Lucent Technologies

Bell Labs Innovations

MAX TNT®

Hardware Installation Guide

Lucent Technologies

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*   Type of computer you are using
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About This Guide

What is in this guide

This guide describes how to install your MAX TNT® unit. It also explains how to install cards. After you have finished reading this guide, you can go on to the *APX 8000/MAX TNT Physical Interface Configuration Guide* to configure your unit. If you experience problems with your unit, or need to perform maintenance on it, see the *APX 8000/MAX TNT Administration Guide.*

Note: This manual describes the full set of features for the MAX TNT unit running True Access™ Operating System (TAOS) software version 8.0.2 or later. Some features might not be available with earlier versions or specialty loads of the software.

⚠ **Warning:** Before installing your MAX TNT unit, be sure to read the safety instructions in the *Edge Access Safety and Compliance Guide*. For information specific to your unit, see Appendix C, "Safety-Related Electrical, Physical, and Environmental Information," in this hardware installation guide.

What you should know

This guide is for the person who configures and maintains a MAX TNT unit. To configure a unit, you need to understand the following:

*   Internet or telecommuting concepts

*   Wide Area Network (WAN) concepts

*   Local Area Network (LAN) concepts, if applicable

Documentation conventions

Following are all the special characters and typographical conventions used in this manual:

Convention	Meaning
Monospace text	Represents text that appears on your computer's screen, or that could appear on your computer's screen.
Boldface mono-space text	Represents characters that you enter exactly as shown (unless the characters are also in ***italics***—see *Italics*, below). If you could enter the characters but are not specifically instructed to, they do not appear in boldface.
Italics	Represent variable information. Do not enter the words themselves in the command. Enter the information they represent. In ordinary text, italics are used for titles of publications, for some terms that would otherwise be in quotation marks, and to show emphasis.
[ ]	Square brackets indicate an optional argument you might add to a command. To include such an argument, type only the information inside the brackets. Do not type the brackets unless they appear in bold face.
|	Separates command choices that are mutually exclusive.
>	Points to the next level in the path to a parameter or menu item. The item that follows the angle bracket is one of the options that appears when you select the item that precedes the angle bracket.
Key1-Key2	Represents a combination keystroke. To enter a combination keystroke, press the first key and hold it down while you press one or more other keys. Release all the keys at the same time. (For example, Ctrl-H means hold down the Control key and press the H key.)
Press Enter	Means press the Enter, or Return, key or its equivalent on your computer.
Note:	Introduces important additional information.
⚠ **Caution:**	Warns that a failure to follow the recommended procedure could result in loss of data or damage to equipment.
⚠ **Warning:**	Warns that a failure to take appropriate safety precautions could result in physical injury.
⚡ **Warning:**	Warns of danger of electric shock.

Documentation set

The APX 8000™/MAX TNT® documentation set consists of the following manuals.

- **Read me first:**

  – *Edge Access Networks Safety and Compliance Guide*
    Contains important safety instructions and country-specific compliance information that you must read before installing a TAOS unit.

  – *TAOS Command-Line Interface Guide*
    Introduces the TAOS command-line environment and shows how to use the command-line interface effectively. This manual describes keyboard shortcuts and introduces commands, security levels, profile structure, and parameter types.

- **Installation and basic configuration:**

  – *APX 8000 Hardware Installation Guide*
    Shows how to install APX 8000 hardware and includes APX 8000 technical specifications.

  – *MAX TNT Hardware Installation Guide* (this manual)
    Shows how to install MAX TNT hardware and includes MAX TNT technical specifications.

  – *APX 8000/MAX TNT Physical Interface Configuration Guide*
    Shows how to configure the cards installed in a TAOS unit and their line attributes for such functions as framing, signaling, and channel usage. It also describes how calls are routed through the system and includes information about configuring the unit in a Signaling System 7 (SS7) environment. This guide explains shelf controller redundancy for an APX 8000 unit.

- **Configuration:**

  – *APX 8000/MAX TNT ATM Configuration Guide*
    Describes how to configure Asynchronous Transfer Mode (ATM) operations on a TAOS unit. This guide explains how to configure physical layer attributes and how to create permanent virtual circuit (PVC) and switched virtual circuit (SVC) ATM interfaces. It includes information about ATM direct and ATM-Frame Relay circuits.

  – *APX 8000/MAX TNT Frame Relay Configuration Guide*
    Describes how to configure Frame Relay operations on a TAOS unit. This guide explains physical layer configuration and restrictions and how to create permanent virtual circuit (PVC) and switched virtual circuit (SVC) interfaces. It includes information about Multilink Frame Relay (MFR) and link management, as well as Frame Relay and Frame Relay direct circuits.

  – *APX 8000/MAX TNT WAN, Routing, and Tunneling Configuration Guide*
    Shows how to configure LAN and WAN routing for analog and digital dial-in connections on a TAOS unit. This guide includes information about IP routing, Open Shortest Path First (OSPF) routing, Internet Group Management Protocol (IGMP) routing, multiprotocol routers, Virtual Routers (VRouters), and tunneling protocols.

  – *MultiVoice for MAX TNT Configuration Guide*
    Shows how to configure the MultiVoice application to run on a MAX TNT unit in both Signaling System 7 (SS7) and H.323 Voice over IP (VoIP) configurations.

- **RADIUS:** *TAOS RADIUS Guide and Reference*
  Describes how to set up a TAOS unit to use the Remote Authentication Dial-In User Service (RADIUS) server and contains a complete reference to RADIUS attributes.

- **Administration:** *APX 8000/MAX TNT Administration Guide*
  Describes how to administer a TAOS unit, including how to monitor the system and cards, troubleshoot the unit, and configure the unit to use the Simple Network Management Protocol (SNMP).

- **Reference:**

  – *APX 8000/MAX TNT Reference*
    An alphabetic reference to all commands, profiles, and parameters supported on TAOS units.

  – *TAOS Glossary*
    Defines terms used in documentation for TAOS units.

Introduction

1

The MAX TNT product offers a rich set of features in a system that is highly customizable.

MAX TNT features overview

A MAX TNT unit is a WAN access switch, or concentrator, designed for the multiple, large-scale access requirements of Internet service providers (ISPs), carrier service providers, and major corporations. The unit supports up to 720 (T1) or 900 (E1) DS0 connections by means of multiple access technologies, and provides voice and data aggregation. It supports switched and leased-line connections and analog and digital transmission. The unit complies with existing standards for networks, authentication, and Simple Network Management Protocol (SNMP) management.

Following is a summary of the MAX TNT features:

- Carrier-class WAN access switch, or concentrator
- High-density traffic capacity:
    - Dial-up—672 (T1) or 960 (E1) sessions
    - ISDN—644 (T1) or 960 (E1) sessions
    - Frame Relay—720 sessions (DS0/E1) or 150 sessions (T1)
    - Asynchronous Transfer Mode (ATM) sessions
- WAN interfaces:
    - Channelized T1 or E1
    - Channelized T3
    - Unchannelized DS3
    - Optical Carrier 3 (OC-3)/Synchronous Transport Module 1 (STM-1)
    - V.35
- Scalable, cost-effective performance
- Reliability:
    - Fully redundant load-sharing power supplies
    - Hot-swappable cards

MAX TNT system overview

The MAX TNT chassis consists of the following major hardware components:

- Shelf controller
- 16 expansion slots
- Slot cards
- Power supplies (ac or dc)

Slot cards in a MAX TNT unit connect to each other via the backplane. The shelf controller manages the system and interacts with the slot cards.

MAX TNT shelf

The MAX TNT chassis is referred to as a *shelf.* It unifies all components into an operational unit. The MAX TNT shelf contains one slot for the shelf controller, sixteen slots for the slot cards, and two power supply bays. The backplane contains multiple buses that interconnect all slots.

MAX TNT supported slot cards

Table 1-1 lists the slot cards supported on a MAX TNT unit and identifies the port speed and port capacity for each card type.

Table 1-1. MAX TNT slot cards and their port speeds and capacity

Card	Port speed	Port capacity
DS3-ATM	44.736Mbps	One active port and one bypass port. Up to four active ports per system.
DS3-ATM2	44.736Mbps	One active port and one bypass port. Up to four active ports per system.
E1	2.048Mbps	Eight channelized ports.
E1 FrameLine	2.048Mbps	10 ports.
E3-ATM	34.368Mbps	One active port and one bypass port. Up to four active ports per system.
Ethernet-2	10/100Mbps	Three 10Mbps ports and one 100Mbps port.
Ethernet-3	10/100Mbps	One autosensing 10/100Mbps port.

Table 1-1. MAX TNT slot cards and their port speeds and capacity (continued)

Card	Port speed	Port capacity
Ethernet-3 ND	10/100Mbps	Four autosensing 10/100Mbps ports (RJ45 connectors).
Hybrid Access III	N/A	186 ports.
MultiDSP (48 ports)	N/A	48 ports that can be used as voice ports, data ports, or some combination of voice and data ports.
MultiDSP (96 ports)	N/A	96 data ports.
OC3-ATM	155.52Mbps	One unchannelized OC-3 port.
Serial WAN (SWAN)	6Mbps to 8Mbps	Four V.35 ports.
Series56 II Digital Modem	56Kbps	48 ports.
Series56 III Digital Modem	56Kbps	48 ports.
Synchronous Transport Module 0 (STM-0)	51.85Mbps	One fiber-optic connection.
T1	1.544Mbps	Eight channelized ports.
T1 FrameLine	1.544Mbps	10 ports.
T3 (channelized)	44.736Mbps	One active port and one bypass port. Up to four active ports per system.
Unchannelized DS3	44.736Mbps	One active port. Up to five active ports per system.

Preparing for Installation

2

Before installing your MAX TNT unit, read the relevant materials and make sure that a PC with the necessary software is available. Check the contents of your MAX TNT package, and select an appropriate installation site. Make sure that you have the required tools and equipment. Also familiarize yourself with the back panel.

Before you begin

⚠ **Warning:** Before installing your MAX TNT unit, be sure to read the safety instructions in the *Edge Access Safety and Compliance Guide*. Also read Appendix C, "Safety-Related Electrical, Physical, and Environmental Information." in this hardware installation guide for information specific to your product.

Before you install a MAX TNT unit, make sure you have the following:

- A suitable location with adequate power.
- At least one active T1 or E1 line set up for bidirectional calling. (Bidirectional calling enables you to test the unit hardware by having the MAX TNT unit dial out on one channel and answer on another channel.)
- A local PC or workstation with VT100 ASCII terminal-emulation software (You must assign an IP address through a connection to the serial port of the MAX TNT unit. Later, you can use Telnet to configure the system.) The PC or workstation must be set to the following values:
  - 9600bps
  - Direct connection
  - 8 data bits
  - No parity
  - 1 stop bit
  - No flow control

When connected to the shelf-controller serial port, the PC or workstation acts as a console terminal through which you can configure the unit.

- A workstation on a different subnet, from which you can ping the unit to verify the configuration.

- The designated IP address for the unit.

- The designated default gateway for the unit, if your setup requires one.

- *(Optional)* A workstation with an Ethernet LAN connection for connecting the unit to the Ethernet network.

- Blank single-slot filler cards for any unused slots in the unit.

Checking the package contents

MAX TNT package contents vary, depending on the base unit and slot cards you order. After opening the package verify that you have the system you ordered. Figure 2-1 shows a MAX TNT shelf.

Figure 2-1. MAX TNT shelf
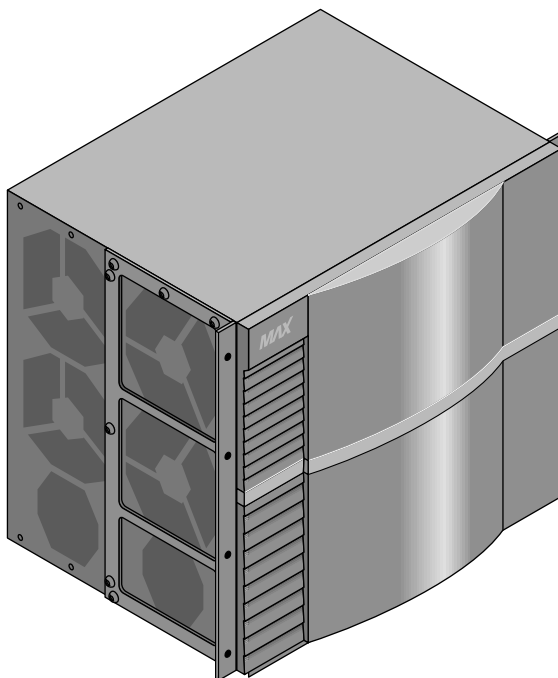
Verify that the package also contains the following items:

- Power cable.

- Personal Computer Memory Card International Association (PCMCIA) cards.

- Rack-mounting kit for mounting the MAX TNT unit in a 19-inch or 23-inch rack.

- Any slot cards you ordered with the system. If you ordered them separately, check the separate packaging.

If you are missing any items, contact your Lucent reseller.

Selecting the installation site

Before you choose a setup location for a MAX TNT unit, read and follow the site and electrical requirements defined in Appendix C, "Safety-Related Electrical, Physical, and Environmental Information."

Select the setup location carefully. Keep in mind that the unit requires proper ventilation and space for current and future cabling requirements. You can rack-mount a MAX TNT unit in a standard equipment cabinet with a width of 19 or 23 inches (48.26cm or 58.42cm), or place it on a flat surface as a free-standing unit. For more information see Appendix C, "Safety-Related Electrical, Physical, and Environmental Information."

Required installation tools and equipment

To install MAX TNT hardware, you need the following tools and equipment:

- RS-232 straight-through modem cable for connecting a PC or workstation to the unit
- Antistatic wrist strap and mats
- Number 2 Phillips screwdriver
- 1/8-inch standard screwdriver
- 3/16-inch standard screwdriver
- 3/8-inch socket wrench
- (*Recommended*) Mechanical lift

Understanding the unit's back panel

Figure 2-2 shows the back panel of a MAX TNT unit. The shelf controller is always slot 17. The remaining slots are numbered 1 through 16. For information about installing a slot card in a slot, see Chapter 3, "Installing a MAX TNT Chassis."

Figure 2-2. Back panel of the MAX TNT
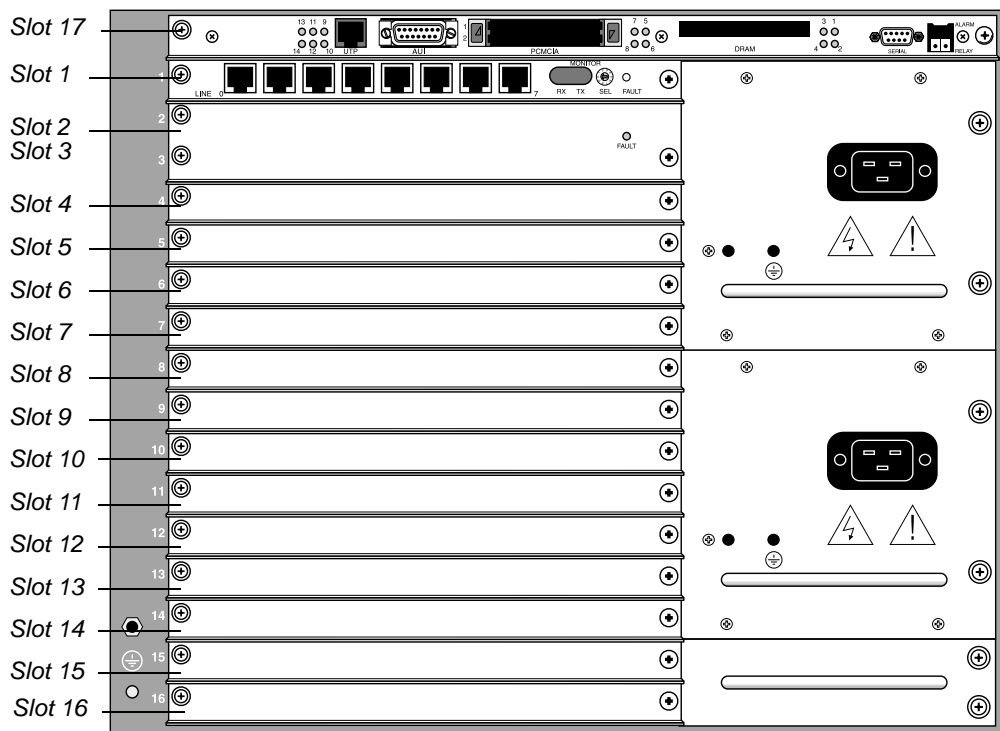
Understanding the shelf-controller back panel

Before you begin installing the hardware, you need some understanding of the ports and other items on the MAX TNT shelf controller. Figure 2-3 shows the location and Table 2-1 describes the function of each element on the shelf controller.

Figure 2-3. MAX TNT shelf-controller back panel
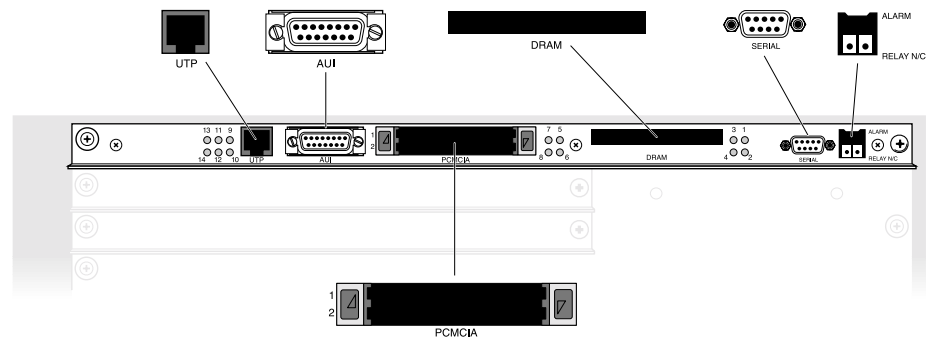
Table 2-1. Description of shelf-controller back-panel items

Back-panel item	Description
UTP port	Ethernet port to connect unshielded twisted-pair (UTP) Ethernet LAN cable to the MAX TNT unit.
SERIAL port	Serial console port for MAX TNT management.
PCMCIA slots	Two flash PCMCIA slots, labeled 1 and 2.
DRAM upgrade slot	PCMCIA slot for DRAM upgrades.

Status lights on the shelf-controller back panel

The status lights (also called LEDs) on the MAX TNT back panel can be helpful if you experience a problem, especially if it occurs shortly after power on. Figure 2-4 shows the location of the status lights on the back panel and Table 2-2 describes them.

Figure 2-4. Location of the MAX TNT status lights
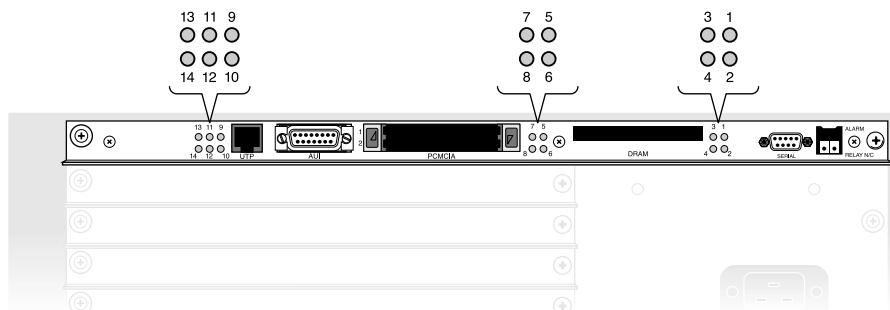
Table 2-2. MAX TNT status lights

Light	Color	Description
1	Green	On when the unit has power.
2	Green	On for any functioning shelf in a multishelf system, whether it is configured as master or slave.
3	Yellow	Behaves as follows: • Illuminated when you restart the unit • Goes out after the unit passes its power-on self test (POST) and is running • Blinks if a fatal error has occurred
4	Yellow	This is the multishelf alarm light. If the master shelf stops operating, this light illuminates on each slave shelf for about 9 seconds. It does not illuminate on the master shelf during a multishelf alarm condition.
5	Green	On when power supply A is installed and working.
6	Green	On when power supply B is installed and working.
7	Yellow	On when power supply A is installed and a fault occurs.
8	Yellow	On when power supply B is installed and a fault occurs.
9	Green	On when an Ethernet 10BaseT link has been established.
10	Green	On when an Ethernet AUI link has been established.
11	Green	On when the Ethernet link is active.

Table 2-2. MAX TNT status lights (continued)

Light	Color	Description
12	Green	On when the Ethernet link is active and link integrity has been confirmed.
13	Green	On when there is Ethernet activity between MAX TNT shelves.
14	Yellow	On when an Ethernet collision occurs.

Installing a MAX TNT Chassis

3

Read the guidelines before installing your MAX TNT unit in a cabinet or chassis. If you install it in a cabinet, install an exhaust shield on the unit. To provide an interface for the unit's initial configuration, you have to connect the serial port of the primary control module to a workstation. Before applying power to the unit, verify that a card is present in the top PCMIA slot of any installed control modules. Also verify that power supplies are properly grounded and that all desired slot cards (expansion modules) are installed.

⚠️ **Warning:** Before installing your MAX TNT unit, be sure to read the safety instructions in the *Edge Access Safety and Compliance Guide*. Also read Appendix C, "Safety-Related Electrical, Physical, and Environmental Information" in this hardware installation guide for information specific to your product.

Guidelines for installing units in a rack or cabinet

Keep the following information in mind when installing MAX TNT units in a rack or cabinet:

- You must install an exhaust shield on the exhaust side of each MAX TNT unit to ensure that hot air from one unit is not being blown into adjacent units. The exhaust side is on the left as viewed from the front of the unit. See "Installing a MAX TNT exhaust shield" on page 3-6.

- Do not concern yourself with air gaps between MAX TNT shelves on a rack, because the unit's fans sufficiently cool each shelf.

- Racks with open sides are recommended because the MAX TNT fans vent on the side of the unit.

- Ensure adequate cooling in the room.

  – The maximum recommended ambient temperature for MAX TNT models is 104° Fahrenheit (40° Celsius). Take care to allow sufficient air circulation or space between units when a MAX TNT unit is installed in a closed or multirack assembly, because the operating ambient temperature of the rack environment might be greater than room ambient temperatures.

  – In enclosed racks, make sure that openings exist in the floor underneath each cabinet to allow the air conditioning up into the cabinet.

  – Exhaust fans at the top of the cabinet are recommended but not required. At a minimum, the cabinets must be ventilated at the top.

Rack-mounting a MAX TNT unit

Before installing the unit in a rack, you must install the rack ears as illustrated in Figure 3-1. Rack ears are normally shipped with your unit. If you did not receive them, contact your Lucent reseller. Apply 7 to 8 inch-pounds (0.8 to 0.9 joules) of torque to each screw.

Figure 3-1. Installing the MAX TNT rack ears

19 Inch kit (shown) Part No. TNT-RM19
23 inch kit (not shown) Part No. TNT-SP-RM23
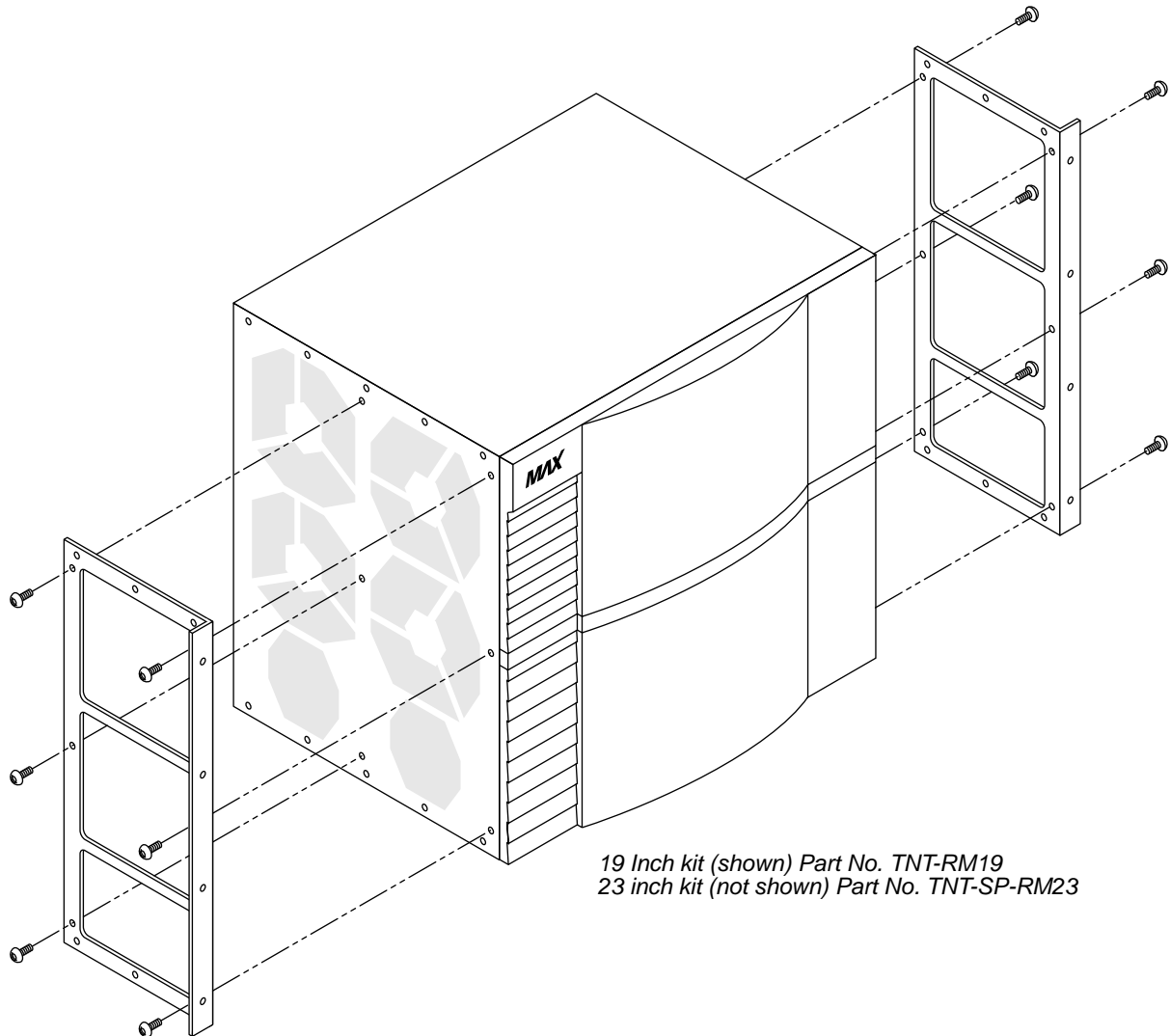
You can mount a MAX TNT unit in a 19-inch or 23-inch (48.26cm or 58.42cm) rack. A single MAX TNT shelf has the dimensions shown in Figure 3-2.

Figure 3-2. MAX TNT dimensions

14.0"

17.4"

11.5"
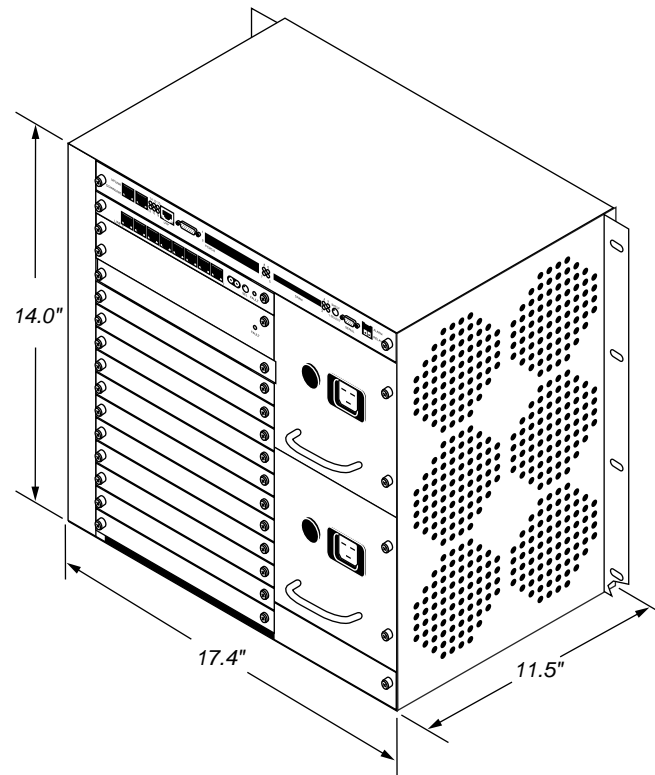
To install a MAX TNT unit in a rack, proceed as follows:

1 Using a mechanical lift (recommended) or a minimum of two installers, raise the unit to the proper height for installation.

2 Insert the unit in the rack and secure it as shown in Figure 3-3. If you need more information, see the instructions that came with your rack.

Figure 3-3. Mounting the MAX TNT in a rack
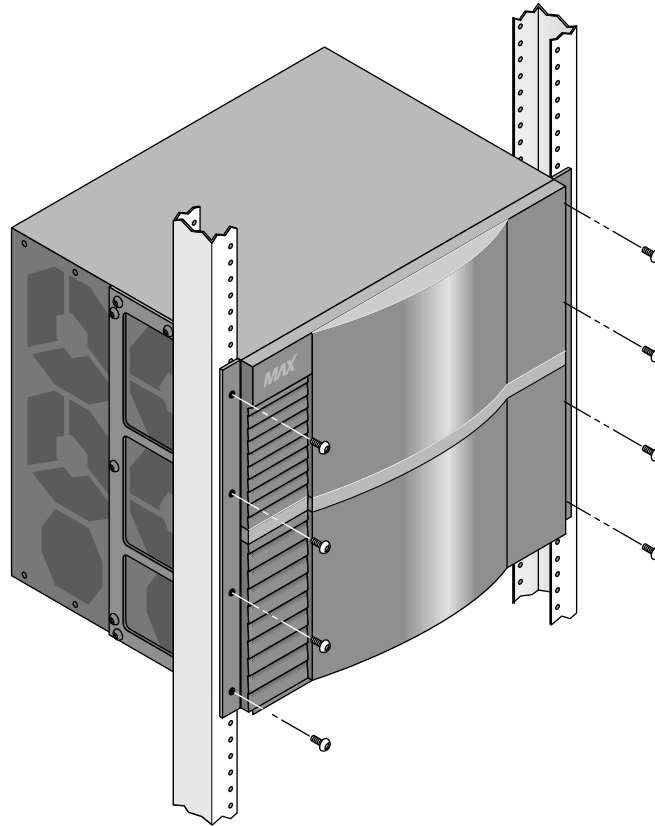
Installing a MAX TNT exhaust shield

You can install an exhaust shield on a rack-mounted MAX TNT unit. The exhaust shield redirects hot air from the unit so that it is not being blown into adjacent units. Figure 3-4 illustrates how to install the exhaust shield in a rack.

To order the shield from your Lucent reseller, ask for product code TNT-SP-SHIELD.

Figure 3-4. Exhaust shield installed in a rack
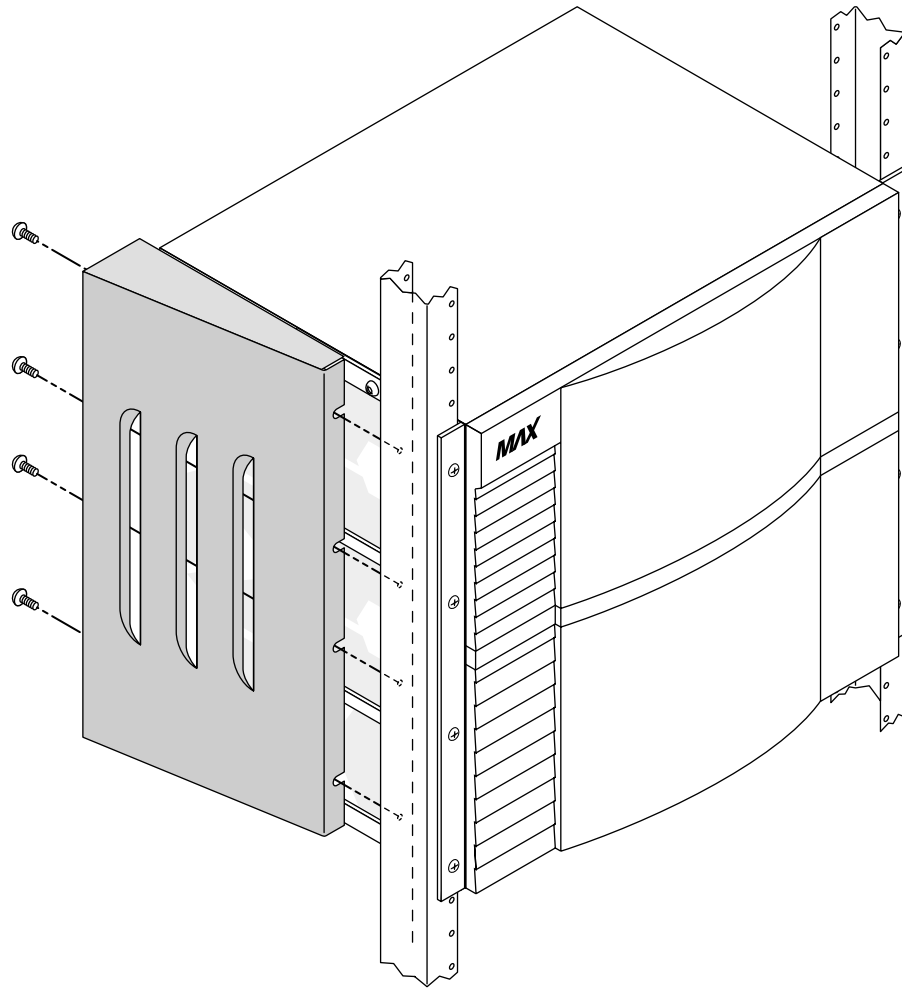
Installing or replacing high-output power supplies

If you have purchased a new MAX TNT unit, it includes high-output power supplies. If you have an older unit and want to install Series56 II or Series56 III Digital Modem cards or MultiDSP cards, you might need to replace the existing power supplies with high-output power supplies.

⚠ **Caution:** Read this section in its entirety before installing Series56 II or Series56 III Digital Modem cards or high-output power supplies. Improper installation of the power supplies can damage the unit.

Before you begin

Before installing the high-output power supply, consider the following:

- The high-output power supply cannot be hot-swapped with existing power supplies. You must power down the unit to replace the power supplies.

- The high-output power supply cannot be used in redundant configurations with existing power supplies. Attempting to mix and match different power supplies will invalidate associated warranties.

- The high-output power supply is 100% plug-in compatible with the existing MAX TNT power supplies. However, because the high-output power supply is not compatible with the old power supply, new power supplies must be installed in pairs.

- The capacitor card installed beneath the power supplies of older MAX TNT units provides redundancy to existing power supplies. Although this card is not used for the high-output power supplies, it must be left in place when installing a high-output power supply to direct the airflow and help cool the unit. New MAX TNT units contain a plate in this space to reduce EMI.

Identifying the high-output power supply

New MAX TNT units have the high-output power supplies preinstalled. Figure 3-5 shows how to identify the new high-output ac power supply and Figure 3-6 shows how to identify the new high-output dc power supply.

Figure 3-5. Identifying the high-output ac power supply
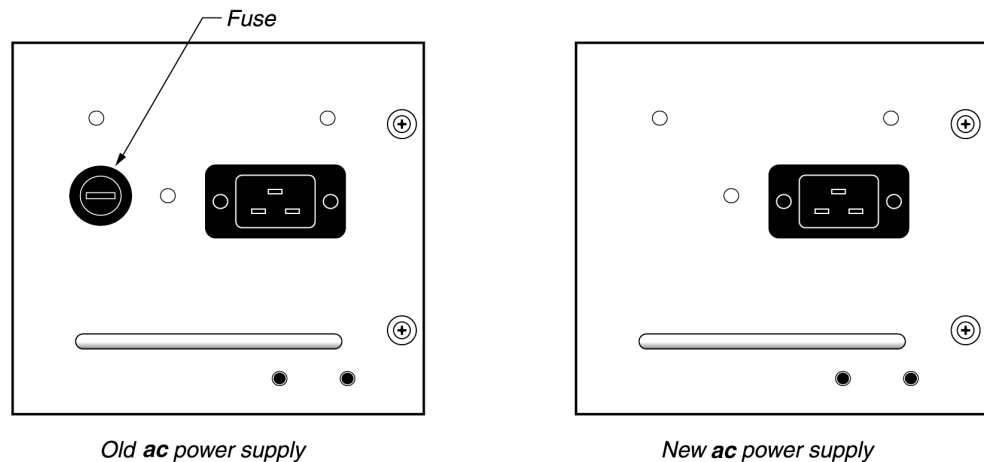
Old **ac** power supply   New **ac** power supply

Note: Verify that your unit is equipped with high-output power supplies before installing components in the MAX TNT chassis.

Figure 3-6. Identifying the high-output dc power supply

Old dc power supply   New dc power supply
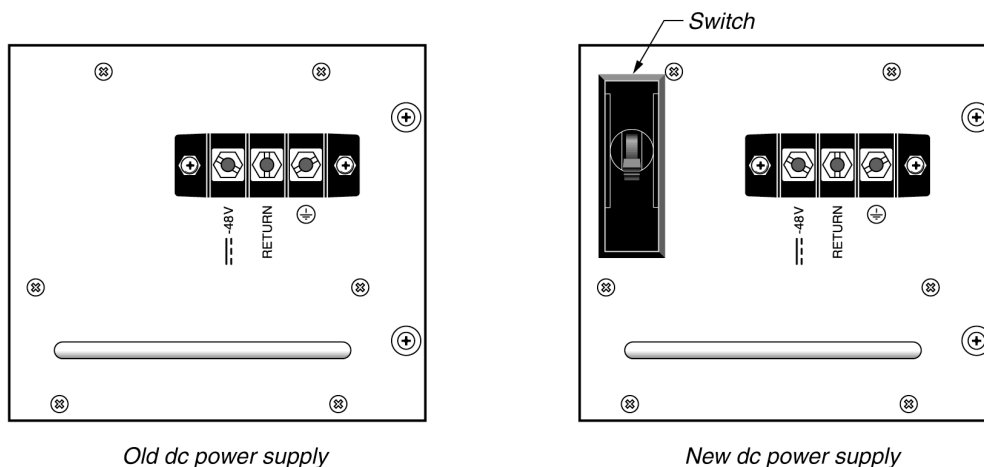
Installing a high-output power supply

To install a high-output power supply, proceed as follows:

1 Power down the unit if necessary. For ac power supplies, unplug the power cord. For dc power supplies, remove dc power from the source.

2 If you have a dc power supply unit, remove the terminal block wires.

3 Unscrew the power supply units from the chassis as shown in Figure 3-7.

Figure 3-7. Unscrewing the power supply
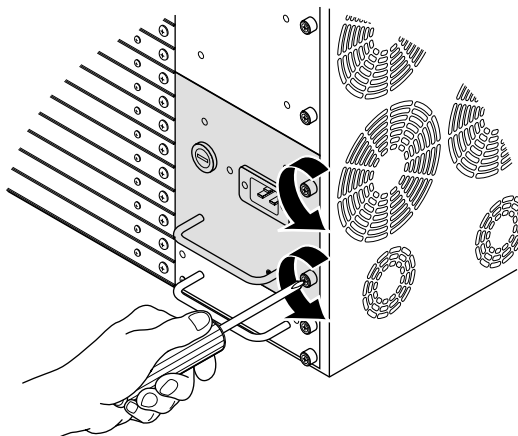
⚠ **Caution:** Do not remove the power supply capacitor card located below the MAX TNT power supplies. Doing so will disrupt airflow within the MAX TNT chassis.

4 Remove the existing power supplies as shown in Figure 3-8.

Figure 3-8. Removing the power supply
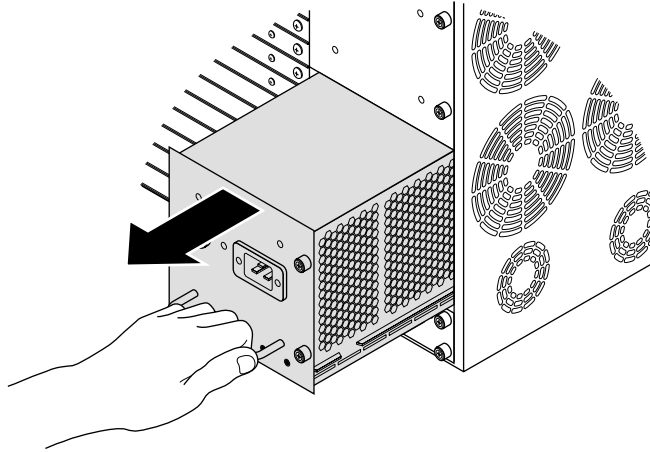
5 Gently insert the new power supply as shown in Figure 3-9.

Figure 3-9. Inserting the power supply
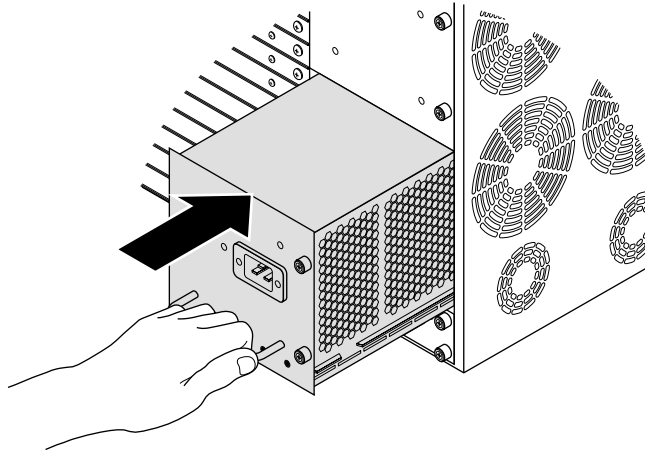
6 Tighten the power supply lockscrews as shown in Figure 3-10.

Figure 3-10. Tightening the power supply lockscrews
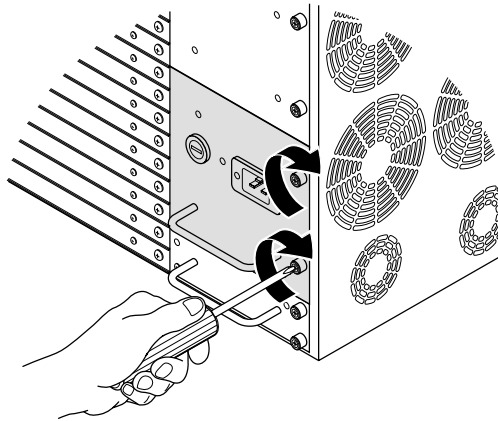
7 If you have a redundant power supply, repeat step 2 through step 6 for the remaining power supply.

Connecting the MAX TNT ac power supply

To connect the ac power supply, plug the power cord into the power supply socket. Plugging in the unit's power supply also applies power to the unit.

Warning: Models with ac power inputs are intended for use with a three-wire grounding type plug (a plug that has a grounding pin). This is a safety feature. Equipment grounding is vital to ensure safe operation. Do not defeat the purpose of the grounding type plug by modifying the plug or using an adapter.

Connecting the MAX TNT dc power supply

The MAX TNT dc power supply requires three inputs: -48Vdc, return (-48Vdc return), and earth/chassis ground. The -48V and return inputs are isolated from ground.

Solid copper wire (14 AWG or 2.5mm²) must be used to connect the power supply terminal block ground to the facility's ground. If the MAX TNT unit is fed from an isolated supply, you must supply a solid ground to earth via copper rods. This ground must have a resistance of less than 5 ohms.

A single drop to all MAX TNT units on one rack is acceptable. Figure 3-11 shows an example of wiring the terminal block.

Warning: Before installing wires to the unit's dc power terminal block, verify that these wires are not connected to any power source and that the MAX TNT power supply switch is in the Off (down) position. Installing live wires (wires connected to a power source) is hazardous.

Figure 3-11. Connecting to dc power
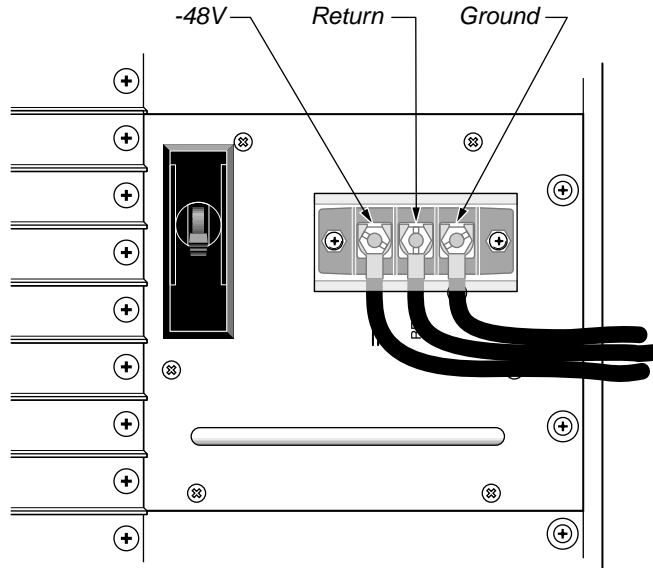
Connecting a workstation to the serial port

To perform the initial configuration of the MAX TNT unit, you must connect a workstation to the unit's serial port.

1 Connect a serial cable from your workstation to the unit as shown in Figure 3-12.

Figure 3-12. Connecting a serial cable to a MAX TNT unit
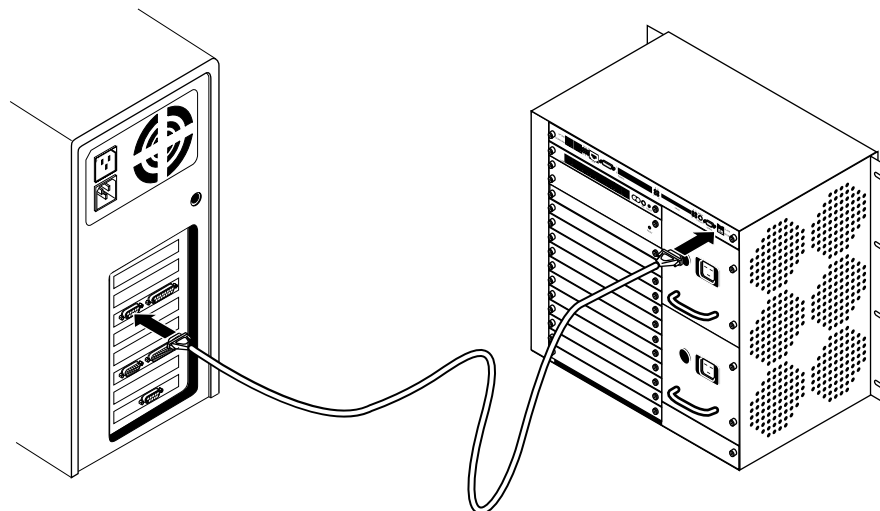
    2   If you have not already done so, set the serial communication options of your communications software as follows:

- 9600bps

- Direct connection

- 8 data bits

- No parity

- 1 stop bit

- No flow control

Connecting a MAX TNT unit to the LAN

All MAX TNT systems have an Ethernet port on the shelf controller. This Ethernet port is designed primarily for out-of-band management over the network and is not intended to support heavy traffic loads. If your MAX TNT will be routing heavy Ethernet traffic, install an Ethernet card and route this traffic through one or more of the ports on that card.

If you do not need a LAN interface, skip this section and proceed to "Connecting a workstation to the serial port" on page 3-11.

To connect the unit to your LAN, plug an Ethernet LAN cable into one of the unit's Ethernet ports. Figure 3-13 shows the Ethernet LAN cable connected to the shelf-controller Ethernet interface for out-of-band management.

Figure 3-13. Connecting an Ethernet cable
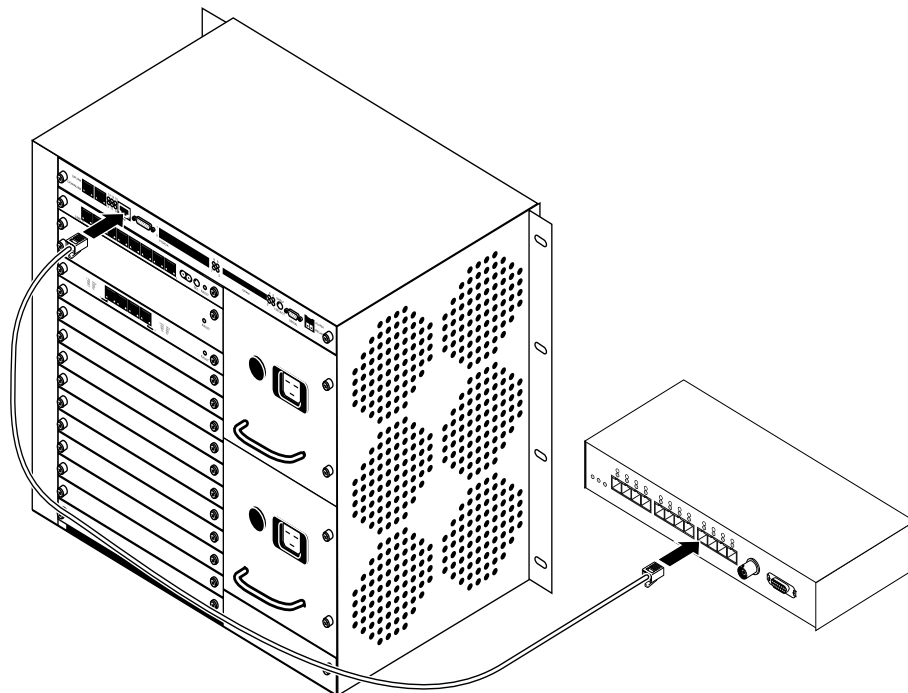
Checking the presence of the PCMCIA card

Each MAX TNT shelf supports up to two PCMCIA flash-memory cards. The system comes with onboard nonvolatile RAM (NVRAM), and each flash card provides its own additional memory.

Make sure a PCMCIA card is inserted in the top PCMCIA slot, identified as PCMCIA 1 in Figure 3-14.

⚠️ **Caution:** Do not remove a PCMCIA flash card while the unit is running. Doing so can damage the card and require its replacement.

Figure 3-14. Verifying the presence of a PCMCIA card in slot 1
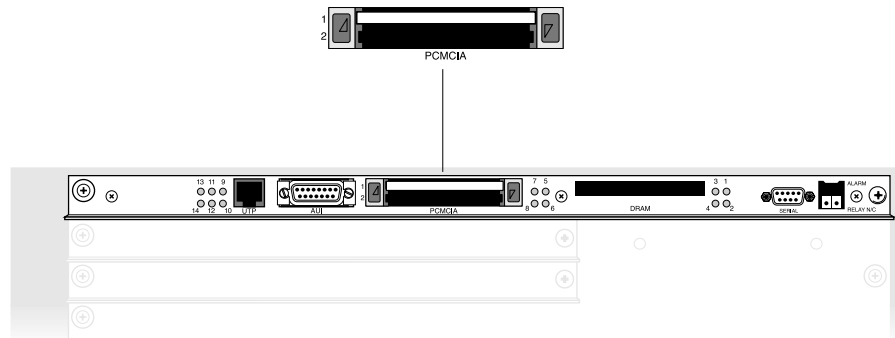
For more information about the function of the PCMCIA flash cards, see the *APX 8000/MAX TNT Administration Guide.*

Powering on a MAX TNT unit

Note: Before powering on an unconfigured MAX TNT unit, you must connect it to a workstation. For instructions see "Connecting a workstation to the serial port" on page 3-11.

To power on your new MAX TNT unit:

1 Position yourself so that you can observe the lights on the back panel while you view the monitor display.

2 Turn on the power to the unit. For ac power supplies, plugging in the power cord supplies power. For dc power supplies, flip the power switch to the On (up) position.

After a few minutes, the terminal emulator displays the following messages. If the messages do not appear, press Ctrl-L to refresh the screen. If they still do not appear, verify that the terminal emulator is connected with a straight-through serial cable and is using the settings listed in step 2 of "Connecting a workstation to the serial port" on page 3-12.

```
        *** TNT, unconfigured unit***
The system date is: Thu Aug 27 12:34:39 1998
If incorrect, please enter the proper value using this
command:
date yymmddhhmm
Please configure these profiles:
SYSTEM
IP-GLOBAL
IP-INTERFACE
LOG
SERIAL
for your operating environment.
TNT>
```

3 Check the PCMCIA flash-card file system to verify that the card and its contents have no errors. Enter the Fsck command as shown in the following example:

```
admin>fsck 1
ffs check in progress for card 1...
Dir 1 not in use

Dir 2 has magic, version 2, size 16, sequence 0xa
Using dir entry: 2, total data blocks: 0x40, directory size: 16

shelf-controller:(0xfe)

    reg   good  1228008 (0x12bce8) Sep 23 18:08

8t1-card:(0x00)

    reg   good   195368 (0x02fb28) Sep 23 18:08

4ether-card:(0x10)

    reg   good   176597 (0x02b1d5) Sep 23 18:08

48modem-card:(0x01)

    reg   good   690472 (0x0a8928) Sep 23 18:09

t3-card:(0x06)

    reg   good   224620 (0x036d6c) Sep 23 18:09
```

```
4swan-card:(0x03)
    reg   good   423878 (0x0677c6) Sep 23 18:09
10-unchan-t1-card:(0x05)
    reg   good   508874 (0x07c3ca) Sep 23 18:09
hdlc2-card:(0x21)
    reg   good   637813 (0x09bb75) Sep 23 18:09
csmx-card:(0x31)
    reg   good   798139 (0x0c2dbb) Sep 23 18:10
flash card 1 fsck: good.
```

Installing or replacing slot cards

Before installing a slot card, make sure that the software running on the system supports the card. This is particularly important for a new card. If the card is not supported by your current software, you must upgrade your system software before you install the card. If you do not upgrade the system software first, the card may not function properly.

For information about software required for a particular slot card and for upgrade instructions, see the release notes. For information about loading software on the MAX TNT unit and recovering from a failed slot card installation, see the *APX 8000/MAX TNT Administration Guide.*

If your package includes slot cards that are not already installed in your unit, insert the cards now.

Identifying slot cards

Some early slot cards produced for both the MAX TNT and APX chassis have long lock screws that extend about 3/16 inch (0.48cm) from the front panel. Slot cards originally produced for only the MAX TNT chassis have short lock screws that extend about 1/16 inch (.16cm) from the front panel. Slot cards currently in production for both chassis have medium length lock screws that extend about 1/8 inch (32cm) from the front panel. Figure 3-15 illustrates the three types of lock screws. The procedure for installing long-lock-screw slot cards in a MAX TNT chassis differs from the one for installing short and medium length lock-screw slot cards.

Figure 3-15. Identifying long, medium, and short lock screws
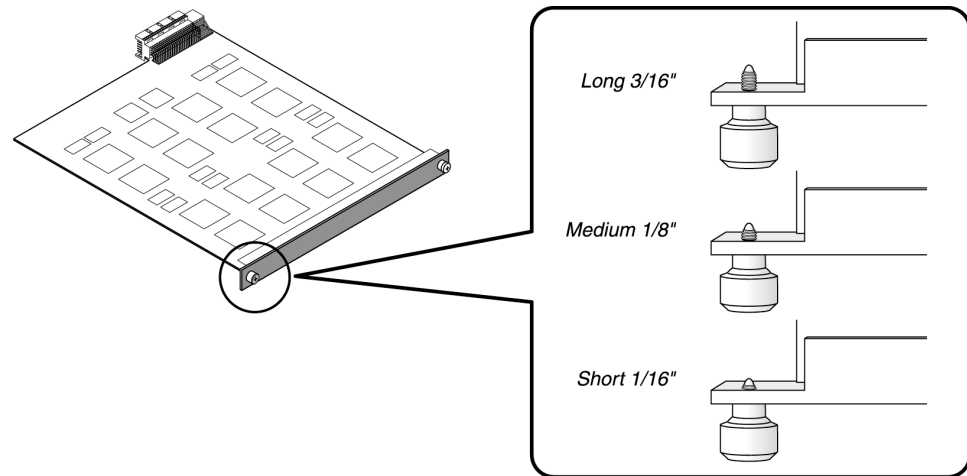
Installing a long-lock-screw slot card

To install a long-lock-screw slot card in the MAX TNT chassis, proceed as follows:

1 Hold the slot card so that the panel is facing you and the lock screw is on the left, and insert the card into the open slot as shown in Figure 3-16.

Figure 3-16. Inserting a slot card into a MAX TNT chassis
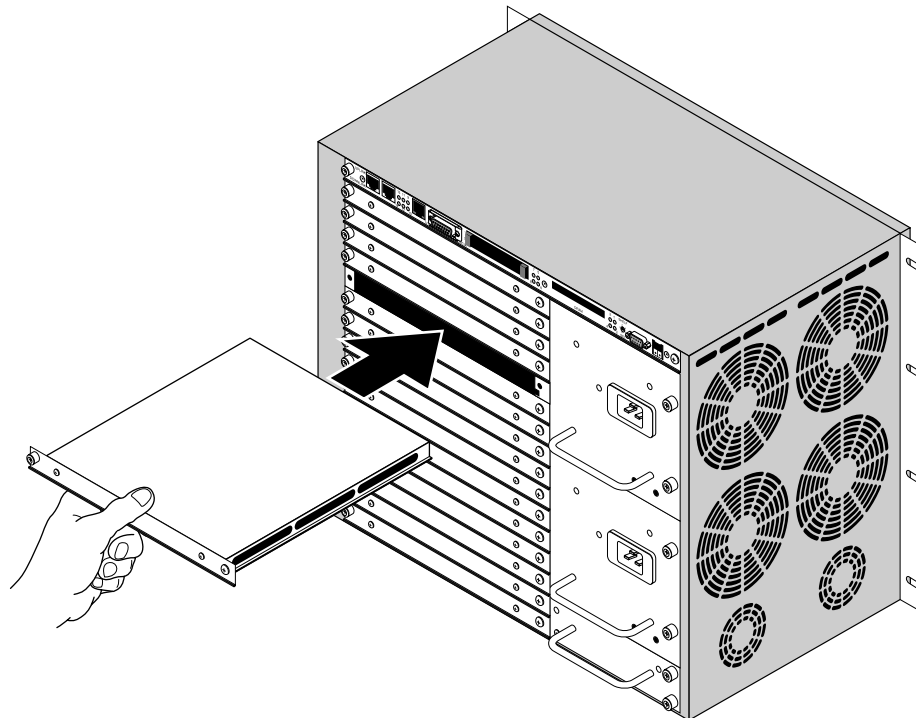
2 Push the card along the internal card guides until the jack screw on the right side of the card panel is seated in the hole in the back panel. The panel of the slot card must touch the back panel of the unit.

3 Using a number 2 Phillips screwdriver, start tightening the lock screw (visible on the *left* side of the card in Figure 3-17) with three complete turns and no more.

⚠ **Caution:** Failure to start the left-hand lock screw correctly can result in stripped or cross-threaded screws or bent end panels.

4 Using a number 2 Phillips screwdriver, tighten the jack screw on the right side of the card as shown in Figure 3-17.

5 Loosen the jack screw one-half turn so that the slot card panel is free to allow the lock screw on the left side to self-align.

6 Using a number 2 Phillips screwdriver, tighten the lock screw on the left side of the card.

7 Finish tightening the jack screw on the right side of the card.

Figure 3-17. Lock screw and jack screw locations
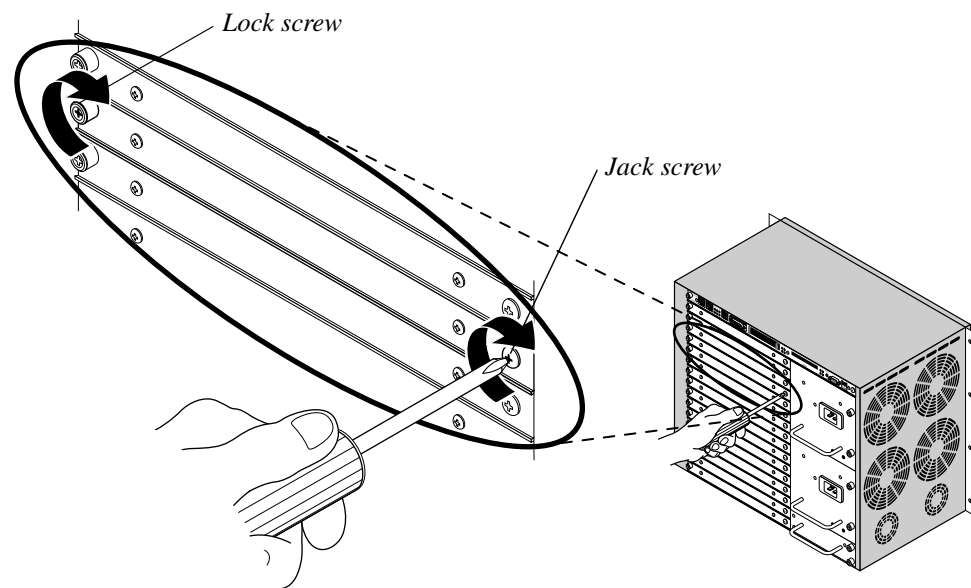
Installing a short or medium length lock-screw slot card

To install a short or medium length lock-screw slot card in the MAX TNT chassis, proceed as follows:

1 Hold the slot card so that the panel is facing you and the lock screw is on the left, and insert the card into the open slot as shown in Figure 3-16.

2 Push the card along the internal card guides until the jack screw (on the right side of the card panel) is seated in the hole in the back panel. The panel of the slot card must touch the back panel of the unit.

⚠ **Caution:** Do not force the slot card into the slot. Doing so can damage the card or slot connector.

3   Using a number 2 Phillips screwdriver, tighten the jack screw as shown in Figure 3-17 to fully seat the card.

4   Loosen the jack screw one-half turn so that the slot card panel is free to allow the lock screw to self-align.

5   Using a number 2 Phillips screwdriver, tighten the lock screw (on the left side of the card, as shown in Figure 3-17).

6   Finish tightening the jack screw.

All MAX TNT slot cards are hot-swappable, which means that you can safely insert or remove cards while power is on.

Note: Be sure to install blank single-slot filler cards in any unused slots to ensure proper airflow.

Removing slot cards

To remove slot cards from the MAX TNT chassis proceed as follows:

⚠   **Caution:** Failure to follow this procedure can result in damage to the card or chassis.

1   Using a number 2 Phillips screwdriver, loosen the lock screw (on the left side of the card, as shown in Figure 3-17) with three turns.

2   Using a number 2 Phillips screwdriver, loosen the jack screw with three turns counterclockwise.

3   Repeat step 1 and step 2 until both screws disengage, then remove the slot card.

Slot Card Specifications and Connection Information

A

Note: Slot card information in this appendix is limited to physical specification and connection information. For slot card software profiles, line attributes, and configuration information, see the *APX 8000/MAX TNT Physical Interface Configuration Guide*.

DS3-ATM card

The DS3-ATM card (shown in Figure A-1) enables a MAX TNT unit to provide one active and one standby trunk connection at data rates of 44.738Mbps. You can configure each port as one of the following types of connections:

• User-to-Network Interface (UNI)

• Interim Inter-Switch Signaling Protocol (IISP) connection

• Direct trunk

One MAX TNT unit can accommodate a maximum of four DS3 ports (two active ports, two standby ports).

Figure A-1. DS3-ATM card
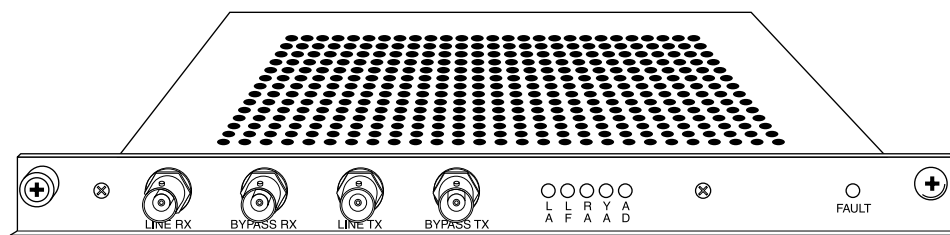
Specifications

Table A-1 lists the specifications for the DS3-ATM card.

Table A-1. DS3-ATM card specifications

Category	Specification
Agency approvals	Electromagnetic Emissions Certifications: FCC Part 15 Class A, CISPR Class A
Interface standards	ITU G.703 ANSI T1.102
Other standards supported	ANSI T1E1.1/94-002R1 ANSI T1.107 ANSI T1.107a ANSI T1.403 ATM Forum UNI 3.0/3.1 Bellcore TR-NWT 001112 Bellcore TR-TSY-000499 Bellcore TR-NWT-000820 ITU G.804 RFC 1407 TR54014 (AT&T ACCUNET T45 and T45R)

Table A-1. DS3-ATM card specifications (continued)

Category	Specification
Physical interfaces	Four (two active, two standby) ATM UNI 3.0/3.1 cell-bearing DS3 ports supporting C-bit/M-framing, PLCP per TR-TSY-000773, and direct cell mapping per G.804 BNC connector per ANSI T1.404
Electrical standards	DSX-3 per ANSI T1.404
Line buildout	0-225 feet (0-68.6m), or 226-450 feet (68.9-137.6m)
Receive equalization	Based on cable length and transmitter
Line code	Bipolar with 8-zero substitution (B3ZS)
Line rate	44.736Mbps ± 20ppm
Frame format	Per ANSI T1.107a (C-bit parity)
Alarm signaling	Upon DS3 Red Alarm, yellow signal sent on the DS3, AIS sent on DS2s Upon DS2 Red Alarm, AIS sent on DS1s
Connectors	75-ohm BNC coaxial
Interfaces per card	One unchannelized DS3 port with integrated CSU/DSU. Maximum of four cards per chassis
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, non-condensing
Operating temperature	32-104° F (0-40° C)

Status lights

All status lights except LA are illuminate upon startup or restart and remain illuminated until the card passes its POST. If no status lights are illuminated, the DS3 interface is disabled or is receiving an Alarm Indication Signal (AIS) or Idle Signal.

Table A-2 explains the DS3-ATM card status lights.

Table A-2. DS3-ATM card status lights

Light	Color	Description
LA	Green	On indicates the DS3 interface is enabled and has not detected any error conditions.
RA	Red	On indicates the DS3 interface is experiencing loss of receive signal.
LF	Red	On indicates the DS3 interface is out of frame alignment.
YA	Yellow	On indicates the DS3 interface has detected Far End Receive Failure indication transmitted from the other side.
AD	Yellow	On indicates the DS3 interface has detected an upstream equipment fault.
FAULT	Yellow	Behaves as follows: • Illuminated when the unit has been reset. • Goes out after the unit passes its power-on self test (POST) and is running. • Blinks if a fatal error has occurred.

Connecting the DS3-ATM card to the WAN

Use two 75-ohm coaxial cables (RG 59/U) to connect the T3 line to the LINE RX and LINE TX ports on the DS3-ATM card.

Inform your service provider that the equipment is connected, so the provider can activate the line.

Connecting redundant DS3-ATM cards

You can install two DS3-ATM cards to provide redundancy. After installing the cards, configure line profiles for each card as explained in the *APX 8000/MAX TNT/DSLTNT Physical Interface Configuration Guide*.

Figure A-2 illustrates a redundant connection.

Figure A-2. DS3-ATM redundant configuration
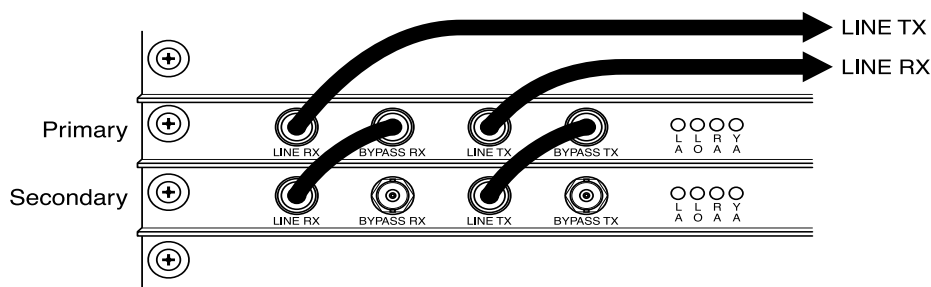
DS3-ATM2 card

The DS3-ATM2 card is a routing card designed to insert, and extract, ATM cells into, and from, a DS3 stream in high-bandwidth routing applications with speeds of up to 44.736Mbps. The DS3-ATM2 card supports 260 simultaneous receive and transmit virtual circuits (VCs), each of which can be configured as a fully routable point-to-point interface. Features include fast packet performance over dedicated connections and OAM/F5 support.

Figure A-3 shows the DS3-ATM2 card.

Figure A-3. DS3-ATM2 card
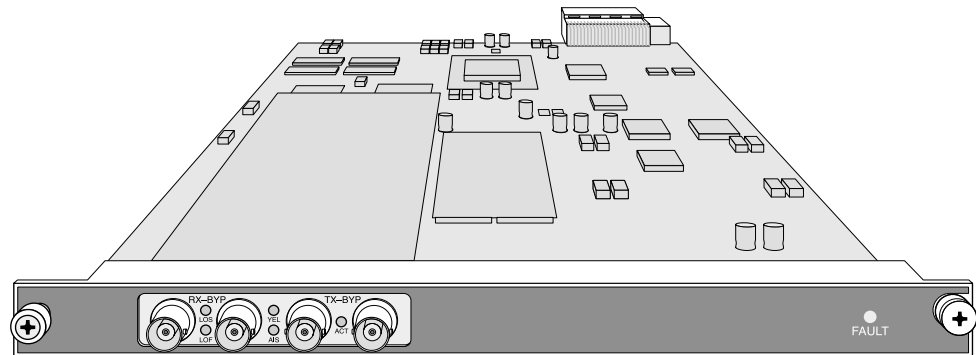
Specifications

The specifications for a DS3-ATM2 card are the same as those for a DS3-ATM card, which are listed in Table A-1 on page A-2.

Status lights

All status lights except ACT illuminate upon startup or restart and remain illuminated until the card passes its POST. If no status lights are illuminated, the DS3 interface is disabled.

Table A-3 explains the DS3-ATM2 card status lights.

Table A-3. DS3-ATM2 status lights

Light	Color	Description
ACT	Green	On indicates that the DS3-ATM2 card is active and enabled, and has not detected any error conditions.
LOS	Yellow	On indicates that the DS3 interface is experiencing loss of receive signal.
LOF	Yellow	On indicates that the DS3 interface is experiencing loss of framing.
YEL	Yellow	On indicates that the DS3 interface has detected a Far End Receive indication transmitted from the other side.

Table A-3. DS3-ATM2 status lights (continued)

Light	Color	Description
AIS	Yellow	On indicates that the DS3-ATM2 card is receiving an Alarm Indication Signal (AIS).
FAULT	Yellow	Behaves as follows: • Illuminates when you restart the unit. • Goes out after the unit passes POST and is running. • Blinks if a fatal error has occurred.

Connecting the DS3-ATM2 card to the WAN

Use two 75-ohm coaxial cables (RG 59/U) to connect the T3 line to the DS3-ATM2 card RX-BYP and TX-BYP ports.

Inform your service provider that the equipment is connected, so the provider can activate the line.

Connecting redundant DS3-ATM2 cards

You can install two DS3-ATM2 cards to provide redundancy. If the primary card fails, either because of a failure to boot up or because the card is in a fault state, the secondary card takes over. For information about configuring a redundant connection, see the *APX 8000/MAX TNT/DSLTNT Physical Interface Configuration Guide*.

Figure A-4 shows a redundant connection.

Figure A-4. DS3-ATM2 redundant connection.
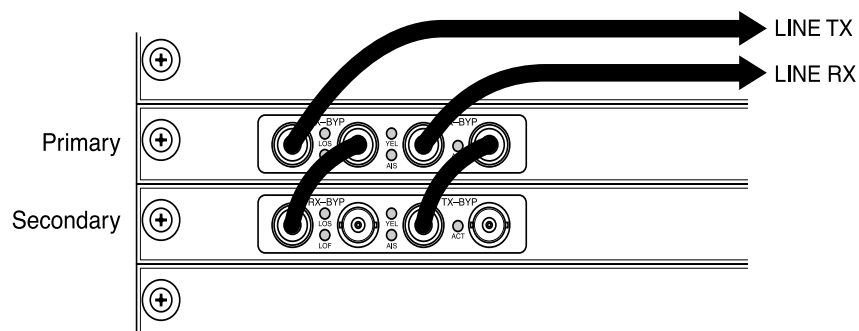
E1 card

The E1 card provides connections to up to eight E1 lines. An E1 line supports 32 64Kbps channels, each of which can transmit and receive data or digitized voice. The line uses framing and signaling to achieve synchronous and reliable transmission. The most common configurations for E1 lines are ISDN Primary Rate Interface (PRI) and unchannelized.

Figure A-5 shows the E1 card.

Figure A-5. E1 card
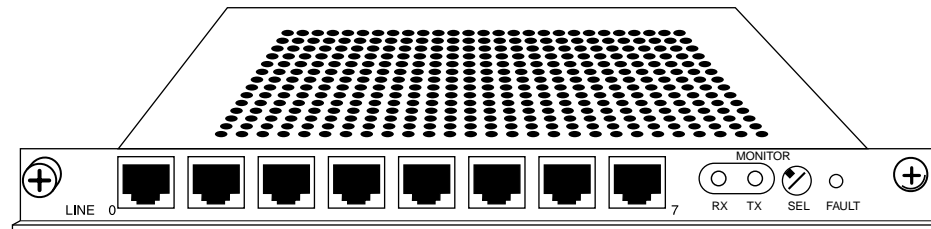
Specifications

Table A-4 lists the specifications for the E1 card.

Table A-4. E1 card specifications

Category	Specification
Interface standards	International Telecommunications Union (ITU) G.703, G.736, G.775, and G.823
	European Telecommunications Standards Institute (ETSI) 300-166 and 300-233
	AT&T PUB 62411
Electrical standards	Conférence Européenne des Postes et des Télécommunications (CEPT) 2.048Mbps pulse mask per G.703 for twisted pair and coaxial cable
Receive equalization	Short haul (12dB) and long haul (43dB)
Line code	High-density bipolar 3 (HDB3)
Line rate	2.048Mbps +/- 25ppm
Rx sensitivity	0 to -43dB
Frame format	Per G.704 frame alignment signal (FAS) with or without cyclic redundancy check 4 (CRC4) multiframe alignment (MFA). No channel-associated signaling (CAS) MFA used for data.
Alarm signaling	Red alarm, out of frame (OOF), FAS, alarm indication signal (AIS), and yellow alarm

Table A-4. E1 card specifications (continued)

Category	Specification
Connectors	Eight RJ-45 (120 ohms). Optionally, BNC coaxial 75-ohm connectors with external cable. (This requires that wire jumpers be configured on the card.)
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Connecting a MAX TNT unit's E1 lines to the WAN

When connecting your E1 lines, keep the following points in mind:

*   Use cable that is specifically constructed for transmission of E1/PRI signals (CCITT G700 series recommended).

*   A MAX TNT unit can connect to any DPNSS access point on a PBX or directly to E1 digital services. The unit can also connect to G.704 framed leased (nonswitching) services for 75-ohm connections.

*   When an the E1 line is installed, the screen of the transmit and receive coaxial cable must be earthed at one end of the line only. Links (jumpers) are provided on the unit to earth the coaxial screens. The default position of the grounding links on the network line interface, when used with coaxial cable adapters, is on the transmit side (Tx) for 1680Kbps network operations.

*   The maximum distance between the E1/PRI WAN interface equipment and the MAX TNT unit should not introduce attenuation of more than 6dB, when measured at half the maximum data rate (1024Kbps). Also, the cable must have a root F characteristic.

Connect the MAX TNT unit's port either directly to the E1 line or through other network interface equipment. Figure A-6 shows an example.

Figure A-6. Connecting a MAX TNT unit's E1 line to the WAN
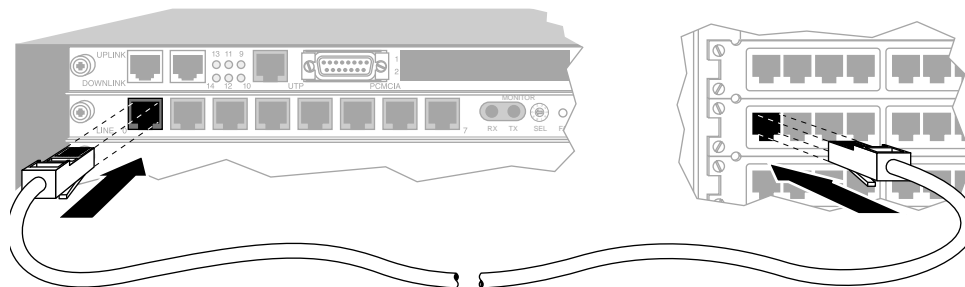
Monitoring the E1 lines with bantam jacks

Each E1 card provides transmit and receive bantam jacks to monitor the status of the E1 lines. The Tx line carries what the MAX TNT unit transmits to the network. The Rx line carries what the unit receives from the network. The bantam jacks do not interfere with the signal either coming into or going out of the unit.

To monitor the E1 lines:

1 Select the line to monitor by setting the select switch on the E1 card.

2 Plug in the bantam jacks.

E1 FrameLine card

The E1 frameline card supports 10 unchannelized E1 lines. The entire bandwidth of each E1 line can be used for a frame relay connection.

Figure A-7 shows the E1 FrameLine card.

Figure A-7. E1 FrameLine card
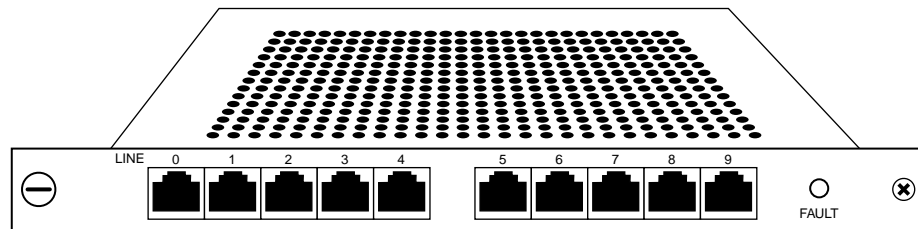
Table A-5 lists the specifications for the E1 FrameLine card.

Table A-5. E1 FrameLine card specifications

Category	Specification
Electrical	CEPT 2.048Mbps pulse mask per G.703 for twisted pair and coaxial
Receive Equalization	Short haul (12dB) and long haul (43dB)
Line Code	HDB3
Line Rate	2.048Mbps +/- 25ppm
Frame Format	Per G.704 FAS with or without CRC4 multiframe alignment (MFA)
Alarm Signaling	
Connectors	10 RJ-45 (120 ohms) Optionally, BNC coaxial (75 ohms) with external cable. (This requires that jumpers be configured on the card.)

E3-ATM card

The E3-ATM slot card inserts into and extracts ATM cells from an E3 stream in full-duplex mode at speeds of up to 34.368Mbps, for routing applications. Two E3-ATM slot cards in the same unit can be connected and configured for redundancy. MAX TNT units support up to two E3-ATM connections (two slot cards, or up to four cards configured redundantly).

The E3-ATM slot card for TAOS units is illustrated in Figure A-8.

Figure A-8. E3-ATM slot card
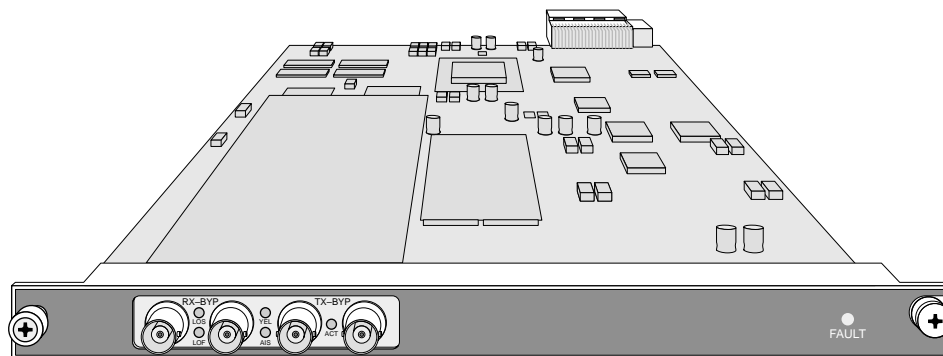
Specifications

Table A-6 provides the specifications for the E3-ATM slot card.

Table A-6. E3-ATM slot card specifications

Category	Specification
Electrical standard	ITU-T G.703
Line buildout	0 to 68.6 meters (0 to 225 feet), or 68.9 to 137.6 meters (226 to 450 feet)
Receive equalization	User configurable, based on cable length and transmitter
Line code	High-density bipolar 3 (HDB3)
Line rate	34.368 Mbps ± 20 ppm
Frame format	ITU-G.751 or B.832
Alarm signaling	Upon loss of signal (LOS) detection, RAI sent on the E3 line
Connectors	Four 75-ohm BNC coaxial (two lines and two backup lines)
Interfaces per card	One E3 port

Table A-6. E3-ATM slot card specifications (continued)

Category	Specification
Maximum cards per unit	Two active slot cards, or four cards configured redundantly
Card dimensions	14.2cm high x 27cm long (5.6 inches x 10.7 inches)
Card weight	~0.9kg (2 pounds)
Operating humidity	0 to 90% noncondensing
Operating temperature	0 to 40° C (32 to 104° F)

Status Lights

All status lights (LEDs) except ACT illuminate upon startup or restart and remain illuminated until the slot card passes its power-on self test (POST). If no status lights are illuminated, the E3 interface either is disabled or is receiving an alarm indication signal (AIS).

Table A-7 explains the E3-ATM slot card status lights.

Table A-7. E3-ATM slot card status lights

Light	Color	Description
LOS (loss of signal)	Yellow	On when the E3-ATM slot card is receiving no signal.
LOF (loss of frame)	Yellow	On when the E3-ATM slot card is receiving a signal, but the framing is incorrect.
YEL	Yellow	On when the E3-ATM slot card is receiving a remote alarm indication (RAI).
AIS	Yellow	On when the E3-ATM slot card is receiving an alarm indication signal (AIS).
ACT	Green	On when the E3-ATM slot card is receiving correct framing. The line is ready to send and receive ATM cells.
FAULT	Yellow	Behaves as follows: • Illuminates when you restart a unit. • Goes out after the unit passes its power-on self test (POST). • Blinks if a fatal error has occurred.

Connecting an E3-ATM slot card to the WAN

Use two 75-ohm coaxial cables to connect an E3 line to an E3-ATM slot card's LINE RX and LINE TX ports.

Inform your service provider that the equipment is connected so the provider can activate the line.

Connecting redundant E3-ATM slot cards

You can install two E3-ATM slot cards to provide redundancy. If the primary card either fails to boot up or is in a fault state, the secondary slot card takes over. For information about configuring a redundant connection, see the *APX 8000/MAX TNT/DSLTNT Physical Interface Configuration Guide*.

Figure A-9 illustrates a redundant connection.

Figure A-9. E3-ATM redundant configuration
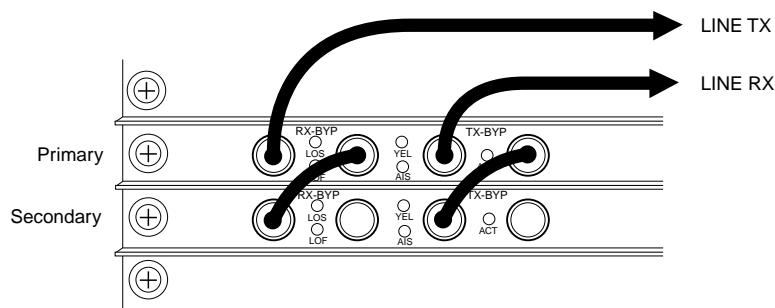
Ethernet-2 card

The Ethernet-2 card has three routed 10BaseT interfaces and one routed 100BaseT interface. The card provides basic multisegment LAN-to-WAN access.

Figure A-10 shows the Ethernet-2 card.

Figure A-10. Ethernet-2 card
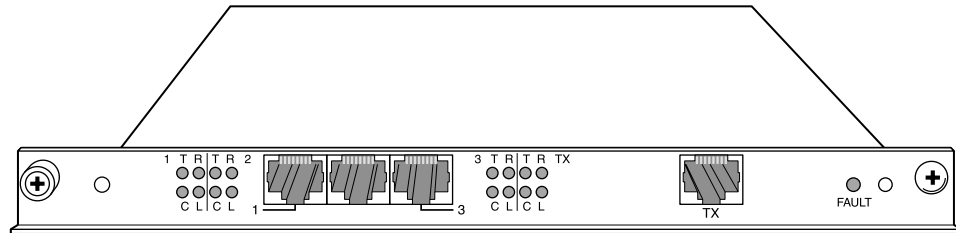
Table A-8 lists the specifications for the Ethernet-2 card.

Table A-8. Ethernet-2 card specifications

Category	Specification
Power requirements	17W
Interfaces per card	Three 10BaseT ports, one 100BaseT port
Connectors	RJ-45
Connector requirements	Must meet Japanese Industrial Standards (JIS) C 5973.
Card dimensions	8.8 inches high x 10.6 inches long (22.35cm x 26.92cm)
Card weight	3.9 pounds (1.77kg)
Operating humidity	10-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Ethernet-3 card

The Ethernet-3 card has a full-duplex 10/100Mbps Ethernet port that is designed to have a high packet-per-second throughput to support Voice over IP (VoIP). The Ethernet-3 card autosenses between 10Mbps and 100Mbps, but does not support autonegotiation, in which Ethernet devices negotiate a common speed and duplex mode.

Specifications

Table A-9 lists the specifications for the Ethernet-3 card.

Table A-9. Ethernet-3 card specifications

Category	Specification
Interfaces per card	One full-duplex
Connector requirements	Must meet Japanese Industrial Standards (JIS) C 5973
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Status lights

Table A-10 explains the Ethernet-3 card status lights.

Table A-10. Ethernet-3 card status lights

Light	Color	Description
A	Yellow	On indicates activity on 10Mbps link.
B	Yellow	On indicates connection to 10Mbps link.
C	Green	On indicates activity on 100Mbps link.
D	Green	On indicates connection to 100Mbps link.

Ethernet 3-ND card

Ethernet 3-ND (no dongle) slot cards for APX/MAX TNT units have four full-duplex 10/100 megabit (Mb) Ethernet ports. The Ethernet 3-ND slot card is an enhancement of the Ethernet-3 slot card.

The Ethernet 3-ND slot card has RJ-45 connections, eliminating the need for a dongle. For more information about installation and configuration of Ethernet connections, see the *APX 8000/MAX TNT/DSLTNT Physical Interface Guide*.

Figure A-11 shows the Ethernet 3-ND card.

Figure A-11. Ethernet 3-ND slot card
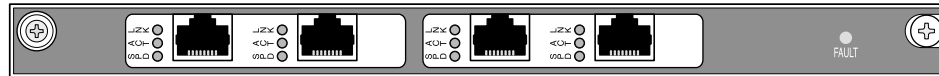
Specifications

Table A-11 provides the specifications for the Ethernet 3-ND card.

Table A-11. Ethernet 3-ND slot card specifications

Category	Specification
Power requirements	35W
Interfaces per card	Four full-duplex
Connector	RJ-45
Connector requirements	Must meet JIS C 5973
Card dimensions	5.6 inches high by 10.7 inches long (14.2cm by 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0 to 90 percent, noncondensing
Operating temperature	32 to 104° F (0 to 40° C)

Status lights

Table A-12 explains the Ethernet 3-ND slot card status lights (LEDs).

Table A-12. Ethernet 3-ND slot card status lights

Light	Color	Description
LNK	Green	On indicates link established.
ACT	Green	On indicates activity (transmission of packets).
SPD	Green	On indicates activity on 100Mbps port. Off indicates activity on 10Mbps port.

Hybrid Access cards

Each ISDN call, and each channel of a dedicated session, requires a High-Level Data Link Control (HDLC) channel to process the HDLC-encapsulated data received from or sent to a WAN interface. Because the MAX TNT base system provides no HDLC resources, you might need to install a Hybrid Access slot card in your unit. Keep in mind that the Series56 II and Series56 III cards also provide up to 48 HDLC channels per slot card.

The following cards require HDLC channels:

- Eight-port E1 card
- Eight-port T1 card
- T3 slot card

The following cards do not require HDLC channels:

- DS3-ATM card
- DS3-ATM2 card

MultiDSP cards

The MultiDSP card is shown in Figure A-12.

Figure A-12. MultiDSP Card
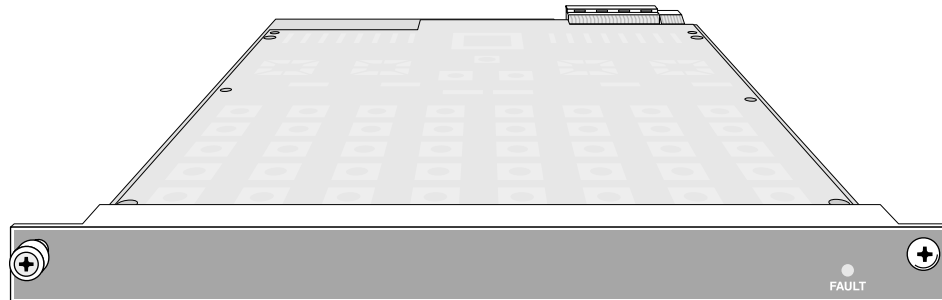
The card is available in a 48-port version and a 96-port version.

48-port MultDSP card

The 48-port MultiDSP card supports up to 48 ports of service. When two services are supported by the card, one service must be data and the other can be V.110 PHS or VoIP. Following are the possible configurations supported by the 48-port card:

- Data (analog, digital, or both) service only
- V.110 service only
- PHS service only
- VoIP service only
- Data and V.110 services
- Data and PHS services
- Data and VoIP services

Downloaded software licenses determine which MultiDSP services are supported by a particular MAX TNT unit and 48-port MultiDSP card. For example, if a unit is licensed to run both data and VoIP, the ports on each installed 48-port MultiDSP card can handle data, VoIP calls, or both.

96-port MultiDSP card

The 96-port MultiDSP card supports up to 96 ports of service. A MAX TNT unit with a 96-port MultiDSP card installed can have software licenses for up to two MultiDSP services, data and V.110. Following are the possible configurations supported by the 96-port card:

- Data (analog, digital, or both) service only
- V.110 service only
- Data and V.110 services

Downloaded software licenses (hash codes) determine which MultiDSP services are supported by a particular MAX TNT unit and 96-port MultiDSP card. For example, if a unit is licensed to

run both data and V.110, the ports on each installed 96-port MultiDSP card can handle data, V.110 calls, or both.

Specifications

Table A-13 lists the specifications for the MultiDSP cards

Table A-13. MultiDSP card specifications

Category	Specification
Physical interfaces	48 ports of supported application per 48-port MultiDSP card 96 ports of supported application per 96-port MultiDSP card
Power requirements	37W, 7.4A
Card weight	~1.5 pounds (0.7kg)
Hot swap capability	Yes
Status light	Multipurpose fault indicator, one per card
Operating humidity	10-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

OC3-ATM card

The OC3-ATM card can be used to route IP over ATM or perform Layer 2 switching between ATM and Frame Relay networks.

Note: A MAX TNT unit must have software version 7.0.1 or later to support the OC3-ATM card.

Specifications

Table A-14 lists the specifications for the OC3-ATM card.

Table A-14. OC3-ATM card specifications

Category	Specification
Power requirements	35W
Transmission distance	LAN; WAN with use of repeaters
Connectors	Fiber SC-1 or RJ-45 copper
Interfaces per card	One full-duplex OC-3c/STM-1 SONET/SDH
Cable requirements	Single-mode (SM) cables: 9/125-micron optical fiber
Connector requirements	Must meet JIS C 5973
Optical input (avg.)	-32.5dBm minimum, -8dBm maximum (SM) -32.5dBm minimum, -14dBm maximum multimode (MM)
Optical output (avg.)	-14dBm minimum, -8dBm maximum, 9/125 micron (SM) -19dBm minimum, -14dBm maximum, 62.5/125 micron (MM)
Optical wavelength (avg.)	1261nm minimum, 1320nm typical, 1360nm maximum (SM) 1270nm minimum, 1310nm typical, 1380nm maximum (MM)
Tx power	-8dBm maximum, -14dBm minimum, 9/125 micron fiber
Rx sensitivity	-8dBm maximum, -32.5dBm minimum, 9/125 micron fiber
Loss budget	18.5dBm
Card dimensions	5.6 inches high x 10.7 inches long (14.2 cm x 27 cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Status lights

All status lights except LA illuminate upon startup or restart and remain illuminated until the card passes its POST. If no status lights are illuminated, the OC3 interface is either disabled or is receiving an Alarm Indication Signal (AIS) or Idle Signal.

Table A-15 explains the OC3-ATM card status lights.

Table A-15. OC3-ATM card status lights

Light	Description
YA	On indicates the OC3 interface has detected a Far End Receive Failure indication transmitted from the other side.
AIS	On indicates the local device has received an alarm indication signal.
LA	On indicates the OC3 interface link is active and has not detected any error conditions.
LF	On indicates the OC3 interface has lost its frame alignment.
RA	On indicates the OC3 interface is experiencing loss of receive signal.

PCTFI card

A peripheral control and timing facilities interface (PCTFI) slot card connects a time slot interchanger (TSI) in a 5ESS SM-2000 switch with a MAX TNT unit. The PCTFI eliminates separate T1 (or E1) digital trunk interfaces in the switch, providing higher speed and broader connectivity between the 5ESS switch and MAX TNT unit.

Figure A-13 shows the MAX TNT PCTFI card.

Figure A-13. PCTFI card

Specifications

Table A-16 provides the specifications for the MAX TNT PCTFI slot card.

Table A-16. PCTFI card specifications

Category	Specification
Line code	Lucent proprietary PCTFI
Frame format	Lucent proprietary PCTFI
Line rate	65.536Mbps (Nominal)
Connectors	MT-RJ optical connectors
Link	62.5µm optical fiber up to 2000 feet (610 meters) in length
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0 to 90% non-condensing
Operating temperature	32 to 104° F (0 to 40° C)

Status lights

All status lights illuminate upon startup or restart. The lights remain illuminated until the card passes its POST.

Table A-17 describes the PCTFI slot card status lights.

Table A-17. PCTFI card status lights

Lights	Color	Description
Fault	Red	On when there is a failure of the 3.3V power supply.
Fault	Yellow	On when the card is in reset or fault condition.
Active PCTI OOS	Yellow	On if the link for either PCT side 0 or PCT side 1 is unavailable or out of service (OOS).
Active PCTI OOS	Green	On if the link for either PCT side 0 or PCT side 1 is active or standing by.

Connecting the PCTFI slot card to the switch

The time-slot interchange unit of the 5ESS switch uses two BKD10 boards, installed as a time-slot interchange slice (TSIS) board pair. One BKD10 board is inserted into TSIS side 0. The other BKD10 board is inserted into TSIS side 1.

The PCTFI card connects to the BKD10 board-pair with a pair of 62.5 micron (μm) fibers with MT-RJ connectors at both ends. Each fiber must not exceed 2000 feet (610 meters).

Each peripheral control and timing (PCT) facility interface link is a duplexed connection, with one active and one standby link. The 5ESS switch determines which side of the duplex PCT facility interface is selected for data transmission.

Series56 Digital Modem cards

The Series56 II and Series56 III digital modem cards provide 48 modems in a single-height slot card that can terminate both modem and HDLC calls. However, the Series56 II and Series56 III cards can process only calls that use a single DS0. These cards cannot process data streams that span multiple DS0s of the same T1 or E1 interface. For this reason, Frame Relay connections cannot use the Series56 II or Series56 III slot cards, but must use the Hybrid Access cards instead. Series56 II and Series56 III ports appear in the output of both the HDLC and Modem commands.

The Series56 II and Series56 III digital modem cards have identical panels as shown in Figure A-14.

Figure A-14. Series56 II or Series56 III digital modem card
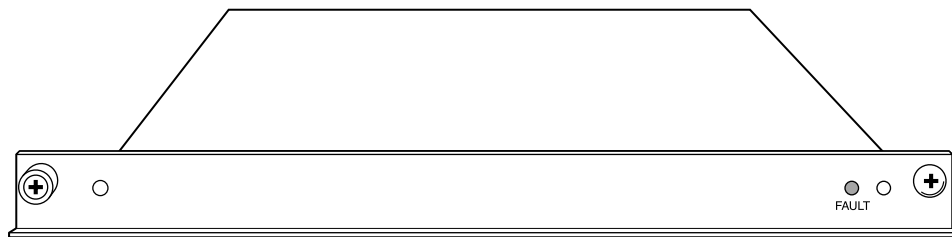
Table A-18 lists the specifications for the Series56 II and Series56 III digital modem cards.

Table A-18. Series56 II and Series56 III digital modem card specifications

Category	Specification
Power requirements	17W
Aggregate data rate	56Kbps analog, 64Kbps digital
Interfaces per card	No external interfaces
Connectors	N/A
Card dimensions	8.8 inches high x 10.6 inches long (22.35cm x 26.92cm)
Card weight	3.9 pounds (1.77kg)
Operating humidity	10-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

STM-0 card

The Synchronous Transport Module 0 (STM-0) card is an optical 51.85Mbps communication circuit designed to be used with the appropriate signaling gateway. Each of its 28 T1 lines can be configured as a Signaling System 7 (SS7) data trunk. When the STM-0 card is configured for SS7 data trunks, the signaling gateway takes control of the data trunks, instructing the MAX TNT unit when to establish or dismantle calls.

The STM-0 card does not support Call-Routing profiles, PRI signaling, or inband signaling.

Specifications

Table A-19 lists the specifications for the STM-0 card.

Table A-19. STM-0 card specifications

Category	Specification
Connectors	Fiber SC-1
Interfaces per card	One full-duplex STM-0 Synchronous Optical Network/Synchronous Digital Hierarchy (SONET/SDH)
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)
Cable requirements	Single-mode cables: 9/125-micron (μm) optical fiber
Connector requirements	Must meet JIS C 5973
Minimum bend radius	3 inches (7.62cm)
Optical input (average)	-32.5dBm minimum, -8dBm maximum for single mode (SM) -32.5dBm minimum, -14dBm maximum for multimode (MM)
Optical output (average)	-14dBm minimum, -8dBm maximum, 9/125μm (SM) -19dBm minimum, -14dBm maximum, 62.5/125μm (MM)
Optical wavelength (average)	1261nm minimum, 1320nm typical, 1360nm maximum (SM) 1270nm minimum, 1310nm typical, 1380nm maximum (MM)
Line rate	51.85Mbps ± 20ppm
Tx power	-8dBm maximum, -14dBm minimum, 9/125μm fiber

Table A-19. STM-0 card specifications (continued)

Category	Specification
Rx sensitivity	-8dBm maximum, -32.5dBm minimum, 9/12μm fiber
Loss budget	18.5dBm
Frame format	STM-0 with VC-3, tributary unit group 2 (TUG-2), and VC-11 mapping
Alarm signaling	Receive line: reception of bad frame (REC) or AIS Generate line: backward AIS (BAIS) Receive line: VC-3 REC or AIS Generate line: VC-3 BAIS Receive line:VC-11 REC or AIS Generate line: VC-11 BAIS Receive line: HG REC or AIS Generate line: HG BAIS

Status lights

All status lights except HG_SYNC illuminate upon startup or restart, and remain illuminated until the card passes its POST. During normal operation, only the HG_SYNC light remains illuminated.

Table A-20 explains the STM-0 card status lights.

Table A-20. STM-0 card status lights

Light	Color	In on, indicates:
RALM	Red	All path alarms. Can mean any of the following: • Path loss of pointer (LOP) • Path alarm indication signal (AIS) • Path remote defect indication (RDI) • Loss of multiframe (LOM)
LRDI	Red	Line remote defect indication. The STM-0 slot card received an alarm from an upstream device that detected the alarm.
LAIS	Red	Line alarm indication signal. The STM-0 slot card received an alarm from a downstream device that detected the failure.
LOS	Red	Loss-of-signal condition on the STM line. The STM slot card has detected all zeros on the line.
LOF	Red	Loss-of-frame condition on the STM-0 line. The STM-0 slot card has detected the absence of a valid framing pattern on the line for 3ms or more.
OOF	Red	Out-of-frame condition on the STM-0 line. The STM-0 slot card has detected absence of a valid framing pattern on the line.

SWAN card

The Serial WAN (SWAN) card has four high-speed V.35 ports, each of which supports data rates of up to 8Mbps. The card provides direct connections to routers or packet switches (Frame Relay connections). Its circuitry includes hardware-based Stac compression. Up to six SWAN cards can be used in a MAX TNT shelf for a total of up to 24 ports.

Figure A-15 shows the SWAN card.

Figure A-15. SWAN card
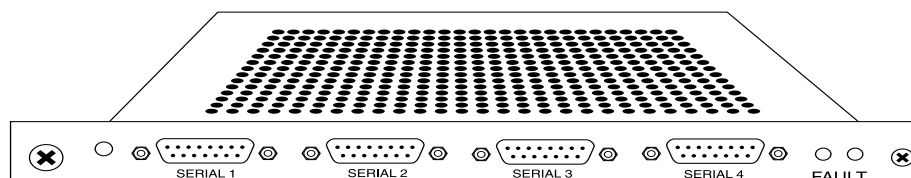
Specifications

Table A-21 lists the specifications for the SWAN card.

Table A-21. SWAN card specifications

Category	Specification
Interface standard	V.35
Power requirements	N/A
Interfaces per card	Four V.35 ports per card, six cards per shelf
Connector requirements	Must meet Japanese Industrial Standards (JIS) C 5973
Card dimensions	8.8 inches high x 10.6 inches long (22.35cm x 26.92cm)
Card weight	3.9 pounds (1.77kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Connecting the SWAN card to the WAN

To connect the SWAN card to the WAN:

1 Using the Lucent Serial WAN cable, connect the 60-pin D connector to the SWAN card as shown in Figure A-16.

Figure A-16. Connecting the SWAN card to the WAN
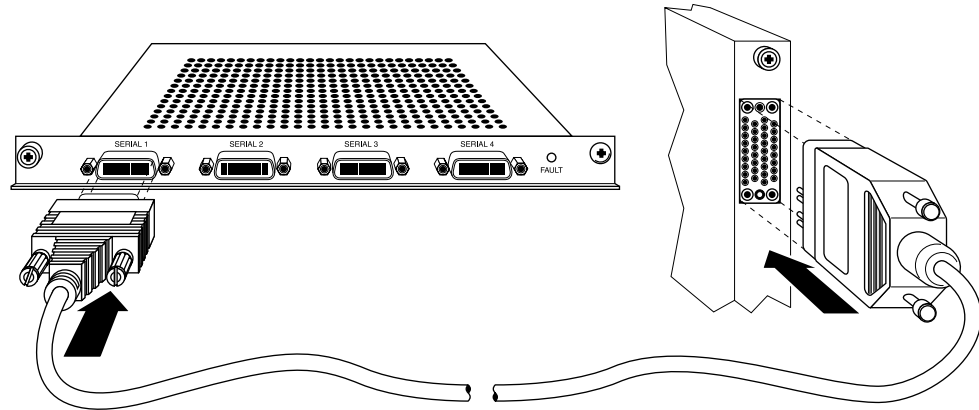
2 Connect the other end of the cable to the V.35 port on a Frame Relay switch or to your WAN interface.

3 Inform your service provider that the equipment is connected, so the provider can activate the line.

T1 card

A T1 line supports 24 64Kbps channels, each of which can transmit and receive data or digitized voice. The line uses framing and signaling to achieve synchronous and reliable transmission. The most common configurations for T1 lines are ISDN Primary Rate Interface (PRI) and dedicated or unchannelized T1, including fractional T1. A T1 card supports up to eight T1 lines.

Figure A-17 shows the T1 card.

Figure A-17. T1 card
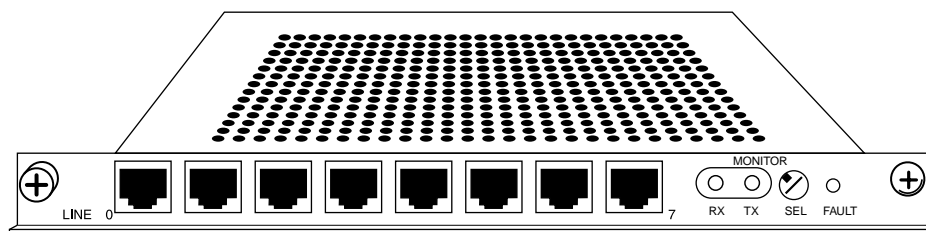
Specifications

Table A-22 lists the specifications for the T1 card.

Table A-22. T1 card specifications

Category	Specification
Interface standards	American National Standards Institute (ANSI) T1.403 and T1.408 ETSI 300-166 and 300-233 AT&T PUB 62411
Electrical standards	DSX-1 per ANSI T1.102 (DSX) DS1 per ANSI T1.403, Pub 62411 (CSU)
Line buildout	0dB, -7.5dB, -15dB or -22.5dB (CSU) 0-133 feet (0-40.54m), 133-266 feet (40.54 -81.1m), 266-399 feet (81.1-121.62m), 399-533 feet (121.62-162.46m), 533-655 (162.46-199.64m) feet (DSX)
Receive equalization	Based on cable length and transmitter
Rx sensitivity	0 to -36dB
Line code	Alternate mark inversion (AMI) and bipolar 8-zero substitution (B8ZS)
Line rate	1.544Mbps ± 32ppm
Frame format	Per ANSI T1.107a

Table A-22. T1 card specifications (continued)

Category	Specification
Alarm signaling	Red Alarm and Yellow Alarm
Connectors	Eight RJ-45 (100-ohm line)
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm)
Card weight	~2 pounds (0.9kg)
Operating humidity	0-90%, noncondensing
Operating temperature	32-104° F (0-40° C)

Connecting the T1 card to the WAN

If your MAX TNT unit's T1/PRI ports have internal channel service units (CSUs), connect them to the demarcation point, which is where the T1/PRI line's metallic interface connects to other equipment. Otherwise, you must install external CSUs or other network (WAN) interface equipment between the MAX TNT unit and the demarcation point.

Figure A-18. Connecting the MAX TNT unit T1 card to the WAN
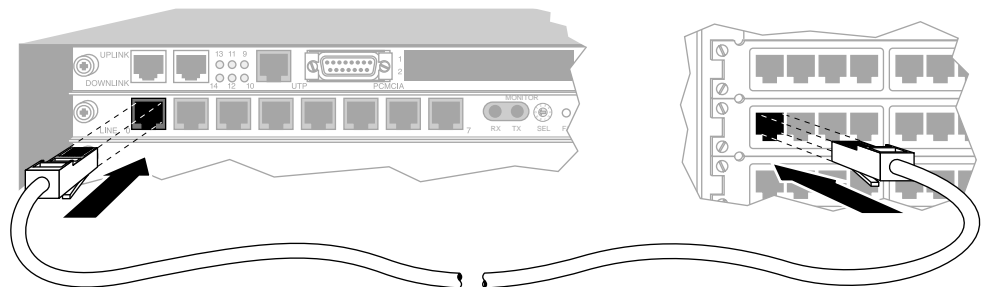
Inform your service provider that the equipment is connected, so the provider can activate the line.

Monitoring the T1 lines with bantam jacks

Each T1 card provides transmit and receive bantam jacks to monitor the status of the T1 lines. The Tx line carries what the MAX TNT unit transmits to the network. The Rx line carries what the unit receives from the network. The bantam jacks do not interfere with the signal either coming into or going out of the unit.

To monitor the T1 lines:

1 Select the line to monitor by setting the select switch on the T1 card.

2 Plug in the bantam jacks.

T1 FrameLine card

The T1 frameline card supports 10 unchannelized T1 lines. The entire bandwidth of each T1 line can be used for a frame relay connection.

Figure A-19 shows the T1 FrameLine card.

Figure A-19. T1 FrameLine card
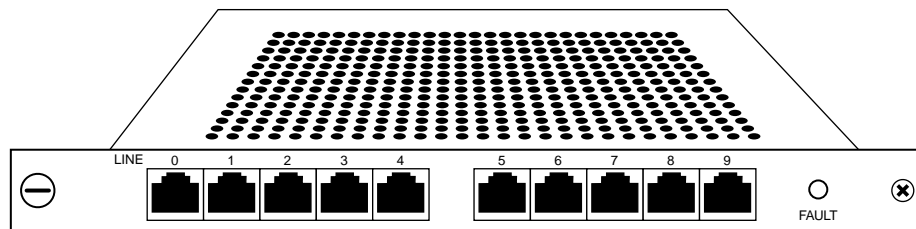
Specifications

Table A-23 lists the specifications for the T1 FrameLine card.

Table A-23. T1 FrameLine card specifications

Category	Specification
Electrical	DSX-1 per ANSI T1.102 (DSX) DS1 per ANSI T1.403, Pub 62411 (CSU)
Line buildout	0dB, -7.5dB, -15dB or -22.5dB (CSU) 0-133 feet (0-40.54m), 133-266 feet (40.54 -81.1m), 266-399 feet (81.1-121.62m), 399-533 feet (121.62-162.46m), 533-655 (162.46-199.64m) feet (DSX)
Receive equalization	Based on cable length and transmitter
Line code	AMI, B8ZS
Line rate	1.544Mbps ± 32ppm
Frame format	Per ANSI T1.107a (M23 or C-bit parity)
Alarm signaling	Red Alarm, yellow signal
Connectors	10 RJ-45 (100-ohm line)

T3 card

A T3 line is a communications circuit composed of seven DS2s, each of which includes four DS1s, each of which in turn is composed of 24 DS0s, for a total of 672 DS0 channels. The T3 card supports one T3 line.

Figure A-20 shows the T3 slot card.

Figure A-20. T3 Card

Specifications

Table A-24 lists the specifications for the T3 card.

Table A-24. T3 card specifications

Category	Specification
Electrical standards	DSX-3 per ANSI T1.404.
Line buildout	0-225 feet (0-68.58m), or 226-450 feet (68.88-137.6m).
Receive equalization	Based on cable length and transmitter.
Line code	Bipolar 3-zero substitution (B3ZS).
Line rate	44.736Mbps ± 20ppm.
Frame format	Per ANSI T1.107a (M23 or C-bit parity).
Alarm signaling	When a DS3 Red Alarm occurs, a Yellow Alarm is sent on the DS3 line and an AIS is sent on DS2 lines. Upon a DS2 Red Alarm, AIS is sent on DS1s.
Connectors	Four 75-ohm BNC coaxial (two lines and two backup lines).

Status lights

All status lights except LA illuminate upon startup or restart and remain illuminated until the card passes its POST. If no lights are illuminated, the T3 interface is either disabled or is receiving an Alarm Indication Signal (AIS) or Idle Signal.

Table A-25 explains the T3 card status lights.

Table A-25. T3 card status lights

Light	Color	Description
LA	Green	On indicates the T3 interface is enabled and has not detected any error conditions.
RA	Red	On indicates the T3 interface is experiencing loss of receive signal.
LO	Red	On indicates the T3 interface is out of frame alignment.
YA	Yellow	On indicates the T3 interface has detected Far End Receive Failure indication transmitted from the other side.
FAULT	Yellow	Behaves as follows: • Illuminates when the unit has been reset. • Goes out when the unit has passed its power-on self test (POST) and is running. • Blinks when a fatal error has occurred.

Connecting the T3 card to the WAN

Connect the T3 line to the T3 card with two 75-ohm coaxial cables (RG 59/U). To provide for redundant operation, the T3 card has a second pair of BNC jacks that can be used to connect to a second T3 card or other Data Terminal Equipment (DTE).

When the T3 card is not powered or is in the reset state, the Line Rx and Line Tx signals are electrically connected to the Bypass Rx and Bypass Tx jacks, respectively. When the T3 card passes its POST, a relay switch connects the line jacks to the card's T3 transceiver.

Inform your service provider that the equipment is connected, so the provider can activate the line.

Unchannelized DS3 card

The unchannelized DS3 card supports 1 unchannelized T3 line. The entire bandwidth of this line can be used for a frame relay connection. A second set of BNC connectors on the card can be connected to a second DS3 card for redundant operation. Each MAX TNT chassis can contain up to two unchannelized DS3 cards.

Figure A-21 shows the unchannelized DS3 card.

Figure A-21. Unchannelized DS3 card
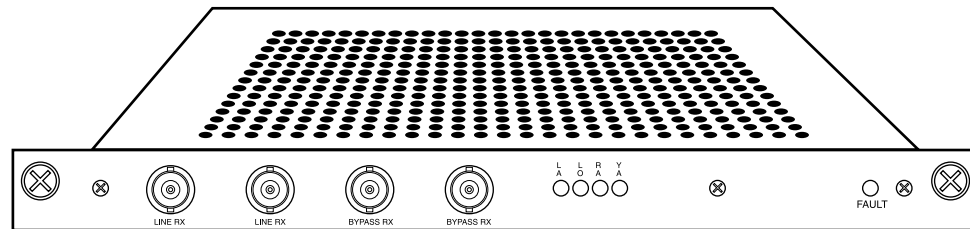
Specifications

Table A-26 lists the specifications for the unchannelized DS3 card.

Table A-26. Unchannelized DS3 card specifications

Category	Specification
Electrical	DSX-3 per ANSI T1.404.
Line buildout	0 to 225 feet (0-68.58m). 226 to 450 feet (68.8-137.6m).
Receive equalization	Based on cable length and transmitter.
Line code	B3ZS.
Line rate	44.736Mbps ± 20ppm.
Frame format	Per ANSI T1.107a (C-bit parity).
Alarm signaling	Upon a DS3 Red Alarm, a yellow signal is sent on the DS3 and an AIS is sent on DS2s. Upon a DS2 Red Alarm, an AIS is sent on DS1s.
Connectors	75-ohm BNC coaxial (two line, two backup).
Interfaces per card	One port per card, up to five cards per system.
Card dimensions	5.6 inches high x 10.7 inches long (14.2cm x 27cm).
Card weight	~2 pounds (0.9kg).

Table A-26. Unchannelized DS3 card specifications (continued)

Category	Specification
Operating humidity	0-90%, noncondensing.
Operating temperature	32-104° F (0-40° C).

Connecting the unchannelized DS3 card to the WAN

Connect the T3 line to the unchannelized DS3 card with two 75-ohm coaxial cables
(RG 59/U). To provide for redundant operation, the unchannelized DS3 card has a second pair
of BNC jacks that can be used to connect to a second unchannelized DS3 card or other Data
Terminal Equipment (DTE).

When the unchannelized DS3 card is not powered or is in the reset state, the Line Rx and Line
Tx signals are electrically connected to the Bypass Rx and Bypass Tx jacks, respectively.
When the UDS3 card passes its POST, a relay switch connects the Line jacks to the card's T3
transceiver.

Inform your service provider that the equipment is connected, so the provider can activate the
line.

Cabling and Connector Specifications

B

MAX TNT units support a variety of interfaces. Each interface has its own specifications and cabling requirements.

Serial port specifications

The serial port uses a standard DE-9 female connector that conforms to the EIA RS-232 standard for serial interfaces. All MAX TNT models use the RS-232 pinouts listed in Table B-1.

Table B-1. Serial port and cabling pinouts

DE-9 pin number	RS-232 signal name	Function	I/O
1	DCD	Data Carrier Detect	O
2	RD	Serial Receive Data	O
3	SD	Serial Transmit Data	I
4	DTR	Data Terminal Ready	I
5	GND	Signal Ground	
6	DSR	Data Set Ready	O
7	RTS	Request to Send	I
8	CTS	Clear to Send	O

Table B-1. Serial port and cabling pinouts (continued)

DE-9 pin number	RS-232 signal name	Function	I/O
*9	*RI	*Ring Indicator	*O

*Pin 9 is not active (Ring Indication signal not supplied).

Ethernet interface specifications

The MAX TNT Ethernet interfaces support the physical specifications of
IEEE l802.3 with Ethernet 2 (Ethernet/DIX) framing.

Supported Ethernet types

MAX TNT units can support any of the following Ethernet interface types:

- 10BaseT (unshielded twisted pair): Twisted-pair Ethernet and IEEE 802.3 (10BaseT) with an RJ-45 connector
- 100BaseT (unshielded twisted pair): Twisted-pair Ethernet and IEEE 802.3u (100BaseT) with an RJ-45 connector
- AUI (attachment unit interface): Standard Ethernet and IEEE (10Base5) with a 15-pin AUI connector

Required equipment

To install an Ethernet interface, you must have the appropriate equipment for the type of interface to be installed.

10BaseT/100BaseT

For a 10BaseT or 100BaseT connection, you need a twisted-pair Ethernet cable terminated with RJ-45 modular jacks.

Use an EIA/TIA 568 or IEEE 802.3 10BaseT cable. Some installations require a crossover cable (for example, when connecting directly to the Ethernet port of a PC).

AUI

For an AUI interface, you need the appropriate transceiver and transceiver cable.

T1/PRI interface specifications

Specifications for a MAX TNT unit's T1/PRI interface include channel service unit (CSU) requirements, specifications for the cables and the plugs available for the unit's WAN interfaces, the pins to be used on the WAN ports, and the WAN switched services that are available to the MAX TNT unit.

T1/PRI CSU requirements

Your T1/PRI requirements depend on whether a T1/PRI port on the MAX TNT unit is equipped with an internal channel service unit (CSU).

Port with internal CSU

If a T1/PRI port on the MAX TNT unit has an internal CSU, you can connect the port directly to the metallic interface of the WAN. To avoid harming the WAN, you must contact your carrier for approval before installation. Once you install the MAX TNT unit, you must notify the carrier before disconnecting the unit from the WAN. If you disconnect or turn off the unit without prior notification, the carrier might temporarily discontinue your T1/PRI service.

A MAX TNT unit's internal CSUs are compatible with wet-loop and dry-loop T1/PRI lines and with span-powered or wet-loop powered T1/PRI lines.

Port without internal CSU

A T1/PRI port of the MAX TNT that does not have an internal CSU cannot connect directly to the WAN. You must connect the port to other equipment that provides the interface to the WAN (for example, an external CSU). Your carrier determines the correct value for the line buildout setting of the CSU. You configure this parameter during installation. (For more information, see the *APX 8000/MAX TNT Reference*.)

Table B-2 lists CSU specifications.

Table B-2. CSU specifications

Information	Value
CSU registration	2CZUSA-74421-DE-N
Critical circuitry power source	Dry loop from local ac power source
Line capture frequency	1.544Mbps ± 200bps
Line code	AMI or B8ZS
Line framing	D4 or ESF
Line input/output impedance	100 ohms ± 5%
Received signal level range	DSX-1 level to -36dB
Transmitted signal level	DSX-1 level into 100 ohms
Line buildout	0.0, -7.5, -15.0, or -22.5dB
Pulse density and consecutive zeros enforcement	In accordance with requirements of AT&T Pub 62411
Line loopback (LLB) set inband code	(10000) repeating binary pattern
Line loopback (LLB) reset inband code	(100) repeating binary pattern

T1/PRI cable specifications

The maximum cable distance between the T1/PRI WAN interface equipment and a MAX TNT unit without CSUs should not exceed 655 feet (200m). Measure the line length and record it when you install the MAX TNT unit. You must specify this length when you configure the parameters in the line's profile.

Use only cables specifically constructed for transmission of T1/PRI signals. The cables must meet standard T1 attenuation and transmission requirements. The following specifications are recommended:

- 100 ohm
- Two twisted pairs, Category 3 or better

The WAN interface cables and plugs described in the following sections are available for the MAX TNT WAN interfaces.

T1/PRI crossover cable: RJ-48C/RJ-48C

Install the RJ-48C/RJ-48C cable when the WAN transmits on pins 5 and 4 and receives on pins 2 and 1. Table B-3 and Figure B-1 show the pinouts.

Table B-3. RJ-48C/RJ-48C crossover cable specifications

Pair #	Signal	Male RJ-48C	Male RJ-48C
1	Receive	2 1	5 4
2	Transmit	5 4	2 1

Figure B-1. RJ-48C/RJ-48C crossover cable
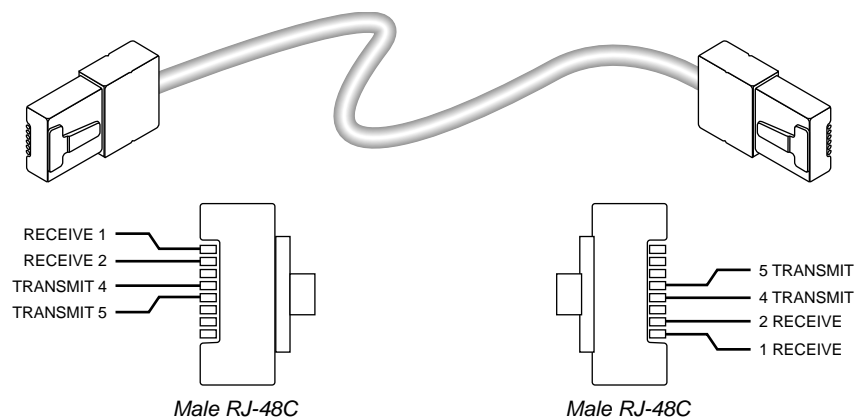
RECEIVE 1
RECEIVE 2
TRANSMIT 4
TRANSMIT 5

Male RJ-48C

5 TRANSMIT
4 TRANSMIT
2 RECEIVE
1 RECEIVE

Male RJ-48C

.

T1/PRI straight-through cable: RJ-48C/RJ-48C

Before installing the RJ-48C/RJ-48C straight-through cable, verify that the WAN transmits on pins 5 and 4 and receives on pins 2 and 1. Table B-4 and Figure B-2 show the pinouts.

Table B-4. RJ-48C/RJ-48C straight-through cable specifications

Pair #	Signal	Male RJ-48C	Male RJ-48C
1	Receive	1 2	1 2
2	Transmit	5 4	5 4

Figure B-2. RJ-48C/RJ-48C straight-through cable

RECEIVE 1
RECEIVE 2
TRANSMIT 4
TRANSMIT 5

5 TRANSMIT
4 TRANSMIT
2 RECEIVE
1 RECEIVE

Male RJ-48C   *Male RJ-48C*
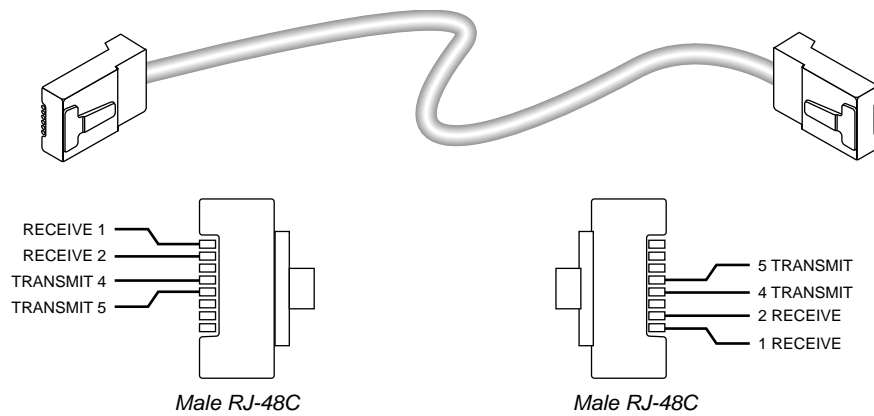
T1/PRI straight-through cable: RJ-48C/DB-15

Before installing the RJ-48C/DB-15 straight-through cable, verify that the WAN transmits on pins 3 and 11 and receives on pins 1 and 9. Table B-5 and Figure B-3 shows the pinouts.

Table B-5. RJ-48C/DB-15 straight-through cable specifications

Pair #	Signal	Male RJ-48C	Male DB-15
1	Receive	1 2	3 11
2	Transmit	5 4	1 9

Figure B-3. RJ-48C/DB-15 straight-through cable

Male DB-15   Male RJ-48C

T1/PRI crossover cable: RJ-48C/DB-15

Before installing the RJ-48C/DB-15 cable, verify that the WAN transmits on pins 1 and 9 and receives on pins 3 and 11. Table B-6 and Figure B-4 show the pinouts.

Table B-6. RJ-48C/DB-15 crossover cable specifications

Pair #	Signal	Male RJ-48C	Male DB-15P
1	Receive	1 2	1 9
2	Transmit	5 4	3 11

Figure B-4. RJ-48C/DB-15 crossover cable
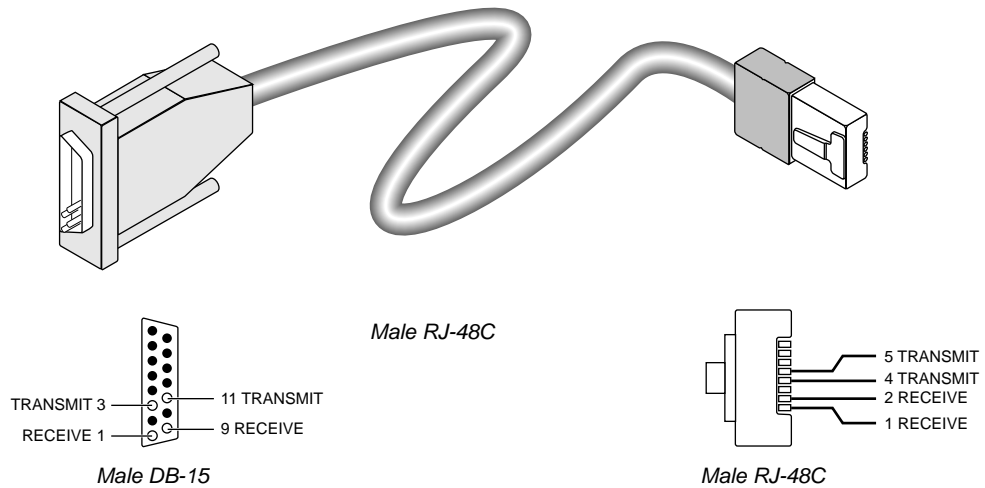
T1/PRI straight-through cable: RJ-48C/Bantam

The WAN side of the RJ-48C/Bantam straight-through cable connects to dual bantam jacks. Table B-7 and Figure B-5 show the pinouts.

Table B-7. RJ-48C/Bantam straight-through cable specifications

Pair #	Signal	Male RJ-48	Male Dual 310-P
1	Receive	1 2	Tip 1 Ring 1
2	Transmit	5 4	Tip 2 Ring 2

Figure B-5. RJ-48C/Bantam straight-through cable

TIP 1 RECEIVE
RING 1 RECEIVE
RING 2 TRANSMIT
TIP 2 TRANSMIT

5 TRANSMIT
4 TRANSMIT
2 RECEIVE
1 RECEIVE

Male Dual 310-P   *Male RJ-48C*
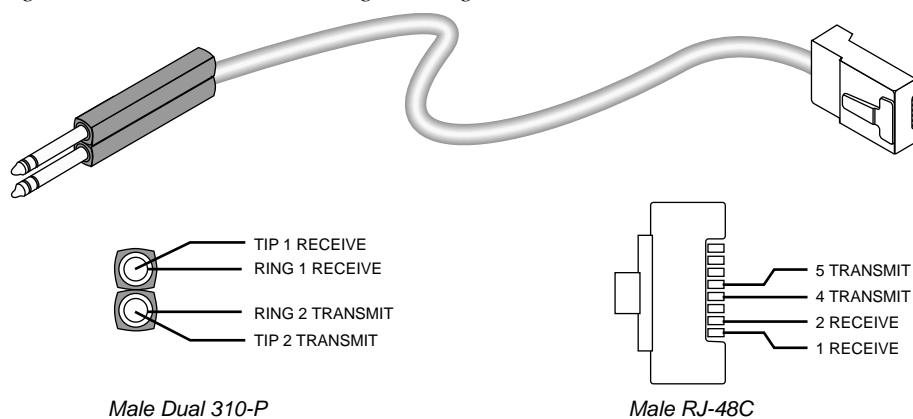
T1 RJ-48C-Loopback plug

The RJ-48C-Loopback plug loops the transmit signal back to the MAX TNT unit. Table B-8 shows the pinouts.

Table B-8. RJ-48C-Loopback plug specifications

Pair #	Signal	Male RJ-48C
1	Receive	1 (connects to 5) 2 (connects to 4)
2	Transmit	5 (connects to 1) 4 (connects to 2)

T1/PRI WAN connectors

Table B-9 lists the pins on the T1/PRI WAN port used for Transmit and Receive. The remaining pins are not connected.

Table B-9. Transmit and Receive pins

MAX TNT T1/PRI interface	RJ-48C DTE
Receive (input) pair, Tip (T1) Receive (input) pair, Ring (R1)	Position 2 Position 1
Transmit (output) pair, Tip (T) Transmit (output) pair, Ring (R)	Position 5 Position 4

WAN switched services available to a MAX TNT unit

MAX TNT units are compatible with both AT&T and Northern Telecom central office switches, and can access all T1/PRI switched digital services offered by AT&T's ACCUNET Switched Digital Services:

*   MCI 56Kbps and 64Kbps services

*   Sprint Switched 56Kbps and 64Kbps services

*   MultiRate and GloBanD (and GVPN in CCITT countries) PRI network services

Note: MAX TNT units can only access Switched-56Kbps services on a T1 access line or a Switched-56 line.

For a listing of the compatible switch types, see the Switch Type parameter listing in the *APX 8000/MAX TNT Reference*. In addition to connecting to switched circuits, a MAX TNT unit can connect to dedicated circuits and to aggregate dedicated and switched circuits.

E1/PRI interface specifications

MAX TNT E1/PRI specifications apply to cables and WAN ports.

E1/PRI cable specifications

The WAN interface cables and plugs described in this section are available for the unit's WAN interfaces.

E1/PRI crossover cable: RJ-48C/RJ-48C

Install the RJ-48C/RJ-48C crossover cable when the WAN interface transmits on pins 5 and 4 and receives on pins 2 and 1. Table B-10 and Figure B-6 show the pinouts.

Table B-10. RJ-48C/RJ-48C crossover cable

Model number RJ-48C-X Part number 2510-0059/0323-001			
Pair #	**Signal**	**Male RJ-48C**	**Male RJ-48C (remote)**
1	Receive	2 1	5 4
2	Transmit	5 4	2 1

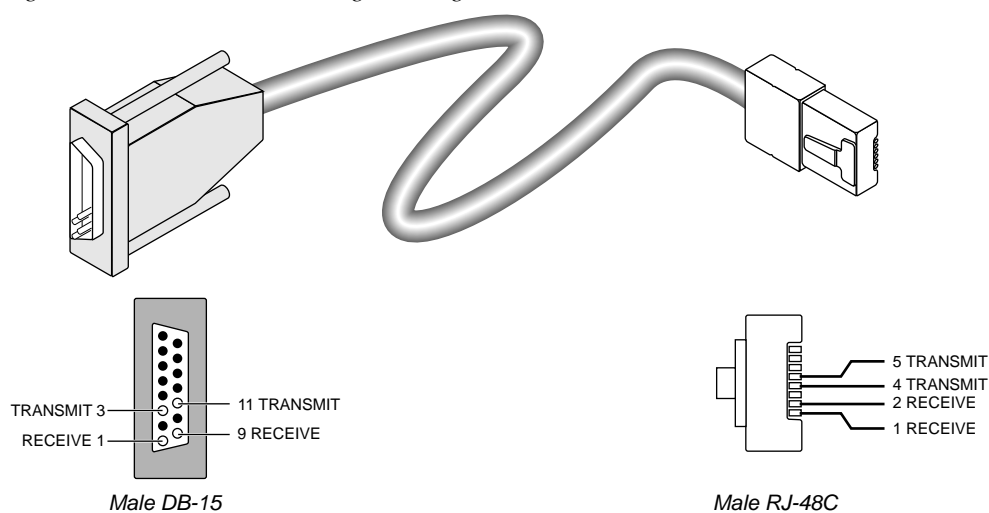*Figure B-6. RJ-48C/RJ-48C crossover cable*
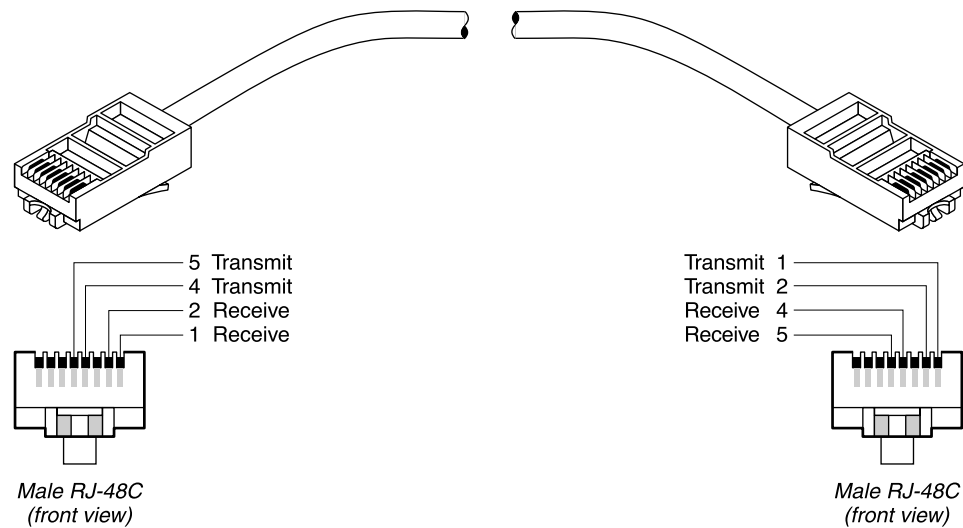
E1/PRI straight-through cable: RJ-48C/RJ-48C

Before installing the RJ-48C/RJ-48C straight-through cable, verify that the WAN interface transmits on pins 2 and 1 and receives on pins 5 and 4. Table B-11 and Figure B-7 show the pinouts.

Table B-11. RJ-48C/RJ-48C straight-through cable specifications

Model number RJ-48C-S Part number 2510-0064-001			
Pair #	**Signal (MAX TNT)**	**Male RJ-48C (MAX TNT)**	**Male RJ-48C (remote)**
1	Receive	1 2	1 2
2	Transmit	5 4	5 4

Figure B-7. RJ-48C/RJ-48C straight-through cable
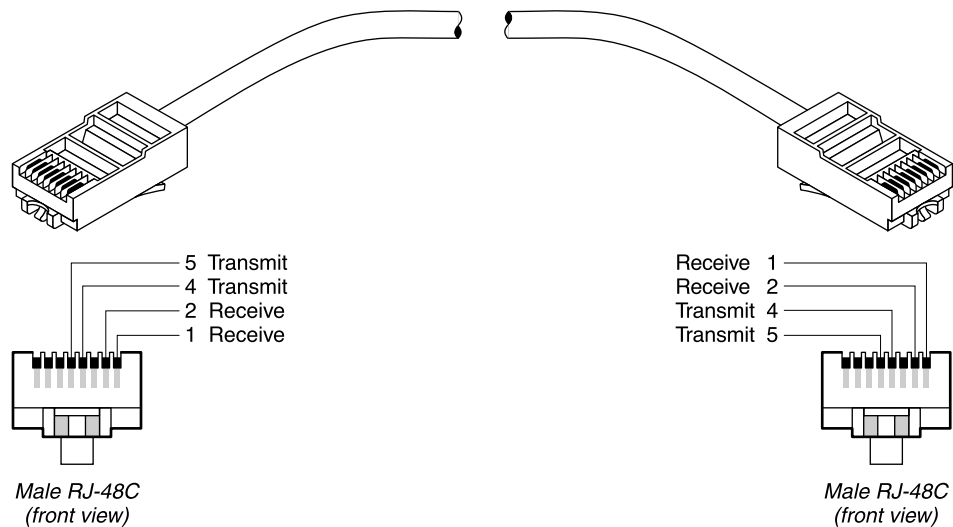
E1/PRI straight-through cable: RJ-48C/DA-15

Before installing the RJ-48C/DA-15 straight-through cable, verify that the WAN interface transmits on pins 3 and 11 and receives on pins 1 and 9. Figure B-8 and Table B-12 show the pinouts.

Table B-12. RJ-48C/DA-15 straight-through cable specifications

Model number DA15-X Part number 2510-0082-001			
Pair #	**Signal**	**Male RJ-48C**	**Male DA-15 (remote)**
1	Receive	1 2	3 11
2	Transmit	5 4	1 9

Figure B-8. RJ-48C/DA-15 straight-through cable
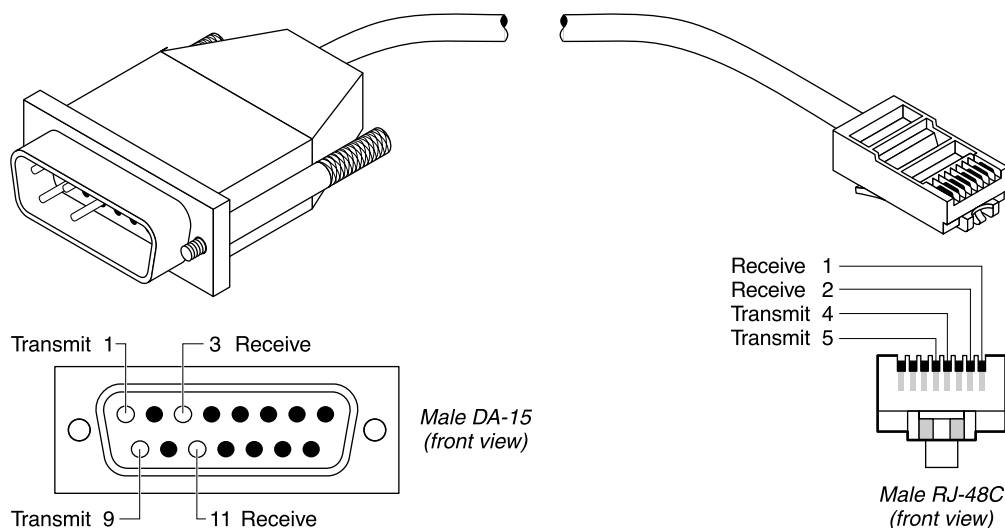
E1/PRI crossover cable: RJ-48C/DA

Before installing the RJ-48C/DA cable, verify that the WAN interface transmits on pins 1 and 9 and receives on pins 3 and 11. Figure B-9 and Table B-13 show the pinouts.

Table B-13. RJ-48C/DA crossover cable specifications

Model number DA15-S Part number 2510-0065-001			
Pair #	**Signal**	**Male RJ-48C**	**Male DA-15 (remote)**
1	Receive	1 2	1 9
2	Transmit	5 4	3 11

Figure B-9. RJ-48C/DA crossover cable
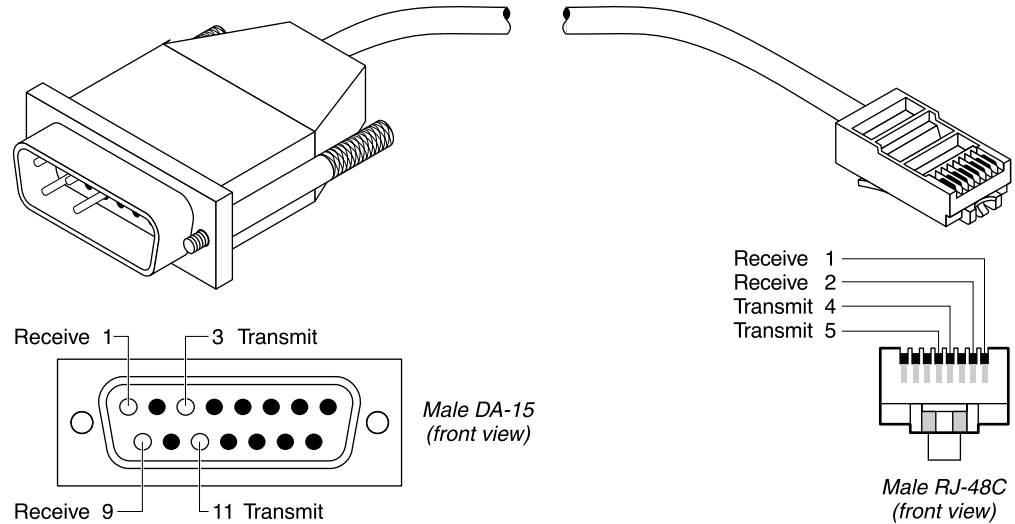
E1/PRI straight-through cable: RJ-48C/Bantam

The WAN side of the RJ-48C/Bantam straight-through cable connects to dual bantam jacks. Figure B-10 and Table B-14 show the pinouts.

Table B-14. RJ-48C/Bantam straight-through cable specifications

Model number DBNT-RJ-48C Part number 2510-0066-001			
Pair #	**Signal**	**Male RJ-48**	**Male Dual-310-P (remote)**
1	Receive	1 2	Tip 1 Ring 1
2	Transmit	5 4	Tip 2 Ring 2

Figure B-10. RJ-48C/Bantam straight-through cable

Ring 1 Receive
Tip 1   Receive
Ring 2 Transmit
Tip 2   Transmit

Male Dual 310-P

Receive 1
Receive 2
Transmit 4
Transmit 5

*Male RJ-48C
(front view)*
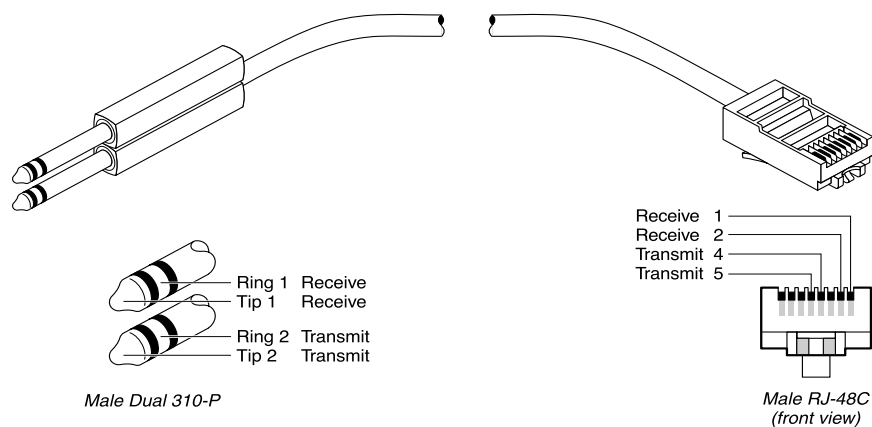
E1/PRI WAN ports

Table B-15 lists the pins on RJ-48C sockets used for E1/PRI WAN interface on the MAX TNT. Only pins 1, 2, 4, and 5 are used. The remaining pins are not connected.

Table B-15. Transmit and Receive pins

MAX TNT E1/PRI interface	RJ-48C DTE
Receive (input) pair, Tip (T1)	Position 2
Receive (input) pair, Ring (R1)	Position 1
Transmit (output) pair, Tip (T)	Position 5
Transmit (output) pair, Ring (R)	Position 4

Note: E1/PRI models are also equipped with BNC connectors.

Serial WAN (SWAN) cable specifications

A MAX TNT unit's serial WAN (SWAN) interface supports dedicated connections to the WAN. Data packets from the MAX TNT bridge or router module can use this interface, but bit streams from devices connected to the unit's serial host ports cannot.

The MAX TNT unit's serial WAN port is compatible with the following two electrical standards:

* V.35
* RS-449/422

In the cable wiring tables that follow, a MAX TNT unit is the Data Terminal Equipment (DTE) that connects to a Data Circuit-terminating Equipment DCE) device through its serial WAN port. The unit receives the Send Timing and Receive Timing clocks from the DCE device.

V.35 cable to WAN

You can connect a V.35 cable (TNT-CAB-v35) to the V.35 port of a DCE device. The V.35 cable has the pinouts described in Table B-16.

Table B-16. V.35 cable pinouts

Pair #	Signal	MAX TNT male DB-44	Host male V.35
1	FGND RI	1 8	A J
2	SD+ SD-	39 40	P S

Table B-16. V.35 cable pinouts (continued)

Pair #	Signal	MAX TNT male DB-44	Host male V.35
3	RD+ RD-	30 29	R T
4	ST+ ST-	41 42	Y AA
5	RT+ RT-	32 31	V X
6	TT+ TT-	38 37	U W
7	DTR DSR	6 11	H E
8	DCD SGND	9 25	F B
9	CTS RTS	7 36	D C

RS-449 cable to WAN

You can connect an RS-449 cable (TNT-CAB-449) to the RS-449 port of a DCE device. The RS-449 cable has the pinouts described in Table B-17.

Table B-17. RS-449 cable pinouts

Pair #	Signal	MAX TNT male DB-44	Host female DB-37
1	FGND RI	1 8	1 15
2	SD+ SD-	39 40	4 22
3	RD+ RD-	30 29	6 24
4	ST+ ST-	41 42	5 23
5	RT+ RT-	32 31	8 26
9	TT+ TT-	38 37	17 35
8	DTR DSR	6 11	12 11
6	DCD SGND	9 25	13 19, 20, 37*
7	CTS RTS	7 36	9 7

* Pin positions separated by commas are jumped to each other.

Serial WAN cable

Figure B-11 and Table B-18 show the pinouts for the V.35 serial WAN (SWAN) cable.

Table B-18. Serial WAN cable pinouts

J1 Pin	J2 Pin
46	A
42	D
43	E
35	C
34	H
33	F
16	B
44	K
16	B
18	T
17	R
28	S
27	P
20	X
19	V
26	W
25	U
24	Y
23	AA

Figure B-11. Serial WAN cable
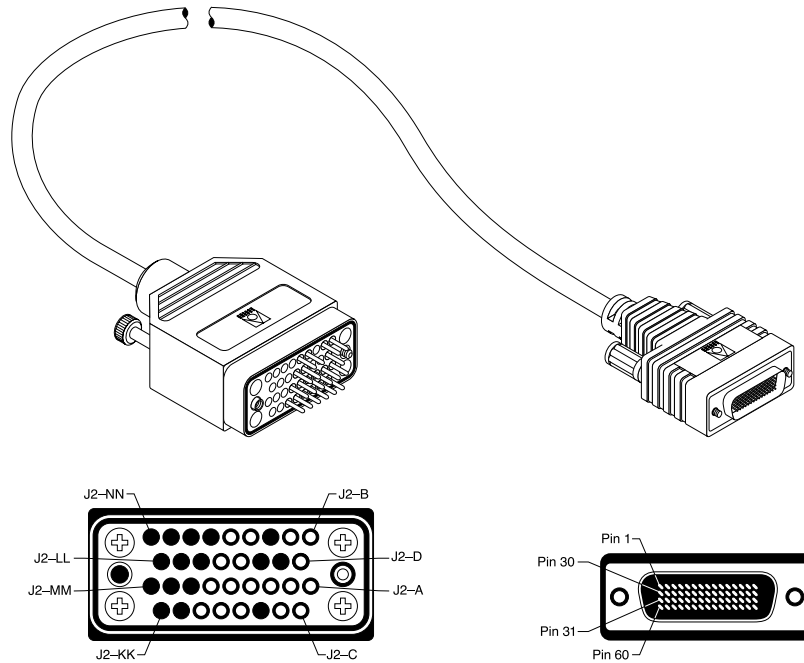
IDSL cable specifications

Figure B-12 and Table B-19 show the pinouts for the dual 50-pin telco-to-triple DB-37 IDSL cable.

Table B-19. IDSL cable pinouts

Pair	P1 Pin	P2 Pin	P3 Pin	J1 Pin	J2 Pin	Signal
1	36			1		Tip1
1	37			26		Ring 1
2	18			2		Tip 2
2	19			27		Ring 2
3	16			3		Tip 3
3	17			28		Ring 3
4	14			4		Tip 4
4	15			29		Ring 4
5	12			5		Tip 5
5	13			30		Ring 5
6	10			6		Tip 6
6	11			31		Ring 6
7	8			7		Tip 7
7	9			32		Ring 7
8	6			8		Tip 8
8	7			33		Ring 8
9	4			9		Tip 9
9	5			34		Ring 9
10	2			10		Tip 10
10	3			35		Ring 10
11	1			11		Tip 11
11	20			36		Ring 11
12	21			12		Tip 12

Table B-19. IDSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	P3 Pin	J1 Pin	J2 Pin	Signal
12	22			37		Ring 12
13	23			13		Tip 13
13	24			38		Ring 13
14	25			14		Tip 14
14	26			39		Ring 14
15	32			15		Tip 15
15	33			40		Ring 15
16	34			16		Tip 16
16	35			41		Ring 16
17		36		17		Tip 17
17		37		42		Ring 17
18		18		18		Tip 18
18		19		43		Ring 18
19		16		19		Tip19
19		17		44		Ring 19
20		14		20		Tip 20
20		15		45		Ring 20
21		12		21		Tip 21
21		13		46		Ring 21
22		10		22		Tip 22
22		11		47		Ring 22
23		8		23		Tip 23
23		9		48		Ring 23
24		6		24		Tip 24
24		7		49		Tip 24
1		4			1	Tip1

Table B-19. IDSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	P3 Pin	J1 Pin	J2 Pin	Signal
1		5			26	Ring 1
2		2			2	Tip 2
2		3			27	Ring 2
3		1			3	Tip 3
3		20			28	Ring 3
4		21			4	Tip 4
4		22			29	Ring 4
5		23			5	Tip 5
5		24			30	Ring 5
6		25			6	Tip 6
6		26			31	Ring 6
7		32			7	Tip 7
7		33			32	Ring 7
8		34			8	Tip 8
8		35			33	Ring 8
9			36		9	Tip 9
9			37		34	Ring 9
10			18		10	Tip 10
10			19		35	Ring 10
11			16		11	Tip 11
11			17		36	Ring 11
12			14		12	Tip 12
12			15		37	Ring 12
13			12		13	Tip 13
13			13		38	Ring 13
14			10		14	Tip 14

Table B-19. IDSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	P3 Pin	J1 Pin	J2 Pin	Signal
14			11		39	Ring 14
15			8		15	Tip 15
15			9		40	Ring 15
16			6		16	Tip 16
16			7		41	Ring 16
17			4		17	Tip 17
17			5		42	Ring 17
18			2		18	Tip 18
18			3		43	Ring 18
19			1		19	Tip19
19			20		44	Ring 19
20			21		20	Tip 20
20			22		45	Ring 20
21			23		21	Tip 21
21			24		46	Ring 21
22			25		22	Tip 22
22			26		47	Ring 22
23			32		23	Tip 23
23			33		48	Ring 23
24			34		24	Tip 24
24			35		49	Tip 24

Figure B-12. HDSL dual 50-pin telco-to-triple-DB-37 cable

Both ends above have same pinouts:

J1-1

All three ends above have same pinouts:

P1-1   P1-19

P1-20   P1-37
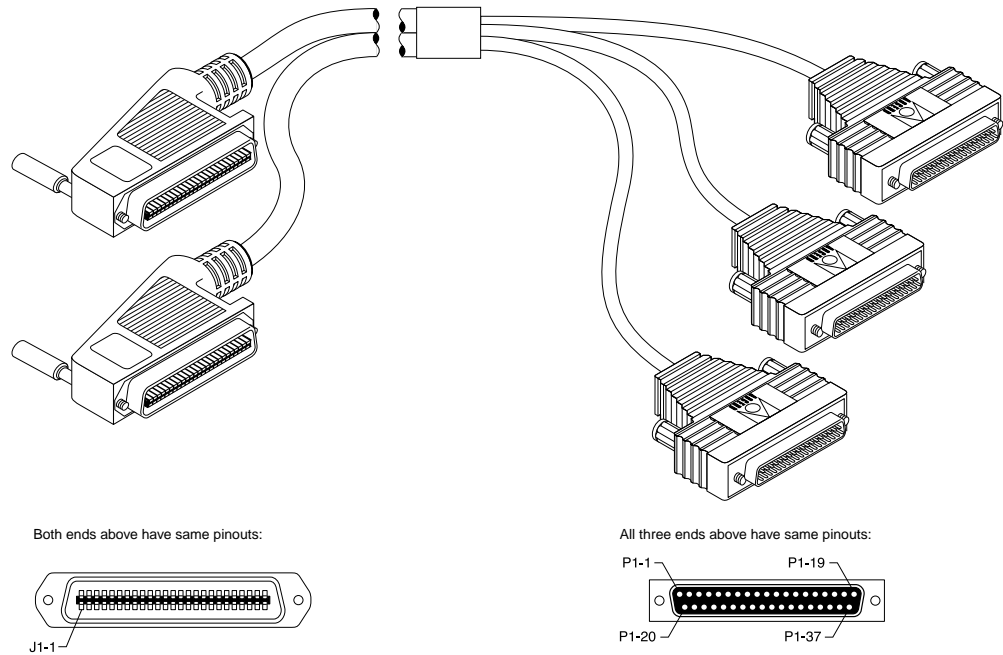
ADSL cable specifications

Figure B-13 and Table B-20 show the pinouts for the 50-pin telco-to-quadruple DB-37 ADSL cable.

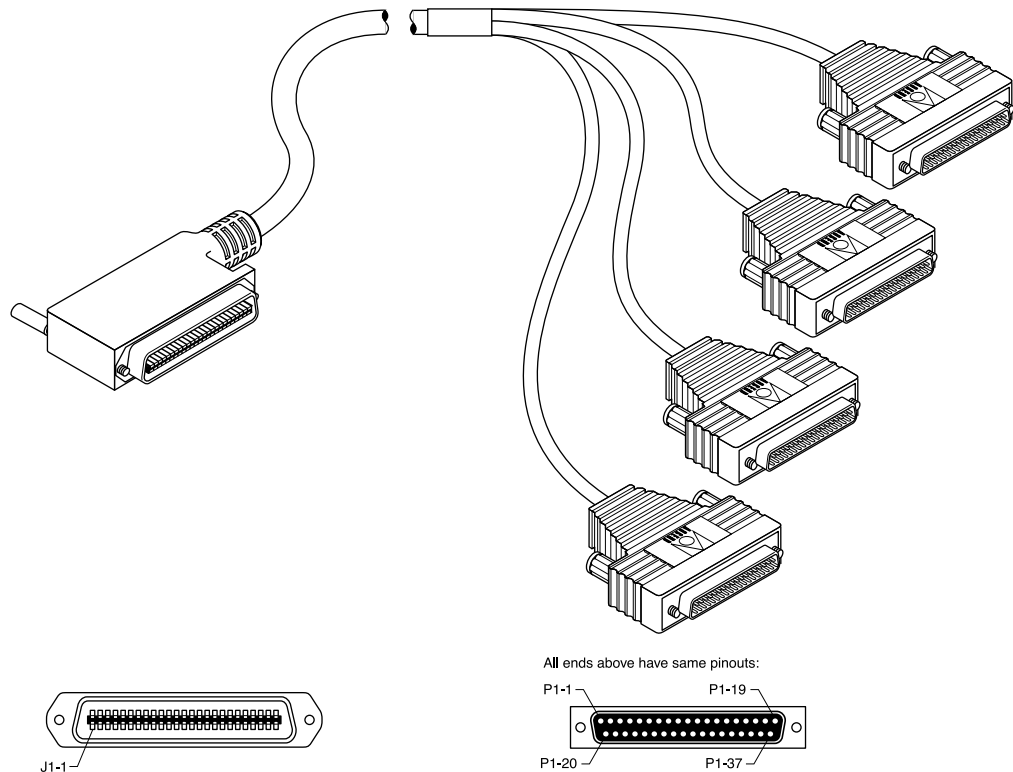*Table B-20. ADSL cable pinouts*

Pair	P1 Pin	P2 Pin	P3 Pin	P4 Pin	J1 Pin	Signal
1	36				1	Tip1
1	37				26	Ring 1
2	18				2	Tip 2
2	19				27	Ring 2
3	16				3	Tip 3
3	17				28	Ring 3
4	14				4	Tip 4
4	15				29	Ring 4
5	12				5	Tip 5
5	13				30	Ring 5
6	10				6	Tip 6
6	11				31	Ring 6
7		36			7	Tip 7
7		37			32	Ring 7
8		18			8	Tip 8
8		19			33	Ring 8
9		16			9	Tip 9
9		17			34	Ring 9
10		14			10	Tip 10
10		15			35	Ring 10
11		12			11	Tip 11
11		13			36	Ring 11
12		10			12	Tip 12

Table B-20. ADSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	P3 Pin	P4 Pin	J1 Pin	Signal
12		11			37	Ring 12
13			36		13	Tip 13
13			37		38	Ring 13
14			18		14	Tip 14
14			19		39	Ring 14
15			16		15	Tip 15
15			17		40	Ring 15
16			14		16	Tip 16
16			15		41	Ring 16
17			12		17	Tip 17
17			13		42	Ring 17
18			10		18	Tip 18
18			11		43	Ring 18
19				39	19	Tip19
19				37	44	Ring 19
20				18	20	Tip 20
20				19	45	Ring 20
21				16	21	Tip 21
21				17	46	Ring 21
22				14	22	Tip 22
22				15	47	Ring 22
23				12	23	Tip 23
23				13	48	Ring 23
24				10	24	Tip 24
24				11	49	Tip 24

Figure B-13. ADSL 50-pin telco-to-quadruple DB-37 cable

SDSL cable specifications

Figure B-14 and Table B-21 show the pinouts for the 50-pin telco-to-dual-DB-37 SDSL cable.

Table B-21. SDSL cable pinouts

Pair	P1 Pin	P2 Pin	J1 Pin	Signal
1	36		1	Tip1
1	37		26	Ring 1
2	18		2	Tip 2
2	19		27	Ring 2
3	16		3	Tip 3
3	17		28	Ring 3
4	14		4	Tip 4
4	15		29	Ring 4
5	12		5	Tip 5

Table B-21. SDSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	J1 Pin	Signal
5	13		30	Ring 5
6	10		6	Tip 6
6	11		31	Ring 6
7	8		7	Tip 7
7	9		32	Ring 7
8	6		8	Tip 8
8	7		33	Ring 8
9	4		9	Tip 9
9	5		34	Ring 9
10	2		10	Tip 10
10	3		35	Ring 10
11	1		11	Tip 11
11	20		36	Ring 11
12	21		12	Tip 12
12	22		37	Ring 12
13		36	13	Tip 13
13		37	38	Ring 13
14		18	14	Tip 14
14		19	39	Ring 14
15		16	15	Tip 15
15		17	40	Ring 15
16		14	16	Tip 16
16		15	41	Ring 16
17		12	17	Tip 17
17		13	42	Ring 17
18		10	18	Tip 18

Table B-21. SDSL cable pinouts (continued)

Pair	P1 Pin	P2 Pin	J1 Pin	Signal
18		11	43	Ring 18
19		8	19	Tip19
19		9	44	Ring 19
20		6	20	Tip 20
20		7	45	Ring 20
21		4	21	Tip 21
21		5	46	Ring 21
22		2	22	Tip 22
22		3	47	Ring 22
23		1	23	Tip 23
23		20	48	Ring 23
24		21	24	Tip 24
24		22	49	Tip 24

The high-performance SDSL data card uses a universal service order code (USOC) RJ-21X 50-pin telco connector. Cable pinouts are shown in Table B-22.

Table B-22. Cable pinouts for the 50-pin telco connector

	Signal	Pin	Signal
1	1R (channel 1 ring)	26	1T (channel 1 tip)
2	2R	27	2T
3	3R	28	3T
4	4R	29	4T
5	5R	30	5T
6	6R	31	6T
7	7R	32	7T
8	8R	33	8T
9	9R	34	9T

Table B-22. Cable pinouts for the 50-pin telco connector (continued)

	Signal	Pin	Signal
10	10R	35	10T
11	11R	36	11T
12	12R	37	12T
13	13R	38	13T
14	14R	39	14T
15	15R	40	15T
16	16R	41	16T
17	17R	42	17T
18	18R	43	18T
19	19R	44	19T
20	20R	45	20T
21	21R	46	21T
22	22R	47	22T
23	23R	48	23T
24	24R	49	24T
25	-48v (return)	50	-48v

Pins 25 and 50 are used only to provide sealing current. To run sealing current, a 48V battery is connected between pins 25 and 50.

Figure B-14. SDSL 50-pin telco-to-dual-DB-37 cable

Both ends above have same pinouts:

P1-1   P1-19

P1-20   P1-37

J1-1

Safety-Related Electrical, Physical, and Environmental Information

Caution: The *Edge Access Safety and Compliance Guide* contains comprehensive safety instructions and country-specific information. Be sure to read the safety instructions in that guide before installing your MAX TNT unit.
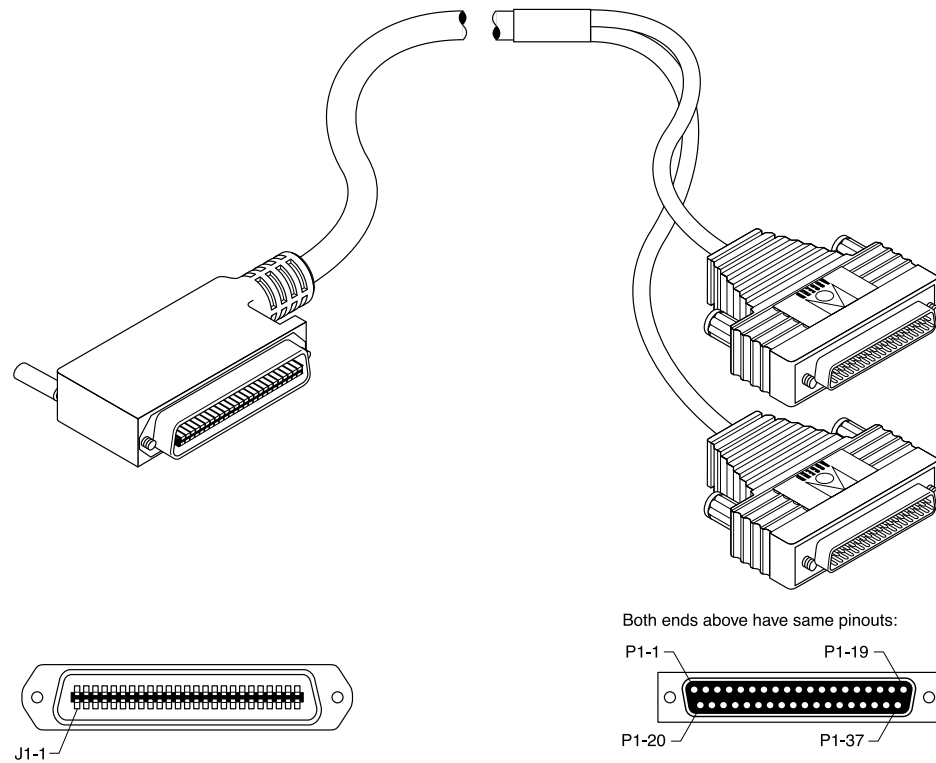
Electronic and electrical specifications

Battery

The MAX TNT shelf controller contains an internal 3V lithium battery. The normal operating life of this battery exceeds five years.

Make sure that only trained engineers authorized by Lucent open the MAX TNT shelf controller for testing, maintenance, installation, or any other purpose. Furthermore, ensure that only trained personnel replace MAX TNT components.

Warning: The battery can explode if incorrectly replaced. Replace the battery only with one of the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Electrical requirements

Table C-1 lists the MAX TNT electrical requirements.

Table C-1. MAX TNT electrical requirements

Element	Value
Voltage	Ac: 90–240Vac (50/60 Hz, single phase) Dc: -40 to -60Vdc
Current	Ac: 16A (per power supply and system) Dc: 25A (per power supply and system)
Input Protection	Ac: 20A/250Vac (internal power supply fuse, not user accessible) Dc: 40A (circuit breaker)

Because the MAX TNT configuration profiles are stored in NVRAM, they are not lost when the unit is turned off.

Note: Use a protected ac power source, or add surge protection between the power source and the unit.

Ground wire size

Table C-2 lists the ground wire specifications for MAX TNT units.

Table C-2. Ground wire size

Product	AWG Size	Cross-sectional area (mm^2)
MAX TNT (ac)	14	2.5
MAX TNT (dc)	10	4.0

Governmental notices

Information about governmental notices required for the United States (U.S. FCC Part 68 Notice, FCC Part 68 Notice), Canada, the European Union, Australia and New Zealand, and Japan, can be found in the *Edge Access Safety and Compliance Guide*.

USOC jacks and codes

A MAX TNT unit uses the following USOC jacks and codes:

Facility Interface Code	Service Order Code	Jack Type
04DU9-BN	6.0N	RJ-48C
04DU9-DN	6.0N	RJ-48C
04DU9-1KN	6.0N	RJ-48C
04DU9-1SN	6.0N	RJ-48C
04DU9-1ZN	6.0N	RJ-48C

Alarm-relay operating specifications

MAX TNT units are equipped with an alarm relay whose contacts are brought out onto the back panel's alarm-relay terminal block. The alarm-relay contacts close during loss of power, during hardware failure, or whenever the unit is being reset, such as during its power-on self test (POST). During normal operation, the alarm-relay contacts remain open.

The gauge of the wire you use to connect to the unit's alarm relay must be based on the current flow of the circuit that the relay is attached to and the capacity of the alarm relay. Because the unit's alarm relay can carry a maximum of 2A, 18–20 AWG wire is adequate.

The alarm relay has the following characteristics:
- 1A at 30Vdc
- 0.3A at 110Vdc
- 0.3A at 125Vac

Physical specifications

A MAX TNT base system (empty with no power supplies) weighs 27.2 pounds (12.34kg). A fully loaded system with 672 modems (single power supply) weighs 130 pounds (58.97kg). The unit has the following dimensions: 14 inches x 17.4 inches x 11.5 inches (35.6cm x 44.2cm x 29.2cm).

Environmental specifications

For best results, house the MAX TNT unit in a room with constant temperature and humidity. In general, cooler environments are better. Humidity must be high enough to prevent accumulation of static electricity, but low enough to prevent condensation.

An operating temperature of 32° to 104° Fahrenheit (0° to 40° Celsius) is recommended. Storage temperatures of -40° to 176° Fahrenheit (-40° to 24° Celsius) are acceptable.

An operating relative humidity of up to 90% is acceptable.

You can operate the unit at altitudes of 0 to 14800 feet (0m to 4500m).

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