	Y-BL BL-Y		Unit 3

Table 40
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Paging mode pair terminations for I/O panel connectors B, E, H

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	**E**	**H**	
T0 R0	27 2	W-O O-W	Slot 1	Slot 4	Slot 7	Unit 0
A PG	29 4	W-BR BR-W				
T1 R1	31 6	R-BL BL-R				Unit 1
A PG	33 8	R-G G-R				
T2 R2	35 10	R-S S-R				Unit 2
A PG	37 12	BL-O O-BL				
T3 R3	39 14	BK-BR BR-BK				Unit 3
A PG	41 16	Y-BL BL-Y				
T0 R0	43 18	Y-G G-Y	Slot 2	Slot 5	Slot 8	Unit 0
A PG	45 20	Y-S S-Y				
T1 R1	47 22	V-O O-V				Unit 1
A PG	49 24	V-BR BR-V				

Table 41
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Paging mode pair terminations for I/O panel connectors C, F, K

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
T2 R2	27 2	W-O O-W	Slot 2	Slot 5	Slot 8	Unit 2
A PG	29 4	W-BR BR-W				
T3 R3	31 6	R-BL BL-R				Unit 3
A PG	33 8	R-G G-R				
T0 R0	35 10	R-S S-R	Slot 3	Slot 6	Slot 9	Unit 0
A PG	37 12	BL-O O-BL				
T1 R1	39 14	BK-BR BR-BK				Unit 1
A PG	41 16	Y-BL BL-Y				
T2 R2	43 18	Y-G G-Y				Unit 2
A PG	45 20	Y-S S-Y				
T3 R3	47 22	V-O O-V				Unit 3
A PG	49 24	V-BR BR-V				

Table 42
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Type 1 mode pair terminations for I/O panel connector A

Pair	Pins	Pair color	I/O panel connectors	Unit number
			A	
T0 R0	27 2	W-O O-W	Slot 0	Unit 0
E M	28 3	W-G G-W		Unit 0
T1 R1	31 6	R-BL BL-R		Unit 1
E M	32 7	R-O O-R		Unit 1
T2 R2	35 10	R-S S-R		Unit 2
E M	36 11	BK-BL BL-BK		Unit 2
T3 R3	39 14	BK-BR BR-BK		Unit 3
E M	40 15	BK-S S-BK		Unit 3

Table 43
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Type 1 mode pair terminations for I/O panel connectors B, E, H

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	E	H	
T0 R0	27 2	W-O O-W				Unit 0
E M	28 3	W-G G-W				
T1 R1	31 6	R-BL BL-R				Unit 1
E M	32 7	R-O O-R				
T2 R2	35 10	R-S S-R	Slot 1	Slot 4	Slot 7	Unit 2
E M	36 11	BK-BL BL-BK				
T3 R3	39 14	BK-BR BR-BK				Unit 3
E M	40 15	BK-S S-BK				
T0 R0	43 18	Y-G G-Y				Unit 0
E M	44 19	Y-BR BR-Y				
T1 R1	47 22	V-O O-V	Slot 2	Slot 5	Slot 8	Unit 1
E M	48 23	V-G G-V				

Table 44
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 2W Type 1 mode pair terminations for I/O panel connectors C, F, K

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
T2 R2	27 2	W-O O-W	Slot 2	Slot 5	Slot 8	Unit 2
E M	28 3	W-G G-W				
T3 R3	31 6	R-BL BL-R				Unit 3
E M	32 7	R-O O-R				
T0 R0	35 10	R-S S-R	Slot 3	Slot 6	Slot 9	Unit 0
E M	36 11	BK-BL BL-BK				
T1 R1	39 14	BK-BR BR-BK				Unit 1
E M	40 15	BK-S S-BK				
T2 R2	43 18	Y-G G-Y				Unit 2
E M	44 19	Y-BR BR-Y				
T3 R3	47 22	V-O O-V				Unit 3
E M	48 23	V-G G-V				

Table 45
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 4W Type 1 mode pair terminations for I/O panel connector A

Pair	Pins	Pair color	I/O panel connectors	Unit number
			A	
TA TB	26 1	W-BL BL-W	Slot 0	Unit 0
RA RB	27 2	W-O O-W		Unit 0
E M	28 3	W-G G-W		Unit 0
TA TB	30 5	W-S S-W		Unit 1
RA RB	31 6	R-BL BL-R		Unit 1
E M	32 7	R-O O-R		Unit 1
TA TB	34 9	R-BR BR-R		Unit 2
RA RB	35 10	R-S S-R		Unit 2
E M	36 11	BK-BL BL-BK		Unit 2
TA TB	38 13	BK-G G-BK		Unit 3
RA RB	39 14	BK-BR BR-BK		Unit 3
E M	40 15	BK-S S-BK		Unit 3

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 46
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 4W Type 1 mode pair terminations for I/O panel connectors B, E, H (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	**E**	**H**	
TA TB	26 1	W-BL BL-W				Unit 0
RA RB	27 2	W-O O-W				
E M	28 3	W-G G-W				
TA TB	30 5	W-S S-W				Unit 1
RA RB	31 6	R-BL BL-R				
E M	32 7	R-O O-R	Slot 1	Slot 4	Slot 7	
TA TB	34 9	R-BR BR-R				Unit 2
RA RB	35 10	R-S S-R				
E M	36 11	BK-BL BL-BK				
TA TB	38 13	BK-G G-BK				Unit 3
RA RB	39 14	BK-BR BR-BK				
E M	40 15	BK-S S-BK				

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 46
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 4W Type 1 mode pair terminations for I/O panel connectors B, E, H (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	E	H	
TA TB	42 17	Y-O O-Y	Slot 2	Slot 5	Slot 8	Unit 0
RA RB	43 18	Y-G G-Y				
E M	44 19	Y-BR BR-Y				
TA TB	46 21	V-BL BL-V				Unit 1
RA RB	47 22	V-O O-V				
E M	48 23	V-G G-V				
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.						

Table 47
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 4W Type 1 mode pair terminations for I/O panel connectors C, F, K (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
TA TB	26 1	W-BL BL-W	Slot 2	Slot 5	Slot 8	Unit 2
RA RB	27 2	W-O O-W				
E M	28 3	W-G G-W				
TA TB	30 5	W-S S-W				Unit 3
RA RB	31 6	R-BL BL-R				
E M	32 7	R-O O-R				
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.						

Table 47
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card 4W Type 1 mode pair terminations for I/O panel connectors C, F, K (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
TA TB	34 9	R-BR BR-R				
RA RB	35 10	R-S S-R				Unit 0
E M	36 11	BK-BL BL-BK				
TA TB	38 13	BK-G G-BK				
RA RB	39 14	BK-BR BR-BK				Unit 1
E M	40 15	BK-S S-BK	Slot 3	Slot 6	Slot 9	
TA TB	42 17	Y-O O-Y				
RA RB	43 18	Y-G G-Y				Unit 2
E M	44 19	Y-BR BR-Y				
TA TB	46 21	V-BL BL-V				
RA RB	47 22	V-O O-V				Unit 3
E M	48 23	V-G G-V				

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 48
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card AC15 Trunk mode pair terminations for I/O panel connector A

Pair	Pins	Pair color	I/O panel connectors	Unit number
			A	
TA TB	26 1	W-BL BL-W	Slot 0	Unit 0
RA RB	27 2	W-O O-W		
TA TB	30 5	W-S S-W		Unit 1
RA RB	31 6	R-BL BL-R		
TA TB	34 9	R-BR BR-R		Unit 2
RA RB	35 10	R-S S-R		
TA TB	38 13	BK-G G-BK		Unit 3
RA RB	39 14	BK-BR BR-BK		
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.				

Table 49
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card AC15 Trunk mode pair terminations for I/O panel connectors B, E, H

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	E	H	
TA TB	26 1	W-BL BL-W	Slot 1	Slot 4	Slot 7	Unit 0
RA RB	27 2	W-O O-W				
TA TB	30 5	W-S S-W				Unit 1
RA RB	31 6	R-BL BL-R				
TA TB	34 9	R-BR BR-R				Unit 2
RA RB	35 10	R-S S-R				
TA TB	38 13	BK-G G-BK				Unit 3
RA RB	39 14	BK-BR BR-BK				
TA TB	42 17	Y-O O-Y	Slot 2	Slot 5	Slot 8	Unit 0
RA RB	43 18	Y-G G-Y				
TA TB	46 21	V-BL BL-V				Unit 1
RA RB	47 22	V-O O-V				
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.						

Table 50
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card AC15 Trunk mode
pair terminations for I/O panel connectors C, F, K

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
TA TB	26 1	W-BL BL-W	Slot 2	Slot 5	Slot 8	Unit 2
RA RB	27 2	W-O O-W				
TA TB	30 5	W-S S-W				Unit 3
RA RB	31 6	R-BL BL-R				
TA TB	34 9	R-BR BR-R	Slot 3	Slot 6	Slot 9	Unit 0
RA RB	35 10	R-S S-R				
TA TB	38 13	BK-G G-BK				Unit 1
RA RB	39 14	BK-BR BR-BK				
TA TB	42 17	Y-O O-Y				Unit 2
RA RB	43 18	Y-G G-Y				
TA TB	46 21	V-BL BL-V				Unit 3
RA RB	47 22	V-O O-V				

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 51
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card Recorded Announcement mode pair terminations for I/O panel connector A

Pair	Pins	Pair color	I/O panel connectors	Unit number
			A	
T0 R0	26 1	W-BL BL-W	Slot 0	Unit 0
SIG B SIG A	29 4	W-BR BR-W		
T1 R1	30 5	W-S S-W		Unit 1
SIG B SIG A	33 8	R-G G-R		
T2 R2	34 9	R-BR BR-R		Unit 2
SIG B SIG A	37 12	BL-O O-BK		
T3 R3	38 13	BK-G G-BK		Unit 3
SIG B SIG A	41 16	Y-BL BL-Y		

Table 52
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card Recorded Announcement mode pair terminations for I/O panel connectors B, E, H

Pair	Pins	Pair color	I/O panel connectors			Unit number
			B	**E**	**H**	
T0 R0	26 1	W-BL BL-W	Slot 1	Slot 4	Slot 7	Unit 0
SIG B SIG A	29 4	W-BR BR-W				
T1 R1	30 5	W-S S-W				Unit 1
SIG B SIG A	33 8	R-G G-R				
T2 R2	34 9	R-BR BR-R				Unit 2
SIG B SIG A	37 12	BL-O O-BK				
T3 R3	38 13	BK-G G-BK				Unit 3
SIG B SIG A	41 16	Y-BL BL-Y				
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 5	Slot 8	Unit 0
SIG B SIG A	45 20	Y-S S-Y				
T1 R1	46 21	V-BL BL-V				Unit 1
SIG B SIG A	49 24	V-BR BR-V				

Table 53
NT8D11 CE/PE Module: NT5K19 E&M Trunk Card Recorded Announcement mode pair terminations for I/O panel connectors C, F, K

Pair	Pins	Pair color	I/O panel connectors			Unit number
			C	F	K	
T2 R2	26 1	W-BL BL-W	Slot 2	Slot 5	Slot 8	Unit 2
SIG B SIG A	29 4	W-BR BR-W				
T3 R3	30 5	W-S S-W				Unit 3
SIG B SIG A	33 8	R-G G-R				
T0 R0	34 9	R-BR BR-R	Slot 3	Slot 6	Slot 9	Unit 0
SIG B SIG A	37 12	BL-O O-BK				
T1 R1	38 13	BK-G G-BK				Unit 1
SIG B SIG A	41 16	Y-BL BL-Y				
T2 R2	42 17	Y-O O-Y				Unit 2
SIG B SIG A	45 20	Y-S S-Y				
T3 R3	46 21	V-BL BL-V				Unit 3
SIG B SIG A	49 24	V-BR BR-V				

Table 54
NT8D13 PE Module: line card pair-terminations for connectors A, C, E, and G
(single loop mode)

Pair	Pins	Pair color	I/O panel connectors				Units per card			
			A	C	E	G	16 (see note)	8	4	2
1T/1R	26/1	W-BL/BL-W	slot	slot	slot	slot	0	0	0	0
2T/2R	27/2	W-O/O-W	X-1	X-4	X-7	X-10	8			
3T/3R	28/3	W-G/G-W					1	1		
4T/4R	29/4	W-BR/BR-W	card	card	card	card	9			
5T/5R	30/5	W-S/S-W	1	4	7	10	2	2	1	1
6T/6R	31/6	R-BL/BL-R					10			
7T/7R	32/7	R-O/O-R					3	3		
8T/8R	33/8	R-G/G-R					11			
9T/9R	34/9	R-BR/BR-R					4	4	2	
10T/10R	35/10	R-S/S-R					12			
11T/11R	36/11	BK-BL/BL-BK					5	5		
12T/12R	37/12	BK-O/O-BK					13			
13T/13R	38/13	BK-G/G-BK					6	6	3	
14T/14R	39/14	BK-BR/BK-BR					14			
15T/15R	40/15	BK-S/S-BK					7	7		
16T/16R	41/16	Y-BL/BL-Y					15			
17T/17R	42/17	Y-O/O-Y	slot	slot	slot	spare	0	0	0	0
18T/18R	43/18	Y-G/G-Y	X-2	X-5	X-8		8			
19T/19R	44/19	Y-BR/BR-Y					1	1		
20T/20R	45/20	Y-S/S-Y	card	card	card		9			
21T/21R	46/21	V-BL/BL-V	2	5	8		2	2	1	1
22T/22R	47/22	V-O/V-O					10			
23T/23R	48/23	V-G/G-V					3	3		
24T/24R	49/24	V-BR/BR-V					11			
25T/25R	50/25	V-S/S-V					spare			
Note: Applies to QPC594 16 Port 500/2500 Line Card.										

Table 55
NT8D13 PE Module: line card pair-terminations for connectors B, D, and F
(single loop mode)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	D	F	16 (see note)	8	4	2
1T/1R	26/1	W-BL/BL-W	slot	slot	slot	4	4	2	
2T/2R	27/2	W-O/O-W	X-2	X-5	X-8	12			
3T/3R	28/3	W-G/G-W				5	5		
4T/4R	29/4	W-BR/BR-W	card	card	card	13			
5T/5R	30/5	W-S/S-W	2	5	8	6	6	3	
6T/6R	31/6	R-BL/BL-R				14			
7T/7R	32/7	R-O/O-R				7	7		
8T/8R	33/8	R-G/G-R				15			
9T/9R	34/9	R-BR/BR-R	slot	slot	slot	0	0	0	0
10T/10R	35/10	R-S/S-R	X-3	X-6	X-9	8			
11T/11R	36/11	BK-BL/BL-BK				1	1		
12T/12R	37/12	BK-O/O-BK	card	card	card	9			
13T/13R	38/13	BK-G/G-BK	3	6	9	2	2	1	1
14T/14R	39/14	BK-BR/BK-BR				10			
15T/15R	40/15	BK-S/S-BK				3	3		
16T/16R	41/16	Y-BL/BL-Y				11			
17T/17R	42/17	Y-O/O-Y				4	4	2	
18T/18R	43/18	Y-G/G-Y				12			
19T/19R	44/19	Y-BR/BR-Y				5	5		
20T/20R	45/20	Y-S/S-Y				13			
21T/21R	46/21	V-BL/BL-V				6	6	3	
22T/22R	47/22	V-O/V-O				14			
23T/23R	48/23	V-G/G-V				7	7		
24T/24R	49/24	V-BR/BR-V				15			
25T/25R	50/25	V-S/S-V				spare			

Note: Applies to QPC594 16 Port 500/2500 Line Card.

Table 56
NT8D13 PE Module: line card pair-terminations for connectors A, C, E, and G
(dual loop mode)

Pair	Pins	Pair color	I/O panel connectors				Units per card			
			A	C	E	G	16 (see note)	8	4	2
1T/1R	26/1	W-BL/BL-W	slot	slot	slot	slot	0	0	0	0
2T/2R	27/2	W-O/O-W	X-1	X-4	Y-2	Y-5	8			
3T/3R	28/3	W-G/G-W					1	1		
4T/4R	29/4	W-BR/BR-W	card	card	card	card	9			
5T/5R	30/5	W-S/S-W	1	4	2	5	2	2	1	1
6T/6R	31/6	R-BL/BL-R					10			
7T/7R	32/7	R-O/O-R					3	3		
8T/8R	33/8	R-G/G-R					11			
9T/9R	34/9	R-BR/BR-R					4	4	2	
10T/10R	35/10	R-S/S-R					12			
11T/11R	36/11	BK-BL/BL-BK					5	5		
12T/12R	37/12	BK-O/O-BK					13			
13T/13R	38/13	BK-G/G-BK					6	6	3	
14T/14R	39/14	BK-BR/BK-BR					14			
15T/15R	40/15	BK-S/S-BK					7	7		
16T/16R	41/16	Y-BL/BL-Y					15			
17T/17R	42/17	Y-O/O-Y	slot	slot	slot	spare	0	0	0	0
18T/18R	43/18	Y-G/G-Y	X-2	X-5	Y-3		8			
19T/19R	44/19	Y-BR/BR-Y					1	1		
20T/20R	45/20	Y-S/S-Y	card	card	card		9			
21T/21R	46/21	V-BL/BL-V	2	5	3		2	2	1	1
22T/22R	47/22	V-O/V-O					10			
23T/23R	48/23	V-G/G-V					3	3		
24T/24R	49/24	V-BR/BR-V					11			
25T/25R	50/25	V-S/S-V					spare			
Note: Applies to QPC594 16 Port 500/2500 Line Card.										

Table 57
NT8D13 PE Module: line card pair-terminations for connectors B, D, and F (dual loop mode)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	**D**	**F**	**16 (see note)**	**8**	**4**	**2**
1T/1R	26/1	W-BL/BL-W	slot	slot	slot	4	4	2	
2T/2R	27/2	W-O/O-W	X-2	X-5	Y-3	12			
3T/3R	28/3	W-G/G-W				5	5		
4T/4R	29/4	W-BR/BR-W	card	card	card	13			
5T/5R	30/5	W-S/S-W	2	5	3	6	6	3	
6T/6R	31/6	R-BL/BL-R				14			
7T/7R	32/7	R-O/O-R				7	7		
8T/8R	33/8	R-G/G-R				15			
9T/9R	34/9	R-BR/BR-R	slot	slot	slot	0	0	0	0
10T/10R	35/10	R-S/S-R	X-3	Y-1	Y-4	8			
11T/11R	36/11	BK-BL/BL-BK				1	1		
12T/12R	37/12	BK-O / O-BK	card	card	card	9			
13T/13R	38/13	BK-G/G-BK	3	1	4	2	2	1	1
14T/14R	39/14	BK-BR/BK-BR				10			
15T/15R	40/15	BK-S/S-BK				3	3		
16T/16R	41/16	Y-BL/BL-Y				11			
17T/17R	42/17	Y-O/O-Y				4	4	2	
18T/18R	43/18	Y-G/G-Y				12			
19T/19R	44/19	Y-BR/BR-Y				5	5		
20T/20R	45/20	Y-S/S-Y				13			
21T/21R	46/21	V-BL/BL-V				6	6	3	
22T/22R	47/22	V-O/V-O				14			
23T/23R	48/23	V-G/G-V				7	7		
24T/24R	49/24	V-BR/BR-V				15			
25T/25R	50/25	V-S/S-V				spare			
Note: Applies to QPC594 16 Port 500/2500 Line Card.									

Table 58
NT8D13 PE Module: QPC74 Recorded Announcement Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	**Slot 2, 5, 8, 11, 14**	**Slot 3, 6, 9, 12, 15**		
0	W-BL/BL-W W-O/O-W	Y-O/O-Y Y-G/G-Y	B-BR/BR-R R-S/S-R	T0/R0 CP0/CS0 (or SMB0)	To recorded announcement machine (see owner's manual)
1	W-G/G-W W-BR/BR-W	Y-BR/BR-Y Y-S/S-Y	BK-BL/BL-BK BK-O/O-BK	T1/R1 CP1/CS1 (or SMB1)	To another recorded announcement machine (or bridged)
2	W-S/S-W R-BL/BL-R	V-BL/BL-V V-O/O-V	BK-G/G-BK BK-BR/BR-BK	T2/R2 CP2/CS2 (or SMB2)	To another recorded announcement machine (or bridged)
3	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	BK-S/S-BK Y-BL/BL-Y	T3/R3 CP3/CS3 (or SMB3)	To another recorded announcement machine (or bridged)

Table 59
NT8D13 PE Module: QPC237 4-wire E&M//DX Trunk pair-terminations

Unit	Slot / Pair color			Connection			Termination
	1, 4, 7, 10, 13, 16	2, 5, 8, 11, 14	3, 6, 9, 12, 15	Type 1 E&M	Type 2 E&M	DX	
0	W-B BL-W	Y-O O-Y	R-BR BR-R	T0 R0	T0 R0	T0 R0	**First trunk** Transmit pair
	W-O O-W	Y-G G-Y	R-S S-R	T1 R1	T1 R1	T1 R1	Receive pair
	W-G G-W	Y-BR BR-Y	BK-BL BL-BK	ESCG E	EB EA		Signaling pair
	W-BR BR-W	Y-S S-Y	BK-O O-BK	ESC M	MB MA		Signaling pair
1	W-S S-W	V-BL BL-V	BK-G G-BK	T0 R0	T0 R0	T0 R0	**Second trunk** Transmit pair
	R-BL BL-R	V-O O-V	BK-BR BR-BK	T1 R1	T1 R1	T1 R1	Receive pair
	R-O O-R	V-G G-V	BK-S S-B	ESCG E	EB EA		Signaling pair
	R-G G-R	V-BR BR-V	Y-BL/ BL-Y	ESC M	MB MA		Signaling pair

Table 60
NT8D13 PE Module: QPC239 Recorded Telephone Dictation Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	**Slot 2, 5, 8, 11, 14**	**Slot 3, 6, 9, 12, 15**		
0					**First trunk**
	W-O/O-W	Y-G/G-Y	R-S/S-R	T0/R0	Voice
	W-G/G-W	Y-BR/BR-Y	BK-BL/BL-BK	DTA0/DTB0	Dial tone
	W-BR/BR-W	Y-S/S-Y	BK-O/O-BK	ARA0/ARB0	Audible ringback tone
1					**Second trunk**
	R-BL/BL-R	V-O/O-V	BK-BR/BR-BK	T1/R1	Voice
	R-O/O-R	V-G/G-V	BK-S/S-BK	DTA1/DTB1	Dial tone
	R-G/G-R	V-BR/BR-V	Y-BL/BL-Y	ARA1/ARB1	Audible ringback tone

Table 61
NT8D13 PE Module: QPC250 Release Line Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	**Slot 2, 5, 8, 11, 14**	**Slot 3, 6, 9, 12, 15**		
0					**First trunk**
	W-BL/BL-W	Y-O/O-Y	R-BR/BR-R	T0/R0 900 ¾	to 900 ¾ termination
	W-G/G-W	Y-BR/BR-Y	BK-BL/BL-BK	T0/R0 600 ¾	or 600 ¾ termination at far end
1					**Second trunk**
	W-S/S-W	V-BL/BL-V	BK-G/G-BK	T1/R1 900 ¾	to 900 ¾ termination
	R-O/O-R	V-G/G-V	BK-S/S-BK	T1/R1 600 ¾	or 600 ¾ termination at far end

Table 62
NT8D13 PE Module: QPC449 Loop Signaling Trunk and QPC450 CO/FX/WATS Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	**Slot 2, 5, 8, 11, 14**	**Slot 3, 6, 9, 12, 15**		
0					**First trunk**
	W-BL/BL-W	Y-O/O-Y	R-BR/BR-R	T0/R0 900 ¾	900 ¾ trunk
	W-O/O-W	Y-G/G-Y	R-S/S-R	T0/R0 600 ¾	600 ¾ trunk
	W-G/G-W	Y-BR/BR-Y	BK-BL/BL-BK	M/MM	(see note)
	W-BR/BR-W	Y-S/S-Y	BK-O/O-BK		
1					**Second trunk**
	W-S/S-W	V-BL/BL-V	BK-G/G-BK	T1/R1 900 ¾	900 ¾ amplifier
	R-BL/BL-R	V-O/O-V	BK-BR/BR-BK	T1/R1 600 ¾	600 ¾ amplifier
	R-O/O-R	V-G/G-V	BK-S/S-BK	M/MM	(see note)
	R-G/G-R	V-BR/BR-V	Y-BL/BL-Y		
2					**Third trunk**
	R-BR/BR-R	W-BL/BL-W	V-O/O-V	T2/R2 900 ¾	900 ¾ trunk
	R-S/S-R	W-O/O-W	V-G/G-V	T2/R2 600 ¾	600 ¾ trunk
	BK-BL/BL-BK	W-G/G-W	V-BR/BR-V	M/MM	(see note)
	BK-O/O-BK	W-BR/BR-W	Y-S/S-Y		
3					**Fourth trunk**
	BK-G/G-BK	W-S/S-W	V-BL/BL-V	T3/R3 900 ¾	900 ¾ amplifier
	BK-BR/BR-BK	R-BL/BL-R	V-O/O-V	T3/R3 600 ¾	600 ¾ amplifier
	BK-S/S-BK	R-O/O-R	V-G/G-V	M/MM	(see note)
	Y-BL/BL-Y	R-G/G-R	V-BR/BR-V		

Note: The M and MM leads are found on QPC295, QPC330, and QPC331 cards.

Table 63
NT8D13 PE Module: Announcement and Music Trunk pair-terminations

Unit	Pair color			Connection	Termination
	Slot 1, 4, 7, 10, 13, 16	Slot 2, 5, 8, 11, 14	Slot 3, 6, 9, 12, 15		
0	W-BL/BL-W W-O/O-W	Y-O/O-Y Y-G/G-Y	R-BR/BR-R R-S/S-R	T/R	Music or announcement source (see note)
1	W-G/G-W W-BR/BR-W	Y-BR/BR-Y Y-S/S-Y	BK-BL/BL-BK BK-O/O-BK	T/R	Music or announcement source (see note)
2	W-S/S-W R-BL/BL-R	V-BL/BL-V V-O/O-V	BK-G/G-BK BK-BR/BR-BK	T/R	Music or announcement source (see note)
3	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	BK-S/S-BK Y-BL/BL-Y	T/R	Music or announcement source (see note)
4	R-BR/BR-R R-S/S-R	W-BL/BL-W W-O/O-W	Y-O/O-Y Y-G/G-Y	T/R	Music or announcement source (see note)
5	BK-BL/BL-BK BK-O/O-BK	W-G/G-W W-BR/BR-W	Y-BR/BR-Y Y-S/S-Y	T/R	Music or announcement source (see note)
6	BK-G/G-BK BK-BR/BR-BK	W-S/S-W R-BL/BL-R	V-BL/BL-V V-O/O-V	T/R	Music or announcement source (see note)
7	BK-S/S-BK Y-BL/BL-Y	R-O/O-R R-G/G-R	V-G/G-V V-BR/BR-V	T/R	Music or announcement source (see note)

Note: When a high impedance (higher than 2 ohm) music or announcement source is used, the volume level of the source may have to be adjusted when altering the source. Low impedance sources (less than 2 ohm) are not usually affected by changes in the source.

Table 64
NT8D37 IPE Module: line card pair-terminations

Pair	Pin numbers	Pair color	Unit 24/card
1T/1R	26/1	W-BL/BL-W	0
2T/2R	27/2	W-O/O-W	1
3T/3R	28/3	W-G/G-W	2
4T/4R	29/4	W-BR/BR-W	3
5T/5R	30/5	W-S/S-W	4
6T/6R	31/6	R-BL/BL-R	5
7T/7R	32/7	R-O/O-R	6
8T/8R	33/8	R-G/G-R	7
9T/9R	34/9	R-BR/BR-R	8
10T/10R	35/10	R-S/S-R	9
11T/11R	36/11	BK-BL/BL-BK	10
12T/12R	37/12	BK-O/O-BK	11
13T/13R	38/13	BK-G/G-BK	12
14T/14R	39/14	BK-BR/BK-BR	13
15T/15R	40/15	BK-S/S-BK	14
16T/16R	41/16	Y-BL/BL-Y	15
17T/17R	42/17	Y-O/O-Y	16
18T/18R	43/18	Y-G/G-Y	17
19T/19R	44/19	Y-BR/BR-Y	18
20T/20R	45/20	Y-S/S-Y	19
21T/21R	46/21	V-BL/BL-V	20
22T/22R	47/22	V-O/V-O	21
23T/23R	48/23	V-G/G-V	22
24T/24R	49/24	V-BR/BR-V	23
25T/25R	50/25	V-S/S-V	Spare

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Table 65
NT8D37 IPE Module: NT8D14 Universal Trunk Card pair-terminations

Lead designations			Pin numbers	Pair color	Unit
RAN mode	Paging mode	Other modes			
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W	1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R	2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R	3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK	5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR	6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y	7

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Note 2: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 66
NT8D37 IPE Module: NT8D15 E&M Trunk Card 2-wire paging mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R	1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Table 67
NT8D37 IPE Module: NT8D15 E&M Trunk Card 2-wire type 1 mode pair-terminations

Pair	Pin numbers	Pair color	Unit
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R	1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK	2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK	3

Note: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Table 68
NT8D37 IPE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	**Type 2**			
TA/TB	TA/TB	26/1	W-BL/BL-W	0
RA/RB	RA/RB	27/2	W-O/O-W	
E/M	EA/EB	28/3	W-G/G-W	
ESC/ESCG	MA/MB	29/4	W-BR/BR-W	
TA/TB	TA/TB	30/5	W-S/S-W	1
RA/RB	RA/RB	31/6	R-BL/BL-R	
E/M	EA/EB	32/7	R-O/O-R	
ESC/ESCG	MA/MB	33/8	R-G/G-R	
TA/TB	TA/TB	34/9	R-BR/BR-R	2
RA/RB	RA/RB	35/10	R-S/S-R	
E/M	EA/EB	36/11	BK-BL/BL-BK	
ESC/ESCG	MA/MB	37/12	BK-O/O-BK	
TA/TB	TA/TB	38/13	BK-G/G-BK	3
RA/RB	RA/RB	39/14	BK-BR/BR-BK	
E/M	EA/EB	40/15	BK-S/S-BK	
ESC/ESCG	MA/MB	41/16	Y-BL/BL-Y	

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.

Table 69
NT8D37 IPE Module: NT8D15 E&M Trunk Card 4-wire type 1 and type 2 mode pair-terminations

Lead designations		Pin numbers	Pair color	Unit
Type 1	**Type 2**			
TA/TB	TA/TB	26/1	W-BL/BL-W	0
RA/RB	RA/RB	27/2	W-O/O-W	
E/M	EA/EB	28/3	W-G/G-W	
ESC/ESCG	MA/MB	29/4	W-BR/BR-W	
TA/TB	TA/TB	30/5	W-S/S-W	1
RA/RB	RA/RB	31/6	R-BL/BL-R	
E/M	EA/EB	32/7	R-O/O-R	
ESC/ESCG	MA/MB	33/8	R-G/G-R	
TA/TB	TA/TB	34/9	R-BR/BR-R	2
RA/RB	RA/RB	35/10	R-S/S-R	
E/M	EA/EB	36/11	BK-BL/BL-BK	
ESC/ESCG	MA/MB	37/12	BK-O/O-BK	
TA/TB	TA/TB	38/13	BK-G/G-BK	3
RA/RB	RA/RB	39/14	BK-BR/BR-BK	
E/M	EA/EB	40/15	BK-S/S-BK	
ESC/ESCG	MA/MB	41/16	Y-BL/BL-Y	

Note 1: Each of the following I/O panel connectors is cabled as shown above: connectors A, B, C, D, E, F, G, H, K, L, M, N, R, S, T, and U. These connectors are associated with backplane slots 0 through 15, sequentially.

Note 2: TA/TB is the transmit pair; RA/RB is the receive pair.

Table 70
NT5K17 Direct Dial Inward Trunk connections for NT8D37 I/O panel connectors A, E, K, R

Lead designations DDI Mode	Pins	Pair color	I/O panel connectors A	E	K	R	Unit number
T0 R0	26 1	W-BL BL-W					Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R	Slot 0	Slot 4	Slot 8	Slot 12	Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 71
NT5K17 Direct Dial Inward Trunk connections for NT8D37 I/O panel connectors B, F, L, S
(Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
DDI Mode			B	F	L	S	
T0 R0	26 1	W-BL BL-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R					
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 71
NT5K17 Direct Dial Inward Trunk connections for NT8D37 I/O panel connectors B, F, L, S
(Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
DDI Mode			B	F	L	S	
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 72
NT5K17 Direct Dial Inward Trunk connections for NT8D37 I/O panel connectors C, G, M, T
(Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
DDI Mode			C	G	M	T	
T0 R0	26 1	W-BL BL-W	Slot 2	Slot 6	Slot 10	Slot 14	Unit 4
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 72
NT5K17 Direct Dial Inward Trunk connections for NT8D37 I/O panel connectors C, G, M, T (Part 2 of 2)

Lead designations DDI Mode	Pins	Pair color	I/O panel connectors C	G	M	T	Unit number
T4 R4	34 9	R-BR BR-R	Slot 3	Slot 7	Slot 11	Slot 15	Unit 0
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y					
T0 R0	42 17	Y-O O-Y					Unit 4
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Table 73
NT5K18 Flexible Central Office Trunk connections for NT8D37 I/O panel connectors A, E, K, R

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
COT			A	E	K	R	
T0 R0	26 1	W-BL BL-W					Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R	Slot 0	Slot 4	Slot 8	Slot 12	
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 74
NT5K18 Flexible Central Office Trunk connections for NT8D37 I/O panel connectors B, F, L, S (Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
COT			B	F	L	S	
T0 R0	26 1	W-BL BL-W					Unit 0
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 1
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 2
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 3
	33 8	R-G G-R	Slot 1	Slot 5	Slot 9	Slot 13	
T4 R4	34 9	R-BR BR-R					Unit 4
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 5
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 6
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 7
	41 16	Y-BL BL-Y					

Table 74
NT5K18 Flexible Central Office Trunk connections for NT8D37 I/O panel connectors B, F, L, S (Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
COT			B	F	L	S	
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 1
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 2
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 3
	49 24	V-BR BR-V					

Table 75
NT5K18 Flexible Central Office Trunk connections for NT8D37 I/O panel connectors C, G, M, T (Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
COT			C	G	M	T	
T0 R0	26 1	W-BL BL-W	Slot 2	Slot 6	Slot 10	Slot 14	Unit 4
	27 2	W-O O-W					
T1 R1	28 3	W-G G-W					Unit 5
	29 4	W-BR BR-W					
T2 R2	30 5	W-S S-W					Unit 6
	31 6	R-BL BL-R					
T3 R3	32 7	R-O O-R					Unit 7
	33 8	R-G G-R					

Table 75
NT5K18 Flexible Central Office Trunk connections for NT8D37 I/O panel connectors C, G, M, T (Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
COT			C	G	M	T	
T4 R4	34 9	R-BR BR-R					Unit 0
	35 10	R-S S-R					
T5 R5	36 11	BK-BL BL-BK					Unit 1
	37 12	BK-S S-BK					
T6 R6	38 13	BK-G G-BK					Unit 2
	39 14	BK-BR BR-BK					
T7 R7	40 15	BK-S S-BK					Unit 3
	41 16	Y-BL BL-Y	Slot 3	Slot 7	Slot 11	Slot 15	
T0 R0	42 17	Y-O O-Y					Unit 4
	43 18	Y-G G-Y					
T1 R1	44 19	Y-BR BR-Y					Unit 5
	45 20	Y-S S-Y					
T2 R2	46 21	V-BL BL-V					Unit 6
	47 22	V-O O-V					
T3 R3	48 23	V-G G-V					Unit 7
	49 24	V-BR BR-V					

Table 76
NT5K19 Flexible E&M 2-Wire Type 1 connections for NT8D37 I/O panel connectors A, E, K, R

Pair	Pins	Pair color	I/O panel connectors				Unit number
			A	**E**	**K**	**R**	
T0 R0	27 2	W-O O-W					Unit 0
E M	28 3	W-G G-W					
T1 R1	31 6	R-BL BL-R					Unit 1
E M	32 7	R-O O-R	Slot 0	Slot 4	Slot 8	Slot 12	
T2 R2	35 10	R-S S-R					Unit 2
E M	36 11	BK-BL BL-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
E M	40 15	BK-S S-BK					

Table 77
NT5K19 E&M 2-Wire Type 1 connections for NT8D37 I/O panel connectors B, F, L, S

Pair	Pins	Pair color	I/O panel connectors				Unit number
			A	E	K	R	
T0 R0	27 2	W-O O-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
E M	28 3	W-G G-W					
T1 R1	31 6	R-BL BL-R					Unit 1
E M	32 7	R-O O-R					
T2 R2	35 10	R-S S-R					Unit 2
E M	36 11	BK-BL BL-BK					
T3 R3	39 14	BK-BR BR-BK					Unit 3
E M	40 15	BK-S S-BK					
T0 R0	43 18	Y-G G-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
E M	44 19	Y-BR BR-Y					
T1 R1	47 22	V-O O-V					Unit 1
E M	48 23	V-G G-V					

Table 78
NT5K19 Flexible E&M 2-Wire Type 1 trunk connections for NT8D37 I/O panel connectors C, G, M, T

Pair	Pins	Pair color	I/O panel connectors				Unit number
			C	G	M	T	
T2 R2	27 2	W-O O-W	Slot 2	Slot 6	Slot 10	Slot 14	Unit 2
E M	28 3	W-G G-W					
T3 R3	31 6	R-BL BL-R					Unit 3
E M	32 7	R-O O-R					
T0 R0	35 10	R-S S-R	Slot 3	Slot 7	Slot 11	Slot 15	Unit 0
E M	36 11	BK-BL BL-BK					
T1 R1	39 14	BK-BR BR-BK					Unit 1
E M	40 15	BK-S S-BK					
T2 R2	43 18	Y-G G-Y					Unit 2
E M	44 19	Y-BR BR-Y					
T3 R3	47 22	V-O O-V					Unit 3
E M	48 23	V-G G-V					

Table 79
NT5K19 Flexible E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors A, E, K, R

Pair	Pins	Pair color	I/O panel connectors				Unit number
			A	**E**	**K**	**R**	
T0 R0	27 2	W-O O-W					Unit 0
A PG	29 4	W-BR BR-W					
T1 R1	31 6	R-BL BL-R					Unit 1
A PG	33 8	R-G G-R	Slot 0	Slot 4	Slot 8	Slot 12	
T2 R2	35 10	R-S S-R					Unit 2
A PG	37 12	BL-O O-BL					
T3 R3	39 14	BK-BR BR-BK					Unit 3
A PG	41 16	Y-BL BL-Y					

Table 80
NT5K19 Flexible E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors B, F, L, S

Pair	Pins	Pair color	I/O panel connectors				Unit number
			B	**F**	**L**	**S**	
T0 R0	27 2	W-O O-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
A PG	29 4	W-BR BR-W					
T1 R1	31 6	R-BL BL-R					Unit 1
A PG	33 8	R-G G-R					
T2 R2	35 10	R-S S-R					Unit 2
A PG	37 12	BL-O O-BL					
T3 R3	39 14	BK-BR BR-BK					Unit 3
A PG	41 16	Y-BL BL-Y					
T0 R0	43 18	Y-G G-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
A PG	45 20	Y-S S-Y					
T1 R1	47 22	V-O O-V					Unit 1
A PG	49 24	V-BR BR-V					

Table 81
NT5K19 Flexible E&M 2-Wire Paging trunk connections for NT8D37 I/O panel connectors C, G, M, T

Pair	Pins	Pair color	I/O panel connectors				Unit number
			C	**G**	**M**	**T**	
T2 R2	27 2	W-O O-W	Slot 2	Slot 6	Slot 10	Slot 14	Unit 2
A PG	29 4	W-BR BR-W					
T3 R3	31 6	R-BL BL-R					Unit 3
A PG	33 8	R-G G-R					
T0 R0	35 10	R-S S-R	Slot 3	Slot 7	Slot 11	Slot 15	Unit 0
A PG	37 12	BL-O O-BL					
T1 R1	39 14	BK-BR BR-BK					Unit 1
A PG	41 16	Y-BL BL-Y					
T2 R2	43 18	Y-G G-Y					Unit 2
A PG	45 20	Y-S S-Y					
T3 R3	47 22	V-O O-V					Unit 3
A PG	49 24	V-BR BR-V					

Table 82
NT5K19 Flexible E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors A, E, K, R

Pair	Pins	Pair color	I/O panel connectors				Unit number
			A	E	K	R	
T0 R0	26 1	W-BL BL-W	Slot 0	Slot 4	Slot 8	Slot 12	Unit 0
SIG B SIG A	29 4	W-BR BR-W					
T1 R1	30 5	W-S S-W					Unit 1
SIG B SIG A	33 8	R-G G-R					
T2 R2	34 9	R-BR BR-R					Unit 2
SIG B SIG A	37 12	BL-O O-BL					
T3 R3	38 13	BK-G G-BK					Unit 3
SIG B SIG A	41 16	Y-BL BL-Y					

Table 83
NT5K19 Flexible E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors B, F, L, S

Pair	Pins	Pair color	I/O panel connectors				Unit number
			B	**F**	**L**	**S**	
T0 R0	26 1	W-BL BL-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
SIG B SIG A	29 4	W-BR BR-W					
T1 R1	30 5	W-S S-W					Unit 1
SIG B SIG A	33 8	R-G G-R					
T2 R2	34 9	R-BR BR-R					Unit 2
SIG B SIG A	37 12	BL-O O-BL					
T3 R3	38 13	BK-G G-BK					Unit 3
SIG B SIG A	41 16	Y-BL BL-Y					
T0 R0	42 17	Y-O O-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
SIG B SIG A	45 20	Y-S S-Y					
T1 R1	46 21	V-BL BL-V					Unit 1
SIG B SIG A	49 24	V-BR BR-V					

Table 84
NT5K19 Flexible E&M 2-Wire Recorded Announcement trunk connections for NT8D37 I/O panel connectors C, G, M, T

Pair	Pins	Pair color	I/O panel connectors				Unit number
			C	G	M	T	
T2 R2	26 1	W-BL BL-W	Slot 2	Slot 6	Slot 10	Slot 14	Unit 2
SIG B SIG A	29 4	W-BR BR-W					
T3 R3	30 5	W-S S-W					Unit 3
SIG B SIG A	33 8	R-G G-R					
T0 R0	34 9	R-BR BR-R	Slot 3	Slot 7	Slot 11	Slot 15	Unit 0
SIG B SIG A	37 12	BL-O O-BL					
T1 R1	38 13	BK-G G-BK					Unit 1
SIG B SIG A	41 16	Y-BL BL-Y					
T2 R2	42 17	Y-O O-Y					Unit 2
SIG B SIG A	45 20	Y-S S-Y					
T3 R3	46 21	V-BL BL-V					Unit 3
SIG B SIG A	49 24	V-BR BR-V					

Table 85
NT5K19 Flexible E&M 4-Wire Type 1 connections for NT8D37 I/O panel connectors A, E, K, R

Lead designations Type 1 mode	Pins	Pair color	I/O panel connectors				Unit number
			A	E	K	R	
TA TB	26 1	W-BL BL-W	Slot 0	Slot 4	Slot 8	Slot 12	Unit 0
RA RB	27 2	W-O O-W					
E M	28 3	W-G G-W					
TA TB	30 5	W-S S-W					Unit 1
RA RB	31 6	R-BL BL-R					
E M	32 7	R-O O-R					
TA TB	34 9	R-BR BR-R					Unit 2
RA RB	35 10	R-S S-R					
E M	36 11	BK-BL BL-BK					
TA TB	38 13	BK-G G-BK					Unit 3
RA RB	39 14	BK-BR BR-BK					
E M	40 15	BK-S S-BK					

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 86
NT5K19 Flexible E&M 4-Wire Type 1 connections for NT8D37 I/O panel connectors B, F, L, S
(Part 1 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
Type 1 mode			B	F	L	S	
TA TB	26 1	W-BL BL-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
RA RB	27 2	W-O O-W					
E M	28 3	W-G G-W					
TA TB	30 5	W-S S-W					Unit 1
RA RB	31 6	R-BL BL-R					
E M	32 7	R-O O-R					
TA TB	34 9	R-BR BR-R					Unit 2
RA RB	35 10	R-S S-R					
E M	36 11	BK-BL BL-BK					
TA TB	38 13	BK-G G-BK					Unit 3
RA RB	39 14	BK-BR BR-BK					
E M	40 15	BK-S S-BK					

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 86
NT5K19 Flexible E&M 4-Wire Type 1 connections for NT8D37 I/O panel connectors B, F, L, S (Part 2 of 2)

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
Type 1 mode			B	F	L	S	
TA TB	42 17	Y-O O-Y					Unit 0
RA RB	43 18	Y-G G-Y					
E M	44 19	Y-BR BR-Y	Slot 2	Slot 6	Slot 10	Slot 14	
TA TB	46 21	V-BL BL-V					Unit 1
RA RB	47 22	V-O O-V					
E M	48 23	V-G G-V					
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.							

Table 87
NT5K19 Flexible E&M AC15 trunk connections for NT8D37 I/O panel connectors A, E, K, R

Lead designations	Pins	Pair color	I/O panel connectors				Unit number
Type 1 mode			A	E	K	R	
TA TB	26 1	W-BL BL-W	Slot 0	Slot 4	Slot 8	Slot 12	Unit 0
RA RB	27 2	W-O O-W					
TA TB	30 5	W-S S-W					Unit 1
RA RB	31 6	R-BL BL-R					
TA TB	34 9	R-BR BR-R					Unit 2
RA RB	35 10	R-S S-R					
TA TB	38 13	BK-G G-BK					Unit 3
RA RB	39 14	BK-BR BR-BK					
Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.							

Table 88
NT5K19 Flexible E&M AC15 Trunk connections for NT8D37 I/O panel connectors B, F, L, S

Lead designations — Type 1 mode	Pins	Pair color	I/O panel connectors B	F	L	S	Unit number
TA TB	26 1	W-BL BL-W	Slot 1	Slot 5	Slot 9	Slot 13	Unit 0
RA RB	27 2	W-O O-W					
TA TB	30 5	W-S S-W					Unit 1
RA RB	31 6	R-BL BL-R					
TA TB	34 9	R-BR BR-R					Unit 2
RA RB	35 10	R-S S-R					
TA TB	38 13	BK-G G-BK					Unit 3
RA RB	39 14	BK-BR BR-BK					
TA TB	42 17	Y-O O-Y	Slot 2	Slot 6	Slot 10	Slot 14	Unit 0
RA RB	43 18	Y-G G-Y					
TA TB	46 21	V-BL BL-V					Unit 1
RA RB	47 22	V-O O-V					

Note: The cable pair designated TA, TB is the transmit pair. The pair designated RA, RB is the receive pair.

Table 89
Pair-terminations for NT5K11 EEPE Module I/O panel connectors A, C, E (single loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			A	C	E	16	8	4	2
1T 1R	26 1	W-BL BL-W				Unit 0	Unit 0	Unit 0	Unit 0
2T 2R	27 2	W-O O-W				Unit 8			
3T 3R	28 3	W-G G-W				Unit 1	Unit 1		
4T 4R	29 4	W-BR BR-W				Unit 9			
5T 5R	30 5	W-S S-W				Unit 2	Unit 2	Unit 1	Unit 1
6T 6R	31 6	R-BL BL-R				Unit 10			
7T 7R	32 7	R-O O-R				Unit 3	Unit 3		
8T 8R	33 8	R-G G-R	Slot X-1 Card 1	Slot X-4 Card 4	Slot X-7 Card 7	Unit 11			
9T 9R	34 9	R-BR BR-R				Unit 4	Unit 4	Unit 2	
10T 10R	35 10	R-S S-R				Unit 12			
11T 11R	36 11	BK-BL BL-BK				Unit 5	Unit 5		
12T 12R	37 12	BL-O O-BK				Unit 13			
13T 13R	38 13	BK-G G-BK				Unit 6	Unit 6	Unit 3	
14T 14R	39 14	BK-BR BR-BK				Unit 14			
15T 15R	40 15	BK-S S-BK				Unit 7	Unit 7		
16T 16R	41 16	Y-BL BL-Y				Unit 15			

Table 89
Pair-terminations for NT5K11 EEPE Module I/O panel connectors A, C, E (single loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			A	**C**	**E**	**16**	**8**	**4**	**2**
17T 17R	42 17	Y-O O-Y				Unit 0	Unit 0	Unit 0	Unit 0
18T 18R	43 18	Y-G G-Y				Unit 8			
19T 19R	44 19	Y-BR BR-Y				Unit 1	Unit 1		
20T 20R	45 20	Y-S S-Y	Slot X-2 Card 2	Slot X-5 Card 5	Slot X-8 Card 8	Unit 9			
21T 21R	46 21	V-BL BL-V				Unit 2	Unit 2	Unit 1	Unit 1
22T 22R	47 22	V-O O-V				Unit 10			
23T 23R	48 23	V-G G-V				Unit 3	Unit 3		
24T 24R	49 24	V-BR BR-V				Unit 11			
25T 25R	50 25	V-S S-V	Spare						

Table 90
Pair-terminations for NT5K11 EEPE Module I/O panel connectors B, D, F (single loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	**D**	**F**	**16**	**8**	**4**	**2**
1T 1R	26 1	W-BL BL-W				Unit 4	Unit 4	Unit 2	
2T 2R	27 2	W-O O-W				Unit 12			
3T 3R	28 3	W-G G-W				Unit 5	Unit 5		
4T 4R	29 4	W-BR BR-W	Slot X-2 Card 2	Slot X-5 Card 5	Slot X-8 Card 8	Unit 13			
5T 5R	30 5	W-S S-W				Unit 6	Unit 6	Unit 3	
6T 6R	31 6	R-BL BL-R				Unit 14			
7T 7R	32 7	R-O O-R				Unit 7	Unit 7		
8T 8R	33 8	R-G G-R				Unit 15			

Table 90
Pair-terminations for NT5K11 EEPE Module I/O panel connectors B, D, F (single loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	**D**	**F**	**16**	**8**	**4**	**2**
9T 9R	34 9	R-BR BR-R				Unit 0	Unit 0	Unit 0	Unit 0
10T 10R	35 10	R-S S-R				Unit 8			
11T 11R	36 11	BK-BL BL-BK				Unit 1	Unit 1		
12T 12R	37 12	BL-O O-BK				Unit 9			
13T 13R	38 13	BK-G G-BK				Unit 2	Unit 2	Unit 1	Unit 1
14T 14R	39 14	BK-BR BR-BK				Unit 10			
15T 15R	40 15	BK-S S-BK				Unit 3	Unit 3		
16T 16R	41 16	Y-BL BL-Y	Slot X-3 Card 3	Slot X-6 Card 6	Spare	Unit 11			
17T 17R	42 17	Y-O O-Y				Unit 4	Unit 4	Unit 2	
18T 18R	43 18	Y-G G-Y				Unit 12			
19T 19R	44 19	Y-BR BR-Y				Unit 5	Unit 5		
20T 20R	45 20	Y-S S-Y				Unit 13			
21T 21R	46 21	V-BL BL-V				Unit 6	Unit 6	Unit 3	
22T 22R	47 22	V-O O-V				Unit 14			
23T 23R	48 23	V-G G-V				Unit 7	Unit 7		
24T 24R	49 24	V-BR BR-V				Unit 15			
25T 25R	50 25	V-S S-V	Spare						

Table 91
Pair-terminations for NT5K11 EEPE Module I/O panel connectors G, I, L (single loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			G	I	L	16	8	4	2
1T 1R	26 1	W-BL BL-W				Unit 0	Unit 0	Unit 0	Unit 0
2T 2R	27 2	W-O O-W				Unit 8			
3T 3R	28 3	W-G G-W				Unit 1	Unit 1		
4T 4R	29 4	W-BR BR-W				Unit 9			
5T 5R	30 5	W-S S-W				Unit 2	Unit 2	Unit 1	Unit 1
6T 6R	31 6	R-BL BL-R				Unit 10			
7T 7R	32 7	R-O O-R				Unit 3	Unit 3		
8T 8R	33 8	R-G G-R	Slot X-1 Card 1	Slot X-4 Card 4	Slot X-7 Card 7	Unit 11			
9T 9R	34 9	R-BR BR-R				Unit 4	Unit 4	Unit 2	
10T 10R	35 10	R-S S-R				Unit 12			
11T 11R	36 11	BK-BL BL-BK				Unit 5	Unit 5		
12T 12R	37 12	BL-O O-BK				Unit 13			
13T 13R	38 13	BK-G G-BK				Unit 6	Unit 6	Unit 3	
14T 14R	39 14	BK-BR BR-BK				Unit 14			
15T 15R	40 15	BK-S S-BK				Unit 7	Unit 7		
16T 16R	41 16	Y-BL BL-Y				Unit 15			

Table 91
Pair-terminations for NT5K11 EEPE Module I/O panel connectors G, I, L (single loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			G	**I**	**L**	**16**	**8**	**4**	**2**
17T 17R	42 17	Y-O O-Y				Unit 0	Unit 0	Unit 0	Unit 0
18T 18R	43 18	Y-G G-Y				Unit 8			
19T 19R	44 19	Y-BR BR-Y				Unit 1	Unit 1		
20T 20R	45 20	Y-S S-Y	Slot X-2 Card 2	Slot X-5 Card 5	Slot X-8 Card 8	Unit 9			
21T 21R	46 21	V-BL BL-V				Unit 2	Unit 2	Unit 1	Unit 1
22T 22R	47 22	V-O O-V				Unit 10			
23T 23R	48 23	V-G G-V				Unit 3	Unit 3		
24T 24R	49 24	V-BR BR-V				Unit 11			
25T 25R	50 25	V-S S-V	Spare						

Table 92
Pair-terminations for NT5K11 EEPE Module I/O panel connectors H, K, M (single loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			H	K	M	16	8	4	2
1T 1R	26 1	W-BL BL-W	Slot X-2 Card 2	Slot X-5 Card 5	Slot X-8 Card 8	Unit 4	Unit 4	Unit 2	
2T 2R	27 2	W-O O-W				Unit 12			
3T 3R	28 3	W-G G-W				Unit 5	Unit 5		
4T 4R	29 4	W-BR BR-W				Unit 13			
5T 5R	30 5	W-S S-W				Unit 6	Unit 6	Unit 3	
6T 6R	31 6	R-BL BL-R				Unit 14			
7T 7R	32 7	R-O O-R				Unit 7	Unit 7		
8T 8R	33 8	R-G G-R				Unit 15			

Table 92
Pair-terminations for NT5K11 EEPE Module I/O panel connectors H, K, M (single loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			H	**K**	**M**	**16**	**8**	**4**	**2**
9T 9R	34 9	R-BR BR-R				Unit 0	Unit 0	Unit 0	Unit 0
10T 10R	35 10	R-S S-R				Unit 8			
11T 11R	36 11	BK-BL BL-BK				Unit 1	Unit 1		
12T 12R	37 12	BL-O O-BK				Unit 9			
13T 13R	38 13	BK-G G-BK				Unit 2	Unit 2	Unit 1	Unit 1
14T 14R	39 14	BK-BR BR-BK				Unit 10			
15T 15R	40 15	BK-S S-BK				Unit 3	Unit 3		
16T 16R	41 16	Y-BL BL-Y	Slot X-3 Card 3	Slot X-6 Card 6	Spare	Unit 11			
17T 17R	42 17	Y-O O-Y				Unit 4	Unit 4	Unit 2	
18T 18R	43 18	Y-G G-Y				Unit 12			
19T 19R	44 19	Y-BR BR-Y				Unit 5	Unit 5		
20T 20R	45 20	Y-S S-Y				Unit 13			
21T 21R	46 21	V-BL BL-V				Unit 6	Unit 6	Unit 3	
22T 22R	47 22	V-O O-V				Unit 14			
23T 23R	48 23	V-G G-V				Unit 7	Unit 7		
24T 24R	49 24	V-BR BR-V				Unit 15			
25T 25R	50 25	V-S S-V	Spare						

Table 93
Pair-terminations for NT5K11 EEPE Module I/O panel connectors A, C, E, (dual loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			A	C	E	16	8	4	2
1T 1R	26 1	W-BL BL-W				Unit 0	Unit 0	Unit 0	Unit 0
2T 2R	27 2	W-O O-W				Unit 8			
3T 3R	28 3	W-G G-W				Unit 1	Unit 1		
4T 4R	29 4	W-BR BR-W				Unit 9			
5T 5R	30 5	W-S S-W				Unit 2	Unit 2	Unit 1	Unit 1
6T 6R	31 6	R-BL BL-R				Unit 10			
7T 7R	32 7	R-O O-R				Unit 3	Unit 3		
8T 8R	33 8	R-G G-R	Slot X-1	Slot X-4	Slot Y-3	Unit 11			
9T 9R	34 9	R-BR BR-R	Card 1	Card 4	Card 2	Unit 4	Unit 4	Unit 2	
10T 10R	35 10	R-S S-R				Unit 12			
11T 11R	36 11	BK-BL BL-BK				Unit 5	Unit 5		
12T 12R	37 12	BL-O O-BK				Unit 13			
13T 13R	38 13	BK-G G-BK				Unit 6	Unit 6	Unit 3	
14T 14R	39 14	BK-BR BR-BK				Unit 14			
15T 15R	40 15	BK-S S-BK				Unit 7	Unit 7		
16T 16R	41 16	Y-BL BL-Y				Unit 15			

Table 93
Pair-terminations for NT5K11 EEPE Module I/O panel connectors A, C, E, (dual loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			A	**C**	**E**	**16**	**8**	**4**	**2**
17T 17R	42 17	Y-O O-Y				Unit 0	Unit 0	Unit 0	Unit 0
18T 18R	43 18	Y-G G-Y				Unit 8			
19T 19R	44 19	Y-BR BR-Y				Unit 1	Unit 1		
20T 20R	45 20	Y-S S-Y	Slot X-2 Card 2	Slot Y-1 Card 5	Slot Y-4 Card 3	Unit 9			
21T 21R	46 21	V-BL BL-V				Unit 2	Unit 2	Unit 1	Unit 1
22T 22R	47 22	V-O O-V				Unit 10			
23T 23R	48 23	V-G G-V				Unit 3	Unit 3		
24T 24R	49 24	V-BR BR-V				Unit 11			
25T 25R	50 25	V-S S-V	Spare						

Table 94
Pair-terminations for NT5K11 EEPE Module I/O panel connectors B, D, F (dual loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	**D**	**F**	**16**	**8**	**4**	**2**
1T 1R	26 1	W-BL BL-W				Unit 4	Unit 4	Unit 2	
2T 2R	27 2	W-O O-W				Unit 12			
3T 3R	28 3	W-G G-W				Unit 5	Unit 5		
4T 4R	29 4	W-BR BR-W	Slot X-2 Card 2	Slot Y-1 Card 5	Slot Y-4 Card 3	Unit 13			
5T 5R	30 5	W-S S-W				Unit 6	Unit 6	Unit 3	
6T 6R	31 6	R-BL BL-R				Unit 14			
7T 7R	32 7	R-O O-R				Unit 7	Unit 7		
8T 8R	33 8	R-G G-R				Unit 15			

Table 94
Pair-terminations for NT5K11 EEPE Module I/O panel connectors B, D, F (dual loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			B	**D**	**F**	**16**	**8**	**4**	**2**
9T 9R	34 9	R-BR BR-R				Unit 0	Unit 0	Unit 0	Unit 0
10T 10R	35 10	R-S S-R				Unit 8			
11T 11R	36 11	BK-BL BL-BK				Unit 1	Unit 1		
12T 12R	37 12	BL-O O-BK				Unit 9			
13T 13R	38 13	BK-G G-BK				Unit 2	Unit 2	Unit 1	Unit 1
14T 14R	39 14	BK-BR BR-BK				Unit 10			
15T 15R	40 15	BK-S S-BK				Unit 3	Unit 3		
16T 16R	41 16	Y-BL BL-Y	Slot X-3 Card 3	Slot Y-2 Card 1	Spare	Unit 11			
17T 17R	42 17	Y-O O-Y				Unit 4	Unit 4	Unit 2	
18T 18R	43 18	Y-G G-Y				Unit 12			
19T 19R	44 19	Y-BR BR-Y				Unit 5	Unit 5		
20T 20R	45 20	Y-S S-Y				Unit 13			
21T 21R	46 21	V-BL BL-V				Unit 6	Unit 6	Unit 3	
22T 22R	47 22	V-O O-V				Unit 14			
23T 23R	48 23	V-G G-V				Unit 7	Unit 7		
24T 24R	49 24	V-BR BR-V				Unit 15			
25T 25R	50 25	V-S S-V	Spare						

Table 95
Pair-terminations for NT5K11 EEPE Module I/O panel connectors G, I, K (dual loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			G	I	K	16	8	4	2
1T 1R	26 1	W-BL BL-W				Unit 0	Unit 0	Unit 0	Unit 0
2T 2R	27 2	W-O O-W				Unit 8			
3T 3R	28 3	W-G G-W				Unit 1	Unit 1		
4T 4R	29 4	W-BR BR-W				Unit 9			
5T 5R	30 5	W-S S-W				Unit 2	Unit 2	Unit 1	Unit 1
6T 6R	31 6	R-BL BL-R				Unit 10			
7T 7R	32 7	R-O O-R				Unit 3	Unit 3		
8T 8R	33 8	R-G G-R	Slot X-1 Card 1	Slot X-4 Card 4	Slot Y-3 Card 2	Unit 11			
9T 9R	34 9	R-BR BR-R				Unit 4	Unit 4	Unit 2	
10T 10R	35 10	R-S S-R				Unit 12			
11T 11R	36 11	BK-BL BL-BK				Unit 5	Unit 5		
12T 12R	37 12	BL-O O-BK				Unit 13			
13T 13R	38 13	BK-G G-BK				Unit 6	Unit 6	Unit 3	
14T 14R	39 14	BK-BR BR-BK				Unit 14			
15T 15R	40 15	BK-S S-BK				Unit 7	Unit 7		
16T 16R	41 16	Y-BL BL-Y				Unit 15			

Table 95
Pair-terminations for NT5K11 EEPE Module I/O panel connectors G, I, K (dual loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			G	I	K	16	8	4	2
17T 17R	42 17	Y-O O-Y	Slot X-2 Card 2	Slot Y-1 Card 5	Slot Y-4 Card 3	Unit 0	Unit 0	Unit 0	Unit 0
18T 18R	43 18	Y-G G-Y				Unit 8			
19T 19R	44 19	Y-BR BR-Y				Unit 1	Unit 1		
20T 20R	45 20	Y-S S-Y				Unit 9			
21T 21R	46 21	V-BL BL-V				Unit 2	Unit 2	Unit 1	Unit 1
22T 22R	47 22	V-O O-V				Unit 10			
23T 23R	48 23	V-G G-V				Unit 3	Unit 3		
24T 24R	49 24	V-BR BR-V				Unit 11			
25T 25R	50 25	V-S S-V	Spare						

Table 96
Pair-terminations for NT5K11 EEPE Module I/O panel connectors H, L, M (dual loop mode)
Shelf Section-A (Part 1 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			H	**L**	**M**	**16**	**8**	**4**	**2**
1T 1R	26 1	W-BL BL-W				Unit 4	Unit 4	Unit 2	
2T 2R	27 2	W-O O-W				Unit 12			
3T 3R	28 3	W-G G-W				Unit 5	Unit 5		
4T 4R	29 4	W-BR BR-W	Slot X-2 Card 2	Slot Y-1 Card 5	Slot Y-4 Card 3	Unit 13			
5T 5R	30 5	W-S S-W				Unit 6	Unit 6	Unit 3	
6T 6R	31 6	R-BL BL-R				Unit 14			
7T 7R	32 7	R-O O-R				Unit 7	Unit 7		
8T 8R	33 8	R-G G-R				Unit 15			

Table 96
Pair-terminations for NT5K11 EEPE Module I/O panel connectors H, L, M (dual loop mode)
Shelf Section-A (Part 2 of 2)

Pair	Pins	Pair color	I/O panel connector			Units per card			
			H	**L**	**M**	**16**	**8**	**4**	**2**
9T 9R	34 9	R-BR BR-R				Unit 0	Unit 0	Unit 0	Unit 0
10T 10R	35 10	R-S S-R				Unit 8			
11T 11R	36 11	BK-BL BL-BK				Unit 1	Unit 1		
12T 12R	37 12	BL-O O-BK				Unit 9			
13T 13R	38 13	BK-G G-BK				Unit 2	Unit 2	Unit 1	Unit 1
14T 14R	39 14	BK-BR BR-BK				Unit 10			
15T 15R	40 15	BK-S S-BK				Unit 3	Unit 3		
16T 16R	41 16	Y-BL BL-Y	Slot X-3	Slot Y-2		Unit 11			
17T 17R	42 17	Y-O O-Y	Card 3	Card 1	Spare	Unit 4	Unit 4	Unit 2	
18T 18R	43 18	Y-G G-Y				Unit 12			
19T 19R	44 19	Y-BR BR-Y				Unit 5	Unit 5		
20T 20R	45 20	Y-S S-Y				Unit 13			
21T 21R	46 21	V-BL BL-V				Unit 6	Unit 6	Unit 3	
22T 22R	47 22	V-O O-V				Unit 14			
23T 23R	48 23	V-G G-V				Unit 7	Unit 7		
24T 24R	49 24	V-BR BR-V				Unit 15			
25T 25R	50 25	V-S S-V	Spare						

Powering up the system and initial loading

This section describes how to power up and initialize an option 51C, 61C, or 81C and install new software.

Preparing for power-up

1   Locate the Keycode Installation diskette that corresponds with the Call Processor (CP) card installed in your system.

2   Locate the round 1/2" diameter Security Device for the NT5D61 Input Output Disk Unit with CD-ROM (IODU/C) card.

3   Make sure that the 8-digit code on the Keycode Installation diskette matches the 8-digit code on the Security Device.

4   Install the Security Device on the IODU/C card:

   • With the Nortel side facing upward, slide the Security Device between the black round security device holder on the top right hand corner of the IODU/C card and the holder clip. Do not bend the clip more than necessary when inserting the Security Device.

   • Ensure that the Security Device is securely in place.

   • In a dual CPU system, install a Security Device for both CPUs

5   Install the IODU/C card(s) into slots 17, 18, and 19.

6   Lock the locking devices by pushing them gently towards the faceplate. Set the ENB/DIS switch to ENB.

7   Verify that all cards are locked into their assigned slots.

8   Verify that all cable connectors are secured.

9   Set all circuit breakers to OFF.

10   Set all faceplate switches to ENB.

11   Set CPUs for normal operation.

- **For option 51C,** set the NORM/MAINT switch on the CP card to MAINT.

- **For options 61C and 81C**, set the NORM/MAINT switch for both CP cards to NORM**.**

Connecting power for AC-powered systems

1   Test the commercial power source for proper voltage (see *Meridian 1 installation planning* (553-3001-120) for voltage requirements).

2   Set the main circuit breaker in the rear of each pedestal to OFF.

3   Set the circuit breakers on each MPDU, or the switch on each module power supply, to OFF in each module.

4   Set the circuit breaker on the blower unit in the front of each pedestal to OFF.

5   Connect the AC power cord for each pedestal to its associated commercial power outlet.

Note: If a problem is found in any of the following steps, resolve that problem before continuing.

6   If not already done, in the power panel set the circuit breaker that provides service for Column 0 to ON.

7   Set the main circuit breaker in Column 0 to ON.

8   Set the circuit breaker on the blower unit in Column 0 to ON. You should hear the blower running.

Note: On initial power-up, the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate faster.

9   Set the circuit breaker on the MPDU, or the switch on the module power supply, to ON in Module 0. After a few seconds, the green LED on the power supply should light.

Repeat this step for each module in the column, one module at a time. (If the module is equipped with a ringing generator, set the breakers or switches for both the power supply and the ringing generator to ON.)

Note: It may take up to 90 seconds for the green LED to light on a ringing generator. This is normal operation.

10   Repeat steps 5 through 9 for each column.

11   Once the green LED is lit on all module power supplies and ringing generators, set the main circuit breaker for each column to OFF, wait at least 30 seconds, then set the breaker back to ON (leave CPU columns off).

•   The breaker should not trip. The blower unit in each column should be running and the green LED on all module power supplies and ringing generators should be lit. All red column LEDs should also be lit.

•   Set the main circuit breakers for the CPU columns to ON (in dual Core systems, set the breakers simultaneously).

At this point, all blower units should be running and the green LED on all module power supplies and ringing generators should be lit. The red column LEDs will remain lit until the system reloads

Connecting power for DC-powered systems

1   Set the main AC circuit breaker to each rectifier to OFF.

2   For each rectifier, test the commercial power source for proper voltage (see *Meridian 1 installation planning* (553-3001-120) for voltage requirements).

3   Remove all distribution fuses, or set all distribution breakers to OFF, on the DC power source for each column.

4   Set all circuit breakers in the rear of each pedestal to OFF.

5   Set the switch on each module power supply and ringing generator to OFF.

6   Set the switch on the blower unit in the front of each pedestal to OFF.

Note 1: If a problem is found in any of the following steps, resolve that problem before continuing.

Note 2: If reserve batteries are equipped, the volt meter on the DC power source should show approximately –48 V.

7   If not already done, connect each rectifier to its associated AC outlet and set the breakers in the power panel to ON.

8   Turn on the rectifiers, one at a time, waiting about 10 seconds between one rectifier and the next. Voltage at the distribution meter should go to about 54 V (equalize voltage) or 52 V (if equalize voltage has not been set up).

Note: Perform steps 9 through l2 for each column. Power on the Core columns last.

9   Replace the distribution fuses, or set the distribution breakers to ON, on the DC power source for the column.

10   Set the circuit breaker for the blower unit (the far left breaker in the rear of the pedestal) to ON in the column.

11   Set the switch on the blower unit (in the front of the pedestal) in the column to ON. You should hear the blower running.

Note: On initial power-up, the blower may rotate slower than expected. As the sensor detects heat, the blower will rotate faster.

12   Set the switch on the module power supply to ON in the column. After a few seconds, the green LED on the power supply should light.

Repeat this step for each module in the column, one module at a time. (If the module is equipped with a ringing generator, set the switch on both the power supply and the ringing generator to ON.)

Note: It may take up to 90 seconds for the green LED to light on a ringing generator. This is normal operation.

At this point, all blower units should be running and the green LEDs on all module power supplies and ringing generators should be lit. The red column LEDs will remain lit until the system reloads.

If you are currently upgrading your system, do not install new software, but return to your upgrade procedure in *Upgrade system installation to release 24* (553-3001-258).

Performing acceptance tests

Perform the following acceptance tests after the system loading is completed:

— Module power supply test

— Blower unit and thermal sensor test

— Sysload test

— System terminal and system monitor test

— PFTU test (if PFTUs are equipped)

— Disk drive unit test

See the *X11 input/output guide* for a detailed explanation of software prompts and the *X11 system messages guide* for the meaning of system messages and display codes generated during acceptance tests.

> *Note:* While performing the tests below, if you fail to see an expected display code, contact your Northern Telecom support representative for assistance.

Module power supply test

Use this procedure to test module power supplies and ringing generators and their interface to the system monitor. This procedure should be performed for each power supply at system installation, or whenever a module is installed.

Performing these tests on a single CPU system may cause a sysload. Performing these tests on a dual CPU system may cause an initialization; disregard INI messages during the tests.

1   Verify that the green LED on each power supply is lit and that each red column LED is OFF**.**

2   Set the power supply to OFF. If there is an MPDU in the module, use the associated circuit breaker on the MPDU. If there is a switch on the power supply, use the switch.

   • The green LED on the power supply should go out.

   • The red column LED should light.

   • The system terminal should display PWR0002 and BSD090.

   Note: If the power supply is in an IPE Module, XMI messages may be generated.

   • The system terminal should then display BSD000.

3   Set the power supply to ON.

   • The green LED on the power supply should light.

   • The red column LED should go out.

   • The system terminal should display PWR0000.

4   Set the power supply to OFF. Wait until the red column LED lights, then unseat the power supply.

   • The red column LED should remain lit.

   • The system terminal should display PWR0002, BSD090, BSD000, and PWR0003.

5   Make sure the power supply switch is OFF and then push it back into the slot. Set the power supply to ON.

   • The green LED on the power supply should light.

   • The red column LED should go out.

   • The system terminal should display PWR0000.

Blower unit and thermal sensor test

Use this procedure to test the NT8D52 Blower Unit and its interface to the system monitor. This test should be performed on the blower unit when a column is initially installed.

Note: In the steps below, if you fail to see an expected display code, contact your Northern Telecom support representative.

1   In the front of the pedestal, set the blower unit circuit breaker, or power switch, to OFF.

   • The red LED at the top front of the column should light.

   • The system terminal should display PWR0006 and BSD090.

   Note: Some DC powered blower units such as the NT8D52DD may also display PWR0005 and PWR0045.

2   Set the blower unit circuit breaker, or power switch, to ON.

   • The column LED should go out.

   • The system terminal should display PWR0046.

3   Use a screwdriver to loosen the retaining screws at the front of the blower unit (see Figure 115) and pull the unit out until it is disconnected from the pedestal.

   Note: Do *not* pull the unit all the way out of the pedestal.

   • The column LED should light.

   • The system terminal should display PWR0006 and BSD090.

4   Reinstall the blower unit and tighten the retaining screws.

   • The column LED should go out.

   • The system terminal should display PWR0046.

5   Heat one of the two thermal sensors under the top cap of the column with a hand-held hair dryer or similar heat source.

- The column LED should light.

- Thirty seconds after the thermal sensor detects 70 degrees C (158 degrees F), the main circuit breaker, or the blower unit circuit breaker, at the rear of the pedestal should trip. The system terminal should display PWR0004, PWR0006, and PWR0007.

6   Allow the sensor to cool, then reset the circuit breaker in the pedestal. If a sysload occurs, allow it to complete.

- The column LED should go out.

- The system terminal should display PWR0044, PWR0046, and PWR0047.

7   Repeat steps 5 and 6 for the other thermal sensor.

Figure 115
Blower unit removal

553-3040
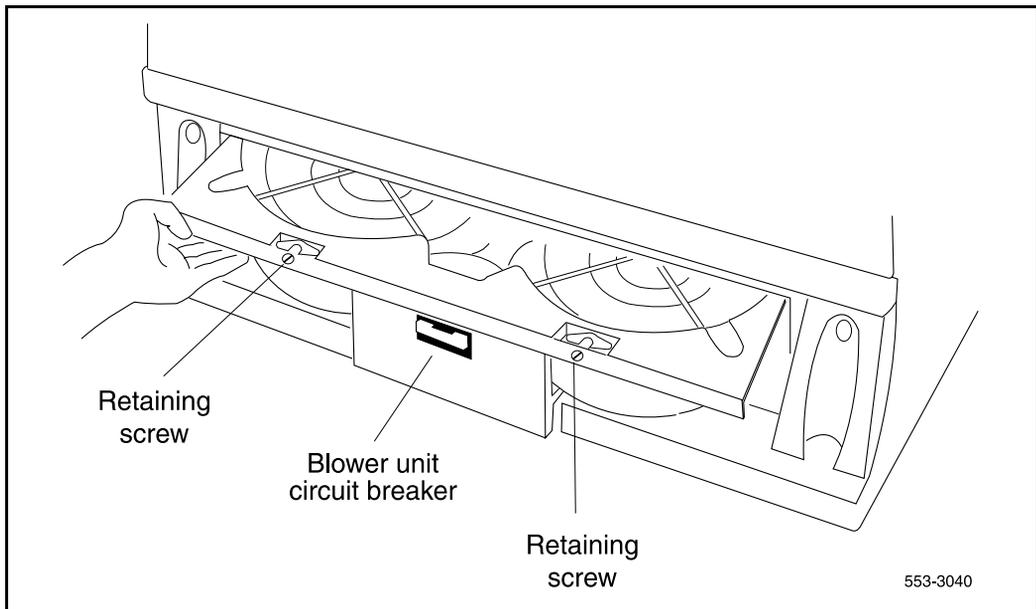
Sysload test

Use this procedure to test the sysload (manual reload) function.

1   Start the sysload:

- **On options 21A and 21**, press the reload (Rld) button on the QPC687 CPU Card.

- **On option 21E**, press the Rld button on the NTND01 ICM Card.

- **On option 51**, press the Rld button (the bottom button) on the single NTND10 CMA Card (QPC581 before X11 release 18).

- **On option 51C**, press the Man Rst button (the bottom button) on the NT6D66 (or NT9D19) Call Processor Card.

- **On options 61 and 71**, simultaneously press the Rld buttons (the bottom buttons) on both NTND10 CMA Cards (QPC581 before X11 release 18).

- **On options 61C, 81, and 81C**, simultaneously press the Man Rst buttons (the bottom buttons) on both NT6D66 (or NT9D19) Call Processor Cards.

The following functions occur during a sysload:

- **On all system options:**

    The red LED at the top of the CPU column should light.

    The major alarm indication should be displayed on all attendant consoles.

    The LED on the front of the disk drive unit should light. (In options 51C, 61C, 81, and 81C, the LED on only one of the disk drive units will light.)

- **On options 21A and 21:**

    The display on the faceplate of the QPC742 FDI Card should indicate the status of the disk drive unit.

    A series of codes should be displayed on the faceplate of the NT8D19 Memory/Peripheral Signaling Card.

- **On option 21E:**

  The display on the faceplate of the QPC742 FDI Card should indicate the status of the disk drive unit.

  A series of codes should be displayed on the NTND01 ICM and NTND02 MSPS Cards.

- **On options 51, 61, and 71:**

  The display on the faceplate of the QPC584 MSI or QPC742 FDI Cards should indicate the status of the disk drive unit.

  The LEDs on the QPC583 or NTND09 Memory Cards should flash as memory checks take place.

  A series of codes should be displayed on the QPC580 CPU Interface Card.

- **On options 51C, 61C, 81, and 81C:**

  The faceplate HEX displays on the NT5D20 IOP/CMDU Card(s) should show a steady "A" with flashing decimal points when the card(s) complete a self-test.

  On the LCD displays on the NT6D66 (or NT9D19) CP Card(s):

  Following the "Selftest Complete" message, watch the LCD for the message "IOP in Slot 17."

  Watch the LCD for the message "Loading Disk OS."

When the sysload is complete, the system terminal displays DONE and the system automatically invokes the initialization program.

The following functions occur when the initialization is complete:

- The column LED should go out.

- The major alarm indication should disappear from all attendant consoles.

- The system automatically runs the programs in the midnight routine.

2   Press the return key on the system terminal to monitor the progress of the midnight routines until the OVL111 BKGD response is received.

System terminal and system monitor test

Use this procedure to test system terminals connected to the Meridian 1.

1   Log into the system:

LOGI (password)

2   Enter the program and check the status of the system monitor:

LD 37
STAT XSM

3   Test the terminal:

TTY x   "x" is the device number assigned to the system terminal

The system terminal should display

ABCDEFGHIJKLM
NOPQRSTUVWXYZ
%*!&()<>=:,.?
READY FOR INPUT

4   Step through the keys on the keyboard one at a time. All keyboard input should be echoed until END is entered.

5   Exit LD 37:

****

PFTU test

Use this procedure to test a PFTU and its interface with the system monitor.

1 Set the line transfer switch on the PFTU to BYPASS. Associated attendant consoles should display a major alarm.

2 Set the line transfer switch on the PFTU to NORMAL.

3 Set the line transfer switch on the attendant console associated with the PFTU to ON. Associated attendant consoles should display a major alarm.

4 Set the line transfer switch on the attendant console associated with the PFTU to OFF. The "major" alarm condition displayed on attendant consoles associated with the PFTU should disappear.

5 Repeat Steps 2 and 3 for each attendant console associated with the PFTU.

6 Set the line transfer switch on the PFTU to BYPASS and test the telephones and trunks connected to the PFTU.

- Place an outgoing call from each telephone associated with the PFTU. Each telephone should be connected directly to a trunk.

- Place an incoming call on each trunk associated with the PFTU. Each trunk should be connected directly to a telephone.

7 Set the line transfer switch on the PFTU to NORMAL and test the telephones and trunks connected to the PFTU. The telephones and trunks associated with the PFTU should return to normal operation.

Disk drive unit test

Use this procedure to test the FDU, MDU (for other than options 51C, 61C, 81, and 81C) or SMDU.

1 Log into the system:

LOGI (password)

2 Enter the program:

LD 37

3 Make sure the disk drive unit is not disabled:

STAT MSI

4   If the disk drive unit is disabled, enable it:

    ENL MSI 0

5   Test the disk drive unit:

    MSI 0

    If the system response is not "OK," see the *X11 input/output guide* for the meaning of the message received.

6   Exit LD 37:

    ****

Use this procedure to test the CMDUs in options 51C, 61C, 81, and 81C.

1   Log into the system:

    LOGI (password)

2   Enter the program:

    LD 137

3   Make sure the CMDU to be tested is not disabled:

    STAT CMDU   checks the status of both CMDUs

4   If the CMDU to be tested is disabled, enable it:

    ENL CMDU x   x represents the number for the specific CMDU

5   Test the CMDU:

    TEST CMDU
    If the system response is not "OK," see the *X11 input/output guide* for the meaning of the message received.

6   Exit LD 137:

****

7   To test the second CMDU, enter

LD 135

Switch CPUs:

SCPU

Repeat steps 1 through 6.

Installing earthquake bracing

Depending on the geographic location, the Meridian 1 floor installation method may or may not require seismic bracing. To meet seismic bracing requirements, the installation must meet the Bellcore or the California OSHPD installation specifications. In locations that do not have earthquakes, a non-seismic installation is acceptable.

In certain seismic-approved applications where the pedestal attachment to the floor may be required but Northern Telecom does not offer the appropriate hardware, the installation organization must contact a seismic engineering firm to install the pedestal that meets Bellcore or California OSHPD requirements. This application could include attachment to a raised wood or steel floor.

The Meridian 1 system of universal equipment modules (UEM's) is designed to withstand most earthquakes. However, to ensure this earthquake security, the installation of two kits is required for each column—a bracing kit provides vertical support to each column of modules and an anchor kit secures each pedestal to the floor.

Installing seismic bracing

The Meridian 1 system has been certified to two of the most stringent seismic specifications for concrete floor mounting: BELLCORE and CALIFORNIA OSHPD:

— BELLCORE is intended for central-office equipment installations. The requirements are defined in the Network Equipment Building System (NEBS), General Equipment Requirements, TR-EOP-000063 issued by Bell Communications Research (BELLCORE). The Meridian 1 system has been certified to meet the maximum severity (Zone 4).

— CALIFORNIA OSHPD as part of the California building code, this specification requires the anchorage of all fixed hospital equipment to be approved by the California Office of Statewide Health Planning and Development (OSHPD), Division of Facilities Development and Financing. Meridian 1 has been certified for such installations under anchorage pre-approval number R-0233.

Selecting the kit

To select the applicable bracing and anchorage kits for your particular installation, you must first determine the following site requirements:

— Identify system configuration (number of columns and modules per column).

— Identify specification requirements (i.e., BELLCORE or CALIFORNIA OSHPD).

— Determine site mounting floor parameters (this information can usually be found in the engineering building drawings):

  • concrete type (hardrock vs lightweight aggregate),

  • minimum concrete compressive strength (megapascals or psi),

  • minimum concrete thickness

First, choose the appropriate module bracing kit using Table 97. Select a separate kit for each column of modules. For column expansion (when an additional module is added to a column which already contains seismic bracing) the expansion bracing kit should be used

Table 97
Seismic Bracing Kits

Seismic Bracing Kit	System configuration
NT8D64CD	1-module
NT8D64CA	2-modules
NT8D64CB	3-modules
NT8D64CC	4-modules
NT8D64BD	expansion

Note: The NT8D64CD kit contains neither bracing rods nor tie bars because these are not needed for single module installations. The NT8D64BD kit does not contain mounting plates as these are not needed for column expansion.

Next, each column must also be secured to the floor. This is accomplished by installing one of two available anchor kits. Select the anchor kit by comparing the site requirements to Table 98. This table shows that either anchor kit can be used to meet the CALIFORNIA OSHPD specification, but only Kit B meets the BELLCORE specification. For those installations where neither specification is required, Kit A is recommended due to its shallower concrete requirement.

Both anchor kits can be used in hardrock concrete as long as the compressive strength exceeds 20.7 megapascals (3000 psi). Only Kit A can be used in lightweight aggregate concrete with a compressive strength greater than 27.6 megapascals (4000 psi). The floor parameters for your installation can usually be found in the engineering building drawings.

Table 98
Seismic Anchor Kit

Kit	Seismic Anchor Kit	BELLCORE	CAL OSHPD	Concrete thk (min)	Light-weight
A	NT8D64BE	No	Yes	90 mm (3.54")	Yes
B	NT8D64CE	Yes	Yes	180 mm (7.09 ")	No

The kits listed in Table 98 contain commercially available mounting hardware. You have the option of purchasing the contents directly from the manufacturer (using the listing below) or ordering the kits directly from Northern Telecom.

— Kit A (NT8D64BE) contains four of each of the following items:

- Hilti HDI 3/4" (box of 25, manufacturer part# 457564), Hilti Corporation (918) 252-6000 or, Multi-Set II (manufacturer part# RM-34), ITW Ramset/Redhead, Incorporated (219) 874-4217

- Hex head bolt, Ø.3/4"-10 x 1.50" long, steel material, zinc plate finish

- Flat washer, internal diameter = 0.812", outside diameter = 1.469", thickness = 0.120", steel material, zinc plate finish

— Kit B (NT8D64CE) contains four of the following item:

- Hilti HSL M16/25 (box of 10, manufacturers part# 665934), Hilti Corporation (918) 252-6000

Finally, to aid installation, four kits have been developed. The seismic anchor hole template kit (NT8D64BH) provides a mylar template to aid floor marking. Only one kit is needed for an installation and this kit is reusable.

Drilling the floor

The following tools are required to drill the holes for the anchor bolts:

— dark marking pencil

— center-punch

— rotary hammer drill

— carbide-tip drill bit:

   • 25.4 mm (1.00 inch) diameter (for Kit A, NT8D64BE)

   • 24.0 mm (0.94 inch) diameter (for Kit B, NT8D64CE)

— blowout bulb or compressed air source

— hammer or mallet

— vacuum

WARNING

Wear safety goggles when drilling anchor holes. For all drilling, use the appropriate tools and follow local codes. Make sure to obey all safety and warning precautions provided by the hammer drill and anchor bolt manufacturers.

Note: The following description applies only to installations into concrete floors.

1   Using the equipment room floor plan mark the position of all of the columns.

2   Center-punch each of the hole centers.

3   Using a carbide-tipped drill bit, hammer drill the holes to the size and depth shown in Table 99.

Table 99
Anchor hole sizes

Kit	Kit part number	Hole diameter	Hole depth
A	NT8D64BE	1.00 inch	3.18 inch
B	NT8D64CE	24 mm	125 mm

Note: Special care should be taken in drilling the holes. The holes have to be drilled straight and perpendicular to the floor surface in order for the anchors to be installed correctly. The drill fixture kit can aid this process.

4   Should you hit reinforcing bar or the hole breaks through, abandon that hole and use the secondary hole location indicated in the anchor hole template.

5   Remove any debris from the holes with a blowout bulb or compressed air. Use a vacuum to dispose of the debris.

6   If the mounting plates are not to be installed immediately, cover the anchor holes to prevent debris from falling into them.

Installing anchor plates

The following tools are required to install the anchors and the anchor plates:

— Kit A

   •   setting tool (Hilti HST 3/4", manufacturer part#329821)

   •   1 1/8 inch open-end wrench

— Kit B

   •   24 mm open-end wrench

Procedure for installing Kit A

1   Insert the anchors into the holes. Use the manufacturer's setting tool to install each anchor flush with the surface of the concrete. The setting tool is required for the Hilti anchor.

2   Locate the two mounting plates for each column over the anchors. Place an adapter bushing into each of the plate holes and insert a 3/4-inch diameter bolt and flat washer as shown in Figure 116.

Figure 116
Mounting plate installation

553-6071
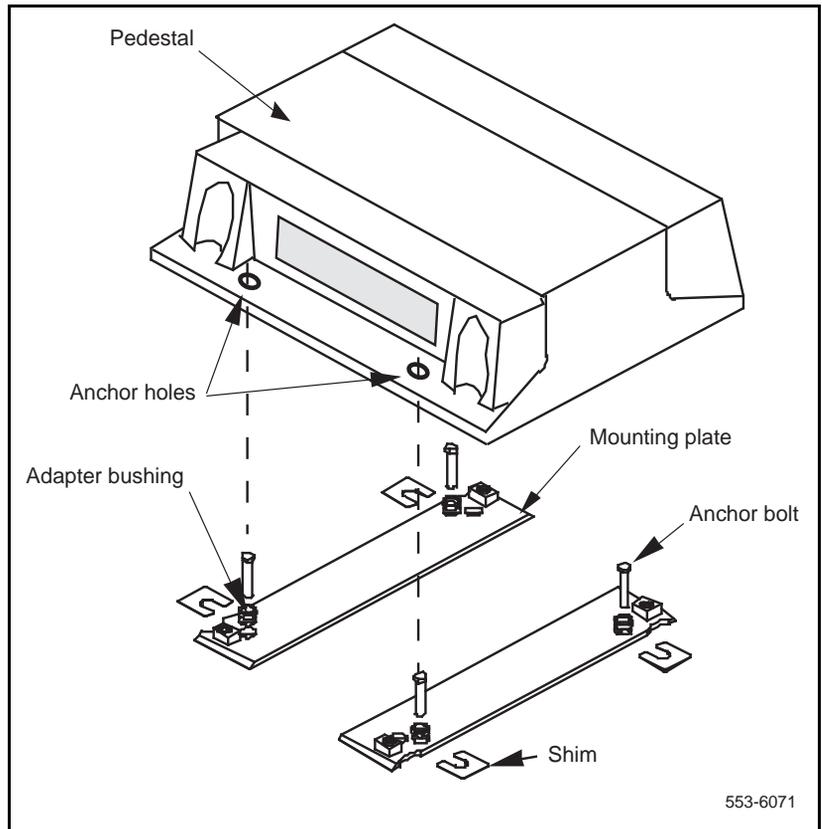
3   Level the plates with shims. Leave the stack of shims exposed until all leveling has been completed (this will allow the addition or removal of shims if necessary).

4   If the installation must meet CALIFORNIA OSHPD, tension proof load testing is required on 50 percent of the anchor bolts. These anchors must be tested to 24,020 newtons (5400 pounds) tension and 122 newton-meters (90 foot-pounds) torque. Any failure requires testing of all remaining anchors.

5   Go to "Installing rods" on page 322.

Procedure for installing Kit B

1   Locate the two mounting plates for each column over the anchor holes. Insert the anchors into the holes and tap the anchors into place with a mallet.

2   Level the plates with shims. Leave the stack of shims exposed until all leveling has been completed (this will allow the addition or removal of shims if necessary).

3   If the installation must meet CALIFORNIA OSHPD, tension proof load testing is required on 50 percent of the anchor bolts. These anchors must be tested to 6230 newtons (1400 pounds) tension and 122 newton-meters (90 foot-pounds) torque. Any failure requires testing of all remaining anchors.

4   Go to "Installing rods" on page 322.

Installing rods

The following tools are required to install the rods:

— 5/16 inch socket wrench

— 1/2 inch open-end wrench (for rods)

— 9/16 inch open-end wrench (for nuts)

Note: The rods should be installed before you position the columns.

1 Remove the top cap on each column:

- Pull forward on the clips underneath the front edge of each air exhaust grill on the top cap. Lift up and remove the grill as illustrated in Figure 117.

Figure 117
Exhaust grill removal
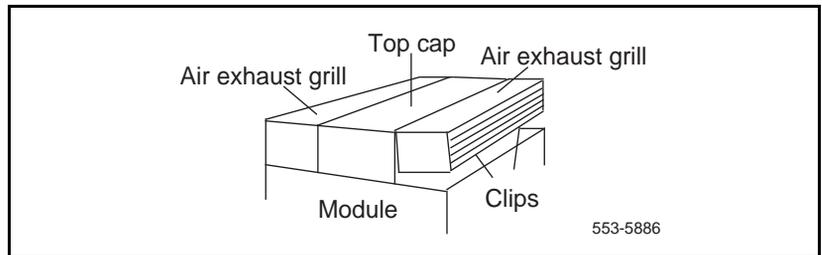
- Use a 5/16 in. socket wrench to remove the six screws that secure the top cap (see Figure 118). Lift the top cap from the column.

2 Remove the side panels on the exterior of each module by removing the four bolts that secure the panel.

Note: In a two-tier or three-tier column, with adequate ceiling clearance, you may be able to thread the rods down the sides of the column without removing the side panels. Insert each rod into its hole at the top of the column.

3 Install bracing rods:

- Position each rod in one of the vertical slots along the sides of the modules and insert the rods into the threaded holes in the pedestal (see Figure 119). Tighten the rods in by hand or snug tight with a 1/2" open-end wrench.

- Place a tie bar over each pair of rods, from side to side across the top of the module, as shown in Figure 119.

- Secure the tie bars with flat washers and hexagon nuts. Torque with 9/16" wrench to 17.6 joules (13.0 ft-lbs).

Note: When installing expansion rods as part of the NT8D64BD bracing kit, the rods are screwed into the previously-installed rods by means of a coupling nut. The resulting two-piece rod should be secured in the same manner as the single rod described above.

4   Reinstall the top cap and grills:

- Position each top cap and install the bolts that secure it.

- Replace the air exhaust grills at the front and rear of each top cap.

5   **For a single-column system**, reinstall the side panels on each module.

For a multiple-column system, install NT8D49AA Spacer Kits between adjacent columns:

- Attach gaskets to both sides in the front section of each spacer (see Figure 120).

- Attach a spacer to one side of each module that will be next to another module, except on the end column (see Figures 120 and 121). Insert the screws through holes in the trim panels.

6   Go to "Positioning and leveling the system" on page 324.

Positioning and leveling the system

The following tools are required to position and level the system:

— socket wrench (anchor bolts):

- 1 1/8 inch for Kit A

- 24 mm for Kit B

— 5/8" socket wrench (pedestal bolts)

Follow the steps below to level the system:

1   Loosen the anchor bolts until the mounting plates are free to move.

2   Starting from one end of the line-up, move a column into position.

3   Loosely install the pedestal mounting hardware (1/2" bolts, lockwasher, plain washer, and insulating washer), using the plastic insulating washers.

Figure 118
Top cap assembly

Mounting bolts

Top cap

Front of column

LED

Screw for LED bracket
on perforated panel

553-3038
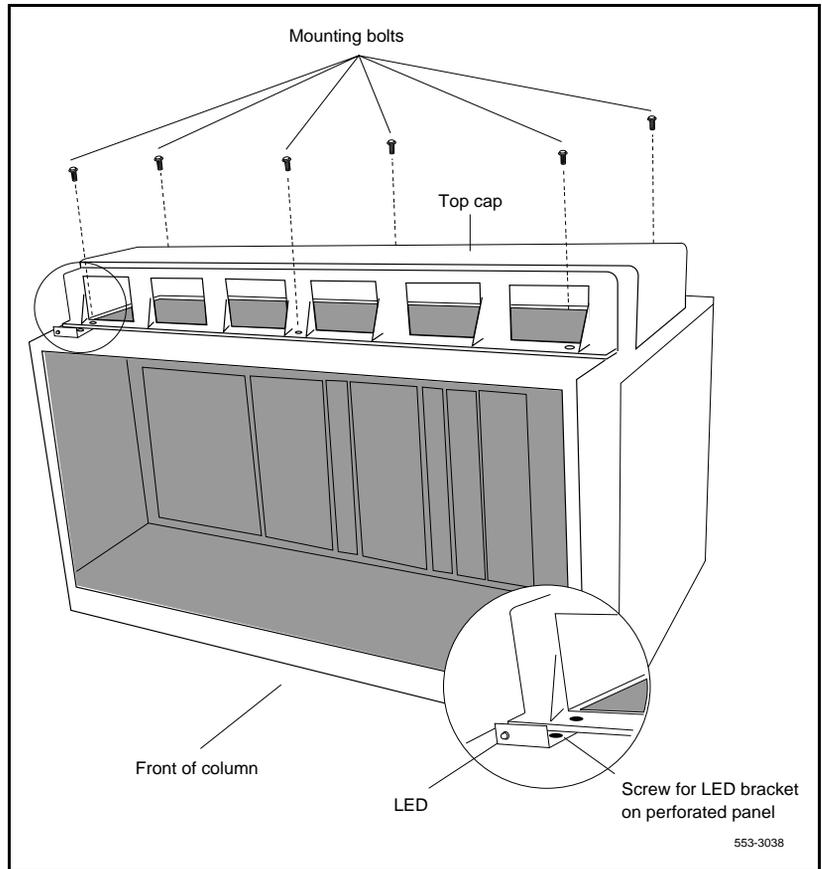
4   Re-level the column, adding or removing shims as needed. Go back and
     re-level any other columns.

5   Repeat the above steps until all columns have been positioned.

6   Slide shims completely under seismic plates. First tighten the pedestal
     mounting bolts, torque to 122 Newton-meters (90 ft-lbs). Then, tighten
     the concrete anchors, torque to 48 Newton-meters (35 ft-lbs).

Figure 119
Installing bracing rods for column support

Tie bars

Earthquake rods

Rods in slots between
modules and
exterior side panels

Side panel

Rods screw
into pedestal

553-3063
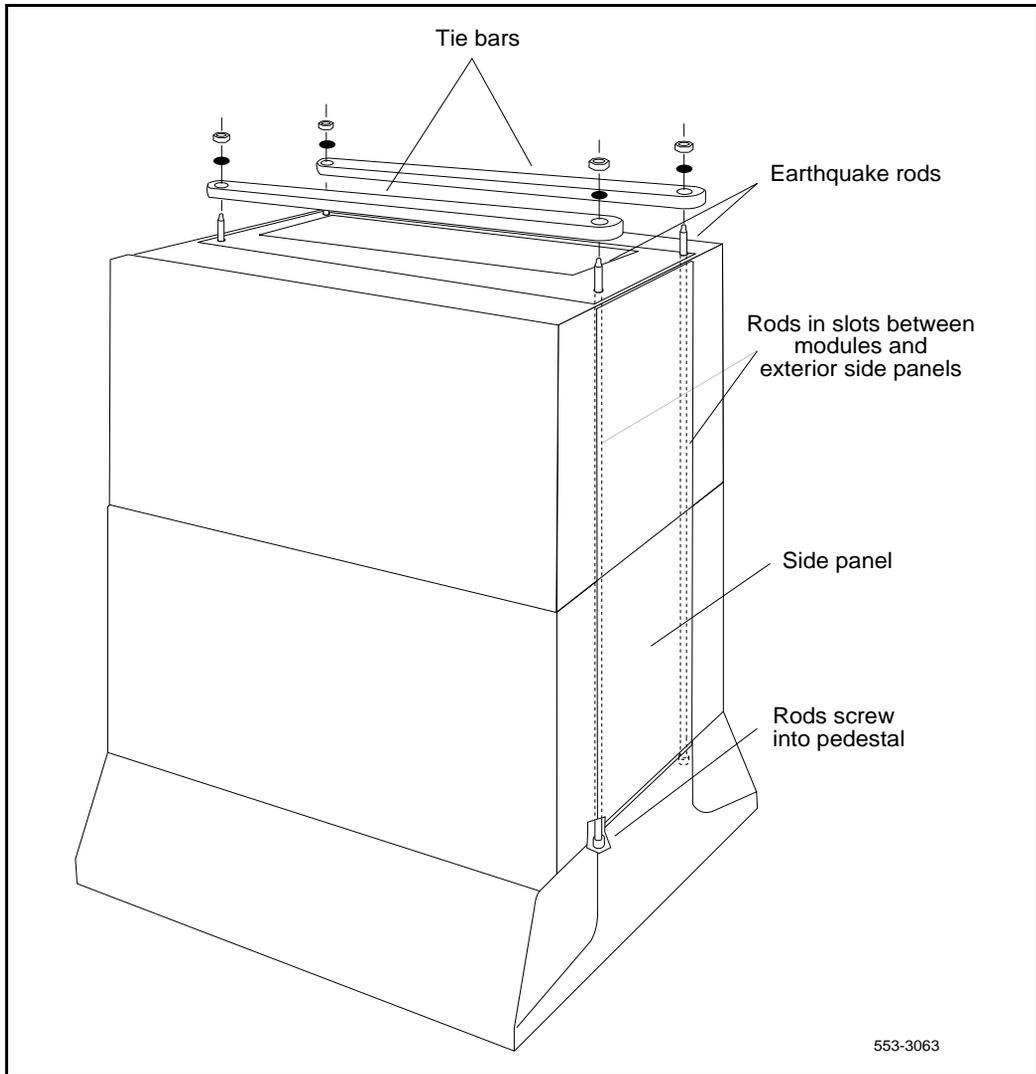
Figure 120
Positioning spacer gaskets

Gasket placement

Rear

Front

553-5641
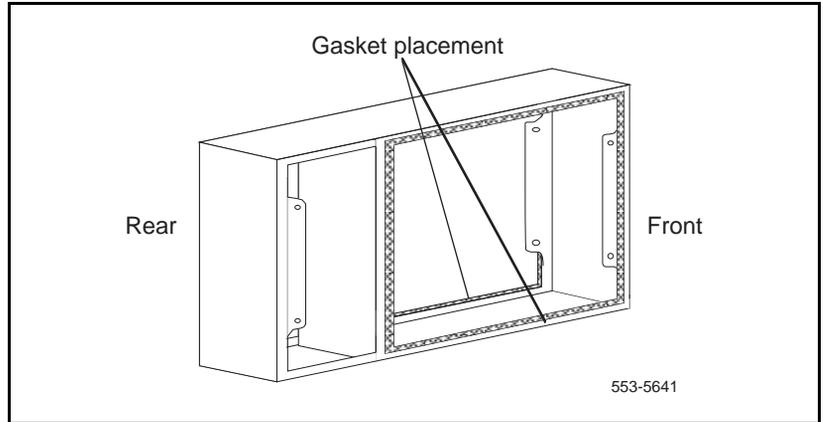
Figure 121
Adding spacers to columns

(end column)

Spacers

Spacers

Attach spacers to one side of each column (except the end column)

553-5383
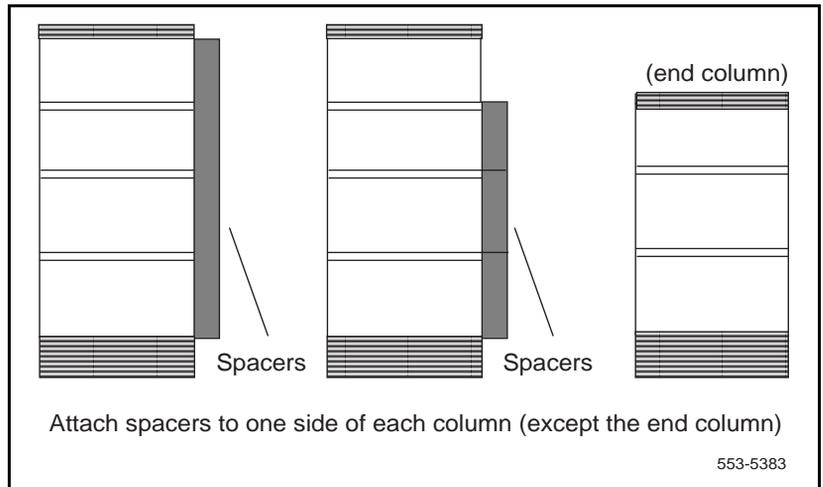
Installing non-seismic bracing

In certain applications where earthquakes do not occur, the pedestal attachment to the floor does not have to meets Bellcore or California OSHPD requirements. This application could include attachment to a raised wood or steel floor using the kits described below.

Selecting the kit

If the installation does not have to meet the Bellcore or OSHPD requirements, the installer can design and install an attachment suitable for the particular installation using:

— NT8D64BF Floor Mounting Kit

— NT8D6401 Insulating Washer Kit

NT8D64BF Floor Mounting Kit

The NT8D64BF Floor Mounting Kit provides the hardware required to secure a Meridian 1 column to concrete floors for non-seismic installations i. e., for a non-Bellcore or OSHPD approved installation.

The kit provides four sets of hardware however, a minimum of two anchors must be used diagonally opposite to secure the column pedestal to the floor. The kit also provides four insulating washers that can be used during kit installation.

NT8D6401 Insulating Washer Kit

The NT8D6401 Insulating Washer Kit is used for attaching the Meridian 1 to the floor when the installer is using a third party anchor kit instead of the Northern Telecom's NT8D64BF Floor Mounting Kit.

In this case, one NT8D6401 Insulating Washer Kit is required for each pedestal to electrically insulate the mounting bolts from the pedestal casting. Each NT8D6401 Insulating Washer Kit provides four insulating washers.

Non-seismic anchor kit installation instructions

To install the NT8D64BF Floor Mounting Kit:

1   Mark the position of each Meridian 1 column using the equipment room floor plan.

2   Mark the location of all four anchor holes for each column using a dark marking pencil.

3   Center-punch the center of each hole in the concrete.

4   Make the hole in concrete by using a rotary hammer drill to the following size and depth:

    •   hole diameter 0.625”

    •   hole depth 2.00”

5   Abandon the hole if you should hit a reinforcing bar or the hole breaks through. A minimum of two diagonally opposite anchors are required for this application.

6   Remove any debris from the hole with a blowout bulb or compressed air. Use a vacuum cleaner to dispose of the debris.

7   Insert the anchors into the holes. Use the manufacturer's setting tool to install each anchor flush with the surface of the concrete. Use the Hilti HST 1/2” setting tool, manufacturer part # 000329805 or equivalent.

8   Position each column over the anchors.

9   Insert bolt, metal washer, and shoulder washer into the pedestal hole, as shown in the Figure 122. On the far side of the pedestal flange, thread a plastic washer, a metal washer, and the nut onto the bolt.

10 Insert the bolt into the concrete anchor.

11 Tighten the nut to the pedestal flange and torque it to the 34 Newton-meters (25 ft-lbs) using a 3/4” socket wrench. Do not overtighten.

12 Repeat steps 8 to 11 for remaining bolts.

Figure 122
Pedestal mounting flange (rear view)
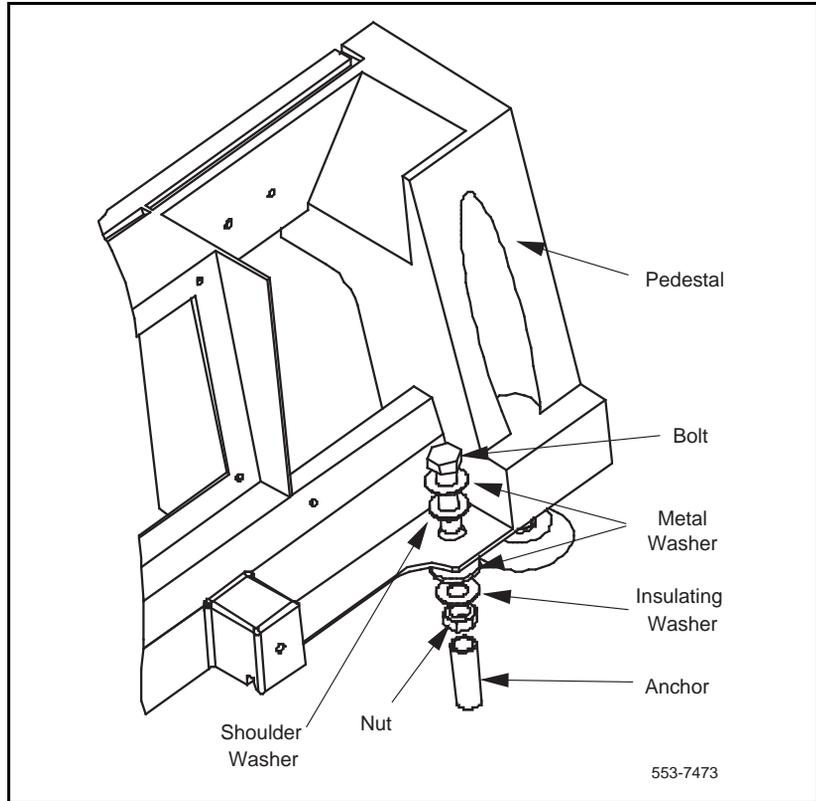
Configuring remote peripheral equipment

Remote peripheral equipment (RPE) allows you to locate peripheral equipment (PE) at a site up to 112.7 km (70 miles) from common equipment (CE) by converting multiplexed loop signals to a form compatible with T-1 type digital transmission. Any medium that conforms to the DS-1 format (1.544 Mbps), including digital microwave radio and fiber optic transmission, may be used to link local and remote sites.

NT8D47 RPE Modules can be configured in:

— an existing column
   RPE Modules can be installed at any level in a column.

— a stand-alone RPE column
   The column consists of the RPE Module, a peripheral equipment module, the top cap, and the pedestal.

RPE Modules house the following cards (see Figure 123):

— slots 2 and 9:   QPC62F (or later vintage) 1.5 MB Converter Card

— slots 3 and 8:   QPC66E (or later vintage) 2 MB Converter Card

— slots 4 and 7:   QPC99F (or later vintage) Carrier Interface Card

— slots 5 and 6:   local end—QPC63F (or later vintage) Local Carrier Buffer Card; remote end—QPC65D (or later vintage) Remote Peripheral Switch Card

— slot 10:   QPC67E (or later vintage) Carrier Maintenance Card

Note: QPC720 Primary Rate Interface (PRI) and QPC472 Digital Trunk Interface (DTI) Cards can be used in slots 1, 11, and 12, but the these cards are not related to the RPE function.

Figure 123
Card slots in the NT8D47 RPE Module

Note: At the remote site, the QPC63 Local Carrier Buffer Cards are replaced by the QPC65 Remote Peripheral Switch Cards.

In an RPE configuration, the common equipment site is the "local" site; the site without common equipment is the "remote" site.

If the distance between local and remote sites is more than 726 m (2500 ft), an office repeater bay (ORB) is required to effectively isolate the carrier span from the Meridian 1 equipment (see Figure 124). An ORB provides:

— span line powering

— error monitoring

— fault-locate system access

— order-wire termination with DID access

— line looping

Figure 124
Possible ORB locations in the RPE system

553-4063
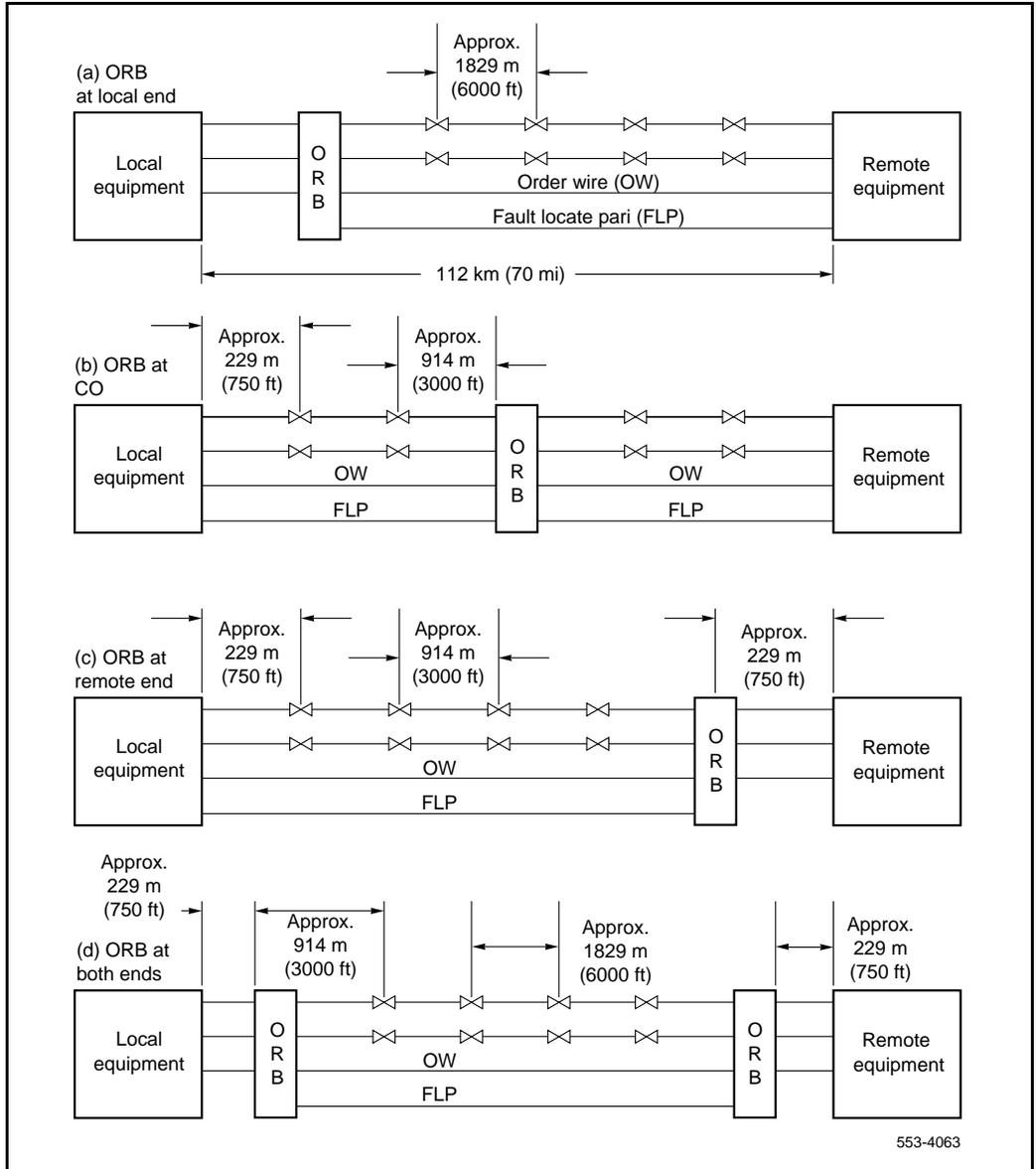
The local and remote sites are connected through two 50-pin connectors, C and D, on the rear of the backplane in RPE Modules (see Figure 125). Two 25-pair cables connect the C and D connectors to the input/output (I/O) panel of the RPE Module (see Figure 126).

At the local site, the RPE Module and the Network Module are connected through 36-pin connectors, E and F, on the rear of the RPE backplane (see Figure 125). Two 18-pair cables connect the E and F connectors to the faceplate connectors on a QPC414 Network Card in the Network Module.

At the remote site, the RPE Module and PE Modules are connected through backplane connectors E and F (see Figure 125). Eighteen-pair cables connect the E and F connectors to the faceplate connectors on QPC659 Dual Loop Peripheral Buffer (DLB) Cards in two PE Modules (the PE Modules support only single loop mode).

The RPE Module accommodates two network loops. The number of RPE Modules required per system depends on the number of connections required at the remote site. If only one network loop is required, only half of the card slots in the module are used. However, the QPC67 Carrier Maintenance Card is always required.

> *Note:* The connector used (E or F) determines which card slots are used. Connector F supports slots 1 through 5. Connector E supports slots 6 through 10.

Installing RPE

Refer to Figure 127, Figure 128, and Figure 129 throughout this procedure.

Local RPE installation

1 Install RPE Modules:

   - To install an RPE Module in an existing column, follow the appropriate procedure in "Adding a module to a column" on page 361.

   - To install a stand-alone RPE column, follow the procedures in "Initial Meridian 1 installation" on page 11.

Figure 125
RPE Module backplane

50-pin connectors to main distribution frame

36-pin connectors to QPC414 (local site) or QPC659 (remote site)

553-5314
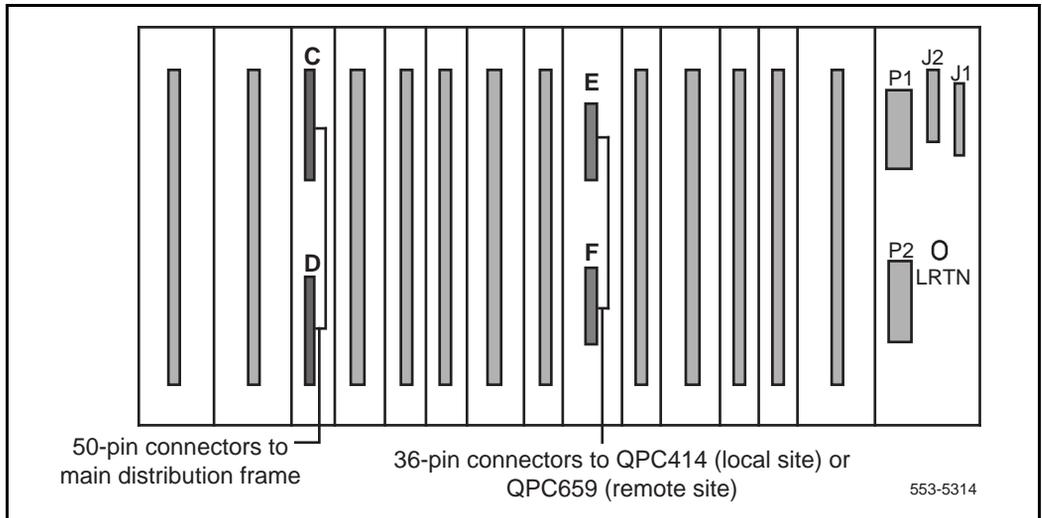
2 **For local RPE to RPE installation**, connect an NT8D85 cable from connector E or F on the backplane of the RPE Module to a faceplate connector on the QPC414 Network Card in the network module. Refer to Figure 127.

Note: If two network loops are required, attach both E and F to the two faceplate connectors on the QPC414 Network Card.

3 **For local RPE to SL-1 cabinet installation** connect the following cables and refer to Figure 128:

- Connect the NT8D86 cable from connector E or F on the backplane of the RPE Module to the I/O panel connector on the RPE Module.

- Connect the NT8D73 shielded cable from the I/O panel on the RPE Module to the I/O connector housing on the SL-1 cabinet.

- Connect the NT9J96 cable from the I/O connector housing on the SL-1 cabinet to a faceplate connector on the QPC414 Network Card in the network module.

Note: If two network loops are required, attach both E and F to the two faceplate connectors on the QPC414 Network Card.

Figure 126
Input/output panel
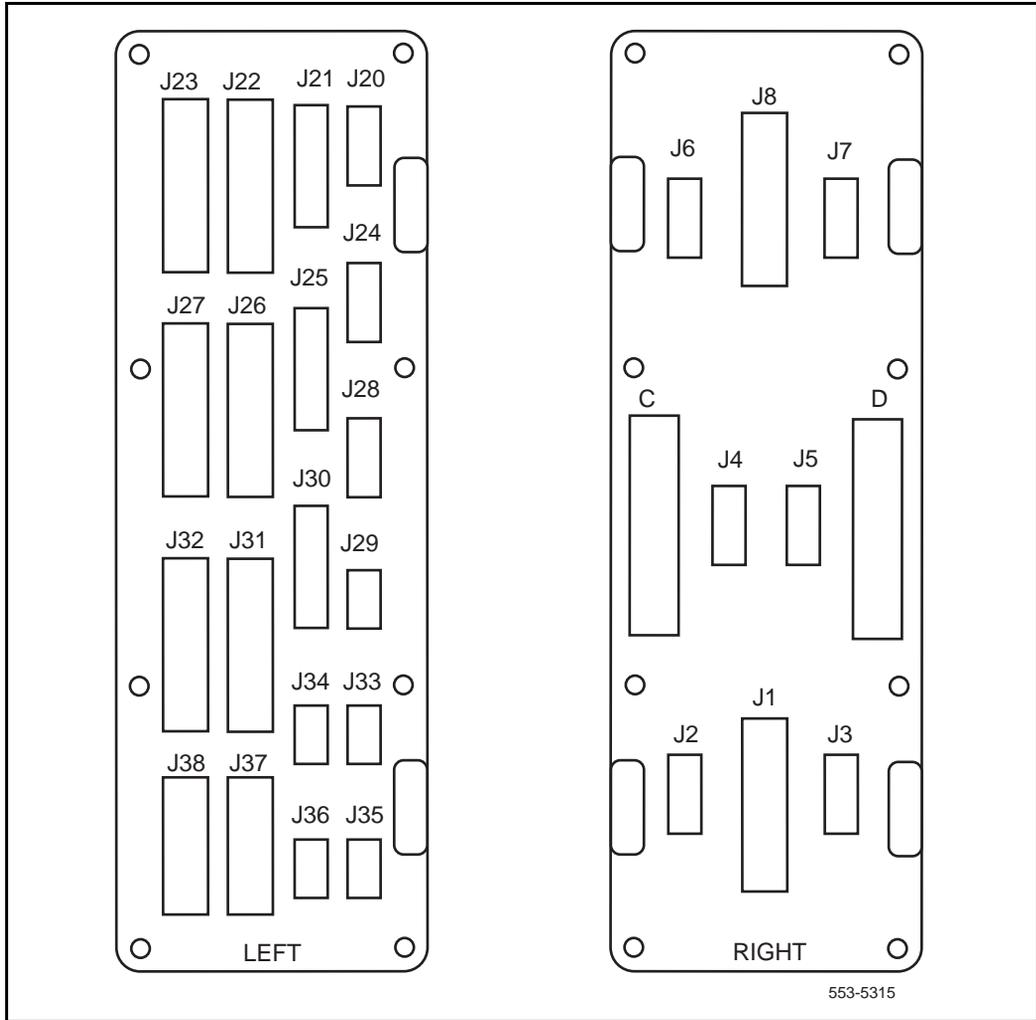
4 **For local RPE to a collocated Meridian 1 installation** connect the following cables and refer to Figure 129:

- Connect the NT8D86 cable from connector E or F on the backplane of the RPE Module to the I/O panel connector on the RPE Module.

- Connect the NT8D73 shielded cable from the I/O panel on the RPE Module to the I/O panel connector on the Network Module of the Meridian 1 column.

- Connect the NTD86 cable from the I/O panel on the Network Module to a faceplate connector on the QPC414 Network Card in the network module. Refer to Figure 129.

Note: If two network loops are required, attach both E and F to the two faceplate connectors on the QPC414 Network Card.

Remote RPE installation

5 **For remote RPE installation**, connect an NT8D85 cable from connector E or F on the backplane of the RPE Module to faceplate connector LPX on the QPC659 DLB Card in a PE Module.

Note: Each DLB card can serve only one RPE loop.

6 Connect two NT9J94AB cables from connectors C and D on the backplane of the RPE Module to cut-outs C and D on the I/O panel.

7 Connect two standard 25-pair A25B connector cables (tip and ring Amphenol cables) from cut-outs C and D on the I/O panel to the main distribution frame (MDF).

8 Check the option switch settings on the QPC62, QPC66, and QPC99 cards. Check the switch settings on the PRI/DTI cards, if equipped. See "RPE option switch settings" on page 349.

9 Inspect the equipment:

- Set all circuit breakers to OFF.

- Lock all cards into their assigned slots.

- Secure all cable connectors.

10   **For remote RPE installation**, set all system monitors as slaves. See "RPE option switch settings" on page 349.

11   Perform the acceptance tests at the end of this chapter.

Figure 127
Remote peripheral equipment cabling

Legend:

RPE = Remote peripheral equipment
PE   = Peripheral equipment
MDF = Main distributing frame
ORB = Office repeater bay
DLB = Dual loop peripheral buffer
●   = Cut-out C or D on the I/O panel

553-5322
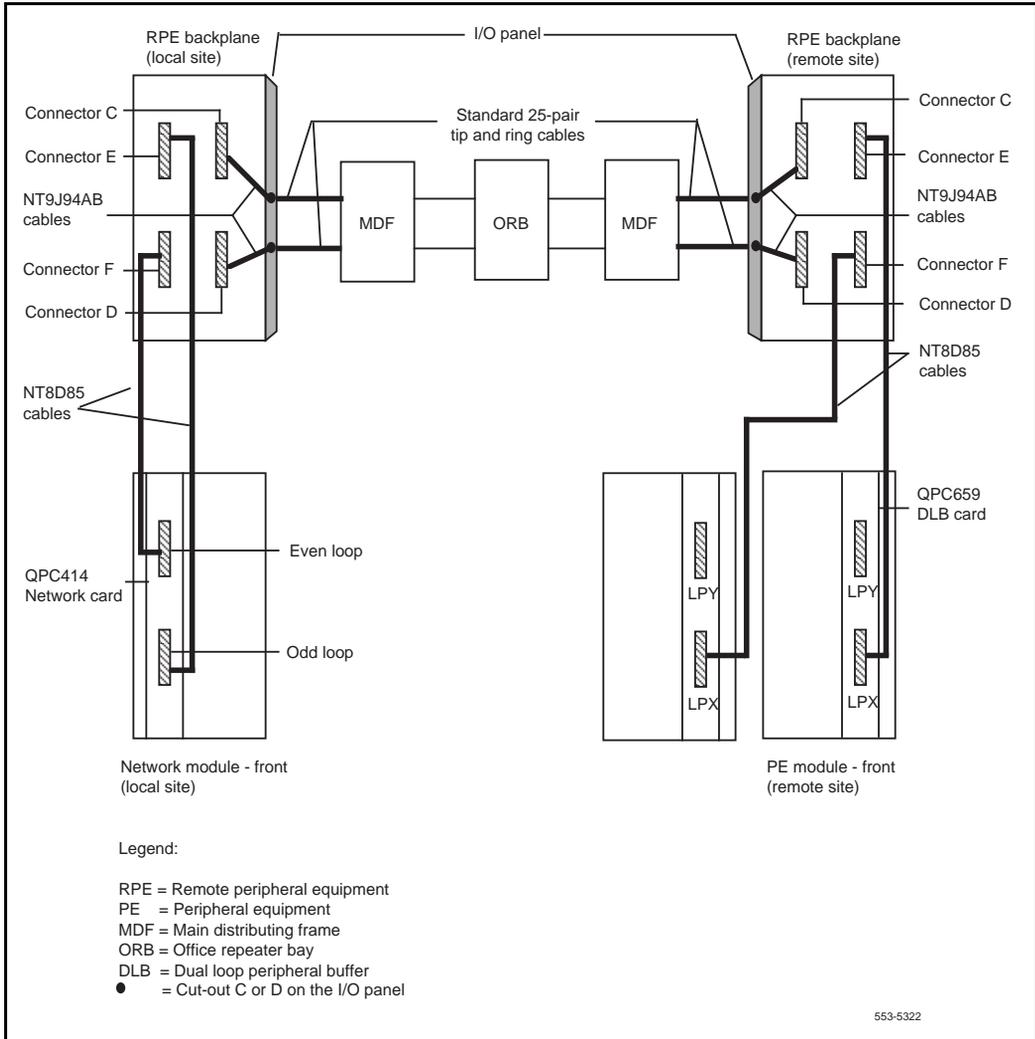
Figure 128 shows the RPE connection to an existing SL-1 cabinet using external shielded cables. It also shows the connection to the MDF and the remote site where the RPE is connected to the PE modules.

Figure 128
RPE cabling to an SL-1 cabinet and PE modules
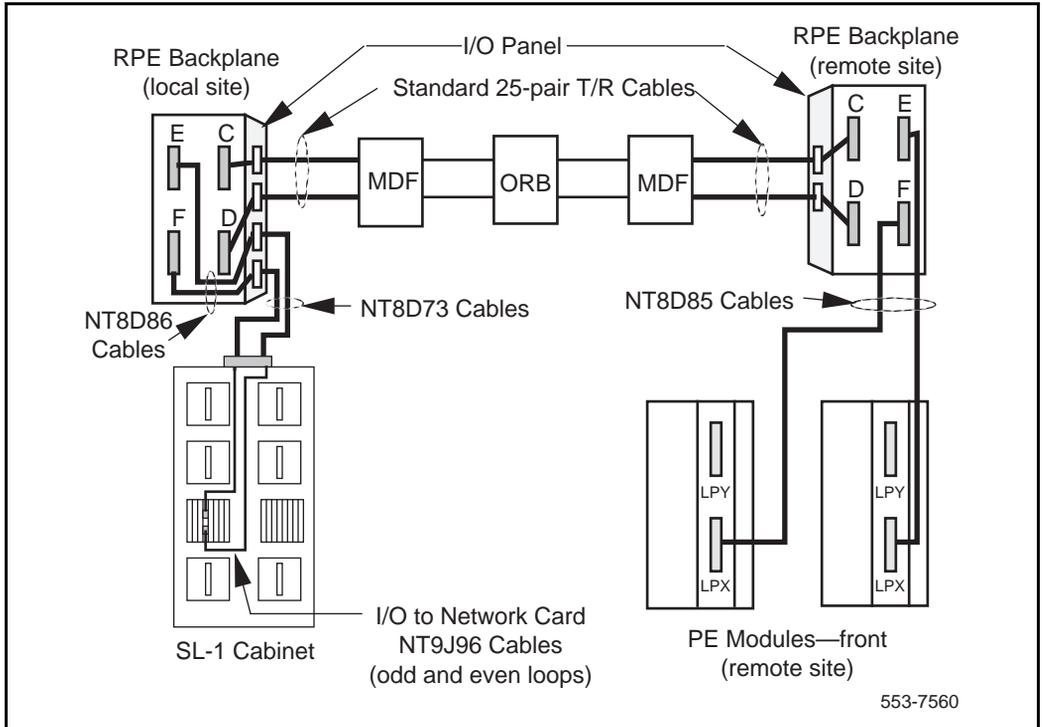
Figure 129 shows the RPE connection to an existing Meridian 1 column using external shielded cables. It also shows the connection to the MDF and the remote site where the RPE is connected to the PE modules.

Connections

All cables, except connector C, D, E, and F cables, are terminated and designated as described in *Telephone and attendant console installation* (553-3001-215). Connector C, D, E, and F cable designations are shown in Tables 100 through 103.

Figure 129
RPE cabling to a collocated Meridian 1 column and PE modules
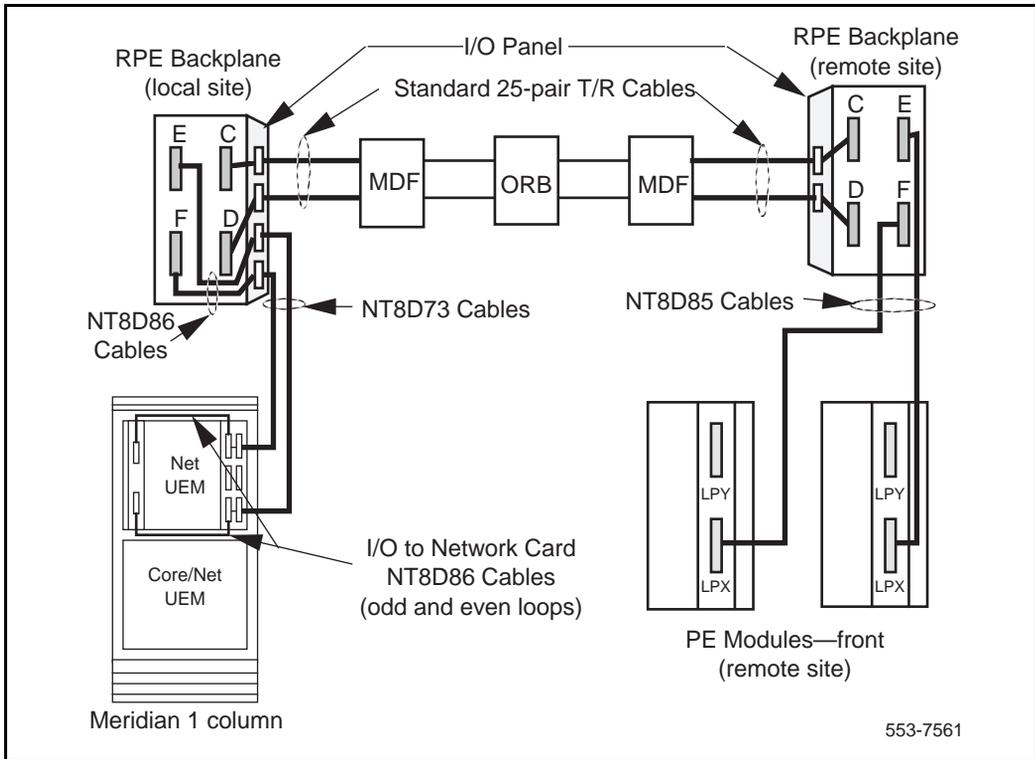
Telephones and consoles are cross-connected to PE modules as described in *Telephone and attendant console installation* (553-3001-215).

The local and remote RPE Modules are cross-connected to the digital carrier cable pairs, as shown in Figures 130 and 131.

The RPE maintenance leads are cross-connected, as shown in Figure 132.

Table 100
Connector C pin assignments (receive signal cable)

Pin number	Lead color	Signal name
C-1	BL-W	C1A
C-2	O-W	C3A
C-3	G-W	C9A
C-4	BR-W	C11A
C-5	S-W	OWT
C-6	BL-R	FLT
C-7	O-R	FLWAA
C-8	G-R	WFIT
C-9	DR-R	OWAT
C-10	S-R	FLAT
C-11 through C-24		GND
C-26	W-BL	C2A
C-27	W-O	C4A
C-28	W-G	C10A
C-29	W-BR	C12A
C-30	W-S	OWR
C-31	R-BL	FLR
C-32	R-O	FLWBA
C-33	R-G	WFIR
C-34	R-DR	OWAR
C-35	R-S	FLAR
C-36 through C-49		GND

Table 101
Connector D pin assignments (transmit signal cable)

Pin number	Lead color	Signal name
D-1	BL-W	C5A
D-2	O-W	C7A
D-3	G-W	C13A
D-4	BR-W	C15A
D-5	S-W	GND
D-6	BL-R	PFT1
D-7	O-R	PFT3
D-8	G-R	DCST
D-9	BR-R	DETT
D-10 through D-24		GND
D-26	W-BL	C6A
D-27	W-O	C8A
D-28	W-G	C14A
D-29	W-BR	C16A
D-30	W-S	GND
D-31	R-BL	PFT5
D-32	R-O	PFT6
D-33	R-G	DCSR
D-34	B-BR	DETR
D-35 through D-49		GND

Table 102
Connector E pin assignments

Pin number	Signal name	Pin number	Signal name
E-1	-SEN02	E-19	SEN02
E-2	-SEN12	E-20	SEN12
E-3	-SEN22	E-21	SEN22
E-4	-SEN32	E-22	SEN32
E-5	LPIN02	E-23	-LPIN02
E-6	LPIN12	E-24	-LPIN12
E-7	LPIN22	E-25	-LPIN22
E-8	LPIN32	E-26	-LPIN32
E-9	LN02	E-27	-LN02
E-10	LN12	E-28	-LN12
E-11	CN22	E-29	-CN22
E-12	CN32	E-30	-CN32
E-13	CN42	E-31	-CN42
E-14	CN52	E-32	-CN52
E-15	MFSS2	E-33	-MFSS2
E-16	-BYP2	E-34	BYP2
E-17	M42	E-35	-M42
E-18	LP02	E-36	-LP02

Table 103
Connector F pin assignments

Pin number	Signal name	Pin number	Signal name
F-1	-SEN01	F-19	SEN01
F-2	-SEN11	F-20	SEN11
F-3	-SEN21	F-21	SEN21
F-4	-SEN31	F-22	SEN31
F-5	LPIN01	F-23	-LPIN01
F-6	LPIN11	F-24	-LPIN11
F-7	LPIN21	F-25	-LPIN21
F-8	LPIN31	F-26	-LPIN31
F-9	LN01	F-27	-LN01
F-10	LN11	F-28	-LN11
F-11	CN21	F-29	-CN21
F-12	CN31	F-30	-CN31
F-13	CN41	F-31	-CN41
F-14	CN51	F-32	-CN51
F-15	MFSS1	F-33	-MFSS1
F-16	-BYP1	F-34	BYP1
F-17	M41	F-35	-M41
F-18	LP01	F-36	-LP01

Figure 130
Local-to-remote RPE cross-connections
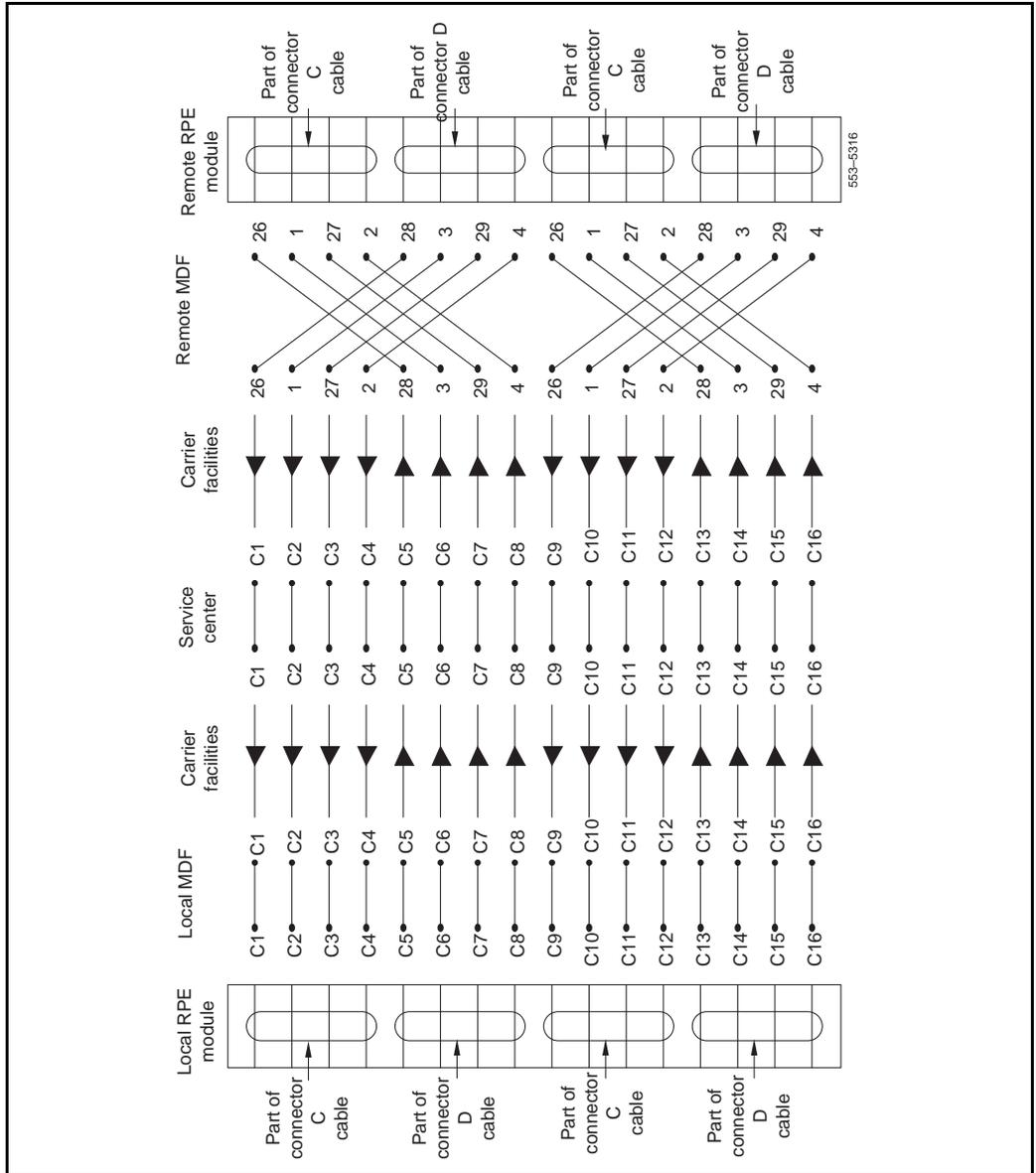
Figure 131
MDF cross-connections

Local end   Service center   Remote end

MDF connections   CA pair no.   CA pair no.   MDF connections

Note 1: Receive and transmit cable pairs to be entered in these columns. Obtained from switching center personnel and work order.

Note 2: ———▶• Indicates transmit to service center from local end.

———◀• Indicates receive from service center at local end.

•———▶— Indicates receive from service center at remote end.

•———◀— Indicates transmit to service center from remote end.

Each set of cable pairs (joined by broken lines) is a separate carrier line (system).

553-5323

Figure 132
Maintenance lead cross-connections (Part 1 of 2)

Figure 132
Maintenance lead cross-connections (Part 2 of 2)

System equipped with ORB at local, remote, or both locations

| Local RPE module | | | | Remote RPE module | | |

Cable no.	Wire color	Lead name		Lead name	Wire color	Cable no.
	S-W	OWT		OWT	S-W	
	W-S	OWR		OWR	W-S	
	BL-R	FLT		FLT	BL-R	
C	R-BL	FLR		FLR	R-BL	C
	O-R	FLWA		FLWA	O-R	
	R-O	FLWB		FLWB	R-O	
	G-R	WFIT		WFIT	G-R	
	R-G	WFIR		WFIR	R-G	
	G-R	DSCT		DSCT	G-R	
D	R-G	DSCR		DSCR	R-G	D
	BR-R	DETT		DETT	BR-R	
	R-BR	DETR		DETR	»	
C	O-R	FLWA		FLWA	O-R	C
	R-O	FLWB		FLWB	R-O	
D	R-G	DCSR		DCSR	R-G	D

Additional RPE modules

553–5324

Note 1: Cross-connections are shown when ORB is located at the local end.

Note 2: If ORB is located at the remote end, the cross-connections shown above for the local end are connected at the remote end, and the connections shown for the remote end are connected at the local end.

Note 3: If there is an ORB at the local and remote ends, cross-connections for both ends are the same as shown above for the local end.

Note 4: All modules are assumed to go to the same remote location.

RPE option switch settings

Verify the switch settings on all of the cards listed in this chapter.

QPC62 1.5M Baud Converter Card

Use QPC62F or later vintage. Set the switches on the card (see Figure 133) according to Table 104.

Figure 133
QPC62 option switch and header pin locations
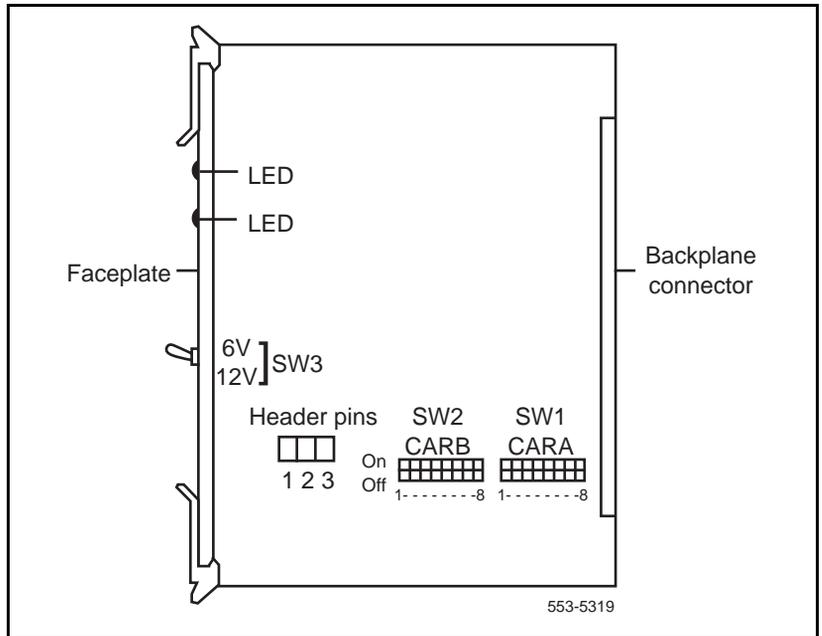
Table 104
QPC62 switch settings

Carrier A & B options* distance to ORB				Switch settings** SW1 and SW2								SW3
Feet		**Meters**		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	
0 – 150***		0 – 45		off	off	on	on	off	on	on	off	6 V
151 – 450		146 – 147		off	on	on	off	on	on	off	on	12 V
451 – 750		448 – 229		on	off	off	on	on	off	on	on	12 V

*	Insert the plug-in jumper (U-link) between header pins 1 and 2 (located at B25).
**	Switch 1 (SW1) is for carrier A; Switch 2 (SW2) is for Carrier B. SW3 is the faceplate toggle switch.
***	Set the card for 0–45 m (0–150 ft) when interfacing directly with the carrier (not through an ORB).

QPC66 2M Baud Converter Card

Use QPC66E or later vintage. Insert the plug-in jumper (U-link) between header pins 1 and 2 located at B35 (see Figure 134).

Figure 134
QPC66 header pin strapping
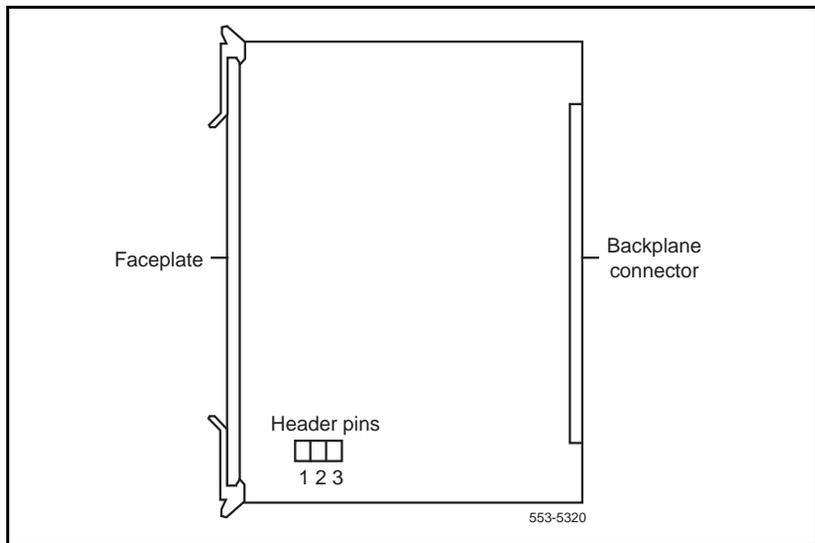
QPC99 Carrier Interface Card

Use QPC99F or later vintage. Set the switches on the card (see Figure 135) according to Tables 105 and 106.

Figure 135
QPC99 option switch locations
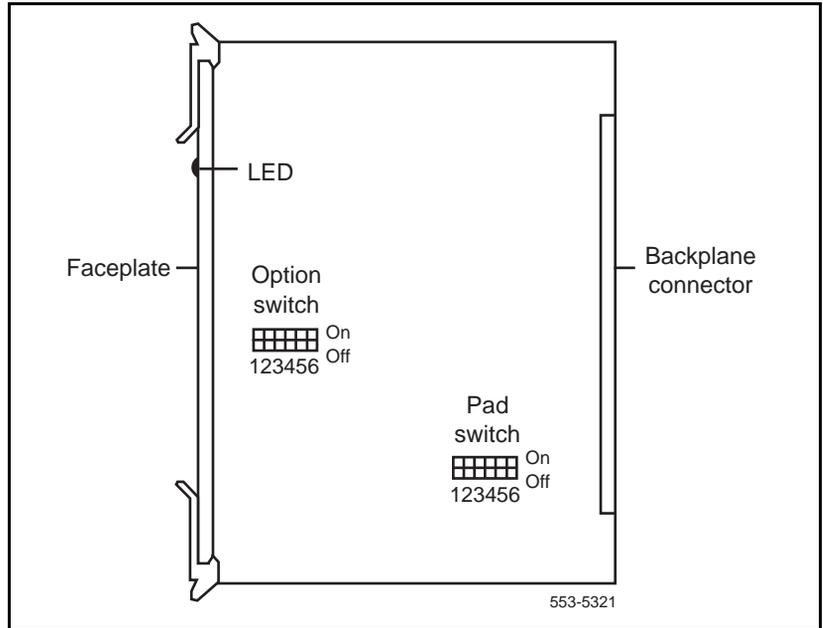
Table 105
QPC99 A20 switch and F25 pad switch

Carrier location	Interface equipment	A20 switch						F25 pad switch					
		1	2	3	4	5	6	7	8	9	10	11	12
Local	ORB at local end (pads in)	off	off	off	on	off	on	on	on	on	on	off	off
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	off	off	off	on	on	on	off	off	off	off	on	on
Remote	ORB at remote end (pads in)	on	off	on	off	off	on	on	on	on	on	off	off
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	off	on	off	on	on	off	off	off	off	on	on
Note: Consult manufacturer for switch settings if card interfaces with other type of carrier equipment.													

Table 106
QPC99 A20 switch and F25 pad switch

Carrier location	Interface equipment	A20 switch						F25 pad switch					
		1	2	3	4	5	6	7	8	9	10	11	12
Local	ORB at local end (pads in)	off	off	off	on	off	on	on	on	on	on	off	off
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	off	off	off	on	on	on	off	off	off	off	on	on
Remote	ORB at remote end (pads in)	on	off	on	off	off	on	on	on	on	on	off	off
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	off	on	off	on	on	off	off	off	off	on	on
Note: Consult manufacturer for switch settings if card interfaces with other type of carrier equipment.													

Table 107
QPC99 S2 switch

Carrier location	Interface equipment	SW2					
		1	**2**	**3**	**4**	**5**	**6**
Local	ORB at local end (pads in)	off	off	off	off	on	on
	Direct to LD-1 or GTE carrier (no ORB at local end) (pads out)	on	on	on	on	off	off
Remote	ORB at remote end (pads in)	off	off	off	off	on	on
	Direct to LD-1 or GTE carrier (no ORB at remote end) (pads out)	on	on	on	on	off	off

NT8D22 System Monitor

At the remote location, set all system monitors as slaves, as shown in the following Tables 108 and 109.

Table 108
NT8D22 System Monitor switch settings for slaves

Switch	1	2	3	4	5	6	7	8
SW1	off	off	*	**	off	off	off	off
SW2	off	off	To set positions 3-8, see Table 109					
SW3	off	off	off	off				

*	Set to on for DC systems; set to off for AC systems.
**	Set to on to enable PFTU (if equipped) during over-temperature condition.
	Set to off to disable PFTU during over-temperature condition.

Table 109
SW2 on each slave—unit number for the slave

Slave unit address	Switch position						Slave unit address	Switch position					
	3	4	5	6	7	8		3	4	5	6	7	8
1	on	on	on	on	on	off	33	off	on	on	on	on	off
2	on	on	on	on	off	on	34	off	on	on	on	off	on
3	on	on	on	on	off	off	35	off	on	on	on	off	off
4	on	on	on	off	on	on	36	off	on	on	off	on	on
5	on	on	on	off	on	off	37	off	on	on	off	on	off
6	on	on	on	off	off	on	38	off	on	on	off	off	on
7	on	on	on	off	off	off	39	off	on	on	off	off	off
8	on	on	off	on	on	on	40	off	on	off	on	on	on
9	on	on	off	on	on	off	41	off	on	off	on	on	off
10	on	on	off	on	off	on	42	off	on	off	on	off	on
11	on	on	off	on	off	off	43	off	on	off	on	off	off
12	on	on	off	off	on	on	44	off	on	off	off	on	on
13	on	on	off	off	on	off	45	off	on	off	off	on	off
14	on	on	off	off	off	on	46	off	on	off	off	off	on
15	on	on	off	off	off	off	47	off	on	off	off	off	off
16	on	off	on	on	on	on	48	off	off	on	on	on	on
17	on	off	on	on	on	off	49	off	off	on	on	on	off
18	on	off	on	on	off	on	50	off	off	on	on	off	on
19	on	off	on	on	off	off	51	off	off	on	on	off	off
20	on	off	on	off	on	on	52	off	off	on	off	on	on
21	on	off	on	off	on	off	53	off	off	on	off	on	off
22	on	off	on	off	off	on	54	off	off	on	off	off	on
23	on	off	on	off	off	off	55	off	off	on	off	off	off
24	on	off	off	on	on	on	56	off	off	off	on	on	on
25	on	off	off	on	on	off	57	off	off	off	on	on	off
26	on	off	off	on	off	on	58	off	off	off	on	off	on
27	on	off	off	on	off	off	59	off	off	off	on	off	off
28	on	off	off	off	on	on	60	off	off	off	off	on	on
29	on	off	off	off	on	off	61	off	off	off	off	on	off
30	on	off	off	off	off	on	62	off	off	off	off	off	on
31	on	off	off	off	off	off	63	off	off	off	off	off	off
32	off	on	on	on	on	on							

Performing acceptance tests

After RPE installation, several tests are performed to verify that the equipment functions properly.

Testing equipment

Test the following:

— To test LD-1 carrier equipment, see *Initial lineup and installation tests* (368-2101-200).

— To test networl loops:

• Load the RPE Diagnostic Program:

LD 33
LOOP L   "L" is the loop number

If the response is **OK**, no faults are detected.

Note: With RPE, include LD 33 in the midnight routines.

• Switch primary carriers on loop L:

SCAR L

Enter loop number again

LOOP L

Note: If any connection memory or channel faults are detected, the affected channel is disabled. See LD 30 to interpret system messages.

— To test telephones, attendant consoles, and add-on modules, see *Telephone and attendant console installation* (553-3001-215).

Note: If outgoing trunks are ground start, lift the receiver and momentarily press the ground start button on the 500 telephone.

Testing transmission quality

Test RPE transmission quality through the monitoring facilities built into the QPC99 Carrier Interface Card (see Figure 136).

Figure 136
QPC99 maintenance jacks and looping switches

553-5317
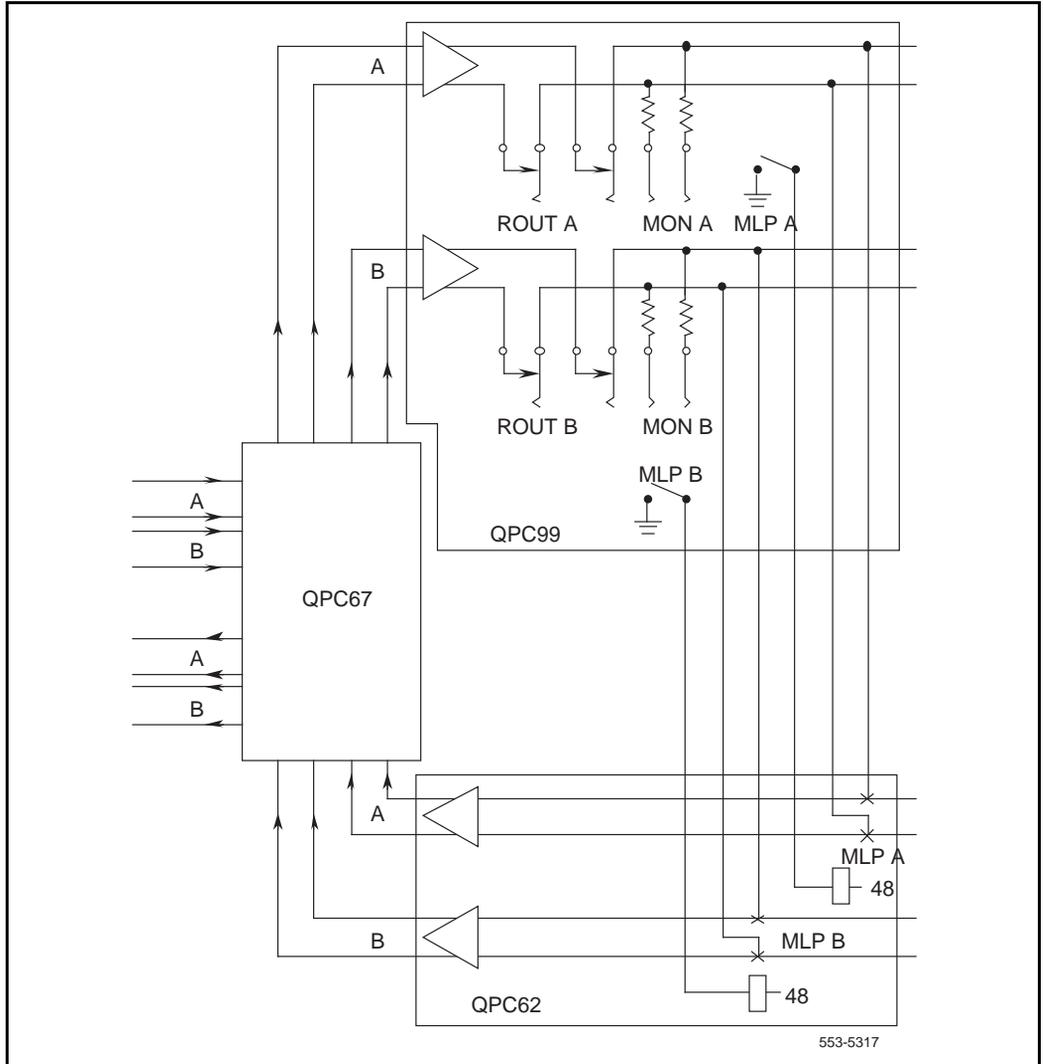
There are four jacks on the front of the QPC99 card:

— ROUT A and ROUT B are input jacks for channels A and B, respectively.

— MON A and MON B are output jacks that monitor the regenerated signal. Connect a test set to a MON jack at any time to test transmission quality.

Check transmission by closing the MLP switch at the rear end, injecting a test signal at the ROUT jack, and monitoring the output at a remote end MON jack. Use this procedure to check the transmission path in both directions.

Locating span line faults

The typical repeatered line maintenance arrangement (see Figure 137) includes a series of fault locating filters and a fault locating cable pair installed in each span line:

— One fault locating filter is used for all repeaters installed in a single housing (maximum 25 two-way repeaters in a single housing).

— A filter with a different audio center frequency is installed in each repeater housing in the span line.

The fault locating filter is a narrow band selective filter centered at one of 12 audio frequencies. The output of each repeater in the housing is bridged across the input of the respective fault locating filter. The outputs of all filters in a span are connected to the common fault locating cable pair. This arrangement permits checking each repeater in a span from either span terminal, using a test signal with an audio frequency component corresponding to the center frequency of the respective fault locating filter.

When a span line produces excessive errors or a failure occurs, perform a fault locating test to locate the defective repeater. The fault locating test uses a Pulse Code Modulation (PCM) line and repeater test set (Lear Seigler Sierra 415A or equivalent). To perform the fault locating test, remove the line from service and connect the test set to the line at the span terminal. Connect the output of the test set transmit section to the span line; connect the receive section input to the corresponding fault locating jack.

A series of test pulses with an audio-frequency component is transmitted down the line. The audio-frequency component is selected to correspond to each of the fault-locating filters in the span. This audio-frequency component appears in the output of each repeater in the span. However, a portion of this signal filters through the appropriate associated fault locating filter and returns to the test set over the fault locating pair.

The amplitude of the test signal is measured on the decibel meter and is a function of the performance of the repeater under the various test signal conditions. If a repeater has failed completely, no test signal is returned to the test set. By changing the audio-frequency component, each repeater in a span can be tested until the faulty or marginal repeater is located.

Figure 137
Typical span line fault locating arrangement

Note 1: Non-polarized M filter on the QPC67 card. There must be no M filters within the repeater span.

Note 2: The previous filter must be good for the signal to continue.

Note 3: Loopback conditions, controlled by the QPC99 card, occur under the following conditions:
— DC on fault locate pair and excessive bipolar violations (BPV)
— DC on fault locate pair and TRIOS present
— TRIOS present

553-5318

Adding a module to a column

The procedures in this chapter apply to adding a module to a column that is fully equipped and powered up. To add a fourth module to a column during initial system installation, see the procedure for placing the fourth module on a column in "Initial Meridian 1 installation" on page 11.

WARNING

A module containing the system CPU (common equipment cards) should never be installed at the third or the fourth tier of a column. Modules containing common equipment should always be installed in the bottom two tiers of Meridian 1 columns. This ensures optimum cooling for the common equipment cards.

A module can be added to a column in one of three positions; a procedure is given for each:

— "Adding a module to the base of a column" on page 362

— "Adding a module between two other modules" on page 367

— "Adding a module to the top of a column" on page 372

If the column is equipped with earthquake bracing, the column support rods must be removed and longer rods must be installed after the module is added. To change the rods, see "Installing earthquake bracing" on page 315.

WARNING

A fully loaded module weighs approximately 58.9 kg (130 lbs). More than one person is required to move a module.

> **WARNING**
>
> In a DC-powered system, power to the column can remain on during the following procedures. In an AC-powered system, however, power to the entire column *must* be shut down throughout the procedures.

Adding a module to the base of a column

If conduit or other cabling runs through modules that are being moved, you must tag and disconnect the cables, pull them out of the modules, and reroute them after all of the modules are repositioned. The top cap can remain on the module it is attached to.

1 Disconnect and remove the NT8D22 System Monitor for the column in the rear of the pedestal (do *not* turn off the blower unit in the front of the pedestals):

   • If the column houses the master system monitor, load overlay 37 and software disable the associated SDI port:

      LD 37
      DIS TTY x   disable the device associated with the port

   • Disconnect the RJ11 cable to J3, then the cable to J6, then pull the system monitor out of the slot.

2 Set all circuit breakers in the rear of the pedestal to OFF (down).

3 Remove the module above the pedestal:

   • Disconnect the power connector to the pedestal (see Figure 123).

   Note: You must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

   • Disconnect the system monitor connector to the pedestal (see Figure 123).

   • Use a 9/16 in. socket wrench to remove the five mounting bolts that secure the module (see Figure 124) and lift it off the column.

Figure 123
NT7D09CA Pedestal—module power and system monitor connections
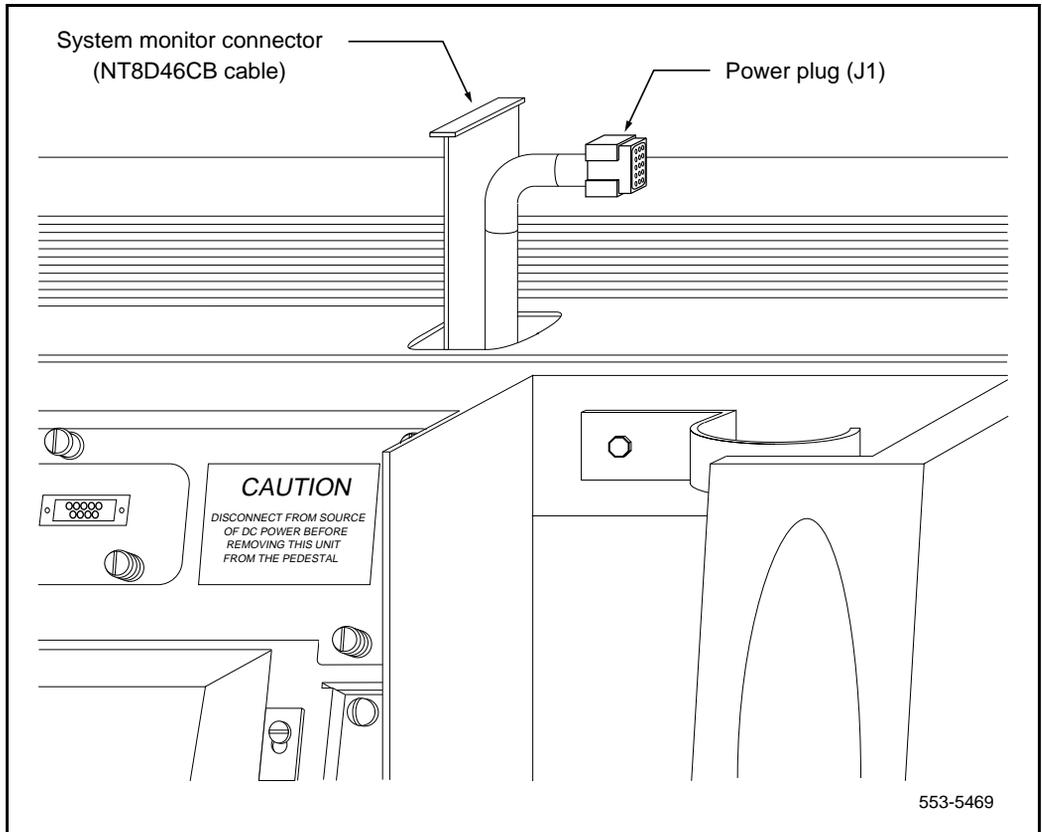
Note: There is an EMI shield (it looks like a brass grill) on the top of each pedestal. Leave this shield on the pedestal. Use a few pieces of tape to hold the shield in position, so the holes for the mounting bolts are aligned with the screw holes on the pedestal. After the module is secured, remove as much of the tape as possible.

Figure 124
Module mounting bolts

Mounting bolts

553-3057
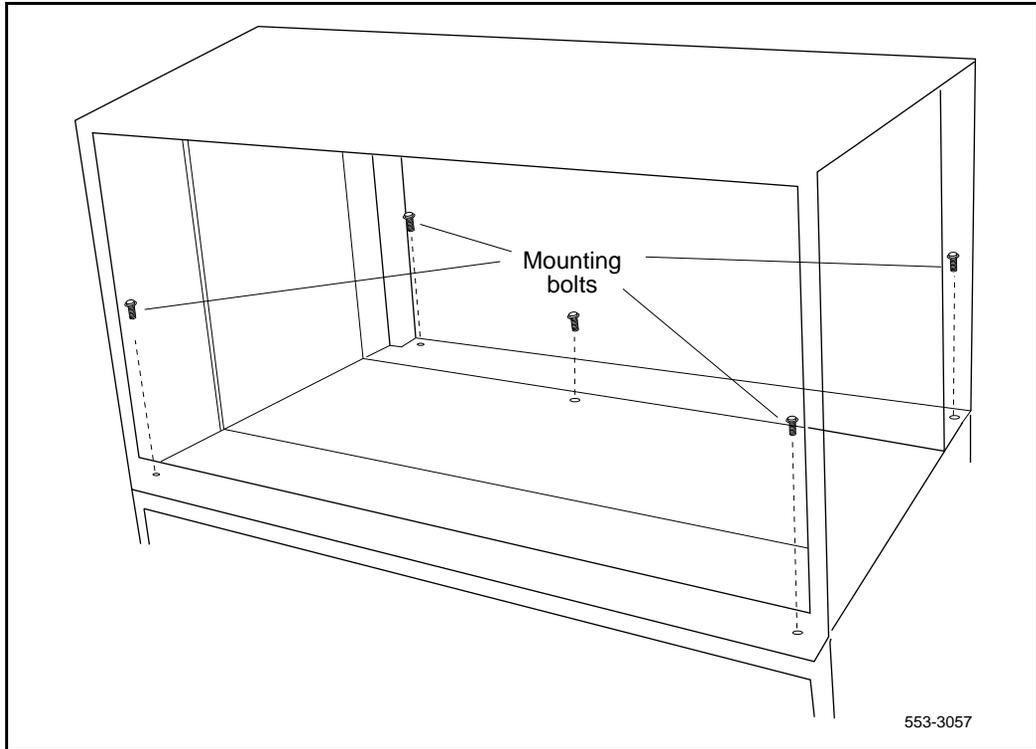
4   Position and secure modules:

- Locate the positioning guides on the pedestal. Make sure the module being added is facing the same direction as the column.

- Place the module being added on the pedestal and adjust it until it is seated securely on the positioning guides.

- Secure the mounting bolts for the module.

- Place the module that was removed onto the top of the module that was added and secure it with the mounting bolts.

5   Connect the power and system monitor cables in the module:

- Connect the power connectors to the pedestal and to the module above (see Figures 123 and 125).

- Attach the frame ground wires to the frame ground post at the base of the module.

- Connect the system monitor cable from the pedestal to connector J1 on the module being added.

- Connect the system monitor cable from connector J2 in the module being added to J1 in the module above.

6   Set all circuit breakers in the pedestal to ON.

7   Reinstall the system monitor in the pedestal:

- Reconnect the RJ11 cable to J6, then the cable to J3. Reinstall the system monitor.

- If the column houses the master system monitor, load overlay 37 and software reenable the associated SDI port:

     LD 37
     ENL TTY x   enable the device associated with the port
     ****   exit LD 37

8   Replace all module covers and the pedestal grill.

Figure 125
Module-to-module power and system monitor connections
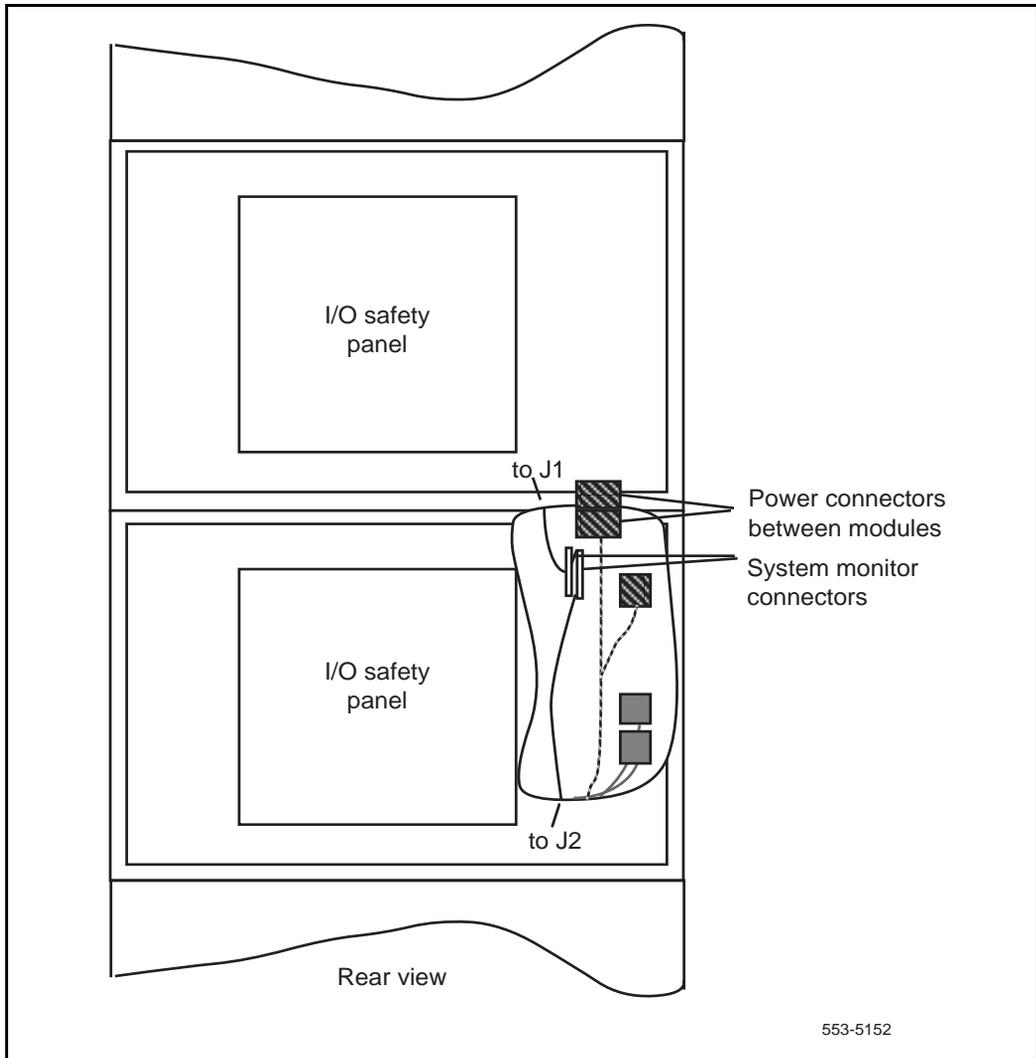
Adding a module between two other modules

If conduit or other cabling runs through modules that are being moved, you must tag and disconnect the cables, pull them out of the modules, and reroute them after all of the modules are repositioned.

The top cap can remain on the module it is attached to.

1   Disconnect and remove the NT8D22 System Monitor for the column in the rear of the pedestal (do *not* turn off the blower unit in the front of the pedestals):

- If the column houses the master system monitor, load overlay 37 and software disable the associated SDI port:

        LD 37
        DIS TTY x   disable the device associated with the port

- Disconnect the RJ11 cable to J3, then the cable to J6, then pull the system monitor out of the slot.

2   Turn off power as necessary:

- With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

- With DC power, set the switch on the module power supply and the circuit breaker in the rear of the pedestal to OFF (down) for any module that will be moved and for the module being added. (All other modules in the column can safely retain power.)

3   Remove the module that will be above the module being added:

- Disconnect the power connectors between the modules (review Figure 125).

- Disconnect the system monitor cable from connector J1 in the module that will be above the module being added.

- Use a 9/16 in. socket wrench to remove the five mounting bolts that secure the module and lift it off the column (see Figure 126).

4   Position and secure modules:

- Locate the positioning guides on what is now the top module in the column (see Figure 127). Make sure the module being added is facing the same direction as the column.

- Place the module being added on top of the column and adjust it until it is seated securely on the positioning guides.

- Secure the mounting bolts for the module.

- Place the module that was removed on top of the module that was added and secure it with the mounting bolts.

5   Connect the power and system monitor cables between modules:

- Connect the power connectors between the module being added and the modules above and below it.

- Connect the system monitor cable from connector J2 in the module below to J1 in the module being added (review Figure 125).

  Connect the system monitor cable from J2 in the module being added to J1 in the module above.

6   Restore power to the module:

- With AC power, set the main circuit breaker to ON (up) in the rear of the pedestal.

- With DC power, set the circuit breaker in the rear of the pedestal then the module power supply to ON (up) for the module that was added and for any module that was moved.

Figure 126
Module mounting bolt

Mounting
bolts

553-3057
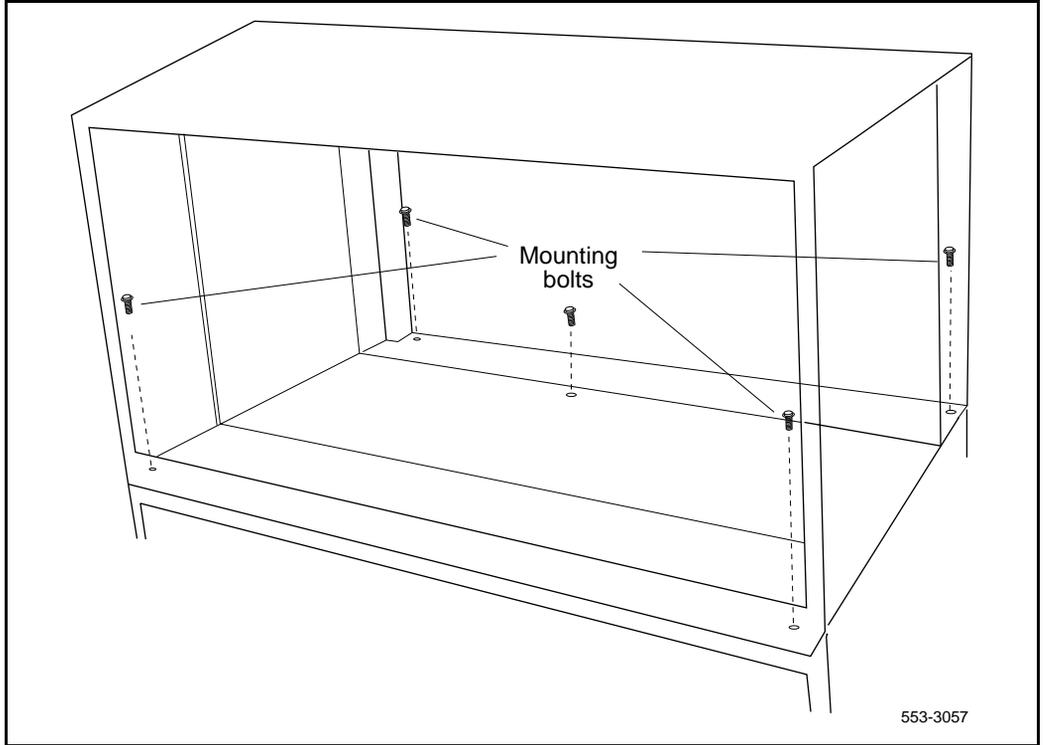
Figure 127
Module positioning guides
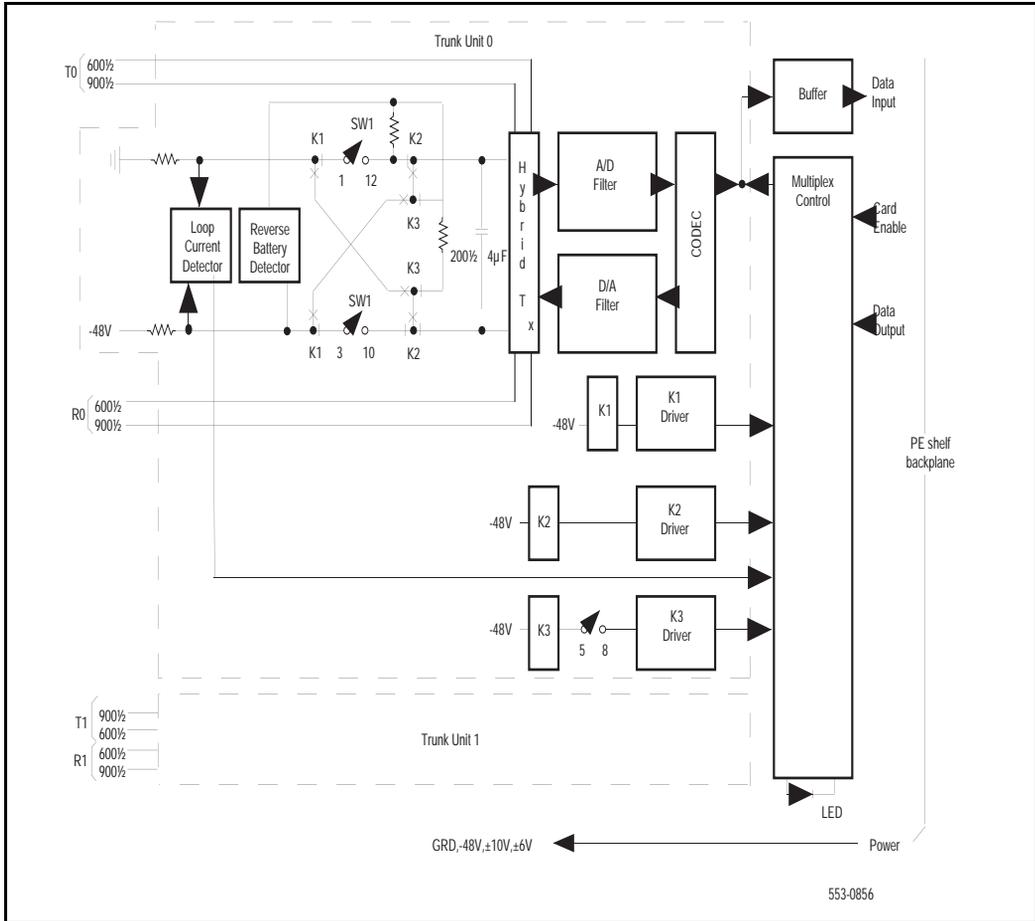
553-0856

7   Reinstall the system monitor in the pedestal:

- Reconnect the RJ11 cable to J6, then the cable to J3. Reinstall the system monitor.

- If the column houses the master system monitor, load overlay 37 and software reenable the associated SDI port:

  LD 37
  ENL TTY x   enable the device associated with the port
  ****   exit LD 37

8   Replace all module covers and the pedestal grill.

Adding a module to the top of a column

In a DC-powered system, power to the column can remain on during this procedure.

If conduit or other cabling runs through the top cap, you must tag and disconnect the cables, pull them out of the way, and reroute them after the new module and the top cap are positioned.

1   Disconnect and remove the NT8D22 System Monitor for the column in the rear of the pedestal (do *not* turn off the blower unit in the front of the pedestals):

   •   If the column houses the master system monitor, load overlay 37 and software disable the associated SDI port:

   LD 37

   DIS TTY x   disable the device associated with the port

   •   Disconnect the RJ11 cable to J3, then the cable to J6, then pull the system monitor out of the slot.

2   Turn off power as necessary:

   •   With AC power, set the main circuit breaker for the column to OFF (down) in the rear of the pedestal.

WARNING

Due to hazardous voltage in AC-powered systems, power to the entire column must be shut down. This shuts down all functions in the column.

   •   With DC power, set the switch on the module power supply and the circuit breaker in the rear of the pedestal to OFF (down) for the module being added.

3 Disconnect power connections to the top cap:

- At the top of the rear of the module, disconnect the orange power connector from the module power harness (see Figure 128). Press the four tabs (two on each side) and let the connector fall loose into the module below.

Figure 128
Orange power connector removal tab locations
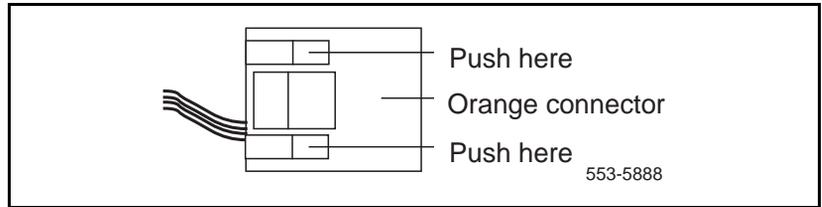
· Disconnect the system monitor cable at connector J2 on the backplane.

4 Remove the top cap and perforated panel:

- For countries other than the UK, pull forward on the clips underneath the front edge of each air exhaust grill on the top cap. Lift up and remove the grill as illustrated in Figure 129).

Figure 129
Air exhaust grill removal
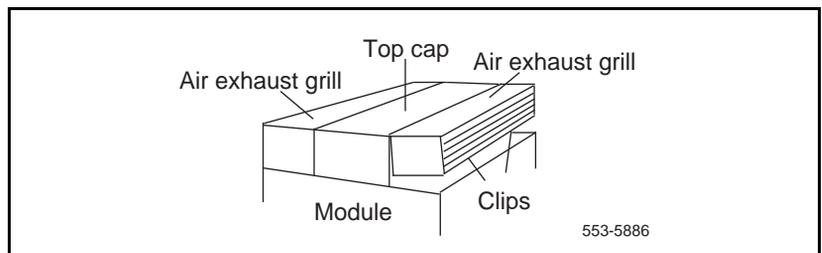
- In the UK, the front and rear air exhaust grills are secured by Southco fasteners located underneath the front edge of the grill. Use a #1 Phillips head screwdriver and turn the fasteners 1/4-turn to release or secure the grill.

Figure 130
UK air exhaust grill removal

553-7375
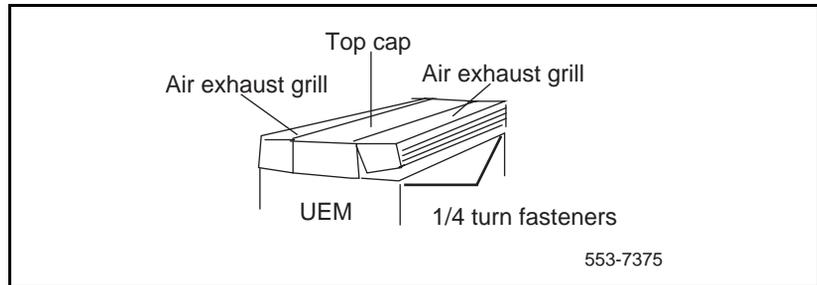
- Use a 5/16 in. socket wrench to remove the six bolts that secure the top cap (see Figure 131). Remove the top cap from the column.

- Remove the screw that secures the perforated panel and LED bracket. Slide the panel slightly to the left (looking at it from the rear of the column) and remove it.

5   Position and secure the module being added:

- Locate the positioning guides on the module in the column (see Figure 132). Make sure the module being added is facing the same direction as the column.

- Place the module being added on top of the column and adjust it until it is seated securely on the positioning guides.

- Use a 9/16 in. socket wrench to secure the module with five mounting bolts (see Figure 133).

Figure 131
Top cap assembly

Mounting bolts

Top cap

Front of column

LED

Screw for LED bracket
on perforated panel

553-3038
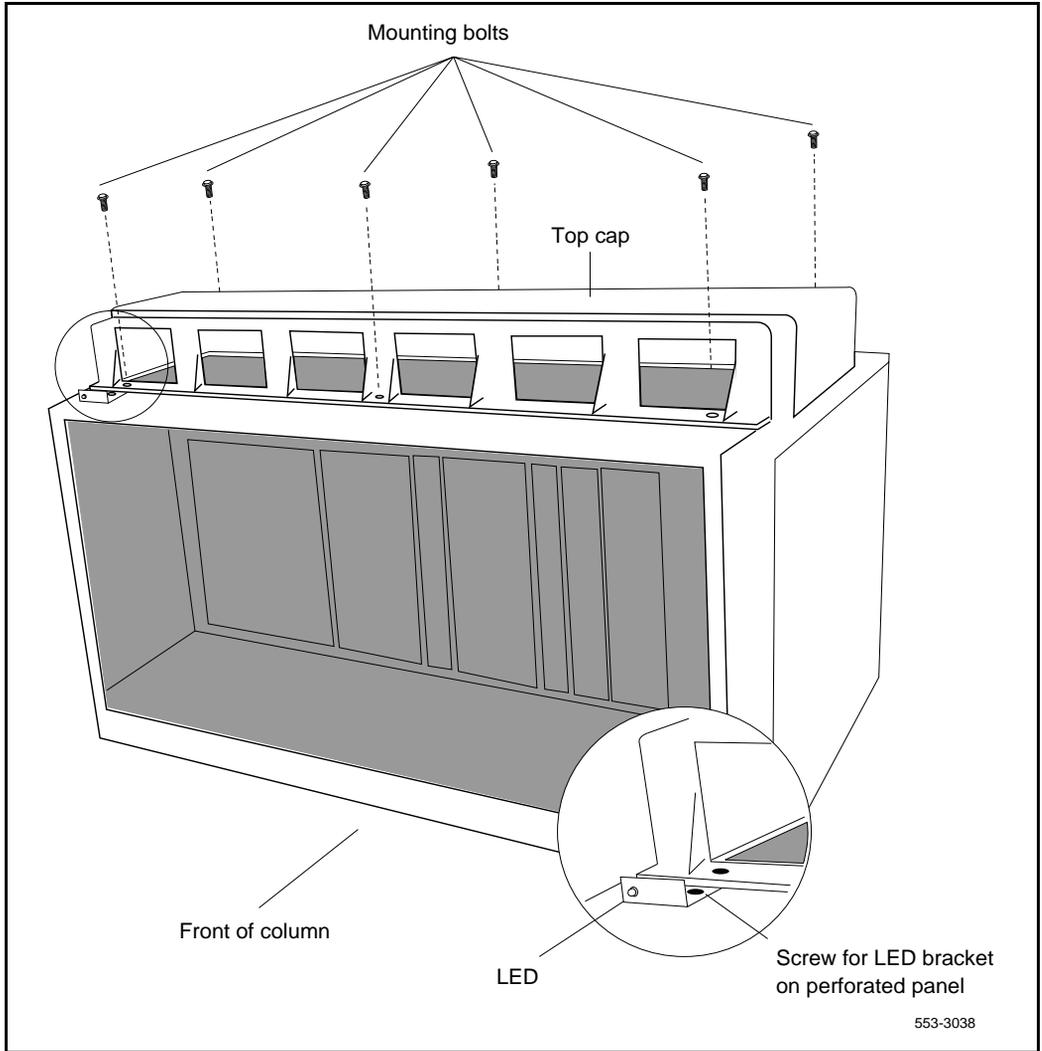
Figure 132
Module positioning guides

Positioning guides

Front

Rear

Opening for
cables

553-3056
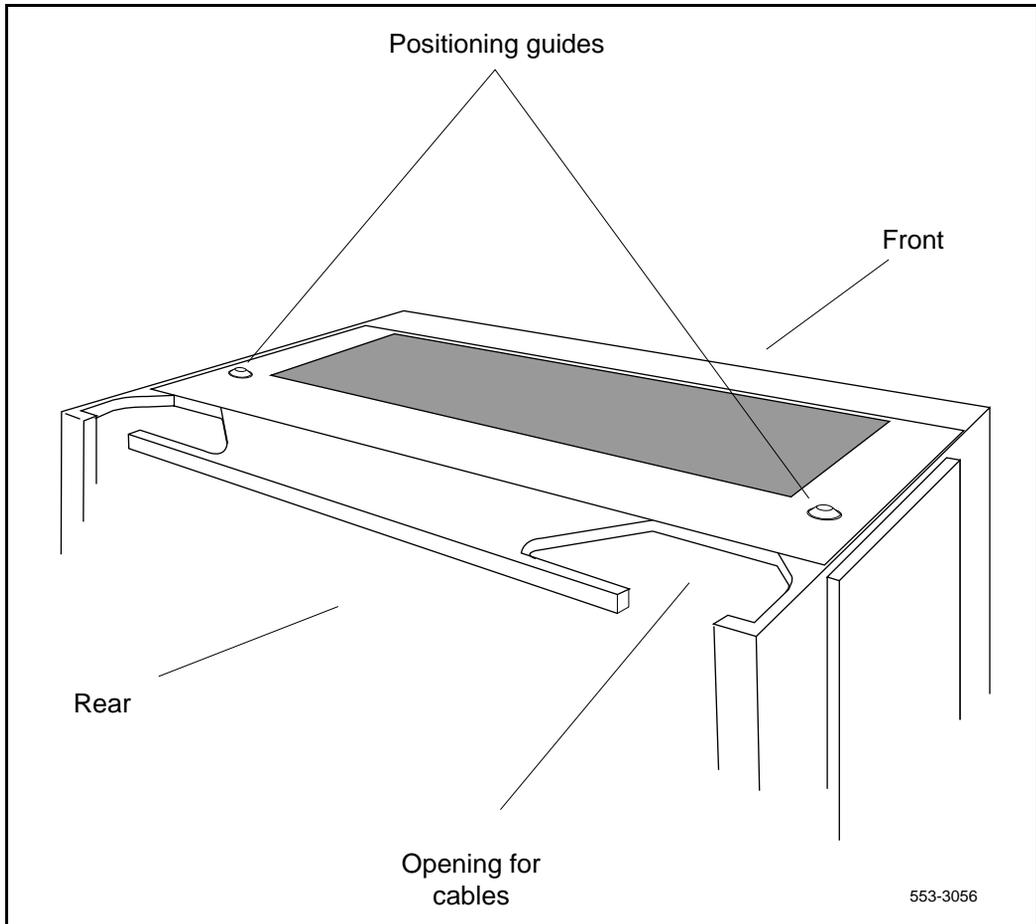
Figure 133
Module mounting bolts

Mounting
bolts

553-3057
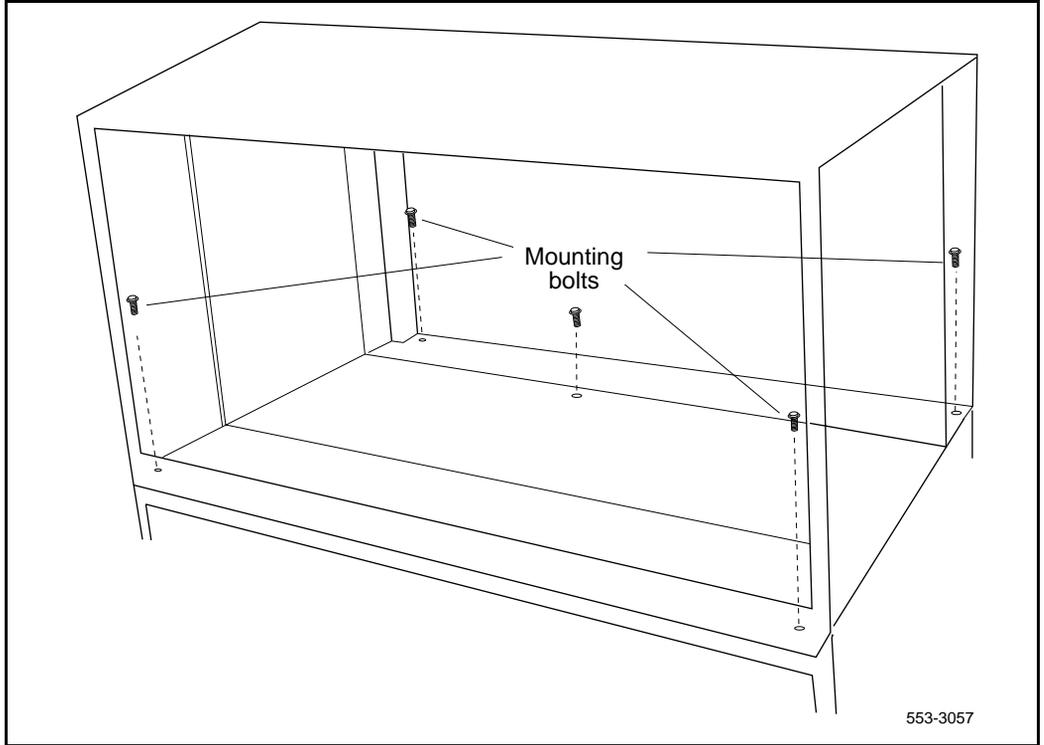
6   Connect the power and system monitor cables between modules:

- Connect the power connectors between the module being added and the module below it (see Figure 134).

- Connect the system monitor cable from connector J2 in the lower module to J1 in the module being added (see Figure 134).

Figure 134
Module-to-module power and system monitor connections
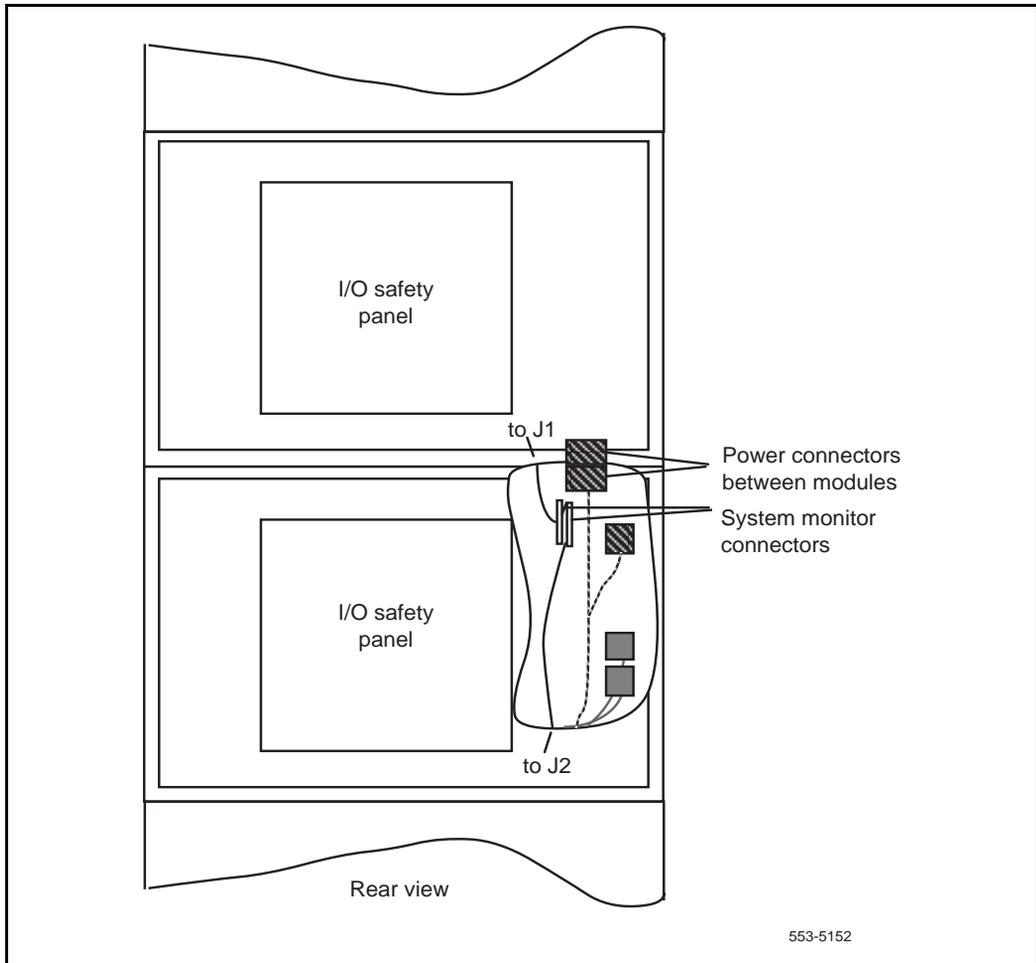
7 Install the perforated panel and top cap on the module being added:

- Position the perforated panel and slide it slightly to the right (at the rear). Install the screw that secures the panel and LED bracket.

- Position wiring from the perforated panel so it rests in the cable well located next to the orange power connector at the rear of the module (see Figure 135).

Figure 135
Cable well location

View at rear of module

553-5889
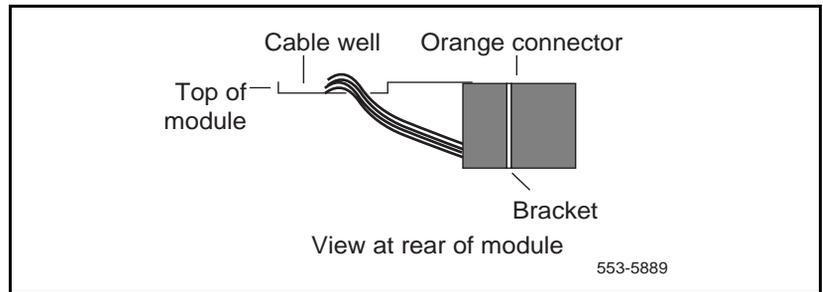
- Position the top cap and install the bolts that secure it.

- Replace the air exhaust grills at the front and rear of the top cap.

8 Reconnect power to the top cap:

- Connect the system monitor cable to J2 on the backplane. Line up the alignment tab on the connector and snap on the pin headers to position the connector correctly (see Figure 136).

Figure 136
Monitor cable J2 backplane alignment tab and key alignment
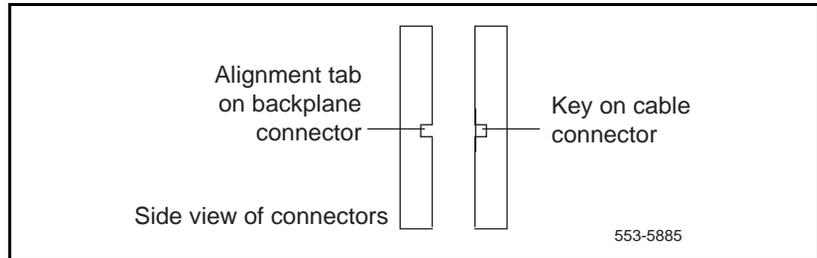
- Connect the orange power connector to the module power harness.

9   Restore power to the module:

- With AC power, set the main circuit breaker to ON (up) in the rear of the pedestal.

- With DC power, set the circuit breaker in the rear of the pedestal and then set the module power supply to ON (up) for the module that was added.

10   Reinstall the system monitor in the pedestal:

- Reconnect the RJ11 cable to J6, then the cable to J3. Reinstall the system monitor.

- If the column houses the master system monitor, load overlay 37 and software reenable the associated SDI port:

  LD 37
  ENL TTY x   enable the device associated with the port
  ****   exit LD 37

11   Replace all module covers and the pedestal grill.

Appendix A: NT0R72, NT6D82, QBL12, QBL15, QCA13

DC-powered systems generally require one AC-input receptacle per rectifier within 1.8 m (6 ft) of each rectifier. The input receptacles required are determined by the number and type of rectifiers used.

> *Note:* Depending on the distance between the input receptacle and the pedestal, a junction box may be required if the column is equipped with a vintage AA or DA NT7D10 PDU. A junction box may be used with the NT7D67CB PDU, but it is not required.

For information on customer-supplied power equipment, refer to Appendix D: "Customer supplied power equipment" on page 471.

Installing an NT6D82 Power System

The NT6D82 Power System can be used with all system options, but it is optimized for options 71 and 81 (and larger option 61 and 61C configurations).

The NT6D82 Power System is an enclosed, front-access power distribution and control panel that supports from one to three 100-amp rectifiers per rack. One to three racks can be paralleled in a single configuration. The maximum capacity of three fully equipped racks is 900 amps.

The rectifiers in an NT6D82 operate on single-phase, 60 Hz, AC service and can be strapped for either 120, 208, or 240 V nominal input. The NT6D82 Power System requires one 50-amp power feed per rectifier.

To install an NT6D82 Power System, follow the instructions provided with the NT6D82 equipment.

Installing a QBL12 distribution box

The QBL12 Power Distribution Box is a wall-mounted unit that connects a customer-provided power plant to options 71 and 81 (and larger option 61 and 61C configurations) (see Figure 137).

Figure 137
QBL12 distribution box
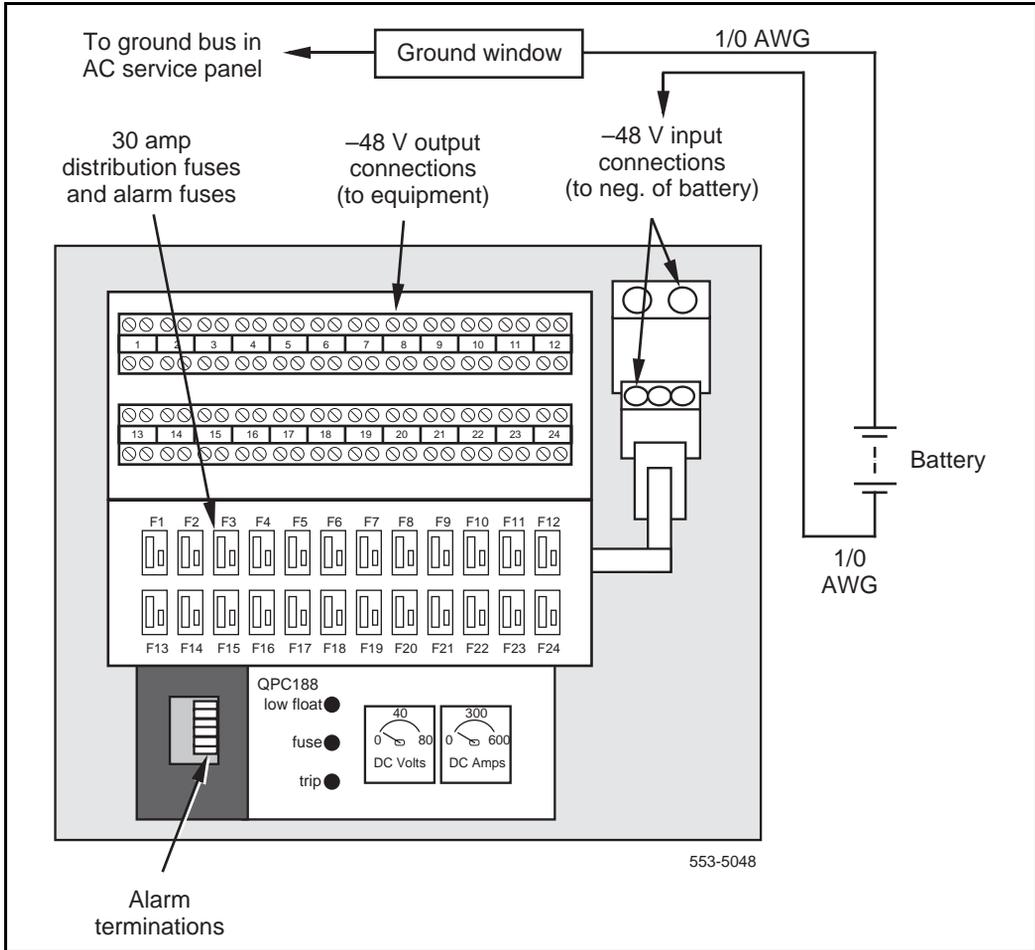
The QBL12 distribution box connects up to 12 Meridian 1 columns (48 modules), with a maximum allowable load current of 600 amps. The distribution box contains 24 distribution fuses. Each distribution fuse supports two modules. Generally, one QBL12 is required per system.

For the receptacle requirements for the customer-provided power plant, refer to the manufacturer's specifications.

Installing a QBL12 and connecting to the power plant or batteries

If batteries are used, follow directions from the power plant manufacturer to connect the batteries to the power plant.

Table 100 summarizes the connections in this procedure.

1   Unpack the distribution box. Check for damage to the unit or the meters. Report any damage to your supplier.

2   Mount the distribution box securely on a wall or other suitable surface:

   • Mount the unit with its bottom edge approximately 1.2 m (4 ft) from the floor within 1.8 m (6 ft) of the power plant.

   • If batteries are used, mount the unit close enough to the batteries to allow a voltage drop of not more than.25 V (.50 V on the loop) on the wire between the QBL12 and the batteries. See *Meridian 1 power engineering* (553-3001-152) to calculate wire size.

3   Connect a black wire between the positive terminal of the power plant or battery string and the system ground source (ground window/LRE) (see Figure 138).

   Typically, this connection is to a ground window that is connected to the ground bus in the service panel.

4   Connect a red wire between the negative output terminal of the power plant or battery string and the –48 V input terminal in the QBL12.

5   Connect a #16 AWG wire between the positive terminal of the power plant or battery string and connector TB3-2 (+ SENSE) of the QBL12 (see Figure 139).

6   Connect a #16 AWG wire between the negative terminal of the power plant or battery string and connector TB3-1 (– SENSE) of the QBL12.

7   Connect a #16 AWG wire between the DCON connection in the rectifier and connector TB3-6 (DCON) in the QBL12.

Note: A wire gauge smaller than #16 can be used if it does not provide more than 2.5 ohms of resistance across its entire length.

Table 100
QBL12 cabling

AWG (typical)	Color	From power plant or battery string	To
#1/0	Black	Positive terminal	System ground source
#1/0	Red	Negative terminal	–48 V input terminal in QBL12
#16	__	Positive terminal	TB3-2 (+ SENSE) in QBL12
#16	__	Negative terminal	TB3-1 (– SENSE) in QBL12
#16	__	DCON connection (in rectifier)	TB3-6 (DCON) in QBL12

Figure 138
QBL12 –48 V and ground connections
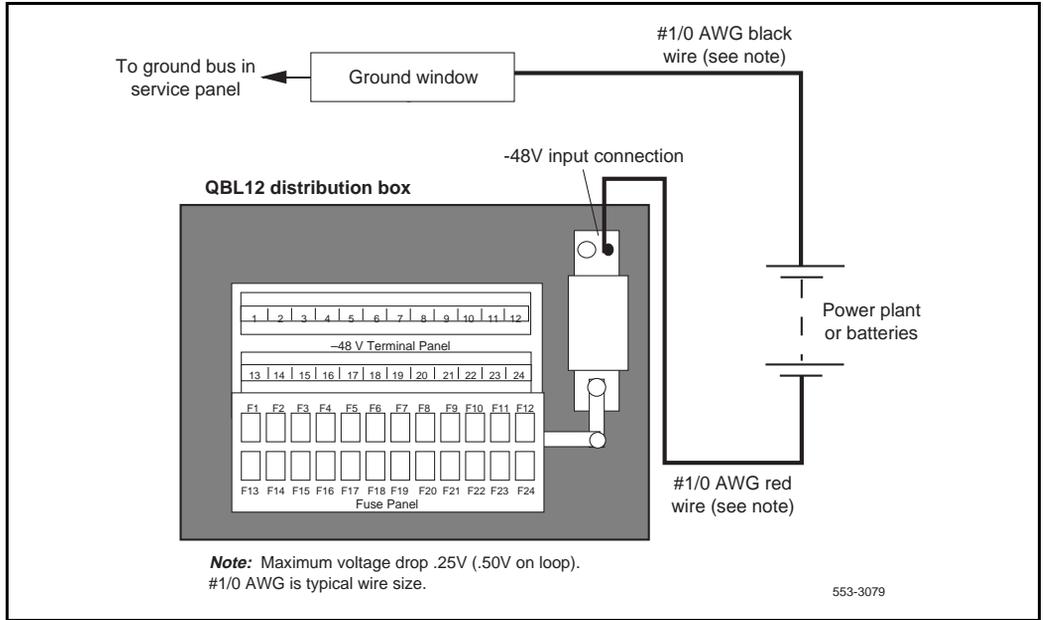
Figure 139
QBL12 SENSE and DCON connections
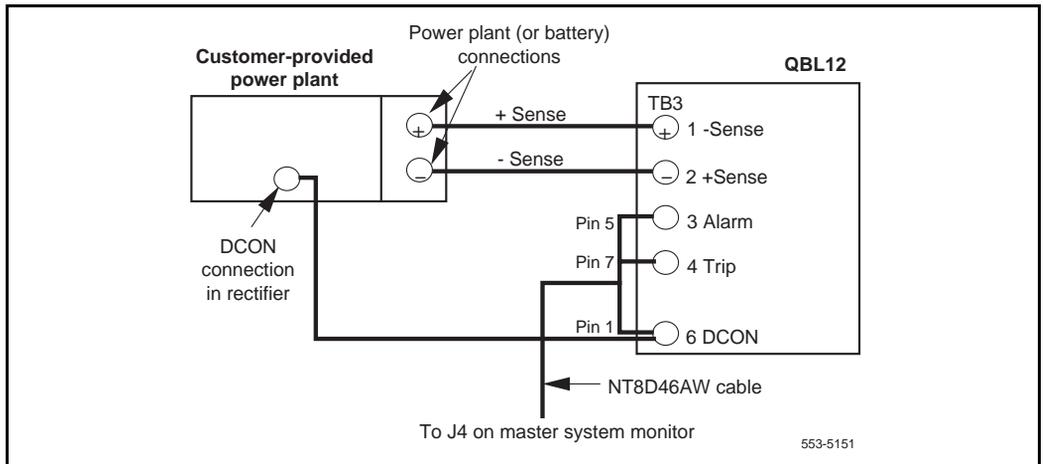
Installing a QBL15 power system

A power plant consisting of the QBL15 Power Distribution Box and NT6D52 or NT0R72 Switched Mode Rectifier can be used with options 21, 21E, 51, 51C, 61, and 61C. The NT6D52 are discontinued and are replaced by NT0R72 rectifiers.

One QBL15 distribution box is needed for every three NT6D52 or NT0R72 rectifiers; up to two QBL15 units can be used per system. This means a QBL15 power system can support a total of six rectifiers that support a maximum of twelve modules.

NT0R72 rectifiers operate on 240 V ac at 20 amps input current.

NT6D52 rectifiers operate on 240 V ac at 20 amps or 120 V ac at 30 amps.

Each rectifier comes equipped with a 20-amp cord and plug for use at 205/240 V ac. One IG-L6-20 or L6-20 receptacle is required for each rectifier.

Note: Do not exceed minimum and maximum input voltage limits of 180 to 250 V ac for NT6D52 rectifiers and 176 to 280 V ac for NT0R72 rectifiers. If only 240 V ac service is available, use a voltage regulation device so the 250 V ac limit cannot be exceeded.

Refer to Figures 140 and 141 throughout the procedures for installing QBL15 distribution boxes and NT0R72 rectifiers.

The dimensions of the QBL15 components are given in Table 101.

Table 101
Equipment dimensions

Equipment	Width		Depth		Height	
	cm	in.	cm	in.	cm	in.
NT6R52 Rectifier	48.3	19.0	35.6	14.0	25.4	10.0
NT0R72 Rectifier	48.3	19.0	35.6	14.0	25.4	10.0
NT7D12 Rectifier Rack	52.7	20.5	38.1	15.0	132.0	52.0
QBL15 Power Distribution Box	55.9	22.0	24.1	9.5	63.5	25.0

Figure 140
NT0R72 rectifier—front view

553-6070
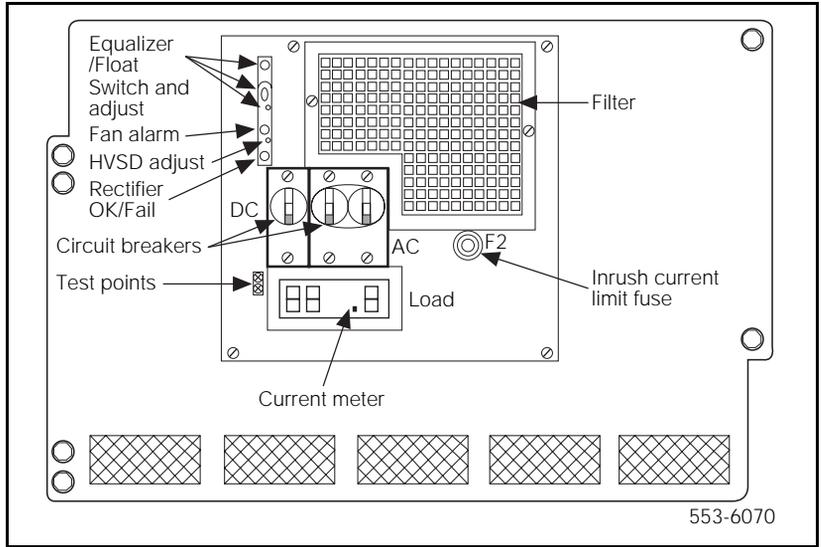
Figure 141
NT0R72 rectifier—rear view

Note: The TB3 label may be located in a different position.   553-3078

System installation procedures
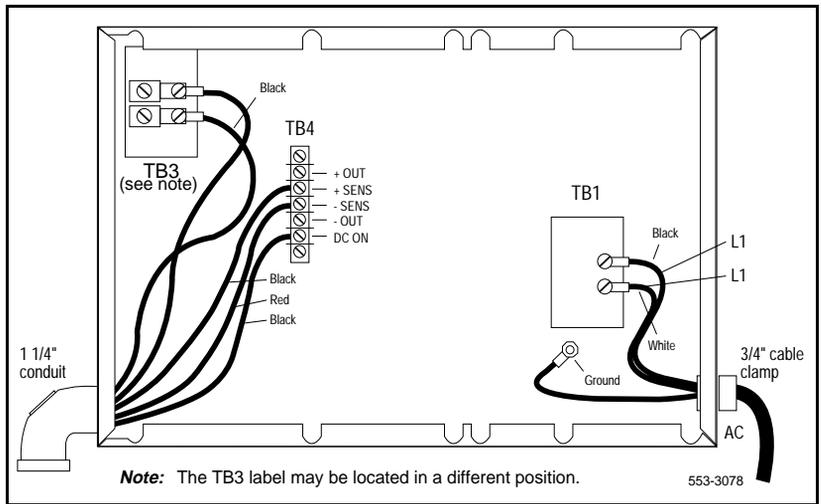
Mounting NT0R72 rectifiers

Use this procedure to install NT0R72 rectifiers in an NT7D12 rectifier rack. The NT7D12 Rectifier Rack Assembly supports up to three rectifiers. Up to two racks can be used per system.

Each rectifier requires oneNT7D1204 Mounting hardware kit and a NT7D1201 Rectifier Baffle assembly that consists of a set of support brackets and a heat baffle plate.

1   Position the rectifier rack. Install a bolt in each of the four holes at the base of the rack to secure the rack to the floor.

2   If not already installed, mount an NT7D1201 baffle assembly on the rack directly below the space for the rectifier (see Figure 142).

Figure 142
NT0R72 rectifiers and NT7D12 rectifier rack
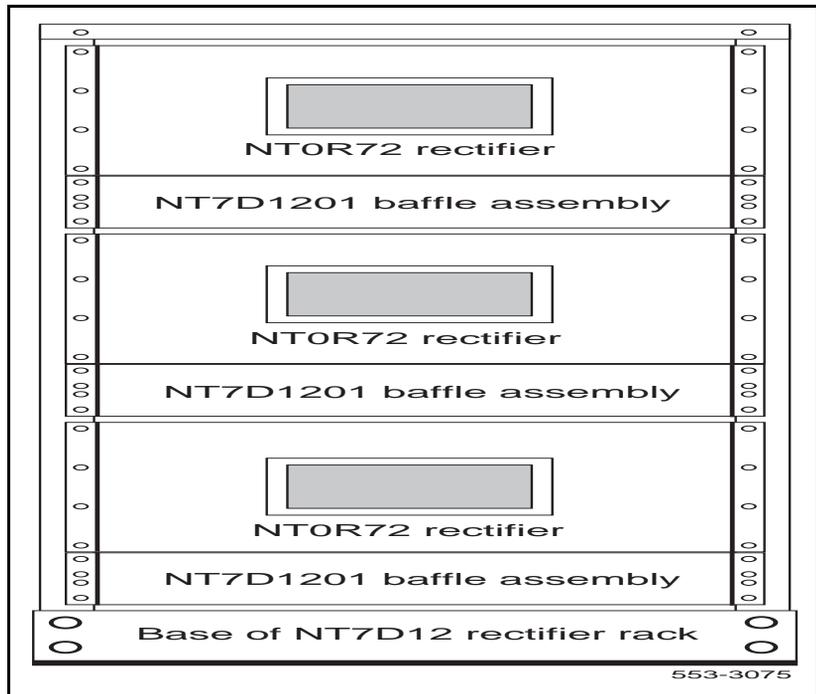
Secure the baffle assembly to the rack with the eight mounting screws provided (see Figure 143).

Figure 143
NT7D1201 baffle assembly mounted in rack

NT7D1201
Baffle assembly

553-3076
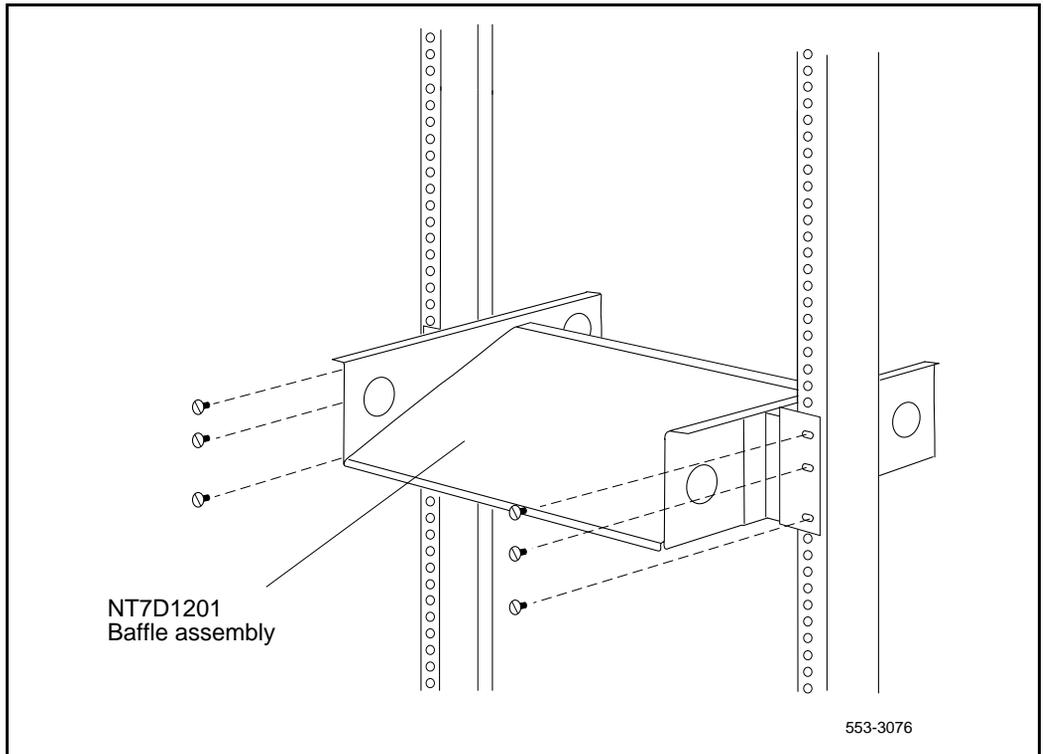
3   Attach NT7D1204 Mounting brackets to NT0R72 rectifiers (see Table 106)

4   Mount the rectifier directly above the baffle assembly. Secure the rectifier to the rack with eight mounting screws and to the baffle assembly with two self-tapping screws (see Figure 144).

Note: For proper weight distribution, install rectifiers starting at the *bottom* of the rectifier rack.

Figure 144
NT0R72 rectifier mounted in rack

553-3077
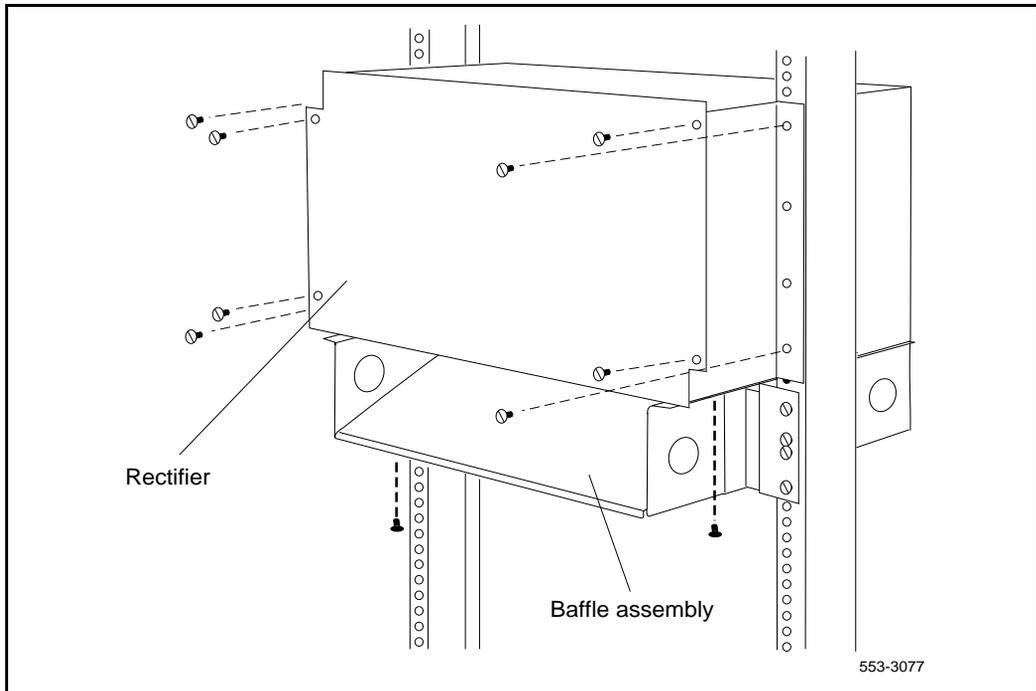
5   Remove the rear cover from the rectifier (leave the cover off until the rectifier and the QBL15 distribution box are connected).

6   If the AC power cord is not installed, connect it to the rear of the rectifier as shown in Figure 141. Do *not* connect it to the commercial power outlet at this point.

7   Perform continuity test from the ground prong on the power cord to the rectifier chassis.

8   Install a 1-1/4 in. conduit fitting as shown in Figure 141.

9   Neatly secure the AC power cord and other external wiring to the rectifier rack with plastic cable ties.

Measuring and adjusting NT0R72 rectifiers

Use this procedure to measure and adjust the high voltage shutdown and float voltage for each NT0R72 rectifier.

Note: Although rectifiers are adjusted during manufacture, they should be measured and, if necessary, readjusted on site.

1 Set the AC BRKR switch on the front of the rectifier to OFF. If connected, disconnect the power cord.

2 If connected, disconnect the wires form the +SENS and -SENS terminals on TB4. Install one jumper from the +OUT terminal the +SENS terminal and an other jumper from the –OUT terminal to the -SENS terminal on TB4 (see Figure 141).

3 Connect a voltmeter to the +OUT and –OUT terminals on TB4.

4 Plug the power cord into the commercial power outlet. Set the DC circuit breaker to ON and set the AC BRKR switch to ON, wait for the ON/RFA LED to turn GREEN.

5 Check the voltmeter. Slowly turn the FLT (float voltage adjustment, see Figure 140) potentiometer clockwise and note the output voltage level where high voltage shutdown occurs. Record this voltage.

6 Slowly turn the FLT potentiometer slightly counterclockwise to lower the rectifier output voltage to a point just below the shutdown voltage. Reset the rectifier by setting the AC BRKR switch to OFF, then back to ON.

If the shutdown voltage you recorded does not fall within the range of acceptable values (see Table 102), adjust the rectifier as follows:

• Turn the HVSD (high voltage shutdown adjustment, (see Figure 140) potentiometer fully clockwise.

• Check the voltmeter. Turn the FLT potentiometer until the voltmeter indicates the desired high voltage shutdown value.

• Slowly turn the HVSD potentiometer counterclockwise and stop when the ON/RFA LED turns RED and the voltmeter reading drops to approximately 0 volts, indicating that the rectifier has shut down.

- • Turn the FLT potentiometer 1/4 turn counterclockwise.

- • Set the AC BRKR switch to OFF, then back to ON.

- • Check the voltmeter. Slowly turn the FLT potentiometer clockwise. The voltmeter reading should increase until the desired high voltage shutdown value is reached and then drop to 0 volts.

- • If necessary, repeat these adjustments until the desired level for high voltage shutdown is set.

7 Turn the FLT potentiometer to obtain the desired float voltage reading (see Table 102). Set the AC circuit breaker to OFF and then back ON.

8 If wires where removed from the SENS terminals on TB4, remove the jumper straps and reconnect the black wire to +SENS and the red wire to -SENS. Store the jumper straps under the two screws provided adjacent to TB4.

9 Perform this procedure on each rectifier.

Table 102
Rectifier settings

Specification	Range
High voltage shutdown	−56.5 to −57.5 V
Float voltage	−51.5 to −54.0 V

Installing a QBL15 distribution box

Use this procedure to install and connect a QBL15 distribution box. When two QBL15 units are installed, connect the battery only to the distribution box with the functional circuit breaker.

Table 103 summarizes the connections in this procedure.

1 Unpack the QBL15. Inspect the unit and the meters for damage.

CAUTION

The QBL15 distribution box weighs approximately 25 kg (50 lb).

---

2 Mount the distribution box securely on a wall or other suitable surface:

- Mount the unit approximately 1.2 m (4 ft) from the floor.

- If batteries are used, mount the unit close enough to the batteries to allow a voltage drop of not more than.25 V (.50 V on the loop) on the #1/0 AWG wire between it and the batteries.

3 Open the front cover of the QBL15 and remove the plate that covers the main circuit breaker (or main fuse—CRS200). Set the circuit breaker to OFF (or remove the fuse).

4 Install and connect a red #1/0 AWG wire between the negative terminal of the battery string and the negative input at the top of the circuit breaker (or fuse) in the QBL15 (see Figure 145).

5 Install and connect a black #1/0 AWG wire between the positive terminal of the battery string and the positive bus in the QBL15.

6 Replace the plate that covers the main circuit breaker (or fuse). Leave the front cover open to connect the QBL15 to the rectifiers.

Table 103
Cabling to connect a QBL15 to batteries

AWG	Color	From battery string	To QBL15
#1/0	Red	Negative terminal	Negative input at the top of the circuit breaker (or fuse)
#1/0	Black	Positive terminal	Positive bus

Figure 145
QBL15 battery connections

Note: Maximum voltage drop .25 V (.50 V on loop).
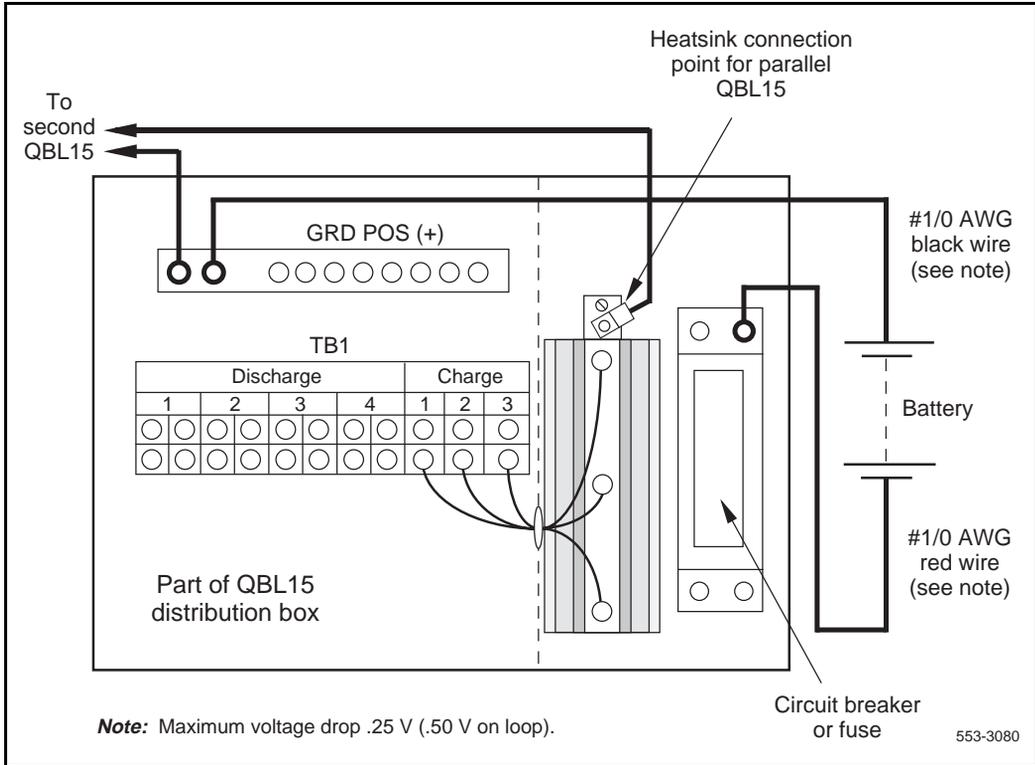
Adding a second QBL15

Table 104 summarizes the connections in this procedure.

1   Unpack and mount the QBL15.

2   Open the front cover of the unit and remove the plate that covers the main circuit breaker (or main fuse—CRS200).

3   Install and connect a red #4 AWG wire between the initially installed QBL15 and the second QBL15.

- Before you install the wire, crimp a ring lug on each end, or use a compression fitting like the type on the positive bus.

- The connection point on each unit is a 1/4-20 stud located at the top of the large heatsink (see Figure 145). Note that there are already four wires connected to the stud.

4   Install and connect a black #4 AWG wire between the initially installed QBL15 and the second QBL15. The connection point on each unit is a compression fitting, labeled GND POS (+), on the positive bus.

5   Do not set the main circuit breaker of the second QBL15 to ON (or do not reinsert the main fuse in the box).

6   Replace the plate that covers the main circuit breaker (or main fuse). Place a tag labeled "CIRCUIT BREAKER IS NON-FUNCTIONAL" on the circuit breaker in the second QBL15.

Table 104
Cabling to add a second QBL15

AWG	Color	From first QBL15	To second QBL15
#4	Red	Stud on the heatsink	Stud on the heatsink
#4	Black	GND POS (+)	GND POS (+)

Connecting NT0R72 rectifiers to the QBL15 distribution box

All wiring between the QBL15 and the rectifier must be contained in the same conduit. A 1-1/4 in., or equivalent, flexible-type conduit is required. Install the conduit in one of the conduit openings on the top of the QBL15 (choose one of the openings near the rear so the door can be closed).

One NT6D54 field wiring kit is required for every three rectifiers connected to a QBL15. The kit contains one male connector (A0290885), two mounts for cable ties (P0594300), four connector contacts (A0290890), and two cable ties (P0567232).

Table 105 summarizes the connections for this procedure.

1   In each rectifier, install #4 AWG wires for –48 V and 48 V return connections (see Figure 146):

- The wires must not be longer than 30 m (100 ft).

- For 48 V return, connect a black wire from terminal 2 on TB3 in the rectifier to the positive bus in the QBL15.

- For –48 V, connect a red wire from terminal 1 on TB3 in the rectifier to charge terminal 1, 2, or 3 on TB1 in the QBL15.

2   In each rectifier, install #22 AWG wires for + SENS, – SENS, and DCON connections (see Figure 146). (A full pair of #24 AWG station wire can be used instead of one, #22 AWG wire. Wrap appropriately colored tape near the ends of each station-wire pair.)

Note: The (+) and (–) sense lead pairs from a rectifier must connect to TB3 in the QBL15, with the first rectifier connected to TB3-1 and TB3-2 (+ and – sense, respectively). A second rectifier connects to TB3-3 and TB3-4, etc.

- Connect a black wire between the + SENS terminal on TB4 in the rectifier and terminal 1, 3, or 5 on TB3 in the QBL15.

- Connect a red wire between the – SENS terminal on TB4 in the rectifier and terminal 2, 4, or 6 on TB3 in the QBL15.

- Connect a blue wire to the DCON terminal on TB4 in the rectifier. This wire will connect to the field wiring kit (installed in the next step) in the QBL15.

3   Install an NT6D54 field wiring kit in the QBL15 (see Figure 147).

- Remove approximately 6 mm (1/4 in.) of insulation from the end of the blue DCON wires from terminal 5 on TB4 in the rectifiers.

- With an AMP 90296-type crimping tool, install one connector contact (A0290890) on the skinned wires.

- Label the wires DCON 0, DCON 1, or DCON 2 as appropriate.

- Insert the connector contact in the male connector (A0290885).

- Connect the male connector to the female connector (A0290886) on the end of the NT8D46AT cable to the system monitor.

- Secure the DCON connectors to the left inside panel of the QBL15 with the cable tie mounts and cable ties supplied with the kit.

4   Make sure all rectifiers in the system are properly connected.

5   Set the AC circuit breakers on all rectifiers to OFF and all circuit breakers on all Meridian 1 columns to OFF.

6   Set the CB0 circuit breaker on just one Meridian 1 column to ON to establish a minimum load.

7   Adjust rectifier float voltage as follows:

- Set the AC and DC circuit breaker on a single rectifier to ON.

- At the QBL15, connect a voltmeter to the (+) and (–) test points (located with the QPC188 Battery Monitor). Adjust the FLT potentiometer on the energized rectifier to obtain the desired float voltage reading, ±5 mV dc.

- Set the AC circuit breaker to OFF.

8   Repeat step 7 for all remaining rectifiers in the system.

9   Disconnect all rectifier power cords until the system is placed in service.

Table 105
Cabling to connect NT0R72 rectifiers to the QBL15 distribution box

AWG	Color	Connection	From rectifier	To QBL15
#4	Black	48 V return	Terminal 2 on TB3	GRD POS (+)
#4	Red	–48 V	Terminal 1 on TB3	Terminal 9, 10, or 11 on TB1
#22	Black	+ sense	+ SENS terminal on TB4	Terminal 1, 3, or 5 on TB3
#22	Red	– sense	– SENS terminal on TB4	Terminal 2, 4, or 6 on TB3
#22	Blue	DCON	DCON terminal on TB4	Field wiring kit; see Figure 145

Figure 146
Rectifier to QBL15 connections

Note 1: All wiring between the rectifier and the QBL15 is contained in the same conduit.
Note 2: Use single cable for 30 m (100 ft) or less, double cable for 30 to 60 m (100 to 200 ft).
Note 3: The terminal function is marked, but the terminal numbers may not be marked.

553-3041
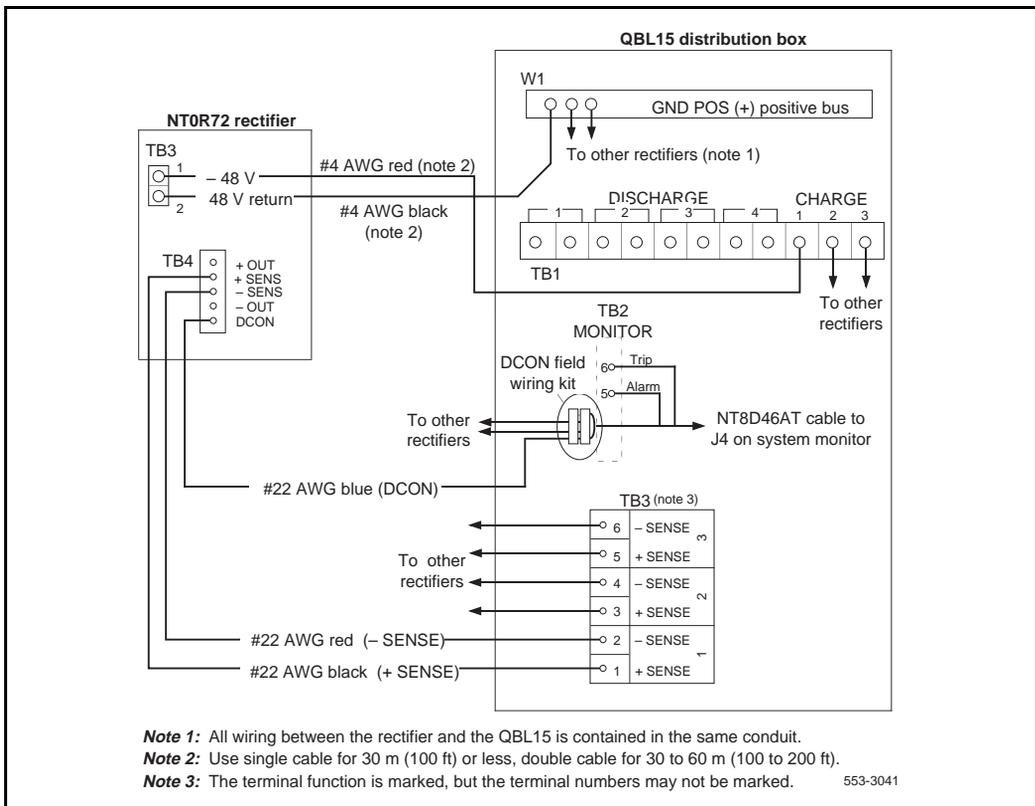
Figure 147
NT6D54 field wiring kit connections
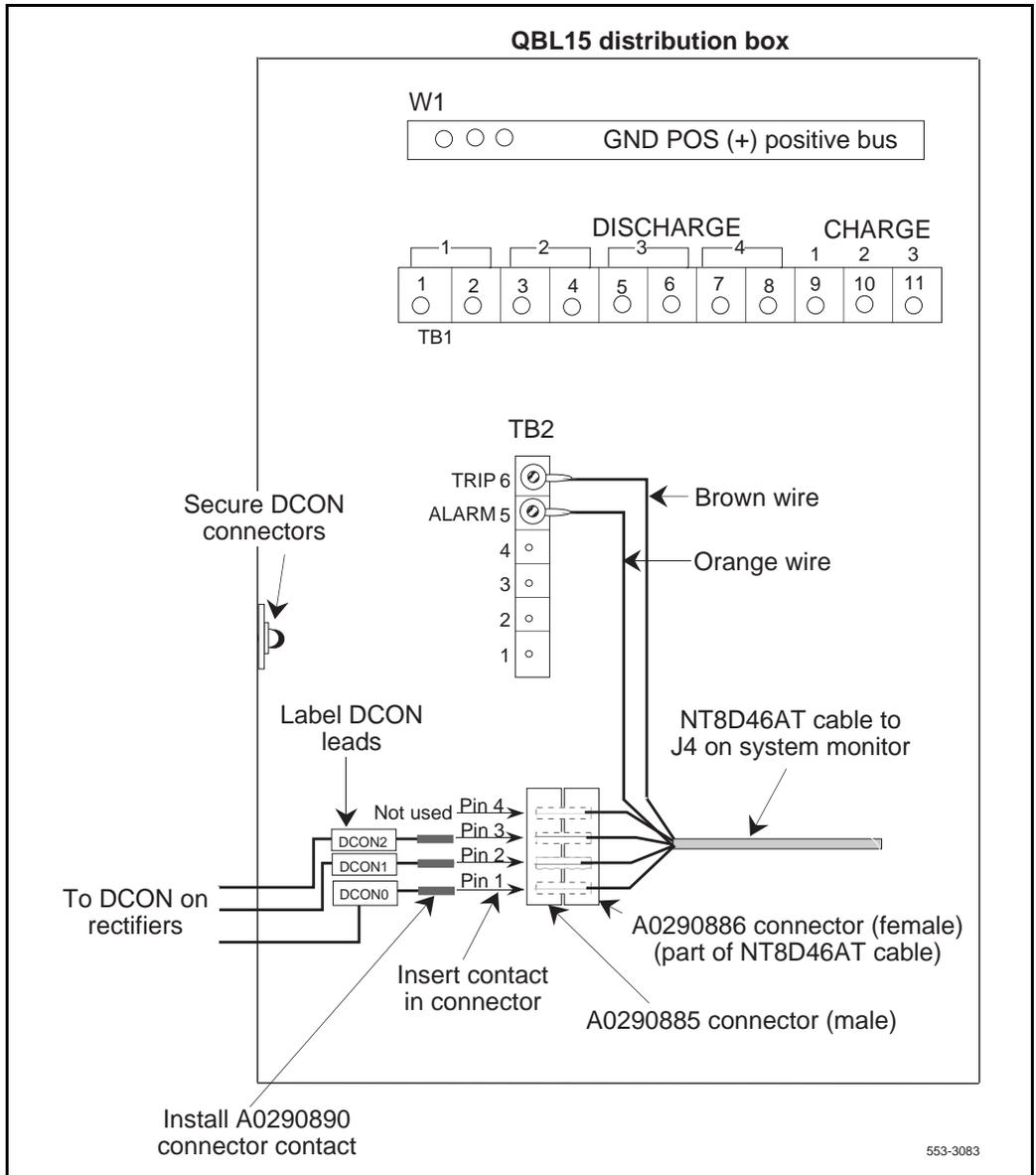
Installing a QCA13 power plant

The QCA13 DC Power Plant can be used with options 71 and 81 (and larger option 61 and 61C configurations).

The QCA13 consists of fusing and distribution hardware, monitoring and control equipment, and up to four NT5C03 rectifiers. Up to two supplemental cabinets can be added, with up to four rectifiers in the first supplemental cabinet and up to two rectifiers in the second cabinet, for a total of ten rectifiers and a total system capacity of 500 amps.

Each of these rectifiers operates from a nominal 208/240 V ac at 23/21 amps. Each rectifier is generally hard-wired to the commercial power source. One 30-amp circuit is required for each rectifier.

To install a QCA13, follow the instructions provided with the QCA13 equipment.

Installing safety ground/protective earth and logic return wiring

The single point ground required by the system can be an isolated ground (IG) bus or AC equipment ground (ACEG) bus in the service panel or transformer. The system is to be connected to safety ground/protective earth in accordance with national requirements. For international use, the system is to be connected to safety ground/protective earth in accordance with Paragraph 2.5 of EN60950/IEC950.

Note: Refer to *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods. Insulated ground wire must be used for system grounding.

Depending on the distances between columns and the service panel, safety ground/protective earth wiring can be daisy-chained or run independently from each column to the service panel.

Figures 148, 149, 150, and 151 show the ACEG as the single point ground and safety ground/protective earth wiring in daisy-chain configurations.

Multiple-column systems often use a logic return equalizer (LRE) as the point where the logic return wires from different columns are consolidated before connecting to the single point ground. The NT6D5303 large LRE (usually used with DC power systems) is available from Northern Telecom.

The LRE used with the QBL12 is a copper bus bar that is mounted on a wall next to the QBL12. The positive bus in the QBL15 is used as the LRE. The LRE used with the QCA13 is located on top of the QCA13 cabinet. The LRE used with the NT6D82 is a copper bus bar mounted in the control/distribution panel or the power plant.

Figures 148, 149, 150, and 151 show the logic return points and wiring configurations.

Figure 148
NT8D62 Ground and logic return distribution—NT6D82 Power System

Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN (+) conductors.
Note 2: Up to three NT6D82 rectifiers can be equipped in a rack for a total of 300 amps.

553-3160
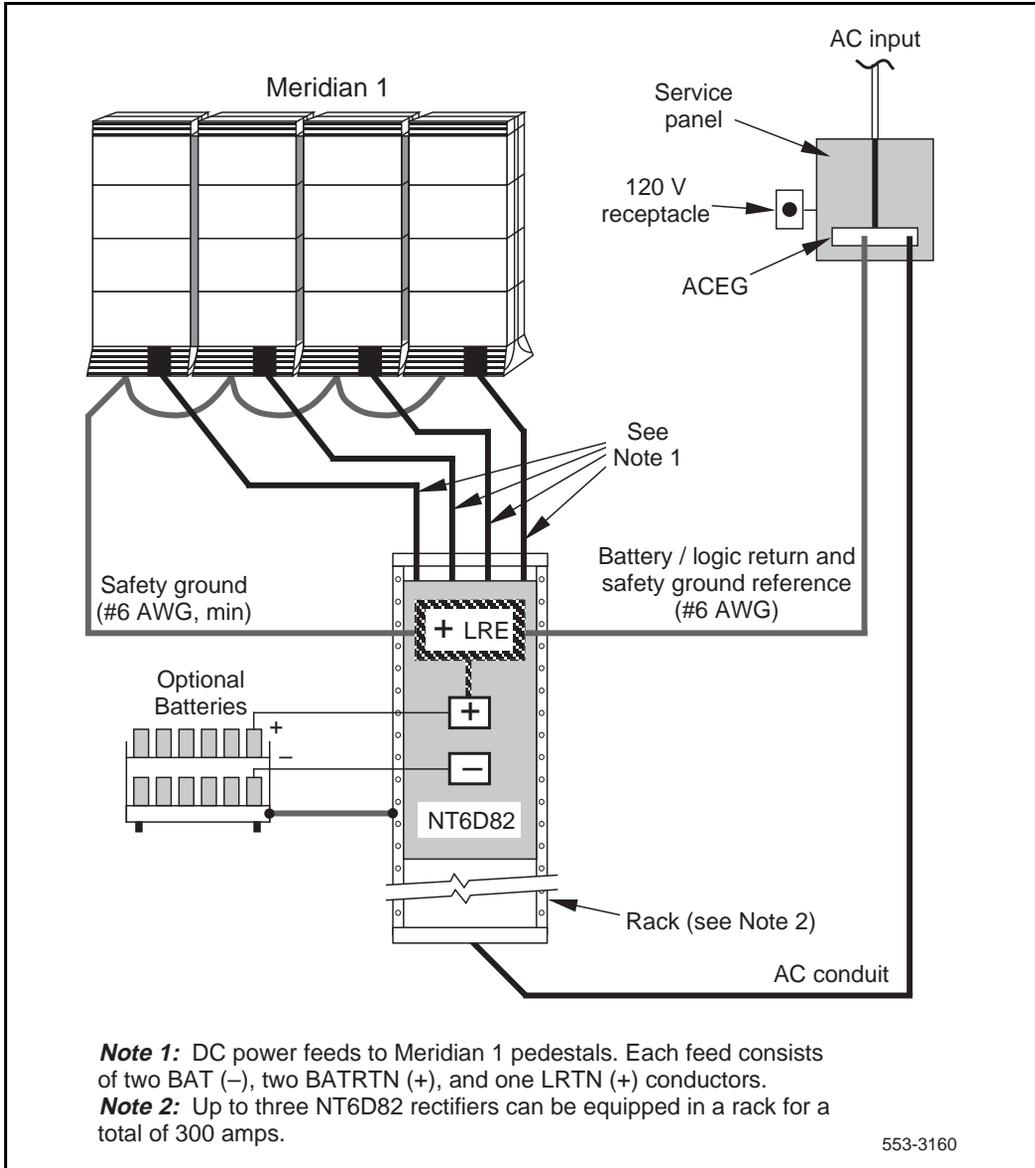
Figure 149
QBL12 ground and logic return distribution

Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN (+) conductors. If required, conductors can be run in conduit, as shown.

Note 2: With customer-provided power equipment, the Meridian 1 frame requires a direct connection to the ACEG. In addition, the positive bus bar in the customer-provided equipment must connect to the ACEG.

553-3161
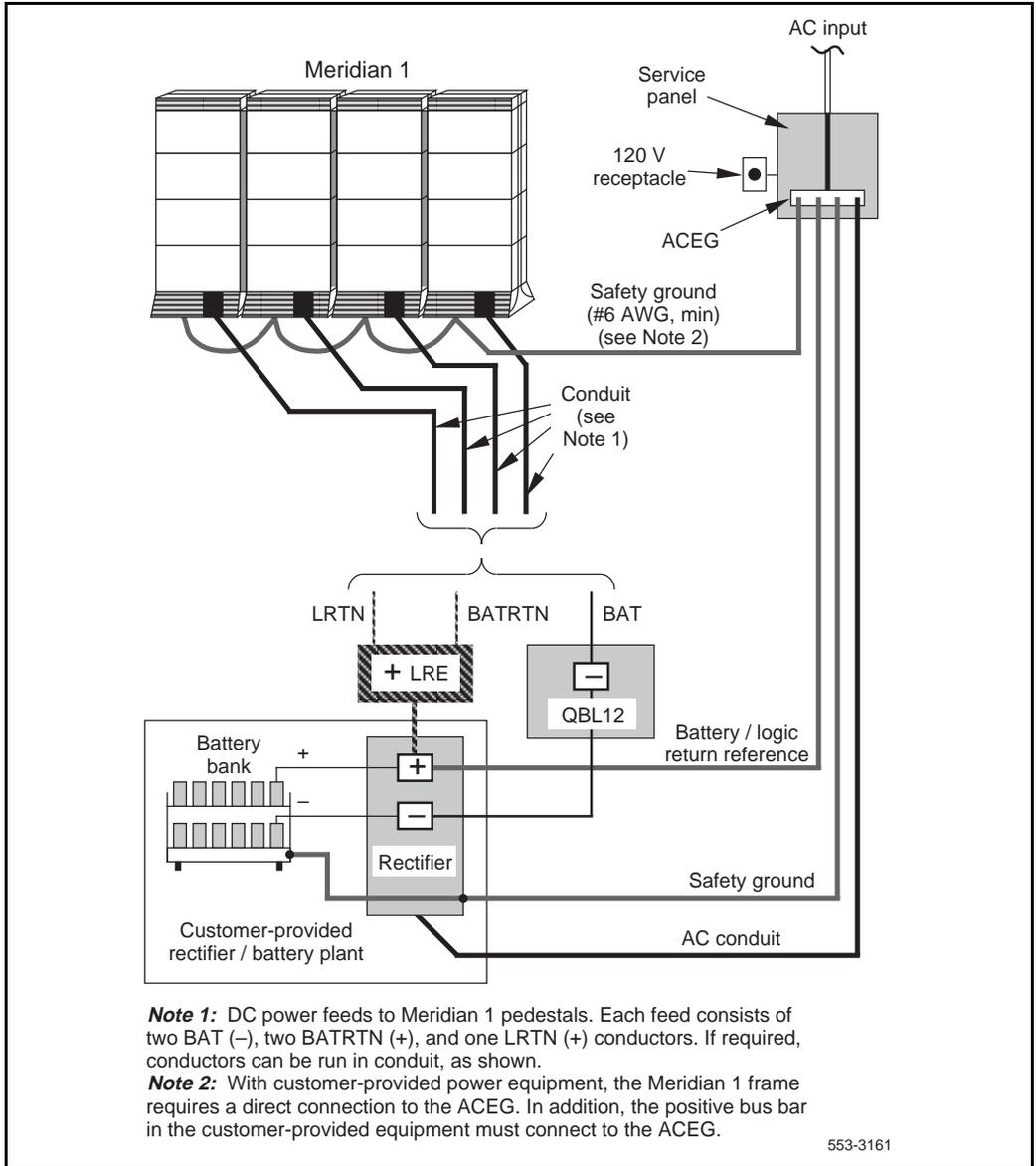
Figure 150
QBL15 ground and logic return distribution

Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of
two BAT(–), two BATRTN(+), and one LRTN(+) conductors.

Note 2: Up to three NT0R72 rectifiers can be equipped in a rack for a
total of 75 amps.

553-3159
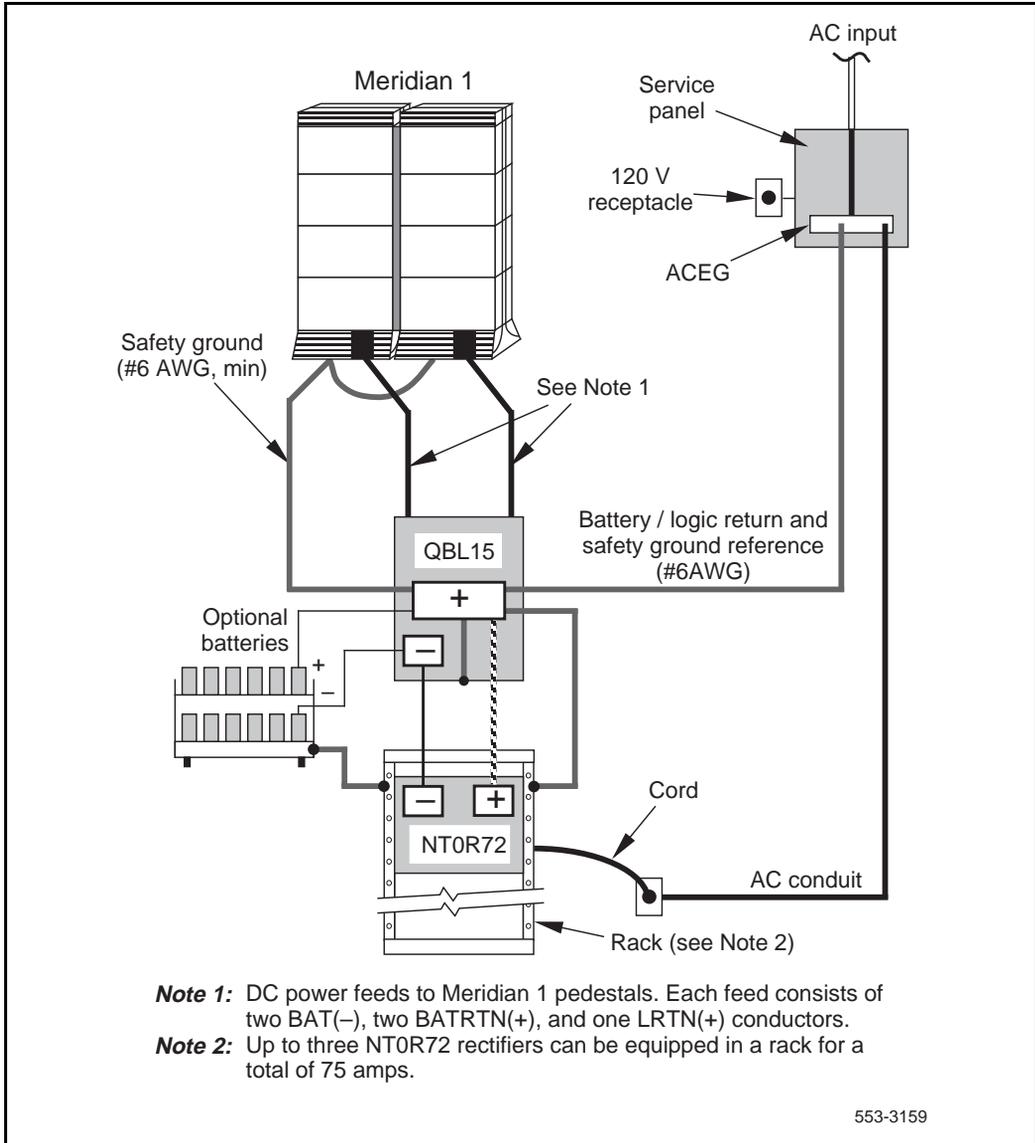
Figure 151
QCA13 ground and logic return distribution
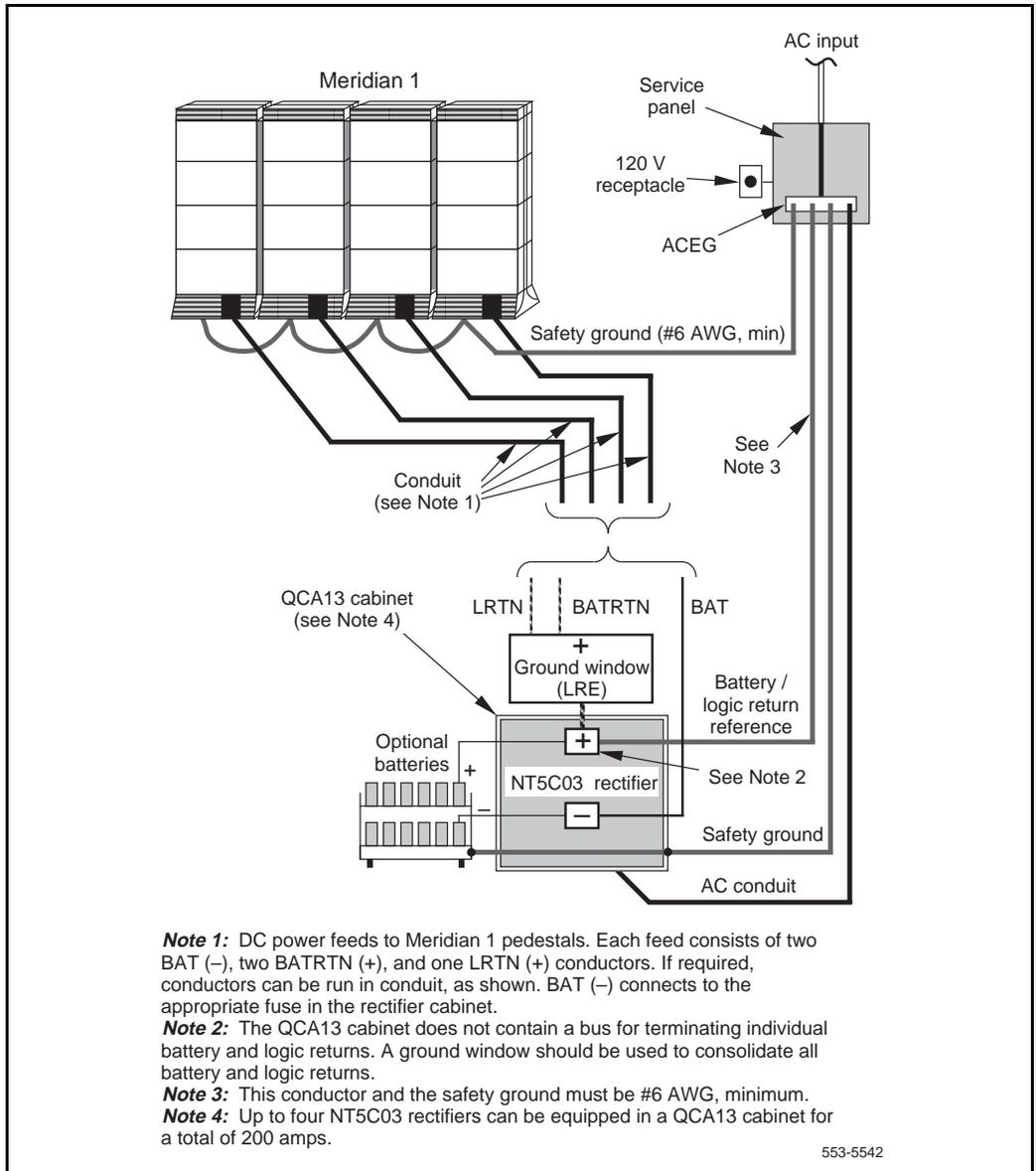
Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN (+) conductors. If required, conductors can be run in conduit, as shown. BAT (–) connects to the appropriate fuse in the rectifier cabinet.
Note 2: The QCA13 cabinet does not contain a bus for terminating individual battery and logic returns. A ground window should be used to consolidate all battery and logic returns.
Note 3: This conductor and the safety ground must be #6 AWG, minimum.
Note 4: Up to four NT5C03 rectifiers can be equipped in a QCA13 cabinet for a total of 200 amps.

553-5542

Installing safety ground/protective earth wiring

WARNING

Failure to follow grounding procedures can result in unsafe or faulty equipment. See *Meridian 1 installation planning* (553-3001-120) for a complete description of approved ground sources and methods.

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1   Make sure all pedestals are disconnected from the power source.

   •   **With an NT682, QBL12, or QCA13**, remove the associated 30-amp fuse.

   •   **With a QBL15**, set the circuit breaker to OFF (or remove the main fuse).

2   At the rear of the pedestal, remove the plastic safety cover over the terminal block to access the safety ground/protective earth lugs (leave the cover off until all pedestal connections are made):

   •   Loosen the three screws holding the cover.

   •   Lift the cover up, then over the three mounting screws on the front panel of the cover.

3   Connect the safety ground/protective earth wire:

Note: Insulated ground wire must be used for system grounding.

For a single-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the pedestal.

For a multiple-column system, connect a #6 AWG wire from the ground source in the service panel to a ground lug on the closest column. Daisy-chain #6 AWG ground wires from one pedestal to the next, connecting all of the columns as illustrated in Figure 152 (or run a #6 AWG wire from the ground source to each column individually).

Figure 152
Column ground lug daisy chain connection

From
ground source

To ground/protective
earth lug (or service panel)

Terminate on
last column

553-3085

Note: With the NT7D67CB PDU, the safety ground/protective earth
wire must be routed within the cable-tie saddles and under the cable
restraint bar at the base of the pedestal.

4 Place a warning tag (WARNING—TELEPHONE SYSTEM GROUND
CONNECTION—DO NOT DISCONNECT) on the connection at the
ground source.

Connecting the PDU

A readily accessible disconnect device for input power is required.

CAUTION

DC power for the NT7D09 Pedestal must be provided with circuit protection of 30 amps for the BAT 0,1 and BAT 2,3 feeds (see Figure 153).

Circuit breakers must be located next to each other and labeled to show that both must be shut off to remove all power to the system.

Figure 153
Circuit protection for the PDU
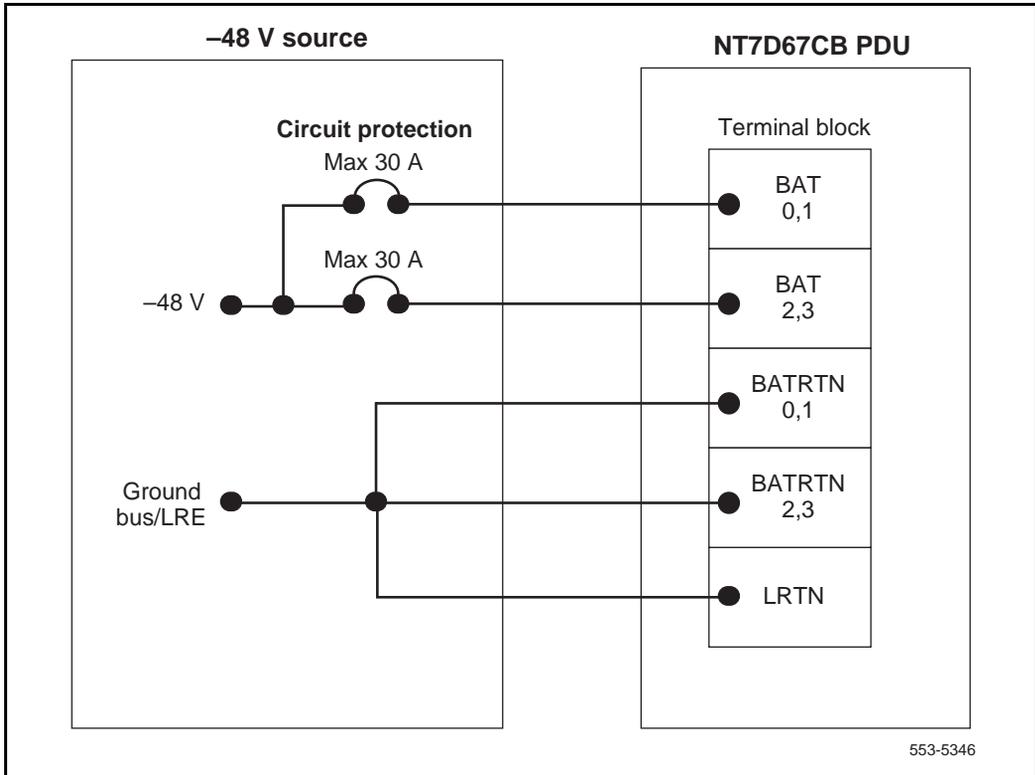
A maximum loop drop of two volts is allowed between the PDU, or junction box, and the external power equipment. See Table 154 for allowable wire sizes. See *Meridian 1 power engineering* (553-3001-152) for detailed information on calculating wire size.

Note: Conduit is required with the NT7D10 PDU.

Figure 154
Wire gauge requirements with two 30-amp feeds (five wires)

Length	#8 AWG	#6 AWG	Single #4 AWG	Double #4 AWG
0–3 m (10 ft)	Yes	Yes	Yes	Yes
3–6 m (20 ft)	Yes	Yes	Yes	Yes
6–9 m (30 ft)	Yes	Yes	Yes	Yes
9–12 m (40 ft)	Yes	Yes	Yes	Yes
12–15 m (50 ft)	Yes	Yes	Yes	Yes
15–18 m (60 ft)	No	Yes	Yes	Yes
18–21 m (70 ft)	No	Yes	Yes	Yes
21–24 m (80 ft)	No	Yes	Yes	Yes
24–27 m (90 ft)	No	No	Yes	Yes
27–30 m (100 ft)	No	No	Yes	Yes
30–60 m (200 ft)	No	No	No	Yes
over 60 m (200 ft)	No	No	No	No

Note 1: Two 30-amp feeds are typically adequate for a column with four modules (five wires total—two 30-amp feed pairs plus logic return).

Note 2: If dual conduit is used, the wires must be run in battery/battery return pairs, with one pair in one conduit and the other pair, plus logic return, in the other conduit.

Legend: Yes = Wire size is adequate for the distance.
No = Wire size has too high a voltage drop and is inadequate for the distance.

The following equipment is located in the rear of each pedestal (see Figure 155) in Meridian 1 columns:

— The PDU distributes power to the entire column.

— The field wiring terminal provides the connection point for wiring brought into the pedestal.

— A circuit breaker is provided for each module in the column and for the blower unit.

Note: All column circuit breakers will trip if a column thermal overload is detected or a DC-power low-voltage condition is sensed.

— The system monitor checks the column temperature, cooling system status, and system voltage status, and controls alarms and line transfer states accordingly.

Figure 155
DC power equipment in the rear of the pedestal—NT7D67CB PDU
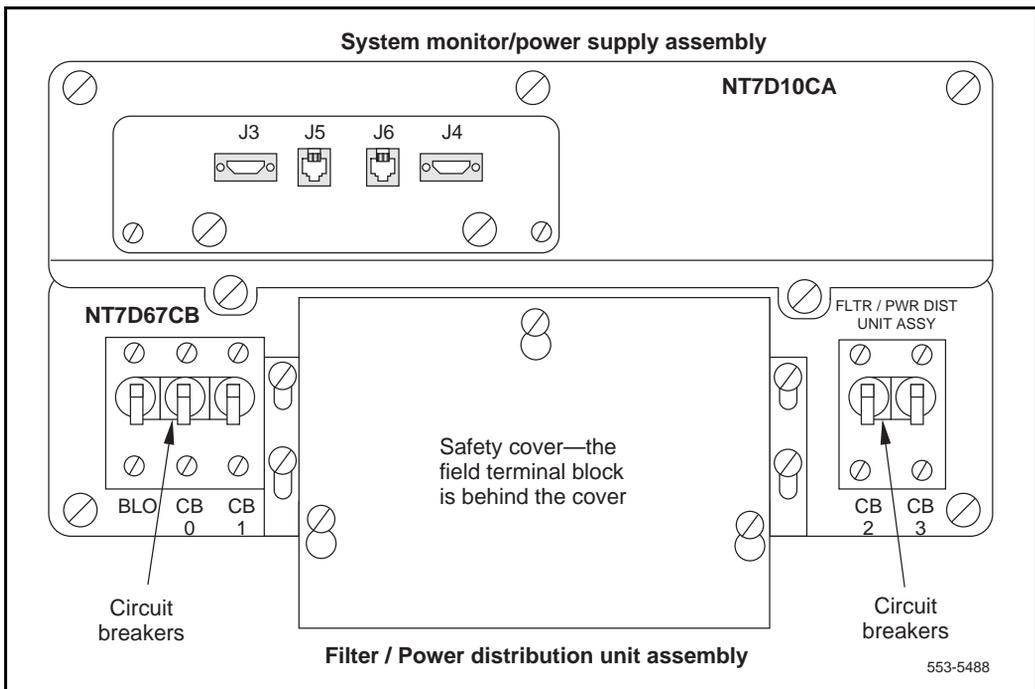
With the NT7D67CB PDU, the safety ground/protective earth wires and all wiring to the terminal block in the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal (see Figure 156).

Conduit is not required with the NT7D67CB PDU. However, 1-1/4 or 3/4 in. conduit can be used if local codes or individual installations require it. Conduit can be routed down through the column from overhead racks or up through the floor. Conduit clamps and the hardware to fasten the conduit are provided in the pedestal. If the NT7D0902 Rear Mount Conduit Kit is used, conduit can enter from the rear of the column (above the floor).

Note: If you are connecting the power system to a vintage AA or DA NT7D10 PDU, go to Appendix B: "NT7D10 PDU connections" on page 425.

Figure 156
Cable routing in the rear of the pedestal—NT7D67CB PDU

Cable-tie saddle   Cable restraint bar   Cable-tie saddle

553-5468
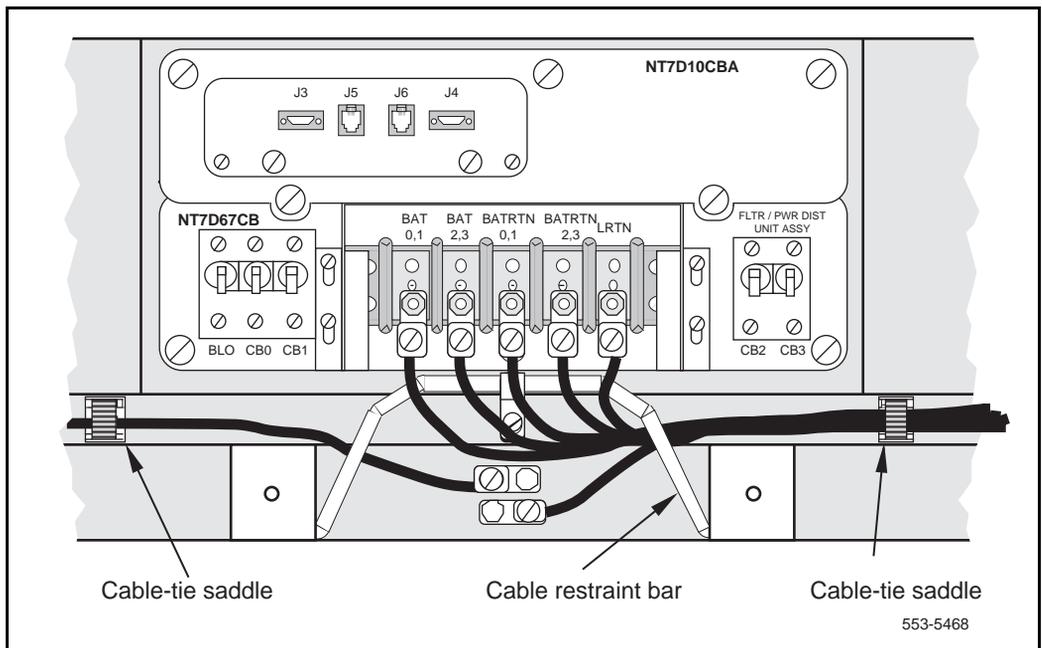
Preparing the NT7D67CB PDU

When a system is shipped, a set of screws secures the leveling bracket at the rear of the NT7D67CB PDU to protect the PDU from vibration damage during transit. The shipping screws should be removed during initial installation.

1   For access to the rear of the PDU, temporarily remove the blower unit in the front of the pedestal:

   •   Turn the screws on the front of the blower unit counter-clockwise.

   •   Grasp the lip at the top edge of the blower unit. Slide the unit out of the glides and onto the bottom ledge of the pedestal. Lift the unit out of the pedestal. (Keep the blower unit in an upright position.)

2   Remove the two shipping screws holding the PDU to the vertical shield in the pedestal.

3   Reinstall the blower unit:

   •   Set the blower unit on the bottom ledge of the pedestal.

   •   Tilt the back of the blower unit up slightly so it will slide into the pedestal glides (you may need to lift the unit). Gently push the unit into position.

   •   Tighten the screws on the front of the blower unit.

Connecting power to the NT7D67CB PDU

To connect the external power system to the PDU, use the following procedure for each column (this procedure gives the connections for a four-module column).

Note: All wiring to the PDU must be routed within the cable-tie saddles and under the cable restraint bar at the base of the pedestal.

1 If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block on the PDU:

- Connect the red wires to BAT 0,1 and BAT 2,3.

- Connect the black wires to BATRTN 0,1 and BATRTN 2,3.

- Connect the remaining wire (orange or white) to LRTN.

Note: If a junction box is used, the connections described in steps 2 through 4 apply to the junction box rather than the PDU.

2 Connect the red BAT (–48 V) wires:

- At the power plant:

   For an NT6D82, connect the wires to the first two circuit breakers in the main control/distribution panel (see Figure 157).

   For a QBL12 or QCA13, connect the wires to the first two available 30-amp fuse output connections on the –48 V terminal panel (see Figure 158).

Note: Each 30-amp fuse output has two connection points on the distribution panel. Only one 30-amp connection point is required for every two modules; typically, #6 AWG is adequate (#4 AWG can be used).

   For a QBL15, connect the wires to terminals 1, 2, 3, or 4 (DISCHARGE) on TB1 (see Figure 159).

- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

  For modules 0 and 1, connect to BAT 0,1.

  For modules 2 and 3, connect to BAT 2,3.

3   Connect the black BATRTN (48 V return) wires:

- At the power plant:

  For an NT6D82, connect two wires to the ground bus/LRE.

  For a QBL12 or QCA13, connect two wires to the LRE.

  For a QBL15, connect two wires to the positive bus.

- At the PDU, connect the wires to the terminal block (one wire feeds two modules):

  For modules 0 and 1, connect to BATRTN 0,1.

  For modules 2 and 3, connect to BATRTN 2,3.

4   Connect the LRTN wire (orange or white):

- At the power plant:

  For an NT6D82, connect the wire to the ground bus/LRE.

  For a QBL12 or QCA13, connect the wire to the LRE.

  For a QBL15, connect the wire to the positive bus.

- At the PDU, connect the wire to LRTN on the terminal block.

5   Reinstall the plastic safety cover over the terminal block:

- Lower the front panel over the mounting screws on the PDU.

- Tighten the three screws holding the cover.

6   Close the covers on the power plant.

Figure 157
PDU to NT6D82 connections

Note 1: Either connecting bar or LVD contacts.
Note 2: Do not connect trip lead if LVD option is installed.

553-5133
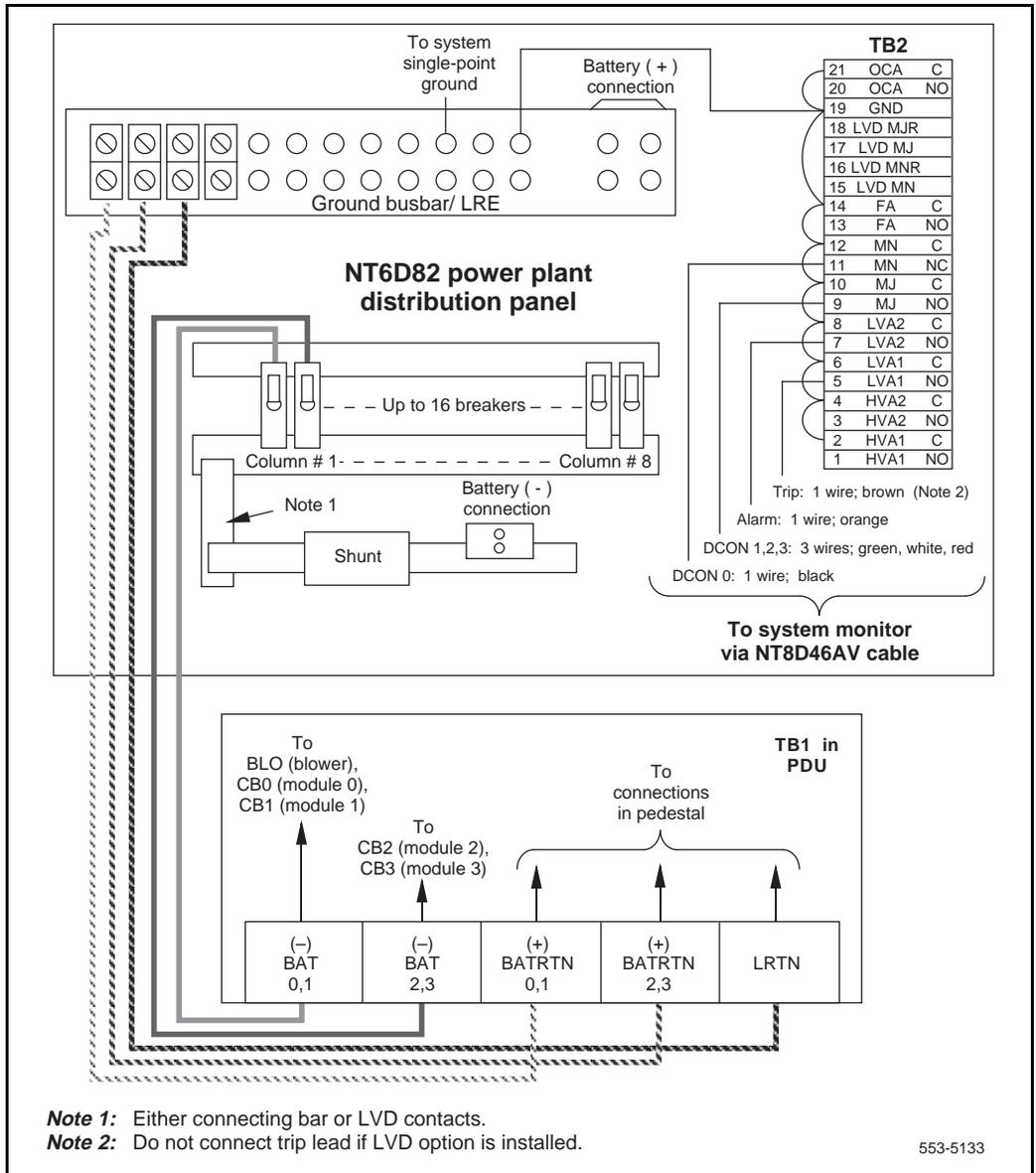
Figure 158
PDU to QBL12 or QCA13 connections

553-3093
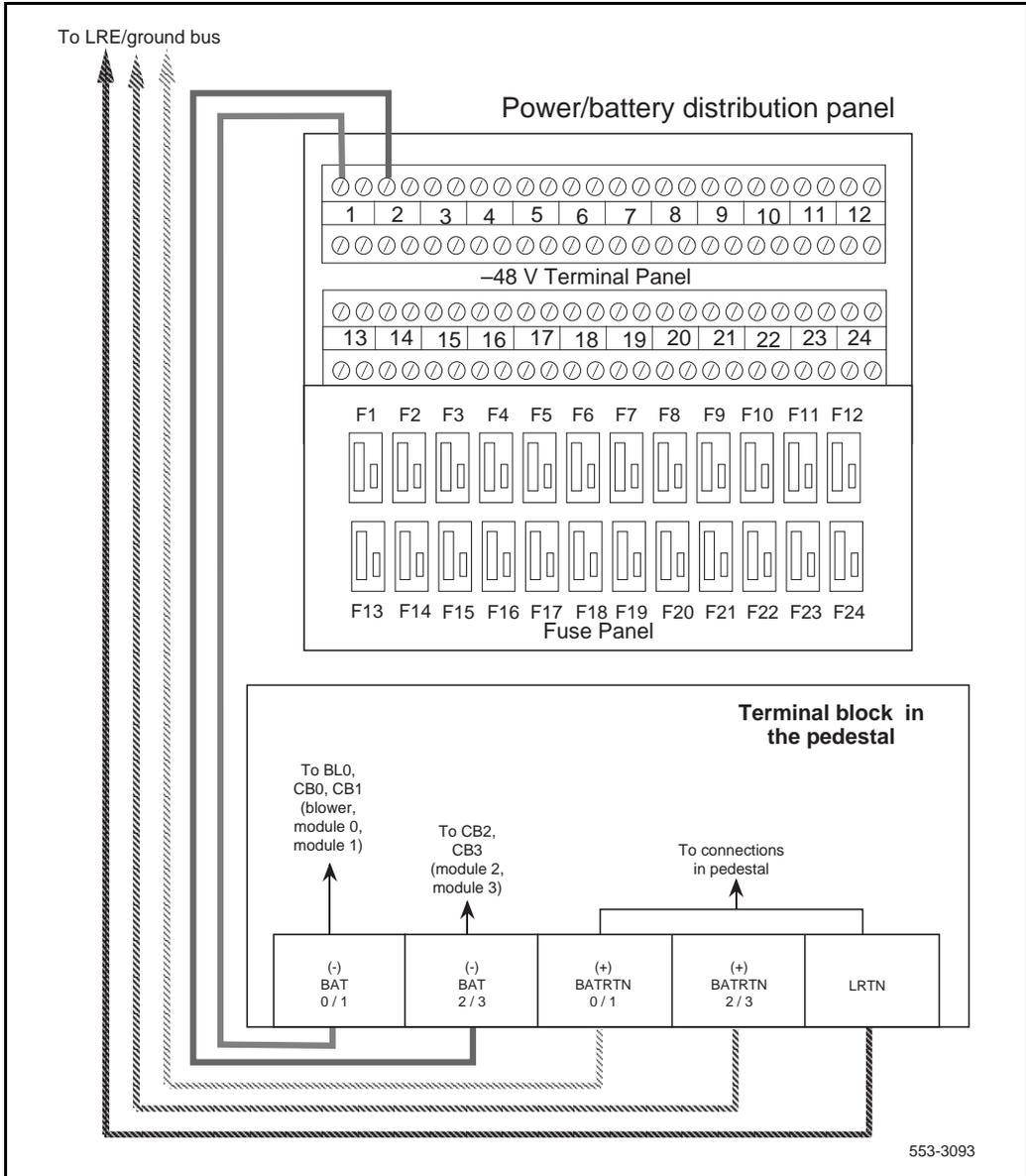
Figure 159
PDU to QBL15 connections

Note: One 30 amp feed per two modules.

553-3091
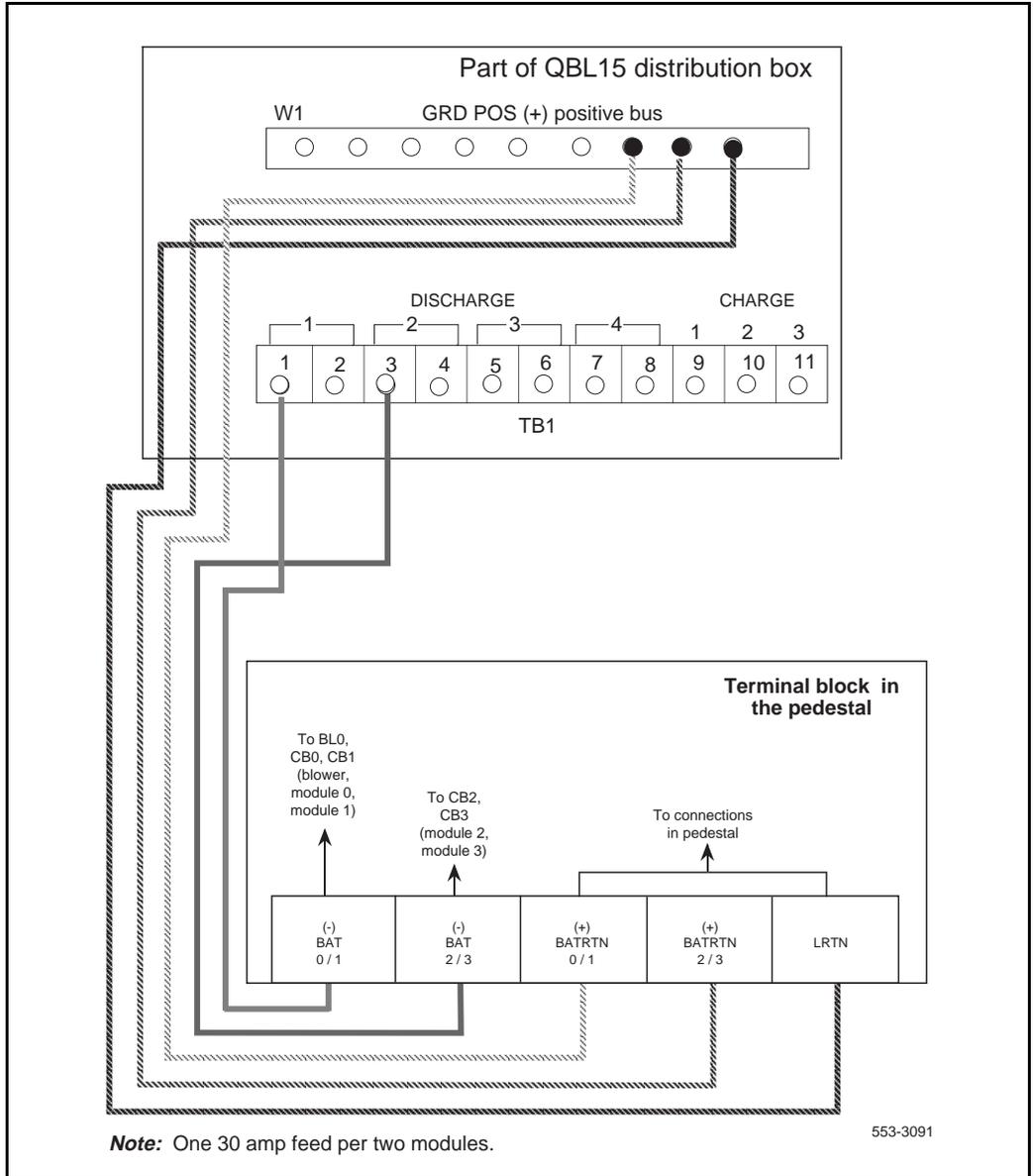
Connecting the NT8D22 system monitor

See "Configuring the system monitor" on page 91 to

— configure system monitor switch settings

— cable the system monitor to the SDI port

— cable system monitors in a multiple-column Meridian 1

— cable the system monitor to PFTUs or external alarms

Use the following cables to extend the alarm and trip leads from connector J4 on the master system monitor to the external power equipment (conduit is not required):

— **For an NT6D82**, use an NT8D46AV cable (see Table 106).

— **For a QBL12**, use an NT8D46AW cable (see Table 107).

— **For a QBL15**, use an NT8D46AT cable (see Table 108).

— **For a QCA13**, use an NT8D46AV cable (see Table 109).

An NT8D46BV cable, 20 m (64 ft), or NT8D46CV cable, 33 m (100 ft), can be used instead of the NT8D46AV cable. Connections are the same as the NT8D46AV cable.

Table 106
NT6D82 alarm and trip lead connections—NT8D46AV cable

Color	Description	Connection at TB2 in the NT6D82
BL	DCON 0	MNA (NO), position 11
R	DCON 1*	MJA(NO), position 9
W	DCON 2*	MJA(NO), position 9
GR	DCON 3*	MJA(NO), position 9
OR	Alarm	LVA2 (NO), position 7
BL	not used	—
BR	not used	—
Y	not used	—
V	not used	—
* Connect the red, white, and green wires together at MJA.		

Table 107
QBL12 alarm and trip lead connections—NT8D46AW cable

Color	Description	Connection at TB3 in the QBL12
BL	DCON 0*	Terminal 6
R	not used	—
W	not used	—
GR	not used	—
OR	Alarm	Terminal 3
BL	not used	—
BR	Trip	Terminal 4
Y	not used	—
V	not used	—
* Also terminate the DCON connection from the rectifier on terminal 6.		

Table 108
QBL15 alarm and trip lead connections—NT8D46AT cable

Color	Description	Connection at TB2 in the QBL15
BL	DCON 0	*
R	DCON 1	*
W	DCON 2	*
GR	not used	—
OR	Alarm	Terminal 5
BL	not used	—
BR	Trip	Terminal 6
Y	not used	—
V	not used	—

*   The A0290885 male connector in the QBL15 connects the DCON wires from the rectifiers to the A0290886 female connector on the end of the NT8D46AT cable. See "Connecting NT0R72 rectifiers to the QBL15 distribution box" on page 398 to install the A0290885 connector.

Table 109
QCA13 alarm and trip lead connections—NT8D46AV cable

Color	Description	Connection at TSA in the QCA13
BL	not used	—
R	not used	—
W	not used	—
GR	not used	—
OR	Alarm	Terminal 50
BL	not used	—
BR	Trip	Terminal 49
Y	not used	—
V	not used	—

Appendix B: NT7D10 PDU connections

Figure 160 shows the location of the vintage AA or DA NT7D10 PDU in the rear of the pedestal. To connect the external power system to the PDU, use the following procedure for each column (this procedure gives the connections for a four-module column).

The –48 V (BAT), 48 V return (RTN), and logic return (LRTN) wires must be installed in conduit, and must be installed in the same conduit.

Figure 160
Power equipment in the rear of the pedestal—NT7D10 PDU

System monitor

PDU

Circuit breaker bank   Ground lugs   Field wiring terminal
                                                   (below PDU)

553-5385
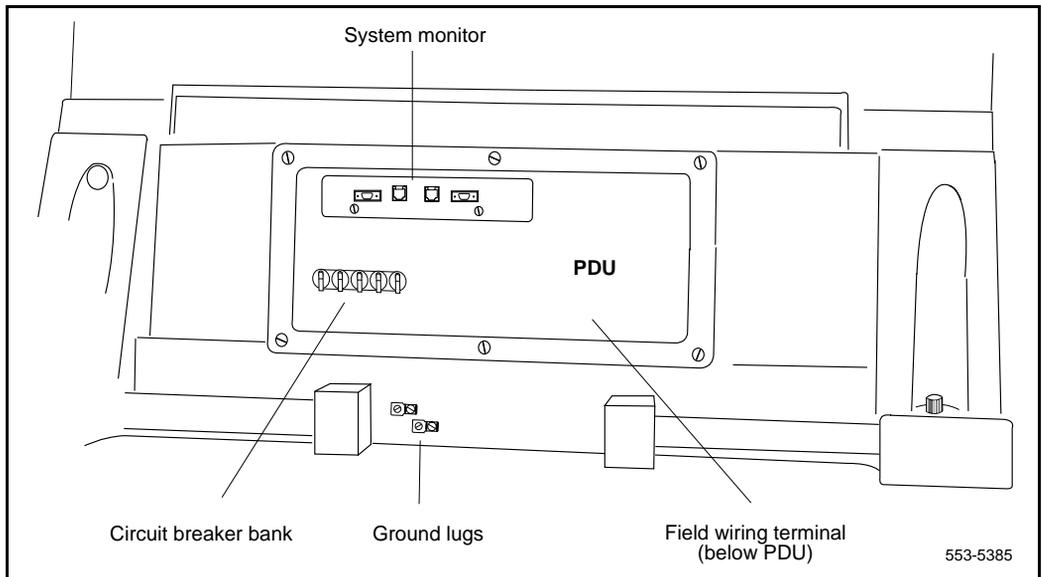
Connecting power to the NT7D10 PDU

1   To access the field wiring terminal block (TB1) in the bottom of the pedestal, you must remove the PDU:

- Remove the I/O safety panel in module 0 (bottom module).

- Disconnect the power plug (J1) and the system monitor ribbon cable between module 0 and the PDU.

Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

- If the module has an SDI paddle board installed on the backplane, temporarily remove the paddle board to avoid damage.

- Disconnect cables from the faceplate of the system monitor.

- Loosen the retaining screws that secure the PDU and pull the unit out of the pedestal.

2   If a junction box is used, insert the conduit from the junction box into one of the conduit access holes in the pedestal.

Connect the wires from the junction box to the matching connections on the terminal block in the pedestal:

- Connect the red wires to BAT 0 through BAT 3.

- Connect the black wires to RTN 0 through RTN 3.

- Connect the remaining wire (orange or white) to LRTN.

Note: If a junction box is used, the connections described in steps 3 through 5 apply to the junction box rather than to the PDU.

3   Connect the red BAT (–48 V) wires:

• At the power plant:

For an MFA150 or NT6D82, connect two wires to the first two circuit breakers in the main control/distribution panel (see Figure 161 for MFA150, Figure 162 for NT6D82).

For a QBL12 or QCA13, connect two wires to the first two available 30-amp fuse output connections on the –48 V terminal panel (see Figure 163).

Note: Each 30-amp fuse output has two connection points on the distribution panel. Only one 30-amp connection point is required for every two modules; typically, #6 AWG is adequate (#4 AWG can be used).

For a QBL15, connect the wires to terminals 1, 2, or 3 (DISCHARGE) on TB1 (see Figure 164).

• At the pedestal, connect the wires to the terminal block:

For modules 0 and 1, connect to BAT 0 and add a strap (if not already installed) between BAT 0 and BAT 1.

For modules 2 and 3, connect to BAT 2 and add a strap (if not already installed) between BAT 2 and BAT 3.

4   Connect the black BATRTN (48 V return) wires:

• At the power plant:

For an MFA150 or NT6D82, connect two wires to the ground bus/LRE.

For a QBL12 or QCA13, connect two wires to the LRE.

For a QBL15, connect two wires to the positive bus.

• At the pedestal, connect the wires to the terminal block:

For modules 0 and 1, connect to RTN 0 and add a strap (if not already installed) between RTN 0 and RTN 1.

For modules 2 and 3, connect to RTN 2 and add a strap (if not already installed) between RTN 2 and RTN 3.

5   Connect the LRTN wire (orange or white):

- At the power plant:

  For an MFA150 or NT6D82, connect the wire to the ground bus/LRE.

  For a QBL12 or QCA13, connect the wire to the LRE.

  For a QBL15, connect the wire to the positive bus.

- At the PDU, connect the wire to LRTN on the terminal block.

6   Reinstall the PDU:

- In the front of the pedestal, set the switch on the front of the blower unit to OFF (down). Unseat the blower unit. Slide the unit forward approximately 7.5 cm (3 in.).

- Insert the PDU and secure it with its retaining screws.

- Insert the blower unit until it is properly plugged into the PDU. Set the switch to ON.

- Reconnect the system monitor and power cables from module 0 to the pedestal.

- Reinstall the SDI paddle board on the backplane if one was removed.

- Reinstall the I/O safety panel.

- Reconnect cables to the faceplate of the system monitor.

7   Close the covers on the power plant.

To connect the NT8D22 system monitor, go to the appropriate chapter:

— **For an MFA150 or NT6D82**, see "Configuring the system monitor" on page 91.

— For a QBL12, QBL15, or QCA13, see Appendix A.

Figure 161
PDU to MFA150 connections

TB1		
8	EQL	
7	EQL	
6	LVA	NO
5	LVA	C
4	LVA	NC
3	LVDA	NO
2	LVDA	C
1	LVDA	NC
TB2		
8	FA	NO
7	FA	C
6	FA	NC
5	RFA MAJ	NC
4	RFA MAJ	NC
3	RFA MIN	NC
2	RFA MIN	NC
1	RFA	C

DCON 0: 1 wire; black

DCON 0,2,3: 3 wires;
green, white, red

Alarm: 1 wire; orange

**To system monitor via
NT8D46AV cable
(Do not connect
trip lead.)**

Ground bus/LRE
(battery/logic return) (+)

**MFA150
distribution
panel**

Charge
battery (-)
bus bar

Shunt

LVD
contactor

e battery (-)
bus bar

**TB1 in
PDU**

To
BLO (blower),   CB2
CB0 (module 0)   (module 2)

To connections
in pedestal

To
CB1
(module 1)

To
CB3
(module 3)

(-)	(-)	(-)	(-)	(+)	(+)	(+)	(+)		
BAT 0	BAT 1	BAT 2	BAT 3	RTN 0	RTN 1	RTN 2	RTN 3	FGND	LRTN

Pedestal
frame

553-5637

Figure 162
PDU to NT6D82 connections

Note 1: Either connecting bar or LVD contacts.
Note 2: Do not connect trip lead if LVD option is installed.

553-5638
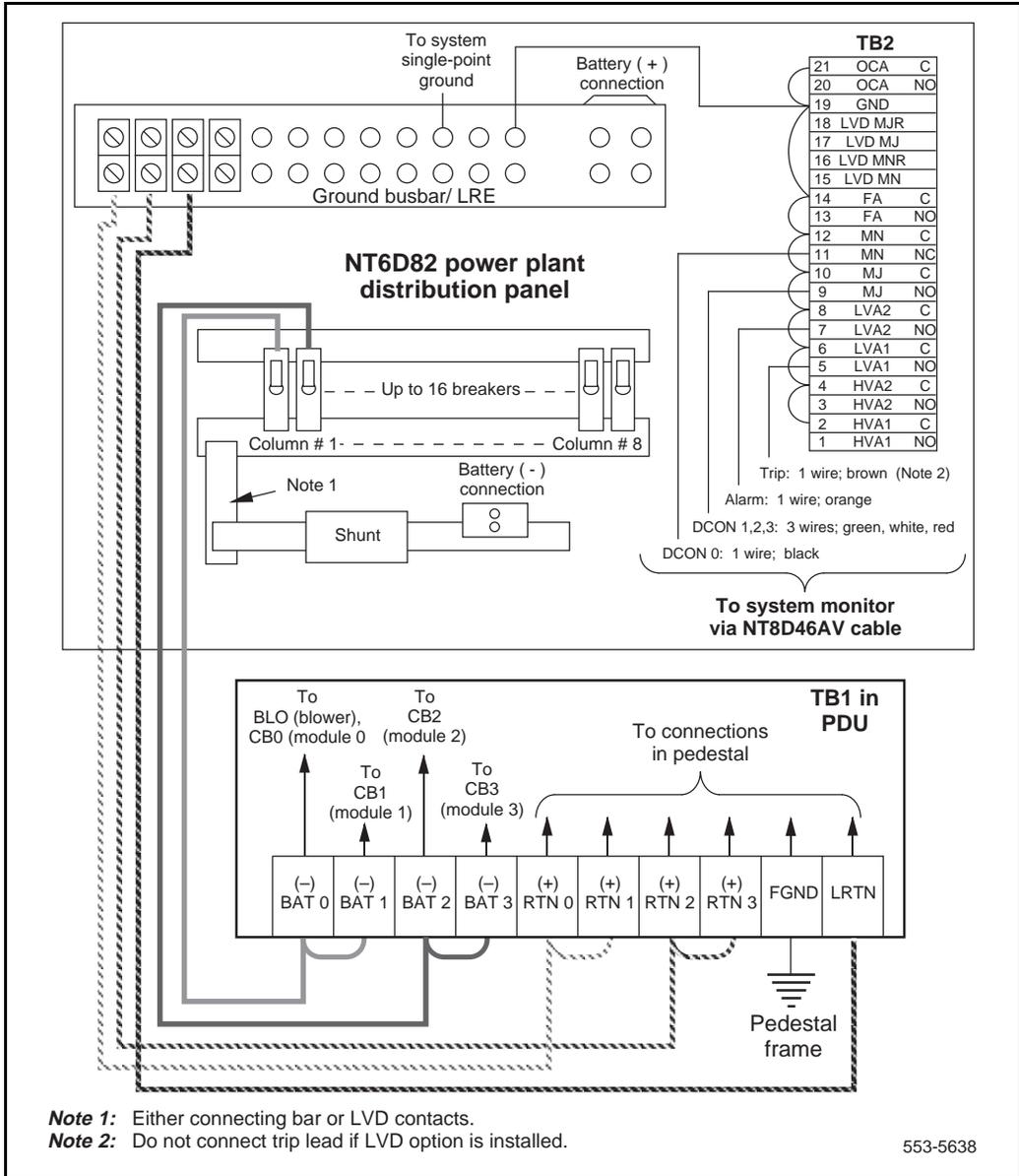
Figure 163
PDU to QBL12 or QCA13 connections

To LRE/
ground bus

Power distribution panel

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

– 48 V Terminal Panel

| 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12

F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24
Fuse Panel

TB1 in PDU

To
BLO (blower),
CB0 (module 0)

To
CB2
(module 2)

To connections
in pedestal

To
CB1
(module 1)

To
CB3
(module 3)

| (–) BAT 0 | (–) BAT 1 | (–) BAT 2 | (–) BAT 3 | (+) RTN 0 | (+) RTN 1 | (+) RTN 2 | (+) RTN 3 | FGND | LRTN |

Pedestal
frame

553-5639
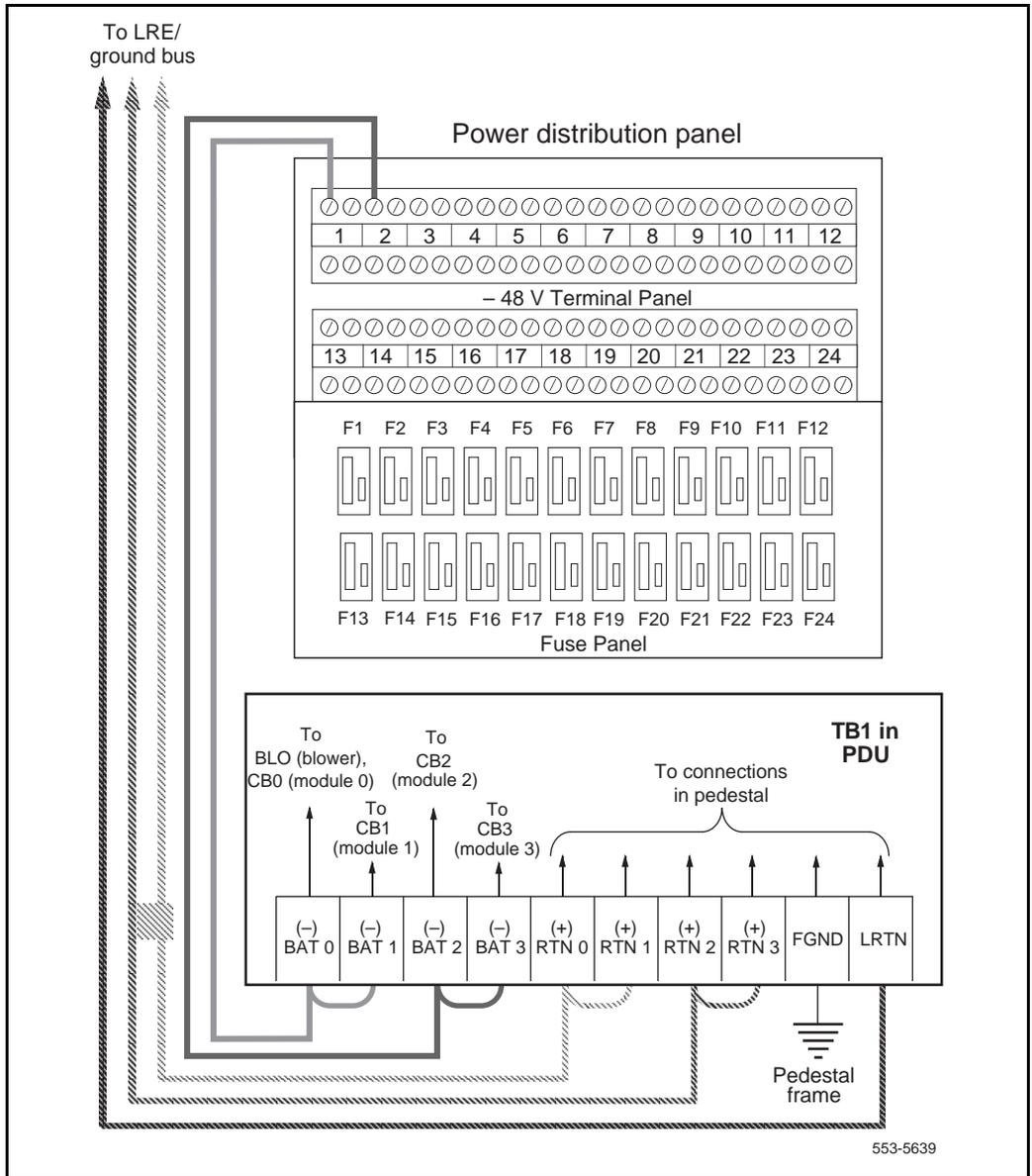
Figure 164
PDU to QBL15 connections

Part of QBL15 distribution box

W1   GRD POS (+) positive bus

DISCHARGE   CHARGE
1   2   3   4   1   2   3

TB1

To
BLO (blower),
CB0 (module 0)

To
CB2
(module 2)

To
CB1
(module 1)

To
CB3
(module 3)

To connections
in pedestal

**TB1 in
PDU**

(−)
BAT 0

(−)
BAT 1

(−)
BAT 2

(−)
BAT 3

(+)
RTN 0

(+)
RTN 1

(+)
RTN 2

(+)
RTN 3

FGND   LRTN

Pedestal
frame

Note: One 30 amp feed per two modules.

553-5640
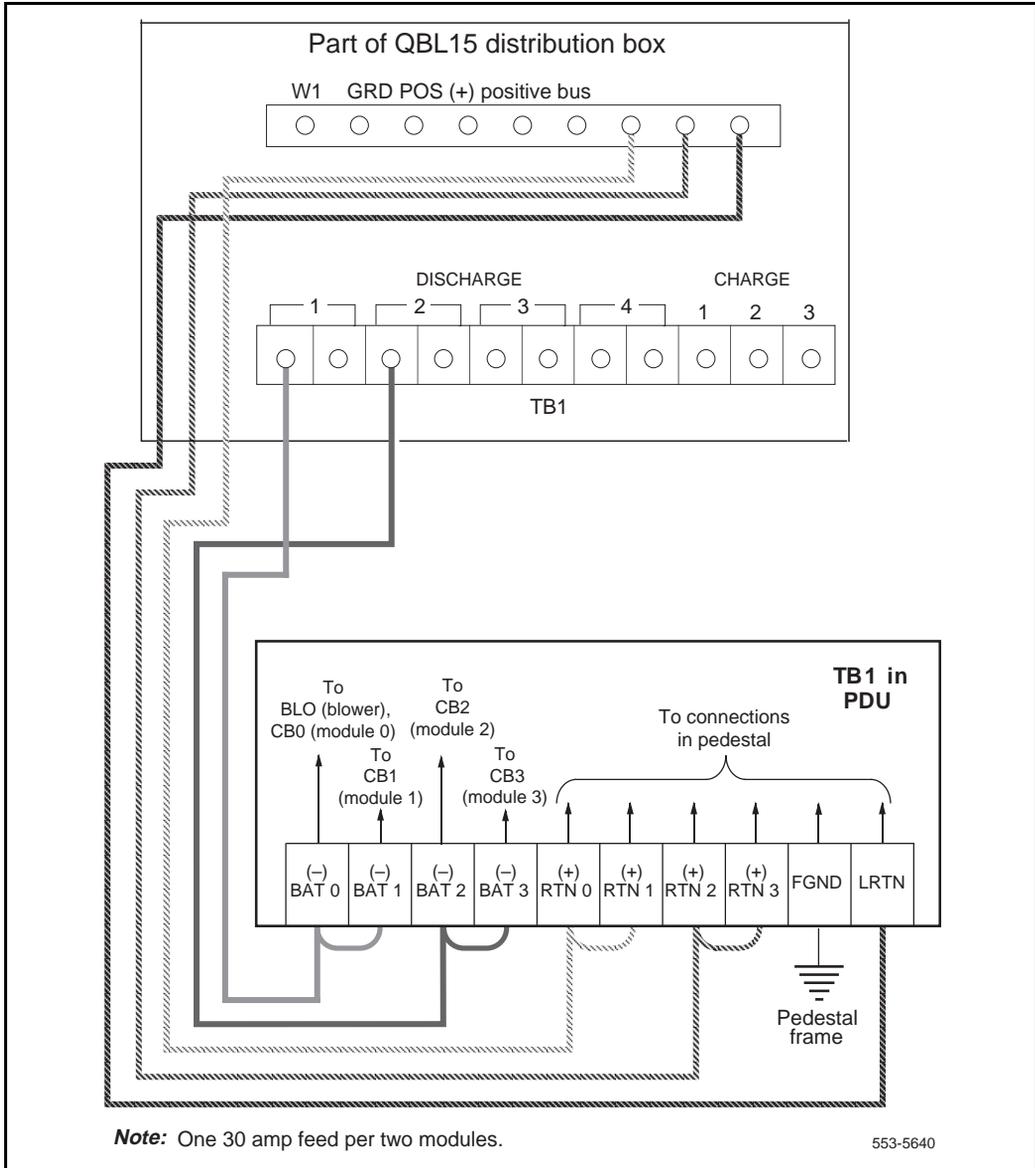
Connecting UK power to the NT7D10 PDU

Use the following procedure for each column to connect the external power supply to the pedestal.

The –48V (BAT), +48V (RTN), and logic return (LRTN) wires must be installed in conduit, and must be installed in the same conduit.

1   Open the front panel on the 8B/2R or 8B/4R master power cabinet.

2   Remove the PDU to access the field wiring terminal block (TB1) in the bottom of the pedestal:

- Remove the backplane cover on the I/O assembly in module 0.

- From the PDU end, disconnect the power plug (J1) and system monitor ribbon cable between module 0 and the PDU.

Note: To disconnect the power plug, you must press a latch trip on the front and rear of the plug. You may need to use a screwdriver blade against the latch trip on the front of the plug.

- If the module has an SDI paddle board installed on the backplane, temporarily remove it to avoid damage.

- Disconnect cables to the system monitor faceplate.

- Loosen the retaining screws that secure the PDU.

3   If required, install a junction box near the appropriate pedestal. Insert the conduit from the junction box into one of the conduit access holes in the pedestal (see Figure 165).

Connect the wires from the junction box to the matching connections on TB1 in the pedestal:

- Connect the red wires, BAT0 through BAT3.

- Connect the black wires, RTN0 through RTN3.

- Connect the remaining wire (which is usually orange), LRTN.

   If a junction box is used, the connections described in Steps 3 through 5 apply to the junction box rather than the pedestal.

4   Connect red-BAT wiring from any of the terminals 1 to 8 on the –VE distribution rail of the master power cabinet to terminal block TB1 in the bottom of the pedestal. See Figure 166.

Figure 165
QBL12 pedestal conduit access hole locations
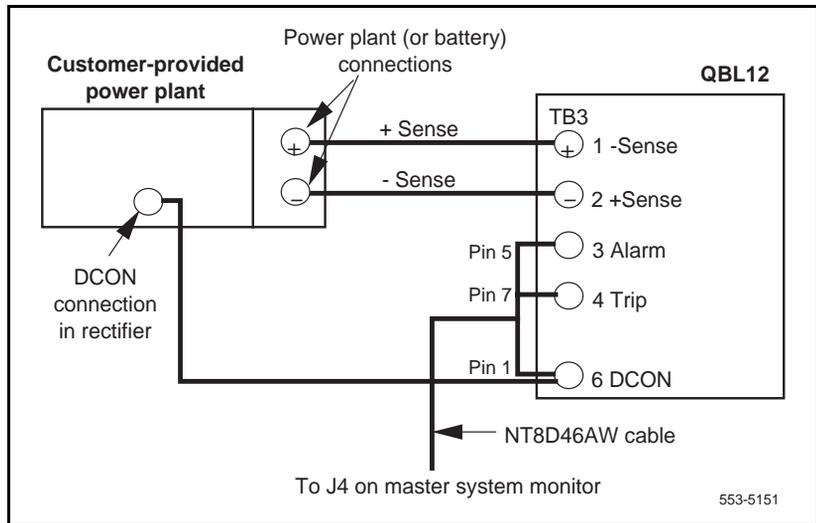
Since one wire is used to feed –48 V to two UEMs (total of two red wires for ?BAT connections) connect as follows:

- For UEM 0 and UEM 1, connect to –BAT0 and add a strap (if not already installed) between –BAT0 and –BAT1 in the pedestal or in the junction box if one is provided.

- For UEM 2 and UEM 3, connect to –BAT2 and add a strap (if not already installed) between –BAT2 and –BAT3 in the pedestal or in the junction box if one is provided.

5 Connect the RTN wiring (black wires) from the +VE BUS in the master power cabinet to terminal block TB1 in the bottom of the pedestal. See Figure 166.

Since one wire is used to feed +48 V to two UEMs (total of two black wires for +RTN connections) connect as follows:

- For UEM 0 and UEM 1, connect to +RTN0 and add a strap (if not already installed) between +RTN0 and +RTN1 in the pedestal or in the junction box if one is provided.

- For UEM 2 and UEM 3, connect to +RTN2 and add a strap (if not already installed) between +RTN2 and +RTN3 in the pedestal or in the junction box if one is provided.

6 Connect an orange #8 AWG LRTN wire from the logic return equalizer (LRE) in the rear of the master power cabinet to LRTN on terminal block TB1 in the pedestal. See Figure 166.

7 Reinstall the PDU:

- Unseat the blower unit in the front of the pedestal. Set the switch on the front of the unit to OFF (down). Slide the unit out approximately 75 mm (3 in).

- Insert the PDU and secure it with its retaining screws.

- Insert the blower unit until it is properly plugged into the PDU. Set the switch to ON.

- Reconnect the system monitor and power cables from module 0 to the pedestal.

- Reinstall the SDI paddle board on the backplane if it was removed.

- Reinstall the backplane cover.

- Reconnect any cables that were disconnected from the system monitor.

8 Replace the rear and top covers of the master power cabinet.

Figure 166
UEM to 8R/2R or 8B/4R master power cabinet connections
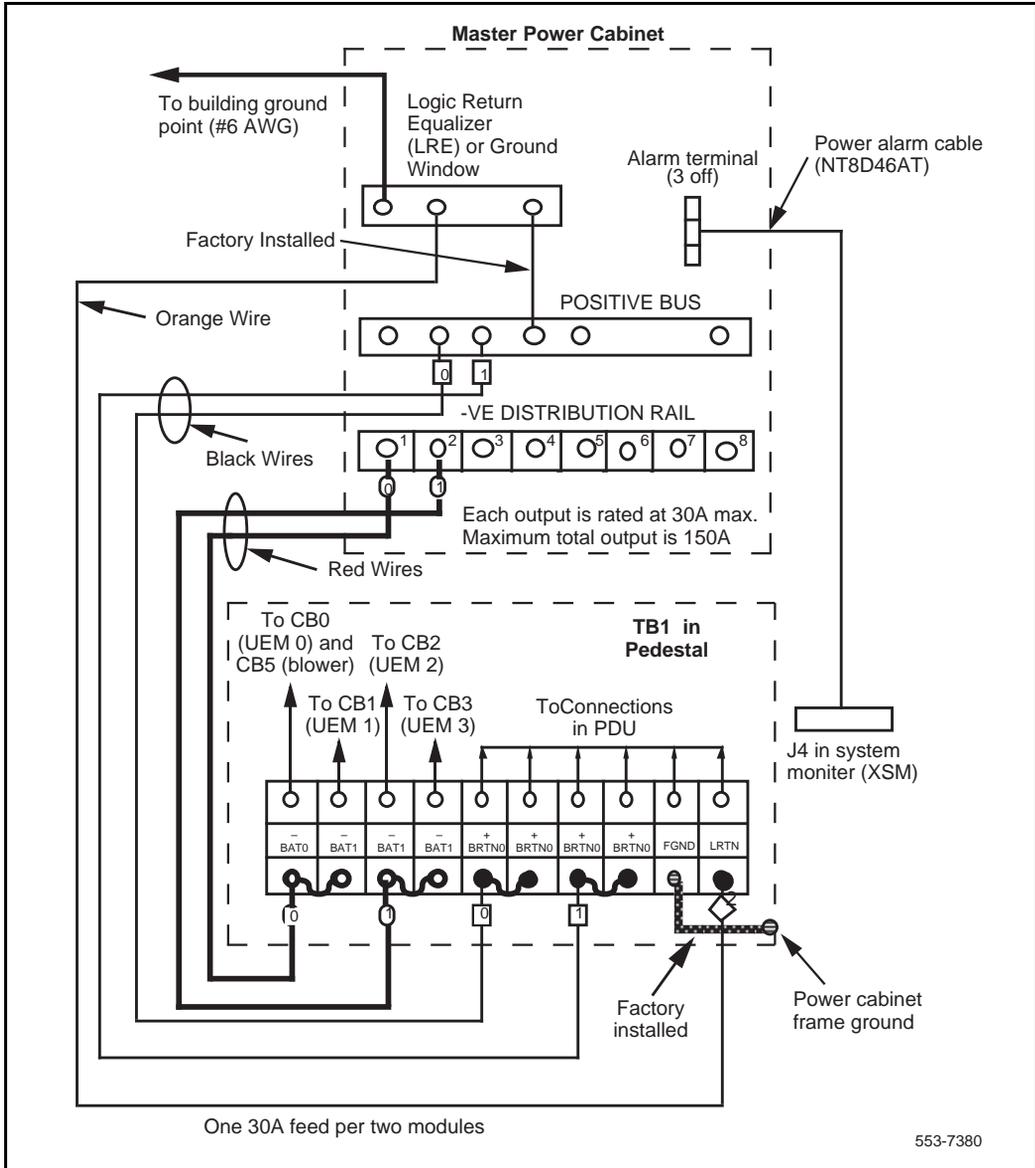
Appendix C: Backplane cabling in NT8D11 and NT8D37 modules

In the backplane configurations in NT8D11 (AC and DC vintage) CE/PE Modules and NT8D37 (AA and DC vintage) IPE Modules, some slots on the backplane are fully cabled to accommodate 24 tip and ring pairs (three cable connectors). Most of the backplane slots, however, accommodate 16 pairs (two cable connectors).

In the 7-cable configuration for the backplane in the NT8D11 CE/PE Module, cables D, G, and L are not used. Those cables are used in the 10-cable expanded configuration (NT8D11BC, NT8D11ED, and later vintage modules).

Table 110 lists cable connections for the 7-cable configuration. Figure 167 shows the backplane slots, and Figure 168 shows the external I/O panel designations.

In the 12-cable configuration for the backplane in the NT8D37 IPE Module, cables D, H, N, and U are not used. Those cables are used in the 16-cable expanded configuration (NT8D37BA, EC, and later vintage modules).

Table 111 lists cable connections in the 12-cable configuration. Figure 169 shows the backplane slots, and Figure 170 shows the external I/O panel designations.

Table 110
NT8D11 cable connections for 7-cable configuration

Backplane slots-shroud rows			I/O panel/cable designation
L0-1	L0-2	L0-3	A
L1-1	L1-2	L2-1	B
L2-2	L3-1	L3-2	C
L4-1	L4-2	L5-1	E
L5-2	L6-1	L6-2	F
L7-1	L7-2	L8-1	H
L8-2	L9-1	L9-2	K
Note: Cables D, G, and L are not used in this configuration.			

Figure 167
NT8D11 backplane cable designations for 7-cable configuration
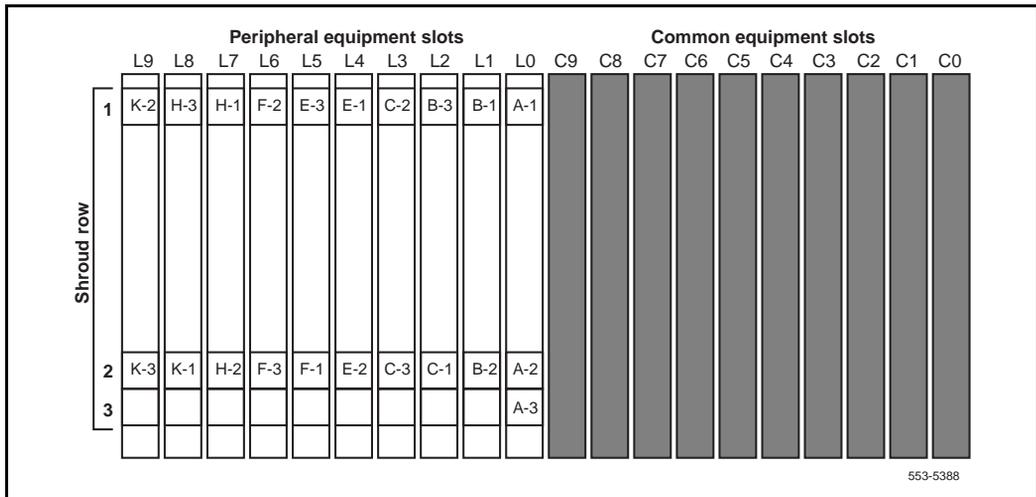
Figure 168
NT8D11 CE/PE Module I/O panels for 7-cable configuration

Left

Right

Note: In the expanded backplane configuration, connectors D, G, and L are used.

553-3138
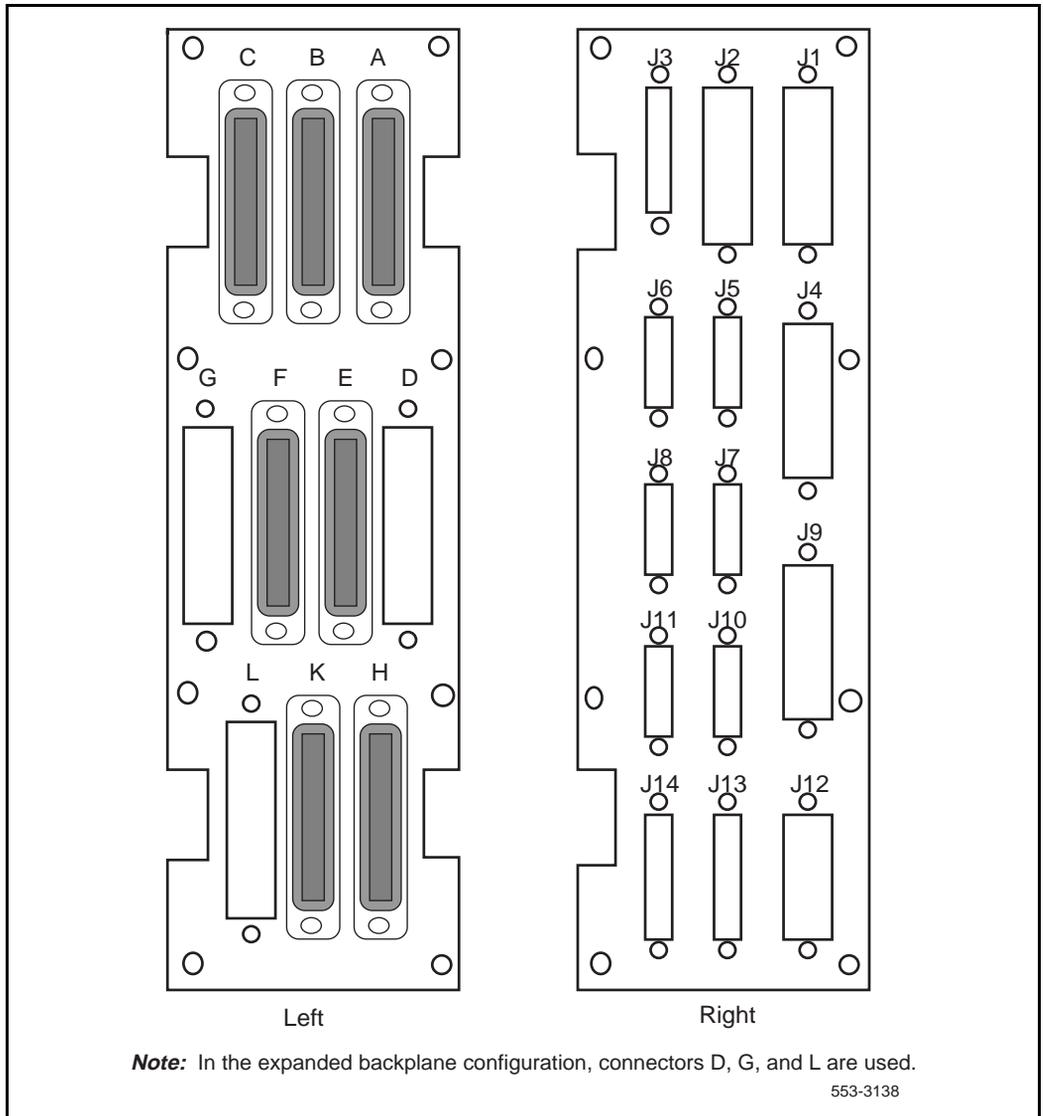
Table 111
NT8D37 cable connections for 12-cable configuration

Backplane slots-shroud rows			I/O panel/cable designation
L0–1	L0–2	L0–3	A
L1–1	L1–2	L2–1	B
L2–2	L3–1	L3–2	C
L4–1	L4–2	L4–3	E
L5–1	L5–2	L6–1	F
L6–2	L7–1	L7–2	G
L8–1	L8–2	L8–3	K
L9–1	L9–2	L10–1	L
L10–1	L11–2	L11–2	M
L12–1	L12–2	L12–3	R
L13–1	L13–2	L14–1	S
L14–2	L15–1	L15–2	T
Note: Cables D, H, N, and U are not used in this configuration.			

Figure 169
NT8D37 backplane cable designations for 12-cable configuration
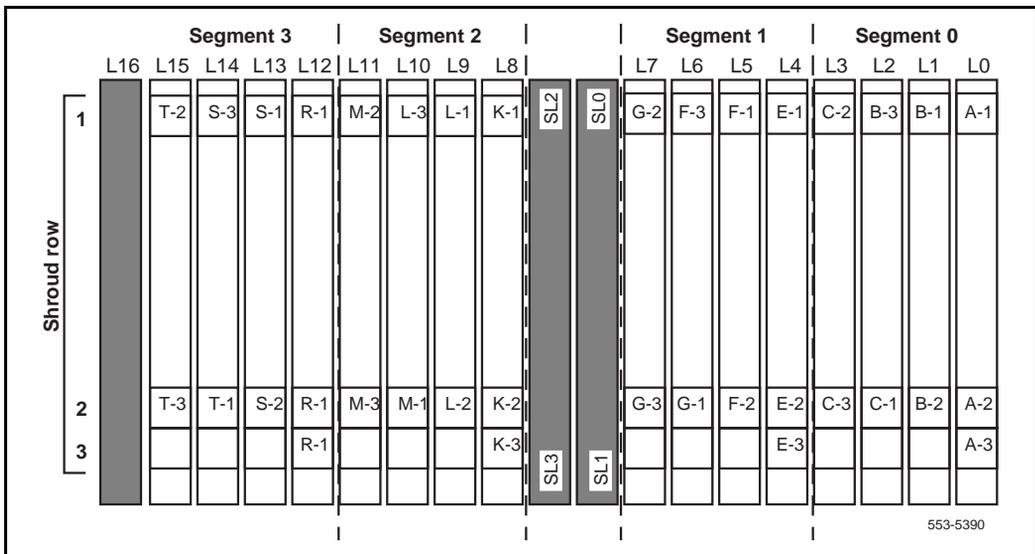
Figure 170
NT8D37 IPE Module I/O panels for 12-cable configuration

Left

Right

Note: In the expanded backplane configuration, connectors D, H, N, and U are used.

553-3137
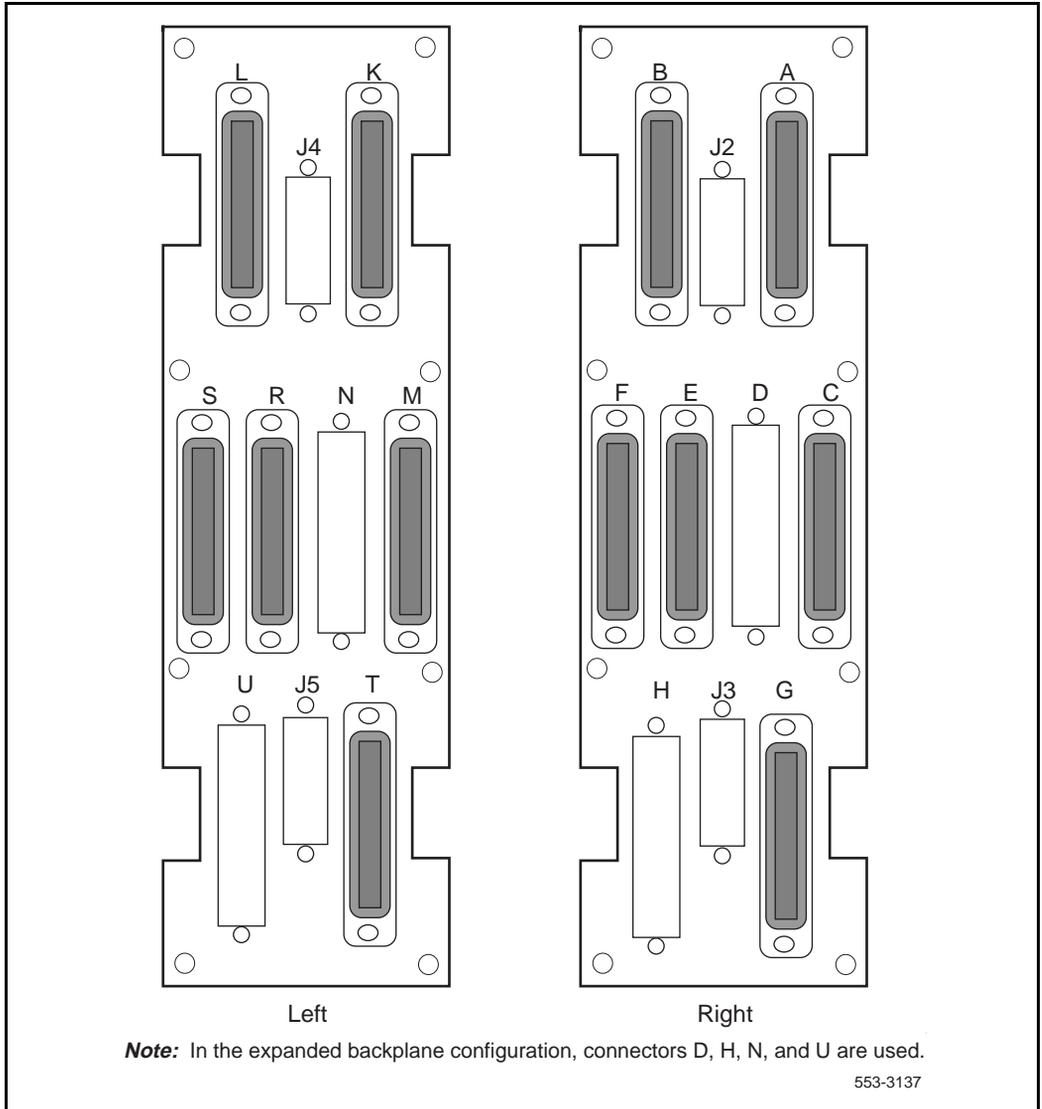
I/O panel connections

Note: The corner vertical channels in the rear of the module are outside of the EMI shield. Cables in those vertical channels must be shielded, and must enter and exit the EMI-shielded area through I/O panels and adapters.

WARNING
Electrical shock hazard
Tip, ring, A, B, E, M, ESC, and ESCG connections may be considered to be Telecommunications Network Voltages (TNV).

---

1   Select an appropriate number of NE-A25B (or equivalent) cables long enough to run from the I/O panels on the rear of the module to the MDF.

2   Attach a tag that shows the module number and the I/O connector designation to both ends of each cable.

3   Connect each cable to the appropriate connector on the I/O panel and run the cables to the MDF.

4   Terminate each cable on the cross-connect block designated with the appropriate module number.

   Note: Refer to "Planning and designating the Modular Distribution Frame (MDF)" on page 67 for information on the MDF layout.

5   Make sure all cables are neatly run, properly seated, and secured with cable ties.

Connecting lines and trunks

Throughout this procedure, make sure wiring is not reversed and is on the proper terminals. Allow enough slack in the wiring to allow tracing and to reconnect wires if they break at the terminal.

1   Extend incoming wiring (such as cables from the central office or wiring from a recorded announcement machine) to the MDF and terminate them on separate connecting blocks.

2   Assign and record terminal numbers (TNs) for each line or trunk. Determine the location of the line or trunk connection and its assigned TN from the work order or assignment records.

3   Connect each line and trunk to the TN using cross-connecting wire (typically 24 AWG type-Z wire). Table 112 lists pair-termination tables for line and trunk cards in NT8D11 (AC and DC vintage) CE/PE modules and NT8D37 (AA and DC vintage) IPE Modules.

4   Cross-connect incoming wiring and lines and trunks at the MDF.

Table 112
Line and trunk pair-termination tables

	NT8D11 CE/PE Module	NT8D37 IPE Module
Line cards	Tables 113 through 115	Tables 123 through 125
Trunk cards	NT8D14 Universal Trunk Card: Tables 115, 116	NT8D14 Universal Trunk Card: Tables 126 through 128
	NT8D15 E&M Trunk Card: Tables 117 through 122	NT8D15 E&M Trunk Card: Tables 129 through 137

Table 113
NT8D11 CE/PE Module: line card pair-terminations for connectors A, B, E, and H (7-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16 per card
			A	B	E	H	
1T/1R	26/1	W-BL/BL-W	slot 0	slot 1	slot 4	slot 7	0
2T/2R	27/2	W-O/O-W					1
3T/3R	28/3	W-G/G-W					2
4T/4R	29/4	W-BR/BR-W					3
5T/5R	30/5	W-S/S-W					4
6T/6R	31/6	R-BL/BL-R					5
7T/7R	32/7	R-O/O-R					6
8T/8R	33/8	R-G/G-R					7
9T/9R	34/9	R-BR/BR-R					8
10T/10R	35/10	R-S/S-R					9
11T/11R	36/11	BK-BL/BL-BK					10
12T/12R	37/12	BK-O/O-BK					11
13T/13R	38/13	BK-G/G-BK					12
14T/14R	39/14	BK-BR/BK-BR					13
15T/15R	40/15	BK-S/S-BK					14
16T/16R	41/16	Y-BL/BL-Y					15
17T/17R	42/17	Y-O/O-Y		slot 2	slot 5	slot 8	0
18T/18R	43/18	Y-G/G-Y					1
19T/19R	44/19	Y-BR/BR-Y					2
20T/20R	45/20	Y-S/S-Y					3
21T/21R	46/21	V-BL/BL-V					4
22T/22R	47/22	V-O/V-O					5
23T/23R	48/23	V-G/G-V					6
24T/24R	49/24	V-BR/BR-V					7
25T/25R	50/25	V-S/S-V					Spare

Table 114
NT8D11 CE/PE Module: line card pair-terminations for connectors C, F, and K (7-cable)

Pair	Pins	Pair color	I/O panel connector			Unit 16 per card
			C	F	K	
1T/1R	26/1	W-BL/BL-W	slot 2	slot 5	slot 8	8
2T/2R	27/2	W-O/O-W				9
3T/3R	28/3	W-G/G-W				10
4T/4R	29/4	W-BR/BR-W				11
5T/5R	30/5	W-S/S-W				12
6T/6R	31/6	R-BL/BL-R				13
7T/7R	32/7	R-O/O-R				14
8T/8R	33/8	R-G/G-R				15
9T/9R	34/9	R-BR/BR-R	slot 3	slot 6	slot 9	0
10T/10R	35/10	R-S/S-R				1
11T/11R	36/11	BK-BL/BL-BK				2
12T/12R	37/12	BK-O/O-BK				3
13T/13R	38/13	BK-G/G-BK				4
14T/14R	39/14	BK-BR/BK-BR				5
15T/15R	40/15	BK-S/S-BK				6
16T/16R	41/16	Y-BL/BL-Y				7
17T/17R	42/17	Y-O/O-Y				8
18T/18R	43/18	Y-G/G-Y				9
19T/19R	44/19	Y-BR/BR-Y				10
20T/20R	45/20	Y-S/S-Y				11
21T/21R	46/21	V-BL/BL-V				12
22T/22R	47/22	V-O/V-O				13
23T/23R	48/23	V-G/G-V				14
24T/24R	49/24	V-BR/BR-V				15
25T/25R	50/25	V-S/S-V				Spare

Table 115
NT8D11 CE/PE Module: NT8D14 pair-terminations for connectors A, B, E, and H (7-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			A	B	E	H	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 0	slot 1	slot 4	slot 7	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y					7
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y	spare	slot 2	slot 5	slot 8	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V					3

Note: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 116
NT8D11 CE/PE Module: NT8D14 pair-terminations for connectors C, F, and K (7-cable)

Lead designations			Pins	Pair color	I/O panel connectors			Unit
RAN mode	Paging mode	Other modes			C	F	K	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 2	slot 5	slot 8	4
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W				5
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R				6
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R				7
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	slot 3	slot 6	slot 9	0
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK				1
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR				2
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y				3
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y				4
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y				5
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O				6
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V				7

Note: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 117
NT8D11 CE/PE Module: NT8D15 2-wire paging mode pair-terminations for connectors A, B, E, and H (7-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	**B**	**E**	**H**	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 0	slot 1	slot 4	slot 7	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3
0T/0R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y	spare	slot 2	slot 5	slot 8	0
1T/1R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V					1

Table 118
NT8D11 CE/PE Module: NT8D15 2-wire paging mode pair-terminations for connectors C, F, and K (7-cable)

Pair	Pins	Pair color	I/O panel connectors			Unit
			C	**F**	**K**	
2T/2R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 2	slot 5	slot 8	2
3T/3R A/PG	30/5 33/8	W-S/S-W R-G/G-R				3
0T/0R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	slot 3	slot 6	slot 9	0
1T/1R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y				1
2T/2R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y				2
3T/3R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V				3

Table 119
NT8D11 CE/PE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors A, B, E, and H (7-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	**B**	**E**	**H**	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 0	slot 1	slot 4	slot 7	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3
0T/0R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y	spare	slot 2	slot 5	slot 8	0
1T/1R E/M	46/21 48/23	V-BL/BL-V V-G/BR-G					1

Table 120
NT8D11 CE/PE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors C, F, and K (7-cable)

Pair	Pins	Pair color	I/O panel connectors			Unit
			C	**F**	**K**	
2T/2R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 2	slot 5	slot 8	2
3T/3R E/M	30/5 32/7	W-S/S-W R-O/O-R				3
0T/0R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK	slot 3	slot 6	slot 9	0
1T/1R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK				1
2T/2R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y				2
3T/3R E/M	46/21 48/23	V-BL/BL-V V-G/BR-G				3

Table 121
NT8D11 CE/PE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors A, B, E, and H (7-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			A	B	E	H	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 0	slot 1	slot 4	slot 7	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y					3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	spare	slot 2	slot 5	slot 8	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BL/BL-V V-O/O-V V-G/G-V V-BR/BR-V					1
Note: TA/TB is the transmit pair; RA/RB is the receive pair.								

Table 122
NT8D11 CE/PE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors C, F, and K (7-cable)

Lead designations		Pins	Pair color	I/O panel connectors			Unit
Type 1	Type 2			C	F	K	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 2	slot 5	slot 8	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R				3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK	slot 3	slot 6	slot 9	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y				1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y				2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BL/BL-V V-O/O-V V-G/G-V V-BR/BR-V				3
Note: TA/TB is the transmit pair; RA/RB is the receive pair.							

Table 123
NT8D37 IPE Module: line card pair-terminations for connectors A, E, K, and R (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16/card
			A	**E**	**K**	**R**	
1T/1R	26/1	W-BL/BL-W	slot 0	slot 4	slot 8	slot 12	0
2T/2R	27/2	W-O/O-W					1
3T/3R	28/3	W-G/G-W					2
4T/4R	29/4	W-BR/BR-W					3
5T/5R	30/5	W-S/S-W					4
6T/6R	31/6	R-BL/BL-R					5
7T/7R	32/7	R-O/O-R					6
8T/8R	33/8	R-G/G-R					7
9T/9R	34/9	R-BR/BR-R					8
10T/10R	35/10	R-S/S-R					9
11T/11R	36/11	BK-BL/BL-BK					10
12T/12R	37/12	BK-O/O-BK					11
13T/13R	38/13	BK-G/G-BK					12
14T/14R	39/14	BK-BR/BK-BR					13
15T/15R	40/15	BK-S/S-BK					14
16T/16R	41/16	Y-BL/BL-Y					15

Table 124
NT8D37 IPE Module: line card pair-terminations for connectors B, F, L, and S (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16/card
			B	**F**	**L**	**S**	
1T/1R	26/1	W-BL/BL-W	slot 1	slot 5	slot 9	slot 13	0
2T/2R	27/2	W-O/O-W					1
3T/3R	28/3	W-G/G-W					2
4T/4R	29/4	W-BR/BR-W					3
5T/5R	30/5	W-S/S-W					4
6T/6R	31/6	R-BL/BL-R					5
7T/7R	32/7	R-O/O-R					6
8T/8R	33/8	R-G/G-R					7
9T/9R	34/9	R-BR/BR-R					8
10T/10R	35/10	R-S/S-R					9
11T/11R	36/11	BK-BL/BL-BK					10
12T/12R	37/12	BK-O/O-BK					11
13T/13R	38/13	BK-G/G-BK					12
14T/14R	39/14	BK-BR/BK-BR					13
15T/15R	40/15	BK-S/S-BK					14
16T/16R	41/16	Y-BL/BL-Y					15
17T / 17R	42 / 17	Y-O / O-Y	slot 2	slot 6	slot 10	slot 14	0
18T / 18R	43 / 18	Y-G / G-Y					1
19T / 19R	44 / 19	Y-BR / BR-Y					2
20T / 20R	45 / 20	Y-S / S-Y					3
21T / 21R	46 / 21	V-BL / BL-V					4
22T / 22R	47 / 22	V-O / V-O					5
23T / 23R	48 / 23	V-G / G-V					6
24T / 24R	49 / 24	V-BR / BR-V					7
25T / 25R	50 / 25	V-S / S-V					Spare

Table 125
NT8D37 IPE Module: line card pair-terminations for connectors C, G, M, and T (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit 16/card
			C	G	M	T	
1T/1R	26/1	W-BL/BL-W	slot 2	slot 6	slot 10	slot 14	8
2T/2R	27/2	W-O/O-W					9
3T/3R	28/3	W-G/G-W					10
4T/4R	29/4	W-BR/BR-W					11
5T/5R	30/5	W-S/S-W					12
6T/6R	31/6	R-BL/BL-R					13
7T/7R	32/7	R-O/O-R					14
8T/8R	33/8	R-G/G-R					15
9T / 9R	34 / 9	R-BR / BR-R	slot 3	slot 7	slot 11	slot 15	0
10T / 10R	35 / 10	R-S / S-R					1
11T / 11R	36 / 11	BK-BL / BL-BK					2
12T / 12R	37 / 12	BK-O / O-BK					3
13T / 13R	38 / 13	BK-G / G-BK					4
14T / 14R	39 / 14	BK-BR / BK-BR					5
15T / 15R	40 / 15	BK-S / S-BK					6
16T / 16R	41 / 16	Y-BL / BL-Y					7
17T / 17R	42 / 17	Y-O / O-Y					8
18T / 18R	43 / 18	Y-G / G-Y					9
19T / 19R	44 / 19	Y-BR / BR-Y					10
20T / 20R	45 / 20	Y-S / S-Y					11
21T / 21R	46 / 21	V-BL / BL-V					12
22T / 22R	47 / 22	V-O / V-O					13
23T / 23R	48 / 23	V-G / G-V					14
24T / 24R	49 / 24	V-BR / BR-V					15
25T / 25R	50 / 25	V-S / S-V					Spare

Table 126
NT8D37 IPE Module: NT8D14 pair-terminations for connectors A, E, K, and R (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			A	E	K	R	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y					7
Note: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.									

Table 127
NT8D37 IPE Module: NT8D14 pair-terminations for connectors B, F, L, and S (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			B	F	L	S	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					3
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R					4
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK					5
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR					6
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y					7
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					1
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O					2
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V					3

Note: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 128
NT8D37 IPE Module: NT8D14 pair-terminations for connectors C, G, M, and T (12-cable)

Lead designations			Pins	Pair color	I/O panel connectors				Unit
RAN mode	Paging mode	Other modes			C	G	M	T	
0T/0R CP/MB	0T/0R A/PG	0T/0R	26/1 27/2	W-BL/BL-W W-O/O-W	slot 2	slot 6	slot 10	slot 14	4
1T/1R CP/MB	1T/1R A/PG	1T/1R	28/3 29/4	W-G/G-W W-BR/BR-W					5
2T/2R CP/MB	2T/2R A/PG	2T/2R	30/5 31/6	W-S/S-W R-BL/BL-R					6
3T/3R CP/MB	3T/3R A/PG	3T/3R	32/7 33/8	R-O/O-R R-G/G-R					7
4T/4R CP/MB	4T/4R A/PG	4T/4R	34/9 35/10	R-BR/BR-R R-S/S-R	slot 3	slot 7	slot 11	slot 15	0
5T/5R CP/MB	5T/5R A/PG	5T/5R	36/11 37/12	BK-BL/BL-BK BK-O/O-BK					1
6T/6R CP/MB	6T/6R A/PG	6T/6R	38/13 39/14	BK-G/G-BK BK-BR/BK-BR					2
7T/7R CP/MB	7T/7R A/PG	7T/7R	40/15 41/16	BK-S/S-BK Y-BL/BL-Y					3
0T/0R CP/MB	0T/0R A/PG	0T/0R	42/17 43/18	Y-O/O-Y Y-G/G-Y					4
1T/1R CP/MB	1T/1R A/PG	1T/1R	44/19 45/20	Y-BR/BR-Y Y-S/S-Y					5
2T/2R CP/MB	2T/2R A/PG	2T/2R	46/21 47/22	V-BL/BL-V V-O/V-O					6
3T/3R CP/MB	3T/3R A/PG	3T/3R	48/23 49/24	V-G/G-V V-BR/BR-V					7

Note: Use LD 14 to select trunk termination impedance (600 ohm or 900 ohm). See the *X11 input/output guide* for information on LD 14.

Table 129
NT8D37 IPE Module: NT8D15 2-wire paging mode pair-terminations for connectors A, E, K, and R (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	**E**	**K**	**R**	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3

Table 130
NT8D37 IPE Module: NT8D15 2-wire paging mode pair-terminations for connectors B, F, L, and S (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			B	**F**	**L**	**S**	
0T/0R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R A/PG	30/5 33/8	W-S/S-W R-G/G-R					1
2T/2R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK					2
3T/3R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					3
0T/0R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V					1

Table 131
NT8D37 IPE Module: NT8D15 2-wire paging mode pair-terminations for connectors C, G, M, and T (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			C	G	M	T	
2T/2R A/PG	26/1 29/4	W-BL/BL-W W-BR/BR-W	slot 2	slot 6	slot 10	slot 14	2
3T/3R A/PG	30/5 33/8	W-S/S-W R-G/G-R					3
0T/0R A/PG	34/9 37/12	R-BR/BR-R BK-O/O-BK	slot 3	slot 7	slot 11	slot 15	0
1T/1R A/PG	38/13 41/16	BK-G/G-BK Y-BL/BL-Y					1
2T/2R A/PG	42/17 45/20	Y-O/O-Y Y-S/S-Y					2
3T/3R A/PG	46/21 49/24	V-BL/BL-V V-BR/BR-V					3

Table 132
NT8D37 IPE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors A, E, K, and R (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			A	E	K	R	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 0	slot 4	slot 8	slot 12	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3

Table 133
NT8D37 IPE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors B, F, L, and S (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			B	F	L	S	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 1	slot 5	slot 9	slot 13	0
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					1
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK					2
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					3
0T/0R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y	slot 2	slot 6	slot 10	slot 14	0
1T/1R E/M	46/21 48/23	V-BL/BL-V V-G/G-V					1

Table 134
NT8D37 IPE Module: NT8D15 2-wire type 1 mode pair-terminations for connectors C, G, M, and T (12-cable)

Pair	Pins	Pair color	I/O panel connectors				Unit
			C	G	M	T	
0T/0R E/M	26/1 28/3	W-BL/BL-W W-G/G-W	slot 2	slot 6	slot 10	slot 14	2
1T/1R E/M	30/5 32/7	W-S/S-W R-O/O-R					3
2T/2R E/M	34/9 36/11	R-BR/BR-R BK-BL/BL-BK	slot 3	slot 7	slot 11	slot 15	0
3T/3R E/M	38/13 40/15	BK-G/G-BK BK-S/S-BK					1
0T/0R E/M	42/17 44/19	Y-O/O-Y Y-BR/BR-Y					2
1T/1R E/M	46/21 48/23	V-BL/BL-V V-G/BR-G					3

Table 135
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors A, E, K, and R (12-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			A	E	K	R	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 0	slot 4	slot 8	slot 12	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y					3
Note: TA/TB is the transmit pair; RA/RB is the receive pair.								

Table 136
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors B, F, L, and S (12-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			B	F	L	S	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 1	slot 5	slot 9	slot 13	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y					3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y	slot 2	slot 6	slot 10	slot 14	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BL/BL-V V-O/O-V V-G/G-V V-BR/BR-V					1
Note: TA/TB is the transmit pair; RA/RB is the receive pair.								

Table 137
NT8D37 IPE Module: NT8D15 4-wire type 1 and type 2 mode pair-terminations for connectors C, G, M, and T (12-cable)

Lead designations		Pins	Pair color	I/O panel connectors				Unit
Type 1	Type 2			C	G	M	T	
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	26/1 27/2 28/3 29/4	W-BL/BL-W W-O/O-W W-G/G-W W-BR/BR-W	slot 2	slot 6	slot 10	slot 14	2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	30/5 31/6 32/7 33/8	W-S/S-W R-BL/BL-R R-O/O-R R-G/G-R					3
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	34/9 35/10 36/11 37/12	R-BR/BR-R R-S/S-R BK-BL/BL-BK BK-O/O-BK	slot 3	slot 7	slot 11	slot 15	0
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	38/13 39/14 40/15 41/16	BK-G/G-BK BK-BR/BR-BK BK-S/S-BK Y-BL/BL-Y					1
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	42/17 43/18 44/19 45/20	Y-O/O-Y Y-G/G-Y Y-BR/BR-Y Y-S/S-Y					2
TA/TB RA/RB E/M ESC/ESCG	TA/TB RA/RB EA/EB MA/MB	46/21 47/22 48/23 49/24	V-BL/BL-V V-O/O-V V-G/G-V V-BR/BR-V					3
Note: TA/TB is the transmit pair; RA/RB is the receive pair.								

Backplane cable expansion

You can reconfigure NT8D11 (AC and DC vintage) CE/PE and NT8D37 (AA and DC vintage) IPE Modules for expanded cabling. By adding and reconfiguring cable ends in the backplane slots, 24 pairs can be connected to each backplane slot.

Note: When backplane slots are reconfigured for expanded cabling, the labeling for NT8D11 CE/PE and NT8D37 IPE Modules must be changed at the MDF to reflect the change in the backplane slots.

To cable lines and trunks with expanded backplane configurations, go to "Cabling lines and trunks" on page 203.

NT8D11 CE/PE Modules

In the NT8D11 Modules, cabling for the first four IPE slots can be expanded using one NT8D81AA Cable/Filter Assembly. Cabling for all of the IPE slots can be expanded using three NT8D81AA Cable/Filter Assemblies.

Note: The first IPE slot is already fully cabled for 24 pairs, so no change is required for that slot.

NT8D11 backplane cable expansion: first four IPE slots only

1   Leave cable A as is in slot position L0.

2   Move cable end B-3 to slot position L1-3.

3   Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.

4   Add cable D to the I/O panel by connecting cable ends D-1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.

Note: Cables E, F, H, and K remain the same. Cable positions G and L are open for further expansion.

5   Label the MDF for one cable for each of the first four IPE slots.

NT8D11 backplane cable expansion: all IPE slots

1   Leave cable A as is in slot position L0.

2   Move cable end B-3 to slot position L1-3.

3   Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.

4   Add cable D to the I/O panel by connecting cable ends D-1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.

5   Move cable end E-3 to slot position L4-3.

6   Remove cable F from the backplane and connect cable ends F-1, F-2, and F-3 to slot positions L5-1, L5-2, and L5-3.

7   Add cable G to the I/O panel by connecting cable ends G-1, G-2, and G-3 to slot positions L6-1, L6-2, and L6-3.

8   Move cable end H-3 to slot position L7-3.

9   Remove cable K from the backplane and connect cable ends K-1, K-2, and K-3 to slot positions L9-1, L9-2, and L9-3.

10 Add cable L to the I/O panel by connecting cable ends L-1, L-2, and L-3 to slot positions L9-1, L9-2, and L9-3.

11 Label the MDF to show one cable for each PE slot.

Table 138 lists cable connections for an expanded configuration.
Figure 171 shows the backplane slots in an expanded configuration.

Table 138
NT8D11 cable connections: expanded configuration

Backplane slots-shroud rows	I/O panel/cable designation
L0-1, 2, 3	A
L1-1, 2, 3	B
L2-1, 2, 3	C
L3-1, 2, 3	D (new cable)
L4-1, 2, 3	E
L5-1, 2, 3	F
L6-1, 2, 3	G (new cable)
L7-1, 2, 3	H
L8-1, 2, 3	K
L9-1, 2, 3	L (new cable)

Figure 171
NT8D11 backplane cable designations: expanded configuration
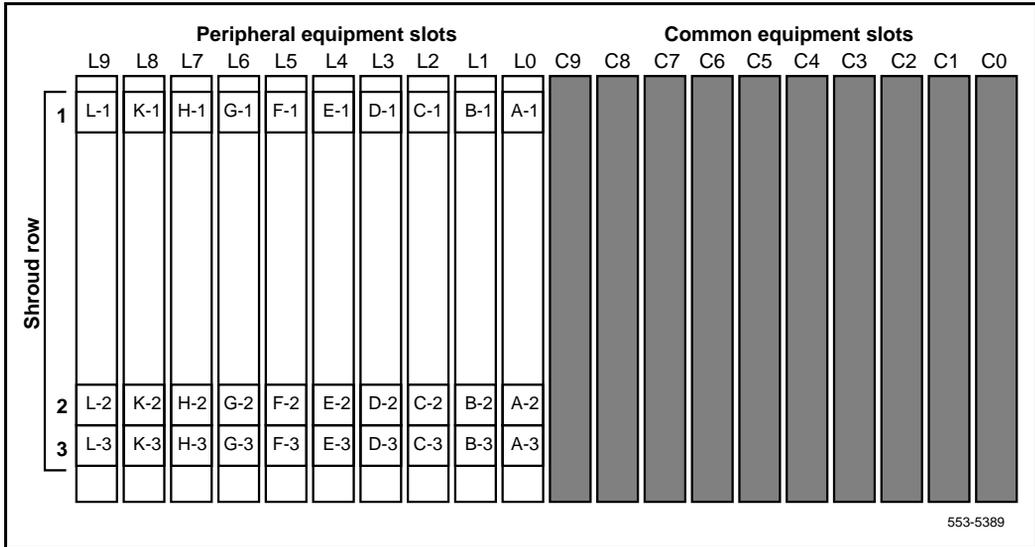
NT8D37 IPE Modules

In the NT8D37 Modules, cabling for each segment can be expanded using one NT8D81AA Cable/Filter Assembly. Cabling for the whole backplane can be expanded using four NT8D81AA Cable/Filter Assemblies.

Note: Backplane slots 0, 4, 8, and 12 (for cables A, E, K, and R) are already fully cabled for 24 pairs, so no change is required to those slots.

NT8D37 backplane cable expansion: Segment 0

1   Leave cable A as is in slot position L0.

2   Move cable end B-3 to slot position L1-3.

3   Remove cable C from the backplane and connect cable ends C-1, C-2, and C-3 to slot positions L2-1, L2-2, and L2-3.

4   Add cable D to the I/O panel by connecting cable ends D-1, D-2, and D-3 to slot positions L3-1, L3-2, and L3-3.

NT8D37 backplane cable expansion: Segment 1

1   Leave cable E as is in slot position L4.

2   Move cable end F-3 to slot position L5-3.

3   Remove cable G from the backplane and connect cable ends G-1, G-2, and G-3 to slot positions L6-1, L6-2, and L6-3.

4   Add cable H to the I/O panel by connecting cable ends H-1, H-2, and H-3 to slot positions L7-1, L7-2, and L7-3.

NT8D37 backplane cable expansion: Segment 2

1   Leave cable K as is in slot position L8.

2   Move cable end L-3 to slot position L9-3.

3   Remove cable M from the backplane and connect cable ends M-1, M-2, and M-3 to slot positions L10-1, L10-2, and L10-3.

4   Add cable N to the I/O panel by connecting cable ends N-1, N-2, and N-3 to slot positions L11-1, L11-2, and L11-3.

NT8D37 backplane cable expansion: Segment 3

1   Leave cable R as is in slot position L12.

2   Move cable end S-3 to slot position L13-3.

3   Remove cable T from the backplane and connect cable ends T-1, T-2, and T-3 to slot positions L14-1, L14-2, and L14-3.

4   Add cable U to the I/O panel by connecting cable ends U-1, U-2, and U-3 to slot positions L15-1, L15-2, and L15-3.

Table 139 lists cable connections for a fully expanded configuration. Figure 172 shows the backplane slots in a fully expanded configuration.

Table 139
NT8D37 cable connections: expanded configuration

Backplane slots-shroud rows	I/O panel/cable designation
L0-1, 2, 3	A
L1-1, 2, 3	B
L2-1, 2, 3	C
L3-1, 2, 3	D (new cable)
L4-1, 2, 3	E
L5-1, 2, 3	F
L6-1, 2, 3	G
L7-1, 2, 3	H (new cable)
L8-1, 2, 3	K
L9-1, 2, 3	L
L10-1, 2, 3	M
L11-1, 2, 3	N (new cable)
L12-1, 2, 3	R
L13-1, 2, 3	S
L14-1, 2, 3	T
L15-1, 2, 3	U (new cable)

Figure 172
NT8D37 backplane cable designations: expanded configuration
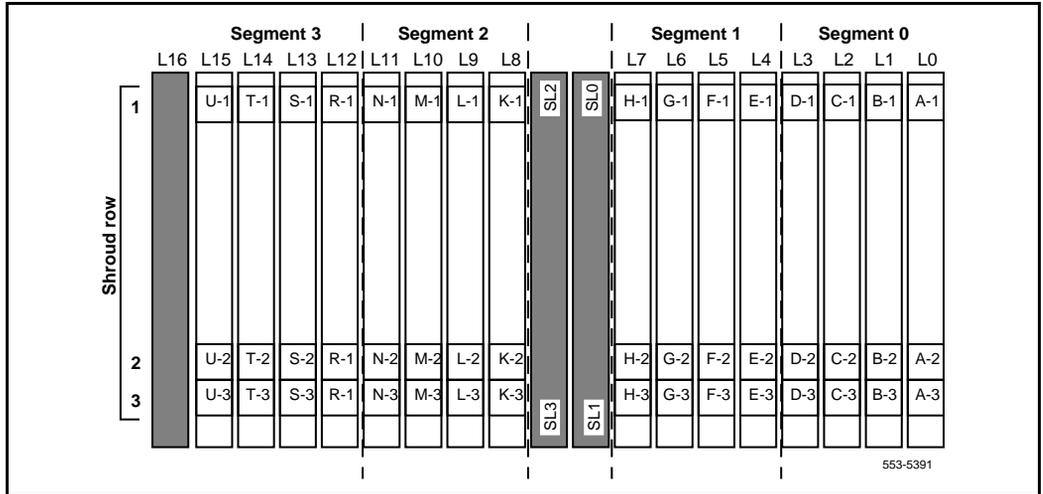
Appendix D: Customer supplied power equipment

For customers decide not to use Northern Telecom Power, Battery Back up or Distribution equipment, this appendix provides the following

— recommended grounding practices (strongly recommended)

— recommended alarm signals, which should be fed from customer power equipment to Meridian 1

— recommended power equipment features

System grounding and interconnection to Meridian 1

Figures 173 and 174 show the recommended method of grounding customer equipment.

Figure 173
Grounding and interconnection of customer Power equipment
to Meridian 1 using NT LRE
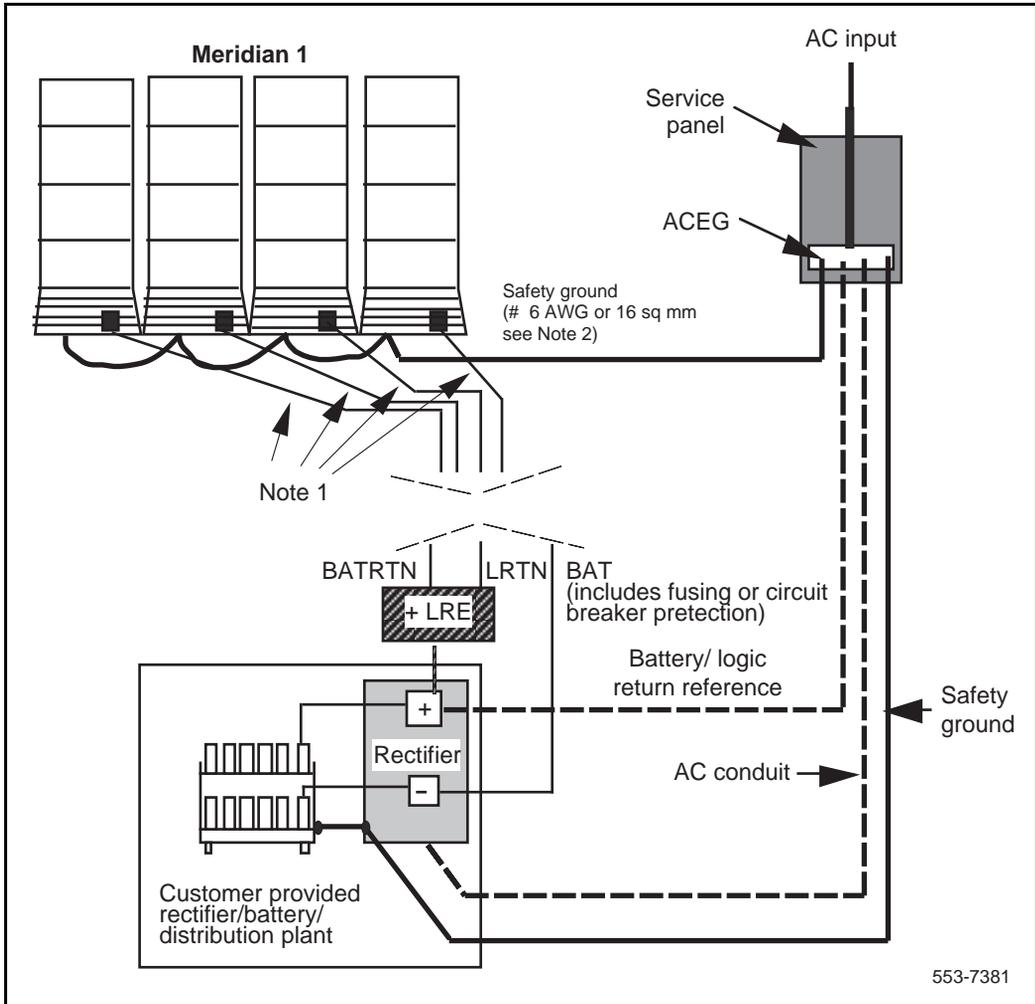
Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN conductors. If required the conductors can be run in conduit.

Note 2: With customer provided power equipment, the Meridian 1 frame requires a safety ground direct connection to the ACEG.

Note 3: The purpose of the LRE (logic return equalizer) is to provide a busbar where the logic return wires from different columns in a multiple column system are consolidated before connecting to the single point ground. The NT6D5303 large LRE is available from Northern Telecom for this purpose and is shown in Figure 173.

Note 4: Customers may also provide their own LRE within the power equipment for consolidation of logic return wires. This LRE must be connected to the Positive bar in the power equipment. The combined LRE/Positive bar must be connected to the single point ground, which is usually the AC Equipment Ground (ACEG) in the AC service panel. This configuration is shown in Figure 174.

Figure 174
Grounding and interconnection of customer Power equipment
to Meridian 1 using customer LRE
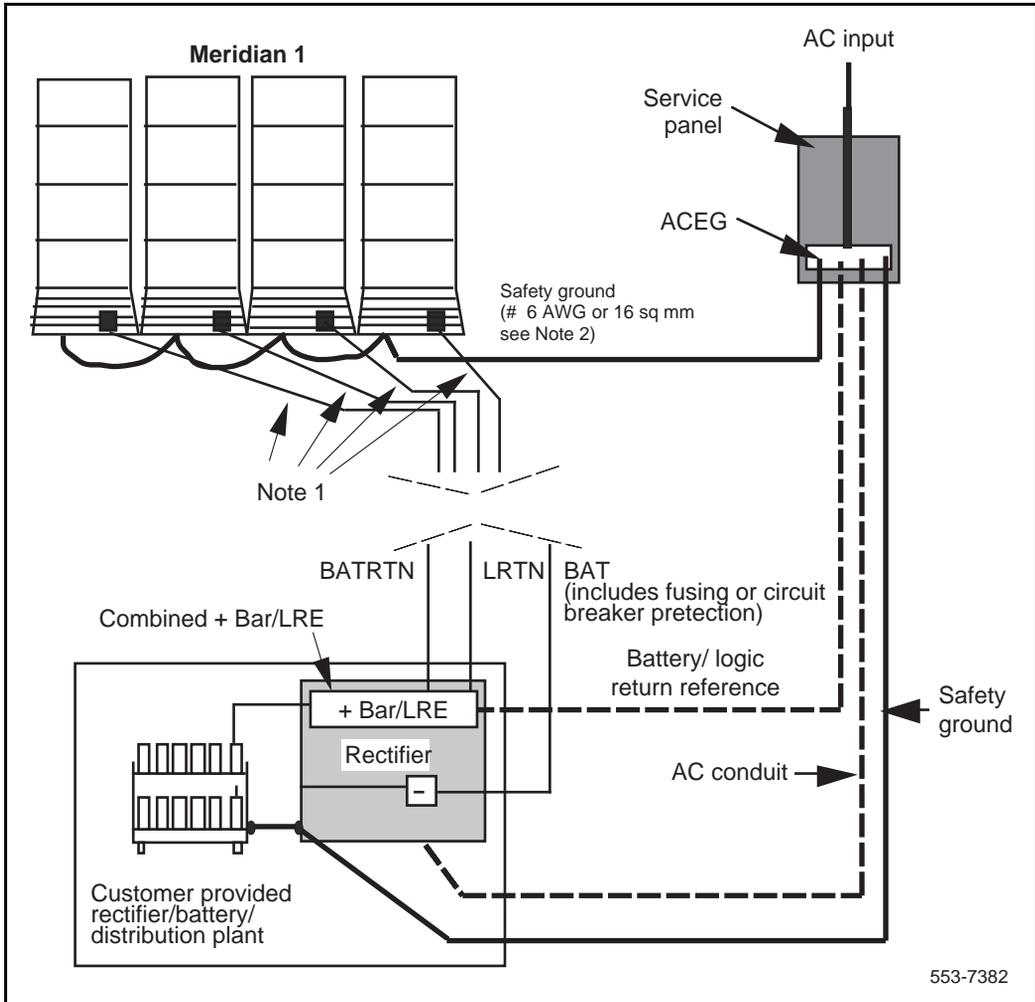
Note 1: DC power feeds to Meridian 1 pedestals. Each feed consists of two BAT (–), two BATRTN (+), and one LRTN conductors. If required the conductors can be run in conduit.

Note 2: With customer provided power equipment, the Meridian 1 frame requires a safety ground direct connection to the ACEG.

Power feed distribution

The customer should provide adequate fusing or circuit breakers in the power equipment that supplies the Meridian 1. The fuses or circuit breakers should be rated at 30 A for every two Meridian 1 modules.

For more information about connections to Power Distribution Unit in Meridian 1 pedestal, see Appendix A.

Recommended signal connections to Meridian 1 System Monitor

Several signal connections should be supplied from the customer power equipment to connector J4 on the NT8D22 system monitor located in the Meridian pedestal. These signal are as follows:

Alarm signal

This signal is normally an open circuit. It is grounded in the case of AC input voltage failure to the power system (resulting in the power system going on battery back up). This signal will activate the Meridian 1 cabinet LED and cause a CPU alert, which will then be registered on monitoring terminals. The alarm signal is pin 5 on connector J4 on the NT8D22 system monitor.

Trip signal

If the customer supplied equipment is not configured with a Low Voltage Disconnect feature that disconnects power to the load after severe discharging of the batteries, then this Trip signal may be used to trip the Meridian 1 circuit breakers and initiate a line transfer.

Note: If the customer power system is fitted with internal Low Voltage disconnect for battery protection, then this signal should not be used.

Typically a disconnect voltage is 42 Volts DC, to provide adequate protection of batteries. When the AC input voltage returns and the batteries are sufficiently recharged, the Meridian 1 power can be restored by switching the Meridian 1 circuit breakers.

The alarm signal is pin 7 on connector J4 on the NT8D22 system monitor. This signal is normally open circuit and is grounded when the Trip signal is activated.

The NT8D46AW cable may be used for providing both Alarm and Trip signals.

For more information, see Appendix A.

Recommended features on customer supplied power equipment

Current and Voltage Meters

Customer supplied power equipment should be fitted with meters, either analog or digital, to allow monitoring of both output voltage and output current.

Visual and Audible Alarms

Customer supplied power equipment should be fitted with visual alarms for the following fault conditions:

— Distribution Fuse or Distribution Circuit breaker trip

— AC Power Fail

— Individual Rectifier fail

Audible alarms may also be provided.

Batteries

To install reserve power equipment (batteries) the installer should follow the instructions provided with the equipment. The batteries shall be connected to ground by the connection of one battery terminal (typically the positive terminal) to the Single Point Ground.

Preventative maintenance as outlined in the battery manufactures installation guide must be carried out on a regular basis and the results logged.

UPS or Auxiliary Generator

When installing UPS equipment, follow the manufacturers documentation carefully. The UPS equipment must be grounded to the ACEG or the Building Ground Reference.

Appendix E: List of terms

AC

Alternating current

AC equipment ground (ACEG)

An insulated conductor, used to protect personnel from injury, that does not normally carry current. The ACEG is permanently bonded to the service panel ground and to metal parts of electrical equipment that do not normally carry current.

AWG

American wire gauge

Backplane

A printed circuit board that extends across the width of the card cage and connects to the circuit card connectors

Battery backup

System power furnished by stand-by batteries that are charged by a charger. If commercial power fails, the batteries will maintain service for a limited period of time, determined by the size of the batteries and the traffic on the system. (Also called battery reserves.)

Battery return (BR, BATRTN, or RTN)

A conductor that carries –48 V dc return current. Although battery return conductors are not grounding conductors, they must be referenced to ground by a single connection.

BTU

Bus terminating unit

Bus

A copper bar, plate, or conductor

Card cage

A frame for holding circuit cards in a module; also called a card chassis

CE/PE

Common equipment/peripheral equipment

CEC

Canadian Electrical Code

Central office (CO)

The site where a telephone company terminates customer lines and houses the switching equipment that interconnects those lines

Central processing unit (CPU)

The main portion of a computer that contains the primary storage, arithmetic and logic units, and the control unit (may also mean a mainframe computer)

Circuit cards

Circuit cards carry the electronics for particular functions (such as memory and switching functions). Most cards are housed in the card cage in a module and connect to the backplane. Some cards must be installed in dedicated slots in a card cage. (Also called circuit packs or boards.)

CMA

Changeover and memory arbitrator

CMDU

Core multi-drive unit

CNI

Core to network interface

Common equipment (CE)

A hardware subsystem that houses one or more central processing units (CPUs), memory cards, disk drive units, and service cards

CSA

Canadian Standards Association

DC

Direct current

DCE

Data communications equipment

DTE

Data terminal equipment

DTR

Digitone receiver

EEPE

Enhanced existing peripheral equipment

FDI

Floppy disk interface

FDU

Floppy disk unit

FG (or FGND)

Frame ground (safety ground)

Ground

A metallic connection, whether intentional or accidental, between an electric circuit or equipment and the earth, or some conducting body that serves in place of the earth. Typically, a connection to earth obtained by a grounding electrode.

Hz

Hertz (cycles per second)

IG

Isolated ground

Input/output (I/O)

      Exchange between a machine and end user equipment

IOP

      Input/output processor

IPB

      Inter-processor bus

IPE

      Intelligent peripheral equipment

LED

      Light emitting diode

Line

      A communications channel or circuit; an electrical path

Logic return (LR or LRTN)

      Sometimes referred to as logic ground, logic return is the voltage reference and current return path that is eventually connected to the single point ground for analog and digital circuits.

Logic return equalizer (LRE)

      The point at which all logic return wires are consolidated before connecting to the single point ground. Physically, the LRE function can be provided by a separate grounding bus bar, by the common battery return bus in a DC power distribution panel, or by the AC equipment ground in an isolated ground service panel.

Loop

      A bidirectional path between network equipment and peripheral equipment

MDF

      Main distribution frame (cross-connect terminal)

MDU

      Multi-disk unit

MFA150

150-amp modular, front access DC power system, rack style

Module power supplies

Individual power units that generate the different DC voltages required by the cards installed in each module

MPDU

Module power distribution unit

MPP600

600-amp modular DC power plant, cabinet style

MSI

Mass storage interface

NEC

National Electrical Code (U.S.A.)

Network equipment

A hardware subsystem that provides digital multiplexed switching for voice, data, and signaling paths

NT6D82

900-amp DC power system, rack style

Pedestal

The bottom element in a column. Each pedestal houses a blower or fan unit, an air filter, the PDU (which contains the column circuit breakers), and the system monitor. (The pedestal in system option 21A houses only the PDU.)

Peripheral equipment (PE)

A hardware subsystem that provides analog and digital line and trunk interfaces and houses a combination of line, trunk, and Digitone receiver circuit cards

PFTU

Power fail transfer unit

Power distribution unit (PDU)

Input power for Meridian 1 is brought into the pedestal to the PDU. The PDU distributes input power to the column.

QBL12

75-amp external DC power distribution unit

QBL15

150-amp external DC power distribution unit

QCA13

50–200-amp rectifier/distribution unit cabinet

RPE

Remote peripheral equipment

SDI

Serial data interface

Single point ground (SPG)

A single connection used to reference electronic equipment to ground; no DC current flows through the connection unless a fault condition exists.

System monitor

A microprocessor-based circuit card that controls and monitors the status of cooling equipment and power-related hardware and functions

System SPG

The point where frame ground, logic return, AC equipment ground, and battery return are connected to ground

TDS

Tone and digit switch

TN

Terminal number

Top cap

The top cap is mounted on the top module of each column. It provides airflow exits, EMI/RFI shielding, I/O cable entry and exit, and overhead cable rack mounting. The top cap covers thermal sensor assemblies for the column.

Trunk

A single circuit between two points, both of which are switching centers or individual distribution points

Universal equipment module (UEM)

A modular, self-contained hardware cabinet that houses a card cage, power supply, backplane, circuit cards, and other basic equipment. When equipped, the UEM becomes a specific type of module, such as a CPU Module or Network Module.

UPS

Uninterruptible power supply

V ac

Voltage alternating current

V dc

Voltage direct current

Index

Meridian 1

Meridian 1

System installation procedures

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