450-1011-201

Network Operations Systems

DNC-50, DNC-100, DNC-500 Dynamic Network Control Systems

Installation Guide for Cabinet Systems

Release: NSR27/28 03 Status: Standard

northern telecom

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Revision History

March 30, 1990

Release NSR27/28 03

Table 15-B, ALIU Options Settings, has been revised to include Alarm Output Options.

January 24, 1990

Release NSR27/28 02

The section "Installing the LAN Interface Unit" has been revised to include a caution message about the proper connection of power to the LIU.

Preface and back pages are revised to show the reissue date, and two blank preface pages have been removed.

November 10, 1989

Release NSR27/28 01.

This issue applies to both NSR27 and NSR28. It is reissued in its entirety because editing has resulted in paging changes.

Procedures for cleaning and operating the Cartridge Tape Drive were expanded to include the tape drive in the 1/4-wide tape SRU. It has a different orientation than the tape drive in the mass storage SRUs. These procedures are in Part 13.

May 12, 1989

Release NSR27 02.

This issue of the NTP is converted to a new document style.

Part 8 of this version contains more detailed instructions on cabling for SCSI file systems.

Table of Contents

1. Introduction

This document provides detailed installation instructions for cabinet-based DNC-50, DNC-100 and DNC-500 Dynamic Network Control Systems. (For rack-mounted systems, see the Installation Guide for Bay Systems, 450-1011-202.)

This document assumes that you are familiar with the equipment and are trained in telephony installation tasks. It also assumes that the system equipment has been delivered and all pre-installation planning and wiring tasks have been completed according to the Installation Planning Guide, 450-1011-200.

Document Release Information

The release information for this issue of this document is found on page 1. The information includes the 10-digit identification number for the practice, plus the following additional information:

(a) **Date:** This is the date the document was released for reproduction or printing. It is not intended to be the same as the software or product release date.

(b) **Product release:** This is the software or product release number associated with the current issue of the document, plus the issue number of document. The format is NSRaa bb, where:

- NSRaa is the Network Software Release number
- bb is a sequential issue number for the document that indicates how many times the document has been released with the specified software release.

(c) **Document release:** A rating code of Draft, Preliminary, or Standard is assigned to the document, reflecting the current status of the document.

How to Use this Document

This document consists of a number of parts. Each part is designed to help you install a particular type of equipment or to perform a specific installation task. Figures are provided with the step-by-step procedures.

A Summary of System Installation

The system is easily installed. The system cabinets are shipped fully assembled with all necessary components built in, except for the modular shared resource units (SRUs). Cable connections are fully connectorized or can be connectorized in the field at the customer's option.

Installation involves unpacking and positioning the cabinets, then interconnecting and leveling them. The SRUs are then inserted into their preassigned positions. Finally, the various cabling connections are made.

Most cabling connections are made to a standardized office cross-connect panel. It is assumed that the panel has been ordered and installed prior to system installation day. If not, ensure that it is installed according to Part 7. (Further pre-installation wiring instructions are available in NTP 555-3001-215, which can be ordered with the office cross-connect panel or separately.)

The pre-installation wiring contractor should have already made all wiring changes and additions, including jumpering between the cross-connect panel and the main distribution frame.

Some equipment, such as modem pools, may require special installation procedures. In such cases, refer to the manufacturer's documentation for special instructions. Also, there may be special environmental, electrical, or space requirements for equipment not supplied by Northern Telecom. Again, refer to the manufacturer's documentation for details.

The installation process follows this sequence, of which each step is detailed in a subsequent part of this installation guide:

(1) Prepare the floor area for the cabinets.

(2) Unpack the cabinets and position them in the designated area.

(3) Line up the cabinets, leveling and interconnecting them.

(4) Unpack and install the SRUs in their assigned positions according to the cabinet provisioning worksheet in the Site Records, 450-1011-152.

(5) Make cable connections as outlined in the wiring logs in the Site Records, 450-1011-152. This worksheet is located in the section titled ‘Wiring Log’. If applicable to your system, install the Alarm Interface Unit (per Part 15), connectorize cables for nonstandard cable lengths (per Part 16), and install the -48 V power system (per Part 17).

(6) Install the peripheral and external equipment according to the floor plan and wiring logs.

(7) When all connections have been made and verified, initialize the system according to the instructions in the Guide to DNC Base Software Installation, 450-1011-302. (That document is available to authorized system installers.)

Getting Ready

Before unpacking and installing the equipment, you should ensure that you have on hand the completed worksheets and forms from the Site Records, 450-1011-152. Also included in theSite Records are the hardcopy record of the assigned shelf positions of the SRUs and a detailed floor plan for the site. All connections and the equipment layout should conform to the worksheets in the Site Records.

In addition, you should ensure that all the tools, equipment, and materials required for installing the system are on hand. All the items required are listed here for your convenience; the specific items required for any given procedure are listed again at the beginning of the procedure.

TOOLS:

1 Chalk line

1 Truck dolly

1 Knife

1 Small wire cutter for plastic tie-wraps

1 Carpenter's level

1 Hexagonal nutdriver (1/4 inches)

1 Hexagonal nutdriver (3/8 inches)

1 Hexagonal nutdriver (3/16 inches)

1 Allen wrench (5/64 inches)

1 Small flat-blade screwdriver

1 Medium Phillips screwdriver

1 Wire-wrap tool

1 QTBIX16A connection tool *

1 Measuring tape.

MATERIALS:

1 Roll of adhesive tape, durex acetate fiber

1 Felt pen

1 Pencil.

* This item is available from Northern Telecom. See your NT sales representative.

2. Preparing the Floor Area for the Cabinets

Before unpacking the cabinets, you must ensure that the installation area is prepared for the equipment. You should have at hand the floor plan, which is found in the Site Records, 450-1011-152, in the section labelled ‘Floor Plan’, and the following tools and materials:

TOOLS:

1 Small wire cutter for plastic tie-wraps

1 Chalk Line.

MATERIALS:

1 Roll of Adhesive Tape, Durex Acetate Fiber

1 Felt Pen.

Preparing the Floor Surface. The floor surface should be firm and unyielding, such as tile or wood covering, or low-pile carpet. This ensures the stability of the cabinets and minimizes stress on cabinet interconnection assemblies.

The floor must also be clean and free of any surface irregularities that might affect the leveling of cabinets.

Marking the Floor for the Cabinets. The floor should be marked with the outline of the cabinets to facilitate their line-up and leveling. This can be done with masking tape and a marker. Refer to the floor plan in the Site Records, 450-1011-152.

You should use existing permanent structures such as walls or electrical outlets as reference points. You can then set out the outline of the cabinets using the masking tape as follows:

(1) Mark the floor with adhesive tape strips outlining the front-of-cabinet line, as shown in Fig. 2-1.

(2) Use the chalk line to draw a distinct front-of-cabinet line on the adhesive tape. This is to ensure the cabinet lineup is perfectly straight. You can mark over the chalk line with a marker to make it clearer.

(3) Similarly, use the tape, chalk line, and marker to outline the sides of each cabinet. Allow 9 mm (3/8 inches) between cabinets. A maximum of eight cabinets can be installed in the same lineup.

Figure 2-1
Marking the Floor for the Cabinet Lineup

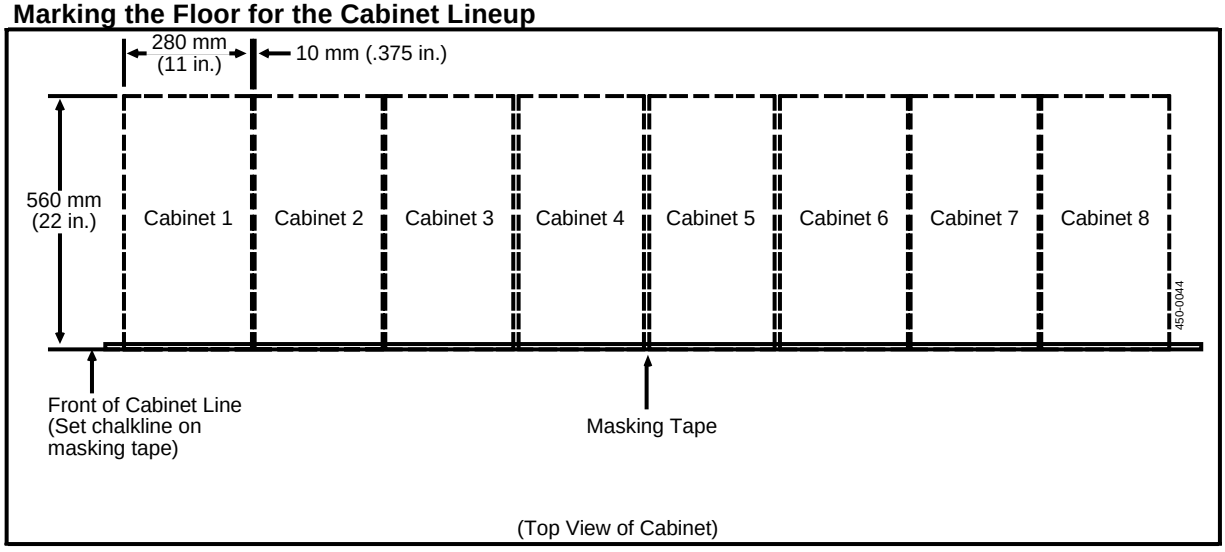
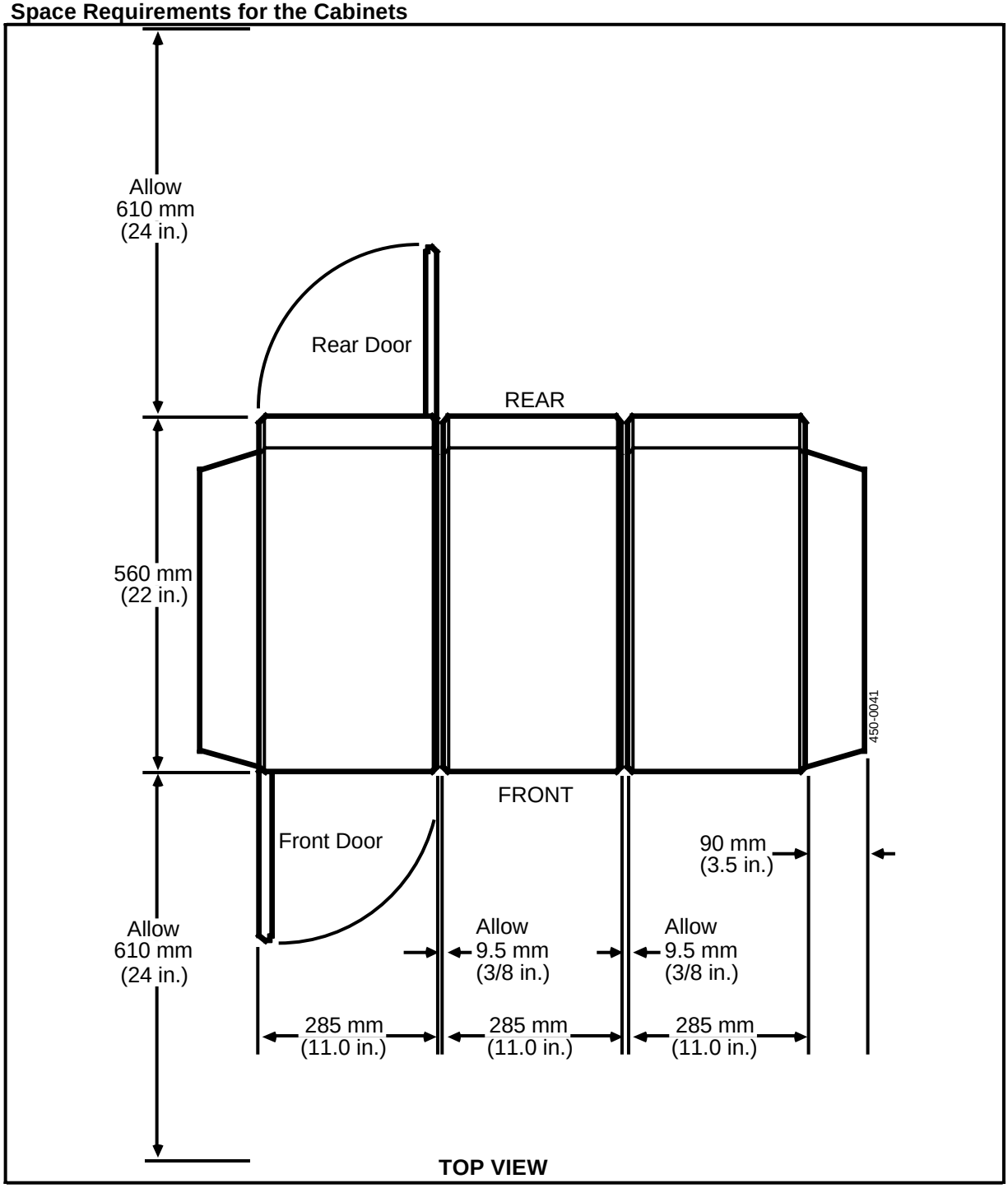


Figure 2-2
Space Requirements for the Cabinets



3. Unpacking and Inspecting the Equipment

Before Starting. All system equipment is packed for maximum protection against damage during shipment. However, inspect the shipping containers for evidence of damage when receiving the equipment. Report any damage to the transportation company immediately.

Next, check the shipping containers against the packing list provided with the delivery. Report any discrepencies immediately to the transportation company.

Two people are required to move the equipment cabinets. The following tools and materials are required to unpack the equipment:

TOOLS:

1 Truck dolly

1 Sharp knife.

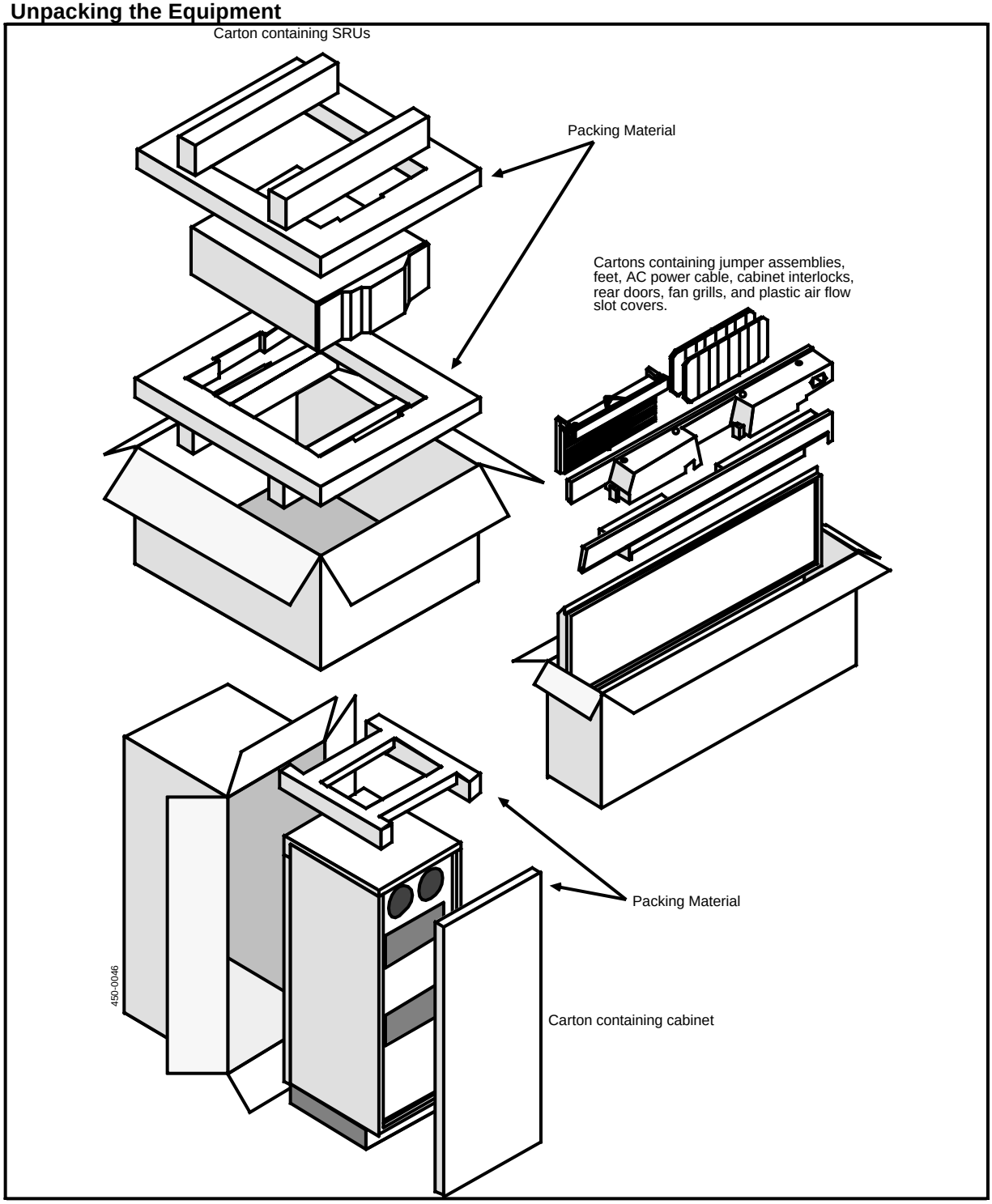
Checking the Packing Lists

There are three types of cartons shipped with cabinet systems. The cartons contain, respectively, the cabinets, the shared resource units (SRUs), and the cabinet accessories, as shown in Fig. 3-1. Once the cartons have been moved to the installation area and inspected for damage, the contents should be checked against the packing list.

> ***Note:*** If a component requires hardware such as screws or mounting brackets, the hardware is taped to the component itself. Cabinets have metal connector covers tie-wrapped to the inside shelf frames. These covers provide protection from electromagnetic interference (EMI) when the connector is not in use.

To identify the contents of the packing containers without opening the containers, locate the Product Engineering Code (PEC), or part number, on the outside of the carton and check it against the packing list.

Figure 3-1
Unpacking the Equipment



Unpacking the Cabinets

- CAUTION -

The system cabinets contain electronic equipment that is sensitive to electrostatic discharge and rough handling. Avoid any undue stress, electrostatic discharge, shock, or vibration when handling, moving, and unpacking the cabinets. Do not touch the backplane connectors.

(1) With the assistance of another person, move the cabinets and other equipment in their shipping cartons to the installation area using the truck dolly.

Note: Rear doors, interconnection assemblies, hardware, and shared resource units (SRUs) are shipped in separate containers as shown in Fig. 3-1.

(2) Cut open one side of the cabinet container with the knife.

- WARNING -

Be careful when handling the cabinet so that you do not injure yourself on the sharp alignment pins on the rear of the cabinet. These pins are used to align the jumper assemblies.

- CAUTION -

Do not grip the front door assembly or the cabinet's internal components. Doing so may misalign the backplane and cause operating faults.

(3) Grasp the sides of the cabinet and gently slide it out of the carton. A second person may assist in removing the carton.

(4) Remove the foam packing material from the top and back of the cabinet.

(5) Repeat Steps 2 to 4 for each cabinet.

(6) Store all packing materials in the event the equipment has to be returned or moved to another site.

(7) Inspect the cabinets for the following:

- damaged connectors or connectors containing foreign material
- defects in the molded plastic housing
- any obvious signs of damage to the cabinet.

(8) Open the cartons containing the rear doors, fan grills and slot covers, the ac power cable, jumper assemblies, and cabinet feet. Remove the

contents and inspect them for damage. Report any damage to the transportation company immediately.

Unpacking the Shared Resource Units

> **- CAUTION -**
> The SRUs are sophisticated electronic devices that are sensitive to electrostatic discharge and rough handling. Avoid any undue stress, electrostatic discharge, shock, or vibration when handling, moving, and unpacking the SRUs.

(1) Open the shipping cartons.

(2) Using appropriate handling precautions for electrostatic discharge, remove the SRUs from their cartons and inspect them for any obvious signs of damage.

> **- CAUTION -**
> Do not touch the SRU connectors.

(3) For each Applications Processor SRU, record the information on the worksheet for the SRU in the Site Records, 450-1011-152. (These worksheets are kept in Part 10 of the Site Records.) Record the following information:
- software license number (and revision code if required)
- SRU serial number.

(4) Place the SRUs in their shipping cartons until they are required for installation into their allotted shelf positions.

Unpacking the Line Cards for the Analog Link SRU

- CAUTION -

The line cards are sophisticated electronic devices that are sensitive to electrostatic discharge and rough handling. Avoid any undue stress, electrostatic discharge, shock, or vibration when handling, moving, and unpacking the cards. Take the following precautions:

Do not touch the edge connectors.
Handle the circuit packs only by the side edges.
Do not set the circuit pack on any surface other that the antistatic bag in which it is wrapped when shipped.
Do not locate/handle the circuit pack near heavy machinery, electrical motors, or transformers.
Do not store the circuit packs in an area with high humidity, high temperatures, or high levels of dust.
Do not stack the circuit packs one on top of the other.

(1) Open the shipping cartons.

(2) Using appropriate handling precautions for electrostatic discharge, remove the circuit packs from their cartons and inspect them for any obvious signs of damage. Do not remove them from the antistatic bags until you are ready to install them in the Analog Link SRU.

(3) Install the circuit packs in their assigned slot positions on the pull-out drawer of the Analog Link SRU, as described in Part 6.

(4) Retain the shipping packaging and antistatic bags in the event a card has to be returned.

4. Installing the Cabinets

This procedure describes how to install cabinets in new systems, then describes how to add cabinets to an existing lineup. It assumes the cabinets have been moved to the installation area, unpacked, and inspected according to Part 3.

The procedure involves positioning the cabinets and installing the interconnecting hardware, which is shipped in separate cartons. Power is supplied from a commercial ac source or from -48 V office battery. If supplied from -48 V office battery, refer to Part 17 for instructions on installing the power supply system.

> ***Note:*** Cabinet systems do not require separate grounding straps. Grounding is provided by the grounding post on the ac input cord when ac power is used. For systems operating from -48 V office battery, the grounding is provided by a ground lead from the office battery.

Ensure that the appropriate hardware and tools are at hand.

EQUIPMENT:

1 per system, Input Jumper Assembly

1 per system, Terminating Jumper Assembly

1 fewer than the total number of cabinets, Horizontal Jumper Assembly

1 per cabinet, rear cabinet door

1 per cabinet, fan cover assembly.

REAR DOOR HARDWARE:

1 Hingepin

1 Slotted screw 6/32 (1/4 inch)

1 Flat washer, #6

1 Hingeplate.

TOOLS:

1 Flat-blade screwdriver

1 Carpenter's level

1 Hexagonal nutdriver (1/4 inches)

1 Allen wrench (5/64 inches)

1 Small wire cutter for plastic tie-wraps.

Installing Cabinets in a New System

IMPORTANT: When adding a cabinet to an existing system, refer to the procedure ‘Adding a Cabinet to an Existing System’, later in this part, for instructions.

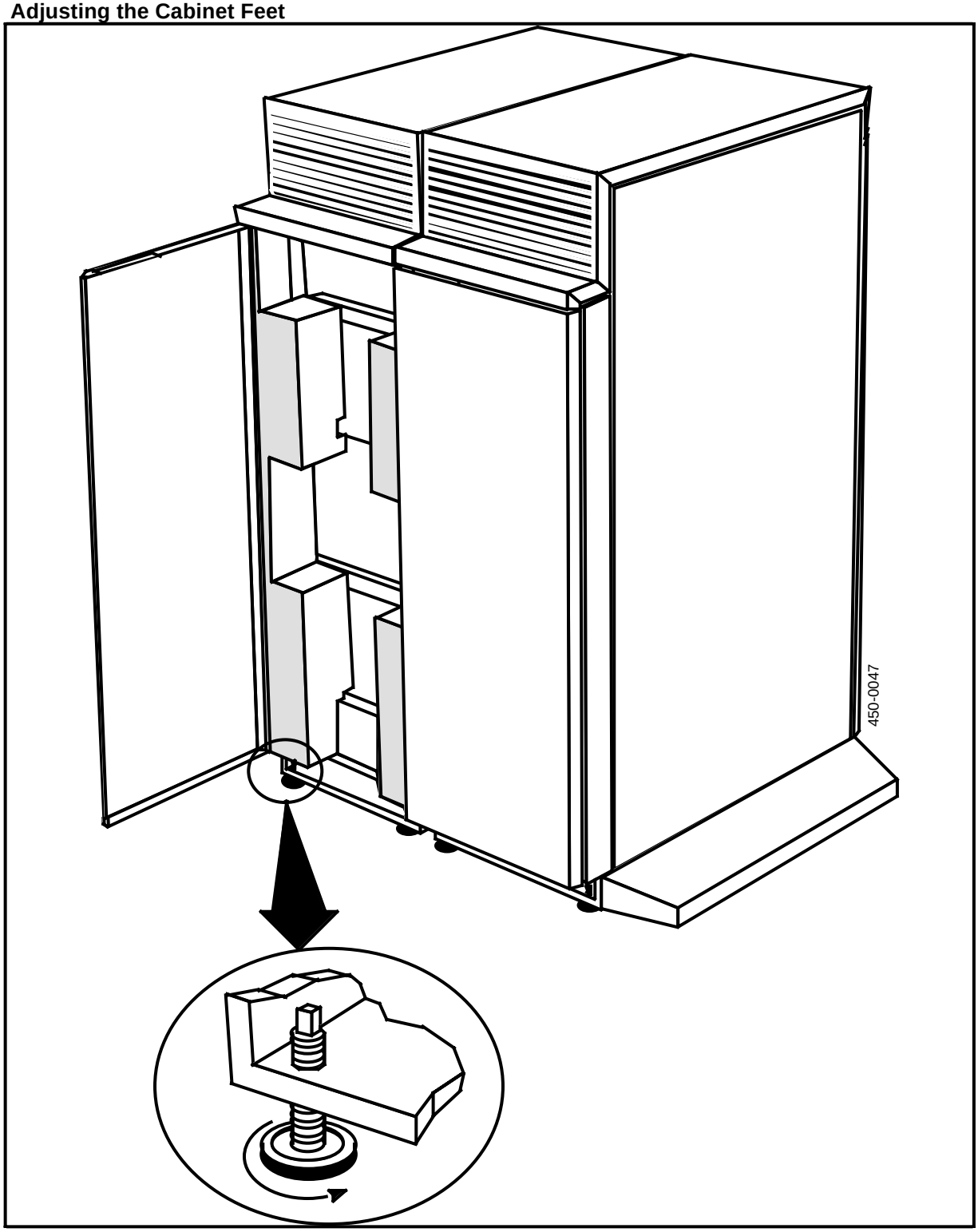
Cabinets are shipped without SRUs installed. The SRUs are plugged in after all cabinets in the system are installed.

Once the floor area has been prepared and the cabinets positioned in the appropriate marked positions, install and interconnect them as follows:

(1) Position the first cabinet in the left-most position (as viewed from the front) along the front-of-cabinet line made when preparing the floor layout. You can use a jumper assembly as a straight edge when aligning the cabinets.

(2) Screw in all four feet on the bottom of the cabinet (fully clockwise), then unscrew each foot by four turns. (See Fig. 4-1.) The feet are threaded at 16 turns per inch.

Figure 4-1
Adjusting the Cabinet Feet



(3) Adjust the pad feet clockwise or counterclockwise as required until the cabinet is level. **This is extemely important:**

- All cabinet tops must be in one level plane, with no horizontal or vertical deviation. (See Fig. 4-2.) This can best be achieved if the floor is level. Use the carpenter's level to ensure the levelness of the cabinets, checking both the rear and the front of the cabinets.
- Misaligned or twisted cabinets can make it difficult to insert SRUs and to interconnect cabinets. Also, misalignment may result in operating faults.
- An assistant may tip the cabinet lineup slightly to allow you to easily turn the feet. Otherwise, turn the feet by slipping a finger between the cabinet bottom and the floor.

(4) Rock the cabinet to ensure solid footing and check it with the carpenter's level to ensure it is level.

(5) Insert and engage the plastic interlocking hardware into the slotted grooves in the right-hand base of the cabinet (facing from the front).

The interlocking hardware will extend in the front by approximately 65 mm (2.5 inches) as shown in Fig. 4-3.

(6) Position the second cabinet to the right of the first (as viewed from the front). A second person may be of assistance for the following steps.

(7) Maneuver the second cabinet onto the interlocking hardware by slipping the cabinet's slotted grooves at the left-hand base of the cabinet onto the interlocks.

(8) Engage the cabinet on the interlocks by pushing it forward onto the locks. The cabinet is engaged when the clip on the back of the interlocking hardware snaps into position.

(9) Turn the cabinet feet the same number of turns as you did for the first cabinet.

(10) Level the second cabinet as you did the first, ensuring that both cabinet tops are on a level plane, with no vertical or horizontal deviation. An assistant may tip the cabinet lineup slightly to allow you to easily turn the feet. Otherwise, turn the feet by slipping a finger between the cabinet bottom and the floor.

Figure 4-2
Aligning the Cabinets

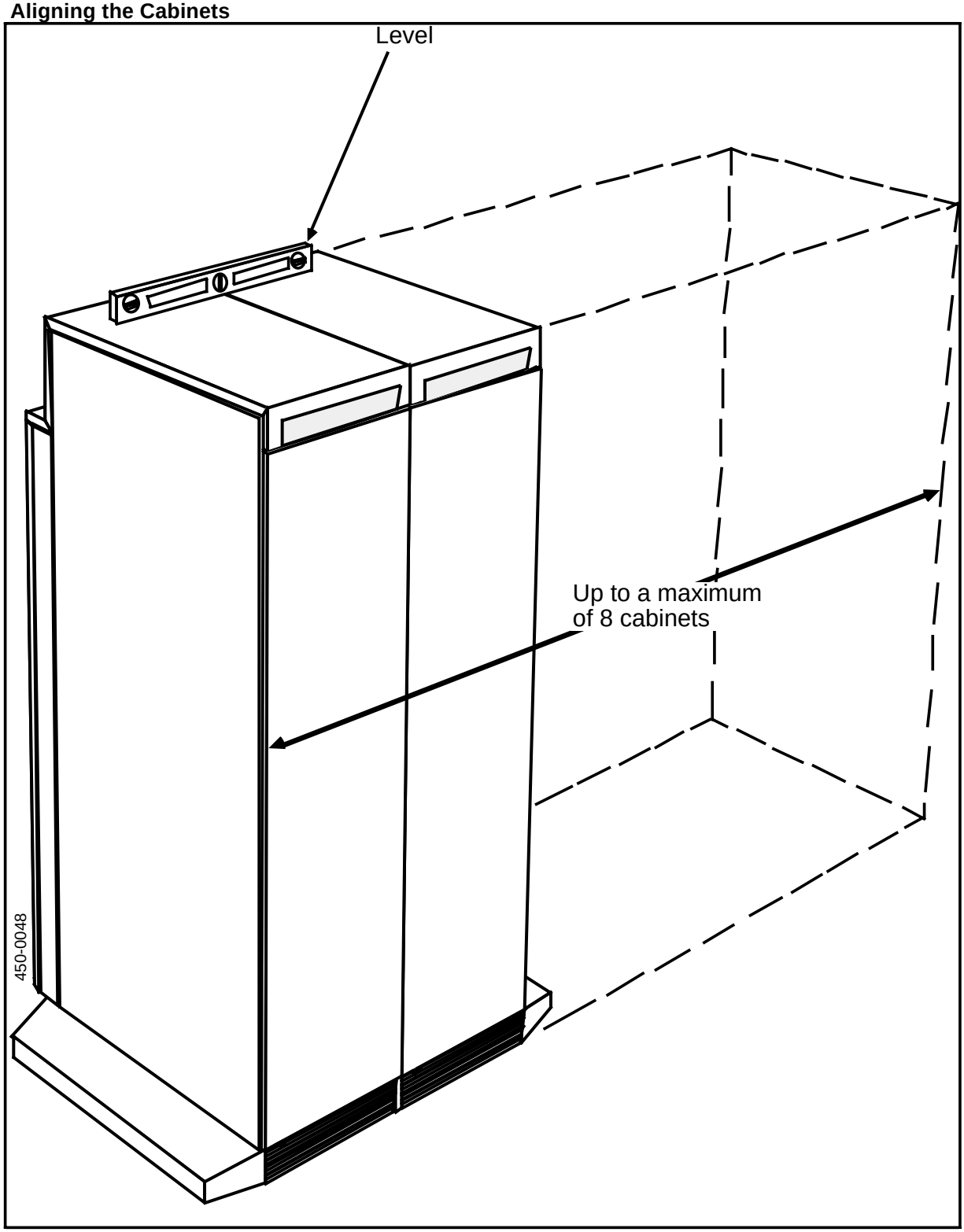
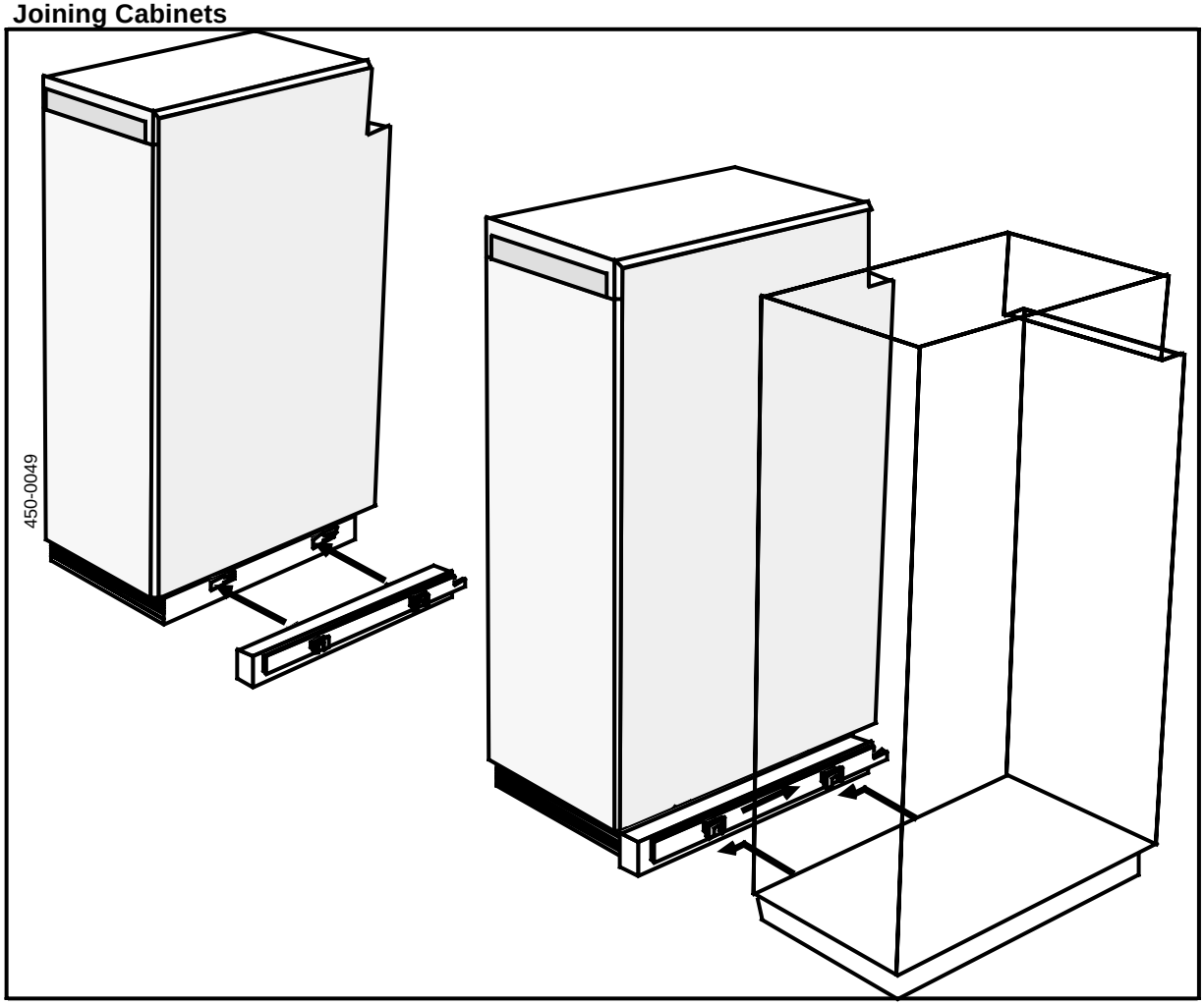


Figure 4-3
Joining Cabinets



(11) Install the horizontal jumper assembly between the cabinets according to the procedure ‘Installing the Horizontal Jumper Assembly’, later in this part. This will help lock the two cabinets together and ensure the proper spacing between them.

IMPORTANT: The gap between cabinets at the top must be the same as at the bottom, 9.5 mm (3/8 inches). This distance accommodates the interconnection assemblies.

If the gap is not correct, adjust the two outside pad feet of the second cabinet and check it for levelness.

(12) Repeat Steps 1 to 11 for each additional cabinet being installed.

Note: It may be necessary to make further leveling adjustments after the shared resource units are installed, as the weight of the SRUs can cause the cabinets to shift somewhat.

(13) When all the cabinets in a lineup have been positioned and plumbed, double check to ensure that the following margin deviations have been met:

- The top of the cabinets must be on a level plane with no deviation.
- The gap between cabinets at the top must be the same as at the bottom, 9.5 mm (3/8 inches).
- The cabinets must not deviate from a straight baseline (the front-of-cabinet line) by more than 1.5 mm (1/16 inch) for an eight-cabinet lineup.

- CAUTION -

Once installed, do not move the cabinets, or operating faults may result.

(14) Insert the plastic end foot supports into the grooves in the base of the two end cabinets, and engage them by pushing them from the front. (See Fig. 4-4.)

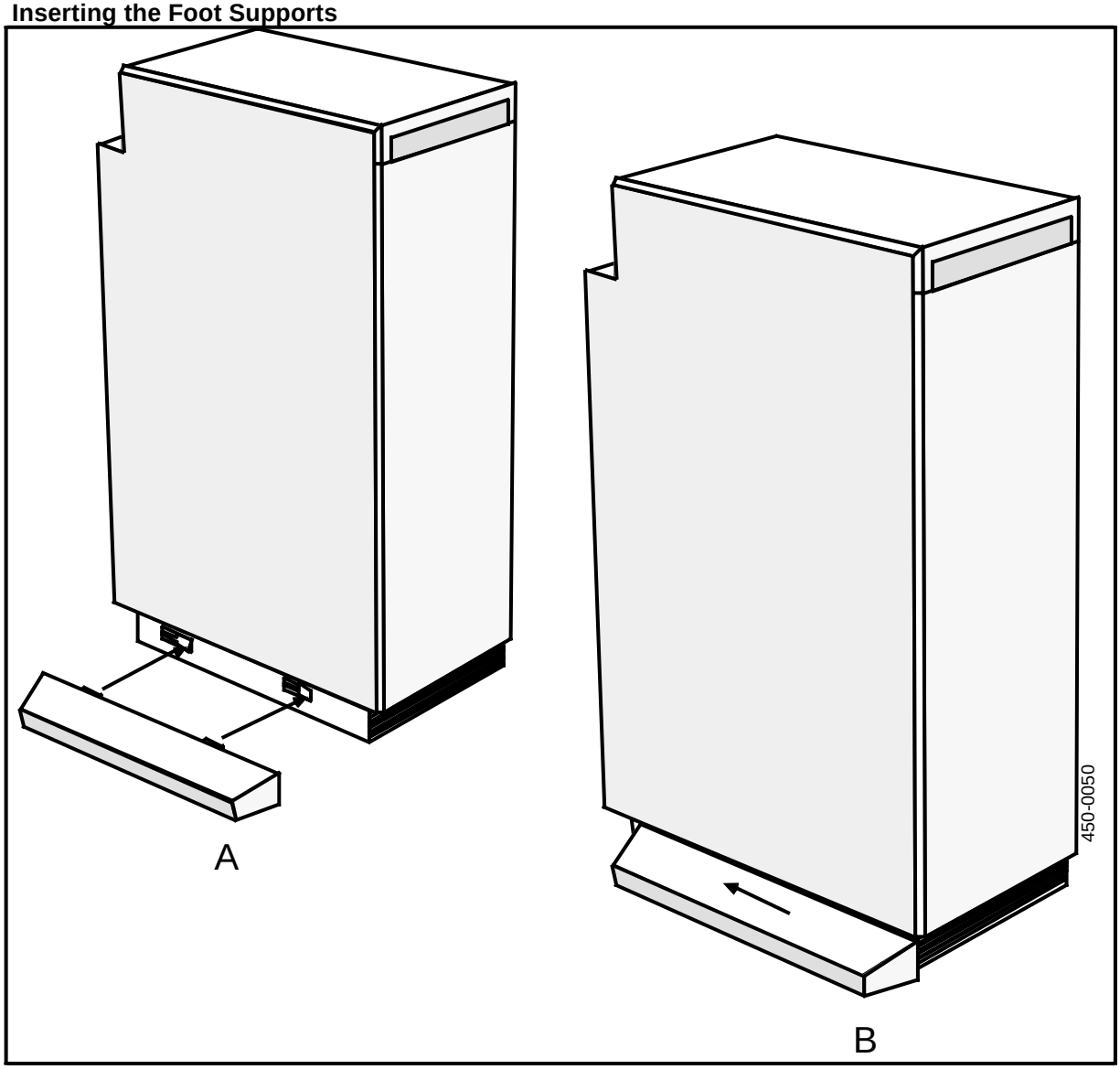
Note: The two foot assemblies (one for each end) are not interchangeable. The part number for the left-hand foot assembly (as viewed from the front) is PO661670; for the right-hand foot assembly, PO657397.

(15) Remove the EMI connectors from inside the cabinets by snipping the tie-wraps with the small wire cutters. Then set the connectors aside to be installed after all shared resources units have been installed.

Installing the Cabinet Jumper Assemblies

There are three types of cabinet jumper assembly: the input, horizontal, and terminating jumper assemblies. They are designed to provide electrical continuity for the system bus from the input jumper, through each shelf and cabinet in the system, to the terminating jumper. Fig. 4-5 shows the jumper assemblies and their features.

Figure 4-4
Inserting the Foot Supports



IMPORTANT: The rear doors can be installed to open from either the left or the right. Decide which way you would like them to open. To open from the right, you must install a hingepin at the bottom of the cabinet input jumper assembly and to the right side of each horizontal jumper assembly. To open from the left, install the hingepin at the bottom of the terminating jumper assembly and the left side of each horizontal jumper assembly. The following instructions assume that you are installing the doors to open from the right.

Installing the Horizontal Jumper Assembly

A horizontal jumper assembly is required between each pair of cabinets. These assemblies should be installed before the input jumper or terminating jumper because they help lock the cabinets into position.

(1) Carefully align the jumper with the alignment pins on the cabinet.

> **- WARNING -**
> The pins are very sharp and may cause injury.

(2) Push the jumper assembly onto the pins with firm but reasonable force, as shown in Fig. 4-6. Ensure that the four bus connectors make contact with the cabinet connecter and that the jumper assembly fits snugly against the cabinet. Make sure that none of the four locking latches slips between the cabinet and the edge of the jumper assembly.

(3) Snap on the four locking latches.

Installing the Input Jumper Assembly

Each cabinet lineup requires one input jumper assembly. The input jumper assembly is installed on the first cabinet in the lineup (the left-most cabinet as viewed from the front). There are two versions, one with a power switch and one without. If the version on your system has no power switch, you must power the system up and down by unplugging the ac input cord.

When cabinets are being added to an existing system that is already equipped with the input jumper, this procedure is not required.

(1) Install the bottom hingepin on the horizontal jumper assembly using the 5/64 Allen wrench as shown in Fig. 4-7. The screw is provided in a plastic bag taped to the jumper assembly.

IMPORTANT: Be certain that you install the bottom hingepin before installing the jumper assembly on the cabinet. Otherwise, installing the pin will be very difficult.

(2) Engage the assembly's ac connector with the female receptor at the base of the cabinet.

(3) Carefully align the assembly with the alignment pins on the cabinet.

> **- WARNING -**
> The pins are very sharp and may cause injury.

Figure 4-5
The Jumper Assemblies

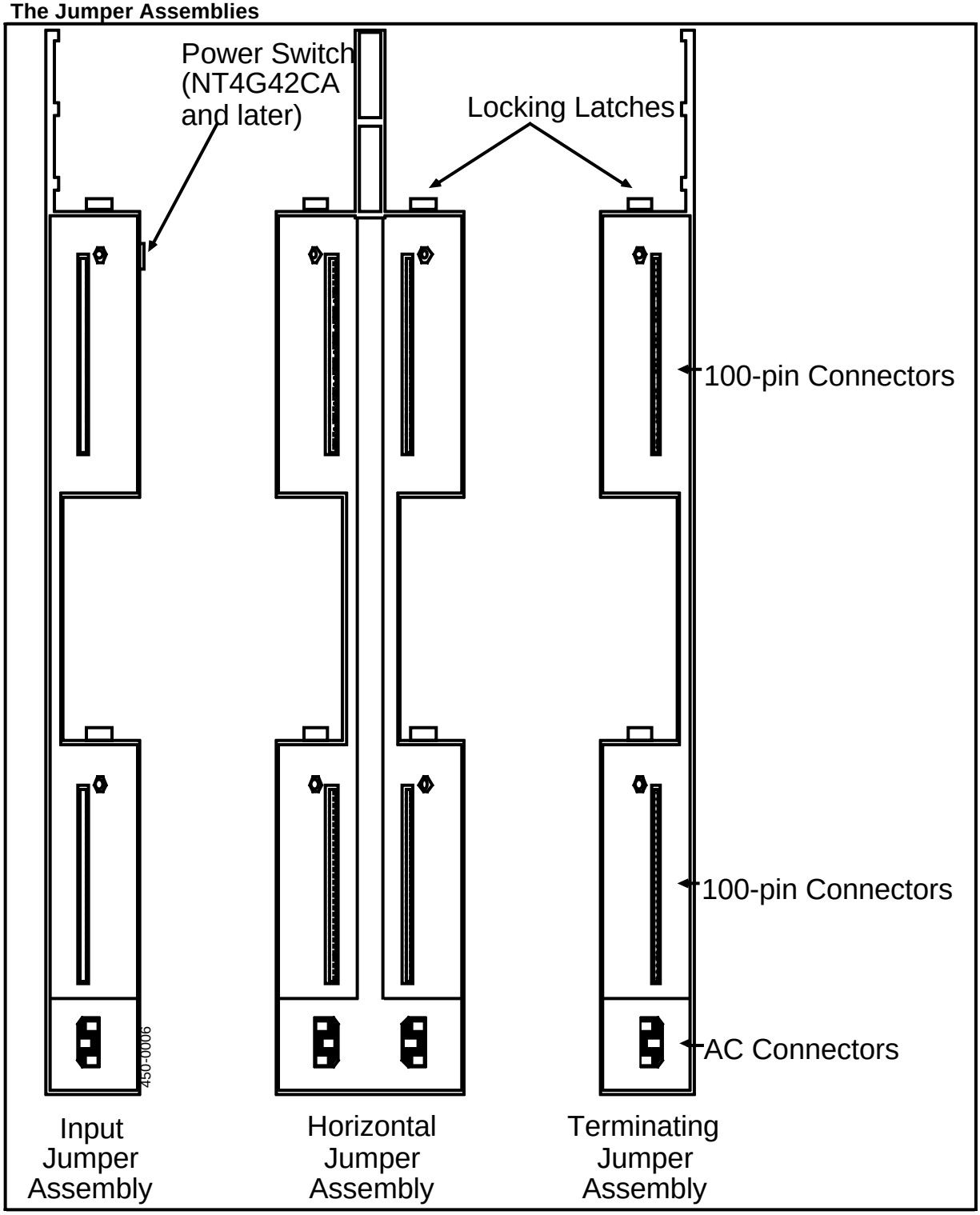


Figure 4-6
Installing the Jumper Assemblies

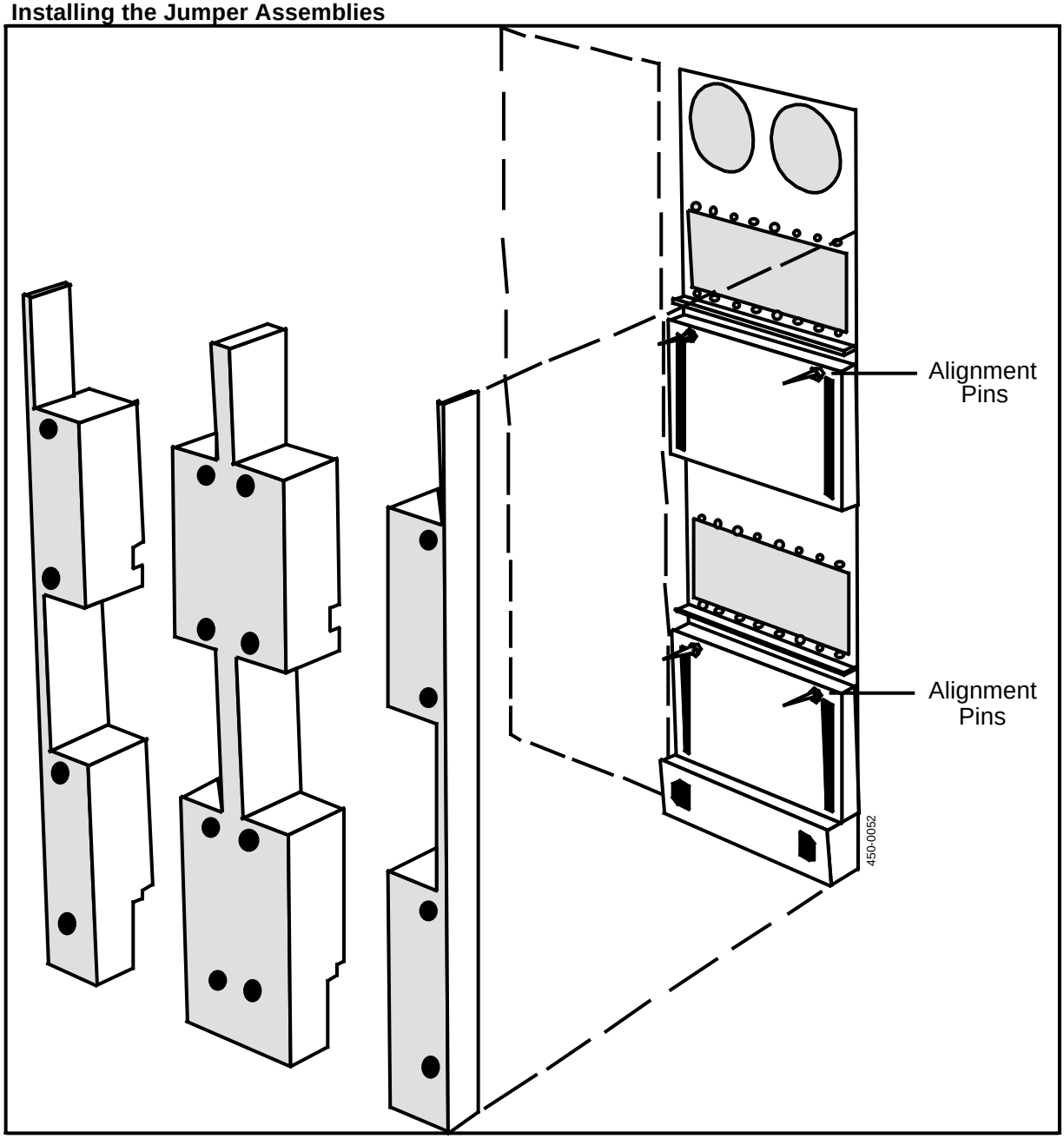
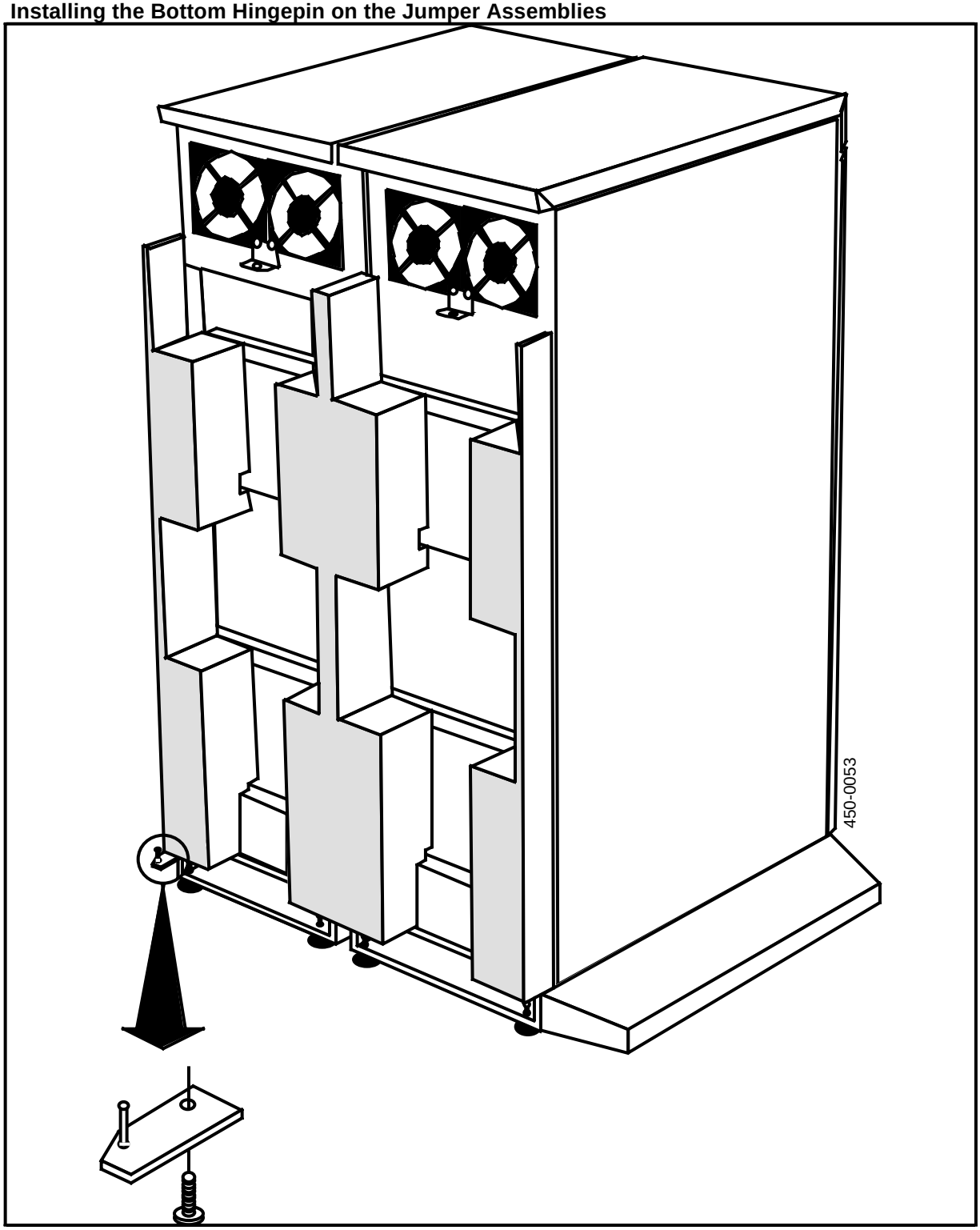


Figure 4-7
Installing the Bottom Hingepin on the Jumper Assemblies



(4) Push the jumper assembly onto the pins with firm but reasonable force. Ensure that the bus connectors make contact with the cabinet connecter and that the jumper assembly fits snugly against the cabinet. Make sure that neither of the locking latches slips between the cabinet and the edge of the jumper assembly.

(5) Snap on the two locking latches.

(6) Locate the ac power cable and plug it into the receptacle at the bottom of the input jumper assembly as shown in Fig. 4-8. DO NOT plug it into the ac source until all system installation tasks have been completed and the system is ready to be initialized. For versions equipped with a power switch, do not switch to the ON position until you are ready to power up the system.

Installing the Terminating Jumper Assembly

Each cabinet lineup requires one terminating jumper assembly. This assembly is always installed on the last cabinet in a lineup, that is, the right-most cabinet as viewed from the front.

When cabinets are added to an existing system, refer to ‘Adding a Cabinet to an Existing System’, later in this part, for the connection procedure.

(1) Install the bottom hingepin on the terminating jumper assembly using the 5/64 inch Allen wrench as shown in Fig. 4-7. The screw is provided in a plastic bag taped to the jumper assembly.

IMPORTANT: Be certain that you install the bottom hingepin before installing the jumper assembly on the cabinet. Otherwise, installing the pin will be very difficult.

(2) Carefully align the assembly with the alignment pins on the cabinet.

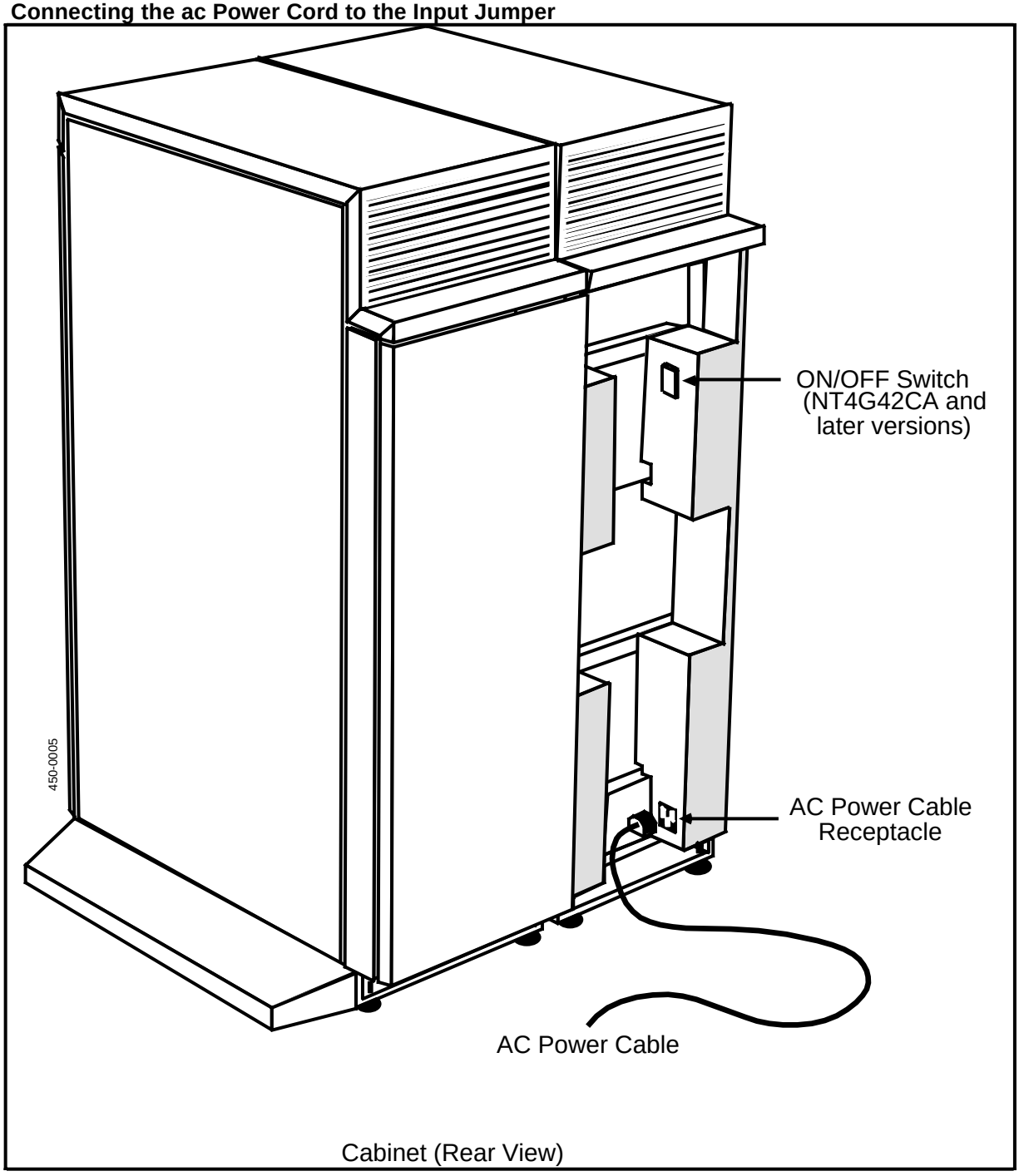
- WARNING -

The pins are very sharp and may cause injury.

(3) Push the jumper assembly onto the pins with firm but reasonable force. Ensure that the bus connectors make contact with the cabinet connector and that the jumper assembly fits snugly against the cabinet. Make sure that neither of the locking latches slips between the cabinet and the edge of the jumper assembly.

(4) Snap on the two locking latches.

Figure 4-8
Connecting the ac Power Cord to the Input Jumper



Installing the Rear Doors and Fan Covers for the Cabinets

Once the cabinets and jumper assemblies have been installed, you can install the rear doors and fan covers. There should be one door and one fan cover for each cabinet. These assemblies are packed with the jumper assemblies in the long cartons, along with a small plastic bag containing the rear door hardware.

> ***Note:*** The rear doors can be installed to open from either the left or right. Typically, they are installed to open from the right. A hingepin is installed on the bottom of a jumper assembly in each cabinet. It is installed on either the right or the left as follows:
>
> - on the right side of each horizontal jumper and the input jumper for doors opening from the right
> - on the left side of each horizontal jumper and the terminating jumper for doors opening from the left.

The plastic bag of hardware should include:

1 Mounting bracket (secures the fan cover)

1 Top pin

1 Bottom pin and bracket

1 Bottom screw and washer

1 Top screw (for Allen wrench) and washer.

Although one person is able to install these assemblies, you may wish to have the assistance of a second person.

(1) With the 1/4-inch nutdriver, loosen (but don't remove) the two inner screws on the two fans at the top of the cabinet. (See Fig. 4-9 for an illustration of these procedures.)

(2) Locate the fan cover mounting bracket in the hardware packet and position it so that it extends outward.

(3) Secure the mounting bracket at the bottom center of the fan cover to the cabinet with the flat-blade screw provided with the hardware.

(4) Push the fan cover up into position at the top of the cabinet, while leaving the bottom portion of the cover free.

(5) Locate the small metal hingepin in the hardware packet. Insert it into the top of the rear door assembly.

(6) Set the bottom of the rear door onto the bottom hingepin, which is fixed on the bottom left side of the left-most jumper assembly, as viewed from the rear.

Figure 4-9
Assembling the Fan Cover and Rear Door

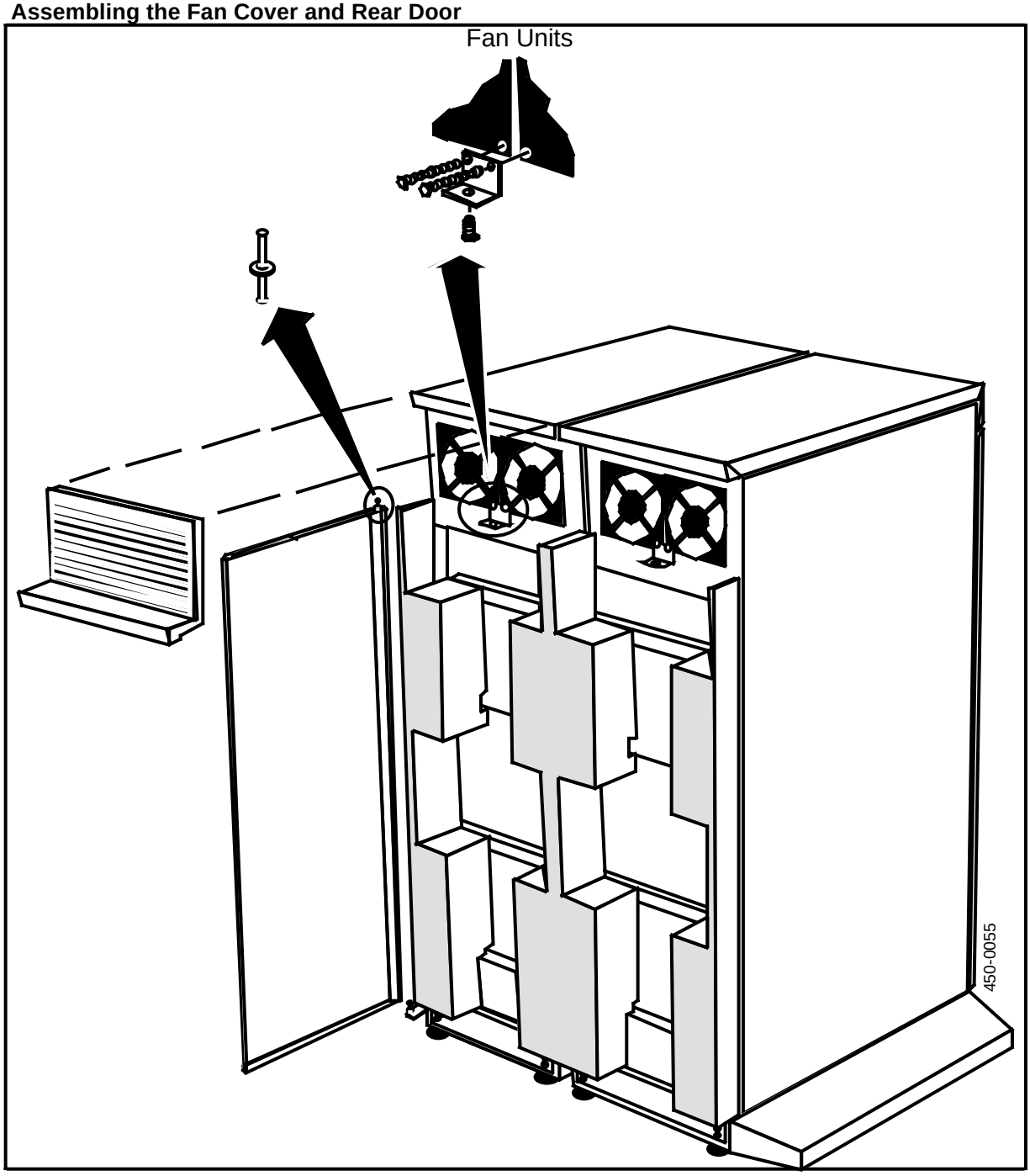
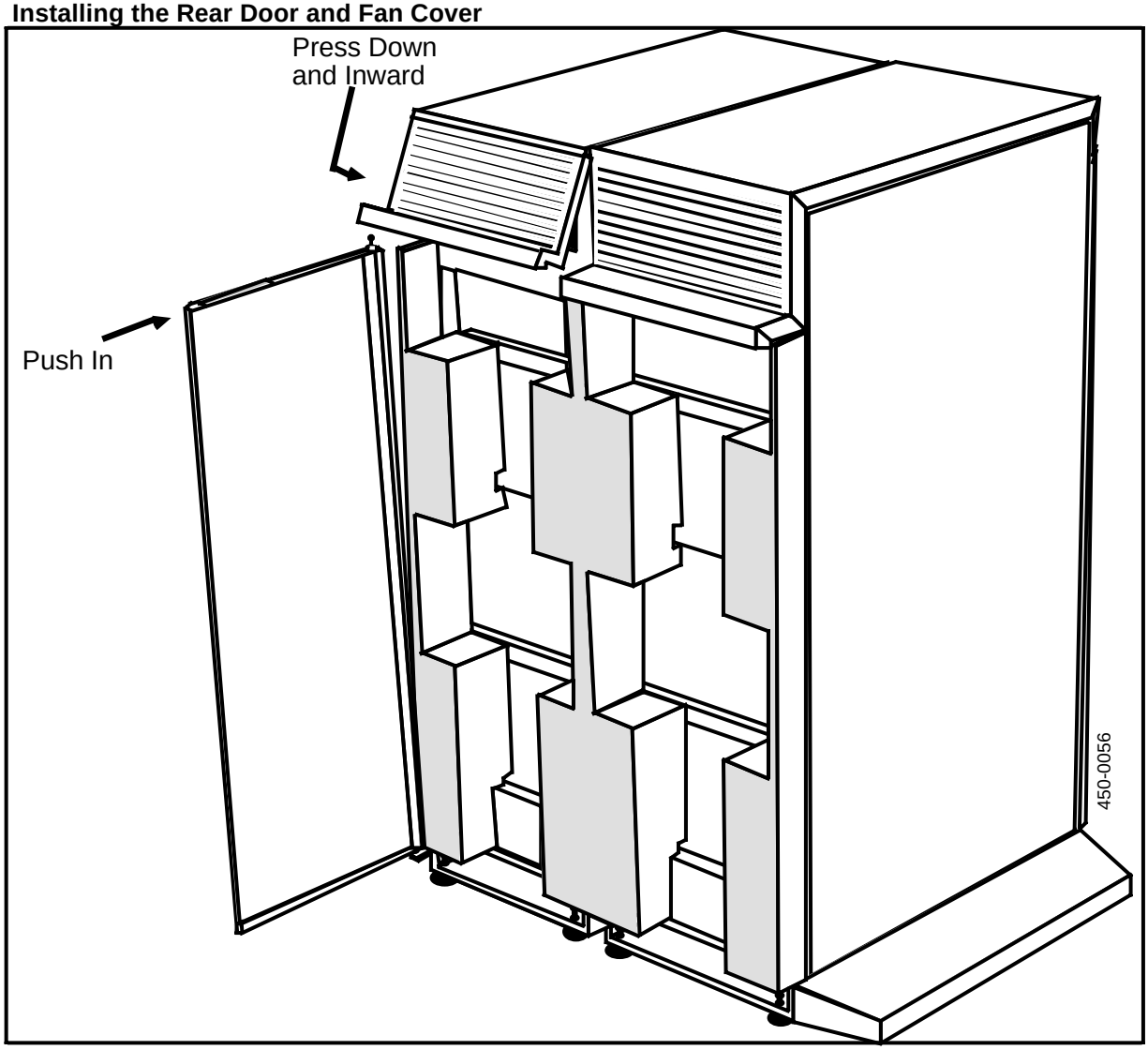


Figure 4-10
Installing the Rear Door and Fan Cover



7) Tilt the rear door outward at the top on a 45-degree slant without disengaging it from the bottom hingepin as shown in Fig. 4-10.

(8) Similarly tilt the bottom of the fan cover outward on a 45-degree slant so that the hingepin hole on the bottom of the fan cover is positioned at the top hingepin in the cabinet door.

(9) Maneuver both the fan cover and rear door so that the top hingepin is inserted into the hingepin hole in the bottom of the fan cover. Push in on the fan cover and the top of the door at the same time until they are vertically straight.

- CAUTION -

The two assemblies may be difficult to engage. Some force is required, and the hingepin may be slightly bent. Take care not to bend it too much or to crack the plastic of the assemblies.

(10) Open and close the rear door to verify that it opens smoothly. If it doesn't, adjust the fan cover by loosening the screws and moving the mounting bracket forward or backward.

Note: The doors are held closed by magnets on the cabinet frame.

(11) Repeat Steps 1 to 10 for each cabinet door.

Adding a Cabinet to an Existing System

The system is designed to be easily expanded by the addition of new cabinets. New cabinets are always added to the right of the existing lineup, as viewed from the front. This convention accommodates the communications addressing scheme used in the system.

When adding a new cabinet or cabinets, proceed as follows:

(1) If the system is powered up, make sure all users have logged off the system, then remove the power by unplugging the power input cable from the base of the input connector assembly.

(2) Remove the foot assembly from the left-most cabinet, as viewed from the rear. (See Fig. 4-4.) Set it aside for now.

(3) Take off the rear door of the left-most cabinet, as viewed from the rear, by removing the screw from the hinge plate at the base of the door with a 5/64-inch Allen wrench. (See Figures 4-9 and 4-10.)

(4) Locate the terminating jumper assembly, which is on the left side of the cabinet, as viewed from the rear.

- WARNING -

When released, the latches on the terminating jumper assembly can snap back rapidly. Release them with care.

(5) Unsnap the locking latches that secure the terminating jumper assembly to the cabinet. (See Figures 4-5 and 4-6.)

(6) Grip the jumper assembly at the top with one hand and at the bottom with the other.

- CAUTION -

The bus connector pins may be damaged if uneven or excessive force is applied when removing the jumper assembly from the cabinet.

(7) Pull outward carefully but firmly first at one end, then the other, to work the jumper assembly off its alignment pins.

- WARNING -

The alignment pins are sharp and may cause injury.

- CAUTION -

Do not touch the bus connectors on the jumper assembly.

(8) Set the assembly aside. You can now install the new cabinet or cabinets. Refer to the appropriate procedures as follows:

- Prepare the floor area for the new cabinets as described in Part 2, ‘Preparing the Floor Area for the Cabinets’.
- Unpack and inspect the new cabinets, doors and horizontal jumper assemblies as described in Part 3, ‘Unpacking and Inspecting the Equipment’.
- Install the cabinets as specified in the procedure ‘Installing Cabinets in a New System’, earlier in this part, ensuring that they are properly lined up, leveled, and spaced.
- Install a horizontal jumper between each pair of cabinets as described in the procedure ‘Installing the Horizontal Jumper Assembly’, earlier in this part. One new horizontal jumper is required for each new cabinet being added to the lineup.
- Install the terminating jumper assembly according to the procedure ‘Installing the Terminating Jumper Assembly’, earlier in this part. This assembly is always installed on the last cabinet in the lineup (the left-most, as viewed from the rear).
- Install the fan cover and rear door on each of the new cabinets according to the procedure ‘Installing the Rear Door and Fan Cover’, earlier in this part.

- Install the shared resource units (SRUs) in their preassigned positions according to Part 6, ‘Installing/Removing the Shared Resource Units’. For information on the SRU position assignments, see the cabinet provisioning worksheets in the Site Records, 450-1011-152.
- Make cabling connections to the office cross-connect panel according to Part 8, ‘Connecting/Disconnecting the Cables at the Cabinets’.
- Make connections to external equipment according to Part 9, ‘Cross-connections to Distribution Frames and Building Wiring’.
- If applicable, install the Alarm Interface Unit according to Part 15, connectorize nonstandard cables per Part 16, and install the -48 V power system per Part 17.

(9) When all installation tasks are completed, initialize the system according to the instructions in the Guide to DNC Base Software Installation, 450-1011-302. (This document is available to authorized system installers.)

5. Setting the NT4G19EA Power Supply for 115 or 220 Vac Operation

The system uses a 115 or 220 Vac commercial outlet as its power source, depending on the number of cabinets. The power supplies shipped with NSR26 and later systems adjust automatically for operation with either 115 or 220 Vac, according to the power supply they receive. (Power supplies in this category are the Loft Power Supply and the Universal Power Supply SRU, NT4G19FA.)

The NT4G19EA Power Supply SRU was shipped with systems prior to NSR26. The NT4G19EA Power Supply SRU has an input voltage setting (for 115 or 220 Vac) that must be verified before the SRU is installed in the cabinet. The power input option is normally set for 115 Vac operation at the factory. This setting serves systems of up to four cabinets. In systems with five or more cabinets, the SRUs must be set for 220 Vac. In such installations, you should verify that the setting is correct before installing the SRUs.

TOOLS:

1 Flat-blade screwdriver

1 Nutdriver (1/4 inches)

1 Medium-size Phillips screwdriver.

Setting the Voltage Option on the Power Supply SRU

This procedure is used to set the voltage selector switch of the Power Supply SRU.

(1) If the Power Supply SRU is already installed, remove it according to the procedure ‘Removing the SRUs from the Cabinets’, in Part 6.

(2) With a Phillips screwdriver, remove the top and bottom latches from the front panel of the SRU. (See Fig. 5-1.)

(3) With a 1/4 inch nutdriver, remove the two screws securing the front panel of the SRU.

(4) Grasp the top of the SRU and carefully pull the front panel away from the SRU.

(5) Grasp the front of the left-hand side panel and slide the panel toward the front as shown in Fig. 5-2.

(6) For 220 Vac operation, unplug the connector from the position marked for 115 Vac and plug it into the position marked for 220 Vac.

(7) Slide the side panel back into place, being careful not to pinch the transformer wires.

(8) To replace the front panel and bezel, insert the front panel into the metal cutouts on the front of the SRU.

(9) With the 1/4-inch nutdriver, secure the front panel to the SRU with two screws.

(10) Use a Phillips screwdriver to replace the screws that hold the top and bottom latches to the SRU.

Figure 5-1
Removing the Faceplate from the NT4G19EA Power Supply SRU

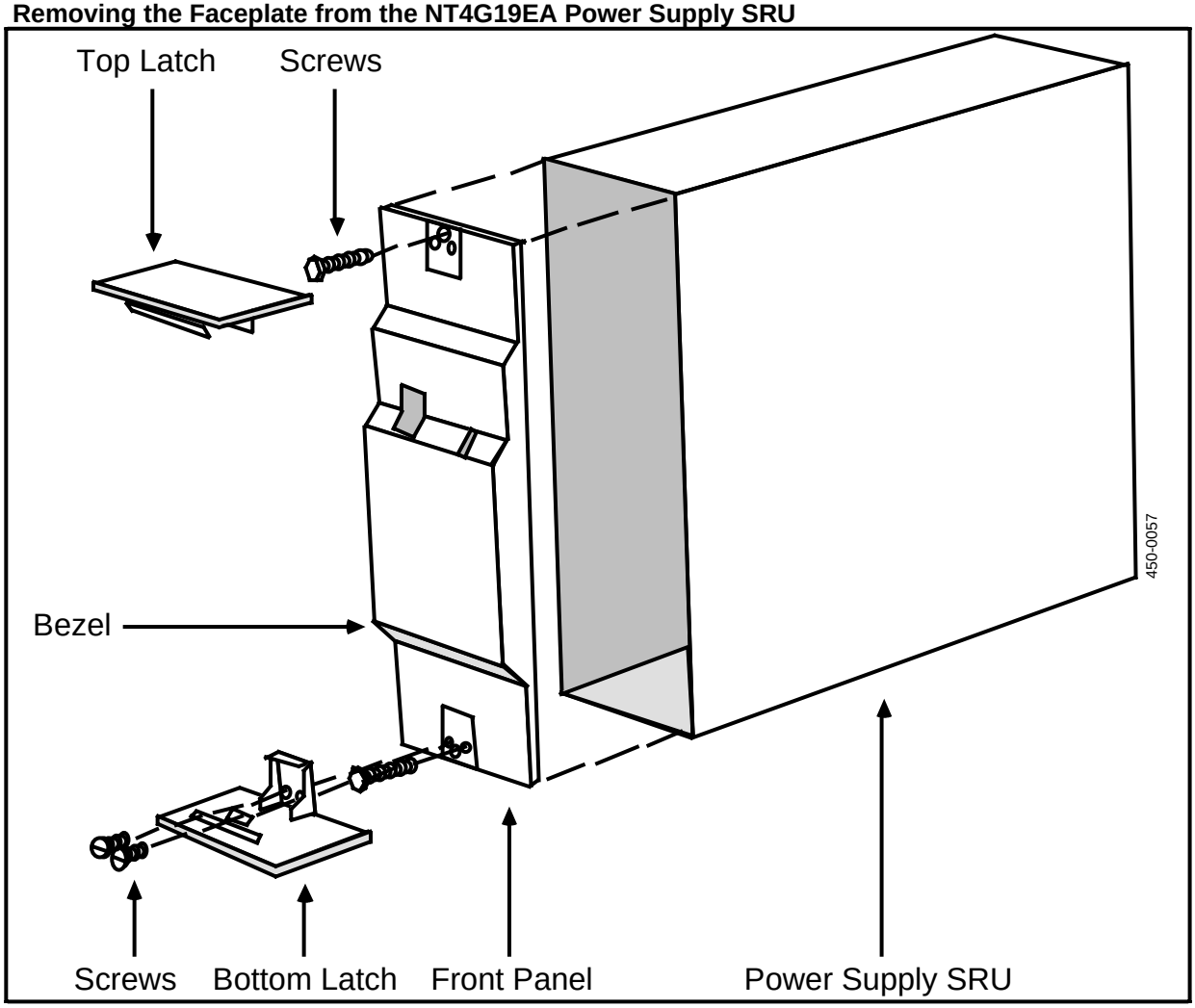
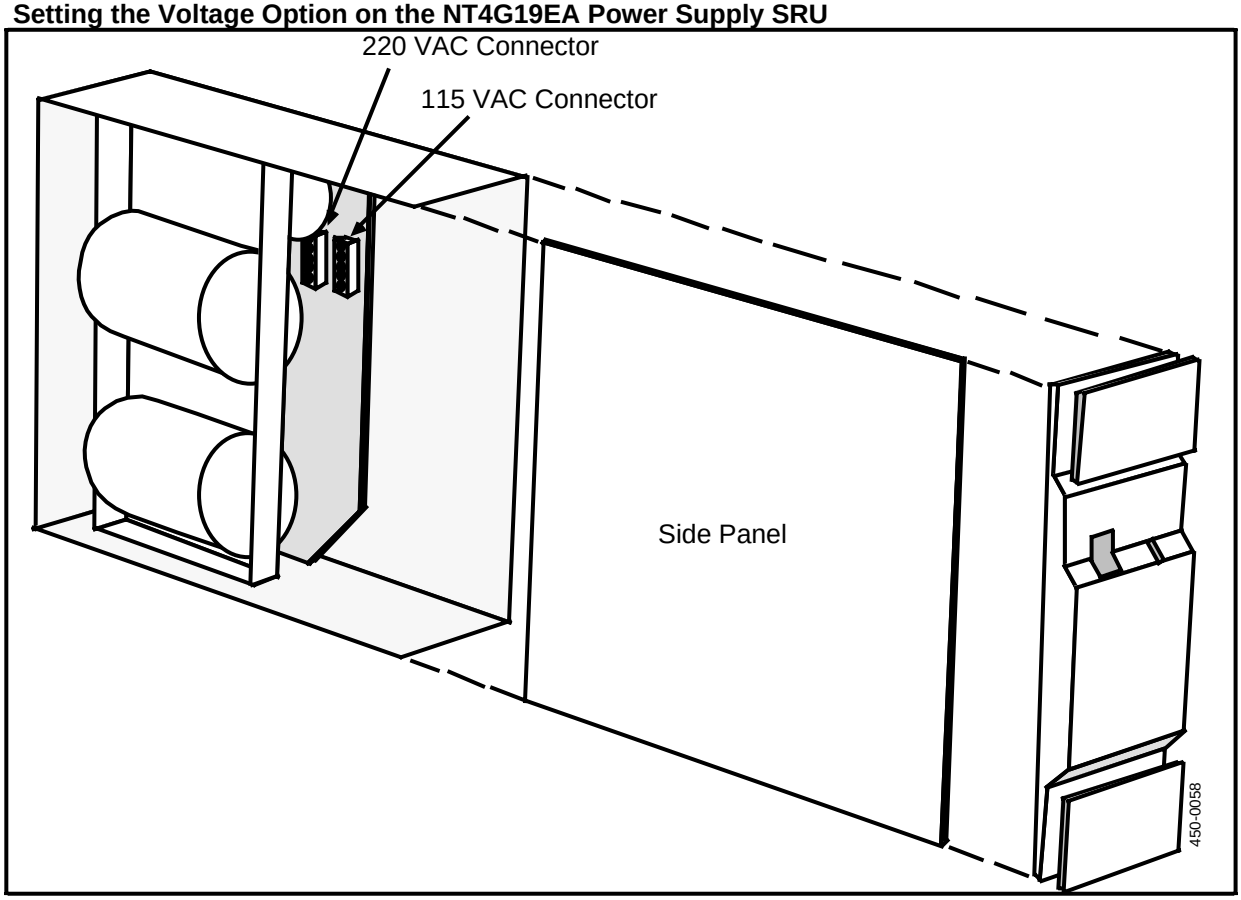


Figure 5-2
Setting the Voltage Option on the NT4G19EA Power Supply SRU



6. Installing/Removing the Shared Resource Units

This procedure explains how to install shared resource units (SRUs). It assumes that the SRUs have been inspected for damage according to the procedure ‘Unpacking the Shared Resource Units’, in Part 3, and also that the cabinets have been installed but not yet powered up.

Power supply units should be installed first. With systems equipped with cabinets NT4G13FA or later, Loft Power Supplies are used. Earlier versions of the cabinet (such as NT4G13DA) use the NT4G19EA Power Supply. The NT4G19FA Power Supply is available as a backup to the Loft Power Supplies or as an upgrade to systems using the NT4G19EA.

For the Loft Power Supply, use the procedure ‘Installing the Loft Power Supply’ below. For the NT4G19EA Power Supply, first install the capacitor interlock as described in ‘Installing the Capacitor Interlocks’ below. The NT4G19FA Power Supply is installed the same way as any other SRU, with no special procedures.

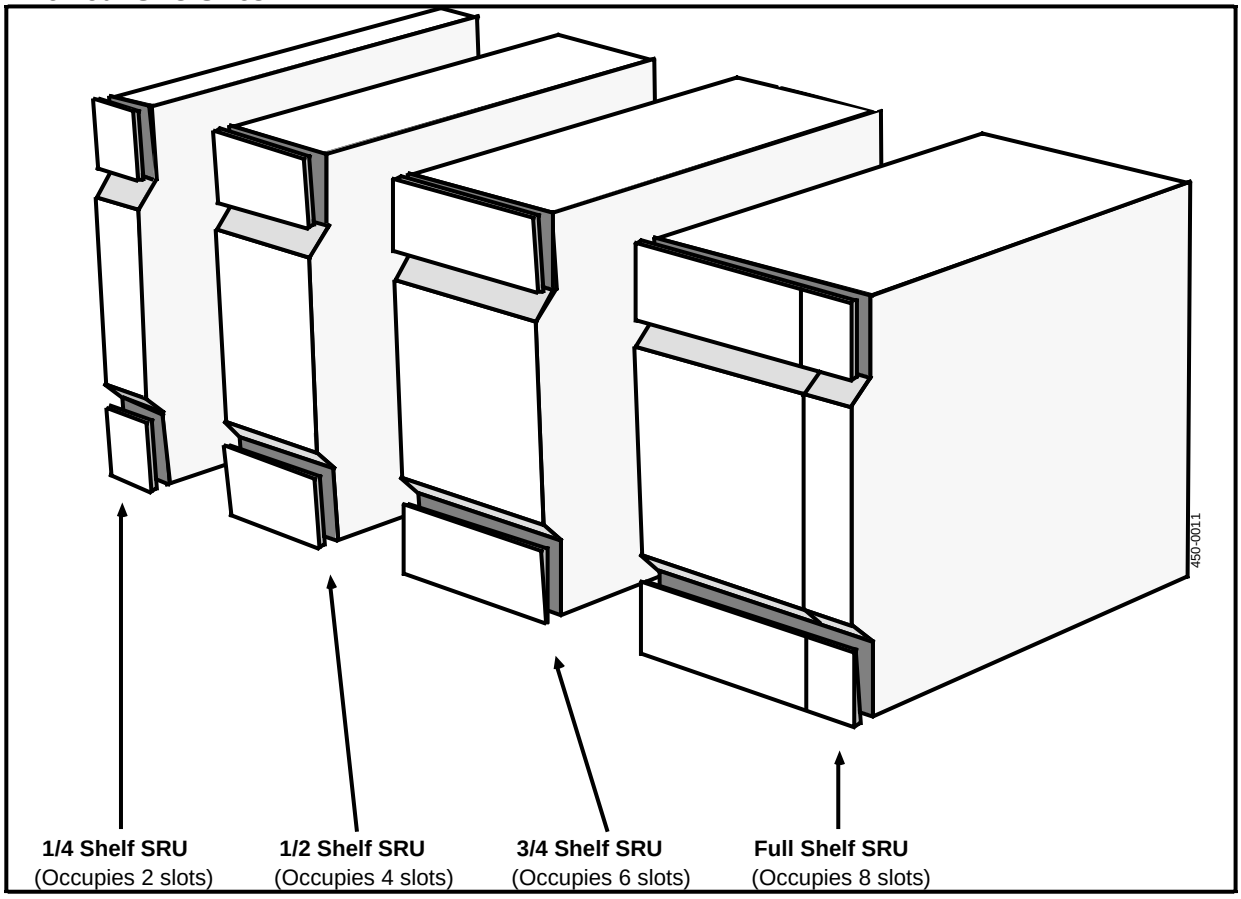
Refer to Fig. 6-1 for a view of the four SRU sizes and the SRU features.

TOOLS:

1 1/4-inch nutdriver (for Loft Power Supplies and Analog Link cards)

1 Medium Phillips screwdriver (for installing capacitor interlocks).

Figure 6-1
The Four SRU Sizes



Installing the Loft Power Supply

The Loft Power Supply is installed in the air plenum of the cabinet (NT4G13FA or later). It cannot be installed in earlier versions of the cabinet (such as NT4G13DA). Once the cabinets have been installed, you can install the Loft Power Supplies as follows:

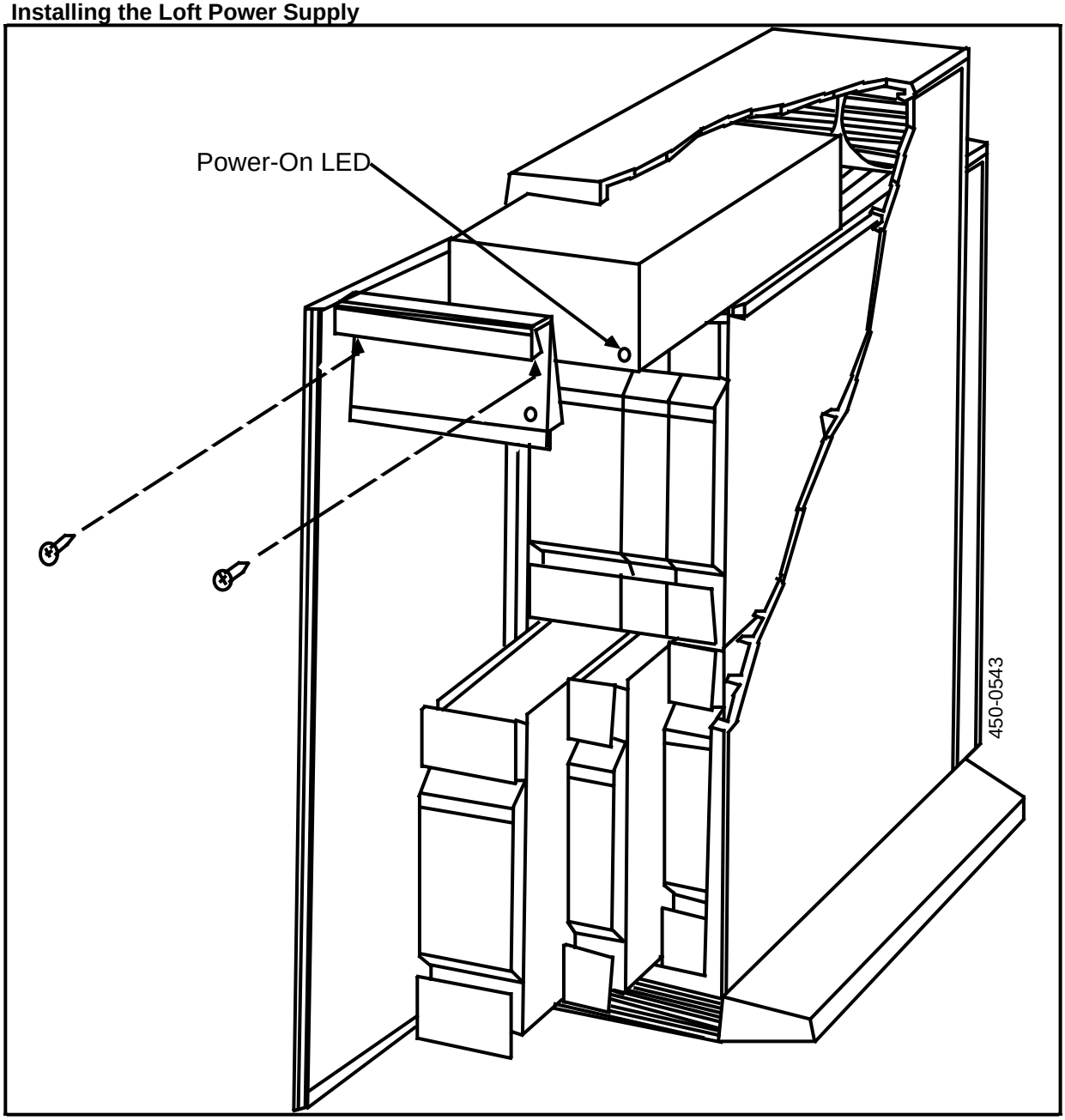
(1) Open the front door of the cabinet.

(2) At the top of the cabinet, remove the two screws above the door on the front bezel with a 1/4-inch nutdriver as shown in Fig. 6-2. Remove the bezel and set it aside with the screws.

(3) Position the power supply with the green LED facing the front and slide it in. Ensure that it makes proper connection with the connector at the rear of the air plenum.

(4) Replace the front bezel and fasten it in place with the two screws. Close the front door when you are finished.

Figure 6-2
Installing the Loft Power Supply



Installing the Capacitor Interlocks (NT4G19EA Power Supply)

Each NT4G19EA Power Supply SRU in the system requires a capacitor interlock, which prevents current buildup and thereby protects against shock. The system will not operate if the interlocks are not installed.

The interlock is shipped with each Power Supply SRU and is installed on the back of the cabinet shelf behind the SRU. Typically, each system has one Power Supply SRU per cabinet, though the configuration may call for two to be installed in the bottom shelves of every second cabinet.

To install the capacitor interlock, proceed as follows:

(1) Locate the capacitor interlock for the Power Supply SRU you are going to install. It is typically taped to the outside of the SRU's packing material.

(2) From the rear of the cabinet, place the capacitor interlock in its position on the metal cover on the back of the shelf as shown in Fig. 6-3 (that is, over the four tapped holes that correspond to the Power Supply's position in the cabinet). There are four screws with the interlock. Start the screws in the holes, but do not tighten them.

(3) Insert the Power Supply SRU into the designated shelf position as described in the procedure ‘Installing the SRUs’, later in this part.

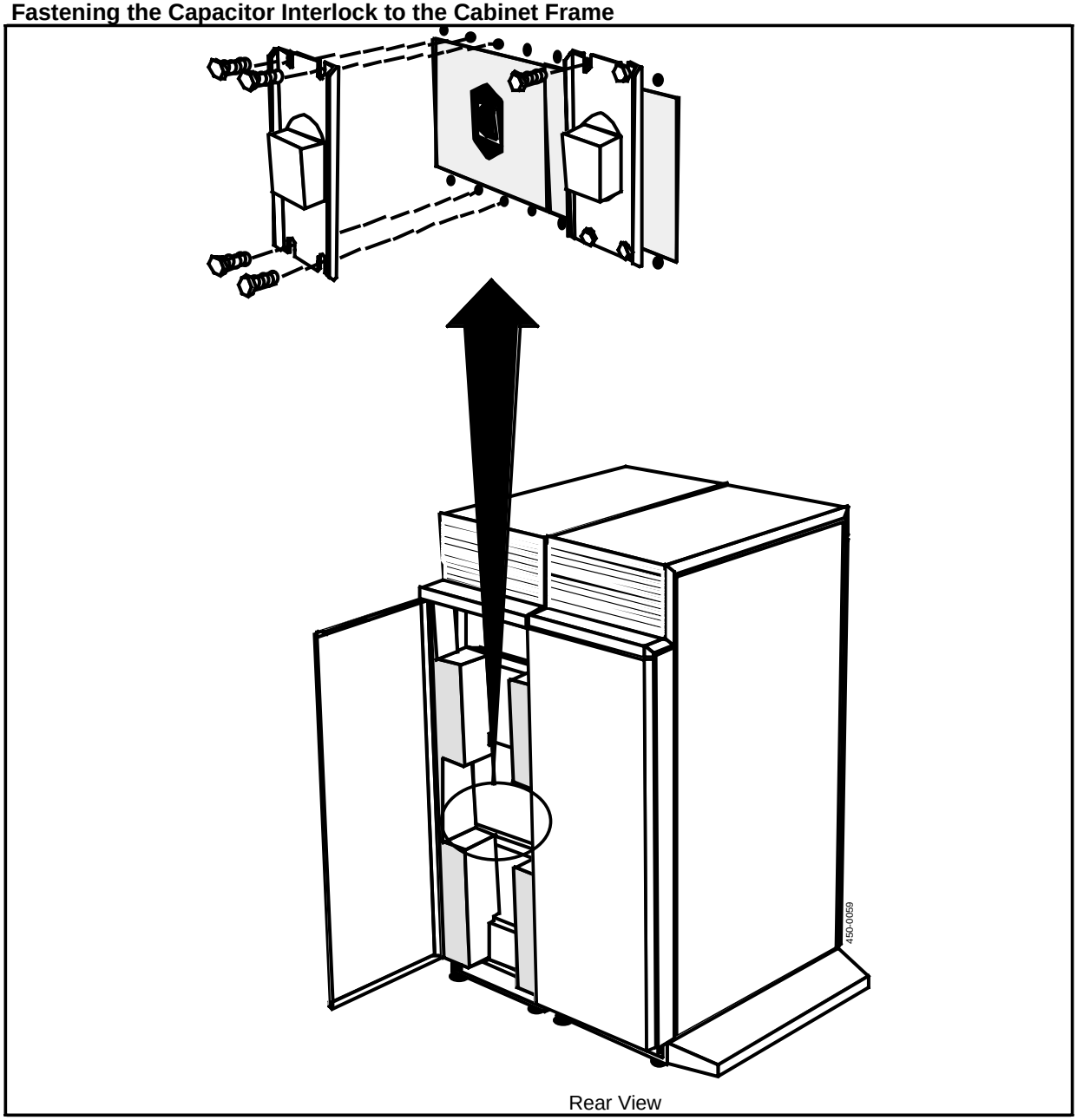
(4) When the Power Supply is firmly in position, make sure that it is plugged into the capacitor interlock, and that the capacitor interlock is properly aligned with the SRU plug.

(5) When the capacitor interlock is properly positioned, tighten the four screws.

(6) Unlatch the SRU and slide it forward. (If you are unfamiliar with the SRU latches, section titled ‘Removing an SRU from a Cabinet’, later in this part.)

(7) Plug the SRU back in to make sure it is making proper connection with the capacitor interlock. If not, reposition the interlock and repeat this test.

Figure 6-3
Fastening the Capacitor Interlock to the Cabinet Frame



Installing the SRUs

SRUs are installed in preassigned shelf positions in the cabinets. The configuration for your system installation has been recorded during configuration planning and has been entered in the Site Records, 450-1011-152. If you do not have the appropriate worksheets, see the system administrator.

- CAUTION -
Always power the system down before installing or removing any SRU, and before connecting or disconnecting any SCSI cable..

Before installing the 350 Megabyte Mass Storage SRU, ensure that the address switch is set to the right address. For SASI systems, set it to 2. For SCSI systems, the address of each device on the SCSI bus is specified on the worksheet titled 'File System Administration' in the Site Records, 450-1011-152.

Before installing a Digital Trunk Link SRU, set the cable equalization switch on the rear of the SRU as described in Part 8.

Install each SRU in its preassigned slot according to the following procedure. The Power Supply SRUs should be installed before any other SRUs.

- WARNING -
The Mass Storage and Power Supply SRUs are very heavy and must be handled carefully to avoid personal injury, or damage to the unit or other equipment.

- CAUTION -
SRUs are sensitive electronic devices and can be damaged by electrostatic shock or rough handling. Do not touch the rear connectors.

(1) Open the shipping carton and remove the SRU.

(2) Grasp the top of the SRU with one hand and the rear of the SRU with the other hand. Do not touch the rear connectors.

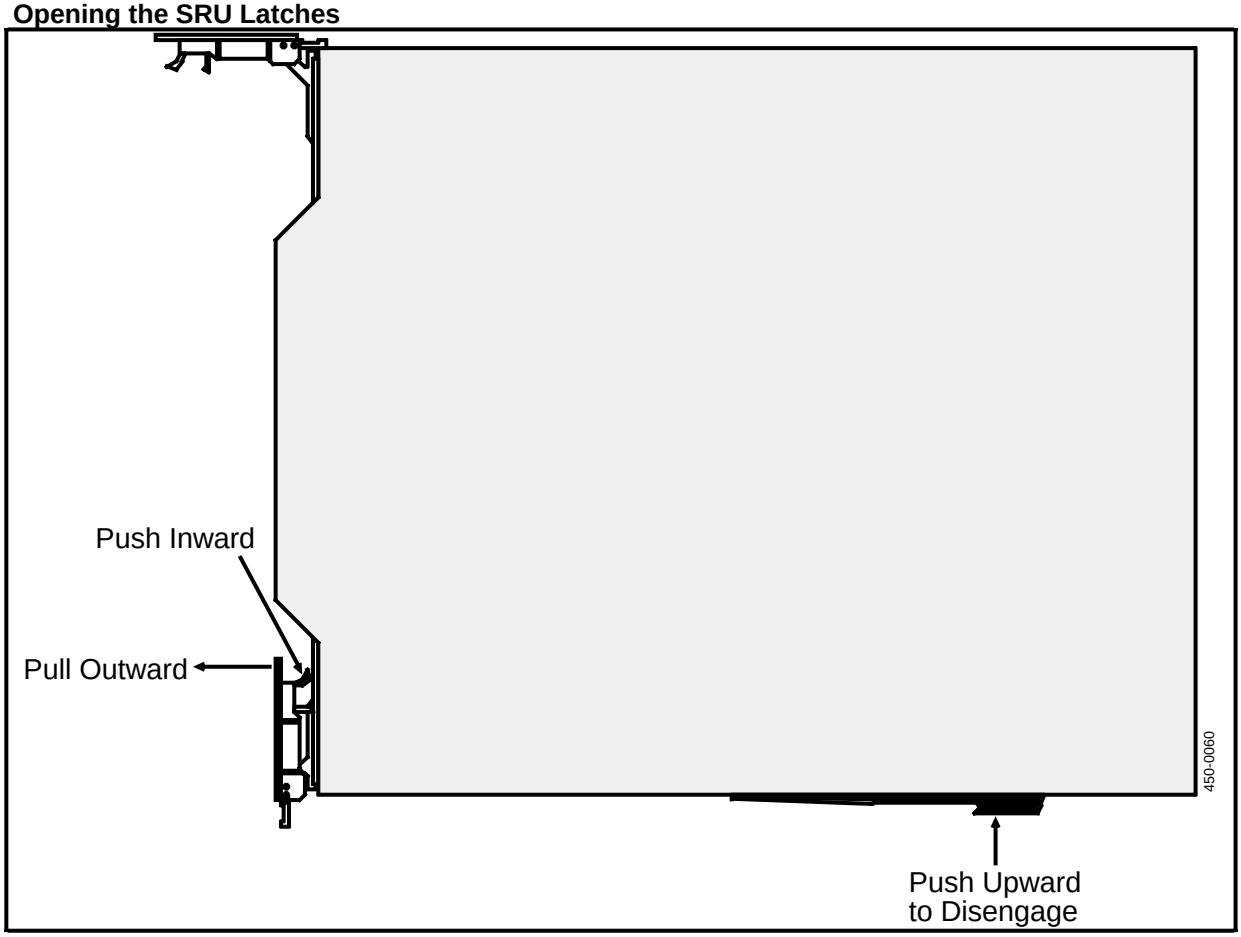
(3) Guide the SRU into the grooved slot of its assigned shelf position. (See the provisioning tables, which should be kept in the Site Records, 450-1011-152.)

(4) Release the primary latches on the top and bottom of the SRU faceplate by pushing the secondary latches with your finger. The secondary latch is underneath the primary latch.

(5) Hold the top and bottom latch levers outward (at right angles to the SRU as shown in Fig. 6-4). Then, gently slide the unit into the shelf, past the safety latch on the bottom of the SRU, until the SRU touches the backplane connector. The latches must clear the front channel.

Note: For SRUs equipped with an adapter cable at the rear, the cable must clear the rear backpanel window as the unit is being inserted into the shelf.

Figure 6-4
Opening the SRU Latches



(6) Push the top and bottom latches with sufficient pressure to engage the rear backplane connector. For each NT4G19EA Power Supply SRU, ensure that the interlock receptacle mates with the capacitor interlock at the rear of the shelf position.

(7) Repeat Steps 1 to 6 for each SRU. Ensure that the faceplates of the SRUs are flush with each other.

(8) If there are any vacant SRU positions, cover the backplane connectors with the metal EMI covers. These covers are shipped inside the cabinet, but are removed before installing the SRUs. Refer to the procedure 'Installing and Removing the EMI Covers', later in this part, for detailed installation instructions.

(9) When the EMI covers are in place, place plastic slot covers over any openings in the backplane cutouts to ensure proper airflow through the cabinet. (See Fig. 6-5.)

Note: The filler plates are attached in segments. Break off as many segments as are required to fill the open space. The filler plates simply snap into the cutout window.

(10) If the Analog Link SRU is present in the system, install the analog line cards as described in the procedure 'Installing the Analog Line Cards', later in this part.

(11) Once the SRUs are all installed, check the cabinets for levelness as described in Part 4, as the weight of the SRUs can cause the cabinets to shift somewhat.

(12) Make the necessary cabling connections at the rear panel of the SRUs according to Part 8. These connections include the following:

- connecting the cable between the Primary Processor and the Mass Storage SRU (or other SRUs in a SCSI cluster)
- making direct cabling connections from RS-232-C devices to the Primary Processor or Applications Processors (to be done only with Northern Telecom's authorization)
- cabling connections to the office cross-connect panel from the interface SRUs (for example, the LANlink and Analog Link SRUs)
- cabling connections to DS1-compatible equipment from Digital Trunk Link SRUs
- plugging in the ac input cable when all installation tasks have been completed and you are initializing the system according to the instructions in the Guide to DNC Base Software Installation, 450-1011-302. (This document is available to authorized system installers.)

(13) Close the cabinet doors for proper air flow and cooling.

Installing and Removing the EMI Covers

Each cabinet includes eight SRU shelf positions. Each shelf position has two connectors, which are both covered for EMI protection when an SRU is installed in the shelf position. If a shelf position is left empty, however, the bus connectors should be covered by the metal EMI covers shipped with the cabinets.

The EMI covers are installed as follows:

(1) Locate an EMI cover (Part no. PO686018-01-AT). Six covers are shipped inside the cabinets, tie-wrapped to the shelf frame in bubblewrap packing. They are removed and set aside when the cabinet is installed. No fasteners are required to install the covers.

(2) From the front of the cabinet, position the EMI cover against the bus connector at the rear of the shelf, moving the cover over the pin at the rear of the shelf.

- WARNING -

The pin is sharp and may cause injury.

(3) The EMI cover is equipped with slots at the top and bottom. Hook these slots onto the shelf frame at the top and the bottom as shown in Fig. 6-6. Leave the cover resting in place and go around to the rear of the cabinet.

(4) From the rear of the cabinet, snap the EMI cover into place by pulling out and down.

(5) To remove an EMI cover, push in and up from the cabinet rear.

Figure 6-5
Installing the Plastic Air Flow Slot Covers

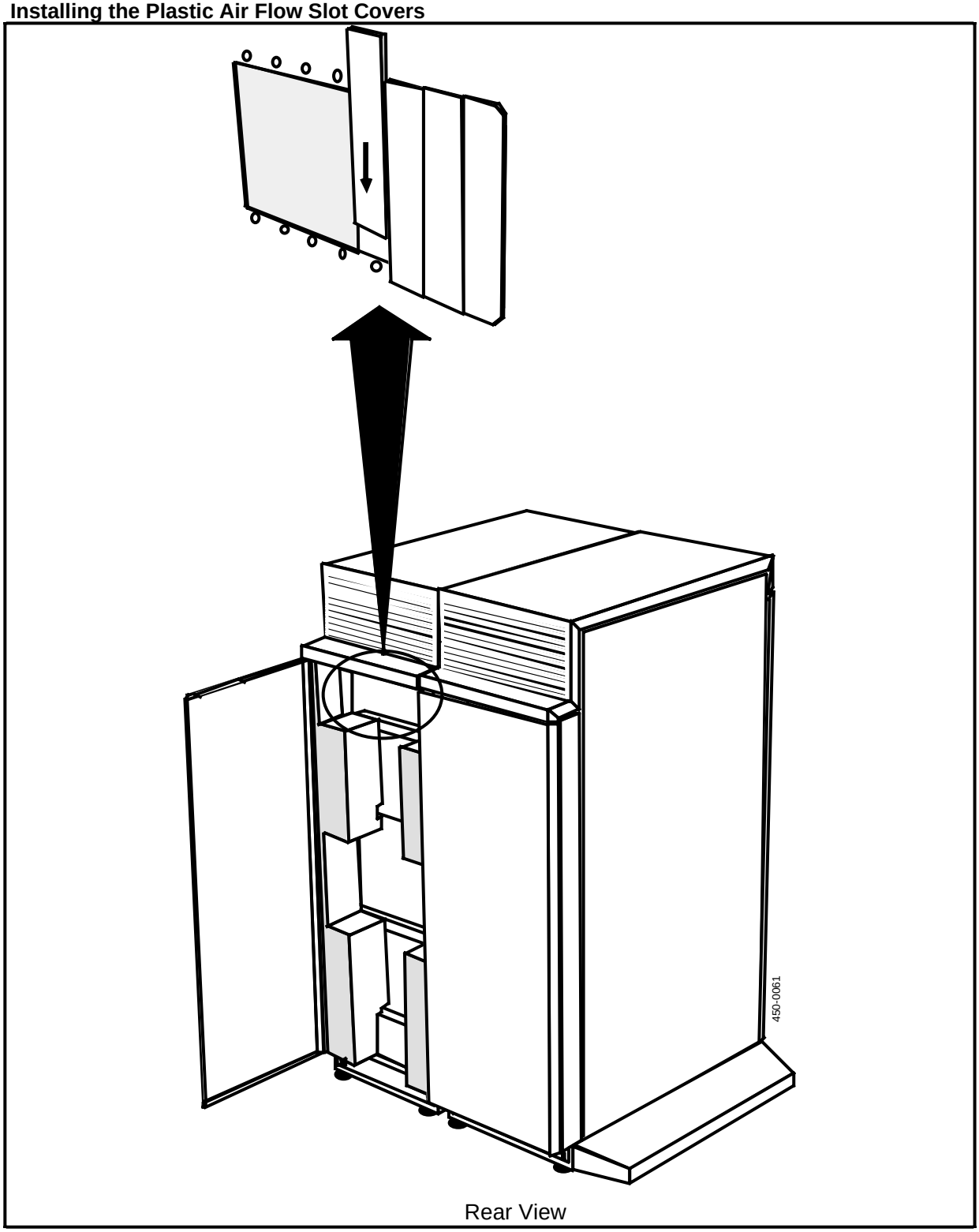
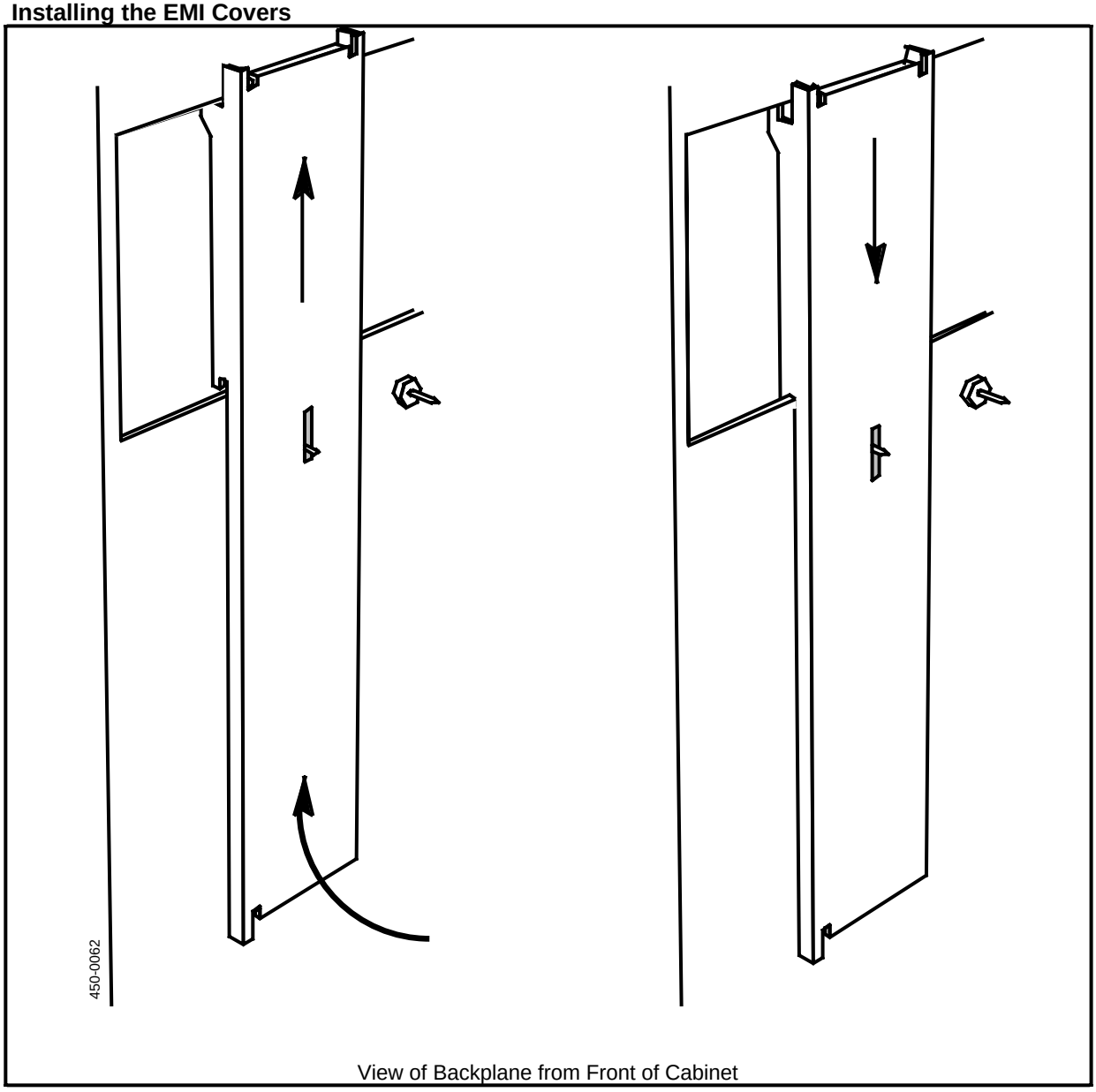


Figure 6-6
Installing the EMI Covers



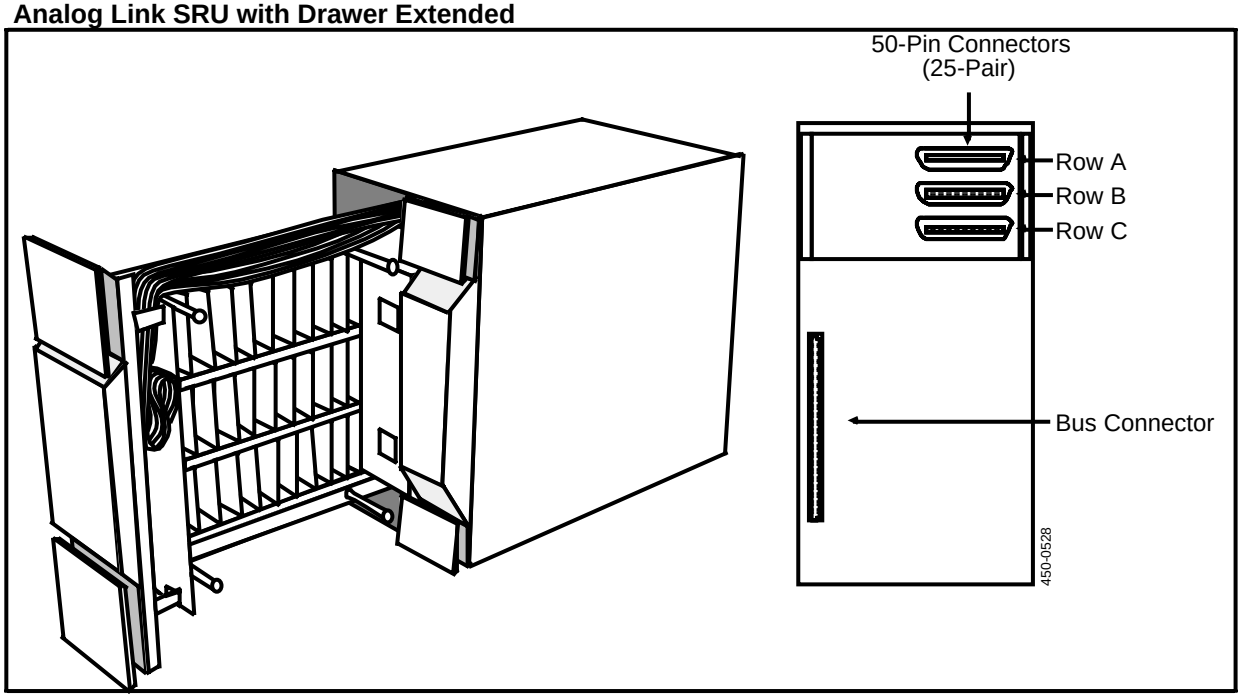
View of Backplane from Front of Cabinet

Installing the Analog Line Cards

When the Analog Link SRU has been installed in the cabinet, install the line cards in the pull-out drawer as follows:

(1) With a 1/4-inch nutdriver, remove the nuts at the top of the drawer cover. Gently slide the drawer out until it is fully extended as shown in Fig. 6-7. The drawer has stops that prevent it from sliding too far.

Figure 6-7
Analog Link SRU with Drawer Extended



(2) Lift the line card cover and pull it away from the drawer to allow insertion of the cards.

- CAUTION -

Handle the line cards with care. A static wrist strap is required. The ground cable on the strap should be attached by the alligator clip to the metal chassis of the SRU.

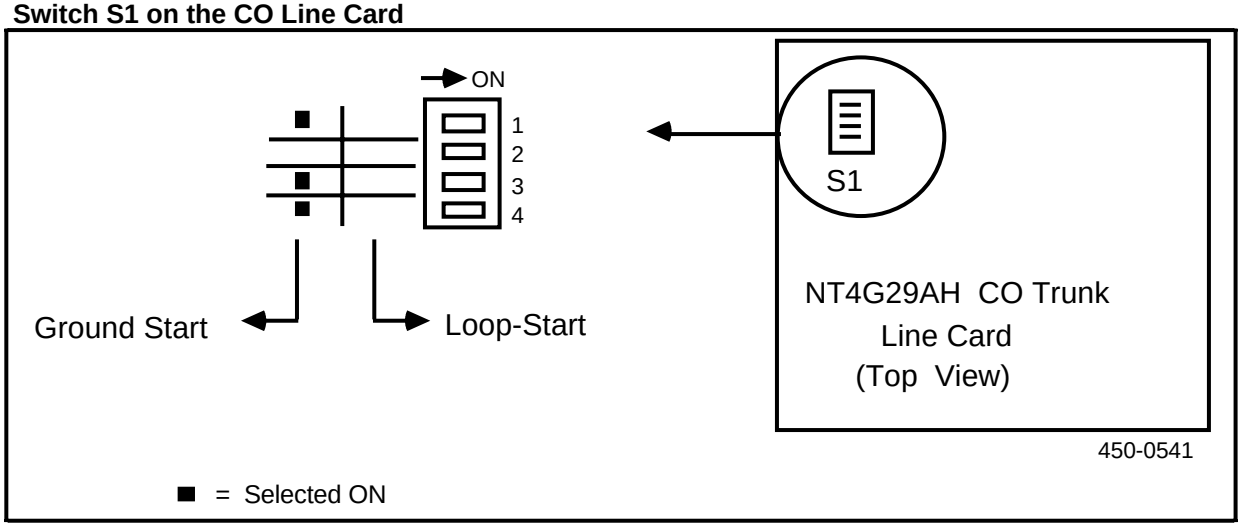
(3) Put on the wrist strap and attach the wrist strap ground cable to the metal chassis of the Analog Link SRU.

(4) Install the line and service cards in their assigned positions according to the configuration worksheets in the Site Records, 450-1011-152. Use the following guidelines:

- The line and service cards are identified by their part numbers on the solder side of the printed circuit board as follows: ,
  NT4G29AH CO Line card
  NT4G29AJ E&M Line card
  NT4G29AE DTMF Receiver card.
- The Peripheral Interface (PIF) card is factory-installed, but must be reseated when the SRU is installed.
- Set or verify the settings of the DIP switches on the CO line card according to the Site Records, 450-1011-152, or consult the system engineer. The settings are as follows:

	1	2	3	4
Loop Start	Off	On	Off	Off
Ground Start	On	Off	On	On

Figure 6-8
Switch S1 on the CO Line Card



- Insert the line and service cards from left to right in Row C beginning at Slot 10. If there are more cards than Row C can accommodate, install them from right to left beginning at Slot 10 of Row B. Similarly, when Row B is filled, fill Row A beginning at Slot 10. (The E&M Line card and DTMF Receiver card require one slot from each of two rows, such as Slot 8 of Rows A and B.)
- Insert the -48 Vdc Converter cards (Part No. NT4G29AG) in Slot 11 of each row equipped with line or service cards.

(5) If the the line card locations are not already recorded in the Analog Link SRU Drawer Map of the Site Records, 450-1011-152, write down the information now and put it into the Site Records.

Note: Card location information is used to configure the lines within the system during software installation. The information is also used to specify where twisted-pair wires are connected to the office cross-connect panel.

(6) Replace the line card cover.

(7) Gently slide the drawer into place in the SRU and close the drawer handles.

(8) With the 1/4-inch nutdriver, secure the drawer with the nuts at the top and bottom.

Removing an SRU from a Cabinet

If an SRU must be removed for maintenance or other purposes, do so according to the following procedure. (Refer to Fig. 6-1 at the beginning of this part for an illustration of SRU features.)

- CAUTION -
Always power the system down before removing any SRU. Before powering down the system, ensure that all users have signed off. Then use the courtesy down function in System Administrative Services as described in Step 1.

(1) Before removing any SRU, you must power the system down. If the system has already been powered down, go to Step 2. Otherwise, follow this sequence:

a) Stop data collection.
b) Inform all users about the system shutdown. Insttruct all users to stop data collection and log off after collection stops.
c) Log off all nodes.
d) Stop any active spool jobs.

(2) Power the system down

(3) Disconnect any cables from the rear of the SRU as described in Part 8.

(4) Release the primary latches on the top and bottom of the SRU faceplate by pushing the secondary latches with your finger. The secondary latch is underneath the primary latch.

(5) Pull outward on the primary latches at the bottom and top of the SRU with sufficient pressure to release the SRU from the backplane connector.

(6) Grasp the faceplate of the disengaged SRU and slide it forward until the safety latch on the bottom of the SRU engages. Do not pull hard on the SRU at this point.

(7) Disengage the safety latch on the bottom runner of the SRU. If it does not disengage easily, relieve the pressure on it by pushing gently on the SRU.

(8) Firmly grasp the top and bottom of the SRU and remove the unit from the shelf. Do not touch the rear connectors.

- WARNING -

Mass Storage SRUs are very heavy for their size. The 350 Megabyte SRU is especially heavy.

Restarting the System after the Removal of an SRU

After removing an SRU, you will usually install a replacement. When you have installed the replacement, proceed as follows to restart the system:

(1) Log on as the superuser.

(2) Select System Administrative Services and press ENTER, to make the System Asdministrative Services Main Menu appear.

(3) Enter Maintenance Services and remove the following PRUs from service: the DNC Application Scheduler PRU (unit number 8531, configuration number 0000) and the DNC Scheduling Services PRU (unit number 8504, configuration number 0000). For instructions on how to remove a PRU from service, see ‘Maintenance for Program Resource Units’ in Part 25 of the Guide to System Administrative Services, 450-1011-301.

(4) Return to the System Administrative Services Main Menu and reset the system date and time. For instructions on setting the date and time, see ‘Changing the System Date and Time’ in Part 3 of the Guide to System Administrative Services, 450-1011-301.

(5) Enter Maintenance Services and restore the DNC Application Scheduler PRU and the DNC Scheduling Servives PRU to service. For instructions on how to restore a PRU to service, see ‘Maintenance for Program Resource Units’ in Part 25 of the Guide to System Administrative Services, 450-1011-301.

7. Installing the Cross-connect Panel

It is assumed that the cross-connect panel and all building wiring and cross-connections have been installed prior to the installation of the system. If this has not been done, or if you are adding a panel or changing wiring, read this part carefully and follow the instructions.

About the Cross-connect Panel

The office cross-connect panel is the central distribution point for system cabling. (See Fig. 7-1.) With the exception of DS1 interfacing, all cabling connections to external equipment are made to the cross-connect panel (or other cross-connect system). The panel thereby minimizes the wiring running in and out of the system cabinets and provides easy access for testing.

Before Making Cross-connections

The office cross-connect panel includes three main sections as follows:

- The top row provides eight 50-pin connectors for connectorized cables from LANlink SRUs. These connectors are labeled LANLINK 1 to 4 for use with LANlink SRUs; ROW A, B and C for connection to the three rows of line cards in an Analog Link SRU; and TRUNKS for a cable to the central office or host PBX. All eight connectors can be used interchangeably; the labeling is for convenience only.
- The nine rows of connectors in the middle portion of the panel are BIX [*]-type connectors. These provide the actual cross-connections between the 50-pin connectors and the building wiring. BIX connectors provide a standard means of terminating cables. They handle 22-, 24-, and 26-gauge solid copper wire; three-pair 24-gauge wiring is recommended.
- At the bottom of the panel is a row of 12 Teladapt jacks for direct connections from stations. One end of the Teladapt cable is plugged into a jack on the panel. The other end is plugged into an M4000 terminal, LIU, or personal computer. This row is removable.

The building wiring is terminated at telephone jacks (typically RJ11C or RJ14C jacks that serve Meridian M4000 terminals, LAN Interface Units, and personal computers with PC LANlink cards.

[*] BIX is a trademark of Northern Telecom.

For central office and PBX connections, cross-connections are made to other distribution panels. Typically, an RJ21X panel is used as a main distribution frame (MDF) for central office connections. There may also be intermediate distribution frames (IDFs) for distribution within the office building. These panels are typically mounted on plywood backboards and located in an equipment room or, in some cases, a telephone closet.

The 50 pins of each connector at the top of the panel are cross-connected to the 50 pins of a specific BIX connector in the middle section of the panel. (See Fig. 7-2.) The BIX connector pins are then connected to the appropriate external devices as follows:

- four wires (and therefore pins) are used for each M4000-series terminal
- four wires are used for each LIU
- four wires are used for each personal computer.

The recommended building wiring is 24-gauge, twisted-pair copper wire. Silver satin cable must not be used; if it is used, the integrity of data transmission cannot be guaranteed, especially if the silver satin cable exceeds 15 m (50 ft).

Color Coding. Color codes are normally used in cross-connect systems to simplify the installation and tracing of cables from one point to another. The color-coded fields represent the use of a particular line in relation to its destination (for example, the central office, a PBX, or a station jack). The guidelines suggested are as follows (they are used on the BIX connectors of the cross-connect panel):

Green Field	(G) toward the switching center or local telephone company
Blue Field	(B) toward the stations (that is, the M4000 terminals, LIUs and PCs)
Red Field	(R) key system apparatus (typically not used in system applications)
White Field	(W) private branch exchange (PBX), Canada
Purple Field	(P) private branch exchange (PBX), USA
Yellow Field	(Y) miscellaneous equipment
Slate Field	(S) multiple bunching connectors

Figure 7-1
Building Wiring and Equipment Layout

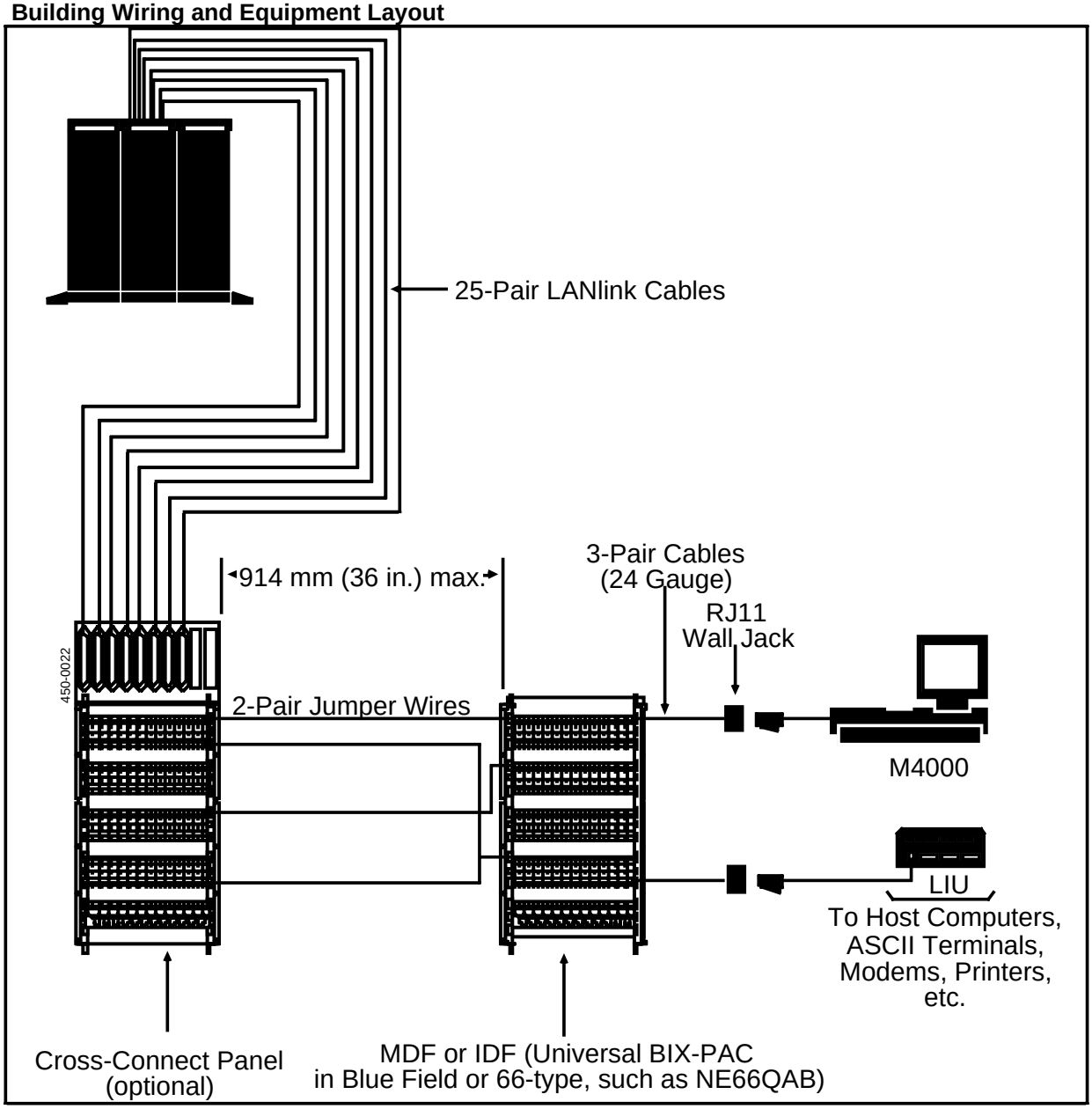
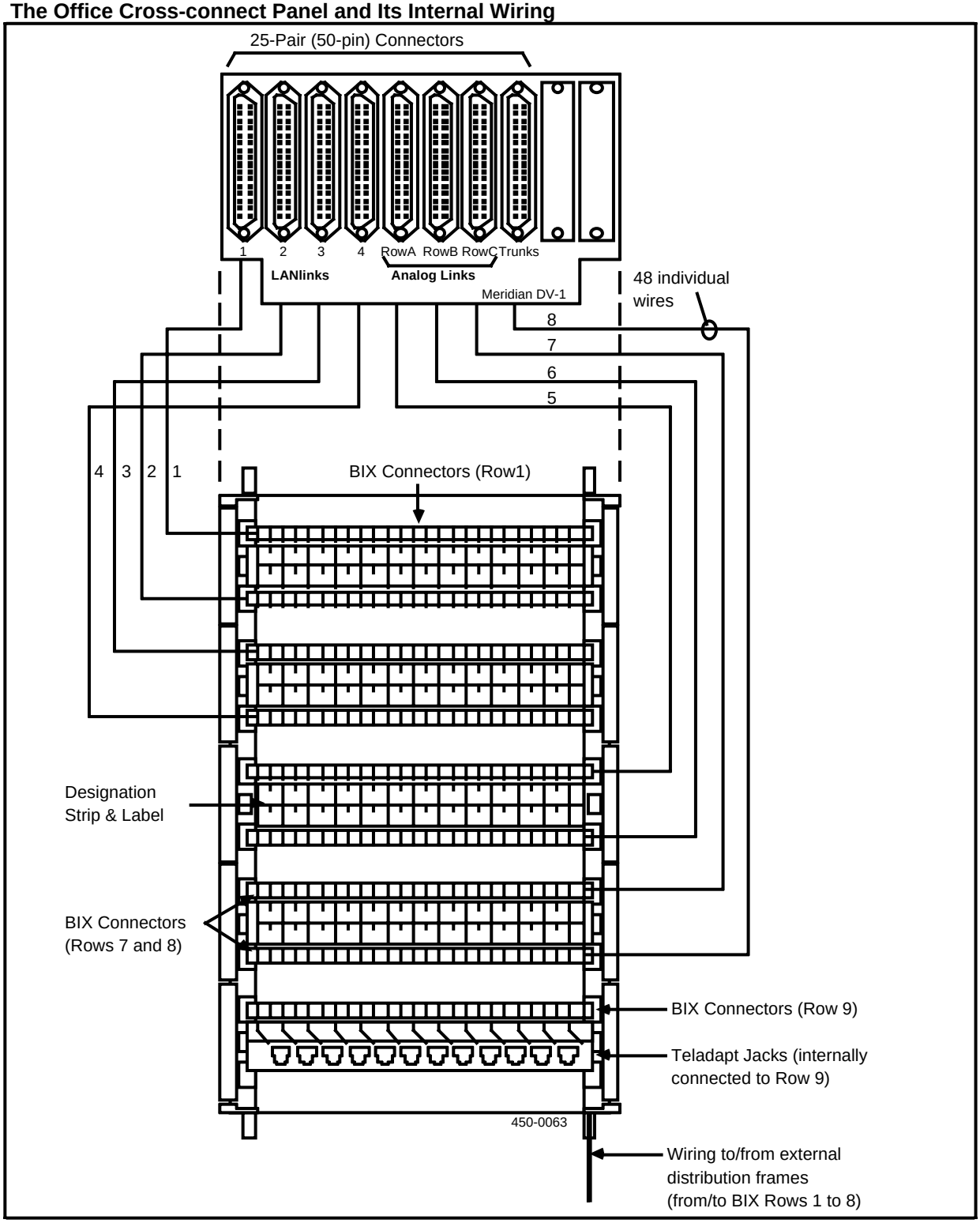


Figure 7-2
The Office Cross-connect Panel and Its Internal Wiring



Unpacking the Office Cross-connect Panel

The office cross-connect panel is shipped with a plastic cabinet and a packet of mounting screws. If the panel has not been installed prior to installation day, proceed as follows:

(1) Locate the shipping carton containing the panel, and move it to its intended installation location. This location is identified on the floor plan, which is stored in the Site Records, 450-1011-152.

(2) Open the shipping carton and remove the panel and its plastic cover. Inspect the items for:
- damaged cabling
- foreign material in the BIX connectors and plugs
- defects in the molded plastic connectors or cover
- any obvious signs of damage to the panel.

(3) Check all items against the packing list. Report any discrepencies or damaged equipment to the transportation company immediately.

How to Install the Office Cross-connect Panel

The panel is 460 mm (18 inches) in height, 200 mm (8 inches) in width, and 76 mm (3 inches) in depth. It requires no external power or grounding. However, it is strongly recommended that the panel be installed on a plywood backboard.

EQUIPMENT:

1 Flat-blade screwdriver

1 Pencil

1 Measuring tape.

MATERIALS:

As required 1/2-inch plywood backboard

As required Fasteners for securing the backboard to the wall.

The panel is installed as follows:

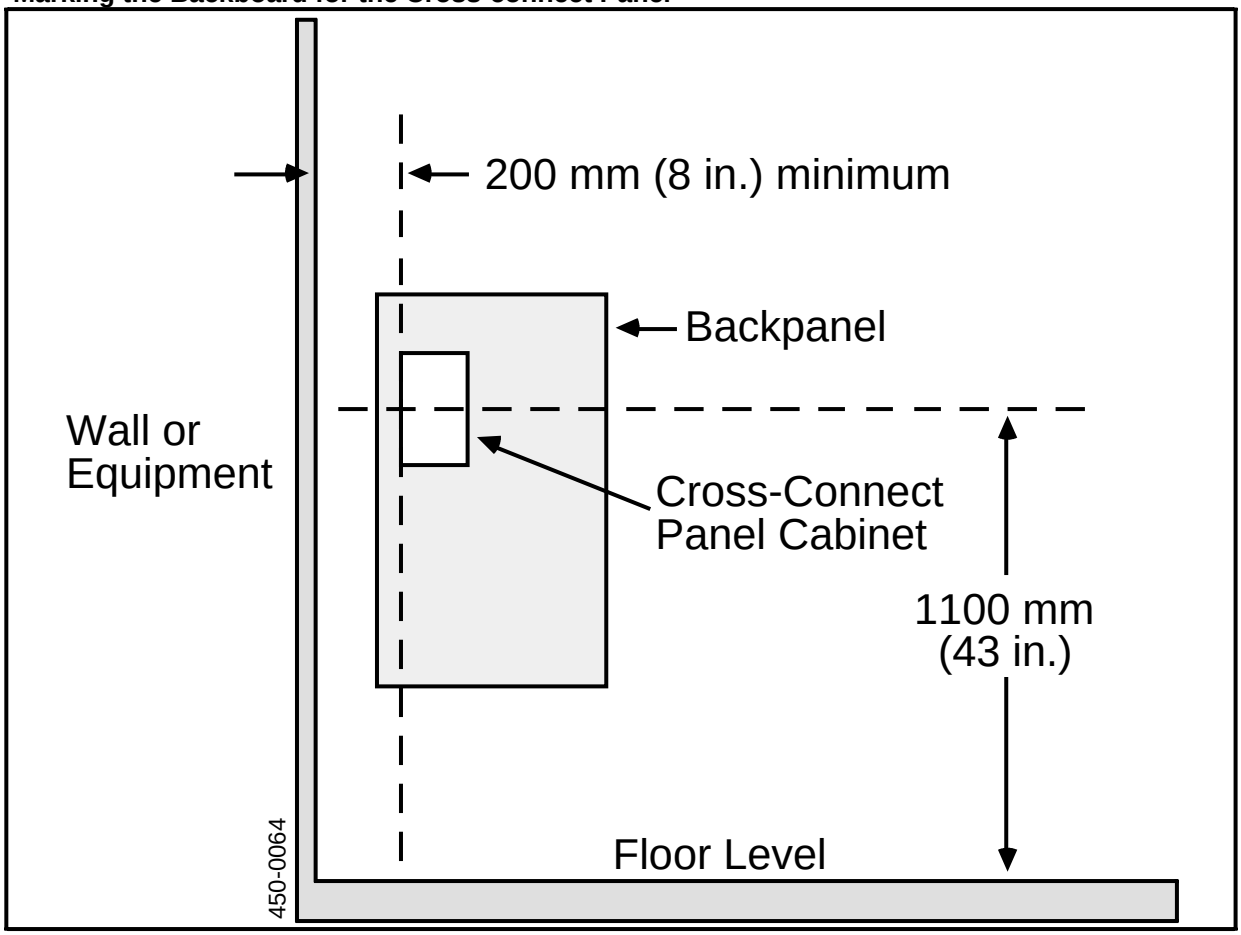
(1) Secure a plywood backboard (1/2-inch plywood is suitable) to the wall where the panel is to be installed.

Note: Additional cross-connect panels can be mounted above, below, or to either side of the first panel, but all cross-connect panels should have at least 200 mm (8 inches) clearance on all sides. A single backboard can be used for all the panels. (Refer to the floor plan and provisioning tables for details for your site.)

(2) Before mounting the cross-connect panel, use a measuring tape and pencil to mark the vertical and horizontal lines on the wall as follows:

- Mark a vertical line approximately 200 mm (8 inches) from the left-hand side wall or from other equipment.
- Mark a horizontal line approximately 1100 mm (43 inches) from the floor.

Figure 7-3
Marking the Backboard for the Cross-connect Panel



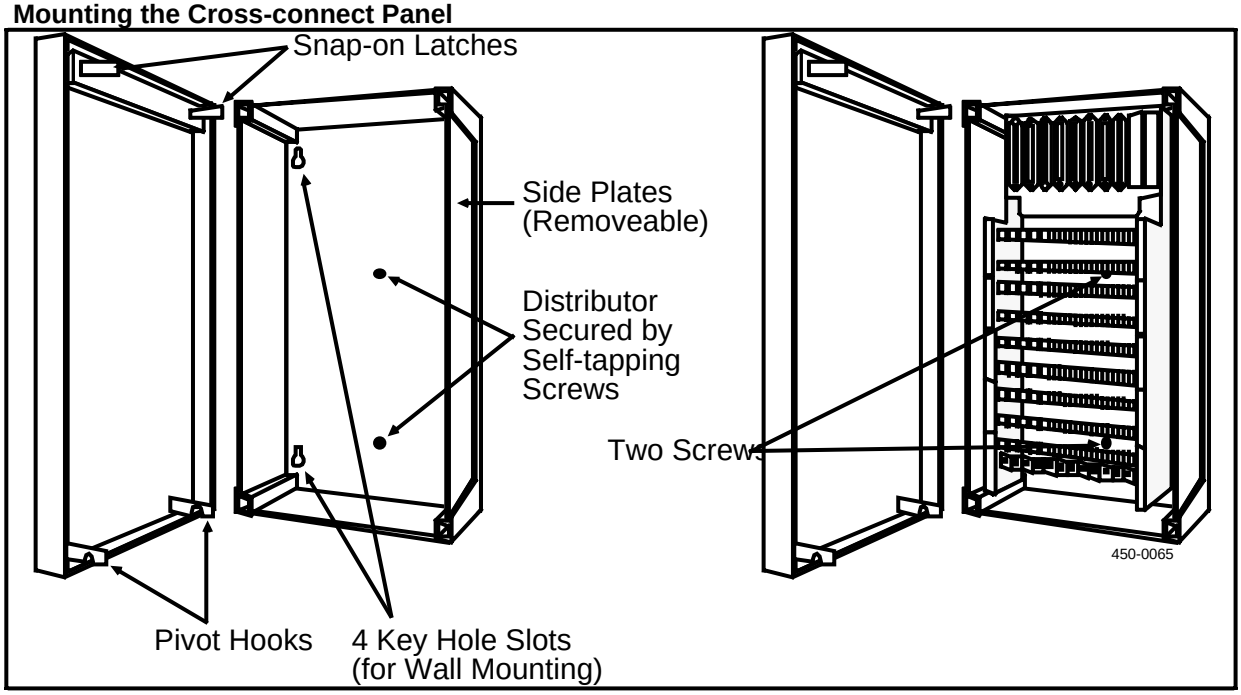
(3) Center the cross-connect panel's plastic cabinet at the intersection of the vertical and horizontal wall markings. Then, secure the cabinet to the wall with the four self-tapping screws provided.

(4) Secure the panel inside the plastic cabinet with the two screws provided. (See Fig. 7-4.)

(5) Secure the front cover of the cabinet by snapping it into the four connectors on the front of the cabinet.

(6) You can now make the cabling connections according to Parts 8 and 9.

Figure 7-4
Mounting the Cross-connect Panel



8. Connecting/Disconnecting the Cables at the Cabinets

This procedures in this part describe the various cabling connections to the SRUs in the system. The connections include:

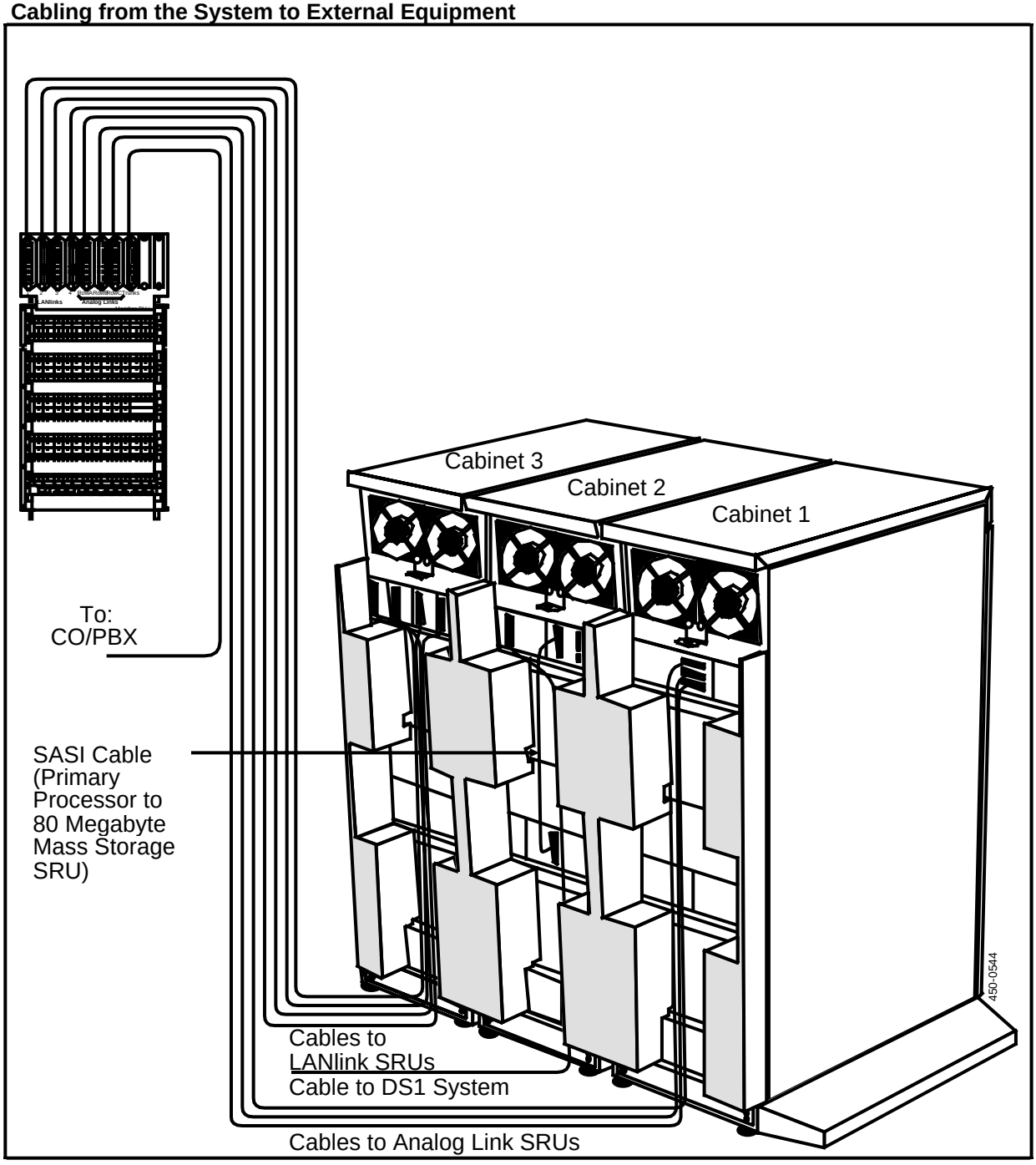
- the cabling that serves as the SCSI (Small Computing Systems Interface) bus for systems using the SCSI interface (that is, the cables inter-connecting the Primary Processor, disk storage SRUs, and tape units)
- the cabling for systems using the SASI interface (Shugart Associates Systems Interface), that is, the cabling between the Primary Processor, the 80 Megabyte Mass Storage SRU, and, optionally, the 350 Megabyte Mass Storage SRU
- direct cabling connections from RS-232-C devices to the Primary Processor or Applications Processors (to be used with Northern Telecom's authorization only)
- cabling connections to the office cross-connect panel from the interface SRUs (for example, the LANlink and Analog Link SRUs)
- cabling from the Digital Trunk Link SRU to DS1-compatible devices
- connecting the ac power input cable to the Input Jumper Assembly.

Cabling connections to the office cross-connect panel and external systems are shown in Fig. 8-1.

Connections are made to the SRUs through cutouts in the metal backpanels of the cabinets. Cables are routed down the left side of each cabinet (facing from the rear). The cables leave the cabinet via a space below the rear door. Cables are typically dressed with plastic ties.

The pre-installation wiring contractor makes the cross-connections from the office cross-connect panel to the building wiring or other distribution frames before the systemis installed. If for some reason the cross-connections have not been made, refer to Part 9 for instructions. These cross-connections are then routed to the central office, the host PBX, or via the building wiring to LAN Interface Units (LIUs), M4000-series terminals, and personal computers.

Figure 8-1
Cabling from the System to External Equipment



- WARNING -

All cabling should be routed and secured according to local building and safety codes. Other cabling considerations are described in the Installation Planning Guide, 450-1011-200.

APPARATUS

1 cable per SCSI interface, maximum 6 m (18 ft) total SCSI bus:
- 0.66 m (2 ft), NT4G09AE
- 1 m (3 ft), NTG409BE
- 1.6 m (5 ft), NTG409CE
- 2 m (6 ft), NTG409DE
- 2.4 m (8 ft), NTG409EE
- 3 m (10 ft), NTG409FE

1 per SASI system, 609 mm (2 ft) SASI cable, NT4G09AG (for the Primary Processor/Mass Storage SRU connection)

1 per SASI system (optional), 1.8 m (6 ft) SASI cable, NT4G09BG (for the 80 Mbyte to 350 Mbyte Mass Storage SRU connection)

1 per Nine-track Magnetic Tape Unit, cable,3 m (10 ft), NTG409AK

1 per LANlink SRU, LANlink-to-office cross-connect panel cable (25 twisted pairs arranged into 12 groups of four wires each). Available in four lengths:
- 4.57 m (15 ft), NT4G09BC
- 9.14 m (30 ft), NTG409CC
- 18.28 m (60 ft), NTG409DC
- 30.48 m (100 ft), NTG409EC

1 per 9-pin RS-232-C connector (optional), 4-inch 9-pin to 25-pin cable adapter, NT4G46EB, for direct ASCII connections to the rear ports of processor SRUs or the 9-pin ports of the LIUs

1 per Digital Trunk Link SRU, DS1 cable, R0061308 (NE-750A), ordered in standard lengths. The cable can be up to 228.6 m (750 ft) without repeaters.

As required Miscellaneous screws provided with the cables

As required Teladapt cables, 4- or 6-conductor (can be used interchangeably).

TOOLS:

1 Small flat-blade screwdriver

1 Nutdriver (3/16 inches)

1 Wire-wrap tool.

Cabling for a SCSI Cluster

A SCSI cluster is a group of devices (maximum 8) connected to a SCSI bus. Each SCSI cluster supports a SCSI file system. A DNC can contain one or more SCSI clusters. Each SCSI cluster includes the Primary Processor SRU or a File Processor SRU, and at least one disk storage SRU. If the disk storage SRU is not equipped with a cartridge tape drive, then the cluster must also include a Cartridge Tape SRU or a Nine-track Tape Unit (for loading system programs and data).

The first SCSI cluster (containing the Primary Processor SRU) can also contain a File Processor SRU. Each additional cluster must contain one File Processor SRU, and may contain a second. Each cluster can contain a maximum of two tape units (tape SRUs or Nine-track Tape Units), and a maximum of four disk storage SRUs. (For the details for your system, see the provisioning tables and cabinet layout worksheets in the Site Records, 450-1011-152.)

- CAUTION -

Do not power up the system until all the cabling connections have been made. If disconnecting a SCSI cable on an operating system, power down the system first.

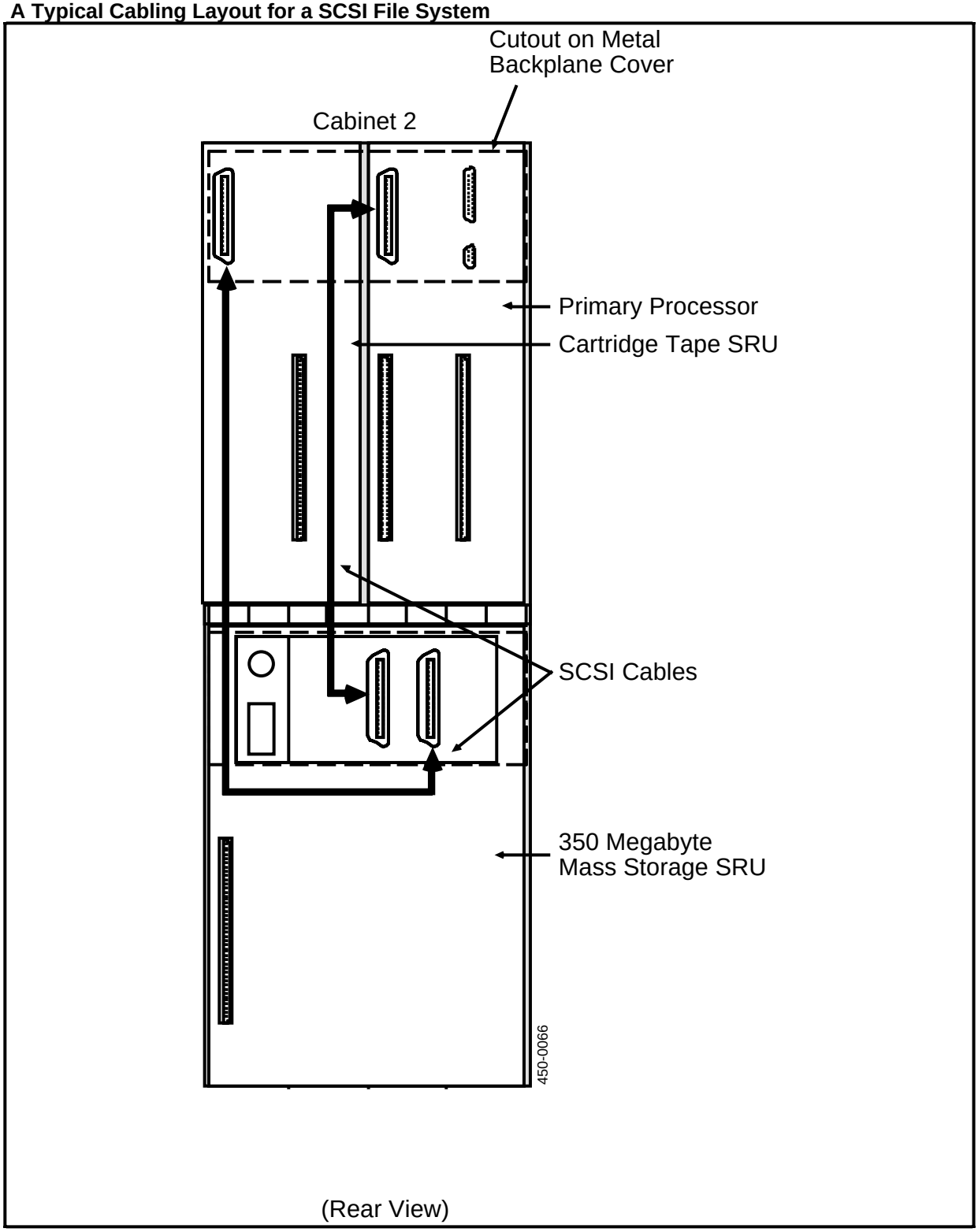
For connector locations and suggested SRU layout, see Fig. 8-2.

To install the cabling for a SCSI cluster, proceed as follows:

(1) Open the rear door of the cabinet to access the rear panels of the SRUs. The Mass Storage SRU should be on the lower shelf (because of its weight). The Mass Storage SRU is to be connected to either the Primary Processor SRU or a File Processor SRU. Locate that SRU directly over the Mass Storage SRU. (You can check their locations from the front of the cabinet, if you wish, as each SRU is labeled on its front panel. Also, the product code is located on a label on the rear panel of each SRU.)

(2) Locate the appropriate SCSI cable, which is typically shipped in the same packing carton as the Storage SRU.

Figure 8-2
A Typical Cabling Layout for a SCSI File System



(3) Push one end of the SCSI cable onto the 50-pin connector at the upper left of the rear panel of the Primary Processor or the File Processor, as viewed from the rear. The connector is keyed so that it connects only one way.

(4) Tighten the two screws on the connector with a flat-blade screwdriver.

(5) If a Mass Storage SRU has a thumbwheel on the rear panel, set the thumbwheel setting to the SRU's address on the SCSI bus. (Addresses 0, 2, 3, and 4 on the SCSI bus are reserved for disk storage SRUs. The first disk storage SRU in the cluster has address 0. Addresses 2, 3, and 4 are assigned in that order as additional disk storage SRUs are added to the SCSI cluster.)

Note: Some Mass Storage SRUs do not have thumbwheels. Instead they have address indicators on the rear panels, with + and - buttons. For an SRUof this type, use the buttons to set the address after the system has been powered up.

(6) Push the other end of the cable onto the left-most (as viewed from the rear) 50-pin connector on the rear panel of the Mass Storage SRU. The connector is keyed so that it connects only one way.

(7) Locate the appropriate length of SCSI cable for the Cartridge Tape SRU connection.

(8) Push one end of the SCSI cable onto the second 50-pin connector at the rear of the Mass Storage SRU. The connector is keyed so that it connects only one way.

(9) Tighten the two screws on the connector with a flat-blade screwdriver.

(10) Route the cable to the Cartridge Tape SRU. Dress the cable as necessary.

(11) Push the free end of the cable onto the 50-pin SCSI connector on the rear of the Cartridge Tape SRU. The connector is keyed so that it connects only one way.

Note: If connecting to a Nine-track Magnetic Tape Unit, the unit must be the last physical unit on the SCSI bus and must be located no more than 5.5 m (18 ft) from the SRU in the cabinet to which it connects. The SCSI cable can be connected to either of the SCSI connectors inside the tape unit. (Refer to the manufacturer's documentation for further information.)

(12) Make the other SCSI cable connections similarly, dressing the cables as required.

(13) Tape SRUs and 1/4 Shelf Disk/Tape SRUs have DIP switches that must be set to indicate the address on the SCSI bus. Set or verify the settings of the switches on each such SRU. The switches are on the front of the 1/4 Shelf Disk/Tape SRU, and on the rear of other SRUs that have cartridge tape drives. Beside the switches there is a diagram showing how to set them for each possible address on the bus. The 1/4 Shelf Disk/Tape SRU must have one of the addresses reserved for disk storage SRUs (0, 2, 3, and 4). Addresses 1 and 5 on the bus are reserved for the first and second tape devices in the SCSI cluster.

(14) Install the bus terminator on the unused connector on the last device on the SCSI bus.

Cabling for Systems Using SASI Connections

There are two cabling layouts for SASI systems. One, the usual configuration, involves only the Primary Processor and the 80 Megabyte Mass Storage SRU. The second layout is used when the system includes the optional 350 Megabyte Mass Storage SRU.

SASI Cabling (Primary Processor to 80 Megabyte Storage SRU)

- CAUTION -

Do not power up the system until the Primary Processor and Mass Storage SRUs have been interconnected. If disconnecting this cable, power down the system first.

(1) If the rear door of the cabinet is closed, open it to access the rear panels of the SRUs. The Primary Processor should be located directly above the Mass Storage SRU. (You can check their locations from the front of the cabinet, if you wish, as each SRU is labeled on its front panel. Also, the product code is located on a label on the rear panel of each SRU.)

(2) Locate the 609 mm (2 ft) SASI cable, which is typically shipped in the same packing carton as the Mass Storage SRU.

(3) Push one end of the SASI cable on to the 50-pin connector at the upper left of the Primary Processor's rear panel, as viewed from the rear. The connector is keyed so that it connects only one way. (See Fig. 8-3.)

(4) Tighten the two screws on the connector with a flat-blade screwdriver.

(5) Push the other end of the extender cable onto the 50-pin connector on the rear panel of the Mass Storage SRU. The connector is keyed so that it connects only one way.

(6) Locate the 1.8 m (6 ft) SASI cable, which is typically shipped in the same packing carton as the 350 Megabyte Mass Storage SRU.

Figure 8-3
Cabling and Layout for Installing the 80 Mbyte Storage SRU

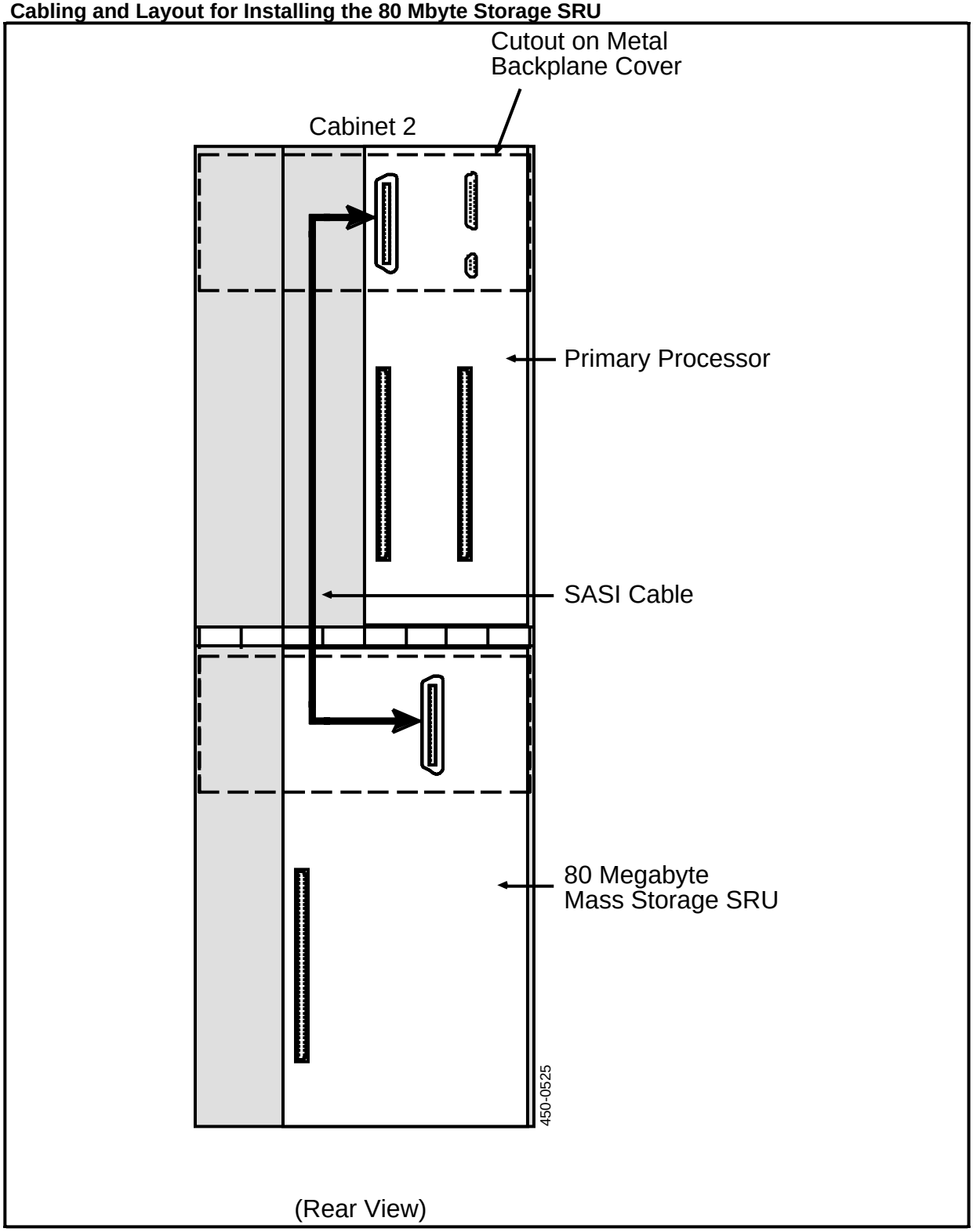
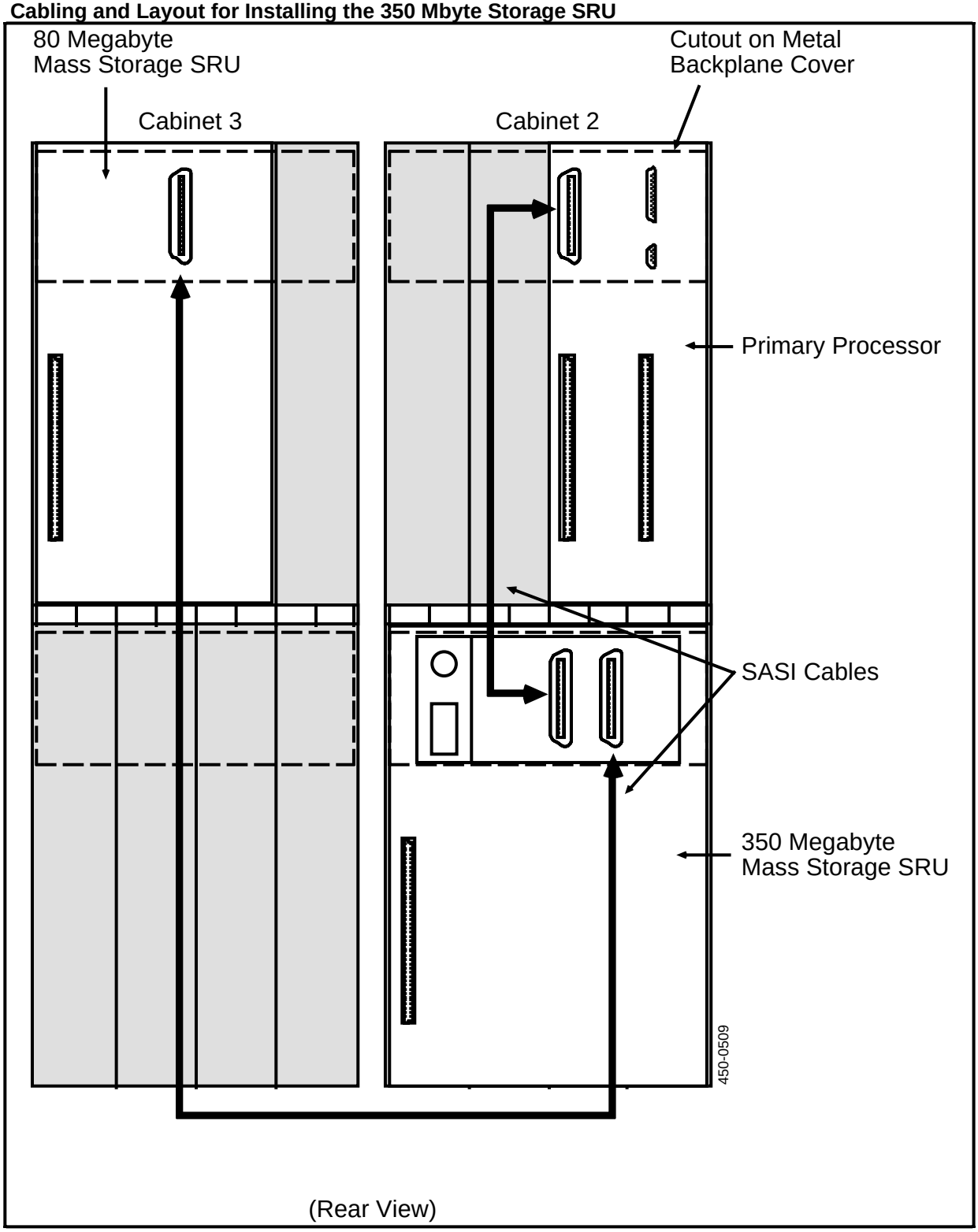


Figure 8-4
Cabling and Layout for Installing the 350 Mbyte Storage SRU



(7) Push one end of the SASI cable onto the 50-pin connector at the rear of the 80 Megabyte Mass Storage SRU. The connector is keyed so that it connects only one way.

(8) Tighten the two screws on the connector with a flat-blade screwdriver.

(9) Route the cable down the rear of the cabinet, out beneath the door and into the cabinet housing the 350 Mbyte Mass Storage SRU. Dress the cable as necessary.

(10) Push the free end of the cable onto the right-most (as viewed from the rear) 50-pin connector on the rear panel of the 350 Mbyte Mass Storage SRU. The connector is keyed so that it connects only one way.

SASI Cabling for the 350 Megabyte Mass Storage SRU

This procedure is optional and is used only if the system includes the optional 350 Mbyte Mass Storage SRU in addition to the 80 Megabyte Storage SRU. If you are upgrading an existing system, you must reorganize the SRUs as shown in Fig. 8-4.

- CAUTION -

Do not power up the system until the Primary Processor and Mass Storage SRU have been interconnected. If disconnecting this cable, power down the system first.

(1) If the rear door of the cabinet is closed, open it to access the rear panels of the SRUs. The Primary Processor should be located directly above the 350 Mbyte Mass Storage SRU. (You can check their locations from the front of the cabinet, if you wish, as each SRU is labeled on its front panel. Also, the product code is located on a label on the rear panel of each SRU.)

(2) Locate the 609 mm (2 ft) SASI cable, which is typically shipped in the same packing carton as the 80 Megabyte Mass Storage SRU.

(3) Push one end of the SASI cable onto the 50-pin connector at the upper left of the Primary Processor's rear panel, as viewed from the rear. The connector is keyed so that it connects only one way.

(4) Tighten the two screws on the connector with a flat-blade screwdriver.

(5) Push the other end of the cable onto the left-most (as viewed from the rear) 50-pin connector on the rear panel of the Mass Storage SRU. The connector is keyed so that it connects only one way.

Direct RS-232-C Connections

The Primary Processor and Applications Processors are each equipped with two RS-232-C connectors on the rear panels for direct connection to RS-232-C compatible devices. One connector has nine pins for direct connection to an ASCII terminal. The second has 25 pins for connection to a modem. The connections are typically used for initializing a new system and for diagnostic purposes, both of which can be performed locally or remotely. To connect a modem to the 9-pin connector, use the NT4G46EB cable adapter.

> ***Note:*** You should make this type of connection only if you have authorization from Northern Telecom.

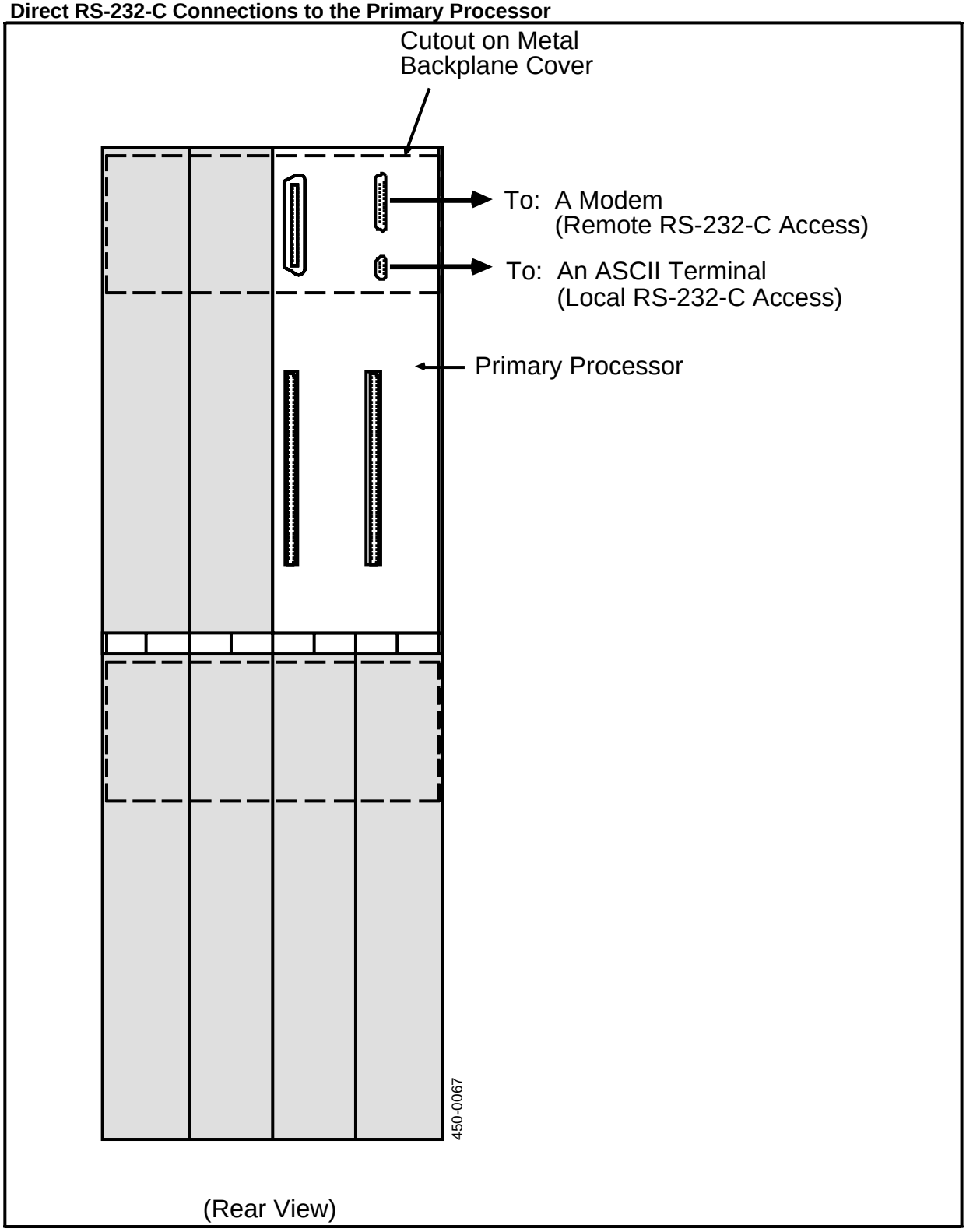
To connect an RS-232-C device to a rear panel port, proceed as follows:

(1) Locate the RS-232-C cable and connect one end of it to the RS-232-C device. You may want to refer to the manufacturer's documentation for assistance.

(2) If you are using the four-inch 9-pin to 25-pin pigtail cable, connect it to the RS-232-C device.

(3) Connect the cable to the RS-232-C port at the rear panel according to Fig. 8-5, tightening the screws on the connector with a flat-blade screwdriver.

Figure 8-5
Direct RS-232-C Connections to the Primary Processor



LANlink Connections to the Cross-connect Panel

The LANlink SRU is equipped with a rear connector that cables the LANlink to one of the connectors at the top of the office cross-connect panel. This procedure assumes that the panel has already been installed. If not, ensure that it is installed according to Part 7.

Each LANlink SRU requires a 25-pair cable. The cable is equipped with D-subminiature Amphenol connectors, and is ordered and shipped separately. The cable is available in various lengths, so be certain that you use the appropriate cable for each LANlink connection.

If the customer so chooses, the cable can be connectorized in the field for non-standard lengths. If this is the case, use the AMP CHAMP MI-1 Crimping tool as described in Part 16 to connectorize the cables. (See Table 8-A for the color codes for the LANlink cable.)

Make the connections as follows:

(1) If the rear door of the cabinet is closed, open it to access the rear panels of the SRUs. Check the wiring log and provisioning worksheets for the position of the LANlink SRUs. (The LANlink SRU is identified by a label on its front panel, and by the product code on a label on the rear panel.)

(2) Locate the cable to be used for that connection.

(3) Push one end of the cable onto the 50-pin connector at the upper right of the LANlink SRU's rear panel, as viewed from the rear. The connector is shaped so that it connects only one way. (See Fig. 8-6.)

(4) Tighten the two screws on the connector with a flat-blade screwdriver.

(5) Route the cable down the left side of the cabinet, as viewed from the rear, and out the space below the rear door. Tie-wrap the cable to the cabinet frame for dressage.

(6) Route the cable to the office cross-connect panel according to the floor plan.

Note: If a cable rack is used, it should be electrically isolated from the system ground.

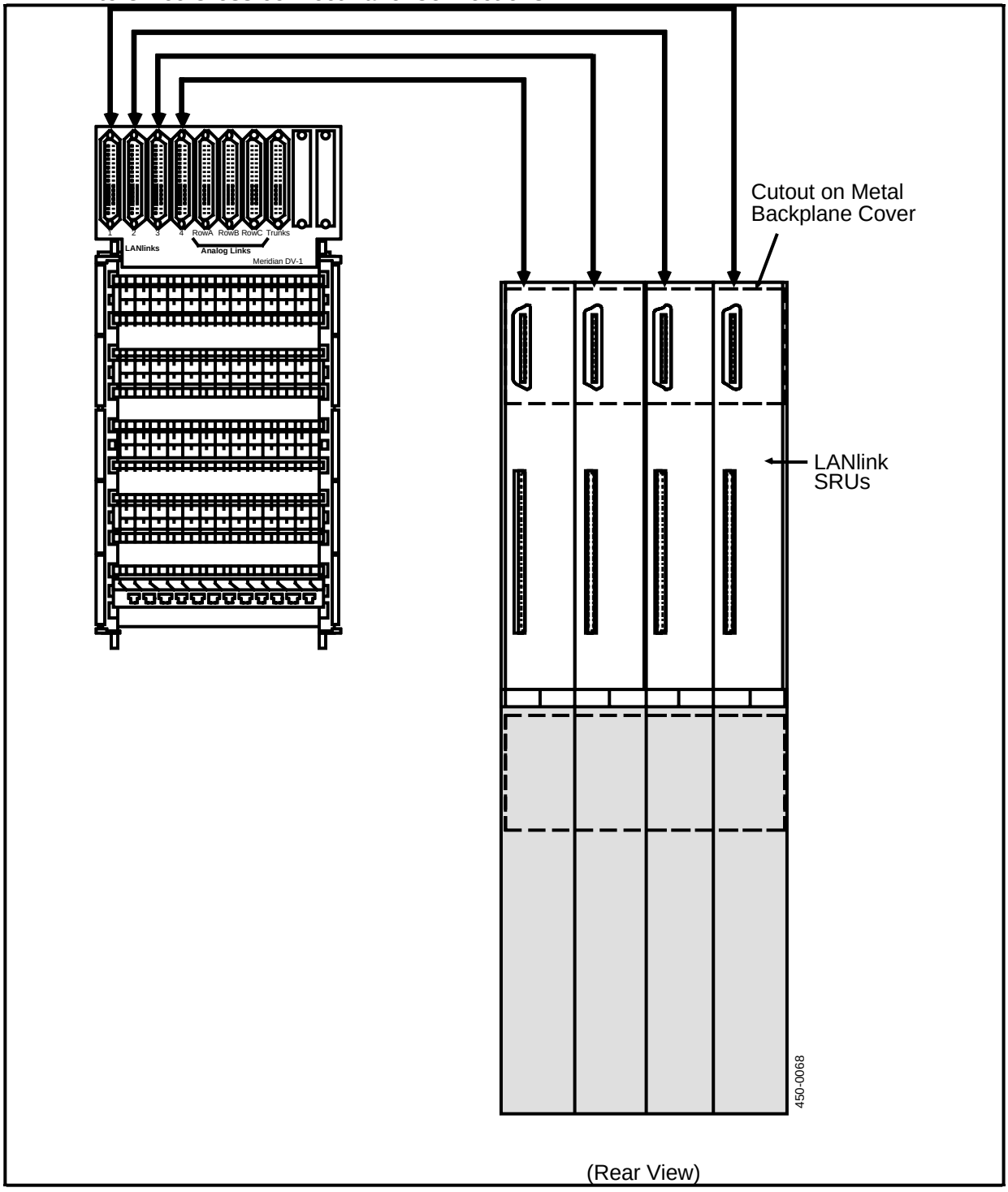
(7) Connect the far end of the cable to one of the four LANlink connectors on the office cross-connect panel. These connectors are the first four on the top left corner of the panel. You may have to lift the retaining bar away from the connectors before making the connection.

(8) When the connector is firmly seated, tighten the screws and lower the retaining bar over the connector to hold it in place.

Table 8-A
COLOR CODES FOR THE LANLINK CABLES

PAIR No.	COLOR CODE
1	White/Blue
2	White/Orange
3	White/Green
4	White/Brown
5	White/Slate
6	Red/Blue
7	Red/Orange
8	Red/Green
9	Red/Brown
10	Red/Slate
11	Black/Blue
12	Black/Orange
13	Black/Green
14	Black/Brown
15	Black/Slate
16	Yellow/Blue
17	Yellow/Orange
18	Yellow/Green
19	Yellow/Brown
20	Yellow/Slate
21	Yellow/Blue
22	Yellow/Orange
23	Yellow/Green
24	Yellow/Brown
25	Yellow/Slate

Figure 8-6
LANlink to Office Cross-connect Panel Connections



Digital Trunk Link Connections to the Cross-connect Panel

The Digital Trunk Link SRU is equipped with a rear connector that cables the SRU to a DS1-compatible terminating or repeating device up to 228.6 m (750 ft) away.

This procedure assumes that the DS1-compatible device has already been installed and that transmission limits have been appropriately engineered. The cable is ordered in standard lengths not exceeding 228.6 m (750 ft) in length.

The customer has the option of customizing the cable in the field. If the cable is not already prepared, use the CERTI-CRIMP Crimping tool to connectorize the 15-pin connectors to the cables, as described in Part 16. A single cable must consist of two twisted pairs (22 or 24 gauge), plus shield ground. (See Table 8-B for pin designations for the Digital Trunk Link connector.)

Make the connections as follows:

(1) If the rear door of the cabinet is closed, open it to access the rear panels of the SRUs. Check the wiring log and provisioning worksheets for the position of the DTL SRUs. (Each SRU is identified by a label on its front panel and by the product code on a label on the rear panel.)

(2) Locate the DS1 interface cable, which is typically shipped with the LANlink cables separately from the DTL SRU.

(3) Push the 15-pin D-subminiature connector into the connector on the rear panel of the DTL SRU. (See Figures 8-7 and 8-8.)

(4) Snug the two screws on the connector with a flat-blade screwdriver.

- CAUTION -

Do not overtighten the screws. If the screws are too tight, problems may be encountered later if they are removed.

(5) Route the cable down the left side of the cabinet, as viewed from the rear, and out the space below the rear door. Tie-wrap the cable to the cabinet frame for dressage.

(6) Route the cable along the floor at the rear of the cabinet, then to a DS1-compatible terminating device such as a DX-1 cross-connect panel or a repeater, or route the cable directly to a DS1-compatible line interface at a host PBX.

(7) Make the wire-wraps for the cable as appropriate using a wire-wrap tool.

(8) Set the 7-position DIP switch on the rear of the SRU to select one of the three ranges of cable equalization. This range is selected according to the length of the interface cable. (See Fig. 8-9 for switch settings.)

(9) Repeat this procedure for each of the DTL SRUs in the system.

Table 8-B
PIN DESIGNATIONS FOR DIGITAL TRUNK LINK CONNECTOR

PIN	DESIGNATION

1	DT0 (Transmit)
2	Frame Ground (cable shield) see note
3	DT1 (Receive)
4	Frame Ground (cable shield) see note
5	no connection
6	no connection
7	no connection
8	no connection
9	DR0 (Transmit)
10	no connection
11	DR1 (Receive)
12	no connection
13	no connection
14	no connection
15	no connection

Note: Frame Grounds are only terminated at the network end.

Figure 8-7
Digital Trunk Link to DS1 Terminating Device Connections

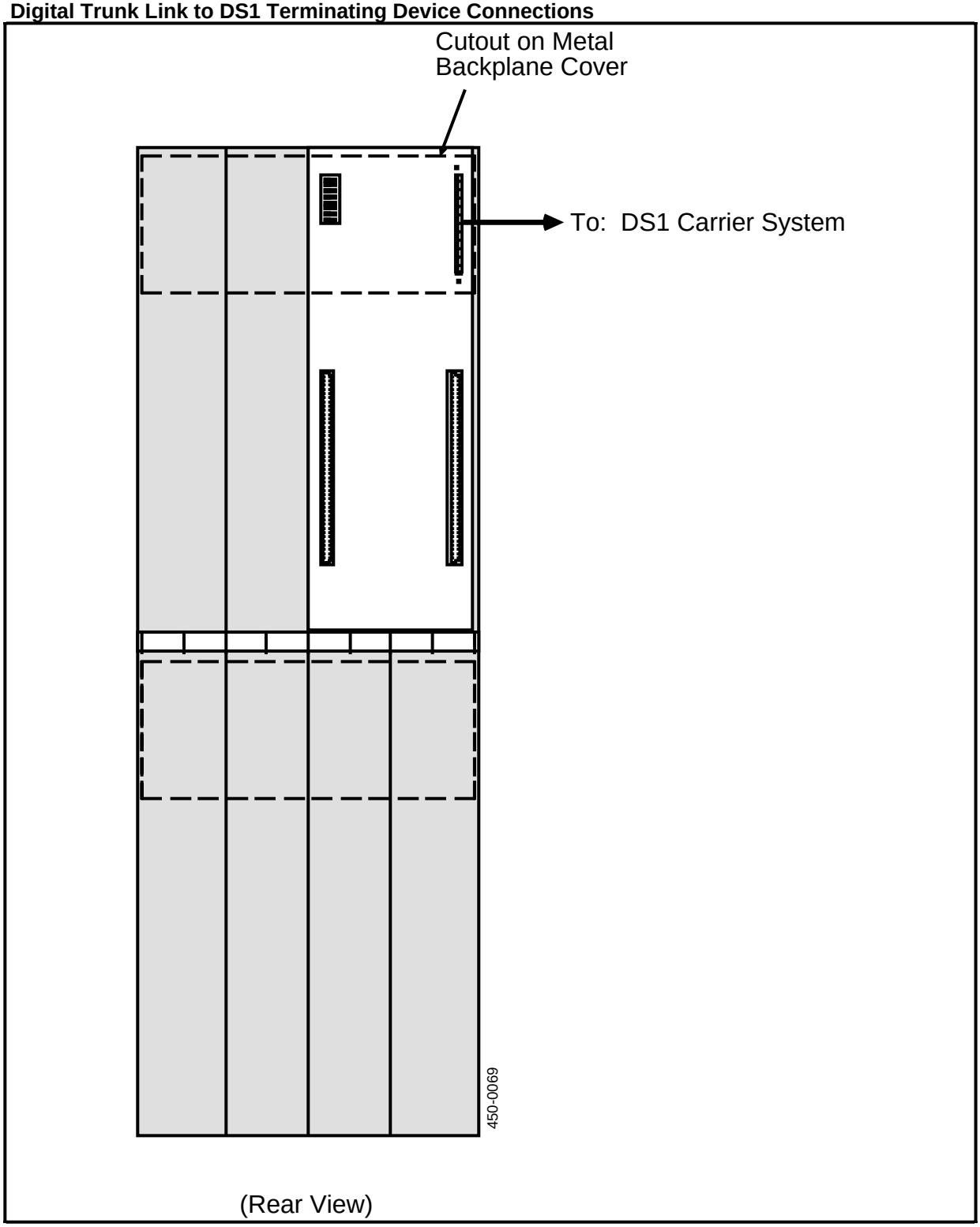


Figure 8-8
The Digital Trunk Link SRU

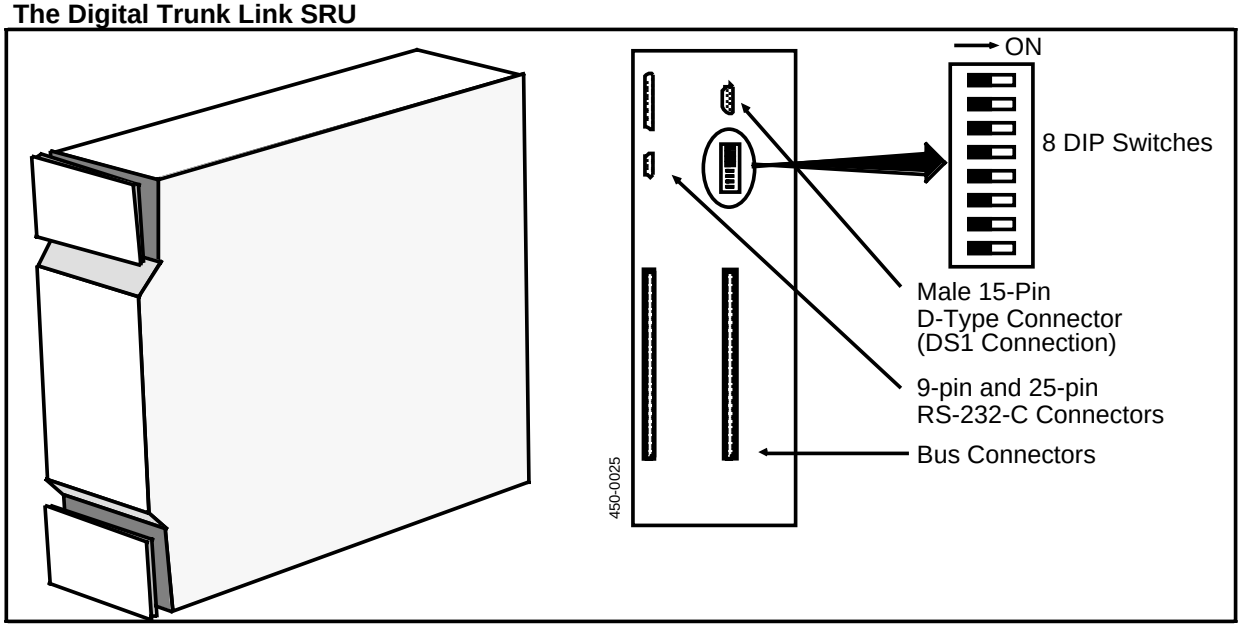
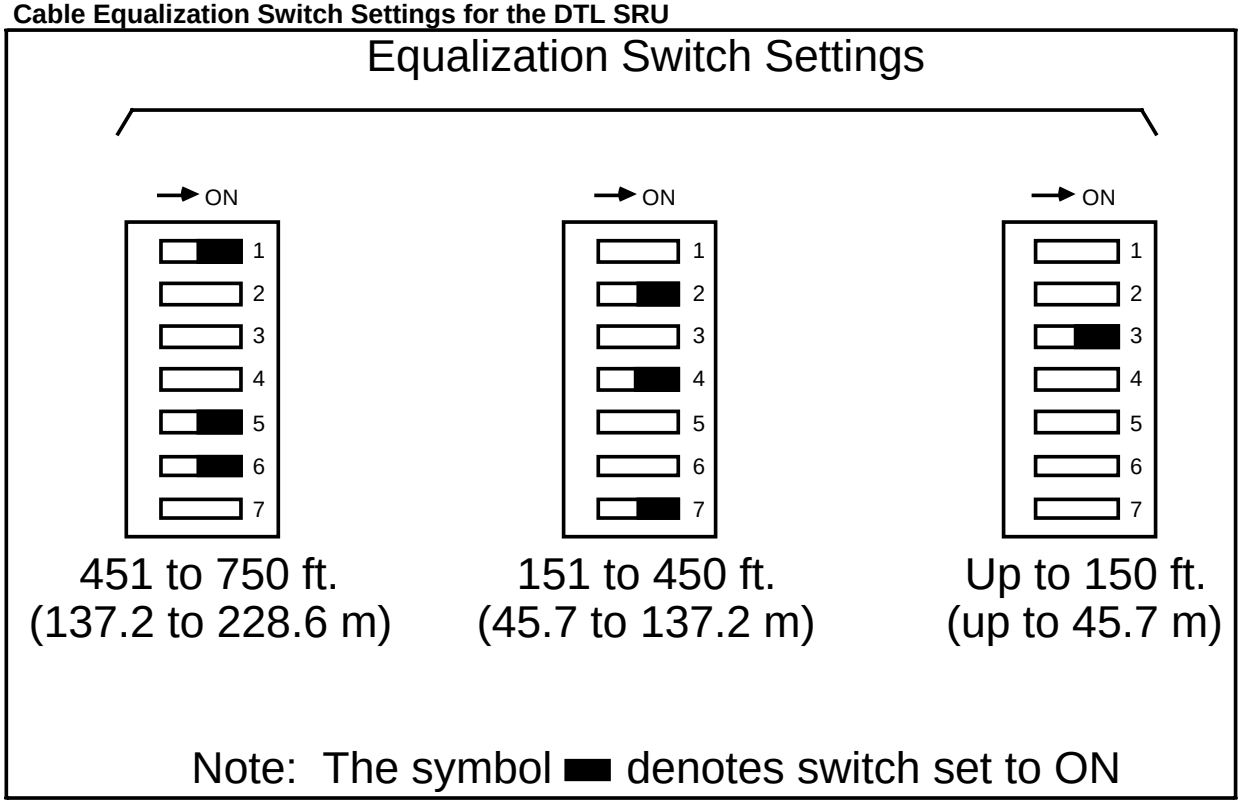


Figure 8-9
Cable Equalization Switch Settings for the DTL SRU



Analog Link Connections to the Cross-connect Panel

The Analog link SRU is equipped with three rear connectors that cable the SRU to the connectors at the top of the office cross-connect panel. Each connector connects one row of line cards in the SRU to the cross-connect panel. The cross-connect panel then routes them to a Main Distribution Frame (MDF) for connection to the central office.

This procedure assumes that the panel has already been installed. If not, ensure that it is installed according to Fig. 8-10.

Each connector requires a 25-pair cable. The cable is equipped with D-subminiature Amphenol connectors, and is ordered and shipped separately. The cable is available in various lengths, so be certain that you use the appropriate cable for each connection.

If the customer so chooses, the cable can be connectorized in the field for non-standard lengths. If this is the case, use the AMP CHAMP MI-1 Crimping tool as described in Part 16 to connectorize the cables. (See Table 8-A for the color codes for the cable, which is the same cable as used for LANlink connections.)

Make the connections as follows:

- WARNING -

To prevent electric shock, power the system down before attempting to attach or remove cables from the Analog Link SRU.

(1) If the rear door of the cabinet is closed, open it to access the rear panels of the SRUs. The positions of the Analog Link SRUs are shown in the wiring log and configuration worksheets in the Site Records, 450-1011-152. (Each SRU is identified by a label on its front panel and by the product code on a label on the rear panel.)

(2) Use a 3/16-inch nutdriver to remove the protective metal cover from each connector on the back of the Analog Link SRU to which you intend to connect to a cable. (See Fig. 8-10.)

Note: The cables correspond to the three rows of line cards in the SRU. The top connector corresponds to Row A, the middle to Row B, and the bottom to Row C.

(3) Locate the cables to be used for the connections.

(4) For each connection, push one end of the cable onto one of the 50-pin connectors of the Analog Link SRU's rear panel. The connectors are shaped so that they only fit one way.

(5) Tighten the two screws on the connector with a flat-blade screwdriver.

(6) Route the cables down the left side of the cabinet, as viewed from the rear, and out the space below the rear door. Tie-wrap the cable to the cabinet frame for dressage.

(7) Route the cable along the floor at the rear of the cabinet, then to the office cross-connect panel according to the floor plan.

Note: A cable rack should be used whenever possible. The rack should be electrically isolated from the system ground.

(8) Connect the far end of each of the cables to one of the three Analog Link connectors on the office cross-connect panel (Rows 1, 2 and 3). Row 1 corresponds to the top connector, Row 2 to the middle connector, and Row 3 to the bottom connector. You may have to lift the retaining bar away from the connectors before making the connections. (See Fig. 8-11 for details of the internal cross-connections for analog lines in the cross-connect panel. Fig. 8-12 shows how to access those lines from an external trunk.)

(9) When the connectors are firmly seated, lower the retaining bar over them to hold them in place.

Figure 8-10
Analog Link to Cross-connect Panel Connections

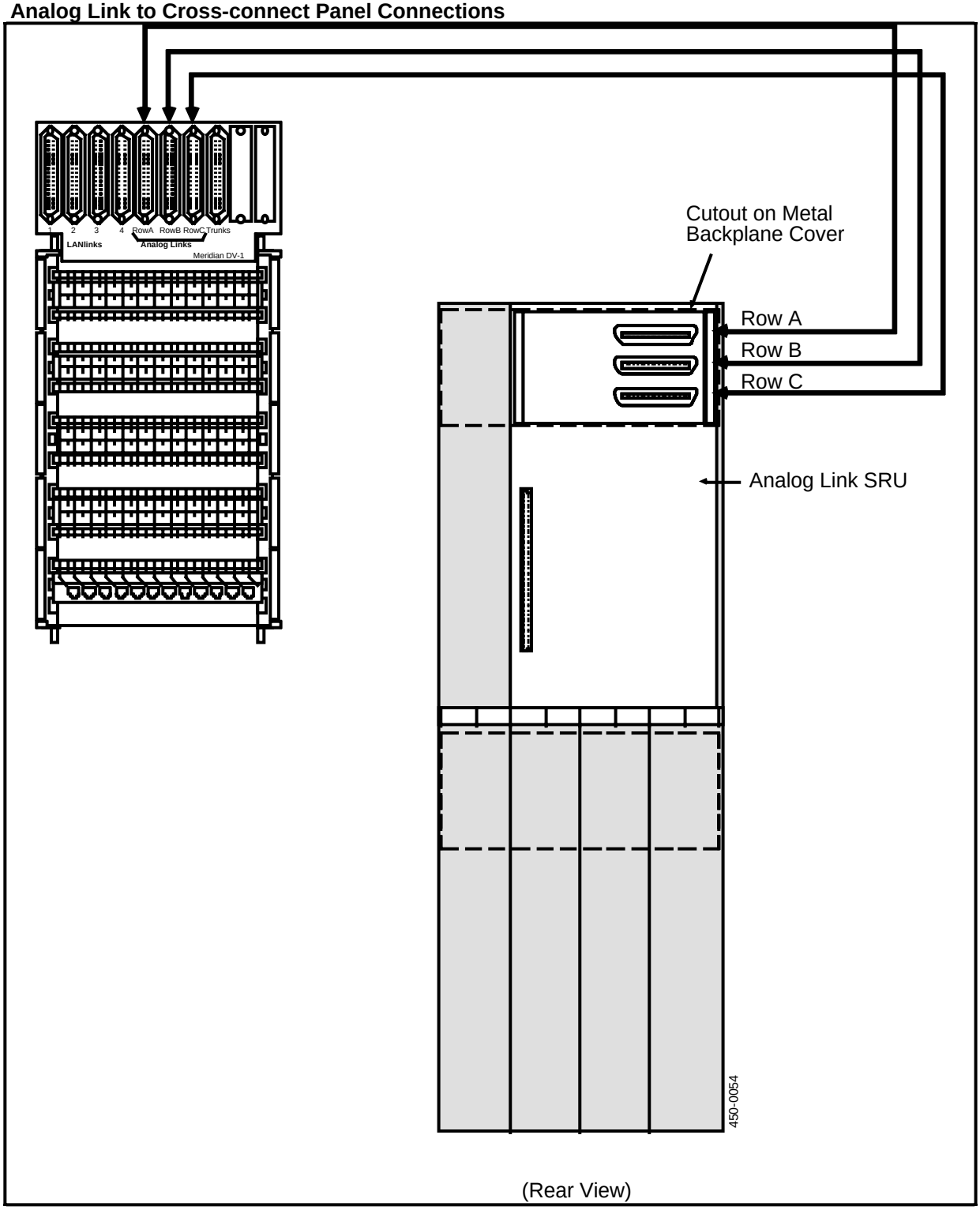
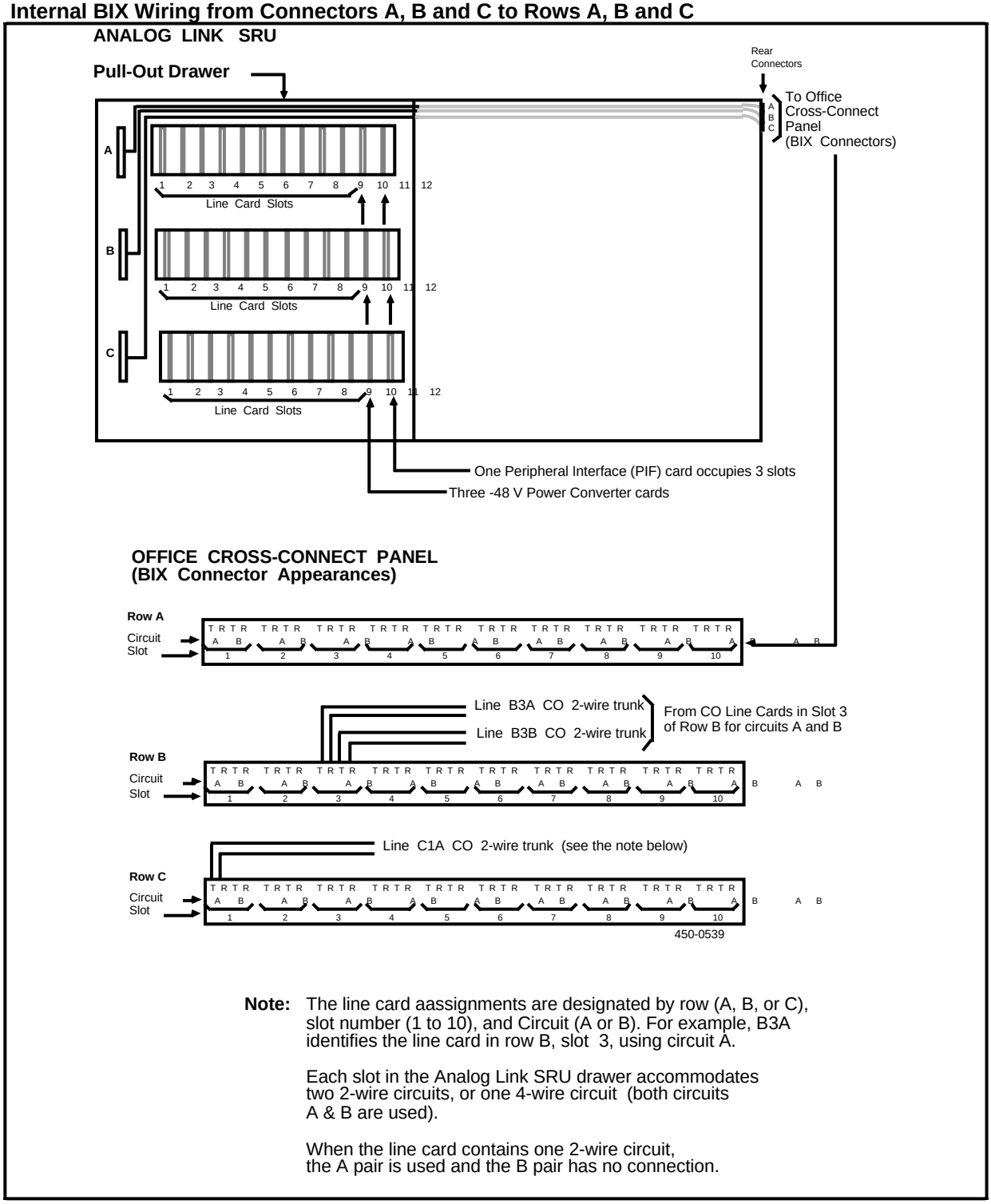


Figure 8-11
Internal BIX Wiring from Connectors A, B and C to Rows A, B and C

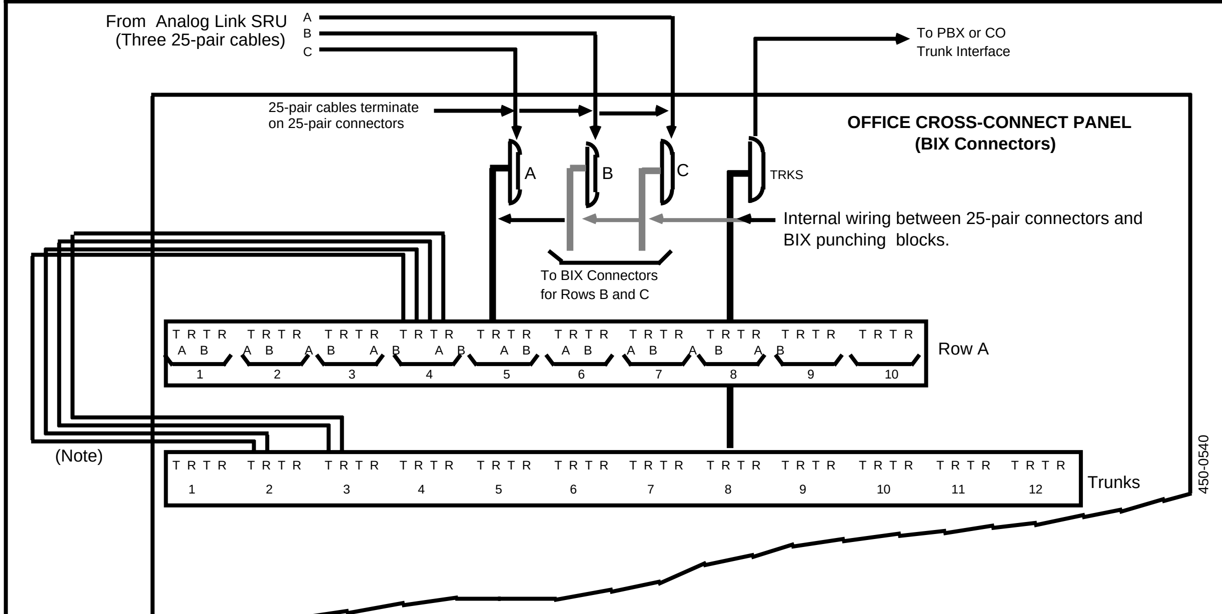


Note: The line card aassignments are designated by row (A, B, or C), slot number (1 to 10), and Circuit (A or B). For example, B3A identifies the line card in row B, slot 3, using circuit A.

Each slot in the Analog Link SRU drawer accommodates two 2-wire circuits, or one 4-wire circuit (both circuits A & B are used).

When the line card contains one 2-wire circuit, the A pair is used and the B pair has no connection.

Figure 8-12
Internal Cross-connections from an External Trunk to Analog Lines



Note: The Analog Link lines may be accessed directly on the BIX punching block terminals, or via the external TRUNK Connector interface. A jumper must cross-connect each line to the BIX punching block for the TRUNK interface connector.

9. Cross-connections to Distribution Frames and Building

Wiring cross-connections should be in place, having been installed by the pre-installation wiring contracter prior to the installation of the system. However, if the connections have not been made, or if updates are required, proceed according to the instructions in this part.

This procedure describes how to make the basic connections to the building wiring. Connections from the LIUs to other devices such as printers, modems, and host computers are described in subsequent parts. For a record of the wiring connections and port assignments, see the floor plan, wiring log, and provisioning tables in the Site Records, 450-1011-152.

EQUIPMENT:

1 QTBIX16A connection tool.

If the connectorized office cross-connect panel is not used, the connector should be cut from the cable from the LANlink SRU. The wires can then be connected individually to the distribution frame according to Table 9-A.

Table 9-A
Wiring Table and Color Coding for LANlink Cables

Each LANlink connection consists of four leads: Tip and Ring for transmit and Tip/Ring for receive. Use the color codes and table below to connect the individual wires of the 25-pair LANlink cable to the distribution frame. These cables are also used for analog lines, which can be either two-wire or four-wire.

LANLink Wiring Table

Color Code Standard

b = blue	bn = brown	r = red	v = violet
o = orange	s = slate	bk = black	
g = green	w = white	y = yellow	

Cable Lead Number = Color Code

1-1 = w-b	7-2 = o-r	14-1 = bk-bn	20-2 = s-y
1-2 = b-w	8-1 = r-g	14-2 = bn-bk	21-1 = v-b
2-1 = w-o	8-2 = g-r	15-1 = bk-s	21-2 = b-v
2-2 = o-w	9-1 = r-bn	15-2 = s-bk	22-1 = v-o
3-1 = w-g	9-2 = bn-r	16-1 = y-b	22-2 = o-v
3-2 = g-w	10-1 = r-s	16-2 = b-y	23-1 = v-g
4-1 = w-bn	10-2 = s-r	17-1 = y-o	23-2 = g-v
4-2 = bn-w	11-1 = bk-b	17-2 = o-y	24-1 = v-bn
5-1 = w-s	11-2 = b-bk	18-1 = y-g	24-2 = bn-v
5-2 = s-w	12-1 = bk-o	18-2 = g-y	25-1 = v-s
6-1 = r-b	12-2 = o-bk	19-1 = y-bn	25-2 = s-v
6-2 = b-r	13-1 = bk-g	19-2 = bn-y	
7-1 = r-o	13-2 = g-bk	20-1 = y-s	

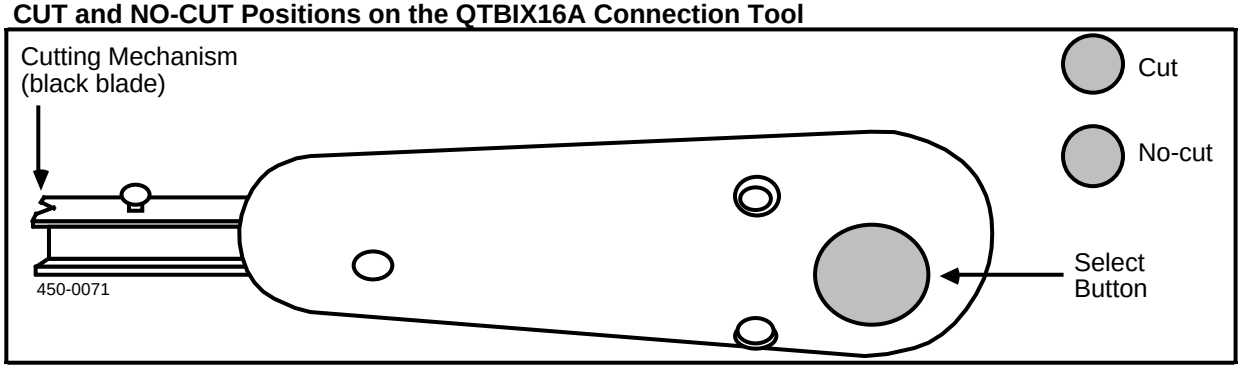
How to Use the QTBIX16A Connection Tool

The QTBIX16A connection tool is used to make the physical connection of the building wiring leads that terminate on the BIX connectors of the office cross-connect panel. This is a special tool designed for making wire terminations at a BIX connector and is used as follows:

> **- CAUTION -**
> Handle the tool with care to avoid damaging it. When not in use, it should be kept in its protective leather sheath.

(1) Set the tool to the CUT or the NO-CUT position, depending on whether you need to cut excess wire at the terminal block or you are looping wire to more than one location. (See Fig. 9-1.)

Figure 9-1
CUT and NO-CUT Positions on the QTBIX16A Connection Tool



(2) Hold the tool with the black cutting blade toward the wires to be cut off. (See Fig. 9-2.)

(3) Insert the tool into the connector. Hold the tool at a right angle to, and level with, the connector.

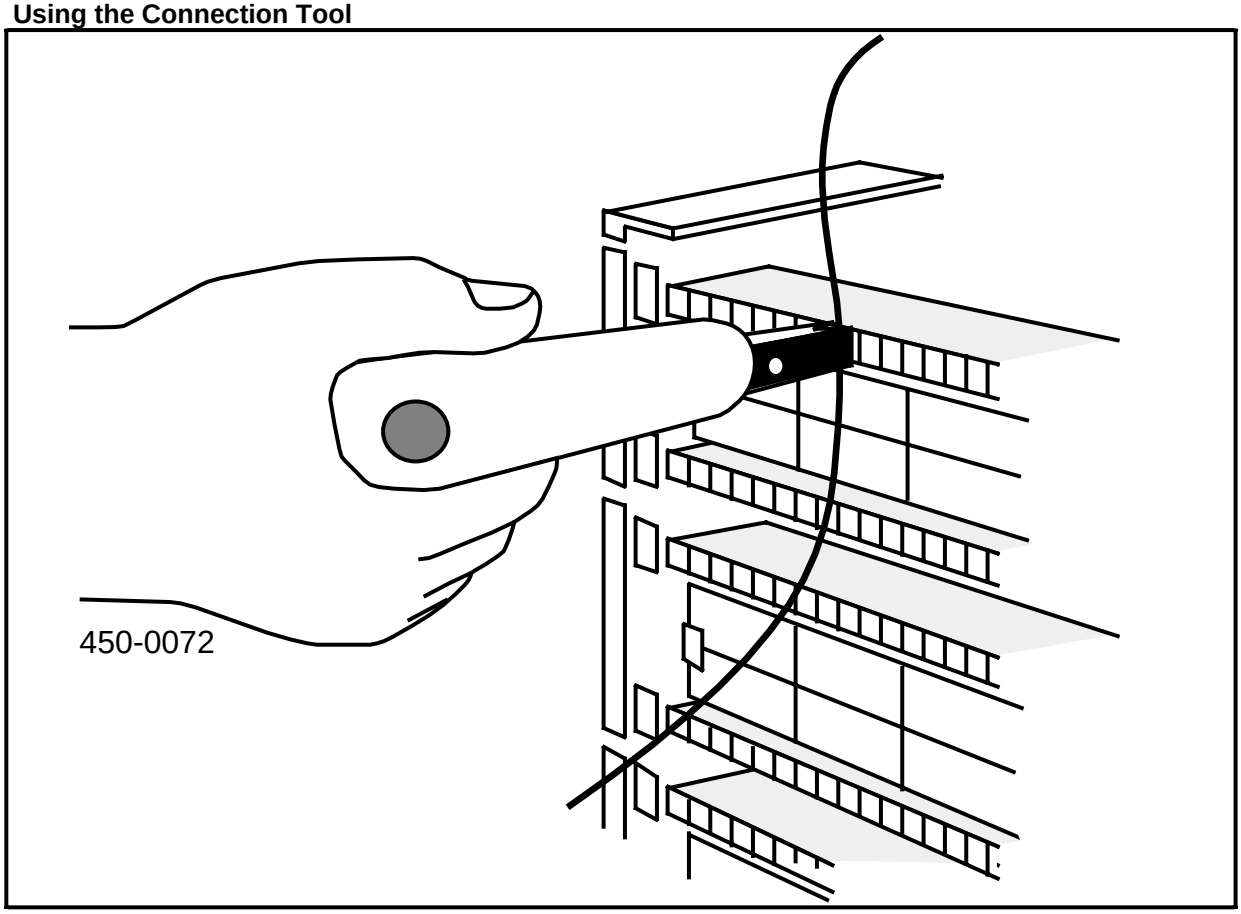
- CAUTION -

Wires will not be properly inserted unless the tool is pushed fully forward and bottomed in the connector. The click made by the tool does not necessarily indicate that the wire has been properly inserted.

(4) Push the connection tool fully forward to seat the wire in the connector.

(5) Apply forward pressure to complete the connection. Note that the excess wire was cut off if the tool was set to the CUT position.

Figure 9-2
Using the Connection Tool



How to Terminate Building Wiring at the Cross-connect Panel

It is assumed that the pre-installation wiring contractor has already installed all necessary building wiring and Teladapt jacks. The cross-connections should have been made from the panel to the building wiring at the same time. However, if this has not been done, proceed as follows:

(1) To locate the station location codes for the wires to be connected, see the floor plan and the wiring log in the Site Records, 450-1011-152. These codes should match the codes that the pre-installation wiring contractor marked on the distribution frames. If no distribution frame is used, the codes should be tagged on the ends of the cables themselves.

(2) Route the cables to the cross-connect panel and up the side of the panel via the distribution rings.

Note: The cable should have 24-gauge twisted-pair wires. Typically, six-wire (three-pair) cable is terminated at the distribution frame, but only four-wire (two-pair) wiring is jumpered to the cross-connect panel as shown in Fig. 9-3.

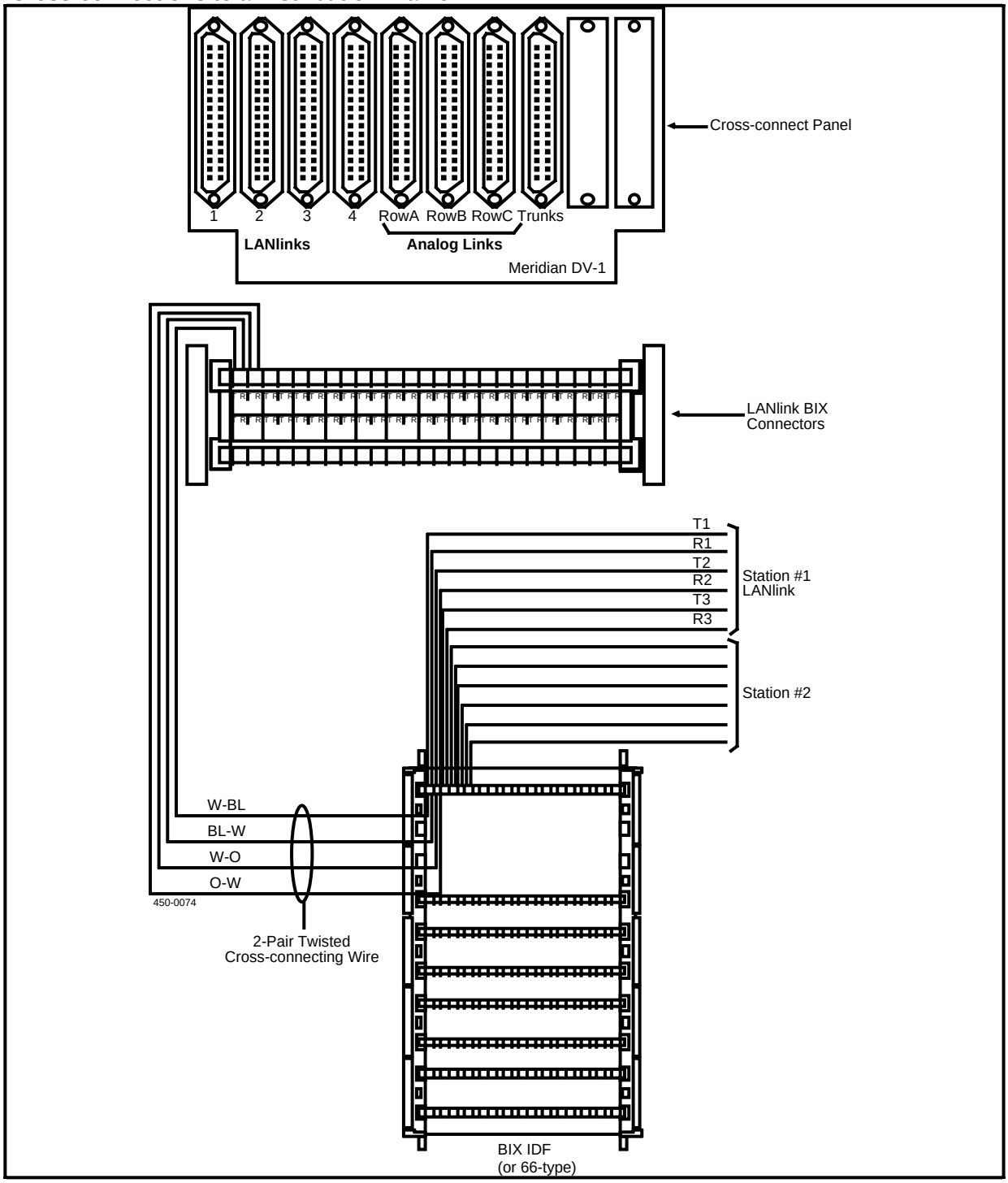
(3) Connect the wires to the appropriate BIX connectors on the cross-connect panel. These connectors cross connect to the 50-pin connectors at the top of the panel as shown in Fig. 9-4.

Figure 9-3
LANlink Cross-connect Designations

Cross-Connect Panel	To: Two-Pair Cross-Connecting Wire	To: Intermediate Distribution Frame
LANLINK CH1 - CH12		
TX T	White/Blue	Tip 1 (T1)
R	Blue/White	Ring 1 (R1)
RX T	White/Orange	Tip 2 (T2)
R	Orange/White	Ring 2 (R2)
	Not Used	Tip 3 (T3)
	Not Used	Ring 3 (R3)

450-0073

Figure 9-4
Cross-connections to a Distribution Frame



10. Connecting the Meridian M4000 Terminals

This procedure is used to connect Meridian M4000-series Terminals to the system. It assumes that the building wiring is in place, and assigned cross-connections are made at the office cross-connect panel and any other distribution frames between the terminal and system.

The M4000 terminals must be located within 610 m (2000 ft) of the system cabinets, measured according to the total length of wiring used, including cross-connect panels. For information on where the terminals are to be located and connected, see the provisioning tables and the floor plan in the Site Records, 450-1011-152.

The M4000 terminals can be connected either directly to the Teladapt jacks at the bottom of the office cross-connect panel or via the building wiring to the BIX connectors on the panel.

When connected via the building wiring, the wiring must consist of twisted pairs. Short stretches of untwisted wire, such as cross-connect or Teladapt cables, are permissible, but long stretches will reduce the 610 m (2000 ft) allowable distance for high-speed LANLink lines.

To connect an M4000 terminal to the system, proceed as follows:

(1) Locate the six-conductor Teladapt cord shipped with the M4000 terminal. Typically, this cord is 1.8 m (7 ft) in length. Do not confuse it with the short length of Teladapt cord used to interconnect the keyboard with the terminal.

(2) Plug one end of the cord into the assigned Teladapt jack. This jack may be on the lower part of the cross-connect panel or on a wall jack. (Refer to the provisioning tables in the Site Records, 450-1011-152, for assignments.)

(3) Run the cable to the M4000 terminal and plug it into the rear of the terminal. (See Fig. 10-2.)

(4) If the keyboard has not already been connected to the terminal, locate the short Teladapt cord and connect one end to the terminal and the other to the keyboard as shown in Fig. 10-3.

(5) If the terminal has not already been connected to a commercial ac source, plug it in. The terminal will power up. It may take a few seconds for the display to come on.

Note: The system administrator enters the appropriate set-up information in System Administrative Services (SAS).

Figure 10-1
M4000-Series Terminal Connected to a Teladapt Jack

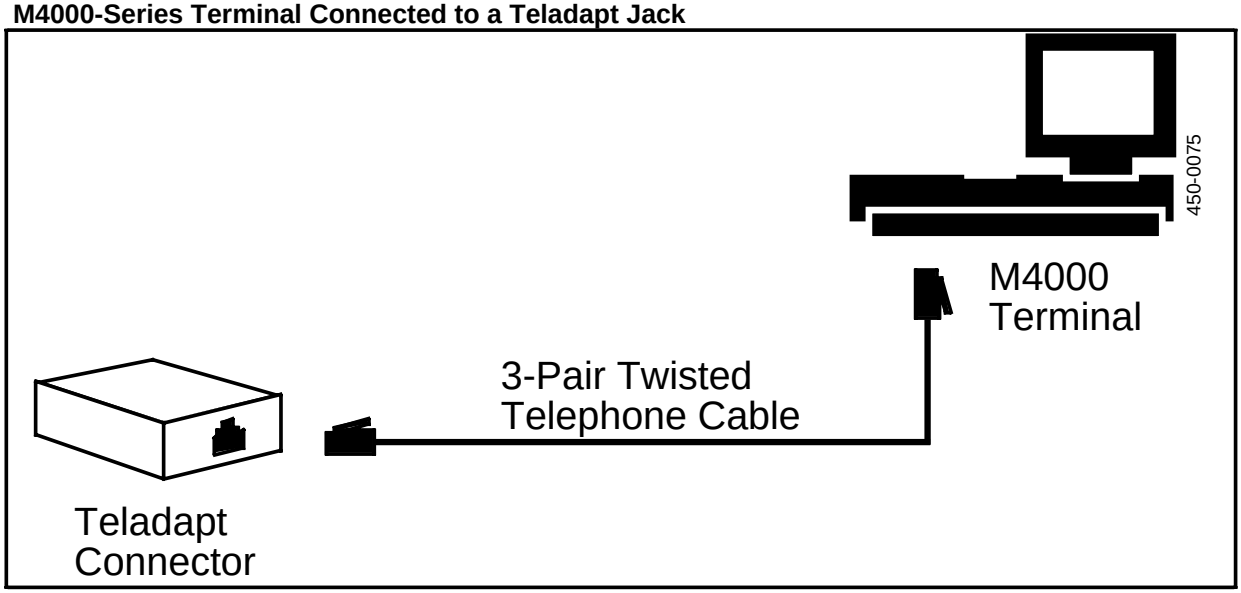


Figure 10-2
Connectors On the Rear of the M4000-Series Terminal

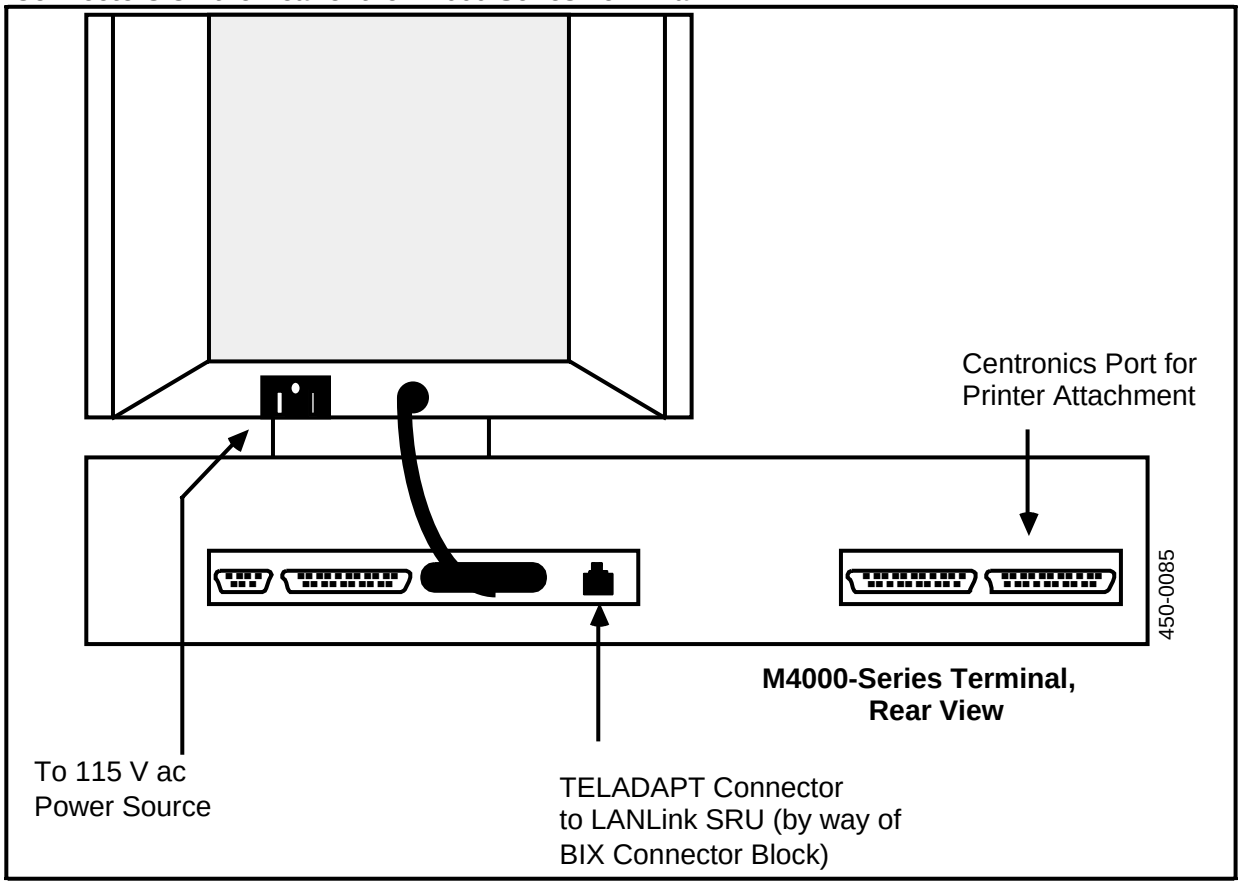
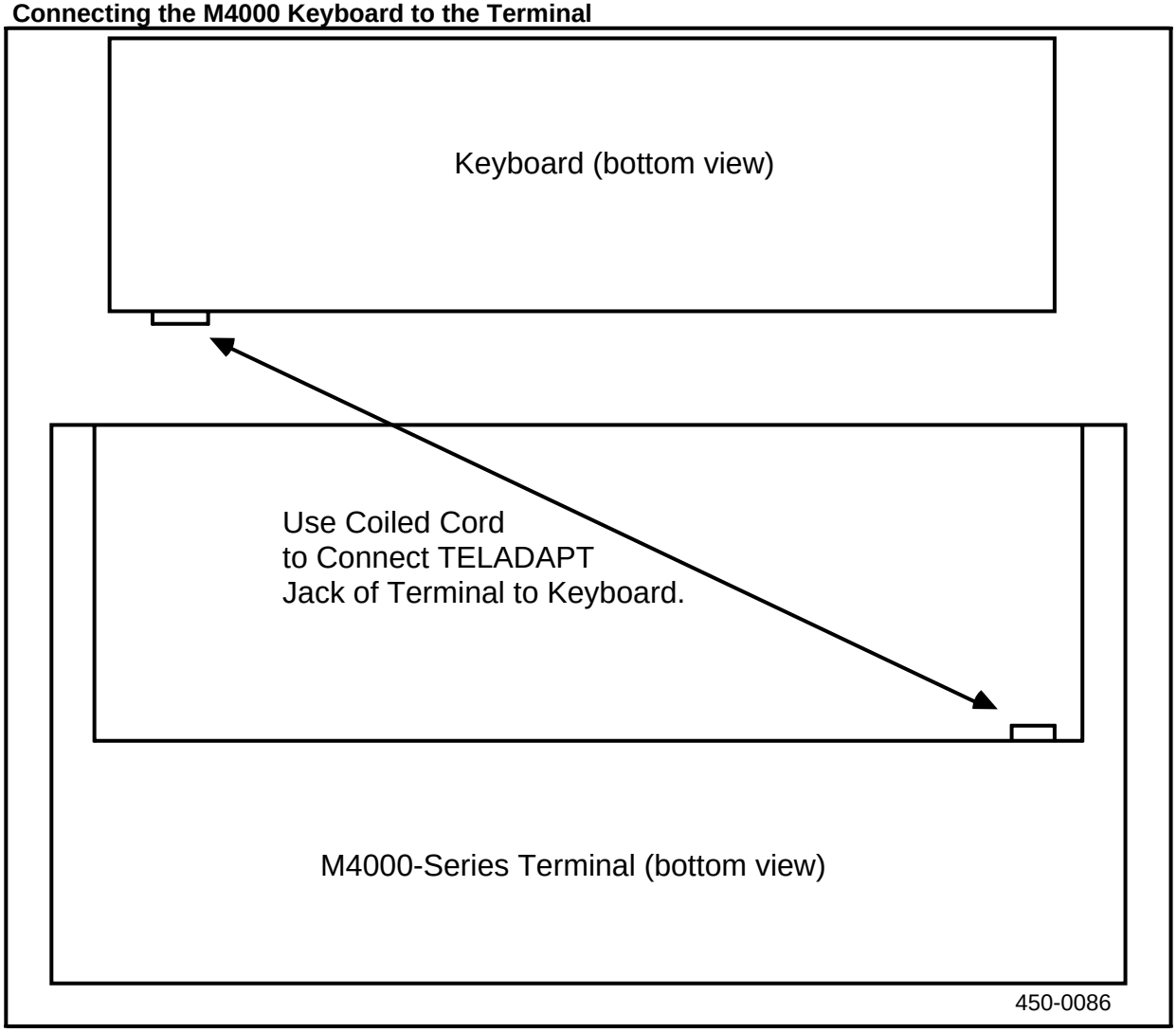


Figure 10-3
Connecting the M4000 Keyboard to the Terminal



Connecting the Headset Accoustic Limiter

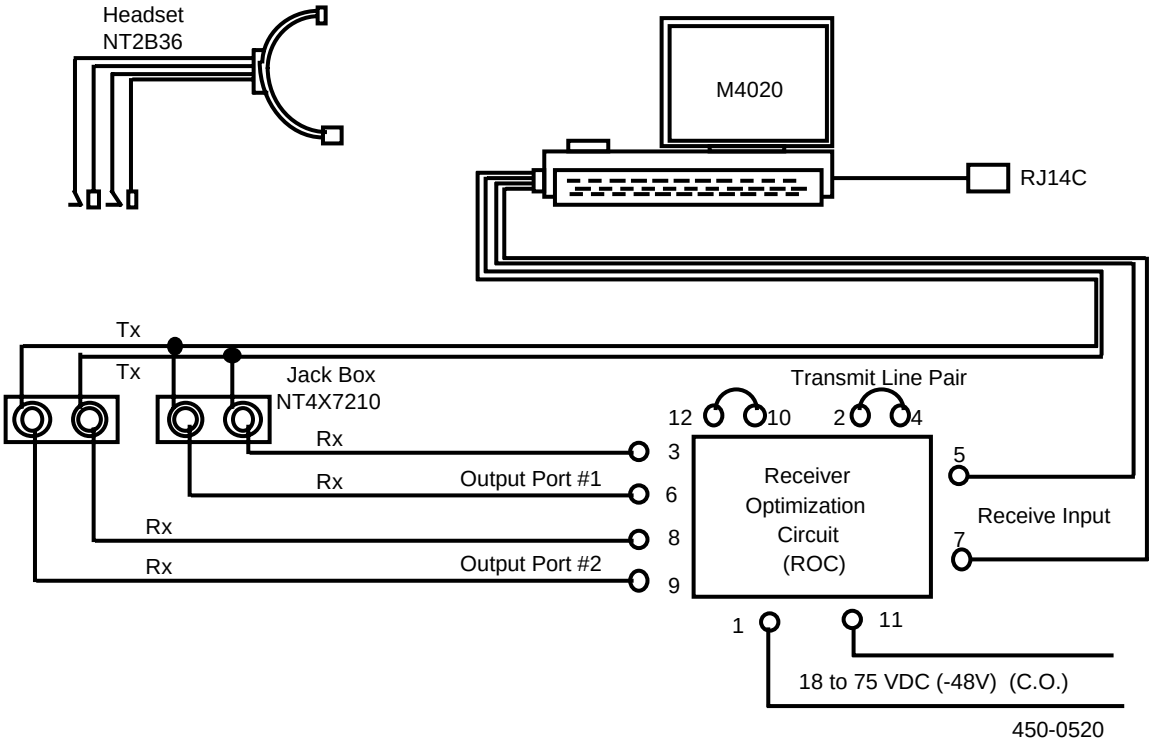
In central-office applications that use the Meridian M4020 for voice services, an accoustic limiter is available for headsets. This device is connected to the M4020 using a four-wire Teladapt cable to the headset jack. (See Fig. 10-4.) The device is to be supplied and connected by the telco.

To install the accoustic limiter, proceed as follows:

(1) Cut the connector off one end of a four-wire Teladapt cable, and strip the wires for connection to the accoustic limiter as shown in Fig. 10-4.

(2) Connect leads from the 1/4-inch phono connectors at the operator's headset to the accoustic limiter.

Figure 10-4
Connecting the Headset Accoustic Limiter to the M4020



Notes:

1. A jumper may be added between pins 2 and 4 to provide a fixed 6 dB gain.
2. Either positive or negative dc voltages may be used. The polarity between pins 1 and 11 is nonpolar.
3. A jumper between pins 10 and 12 raises the maximum ROC output power from 1.02 mW to 3.2 mW.
4. The Receiver Optimizer Circuit (ROC) is to be provided and wired by the telco.
5. The current drain per ROC is less than 10mA.

11. Connecting the LAN Interface Units to the System

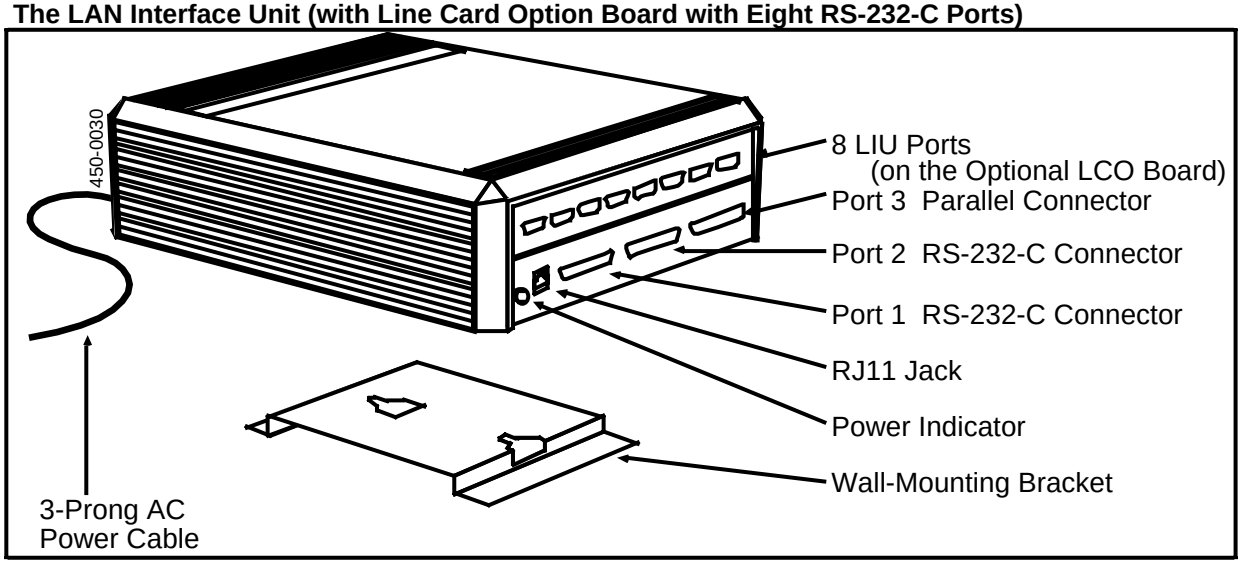
This procedure is used to connect LAN Interface Units (LIUs) to the system. It assumes that the building wiring is in place, and that assigned cross connections are made at the office cross-connect panel and any other distribution frames between the terminal and system.

Each LIU must be located within 610 m (2000 ft) of the system cabinets, measured according to the total length of wiring used, including cross-connect panels. For information on where the LIUs are to be located and connected, see the provisioning tables and the floor plan in the Site Records, 450-1011-152.

The LIUs can be connected either directly to the Teladapt jacks at the bottom of the office cross-connect panel or via the building wiring to the BIX connectors on the panel.

When LIUs are connected via the building wiring, the wiring must consist of twisted pairs. Short stretches of untwisted wire, such as cross-connect or Teladapt cables, are permissible, but long stretches will reduce the 610 m (2000 ft) allowable distance for high-speed LANlink lines.

Figure 11-1
The LAN Interface Unit (with Line Card Option Board with Eight RS-232-C Ports)



Installing the LAN Interface Unit

If the LIUs have not been installed prior to installation day, proceed as follows (all options are set at the factory prior to shipment):

(1) Refer to the floor plan, wiring log, and configuration drawings for information on where the LIUs are to be installed and how they are to be cabled.

The total distance between the LIU and the cabinet must not exceed 610 m (2000 ft), including the distance between the cabinet to the cross-connect panel, from the cross-connect panel to the RJ11 jack, and from the jack to the LIU.

(2) Remove the LIU from the carton, along with the ac power cord, high-speed line cord, and wall-mounting bracket.

CAUTION:
The commercial power outlet should be installed near the equipment so that it is easily accessible. The power connection should be made using a plug and socket (not a permanent connection) since the primary means of disconnecting power to the LIU is by pulling the LIU plug out of the power socket.

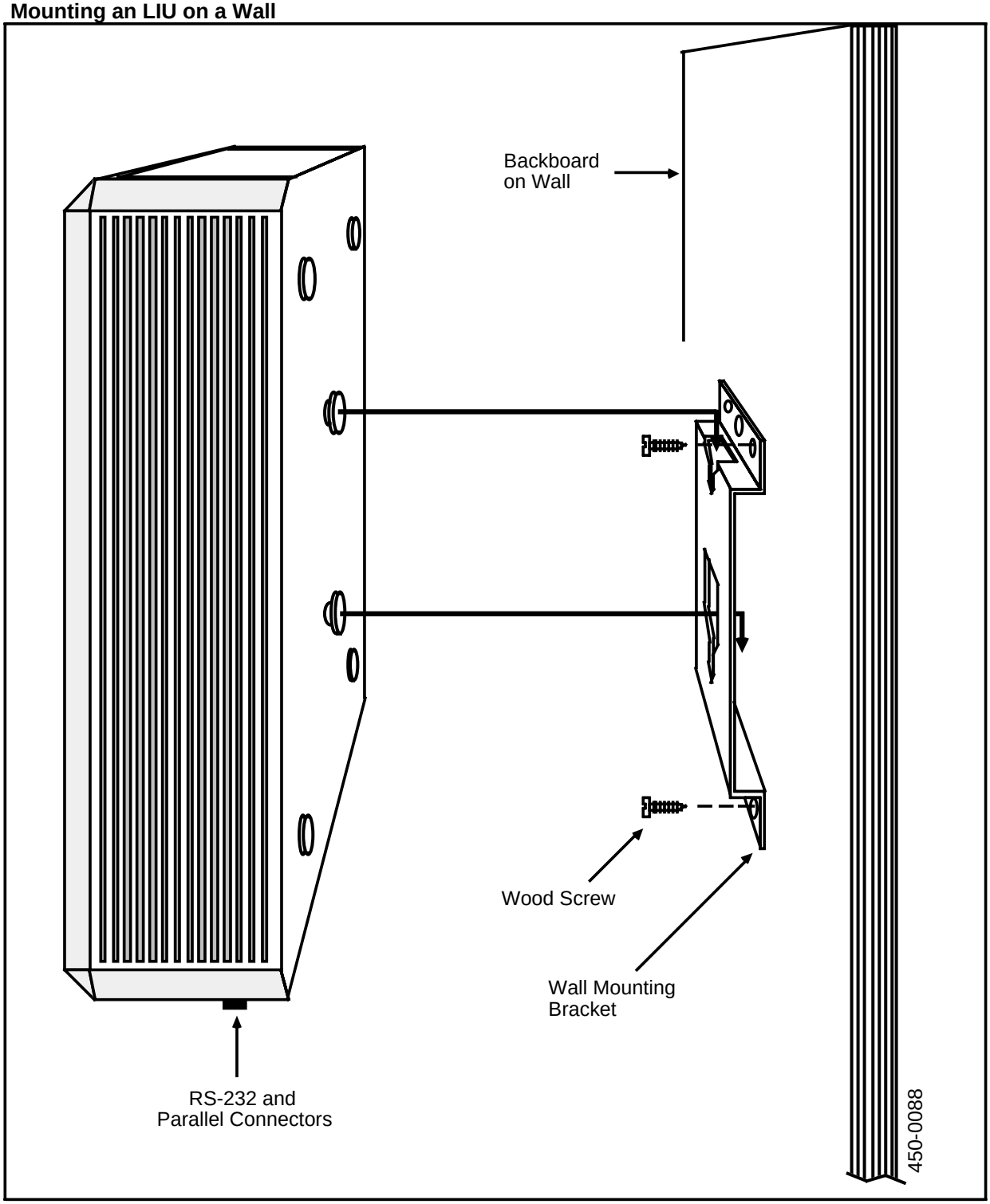
(3) Set each LIU on a flat surface, such as a table, or install it on a wall according to Fig. 11-2.

Each location should be close to a commercial 110 Vac source, be well ventilated, and free from disturbance from passers-by.

(4) Make the cabling connections as described in the following procedures, then plug in the LIU's power cord to power it up. The Power light should come on.

Note: The system administrator enters the appropriate set-up information in System Administrative Services (SAS).

Figure 11-2
Mounting an LIU on a Wall



Connecting an LIU to the System

To connect an LIU directly to the cross-connect panel, proceed as follows:

(1) Locate the six-conductor Teladapt cord shipped with the LIU.

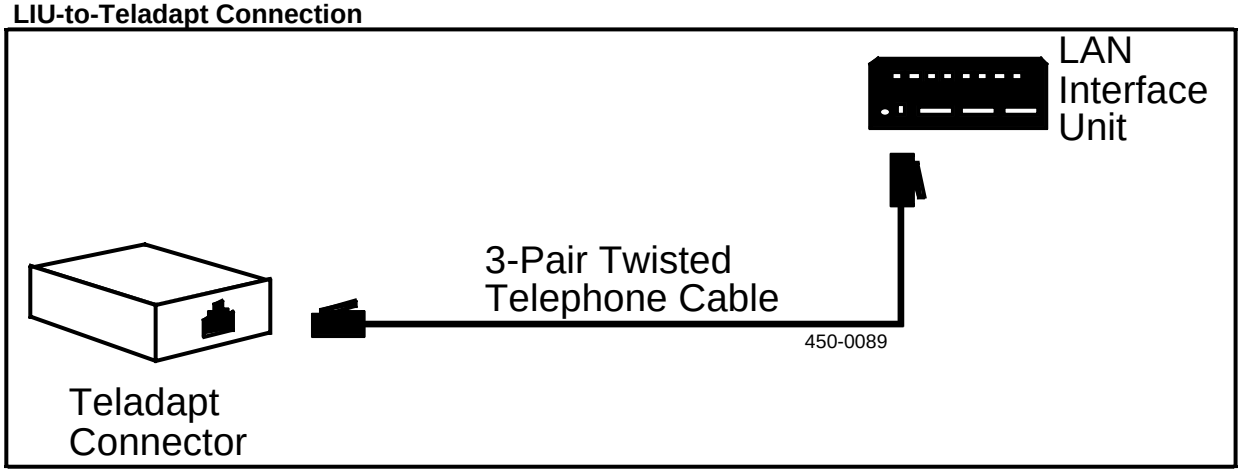
(2) Plug one end of the cord into the assigned Teladapt jack. This may be a jack on the office cross-connect panel, or one connected to the building wiring. (Refer to the provisioning tables in the Site Records, 450-1011-152, for assignments.)

(3) Run the cable to the LIU and plug it into the rear of the LIU. (See Fig. 11-3.)

Removing an LIU from Service

To remove an LIU from service, make sure all port personalities on the LIU and the LIU itself have been courtesied down in System Administrative Services first. (Courtesying down is a function in SAS that allows software and hardware units to be taken out of service individually, without interfering with other functioning units.) For procedures for removing an LIU from service, see the Guide to System Administrative Services, 450-1011-301.

Figure 11-3
LIU-to-Teladapt Connection



12. Connecting Peripherals, Hosts, and Modems to the LIU

The LAN Interface Unit (LIU) is equipped with ports for connection to external devices such as ASCII terminals, printers, host computers, and modems. The basic LIU is equipped with two 25-pin RS-232-C ports and one parallel Centronics-type port.

Optional kits are available as follows:

- The Line Card Option (LCO) Board, has an additional eight 9-pin RS-232-C ports.
- The Mag Tape Option Board, has an additional two parallel Centronics-type ports. The SASI version of the Nine-track Magnetic Tape Unit connects to port 04 on this board. (The SCSI version of the unit connects directly to the SCSI bus.)
- The Alarm Interface Unit (ALIU) monitors the status of the system and provides visual and audible alarms. (See Part 15 for installation instructions.)

This procedure assumes the LIU has already been installed according to Part 11. When connecting the external devices to the LIUs, refer to the floor plan and the provisioning tables in the Site Records, 450-1011-152, for equipment layout and cabling information.

The LIU RS-232-C ports are configured as data terminal equipment (DTE) and therefore require a null modem cable (or modem eliminator) to be connected directly to other data terminal equipment (such as ASCII terminals, printers, and host computers). If modems are used, the null modem cable is not required.

> ***Note:*** Data communications involving RS-232-C devices use a cabling convention whereby DTE devices must be connected directly to data circuit-terminating equipment (DCE) devices. The null modem cable interchanges two wires so that the LIU appears to the DTE as data circuit-terminating equipment (DCE). Modems, being DCE, can connect directly to the LIU.

Connecting a Modem to an LIU

Modems are used to connect the LIU to peripheral devices, networks, or host computers. Modems may be installed individually or in pools according to the manufacturer's documentation.

Make the connections to the LIU as follows:

(1) Connect an RS-232-C cable to the modem.

(2) Run the cable from the modem to the LIU according to the floor plan and wiring drawings.

> **- WARNING -**
> All wiring and cabling should be routed and secured according to local building and safety codes.

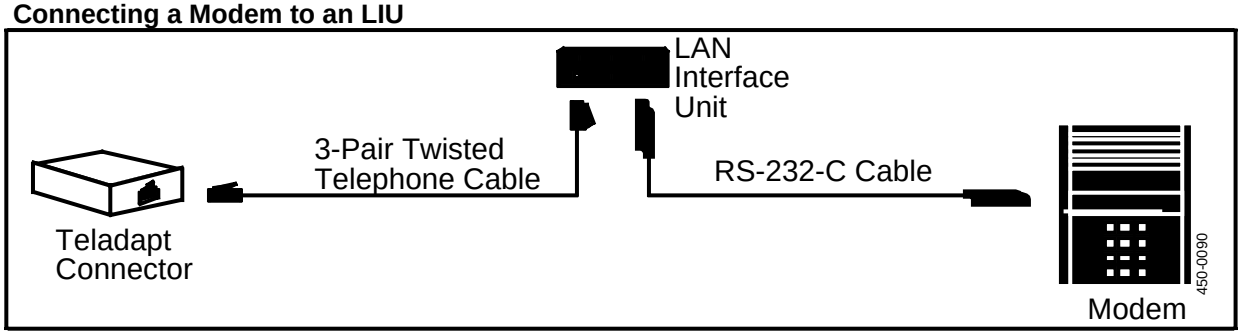
(3) Connect the RS-232-C cable to the LIU according to Fig. 12-1. Refer to the provisioning tables for the port assignments.

(4) Tighten the two screws on the RS-232-C cable.

(5) Power up and verify the operation of the modem according to the manufacturer's documentation.

Note: The communications parameters of the modem must be compatible with those set for the communications link in System Administrative Services. The system administrator sets up the parameters according to the Guide to System Administrative Services, 450-1011-301.

Figure 12-1
Connecting a Modem to an LIU



Connecting an ASCII Terminal to an LIU

An ASCII terminal connects to the system via an asynchronous RS-232-C port in the LIU. The terminal itself should be installed according to the manufacturer's instructions. Connect the cabling as follows:

(1) Connect the RS-232-C cable to the terminal. Unless you are connecting the terminal via a modem, you require a null modem cable. You may want to refer

to the terminal manufacturer's documentation for a description of the terminal's RS-232-C port.

(2) Run the RS-232-C cable from the terminal to the LIU (or modem, for remote connections) according to the floor plan and wiring drawings.

- WARNING -

All wiring and cabling should be routed and secured according to local building and safety codes.

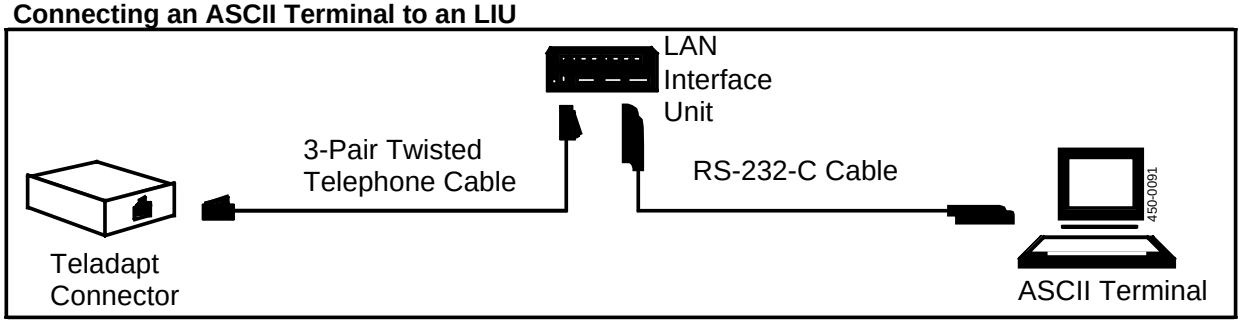
(3) Connect the cable to the LIU (or modem) according to Fig. 12-2. Refer to the provisioning tables for the port assignments.

(4) Tighten the two screws on the RS-232-C cable.

(5) Power up and verify the operation of the terminal according to the manufacturer's documentation.

Note: The communications parameters of the terminal must be compatible with those set for the communications link in System Administrative Services. The system administrator sets up the parameters according to the Guide to System Administrative Services, 450-1011-301.

Figure 12-2
Connecting an ASCII Terminal to an LIU



Connecting a Serial Printer to an LIU

A printer connects to the system via either an asynchronous RS-232-C port in the LIU, or via the LIU's parallel Centronics port. The printer itself should be installed according to the manufacturer's instructions. Connect the cabling as follows:

(1) Connect the RS-232-C cable to the printer. Unless you are connecting the printer via a modem, you require a null modem cable. You may want to refer to the printer manufacturer's documentation for a description of the printer's RS-232-C port.

(2) Run the RS-232-C cable from the printer to the LIU (or modem, for remote connections) according to the floor plan and wiring drawings.

> **- WARNING -**
> All wiring and cabling should be routed and secured according to local building and safety codes.

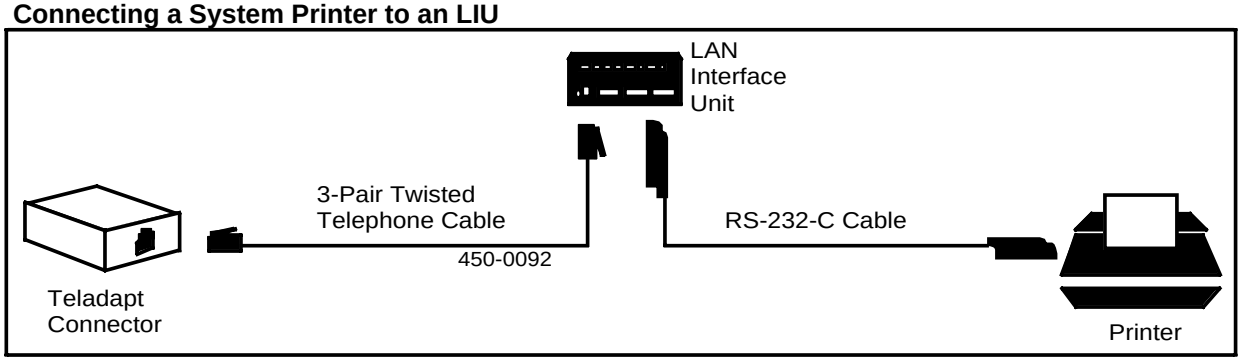
(3) Connect the RS-232-C cable to the LIU (or modem, if a remote connection) according to Fig. 12-3. Refer to the provisioning tables for the port assignments.

(4) Tighten the two screws on the RS-232-C cable.

(5) Power up and verify the operation of the printer according to the manufacturer's documentation.

Note: The communications parameters of the printer must be compatible with those set for the communications link in System Administrative Services. The system administrator sets up the parameters according to the Guide to System Administrative Services, 450-1011-301.

Figure 12-3
Connecting a System Printer to an LIU



Connecting a Host Computer to an LIU

A host computer (IBM, IBM-compatible, or ASCII-compatible host) connects to the system via an RS-232-C port in the LIU. The computer itself should be installed according to the manufacturer's instructions. Connect the cabling as follows:

(1) Connect the RS-232-C cable to the appropriate port in the host. Unless you are connecting the host via a modem, you require a null modem cable. You may

want to refer to the manufacturer's documentation for a description of the RS-232-C port.

(2) Run the RS-232-C cable from the host to the LIU (or modem, for remote connections) according to the floor plan and wiring drawings.

> **- WARNING -**
> All wiring and cabling should be routed and secured according to local building and safety codes.

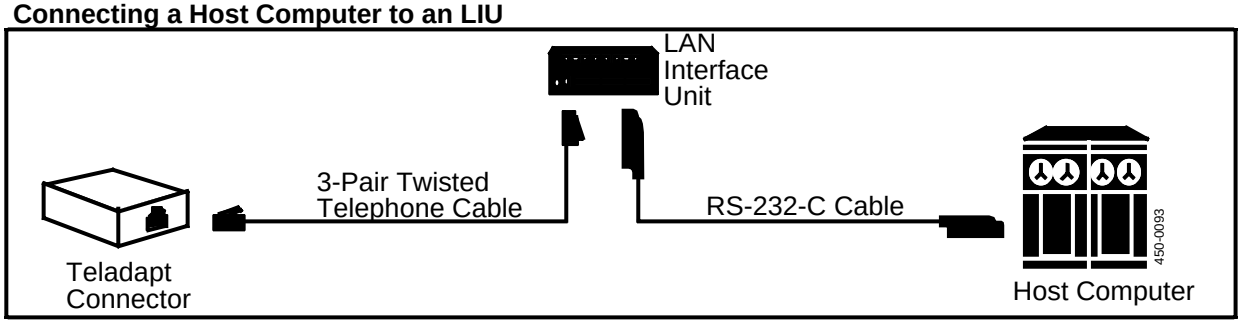
(3) Connect the RS-232-C cable to the LIU (or modems, for remote connections) according to Fig. 12-4. Refer to the provisioning tables for the port assignments.

(4) Tighten the two screws on the RS-232-C cable.

(5) Power up and verify the operation of the computer according to the manufacturer's documentation.

Note: The communications parameters of the computer must be compatible with those set for the communications link in System Administrative Services. The system administrator sets up the parameters according to the Guide to System Administrative Services, 450-1011-301.

Figure 12-4
Connecting a Host Computer to an LIU



Connecting a Nine-track Magnetic Tape Unit to an LIU (SASI Version)

The SASI version of the Nine-track Magnetic Tape Unit requires a dedicated LAN Interface Unit (LIU), which must be equipped with a Mag Tape Option Board. The tape unit connects to port 04, which is one of the parallel ports on the option board. The dedicated LIU is placed inside the tape unit's cabinet. (The SCSI version of the Nine-track Magnetic Tape Unit does not require an LIU for connection to the system. Instead, it connects directly to a Mass Storage SRU or other device on the SCSI bus.)

This procedure describes how to:

- place the LAN Interface Unit (LIU) inside the cabinet of the tape unit

- connect the LIU to the tape unit
- connect the LIU's Teladapt connector to the cross-connect panel.

The procedure assumes that the wiring between the LANlink SRU and the cross-connect panel is in place, and that the appropriate cross-connections have been made. (These cross-connections are made either to one of the Teladapt jacks at the bottom of the cross-connect panel, if the tape unit is located near the panel, or to an appropriate distribution frame.)

Two 110 Vac sources are required, one for the tape unit and one for the LIU. All option switches and jumpers on the tape unit are set at the factory prior to shipment.

- WARNING -
All wiring and cabling should be routed and secured according to local building and safety codes.

To install the tape unit and its associated LIU, proceed as follows:

(1) Open the front door of the tape unit's cabinet, using a 1/8 in. hexagonal key to open the latch. (See Fig. 12-5.)

(2) Run the LIU power cord out the back of the tape drive cabinet, through the access slot at the bottom. Do not plug the cord into the power source yet.

(3) Place the LIU inside the cabinet of the tape unit, so that the LIU rests securely on the cabinet floor. The connectors on the faceplate of the LIU should all face towards the front of the cabinet.

(4) Locate the two cables that are to be run between the LIU and the tape unit. Connect one end of each of the cables to the 50-pin connectors of the LIU option board (the upper connectors).

(5) As shown in Fig 12-6, connect the other end of the cables to the connectors on the tape drive interface in the tape unit. Make connections as follows:
   - Connect J4 (left) of the LIU to J4 (rear) of the tape unit.
   - Connect J5 (right) of the LIU to J5 (front) of the tape unit.

(6) Secure the cables at the tape drive interface circuit board with the collars and hardware provided.

(7) Locate the Teladapt cord (four conductors) and run it through the access slot at the bottom rear of the tape unit. Plug it into the Teladapt connector on the LIU front panel.

(8) Plug the other end of the Teladapt cord into the assigned Teladapt jack of the office cross-connect panel (or other jack, according to the worksheets)

(9) Ensure that the tape unit circuit breaker is set to Off (that is, ‘0’ is pressed, as shown in Fig. 12-5).

(10) Plug the tape unit into its 110 Vac power source, and plug the LIU into its 110 Vac power source.

(11) Activate both power sources. On the tape unit, the LOGIC OFF LED should light; at the same time, on the LIU, the power LED should light.

(12) Close the tape unit cabinet front door, and press to latch.

(13) Power up the tape unit and LIU.

(14) To verify the operation of the tape unit, load a tape according to the instructions in the Guide to System Administrative Services, 450-1011-301.

Figure 12-5
Nine-track Magnetic Tape Drive (SASI Version)

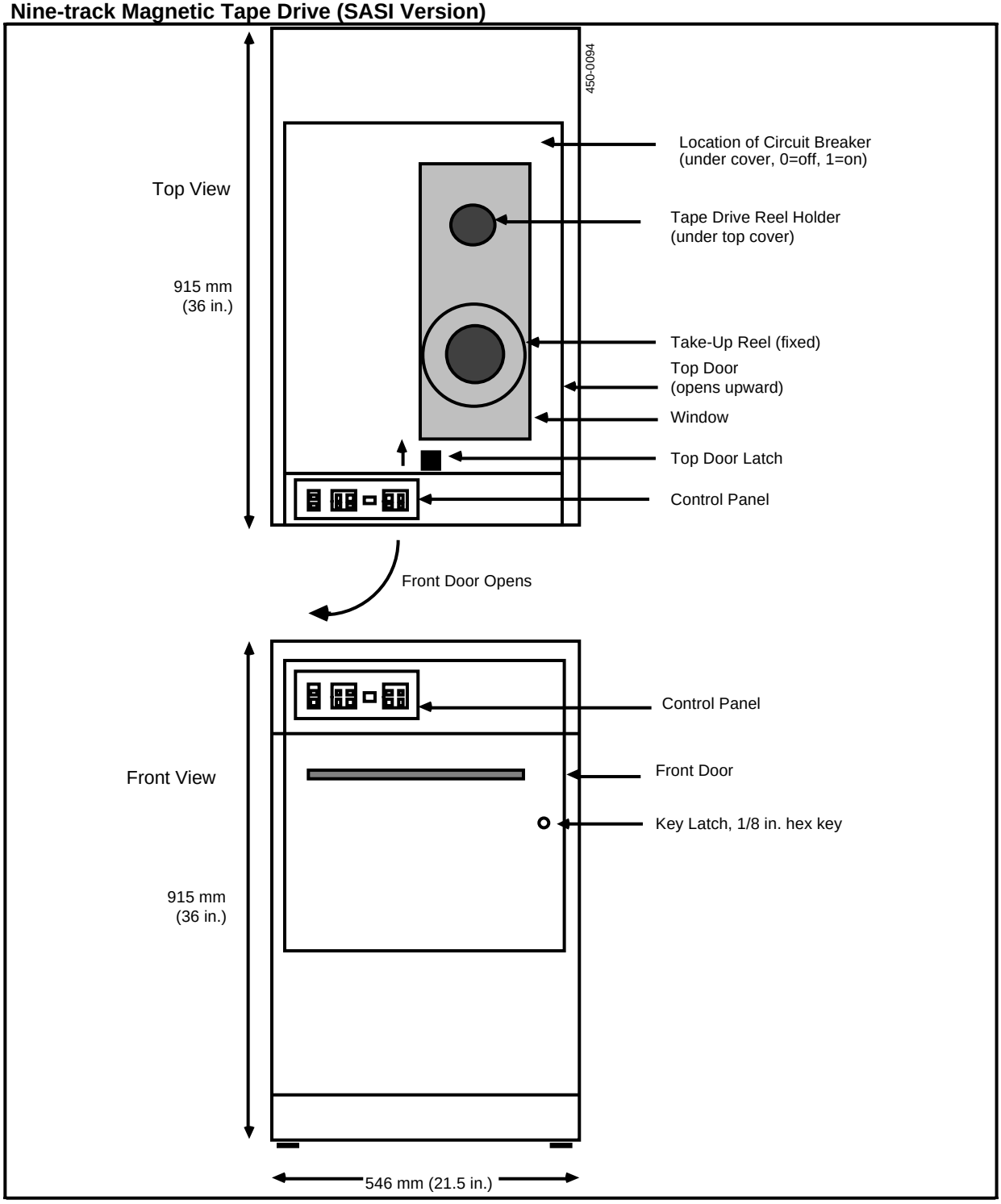
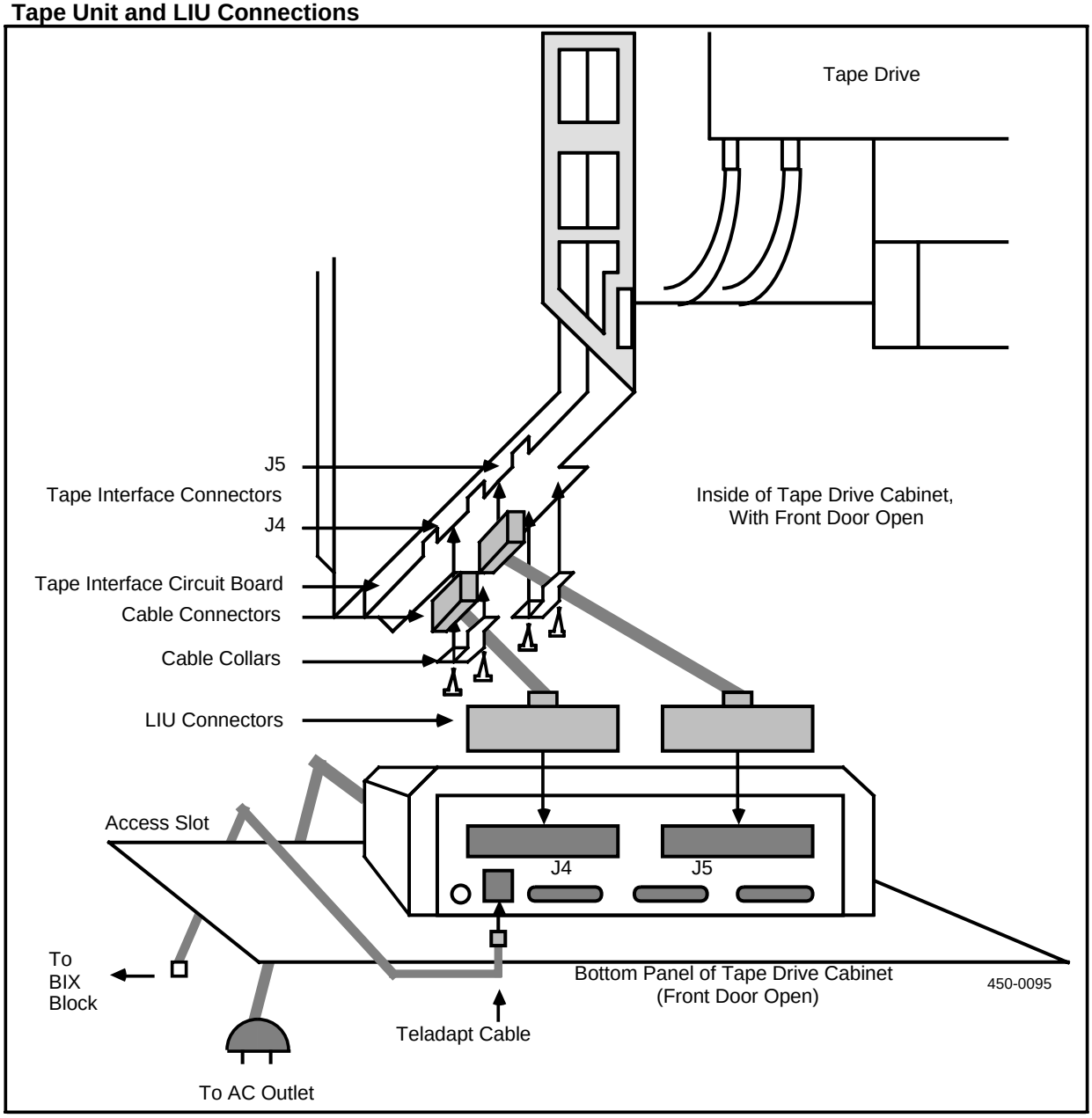


Figure 12-6
Tape Unit and LIU Connections



13. Using the Cartridge Tape Drive

Each DNC system is equipped with one or more SRUs with slots for cartridge tapes. Cartridge tapes are used to load new software releases, perform backups of programs and data, and restore programs and data in the event of equipment failures.

Three types of SRU accomodate cartridge tapes:

(a) DNC systems with the Shugart Associates Systems Interface (SASI) interface use one 80-megabyte Mass Storage SRU. It accepts the tape cartridge in a vertical orientation.

(b) The Cartridge Tape SRU, used in DNC systems with the Small Computing Systems Interface (SCSI), accepts the tape cartridge in a vertical orientation.

(c) The 1/4-shelf Disk/Tape SRU (either 80-megabyte or 160-megabyte SRU) used in DNC SCSI systems, accepts the tape cartridge in a horizontal orientation. The 1/4 Shelf Disk/Tape SRUs are used only with NSR27 and later software.

- CAUTIONS -

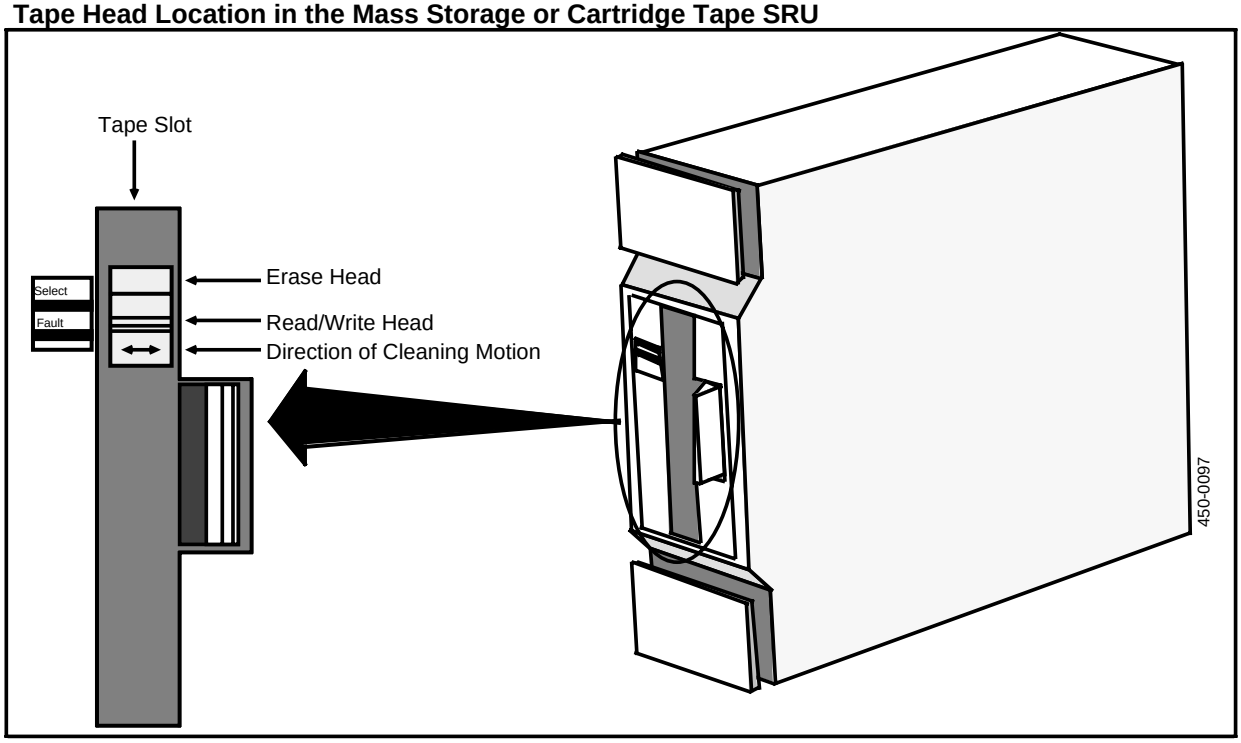
1. To ensure proper operation, carefully clean the tape heads after the system loads for the first time, and before every tape drive session.

2. If you intend to download data to a tape, ensure that it is blank or that any data on it may be overwritten.

3. Load a tape in the cartridge slot ONLY when the administration procedures contain explicit instructions to that effect. The cartridge slot must otherwise be empty at all times.

4. Retension a new cartridge tape prior to first use, and prior to each use if used infrequently.

Figure 3-1
Tape Head Location in the Mass Storage or Cartridge Tape SRU



Cleaning the Tape Heads

Tools:

- denatured (isopropyl) alcohol
- foam or lint-free swabs, 6 in. long.

Steps:

(1) Locate the tape heads inside the SRU slot that accepts the cartridge tape.

Mass Storage and Cartridge Tape SRUs: the heads are located inside and at the rear of the cartridge slot. See Figure 13-1.

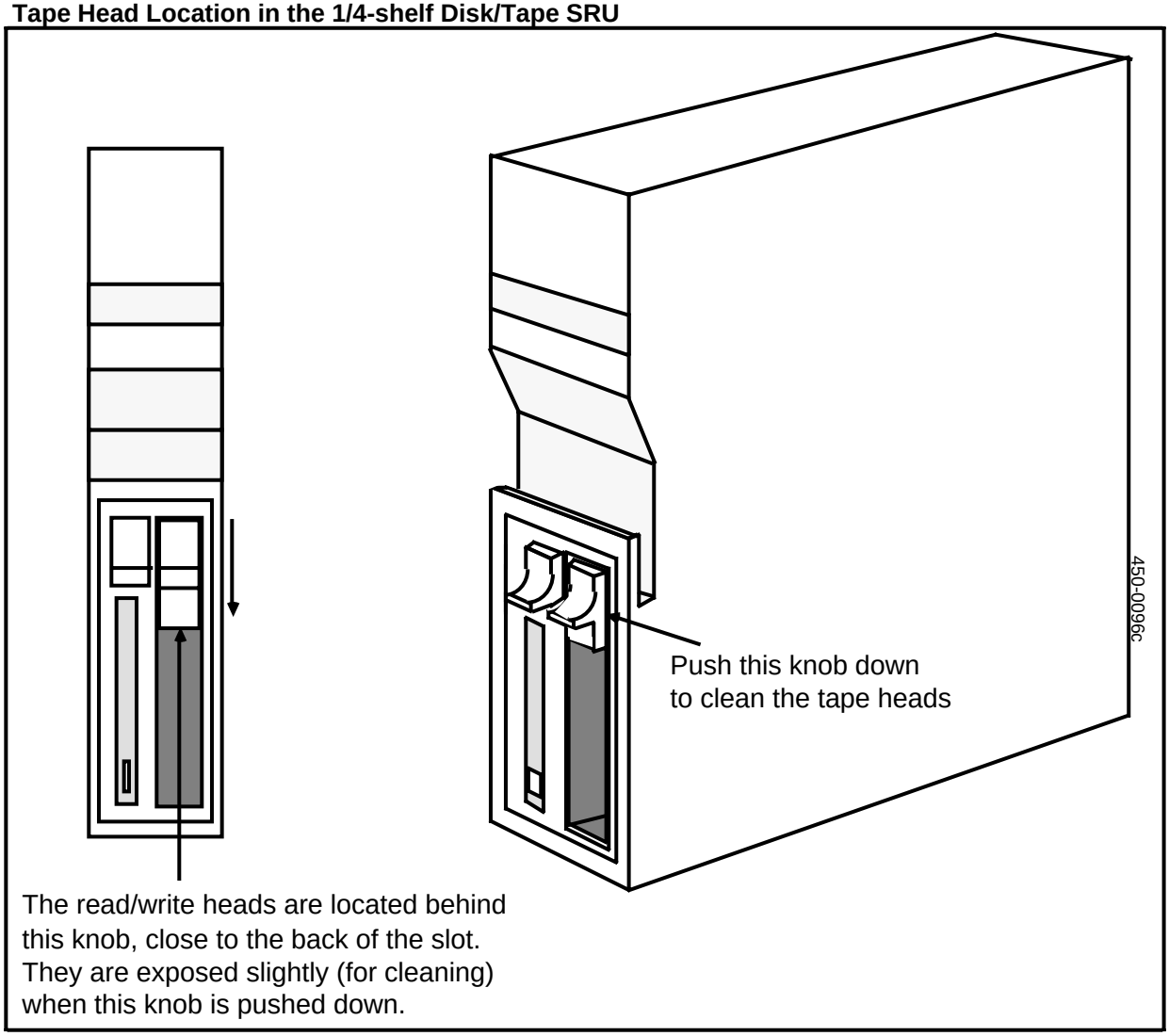
1/4-shelf Disk/Tape SRUs: the heads are located inside and at the top of the cartridge slot. See Figure 13-2.

(2) Dampen (don't saturate) a foam swab with denatured alcohol and wipe the swab over the tape heads.

Use a cleaning motion at right angles to the direction of tape travel. Avoid touching any rubber parts with the alcohol. Some deterioration of the rubber can result.

(3) With a dry swab, wipe any excess alcohol from the tape heads, also using a motion at right angles to the tape travel.

Figure 13-2
Tape Head Location in the 1/4-shelf Disk/Tape SRU



Inserting the Tape Cartridge into the Mass Storage or Cartridge Tape SRU

Load the tape cartridge into the slot as follows:

(1) Set the SAFE pointer on the tape as required:
- If you are downloading data from the system hard disk to tape, set the pointer away from SAFE.
- If you are uploading data from the tape to the system hard disk, set the pointer toward SAFE.

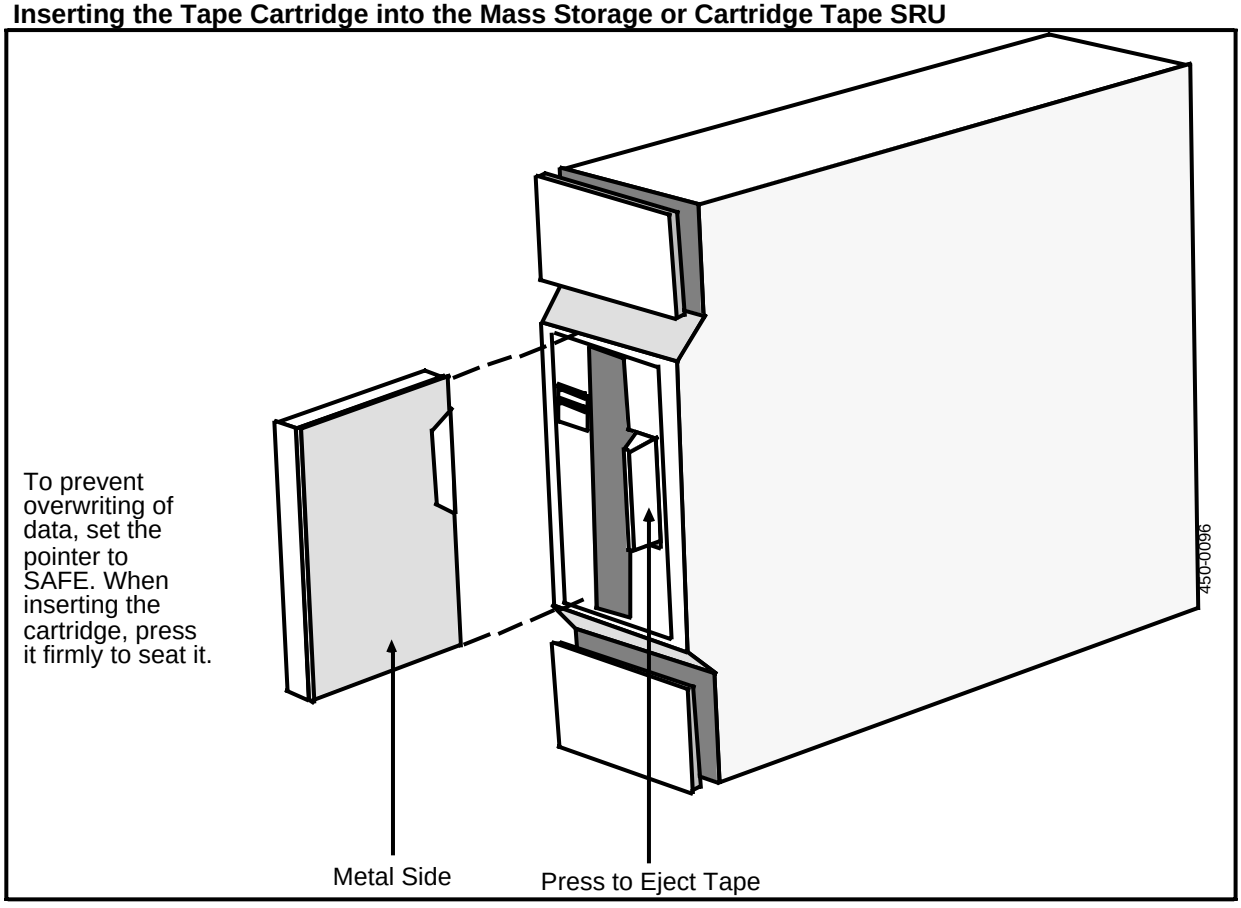
(2) Open the door of the appropriate cabinet or rack and locate the cartridge tape drive.

(3) Hold the tape cartridge being installed with the metal side facing toward the right, and the keyed slot at the rear, as shown in Figure 13-3.

(4) Guide the tape cartridge into the grooved slot of the tape drive.

(5) Push the cartridge firmly until solid contact is made and the tape is latched in place. The red light on the SRU should light. Insertion is complete.

Figure 13-3
Inserting the Tape Cartridge into the Mass Storage or Cartridge Tape SRU



Inserting the Tape Cartridge into the 1/4-shelf Disk/Tape SRU

Load the tape cartridge into the slot as follows:

(1) Set the SAFE pointer on the tape as required:
- If you are downloading data from the system hard disk to tape, set the pointer away from SAFE.
- If you are uploading data from the tape to the system hard disk, set the pointer toward SAFE.

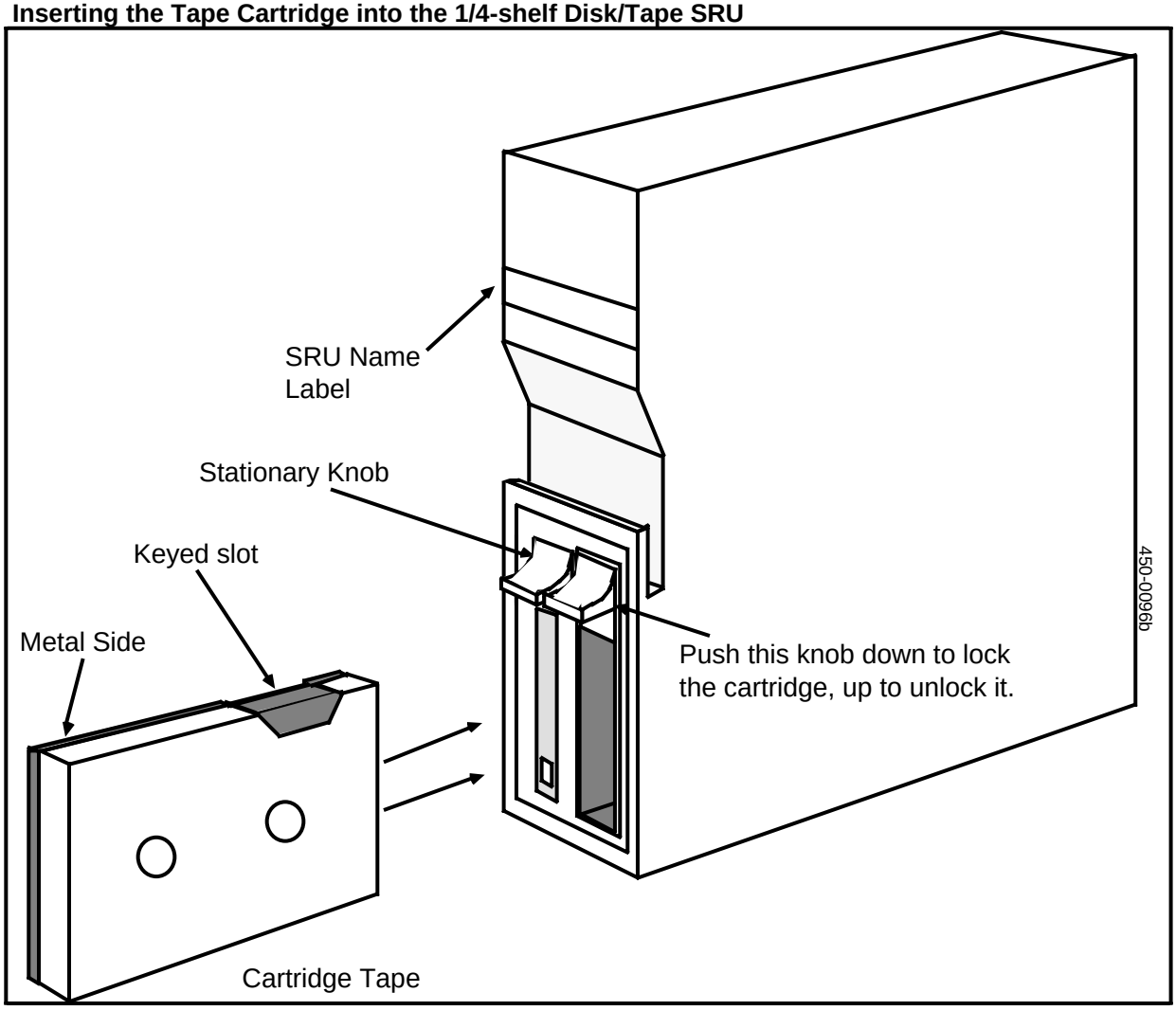
(2) Open the door of the appropriate cabinet or rack and locate the cartridge tape drive.

(3) Hold the tape cartridge with the metal side facing toward the left, and the keyed slot on the top, as shown in Figure 13-4.

(4) Guide the tape cartridge into the slot of the SRU, pushing forward so that the cartridge rests partially in place.

(5) Push downward the knob located above the slot. This locks the cartridge into place. If done correctly, the drive operates to find the beginning of the tape. Insertion is complete.

Figure 13-4
Inserting the Tape Cartridge into the 1/4-shelf Disk/Tape SRU



Removing a Tape

After use, remove the tape from the SRU as follows:

(1) There are two kinds of mechanisms for releasing the tape:

Mass Storage and Cartridge Tape SRUs: Push inward the latch at the right side of the tape slot (Figure 13-3). The tape cartridge then ejects.

1/4-shelf Disk/Tape SRUs: Push upward the knob located above the tape slot (Figure 13-4). This unlocks the cartridge.

(2) Remove the tape cartridge from the slot.

(3) Store the tape cartridge in a safe place, free from dust, extreme temperatures, high humidity, and sources of electrical or magnetic interference.

Retensioning a Tape

If you are the superuser, you can retension a tape. (Only the superuser can access the Utilities Services _ Main Menu, as required by this procedure.) Retensioning consists of spooling the tape end-to-end and back, and requires an installed system.

Note: Retension new tapes three times prior to use; otherwise, data errors may occur.

(1) Sign on as the superuser.
The main menu appears.

(2) Select SYSTEM ADMINISTRATIVE SERVICES, and press ENTER.
The System Administrative Services Main Menu appears.

(3) Select Utilities and press ENTER.
The Utilities Service - Main Menu appears.

(4) Select Helix Command Interpreter, and then press ENTER.
The system prompt appears. (It is usually '>'.)

(5) Insert the new cartridge tape in the SRU. (See Figure 13-3 or 13-4.)

(6) Enter the command TRET and press RETURN.
The tape spools from end to end.

(7) Repeat the above step twice more.

(8) Enter the command

EXIT

and press RETURN.
The Utilities Service - Main Menu appears.

(9) Press <Exit>.
The System Administrative Services Main Menu appears.

14. Powering Up the System

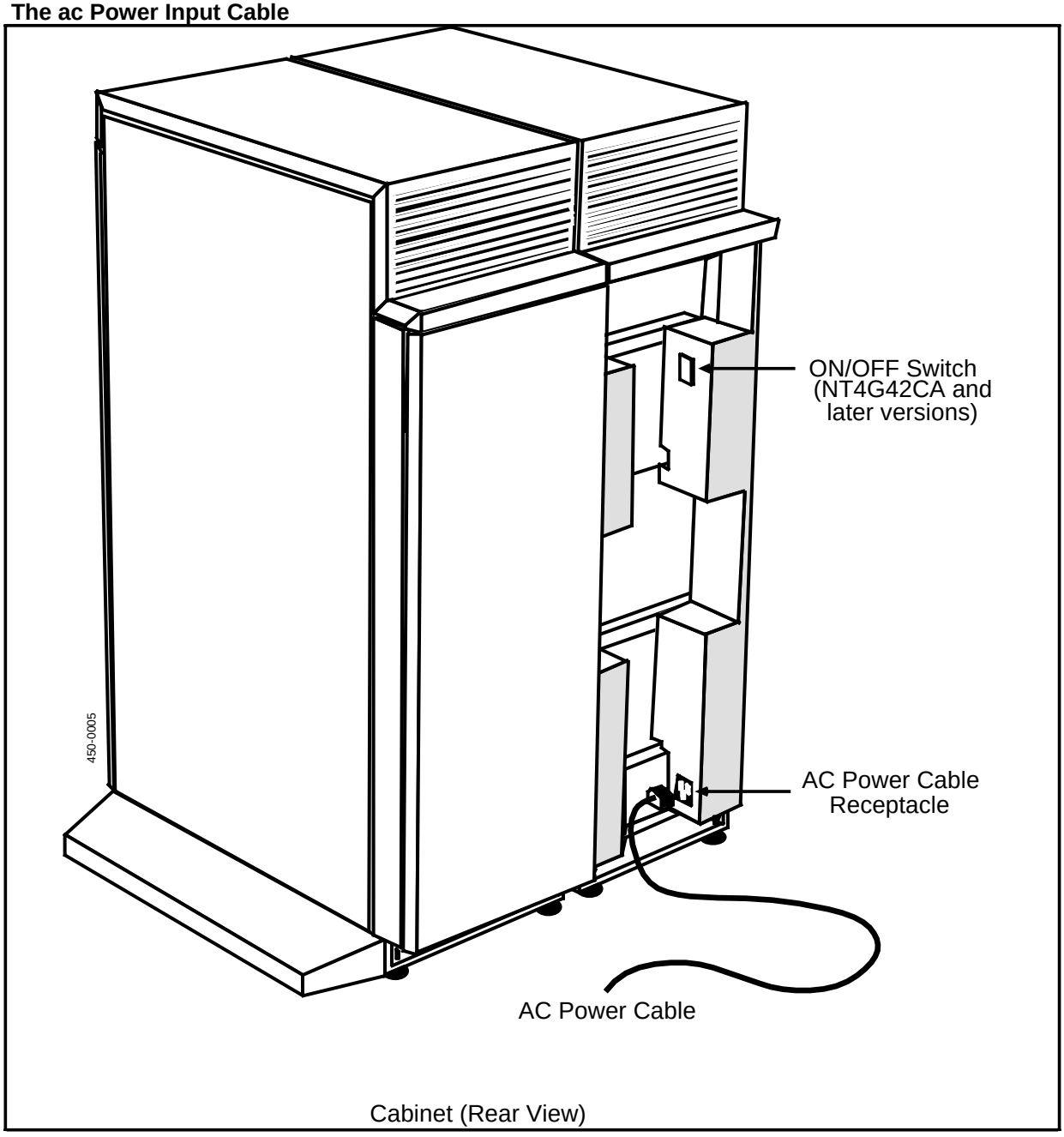
The system should not be powered up until the appropriate point in the initialization procedure (which is documented in the Guide to DNC Base Software Installation, 450-1011-302). However, should an installed system require reinitialization, use the procedure below.

Your system may or may not be equipped with a power switch on the Input Jumper Assembly. (See Fig. 14-1.) If your system is so equipped, you power up the system by setting the switch to ON. If your system is not equipped with a power switch, it is powered up when plugged into an ac source (115 or 220 Vac).

Some applications may use an uninterrupted power supply (UPS). If so, make sure the UPS is powered up first.

To reinitialize a system already in operation, power it off and power it up again after about 30 s. If the system is equipped with a switch, switch it to OFF, then to ON. If it is not equipped with a switch, unplug the power input cable from the cabinet input jumper assembly, then plug it in again.

Figure 14-1
The ac Power Input Cable



15. Installing the Alarm System

This part describes how to install the Alarm System in the system. The Alarm System is based on an Alarm Interface Unit (ALIU), which is an option board that can be installed in the LAN Interface Unit. One ALIU is required for each site.

The ALIU monitors the system for hardware and software failures. It provides outputs for visual and audible alarms to the central office or customer's alarm system as minor, major, and critical alarms. It also provides visual indicators of system alarms. (See Fig. 15-1 for the connections between the ALIU and the central office or customer's alarm system.)

The connection procedure includes connecting an RS-232-C port on the ALIU face panel to one of the base LIU's RS-232-C ports. (See Fig. 15-2 for the front panel layout of the ALIU.) A second connector is then cabled to the central office. This cable must be provided by the customer. (Refer to Table 15-A for the pin assignments for the 37-pin customer interface connector.)

The ALIU is equipped with a set of options that can be set for specific purposes on site. The default settings and the options are shown in Table 15-B. If the defaults are to be changed, the LIU must be opened and the jumpers changed.

EQUIPMENT:

1 NT4G46BK Alarm Interface Unit Option Kit

1 per ALIU, optional custom-built cable for connection to the customer's equipment . (See Table 15-A for pin designations.)

TOOLS:

1 Medium Phillips screwdriver.

The procedure assumes that the LIU has not yet been installed. If it has, the cover can still be removed should you need to change the options. Proceed as follows:

- WARNING -
All wiring and cabling should be routed and secured according to local building and safety codes.

(1) Before installing the LIU that houses the ALIU, refer to Table 15-B for the default values of the options on the ALIU. If the options are to be changed, do so as follows:
- Remove the four screws on the LIU cover with the Phillips screwdriver.
- Lift off the cover to expose the protective EMI cover.
- Remove the single screw that fixes the EMI cover to the LIU.
- Lift off the EMI cover to expose the ALIU board and the jumper options. Set the options per Table 15-B.
- Replace the EMI and LIU covers.

(2) Install the LIU according to Part 11. Do not power up the LIU until the rest of this procedure is complete.

(3) Plug one end of the RS-232-C cable (NT4G46AX) into Port 2 on the base of the LIU, and plug the other end into the RS-232-C port on the ALIU. (See Fig. 15-1.)

(4) Connect the Customer Alarm Interface cable to the Customer Interface Connector (P4) on the ALIU. (Refer to Table 15-A for the pin designations for building the cable.)

(5) Plug the other end of the Customer Alarm Interface cable into the central office or customer premises equipment.

(6) Plug in the ac power cord for the LIU. The LED on the base part of the front panel of the LIU should light.

(7) Test the LEDs on the ALIU by pressing the lamp test (LP TST) button. The green link OK (LNK OK) LED and the three alarm LEDs (CR, MJ, and MN) should light up while the LP TST button is pressed.

In normal running mode, the green LNK OK LED should be lit, and the three alarm LEDs should not be lit.

Figure 15-1
Connections Between the ALIU and the Central Office Equipment

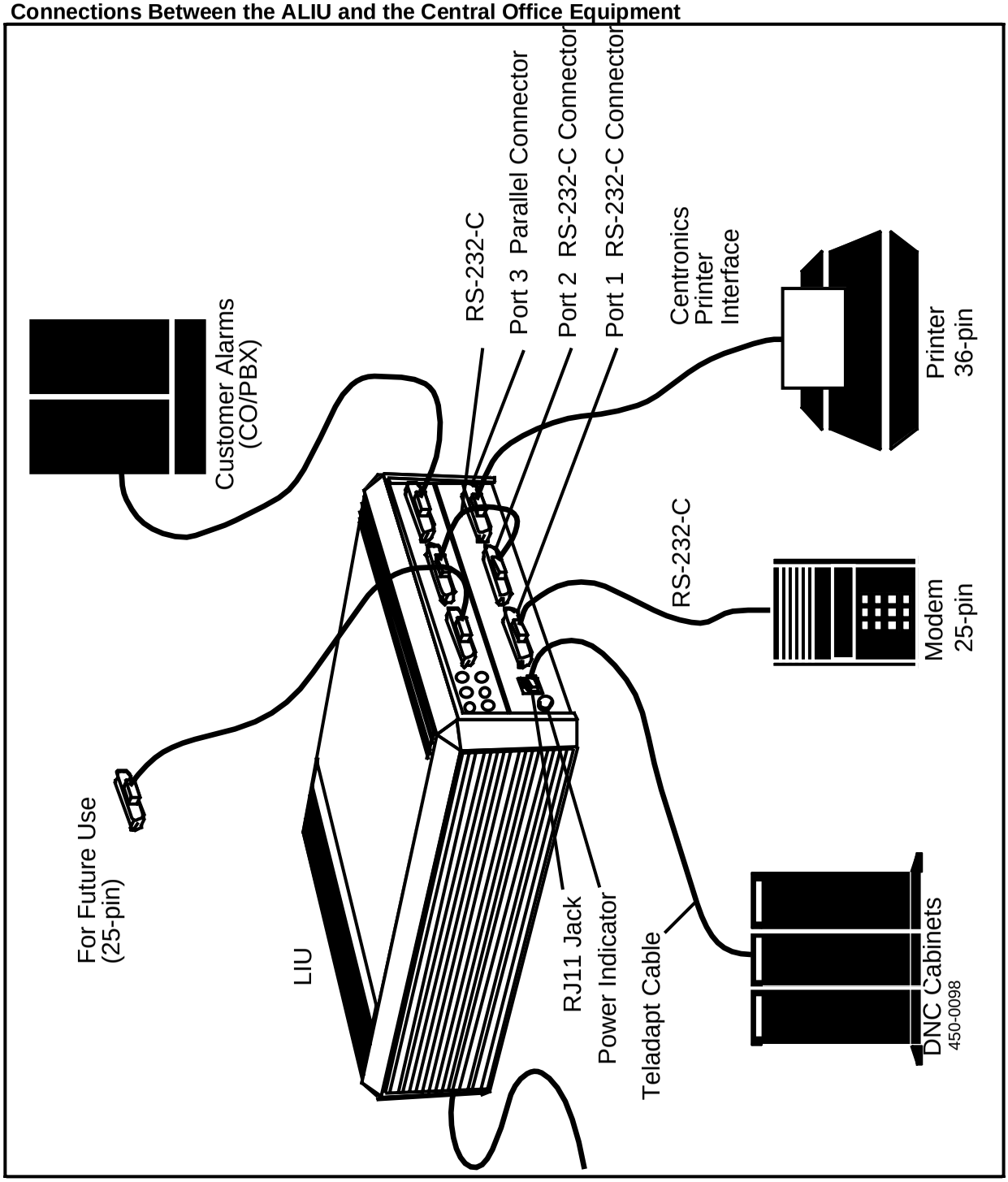


Figure 15-2
Front Panel of an LIU Equipped with an ALIU

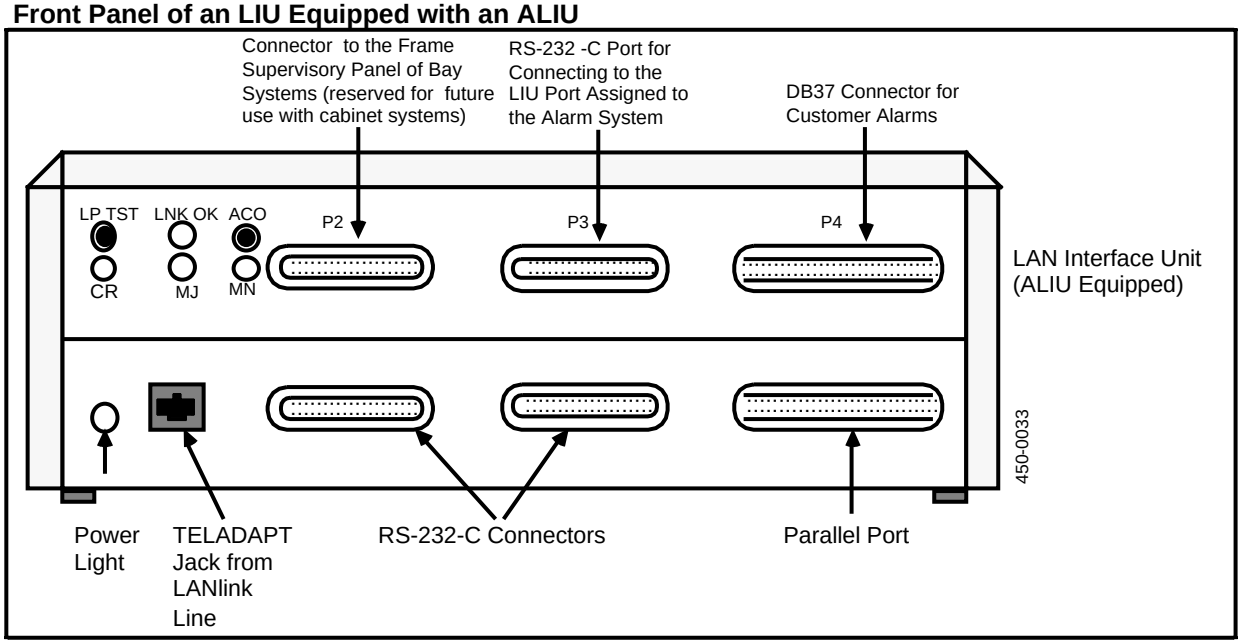


Table 15-A
Pin Assignments for the Customer Interface Connector (P4)

Note 1: Each pair of pins (that is, each relay closure circuit) is independent and isolated from all other pairs. The pairs are denoted by the same name, prefixed by a + or a -.

Note 2: To generate an alarm on an input line (ALARM ACTIVE), the plus and minus pins of the pair for that line require the following input signals:

- On each + pin, provide a BR (battery return) signal.
- On each - pin, provide a -48 V input.

To remove an alarm from an input line, that is, no alarm is present (ALARM INACTIVE), the plus and minus pins of the pair for that line require the following input signals:

- On each + pin, provide a -48 V input or no contact (-48 V is recommended to avoid a ‘floating pin’ condition).
- On each - pin, provide a -48 V input.

Note 3: The output lines (CRA, CRV, MJA, MJV, MNA, MNV, BAY, AUXREL1, and AUXREL2) are relays in the ALIU that operate by opening and closing as follows:

- An ACTIVE ALARM is signified by closure of the relay between the + and - pins. Maximum current through the relay is 0.4 A (relay closed).

Table 15-A Continued
Pin Assignments for the Customer Interface Connector (P4)

- An open circuit between the + and - pins signifies that there is no alarm present (ALARM INACTIVE). Maximum voltage across the relay is 110 V (relay open).

Caution: These relays are intended for use with dc power only, and cannot be used with ac.

PIN No.	SIGNAL NAME	FUNCTIONAL DESCRIPTION
OUTPUT LINES:		
1	+CRA	Critical alarm relay contact for audible alarm indicators
20	-CRA	
2	+MJA	Major alarm relay contact for audible alarm indicators
21	-MJA	
3	+MNA	Minor alarm relay contact for audible alarm indicators
22	-MNA	
4	+CRV	Critical alarm relay contact for visual alarm indicators
23	-CRV	
5	+MJV	Major alarm relay contact for visual alarm indicators
24	-MJV	
6	+MNV	Minor alarm relay contact for visual alarm indicators
25	-MNV	
7	+BAY	Relay contact for the bay alarm indicator
26	-BAY	
8	+AUXREL1	Auxiliary contact for relay 1
27	-AUXREL1	
9	+AUXREL2	Auxiliary contact for relay 2
28	-AUXREL2	
INPUT LINES		
10	+USERIN1	Auxiliary input 1
29	-USERIN1	
11	+USERIN2	Auxiliary input 2
30	-USERIN2	
12	+USERIN3	Auxiliary input 3 (cabinets only)
31	-USERIN3	

Table 15-A Continued
Pin Assignments for the Customer Interface Connector (P4)

PIN No.	SIGNAL NAME	FUNCTIONAL DESCRIPTION
13	+REMACO	Remote ACO input
22	-REMACO	
14	+AUXIN1	Auxiliary input 1 (cabinets only)
33	-AUXIN1	
15	+AUXIN2	Auxiliary input 2 (cabinets only)
34	-AUXIN2	
16	+AUXIN3	Auxiliary input 3 (cabinets only)
35	-AUXIN3	
OTHER CONNECTIONS		
17	+FRAME GROUND	
36	-FRAME GROUND	
18	+SPARE	
37	+BR	
19	+BR	

Table 15-B
ALIU Options Settings

The default settings are the Pin1 to Pin2 connections in all cases up to J20, except for J3 and J10/J16.

J11 and J12 (Opto-coupler Input Voltage Options) are only used for systems with a 24 Vdc source or reference the Battery Return on P2 and P4 of J11. The defaults for J11 and J12 are therefore OUT. If the J11 or J12 defaults are to be changed, you must order the jumpers separately (order code A0292488) and install them (maximum of nine jumpers).

J21 to J29 are used to control the alarm output signal. The default settings are:
- pin 3 to pin 2 for J21, J22, J24, J25, J27, and J28
- pin 1 to pin 2 for J23, J26, J29.

The opposite settings for all of these pins result in alarm condition from a contact opening, i.e., loss of signal.

JUMPER	STRAPPING OPTION	FUNCTION
ALARM CUT-OFF OPTIONS		
J1	Pin1 to Pin2 (default)	Auxiliary 1 relay ACO enabled
	Pin 3 to Pin 2	Auxiliary 1 relay ACO disabled
J2	Pin1 to Pin2 (default)	Auxiliary 2 relay ACO enabled
	Pin 3 to Pin 2	Auxiliary 2 relay ACO disabled
J3	Pin1 to Pin2	Single command of visual and audible alarms, including ACO
	Pin 3 to Pin 2 (default)	Separate commands for control of visual and audible alarms, ACO alarms only
J6	Pin1 to Pin2 (default)	Bay alarm ACO disabled
	Pin 3 to Pin 2	Bay alarm ACO enabled
OPTO-COUPLER INPUT SOURCE OPTIONS		
J14, J15	Pin1 to Pin2 (default)	FAN1ALM inputs selected
	Pin 3 to Pin 2	AUXIN1 inputs selected
J19, J20	Pin1 to Pin2 (default)	FAN2ALM inputs selected
	Pin 3 to Pin 2	AUXIN2 inputs selected
J17, J18	Pin1 to Pin2 (default)	FUSEALM inputs selected
	Pin 3 to Pin 2	AUXIN3 inputs selected
J10, J16	Pin1 to Pin2 (not used)	Reserved for future use
	Pin 3 to Pin 2	USERIN1 inputs always selected

-continued-

Table 15-B Continued
ALIU Options Settings

JUMPER	STRAPPING OPTION	FUNCTION
OPTO-COUPLER INPUT VOLTAGE OPTIONS		
J11: A1,B1	in	BR common to P2 and P4
	out (default)	P2 BR and P4 BR isolated
J11: A2,B2	in	24 Vdc operation selected
	out (default)	48 Vdc operation selected
J11: A3,B3	in	24 Vdc operation selected
	out (default)	48 Vdc operation selected
J11: A4,B4	in	24 Vdc operation selected
	out (default)	48 Vdc operation selected
J12: A1,B1	in	24 Vdc operation selected (PCON1ALM)
	out (default)	48 Vdc operation selected (PCON1ALM)
J12: A2,B2	in	24 Vdc operation selected (PCON2ALM
	out (default)	48 Vdc operation selected (PCON2ALM)
J12: A3,B3	in	24 Vdc operation selected (PCON3ALM)
	out (default)	48 Vdc operation selected (PCON3ALM)
J12: A4,B4	in	24 Vdc operation selected (PCON4ALM)
	out (default)	48 Vdc operation selected (PCON4ALM)
J12: A5,B5	in	24 Vdc operation selected (FSPACO)
	out (default)	Vdc operation selected (FSPACO)
ALARM RELAY OPTIONS		
J13	Pin1 to Pin2 (default)	FSP LFFAIL relay output selected (one output connected to -48 V).
	Pin 3 to Pin 2	Frame fail lamp relay contact available as a pair of outputs.
J8 and J9	Pin1 to Pin2 (default)	FSP LCR, LMJ, LMN, and LACO relay outputs selected with common BR return
	Pin 3 to Pin 2	LCR, LMJ and LMN relay outputs available to customer along with common return (CMNRTN); ACO lamp relay contacts available as a pair of outputs

-continued-

Table 15-B Continued
ALIU Options Settings

JUMPER	STRAPPING OPTION	FUNCTION
ALARM OUTPUT OPTIONS		
J21	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Auxiliary 2 relay contact closure Auxiliary 2 relay contact opening
J22	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Auxiliary 1 relay contact closure Auxiliary 1 relay contact opening
J23	Pin 1 to Pin 2 (default) Pin 3 to Pin 2	Bay contact closure Bay contact opening
J24	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Minor visual contact closure Minor visual contact opening
J25	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Major visual contact closure Major visual contact opening
J26	Pin 1 to Pin 2 (default) Pin 3 to Pin 2	Critical visual contact closure Critical visual contact opening
J27	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Minor audible contact closure Minor audible contact opening
J28	Pin 3 to Pin 2 (default) Pin 1 to Pin 2	Major sudible contact closure Major audible contact opening
J29	Pin 1 to Pin 2 (default) Pin 3 to Pin 2	Critical audible contact closure Critical audible contact opening

16. How to Connectorize Cables

This procedure describes how to connectorize cables of various sizes and types, when the preset lengths of cable are not appropriate. There are two types of cable connectorization described here, each requiring its own tool:

- The AMP CHAMP MI-1 tool is used for 25-pair cable connectorization.,
- The CERTI-CRIMP tool is used for DS1 cables, connected to the Digital Trunk Link (DTL) SRU.

TOOLS FOR 25-PAIR CABLES:

1 AMP CHAMP MI-1 Crimping Tool

1 AMP CHAMP T-Handle Insertion Tool, AMP 229384-1.

TOOLS FOR DS1 CABLES:

1 CERTI-CRIMP Crimping Tool, AMP 90312-1.

APPARATUS FOR DS1 CABLES:

1 Receptacle (15-pin) for DTL SRU female connector (AMP 205205-1 with metal shell)

Socket Pins (female) for 20/24 AWG Wire (AMP 66504-9)

Cable Housing with screws (AMP 206471-1).

Connectorization Using the MI-1 Tool

This procedure describes how to connectorize a 25-pair cable, such as those used with the LANlink SRU. (Refer to Fig. 16-1 for details of the tool parts.)

(1) Position the tool on a workbench or the step of a ladder. Secure the base plate of the MI-1 with C-clamps or a similar device. Make certain that nothing interferes with the opening of the tool handles.

(2) Butt and strip the cable sheath approximately 221 mm (8 inches) from the cable end to be terminated.

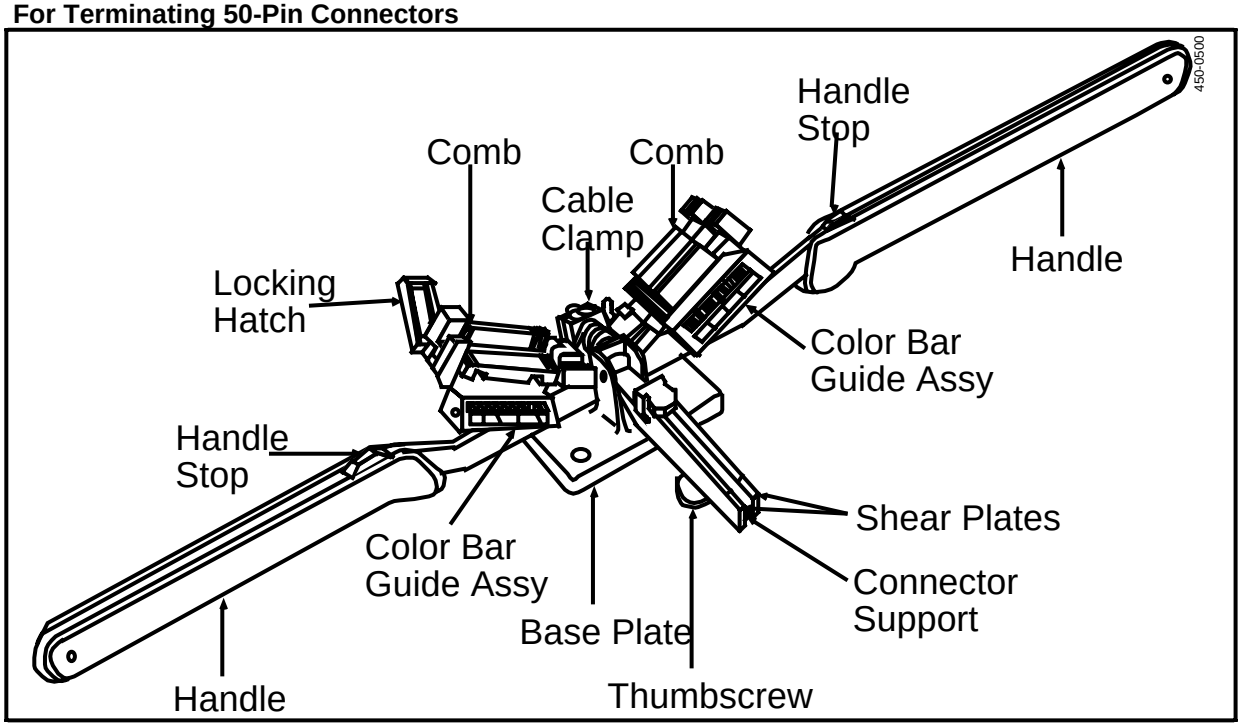
(3) Depending on the size of the cable (number of pairs) and the number of connectors being terminated, organize the wires according to a suitable plan. Split the wire binders and sort the pairs as required for each connector.

(4) Open the tool handle fully.

(5) Press on the left side of the locking latch until it snaps open, then press on the right side to open the latch completely.

(6) Rotate both wire holders outward, then move the block holder down.

Figure 16-1
AMP CHAMP Portable Hand Tool Type MI-1
For Terminating 50-Pin Connectors



(7) Ensure that the lettering at the ends of the color bar correspond to the type of connector to be terminated. The letter M is for male connectors and the letter F is for female connectors. If necessary, rotate the color bar guides 180° to obtain the correct position of the color bar. The tool is now ready to receive the wires and a connector.

(8) Open the cable clamp and place the cable on the cable block so that the sheathing extends approximately 13 mm (1/2 inch) above the block. Hold the cable in position and close the cable clamp.

(9) Loosen the torque screw by rotating it counterclockwise through several turns.

(10) Align the connector (male or female) with the front of the block holder. Make sure the **low** number positions are on the left and the **high** number positions are on the right.

(11) Insert the connector into the block holder between the shear plates, and turn the torque screw until slippage occurs (indicating the correct torque).

(12) Pull the group of wires forward. Select the first pair of wires that corresponds with the color bar guide, starting from the center of the tool. Split the pair (tip & ring), one wire to the left and the other to the right, to correspond with the colour bar guide. For example, if the first pair being wired in a male connector is blue (tip) and white (ring), the blue wire goes to the left and the white wire goes to the right (for a female connector the opposite applies).

(13) Feed both wires through the appropriate left or right outer comb (rear) and inner comb (front). While keeping the wire taut, bend each wire under the inner comb and around the inside of the guides toward the center of the tool. Ensure that both wires are laced through both combs properly.

(14) Repeat Steps 12 and 13 until half the pairs are laced into the tool. Then continue with the remaining pairs in the same manner, but bend the wires in the opposite direction toward the tool handle.

(15) Ensure that all wires are parallel in the combs and that the connector is bottomed (fully inserted) in the block holder. Raise the block holder to the vertical position.

(16) Raise both the right and left wire holders (one by one) to the vertical position, making sure that the wires remain in the combs.

(17) Hook the locking latch onto the right wire holder, then press on the left side of the locking latch until it is secure.

(18) Check alignment of wires from the sides of both wire holders. Each conductor must be aligned with a single contact.

(19) Raise the handles until the handle stop of both handles butt against each other. This shears all wire ends and fully crimps all wires into the connector.

(20) Lower the handles and remove the sheared wire ends from the wire holders.

(21) Loosen the torque screw by turning counterclockwise. Then open the locking latch and rotate both wire holders downward. Open the cable clamp and slide the terminated connector straight out of the block holder.

(22) Ensure that each wire is fully and evenly inserted into the contact slot.

(23) Check that all wires have been sheared to the proper length, and that no exposed conductor strands are visible. Check that the insulation is not cut in any area except where the wire is inserted into the slot.

(24) Ensure that the contacts are not deformed or crushed, and that the wires have not been cut above the strain relief slot in the contacts.

Note: If any of the wires are not properly terminated, reinsert them using the AMP T-Handle Insertion Tool. (See Fig. 16-2.)

Connectorization of DS1 Cables (CERTI-CRIMP)

This procedure describes how to connectorize DS1 cables used with the Digital Trunk Link SRU. The CERTI-CRIMP tool is used to crimp individual leads with female socket pins (AMP 66504-9) for 20/24 guage wires. (Refer to Fig. 16-3, View

A for designation of the tool parts.) All the leads are crimped with pins first, and then inserted into the 15-pin DTL connector (AMP 205205). Proceed as follows:

(1) Prepare the cable end by stripping off the sheath approximately 50 mm (2 inches).

(2) Strip off the shield of both pairs to the same length as the sheath, except retain the two ground lead wires.

Note: The DTL cable is grounded only at one end of the two connecting ends. At the nonconnecting end, the shields (including the ground lead wires) are trimmed to the same length as the sheath, then taped. At the connecting end, the thicker ground lead wire from within the shield is retained but the shield is trimmed to the same length as the sheath and taped.

(3) Select the four leads and strip the wires 2 mm (5/64 inch).

(4) Open the handles of the CERTI-CRIMP tool by squeezing them to the bottom and then letting them out to the fully open position.

(5) Facing the back of the tool, grasp the contact locator and pull out and up. Spring tension will hold the locator against the crimper jaws, as shown in Fig. 16-3, View B.

Figure 16-2
AMP CHAMP T-Handle Insertion Tool, 229384-1
For Inserting Single Wires Into Connectors

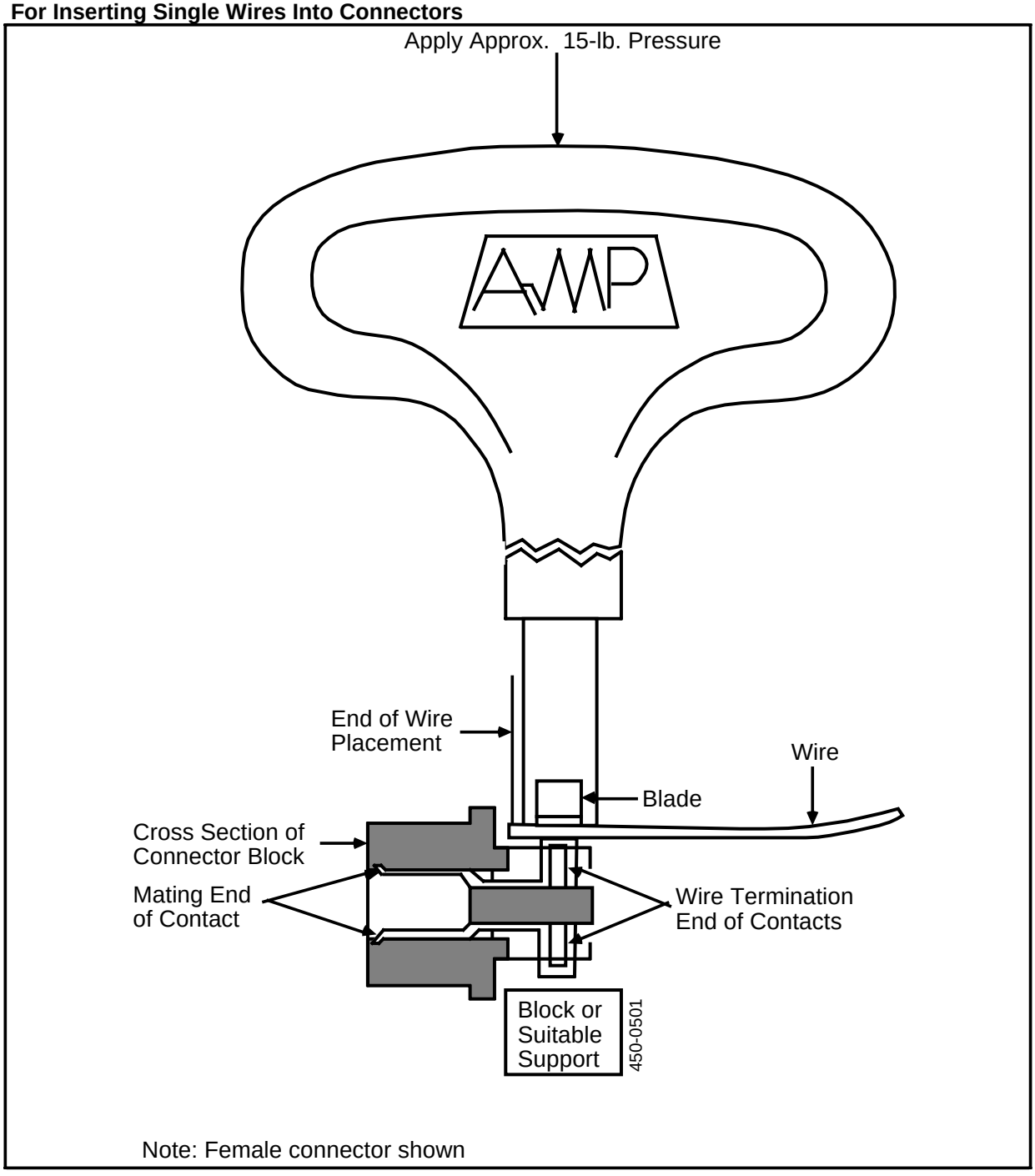
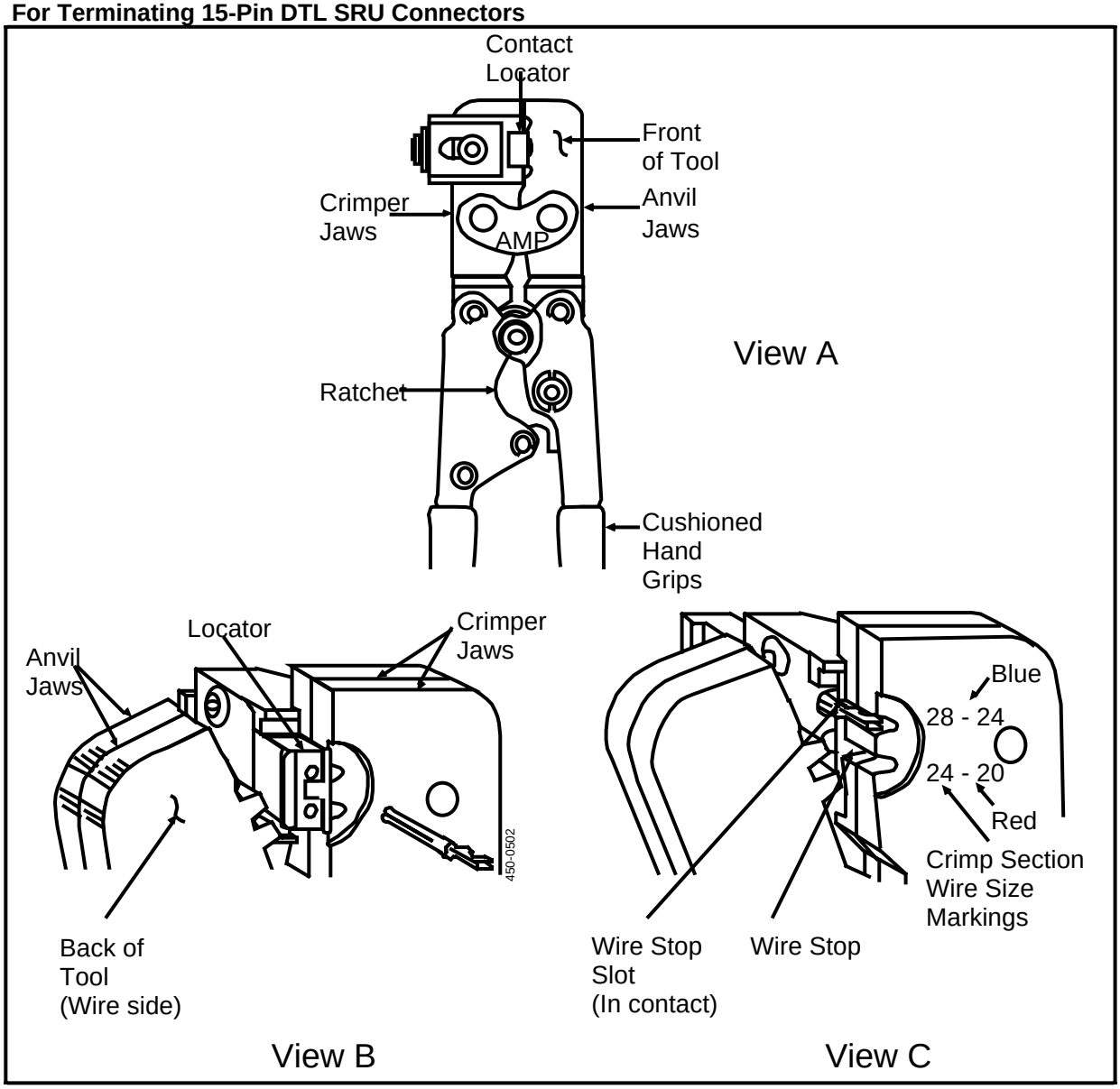


Figure 16-3
CERTI-CRIMP Tool, AMP 90312-1
For Terminating 15-Pin DTL SRU Connectors



(6) Insert a female socket pin into the 20/24 crimp slot; the V-shape opening of the crimping barrel of the pin should face toward the groove of the crimper jaws, as shown in Fig. 16-3, View B.

Note: The color dot on the pin must be red to match the color of the 20/24 crimp slot designation on the tool.

- CAUTION -

Do not attempt to close the tool handles while the locator is positioned between the tool jaws.

(7) Grasp the locator and pull outward, allowing the spring tension to pull the locator down and the wire stop to enter the slot between the contact shoulder and the V-shape wire barrel, as shown in Fig. 16-3, View C.

(8) Squeeze the handles of the tool until the ratchet is just engaged. Do not allow the V-shape barrel to be squeezed or deformed.

(9) Insert the trimmed end of the first wire into the pin until it comes to stop against the wire stop, then squeeze to crimp. The handles must be fully squeezed before the handle ratchet will release.

(10) Open the handles. Grasp the locator and pull out and up. Remove the crimped pin socket from the tool.

(11) Repeat the crimping procedure for the remaining three wires and (if applicable) for the two ground lead wires.

(12) Check all leads for proper crimping. Repeat the stripping and crimping procedure, if necessary.

(13) Insert all the crimped leads into the connector according to their assigned pin locations. Refer to Table 16-A for identification of the six pins. If necessary, an AMP Insertion/Extraction Tool (AMP 91067-2) may be used to insert the pins into the connector socket.

(14) Tape the cable at the end of the sheath. Assemble the connector housing (AMP 207908-4) with the screws provided.

Table 16-A
PIN DESIGNATIONS FOR DS1 CABLES

PIN	DESIGNATION
1	DT0 (transmit)
2	Frame ground (cable shield)
3	DT1 (receive)
4	Frame ground (cable shield)
5	
6	
7	
8	
9	DR0 (transmit)
10	
11	DR1 (receive)
12	
13	
14	
15	

Note: Of pins 1 to 15, only those used are listed. All others are no connection.

17. Installing a -48 Vdc Power Distribution System

This part describes how to install a -48 V Power Distribution System. This system is used when the cabinets are powered from -48 V office battery, rather than commercial 110/220 Vac power.

Installing a Factory-configured -48 V Power System

This procedure describes how to install a -48 Vdc Power Distribution System on cabinet systems. The ordering codes provided for Northern Telecom products reflect the most recent versions at the time of printing.

- CAUTION -

If, for any reason, the input box requires service, power to the system must be removed at the main disconnect device. This must be done by qualified personnel.

A Distribution Box can be serviced after removing power to the system by switching the circuit breaker located in the input box to the OFF position.

(1) Remove the preassembled power system from the shipping container. The system is ready to install on the cabinets. Connection hardware required to connect long or short cable and the input box to the cabinet is supplied with the system.

(2) If the system is operating, make sure all users have signed off, and power the system down.

(3) Remove the ac input cord from the input jumper (if applicable).

(4) Remove the dc serial ID label from the plastic bag shipped with the input box.

The following label fields have been filled in at the factory: volts (dc), amps, and model number (NT4G01__).

(5) Copy into the appropriate fields on the dc label, in permanent ink, the following information from the ID label located on the ac input jumper: serial number, manufacturing date code, and Rel/Mix number.

(6) Place the dc serial ID label over the ac serial ID label (which gives the voltage rating, frequency, model number, and so on) located on the input jumper.

(7) Remove the ac input jumper from the rear of cabinet 1 (the right-most cabinet as viewed from the rear).

(8) Remove the horizontal jumper assemblies that interconnect the cabinets. Then remove the terminating jumper assembly from the last cabinet in the lineup (the left-most as viewed from the rear).

(9) Remove the two nuts securing the ac bus cover to the two studs on the lower bus cover of each cabinet on which a box will be installed, that is, at least from cabinets 1 and 2, and possibly from cabinets 5 and 8. (See Fig. 17-1.)

Note: Because the connection between the distribution box and the input box may be fairly stiff, it may be necessary to perform Steps 10 and 11 at the same time.

(10) Position the input box (with circuit breaker) at the bottom center on the rear of the cabinet. The holes in the 'ears' on the side of the box should fit over the two studs, and the two mounting holes on the upper flange of the box should coincide with the two holes on the rear of the cabinet.

(11) Place the first distribution box (connected to the input box with conduit) on the second cabinet in the same manner.

(12) Replace the nuts removed in Step 9, and tighten them to secure the boxes in place.

(13) Secure the top of the boxes to the rear panel using the two short (1/4 inch) screws supplied.

(14) For cabinet systems containing more than four cabinets, repeat the procedure to install the additional distribution box in cabinet 5.

(15) For a cabinet system with eight cabinets, repeat the procedure to install the last distribution box in cabinet 8.

(16) Reconnect all the jumper assemblies in their appropriate positions.

Note: For all the following instructions, the -48 V to +32 V Power Converter SRUs must be located in positions 1, 2, or 3, which are defined as the three right-most SRU postions in the top of a cabinet as viewed from the rear.

(17) Install the -48 V to + 32 V converter SRUs (NT4G50DA) as described in Table 17-A. (Also see Figures 17-1 and 17-2.)

(18) Connect the distribution boxes to the Power Converter SRUs by attaching the connector backshell housing to the rear of the cabinet. Drive two 1/2-inch screws from the outside of the cabinet, and fasten them with the two nuts on the inside of the cabinet rear pannel. Before fully tightening the screws, ensure that each connector is aligned with the connector on the SRU so that full engagement is achieved (Fig. 17-3).

(19) Ensure that the circuit breaker located in the input box is in the OFF position.

The system is now ready to have the power and grounding cables connected.

- CAUTION -

Power and grounding connections must be made by qualified personnel in accordance with local electrical codes and the applicable portions of the National Electrical Code/Canadian Electrical Code. See the stuffer shipped with in the input box (Fig. 17-4).

(20) Power up the system by moving the circuit breaker located in the input box to the ON position.

Figure 17-1
Installation of Factory-configured System (2 to 4 Cabinets)

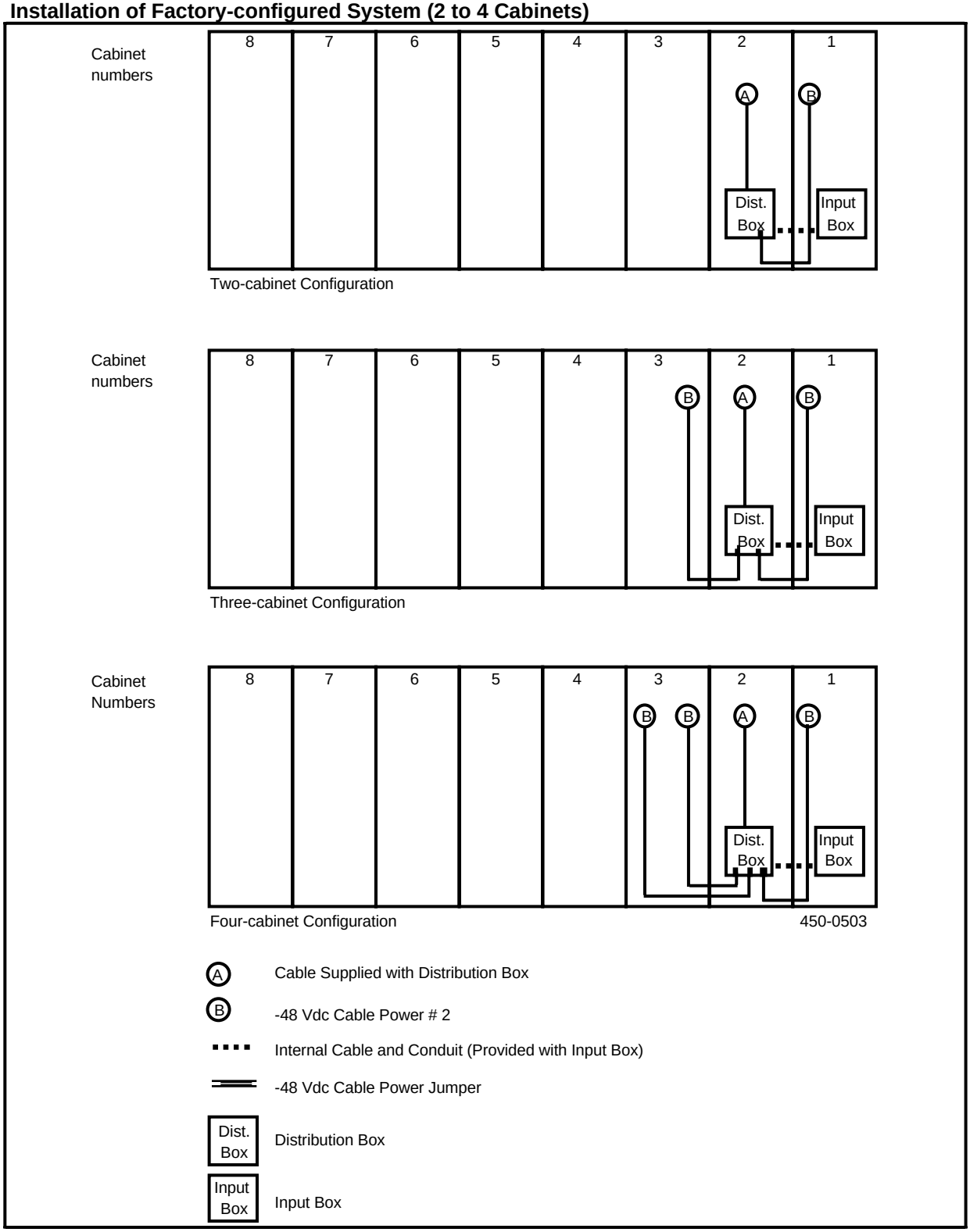


Figure 17-2
Installation of Factory-configured System (5 to 8 Cabinets)

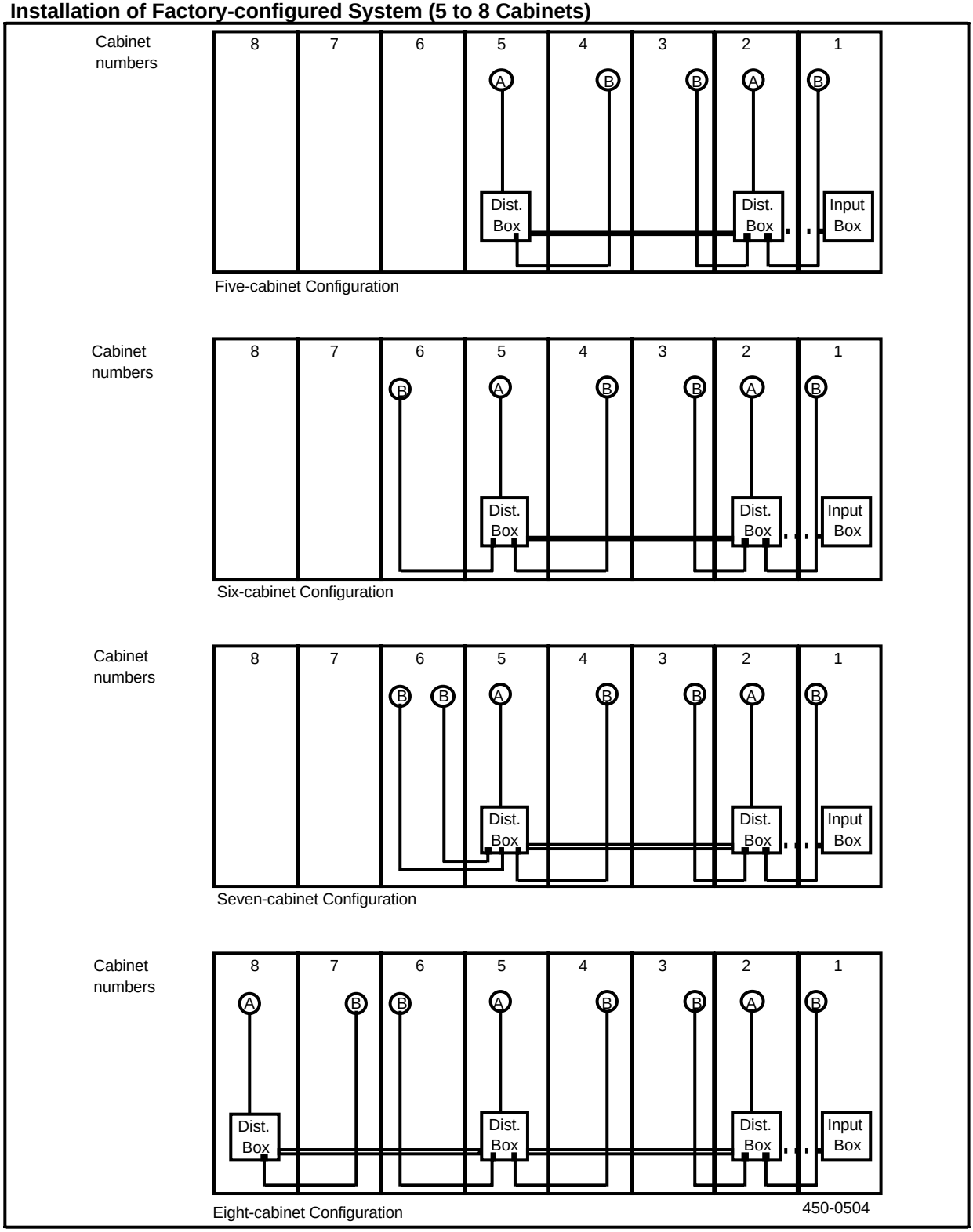


Figure 17-3
Securing the Connector Backshell Housing to the Rear of the Cabinet

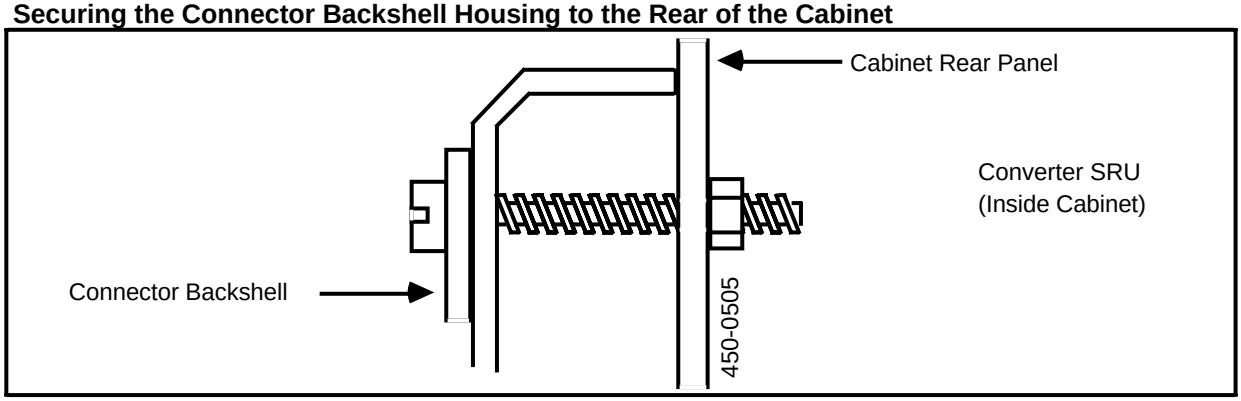


Figure 17-4
Field Wiring Instructions

FIELD WIRING INSTRUCTIONS

-48 VOLT DC SUPPLIED DATA VOICE INSTRUCTIONS

This System has been designed to comply with the requirements for Field Wiring of stationary units in accordance with the 1987 National Electrical Code, NFPA 70 or the Canadian Electrical Code C22.1.

This system has been provided with an opening to accommodate a 1 inch trade size fitting for the attachment of a field installed electrical raceway, conduit or cable/strain relief. Refer to local codes and requirements for suitable methods of attachment.

USE #6 AWG COPPER CONDUCTORS, RATED AT LEAST 90˚ C.

A MAIN DISCONNECT DEVICE MUST BE PROVIDED IN ORDER TO COMPLY WITH THE REQUIREMENTS FOR PERMANENTLY CONNECTED PRODUCTS IN ACCORDANCE WITH THE NATIONAL/CANADIAN ELECTRICAL CODE.

BRANCH CIRCUIT OVERCURRENT PROTECTION SHOULD BE PROVIDED FOR THIS SYSTEM AT THE SOURCE OF SUPPLY. THE PROTECTION DEVICE SHOULD BE SIZED IN ACCORDANCE WITH THE MARKED ELECTRICAL RATING OF THE SYSTEM AND SHOULD ALLOW 150% OF THE MARKED RATINGS FOR TEN SECONDS TO COMPENSATE FOR STARTING CURRENT DEMANDS.

The anticipated nominal current draw for -48 Vdc systems is as follows:

2 Tower System: -48 V, 17 A, DC
3 Tower System: -48 V, 25 A, DC
4 Tower System: -48 V, 34 A, DC
5 Tower System: -48 V, 42 A, DC
6 Tower System: -48 V, 50 A, DC
7 Tower System: -48 V, 59 A, DC
8 Tower System: -48 V, 67 A, DC

TERMINAL BLOCK

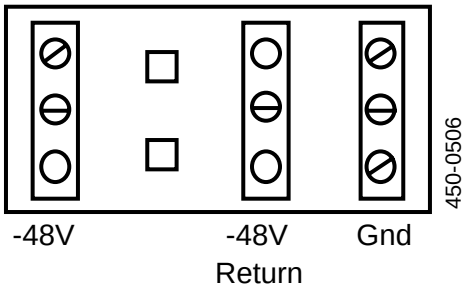


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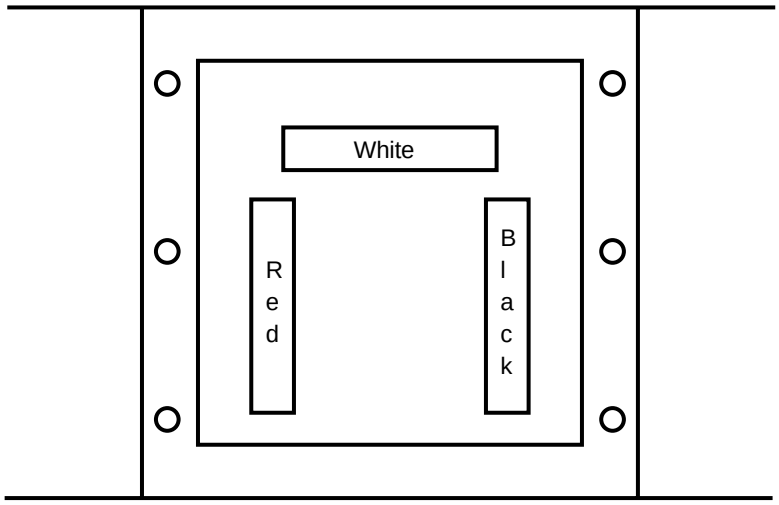
Figure 17-5
Bus Bar Positions and Wire Coding



Red: Red wire carrying -48 V
Black: Black wire carrying -48 V Return
White: White wire carrying converter balance signal
Not Shown: Green wire carrying system ground

Table 17-A
CONVERTER REQUIREMENTS

SYSTEM SIZE	ONE CONVERTER IN CABINET #	TWO CONVERTERS IN CABINET #	PEC CODE
2 Cabinets	1,2	-	NT4G13AK
3 Cabinets	1,2,3	-	NT4G13AL
4 Cabinets	1,2	3	NT4G13AM
5 Cabinets	1,2,3,4,5	-	NT4G13AN
6 Cabinets	1,2,3,4,5,6	-	NT4G13AP
7 Cabinets	1,2,3,4,5	6	NT4G13AQ
8 Cabinets	1,2,3,4,5,6,7,8	-	NT4G13AR

Table 17-B
HARDWARE REQUIREMENTS FOR A POWER SYSTEM UPGRADE

This table lists the hardware required to expand a -48 V Power Distribution System (from two cabinets to up to eight cabinets).

CHANGE FROM	CHANGE TO	HARDWARE REQUIRED
2	3	-48 V Cable Power # 2 (NT4G09BH/A0331639)
3	4	-48 V Cable Power # 2
4	5	-48 V Distribution Box (NT4G13AH/A0333762) -48 V Cable Power Jumper (NT4G09CH/A0331640)
5	6	-48 V Cable Power # 2
6	7	-48 V Cable Power # 2
7	8	-48 V Distribution Box (NT4G13AH/A0333762) -48 V Cable Power Jumper (NT4G09CH/A0331640)

Table 17-C
SYSTEM CURRENT DEMANDS

Branch circuit overcurrent protection should be provided for this system at the source of supply. The protection device should be sized in accordance with the marked electrical rating of the system and should allow 150% of the marked rating for 10 s to compensate for the starting current demands.

SYSTEM SIZE	CURRENT
2-cabinet system	-48 V, 17 A
3-cabinet system	-48 V, 25 A
4-cabinet system	-48 V, 34 A
5-cabinet system	-48 V, 42 A
6-cabinet system	-48 V, 50 A
7-cabinet system	-48 V, 59 A
8-cabinet system	-48 V, 67 A

Installing the Cabinet Downgrade Kit (NT4G13AT)

This procedure describes how to install the cabinet downgrade kit NT4G13AT, which reduces the number of cabinets served by the power system. The kit consists of labels that are to be placed over the dc serial ID label that is located on the input jumper to change the amperage rating.

Downgrade from Eight to Seven Cabinets

When downgrading from eight to seven cabinets, see Fig. 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 5 that secure the power cable (NT4G09BH A0331639) which connects the box in cabinet 5 to the box in cabinet 8.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of the power jumper cable connecting cabinets 5 and 8.

(6) On the same cable, loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) Remove the cable from the distribution box in cabinet 5.

(8) Remove the eight screws securing the front cover plate to the distribution box in cabinet 8.

(9) Remove the cover plate.

(10) Loosen the two screws on the strain relief on the distribution box in cabinet 8 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 8 to the power converter in cabinet 7.

(11) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of the power cable #2 connecting the box in cabinet 8 with the power converter in cabinet 7.

(12) Loosen and remove the nut and washer holding the green wire from power cable #2 to the stud in the lower portion of the box.

(13) Remove the cable from the distribution box in cabinet 8.

(14) Detach the connector backshell from the power converter located in cabinet 7 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(15) Detach the connector backshell from the power converter located in cabinet 7 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(16) Remove the vertical jumper and the horizontal jumper connecting cabinets 7 and 8.

(17) Remove the two screws securing the distribution box to the rear panel of cabinet 8.

(18) Remove the two nuts securing the distribution box to cabinet 8.

(19) Remove the distribution box from cabinet 8.

(20) Attach power cable #2 (removed from cabinet 8) to the power converter in cabinet 6.

Note: There should be two power converters located in cabinet 6 and none in cabinet 7.

(21) Lightly secure the connector backshell to the cabinet backpanel using two 1/2-inch screws.

(22) Engage the power converter to ensure alignment.

(23) Fully tighten the screws holding the backshell.

(24) Insert the cable end through the strain relief in the top of the distribution box located in cabinet 5. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(25) Securely tighten the clamping screws of the strain relief.

(26) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(27) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(28) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(29) Securely clamp the wires in place by tightening the screws.

(30) Replace the front cover plate and secure with the eight screws removed previously.

Downgrade from Seven to Six Cabinets

When downgrading from seven to six cabinets, see Fig. 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 5 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 5 to the power converter in cabinet 6.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of power cable #2.

(6) Loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) Remove the cable from the distribution box in cabinet 5.

(8) Remove the strain relief from the distribution box.

(9) Cover the hole in the distribution box with the snap-in hole cover supplied with the kit.

(10) Detach the connector backshell from the power converter located in cabinet 6 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(11) Replace the front cover plate and secure with the eight screws removed previously.

Downgrade from Six to Five Cabinets

When downgrading from six to five cabinets, see Fig. 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 5 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 5 to the power converter in cabinet 6.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of power cable #2.

(6) Loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) After removing the green wire from the stud, replace the washer and nut on the stud.

(8) Remove the cable from the distribution box in cabinet 5.

(9) Remove the strain relief from the distribution box.

(10) Cover the hole in the distribution box with the snap-in hole cover supplied with the kit.

(11) Detach the connector backshell from the power converter located in cabinet 6 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(12) Replace the front cover plate and secure with the eight screws removed previously.

Downgrade from Five to Four Cabinets

When downgrading from five to four cabinets, see Figures 17-1 and 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 2 that secure power jumper cable (NT4G09CH A0331640). This cable connects the box in cabinet 2 to the box in cabinet 5.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of the power jumper cable connecting cabinets 2 and 5.

(6) From the same cable, loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) Remove the cable from the distribution box in cabinet 2.

(8) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(9) Remove the cover plate.

(10) Loosen the two screws on the strain relief on the distribution box in cabinet 5 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 5 to the power converter in cabinet 4.

(11) Loosen, but do not remove, the screw in each of the three bus bars that secures the red, black, and white wires of power cable #2. This cable connects the box in cabinet 5 with the power converter in cabinet 4

(12) Loosen and remove the nut and washer holding the green wire from power cable #2 to the stud in the lower portion of the box.

(13) Remove the cable from the distribution box in cabinet 5.

(14) Detach the connector backshell from the power converter located in cabinet 4 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(15) Remove the horizontal jumper connecting cabinets 4 and 5, and the vertical jumper on cabinet 5.

(16) Remove the two screws securing the distribution box to the rear panel of cabinet 5.

(17) Remove the two nuts securing the distribution box to cabinet 5.

(18) Remove the distribution box from cabinet 5.

(19) Attach power cable #2 (removed from cabinet 5) to the power converter in cabinet 3.

Note: There should be two power converters located in cabinet 3, and none in cabinet 4.

(20) Lightly secure the connector backshell to the cabinet backpanel using two 1/2-inch screws.

(21) Engage the power converter to ensure alignment.

(22) Fully tighten the screws holding the backshell.

(23) Insert the cable end through the strain relief in the top of the distribution box located in cabinet 2. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(24) Securely tighten the clamping screws of the strain relief.

(25) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(26) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(27) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(28) Securely clamp the wires in place by tightening the screws.

(29) Replace the front cover plate and secure with the eight screws removed previously.

Downgrade from Four to Three Cabinets

When downgrading from four to three cabinets, see Figure 17-1 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 2 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 2 to the power converters in cabinet 3.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of power cable #2.

(6) Loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) After removing the green wire from the stud, replace the washer and nut on the stud.

(8) Remove the cable from the distribution box in cabinet 2.

(9) Remove the strain relief from the distribution box.

(10) Cover the hole in the distribution box with the snap-in hole cover supplied with the kit.

(11) Detach the connector backshell from the power converter located in cabinet 3 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(12) Replace the front cover plate and secure with the eight screws removed previously.

Downgrade from Three to Two Cabinets

When downgrading from three to two cabinets, see Fig. 17-1 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 2 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 2 to the power converters in cabinet 3.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secures the red, black, and white wires of power cable #2.

(6) Loosen and remove the nut and washer holding the green wire to the stud in the lower portion of the box.

(7) After removing the green wire from the stud, replace the washer and nut on the stud.

(8) Remove the cable from the distribution box in cabinet 2.

(9) Remove the strain relief from the distribution box.

(10) Cover the hole in the distribution box with the snap-in hole cover supplied with the kit.

(11) Detach the connector backshell from the power converter located in cabinet 3 by removing the two 1/2-inch screws holding the backshell to the rear panel of the cabinet.

(12) Replace the front cover plate and secure with the eight screws removed previously.

Installing Upgrade Kit NT4G13AU (From Two to Three Cabinets)

This procedure describes how to expand a -48 Vdc system from two to three cabinets. The kit consists of one cable (NT4G09BH A0331639) and a label.

The procedure consists of adding a cable to the distribution box in cabinet 2, and connecting the new cable to the power converter in cabinet 3. See Fig. 17-1 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Attach the new power cable #2 to the power converter in cabinet 3.

(4) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(5) Engage the power converter to ensure proper alignment.

(6) Tighten the screws holding the backshell.

(7) Remove one of the snap-in hole covers from the bottom of the distribution box located in cabinet 2.

(8) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(9) Insert the cable end through the empty strain relief in the distribution box located in cabinet 2. Ensure that approximately 1/4-inch of the cable jacket protrudes through the strain relief and into the box.

(10) Securely tighten the clamping screws on the strain relief.

(11) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(12) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(13) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(14) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(15) Replace the front cover plate and secure with the eight screws removed previously.

(16) Place the label supplied with the kit over the existing dc serial ID label (on the input jumper) after copying all of the appropriate information from the old label into the correct fields on the new label (in permanent ink).

Installing Upgrade Kit NT4G13AV (From Three to Four Cabinets)

This procedure describes how to expand a -48 Vdc system from three to four cabinets. The kit consists of one cable (NT4G09BH A0331639) and a label.

This procedure consists of adding a cable to the distribution box in cabinet 2, and connecting the new cable to the power converter in cabinet 3. See Fig. 17-1 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Attach the new power cable #2 to the power converter in cabinet 3.

Note: In this configuration there will be two power converters in cabinet 3.

(4) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(5) Engage the power converter to ensure proper alignment.

(6) Tighten the screws holding the backshell.

(7) Remove the snap-in hole cover from the bottom of the distribution box located in cabinet 2.

(8) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(9) Insert the cable end through the empty strain relief in the distribution box located in cabinet 2. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(10) Securely tighten the clamping screws on the strain relief.

(11) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(12) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(13) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(14) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(15) Replace the front cover plate and secure with the eight screws removed previously.

(16) Place the label supplied with the kit over the existing dc serial ID label (on the input jumper) after copying all of the appropriate information from the old label into the correct fields on the new label (in permanent ink).

Installing Upgrade Kit NT4G13AW (From Four to Five Cabinets)

This procedure describes how to expand a -48 Vdc system from four to five cabinets. The kit consists of one cable (NT4G09CH A0331640) and a label.

This procedure consists of removing one existing power cable #2 from the old distribution box (to be placed in cabinet 5), and connecting the existing distribution box (in cabinet 2) to the new distribution box with the new jumper cable. Install the removed power cable #2 in the new distribution box. See Figures 17-1 and 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 2.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 2 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 2 to one of the power converters in cabinet 3.

(5) Loosen, but do not remove, the screw in each of the three bus bars that secure the red, black, and white wires of power cable #2. This cable connects the box in cabinet 2 with the power converter in cabinet 3.

(6) Loosen and remove the nut and washer holding the green wire from power cable #2 to the stud in the lower portion of the box.

(7) Remove the cable from the distribution box in cabinet 7.

(8) Insert the new power jumper cable end through the now empty strain relief in the distribution box located in cabinet 2. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(9) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(10) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(11) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(12) Securely clamp the wires in place by tightening the screws.

(13) Repeat the above steps to secure the other end of the power jumper cable in the new distribution box.

Note: The power jumper cable should enter the new distribution box through the bottom-right side of the box as viewed when installed.

(14) Remove the horizontal jumpers connecting cabinets 4 and 5, and the vertical jumpers located on cabinet 5.

(15) Remove the two nuts from the studs on the rear of cabinet 5.

(16) Place the new distribution box on the studs on the rear of cabinet 5.

(17) Secure the distribution box to the rear panel of cabinet 5 with the two nuts removed previously.

(18) Finish securing the box to the cabinet by driving the two screws supplied with the box through the ears of the box and into the nuts located on the rear panel of the cabinet.

(19) Attach the power cable #2 that was removed from cabinet 2 to the power converter in cabinet 4.

(20) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(21) Engage the power converter to ensure proper alignment.

(22) Fully tighten the screws holding the backshell.

(23) Remove the snap-in hole cover from the bottom of the distribution box located in cabinet 5.

(24) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(25) Insert the cable end through the empty strain relief in the distribution box located in cabinet 5. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(26) Securely tighten the clamping screws on the strain relief.

(27) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(28) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(29) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(30) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(31) Securely clamp the wires in place by tightening the screws.

(32) Attach power cable #1 (supplied with the new box) to the power converter in cabinet 5.

(33) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(34) Engage the power converter to ensure proper alignment.

(35) Fully tighten the screws holding the backshell.

(36) Replace the front cover plate and secure with the eight screws removed previously.

Installing Upgrade Kit NT4G13AX (From Five to Six Cabinets)

This procedure describes how to expand a -48 Vdc system from five to six cabinets. The kit consists of one cable (NT4G09BH A0331639) and a label.

This procedure consists of adding one cable to the distribution box in cabinet 5, and connecting the new cable to the power converter in cabinet 6. See Fig. 17-1 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Attach the new power cable #2 to the power converter in cabinet 6.

(4) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(5) Engage the power converter to ensure proper alignment.

(6) Tighten the screws holding the backshell.

(7) Remove the snap-in hole cover from the bottom of the distribution box located in cabinet 5.

(8) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(9) Insert the cable end through the empty strain relief in the distribution box located in cabinet 5. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(10) Securely tighten the clamping screws on the strain relief.

(11) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(12) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(13) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(14) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(15) Securely clamp the wires in place by tightening the screws.

(16) Replace the front cover plate and secure with the eight screws removed previously.

(17) Place the label supplied with the kit over the existing dc serial ID label (on the input jumper) after copying all of the appropriate information from the old label into the correct fields on the new label (in permanent ink).

Installing Upgrade Kit NT4G13AY (From Six to Seven Cabinets)

This procedure describes how to expand a -48 Vdc system from six to seven cabinets. The kit consists of one cable (NT4G09BH A0331639) and a label.

This procedure consists of adding one cable to the distribution box in cabinet 5, and connecting the new cable to the power converter in cabinet 6. See Fig. 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Attach the new power cable #2 to the power converter in cabinet 6.

Note: In this configuration, there will be two power converters in cabinet 6.

(4) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(5) Engage the power converter to ensure proper alignment.

(6) Tighten the screws holding the backshell.

(7) Remove the snap-in hole cover from the bottom of the distribution box located in cabinet 5.

(8) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(9) Insert the cable end through the empty strain relief in the distribution box located in cabinet 5. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(10) Securely tighten the clamping screws on the strain relief.

(11) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(12) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(13) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(14) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(15) Securely clamp the wires in place by tightening the screws.

(16) Replace the front cover plate and secure with the eight screws removed previously.

(17) Place the label supplied with the kit over the existing dc serial ID label (on the input jumper) after copying all of the appropriate information from the old label into the correct fields on the new label (in permanent ink).

Installing Upgrade Kit NT4G13AZ (From Seven to Eight Cabinets)

This procedure describes how to expand a -48 Vdc system from seven to eight cabinets. The kit consists of one cable (NT4G09CH A0331640), one distribution box (NT4G13AH A0333762) and a label.

This procedure consists of removing the existing power cable #2 from the old distribution box (to be placed in cabinet 5), and connecting the existing distribution box (in cabinet 5) to the new distribution box with the new jumper cable. Install the removed power cable #2 in the new distribution box. Proceed as follows. See Fig. 17-2 for the locations of the input and distribution boxes, Fig.17-5 for the wiring for the bus bar, and proceed as follows:

(1) Power down the -48 Vdc system by moving the circuit breaker located in the input box to the OFF position.

(2) Remove the eight screws securing the front cover plate to the distribution box in cabinet 5.

(3) Remove the cover plate.

(4) Loosen the two screws on the strain relief on the distribution box in cabinet 5 that secure power cable #2 (NT4G09BH A0331639). This cable connects the box in cabinet 5 to one of the power converters in cabinet 6.

(5) Loosen, but do not remove, the screw in each of the three bus bars which secure the red, black, and white wires of the power cable #2 connecting the box in cabinet 5 with the power converter in cabinet 6.

(6) Loosen and remove the nut and washer holding the green wire from power cable #2 to the stud in the lower portion of the box.

(7) Remove the cable from the distribution box in cabinet 5.

(8) Insert the new power jumper cable end through the now empty strain relief in the distribution box located in cabinet 5. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(9) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(10) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(11) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(12) Securely clamp the wires in place by tightening the screws.

(13) Repeat the above steps to secure the other end of the power jumper cable in the new distribution box.

Note: The power jumper cable should enter the new distribution box through the bottom-right side of the box as viewed when installed.

(14) Remove the horizontal jumpers connecting cabinets 7 and 8 and the vertical jumpers located on cabinet 8.

(15) Remove the two nuts from the studs on the rear of cabinet 8.

(16) Place the new distribution box on the studs on the rear of cabinet 8.

(17) Secure the distribution box to the rear panel of cabinet 8 with the two nuts removed previously.

(18) Finish securing the box to the cabinet by driving the two screws supplied with the box through the ears of the box and into the nuts located on the rear panel of the cabinet.

(19) Attach the power cable #2 that was removed from cabinet 5 to the power converter in cabinet 7.

(20) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(21) Engage the power converter to ensure proper alignment.

(22) Fully tighten the screws holding the backshell.

(23) Remove the snap-in hole cover from the bottom of the distribution box located in cabinet 8.

(24) In the empty hole in the distribution box, install the strain relief supplied with the new power cable #2.

Note: It may be necessary to remove the small access cover from the bottom of the distribution box in order to tighten the locknut on the inside of the box.

(25) Insert the cable end through the empty strain relief in the distribution box located in cabinet 8. Ensure that approximately 1/4-inch of cable jacket protrudes through the strain relief and into the box.

(26) Securely tighten the clamping screws on the strain relief.

(27) Remove a nut and washer from one of the empty studs in the lower portion of the box.

(28) Place the ring terminal from the green wire over the stud in the lower part of the distribution box.

(29) Place the flat washer over the ring terminal, and secure with the nut removed previously.

(30) Insert the stripped ends of the red, black, and white wires into the through holes of the bus bars. Ensure that all of the strands of each wire are in the hole and that each wire is in the correct bus bar.

Note: Maintain the color code on the wires so that the wires that are inserted match the colors of those wires that were factory installed.

(31) Securely clamp the wires in place by tightening the screws.

(32) Attach the power cable #1 that was supplied with the new box to the power converter in cabinet 8.

(33) Lightly secure the connector backshell to the cabinet backpanel with two 1/2-inch screws.

(34) Engage the power converter to ensure proper alignment.

(35) Fully tighten the screws holding the backshell.

(36) Replace the front cover plate and secure with the eight screws removed previously.

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