NBX® Installation Guide

Release 4.1

- **SuperStack 3 NBX**

- **NBX 100**

http://www.3com.com/

CONTENTS

2 INSTALLING SYSTEM HARDWARE COMPONENTS

3 **TELEPHONES AND ATTENDANT CONSOLES**

4 **ANALOG LINE CARDS**

5 **ANALOG DEVICES**

6 **BRI-ST DIGITAL LINE CARD**

7   E1 ISDN PRI DIGITAL LINE CARD

8   T1 DIGITAL LINE CARD

9   CONFIGURING IP TELEPHONY

10   TROUBLESHOOTING

A   SPECIFICATIONS

B   CIRCUIT PROVISIONING

C   GUIDELINES FOR CONNECTING REMOTE AUDIO DEVICES

INDEX

FCC CLASS A VERIFICATION STATEMENT

INDUSTRY CANADA NOTICE

3COM END USER SOFTWARE LICENSE AGREEMENT TERMS AND CONDITIONS AND LIMITED WARRANTY

ABOUT THIS GUIDE

This guide provides information and instructions for installing the SuperStack® 3 NBX® or the NBX® 100 Networked Telephony Solutions. It is intended for installation technicians.

> **i** *If the information in the release notes differs from the information in this guide, follow the instructions in the release notes. Release notes are available on the* NBX Resource Pack CD.

For information about monitoring, changing, and maintaining the system, see the *NBX Administrator's Guide*.

How to Use This Guide

Table 1 shows where to look for specific information in this guide.

Table 1   Overview of the Guide

If you are looking for	Turn to
An overview of the installation process, hardware components, and installation prerequisites	Chapter 1
How to install hardware components and telephone lines	Chapter 2
How to install Telephones and Attendant Consoles	Chapter 3
How to install Analog Line Cards	Chapter 4
How to install Analog Terminal Cards, Analog Terminal Adapters, and Analog Devices	Chapter 5
How to install BRI-ST Digital Line Cards	Chapter 6
How to install E1 Digital Line Cards	Chapter 7
How to install T1 Digital Line Cards	Chapter 8
How to configure IP telephony	Chapter 9
Troubleshooting information	Chapter 10
System and component specifications	Appendix A
ISDN BRI, ISDN PRI, and T1 circuit provisioning information	Appendix B

Table 1 Overview of the Guide (continued)

If you are looking for	Turn to
Guidelines for connecting remote audio devices	Appendix C
References to all topics in this book	Index
FCC, Industry Canada, and Warranty information	the last pages in this book

Conventions

Table 2 lists conventions that are used throughout this guide.

Table 2 Notice Icons

Icon	Notice Type	Description
$\boxed{i\!\!>}$	Information note	Information that describes important features or instructions
$\bigtriangleup\!\!!$	Caution	Information that alerts you to potential loss of data or potential damage to an application, device, system, or network
$\bigtriangleup\!\!\!\frac{1}{4}$	Warning	Information that alerts you to potential personal injury

International Terminology

Table 3 lists the United States and international equivalents of some of the specialized terms used in the NBX documentation.

Table 3 International Terminology

Term in U.S. English	Term Outside the U.S.
Toll restrictions	Call barring
Pound key (#)	Hash key (#)
CO (central office)	Telephone Exchange
Adjunct	Additional add-on module
Toll-free	Free-phone
Analog Line Card	Analog Trunk Line Interface Module

Documentation	This documentation is designed to help NBX system installers, administrators, and phone users to learn, use, and maintain the NBX 100 system and the NBX SuperStack 3 system.

Your Comments

Your suggestions are important to us because we want to make our documentation more useful to you.

Please send e-mail comments about this guide or any of the NBX documentation and Help systems to:

`NBX_Techpubs_comments@3com.com`

Please include the following information with your comments:

- Document title
- Document part number (found on the front page)
- Page number
- Your name and organization (optional)

Example: *NBX Installation Guide*
Part Number 900-0094-01
Page 25

As always, please address all questions regarding the NBX hardware and software with your 3Com NBX Voice Authorized Partner.
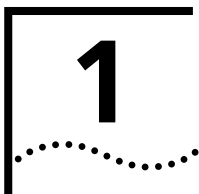
1 **INTRODUCTION**

The NBX® Networked Telephony Solutions contain these components:

- One Call Processor (either the SuperStack 3 NBX Call Processor, or the NBX 100 Call Processor)
- One chassis (either the NBX Gateway Chassis, which can house up to 4 cards, or the first NBX 100 Chassis, which can house up to 5 cards).
- Optionally, one or more additional chassis (either the NBX Gateway Chassis, which can house up to 4 cards each, or the NBX 100 Chassis, which can house up to 6 cards each). One of the cards in an NBX 100 expansion chassis must be a Hub card. If you use the NBX Gateway chassis, no Hub card is required because the chassis has its own Ethernet connector.
- One or more NBX telephones (either Business Telephones or Basic Telephones) and analog devices such as fax machines
- Optionally, one or two NBX 1105 Attendant Consoles

This chapter covers the following topics:

- [Overview of NBX Hardware Components](#)
- [Overview of Application Software](#)

See the *NBX Administrator's Guide* for information about configuring the Dial Plan and maintaining the 3Com NBX Communications System.

> *Before you install any Analog Line Cards or Digital Line Cards, you may want to configure the Dial Prefix settings. For information on this topic, please refer to "Dial Prefix Settings" in the* Administrator's Guide *or the Help (Dial Plan > Operations > Dial Prefix Settings).*

| **Overview of NBX Hardware Components** | An NBX Networked Telephony Solution comprises a Call Processor, a chassis with removable cards, one or more NBX Business Telephones or NBX Basic Telephones, and the Attendant Console. |

$\boxed{\mathbf{i}}$ *This section lists all cards that can be used with the NBX system. Not all cards may be available in every region.*

| **SuperStack 3 NBX Call Processor** | The heart of the 3Com SuperStack 3 system is the rack-mountable SuperStack 3 NBX Call Processor (Figure 1), which houses a nonremovable network call processor board. You must have one and only one call processor per NBX network. |

The SuperStack 3 NBX Call Processor, which fits into a standard 19-inch equipment rack:

- Manages call traffic, voice mail, and the Automated Attendant
- Supports the Telephony Application Programming Interface (TAPI) 2.X for Computer Telephony Integration (CTI) applications
- Includes an Internet Message Access Protocol (IMAP4) message server for integration of voice mail and e-mail and a web server to support web-based system administration
- Contains the system power supplies, cooling fans, and one or two disk drives.

$\boxed{\mathbf{i}}$ *Because the SuperStack 3 NBX processor board is not removable, it cannot be serviced in the field. You must return the entire unit for service.*

The SuperStack 3 NBX Call Processor is available in the following base models:

- With a single power supply and licensed for 250 devices
- With redundant power supplies and licensed for 250 devices

$\triangle$ *CAUTION: Each of the two power supply units in the redundant model has its own overcurrent protection device. That is, the overcurrent device for one power supply does not protect the second power supply.*

The SuperStack 3 NBX Call Processor can be licensed for up to 1500 devices. See "System Configuration Guidelines" later in this chapter for more information on the total number of supported devices.

The SuperStack 3 NBX Call Processor supports all existing NBX line cards. See "NBX Gateway Chassis and Cards" later in this chapter for additional details.

Figure 1   Front Panel of the SuperStack 3 NBX Call Processor
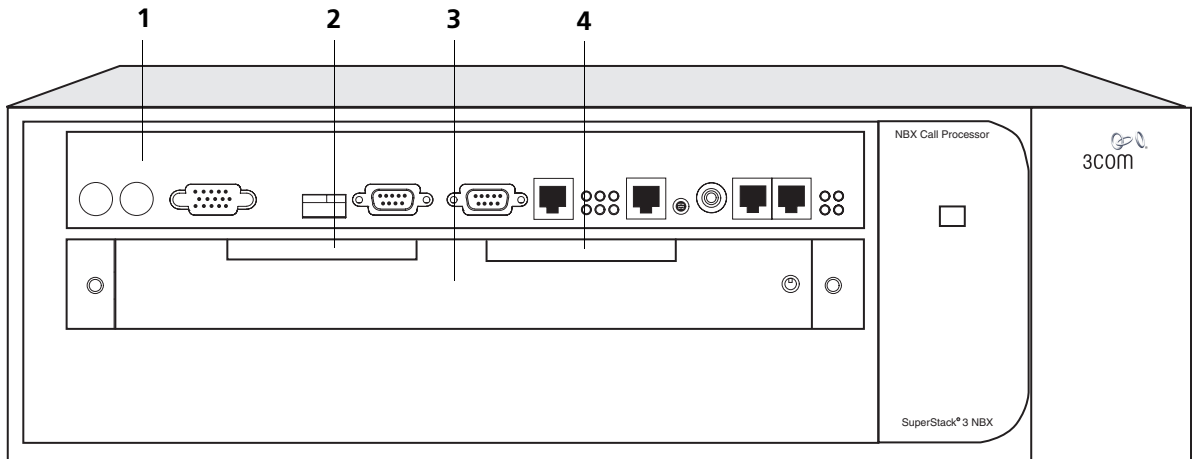
1	NCP Board	Nonremovable Call Processor with connections and ports
2	Disk Drive Number 1	By default, the Primary Drive
3	Disk Drive Tray	Shipped with the primary drive installed on the left
4	Disk Drive Number 2	Position of the optional secondary disk drive

The front panel of the SuperStack 3 NBX Call Processor (Figure 1) has the following status lights (LEDs) and connectors:

- **Keypad Connector** — Reserved for future use.

- **Mouse Connector** — Reserved for future use.

- **Video Connector** — Reserved for future use.

- **USB Connector** — Reserved for future use.

- **COM1** — COM1 provides a DTE (Data Terminating Equipment) connection for use with a VT100-compatible control terminal.

- **COM2** — Reserved for future use.

- **Ethernet 1 Port (RJ45 10/100 Mbps)** — This port can operate at either 10 Mbps or 100 Mbps. It is normally active and is used to connect the SuperStack 3 NBX Call Processor to your network.

- **Ethernet 2 Port (RJ45 10/100 Mbps)** — This port can operate at either 10 Mbps or 100 Mbps. It is normally inactive and becomes active only if the Ethernet 1 connector experiences a link failure. This port is used to connect the SuperStack 3 to your network, usually through a different switch than Ethernet port 1, in order to provide a fail-over or backup connection for the Ethernet 1 port.

⚠ *CAUTION: Do not use the Ethernet 2 connector to connect your administration computer. The Ethernet 2 connector is inactive unless the Ethernet 1 connector experiences a link failure.*

- **Ethernet Activity Indicators (LEDs)**
- **MOH (music-on-hold) Connector** — This mini-jack (mono or stereo) accepts music-on-hold audio from the line output of a CD player, tape player, or other music source.
- **Volume Control** — This adjusting screw controls the volume of the Music On Hold (MOH).
- **External Paging Connector** — This RJ-11 connector provides an audio output or a dry contact switch connection for use with a public address system.
- **External Alert Connector (RJ11)** — Reserved for future use.

Status Lights (LEDs) — These status lights indicate power, initialization, system status, and drive activity. See Figure 24 in Chapter 2 for details.

NBX 100 Chassis   The rack-mountable or wall-mountable NBX 100 chassis holds the system power supply, disk drive, cooling fans, and removable cards. All controls and connections are on the front of the chassis.

The chassis fits into a standard 19-inch equipment rack, or it can be wall-mounted or placed on a table.

An NBX 100 system can have one or more chassis. The number depends on how many external telephone lines the system must support and the equipment that you choose for attaching telephones.

Figure 2 NBX 100 Chassis
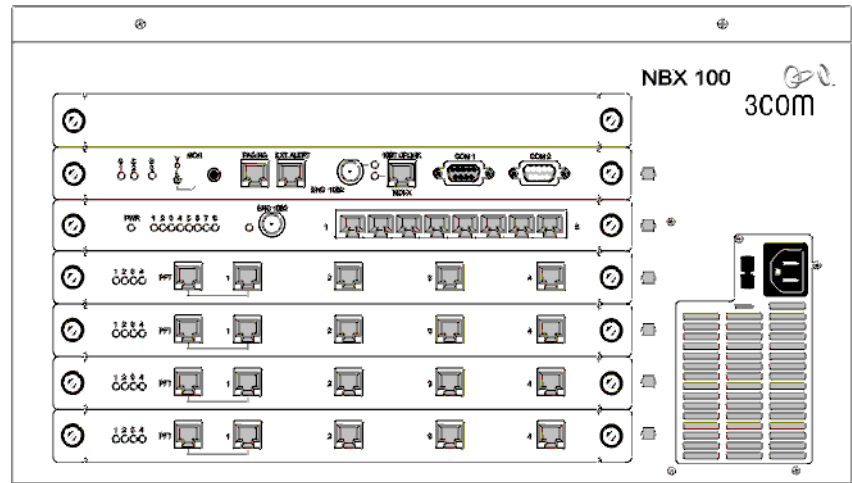
Up to six cards slide into the front of the chassis. (The top slot has no access to the backplane. Always cover the top slot with a blank faceplate.) An internal backplane connects the cards to each other.

NBX 100 Call Processor

The top active slot in the first NBX 100 chassis holds the NBX 100 Call Processor, which:

- Manages call traffic, voice mail, and the Automated Attendant.
- Supports the Telephony Application Programming Interface (TAPI) 2.X for Computer Telephony Integration (CTI) applications.
- Includes an Internet Messaging Access Protocol 4 (IMAP4) message server for integration of voice mail and e-mail and a web server to support web-based system administration.
- Contains a power supply, cooling fans, and the system disk drive.
- Supports all NBX line cards.

You must have one and only one Call Processor per system.

Figure 3 NBX 100 Call Processor
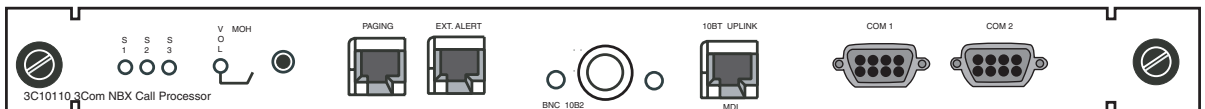
The NBX 100 Call Processor has the following status lights and connectors:

- **Status Lights** — The three status lights (S1, S2, and S3) indicate:

  S1 and S2 — Indicate operating system status.

  If both S1 and S2 flash (approximately 2 flashes per second), the hardware is initializing.

  If S1 is on and S2 is off, the operating system software has started successfully.

  If S1 and S2 are both on, the operating system software has not started successfully.

  S3 — Indicates the status of music on hold (MOH).

  If S3 is flashing (approximately 2 flashes per second), the music on hold processor is initializing. If this flashing continues for more than 2 minutes, the processor has not started successfully.

  If S3 is on, the MOH processor has started successfully.

  If S3 is flashing slowly (approximately 1 second on and 1 second off), the MOH processor has started successfully, but no music source is connected.

- **VOL - MOH** — This mini-jack (mono or stereo) accepts Music-On-Hold audio from the line-output of a CD player, tape player, or other music source. The adjusting screw next to the jack controls the MOH volume.

- **PAGING** — This RJ11 connector provides an audio output or a dry contact switch connection for use with a public address system.

- **EXT ALERT** — This RJ11 connector is reserved for future use.

- **BNC 10B2** and **10BT UPLINK MDI** — These connectors provide alternative means for connecting to an Ethernet hub.

These are two alternative connections for a single port. They cannot be used simultaneously.

If you use the Uplink connector, be sure to program the switch or router on the other end for 10BASE-T half-duplex operation.

- **COM1** — The COM1 connector provides a DTE (Data Terminal Exchange) connection for use with a VT100-compatible control terminal. This connection provides command line access to the Call Processor's operating system and diagnostic commands.

- **COM2** — Reserved for future use.

Supported Connections   Table 4 summarizes the connections on the SuperStack 3 NBX Call Processor.

Table 5 summarizes the connections on the NBX 100 Call Processor.

Table 4   Connections on the SuperStack 3 NBX Call Processor

Physical Connectors	Card Connections	Uplinks
Telephony adjuncts ■ Paging ■ Music on Hold	■ 4-port Analog Line Card (TLIM) ■ T1, E1, and BRI-ST NBX Digital Line Cards ■ 4-Port NBX Analog Terminal Card ■ NBX Single-Port Analog Adapter ■ NBX 10BASE-T Hub Card ■ NBX Telephones: — NBX Model 1102 Business Telephone — NBX Model 2102 Business Telephone — NBX Model 2102-IR Business Telephone with infrared port — NBX Model 2101 Basic Telephone ■ NBX 1105 Attendant Console	■ Dual, redundant 10/100 switched Ethernet ports. Ethernet port 2 is normally inactive (used as a fail-over port for Ethernet port 1). ■ Dual RJ-45 MDI straight-through terminations

Table 5   Connections on the NBX 100 Call Processor

Physical Connectors	Card Connections	Uplinks
Telephony adjuncts ■ Paging ■ Music on Hold	■ 4-port Analog Line Card (TLIM) ■ T1, E1, and BRI-ST NBX Digital Line Cards ■ 4-Port NBX Analog Terminal Card ■ NBX Single-Port Analog Adapter ■ NBX 10BASE-T Hub Card ■ NBX Business Telephones: — NBX Model 1102 Business Telephone — NBX Model 2202 Business Telephone — NBX Model 2202-IR Business Telephone with infrared port — NBX Model 2101 Basic Telephone ■ NBX 1105 Attendant Console	■ 10BASE-T RJ45 connector ■ 10BASE-T BNC connector

System Configuration Guidelines	When you configure an SuperStack 3 NBX system or an NBX 100 system, the number of devices that you can include is governed by three kinds of limits:

- **Total** device limits per system
- **Individual** device limits on certain devices
- **Licensed** device limits on certain devices

Total Device Limits on the NBX System	Each NBX system is shipped with a total-device-limit license that controls the total number of devices that you can configure on the system:

- **Total on the NBX 100** — 200 devices (factory default and maximum device limit)

  For support above 200 devices, purchase a SuperStack 3 NBX Call Processor.

- **Total on the SuperStack 3 NBX** — 250 devices (factory default)

  To add more devices to a 250-device SuperStack 3 NBX system, you can purchase additional licenses in 125-device or 250-device increments, up to a maximum of 1500 devices. (For the current device and license configuration on your system, see **NBX NetSet > Operations > Licenses** as well as the **Usage Report** accessible from the Licenses screen.)

*CAUTION: Your configuration must conform to **all** of these limits:*

- *The limit imposed by the total system license (explained next)*
- *The individual limits on the number of devices of each type (explained later in this topic)*
- *The license requirements for some hardware and software*

What Counts Toward the Total Device Limit?

The NBX systems count many physical devices and certain software applications as devices toward the total device limit:

- **Physical Devices** — Each NBX telephone, each channel on a Digital Line Card, and each port on an Analog Line Card counts as one device. Additional physical device limits are listed in the table later in this topic.

- **Software "Devices" (Applications)** — The NBX Media Driver application counts as one device. Each installation (client) of the pcXset Soft Telephone application counts as one device.

What Does NOT Count Toward the Total Device Limit?

The NBX systems do not count most applications toward the total device limit, although some may be governed by license limits. Examples: voice mail ports, automated attendant ports, Call Park zones, System Speed Dials, and any other item with "None" in the second column in the table later in this topic.

Individual Device Limits   Certain individual device types are limited to a maximum per system because of internal product rules. For example, the NBX Analog Line Card has 4 ports. Although each of these ports counts as a device, the NBX SuperStack 3 system architecture limits the system to 180 cards, and thus 720 (not 1500) ports.

Individual device limits are listed in the table later in this topic.

Licensed Device Limits   Certain individual devices and applications have count limits that are governed by licenses. (See the 3Com Price List or your 3Com NBX Voice-Authorized Partner for details on available incremental licences.)

Example: You can install a license for 2 Virtual Tie Lines (VTLs), and then add incremental 2-unit licenses up to a limit of 8 VTLs on an NBX 100 system or up to 48 VTLs on a SuperStack 3 NBX system.

How These Three Limit Types Interact   As you add devices to an NBX system, you must keep in mind **all three** of these limitations:

- **Total** device limit for the system
- **Individual** device limit for certain device types
- **License** limit for certain device types

Example: Your SuperStack 3 NBX system has a license for 750 total devices and you want to configure 450 telephones:

■ You configure six 4-port NBX Analog Line Cards, and twelve 4-port NBX Analog Terminal Cards (for analog telephones and FAX machines).

   The total device count is now (6 x 4) + (12 x 4) = 72.

■ You then configure 450 NBX telephones.

   The total device count is now 522. You can configure 228 additional devices (750 - 522).

■ You want to configure 200 Attendant Consoles, but, because the individual device limit for Attendant Consoles is 100, you can configure only 100 of them.

   The total device count is now 622. You can configure 128 additional devices (750 - 622).

■ You want to add Virtual Tie Lines (VTLs), but you can add only 48 because that is the maximum license level available for VTLs.

   Because VTLs do not count toward the device limit, the total device count remains at 622. So, after you add 48 VTLs, you can still configure up to 128 additional devices.

Table of Maximum Device Counts   This table lists each NBX device and application, with information on whether it counts toward the total device count and the maximum number allowed per NBX system.

For the current device and license configuration on your system, see **NBX NetSet > Operations > Licenses** as well as the **Usage Report** accessible from the Licenses screen. See the 3Com Price List or your 3Com NBX Voice-Authorized Partner for details on available incremental licences.

Table 6 Supported Features on the SuperStack 3 NBX and NBX 100 Call Processors

	Per-Unit Device Count Toward Total System Count	Maximum Number Per SuperStack 3 System	Maximum. Number Per NBX 100 System
System Device Capacity			
NBX 1102 Business Telephone	1	1500	200
NBX 2101 Basic Telephone	1	1500	200
NBX 2102 Business Telephone	1	1500	200
NBX 2102-IR Business Telephone	1	1500	200
NBX 1105 Attendant Console	1	100	50
pcXset Soft Telephone	1 per pcXset PC telephone client	1500	200
NBX Media Driver (for WAV devices)	1 driver per system, which enables up to the maximum allowable number of WAV devices	1500	200
Polycom IP 3000 Speaker Telephone	1	93 cards (1488 ports)	12 cards (192 channels)
CITELlink Handset Gateway card	16 per card	1500	200
4-Port NBX Analog Terminal Card (ATC)	4 per card	375 cards (1500 ports)	50 cards (200 ports)
	CAUTION: SuperStack 3 NBX: If you are using the 3Com SuperStack II ARPS (Advanced Redundant Power Supply) as a backup power supply for the NBX Gateway Chassis, you are limited to two ATC cards of version 3C10117 or 3C10117B per NBX Gateway Chassis. (Version 3C10117C is not restricted in this way.)		
ATA (NBX Single-port Analog Terminal Adapter)	1	1500	200
4-Port NBX Analog Line Card	4 per card	180 cards (720 ports)	25 cards (100 ports)
T1 Card (DS1)	24 per card	30 cards (720 channels)	3 cards (72 channels)
T1 Card (ISDN PRI)	23 per card	31 cards (713 channels)	3 cards (69 channels)
E1 Card (ISDN PRI)	30 per card	24 cards (720 channels)	3 cards (90 channels)
ISDN BRI-ST card	8 per card	90 cards (720 channels)	12 cards (96 channels)
System Architecture Attributes			
Virtual Tie Lines	None	48	8
ConneXtions (H323) ports	None	100	16
Application and Call Processing Attributes			
Auto Attendants	None	99	99

Table 6 Supported Features on the SuperStack 3 NBX and NBX 100 Call Processors (continued)

	Per-Unit Device Count Toward Total System Count	Maximum Number Per SuperStack 3 System	Maximum. Number Per NBX 100 System
Voice Mail Ports (simultaneous)	None	72	12
Voice Mailboxes	None	1500	200
Phantom Mailboxes	None	1000	150
Call Park Zones	None	100	9 with the default 3-digit dial plan; up to 100 if you modify the dial plan.
Call Pickup	None	100	32
Conference Calls (simultaneous)	None	12	4
Directed Pickup	None	50	10
Group Pickup	None	50	32
Hunt Groups or Calling Groups	None	100	48
Music On Hold	None	1	1
Paging	None	3	3
System Speed Dials	None	100	100
Personal Speed Dials	None	99	99
Call Detail Reporting	None	1	1
Call Record and Monitor	None	1	1

NBX Gateway Chassis and Cards

The NBX Gateway Chassis (Figure 3) contains four universal card slots and a built-in RPS connector for an optional Redundant Power Supply (see "Redundant Power Supply" in the next section). You can use the following cards in the NBX Gateway Chassis:

- NBX 4-port Analog Line Card

- T1 and E1 NBX Digital Line Cards

- NBX ISDN BRI-ST Card

- NBX 4-Port Analog Terminal Card (limit of 2 ATCs (either 3C10117 or 3C10117A) per chassis if you are using the 3Com SuperStack II ARPS (Advanced Redundant Power Source) as a backup power supply for the NBX Gateway Chassis). This restriction does not apply to the 3C10117C 4-Port Analog Terminal Card.

Figure 4 NBX Gateway Chassis (Front)
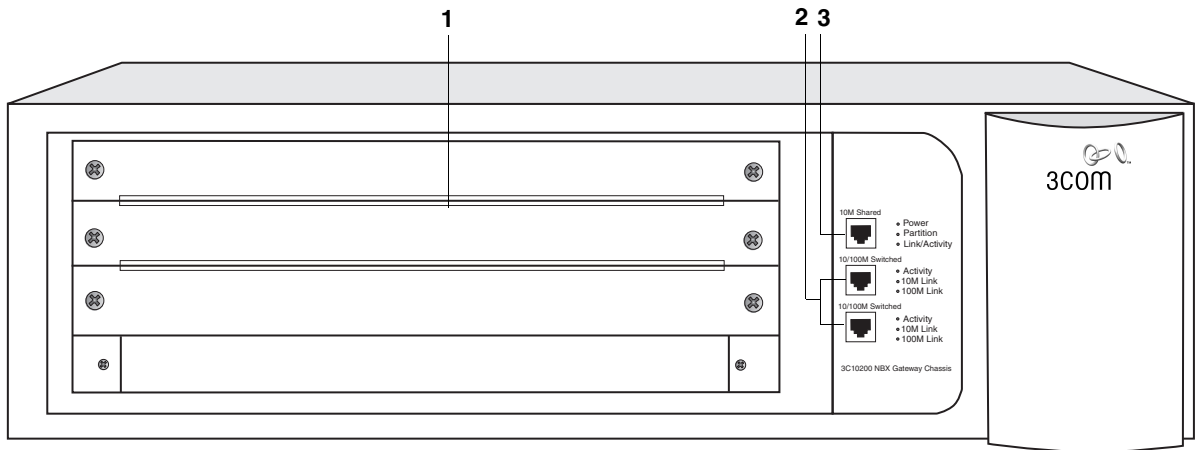
1	**4-slot chassis**	As shipped from the factory, the top three slots are covered with blank faceplates; the bottom slot is open
2	**10/100 Mbps switched Ethernet connection**	Two redundant uplink ports. The upper port is normally active. The lower port is active only if the upper port experiences a link failure.
3	**10 Mbps shared Ethernet connection**	One port

A single SuperStack 3 NBX Call Processor can support up to 25 NBX Gateway Chassis. Use the upper 10/100 uplink port on each Gateway Chassis to connect to the LAN. The lower port is normally inactive and becomes active only if the upper port experiences a link failure. You must use straight through Ethernet cable connections; you cannot use MDI/MDIX connections.

Redundant Power Supply

You can attach a redundant power supply to the RPS connector on the back of the NBX Gateway Chassis. Table 7 describes the items you need to purchase, assemble, and connect to the chassis. See your authorized 3Com NBX Voice Authorized Partner for purchasing details.

Table 7 Items in the Redundant Power Supply

Order Number	**Description**	**Quantity**
3C16071B	SuperStack II ARPS Chassis	1
3C16074A	Type 2A, 100W Power Module (NLP100-9640)	2

Table 7   Items in the Redundant Power Supply

Order Number	Description	Quantity
3C16078	Type 2 "Y" Cable	1

To connect the redundant power supply to the NBX Gateway chassis:

1 Assemble the redundant power supply according to the instructions in the SuperStack 3 ARPS documentation.

2 Attach the "Y" cable to the RPS connector on the back of the NBX Gateway Chassis.

3 Connect the SuperStack 3 ARPS chassis to a source of AC power.

⚠️ *CAUTION: If you are using the 3Com SuperStack II ARPS (Advanced Redundant Power Source) as a backup power supply for the NBX Gateway Chassis, you can have no more than 2 Analog Terminal Cards (either 3C10117 or 3C10117A) per NBX Gateway Chassis. This restriction does not apply to the 3C10117C 4-Port Analog Terminal Card.*

Single-Port Analog Terminal Adapter   The Single-Port Analog Terminal Adapter (ATA) is a small desktop box that provides single port for connecting an analog telephone or fax machine to an NBX system. You connect the analog device to the ATA using the port with the telephone icon. The ATA can connect to any Ethernet port including the computer port on an NBX Business Telephone.

Figure 5   Single-Port Analog Terminal Adapter — Front View
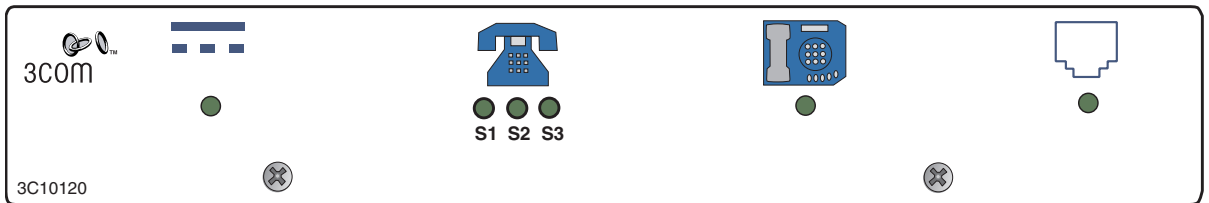
Figure 6   Single-Port Analog Terminal Adapter — Rear View
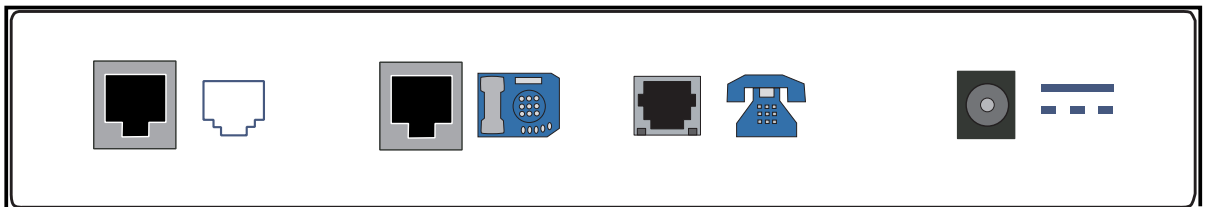
The Single-Port Analog Terminal Adapter has these lights and connectors:

- **Analog Port Status Lights (S1, S2, S3)** — The lights below the icon for the analog telephone indicate the status of the Analog Port. S3 turns on when the analog telephone is in use. S2 blinks briefly every two seconds when an analog telephone is connected to the ATA. If no analog telephone is connected, S2 is always off. S1 is reserved for future use.

- **Single Status Lights** — The lights located below the icons for the power connector, the Ethernet MDI port, and the Ethernet MIDI-X port indicate the status of the related port.

- **Analog Port** — A connection for an analog telephone or fax machine.

- **Ethernet MDI-X Port** — Provides a cross-over connection to the same network as the NBX system.

- **Ethernet MDI Port** — Provides a straight-through connection to the same network as the NBX system.

> **i** *The Single-Port Analog Terminal Adapter may require a telephone connector for use outside North America. The part number is 3C10120-xx, where xx is the country code. Contact your 3Com NBX Voice Authorized Partner for country-specific requirements.*

4-Port Analog Terminal Card

Each 4-Port Analog Terminal Card allows ordinary analog (2500-series compliant) telephones, cordless telephones and Group-3 fax machines, to operate with NBX systems. The SuperStack 3 NBX system supports up to 375 4-Port Analog Terminal Cards, for a total of 1500 devices. The NBX 100 system supports up to eight 4-Port Analog Terminal Cards, for a total of 32 devices.

> ⚠ **CAUTION:** *If you are using a 3Com SuperStack II ARPS (Advanced Redundant Power Supply) as a backup power supply for the Gateway chassis, you must not configure more than two Analog Terminal Cards (3C10117) in any one SuperStack 3 Gateway chassis. Version 3C10117C is not restricted in this way.*

When a 4-Port Analog Terminal Card senses that a port is being used for fax transmission, it switches that port to *reliable* mode. Unlike normal voice transfers, which drop packets when they encounter congestion, reliable mode transmissions take as much time as needed to ensure that there are no lost packets. Reliable mode also uses twice the bandwidth.

Figure 7 NBX 4-Port Analog Terminal Card (3C10117)
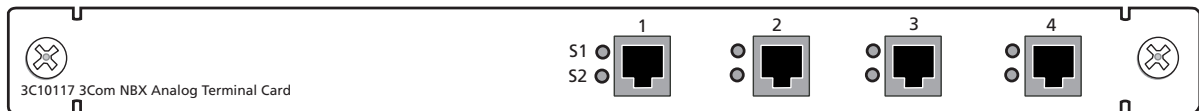
Each 4-Port Analog Terminal Card (3C10117) has the following lights and connectors:

- **Ports** — Four RJ11 ports, numbered 1 through 4.

- **Status Lights (S1 and S2)** — The S1 light indicates the status of each port. S1 is on when the attached device is off hook. S1 is off when the attached device is on hook. When S2 is on, there is a call connected on this port.

> **i** *If you upgrade your NBX system to release R4.1, the behavior of the status lights on the 3C10117 board changes. S1 behaves in the same way*

as the single status light on the 3C10117C board (as discussed in the next section). S2 is unused.

Figure 8   NBX 4-Port Analog Terminal Card (3C10117C)
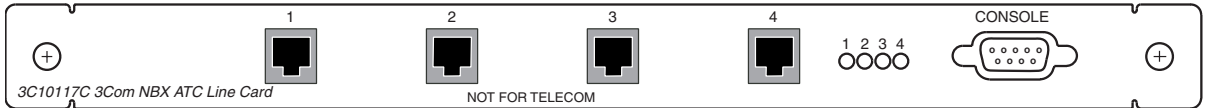
Each 4-Port Analog Terminal Card (3C10117C) has the following connectors and lights:

- **Console Connector** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

- **Analog Connectors (1 through 4)** — Four connectors enable you to connect analog devices to the NBX system.

- **Status Lights (1 through 4)** — Each light indicates the status of the associated port.

  Initialization:

  - **Fast steady blink** – Waiting for software download.

  - **Solid on** – Software has been downloaded. The flash memory on the board is being loaded.

  - **Slow, non-symmetric blinking pattern** – Waiting for the completion of the binding process to the call processor.

  Operation:

  - **Off for 9 to 10 seconds, on briefly** – Idle, telephone is on hook.

  - **On for 9 to 10 seconds, off briefly** – Idle, telephone is off hook.

4-Port Analog Line Card

The NBX 4-Port Analog Line Card connects up to four analog telephone lines to the NBX system. The SuperStack 3 NBX system can support up to 180 line cards (720 CO telephone lines) using multiple NBX Gateway chassis. The NBX 100 system can support up to 25 line cards (100 CO telephone lines) using multiple NBX 100 chassis. See for information on how to connect multiple NBX 100 chassis together using Hub cards.

Figure 9 NBX 4-Port Analog Line Card (3C10114)

Each 4-Port Line Card (3C10114) contains the following lights and connectors:

- **Status Lights (labeled 1 through 4)** — These lights show the status of each line.

  Initialization:

  - **All four lights flash in unison** – Hardware is initializing.
  - **A light flashes on twice, off for 2 seconds** – Associated port has been initialized successfully.

  Operation:

  - **Off for 9 to 10 seconds, on briefly** – Idle, the line is not in use.
  - **On for 9 to 10 seconds, off briefly** – A telephone call is connected on this port.

> **i** *If you upgrade your NBX system to release R4.1, the behavior of the status lights on the 3C10114 board changes (see the description of the 3C10114C status lights in the next section).*

- **PFT (Power Fail Transfer) Connector** — If a 4-Port Line Card loses power, its line connection for Port 1 switches to the PFT connector. You can then attach an analog telephone to maintain an outside connection (useful for emergency access). For international users, see "Power Fail Transfer" on page 45 for a feature limitation.

- **Analog Connectors (1 through 4)** — These connect analog telephone lines from the telephone company's central office (CO) switch to the NBX system.

Figure 10 NBX 4-Port Analog Line Card (3C10114C)
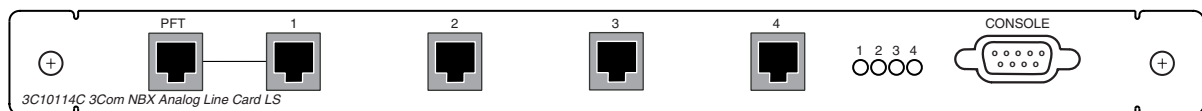
Each 4-Port Line Card (3C10114C) contains the following lights and connectors:

- **PFT (Power Fail Transfer) Connector** — If a 4-Port Analog Line Card loses power, its line connection for Port 1 switches to the PFT connector. You can then attach an analog telephone to maintain an outside connection (useful for emergency access). For international users, see "Power Fail Transfer" on page 45 for a feature limitation.

- **Analog Connectors (1 through 4)** — These connect analog telephone lines from the telephone company's central office (CO) switch to the NBX system.

- **Status Lights (1 through 4)** — These lights show the status of each analog telephone line.

  Initialization:

  - **Fast steady blink** – Waiting for software download.

  - **Solid on** – Software has been downloaded. The flash memory on the board is being loaded.

  - **Slow, non-symmetric blinking pattern** – Waiting for the completion of the binding process to the call processor.

  Operation:

  - **Off for 9 to 10 seconds, on briefly** – Idle, line is not in use.

  - **On for 9 to 10 seconds, off briefly** – Idle, line is in use.

- **Console Connector** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

T1 Digital Line Card The T1 Digital Line Card (Models 3C10116, 3C10116B, and 3C10126C) is an optional card that lets you connect a T1 line to the NBX system.

T1 Digital Line Cards can use DS1 signaling (sometimes referred to as Standard T1) or ISDN Primary Rate Interface (PRI) signaling.

The SuperStack 3 NBX system can accommodate up to 30 T1 Digital Line Cards (720 channels) if they are configured for DS1 operation, and 31 T1 Digital Line Cards (713 channels) if they are configured for ISDN PRI operation.

The NBX 100 system can accommodate up to 3 T1 Digital Line Cards (72 channels), if you connect them using MDI-X ports. If you connect a T1

Digital Line Card using the NBX 100 system backplane, the system can accommodate only one card.

An external Channel Service Unit (CSU) is required when using T1 Digital Line Cards.

i *By default, the NBX system autodiscovers a T1 Digital Line Card as DS1. You can then configure it for ISDN PRI operation if you want.*

When configured as standard T1 (DS1), the card supports in-band signaling of 24 DS0 (64 Kbps) "voice" channels and a variety of signaling types and protocols. The T1 carries data at a rate of 1.544 Mbps.

When configured as ISDN PRI, the T1 card supports 23 voice channels with PRI services such as Direct Inward Dialing (DID).

i *ISDN PRI services require specific circuit provisioning, which you must obtain before you can use the T1 card in PRI mode. See* Appendix B *for more information.*

i *If you are using the T1 Digital Line Card Model 3C10116, the NBX system must be running system software at Release 2.6 or higher. The Model 3C10116 is a manufacturing change only. It has no effect on quality or function.*

Figure 11 T1 Digital Line Card (Model 3C10116)

The T1 Digital Line Card has the following lights and connectors:

- **T1** — This RJ-48C connector makes a patch cord connection to a T1 interface (CSU/DSU).

- **Status Lights** — These lights indicate the status of the card's signaling, synchronization, and loop back test.

  - **CF** — When this light is on, it indicates a Carrier Failure. The T1 card is not receiving carrier signals from the far end of the T1 line.

  - **RA** — When this light is on, it indicates a Remote Alarm. The far (remote) end of the T1 line is not receiving appropriate signaling from the T1 board.

- **LB** — Indicates that loop-back testing is in progress.

- **Nominal** — Indicates that the T1 board is ready to send and receive information.

- **10BASE-T Uplink** — This RJ-45 Ethernet connector connects the T1 card to an external LAN hub. You can use this connector to isolate T1 traffic. If the T1 Digital Line Card is used in an NBX Gateway Chassis, you do not need to use this connector because the NBX Gateway chassis is connected to the LAN.

> *If you use the Uplink connector, be sure to program the switch or router on the other end for 10BASE-T half-duplex operation.*

- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

> ⚠ *CAUTION: You cannot operate this equipment when the main power fails.*

E1 Digital Line Card The E1 Digital Line Card, used outside of North America, provides E1 connectivity using the ISDN PRI protocol. It carries data at a rate of 2.048 Mbps and can carry 32 channels, each with 64 Kbps. Thirty of these channels are available for calls. Like the T1 ISDN PRI Card, the E1 PRI Card supports PRI software features such as DID.

> *ISDN PRI services require specific circuit provisioning, which you must obtain before using this card. See* Appendix B *for more information.*

Figure 12   E1 Digital Line Card
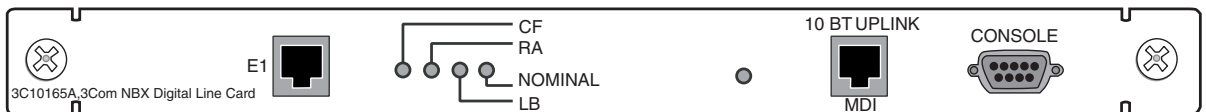
Each E1 card has the following lights and connectors:

- **E1** — This RJ-48C connector makes a connection to an ISDN interface channel service unit/data service unit (CSU/DSU).

- **Status Lights** — These lights indicate the status of the card's signaling, synchronization, and loop back test.

  - **CF** — When this light is on, it indicates a Carrier Failure. The E1 card is not receiving carrier signals from the far end of the E1 line.

- **RA** — When this light is on, it indicates a Remote Alarm. The far end of the E1 line is not receiving appropriate signaling from the E1 board.

- **LB** — Indicates that loop-back testing is going on.

- **Nominal** — Indicates that the T1 board is ready to send and receive information.

- **10BASE-T Uplink MDI** — This RJ-45 Ethernet connector connects the card to an external LAN hub. If the E1 Digital Line Card is used in an NBX Gateway Chassis, you do not need to use this connector because the NBX Gateway chassis is connected to the LAN.

> *If you use the Uplink connection, be sure to program the switch or router at the other end for 10BASE-T half-duplex operation.*

- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

> *If you require an alternative (bare wire-end) cable to use with the ISDN PRI Digital Line Card, contact a 3Com Customer Support representative.*

> *CAUTION: You cannot operate this equipment when the main power fails.*

BRI-ST Digital Line Card
The ISDN BRI-ST (Basic Rate Interface) Digital Line Card (Figure 13) has four separate ports, each of which accommodates two B channels and one D channel. Each B channel carries user data at 64 Kbps and the D channel operates at 16 Kbps. If the two B channels are bonded, the transmission rate is 128 Kbps.

Figure 13 BRI-ST Digital Line Card
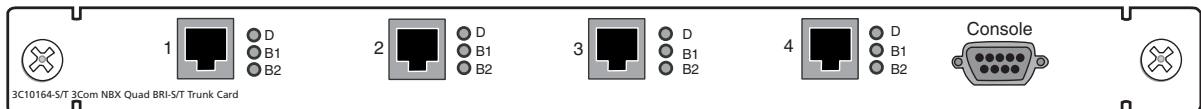
> *CAUTION: The BRI-ST and BRI-U Digital Line Cards are not approved for use in the United States or Canada.*

- **Status Lights** — Each port has three status lights (listed top to bottom) to indicate:

- **D** — Lights when this signaling channel is active.

- **B1** — Lights when this data channel is active (a call is in progress).

- **B2** — Lights when this data channel is active (a call is in progress).

- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

⚠️ *CAUTION: You cannot operate this equipment when the main power fails.*

8-Port Hub Card   The Hub card provides eight 10BASE-T Ethernet ports to connect NBX telephones (or other 10BASE-T devices) to the LAN. The card also has a 10BASE2 connection to allow you to connect to another hub or switch. (Cards within a single chassis have LAN connections to each other through the chassis backplane, so you do not need to connect them to a hub.) You can also use the 10BASE2 connection on the 8-port hub card to connect to another NBX 100 chassis.

ℹ️ *If you use the 10BASE2 connector, be sure to provide a 50 ohm terminator.*

Figure 14   NBX 8-Port Hub Card
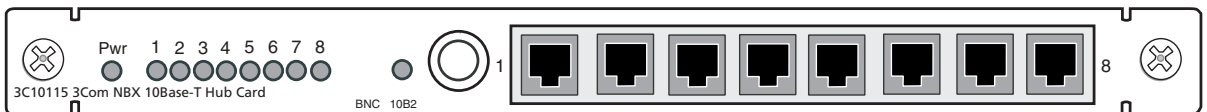
The NBX 8-Port Hub card contains the following status lights and connectors:

- **Status Lights (PWR and 1 through 8)** — These lights indicate the status of power to the hub and the status of the 8 10BASE-T ports.

- **BNC 10B2 (Coax) Connector** — This connects the NBX system to external hubs/switches.

- **Ethernet Hub Ports (8)** — These UTP RJ45 MDI-X ports connect devices to the LAN.

NBX Telephones   The three NBX Business Telephones (Models 1102, 2102, and 2102-IR) provide the familiar features of a business telephone and extra features such as one-touch access to voice mail. The Basic Telephone (Model 2101) provides a subset of the features found on an NBX Business Telephone.

The Programmable Access buttons on all Business Telephone models allow personal and system-wide settings. Three Programmable buttons on the Basic Telephone provide similar settings. The telephone features are described in detail in the *NBX Telephone Guide*.

⚠ **CAUTION:** *To avoid damage to the NBX telephone, do not connect it directly to a standard telephone line. Although the RJ11 connector for a traditional telephone fits into the NBX telephone's RJ45 jack, the electrical interfaces are not compatible and the telephone will not work.*

The Model 1102 Business Telephone (Figure 15) operates at 10 Mbps and contains a 10 Mbps Ethernet hub with two ports. One port of the hub connects the telephone to the LAN; the other port can be used to connect a computer to the LAN.

Figure 15 NBX Business Telephone (Model 1102)
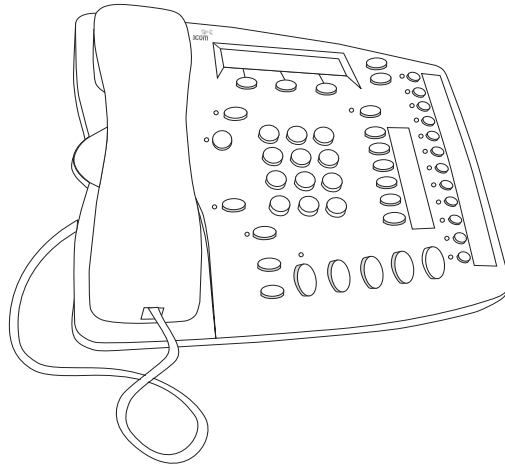
The Models 2102 and 2102-IR Business Telephones (Figure 16) operate at either 10 Mbps or 100 Mbps and contain a 10/100 Mbps switch with two ports. One port of the switch connects the telephone to the LAN and the other port can be used to connect a computer to the LAN. The 2102-IR Business Telephone has an infrared port that allows the user to exchange data between a Personal Digital Assistant device and the telephone.

Figure 16   NBX Business Telephone (Models 2102 and 2102-IR)
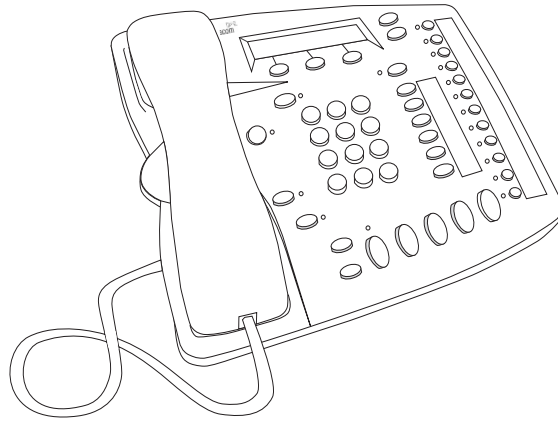
The Model 2101 Basic Telephone (<u>Figure 17</u>) operates at either 10 Mbps or 100 Mbps and contains a 10/100 Mbps switch with two ports. One port of the switch connects the telephone to the LAN and the other port can be used to connect a computer to the LAN.

CAUTION: *To avoid damage to the NBX telephone, do not connect an NBX telephone or Attendant Console directly to a standard telephone line. Although the RJ11 connector for a traditional telephone fits into the NBX telephone's RJ45 jack, the electrical interfaces are not compatible and the telephone will not work.*

Figure 17   NBX Basic Telephone (Model 2101)

Attendant Console   The Attendant Console (at right in Figure 18) provides attendant (receptionist) access and monitoring for up to 100 extensions.

⚠️   *CAUTION: To avoid damage to the NBX telephone, do not connect an NBX telephone or Attendant Console directly to a standard telephone line. Although the RJ11 connector for a traditional telephone fits into the NBX telephone's RJ45 jack, the electrical interfaces are not compatible and the telephone will not work.*

See the *NBX Telephone Guide* for details about the Attendant Console.

Figure 18 NBX Business Telephone (Model 2102) with Attendant Console
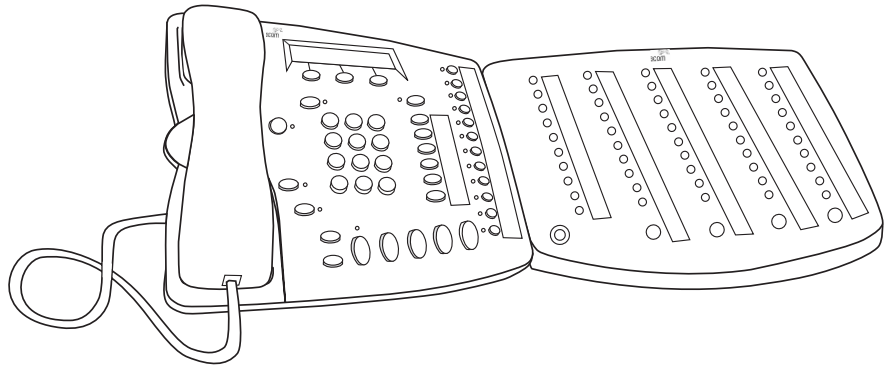
Overview of Application Software	Two applications, available on the Resource Pack CD, are counterparts to two NBX system hardware devices:

- The NBX Complement Attendant software runs on a PC and provides the functions of an Attendant Console station.

- The pcXset software also runs on a PC and provides most of the features of an NBX Business Telephone.

These software applications and documents are available on the *NBX Resource Pack CD*:

- Complement Attendant Software *

- pcXset *

- NBX Call Reports *

- NBX TAPI Service Provider (NBXTSP)

- Windows 95 Prerequisites (for NBXTSP only)

- NBX TAPI Dialer *

- Palm Dialer

- ConneXtions

- NBX Wave Telephone (now called the NBX Media Driver)

- 3Com Network Supervisor

- Adobe Acrobat

- Label Makers

- Microsoft Internet Explorer (versions 5.5 and 6.0) *

- Quick Reference Guides for the NBX Business Telephone, NBX Basic Telephone, and telephones connected to the NBX system through a port on the Analog Terminal Card or the Analog Terminal Adapter

Items in the Other Software *list marked with an asterisk (*) have been tested with Window XP Home Edition and Windows XP Professional Edition.*

2

INSTALLING SYSTEM HARDWARE COMPONENTS

This chapter provides information and instructions for installing standard and optional hardware components for the NBX® 100 and the SuperStack® 3 NBX Telephone Systems. It covers these topics:

- Introduction
- Installation Overview
- International Feature Support
- Installation Requirements
- Installation Questions
- Before You Begin Installation
- Important Safety Information
- Unpacking and Examining the Components
- Recording MAC Addresses
- Installing the NBX 100 Chassis
- Installing the SuperStack 3 NBX System
- Configuring NBX System Networking
- Connecting Cards and Devices
- Selecting Regional Software and Components
- Using Auto Discovery for Initial System Configuration
- Connecting Telephone Lines
- Adding External Hardware
- Configuring Routing Devices

Introduction

This guide uses the following definitions for administrators, users, and callers of the NBX system:

- **Administrator** — The person responsible for managing and maintaining the LAN. This person has "administrator" privileges on the system.

- **User** — A person with user login privileges on the system.

- **Caller** — A person calling into the system.

Before you begin to install the NBX system, perform these tasks:

- Complete a system plan
- Order telephone lines
- Optionally, develop a dial plan (if you choose not to use one of the provided NBX system default dial plans)

Completing a System Plan

Before you install the system, work with the client to develop a system plan using the *NBX System Planning Guide* (available on the *Resource Pack CD*). This guide enables you and the client to specify the system configuration that best meets the client's needs.

Ordering Telephone Lines

After you complete the system plan, have the client contact the local telephone service provider to order the necessary lines and services. If the client is ordering T1, E1, or BRI-ST lines, see Appendix B for additional information.

Developing a Dial Plan

The NBX system ships with several default Dial Plan configuration files, typically a 3-digit and a 4-digit file for each country. If one of the default dial plans does not meet the needs of the client site, you can either modify an existing plan or create a new plan. The new plan can be loaded on the system during the installation process, or you can develop and import a customized dial plan later.

See the *NBX Administrator's Guide* for complete information on developing and modifying a dial plan.

| **Installation Overview** | This section contains a list of general installation tasks. Many of the tasks include sub-tasks that are not listed in detail. One such task is hardware installation, which includes installing the disk drive and cards into the chassis. These tasks are described more fully in subsequent chapters. |

General installation tasks:

- Unpack and examine components.

- Read and follow the safety precautions. See "Important Safety Information" later in this chapter for detailed safety information.

- Read and follow the installation requirements. See "Installation Requirements" later in this chapter for more information.

- Record Media Access Control (MAC) addresses.

- Install the hardware components.

- Configure system-wide settings.

- Install and configure telephones.

- Configure 4-port Line Cards.

- Configure Digital Line Cards.

- Add external hardware, such as a music-on-hold (MOH) device.

International Feature Support

For international users, several features and devices warrant special attention, as described in this section.

Power Fail Transfer

For the Power Fail Transfer (PFT) feature, the first connector on the line card is available for power-fail situations only in North America.

⚠️ *CAUTION: Verify that you have access to a mobile or analog telephone, connected to your standard PSTN, in case of power failure.*

Analog Terminal Connectors

The Single-Port Analog Terminal Adapter and each port on the 4-Port Analog Terminal Card may require a telephone connector for use outside North America. The part number is 3C10120-xx, where xx is the country code. Contact your 3Com NBX Voice Authorized Partner for more information on country-specific requirements.

Power Line Kit (E-Brick)   The adapter (3C10125-*xx*) on the power line kit is provided with the relevant pins for the country of use.

Language Support   If your local language is not provided in the Voice Prompts, you may want to re-record your Automated Attendant's main menu and system-wide Time-dependent greetings. For information on how to modify an Automated Attendant, see the "Automated Attendant" section in Chapter 6, "NBX Messaging," in the *NBX Administrator's Guide*.

> *You can choose the language that you want to use on the system. This sets the system tones and cadences to those used by telephone companies in your country, sets the voice prompts to the language of your choice, and allows you to access some online user documentation in that language from the NBX NetSet utility. See the* NBX Administrator's Guide *for more details.*

Installation Requirements   Verify that you meet the prerequisites detailed in the following sections before you install the NBX system.

Electrical Requirements   Verify that the site meets the following electrical requirements.

- In North America, each NBX chassis requires a standard 110 VAC electrical connection.

- The NBX system should have its own breaker-protected circuit, which uses the standard, three-wire, grounded configuration.

- Verify that there are enough outlets and circuit capacity in the chosen location to supply power to the NBX chassis and any auxiliary equipment you install, such as a paging amplifier and an MOH device. The label on the side of the chassis lists the electrical requirements of the system.

- In North America, each NBX telephone needs a 110 VAC power outlet.

> *CAUTION: 3Com strongly recommends that you use UL listed surge suppression devices for the telephones and the local telephone lines and an uninterruptible power supply for each NBX chassis.*

Environmental Requirements

You can install the NBX system in any clean, dry, well-ventilated location. Take these environmental guidelines into consideration:

- The area must be safe from water damage. A wet basement, a utility closet, or an area near a window are not proper locations.

⚠️ *CAUTION: Do not use the NBX system outdoors.*

- The area must be safe from physical interference. For example, do not put the chassis where it might be struck by a swinging door or where cables might be pinched by a door or snagged by people passing by.

- Do not install the NBX system in an area that is exposed to strong electromagnetic fields, dust, smoke, or airborne debris.

- Verify that the installation site has sufficient cooling and air circulation to maintain ambient temperatures from 0 °C through 40 °C (32 °F through 104 °F) and a humidity range of 5% to 85%, noncondensing.

Physical Requirements

You can install an NBX 100 chassis in a standard equipment rack or mount the chassis on a wall. You can mount a SuperStack 3 NBX Call Processor or a SuperStack 3 NBX Chassis in an equipment rack. Verify that the site meets these physical requirements:

- The NBX system must be installed in a secure area. Telephone service and voice messaging are critical business services. Protect them from tampering or accidental interference.

- To rack-mount the either the NBX 100 system or the SuperStack 3 NBX system, you need a standard 486-mm (19-in.) equipment rack, properly installed and grounded per the manufacturer's instructions.

  The NBX 100 chassis requires six rack units, with 27 cm (10.5 in.) of vertical space and 23 cm (9 in.) of depth. All connections are on the front of the chassis.

  The SuperStack 3 Call Processor and the SuperStack 3 Gateway chassis each require 4 rack units, with 13.3 cm (5.25 in.) of vertical space and 30.5 cm (12 in.) of depth. All data connections are on the front of the chassis and power connections are on the back.

- If you wall-mount the NBX 100 chassis, it must be attached securely to a plywood mounting board that is firmly attached to the wall. The mounting location must be able to support at least 13.5 kg (30 lbs) per chassis. You cannot wall-mount a SuperStack 3 NBX Call Processor or a SuperStack 3 NBX Gateway chassis.

- Allow at least 8 cm (3 in.) of space on either side of the NBX chassis for proper ventilation. Read the CAUTION on the next page.

⚠️ *CAUTION: The chassis cooling fans expel warm air from the left side of the NBX 100 chassis and from the right side of the SuperStack 3 NBX chassis. If you are installing two or more NBX 100 chassis or two or more SuperStack 3 NBX chassis, do not mount them side by side because the warm air expelled from one unit is drawn into the second unit, reducing the effectiveness of the cooling system.*

Local Telephone Service

Before you install the NBX system, be sure that the client site meets the following local telephone service requirements:

- The client's local telephone company has installed local telephone lines and assigned telephone numbers.
- If necessary, you have extended the wires from a centrally located telephone interface panel to the installation site.
- Each analog telephone line has dial tone.

⚠️ *CAUTION: 3Com strongly recommend the use of surge suppression devices on all local telephone lines.*

- If you are installing an optional BRI-ST, T1, or E1 Digital Line Card, verify that the client's telephone company has installed BRI-ST, T1, or E1 lines and run them to the installation location.

Installation Questions

If you have not already planned the installation, the following topics may help you to understand the issues that you may encounter when you install the telephone system.

Who Should Install the NBX System?

A technician who understands Ethernet 10BASE-T and 100BASE-T cabling requirements and telephony configuration should install and configure the system. If you are using the optional IP capabilities of the NBX system, the technician also needs to understand IP, subnetworks, and DHCP (Dynamic Host Configuration Protocol).

After the initial installation, the local administrator should be able to install additional telephones and manage the system.

If the cabling scheme has not been designed and installed, you should consult a qualified network design engineer. Although it is not difficult to set up a small 10BASE-T or 100BASE-T LAN, a well-designed network should accommodate future growth without redesign. The NBX system documentation does not explain the workings of Ethernet or IP, or the requirements for cabling a network.

Does the Telephone Company Need to Be Involved?

You must rely on the local telephone company to provide one or more loop-start lines and the telephone number or numbers. If a fax machine will not connect directly to the NBX system through an Analog Terminal Adapter, reserve at least one telephone line for the fax machine.

⚠ *CAUTION: To avoid damage to any NBX telephone, do not connect it directly to a standard telephone line. Although the RJ11 connector for a traditional telephone fits into the NBX telephone's RJ45 jack, the electrical interfaces are not compatible and the telephone will not work.*

Can Existing Office Telephone Wires Be Reused?

You might be able to reuse the wires if they comply with10BASE-T or 100BASE-T cabling specifications, but you will probably need to replace the connectors. An Ethernet 10BASE-T or 100BASE-T device requires eight wires (four pairs) connected to specific pins on RJ45 connectors, a task best left to a qualified technician using the proper tools.

If you already have a 10BASE-T or 100BASE-T LAN connecting the desktops, it might be simpler to ignore existing telephone wires and connect the NBX telephones to the LAN. Each NBX telephone functions as an Ethernet hub (1102) or switch (2101 and 2102), allowing you to connect the computer's network interface card directly to the telephone.

Is Any Additional Equipment Required?

You may need some of the following components:

- If you are using standard or ISDN PRI Digital Line Cards, you must have a Channel Service Unit (CSU).

- To configure the NBX system, you need a computer equipped with a browser, such as Microsoft Internet Explorer Release 5.5, a network interface card, and a CD-ROM drive. You may also need to provide IP configuration parameters for the system.

- Computers that use Computer Telephony Integration (CTI) applications need an operating system that supports the Microsoft TAPI 2.X standard, such as Windows 95, Windows 98, Windows 2000, or Windows NT, and a browser to download the TAPI-related NBX support software through the NBX NetSet utility.

- If you choose to install the NBX system in an equipment rack, you need a standard 486 mm (19 in.) rack.

- You might need 10BASE-T or 100BASE-T Ethernet cable and connectors to connect the telephones to the hub. Each telephone includes a 10-foot cable.

- 3Com strongly recommends the use of surge suppression devices on all local telephone lines.

What External Devices Can Connect to an NBX System?

The following devices can be connected to an NBX system:

- Music-on-hold device, such as a radio, tape player, disk player, or computer sound card, equipped with a line out (600 ohm) connection can be connected directly into the Call Processor to provide audio for callers waiting on hold.

- Third-party 10BASE-T or 100BASE-T Ethernet hubs and switches. In a SuperStack 3 NBX system, you can connect the Ethernet 1 port on the SuperStack 3 NBX Call Processor to an external 10BASE-T or 100BASE-TX compliant hub. You can connect the Shared Ethernet port or the upper switched 10/100 Mbps Ethernet port to an external 10BASE-T or 100BASE-TX compliant hub.

> *If you are connecting third-party routers or switches to the NBX system, be sure that the connection is programmed for half-duplex operation.*

- Multiple NBX hub cards (NBX 100). In an NBX 100 system, you can use the BNC or 10BT Uplink connector on a hub card or on the Network Call Processor to connect to an external 10BASE-T compliant hub.

- An ISDN (Integrated Services Digital Network) router, Frame Relay Access Device (FRAD) router, or Voice Over IP gateway.

- A WAN. You can access NBX systems located at branch offices through a wide area network (WAN). Before you use the NBX system for voice over the WAN, verify that the WAN offers adequate bandwidth, and that the gateways can be configured to provide the correct routing information.

- External paging amplifier. Both the NBX 100 Call Processor and the SuperStack 3 NBX Call Processor include an RJ11 jack to connect an externally powered paging amplifier.

- Standard telephone for power-fail situations. In the United States, you can connect a standard POTS (Plain Old Telephone Service — 2500-series compatible) telephone to an RJ11 connector on the front of an NBX 4-Port Line Card.

How Many Telephones or Devices Does the NBX System Support?

The NBX 100 system accommodates any combination of 200 devices. The SuperStack 3 NBX system can support any combination of 1500 devices. See Table 5 and Table 4. The following items are defined as devices in the NBX system:

- Each NBX telephone

- Each Single-port Analog Terminal Adapter (ATA)

- Each *port* on a 4-Port Analog Terminal Card

- Each Attendant Console

- Each T1 or E1 *channel*

- Each B *channel* (if you are using ISDN BRI)

- Each Line Card *port*

- Each instance (installation) of the pcXset™ software application

- Each ConneXtions H.323 *port*

Examples:

- With 300 NBX telephones, a SuperStack 3 NBX system can accommodate up to 1200 additional devices, in any combination of card ports, Attendant Console, T1 channels, and so on.

- With 124 telephones, an NBX 100 system can have no more than 76 additional devices.

$\boxed{i}$ *Voice mail ports do not contribute to the device count.*

What Effect Does an NBX System Have on a LAN?

A 10 Mbps Ethernet LAN can support a fully configured, fully utilized NBX 100 system. A 100 Mbps Ethernet LAN can support a fully configured, fully utilized NBX SuperStack 3 system. That is, a 10 Mbps Ethernet LAN with 200 "voice devices" (NBX telephones and outside telephone lines) can support the toll-quality audio provided by the NBX 100 system even when all 200 devices are in use. Similarly, a 100 Mpbs LAN can support toll-quality audio with a fully configured SuperStack 3 NBX system. If you use an Ethernet switch, verify that it supports the 802.1P and 802.1Q specifications.

Silence Suppression

Silence suppression enables you to reduce network traffic. When silence suppression is enabled, the NBX device detects silence in the audio stream, such as a pause in conversation, and stops sending packets. The receiving NBX device generates white noise for the periods represented by silence indicator packets so that the listener does not hear true silence and worry that the call has been disconnected. The receiving NBX device can be another NBX telephone, or for external calls, it can be an Analog Line Card port or a channel on a Digital Line Card.

A careful listener might notice the difference between generated and actual background noise, so silence suppression is turned off by default. You can enable or disable silence suppression for the entire system or for individual telephones and line card ports.

NBX System Quality of Service

Quality of Service (QoS) is a way to allocate resources in data switches and routers so that data can be prioritized, with the most time-critical data receiving higher priority. At Layer 2, the NBX system supports Ethernet 802.1Q, "Standard for Virtual Bridged Local Area Networks," and its associated specification, 802.1P, "Standard for Local and Metropolitan Area Networks, Supplement to Media Access Control (MAC) Bridges: Traffic Class Expediting and Dynamic Multicast Filtering." These IEEE Ethernet standards define how Ethernet packets can be prioritized.

At Layer 3, the NBX supports IP Precedence, also called IP Type Of Service (ToS), to specify the class of service for each packet. The NBX also allows you to configure settings for the emerging Differentiated Services technology, which defines prioritizing over the WAN.

Low-bandwidth Connections

You can configure a telephone to operate in lower-bandwidth environments such as a single B channel of a BRI ISDN line or other links with bandwidth as low as 56 Kbps.

- The preferred method for enabling this is to select ADPCM only audio, forcing the device to use lower-bandwidth audio when communicating with other system devices.

- Alternatively, you can configure the telephone as a low-bandwidth device by selecting the Low Bandwidth check box when you are modifying the device parameters. This setting eliminates some of the NBX system's internal status messages, to and from the phone, as well as features that require multicast data traffic including (examples: paging, conferencing, and music-on-hold). This low bandwidth setting offers users a method to further limit the amount of bandwidth that the link would be required to support.

Before You Begin Installation

Before you install the NBX 100 or SuperStack 3 system hardware:

- Complete the system plan. See the *System Planning Guide* on the *NBX Resource Pack CD*.

- Prepare the dial plan. See "Developing a Dial Plan" earlier in this chapter.

- Verify that the external telephone lines are active and present at the client's location.

- Gather the system components at the installation location.

- Gather the required and recommended tools and equipment.

- Verify that an existing LAN is in place and is operational and that LAN port connections are available.

- Read and follow the safety information and precautions later in this chapter.

Required and Recommended Tools and Equipment

These tools and equipment are typically required to install an NBX system:

- Screwdrivers (flat and Phillips)

- Pliers

- Antistatic grounding strap

- Punch down tool

- Test set

- Four rack screws appropriate to the rack (if rack mounting the chassis)

Important Safety Information

Before you install or remove any components or perform any maintenance procedures on the system, you must read the following safety information.

WARNING: *Verify that each NBX 100 Chassis (the one with the Call Processor board and any expansion chassis) is set to the correct voltage for your country requirements. The voltage is indicated on the voltage selector switch next to the main cable inlet on the front panel of each chassis. The label to the left of this switch shows the 115 and 230 volt selection positions. If the incorrect voltage for your country is set, use a small flat-blade screwdriver to toggle the switch up or down on each chassis. (The SuperStack 3 Call Processor works with either 115 volt or 230 volt power, so it has no mechanism for changing voltage.)*

WARNING: *The system must be installed in a secure (locked) area that can be accessed only by trained personnel.*

The components and telephones of the NBX system are electronic devices. To avoid injury and damage to the equipment, follow these important safety precautions when you install, use, or service it:

- Allow only qualified personnel to install and remove the unit.

- Always connect the unit to a grounded (protective earthed) outlet to comply with international safety and EMC standards.

- Read and understand all instructions.

- Always disconnect a device from its power source before you clean it. If your SuperStack 3 NBX Call Processor has redundant power supplies, you must disconnect both power cords.

- *CAUTION: Each of the two power supply units in the redundant model has its own overcurrent protection device which operates independently. That is, the overcurrent device for one power supply does not protect the second power supply.*

- Do not disassemble components of the system. If you suspect that a card, chassis, or telephone is defective, call a service representative.

- Do not use this product near water. Do *not* install the call processor, the chassis, or a telephone in a damp area, such as a basement.

- Never cover or block the ventilation holes on the chassis or telephones. Proper ventilation is required to ensure normal operation of each component and to avoid component failures.

- *WARNING: Never push objects into ventilation holes on the chassis or telephone. Electrical voltages in system components can cause bodily harm.*

- Do not use the telephone during an electrical storm. Lightning poses a remote risk of electric shock through any telephone system.

- Never use a telephone that is near the source of a gas leak to report the leak.

- Both the NBX 100 and the SuperStack 3 NBX Call Processors are equipped with a three-prong grounding plug. Do not defeat the protection offered by the plug by clipping the grounding prong or by using an adapter to connect the system to a two-wire power source.

- Do not staple the NBX power cord or otherwise attach it to building surfaces.

- Do not use any AC power converter on an NBX Basic Telephone, Business Telephone, or Attendant Console other than the one that is shipped with the device.

- **Power Cord Set:**

  - For European countries, see Table 8. If your country is not listed specifically, use the power cord set information for Europe.

  - For countries outside of Europe, you must use a power cord set that complies with the relevant national standards for cable type and appliance coupling.

Table 8 Regulatory Requirements

Country or Region	Power Cord Set Details
Europe	■ The supply plug must comply with CEE 7/7 ("SCHUKO")
	■ The main cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
United Kingdom	■ The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5A fuse that complies with BS1362.
	■ The main cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Italy	■ The supply plug must comply with CEI23-16/VII.
	■ The main cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Denmark	■ The supply plug must comply with section 107-2-D1, standard DK2-1a or DK2-5a.
Switzerland	■ The supply plug must comply with SEV/ASE 1011.

■ The appliance coupler (that is, the connector to the *unit*, not the connector to the *wall plug*) must have a configuration that mates with an EN60320/IEC320 appliance inlet.

■ The socket outlet must be near the unit and easily accessible. You can remove power from the unit only by disconnecting the power cord from the outlet. If your SuperStack 3 NBX Call Processor has redundant power supplies, you must disconnect both cords from the wall.

■ This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. These conditions are maintained only if the equipment to which the unit is connected also operates under SELV conditions.

■ France only:
This unit cannot be powered from IT (Impédance à la Terre) supplies. If your supplies are of IT type, this unit must be powered by 230V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).

When this system is used in Australia, you must connect the equipment to the telephone network via a line-isolating unit (LIU) that complies with ACA TS001 - 1997.

CAUTION: *(Australia only.) The NBX 100 and the SuperStack 3 NBX equipment will be inoperable when main power fails.*

Lithium Battery Safety

The following information is important. Please read it carefully.

WARNING: The battery is not field replaceable. If you suspect a battery failure, contact your 3Com NBX Voice Authorized Partner.

There is a danger of explosion if the battery is incorrectly replaced. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Consignes Importantes de Sécurité

Nous vous demandons de lire attentivement les consignes suivantes de sécurité avant d'installer ou de retirer l'appareil.

AVERTISSEMENT: Les avertissements présentent des consignes que vous devez respecter pour garantir votre sécurité personnelle. Vous devez respecter attentivement toutes les consignes.

AVERTISSEMENT: Vérifiez que le systeme est paramétré sur le réglage de tension conforme aux exigences du pays d'utilisation.

AVERTISSEMENT: Le systeme doit être rangé (verrouillé) dans un endroit sûr et seul le personnel ayant reçu une formation peut y avoir accès.

- L'installation et la dépose de cette unité doivent être confiés à un personnel qualifié.

- L'unité ne devrait pas etre branchée à une prise de courant alternatif (C.A.) sous aucun prétexte sans un branchement mise à la terre protectrice (mise à la masse).

- Vous devez raccorder cette unité à une sortie mise à la terre protectrice (mise à la masse) afin de respecter les normes internationales de sécurité et les normes de compatibilité électromagnétique.

- Cordon Électrique:
  Pour les pays européens, consultez le tableau 9 et utilisez les informations sur le cordon d'alimentation pour Europe si votre pays ne figure pas dans la liste. Pour les pays noneuropéens, utilisez obligatoirement un cordon d'alimentation conforme aux normes nationales pertinentes au couplage d'appareils et aux types de câblages.

Table 9   Cordon Électrique

Pays ou Region	Détails du Cordon Électrique
Europe	■ La prise secteur doit être conforme aux normes CEE 7/7 ("SCHUKO")
	■ Le cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Table 9   Cordon Électrique (continued)

Pays ou Region	Détails du Cordon Électrique
Royaume-Uni	■ La prise secteur doit être conforme aux normes BS1363 (tripolaire, 13 amp) et équipée d'un fusible 5A à conformité BS1362.
	■ Le cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).
Italie	■ La prise secteur doit être conforme aux normes CEI23-16/VII.
	■ Le cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).
Danemark	■ La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse	■ La prise mâle d'alimentation doit respecter la norme SEV/ASE 1011.

■ Le coupleur d'appareil (le connecteur de l'unité et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d'appareil EN60320/IEC 320.

■ La prise secteur doit se trouver à proximité de l'appareil et son accès doit être facile. Vous ne pouvez mettre l'appareil hors circuit qu'en débranchant son cordon électrique au niveau de cette prise.

■ L'appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l'équipement auquel il est raccordé fonctionne dans les mêmes conditions.

■ **Uniquement pour la France:**
Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d'un transformateur d'isolement à rapport 1:1, avec un point secondaire de connexion portant l'appellation Neutre et avec raccordement direct à la terre (masse).

Batterie au lithium   Veuillez lire attentivement la note suivante.

AVERTISSEMENT: Le remplacement incorrect de batterie au lithium présente un risque d'explosion. Remplacez cette batterie par une batterie identique ou de type équivalent, en respectant les recommandations du constructeur. Vous devez vous débarrasser des batteries usées en respectant les consignes du constructeur.

Wichtige Sicherheitsinformationen

Sie müssen die folgenden Sicherheitsinformationen sorgfältig durchlesen, bevor Sie das Gerät installieren oder ausbauen.

⚠ *WARNHINWEIS: Warnhinweise enthalten Anweisungen, die Sie zu Ihrer eigenen Sicherheit befolgen müssen. Alle Anweisungen sind sorgfältig zu befolgen.*

⚠ *WARNHINWEIS: Achten Sie darauf, daß an dem NBX die Ihrem Land entsprechende Spannung eingestellt ist.*

⚠ *WARNHINWEIS: Das NBX muß an einem sicheren (abgeschlossenen) Ort aufbewahrt werden, zu dem nur ausgebildete Mitarbeiter Zugang haben.*

- Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

- Das Gerät nicht an eine Wechselstromsteckdose anschließen, die über keine Schutzerdung verfügt.

- Das Gerät muß an eine Steckdose mit Schutzerdung angeschlossen werden, die internationalen Sicherheitsvorschriften und den Vorschriften zur EMV entspricht.

- Netzkabelsatz:
  Für europäische Länder, siehe Tabelle 10 und einen Netzkabelsatz verwenden für Europa wenn Ihr Land nicht einzeln aufgeführt ist. Für nichteuropäische Länder müssen Sie einen Netzkabelsatz verwenden, der die entsprechenden nationalen Geräteanschluß- und Kabeltypnormen erfüllt.

Table 10 Anschlußkabelsatz

Land	Anschlußkabelsatz
Europa	■ Der Netzstecker muß die Norm CEE 7/7 erfüllen ("SCHUKO").
	■ Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen.
Vereinigtes Königreich	■ Der Netzstecker muß die Norm BS1363 (13 Ampere, 3 Stifte) erfüllen und mit einer 5-A-Sicherung gemäß Norm BS1362 ausgestattet sein.
	■ Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen.
Italien	■ Der Netzstecker muß die Norm CEI23-16/VII erfüllen.
	■ Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen.
Dänemark	■ Der Netzstecker muß die Vorschriften laut Abschnitt 107-2-D1 der Norm DK2-1a oder DK2-5a erfüllen.
Schweiz	■ Der Netzstecker muß die Norm SEV/ASE 1011 erfüllen

- Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß eine passende Konfiguration für einen Geräteeingang gemäß EN60320/IEC320 haben.

- Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.

- Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

- **Nur für Frankreich:**
  Diese Einheit kann nicht über Anschlüsse des Typs IT† betrieben werden. Wenn Sie über IT-Anschlüsse verfügen, muß die Einheit über einen geerdeten Trenner mit einem Übersetzungsverhältnis 1:1 mit 230 V (2P+T) betrieben werden; dabei muß der zweite Anschlußpunkt die Bezeichnung Neutral tragen.

  †Impédance à la terre

Lithiumbatterie Bitte lesen Sie den folgenden Hinweis sorgfältig durch.

WARNHINWEIS: Wird die Lithiumbatterie falsch ersetzt, besteht Explosionsgefahr. Die Batterie nach den Empfehlungen des Herstellers durch eine Batterie des gleichen oder eines gleichwertigen Typs ersetzen. Verbrauchte Batterien nach den Angaben des Herstellers entsorgen.

Unpacking and Examining the Components

Unpack the system components and examine them. Depending on the size and configuration of the system that was ordered, there may be multiple chassis and line cards. If you have not received all components, contact your 3Com NBX Voice Authorized Partner. Please have the Sales Order Number available.

The NBX 100 chassis contains seven slots. The top slot is reserved and must be covered by a blank front panel. The next slot contains the Call Processor. The remaining five slots can contain any combination of NBX cards. For more details, see Chapter 1.

The SuperStack 3 NBX Gateway Chassis contains four slots. Any NBX card can be inserted into any slot. For more details, see Chapter 1

Recording MAC Addresses

After you unpack the system components (chassis, cards, and telephones), record the Media Access Control (MAC) address numbers of:

- Each NBX 4-Port Line Card
- Each NBX 4-Port Analog Terminal Card
- Each Digital Line Card

The MAC addresses are printed on labels attached to each card. These addresses enable you to identify a card when you configure it using the NBX NetSet utility. After a card is inserted into a chassis, the MAC address is no longer visible.

To locate the MAC address label, hold the card with the face plate side of the card toward you, and see Table 11.

Table 11 Locations of MAC Address Labels on Cards

Card Type	Location of MAC Address Label
4-Port Analog Line Card (3C10114)	On the component side of the card, in the left, rear corner
4-Port Analog Line Card (3C10114C)	On the component side of the card, in the right front corner
4-Port Analog Terminal Card (3C10117)	On the component side of the card, in the left, rear corner
4-Port Analog Terminal Card (3C10117C)	On the component side of the card, in the right front corner
BRI-ST Digital Line Card	On the component side of the card, in the right, front corner
E1 Digital Line Card	On the component side of the lower board, near the front
T1 Digital Line Card	On the component side of the lower board, near the front
Single-Port Analog Terminal Adaptor	On the bottom of the unit

When you install these cards into the chassis, 3Com recommends that you install one card at a time, and that you install the cards in the order of the MAC addresses. This precaution ensures that the NBX system assigns sequential, contiguous groups of device extensions to each board. After each board is autodiscovered by the system, you can use the NBX NetSet utility to determine the MAC address of each individual port.

A well-organized physical configuration can simplify:

- Management of incoming telephone lines, by associating line card ports with specific telephone numbers
- Troubleshooting, by associating groups of channel numbers with specific cards
- System expansion

| **Installing the NBX 100 Chassis** | You can mount the NBX 100 chassis on the wall or in an equipment rack. |

Installing the Disk Drive

The disk drive holds the NBX 100 Call Processor software, the configuration database, and NBX Messaging software.

> **i** *3Com recommends that you install the disk drive in the chassis before you mount the chassis on a wall or in a rack.*

A system requires only one Call Processor and disk drive, even when you have more than one chassis. For example, an installation can have two chassis to accommodate additional line cards, but only one chassis holds the Call Processor and disk drive.

> **!** *CAUTION: To avoid damage to electronic circuits, always wear an anti-static grounding strap when handling the disk drive or NBX system components. When you ground the strap, do not ground it to the NBX chassis because the chassis is not grounded until you install it in a properly grounded setting.*

> **i** *If you purchased an upgrade to the NBX voice mail (to add more voice mail ports), you cannot install the upgrade license key unless the disk drive is installed in the correct chassis.*
>
> *One of the chassis boxes has an extra label which lists a voice mail key code. Be sure to install the disk drive in the chassis that came with the key code label. If you discarded the chassis boxes, look on the system invoice for the chassis containing the voice mail key code label.*

To install the disk drive in the NBX 100 chassis:

1 Remove the top cover of the NBX 100 chassis. Use a Phillips screwdriver to remove the screws from the top-front of the NBX 6-slot chassis. Pull the cover forward slightly, and then lift it from the chassis. Figure 19 shows a rear view of the interior of the chassis.

Figure 19 Installing the Disk Drive and Data Cable
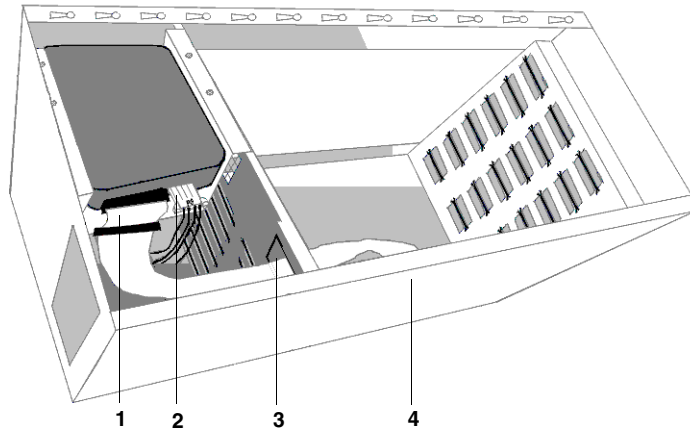
Item	Explanation
1	Data cable (IDE ribbon cable).
	Note: You can attach either end of the data cable to the disk drive.
2	Power connector.
	Note: The power supply has extra connectors to allow for future expansion.
3	Opening in the chassis interior wall.
4	Approximate location of J9 connector on chassis backplane

2 Attach the disk drive data cable (IDE ribbon cable) to the IDE connector on the disk drive. The cable connectors and the connector on the disk drive are keyed to ensure proper alignment.

> *Use only the IDE cable supplied with the NBX system. Older cables may not be keyed.*

3 Attach one of the power supply connectors from the chassis power supply to the disk drive. You can use any of the appropriate connectors on the power supply.

4 Using the four 6-32 Phillips head screws provided, attach the disk drive to the chassis, above the power supply, as shown in Figure 19.

5 Route the data cable through the rectangular opening in the chassis inner wall.

> *Be sure to connect the disk drive data cable to J9 on the chassis backplane, which is mounted on the back wall of the chassis. Do not connect the cable to the Call Processor.*

6 Attach the other end of the data cable to *J9* at the top of the chassis backplane circuit board. *J9* is keyed to ensure proper alignment of the connectors.

7 Replace the cover on the chassis.

If you choose, you may mount the NBX 100 Call Processor chassis either in an equipment rack or on the wall. Follow the instructions described in "Mounting the NBX 100 Chassis" next.

Mounting the NBX 100 Chassis

To mount the Call Processor chassis in an equipment rack or on the wall, you need:

- Two mounting brackets (supplied with the Call Processor)
- Four mounting screws (supplied with the Call Processor)
- Phillips screwdriver
- Drill and drill bit (wall-mount only)
- Level (wall-mount only)
- 19-in. equipment rack (for rack mounting only)

Mounting the NBX 100 Chassis in an Equipment Rack

To mount the NBX 100 chassis in an equipment rack:

Verify that the equipment rack is properly installed and grounded and that the installation area is properly ventilated.

1 Attach the two mounting brackets securely to the sides of the NBX 100 Call Processor chassis, using the upper and lower holes in each of the brackets and the two holes near the front of the chassis. See Figure 20.

Figure 20   Attaching Brackets to the NBX 100 Call Processor
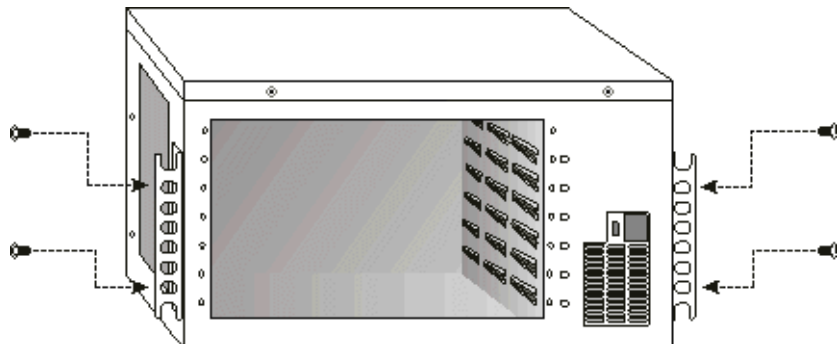
2 Install one screw into each vertical rail of the rack. Leave a space of at least 6.5 cm (2.5 in.) between this location and any other equipment in the rack.

Do not tighten the screws. Thread them just far enough so that they are secure. The slots on the bottom of the Call Processor chassis mounting brackets slip onto these screws.

3 Lift the chassis and slip the keyed slots of the mounting brackets onto the two screws you installed in Step 1.

4 Hold the chassis in place and install a mounting screw in the top keyed slot of each bracket.

5 Tighten all four screws securely.

Mounting the NBX 100 Chassis on a Wall

To mount the NBX 100 system chassis on a wall:

Before you wall-mount a chassis, prepare an area by attaching a suitable mounting surface securely to the wall studs. For effective cooling air flow, do not mount multiple chassis side by side. If you do, one chassis draws in warm air from the other, limiting the effectiveness of the cooling fans.

1 Install the brackets on the back of the chassis, as shown in Figure 21.

Figure 21   Installing Chassis Mounting Brackets for Wall-mounting
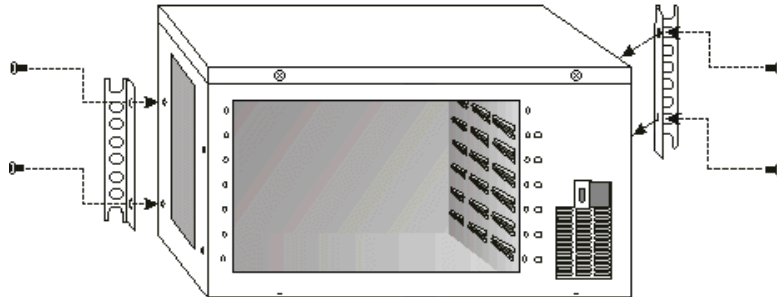
2 Use the dimensions shown in <u>Figure 22</u> to mark the locations where you will drill the pilot holes into the mounting surface.

Figure 22   Chassis Wall-mount Dimensions

465mm (18.25 in)

89 mm
(3.5 in)

63 mm (2.5 in)
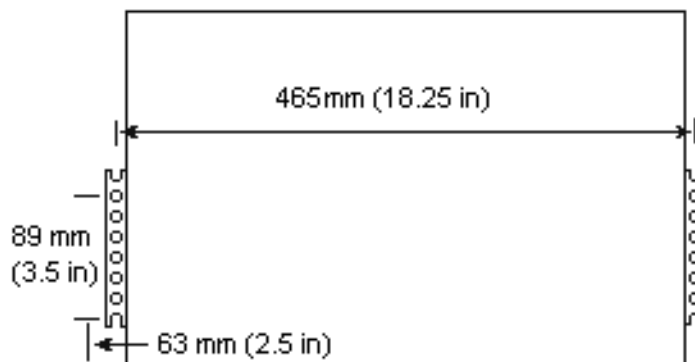
⚠ **CAUTION:** *If you wall-mount the NBX 100 chassis, you must attach the chassis securely to a plywood mounting board which is firmly attached to the wall. A fully configured 6-slot chassis can weigh up to 13.5 kg (30 lb).*

3 Drill pilot holes at the locations you marked.

4 Install the two lower mounting screws.

Do not tighten the screws. Thread them just far enough so that they will support the weight of the NBX 100 chassis.

5 Lift the chassis and slide the two keyed mounting brackets over the screws in the wall.

6 While holding the chassis in place, install screws into the top holes of each mounting bracket, and then tighten all four screws.

Powering Your NBX 100 System

To turn on power to the NBX 100 system:

1 Insert the power cord into the power receptacle on the front right side of the chassis.

2 Allow approximately 3 minutes for the system bootstrap process to finish.

3 Examine the status lights on the Call Processor card to ensure that the system is running properly. After the system completes the startup process, the S1 light is on, S2 is off, and S3 is on but blinks off briefly approximately every 5 seconds.

You are now ready to configure networking for the NBX 100 system. See <u>"Configuring NBX System Networking"</u> later in this chapter.

Installing the SuperStack 3 NBX System	The SuperStack 3 NBX System is composed of the SuperStack 3 NBX Call Processor and one or more SuperStack 3 NBX Gateway Chassis. The Call Processor contains a factory-installed disk drive and call processor circuit board. The NBX Gateway Chassis are used to contain the interface cards. You are now ready to mount the SuperStack 3 NBX Call Processor in a rack.
Rack-mounting the SuperStack 3 NBX Call Processor	To install the SuperStack 3 NBX Call Processor, mount it in an equipment rack and apply power. For an overview of the Call Processor and its components, see "NBX Gateway Chassis and Cards" in Chapter 1.

To mount the SuperStack 3 NBX Call Processor (Figure 23), you require the following tools and materials:

- Four mounting screws
- Phillips screwdriver or wrench

> *Verify that the equipment rack is properly installed and grounded, and that the installation area is properly ventilated.*

Figure 23   Installing the SuperStack 3 NBX Call Processor
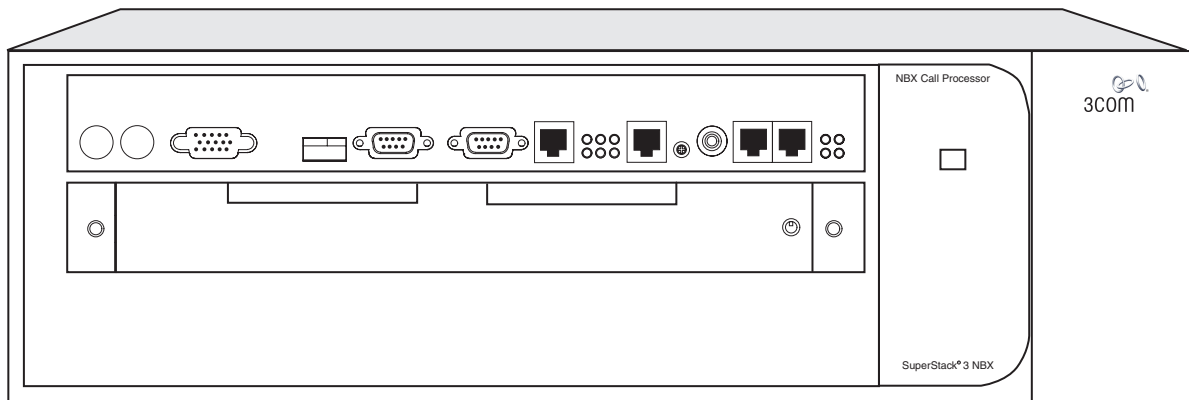
1 Install one screw into each vertical rail of the 19-inch rack. Leave at least 6.5 cm (2.5 inches) above other equipment in the rack.

Do not tighten the screws. Thread them just far enough so that they are secure. The slots on the bottom of the Call Processor mounting brackets slip onto these screws.

2 Verify that the Call Processor mounting brackets are securely installed on the front of the box.

3 Lift the Call Processor and slip the keyed slots of the mounting brackets onto the two screws you installed in Step 1.

4 Hold the Call Processor in place, install a mounting screw in the top hole of each bracket, and then tighten all four screws securely.

Mounting the NBX Gateway Chassis

You are now ready to mount the NBX Gateway Chassis. For an overview of this chassis, see "NBX Gateway Chassis and Cards" in Chapter 1.

The tools, materials, and procedures for rack-mounting the NBX Gateway Chassis are essentially identical to those for mounting the SuperStack 3 NBX Call Processor. For more detailed information, see "Installing the SuperStack 3 NBX System" earlier in this chapter.

Installing a Second Disk for Disk Mirroring

Disk mirroring provides the ability to run a second disk in parallel with the first. For more detailed information about disk mirroring, see "Disk Mirroring" in the *NBX Administrator's Guide*.

> *Disk Mirroring is an optional feature. If you do not install a second disk when you first install your Network Telephone System, you can purchase an upgrade kit at a later time. If you are not installing a second disk with your Network Telephone System, you can skip this section and proceed to* "Powering Your SuperStack 3 NBX System" *later in this chapter.*

This section describes how to install your second disk when you are setting up your NBX system. While the primary disk is already mounted in your Network Call Processor chassis, the second disk (if you purchased one) is packaged separately for you to install.

> *CAUTION: To avoid damage to electronic circuits, always wear an anti-static grounding strap when handling the disk drive or NBX system components. When you ground the strap, do not ground it to an NBX chassis because the chassis is not grounded until you install it in a properly grounded setting.*

To install an additional disk drive for disk mirroring:

1 Install the key code for your disk mirroring license.

2 Shut down system software.

3 Turn off power to your system. If your SuperStack 3 NBX Call Processor has redundant power supplies you must disconnect both supplies.

4 Remove the disk drive tray on your Network Call Processor.

5 Unpack the second disk drive and install it in slot number 2 of the disk tray.

6 Connect the ribbon cable correctly.

7 Re-insert the disk drive tray.

After you add power to the system, disk synchronization begins automatically and finishes in approximately 60 to 90 minutes, depending on the amount of information on disk 1 that must be mirrored on disk 2.

Powering Your SuperStack 3 NBX System

To turn on power to the SuperStack 3 NBX Call Processor and the NBX Gateway chassis, follow these steps:

1 Attach a power cord to the back of each chassis. If your SuperStack 3 NBX Call Processor has redundant power supplies, connect both power cords to both power connectors.

2 Allow approximately 3 minutes for the system to complete the bootstrap process.

Examine the status lights (LEDs) on the Call Processor front panel to ensure that the system is running properly. The PWR status light indicates that the system power is turned on. Status lights 1, 2, and 3 (Figure 24) indicate disk status.

For more detailed information on the disk states, see the "Disk Mirroring" section in Chapter 5, "System Configuration," in the *NBX Administrator's Guide*.

Figure 24 Disk and Power Status Lights (LEDs)
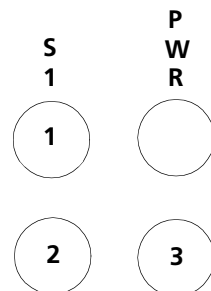
You are now ready to establish network/LAN Connectivity. See "Configuring NBX System Networking" next.

Configuring NBX System Networking	Configuring the networking for the NBX system involves these steps:

- Establishing IP Connectivity
- Modifying Default IP Settings
- Establishing LAN Connections
- Configuring IP Addresses for Your LAN

Establishing IP Connectivity

You need IP connectivity to use the NBX NetSet utility to configure and manage the NBX system. You do not need to install any special software to run the NBX NetSet utility, but your computer must have the following:

- A network interface card (NIC). Your computer must have a network interface card in order to connect to the local area network.

- IP connectivity software

  Most computer operating systems, such as Windows 95, Windows 98, Windows 2000, and Windows NT, include IP connectivity software. If you can view web sites using a browser, or receive e-mail, the computer is IP-enabled. If you need to configure the computer's IP settings, see the computer operating system documentation.

- A web browser

  A browser (Microsoft Internet Explorer 5.5 or higher) allows you to access the NBX NetSet utility, the configuration interface for the NBX system. To enhance the appearance of the NBX NetSet utility online Help, be sure that the browser is configured to allow JavaScript and style sheets (CSS).

Modifying Default IP Settings

Each NBX 100 and SuperStack 3 NBX system is shipped with default IP settings. The default IP address is part of a block of addresses reserved by the Internet Engineering Task Force (IETF) for use on private IP networks, that is, networks that do not connect to the Internet.

With most installations, you need to change the IP settings of the NBX system to conform to the network. The IP settings include:

- **Host Name** — A name for the system, up to 30 characters in length, including spaces, underscores, and hyphens.

- **IP Address** — An IP address for the Call Processor that is consistent with your local area network. Consult your network administrator if you need assistance.

- **Default Gateway** — An IP address for the gateway through which you access the Call Processor. If all devices (telephones, adaptors, and cards) are on the same subnet as the Call Processor, you do not need to specify a gateway IP address. Consult your network administrator if you need assistance.

- **Subnet Mask** — An IP address mask that is consistent with your local area network. Consult your network administrator if you need assistance.

To help you determine if you need to make changes to the NBX system IP settings, see Table 12, later in this section. To avoid address conflicts with devices on your local network, change the IP settings of NBX system *before* you connect the system to the LAN.

Overview of how to change the IP settings of the NBX system:

- Temporarily change the IP address of your computer to conform with the default IP settings of the NBX system.

- Connect your computer to the NBX system.

- Use the NBX NetSet utility to modify the IP settings of the NBX system.

- Restore the IP settings of your computer and reconnect it to the LAN.

- Connect the NBX system to your local network.

To change the IP settings of the NBX system:

1 Use a category 5 Ethernet crossover cable to connect the computer's network interface card (NIC) directly to your NBX system:

- NBX 100 Call Processor — Use the 10BT UPLINK MDI-X port.

- SuperStack 3 NBX Call Processor — Use the Ethernet 1 port.

By connecting the computer directly to the NBX system, you isolate the system from the network and eliminate the influence of routers and proxy servers.

2 Record the existing IP settings on the computer so you can restore them later.

3 Change the IP settings of your computer to:

IP address:	192.168.1.191
Default gateway:	0.0.0.0
Subnet mask:	255.255.255.0

⚠️ **CAUTION:** *Do not set your computer address to 192.168.1.19**2** because this IP address is used temporarily during system startup. If you use that address for your computer, a conflict results and the system may not start properly.*

4 Reboot the computer so that the new settings take effect.

5 Start a browser.

6 To access the NBX NetSet utility, enter the following address into the browser's IP address field:

`192.168.1.190`

This is the default IP address of the NBX 100 and SuperStack 3 NBX Call Processors.

If the connection attempt fails, check the browser's Proxy Server setting and verify that it is configured for a direct connection. Also, check the Connection setting and verify that it is set for a direct LAN connection, not a dial-up connection.

After you connect, you can log in to the NBX NetSet utility using the default administrator user name and password.

⚠️ **CAUTION:** *If you change the administrator password, you cannot retrieve (return) to the default, nor can you retrieve your new password if you forget it. If you make any password changes, record them in a safe place.*

Table 12 describes possible network environments and the configuration needed to enable IP connectivity to the NBX system.

Table 12 IP Addressing and the NBX System

Local IP Environment	NBX System Configuration
No IP networking currently in use	You do not need to change the IP settings in the NBX system, but you probably need to configure the IP settings in the computer that you use to communicate with the NBX NetSet utility.
	The computer must have an Ethernet NIC card, IP connectivity software installed and configured, and a web browser. See the computer's operating system documentation for how to install and configure IP connectivity software.
	Set the computer's IP parameters to these settings:
	■ IP address: 192.168.1.191
	■ Default gateway: 192.168.1.1
	■ Subnet mask: 255.255.255.224
	If you connect the LAN to the Internet in the future, your Internet service provider gives instructions on how to configure the IP settings of devices on the network. You must change the IP settings of the NBX system at that time.

CAUTION: Do not set your computer address to 192.168.1.192 because this IP address is used temporarily during system startup. If you use that address for your computer, a conflict results and the system may not start properly.

Local IP Environment	NBX System Configuration
Private IP network, no subnets	You probably need to change the NBX system IP address to conform with the existing IP addressing scheme.
	You must change the NBX system IP address (192.168.1.190) if that address is already in use on the network.
Private IP network, with subnets	You probably need to change the NBX system IP address to conform with the existing address space. You must change the NBX system IP address (192.168.1.190) if that address is already in use on the network.
	You must change the NBX System subnet mask (255:255:255:0) if it does not conform to the network subnet scheme.
	You must change the NBX system default gateway from 0.0.0.0 to the IP address of the default gateway for the subnet where you install the NBX system.
Internet connectivity; addresses provided by the Internet Service Provider.	You must change the NBX system IP address, default gateway, and possibly the subnet mask. Ask the ISP to provide a fixed IP address, subnet mask, and default gateway.
	You must have a fixed IP address because the Call Processor does not support DHCP or BOOTP.
Internet connectivity; addresses provided from address block controlled by the client's organization.	You must change the NBX system IP address, default gateway, and possibly the subnet mask. Ask the local network administrator to provide a fixed IP address, (the NBX 100 Call Processor does not support DHCP or BOOTP) a subnet mask, and a default gateway.

Configuring IP Addresses for Your LAN	You must now adjust the default IP addresses and provide the IP addresses specific to your LAN.

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration.*

3 On the *System Settings* tab, click *System-wide*.

4 Edit the IP settings to conform to your LAN.

5 Click *Apply* and review your changes.

6 Click *OK* to close the dialog box.

Establishing LAN Connections	After you establish IP connectivity, you are ready to install the LAN connections.

Establishing NBX 100 LAN Connections

Connect the NBX 100 Call Processor to your network using either the BNC 10B2 connector or the 10BT UPLINK MDI-X port.

> **i**> *These are two different connection points for a single port. They cannot be used simultaneously.*

> **i**> *If you use the Uplink connector, be sure to program the switch or router on the other end for half-duplex operation.*

You do not need to connect cards to each other within a chassis. They are connected by the chassis backplane.

> **i**> *Do not connect telephone lines or NBX telephones yet.*

Establishing SuperStack 3 NBX LAN Connections

Connect the SuperStack 3 NBX Call Processor to your LAN using the Ethernet 1 port. The Ethernet 2 port is a fail-over port that is active only if the Ethernet 1 port experiences a link failure. This port can operate at 10 Mbps and 100 Mbps; it automatically senses the speed of your LAN.

Connect the NBX Gateway chassis to your LAN using one of these:

- The 10 Mbps shared connector — Operates at 10 Mbps only
- The upper 10/100 Mbps connector — Operates at either 10 Mbps or 100 Mbps and automatically senses the speed of your LAN
- The lower 10/100 Mbps RJ45 connector — Operates at either 10 Mbps or 100 Mbps and automatically senses the speed of your LAN

You do not need to connect cards to each other within an NBX Gateway chassis. They are connected by the chassis backplane.

> *Do not connect telephone lines or NBX telephones yet.*

Connecting Cards and Devices

After you configure and test the NBX system, you are ready to connect and configure cards into the chassis and attach optional additional devices such as Music On Hold.

Connecting 4-Port Line Cards

You can install cards with the power on. To connect and configure the NBX 4-Port Line card:

1 Remove the blank faceplate from one of the slots.

2 Verify that the edges of the card ride in the chassis guide slots, and then slide the card in until you feel slight resistance. Press firmly on both sides of the front of the card until you feel it seat in the connector, and then tighten the two knurled knobs.

> *If you cannot seat the card with light pressure, remove it and check for obstructions.*

3 After you seat the card, wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the card to initialize.

4 Autodiscover the line card. Auto Discovery finds each line card and assigns extensions. For more information, see "Using Auto Discovery for Initial System Configuration" later in this chapter.

> *3Com recommends that you install the cards in MAC address order. This practice makes it easier to diagnose and troubleshoot problems.*

Mapping Line Card Ports to Telephone Lines

You can run the system using the default configuration, but to have complete control over telephone operations, you need to know which telephone line is assigned to which line card port so that you can map CO telephone lines to telephones and manage lines for maximum performance. Use the NBX NetSet utility to quickly reassign extensions.

When you connect the telephone lines, the order in which the telephone lines deliver calls matches the order of line card port extensions. For example, connect the line that rings first to the port with the lowest numbered extension, connect the next telephone line to next-lowest extension, and so forth. Extension numbers for Line Card ports are assigned based on the first unused extension number. Therefore, the extensions vary from system to system.

Line card ports are labeled on the front panel of the card. The first connector, labeled PFT (Power Fail Transfer), accepts a standard POTS (2500 touch-tone series compatible) telephone. If there is a power failure, this port continues to provide dial tone and telephone service. Do *not* count this port as a line port.

Connecting Digital Line Cards

You can install cards with the power on. To connect and configure the digital line cards:

1 Remove one of the blank faceplates from the chassis.

2 Install the card securely.

Verify that the edges of the card ride in the chassis guide slots, and then slide the card in until you feel slight resistance. Press firmly on both sides of the front of the card until you feel it seat in the connector, and then tighten the two knurled knobs.

> **i** *If you cannot seat the card with light pressure, remove it and check for obstructions and alignment problems.*

3 Wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the card to initialize.

4 Autodiscover the digital line card. Auto Discovery finds each port on each digital line card and assigns port extensions. You can then perform the following tasks to configure the line card ports.

> **i** *Autodiscover telephones and analog line cards* before *you autodiscover digital line cards. For more information about Auto Discovery, see* "Using Auto Discovery for Initial System Configuration" *later in this chapter.*

Connecting Analog Terminal Cards

You can install cards with the power on. To connect and configure the analog terminal cards:

1 Remove one of the blank faceplates from the chassis.

2 Install the analog terminal card securely.

Verify that the edges of the card ride in the chassis guide slots, and then slide the card in until you feel slight resistance. Press firmly on both sides of the front of the card until you feel that it is seated in the connector, and then tighten the knurled knobs.

> *If you cannot seat the card with light pressure, remove it and check for obstructions.*

3 Wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the card to initialize.

4 Autodiscover the analog terminal card. For more information about Auto Discovery, see "Using Auto Discovery for Initial System Configuration" later in this chapter.

Auto Discovery finds each port on each Analog Terminal Card and assigns port extensions.

Connecting a Single-Port Analog Terminal Adapter

If you are installing any Single-Port Analog Terminal Adapters (ATAs), install them after installing the cards in the chassis.

To install a Single-Port ATA.

1 Connect the analog telephone or fax machine to the analog port on the ATA. The analog port has a picture of an analog telephone beside it. See Figure 25.

2 Connect the Ethernet Hub MDI port on the ATA to the LAN. The Ethernet Hub MDI port is the connector on the far left side.

Figure 25 Single-Port ATA Connectors — Rear View
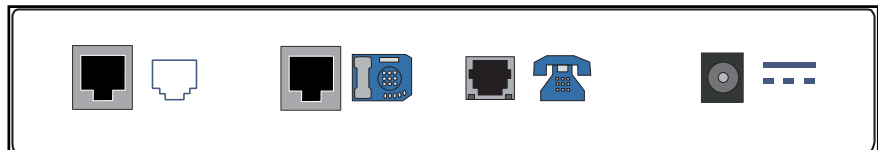
3 You can optionally connect a local PC (or other Ethernet device) to the Ethernet MDI-X port on the ATA. This serves as a hub to connect the local PC to the LAN. The Ethernet MDI-X port has a picture of an NBX Business telephone beside it.

4 Connect the AC power adapter to the AC power connector on the ATA.

5 Plug the AC power adapter into a wall outlet.

> **i** *The Single-Port Analog Terminal Adapter may require a telephone connector for use outside North America. The part number is 3C10120-xx, where xx is the country code. Contact your supplier for more information on country-specific requirements.*

Connecting an NBX Attendant Console

The optional NBX 1105 Attendant Console provides attendant (receptionist) access and monitoring for up to 100 extensions per console.

Do not autodiscover the Attendant Console before you have autodiscovered telephones and Analog Line Cards. For more information about Auto Discovery, see "Using Auto Discovery for Initial System Configuration" later in this chapter.

To connect an NBX Attendant Console:

1 Connect the power source to the Attendant Console.

2 Connect the Attendant Console to the LAN switch port located on the underside of the NBX telephone.

3 Autodiscover the Attendant Console.

An Attendant Console must be associated with only one NBX telephone. When you autodiscover an Attendant Console, the NBX system associates it with a telephone based on the following factors:

■ If there are no other Attendant Consoles on the system, associate the new Attendant Console with the NBX Business Telephone or NBX Basic Telephone that has the lowest extension number.

■ If one or more Attendant Consoles are already configured in the system, find all NBX Business Telephones and NBX Basic Telephones that currently have an associated Attendant Console and associate the new Attendant Console with the NBX Business Telephone that has the lowest extension number.

Typically, you want to associate an Attendant Console with the telephone to which it is connected. If the Auto Discovery process associates an Attendant Console with a telephone other than the one you want, see "Associating an Attendant Console with a Specific Telephone" later in this section for instructions on how to associate the Attendant Console with a different telephone.

Associating an Attendant Console with a Specific Telephone

To associate an Attendant Console with a specific telephone:

1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

2 In the *Device Configuration* window, click the *Attendant Console* tab.

3 Select an Attendant Console from the list.

4 Click *Modify.*

5 In the *Modify Attendant Console* window, select a telephone from the list.

6 Click *Apply* and review your changes.

7 Click *OK* to close the dialog box.

For more information on configuring and using the NBX Attendant Console, see Chapter 3.

Installing a Power Adapter If you are installing a power adapter using the power line kit, the cable length can be anything within the 10BASE-T specification, including the length from the patch panel to the brick and then to the telephone. In 10BASE-T, the maximum segment is 100m (328 feet) so if the length from the patch panel to the brick is 8.5m (28 feet), then 91.5m (300 feet) is supported.

If you use a 100m cable that does not conform with the 10BASE-T specification, and the device does not work, the problem is typically not related to the power supply.

![i] *For international users, the adapter (3C10125-xx) on the power line kit is provided with the relevant pins for the country of use.*

![i] *When used in Australia, you must connect the equipment to the telephone network via a line isolating unit (LIU) complying with ACA TS001-1997.*

![warning] *WARNING: (Australia only) This equipment will be inoperable when main power fails.*

Installing an Ethernet Power Source	3Com Ethernet Power Source (EPS) is an intelligent power device that can be used in the network over existing data wiring. The EPS creates a single, continuous source of power.

The power source is designed for use with a standard 10BASE-T/100BASE-TX Ethernet network over standard TIA/EIA-568B, Category 5 cable. The DC operating power for the data terminal units is fed through the unused pairs (7/8) and (4/5).

See the 3Com Ethernet Power Source documentation for installation and configuration information.

Selecting Regional Software and Components

After you complete the hardware installation test, you can download your preferred regional language software and components.

> *U.S. English is installed by default and cannot be removed. It is used as a fallback in case another Regional Software Pack fails to load properly.*

The Regional Software Packs include:

■ Localized static voice prompts heard by callers, telephone users, and administrators. These are messages that users or administrators are not able to change by re-recording a new message, for example, prompts used for setting up Auto Attendants and voice mailboxes.

■ Default prompts for configurable voice messages. Users and administrators can record these messages and substitute their recorded messages for the default versions.

■ Tones and cadences

■ Localized User Help for the NBX NetSet utility

■ Localized *NBX Telephone Guide* and Quick Reference Guides, which are accessed from the NBX NetSet utility and the *Resource Pack CD*

■ Dynamic code for the regional pack

Installing Regional Software and Components

When you access the NBX NetSet utility for the first time, you have the opportunity to select and download the appropriate regional language software and components.

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *Operations*.

3 Click the *Regional Software* tab (Figure 26). For a description of the status values, see Table 13, later in this section.

Figure 26   Regional Software Tab

For each listed region, you see a status. See Table 13 for an explanation of each possible status.

4 Select *Install.* The Install Regional Software dialog box appears (Figure 27).

5 Either browse to the *install* folder on the Resource Pack CD and select the language (.taz file) you want, or type the path in the text box.

6 Click *Upgrade*. This action installs software, including the appropriate regional components.

<i> *After you install the regional software and components, you must enable the language. That is, you must make your preferred language the current language on the NBX system. See the* NBX Administrator's Guide *for more information.*

Figure 27 Install Regional Software Dialog Box
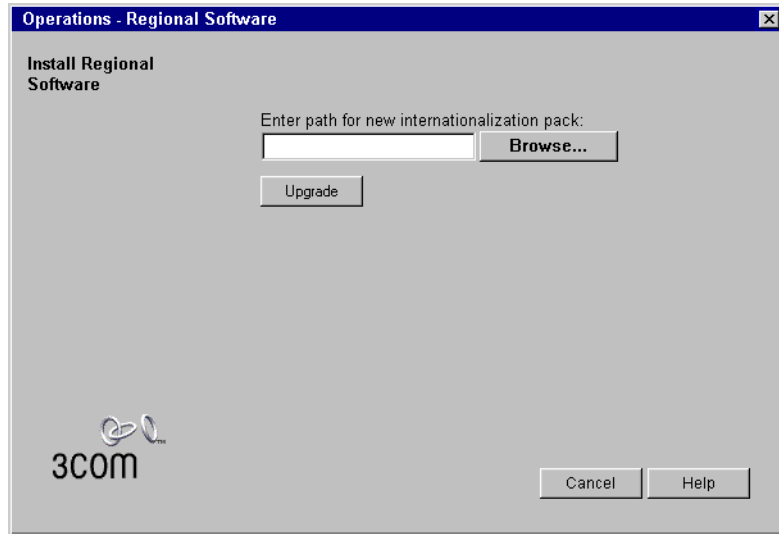
Table 13 Regional Software Status

Status	Description
In Use	All of the components associated with the language and country are installed and at least one (voice prompts, tones and cadences, or documentation) has been selected for use.
Available for Use	All of the components associated with the language and country are installed, but none of them are currently selected for use.
Not Fully Installed	One or more of the components associated with the language and country are either not installed, or the wrong version of at least one component is installed.
Error while Loading	One or more of the files associated with a component are missing. This situation should never occur.

Removing Regional Software and Components

You can use the NBX NetSet utility to remove regional language software and components.

1 In the *NBX NetSet - Main Menu* window, click *Operations*.

2 In the *Operations* window, click the *Regional Software* tab.

3 On the *Regional Software* tab, click *Remove*. The Remove Regional Software dialog box appears (Figure 28).

Figure 28 Remove Regional Software Dialog Box
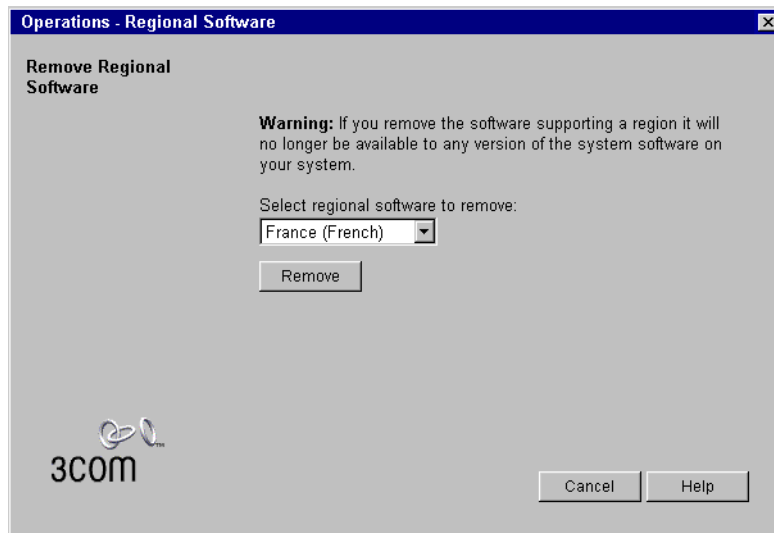
4 From the scroll-down list, select the region that you want to remove and click *Remove*.

> **i** *U.S. English is permanently installed and cannot be removed.*

When you remove a Regional Software Pack, the NBX system removes *all* versions of the components associated with that region (except for U.S. English), and that region becomes unavailable.

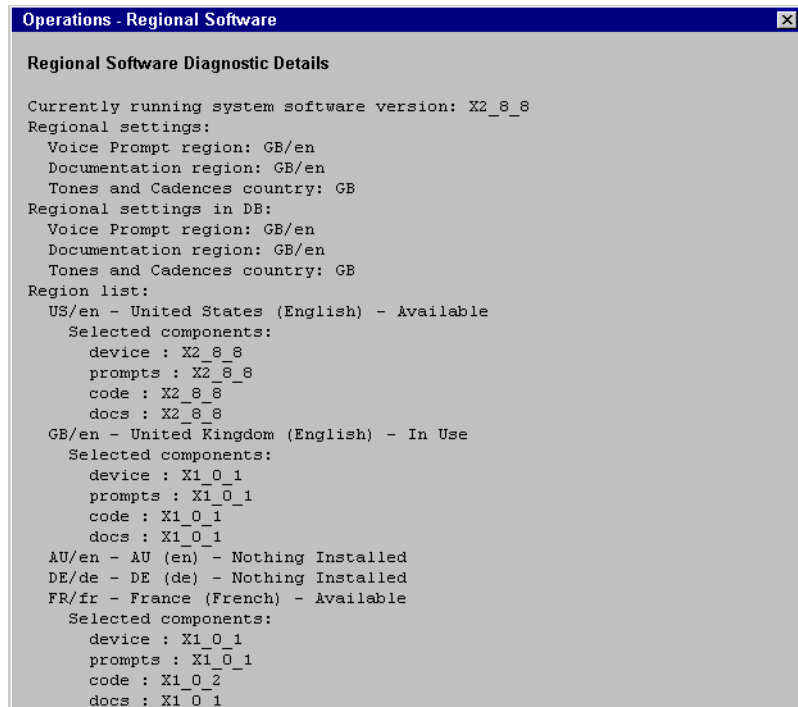If you remove a version of the system software, the system verifies whether the installed regional components are supported by the remaining versions of the system software. If unsupported regional components are discovered, the system asks if you want to remove them. If you decline this option, the residual components cannot be individually removed until you remove all components and versions of the Regional Software Pack.

Viewing Regional Software Details

You can view the details of a regional installation. This provides information that is valuable for troubleshooting purposes.

1 In the *NBX NetSet - Main Menu* window, click *Operations*.

2 In the *Operations* window, click the *Regional Software* tab.

3 On the *Regional Software* tab (Figure 26), click *Details*. The *Regional Software Diagnostic Details* window appears (Figure 29) containing detailed information (including version number) on all software components associated with each installed region. Scroll up or down to view the information.

4 To leave this window, scroll to the bottom of the window and click *Close*.

Figure 29 Regional Software Diagnostic Details Window (Partial)

```
Operations - Regional Software                                    ×

Regional Software Diagnostic Details

Currently running system software version: X2_8_8
Regional settings:
  Voice Prompt region: GB/en
  Documentation region: GB/en
  Tones and Cadences country: GB
Regional settings in DB:
  Voice Prompt region: GB/en
  Documentation region: GB/en
  Tones and Cadences country: GB
Region list:
  US/en - United States (English) - Available
    Selected components:
      device : X2_8_8
      prompts : X2_8_8
      code : X2_8_8
      docs : X2_8_8
  GB/en - United Kingdom (English) - In Use
    Selected components:
      device : X1_0_1
      prompts : X1_0_1
      code : X1_0_1
      docs : X1_0_1
  AU/en - AU (en) - Nothing Installed
  DE/de - DE (de) - Nothing Installed
  FR/fr - France (French) - Available
    Selected components:
      device : X1_0_1
      prompts : X1_0_1
      code : X1_0_2
      docs : X1_0_1
```

Using Auto Discovery for Initial System Configuration

Using Auto Discovery simplifies initial system configuration by adding information about new devices to the configuration database. "Devices" include telephones, Analog Line Cards, Digital Line Cards, NBX 1105 Attendant Consoles, as well as "virtual devices" that exist on the network such as the pcXset Soft Telephone and the ConneXtions H.323 Gateway.

> **i** *After a device has been discovered, the Auto Discovery process does not find that device again. If you want to remove a device from the system, you must use the NBX NetSet utility to manually remove the device and its database record.*

Table 14 summarizes Auto Discovery actions for NBX system components.

**Table 14** Auto Discovery Actions on NBX System Components

Component	Auto Discovery Action
NBX 4-Port Line Card	Gathers configuration information from each port on the card, assigns a default extension, and enters the information into the configuration database.
Digital Line Card	Gathers configuration information from the card, assigns a default extension, and enters the information into the configuration database.
	After you autodiscover the Digital Line Card, you may need to edit the Dial Plan to configure Direct Inward Dial (DID) numbers.
Telephones	Gathers configuration information from the telephone, assigns a default User Profile labeled "new user," assigns the next lowest available extension number to the profile, and enters the information into the configuration database.
	By default, Auto Discovery assigns extension number 100 (3-digit Dial Plan) or 1000 (4-digit Dial Plan) as the first telephone extension. You can use the NBX NetSet utility to specify a new extension starting number. To simplify Auto Attendant configuration, you should start a range at a base number, for example, 100/1000, 200/2000, 300/3000, or 400/4000. The default Auto Attendant assumes that extension 100 (3-digit dial plan) or 1000 (4-digit dial plan) is the extension of a human attendant (receptionist).
NBX 1105 Attendant Console	Finds and configures any installed NBX 1105 Attendant Consoles.
pcXset Soft Telephone	Performs telephone discovery actions on installations of the pcXset PC Telephone Client when the following conditions are true:
	■ The pcXset PC Soft Telephone program is running.
	■ The pcXset PC Soft Telephone host computer is connected to the network.
	■ You have entered the proper license key into the NBX NetSet utility.
ConneXtions H.323 Gateway	Configures line card port settings when the following conditions are true:
	■ The ConneXtions H.323 Gateway program is running.
	■ The ConneXtions H.323 Gateway host computer is connected to the network.
	■ You have entered the proper license key into the NBX NetSet utility.

Initial System Configuration   To use Auto Discovery for initial system configuration:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 In the *System Configuration* dialog box, click the *System Settings* tab. See Figure 30.

Figure 30   System Settings Tab
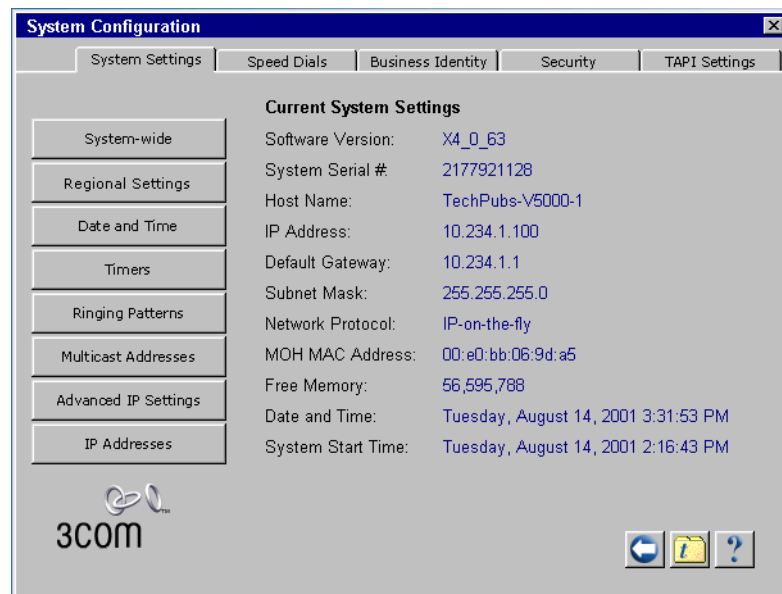
4 Click *System-wide*. The System Settings dialog box appears (Figure 31).

Figure 31 System Settings Dialog Box

5 Select the check box for the device you are configuring. 3Com recommends that you autodiscover one device type at a time. Table 15 describes each choice.

Table 15 Auto Discovery Check Boxes

Check Box	Action
Auto Discover Telephones	Discovers NBX telephones, 4-Port Analog Terminal Cards, and Single-port Analog Terminal Adaptors.
Auto Discover Line Cards	Discovers 4-Port Analog Line Cards.
Auto Discover Digital Line Cards	Discovers Digital Line Cards (BRI-ST, E1, and T1).
Auto Discover Attendant Consoles	Discovers 1105 Attendant Consoles.

6 Click *Apply.*

It takes a few moments for Auto Discovery and the software download process to complete. The Call Processor initializes devices one at a time. If you have connected many new devices to the system at the same time, the Auto Discovery process requires more time.

A fully initialized telephone displays its extension and the date and time. If there are no extensions available, Auto Discovery fails, and the telephone's display panel continues to display the telephone's MAC address.

If you are installing an NBX 1105 Attendant Console, connect it after you have discovered all of the telephones to ensure that all telephone extensions map to the Attendant Console.

Disabling Auto Discovery

After you finish Auto Discovery for the initial configuration, disable it so that the Call Processor does not continue to search for added devices.

To disable Auto Discovery:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 Click *System-wide*.

4 Clear all *Auto Discover* check boxes.

5 Click *Apply.*

6 Click *OK* to close the dialog box.

Configuring the Operating Mode

You can configure the NBX system to behave in one of the three traditional telephone system modes:

- Key mode

  CO lines map to individual buttons on users' telephones. To configure key mode behavior using the NBX NetSet utility, use Button Mappings and the Auto Extension setting for each line card port. Button Mappings enable you to map a line card port extension to a specific Access button on an NBX telephone. Button Mappings identify the telephones that ring when a call comes in on the mapped CO line. Auto Extension specifies the destination of a call that is not answered at any of the telephones.

■ PBX mode

CO lines are pooled and arbitrated by the Call Processor. The CO lines do not map to individual telephones. All incoming calls go first to a receptionist's telephone or the Automated Attendant. If the call goes to a receptionist's telephone, the receptionist forwards the call to the user's extension, or if the user is out of the office, the call can be sent directly to the user's voice mailbox. To call an outside number, a user must dial the line pool access number, typically 9, and the Call Processor assigns the next available line. PBX mode allows you to make maximum use of a limited number of CO lines.

■ Hybrid mode

Combines key mode and PBX mode. Some CO lines are mapped directly to telephones, while the rest are pooled.

PBX mode is the easiest configuration to set up and manage. Key mode requires more configuration because you must map the CO lines to telephones.

By using pooled lines, mapped lines, a receptionist telephone, and the Automated Attendant, you can configure the NBX system to support a wide range of operational requirements.

Reassigning Extensions and Setting Line Card Port Options

For this procedure, you need the list of line card port MAC addresses that were created when you installed the line cards.

To reassign extensions and set line card port options:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

3 Click the *Line Card Ports* tab. See Figure 32.

Figure 32   Line Card Ports Tab
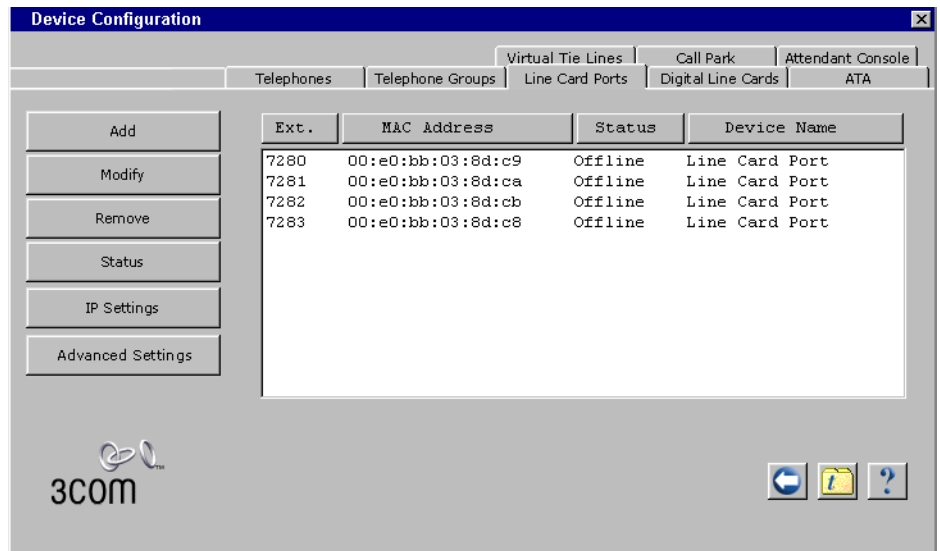
4 Select the port with the lowest extension.

5 Click *Modify.* The Modify Line Card Port dialog box (Figure 33) appears.

Figure 33   Modify Line Card Port Dialog Box
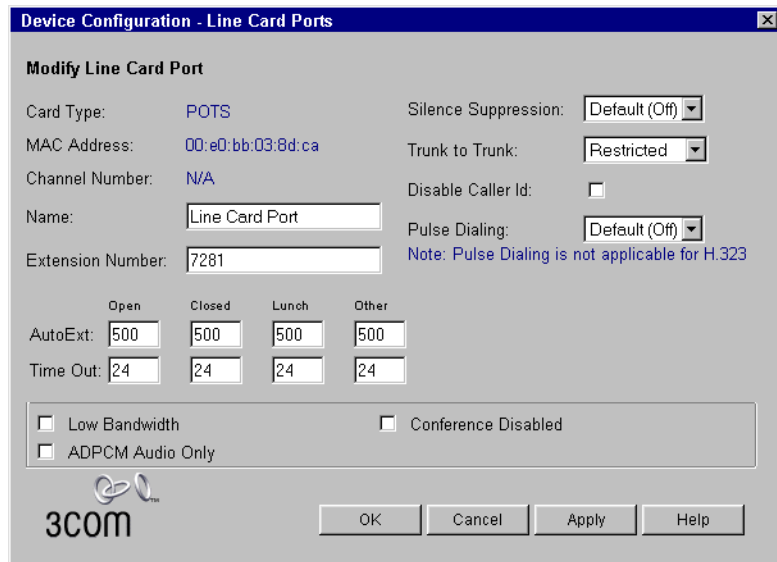
6 Edit the line card port fields as needed. Table 16 at the end of this section describes the fields.

7 After you have made all of your changes for the current Line Card port, click *Apply* to enable the changes and review them.

8 Click *OK* to exit the dialog box and return to the Line Card Ports tab (Figure 32).

9 Repeat this procedure for each line card port.

Table 16 Modify Line Card Port Fields

Field	Purpose
Card Type	Identifies the type of communications through this port. Auto Discovery provides the correct setting for Card Type. You cannot modify this property.
MAC Address	Identifies this device. Auto Discovery provides the correct MAC Address. You cannot modify this property.
Name	The name associated with the line card port. This name appears on the telephone and in associated lists, to help you identify this card.
Extension Number	The extension number assigned to this port during the Auto Discovery process, or assigned manually.
	See an example of how to modify the extension number of a Line Card Port immediately after this table.
Silence Suppression	Specifies whether this port operates under the control of system-wide Silence Suppression settings. See the *NBX Administrator's Guide* for more information.
	The system-wide default setting (either On or Off) is marked as the default setting in the pull-down list. If you want to override the system-wide default for this port, select the non-default setting from the list.
Trunk to Trunk	Refers to an incoming call being transferred to an outside line. Although Trunk to Trunk permission can be granted to individual users through a Class of Service setting, setting the permission at each line card port provides a system-level mechanism to enable or disable this feature.
	From the pull-down list, select Restricted (the default) or Unrestricted.
Disable Caller ID	Disables inbound Caller Identification for this line card port. This also eliminates the Caller ID Wait Timer (6 seconds by default) for picking up incoming Auto Attendant calls.
Pulse Dialing	Sets the default mode of operation for this port.
	Values: On, Off, Default

Table 16   Modify Line Card Port Fields (continued)

Field	Purpose
AutoExt	AutoExt works in conjunction with telephone button mappings to define where incoming calls ring. If the line is mapped to a telephone, it rings at that telephone first. If the Time Out period is reached, the incoming call rings at the auto extension specified for the Time of Day service mode (Open, Closed, Lunch, or Other).
Time Out	The number of seconds that must pass before the incoming call rings at the specified auto extension.
	This time must be 7 seconds or longer for the system to capture Caller ID.
Low Bandwidth	Turns on data compression and other measures designed to reduce the packet stream to a minimum
	Enable the Low Bandwidth check box for any Analog Line Card port that will be used to connect to low bandwidth telephones.
ADPCM Audio Only	Restricts the port to ADPCM audio.
Conference Disabled	Prohibits this port from being used as part of a conference call.

Example:

During the Auto Discovery process, the NBX system might assign extensions to Line Card ports as shown in Table 17.

Table 17

Analog Line Card (3C10114)		Analog Line Card (3C10114C)	
MAC Address	**Extension**	**MAC Address**	**Extension**
00:e0:bb:03:8d:c8	7260	00:e0:bb:03:8d:cc(1)	7260
00:e0:bb:03:8d:c9	7261	00:e0:bb:03:8d:cc(2)	7261
00:e0:bb:03:8d:ca	7259	00:e0:bb:03:8d:cc(3)	7259
00:e0:bb:03:8d:cb	7258	00:e0:bb:03:8d:cc(4)	7258

Usually, you want to have the lowest extension number associated with the first port, the next highest extension number associated with the second port, and so on.

To reassign the extension numbers:

1 Record the extensions and either the MAC addresses or port numbers for the four Line Card ports.

> *For the 3C10114 board, record the MAC addresses. Each port has a unique MAC address.*
>
> *For the 3C10114C board, record the port numbers. Each port has the same MAC address. Ports are numbered from 1 through 4 in parentheses, after the MAC address.*

2 In the *NBX NetSet – Main Menu* window, click *Reports*.

3 Click the *Device List* tab.

4 Review the extensions in the scroll list to find the highest extension number that has been assigned. Add one to that extension and record it. For example, if the highest assigned extension number is 7268, you record 7269.

5 Return to the *Line Cards* tab.

6 From the four Line Card ports you recorded, select the port with highest MAC address or port number and click *Modify*.

7 In the Modify Line Card Port dialog box, change the extension number (7258 in this example) to the extension number you recorded when you were viewing the Device List tab (7269).

8 Click *OK*. The Line Card Ports tab reappears showing the new extension number. Extension 7258 is now unused.

9 From the four Line Card Ports you recorded, select the port to which you want to assign the unused extension. In the example, 7258 is the lowest extension number of the four, so select the port with the lowest MAC address or port number and click *Modify*.

10 Change the extension number and click OK.

Repeat steps 9 and 10. Each time you assign an extension, the previous extension is no longer used, and you can assign it to the appropriate port. When you are finished:

■ The four original extensions (7258 through 7261) are assigned to the line card ports in the same order as the MAC addresses or port numbers.

■ The unused extension (7269) is again unused.

| **Connecting Telephone Lines** | After you have installed and configured the system for initial startup, connect the telephone company lines to the line card ports so that you can start receiving outside calls. |

Adding External Hardware

External devices connect to the front of the Call Processor. See "What External Devices Can Connect to an NBX System?" earlier in this chapter.

Connecting a Music-on-Hold (MOH) Input Device

Use a patch cord with phono-type connectors (stereo or mono) to connect line level audio from any audio device that has a line-out jack to the MOH jack on the front of the Call Processor.

Adjusting Music-on-Hold (MOH) Volume

To adjust the volume of music on hold (MOH):

1 Use a nonferrous (plastic or aluminum) adjustment tool to adjust the volume control on the front of the Call Processor to about mid-range.

2 Use an NBX telephone to call another extension, and have the person put you on hold.

3 While listening to the music, adjust the volume control on the music-on-hold input device.

Connecting a Paging Amplifier

Connect the paging device to the paging connector on the front of the Call Processor. See the documentation for your paging amplifier for information about that device. For information about how to page from a telephone on the NBX system, see "Paging" in the "Getting More From Your Telephone System" chapter in the *NBX Telephone Guide*.

The paging connector on the Call Processor is an RJ-11 connector. It is a line-out, 600 ohm audio interface with a dry contact closure for use with an external paging amplifier (Table 18).

Table 18   Paging Amplifier Connector

Pin 1	Not connected
Pin 2	Relay common
Pin 3	Ring
Pin 4	Tip
Pin 5	Relay contact
Pin 6	Not connected

Configuring Routing Devices

If you have a low-bandwidth device on the LAN, such as an ISDN router, you must update the device's routing table to filter NBX system multicast addresses. The NBX system uses Ethernet multicast addresses to implement some system features, such as paging and conferencing, which can overwhelm a low-bandwidth link.

If you have telephones connected to the network through a low-bandwidth link, you can configure them so that they do not generate multicast traffic (Table 19). For more information, see "Low-bandwidth Telephony" in the *NBX Administrator's Guide*. You must still filter multicasts to ensure that multicasts generated by other NBX devices are not propagated through the low-bandwidth link.

Table 19 Layer 2 Multicast Addresses

Multicast Address	Description
01:e0:bb:00:00:1d	System state
01:e0:bb:00:00:15	Music on hold
01:e0:bb:00:00:11	Page
01:e0:bb:00:00:25	Conference call channel 0
01:e0:bb:00:00:35	Conference call channel 1
01:e0:bb:00:00:31	Conference call channel 2
01:e0:bb:00:00:39	Conference call channel 3
01:e0:bb:00:00:09	Download service
01:e0:bb:00:00:01	Paging audio 1
01:e0:bb:00:00:05	Paging audio 2
01:e0:bb:00:00:0d	Paging audio 3
01:e0:bb:00:00:3d	Conference 4
01:e0:bb:00:00:30	Conference 5
01:e0:bb:00:00:34	Conference 6
01:e0:bb:00:00:3c	Conference 7
01:e0:bb:00:00:38	Conference 8
01:e0:bb:00:00:28	Conference 9
01:e0:bb:00:00:2c	Conference 10
01:e0:bb:00:00:24	Conference 11

i *An NBX 100 system does not support Conference channels 4 through 11.*

3

TELEPHONES AND ATTENDANT CONSOLES

This chapter tells you how to install:

- NBX Business Telephones
- NBX Basic Telephones
- NBX Attendant Consoles

> *For information about installing the system hardware components, see* Chapter 2.

Adding Telephones

This section tells you how to add NBX Business and Basic Telephones to the NBX system.

Adding Telephones During System Installation

There are two ways to add a new telephone: using Auto Discovery, and manually.

- **Auto Discovery method** — Auto Discovery is the simplest and most common method of adding a new telephone. When you enable Auto Discovery and then connect a new NBX Business Telephone to the LAN, several messages pass between the Call Processor and the telephone. The result is that the new telephone receives the next lowest available extension and a default set of properties. The extension number appears on the telephone's display panel. For instructions on connecting a telephone to the LAN, see "Connecting the Telephone to the LAN" later in this section.

  You typically use the Auto Discovery method when you are installing an NBX system for the first time and have several telephones to add. It is good installation practice to autodiscover telephones one at a time, label them with the extension number they have been assigned, and then disconnect them. The customer can then use the extension labels to assign specific telephones to individuals and place the telephones in the correct locations.

You can also use the Auto Discovery method to add single telephones or small numbers of telephones at a later time (for example, when the customer wants to add telephones for recently hired people).

- **Manual method** — You can disable Auto Discovery and configure telephones manually, using the NBX NetSet utility. However, if you have many telephones to configure, manual configuration can be a tedious and error-prone process.

  Typically, you would add a telephone manually only if you wanted to configure a particular feature at the same time. For example, you might want to configure the telephone so that it would not receive paging broadcasts. However, you can autodiscover a telephone and later modify it to configure the features. For information about adding telephones manually, see the *NBX Administrator's Guide*.

For either method of adding a telephone, you must connect the telephone to the network segment on which the Call Processor resides. If you use Auto Discovery, you must enable the Auto Discover Telephones check box before you connect the telephone. If you add a telephone manually, it does not matter whether you connect the telephone before or after you use the NBX NetSet utility to add it.

Connecting Power to the Telephone

Connect the AC power converter provided with the telephone to the power connection on the underside of the telephone and then connect the other end of the power converter to an AC power outlet.
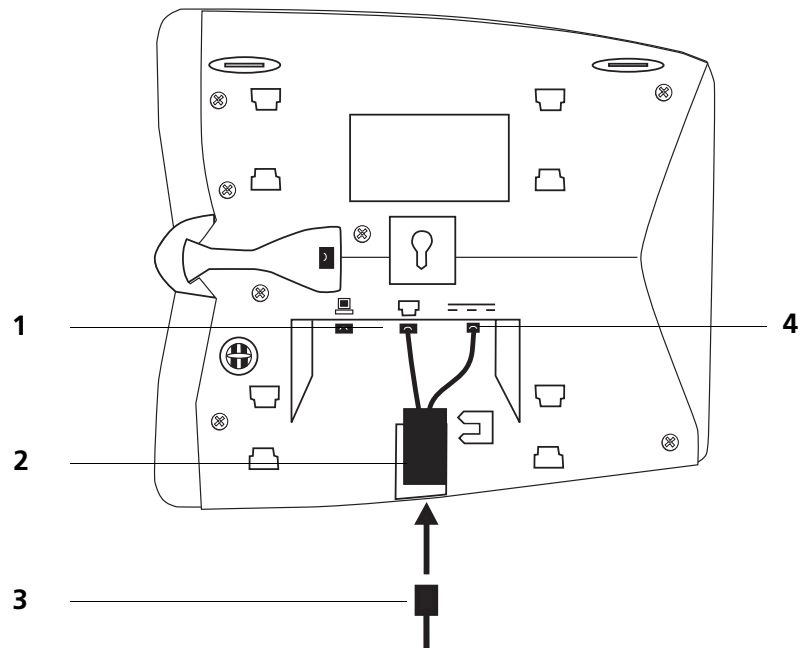
Connecting the Telephone to an Ethernet Power Source

An Ethernet Power Source provides both data and power to the telephone over a Category 5 Ethernet cable. To properly connect the telephone, you must use a splitter (3C10223 - package of 12). One end of the splitter attaches to the Category 5 Ethernet cable that comes from the Ethernet Power Source. The other end of the splitter has two connectors:

- A power connector that plugs into the power jack on the underside of the telephone

- An RJ45 connector that plugs into the data port on the underside of the telephone

See Figure 34.

**Figure 34**   Connecting the Splitter Cable to an NBX Telephone

1   *RJ45 data cable connector (part of splitter cable)*

2   *RJ45 female connector (part of splitter cable)*

3   *Category 5 Ethernet cable from Ethernet Power Source*

4   *Power connector (part of splitter cable)*

Connecting the Telephone to the LAN

To connect the telephone:

1 Connect a Category 5 Ethernet cable to an available hub port or wall jack that is connected to the same subnet as the Call Processor.

2 Connect the other end of the Ethernet cable to the LAN connector on the underside of the telephone, as shown in Figure 35.

Figure 35　Underside of the Business Telephone (Model 1102)
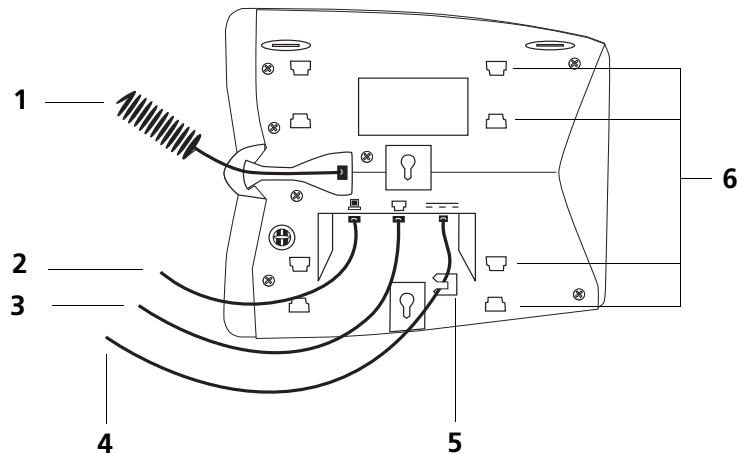
1　*Handset cord (to handset)*
2　*Computer cable (to desktop computer)*
3　*Ethernet cable (to wall jack)*
4　*Power cord (to electric outlet)*
5　*Strain relief tab that prevents the power from becoming disconnected*
6　*Tabs for the mounting bracket*

The undersides of the NBX Model 2102 Business Telephone, Model 2102-IR Business Telephone, and Model 2101 Basic Telephone are similar.

Verifying Telephone Installation

When you initialize the telephone, the display panel shows several messages. After the initialization is completed, the display panel shows the current system date and time and the telephone's extension.

Connecting a Computer to the Telephone

The NBX Model 1102 Business Phone contains a two-port hub with connectors on the underside of the phone. One port is used to connect the telephone to the LAN and the other connects a computer or other Ethernet device to the LAN.

The NBX Model 2102 Business Phone, the Model 2102-IR Business Phone, and the Model 2101 Basic Phone contain a two-port Ethernet switch with connectors on the underside of the phone. One port is used to connect the telephone to the LAN and the other port connects a computer or other Ethernet device to the LAN.

To connect a computer to the hub or switch port on the telephone:

- Use a Category 5 UTP cable with RJ-45 connectors.
- Connect one end of the Category 5 cable to the computer's Ethernet network interface card (NIC).
- Connect the other end of the cable to the Ethernet port or switch on the underside of the telephone.
- The telephone serves as an Ethernet hub (Model 1102) or switch (Models 2101, 2102, and 2102-IR) connecting the computer and LAN.

> **i** *If you are using a 10 Mbps telephone (Model 1102), your transfer speed is limited to 10 Mbps regardless of your LAN speed.*

Attaching the Telephone Support Bracket

Slip the tabs on the telephone's underside into the slots on the bracket, and then snap the opposite mounting points into place. The telephone support bracket can be attached in one of three positions (Figure 36).

Figure 36   Attachment Positions for the Telephone Support Bracket
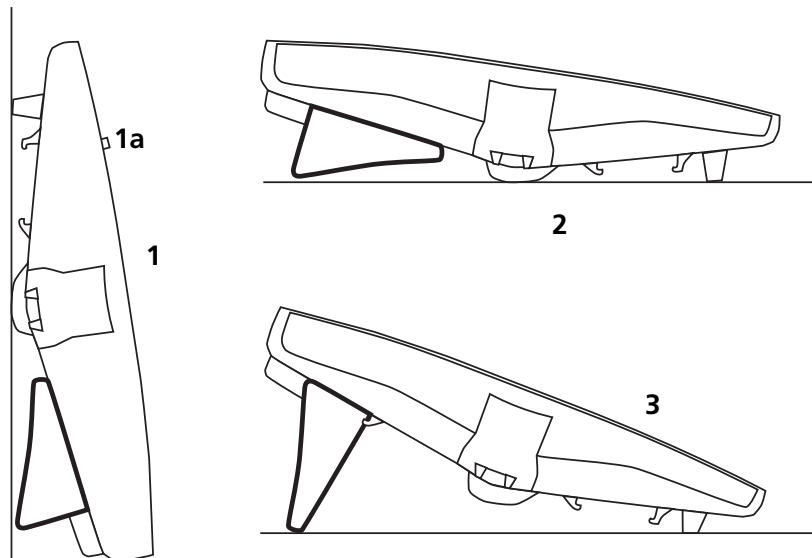
1 Wall mounting position (phone peg (**1a**) must be extended as shown to support the handset)

2 Low-profile desk mounting position

3 High-profile desk mounting position

Adding a New Telephone Using Auto Discovery

Before you enable Auto Discovery, be sure that a 3-digit or 4-digit dial plan is installed and that you have specified a starting extension. See the NBX Administrator's Guide.
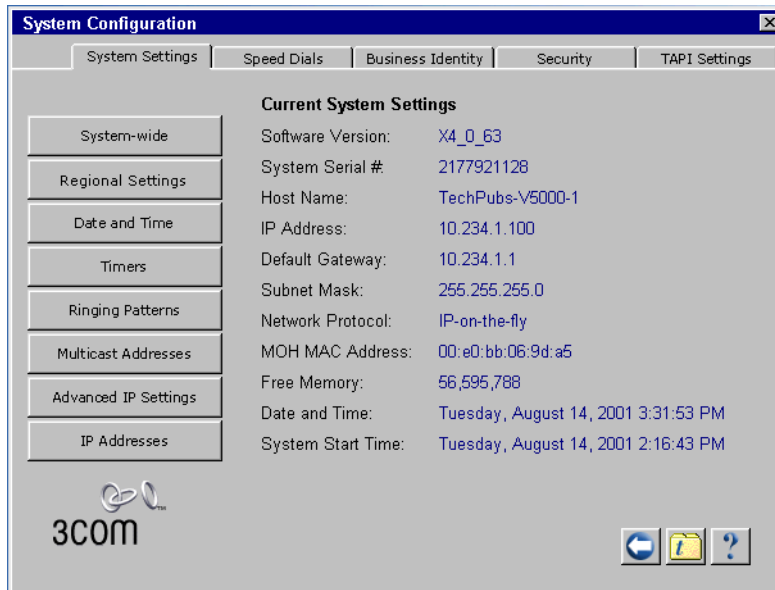
To autodiscover a telephone:

1 In the *NBX NetSet - Main Menu* window, (Figure 37), click *System Configuration*. The System Configuration window (Figure 38) appears.
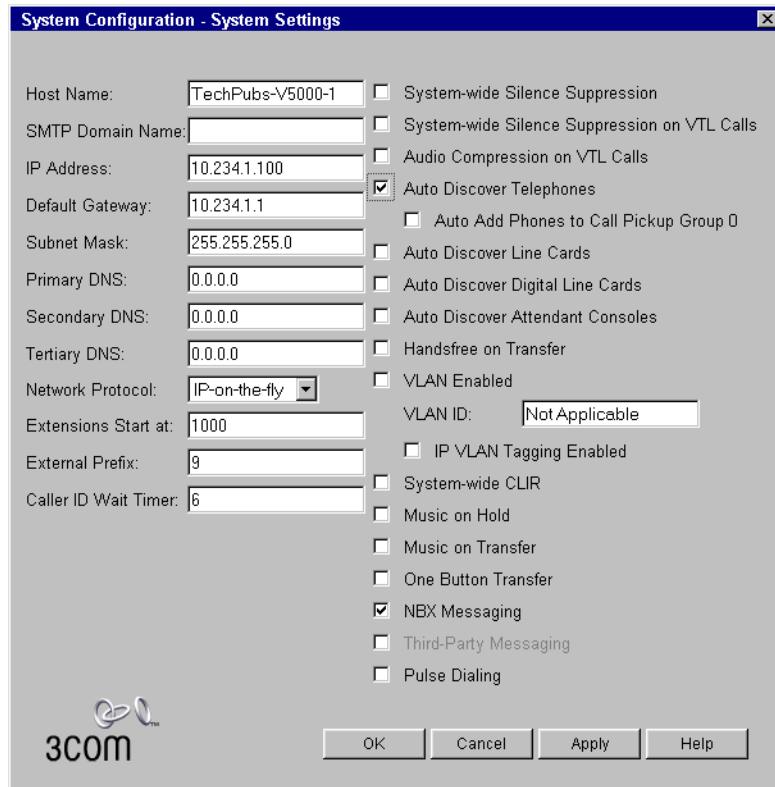
Figure 37   NBX NetSet - Main Menu Window
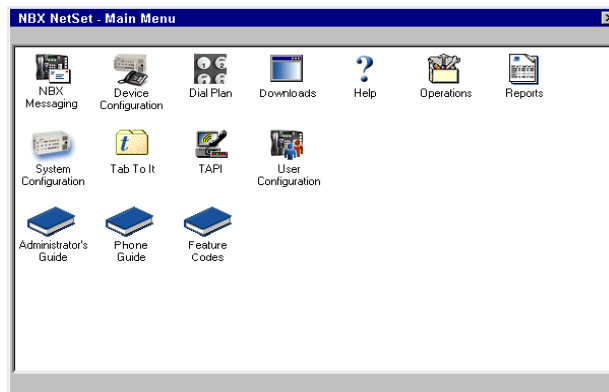
Figure 38   System Settings Tab

2 Click the *System-wide* button. The System-wide dialog box (Figure 39) appears.

Figure 39 System Settings - System-wide Dialog Box

3 Clear all check boxes associated with autodiscovering devices.

4 Enable the *Auto Discover Telephones* check box.

5 Optionally, enable the *Auto Add Phones to Call Pickup Group 0* check box.

> **i** *Whether or not you select this check box, you can later change the call pickup group for any telephone. See the* NBX Administrator's Guide *for information about Call Pickup Groups.*

6 Click *OK*.

7 For each telephone that you want to autodiscover:

a Remove the telephone from the packing box.

b Connect power to the telephone. See "Connecting Power to the Telephone" earlier in this section.

c Connect the telephone to the LAN on which the Call Processor resides. See "Connecting the Telephone to the LAN" earlier in this section.

d Wait until the telephone display panel contains an extension number.

e Record the extension number on the telephone's shipping box.

f Disconnect the telephone from the LAN.

g Disconnect power from the telephone.

h Place the telephone back in its shipping box.

The telephone can now be placed in the appropriate location based on the telephone extension assignments the customer has chosen.

Adding an NBX Model 1105 Attendant Console

The NBX 1105 Attendant Console provides extension button mappings and displays the current status of each mapped extension. A receptionist typically uses the Attendant Console to connect incoming calls to telephone extensions.

When you install a new NBX system, add all telephones before you autodiscover any Attendant Console. The Auto Discovery process assigns the extension of each known telephone to a button on the Attendant Console and saves a lot of time compared to the manual assignment of button mappings.

Autodiscovering an Attendant Console

To autodiscover an Attendant Console:

1 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

2 Click the *System Settings* tab.

3 Click the *System-wide* button. The System Settings dialog box (Figure 40) appears.

Figure 40   System Settings — System-wide Dialog Box

4 Clear all check boxes associated with autodiscovering devices.

5 Enable *Auto Discover Attendant Consoles* and click *OK*.

6 Wait 2 minutes (more on a SuperStack 3 NBX system that has many devices) for the NBX system to autodiscover the Attendant Console and assign the extensions of all known telephones to its buttons.

When you autodiscover an Attendant Console, the NBX system associates it with a telephone based on the following factors:

- If there are no other Attendant Consoles on the system, associate the new Attendant Console with the NBX Business or NBX Basic Telephone that has the lowest extension number.

- If one or more Attendant Consoles are already configured in the system, find all NBX Business Telephones and NBX Basic Telephones that currently have an associated Attendant Console and associate the new Attendant Console with the Business or Basic Telephone that has the lowest extension number.

Typically, you want to associate an Attendant Console with the telephone beside it. If the Auto Discovery process associates an Attendant Console with a telephone other than the one you want, see "Associating an Attendant Console with a Specific Telephone" in Chapter 2 for instructions on how to change the association.

Verifying Extension Assignments on an Attendant Console

After you have autodiscovered an Attendant Console, you can verify which telephone extensions have been assigned to the Attendant Console buttons.

To verify the extension assignments:

1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

2 Click the *Attendant Console* tab.

3 Select the Attendant Console from the list.

4 Click the *Button Mappings* button. The Attendant Console Button Mappings dialog box (Figure 41) appears. The example shows two previously autodiscovered telephones, extensions 1003 and 1004, which have been assigned to the first two button in the first column.

Figure 41   Attendant Console Button Mappings Dialog Box
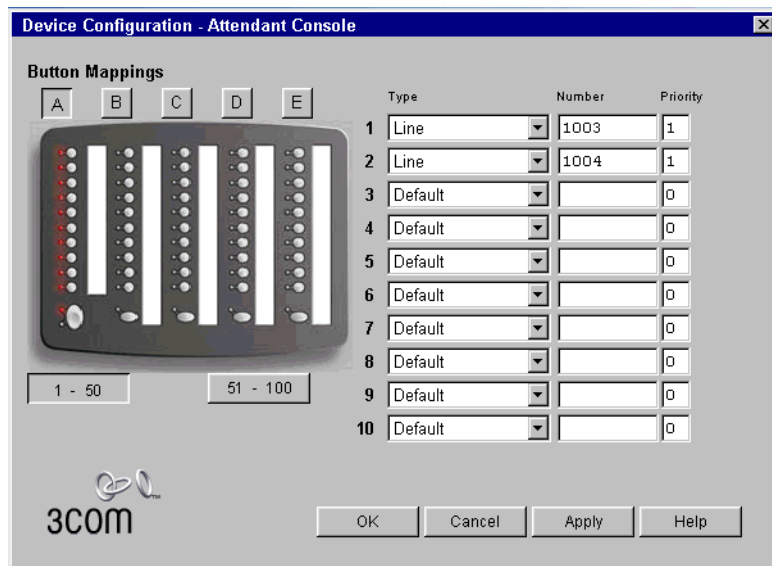
For more about button mappings on an Attendant Console, see Chapter 3, "Device Configuration," in the *NBX Administrator's Guide.*

4

ANALOG LINE CARDS

This chapter tells you how to install and how to verify the successful installation of Analog Line Cards.

> ℹ️ *For information about installing the system hardware components, see* Chapter 2.

Each NBX 4-Port Analog Line Card provides access for up to four analog telephone lines into your NBX system. The NBX system treats a line card port as an extension and assigns a unique extension number to each port.

You use Auto Discovery to detect Line Card ports, and you define the starting address for Auto Discovery of devices in the system dial plan. For a 3-digit dial plan, the default starting address is 750; for a 4-digit dial plan, the starting address is 7250. Auto Discovery assigns the first unassigned number to the first Line Card port.

> ℹ️ *Before you install any Analog Line Cards, you may want to configure the Outdialing Prefixes. For information on this topic, please refer to "Outdialing Prefix Settings" in Chapter 2 of the* Administrator's Guide *or the Help (Dial Plan > Operations > Set Outdial Prefixes).*

Autodiscovering Analog Line Cards

To autodiscover an Analog Line Card:

1 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

2 Click the *System Settings* tab.

3 Click the *System-wide* button.

4 Clear all check boxes associated with autodiscovering devices.

5 Enable *Auto Discover Line Cards*.

6 Click *OK*.

Inserting an Analog Line Card

Read the following Caution before you insert an 4-port Analog Line Card.

⚠ *CAUTION: To insert the 4-Port Analog Line Card into the chassis, you must leave the system powered up.*

To insert the 4-Port Analog Line Card:

1 Find the MAC address of the card on the label on the card.

2 Record the MAC address for the configuration process.

3 Select a slot for the card in the chassis and use a Phillips screwdriver to remove the blank faceplate from the slot.

4 Insert the analog line card into the slot.

5 Slide the card into the chassis until you feel it touch the connectors.

6 To seat the analog line card into the connectors, apply firm pressure to both the left and right sides of the front of the card.

ⓘ *If you cannot seat the card with light pressure, remove it and check for obstructions.*

7 Tighten the left and right screws on the front of the card to secure it to the chassis.

⚠ *CAUTION: Wait 2 minutes (more on a SuperStack 3 NBX system that has many devices) for the card to initialize and for the system to update its database.*

Verifying an Analog Line Card

After you have added an Analog Line Card, you can verify that the card was properly discovered and is ready for configuration by:
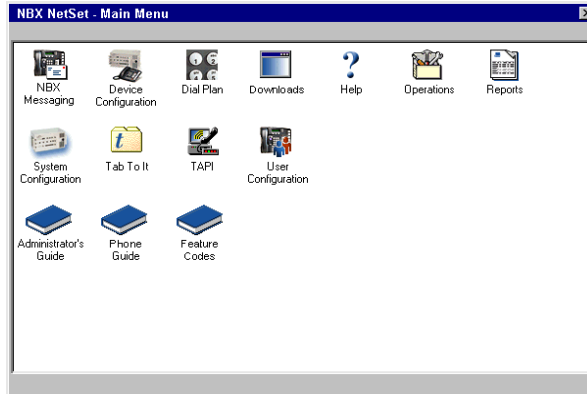
- Using the NBX NetSet Utility
- Using Status Lights

Using the NBX NetSet To verify the status of an Analog Line Card using the NBX NetSet utility:
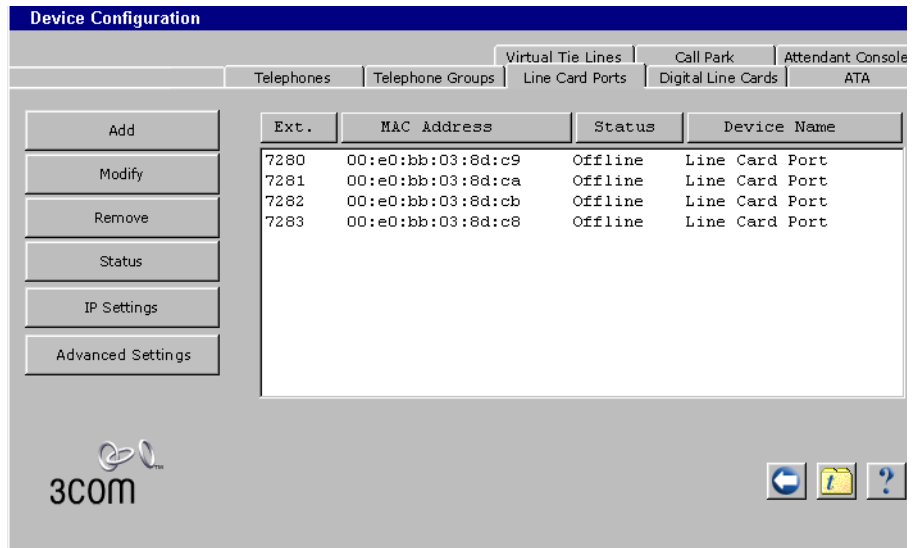**Utility**

1 In the *NBX NetSet - Main Menu* window (Figure 42) click *Device Configuration*.

Figure 42   NBX NetSet - Main Menu Window

2 In the Device Configuration dialog box, click the Line Card Ports tab. See Figure 43.

Figure 43   Line Card Ports Tab

3 Compare the MAC addresses to the MAC address of the card that you recorded before you inserted the card. Table 20 shows a typical set of MAC addresses, with the associated port numbers and assigned extensions.

Table 20 MAC Addresses for the Ports on a 4-Port Analog Line Card

ATA Card or Port	MAC Address	Extension
4-Port Analog Terminal card	*00:e0:bb:03:91:44*	*Not applicable*
Port 1	*00:e0:bb:03:91:45*	*7251*
Port 2	*00:e0:bb:03:91:46*	*7250*
Port 3	*00:e0:bb:03:91:47*	*7252*
Port 4	*00:e0:bb:03:91:48*	*7253*

The ports on an Analog Line Card are usually not autodiscovered in order. The example in Table 20 shows that port 2 was discovered first (because it was assigned the lowest extension number), then ports 1, 3, and 4.

Using Status Lights

You can use the status lights on an Analog Line Card to help verify that the card has been properly discovered by the NBX system.

When an Analog Line Card is initializing, all four status lights (labelled 1 through 4) blink on and off in unison, approximately once every second.

After an Analog Line Card has been autodiscovered, each status light is off most of the time, but blinks on briefly approximately once every 10 seconds. The order in which the status lights blink is the same as the order in which the ports were autodiscovered. For the example shown in Table 20, the lights would blink on in the order 2, 1, 3, 4.

5

ANALOG DEVICES

This chapter tells you how to install and how to verify the successful installation of these analog devices:

- 4-Port Analog Terminal Card
- Single-port Analog Terminal Adapter

These devices allow you to attach analog telephones and fax machines to the NBX system.

> *For information about installing the system hardware components, see* [Chapter 2](#).

A 4-Port Analog Terminal card or a Single-Port Analog Terminal Adapter (ATA) allows analog (2500-series compliant) devices, such as cordless telephones and fax machines, to operate with NBX systems.

Certain limitations apply because of the differences between an analog device and an NBX Business Telephone or NBX Basic Telephone:

- A user can dial 500 on a telephone connected to either an ATA or to a port on a 4-Port Analog Terminal Card to gain access to voice mail.

- A user cannot forward calls to voice mail by enabling a button such as the FWD MAIL button on the NBX Business Telephone. You can use a feature code to have the system automatically transfer calls to voice mail if your analog telephone is not answered.

- An analog telephone can make or answer only one call. If the analog telephone is in use, an incoming call automatically goes to voice mail. However, if you have purchased the Call Waiting service from your telephone company, and you have an incoming analog telephone line mapped directly to your analog telephone, you can press the hook switch to toggle back and forth between two calls.

- An ATA and each port on a 4-Port Analog Terminal Card support call transfer. To transfer a call from an analog telephone, you must depress

the hook switch briefly to obtain dial tone, and then dial the extension to which you want to transfer the call and hang up.

■ By using feature codes, you can create conference calls and forward calls using your analog telephone. See the *NBX Feature Codes Guide* in the NBX NetSet utility.

Adding an Analog Terminal Card

To add a 4-Port Analog Terminal Card to the NBX system:

1 In the *NBX NetSet - Main Menu* window, click *System Configuration*. The System Configuration dialog box (Figure 44) appears.

Figure 44 System Settings Tab
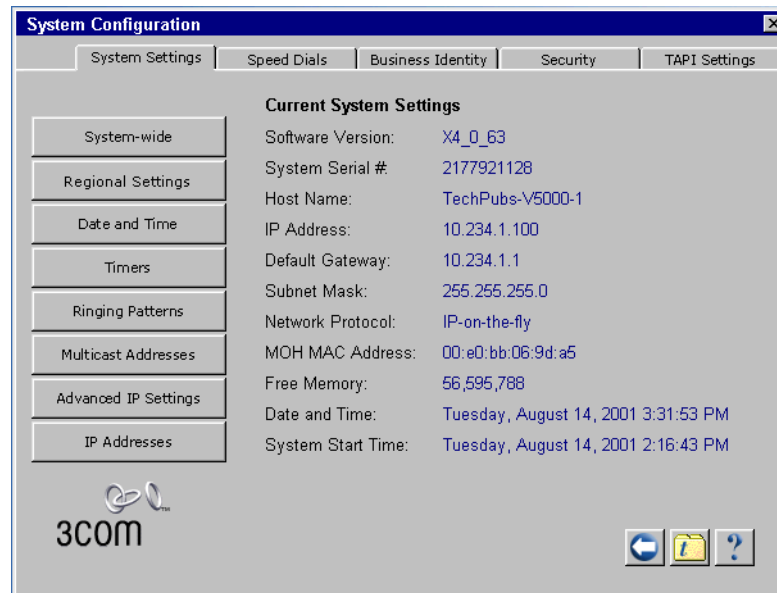
2 Click *System-wide*. The System Settings — System-wide dialog box appears (Figure 45).

Figure 45   System Settings — System-wide Dialog Box

3 Clear all check boxes associated with autodiscovering devices.

4 Click the *Auto Discover Telephones* check box to select it.

> **i** *The* Auto Discover Telephones *check box controls the autodiscovery of Analog Terminal Cards, Analog Terminal Adapters, and NBX Telephones.*

5 Click *OK*.

Inserting an Analog Terminal Card

Read the following Caution before you insert the 4-Port Analog Terminal Card (ATC).

⚠ **CAUTION:** *To insert the ATC into the chassis, you must leave the system powered up.*

To insert the analog terminal adapter card:

1 Find the MAC address of the ATC on the label on the card.

2 Record the MAC address for the configuration process.

3 Select a slot for the card in the chassis and use a Phillips screwdriver to remove the blank faceplate from the slot.

4 Insert the card into the slot.

5 Slide the card into the chassis until you feel it touch the connectors.

6 To seat the card into the connectors, apply firm pressure to both the left and right sides of the front of the card.

ℹ *If you cannot seat the card with light pressure, remove it and check for obstructions.*

7 Tighten the left and right screws on the front of the card to secure it to the chassis.

⚠ **CAUTION:** *Wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the Analog Terminal Card to initialize and for the system to update its database.*

|	
Verifying Analog Terminal Card Ports	After you have autodiscovered an Analog Terminal Card, you can verify that the card is properly installed by using the NBX NetSet utility and by examining the status lights on the front of the card.
Using the NBX NetSet Utility	To verify the proper installation of an Analog Terminal Card using the NBX NetSet utility:

1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

2 In the *Device Configuration* dialog box, click the *ATA* tab. (See Figure 46.)

Figure 46 ATA Tab
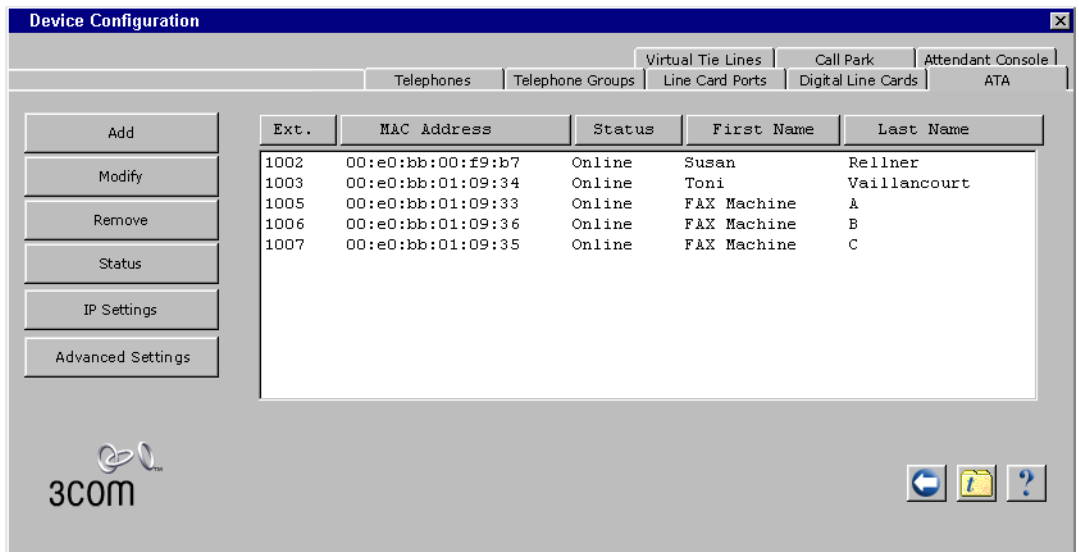
3 Compare the MAC addresses or port numbers that appear in the list to the MAC address and port numbers you recorded before you inserted this Analog Line Card.

The four ports of the 4-Port Analog Terminal Card appear in the list of ATAs, along with the ports of any previously discovered 4-Port Analog Terminal Cards, and any Single-Port Analog Terminal Adapters (ATAs).

Each of the four ports on an Analog Terminal Adapter Card has a MAC address. For the 3C10114 card, the MAC address is based on, but not identical to, the MAC address of the card. Table 21 shows a sample set of MAC addresses for a 4-Port Analog Terminal Card and the ports on the card. For the 3C10114C card, all ports have the same MAC address and individual port numbers appear in parentheses after the MAC address.

Table 21 MAC Addresses for the Ports on a 4-Port ATA Card

ATA Card or Port	MAC Address	Extension
4-Port Analog Terminal card	00:e0:bb:00:09:32	Not Applicable
Port 1	00:e0:bb:00:09:33	1001
Port 2	00:e0:bb:00:09:34	1002
Port 3	00:e0:bb:00:09:35	1007
Port 4	00:e0:bb:00:09:36	1006

The ports on an Analog Terminal Card, single-port ATAs, and NBX Telephones are autodiscovered using a single Auto Discovery process (by enabling the Auto Discover Telephones check box). You may find that the NBX system does not assign extension numbers to ports on an Analog Terminal Card in the order of the MAC addresses. The example in Table 21 *shows that the four ports were discovered in the order 1, 2, 3, 4 based on MAC address order, but the extensions were assigned in the order 1, 2, 4, 3. If you connect telephones, single-port Analog Terminal Adapters, and Analog Terminal Cards before you turn on Auto Discovery, there may be gaps between the extensions assigned to ATC ports.* Table 21 *shows that ports 1 and 2 were assigned extensions 1001 and 1002, respectively. By examining the information on the ATA Tab (see* Figure 46*), you can verify that extensions 1003 and 1004 have been assigned to NBX Telephones and extension 1005 was assigned to a single-port Analog Terminal Adapter.*

Using Status Lights   After you autodiscover a 4-port Analog Terminal Card, you can use the status lights to help determine if the card has been properly discovered.

3C10117 Analog Terminal Card

Whether or not you connect an analog telephone to one of the ports, the S2 light blinks on briefly approximately every 10 seconds

If you connect an analog telephone or fax machine to one of the ports, the S1 light turns on when the telephone is off hook and turns off when it is on hook. The S2 light turns on when a call is connected on this port.

3C10117C Analog Terminal Card

Each port has a single status light. Table 22 explains each light pattern.

Table 22 Status Light Patterns (3C10117C)

Light Pattern	Meaning
All lights show a fast steady blink	The card is waiting for the completion of a software download operation.
All lights are on	The software has been downloaded and the flash memory on the card is being loaded.
Slow non-symmetric flashing	The card is trying to find the Call Processor.
Off for 9 to 10 seconds, on briefly	The phone attached to this port is on hook. There is no call active.
On for 9 to 10 seconds, off briefly	The phone attached to this port has been taken off hook for a call.

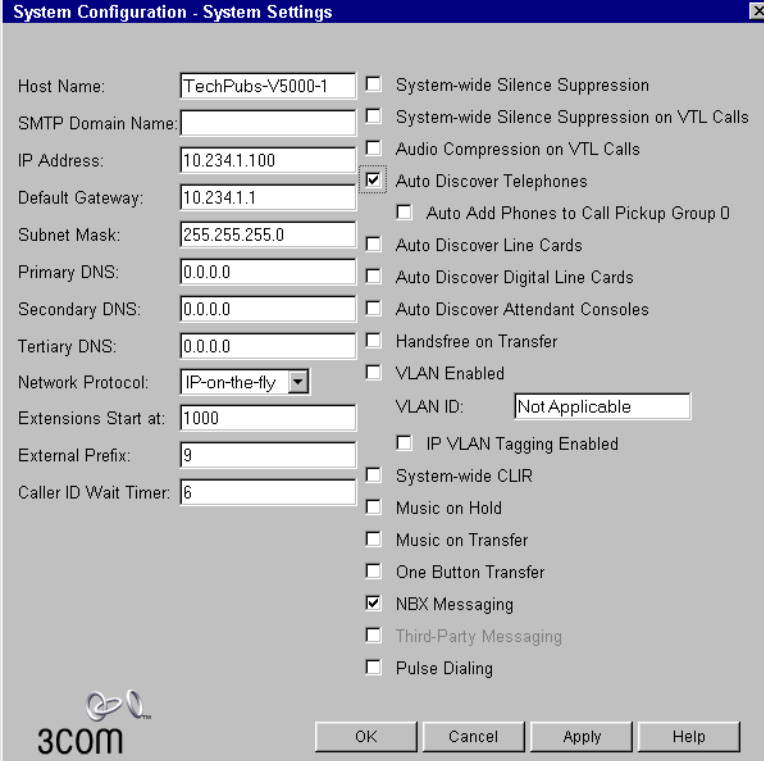**Adding an Analog Terminal Adapter (ATA)**

To add an Analog Terminal Adapter (ATA) to your NBX system you must first enable Auto Discovery. You autodiscover a Single-Port Analog Terminal Adapter (ATA) in the same way that you autodiscover NBX telephones and 4-port Analog Terminal Adapters.

1 In the *NBX NetSet - Main Menu* window, click *System Configuration*. The System Configuration dialog box (Figure 47) appears.

Figure 47 System Configuration Dialog Box
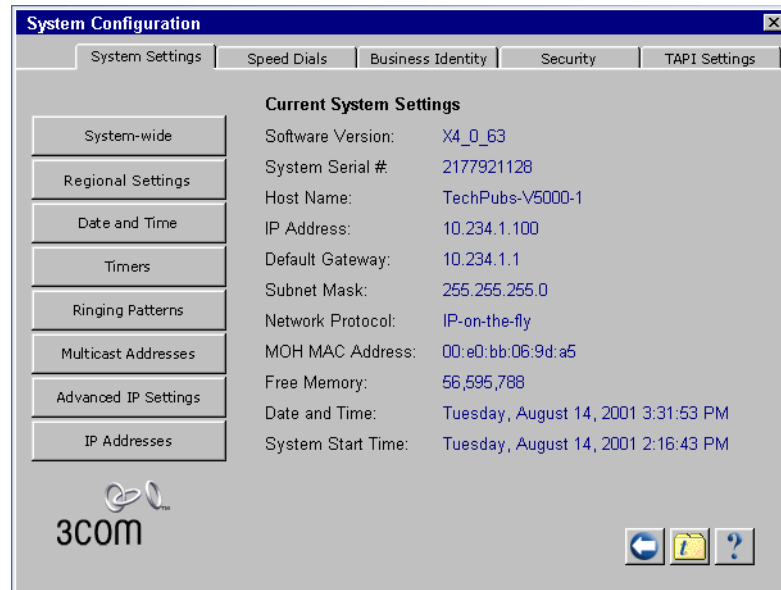
2 Click *System-wide*. The System Settings dialog box (Figure 48) appears.

Figure 48 System Settings — System-wide Dialog Box

3 Clear all check boxes associated with autodiscovering devices.

4 Click the *Auto Discover Telephones* check box to select it.

The Auto Discover Telephones *check box controls the autodiscovery of Analog Terminal Cards, Analog Terminal Adapters, and NBX Telephones.*

5 Click *OK*.

Connecting the Analog Terminal Adapter

After you have enabled Auto Discovery, connect the Analog Terminal Adapter (ATA) to the same network segment as the one on which the call processor resides. To connect the ATA:

1 Connect the AC power converter provided with the ATA to the power connector on the ATA. Connect the other end of the power converter to an AC power outlet.

2 Connect a Category 5 Ethernet cable to the ATA RJ-45 connector that has no icon beside it. Connect the other end of the Category 5 Ethernet cable to the LAN on which the Call Processor is located.

3 Wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the NBX system to discover the ATA.

Verifying an Analog Terminal Adapter

After the NBX system has autodiscovered an Analog Terminal Adapter, you can verify that the ATA has been properly discovered.

Using the NBX NetSet Utility

To verify that the NBX system properly discovered the ATA:

1 In the *NBX NetSet - Main Menu* window, click Device Configuration. The Device Configuration dialog box (Figure 49) appears.

Figure 49 Device Configuration Dialog Box
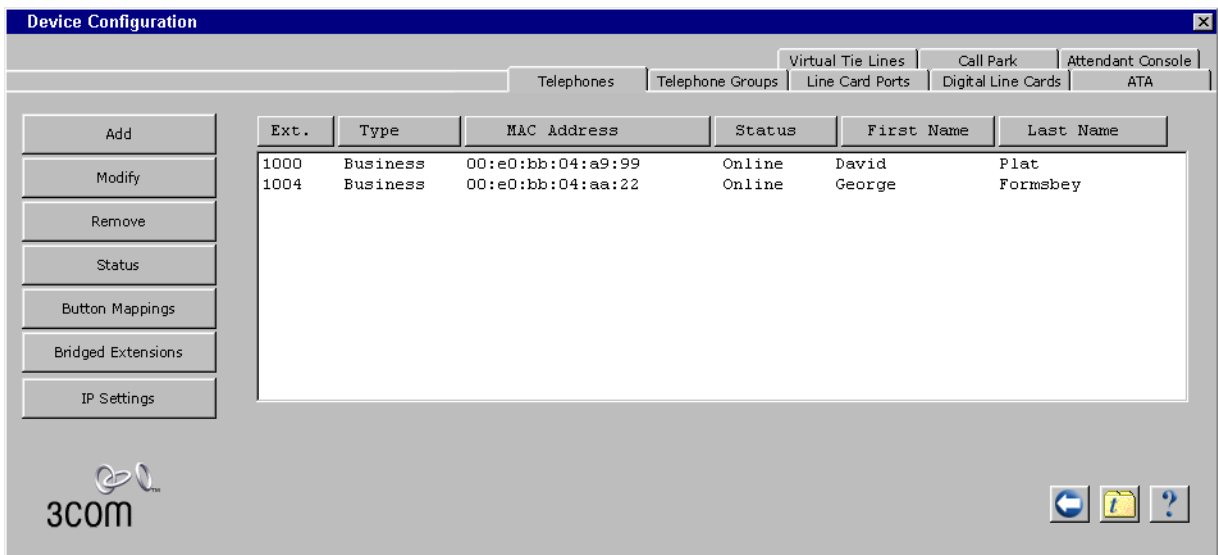
2 Click the ATA tab. See Figure 50. The ATA tab displays information about all discovered single-port ATAs and all ports on discovered Analog Terminal Adapter Cards

Figure 50 Device Configuration Dialog Box — ATA Tab
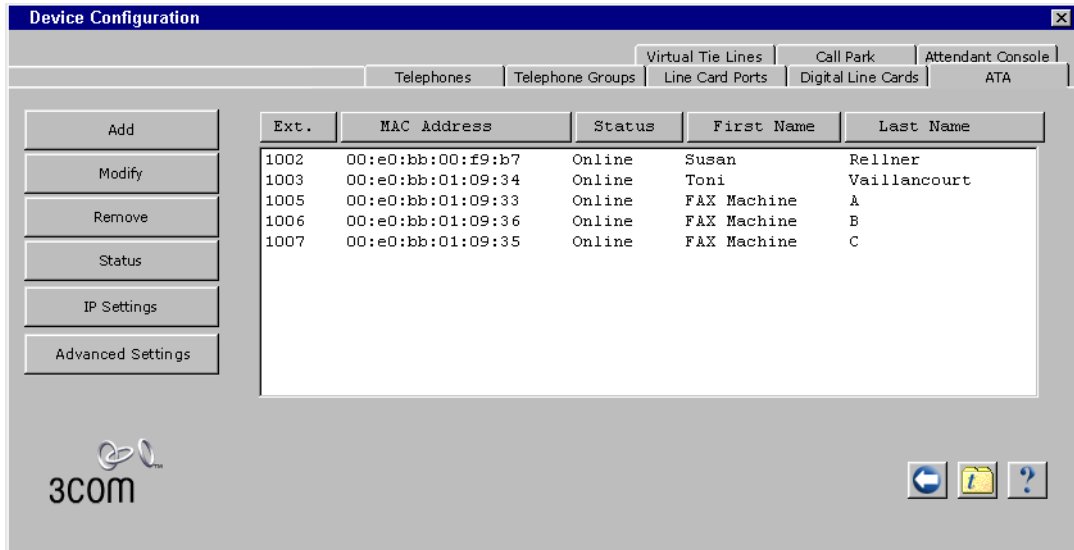
3 Use the MAC address that you recorded prior to installing the ATA to identify it in the list. The MAC address on the ATA and the MAC address displayed in the list on the ATA tab should be identical.

Using Status Lights Use the status lights on an ATA to help verify that the ATA has been properly discovered. The lights below the icon for the analog telephone (S1, S2, and S3) indicate the status of the Analog Port.

- S3 turns on when the analog telephone or fax machine is in use.

- S2 turns on briefly every two seconds when an analog telephone or fax machine is connected to the ATA. If no device is connected to the ATA, S2 is off.

- S1 is reserved for future use.

6

BRI-ST DIGITAL LINE CARD

This chapter tells you how to install and verify the successful installation of the ISDN BRI-ST (Basic Rate Interface) Digital Line Card.

For information about installing the system hardware components, see Chapter 2.

The following sections describe how to add and configure a BRI-ST Digital Line Card to handle four BRI spans using the ST interface. In this section, and in the NBX NetSet utility, digital line cards are referred to as cards and boards.

This section covers the following topics:

- Adding a BRI-ST Digital Line Card
- Verifying a BRI-ST Digital Line Card

An NBX 100 system can accommodate up to 12 BRI-ST cards and a SuperStack 3 NBX system can accommodate up to 90 BRI-ST cards using ISDN BRI-ST signaling. Each BRI-ST card (3C10164-S/T) supports the Basic Rate Interface protocol (ST interface only).

Before you install any BRI-ST Digital Line Cards, you may want to configure the Outdialing Prefix settings. For information on this topic, see the "Outdialing Prefix Settings" section in Chapter 2, "Dial Plan," in the NBX Administrator's Guide *or the Help: Dial Plan > Operations > Set Outdial Prefixes.*

Adding a BRI-ST Digital Line Card

To add an ISDN BRI-ST Digital Line Card to an NBX system, use the information in these sections:

- Preparing the NBX System for BRI Cards
- Ordering DID, CLIP, and MSN Services for BRI
- Inserting the BRI-ST Digital Line Card

⚠ *CAUTION: The BRI-ST and BRI-U Digital Line Cards are not approved for use in the United States or Canada.*

Preparing the NBX System for BRI Cards

Before you insert the BRI-ST Digital Line Card into the chassis, order an ISDN BRI-ST line from your telephone carrier and have them install it.

Ordering DID, CLIP, and MSN Services for BRI

When you order BRI services with DID, CLIP, or MSN, the local telephone carrier assigns a block of telephone numbers to you. You may be able to request that the local telephone carrier pass you a specific number of digits for each incoming telephone call. Sometimes the carrier does not offer any choice. In either case, you need to know how many digits the carrier passes.

Example: Carriers commonly pass either the last three digits or last four digits of the number for each incoming call.

Sometimes the last digits of the telephone numbers the carrier assigns to you do not match the telephone extension numbers you want to use for internal calls. You can create entries in your Dial Plan file to translate the incoming numbers into the corresponding extension numbers.

Example: You want to use internal extensions from 4000 through 4999, but the local telephone carrier assigns you numbers from 617-555-3500 through 617-555-4499. You can create translator entries in the Dial Plan configuration file to translate an incoming digit sequence such as 3795 into extension number 4295, and a sequence such as 4213 into 4713. The configuration would require several translator entries to handle subsets of the total range. A unique set of entries would handle incoming digit sequences from 3500 through 3599, from 3600 through 3699, and each of the other sequences in which the first two digits were unique in the range from 37XX through 44XX.

If the DDI/DID numbers match your internal extension numbers, the translator entries in your Dial Plan configuration file can be much simpler.

Example: You plan to use internal extensions from 100 through 299, and the local telephone company assigns you numbers from 617-555-4100 through 617-555-4299. If the local telephone carrier passes you three digits, you need no translator entries in the Dial Plan configuration file. If the carrier passes you four digits, you could add a single set of translator entries to the configuration file to remove the first digit (4) and use the remaining three digits as the internal extension.

Enabling Auto Discovery

To enable Auto Discovery for digital line cards:

1 Log in to the NBX NetSet utility using the administrator login ID and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 In the *System Configuration* window, click the *System Settings* tab.

4 Clear all check boxes associated with autodiscovering devices.

5 Click the *Auto Discover Telephones* check box to select it.

6 Click *OK*.

Inserting the BRI-ST Digital Line Card

Do not remove the power cable from the chassis before you insert the BRI-ST card.

To insert the BRI-ST card into the chassis:

1 Write down the MAC address of the BRI-ST card.

2 Select a slot for the BRI-ST card in the chassis, and use a Phillips screwdriver to remove the blank faceplate from the slot.

3 Insert the BRI-ST card into the slot.

4 Slide the BRI-ST card into the chassis until you feel it touch the connectors.

5 To seat the BRI-ST card into the connectors, press firmly on both sides of the front of the card.

If you cannot seat the card with light pressure, remove it and check for obstructions and misalignment.

6 Tighten the left and right screws on the front of the BRI-ST card to secure it to the chassis.

7 Wait 3 minutes (more on a SuperStack 3 NBX system with many devices) for the system to discover the BRI-ST card and update the database.

⚠️ *CAUTION: When you insert the BRI-ST Digital Line Card, it begins an initialization sequence. Also, because you enabled the Auto Discover Digital Line Cards check box, the system recognizes the addition of the BRI-ST card and begins to update its database. Allow 3 minutes for both of these processes to be completed. On a SuperStack 3 NBX system with many devices, it may take more than 3 minutes. If you attach a console cable to the CONSOLE port on the BRI-ST card and use Hyperterminal software to view the text output, you can see status messages. See* "Connecting a Computer to a Serial Port", *in* Chapter 10*.*

Verifying a BRI-ST Digital Line Card

After you autodiscover a BRI-ST Digital Line Card, you can verify that it was properly discovered by:

- Using the NetSet Utility
- Using Status Lights

Using the NetSet Utility

To verify that the BRI-ST card has been properly discovered:

1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

2 Click the *Digital Line Cards* tab. See Figure 51.

3 Examine the list of Digital Line Cards to find the BRI-ST board with the correct MAC address. The *Type* column should contain *BRI* and the *Status* column should contain *Ready*.

4 From the *Select Device Type* pull-down list, select *ISDN BRI Channel List*.

5 Click *Apply*. The ISDN BRI Channel List (Figure 52) appears.

6 Verify that the *Ext.* column contains an extension for each channel.

7 Verify that the *Status* column contains *Ready* for each channel.

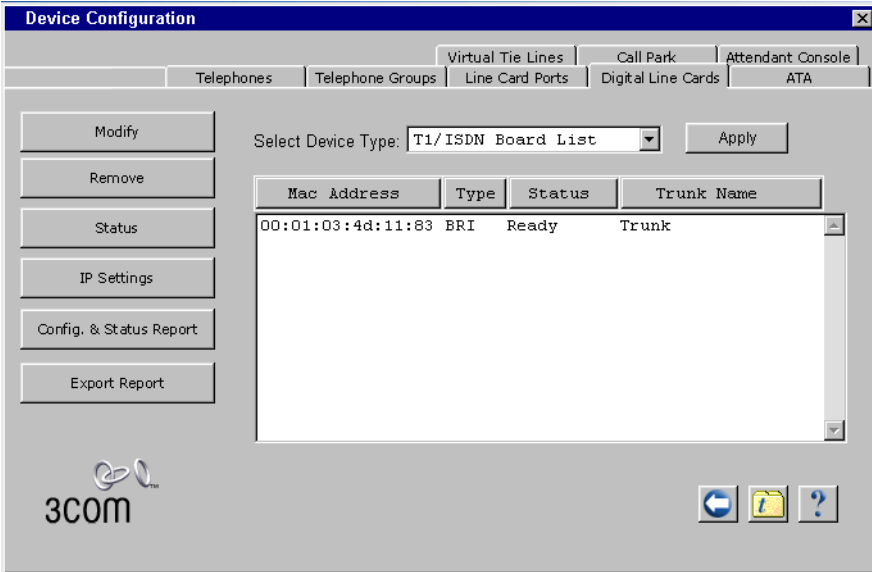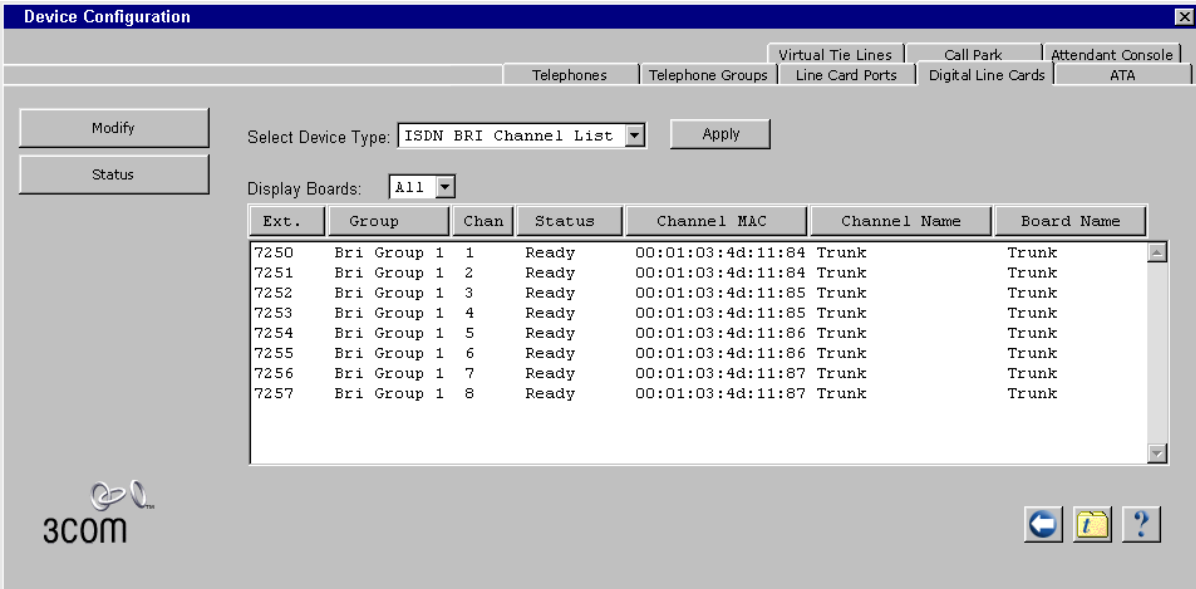**Figure 51**   Digital Line Cards Tab

Figure 52   ISDN BRI Channel List

Using Status Lights   To verify that a BRI-ST Digital Line Card has been properly discovered:

1 During the Auto Discovery process each of the status lights turns amber briefly starting with span 1 (channels D, B1, and B2) and continuing through span 4 (channels D, B1, and B2).

2 After approximately 30 seconds, the B1 status light on all four spans turns green for approximately one minute.

3 All lights turn off when Auto Discovery is completed.

After you connect an ISDN BRI span to a port on the BRI-ST Digital Line Card, the D light turns green if the span is operating properly, and turns amber if there is a problem.

For a span that is operating properly, when the NBX system initiates a call on a B channel, the corresponding light initially turns amber. When the call is answered, the light turns green. Similarly, when the NBX system receives a call on a B channel, the corresponding light initially turns amber. When the NBX system answers the call, the light turns green.

You are now ready to configure the ISDN BRI-ST Digital Line Card. See Chapter 3, "Device Configuration," in the *NBX Administrator's Guide*.

7

E1 ISDN PRI DIGITAL LINE CARD

This chapter tells you how to install and how to verify the successful installation of an E1 Digital Line Card.

For information about installing the system hardware components, see Chapter 2.

This section describes how to add an E1 Digital Line Card (3C10165A) and how to connect to an E1 service provided by the local telephone company. In the NBX NetSet utility, digital line cards are referred to as either cards or boards.

This section covers the following topics:

- Adding an E1 Digital Line Card
- Verifying an E1 Digital Line Card

An NBX 100 system can accommodate up to 3 E1 boards, and a SuperStack 3 NBX system can accommodate up to 24 E1 boards.

You can configure an E1 Digital Line Card for ISDN PRI signaling only.

Before you install any E1 Digital Line Cards, you may want to configure the Outdialing Prefix settings. For information on this topic, see the "Setting Outdialing Prefix Settings" section in Chapter 2, "Dial Plan," in the NBX Administrator's Guide *or the Help: Dial Plan > Operations > Set Outdial Prefixes.*

| **Adding an E1 Digital Line Card** | The following sections tell you how to add an E1 Digital Line Card to an NBX system: |

- Preparing the NBX System for E1 Cards
- Ordering DID, CLIP, and MSN Services for E1
- Inserting the E1 Digital Line Card

Preparing the NBX System for E1 Cards

Before you insert the E1 Digital Line Card into the chassis, order an E1 line, with the specifications you want, from your telephone carrier, and have them install the line.

Ordering DID, CLIP, and MSN Services for E1

When you order E1 with DID, CLIP, or MSN services, the local telephone carrier assigns a block of telephone numbers to you. Usually, you can request a specific range of numbers, but sometimes the carrier assigns numbers other than the ones you request.

You may be able to request that the local telephone carrier pass you a specific number of digits for each incoming telephone call. Sometimes the carrier does not offer any choice. In either situation, you need to know how many digits the carrier passes.

Example: Carriers commonly pass either the last three digits or last four digits of the number for each incoming call. Sometimes the last digits of the telephone numbers the carrier assigns to you do not match the telephone extension numbers you want to use for internal calls. You can create entries in your Dial Plan configuration file to translate the incoming numbers into the corresponding extension numbers.

Example: You want to use internal extensions from 4000 through 4999, but the local telephone carrier assigns you numbers from 617-555-3500 through 617-555-4499. You can create translator entries in the Dial Plan configuration file to translate an incoming digit sequence such as 3795 into extension number 4295, and a sequence such as 4213 into 4713. The configuration would require several translator entries to handle subsets of the total range. A unique set of entries would handle incoming digit sequences from 3500 through 3599, from 3600 through 3699, and each of the other sequences in which the first two digits were unique in the range from 37XX through 44XX.

If the DDI/DID numbers match your internal extension numbers, the translator entries in your Dial Plan configuration file can be much simpler.

Example: You plan to use internal extensions from 100 through 299, and the local telephone company assigns you numbers from 617-555-4100 through 617-555-4299. If the local telephone carrier passes you three digits, you need no translator entries in the Dial Plan configuration file. If the carrier passes you four digits, you could add a single set of translator entries to the configuration file to remove the first digit (4) and use the remaining three digits as the internal extension.

Enabling Auto Discovery for Digital Line Cards

To enable Auto Discovery for digital line cards:

1 Log in to the NBX NetSet utility using the administrator login ID and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 In the *System Settings* tab window, click the *System-wide*.

> **i** *Other check boxes may be selected based upon previous Auto Discoveries. You do not need to clear these check boxes to install the E1 card.*

4 Clear all check boxes associated with autodiscovering devices.

5 Click the *Auto Discover Digital Line Cards* check box to select it.

6 Click *OK*.

Inserting the E1 Digital Line Card

Do not remove the power cable from the chassis before inserting the E1 card.

To insert the E1 Digital Line Card into the chassis:

1 Write down the MAC address of the E1 card.

2 Select a slot for the E1 card in the chassis, and use a Phillips screwdriver to remove the blank faceplate from the slot.

3 Slide the E1 card into the chassis until you feel it touch the connectors.

4 To seat the E1 card into the connectors, press firmly on both sides of the front of the card.

> **i** *If you cannot seat the card with light pressure, remove it and check for obstructions.*

5 Tighten the left and right screws on the front of the E1 card.

6 Wait 3 minutes (more on a SuperStack 3 NBX system with many devices).

⚠ *CAUTION: When you insert the E1 Digital Line Card, it begins an initialization sequence. Also, because you enabled the Auto Discover Digital Line Cards check box, the system recognizes the addition of the E1 card and begins to update its database. Allow 3 minutes for both of these processes to be completed. On a SuperStack 3 NBX system with many devices, you may need to allow more time. If you attach a console cable to the CONSOLE port on the E1 card and use Hyperterminal software to view the text output from the card, you will see status messages associated with the initialization of the E1 card. See* "Connecting a Computer to a Serial Port", *in* Chapter 10.

Verifying an E1 Digital Line Card   After the Auto Discovery process is completed, you can verify that the E1 Digital Line Card has been properly discovered by using the NBX NetSet utility and by examining the status light on the Digital Line Card.

Using the NBX NetSet Utility   To verify the that the E1 Digital Line Card has been properly discovered you can use the NBX NetSet Utility.

1 In the *NBX NetSet - Main Menu* window, click Device Configuration.

2 Click the *Digital Line Cards* tab. See Figure 53.

3 Verify that the E1 Digital Line Card appears in the *T1/ISDN Board List.* To help identify the board, use the E1 board MAC address that you wrote down. The *Status* column should contain *Ready.*

4 From the *Select Device Type* pull-down list, select *ISDN PRI Channel* List.

5 Click *Apply.* The ISDN PRI Channel List (Figure 54) appears.

6 Scroll through the channel list to verify that 30 channels appear. Use the MAC addresses of the channels to identify the ones associated with the E1 Digital Line Card. The MAC addresses of the channels follow in sequential order from the MAC address of the E1 Digital Line Card.

Figure 53   Digital Line Cards Tab
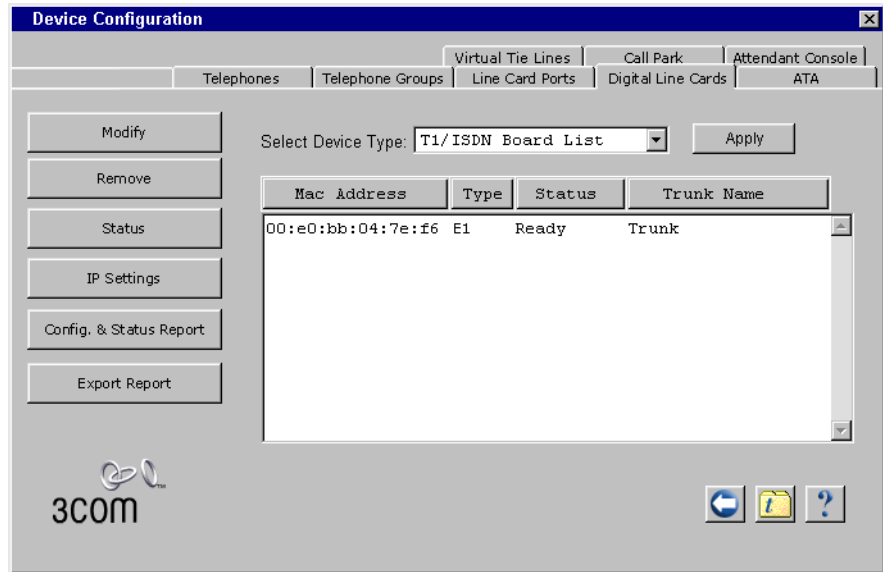

Figure 54   ISDN PRI Channel List
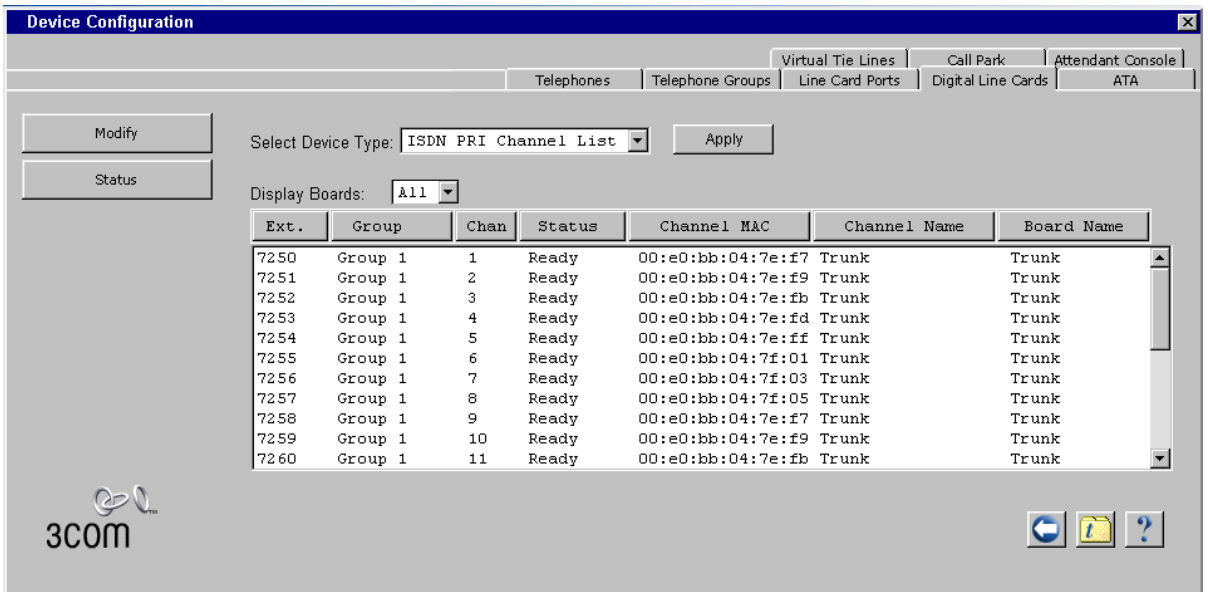
Using the Status Lights

You can use the E1 Digital Line Card status lights to verify that the E1 card was properly discovered.

After the Auto Discovery process has completed, and before you connect the E1 Digital Line Card to the telephone company's E1 line, the CF (Carrier Fail) light should appear solid green.

You are now ready to configure the E1 Digital Line Card. Refer to the *NBX Administrator's Guide* for instructions.
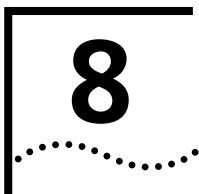
8

T1 DIGITAL LINE CARD

This chapter tells you how to install and how to verify the successful installation of a T1 Digital Line Card. In the NBX NetSet utility, digital line cards are referred to as either cards or boards.

> *For how to install the system hardware components, see* Chapter 2.

The following sections describe how to add a T1 Digital Line Card (3C10116C) and how to connect to a T1 service provided by the local telephone company:

- Adding a T1 Digital Line Card
- Verifying the T1 Digital Line Card

An NBX 100 system can accommodate up to 3 T1 Digital Line Cards and a SuperStack 3 NBX system can accommodate up to 30 T1 Digital Line Cards.

> *Before you install T1 Digital Line Cards, you may want to configure the Outdialing Prefix settings. See "Outdialing Prefix Settings" in Chapter 2, "Dial Plan," of the* NBX Administrator's Guide *or the Help: Dial Plan > Operations > Set Outdial Prefixes.*

You can choose to configure the T1 Digital Line Card to use one of two types of signaling:

- DS1 protocol (sometimes referred to as "Standard T1")
- ISDN PRI (Primary Rate Interface) signaling

> *By default, the Auto Discovery process selects DS1 as the signaling type for a T1 Digital Line Card.*

The NBX system provides E911 (emergency) connectivity if the T1 Digital Line Card is configured for ISDN PRI (Primary Rate Interface) signaling. The system provides the calling number (ANI) so that the emergency services personnel can determine the location of the caller from the E911 database. You must update the CO (PSAP) databases.

Adding a T1 Digital Line Card

Adding a T1 Digital Line Card to a system requires:

- Preparing the NBX System for a T1 Card
- Ordering DID (Direct Inward Dialing) Services for T1
- Enabling Auto Discovery for Digital Line Cards
- Inserting the T1 Digital Line Card

Preparing the NBX System for a T1 Card

Before you insert the T1 Digital Line Card into the chassis, order a T1 line from your telephone carrier and have them install the line. In some cases, the telephone company offers T1 services only with specific, pre-defined parameters. However, some telephone companies offer a number of configuration choices with their T1 services.

Ordering DID (Direct Inward Dialing) Services for T1

When you order a T1 line with DID capability (Direct Inward Dial), the local telephone carrier assigns a block of telephone numbers to you. Usually, you can request a specific range of numbers, but sometimes the carrier assigns numbers other than the ones you request.

You may be able to request that the local telephone carrier pass you a specific number of digits for each incoming telephone call. Sometimes the carrier does not offer any choice. In either situation, you need to know how many digits the carrier passes.

Example: Carriers commonly pass either the last three digits or last four digits of the number for each incoming call. Sometimes the last digits of the telephone numbers the carrier assigns to you do not match the telephone extension numbers you want to use for internal calls. You can create entries in your Dial Plan configuration file to translate the incoming numbers into the corresponding extension numbers.

Example: You want to use internal extensions from 4000 through 4999, but the local telephone carrier assigns you numbers from 617-555-3500 through 617-555-4499. You can create translator entries in the Dial Plan configuration file to translate an incoming digit sequence such as 3795 into extension number 4295, and a sequence such as 4213 into 4713. The configuration would require several translator entries to handle subsets of the total range. A unique set of entries would handle incoming digit sequences from 3500 through 3599, from 3600 through 3699, and each of the other sequences in which the first two digits were unique in the range from 37XX through 44XX.

If the DDI/DID numbers match your internal extension numbers, the translator entries in your Dial Plan configuration file can be much simpler.

Example: You plan to use internal extensions from 100 through 299, and the local telephone company assigns you numbers from 617-555-4100 through 617-555-4299. If the local telephone carrier passes you three digits, you need no translator entries in the Dial Plan configuration file. If the carrier passes you four digits, you could add a single set of translator entries to the configuration file to remove the first digit (4) and use the remaining three digits as the internal extension.

Enabling Auto Discovery for Digital Line Cards

To enable Auto Discovery for digital line cards:

1 Log in to the NBX NetSet utility using the administrator login ID and password.

2 In the *NBX NetSet - Main Menu* window (Figure 55), click *System Configuration*.

Figure 55 NBX NetSet - Main Menu Window
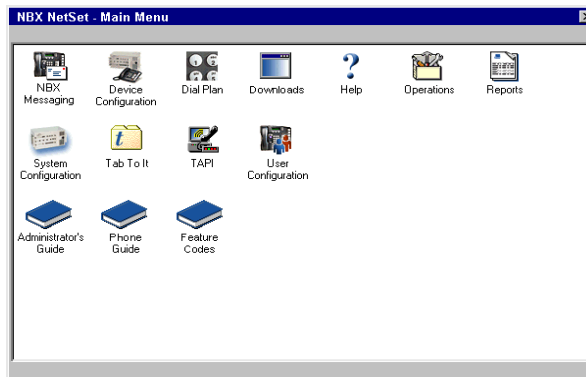
3 The System Configuration window appears (Figure 56). On the *System Settings* tab, click *System-wide*. The System-wide Dialog Box appears (Figure 57).

4 Clear all check boxes associated with autodiscovering devices.

5 Click the *Auto Discover Digital Line Cards* check box to select it.

6 Click *OK*.

Figure 56   System Configuration — System Settings Tab
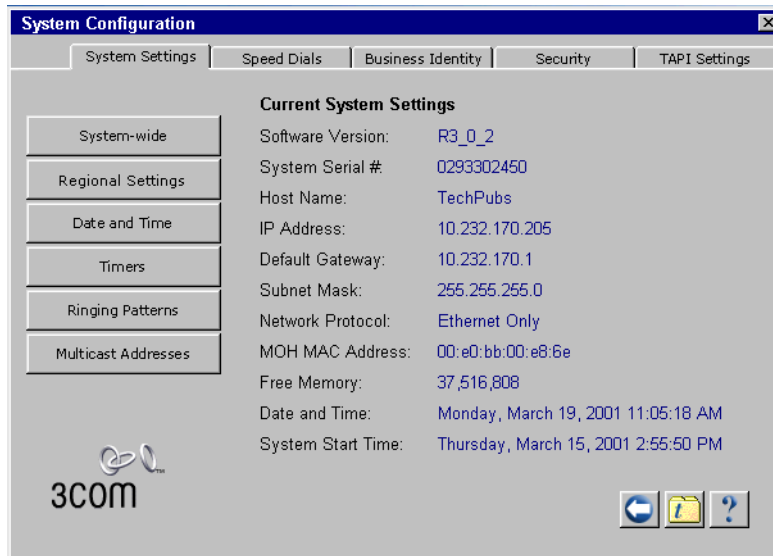
Figure 57   System-wide Dialog Box
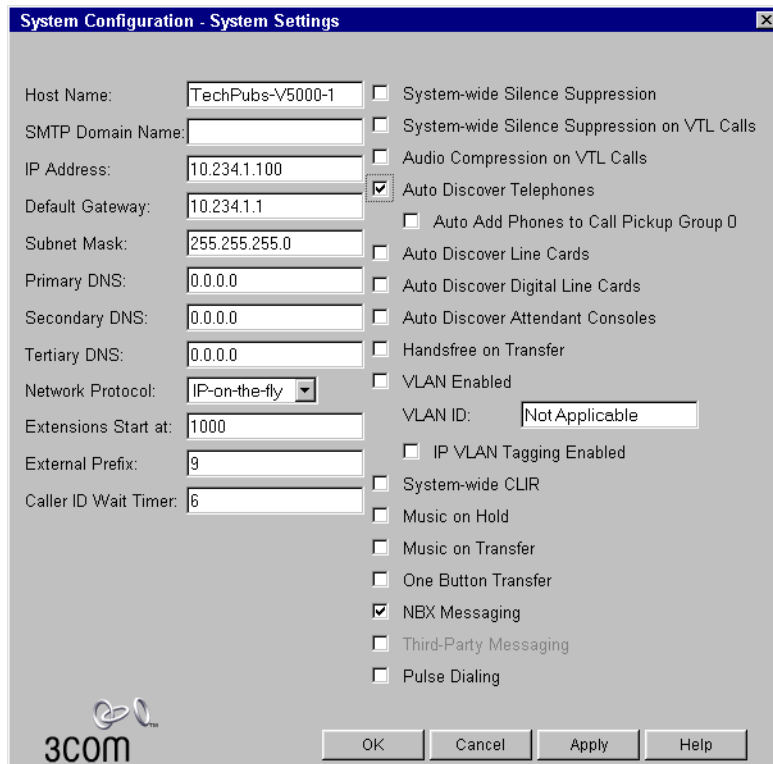
Inserting the T1 Digital Line Card

Read the following Caution before you insert the T1 Digital Line Card.

⚠ *CAUTION: To insert the T1 Digital Line Card into the chassis, you must leave the system powered up.*

To insert the T1 card:

1 Find the MAC address of the T1 card on the label on the card.

2 Record the MAC address for the configuration process.

3 Select a slot for the T1 card in the chassis and use a Phillips screwdriver to remove the blank faceplate from the slot.

4 Insert the T1 card into the slot.

5 Slide the T1 card into the chassis until you feel it touch the connectors.

6 To seat the T1 card into the connectors, apply firm pressure to both the left and right sides of the front of the card.

ℹ *If you cannot seat the card with light pressure, remove it and check for obstructions.*

7 Tighten the left and right screws on the front of the T1 card to secure it to the chassis.

8 Wait 3 minutes (more on a SuperStack 3 NBX system with many devices).

⚠ *CAUTION: When you first insert the T1 card it must initialize and the NBX system must update its database. You must wait 3 minutes because the T1 card reboots twice during the initialization process. On a SuperStack 3 NBX system with many devices, you may need to allow additional time. If you attach a console cable to the CONSOLE port on the T1 card and use Hyperterminal software to view the text output from the card, you will see status messages associated with the two reboot processes. See* "Connecting a Computer to a Serial Port", *in* Chapter 10.

ℹ *Another way that you can be sure that it is safe to proceed is to examine the status lights on the front panel of the T1 card. After the Auto Discovery process has completed, and before you connect the T1 Digital Line Card to the telephone company's T1 line, the CF (Carrier Fail) light should appear solid green.*
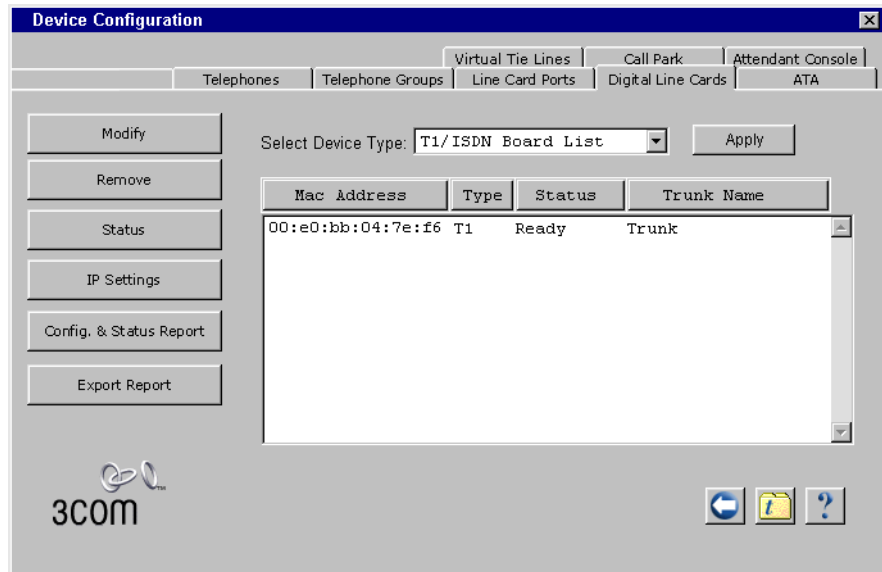
Verifying the T1 Digital Line Card

After the Auto Discovery process has completed, you can verify that the T1 Digital Line Card has been properly discovered by using the NBX NetSet utility and by examining the T1 status lights.

Using the NBX NetSet Utility
To use the NBX NetSet utility to verify that the T1 Digital Line Card has been properly discovered:

1 In the *NBX NetSet - Main Menu* window, click Device Configuration.

**2** Click the *Digital Line Cards* tab. See Figure 58.

Figure 58   Digital Line Cards Tab

3 Verify that the T1 board appears in the T1/ISDN Board List. Use the MAC addresses of the channels to identify the ones associated with the T1 Digital Line Card. The MAC addresses of the channels follow in sequential order from the MAC address of the T1 Digital Line Card.

4 From the *Select Device Type* pull-down list, select *T1 Channel List*.

5 Click *Apply*. See Figure 59.

6 Scroll through the list of channels to verify that 24 channels appear in the list.

Figure 59   T1 Channel List
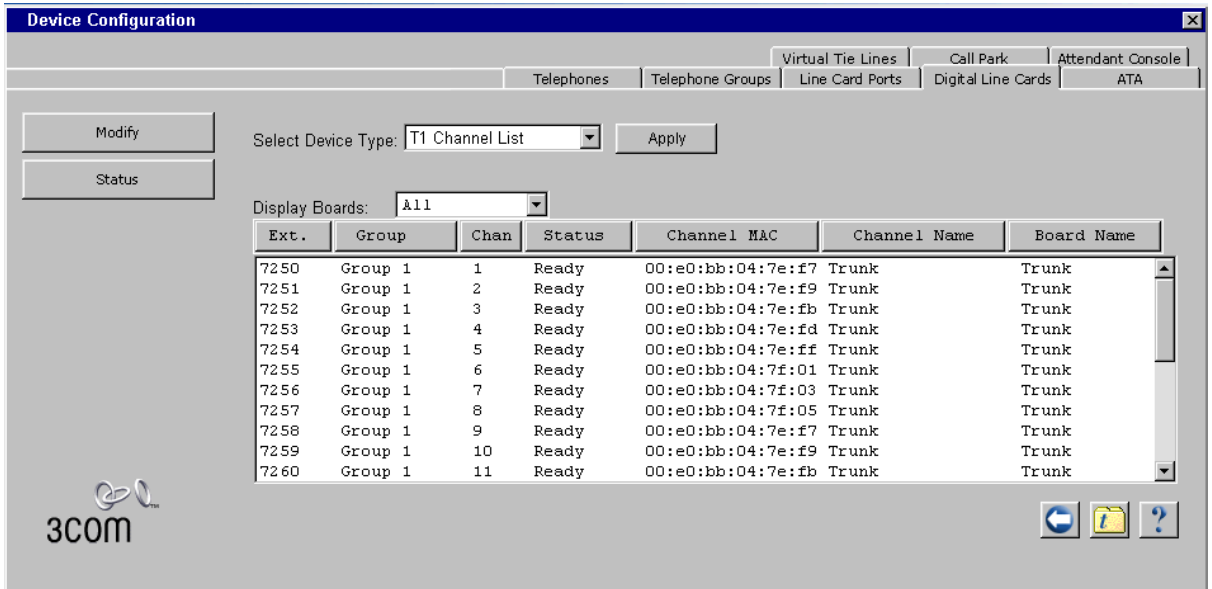
Using the Status Lights   To verify the proper discovery of a T1 Digital Line Card, you can use the status lights on the T1 board.

After the Auto Discovery process has completed, and before you connect the T1 Digital Line Card to the telephone company's T1 line, the CF (Carrier Fail) light should appear solid green.

You are now ready to configure the T1 Digital Line Card for either DS1 signaling or ISDN PRI signaling. See Chapter 2, "Device Configuration," in the *NBX Administrator's Guide* for instructions.

9

CONFIGURING IP TELEPHONY

This chapter describes IP telephony and provides instructions for configuring the NBX 100 Communication System. It covers these topics:

IP Telephony Overview

You can integrate the NBX system into any network infrastructure because it can operate at both Layer 2 (Ethernet) and Layer 3 (IP). The system defaults to Ethernet operation, which fits the needs of many small telephone systems. As the system grows, you can add IP telephony.

IP telephony is an optional feature of the system. You must purchase a license key to enable IP telephony.

⚠ *CAUTION: A qualified network design engineer should set up an IP network for the first time.*

If all the telephones in your office connect to the same Local Area Network (LAN), there is little reason to implement IP telephony. Even if your network includes a few subnetworks, you can configure the routers to pass NBX Ethernet frames and avoid the need for IP operation. In a more widely distributed setting with several subnetworks or with a part of the network distributed over a Wide Area Network (WAN), IP telephony may be required.

This section covers these topics:

- Implementing IP
- Using DHCP
- Standard IP Configuration
- IP On-the-Fly Configuration
- Providing the Call Processor IP Address to Devices

Implementing IP   You can implement IP in one of two ways:

- Standard IP

    All telephones and line card ports receive an IP address, either from a Dynamic Host Configuration Protocol (DHCP) server or through manual assignment.

- IP On-the-Fly

    Telephones and other devices on the same subnetwork as the Call Processor communicate with other devices on that subnet using Ethernet frames so they do not need IP addresses. Devices receive an IP address only when they need to communicate with a device on a different subnetwork. The system administrator specifies a list of IP addresses using the NBX NetSet utility. When a local device needs an IP address, the system assigns one from the list. Remote devices receive their IP addresses either through a DHCP server or through manual assignment.

Using DHCP   A DHCP server assigns IP addresses to devices on the network from a predefined group of addresses. It assigns these addresses for a fixed amount of time which depends on how the DHCP server is configured. At the end of the time period, if the device is still active and needs the IP address to continue operating, the DHCP server renews the same IP address for another time period. If the device is no longer active at the end of the time period, the DHCP server adds the IP address to the list of available addresses which can be allocated to requesting devices.

If your DHCP server can serve multiple subnetworks (by using a BOOTP Relay agent, also known as an IP helper address), you can provide IP configuration settings (IP address, subnet mask, and default gateway address) for all of your system devices. However, each device in the system requires the IP address of the Call Processor. If the device and the Call Processor are located on the same subnetwork, the device receives this information through commands or status messages passed at the Ethernet layer. If the device and the Call Processor are located on different subnets, you can configure the DHCP server to pass the IP address of the Call Processor to the device. See "Providing the Call Processor IP Address to Devices" later in this chapter.

When you enable IP on the NBX system, every NBX telephone and line card operates as a DHCP client. You manually configure IP settings either using the NBX NetSet utility or by using the telephone key pad. The Call Processor must have a fixed IP address, which is assigned during installation. The NBX 1105 Attendant Console operates in Ethernet mode only.

Standard IP Configuration

The NBX system must be configured differently in each of the following standard IP situations:

- All telephones and devices are on the same subnetwork as the Call Processor.

  If you use standard IP with a DHCP server, verify that the server has enough IP addresses to handle the number of telephones and devices in the NBX system.

  If you are not using a DHCP server, use the NBX NetSet utility to configure an IP address for each NBX telephone and device.

- Some telephones are on separate subnetworks.

  If you use a DHCP server, verify that the server has enough IP addresses to handle the number of telephones and devices on the separate subnetwork.

  If you are not using a DHCP server, you must configure the IP address of the Call Processor into each telephone that is on a separate subnetwork.

IP On-the-Fly Configuration

The NBX system must be configured differently in each of the following IP On-the-Fly situations:

- All telephones and devices are on the same subnetwork as the Call Processor.

  You do not need to use IP in this environment. Devices always use Ethernet (Layer 2) communications, and the Call Processor never needs to give out an IP address.

- Some telephones are on separate subnetworks.

  If you use a DHCP server, verify that the server has enough IP addresses to handle the number of telephones and devices in the NBX system. Optionally, you can configure the DHCP server to pass the IP address of the Call Processor to DHCP client devices. For an example,

see Appendix C, "Configuring Option 184 on a Windows 2000 DHCP Server," in the *NBX Administrator's Guide.*

If you are not using DHCP, you must use the NBX NetSet utility to configure a block of IP addresses for use by IP On-the-Fly devices.

Devices on the same subnetwork as the Call Processor are given an IP address only if they need to communication with a device external to the subnet on which they and the Call Processor reside. You must manually configure the system to define an IP address for each telephone that is on a subnetwork that is separated from the Call Processor. You must manually configure each telephone on a separate subnetwork with the IP address of the Call Processor. See "Configuring IP On-the-Fly" later in this chapter.

Providing the Call Processor IP Address to Devices

To provide the IP address of the Call Processor to devices on other subnetworks, use one of these methods:

■ Program the IP address of the Call Processor directly into each telephone using the telephone key pad.

■ Program a custom DHCP option on the DHCP server and configure the server to pass the IP address of the Call Processor to remote devices through the standard DHCP configuration process.

RFC 2132 (DHCP Options and BOOTP Vendor Extensions) defines vendor specific options that allow you to configure the server to send locally defined information to DHCP clients. NBX system devices support option 184. If you create and activate option 184 on your DHCP server, and use it to specify the IP address of the Call Processor, you do not need to manually configure the address on the NBX devices. For an example of how to configure a DHCP server for option 184, see Appendix C, "Configuring Option 184 on a Windows 2000 DHCP Server" in the *NBX Administrator's Guide.*

The IETF (Internet Engineering Task Force) is currently considering a draft document that would identify "call processor address" as a defined DHCP option, eliminating the need to manually define the option on your DHCP server.

Configuring IP Telephony	Setting up IP telephony is the same whether you are installing the NBX system for the first time or adding IP to an existing system. The general steps for setting up IP telephony are covered in these sections:

- Enabling IP Telephony
- Selecting the Operating Mode
- Configuring IP On-the-Fly
- Configuring the DHCP Server
- Manually Configuring Telephone IP Settings

Enabling IP Telephony	To enable IP telephony, add the license key:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *Operations*.

3 In the *Operations* window, click the *Licenses* tab.

4 Click *Add License*. The Add License dialog box appears.

5 Type your IP license key into the License Key field.

$\mathbf{i}$ > *The License Key field is not case-sensitive.*

6 Click *OK*.

Selecting the Operating Mode	To select the IP operating mode:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 In the *System Configuration* window, click the *System Settings* tab.

4 Click *System-wide*. The System Configuration - System Settings dialog box appears.

5 Select the appropriate entry from the *Network Protocol* list. The choices:

- **Ethernet Only** — Layer 2.
- **Standard IP** — Every device requires an IP address. Either use DHCP or manually assign the IP addresses.

- **IP On-the-Fly** — The Call Processor provides IP addresses as needed to local devices. Remote devices obtain IP addresses from the DHCP server, or you can manually program their IP addresses.

6 Click *OK*.

Configuring IP On-the-Fly

Before you configure IP On-the-Fly, consider how many addresses you need.

The number of addresses needed depends on the number of devices that are likely to use IP communications at one time and in one device location. For example, if you have twelve devices (four line card ports and eight telephones) on the Call Processor subnetwork, and four telephones on other subnetworks, the number of IP addresses required depends on the activity on the system.

If an external telephone call arrives on one of the line card ports and the call is intended for one of the *remote* telephones, then the line card port needs an IP address to participate in the call and obtains one from the IP On-the-Fly address pool. The remote telephone needs an IP address too. However, the remote telephone cannot obtain an IP address from the IP On-the-Fly pool of addresses because it is not on the same subnet as the Call Processor. If the remote telephone does not already have an IP address, either assigned by a DHCP server or manually programmed through the telephone buttons, it cannot participate in the call.

If an external telephone call arrives on one of the line card ports and the call is intended for one of the *local* telephones, neither the line card port nor the telephone require an IP address. Both can communicate at the Ethernet layer (Layer 2).

After you determine the range of IP addresses that you need, configure IP On-the-Fly:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 In the *NBX NetSet - Main Menu* window, click *System Configuration*.

3 Click *IP Addresses*.

4 In the *IP Addresses* dialog box, click *Add*. The Add Dynamic IP Address dialog box (Figure 60) appears.

Figure 60   Add Dynamic IP Address Dialog Box
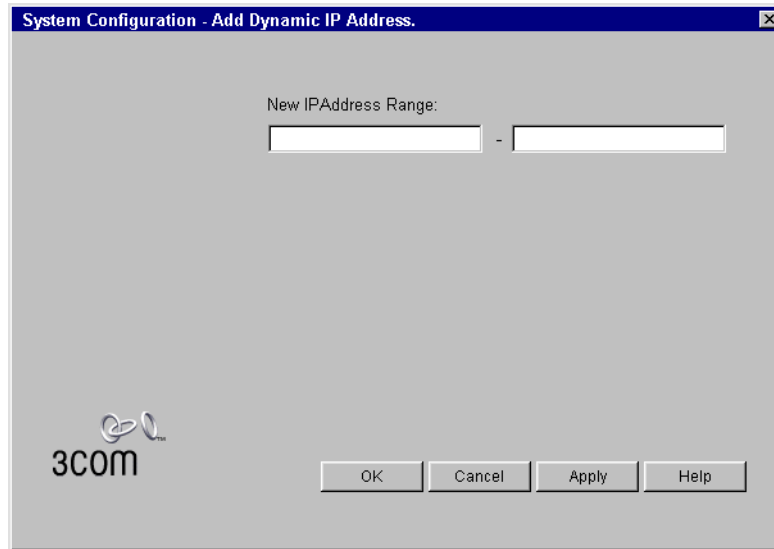
5 Specify an address range.

6 Click *OK*.

Configuring the DHCP Server   If you choose to use DHCP, contact your network administrator to configure the DHCP server. For an example, see Appendix C, "Configuring Option 184 on a Windows 2000 DHCP Server," in the *NBX Administrator's Guide.*

Manually Configuring Telephone IP Settings   For a telephone to work properly on a subnetwork separated from the Call Processor, you must configure three IP settings (IP address, default gateway, and subnet mask). You can use the NBX NetSet utility to manually configure the settings, or you can enter the settings directly from the telephone key pad.

To configure telephone IP settings with the NBX NetSet utility:

1 Connect the telephone to the same subnetwork as the Call Processor.

$\boxed{\mathbf{i}}$ *If the telephone has not already been discovered by the Call Processor, go to the* System Configuration - System Settings *window and enable* Auto Discover Telephones.

2 Log in to the NBX NetSet utility using the administrator name and password.

3 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

4 Click the *Telephones* tab.

5 Select the telephone from the *Telephones* list.

6 Click *IP Settings*. The Modify IP Settings dialog box (Figure 61) appears.

> **i** *The IP Settings button does not appear until you enable IP for the system by entering the license key.*

Figure 61 Modify IP Settings Dialog Box

7 In the *IP Settings* dialog box, specify the IP settings for this device. The IP Settings dialog box shows two groups of IP settings:

- **IP Settings Reported by Device** — Typically, if you are configuring a new telephone, you see 0.0.0.0 in each of the IP address, Default Gateway, and Subnet Mask fields. Note that if a telephone has an IP address, default gateway, and subnet mask, you cannot change those values using the NBX NetSet utility.

- **Manually Assigned IP Settings** — Use these fields to configure the IP settings for the telephone. You can change an IP setting only if the corresponding field under IP Settings Reported by Device is 0.0.0.0. If the field contains a value other than 0.0.0.0, you can change the value only through the telephone buttons. See the next section.

> **i** *Manually assigned settings take precedence over settings assigned automatically by DHCP. If you manually enter the IP settings for a telephone using the telephone key pad, these settings replace any settings supplied by a DHCP server, and the telephone no longer searches for a DHCP server when it is plugged into a network.*

8 Click *OK*.

The Ethernet (Layer 2) communications between the Call Processor and the telephone ensure that the telephone receives the IP address of the Call Processor as part of the configuration.

Entering Data Using the Telephone Key Pad Keys

In the sections that follow, you must enter data into a telephone using the key pad. For manual data entry, the buttons on the telephone key pad (see Figure 62) have these functions:

Program	Press this button to access the menu of functions. Press it again to exit from any menu without making changes.
AB18	Used to enter an IP address for the telephone.
AB17	Used to enter a subnet mask for the telephone.
AB16	Used to enter the default gateway.
AB15	Used to enter the IP address of the Call Processor.
Key pad keys	Numeric keys are used to enter digits from 0 through 9. The # key saves the data you have entered.
Left Motion Key	Used to move the cursor to the left in the telephone display panel.
Right Motion Key	Used to move the cursor to the right in the telephone display panel.

Figure 62 NBX Business Telephone Local User Interface Controls
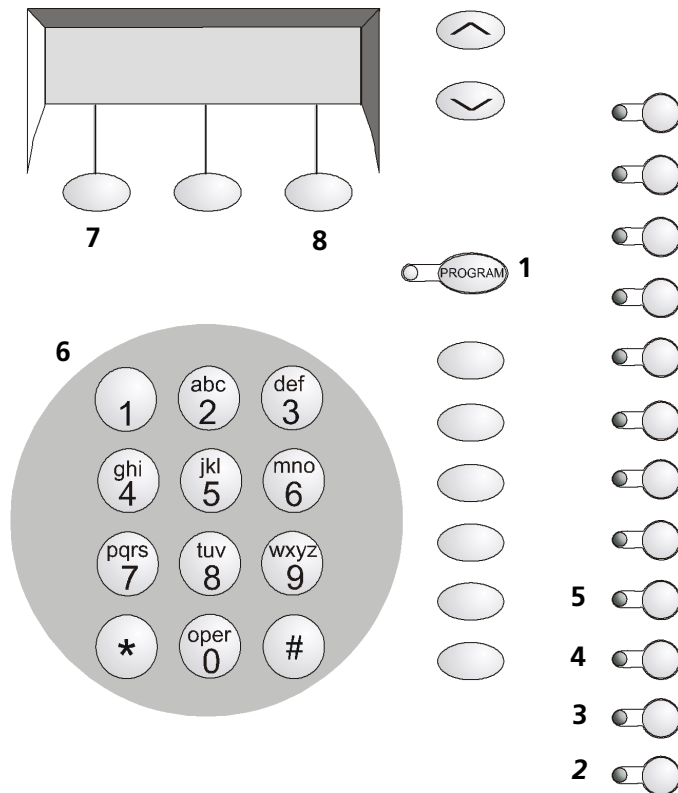
To manually configure telephone IP settings using the telephone key pad:

1 Disconnect the telephone from the LAN.

2 Disconnect and reconnect the telephone power connector.

3 In the following steps, the numbers in parentheses represent locations on the telephone key pad shown in Figure 62.Enter the telephone IP address:

 a Press the telephone *Program* button (1) to start the LUI.

 b Press the *AB18* button (2) on the telephone keypad.

 c Enter the IP address, and press the # key.

4 Enter the subnet mask:

   a Press the telephone *Program* button (1) to start the LUI.

   b Press the *AB17* button (3) on the telephone keypad.

   c Enter the subnet mask, and press the # key.

5 Enter the default gateway address:

   a Press the telephone *Program* button (1) to start the LUI.

   b Press the *AB16* button (4) on the telephone keypad.

   c Enter the default gateway address, and press the # key.

6 Enter the IP address of the Call Processor:

   a Press the telephone *Program* (1) button to start the LUI.

   b Press the AB15 (5) button on the telephone key pad.

   c Enter the Call Processor IP address, and press the # key.

7 Reconnect the telephone to the network.

Automatically Configuring Telephone IP Settings

When you connect an NBX Business Telephone to a network, it searches for a DHCP server. If you are using Ethernet (Layer 2) networking only, that is, all telephones are on the same subnet as the Call Processor, the telephone receives the following configuration information from the Call Processor:

- The IP settings (IP address, subnet mask, and default gateway address) for the telephone to use
- The IP address of the Call Processor

The telephone then stops searching for a DHCP sever.

If a telephone is on a different subnet than the Call Processor and a DHCP server provides IP settings to the telephone, the telephone cannot communicate with the Call Processor until it has the Call Processor IP address. There are two methods of providing the Call Processor IP address to the telephone:

- Manually configure the Call Processor IP address into the telephone. See "Manually Configuring Telephone IP Settings" earlier in this chapter.
- Provide the IP address to the telephone using DHCP custom option 184. For an example of how to configure option 184 on a DHCP server, see Appendix C, "Configuring Option 184 on a Windows 2000 DHCP Server," in the *NBX Administrator's Guide.*

> *The methods for configuring special options vary depending on the DHCP server, and the example in the NBX Administrator's Guide may not apply directly to your DHCP server. For assistance, contact your network administrator, the vendor of the DHCP server, or a qualified 3Com service representative.*

Configuring Line Card Ports

Typically, your line card ports reside on the same subnetwork as the Call Processor. If you use IP On-the-Fly, or if you use Standard IP with DHCP, IP configuration is automatic. Verify that your server has enough addresses. However, if you are using Standard IP without DHCP, you must manually configure the IP settings for each line card port.

To manually configure IP settings for line card ports:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 If you have not already done so, use Auto Discovery to add line card ports to the configuration database. For more information see "Configuring a Line Card Port" in the *NBX Administrator's Guide*.

3 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

4 Click the *Line Card Ports* tab and select a line card port from the list.

5 Click *IP Settings*.

> *The IP Settings button does not appear until you enable IP for the system by entering the license key.*

6 In the *IP Settings* dialog box, specify the IP configuration for this device.

7 Click *OK*.

Configuring T1, E1, and BRI Channels

All digital line cards must reside on the same subnetwork as the Call Processor. If you are using IP On-the-Fly or Standard IP and DHCP, IP configuration is automatic.

If you are using Standard IP without DHCP, you must manually configure the IP settings for each channel on the T1, E1, or ISDN BRI card.

To manually configure channels:

1 Log in to the NBX NetSet utility using the administrator username and password.

2 If you have not already done so, use Auto Discovery or manual configuration to add the T1, E1, or ISDN BRI channels to the configuration database of the Call Processor.

3 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

4 Click the *Digital Line Cards* tab.

5 From the *Select Device Type* list, select one of the following:

- T1 Channel List

- ISDN PRI Channel List

- ISDN BRI Channel List

6 Click *Apply*.

7 Select a channel from the list you selected.

8 Click *IP Settings*.

> **i** *The* IP Settings *button does not appear until you enable IP for the system by entering the license key.*

9 In the *IP Settings* dialog box:

  a Specify the IP configuration for the channels.

  b Set the IP address for the board.

  c Click *OK*.

10 Reboot the card for the settings to take effect.

> **i** *All digital line cards must reside on the same subnetwork as the Call Processor. IP configuration is required to allow calls between telephones on remote subnetworks.*

> **i** *You cannot configure ConneXtions ports in the IP Settings dialog box. See "ConneXtions H.323 Gateway" in the* NBX Administrator's Guide *for more information.*

IP Type of Service The header of an IP packet contains an 8-bit field called Type of Service (ToS). The ToS field indicates the precedence (relative importance) of the packet. NBX systems use ToS settings, and many routers examine the ToS field and give precedence to packets with a high ToS setting.

Setting ToS when you transmit IP packets does not guarantee that those packets receive priority. The capability and configuration of the network routers can affect packet flow regardless of ToS settings. Your network routers must support ToS for the NBX ToS settings to have any effect.

By default, NBX systems use the following ToS settings:

- Precedence = CRITIC/ECP
- Delay = Low
- Throughput = Normal
- Reliability = Normal — Do not change this setting because NBX systems use the H.3 protocol, which ensures packet delivery.

These default settings correspond to the default hexadecimal input value 0x90. The default settings are appropriate for most networks. However, if IP telephony packets must have special consideration on your network, you can adjust the ToS settings for NBX packets. Typically, you need to change these settings only when your network bandwidth use is 80 percent or higher. Most systems function properly with the default ToS settings if the bandwidth use is below 80 percent.

When changing ToS settings, consider the ToS settings of other packetizing devices on your system.

Low-bandwidth Telephony To support remote users, you can configure an NBX Business Telephone or NBX Basic Telephone to operate over a low-bandwidth link. For reliable audio, the link must support throughput of at least 64 Kbps. An example is a single B channel of a Basic Rate Interface (BRI) ISDN line or a single channel on a T1 line.

An ISDN connection is not the only method of connecting a remote telephone. The ability of NBX systems to operate in Ethernet (Layer 2) mode or IP (Layer 3) mode gives you several connection options such as cable modem, frame relay, and DSL. Your 3Com NBX Voice Authorized Partner can help you to design a system to meet your needs.

You enable low-bandwidth communications in an NBX system at the device level using the NBX NetSet utility.

To enable low-bandwidth communication for a particular telephone:

1 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.

2 Click the *Telephones* tab. From the list of telephones, select the telephone that you want to configure for low-bandwidth operation.

3 Click *Modify*. The Modify Telephone dialog box appears.

4 Click the *Low Bandwidth* check box and then click *OK*.

A low-bandwidth telephone cannot play music on hold.

> **i** *Although the NBX NetSet utility allows you to change the method used for voice mail compression, if you change the setting from the default, ADPCM to MuLaw, your system cannot support voice messaging services over low-bandwidth connections.*

The rest of the configuration is done at the telephone and at the router. At the telephone, you specify the IP address of the Call Processor. See "Manually Configuring Telephone IP Settings" earlier in this chapter. Once your low-bandwidth link is operational and connected to the Call Processor, the Auto Discovery process can discover and configure the telephone, or you can manually configure it through NBX NetSet or LUI.

You can operate with the link "always open" or you can set it up to autodial. With an autodial connection, when you lift the receiver on the telephone, the ISDN router or terminal adapter establishes the link to the Call Processor. In the other direction, a call to the extension of the remote telephone initiates the connection. To ensure that there is time to complete the call, you may need to modify the time-out values of the system. Consult your 3Com NBX Voice Authorized Partner or a 3Com-qualified service person for assistance.

The specific configuration tasks required for setting up the link between the Call Processor and the remote telephone depend on the type of equipment and the Telco/ISP that you use. For help in selecting equipment and configuring it, contact your 3Com NBX Voice Authorized Partner or a 3Com-qualified support person.

After you enable low-bandwidth communication for a telephone, complete the configuration of the low-bandwidth IP connection:

1 Use the telephone keypad to configure IP settings on the telephone. See "Manually Configuring Telephone IP Settings" earlier in this chapter for more information on how to do this.

2 Configure the telephone in the configuration database of the Call Processor.

10 T**ROUBLESHOOTING**

This chapter contains maintenance and troubleshooting information that can help you resolve simple problems. It covers these topics:

- Telephone Troubleshooting
    - Using the Telephone Local User Interface (LUI) Utility
    - Using H3PingIP
- System-level Troubleshooting
    - Digital Line Card Troubleshooting
    - Alarm Conditions (Overview)
    - Alarm Descriptions
    - Alarms on NBX Digital Line Cards
    - Configuration and Status Reports
- Connecting a Computer to a Serial Port
- Servicing the Network Call Processor Battery
- Getting Service and Support

The SuperStack 3 NBX hardware needs no routine maintenance. However, you should perform periodic backups of the configuration database and, if necessary, the voice messages, especially after you make changes to system or user configurations.

Telephone Troubleshooting

If you believe that a problem is associated with a particular telephone, use the telephone troubleshooting procedures.

Using the Telephone Local User Interface (LUI) Utility

The firmware within each NBX Business Telephone and NBX Basic Telephone includes a telephone diagnostic and configuration utility called the Local User Interface (LUI).

To run the LUI utility:

1 Disconnect the telephone from the LAN.

2 Cycle power to the telephone by disconnecting and then reconnecting its power connector.

For more information about NBX telephone connections, see Chapter 3.

3 To start the LUI:

- On the NBX Business Telephone, press the *Program* button.
- On the NBX Basic Telephone, press the MSG button.

4 To maneuver through the menu items:

- Use the scroll buttons to view menu items
- Use the key pad or Access buttons to select a menu item. Use the Access buttons to select menu items or to enter hexadecimal digits.

LUI features on the NBX Business Telephone are shown and described in Figure 146.

LUI features on the NBX Basic Telephone are shown and described in Figure 147.

Table 72 describes the LUI menu items.

Figure 63 Local User Interface (LUI) Controls on the NBX Business Telephone
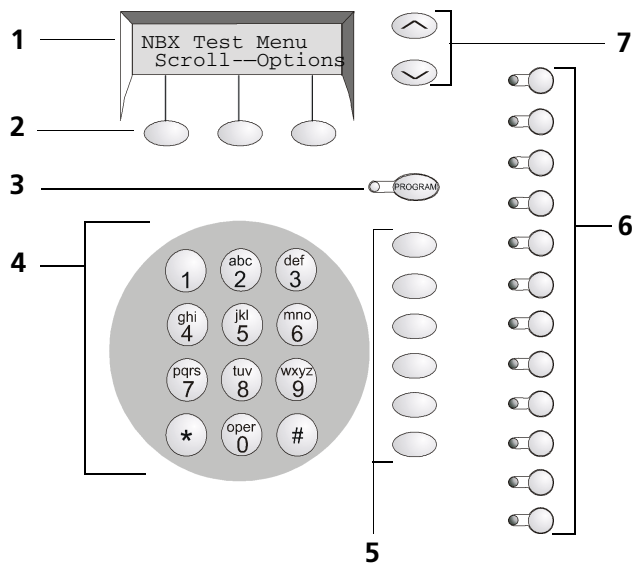
1 Display panel.

2 Soft buttons. The left and right buttons are for moving the cursor left or right. The middle button is not used.

3 Program button for starting or exiting the utility.

4 Key pad for selecting menu items or entering numeric characters.

5 Access buttons AB1-AB6 for selecting menu items.

6 Access buttons AB7-AB18 for selecting menu items or functions.

7 Scroll buttons.
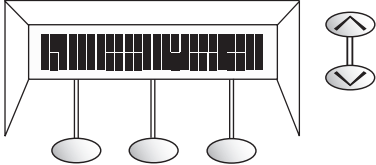
Figure 64 Local User Interface (LUI) Controls on the NBX Basic Telephone
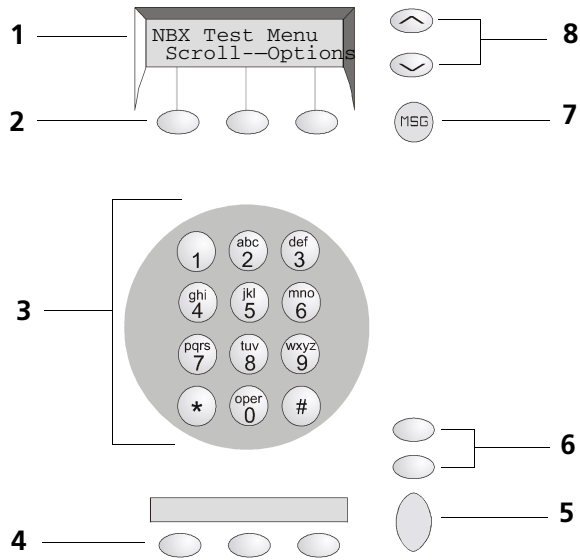
1 Display panel.

2 Soft buttons. The left and right buttons are for moving the cursor left or right. The middle button is not used.

3 Key pad for selecting menu items or entering numeric characters.

4 Access buttons AB1-AB3 for selecting functions.

5 Hold button.

6 Volume Up and Volume Down buttons.

7 MSG (voice mail message) button.

8 Scroll buttons.

Table 23 LUI Menu Items — Business and Basic Telephones

Option Name	Description
1 View Settings	Dial 1 to access a menu in which you use the scroll buttons to view these options:
	■ **MAC Address** – MAC address of this telephone.
	■ **NCP MAC Address** – MAC address of call processor All Fs indicates that the telephone responds to any Control Processor. This is the default setting.
	■ **SW Build Ident.** – Revision of software running on this telephone.
	■ **Serial # Rev** – Serial number and hardware revision of this telephone.
	■ **My IP Address** – IP address of this telephone.
	■ **Subnet Mask** – The IP mask applicable to this subnetwork.
	■ **Gatwy IP Address** – IP address of the default gateway for this subnetwork.
	■ **NCP IP Address** – IP address of the call processor with which this telephone communicates.
	To return to the main menu:
	■ On the NBX Business Telephone, press *Program.*
	■ On the NBX Basic Telephone, press *MSG*.
2 Set my IP	Lets you specify the IP address of this telephone.
	When entering an IP address:
	■ Use the key pad to enter digits 0–9.
	■ Use the left and right soft keys to move the cursor left or right.
	■ If any of the fields within the IP address contain only one or two digits, add leading zeros. Example: Enter 10.234.1.125 as 010.234.001.125
	■ Press the # key to commit your address change.
	■ To exit without saving any changes:
	On the NBX Business Telephone, press *Program*.
	On the NBX Basic Telephone, press *MSG*.
	To change a telephone back to its default setting, enter all Fs for the NCP IP address.
3 Set SubNMsk	Lets you specify the mask that is appropriate for this subnetwork.

Table 23 LUI Menu Items — Business and Basic Telephones (continued)

Option Name	Description
4 Set Gatwy IP	Lets you specify the IP address of the default gateway for this subnetwork.
5 Set NCP IP	Lets you specify the IP address of the Network Call Processor (NCP). In all but special circumstances, the system status messages communicate this information.
	When entering an IP address:
	■ Use the key pad to enter digits 0–9.
	■ Use the left and right soft keys to move the cursor left or right.
	■ Press the # key to commit your address change.
	■ To exit without saving any changes:
	On the NBX Business Telephone, press *Program*.
	On the NBX Basic Telephone, press the *MSG* button.
	To change a telephone back to its default setting, enter all Fs for the NCP IP address.
6 Test – Run Ping H3/IP	For use only by a qualified 3Com service person. Contact 3Com before using this test.
7 Test – LEDs	On the NBX Business Telephone, turns on all LEDs for 5 seconds. Lets you quickly check for inoperative lights.
	NOTE: On the NBX Basic Telephone, turns on the icons and words on the right side of the display panel for 5 seconds. Icons: Telephone icon plus the number 1 (top line) and telephone icon plus the number 2 (bottom line) Words: FWD (top line) and IN (bottom line)
8 Test – LCD	Illuminates every pixel on the display for 5 seconds.
9 Test – Buttons	Puts the telephone in the button test state. Press any telephone button to hear a tone and see a description of the button's function.
	To return to the main menu:
	■ On the NBX Business Telephone, press *Program* twice.
	■ On the NBX Basic Telephone, press *MSG* twice.

Table 23 LUI Menu Items — Business and Basic Telephones (continued)

Option Name	Description
* Test – Handset	Sounds a tone through the earpiece of the telephone's handset for 5 seconds.
0 Test – Speaker	Sounds a tone through the telephone's speaker for 5 seconds.
	NOTE: NBX Business Telephone only.
# Audio X-Conn	Cross connects the audio channels - handset mouthpiece to speaker, microphone to handset earpiece. The connection times out after 10 seconds. (The telephone's microphone is located in the lower right corner of the telephone.)
	NOTE: NBX Business Telephone only.
AB1 Set NCP MAC	Lets you specify the MAC address of the Network Call Processor (NCP). In all but special circumstances, the system status messages communicate this information.
	When entering a MAC address:
	■ Use the key pad to enter digits 0–9.
	■ To enter the hex digits A–F:
	On the NBX Business Telephone, use Access buttons 1–6.
	On the NBX Business Telephone, use buttons AB1, AB2, AB3, Hold, Volume Down, and Volume Up.
	■ Use the left and right soft keys to move the cursor left or right.
	■ Press the # key to commit your address change, or to exit without saving the changes:
	On the NBX Business Telephone, press *Program*.
	On the NBX Basic Telephone, press *MSG*.
	To change a telephone back to its default setting, enter all Fs for the NCP MAC address.
AB2 EEProm Mem	Lets you scroll through the locations in the memory of the telephone. The information is presented in hexadecimal format and can be properly interpreted only by a qualified 3Com service person. Contact 3Com before using this test.
Program – Exits	Press the Program button to exit from the LUI menu.
	NOTE: NBX Business Telephone only.
MSG BTN – Exits	Press the MSG button to exit from the LUI menu.
	NOTE: NBX Basic Telephone only.

Using H3PingIP   You can use the H3PingIP menu item to ping another device on the network to test the telephone's connectivity and to check the packet delay.

When using H3PingIP to test for connectivity, you must use the IP address of a device that is connected to the NBX system NCP. You should not use the NCP IP address. The NBX Business Telephone uses the IP Gateway and subnet mask information programmed into it using the AB16 and AB17 buttons.

H3PingIP shows the following information:

- **Port** — The UDP Destination Port.
- **Tx** — The number of packets transmitted.
- **Rx** — The number of packets received.
- **mS** — The delay time, in milliseconds.

If you ping a device on a subnetwork different than the one on which the telephone is located, the delay time is greater.

System-level Troubleshooting

For each symptom listed in Table 73, perform the suggested actions in the order listed.

⚠️ *WARNING: Before you remove any component, shut down THE system software and then turn off the power to the chassis by removing the chassis power cord. If the system has two power supplies, remove both power cords.*

Table 24 Troubleshooting Actions

Symptom	Possible Cause	Suggested Action
Date/time display on telephones is wrong, either incorrect date or just random characters.	A power surge has corrupted the system time.	If the display shows incorrect date, use the NBX NetSet utility to reset system time. If the display shows random characters, for example, 00; 0 #, you must:
		1 Disconnect power to the chassis that holds the Call Processor.
		2 Wait 60 seconds.
		3 Reconnect power to the system.
		4 Use the NBX NetSet utility to enter the correct date and time.
	Problem with Network Call Processor battery.	Contact your 3Com NBX Voice Authorized Partner.
Your browser cannot find the NBX NetSet utility.	No IP connectivity	Verify that the computer you are using to run the browser has network connectivity. See "Establishing IP Connectivity" in Chapter 2.
	Routing problems	If your local IP environment includes a proxy server, you might need to reconfigure your browser parameters to ignore the proxy server. See the online help for your browser.

Table 24 Troubleshooting Actions (continued)

Symptom	Possible Cause	Suggested Action
	Invalid IP configuration	The system has a default IP configuration which might need to be changed to match your local IP environment. Temporarily change the IP configuration of your computer so that the subnet configuration matches the system configuration. Specify 255.255.255.0 as the subnet and use IP address 192.168.1.191. After you change your computer's IP configuration, connect to the system and change its IP configuration to match the IP environment of your local network. Change your computer's IP configuration back to its original settings, and then connect to the NBX NetSet utility using the new IP address. See "Establishing IP Connectivity" in Chapter 9.
Cannot open the NBX NetSet utility using the administrator username and password.	The CAPS LOCK key on your keyboard is activated.	The NBX NetSet utility username and passwords are case-sensitive. For example, the NBX NetSet utility accepts "administrator" but it rejects "Administrator" and "ADMINISTRATOR".
Callers on hold do not hear music.	No music source connected to the Call Processor.	See "Adding External Hardware" in Chapter 2 for more information.
	MOH audio is disabled.	Enable MOH audio in NBX NetSet > System Configuration > System Settings > System-wide. See "Connecting a Music-on-Hold (MOH) Input Device" in Chapter 2.
	MOH volume is set too low.	See "Adjusting Music-on-Hold (MOH) Volume" in Chapter 3.
Lose date and time when rebooting the system.	Problem with the battery on the Call Processor.	See "Servicing the Network Call Processor Battery" later in this chapter.

Table 24   Troubleshooting Actions (continued)

Symptom	Possible Cause	Suggested Action
The NBX NetSet utility is very slow in responding.	Your network uses a proxy server for Internet access.	A common networking practice is to employ a proxy server to shield your network from intrusion by unauthorized users. However, communications with the NBX NetSet utility do not need to pass through the proxy server. To speed access to the NBX NetSet utility, configure your browser to access the NBX system without going through the proxy server.
All greetings and prompts are missing. For example, calling the Auto Attendant or a user's mailbox produces silence instead of the expected greetings.	The wrong message compression format was selected.	Prior to R1.1.0, all audio used MuLaw compression. With R1.1.0, audio, that is, any prompt, message, or greeting, was recorded using ADPCM compression. If you are running R1.1.0 or higher, you must leave the compression format set to ADPCM. The ability to select the format allows you to migrate existing data into an older database for backwards compatibility.
		For instructions on how to change the voice mail compression format, see the "NBX Voice Mail" section in Chapter 6 of the *NBX Administrator's Guide.*
Caller ID information is not appearing when an outside call arrives.	Your local telephone company is not providing Caller ID service to you.	Caller ID is typically an optional service which you must order from your telephone company.
		You may be able to see caller ID by number or by name (or both) depending on the service your telephone company provides.
	You are answering the telephone before the Caller ID information is fully received.	Caller ID information does not appear immediately. It usually appears between the first and second rings. If you answer the call too quickly, the information is never received. If you transfer the call, the person you transfer the call to sees your ID instead of the ID of the original caller.

Digital Line Card Troubleshooting

In order to correctly troubleshoot a Digital Line Card, you must determine whether the origin of the problem is:

- The hardware
- The software configuration
- The CSU (Channel Service Unit)
- The telephone company's line

To eliminate the Digital Line Card (T1 or E1) attach a loop back connector in place of the telephone company's line. Configure the card as described in the appropriate section of Chapter 3.

After you complete the configuration, and with the loopback connector in place, verify that the Nominal status light on the front panel of the T1 or E1 Digital Line Card is turned on (appears steady and green).

- If the Nominal status light does not turn on, the problem is most likely in the Digital Line Card, and you should contact 3Com Technical Support to report the problem.
- If the Nominal light turns on, the problem is either in the CSU (Channel Service Unit) or in the telephone company's line. Contact the telephone company for assistance.

Alarm Conditions (Overview)

T1 and E1 Digital Line Cards may experience these alarm conditions:

- Red Alarm — Indicates one of these conditions:
  - Loss of Signal (LOS)
  - Loss of Framing (LOF) also known as Out of Frame (OOF)
- Blue Alarm — Indicates an Alarm Indication Signal (AIS)
- Yellow Alarm — Indicates a Remote Alarm Indication (RAI)

An alarm condition may be a:

- Signal — Information transmitted either in the upstream or downstream direction, warning of a detected failure:
- State — A condition, activated at a terminal device, indicating that a problem exists and remedial action is required.

$\boxed{i}$ *T1 and E1 Digital Line Cards are considered "downstream" equipment.*

Alarm Descriptions   **Red Alarm**

- **Carrier Fail Alarm** (Red CFA) — A state that exists at a downstream terminal device, based upon the terminal device detecting an incoming LOS or LOF.

Blue Alarms

- **AIS, Keep-alive/Blue** — A **signal** that is transmitted instead of the normal signal to maintain transmission continuity and to indicate to the receiving equipment that there is a transmission interruption either at the equipment that is generating the AIS signal or upstream of that equipment. The all ones signal is generated:

  - To maintain transmission continuity

  - To notify downstream equipment of a transmission fault

  - To indicate to downstream equipment that a DS1 framed signal is not being generated

  The transmission fault may be located at the equipment that is generating the alarm signal, or it may be located upstream of that equipment.

- **AIS CFA** (also known as Blue CFA) — A **state** that exists at the downstream equipment and indicates that it has detected an AIS signal from the upstream equipment.

Yellow Alarms

- **RAI** (also known as Yellow Alarm Signal) — A **signal** transmitted in the outgoing direction when a terminal determines that it has lost the incoming signal. The terminal equipment generates the Yellow Alarm Signal for a minimum of 1 second using one of these methods:

  - If you are using Super Frame (SF), the terminal equipment generates the Yellow Alarm Signal by setting the second bit in all channels of the Super Frame to 0 (zero).

  - If you are using Extended Super Frame (ESF), the terminal equipment generates the Yellow Alarm Signal by sending an alternating pattern of 8 ones followed by 8 zeros on the Facilities Data Link (FDL).

- **Yellow CFA** — A **state** that is activated at the terminal equipment when the terminal equipment detects a Yellow Alarm Signal. The Yellow Alarm Signal comes from the equipment at the other end when the far end equipment enters a Red CFA state. See Red Alarm, earlier in this section.

Alarms on NBX Digital Line Cards

The T1 and E1 Digital Line Cards support all of the alarm states and signals described in "Alarm Descriptions" earlier in this chapter. Two status lights indicate the status of the T1 and E1 cards:

Table 25 Digital Line Card Status Lights

Status Light	Purpose
Nominal	**On:** Indicates that there are no error or alarm conditions.
	Flashing: Indicates that a call is active on at least one channel of the T1 or E1 Digital Line Card.
CF (Carrier Fail)	**On:** Indicates that a Red Alarm state or Blue Alarm state exists on the card.
	To determine which alarm state exists:
	1 Log in to the NBX NetSet utility using the administrator login ID and password.
	2 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
	3 Click the *Digital Line Cards* tab.
	4 In the *Select Device Type* pull-down list, select *T1 Span List* or, if you are using an E1 card, select *ISDN PRI Span List*.
	5 Click *Apply*.
	6 Select the span you want.
	7 Click *Status*. The words *Red Alarm* or *Blue Alarm* appear in the *Status* field.
RA (Remote Alarm)	**On:** Indicates a Yellow Alarm state on the card.
	To confirm that the Yellow Alarm state exists:
	1 Log in to the NBX NetSet utility using the administrator login ID and password.
	2 In the *NBX NetSet - Main Menu* window, click *Device Configuration*.
	3 Click the *Digital Line Cards* tab.
	4 In the *Select Device Type* pull-down list, if you are using a T1 Digital Line Card, select *T1 Span List* or, if you are using an E1 Digital Line Card, select *ISDN PRI Span List*.
	5 Click *Apply*.
	6 Select the span you want and click *Status*. The words *Yellow Alarm* appear in the *Status* field.
	NOTE: This light is used only on the T1 Digital Line Card.
LB (Loop Back)	**On:** Indicates that the card is in loop-back testing mode.
	NOTE: This light is not used to indicate any of the Red, Blue, or Yellow alarms.

Configuration and Status Reports
You can obtain the status of all Digital Line Cards in the NBX system with either of these two methods:

Select the Digital Line Cards tab and:

- Click *Config & Status Report*. The formatted report appears on the screen with headings shown in a larger font.
- Click *Export Report*. The unformatted report appears on the screen. To save the report as an ASCII text file, select *Save as* from the *File* menu of your browser.

describes in alphabetical order (not the order of appearance) the headings in the Configuration and Status Report.

Table 26   Configuration and Status Report Headings

Heading	Description
#Chs	Number of channels.
#Dsp	Number of digital signal processors.
#OffCh	Number of channels in the offline state.
#OnChs	Number of channels in the online state.
AEClosed	Autoattendant extension when business is closed.
AELunch	Autoattendant extension when business is at lunch.
AEOpen	Autoattendant extension when business is open.
AEOther	Autoattendant extension for Other hours.
ANI	Automatic Number Identification. The telephone number from which the call originated.
Audio Input	Numeric value of audio input control setting.
Audio Output	Numeric value of audio output control setting.
BdId	Board (card) ID number.
BdId Name	Board (card) name.
Brd	The number of the board (card) in a multiple board system.
CO Switch Protocol	Protocol (ETS1, QSIG Slave) used by the CO switch (not applicable to T1).
Card Type	Type of card (T1, ISDN PRI, E1, BRI).
Ch	Channel.
Ch List	Channels supported by a DSP.
Ch MAC Address	MAC address of a channel.
Ch Name	Name of a channel.

Table 26   Configuration and Status Report Headings (continued)

Heading	Description
ChId	Unique identifying number of a channel in a list of channels, possibly including channels from more than one board.
ChNo	Channel number. For example: 1–24 for a T1 board.
CurState	Current state of a channel (in use, idle, available).
DNIS/DID	Number of digits passed that identify the called party.
DSP Name	Name of a digital signal processor.
DSP Status	Status of a digital signal processor.
DSP Version	Version of code running on a digital signal processor.
Digit Collection	Specifies the data the CO sends and the format in which it is sent over the span of an incoming call. Can include both DNIS/DID and ANI, and can specify the order in which they arrive, and the number of digits involved.
Echo Canceller	The state of the echo cancellation function. Values: Enabled, Disabled.
E&M Direction	For a T1 line, the direction of the E&M signaling. Values: Two Way, One Way. Default: Two Way.
ErrorCnt	The number of errors for this channel.
ErrorCode	The code that identifies the type of error.
Ext.	Extension.
FlashHookTransfer	Status of flash hook transfer function. If enabled, allows user receiving a call to do a flash hook transfer to another trunk line Values: Enabled, Disabled. Default: Enabled
Framing Type	Type of framing used on this board (ES4, D4). For a T1 board, ESF is always associated with a B8ZS line coding, and D4 is always associated with AMI line coding.
GpId	Group ID number.
Group Name	Group name.
Guard	A time out value that controls the waiting period after a call completes, before the channel can be used for another outbound call from NBX system.
InterfaceType	Type of interface. Values: E1, T1, ISDN, no config. Default: T1. Does not apply to T1 E&M.
Line Code	Type of line coding used (HDB3, AMI). For a T1 board, AMI line coding is always associated with D4 framing, and B8ZS line coding is always associated with ESF framing.
Line Length	Length of the line between the termination and the board.
MAC Address	A 48-bit address unique to each network device.
Model Number	The model number of the board.

Table 26 Configuration and Status Report Headings (continued)

Heading	Description
NCP Conne	The amount of time that the digital line card waits for the NCP to connect the call. "USER_ALERTING_NO_ANSWER" errors mean that this value may be too small.
NCP Gener	A timeout value that controls how long the digital line card waits for a response from the call processor. Do not modify this value.
Network Digit	A timeout value that controls how long the digital line card waits between digits sent on an incoming call.
OffHk Min	The minimum time an analog telephone, connected to an Analog Terminal Card, must be off hook for the NBX system to recognize that the telephone has been picked up.
On Line	One possible status of a channel.
Protocol	A signaling method used to make calls.
RxWnkMax	The maximum duration of a received Wink signal.
RxWnkMin	The minimum duration of a received Wink signal.
SpId	Span ID.
SpNo	Span number.
Group Name	Name of this group.
Span MAC Address	MAC address assigned to this span.
Span Name	Name of span.
SpanNo	Identifying number for a span.
Start Type	Mechanism used to indicate start of a call.
Status	Status of a channel, span, card. Values: Online, Idle, Unknown. Default: Online
TEI	For a BRI board, the Terminal Equipment Identification number. The telco may provide this number or the system may assign it, depending on how you purchased the BRI lines.
TEP Version	The version of software running on the board.
Time Last Seen	Last time activity was recorded for this board.
Timing Mode	Internal: Timing is generated from within the digital line card. Loop: Timing is taken from the central office.
Trunk to Trunk	Whether call transfers are allowed from one trunk to another. Values: Enabled (default), Disabled, Restricted, Unrestricted.
TxGudMin	The minimum duration of a transmitted Guard signal.
TxWnkDura	The duration of a transmitted Wink signal.
Wink Wait	This time out value controls how long the digital line card waits to respond with a wink signal on an outgoing call. If you see "no_wink_received" errors, this value may be too small.

Connecting a Computer to a Serial Port

On the SuperStack 3 Call Processor, the NBX 100 Call Processor, and on some of the NBX cards, you can connect a computer to a serial port and, by running a terminal emulation program on the computer, you can obtain information about the status of the card or the NBX system.

You can connect a computer directly to the serial port on these cards:

Table 27 Serial Port Connections

Card	Port
SuperStack 3 NBX Call Processor	COM1
NBX 100 Call Processor	COM1
BRI-ST Digital Line Card	CONSOLE
E1 Digital Line Card	CONSOLE
T1 Digital Line Card	CONSOLE
4-Port Analog Line Card (3C10114C only)	CONSOLE
4-Port Analog Terminal Card (3C10117C only)	CONSOLE

It does not matter which computer operating system you use. As long as the computer has a terminal emulation program that can emulate a VT100 terminal (for example, Microsoft Hyperterminal), it can communicate with any of the cards listed in Table 76.

To connect the computer to the COM1 or CONSOLE port on a board:

1 Using a standard computer serial cable (9-pin male to 9-pin female), connect the male end of the cable to the female connector (COM1 or CONSOLE) on the front panel of the board.

2 Connect the female end of the cable to an available serial port on the computer.

3 Start the terminal emulation software and create a new connection.

4 Configure the connection to use the serial port to which you connected the cable and to use the settings in Table 77.

Table 28 Terminal Emulation Program Properties

Property	Value
Emulation	VT100
Baud Rate	9600
Data bits	8
Parity	None
Stop bits	1
Flow control	None

All messages that associated with the board (for example, the initialization process) appear in the terminal emulation window.

Servicing the Network Call Processor Battery

If you lose the system date and time when you reboot the SuperStack 3 NBX system, it could mean that the Call Processor battery must be replaced. The battery is not a user-serviceable item. If you suspect a problem with the battery, contact your 3Com Technical Support representative.

WARNING: There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Getting Service and Support

Your authorized 3Com NBX Voice Authorized Partner can assist you with all of your support needs, including systems and cable plant design, installation, configuration, and project management.

A choice of maintenance services, including remote diagnostics, on-site support, telephone technical support, and hardware replacement, is available from your 3Com NBX Voice Authorized Partner. Training and enhancement services are also available.

A
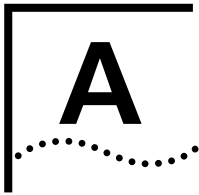
SPECIFICATIONS

This appendix contains physical, environmental, electrical, and configuration specifications for the NBX hardware.

- Government Approvals
- SuperStack 3 NBX Call Processor
- SuperStack 3 NBX Gateway Chassis
- NBX 100 Call Processor
- NBX 100 6-Slot Chassis
- NBX 4-Port Analog Line Cards
- NBX 4-Port Analog Terminal Cards
- NBX Single-Port Analog Terminal Adapter (ATA)
- NBX BRI-ST Digital Line Card
- NBX E1 and T1 Digital Line Cards
- NBX 2102 and 2102-IR Business Telephones
- NBX 2101 Basic Telephone
- NBX 1105 Attendant Console
- NBX 1102 Business Telephone
- NBX 8-Port Hub Card
- Power Line Kit (E-Brick)

Government Approvals	The 3Com® Networked Telephony Solutions are in compliance with the industry standards listed in this section.

Safety IEC60950 Edition 3 (plus all national deviations)
EN60950 1992 / A11: 1997 (plus ZB & ZC deviations)
UL 1950 3rd Edition
CSA 22.2#950 3rd Edition
AS/NZS 3260

EMC Emissions EN55022, CISPR22, AS/NZS3548, FCC Part 15, ICES-003 (Class A)

EMC Immunity EN55024
IEC61000-4-2 Electrostatic discharge
IEC61000-4-3 Radiated immunity
IEC61000-4-4 Fast transients
IEC61000-4-5 Surge
IEC61000-4-6 Conducted immunity
IEC61000-4-8 Magnetic
IEC61000-4-11 Dips and interruptions

Other EN61000-3-2 Harmonic emission
EN61000-3-3 Flicker
CTR3/A1 BRI Interface
CTR4/A1 PRI Interface
ACA TS031 Australian BRI Interface
ACA TS038 Australian PRI Interface
FCC Part 68

SuperStack 3 NBX Call Processor

The SuperStack 3 NBX Call Processor includes the box, fans, one or two power supplies, backplane, and mounting brackets. It can accommodate a second drive for disk mirroring (Table 29).

Table 29   SuperStack 3 NBX Call Processor Specifications

Weight	As Shipped (One disk): 9.1 kg (20 lbs.)
	With two disks: 10.5 kg (23 lbs.)
Dimensions	H: 133 mm (5.24 in.)
	W: 440 mm (17.3 in.)
	D: 320 mm (12.6 in.)
Compliance	This is an FCC Class A device.
Controls	Music on Hold level adjustment (controls the gain of the input circuit for the Music on Hold function).
Electrical	100-240VAC @ 2.2A, 50-60Hz
	Optional: Second power supply
Environmental	Ambient temperature: 0 to 40 °C (32 to 104 °F)
	Humidity: 5% to 85% noncondensing
Connectors	COM1, Ethernet1, Ethernet2, Audio In, Night Bell
	Unsupported: Keyboard, mouse, VGA, USB port, COM2 port
LED Indicators	Upper Right Indicator: Power.
	Other Indicators: Administrator programmable
3C10201	Call Processor, single power supply, 250-device license
3C10202	Call Processor, dual power supplies, 250-device license

SuperStack 3 NBX Gateway Chassis

The SuperStack 3 NBX Gateway chassis includes the metal box, fans and power supply, backplane, and mounting brackets. See Table 30.

Table 30 SuperStack 3 NBX 4-Slot Chassis Specifications

Weight	Empty: 6 kg (13.2 lbs)
Dimensions	H: 133 mm (5.24 in.)
	W: 440 mm (17.3 in.)
	D: 320 mm (12.6 in.)
Compliance	This is an FCC Class A device.
Electrical	100-240VAC @ 2.2A, 50-60Hz
Environmental	Ambient temperature: 0 to 40 °C (32 to 104 °F)
	Humidity: 5% to 85% noncondensing
4 Slots	For NBX interface cards
3C10200	NBX Gateway Chassis

NBX 100 Call Processor

The NBX 100 Call Processor must reside in the top slot in the chassis. You need only one Call Processor per system, even when they system has more than one chassis. See Table 31.

Table 31 NBX 100 Call Processor Specifications

Weight	1 lb 2 oz (510 gm)
Environmental	Ambient temperature: 32 °F to 104 °F (0 °C to 40 °C)
	Humidity: 5% to 85% noncondensing
Controls	Music on Hold level adjustment (screwdriver-adjustable, controls the gain of the input circuit for the music-on-hold function).

Table 31 NBX 100 Call Processor Specifications (continued)

Connectors	10BASE2 port BNC male connector for external hub connection
	RJ-45 10BASE-T DCE port for external hub connection (Uplink)
	RS-232, DB9 DTE connector (serial port)
	RS-232, DB9 DCE connector (serial port)
	3.5 mm Audio input jack for line-level audio
	RJ-11 Ext. Alert (Reserved for future use).
	RJ-11 Paging (Line-out 600-ohm audio interface with a dry contact closure for use with an external paging amplifier.)
	Pin 1 - Not Connected Pin 2 - Relay common Pin 3 - Ring Pin 4 - Tip Pin 5 - Relay Contact Pin 6 - Not connected
Indicators	CPU Status (Front panel LED; a steady blink indicates that the CPU functioning correctly.)
	DSP Status (Front panel LED; a steady blink indicates that the digital signal processor is functioning correctly.)
3C10110	NBX 100 Call Processor card

NBX 100 6-Slot Chassis

The NBX 100 6-Slot chassis includes the metal box, fan, power supply, disk drive, backplane, and mounting brackets (Table 32).

Table 32 NBX 100 6-Slot Chassis Specifications

Weight	Empty: 22 lb (9.9 kg)
	Configured: 30 lb (13.5 kg)
Dimensions	H: 10.5 in. (264.7 mm) W: 17.3 in. (431.8 mm) D: 9.0 in. (225.6 mm)
Electrical	US and Canada: 115/230 VAC @ 4/2 A, 60/50 Hz
Environmental	Ambient temperature: 32 °F to 104 °F (0 °C to 40 °C)
	Humidity: 5% to 85% noncondensing
3C10111	NBX 100 6-slot chassis

NBX 4-Port Analog Line Cards

A optional analog line card is the system's interface to the telephone company's CO lines. There are two models of the Analog Line Card:

3C10114

Table 33 contains the 3C10114 4-Port Analog Line Card specifications.

Table 33 3C10114 NBX 4-Port Analog Line Card Specifications

Weight	510 gm (18 oz)
Government approvals	FCC Part 68
	FCC registration numbers: SSAUSA-25639-PF-TQ
	Fully protected PBX: SSAUSA-25639-MF-T
	Fully protected multifunction systems: SSAUSA-25639-KF-T
	Fully protected key telephone system: FCC Part 15 Class A REN: 0.2 A per line jack
Connectors	Connects up to four Loop Start PSTN telephone lines via four RJ-11 ports
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing
3C10114	4-Port Analog Line Card

3C10114C   Table 34 contains the 3C10114C 4-Port Analog Line Card specifications.

Table 34   3C10114C NBX 4-Port Analog Line Card Specifications

Weight	510 gm (18 oz)
Government approvals	FCC Part 68
	FCC registration numbers: SSAUSA-25639-PF-TQ
	Fully Protected PBX SSAUSA-25639-MF-T
	Fully Protected Multifunction Systems SSAUSA-25639-KF-T
	Fully Protected Key Telephone System FCC Part 15 Class A
	CE: This product complies with the requirements of European Directive 1995/5/EC
	Emissions
	IECS-003 Class A
	FCC Part 15 Class A
	EN 55022 Class A
	AS/NZS 3548 Class A
	EN61000-3-2
	EN61000-3-3
	CNS 13438 Class A
Facility Interface Code	02LS2
Service Organization Code	9.0 F
Connectors	Connects up to four Loop Start PSTN telephone lines via four RJ-11C ports
	Serial port (CONSOLE) for diagnostic access
USOC Jack	RJ11C
REN	0.2 A
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 10% to 90% noncondensing
3C10114C	4-Port Analog Line Card

NBX 4-Port Analog Terminal Cards

The 4-Port Analog Terminal Card is an optional card. It enables you to connect up to four analog components, such as cordless phones or fax machines, to an NBX system. There are two models of the Analog Terminal Card.

3C10117

Table 35 contains the 3C10117 Analog Terminal Card specifications.

Table 35 NBX 4-Port Analog Terminal Card Specifications

Connectors	RJ-11. Connects up to four analog devices to the NBX system
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing

3C210117C

Table 35 contains the 3C10117C Analog Terminal Card specifications.

⚠ *CAUTION: The 3C10117C 4-Port Analog Terminal Card is not intended to connect directly to any telephone network.*

Table 36 NBX 4-Port Analog Terminal Card Specifications

Connectors	Connects up to four analog devices to the NBX system
	Serial port (CONSOLE) for diagnostic access
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 10% to 90% noncondensing

NBX Single-Port Analog Terminal Adapter (ATA)

The Single-Port Analog Terminal Adapter (ATA) is an optional component. It enables you to connect a single analog device, such as a cordless telephone or fax machine, to an NBX system (Table 37).

Table 37 Single-Port ATA Specifications

Connectors	Standard RJ-11 port
	Standard RJ-45 port
	Hub port for additional Ethernet component or NBX set
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing
3C10120	Single-Port Analog Terminal Adapter

NBX BRI-ST Digital Line Card	The BRI-ST Digital Line Card is an optional card that enables you to connect a BRI-ST line to the SuperStack 3 NBX system or the NBX 100 system (Table 38).

Table 38 BRI-ST Digital Line Card Specifications

Weight	455 gm (1 lb)
Connectors	Four RJ-45 connectors (one for each BRI-ST line) and one serial diagnostic port
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing
3C10164-ST	BRI-ST Digital Line Card

⚠ **CAUTION:** *The BRI-ST and BRI-U Digital Line Cards are not approved for use in the United States or Canada.*

NBX E1 and T1 Digital Line Cards	The E1 and T1 Digital Line Cards (Table 39) are optional cards. They enable you to connect a E1 or T1 line to the NBX system.

Table 39 E1 and T1 Digital Line Card Specifications

Weight	397 gm (14 oz)
Connectors	One RJ-45 connector for 10BASE-T line
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing
3C10165	E1 Digital Line Card
3C10116B	T1 Digital Line Card

**NBX 2102 and
2102-IR Business
Telephones**

The NBX 2102 and 2102-IR Business Telephones (Table 40) include a 2 x
24 character LCD display, 18 programmable buttons, 10 dedicated
feature buttons, and an integrated 10/100 Mbps switch port. The
2102-IR telephone has an infra-red port that allows you to use a personal
digital assistant (for example, a Palm PDA) in conjunction with this phone.

Table 40   NBX 2102 and 2102-IR Business Telephone Specifications

Compliance	FCC Class B device	
Electrical		
Model 2102	3C10226A-AA Australia:	240VAC, 50Hz, 13W
	3C10226A-CN China:	220VAC, 50Hz, 13W
	3C10226A-ME Europe:	230VAC, 50Hz, 13W
	3C10226A-SA South Africa:	230VAC, 50Hz, 13W
	3C10226A-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10226A-US North America:	120VAC, 60Hz, 13W
Model 2102-IR	3C10228IRA-AA Australia:	240VAC, 50Hz, 13W
	3C10228IRA-CN China:	220VAC, 50Hz, 13W
	3C10228IRA-ME Europe:	230VAC, 50Hz, 13W
	3C10228IRA-SA South Africa:	230VAC, 50Hz, 13W
	3C10228IRA-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10228IRA-US North America:	120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	

**NBX 2101
Basic Telephone**

The NBX 2101 Basic Telephone (Table 41) includes a 2 x 24 character LCD display and three programmable buttons.

Table 41 NBX 2101 Basic Telephone Specifications

Compliance	FCC Class B device	
Electrical	3C10248A-AA Australia:	240VAC, 50Hz, 13W
	3C10248A-CN China:	220VAC, 50Hz, 13W
	3C10248A-ME Mainland Europe:	230VAC, 50Hz, 13W
	3C10248A-SA South Africa:	230VAC, 50Hz, 13W
	3C10248A-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10248A-US North America:	120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	

**NBX 1105
Attendant Console**

The NBX 1105 Attendant Console (Table 42) supports up to 100 functions with status LED display (50 buttons, each with high/low shift position).

Table 42 NBX 1105 Attendant Console Specifications

Compliance	FCC Class A device	
Electrical	3C10223-AA Australia:	240VAC, 50Hz, 13W
	3C10223-CN China:	220VAC, 50Hz, 13W
	3C10223-ME Mainland Europe:	230VAC, 50Hz, 13W
	3C10223-SA South Africa:	230VAC, 50Hz, 13W
	3C10223-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10223-US North America:	120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	

NBX 1102 Business Telephone

The NBX 1102 Business Telephone (Table 43) includes 18 programmable buttons, 10 dedicated feature buttons, a 2 x 16 LCD display, and an integrated 10 Mbps hub port.

Table 43 NBX Model 1102 Business Telephone Specifications

Weight	1.8 kg (4 lbs)	
Compliance	FCC Class B device	
Electrical	3C10121-AA Australia:	240VAC, 50Hz, 13W
	3C10121-CN China:	220VAC, 50Hz, 13W
	3C10121-ME Europe:	230VAC, 50Hz, 13W
	3C10121-SA South Africa:	230VAC, 50Hz, 13W
	3C10121-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10121-US North America:	120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	

NBX 8-Port Hub Card

The hub card (Table 44) is an optional component. It enables you to connect any 10BASE-T hub or switch to the Call Processor to provide LAN connectivity to the system.

Table 44 NBX 8-Port Hub Card Specifications

Weight	397 gm (14 oz)
Connectors	Eight RJ-45 connectors for 10BASE-T lines One BNC male connector for 10BASE2 coaxial line
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing
3C10115	8-Port Hub Card

| **Power Line Kit (E-Brick)** | This kit (3C10125-XY) enables you to provide both Ethernet signaling and power over the Ethernet cable to any NBX telephone and to the Model 1105 Attendant Console. |

The adapter on the power line kit connects to an AC outlet. It accepts a Category 5 Ethernet cable (RJ-45 connector, signaling only) from the network and provides an RJ-45 output connector for the NBX telephone. The output connector provides both the Ethernet signals and DC power for the telephone. The Ethernet signals are on the standard pins. The DC power is provided on pins 7 and 8, which are normally unused in an Ethernet cable.

At the NBX telephone or Attendant Console, a splitter (included with the kit) has an RJ-45 connector that accepts the Ethernet cable from the adapter. The outputs from the splitter are a power connector and an Ethernet cable that you attach to the corresponding connection points on the telephone or console.

To obtain the appropriate kit model for use in your country, specify the two letters after the 3C number (Table 45).

Table 45 3C10125-*xx* Power Line Kit Specifications

3C10125-AA	Australia, New Zealand:	240 VAC, 50 Hz, 13 VA
3C10125-ME	Mainland Europe:	230 VAC, 50 Hz, 13 VA
3C10125-UK	United Kingdom:	230 VAC, 50 Hz, 13 VA
3C10125-US	United States, Canada, and Latin America:	120 VAC, 60 Hz, 15.6 VA

B
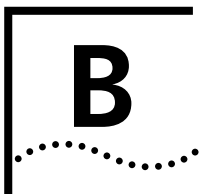
CIRCUIT PROVISIONING

This appendix describes the circuit provisioning requirements for analog telephone lines, T1 lines, and for ISDN PRI services on T1 lines. It contains the following topics:

- Caller ID Choices for Analog Lines
- T1 Prerequisites
- T1 Recommendations
- ISDN PRI Prerequisites
- ISDN PRI Recommendations
- ISDN BRI Prerequisites
- ISDN BRI Recommendations

Caller ID Choices for Analog Lines

When you order analog telephone lines from your telephone service provider, you can also order caller ID service. Your telephone service provider can tell you the format in which they provide caller ID information.

You can configure your NBX system to work with any of these formats:

- Bellcore GR-30-CORE
- ETSI FSK
- ETSI DTMF
- British Telecom SIN 242
- NTT Telephone Interface Services

See the *NBX Administrator's Guide* for information on how to configure Analog Line Card ports for the caller ID format you want to use.

T1 Prerequisites	All contact information *must* be available at time of installation, including telephone numbers and appropriate account representative contact information from the client's carrier.

T1 Recommendations

If the client is using standard (DS1) T1 lines, 3Com recommends that the circuits from the T1 provider meet the following criteria:

- **Framing Type** — Use either ESF with B8ZS.
- **Zero Code Suppression** — Use D4 with AMI.
- **Signaling** — E&M/Wink is required.
- **Start Type** — Wink Start is required.

![i] *Some Central Offices that use a DMS 100 switch may configure T1 circuits with an option to provide outbound dial tone. This configuration does not provide a wink for outbound calls. The NBX system does not need dial tone as it provides its own. Verify that the outbound channels are configured for Wink Start.*

- **Line Hunting** — Obtain from the telephone company the method they use to hunt for an available channel on the T1 span. The NBX system typically searches downward from high-numbered channels when trying to place an outgoing call. If the telephone company searches upward from low-numbered channels for calls to the NBX system, conflicts are avoided.
- **Circuit Type** — 4-wire is required.
- **DID Applications** — When using DID or DNIS, 3Com recommends ordering telephone numbers that easily fit into the NBX system numbering plan. Although the numbering plan is extremely flexible, it is far easier to use if you have 3 or 4 digit DID\DNIS codes. This allows for a simple dial plan implementation.

  If the client is using 3-digit internal extensions, try to use the 100-499 range. Have the client ask the carrier to use the corresponding three digits for the DID\DNIS numbers/code. If the client is using 4-digit extensions, have them ask for the 1000-4999 range and request that the carrier use corresponding four digits for the DID/DNIS numbers/code.

  If the client requires Caller-ID type services, the carrier *must support* in-band ANI. As part of the order process, the client must ask the telephone company if this service is available.

- **CSU** — An external CSU (Channel Service Unit) is required with each T1 installation. Many CSUs support conversion of ESF (with B8ZS) services into D4 (with AMI). In some locations it may be easier to order the T1 as ESF with B8ZS and perform the conversion in the CSU.

i *If the client chooses this method, verify that the CSU supports this conversion.*

ISDN PRI Prerequisites

Before you install and configure ISDN PRI services on T1 circuits, gather the following information and have it available at the time of installation:

- All telephone numbers to be activated
- PRI circuit ID
- Carrier's testing department name and telephone numbers
- Carrier's circuit provisioning department names and numbers
- Carrier's account representative account information
- Requested smart jack be installed in customer's suite (not at the minimum point of entry)

CSU Required Each PRI installation requires an external Channel Service Unit (CSU).

ISDN PRI Recommendations

For ISDN PRI services, 3Com recommends the settings discussed in the following sections.

- **Framing Type** — The recommended (also the default) configuration is Extended Super Frame (ESF).

  The multi-frame formats F4, F12 (D4 or SF), and F72 are also supported.

- **Zero Code Suppression** — The recommended (also the default) configuration is B8ZS.

  AMI is also supported, but 3Com does not recommend this choice.

- **DID Applications** — For DID or DNIS, 3Com recommends that you order telephone numbers that easily fit in the NBX system numbering plan. If possible, use 3 or 4 digit DID/DNIS codes, which allow for simple dial plan implementation.

Recommended:

- With 3 digit extensions 100-499, the last three digits of the DID/DNIS codes should be 100-499.

- With 4 digit extensions 1000-4999, the last four digits of the DID/DNIS codes should be 1000-4999.

- **Line Hunting Sequence** — 3Com recommends that the telephone company start with channel one and hunt upward for incoming calls. This works well with NBX systems, because they start at the highest channel number and hunt down for outgoing calls. The client must verify which services are available from the telephone company.

- **Supported Telephone Central Office Switch Protocols** — NBX system ISDN PRI services support the following central office switch protocols:

  - AT&T 5ESS Custom

  - DMS Custom

  - National ISDN NI-1/NI-2

- **Caller ID by Name** — If you configure your T1 Digital Line Card for ISDN PRI operation, you can subscribe with your telephone service provider for caller ID by name service, but only if your telephone service provider uses National ISDN-2 or AT&T 5ESS Custom.

ISDN BRI Prerequisites

Before you start to install a BRI circuit, collect all of the following information:

- All telephone numbers to be activated

- Circuit ID

- Carrier's testing department name and telephone numbers

- Carrier's circuit provisioning department names and numbers

- Carrier's account representative account information

| **ISDN BRI Recommendations** | When you work with the telephone company to install an ISDN BRI circuit, 3Com recommends the parameters discussed in the following sections. |

- **Interface** — The BRI connection supplied by the telephone company must terminate at an S/T interface. Connections terminating at the U interface are not supported.

- **Point-to-Point and Point-to-Multipoint** — Both point-to-point and point-to-multipoint configurations are supported.

  The appropriate TEI (Terminal Endpoint Identifier) must be entered when configuring the BRI card. Typically, Automatic TEI assignment is used on Point-to-Multipoint lines. For Point-to-Point lines, set the TEI value to 0 (zero).

  By default the system is configured to use Automatic TEI assignment. Thus, if the line provided is Point-to-Point, this will typically mean the TEI has to be set to 0 (zero) when configuring.

- **DDI/MSN Applications** — For DDI/MSN, 3Com recommends that you order telephone numbers that easily fit in the NBX system numbering plan. If possible, use 3 or 4 digit DDI/MSN codes, which allow for simple dial plan implementation.

  - With 3 digit extensions 100-499, the last three digits of the DDI/MSN codes should be 100-499.

  - With 4 digit extensions 1000-4999, the last four digits of the DDI/MSN codes should be 1000-4999.

- **Supported Telephone Central Office Switch Protocols** — NBX system ISDN BRI services support the ETSI central office switch protocol.

C
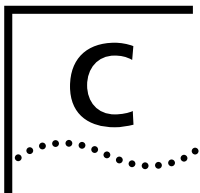
GUIDELINES FOR CONNECTING REMOTE AUDIO DEVICES

This appendix provides guidelines for connecting a remote audio device to the NBX 100 Networked Telephone Solution. The remote audio device can be an NBX Business Telephone, an NBX Basic Telephone, an Analog Line Card, a Single-Port Analog Terminal Adapter (ATA), a 4-Port Analog Terminal Card, a Digital Line Card, or other product.

The guidelines provided are for a single device, but the issues discussed can be scaled to cover multiple devices. The guidelines include the following topics.

- Maximum Transfer Unit (MTU)
- Communication Latency Requirements
- Bandwidth Requirements
- Installing Fax Machines with ATAs

Maximum Transfer Unit (MTU)

The system requires that the interconnection mechanism provide an apparent MTU of a full size IEEE 802.1 packet (1514 bytes of information plus 4 byte CRC). The interconnection can fragment packets into smaller frames but *must* reassemble the packets prior to delivery to any NBX device. The NBX devices do not presently support IP (or other) packet fragmentation and reassembly.

Communication Latency Requirements

The interconnect latency requirements can be broken into two main categories: large packet latency and small packet latency. Depending on the configuration of the interconnection mechanism, these latencies can be quite different, often due to the interconnection device applying compression to the packets. The compression function can increase exponentially with packet size, resulting in very long delays for large packets.

Large Packet Latency

The round-trip latency on large packets, 300 bytes to full MTU, must be less than 450 ms. The system will support an occasional packet delay of 450 to 900 ms, but each such delay will cause retries and thus affect bandwidth and performance. If delays in excess of 450 ms occur at a "high rate" (more than one such delay every three seconds) then system degradation can occur, resulting in problems initializing (downloading devices) as well as sluggish performance of system features.

Small Packet Latency

The round-trip latency on small packets, from 64 bytes up to the large packet size, should be less than 150 ms, to maintain a high performance level (this is especially significant in the quality of user conversations). Longer latency will not cause system failure but can result in "talk-over" situations within a conversation. Additionally, the longer latency can cause the system to appear sluggish during user interaction (dialing, answering, etc.).

Bandwidth Requirements

The interconnect bandwidth requirements depend on the selected audio compression and system configuration [Layer 2 or Layer 3 (IP)] topology.

Layer 2 Mulaw (G.711) Audio (Normal Setting)

The interconnection bandwidth requirements for a device configured as a Layer 2 device running G.711 audio for each party in a conversation requires a maximum of 73 Kbps. Thus, a point-to-point call requires this peak bandwidth in each direction, while a 3-party conference requires a peak of 219 Kbps in one direction. For more information, see "Notes on Bandwidth Requirements" later in this appendix.

Layer 3 Mulaw (G.711) Audio

The overhead for running a device as a Layer 3 device results in a maximum bandwidth requirement of 86 Kbps per party in the conversation. Thus, a point-to-point call requires this peak bandwidth in each direction, while a 3-party conference requires a peak of 258 Kbps in one direction. For more information, see "Notes on Bandwidth Requirements" later in this chapter.

Layer 2 ADPCM Audio (Reduced Bandwidth Setting)

The interconnection bandwidth requirements for a device configured as a Layer 2 device running ADPCM audio for each party in a conversation requires a maximum of 42 Kbps. Thus, a point-to-point call requires this peak bandwidth in each direction, while a 3-party conference requires a peak of 126 Kbps in one direction. For more information, see "Notes on Bandwidth Requirements" later in this chapter.

Layer 3 ADPCM Audio (Reduced Bandwidth Setting)

The overhead for running a device as a Layer 3 device results in a maximum bandwidth requirement of 54.7 Kbps per party in the conversation. Thus, a point-to-point call requires this peak bandwidth in each direction, while a 3-party conference requires a peak of 164 Kbps in one direction. See "Notes on Bandwidth Requirements" next.

Notes on Bandwidth Requirements

Silence suppression reduces bandwidth requirements on average by 30 to 40 percent. However, do not assume this much bandwidth reduction when determining the peak requirements. These bandwidth reduction values do not include link overhead (for example, packet encapsulation, additional bytes for error detection/correction, etc.) which may be added by the customer's specific interconnection device. This overhead is not under the control of the NBX system, but must be added based upon the device specification.

**Installing Fax
Machines with ATAs**

When installing a fax machine with a Single-Port Analog Terminal Adapter, consider the following points:

- A fax machine requires twice the bandwidth (150 Kbps) of a voice device.

- A fax machine must be configured to use Mulaw compression.

- Problems encountered receiving or sending faxes could indicate network traffic issues.

- Some PC faxes or modems may not work properly due to the very low latency requirements of such devices.

- The most effective way to install a fax machine is to install it using a Single-Port ATA connected to a hub card in the NBX system, or to use a dedicated switch port for the ATA connected to the fax machine.

INDEX

FCC CLASS A VERIFICATION STATEMENT

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

Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment.

This equipment complies with Part 68 of the FCC rules. This unit bears a label which contains the FCC registration number and Ringer Equivalency Number (REN). If requested, this information must be provided to the telephone company.

This equipment uses the following standard FCC Part 68-compliant jacks and plugs for network connections:

USOC RJ11C for connecting to the telephone network

USOC RJ45 and BNC connectors for connecting to the local area network

This equipment contains FCC-compliant modular jacks. It is designed to be connected to the telephone network or premises wiring using compatible modular plugs and cabling which comply with the requirements of FCC Part 68 rules.

The Ringer Equivalency Number (REN) is used to compute the number of devices that can be connected to a telephone line. An excessive REN value on a line can result in the devices not ringing in response to incoming calls. In most, but not all areas, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. For products approved after July 23, 2001, the REN for this product is part of a product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (for example, 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

In the unlikely event that this equipment causes harm to the telephone network, the telephone company can temporarily disconnect your service. The telephone company will try to warn you in advance of any such disconnection, but if advance notice is not practical, it may disconnect the service first and notify you as soon as possible afterwards. In the event that such a disconnection is deemed necessary you will be advised of your right to file a complaint with the FCC.

From time to time, the telephone company may make changes in its facilities, equipment, operations, or procedures which could affect the operation of this equipment. If this occurs, the telephone company is required to provide you with advance notice so you can make the modifications necessary to maintain uninterrupted service

Repairs to this equipment can be made only by the manufacturer or its authorized agents. In the event that this equipment requires service, contact your equipment vendor or the manufacturer, 3Com Corporation.

NBX Telephones are compatible with inductively coupled hearing aids.

If trouble is experienced with this NBX equipment, for repair or warranty information, please contact 3Com Corporation, 5400 Bayfront Plaza, P.O. Box 58145, Santa Clara, California, USA, Telephone: 800-NET-3Com or visit the web site at www.3com.com. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of this NBX equipment does not disable your alarm equipment. If you have questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

This equipment is capable of providing users access to interstate providers of operator services through the use of access codes. Modification of this equipment by call aggregators to block access to dialing codes is a violation of the Telephone Operators Consumers Act of 1990.

INDUSTRY CANADA NOTICE

NOTICE: The Industry Canada (IC) label identifies certified equipment. This certification means that the equipment meets the telecommunications network protective, operational, and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The department does not guarantee the equipment will work to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The user should be aware that compliance with the above conditions might not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines, and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas. **Caution:** Users should not attempt to make such connections themselves, but should contact the appropriate electrical inspection authority or electrician, as appropriate.

NOTICE: The Ringer Equivalency Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination of an interface may consist of any combination of devices subject only to the requirement that the sum of the ringer equivalency numbers of all devices does not exceed 5.

Important: Read before using this product.

3COM END USER SOFTWARE LICENSE AGREEMENT TERMS AND CONDITIONS AND LIMITED WARRANTY

READ THE TERMS AND CONDITIONS OF THIS AGREEMENT CAREFULLY BEFORE USING THE 3Com PRODUCT ACCOMPANYING THIS AGREEMENT (THE "PRODUCT"). BY USING THE PRODUCT YOU ARE ACCEPTING AND AGREEING TO BE BOUND BY THIS AGREEMENT. IF YOU ARE NOT WILLING TO BE BOUND BY THE TERMS OF THIS AGREEMENT, YOU SHOULD PROMPTLY RETURN THE UNUSED PRODUCT AND PACKAGING TO THE DEALER THAT SOLD THE PRODUCT TO YOU, AND YOU WILL RECEIVE A REFUND OF THE PURCHASE PRICE. THIS AGREEMENT REPRESENTS THE ENTIRE AGREEMENT CONCERNING THE PRODUCT BETWEEN YOU AND 3Com CORPORATION ("3Com"), AND IT SUPERSEDES ANY PRIOR PROPOSAL, REPRESENTATION, OR UNDERSTANDING CONCERNING THE PRODUCT BETWEEN YOU AND 3Com.

3Com and you, the purchaser, agree that the following terms and conditions (sometimes referred to herein as this "Agreement") shall govern your purchase of the Product from an authorized 3Com dealer. The term "Product" includes (i) the equipment accompanying these terms and conditions and (ii) the software included in such equipment or otherwise furnished to you in connection with your purchase and/or use of such equipment (the "Software"). This Agreement covers Products for use only in the United States and Canada.

1 Software License.

(a) License Grant. Subject to the terms and conditions contained herein, 3Com grants you a personal, non-transferable and non-exclusive license to use the Software, in object code form only, for your internal business needs on a single Product in accordance with the accompanying system documentation (the "Documentation"). This license grant shall be limited to use with the equipment for which the Software was obtained, or, on a temporary basis, on back-up equipment when the original equipment is inoperable. Use of the Software on multiple processors is prohibited unless otherwise agreed to in writing by 3Com.

(b) Restrictions. Except as expressly authorized by this Agreement or under applicable law, you are not permitted to copy or use the Software in any manner. Without limiting the generality of the foregoing, you agree that you will not do any of the following: (i) decompile, reverse engineer, disassemble, or otherwise reduce the Software to a human-perceivable form; (ii) transfer the Software from one computer to another, including other servers and/or other storage devices; (iii) transfer the Software to any other party, except when transferring it with the Product in accordance with the terms of this Agreement; or (iv) modify, adapt, translate, rent, sublicense, lease, loan, resell for profit, distribute, network or create derivative works based upon the Software or any part thereof.

(c) Ownership of Software. Title to and ownership of the Software shall remain with 3Com and its suppliers. This license is not a sale of the Software or any copy.

(d) Third-Party Applications. Any third party supplier of computer programs included in the Software is a third party beneficiary of the provisions of this Section 1, and such third party may protect its rights in the Software against violations of this license.

(e) Confidentiality. You agree to maintain the Software in confidence and to not disclose the Software to any third party without the express written consent of 3Com. You further agree to take all reasonable precautions to preclude access of unauthorized persons to the Software.

(f) <u>Termination</u>. 3Com may terminate this Section 1 and the licenses granted hereby upon the breach by you of any the provisions of this Section 1. Upon such termination, you agree to return the Product, including the Software and all copies and portions thereof, to 3Com.

2 <u>Limited Warranty</u>. If the Product does not operate in accordance with 3Com's standard specifications or Documentation during the Warranty Period, you must promptly notify the authorized 3Com dealer from whom you purchased the Product. You must provide your authorized 3Com dealer with proof of purchase price and dated invoice. During the Warranty Period, upon being contacted, your authorized 3Com dealer (or another authorized 3Com dealer designated by 3Com) will, at its option, either repair or replace the Product, provided it is delivered at your expense to an authorized 3Com service facility designated by 3Com or your authorized 3Com dealer. Your authorized 3Com dealer (or another authorized 3Com dealer designated by 3Com) will provide you with a replacement Product if either the NCP (Network Call Processor) Card fails and/or if 25% of the system (lines and/or stations) becomes inoperable at any time during the Warranty Period. You have the right, as your exclusive remedy, to return the Product to your authorized 3Com dealer (or another authorized 3Com dealer designated by 3Com) for a refund of the purchase price from such authorized 3Com dealer if such authorized 3Com dealer is unable to repair or replace the Product pursuant to the terms of this warranty. You shall bear all shipping, packing, and insurance costs and all other costs, excluding labor and parts, necessary to effectuate repair, replacement or refund under this warranty.

The "Warranty Period" shall commence on the date that the Product was purchased by the authorized 3Com dealer from whom you purchased the Product and shall expire on the second anniversary thereof. At the time of purchase, your authorized 3Com dealer will notify you in writing of the commencement date and the expiration date of the Warranty Period.

Purchased or replacement parts and products may be new, remanufactured or refurbished. Any removed parts and/or Products shall become the property of 3Com.

Coverage under this warranty program shall require the authorized 3Com dealer to contact the 3Com Customer Service Department to generate a Return Merchandise Authorization (RMA) Number for any Product(s) the 3Com Service Representative deems defective.

3 <u>Warranty Exclusions</u>. EXCEPT AS STATED IN SECTION 2 HEREOF, 3Com AND ITS AFFILIATES, DISTRIBUTORS, DEALERS AND SUPPLIERS, MAKE NO WARRANTIES, EXPRESS OR IMPLIED, AND TO THE EXTENT PERMITTED BY APPLICABLE LAW, 3Com DISCLAIMS ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE AND NON-INFRINGEMENT. IF IMPLIED WARRANTIES MAY NOT BE DISCLAIMED UNDER APPLICABLE LAW, THEN ANY IMPLIED WARRANTIES ARE LIMITED IN DURATION TO 90 (NINETY) DAYS AFTER DELIVERY OF THE PRODUCT TO YOU. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

THE WARRANTY SET FORTH IN SECTION 2 HEREOF, DOES NOT EXTEND TO ANY PRODUCT, WHICH HAS BEEN DAMAGED AS A RESULT OF (1) ACCIDENT, MISUSE OR ABUSE; (2) YOUR FAILURE TO FOLLOW 3Com'S INSTALLATION, OPERATION OR MAINTENANCE INSTRUCTIONS; OR (3) UNAUTHORIZED SERVICE OR PARTS.

4 <u>Post-Warranty Service</u>. 3Com highly recommends purchasing an extended warranty for all 3Com Products to significantly reduce unexpected repair costs after the Warranty Period. You can purchase a post-warranty service contract from your authorized 3Com dealer. Please contact your authorized 3Com dealer for post-warranty service on all 3Com Products.

5 <u>Infringement</u>. 3Com shall defend you, at 3Com's expense, from and against any claim brought by a third party alleging that the Product infringes any: (i) United States patent issued on or before the commencement date of the Warranty Period; (ii) United States trademark issued on or before the commencement date of the Warranty Period; (iii) copyright, or (iv) trade secret, and shall indemnify you against all damages and costs assessed against you that are payable as part of a final judgment or settlement. The indemnification obligation of this Section 5 shall not apply to any claim arising out of (i) the combination of the Product with other products not claimed to be owned or developed by or on behalf of 3Com; (ii) the modification of the Product, or any part thereof, unless such modification was made by or on behalf of 3Com; (iii) any software or other technology not claimed to be owned by 3Com; or (iv) any infringement caused by your action.

If you seek indemnification pursuant to this Section 5 from or against the assertion of any claim by a third person (a "Third Person Assertion"), you shall give prompt notice to 3Com. Within twenty (20) business days of receipt of notice from you pursuant to this Section 5, 3Com shall have the right exercisable by written notice to you, to assume the defense of a Third Person Assertion. If 3Com assumes such defense, 3Com may select counsel. If 3Com controls the defense of a Third Person Assertion, 3Com shall have the right to consent to the entry of judgment with respect to, or otherwise settle, such Third Person Assertion with your prior written consent, which consent shall not be unreasonably withheld. You shall reasonably cooperate in the defense of any Third Person Assertion.

6 <u>Exclusive Remedies and Limitations of Liability</u>. THE ENTIRE LIABILITY OF 3Com AND ITS AFFILIATES, DISTRIBUTORS, DEALERS AND SUPPLIERS (AND THE DIRECTORS, OFFICERS, EMPLOYEES, AGENTS AND AFFILIATES OF ALL OF THEM) AND YOUR EXCLUSIVE REMEDIES FOR ANY DAMAGES SHALL BE (1) FOR

FAILURE OF PRODUCTS DURING THE WARRANTY PERIOD, THE REMEDIES STATED IN SECTION 2 HEREOF; (2) FOR INFRINGEMENT, THE REMEDIES STATED IN SECTION 5 HEREOF; AND (3) FOR CLAIMS OTHER THAN SET FORTH ABOVE, 3Com LIABILITY SHALL BE LIMITED TO PROVEN DIRECT DAMAGES IN AN AMOUNT NOT TO EXCEED THE ORIGINAL DISCOUNTED PURCHASE PRICE OF THE PRODUCT.

3Com SHALL IN NO EVENT BE LIABLE FOR THE FOLLOWING TYPES OF DAMAGES: (1) INCIDENTAL DAMAGES; (2) SPECIAL OR CONSEQUENTIAL DAMAGES; (3) LOST PROFITS, SAVINGS OR REVENUES OF ANY KIND, INCLUDING WITHOUT LIMITATION LOSS OF DATA, MESSAGES, OR TELEPHONE CALLS; AND (4) CHARGES FOR COMMON CARRIER TELECOMMUNICATIONS SERVICES OR FACILITIES ACCESSED THROUGH OR CONNECTED TO PRODUCTS. TO THE EXTENT PERMITTED BY LAW, SUCH DAMAGES ARE HEREBY EXCLUDED BOTH FOR PROPERTY DAMAGE, AND TO THE EXTENT NOT UNCONSCIONABLE, FOR PERSONAL INJURY DAMAGE.

THE FOREGOING LIMITATIONS OF LIABILITY SHALL APPLY REGARDLESS OF THE CAUSE OF ACTION UNDER WHICH SUCH DAMAGES ARE SOUGHT.

SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

7 Third-Party Products. The decision to acquire hardware, software (in any form), supplies or service (other than the Product accompanying this Agreement) from parties other than 3Com ("Third Party Products") is yours, even if 3Com helps you identify, evaluate or select them. EXCEPT AS SPECIFICALLY AGREED TO IN WRITING, 3Com IS NOT RESPONSIBLE FOR, AND EXPRESSLY DISCLAIMS LIABILITY FOR, PERFORMANCE OR QUALITY OF THIRD PARTY PRODUCTS OR THEIR SUPPLIERS; any claim that you have in connection with the Third Party Products and any remedies for such claim will be against the supplier of such Third Party Products.

8 Assignment. You may not assign this Agreement (including the licenses granted hereby), either in whole or in part, whether by operation of law or otherwise, without the prior written consent of 3Com. Any attempt to assign your rights, duties or obligations under this Agreement without such consent shall be null and void. Subject to the foregoing, the rights and liabilities of the parties under this Agreement will bind and inure to the benefit of the parties' respective successors and permitted assigns.

9 General. You acknowledge that you have read this Agreement, understand it, and that by using the Product you agree to be bound by the terms and conditions of this Agreement. You assume full responsibility for the use of the Software and agree to use the Software legally and responsibly. This Agreement shall be governed by the substantive laws of the State of California, without regard to conflicts of law principles, except as to copyright matters, which are governed, by federal law. This Agreement is deemed entered into, by both parties, in Santa Clara, California. In the event that any provision of this Agreement shall be held by a court or other tribunal of competent jurisdiction to be unenforceable, such provision shall be enforced to the maximum extent permissible and the remaining provisions of this Agreement shall remain in full force and effect. All rights in the Software not specifically granted in this Agreement are reserved by 3Com, and, except for the express licenses granted herein, no other licenses are granted by 3Com by implication, estoppel or otherwise. You agree not to export the Product, without the express written consent of 3Com.

Should you have any questions concerning this Agreement, you may contact 3Com at the address set forth below.

3Com Corporation
5400 Bayfront Plaza
P.O. Box 58145
Santa Clara, California, USA
95052-8145

North America:
Tel: 800-NET-3Com

Outside North America:
www.3com.com