NBX Installation Guide

NBX V3000

Release 4.4

Part Number 900-0200-01 AA
Published October 2004

http://www.3com.com/

3Com Corporation
350 Campus Drive
Marlborough, MA
01752-3064

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libtar 2.1.11

Developed by:
Campus Information Technologies and Educational Services, University of Illinois at Urbana-Champaign

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OpenBSD: basename.c,v 1.4 1999/05/30 17:10:30 espie Exp

OpenBSD: dirname.c,v 1.4 1999/05/30 17:10:30 espie Exp

OpenBSD: fnmatch.c,v 1.6 1998/03/19 00:29:59 millert Exp

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gethostname.c: minimal substitute for missing gethostname() function

created 2000-Mar-02 jmk

requires SVR4 uname() and -lc

by Jim Knoble <jmknoble@pobox.com>

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glob.c

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OpenBSD: strlcat.c,v 1.5 2001/01/13 16:17:24 millert Exp

OpenBSD: strlcpy.c,v 1.4 1999/05/01 18:56:41 millert Exp

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strmode.c

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zlib.h — Interface of the “zlib” general-purpose compression library, version 1.1.4, March 11th, 2002

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imapproxy

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imap daemon

Program: IMAP4rev1 server

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Networks and Distributed Computing
Computing & Communications, Administration Building, AG-44
University of Washington
Seattle, WA 98195
Internet: MRC@CAC.Washington.EDU

Date: 5 November 1990
Last Edited: 6 January 1997

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imapclient

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Date: 22 November 1989
Last Edited: 9 January 1998

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IMAP\imapproxy\amigados.c, IMAP\imapproxy\amigpk.c, and IMAP\imapproxy\amigaunpk.c

CONTENTS

2 INSTALLING SYSTEM HARDWARE COMPONENTS

About This Guide

This guide provides information and instructions for installing the NBX® 3000 Networked Telephony Solution. It is intended for authorized installation technicians.

- *If the information in the release notes differs from the information in this guide, follow the instructions in the release notes.*
- *Release notes and all product technical manuals are available on the* NBX Resource Pack CD *and the 3Com Partner Access Web Site.*
- *For information about monitoring, changing, and maintaining the system, see the* NBX Administrator's Guide *on the* NBX Resource Pack CD *or in the NBX NetSet interface*.
- *For information about using the telephones on an NBX system, see the* NBX Telephone Guide *and the* NBX Feature Codes Guide *on the* NBX Resource Pack CD *or in the NBX NetSet interface.*

How to Use This Guide

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

Table 1 Overview of the Guide

Description	Chapter
An overview of the installation process and hardware components	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 and Analog Terminal Adapters	Chapter 5
How to install BRI-ST Digital Line Cards	Chapter 6
How to install E1 ISDN PRI Digital Line Cards	Chapter 7
How to install T1 Digital Line Cards	Chapter 8
How to configure IP telephony	Chapter 9

Table 1 Overview of the Guide (continued)

Description	Chapter
Troubleshooting information	Chapter 10
System and component specifications	Appendix A
ISDN BRI, ISDN PRI, and T1 circuit provisioning information	Appendix B
Guidelines for connecting remote audio devices	Appendix C
Obtaining Support for Your 3Com Product	Appendix D
References to all topics in this book	Index
FCC, Industry Canada, Software License Agreement, 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
	Information note	Information that describes important features or instructions
	Caution	Information that alerts you to potential loss of data or potential damage to an application, device, system, or network
	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 used in U.S.	Term used outside the U.S.
Toll restrictions	Call barring
Pound key (#)	Hash key (#)
CO (central office)	Telephone Exchange
Toll-free	Free-phone
Analog Line Card	Analog Trunk Line Interface Module

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Your suggestions are important to us. They help us to make the NBX documentation more useful to you.

Send comments about this guide or any of the 3Com NBX documentation and Help systems to:

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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 900-0200-01 Rev AA

Page 20

As always, address all questions regarding the NBX hardware and software to your 3Com NBX Voice-Authorized Partner.

1 INTRODUCTION

This chapter describes NBX hardware and software in these topics:

- The NBX V3000 IP Telephony Platform
- Overview of NBX Cards and Devices
- Overview of Application Software
- NBX V3000 System Configuration Guidelines

For information about how to prepare your site for installation and how to choose the appropriate system components, see the *NBX System Planning Guide* on the *NBX Resource Pack CD* or on the 3Com Partner Access web.

For information about configuring the Dial Plan and maintaining your NBX system, see the *NBX Administrator's Guide* in the NBX NetSet™ utility, on the *NBX Resource Pack CD,* or on the 3Com Partner Access web.

The NBX V3000 IP Telephony Platform

The NBX V3000 (Figure 1) houses these components:

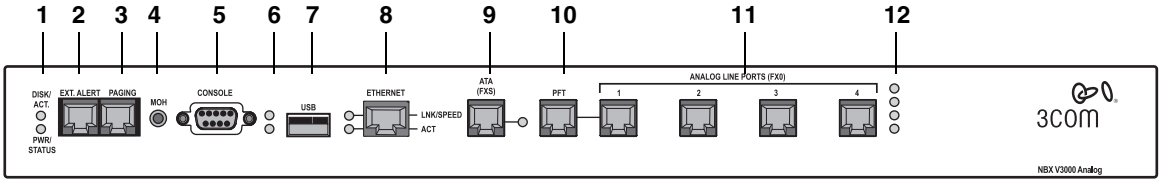
- Network Call Processor (NCP)
- Four analog FXO ports and 1 Analog FXS port
- System disk drive
- Optional memory upgrade module
- Front panel connections for network and external device connectivity

The NCP manages call traffic, voice mail, and the Automated Attendant. It can be licensed and configured for up to 1500 devices. See "NBX V3000 System Configuration Guidelines" on page 43 for more information on the total number of supported devices.

NBX V3000 Connectors and LEDs

Figure 1 shows the front panel of the NBX V3000 and describes each front panel connector and status light.

Figure 1 NBX V3000 Connectors and LEDs



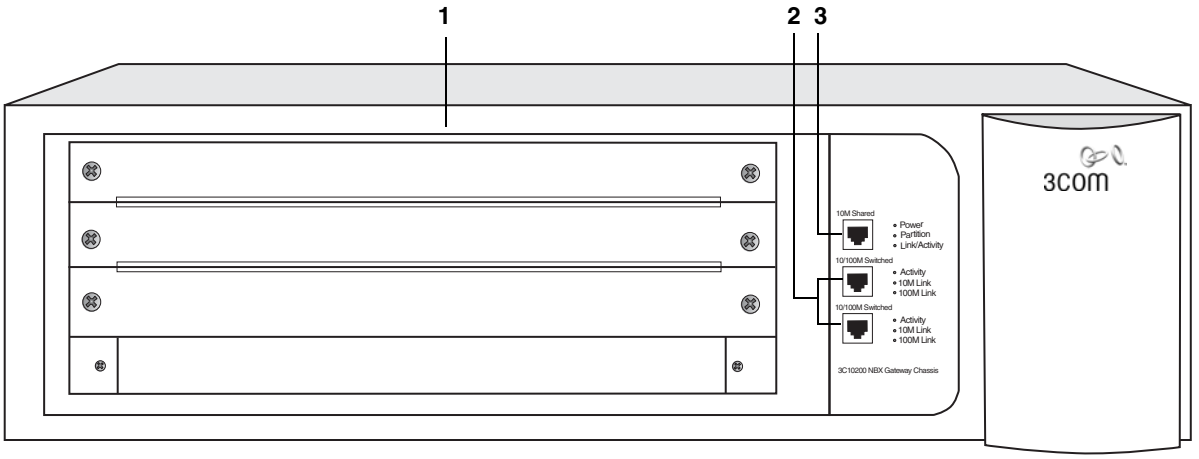
1	**Status Lights**	DISK ACT. — Disk activity. Flashing indicates disk activity. PWR./STATUS: ■ Blinking green — System is booting. ■ Blinking red — System boot has failed. ■ Green — System is operational.
2	**Ext. Alert**	Reserved for future use.
3	**Paging**	RJ-11 connector for a 600 Ohm analog paging amplifier.
4	**MOH**	Mini-jack (mono or stereo) that accepts music-on-hold audio (max 2V peak to peak) from the line output of a CD player, tape player, or other music source.
5	**Console**	DB-9 connector that provides an RS-232 (DCE) TTY terminal connection for access to system CLI commands and status messages. For information on how to connect to the NBX V3000 using the Console connector, see "Connecting a Computer to an NCP" on page 155.
6	**Status Lights**	Status lights S1 (bottom) and S2 (top) show boot status: ■ S2 flashing green — System boot sequence has started. ■ S2 green — Disk drive initialization is complete. ■ S1 and S2 flash alternately — A file system check (FSCK) is running due to previous improper system shutdown. (Do not turn off the system until you have run the system shutdown operation through the NBX NetSet utility (*Operations* > *Reboot/Shutdown*).
7	**USB**	Reserved for future use.

8	**Ethernet**	The RJ-45 Ethernet port connects the system to the network. The connection can operate at 10Mbit or 100Mbit. LNK/SPEED ■ Yellow — 10Mbit link ■ Green — 100Mbit link ■ Off — No link ACT ■ Flashing Green — Activity on port ■ Off — No activity
9	**ATA (FXS)**	Analog Terminal Adapter port, RJ-11 FSX (Foreign Exchange Station) connector for connecting an analog device, such as an analog telephone or a fax machine, to the system. The LED associated with the port indicates the state of the 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 NCP. 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.
10	**PFT**	Power Fail Transfer port, RJ-11 accepts a standard POTS (2500-series compatible) telephone. If there is a power failure, this port continues to provide dial tone and telephone service.
11	**Analog Line Ports (FX0)**	Four RJ-11 Foreign Exchange Office (FXO) ports for connecting central office telephone lines.
12	**Status Lights**	A status light for each FXO port indicates the state of 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 NCP. Operation: ■ Off for 9 to 10 seconds, on briefly — Idle. ■ On for 9 to 10 seconds, off briefly — Call is connected.

NBX Gateway Chassis

The NBX Gateway Chassis (**1** in Figure 2) contains four card slots so you can connect optional interface cards to your system. As shipped from the factory, the top three have faceplates and the fourth is left open. For installation instructions, see Chapter 2.

Figure 2 NBX Gateway Chassis (Front)



1	**4-slot chassis**	Removable faceplates installed
2	**10/100 Mbps switched Ethernet connection**	Two redundant uplink ports
3	**10 Mbps shared Ethernet connection**	One port

Use the upper 10/100 uplink port on each Gateway Chassis (shown at the top of the bracket labeled **2**) 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.

Gateway Chassis Redundant Power Supply

You can attach a redundant power supply to the RPS connector on the back of the NBX Gateway Chassis. Table 4 describes the items that you must purchase, assemble, and connect to the chassis. See your 3Com NBX Voice-Authorized Partner for purchasing details.

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 of Models 3C10117, 3C10117A, or 3C10117B-INT per Gateway Chassis. This restriction does not apply to the 3C10117C Analog Terminal Card.*

Table 4 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
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 II ARPS documentation.
2. Attach the "Y" cable to the RPS connector on the back of the NBX Gateway Chassis.
3. Connect the SuperStack II ARPS chassis to a source of AC power.

NBX 100 Chassis

The NBX 100 Chassis can be used as an expansion chassis for an NBX system. The NBX 100 Chassis holds a power supply, cooling fans, and up to five removable cards. You must install an NBX Uplink Card or Hub Card to connect the chassis to the network.

The top slot of an NBX 100 6-Slot Chassis has no access to the backplane. If you are using an NBX 100 chassis as an expansion chassis, always cover the top slot with a blank faceplate.

Overview of NBX Cards and Devices

This section lists all of the NBX cards that can be used with an NBX system. To use these cards with an NBX V3000 system, you must install an NBX expansion chassis.

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, see "Dial Prefix Settings" in Chapter 2 in the NBX Administrator's Guide *or the NBX NetSet Help at Dial Plan > Operations > Dial Prefix Settings.*

Analog Line Card

The NBX Analog Line Card connects up to four analog telephone lines to the NBX system.

Figure 3 NBX Analog Line Card (3C10114)

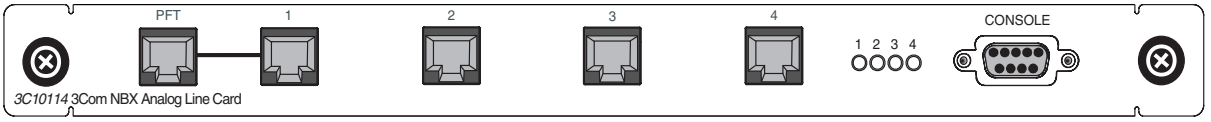
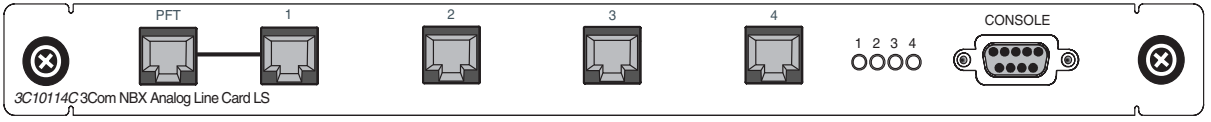


Figure 4 NBX Analog Line Card (3C10114C)



Functionally, 3C10114 and 3C10114C are identical. However, 3C10114C uses some different internal components so that 3C10114C requires NBX software release R4.1 or higher. Each Analog Line Card contains the following lights and connectors:

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

  Initialization (prior to Release R4.1):

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

  Initialization (Release R4.1 and higher):

  - **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 NCP.

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.

- **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 is an optional card that lets you connect a T1 line to the NBX system. When configured as standard T1 (DS1), the T1 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).

You must have an external Channel Service Unit (CSU) when using the 3C10116C T1 Digital Line Card. 3C10116D includes an onboard CSU. The 3C10116D can provide CSU performance statistics, supports loopback testing, and can be configured as a remote device that communicates with its NCP over a routed network.

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.

Figure 5 T1 Digital Line Card (3C10116C)

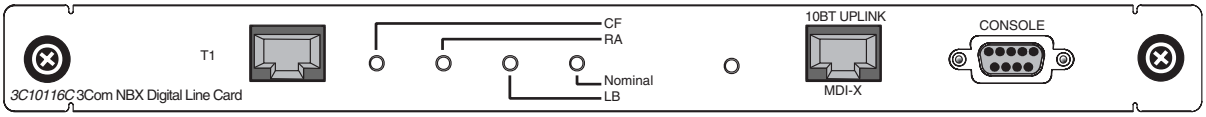
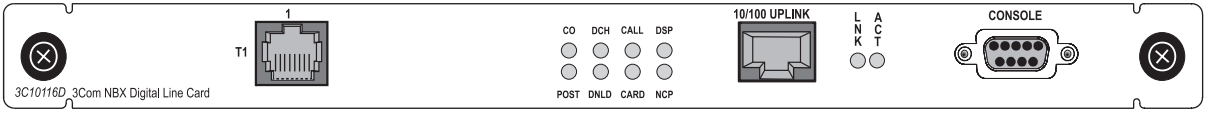


Figure 6 T1 Digital Line Card (3C10116D)



The 3C10116C 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** — On indicates a Carrier Failure. The T1 card is not receiving carrier signals from the far end of the T1 line.
  - **RA** — On indicates a Remote Alarm. The far (remote) end of the T1 line is not receiving appropriate signaling from the T1 board.
  - **LB** — On indicates that loop-back testing is in progress.
  - **Nominal** — On indicates ready to send and receive information.
- **10BASE-T Uplink** — This RJ-45 Ethernet connector connects the T1 card to an external LAN hub or switch. 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 has an Ethernet connector to connect the chassis to the LAN.

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

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

The 3C10116D T1 Digital Line Card has the following lights and connectors:

- **T1** — This RJ-48C connector makes a patch cord connection to a T1 interface.
- **Status Lights** — These lights indicate the status of the T1 card's signaling, synchronization, and loop back test.
  - **CO** — Central Office:

    Amber — Alarm condition at the remote end or the CO is not connected or available.

    Green — No alarm condition.
  - **POST** — Power On Self Test

Off — POST test is running. The test runs approximately 5-seconds after you apply power to the board. After 5-seconds, Off indicates the POST test failed.

Green — POST test completed successfully.

- **DCH** — D channel status of an ISDN PRI connection

  Off — No T1 or T1 PRI line is attached or that the card does not need a D channel, such as when the card is running T1-robbed-bit (CAS).

  Green — Card is configured for ISDN PRI operation and an active PRI connection has been established.

  Amber — The D channel has not yet been established. It can take several seconds after the card has completed its power up tests for the card to establish a connection with the PRI trunk. If the DCH light goes to amber after the connection has been established, it can mean that an active control channel connection through the PRI line has been lost.

- **DNLD** — Download

  Flash — The card is downloading software from the NBX Network Call Processor.

  Green — The download is complete or the Power-On-Self-Test (POST) is running.

  Amber — The download was interrupted before it completed.

  On a LAN, the download process completes quickly. If the download from NCP to digital line card must travel a routed network path, the download can take a few minutes. If the DNLD light remains amber, it can indicate a severely congested network or a hardware problem with the T1 card.

- **CALL** — Call audio traffic

  Off — No audio traffic on the T1 link.

  Flashing — Audio traffic is present.

- **CARD** — Card Software Status

  Green — The card has finished downloading software from the NCP and all software processes have started successfully.

  Amber — A problem with one or more of the software processes running on the card. The card automatically reboots itself if it detects a problem with any of its software processes.

- **DSP** — Reserved for future use
- **NCP** — Network Call Processor

  Amber — The card is trying to establish contact with an NCP.

  Green — The card has established contact with an NCP.
- **LNK** — Ethernet link.

  Green — The 10/100 Uplink port is connected to a 10Mb or to a 10/100 Mb hub or switch.

  Red — The 10/100 Uplink port is connected to a 100 Mb hub or switch.

  Off — There is no connection to the 10/100 Uplink port.
- **ACT**— Ethernet activity.

  Rapid blink — Data is passing into or out of the T1 card through the 10/100 Uplink port.

- **10/100 Uplink** — This RJ-45 Ethernet connector connects the T1 card to an external LAN hub or switch. 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 has an Ethernet connector to connect the chassis to the LAN.
- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

CAUTION: *This equipment does not operate 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.

3C10165D includes an onboard CSU. The 3C10165D can provide CSU performance statistics, can be enabled for loopback testing, and can be configured as a remote device that communicates with its NCP over a routed network.

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

Figure 7 E1 Digital Line Card (3C10165C)

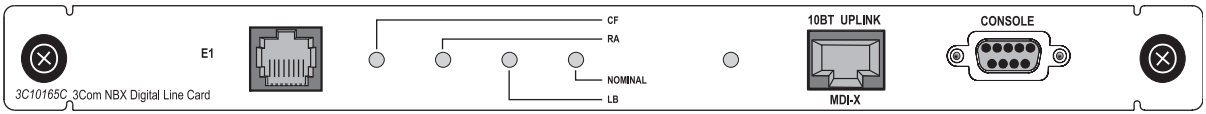
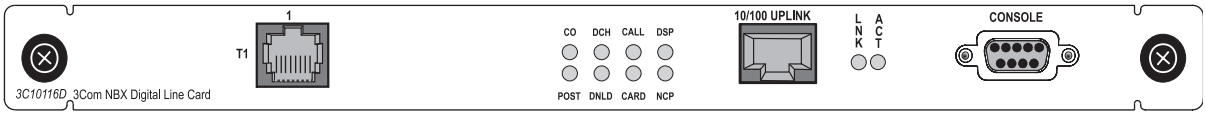


Figure 8 E1 Digital Line Card (3C10165D)



Each 3C10165C 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** — On indicates a Carrier Failure. The card is not receiving carrier signals from the far end of the E1 line.
  - **RA** — On indicates a Remote Alarm. The far end of the E1 line is not receiving appropriate signaling from the E1 board.
  - **LB** — On indicates that loop-back testing is going on.
  - **Nominal** — On indicates ready to send and receive information.
- **10BASE-T Uplink MDI** — This RJ-45 Ethernet connector connects the card to an external LAN hub or switch. 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 has an Ethernet connector to connect the chassis to the LAN.

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

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

Each 3C10165D E1 Digital Line Card has the following lights and connectors:

- **E1** — This RJ-48C connector makes a patch cord connection to a E1 interface.

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

    Amber — Alarm condition at the remote end or the CO is not connected or available.

    Green — No alarm condition.
  - **POST** — Power On Self Test:

    Off — POST test is running. The test runs approximately 5-seconds after you apply power to the board. After 5-seconds, Off indicates the POST test failed.

    Green — POST test completed successfully.
  - **DCH** — D channel status of an ISDN PRI connection

    Off — No E1 or E1 PRI line is attached.

    Green — Card is configured for ISDN PRI operation and an active PRI connection has been established.

    Amber — The D channel has not yet been established. It can take several seconds after the card has completed its power up tests for the card to establish a connection with the PRI trunk. If the DCH light goes to amber after the connection has been established, it can mean that an active control channel connection through the PRI line has been lost.
  - **DNLD** — Download

    Flash — The card is downloading software from the NBX Network Call Processor.

    Green — The download is complete or the Power-On-Self-Test (POST) is running.

    Amber — The download was interrupted before it completed.

    On a LAN, the download process completes quickly. If the download from NCP to digital line card must travel a routed network path, the download may take a few minutes. If the DNLD light remains amber, it can indicate a severely congested network or a hardware problem with the card.
  - **CALL** — Call audio traffic

    Off — No audio traffic on the T1 link.

    Flashing — Audio traffic is present.

- **CARD** — Card Software Status.

  Green — The card has finished downloading software from the NCP and all software processes have started successfully.

  Amber — A problem with one or more of the software processes running on the card. The card automatically reboots itself if it detects a problem with any of its software processes.

- **DSP** — Reserved for future use.
- **NCP** — Network Call Processor communications status.

  Amber — The card is trying to establish contact with an NCP.

  Green — The card has established contact with an NCP.

- **LNK** — Ethernet link status.

  Green — The 10/100 Uplink port is connected to a 10Mb or to a 10/100 Mb hub or switch.

  Red — The 10/100 Uplink port is connected to a 100 Mb hub or switch.

  Off — There is no connection to the 10/100 Uplink port.

- **ACT**— Ethernet activity.

  Rapid blink — Data is passing into or out of the card through the 10/100 Uplink port.

- **10/100 Uplink** — This RJ-45 Ethernet connector connects the E1 card to an external LAN hub or switch. You can use this connector to isolate E1 traffic. 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 has an Ethernet connector to connect the chassis to the LAN.
- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

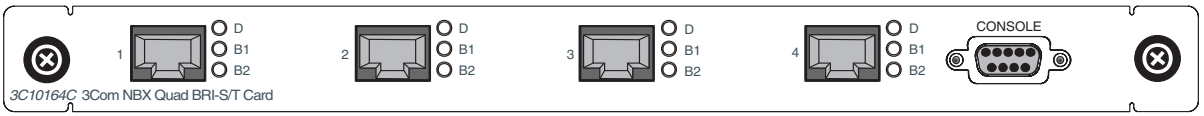
If you require an alternative (bare wire-end) cable to use with the ISDN PRI Digital Line Card, contact your 3Com NBX Voice-Authorized Partner.

CAUTION: *This equipment does not operate when the main power fails.*

BRI-ST Digital Line Card

The ISDN BRI-ST (Basic Rate Interface) Digital Line Card (Figure 9) 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 9 BRI-ST Digital Line Card (3C10164C)



CAUTION: *The BRI-ST 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):
  - **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).

  During the Auto Discover process:

  - Each status light turns amber briefly starting with span 1 (channels D, B1, and B2) and continuing through span 4 (channels D, B1, and B2). After approximately 30 seconds, the B1 status light on all four spans turns green for approximately one minute. All lights turn off when the Auto Discover process is completed.

  After you connect an ISDN BRI span to a port:

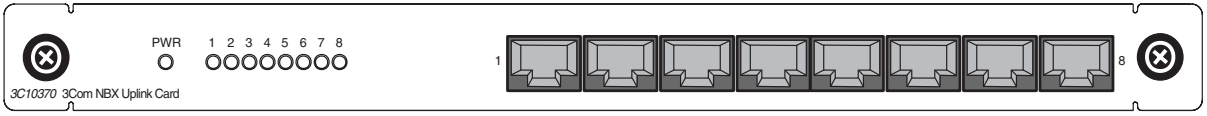
  - The D light turns green if the span is operating properly, and turns amber if there is a problem. For a span that is operating properly, when the NBX system initiates or receives a call on a B channel, the corresponding light initially turns amber. When the call is answered, the light turns green.
- **Console** — This DB-9 connector provides an RS-232 (DCE) TTY terminal connection for maintenance access.

CAUTION: *This equipment does not operate when the main power fails.*

10BASE-T Uplink Card

The 10BASE-T Uplink Card provides eight 10BASE-T Ethernet ports to connect 3Com Telephones (or other 10BASE-T devices) to the LAN. The Uplink Card (3C10370) replaces the 10BASE-T Hub Card (3C10115).

Figure 10 NBX Uplink Card (3C10370)



The NBX 10BASE-T Uplink Card contains these 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 10BASE-T ports.
- **Ethernet Hub Ports (8)** — These RJ-45 MDI-X ports connect devices to the LAN.

Analog Terminal Card

Each Analog Terminal Card allows connections for up to four analog (2500-series compliant) telephones and Group-3 fax machines. When an Analog Terminal Card senses that a port is being used for fax transmission, it switches that port to *reliable* mode. Unlike voice transfers, which drop packets due to congestion, reliable mode transmissions take as much time as needed to ensure that there are no lost packets. However, reliable mode also uses twice the bandwidth.

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 of Models 3C10117, 3C10117A, or 3C10117B-INT per Gateway Chassis. This restriction does not apply to the 3C10117C Analog Terminal Card.*

Figure 11 NBX Analog Terminal Card (3C10117B-INT)

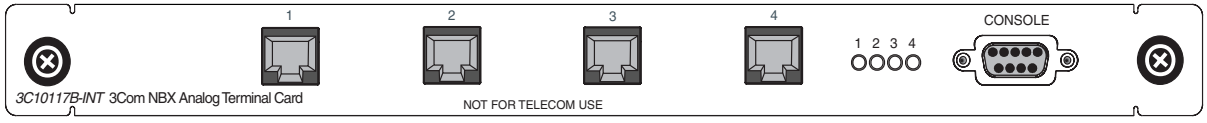
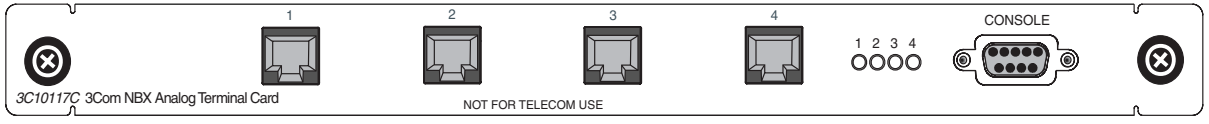


Figure 12 NBX Analog Terminal Card (3C10117C)



Each Analog Terminal Card has the following lights and connectors:

- **Analog Connectors (1 through 4)** — Four RJ11connectors 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 NCP.

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

Analog Terminal Adapters

The single-port Analog Terminal Adapter (ATA) is a desktop box that connects an analog telephone or fax machine to an NBX system.

Figure 13 Analog Terminal Adapter (3C10400) — Front View

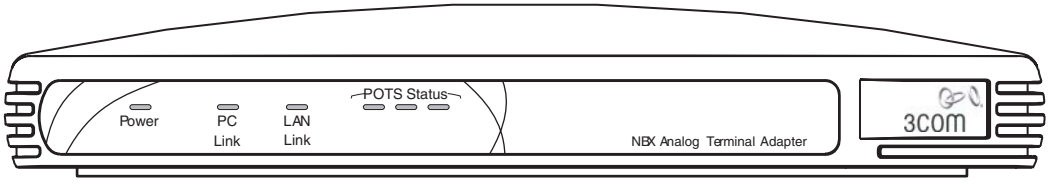
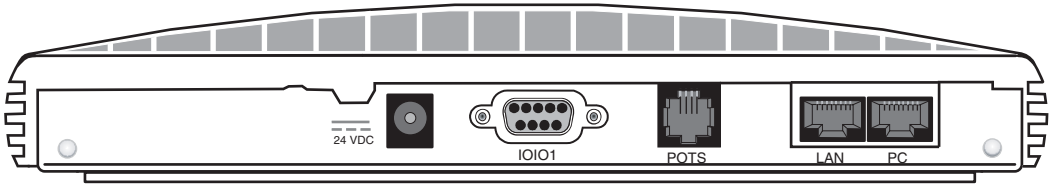


Figure 14 Analog Terminal Adapter (3C10400) — Rear View



The Analog Terminal Adapter (3C10400) has the same functions as the 3C10120B plus these features:

- **Power Over Ethernet (PoE)** — The 3C10400 ATA can accept power over the Ethernet cable. It meets the IEEE 802.3af standard for Power over Ethernet. It can also accept power from an AC power adapter plugged into a wall socket.
- **Diagnostic Port** — The 3C10400 ATA has an RS232 DB9 connector to which you can connect a serial cable. Using a terminal emulation program such as Hyperterm, you can access the ATA and use diagnostic and troubleshooting commands.

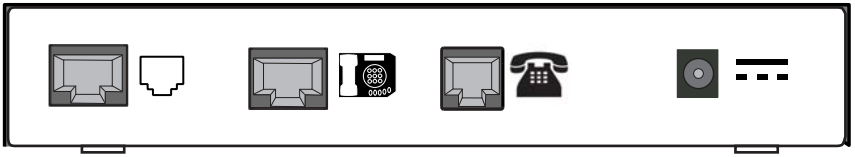
Only qualified 3Com service personnel should use the serial diagnostic port.

The Analog Terminal Adapter (3C10400) has these lights and connectors:

- **Power Light** — The light below the icon for power indicates that the ATA is receiving power.
- **POTS Status Lights (S1, S2, S3)** — The POTS (Plain Old Telephone Service) status lights indicate the status of the Analog Port. S3 turns on when the analog telephone is in use. S2 blinks briefly every ten 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.
- **PC Link Light** — Indicates that there is an external network device connected to the ATA.
- **LAN Link Light** — Indicates that the ATA is connected to the network.
- **10101** — Serial port for diagnostics.
- **POTS** — A connection for an analog telephone or fax machine.
- **PC** — Provides a connection for a network device such as a 3Com telephone.
- **LAN** — Provides a connection to the network.

Figure 15 Analog Terminal Adapter (3C10120B) — Front View

Figure 16 Analog Terminal Adapter (3C10120B) — Rear View



The Analog Terminal Adapter (3C10120B) has these lights and connectors:

- **Power Light** — The light below the icon for power indicates that the ATA is receiving power.
- **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 ten 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 and the Ethernet ports indicate the status of the related port.
- **Analog Port** — A connection for an analog telephone or fax machine.
- **Hub Port** — Provides a connection for a network device such as a 3Com telephone.
- **Network Port** — Provides a connection to the network.

The Analog Terminal Adapter might require a telephone connector adapter for use outside of North America. Contact your 3Com NBX Voice-Authorized Partner for country-specific requirements.

3Com Telephones

3Com Telephones provide the familiar features of a business telephone and extra features such as one-touch access to voice mail. 3Com Telephones operate at either 10 Mbps or 100 Mbps and contain a 10/100 Mbps switch with two ports. One port connects the telephone to the LAN and the other port can be used to connect a computer to the LAN. 3Com Telephones that have the IR designation in their part numbers, such as the 3C10228IRB and 3C10228IRPE, have an infrared port that allows the user to exchange data between a Personal Digital Assistant device and the telephone.

These 3Com devices require a license:

- 3102 Business Telephone
- 3101 or 3101SP Basic Telephones
- 3105 Attendant Console

You must enter a license key into the NBX NetSet utility License page before the NBX Auto Discover process can discover any of these devices.

Figure 17 3Com Business Telephone Model 3102

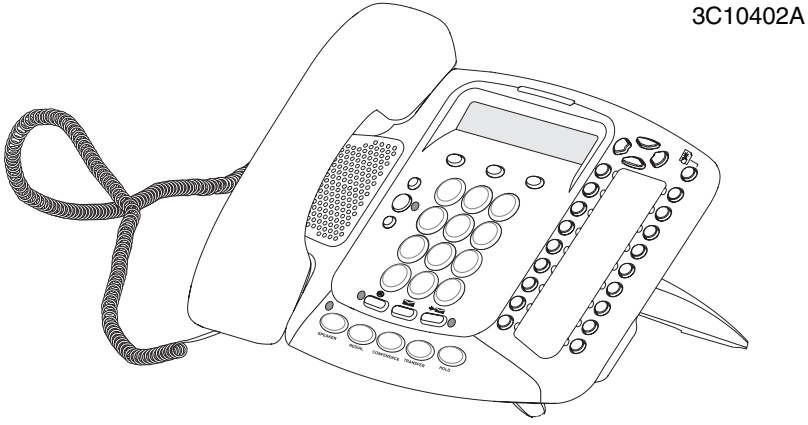
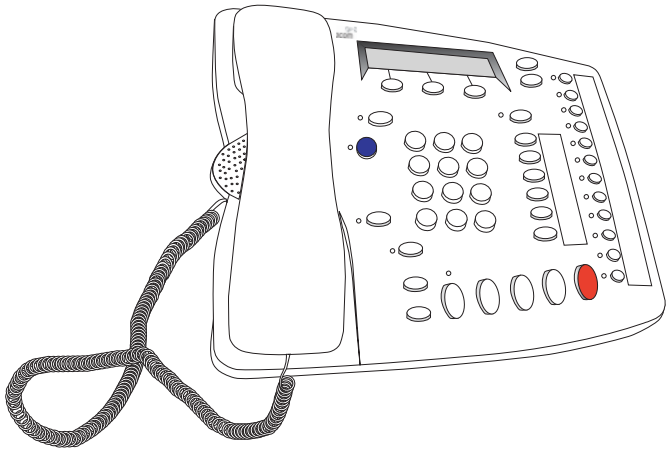
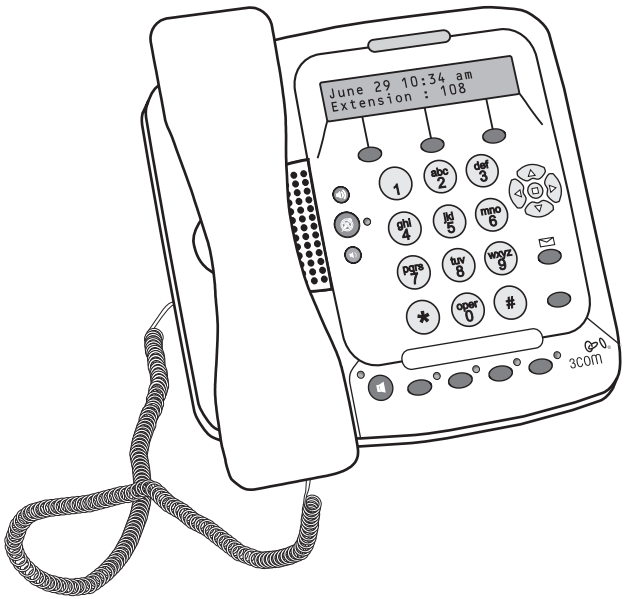


Figure 18 3Com Business Telephone Model 1102, 2102, or 2101-IR



3C10121
3C10226B
3C10226PE
3C10281B
3C10281PE
3C102281IRB
3C10281IRPE

Figure 19 3Com Basic Telephone 3101SP



The 3101 Basic Telephone (3C10401A) does not include a microphone, which means it does not support speaker phone operation.

The 3101SP Basic Telephone (3C10410SPKRA) has a microphone and supports speaker phone operation.

All other features operate the same on the two telephones.

CAUTION: *To avoid damage to the 3Com telephone, do not connect a 3Com telephone or Attendant Console directly to a standard telephone line. Although the RJ-11 connector for a traditional telephone fits into the 3Com telephone's RJ-45 jack, the electrical interfaces are not compatible and the telephone will not work.*

Figure 20 3Com Basic Telephone 2101

Attendant Console

The 3Com Attendant Console provides attendant (receptionist) access and monitoring for up to 100 extensions. You can associate up to two Attendant Consoles with any one 3Com Telephone. See the *NBX Telephone Guide* for details about how to use an Attendant Console.

Third-party Devices

3Com works with third-party suppliers to provide a range of devices that are compatible with NBX systems. For more information on third-party devices, see your 3Com NBX Voice-Authorized Partner. For information on how to install, configure, and manage a third-party device, see the documentation that comes with the device.

Overview of Application Software

Two applications, available on the NBX Resource Pack CD, are counterparts of two NBX system hardware devices:

- The NBX Complement Attendant Software (CAS) runs on a PC and provides the functions of an Attendant Console.
- The pcXset™ Soft Telephone also runs on a PC and provides most of the features of a 3Com Business Telephone.

In addition, these software applications and documents are available on the *NBX Resource Pack CD*:

- NBX Call Reports
- NBX TAPI Service Provider (NBXTSP)
- Desktop Call Assistant (formerly called TAPI Dialer)
- Palm Dialer
- ConneXtions
- NBX Media Driver
- 3Com Network Supervisor (evaluation)
- LabelMaker utility

NBX V3000 System Configuration Guidelines

The basic NBX V3000 system license enables up to 250 devices. (Devices and device limits are explained in detail later in this chapter.) If you want more than 250 devices on your NBX V3000 system, you must purchase and install a memory upgrade kit and additional system device licenses. The system can support up to a maximum of 1500 devices.

The basic NBX V3000 includes fifteen Group 2 Telephone Licenses embedded in the system. A Group 2 Telephone License (3C10412) enables a 3Com 3102 Business Telephone (3C10402A). To connect more than fifteen 3102 Business Telephones, or to connect other types of 3Com telephones, you will need to purchase additional telephone licenses.

The NBX V3000 comes with 4 NBX Messaging ports and a limit of 400 hours of message storage. (A messaging port is used for each Automated Attendant session and each voice mail session.) If you want more than 4 NBX Messaging ports, you must purchase and install additional NBX Messaging licenses. To go above 12 NBX Messaging ports, you must install the memory upgrade (if you haven't already done so to upgrade the device limit). The system can support up to 72 NBX Messaging ports. If you purchase any additional NBX Messaging license, message storage hours are limited only by available disk space. (However, the NBX administrator can establish limits for users on number of messages, message length, and retention period.)

NBX V3000 Device Limits

Three kinds of limits govern the number of devices that you can include when you configure an NBX V3000 system:

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

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

- *The limit imposed by the total system license (explained next)*
- *The individual limits on certain device types (explained later in this topic)*
- *The license requirements for some hardware and software*

What Counts Toward the Total Device Limit?

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

- **Physical Devices** — Each 3Com Telephone, each Analog Terminal Adapter, 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 Table 5 on page 46.
- **Software "Devices"** — Each NBX Media Driver port 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 Table 5 on page 46.

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 system architecture limits the system to 180 Analog Line Cards (4 x 180), and thus the system can support 720 not 1500 analog line ports.

Licensed Device Limits

Certain 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 device licences.)

How the System Limits Interact

As you add devices to an NBX system, you must keep in mind **all** of these limitations:

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

Example: Your NBX V3000 has the memory upgrade installed, it is licensed for 1500 total devices and you want to configure 450 telephones:

- You configure 6 NBX Analog Line Cards, and 12 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 3Com Telephones.

  The total device count is now 522. You can configure 978 additional devices (1500–522).

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

  The total device count is now 622. You can configure 878 additional devices (1500–622).

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

  VTLs do not count toward the device limit, so the total device count remains at 622. So, after you add 48 VTLs, you can still configure up to 878 additional devices.

Table of Maximum Device Counts

Table 5 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 incremental licences.

Some of the limits in Table 5 can be affected by your dial plan. The optional 3-digit dial plan does not have enough extensions to allow you to reach all the device limits.

Table 5 Device Limits on the NBX V3000

Device/application Description	Per-Unit Device Count Toward Total System Count	Maximum Number with Memory Upgrade	Maximum Number without Memory Upgrade	Device/software License Required?
1102, 2102, or 2102-IR Business Telephone	1	1500	250	No
2101 Basic Telephone	1	1500	250	No
1105 Attendant Console	1	100	100	No
3102 Business Telephone	1	1500	250	Yes
3101 or 3101SP Basic Telephone	1	1500	250	Yes
3105 Attendant Console	1	100	100	Yes
pcXset Soft Telephone	1 per pcXset PC telephone client	1500	250	Yes
NBX Media Driver (for WAV devices)	1 driver per system enables the max allowable number of WAV devices	1500	250	Yes
Polycom IP 3000 Speaker Phone	1	1500	250	Yes
CITELlink Handset Gateway card	16 per card	1488 (93 cards)	240 (15 cards)	Yes
NBX Analog Terminal Card (ATC)	4 per card	1500 (375 cards)	250 (62 cards)	No
NBX Analog Terminal Adapter (ATA)	1	1500	250	No
NBX Analog Line Card	4 per card	720 devices/channels (180 cards)	248 devices/channels (62 cards)	No
NBX T1 Card (DS1)	24 per card	720 channels (30 cards)	240 channels (10 cards)	No
NBX T1 Card (ISDN PRI)	23 per card	713 channels (31 cards)	230 channels (10 cards)	No
NBX E1 Card (ISDN PRI)	30 per card	720 channels (24 cards)	240 channels (8 cards)	No
NBX ISDN BRI-ST card	8 per card	720 channels (90 cards)	248 channels (31 cards)	No

Table 5 Device Limits on the NBX V3000 (continued)

Device/application Description	Per-Unit Device Count Toward Total System Count	Maximum Number with Memory Upgrade	Maximum Number without Memory Upgrade	Device/software License Required?
System Architecture Attributes				
Virtual Tie Lines	None	48	8	Yes
ConneXtions (H323) ports	None	100	100	Yes
Bridged Extensions	None	400 Primary 1200 Bridged	400 Primary 1200 Bridged	No
Application and Call Processing Attributes				
Auto Attendants	None	100	100	No
		Note: The optional 3-digit dial plan might not provide enough extensions to support 100 Auto Attendants.		
Voice Mail Ports	None	72	12	Yes (above 4 ports)
Voice Mailboxes	None	1500	250	Yes (covered by total system device license)
Phantom Mailboxes	None	1000	1000	No
		Note: The optional 3-digit dial plan does not provide enough extensions to support 1000 Phantom Mailboxes.		
Call Park Zones	None	100	100	No
		Note: The optional 3-digit dial plan might not provide enough extensions to support 100 Call Park Zones.		
Call Pickup	None	100	100	No
Conference Calls	None	12	12	No
Directed Pickup	None	50	50	No
Group Pickup	None	50	50	No
Hunt Groups or Calling Groups	None	100	100	No
		Note: The optional 3-digit dial plan might not provide enough extensions to support 100 groups.		
Music On Hold	None	1	1	No
Paging	None	3	3	No
Page Zones	None	9	9	No
System Speed Dials	None	100	100	No
Personal Speed Dials	None	100	100	No
Call Detail Reporting	None	1	1	No

Table 5 Device Limits on the NBX V3000 (continued)

Device/application Description	Per-Unit Device Count Toward Total System Count	Maximum Number with Memory Upgrade	Maximum Number without Memory Upgrade	Device/software License Required?
Call Record and Monitor	None	1	1	No
TAPI Route Points	None	100	100	
		Note: The optional 3-digit dial plan might not provide enough extensions to support 100 TAPI Route Points.		

2 Installing System Hardware Components

This chapter explains how to install standard and optional hardware components for the NBX® V3000 Networked Telephony System. It covers these topics:

Introduction

This guide uses the following definitions for administrators, users, and callers on 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

International Feature Support

For international users, the following features and devices warrant special attention.

Power Fail Transfer

For the Power Fail Transfer (PFT) feature, is available only in North America.

CAUTION: *You should have access to a mobile or analog telephone that is connected to your standard PSTN.*

Analog Terminal Connectors

The NBX Analog Terminal Adapter, the ATA port on the NBX V3000, and each port on the NBX Analog Terminal Card may require a telephone connector for use outside North America. Contact your 3Com NBX Voice-Authorized Partner for information on country-specific requirements.

Language Support

The NBX Resource Pack CD includes these localized components:

- Telephone tones and cadences that match those used by telephone companies in different countries
- Localized online user documentation
- Localized voice prompts

If the required language is not provided in the voice prompts, which you can load and activate using the NBX NetSet utility, you can record new Automated Attendant 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*.

Installation Requirements

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

3Com does not support more than one NBX system on a local area network. You can connect NBX systems over a WAN using VTLs, as described the NBX Administrator's Guide*, however, installing more than one NCP on a LAN can cause unpredictable results.*

Electrical Requirements

Verify that the site meets the following electrical requirements.

- Each NBX chassis requires an electrical connection.
- The NBX system should have its own breaker-protected circuit that 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 that you install, such as a paging amplifier and an MOH device. The label on each chassis lists the electrical requirements of the system.
- You can eliminate the power adapter for the telephone by using a powered Ethernet cable. See "Using a Powered Ethernet Cable to Power the Telephone" in Chapter 3 for more information.

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 disturbed by a door or 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

When you install an NBX system, verify that the installation site meets these physical requirements:

- The NBX system should be installed in a secure area. Telephone service and voice messaging are crucial business services. Protect them from tampering or accidental interference.
- To rack-mount an NBX V3000 or an NBX chassis, use a standard 486-mm (19-in.) equipment rack, properly installed and grounded according to the manufacturer's instructions.
  - The NBX V3000 requires one rack unit.
  - The NBX Gateway Chassis requires 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 NBX V3000 and the NBX Gateway Chassis and power connections are on the back.
- Allow at least 8 cm (3 in.) of space on either side of the NBX chassis for proper ventilation.

Local Telephone Service

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

- The 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 recommends that you use UL-listed 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 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 discuss 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 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 3Com telephone, do not connect it directly to a standard telephone line. Although the RJ-11 connector for a traditional telephone fits into the 3Com telephone's RJ-45 jack, the electrical interfaces are not compatible and the telephone will not work.*

Can Existing Office Telephone Wires Be Reused?

You may 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 RJ-45 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, you can ignore existing telephone wires and connect the 3Com telephones to the LAN. Each 3Com telephone functions as an Ethernet hub or switch, allowing you to connect the computer's network interface card directly to the phone.

Is Any Additional Equipment Required?

You may need some of the following components:

- To configure the NBX system, you need a computer equipped with a browser, such as Microsoft Internet Explorer Release 5.5 or higher, a network interface card, and a CD-ROM drive. You 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 98, Windows XP, 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 may 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 that you use of surge suppression devices on all local telephone lines.
- 3Com 3101, 3101SP, 3102, and 3105 devices support Power over Ethernet (PoE). They do not come with AC power adapters. You can power these devices with any IEEE 802.3af-compliant power source or with optional AC power adapters. The packing sheet that ships with each device shows the device power options.

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 NCP to provide audio for callers waiting on hold.
- Third-party 10BASE-T or 100BASE-T Ethernet hubs and switches.
- 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. The NBX system includes an RJ-11 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 RJ-11 connector on the front of an NBX Analog Line Card or an NBX V3000.

How Many Telephones or Devices Does the NBX System Support?

The NBX V3000 can support up to 1500 devices. Support above 250 devices requires an optional license and the installation of additional system memory. (NBX V3000 Memory Upgrade Kit - part number 3C10240.)

For detailed information on device limits, see "NBX V3000 System Configuration Guidelines" on page 43.

What Effect Does an NBX System Have on a LAN?

A 100 Mbps Ethernet LAN can support a fully configured, fully utilized NBX V3000 system. That is, a 100 Mpbs LAN can support toll-quality audio with a fully configured NBX V3000 system even when all 1500 devices are in use. If you use an Ethernet switch, verify that it supports the 802.1P and 802.1Q specifications.

Silence Suppression and Bandwidth

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 3Com telephone, or for external calls, it can be an analog line port or a channel on an NBX Digital Line Card.

A careful listener might notice the difference between generated and actual background noise, so silence suppression is turned off by default. Silence Suppression settings result in a small compromise to audio quality. Do not enable Silence Suppression unless you are trying to solve bandwidth constraint issues.

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 default hexadecimal value for NBX system IP ToS settings is 0xb8.

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 a low-bandwidth connection is to select G729 audio, forcing the device to use lower-bandwidth compressed audio when communicating with other system devices.
- Alternatively, you can configure the telephone as a low-bandwidth device by disabling some of the internal features such as paging, conferencing, and music-on-hold. A check box in the NBX NetSet Device Configuration screen automatically selects the best parameters for low-bandwidth connections.

You can also connect an NBX Telephone to the system over a broadband connection and that is not considered a low-bandwidth connection. See the NBX Administrator's Guide *for information about connecting a remote telephone over a broadband connection.*

Before You Begin Installation

Before you install the NBX system hardware:

- Complete the system plan. See the *System Planning Guide* on the *NBX Resource Pack CD*.
- Verify that the external telephone lines are active and present at the installation location.
- Gather the system components at the installation location.

- 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

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: *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.
- 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 this product 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.
- Each NBX system and chassis is 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 power cord or otherwise attach it to building surfaces.
- Do not use any AC power converter on a 3Com device other than the one that is shipped with the device. On 3Com PoE-compliant devices, the power converter is an optional component.
- **Power Cord Set:**
  - For European countries, see Table 6. 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 6 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.
- 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.) NBX equipment will be inoperable when main power fails.*

Lithium Battery Safety

The following information is important. 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 7 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).
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 8 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.

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.

Installing the NBX V3000 System Hardware

Installing NBX V3000 system hardware involves these steps:

- Recording MAC Addresses
- Optionally Upgrading the NBX V3000 Memory
- Rack-mounting the NBX V3000

Recording MAC Addresses

After you install the system disk drive, you should record the MAC addresses of the ports that interface with CO equipment. If you will be installing optional cards into a chassis, 3Com recommends that you install one card at a time, and that you install the cards in the order of the MAC addresses of the ports on the card. This process ensures that the NBX system assigns sequential, contiguous groups of device extensions to each board. If you enable the Auto Discover process to configure the cards, you can then use the NBX NetSet utility to view 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

NBX V3000

- To determine the MAC address of the analog lines of the NBX V3000, view the label on the back of the NBX V3000. The MAC address is labeled **FXO MAC Address**. All four analog line ports share one MAC address. After the ports are discovered by the NBX Auto Discover process, they are differentiated in the NBX NetSet utility by a channel number, 1-4.

Optional NBX Cards

- To determine the MAC addresses of the ports on optional NBX Analog Line Cards, NBX Analog Terminal Cards, and NBX Digital Line Cards, view the MAC address label attached to each card. MAC address labels are located on the component side of NBX cards. All four ports on a card share one MAC address and they are differentiated by a channel number, 1-4. After a card is inserted into a chassis, the MAC address is not visible.

On Analog Line Card 3C10114, which is no longer in production, each port has a different MAC address and port addresses are consecutive. A label on the card shows the base MAC address, which is the address for port 1. The other three ports are incremented versions of the base MAC address.

Optionally Upgrading the NBX V3000 Memory

The basic NBX V3000 system includes a socket for an optional memory upgrade module (part number 3C10240). See Table 5 on page 46 for details on when a memory upgrade is required.

CAUTION: *Always wear a properly grounded anti-static strap when you remove the cover from the NBX V3000 system and when you handle a memory module. Leave the memory module in its anti-static container until you are ready to install it.*

To upgrade NBX V3000 memory:

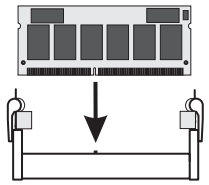
1. If the system is running, shut down the NBX V3000 system software:
   a. Use the administrator login to open the NBX NetSet utility, and then click *Operations* > *Reboot/Shutdown*.
   b. Click *Shutdown*, and then wait a moment for the message that verifies that it is safe to turn the power off.

CAUTION: *You must shut down the system software before you remove power from the NBX V3000 system to avoid file corruption problems.*

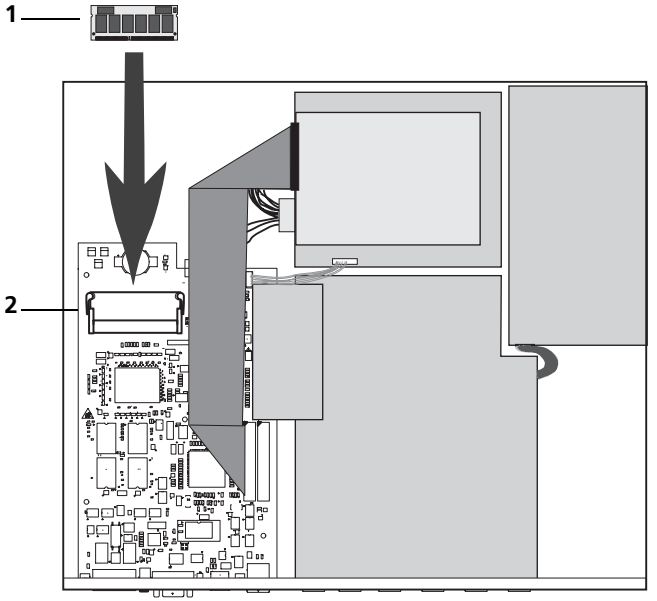
2. Turn off the power switch on the back of the NBX V3000, and then disconnect the power cord.
3. If necessary, remove the NBX V3000 from the rack, and then remove the two rack mounting brackets from the NBX V3000.
4. Remove the nine screws (three from each side and three from the back) that secure the top cover of the NBX V3000.
5. Slide the cover slightly to the rear of the unit, and then lift the cover off.
6. Slide the memory module into the memory socket until the cutouts on the side of the memory module line up with the socket locking tabs, and then press down on the memory module until it locks into place.

   See Figure 21. When you slide the new memory module into the socket, make sure the slot on the module lines up with the tab on the socket.

Figure 21 Inserting the NBX V3000 Memory Module



When you insert the memory module, make sure the slot on the module lines up with the tab on the socket.



1	512 MB memory module
2	Memory expansion socket

To *remove* the memory module, slide both locking tabs away from the memory module until the module pops up, and then pull the memory module from the socket.

7 Replace the NBX V3000 cover and rack mounting brackets and reinstall the system in the rack.

8 Attach the power cord and then turn on the power switch. You can verify a successful boot operation by viewing the status lights on the front of the NBX V3000. See Figure 1 on page 22.

9 To verify that the system recognizes the added memory, log into the NBX NetSet utility as administrator, click System Configuration, and view the Free Memory value. The value will be greater than 500,000,000 bytes.

Rack-mounting the NBX V3000

Mounting an NBX V3000 in an equipment rack requires:

- Four rack mounting screws
- Phillips screwdriver or wrench

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

1. Install the two rack mount brackets securely onto the front corners of the NBX V3000 using the screws provided.
2. Lift the NBX V3000 into the rack and install one rack-mounting 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.
3. Hold the NBX V3000 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 optional NBX Gateway Chassis. For an overview of this chassis, see "NBX Gateway Chassis" in Chapter 1.

The tools, materials, and procedures for rack-mounting the NBX Gateway Chassis are essentially identical to those for mounting the NBX V3000.

Powering Your NBX V3000 System

To turn on power to the NBX V3000 and the optional NBX Gateway chassis, follow these steps:

1. Attach a power cord to the back of each unit. For an NBX Gateway Chassis, attaching the power cord applies power to the unit. For an NBX V3000, press the power button on the back of the unit to the ON position.
2. Allow approximately 3 minutes for the NBX V3000 to complete the boot process.

   Examine the status lights (LEDs) on the front panel to ensure that the system is running properly. Figure 1 on page 22 describes the states of the status lights of the NBX V3000.

   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 the NBX System IP Address

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 Microsoft Internet Explorer 5.5 or higher, which enables access to the NBX NetSet utility, the configuration interface for the NBX system.

Modifying Default IP Settings

Each 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.

CAUTION: *Connecting two NBX systems to the same subnetwork (for example, using IP addresses 10.233.20.100 and 10.233.20.200 for two NCPs) is unsupported.*

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 NBX system 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 NBX system. If all devices (telephones, adaptors, and cards) are on the same subnet as the NCP, 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 9, 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.

Summary 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 Ethernet 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 that IP address is used temporarily during system startup. If you use that address for your computer, a conflict results and the system might 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 address field:

   `192.168.1.190`

   This is the default IP address of the NBX system.

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. See the next topic, "Configuring the NBX System IP Address" for instructions on configuring the NBX IP settings.

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

Table 9 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. 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 192.168.1.19**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.*	
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 or if you are using a different range of addresses.

Table 9 IP Addressing and the NBX System (continued)

Local IP Environment	NBX System Configuration
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 for the NCP.
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 NCP does not support DHCP or BOOTP) a subnet mask, and a default gateway.

Configuring the NBX System IP Address

You must change the default IP address of the NBX system and specify IP settings appropriate for 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.
7. Return to the Main Menu or to the Tab-To-It interface and click *Operations > Reboot/Shutdown*.
8. Click Reboot.

Be sure to restore your computer's original IP settings.

Establishing LAN Connections

Connect the NBX system to your LAN using the Ethernet port. This port can operate at 10 Mbps and 100 Mbps; it automatically senses the speed of your LAN. See Figure 1 on page 22 for information on how to verify network connectivity using the status lights.

Connect the optional 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 3Com telephones yet.

Test Connectivity

After the NBX system finishes its reboot operation and you have restored your computer's original IP settings, test connectivity to the NBX system.

1. Open a browser on your computer.
2. Type the IP address you assigned to the NBX system in the browser's address box, and then press Enter.

   The NBX NetSet utility login screen should appear in your browser.

Connecting Cards and Devices

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

Connecting Analog Line Cards

You can install cards with the power on to the chassis. To connect and configure an NBX Analog 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 at least 2 minutes for the card to initialize.

4 Use the NBX Auto Discover feature to configure the card. The Auto Discover feature finds each line card port and assigns extensions. For more information, see "Using Auto Discover for Initial System Configuration" on page 79.

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 analog line 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. 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 the chassis. 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.

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

3 Wait at least 3 minutes for the card to initialize.

4 Use the Auto Discover feature to configure the digital line card. The Auto Discover feature finds each port on each digital line card and assigns port extensions.

Use the Auto Discover feature to configure telephones and analog line cards before *you enable Auto Discover for digital line cards. For more information about the Auto Discover feature, see* *"Using Auto Discover for Initial System Configuration" on page 79*.

Connecting Analog Terminal Cards

You can install cards with the power on to the chassis. To connect and configure 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 at least 2 minutes for the card to initialize.

4 Use the Auto Discover feature to configure the analog terminal card. For more information about the Auto Discover feature, see "Using Auto Discover for Initial System Configuration" on page 79.

The Auto Discover process finds each port on each Analog Terminal Card and assigns port extensions.

Connecting an Analog Terminal Adapter

If you are installing one or more Analog Terminal Adapters (ATA), install them after installing chassis cards.

To install an ATA:

1 Connect the analog telephone or fax machine to the analog port on the ATA. The analog port on a 3C10120B ATA has a picture of an analog telephone beside it. See Figure 22. The analog port on a 3C10400 ATA is labeled POTS (Plain Old Telephone Service). See Figure 23.

The Analog Terminal Adapter may require a telephone connector for use outside North America. Contact your supplier for more information on country-specific requirements.

2 Connect the Ethernet port on the ATA to the LAN. The Ethernet port on a 3C10120B ATA is the connector on the far left side. On the 3C10400 ATA, the Ethernet port is labeled LAN.

Figure 22 3C10120B ATA Connectors

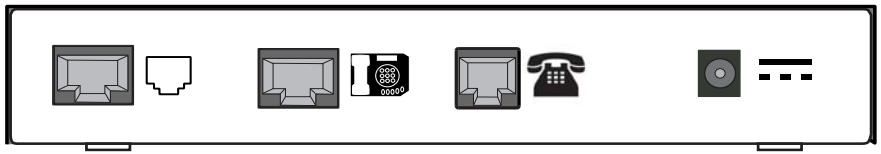
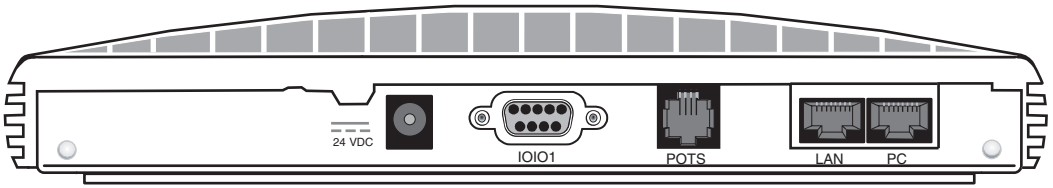


Figure 23 3C10400 ATA Connectors



3 You can optionally connect a PC (or other Ethernet device) to the Ethernet port on the ATA. The 3C10120B Ethernet port has a picture of an NBX telephone beside it. The Ethernet port on the 3C10400 ATA is labeled PC.

4 Connect the AC power adapter to the AC power connector on the ATA. If you are using a powered Ethernet cable instead of the AC adapter, see "Using Power over Ethernet with an ATA" next.

5 Plug the AC power adapter into a wall outlet.

6 Use the Auto Discover feature to configure the ATA. For more information about Auto Discover, see "Using Auto Discover for Initial System Configuration" on page 79.

7 If the ATA is connected to a fax machine, configure the port for fax usage:

a Open the NBX NetSet utility and go to *Device Configuration* > *ATA*.

b Select the ATA from the list and click *Modify*.

c Enable the check box labeled *Fax Machine*, then click *Apply*.

Configuring an ATA port for fax operation optimizes the performance for inbound and outbound faxes. If you make a voice call using the ATA device (for example, if you use the telephone portion of the fax machine), the quality of the audio may be affected. If you make a VTL call using the

ATA device, the audio may be unusable. If you configure the port for fax operation, expect lower quality voice calls on that port. If you configure the port for voice calls, the performance is not optimized for faxes.

Using Power over Ethernet with an ATA

The 3C10120B requires the use of a splitter device to accept Power over Ethernet (PoE).

The 3C10400 ATA can accept power over the Ethernet cable. It meets the IEEE 802.3af standard for Power over Ethernet. See Table 10 for power connection instructions.

The 3C10400 ATA can also accept power from an AC power adapter plugged into a wall socket. If you supply power to the ATA using an AC power adapter and then also supply power on the Ethernet cable, the ATA uses the Ethernet power source. If you supply power to the ATA over the Ethernet cable and then also connect the AC power adapter, the ATA continues to use the Ethernet cable power source. If you connect both power sources to the ATA and later remove the Ethernet cable, the ATA switches to use the AC power adapter.

Table 10 Connecting Power to an NBX Analog Terminal Adapter

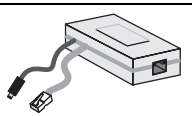
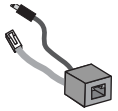
Power Source	NBX ATA Model	Connection Details
AC power adapter	3C10400 3C10120B	Any NBX ATA can accept power from an AC power adapter. Use the power adapter that comes with your ATA. On all NBX devices, the power connector is labeled with the DC power symbol: ⎓
Power over Ethernet (IEEE 802.3af) power source	3C10400	Connect the powered Ethernet cable directly to the telephone's Ethernet connector. No separate power connection is required.
	3C10120B	Devices that predate the 802.3af standard can be powered by an 802.3af-compliant power supply with the use of the *3Com Network Jack to NBX Phone Power Module* (3CNJVOIPMOD-NBX), which is 802.3af-compliant. The module removes power from a powered Ethernet cable and splits it into a power jack and an unpowered Ethernet connection that you connect to the ATA's LAN port and power connection.  3CNJVOIPMOD-NBX

Table 10 Connecting Power to an NBX Analog Terminal Adapter (continued)

Power Source	NBX ATA Model	Connection Details
3Com Ethernet Power Source: ■ 3C10220 (12-port) ■ 3C10222 (24-port)	3C10400 3C10120B	The 3Com Ethernet Power Source predates the 802.3af standard. Any NBX device can be powered by a 3Com Ethernet Power Source if you use and NBX Power Splitter (3C10223 – package of 12). The NBX Power Splitter removes power from a powered Ethernet cable and splits it into a power jack and an unpowered Ethernet connection that you connect to the ATA's LAN port and power connection.  3C10223

CAUTION: *You can damage an NBX device by using an NBX power splitter (3C10223) with the 3Com Network Jack Power over Ethernet Multiport Midspan Solution (3CNJPSE24). Use the NBX power splitter (3C10223) only with the 3Com Ethernet Power Source (3C10220, 12-port, or 3C10222, 24-port).*

Selecting Regional Software and Components

After you complete the hardware installation, 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 voice prompts heard by callers, telephone users, and administrators. These are messages that users or administrators are not able to change by 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 can select and download the regional language software and components.

1. Log in to the NBX NetSet utility using the administrator username and password and then click *Operations* > *Regional Software*.

   For a description of the status values for each listed region see Table 11.

2. Select *Install.* The Install Regional Software dialog box appears.
3. Either browse to the *install* folder on the *NBX Resource Pack CD* and select the language (.taz file) that you want, or type the path in the text box.
4. Click *Upgrade*.

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. For more information, see the NBX Administrator's Guide*, or use the NBX NetSet utility to go to* System Configuration > System Settings > Regional Settings *and then click Help.*

Table 11 NBX NetSet Regional Software Tab – Status Values

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.

Using Auto Discover for Initial System Configuration

Using the Auto Discover feature simplifies initial system configuration by adding information about new devices to the configuration database. "Devices" include telephones, Analog Line Card ports, Digital Line Card channels, Analog Terminal Adapter ports, 3Com Attendant Consoles, and "virtual devices" such as the pcXset Soft Telephone and the ConneXtions H.323 Gateway.

Before you use the Auto Discover process to configure telephones and attendant consoles, you should review the procedures in Chapter 3, Telephones and Attendant Consoles.

After a device has been discovered, the Auto Discover process does not find that device again. To remove a device from the system, you must use the NBX NetSet utility to manually remove the device and its database record.

Licensed devices, such as the 3102 Business Telephone, 3101 and 3101SP Basic Telephones, and the 3105 Attendant Console will not be discovered until after you have entered the device license.

Table 12 summarizes Auto Discover actions for NBX system components.

Table 12 Auto Discover Actions on NBX System Components

Component	Auto Discover Action
NBX Analog Line Card NBX V3000 analog line ports	Gathers configuration information from each port on the card, assigns a default extension, and enters the information into the configuration database.
NBX Digital Line Card	Gathers configuration information from the card, assigns a default extension, and enters the information into the configuration database. After you Auto Discover the Digital Line Card, you may need to edit the Dial Plan to configure Direct Inward Dial (DID) numbers.
Telephones Analog Terminal Cards Analog Terminal Adapters NBX V3000 ATA port	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. Auto Discover Telephones finds both Analog Terminal Cards and Analog Terminal Adapters. By default, the Auto Discover process assigns extension number 1000 (4-digit Dial Plan) or 100 (3-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, 1000/100, 2000/200, 3000/300, or 4000/400. The default Auto Attendant assumes that extension 1000 (4-digit dial plan) or 100 (3-digit dial plan) is the extension of a human attendant (receptionist).

Table 12 Auto Discover Actions on NBX System Components (continued)

Component	Auto Discover Action
3Com Attendant Console	Finds and configures any installed 3Com Attendant Consoles. The first 100 existing telephones, except for the extension that is associated with the Attendant Console, are mapped to Attendant Console buttons. The lowest extension is automatically associated with the Attendant Console. Typically, you would wait until you have installed all your telephones before you enable Auto Discover Attendant Consoles.
pcXset Soft Telephone	Enables the Auto Discover feature on installations of the pcXset PC Telephone Client when the following conditions are true: ■ The pcXset PC Soft Telephone program is running on the host PC. ■ 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.

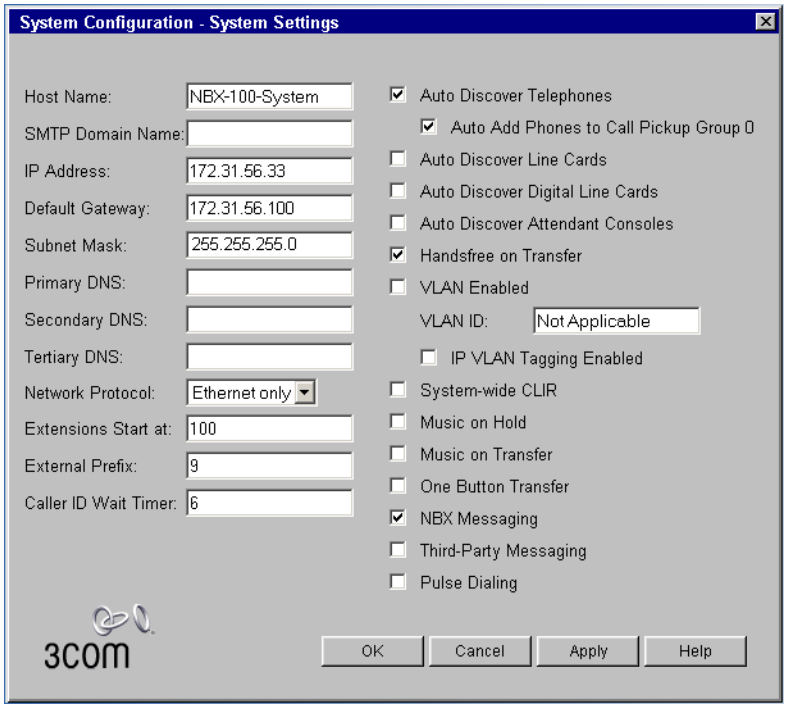
Before you use the Auto Discover process to configure telephones and attendant consoles, you should review the procedures in Chapter 3, Telephones and Attendant Consoles.

Initial System Configuration

To use the Auto Discover feature 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.
4. Click *System-wide*. The System Settings dialog box appears (Figure 24).

Figure 24 System Settings Dialog Box



5 Select the check box for the device you are configuring. 3Com recommends that you Auto Discover one device type at a time. Table 13 describes each choice.

Table 13 Auto Discover Check Boxes

Check Box	Action
Auto Discover Telephones	Discovers 3Com telephones, Analog Terminal Cards, the ATA port on the NBX V3000, and Analog Terminal Adaptors. *Auto Add Phones to Call Pickup Group 0* Members of a Call Pickup Group can answer calls that ring on other group members' telephones. The default system includes one Call Pickup Group. 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.

Table 13 Auto Discover Check Boxes

Check Box	Action
Auto Discover Line Cards	Discovers Analog Line Cards and analog line ports on the NBX V3000.
Auto Discover Digital Line Cards	Discovers Digital Line Cards (BRI-ST, E1, and T1).
Auto Discover Attendant Consoles	Discovers Attendant Consoles. Do not discover Attendant Consoles until after you have discovered telephones. Part of the Auto Discover process is to associate the lowest extension with the Attendant Console and the to map the next 100 extensions to the buttons on the Attendant Console.

6 Click *Apply*.

Auto Discover Usage Notes

- It takes a few moments for the Auto Discover process and the software download process to complete. The NCP initializes devices one at a time. If you have connected many new devices to the system at the same time, the Auto Discover process requires more time.
- A fully initialized telephone displays its extension and the date and time. If there are no extensions available, the Auto Discover process fails, and the telephone's display panel continues to display the telephone's MAC address.
- If you are installing a 3Com Attendant Console, connect it after you have discovered all of the telephones. The Auto Discover Attendant Consoles process maps all existing telephone extension to the Attendant Console.
- If you are adding licensed devices to the system (3102, 3101, 3101SP and 3105), the devices will not be discovered until you add the device license to the system.

Disabling the Auto Discover Feature

After you finish the Auto Discover process for the initial configuration, you can disable it so that the NCP does not continue to search for added devices.

To disable the Auto Discover feature:

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.

NBX System Operating Modes

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

- **Key mode – CO lines map to 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 a 3Com 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 NCP**

  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 NCP assigns the next available line. PBX mode allows you to make maximum use of a limited number of CO lines.

Direct Inward Dialing (DID) configuration requires changes to the system dial plan. For more information on DID, see the NBX Administrator's Guide.

- **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.

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.
4. Select the port with the lowest extension.
5. Click *Modify*. The Modify Line Card Port dialog box appears.
6. Edit the line card port fields as needed. Table 14 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.
9. Repeat this procedure for each line card port.

Table 14 Modify Line Card Port Fields

Field	Purpose
Card Type	Identifies the type of communications through this port. The Auto Discover process provides the correct setting for Card Type. You cannot modify this property. The most common type is POTS, "Plain Old Telephone System."
MAC Address	Identifies this device. The Auto Discover process provides the correct MAC Address. You cannot modify this property.
Channel Number	On Analog Line Card 3C10114, each port has a different MAC address, port addresses are consecutive and Channel Number is not applicable. Analog Line Card 3C10114C and the NBX V3000 each have only one MAC address; each port is identified by a Channel Number, 1-4.

Table 14 Modify Line Card Port Fields (continued)

Field	Purpose
Name	The name associated with the line card port. This name appears in lists in the NBX NetSet utility.
Extension Number	The extension number assigned to this port during the Auto Discover process, or assigned manually. Table 15 shows an example of how to modify the extension number of a Line Card Port.
Silence Suppression	Specifies whether this port operates under the control of system-wide Silence Suppression settings. Enable Silence Suppression only when you have bandwidth constraints and you need to reduce network traffic. Enabling Silence Suppression results in lower quality audio. See "Silence Suppression and Bandwidth" on page 55 for more information. The system-wide default setting (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. Pulse dialing, also called Rotary or Decadic dialling, dates to rotary dial telephone technology. You would enable pulse dialing only in isolated instances to be compatible with older CO equipment. This setting overrides the system-wide setting (System Configuration > System Settings > System-wide). **Values:** On, Off, Default
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). Using the AutoExt is one way to route incoming calls to a TAPI Route Point for call center operations.

Table 14 Modify Line Card Port Fields (continued)

Field	Purpose
Time Out	The number of seconds that must pass before the incoming call rings at the specified auto extension. The Time Out value must be 7 seconds or longer for the system to capture Caller ID.
Bandwidth Considerations settings allow you to change the amount of bandwidth used by this port. 3Com recommends that you use default values and change these settings only when you have bandwidth constraint issues that you cannot solve by other measures or you are configuring a device connected over a low-bandwidth link.	
Set All For Low Bandwidth Connection Compression	Turns on data compression and other measures designed to reduce the packet stream to a minimum Enable the Low Bandwidth check box for a telephone you link to the network by a low bandwidth connection such as an ISDN line. If you are connecting a telephone to the NBX system through a broadband connection, do not enable the Low Bandwidth settings. Through a low bandwidth connection you cannot play music on hold. Default - Off (unchecked)
Audio Compression	Selects an Audio Compression setting: ■ Default — The system-wide setting ■ None - G.711 — No compression, G.711 (MULAW) audio encoding ■ Med - ADPCM — Medium compression, ADPCM audio encoding ■ High - G.729 — High compression, G.729 audio encoding.
Conference Disabled	Prevents this telephone from initiating conference calls, however, the telephone can still participate in conferences initiated by someone else.
Periodic Status Message Disabled	Disables the status messages between device and NCP.

Example:

During the Auto Discover process, the NBX system may assign extensions to Line Card ports as shown in Table 15.

Table 15 Examples of Line Card Addresses

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

Typically, 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.
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 that 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 analog line ports so that you can start receiving outside calls.

Adding External Hardware

External devices connect to the front of the NBX system. See "What External Devices Can Connect to an NBX System?" on page 54.

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 NCP. The audio input should be max 2V peak to peak.

Connecting a Paging Amplifier

Connect the paging device to the paging connector on the front of the NCP. 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 *NBX Telephone Guide*.

The paging connector on the NCP 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 16).

Table 16 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.

If you have telephones connected to the network through a low-bandwidth link, such as an ISDN connection, you can configure them so that they do not generate multicast traffic (Table 17). For more information, see 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 17 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

3 TELEPHONES AND ATTENDANT CONSOLES

This chapter explains how to install:

- 3Com Business Telephones
- 3Com Basic Telephones
- 3Com Attendant Consoles

WARNING: *3Com Telephones are intended for connection only on internal Local Area Networks. Do not install them outside of buildings.*

Adding Telephones

This section tells you how to add 3Com Telephones to the NBX system.

Before you can Auto Discover any licensed devices, you must enter the device license into the system.

Adding Telephones During System Installation

There are two ways to add a new telephone: Auto Discover, and manual configuration.

- **Auto Discover method** — Auto Discover is the simplest and most common method of adding a new telephone. When you enable the Auto Discover feature and then connect a new 3Com Telephone to the LAN, the 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" on page 95.

  It is good installation practice to Auto Discover 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.

- **Manual method** — You can disable the Auto Discover feature 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.

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 NCP resides. If you use the Auto Discover feature, 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. On all NBX devices, the power connector is labeled with the DC power symbol:

Using a Powered Ethernet Cable to Power the Telephone

To eliminate the power converter, you can connect your 3Com Telephone to a powered Ethernet cable. NBX devices can use Ethernet power directly or through the use of one of two types of splitter devices. The method you use to connect an NBX device to a powered Ethernet cable depends on the type of Ethernet power in use at your facility and the type of NBX device you are connecting. On all NBX devices, the Ethernet connector is labeled with this symbol:

NBX devices work with these Ethernet power sources:

- Ethernet power sources that comply with the IEEE 802.3af standard, commonly called Power over Ethernet or PoE
- 3Com Ethernet power sources that predate the IEEE 802.3af standard

See Table 18 for power connection instructions.

Table 18 Connecting Power to a 3Com Telephone

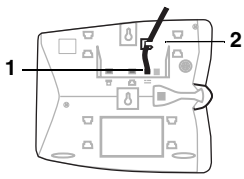
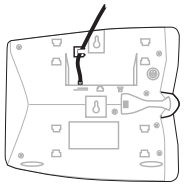
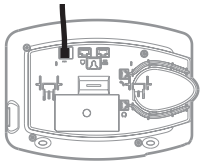
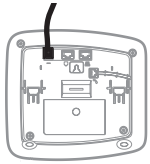
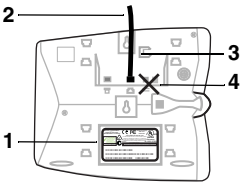
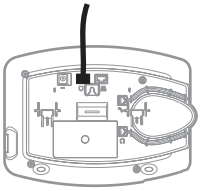
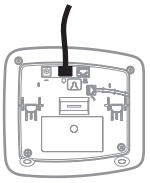
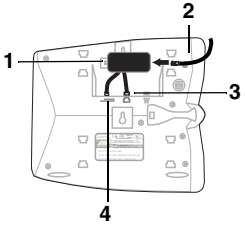
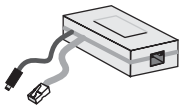
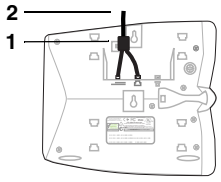
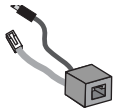
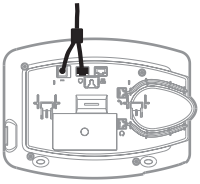
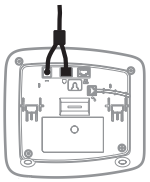
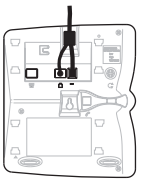
Power Source	3Com Telephone	Connection Details	
AC power adapter (commonly known as a 'power brick') Any 3Com Telephone can accept power from a power adapter.	All 3Com Telephones On all NBX devices, the power connector is marked by the DC power symbol: ⎓		Connect the AC adapter's power jack **1** to the power connector on the bottom of the phone. Run the cable through the strain-relief tab **2** to prevent power from becoming disconnected.
			The location of the power connector varies on different telephone models. The first connection diagram shows a Business Telephone that includes **PE** in the part number, for example, 3C10226PE. The second diagram shows an earlier model telephone.
			3102 Business Telephone. A power adapter is an optional component on the 3102 Business Telephone.
			3101 and 3101SP Basic Telephone. A power adapter is an optional component on the 3101and 3101SP Basic Telephones
			2101 Basic Telephone.

Table 18 Connecting Power to a 3Com Telephone (continued)

Power Source	3Com Telephone	Connection Details
Power over Ethernet (IEEE 802.3af standard) power source	3Com Business Telephones: 3C10281PE (1102) 3C10226PE (2102) 3C10228IRPE (2102) 3C10402A (3102) 3Com Basic Telephone: 3C10410A (3101) 3C10410SPA (3101) 3C10248PE (2101)	 The part number appears in the label **1** on the bottom of the telephone. Connect the powered Ethernet cable **2** directly to the telephone's Ethernet connector **3**. No separate power connection is required **4**. All 3Com telephones identify the Ethernet connection with this icon:   3102 Business Telephone  3101 and 3101SP Basic Telephones  2101 Basic Telephone
	3Com Business Telephones: 3C10121 (1102) 3C10122(1102) 3C101226A (2102) 3C101226B (2102) 3C10228IRA (2102) 3C10228IRB (2102) 3C10281B (2102) 3Com Basic Telephone: 3C10248B (2101)	 3Com Telephones that predate the IEEE 802.3af standard can be powered by an 802.3af-compliant power supply with the use of the *3Com Network Jack to NBX Phone Power Module* (3CNJVOIPMOD-NBX), which is 802.3af-compliant. The module **1** receives power from an Ethernet cable **2** and splits it into an unpowered Ethernet **3** connection and a power jack **4**. 

If you connect both a power brick and a powered Ethernet cable to a "PE" or a 3101, 3101SP, or 3102 3Com Telephone, the telephone uses the Ethernet power if it is available and uses the power brick power only if Ethernet power is removed.

Table 18 Connecting Power to a 3Com Telephone (continued)

Power Source	3Com Telephone	Connection Details
3Com Ethernet Power Source: ■ 3C10220 (12-port) ■ 3C10222 (24-port)	3Com Business Telephones: 3C10121 (2102) 3C10122 (2102) 3C101226A (2102) 3C101226B (2102) 3C10228IRA (2102) 3C10228IRB (2102) 3C10281B (2102) 3C10281PE (2102) 3C10226PE (2102) 3C10228IRPE (2102) 3C10402A (3102) 3Com Basic Telephones: 3C10410A (3101) 3C10410SPA (3102) 3C10248B (2101) 3C10248PE (2101)	 The 3Com Ethernet Power Source predates the IEEE 802.3af standard. 3Com Telephones that are 802.3af-compliant can be powered by a 3Com Ethernet Power Source if you use an NBX Power Splitter (3C10223 – package of 12). The NBX Power Splitter **1** removes power from a powered Ethernet cable **2**.  3C10223   3102 Business Telephone  3101 and 3101SP Basic Telephones  2101 Basic Telephone

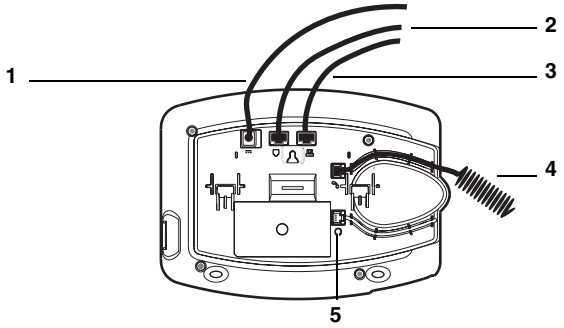
CAUTION: *You can damage an NBX device by using an NBX power splitter (3C10223) with the 3Com Network Jack Power over Ethernet Multiport Midspan Solution (3CNJPSE24). Use the NBX power splitter (3C10223) only with the 3Com Ethernet Power Source (3C10220, 12-port, or 3C10222, 24-port).*

Connecting the Telephone to the LAN

To connect the telephone:

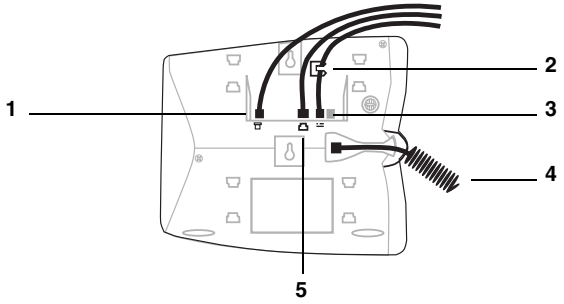
1. Connect a Category 5 Ethernet cable to an available hub port or wall jack that is connected to the same subnet as the NCP.
2. Connect the other end of the Ethernet cable to the LAN connector on the underside of the telephone.

Figure 25 Connections for 3Com 3102 Business Telephones



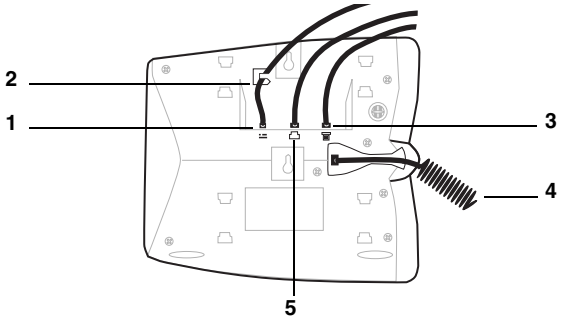
1. Power cable. Ask your Administrator how you should power your phone. Then see Table 18 for instructions on how to connect your telephone to power. (Figure 27 shows a connection using an optional AC adapter.)
2. Ethernet cable (to data jack)
3. Ethernet cable (optional; to connect a computer or an Attendant Console to the network)
4. Handset cord (to handset)
5. Headset connection (to connect an optional headset)

Figure 26 Connections for 3Com 1102 Business Telephones



1. Ethernet cable (optional; to connect a computer or an Attendant Console to the network)
2. Strain-relief tab to prevent power cord from becoming disconnected
3. Power cable. Ask your Administrator how you should power your phone. Then see Table 18 for instructions on how to connect your telephone to power. (Figure 27 shows a connection using an AC adapter.)
4. Handset cord (to handset)
5. Ethernet cable (to data jack)

Figure 27 Connections for 3Com 2102 Business Telephones



1 Power cable. Ask your Administrator how you should power your phone. Then see Table 18 for instructions on how to connect your telephone to power. (Figure 27 shows a connection using an AC adapter.)

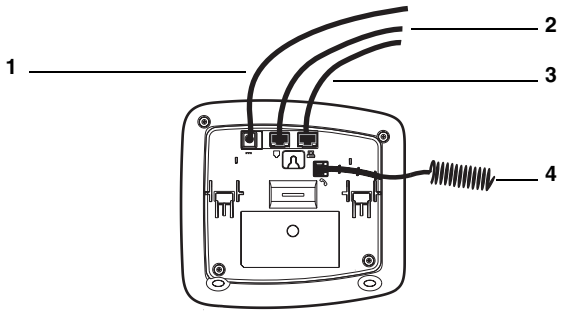
2 Strain-relief tab to prevent power from becoming disconnected

3 Ethernet cable (optional; to connect a computer or an Attendant Console to the network)

4 Handset cord (to handset)

5 Ethernet cable (to data jack)

Figure 28 Connections for 3Com 3101 and 3101SP Basic Telephones



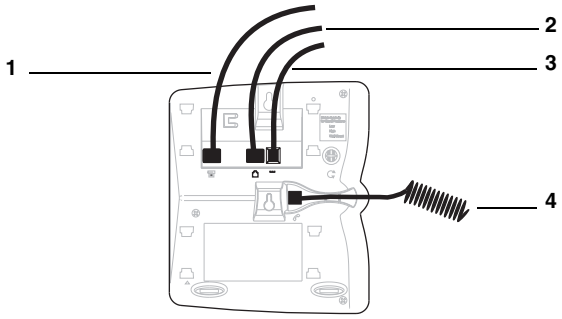
1 Power cable. Ask your Administrator how you should power your phone. Then see Table 18 for instructions on how to connect your telephone to power. (Figure 28 shows a connection using an optional AC adapter.)

2 Ethernet cable (to data jack)

3 Ethernet cable (optional; to connect a computer or an Attendant Console to the network)

4 Handset cord (to handset)

Figure 29 Connections for 3Com 2101 Basic Telephones



1. Ethernet cable (optional; to connect a computer or an Attendant Console to the network)
2. Ethernet cable (to data jack)
3. Power cable. Ask your Administrator how you should power your phone. Then see Table 18 for instructions on how to connect your telephone to power. (Figure 29 shows a connection using an optional AC adapter.)
4. Handset cord (to handset)

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

3Com telephones 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 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 switch port on the underside of the telephone.

  The Ethernet port is labeled with this icon: 

Adding a New Telephone Using the Auto Discover Feature

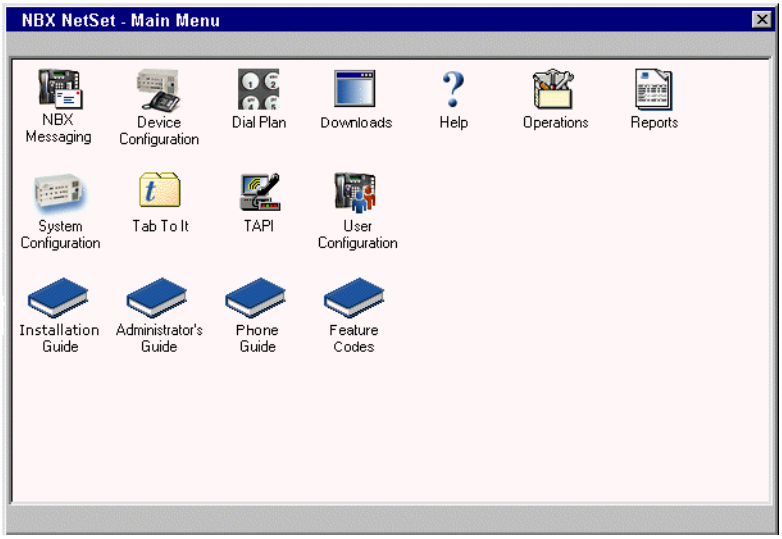
Before you enable the Auto Discover feature, be sure that you have the dial plan you want installed. Your extension range is one factor you must consider when setting up Virtual Tie Lines for multi-site telephone connectivity.

If you are adding licensed devices, such as the 3102, 3101, 3101SP, or 3105, you must first add the license key into the NBX NetSet utility. The Auto Discover process will not discover a licensed device if the license has not been added to the system.

To Auto Discover a telephone:

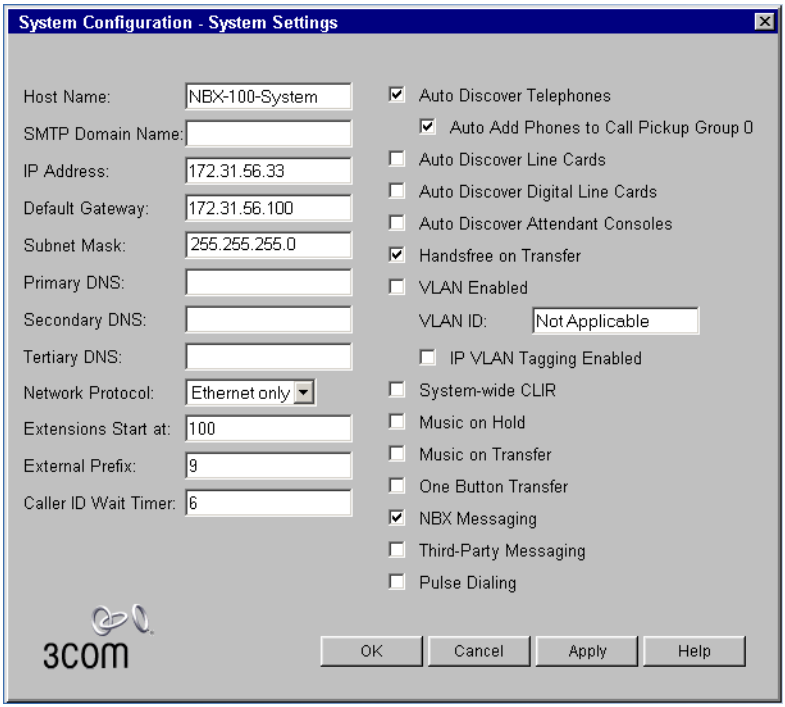
1 In *NBX NetSet - Main Menu* window, (Figure 30), click *System Configuration*. The System Configuration window appears.

Figure 30 NBX NetSet - Main Menu Window



2 Click the *System-wide* button. The System-wide dialog box (Figure 31) appears.

Figure 31 System Settings - System-wide Dialog Box



3 Clear all check boxes associated with Auto Discover.

4 Enable the *Auto Discover Telephones* check box.

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

Members of a Call Pickup Group can answer calls that ring on other group members' telephones. The default system includes one Call Pickup Group. 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 Auto Discover:

   a Remove the telephone from the packing box.

   b Connect power to the telephone as described on page 92 or on the packing sheet that comes with the telephone.

   c Connect the telephone to the LAN on which the NCP resides as described on page 95 or on the packing sheet that comes with the telephone.

   d Wait until the telephone display panel displays 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.

   Once you have discovered a telephone, it retains its settings. The telephone can now be placed in the appropriate location based on the telephone extension assignments the customer has chosen.

8 When you connect the telephone to the LAN and power, the extension appears on the display panel.

Adding a 3Com Attendant Console

The optional 3Com Attendant Console provides extension button mappings for up to 100 extensions per console 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 Auto Discover any Attendant Console. The Auto Discover process assigns the extension of each known telephone to a button on the Attendant Console and associates the Attendant Console with an existing telephone extension.

Connecting Power to the Attendant Console

Connect the AC power converter provided with the Attendant Console to the power connection on the bottom of the Attendant Console and then connect the other end of the power converter to an AC power outlet. On all NBX devices, the power connector is marked by the DC power symbol:

The 3Com 3105 Attendant Console complies with the IEEE 802.3af standard, commonly called Power over Ethernet (PoE), so a power converter is an optional component. To use a power converter, order power adapter 3C10224-XX, where XX is the country code:

- AA (Australia/New Zealand)
- CN (China)
- ME (Europe/LAT)
- SA (South Africa)
- UK (United Kingdom)
- US (North America)

Using a Powered Ethernet Cable to Power an Attendant Console

To eliminate the power converter, you can connect your Attendant Console to a powered Ethernet cable. The Attendant Console cannot accept power directly from an IEEE 802.3af-compliant power source. You must use a device to remove power from the cable. The device you use to connect an Attendant Console to a powered Ethernet cable depends on the type of Ethernet power in use at your facility. NBX devices work with:

- Ethernet power sources that comply with the IEEE 802.3af standard
- 3Com Ethernet power sources that predate 802.3af

See Table 19 for power connection instructions for 3Com Attendant Consoles.

Table 19 Connecting Power to a 3Com Attendant Console

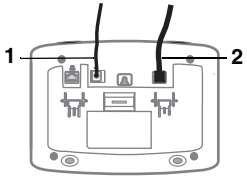
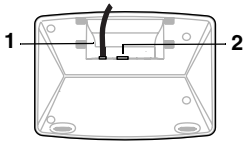
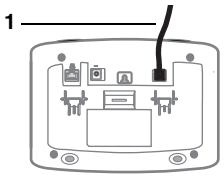
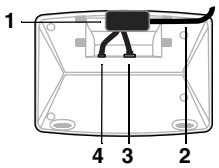
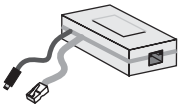
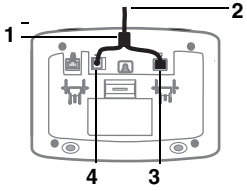
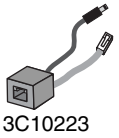
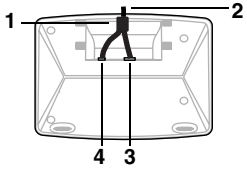
Power Source	Connection Details
AC power adapter The Attendant Console can accept power from a power adapter. Use the adapter that comes with your Attendant Console.	 Connect the AC adapter's power jack to the power connector **1** on the bottom of the Attendant Console. Connect an Ethernet cable **2** from a 3Com Telephone switch port or from a data jack to the Ethernet connector on the bottom of the Attendant Console.  3105 Attendant Console, top 1105 Attendant Console, bottom

Table 19 Connecting Power to a 3Com Attendant Console (continued)

Power Source	Connection Details
Power over Ethernet (802.3af-compliant) power source	 The 3105 is compliant with 802.3af. You can connect a powered Ethernet cable **1**, directly to the device's Ethernet connector.  The 1105 predates the 802.3af standard so you must use a *3Com Network Jack to NBX Phone Power Module* (3CNJVOIPMOD-NBX) **1**.  The module receives power from an 802.3af-compliant power source through an Ethernet cable **2** and splits it into an unpowered Ethernet connection **3** and a power jack **4**.
3Com Ethernet Power Source: ■ 3C10220 (12-port) ■ 3C10222 (24-port)	 The 3Com Ethernet Power Source predates 802.3af so you must use a *3Com NBX Telephone Power Splitter* (3C10223) **1** to split a powered Ethernet connection **2** into an unpowered Ethernet connection **3** and a power jack **4**   3105 Attendant Console, top 1105 Attendant Console, bottom

Connecting the Attendant Console to the Network

To connect a 3Com Attendant Console:

1 Connect the Attendant Console to the Ethernet port located on the bottom of the 3Com telephone. The telephone's Ethernet port is identified by this symbol:

The Attendant Console does not need to be connected directly to a telephone. You can connect it to the LAN instead. The LAN port on the bottom of the Attendant Console is identified by this symbol:

Auto Discovering an Attendant Console

When you Auto Discover 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, the Auto Discover process associates the new Attendant Console with the 3Com Business or Basic Telephone that has the lowest extension number.
- If one or more Attendant Consoles are already configured in the system, the Auto Discover process finds all 3Com Telephones that currently have an associated Attendant Console and associates the new Attendant Console with the telephone that has the lowest extension number. For example, if the existing Attendant Console is associated with extension 1000, the new Attendant Console will also be associated with extension 1000.
- The system will map up to 100 extensions to the Attendant Console. These extensions will always be the lowest 100 extensions even if these extensions are already mapped to an existing Attendant Console. To map other extensions to an Attendant Console, you must map the extensions manually using the Attendant Console Button Mappings screen in the NBX NetSet utility.

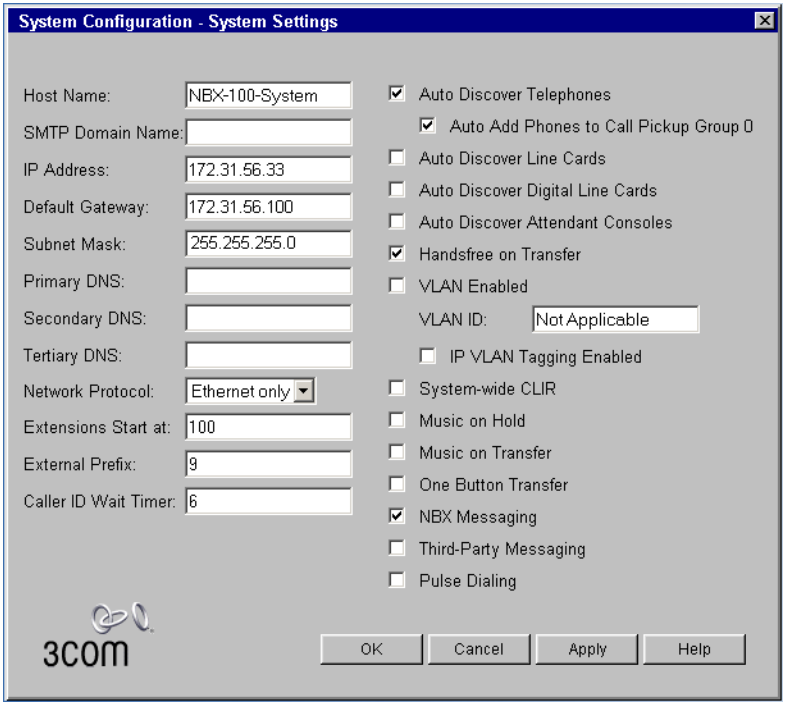
Typically, you want to associate an Attendant Console with the telephone beside it. If the Auto Discover process associates an Attendant Console with a telephone other than the one you want, see "Associating an Attendant Console with a Specific Telephone" on page 106 for instructions on how to change the association.

Do not Auto Discover the Attendant Console before you have configured all telephones and Analog Line Cards.

To Auto Discover an Attendant Console:

1 In the *NBX NetSet - Main Menu* window, click *System Configuration* > *System Settings* > *System-wide.* The System Settings dialog box (Figure 32) appears.

Figure 32 System Settings — System-wide Dialog Box



1 Clear all check boxes associated with Auto Discover.

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

3 Wait at least 2 minutes for the NBX system to Auto Discover the Attendant Console and assign the extensions of all known telephones to its buttons.

Attendant Console Notes

- When automatically mapping extensions to an Attendant Console, the system maps the first 100 extension to Attendant Console buttons except for the extension associated with the Attendant Console. If you add a second Attendant Console to the system, that Attendant Console will also have the first 100 extensions mapped to its buttons. To map extensions above the first 100, you must manually map the

extensions. For more about manually adding an Attendant Console and mapping Attendant Console buttons, see Chapter 3, "Device Configuration," in the *NBX Administrator's Guide.*

- When you are finished configuring the Attendant Console, you can use the NBX LabelMaker utility to create printed labels.

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.

Verifying Extension Assignments on an Attendant Console

After you Auto Discover 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 appears.

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

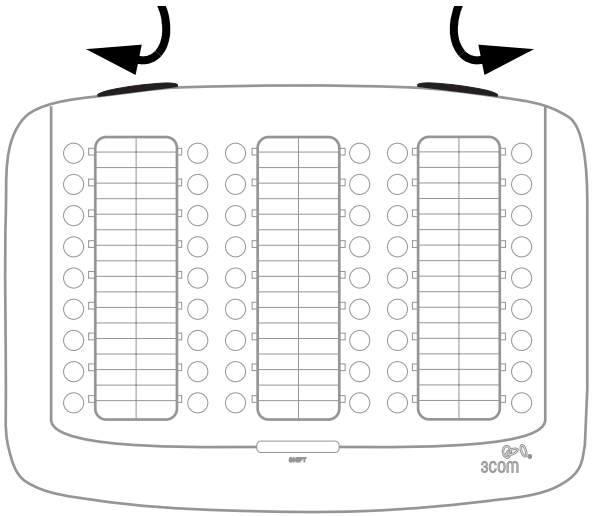
Attendant Console Labels

You can create and print Attendant Console labels using the NBX LabelMaker utility. To download the LabelMaker utility:

1. Log into NBX NetSet as an administrator.
2. Click *Downloads* > *LabelMaker*.

After you print the labels and then cut them out, remove the plastic cover from the Attendant Console and install the labels. On the 3Com 3105 Attendant Console, remove the cover by pulling up on the two tabs at the top of the Attendant Console until the top of the cover pops off.

Figure 33 3105 Attendant Console Label Cover Tabs



Adding a Remote Telephone

NBX system software (release R4.2 and higher) supports Network Address Port Translation (NAPT, also called NAT overloading). NAPT allows you to put a 3Com Telephone behind a device that applies network address translation at a remote location, such as a home office, and connect to the NBX NCP through an Internet connection. One typical configuration is to connect a cable/DSL modem to a small office/home office router that includes a firewall and Ethernet ports. You connect the 3Com Telephone directly to one of the Ethernet ports. Another option is use the pcXset soft telephone application instead of a 3Com Telephone.

For information about installing a remote telephone, see Chapter 3, "Device Configuration," in the *NBX Administrator's Guide*.

4 Analog Lines

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

The NBX V3000 includes four analog line ports. Each NBX Analog Line Card provides access for up to four analog telephone lines into your NBX system. You can add more analog line ports by adding an expansion chassis and NBX Analog Line Cards to the system. The NBX system treats a line card port as an extension and assigns a unique extension number to each port.

You use the Auto Discover feature to detect analog line ports, and you define the starting address used by the Auto Discover process in the system dial plan. For a 4-digit dial plan, the starting address is 7250. For a 3-digit dial plan, the default starting address is 750. The Auto Discover process assigns the first unassigned number to the first analog line port.

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

Auto Discover Analog Line Cards

To Auto Discover analog line ports:

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 Auto Discover.
5. Enable *Auto Discover Line Cards*.
6. Click *OK*.

Inserting an Analog Line Card

When you insert an Analog Line Card into an NBX chassis, you may leave the system powered up. The Auto Discover process begins as soon as the system detects the new card.

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

CAUTION: *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.

   Wait at least two minutes 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 Utility

To verify the status of an Analog Line 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 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 an Analog Line Card

ATA Card or Port	MAC Address	Extension
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 auto discovered 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 auto discovered, 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 auto discovered. For the example shown in Table 20, the lights would blink on in the order 2, 1, 3, 4.

For more information on Analog Line Card status lights, see page 26.

5 Analog Devices

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

- Analog Terminal Card
- Analog Terminal Adapter
- The ATA port on an NBX V3000

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

WARNING: *The 3Com Analog Terminal Adapter is intended for connection only on internal LANs. Do not install it outside of buildings. Do not connect it to any networking device outside of the building in which the telephones are located.*

A four-port Analog Terminal Card (ATC), a single-port Analog Terminal Adapter (ATA), or the ATA port on an NBX V3000 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 a 3Com Business Telephone or 3Com Basic Telephone:

- A user can dial 500 on a telephone connected to either an analog port 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 3Com 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 analog port supports 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.
- Configuring an analog port for fax operation optimizes the performance for inbound and outbound faxes but compromises audio quality. If you make a voice call using the analog device (for example, if you use the telephone portion of the fax machine), the quality of the audio may be affected. If you make a VTL call using the analog device, the audio may be unusable.

Adding an Analog Terminal Card

To add an optional Analog Terminal Card to the NBX system:

1. In the *NBX NetSet - Main Menu* window, click *System Configuration*. The System Configuration dialog box appears.
2. Click *System-wide*. The System Settings — System-wide dialog box appears.
3. Clear all check boxes associated with Auto Discover.
4. Click the *Auto Discover Telephones* check box to select it.

   The Auto Discover Telephones check box enables and disables the Auto Discover process for Analog Terminal Cards, Analog Terminal Adapters, and 3Com Telephones.
5. Click *OK*.

Inserting an Analog Terminal Card

When you insert the ATC into the chassis, you may leave the system powered up. The Auto Discover process begins as soon as the system senses the new card.

Functionally, ATCs 3C10114 and 3C10114C are identical. However, 3C10114C uses some different internal components so that 3C10114C requires NBX software release R4.1 or higher.

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.

CAUTION: *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.

Wait at least 2 minutes for the Analog Terminal Card to initialize and for the system to update its database.

Verifying Analog Terminal Card Ports

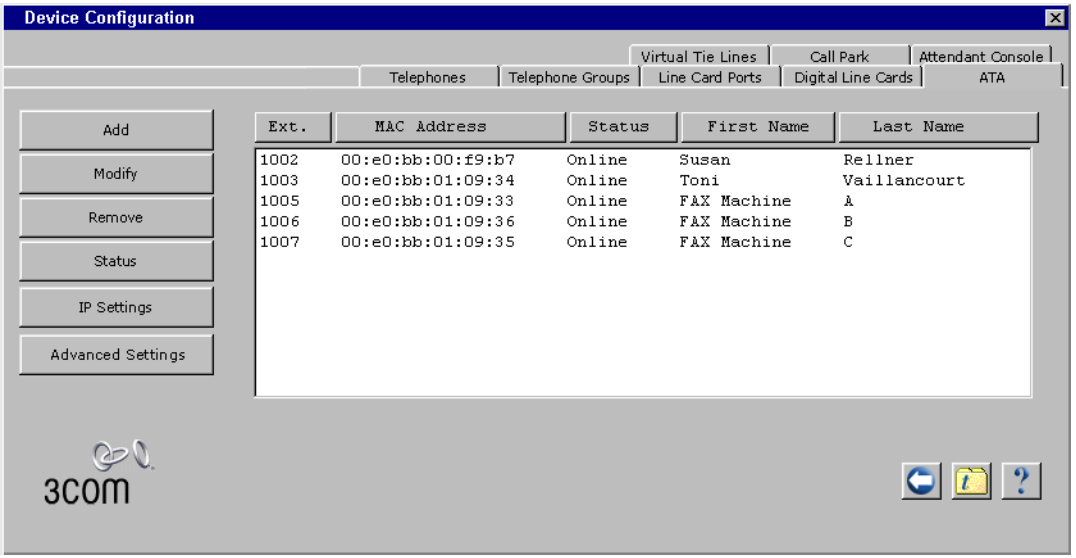
After you have used the Auto Discover feature to add an Analog Terminal Card, you can verify that the card is properly installed by using the NBX NetSet utility, described next, and by examining the status lights on the front of the card, which are described on page 35.

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 34.)

Figure 34 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 card.

   The four ports of an Analog Terminal Card appear in the list of ATAs, along with the ports of any previously discovered Analog Terminal Cards, and any Analog Terminal Adapters (ATAs) and the ATA port on an NBX V3000.

   The Auto Discover Telephones check box (*System Configuration* > *System-wide*) is how you enable the Auto Discover feature for the four ports on each Analog Terminal Card, the single port on each Analog Terminal Adapter, and for 3Com Telephones.

Adding an Analog Terminal Adapter (ATA)

To add an Analog Terminal Adapter (ATA) to your NBX system you must first enable the Auto Discover feature. You Auto Discover an Analog Terminal Adapter (ATA) in the same way that you discover 3Com telephones and Analog Terminal Cards.

1. In the *NBX NetSet - Main Menu* window, click *System Configuration*. The System Configuration dialog box appears.
2. Click *System-wide*. The System Settings dialog box appears.
3. Clear all check boxes associated with Auto Discover.
4. Click the *Auto Discover Telephones* check box to select it.

The Auto Discover Telephones *check box enables and disables the Auto Discover process for Analog Terminal Cards, Analog Terminal Adapters, and 3Com Telephones.*

5. Click *OK*.

Connecting the Analog Terminal Adapter

After you have enabled the Auto Discover feature, connect the Analog Terminal Adapter (ATA) to the same network segment as the one on which the NCP 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.

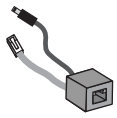
   If you are using a powered Ethernet cable with your 3C10400 ATA, see the "Using Power over Ethernet with a 3C10400 ATA" next. The 3C10120B cannot use a powered Ethernet cable due to its power requirements.
2. Connect a Category 5 Ethernet cable to the ATA RJ-45 connector that has no icon beside it. Connect the other end of the Category 5 Ethernet cable to the LAN on which the NCP is located.
3. Wait 2 minutes (more on a SuperStack 3 NBX system with many devices) for the NBX system to discover the ATA.
4. If the ATA is connected to a fax machine, configure the port for fax usage:
   a. Open the NBX NetSet utility and go to *Device Configuration* > *ATA*.
   b. Select the ATA from the list and click *Modify*.
   c. Enable the check box labeled *Fax Machine*, then click *Apply*.

Configuring an ATA port for fax operation optimizes the performance for inbound and outbound faxes. If you make a voice call using the ATA device (for example, if you use the telephone portion of the fax machine), the quality of the audio may be affected. If you make a VTL call using the ATA device, the audio may be unusable. If you configure the port for fax operation, expect lower quality voice calls on that port. If you configure the port for voice calls, the performance is not optimized for faxes.

Using Power over Ethernet with a 3C10400 ATA

The NBX Analog Terminal Adapter 3C10400 meets the IEEE 802.3af standard for Power over Ethernet and can accept power directly from an 802.3af-compliant power source. Earlier models of the ATA, 3C10120B, require an AC power converter due to their power requirements.

The table describes how to connect a powered Ethernet cable to a 3C10400 Analog Terminal Adapter.

Power Source	Connection Details
Power over Ethernet (IEEE 802.3af) power source	Connect the powered Ethernet cable directly to the telephone's Ethernet connector. No separate power connection is required.
3Com Ethernet Power Source: ■ 3C10220 (12-port) ■ 3C10222 (24-port)	The 3Com Ethernet Power Source predates 802.3af. Any NBX device can be powered by a 3Com Ethernet Power Source if you use an NBX Power Splitter (3C10223 – package of 12). The NBX Power Splitter removes power from a powered Ethernet cable and splits it into a power jack and an unpowered Ethernet connection that you connect to the ATA's LAN port (labeled *LAN*) and power connection (labeled ⎓).  3C10223

CAUTION: *You can damage an NBX device by using an NBX power splitter (3C10223) with the 3Com Network Jack Power over Ethernet Multiport Midspan Solution (3CNJPSE24). Use the NBX power splitter (3C10223)* ***only*** *with the 3Com Ethernet Power Source (3C10220, 12-port, or 3C10222, 24-port).*

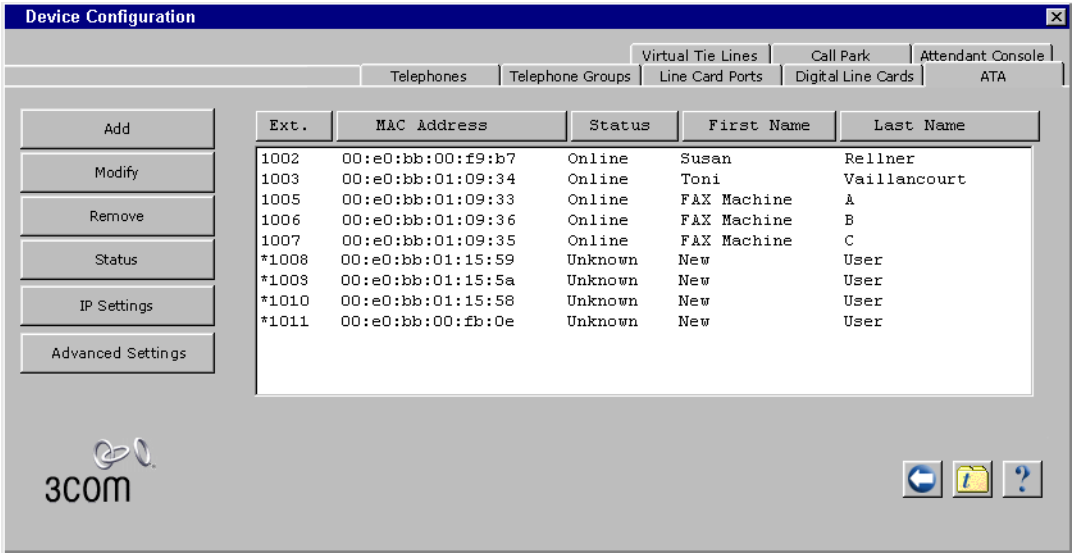
Verifying an Analog Terminal Adapter or the ATA Port

After the NBX system has discovered an Analog Terminal Adapter or the ATA port on an NBX V3000, you can verify that the port has been properly discovered and see which extension number the system has assigned. The system assigns the next lowest available extension to the analog port.

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 appears.
2. Click the ATA tab. See Figure 35. The ATA tab displays information about all discovered ATAs and all ports on discovered Analog Terminal Adapter Cards

Figure 35 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.

   Use the status lights on an ATA to help verify that the ATA has been properly discovered:

   - For information on the status light of the ATA port of an NBX V3000, see page 22.
   - For information on the status light of the ATA 3C10400, see page 36.
   - For information on the status light of the ATA 3C10120B, see page 38.

6 BRI-ST DIGITAL LINE CARD

This chapter tells you how to install into an NBX chassis and verify the successful installation of the optional 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:

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

Preparing the NBX System for BRI Cards

Before you insert the BRI-ST Digital Line Card into an NBX 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 the Auto Discover Feature

To enable the Auto Discover feature 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 Auto Discover.
5. Click the *Auto Discover Digital Line Cards* check box to select it.
6. Click *OK*.

Inserting the BRI-ST Digital Line Card

When you insert the BRI-ST card into the chassis, you may leave the system powered up. The Auto Discover process begins as soon as the system senses the new 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.

CAUTION: *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.

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 at least 3 minutes for both of these processes to be completed. 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 an NCP" *in* Chapter 10.

Verifying a BRI-ST Digital Line Card

After you Auto Discover a BRI-ST Digital Line Card, you can verify that it was properly discovered by using the NBX NetSet utility, described next, or by viewing the card's status lights, which is described later.

Using the NBX 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.

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 appears.

6 Verify that the *Ext.* column contains an extension for each channel.

7 Verify that the *Status* column contains *Ready* for each channel.

You can also use the status lights on the front of the card to verify that a BRI-ST Digital Line Card has been properly discovered. See page 34 for details about BRI-ST card status lights.

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 section describes how to add an E1 Digital Line Card 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.

For information about installing system hardware, see Chapter 2.

This section covers the following topics:

Installation Notes

- See "NBX V3000 System Configuration Guidelines" on page 43 for information on the number of E1 cards supported by an NBX Network Call Processor.
- You can configure an E1 Digital Line Card for ISDN PRI signaling only.
- The 3C10165D E1 Digital Line Card can be installed at a remote location and communicate with its NCP over a routed network. For information on how to set up a remote E1 card, see the *NBX Administrator's Guide*.
- Before you install E1 Digital Line Cards, you may want to configure the Outdialing Prefix settings. For more information, see the Dial Plan chapter of the *NBX Administrator's Guide*.
- For IP operations, the 3C10165D E1 Digital Line Card must have either a static IP address or get its IP address from DHCP. The 3C10165D E1 Digital Line Card cannot use the NBX IP On-the-Fly feature.
- 3C10165D E1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

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 the Auto Discover Feature for Digital Line Cards

To enable the Auto Discover feature 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*.

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 Auto Discover.
5. Click the *Auto Discover Digital Line Cards* check box to select it.
6. Click *OK*.

Inserting the E1 Digital Line Card

When you insert the E1 card into the chassis, you may leave the system powered up. The Auto Discover process begins as soon as the system senses the new 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.

CAUTION: *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).

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 an NCP" *in* Chapter 10.

Verifying an E1 Digital Line Card

After the Auto Discover process is completed, you can verify that the E1 Digital Line Card has been properly discovered by using the NBX NetSet utility, described next, and by examining the status light on the Digital Line Card, described on page 129.

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.

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 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.

Using the Status Lights

You can use the E1 Digital Line Card status lights to verify that the E1 card was properly discovered.

3C10165C — After the Auto Discover 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.

3C10165D — After the Auto Discover process has completed, and before you connect the E1 Digital Line Card to the telephone company's E1 line, the POST (Power On Self Test) light and the NCP light should both be solid green.

For a complete description of all the status lights on the front of the E1 card, see "E1 Digital Line Card" on page 30.

You are now ready to configure the E1 Digital Line Card. See the *NBX Administrator's Guide* for instructions.

8 T1 Digital Line Card

This chapter tells you how to install a T1 Digital Line Card. In the NBX NetSet utility, digital line cards are referred to as either cards or boards. The following sections describe how to add a T1 Digital Line Card (3C10116C and 3C10116D) and how to connect to a T1 service provided by the local telephone company:

Installation Notes

- See "NBX V3000 System Configuration Guidelines" on page 43 for information on the number of T1 cards supported by an NBX Network Call Processor.
- You can choose to configure a T1 Digital Line Card to use one of two types of signaling:
  - DS1 protocol (sometimes called Standard T1). By default, the Auto Discover process selects DS1 as the signaling type.
  - ISDN PRI (Primary Rate Interface) signaling.
- The 3C10116D T1 Digital Line Card can be installed at a remote location and communicate with its NCP over a routed network. For information on how to set up a remote T1 card, see the *NBX Administrator's Guide*.
- Before you install any T1 Digital Line Cards, you may want to configure the Outdialing Prefix settings. For more information, see the Dial Plan chapter of the *NBX Administrator's Guide*.
- For IP operations, a 3C10116D T1 Digital Line Card must have either a static IP address or get its IP address from DHCP. 3C10116D T1 Cards cannot use the NBX IP On-the-Fly feature.
- 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

- 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 Discover 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 Discover for Digital Line Cards

To enable the Auto Discover feature 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. The System Configuration window appears. On the *System Settings* tab, click *System-wide*. The System-wide Dialog Box appears.
4. Clear all check boxes associated with Auto Discover.
5. Click the *Auto Discover Digital Line Cards* check box to select it.
6. Click *OK*.

Inserting the T1 Digital Line Card

When you insert the T1 Digital Line Card into the chassis, you may leave the system powered up. The Auto Discover process begins as soon as the system senses the new card.

To insert the T1 card:

1. Find the MAC address of the T1 card on the label on the component side of 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.

CAUTION: *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).

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 an NCP" *in* Chapter 10.

Verifying the T1 Digital Line Card

After the Auto Discover 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.

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*.

6 Scroll through the list of channels to verify that 24 channels appear in the list.

Using the Status Lights

To verify the presence of a Digital Line Card in the system, you can use the status lights on the front of the card.

3C10116C — After the Auto Discover process has completed, and before you connect the T1 Digital Line Card to the telephone company's E1 line, the CF (Carrier Fail) light should appear solid green.

3C10116D — After the Auto Discover process has completed, and before you connect the T1 Digital Line Card to the telephone company's E1 line, the POST (Power On Self Test) light and the NCP light should both be solid green.

For a complete description of the status lights on the front of the card, see "T1 Digital Line Card" on page 27.

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 IP. It covers these topics:

IP Telephony Overview

You can integrate the NBX system into any network infrastructure because it can operate at either Layer 2 (Ethernet) or Layer 3 (IP).

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) and you do not have your LAN segmented into subnetworks, 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
- Standard IP Configuration
- IP On-the-Fly Configuration
- Providing the NCP IP Address to Devices

Implementing IP

You can implement IP in one of two ways:

- Standard IP

  All devices 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 subnet as the NCP 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.

Standard IP Configuration

The NBX system must be configured differently in each of the following situations:

- All telephones and devices are on the same subnetwork as the NCP.

  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 3Com 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 connect a new telephone to the subnetwork, you must provide a means for the telephone to get the IP address of the NCP. You can configure DHCP option 184 on your DHCP server for this purpose. Alternatively you can use the telephone's Local User Interface (LUI) utility to program the NCP address in into each telephone.

Using DHCP

A DHCP server can assign IP addresses to telephones from a predefined group of addresses. (The NCP must have a static IP address.) It assigns these addresses for a fixed amount of time that 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 returns the IP address to the list of available addresses that 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 settings (IP address, subnet mask, and default gateway address) for all of your system devices. However, each NBX device in the system requires the IP address of the NCP. If the device and the NCP are located on the same subnetwork, the device receives this information through status messages passed at the Ethernet layer. If the device and the NCP are located on different subnets, you can configure the DHCP server to pass the IP address of the NCP to the device. See "Providing the NCP IP Address to Devices" on page 140.

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 NCP.

  You do not need to use IP in this environment. Devices always use Ethernet (Layer 2) communications, and the NCP 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 NCP 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, and configure the NCP's IP address into each telephone that will be located on a remote subnetwork.

  Devices on the same subnetwork as the NCP are given an IP address only if they need to communicate with a device that is on a different subnet. See "Configuring IP On-the-Fly" on page 142.

3C10165D E1 and 3C10116D T1 Digital Line Cards do not support the NBX IP On-the Fly feature. If your system uses IP On-the-Fly, then you must assign a static IP address to the card or use DHCP to assign an IP address to the card, even if the card will be installed on the same subnet as the NCP.

Providing the NCP IP Address to Devices

To provide the IP address of the NCP to devices on other subnetworks, use one of these methods:

- Program the IP address of the NCP directly into each telephone using the telephone key pad. See Chapter 10, Troubleshooting, in the *NBX Administrator's Guide* for instructions on how to use the telephones Local User Interface (LUI) utility.
- Program a custom DHCP option on the DHCP server and configure the server to pass the IP address of the NCP to remote devices through the standard DHCP configuration process.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP option 184. If your DHCP server is set up to use option 184, you must still manually configure these digital line cards. See the NBX Administrator's Guide *for more information.*

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 NCP, 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.*

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:

- Selecting the Operating Mode
- Configuring IP On-the-Fly
- Configuring the DHCP Server
- Manually Configuring Telephone IP Settings

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 NCP 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.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support the NBX IP On-the Fly feature. If your system uses IP On-the-Fly, then you must assign a static IP address to the card or use DHCP to assign an IP address to the card, even if the card will be installed on the same subnet as the NCP.

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 NCP 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 NCP. 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 appears.

5 Specify an address range, and then 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*.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP option 184. Before you install a 3C10165D E1 or 3C10116D T1 card at a site that is remote from the system's NCP, you must first initialize the card by connecting it to the same subnet as the NCP.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

Manually Configuring Telephone IP Settings

For a telephone to work properly on a subnetwork separated from the NCP, 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 NCP.

If the telephone has not already been discovered by the NCP, 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 appears. (The IP Settings button does not appear unless you have enabled IP for the system.)

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.

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 NCP and the telephone ensure that the telephone receives the IP address of the NCP as part of the configuration.

Entering Data Using the Telephone Key Pad

You can program IP configuration directly into a telephone using the telephone Local User Interface (LUI) utility.

You can start the LUI utility on any 3Com telephone by cycling power to the telephone, and then starting the utility before the telephone finishes its download sequence. Each telephone has a different method of starting the LUI utility:

- For the 3102 Business Telephone, press
  
- For the 3101 and 3101SP Basic Telephones, press the center select button:
  
- For the 1102, 2102, and 2102-IR Business Telephones, press
  

- For the 2101 Basic Telephone, press the Message button:

For detailed instructions on how to use the LUI utility, see the *NBX Administrator's Guide*.

Automatically Configuring Telephone IP Settings

When you connect a 3Com Telephone to a network, it searches for a DHCP server. If the telephone is on the same subnet as the NCP, the telephone receives the following configuration information from the NCP:

- The IP settings (IP address, subnet mask, and default gateway address) for the telephone to use
- The IP address of the NCP

The telephone then stops searching for a DHCP sever.

If a telephone is on a different subnet than the NCP and a DHCP server provides IP settings to the telephone, the telephone cannot communicate with the NCP until it has the NCP IP address. There are two methods of providing the NCP IP address to the telephone:

- Manually configure the NCP IP address into the telephone using the telephone LUI utility. See "Manually Configuring Telephone IP Settings" on page 143.
- Provide the IP address to the telephone using DHCP 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 Analog Line Card Ports

Typically, your analog line card ports reside on the same subnetwork as the NCP. 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 the Auto Discover feature 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*.
6. In the *IP Settings* dialog box, specify the IP configuration for this device.
7. Click *OK*.

Configuring T1, E1, and BRI Channels

If all digital line cards reside on the same subnetwork as the NCP, and 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 T1, E1, and ISDN BRI cards.

3C10165D E1 cards and 3C10116D T1 cards can be installed in a remote location and communicate with the NCP over a routed network. For information on how to configure these cards for remote operation, see the NBX Administrator's Guide.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP option 184. Before you install a 3C10165D E1 or 3C10116D T1 card at a site that is remote from the system's NCP, you must first initialize the card by connecting it to the same subnet as the NCP

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support the NBX IP On-the Fly feature. If your system uses IP On-the-Fly, then you must assign a static IP address to the card or use DHCP to assign an IP address to the card, even if the card will be installed on the same subnet as the NCP.

3C10165D E1 Digital Line Cards and 3C10116D T1 Digital Line Cards do not support DHCP lease times of less than 20 minutes.

To manually configure channel IP addresses:

1. Log in to the NBX NetSet utility using the administrator username and password.
2. If you have not already done so, use the Auto Discover feature or manual configuration to add the T1, E1, or ISDN BRI channels to the configuration database.
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 *T1/ISDN Board List*.
6. In the board list select a board, and then click *IP Settings*.
7. To assign one IP address manually and have the NBX system assign the remaining addresses automatically, enter the first address in the *First IP Address* box. The system adds the remaining addresses sequentially when you apply the changes.

   3C10165D E1 cards and 3C10116D T1 cards need only one IP address. Enter the IP address in the *First IP Address* box. The *Assign Addresses Individually* button does not appear when you are configuring 3C10165D E1 cards and 3C10116D T1 cards.
8. To assign IP addresses individually on digital line cards other than 3C10165D E1 cards and 3C10116D T1 cards, click *Assign Addresses Individually*.
   a. Specify an IP address for each channel.
   b. In the *Common Subnet Mask* and *Common Default Gateway* fields, enter IP values that are appropriate for your network.
   c. Click *Ok*.
9. In the IP Settings screen, click *Apply*.
10. Wait 3 minutes for the changes to take effect.
11. Verify your changes.
12. Click OK to close the dialog box.

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.*

Low-bandwidth Telephony

To support remote users, you can configure a 3Com Business Telephone or 3Com 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 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 *Set All For Low Bandwidth Connection Compression* check box and then click *OK*.

A low-bandwidth telephone cannot play music on hold, initiate a page or participate in conference calls.

Although the NBX NetSet utility allows you to change the method used for compression, if you change the setting from the default, ADPCM to None, 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 NCP. See "Manually Configuring Telephone IP Settings" on page 143. When your low-bandwidth link is operational and connected to the NCP, the Auto Discover process can discover and configure the telephone, or you can manually configure it through the NBX NetSet utility.

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 NCP. 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 technician for assistance.

The specific configuration tasks required for setting up the link between the NCP 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 technician.

After you enable low-bandwidth communication for a telephone, complete the configuration of the low-bandwidth IP connection:

1. Use the telephone key pad to configure IP settings on the telephone. See "Manually Configuring Telephone IP Settings" on page 143 for more information.
2. Configure the telephone in the configuration database.

Broadband Telephony

NBX system software (release R4.2 and higher) supports Network Address Port Translation (NAPT, also called NAT overloading). NAPT allows you to put an NBX Telephone behind a device that applies network address translation at a remote location, such as a home office, and connect to the NCP through an Internet connection. One typical configuration is to connect a cable/DSL modem to a small office/home office router that includes a firewall and Ethernet ports. You connect the NBX Telephone directly to one of the Ethernet ports. Another option is use the pcXset soft telephone application instead of an NBX Telephone.

This section summarizes the tasks you must complete to configure an NBX Telephone for operation behind the NAPT device. Because the configuration interface on each device varies, detailed procedures for NAPT device configuration are beyond the scope of this document. For information about configuring the NAPT device, see the documentation for that device.

To add a broadband connected telephone behind a NAPT device:

1. Make sure the NBX system is set up for IP operations, either Standard IP or IP On-the-Fly. If you are not using a VPN connection to establish access from your home system to the NBX system network, the NBX system must have a public IP address.
2. Use the NBX NetSet utility to enable *Auto Discover Telephones* (*System Configuration* > *System Settings* > *System-wide*) and then connect the NBX Telephone to the NBX system.

   Auto discovering the telephone while it is connected locally to the NBX network allows the system to configure the phone in the database and assign an extension number. You could manually add the telephone to the database instead of using the Auto Discover feature.
3. Move the telephone to its intended location. Connect it to power and then use the telephone Local User Interface (LUI) utility to program these settings:
   - NCP MAC address — Required only when the network has more than one Network Call Processor.
   - Telephone IP address — A private IP address matching the IP address scheme on the LAN side of the NAPT device but outside of the DHCP address range configured in the NAPT device. The telephone must have a static IP address. For pcXset, this would be the IP address of the computer.
   - NCP IP address — The IP address of the NCP that the phone must communicate with. If you are not connecting to the network through a VPN connection, the NBX system must have a public IP address.
   - Subnet Mask — The address mask in use on the LAN side of the NAPT device.
   - Default Gateway — The IP address of the NAPT device on the LAN.

   For details on how to start the LUI utility, see "Entering Data Using the Telephone Key Pad" on page 144.
4. Configure the NAPT device:

   Use the device's user interface to map UDP ports 2093-2096 to the NBX telephone IP address. These UDP ports are registered ports for NBX operations. This mapping feature, known as virtual server, port mapping, port range forwarding, or rules, is required to allow traffic to pass to and from the NBX Telephone.

10 TROUBLESHOOTING

This chapter contains maintenance and troubleshooting information that can help you resolve simple problems. It covers these topics:

The SuperStack 3 NBX hardware needs no routine maintenance. However, you should perform periodic backups of the configuration database, especially after you make changes to system or user configurations.

System-level Troubleshooting

For each symptom listed in Table 21, 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. The NBX V3000 has a power switch on the back of the unit near the power cord. For the NBX 100 and SuperStack 3 NBX, you must remove the power cord. If the system has two power supplies (SuperStack 3 NBX only), remove both power cords.*

Table 21 Troubleshooting Actions

Symptom	Possible Cause	Suggested Action
Date/time display on telephones is wrong, either incorrect date or shows random characters.	A power surge has corrupted the system time.	If the display shows incorrect date, use NBX NetSet to reset the system time. If the display shows random characters, for example, 00; 0 #, you must: **1** Disconnect power to the chassis that holds the NCP. **2** Wait 60 seconds. **3** Reconnect power to the system. **4** Use NBX NetSet to enter the correct date and time.
	Problem with Network NCP battery.	Contact your 3Com NBX Voice-Authorized Partner.
Your browser cannot connect to 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" on page 68.
	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 Help for your browser.

Table 21 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" on page 68 complete information.
Cannot open NBX NetSet using the administrator username and password.	The CAPS LOCK key on your keyboard is activated.	NBX NetSet username and passwords are case-sensitive. For example, NBX NetSet accepts "administrator" but it rejects "Administrator" and "ADMINISTRATOR".
Callers on hold do not hear music.	No music source is connected to the Call Processor.	See "Adding External Hardware" on page 88 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" on page 88.
	MOH volume is set too low.	Adjust the MOH volume on the device that is providing audio to the NBX system. The audio input should be max 2V peak to peak.
Lose date and time when rebooting the system.	Problem with the battery on the NCP.	See "Servicing the Network Call Processor Battery" on page 156.

Table 21 Troubleshooting Actions (continued)

Symptom	Possible Cause	Suggested Action
NBX NetSet 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 NBX NetSet do not need to pass through the proxy server. To speed access to NBX NetSet, 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. In release R2.6 and all later releases, the compression is set to ADPCM and you cannot change it.
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.

Connecting a Computer to an NCP

You can connect a computer directly to an NBX Network Call Processor and access CLI commands and system status messages through a terminal emulation program. Typically, direct access to the NCP is for maintenance and troubleshooting purposes and should be done only under the direction of a support technician.

You can connect a computer directly to these NBX devices:

Table 22 Serial Port Connections

Card	Port
NBX NCP	CONSOLE or COM1
BRI-ST Digital Line Card	CONSOLE
E1 Digital Line Card	CONSOLE
T1 Digital Line Card	CONSOLE
NBX Analog Line Card (3C10114C only)	CONSOLE
NBX Analog Terminal Card (3C10117C only)	CONSOLE
NBX Analog Terminal Adapter (3C10400 only)	10101
3Com 3105 Attendant Console	Serial

To connect to the serial port on a 3Com 3105 Attendant Console, you must use a DB9 (female)-to-RJ-45 adapter.

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 22.

To connect the computer to the COM1 or CONSOLE port:

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 23.

Table 23 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 an NBX system, it could mean that the NCP 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. It covers these topics:

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

European Community CE Notice

Marking by the symbol:

CE

indicates compliance with the essential requirements of Directive 73/23/EC and the essential requirements of articles 3.1(b), 3.2, and 3.3 of Directive 1999/5/EC.

Other Approvals

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

NBX V3000 Call Processor

The NBX V3000 Call Processor includes the box, fans, one power supply, backplane, and mounting brackets. See Figure 1 on page 22 for information about NBX V3000 connectors and status lights.

Table 24 NBX V300 Call Processor Specifications

Weight	5.45 kg (12 lbs.)
Dimensions	H: 42 mm (1.6 in.) W: 440 mm (17.3 in.) D: 355 mm (14 in.)
Compliance	This is an FCC Class A device.
Electrical	100-240VAC @ 2.2A, 50-60Hz
Environmental	Ambient temperature: 0 to 50 ×C (32 to 122 ×F) Humidity: 10% to 90% noncondensing Vibration and shock: EN 60068 (IEC 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 25 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
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.

Table 26 3C10200 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

NBX 100 Call Processor

The NBX 100 Call Processor must reside in the top slot in an NBX 6-Slot chassis.

Table 27 3C10110C, 3C10110D NBX 100 Call Processor

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 (adjustable, controls the gain of the input circuit for the music-on-hold function).
Connectors	10BASE2 port BNC male connector for external hub connection (BNC connector discontinued on 3C10110D) RJ-45 10BASE-T DCE port for external hub connection 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

NBX 100 6-Slot Chassis

The NBX 100 6-Slot chassis includes the fan, power supply, disk drive, backplane, and mounting brackets.

Table 28 3C10111C 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

NBX 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 29) and 3C10114C (Table 30).

Table 29 3C10114 NBX 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

Table 30 3C10114C NBX 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
REN	0.2 A
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F) Humidity: 10% to 90% noncondensing

NBX Analog Terminal Cards

The Analog Terminal Card is an optional card. It enables you to connect up to four analog components, such analog phones or fax machines, to an NBX system.

CAUTION: *The NBX Analog Terminal Card is not intended to connect directly to any telephone network.*

Table 31 3C10117 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

Table 32 3C10117C Analog Terminal Card Specifications

Connectors	RJ-11. 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 Analog Terminal Adapter (ATA)

The Analog Terminal Adapter (ATA) enables you to connect a single analog device, such as a cordless telephone or fax machine, to an NBX system (Table 33). The 3C10400 ATA can accept power from an IEEE 802.3af-compliant (Power over Ethernet) power supply.

Table 33 3C10120B, 3C10400 ATA Specifications

Connectors	Standard RJ-11 port
	Standard RJ-45 port
	Hub port for additional Ethernet component
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)
	Humidity: 5% to 85% noncondensing

NBX BRI-ST Digital Line Card

The BRI-ST Digital Line Card enables you to connect a BRI-ST line to an NBX system through an NBX expansion chassis.

Table 34 3C10164-ST 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

NBX E1 and T1 Digital Line Cards

The E1 and T1 Digital Line Cards enable you to connect an E1 or T1 line to an NBX system.

Table 35 3C10165D E1 and 3C10116D T1 Digital Line Card Specifications

Weight	397 gm (14 oz)
Connectors	One RJ-45 connector for 10BASE-T line One RJ-45 connector for T1/E1 line Serial port (CONSOLE) for diagnostic access
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F) Humidity: 5% to 85% noncondensing

NBX Hub Card

The NBX Hub Card has been replaced by the NBX Uplink Card.

Table 36 3C10115 NBX 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

NBX Uplink Card

The uplink card is an optional component.

Table 37 3C10370 NBX Uplink Card Specifications

Weight	397 gm (14 oz)
Connectors	Eight RJ-45 connectors for 10BASE-T lines
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F) Humidity: 5% to 85% noncondensing

WARNING: *3Com Telephones are intended for connection only on internal Local Area Networks. Do not install them outside of buildings. Do not connect them to any networking device outside of the building in which the telephones are located.*

3Com 3102 Business Telephone

The 3Com 3102 Business Telephone includes a 2 x 24 character display, 18 programmable buttons, 8 dedicated feature buttons, and a 10/100 Mbps switch port. 3Com 3102 Business Telephones can accept power from an IEEE 802.3af-compliant (Power over Ethernet) power supply.

Table 38 3Com 3102 Business Telephone Specifications

Compliance	FCC Class A device	
Electrical	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
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	
Weight	1061 gm (2lb 6oz)	
Dimensions	27 x 23 x 11 cm (10.6 x 9.1 x 4.3 in)	

3Com 2102 and 2102-IR Business Telephones

The 3Com 2102 and 2102-IR Business Telephones include a 2 x 24 character display, 18 programmable buttons, 10 dedicated feature buttons, and a 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) to exchange data with the phone. 3Com 2102 series telephones that have "PE" in the part number, for example, 3C10226PE, can accept power from an 802.3af-compliant (Power over Ethernet) power supply.

Table 39 3Com 2102 and 2102-IR Business Telephone

Compliance		FCC Class A device	
Electrical			
	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
	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	

3Com 1102 Business Telephone

The 3Com 1102 Business Telephone includes 18 programmable buttons, 10 dedicated feature buttons, a 2 x 16 display, and a 10 Mbps hub port.

Table 40 3Com 1102 Business Telephone Specifications

Weight	1.8 kg (4 lbs)
Compliance	FCC Class A device

Table 40 3Com 1102 Business Telephone Specifications (continued)

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	

3Com 3101 Basic Telephone

The 3Com 3101 Basic Telephone includes a 2 x 24 character display, four programmable buttons, and a 10/100 Mbps switch port.

Table 41 3Com 3101 Basic Telephone Specifications

Compliance	FCC Class A device
Electrical	3C10410A, 3C10410SPA-AA Australia: 240VAC, 50Hz, 13W 3C10410A, 3C10410SPA-CN China: 220VAC, 50Hz, 13W 3C10410A, 3C10410SPA-ME Mainland Europe: 230VAC, 50Hz, 13W 3C10410A, 3C10410SPA-SA South Africa: 230VAC, 50Hz, 13W 3C10410A, 3C10410SPA-UK United Kingdom: 230VAC, 50Hz, 13W 3C10410A, 3C10410SPA-US North America: 120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F) Humidity: 5% to 85% noncondensing
Weight	870 gm (1lb 15oz)
Dimensions	21 x 22 x 11 cm (8.3 x 8.7 x 4.3 in)

3Com 2101 Basic Telephone

The 3Com 2101 Basic Telephone includes a 2 x 24 character display, three programmable buttons, and a 10/100 Mbps switch port.

Table 42 3Com 2101 Basic Telephone Specifications

Compliance	FCC Class A 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	

3Com 3105 Attendant Console

The 3Com 3105 Attendant Console supports up to 100 functions with status LED display (50 buttons, each with high/low shift position). It operates at 10Mbps, in half duplex mode.

Table 43 3Com 3105 Attendant Console Specifications

Compliance	FCC Class A device	
Electrical	3C10224-AA Australia:	240VAC, 50Hz, 13W
	3C10224-CN China:	220VAC, 50Hz, 13W
	3C10224-ME Mainland Europe:	230VAC, 50Hz, 13W
	3C10224-SA South Africa:	230VAC, 50Hz, 13W
	3C10224-UK United Kingdom:	230VAC, 50Hz, 13W
	3C10224-US North America:	120VAC, 60Hz, 13W
Environmental	Ambient temperature: 0 °C to 40 °C (32 °F to 104 °F)	
	Humidity: 5% to 85% noncondensing	
Weight	792 gm (1lb 15oz)	
Dimensions	26 x 19 x 8 cm (10.3 x 7.5 x 3.2 in)	

3Com 1105 Attendant Console

The 3Com 1105 Attendant Console supports up to 100 functions with status LED display (50 buttons, each with high/low shift position). It operates at 10Mbps, in half duplex mode.

Table 44 3Com 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	

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

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.

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.

  For 3-digit internal extensions, try to use the 100-499 range. Have the carrier provide the corresponding three digits for the DID\DNIS numbers/code. For 4-digit extensions, ask for the 1000-4999 range and request that the carrier use corresponding four digits for the DID/DNIS numbers/code.

  For Caller-ID type services, the carrier *must support* in-band ANI.

  For more information, see "Ordering DID (Direct Inward Dialing) Services for T1" on page 132.

- **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. You must 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. 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 an NBX System. The remote audio device can be a 3Com Telephone, an Analog Line Card, an Analog Terminal Adapter (ATA), an Analog Terminal Card, a Digital Line Card, or other product.

For instructions on configuring an NBX device to connect over a broadband connection (for example, a 3Com Telephone in your home, behind a DSL Router) see *"Adding a Remote Telephone"* in Chapter 2 of the *NBX Administrator's Guide*.

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)

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.

NBX default audio settings deliver optimum audio quality. Any change to default audio settings affects audio quality.

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 peak requirements. These bandwidth reduction values do not include link overhead (packet encapsulation, additional bytes for error detection/correction, etc.) which may be added by the 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 (160 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 an ATA connected to an uplink card or hub card in the NBX system, or to use a dedicated switch port for the ATA connected to the fax machine.
- Configuring an ATA port for fax operation optimizes the performance for inbound and outbound faxes. If you make a voice call using the ATA device (for example, if you use the telephone portion of the fax machine), the quality of the audio may be affected. If you make a VTL call using the ATA device, the audio may be unusable.

D OBTAINING SUPPORT FOR YOUR 3COM PRODUCTS

3Com offers product registration, case management, and repair services through eSupport.3com.com. You must have a user name and password to access these services, which are described in this appendix.

Register Your Product to Gain Service Benefits

To take advantage of warranty and other service benefits, you must first register your product at:

http://eSupport.3com.com/

3Com eSupport services are based on accounts that are created or that you are authorized to access.

Solve Problems Online

3Com offers these support tools:

- **3Com Knowledgebase —** Helps you to troubleshoot 3Com products. This query-based interactive tool is located at:

  http://knowledgebase.3com.com

  It contains thousands of technical solutions written by 3Com support engineers.

- **Connection Assistant** — Helps you to install, configure, and troubleshoot 3Com desktop and server network interface cards (NICs), wireless cards, and Bluetooth devices. This diagnostic software is located at:

  http://www.3com.com/connectionassistant

Purchase Extended Warranty and Professional Services

To enhance response times or extend your warranty benefits, you can purchase value-added services such as 24x7 telephone technical support, software upgrades, onsite assistance, or advanced hardware replacement.

Experienced engineers are available to manage your installation with minimal disruption to your network. Expert assessment and implementation services are offered to fill resource gaps and ensure the success of your networking projects. For more information on 3Com Extended Warranty and Professional Services, see:

http://www.3com.com/

Contact your authorized 3Com reseller or 3Com for additional product and support information. See the table of access numbers later in this appendix.

Access Software Downloads

You are entitled to *bug fix / maintenance releases* for the version of software that you initially purchased with your 3Com product. To obtain access to this software, you need to register your product and then use the Serial Number as your login. Restricted Software is available at:

http://eSupport.3com.com/

To obtain software releases that *follow* the software version that you originally purchased, 3Com recommends that you buy an Express or Guardian contract, a Software Upgrades contract, or an equivalent support contract from 3Com or your reseller. Support contracts that include software upgrades cover feature enhancements, incremental functionality, and bug fixes, but they do not include software that is released by 3Com as a separately ordered product. Separately orderable software releases and licenses are listed in the 3Com Price List and are available for purchase from your 3Com reseller.

Contact Us

3Com offers telephone, internet, and e-mail access to technical support and repair services. To access these services for your region, use the appropriate telephone number, URL, or e-mail address from the table in the next section.

Telephone Technical Support and Repair

To obtain telephone support as part of your warranty and other service benefits, you must first register your product at:

http://eSupport.3com.com/

When you contact 3Com for assistance, please have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision level
- Diagnostic error messages
- Details about recent configuration changes, if applicable

To send a product directly to 3Com for repair, you must first obtain a return materials authorization number (RMA). Products sent to 3Com without authorization numbers clearly marked on the outside of the package will be returned to the sender unopened, at the sender's expense. If your product is registered and under warranty, you can obtain an RMA number online at http://eSupport.3com.com/. First-time users must apply for a user name and password.

Telephone numbers are correct at the time of publication. Find a current directory of 3Com resources by region at:
http://csoweb4.3com.com/contactus/

Country	Telephone Number	Country	Telephone Number
Asia, Pacific Rim — Telephone Technical Support and Repair			
Australia	1 800 678 515	Pakistan	+61 2 9937 5083
Hong Kong	800 933 486	Philippines	1235 61 266 2602 or 1800 1 888 9469
India	+61 2 9424 5179 or 000800 650 1111	P.R. of China	800 810 3033
Indonesia	001 803 61009	Singapore	800 6161 463
Japan	00531 616 439 or 03 3507 5984	S. Korea	080 333 3308
Malaysia	1800 801 777	Taiwan	00801 611 261
New Zealand	0800 446 398	Thailand	001 800 611 2000

You can also obtain support in this region at this e-mail address: apr_technical_support@3com.com

Or request a return material authorization number (RMA) by FAX using this number: +61 2 9937 5048

Country	Telephone Number	Country	Telephone Number
Europe, Middle East, and Africa — Telephone Technical Support and Repair			
From anywhere in these regions, call: +44 (0)1442 435529			
From the following countries, call the appropriate number:			
Austria	01 7956 7124	Luxembourg	342 0808128
Belgium	070 700 770	Netherlands	0900 777 7737
Denmark	7010 7289	Norway	815 33 047
Finland	01080 2783	Poland	00800 441 1357
France	0825 809 622	Portugal	707 200 123
Germany	01805 404 747	South Africa	0800 995 014
Hungary	06800 12813	Spain	9 021 60455
Ireland	01407 3387	Sweden	07711 14453
Israel	1800 945 3794	Switzerland	08488 50112
Italy	199 161346	U.K.	0870 909 3266
You can also obtain support in this region using this URL: http://emea.3com.com/support/email.html			
Latin America — Telephone Technical Support and Repair			
Antigua	1 800 988 2112	Guatemala	AT&T +800 998 2112
Argentina	0 810 444 3COM	Haiti	57 1 657 0888
Aruba	1 800 998 2112	Honduras	AT&T +800 998 2112
Bahamas	1 800 998 2112	Jamaica	1 800 998 2112
Barbados	1 800 998 2112	Martinique	571 657 0888
Belize	52 5 201 0010	Mexico	01 800 849CARE
Bermuda	1 800 998 2112	Nicaragua	AT&T +800 998 2112
Bonaire	1 800 998 2112	Panama	AT&T +800 998 2112
Brazil	0800 13 3COM	Paraguay	54 11 4894 1888
Cayman	1 800 998 2112	Peru	AT&T +800 998 2112
Chile	AT&T +800 998 2112	Puerto Rico	1 800 998 2112
Colombia	AT&T +800 998 2112	Salvador	AT&T +800 998 2112
Costa Rica	AT&T +800 998 2112	Trinidad and Tobago	1 800 998 2112
Curacao	1 800 998 2112		AT&T +800 998 2112
Ecuador	AT&T +800 998 2112	Uruguay	AT&T +800 998 2112
Dominican Republic	AT&T +800 998 2112	Venezuela	57 1 657 0888
		Virgin Islands	
You can also obtain support in this region in the following ways:			
■ Spanish speakers, enter the URL: http://lat.3com.com/lat/support/form.html			
■ Portuguese speakers, enter the URL: http://lat.3com.com/br/support/form.html			
■ English speakers in Latin America, send e-mail to: lat_support_anc@3com.com			
US and Canada — Telephone Technical Support and Repair			
All locations:	Network Jacks; Wired or Wireless Network Interface Cards:		1 847-262-0070
	All other 3Com products:		1 800 876 3266

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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, 350 Campus Drive, Marlborough, MA 01752-3064, 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.

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Register Online: When you first call 3Com, we will collect customer and product information from you to determine warranty status. You can eliminate this step and speed your access to technical support by registering online at **http://eSupport.3com.com/**

3Com Corporation
350 Campus Drive
Marlborough, MA
01752-3064

North America:
Tel: 800-NET-3Com
(1-800-638-3266)

Outside North America:
See Appendix D of this guide or www.3com.com